

Application Note

E Series EtherCAT Drive Complete Setup with KEYENCE KV STUDIO

> www.hiwinmikro.tw MD40UE01-2307_V1.0

Revision History

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

MD40UE01-2307_V1.0



Release Date	Version	Applicable Product	Revision Contents
Jul. 25 th , 2023	1.0	E series EtherCAT 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 EtherCAT drive is used with KEYENCE KV-7000 series PLC.

Specifications of Software/Hardware

Name	Version of Software/Firmware
	Software (Thunder): 1.9.17.0 or above
E1 Series EtherCAT Drive	Firmware: 2.8.16 or above
	ESI file: HIWIN_MIKROSYSTEM_ED1F_20221209 or above
	Software (Thunder): 1.9.7.0 or above
E2 Series EtherCAT Drive	Firmware: 3.9.16 or above
	ESI file: HIWIN_MIKROSYSTEM_ED2F_20230614 or above
	Software (KV STUDIO): 11.61 or above
KETENCE KV-7500	Firmware: 2.303 or above
KEYENCE KV-XH16EC	Firmware: 1.004 or above

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1. Communication and module setup

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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 used to connect with the computer, and positioning motion unit is used to connect with the drive.

CPU Unit

Positioning Motion Unit





Figure 1.1.2

	Table 1.1.1											
NO.		Description										
А	Model of CPU unit											
В	LCD screen display											
С	Computer USB port											
D	CPU unit network port											
E	LED display lights	Green light: Successful connection	Red light: Connection failure									
F	Model of positioning motion unit											
G	Motion unit network port											

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Communication and module setup

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1.2 Create new project

1. Open KV STUDIO and click **File** \rightarrow **New project**.

i k	V STUDIO	
File	(F) View(V) Monitor/Simulator(N)	Operation recorder/Replay(R) Tool(T) Window(W) Help(H)
	New project(N)	Ctrl+N
-	Open project(O)	Ctrl+O
	Register sensor settings file(E)	
	Memory card(M)	• • • • • • • • • • • • • • • • • • •
	Printer setup(W)	
	Recent projects(D)	•
	Exit(X)	

Figure 1.2.1

2. Enter the project name and select a location. Click **OK**.

📰 K	V STUDIO									
File	(F) View(V) Monitor/Simulator(N)	Operation recorder/	/Replay(R) Tool(T)	Window(W)	Help(H)					
	New project(N)	Ctrl+N	- ! 📾 🚏			EV DEV	F5 SF5 F4 SF4 F7	SF7 F8 SF8 F9	SF9	
-	Open project(O)	Ctrl+O		>> ○ J				Comments		*
	Register sensor settings file(E)									
	Memory card(M)	•	New project			×				
	Printer setup(W)		Project name(N)		PLC model(K)					
	Recent projects(D)	•			KV-7500	~				
	Exit(X)		Position(P) C:\Users\asd248713	Documents\KEYENC	EKVS11GKVSV R	tefer(S)				
			Comment(C)		OK Ci	ancel				

Figure 1.2.2

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Communication and module setup E Series EtherCAT Drive Complete Setup with KEYENCE KV STUDIO

3. Successfully create a new project.



Figure 1.2.3

1.3 Open the project

1. Open KV STUDIO and select File→ Open project.

_										
10 K	/ STUDIO									l
File(F) View(V) Monitor/Simulator(N)	Operation record	er/Replay(R)	Tool(T)	Window(W)	Help(H)				
	New project(N)	Ctrl+N	-	1 🖬 🚏	-si 🗈 🔂 🖬	K	EV F5 SF5 F4	SF4 F7 SF7 F8 SF8 I	F9 SF9	
	Open project(O)	Ctrl+O		КЫТ	>> ○			- Commen	ts 注釋 1	*
	Register sensor settings file(E)									
	Memory card(M)	•								
	Printer setup(W)									
	Recent projects(D)	•								
	Exit(X)									

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Communication and module setup

2. Select the saved project and click **Open**.

iii K	V STUDIO						
File(F) View(V) Monitor/Simulator(N)	Operation record	ler/Replay(R)	Tool(T) Wi	ndow(W) Help(H)		
	New project(N)	Ctrl+N	-	🖻 🚏 🗐	🗈 👌 🗹 🕵 🏛 🎝 💷 🖫	F5 SF5 F4 SF4 F	7 SF7 F8 SF8 F9 SF9 O
-	Open project(O)	Ctrl+O	1 144 A 14				▼ Comments 注釋 1 ▼
	Register sensor settings file(E)		ill Open			×	
	Memory card(M)	•	Look in:	5466	~ G	🦻 📂 🛄 🕶	
	Printer setup(W)			Name		6/16/2023 9:33 AM	
	Recent projects(D)	•	Quick access	1_CPUMEN	N	6/16/2023 9:33 AM 6/21/2023 5:33 PM	
	Exit(X)		Desktop				
			Libraries				
			This PC				
				<		>	
			Network	File name:		 ✓ Open 	
				Files of type:	KVS project file(*.kpr)	 ✓ Cancel 	
			Move folder	Projec	t info		
			Default folde	r(X)		^	
			O Sample fold	er(P)			
			Select fold	ler(J)			

