

# BV Series(B01) BLDC Motor Drive Parameter and Register

Rev1.1 — 30 December 2020

\*This document is subject to change without notice.

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## 1. Registers、Parameters and Operation Data

### 1.1. NET-IO Commands

NET-IO ON/OFF do not save in the EEPROM

Register Hex	Name	Description	READ/WRITE
1400h	NET-IO(NET-IN) ON/OFF command	A bit field. Each bit as the ON/OFF status of each NET-IO point. 0 = OFF    1 = ON (The function of each NET_IO point can be set through parameter ID:09-01 ~09-06)	R/W

( ) is the default function.

Register Hex	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1400h	Upper	-	-	-	-	-	-	-
	lower	-	-	NET-X5 (NC)	NET-X4 (NC)	NET-X3 (NC)	NET-X2 (NC)	NET-X0 (NC)

### 1.2. Maintenance Commands

Reset alarm, clear alarm history. All commands can be read and written (READ/WRITE). Executes when writing from 0 to 1.

Register Hex	Name	Description	READ/WRITE
0A00h	Alarm Reset	Resets the alarms that are present. Some alarms cannot be reset with the "reset alarm."	R/W
0A22h	Clear alarm record	Clears alarm records.	R/W
0A26h	Clear Communication error record	Clears the communication error records.	R/W
0A27h	Configuration	Executes the parameter recalculation and the setup.	R/W

### 1.3. Monitor Commands

Monitor the operation speed, alarm and warning records, etc. All commands can be read (READ).

#### 1.3.1. Dynamic Data

Use the 「Dynamic Data」 page of A\_HMI program to monitor the motor status. Can switch page with parameter ID:09-11.

**NOTE** Reserved ID: 02, 07, 08, 09, 11, 14

Register Hex	ID	Name	Description	Range					
0000h	01	Motor state	Motor operation status	0: STOP 2: RUN 3: EBRKAE 4: FREE 5: FAULT 6: WAIT / INHIBIT 7: MOVING (SERVO ON) 8: SLIGHT-POS-KEEPING					
0002h	03	Motor speed	The speed of the motor.	0 ~ 65535 r/min					
0003h	04	Alarm No.	Current error code.	Refer to "2Protect Function (Alarm)"					
0004h	05	Motor direction	The motor operation direction.	0: CW    1: CCW					
0005h	06	Command speed	The command speed.	0 ~ 65535 r/min					
0009h	10	Supply input	Input supply voltage.	0 ~ 65535 (1=0.01VDC)					
000Bh	12	Output duty%	Output %	0 ~ 1000 (1=0.1%)					
000Ch	13	Direct input status (X1 ~ X5)	Each digit as an input status. <table border="1" style="margin-left: 20px;"> <tr> <td>X5</td> <td>X4</td> <td>X3</td> <td>X2</td> <td>X1</td> </tr> </table> Example: 01011 means X1=ON、X=ON、X= OFF、X4=ON、X5=OFF。	X5	X4	X3	X2	X1	0: OFF 1: ON
X5	X4	X3	X2	X1					
000Eh	15	Direct output status	Each digit as an output status. <table border="1" style="margin-left: 20px;"> <tr> <td>-</td> <td>-</td> <td>Y3</td> <td>Y2</td> <td>Y1</td> </tr> </table> Example: 00010 means Y1=OFF、Y2=ON、Y3=OFF。	-	-	Y3	Y2	Y1	0: OFF 1: ON
-	-	Y3	Y2	Y1					
000Fh	16	VR1 input volage	Analog input VR1_M voltage	0 ~ 1000 (1=0.01VDC)					

**1.3.2. Alarm Record**

Register Hex	ID	Name	Description	Range
3300h	01	Alarm Record 1	The latest Alarm	0 ~ 22 Alarm Refer to <a href="#">“2Protect Function (Alarm)”</a>
3301h	02	Alarm Record 2	Alarm records of the most recent 2 to 10.	
3302h	03	Alarm Record 3		
3303h	04	Alarm Record 4		
3304h	05	Alarm Record 5		
3305h	06	Alarm Record 6		
3306h	07	Alarm Record 7		
3307h	08	Alarm Record 8		
3308h	09	Alarm Record 9		
3309h	10	Alarm Record 10		

