Autonics

Controller Integrated 2-Phase Closed-Loop Stepper Motor Driver [DC type, Frame size 20/28/35/42/56/60, CC-Link Comm.] **AiC-D-CL Series**

INSTRUCTION MANUAL

Thank you for choosing our Autonics product. Please read the following safety considerations before use.

Safety Considerations

 $\stackrel{\text{\tiny $\%$}}{\times}$ Please observe all safety considerations for safe and proper product operation to avoid hazards. $\stackrel{\text{\tiny $\%$}}{\times}$ symbol represents caution due to special circumstances in which hazards may occur.

Warning Failure to follow these instructions may result in serious injury or death. ⚠ Caution Failure to follow these instructions may result in personal injury or product damage.

∆ Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus,
- medical equipment, snips, venicles, railways, aircrart, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)
 Failure to follow this instruction may result in personal injury, economic loss or fire.

 2. Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact or salinity may be present. Failure to follow this instruction may result in explosion or fire
- Do not connect, repair or inspect the unit while connected to a power source.
 Failure to follow this instruction may result in fire or electric shock.
 Install the unit after considering counter plan against power failure.
- Failure to follow this instruction may result in personal injury, economic loss or fire.

 5. Check 'Connections' before wiring.
 Failure to follow this instruction may result in fire.
- 6. Do not disassemble or modify the unit.
- Failure to follow this instruction may result in fire or electric shock.
- 7. Install the driver in the housing or ground it.

 Failure to follow this instruction may result in personal injury, fire or electric shock.
- 8. Do not touch the unit during or after operation for a while.
 Failure to follow this instruction may result in burn or electric shock due to high temperature of the surface.

 9. Emergency stop directly when error occurs.

⚠ Caution

- When connecting the power input, use AWG 18(0.75mm²) cable or over.
 Brake is non-polar. When connecting the brake, use AWG 24(0.2mm²) cable or over. Failure to follow this instruction may result in fire or malfunction due to contact failure.

 To use the motor safely, do not apply external force to the motor.

 It is recommended to use STOPPER for the vertical load.

- 5. Install overcurrent prevention device (e.g. the current breaker, etc) to connect the
- Failure to follow this instruction may result in fire.

 Check the control input signal before supplying power to the driver.
- Failure to follow this instruction may result in personal injury or product damage by
- Install a safety device to maintain the vertical position after turn off the power of
- **this driver.**Failure to follow this instruction may result in personal injury or product damage by
- releasing holding torque of the motor.

 8. Use the unit within the rated specifications.
 Failure to follow this instruction may result in fire or product damage.
- Use a dry cloth to clean the unit and do not use water or organic solvent.
 Failure to follow this instruction may result in fire or electric shock.
 The driver may overheat depending on the environment.
 Install the unit in the well ventilated place and forced cooling with a cooling fan.
- Failure to follow this instruction may result in product damage or degradation by heat.

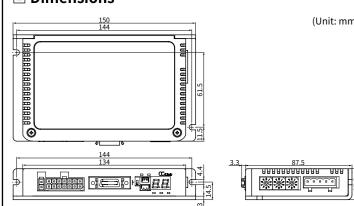
 11. Keep the product away from metal chip, dust and wire residue which flow into the Failure to follow this instruction may result in fire or product damage.

- 12. Use the designated motor only.
 Failure to follow this instruction may result in fire or product damage

Product Components

Before use the product, check all components are contained.

Dimensions



Manual

For the detail information and instructions, please refer to the user manual, communication manual, library manual and guick manual, and be sure to follow cautions written in the technical descriptions (catalog, website). isit our website (www.autonics.com) to download manuals

- «The above specifications, dimensions, etc. are subject to change and some models may
- be discontinued without notice.