Figure 1.3.2

4. Successfully open a new project.

KV STUDIO -[Editor: KV-7500]] - [5466]		– 🗆 🗙		
File(F) Edit(E) View(V) Prog	ram(M) ST/Script(S)	Convert(A) Monitor/Simulator(N) Debug(D) Tool(T) Window(W)	Help(H)		
i 🗅 🍋 🖶 🗟 🗠 🚔 💀	🗟 🕜 🗄 🔛 USB	• ! 🐑 🔐 🚚 🐌 🖓 🚮 🕮 🕮 📖 🔛 ! ! !! !!	5 F4 SF4 F7 SF7 F8 SF8 F9 SF9		
: .< ;: :: :Z @ III: III 15	5 8 🖡 🔍 🔍	▶ ■ ++ ▲ + > ▼ →+ > ◎ ↓ □ 💀 🖄 🗄 Editor	▼ Comments		
Project 🛛 📮 🗙	[2] Axis control setting	🗙 [2] Point parameter 🗙 Main 🗙			
Unit configuration	View filter(F) [Dis	play level] All 🧹 📑 🔛 👘 🕸 📀			
			Axis1:		
		Unit of coord	mm 👻		
		Place of decimal point	0.001		
Unit configurat	Unit coordinate	360 degree display	No		
Device comment	transformation	Rotate angle near selection	Yes		
Label		Coordinate transformation numerator	125		
CPU system setting		Coordinate transformation denominator	1048576		
🚊 👬 Program: 5466		Soft limit coordinate sysetm	Logic system		
🚊 🦲 Every-scan exec	Coffeend line it as and	Soft limit (+)	Disable		
🌐 🧱 Main	Software limit coord	Soft limit (+) coordinate	0.000 mm		
📒 Initialize modu		Soft limit (-)	Disable		
Standby module	Axis orror	Soft fifthil (-) coordinate	0.000 mm		
Fixed-period mo	Axis error	Absolute position detection system	ARS		
Inter-unit sync		Stop method (operation enable relay OFE)	Deceleration ston		
= Sunction Block		Stop method (soft limit)	Deceleration stop		
heepeeden Init	Axis control function	Stop method (external limit)	Immediate stop		
	Axis control runction	Stop method (other errors)	Deceleration stop		
AXIS JOG		Motor rotate direction	(+) operation forward pulse		
		Servo OFF timing	Servo OFF after axis stop		
Project Library		-			
Ready			🗢 USB		

1.4 Select connection type

1. Click on **communication setting**, select a connection path for the controller and click **OK**.





1.5 IP setting and connection

1. When the controller (CPU unit) is set as default, it is required to use a USB cable for CPU unit connection to open the KV STUDIO software interface. (If the controller is not set as default, skip to step 7).



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Communication and module setup

2. Create a new project.

📰 K	V STUDIO								
File	(F) View(V) Monitor/S	imulator(N) Operatio	n recorder/	/Replay(R) Tool(T)	Window(W)	Help(H)			
	New project(N)	Ctrl+1	l I	- 🗈 🗬	-11 🔂 🛃	5 1 1 1	EV	F5 SF5 F4 SF4 F7 SF7 F8 SF8 F9 SF3	
P	Open project(O)	Ctrl+0			7 H > 🔿 🤳	🖳 Ö 💷 !		- Comments	Ŧ
	Register sensor settings	ile(E)							
	Memory card(M)		•	New project	_	_	×		
	Printer setup(W)			Project name(N)		PLC model(K)			
	Recent projects(D)		•			KV-7500	~		
	Exit(X)			Position(P) C:\Users\asd248713	Documents\KEYENCE	K /S11G\KVS\ Refer(S	S)		
				Detail(D)		OK Cancel	~		
				Confirm unit setting info	ormation		×		
				* [Yes]Start Unit Editor	ow? r.				
				* [No]Close this dialo * [Read unit setting]R	g. ead unit setting inform	ation from PLC.			
				Yes(Y) No(N)	Read unit setting)(U)		

Figure 1.5.2

3. Right-click on the **Unit configuration** to open **Unit Editor**.

MV STUDIO -[Editor: KV-7500]	- [5466]											
File(F) Edit(E) View(V) Prog	gram(M) ST/Script(S) Convert(A) Monitor/Sin	nulator(N) Debug(D) Too	ol(T) Window(W) Help	(H)							
🛤 면 🕫 여 🐯 것, 책 라 캦 각 ! 🕎 🗐 🍰 🗮 🗟 🕥 🦏 👺 📲 🥶 !												
Project u x Main x												
E Unit configuration												
[0] KV-7500	1 Unit Editor(U)	1	2	2	1	E C						
🖬 [1] KV-XH16ML	Setup mail(T)	1	2	5	4	J						
[2] KV-XH16EC	Mail Command Maker(R)											
Device comment	Simple PLC link setting(G)	1										
🗖 Label 🖬	FTP client setting(J)	L										
CPU system setting 📈	Setup logging/trace(L)	1										
Program: 5466	Error monitor(W)	1										
i 📓 Main	Scan time monitor(S)	1										
📒 Initialize modu 🔒	Performance monitor(A)											
📩 Standby module		-										
Fixed-period mo	Change model(P)	1										
Function Block	00002											
👖 🙀 Absencoder_Initia	000001											
🖬 🙀 Axis_Jog												
<pre>Enable_errormap_a</pre>												
Home Return												
Parameter_Read												
🖬 🙀 Parameter_Write												
🖬 📷 Pointwrite	00003											
🖬 📲 Pos	00005											
Macro												
🗦 Subroutine macro												
Self-hold macro												

Figure 1.5.3

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4. Acquire the configuration information of the unit connected to the PLC to automatically read the existing positioning motion unit model of the user.

🚟 Unit Editor	- Edit mode								- 🗆	×
File(F) Edit(E) Convert(P)	View(V) O	ption(O) Wi	ndow(W) H	lelp(H)					
💀 💣 🖬	% 🖻 💼 🛛	< 🔳 🔍 🛛	1 😿 🐔 月	L Er Bati	i 🔣 🔧 🍇	0				
A	cquire the config	guration inform	nation of the u	unit connecte	d to the PLC.			Unit		ą
Width:139m		U KV-7500	L KV-XH04MI.	2 RV-XHIERC				Select unit(1) Setu	ıp unit(<u>2)</u>	
Height:90mm										
Depth:95mm Curr. Cons. 52	20mA							Dewer unit		^
Weight:650g								KV-PU1	AC power unit (
		R30000	R34000	R38000				KV-U7	AC power supply	-
		-33915	-37515	-51115				🗆 📶 Additional I,	O unit(input)	
						-		KV-B16X*	16-point input	
		Unit Editor					×	KV-C32X*	32-point input	
								KV-C64X*	64-point input	x 4 (, y, ,
								Additional I	O unit(output)	
		(?)	Onit settings At the same	s are read in time, the co	the initializant	tion status. Iv being edited v	vill be	KV-B8RC	8-point relay o	
			discarded.			,		KV-B16R*	16-point relay	
			OK?					KV-B16T*	16-point transi	
						+		KV-C32T*	32-point transi	
						Vec	No	KV-C64T*	64-point transi	• 🗸
						103	NO		/o	
Message										ņ
	Process	Row	No.	Code	Message					
н + + н М	lessage /					[] <				>
Acquire the con	figuration inform	nation of the u	nit connected	to the PLC.			Editor Lin	ne:1, Col:1 OK	Cancel Apply]] //

Figure 1.5.4

5. Check if the communication path is **USB**, and click **PLC Transfer** to store the files in PLC. (It is normal if "PLC error" occurs, users can click **Clear** to erase it.)

