
Modbus

User Manual



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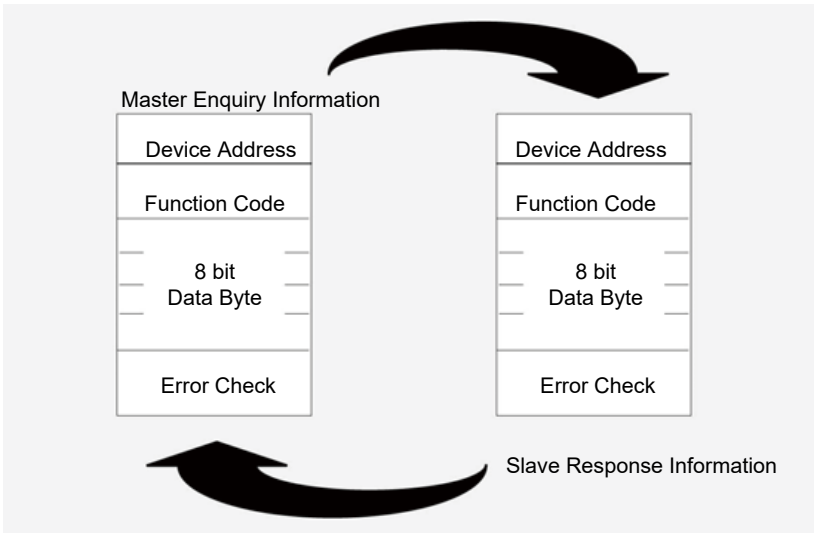
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1 Introduction of Modbus Protocol Communication

Modbus Communication protocol was first developed by Modicon Company. It is a bus protocol widely used in industrial field by adopting the master-slave communication mode, that is, only the host can initiate a request and the slave equipment provides the requested data to the host or performs the operation requested in the query. The master-slave query response mechanism is shown in the figure below.



The host can access the slave devices by specifying the node address, or access all the slave devices by sending broadcast messages. The slave device only responds to its own queries and does not respond to broadcast queries.

Modbus communication protocol is an application layer message transmission protocol, including RTU, ASCII and TCP. The standard Modbus protocol physical layer interface includes RS232, RS485 as well as Ethernet.

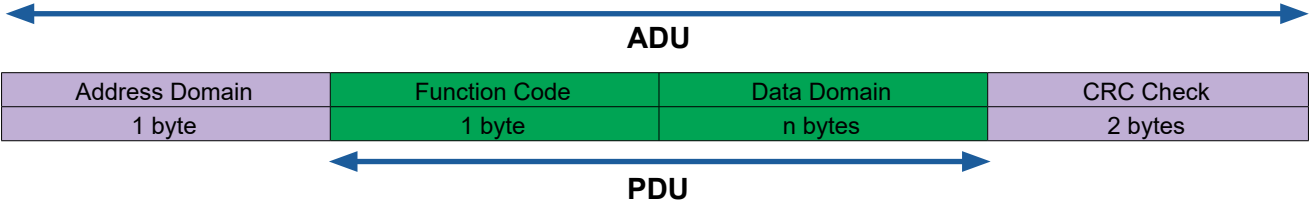
Both Modbus RTU and Modbus ASCII are in serial transmission mode. Among them, Modbus RTU adopts binary representation and compact data structure, with high communication efficiency and wide application. Modbus ASCII adopts ASCII code transmission and uses special characters as the start and end identification of its bytes. Its transmission efficiency is much lower than that of Modbus RTU protocol.

Modbus TCP is a kind of communication transmitted through industrial Ethernet TCP/IP network. Modbus data transmission provides real-time communication between client and server connected to Ethernet TCP/IP network.

2 Modbus Data Frame Structure

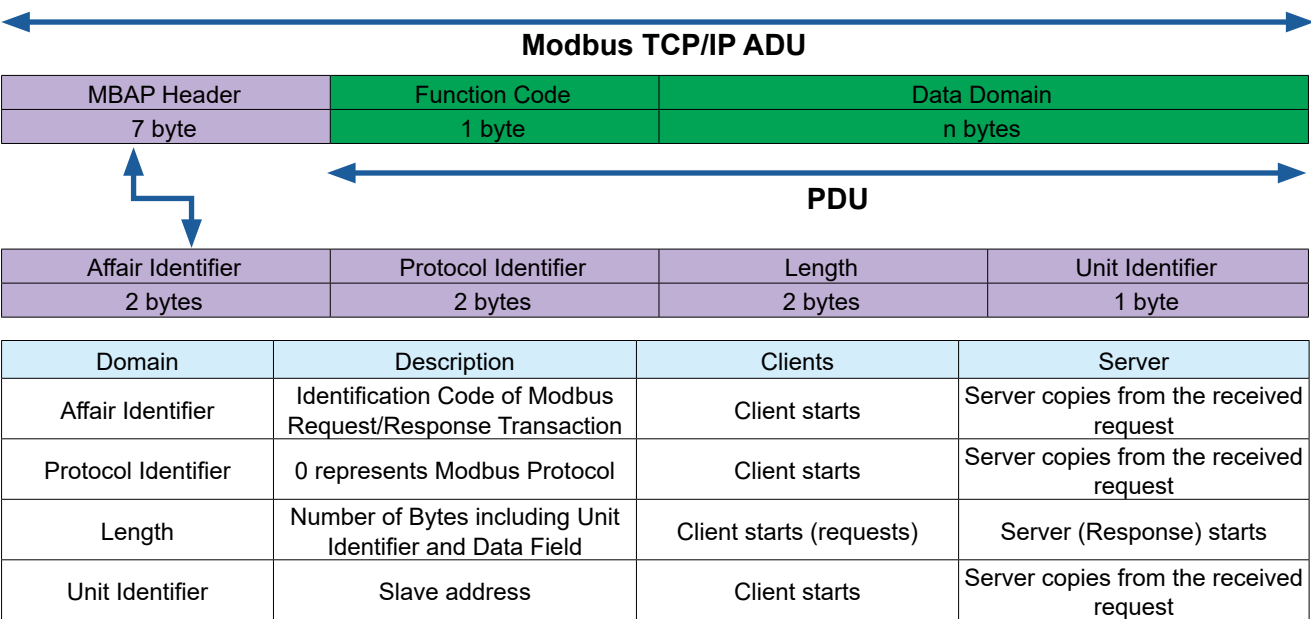
2.1 Modbus RTU Data Frame Structure

Modbus RTU protocol establishes the query message by putting the slave device address (or broadcast), the function code defining the requested operation, the data to be sent as well as CRC verification into the host query. The response message in slave device also uses Modbus RTU message structure, including the slave device address, the function code requesting operation, the data to be sent as well as CRC check. If there is fault when receiving the information or slave cannot operate the requested action, the slave machine will send an abnormal information as a response. Modbus RTU data frame structure is as follows:



2.2 Modbus TCP Data Frame Structure

Modbus TCP protocol is based on Modbus RTU protocol, yet it adds MBAP (Modbus Application Protocol Header) message header on that basis. As TCP is service based on reliable connection, there is no CRC check in Modbus TCP protocol. All the sending and receiving by Modbus TCP ADU depends on TCP transmission control protocol, whose port number is 502. Modbus TCP data frame structure is as follows:



Affair Identifier: Used for transaction pairing. The Modbus server copies the requested transaction identifier in the response.

Protocol Identifier: Modbus protocol identifier is 0x0000.

Length: This includes unit identifier and number of bytes of PDU. The unit is byte.

Unit Identifier: The server IP address identification code, which is set by the Modbus client in the request, must return the same value in the response.

Notes:

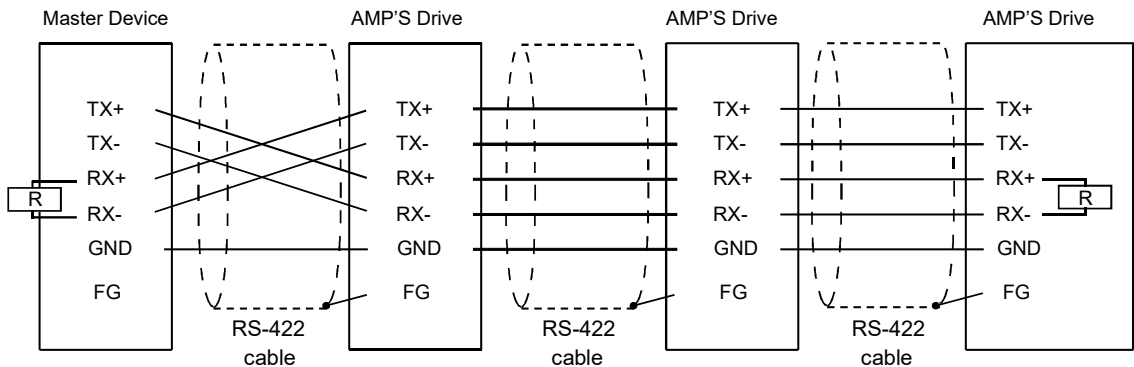
ADU: Application Data Unit

PDU: Protocol Data Unit

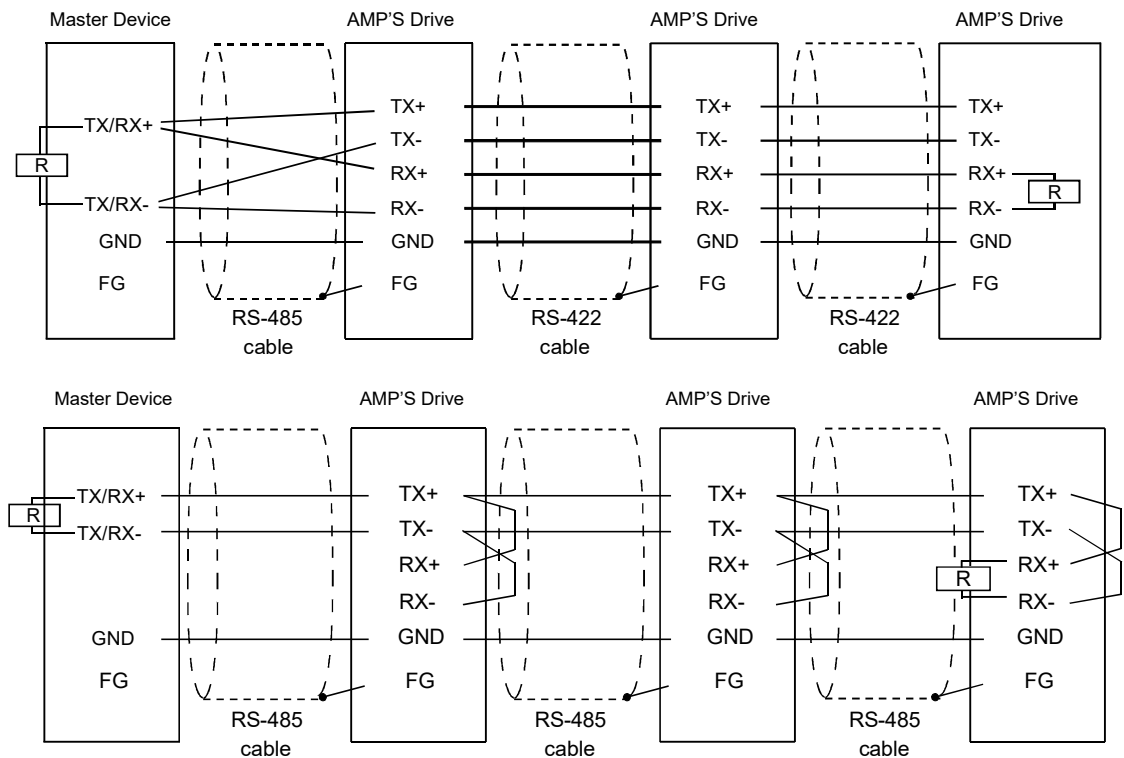
3 Modbus Wiring

3.1 Modbus RTU Wiring

Modbus RTU protocol uses RS-232 or RS-485 physical layer. Using RS-485 physical layer can configure 1-32 slave machine address to form RS-422/RS-485 network topology. Generally, 120Ω terminal resistance is connected in parallel at the physically connected end device. Modbus RTU supports full-duplex and half-duplex connection mode. Usually we recommend using full-duplex connection mode to build communication network. RS422 full-duplex four-wire system wiring mode is shown in the figure:



RS485 half-duplex two-wire system wiring mode is shown in the figure:



Notes: R represents 120Ω terminal resistor

3.2 Modbus TCP Wiring

All products supporting Modbus TCP communication protocol use RJ45 connector, which conforms to 100 base-tx (100Mbps) and can be connected with standard class 5 or above as well as straight-through network cable.

4 Modbus Configuration

4.1 Modbus RTU Configuration

Download the debugging software of corresponding products from AMP'S website (<https://www.applied-motion.com/s/>) and configure the parameters of Modbus RTU communication through it.

4.1.1 Master Communication Parameter Configuration

1. Baud Rate: In accordance with the slave
2. Data bit: 8 bit data bit
3. Stop bit: 1 bit stop bit
4. Check bit: no check bit

4.1.2 AMP Drive Communication Parameter Configuration on Slave Device

1. Slave Device Address

In the same network, each slave device has a unique address. Only the slave device that meets the address requirements will respond to the command sent by the master device. Modbus address "0" is the broadcast address, which cannot act as a slave device address. Under Modbus RTU communication protocol, the scope of slave device address is 1 to 32. If the drive of communication address setting knob switch is installed, the address is set through the knob switch. If the knob switch is not installed on the drive, then it is set by configuration software or by SCL command DA.

2. Baud Rate

The master and slave devices must set at the same baud rate. If the drive of baud rate setting dial switch is installed, then the baud rate is set through the dial switch. If there is not, then it should be set by configuration software or through SCL command BR. The relationship between BR command parameter and baud rate is listed as follow:

- 1: 9600bps
- 2: 19200bps
- 3: 38400bps
- 4: 57600bps
- 5: 115200bps

3. Power-on Working Mode

Configure the operating mode of the drive after power on. Set through SCL command PM. The corresponding relationship between PM command parameter value and working mode in Modbus RTU communication mode is as follows:

- 8: After power on, the driver is in enable working mode.
- 9: After power on, the drive is in the working mode that conduct the Q programming automatically.
- 10: After power on, the drive is in non-enable working mode.

4. Communication Protocol

Configure 32-bit data high-and-low byte discharge sequence and RS-485 communication full-duplex/half-duplex connection mode. It is set by configuration software or by SCL command PR. The corresponding relationship between PR command parameter value and communication protocol is as follows:

- 5: Half-duplex Connection Mode, Big Endian
- 133: Half-duplex Connection Mode, Little Endian
- 261: Full-duplex Wiring Mode, Big Endian
- 389: Full-duplex Connection Mode, Little Endian

Notes:

Big Endian indicates that the high 16-bit data of 32-bit data is arranged at the low address end of memory while the low 16-bit data of all is arranged at the high address end of memory.

Little Endian indicates that the low 16-bit data of 32-bit data is arranged at the low address end of memory while the high 16-bit data of all is arranged at the high address end of memory.

4.2 Modbus TCP Configuration

Download the debugging software of corresponding product at AMP'S website (<https://www.applied-motion.com/s/>) and configure the parameters of Modbus TCP communication through the software.

4.2.1 Client Communication Parameter Configuration

1. Customer IP address: IP address that is in the same network segment with server
2. Port number: Server's port number that uses Modbus TCP communication, fixed with 502

4.2.2 Server AMP Drive Communication Parameter Configuration

1. Server IP Address

In the same network, each slave device has a unique IP address and only the server that meets the address requirements will respond to the client's request order. If the drive of the IP address selection switch is installed, then the IP address is set through the switch. If the IP address selector switch is not installed on the drive, then it is set through the configuration software, which allows you to change the IP address corresponding to each gear of the switch.

2. Power-On Working Mode

Configure the operating mode of the drive after power on. Set through SCL command PM and the PM command parameter value is the same as that in Modbus TCP communication mode. The corresponding relationship between working modes is as follows:

- 8: After power on, the driver is in enable working mode.
- 9: After power on, the drive is in the working mode that conduct the Q programming automatically.
- 10: After power on, the drive is in non-enable working mode.

3. Communication Protocol

Configure the high and low byte arrangement order of 32-bit data. It can be set by configuration software or by SCL command PR. The corresponding relationship between PR command parameter value and data codes is as follows:

- 5: Big Endian
- 133: Little Endian

Notes:

Big Endian indicates that the high 16-bit data of 32-bit data is arranged at the low address end of memory while the low 16-bit data of all is arranged at the high address end of memory.

Little Endian indicates that the low 16-bit data of 32-bit data is arranged at the low address end of memory while the high 16-bit data of all is arranged at the high address end of memory.

5 Function Code Modbus supports

The Modbus function codes Applied Motion Products drive supports are as follows:

0x03: Read hold register

0x06: Write a single register

0x10: Write multiple registers

5.1 Function Code 0x03: Read hold register

Read single or multiple holding registers, which can be max. up to 50 while the broadcast command is not supported.

e.g. Read the drive status with slave address 1 and the register address is 40002, when we assume that the register value is 0x0009.

Command Message(Master)				Response Message(Slave)		
Function	Data	Number of Bytes		Function	Data	Number of Bytes
Slave Address	01H	1		Slave Address	01H	1
Function Code	03H	1		Function Code	03H	1
Starting Data Address	00H(High) 01H(Low)	2		Number of Data (In Byte)	02H	1
Number of Data (In word)	00(High) 01(Low)	2		Content of Starting Data Address 40002	00H(High) 09H(Low)	2
CRC Check Low	D5H	1		CRC Check Low	78H	1
CRC Check High	CAH	1		CRC Check High	42H	1

Master sends: 01 03 00 01 00 01 D5 CA

Slave replies: 01 03 02 00 09 78 42

The data format returned by the exception is: 01 83 XX CRC_L CRC_H

Among them,

XX = 01H means does not support to read the function code 03H;

XX = 02H means illegal register;

XX = 03H means illegal data area;

XX = 11H means register does not support read or write

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Number of Register	CRC Check
Modbus RTU	None	01	03	00 01	00 01	D5 CA
Modbus TCP	00 00 00 00 00 06 01	None	03	00 01	00 01	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	03	02	00 09	78 42
Modbus TCP	00 00 00 00 00 05 01	None	03	02	00 09	None

5.2 Function Code 0x06: Write a single register

Write a single holding register. When a broadcast command is used, all the same registers of the slave devices on the bus perform to write operations.

For example, write the motor running speed to the drive whose slave device address is 11. The register address is 40030. Assuming that the motor speed is set to 12.5 rps, write the data bit $12.5 \times 240 = 3000$, which is converted to hexadecimal BB8H.

Command Message(Master)				Response Message(slave)		
Function	Data	Number of Bytes		Function	Data	Number of Bytes
Slave Address	0BH	1		Slave Address	0BH	1
Function Code	06H	1		Function Code	06H	1
Starting Data Address	00H(High) 1DH(Low)	2		Starting Data Address	00H(High) 1DH(Low)	2
Content of Data	0B(High) B8(Low)	2		Content of Data	0B(High) B8(Low)	2
CRC Check Low	1EH	1		CRC Check Low	1EH	1
CRC Check High	24H	1		CRC Check High	24H	1

Master sends: 0B 06 00 1D 0B B8 1E 24

Slave replies: 0B 06 00 1D 0B B8 1E 24

The data format returned by the exception is: 0B 86 XX CRC_L CRC_H

Among them,

XX = 01H, does not support to write in function code 06H

XX = 02H, illegal register

XX = 03H, illegal data area

XX = 12H, register does not support read or write

XX = 13H, set value exceeds the scope

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	0B	06	00 1D	0B B8	1E 24
Modbus TCP	00 00 00 00 00 06 0B	None	06	00 1D	0B B8	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	0B	06	00 1D	0B B8	1E 24
Modbus TCP	00 00 00 00 00 06 0B	None	06	00 1D	0B B8	None

5.3 Function Code 0x10: Write multiple registers

Write single or multiple holding registers, with a maximum of 50 registers allowed. When a broadcast command is used, the same registers of all slave devices on the bus perform to write operations.

e.g. Write the target distance to the drive with the slave address of 10. The register addresses are 40031 and 40032. Assuming that the target distance is 30000, it is converted into hexadecimal 7530H. It transmits in Big Endian encoding.

