ZLAC8015D Servo Driver (Special For HUB Servo Motor)

CANopen Communication Instruction

Version	Description	Date
V1.0	-	2020-03-14
V1.04	1. Add RPDO mapping example; 2. Add SDO error feedback code (command word 0x80); 3. Add brake control; 4. Revise some control routine errors; 5. Revise some object dictionaries; 6. Add power cable short circuit function after alarm (2026).	2021-7-15
V1.05	Add I/O emergency stop post-processing mode (2026 03)	2022-7-28
V1.06	Modify the 2008 maximum motor speed	2023-2-16
V1.07	Add 2026 05 parking mode Increase 2026 06 given speed resolution	2023-4-16
V1.08	Add 603F Speed setting error Added the address for enabling the 2026 06 Speed Offset function	2024/03/25

CATALOG

1、Outline

This manual only gives a brief introduction to the most commonly used related concepts and precautions in the use of ZLAC8015D, so that users can understand the normal use of ZLAC8015D series products in the shortest time.

Communication Standard followed by ZLAC8015D

- CAN 2.0A Standard
- CANopen Standard protocol DS 301 V4.02
- CANopen Standard protocol DS 402 V2.01

Services supported by ZLAC8015D

- SDO Service
- PDO Service: each slave station could configure up to 4 TxPDO and 4 RxPDO
- NMT Slave Service
- Device Monitor: supports Heartbeat Message

The following description takes the driver address as 1, the baud rate as 500K.

The driver address can be set to 1-127. ZLAC8015D has 5 optional baud rates: 100kHz, 125kHz, 250kHz, 500kHz, 1MHz. Baud rate could be set through software, its default value is 500kHz.

2、CiA301 Description

2.1 Communication object identifier（COB-ID）

The communication object identifier (COB-ID) is used to specify the priority of the communication object and to identify the communication object. In CANopen protocol, it is stipulated that 11 arbitration bits are divided into the high 4 bits of the Function Code and the low 7 bits of the node address (Node-ID), which is called COB-ID (Communication Object Identifier).

CANopen predefined master / slave connection set										
10	9	8	7	6	5	4	3	2	1	0
Function Code				Node-ID						

※ Node-ID range is 1~127 (0 is not allowed to be used).

Object	Function Code	Node-ID	COB-ID	Object Dictionary Index
NMT(Network Management)	0000	0	0x000	-
Sync Message	0001	0	0x080	0x1005
Emergency	0001	1-127	0x081-0x0FF	0x1014
TPDO0	0011	1-127	0x181-0x1FF	0x1800

RPDO0	0100	1-127	0x201-0x27F	0x1400
TPDO1	0101	1-127	0x281-0x2FF	0x1801
RPDO1	0110	1-127	0x301-0x47F	0x1401
TPDO2	0111	1-127	0x381-0x3FF	0x1802
RPDO2	1000	1-127	0x401-0x47F	0x1402
TPDO3	1001	1-127	0x481-0x4FF	0x1803
RPDO3	1010	1-127	0x501-0x57F	0x1403
RSDO Server Send	1100	1-127	0x581-0x5FF	0x1200
TSDO Client Respond	1011	1-127	0x601-0x67F	0x1200
NMT Error Control	1110	1-127	0x701-0x77F	0x1016-0x1017

2.2 Object Dictionary (OD)

Object Dictionary is the core concept of CANopen. Every CANopen device in the network has an object dictionary. Object Dictionary is an ordered collection of data objects. These objects describe all the communication and device parameters of the device, and their positions are determined in Object Dictionary by a 16-bit index and an 8-bit subindex.

Object Dictionary supported by ZLAC8015D

Index Range	Description
0x1000-0x1A03	CiA301 Communication Object Sub-Protocol Area
0x2000-0x2035	Factory Custom Area
0x603F-0x60FF	CiA402 Motion Control Sub-Protocol Area

※*See Appendix A for details*

2.3 Service Data Object (SDO)

SDO is used to access the Object Dictionary of a device. The visitor is called a Client, and the CANopen device whose object dictionary is accessed and provides the requested service is called a Server. The client's CAN message and the server's response CAN message always contain 8 bytes of data (although not all data bytes are necessarily meaningful). A client's request must have a response from the server.

SDO Message Format

Byte0	Byte1:2	Byte3	Byte4:7
SDO Command	Object Index	Object Sub-Index	Data

Command Word Description

Command	Function	Type	Data Length
2F	Setting	M->S Request	1 byte
2B	Setting	M->S Request	2 byte
27	Setting	M->S Request	3 byte
23	Setting	M->S Request	4 byte

60	Setting feedback	S->M Confirm	
40	Read	M->S Request	0 byte
4F	Read feedback	S->M Answer	1 byte
4B	Read feedback	S->M Answer	2 byte
47	Read feedback	S->M Answer	3 byte
43	Read feedback	S->M Answer	4 byte
80	Error feedback	S->M Answer	4 byte

※Eg: write data 0x03 into the object dictionary with index 0x6060 and sub-index 0 through SDO message.

COB-ID	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Client→Server								
0x601	2F	60	60	00	03	00	00	00
Server→Client								
0x581	60	60	60	00	00	00	00	00

2.4 Network Management Terminal NMT

NMT provides network management service. This service is implemented using a master-slave communication mode (so there is only one NMT master node). Only the NMT master node can transmit NMT module control messages, all slave nodes must support the NMT module control service, and the NMT module control does not need to response. The message format is as follows:

NMT master node → NMT slave node		
COB-ID	**Byte 0**	**Byte 1**
0x000	Command	Node-ID

When Node-ID=0, all NMT slave nodes are addressed. The corresponding relationship between the value of the command word and the service is as follows:

Command	NMT Service
0x01	Start command (Put the node into operating state)
0x02	Stop command (Put the node into stop state)
0x80	Pre-operation command (Put the node into pre-operation state)
0x81	Reset node application layer (Put the node into application layer reset state)
0x82	Reset node communication (Put the node into communication reset state)

The node status is described in the following table:

Status	Description
Initialization	Initialize CAN controller after the node is powered on.
Application layer reset	Node application reset
Communication reset	Node CANopen communication reset
Pre-operational state	Node CANopen communication is in operation; Could communicate with SDO and NMT.

Operating state	After the node receives the start command sent by NMT master station, the node's PDO communication is activated.
Stop state	After the node receives the stop command from NMT master station, the node's PDO communication is prohibited.

※ Eg: send NMT command to switch the communication status of driver #1 to operating state.

COB-ID	Byte0	Byte1
0x000	01	01

After sending the command, the coomunication of driver #1 is switched to operating state, PDO communication is allowed.

2.5 Heartbeat (NMT Error Control)

NMT error control is mainly used to detect whether the device in the network is online and the state of the device, including node/life protection and heartbeat. Currently, ZLAC8015D only supports the heartbeat method.

A node can be configured to generate periodic messages which are called Heartbeat messages. The heartbeat mode uses a producer (slave)-consumer (master) model. CANopen device can send heartbeat messages according to the period set by the producer's heartbeat interval object 0x1017, the unit is ms. A node in the network that always has a consumer heartbeat function monitors the producer according to the consumer time set by object 0x1016. Once the producer's heartbeat of the corresponding node is not received within the consumer heartbeat time range, the node is considered to be offline (Or there is a fault).

The CANopen slave station sends the heartbeat message according to the heartbeat production time (ms) filled in 1017h in its object dictionary, and CANopen master station (NMT master station) will check according to the heartbeat consumption time filled in its 1016h. Assuming that more than a few heartbeat consumption times, CANopen master (NMT master) has not received the heartbeat message from the slave station, it is considered that the slave station is offline or damaged.

The slave sends heartbeat messages every 0x1017 time to monitor the master of the slave (or other slaves) . If the heartbeat message is not received within the consumer time, the slave is considered to be offline. 0x1017×2 should be smaller than the consumer time of the master of the slave (or other slaves), otherwise it is easy to report that the slave is offline incorrectly.

The heartbeat message format is as follows:

Heartbeat producer→Consumer	
COB-ID	**Byte 0**
0x700+Node-ID	State

The status description is as follows:

State	Description
0x00	Boot-up
0x04	Stop state
0x05	Operating state
0x7F	Pre-operation state

※ZLAC8015D is a heartbeat producer.

※ Eg: configure driver #1 to upload heartbeat message with interval time 500ms.

COB-ID	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Send								
0x601	2B	17	10	00	E8	03	00	00
Receive								
0x581	60	17	10	00	00	00	00	00

After the configuration is completed, the driver will upload heartbeat message with interval time 500ms. If the current status is pre-operational state, format is as follows:

COB-ID	Byte 0
0x701	7F

2.6 Process Data Object (PDO)

PDO belongs to process data, which is used to transmit real-time data, that is, one-way transmission. It does not require the receiving node to respond with CAN messages to confirm. It belongs to the "production and consumption" model in terms of communication. The length of PDO can be less than 8 bytes, and the transmission speed is relatively fast. Each PDO information includes sending PDO (TxPDO) and receiving PDO (RxPDO) information, and its transmission mode is defined in the PDO communication parameter index. All PDO transmission data must be mapped to the corresponding index area through the object dictionary.

