KEYENCE

Programmable Controller

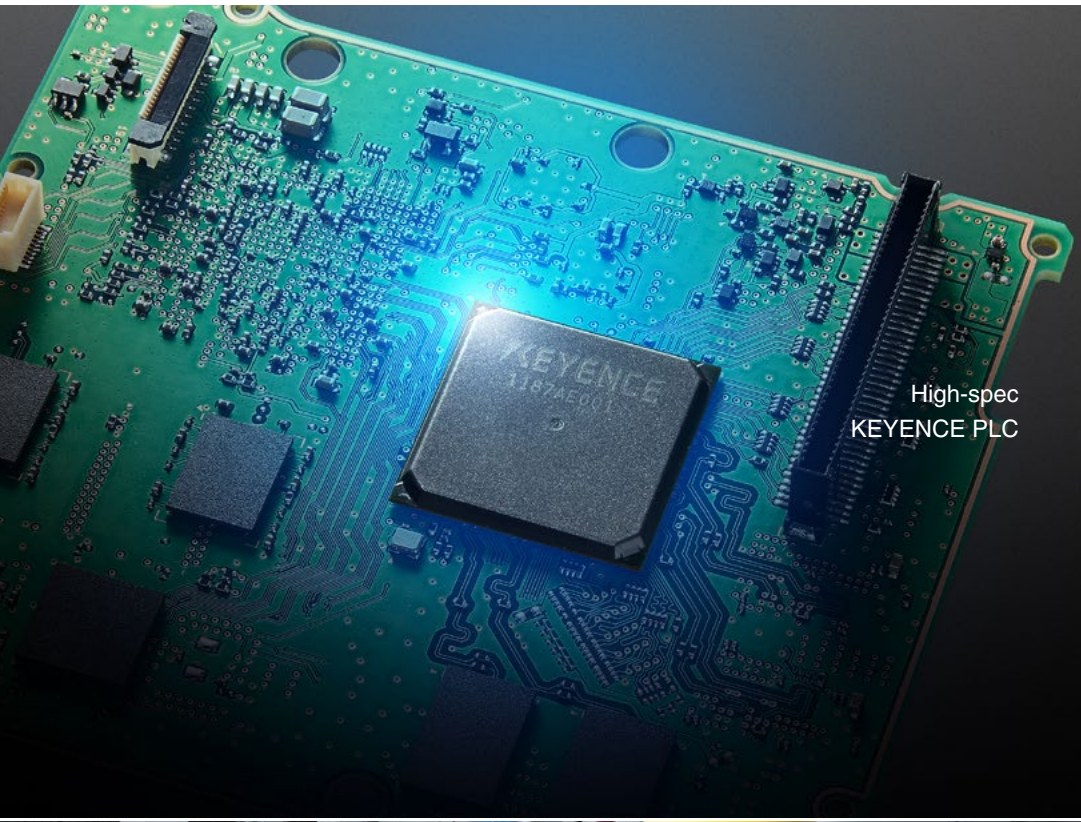
NEW KV Series

Improved speed

KV-8000 SERIES

KV-8000 SERIES

New concept for improved equipment performance and operation rate



High-spec
KEYENCE PLC

Built-in dedicated control ASIC
Basic Instructions

0.96ns

FASTEST IN INDUSTRY

Ultra-high-speed CPU inner bus
Interrupt response performance

4μs

FASTEST IN INDUSTRY

Built-in dedicated motion SoC
Control period

125μs/5axes

FASTEST IN ITS CLASS

Using a new PLC to
solve on-site problems

Communication with sensor/PLC

Program-less control

INDUSTRY FIRST

Automatic data recording when a problem occurs

Machine Operation Recorder function

INDUSTRY FIRST

Relation mapping

for problem identification

INDUSTRY FIRST

LINE-UP

KV-8000

Fusion of the superior processing ability with the Machine Operation Recorder function

CPU unit with built-in EtherNet/IP™ port

KV-8000

Drive Recorder
for KV series

EtherNet/IP™

Basic performance	Function	Communication port
LD instruction execution speed: 0.96 ns	Machine Operation Recorder function	EtherNet/IP™ port
Program capacity: 1500k steps max.	Logging/trace	USB port
	FTP client/ server	

X-Unit

Autonomous decentralised control
for reducing CPU unit load

Unit interrupt | Inter-unit synchronisation | Autonomous decentralised control

Positioning/Motion unit

KV-XH16ML/XH04ML

- Control period: 125 µs/5 axes FASTEST IN ITS CLASS
- Positioning, speed, interpolation, torque, synchronous control

MECHATROLINK

Ethernet unit

KV-XLE02

- Communication speed: 1 Gbps
- Program-less communication with third-party PLCs INDUSTRY FIRST

EtherNet/IP™

Serial communication unit

KV-XL202/XL402

- Program-less communication with third-party PLCs INDUSTRY FIRST
- Modbus master/slave support

CAMERA

Linked recording of video and device changes

Camera input unit
KV-CA02

- Up to 4 connectable units
- Up to 2 cameras connectable for 1 unit
- Cable length: 5/10/20 m

Compact standard camera
KV-CA1H

- Image resolution: 640 (H) × 480 (V)
- Frame rate: 10/30/120 fps
- Viewing angle
  - Horizontal viewing angle: Approx. 60°
  - Vertical viewing angle: Approx. 47°

Wide field and high-resolution camera
KV-CA1W

- Image resolution: 1280 (H) × 960 (V)
- Frame rate: 10/30 fps
- Viewing angle
  - Horizontal viewing angle: Approx. 180°
  - Vertical viewing angle: Approx. 150°

S-Unit

High responsiveness that takes advantage of high-speed performance of CPU unit

Unit interrupt | **Inter-unit synchronisation** | **Buffering**

High-speed I/O unit
KV-SIR32XT

- Input response speed: 2 µs, Output response speed: 1 µs FASTEST IN INDUSTRY
- PWM output: 8 points

High-speed analogue input unit
KV-SAD04
High-speed analogue output unit
KV-SDA04

- Conversion speed: 10 µs/ch
- Resolution: 1/20000

High-speed positioning unit
KV-SH04PL

- Starting time: 1 µs or less FASTEST IN INDUSTRY
- Control period: 62.5 µs/4 axes FASTEST IN INDUSTRY

High-speed counter unit
KV-SSC02

- Input frequency: 16 MHz FASTEST IN INDUSTRY
- Internal clock for input capture: 50 ns FASTEST IN INDUSTRY

UNIT LINE-UP

Outstanding lineup of units that can handle all possible control requirements

I/O Unit

→ P. 42

* KV-xxxxA, KV-xxxTC, or KV-C64XB can also be used

Input Unit

16-point
Screw Terminal Block

Input Unit
KV-B16XC

32-point Connector

Input Unit
KV-C32XC

64-point Connector

Input Unit
KV-C64XC

Output Unit

Screw Terminal Block

Relay Output Unit
KV-B16RC

8-point Relay Output Unit
(Independent Common Point)
KV-B8RC

16-point Screw Terminal Block

Transistor (Sink) Output Unit
with Overcurrent Protection
KV-B16TD

Transistor (Source)
Output Unit
KV-B16TCP

32-point Connector

Transistor (Sink) Output Unit
with Overcurrent Protection
KV-C32TD

Transistor (Source)
Output Unit
KV-C32TCP

64-point Connector

Transistor (Sink) Output Unit
with Overcurrent Protection
KV-C64TD

Transistor (Source)
Output Unit
KV-C64TCP

Input/ Output Hybrid Unit

64-point Connector

S-Unit

32-point Input + 32-point
Transistor (Sink) Output
High-Speed I/O Unit
KV-SIR32XT

16-point
Screw Terminal Block

8-point Input + 8-point
Transistor (Sink) Output Unit
KV-B8XTD

32-point Connector

16-point Input + 16-point
Transistor (Sink) Output Unit
KV-C16XTD

64-point Connector

32-point Input +
32-point Transistor
(Sink) Output Unit
KV-C32XTD

Analogue/ Temperature Control Unit

→ P. 44

S-Unit

4 ch High-speed
Analogue Input Unit
KV-SAD04

4 ch
A/D Conversion Unit
KV-AD40V

4 ch
A/D Conversion Unit
KV-AD40G

4 ch
A/D Conversion Unit
KV-AD40

S-Unit

4 ch High-speed
Analogue Output Unit
KV-SDA04

4 ch
D/A Conversion Unit
KV-DA40V

4 ch
D/A Conversion Unit
KV-DA40

2 ch A/D Conversion +
2 ch D/A Conversion Unit
KV-AM40V

4 ch Temperature
Control Unit
KV-TF40

4 ch Temperature/
Analogue Multi-input Unit
KV-TP40

Positioning/ Motion unit

→ P. 46

X-Unit

MECHATROLINK

4-axis MECHATROLINK-III
Positioning/Motion unit
KV-XH04ML

X-Unit

MECHATROLINK

16-axis MECHATROLINK-III
Positioning/Motion unit
KV-XH16ML

MECHATROLINK

16-axis MECHATROLINK-II
Positioning/Motion Unit
KV-ML16V

2-axis Pulse Train
Positioning/Motion Unit
KV-MC20V

4-axis Pulse Train
Positioning/Motion Unit
KV-MC40V

KV-M Series Function
Extension Unit
KV-MX1

Positioning/ High-Speed Counter Unit

→ P. 48

S-Unit

4-axis Pulse Train High-Speed Positioning Unit
KV-SH04PL

S-Unit

2 ch High-Speed Counter Unit
KV-SSC02

8-axis Communication Positioning Unit
KV-LH20V

2-axis Pulse Train Positioning Unit
KV-H20S

4-axis Pulse Train Positioning Unit
KV-H40S

2-axis Pulse Train Sync/Cam Movement Unit
KV-H20G

2 ch High-speed Counter Unit
KV-SC20V

Communication/ Network Unit

→ P. 50, 58

X-Unit

Ethernet Unit
KV-XLE02

Ethernet Unit
KV-LE21V

EtherNet/IP™ Unit
KV-EP21V

FL-net Unit
KV-FL20V

X-Unit

Serial Communication Unit
KV-XL202

X-Unit

Serial Communication Unit
KV-XL402

Serial Communication Unit
KV-L21V

High-speed Multi-link Unit
KV-LM21V

CC-Link Master/Local Unit
KV-CL20

DeviceNet™ unit
KV-DN20

KL Master Unit
KL-N20V

Camera Input/Power Supply Unit

→ P. 38, 40

Camera Input Unit
KV-CA02

AC Power Supply Unit with Error Output
KV-PU1

Bus-connected Unit
KV-7000C

Machine Operation Recorder function

Quick recovery with the ability to know the cause of problems and to perform fundamental countermeasures

With conventional models, investigating the cause of a problem has required time and know-how for executing accurate situation checking, cause troubleshooting, and detailed cause investigation. The KV-8000 Series significantly reduces problem resolution speeds by recording all data related to a problem event.

Recording

Recording of all data

Records all devices, cameras, and events. All equipment data is recorded automatically.

Playback

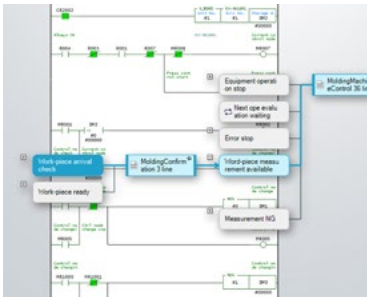
Replays

View linked playback of various data sources recorded from the moment a problem occurred.

Analysis

Relation mapping

Analyse ladder programs and view tree-diagrams of related devices.

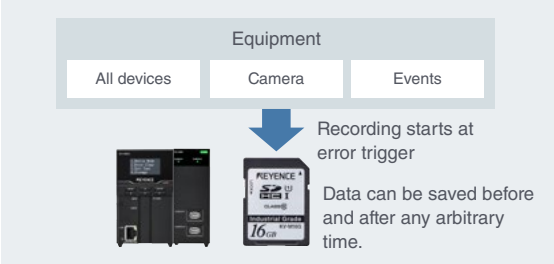


Reduced downtime through recording, playback, and analysis

Recording of All Devices

Records all devices, cameras, and events

Equipment data is recorded in chronological order whenever a problem occurs. This enables to see exactly what happened both before and after the event.



[Camera] Record the operation status of the mechanism

Record equipment appearance changes by using a camera unit. Recording is possible in conjunction with the chronological order of the ladder program, which enables easy analysis later.

KV-CA1H (Compact standard camera)
KV-CA1W (Wide field and high-resolution camera)

One-step trigger configuration

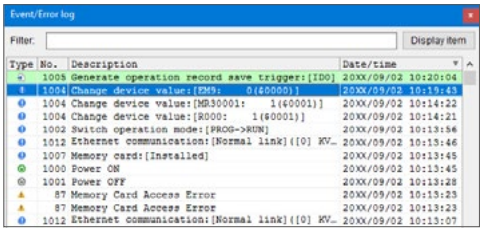
The only setting that needs to be configured for equipment problems is the trigger setting. In addition, up to 4 patterns can be registered, which enables to configure the settings according to the targeted problem details.

[All devices] Scan unit-based recording

Record changes on all devices based on scan time. The ability to display the data together with the ladder program enables later analysis with the same ease of use as debugging.

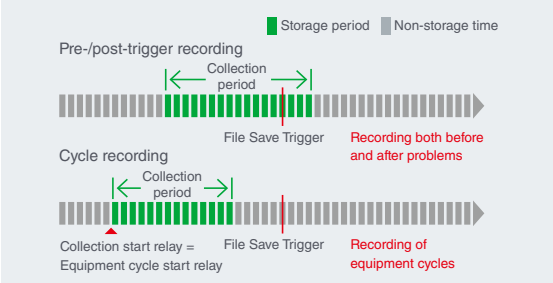
[Event] Recording of changes

Records the write log from the HMI, PC, or PLC. This enables to check in chronological order what changed both before and after the problem occurred.



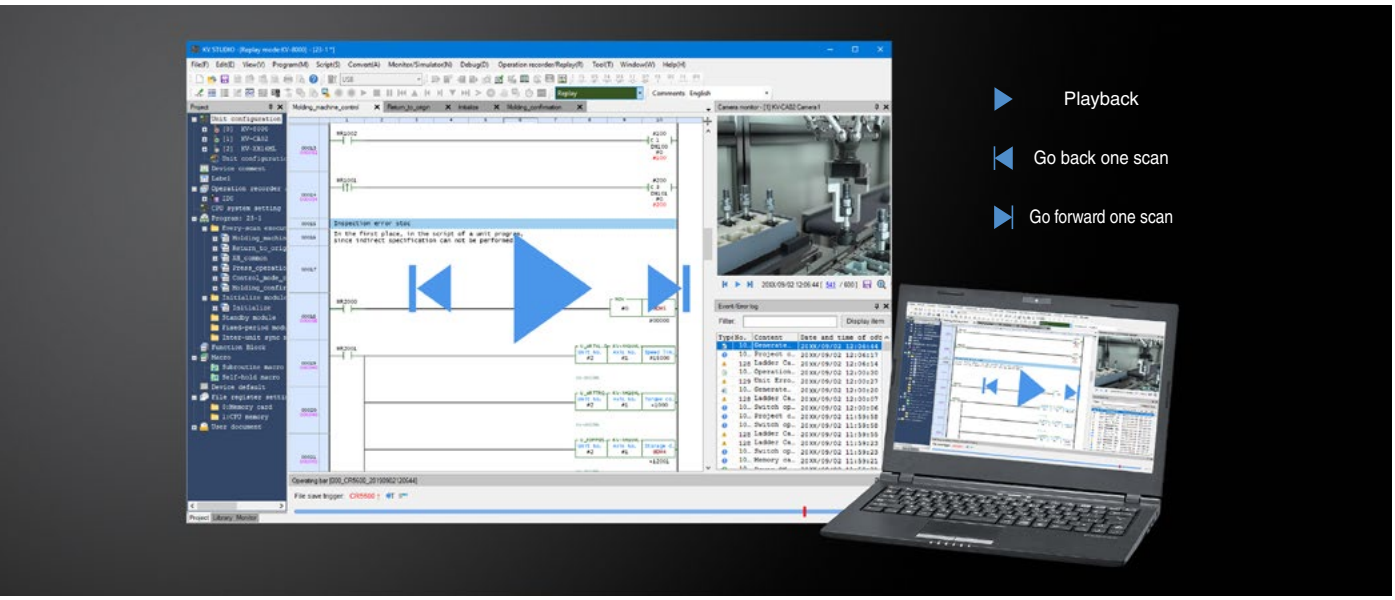
Cycle recording function

Recording is possible at the start of an equipment cycle in addition to before and after a problem. Comparing the data with a normal cycle can help with factor analysis of stoppages without alarms.



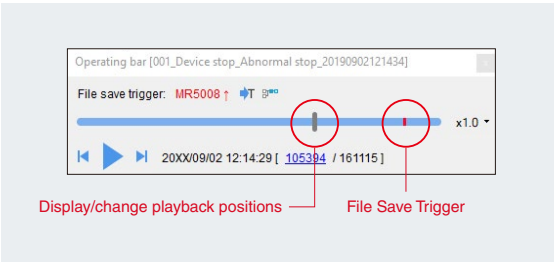
Reduced downtime through recording, playback, and analysis

Synchronised playback



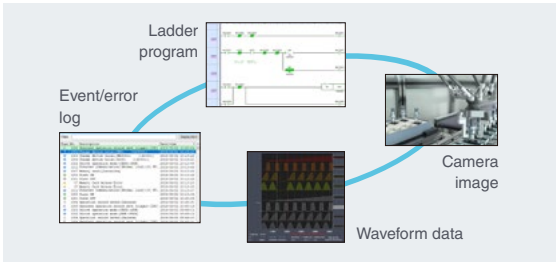
Playback in replay mode

Recorded data can be played back later in replay mode. The prepared operation bar can be used to check backward beginning with the time when the problem occurred.



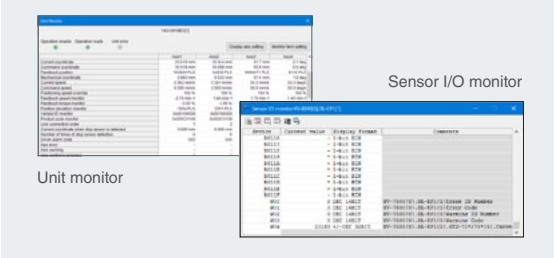
Synchronised playback of recorded operations

The ladder program, waveform data, camera image, and event/error log are synchronised for playback to accurately understand the conditions both before and after the problem occurred.



Unit information replay

Various monitoring functions including unit monitoring, registration monitoring, and sensor I/O monitoring can be used even in replay mode. This allows users to investigate the cause of problems in the same environment as debugging.

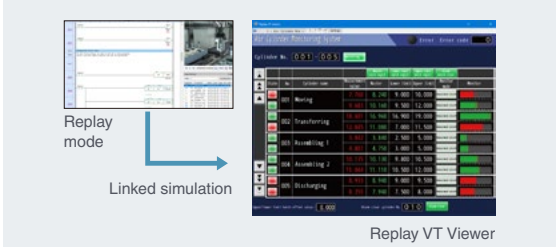


Various playback functions

Flexible playback is possible with single-scan forward/backward playback, and single-frame forward/backward camera image playback. The playback speed can also be changed.

Compatibility with Replay VT Viewer

The touch panel simulator operates in conjunction with the recorded operations stored in the PLC. The availability of an operation confirmation screen at startup makes it easier to understand the situation faster.

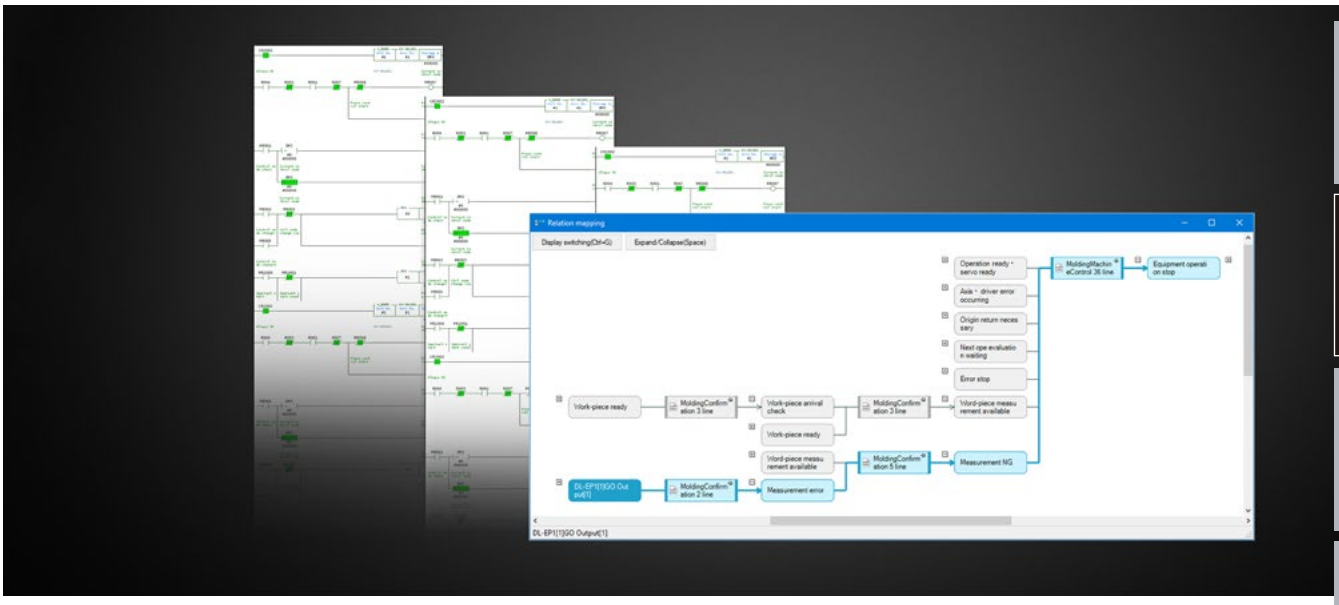


KV REPLAY VIEWER

Includes dedicated software for replay mode. Avoid the risk of rewriting the program with the ability to immediately check the conditions before and after the problem occurred using replay mode.

Reduced downtime through recording, playback, and analysis

Analysis function

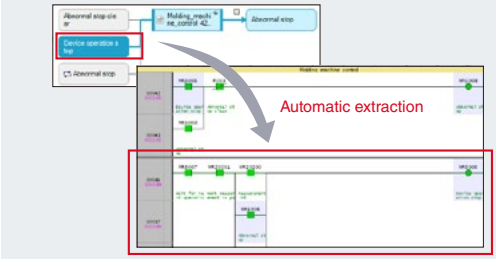


Relation mapping

Search/extract not only device and configuration changes related to the error but also externally rewritten devices, and create a tree diagram automatically. Causes can be investigated early just by following the block.

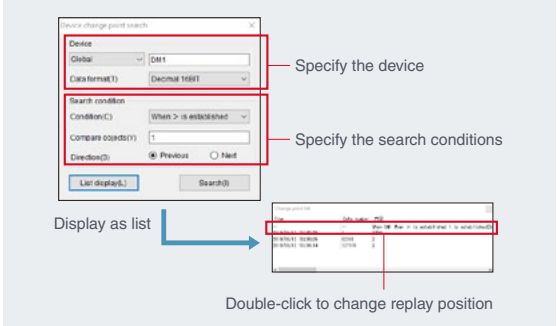
Automatic extraction of related ladder programs

Automatically extract related ladder programs by selecting a block within the relation mapping. Narrow down and check only the programs that caused the device to change, ensuring more efficient cause analysis.



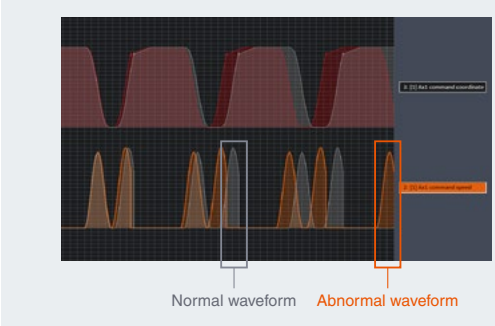
Change-point search function

Search for the moment when a device changed. This enables to confirm when the bit rises and when the word reaches a specific value. Because the replay position can be changed from the search results, factor analysis can be performed with greater efficiency.



Waveform checking and comparison of operation record

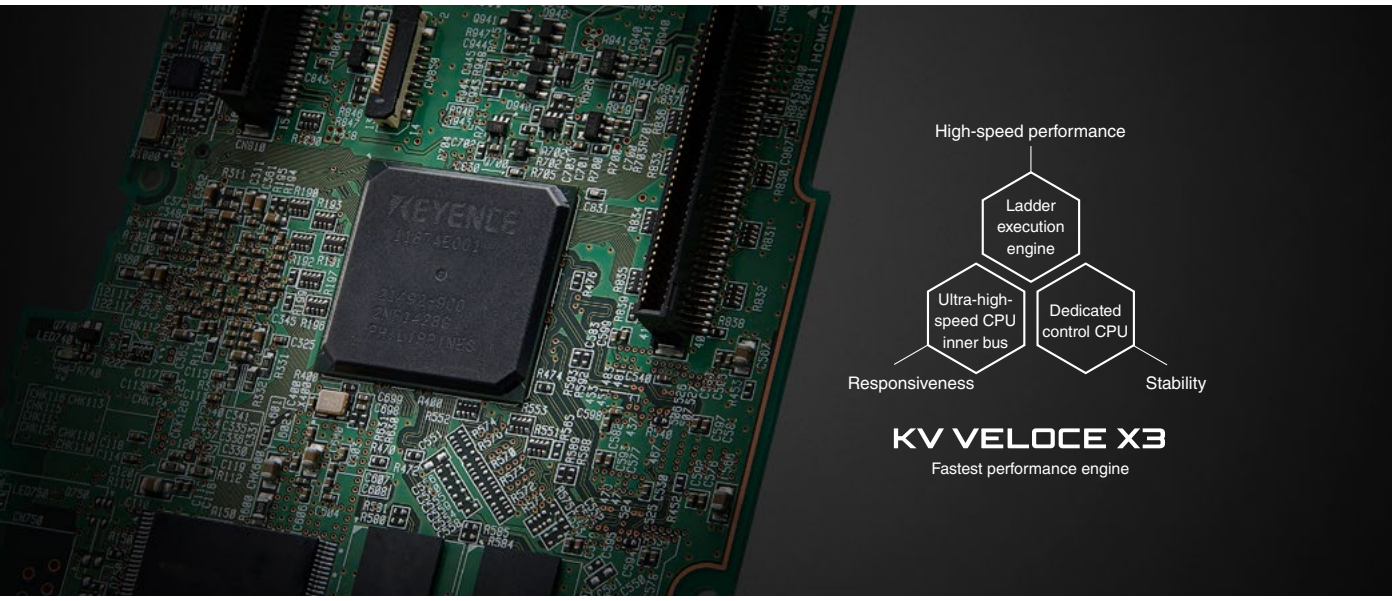
Review conditions both before and after the problem occurred. Because differences in behaviour can be checked by superimposing the normal and abnormal waveforms, the causes of problems can be identified early on.



High-speed performance

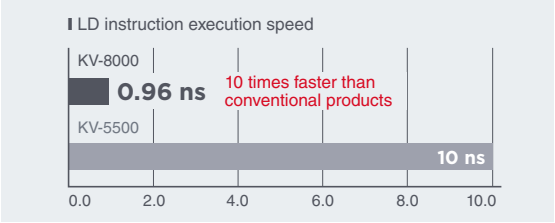
Fastest “brain” optimised exclusively for PLCs

KV VELOCE X3



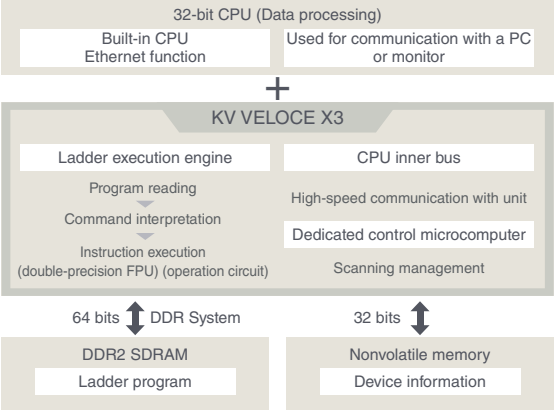
Basic instruction execution: 0.96 ns FASTEST IN INDUSTRY

KV VELOCE, heralded as the industry's fastest processor, has evolved even further. By speeding up the core clock as well as simultaneous execution of multiple instructions, instruction execution speeds (LD commands) are approx. 10 times faster than conventional models. This allows for even further speed increases in device control.



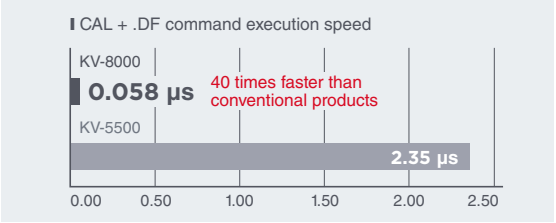
High-speed access using built-in DDR2 SDRAM

A large-capacity DDR2 SDRAM with high-speed access has been adopted as the storage memory of ladder program. With KV VELOCE X3, communication is carried out at a width of 64 bits for best-in-class capacity as well as high-speed processing.



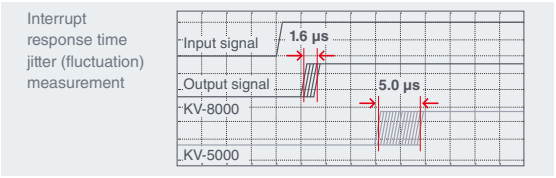
Ultra-high-speed and high-precision processing due to double-precision FPU FASTEST IN ITS CLASS

Incorporation of a double-precision FPU (floating-point unit) delivers a double-precision calculation instruction execution speed 40 times faster than conventional models. Increased double-precision processing speed and reductions in calculation errors due to double precision allow for high speeds and high accuracy to be achieved simultaneously.



Built-in dedicated control microcomputer suppresses fluctuations

Whereas information system processing (communication with the PC and display) and control system processing (scan management), which were conventionally performed by one microcomputer, have been separated, and the KV VELOCE X3 is equipped with control system processing. Due to real-time scanning monitoring, processing fluctuations can also be reduced.

