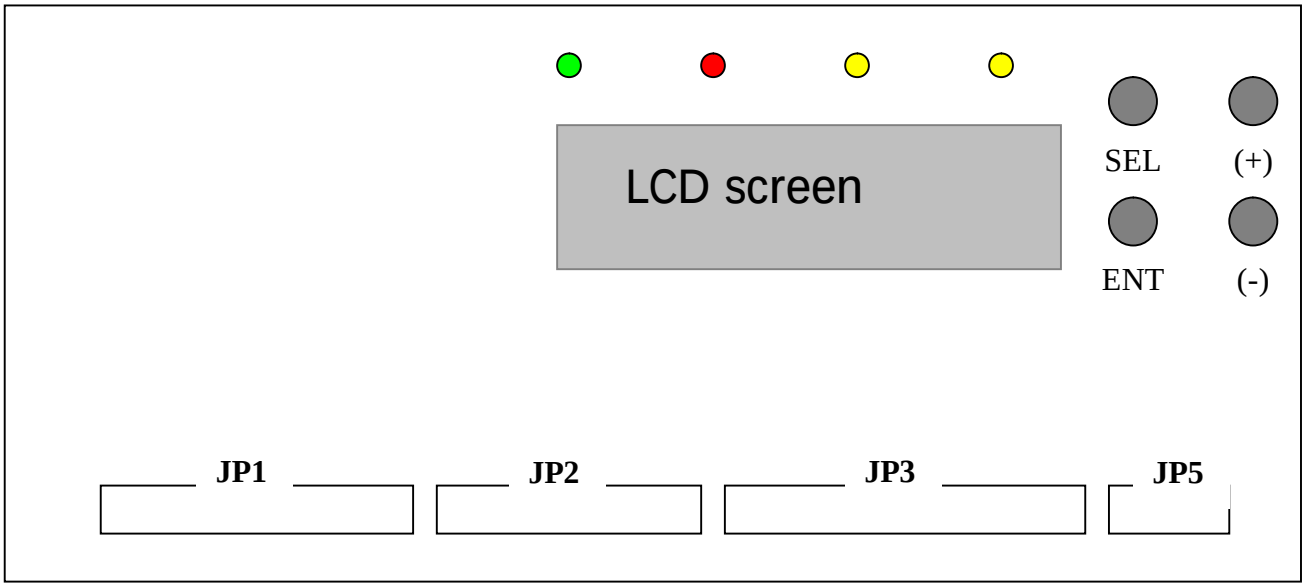
High Precision Digital 8-Group Serial/Parallel Ratio-metric Simultaneous Controller DRC-412

USER MANUAL



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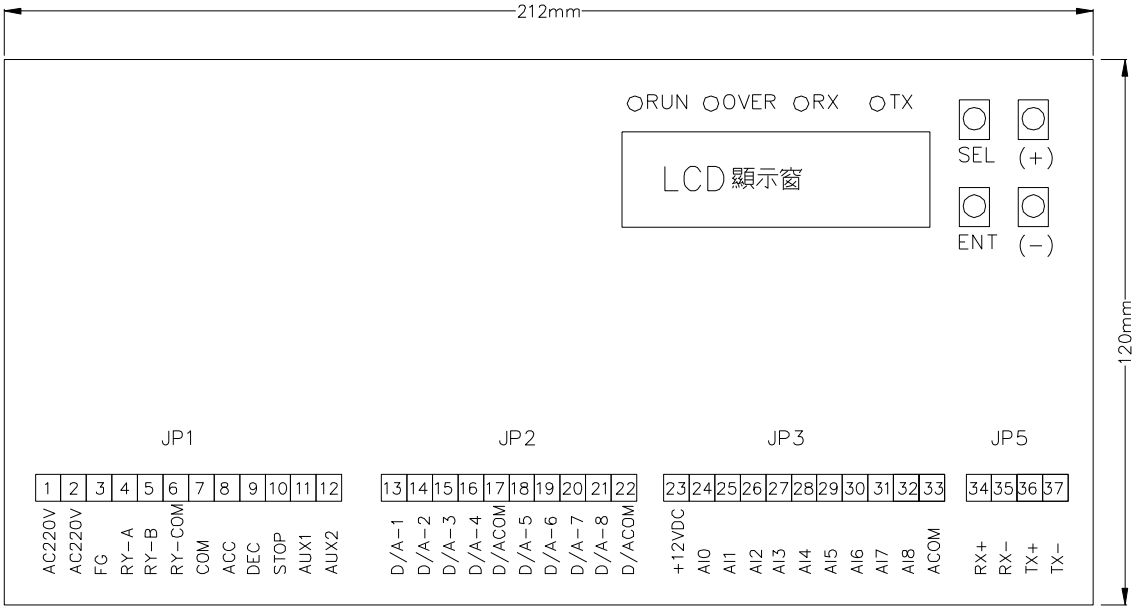
1. Features

