

Application Note

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

> www.hiwinmikro.tw MD37UE01-2405_V1.2

Revision History

The version of the manual is also indicated on the bottom of the front cover.

MD37UE01-2405_V1.2



— Release Date

Release Date	Version	Applicable Product	Revision Contents		
May 20 th , 2024	1.2	E Series MECHATROLINK-III Drive	Support E series drives. Modify the term of E1 to E series.		
Oct. 18 th , 2023	1.1	E1 MECHATROLINK-III Drive	 Update section 3.1 Positioning control. Update section 4.3 Origin sensor and Z-phase. 		
Jun. 30 th , 2023	1.0	E1 MECHATROLINK-III Drive	First edition.		

Related Documents

Through related documents, users can quickly understand the positioning of this manual and the correlation between manuals and products. Go to HIWIN MIKROSYSTEM's official website \rightarrow Download \rightarrow Manual Overview for details (<u>https://www.hiwinmikro.tw/Downloads/ManualOverview_EN.htm</u>).

Preface

This manual provides detailed information on the operation of PLC software KV STUDIO when E series MECHATROLINK-III drive is used with KEYENCE KV-7000 series PLC.

Specifications of Software/Hardware

Name	Version of Software/Firmware		
	Software (Thunder): 1.9.16.0 or above		
E Series MECHAI ROLINK-III DIVE	Firmware: 2.8.16		
	Software (KV STUDIO): 11.61 or above		
KETENCE KV-7500	Firmware: 2.400 or above		
KEYENCE KV-XH04ML	Firmware: 1.106 or above		

Table of Contents

1.	Communi	cation and module setup	1-1
	1.1	Introduction of hardware device	1-2
	1.2	IP setting and connection	1-4
	1.3	Axis configuration	1-12
2.	Paramete	rs setup	2-1
3.	Trial run		3-1
	3.1	Positioning control	3-2
	3.2	Starting speed, acceleration and deceleration rate/time, acceleration curve	3-4
4.	Origin retu	ırn	4-1
	4.1	Immediate Z-phase origin return	4-2
	4.2	Limit switch rising edge	4-3
	4.3	Origin sensor and Z-phase	4-4

1. Communication and module setup

1.	Communio	cation and module setup	1-1
	1.1	Introduction of hardware device	1-2
	1.2	IP setting and connection	1-4
	1.3	Axis configuration1	-12

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

1.1 Introduction of hardware device



Figure 1.1.1

KEYENCE KV-7500 is a controller composed of a CPU unit and one or more positioning motion units. For the first use, users need to combine CPU unit and positioning motion unit and prepare a 24 VDC 1.8 A power supply for CPU unit. CPU unit is mainly used to connect with the computer, and positioning motion unit is mainly used to connect with the drive.



MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

Field A

Model of CPU unit.

Field B

LCD screen display.

Field C

Computer USB port.

Field D

CPU unit network port.

Field E

LED display lights. Red light: Unit connection failure. Green light: Successful unit connection.

Field F

Model of positioning motion unit.

Field G

Motion unit network port.

Users need to adopt Keyence's special network cable for motion unit and drive; ordinary network cables may not be able to communicate successfully.

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

1.2 IP setting and connection

1. For first-time setup, connect USB cable and network cable to CPU unit and the computer, and open KV STUDIO software interface.



Figure 1.2.1

2. Create a new project.

(In this step, press **NO** in "Confirm unit setting information" to prevent automatic generation of unit configuration, which will be set in step 6.)

KV STUDIO	– o ×
File(F) View(V) Monitor/Simulator(N) Operation rec	order/Replay(R) Tool(T) Window(W) Help(H)
New project(N) Ctrl+N	- ! 🖻 🗑 🛥 🛃 😥 🗹 🐔 🏛 🕼 💷 🖼 ! 다 🍄 다 다 다 다 다 이 다 다 다 다 다 다 다 다 다 다 다 다 다
Open project(O) Ctrl+O	■ N K(▲ K H ▼ H) > ③
Register sensor settings file(E)	New project X
Memory card(M)	Project name(N) PLC model(K)
Printer setup(W)	KV-7500 V
Recent projects(D)	Position(P)
Exit(X)	C:\Users\paulisaking\Documents\KEYENCE\KVS11GKVS\ Refer(S)
	Comment(C)
	Confirm unit setting information X
	Setup unit setting info now?
	* [Yes]Start Unit Editor. * [No]Close this dialog. * [Read unit setting]Read unit setting information from PLC.
	Yes(Y) No(N) Read unit setting(U)

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

3. Set IP address to 192.168.0.100, which is in the same network domain as the controller.

Network Connections		
$\leftarrow \rightarrow$ \checkmark \bigstar \bigstar Control Panel \Rightarrow Network	vork and Internet > Network Connections	ٽ ×
Organize 🝷 Disable this network device	Diagnose this connection Rename t	his connection View status of this connection
Ethernet	Ethernet 4(test) 毎法辨識的網路	網際網路通訊協定第 4 版 (TCP/IPv4) Properties X
Intel(R) Ethernet Connection (14)	Intel(R) Gigabit CT Desktop Adap	General
		You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
		Obtain an IP address automatically
		Use the following IP address:
		IP address: 192 . 168 . 0 . 100
		Subnet mask: 255 . 255 . 0
		Default gateway:
		Obtain DNS server address automatically
		Use the following DNS server addresses:
		Preferred DNS server:
		Alternate DNS server:
		Validate settings upon exit Advanced
		OK Cancel