ZLAC8015D supports 4 groups of sending and receiving PDO, the related objects are as follows:

Object	COB-ID	Communication Object	Mapping Parameter
TPDO0	0x181-0x1FF （0x180+ Node-ID）	0x1800	0x1A00
RPDO0	0x201-0x27F （0x200+ Node-ID）	0x1400	0x1600
TPDO1	0x281-0x2FF （0x280+ Node-ID）	0x1801	0x1A01
RPDO1	0x301-0x37F （0x300+ Node-ID）	0x1401	0x1601
TPDO2	0x381-0x3FF （0x380+ Node-ID）	0x1802	0x1A02
RPDO2	0x401-0x47F （0x400+ Node-ID）	0x1402	0x1602
TPDO3	0x481-0x4FF （0x480+ Node-ID）	0x1803	0x1A03
RPDO3	0x501-0x57F （0x500+ Node-ID）	0x1403	0x1603

2.6.1 Communication Parameter

1. PDO CAN identifier

The PDO CAN identifier is the COB-ID of the PDO, which contains control bits and identification data, to determine the bus priority of PDO. The COB-ID is located in the sub-index 01 of the communication parameters (RPDO: 1400h~1403h, TPDO: 1800h~1803h), and its highest bit determines whether the PDO is valid.

2. PDO transmission type

The PDO transmission type is located on the sub-index 02 of the communication parameters (RPDO: 1400h~1403h, TPDO: 1800h~1803h).

Asynchronous Transmission: the transmission is triggered by events, including data change, periodic event timer.

Synchronous Transmission: it's related to synchronization frames in the network.

For sub-index 02 of communication parameters (RPDO: 1400h~1403h, TPDO: 1800h~1803h), different values represent different transmission types, it defines the method of triggering TPDO transmission or processing the received RPDO. The specific correspondence is as follows:

Transmission Type	**Synchronous Transmission**		**Asynchronous Transmission**
	Cyclic	Acyclic	
0		√	
1-240	√		
241-254	√		
254, 255			√

Note:

1) When TPDO transmission type is 0, if the data of the mapping object changes, and a synchronization frame is received, the TPDO is sent.

2) When TPDO transmission type is 1~240, and the synchronization frames with corresponding number is received, the TPDO is sent .

3) When TPDO transmission type is 254 or 255, and the mapping data changes, or the event timer arrives, the TPDO is sent.

4) When RPDO transmission type is 0~240, as long as a synchronization frame is received, the latest data of RPDO will be updated to the application. When RPDO transmission type is 254 or 255, the received data will be directly updated to the application.

※Note: ZLAC8015D only supports 254/255 transmission method at present.

3. Prohibition Time

The prohibition time is set for TPDO, and it's stored in the sub-index 03 of the communication parameter (1800h~1803h) to prevent the CAN network from being continuously occupied by the higher priority PDO. The unit of this parameter is 100us. After setting the value, the transmission interval of the same TPDO shall not be less than the time corresponding to this parameter.

Eg: if TPDO2 prohibition time is 300, the transmission interval of TPDO will not be less than 30ms.

Recommendation: when objects that change frequently (such as position feedback, speed feedback, etc.) are configured to TPDO, and TPDO transmission type is asynchronous, it is recommended to set a certain prohibition time.

4. Event timer

For asynchronous transmission TPDO (transmission type is 254 or 255), we define the Event Timer, which is located on the sub-index 05 of the communication parameter (1800h~1803h), and the unit is 500us. Event Timer can also be regarded as a trigger event, which will also trigger the corresponding TPDO transmission. If other events such as data changes occur during the timer running period, TPDO will also trigger and the event counter will be reset immediately.

2.6.2 PDO Mapping Parameters

PDO mapping parameter contains a pointer to the process data corresponding to the PDO that needs to be sent or received to point to PDO, including index, sub-index and the length of the mapping object. The data length of each PDO can be up to 8 bytes, and one or more objects can be mapped at the same time. Among them, sub-index 0 records the number of objects specifically mapped by the PDO, and sub-index 1~8 are the mapping content. The mapping parameter content is defined as follows:

Eg: map 0x6040 to 0x1A00 01:

	Byte 7	**Byte 6**	**Byte 5**	**Byte 4**	**Byte 3**	**Byte 2**	**Byte 1**	**Byte 0**
	2B	**00**	**1A**	**01**	**10**	**00**	**40**	**60**
Define	2B	Mapping Area		Sub-index No.	Mapping object length	Mapped object sub-index	Mapped object index	

2.6.3 PDO Mapping Example

1.Eg: configure 0x606C 03 as TPDO0, and use event trigger (254) or timer trigger (255) as the transmission mode.

Event trigger:

Master Station（COB-ID:0x601）	**Slave Station (COB-ID:0x581）**	**Function Description**
2F 00 1A 00 00 00 00 00	60 00 1A 00 00 00 00 00	Clear TPD00 mapping
23 00 1A 01 20 00 6C 60	60 00 1A 01 00 00 00 00	Map 0x606C 03 to 0x1A00 01
23 00 18 02 FE 00 00 00	60 00 18 02 00 00 00 00	Set TPDO0 transmission mode to event trigger
2F 00 1A 00 01 00 00 00	60 00 1A 00 00 00 00 00	Start TPDO0 mapping
2B 10 20 00 01 00 00 00	60 10 20 00 00 00 00 00	Save parameters to EEPROM

Timer trigger:

Master Station（COB-ID:0x601）	**Slave Station (COB-ID:0x581）**	**Function Description**
2F 00 1A 00 00 00 00 00	60 00 1A 00 00 00 00 00	Clear TPDO0 mapping
23 00 1A 01 20 00 6C 60	60 00 1A 01 00 00 00 00	Map 0x606C 03 to 0x1A00 01
23 00 18 02 FF 00 00 00	60 00 18 02 00 00 00 00	Set TPDO0 transmission mode to timer trigger
2F 00 18 05 E8 03 00 00	60 00 18 05 00 00 00 00	Set the timer time to 500ms
2F 00 1A 00 01 00 00 00	60 00 1A 00 00 00 00 00	Start TPDO0 mapping
2B 10 20 00 01 00 00 00	60 10 20 00 00 00 00 00	Save parameters to EEPROM

After the mapping is completed, switch the communication status to operation mode to enable PDO transmission and send the NMT start command

The format of the NMT startup command is as follows:

COB-ID: 000 Data: 01+ID (00 represents opening all address PDO)

The TPDO upload format is shown in the table below:

Slave station（COB-ID:0x181）	**Function Description**
01 02 03 04	Upload data from 606C 03 as 01 02 03 04

2. Configure 0x60FF 01 and 60FF 02 as RPDO1, transmission mode event triggered (asynchronous mode)

Master Station （COB-ID:0x601）	Slave station COB-ID:0x581）	Function Description
2F 01 16 00 00 00 00 00	2F 01 16 00 00 00 00 00	Clear RPDO1 mapping
23 01 16 01 20 01 FF 60	23 01 16 01 00 00 00 00	Mapping 0x60FF 01 to 0x1601 01
23 01 16 02 20 02 FF 60	23 01 16 02 00 00 00 00	Mapping 0x60FF 02 to 0x1601 02
2F 01 16 00 02 00 00 00	2F 01 16 00 00 00 00 00	Start RPDO1 mapping
2B 10 20 00 01 00 00 00	2B 10 20 00 00 00 00 00	Save parameters to ERRPOM

After the mapping is completed, switch the communication status to operation mode to enable PDO transmission and send the NMT start command

The format of the NMT startup command is as follows:

COB-ID: 000 Data: 01+ID (00 represents opening all address PDO)

The RPDO sending format is shown in the table below:

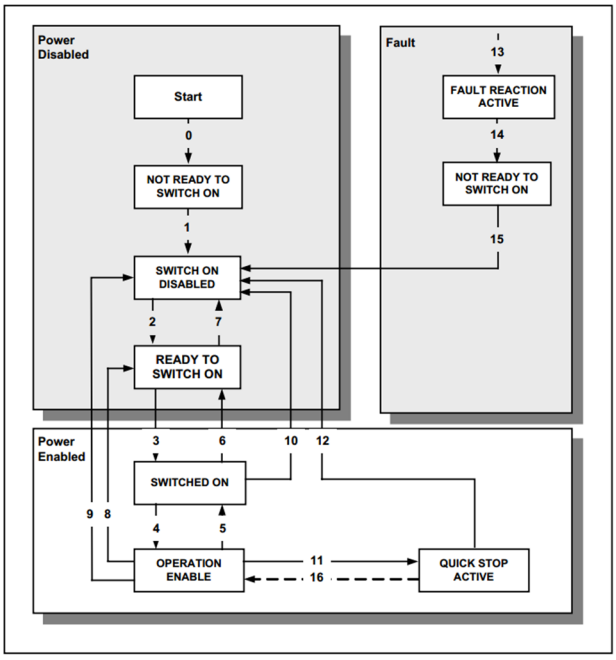
Master Station （COB-ID:0x301）	Function Description
01 02 03 04 05 06 07 08	01 02 03 04 Write 60FF 01 05 06 07 08 Write 60FF 02

3、CiA402 Description

3.1 CiA402 State Machine

CiA402 protocol defines the standard state machine of motion control device, as well as various operating modes and their definitions in object dictionary.