 Be sure to follow cautions written in the instruction manual, user manual and the echnical descriptions (catalog, website)

Specifications

Model*1 Power supply Allowable voltage range		_	AiC-D-28SB-CL	AiC-D-35SB-CL	AiC-D-42SA(-B)-CL	AiC-D-56SA(-B)-CL	AiC-D-60SA(-B)-CL		
		AiC-D-20MA-CL	AiC-D-28MB-CL	AiC-D-35MB-CL	AiC-D-42MA(-B)-CL	AiC-D-56MA(-B)-CL	AiC-D-60MA(-B)-CL		
		AiC-D-20LA-CL	AiC-D-28LB-CL	AiC-D-42LA(-B)-CL	AiC-D-56LA(-B)-CL	AiC-D-60LA(-B)-CL			
		Aic-D-20LA-CL Aic-D-28LB-CL Aic-D-35LB-CL Aic-D-42LA(-B)-CL Aic-D-56LA(-B)-CL Aic-D-60LA(-B)-CL 24VDC==							
Allowable vo	ltage range	90 to 110% of the rated vo	ltage						
D	STOP**2	Max. 10W			Max. 10W	Max. 12W	Max. 15W		
Consumption Max. during operation		Max. 60W			Max. 60W	Max. 120W	Max. 240W		
Max. RUN cui		0.6A/Phase	1.0A/Phase	1.2A/Phase	1.7A/Phase	3.5A/Phase	•		
STOP current**5		20 to 100% of max. RUN cu	irrent (factory default: 5	0%)	•				
Rotation spe	ed	0 to 3000rpm	•	•					
Resolution**5		500(factory default), 1000, 1600, 2000, 3600, 4000, 5000, 6400, 7200, 10000 [Pulse/Rev]	500(factory default), 1 6400, 7200, 10000, 160	000, 1600, 2000, 3600, 5000, 000 [Pulse/Rev]	500 (factory default), 10	00, 1600, 2000, 3200, 3600, 5	5000, 6400, 7200, 10000F		
		_	Ai-M-28SB	Ai-M-35SB	Ai-M-42SA(-B)	Ai-M-56SA(-B)	Ai-M-60SA(-B)		
Applied motor	or ^{*1}	Ai-M-20MA	Ai-M-28MB	Ai-M-35MB	Ai-M-42MA(-B)	Ai-M-56MA(-B)	Ai-M-60MA(-B)		
		Ai-M-20LA	Ai-M-28LB	Ai-M-35LB	Ai-M-42LA(-B)	Ai-M-56LA(-B)	Ai-M-60LA(-B)		
Speed filter*	5			, 80, 100, 120, 140, 160, 180, 2					
Positioning C	ain ^{#5}	(P Gain, I Gain)=(1, 1), (2, 1	(3, 1), (4, 1), (5, 1), (1, 2)	2), (2, 2), (3, 2), (4, 2), (5, 2), (1, 3	3), (2, 3), (3, 3), (4, 3), (5, 3), u	iser setting			
Positioning r	ange	-2,147,483,648 to +2,147,4	183,647						
In-Position		Fast Response: 0(factory d	efault) to 7, Accurate Re	sponse: 0 to 7					
Motor rotatio	n direction*5	CW, CCW							
Status indica		 Power/Alarm indicator: green/red LED Alarm/Warning status display part: red LED 7 segment In-Position indicator: yellow LED CC-Link status indicator: red, green LED 							
I/O voltage le		[H]: 5-30VDC==, [L]: 0-2VDC==							
I/O	Input	Exclusive input: 3, general input: 8							
	Output	General output: 7							
External pow		VEX(recommended: 24VDC==), GEX(GND)							
Operation me		Jog, Continuous, Index, Pr	ogram mode						
Index step nu		64 steps							
	Step	256 steps							
Program	Control	ABS (move absolute positi	on), INC (move increme	ntal position), HOM (home sea (start repetition), RPE (end re	rch), ICJ (jump input condi	tion), IRD (waiting input), Of	PC (on/off of output port		
function	command	OPT (on pulse from output	t port), JMP (Jump), REP	(start repetition), RPE (end re	petition), END (end progran	1), POS (position set), TIM (t	imer)		
	Start	Power On Program auto-si							
	Home search	Power On Home Search auto-start function							
Home search		Home, limit home, zero ho		N.I.					