📰 KV STUDIO -	[Editor: KV-7500)] - [5466 *]							
File(F) Edit(E)	View(V) Pro	gram(M) ST/Sc	ript(S) Cor	nvert(A) Monitor	r/Simulator(N)	Debug(D) To	ool(T) Window(W)	Help(H)	
i 🗅 🔒 🖶 🖩	a 🖻 🔒 🗟 🖡	i 🗟 🕜 i 🔛	USB	-) 🗗 🔂 🔂	Q 🛃 🍕 🏛	🚉 🖭 🕎 : F5 SF5	F4 SF4 F7 SF7 F8 SF8 F9 S 41 41 -012- I I III	-9
: _ ∺ ⊞ ≌ \$	2 🖾 🎬 🖷 🕻	i 😼 🗟 🚽 🔘			N ▼	0 😃 🖳 Ö	Editor	- Comments 🗄	釋 1
Project	Į Χ	Main 🗙			Trans	fer to PLC			
Image: Construction Image: Constr	nfiguration KV-7500 KV-XH04ML KV-XH16EC configuratio comment tem setting 1: 5466	00001		1		2	3	4	
E Contraction of the second se	y-scan execut ain ialize module d-period modul -r-unit sync m n Block ncoder_Initia _Jog le_errormap_a ryMode_Touchp	00002 000001				PLC error PLC error occurs. (INo Ladder Program No program. Clear(C)	(0 to 40) m] Ignore (I)		

Figure 1.5.5

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Communication and module setup

6. Execute **PLC Transfer**, and the display light of the positioning motion unit will turn from red to green, indicating the successful setting of the CPU unit and the positioning motion unit.

iii Tr	ansfer program [Communication des	tination: KV-7500, route: USB]	×
Trans	fer items(I)		
	Item		
	Unit setting info		
1	Global device comments		
1	Global label		
1	CPU system setting		
1	Program		
1	Device default info		
~	Logging/trace setting info		
~	Ethernet/serial function setting info		
~	File Register setting	Unit setting info	
	User document		
	Positioning unit parameter		
	Select all(S) Cancel all(D)		
Cle	ear program in PLC(Q)		
• Tra	Insfer in PROGRAM mode(P)		
OTra	Insfer in RUN mode(R)		
	Execute(E) Cancel(C)		

Figure 1.5.6

 Set computer IP address to 192.168.0.100, which is in the same network domain as the controller (192.168.0.10) and use **Ethernet cable** to connect. If the CPU unit is not set as default, users can use a network cable or USB to connect to the CPU unit.

😰 Network Connections	- 0	×
← → ✓ ↑ (型 > Control Panel > All Control Panel Items > Network Connections 3回答编89通訊協定第4版 (TCP/IPv4) Properties X		م
Organize Disable this network device Diagnose this connection Rename this con General General		?
Ethernet hivinmikro.com.tw Intel(R) Ethernet Connection (12) Ethernet 3 Network cable unplugged Realtek PCIe GbE Family Controller 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 . 255 . 0		
Default gateway:	ew available.	
Obtain DNS server address automatically		
• Use the following DNS server addresses:		
Preferred DNS server:		
Alternate DNS server:		
Validate settings upon exit		
OK Cancel		
2 items 1 item selected		🗄 🖂

Figure 1.5.7

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8. Create a new project. (This step can be skipped if the project has already been created.)

iii K	V STUDIO		
File	(F) View(V) Monitor/S	Simulator(N) Operation reco	rder/Replay(R) Tool(T) Window(W) Help(H)
	New project(N)	Ctrl+N	88. 69. 89. 89. 39. 39. 49. 49. 49. 49. 19. 19. 19. 19. 19. 19. 19. 19. 19. 1
-	Open project(O)	Ctrl+O	II K(▲ K H ▼ H > O J ♀ ∅ > O ↓ ♀ ∅
	Register sensor settings	ile(E)	
	Memory card(M)	•	New project X
	Printer setup(W)		Project name(N) PLC model(K)
	Recent projects(D)	•	KV-7500 ~
	Exit(X)		Position(P) CUlsers(asd248713)Documents(KEYENCE) /S11G(KVS) Refer(S)
_			Comment/C)
			Detail(D) OK Cancel
			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)

Figure 1.5.8

9. Click the **communication setting** and switch to the **Ethernet**. Enter 192.268.0.100 in the **IP address** of the computer. (Users can skip to step 12 if using a **USB** for communication).



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10. Select the **Network card** that is connected to the controller and click on **Execute**.

Search destination					×
- Select network card Network card (N)	Realte	k PCIe GbE Family Controlle) Ethernet Connection (12)	r 1219-V		~
IP address Subnet mask Port No.(P) 85	Realtel 255.2	K PCIe GbE Family Controlle 55.0.0 Execute(S)) Stop(B)		
Find Ethernet unit wi *Network load may Result	here bro / increa	padcast packets reach. (KN se according to the number	/ only) r of connected units.		
MAC address		Connected Unit type	IP address	Project name	

Figure 1.5.10

11. After successful execution, select the Search results below and click Select.

earch destination				>
- Select network car	d			
Network card (N)	Realtek PCIe GbE Family C	Controller		\sim
IP address	192.168.0.100			
Subnet mask	255.255.255.0			
Port No.(P)	500 Ex	ecute(S) Stop(B) Search in progress	
Find Ethernet unit w	here broadcast packets re	ach. (KV only)		
*Network load ma	y increase according to the	number of connected unit	S.	
Result				
MAC address	Connected Unit ty	pe IP address	Project name	
00-01-FC-CE-79-30	KV-7500	192.168.0.10	11	
				•
				•
				•
				•
				_

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12. Right-click on the Unit configuration to open Unit Editor.