State machine describes the state of the device and the possible control sequences of driver. The status of each step represents a specific internal or external behavior, and the status of the device also determines which commands could be received.



Driver state machine

※ The corresponding state description of the state machine is as follows:

State Name	Description
NOT READY TO SWITCH ON	It only supplies power to the driver chip, the driver is initializing and self-checking, the driver function is not enabled, and this state is an internal state.
SWITCH ON DISABLED	After the driver is initialized, the driver parameters are established and could be modified. This state does not supply power to the motor. This state is the lowest state that user can operate. This state is also the state that use will contact after the driver is powered on.
READY TO SWITCH ON	The driver parameters could be modified, the driver function is not enabled, waiting to enter SWITCH ON state.
SWITCH ON	Provide high voltage to the driver, the power amplifier is ready, the driver parameters could be modified, and the driver function is not enabled.
OPERATION ENABLE	If no fault is detected, the driver function is enabled, and the motor is powered on. The driver parameters could be modified. According to BP [N] parameter, it is determined whether the brake will be automatically released in this state.
QUICK STOP ACTIVE	The driver parameters could be modified, the emergency stop function is enabled, the driver function is enabled, and the motor is powered on.
FAULT REACTION ACTIVE	The driver parameters could be modified, the driver has a fault, the fault response function is enabled, and the drive function is disabled. This state cannot be entered manually. The driver will enter this state automatically when a fault occurs.

Driver state machine is controlled by bit0-bit3, bit7 of the control word (object 6040h). The specific description is as follows:

※ Control word switching state:

Command	Control Word					State Switch
	Bit7	Bit3	Bit2	Bit1	Bit0	
Shutdown	0	X	1	1	0	2,6,8
Switchon	0	0	1	1	1	3
Switchon +Enable operation	0	1	1	1	1	3+4
Disable voltage	0	X	X	0	X	7,9,10,12
Quick stop	0	X	0	1	X	7,10,11
Disable Operation	0	0	1	1	1	5
Enable Operation	0	1	1	1	1	4,16
Fault reset	↑	X	X	X	X	15
Bit marked as X is invalid.						

Each state in state machine could be displayed through bit0-bit3, bit5, bit6 of status word (object 6041h), the specific description is as follows:

※ Status word switching state

State	State word					
	Bit6	Bit5	Bit3	Bit2	Bit1	Bit0
NOT READY TO SWITCH ON	0	X	0	0	0	0
SWITCH ON DISABLED	1	X	0	0	0	0
READY TO SWITCH ON	0	1	0	0	0	1
SWITCH ON	0	1	0	0	1	1
OPERATION ENABLE	0	1	0	1	1	1
QUICK STOP ACTIVE	0	0	0	1	1	1
FAULT REACTION ACTIVE	0	X	1	1	1	1
NOT READY TO SWITCH ON	0	X	1	0	0	0
Bit marked as X is invalid.						

3.2 Control Word And Status Word

The start and stop control commands and state description of the driver are mainly realized through the control word 6040h and the status word 6041h. Therefore, the skilled use of the control word and status word is very necessary. The following table briefly describes the definition of the control word and status word.

Control Word	Common Command	Function Description
6040h	00	Initialization step 0: At this time, the low 4-bit status of 6041 is 0000, motor is released;
	06	Initialization step 1: At this time, the low 4-bit status of 6041 is 0001, motor is released;
	07	Initialization step 2: At this time, the low 4-bit status of 6041 is 0011, motor is enabled;
	0F	Initialization step 3: At this time, the low 4-bit status of 6041 is 0111, motor is enabled;
	0F	Start command in Profile Velocity Mode (6061 = 3);
	0F->1F	Start command in Profile Torque Mode (6061 = 4); Absolute motion start command in position mode (6061 = 1);
	4F->5F	Relative motion start command in position mode (6061 = 1);

Status Word	Bit Definition	Function Description
	Bit0~Bit3	6040=0： xxxx xxxx xxxx 0000 6040=6： xxxx xxxx xxxx 0001 6040=7： xxxx xxxx xxxx 0011 6040=F： xxxx xxxx xxxx 0111
	Bit7	0: driver is normal; 1: driver alarms;

	Bit8	0: torque is not completed; 1: torque has been completed;
	Bit11	0: the status of Bit4 at 6040h is 0; 1: the status of Bit4 at 6040h is 1;
	Bit13	0: motor release; 1: motor is enabled;
	Bit14	0: motor is stopped; 1: motor is running;
	Bit15	0: The motion is not in position in position mode; 1: The motion is in position in position mode.

Eg: Initialize the driver after power-on. After initialization, it enters the normal operation state. This operation is generally performed after power-on.

Master station	Slave station	Status word of slave station
00: 01 00	NMT initialization	NMT initialization
601: 2B 40 60 00 00 00 00 00	581: 60 40 60 00 00 00 00 00	6041: xxxx xxxx xxxx 0000
601: 2B 40 60 00 06 00 00 00	581: 60 40 60 00 00 00 00 00	6041: xxxx xxxx xxxx 0001
601: 2B 40 60 00 07 00 00 00	581: 60 40 60 00 00 00 00 00	6041: xxxx xxxx xxxx 0011
601: 2B 40 60 00 0F 00 00 00	581: 60 40 60 00 00 00 00 00	6041: xxxx xxxx xxxx 0111

CANopen sets the operation mode of the driver through the object 6060h (Mode of Operation) and reflects the current operation mode status of the driver through the object 6061h (Mode of operation display). ZLAC8015D series driver currently supports 3 operation modes: Profile Position Mode, Profile Velocity Mode, and Profile Torque Mode.

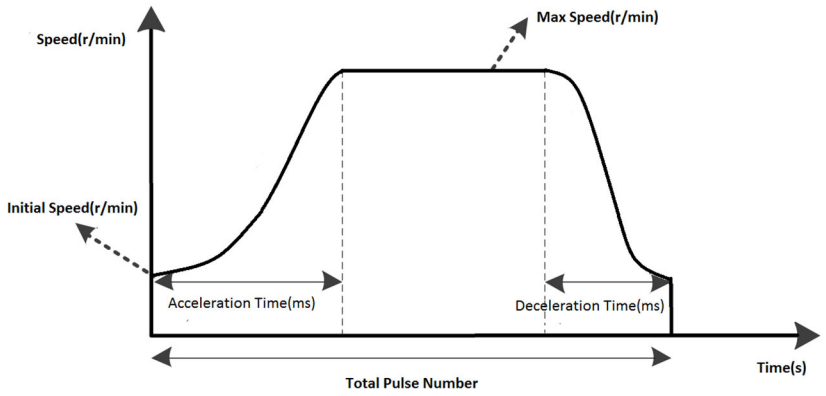
※ Driver Operation Mode:

Index	Sub-Index	Name	Type	Attribute	PDO Mapping	Parameter Range	Default
6060h	00	Modes_of_operation	I8	RW	NO	0: undefined 1: Profile Position Mode 3: Profile Velocity Mode 4: Profile Torque Mode	0

3.3 Profile Position Mode

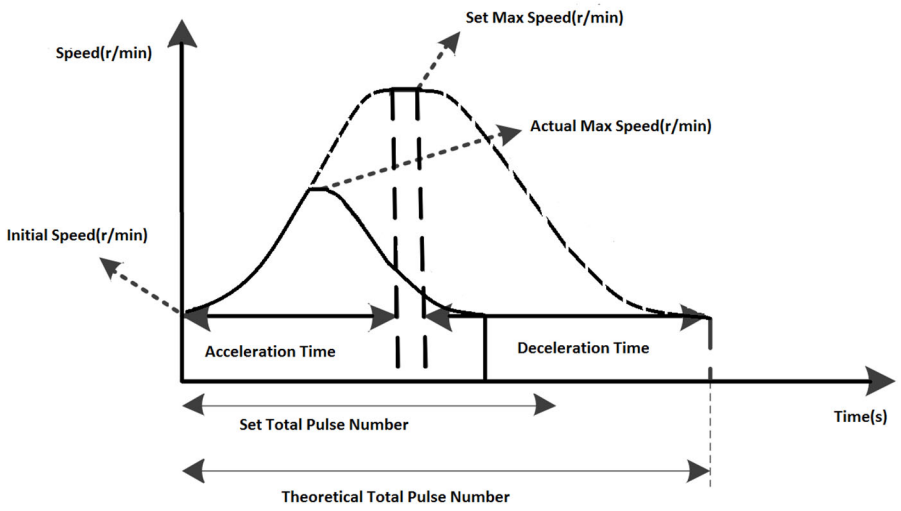
3.3.1 Profile Position Mode Description

Profile position mode is realized by an S-shaped acceleration and deceleration curve. User could set several parameters such as initial speed, maximum speed, acceleration time, deceleration time, and total pulse number through the bus to achieve precise position control. The S-shaped acceleration / deceleration curve is shown in the figure below.