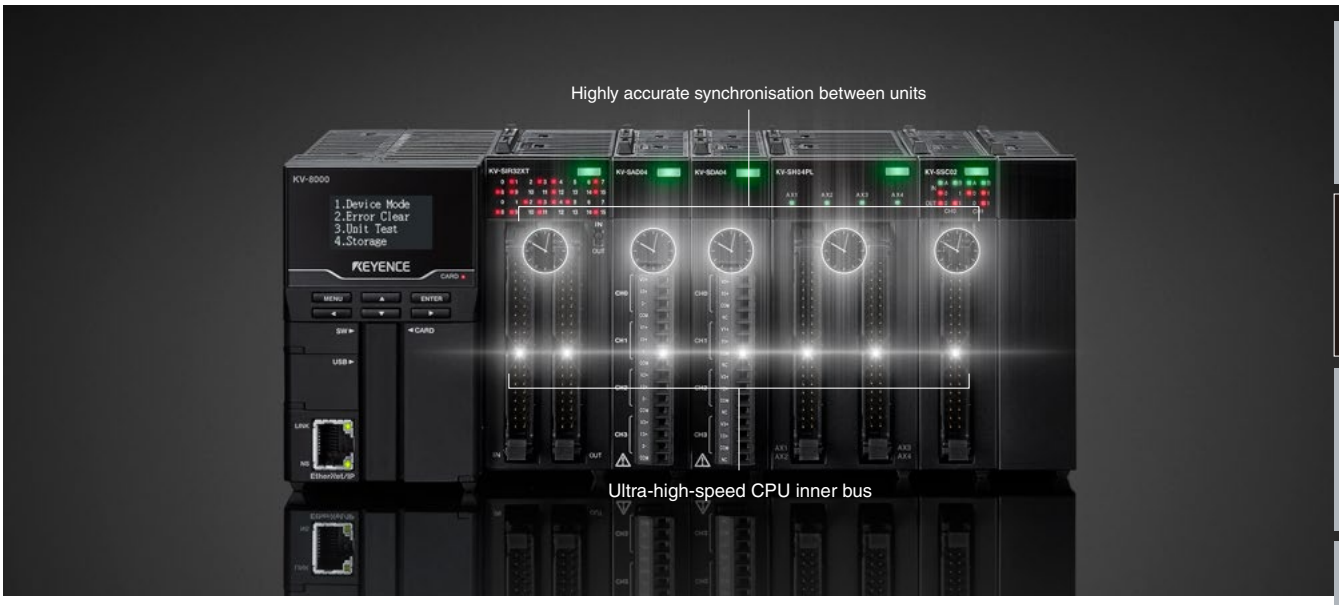


Stability due to faster END processing

By incorporating a dedicated control microcomputer into KV VELOCE X3, access speeds are 20 times faster than conventional models. Making END processing, which is prone to scan time fluctuations, faster realises more stable control.

New bus system enabling both high-speed performance and synchronisation

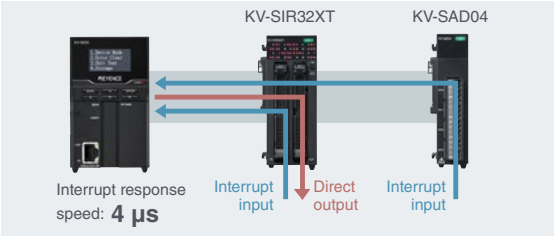
Ultra-high-speed CPU inner bus



Unit interrupt response speed: 4 µs

FASTEST IN INDUSTRY

Unit interrupt response speeds of 4 µs are possible due to the ultra-high-speed CPU inner bus. Through improved system responsiveness, control is possible at even higher speeds and with even higher accuracy.



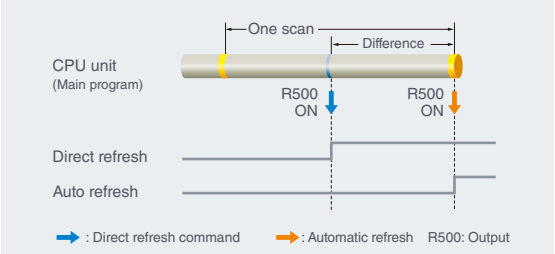
Highly accurate synchronisation between units

Highly accurate synchronicity between units has been achieved by adjusting the start timing of the internal period of the units. Synchronous refreshing and synchronous output are available for different types as well.

Direct refresh response speeds: 1 µs

FASTEST IN INDUSTRY

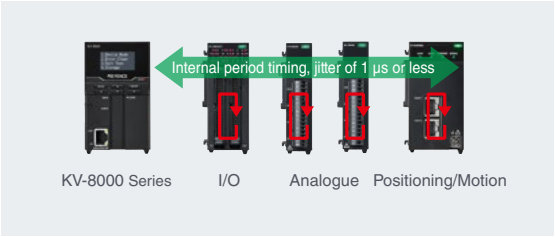
Even during program execution, I/O information can be refreshed at 1 µs. Combination with unit interruption enables to improve system responsiveness.



Inter-unit synchronisation accuracy, jitter: 1 µs or less

BEST CLASS IN INDUSTRY

With KV VELOCE X3, the internal period timing for each unit is corrected and monitored in real time, which enables highly accurate control with jitter of 1 µs or less.



Inter-unit synchronisation period: As little as 40 µs

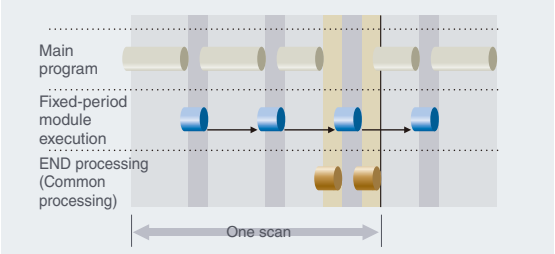
FASTEST IN INDUSTRY

The synchronisation period for each unit can be set to as little as 40 µs. This enables applications with high speed and accuracy such as acquiring the data from multiple measurement instruments with the same timing.

Fixed-period module execution speeds: 50 µs

FASTEST IN INDUSTRY

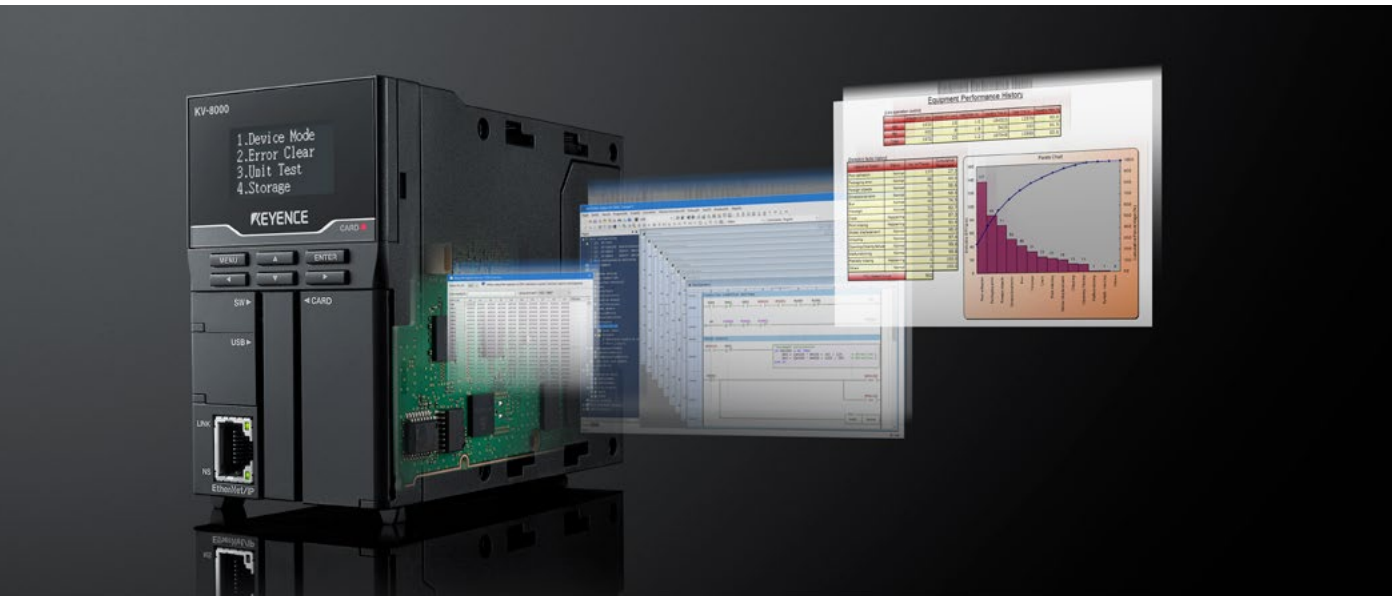
Execution cycle: Compatibility with a minimum 50 µs fixed-period module. In addition, because up to four types of fixed-period modules can be used, even processing with different execution cycles is supported.



Large capacity

Project area and user memory area customisation

Memory customisation function



Built-in 64 MB large-capacity CPU memory

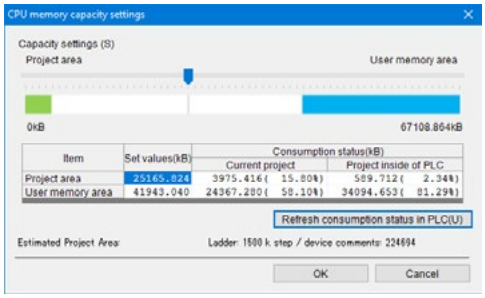
BEST IN ITS CLASS

The memory capacity has been greatly expanded for greater freedom with memory usage, including the capacity for programs and comments. Now, not only the memory can be used for storing programs, but various other applications are available.

Program capacity: 1500k steps max.	**File register: 512k words max.**
SD card-free logging/ program loading/save	**Free memory for documents of materials detailing the equipment**

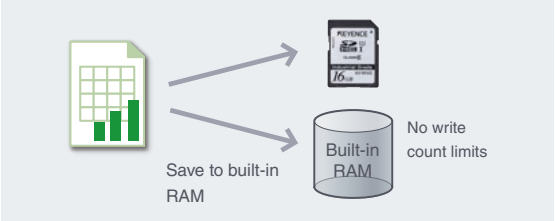
Memory customisation function

Adjust the user memory area to be used to suit any application. Simply determine the area to be occupied for the project and for the user memory for easy configuration.



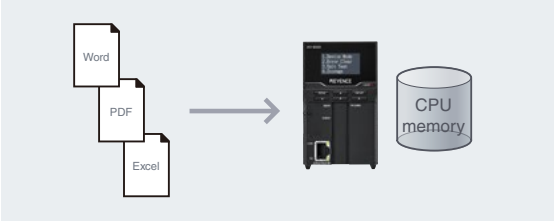
RAM disk function

The RAM disk function, capable of writing unlimited number of times, allows high-frequency memory access and can act as a storage location for uploading via FTP. Also, the RAM is built-in, which enables fast-cycle logging.



Document saving in CPU memory

Maintenance material and specifications can be saved in the CPU memory. PDF files can also be displayed on the touch panel, so users can check files on-site without a PC.



Loading/saving program files

Loading and saving of programs is possible using user memory. This allows for projects to be saved for backup when trouble occurs as well as program rewriting via FTP.

File register entry

Store file registers of up to 512k words to user memory. Even with numerous setting parameters per device, or when using multiple devices, changeovers can be easily handled.

Information collection system that suits the application

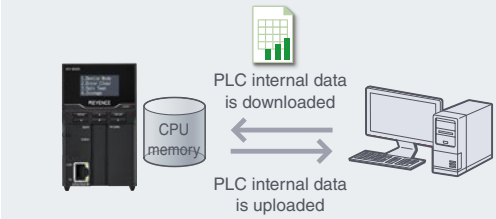
Built-in logging/tracing functions in CPU

CPU unit with built-in logging function

The CPU comes equipped with an SD card slot and a logging function. Record data, such as equipment operation status, measured values, and inspection results, at any time and at no additional cost.

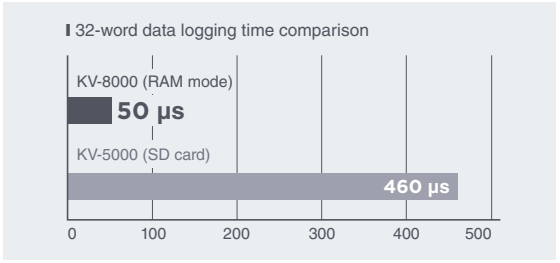
SD card-free logging

The built-in CPU memory can be used for logging even without an SD card for logging even in locations where media usage is restricted. Saved data can be transferred to a PC via FTP.



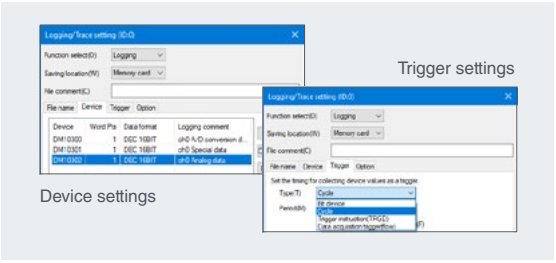
Ultra-high-speed collection

Using the built-in CPU memory enables logging at speeds 9 times faster than conventional models. Also, with no limit on the number of writes, there's no need to worry about service life.



Dedicated setup wizard for immediate configuration

The included logging setup wizard enables to easily configure logging settings just by setting the file name, device, and triggers.



Trace function

Data both before and after a problem occurs can be extracted and saved, which enables to easily find the cause of the problem. The amount of data to be collected before and after the trigger can also be set.

Up to 512 devices per setting Ver. UP

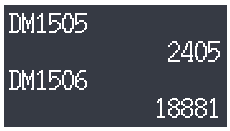
Logging is possible for up to 512 devices per setting, four times that of conventional models. Logging is also possible for up to 10 settings (5120 devices) with 1 CPU.

Viewable, outputtable information

Hyper access window

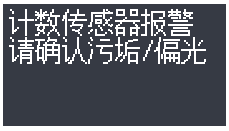
Device monitor function

Using the switch operation in the main CPU unit, device monitoring and modification is possible. This allows for information in the PLC to be monitored immediately even on-site without a PC.



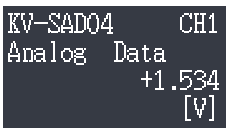
User messaging function

This function enables display of pre-registered messages. Up to 63 message patterns in 8 languages can be registered. These messages can be used, for example, for displaying commands to operators when an alarm occurs.



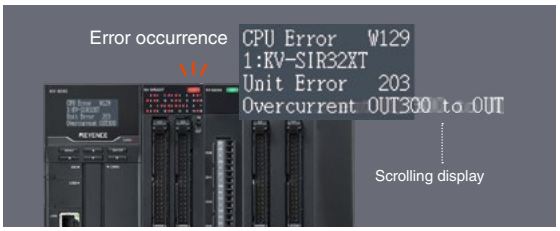
Unit monitoring function

To check or change a unit's settings and operation conditions, press the direct access switch on the target unit.



Error message display

If an error occurs on an expansion unit, not only the error code but also the error details are displayed. This enables to understand the situation immediately on-site without looking at a manual.



Unit testing function

Efficiency at start-up is increased due to the ability to perform forced output and the ability to check the wiring of every connected unit without program transmission.

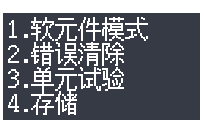
High-speed I/O Unit KV-SIR32XT	Input status monitoring, forced output
High-speed Analogue Input Unit KV-SAD04	Analogue value monitoring, input range modification
High-speed Analogue Output Unit KV-SDA04	Forced output, output range modification

File management between CPU memory and SD card

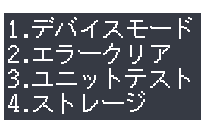
The ability to copy data between CPU memory and an SD card without a PC is a useful feature for data management.

Improved display power of the lauded Hyper Access Window

16 characters wide × 4 lines high



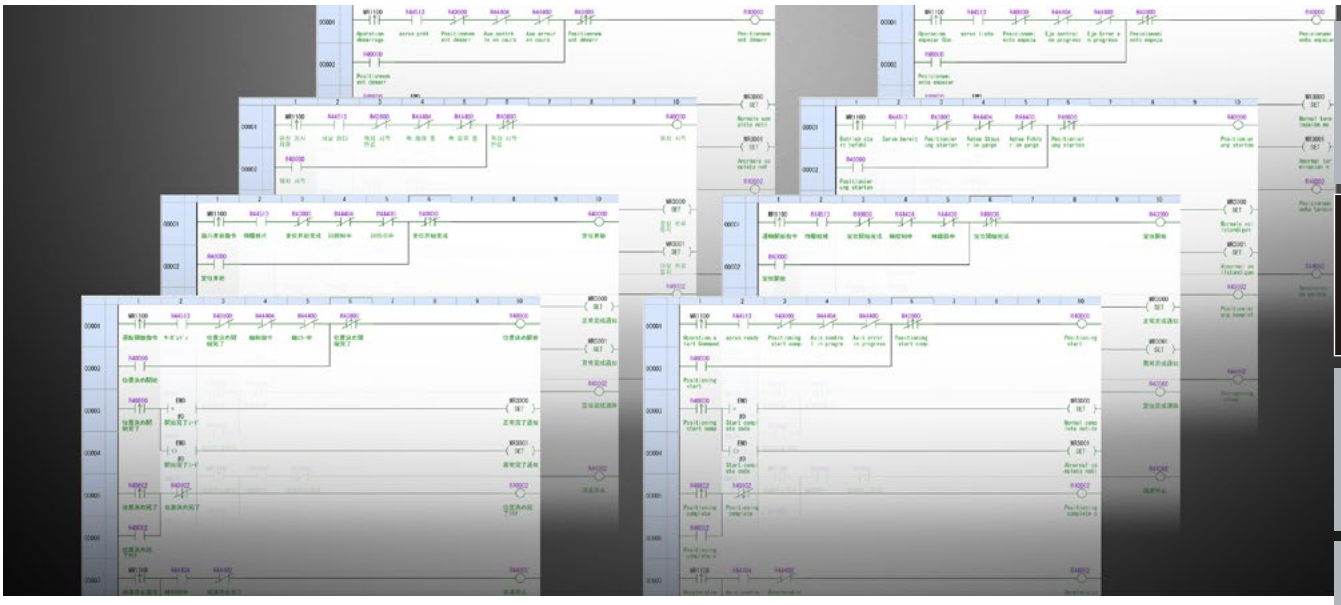
Multi-language display



Full-width display

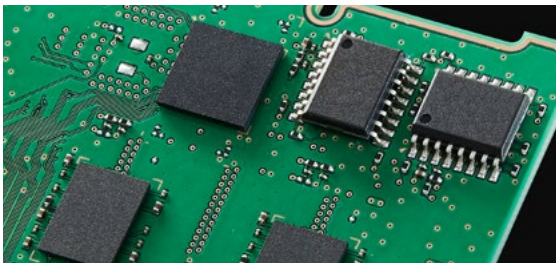
Optimised functions for universal application

Battery-less/multi-language support



All devices battery-less

Due to the adoption of large-capacity non-volatile memory, all of the devices are battery-less. This means that no data will be lost due to the battery running out and no need to perform on-site trouble support.

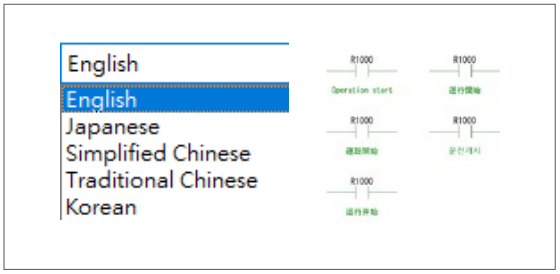


Up to 8 languages can be saved in the CPU memory

As device comments can be saved to the large-capacity CPU memory, programs read from the PLC can also be switched to the more familiar display language.

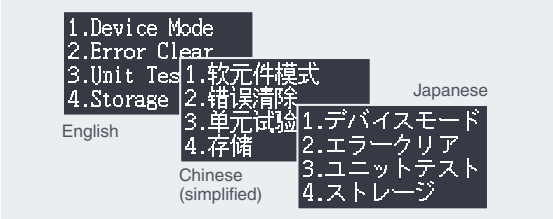
Comments can be input and displayed in up to 8 languages

Comments can be registered in up to 8 languages for a single project. The language can be changed just by selecting the display language, so monitoring and edit operations can be performed in a language familiar to the user.



Multi-language Hyper Access Window display

The access window, used at checking device values or error details, supports three different languages: English, Chinese, and Japanese. The display can be switched at the main unit, which enables operators to easily check the display in a language most familiar.

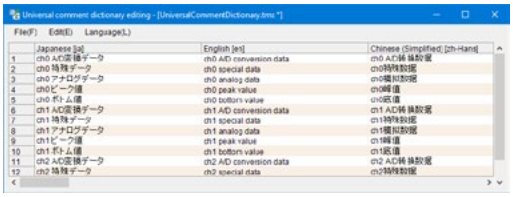


Compatible management of files between languages

Both the PLC main unit system and KV STUDIO offer full Unicode compatibility. In addition, different languages and OS are also compatible, eliminating failures or garbled characters when reading programs.

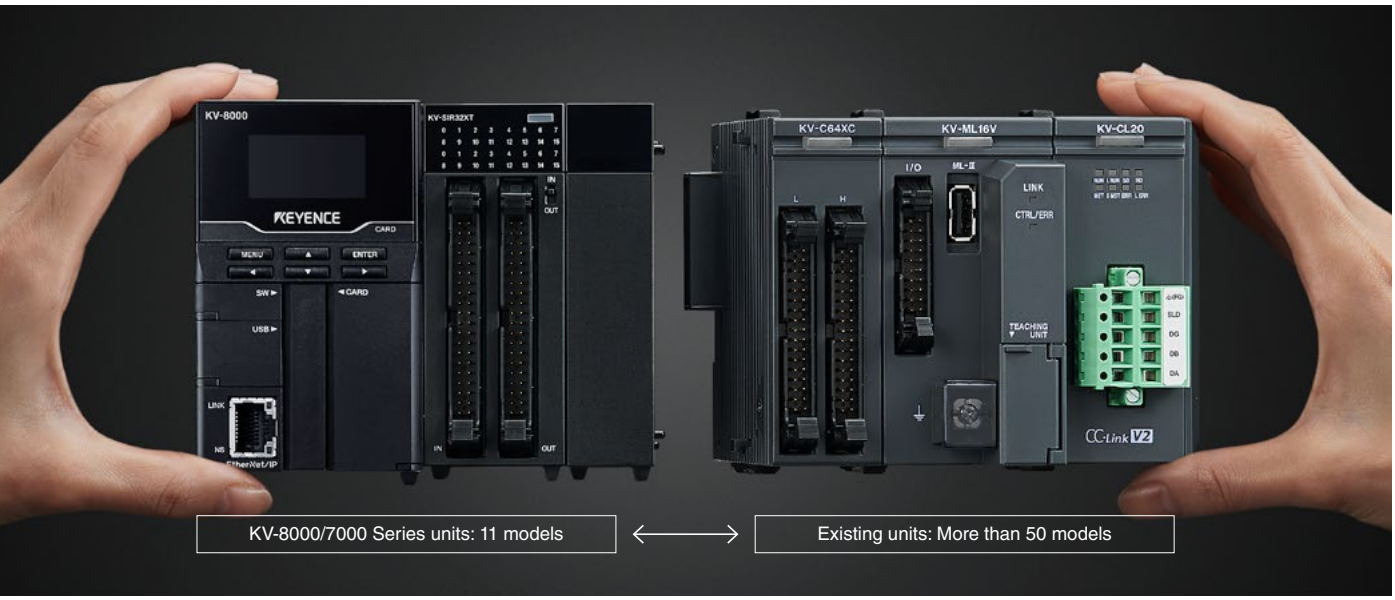
Universal comment dictionary editing

The translation dictionary table is available for converting device comments into multiple languages. Users can also add to the dictionary at any time, making this feature ideal for applying uniform in-house comments.



Direct connection to existing expansion units

Usable with all existing units



Directly connectable to existing units

The KV-8000 Series can be directly connected not only to S-Unit/X-Unit but also to existing units. The current assets can be used as they are.

Baseless structure

The CPU unit and expansion unit can be connected via the connector on the side of the main unit. DIN rail mounting is also possible, decreasing costs for the base unit.

KV-B1 Calendar timer retention battery

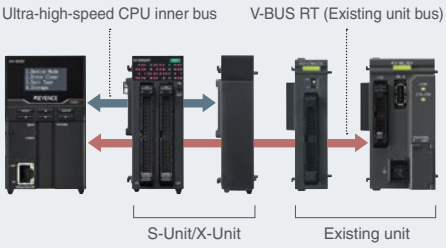
In applications that utilise the calendar timer, this battery is used when the power supply is turned off for extended periods of time. Because the battery is mounted on the front of the CPU unit and can be changed while the unit is turned on, replacement is easy.

Hi-Speed USB support

USB 2.0 support realises even faster monitoring through such functions as real-time chart monitoring.

No loss in speed when mounted to existing units

Because a dedicated bus for communicating with existing units is installed separately from the CPU inner bus, there are no losses in speed. Expansion bus communication performance that is comparable to conventional models can be achieved just by replacing the CPU unit with the KV-8000 Series.



Equipped with 24 VDC supply terminals

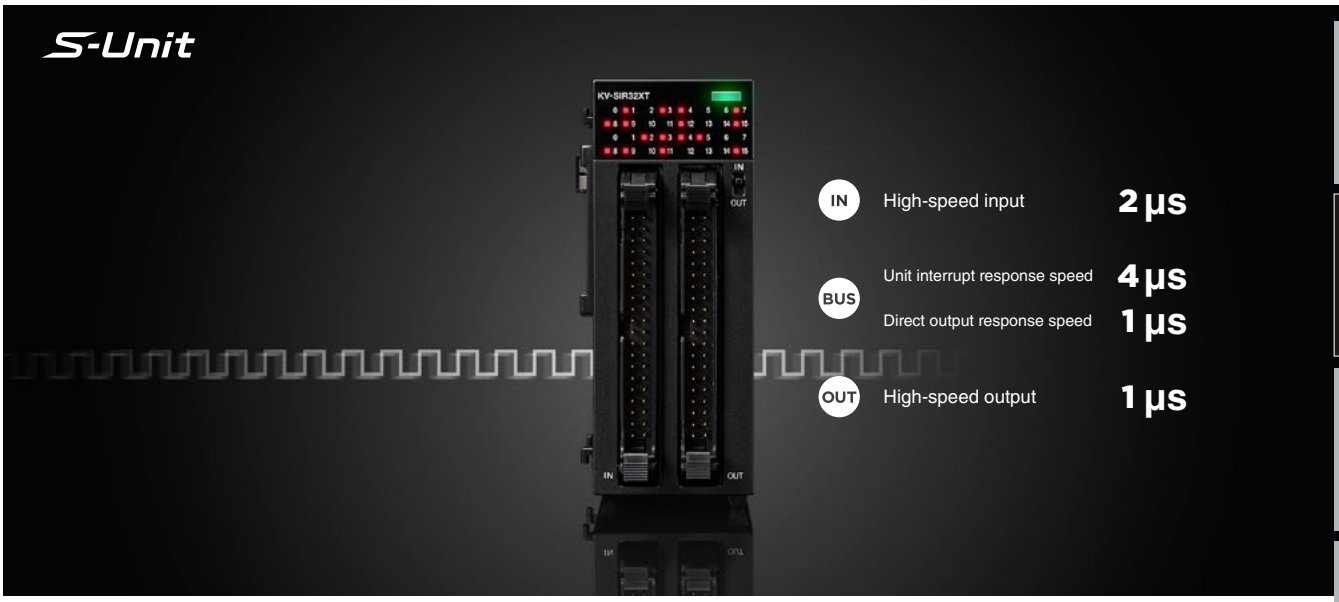
24 VDC power can be directly supplied to the CPU unit. The 24 VDC power supply in the control panel can also be used to save costs and space.

Built-in SD memory card slot

An SD card can be used for such tasks as gathering long-term logging data or adding programs on-site, which may call for rewriting.

High-speed I/O unit

KV-SIR32XT



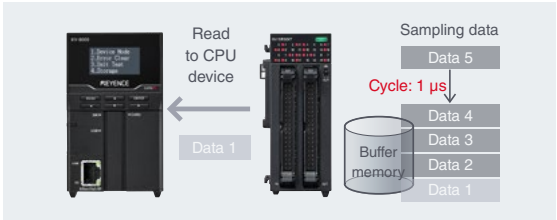
High-speed input: 2 µs, High-speed output: 1 µs

FASTEST IN INDUSTRY

Adoption of a high-speed isolator and optimisation of the circuit design realise faster unit OFF-to-ON times. Also, due to CPU inner bus and unit responsiveness, system-wide high-speed processing is possible.

Buffering function

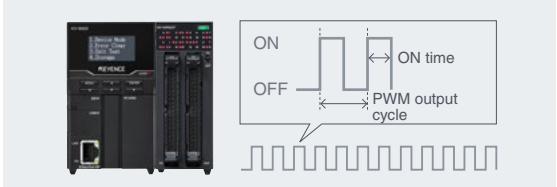
A signal input state can be buffered inside the unit in units of 1 µs at minimum. Data is imported to the CPU device through dedicated commands, so checking high-speed signal states can be done without burdening the memory.



PWM output function

PWM output at a maximum of 100 kHz in units of 0.1 µs is possible using the high-speed output terminal. Enabling simple motor control and LED illumination control without increasing costs.

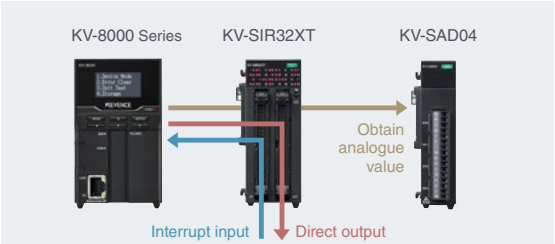
* With a single KV-SIR32XT unit, up to 8-point PWM output is possible.



Unit interrupt response speed: 4 µs

FASTEST IN INDUSTRY

Using unit interrupt, output response speeds of 4 µs are possible for input. In addition to high-speed I/O processing, a wide range of abilities are possible for applications that benefit from speed, including analogue value acquisition when a signal turns ON.

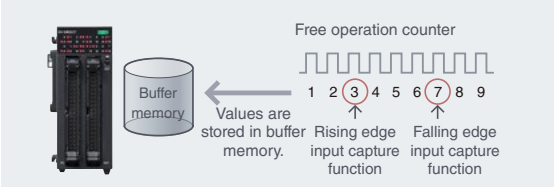


Unit interrupt supported by all terminals

With the ability to use 32-point input for all terminals (64 points for the whole system) for unit interruption, a wide range of uses is possible, including high-speed processing applications and applications that call for accuracy.

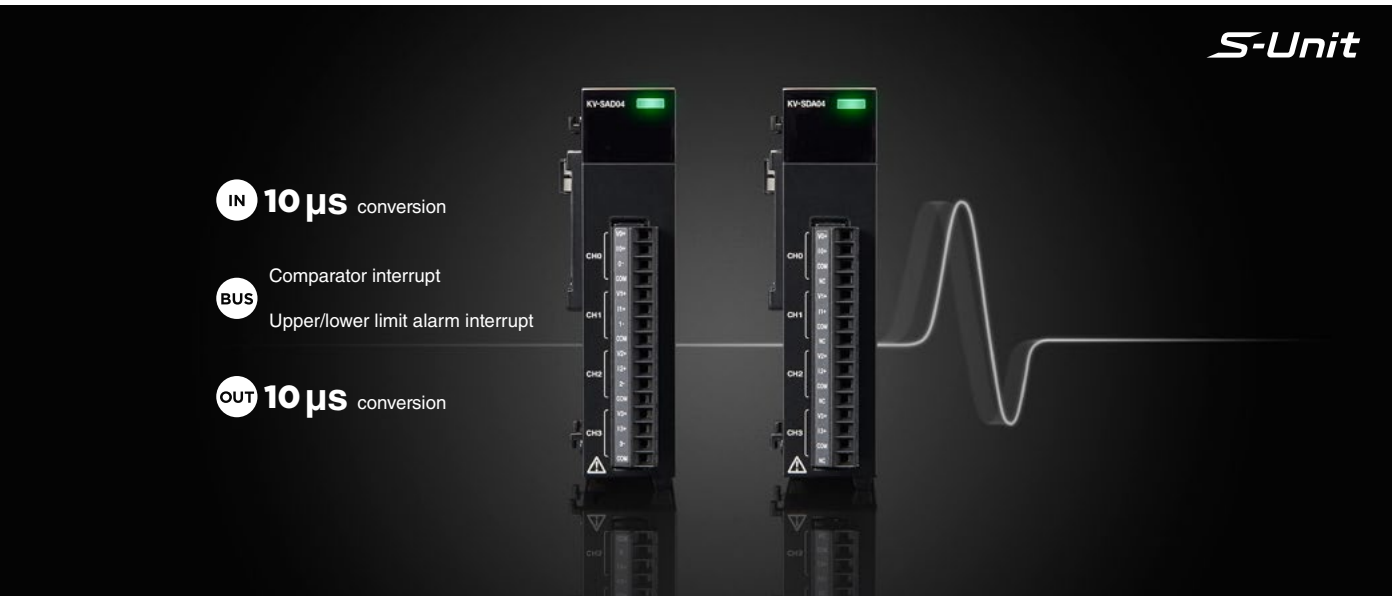
Input capture function

By incorporating a 32-bit free operation counter in the unit, input capturing of the count value is possible in units of 0.1 µs. This function can be used in applications that take advantage of high-speed performance, including measurement between two signal points or ON width measurements.