Figure 1.2.3

4. Switch KV STUDIO mode to Editor, so that the subsequent operations could be carried out.



Figure 1.2.4

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

5. Select **USB** as communication path.

K	V STUDIO -[Editor: KV-7	500] - [0615 *]							
File(F) Edit(E) View(V) P	Program(M) S1	r/Script(S)	Convert(A)	Monitor/Simulator(N)	Debug(D)	Tool(T)	Window(W)	Help(H)
: 🗅	💊 🗄 🗟 🖻 😫 🗟	🖶 🗟 🕜 📘	USB		- 🗈 🖬 🚽 🔂	Q 🗹 🐝 🗉	E 😂 🖭	EV F5 SF5	F4 SF4 F7 S
1_	🗄 🗄 💒 🐼 🌆 🖷	1 5 6 6	USB		H H ▼ HI >		Ö 💷 🗄	Editor	•
Projec	д	×	Ethernet		elect communicatio	on path		9	
	Unit configuration [0] KV-7500 Unit configurat: Device comment Label CPU system setting Program: 0615 Every-scan exect Main Initialize modu: Standby module Fixed-period mode Inter-unit sync Function Block Macro Subroutine macro	io ut le m	Bluetoot Modem Routing s	n setting					
= 🖻	Device default File register sett	ir							
a 🤷	1:CPU memory card 1:CPU memory User document								

Figure 1.2.5

6. Click Unit configuration on the upper left side, and then right-click to select Unit Editor.



Figure 1.2.6

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

7. Click "Acquire the configuration information of the unit connected to the PLC" and press **Yes** to read the existing positioning motion unit model of the user.

Unit Editor - Edit mode	- 🗆 ×
File(F) Edit(E) Convert(P) View(V) Option(O) Window	w(W) Help(H)
📲 🔐 😹 🕹 💼 🗹 💷 🏟 🛒 🚳 🛼 🚆	r 🗈 💼 🔣 🔧 🐜 🛛 🕐
Acquire the configuration information of the unit	connected to the PLC.
0 1 Width:97mm KV-7500 KV-XH04ML	Select unit(1) Setup unit(2)
Height:90mm Depth:95mm	📭 🚝 🖂 🖼 📷 🚮 🛃 [0] KV-750
Curr. Cons.:360mA	Function
Weight:460g	Socket function Not used(*)
R30000 R34000	🗆 Base
-33915 -37515	Leading DM No. DM10000
	Number of DMs 230
 Unit Editor Unit settings are read in the initialization status. At the same time, the content currently being edited discarded. OK? Mes Yes 	No

Figure 1.2.7

8. When the models of CPU unit and positioning motion unit appear, click **OK** on the lower right side.

Unit Editor - Edit mode						\Box \times
File(F) Edit(E) Convert	(P) View(V) O	otion(O) Wind	ow(W) Help(H)			
💀 🔐 🚰 🛣 🖻 🛍	2 🖬 🚳 🖬	🖌 🔂 🕌 🕷	b to 🖪 🔧	%		
	0	1	^ Unit			
Width:97mm Height:90mm Depth:95mm Curr. Cons.:360mA	KV-7500 B	V-XH04ML	Select unit	t(1) Setup u	unit(2)	
weight:460g			No set	t project.		
	R30000 -33915	R34000 -37515				
			No set	project.		
<			> \[
Message						
Process	Row	No. Coo	ie Message	2		
H + + H Message			<			>
		Editor	Line:2, Col:1	OK	Cancel	Apply

Figure 1.2.8

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

9. Check if the model under Unit configuration is consistent with the model of actual controller.



Figure 1.2.9

10. Check if the communication path is USB, and press PLC Transfer > Execute. At this time, the display light on the upper right side of the positioning motion unit will turn from red to green (refer to Field E in Figure 1.1.2), representing successful setup of CPU unit and positioning motion unit.



Figure 1.2.10

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

11. After completing unit editor settings, select **Serial** as communication path and click **Comm settings** > **Ethernet** > **Search destination**.

KV	STUDIO -[I	Editor: KV	/-7500] - [0	0615 *]						
File(F)	Edit(E)	View(V)	Program	(M)	ST/Script(S)	Convert(A)	Monitor/Simulator(N)	Debug(D)	Tool(T)	Window(W)	Help(H)
: 🗅 📂		1	a 🖶 🗟	0	Serial		• 🖻 🗗 🗐 🦻	à 🗹 🐝 🗉	1 🚉 💷	EV F5 SF5	F4 SF4 -
A 2	1 i = i = i = i = i = i = i = i = i = i	60° 199	4 1 5	B	<u>-</u> • • •	. II. II. III.	▲ H H ♥ HH >	9 4 5	Ö 💷 🗄	Editor	
		Col	mm settings	/			×				
		P	C comm port	/			_				
			O USB(U)		O Serial(S)						
			Ethernet(E)	-	O Bluetooth(H)	O Modem(M)				
		E	thernet settings				-				
			IP address(I)	0	. 0 . 0 . 0	Search dest.(F					
			Port No.(P)	8500)	Conn. test(T).					
		-0	Routing setting	g(R)							
			PC comm port : U via VT/DT : No via network : No Connected mode	USB o el:							
						Detail(A)	ee)				
			Jestinations(L)		0	< Car	icel				

Figure 1.2.11

12. Click the network card that is connected to CPU unit and then click on Execute.

Search destination				×			
Search destination X Select network card Network card Network card (N) Intel(R) Ethernet Connection (14) [219-V IP address Intel(R) Gigabit CT Desktop Adapter Subnet mask 255.255.254.0 Port No.(P) 8500 Execute(S) Stop(B)							
Find Ethernet unit where br *Network load may increa	oadcast packets reach. (K ase according to the numbe	V only) r of connected units.					
Result							
MAC address	Connected Unit type	IP address	Project name				
			Select	Cancel			

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

13. After pressing **Execute** for a few seconds, the results will be displayed below. Select the connected unit type and click **Select**.