Profile position mode acceleration/deceleration curve

When the total pulse number set by user is small, the motor may need to decelerate before it accelerates to the maximum speed (that is, the motor does not accelerate to the maximum speed set by the user during actual operation). The speed curve is shown in the figure below. The solid line in the figure shows the actual running curve of the motor, and the dotted line is the curve that motor needs to run, to accelerate to the set maximum speed. The theoretical total pulse number is the minimum total pulse number calculated according to the user-set parameters (initial speed, maximum speed, acceleration time, deceleration time). When the total pulse number set by the user is less than the theoretical total pulse number, the motor will run as shown by the solid line in the figure.



Profile position mode acceleration/deceleration curve (not accelerated to the set maximum speed)

Status word

Status word	Bit	Function Description
6041h	Bit0~Bit3	6040=0： xxxx xxxx xxxx 0000 6040=6： xxxx xxxx xxxx 0001 6040=7： xxxx xxxx xxxx 0011 6040=F： xxxx xxxx xxxx 0111
	Bit5	0: Emergency stop 1: Non-emergency stop (command emergency stop)
	Bit10	0: Target position is not in place 1: Target position in place
	Bit12	0：The target location has not taken effect 1：Target location effective
	Bit13	0: Motor operation is not in place 1: Motor running in place (Based on the drive overshoot threshold)
	Bit14	0: Motor stop 1: Motor is running;
	Bit15	0：In the non-external scram state. 1：In external scram state

※ Related Object Dictionary Content

Index	Sub-Index	Name	Description	Type	Attribute	PDO mapping	Defaults
6040h	00	Controlword	Controlword	U16	RW	YES	0
6060h	00	Modes_of_operation	0: Undefined; 1: Profile position mode; 3: Profile velocity mode; 4: Profile torque mode;	I8	RW	YES	0
607Ah	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Target_position (left)	Range of total pulse number in pofile position mode operation: relatively: -0x7FFFFFFF~0x7FFFFFFF absolute:	I32	RW	YES	0

			-0x3FFFFFFF~0x3FFFFFFF				
	02	Target_position (right)	Range of total pulse number in profile position mode operation: relatively: -0x7FFFFFFF~0x7FFFFFFF absolute: -0x3FFFFFFF~0x3FFFFFFF	I32	RW	YES	0
6081h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_velocity (left)	Maximum speed in profile position mode; Range: 1-1000r/min;	U32	RW	YES	120r/min
	02	Profile_velocity (right)	Maximum speed in position mode; Range: 1-1000r/min;	U32	RW	YES	120r/min
6083h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_acceleration (left)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
	02	Profile_acceleration (right)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
6084h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_deceleration (left)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
	02	Profile_deceleration (right)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	500ms

3.3.2 Profile Position Mode Configuration Routine

Make the motor run relatively based on the parameters (acceleration time 100ms, deceleration time 100ms, maximum speed 60r / min, total pulse number 3200).

Profile position mode initialization:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2F 60 60 00 01 00 00 00	60 60 60 00 00 00 00 00	Set profile position mode
23 83 60 01 64 00 00 00	60 83 60 01 00 00 00 00	Set the left motor Acceleration time 100ms
23 83 60 02 64 00 00 00	60 83 60 02 00 00 00 00	Set the right motor Acceleration time 100ms
23 84 60 01 64 00 00 00	60 84 60 01 00 00 00 00	Set the left motor Deceleration time 100ms
23 84 60 02 64 00 00 00	60 84 60 02 00 00 00 00	Set the right motor Deceleration time 100ms
23 81 60 01 3C 00 00 00	60 81 60 01 00 00 00 00	Set the left motor Maximum speed 60r/min
23 81 60 02 3C 00 00 00	60 81 60 02 00 00 00 00	Set the right motor Maximum speed 60r/min
2B 40 60 00 06 00 00 00	60 40 60 00 00 00 00 00	Enable motor
2B 40 60 00 07 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	

Relative position control of both motors:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 7A 60 01 00 7D 00 00	60 7A 60 01 00 00 00 00	Set the left motor Target position 32000
23 7A 60 02 00 83 FF FF	60 7A 60 02 00 00 00 00	Set the right motor Target position -32000
2B 40 60 00 4F 00 00 00	60 40 60 00 00 00 00 00	Start relative movement
2B 40 60 00 5F 00 00 00	60 40 60 00 00 00 00 00	
23 7A 60 01 00 83 FF FF	60 7A 60 01 00 00 00 00	Set the left motor Target position-32000
23 7A 60 02 00 7D 00 00	60 7A 60 02 00 00 00 00	Set the right motor Target position 32000
2B 40 60 00 4F 00 00 00	60 40 60 00 00 00 00 00	Start relative movement
2B 40 60 00 5F 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motors

Absolute position control of both motors:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 7A 60 01 00 7D 00 00	60 7A 60 01 00 00 00 00	Set the left motor Target position 32000
23 7A 60 02 00 83 FF FF	60 7A 60 02 00 00 00 00	Set the right motor

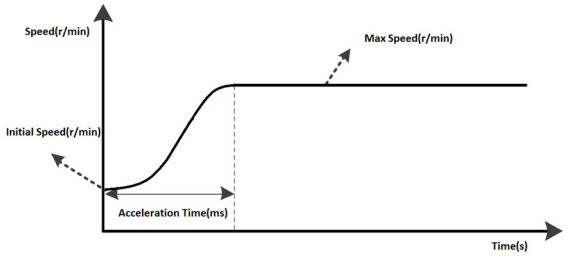
		Target position -32000
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	Start absolute movement
2B 40 60 00 1F 00 00 00	60 40 60 00 00 00 00 00	
23 7A 60 01 00 83 FF FF	60 7A 60 01 00 00 00 00	Set the left motor Target position -32000
23 7A 60 02 00 7D 00 00	60 7A 60 02 00 00 00 00	Set the right motor Target position 32000
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	Start absolute movement
2B 40 60 00 1F 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motors

※ Note: In position control, the switch of control word will control both motors at the same time, so when controlling a single motor, the target position of the other motor should be given 0.

3.4 Profile Velocity Mode

3.4.1 Profile Velocity Mode Description

The acceleration curve in Profile velocity mode is shown in the figure below. Differ from Profile position mode, Profile velocity mode only needs to set 3 parameters: initial speed, target speed, acceleration time. After the motor accelerates to the maximum speed according to set 3 parameters , it will run uniformly at the maximum speed.



Profile Velocity Mode acceleration curve

Status word

Status word	Bit	Function Description
6041h	Bit0~Bit3	6040=0： xxxx xxxx xxxx 0000 6040=6： xxxx xxxx xxxx 0001 6040=7： xxxx xxxx xxxx 0011 6040=F： xxxx xxxx xxxx 0111
	Bit5	0: Emergency stop 1: Non-emergency stop (command emergency stop)
	Bit10	0: Speed not in place 1: Speed in place
	Bit12	0： Speed is not 0 speed 1： Speed is 0 speed
	Bit14	0: Motor stop 1: Motor is running
	Bit15	0： In the non-external scram state 1： In external scram state

※ Related Object Dictionary Content

Index	Sub-Index	Name	Description	Type	Attribute	PDO mapping	Defaults
200Fh	00	Synchronous/asynchronous control flag	0: Asynchronous control 1: Synchronization control	U16	RW	YES	0
6040h	00	Controlword	Control word	U16	RW	YES	0
6060h	00	Modes_of_operation	0: Undefined; 1: Profile position mode; 3: Profile Velocity mode; 4: Profile torque mode;	I8	RW	YES	0
6083h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_acceleration (left)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
	02	Profile_acceleration (right)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
6084h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_deceleration (left)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
	02	Profile_deceleration (right)	Deceleration time; Range: 0-32767ms;;	U32	RW	YES	500ms
60FFh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Target_velocity (left)	Target speed in profile velocity mode; range: -1000~1000r/min;	I32	RW	YES	0
	02	Target_velocity (right)	Target speed in profile velocity mode; range: -1000~1000r/min;	I32	RW	YES	0
	03	Left and right target speed combination	The current movement speed of	U32(I16+I	RO	YES	0

		Low 16 is the left motor High 16 is the right motor	the motor, unit is 0.1r/min	16)			

3.4.2 Profile Velocity Mode Configuration Routine

Make the motor run based on the parameters (acceleration time 100ms, deceleration time 100ms, maximum speed 60r/min).