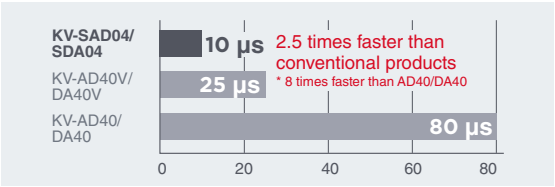
High-speed analogue I/O unit

KV-SAD04/SDA04



Ultra-high-speed conversion: 10 µs/ch

The high-speed performance of a CPU unit realises significantly faster conversion speeds, reaching speeds 2.5 times faster than conventional models. This leads to increased responsiveness throughout the system as well as improved production efficiency and quality.



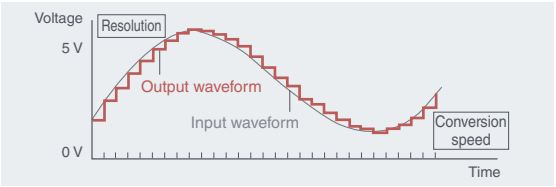
Buffering function * KV-SAD04 only

A signal input state can be buffered inside the unit in units of 10 µs at minimum. In addition, periodically importing the count values to the CPU device allows for continued buffering.

Buffering period		10 µs or more
Buffering data amount		4095 points * Periodically transferable to CPU device
Operating mode	Continuous buffering	Buffered importing to the CPU device is performed without stopping sampled data.
	Trigger buffering	Specified data from before and after a trigger input is stored in buffer memory. Buffered importing is used to import data to the CPU device.

High resolution: 1/20000

In addition to faster conversion speeds, high-accuracy resolutions of 1/20000 have also been achieved. This allows for reliable capturing of changes in high-speed analogue signals, a conventionally difficult task.



Unit interrupt support

Due to unit interruption, high-speed processing is possible for applications where responsiveness is particularly necessary, including comparator unification and upper/lower limit alarm functions. Processing at ultra-high response speeds of 4 µs is possible.

	Unit interrupt function	Main cause of interrupts
KV-SAD04	Comparator unification	At ON/OFF of comparator upper limit relay and lower limit relay * When comparator function is used
	Buffering completion	At buffering completion * When using the buffering function
KV-SDA04	Upper/ lower limit alarm	At ON/OFF of upper/lower limit alarm function upper limit relay and lower limit relay * When upper/lower limit alarm function is used

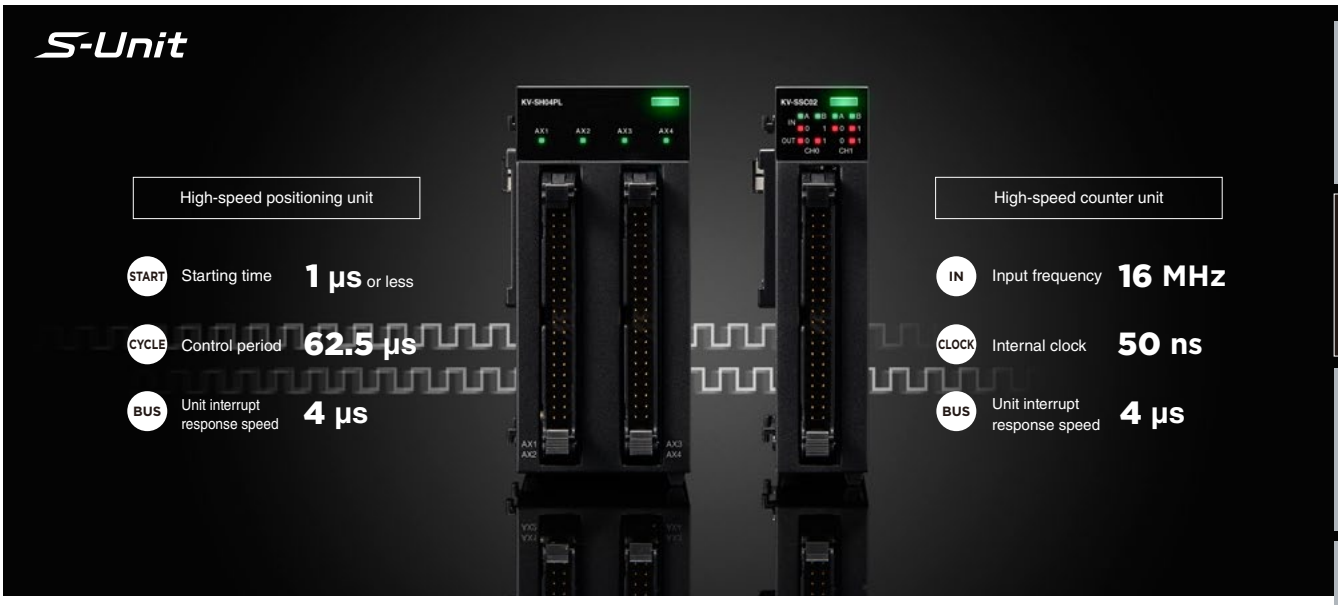
Various prepared unit-dedicated commands

KV-SAD04 dedicated commands	Read A/D conversion (special) data	U_RDAD	Read special data from buffer memory
	Batch read A/D conversion data	U_RDADB	Batch read A/D conversion data, special data, analogue data, peak values, and bottom values from buffer memory
	Read buffering data	U_RDBF	Batch read buffered special data from buffer memory
	Special data offset value modification	U_WROFST	Modify the special data offset value
	Write scaling setting value	U_WRSCL	Write the scaling setting value to the buffer memory

KV-SAD04 dedicated commands	Write comparator setting values	U_WRLMT	Write comparator setting values to the buffer memory
	Write average constant	U_WRAVG	Write the average constant to the buffer memory
KV-SDA04 dedicated commands	D/A conversion output data modification	U_WRDA	Modify the data output from D/A conversion
	Output data offset value modification	U_WROFST	Modify the output data offset value
	Write scaling setting value	U_WRSCL	Write the scaling setting value to the buffer memory
	Write upper/lower limit alarm values	U_WRLMT	Write the upper and lower limit alarm values to the buffer memory

High-speed positioning unit/high-speed counter unit

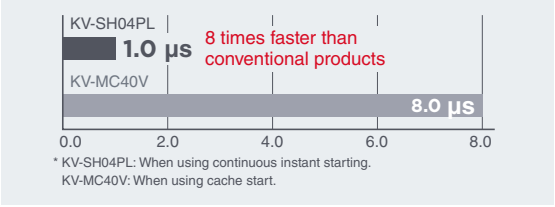
KV-SH04PL/KV-SSC02



High-speed positioning unit **KV-SH04PL**

Starting time: 1 µs or less FASTEST IN INDUSTRY

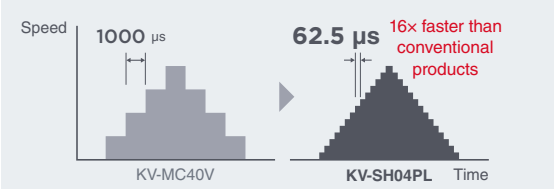
Enjoy less time until pulse output. Takt time can be shortened by reducing the startup wait time.



* KV-SH04PL: When using continuous instant starting.
KV-MC40V: When using cache start.

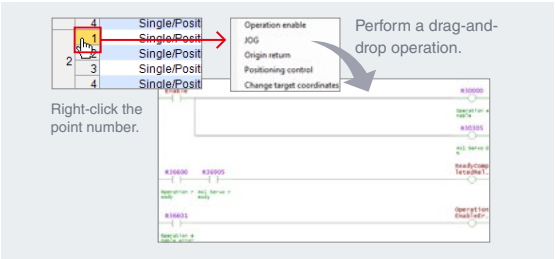
Control period: 62.5 µs FASTEST IN INDUSTRY

Detailed position instruction output. Smooth positioning control can be achieved even with rapid speed changes.



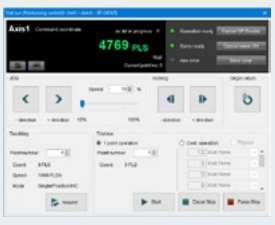
Automatic program creation using drag-and-drop

Automatic creation using drag-and-drop Operations such as JOG operations and positioning control can be created without the manual.



Trial run window that can be used immediately

JOG and test operations can be performed. There is no need to add ladder programs or perform touch panel drafting.



High-speed counter unit **KV-SSC02**

Input frequency: 16 MHz BEST IN INDUSTRY

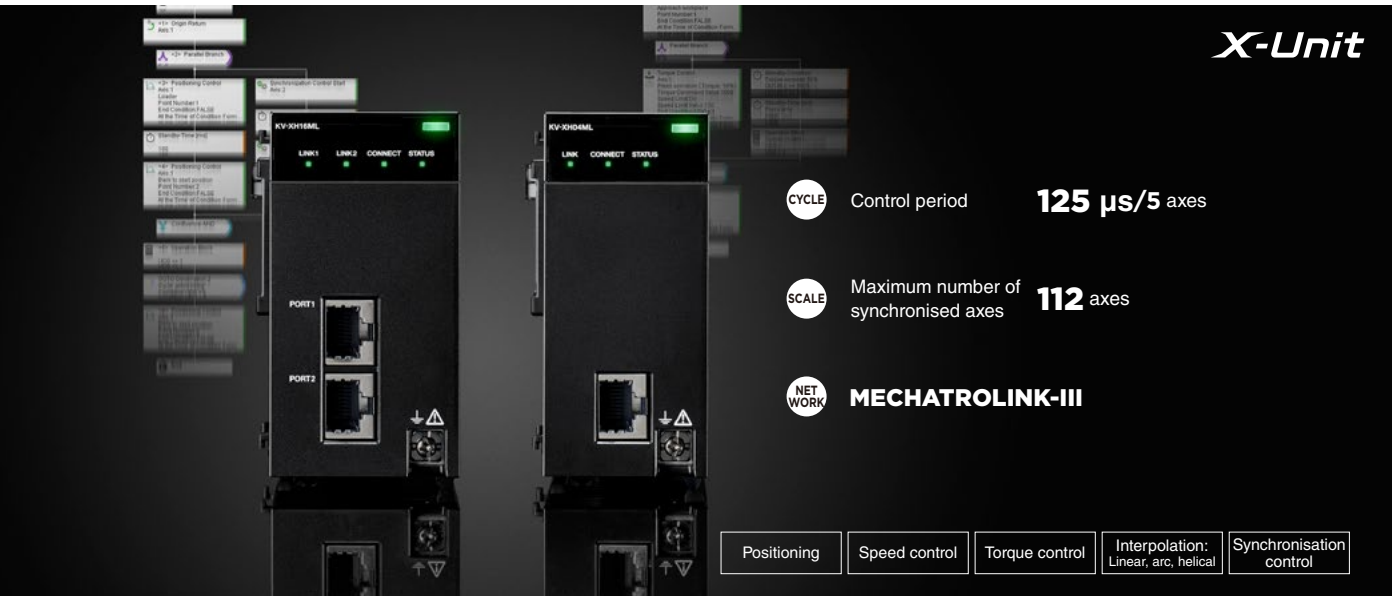
Receive 16 MHz, high-speed encoder signals. This enables connections to devices such as high-resolution linear encoders, so the effectiveness of this feature is demonstrated in highly accurate positioning and measurement applications.

Input capture function: 50 ns BEST IN INDUSTRY

Perform measurements using an internal clock of 50 ns at fastest without being affected by scan times. This makes it possible to perform highly accurate measurements such as measurement between two signal points and ON width measurements.

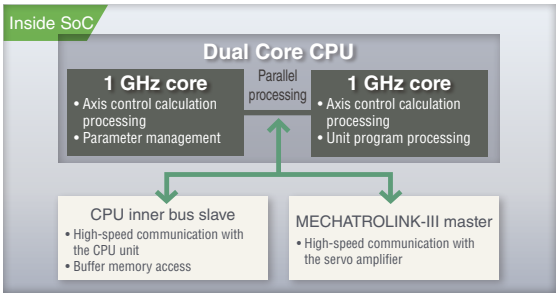
Positioning/Motion unit

KV-XH16ML/KV-XH04ML



Equipped with a dedicated motion control engine

A 1 GHz Dual Core SoC is used to enable the execution of high-load internal calculations at high speed. Performing calculation processing in parallel, which is the optimal method, enables ultra-high-speed operations.



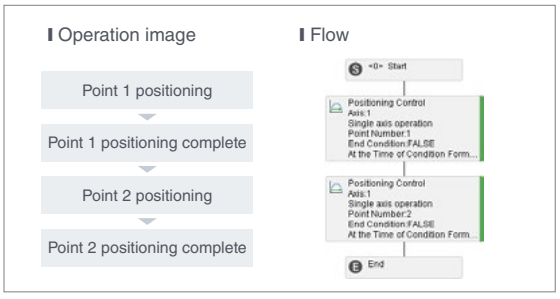
Servo amplifier synchronisation with up to 112 axes

BEST IN ITS CLASS

By using inter-unit synchronisation, up to 112 axes can be synchronised with the servo amplifier. This makes it possible to perform large-scale control with even higher accuracy.

Flows, configuring settings exactly according to an image of the operations

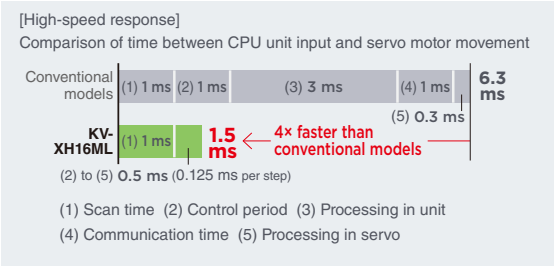
Flows can be used to perform programming exactly according to the overview of operations determined at the design. These are effective in continuous operation and conditional branching.



Control period: 125 µs/5 axes

FASTEST IN ITS CLASS

Dual Core parallel processing and MECHATROLINK-III high-speed communication enable a best-in-class control period. The effectiveness of this feature is demonstrated in control applications that require accurate takt time and position instructions.



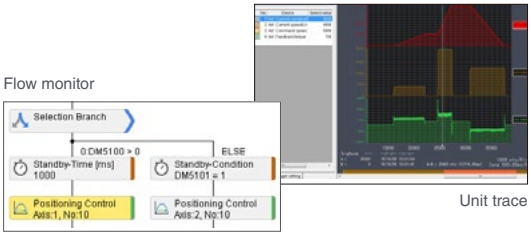
High-speed response with autonomous distribution control

Motor control with high-speed response is possible because the units execute programs autonomously. Because the processing can be distributed, it is not affected by the scan time.

* When using a unit program

Monitoring functions improve debugging efficiency

The unit trace which can check the status of units with waveforms and the flow monitor which can monitor the active block when using a flow enable efficient debugging.

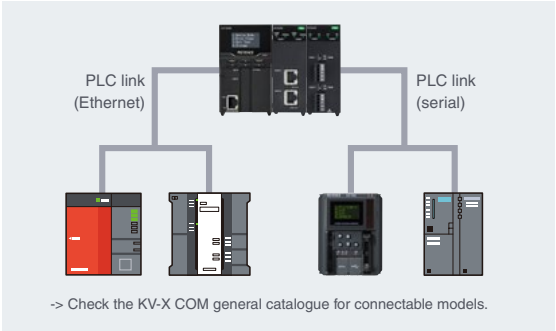


Ethernet unit/Serial communication unit

KV-XLE02/KV-XL202/XL402

Program-less communication with over 100 PLC models INDUSTRY FIRST

Because PLC links can be established without programs for both Ethernet and serial communication, it is possible, for example, to visualise data links and existing equipment in a previous or following process easily according to the interface of the target PLC.



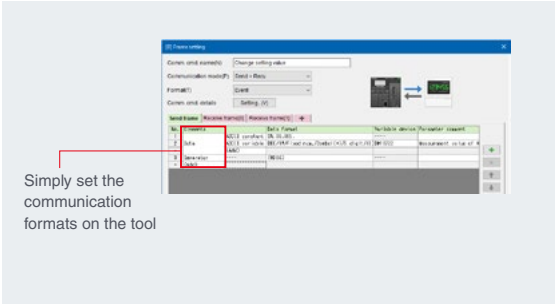
-> Check the KV-X COM general catalogue for connectable models.

Compatibility with four major networks

As compatible with the four major networks used around the world by a single unit, even when connecting to a different network, there is no need to change the system configuration. This eliminates the troublesome tasks of redesigning systems and reselecting devices.

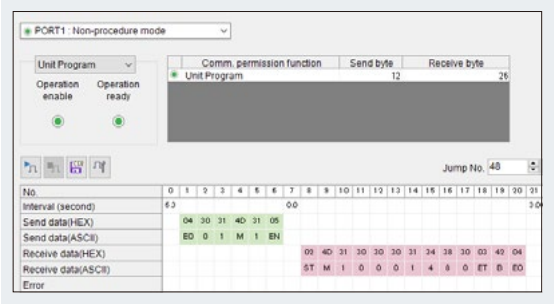
Ladder-less communication using PROTOCOL STUDIO

Communication formats can be defined and communication commands can be created simply by configuring the settings of a dedicated tool instead of the conventional method that requires writing a ladder program. Such ladder-less communication leads to reduced work hours.



Communication test/monitor function

The built-in communication test function can be used to confirm communication without creating a communication program. Meanwhile, the communication monitor function can monitor transmission/reception statuses. This enables to reduce startup time and analysis time if a communication error occurs.

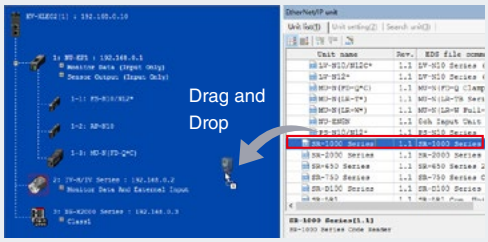


Constructing seamless networks

Ethernet / EtherNet/IP™ function

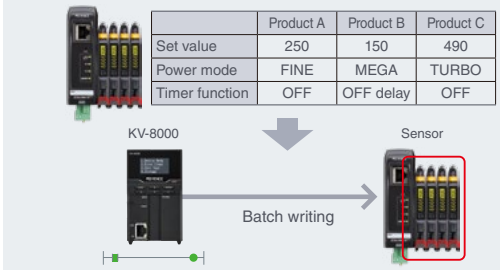
Implementing communication immediately just by selecting devices

Communication can be performed without a program just by selecting and placing KEYENCE sensor devices. Over 200 types of sensors are supported, which enables flexible support of a wide variety of applications.



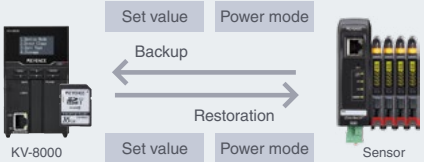
Sensor setting level changes

Setting information for each sensor is registered for each product, allowing for level changes from the PLC. Also, when combined with the VT Series, changing levels can be done with a single touch.



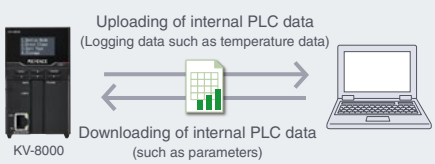
Backup and restoration of setting information

Sensor setting information can be saved to an SD card. This information can be written to a different sensor. This reduces the man-hours required for adjustments when replacing sensors and when problems occur.



FTP client/server function

The data collected with the CPU's built-in logging/trace function and the device values saved to the CPU memory or an SD card can be uploaded to a PC. It is also possible to read files from a PC to the PLC.



Enables simultaneous use of socket communication and EtherNet/IP™

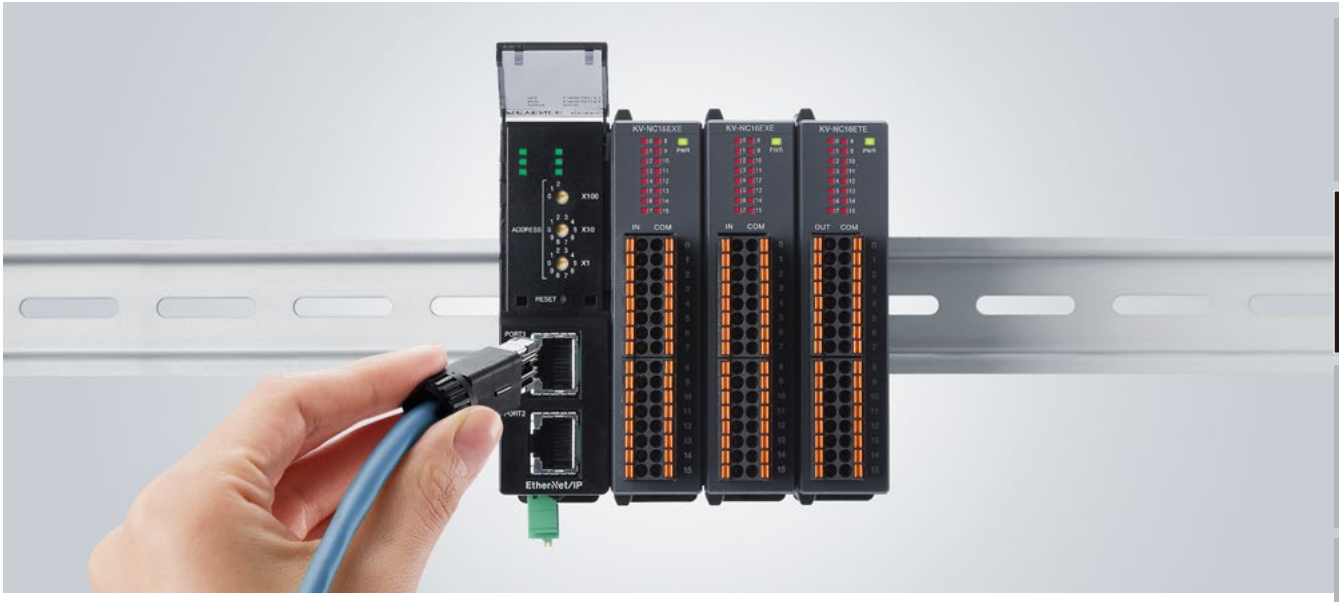
Socket communication can be performed while EtherNet/IP™ communication is being performed on the same network, which enables seamless, application-specific control of everything from upper-level PCs to sensor devices.

Up to 48 sockets

Using both flows and KV socket communication, up to 48 sockets are supported. This enables communication with multiple Ethernet communication devices such as PCs and measurement instruments.* When using the KV-XLE02

Constructing seamless networks

EtherNet/IP™ supported remote I/O systems

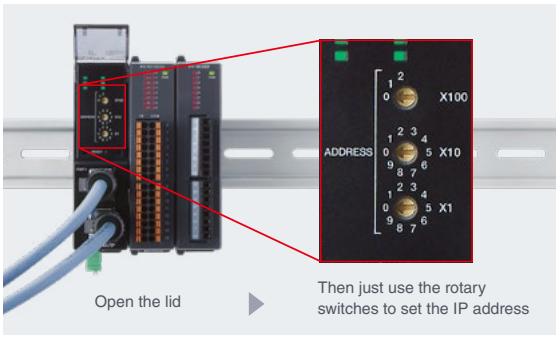


Space saving THINNEST IN INDUSTRY

The thinnest case in the industry minimises the installation space requirements. Furthermore, the European terminal block types require no external terminal block, which further reduces the installation space requirements.

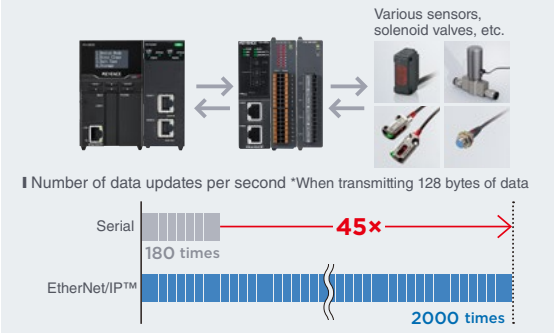
Just turn the rotary switches to configure the hardware settings

The IP address can be set with the built-in rotary switches of the communication unit. There is no need to use a PC, so the settings can be configured easily by the on-site operator.



High-speed communication with a maximum speed of 0.5 ms

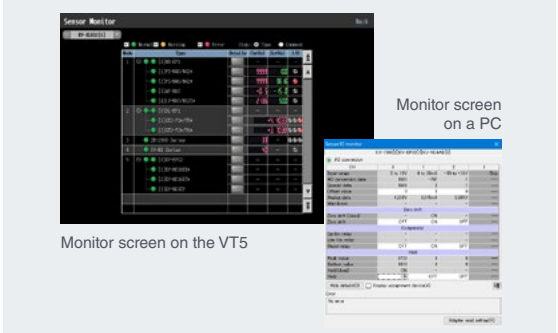
EtherNet/IP™ enables high communication speeds of 0.5 ms. This can be used between expansion units to perform operations such as the high-speed acquisition of sensor data and measured values for high-speed response applications.



Multiple dedicated monitors available

Dedicated monitors for remote I/O and for the sensors are available. KEYENCE's VT5* touch panel can be used to monitor the devices from a list without performing drafting, which is useful when identifying the cause of an error that has occurred.

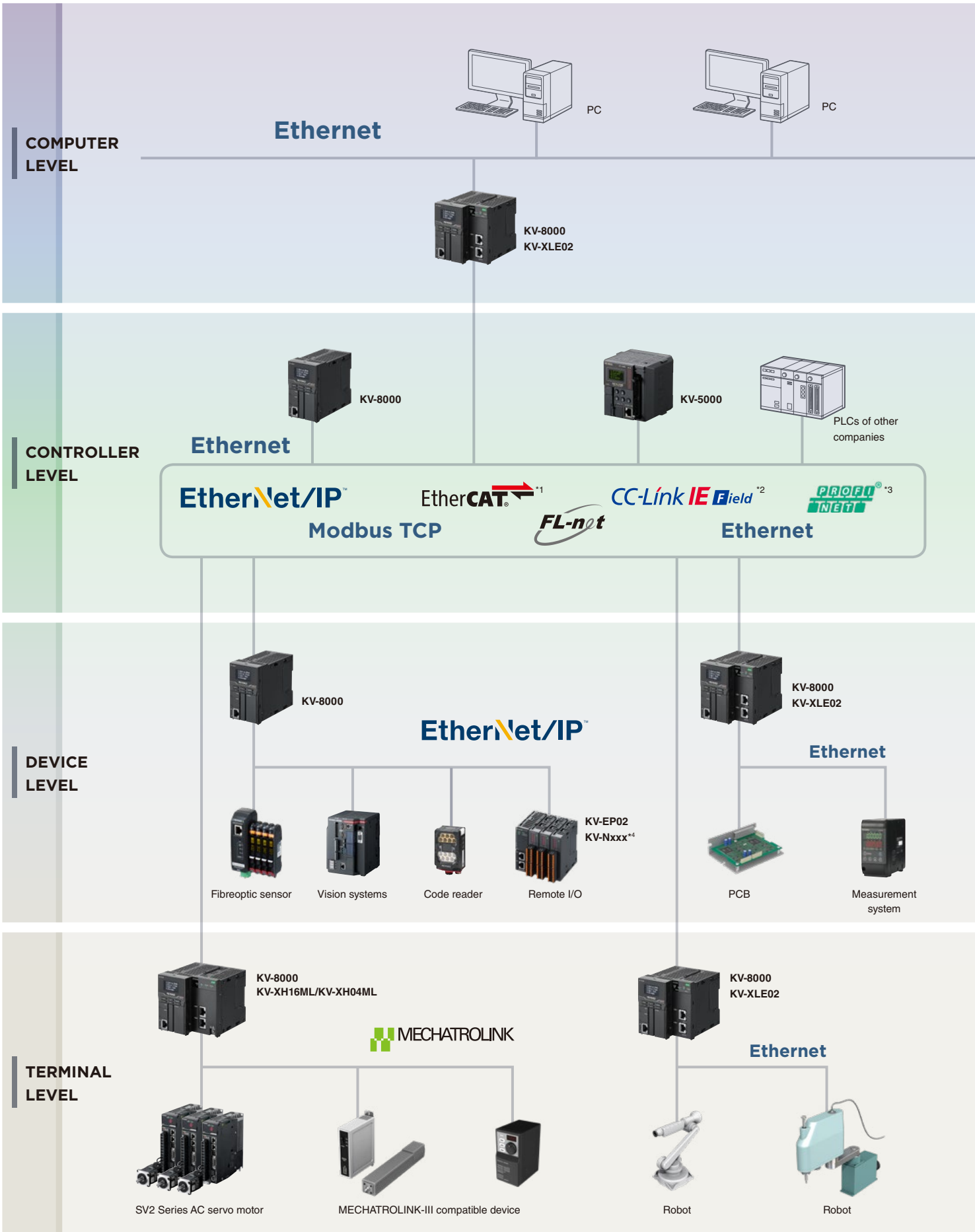
* This is not supported by the VT5-W07M and by Soft-VT.