Command Message(Master)			Response Message(slave)		
Function	Data	Number of Bytes	Function	Data	Number of Bytes
Slave Address	0AH	1	Slave Address	0AH	1
Function Code	10H	1	Function Code	10H	1
Starting Data Address	00H(High) 1EH(Low)	2	Starting Data Address	00H(High) 1EH(Low)	2
Number of Data (In word)	00H(High) 02H(Low)	2	Number of Data (In word)	00(High) 02(Low)	2
Number of Data (In byte)	04H	1	CRC Check Low	20H	1
Content of First Data Address	00H(High) 00H(Low)	2	CRC Check High	B5H	1
Content of Second Data Address	75H(High) 30H(Low)	2			
CRC Check Low	70H	1			
CRC Check High	8FH	1			

Master sends: 0A 10 00 1E 00 02 04 00 00 75 30 70 8F

Slave replies: 0A 10 00 1E 00 02 20 B5

The data format returned by the exception is:

0A 90 XX CRC_L CRC_H

Among them, XX = 01H: does not support to write in function code 10H

XX = 02H: Illegal register

XX = 03H: Illegal data area

XX = 12H: Register does not support writing in

XX = 13H: Set value is out of range

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	0A	10	00 1E	00 02	04	00 00 75 30	70 8F
Modbus TCP	00 00 00 00 00 0B 0A	None	10	00 1E	00 02	04	00 00 75 30	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	0A	10	00 1E	00 02	20 B5
Modbus TCP	00 00 00 00 00 06 0A	□	10	00 1E	00 02	None

6 SCL Command Code Table

6.1 Operation Code

In the Modbus register table, register 40125 is defined as the operation code register. If we write corresponding operation code to register 40125, then it operates the corresponding movement of operation code. The operation code that supports is listed as below:

SCL Command Encoding Table							
Function	SCL	Opcode	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5
Alarm Reset	AX	0xBA	x	x	x	x	x
Start Jogging	CJ	0x96	x	x	x	x	x
Stop Jogging	SJ	0xD8	x	x	x	x	x
Encoder Function ^{1*}	EF	0xD6	0,1,2 or 6	x	x	x	x
Encoder Position	EP	0x98	Position	Position	x	x	x
Feed to Double Sensor ^{1*}	FD	0x69	I/O Point 1	Condition 1	I/O Point 2	Condition 2	x
Follow Encoder ^{1*}	FE	0xCC	I/O Point	Condition	x	x	x
Feed to Length	FL	0x66	x	x	x	x	x
Feed to Sensor with Mask Distance	FM	0x6A	I/O Point	Condition	x	x	x
Feed and Set Output	FO	0x68	I/O Point	Condition	x	x	x
Feed to Position	FP	0x67	x	x	x	x	x
Feed to Sensor	FS	0x6B	I/O Point	Condition	x	x	x
Feed to Sensor with Safety Distance	FY	0x6C	I/O Point	Condition	x	x	x
Jog Disable ^{1*}	JD	0xA3	x	x	x	x	x
Jog Enable ^{1*}	JE	0xA2	x	x	x	x	x
Motor Disable	MD	0x9E	x	x	x	x	x
Motor Enable	ME	0x9F	x	x	x	x	x
Seek Home	SH	0x6E	I/O Point	Condition	x	x	x
Set Position	SP	0xA5	Position	Position	x	x	x
Filter Input ^{1*}	FI	0xC0	I/O Point	Filter Time	x	x	x
Filter Select Inputs ^{1*}	FX	0xD3	x	x	x	x	x
Step Filter Freq ^{1*}	SF	0x06	Frequency	x	x	x	x
Analog Deadband ^{1*}	AD	0xD2	0.001 V	x	x	x	x
Alarm Reset Input ^{1*}	AI	0x46	Function ('1'..'3')	I/O Point	x	x	x
Alarm Output ^{1*}	AO	0x47	Function ('1'..'3')	I/O Point	x	x	x
Analog Scaling ^{1*}	AS	0xD1	x	x	x	x	x
Define Limits ^{1*}	DL	0x42	1..3	x	x	x	x
Full Closed-loop Control Switch	XM	0x54	0..1	x	x	x	x
Set Output	SO	0x8B	I/O Point	Condition	x	x	x
Wait for Input	WI	0x70	x	x	x	x	x
Queue Load & Execute	QX	0x78	1..12	x	x	x	x

Wait Time	WT	0x6F	0.01 sec	×	×	×	×
Stop Move & Kill Buffer, Max Decel	SK	0xE1	×	×	×	×	×
Stop Move & Kill Buffer, Normal Decel	SKD	0xE2	×	×	×	×	×

Notes: "x" in the table means do not use

***: M56S series products do not support this operation code**

E.g. In AMP product SCL command “FL” means conducting relative position control. In Modbus, writing “0x66” in register 40125 (that is FL’s Opcode in register table) means conducting relative position control.

For detailed operation code function, please refer to HOST COMMAND REFERENCE brochure.

6.2 I/O Command Code

The coding of digital input/output port and status is shown in the table below.

Character	Hex	Description
'0'	0x30	Z-phase signal for encoder
'1'	0x31	Digital input/ output port 1
'2'	0x32	Digital input/ output port 2
'3'	0x33	Digital input/ output port 3
'4'	0x34	Digital input/ output port 4
'5'	0x35	Digital input/ output port 5
'6'	0x36	Digital input/ output port 6
'7'	0x37	Digital output port 7
'8'	0x38	Digital output port 8
'9'	0x39	Digital output port 9
'.'	0x3A	Digital output port 10
','	0x3B	Digital output port 11
'<'	0x3C	Digital output port 12
'L'	0x4C	Low-level (Optocoupler on)
'H'	0x48	High-level (Optocoupler off)
'R'	0x52	Rising edge of the signal
'F'	0x46	Rising edge of the signal

E.g. In AMP product SCL command “FS1F”. In Modbus, when write “0x6B” in register 40125, “0x31” in register 40126 and “0x46” in register 40127, they conduct the same control.

7 Modbus Example Program

AMP different product series have different register address. When it is in use, one can change the register address according to different product series in the following example program.

7.1 Position Control Example Program

The slave station equipment address is 1. Set the acceleration, deceleration, speed and target position. The corresponding AMP SCL commands are as follows:

SCL Command	Set Values	Unit	Register Address	Hexadecimal Format Register Address	Write in Register Value	Explanation
AC	100	Rps/sec	40028	00 1B	600	The default acceleration is 100 and it needs to write 600 in register 40028 (0x0258).
DE	100	Rps/sec	40029	00 1C	600	The default deceleration is 100 and it needs to write 600 in register 40029 (0x0258).
VE	1	Rps	40030	00 1D	240	The default velocity is 1 and it needs to write 240 in register 40030 (0x00F0).
DI	200000	Counts	40031,40032	00 1E, 00 1F	200000	The default aim position is 200000 and it needs to write 200000 in 40031 and 40032 (0x00030D40).

Then:

Notes: Before reading the following message, please read the conversion relationship in note 1) and the message format in Appendix |

Acceleration for planned curves pre write-in (40028)= 600 (0x0258) while deceleration (40029)= 600 (0x0258). Velocity (40030)= 240(0x00F0) and target location (40031, 40032)= 200000(0x00030D40). Note that for the different PR mode, there is difference of high and low bits in 32 bit register input data. Its message is as follows:

If PR = 5, in Big Endian mode:

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 1B	00 05	0A	02 58 02 58 00 F0 00 03 0D 40	CD 83
Modbus TCP	00 00 00 00 00 11 01	None	10	00 1B	00 05	0A	02 58 02 58 00 F0 00 03 0D 40	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	MBAP Message Header Register Amount	CRC Check
Modbus RTU	None	01	10	00 1B	00 05	70 0D
Modbus TCP	00 00 00 00 00 06 01	None	10	00 1B	00 05	None

If PR=133, that is in Little Endian Mode:

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 1B	00 05	0A	02 58 02 58 00 F0 0D 40 00 03	7B 9A
Modbus TCP	00 00 00 00 00 11 01	None	10	00 1B	00 05	0A	02 58 02 58 00 F0 0D 40 00 03	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	00 1B	00 05	70 0D
Modbus TCP	00 00 00 00 00 06 01	None	10	00 1B	00 05	None

Write in command code (40125) data 0x0067 (FP) and execute the absolute position control

The Modbus RTU/TCP message sent by the host is as follows: // **Execute relative movement and SCL command FL**//

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Number of Bytes	CRC Check
Modbus RTU	None	01	06	00 7C	00 66	C8 38
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 66	None

Write in command code (40125) data 0x0067 (FP) and execute the absolute position control

The Modbus RTU/TCP message sent by the host is as follows: // **Execute absolute movement, SCL command FP**//

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Number of Bytes	CRC Check
Modbus RTU	None	01	06	00 7C	00 67	09 F8
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 67	None

Write in command code register (40125) data 0x00E1 (SK) and execute the stop control

The Modbus RTU/TCP message sent by the host is as follows: // **Stop at the maximum deceleration and SCL command SK**//

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Number of Bytes	CRC Check
Modbus RTU	None	01	06	00 7C	00 E1	88 5A
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 E1	None

Read the target location register(40031,40032) and its message lists as follow:

The Modbus RTU/TCP message sent by the host is as follows: //**Read the register 40031, 40032**//

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Number of Bytes	CRC Check
Modbus RTU	None	01	03	00 1E	00 02	A4 0D
Modbus TCP	00 00 00 00 00 06 01	None	03	00 1E	00 02	None

Notes:

1. When reading and writing MODBUS message, pay attention to the conversion relationship between register addresses. For example, register 40125 is converted to 0x007c, i.e $40125 - 40000 - 1 = 124 (0x007C)$
2. Difference between PR = 5 mode and PR = 133 mode:
In order to write the target location $D_i = 200000$ to the target location register (40032, 40031), that is, to the 32-bit register address $200000 (0x030D40)$
 - in PR = 5, i.e. Big Endian mode, it means that the 32-bit data written is high, and the 16-bit data is discharged at the low address end of the memory. The 16-bit data is arranged at the high address end of the memory
 - in PR = 133, i.e. Little Endian mode, it means that the 32-bit data written is low, and the 16-bit data is discharged at the low address end of the memory, The high 16-bit data is placed at the high address end of the memory
3. Speed, acceleration / deceleration register parameter set value unit
 - the set value of speed register parameter is 1/240 RPS
 - set value of acceleration / deceleration register parameter, unit: 1/6 RP

7.2 Velocity Control Example Program

The slave machine's address is 1 and set the acceleration, deceleration as well as velocity, the corresponding AMP SCL commands are as below:

SCL Command	Set Values	Unit	Register Address	Hexadecimal Format Register Address	Write in Register Value	Explanation
JA	100	Rps/sec	40047	00 2E	600	The default acceleration is 100 and needs to write 600 (0x0258) in register 40047
JL	100	Rps/sec	40048	00 2F	600	The default deceleration is 100 and needs to write 600 (0x0258) in register 40048
JS	10	Rps	40049	00 30	2400	The default velocity is 10 and needs to write 2400 (0x0960) in register 40049

Then:

The default acceleration (40047) in writing in planned curves data 0x0258 while deceleration (40048) data 0x00258 and velocity (40049) data 0x0960

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 2E	00 03	06	02 58 02 58 09 60	20 23
Modbus TCP	00 00 00 00 00 0D 01	None	10	00 2E	00 03	06	02 58 02 58 09 60	None

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	00 2E	00 03	E0 01
Modbus TCP	00 00 00 00 00 06 01	None	10	00 2E	00 03	None

Write the command operation code register (40125) data 0x0096 (CJ), that is to execute the start Jog control

The Modbus RTU/TCP message sent by the host is as follows: */**Write 00 96 in register 40125**/*

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 7C	00 96	C8 7C
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 96	None

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 7C	00 96	C8 7C
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 96	None

Write the command operation code register (40125) data 0x00D8 (SJ), that is to execute the stop Jog control

The Modbus RTU/TCP message sent by the host is as follows: */**Write 00 D8 in register 40125**/*

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 7C	00 D8	48 48
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 D8	None

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 7C	00 D8	48 48
Modbus TCP	00 00 00 00 00 06 01	None	06	00 7C	00 D8	None

7.3 Homing Control Example Program

The slave station equipment address is 1 and the Electronic Gear EG= 10000 Pulses/r. Set the acceleration/ deceleration back to the origin as well as the first speed, the second speed and the torque limit using hard limit back to the origin mode. The corresponding AMP SCL command is as follows:

SCL Command	Set Values	Unit	Register Address	Hexadecimal Format Register Address	Write in Register Value	Explanation
HA1	20	Rps/sec	40357,40358	01 64,01 65	120	The default set acceleration/deceleration is 20 and needs to write 120 (0x00000078) into register 40357, 40358
HL1	0	Rps/sec	40359,40360	01 66,01 67	0	Reserve
HV1	5	Rps	40361,40362	01 68,01 69	1200	The default set of the first velocity is 5 and needs to write 1200 (0x000004B0) into register 40361, 40362
HV2	1	Pulses	40363,40364	01 6A,01 6B	240	The default set of second velocity is 1 and needs to write 240 (0x000000F0) into register 40363, 40364
HO	5000	Pulses	40365,40366	01 6C,01 6D	5000	The default set of the homing deviation is 5000 and needs to write 5000 (0x00001388) into register 40365, 40366
HC	70	%	40279,40280	01 16,01 17	700	The torque limit of default hard limit returning to origin mode is 70% and it needs to write 700 (0x000002BC) into registr 40279, 40280

Then:

The default write homing of acceleration and deceleration (40357, 40358) is data 0x00000078 and the data of the first velocity (40361, 40362) is 0x000004B0 while for the second velocity (40363, 40364) is data 0x000000F0. The homing deviation (40365, 40366) IS DATA 0X00001388. Note the difference of PR mode and the difference between high0bit and low-bit when putting in data in the 32-bit register and the result is that below:

If PR = 5, in Big Endian mode:

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	01 64	00 0A	14	00 00 00 78 00 00 00 00 00 00 04 B0 00 00 00 F0 00 00 13 88	66 26
Modbus TCP	00 00 00 00 00 1B 01	None	10	01 64	00 0A	14	00 00 00 78 00 00 00 00 00 00 04 B0 00 00 00 F0 00 00 13 88	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	01 64	00 0A	00 2D
Modbus TCP	00 00 00 00 00 06 01	None	10	01 64	00 0A	None

If PR = 133, in Little Endian mode:

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	01 64	00 0A	14	00 78 00 00 00 00 00 00 04 B0 00 00 00 F0 00 00 13 88 00 00	96 68
Modbus TCP	00 00 00 00 00 1B 01	None	10	01 64	00 0A	14	00 78 00 00 00 00 00 00 04 B0 00 00 00 F0 00 00 13 88 00 00	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	01 64	00 0A	00 2D
Modbus TCP	00 00 00 00 00 06 01	None	10	01 64	00 0A	None

Write in command operation code register (40125) and the data is 0x00DB (FH). When we write parameter register (40126) with data 0x0001. This chooses the first homing mode to execute homing control.

The Modbus RTU/TCP message sent by the host is as follows: `/**Write 00 DB in register 40125 while 00 01 in register 40126**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 7C	00 02	04	00 DB 00 01	45 25
Modbus TCP	00 00 00 00 00 0D 01	None	10	00 7C	00 02	04	00 DB 00 01	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	00 7C	00 02	80 10
Modbus TCP	00 00 00 00 00 06 01	None	10	00 7C	00 02	None

When choosing the first to fourth homing mode, it needs to set the maximum torque of motors when the origin return is in process. Through hard limit it will be returned to the origin mode. The torque limit of 100% corresponds to 1 time of the related torque of the motor.

The default write of the maximum torque (40279/40280) with data 0x000002bc are in the process of returning to the origin, that is, execute according to the maximum 70% of the motor rated torque. The message is as follows:

If PR=5, that is to say, under the Big Endian mode:

The Modbus RTU/TCP message sent by the host is as follows: `/**Write 000002BC in register 40279, 40280 **/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	01 16	00 02	04	00 00 02 BC	7F C8
Modbus TCP	00 00 00 00 00 0B 01	None	10	01 16	00 02	04	00 00 02 BC	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	01 16	00 02	A1 F0
Modbus TCP	00 00 00 00 00 06 01	None	10	01 16	00 02	None

If PR = 133, in Little Endian mode:

The Modbus RTU/TCP message sent by the host is as follows: `/**Write 02BC0000 in register 40279, 40280 **/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	01 16	00 02	04	02 BC 00 00	BF 45
Modbus TCP	00 00 00 00 00 0B 01	None	10	01 16	00 02	04	02 BC 00 00	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	10	01 16	00 02	A1 F0
Modbus TCP	00 00 00 00 00 06 01	None	10	01 16	00 02	None

Note:

1. When the homing return mode chooses the self-defined first to fourth homing mode, after the motor has returned to the mechanical origin, it will continue to move for a period. When the movement completes, the motor current location is 0.
2. When the 1st to the 35th homing modes defined in CiA402 are selected as the homing mode, the motor stops moving after returning to the mechanical origin and is powered on. The current position of motor is the value of the origin offset.
3. The signal input ports of the origin sensor and limit sensor are set in the digital I/O interface of Luna software.

7.4 Example Program of Inner Q Programming Control

7.4.1 Example Program of Applied Motion Products Drive Internal Q programming

Segment 7	Segment 8	Segment 9	Segment 10	Segment 11	Segment 12
Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6

Current Segment

Segment 1

Line	Label	Cmd	Param1	Param2	Comment
1		AC	100		Sets the ""Feed to"" Acceleration
2		DE	100		Sets the ""Feed to"" Deceleration
3		VE	2		Sets the ""Feed to"" Velocity
4		JS	3		Sets the Jog Speed
5		JA	150		Sets the Jog Acceleration
6		MT	1		Enables Multi-Tasking
7	Label3	TI	1H		Tests Input 1 for a High State
8		QJ	F	#Label1	If Test Input False, Jumps over Queue Call
9		QC	2		Opens Segment 2 if TI is True
10	Label1	TI	2H		Tests Input 2 for a High State
11		QJ	F	#Label2	If Test Input False, Jumps over Queue Call
12		QC	3		Opens Segment 3 if TI is True
13	Label2	QG	#Label3		Jumps back to initial test input
14					
15					

7.4.2 Variable Contrast Table of Q Programming

Function	Mapping User Registers	Register Address	Default Curve Parameters	Unit	Write user register value	Explanation
Acceleration	4	4006, 40068	100	Rps/sec	600	Set Value = Acceleration * 6
Deceleration	5	40069, 40070	100	Rps/sec	600	Set Value = Deceleration * 6
Velocity	6	40071, 40072	1	Rps	240	Set Value = Velocity * 240
First Target Location	7	40073, 40074	200000	Counts	200000	1:1 relationship
Second Target Location	8	40075, 40076	-200000	Counts	-200000	1:1 relationship
Operation Code	1	40061, 40062				judge, operate

7.4.3 AMP Setting on Drives compatible with Modbus

Other settings are described as above, but the internal Q programming function of the drives needs to be applied and PM = 9 needs to be set (or in the configuration interface → control mode).

Select SCL/Q and check Modbus → Q program interface and check power on to automatically execute Q program and then download it to the drive. That is, after the drive powers on, the Q program is automatically executed from the first program segment.

7.4.4 Modbus Read/Write Operation

1) If PR = 133, then it is in Little Endian mode

Pre-read the data of user defined register 1 (40061, 40062), 2 (40063, 40064) and 3 (40065, 40066)

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 3C	00 06	05 C4
Modbus TCP	00 00 00 00 00 06 01	None	03	00 3C	00 06	None

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	03	0C	00 00 00 00 00 0B 00 00 00 0C 00 00	E9 B3
Modbus TCP	00 00 00 00 00 0F 01	None	03	0C	00 00 00 00 00 0B 00 00 00 0C 00 00	None

Pre-write user defined register 4 (40067, 40068) data 600, user defined register 5 (40069, 40070) data 600 (0x00000258), user defined register 6 (40071, 40072) data 240 (0x000000F0), user defined register 7 (40073, 40074) data 200000 (0x00030D40) as well as user defined register 8 (40075, 40076) data -200000 (0xFFFFCF2C0).

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 42	00 0A	14	02 58 00 00 02 58 00 00 00 F0 00 00 0D 40 00 03 F2 C0 FF FC	DC FC
Modbus TCP	00 00 00 00 00 1B 01	None	10	00 42	00 0A	14	02 58 00 00 02 58 00 00 00 F0 00 00 0D 40 00 03 F2 C0 FF FC	None

Pre-write the user defined register 1 (40061, 40062) data 11(0x000B) and judge from the inner Q programme in drive, whether the data in register1 is equal to that in register 2. If so, then run to the target position 200000.

The Modbus RTU/TCP message sent by the host is as follows: */**Write 40061, 40062**/*

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 3C	00 02	04	00 0B 00 00	81 2C
Modbus TCP	00 00 00 00 00 0B 01	None	10	00 3C	00 02	04	00 0B 00 00	None

Or */**Write 40061**/*

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 3C	00 0B	08 01
Modbus TCP	00 00 00 00 00 06 01	None	06	00 3C	00 0B	None

Pre-write the user defined register 1 (40061, 40062) data 12(0x0000C) and judge from the inner Q programme in drive, whether the data in register 1 is equal to that in register 3. If so, then run to the target position -200000.