13. Acquire the configuration information of the unit connected to the PLC to automatically read the existing positioning motion unit model of the user.



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14. Click **PLC Transfer** to store the files in PLC. (It is normal if "PLC error" occurs, users can click **Clear** to erase it.)



Figure 1.5.14

15. Execute PLC Transfer.



Figure 1.5.15

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2. Parameters setup

2.	Para	ameters s	setup	2-1
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		2.1.2	PDO setting	2-3
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	2.2	Ах	kis control setting	2-7

2.1 Axis configuration setting

2.1.1 Install ESI files

1. Expand the default positioning motion unit and double-click the **Axis configuration setting**.

🞆 KV STUDIO -[Editor: KV-7500] - [11]				
File(F) Edit(E) View(V) Program(M) ST/Scrip	t(S) Convert(A) M	1onitor/Simulator(N) Debug(D)) Tool(T) Window(W)	Help(H)
i 🗅 🤒 🗄 🗟 🖄 🛤 🖶 🗟 🥝 i 🔛	USB	- 🗈 🐨 📲 🔂 🖸	🛃 🏭 🚉 💷 📑	
i 🕼 🌐 🕮 🜌 🗃 🎬 🖷 🏷 🗞 🛼 🌘			🖑 🖳 🖉 📧 📄 🗄 Edit	tor 💌
Project 🕂 🗘	🕻 Main 🗙			
🗉 🖬 Unit configuration				
[0] KV-7500		1	2	3
<pre>[1] KV-XHOWAL K34000 DH1050 [2] KV-XH16EC R38000 DM1040 Axis configuration setting</pre>	00001			

Figure 2.1.1.1

2. Click the **Register ESI file** and select the latest ESI file for E series drives. (Path: C:\Thunder\doc\ESI Files).

[2] Axis configuration setting		×
KV-XH16EC Set up max. number of axes Control period(L)	16 axes 1ms v Help	Search

Figure 2.1.1.2

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2.1.2 PDO setting

1. Double-click or drag the drive to be selected, and the **Slave detailed setting** window will pop up.

xis configuration	setting					
-XH16EC	Set up max. number of axes Control period(L)	16 axes 1ms → Halo		Search All Vendors All All Vendors Servo Drive Servo Drive E1 CoE Drive (0x000 Servo Drives) E2 CoE Drive (0x000 Servo Drives E2 CoE Drive (0x000 Servo Drives) E3 Servo Drives E4 Servo Drives	RP. 10000) [Detaile	d setting red
Slave deta Basic Director	iled setting PDO mapping Motion function setting PDO mapping name (index) (Add) (Add)	PD0 entry name	Index	Data size (bit)	+	2P.
-				ОК	Cancel	setting(D)

Figure 2.1.2.1

2. On the **PDO mapping** tab, set the PDO according to the requirement. (Users can first select the PDO combination and click add or delete afterwards.)

Direction	PDO mapp	jpo name (index)	PDO	entry name	Index		Data size (bit)		
₽÷	RxPDO 4 (0x1603) (Add) (Add)	Add PDO 1403 TxPDO 4 Name(N) Index (map)(I) Nar Statusword Mode of operatic Position actual v Velocity actual va Torche Probe sta Touch Probe sta Touch Probe 1 p Digital inputs (Add)	TxPDO 4 Add PDO entry Select from defauit d PDO entry name(N) Index(I) Sub-index(U) Data type(D)	evice definition 60FE 0 BOOL OK	HEX V DEC V Cancel	× 16 8 32 16 16 16 16 16 22 32 32 Cana	+ ×	16 8 16 32 16 32	+ ×

Figure 2.1.2.2

Note: The number of **PDO Read** and **PDO Write** is limited to 8 each. HIWIN MIKROSYSTEM CORP.

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Parameters setup

3. On the Motion function setting tab, right-click and select the Automatic assignment option and click OK.

Slave detail	ed setting			×
Basic P	DO mapping Motion function setting			
Motion fu	nction map(M)			
Direction	Function name	Process data	Bit Position 🔷	
	Control word [mandatory]	0x1603: RxPDO 4.0x6040:00: Controlword *	-	
	Position control - target position [mandatory]	0x1603: RxPDO 4.0x607A:00: Target Position	-	
	Position control - latch control	0x1603: RxPDO 4.0x60B8:00: Touch probe function		
	Change control mode	0x1603: RxPDO 4.0x6060:00: Mode of operation	Automatic assignment(A)	1
	Speed control - target speed	0x1603: RxPDO 4.0x60FF:00: Target velocity		_
	Torque control - target torque	0x1603: RxPDO 4.0x6071:00: Target torque	-	
	Torque limit	<no assignment=""></no>	-	
	Torque control - max speed	<no assignment=""></no>	-	
	Speed feedforward	<no assignment=""></no>	-	
	Torque feedforward	<no assignment=""></no>	-	
	Positive direction torque limit	<no assignment=""></no>	-	
Slave axis	s parameter(S)			_
	Parameter	Setting item		
Motor typ	e selection		Rotary type	
Electronic	c gear ratio(numerator)		1	1
Electronic	c gear ratio(denominator)		1	
Speed un	nit		Command position/sec	2
Speed un	hit coefficient		1.000	J
			OK Cancel	

Figure 2.1.2.3

After the PDO setting is completed, users need to enter the relevant information of the motor in the 4. lower right corner. Click **OK** after the setting is completed.

