SERVO ELECTRIC GRIPPER

(SUPPLEMENTARY CAN PROTOCOL)

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Servo electric gripper 4B4C series

SupplementARY CAN Protocol

1 CAN Bus Protocol

The baud rate of CAN bus is 500K. It adopts the extended identifier and data frame format. It does not use the standard identifier and remote frame. The extended identifier has 29 bits, which are defined from low-order to high-order bits as follows:

bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Description	Reserve				Operation type 00: Register reading		Start address of a register												Device ID :1 - 16382													
Example	0	0	0	0	0	1	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	The ID of 0x04FF0001 operation device is 1. The start address of the register is 1020 (binary number: 0b0011111100). The operation type is register writing.																															

	Meaning
bit31-28	Reserve
bit27, bit26	bit27=0, bit26=0: register reading flags; read the content of the gripper register. bit27=0, bit26=1: register writing flags; set the content of the gripper register. bit27=1, bit26=0: instructions for finger motion in the specified position; control fingers to move to the specified position; set the finger movement speed and force values. bit27=1, bit26=1: finger servo follow-up instructions; control fingers to move based on the preset movement angle.
bit14-25	Start address of the read/written register (range: 2-2400)
bit13-0	Device ID: There are two Device IDs in a gripper, i.e., the settable Device ID (default ID: 1; sometimes the user can change it to 1-16383) and the ID for broadcast (16383).

1.1 Register reading

The instruction frame and response frame for reading the content of a gripper register have the following formats:

Transmission to gripper					**Gripper response**				
ExtId	bit	bit 27\26	bit14-25	bit 13-0	ExtId	bit	bit	bit14-25	bit

Identifier		31-28				Identifier		31-28	27\26		13-0
		Reserve	0B00 (read)	Register address +1000	ID			Reserve	0B00 (read)	Register address +1000	ID
DLC Data length		1				DLC Data length		N (The length of the read register content should not be larger than 8.)			
Data content	TX[0]	N (The length of the register content to be read should not be larger than 8.)				Data content	RX[0]	Low-order 8 bits in the value of Register 1			
	TX[1]	Nonuse					RX[1]	High-order 8 bits in the value of Register 1			
	TX[2]	Nonuse					RX[2]	Low-order 8 bits in the value of Register 2			
	TX[3]	Nonuse					RX[3]	Low-order 8 bits in the value of Register 2			
	TX[4]	Nonuse					RX[4]	Low-order 8 bits in the value of Register 3			
	TX[5]	Nonuse					RX[5]	Low-order 8 bits in the value of Register 3			
	TX[6]	Nonuse					RX[6]	Low-order 8 bits in the value of Register 4			
	TX[7]	Nonuse					RX[7]	Low-order 8 bits in the value of Register 4			

For example, if we want to read the current actual force value, opening, current, and temperature of a gripper (ID=1) (start address of the register: 1120; length: 8 bytes), the instruction frame and the response frame will be as follows:

Transmission to gripper						**Gripper response**					
ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0	ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0
		Reserve	0B00 (read)	Register address 0b010001 100000	0b00000 0000000 01			Reserve	0B00 (read)	Register address 0b010001 100000	0b0000 000000 0001
DLC Data length		1				DLC Data length		8 (The length of the read register content should not be larger than 8.)			
Data	TX[0]	8 (The length of the register content to				Data	RX[0]	0xF3	Current force value: 243		

content		be read should not be larger than 8.)	content			(0x00F3)
	TX[1]	Nonuse (enter 0 as supplementary data)		RX[1]	0x00	
	TX[2]	Nonuse (enter 0 as supplementary data)		RX[2]	0x03	Current opening: 1000 (0x03E8)
	TX[3]	Nonuse(enter 0 as supplementary data)		RX[3]	0xE8	
	TX[4]	Nonuse (enter 0 as supplementary data)		RX[4]	0x00	Current: 0 (0x0000)
	TX[5]	Nonuse(enter 0 as supplementary data)		RX[5]	0x0	
	TX[6]	Nonuse (enter 0 as supplementary data)		RX[6]	0x00	Current temperature: 34 (0x0022)
	TX[7]	Nonuse (enter 0 as supplementary data)		RX[7]	0x22	

For example, if we want to read the current error code and status of a gripper (ID=1) (start address of the register: 1128; length: 4 bytes), the instruction frame and the response frame will be as follows:

Transmission to gripper						**Gripper response**					
ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0	ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0
		Reserve	0B00 (read)	Register address 0b010001 101000	0b0000 0000000 0001			Reserve	00 (read)	Register address 0b010001 101000	0b0000 0000000 0001
DLC Data length		1				DLC Data length		4 (The length of the read register content should not be larger than 8.)			
Data content	TX[0]	4 (The length of the register content to be read should not be larger than 8.)				Data content	RX[0]	0x00	No current error (0x0000)		
	TX[1]	Nonuse(enter 0 as supplementary data)					RX[1]	0x00			
	TX[2]	Nonuse(enter 0 as supplementary data)					RX[2]	0x01	Current status: The gripper has unclenched to its maximum opening and has stopped (0x0001).		
	TX[3]	Nonuse(enter 0 as supplementary data)					RX[3]	0x00			
	TX[4]	Nonuse(enter 0 as supplementary data)					RX[4]	Gibberish (enter 0 as supplementary data)			
	TX[5]	Nonuse (enter 0 as supplementary data)					RX[5]				
	TX[6]	Nonuse (enter 0 as supplementary data)					RX[6]	Gibberish (enter 0 as supplementary data)			
	TX[7]	Nonuse(enter 0 as supplementary data)					RX[7]				

1.2 Register writing

The instruction frame and response frame for writing the content of a gripper register have the following formats:

Transmission to gripper						Gripper response					
ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0	ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0
		Reserve	0b01 (write)	Register address +1000	ID			Reserve	0b01 (write)	Register address +1000	ID
DLC Data length		N: Length of the data to be written to the register				DLC Data length		1: Length of the returned data			
Data content	TX[0]	Data content		Low-order 8 bits in Register 1		Data content	RX[0]	N (Length of the data written to the register)			
	TX[1]	Data content		High-order 8 bits in Register 1			RX[1]	Gibberish (enter 0 as supplementary data)			
	TX[2]	Data content		Low-order 8 bits in Register 2			RX[2]	Gibberish (enter 0 as supplementary data)			
	TX[3]	Data content		High-order 8 bits in Register 2			RX[3]	Gibberish (enter 0 as supplementary data)			
	TX[4]	Data content		Low-order 8 bits in Register 3			RX[4]	Gibberish (enter 0 as supplementary data)			
	TX[5]	Data content		High-order 8 bits in Register 3			RX[5]	Gibberish (enter 0 as supplementary data)			
	TX[6]	Data content		Low-order 8 bits in Register 4			RX[6]	Gibberish (enter 0 as supplementary data)			
	TX[7]	Data content		High-order 8 bits in Register 4			RX[7]	Gibberish (enter 0 as supplementary data)			

Example: Operate a gripper (ID=1) to grasp an object based on the grip force of 500 g, the speed (500) and the opening (0 mm). The instruction frame and response frame have the following formats:

Transmission to gripper						Gripper response					
ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0	ExtId Identifier		bit 31-28	bit 27\26	bit14-25	bit 13-0
		Reserve	0b01 (write)	Register address: 0b001111 111100	0b0000 000000 0001			Reserve	0b01 (write)	Register address 0b001111 111100	0b0000 000000 0001
DLC Data length		6: Length of the data to be written to the register				DLC Data length		1: Length of the returned data			
Data	TX[0	0x00	The target opening is set to 0			Data	RX[0]	6: Length of the data written to			

content	]		(0x0000).	content		the register
	TX[1]	0x00			RX[1]	Gibberish (enter 0 as supplementary data)
	TX[2]	0xF4	The running speed is set to 500 (0x01F4).		RX[2]	Gibberish (enter 0 as supplementary data)
	TX[3]	0x01			RX[3]	Gibberish (enter 0 as supplementary data)
	TX[4]	0xF4	The grip force is set to 500 (0x01F4).		RX[4]	Gibberish (enter 0 as supplementary data)
	TX[5]	0x01			RX[5]	Gibberish (enter 0 as supplementary data)
	TX[6]	Gibberish (enter 0 as supplementary data)			RX[6]	Gibberish (enter 0 as supplementary data)
	TX[7]	Gibberish (enter 0 as supplementary data)			RX[7]	Gibberish (enter 0 as supplementary data)