1. The four-in-one feature:
   (1) Press-button master speed control or VR speed adjustment.
   (2) Ratio-metric simultaneous control.
   (3) Displacement feedback fine tuning modification control.
   (4) Communication control speed adjustment.
2. The device can work with various kinds of motor drives including servo drives, inverters and DC drives to carry out high precision ratio-metric simultaneous control.
3. To precisely synchronize the speed of several motors, digital ratio-metric setting has excellent linearity – ±≦0.025%.
4. DRC-412 has an open circuit design and is highly resistant to interference.
5. As long as the basic parameters have been input, DRC-412 can select either serial or parallel synchronization as per the customer's request.
6. Each controller has an independent master speed input contact and 8 voltage outputs, capable of indicating separate voltages and displacement detection input contact.
7. The device has a serial communication interface, capable of enabling simultaneous movement of a maximum of 32 motors.
8. Serial ratio-metric simultaneous movement is easy to operate.
9. Each output has an independent VR or displacement detector input contact, allowing the setting of ±% value. The value can be set at a maximum of ±100%.
10. The D/A output is 12Bit, with each graduation equivalent to 0V/4095=2.44mV.
11. The device has a zero-speed contact output relay.
12. The device has a stand, allowing it to be mounted directly onto a rail.

    Applications: Ratio-metric simultaneous control of machines including thread extrusion,synthetic leather, dyeing, adhesive tape and paper machines.

2. Dimensions and lights

2-1 Dimensions: 212mm X 120mm



LCD screen

2-2 LED lights

(1) RUN light: If no master speed has been input (no movement), RUN light flashes. When master speed begins to move, RUN light continues to output.

(2) OVER light: When the system detects excessive output, the light is lit.

(3) RX light : When RS-422 completes receipt, RX light flashes once.

(4) TX light : When RS-422 completes transmission, TX light flashes once.

3. TC-6068E Operation Diagram

JP1	Terminal	Function
1	ACI	AC 220V L
2	AC2	AC 220V N
3	FG	Grounding
4	Y-A	Alarm RELAY A contact
5	Y-B	Alarm RELAY B contact
6	Y-C	Alarm RELAY C contact
7	COM	Contact input COMMON point
8	INC	When in contact speed adjustment mode, <Accelerate> contact
9	DEC	When in contact speed adjustment mode, <Decelerate> contact
10	STOP	When in contact speed adjustment mode, <Stop> contact
11	AUX1	<Joggle output> contact
12	AUX2	<Manual output> contact

JP2	Terminal	Function
1	DA1	Group 1 analogue output
2	DA2	Group 2 analogue output
3	DA3	Group 3 analogue output
4	DA4	Group 4 analogue output
5	0V	Analogue output 0V COMMON point
6	DA5	Group 5 analogue output
7	DA6	Group 6 analogue output
8	DA7	Group 7 analogue output
9	DA8	Group 8 analogue output
10	0V	Analogue output 0V COMMON point

JP3	Terminal	Function
1	+10	Externally adjusting VR power supply, maximum 60 mA
2	AI0	External master speed input
3	AI1	Group 1 externally adjusting input
4	AI2	Group 2 externally adjusting input
5	AI3	Group 3 externally adjusting input
6	AI4	Group 4 externally adjusting input
7	AI5	Group 5 externally adjusting input

JP3	Terminal	Function
8	AI6	Group 6 externally adjusting input
9	AI5	Group 5 externally adjusting input
10	AI6	Group 6 externally adjusting input
11	0V	Analogue input 0V

JP5	Terminal	Function
1	RX+	RS-422 receipt +
2	RX-	RS-422 receipt -
3	TX+	RS-422 transmission +
4	TX-	RS-422 transmission -

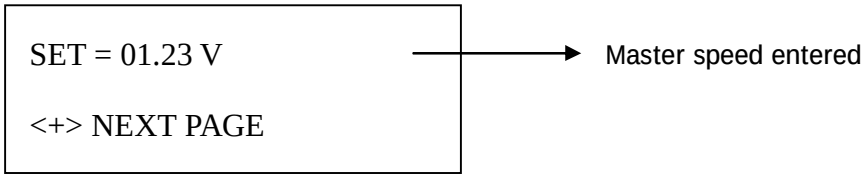
4. Setting parameters (Description of the buttons)

(1) <SEL> button: Press <SEL> to indicate parameter number and content. Press again to exit.