Search destination X								
Select network card	Select network card							
Network card (N)	Intel(R) Gigabit CT Desktop	Adapter		~				
IP address	192.168.0.100	92.168.0.100						
Subnet mask	255.255.255.0	255.255.255.0						
Port No.(P) 8500 Execute(S) Stop(B)								
Find Ethernet unit wh	nere broadcast packets read	ch. (KV only)						
*Network load may	increase according to the r	umber of connected ur	nits.					
Result								
MAC address	Connected Unit type	IP address	Project name					
00-01-FC-34-7E-21	KV-7500	192.168.0.10	0615					
			Select	Cancel				

Figure 1.2.13

14. Click **OK** to complete the connection.

~		
USB(U)	○ Serial(S)	
Ethernet(E)	O Bluetooth(H)	O Modem(M)
thernet settings		
IP address(I)	192 . 168 . 0 . 10	Search dest.(F)
Port No.(P)	8500	Conn. test(T)
Port No.(P)	(R)	Conn. test(T)
Port No.(P) Routing setting PC comm port : U via VT/DT : No	(R) SB	Conn. test(T)
Port No.(P) Routing setting PC comm port : U via VT/DT : No via network : No Connected mode	(R) SB	Conn. test(T)

Figure 1.2.14

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

15. Switch KV STUDIO mode to **Monitor**, and check if the motion unit models are turned to green lights, indicating the connection between PC and CPU unit is established.





16. Check if the communication type of the drive is MECHATROLINK-III and is set to "Drive ready" state (For detailed setting operation, please refer to "E Series Servo Drive Thunder Software Operation Manual"). Set Access to **Controller** so that the positioning motion unit of Keyence controller can be connected to the drive.

😏 Thunder (1.9.10.0), Hub 1, Port 5			
File Tools Settings Access Help			
File Tools Settings Access Help N Thunder E1 X Controller Mdl. ED1F-LG-1022-00-00 Ver. 2.8.10 Typ. MECHATROLINK-III Pwr. 110V / 220V, 1kW Mod. 1. N/A Act. Position mode Mot. Typ. AC servo Mdl. EM1CM402BF0C Enc. Enc.			
 Int. Typ. Serial Res. 23 bits, 8,388,608 v 			
No Error			
No Warning			
Servo ready Drive ready Main power is normal No alarm occurs Motor parameters are set FSTP signal is off			

Figure 1.2.16

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

1.3 Axis configuration

1. Switch KV STUDIO mode to **Editor**. Click the positioning motion unit which will be connected to the drive and open **Axis configuration setting**.



Figure 1.3.1

2. At this time, the following screen will appear. Double-clicking **Servo** on the right, and the icon of a servo motor will appear on the left. Please enter the relevant information of the drive on the lower right side.

[1]Axis configuration setting		×
KV-XH04ML Set up max. number of axes MECHATROLINK-III communication period(L) (Control period) Help Servo Axis1 (41-0H)	4 axes 500us V	MECHATROLINK-III slave list
		Servo Atis No.(N) 1 Atis comments(A) Station address(D) 41 Extended address(E) 0 Automatic Parameter Reading(P) Setup(S) OK Cancel

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

3. Open the cover of drive panel and observe SW1 and SW2. The arrow direction of knob indicates the station address of the drive, SW1 refers to tens digit, and SW2 refers to units digit. However, some station addresses are not supported by the drive, as shown in the table in Figure 1.3.4. If SW1=0, the value of SW2 cannot be a number from 0 to 2; if SW1=F, the value of SW2 cannot be a number from 0 to 7. If the station address of the drive is the above number, please turn the knobs of SW1 and SW2 to avoid the above range and restart the power. Finally, enter the station address of the drive to Station address shown in Figure 1.3.4.



Figure 1.3.3

Servo		
Axis No.(N)	1	*
Axis comments(A)		
Station address(D)	8	-
Extended address(E)	0	

SW1	SW2	Station Address	Automatic Parameter Reading(P)
0	0 to 2	Reserved	Setup(S)
0	3	03h	
ł	i	l	
E	F	EFh	
F	0 to F	Reserved	OK Cancel

Figure 1.3.4

Note:

If the drive is set to gantry, the slave's SW2 needs to be set to 8, otherwise it may cause gantry communication errors.

HIWIN MIKROSYSTEM CORP.

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

4. After completing station address setting, do not set up coordinate transformation at this time, which will be set after coordinate unit in chapter 2.

Servo	
Axis No.(N)	
Axis comments(A) E1	
Station address(D) 8	KV STUDIO ×
Extended address(E) 0	
Automatic Parameter Reading(P)	New setting data detected. Set up coordinate transformation?
Setup(S)	Yes No
OK Cancel	

Figure 1.3.5

5. Click **PLC Transfer** to import the existing setting values into the controller.



Figure 1.3.6

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO Communication & module setup

6. Press **Execute**.

🖀 Transfer program [Communication destination: KV-7500, route: Ethernet 192.168.0.10] 👘 🗙

Trans	fer items(I)
	Item
1	Unit setting info
~	Global device comments
~	Global label
\checkmark	CPU system setting
\checkmark	Program
~	Device default info
~	Logging/trace setting info
~	Ethernet/serial function setting info
	File Register setting
	User document
\checkmark	Positioning unit parameter
	Select all(S) Cancel all(D)
Cle	ar program in PLC(Q)
l Ca	ution
Frans unit se Etherr comm	fer is conducted via Ethernet. When etting information is transferred and net setting is changed, the nunication may be disabled.
🖲 Tra	nsfer in PROGRAM mode(P)
🔿 Tra	nsfer in RUN mode(R)
	Execute(E) Cancel(C)

Figure 1.3.7

MD37UE01-2405

Communication & module setup E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

(This page is intentionally left blank.)