※ Assume that the slave station number of the driver is 1. CANopen instruction control is described in the following table:

Profile velocity mode asynchronous control initialization:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 0F 20 00 00 00 00 00	60 0F 20 00 00 00 00 00	Set asynchronous control
2F 60 60 00 03 00 00 00	60 60 60 00 00 00 00 00	Set profile velocity mode
23 83 60 01 64 00 00 00	60 83 60 01 00 00 00 00	Set the left motor Acceleration time 100ms
23 83 60 02 64 00 00 00	60 83 60 02 00 00 00 00	Set the right motor Acceleration time 100ms
23 84 60 01 64 00 00 00	60 84 60 01 00 00 00 00	Set the left motor Deceleration time 100ms
23 84 60 02 64 00 00 00	60 84 60 02 00 00 00 00	Set the right motor Deceleration time 100ms
2B 40 60 00 06 00 00 00	60 40 60 00 00 00 00 00	Enable motor
2B 40 60 00 07 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	

Velocity control of the left motor:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 FF 60 01 64 00 00 00	60 FF 60 01 00 00 00 00	Set the left motor Target speed 100rpm
23 FF 60 01 9C FF FF FF	60 FF 60 01 00 00 00 00	Set the left motor Target speed -100rpm
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motor

Velocity control of the right motor:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 FF 60 02 64 00 00 00	60 FF 60 02 00 00 00 00	Set the right motor target speed 100rpm
23 FF 60 02 9C FF FF FF	60 FF 60 02 00 00 00 00	Set the right motor Target speed -100rpm
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motor

Profile velcity mode synchronization control initialization:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 0F 20 00 01 00 00 00	60 0F 20 00 00 00 00 00	Set synchronization control
2F 60 60 00 03 00 00 00	60 60 60 00 00 00 00 00	Set profile velocity mode
23 83 60 01 64 00 00 00	60 83 60 01 00 00 00 00	Set the left motor Acceleration time 100ms
23 83 60 02 64 00 00 00	60 83 60 02 00 00 00 00	Set the right motor Acceleration time 100ms
23 84 60 01 64 00 00 00	60 84 60 01 00 00 00 00	Set the left motor Deceleration time 100ms
23 84 60 02 64 00 00 00	60 84 60 02 00 00 00 00	Set the right motor Deceleration time 100ms
2B 40 60 00 06 00 00 00	60 40 60 00 00 00 00 00	Enable motor
2B 40 60 00 07 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	

Synchronous velocity control:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 FF 60 03 64 00 64 00	60 FF 60 03 00 00 00 00	Set synchronization control Target speed 100rpm
23 FF 60 03 9C FF 9C FF	60 FF 60 03 00 00 00 00	Set synchronization control Target speed -100rpm
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motors

※Note: Synchronous target speed: low 16 is the left motor, high 16 is the right motor.

3.5 Profile Torque Mode

3.5.1 Profile Torque Mode Description

In Profile torque mode, the value of operation mode object 6060h needs to be set to 4. When the operation mode status reads the register of object 6061h as 4, the relevant operations of torque mode operation mode can be performed. The objects involved in this mode are as follows:

Status word

Status word	Bit	Function Description
6041h	Bit0~Bit3	6040=0： xxxx xxxx xxxx 0000 6040=6： xxxx xxxx xxxx 0001 6040=7： xxxx xxxx xxxx 0011 6040=F： xxxx xxxx xxxx 0111
	Bit5	0: Emergency stop 1: Non-emergency stop (command emergency stop)
	Bit10	0: Torque is not in place 1: Torque in place

	Bit14	0: Motor stop 1: Motor is running
	Bit15	0：In the non-external scram state 1：In external scram state

※ Related Object Dictionary Content

Index	Sub-Index	Name	Description	Type	Attribute	PDO mapping	Defaults
200Fh	00	Synchronous/asynchronous control flag	0: Asynchronous control 1: Synchronization control	U16	RW	YES	0
6040h	00	Controlword	Control word	U16	RW	YES	0
6060h	00	Modes_of_operation	0: Undefined; 1: Profile position mode; 3: Profile Velocity mode; 4: Profile torque mode;	I8	RW	YES	0
6071h	00	Number of sub-indexes	Number of sub-indexes	U16	RW	NO	2
	01	Target_torque (left)	Unit: mA Range: -30000~30000;	I16	RW	YES	0
	02	Target_torque (right)	Unit: mA Range: -30000~30000;	I16	RW	YES	0
	03	Left and right target torque combination Low 16 is the left motor High 16 is the right motor	Unit: mA Range: -30000~30000;	U32(I16+I16)	RW	YES	0
6087h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Torque_slope (left)	Current/1000/second; Unit: mA/s;	U32	RW	YES	300ms
	02	Torque_slope (right)	Current/1000/second; Unit: mA/s;	U32	RW	YES	300ms

3.5.2 Profile Torque Mode Configuration Routine

Complete torque work, target torque is 100mA.

※ Assume that the slave station number of the driver is 1. CANopen instruction control is described in the following table:

Profile torque mode asynchronous control initialization:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 0F 20 00 00 00 00 00	60 0F 20 00 00 00 00 00	Set asynchronous control
2F 60 60 00 04 00 00 00	60 60 60 00 00 00 00 00	Set profile torque mode
23 87 60 01 64 00 00 00	60 87 60 01 00 00 00 00	Set the left motor Torque slope 100mA/s
23 87 60 02 64 00 00 00	60 87 60 02 00 00 00 00	Set the right motor Torque slope 100mA/s
2B 40 60 00 06 00 00 00	60 40 60 00 00 00 00 00	Enable motor
2B 40 60 00 07 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	

Torque control of the left motor:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 71 60 01 E8 03 00 00	60 71 60 01 00 00 00 00	Set the left motor Target torque 1000mA/s
2B 71 60 01 18 FC FF FF	60 71 60 01 00 00 00 00	Set the left motor Target torque -1000mA/s
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motor

Torque control of the right motor:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 71 60 02 E8 03 00 00	60 71 60 02 00 00 00 00	Set the right motor Target torque 1000mA/s
2B 71 60 02 18 FC FF FF	60 71 60 02 00 00 00 00	Set the right motor Target torque -1000mA/s
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motor

※Note: The left/right target torque is 16-bit data, the SDO write command word is 0x2B, the synchronization target torque is 32-bit data, and the SDO write command word is 0x23.

Profile torque mode synchronization control initialization:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 0F 20 00 01 00 00 00	60 0F 20 00 00 00 00 00	Set synchronization control
2F 60 60 00 04 00 00 00	60 60 60 00 00 00 00 00	Set profile torque mode
23 87 60 01 64 00 00 00	60 87 60 01 00 00 00 00	Set the left motor Torque slope 100mA/s
23 87 60 02 64 00 00 00	60 87 60 02 00 00 00 00	Set the right motor Torque slope 100mA/s
2B 40 60 00 06 00 00 00	60 40 60 00 00 00 00 00	Enable motor
2B 40 60 00 07 00 00 00	60 40 60 00 00 00 00 00	
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	

Synchronous torque control:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
23 71 60 03 E8 03 E8 03	60 71 60 03 00 00 00 00	Set synchronization control Target torque 1000mA/s
23 71 60 03 18 FC 18 FC	60 71 60 03 00 00 00 00	Set synchronization control Target torque -1000mA/s
2B 40 60 00 00 00 00 00	60 40 60 00 00 00 00 00	Stop motors

※Note: Synchronous target speed: low 16 is the left motor, high 16 is the right motor.

3.6 Emergency Stop Instruction

The emergency stop can be controlled by an external input signal, or it could be achieved by switching the state of the control word through communication.