RS485 comm. Comm. speed**			9600, 19200, 38400, 57600, 115200(factory default) bps						
K3463 CUIIIII.	t	Overcurrent, overspeed, position tracking, overload, overheat, motor connection, encoder connection, regenerative voltage, motor misalignment, command spee input voltage, in-position, memory, emergency stop, program mode, index mode, home search mode, comm. station setting, comm. mode setting, comm. station setting change, comm. mode setting change, comm. failure							
Alarm output		+ coftware limit + border	are limit, overload						
Alarm output									
Alarm output		Over 100MΩ (500VDC== m							
Alarm output Warning outp Insulation res Dielectric stro	sistance	Over 100M Ω (500VDC== m 1,000VAC \sim 60Hz for 1 min							
Alarm output Warning outp Insulation res Dielectric stre Vibration	sistance	Over $100M\Omega$ (500VDC== m $1,000VAC \sim 60Hz$ for 1 min 1.5mm amplitude at frequ	ency of 10 to 55Hz (for 1	min) in each X, Y, Z direction f	or 2 hours				
Alarm output Warning outp Insulation res Dielectric stre Vibration	sistance	Over 100MΩ (500VDC== m 1,000VAC ~ 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3		or 2 hours				
Alarm output Warning outp Insulation res Dielectric stre Vibration Shock	sistance ength Ambient temp.	Over $100M\Omega$ (500VDC== m 1,000VAC \sim 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e 0 to 50°C, storage: -10 to 60°C	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3 0°C		or 2 hours				
Alarm output Warning outp Insulation res Dielectric stre Vibration Shock	sistance ength	Over 100MΩ (500VDC= m 1,000VAC ~ 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e 0 to 50°C, storage: -10 to 6 35 to 85%RH, storage: 10 t	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3 0°C		or 2 hours				
Alarm output Warning outp Insulation res Dielectric stro Vibration Shock Environment Protection st	Ambient temp. Ambient humi.	Over $100M\Omega$ (500VDC= m 1,000VAC ~ 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e 0 to 50°C, storage: -10 to 6 a 35 to 85%RH, storage: 10 t 1P20(IEC standard)	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3 0°C o 90%RH	3 times					
Alarm output Warning outp Insulation res Dielectric stro Vibration Shock Environment Protection st	Ambient temp. Ambient humi.	Over 100MΩ (500VDC= m 1,000VAC~ 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e 0 to 50°C, storage: -10 to 60 35 to 8596RH, storage: 10 t 1P20(IEC standard) • Power cable: C.1-PW-□*	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3 0°C o 90%RH			ble - normal: C1D14M(B)-□,	/ moving: C1DF14M(B)-[
Alarm output Warning outp Insulation res Dielectric stre Vibration Shock Environment	Ambient temp. Ambient humi.	Over $100M\Omega$ (500VDC= m 1,000VAC ~ 60Hz for 1 min 1.5mm amplitude at frequ 300m/s² (approx. 30G) in e 0 to 50°C, storage: -10 to 6 a 35 to 85%RH, storage: 10 t 1P20(IEC standard)	ency of 10 to 55Hz (for 1 ach X, Y, Z direction for 3 0°C o 90%RH	3 times		ble - normal: C1D14M(B)-□ ,	/ moving: C1DF14M(B)-L		