**1.3.3. Communication Error (COM Error)**

**NOTE** Communication error records saved in the RAM. It will be lost if turning off the drive power.

Register Hex	ID	Name	Description	Range
4800h	01	Communication error code 1	The latest communication error code.	132(84h): Frame error or CRC error 133(85h): Timeout 136(88h): Command not yet defined 140(8Ch): Out of range. 141(8Dh): CMD Denied (Could be motor in operation).
4801h	02	Communication error code 2	Communication error code records of the most recent 2 to 10.	
4802h	03	Communication error code 3		
4803h	04	Communication error code 4		
4804h	05	Communication error code 5		
4805h	06	Communication error code 6		
4806h	07	Communication error code 7		
4807h	08	Communication error code 8		
4808h	09	Communication error code 9		
4809h	10	Communication error code 10		

## 1.4. Operation Data (Speed/Duty,ACC,DEC,Tq)

Operation data can be set through communication. There are 2 indexing operation data (No.0, No1) can be selected by input function M0. Some operation data can be set for each direction (CW, CCW) which can be selected by the operation direction.

ID	Name	Description	Range	Default	Effective *	Control Mode **	
						Speed	Duty
07-01	Digital speed No.0	Digital data indexing speed.	100 ~ 10000 r/min	200	A	O	X
07-02	Digital speed No.1						
07-03	Digital duty No.0	Digital data indexing duty.	100 ~ 1000 (1=0.1 %)	200	A	X	O
07-04	Digital duty No.1						
07-05	No.0 torque limit CW	Digital data indexing torque limit.	100 ~ 1000 (1=0.1 %)	1000	A	O	O
07-06	No.0 torque limit CCW						
07-07	No.1 torque limit CW						
07-08	No.1 torque limit CCW						
07-09	No.0 ACC CW	ACC (Acceleration time) Speed: Time from 0 to 3000 r/min. Duty: Time from 0 to 100%.  DEC (Deceleration time) Speed: Time from 3000 to 0 r/min. Duty: Time from 100 to 0%.	1 ~ 100 (1=0.1 s)	5	A	O	O
07-10	No.0 DEC CC						
07-11	No.0 ACC CCW						
07-12	No.0 DEC CCW						
07-13	No.1 ACC CW						
07-14	No.1 DEC CC						
07-15	No.1 ACC CCW						
07-16	No.1 DEC CCW						

\* Indicates the timing for the data to become effective A: Effective immediately, C: Effective after executing the configuration, D: Effective after re-power the drive.

\*\* O: Possible to use, X: Not possible to use

### Operation Data Register

All operation data have both EEP and RAM.

It takes 20ms to write data into EEP.

It takes <5ms to write data into RAM.

**NOTE** Please access RAM only during operation. EEP have life limitations which should be only use for one-time parameter setup.

Data No.	Register Address (Hex)									
	Speed		ACC		DEC		Tq Limit		Duty	
	EEP	RAM	EEP	RAM	EEP	RAM	EEP	RAM	EEP	RAM
0	0700h	4300h	-	-	-	-	-	-	0702h	4302h
1	0701h	4301h	-	-	-	-	-	-	0703h	4303h
0 CW	-	-	0708h	4308h	0709h	4309h	0704h	4304h	-	-
0 CCW	-	-	070Ah	430Ah	070Bh	430Bh	0705h	4305h	-	-
1 CW	-	-	070Ch	430Ch	070Dh	430Dh	0706h	4306h	-	-
1 CCW	-	-	070Eh	430Eh	070Fh	430Fh	0707h	4307h	-	-

## 1.5. Parameters

Parameters can be used vary depending on the control mode.

**NOTE** Eff: Indicates the timing for the data to become effective A: Effective immediately, C: Effective after executing the configuration, D: Effective after re-power the drive.