[2] Axis configuration	setting			×
KV-XH16EC	Set up max. number of axes Control period(L)	16 axes 1ms ∨ Help	Search All All vendors → HIWIN MIKROS → Servo Drive → Servo Drive → E 2 CoE → Vriual axis → Register ESI fil	YSTEM CORP. Drive (0x00010000) [Detailed setting required] a Drive (0x00010000) [Detailed setting required] e]
			Axis No.(A) Product name(N) Vendor(V) Axis comment(C) Encoder resolution(E) Max. motor speed(S) Max. motor torque(T)	1 • E1 CoE Drive • HIWIN MIKROSYSTEM CORP. • 23bit (838608) PLS/rev Custom(U) 3000.00 3500.00 % Slave detailed setting(D) OK Cancel

Figure 2.1.2.4

Note: If the Axis configuration setting is completed, click OK and Yes. The coordinate transformation calculation that pops up at this time can be ignored, which would be set in the subsequent steps. 2-4

2.1.3 Object setting (N-OT, P-OT, DOG)

For detailed information on the object **0x60FDh**, please refer to section 3.2 **Standardized device profile area** in "E Series Servo Drive EtherCAT(CoE) Communications Command Manual."

Method 1: According to the user I/O setting, set N-OT, P-OT, and DOG signals to Input 16 (I1), Input 17 (I2), and Input 18 (I3) in object **0x60FDh**.

Slave deta	iled setting		X
Basic	PDO mapping Motion function setting		
Motion f	unction map(M)		
Direction	n Function name	Process data	Bit Position
	Torque control - target torque	0x1603: RxPDO 4.0x6071:00: Target torgue	
	Torque limit	<no assignment=""></no>	
	Torque control - max speed	<no assignment=""></no>	
	Speed feedforward	<no assignment=""></no>	
	Torque feedforward	<no assignment=""></no>	
	Positive direction torque limit	<no assignment=""></no>	
	Negative direction torque limit	<no assignment=""></no>	
	Status word [mandatory]	0x1A03: TxPDO 4.0x6041:00: Statusword	
.	(+) limit switch	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	16
	(-) limit switch	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	17
	Origin sensor	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	18 🗸
Slave a)	is parameter(S)	0.852	
	Parameter	Setting it	em
Motor type selection			KOTALY TYPE
Electron	ic gear ratio(numerator)		1
Electron	ic gear ratio(denominator)		Command position/ose
Speedu			Commana postaon/sec
Speedu	init coerricient]	1.000

Figure 2.1.3.1

In the IO setting interface in Thunder, tick User defined and set all the Input to Not configure.



Figure 2.1.3.2

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Method 2: According to the pin definition of **0x60FDh**, set the N-OT, P-OT, and DOG signals as bit 0, bit 1, and bit 2 in object **0x60FDh**.

Slave deta	ailed setting		×
Basic	PDO mapping Motion function setting		
Motion f	function map(M)		
Directio	n Function name	Process data	Bit Position 🔦
	Torque control - target torque	0x1603: RxPDO 4 0x6071:00: Target torque	
	Torque limit	<no assignments<="" td=""><td></td></no>	
	Torque control - max speed	<no assignment=""></no>	
	Speed feedforward	<no assignment=""></no>	
	Torque feedforward	<no assignment=""></no>	
	Positive direction torque limit	<no assignment=""></no>	
	Negative direction torque limit	<no assignment=""></no>	
	Status word [mandatory]	0x1A03; TxPDO 4.0x6041:00; Statusword	
	(+) limit switch	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	16
- 🔶	(-) limit switch	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	17
	Origin sensor	0x1A03: TxPDO 4.0x60FD:00: Digital inputs	18 🗸
Slave a	xis parameter(S)	0.0	Neur
	Parameter	Setting	Item
Motor ty	peselection		KOTALY LYDE *
Electronic gear ratio(numerator)			1
Electron	nic gear ratio(denominator)		Common Localitan too
Speedu	unit		Command position/sec
Speedu	unit coefficient		1.000

Figure 2.1.3.3

In the IO setting interface in Thunder, tick **User defined** and set the **Input** pins for N-OT, P-OT, and DOG signals.

😏 I/O configuration						- 0	X
Input signal setup	Output signal s	etup					
🔽 User defined	N-OT	P-OT	P-CON (*)	S-ON (*)	C-SEL (*)	N-CL (*)	
Input number	I2 (CN6-2)	I1 (CN6-1)					
Signal type	Close active	Close active					
Force on/off			Force Off	Force Off	Force Off	Force Off	
	<					>	
			(*) : Fieldbus s	ervo drive do	es not suppor	t this function.	
	I HIWIN MIKROSYSTEM		CN6				
	E1						
	CN1 CHARGE	P-0	DT 1 11 01	+ 11 COIN	<u></u>		
	12	§ N-C	DT 2 12 0	- (12			
		DOG(DE	C) <u>3</u> 13 02	+ 13 TGON			
		Za Cz	4 14 02	2- 14			
	B3 · ·	Ĩ	5 15 03	+ 15 D-RDY			
	02						
		N e	1 11 04				
	v i i i		0 III 0				
	AA 📼	C NY	05				
	(†) (†)		08	- 20			
			Close a	ctive			
			Open a	ctive			

Figure 2.1.3.4

2.2 Axis control setting

1. Double-click the **Axis control setting**, set the **coordinate unit** and the **place of the decimal point**, and then click the **coordinate transformation calculation** at the top.

👬 KV STUDIO -[Editor: KV-7500] - [11 *]			
File(<u>F</u>) Edit(<u>E</u>) View(<u>V</u>) Program(<u>M</u>) ST/Script(<u>S</u>) Convert(<u>A</u>) Monito	r/Simulator(<u>N</u>) Debug(<u>D</u>) Tool(<u>T</u>) Window(<u>W</u>) Help(<u>H</u>)	
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i 🖍 🌐 🖴 🌌 🐼 🎬 🖷 🏷 💀 🛼 🔘		K H ▼ H > ۞	Comments Comment 1
Project 🦊 🗶	[2] Axis control setting	× Main ×	
Unit configuration	View filter(E) [Dis	play level] All 🗸 🗸 😨 😵 📀	
[0] KV-7500			Axis1:
[1] KV-XH04ML R34000 DM10300		Unit of coord	mm
■ [2] KV-XH16 C ROCCC LINCTO		Place of decimal point	0.001 -
	Unit coordinate	360 degree display	No
Unit common setting	transformation	Rotate angle near selection	Yes
Axis control setting		Coordinate transformation numerator	625
- Point parameter		Coordinate transformation denominator	524288
🖬 🔕 Sync control setting		Soft limit coordinate sysetm	Logic system
init Program		Soft limit (+)	Disable
Option setting	Software limit coord	Soft limit (+) coordinate	0.000 mm
Init configuration switching		Soft limit (-)	Disable
		Soft limit (-) coordinate	0.000 mm
Device comment	Axis error	Limit switch error setting	Error

Figure 2.2.1

Table 2.2.1

Category	Name	Description
Unit coordinate	Unit of coordinate	Unit: mm, inch, deg, PLS
transformation	Place of decimal point	When the coordinate unit is set to PLS (pulse), the setting is invalid.