2. Parameters setup

MD37UE01-2405

Parameters setup

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

1. Click **Axis control setting** and set unit of coordinate and place of decimal point. Then, click coordinate transformation at the top.

KV STUDIO -[Editor: KV-7500] - [0615 *]				
File(F) Edit(E) View(V) Program(M) ST/Script(S) Co	onvert(A) Monitor/Sir	nulator(N) Debug(D) Tool(T) Window(W) Help(H)		
: 🗅 🤒 🗟 📾 📸 🚵 🖶 🗔 🔇 ! 🔛 Ethernet	- 🗆 🖬	8- 4월 1월 1월 1월 🔤 😂 🏛 👔 🚱 🐨 🕼	SF7 F8 SF8 F9 SF9	
i 🖉 🗄 🗱 🌌 📾 🎬 📲 🏷 🔂 💁 🌑 🕨 🛙	H H A H H	▼ >> > 🔍 🖳 🔤 🖄 🔤 🗄 Editor	- Comments Co	mment 1 🔹
Project 📮 🗙	[1] Axis control setting	×		
E 👬 Unit configuration	View filter(F) [Dis	splay level] All 🗸 🗸 📑	* 🕐	
[0] KV-7500				Axis1:E1
[1] KV-XH04ML R34000 DM10300		Unit of coord		mm
- Axis configuration setting		Place of decimal point		0.001 -
📫 Unit common setting	Unit coordinate	360 degree display		No
Axis control setting	transformation	Rotate angle near selection		Yes
Point parameter		Coordinate transformation numerator		1
🖬 🦓 Sync control setting		Coordinate transformation denominator		1
SV2 setting		Soft limit coordinate sysetm		Logic system
init Program		Soft limit (+)		Disable
Option setting	Software limit coord	Soft limit (+) coordinate		0.000 mm
Tunit configuration switching		Soft limit (-)		Disable
T Device comment		Soft limit (-) coordinate		0.000 mm
E DEVICE COMMENC	Axis error	Limit switch error setting		Error



2. After setting the relevant parameters, click **Advanced setting** to complete the setting of encoder resolution and servo electronic gear ratio.

The settings in Figure 2.1 and Figure 2.2 take resolution of 8388608 pulse/rev for one motor revolution (1mm) and 1:1 electronic gear ratio as an example.

Coordinate transformation calculation [Ax	is 1 :]		×	
Coordinate transformation setting value	e fitted in the operation environmer	t is calculated.		
Mechanic configuration(M)	Ball screw pitch			
Ball screw ~	P Coordinate unit(V)	= <u>1.000</u> mm ~		
Gear ratio n	Gear ratio n [output axis side](O)	1	Advanced setting	×
Ball screw pitch (P)	m [motor axis side](I) Axis control common setting Decimal place(A)	0.001	Encoder resolution(E) Servo electronic gear numerator(N) Servo electronic gear denominator(D)	8388608 PLS/rev
		Advanced setting(H)	<u>}</u>	OK Cancel
	Execute calculation(E)		KV STUDIO	×
Calculation result In operation environment, Number of is 8388.608	PLS required for moving	0.001mm	Map se	tting?
Set up coordinate transformation rati <u>Coordinate transformation denomina</u> Coordinate transformation numerato	io of axis control common setting a ator1048576 r125 Error in	is follows. fo(R)	Yes	No
	OK(W)	Cancel(C)		

Figure 2.2

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

Parameters setup

3. Turn on **Axis control setting** and complete parameter settings in operating speed, JOG, and origin return. **Absolute position detection system** is set according to the encoder: incremental type is set to INC; absolute type is set to ABS.