**NOTE** Control Mode: ○: Possible to use, ×: Not possible to use

### 1.5.1. Motor Parameters

ID (Register)	Name	Description	Range	Default	Eff	Control Mode	
						Spd.	Duty
01-01 (0100h)	Hall Sensor Seq <b>Hall</b>	The hall signal logic.	0: B (Rising to rising) 1: A (Rising to falling)	1	C	O	O
01-02 (0101h)	Motor Poles	Number of poles of the motor.	2/4/8/10	8	C		
01-03 (0102h)	Motor No Load Full Spd	Motor speed when given rated voltage without load.	100 ~ 65535 r/min	4188	C		X
01-06 (0105h)	CW View	Motor operation CW point of view.	0: Top (from shaft) 1: Bottom	1	C		O
05-01 (0500h)	Motor OT Sensor Type	Motor over temperature protect switch logic setting	0: Normal Open 1: Normal Close 2: Disable Function	2	C		O

### 1.5.2. IO Parameters

**NOTE** When the same input signal is assigned to both NET I/O and direct I/O, the function will be executed if any of the terminals becomes active.

ID (Register)	Name	Description	Range	Default	Eff	Control Mode							
						Spd.	Duty						
02-01 (0200h)	SC/CC Mode	<b>SC:</b> START/STOP, CCW/CW <b>CC:</b> FWD, REV	0: SC Mode 1: CC Mode	0	C	O	O						
08-10 (0809h)	VA-OUT Speed Range	VA-OUT is ON when the difference of motor speed and command speed is smaller than this range.	0 ~ 400 r/min	200									
06-01 (0600h)	Input X1 Function	Direct I/O (X1 ~X6) Function Setting.	0: NC 1: START/STOP (FWD) 2: CCW/CW (REV) 5: FREE 6: STOP-MODE 7: EBRAKE/ALM-RST 8: ALM-RST 10: M0 13: EBRAKE 14: KEY-SWITCH 15: E-FWD 16: E-REV 21: EXT-ERROR	2									
06-02 (0601h)	Input X2 Function			1									
06-03 (0602h)	Input X3 Function			16									
06-04 (0603h)	Input X4 Function			8									
06-05 (0604h)	Input X5 Function			10									
06-06 (0605h)	Input X6 Function (5V SOURCE)			14									
06-07 (0606h)	Always ON Input 1 (AOI1)			Virtual Input. Functions assigned to these terminals would be ON automatically. Please do not assign START/STOP, FWD, REV to these terminals.				0					
06-08 (0607h)	Always ON Input 2 (AOI2)	0											
06-09 (0608h)	Output Y1 Function	Direct I/O (Y1, Y2, YH) Function Setting.	0: NC 1: SPD-OUT 2: ALM-OUT 3: BUSY-OUT 4: VA-OUT 5: PARK-BRAKE 6: DEC-IND 7: REV-IND 8: PWR-IND 9: STATUS-IND 10: BATT-GAUGE1 11: BATT-GAUGE2	2									
06-10 (0609h)	Output Y2 Function			2									
06-11 (060Ah)	Output Y3 Function			1									
06-16 (060Fh)	I/O ON Logic	Set direct IO ON logic. This is a bit field. Each bit represents the ON logic of an IO. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>X1 Logic</td> </tr> <tr> <td>1</td> <td>X2 Logic</td> </tr> </tbody> </table>	Bit	Description				0	X1 Logic	1	X2 Logic	0: ON logic is open loop 「ON」 = Open loop 「OFF」 = Closed loop  1: ON logic is closed loop 「ON」 = Closed loop	65535
Bit	Description												
0	X1 Logic												
1	X2 Logic												

		2	X3 Logic	「OFF」 = Open loop					
		3	X4 Logic						
		4	X5 Logic						
		5	X6 Logic						
		6	AOI1 Logic						
		7	AOI2 Logic						
		8	Y1 Logic						
		9	Y2 Logic						
		10	Y3 Logic						
		11 ~ 15	Reserved						
09-01 (0900h)	NET-X0 Function	NET-IO (NET-IN) Function Setting		0: NC 1: START/STOP (FWD) 2: CCW/CW (REV) 5: FREE 6: STOP-MODE 7: EBRAKE/ALM-RST 8: ALM-RST 10: M0 13: EBRAKE 14: KEY-SWITCH 15: E-FWD 16: E-REV 21: EXT-ERROR	0				
09-02 (0901h)	NET-X1 Function				0				
09-03 (0902h)	NET-X2 Function				0				
09-04 (0903h)	NET-X3 Function				0				
09-05 (0904h)	NET-X4 Function				0				
09-06 (0905h)	NET-X5 Function				0				