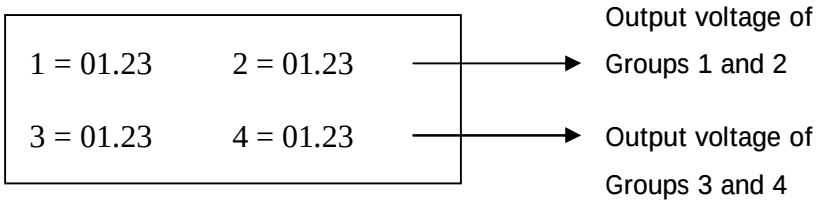
(2) <+>, <-> button: Press <+> or <-> to select the number of the parameter you wish to change. Once it is done, press <ENT> to enter the parameter change mode. Use <+> or <-> to change the content of the parameter.

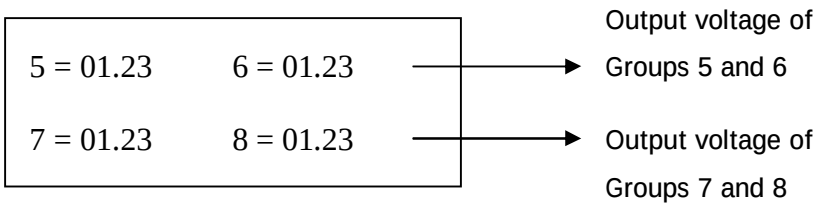
(3)<ENT> button: When the content of the parameter is displayed, press <ENT> to enter the change mode. <SET=> begins to flash. Once the change is made, press <ENT> again to save the change in the memory.

LCD screen general display

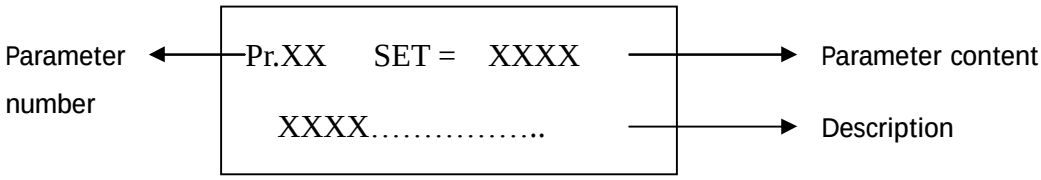


Press <+> to cyclically switch

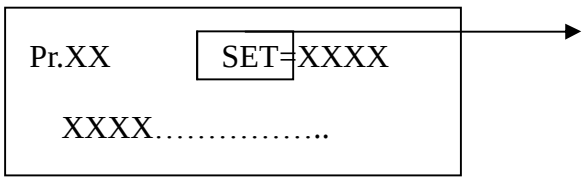




Changing parameters



Press <SEL> to enter parameter display mode. Press <+> or < -> to change parameter number. Once a number is chosen, press <ENT> to enter parameter change mode.



Once entering the parameter change mode, press <+> or <-> to change parameter content. Press <ENT> to save the change in the system's memory.

5. Description of parameters

Pr • 01 Group 1 output basic ratio

Message: Ratio of DA1

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 1 output (DA1) and the source's basic ratio. For example, if the source is 5.0 V, the basic ratio is set at 1.2000. If there is no other ratio adjustments, the output is 5.0 V x1.2000 = 6.0 V.

Pr • 02 Group 2 output basic ratio

Message: Ratio of DA2

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 2 output (DA2) and the source's basic ratio.

Pr • 03 Group 3 output basic ratio

Message: Ratio of DA3

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 3 output (DA3) and the source's basic ratio.

Pr • 04 Group 4 output basic ratio

Message: Ratio of DA4

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 4 output (DA4) and the source's basic ratio.

Pr • 05 Group 5 output basic ratio

Message: Ratio of DA5

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 5 output (DA5) and the source's basic ratio.

Pr • 06 Group 6 output basic ratio

Message: Ratio of DA6

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 6 output (DA6) and the source's basic ratio.

Pr • 07 Group 7 output basic ratio

Message: Ratio of DA7

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 7 output (DA7) and the source's basic ratio.