- **3: Max. power consumption during operation. When changing the load rapidly, instantaneous peak current may increase. The capacity of power supply should be over 1.5 to 2 tim **4: Run current varies depending on the input RUN frequency and max. RUN current at the moment varies also.

 **5: Settable with the dedicated program (atMotion).

 **6: ☐ of model name indicates cable length (010, 020, 520, 070, 100, 150, 200). E.g.)CJ-PW-010: Im power cable.

 **7: ☐ of model name indicates cable length (010, 020, 030, 050, 070, 100, 150, 200). E.g.)CO20-MP070-R: 7m I/O cable.

 **8: ☐ of model name indicates cable length (1, 2, 3, 5, 7, 10, 15, 20).

 (B) of model name indicates the built-in brake type, none indicates the standard type. E.g.) C1DF14MB-10: 10m moving type, built-in brake type motor+encoder cable.

 **9: The weight includes packaging. The weight in parenthesis is for unit only.

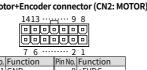
 **Environment resistance is rated at no freezing or condensation.

	© CC-LIIIK COIIIIII	unication		
	Comm. standard	CC-Link Ver.1.10	Max. transmit distance	Depend on comm. speed
Station type Remote Device station F			Remote I/O	• 1 station occupied: Ryn/RXn 32 points each
	Connection cable	CC-Link dedicated cable	Remote register	• 1 station occupied: RWrn/RWwn 4 words each
Comm. speed		156k, 625k, 2.5M, 5M, 10M bps	Command	Point table read/write, parameter read/write, read only, special command monitor only, network connection, drive control, motion control, drive status
	Station number	01 to 64	Comm. setting switch	10 bit rotary switch (0 to 9): 3, 1 bit DIP switch (ON/OFF)
	Number of occupied stations	1 station occupied, 2 stations occupied	_	

Unit Descriptions

3. I/O connector (CN3: SIGNAL I/O)

er connector (CN1: PWR) Pin No. Function 1 24VDC== 2 GND



7 6 2 1								
in No.	Function		Function					
1	GND	8	+5VDC==					
2	Encoder A	9	Encoder A					
3	Encoder B	10	Encoder B					
4	Encoder Z	11	Encoder Z					
5	F.G.	12	N-C					
6	Motor A	13	Motor B					
7	Motor A	14	Motor B					

Pin No. Function I/O 1 VEX —

Functions can be assigned in general input/output For more information, refer to 'user manual'.

4-2. Brake connector (CN5: BRAKE)

4-1. K3 463 COIIIIII. COIIIIECCOI (CN4: K3463)								
	Pin No.	Function						
7 5	1	RS485 DATA-						
2 1	2	RS485 DATA+						
*RS485 comm. is for parameter setting and operation test instead of driver operation. When operating with CC-Link, disconnect the RS485 co,mm. from the device.								

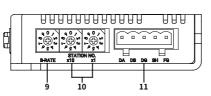
Pin No. Function

1 Brake2 Brake+

*Corresponding connector is built-in brake type only

- **5-1. Servo On/Off indicator (SERVO, Orange)** : Turns ON when Servo is operating, turns OFF when Servo is not operating
- 5-2. In-Position indicator (INP., Yellow)

- 5-3. Power/Alarm indicator (PWR/AL, Green/Red)
- : Green Turns ON when the unit operates normally after supplying power Flashes when limit signal is input or overload status is maintained
- Red When alarm occurs, flashes depending on the alarm type, refer to '■ Alarm/Warning'
- 6. Alarm/Warning status display part (7 segment, Red)
 : Displays the corresponding number, when alarm occurs
- 7. CC-Link status indicator (L.ERR / L.RUN, Red/Green)
 : L.RUN Turns ON when communication operates normally
 L.ERR Turns ON when communication failure
- 8. CC-Link station setting DIP switch (SW1)
- Setting CC-Link station setting
 ON 2 stations occupied OFF(factory default) 1 station occupied



9. CC-Link comm. speed setting rotary switch (B-RATE)

	-			
	Setting	Comm. speed (bps)	Setting	Comm. speed (bps)
•	0	156k	5	
0/1	1	625k	6	
€	2	2.5M	7	Disable
	3	5M	8	
3 '	4	10M	9	

10. CC-Link station setting rotary switch (STATION NO.)

	Setting	Station No. (×10)		Setting	Station No. (×1)
	0	0×10		0	0
	1	1×10		1	1
	2	2×10		2	2
90/	3	3×10	1 9 0 7 3	3	3
°€€2	4	4×10		4	4
ا له ي و ۱	5	5×10	ا له ي و ا	5	5
	6	6×10		6	6
×10	7		×1	7	7
	8	Disable		8	8
	9			9	9