### 1.5.3. Operation and Protect Parameters

ID (Register)	Name	Description	Range	Default	Eff	Control Mode	
						Spd.	Duty
02-05 (0204h)	Startup Output	Initial output % (For heavy load startgin only).	0 ~ 300 (1=0.1%)	0	C	O	O
05-07 (0506h)	Stall Tq Limit Alarm	Alarm setting when torque limited and motor stalled.	0: Continuous ouput 1 ~ 65535: Alarm in the time set after stall (Unit: ms).	3000	C		
05-08 (0509h)	Tq Limit Overboost Time	Allowed time for output current to over limit value.	0 ~ 1000 (1=0.1 s)	600	C		
05-09 (0508h)	Tq Limit Recover Time	Output current have to be smaller than limit value over this time to be able to boost again.	0 ~ 1000 (1=0.1 s)	10	C		
08-07 (0806h)	Reverse Operation	Set if change direction during operation is allowed	0: Canoot change 1: Can change direction	1	C		
08-09 (0808h)	Position Keeping	Set the motor holding torque algorithm.	• 0: Free • 1: Dynamic Brake	1	C		
08-11 (080Ah)	BRAKE Delay	The delay time for BRAKE-OUT to lock the brake after motor stop	0 ~ 100 (1=0.1s)	30	C		
08-12 (080Ah)	KEY-SWITCH Off Delay	The motor delecerate to stop in this time after KEY-SWITCH is off.	0 ~ 100 (1=0.1s)	25	C		
08-02 (0801h)	Speed Control P Gain	Speed control Gain P	0 ~ 65535	10	C		
08-04 (0803h)	Speed Control D Gain	Speed Control Gain D	0 ~ 65535	100	C		
01-10 (0109h)	Hall Seq. Alarm	Alarm setting when motor seq error.	0: Disable 1: Enable (only works when 08-01=0)	0	C	O	X
02-16 (020Fh)	Power On Run Inhibit Alarm	An alarm generates if the throttle is not at netrual point during power on for a time.	0: Disable 1 ~ 100 (1=0.1s)	0	C		O
05-04 (0503h)	Over Speed Alarm Setting	Alarms when motor speed is over this setting	0: Disable 1 ~ 10000 r/min	10000	C		O

## 1.5.4. Common Parameters

ID (Register)	Name	Description	Range	Default	Eff	Control Mode	
						Spd.	Duty
02-06 (0205h)	Command Source	Speed and duty control command source.	Refer to "3.1 Command Source Table"	0	C		
02-14 (020Dh)	KEY-SWITCH Mode	Drive is in inhibit status when not enabled which cannot output. To enable the drive before operation is required.	<ul style="list-style-type: none"> <li>0: Enable when KEY-SWITCH input is ON</li> <li>1: Enable after KEY-SWITCH input is ON for 5 sec. MBRAKE-OUT control by FREE input.</li> <li>2: Enable automatically when power on</li> </ul>	0	C	0	0
08-01 (0800h)	Control Mode	Select the control mode	0: Speed 1: Duty (open-loop)	0	C		
08-15 (080Eh)	BATT-GAUGE1 Voltage	BATT-GAUGE1 active votlage	0 ~ 65535 (1=0.01 VDC)	2400	C		
08-16 (080Fh)	BATT-GAUGE2 Voltage	BATT-GAUGE2 active votlage	0 ~ 65535 (1=0.01 VDC)	2000	C		