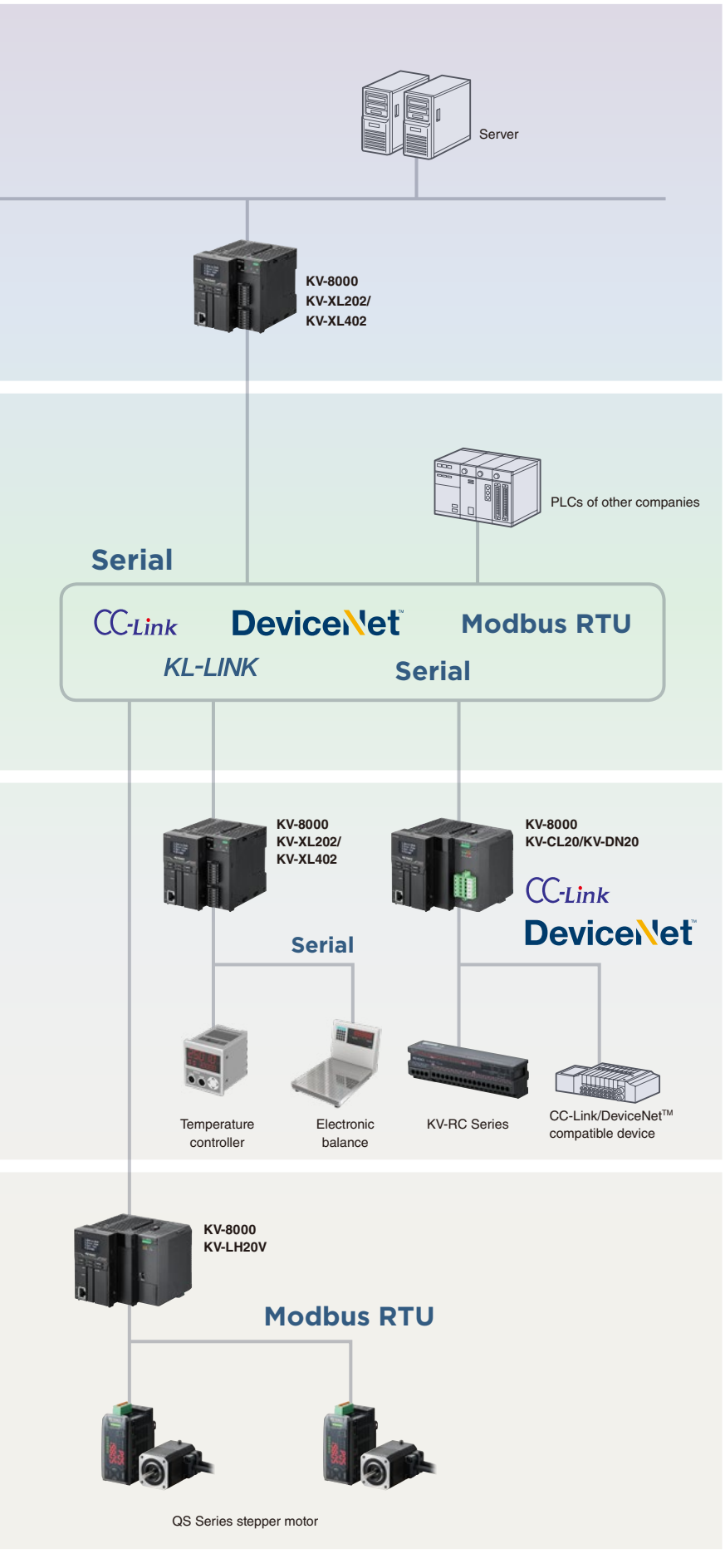
NETWORK

Optimal network for your needs

A setup that suits your operating environment and equipment can be found by a customisable network configuration. With compatibility for various types of open networks, simply adding to an existing system is possible.



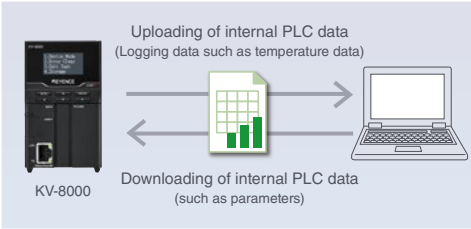
*1 Slave *2 Intelligent device station *3 Device *4 See P. 54 for details.



COMPUTER LEVEL

FTP client/server function

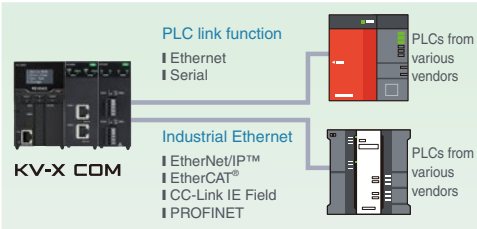
Upload data collected through logging/trace functions to a PC or download data from a PC.



CONTROLLER LEVEL

PLC link function, compatibility with four major networks

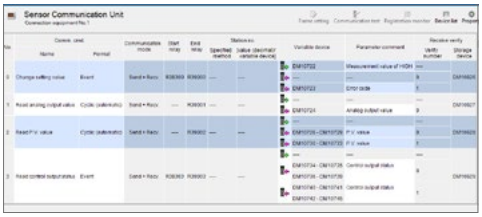
Establish communication with PLCs from various vendors without creating programs. Four major networks are supported, which further enables connections with various PLCs.



DEVICE LEVEL

Connect to communication devices without ladder programs

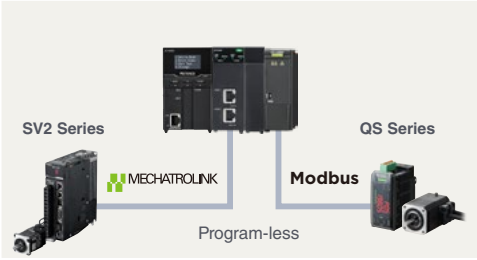
Ladder-less Ethernet communication and serial communication are possible with various communication devices, including KEYENCE sensors.



TERMINAL LEVEL

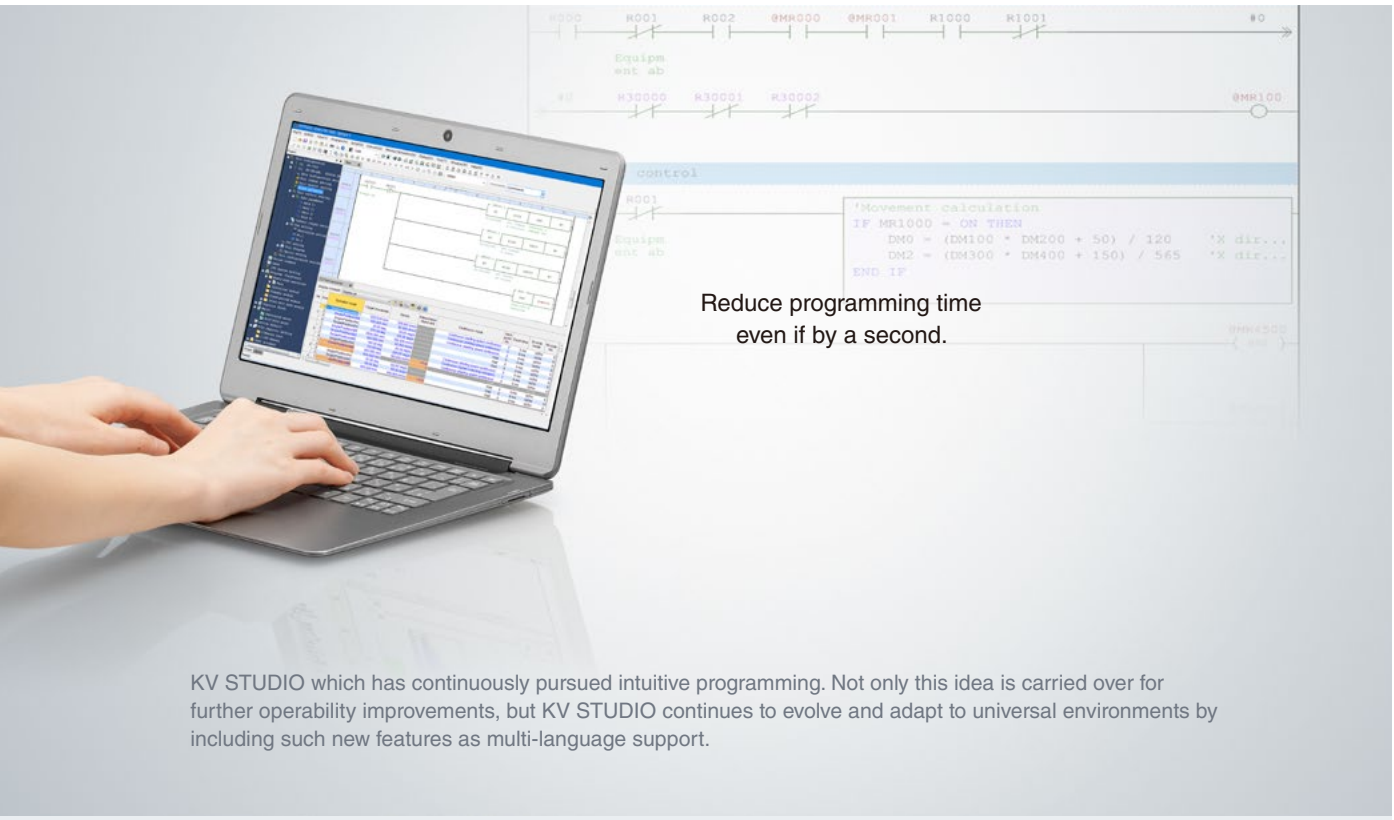
Connect to various motors with simplified wiring

Motor devices such as AC servo motors, stepper motors, and electric actuators can be connected to and controlled with simplified wiring.



Programming support software

KV STUDIO



KV STUDIO which has continuously pursued intuitive programming. Not only this idea is carried over for further operability improvements, but KV STUDIO continues to evolve and adapt to universal environments by including such new features as multi-language support.

From system design to debugging and maintenance

Working toward greater man-hour reductions

System design	Configuration of individual unit settings	Programming	Debugging	Operation recording analysis

All units can be easily used.

Integrating all applications

KV REPLAY VIEWER	PROTOCOL STUDIO	EtherNet/IP™ settings	KV DATALINK+	KV MOTION+

Suitable for universal environments

Broadened development environments due to multi-language support

English	Japanese	Chinese (simplified)	Chinese (traditional)	Korean

Local device and macro function

Structured programming

Every-scan execution
Executes each scan.

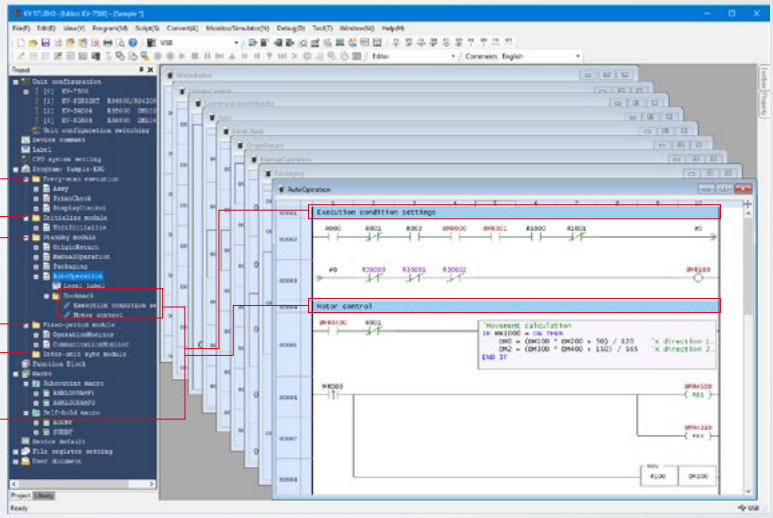
Initialise module
Only executes the first scan of the program execution.

Standby module
Only executes when required.

Fixed-period module
Executes in a pre-set fixed-period, irrespective of scan time.

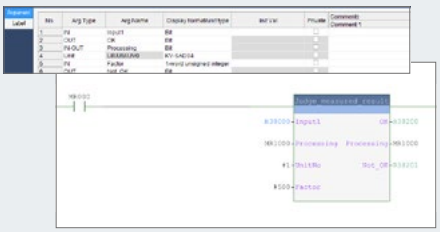
Inter-unit synchronisation module
Executes according to the inter-unit synchronisation period.

Bookmark
Comments from any line can be registered as an object that can be jumped to from the workspace.



Function block support

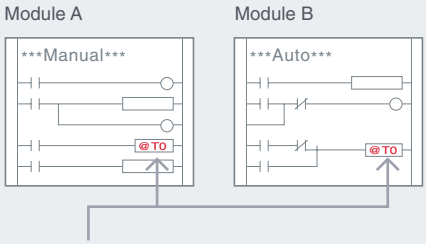
Two types, function blocks and functions, can be created. Up to eight levels of function blocks can be nested, which allows efficient programming that makes use of the available assets.



- Four types of arguments can be set: IN, OUT, IN-OUT, and UNIT.
- Up to eight levels of nesting is supported.

Local devices enable modules to be reused with ease

By taking advantage of local devices that can be used only in a module, module diversion is possible without concerning about overlapping devices between modules. To use this function, simply add @ in front of the device number.



Simply add @ in front of the device number.

Various prepared unit-dedicated commands

A number of processes that tend to be complicated in programs have been prepared as unit-dedicated commands. This not only reduces man-hours for programming but also increases program diversion.

High-speed I/O unit (KV-SIR32XT)

Read buffering data

U_RDBF	KV-SIR32XT	Storage device	Number of data
Unit No. #2	CH No. #2	DM0	#100

High-speed analogue unit (KV-SAD04/ SDA04)

Read A/D conversion data

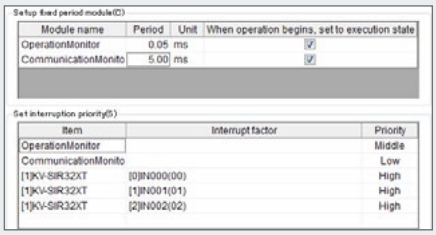
U_RDAD.S	KV-SAD04	Storage device
Unit No. #1	CH No. #1	DM120

Write D/A conversion data

U_WRDA.S	KV-SDA04	Output data
Unit No. #5	CH No. #2	DM0

Fixed-period execution and interrupt-priority user designs

Program and module priorities can be set as needed according to the application, such as for processing that emphasises speed or those that emphasise stability.



Setup fixed period module(D)

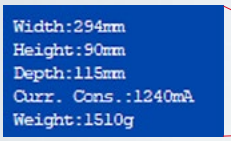
Module name	Period	Unit	When operation begins, set to execution state
OperationMonitor	0.05	ms	☑
CommunicationMonito	5.00	ms	☑

Set interruption priority(S)

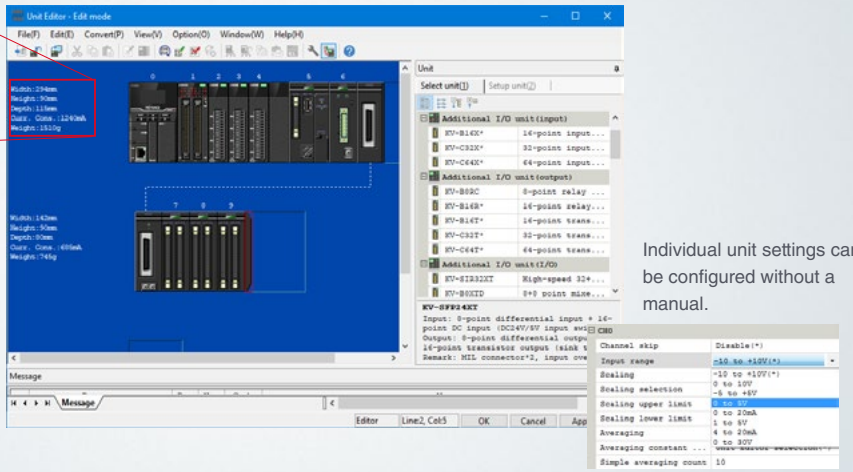
Item	Interrupt factor	Priority
OperationMonitor		Middle
CommunicationMonito		Low
[1]KV-SIR32XT	[0]IN000(00)	High
[1]KV-SIR32XT	[1]IN001(01)	High
[1]KV-SIR32XT	[2]IN002(02)	High

Centralised management of unit configurations and settings

Unit editor



The automatic calculation function is useful when designing control panels and selecting power supplies.

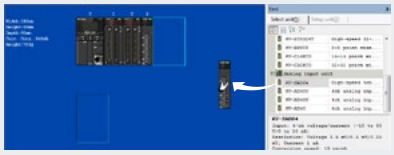


Individual unit settings can be configured without a manual.

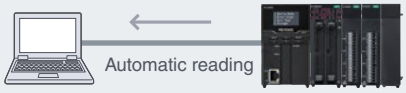
Intuitive unit configuration

Simply drag and drop required units from the list for easy configuration. When connected to a PLC, the model configuration can be automatically downloaded.

- Drag-and-drop configuration

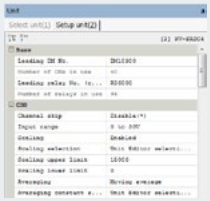


- Connect to PLC to download model configuration

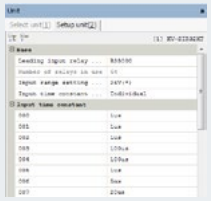


Manual-less configuration of unit settings

With the ability to batch configure expansion unit settings, there is no need for dedicated software. Because the settings are easily understood by anyone, from maintenance supervisors to other workers, efficiency can be improved.



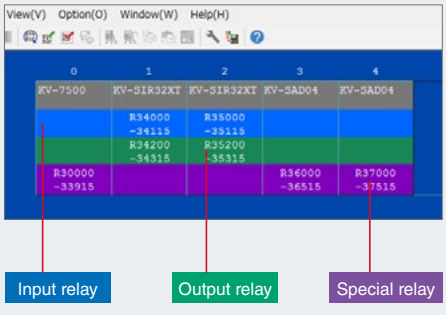
High-speed analogue input unit
- Input range setting
- Scaling setting
- Average processing setting



High-speed I/O unit
- Input voltage setting
- Input time constant setting

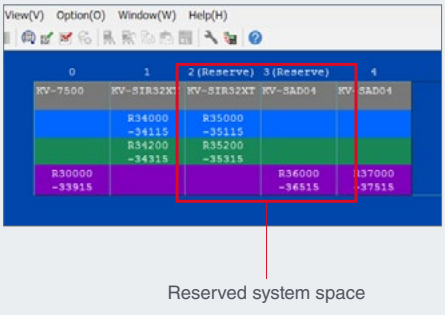
Device assignment with an emphasis on visibility

The assignments for each unit are displayed with different colours for input devices, output devices, and special devices. This enables to confirm the areas occupied by a unit device at a glance.



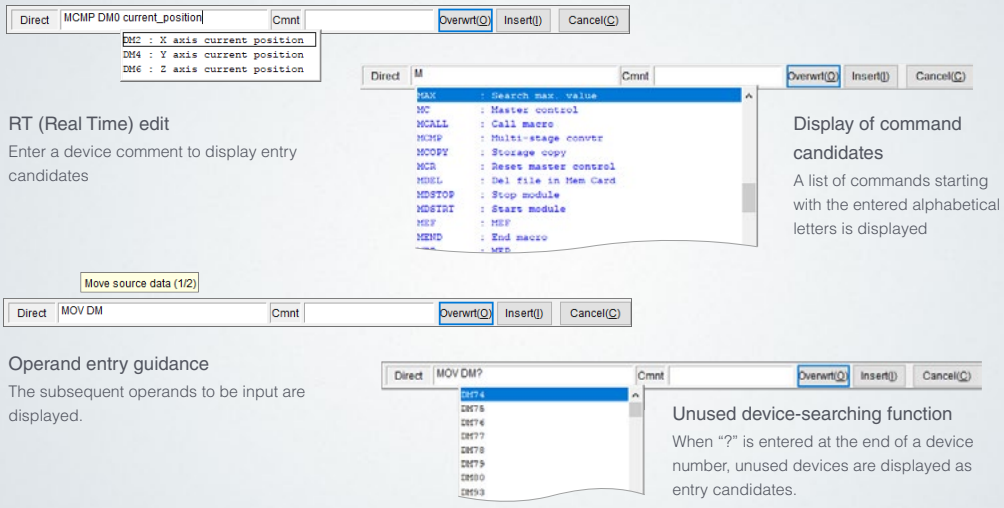
Unit reservation function

Reservations can be set when configuring the units. With base equipment and equipment with additional functions, diversion is possible without changing the device assignments.



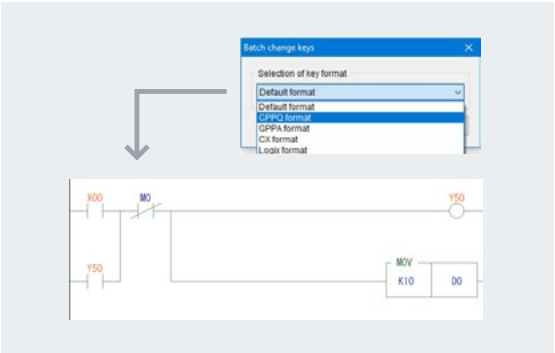
Fusing familiar operation with intuitive operation

Command entry support



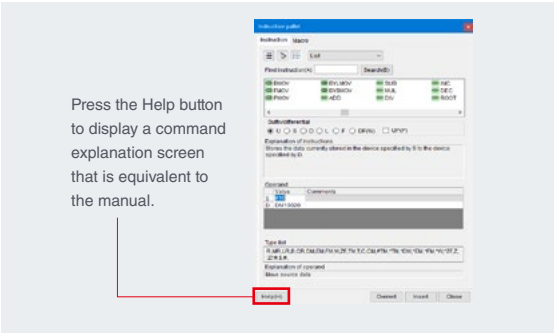
Key customising

Even if you are used to using different ladder software, switching to this software is easy. Users can specify their own keyboard operations by assigning unique shortcut keys.



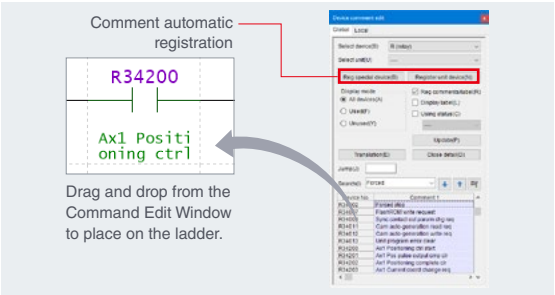
Command search function "Command palette"

All commands are displayed with symbols. The "Ambiguous search" function that displays relevant commands even when commands made by another company are entered is also available. Commands are explained concisely, and can be used easily without a manual.



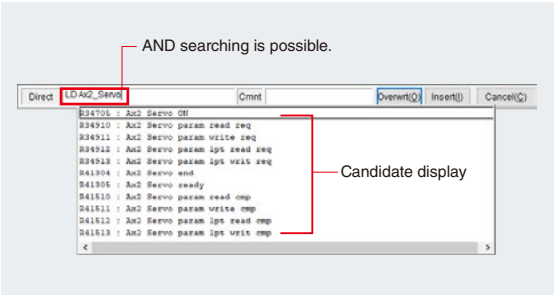
Automatic registration of comments on special units

Comment entry is one of the most time-consuming tasks when programming. However, "KV STUDIO" enables a considerable reduction in the time needed for comment entry by automatically registering comment entry on special units that need additional time and labour.



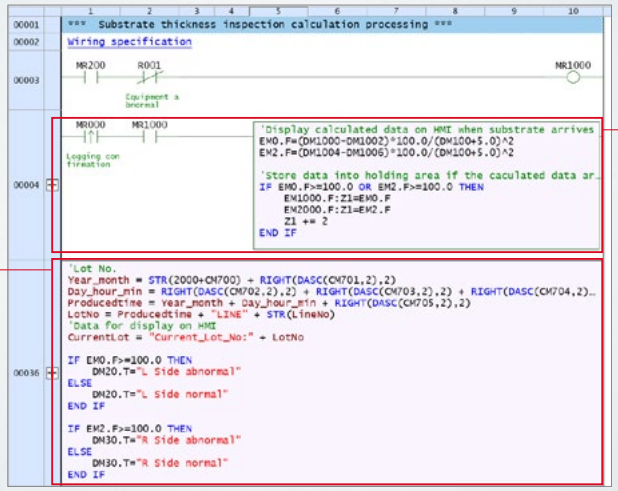
RT (Real Time) edit

Directly entering a device comment or buffer memory comment during command entry displays the comment as a candidate, which enables programming without a manual. The search capability has been improved through the addition of AND searches.



Direct programming of algorithm and character processing

KV Script

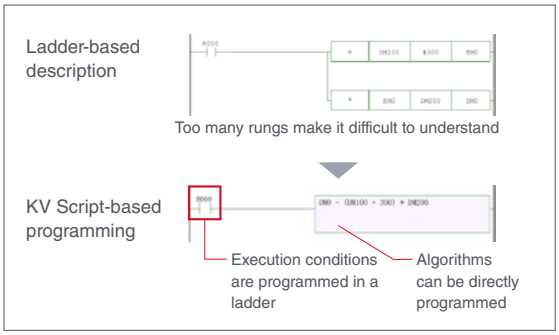


Box script
Condition execution script that allows execution conditions to be described with a ladder.

Area script
Regular execution script with no execution conditions

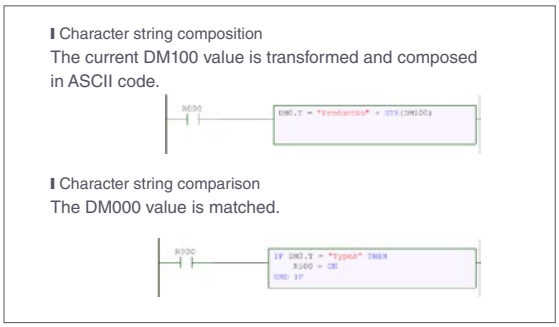
Directly programmable algorithms

Calculation processing programs can be executed just by writing the formula directly. This not only reduces programming work but also increases visibility when debugging.



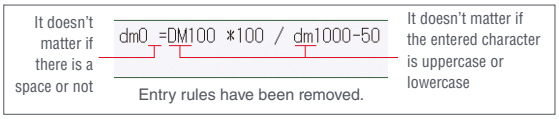
Easy processing of strings

Character strings that are not easily handled using ladder language can be described as is. Like algorithms, character strings can be easily composed or compared, and users can compose them without considering the number of devices or ASCII codes, allowing for intuitive understanding of the details.



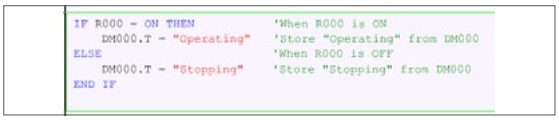
“Ambiguous entry” for intuitive programming

“Ambiguous entry” allows users to enter characters without knowing the details of an input method. Users can create programs without worrying about the case or spacing of letters.



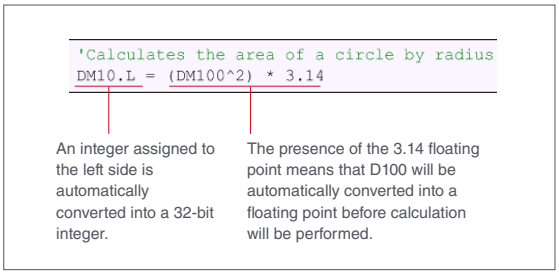
Description of control statements

Syntaxes and various functions that enable advanced processing are prepared. Programs that cannot be handled easily by the ladder can be described concisely.



Automatic model conversion processing

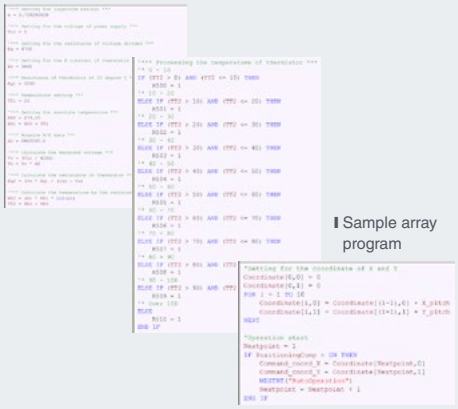
With KV Script, conversions can be performed automatically, even for processing that requires the model to be noted and recorded, such as floating-point calculations. Because the conventionally troublesome work of specifying the model has been eliminated, programming has become more intuitive.



Local (label) and array variable compatibility

Using local variables (labels), which are valid only in modules, KV Script enables further advanced variable processing without concerning about PLC-specific device numbers. Array variables can be used as well.

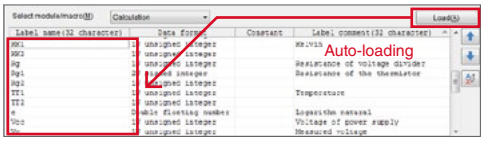
Sample local variable program



Sample array program

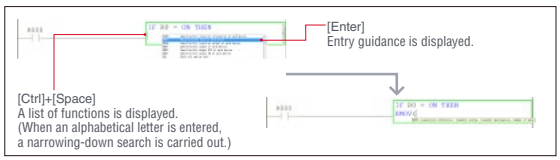
Auto-loading local variables (label)

Local variables found in the program can be automatically loaded in the Label Edit screen. Because only the data format is set, the time and effort required for input when defining variables can be significantly reduced.



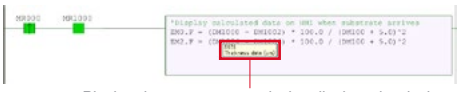
Immediately available entry support function

The auxiliary guidance function allows for smoother entry by providing a list of functions and input details for each function. In addition, pressing the F1 key will display a help window for the selected function.



Tool tip monitor

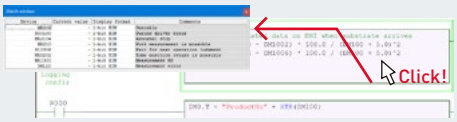
Simply placing the cursor over the device during monitoring displays the device comments and current values, so monitoring a device is easy.



Placing the cursor over a device displays the device comments and the current value (during monitoring)

Watch window

Monitoring all devices within KV Script is possible just by clicking the device during monitoring. This allows for debugging in much the same way as a ladder program monitor.



Usable operators and control statements in KV Script

Operator

Type	Operator	Description
Arithmetic	+	Calculate sum of 2 values (addition)
	-	Calculate difference of 2 values (subtraction)
	*	Finds the product of 2 values (multiplication)
	/	Calculate quotient of 2 values (division)
	^	Calculate the power
	MOD	Divide 2 values, return remainder
Compare	<	Less than
	<=	Less than or equal to (or less)
	>	Larger than
	>=	Greater than or equal to (above)
	=	Equal to (equivalent)
	<>	Unequal to (inequivalent)
Assign	=	Substitute the right into the left
	+=	Left plus Right
	-=	Left minus Right
	*=	Left multiplied by Right
	/=	Left is divided by Right
Character string	+, &	Connect 2 character strings
Logic	AND	Logical multiplication of 2 values
	OR	Logical addition of 2 values
	XOR	EOR(exclusive or) of 2 values
	NOT	Logical negation of a value

Control Statement

Type	Control Statement	Description

Conditional branch	IF statement	IF <Conditional expression 1> THEN
		(If Conditional expression 1 is true, executed)
		ELSE IF <Conditional expression 2> THEN
		(If Conditional expression 2 is true, executed)
		ELSE IF <Conditional expression 3> THEN
		(If Conditional expression 3 is true, executed)
		ELSE
		(If all conditional expressions are not true, executed)
		END IF

	SELECT statement	SELECT CASE <Device comparison> CASE <Condition 1> (If equal to condition 1, executed) CASE <Condition 2>, <Condition 3> (If equal to condition 2 or condition 3, executed) CASE <Condition 4> TO <Condition 5> (If in between condition 4 and condition 5, executed) CASE IS <Comparison> <Condition 6> (If the comparison with 6 is true, executed) CASE ELSE (If equal to none of the conditions, executed) END SELECT

Type	Control Statement	Description
Conditional branch	MC statement	MC <Conditional expression> THEN (If the conditional expression is true, executed) MCR
Loop control	FOR statement	FOR <Looping conditional expression> (If the looping conditional expression is met, looping is executed) NEXT
	WHILE statement	WHILE <Conditional expression> (When the conditional expression is met, looping is executed) END WHILE
	DO statement	DO (Until the conditional expression is met, looping is executed) UNTIL <Conditional expression>

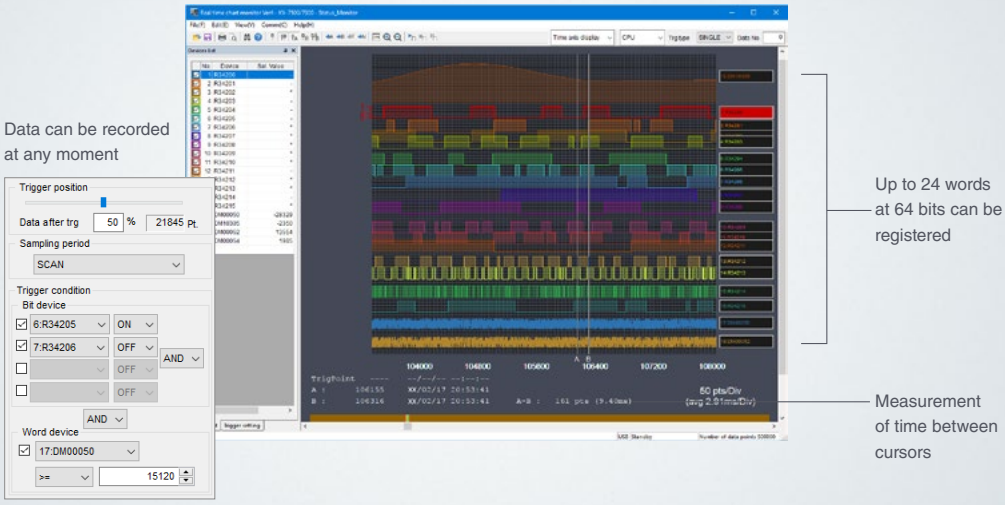
Data Type

Suffix	Description
(Device) .U	Processed as unsigned 16-bit data* (0 to 65535)
(Device) .S	Processed as signed 16-bit data (-32768 to 32767)
(Device) .D	Processed as unsigned 32-bit data (0 to 4294967295)
(Device) .L	Processed as signed 32-bit data (-2147483648 to 2147483647)
(Device) .F	Processed as floating real number data -3.4E38 ≤ n ≤ -1.4E - 45 n = 0 1.4E - 45 ≤ n ≤ 3.4E38 (Significant digits: Approx. 7 digits)
(Device) .DF	Handled as double precision floating point actual number data -1.79E + 308 ≤ n ≤ -2.23E - 308 n = 0 + 2.23E - 308 ≤ n ≤ +1.79E + 308 (Significant digits: Approx. 16 digits)
(Device) .B	Processed as bit data (ON: true, OFF: false)
(Device) .T	Processed as text string data

* .U can be omitted when programming. Word device without suffix is handled as 16-bit unsigned data.