11. CC-Link Connector (CN6: DA DB DG SH FG)

						•			•	
ı	$\overline{}$	$\overline{}$	$\overline{}$	$\overline{}$	$\overline{}$	Pin N	No.	Function	Pin No.	Function
	- `	•	_	_	_]		1	F.G.	4	1 DB
Į	_						2	SLD	!	DA
	5	4	3	2	1		3	DG	-	
Co	Connector specifications]									

		Specifications				
Туре	!	Connector	Connector terminal	Housing	Manufacture	
CN1	Driver	LAD1140-02	-	-	LIANILIM	
CNI	Power	CHD1140-02	CTD1140	-	HANLIM	
CN2 Driver		35318-1420	I-		Malan	
CINZ	Motor+Encoder	5557-14R	5556T]_	Molex	
	Driver	10220-52A2 PL	I-	-	3M	
CN3		10150-3000PE	I-	10350-52F0-008	SIVI	
	I/O connector	CO20-MP□-R (Sold separately)	-	_	Autonics	
CN4	Driver	053254-0270	_	_		
CN4	RS485 connector	51065-0200	50212-8000	-	Molex	
CN5	Driver	5268-02A	-	-		
CNO	Brake	ake 5264-02		-		
CN6	Driver	2EHDRC-05P-OR*1	-	-	Dinklo	
CIND	CC-Link connector	2ESDV-05P-OR	I-	_	Dinkle	

- * 1: CC-Link dedicated cable must be used and performance can not be guaranteed when using other cables.
 * Above connectors are suitable for AiC-D-CL Series.
 The connectors can be used with equivalent or substitute.

*1: Corresponding pins are only in built-in brake type.
*The Connection diagram is base on built-in brake type

Configuration Diagram

PLC

PC & atMotion

Alarm status Alarm type

E. I Overcurrent error
E. 2 Overspeed error

E.b. Input voltage error

F. F. In-Position error

E.d. Memory error E.E. Emergency stop

RS485 DATA+ o

RS485 DATA- ⊶

IN0 to IN7 •—

-Limit • 12

GFX o-

ORG ----(10)-

E.3 Position tracking error

Motor connection error

E.H. Home search mode error When failed to find home

Alarm/Warning

- CC-Link cable

- RS232C / -

SCM Series

communication

Settings of start, stop, rotation direction, etc.

-This function stops motor to protect driver, depending on the error status such as overcurrent

or overspeed.
-In case of normal status, output turns ON, and in case of alarming status, output turns OFF.
-When supplying alarm reset, driver returns to the normal status.

Vhen driver inner temperature is over 80°0 When motor cable connection error occurs at driver When encoder cable connection error occurs at driver

When regenerative voltage is over 78V
When motor is in misalignment
When command speed is over 3,500rpm
When input voltage is out of 24VDC=±10%

When input voltage is out of 24VDC=±10%
When position error (over 1) is kept over 3 sec, after motor stopped.
When memory error is detected as power supplied When emergent stopped with emergency stop command
When 'END' command is not exist at the last step When step is not selected
When other commands is used but 'INC', 'ABS' When index command is not completed due to the stop command

24VDC==-

→ BRAKF+*

── BRAKF-*

+5VDC==

※Index

(): I/O

☐: N·C

O: Input

: Output

Connection for Motor and Driver

VEX • 10kΩ

11 10kΩ

Descriptions

In-Position

AiC-D-CL Series

(Controller Integrated Motor driver)

⊞ - - - Brake cable -

= - - - I/O cable - - External I/O

Rated current --- --- Motor+Encoder cable

Ai-M Series

(Motor)

■ Motion Device Management Program [atMotion]

In-Position output represents output condition of positioning completion signal.
 If the gap between target position and real position is under In-Position setting value after position command pulse has finished, In-Position output turns ON and In-Position indicator turns ON.

reverse, when the gap is over In-Position setting value, In-Position output turns OFF and -Position indicator turns OFF.

atMotion provides GUI control for easy and convenient parameter setting and monitoring data management of multiple devices. Visit our website (www.autonics.com) to download the user manual and software