Pr • 08 Group 8 output basic ratio

Message: Ratio of DA8

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: Group 8 output (DA7) and the source's basic ratio.

Pr • 09 Master speed setting's acceleration time

Message: SP Inc. Ramp (S)

Range: 000.1-200.0

Factory setting: 2.0 (seconds)

Description: The setting is used to adjust master speed input's acceleration buffer time. It can be used to achieve a uniform acceleration. If the source of master speed is set at contact speed adjustment, the parameter is the acceleration time after pressing the acceleration contact.

The time is defined as the time it takes going from 0V to 10V.

Pr • 10 Master speed setting's deceleration time

Message: SP Dec. Ramp (S)

Range: 000.1-200.0

Factory setting: 2.0 (seconds)

Description: The setting is used to adjust master speed input's deceleration buffer time. It can be used to achieve a uniform deceleration. If the source of master speed is set at contact speed adjustment, the parameter is the deceleration time after pressing the deceleration contact.

The time is defined as the time it takes going from 10V to 0V.

Pr • 11 Joggle voltage

Message: Joggle voltage

Range: 0-10.00 (V)

Factory setting: 0.50 (V)

Description: When input contact AUX1 moves, master speed input will turn into joggle voltage. The setting can be used to test the system.

Pr • 12 Minimum working voltage for analogue input of master speed

Message: Min. Input Vol.

Range: 0-2.55 (V)

Factory setting: 0.50 (V)

Description: When master speed input is analogue, if the input voltage is smaller than the parameter, it will be considered 0V to avoid noise voltage when master speed stops.

Pr • 13 Modification ratio for master speed analogue input

Message: Ratio of Input

Range: 0.0001-6.5535

Factory setting: 1.0000

Description: The setting is used to set the input ratio when the master speed is analogue input. For example, if input is 6.0V, the parameter is set at 0.8. The controller will handle master speed using 6.0 V x0.8 = 4.8 V.

Pr • 14 Selecting analogue input adjustment function

Message: Adjust Mode

Range: 0-2

Factory setting: 1

Description: The parameter selects its mode based on 6 groups of analogue adjustment input function.

0 = Not applicable. A/D conversion input value can be obtained through communication.

1 = Upward adjustment. Each group's output ratio is obtained by adding analogue input to the basic ratio.

For example, if the basic ratio is 1.0000. Analogue input is adjusted to 0.1000. The output ratio is 1.0000 + 0.1000 = 1.1000

2 = Center ratio adjustment. Each group's output ratio is still obtained by adding analogue input to the basic ratio. However, analogue input

will make plus or minus adjustments based on the input's center. For example, if the basic ratio is 1.0000 and the analogue input is adjusted to –0.1000, the output ratio is 1.0000 – 0.1000 = 0.9000.

Pr • 15 Group 1 A/D (AI1) adjustment range

Message: Range of Adj.1

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: AI1 input is 0-10V. The parameter may be used to define the ratio adjustment corresponding to the range.

For example, AI1 = 4V, Pr.13 = 0.1000, Pr.01 = 1.0000

If Pr.14 = 1 (upward adjustment), the output ratio of DA1 is

1.0000 + (4/10) x 0.1000 = 1.0400

If Pr.14 = 2 (center adjustment), the output ratio of DA1 is

1.0000 + ((4-5)/5) x 0.1000 = 0.9000

<5 is the center voltage of 0-10V>

Pr • 16 Group 2 A/D (AI2) adjustment range

Message: Range of Adj.2

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI2. Refer to Pr.15 for its description.

Pr • 17 Group 3 A/D (AI3) adjustment range

Message: Range of Adj.3

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI3. Refer to Pr.15 for its description.

Pr • 18 Group 4 A/D (AI4) adjustment range

Message: Range of Adj.4

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment

corresponding to AI4. Refer to Pr.15 for its description.

Pr • 19 Group 5 A/D (AI5) adjustment range

Message: Range of Adj.5

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI5. Refer to Pr.15 for its description.

Pr • 20 Group 6 A/D (AI6) adjustment range

Message: Range of Adj.6

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI6. Refer to Pr.15 for its description.

Pr • 21 Group 7 A/D (AI7) adjustment range

Message: Range of Adj.7

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI7. Refer to Pr.15 for its description.

Pr • 22 Group 8 A/D (AI8) adjustment range

Message: Range of Adj.8

Range: 0.0001-6.5535

Factory setting: 0.1000

Description: The parameter is used to define the ratio adjustment corresponding to AI8. Refer to Pr.15 for its description.