Oscilloscope function: Taking advantage of high-speed PLCs

Real-time chart monitor

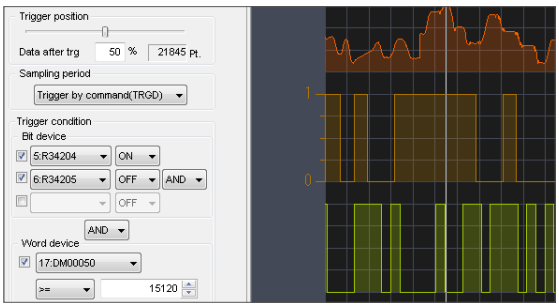


Instantaneous changes are not missed

Because data is acquired by the CPU unit, instantaneous changes that are conventionally only picked up by an oscilloscope can be accurately detected.

Trace function

Take advantage of not only a monitoring function but also a trace function that obtains data before and after an event occurs. This function can help determining causes when a problem occurs.



Local device and local label display compatibility

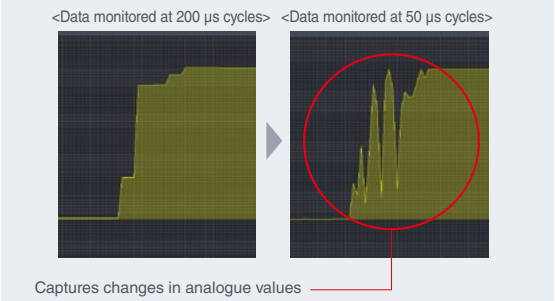
Due to support for local devices and local label displays, equal usability can be achieved in structured programs even when local devices and labels are used.

Simultaneous monitoring of 24 words at 64 bits

Simultaneous monitoring of up to 24 words at 64 bits is possible. This enables to perform simultaneous, batch monitoring of control performing high-speed handshaking and inspections that have a large number of measurement items.

50 µs cycle monitoring that surpasses scanning limitations

Achieve real-time monitoring with no lost information even with high-speed signals when using a 50 µs fixed-period module. In addition, setting trigger conditions to TRGD makes configuration simple.



500,000 samples

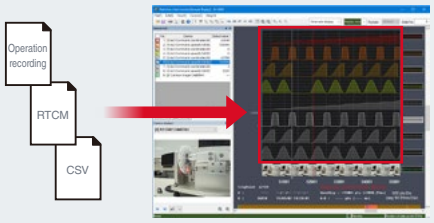
Even when 24 words at 64 bits are monitored simultaneously, up to 500,000 data points can be recorded in the log, so it is possible to determine the status of devices from a series of cycles performed by equipment even in applications that perform high-speed sampling.

Simulator support

The KV STUDIO Simulator function is supported. The status of devices can be displayed as waveforms even if no PLC is present, which enables efficient debugging.

Waveform comparison function

Check by comparing with previously recorded data. This function is useful for checking changes in behaviour after changing a parameter and for identifying error points compared to normal.

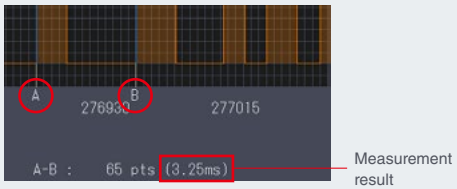


Real-time XY display

A new way to view the XY display (lines/dots) is now supported. This makes it possible to check movement (such as trace control using two axes) as-is in two dimensions, which improves debugging capability.

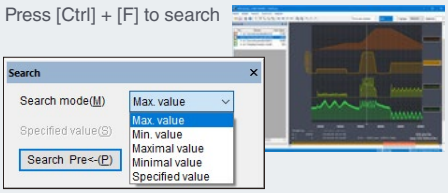
Analysis function using cursors

Cursors can be used to measure the time between two points or to check the information of multiple devices indicated by the cursors. This is useful in reducing takt time and monitoring for symptoms.



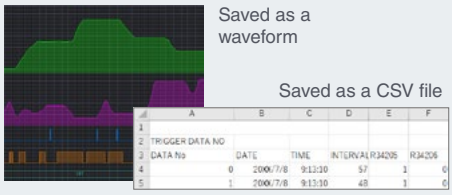
Immediately search where you want to see

Within the obtained data, it is possible to search for and jump to the maximum value, minimum value, local maximum, local minimum, etc. This enables to easily perform cause analysis during debugging.



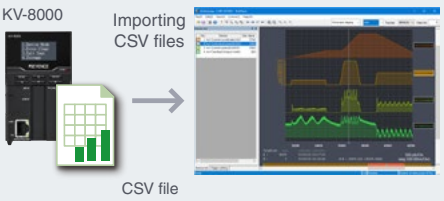
Two formats to save data

When it is necessary to analyse the obtained data at a later time, it can be saved in one of two formats: as a waveform or as a CSV file.



Importing CSV files

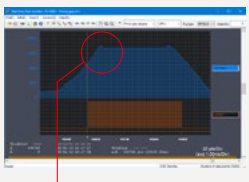
CSV files logged by the KV Series can be imported and analysed. Data can also be compared by processing multiple logging data entries into a single file.



Applications

Checking for analogue waveform and sensor offset at a glance

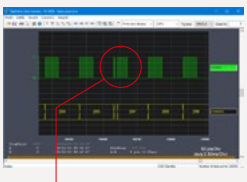
When the timing sensor is on, the measurement instrument values are monitored, but the obtained measured values may differ from the actual values.



Timing sensor rising edge and offset

Immediate cause determination by accurately catching high-speed signals

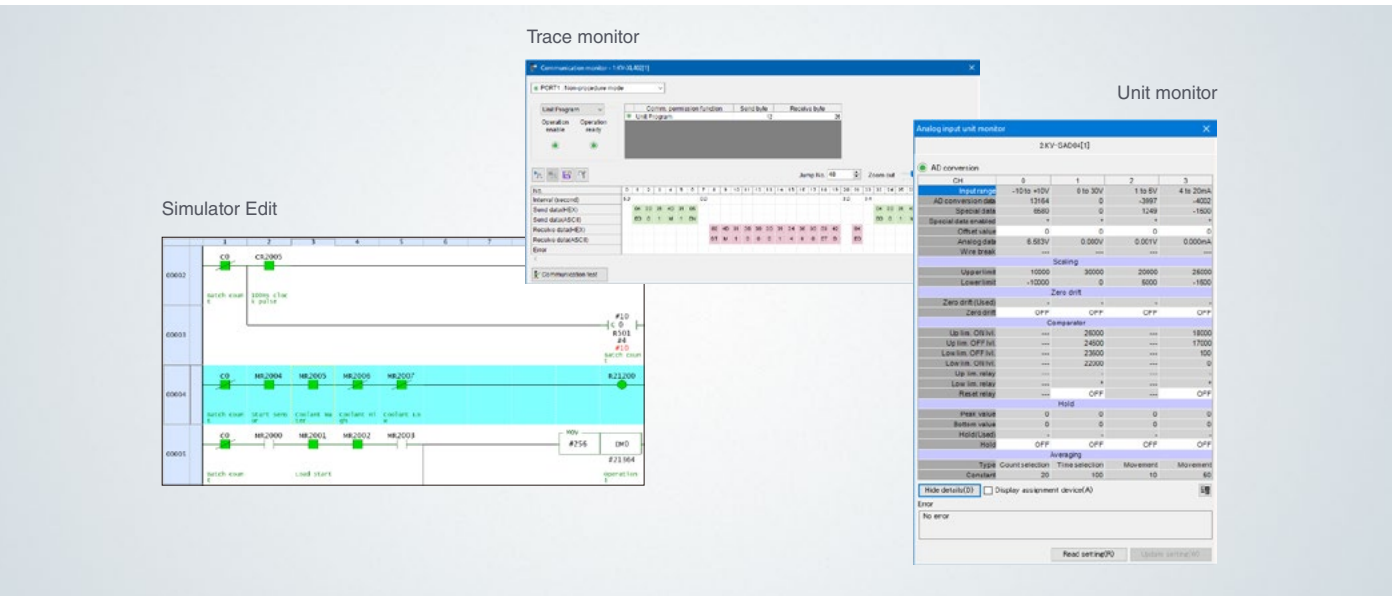
When counting the number of connector pins, there are sometimes errors in the count. It is necessary to analyse the cause of this problem.



Erroneous sensor output detected

Compatible with simulator edit

Simulator/Various monitoring functions



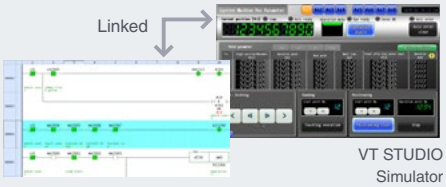
Simulator Edit

The simulator function also includes an editor function that enables debugging even without a PLC unit. This allows for comfortable simulation just as with online editing.

Ctrl Shift F2 Start Simulator Edit F11 Transmit Simulator Edit

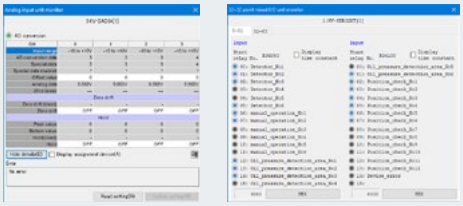
VT simulator link

Simulations can be created by linking KV STUDIO and VT STUDIO. Also, taking advantage of Simulator Edit allows for efficient debugging.



Dedicated monitors for each unit

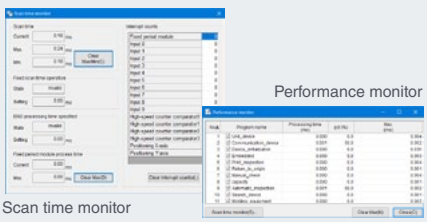
A dedicated monitor is provided for each unit, from high-speed I/O units to high-speed analogue units. Immediately ascertain unit statuses during debugging and maintenance.



Monitor for KV-SAD04 Monitor for KV-SIR32XT

Various monitoring functions for understanding execution status

With a PLC in pursuit of high-speed performance, the monitor functions related to processing times are improved. These improvements are useful for debugging in pursuit of takt times, from scan times to module processing times.



Derivation monitor

The derivation monitor allows confirmation of rising and falling signals, which were difficult to confirm with conventional monitors. Differential detection can also be performed without adding a command for debugging.

Event/Error monitor

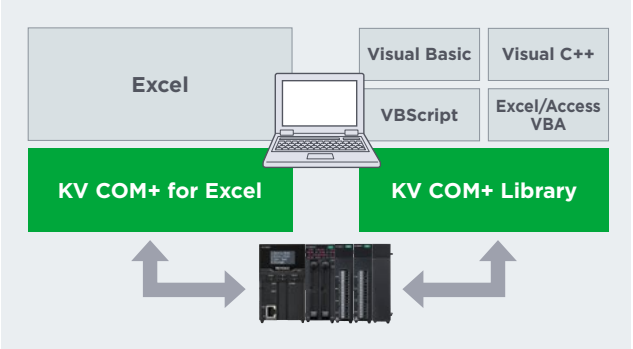
This built-in function improves reliability, availability, and serviceability by keeping a log of errors, user alarms, PLC events, and device value changes.

Supports PLC data collection/transmission and monitoring

KV COM+ for Excel/Library

"KV COM+" two applications

To connect a PC and a PLC, this software enables to perform program-free connection without concerning about cumbersome communication protocol such as serial and Ethernet communications. The lineup of software includes "KV COM+ for Excel", which can import PLC-internal devices to Excel with no programming, and "KV COM+ Library", which can construct advanced system configurations in combination with other applications.

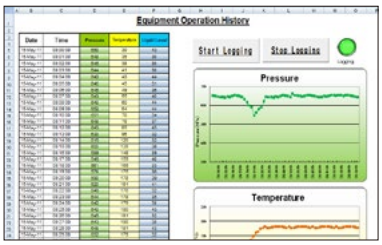


Three basic functions*

* Functions for KV COM+ for Excel

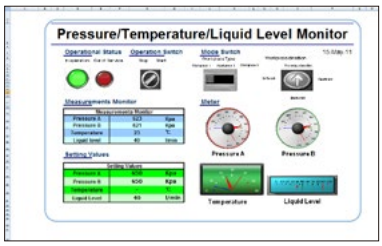
Data logging

Freely downloads and stores PLC-internal devices to Excel without programs.



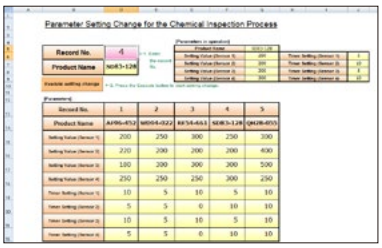
PLC monitor

Can display the condition of PLC devices in real-time on the monitor of an off-site PC.



Data folder

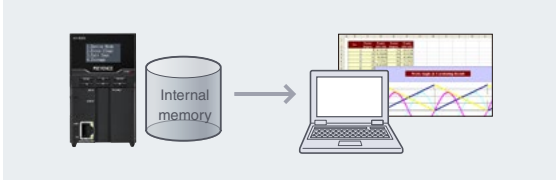
Can perform batch rewriting of PLC-internal data (setting values, current values, etc.) from an Excel list.



Basic Performance

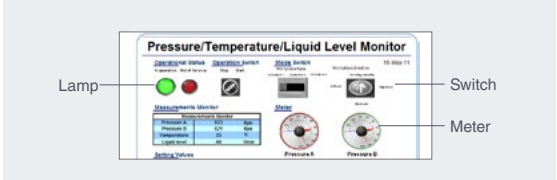
Equipped with real-time logging/trace functions

Enables high-speed logging as fast as 10 ms with the new algorithm which downloads data to PC while constantly buffering data in the PLC.



GUI parts prepared as standard

Switches, lamps, and meters have been prepared as standard to increase the operational feeling and visibility on a PC. This helps to reduce software development time and improve visibility.



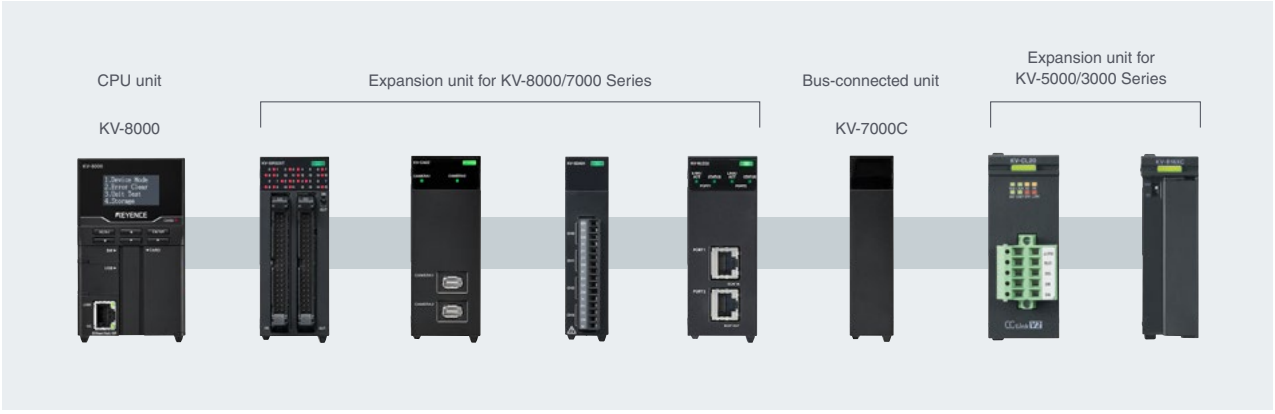
CPU Unit KV-8000 Series

CPU unit
KV-8000

EtherNet/IP™

Basic performance ▷	Program capacity: 1500 k steps max.	CPU memory capacity: 64 MB	LD instruction speed: 0.96 ns
Functions ▷	Machine Operation Recorder function		
Communication port ▷	EtherNet/IP™	USB 2.0	
Left unit ▷	AC power supply unit with error output KV-PU1		

Unit configuration



Camera units, others

Camera input unit
KV-CA02

Compact standard camera
KV-CA1H

Wide field and high-resolution camera
KV-CA1W

SD cards

Industrial SD card
KV-M16G/M4G

General specifications

Item	Specifications				
System configuration	System configuration using an expansion unit for KV-5000/3000 Series			System configuration using an expansion unit for KV-8000/7000 Series only	
Power voltage	24 VDC (±10%)			24 VDC (-15%/+20%)	
Operating ambient temperature	0 to +50°C (No freezing)			0 to +55°C (No freezing)	
Operating ambient humidity	10 to 95% RH (No condensation)			5 to 95% RH (No condensation)	
Storage ambient temperature	-20 to +70°C			-25 to +75°C	
Storage ambient humidity	10 to 95% RH (No condensation)			5 to 95% RH (No condensation)	
Operating environment	No dust or corrosive gas				
Operating altitude	2000 m or less				
Pollution degree	2				
Noise immunity	1500 Vp-p or more, Pulse width: 1 µs, 50 ns (based on a noise simulator), IEC standard-compliant (IEC61000-4-2/3/4/6)				
Withstand voltage	1500 VAC, 1 minute (between the power supply terminal and the I/O terminals and between the external terminals and the case)				
Insulation resistance	50 MΩ or more (between the power terminals and the I/O terminals, and between the external terminals and the case, with 500 VDC megohmmeter)				
Vibration resistance	Compliant with JIS B 3502 and IEC61131-2	Intermittent vibration			No. of scans
		Frequency	Acceleration	Half amplitude	10 times in each of X, Y, and Z directions (for 100 min.)
		5 to 9 Hz	-	3.5 mm	
		9 to 150 Hz	9.8 m/s²	-	
		Continuous vibration			
		Frequency	Acceleration	Half amplitude	
		5 to 9 Hz	-	1.75 mm	
		9 to 150 Hz	4.9 m/s²	-	
Impact resistance	Acceleration 150 m/s², Operation time 11 ms, twice in each of the X, Y and Z directions				
Internal current consumption*	400 mA or less				
Weight	KV-8000: Approx. 340 g, KV-B1 (battery): Approx. 10 g				

*The maximum current consumption is 3.2 A when using the expansion unit.

Functional socket

Model	Number of sockets		Port number
	TCP	UDP	
PC application*1	16	0	8500 (set within the range of 1 to 65535)
Host link communication*2 *3	Total 15	1	8501 (set within the range of 1 to 65535)
MC protocol communication*2 *3		1	5000 (set within the range of 1 to 65535)*4
VT connection	0	1	8502 (set within the range of 1 to 65535)
FTP server	4	-	20, 21
Automatic clock data adjustment	-	1	123
E-mail transmission and reception (SMTP, POP3)	2	-	25, 110
DNS	-	1	53
FTP client	2	-	20, 21 (set within the range of 1 to 65535)
EtherNet/IP™ cyclic communication function	Total 320	1	2222
EtherNet/IP™ message communication function		1	44818
KV socket communication	Total 16		Arbitrary value (set within the range of 1 to 65535)

*1 KV STUDIO, KV COM+ *2 TCP socket and UDP socket can be used simultaneously.
*3 Up to 15 TCP sockets can be used. *4 Port numbers can be set to TCP socket and UDP socket individually.

Specifications - Camera input unit

Model	KV-CA02
Connectable CPU units	KV-8000
Maximum number of connected units	4
Number of ports	2
Supported camera models	KV-CA1H (Compact standard camera) KV-CA1W (Wide field and high-resolution camera)
Cable length	5/10/20 m
Recording time	Approx. 3 minutes*1
Internal current consumption	260 mA or less*2
Weight	Approx. 190 g

*1 Record time for one KV-CA1H with the following configuration of settings (initial value). The actual recording time varies depending on the number of devices, the frame rate, and the image quality settings.
Frame rate: 30 fps
Image quality: 3
In addition, the recorded video is cleared when the power is turned off.
*2 Internal current consumption for the KV-CA02 only. Connecting a camera adds the internal current consumption of the connected camera.

General specifications - Camera

Model	KV-CA1H	KV-CA1W
Operating ambient temperature	0 to 50°C (No freezing)	
Operating ambient humidity	35 to 85% RH (No condensation)	
Storage ambient temperature	-20 to 60°C (No freezing)	
Storage ambient humidity	35 to 85% RH (No condensation)	
Pollution degree	3	
Vibration resistance	10 to 500 Hz, Power spectral density: 0.033 G²/Hz, Directions of X, Y, and Z	
Enclosure rating	IP65F*1	

*1 The enclosure rating is evaluated with the camera cable connected.

Performance specifications

Model			KV-8000
Arithmetic control mode			Stored program mode
I/O control mode			Refresh mode
Program language			Expanded ladder, KV Script, mnemonic
Number of commands	Basic instructions		80 classes, 181 instructions
	Applied instructions		50 classes, 67 instructions
	Arithmetic operation instruction		125 classes, 318 instructions
	Extended instructions		77 classes, 132 instructions
	Total		332 classes, 698 instructions
Instruction execution speed	Basic instructions		Min. 0.96 ns
	Applied instructions		Min. 5.75 ns
	Double precision floating-point instruction		Min. 58 ns
CPU memory capacity			64 MB
Program capacity			Approx. 1500 k steps
Maximum number of units to be installed			16 units (KV-8000/7000 Series expansion unit only) 48 units (KV-8000/7000 Series expansion unit, KV-5000/3000 Series expansion unit (when extension unit (KV-EB1) is used))
Maximum number of I/O points			Maximum 3072 points for expansion (KV-EB1S/KV-EB1R: 2 units used, 64-point unit used)
Bit device	Input relay	R	Total 32000 points 1 bit
	Output relay		
	Internal auxiliary relay		
	Link relay	B	32768 points 1 bit
	Internal auxiliary relay	MR	64000 points 1 bit
	Latch relay	LR	16000 points 1 bit
	Control relay	CR	1280 points 1 bit
Word device	Timer	T	4000 points 32 bits
	Counter	C	4000 points 32 bits
	Data memory	DM	65535 points 16 bits
	Expansion data memory	EM	65535 points 16 bits
	File register (Current bank)	FM	524288 points 16 bits
	File register (Dial mode)	ZF	
	Link register	W	32768 points 16 bits
	Temporary memory	TM	512 points 16 bits
	Index register	Z	12 points 32 bits
	Control memory	CM	7600 points 16 bits
Number of comments/labels stored in main unit	Device comment		Approx. 224000
	Label		Approx. 285000
Power failure hold function	Program memory		Flash ROM can be written 10000 times
	Device		Nonvolatile RAM
	Calendar timer		Backup condenser lasts approx. 15 days (at 25°C) (Approx. 5 years with KV-B1 (battery) (at 25°C))
Self-diagnosis function			CPU error, RAM error, other

EtherNet/IP™ communication specifications

Model				Specifications
Supported transmission rate				100BASE-TX
CIP service	Cyclic communication	Number of connections		256*1
		RPI (Communication cycle)		0.5 to 10000 ms (in units of 0.5 ms) Can be set per connection. (Data is updated regardless of the number of nodes.)
		Transmission trigger	Output to adapter	Cyclic
			Input from adapter	Cyclic/Change Of State*2
		Allowable band for cyclic communication	(at 504 bytes)	10000 (pps)*3
			(at 1444 bytes)	5000 (pps)*3
		Maximum number of refresh words		16 k words
		Maximum data size for 1 connection*4		504 bytes or 1444 bytes
		Multicast filtering function*5		Provided (IGMP client function)
	Message communication	Class 3 (connection type)	Server	Number of connections: 256*6
		UCMM (non-connection type)	Client	Number of simultaneous actions: 32
			Server	Number of simultaneous actions: 96
EtherNet/IP™ conformance test				Compliant with CT15

*1 In total, the number of connections used for the message communication function in Class 3 (connection type) should be a maximum of 256. *2 Can communicate with devices that output data using the Change Of State (send data when any change occurs) method. *3 Abbreviation of "packet per second," indicating the number of sent/received packets that can be processed per second. *4 Data synchronism in connections is guaranteed. Also, when using 505 bytes or more, the device used must support Large Forward Open (an optional CIP specification). *5 The included IGMP client function enables to filter out the unnecessary multicast packets by using an Ethernet switch that supports IGMP snooping. *6 In total, the number of connections used for the cyclic communication function should be a maximum of 256.

Specifications - Camera

Model	KV-CA1H	KV-CA1W
Installation distance	200 mm to ∞	100 mm to ∞
Focal point distance	3.8 mm (fixed)	1.05 mm (fixed)
Field of view	Horizontal viewing angle: Approx. 60° Vertical viewing angle: Approx. 47°	Horizontal viewing angle: Approx. 180° Vertical viewing angle: Approx. 150°
Image sensor	1/2.9 inch colour CMOS	
Resolution	640 (H) × 480 (V)	1280 (H) × 960 (V)
Frame rate	10 / 30 / 120 fps	10 / 30 fps
Internal current consumption*1	70 mA or less	70 mA or less
Weight	Approx. 90 g	Approx. 140 g

*1 Maximum current consumption inside the camera when the power supplied to the CPU unit is 24 VDC (-15%/+20%). The maximum current consumption inside the camera is 120 mA when the unit power supplied to the camera is 12 to 24 V (-10%/+20%).