## 1.5.5. Analog Signal Parameters

ID (Register)	Name	Description	Range	Default	Eff	Control Mode	
						Spd.	Duty
01-05 (0104h)	Throttle Map	Output when VR1 is at neutral point	0 ~ 1000 (1=0.1%)	500	C	0	0
02-07 (0206h)	Max analog input v	Analog input max votlage	0 ~ 1000 (1=0.01 VDC)	500	C	0	0
02-08 (0207h)	Min analog input v	Analog input min votlage	0 ~ 1000 (1=0.01 VDC)	30	C	0	0
02-09 (0208h)	VR1 Mode	Select the input type of VR1	0 = Single-Ended 1 = Single-Ended Reverse 2 = Wig-Wag 3 = Wig-Wag Reverse 4 = Unipolar	0	C	0	0
02-10 (0209h)	VR2 Mode	Select the input type of VR2	0 = Single-Ended 1 = Single-Ended Reverse	1	C	0	0
02-11 (020Ah)	Analog input scale max.	When parameter 02-06 = 4 The VR2 could set the tuning scale of VR1 by ths range.	0 ~ 1000 (1=0.1 %)	1000	C	0	0
02-12 (020Bh)	Analog input scale min.		0 ~ 1000 (1=0.1 %)	100	C	0	0
02-13 (020Ch)	Analog Input Stop Setting	Operation for analog input is 0.	0: Motor stops 1: Motor run at min speed	0	C	0	0
03-01 (0300h)	No.0 VR Max speed CW	Tuning range when using VR to control speed for different operation data No. and direction.	200 ~ 10000 r/min	3000	C	0	X
03-02 (0301h)	No.0 VR Min speed CW		100 ~ 10000 r/min	100	C	0	X
03-03 (0302h)	No.0 VR Max speed CCW		200 ~ 10000 r/min	3000	C	0	X
03-04 (0303h)	No.0 VR Min speed CCW		100 ~ 10000 r/min	100	C	0	X
03-05 (0304h)	No.1 VR Max speed CW		200 ~ 10000 r/min	1500	C	0	X
03-06 (0305h)	No.1 VR Min speed CW		100 ~ 10000 r/min	100	C	0	X
03-07 (0306h)	No.1 VR Max speed CCW		200 ~ 10000 r/min	1500	C	0	X
03-08 (0307h)	No.1 VR Min speed CCW		100 ~ 10000 r/min	100	C	0	X
03-09 (0308h)	No.0 VR Max Duty CW	Tuning range when using VR to control duty for different operation data No. and direction.	0 ~ 1000 (1=0.1 %)	990	C	X	0
03-10 (0309h)	No.0 VR Min Duty CW		0 ~ 1000 (1=0.1 %)	0	C	X	0
03-11 (030Ah)	No.0 VR Max Duty CCW		0 ~ 1000 (1=0.1 %)	990	C	X	0
03-12 (030Bh)	No.0 VR Min Duty CCW		0 ~ 1000 (1=0.1 %)	0	C	X	0
03-13 (030Ch)	No.1 VR Max Duty CW		0 ~ 1000 (1=0.1 %)	500	C	X	0
03-14 (030Dh)	No.1 VR Min Duty CW		0 ~ 1000 (1=0.1 %)	0	C	X	0
03-15	No.1 VR Max Duty		0 ~ 1000 (1=0.1 %)	500	C	X	0

(030Eh)	CCW						
03-16 (030Fh)	No.1 VR Min Duty CCW		0 ~ 1000 (1=0.1 %)	0	C	X	O
04-01 (0400h)	No.0 VR Max Tq limit CW	Tuning range when using VR to control torque limit for different operation data No. and direction.	100 ~ 1000 (1=0.1 %)	1000	C	O	O
04-02 (0401h)	No.0 VR Min Tq limit CW		100 ~ 1000 (1=0.1 %)	100	C	O	O
04-03 (0402h)	No.0 VR Max Tq limit CCW		100 ~ 1000 (1=0.1 %)	1000	C	O	O
04-04 (0403h)	No.0 VR Min Tq limit CCW		100 ~ 1000 (1=0.1 %)	100	C	O	O
04-05 (0404h)	No.1 VR Max Tq limit CW		100 ~ 1000 (1=0.1 %)	1000	C	O	O
04-06 (0405h)	No.1 VR Min Tq limit CW		100 ~ 1000 (1=0.1 %)	100	C	O	O
04-07 (0406h)	No.1 VR Max Tq limit CCW		100 ~ 1000 (1=0.1 %)	1000	C	O	O
04-08 (0407h)	No.1 VR Min Tq limit CCW		100 ~ 1000 (1=0.1 %)	100	C	O	O

#### 1.5.6. Commnication Paramters

Communication parameters support all the control modes.