The Modbus RTU/TCP message sent by the host is as follows: */**Write 40061, 40062**/*

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 3C	00 02	04	00 0C 00 00	30 ED
Modbus TCP	00 00 00 00 00 0B 01	None	10	00 3C	00 02	04	00 0C 00 00	None

Or: `/**Write 40061**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 3C	00 0C	49 C3
Modbus TCP	00 00 00 00 00 06 01	None	06	00 3C	00 0C	None

Pre-read the data in user defined register 4(40067, 40068). Q programme can put the content of user defined register 4 into acceleration register A.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 42	00 02	64 1F
Modbus TCP	00 00 00 00 00 06 01	None	03	00 42	00 02	None

Pre-read the data in user defined register 4(40069, 40070). Q programme can put the content of user defined register 5 into deceleration register B.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 44	00 02	84 1E
Modbus TCP	00 00 00 00 00 06 01	None	03	00 44	00 02	None

Pre-read the data in user defined register 6 (40071, 40072). Q programme can put the content in user defined register 6 into velocity register V.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 46	00 02	25 DE
Modbus TCP	00 00 00 00 00 06 01	None	03	00 46	00 02	None

Pre-read the data in user defined register 7 (40073, 40074). Q programme can put the content in user defined register 7 into location register D.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 48	00 02	44 1D
Modbus TCP	00 00 00 00 00 06 01	None	03	00 48	00 02	None

Pre-read the data in user defined register 8 (40075, 40076). Q programme can put the content in user defined register 8 into location register D.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 4A	00 02	E5 DD
Modbus TCP	00 00 00 00 00 06 01	None	03	00 4A	00 02	None

Read the status register (40002) and it can reveal the drive's running status. For example, if the feedback information is 0x4001, it means Q programme is running and the drive is in enable status.

For details please see "Host Command Reference Brochure". Its message is as follows:

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 01	00 01	D5 CA
Modbus TCP	00 00 00 00 00 06 01	None	03	00 01	00 01	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	03	02	40 01	48 44
Modbus TCP	00 00 00 00 00 05 01	None	03	02	40 01	None

Read the line number of Q programme currently executes (40018)

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 11	00 01	D4 0F
Modbus TCP	00 00 00 00 00 06 01	None	03	00 11	00 01	None

Read the acceleration(40028), deceleration(40029), velocity(40030), target location (40031, 40032) of the planned curves.

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 1B	00 05	F5 CE
Modbus TCP	00 00 00 00 00 06 01	None	03	00 1B	00 05	None

2) If PR = 5, then it is in Big Endian mode

Pre-read the data of user defined register 1 (40061, 40062), 2(40063, 40064) and 3 (40065, 40066)

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	CRC Check
Modbus RTU	None	01	03	00 3C	00 06	05 C4
Modbus TCP	00 00 00 00 00 06 01	None	03	00 3C	00 06	None

The Modbus RTU/TCP message returned by the slave station equipment is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	03	0C	00 00 00 00 00 00 00 0B 00 00 00 0C	36 B4
Modbus TCP	00 00 00 00 00 0F 01	None	03	0C	00 00 00 00 00 00 00 0B 00 00 00 0C	None

Pre-write the user defined register 4 (40067, 40068) data 600, user defined register 5 (40069, 40070) data 600 (0x00000258), user defined register 6 (40071, 40072) data 240 (0x000000F0), user defined register 7 (40073, 40074) data 200000(0x00030D40) and user defined register 8 (40075, 40076) data -200000 (0xFFFFCF2C0)

The Modbus RTU/TCP message sent by the host is as follows:

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 42	00 0A	14	00 00 02 58 00 00 02 58 00 00 00 F0 00 03 0D 40 FF FC F2 C0	BF 30
Modbus TCP	00 00 00 00 00 1B 01	None	10	00 42	00 0A	14	00 00 02 58 00 00 02 58 00 00 00 F0 00 03 0D 40 FF FC F2 C0	None

Pre-write the user defined register 1 (40061, 40062) data 11 (0x000B). The Q programme inside the drive judges whether the data in register 1 is equal to that in register 2. If yes, then run to the aim position 200000.

The Modbus RTU/TCP message sent by the host is as follows: `/**Write 40061, 40062**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 3C	00 02	04	00 00 00 0B	B1 29
Modbus TCP	00 00 00 00 00 0B 01	None	10	00 3C	00 02	04	00 00 00 0B	None

Or: `/**Write 40061**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 3C	00 0B	08 01
Modbus TCP	00 00 00 00 00 06 01	None	06	00 3C	00 0B	None

Pre-write the user defined register 1 (40061, 40062) data 12 (0x0000C). The Q programme inside the drive judges whether the data in register 1 is equal to that in register 3. If yes, run to the aim position -200000.

The Modbus RTU/TCP message sent by the host is as follows: `/**Write 40061, 40062**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Register Amount	Number of Bytes	Data Content	CRC Check
Modbus RTU	None	01	10	00 3C	00 02	04	00 00 00 0C	F0 EB
Modbus TCP	00 00 00 00 00 0B 01	None	10	00 3C	00 02	04	00 00 00 0C	None

Or: `/**Write 40061**/`

Modbus Protocol Type	MBAP Message Header	Address Code	Function Code	Register Address	Data Content	CRC Check
Modbus RTU	None	01	06	00 3C	00 0C	49 C3
Modbus TCP	00 00 00 00 00 06 01	None	06	00 3C	00 0C	None

Appendix 1 Function Code Message Format

Function Code 0x03 reads the Keep Register:

Query Message:

QUERY	
Field Name	Example (Hex)
Slave Address	11
Function	03
Starting Address Hi	00
Starting Address Lo	6B
No. of Points Hi	00
No. of Points Lo	03
Error Check (LRC or CRC)	—

Response Message:

RESPONSE	
Field Name	Example (Hex)
Slave Address	11
Function	03
Byte Count	06
Data Hi (Register 40108)	02
Data Lo(Register 40108)	2B
Data Hi(Register 40109)	00
Data Lo(Register 40109)	00
Data Hi(Register 40110)	00
Data Lo(Register 40110)	64
Error Check (LRC or CRC)	—

Function Code 0x06 writes a single register

Query Message:

QUERY	
Field Name	Example (Hex)
Slave Address	11
Function	06
Register Address Hi	00
Register Address Lo	01
Preset Data Hi	00
Preset Data Lo	03
Error Check (LRC or CRC)	—

Response Message:

RESPONSE	
Field Name	Example (Hex)
Slave Address	11
Function	06
Register Address Hi	00
Register Address Lo	01
Preset Data Hi	00
Preset Data Lo	03
Error Check (LRC or CRC)	—

Function Code writes multiple Register

Query Message:

QUERY	
Field Name	Example (Hex)
Slave Address	11
Function	10
Starting Address Hi	00
Starting Address Lo	01
No. of Registers Hi	00
No. of Registers Lo	02
Byte Count	04
Data Hi	00
Data Lo	0A
Data Hi	01
Data Lo	02
Error Check (LRC or CRC)	—

Response Message:

RESPONSE	
Field Name	Example (Hex)
Slave Address	11
Function	10
Starting Address Hi	00
Starting Address Lo	01
No. of Registers Hi	00
No. of Registers Lo	02
Error Check (LRC or CRC)	—

Appendix 2 Modbus abnormal Response and Code

Query Message:

QUERY		
Byte	Contents	Example
1	Slave Address	0A
2	Function	01
3	Starting Address Hi	04
4	Starting Address Lo	A1
5	No. of Coils Hi	00
6	No. of Coils Lo	01
7	LRC	4F

Abnormal Response Message

EXCEPTION RESPONSE		
Byte	Contents	Example
1	Slave Address	0A
2	Function	81
3	Exception Code	02
4	LRC	73

In the above example, the slave machine address is 10 (0AH) and the function code of reading coil status is 01. The address the master visits the coil is 1245(04A1H) while the coil amount is 1(0001H).

If the slave machine does not exist such coil address, then return an abnormal response to the master in abnormal code 02, which means this register address is illegal.

AMP drive abnormal response code table:

Code(Hex)	Name	Meaning
01	Function Code not support	The function machine does not support this function code
02	Illegal Register	The function machine does not support this function code
03	Illegal Data Area	Register for visit is 0
11	Register does not support read	The register address for visit does not support read
12	Register does not support write in	The register address for visit does not support write in
13	The set value exceeds the scope	The value for writing in exceeds the setting scope for the register

Appendix 3 CRC Check

The CRC area of cyclic redundancy check is 2 bytes, including a 16-bit binary data. The CRC value is calculated by the transmitting device and the calculated value is attached to the message.

When receiving information, the receiving device recalculates the CRC value and compares the calculated value with the received actual value in the CRC area. If they are different, an error is generated.

At the beginning of CRC, set all 16-bits of the register to “1” and then put the data of two adjacent 8-bit bytes into the current register. The 8-bit data of each character is used to generate CRC and the start-bit, stop-bit as well as parity-bit are not added to CRC.

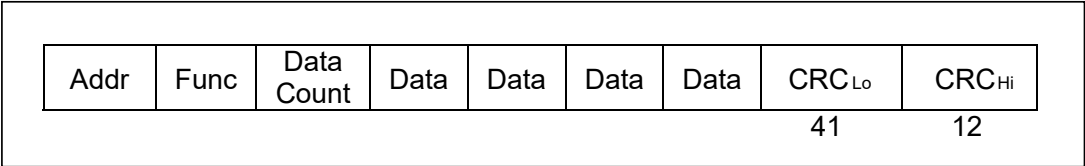
When generating CRC, XOR operation is performed between every 8-bit data and the value of the register. The result is shifted to the right by one bit (in the direction of LSB) and uses “0” to fill in MSB. LSB is tested and if LSB is “1”, it will be XOR with the preset fixed value. If LSB is “0”, no XOR operation will be performed.

Repeat the above process until the shift is 8 times. After the 8th shift, the next 8-bit data is XOR with the current value of the register. After the information is processed, the final value in the deposit is the CRC value.

The process to generate CRC:

- 1. Set the 16-bit CRC register as FFFFH
- 2. The first 8-bit data performs XOR operation with the lower 8-bit of CRC register and puts the result into CRC register.
- 3. Shift CRC register to the right by 1-bit, fill MSB with zero and check LSB.
- 4. (If LSB = 0): repeat 3 and move right for 1-bit.
(If LSB=1): CRC register does XOR operation with A001H
- 5. Repeat 3 and 4 until 8 shifts are completed and the processing of 8-bit bytes is completed
- 6. Repeat steps 2 to 5 and process the next 8-bit data until all bytes are processed
- 7. The final value of CRC register is the register value.
- 8. When putting the CRC value into the message, the upper 8 bits and the lower 8 bits shall be placed separately. Put the CRC value into the message. When sending the 16-bit CRC value in the message, send the low 8 bits first and then the high 8 bits.

If CRC value is 1241:



For example:

Various possible CRC values are loaded in two columns. One column is in the high 8-bit area of 16-bit CRC, which is the CRC value (0-256)

The another kind is the low 8-bit area, which is the low-bit value of CRC.

The CRC obtained by this method is faster than that of calculating a new CRC value for each new character in the buffer.

Note: This function internally exchanges high/low bytes in CRC and its bytes have been exchanged in the returned CRC value.

Hence, the CRC value returned by this function can be directly transmitted in the information.

Example Program:

The function takes 2 independent variables:

unsigned char *puchMsg ; To generate a CRC value, point the pointer to the buffer containing binary data

unsigned short usDataLen ; Number of Bytes in the Buffer.

This function returns CRC as a type "unsigned short". "unsigned short".

The Function CRC generates

```
unsigned short CRC16(puchMsg, usDataLen)
```

```
unsigned char *puchMsg ; /*Calculate CRC according to the number of bytes from the CRC*/
```

```
unsigned short usDataLen ; /* quantity of bytes in message */
```

```
{
```

```
unsigned char uchCRCHi = 0xFF ; /* Initialize high byte */
```

```
unsigned char uchCRCLo = 0xFF ; /* Initialize low byte*/
```

```
unsigned uIndex ; /*CRC Table*/
```

```
while (usDataLen—) /*Through the data buffer*/
```

```
{
```

```
uIndex = uchCRCHi ^ *puchMsgg++ ; /*Calculate CRC*/
```

```
uchCRCHi = uchCRCLo ^ auchCRCHi[uIndex] ;
```

```
uchCRCLo = auchCRCLo[uIndex] ;
```

```
}
```

```
return (uchCRCHi << 8 | uchCRCLo) ;
```

Appendix 4 Modbus/RTU 16-bit CRC Check Example Program

```

using System;
using System.Collections.Generic;
using System.Text;

namespace Modbus
{
    public static class Utility
    {
        private static readonly ushort[] m_CrcTable =
        {
            0X0000, 0XC0C1, 0XC181, 0X0140, 0XC301, 0X03C0, 0X0280, 0XC241,
            0XC601, 0X06C0, 0X0780, 0XC741, 0X0500, 0XC5C1, 0XC481, 0X0440,
            0XCC01, 0X0CC0, 0X0D80, 0XCD41, 0X0F00, 0XCFC1, 0XCE81, 0X0E40,
            0X0A00, 0XCAC1, 0XCB81, 0X0B40, 0XC901, 0X09C0, 0X0880, 0XC841,
            0XD801, 0X18C0, 0X1980, 0XD941, 0X1B00, 0XDBC1, 0XDA81, 0X1A40,
            0X1E00, 0XDEC1, 0XDF81, 0X1F40, 0XDD01, 0X1DC0, 0X1C80, 0XDC41,
            0X1400, 0XD4C1, 0XD581, 0X1540, 0XD701, 0X17C0, 0X1680, 0XD641,
            0XD201, 0X12C0, 0X1380, 0XD341, 0X1100, 0XD1C1, 0XD081, 0X1040,
            0XF001, 0X30C0, 0X3180, 0XF141, 0X3300, 0XF3C1, 0XF281, 0X3240,
            0X3600, 0XF6C1, 0XF781, 0X3740, 0XF501, 0X35C0, 0X3480, 0XF441,
            0X3C00, 0XFCC1, 0XFD81, 0X3D40, 0XFF01, 0X3FC0, 0X3E80, 0xFE41,
            0XFA01, 0X3AC0, 0X3B80, 0XFB41, 0X3900, 0XF9C1, 0XF881, 0X3840,
            0X2800, 0XE8C1, 0XE981, 0X2940, 0XEB01, 0X2BC0, 0X2A80, 0XEA41,
            0XEE01, 0X2EC0, 0X2F80, 0XEF41, 0X2D00, 0XEDC1, 0XEC81, 0X2C40,
            0XE401, 0X24C0, 0X2580, 0XE541, 0X2700, 0XE7C1, 0XE681, 0X2640,
            0X2200, 0XE2C1, 0XE381, 0X2340, 0XE101, 0X21C0, 0X2080, 0XE041,
            0XA001, 0X60C0, 0X6180, 0XA141, 0X6300, 0XA3C1, 0XA281, 0X6240,
            0X6600, 0XA6C1, 0XA781, 0X6740, 0XA501, 0X65C0, 0X6480, 0XA441,
            0X6C00, 0XACC1, 0XAD81, 0X6D40, 0XAF01, 0X6FC0, 0X6E80, 0XAE41,
            0XAA01, 0X6AC0, 0X6B80, 0XAB41, 0X6900, 0XA9C1, 0XA881, 0X6840,
            0X7800, 0XB8C1, 0XB981, 0X7940, 0XBB01, 0X7BC0, 0X7A80, 0XBA41,
            0XBE01, 0X7EC0, 0X7F80, 0XBF41, 0X7D00, 0XBDC1, 0XBC81, 0X7C40,
            0XB401, 0X74C0, 0X7580, 0XB541, 0X7700, 0XB7C1, 0XB681, 0X7640,
        }
    }
}

```

```
0X7200, 0XB2C1, 0XB381, 0X7340, 0XB101, 0X71C0, 0X7080, 0XB041,
0X5000, 0X90C1, 0X9181, 0X5140, 0X9301, 0X53C0, 0X5280, 0X9241,
0X9601, 0X56C0, 0X5780, 0X9741, 0X5500, 0X95C1, 0X9481, 0X5440,
0X9C01, 0X5CC0, 0X5D80, 0X9D41, 0X5F00, 0X9FC1, 0X9E81, 0X5E40,
0X5A00, 0X9AC1, 0X9B81, 0X5B40, 0X9901, 0X59C0, 0X5880, 0X9841,
0X8801, 0X48C0, 0X4980, 0X8941, 0X4B00, 0X8BC1, 0X8A81, 0X4A40,
0X4E00, 0X8EC1, 0X8F81, 0X4F40, 0X8D01, 0X4DC0, 0X4C80, 0X8C41,
0X4400, 0X84C1, 0X8581, 0X4540, 0X8701, 0X47C0, 0X4680, 0X8641,
0X8201, 0X42C0, 0X4380, 0X8341, 0X4100, 0X81C1, 0X8081, 0X4040

};

/// <summary>
/// Calculate Longitudinal Redundancy Check.
/// </summary>
/// <param name="data">The data used in LRC</param>
/// <returns>LRC value</returns>
public static byte CalculateLrc(byte[] data)
{
    if (data == null)
    {
        throw new ArgumentNullException("data");
    }
    byte lrc = 0;
    foreach (byte b in data)
    {
        lrc += b;
    }
    lrc = (byte)((lrc ^ 0xFF) + 1);
    return lrc;
}

/// <summary>
/// Calculate Cyclical Redundancy Check
/// </summary>
/// <param name="data">The data used in CRC</param>
/// <returns>CRC value</returns>
```

```
public static byte[] CalculateCrc(byte[] data)
{
    if (data == null)
    {
        throw new ArgumentNullException("data");
    }
    ushort crc = ushort.MaxValue;
    foreach (byte b in data)
    {
        byte tableIndex = (byte)(crc ^ b);
        crc >>= 8;
        crc ^= m_CrcTable[tableIndex];
    }
    return BitConverter.GetBytes(crc);
}
}
```

The following is the calling method:

```
byte[] _Data = new byte[] { 0x31, 0x32};
byte[] _Crc = Modbus.Utility.CalculateCrc(_Data);
//result: _Crc = { 0x95, 0xf5 }
```

Appendix 5 Modbus Register Table

M56S Series Modbus General Register Table					
Register	Access	Data Type	Units	Description	SCL Register
40001..002	Read	LONG	——	Alarm Code (AL)	f
40003..004	Read	LONG	——	Status Code (SC)	s
40005	Read	SHORT	——	Digital Output Status(IO)	y
40006	Read	SHORT	——	Digital Input Status (IS)	i
40007..008	Read	LONG	pulses	Immediate Absolute Position(IP)	l
40009..010	Read	LONG	pulses	Secondary Encoder Position(EQ) (Only For M56S)	
40011..012	Read	LONG	pulses	Encoder Position(EP)	e
40013..014	Read	LONG	pulses	Internal Use	
40015	R/W	SHORT		Reserved	
40016	Read	SHORT	rev	Encoder Multi-turn Data	
40017	Read	SHORT	1/240rps	Immediate Actual Velocity (IV)	v
40018	Read	SHORT	1/240rps	Immediate Target Velocity (IV1)	w
40019	Read	SHORT	0.1℃	Immediate Drive Temperature (IT)	t
40020	Read	SHORT	0.1℃	Immediate DSP Temperature (IT1)	
40021	Read	SHORT	0.1℃	Immediate Encoder Temperature (IT2)	
40022	Read	SHORT	0.1V	Immediate DC_Bus Voltage (IU)	u
40023..024	Read	LONG	pulses	Immediate Position Error(IX)	x
40025	R/W	SHORT		Number of encoder communication errors	
40026	Read	SHORT	mv	Analog Input 1 (IA1)	j
40027	Read	SHORT	mv	Analog Input 2 (IA2)	k
40028	R/W	SHORT	mv	Analog Output 1 (OA1)	T
40029	R/W	SHORT	mv	Analog Output 2 (OA2)	W(Capital)
40030	Read	SHORT	——	Q Program Line Number	b

M56S Series Modbus General Register Table

Register	Access	Data Type	Units	Description	SCL Register
40031	Read	SHORT	0.1%	Immediate Current Command (IC)	c
40032	Read	SHORT	0.1%	Q Current (IQ)	q
40033..034	Read	LONG	pulses	Relative Distance(ID)	d
40035..036	Read	LONG	pulses	Sensor Position	g
40037	Read	SHORT	—	Condition Code	h
40038	Read	SHORT	—	Control Mode	m
40039	Read	SHORT	—	Velocity Move State	n
40040	Read	SHORT	—	Point-to-Point Move State	o
40041	Read	SHORT	—	Q Segment Number	p
40042	Read	SHORT	—	Model Number	
40043	Read	SHORT	—	Sub Model	
40044	Read	SHORT	—	DSP Firmware Version	
40045	Read	SHORT	—	FPGA Firmware Version NO 1	
40046	Read	SHORT	—	FPGA Firmware Version LA 2	
40047..048	R/W	LONG	pulses	Input Counter	I (Capital)
40049..050	R/W	LONG	pulses	Pulse Counter	S (Capital)
40051	R/W	SHORT	—	Internal Use	
40052..053	Read	LONG	s	Power Up Seconds	
40054..055	Read	LONG	times	Power On Times	
40056	Read	SHORT	—	Encoder Firmware Version	
40057	R/W	SHORT	—	Internal Use	
40058	Read	SHORT	—	Internal Use	
40059	Read	SHORT	—	Internal Use	
40060	R/W	SHORT	1%	Internal Use	
40061	R/W	SHORT	pulses	Internal Use	