KV STUDIO -[Editor: KV-7500] - [0615 *]			
File(F) Edit(E) View(V) Program(M) ST/Script(S) Co	onvert(A) Monitor/Si	mulator(N) Debug(D) Tool(T) Window(W) Help(H)	
: 🗅 🔥 🗟 🚔 📸 🗟 🖶 🗟 🍞 i 🛍 Ethernet	- 🛛 📼 🖬	🖥 🖶 😥 🖬 🛍 😂 📟 🔛 🗄 부 후 다 후 모 후 부 **	-3 SF3
- 二 三 逆 図 闘 唱 🖫 🏷 🗞 🛼 🌒 🔍 🕨 🛽		▼ >> > > 0 🖑 🖳 😨 🙆 🔤 🕴 Editor 🔹 Comment	s Comment 1 •
Project 🛛 🗘 🗙	[1] Axis control setting	×	
- I Unit configuration	10.000		
n [0] KV-7500	View filter(F)	splay level j Ali	
- [1] KV-XH04ML R34000 DM10300			Axis1:E1
The Axis configuration setting	Software limit coord	Soft limit (-) coordinate	0.000 mm
Unit common setting	Axis error	Limit switch error setting	Error
Axis control setting		Stop method (operation enable relay OEE)	Deceleration ston
Point parameter		Stop method (soft limit)	Deceleration stop
a Sync control setting		Stop method (other errors)	Deceleration stop
SV2 setting	Axis control function	Motor rotate direction	(+) operation forward pulse
Duit Program	and the second	Servo OFF timing	Servo OFF after axis stop
Option setting		Servo end check time	0 ms
Thit configuration switching		Backlash compensation movement	0.000 mm
T Device comment		Speed threshold value at the time or switching the positioning control mode Speed switching selection	Continuous (Current point s
T Label	0.000	Select acceleration/deceleration setting	Ratio
CPU system setting	Common in	Select linear interpolation speed	Synthesized speed
🖀 🚔 Program: 0615	position control	Select helical interpolation speed	3-axis synthesized speed
🝵 🫅 Every-scan execution		Select inching operation after detected stop sensor	Prioritize inching operation
🖬 🔜 Main		Operation starting speed	0.000 mm/s
- Initialize module		Max. operation speed	50.000 mm/s
Standby module		Operation acceleration gunve	0.010 mm/s/ms
- Fixed-period module	Operation speed	Operation acceleration SIN ratio	100 %
Inter-unit sync module		Operation decel rate/lime	0.010 mm/s/ms
- 🗐 Function Block		Operation deceleration curve	SIN
🔳 🗐 Macro		Operation deceleration SIN ratio	100 %
- 🛃 Subroutine macro		JOG starting speed	1.000 mm/s
📴 Self-hold macro		JOG high speed	5.000 mm/s
— 🛄 Device default		JOG acceleration curve	0.010 mm/s/ms
🚍 👘 File register setting	100	JOG acceleration SIN ratio	100 %
- 🛅 0:Memory card		JOG decel rate/time	0.010 mm/s/ms
1:CPU memory		JOG deceleration curve	Linear
🙍 🔷 User document		JOG deceleration SIN ratio	100 %
		JOG inching movement	1.000 mm
		Origin return method	Immediate 2-phase origin re
		Origin return starting speed	0.000 mm/s
		Origin return operation speed	2 000 mm/s
		Origin return accel rate/time	0.010 mm/s/ms
		Origin return acceleration curve	SIN
		Origin return acceleration SIN ratio	100 %
	and the second second	Origin return decel rate/time	0.010 mm/s/ms
	Origin return	Origin return deceleration curve	SIN
		Origin return deceleration SIN ratio	(_) direction
		Origin return direction	(-) direction
		Movement after DOG ON	0.000 mm
		Origin return dwell time	0 ms
		Torque threshold time	0 ms
		Torque threshold	100.00 %
		Home position coordinate	0.000 mm



Note:

The highest operation speed must be equal to the rated operation speed of the motor. The setting of origin return, JOG, operating starting speed, high speed, acceleration and deceleration rate/time, and acceleration curve are based on the same concept, which will be describe in detail in chapter 3. The unit of 1 mm/s here indicates that the motor speed is 1 rev/s (60 rpm).

MD37UE01-2405

Parameters setup

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

4. After the parameters are set, click **PLC Transfer** and switch KV STUDIO mode to **Monitor**.

KV STUDIO -[Editor: KV-7500] - [0615 *]							
File(F) Edit(E) View(V) Program(M) ST/Scrip	ot(S) Convert(A) N	Aonitor/Simulator(N) Debug(D)	Tool(T)	Window(W) Help(H)		
i 🗅 📂 🗟 📾 🖄 🗟 🖶 🖨 🖧 😮 i 🛍 Et	hernet	• 🖻 🗑 🚮 🌆 🕺 🖬	🏛 🗳 🖭	EV F5 SF5 F4 SF4	F7 SF7 F -OØ-	8 SF8 <u>F9 SF9</u>	
i 🔏 🖽 🐹 🐼 📾 🎬 📲 🏅 🗞 🗞 🛼 🔘 (K H V H > 🖉 🗏 🖳	0 200	Editor	- C	omments Comment 1	-
Project 🛛 🗘 🗙	[1] Axis control setting	×		Editor			
Unit configuration	View filter(F)	Display level] All		Online edit			
= [1] KV-XH04MT, R34000 DM10300				Simulator edit		Axis1:E1	
avia configuration setting		Unit of coord	/		_	mm	
This company acting	200200000000000	Place of decimal point				0.001	
onic common secting	Unit coordinate	360 degree display	<u> </u>			No	
AX1S CONTROL SETTING Point parameter	KV STUDIO					× 3	
Sync control setting SV2 setting	Update ti	ime in PLC and ladder diagram program	is different, r	so could it not be transferre	d to PLC, bu	t transferred to monitor directly? 6	
- 🚔 Unit Program		Monitor mode(M)	PLC transfe	er -> monitor mode(T)	Cancel	e	
Dption setting		Soft limit (_)			1	Disable	
🔄 🥼 Unit configuration switching		Soft limit (-) coordinate				0 000 mm	
T Device comment	Axis error	Limit switch error setting				Error	
🔚 Label		Absolute position detection sys	tem			ABS -	
CPU system setting		Stop method (operation enable	relay OFF)		Deceleration stop	
💼 🚔 Program: 0615		Stop method (soft limit)				Deceleration stop	
E Every-scan execution		Stop method (other errors)				Deceleration stop	
Main	Axis control function	Motor rotate direction				(+) operation forward pulse	

Figure 2.4

To save this project, switch KV STUDIO mode to Editor, and click File > Save project or Save project as and set project name and position to complete the archive.