CPU Unit KV-7000 Series

CPU unit
KV-7500

EtherNet/IP™

Basic performance ▷	Program capacity: 1500 k steps max.	CPU memory capacity: 64 MB	LD instruction speed: 0.96 ns
Communication port ▷	EtherNet/IP™	USB 2.0	
Left unit ▷	AC power supply unit with error output KV-PU1		

CPU unit
KV-7300

Basic performance ▷	Program capacity: 160 k steps max.	CPU memory capacity: 21 MB	LD instruction speed: 0.96 ns
Communication port ▷	RS-232C	USB 2.0	
Left unit ▷	AC power supply unit with error output KV-PU1		

CPU unit KV-5000/3000 Series

CPU unit
KV-5500

EtherNet/IP™

- Program capacity: 260k steps
- LD instruction: 10 ns
- EtherNet/IP™

CPU unit
KV-5000

FL-net

- Program capacity: 260k steps
- LD instruction: 10 ns
- Ethernet/FL-net

CPU unit
KV-3000

- Program capacity: 160 k steps
- LD instruction: 10 ns
- RS-232C

Power Supply Units, Others

AC Power Supply Unit with Error Output
KV-PU1

Calendar timer retention battery
KV-B1

AC Power Unit
KV-U7

Error Output Unit
KV-DR1

Bluetooth Unit
KV-BT1

Bluetooth®

Performance specifications - CPU unit - KV-7000/5000/3000 Series

Model				KV-7500	KV-7300	KV-5500	KV-5000	KV-3000
Arithmetic control mode				Stored program mode				
I/O control mode				Refresh mode				
Program language				Expanded ladder, KV Script, mnemonic				
Number of commands	Basic instructions			80 classes, 181 instructions		81 classes, 182 instructions		
	Applied instructions			50 classes, 67 instructions		42 classes, 59 instructions		
	Arithmetic operation instruction			125 classes, 318 instructions		124 classes, 315 instructions		
	Extended instructions			76 classes, 131 instructions		98 classes, 147 instructions		
	Total			331 classes, 697 instructions		345 classes, 703 instructions		
Instruction execution speed	Basic instructions			Min. 0.96 ns		Min. 10 ns		
	Applied instructions			Min. 5.75 ns		Min. 20 ns		
	Double precision floating-point instruction			Min. 58 ns		Min. 2350 ns		
CPU memory capacity				64 MB	21 MB	-		
Program capacity				Approx. 1500 k steps	Approx. 160 k steps	Approx. 260 k steps		Approx. 160 k steps
Maximum number of units to be installed				16 units (KV-7000 Series expansion unit only), 48 units (KV-7000 Series expansion unit, KV-5000/3000 Series expansion unit (when extension unit (KV-EB1) is used))		16 units (48 units when expansion units are connected)		
Maximum number of I/O points				Maximum 3072 points for expansion (KV-EB1S/KV-EB1R: 2 units used, 64-point unit used)		Maximum 3096 points for expansion (KV-EB1S/KV-EB1R: When 2 units are expanded, 64-point I/O unit is used)		
Bit device	Input relay		R	Total 32000 points* 1 bit		Total 16000 points 1 bit		
	Output relay							
	Internal auxiliary relay							
	Link relay		B	32768 points 1 bit		16384 points 1 bit		
	Internal auxiliary relay		MR	64000 points 1 bit		16000 points 1 bit		
	Latch relay		LR	16000 points 1 bit		16000 points 1 bit		
	Control relay		CR	1280 points 1 bit		640 points 1 bit		
Word device	Timer		T	4000 points 32 bits				
	Counter		C	4000 points 32 bits				
	Data memory		DM	65535 points 16 bits				
	Expansion data memory		EM	65535 points 16 bits				
	File register	Current bank	FM	524288 points 16 bits		131072 points 16 bits		
		Dial mode	ZF					
	Link register		W	32768 points 16 bits		16384 points 16 bits		
	Temporary memory		TM	512 points 16 bits				
	Index register		Z	12 points 32 bits				
	Control memory		CM	6000 points 16 bits				
Number of comments/ labels stored in main unit	Device comment			Approx. 224000	Approx. 102000	Approx. 96000		Approx. 30000
	Label			Approx. 285000	Approx. 131000	Approx. 137000		Approx. 44000
Power failure hold function	Program memory			Flash ROM can be written 10000 times		Flash ROM can be written 100000 times		
	Device			Nonvolatile RAM		5 years (operating ambient temperature of 25°C in the power failure hold mode)		
	Calendar timer			Backup condenser lasts approx. 15 days (at 25°C) (Approx. 5 years with KV-B1 (battery) (at 25°C))				
Self-diagnosis function				CPU error, RAM error, other				

* In the case of CPU function version 2.2 or earlier, the total of R is 16000 relays

Performance specifications - AC power unit (for KV-8000, KV-7000 Series)

Model			KV-PU1
Input supply voltage			100 to 240 VAC (-15%/+10%) (50/60 Hz)
Output voltage			24 VDC ±10%
Output capacity			1.8 A (total power supply to various units and extra power supply)
Internal power consumption			0.96 A or less
Momentary stop time			20 ms or less (depending on rated I/O conditions)
Starting time			Max. 3 sec. or less
Error output	Output mode		Relay (NC contact)
	Rated load		24 VDC, 0.5 A
	ON resistance		50 mΩ or less
	Response time	OFF to ON	10 ms or less
		ON to OFF	5 ms or less
	Relay life		Electrical: 100000 times or more (20 times/min.) Mechanical: 20 million times or more
	Relay replacement		Impossible
Weight			Approx. 300 g

Performance specifications - Error output unit

Model		KV-DR1
Output mode		Relay (NC contact)
Rated load		24 VDC, 0.5 A
ON resistance		50 mΩ or less
Response time	OFF to ON	10 ms or less
	ON to OFF	5 ms or less
Relay life		Electrical: 100000 cycles or more (20 cycles/minute)
		Mechanical: 20 million cycles or more
Relay replacement		Impossible
Internal current consumption		5 VDC, 30 mA or less (supplied from the CPU unit)
Weight		Approx. 90 g

General specifications - CPU unit - KV-7000/5000/3000 Series

Item	Specifications	
System configuration	System configuration using an expansion unit for KV-5000/3000 Series	System configuration using an expansion unit for KV-7000 Series only
Power voltage	24 VDC (±10%)	24 VDC (-15%/+20%)
Operating ambient temperature	0 to +50°C (No freezing)	0 to +55°C (No freezing)
Operating ambient humidity	10 to 95% RH (No condensation)	5 to 95% RH (No condensation)
Storage ambient temperature	-20 to +70°C	-25 to +75°C
Storage ambient humidity	10 to 95% RH (No condensation)	5 to 95% RH (No condensation)
Operating environment	No dust or corrosive gas	
Operating altitude	2000 m or less	
Pollution degree	2	
Noise immunity	1500 Vp-p or more, Pulse width: 1 µs, 50 ns (based on a noise simulator), IEC standard-compliant (IEC61000-4-2/3/4/6)	
Withstand voltage	1500 VAC, 1 minute (between the power supply terminal and the I/O terminals and between the external terminals and the case)	
Insulation resistance	50 MΩ or more (between the power terminals and the I/O terminals, and between the external terminals and the case, with 500 VDC megohmmeter)	
Vibration resistance	Compliant with JIS B 3502 and IEC61131-2	Intermittent vibration: Frequency / Acceleration / Half amplitude; 5 to 9 Hz / - / 3.5 mm; 9 to 150 Hz / 9.8 m/s² / -; Continuous vibration: Frequency / Acceleration / Half amplitude; 5 to 9 Hz / - / 1.75 mm; 9 to 150 Hz / 4.9 m/s² / -; No. of scans: 10 times in each of X, Y, and Z directions (for 100 min.)
Impact resistance	Acceleration 150 m/s², Operation time 11 ms, twice in each of the X, Y and Z directions	
Internal current consumption	CPU unit	KV-7500: 200 mA or less, KV-7300: 200 mA or less, KV-5500: 320 mA or less, KV-5000: 320 mA or less, KV-3000: 320 mA or less
	Extension	KV-EB1S: 15 mA or less, KV-EB1R: 25 mA or less
Weight	CPU unit	KV-7500: Approx. 270 g, KV-7300: Approx. 270 g, Bus connection unit: Approx. 130 g, KV-B1 (battery): Approx. 10 g, KV-5500: Approx. 320 g, KV-5000: Approx. 320 g, KV-3000: Approx. 300 g
	End unit	Approx. 30 g
	Start unit	Start unit for KV-5500/5000/3000: Approx. 20 g
	Extension unit	KV-EB1S: Approx. 90 g, KV-EB1R: Approx. 115 g

Performance specifications - AC power unit (for KV-5000/3000, KV-EB1)

Model	KV-U7
Input supply voltage	100 to 240 VAC ±10% (50/60 Hz)
Output voltage	24 VDC ±10%
Output capacity	1.8 A (total power supply to various units and extra power supply)
Internal power consumption	135 VA or less
Momentary stop time	10 ms or less
Starting time	2 sec. or less
Weight	Approx. 190 g

Performance specifications - Bluetooth unit

Model	KV-BT1
Bluetooth® version	Bluetooth® Ver. 2.0 + EDR
Frequency band	2402 MHz to 2480 MHz
Output class	Class 2-compatible
Transmission method	FH-SS (Frequency hopping spread spectrum)
Used profile	SPP
Communication distance	10 m * Varies depending on the environment.
Product definition by radio laws in each country*1	Japan: * Device with built-in wireless module with construction certification.
	America: * Device with FCC Part 15C-compliant built-in wireless module. FCC ID: RYYEYXFDC
	Canada: * Device with RSS-210-compliant built-in wireless module. IC ID: 4389A-EYXFDC
	EU Member States (RE directive)
	China (SRRC wireless certification)
	Taiwan (NCC wireless certification)
	Singapore (IMDA wireless certification)
	Thailand (NTC radio regulation)
Supported CPU unit	KV-5500, KV-5000 (Ver. 1.1 or later), KV-3000 (Ver. 2 or later)

*1 Use KV-BT1 only in countries that support the Radio Act. If used in any other country, be sure to use according to the laws and ordinances regarding radio waves of that country.

High-speed I/O unit

Connector, 32-point input + 32-point transistor (sink) output

KV-SIR32XT

S-Unit

Basic performance ▷	Input response speed: 2 µs Output response speed: 1 µs	Unit interrupt supported in all points	Inter-unit synchronisation
Functions ▷	Buffering	Input capture	PWM output: 8 points
Hardware ▷	24 V/5 V input switching	All-point overcurrent protection output	LED display illumination

Input unit

16-point screw terminal block

KV-B16XC

32-point connector

KV-C32XC

64-point connector

KV-C64XC

Output unit

16-point screw terminal block relay output

KV-B16RC

8-point screw terminal block relay output (independent common point)

KV-B8RC

16-point screw terminal block transistor (sink) output with overcurrent protection

KV-B16TD

16-point screw terminal block transistor (source) output

KV-B16TCP

32-point connector transistor (sink) output with overcurrent protection

KV-C32TD

32-point connector transistor (source) output

KV-C32TCP

64-point connector transistor (sink) output with overcurrent protection

KV-C64TD

64-point connector transistor (source) output

KV-C64TCP

I/O unit

Screw terminal block 8-point input + 8-point transistor (sink) output

KV-B8XTD

Connector 16-point input + 16-point transistor (sink) output

KV-C16XTD

Connector 32-point input + 32-point transistor (sink) output

KV-C32XTD

Specifications - Input

Model	KV-B16XC		KV-C32XC		KV-C64XC
External connection method	Removable terminal block		Connector (MIL standard)*1		
Number of inputs	16 points		32 points		64 points
Input mode	24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode	24 VDC mode*4
Maximum input voltage	26.4 VDC				
Rated input voltage	24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 4.1 mA
Minimum ON voltage	19 V	3.5 V	19 V	3.5 V	19 V
Maximum OFF current	1.5 mA	-	1.5 mA	-	1.5 mA
Maximum OFF voltage	-	1.5 V	-	1.5 V	-
Common method	16 points/1 common (2 terminals)*2		32 points/1 common (2 terminals)*2		32 points/1 common (2 terminals) × 2*3
Input time constant (four-level switching)	See table below				
Input impedance	4.3 kΩ				5.6 kΩ
Internal current consumption	15 mA or less				25 mA or less
Weight	Approx. 120 g		Approx. 110 g		Approx. 140 g

Input time constant setting	OFF to ON		ON to OFF	
	Typ.	Max.	Typ.	Max.
25 µs	25 µs	65 µs	75 µs	120 µs
300 µs*5	275 µs	365 µs	275 µs	420 µs
1 ms	1 ms	1.2 ms	1 ms	1.2 ms
10 ms	10 ms	12 ms	10 ms	12 ms

*1 Connectors for connector-type I/O units are not included XC Series Terminal Block Conversion Unit is available.
*2 Even though KV-B16XC and KV-C32XC have two common points, they are the same internally.
*3 Although KV-C64XC has four common points, the H side (2 points) are the same, and the L side (2 points) are the same as internal points.
*4 All terminals are compatible with the 2-wire system (However, EV Series 2-wire system proximity sensors are not supported).
*5 Configurable only when KV-8000/7500/7300/5500/5000/3000 is connected. Cannot be selected when connected to KV-1000/700.

Specifications - Output

Model		KV-B16RC	KV-B8RC	KV-B16TD	KV-B16TCP	KV-C32TD	KV-C32TCP	KV-C64TD	KV-C64TCP
External connection method		Removable terminal block				Connector (MIL standard)*1			
Number of outputs		16 points	8 points	16 points		32 points		64 points	
Common method		8 points/1 common	Independent	16 points/1 common (2 terminals)*2		32 points/1 common (2 terminals)*2		64 points/1 common (4 terminals)*3	
Output mode		Relay		MOSFET (sink) (with overcurrent protection function)	Transistor (source)	MOSFET (sink) (with overcurrent protection function)	Transistor (source)	MOSFET (sink) (with overcurrent protection function)	Transistor (source)
Rated load		250 VAC/30 VDC, 2A (8 A/1 common)	250 VAC/30 VDC, 2 A	30 VDC, 0.3 A	30 VDC, 0.2 A	30 VDC, 0.2 A			
Leakage current at OFF		-		100 µA or less					
Residual voltage at ON				0.5 V or less					
ON resistance		50 mΩ or less		-					
Operation time	OFF to ON	10 ms or less		100 µs or less	10 µs or less	100 µs or less	10 µs or less	150 µs or less	50 µs or less
	ON to OFF			300 µs or less	200 µs or less	300 µs or less	200 µs or less	300 µs or less	200 µs or less
Internal current consumption		120 mA or less	65 mA or less	45 mA or less	30 mA or less	65 mA or less	55 mA or less	120 mA or less	100 mA or less
Weight		Approx. 190 g	Approx. 160 g	Approx. 130 g		Approx. 100 g		Approx. 140 g	

*1 Connectors for connector-type I/O units are not included XC Series Terminal Block Conversion Unit is available.
*2 Although KV-B16TD, KV-C32TD, KV-B16TCP, and KV-C32TCP have two points, they are the same internally.
*3 Although KV-C64TD and KV-C64TCP have four points, they are the same internally.

Specifications - I/O

Model		KV-SIR32XT (32 points + 32 points)		KV-B8XTD (8 + 8 points)		KV-C16XTD (16 + 16 points)		KV-C32XTD (32 points + 32 Points)
External connection method		Connector (MIL specification)*1		Removable terminal block		Connector (MIL standard)*1		
Input	Number of inputs	32 points		8 points		16 points		32 points
	Input mode	24 VDC mode	5 VDC mode*2 (with overvoltage protection function*3)	24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode	24 VDC mode*4
	Maximum input voltage	28.8 VDC	6.0 VDC	26.4 VDC				
	Rated input voltage	24 VDC, 5.1 mA	5 VDC, 8.8 mA	24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 4.1 mA
	Minimum ON voltage	19 V	3.5 V	19 V	3.5 V	19 V	3.5 V	19 V
	Maximum OFF current	1.5 mA	-	1.5 mA	-	1.5 mA	-	1.5 mA
	Maximum OFF voltage	-	1.5 V	-	1.5 V	-	1.5 V	-
	Common method	16 points/1 common (2 terminals)*5		8 points/1 common (1 terminal)		16 points/1 common (1 terminal)		32 points/1 common (2 terminals)*6
	Input time constant	1 µs/10 µs/20 µs/100 µs/500 µs/1 ms/5 ms/10 ms/50 ms		25 µs/300 µs*7/1 ms/10 ms				
	Input impedance	4.4 kΩ	350 Ω	4.3 kΩ				5.6 kΩ
Output	Number of outputs	32 points		8 points		16 points		32 points
	Output mode	MOSFET (sink) (with overcurrent protection function)*8		MOSFET (sink) (with overcurrent protection function)				
	Rated load	30 VDC, 0.2 A (1.6 A/1 common)		30 VDC, 0.3 A		30 VDC, 0.2 A		
	Leakage current at OFF	100 µA or less		100 µA or less				
	Residual voltage at ON	0.5 VDC or less		0.5 VDC or less				
	Common method	16 points/1 common (2 terminals)*5		8 points/1 common (1 terminal)		16 points/1 common (1 terminal)		32 points/1 common (2 terminals)*6
	Operation time OFF to ON	1 µs or less: (Load: 5 mA to 200 mA)		100 µs or less				150 µs or less
	Operation time ON to OFF	5 µs or less: (Load: 5 mA to 200 mA)		300 µs or less				
Internal current consumption		130 mA or less		30 mA or less		40 mA or less		65 mA or less
Weight		Approx. 190 g		Approx. 130 g		Approx. 110 g		Approx. 130 g

*1 Connectors for connector-type I/O units are not included XC Series Terminal Block Conversion Unit is available.
*2 5 VDC mode can only be used with IN100 to IN115.
*3 If an overvoltage is detected, all inputs (IN100 to IN115) in the shared commons will be turned OFF until the power is cycled or until PRG is switched to RUN.
*4 All terminals are compatible with the 2-wire system (However, EV Series 2-wire system proximity sensors are not supported).
*5 The four input and output COMs (input COM0 and COM1, and output COM2 and COM3) are independent. For each COM, those with two terminals are short-circuited internally.
*6 Although there are two input COMs and two output COMs, these COM pairs are the same internally. The input COM and output COM terminals are independent.
*7 Configurable only when KV-8000/7500/7300/5500/5000/3000 is connected. Cannot be selected when connected to KV-1000/700.
*8 If an overcurrent is detected at even one point, protection operation (output OFF) will be enforced for all of the outputs in the shared commons (COM2: OUT200 to 215, COM3: OUT300 to 315) and automatic recovery will be repeated until the cause is eliminated.

High-speed analogue input unit

European terminal block with 4 input channels

KV-SAD04 S-Unit

Conversion speed: 10 µs	Resolution: 1/20000
Overall accuracy: ±0.1%*1	Unit interrupt
Inter-unit synchronisation	Buffering input
4 ch	Voltage/Current

*1 At 25°C ±5°C

High-speed analogue output unit

European terminal block with 4 output channels

KV-SDA04 S-Unit

Conversion speed: 10 µs	Resolution: 1/20000
Overall accuracy: ±0.1%*1	Unit interrupt
Inter-unit synchronisation	4 ch
Voltage/Current	

*1 At 25°C ±5°C

A/D conversion unit

Screw terminal block with 4 input channels

KV-AD40V

Conversion speed: 25 µs	Resolution: 1/20000
Overall accuracy*1 ±0.1%	4 ch
Voltage/Current	

*1 At 25°C ±5°C

Screw terminal block with 4 input channels

KV-AD40

Conversion speed: 80 µs	Resolution: 1/4000
Overall accuracy*1: ±0.2%	4 ch
Voltage/Current	

*1 At 25°C ±5°C

Screw terminal block with 4 input channels

KV-AD40G

Conversion speed: 80 µs	Resolution: 1/30000
Overall accuracy*1: ±0.05%	Buffering input
4 ch	Voltage/Current

*1 At 25°C ±5°C

D/A conversion unit, A/D and D/A conversion unit

Screw terminal block with 4 output channels

KV-DA40V

Conversion speed: 25 µs	Resolution: 1/20000
Overall accuracy*1 ±0.1%	4 ch
Voltage/Current	

*1 At 25°C ±5°C

Screw terminal block with 4 output channels

KV-DA40

Conversion speed: 80 µs	Resolution: 1/4000
Overall accuracy*1: ±0.2%	4 ch
Voltage/Current	

*1 At 25°C ±5°C

Screw terminal block with 2 input + 2 output channels

KV-AM40V

Conversion speed: 80 µs	Resolution: 1/8000
Overall accuracy*1: ±0.2%	Input: 2 ch, Output: 2 ch
Voltage/Current	

*1 At 25°C ±5°C

Temperature control unit

Screw terminal block with 4 input channels

KV-TF40

Conversion speed: 125 ms	Indicated accuracy: ±0.3%*1
Insulated between channels	Heating/cooling control
4 ch	Thermocouples/ Platinum temperature measurement resistance

*1 At 25°C ±5°C

Temperature/Analogue multi-input unit

Screw terminal block with 4 input channels

KV-TP40

Conversion speed: 50 ms/4 ch	Resolution: 1/20000
Overall accuracy*1: ±0.2%	Insulated between channels
4 ch	Thermocouples/Platinum temperature measurement resistance/Voltage/Current

*1 At 25°C ±5°C

Specifications - A/D conversion unit and D/A conversion unit

Model		Analogue input			Analogue output		
		KV-SAD04	KV-AD40V	KV-AD40	KV-SDA04	KV-DA40V	KV-DA40
Analogue I/O point		Input: 4 points (differential input)			Output: 4 points		
Analogue I/O range (resolution)		Input voltage: -10 to +10 V (0.5 mV 1/40000) -5 to +5 V (0.25 mV 1/40000) 0 to 10 V (0.5 mV 1/20000) 0 to 30 V (1.5 mV 1/20000) 0 to 5 V (0.25 mV 1/20000) 1 to 5 V (0.25 mV 1/16000) Input current: 0 to 20 mA (1 µA 1/20000) 4 to 20 mA (1 µA 1/16000)	Input voltage: -10 to +10 V (0.5 mV 1/40000) -5 to +5 V (0.25 mV 1/40000) 0 to 10 V (0.5 mV 1/20000) 0 to 5 V (0.25 mV 1/20000) 1 to 5 V (0.25 mV 1/16000) Input current: 0 to 20 mA (1 µA 1/20000) 4 to 20 mA (1 µA 1/16000)	Input voltage: -10 to +10 V (2.5 mV 1/8000) 0 to 10 V (2.5 mV 1/4000) 0 to 5 V (1.25 mV 1/4000) 1 to 5 V (1.25 mV 1/3200) Input current: 0 to 20 mA (5 µA 1/4000) 4 to 20 mA (5 µA 1/3200)	Output voltage: -10 to +10 V (0.5 mV 1/40000) 0 to 10 V (0.5 mV 1/20000) 0 to 5 V (0.25 mV 1/20000) 1 to 5 V (0.25 mV 1/16000) Output current: 0 to 20 mA (1 µA 1/20000) 4 to 20 mA (1 µA 1/16000)	Output voltage: -10 to +10 V (0.5 mV 1/40000) 0 to 10 V (0.5 mV 1/20000) 0 to 5 V (0.25 mV 1/20000) 1 to 5 V (0.25 mV 1/16000) Output current: 0 to 20 mA (1 µA 1/20000) 4 to 20 mA (1 µA 1/16000)	Output voltage: -10 to +10 V (2.5 mV 1/8000) 0 to 10 V (2.5 mV 1/4000) 0 to 5 V (1.25 mV 1/4000) 1 to 5 V (1.25 mV 1/3200) Output current: 0 to 20 mA (5 µA 1/4000) 4 to 20 mA (5 µA 1/3200)
Input impedance		Voltage: 1 MΩ, Current: 250 Ω	Voltage: 5 MΩ, Current: 250 Ω	Voltage: 1 MΩ, Current: 250 Ω	-		
Conversion speed		10 µs/ch	25 µs/ch*1	80 µs/ch	10 µs/ch	25 µs/ch	80 µs/ch
Conversion precision	25°C ±5°C	±0.1% (±20 digit)	Voltage: ±0.1% of F.S.*2 Current: ±0.1% of F.S.	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.	±0.1% (±20 digit)	Voltage: ±0.1% of F.S. Current: ±0.2% of F.S.	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.
	0 to 50°C*4	±0.2% (±40 digit)	Voltage: ±0.2% of F.S.*3 Current: ±0.2% of F.S.	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.	±0.2% (±40 digit)	Voltage: ±0.3% of F.S. Current: ±0.3% of F.S.	Voltage: ±0.4% of F.S. Current: ±0.4% of F.S.
Insulation mode		Between unit and CPU: Photocoupler and transformer insulation, Between channels: Non-insulation					
Internal current consumption		80 mA or less	140 mA or less	110 mA or less	170 mA or less	170 mA or less	230 mA or less
Others		Absolute max. input: Voltage: -15 V/+35 V, Current: 30 mA	Absolute max. input: Voltage: ±15 V, Current: 30 mA		Min. load resistance: Voltage: 1 kΩ Max. load resistance: Current: 500 Ω	Min. load resistance: Voltage: 1 kΩ Max. load resistance: Current: 500 Ω	Min. load resistance: Voltage: 1 kΩ Max. load resistance Current: 400 Ω
Weight		Approx. 130 g	Approx. 150 g		Approx. 140 g	Approx. 150 g	

*1 When temperature drift correction is used, temperature drift correction time of 25 µs is added regardless of the number of channels used. *2 This is a specification for using temperature drift correction. When temperature drift correction is not used, the conversion precision is as follows: Voltage: ±0.5% of F.S., Current: ±0.6% of F.S. *3 This is a specification for using temperature drift correction. When temperature drift correction is not used, the conversion precision is as follows: Voltage: ±0.7% of F.S., Current: ±0.7% of F.S. *4 0 to 55°C for KV-SAD04/KV-SDA04.

Specifications - High-precision A/D conversion unit

Model	KV-AD40G	
Analogue input point	4 points (differential input)	
Analogue input range (resolution)	Voltage: -10 to 10 V (0.33 mV 1/60000) 0 to 10 V (0.33 mV 1/30000) 0 to 5 V (0.17 mV 1/30000) 1 to 5 V (0.17 mV 1/24000)	Current: 0 to 20 mA (0.67 µA 1/30000) 4 to 20 mA (0.67 µA 1/24000)
Input resistance	Voltage: 5 MΩ, Current: 250 Ω	
Insulation mode	Between unit and CPU: Photocoupler insulation, Between CH_A (0 and 1) and CH_B (0 and 1): Photocoupler insulation*	
Conversion speed	80 µs/2 ch, 160 µs/4 ch (the quickest 50 µs/2 ch, 100 µs/4 ch when data buffering function is used)	
Conversion precision	Voltage: ±0.05% of F.S. (at 25°C) ±0.1% of F.S. (at 0 to 50°C)	Current: ±0.05% of F.S. (at 25°C) ±0.1% of F.S. (at 0 to 50°C)
Absolute maximum input	Voltage: ±15 V, Current: 30 mA	
External trigger input	Number of input points: 1, Input signal: NPN open collector, no-voltage contact signal Minimum ON voltage: 1 V, Maximum OFF current: 0.1 mA	
Data buffering function	Data buffering period: 50 µs to 3 s, buffering data quantity: max. 10000 words/ch, Synchronism: CH_A0 - CH_B0 and CH_A1 - CH_B1 have data synchronism	
Special function	Scaling, average processing (specification of the number of times, time specification, moving average, primary delay filter), data offset, zero shift, zero clip, peak/valley value locking, comparator, wire breaking detection, data buffering, external trigger	
Internal current consumption	220 mA or less	
Weight	Approx. 190 g	

* Not insulated between CH_A0 and CH_A1 or between CH_B0 and CH_B1

Specifications - A/D and D/A conversion unit

Model	KV-AM40V
Analogue input points/output points	Input: 2 points (differential input) Output: 2 points
Analogue input range/output range (resolution)	Voltage: -10 to +10 V (1.25 mV 1/16000), -5 to +5 V*2 (0.625 mV 1/16000), 0 to 10 V (1.25 mV 1/8000), 0 to 5 V (0.625 mV 1/8000), 1 to 5 V (0.625 mV 1/6400) Current: 0 to 20 mA (2.5 µA 1/8000), 4 to 20 mA (2.5 µA 1/6400)
Conversion speed	80 µs/ch*1 *3
Insulation mode	Between unit and CPU: Photocoupler insulation Between channels: Non-isolated
Input resistance	Voltage: 5 MΩ, Current: 250 Ω
Conversion precision	±0.2% of F.S. (at 25°C ±5°C), ± 0.4% of F.S. (at 0 to 50°C)*4
Minimum load resistance	Voltage: 1 kΩ
Maximum load resistance	Current: 600 Ω
Absolute maximum input	Voltage: ±15 V, Current: 30 mA
Internal current consumption	140 mA or less
Weight	Approx. 150 g

*1 When temperature drift correction is used, temperature drift correction time is added regardless of the number of channels used.
*2 Analogue output is not available for the range of -5 to +5 V.
*3 A/D conversion and D/A conversion are processed independently.
*4 ±0.2% of F.S. (at 0 to 50°C) when temperature drift correction for A/D conversion is used.

Specifications - Temperature/Analogue multi-input unit

Model	KV-TP40		
Number of temperature input points	4 ch		
Input	Thermocoupler	Platinum temperature measuring resistor	Voltage and current
Input range	K: -270.0 to 1372.0°C J: -210.0 to 1200.0°C T: -270.0 to 400.0°C E: -270.0 to 1000.0°C N: -270.0 to 1300.0°C R: -50.0 to 1768.0°C S: -50.0 to 1768.0°C B: 0.0 to 1820.0°C WRe5-26: 0.0 to 2315.0°C	Pt100: -200.0 to 850.0°C JPt100: -200.0 to 600.0°C	Voltage: -10 to +10 V (0.5 mV 1/40000) 0 V to 10 V (0.5 mV 1/20000) -5 V to +5 V (0.5 mV 1/20000) 0 V to 5 V (0.5 mV 1/10000) 1 V to 5 V (0.5 mV 1/8000) -100 mV to +100 mV (5 µV 1/40000) 0 mV to 100 mV (5 µV 1/20000) Current: 0 mA to 20 mA (2 µA 1/10000) 4 mA to 20 mA (2 µA 1/8000)
Indicated accuracy	±0.2% of F.S. (at 25°C ±5°C), ±0.4% of F.S. (at 0 to 50°C)		
Cold junction correction precision	±1°C (during thermocouple input)		
Input resistance	Voltage: 1 MΩ, Current: 250 Ω		
Absolute maximum input	Current: ±15 V, Voltage: ±30 mA		
Conversion speed	50 ms/4 ch		
Insulation mode	Between an input terminal and CPU: Photocoupler and transformer insulation, Between channels: Photocoupler and transformer insulation		
Other functions	External cold junction correction, wire-breaking detection function, scaling function, average processing function (time average, average of the number of times, moving average, primary delay filter), special data offset function, alarm function, rate of change calculation, rate of change alarm function		
Internal current consumption	90 mA or less		
Weight	Approx. 190 g		

Specifications - Temperature control unit

Model	KV-TF40	
Number of temperature input points	4 ch	
Input*1	Thermocoupler	Platinum temperature measuring resistor
Temperature sensor types	K, J, T, E, R, B, N, S, W5Re/W26Re	JPt100, Pt100
Indicated accuracy	±0.3% of F.S. ±1 digit (at 25°C), ±0.7% of F.S. ±1 digit (at 0 to 50°C)	
Cold junction correction precision	±1°C	
Sampling cycle	125 ms/ch (500 ms/4 ch)	
Control period	1 to 100 seconds	
Operation mode	PID control (with auto-tuning and 3 mode stabiliser function installed), Heat/cool PID control (with auto-tuning and 3 mode stabiliser function installed), ON/OFF control	
Tuning mode	PID auto-tuning mode	
Control output	Transistor (sink)	
Alarm output*2	Transistor (sink)	
Alarm mode*3	Absolute value upper limit, absolute value lower limit, deviation upper limit, deviation lower limit, deviation upper limit unexcited, deviation lower limit unexcited, deviation upper and lower limits, within upper and lower limit deviation, absolute value upper limit unexcited, absolute value lower limit unexcited	
Output rated load	30 VDC, 100 mA or less	
Leak current at output OFF	100 µA or less	
Residual voltage at output ON	1.5 V or less	
Current sensor (CT) input*4	4 ch	
Current measurement precision	Larger of ±5% of an input value and ±2 A of an input value	
Insulation mode	Between inputs and outputs: Photocoupler and transformer insulation, Between input channels: Photocoupler and transformer insulation	
Memory element	EEPROM rewritable one million times	
Other functions	Heater wire breaking alarm, control loop wire breaking alarm, measured value bias, output limit, slope setup, manual reset, output control when an error occurs	
Internal current consumption	210 mA or less	
Weight	Approx. 270 g	

*1 Can be set for each channel. *2 Because the alarm output is used as cooling control output when heat/cool control is used, the alarm output cannot be used as an alarm output function. *3 Standby operation ON/OFF can be selected in each alarm mode. *4 Use a KEYENCE sensor (OP-6694). (Sold separately.)