Item	Minimum requirements
System	IBM PC compatible computer with Intel Pentium III or above
Operations	Microsoft Windows 98/NT/XP/Vista/7/8/10
Memory	256MB+
Hard disk	1GB+ of available hard disk space
VGA	Resolution: 1024x768 or higher
Others	RS232C serial port(9-pin), USB port

■ Troubleshooting

				_ ,		•	
₩When E.E. to E.H. alarm occurs,	the motor stops, but the current flowing into the motor is	l.	Malfunction	Causes	Troubleshooting		
 Warning -This function notices dangers with the alarm indicator prior to motor stop with limit signal or overload alarm. 					When communication is	The communication cable is not connected.	Check communication cable wiring. Check communication cable connection correctly.
-When turning out from the alarming condition, driver returns to the normal status automatically. Warning Warning turns						The communication port or speed settings are not correct.	Check communication port and speed settings are correct.
status Warning type	Descriptions	status					Check that servo On/Off input signal is Off.
또 I + Software limit	When normal direction(CW) software limit is ON			When motor does not	Servo is not On.	In case of On, servo is Off and excitation of	
년.리 - Software limit	When reverse direction(CCW) software limit is ON	Ston	Pomai	Remain	excite		motor is released.
년.3 + Hardware limit	When normal direction(CW) hardware limit is ON	Jotop	Incindiii			Alarm occurs.	Check the alarm type and remove the cause
또 Hardware limit	When reverse direction(CCW) hardware limit is ON			」Ⅰ			of alarm.
५.5 Overload warning	9.5 Overload warning When maximum load is kept connected over 10 sec (motor or driver can be overheated)				When motor rotates to the opposite direction	MotorDir parameter setting	Check the MotorDir parameter settings.
	n if the warning occurs and the motor current is not blo y operates in alarming status, the driver can be damag		of the designated direction	is not correct.	onedit the Motor Shi parameter Settings.		
Please operate the driver, av		,cu.				Connection between	
	, indicators flash with interval of 0.4 sec until the alarm	warnir	ng is		When motor drive is	motor and encoder is	Check the Motor+Encoder connection cable.
cleared.	,				unstable	unstable.	
<e.g. alarm="" o<="" td="" when=""><td>ccurs> 1 2 3 4 5 6</td><td></td><td></td><td></td><td>distable</td><td>Motor gain value is not</td><td>Change the Motor Gain parameter as the</td></e.g.>	ccurs> 1 2 3 4 5 6				distable	Motor gain value is not	Change the Motor Gain parameter as the
∼E.g. Wileii alaiiii 0						correct.	certain value.
	0.4sec	- 1					

Cautions during Use

Otherwise, it may cause unexpected accidents.

2. 24VDC= power supply should be insulated and limited voltage/current or Class 2,

SELV power supply device.

Follow instructions in 'Cautions during Use'.

3. Re-supply power after min. 1 sec from disconnected power.

4. In case communication is unstable due to the noise generated by supplied power or

peripheral device, use ferrite core at communication line.

 It is recommended to use 485 converter with the separate power. (Autonics product, SCM-38I, recommended) 6. The thickness of cable should be same or thicker than the below specifications when

connecting the cable for the connector.

① CN1 (power connector): AWG18
② CN2 (motor+encoder connector): AWG22, AWG24

③ CN3 (I/O connector): AWG28

Keep the distance between power cable and signal cable more than 10cm.

3. Motor vibration and noise can occur in specific frequency period

O Change motor installation method or attach the damper.

Use the unit out of the dedicated frequency range when vibration and noise occurs due to changing motor RUN speed.

For using motor, it is recommended to maintenance and inspection regularly.

Unwinding bolts and connection parts for the unit installation and load connection

2 Strange sound from ball bearing of the unit

Damage and stress of lead cable of the unit
 Connection error with motor

⑤ Inconsistency between the axis of motor output and the center, concentric (eccentric, declination) of the load, etc.

10. This product does not prepare protection function for a motor.

11. This unit may be used in the following environm

① Indoors (in the environment condition rated in 'Specifications')

② Altitude max. 2,000m

3 Pollution degree 2

4 Installation category II

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Autonics