	V STUDIO -[E	Editor: KV-	7500] - [0615 *	1						
File(F) Edit(E)	View(V)	Program(M)	ST/Script(S)	Convert(A)	Monitor/Simulator(N)	Debug(D)	Tool(T)	Window(W)	Help(H)
	New projec	:t(N)		Ctrl+N		- 🗄 🔛 🔐 🚮 🔂	Q 🛃 🍕 🗉	I 🚉 🖭		E E4 SE4 E7 S
•••	Open proje	ect(O)		Ctrl+O				Ò R0	Editor	-
	Close proje	ct(C)			control se	tting 🗙				
	Save projec	rt(S)		Ctrl+S						
	Save projec	ct as(A)			Iter(F)	Save project as			>	< 🤨 😰 🥙
	Save comp	act project	t(J)			Project name(N)		PLC mod	el(K)	
	Verify proje	ect(B)				0615		KV-7500		
	Project pro	perty(F)			ordinate	Position(P)				
	Register ser	nsor setting	gs file(E)		mation	C:\Users\paulisaking\Docum	ents\KEYENCE	E\KVS11G\K\	/S\ Refer(S)	
	Import(I)				•	Comment(C)				
	Memory ca	rd(M)			•				^	
	Save device	e commen	ts in CSV/TXT f	ormat(K)					\vee	
	Read devic	e commer	nts in CSV/TXT	format(Q)	ror	Detail(D)		OK	Cancel	
	Mnemonics	s list(R)			•	Absolute position of	refection syste			
	Output CSV	//TXT file(l	J)		•	Stop method (soft	limit)	elay OFF)		
	HTML file o	output(T)			×	Stop method (othe	r errors)			

Figure 2.5

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

Parameters setup

Supplementary note:

If users use KV STUDIO for the second time and would like to adopt the previous project, please click **File > Open project** and select the previously set project or click the area in orange boxes in Figure 2.7 to read the previous PLC project.

Π.	New project(N)	Ctrl+N			1 📾 💷	an 📭 🖓 i	at 121. 123	E ES SE	F4 SF4	F7 SE
2	Open project(O)	Ctrl+O		II M A	I H H W			; - #	- 46 46	-00
	Register sensor settings file(E)		1		11 71 1		0.3.0			
	Memory card(M)		•							
	Printer setup(W)		-1							
	Recent projects(D)		•							
	Exit		-1							

Figure 2.6

KV STUDIO

File(F) View(V) Monitor	/Simulator(N) Operation recorder/Replay(R) Tool(T) Window(W) Help(H)
i 🗅 😝 🖶 📾 🖻 🛍 🗟	k 🖶 💫 ? 👔 Ethernet 🔹 🔹 🖬 📾 🖬 🛃 🔂 🗹 🛒 🏛 🛍 🗐 🗐 🗐 👬 🕸 가 🌮
	1 [*]
	Read PLC X
	[Communication destination: KV-7500, route: Ethernet 192.168.0.10]
	Read items(I)
	Item
	Vult setting info
	Global device comments
	I Global label
	CPU system setting
	✓ Program
	Device default info
	✓ Logging/trace setting info
	Ethernet/serial function setting info
	✓ File Register setting
	User document
	Positioning unit parameter
	Device value
	Select all(S) Cancel all(D)
	Execute(E) Cancel(C)

Figure 2.7

MD37UE01-2405

Parameters setup

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

(This page is intentionally left blank.)

3. Trial run

3.	Trial run		3-1
	3.1	Positioning control	3-2
	3.2	Starting speed, acceleration and deceleration rate/time, acceleration curve	3-4

MD37UE01-2405

Trial run

3.1 Positioning control

1. Check if the KV STUDIO mode is **Monitor**. Click the positioning motion unit set by the parameter and right-click > **Trial run** > **Positioning control** > **Axis**.

KV STUDIO -[Monitor: KV-7500]	- [0615 *]			
File(F) Edit(E) View(V) Progra	m(M) ST/Script	t(S) Convert(A)	Monitor/Simulator(N) Debug(D) Tool(T) Window(W) Help(H)	
i 🗅 👩 🗄 🗎 😭 🛍 🗟 🖨 I	à 🕜 🗄 🛍 Eth	ernet		8 SF8 <u>F9 SF9</u>
i 🦨 🗮 📰 🌌 🗺 🎬 🖷 🏅 🕻	ठै 🗟 🔩 🖲 🍭	▶ II I • €	▲ K H ▼ H > ◎ 🖑 🗣 ⊘ 🔤 🕴 Monitor 💽 C	omments Comment 1
Project	ά×	[1] Axis control setti	ng 🗙	
Unit configuration		View filter(F)	[Display level] All 🗸 🔀 🔛 🐯 🐼 📀	
	000 000000			Axis1:E1
a o [1] Avis configure	Unit Editor(U)		Soft limit (+)	Disable
Unit common as			Soft limit (+) coordinate	0.000 mm
Duic common se	Device assignment	ient display(D)	Soft limit (-)	Disable
AXIS CONCEPT S	Unit monitor(C)	Soft limit (-) coordinate	0.000 mm
Point paramete			Limit switch error setting	Effor
Sync control a	Unit tracing(A)		Stop method (operation enable relay OEE)	Deceleration ston
SV2 setting	Trial run(T)	1	Positioning control(P) Avis1(1)	Deceleration stop
Unit Program	Synchronous	antrol(S)	Second constant/(S)	Deceleration stop
Option setting	oynem onous et	5111101(0)		(+) operation forward pulse
Unit configuration	Slave apparatu	s restart(E)	Torque control(T)	Servo OFF after axis stop
Levice comment			Servo end check time	0 ms
T Label			Backlash compensation movement	0.000 mm
CPU system setting			Speed threshold value at the time of switching the positioning control mode	50 rpm
🚍 🚔 Program: 0615			Speed switching selection	Continuous (Current point s
🚍 🧰 Every-scan execution		Common in	Select acceleration/deceleration setting	Ratio
🖬 🔛 Main		position control	Select linear interpolation speed	Synthesized speed
			Select helical internalation sneed	2-avis evrilhasized enood

Figure 3.1.1

2. Check if "Axis error" turns to red light. If there is an error, click Error clear first; if there is no error, click Cancel OP. Enable. When "Operation ready" turns to green light, click Cancel servo ON and wait for "Servo ready" light to turn green. The action sequence cannot be reversed. After completing "Servo ready", users can execute JOG movement in forward and reverse directions.