Positioning/Motion unit with simplified wiring

4-axis MECHATROLINK-III

KV-XH04ML

X-Unit MECHATROLINK

Basic performance ▷	4 axes	Control period: 500 µs/4 axes	Transmission speed: 100 Mbps	Unit interrupt	Inter-unit synchronisation
Control mode ▷	Positioning	Speed	Torque	Synchronisation	
Interpolation ▷	Straight-line	Arc	Helical		

16-axis MECHATROLINK-III

KV-XH16ML

X-Unit MECHATROLINK

Basic performance ▷	16 axes	Control period: 125 µs/5 axes	Transmission speed: 100 Mbps	Unit interrupt	Inter-unit synchronisation
Control mode ▷	Positioning	Speed	Torque	Synchronisation	
Interpolation ▷	Straight-line	Arc	Helical		

16-axis MECHATROLINK-II

KV-ML16V

MECHATROLINK

Basic performance ▷	16 axes	Control period: 1000 µs/4 axes	Transmission speed: 10 Mbps			
Control mode ▷	Positioning	Speed	Torque	Synchronisation	Fine	Manual pulser*
Interpolation ▷	Straight-line	Arc	Helical			

* KV-MX1 is needed

Pulse train positioning/motion unit

KV-MC20V

KV-MC40V

2-axis differential line driver output

KV-MC20V

4-axis differential line driver output

KV-MC40V

Basic performance ▷	2 axes/ 4 axes	Control period: 1000 µs	Output frequency: 4 MHz	
Control mode ▷	Positioning	Synchronisation	Fine	Manual pulser*1
Interpolation ▷	Straight-line	Arc	Helical*2	

*1 KV-MX1 is needed
*2 KV-MC40V only

Function extension unit

High-speed counter function, 12-point universal input + 12-point universal output

KV-MX1

Basic performance ▷	High-speed counter	SD memory card

Incremental type :4 points, 6.4 MHz response frequency
Absolute type :2 points, 20 kHz response frequency
Common input/output :12 points/12 points

Specifications - Positioning/Motion unit (KV-XH16ML/KV-XH04ML)

Model		KV-XH16ML	KV-XH04ML
No. of control axes		16 axes (total including virtual axes)	4 axes (total including virtual axes)
Built-in device		Relay: 2112 points (132 ch), Data memory: 4 words	Relay: 576 points (36 ch), Data memory: 4 words
Refresh		Automatic refresh, direct refresh, inter-unit synchronisation refresh	
Output format		MECHATROLINK-III	
Control mode		Position control	
		Torque control	
		Speed control	
		ML-III command	
		I/O control	
Control period		62.5 µs or more (For SV2 Series: 125 µs or more)	500 µs or more
Starting time		125 µs	500 µs
Axis control function execution method		Ladder program, unit program (flow, C language)	Ladder program, unit program (flow)
Unit program capacity		3 MB (Max. number of blocks: Approx. 20000)	
Flow	Maximum number of flows	256	
	Number of simultaneous activities	Unlimited	
	Internal data memory	524288 words	
Position unit		mm, deg (angle), PLS (pulse count), decimal place 0 to 9, unit conversion function available	
Cumulative address		-2147483648 to +2147483647 specification units	
Positioning control	Positioning mode	Absolute value/relative value	
	Position setting range	-2147483648 to +2147483647 specification units	
	Interpolation	Linear interpolation (up to 16 axes), arc interpolation, helical interpolation	
	Single operation address	-2147483648 to +2147483647 specification units	
	Acceleration/ deceleration curve	Straight-line, SIN	
	Acceleration/ deceleration time	0 to 65535 ms	
	M-code	1 to 65000, WITH/AFTER mode	
	Sensor positioning	External input-based switching control from speed to position	
	Number of points	100 points/axis (Trace control of 100 points or more using flows is also possible.)	
	Special function	Sync type follow-up control, absolute position follow-up control	
Synchronisation control	Input	External reference, instruction coordinates, current coordinates	
	Input filter	Reverse rotation protection function	
	Clutch	Select from direct, slide, and follow-up	
	Cam	Resolution: 2048 to 32768, Data points: 4 to 64 (changes according to the resolution)	
	Correction during operation	Correction via auxiliary input, phase correction, and lead angle correction	
Origin return	Origin return method	Data set type, Dog type (push), Dog type ("With Z phase" or "Without Z phase" can be selected), Dog type inching ("With Z phase" or "Without Z phase" can be selected), immediate Z phase, origin sensor and Z phase, limit switch rising edge, origin sensor midpoint/rising edge	
JOG/inching		JOG (high speed/low speed), inching (specifiable pulses)	
Teaching		Current coordinate teaching	
Memory data		Point parameters (each axis), synchronisation parameters (each axis), cam data, unit program, servo parameters, settings can be read and written during RUN (with some restrictions)	
Output display		LINK, CONNECT, error status	
Self-diagnosis function		Diagnosis can be made through hardware errors, various parameter errors, error numbers, and error messages	
Parameter setting		Parameters can be set from KV STUDIO, ladder programs, and unit programs	
Data backup		Coordinates: Nonvolatile memory backup (unlimited), Parameter settings: Flash ROM backup (20000 switches)	
Internal current consumption		KV-XH16ML: 400 mA or less, KV-XH04ML: 160 mA or less	
Weight		KV-XH16ML: Approx. 280 g, KV-XH04ML: Approx. 190 g	

Specifications - MECHATROLINK-III (KV-XH16ML/KV-XH04ML)

Communication standard	MECHATROLINK-III
Transmission speed	100 Mbps
Number of ports	KV-XH16ML: 2, KV-XH04ML: 1
Max. distance between stations	100 m*
Min. distance between stations	0.2 m
Transmission media/cable	Category 5e-compliant, STP cross cable
Number of connected stations	KV-XH16ML: Max. 16 Control period: 62.5 µs (up to 2 stations), 125 µs (up to 5 stations), 250 µs (up to 10 stations), 500 µs (up to 16 stations) KV-XH04ML: Max. 4 Control period: 500 µs (up to 4 stations)
Number of transmitted bytes	48 bytes (standard servo profile), 48 bytes (standard stepper motor drive profile), 64 bytes (standard inverter drive profile), 16/32/48/64 bytes (standard I/O profile)

* For instances with 30 m or more, use ferrite cores (OP-84409) with 2 turn-winding.

Specifications - MECHATROLINK-II (KV-ML16V)

Communication standard	MECHATROLINK-II
Transmission speed	10 Mbps
Number of ports	Supports 1 port end connection only
Max. transmission distance	15 slave units or less: 50 m, 16 slave units: 30 m, Can be extended with repeater
Min. distance between stations	0.5 m
Transmission media/cable	Special 2-core shield twisted-pair dedicated cable
Number of connected stations	Max. 16 slave units 32-byte mode: 0.5 ms (up to 2 axes), 1.0 ms (up to 4 axes), 1.5 ms (up to 6 axes), 2.0 ms (up to 8 axes), 2.5 ms (up to 12 axes), 3.0 ms (up to 16 axes) 17-byte mode not supported
Number of transmitted bytes	32-byte mode

Specifications - Positioning/Motion unit (KV-ML16V/KV-MC40V/KV-MC20V)

Model		KV-ML16V	KV-MC40V	KV-MC20V
No. of control axes		16 axes (total including virtual axes)	4 axes + 1 axis (virtual axis)	2 axes
Built-in device		[16 axes in use] Relay: 2688 points (168 ch) Data memory: 222 words (high speed) 1242 words (simple) [8 axes in use] Relay: 1644 points (104 ch) Data memory: 222 words (high speed) 762 words (simple) [4 axes in use] Relay: 1152 points (72 ch) Data memory: 222 words (high speed) 522 words (simple)	Relay: 1280 points (80 ch) Data memory: 90 words (high speed) 582 words (simple)	Relay: 896 points (56 ch) Data memory: 54 words (high speed) 402 words (simple)
Output format		MECHATROLINK-II	Differential line driver output (switchable among 1-pulse method, 2-pulse method, and A/B-phase method)	
Maximum output pulse		-	4 Mpps	
Control mode		Position control, Torque control, Speed control, ML-II command, I/O control	Position control	
Control period		0.5 ms (up to 2 axes), 1.0 ms (up to 4 axes), 1.5 ms (up to 6 axes), 2.0 ms (up to 8 axes), 2.5 ms (up to 12 axes), 3.0 ms (up to 16 axes)	1.0 ms	
Interface		Input: Photocoupler input, Output: Open collector output (30 VDC 50 mA)		
		MECHATROLINK-II port	-	-
Input time constant		Each input is set in 11 stages for each block		
Axis control function execution method		Ladder program, motion flow		
Motion flow	Program capacity	768 kB		
	Maximum number of blocks	A total of 256 blocks in all flows		
	Maximum number of flows	32		
	Number of simultaneous activities	Number of connectable axes × 2		
Position unit		mm, deg (angle), PLS (pulse count), decimal place 0 to 9, unit conversion function available		
Cumulative address		-2147483648 to +2147483647 instruction units		
Positioning control	Positioning mode	Absolute value/relative value		
	Position setting range	-2147483648 to +2147483647 instruction units		
	Interpolation	Linear interpolation (up to 16 axes), arc interpolation, helical interpolation		
	Single operation address	-2147483648 to +2147483647 instruction units		
	Acceleration/ deceleration curve	Straight-line, SIN, Bezier		
	Acceleration/ deceleration time	0 to 65535 ms		
	Starting time	Independent/interpolation: 2 to 3 control periods (When the 1st axis is activated)	Independent: 500 to 600 µs Interpolation (linear 2 axes): 600 to 700 µs Interpolation (arc 2 axes): 700 to 800 µs Interpolation (helical 3 axes): 800 to 900 µs (only for KV-MC40V) (When the 1st axis is activated)	
		Cache start: 1 to 2 control periods	Zero start: Input time constant +2 µs, Direct cache start: Max. 8 µs	
	M-code	1 to 65000, WITH/AFTER mode		
	Sensor positioning	External input-based switching control from speed to position		
	Number of points	800 points/axis		
Synchronisation control	Input	Counter (KV-MX1 required), instruction coordinates, current coordinates (KV-ML16V only)		
	Clutch	Select from direct, slide, and follow-up		
	Cam	Resolution: 2048 to 32768, Data points: 4 to 64 (changes according to the resolution)		
	Contact output	16 points (including 8 external output points) × 2		
	Correction during operation	Correction via auxiliary input, phase correction, and lead angle correction		
Fine control	Fine data work area	8 MB		
	Built-in ROM capacity	512 kB		
	Number of settings	Built-in ROM: 100, SD memory card: 1000		
	Data capacity of one setting	Built-in ROM: 512 kB, SD memory card: 8 MB (KV-MX1 is required)		
Origin return	Origin return method	Origin sensor edge/midpoint, push origin return, Dog type ("With Z phase" or "Without Z phase" can be selected), data set type, no limit switch*		
Speed control	Speed instruction range	-1000000 to 1000000 (× 0.01 min^{-1})	-	-
Torque control	Torque instruction range	-80000 to 80000 (× 0.01%)	-	-
JOG/inching		Inching (Number of pulses can be specified), JOG (high speed/low speed)		
Teaching		Current coordinate teaching and teaching from the counter current value are supported		
Memory data		Point parameters 800 points (each axis), synchronisation parameters (each axis), fine setting (built-in ROM: 512 kB, expandable with SD card), cam data, motion flow setting, etc. can be read and written during RUN (with some restrictions)		
High-speed counter		When KV-MX1 is connected: INC 4 ch/ABS Grey, residual Grey, binary 2 ch (switched, based on settings) Max. 6.4 MHz (2-phase, 4 multiplication)		
5 V power output		-	5 V ±5%, Max. 100 mA (total value)	
Output display		Error status/MECHATROLINK-II communication status	Error status/Pulse output status	
Self-diagnosis function		Diagnosis can be made through hardware errors, various parameter errors, error numbers, and error messages		
Parameter setting		Parameters can be set from KV-HPD1, "KV STUDIO," and ladder programs		
Data backup		Coordinates, error/warning log backup, parameter settings backup via flash ROM, 100000 times switching		
Internal current consumption		Main unit: 200 mA or less, External I/O: 120 mA or less	Main unit: 180 mA or less, External I/O: 130 mA or less	Main unit: 120 mA or less, External I/O: 80 mA or less
Weight		Approx. 220 g	Approx. 225 g	Approx. 170 g

* Only available for KV-MC20V/MC40V

Specifications - Function extension unit

Model	KV-MX1
Supported unit	KV-ML16V/KV-MC40V/KV-MC20V
Maximum number of connected units	One unit per positioning/motion unit, the right side only
Input frequency	Max. 6.4 MHz (2-phase, 4-multiplication)
Number of counter points	INC: 4 points, ABS: 2 points (set by KV STUDIO)
Internal current consumption	Main unit: 30 mA or less, external I/O: 100 mA or less
Weight	Approx. 160 g

Positioning/ high-speed counter

High-speed positioning unit

4-axis differential line driver/open collector output

KV-SH04PL

S-Unit

Basic performance ▷	4 axes	Control period: 62.5 µs/4 axes	Starting time: 1 µs or less	Output frequency: 8 MHz
	Change processing response time: 125 µs	Unit interrupt	Inter-unit synchronisation	
Control mode ▷	Positioning	Speed		
Interpolation ▷	Straight-line			

High-speed counter unit

2-channel differential line driver/open collector input

KV-SSC02

S-Unit

Basic performance ▷	16 MHz* response frequency	Control I/O: 1 µs	Unit interrupt	Inter-unit synchronisation
Control mode ▷	Presettable up/down	Enable	Frequency count	Tachometer
Functions ▷	Serial encoder communication	Input capture	Buffering	

* With 2-phase, 4-multiplication

Communication positioning unit

8 axes Modbus RTU

KV-LH20V

8 axes	Modbus RTU
Positioning	Speed*1
Simplified wiring	

*1 When a stepper motor of ORIENTAL MOTOR Co., Ltd. is used.
*2 Contact your sales representative regarding connectable models.

High-speed counter unit

2 ch input

KV-SC20V

4 MHz*response frequency	Presettable up/down
Enable	Frequency count
Tachometer	Input capture

* With 2-phase, 4-multiplication

Specifications - High-speed positioning unit

Model	KV-SH04PL	
Output frequency	1 Hz to 8 MHz	
Output format	Differential line driver output/open collector output (switched per axis via hardware switch) (1-pulse mode/2-pulse mode/2-phase 1-multiplication/2-phase 2-multiplication/2-phase 4-multiplication)	
No. of control axes	4 axes	
Control mode	Standard mode	High-speed mode
Control period	500 µs	62.5 µs
Starting time	500 µs or more	8 µs or more (continuous instant starting: 1 µs)
Basic operation	Origin return/JOG, linear interpolation (2 to 4 axes), position control (ABS/INC), speed control (+/- direction)	Origin return/JOG, position control (ABS/INC), speed control (+/- direction)
Function	Speed change, target change, stop sensor, speed override, stop at specified angle, continuous operation interrupt, forced next point, absolute position follow-up control, sync type follow-up control	Speed change, target change, stop sensor, continuous instant starting
Position unit	mm, deg (angle), PLS (pulse count), decimal place 0 to 9, unit conversion function	PLS (pulse count)
Acceleration/deceleration curve	Straight-line, SIN	Straight-line
Acceleration/deceleration rate	Acceleration/deceleration individual setting	
Acceleration/deceleration time	0 to 65535 ms	-
No. of positioning points	100 points/axis	
Position instruction range	-2147483648 to 2147483647	
M-code	0 to 65000, WITH/AFTER mode	
Origin return method	Dog type ("With Z phase" or "Without Z phase" can be selected by pushing the button), Dog type inching ("With Z phase" or "Without Z phase")*, origin sensor (edge/midpoint/Z-phase), limit switch edge, immediate Z-phase origin return, data set type	
JOG/inching	Inching (number of pulses can be specified)*, JOG	
Teaching	Current coordinate teaching	
Input	Positive (negative) direction limit switch, origin sensor, stop sensor, continuous instant starting, 1 point per axis for 4 points in total, 24 VDC input possible	
	Forced stop input, 1 point shared by whole axes, 24 VDC input possible	
	Z-phase input (+) (-), servo end, servo ready, drive alarm, 1 point per axis for 4 points in total, 5 VDC input possible	
Output	Pulse output (differential line driver): equivalent to AM26C31 (max. 20 mA), Pulse output (open collector): rated load: 30 VDC, 0.1 A or less	
	Drive alarm reset, servo ON, deviation counter clear, rated load: 30 VDC, 0.1 A or less	
Others	Multi-axis simultaneous starting based on unit interrupt/inter-unit synchronisation	
24 V power input (I/O)	24 VDC (-15%/+20%)	
5 V power output	5 VDC (±10%), 200 mA or less	
Internal current consumption	200 mA or less, external I/O: 260 mA or less	
Weight	Approx. 230 g	

* High-speed mode cannot be set.

Specifications - High-speed counter unit

Model		KV-SSC02	KV-SC20V
Input frequency		Single phase 4 MHz (16 MHz during 2-phase, 4-multiplication)	Single phase 1 MHz (4 MHz during 2-phase, 4-multiplication)
Counting range		32 bits	
Number of channels		2 ch	
Mode	Input selection	External terminal (CH0, CH1), internal clock (0.05 µs, 1 µs, 10 µs, 100 µs), other CH coincidence output, communication: EnDat2.2/22, BiSS (C-mode), YASKAWA serial	External terminal (CH0, CH1), internal clock (1 µs, 10 µs, 100 µs), other CH coincidence output
	Input mode	1-pulse with/without direction, 2-pulse addition/subtraction operation, 2-phase 1-multiplication/2-multiplication/4-multiplication	
	Counting operation mode	• Up-down counting mode • Enable counting mode • Preset counting mode • Set timer counting mode • Enable accumulative counting mode	
	Counting mode	Linear, ring	
	Frequency, revolution counter operation mode	• Frequency counting mode • Revolution counter B mode (1-revolution time measurement) • Revolution counter A mode (pulse interval measurement)	
Input	Count input	A-phase/B-phase/Z-phase (preset), 3 points for each channel, 6 points in total 5/12/24 VDC input possible, line driver input possible, photocoupler insulation	
	Control input	Enable (also used for input capture) input, 1 point for each channel, 2 points in total 12 to 24 VDC input possible, photocoupler insulation	
		Input capture input, 2 points for each (4 points in total) 12 to 24 VDC input possible, photocoupler insulation	
Output	Comparator coincidence output	2 points for each channel, 4 points in total, photocoupler insulation Rated load: 30 VDC, 0.2 A or less	2 points for each channel, 4 points in total, photocoupler insulation Rated load: 30 VDC 0.1 A or less
Input capture function		By external input (max. 4 points)	
Buffering function		Buffering period: 1 µs or more	-
Input filter function		Input time constant switching (6 types of counting/9 types of control)	Input time constant switching (4 types of counting/7 types of control)
Preset function		Possible to select from preset (Z-phase) input and internal relay-based rising edge/falling edge/level (only when an external input is used)	
Serial encoder communication function	Supported encoder	Absolute encoders that support EnDat2.2/22, BiSS (C-mode), and YASKAWA serial	-
	Communication cycle	EnDat2.2/22: 50 µs, BiSS (C-mode): 50 µs, YASKAWA serial: 62.5 µs	-
	Input	Equivalent to a differential line receiver that meets the EIA RS485 standard	-
	Output	Equivalent to a differential line driver that meets the EIA RS485 standard	-
	Encoder 5 V power	5 VDC (±5%), 300 mA or less	-
Others		Unit interrupt, inter-unit synchronisation	-
Internal current consumption		190 mA or less	95 mA or less
Weight		Approx. 130 g	Approx. 120 g

Specifications - Communication positioning unit

Model		KV-LH20V
Control mode		Positioning (PTP: point to point) control (independent), Speed control*1
No. of control axes		1 to 8 axes
No. of positioning points		64 points/axis*2
Communication interface	Communication standard	RS-485 (2 wires)
	Communication protocol	Modbus RTU
Transmission specifications	Transmission speed	9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400 bps
	Transmission distance	Total extension: 1200 m max.*3
Internal current consumption		120 mA or less
Weight		Approx. 110 g or less

*1 Only when a stepper motor from ORIENTAL MOTOR Co., Ltd. is used. *2 63 points/axis when ORIENTAL MOTOR's motor driver is used. *3 When the transmission speed is 230400 bps, the total extension is limited up to 500 m.

Ethernet Unit

1000 Mbps × 2 ports
KV-XLE02

X-Unit

EtherNet/IP
CC-Link IE Field
EtherCAT
PROFINET

Hardware ▷	Ethernet	Communication speed: 1 Gbps	2 independent ports		
Functions ▷	EtherNet/IP™	EtherCAT®*1	CC-Link IE Field*2	PROFINET*3	PLC link
	PROTOCOL STUDIO	Sensor application	Modbus/TCP client/server	FTP client/FTP server	KV socket
	MC protocol/ SLMP	Unit interrupt	Inter-unit synchronisation		

*1 Slave *2 Intelligent device station
*3 Device

100 Mbps × 1 port
KV-LE21V

Hardware ▷	100BASE-TX, 10BASE-T		
Functions ▷	Simple PLC link	FTP client/ FTP server	
	MC protocol	KV socket	

EtherNet/IP™ Unit

100 Mbps × 1 port
KV-EP21V

EtherNet/IP

Hardware ▷	Communication speed: 100 Mbps	
Functions ▷	EtherNet/IP™	Sensor application
	Simple PLC link	FTP client/ FTP server
	MC protocol	

FL-net Unit

100 Mbps × 1 port
KV-FL20V

FL-net

Hardware ▷	Communication speed: 100 Mbps	FL-net Ver. 2 compliant
Functions ▷	Cyclic transmission	Message transmission

High-speed Multi-link Unit

RS-485 × 1 port
KV-LM21V

Hardware ▷	Communication speed: 2 Mbps	Wiring length: 1 km
Functions ▷	Serial PLC link	VT3 megalink connection
	Dual-port function	

Serial Communication Unit

RS-232C × 2 ports
KV-XL202

X-Unit

Hardware ▷	RS-232C	Communication speed: 230 kbps
	2 independent ports	
Functions ▷	PLC link	PROTOCOL STUDIO
	Modbus master/slave	Non-procedure
	Unit interrupt	Inter-unit synchronisation

RS-422A/485 × 2 ports
KV-XL402

X-Unit

Hardware ▷	RS-422A/RS-485	Communication speed: 230 kbps
	2 independent ports	
Functions ▷	PLC link	PROTOCOL STUDIO
	Modbus master/slave	Non-procedure
	Unit interrupt	Inter-unit synchronisation

RS-232C × 1 port +
RS-232C/422A/485 × 1 port
KV-L21V

Hardware ▷	Communication speed: 230 kbps	2 independent ports
	RS-232C	RS-422A/485
Functions ▷	PROTOCOL STUDIO	Non-procedure
	Modbus master/slave	

■ Specifications - Ethernet unit (KV-XLE02)

Model		KV-XLE02		
		10BASE-T	100BASE-TX	1000BASE-T
Connection interface		RJ-45 8-pole modular connector × 2 ports		
Transmission rate*1		10 Mbps	100 Mbps	1000 Mbps
Transmission media*2		Category 3 or higher UTP or STP (STP is recommended)	Category 5 or higher UTP or STP (STP is recommended)	Category 5e or higher UTP or STP (double-shielded STP is recommended)
Max. cable length*3		100 m	100 m	100 m
Max. number of connectable hubs*4		4	2	1
Refresh		Automatic refresh, direct refresh, inter-unit synchronisation refresh		
Ethernet functions		KV socket communication, PLC link, PROTOCOL STUDIO, FTP server/client, e-mail sending/receiving, KV sensor network, Modbus server*5, MC protocol/SLMP*6, etc.		
Industrial networks*7		EtherNet/IP™, PROFINET, EtherCAT®,*8 CC-Link IE Field*9		
Ethernet function execution methods		Ladder program, unit program (flow)		
Unit program capacity		3 MB (Max. number of blocks: Approx. 20000)		
Flow	Max. number of flows	256		
	Number of simultaneous activities	Unlimited		
	Internal data memory	524288 words		
PROTOCOL STUDIO	Transmission method	Cyclic communication: Tx + Rx, Tx only, Rx only. Event communication: Tx + Rx, Tx only, Rx only, Tx + Continuous Rx		
	Max. number of connected devices	16		
	Max. number of communication commands	160/320*10		
	Max. number of total frames	Rx: 160/320*10 × 16 Tx: 160/320*10 × 1		
	Max. number of compared received frames	16 per command		
	Max. number of block elements	96 per frame		
	Transmission data length	Standard: 1 to 2048 bytes per frame, Extended: 1 to 16384 bytes per frame		
	Reception data length	Standard: 1 to 2048 bytes per frame, Extended: 1 to 16384 bytes per frame		
PLC link	Communication patterns	Write, read, transfer		
	Number of link settings*11	512 settings max.*11		
	Link data size	1440 words max. per setting (bit: 720 words, word: 720 words), 737280 words max. (total) (1440 words × 512 settings)		
	Data unit	1 word		
	Number of connected models	16 models max.*11		
	Number of connected units	64 max.*11		
	Trigger types	Cyclic/event (64 settings max. for event*11)		
	Update interval	1 to 65535 ms		

*1 10 Mbps/100 Mbps/1000 Mbps MDI/MDI-X automatic switching function supported
*2 STP = Shielded twisted pair cable; UTP = Unshielded twisted pair cable
*3 The maximum cable length refers to the distance between the KV-XLE02 and the Ethernet switch.
*4 The maximum number of connection is not limited when an Ethernet switch is used.
*5 Modbus is a registered trademark or trademark of Schneider Electric.
*6 SLMP is a registered trademark or trademark of Mitsubishi Electric Corporation.
*7 Industrial network trademarks
- EtherNet/IP™ is a registered trademark or trademark of ODVA. • PROFINET is a registered trademark or trademark of PROFIBUS Nutzerorganisation e.V.
- EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany
- CC-Link IE Field is a registered trademark or trademark of Mitsubishi Electric Corporation.

*8 EtherCAT® is fixed at 100 Mbps. It is not usable at different transmission rates.
*9 CC-Link IE Field is fixed at 1000 Mbps. It is not usable at different transmission rates.
*10 The max. is 160 when "Standard" is set for the number of communication commands in Unit Editor and 320 when "Extended" is set.
*11 Total for one KV-XLE02 unit.

■ Selectable industrial Ethernet combinations

Port 1 / Port 2	EtherNet/IP™ scanner*1	EtherNet/IP™ adapter*1	PROFINET*1	CC-Link IE Field*2	EtherCAT®*2	Do not use (industrial Ethernet)
EtherNet/IP™ scanner*1	×*4	×	✓	✓*6	×*5	✓
EtherNet/IP™ adapter*1	×	×	✓	✓*6	×*5	✓
PROFINET*1	✓	✓	×*4	✓*6	×*5	✓
CC-Link IE Field*2	×*7	×*7	×*7	✓*7	×*5	×*7
EtherCAT®*2	×*5	×*5	×*5	×*5	✓*5	×*5
Do not use (industrial Ethernet)	✓	✓	✓	✓*6	×*5	✓

*1 EtherNet/IP™ and PROFINET can be used together with a general-purpose Ethernet network*3.
*2 When CC-Link IE Field or EtherCAT® is selected, a general-purpose Ethernet network*3 cannot be used at the same time.
*3 A general-purpose Ethernet network refers to the general Ethernet functions of KV-XLE02 such as FTP and socket communication, which are available without using EtherNet/IP™, PROFINET, CC-Link IE Field, and EtherCAT® open networks.
*4 Both ports cannot be set to EtherNet/IP™ or PROFINET simultaneously.
*5 EtherCAT® occupies both ports at all times.
*6 When the network topology is set to the star type.
*7 CC-Link IE Field can only be used on port 1. However, it occupies both port 1 and port 2 only when the network topology is set to the ring or line type.

■ EtherCAT® communication specifications*1

Model		KV-XLE02
Supported transmission rate		100BASE-TX
Process communication	Size	Rx: 0, 32, 128, 256, 512, 1016 bytes*2
		Tx: 0, 32, 128, 256, 512, 1016 bytes*2
	Supported modes	SyncManager Distributed Clock
Mailbox communication	Size	In: 128 bytes, Out: 128 bytes
	Function	SDO Request, SDO Response, SDO Information, CompleteAccess
Device profile		CoE
Explicit Device IDs		1 to 65535
SyncManagers		4 (0/1: Mailbox communication, 2/3: Process communication)
FMMU		3
Diagnosis Log Object		Not supported

*1 EtherCAT® uses two ports for IN and OUT, so it cannot be used simultaneously with another function.
*2 Both Rx and Tx cannot be set to 0 bytes simultaneously.

■ PROFINET communication specifications

Model	KV-XLE02
Supported transmission rate	1000BASE-T, 100BASE-TX, 10BASE-T
Supported functions	Cyclic communication (I/O communication), record data communication, alarm communication
PROFINET cyclic communication	In: 16, 32, 64, 128, 232 bytes*1 Out: 16, 32, 64, 128, 232 bytes*1
	RPI: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512 ms
	Number of connectable controllers: 1
Applicable protocols	LLDP, DCP
PNIO version	V2.32
Conformance class	Compliant with Conformance Class A

*1 This is the size per slot. Up to six slots can be set for both In and Out.

■ CC-Link IE Field communication specifications

Model		KV-XLE02
Supported transmission rate		1000BASE-T
Supported network topologies		Star/Line/Ring
Operating station		Intelligent device station
Device type ID		1
Cyclic transmission	Max. size	RX: 128 CH, RY: 128 CH RWr: 1024 W, RWw: 1024 W
Transient transmission (server/client)	Max. size	968 bytes
Device file		CSP+
SLMP		Only diagnostic commands supported

■ EtherNet/IP™ communication specifications (with scanner)

Model				KV-XLE02	KV-EP21V
Supported transmission rate				1000BASE-T, 100BASE-TX, 10BASE-T	100BASE-TX, 10BASE-T
CIP service	Cyclic communication	Number of connections		256*1	
		RPI (Communication cycle)		0.5 to 10000 ms (in units of 0.5 ms) Can be set per connection. (Data is updated regardless of the number of nodes.)	
		Transmission trigger	Output to adapter	Cyclic/Change Of State*2	Cyclic
			Input from adapter	Cyclic/Change Of State*2	
		Allowable band for cyclic communication*4	(at 504 bytes)	30000 (pps)*3	12000 (pps)*3
			(at 1444 bytes)	15000 (pps)*3	6000 (pps)*3
		Maximum number of refresh words		24 k words	
		Maximum data size for 1 connection*5		504 bytes or 1444 bytes	
		Multicast filtering function*6		Provided (IGMP client function)	
	Message communication	Class 3 (connection type)	Server	Number of connections: 256*7	
		UCMM (non-connection type)	Client	Number of simultaneous actions: 32	
			Server	Number of simultaneous actions: 256	Number of simultaneous actions: 96
EtherNet/IP™ conformance test				Compliant with CT13	Compliant with A7
MDI/MDI-X automatic switching function				Supported	-

*1 In total, the number of connections used for the message communication function in Class 3 (connection type) should be a maximum of 256.
*2 Can communicate with devices that output data using the Change Of State (send data when any change occurs) method. The KV-EP21V (or the KV-8000/7500/5500) cannot output data with the Change Of State method.
*3 Abbreviation of "packet per second," indicating the number of sent/received packets that can be processed per second.
*4 If the communication bandwidth is more than 100 Mbps, use a 1000 Mbps-compatible Ethernet switch.
*5 Data synchronism in connections is guaranteed. Also, when using 505 bytes or more, the device used must support Large Forward Open (an optional CIP specification).
*6 Because the Ethernet unit has an IGMP client function, unnecessary multicast packets can be filtered by using an Ethernet switch supporting IGMP Snooping.
*7 In total, the number of connections used for the cyclic communication function should be a maximum of 256.

■ EtherNet/IP™ communication specifications (with adapter)

Model				KV-XLE02
Supported transmission rate				1000BASE-T, 100BASE-TX, 10BASE-T
CIP service	Cyclic communication	Number of connections		256*1
		RPI (Communication cycle)		0.5 to 10000 ms (in units of 0.5 ms) Can be set by connection. (Data is updated regardless of the number of nodes.)
		Transmission trigger	Output to scanner	Cyclic/Change Of State*2
			Input from scanner	Cyclic/Change Of State*2
		Allowable band for cyclic communication	(at 504 bytes)	30000 (pps)*3
			(at 1444 bytes)	15000 (pps)*3
		Maximum number of refresh words		1444 words
		Maximum data size for 1 connection*4		504 bytes or 1444 bytes
		Multicast filtering function		Not provided
	Message communication	Class 3 (connection type)	Server	Number of connections: 256*5
		UCMM (non-connection type)	Client	Not provided
			Server	Number of simultaneous actions: 256
EtherNet/IP™ conformance test				Compliant with CT13

*1 In total, the number of connections used for the message communication function in Class 3 (connection type) should be a maximum of 256.
*2 Can communicate with devices that output data using the Change Of State (send data when any change occurs) method.
*3 Abbreviation of "packet per second," indicating the number of sent/received packets that can be processed per second.
*4 Data synchronism in connections is guaranteed. Also, when using 505 bytes or more, the device used must support Large Forward Open (an optional CIP specification).
*5 In total, the number of connections used for the cyclic communication function should be a maximum of 256.