M56S Series Modbus General Register Table

Register	Access	Data Type	Units	Description	SCL Register
40062	R/W	SHORT	ms	Internal Use	
40063	R/W	SHORT	—	Internal Use	
40064	R/W	SHORT	—	Internal Use	
40065	R/W	SHORT	0 ~ 3000	Torque Limit Dynamic CW	Y
40066	R/W	SHORT	0 ~ 3000	Torque Limit Dynamic CCW	Z
40067..068	R/W	LONG		Alarm Code	r
40069	Read	SHORT	—	Alarm Buffer 0 Alarm Code Record 0	
40070	Read	SHORT	—	Alarm Buffer 1 Alarm Code Record 1	
40071	Read	SHORT	—	Alarm Buffer 2 Alarm Code Record 2	
40072	Read	SHORT	—	Alarm Buffer 3 Alarm Code Record 3	
40073	Read	SHORT	—	Alarm Buffer 4 Alarm Code Record 4	
40074	Read	SHORT	—	Alarm Buffer 5 Alarm Code Record 5	
40075	Read	SHORT	—	Alarm Buffer 6 Alarm Code Record 6	
40076	Read	SHORT	—	Alarm Buffer 7 Alarm Code Record 7	
40077..078	Read	LONG	s	Alarm Buffer 8 The Generation Time Of Alarm Code Record 0	
40079..080	Read	LONG	s	Alarm Buffer 9 The Generation Time Of Alarm Code Record 1	
40081..082	Read	LONG	s	Alarm Buffer 10 The Generation Time Of Alarm Code Record 2	
40083..084	Read	LONG	s	Alarm Buffer 11 The Generation Time Of Alarm Code Record 3	
40085..086	Read	LONG	s	Alarm Buffer 12 The Generation Time Of Alarm Code Record 4	
40087..088	Read	LONG	s	Alarm Buffer 13 The Generation Time Of Alarm Code Record 5	
40089..090	Read	LONG	s	Alarm Buffer 14 The Generation Time Of Alarm Code Record 6	
40091..092	Read	LONG	s	Alarm Buffer 15 The Generation Time Of Alarm Code Record 7	

M56S Series Modbus General Register Table

Register	Access	Data Type	Units	Description	SCL Register
40093..094	Read	LONG	—	Alarm Buffer 16 The Number Of Alarms	
40095..096	Read	LONG	—	Alarm Buffer 17 The Number Of Alarms	
40097..098	Read	LONG	—	Alarm Buffer 18 The Number Of Alarms	
40099..100	Read	LONG	—	Alarm Buffer 19 The Number Of Alarms	
40101..102	Read	LONG	—	Alarm Buffer 20 The Number Of Alarms	
40103..104	Read	LONG	—	Alarm Buffer 21 The Number Of Alarms	
40105..106	Read	LONG	—	Alarm Buffer 22 The Number Of Alarms	
40107..108	Read	LONG	—	Alarm Buffer 23 The Number Of Alarms	
40109..110	Read	LONG	—	Alarm Buffer 24 The Value Resulting In Alarm Code Record 0	
40111..112	Read	LONG	—	Alarm Buffer 25 The Value Resulting In Alarm Code Record 1	
40113..114	Read	LONG	—	Alarm Buffer 26 The Value Resulting In Alarm Code Record 2	
40115..116	Read	LONG	—	Alarm Buffer 27 The Value Resulting In Alarm Code Record 3	
40117..118	Read	LONG	—	Alarm Buffer 28 The Value Resulting In Alarm Code Record 4	
40119..120	Read	LONG	—	Alarm Buffer 29 The Value Resulting In Alarm Code Record 5	
40121..122	Read	LONG	—	Alarm Buffer 30 The Value Resulting In Alarm Code Record 6	
40123..124	Read	LONG	—	Alarm Buffer 31 The Value Resulting In Alarm Code Record 7	
40125	R/W	SHORT	—	Command Opcode	
40126	R/W	SHORT	—	Parameter 1	
40127	R/W	SHORT	—	Parameter 2	
40128	R/W	SHORT	—	Parameter 3	
40129	R/W	SHORT	—	Parameter 4	
40130	R/W	SHORT	—	Parameter 5	
40131..132	R/W	LONG	—	Accumulator	0
40133..134	R/W	LONG	—	User Defined Register 1	1

M56S Series Modbus General Register Table

Register	Access	Data Type	Units	Description	SCL Register
40135..136	R/W	LONG	—	User Defined Register 2	2
40137..138	R/W	LONG	—	User Defined Register 3	3
40139..140	R/W	LONG	—	User Defined Register 4	4
40141..142	R/W	LONG	—	User Defined Register 5	5
40143..144	R/W	LONG	—	User Defined Register 6	6
40145..146	R/W	LONG	—	User Defined Register 7	7
40147..148	R/W	LONG	—	User Defined Register 8	8
40149..150	R/W	LONG	—	User Defined Register 9	9
40151..152	R/W	LONG	—	User Defined Register 10	:
40153..154	R/W	LONG	—	User Defined Register 11	;
40155..156	R/W	LONG	—	User Defined Register 12	<
40157..158	R/W	LONG	—	User Defined Register 13	=
40159..160	R/W	LONG	—	User Defined Register 14	>
40161..162	R/W	LONG	—	User Defined Register 15	?
40163..164	R/W	LONG	—	User Defined Register 16	@
40165..166	R/W	LONG	—	User Defined Register 17	[
40167..168	R/W	LONG	—	User Defined Register 18	\
40169..170	R/W	LONG	—	User Defined Register 19]
40171..172	R/W	LONG	—	User Defined Register 20	^
40173..174	R/W	LONG	—	User Defined Register 21	_
40175..176	R/W	LONG	—	User Defined Register 22	`

M56S Series---P0(PID)

Register	Access	Data Type	Units	Range	Description	SCL Register
40177..178	R/W	LONG	—	0 ~ 2	Tuning Mode Selection (UM)	
40179..180	R/W	LONG	—	0 ~ 10	Load Type (LY)	
40181..182	R/W	LONG	—	0 ~ 100	Inertia Ratio (NR)	
40183..184	R/W	LONG	—	1 ~ 20	1st Mechanical Stiffness Level (KG)	
40185..186	R/W	LONG	—	1 ~ 20	2nd Mechanical Stiffness Level (KX)	
40187..188	R/W	LONG	0.1Hz	0 ~ 20000	1st Position Loop Gain (KP)	
40189..190	R/W	LONG	ms	0 ~ 30000	1st Position Loop Integral Time Constant (KI)	
40191..192	R/W	LONG	ms	0 ~ 30000	1st Position Loop Derivative Time Constant (KD)	
40193..194	R/W	LONG	0.1Hz	0 ~ 40000	1st Position Loop Derivative Filter (KE)	
40195..196	R/W	LONG	0.01%	-30000 ~ 30000	Velocity Feedforward Gain (KL)	
40197..198	R/W	LONG	0.1Hz	0 ~ 40000	Velocity Feedforward Filter (KR)	
40199..200	R/W	LONG	0.01%	-30000 ~ 30000	1st Velocity Command Gain (KF)	
40201..202	R/W	LONG	0.1Hz	0 ~ 30000	1st Velocity Loop Gain (VP)	
40203..204	R/W	LONG	ms	0 ~ 30000	1st Velocity Loop Integral Time Constant (VI)	
40205..206	R/W	LONG	0.01%	0 ~ 20000	Acceleration Feedforward Gain (KK)	
40207..208	R/W	LONG	0.1Hz	0 ~ 40000	Acceleration Feedforward Filter (KT)	
40209..210	R/W	LONG	0.1Hz	0 ~ 40000	1st Torque Command Filter (KC)	
40211..212	R/W	LONG	0.1Hz	0 ~ 20000	2nd Position Loop Gain (UP)	
40213..214	R/W	LONG	ms	0 ~ 30000	2nd Position Loop Integral Time Constant (UI)	
40215..216	R/W	LONG	ms	0 ~ 30000	2nd Position Loop Derivative Time Constant (UD)	

M56S Series---P0(PID)						
Register	Access	Data Type	Units	Range	Description	SCL Register
40217..218	R/W	LONG	0.1Hz	0 ~ 40000	2nd Position Loop Derivative Filter (UE)	
40219..220	R/W	LONG	0.01%	-30000 ~ 30000	2nd Velocity Command Gain (UF)	
40221..222	R/W	LONG	0.1Hz	0 ~ 30000	2nd Velocity Loop Gain (UV)	
40223..224	R/W	LONG	ms	0 ~ 30000	2nd Velocity Loop Integral Time Constant (UG)	
40225..226	R/W	LONG	0.1Hz	0 ~ 40000	2nd Torque Command Filter (UC)	
40227..228	R/W	LONG	0.1Hz	0 ~ 20000	Full Closed-loop Position Loop Gain (XP) (Only For M56S)	
40229..230	R/W	LONG	ms	0 ~ 30000	Full Closed-loop Position Loop Integral Time Constant (XI) (Only For M56S)	
40231..232	R/W	LONG	ms	0 ~ 32767	Full Closed-loop Position Loop Derivative Time Constant (XD) (Only For M56S)	
40233..234	R/W	LONG	0.1Hz	0 ~ 40000	Full Closed-loop Position Loop Derivative Filter (XE) (Only For M56S)	
40235..236	R/W	LONG	0.01%	-30000 ~ 30000	Full Closed-loop Velocity Command Gain (XF) (Only For M56S)	
40237..238	R/W	LONG	0.1Hz	0 ~ 30000	Full Closed-loop Velocity Loop Gain (XV) (Only For M56S)	
40239..240	R/W	LONG	ms	0 ~ 30000	Full Closed-loop Velocity Loop Integral Time Constant (XG) (Only For M56S)	
40241..242	R/W	LONG	0.1Hz	0 ~ 40000	Full Closed-loop Torque Command Filter (XC) (Only For M56S)	
40243..244	R/W	LONG	—	0 ~ 4	Automatic Gain Switching Method (SD)	O (Capital)
40245..246	R/W	LONG	pulses	0 ~ 2147483647	Use Position Error as the Condition (PN)	
40247..248	R/W	LONG	1/240rps	0 ~ 24000	Use Actual Speed as the Condition (VN)	

M56S Series---P0(PID)

Register	Access	Data Type	Units	Range	Description	SCL Register
40249..250	R/W	LONG	0.1%	0 ~ 3000	Use Actual Torque as the Condition (TN)	
40251..252	R/W	LONG	ms	0 ~ 10000	Gain Switching Waiting Time 1 (SE1)	
40253..254	R/W	LONG	ms	0 ~ 10000	Gain Switching Waiting Time 2 (SE2)	
40255..256	R/W	LONG	——	0 ~ 3	Velocity Feedback Filter (LR)	
40257..258	R/W	LONG	——	0 ~ 1	Self-adapting Filter Switch (AE)	
40259..260	R/W	LONG			Reserved	

M56S Series---P1(Configuration)

Register	Access	Data Type	Units	Range	Description	SCL Register
40261..262	R/W	LONG			Reserved	
40263..264	R/W	LONG	—	1,2,7,11,15,21	Main Control Mode (CM)	
40265..266	R/W	LONG	—	1,2,7,11,15,21	Secondary Control Mode (CN)	
40267..268	R/W	LONG	—	8 ~ 10	Operation Mode When Power-up (PM)	
40269..270	R/W	LONG	—	1 ~ 2	Speed Control Clamp Mode (JM)	
40271..272	R/W	LONG	—	0 ~ 1	Full Closed-loop Control Switch (XM) (Only For M56S)	
40273..274	R/W	LONG	0.1%	-3000 ~ 3000	Torque Command of Internal Torque Mode (GC)	G
40275..276	R/W	LONG	0.1%	0 ~ 3000	1st Torque Limit (CC)	
40277..278	R/W	LONG	0.1%	0 ~ 3000	Target Value of Torque Arrival (CV)	
40279..280	R/W	LONG	0.1%	0 ~ 3000	Torque Limit of Hard Stop Homing (HC)	
40281..282	R/W	LONG	ms	0 ~ 30000	Current Foldback Continuous Time (CL)	
40283..284	R/W	LONG	—	0 ~ 5	Torque Limit Method (LD)	
40285..286	R/W	LONG	—	0 ~ 1	Rotational Direction Setup (RN)	
40287..288	R/W	LONG			Reserved	
40289..290	R/W	LONG	—	1 ~ 511	Communication Protocol (PR)	
40291..292	R/W	LONG	ms	0 ~ 20	Transmit Delay (TD)	
40293..294	R/W	LONG	—	1 ~ 5	RS-485 Baud Rate (BR)	
40295..296	R/W	LONG	—	0 ~ 32	RS-485 Address (DA)	
40297..298	R/W	LONG	—	1 ~ 127	Node ID (CO)	
40299..300	R/W	LONG	—	0 ~ 7	CANopen Baud Rate	
40301..302	R/W	LONG	Ω	10 ~ 32000	Regeneration Resistor Value (ZR)	
40303..304	R/W	LONG	W	1 ~ 32000	Regeneration Resistor Wattage (ZW)	

M56S Series---P1(Configuration)

Register	Access	Data Type	Units	Range	Description	SCL Register
40305..306	R/W	LONG	ms	0 ~ 8000	Regeneration Resistor Time Constant (ZT)	
40307..308	R/W	LONG	—	0 ~ 1	Keypad Setting Lock (PK)	
40309..310	R/W	LONG	—	0 ~ 20	Default Display (DD)	
40311..312	R/W	LONG	—	0 ~ 4294967295	Alarm Mask (MA)	
40313..314	R/W	LONG	0.1%	0 ~ 3000	2nd Torque Limit (CX)	
40315..316	R/W	LONG	0.1%	0 ~ 3000	3rd Torque Limit (CY)	
40317..318	R/W	LONG	0.1%	0 ~ 3000	4th Torque Limit (CZ)	
40319..320	R/W	LONG	ms	0 ~ 30000	Motor Stall protection time (HT)	
40321..322	R/W	LONG	—	0 ~ 5	Dynamic Brake Sequence when Servo Off (YV)	
40323..324	R/W	LONG	—	0 ~ 3	Dynamic Brake Sequence when Fault Occurs (YR)	
40325..326	R/W	LONG	ms	0 ~ 30000	Dynamic Brake Action Time during Deceleration of Servo Off (YM)	
40327..328	R/W	LONG	ms	0 ~ 30000	Dynamic Brake Action Time during Deceleration when Fault Occurs (YN)	
40329..330	R/W	LONG	—	0 ~ 1	Main Power Phase Lost Detecting (OT)	
40331..332	R/W	LONG	0.1%	0 ~ 3000	Current Ramp Limit (RT)	
40331	R/W	SHORT			Reserved	
40332	R/W	SHORT			Reserved	
40333	R/W	SHORT			Reserved	
40334	R/W	SHORT			Reserved	

M56S Series---P2(Trajectory)

Register	Access	Data Type	Units	Range	Description	SCL Register
40335..336	R/W	LONG	1/6(rps/s)	1 ~ 30000	Max Brake Deceleration (AM)	
40337..338	R/W	LONG	1/240rps	0 ~ 24000	Max Velocity (VM)	M
40339..340	R/W	LONG	1/6(rps/s)	1 ~ 30000	Jog Accel (JA)	K
40341..342	R/W	LONG	1/6(rps/s)	1 ~ 30000	Jog Decel (JL)	L
40343..344	R/W	LONG	1/240rps	-24000 ~ 24000	Jog Velocity (JS)	J
40345..346	R/W	LONG	1/6(rps/s)	1 ~ 30000	Point-to-Point Accel (AC)	A
40347..348	R/W	LONG	1/6(rps/s)	1 ~ 30000	Point-to-Point Decel (DE)	B
40349..350	R/W	LONG	1/240rps	0 ~ 24000	Point-to-Point Velocity (VE)	V
40351..352	R/W	LONG	pulses	-2147483647 ~ 2147483647	Point-to-Point Distance (DI)	D
40353..354	R/W	LONG	pulses	-2147483647 ~ 2147483647	Point-to-Point Change Distance (DC)	C
40355..356	R/W	LONG	1/240rps	0 ~ 24000	Point-to-Point Change Velocity (VC)	U
40357..358	R/W	LONG	1/6(rps/s)	1 ~ 30000	Homing Accel /Decel (HA1)	
40359..360	R/W	LONG			Reserved	
40361..362	R/W	LONG	1/240rps	0 ~ 24000	Homing Velocity 1 (HV1)	
40363..364	R/W	LONG	1/240rps	0 ~ 24000	Homing Velocity 2 (HV2)	
40365..366	R/W	LONG	pulses	-2147483647 ~ 2147483647	Homing Offset (HO)	
40367..368	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 1 (JC1)	
40369..370	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 2 (JC2)	
40371..372	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 3 (JC3)	
40373..374	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 4 (JC4)	
40375..376	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 5 (JC5)	

M56S Series---P2(Trajectory)

Register	Access	Data Type	Units	Range	Description	SCL Register
40377..378	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 6 (JC6)	
40379..380	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 7 (JC7)	
40381..382	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 8 (JC8)	
40383..384	R/W	LONG	ms	0 ~ 125	Jerk Time (JT)	
40385..386	R/W	LONG	ms	0 ~ 1000	Jerk Filter (KJ)	
40387..388	R/W	LONG	ms	0 ~ 125	Interpolation Filter (FF)	
40389..390	R/W	LONG	1/240rps	0 ~ 24000	Velocity Limit of Torque Mode (VT)	
40391	R/W	SHORT			Reserved	
40392	R/W	SHORT			Reserved	
40393	R/W	SHORT			Reserved	
40394	R/W	SHORT			Reserved	
40395	R/W	SHORT			Reserved	
40396	R/W	SHORT			Reserved	
40397	R/W	SHORT			Reserved	
40398	R/W	SHORT			Reserved	

M56S Series---P3(Encoder & Step/Dir)						
Register	Access	Data Type	Units	Range	Description	SCL Register
40399..400	R/W	LONG	—	1 ~ 2147483647	Electronic Gear Ratio - Numerator (EN)	
40401..402	R/W	LONG	—	1 ~ 2147483647	Electronic Gear Ratio - Denominator (EU)	
40403..404	R/W	LONG	0.1μs	0 ~ 32000	Pulse Input Noise Filter (SZ)	
40405..406	R/W	LONG	—	0 ~ 31	Pulses Input Setting (PT)	
40407..408	R/W	LONG	pulses	0 ~ 2147483647	Position Error Limit (PF)	
40409..410	R/W	LONG	pulses/rev	200 ~ 131072	Command Pulses per Revolution (EG)	
40411..412	R/W	LONG	—	0 ~ 1	Second Encoder Direction (PV) (Only For M56S)	
40413..414	R/W	LONG			Reserved	
40415..416	R/W	LONG			Reserved	
40417..418	R/W	LONG	rev	1 ~ 100	Hybrid Deviation Clear Setting (XT) (Only For M56S)	
40419..420	R/W	LONG	pulses	0 ~ 2147483647	Hybrid Deviation Fault Threshold (XO) (Only For M56S)	
40421..422	R/W	LONG	pulses/rev	200 ~ 100000	Second Encoder Resolution (XR) (Only For M56S)	
40423..424	R/W	LONG	—	0 ~ 256	Pulses Output Mode (PO)	
40425..426	R/W	LONG	—	0 ~ 13107200	Pulses Output Gear Ratio - Numerator (ON)	
40427..428	R/W	LONG	—	0 ~ 13107200	Pulses Output Gear Ratio - Denominator (OD)	
40429..430	R/W	LONG	—	0 ~ 3	Absolute Encoder Usage (ES)	
40431	R/W	SHORT	—	0 ~ 1	Electronic Gearing Switch (PU)	
40432	R/W	SHORT			Reserved	
40433	R/W	SHORT			Reserved	
40434	R/W	SHORT			Reserved	
40435	R/W	SHORT			Reserved	
40436	R/W	SHORT			Reserved	
40437	R/W	SHORT			Reserved	

M56S Series---P3(Encoder & Step/Dir)

Register	Access	Data Type	Units	Range	Description	SCL Register
40438	R/W	SHORT			Reserved	
40439	R/W	SHORT			Reserved	
40440	R/W	SHORT			Reserved	

M56S Series---P4(Analog)

Register	Access	Data Type	Units	Range	Description	SCL Register
40441..442	R/W	LONG			Reserved	
40443..444	R/W	LONG	1/240rps	0 ~ 24000	Analog Input Velocity Gain (AG)	
40445..446	R/W	LONG	0.1%	0 ~ 3000	Analog Input Torque Gain (AN)	
40447..448	R/W	LONG	mv	-10000 ~ 10000	Analog Input 1 Offset (AV1)	
40449..450	R/W	LONG	mv	-10000 ~ 10000	Analog Input 2 Offset (AV2)	
40451..452	R/W	LONG	mv	0 ~ 255	Analog Input 1 Deadband (AD1)	
40453..454	R/W	LONG	mv	0 ~ 255	Analog Input 2 Deadband (AD2)	
40455..456	R/W	LONG	0.1Hz	1 ~ 20000	Analog Input 1 Filter (AF1)	
40457..458	R/W	LONG	0.1Hz	1 ~ 20000	Analog Input 2 Filter (AF2)	
40459..460	R/W	LONG	mv	-10000 ~ 10000	Analog Input 1 Threshold (AT1)	
40461..462	R/W	LONG	mv	-10000 ~ 10000	Analog Input 2 Threshold (AT2)	
40463..464	R/W	LONG	—	0 ~ 1	Velocity Limit Setting of Torque Control (FA1)	
40465..466	R/W	LONG			Reserved	
40467..468	R/W	LONG			Reserved	
40469..470	R/W	LONG			Reserved	
40471..472	R/W	LONG			Reserved	
40473..474	R/W	LONG	—	1 ~ 32000	Analog Output 1 Scale (OS1) (Only For M56S)	
40475..476	R/W	LONG	—	1 ~ 32000	Analog Output 2 Scale (OS2) (Only For M56S)	
40477..478	R/W	LONG	—	0 ~ 5	Analog Output 1 Function (XA1) (Only For M56S)	