XISI Command coordinate	Ax ctrl in progress	o ot	peration ready C	ancel OP. Enable
	39.397 mm	• Se	ervo ready	Cancel servo ON
	Current point	Wait Ax	is error	Error clear
00		Inching		Origin return
	Speed 100 🜩 %	41		0
- direction + direction 1 eaching	Speed 100 🗘 % 0% 100% Trial run () 1 point operation	- direction	+ direction	S
- direction + direction 1 eaching	Speed 100 🗘 % 0% 100% Trial run (a) 1 point operation Point number 1	- direction	+ direction	Repeat
- direction + direction 1 eaching oint number 1÷	Speed 100 🗘 % 0% 100% Trial run (a) 1 point operation Point number 1 Coord. 0.000 mm	- direction	+ direction	Repeat ne ^
- direction + direction 1 Paching oint number 1÷ Coord. 0.000 mm Speed 1.000 mm/s	Speed 100 🗘 % 0% 100% Trial run (a) 1 point operation Point number 1 Coord. 0.000 mm	- direction	+ direction	Repeat ne v

Figure 3.1.2

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

Trial run

3. When JOG is moving, users can open **Scope** in **Thunder**, select "7. Motor velocity" to check the speed feedback of the motor, and check if the set speed command is consistent with actual speed feedback of the motor. According to 5.00 mm/s JOG high speed set by the parameter, the corresponding speed is 300 rpm.

	🕗 Scope Axis: X_		-		×
Speed (rpm)	300			 T	S
	200	JOG starting speed	5.000 mm/s	R	<u> </u>
	220	JOG high speed	5.000 mm/s		X
	200	JOG accel rate/time	1.000 mm/s/ms		в
	180	JOG acceleration curve	SIN	Т	
	JOG	JOG acceleration SIN ratio	100 %	2	
	120	JOG decel rate/time	1.000 mm/s/ms		
	100	JOG deceleration curve	SIN		≜
	80	JOG deceleration SIN ratio	100 %		-
	60 40 20				
	0 	-0.0160177 rpm			



Note:

- (1) If users would like to achieve the position, speed, acceleration, and deceleration set by the positioning motion unit in equal proportion, please set drive parameter electronic gear ratio Pt210 and Pt20E to 1:1.
- (2) Thunder 1.9.20.0 or above and drive firmware version 2.8.16 or above support the electronic gear ratio setting other than 1:1.

3.2 Starting speed, acceleration and deceleration rate/time,

acceleration curve

1. Complete the parameter setting in Figure 3.2.1 with the above-mentioned setting method.

	JOG starting speed	1.000 mm/s
	JOG high speed	25.000 mm/s
	JOG accel rate/time	0.010 mm/s/ms
	JOG acceleration curve	SIN
JOG	JOG acceleration SIN ratio	100 %
	JOG decel rate/time	0.010 mm/s/ms
	JOG deceleration curve	Linear

Figure 3.2.1

2. Open **Thunder** > **Tools** > **Real-time data collection** and click **Start** to capture the speed command dPosVelCmd.

communicatio	n setup	💦 🧭 Real-time d	ata collection 2.1	85	_	
PROFINE I setu	ip	File Tools S	essions			
Phase initializa	tion setup	A				
Auto tune		0.D3COE	+			
Absolute enco	der initialization	Slave: : Ø C	D3COE>	Samples 2000000	I Upd vars	
Analog offset		Start event		- Campies		-
Dynamic brake	e resistor wizard			Rate T		
Gantry control	system	Stop event		fr=32000/rate= dt=1/Fr=	8000 Hz 0 125 msec	
Electronic cam	Electronic cam			samples*dt=	41:40.00 min	
Tuneless		USB				
Error man setu	n	Sync	Variables to be	e recorded(up to 8)	e	
L/O configurati	Error map setup			4u		
Real-time data	collection	Start(E5)	1			
Spectrum anal	vzer	Chart(, C)	4			
Error loa	,	Stop				
Messages+co	Messages+command prompt Set to factory default					
			2 words/sample	e (4 bytes)		
Set to factory o						
Update firmwa	ire					

Figure 3.2.2

MD37UE01-2405

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

Trial run

3. Execute JOG movement in forward direction for a few seconds and release it, wait for the motor to stop.

Trial run [Positioning control]- Unit1 - Av	is1:E1 - KV-XH04ML		×
Axis1 Command coordinate	Ax ctrl in progress	Operation	ready Cancel OP. Enable
10	97.003 mm	Servo rea	dy Cancel servo ON
	V Current point n	/ait Axis error p: 0	Error clear
JOG	- Ir	iching	Origin return
- direction + direction 10%	speed 100 🗭 %	- direction + dir	Pection S
Teaching	Trial run		
	I point operation	◯ Cont. o	peration Repeat
Point number 1 🗧	Point number 1 🖨] 1	🗘 Wait: None 🗸 🔨
Coord. 0.000 mm	Coord. 0.000 mm		🗘 Wait None 🗸 🗸
Speed 1.000 mm/s			🗣 Wait: None 🗸 🗸
Mode Single/Position/INC			🗘 Wait: None 🗸 🗸
Acquire	► St	art Dec	cel Stop 📕 Force Stop

Figure 3.2.3

4. Open **Thunder > Tools > Real-time data collection**, click **Stop** and then press **Graph** (refer to Figure 3.2.2) to generate Figure 3.2.4.