2. After the relevant parameters are set, click **execute the calculation**. Then, click **OK** and click **Yes**. Note: The setting is based on the resolution of 8388608 pulse/rev for one motor revolution (1mm) and 1:1 electronic gear ratio as an example. If the speed is 1 mm/s, the motor speed will be 60 rpm.



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3. Axis parameter setting. (Set the parameters in table 2.2.2).

KV STUDIO - [Editor: KV-7500] - [11 *]										
File(F) Edit(E) View(V) Program(M) ST/Script(File(E) Edit(E) View(V) Program(M) ST/Script(S) Convert(A) Monitor/Simulator(N) Debug(D) Tool(T) Window(W) Help(H)									
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Project A ×	[2] Axis control setting	× Main ×								
■ 📲 Unit configuration										
[0] KV-7500	View filter(F) [Dis									
[1] KV-XH04ML R34000 DM10300		TSIDD memory (omer errors)	Axis1:							
[2] KV-XH16EC R38000 DM10400		Motor rotate direction	(+) operation forward pulse							
Axis configuration setting		Servo OFF timing	Servo OFF after axis stop							
unit common setting	Axis control function	Servo end check time	0 ms							
Axis control setting		Servo end range	0.000 mm							
Point parameter		Backlash compensation movement	0.000 mm							
🙍 🦄 Sync control setting		Speed witching selection	Continuous (Current point s							
- Duit Program		Select acceleration/deceleration setting	Ratio							
👘 Option setting	Common in	Select linear interpolation speed	Synthesized speed							
Unit configuration switching	position control	Select helical interpolation speed	3-axis synthesized speed							
💾 Device comment		Select inching operation after detected stop sensor	Prioritize inching operation							
- 류 Label		Operation starting speed	0.000 mm/s							
CPU system setting		Max. operation speed	50.000 mm/s							
🚍 🚔 Program: 11		Operation accel rate/time	0.010 mm/s/ms							
Every-scan execution	Operation speed	Operation acceleration SIN ratio	100 %							
🕶 🧱 Main		Operation decel rate/time	0.010 mm/s/ms							
Initialize module		Operation deceleration curve	SIN							
		Operation deceleration SIN ratio	100 %							
Fixed-period module		JOG starting speed	2.000 mm/s							
Inter-unit sync module		JOG high speed	50.000 mm/s							
- Function Block		JOG accel rate/time	0.010 mm/s/ms							
🚍 🚍 Macro	100	IOG acceleration SIN ratio	100 %							
🔄 🛃 Subroutine macro	000	JOG decel rate/time	0.010 mm/s/ms							
📑 Self-hold macro		JOG deceleration curve	SIN							
Device default		JOG deceleration SIN ratio	100 %							
🖀 劑 File register setting		JOG inching movement	1.000 mm							
0:Memory card		Origin return method	DOG (w/ Z-phase)							
1:CPU memory		Origin return starting speed	0.000 mm/s							
🙍 🎴 User document		Origin return operation speed	0.200 mm/s							
		Origin return accel rate/time	0.010 mm/s/ms							
		Origin return acceleration curve	SIN							
		Origin return acceleration SIN ratio	100 %							
		Origin return decel rate/time	0.010 mm/s/ms							
	Origin return	Origin return deceleration curve	SIN							
		Origin return deceleration SIN ratio	100 %							
		Origin return direction	0.000 mm							
		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							
		Auto home position move	No and and a							
	Absolute position	Operation speed	30.000 mm/s							
	follow-up control	Decel rate/time	0.010 mm/s/ms							
		Variable cear ratio numerator	1							
< >	Synchronous follow-up control	Variable gear ratio denominator	1							
Project Library	ronow up control	Output filter	0 ms							

Ready

Figure 2.2.3

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Parameters setup

		Table 2.2.2				
Category	Name	Description				
	Operation starting speed	In positioning control, the momentary starting speed which starts from a static state is the operation starting speed.				
Operation speed	Max. operation speed	Set the upper limit of the position control speed and enter the rated speed of the motor.				
Operation speed	Operation acceleration rate/time	Unit: ms, coordinate unit/s/ms				
	Operation deceleration rate/time	Unit: ms, coordinate unit/s/ms				
	JOG starting speed	Unit: coordinate unit/s				
	JOG high speed	Unit: coordinate unit/s				
JOG	JOG acceleration rate/time	Unit: ms, coordinate unit/s/ms				
	JOG deceleration rate/time	Unit: ms, coordinate unit/s/ms				
	JOG inching movement	The moving speed is set as the JOG starting speed.				
	Origin return method	Set origin return method.				
	Origin return starting speed	Set the starting speed for origin return and the starting speed moving to the home position.				
	Origin return creep speed	The speed when motor reaches the final origin during origin return.				
	Origin return acceleration rate/time	Unit: ms, coordinate unit/s/ms				
Origin return	Origin return deceleration rate/time	Unit: ms, coordinate unit/s/ms				
	Origin return direction	Select the start direction for origin return and the operating direction before origin return is completed.				
	Origin coordinate	Set the current coordinates when origin return is completed.				
		Do not set the parameter to 0 when the origin return method is				
	Movement after DOG ON	selected as "DOG type inching (with Z-phase)" or "DOG type inching (without Z-phase)."				
Absolute position	Operation speed	Set the operation speed for the absolute position follow-up control.				
follow-up control	Acceleration rate/time	Unit: ms, coordinate unit/s/ms				
•	Deceleration rate/time	Unit: ms, coordinate unit/s/ms				

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Parameters setup

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4. Click **PLC Transfer** to store the files in PLC. (It is normal if "PLC error" occurs, users can click **Clear** to erase it.)