M56S Series---P4(Analog)

Register	Access	Data Type	Units	Range	Description	SCL Register
40479..480	R/W	LONG	—	0 ~ 5	Analog Output 2 Function (XA2) (Only For M56S)	
40481	R/W	SHORT			Reserved	
40482	R/W	SHORT			Reserved	
40483	R/W	SHORT			Reserved	
40484	R/W	SHORT			Reserved	
40485	R/W	SHORT			Reserved	
40486	R/W	SHORT			Reserved	
40487	R/W	SHORT			Reserved	
40488	R/W	SHORT			Reserved	
40489	R/W	SHORT			Reserved	
40490	R/W	SHORT			Reserved	

M56S Series---P5(I/O)

Register	Access	Data Type	Units	Range	Description	SCL Register
40491..492	R/W	LONG	—	0 ~ 46	Digital Input 1 Function (MU1)	
40493..494	R/W	LONG	—	0 ~ 46	Digital Input 2 Function (MU2)	
40495..496	R/W	LONG	—	0 ~ 46	Digital Input 3 Function (MU3)	
40497..498	R/W	LONG	—	0 ~ 46	Digital Input 4 Function (MU4)	
40499..500	R/W	LONG	—	0 ~ 46	Digital Input 5 Function (MU5)	
40501..502	R/W	LONG	—	0 ~ 46	Digital Input 6 Function (MU6)	
40503..504	R/W	LONG	—	0 ~ 46	Digital Input 7 Function (MU7)	
40505..506	R/W	LONG	—	0 ~ 46	Digital Input 8 Function (MU8)	
40507..508	R/W	LONG	—	0 ~ 46	Digital Input 9 Function (MU9)	
40509..510	R/W	LONG	—	0 ~ 46	Digital Input 10 Function (MUA)	
40511	R/W	SHORT			Reserved	
40512	R/W	SHORT			Reserved	
40513	R/W	SHORT			Reserved	
40514	R/W	SHORT			Reserved	

M56S Series---P5(I/O)

Register	Access	Data Type	Units	Range	Description	SCL Register
40515	R/W	SHORT			Reserved	
40516	R/W	SHORT			Reserved	
40517	R/W	SHORT			Reserved	
40518	R/W	SHORT			Reserved	
40519..520	R/W	LONG	——	0 ~ 36	Digital Output 1 Function (MO1)	
40521..522	R/W	LONG	——	0 ~ 36	Digital Output 2 Function (MO2)	
40523..524	R/W	LONG	——	0 ~ 36	Digital Output 3 Function (MO3)	
40525..526	R/W	LONG	——	0 ~ 36	Digital Output 4 Function (MO4)	
40527..528	R/W	LONG	——	0 ~ 36	Digital Output 5 Function (MO5)	
40529..530	R/W	LONG	——	0 ~ 36	Digital Output 6 Function (MO6)	
40531	R/W	SHORT			Reserved	
40532	R/W	SHORT			Reserved	
40533	R/W	SHORT			Reserved	
40534	R/W	SHORT			Reserved	
40535	R/W	SHORT			Reserved	
40536	R/W	SHORT			Reserved	
40537	R/W	SHORT			Reserved	
40538	R/W	SHORT			Reserved	
40539..540	R/W	LONG	ms	0 ~ 32000	Move Command Waiting Time When Brake Release (BD)	
40541..542	R/W	LONG	ms	0 ~ 32000	Servo-off Brake Engage Waiting Time (BE)	
40543..544	R/W	LONG			Reserved	
40545..546	R/W	LONG	——	0 ~ 10	Home Sensor (HX)	
40547..548	R/W	LONG	ms	0 ~ 8000	Digital Input 1 Filter (FI1)	
40549..550	R/W	LONG	ms	0 ~ 8000	Digital Input 2 Filter (FI2)	
40551..552	R/W	LONG	ms	0 ~ 8000	Digital Input 3 Filter (FI3)	
40553..554	R/W	LONG	ms	0 ~ 8000	Digital Input 4 Filter (FI4)	

M56S Series---P5(I/O)						
Register	Access	Data Type	Units	Range	Description	SCL Register
40555..556	R/W	LONG	ms	0 ~ 8000	Digital Input 5Filter (FI5)	
40557..558	R/W	LONG	ms	0 ~ 8000	Digital Input 6 Filter(FI6)	
40559..560	R/W	LONG	ms	0 ~ 8000	Digital Input 7 Filter (FI7)	
40561..562	R/W	LONG	ms	0 ~ 8000	Digital Input 8 Filter (FI8)	
40563..564	R/W	LONG	ms	0 ~ 8000	Digital Input 9 Filter(FI9)	
40565..566	R/W	LONG	ms	0 ~ 8000	Digital Input 10 Filter (FIA)	
40567..568	R/W	LONG	pulses	0 ~ 2147483647	Dynamic Follow Error Thresh- old(PL)	
40569..570	R/W	LONG	pulses	0 ~ 32000	In-position Output Threshold (PD)	
40571..572	R/W	LONG	ms	0 ~ 32000	Time Constant of Motion Output Condition (PE)	
40573..574	R/W	LONG	ms	0 ~ 20000	Pulse Complete Timing (TT)	
40575..576	R/W	LONG	1/240rps	24 ~ 480	Zero Speed Width (ZV)	
40577..578	R/W	LONG	1/240rps	24 ~ 24000	Speed Coincidence Width (VR)	
40579..580	R/W	LONG	1/240rps	0 ~ 24000	Target Value of AT-speed (VV)	
40581..582	R/W	LONG	0.1%	0 ~ 3000	Torque Arrival Width (TV)	
40583..584	R/W	LONG	pulses	-2147483647 ~ 2147483647	Near Target Position (DG)	
40585..586	R/W	LONG	pulses	-2147483647 ~ 2147483647	Positive Software Limit (LP)	
40587..588	R/W	LONG	pulses	-2147483647 ~ 2147483647	Negative Software Limit (LM)	
40589..590	R/W	LONG	—	-4 ~ 35	Homing Method (HE)	
40591..592	R/W	LONG			Reserved	
40593..594	R/W	LONG	—	0 ~ 4	Zero Speed Clamp funnction in velocity mode(MS)	

M56S Series---P7(Gain)

Register	Access	Data Type	Units	Range	Description	SCL Register
40677	R/W	LONG			Reserved	
40678	R/W	LONG		-32768 ~ 32767	Model Control Function(MX)	
40679	R/W	LONG	0.1/s	10 ~ 20000	Model Gain (KM)	
40680	R/W	LONG	0.001	500 ~ 2000	Model Damping(KZ)	
40681	R/W	LONG	0.1Hz	10 ~ 2500	Model Anti-Resonance Frequency(GA)	
40682	R/W	LONG	0.1Hz	10 ~ 2500	Model Resonance Frequency(GB)	
40683	R/W	LONG			Reserved	
40684	R/W	LONG			Reserved	
40685	R/W	LONG			Reserved	
40686	R/W	LONG			Reserved	
40687	R/W	LONG			Reserved	
40688	R/W	LONG	0.1Hz	10 ~ 2000	Vibration Suppression Frequency(SF)	
40689	R/W	LONG	0.01	10 ~ 1000	Vibration Suppression Gain(SG)	
40690	R/W	LONG			Reserved	
40691	R/W	LONG			Reserved	
40692	R/W	LONG			Reserved	
40693	R/W	LONG			Reserved	
40694	R/W	LONG			Reserved	
40695	R/W	LONG			Reserved	
40696	R/W	LONG			Reserved	
40697	R/W	LONG			Reserved	
40698	R/W	LONG		-32768 ~ 32767	Extended Function(EX)	
40699	R/W	LONG	0.01	10 ~ 1000	Disturbance Compensation Gain(DX)	
40700	R/W	LONG	0.01	10 ~ 1000	Disturbance Compensation Gain2(DY)	
40701	R/W	LONG	0.01	0 ~ 100	Disturbance Torque Gain(DT)	
40702	R/W	LONG	0.1Hz	-10000 ~ 10000	Disturbance Delay Compensation (DM)	
40703	R/W	LONG	0.01	1 ~ 1000	Disturbance Response Compensation(DJ)	

M56S Series---P7(Gain)						
Register	Access	Data Type	Units	Range	Description	SCL Register
40704	R/W	LONG	Hz	100 ~ 500	Velocity Observer Band-width(VO)	
40705	R/W	LONG	0.01	1 ~ 1000	Velocity Observer Response Compensation(VJ)	
40706	R/W	LONG	0.1Hz	-10000 ~ 10000	Velocity Observer Delay Compensation(VK)	
40707	R/W	LONG			Reserved	
40708	R/W	LONG	Hz	100 ~ 1000	Anti-Resonance Frequency(VF)	
40709	R/W	LONG	0.01	0 ~ 300	Anti-Resonance Gain(VG)	
40710	R/W	LONG	0.01	0 ~ 300	Anti-Resonance Gain2(VH)	
40711	R/W	LONG	1.0%	1 ~ 1000	Anti-Resonance Compensation Gain(VL)	
40712	R/W	LONG	Hz	-1000 ~ 1000	Anti-Resonance Compensation Frequency1(VX)	
40713	R/W	LONG	Hz	-1000 ~ 1000	Anti-Resonance Compensation Frequency2(VY)	
40714	R/W	LONG	Hz	300 ~ 6000	Anti-Resonance Compensation Frequency3(VZ)	
40715	R/W	LONG			Reserved	
40716	R/W	LONG			Reserved	
40717	R/W	LONG			Reserved	
40718	R/W	LONG			Reserved	
40719	R/W	LONG			Reserved	

ST/STM/SWM/STF Series

Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)	f
40002	Read Only	SHORT	Status Code (SC)	s
40003	Read Only	SHORT	reserved	y
40004	Read Only	SHORT	Input Status	i
40005..6	Read Only	LONG	Encoder Position (IE, EP) [requires encoder feedback]	e
40007..8	Read Only	LONG	Immediate Absolute Position	l
40009..10	Read Only	LONG	Absolute Position Command	P (Capital)
40011	Read Only	SHORT	Immediate Actual Velocity (IV0) [requires encoder feedback]	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1)	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT)	t
40014	Read Only	SHORT	Immediate DC Bus Voltage (IU)	u
40015..16	Read Only	LONG	Immediate Position Error (IX) [requires encoder feedback]	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA) [reserved on STF]	a
40018	Read Only	SHORT	Q Program Line Number	b
40019	Read Only	SHORT	Immediate Current Command (IC)	c
40020..21	Read Only	LONG	Relative Distance (ID)	d
40022..23	Read Only	LONG	Sensor Position	g
40024	Read Only	SHORT	Condition Code	h
40025	Read Only	SHORT	Analog Input 1 (IA1) [reserved on STF]	j
40026	Read Only	SHORT	Analog Input 2 (IA2) [reserved on STF]	k
40027	Read Only	SHORT	Command Mode (CM)	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC)	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE)	B

ST/STM/SWM/STF Series				
Register	Access	Data Type	Description	SCL Register
40030	R/W	SHORT	Velocity (VE)	V
40031..32	R/W	LONG	Point-to-Point Distance (DI)	D
40033..34	R/W	LONG	Change Distance (DC)	C
40035	R/W	SHORT	Change Velocity (VC)	U
40036	Read Only	SHORT	Velocity Move State	n
40037	Read Only	SHORT	Point-to-Point Move State	o
40038	Read Only	SHORT	Q Program Segment Number	p
40039	Read Only	SHORT	Reserved	r
40040	Read Only	SHORT	Phase Error	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags	F
40044	R/W	SHORT	Reserved	G
40045..46	R/W	LONG	Input Counter	I
40047	R/W	SHORT	Jog Accel (JA)	
40048	R/W	SHORT	Jog Decel (JL)	
40049	R/W	SHORT	Jog Velocity (JS)	J
40050	R/W	SHORT	Accel/Decel Current (CA) [STM, SWM only]	
40051	R/W	SHORT	Running Current (CC)	N
40052	R/W	SHORT	Idle Current (CI)	O
40053	R/W	SHORT	Steps per Revolution (EG) / 2	R
40054..55	R/W	LONG	Pulse Counter	S
40056	R/W	SHORT	Analog Position Gain (AP) [reserved on STF]	X
40057	R/W	SHORT	Analog Threshold (AT) [reserved on STF]	Y
40058	R/W	SHORT	Analog Offset (AV) [reserved on STF]	Z

ST/STM/SWM/STF Series

Register	Access	Data Type	Description	SCL Register
40059..60	R/W	LONG	Accumulator	0
40061..62	R/W	LONG	User Defined Register	1
40063..64	R/W	LONG	User Defined Register	2
40065..66	R/W	LONG	User Defined Register	3
40067..68	R/W	LONG	User Defined Register	4
40069..70	R/W	LONG	User Defined Register	5
40071..72	R/W	LONG	User Defined Register	6
40073..74	R/W	LONG	User Defined Register	7
40075..76	R/W	LONG	User Defined Register	8
40077..78	R/W	LONG	User Defined Register	9
40079..80	R/W	LONG	User Defined Register	:
40081..82	R/W	LONG	User Defined Register	;
40083..84	R/W	LONG	User Defined Register	<
40085..86	R/W	LONG	User Defined Register	=
40087..88	R/W	LONG	User Defined Register	>
40089..90	R/W	LONG	User Defined Register	?
40091..92	R/W	LONG	User Defined Register	@
40093..94	R/W	LONG	User Defined Register	[
40095..96	R/W	LONG	User Defined Register	\
40097..98	R/W	LONG	User Defined Register]
40099..100	R/W	LONG	User Defined Register	^
40101..102	R/W	LONG	User Defined Register	_
40103..104	R/W	LONG	User Defined Register	`

ST/STM/SWM/STF Series				
Register	Access	Data Type	Description	SCL Register
40105	R/W	SHORT	Brake Release Delay	
40106	R/W	SHORT	Brake Engage Delay	
40107	R/W	SHORT	Idle Current Delay (CD)	
40108	Read Only	SHORT	(reserved)	
40109	Read Only	SHORT	(reserved)	
40110	R/W	SHORT	Analog Filter Gain [reserved on STF]	
40111	Read Only	SHORT	(reserved)	
40112	Read Only	SHORT	(reserved)	
40113	R/W	SHORT	(reserved)	
40114	R/W	SHORT	(reserved)	
40115	R/W	SHORT	(reserved)	
40116	R/W	SHORT	(reserved)	
40117	R/W	SHORT	(reserved)	
40118	R/W	SHORT	(reserved)	
40119	R/W	SHORT	(reserved)	
40120	R/W	SHORT	(reserved)	
40121	R/W	SHORT	(reserved)	
40122	R/W	SHORT	(reserved)	
40123	R/W	SHORT	(reserved)	
40124	R/W	SHORT	(reserved)	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	R/W	SHORT	Harmonic Smoothing Phase (HP) [STF only] only]	

ST/STM/SWM/STF Series

Register	Access	Data Type	Description	SCL Register
40132	R/W	SHORT	Harmonic Smoothing Gain (HG) [STF only]	
40133	R/W	SHORT	Step Smoothing filter (SF) [STF only]	
40134	R/W	SHORT	(reserved)	
40135	R/W	SHORT	Motor Details [STF only]	
40136	R/W	SHORT	Step Input Mode (PM) [STF only]	
40137	R/W	SHORT	Step Noise Filter [STF only]	
40138	R/W	SHORT	Control Mode (CM) [STF only]	
40139	R/W	SHORT	Power up mode (PM) (STF only)	
40140	R/W	SHORT	Enable Input Use (SI) [STF only]	
40141	R/W	SHORT	Alarm Reset Input Use (AI) [STF only]	
40142	R/W	SHORT	Limit Input Use (DL) [STF only]	
40143	R/W	SHORT	Alarm Output Use (AO) [STF only]	
40144	R/W	SHORT	Brake Output Use (BO) [STF only]	
40145	R/W	SHORT	Motion Output Use (MO) [STF only]	
40146	R/W	SHORT	Anti-resonance filter freq (CF) [STF only]	
40147	R/W	SHORT	Anti-resonance filter gain (CG) [STF only]	
40148	Read Only	SHORT	(reserved)	
40149	R/W	SHORT	Baud Rate (BR) [STF only]	
40150	R/W	SHORT	Comm Protocol [STF-R only]	
40151	R/W	SHORT	RS-485 transmit delay (TD) [STF only]	
40152	Read Only	SHORT	(reserved)	
40153	Read Only	SHORT	(reserved)	
40154	Read Only	SHORT	(reserved)	
40155	Read Only	SHORT	(reserved)	
40156	Read Only	SHORT	(reserved)	
40157	Read Only	SHORT	(reserved)	
40158	Read Only	SHORT	(reserved)	
40159	Read Only	SHORT	(reserved)	
40160	R/W	SHORT	Max Accel (MA) [STF only]	

ST/STM/SWM/STF Series				
Register	Access	Data Type	Description	SCL Register
40161	Read Only	SHORT	(reserved)	
40162	R/W	SHORT	RS-485 address (DA) [STF only]	
40163	Read Only	SHORT	(reserved)	
40164	Read Only	SHORT	(reserved)	
40165	Read Only	SHORT	(reserved)	
40166	Read Only	SHORT	(reserved)	
40167	R/W	SHORT	HOMING_ACCEL1 [STF only]	
40168	R/W	SHORT	[HOMING_ACCEL2] [STF only]	
40169	R/W	SHORT	[HOMING_ACCEL3] [STF only]	
40170	R/W	SHORT	[HOMING_DECEL1] [STF only]	
40171	R/W	SHORT	[HOMING_DECEL2] [STF only]	
40172	R/W	SHORT	[HOMING_DECEL3] [STF only]	
40173	R/W	SHORT	[HOMING_VELOCITY1] [STF only]	
40174	R/W	SHORT	[HOMING_VELOCITY2] [STF only]	
40175	R/W	SHORT	[HOMING_VELOCITY3] [STF only]	
40176	Read Only	SHORT	(reserved)	
40177	Read Only	SHORT	(reserved)	
40178	Read Only	SHORT	(reserved)	
40179	Read Only	SHORT	(reserved)	
40180	Read Only	SHORT	(reserved)	
40181	Read Only	SHORT	(reserved)	
40182	R/W	SHORT	[MASK_ALARM] [STF only]	
40183	R/W	SHORT	[JERK_TIME] [STF only]	
40184	Read Only	SHORT	reserved	
40185..40186	R/W	LONG	[HOMING_DISTANCE] [STF only]	
40187	Read Only	SHORT	(reserved)	
40188	Read Only	SHORT	(reserved)	
40189	Read Only	SHORT	(reserved)	
40190	Read Only	SHORT	(reserved)	

ST/STM/SWM/STF Series

Register	Access	Data Type	Description	SCL Register
40191	Read Only	SHORT	(reserved)	
40192	Read Only	SHORT	(reserved)	
40193	Read Only	SHORT	(reserved)	
40194	Read Only	SHORT	(reserved)	
40195	Read Only	SHORT	(reserved)	
40196	Read Only	SHORT	(reserved)	
40197	Read Only	SHORT	(reserved)	
40198	Read Only	SHORT	(reserved)	
40199	Read Only	SHORT	Drive Model ID Number [STF only]	
40200	Read Only	SHORT	Drive Sub Model ID Number [STF only]	
40201	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_1] [STF only]	
40202	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_2] [STF only]	
40203	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_3] [STF only]	
40204	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_4] [STF only]	
40205	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_5] [STF only]	
40206	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_6] [STF only]	
40207	R/W	SHORT	MotorData [OTHER_MOTOR_NAME_7] [STF only]	
40208	R/W	SHORT	MotorData [OTHER_HYPERBOLIC_GAIN] [STF only]	
40209	R/W	SHORT	MotorData [OTHER_HYPERBOLIC_ PHASE] [STF only]	
40210	R/W	SHORT	MotorData [OTHER_MAX_CURRENT] [STF only]	
40211	R/W	SHORT	MotorData [OTHER_TORQUE] [STF only]	
40212	R/W	SHORT	MotorData [OTHER_INERTIA] [STF only]	
40213	R/W	SHORT	MotorData [OTHER_RATED_TORQUE_1] [STF only]	
40214	R/W	SHORT	MotorData [OTHER_RATED_TORQUE_2] [STF only]	
40215	R/W	SHORT	MotorData [OTHER_ROTOR_INERTIA_1] [STF only]	