Figure 3.2.4

MD37UE01-2405

<u>Trial run</u>

5. According to the setting in chapter 2 that the resolution for one motor revolution (1mm) is 8388608 pulse/rev, 1.00 mm/s starting speed corresponds to 60 rpm actual speed; 25.00 mm/s JOG high speed corresponds to 1500 rpm actual speed.

Choose SIN for acceleration curve since the speed command from starting speed to high speed is in a curved shape; choose a straight line for deceleration curve since the speed command from high speed to starting speed is in a straight line.

The acceleration/deceleration time of 0.010 mm/s/ms corresponds to actual acceleration of 0.6 rpm/ms, indicating that the speed increases by 0.6 rpm every 1 ms.



Figure 3.2.5

4. Origin return

4.	Origin retu	ırn	4-1
	4.1	Immediate Z-phase origin return	4-2
	4.2	Limit switch rising edge	4-3
	4.3	Origin sensor and Z-phase	4-4

C

Origin return

4.1 Immediate Z-phase origin return

1. Use the above-mentioned setting method to complete the setting of origin return method and direction in Figure 4.1.1.

	Origin return method	Immediate Z-phase origin return
	Origin return starting speed	0.000 mm/s
	Origin return creep speed	5.000 mm/s
	Origin return operation speed	5.000 mm/s
	Origin return accel rate/time	1.000 mm/s/ms
	Origin return acceleration curve	SIN
	Origin return acceleration SIN ratio	100 %
	Origin return decel rate/time	1.000 mm/s/ms
rigin roturn	Origin return deceleration curve	SIN
ngin return	Origin return deceleration SIN ratio	100 %
	Origin return direction	(-) direction
	Origin coordinate	0.000 mm



Note:

Immediate Z-phase origin return can be used without any external input signal. This method can be adopted if users cannot input external P-OT, N-OT, DOG, EXT-PROBE1 signals to the drive. If users would like to use external P-OT, N-OT, DOG, EXT-PROBE1 signals for origin return, I/O setting of the drive must be completed first. (For detailed information, please refer to " E Series Servo Drive Thunder Software Operation Manual.")

2. After "Operation ready" and "Servo ready" turn to green light, click **Origin return**. The motor will move in origin return direction and search for the encoder origin (index). It will stop after finding the origin.



Figure 4.1.2

Note:

When using with an incremental encoder, users need to check if the encoder supports index signal output.

E Series MECHATROLINK-III Drive Complete Setup with KEYENCE KV STUDIO

MD37UE01-2405 Origin return

4.2 Limit switch rising edge

After "Operation ready" and "Servo ready" turn to green light, click **Origin return**. When the motor moves in reverse direction, after touching N_OT signal, it will immediately move in forward direction and exit from the signal. After disengagement, the motor will move in reverse direction again and stop until it reaches N_OT. This origin return method only supports in reverse direction.



Figure 4.2.1

MD37UE01-2405

<u>Origin return</u>

4.3 Origin sensor and Z-phase

After "Operation ready" and "Servo ready" turn to green light, click **Origin return**. When the motor moves in reverse direction, after touching EXT-PROBE1 signal of origin sensor, it will immediately move in forward direction and exit from the signal. After disengagement, the motor will move in reverse direction again and stop until it reaches EXT-PROBE1 signal of origin sensor.

			Trial run [Positioning control]- Unit1 - Axis1:E1 - KV-XH04ML					×
			Axis1 co	mmand coordinate	Ax ctrl in p	rogress	Operation ready Servo ready	Cancel OP. Enable Cancel servo ON
	Origin return method	Origin sensor and Z-phase			Curre	Wait nt point no: 0	Axis error	Error clear
	Origin return starting speed	0.010 mm/s	JOG			Inching		Origin return
Origin return	Origin return creep speed	0.500 mm/s		>	Speed 100 🜩 %	%		
	Origin return operation speed	0.500 mm/s	<					0
	Origin return accel rate/time	0.100 mm/s/ms	-					
	Origin return acceleration curve	SIN						
	Origin return acceleration SIN ratio	100 %	- direction + direction 10%		100% - direction + direction			
	Origin return decel rate/time	0.100 mm/s/ms	Teaching Point number 1		Trial run			
	Origin return deceleration curve	SIN			1 point operation Cont. operation Repeat			
	Origin return deceleration SIN ratio	100 %			Point number	1	1 🗎 Wait	None
	Origin return direction	(-) direction			1 one number	•		
	Origin coordinate	0.000 mm	Coord. 0.	000 mm	Coord. 0.000	mm	- Wait	None
			Speed 1.000 mm/s Mode Single/Position/INC		🗘 Wait			None 🗸
							🗘 Wait	None 🗸 🗸
				Acquire		▶ Start	Decel Stop	Force Stop



Supplementary note:

- 1. The above are the three origin return methods supported by Keyence positioning motion unit. For other methods and detailed information, please refer to chapter 8 in "KV-XH16ML/XH04ML User's Manual."
- 2. The origin sensor and DOG signal for origin return will correspond to EXT-PROBE1 input signal of the drive.
- 3. EXT-PROBE1 related functions are only supported by Thunder 1.9.20.0 or above and drive firmware version 2.8.16 or above.