Figure 2.2.4

4. Save the project.

👬 KV STUDIO - [Editor: KV-7500] - [11 *]								
File(E) Edit(E) View(V) ST/Script(S)) Convert(<u>A</u>) Monito	or/Simulator(<u>N</u>) Debug(<u>D</u>)	Tool(T) Window(W)	Help(<u>H</u>)				
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.4 ;= := :2 @ [:] .4 ;= := : 2 @ [:] .4 ;= := :2 @ [:] .4 ;= :2 @ [:]		H H V H > 🔘	🖑 🖳 🕐 🛄 🕴 Edit	tor 🝷	Comments Comment	1 •		
Project Save project(Ctrl+S) 4 ×	Main 🗙							
Dit configuration								
[0] KV-7500		1	2	3	4	5		
■ [1] KV-XH04ML R34000 DM10300		_		_				
 [2] KV-XHIEC R38000 DM10400 Axis configuration setting Axis control setting Point parameter Sync control setting Unit Program Option setting 	00001							
<pre>Unit configuration switching Device comment Label CPU system setting Program: 11 Every-scan execution Every-s</pre>	00002							
Fixed-period module Inter-unit sync module Function Block	00003							

Figure 2.2.5

3. Trial run

3.	Trial run		3-1
	3.1	Homing	3-2
	3.2	Positioning control	3-4
	3.3	Starting speed, acceleration and deceleration rate/time, acceleration curve	3-6

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Trial run

E Series EtherCAT Drive Complete Setup with KEYENCE KV STUDIO

3.1 Homing

1. Click PLC Transfer to store the files in PLC.



Figure 3.1.1

2. Switch the KV STUDIO mode to Monitor.

👬 KV STUDIO -[Editor: KV-7500] - [11 *]									—		×
File(<u>F</u>) Edit(<u>E</u>) View(<u>V</u>) Program(<u>M</u>) ST/Script(S) Conv	/ert(<u>A</u>) N	Monitor/Sim	ulator(<u>N</u>)	Debug(<u>D</u>)	Tool(T)	Windo	w(<u>W</u>) Help(<u>H</u>)			
i 🗅 👝 🗐 📾 🖻 🛤 🖶 🖶 🖧 📿 i 🔐 u	ISB			e 🖓 🗧	🔁 🖸 🖻	1 🛋 🏛			F7 SF7 F8	SF8 F9	SF9
			H A H	H V H) en 1	Editor	- Com	ments	
	14.5							Editor	- Com	in rents	Ŧ
Project 4 X	Mam	×						Monitor			
Unit configuration								Online edit			- +
■ [0] KV-7500		1	2	3	4	5	6	Simulator Simulator edit		10	<u>↑</u>
[1] KV-XH04ML R34000 DM103								Simulator cuit	_		^
[2] KV-XH16EC R38000 DM104	00001										
-Br Axis configuration setting			_					++++			
Unit common setting											
Axis control setting	00002										
Point parameter								· · · · · · · · · · · · · · · · · · ·			
H W Sync control setting											
Onit Program	00003										
Option Setting Init configuration switching											
Device comment											
	00004										
CPU system setting											
a Program: 11											
Every-scan execution	00005										
🖬 🔛 Main 🗸 🗸 🗸											
< >											
Project Library	00006										~
Ready		•								÷	USB:

Figure 3.1.2

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E Series EtherCAT Drive Complete Setup with KEYENCE KV STUDIO

Trial run

3. Click the adopted positioning motion unit. Right-click and select **Trial run**→ **Positioning control**→ **Axis**.

📓 KV STUDIO - [Monitor: KV-7500] - [11 *] -	×
File(F) Edit(E) View(V) Program(M) ST/Script(S) Convert(A) Monitor/Simulator(N) Debug(D) Tool(T) Window(W) Help(H)	
· 브 약 약 양 양 밖 밖 많 🖶 🗎 📓 📾 👘 😨 📲 📲 💷 🗐 🐨 🐨 🐨	F9
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Project 4 X Main X	
I Unit configuration	+
Image: Constraint of the second sec	*
The Axis configuration setting This Unit Editor(U)	
Unit common setting Device assignment display(D)	
Point parameter Unit monitor(C)	
n Sync control setting	
Option setting Trial run(□) Positioning control(P) Axis1(1)	
Unit configuration switching Synchronous control(S) Speed control(S)	
Image: Device comment Station alias setup(H) Torque control(I)	
CPU system setting	 *
Watch window	ųΧ
Every-scan execution Device Current value Display format Comments	



4. Check if "Axis error" turns to red light. If there is an error, click **Error clear** first; if there is no error, click **OP. Enable**. When "Operation ready" turns to green light, click **servo ON** and wait for "Servo ready" light to turn green. After completing "Servo ready," users can execute **Origin return**.

Trial run [Positioning control]- Unit2 - Axis1: - KV-XH16EC X			
Axis1 Command coordinate	Ax ctrl in progress	Operation	
	0.960		
	9.009 mm	Servo reau, Cancel servo UN	
	Wait Current point no: 0	Axis error Error clear	
JOG	Inching	Origin return	
- direction + direction 10% 100% - direction + direction			
Teaching	Trial run		
	I point operation	O Cont. operation 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	Start	Decel Stop Force Stop	

Note:

1. The above is the operational method for homing. For detailed information, please refer to section 8.4 **Origin Return Operation Trajectory** in the Positioning/Motion Unit "KV-XH64EC/XH32EC/XH16EC User's Manual."

Figure 3.1.4

2. For the limit switch setting for homing, please refer to section 2.1.2 **PDO setting**.

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Trial run

3.2 Positioning control

1. Switch the KV STUDIO mode to Monitor.



Figure 3.2.1

2. Click the positioning motion unit to be used, right click and select **Trial run**→ **Positioning control**→ **Axis**.