ST/STM/SWM/STF Series				
Register	Access	Data Type	Description	SCL Register
40216	R/W	SHORT	MotorData [OTHER_ROTOR_INERTIA_2] [STF only]	
40217	R/W	SHORT	MotorData [OTHER_MOTOR_VOLTAGE] [STF only]	
40218	R/W	SHORT	MotorData [OTHER_MOTOR_RESISTANCE] [STF only]	
40219	R/W	SHORT	MotorData [OTHER_MOTOR_INDUCTANCE] [STF only]	
40220	Read Only	SHORT	reserved	
40221	Read Only	SHORT	reserved	
40222	Read Only	SHORT	reserved	
40223	Read Only	SHORT	reserved	
40224	Read Only	SHORT	reserved	
40225	R/W	SHORT	MotorData[AMP_MOTOR_NAME_1] [STF only]	
40226	R/W	SHORT	MotorData[AMP_MOTOR_NAME_2] [STF only]	
40227	R/W	SHORT	MotorData[AMP_MOTOR_NAME_3] [STF only]	
40228	R/W	SHORT	MotorData[AMP_MOTOR_NAME_4] [STF only]	
40229	R/W	SHORT	MotorData[AMP_MOTOR_NAME_5] [STF only]	
40230	R/W	SHORT	MotorData [AMP_MOTOR_NAME_6] [STF only]	
40231	R/W	SHORT	MotorData [AMP_MOTOR_NAME_7] [STF only]	
40232	R/W	SHORT	MotorData [AMP_HYPERBOLIC_GAIN] [STF only]	
40233	R/W	SHORT	MotorData [AMP_HYPERBOLIC_PHASE] [STF only]	
40234	R/W	SHORT	MotorData [AMP_MAX_CURRENT] [STF only]	
40235	R/W	SHORT	MotorData [AMP_TORQUE] [STF only]	
40236	R/W	SHORT	MotorData [AMP_INERTIA] [STF only]	
40237	R/W	SHORT	MotorData [AMP_RATED_TORQUE_1] [STF only]	
40238	R/W	SHORT	MotorData [AMP_RATED_TORQUE_2] [STF only]	
40239	R/W	SHORT	MotorData [AMP_ROTOR_INERTIA_1] [STF only]	
40240	R/W	SHORT	MotorData [AMP_ROTOR_INERTIA_2] [STF only]	

ST/STM/SWM/STF Series

Register	Access	Data Type	Description	SCL Register
40241	R/W	SHORT	MotorData [AMP_MOTOR_VOLTAGE] [STF only]	
40242	R/W	SHORT	MotorData [AMP_MOTOR_RESISTANCE] [STF only]	
40243	R/W	SHORT	MotorData [AMP_MOTOR_ INDUCTANCE] [STF only]	
40244	Read Only	SHORT	reserved	
40245	Read Only	SHORT	reserved	
40246	Read Only	SHORT	reserved	
40247	Read Only	SHORT	reserved	
40248	Read Only	SHORT	reserved	
40249	Read Only	SHORT	reserved	
40250	Read Only	SHORT	reserved	

SSDC/SSM/TSM/TXM Series

Register	Access	Data Type	Description	SCL Reg
40001	Read Only	SHORT	Alarm Code (AL) Alarm code low 16-bit	f
40002	Read Only	SHORT	Status Code (SC)	s
40003	Read Only	SHORT	Reserved	
40004	Read Only	SHORT	Drive Digital output (IS)	i
40005..6	Read Only	LONG	Encoder Position (IE, EP)	e
40007..8	Read Only	LONG	Immediate Absolute Position (IP)	l
40009..10	Read Only	LONG	Absolute Position Command (SP)	P (Capital)
40011	Read Only	SHORT	Immediate Actual Velocity (IV0)	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1)	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT)	t
40014	Read Only	SHORT	Immediate DC Bus Voltage (IU)	u
40015..16	Read Only	LONG	Immediate Position Error (IX)	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA)	a
40018	Read Only	SHORT	Q Program Line Number	b
40019	Read Only	SHORT	Immediate Current Command (IC)	c
40020..21	Read Only	LONG	Relative Distance (ID)	d
40022..23	Read Only	LONG	Sensor Position	g
40024	Read Only	SHORT	Condition Code	h
40025	Read Only	SHORT	Analog Input 1 (IA1)	j
40026	Read Only	SHORT	Analog Input 2 (IA2)	k
40027	Read Only	SHORT	Command Mode (CM)	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC)	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE)	B
40030	R/W	SHORT	Velocity (VE)	V

SSDC/SSM/TSM/TXM Series

Register	Access	Data Type	Description	SCL Reg
40031..32	R/W	LONG	Point-to-Point Distance (DI)	D
40033..34	R/W	LONG	Change Distance (DC)	C
40035	R/W	SHORT	Change Velocity (VC)	U
40036	Read Only	SHORT	Velocity Move State	n
40037	Read Only	SHORT	Point-to-Point Move State	o
40038	Read Only	SHORT	Q Program Segment Number	p
40039	Read Only	SHORT	Reserved	
40040	Read Only	SHORT	Phase Error	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags	F
40044	R/W	SHORT	Current Command (GC)	G
40045..46	R/W	LONG	Input Counter	I
40047	R/W	SHORT	Jog Accel (JA)	
40048	R/W	SHORT	Jog Decel (JL)	
40049	R/W	SHORT	Jog Velocity (JS)	J
40050	R/W	SHORT	Max Velocity (VM)	
40051	R/W	SHORT	Continuous Current (CC)	N
40052	R/W	SHORT	Peak Current (CP)	
40053	R/W	SHORT	Steps per Revolution (EG)	R
40054..55	R/W	LONG	Pulse Counter	S
40056	R/W	SHORT	Analog Position Gain (AP)	X
40057	R/W	SHORT	Analog Threshold (AT)	Y
40058	R/W	SHORT	Analog Offset (AV)	Z
40059..60	Read Only	LONG	Accumulator	0

SSDC/SSM/TSM/TXM Series				
Register	Access	Data Type	Description	SCL Reg
40061..62	R/W	LONG	User Defined Register 1	1
40063..64	R/W	LONG	User Defined Register 2	2
40065..66	R/W	LONG	User Defined Register 3	3
40067..68	R/W	LONG	User Defined Register 4	4
40069..70	R/W	LONG	User Defined Register 5	5
40071..72	R/W	LONG	User Defined Register 6	6
40073..74	R/W	LONG	User Defined Register 7	7
40075..76	R/W	LONG	User Defined Register 8	8
40077..78	R/W	LONG	User Defined Register 9	9
40079..80	R/W	LONG	User Defined Register 10	:
40081..82	R/W	LONG	User Defined Register 11	;
40083..84	R/W	LONG	User Defined Register 12	<
40085..86	R/W	LONG	User Defined Register 1	=
40087..88	R/W	LONG	User Defined Register 14	>
40089..90	R/W	LONG	User Defined Register 15	?
40091..92	R/W	LONG	User Defined Register 16	@
40093..94	R/W	LONG	User Defined Register 17	[
40095..96	R/W	LONG	User Defined Register 18	\
40097..98	R/W	LONG	User Defined Register 19]
40099..100	R/W	LONG	User Defined Register 20	^
40101..102	R/W	LONG	User Defined Register 21	_
40103..104	R/W	LONG	User Defined Register 22	`
40105	R/W	SHORT	Brake Release Delay (BD)	

SSDC/SSM/TSM/TXM Series

Register	Access	Data Type	Description	SCL Reg
40106	R/W	SHORT	Brake Engage Delay (BE)	
40107	R/W	SHORT	Idle Current Delay (CD) (Only for SSDC)	
40108	Read Only	SHORT	Accel/Decel Current (CA) (Only for SSDC)	
40109	Read Only	SHORT	Firmware version	
40110	R/W	SHORT	Analog Filter Gain (AF)	
40111	Read Only	SHORT	Reserved	
40112	Read Only	SHORT	Alarm Code High bit (AL1)	
40113	Read Only	LONG	Reserved	
40114	R/W	SHORT	Full closed-loop Position Proportion Constant (XP)	
40115	R/W	SHORT	Full closed-loop Position Differential Constant (XD)	
40116	R/W	SHORT	Full closed-loop Differential Filter (XE)	
40117	R/W	SHORT	Full closed-loop Velocity Proportion Constant (XV)	
40118	R/W	SHORT	Full closed-loop Velocity Integrator Constant (XI)	
40119	R/W	SHORT	Filter Input 3# (FI3) (Only for SSDC)	
40120	R/W	SHORT	Filter Input 4# (FI4) (Only for SSDC)	
40121	R/W	SHORT	Except for SSDC	Filter Input 1#
			SSDC	Filter Input 5# (FI5)
40122	R/W	SHORT	Except for SSDC	Filter Input 2#
			SSDC	Filter Input 6# (FI6)
40123	R/W	SHORT	Except for SSDC	Filter Input 3#
			SSDC	Filter Input 7# (FI7)
40124	R/W	SHORT	Except for SSDC	Filter Input 4# (not SSM)
			SSDC	Filter Input 8# (FI8)
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	R/W	SHORT	Full closed-loop Encoder Resolution (XR)	
40132	R/W	SHORT	Full closed-loop Transmission Ration (XL)	

SSDC/SSM/TSM/TXM Series

Register	Access	Data Type	Description	SCL Reg
40133	R/W	SHORT	Smoothing filter frequency (SF)	
40134	R/W	SHORT	Address Upper (AU) (only for SS)	
			Full closed-loop Mode Select (XM) (only for SSDC)	
40135	R/W	SHORT	Motor Detail	
40136	R/W	SHORT	Step Mode/Input noise filter (SZ)	
40137	Read Only	SHORT	Reserved	
40138	R/W	SHORT	Control Mode set (CM)	
40139	R/W	SHORT	Operation Mode (PM)	
40140	R/W	SHORT	Servo Enable (SI)	
40141	R/W	SHORT	Alarm Reset (AI)	
40142	R/W	SHORT	Define Limits Input (DL)	
40143	R/W	SHORT	Alarm Output (AO)	
40144	R/W	SHORT	Brake Output (BO)	
40145	R/W	SHORT	Motion Output (MO) Y3,Y4, Y5, Y6	
40146	R/W	SHORT	Anti-Resonance Filter Frequency (CF) (SSDC only)	
40147	R/W	SHORT	Anti-Resonance Filter Gain (CG) (SSDC only)	
40148	R/W	SHORT	Low Voltage (LV)	
40149	R/W	SHORT	Baud Rate (BR)	
40150	R/W	SHORT	Communication Protocol (PR)	
40151	R/W	SHORT	Transmit Delay (TD)	
40152	R/W	SHORT	Full closed-loop Inertia Feed Forward Constant (XK)	
40153	R/W	SHORT	Position Proportional Gain (KP)	
40154	R/W	SHORT	Position Derivative Gain (KD)	
40155	R/W	SHORT	Derivative Filter factor (KE)	
40156	R/W	SHORT	Velocity Proportional Gain (VP)	

SSDC/SSM/TSM/TXM Series

Register	Access	Data Type	Description		SCL Reg
40157	R/W	SHORT	Velocity Integral Gain (VI)		
40158	R/W	SHORT	Acceleration Feed-forward (KK)		
40159	R/W	SHORT	Torque Command Filter (KC)		
40160	R/W	SHORT	Max Acceleration (AM)		
40161	R/W	SHORT	Position Fault Window (PF)		
40162	R/W	SHORT	Address (DA)		
40163	R/W	SHORT	Analog Velocity Gain (AG)		
40164	R/W	SHORT	Jog Change Velocity(JC)		
40165	R/W	SHORT	Jog Mode (JM)		
40166	R/W	SHORT	Analog Torque Gain (AN)		
40167	R/W	SHORT	Homing Acceleration 1 (HA1)		
40168	R/W	SHORT	Homing Acceleration 2 (HA2)		
40169	R/W	SHORT	Homing Acceleration 3 (HA3)		
40170	R/W	SHORT	Homing Deceleration 1 (HL1)		
40171	R/W	SHORT	Homing Deceleration 2 (HL2)		
40172	R/W	SHORT	Homing Deceleration 3 (HL3)		
40173	R/W	SHORT	Homing Velocity 1 (HV1)		
40174	R/W	SHORT	Homing Velocity 2 (HV2)		
40175	R/W	SHORT	Homing Velocity 3 (HV3)		
40176	R/W	SHORT	Hard-Stop Current Limit (HC)		
40177	R/W	SHORT	Pulse Complete Timing (TT)		
40178	R/W	SHORT	TSM, SSM series	Tach Output (TO)	
			SS Series	Dumping Power (DP)	
40179	R/W	SHORT	Dynamic Position Error Count (PL)		

SSDC/SSM/TSM/TXM Series				
Register	Access	Data Type	Description	SCL Reg
40180	R/W	SHORT	In-Position Timing (PE)	
40181	R/W	SHORT	In-Position Counts (PD)	
40182	R/W	SHORT	Alarm Mask (MA)	
40183..187	Read Only	LONG	Reserved	
40188..189	R/W	LONG	Homing Distance (HO) (Only for SSDC)	
40190..191	Read Only	LONG	Full closed-loop Encoder Position (IW) (Only for SSDC)	
40192..193	Read Only	LONG	Full closed-loop Hibrid Deviation Fault Threshold (XO) (Only for SSDC)	
40194	R/W	SHORT	Full closed-loop Hibrid Deviation Clear Setting (XT) (Only for SSDC)	
40195	R/W	SHORT	Full closed-loop Overall Servo Filter(XC) (Only for SSDC)	
40196	R/W	SHORT	Communication Watchdog Enable (ZE) (Only for SSDC)	
40197	R/W	SHORT	Communication Watchdog Time (ZS) (Only for SSDC)	
40198	R/W	SHORT	Communication Watchdog Action (ZA) (Only for SSDC)	
40199	Read Only	SHORT	Model Number (Only for SSDC) (MV)	
40200	Read Only	SHORT	Sub Model (Only for SSDC) (MV1)	

MBDV/MDX+ Series

Register	Access	Data Type	Units	Description	SCL Register
40001..002	Read Only	LONG	——	Alarm Code (AL)	f
40003..004	Read Only	LONG	——	Status Code (SC)	s
40005	Read Only	SHORT	——	Digital Output Status (IO)	y
40006	Read Only	SHORT	——	Digital Input Status (IS)	i
40007..008	Read Only	LONG	pulses	Immediate Absolute Position (IP)	l
40009..010	Read Only	LONG	pulses	Secondary Encoder Position (EQ)	
40011..012	Read Only	LONG	pulses	Encoder Position (EP)	e
40013..014	Read Only	LONG	pulses	Internal Use	
40015	R/W	SHORT		Reserved	
40016	Read Only	SHORT	rev	Encoder Multi-turn Data	
40017	Read Only	SHORT	1/240rps	Immediate Actual Velocity (IV)	v
40018	Read Only	SHORT	1/240rps	Immediate Target Velocity (IV1)	w
40019	Read Only	SHORT	0.1°C	Immediate Drive Temperature (IT)	t
40020	Read Only	SHORT	0.1°C	Immediate DSP Temperature (IT1)	
40021	Read Only	SHORT	0.1°C	Immediate Encoder Temperature (IT2)	
40022	Read Only	SHORT	0.1V	Immediate DC_Bus Voltage (IU)	u
40023..024	Read Only	LONG	pulses	Immediate Position Error (IX)	x
40025	R/W	SHORT		Reserved	
40026	Read Only	SHORT	mv	Analog Input 1 (IA1)	j
40027	Read Only	SHORT	mv	Analog Input 2 (IA2)	k
40028	R/W	SHORT	mv	Analog Output 1 (OA1)	T
40029	R/W	SHORT	mv	Analog Output 2 (OA2)	W (Capital)
40030	Read Only	SHORT	——	Q Program Line Number	b

MBDV/MDX+ Series					
Register	Access	Data Type	Units	Description	SCL Register
40031	Read Only	SHORT	0.1%	Immediate Current Command (IC)	c
40032	Read Only	SHORT	0.1%	Q Current (IQ)	q
40033..034	Read Only	LONG	pulses	Relative Distance (ID)	d
40035..036	Read Only	LONG	pulses	Sensor Position	g
40037	Read Only	SHORT	—	Condition Code	h
40038	Read Only	SHORT	—	Control Mode	m
40039	Read Only	SHORT	—	Velocity Move State	n
40040	Read Only	SHORT	—	Point-to-Point Move State	o
40041	Read Only	SHORT	—	Q Segment Number	p
40042	Read Only	SHORT	—	Model Number	
40043	Read Only	SHORT	—	Sub Model	
40044	Read Only	SHORT	—	DSP Firmware Version	
40045	Read Only	SHORT	—	FPGA Firmware Version NO	
40046	Read Only	SHORT	—	FPGA Firmware Version LA	
40047..048	R/W	LONG	pulses	Input Counter	I (Capital)
40049..050	R/W	LONG	pulses	Pulse Counter	S (Capital)
40051	R/W	SHORT	—	Internal Use	
40052..053	Read Only	LONG	s	Power Up Seconds	
40054..055	Read Only	LONG	times	Power On Times	
40056	Read Only	SHORT	—	Encoder Firmware Version	
40057	R/W	SHORT	—	Internal Use	
40058	Read Only	SHORT	—	Internal Use	
40059	Read	SHORT	—	Internal Use	
40060	R/W	SHORT	1%	Internal Use	

MBDV/MDX+ Series

Register	Access	Data Type	Units	Description	SCL Register
40061	R/W	SHORT	pulses	Internal Use	
40062	R/W	SHORT	ms	Internal Use	
40063	R/W	SHORT	—	Internal Use	
40064	R/W	SHORT	—	Internal Use	
40065	R/W	SHORT	0 ~ 3000	Torque Limit Dynamic CW	Y
40066	R/W	SHORT	0 ~ 3000	Torque Limit Dynamic CCW	Z(Capital)
40067..68	Read Only	LONG	—	Alarm Code	r
40069	Read Only	SHORT	—	Alarm Buffer 0 Alarm Code Record 0	
40070	Read Only	SHORT	—	Alarm Buffer 1 Alarm Code Record 1	
40071	Read Only	SHORT	—	Alarm Buffer 2 Alarm Code Record 2	
40072	Read Only	SHORT	—	Alarm Buffer 3 Alarm Code Record 3	
40073	Read Only	SHORT	—	Alarm Buffer 4 Alarm Code Record 4	
40074	Read Only	SHORT	—	Alarm Buffer 5 Alarm Code Record 5	
40075	Read Only	SHORT	—	Alarm Buffer 6 Alarm Code Record 6	
40076	Read Only	SHORT	—	Alarm Buffer 7 Alarm Code Record 7	
40077..78	Read Only	LONG	s	Alarm Buffer 8 The Generation Time Of Alarm Code Record 0	
40079..80	Read Only	LONG	s	Alarm Buffer 9 The Generation Time Of Alarm Code Record 1	
40081..82	Read Only	LONG	s	Alarm Buffer 10 The Generation Time Of Alarm Code Record 2	
40083..84	Read Only	LONG	s	Alarm Buffer 11 The Generation Time Of Alarm Code Record 3	
40085..86	Read Only	LONG	s	Alarm Buffer 12 The Generation Time Of Alarm Code Record 4	
40087..88	Read Only	LONG	s	Alarm Buffer 13 The Generation Time Of Alarm Code Record 5	
40089..90	Read Only	LONG	s	Alarm Buffer 14 The Generation Time Of Alarm Code Record 6	
40091..92	Read Only	LONG	s	Alarm Buffer 15 The Generation Time Of Alarm Code Record 7	
40093..94	Read Only	LONG	—	Alarm Buffer 16	

MBDV/MDX+ Series					
Register	Access	Data Type	Units	Description	SCL Register
40095..96	Read Only	LONG	—	Alarm Buffer 17	
40097..98	Read Only	LONG	—	Alarm Buffer 18	
40099..100	Read	LONG	—	Alarm Buffer 19	
40101..102	Read Only	LONG	—	Alarm Buffer 20	
40103..104	Read Only	LONG	—	Alarm Buffer 21	
40105..106	Read Only	LONG	—	Alarm Buffer 22	
40107..108	Read Only	LONG	—	Alarm Buffer 23	
40109..110	Read Only	LONG	—	Alarm Buffer 24 The Value Resulting In Alarm Code Record 0	
40111..112	Read Only	LONG	—	Alarm Buffer 25 The Value Resulting In Alarm Code Record 1	
40113..114	Read Only	LONG	—	Alarm Buffer 26 The Value Resulting In Alarm Code Record 2	
40115..116	Read Only	LONG	—	Alarm Buffer 27 The Value Resulting In Alarm Code Record 3	
40117..118	Read Only	LONG	—	Alarm Buffer 28 The Value Resulting In Alarm Code Record 4	
40119..120	Read Only	LONG	—	Alarm Buffer 29 The Value Resulting In Alarm Code Record 5	
40121..122	Read Only	LONG	—	Alarm Buffer 30 The Value Resulting In Alarm Code Record 6	
40123..124	Read Only	LONG	—	Alarm Buffer 31 The Value Resulting In Alarm Code Record 7	
40125	R/W	SHORT	—	Command Opcode	
40126	R/W	SHORT	—	Parameter 1	
40127	R/W	SHORT	—	Parameter 2	
40128	R/W	SHORT	—	Parameter 3	
40129	R/W	SHORT	—	Parameter 4	
40130	R/W	SHORT	—	Parameter 5	
40131..132	Read Only	LONG	—	Accumulator	0
40133..134	R/W	LONG	—	User Defined Register 1	1
40135..136	R/W	LONG	—	User Defined Register 2	2
40137..138	R/W	LONG	—	User Defined Register 3	3