ID (Register)	Name	Description	Range	Default	Eff
05-14 (050Dh)	RS232 Timeout	RS-232 timeout setting	0: Disabled 1 ~ 10000 ms (Alarm after the time set when no signal.)	0	C
05-15 (090Eh)	RS232 Alarm	Alarm when the number of RS232 error is greater than this setting.	1 ~ 10	0	C

## 2. Protect Function (Alarm)

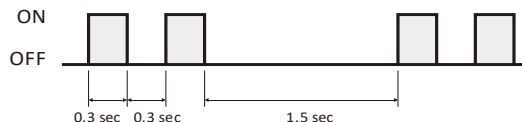
When an alarm generates, the motor coast to stop, the ALM-OUT will turn ON and the ALM-LED blinks.

Before resetting an alarm, always remove the cause of the alarm and ensure safety and perform one of the reset operations specified below.

- Turn the ALM-RST input OFF for more than 0.5 sec then turn it to ON for more than 0.5 sec then turn it OFF.
- Cycle the power. When cycling the power please turn the power off for at least 1 min or till the PWR LED off then turn the power on again.

**NOTE** The alarm cannot be reset If the driver operation command is ON (etc. START/STOP input is ON). Please turn all the operation command to OFF before reset the alarm.

When an alarm generates, the ALM LED blinks. The type of alarm can be confirmed by the blink count of ALM LED.



### 2.1. Error Code

LED Blink	Code	Protect Function	Description	Reset	
				IO/CMD	Repower
Blink 1 time	1	Over current	Excessive current has flown through the drive.	O	O
Blink 2 time	2	Over load	The load exceeds the set value has applied to the motor more than 5 sec. The set value can be set through parameters.	O	O
Blink 3 time	3	Feddback error (Hall)	The hall sensor or encoder wiring is bad or not connected.	O	O
Blink 4 time	4	Over voltage	The input power supply voltage has exceeded the maximum Limit of the driver. Or the inertia of the load is too large.	O	O
Blink 5 time	5	Under voltage	The input power supply voltage is under the low limit.	O	O
Blink 6 time	6	Drive overheat	The dirve's temperature is over its maximum limit.	O	O
Blink 7 time	7	Startup fault	The motor failed to start. The motor cable is not connected correctly.	O	O
Blink 8 time	8	EEP data error	Error in EEPROM data. (Can NOT be reset by ALM-RST input)	X	X
Blink 10 time	10	Motor overheat	The motor's temperature is too high. (The MOT-OT terminal has been set to ON state.)	O	O
Blink 12 time	12	Over speed	The speed has exceeded the maximum setup of the drive.	O	O
Blink 14 time	14	Prevention of operation at power on	The main power supply was cycled when the FWD input or REV input was set to ON.	X	O
Blink 15 time	15	External stop	EXT-ERROR input is ON.	O	O
Blink 20 time	20	Hall sequence fault	The hall sequence was incorrect.	O	O
Blink 21 time	21	Communication error	RS232 or RS485 time out.	O	O
Blink 22 time	22	Parameter error	The parameter setup value was incorrect.	O	O