📷 KV STUDIO -[Monitor: KV-7500] - [11*]		- 0	×
File(<u>F</u>) Edit(<u>E</u>) View(<u>V</u>) Program(<u>M</u>) ST/Script(<u>S</u>) C	Convert(A) Monitor/Simulator(N) Debug(D) Tool(T) Window(W) Help(H)		
🗄 🗅 🥶 🖶 📾 🕸 🛍 🗟 🖶 🛴 🕢 🗄 🛍 USB	- 김 밖 밖 밖 … 다 !! 🔤 🖼 👰 🖬 🔯 🕥 🐗 🕾 📲 🚭 !! 🔻	SF7 F8 SF8 F9 -Ø- I i	SF9
i 🖍 🌐 📰 🌌 🐼 🎬 🖷 🏅 💀 💀 🖳 🔘 🔘	▶ 🔳 K(▲ ▼ > > ۞ 🥮 🗣 🖄 🔤 🕴 Monitor	Comments	_
Project 🛛 🗘 🗙	Main 🗙		
 Unit configuration [0] KV-7500 [1] KV-XH04ML R34000 DM10300 [2] KV-XH16EC R38000 DM10400 [3] KV-XH16EC R38000 DM10400 [4] Axis configuration setting [4] Whit common setting [5] Point parameter [6] Sync control setting [6] Unit Program 	Unit Editor(U) Unit Editor(C) Unit monitor(C) Unit tracing(A)	9 30	+
Option setting	Trial run(] Positioning control(P) Axis1(1)		
Unit configuration switching Device comment Label	Synchronous control(S) Speed control(S) Station alias setup(H) Torque control(I)		
CPU system setting	Watch window	<u> </u>	ά×
Fried Devery-scan execution	Device Current value Display format Co	mments	
Ready	— PROG Sc	:an= 0.13ms 🕁	USB 🔐

Figure 3.2.2

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Trial run

3. Check if "Axis error" turns to red light. If there is an error, click **Error clear** first; if there is no error, click **OP. Enable**. When "Operation ready" turns to green light, click **servo ON** and wait for "Servo ready" light to turn green. After completing "Servo ready", users can execute **JOG** in forward/backward direction.

Axis1 Command coordinate	Ax ctrl in progress	• Operation ready	Cancel OP. Enable
	9.869 mm	 Servo read, 	Cancel servo ON
	Wait Current point no: 0	Axis error	Error clear
JOG	Inchin	ıg	Origin return
- direction + direction 10%	100% - c	direction + direction	ల
Teaching	Trial run		
	I point operation	O Cont. operation	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	Start	Decel Stop	Force Stop

Figure 3.2.3

4. When JOG is moving, open Scope in Thunder to monitor the feedback velocity of the motor (Observe physical quantity: 7-Motor velocity) and check if the velocity command of the controller is consistent with the actual feedback velocity of the motor. For example, when the JOG high speed is set to 10.00 mm/s, the motor velocity can be obtained as 600 rpm when the unit is converted into rpm according to the setting of coordinate transformation calculation.



3.3 Starting speed, acceleration and deceleration rate/time,

acceleration curve

1. Complete the parameter setting in Figure 3.3.1 with the above-mentioned setting method.

2.000 mm/s
50.000 mm/s
0.010 mm/s/ms
SIN
100 %
0.010 mm/s/ms
SIN
100 %
1.000 mm



"dPosVelCmd" and click Start (F5) to capture the data.

S .	Thunder (1.9.17.0), Hub 1, Port 8				— C	ı ×
File	Tools Settings Access Help	Devel time det				
=	Communication setup	File Tech Car	a collection 2.185			
	PROFINET setup	Flie Iools Sess	sions			E
	Phase initialization setup	0.D3COE	+			
	Auto tune	Slave: : 0 (D)	3COE) Samples 2e+7	Upd vars	Т	
	Absolute encoder initialization	Start event	Data 8			
	Analog offset		Er=22000/rate=	4000 H-		
	Dynamic brake resistor wizard	Stop event	dt=1/Fr=	0.25 msec		
	Gantry control system		samples*dt=	83:20.00 min		
	Electronic cam	USB	Matchine to be seen at all on the O			
	Tuneless	Sync	X_enc_pos	1 X_vel_fbf	f	
	Error map setup	🗖 Multi sessior	AL9A0	S P_OT	S	
<	I/O configuration	Start(F5)	X_run_pcmd	S		
	Real-time data collection	Stop	NewPulseCmd	1 X_vel_ff_int	f	
	Spectrum analyzer	Stop				
	Error log	Graph	11 words/sample (22 bytes)			
	Messages+command prompt					
	Set to factory default					
	Update firmware					EM
	Servo ready					LM
	Drive ready	~		Access Channel:	Controller	

Figure 3.3.2

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E Series EtherCAT Drive Complete Setup with KEYENCE KV STUDIO

Trial run

3. Press and hold **JOG** to move the motor for a certain distance and release it. Wait for the motor to stop.

Trial run [Positioning control]- Unit2 - Axis1: - KV-XH16EC X			
Axis1 Command coordinate	Ax ctrl in progress • • • • • • • • • • • • • • • • • •	Operation ready Cancel OP. Enable Servo ready Cancel servo ON Axis error Error clear	
JOG - direction + direction 10%	Speed 10 🗭 %	on + direction	
Teaching Point number 1 € Coord. 0.000 mm Speed 1.000 mm/s Mode Single/Position/INC	Trial run 1 point operation Point number 1 Coord. 0.000 mm	○ Cont. operation Repeat 1 Wait. None ▲ Wait. None ▲ Wait. None ▲ Wait. None ▲	
Acquire	Start	Decel Stop Force Stop	

Figure 3.3.3

4. Open Thunder \rightarrow **Real-time data collection**, click **Stop** and then click **Graph** (refer to Figure 3.3.2)



to generate Figure 3.3.4.

Figure 3.3.4

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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 the actual acceleration of 0.6 rpm/ms, indicating that the speed increases by 0.6 rpm every 1 ms.



Figure 3.3.5