MBDV/MDX+ Series

Register	Access	Data Type	Units	Description	SCL Register
40139..140	R/W	LONG	—	User Defined Register 4	4
40141..142	R/W	LONG	—	User Defined Register 5	5
40143..144	R/W	LONG	—	User Defined Register 6	6
40145..146	R/W	LONG	—	User Defined Register 7	7
40147..148	R/W	LONG	—	User Defined Register 8	8
40149..150	R/W	LONG	—	User Defined Register 9	9
40151..152	R/W	LONG	—	User Defined Register 10	:
40153..154	R/W	LONG	—	User Defined Register 11	;
40155..156	R/W	LONG	—	User Defined Register 12	<
40157..158	R/W	LONG	—	User Defined Register 13	=
40159..160	R/W	LONG	—	User Defined Register 14	>
40161..162	R/W	LONG	—	User Defined Register 15	?
40163..164	R/W	LONG	—	User Defined Register 16	@
40165..166	R/W	LONG	—	User Defined Register 17	[
40167..168	R/W	LONG	—	User Defined Register 18	\
40169..170	R/W	LONG	—	User Defined Register 19]
40171..172	R/W	LONG	—	User Defined Register 20	^
40173..174	R/W	LONG	—	User Defined Register 21	_
40175..176	R/W	LONG	—	User Defined Register 22	`

MBDV/MDX+ Series—P0 Group(PID)

Register	Access	Data Type	Units	Range	Description	SCL Register
40177..178	R/W	LONG	—	0 ~ 2	Tuning Mode Selection (UM)	
40179..180	R/W	LONG	—	0 ~ 10	Load Type (LY)	
40181..182	R/W	LONG	—	0 ~ 100	Inertia Ratio (NR)	
40183..184	R/W	LONG	—	1 ~ 20	1st Mechanical Stiffness Level (KG)	
40185..186	R/W	LONG	—	1 ~ 20	2nd Mechanical Stiffness Level (KX)	
40187..188	R/W	LONG	0.1Hz	0 ~ 20000	1st Position Loop Gain (KP)	
40189..190	R/W	LONG	ms	0 ~ 30000	1st Position Loop Integral Time Constant (KI)	
40191..192	R/W	LONG	ms	0 ~ 30000	1st Position Loop Derivative Time Constant (KD)	
40193..194	R/W	LONG	0.1Hz	0 ~ 40000	1st Position Loop Derivative Filter (KE)	
40195..196	R/W	LONG	0.01%	-30000 ~ 30000	Velocity Feedforward Gain (KL)	
40197..198	R/W	LONG	0.1Hz	0 ~ 40000	Velocity Feedforward Filter (KR)	
40199..200	R/W	LONG	0.01%	-30000 ~ 30000	1st Velocity Command Gain (KF)	
40201..202	R/W	LONG	0.1Hz	0 ~ 30000	1st Velocity Loop Gain (VP)	
40203..204	R/W	LONG	ms	0 ~ 30000	1st Velocity Loop Integral Time Constant (VI)	
40205..206	R/W	LONG	0.01%	0 ~ 20000	Acceleration Feedforward Gain (KK)	
40207..208	R/W	LONG	0.1Hz	0 ~ 40000	Acceleration Feedforward Filter (KT)	
40209..210	R/W	LONG	0.1Hz	0 ~ 40000	1st Torque Command Filter (KC)	
40211..212	R/W	LONG	0.1Hz	0 ~ 20000	2nd Position Loop Gain (UP)	
40213..214	R/W	LONG	ms	0 ~ 30000	2nd Position Loop Integral Time Constant (UI)	
40215..216	R/W	LONG	ms	0 ~ 30000	2nd Position Loop Derivative Time Constant (UD)	

MBDV/MDX+ Series—P0 Group(PID)

Register	Access	Data Type	Units	Range	Description	SCL Register
40217..218	R/W	LONG	0.1Hz	0 ~ 40000	2nd Position Loop Derivative Filter (UE)	
40219..220	R/W	LONG	0.01%	-30000 ~ 30000	2nd Velocity Command Gain (UF)	
40221..222	R/W	LONG	0.1Hz	0 ~ 30000	2nd Velocity Loop Gain (UV)	
40223..224	R/W	LONG	ms	0 ~ 30000	2nd Velocity Loop Integral Time Constant (UG)	
40225..226	R/W	LONG	0.1Hz	0 ~ 40000	2nd Torque Command Filter (UC)	
40227..228	R/W	LONG	0.1Hz	0 ~ 20000	Full Closed-loop Position Loop Gain (XP)	
40229..230	R/W	LONG	ms	0 ~ 30000	Full Closed-loop Position Loop Integral Time Constant (XI)	
40231..232	R/W	LONG	ms	0 ~ 32767	Full Closed-loop Position Loop Derivative Time Constant (XD)	
40233..234	R/W	LONG	0.1Hz	0 ~ 40000	Full Closed-loop Position Loop Derivative Filter (XE)	
40235..236	R/W	LONG	0.01%	-30000 ~ 30000	Full Closed-loop Velocity Command Gain (XF)	
40237..238	R/W	LONG	0.1Hz	0 ~ 30000	Full Closed-loop Velocity Loop Gain (XV)	
40239..240	R/W	LONG	ms	0 ~ 30000	Full Closed-loop Velocity Loop Integral Time Constant (XG)	
40241..242	R/W	LONG	0.1Hz	0 ~ 40000	Full Closed-loop Torque Command Filter (XC)	
40243..244	R/W	LONG	—	0 ~ 4	Automatic Gain Switching Method (SD)	O (Capital)
40245..246	R/W	LONG	pulses	0 ~ 2147483647	Use Position Error as the Condition (PN)	
40247..248	R/W	LONG	1/240rps	0 ~ 24000	Use Actual Speed as the Condition (VN)	

MBDV/MDX+ Series—P0 Group(PID)

Register	Access	Data Type	Units	Range	Description	SCL Register
40249..250	R/W	LONG	0.1%	0 ~ 3000	Use Actual Torque as the Condition (TN)	
40251..252	R/W	LONG	ms	0 ~ 10000	Gain Switching Waiting Time 1 (SE1)	
40253..254	R/W	LONG	ms	0 ~ 10000	Gain Switching Waiting Time 2 (SE2)	
40255..256	R/W	LONG	—	0 ~ 3	Velocity Feedback Filter (LR)	
40257..258	R/W	LONG	—	0 ~ 1	Self-adapting Filter Switch (AE)	
40259..260	R/W	LONG			Reserved	

MBDV/MDX+ Series—P1 Group(Configuration)

Register	Access	Data Type	Units	Range	Description	SCL Register
40261..262	R/W	LONG			Reserved	
40263..264	R/W	LONG	—	1,2,7,11,15,21	Main Control Mode (CM)	
40265..266	R/W	LONG	—	1,2,7,11,15,21	Secondary Control Mode (CN)	
40267..268	R/W	LONG	—	8 ~ 10	Operation Mode When Power-up (PM)	
40269..270	R/W	LONG	—	1 ~ 2	Speed Control Clamp Mode (JM)	
40271..272	R/W	LONG	—	0 ~ 1	Full Closed-loop Control Switch (XM)	
40273..274	R/W	LONG	0.1%	-3000 ~ 3000	Torque Command of Internal Torque Mode (GC)	G
40275..276	R/W	LONG	0.1%	0 ~ 3000	1st Torque Limit (CC)	
40277..278	R/W	LONG	0.1%	0 ~ 3000	Target Value of Torque Arrival (CV)	
40279..280	R/W	LONG	0.1%	0 ~ 3000	Torque Limit of Hardstop Homing (HC)	
40281..282	R/W	LONG	ms	0 ~ 30000	Current Foldback Continuous Time (CL)	
40283..284	R/W	LONG	—	0 ~ 5	Torque Limit Method (LD)	
40285..286	R/W	LONG	—	0 ~ 1	Rotational Direction Setup (RN)	
40287..288	R/W	LONG			Reserved	
40289..290	R/W	LONG	—	1 ~ 511	Communication Protocol (PR)	
40291..292	R/W	LONG	ms	0 ~ 20	Transmit Delay (TD)	
40293..294	R/W	LONG	—	1 ~ 5	RS-485 Baud Rate (BR)	
40295..296	R/W	LONG	—	0 ~ 32	RS-485 Address (DA)	
40297..298	R/W	LONG	—	1 ~ 127	CANopen/IP Node ID (CO)	
40299..300	R/W	LONG	—	0 ~ 7	CANopen Baud Rate	
40301..302	R/W	LONG	Ω	10 ~ 32000	Regeneration Resistor Value (ZR)	

MBDV/MDX+ Series—P1 Group(Configuration)

Register	Access	Data Type	Units	Range	Description	SCL Register
40303..304	R/W	LONG	W	1 ~ 32000	Regeneration Resistor Wattage (ZW)	
40305..306	R/W	LONG	ms	0 ~ 8000	Regeneration Resistor Time Constant (ZT)	
40307..308	R/W	LONG	—	0 ~ 1	Keypad Setting Lock (PK)	
40309..310	R/W	LONG	—	0 ~ 20	Default Display (DD)	
40311..312	R/W	LONG	—	0 ~ 4294967295	Alarm Mask (MA)	
40313..314	R/W	LONG	0.1%	0 ~ 3000	2nd Torque Limit (CX)	
40315..316	R/W	LONG	0.1%	0 ~ 3000	3rd Torque Limit (CY)	
40317..318	R/W	LONG	0.1%	0 ~ 3000	4th Torque Limit (CZ)	
40319..320	R/W	LONG	ms	0 ~ 30000	Motor Stall Protection Time (HT)	
40321..322	R/W	LONG	—	0 ~ 5	Dynamic Brake Sequence when Servo Off (YV)	
40323..324	R/W	LONG	—	0 ~ 3	Dynamic Brake Sequence when Fault Occurs (YR)	
40325..326	R/W	LONG	ms	0 ~ 30000	Dynamic Brake Action Time during Deceleration of Servo Off (YM)	
40327..328	R/W	LONG	ms	0 ~ 30000	Dynamic Brake Action Time during Deceleration when Fault Occurs (YN)	
40329..330	R/W	LONG	—	0 ~ 1	Main Power Phase Lost Detecting (OT)	
40331..332	R/W	LONG	0.1%	0 ~ 3000	Current Ramp Limit (RT)	
40333..334	R/W	LONG	0.1V	200~800	Dumping Circuit Working Voltage (DW) (Only for MBDV)	

MBDV/MDX+ Series—P2 Group(Trajectory)

Register	Access	Data Type	Units	Range	Description	SCL Register
40335..336	R/W	LONG	1/6(rps/s)	1 ~ 30000	Max Brake Deceleration (AM)	
40337..338	R/W	LONG	1/240rps	0 ~ 24000	Max Velocity (VM)	M
40339..340	R/W	LONG	1/6(rps/s)	1 ~ 30000	Jog Accel (JA)	K (Capital)
40341..342	R/W	LONG	1/6(rps/s)	1 ~ 30000	Jog Decel (JL)	L
40343..344	R/W	LONG	1/240rps	-24000 ~ 24000	Jog Velocity (JS)	J
40345..346	R/W	LONG	1/6(rps/s)	1 ~ 30000	Point-to-Point Accel (AC)	A
40347..348	R/W	LONG	1/6(rps/s)	1 ~ 30000	Point-to-Point Decel (DE)	B
40349..350	R/W	LONG	1/240rps	0 ~ 24000	Point-to-Point Velocity (VE)	V (Capital)
40351..352	R/W	LONG	pulses	-2147483647 ~ 2147483647	Point-to-Point Distance (DI)	D
40353..354	R/W	LONG	pulses	-2147483647 ~ 2147483647	Point-to-Point Change Distance (DC)	C (Capital)
40355..356	R/W	LONG	1/240rps	0 ~ 24000	Point-to-Point Change Velocity (VC)	U (Capital)
40357..358	R/W	LONG	1/6(rps/s)	1 ~ 30000	Homing Accel /Decel (HA1)	
40359..360	R/W	LONG			Reserved	
40361..362	R/W	LONG	1/240rps	0 ~ 24000	Homing Velocity 1 (HV1)	
40363..364	R/W	LONG	1/240rps	0 ~ 24000	Homing Velocity 2 (HV2)	
40365..366	R/W	LONG	pulses	-2147483647 ~ 2147483647	Homing Offset (HO)	
40367..368	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 1 (JC1)	
40369..370	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 2 (JC2)	
40371..372	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 3 (JC3)	
40373..374	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 4 (JC4)	

MBDV/MDX+ Series—P2 Group(Trajectory)

Register	Access	Data Type	Units	Range	Description	SCL Register
40375..376	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 5 (JC5)	
40377..378	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 6 (JC6)	
40379..380	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 7 (JC7)	
40381..382	R/W	LONG	1/240rps	-24000 ~ 24000	Internal Velocity Control: Speed 8 (JC8)	
40383..384	R/W	LONG	ms	0 ~ 125	Jerk Time (JT)	
40385..386	R/W	LONG	ms	0 ~ 1000	Jerk Filter (KJ)	
40387..388	R/W	LONG	ms	0 ~ 125	Interpolation Filter (FF)	
40389..390	R/W	LONG	1/240rps	0 ~ 24000	Velocity Limit of Torque Mode (VT)	
40391..392	R/W	LONG	1/240rps	0 ~ 24000	Dynamic Brake Velocity (DV)	
40393..394	R/W	LONG	—	0 ~ 1	No COMM Detect Enable (ZE) (Only for MBDV)	
40395..396	R/W	LONG	ms	0 ~ 10000	No COMM Detect Time (ZS) (Only for MBDV)	
40397..398	R/W	LONG	—	1 ~ 16	No COMM Detect Action (ZA) (Only for MBDV)	

MBDV/MDX+ Series—P3 Group(Encoder & Step/Dir)

Register	Access	Data Type	Units	Range	Description	SCL Register
40399..400	R/W	LONG	—	1 ~ 2147483647	Electronic Gear Ratio – Numerator (EN)	
40401..402	R/W	LONG	—	1 ~ 2147483647	Electronic Gear Ratio - Denominator (EU)	
40403..404	R/W	LONG	0.1μs	0 ~ 32000	Pulse Input Noise Filter (SZ)	
40405..406	R/W	LONG	—	0 ~ 31	Pulse Input Setting (PT)	
40407..408	R/W	LONG	pulses	0 ~ 2147483647	Position Error Limit (PF)	
40409..410	R/W	LONG	pulses/ rev	200 ~ 131072	Command Pulses per Revolution (EG)	R
40411..412	R/W	LONG	—	0 ~ 1	Second Encoder Direction (PV)	
40413..414	R/W	LONG			Reserved	
40415..416	R/W	LONG			Reserved	
40417..418	R/W	LONG	rev	1 ~ 100	Hybrid Deviation Clear Setting (XT)	
40419..420	R/W	LONG	pulses	0 ~ 2147483647	Hybrid Deviation Fault Threshold (XO)	
40421..422	R/W	LONG	pulses/ rev	200 ~ 100000	Second Encoder Resolution (XR)	
40423..424	R/W	LONG	—	0 ~ 256	Pulses Output Mode (PO)	
40425..426	R/W	LONG	—	0 ~ 13107200	Pulse Output Gear Ratio - Numerator (ON)	
40427..428	R/W	LONG	—	0 ~ 13107200	Pulse Output Gear Ratio - Denominator (OD)	
40429..430	R/W	LONG	—	0 ~ 3	Absolute Encoder Usage (ES)	
40431..432	R/W	LONG	—	0 ~ 1	Electronic Gearing Switch (PU)	
40433..434	R/W	LONG	0.01Ω	350 ~ 10000	Dynamic Brake Resistance Ohms	
40435..436	R/W	LONG	W	100 ~ 30000	Dynamic Brake Resistance Power	
40437..438	R/W	LONG	rev	0 ~ 32766	Absolute Encoder Multi-turn Data Upper Limit @ ES=4 (FV)	
40439..440	R/W	LONG			Reserved	

MBDV/MDX+ Series—P4 Group(Analog)

Register	Access	Data Type	Units	Range	Description	SCL Register
40441..442	R/W	LONG			Reserved	
40443..444	R/W	LONG	1/240rps	0 ~ 24000	Analog Input Velocity Gain (AG)	
40445..446	R/W	LONG	0.1%	0 ~ 3000	Analog Input Torque Gain (AN)	
40447..448	R/W	LONG	mv	-10000 ~ 10000	Analog Input 1 Offset (AV1)	
40449..450	R/W	LONG	mv	-10000 ~ 10000	Analog Input 2 Offset (AV2)	
40451..452	R/W	LONG	mv	0 ~ 255	Analog Input 1 Deadband (AD1)	
40453..454	R/W	LONG	mv	0 ~ 255	Analog Input 2 Deadband (AD2)	
40455..456	R/W	LONG	0.1Hz	1 ~ 20000	Analog Input 1 Filter (AF1)	
40457..458	R/W	LONG	0.1Hz	1 ~ 20000	Analog Input 2 Filter (AF2)	
40459..460	R/W	LONG	mv	-10000 ~ 10000	Analog Input 1 Threshold (AT1)	
40461..462	R/W	LONG	mv	-10000 ~ 10000	Analog Input 2 Threshold (AT2)	
40463..464	R/W	LONG	—	0 ~ 1	Velocity Limit Setting of Torque Control (FA1)	
40465..466	R/W	LONG			Reserved	
40467..468	R/W	LONG			Reserved	
40469..470	R/W	LONG			Reserved	
40471..472	R/W	LONG			Reserved	
40473..474	R/W	LONG	—	1 ~ 32000	Analog Output 1 Scale (OS1)	
40475..476	R/W	LONG	—	1 ~ 32000	Analog Output 2 Scale (OS2)	
40477..478	R/W	LONG	—	0 ~ 5	Analog Output 1 Function (XA1)	
40479..480	R/W	LONG	—	0 ~ 5	Analog Output 2 Function (XA2)	
40481..482	R/W	LONG			Reserved	
40483..484	R/W	LONG			Reserved	
40485..486	R/W	LONG			Reserved	
40487..488	R/W	LONG			Reserved	
40489..490	R/W	LONG			Reserved	

MBDV/MDX+ Series—P5 Group(I/O)

Register	Access	Data Type	Units	Range	Description	SCL Register
40491..492	R/W	LONG	—	0 ~ 46	Digital Input 1 Function (MU1)	
40493..494	R/W	LONG	—	0 ~ 46	Digital Input 2 Function (MU2)	
40495..496	R/W	LONG	—	0 ~ 46	Digital Input 3 Function (MU3)	
40497..498	R/W	LONG	—	0 ~ 46	Digital Input 4 Function (MU4)	
40499..500	R/W	LONG	—	0 ~ 46	Digital Input 5 Function (MU5)	
40501..502	R/W	LONG	—	0 ~ 46	Digital Input 6 Function (MU6)	
40503..504	R/W	LONG	—	0 ~ 46	Digital Input 7 Function (MU7)	
40505..506	R/W	LONG	—	0 ~ 46	Digital Input 8 Function (MU8)	
40507..508	R/W	LONG	—	0 ~ 46	Digital Input 9 Function (MU9)	
40509..510	R/W	LONG	—	0 ~ 46	Digital Input 10 Function (MUA)	
40511..512	R/W	LONG			Reserved	
40513..514	R/W	LONG			Reserved	
40515..516	R/W	LONG			Reserved	
40517..518	R/W	LONG			Reserved	
40519..520	R/W	LONG	—	0 ~ 36	Digital Output 1 Function (MO1)	
40521..522	R/W	LONG	—	0 ~ 36	Digital Output 2 Function (MO2)	
40523..524	R/W	LONG	—	0 ~ 36	Digital Output 3 Function (MO3)	
40525..526	R/W	LONG	—	0 ~ 36	Digital Output 4 Function (MO4)	
40527..528	R/W	LONG	—	0 ~ 36	Digital Output 5 Function (MO5)	
40529..530	R/W	LONG	—	0 ~ 36	Digital Output 6 Function (MO6)	
40531..532	R/W	LONG			Reserved	
40533..534	R/W	LONG			Reserved	
40535..536	R/W	LONG			Reserved	
40537..538	R/W	LONG			Reserved	

MBDV/MDX+ Series—P5 Group(I/O)

Register	Access	Data Type	Units	Range	Description	SCL Register
40539..540	R/W	LONG	ms	0 ~ 32000	Move Command Waiting Time When Brake Release (BD)	
40541..542	R/W	LONG	ms	0 ~ 32000	Servo-off Brake Engage Waiting Time (BE)	
40543..544	R/W	LONG			Reserved	
40545..546	R/W	LONG	—	0 ~ 10	Home Sensor (HX)	
40547..548	R/W	LONG	ms	0 ~ 8000	Digital Input 1 Filter (FI1)	
40549..550	R/W	LONG	ms	0 ~ 8000	Digital Input 2 Filter (FI2)	
40551..552	R/W	LONG	ms	0 ~ 8000	Digital Input 3 Filter (FI3)	
40553..554	R/W	LONG	ms	0 ~ 8000	Digital Input 4 Filter (FI4)	
40555..556	R/W	LONG	ms	0 ~ 8000	Digital Input 5 Filter (FI5)	
40557..558	R/W	LONG	ms	0 ~ 8000	Digital Input 6 Filter(FI6)	
40559..560	R/W	LONG	ms	0 ~ 8000	Digital Input 7 Filter (FI7)	
40561..562	R/W	LONG	ms	0 ~ 8000	Digital Input 8 Filter (FI8)	
40563..564	R/W	LONG	ms	0 ~ 8000	Digital Input 9 Filter (FI9)	
40565..566	R/W	LONG	ms	0 ~ 8000	Digital Input 10 Filter (FIA)	
40567..568	R/W	LONG	pulses	0 ~ 2147483647	Dynamic Follow Error Threshold (PL)	
40569..570	R/W	LONG	pulses	0 ~ 32000	In-position Output Threshold (PD)	
40571..572	R/W	LONG	ms	0 ~ 32000	Time Constant of Motion Output Condition (PE)	
40573..574	R/W	LONG	ms	0 ~ 20000	Pulse Complete Timing (TT)	
40575..576	R/W	LONG	1/240rps	24 ~ 480	Zero Speed Width (ZV)	
40577..578	R/W	LONG	1/240rps	24 ~ 24000	Speed Coincidence Width (VR)	
40579..580	R/W	LONG	1/240rps	0 ~ 24000	Target Value of AT-speed (VV)	

MBDV/MDX+ Series—P5 Group(I/O)

Register	Access	Data Type	Units	Range	Description	SCL Register
40581..582	R/W	LONG	0.1%	0 ~ 3000	Torque Arrival Width (TV)	
40583..584	R/W	LONG	pulses	-2147483647 ~ 2147483647	Near Target Position (DG)	
40585..586	R/W	LONG	pulses	-2147483647 ~ 2147483647	Positive Software Limit (LP)	
40587..588	R/W	LONG	pulses	-2147483647 ~ 2147483647	Negative Software Limit (LM)	
40589..590	R/W	LONG	—	-4 ~ 35	Homing Method (HE)	
40591..592	R/W	LONG	—	1 ~ 8	Emergency Stop (EO)	
40593...594	R/W	LONG	—	0 ~ 1	Zero Speed Clamp Function in Velocity Mode (MS)	

Note:

The two axes of the MBDV-2X-520AC driver can be configured into two different node addresses, and the following three modes are supported when sending instructions to operate the Modbus register.