※ Related Object Dictionary Content

Index	Sub-Index	Name	Description	Type	Attribute	PDO mapping	Defaults
2003h	00	Input signal status	2 input signal level status Bit0-Bit1: X0-X1 input level status;	U16	RO	YES	0
2030h	01	Input terminal effective level	Bit0: Input terminal X0 control bit; Bit1: Input terminal X1 control bit; Bit2-Bit15: Reserved; 0: Default; 1: Level inversion; The driver defaults to the input terminal level rising edge or high level	U16	RW	YES	0

			active;				
	02	Function selection of input terminal X0 terminal	0: Undefined; 1-6: NC; 9: Emergency stop signal;	U16	RW	YES	9
	03	Function selection of input terminal X1 terminal		U16	RW	YES	0
605Ah	00	Quick_stop_option_code	Driver processing method after quick stop command. 5: Stop normally , maintain quick stop status; 6: Decelerate to stop emergencely and maintain quick stop state; 7: Emergency stop, maintain quick stop state;	I16	RW	NO	5
6085h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Quick_stop_deceleration (left)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	10ms
	02	Quick_stop_deceleration (right)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	10ms

Emergency Stop Instruction:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 40 60 00 02 00 00 00	60 40 60 00 00 00 00 00	The motor stops and remains enabled
2B 40 60 00 0F 00 00 00	60 40 60 00 00 00 00 00	Motor enable (release quick stop state)

3.7 Error And Clear

ZLAC8015D supports protections such as overvoltage and overcurrent. All fault information can be obtained by reading object 0x603F.

0x603F	Function Desription
0x0000 0000h	No error
0x0000 0001h	Over-voltage
0x0000 0002h	Under-voltage

0x0000 0100h	EEPROM read and write error
0x0004 0004h	Over-current
0x0008 0008h	Overload
0x0010 0010h	Current out of tolerance （Reserved）
0x0020 0020h	Encoder out of tolerance
0x0040 0040h	Velocity out of tolerance （Reserved）
0x0080 0080h	Reference voltage error
0x0200 0200h	Hall error
0x0400 0400h	High motor temperature
0x0800 0800h	Encoder error
0x2000 2000h	Speed setting error

※Note: No error/over-voltage/under-voltage/EEPROM read and write error are common faults are error for both motors. Other errors are divided into left and right drives. The high 16 bits of the error code are left driver, and the low 16 bits are right driver.

Clear error:

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 40 60 00 80 00 00 00	60 40 60 00 00 00 00 00	Clear error

3.8 External Brake

※ Related Object Dictionary Content

Index	Sub-Index	Name	Description	Type	Attribute	PDO mapping	Defaults
2030h	04	Output terminal effective level	Bit0: Input terminal Y0 control bit; Bit1: Input terminal Y1 control bit; Bit2: Input terminal B0 control bit; Bit3: Input terminal B1 control bit; 0: Default; 1: Level inversion; The driver defaults to the input terminal level rising edge or high level active;	U16	RW	YES	0
	07	Output terminal B0 terminal	Brake state 0: Open	U16	RW	YES	0

		function selection	1: Close				
	08	Output terminal B1 terminal function selection	Brake state 0: Open 1: Close	U16	RW	YES	0

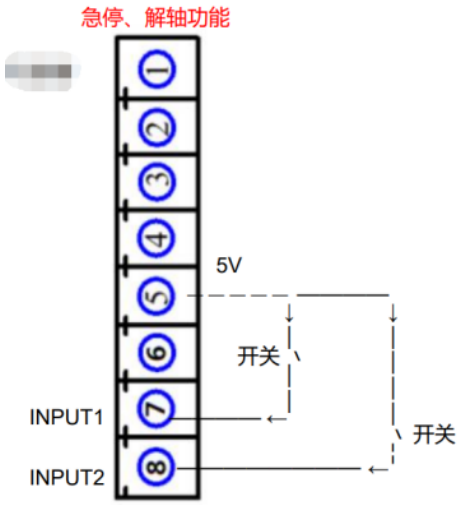
※Note: For wire connection of external brake, please refer to《ZLAC8015D MANUAL》. The default state of external brake is opened.

Close the brake (Left motor B0):

Master Station (COB-ID:0x601)	Slave Station (COB-ID:0x581)	Function Description
2B 30 20 07 00 00 00 00	60 30 20 00 00 00 00 00	Close the brake of the left motor

3.9 I/O Emergency Stop Processing Method

3.9.1 Wiring Diagram J4



I/O emergency stop processing method (CAN address; 2026h 03)

0: Lock shaft (Motor stops with holding force)
1: Release shaft (Turning off PWM output signal, motor is under free running status)

Method a. Set value of object 605Ah to 5: When pressing the emergency stop button, the motor will stop according to the deceleration time and turn cut off the PWM control signal, to cut off the current supply to the motor.

Method b. Set value of object 605Ah to 6: When pressing the emergency stop button, the motor will stop according to the emergency stop deceleration time and then turn off the PWM control signal, to cut off the current supply to the motor.

Method c. Set value of object 605Ah to 7: When pressing the emergency stop button, the PWM control signal will be immediately turned off, and the motor will continue to run under inertia and gradually stop.

4、Object Dictionary

ZLAC8015D series bus type servo driver parameter register includes 3 parts: 1000h-1FFFh register defined by CIA301, 2000h-2FFFh register defined by the manufacturer and 6000h-6FFFh register defined by CIA402.

1000h-1FFFh register is CANopen related basic communication parameter defined by CIA301, including SDO, PDO, and mapping register.

2000h-2FFFh register is a manufacturer-defined register content, subdivision and current modification could be implemented within this group of parameters.

6000h-6FFFh register is motion parameter related to motion control defined by CIA402, including profile position mode, profile velocity mode, profile torque mode, other operation mode registers, and related motion parameter registers.

Index	Sub-index	Name	Description	Type	Attributes	PDO mapping	Defaults
CiA301 Basic Communication Parameter Group							
1000h	00	Device Type	This device supports CiA301, CiA402 protocol	U32	RO	NO	0X00040192
1001h	00	Error Register	Driver current error status	U8	RO	NO	0
1005h	00	COB ID SYNC	COB identifier of synchronization message	U32	RW	NO	0x80
1009h	00	Manufacturer Hardware Version	Hardware version	U16	RO	NO	-
100Ah	00	Manufacturer Software Version	Software version	U16	RO	NO	-
1014h	00	COB ID EMCY	EMNC Emergency Message COB	U32	RW	NO	0x80
1017h	00	Producer Heartbeat Time	Producer heartbeat interval, unit: ms	U16	RW/S	NO	0
1018h	00	Number of entries	Number of entries	U8	RO	NO	5
	01	Vendor ID	Vendor ID	U32	RO	NO	0x0100
	02	Product Code	Supplier Product Number	U32	RO	NO	0x0001
1200h	00	Number of entries	Number of entries	U8	RO	NO	2
	01	COB ID Client to Server	COB ID Client to Server	U32	RO	NO	600h+Node-ID
	02	COB ID Server to Client	COB ID Server to Client	U32	RO	NO	580h+Node-ID
1400h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	RPDO0 COB ID	U32	RO	NO	200+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0

	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1401h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	RPDO1 COB ID	U32	RO	NO	300+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1402h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	RPDO2 COB ID	U32	RO	NO	400+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1403h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	RPDO3 COB ID	U32	RO	NO	500+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1600h	00	Number of entries	Number of entries	U8	RO	NO	1
	01	PDO Mapping Entry	Map to 6040h register	U32	RW/S	NO	60400010h
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1601h	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
1602h	00	Number of entries	Number of entries	U8	RO	NO	0

	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1603h	00	Number of entries	Number of entries	U8	RO	NO	0
	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1800h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	TPDO0 COB ID	U32	RO	NO	180+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1801h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	TPDO1 COB ID	U32	RO	NO	280+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1802h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	TPDO2 COB ID	U32	RO	NO	380+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0
1803h	00	Number of entries	Number of sub-indexes	U8	RO	NO	5
	01	COB ID	TPDO3 COB ID	U32	RO	NO	480+Node-ID
	02	Transmission Type	Transmission Type	U8	RW/S	NO	FFh
	03	Inhibit Time	Inhibit Time	U16	RW/S	NO	0
	04	Compatibility Entry	Compatibility Entry	U8	RW	NO	0
	05	Event Timer	Event Timer	U16	RW/S	NO	0

1A00h	00	Number of entries	Number of entries	U8	RO	NO	0
	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1A01h	00	Number of entries	Number of entries	U8	RO	NO	0
	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1A02h	00	Number of entries	Number of entries	U8	RO	NO	0
	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
1A03h	00	Number of entries	Number of entries	U8	RO	NO	0
	01	PDO Mapping Entry	Unmapped	U32	RW/S	NO	-
	02	PDO Mapping Entry_2	Unmapped	U32	RW/S	NO	-
	03	PDO Mapping Entry_3	Unmapped	U32	RW/S	NO	-
	04	PDO Mapping Entry_4	Unmapped	U32	RW/S	NO	-
Factory custom parameters							
2000h	00	Communication power-down protection time	Driver and host communication power-down time setting Unit: ms Range: 0-32767;	U16	RW	YES	0
2001h	00	RS485 custom driver node number	Rage:1 - 127.	U16	RW	YES	1
2002h	00	RS485 custom communication	1: 128000bps 2: 115200bps	U16	RW	YES	2

		baudrate	3: 57600bps 4: 38400bps 5: 19200bps 6: 9600bps				
2003h	00	Input signal status	2 input signal level status; Bit0 – Bit1: X0 ~ X1 input level status;	U16	RO	YES	0
2004h	00	Output signal status	4 output signal level status; Bit0 ~ Bit1: Y0 ~ Y1 output status; Bit2 ~ Bit3: B0 ~ B1 output status;	U16	RO	YES	0
2005h	00	Clear postion feedback	Clear position feedback in profile position mode 0: Invalid; 1: Cleared position feedback. Not save High 8 bits: (left) Low 8 bits: (right)	U16	RW	YES	0
2006h	00	Set original position(absolute position move)	Set current position as original position for absolute position move. 0: Invalid; 1: Set original position (left) 2: Set original position (right) 3: Set original position synchronously	U16	RW	YES	0
2007h	00	Shaft lock method	0: Not enable, not lock the shaft; 1: Not enable, lock the shaft;	U16	RW	YES	0
2008h	00	Motor max speed	Motor max working speed Unit: r/min; Range: 1-1000r/min;	U16	RW	YES	1000
2009h	00	Register parameter setting	0: Invalid; 1: Restore factory settings;	U16	RW	YES	0