Pr • 23 Selecting source of master speed

Message: Main Source Selection

Range: 0-2

Factory setting: 0

Description: The parameter can be used to select the source of master speed.

0 = Master speed is adjusted at the contact. Input <INC>=>Accelerate,

<DEC>=>Decelerate

<ZERO>=>Zero

1 = Master speed is adjusted through analogue input. It is input via <MSPD> pin.

2 = Master speed is sent via RS-422 RX+, RX-.

Pr • 24 Group 1 output (DA1) source selection

Message: DA1 Source Selection

Range: 0-1

Factory setting: 0

Description: The parameter may be used to select the source of Group 1 output (DA1).

0 = Master speed

1 = Communication designated

Pr • 25 Group 2 output (DA2) source selection

Message: DA2 Source Selection

Range: 0-2

Factory setting: 1

Description: The parameter may be used to select the source of Group 2 output (DA2).

0 = Master speed

1 = DA1

2 = Communication designated

Pr • 26 Group 3 output (DA3) source selection

Message: DA3 Source Selection

Range: 0 ~3

Factory setting: 2

Description: The parameter may be used to select the source of Group 3 output (DA3).

0 = Master speed

1 = DA1

2 = DA2

3 = Communication designated

Pr • 27 Group 4 output (DA4) source selection

Message: DA4 Source Selection

Range: 0-4

Factory setting: 3

Description: The parameter may be used to select the source of Group 4 output (DA4).

0 = Master speed

1 = DA1

2 = DA2

3 = DA3

4 = Communication designated

Pr • 28 Group 5 output (DA5) source selection

Message: DA5 Source Selection

Range: 0-5

Factory setting: 4

Description: The parameter may be used to select the source of Group 5 output (DA).

0 = Master speed

1 = DA1

2 = DA2

3 = DA3

4 = DA4

5 = Communication designated

Pr • 29 Group 6 output (DA6) source selection

Message: DA6 Source Selection

Range: 0-5

Factory setting: 5

Description: The parameter may be used to select the source of Group 6 output (DA6).

0 = Master speed

1 = DA1

2 = DA2

3 = DA3

4 = DA4

5 = DA5

6 = Communication designated

Pr • 30 Group 7 output (DA7) source selection

Message: DA7 Source Selection

Range: 0-7

Factory setting: 6

Description: The parameter may be used to select the source of Group 7 output (DA7).

0 = Master speed

1 = DA1

2 = DA2

3 = DA3

4 = DA4

5 = DA5

6 = DA6

7 = Communication designated

Pr • 31 Group 8 output (DA8) source selection

Message: DA8 Source Selection

Range: 0-8

Factory setting: 7

Description: The parameter may be used to select the source of Group 8 output (DA8).

0 = Master speed

1 = DA1

2 = DA2

3 = DA3

4 = DA4

5 = DA5

6 = DA6

7 = DA7

8 = Communication designated

Pr • 32 Communication output source selection

Message: ComTX Source Sel

Range: 0-8

Factory setting: 8

Description: If Pr.34=0, communication will automatically send the output

designated by the parameter to the next level, which may be used for parallel output of communication strings.

0 = Master speed
1 = DA1
2 = DA2
3 = DA3
4 = DA4
5 = DA5
6 = DA6
7 = DA7
8 = DA8

Pr • 33 Minimum output voltage

Message: Min. Out Voltage

Range: 0-2.00

Factory setting: 0

Description: The setting is applicable to all the output of DA1-DA8. When the output voltage is smaller than the setting, the preset voltage will be output to avoid the low torque activated by certain drives.

Pr • 34 Communication address

Message: Modbus Address

Range: 1-255

Factory setting: 1

Description: The parameter can designate each controller's station number. When different controllers are on the same RS-485 line, each controller has to have a different communication address.

Pr • 35 Communication rate

Message: Modbus Baudrate

Range: 1-5

Factory setting: 4

Description:

Setting	Transmission rate
1	2400 BPS
2	4800 BPS
3	9600 BPS
4	19200 BPS
5	38400 BPS

Pr • 36 Communication format

Message: 0=n, 8, 2; 1=e, 8, 1; 2=n, 8, 1

Range: 0-2

Factory setting: 0

Description: RS-485 communication format.

Setting	Transmission format
0	N,8,2
1	E,8,1
2	N,8,1

Pr • 37 Average number of times of A/D conversion

Message: A/D Average Time

Range: 1-16

Factory setting: 1

Description: The A/D converter on the controller. If input noise is greater, the average number of times can be increased for steadier conversion, with slower reaction. Set the parameter to an adequate number.