### 3. Appendix

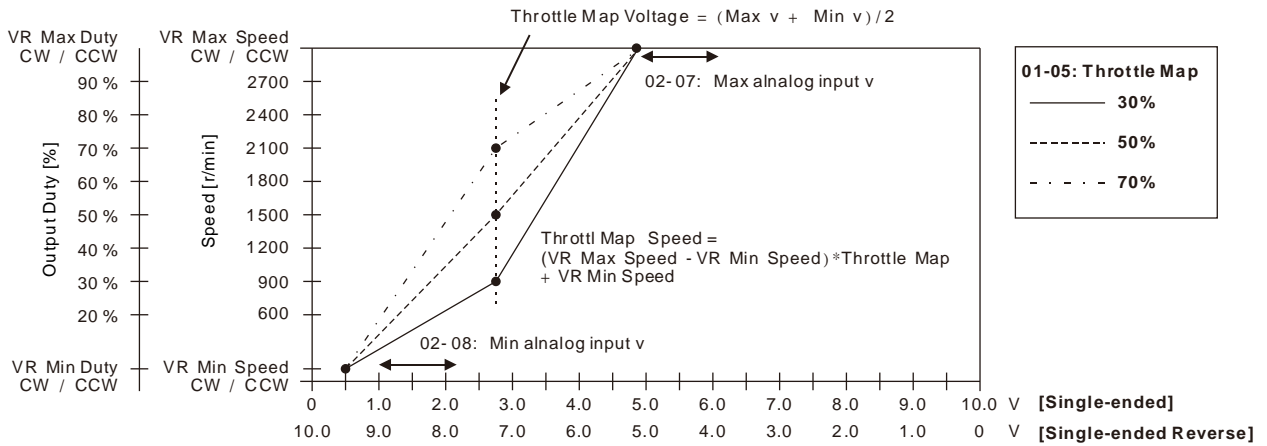
#### 3.1. Command Source Table

D = Digital Setting(parameter/comm)

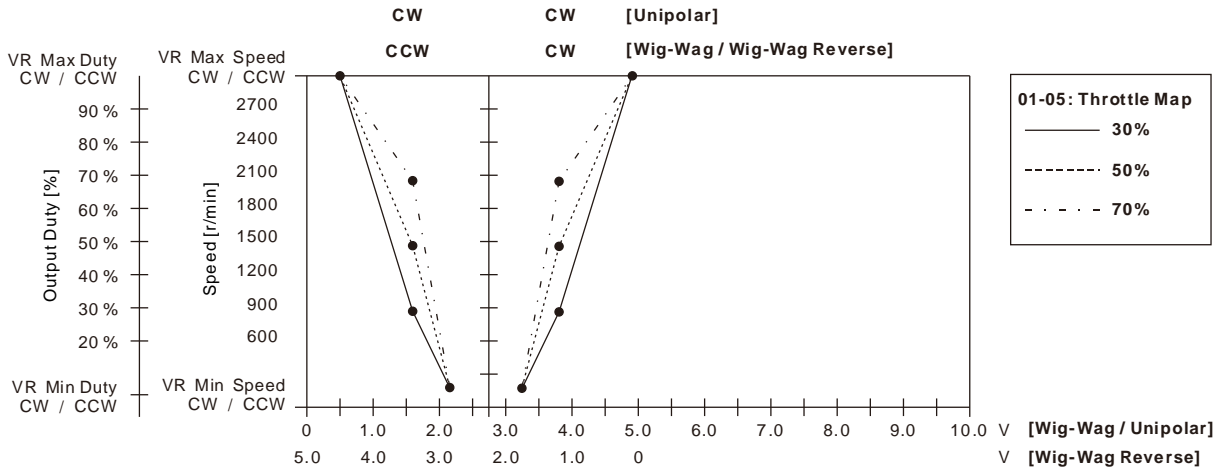
ID 02-06 Setting	Speed/Duty	ACC	DEC	Tq Limit	Description
0 (default)	VR1	D	D	D	VR1 to control speed.
1	D	D	D	D	All operation data set by digital.
2		-	-	-	Reserved.
3	VR1	D	D	VR2	VR1 to control speed. VR2 to control torque limit.
4	VR1 (Scale by VR2)	D	D	D	VR1 to control speed. VR2 to control the scale of VR1.

#### 3.2. VR1 Setting Example

- Single-ended / Single-ended Reverse



- Wig-wag / Wig-wag Reverse / Unipolar



### Trumman Technology Corp.

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