200Ah	00	CAN custom driver node number	Range: 1-127;	U16	RW	YES	1
200Bh	00	CAN custom communication baudrate	0: 1000 Kbit/s 1: 500 Kbit/s 2: 250 Kbit/s 3: 125 Kbit/s 4: 100 Kbit/s	U16	RW	YES	1
200Ch	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Motor pole pair number (left)	4-64	U16	RW	YES	15
	02	Motor pole pair number (right)	4-64	U16	RW	YES	15
200Dh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Starting speed (left)	The initial speed at which the movement started; Unit The initial speed at which the movement started; Unit: r/min; Range: 1-256r/ min;	U16	RW	YES	1r/min
	02	Starting speed (right)	The initial speed at which the movement started; Unit The initial speed at which the movement started; Unit: r/min; Range: 1-256r/ min;	U16	RW	YES	1r/min
200Eh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Encoder wire number setting (left)	0-4096	U16	RW	YES	1024
	02	Encoder wire number setting (right)	0-4096	U16	RW	YES	1024
200Fh	00	Synchronous/asynchronous control flag	0: Asynchronous control 1: Synchronous control	U16	RW	YES	0
2010h	00	Whether the parameter are updated to EEPROM	Whether the communication write function code value is updated to EEPROM 0: Invalid; 1: Parameters with	U16	RW	YES	0

			attribute RW / S are updated to EEPROM synchronously;				
2011h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Offset angle of motor and Hall (left)	Unit: 1°; Range: -360-+360	I16	RW	YES	0
	02	Offset angle of motor and Hall (right)	Unit: 1°; Range: -360-+360	I16	RW	YES	0
2012h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Overload factor (left)	Range: 0-300, Unit: %	U16	RW	YES	200
	02	Overload factor (right)	Range: 0-300, Unit: %	U16	RW	YES	200
2013h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Motor temperature protection threshold (left)	Unit: 0.1°C; Range: 0-1200	U16	RW	YES	800
	02	Motor temperature protection threshold (right)	Unit: 0.1°C; Range: 0-1200	U16	RW	YES	800
2014h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Rated current (left)	Driver rated output current Unit: 0.1A; Range: 0-150	U16	RW	YES	150
	02	Rated current (right)	Driver rated output current Unit: 0.1A; Range: 0-150	U16	RW	YES	150
2015h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Maximum current (left)	Maximum driver output current Unit: 0.1A; Range: 0-300	U16	RW	YES	300
	02	Maximum current (right)	Maximum driver output current Unit: 0.1A; Range: 0-300	U16	RW	YES	300

2016h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Overload protection time (left)	Driver overload protection time Unit: 10ms; Range: 0-6553	U16	RW	YES	300
	02	Overload protection time (right)	Driver overload protection time Unit: 10ms; Range: 0-6553	U16	RW	YES	300
2017h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Out of tolerance alarm threshold (left)	Encoder tolerance threshold Unit: *10counts; Range: 1-6553	U16	RW	YES	409
	02	Out of tolerance alarm threshold (right)	Encoder tolerance threshold Unit: *10counts; Range: 1-6553	U16	RW	YES	409
2018h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed smoothing coefficient	0-30000	U16	RW	YES	50
	02	R speed smoothing coefficient	0-30000	U16	RW	YES	50
2019h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L current loop proportional coefficient	0-30000	U16	RW	YES	600
	02	R current loop proportional coefficient	0-30000	U16	RW	YES	600
201Ah	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L current loop integral gain	0-30000	U16	RW	YES	300
	02	R current loop integral gain	0-30000	U16	RW	YES	300
201Bh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L feedforward output smoothing	0-30000	U16	RW	YES	100

		coefficient					
	02	R feedforward output smoothing coefficient	0-30000	U16	RW	YES	100
201Ch	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L torque output smooth coefficient	0-30000	U16	RW	YES	100
	02	R torque output smooth coefficient	0-30000	U16	RW	YES	100
201Dh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed proportional gain Kp	0-30000	U16	RW	YES	500
	02	R speed proportional gain Kp	0-30000	U16	RW	YES	500
201Eh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed integral gain Ki	0-30000	U16	RW	YES	100
	02	R speed integral gain Ki	0-30000	U16	RW	YES	100
201Fh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed feedforward gain Kf	0-30000	U16	RW	YES	1000
	02	R speed feedforward gain Kf	0-30000	U16	RW	YES	1000
2020h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L position proportional gain Kp	0-30000	U16	RW	YES	50
	02	R position proportional gain Kp	0-30000	U16	RW	YES	50
2021h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L position feedforward gain Kf	0-30000	U16	RW	YES	200
	02	R position feedforward gain Kf	0-30000	U16	RW	YES	200
2022h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed observer coefficient 1	0-30000	U16	RW	YES	1000

	02	R speed observer coefficient 2	0-30000	U16	RW	YES	1000
2023h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed observer coefficient 2	0-30000	U16	RW	YES	750
	02	R speed observer coefficient 2	0-30000	U16	RW	YES	750
2024h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed observer coefficient 3	0-30000	U16	RW	YES	350
	02	R speed observer coefficient 3	0-30000	U16	RW	YES	350
2025h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	L speed observer coefficient 4	0-30000	U16	RW	YES	1000
	02	R speed observer coefficient 4	0-30000	U16	RW	YES	1000
2026h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	YES	2
	01	Alarm PWM processing method	0: close; 1: open	U16	RW	YES	0
	02	Overload processing method	0: close; 1: open	U16	RW	YES	0
	03	I/O emergency stop processing mode	0:Lock shaft(Motor stops with holding force) 1:Release shaft(Turning off PWM output signal,motor is under free running status) **Method a.** Set value of object 605Ah to 5:When pressing the Emergency stop button,the motor will stop according to the deceleration time and turn cut off the PWM control signal,to cut off the current supply to the motor. **Method b.**Set value of object 605Ah to 6: When pressing the emergency stop button,the motor will stop according to the emergency stop deceleration	U16	RW	YES	0

			time and then turn off the PWM control signal,to cutoff the current supply tothe motor. **Method c.**Set value of object 605Ah to 7:When pressing the emergency stop button,the PWM control signal will be immediatelyturned off,and the motor will continue to rununder inertia and gradually stop.				
	04	Parking mode	0: Close 1: Open	U16	RW	YES	0
	05	Given speed resolution	1/Set value=Final speed resolution. Set value range: 1-A 1: Speed resolution 1RPM 2: Speed resolution 0.5RPM 3: Speed resolution 1/3 RPM 4: Speed resolution 0.25RPM 5: Speed resolution 0.2RPM 6: Speed resolution 1/6RPM 7: Speed resolution 1/7RPM 8: Speed resolution 0.125RPM 9: Speed resolution 1/9RPM A: Speed resolution 0.1RPM	U16	RW	YES	1
	06	Velocity overshoot	0: close; 1: Open;	U16	RW	YES	1
2027h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	No	4
	01	Regen resistor value	Unit 0.1Ω Range 0-1000(*0.1)	U16	RW/S	YES	50
	02	Regen resistor power	Unit 0.1V Range 0-1000	U16	RW/S	YES	100
	03	Open voltage	Unit 0.1V Range 240-750(*0.1)	U16	RW/S	YES	650