Pr • 38 Setting the password

Message: PassWord

Range: 0000-9999

Factory setting: 1234

Description: Setting a password to protect Parameters 01-29. The preset password can only be changed after it has been verified.

6. Quick reference to setting parameters

No.	Range	Factory setting	Description
01	0.0001-6.5535	1.0000	Group 1 output basic ratio
02	0.0001-6.5535	1.0000	Group 2 output basic ratio
03	0.0001-6.5535	1.0000	Group 3 output basic ratio
04	0.0001-6.5535	1.0000	Group 4 output basic ratio
05	0.0001-6.5535	1.0000	Group 5 output basic ratio
06	0.0001-6.5535	1.0000	Group 6 output basic ratio
07	0.0001-6.5535	1.0000	Group 7 output basic ratio
08	0.0001-6.5535	1.0000	Group 8 output basic ratio
09	0.1-200.0	2.0	Master speed setting's acceleration time
10	0.1-200.0	2.0	Master speed setting's deceleration time
11	0-10.0	0.5	Joggle voltage
12	0-2.55	0.5	Minimum working voltage for analogue input of master speed
13	0.0001-6.5535	1.0000	Modification ratio for master speed analogue input
14	0-2	0	Selecting analogue input adjustment function
15	0.0001-6.5535	0.1000	Group 1 A/D (AI1) adjustment range
16	0.0001-6.5535	0.1000	Group 2 A/D (AI2) adjustment range
17	0.0001-6.5535	0.1000	Group 3 A/D (AI3) adjustment range
18	0.0001-6.5535	0.1000	Group 4 A/D (AI4) adjustment range
19	0.0001-6.5535	0.1000	Group 5 A/D (AI5) adjustment range
20	0.0001-6.5535	0.1000	Group 6 A/D (AI6) adjustment range
21	0.0001-6.5535	0.1000	Group 7 A/D (AI5) adjustment range
22	0.0001-6.5535	0.1000	Group 8 A/D (AI6) adjustment range
23	0-2	0	Selecting source of master speed
24	0-1	1	Group 1 output (DA1) source selection
25	0-2	2	Group 2 output (DA2) source selection
26	0-3	3	Group 3 output (DA3) source selection
27	0-4	4	Group 4 output (DA4) source selection
28	0-5	5	Group 5 output (DA5) source selection
29	0-6	6	Group 6 output (DA6) source selection
30	0-7	7	Group 7 output (DA7) source selection

No.	Range	Factory setting	Description
31	0-8	8	Group 8 output (DA8) source selection
32	0-8	8	Communication output source selection
33	0-1	0	Communication mode
34	1-255	1	Communication address
35	1~ 5	4	Communication rate
36	0-2	0	N,8,2 / E,8,1 /N,8,1 selection
37	1-16	1	Average number of times of A/D conversion
38	0-9999	1234	Setting the password

7. Description of communication parameters

No.	Property	Description	Range
00000	R	MSPD A/D read in	0-4095
00001	R	AI1 read in	0-4095
00002	R	AI2 read in	0-4095
00003	R	AI3 read in	0-4095
00004	R	AI4 read in	0-4095
00005	R	AI5 read in	0-4095
00006	R	AI6 read in	0-4095
00007	R	AI7 read in	0-4095
00008	R	AI8 read in	0-4095
00009	R	Master speed's current value	0-4095
00010	R/W	DA1 direct output designated value	0-4000
00011	R/W	DA2 direct output designated value	0-4000
00012	R/W	DA3 direct output designated value	0-4000
00013	R/W	DA4 direct output designated value	0-4000
00014	R/W	DA5 direct output designated value	0-4000
00015	R/W	DA6 direct output designated value	0-4000
00016	R/W	DA7 direct output designated value	0-4000
00017	R/W	DA8 direct output designated value	0-4000
00018	R/W	Group 1 output basic ratio	1-65535

No.	Property	Description	Range
00019	R/W	Group 2 output basic ratio	1-65535
00020	R/W	Group 3 output basic ratio	1-65535
00021	R/W	Group 4 output basic ratio	1-65535
00022	R/W	Group 5 output basic ratio	1-65535
00023	R/W	Group 6 output basic ratio	1-65535
00024	R/W	Group 7 output basic ratio	1-65535
00025	R/W	Group 8 output basic ratio	1-65535
00026	R/W	Master speed communication written in	0-4000