The first mode: Operate registers of the two axes separately at different node addresses. The Modbus register addresses are shown in the table above.

The second mode: Operate registers of the two axes by using the node addresses of axis 1. The Modbus register addresses of axis 1 are shown in the table above and the addresses of axis 2 = the addresses of axis 1 + 1000.

The third mode: Operate registers of the two axes by using the node addresses of axis 1. The addresses of the same Modbus register for axis 1 and axis 2 are interleaved according to the data type, and the start address is 42001. For example, the first register of the two axes is 32-bit Alarm Code, the second register is 32-bit Status Code, and the third register is 16-bit Digital Output Status.

Then:

42001..002: 40001..002 registers of axis 1

42003..004: 40001..002 registers of axis 2

42005..006: 40003..004 registers of Axis 1

42007.. 008: 40003..004 registers of Axis 2

42009: 40005 register of axis 1

42010: 40005 register of axis 2

• For registers of 16-bit data

42000+2n-1: 40000+n register of axis 1

42000+2n: 40000+n register of axis 2

• For registers of 32-bit data

(42000+2n-1)..(42000+2n): (40000+n)..(40000+n+1) registers of axis 1

(42000+2n+1)..(42000+2n+2): (40000+n)..(40000+n+1) registers of axis 2

The range of n: $1 \leq n \leq 593$

MDX/SV200 Series				
Register	Access	Data Type	Description	SCL Register
40001	Read Only	SHORT	Alarm Code (AL)	f
40002	Read Only	SHORT	Status Code (SC)	s
40003	Read Only	SHORT	Output Status (Only for SV200)	
40004	Read Only	SHORT	Drive Digital In/Out	i
40005..6	Read Only	LONG	Encoder Position (IE, EP)	e
40007..8	Read Only	LONG	Immediate Absolute Position	l
40009..10	Read Only	LONG	Absolute Position Command	
40011	Read Only	SHORT	Immediate Actual Velocity (IV0)	v
40012	Read Only	SHORT	Immediate Target Velocity (IV1)	w
40013	Read Only	SHORT	Immediate Drive Temperature (IT)	t
40014	Read Only	SHORT	Immediate DC Bus Voltage (IU)	u
40015..16	Read Only	LONG	Immediate Position Error (IX)	x
40017	Read Only	SHORT	Immediate Analog Input Value (IA)	a
40018	Read Only	SHORT	Q Program Line Number	b
40019	Read Only	SHORT	Immediate Current Command (IC)	c
40020..21	Read Only	LONG	Relative Distance (ID)	d
40022..23	Read Only	LONG	Sensor Position	g
40024	Read Only	SHORT	Condition Code	h
40025	Read Only	SHORT	Analog Input 1 (IA1)	j
40026	Read Only	SHORT	Analog Input 2 (IA2)	k
40027	Read Only	SHORT	Command Mode (CM)	m
40028	R/W	SHORT	Point-to-Point Acceleration (AC)	A
40029	R/W	SHORT	Point-to-Point Deceleration (DE)	B

MDX/SV200 Series

Register	Access	Data Type	Description	SCL Register
40030	R/W	SHORT	Velocity (VE)	V
40031..32	R/W	LONG	Point-to-Point Distance (DI)	D
40033..34	R/W	LONG	Change Distance (DC)	C
40035	R/W	SHORT	Change Velocity (VC)	U
40036	Read Only	SHORT	Velocity Move State	n
40037	Read Only	SHORT	Point-to-Point Move State	o
40038	Read Only	SHORT	Q Program Segment Number	p
40039	Read Only	SHORT	Reserved	r
40040	Read Only	SHORT	Phase Error	z
40041..42	R/W	LONG	Position Offset	E
40043	R/W	SHORT	Miscellaneous Flags	F
40044	R/W	SHORT	Current Command (GC)	G
40045..46	R/W	LONG	Input Counter	I
40047	R/W	SHORT	Jog Accel (JA)	
40048	R/W	SHORT	Jog Decel (JL)	
40049	R/W	SHORT	Jog Velocity (JS)	J
40050	R/W	SHORT	Max Velocity (VM)	M
40051	R/W	SHORT	Running Current (CC) for stepper, Continuous Current for servo	N
40052	R/W	SHORT	Idle Current (CI) for stepper Peak Current (CP) for servo	O (Capital)
40053	Read Only	SHORT	Reserved	R
40054..55	R/W	LONG	Pulse Counter	S
40056	R/W	SHORT	Analog Position Gain (AP)	X
40057	R/W	SHORT	Analog Threshold (AT)	Y
40058	R/W	SHORT	Analog Offset (AV)	Z

MDX/SV200 Series				
Register	Access	Data Type	Description	SCL Register
40059..60	Read Only	LONG	Accumulator	0
40061..62	R/W	LONG	User Defined Register	1
40063..64	R/W	LONG	User Defined Register	2
40065..66	R/W	LONG	User Defined Register	3
40067..68	R/W	LONG	User Defined Register	4
40069..70	R/W	LONG	User Defined Register	5
40071..72	R/W	LONG	User Defined Register	6
40073..74	R/W	LONG	User Defined Register	7
40075..76	R/W	LONG	User Defined Register	8
40077..78	R/W	LONG	User Defined Register	9
40079..80	R/W	LONG	User Defined Register	:
40081..82	R/W	LONG	User Defined Register	;
40083..84	R/W	LONG	User Defined Register	<
40085..86	R/W	LONG	User Defined Register	=
40087..88	R/W	LONG	User Defined Register	>
40089..90	R/W	LONG	User Defined Register	?
40091..92	R/W	LONG	User Defined Register	@
40093..94	R/W	LONG	User Defined Register	[
40095..96	R/W	LONG	User Defined Register	\
40097..98	R/W	LONG	User Defined Register]
40099..100	R/W	LONG	User Defined Register	^
40101..102	R/W	LONG	User Defined Register	_
400103..104	R/W	LONG	User Defined Register	`

MDX/SV200 Series

Register	Access	Data Type	Description	SCL Register
40105	R/W	SHORT	Brake Release Delay	
40106	R/W	SHORT	Brake Engage Delay	
40107	Read Only	SHORT	Reserved	
40108	Read Only	SHORT	Reserved	
40109	Read Only	SHORT	Firmware version	
40110	R/W	SHORT	Analog Filter Gain	
40111	Read Only	SHORT	Reserved	
40112	Read Only	SHORT	Alarm Code High bit	
40113	R/W	SHORT	Jog Change Speed1 (JC1) (SV200 only)	
40114	R/W	SHORT	Jog Change Speed2 (JC1) (SV200 only)	
40115	R/W	SHORT	Jog Change Speed3 (JC3) (SV200 only)	
40116	R/W	SHORT	Jog Change Speed4 (JC4) (SV200 only)	
40117	R/W	SHORT	Jog Change Speed5 (JC5) (SV200 only)	
40118	R/W	SHORT	Jog Change Speed6 (JC6) (SV200 only)	
40119	R/W	SHORT	Jog Change Speed7 (JC7) (SV200 only)	
40120	R/W	SHORT	Jog Change Speed8 (JC8) (SV200 only)	
40121	R/W	SHORT	X9 Input Filter	
40122	R/W	SHORT	X10 Input Filter	
40123	R/W	SHORT	X11 Input Filter	
40124	R/W	SHORT	X12 Input Filter	
40125	R/W	SHORT	Command Opcode	
40126	R/W	SHORT	Parameter 1	
40127	R/W	SHORT	Parameter 2	
40128	R/W	SHORT	Parameter 3	
40129	R/W	SHORT	Parameter 4	
40130	R/W	SHORT	Parameter 5	
40131	R/W	SHORT	Global Gain (Jerk Time on MDX)	

MDX/SV200 Series				
Register	Access	Data Type	Description	SCL Register
40132	R/W	SHORT	Global Gain1 (VFF gain on MDX)	
40133	R/W	SHORT	Position LoopProportional Gain (KF) (Position Gain on MDX)	
40134	R/W	SHORT	Differential Gain (KD) aka "Damping" Gain	
40135	R/W	SHORT	Velocity Feedback Gain (KV)	
40136	R/W	SHORT	Integral Gain (KI)	
40137	R/W	SHORT	Inertia Feed forward Gain (KK)	
40138	R/W	SHORT	Jerk Filter (KJ) "Smoothing" Filter	
40139	R/W	SHORT	Velocity Mode Proportional Gain (VP)	
40140	R/W	SHORT	Velocity Loop Integral Gain (VI)	
40141	R/W	SHORT	Damping Filter Gain (KE)	
40142	R/W	SHORT	Current Filter Gain (KC)	
40143	R/W	SHORT	Control Mode (CM)	
40144	Read Only	SHORT	Control Mode 1 (SV200 only)	
40145	R/W	SHORT	Power-up Mode (PM)	
40146	R/W	SHORT	Jog Mode (JM)	
40147	R/W	SHORT	Hard-Stop Current Limit (HC)	
40148	R/W	SHORT	Max Acceleration (AM)	
40149	Read Only	SHORT	Encoder Resolution (quad counts divided by motor poles)	
40150	Read Only	SHORT	(Reserved)	
40151	Read Only	SHORT	Electronic Gearing value (EG) (aka Step Resolution)	
40152	R/W	SHORT	Electronic Ratio Numerator (SV200 only)	
40153	R/W	SHORT	Electronic Ratio Denominator (SV200 only)	
40154	R/W	SHORT	Step Input Pulse Type (PT)	
40155	R/W	SHORT	Position Fault limit (PF)	

MDX/SV200 Series

Register	Access	Data Type	Description	SCL Register
40156	R/W	SHORT	In-Position Count	
40157	R/W	SHORT	Position Error Range	
40158	R/W	SHORT	In-Range Count	
40159	R/W	SHORT	Pulse Input Complete Time	
40160	R/W	SHORT	Analog Velocity Gain	
40161	R/W	SHORT	Analog Torque Gain	
40162	R/W	SHORT	Analog Offset 1	
40163	R/W	SHORT	Analog Offset 2	
40164	R/W	SHORT	Analog Type	
40165	R/W	SHORT	Analog Deadband 1	
40166	R/W	SHORT	Analog Deadband 2	
40167	R/W	SHORT	Differential Analog Deadband	
40168	R/W	SHORT	Analog Function	
40169	R/W	SHORT	Servo Enable Input Usage (SI)	
40170	R/W	SHORT	Alarm Reset Input (AI)	
40171	R/W	SHORT	Define Limits Input (DL)	
40172	R/W	SHORT	Motion Input (SV200 only)	
40173	R/W	SHORT	Alarm Output (AO)	
40174	R/W	SHORT	Brake Output (BO)	
40175	R/W	SHORT	Motion Output (MO)	
40176	Read Only	SHORT	(Reserved)	
40177	R/W	SHORT	Communication Protocol (PR)	
40178	R/W	SHORT	Transmit Delay (TD)	

MDX/SV200 Series				
Register	Access	Data Type	Description	SCL Register
40179	R/W	SHORT	Baud Rate (BR)	
40180	R/W	SHORT	Communication Address (DA represented as ASCII value)	
40181	R/W	SHORT	Velocity Reached Value	
40182	R/W	SHORT	Tach-out Count setting (SV200 only)	
40183	R/W	SHORT	Torque Reached Value (Units: 0.01A)	
40184	R/W	SHORT	Front Panel Parameters Lock (Torque limit on MDX)	
40185	R/W	SHORT	Front Panel Default Display setting (SV200 only)	
40186	R/W	SHORT	Mask Alarm setting	
40187	R/W	SHORT	Homing Acceleration 1	
40188	R/W	SHORT	Homing Acceleration 2	
40189	R/W	SHORT	Homing Acceleration 3	
40190	R/W	SHORT	Homing Deceleration 1	
40191	R/W	SHORT	Homing Deceleration 2	
40192	R/W	SHORT	Homing Deceleration 3	
40193	R/W	SHORT	Homing Velocity 1	
40194	R/W	SHORT	Homing Velocity 2	
40195	R/W	SHORT	Homing Velocity 3	
40196	R/W	SHORT	Clamp Resistance (SV200 only)	
40197	R/W	SHORT	Clamp Count (SV200 only)	
40198	R/W	SHORT	Clamp time (SV200 only)	
40199	Read Only	SHORT	Drive Model ID Number	
40200	Read Only	SHORT	Drive Sub Model ID Number	

Appendix 6 Drive Alarm and Status Code

1. Alarm Code

The alarming code is used to express the current alarming information by the drive. User can reach the detailed alarming information by enquiring the alarming code register. Each bit of the alarming code register represents different alarming information. When one bit is set 1, it means the drive is in the alarming status of its definition. The detail definition of each bit can refer to the following table.

Stepper and StepServo Alarm Code Table:

Register	Bit	STAC	ST	STF/STB	STM/SWM	SSM/TSM/TXM	SSDC/SS
40001	0	Position Error out of Limit					
	1	CCW Direction Limit Prohibited					
	2	CW Direction Limit Prohibited					
	3	Drive over-temperature					
	4	Release Failure	Drive Internal Voltage Error				
	5	Drive under Voltage					
	6	Drive under Voltage	Drive under Voltage				
	7	Drive Over-current					
	8	Motor Winding Switch					
	9	Motor Encoder Error	Reserve			Motor Encoder Signal Error	
	10	Abnormal Communication					
	11	Parameter Save Error					
	12	Command the motor to run when it is not enabled					
	13	Abnormal Motor Resistance	Reserve			Motor Heavy Load Status	
	14	Q Programme for calling is empty					
	15	Reserve				Memory Error	
40112	0	Reserve					Release Failure

MDX Alarm Code Table:

Register	Bit	MDX/SV200	Register	Bit	MDX/SV200
40001	0	Position Error out of Limit	40112	0	Reserve
	1	CCW Direction Limit Prohibited		1	Reserve
	2	CW Direction Limit Prohibited		2	Reserve
	3	Drive over temperature		3	Reserve
	4	Drive internal Voltage Error		4	Reserve
	5	Drive over-voltage		5	Emergency Stop
	6	Drive under voltage		6	Bus Communication Interruption
	7	Drive over current		7	
	8	Hall Signal Error		8	
	9	Encoder Signal Error		9	
	10	Abnormal Communication		10	
	11	Parameter Save Error		11	
	12	Internal Use/ Excess Regen (SV200 only)		12	
	13	Current Foldback/Motor Heavy Load Status		13	
	14	The called Q segment is empty		14	
	15	Command the motor to run when it is not enabled		15	

M56S/MBDV/MDX+ Alarm Code (Main Code) Table:

Register	Bit	Explanation	Bit	Explanation
40001 40002	0	Position Error out of Limit	16	Drive main Circuit Power Input Phase Loss
	1	CCW Direction Limit Prohibited	17	STO Prohibited
	2	CW Direction Limit Prohibited	18	Reserve
	3	Overtemperature	19	Motor Velocity exceeds Limit
	4	Internal Error	20	Drive under Voltage
	5	Power Voltage over Range	21	Emergency Stop
	6	Reserve	22	Second Encoder not connected
	7	Drive over Current	23	Full closed-loop Hybrid Deviation Over Limit
	8	Reserve	24	Absolute Encoder Battery under Voltage
	9	Motor Encoder not connected	25	Absolute Position Loss
	10	Abnormal Communication	26	Absolute Position Overflow
	11	Reserve	27	Reserve
	12	Release Failure	28	Absolute Encoder Multi-turn Error
	13	Motor heavy Load Protection	29	Abnormal Motor Action Protection
	14	Reserve	30	Communication Error
	15	Abnormal Start Alarm	31	Homing Parameter Configuration Error

M56S/MBDV/MDX+ Alarm Code (Auxiliary Code) Table:

Register (40001..02) Bit	Explanation	Register (40067..68) Bit	Explanation
3	Overtemperature	5	Drive Processor over Temperature
		6	Drive Power Module over Temperature
		7	Motor over Temperature
4	Internal Error	8	Parameter read Failure
		9	Inside Voltage Error
		10	Reserve function and keep "0"
		11	Reserve function and keep "0"
		12	FPGA Error
		13	Parameter Save Failure
		14	Motor Encode Communication Error
5	Power Voltage over Scope	15	Drive over Voltage
		16	Drive Low Voltage
7	Over-current	2	Low-end over Current
		3	High-end over Current
		4	Reading over Current
15	Abnormal Start Warning	17	The motor commands its operation when it is not enabled.
		18	The motor commands its operation when it is not enabled.
		19	I/O Signal Function Multiplex
29	Motor Movement Adnormal Protection	24	Motor Locked-rotor Protection
		25	Motor Anti-collision Protection

2. Status Code

The status code is used to indicate the drive's current working status. Users can understand the specific status information by querying the status register. Each bit of the state code register represents different status information. When a bit is set to 1, it indicates that the drive is in the state defined by the bit. Specifically, the definition of each bit can be referred to the following table.

ST/STM/SWM/STF/SSM/TSM/TXM/SV200/MDX Drive Status Code Table:

Register	Bit	Explanation
40002	0	Enable
	1	Sampling (Software oscilloscope function on)
	2	The drive reports a failure
	3	In Position
	4	Moving
	5	Jogging
	6	Stopping/Decelerating
	7	Wait for the Input Signal (e.g. follow WI command)
	8	Parameter Saving
	9	Drive reports alarming
	10	Homing
	11	Wait time (e.g. follow WT/WD command)
	12	Internal Use
	13	Encode checking
	14	Q Programme Running
	15	Initialization (stepping system), Servo ready (servo system)

Servo M56S/MBDV/MDX+ Drive Status Code Table:

Register	Bit	Explanation	Bit	Explanation
40003 40004	0	Servo Enable	16	CSP following
	1	Sampling (Luna software oscilloscope function opens)	17	Consistent Speed
	2	The drive reports a failure	18	Zero Speed
	3	In Position	19	Torque Arrival
	4	Moving	20	Consistent Torque
	5	Jogging	21	The second set of gain is in operation.
	6	Stopping/Decelerating	22	The second control mode is in operation.
	7	Wait for Input Signal (e.g. follow WI command)	23	Velocity Arrival
	8	Parameter saving	24	Homing completes
	9	The drive reports an alarm	25	Reserve
	10	Homing	26	Reserve
	11	Wait time (e.g. follow WT/WD command)	27	Reserve
	12	Internal Use	28	Reserve
	13	Encoder checking	29	Reserve
	14	Q programme running	30	Reserve
	15	Servo ready	31	Reserve

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