	04	Close voltage	Unit 0.1V Range 210-720(*0.1)	U16	RW/S	YES	600
	05	Function control	Open/close 0: Close 1: Open	U16	RW/S	YES	1
2030h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	8
	01	Input port effective level	Bit0: Input terminal X0 control bit; Bit1: Input terminal X1 control bit; Bit2- Bit15: Reserved; 0: Default; 1: level inversion; The driver's default input terminal level rising edge or high level is valid;	U16	RW	YES	0
	02	Input port X0 function selection	0: undefined; 1-6：NC； 9: emergency stop signal;	U16	RW	YES	9
	03	Input port X1 function selection		U16	RW	YES	0
	04	Output port effective level	Bit0: Input terminal Y0 control bit; Bit1: Input terminal Y1 control bit; Bit2: Input terminal B0 control bit; Bit3: Input terminal B1 control bit; 0: Default; 1: Level inversion; The driver defaults to the input terminal level rising edge or high level active;	U16	RW	YES	0
	05	Output port Y0 function selection	0: undefined; 1: Alarm signal; 2: Driver status signal; 3: Signal in place (reserved);	U16	RW	YES	0
	06	Output port Y1 function selection	0: undefined; 1: Alarm signal; 2: Driver status signal; 3: Signal in place (reserved);	U16	RW	YES	0
	07	Output port B0	Brake state	U16	RW	YES	0

		function selection	0: Open 1: Close				
	08	Output port B1 function selection	Brake state 0: Open 1: Close	U16	RW	YES	0
2031h	00	Software version	Factory default	U16	RO	NO	-
2032h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	3
	01	Motor temperature (left)	Unit: 0.1°C; Range: -500~1200°C	U16	RO	YES	-
	02	Motor temperature (right)	Unit: 0.1°C; Range: -500~1200°C	U16	RO	YES	-
	03	Driver temperature	Unit: 0.1°C; Range: -500~1200°C				-
2033h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Motor status register (left)	The driver controls the motor motion state 0: The motor is stationary; 1: Motor is running;	U16	RO	YES	0
	02	Motor status register (right)	The driver controls the motor motion state 0: The motor is stationary; 1: Motor is running;	U16	RO	YES	0
2034h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Hall input state (left)	0-7; If 0 or 7 appears, it is a Hall error	U16	RO	YES	0
	02	Hall input state (right)	0-7; If 0 or 7 appears, it is a Hall error	U16	RO	YES	0
2035h	00	Bus voltage	Unit: 0.01V	U16	RO	YES	0
CiA 402 Parameter							
603Fh	00	Error_code	Factory-defined drive error conditions. High 16 bit: right motor, Low 16 bit: left motor. 0x0000 0000h: no error; 0x0000 0001h: over-voltage; 0x0000 0002h:	U16	RO	YES	0

			under-voltage; 0x0000 0100h：EEPROM read and write error; Left motor: 0x0000 0004h: over-current; 0x0000 0008h: overload; 0x0000 0010h: current out of tolerance;(Reserved) 0x0000 0020h: encoder out of tolerance; 0x0000 0040h: velocity out of tolerance;(Reserved) 0x0000 0080h: reference voltage error; 0x0000 0200h: hall error; 0x0000 0400h: high motor temperature. 0x0000 0800h: Encoder error 0x0000 2000h：Speed setting error（The given speed cannot exceed the rated speed） Right Motor: 0x0004 0000h: over-current 0x0008 0000h: overload 0x0010 0000h: current out of tolerance;(Reserved) 0x0020 0000h: encoder out of tolerance; 0x0040 0000h: velocity out of tolerance;(Reserved) 0x0080 0000h: reference voltage error; 0x0200 0000h: hall error; 0x0400 0000h: high motor temperature 0x0800 0000h: Encoder				

			error 0x0000 2000h：Speed setting error（The given speed cannot exceed the rated speed）				
6040h	00	Controlword	Control word	U16	RW	YES	0
6041h	00	Statusword	Status word; High 16 bit: left motor; Low 16 bit: right motor.	U16	RO	YES	0
605Ah	00	Quick_stop_option_code	Driver processing method after quick stop command. 0x00 05: Stop normally , maintain quick stop status; 0x00 06: Decelerate to stop emergencely and maintain quick stop state; 0x00 07: Emergency stop, maintain quick stop state;	I16	RW	NO	5
605Bh	00	Shutdown_option_code	Driver processing method after the close command 0x00 00: invalid; 0x00 01: Stop normally, go to ready to switch on state;	I16	RW	NO	1
605Ch	00	Disable_operation_option_code	Driver processing mode after the disable operation command 0x00 00: Invalid; 0x00 01: Stop normally , switch to switched on state;	I16	RW	NO	1
605Dh	00	Disable_operation_option_code	Driver processing mode after the disable operation command 0x00 01: Stop normally , switch to Operation Enabled state; 0x00 02: Decelerate to stop emergencely and maintain Operation Enabled state;	I16	RW	NO	1

			0x00 03: Emergency stop, maintain Operation Enabled state;				
6060h	00	Modes_of_operation	0: undefined; 1: position mode; 3: velocity mode; 4: torque mode;	I8	RW	YES	0
6061h	00	Modes_of_operation_display	0: undefined; 1: position mode; 3: velocity mode; 4: torque mode;	I8	RO	YES	0
6064h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Position_actual_value (left)	Actual position feedback, unit: count;	I32	RO	YES	0
	02	Position_actual_value (right)	Actual position feedback, unit: count;	I32	RO	YES	0
606Ch	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	3
	01	Velocity_actual_value (left)	Current motor speed, Unit: 0.1 r / min	I32	RO	YES	0
	02	Velocity_actual_value (right)	Current motor speed, Unit: 0.1 r / min	I32	RO	YES	0
	03	Left motor and right motor speed actual value combination High 16 is left motor, Low 16 is right motor.	Current motor speed, Unit: 0.1 r / min	U32(I16+I16)	RO	YES	0
6071h	00	Number of sub-indexes	Number of sub-indexes	U16	RW	NO	3
	01	Target torque (left)	Unit: mA Range: -30000~30000;	I16	RW	YES	0
	02	Target torque (right)	Unit: mA Range: -30000~30000;;	I16	RW	YES	0
	03	Left moroe and right motor target torque combination Low 16 is the left motor, High 16 is the right motor	Unit: mA Range: -30000~30000;	U32(I16+I16)	RW	YES	0
6077h	00	Number of	Number of sub-indexes	U16	RO	NO	3

		sub-indexes					
	01	Torque actual value (left)	Unit: 0.1A Range: -600~600;	I16	RO	YES	0
	02	Torque actual value (right)	Unit: 0.1A Range: -600~600;	I16	RO	YES	0
	03	Left motor and right motor torque actual value combination Low 16 is the left motor, High 16 is the right motor	Unit: 0.1A Range: -600~600;	U32(I16+I16)	RW	YES	0
607Ah	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Target_position (left)	Total number of pulses in profile position mode; Range: Relative: -0x7FFFFFFF~0x7FFFFFFF Absolute: -0x3FFFFFFF~0x3FFFFFFF	I32	RW	YES	0
	02	Target_position (right)	Total number of pulses in profile position mode; Range: Relative: -0x7FFFFFFF~0x7FFFFFFF Absolute: -0x3FFFFFFF~0x3FFFFFFF	I32	RW	YES	0
6081h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_velocity (left)	Max speed in profile position mode; Range: 1-1000r/min;	U32	RW	YES	120r/min
	02	Profile_velocity (right)	Max speed in profile position mode; Range: 1-1000r/min;	U32	RW	YES	120r/min
6082h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	End_velocity (left)	Start / stop speed in profile position mode; Range: 1-250r/min;	U32	RW	YES	1r/min
	02	End_velocity (right)	Start / stop speed in profile position mode; Range: 1-250r/min;	U32	RW	YES	1r/min

6083h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_acceleration (left)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
	02	Profile_acceleration (right)	Acceleration time; Range: 0-32767ms;	U32	RW	YES	500ms
6084h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Profile_deceleration (left)	Deceleration time; Range: 32767ms;	U32	RW	YES	500ms
	02	Profile_deceleration (right)	Deceleration time; Range: 32767ms;	U32	RW	YES	500ms
6085h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Quick_stop_deceleration (left)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	10ms
	02	Quick_stop_deceleration (right)	Deceleration time; Range: 0-32767ms;	U32	RW	YES	10ms
6087h	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Torque Slope (left)	Current/1000/second; Unit: mA/s;	U32	RW	YES	300ms
	02	Torque Slope (right)	Current/1000/second; Unit: mA/s;	U32	RW	YES	300ms
60FFh	00	Number of sub-indexes	Number of sub-indexes	U16	RO	NO	2
	01	Target_velocity (left)	Target speed in profile velocity mode; Range: -1000-1000r/min;	I32	RW	YES	0
	02	Target_velocity (right)	Target speed in profile velocity mode; Range: -1000-1000r/min;	I32	RW	YES	0
	03	Left and right target speed combination Low 16 is the left motor High 16 is the right moto	Target speed in profile velocity mode; Range: -1000~1000r/min;	U32(I16+I16)	RO	YES	0

Note:

- U16 means unsigned 16 bits; I16 means signed 16 bits; U32 means unsigned 32 bits; I32 means signed 32 bits.