■ Specifications - EtherNet/IP™ unit/Ethernet unit

Model	KV-XLE02			KV-EP21V			KV-LE21V		
Function name	Number of sockets		Port number	Number of sockets		Port number	Number of sockets		Port number
	TCP	UDP		TCP	UDP		TCP	UDP	
PC application*1	8	0	8500*2	8	0	8500*2	8	0	8500*2
Modbus server function	Total 15	1	502*2 *5	-		-	-		-
Host link communication*3 *4		1	8501*2	Total 15	1	8501*2	Total 15	1	8501*2
MC protocol communication*3 *4		1	5000*2 *5		1	5000*2 *5		1	5000*2 *5
VT connection	0	1	8502*2	0	1	8502*2	0	1	8502*2
KV socket communication	Total 16		Arbitrary*2	-		-	Total 8		Arbitrary*2
FTP server	4	-	20, 21	4	-	20, 21	4	-	20, 21
Automatic clock data adjustment	-	1	123	-	1	123	-	1	123
E-mail transmission and reception (SMTP, POP3)	2	-	25, 110	2	-	25, 110	2	-	25, 110
DNS	-	1	53	-	1	53	-	1	53
FTP client	2	-	20, 21*2	2	-	20, 21*2	2	-	20, 21*2
Simple PLC link	-	-	-	-	1	5001*2	-	1	5001*2
EtherNet/IP™ cyclic communication function	Total 320	1	2222	Total 320	1	2222	-		-
EtherNet/IP™ message communication function		1	44818		1	44818	-		-
PROFINET	0	4	34964, 49152, 49153, 49154	-		-	-		-
PLC link	Total 64		Arbitrary*2	-		-	-		-
Flow	Total 32		Arbitrary*2	-		-	-		-
PROTOCOL STUDIO	Total 16		Arbitrary*2	-		-	-		-
Internal current consumption	200 mA or less			100 mA or less			80 mA or less		
Weight	Approx. 190 g			Approx. 120 g					

*1 KV STUDIO, KV COM+ *2 This can be set to a value in the range of 1 to 65535. *3 TCP and UDP sockets can be used simultaneously. *4 Up to 15 TCP sockets can be used.
*5 Port numbers can be set to TCP and UDP sockets individually.

■ Specifications - FL-net unit

Model	KV-FL20V
Transmission speed	Automatic switching between 10 Mbps and 100 Mbps
Interface	IEEE802.3 compliant (CSMA/CD compliant)
Maximum cable length*	100 m
Transmission protocol	UDP/IP FA link protocol
Maximum number of nodes	254
Amount of cyclic data	Max. (8k bits + 8k words)/node
Amount of message data	Max. 1024 bytes
Internal current consumption	80 mA or less
Weight	Approx. 120 g

*The maximum cable length refers to the distance between the KV-FL20V and the Ethernet switch (the hub).

■ Specifications - High-speed multi-link unit

Model		KV-LM21V
Interface	Connection	Terminal block
Transmission specifications	Communication speed (Baud rate)	19200 bps, 115200 bps, 0.5 Mbps, 1.0 Mbps, 2.0 Mbps
	Transmission distance	19200 bps: 1000 m or less, 115200 bps: 1000 m or less, 0.5 Mbps: 500 m or less, 1.0 Mbps: 200 m or less, 2.0 Mbps: 100 m or less
	Number of transmission units	15
	Terminator	Set by the switch on the front face of the main unit
	Connection topology	Multidrop (unable to separate)
Internal current consumption		120 mA or less
Weight		Approx. 110 g

*The specifications may differ depending on usage. Check your manual for more information.

Specifications - Serial communication unit

Item			KV-XL202	KV-XL402	
Communication standard			RS-232C	RS-422A RS-485 (4 wires)	RS-422A RS-485 (2 wires)
Connection interface			European terminal block with 7 poles (detachable) × 2 ports	European terminal block with 5 poles (detachable) × 2 ports	
Electrical termination (terminator)			-	ON/OFF set by the switch on the front face	
Transmission specifications	Transmission speed		1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bps		
	Transmission method		Full duplex	Full duplex	Half duplex
	Data format	Start bit	1 bit		
		Data bit	7 bits, 8 bits		
		Stop bit	1 bit, 2 bits		
	Error detection	Parity	Even, odd, none		
	RS/CS flow control		ON or OFF	ON or OFF (only in PLC link mode)	
	Transmission distance		15 m	Total extension: 1200 m max.*1 *2	
	Number of transmission units		1	32*1	
Refresh			Automatic refresh, direct refresh, inter-unit synchronisation refresh		
Serial communication functions			Non-procedure, PROTOCOL STUDIO, Modbus slave, etc.		
Serial communication function execution methods			Ladder program, unit program (flow)		
Unit program capacity			3 MB (Max. number of blocks: Approx. 20000)		
Flow	Maximum number of flows		256		
	Number of simultaneous activities		Unlimited		
	Internal data memory		524288 words		
PROTOCOL STUDIO	Transmission method		Cyclic communication: Tx + Rx, Tx only, Rx only Event communication: Tx + Rx, Tx only, Rx only, Tx + Continuous Rx, Break Tx		
	Maximum number of connected devices		2		
	Max. number of communication commands		48/96*3		
	Maximum number of total frames		Rx: 48/96*3 × 16; Tx: 48/96*3 × 1		
	Max. number of compared received frames		16 per command		
	Maximum number of block elements		96 per frame		
	Transmission data length		1 to 2048 bytes per frame		
	Reception data length		1 to 2048 bytes per frame		
PLC link	Communication patterns		Write, read, transfer		
	Number of link settings		512 settings max.*4		
	Link data size		1440 words max. per setting (bit: 720 words, word: 720 words) 737280 words max. (total) (1440 words × 512 settings)		
	Data unit		1 word		
	Number of connected models		2 models max. (1 model × 2 ports)		
	Number of connected units		2 max. (1 unit × 2 ports)		
	Trigger types		Cyclic/event (64 settings max. for event*4)		
	Update interval		10 to 65535 ms		
Internal current consumption			KV-XL202: 140 mA or less, KV-XL402: 150 mA or less		
Weight			KV-XL202: Approx. 200 g, KV-XL402: Approx. 190 g		

*1 Depends on the function to be used.
*2 The total extension is 500 m max. at a transmission rate of 230400 bps. The transmission rate and distance vary depending on the device to be connected. Check the values with the actual device.
*3 The max. is 48 when "Standard" is set for the number of communication commands in Unit Editor and 96 when "Extended" is set.
*4 Total for one KV-XL202/XL402 unit.

Specifications - Serial communication unit

Model	KV-L21V
Interface	Port 1: RS-232C Port 2: RS-232C, RS-422A, RS-485 (4 wires), RS-485 (2 wires) switchable
Transmission method	RS-232C, RS-422A, RS-485 (4 wires): full duplex RS-485 (2 wires): half duplex
Transmission speed	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bps
Transmission distance	RS-232C: 15 m or less RS-422A, RS-485 (4 wires), RS-485 (2 wires): Total extension of 1200 m or less*
Internal current consumption	120 mA or less
Weight	Approx. 150 g

* Total length of 500 m or less for transmission speed 230400 bps. The transmission rate and distance vary depending on the device to be connected. Check the values with the actual device.

Communication format specifications (KV-XL202/XL402)

Operation mode	Available interfaces		
	KV-XL202	KV-XL402	
	RS-232C	RS-422A RS-485 (4 wires)	RS-422A RS-485 (2 wires)
KV host link mode	✓	✓	×
KV STUDIO mode	✓	✓	×
PROTOCOL STUDIO mode	✓	✓	✓
PLC link mode	✓	✓	✓
Non-procedure mode	✓	✓	✓
Link mode	✓	✓	×
Protocol mode 1	✓	✓	×
Protocol mode 4	✓	✓	×
Modbus slave mode	✓	✓	✓

Communication format specifications (KV-L21V)

Operation mode	Available interfaces			
	Port 1	Port 2		
	RS-232C	RS-232C	RS-422A RS-485 (4 wires)	RS-485 (2 wires)
KV host link mode	✓	✓	✓	×
KV mode (text transmission and reception)	✓	✓	✓	✓
KV STUDIO mode	✓	✓	✓	×
PROTOCOL STUDIO mode	✓	✓	✓	✓
Non-procedure mode	✓	✓	✓	✓
Link mode	✓	✓	✓	×
Protocol mode 1	✓	✓	✓	×
Protocol mode 4	✓	✓	✓	×
Modem setup mode	✓	×	×	×
Modem operation mode	✓	×	×	×
Modbus master mode	✓	✓	✓	✓
Modbus slave mode	✓	✓	✓	✓

KV-XL202 wiring example (common for PORT1 and PORT2)

Pin number	Signal name	Signal direction
1	SD (send data)	Output
2	RD (receive data)	Input
3	RS (request to send)*1	Output
4	CS (clear to send)*2	Input
5	ER (equipment ready)	Output
6	DR (dataset ready)	Input
7	SG	-

*1 Changes to Low when reception is disabled. Normally "High".
*2 Set this to High normally. Set this to Low when disabling reception.

KV-XL402 wiring example (common for PORT1 and PORT2)

Pin number	RS-422A/485 (4 wires)		RS-422A/485 (2 wires)	
	Signal name	Signal direction	Signal name	Signal direction
1	SDA-	Output	SR-	I/O
2	SDB+	Output	SR+	I/O
3	RDA-	Input	-	-
4	RDB+	Input	-	-
5	SG	-	SG	-

Communication Unit

EtherNet/IP™ Compatible Communication Unit

KV-EP02

Hardware ▷	EtherNet/IP™	2 ports (built-in switching hub function)
	Transmission speed: 100 Mbps	Maximum number of connectable units: 15*
Functions ▷	Backup and restore	Sensor monitor
	Batch sensor transmission	

* When the scanner is the KV-8000/7000/5000/3000 Series (The maximum number of units is 7 for analogue units.)

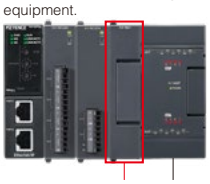
EtherNet/IP™

European Terminal Block/ MIL Connector → Screw Terminal Block Conversion Unit

KV-NC1

Connection example

A connection conversion unit can be used to connect a terminal block type expansion unit. This enables optimum selections when modifying equipment.



Remote I/O Unit

European Terminal Block Type I/O Unit

16-point input
KV-NC16EXE

8-point relay output
KV-NC8ER

16-point transistor (sink) output
KV-NC16ETE

16-point transistor (source) output
KV-NC16ETPE

Screw Terminal Block Type I/O Unit

8-point input
KV-N8EX

8-point relay output
KV-N8ER

8-point transistor (sink) output
KV-N8ET

8-point transistor (source) output
KV-N8ETP

8-point input
8-point relay output
KV-N8EXR

16-point input
KV-N16EX

16-point relay output
KV-N16ER

16-point transistor (sink) output
KV-N16ET

16-point transistor (source) output
KV-N16ETP

8-point input
8-point transistor (sink) output
KV-N8EXT

MIL Connector Type I/O Unit

16-point input
KV-NC16EX

16-point transistor (sink) output
KV-NC16ET

16-point transistor (source) output
KV-NC16ETP

16-point input
16-point transistor (sink) output
KV-NC16EXT

32-point input
KV-NC32EX

32-point transistor (sink) output
KV-NC32ET

32-point transistor (source) output
KV-NC32ETP

32-point input
32-point transistor (sink) output
KV-NC32EXT

European Terminal Block Type Analogue Unit

4 analogue inputs
KV-NC4AD

2 analogue outputs
KV-NC2DA

Screw Terminal Block Type Analogue Unit

2 analogue inputs/
1 analogue output
KV-N3AM

European Terminal Block Type Temperature Input Unit

4 temperature inputs
KV-NC4TP

■ General specifications - KV-EP02

Item	Specifications				
Power voltage	24 VDC (+10%/-15%)				
Operating ambient temperature	0 to +55°C (no freezing)*1 *2				
Operating ambient humidity	5 to 95% RH (No condensation)*1				
Storage ambient temperature	-25 to +75°C				
Storage ambient humidity	5 to 95% RH (No condensation)*1				
Operating environment	No dust or corrosive gas				
Operating altitude	2000 m or less				
Pollution degree	2				
Overvoltage category	I				
Noise immunity	1500 Vp-p or more; pulse width: 1 µs, 50 ns (based on noise simulator); IEC standard-compliant (IEC61000-4-2/3/4/6)				
Withstand voltage	1500 VAC for 1 minute between the power terminals and the I/O terminals, and between the external terminals and the housing (1000 VAC for 1 minute between the power supply terminal and output terminals for the transistor output type expansion I/O unit)				
Insulation resistance	50 MΩ or more (between the power terminals and the input terminals and between the external terminals and the housing, with 500 VDC megohmmeter)				
Vibration resistance*3	Compliant with JIS B 3502 and IEC61131-2	Intermittent vibration			No. of scans
		Frequency	Acceleration	Half amplitude	10 times in each of the X, Y, and Z directions (for 100 min.)
		5 to 9 Hz	-	3.5 mm	
		9 to 150 Hz	9.8 m/s²	-	
		Continuous vibration			
		Frequency	Acceleration	Half amplitude	
		5 to 9 Hz	-	1.75 mm	
		9 to 150 Hz	4.9 m/s²	-	
Shock resistance*3	Acceleration: 150 m/s², Operation time: 11 ms, 3 times in each of the X, Y, and Z directions				
Internal current consumption*4	120 mA or less				
Weight	Approx. 130 g				

*1 Guaranteed range in which the system can be used.
*2 The temperature below the unit centre (30 mm) inside a control panel.
*3 When mounted on a DIN rail.
*4 The maximum current consumption including that of expansion units is 1.8 A.

■ Performance specifications - KV-EP02

Item	Specifications	
	10BASE-T	100BASE-TX
Connection interface	RJ-45 8-pole modular connector × 2 ports	
Transmission rate*1	10 Mbps	100 Mbps
Transmission media*2	Category 3 or higher UTP or STP (STP is recommended)	Category 5 or higher UTP or STP (STP is recommended)
Max. cable length*3	100 m	100 m
Max. number of connectable hubs*4	4	2

*1 10 Mbps/100 Mbps MDI/MDI-X automatic switching function supported
*2 STP = Shielded twisted pair cable; UTP = Unshielded twisted pair cable
*3 The maximum cable length refers to the distance between the KV-EP02 and the Ethernet switch.
*4 The maximum number of connection is not limited when an Ethernet switch is used.

■ EtherNet/IP™ communication specifications - KV-EP02

Item		Specifications
EtherNet/IP™ specifications	Supported functions	Cyclic communication
		Message communication (explicit message communication), UCMM, and Class 3 support
	Number of connections	64
	RPI (Communication cycle)	0.5 to 10000 ms (in units of 0.5 ms)
	Trigger	Cyclic
	Conformance test	Compliant with CT14

* EtherNet/IP™ is a registered trademark or a trademark of ODVA.

Performance specifications - Expansion input unit

Model	KV-NC16EX (16 points)		KV-NC16EXE (16 points)		KV-NC32EX (32 points)	
External connection method	Connector		European terminal block		Connector	
Input terminals	24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode
Maximum input voltage	26.4 VDC					
Rated input voltage	24 VDC, 5.2 mA	5 VDC, 1 mA	24 VDC, 5.2 mA	5 VDC, 1 mA	24 VDC, 5.2 mA	5 VDC, 1 mA
Minimum ON voltage	19 V	3.5 V	19 V	3.5 V	19 V	3.5 V
Maximum OFF current	1.5 mA	-	1.5 mA	-	1.5 mA	-
Maximum OFF voltage	-	1.5 V	-	1.5 V	-	1.5 V
Common method	16 points/1 common (2 terminals)*1		16 points/1 common (16 terminals)*2		32 points/1 common (2 terminals)*1	
Input time constant (four-level switching)	Input time constant setting	OFF to ON Typ.	OFF to ON Max.	ON to OFF Typ.	ON to OFF Max.	
	25 µs	10 µs	50 µs	50 µs	150 µs	
	300 µs	240 µs	290 µs	280 µs	390 µs	
	1 ms	1 ms	1.2 ms	1 ms	1.2 ms	
	10 ms	10 ms	11 ms	10 ms	11 ms	
Input impedance	4.4 kΩ					
Internal current consumption	20 mA or less		20 mA or less		20 mA or less	
Weight	Approx. 100 g		Approx. 120 g		Approx. 110 g	

*1 The KV-NC16EX and KV-NC32EX have 2 COM terminals, but these are shared internally.
*2 The KV-NC16EXE has 16 COM terminals, but these are shared internally.

Performance specifications - Expansion output unit

Model		KV-NC8ER (8 points)	KV-NC16ET (P) (16 points)	KV-NC16ET (P) E (16 points)	KV-NC32ET (P) (32 points)
Output mode		Relay	MOSFET output (With overcurrent protection function)*1 *6		
External connection method		European terminal block	Connector	European terminal block	Connector
Rated load		250 VAC/ 30 VDC, 2 A	30 VDC, 0.2 A*7		
Leakage current at OFF		-	100 µA or less		
Residual voltage at ON		-	0.6 VDC or less		
ON resistance		50 mΩ or less	-		
Common method		4 points/1 common (8 terminals)*3	16 points/1 common (2 terminals)*2 *4	16 points/1 common (16 terminals)*2	32 points/1 common (2 terminals)*2 *5
Response time	OFF to ON	10 ms or less	100 µs or less (with a load of 1 mA or more)		
	ON to OFF		200 µs or less (with a load of 1 mA or more)		
Internal current consumption		70 mA or less	30 mA or less	30 mA or less	50 mA or less
Weight		Approx. 130 g	Approx. 100 g	Approx. 120 g	Approx. 110 g
Relay life		Electrical: 100000 times or more (20 times/min.) Mechanical: 20 million times or more	-		
Relay replacement		Impossible	-		

*1 If even a single overcurrent is detected, the protection operation (output turned OFF) and automatic recovery are repeated for all outputs within the shared common*4 *5, until the cause of the problem is removed.
*2 The KV-NC16ET(P), KV-NC16ET(P)E, and KV-NC32ET(P) COM terminals are shorted internally.
*3 The KV-NC8ER has four C0s and four C1s, and each set of C0s and C1s is shorted internally. (The sets of C0s and C1s are independent.)
*4 The outputs within the shared common that are protected when an overcurrent is detected are outputs 000 to 007 or 008 to 015 for the KV-NC16ET(P) and KV-NC16ET(P)E.
*5 The outputs within the shared common that are protected when an overcurrent is detected are outputs 000 to 015 or 100 to 115 for the KV-NC32ET(P).
*6 Sink output types use MOSFET (N-ch) output. Source output types use MOSFET (P-ch) output.
*7 The rated load of each common terminal is 1.6 A for the KV-NC16ET(P) and KV-NC32ET(P), and 3.2 A for the KV-NC16ET(P)E.

Performance specifications - Expansion I/O unit

Model			KV-NC16EXT (16 + 16 points)		KV-NC32EXT (32 + 32 points)	
External connection method			Connector			
Input	Number of inputs		16 points		32 points	
	Input mode		24 VDC mode	5 VDC mode	24 VDC mode	
	Maximum input voltage		26.4 VDC			
	Rated input voltage		24 VDC, 5.2 mA	5 VDC, 1 mA	24 VDC, 3.6 mA	
	Minimum ON voltage		19 V	3.5 V	19 V	
	Maximum OFF current		1.5 mA	-	1.5 mA	
	Maximum OFF voltage		-	1.5 V	-	
	Common method		16 points/1 common (1 terminal)*1		32 points/1 common (2 terminals)*1	
	Input time constant	Input time constant setting	OFF to ON Typ.	OFF to ON Max.	ON to OFF Typ.	ON to OFF Max.
		25 µs	10 µs	50 µs	50 µs	150 µs
		300 µs	240 µs	290 µs	280 µs	390 µs
		1 ms	1 ms	1.2 ms	1 ms	1.2 ms
		10 ms	10 ms	11 ms	10 ms	11 ms
	Input impedance		4.4 kΩ		6.3 kΩ	
Output	Number of outputs		16 points		32 points	
	Output mode		MOSFET (N-ch) (with overcurrent protection function)*2			
	Rated load		30 VDC, 0.2 A*3			
	Leakage current at OFF		100 µA or less			
	Residual voltage at ON		0.6 VDC or less			
	Common method		16 points/1 common (1 terminal)*1		32 points/1 common (2 terminals)*1	
	Operation time	OFF to ON	100 µs or less (with a load of 1 mA or more)			
		ON to OFF	200 µs or less (with a load of 1 mA or more)			
Internal current consumption			30 mA or less		60 mA or less	
Weight			Approx. 120 g		Approx. 150 g	

*1 The input COM and output COM terminals are independent.
*2 If even a single overcurrent is detected, the protection operation (output turned OFF) and automatic recovery are repeated for all outputs within the shared common, until the cause of the problem is removed.
*3 The rated load of each common is 1.6 A.

Performance specifications - Temperature input unit

Model	KV-NC4TP	
Number of inputs*1	4 points	
Input	Thermocoupler	Platinum temperature measuring resistor
Input range	K: -270.0 to 1372.0°C J: -210.0 to 1200.0°C T: -270.0 to 400.0°C E: -270.0 to 1000.0°C N: -270.0 to 1300.0°C R: -50.0 to 1768.0°C S: -50.0 to 1768.0°C B: 0.0 to 1820.0°C WRe5-26: 0.0 to 2315.0°C	Pt100: -200.0 to 850.0°C, JPt100: -200.0 to 600.0°C
Overall accuracy	±(0.2% of F.S. +1°C) (at 25°C ±5°C) ±(0.4% of F.S. +1°C) (at 0 to 55°C)	±0.2% of F.S. (at 25°C ±5°C), ±0.4% of F.S. (at 0 to 55°C)
Allowable wiring resistance	-	100 Ω max./wire (no variation allowed among three wires)
Conversion speed	125 ms/channel	
Insulation mode	Between input terminals and base unit: Photocoupler/semiconductor relay/transformer isolation, Between channels: (When resistance thermometer is not used): Semiconductor relay isolation; (When resistance thermometer is used): No isolation	
Internal current consumption	40 mA or less	
Weight	Approx. 110 g	

*1 Individual setting is possible for each channel.

Performance specifications - Analogue I/O unit

Model			KV-NC4AD	KV-NC2DA
Conversion			A/D conversion	D/A conversion
Analogue input point			4 points (single end)	2 points
Analogue input range/ resolution	Voltage	-10 V to +10 V	1/8000 2.5 mV	1/8000 2.5 mV
		0 to 10 V	1/4000 2.5 mV	1/4000 2.5 mV
		0 to 5 V	1/4000 1.25 mV	1/4000 1.25 mV
		1 to 5 V	1/3200 1.25 mV	1/3200 1.25 mV
	Current	0 to 20 mA	1/4000 5 µA	1/4000 5 µA
		4 to 20 mA	1/3200 5 µA	1/3200 5 µA
Conversion speed			80 µs/channel*1	80 µs/channel
Conversion precision	Voltage	Without temperature compensation	±0.3% of F.S. (at 25°C ±5°C) ±0.5% of F.S. (at 0 to 55°C)	±0.3% of F.S. (at 25°C ±5°C) ±0.5% of F.S. (at 0 to 55°C)
		With temperature compensation	±0.3% of F.S. (at 0 to 55°C)	
	Current	Without temperature compensation	±0.4% of F.S. (at 25°C ±5°C) ±0.6% of F.S. (at 0 to 55°C)	±0.3% of F.S. (at 25°C ±5°C) ±0.5% of F.S. (at 0 to 55°C)
		With temperature compensation	±0.4% of F.S.(at 0 to 55°C)	
Input resistance			Voltage: 5 MΩ, Current: 250 Ω	-
Absolute maximum input			Current: ±15 V, Voltage: ±30 mA	-
Insulation mode	Between analogue I/O and CPU		Isolated (photocoupler, transformer)	
	Between analogue I/O channels		Non-isolated	
Minimum load resistance	Voltage		-	1 kΩ
Maximum load resistance	Current		-	600 Ω
Internal current consumption			80 mA or less	110 mA or less
Weight			Approx. 100 g	Approx. 100 g

*1 When temperature drift correction is used, a temperature drift correction time of 80 µs is added regardless of the number of channels used.

Performance specifications - Expansion input unit

Model	KV-N8EX (8 points)		KV-N16EX (16 points)	
External connection method	Terminal block			
Input terminals	24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode
Maximum input voltage	26.4 VDC			
Rated input voltage	24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 5.3 mA	5 VDC, 1 mA
Minimum ON voltage	19 V	3.5 V	19 V	3.5 V
Maximum OFF current	1.5 mA	-	1.5 mA	-
Maximum OFF voltage	-	1.5 V	-	1.5 V
Common method	8 points/1 common (2 terminals)*1		16 points/1 common (2 terminals)*1	
Input time constant (four-level switching)	Input time constant setting	OFF to ON Typ.	OFF to ON Max.	ON to OFF Typ.	ON to OFF Max.
	25 µs	10 µs	50 µs	50 µs	150 µs
	300 µs	240 µs	290 µs	280 µs	390 µs
	1 ms	1 ms	1.2 ms	1 ms	1.2 ms
	10 ms	10 ms	11 ms	10 ms	11 ms
Input impedance	4.3 kΩ			
Internal current consumption	20 mA or less			
Weight	Approx. 150 g		Approx. 220 g	

*1 The KV-N8EX and KV-N16EX have 2 COM terminals, but these are shared internally.

Performance specifications - Expansion output unit

Model		KV-N8ER (8 points)	KV-N16ER (16 points)	KV-N8ET (P) (8 points)	KV-N16ET (P) (16 points)
Output mode		Relay		MOSFET output (with overcurrent protection function)*3*5	
External connection method		Terminal block			
Rated load		250 VAC/30 VDC, 2 A		30 VDC, 0.5 A	
Leakage current at OFF		-		100 µA or less	
Residual voltage at ON		-		0.8 VDC or less (with 0.5 A output), 0.6 VDC or less (with 0.3 A output)	
ON resistance		50 mΩ or less		-	
Common method		Independent	4 points/1 common (8 terminals)*1	8 points/1 common (4 terminals)*2	16 points/1 common (8 terminals)*2 *4
Response time	OFF to ON	10 ms or less		100 µs or less (with a load of 1 mA or more)	
	ON to OFF			200 µs or less (with a load of 1 mA or more)	
Relay life		Electrical: 100000 times or more (20 times/min.) Mechanical: 20 million times or more		-	
Relay replacement		Impossible		-	
Internal current consumption		60 mA or less	100 mA or less	30 mA or less	40 mA or less
Weight		Approx. 230 g	Approx. 260 g	Approx. 160 g	Approx. 210 g

*1 The KV-N16ER has two terminals for each of C0, C1, C2, and C3 respectively, which are shorted internally. (C0, C1, C2, and C3 are independent.)
*2 The KV-N8ET(P) and KV-N16ET(P) COM terminals are shorted internally.
*3 If even a single overcurrent is detected, the protection operation (output turned OFF) and automatic recovery are repeated for all outputs within the shared common*4, until the cause of the problem is removed.
*4 The outputs within the shared common that are protected when an overcurrent is detected are outputs 000 to 007 or 008 to 015 for the KV-N16ET(P).
*5 Sink output types use MOSFET (N-ch) output. Source output types use MOSFET (P-ch) output.

Performance specifications - Expansion I/O unit

Model			KV-N8EXR (8 + 8 points)		KV-N8EXT (8 + 8 points)	
External connection method			Terminal block			
Input	Number of inputs		8 points			
	Input mode		24 VDC mode	5 VDC mode	24 VDC mode	5 VDC mode
	Maximum input voltage		26.4 VDC			
	Rated input voltage		24 VDC, 5.3 mA	5 VDC, 1 mA	24 VDC, 5.3 mA	5 VDC, 1 mA
	Minimum ON voltage		19 V	3.5 V	19 V	3.5 V
	Maximum OFF current		1.5 mA	-	1.5 mA	-
	Maximum OFF voltage		-	1.5 V	-	1.5 V
	Common method		8 points/1 common (1 terminal)*1			
	Input time constant	Input time constant setting	OFF to ON Typ.	OFF to ON Max.	ON to OFF Typ	ON to OFF MAX
		25 µs	10 µs	50 µs	50 µs	150 µs
		300 µs	240 µs	290 µs	280 µs	390 µs
		1 ms	1 ms	1.2 ms	1 ms	1.2 ms
		10 ms	10 ms	11 ms	10 ms	11 ms
	Input impedance		4.3 kΩ			
Output	Number of outputs		8 points			
	Output mode		Relay		MOSFET (N-ch) (with overcurrent protection function)*4	
	Rated load		250 VAC/30 VDC, 2A		30 VDC, 0.5 A	
	Leakage current at OFF		-		100 µA or less	
	Residual voltage at ON		-		0.8 VDC or less (with 0.5 A output) 0.6 VDC or less (with 0.3 A output)	
	ON resistance		50 mΩ or less		-	
	Common method		4 points/1 common (2 terminals)*1 *2		8 points/1 common (4 terminals)*1 *3	
	Operation time	OFF to ON	10 ms or less		100 µs or less (with a load of 1 mA or more)	
		ON to OFF			200 µs or less (with a load of 1 mA or more)	
	Relay life		Electrical: 100000 cycles or more (20 cycles/minute), Mechanical: 20 million cycles or more		-	
	Relay replacement		Impossible		-	
Internal current consumption			60 mA or less		30 mA or less	
Weight			Approx. 230 g		Approx. 210 g	

*1 The input COM and output COM terminals are independent.
*2 The KV-N8EXR has two C1 output terminals and two C2 output terminals, but each pair of these terminals is shared internally. (C1 and C2 are isolated.)
*3 The KV-N8EXT has four COM output terminals, but these terminals are shared internally.
*4 If even a single overcurrent is detected, the protection operation (output turned OFF) and automatic recovery are repeated for all outputs within the shared common, until the cause of the problem is removed.

Performance specifications - Analogue I/O unit

Model			KV-N3AM	
Conversion			A/D conversion	D/A conversion
Number of points			2 (single end)	1 point
Analogue I/O range/ resolution	Voltage*1	-10 V to +10 V	1/8000 2.5 mV	1/8000 2.5 mV
		0 to 10 V	1/4000 2.5 mV	1/4000 2.5 mV
		0 to 5 V	1/4000 1.25 mV	1/4000 1.25 mV
		1 to 5 V	1/3200 1.25 mV	1/3200 1.25 mV
	Current*1	0 to 20 mA	1/4000 5 µA	1/4000 5 µA
		4 to 20 mA	1/3200 5 µA	1/3200 5 µA
Conversion speed			80 µs/channel*2	80 µs/channel*2
Conversion precision	Voltage	Without temperature compensation	±0.3% of F.S. (at 25°C ±5°C), ±0.5% of F.S. (at 0 to 55°C)	±0.3% of F.S. (at 25°C ±5°C), ±0.5% of F.S. (at 0 to 55°C)
		With temperature compensation	±0.3% of F.S. (at 0 to 55°C)	
	Current	Without temperature compensation	±0.4% of F.S. (at 25°C ±5°C), ±0.6% of F.S. (at 0 to 55°C)	±0.3% of F.S. (at 25°C ±5°C), ±0.5% of F.S. (at 0 to 55°C)
		With temperature compensation	±0.4% of F.S. (at 0 to 55°C)	
Input resistance	Voltage		5 MΩ	-
	Current		250 Ω	-
Absolute maximum input	Voltage		±15 V	-
	Current		±30 mA	-
Insulation mode	Between analogue I/O and CPU		Isolated (photocoupler, transformer)	
	Between analogue input and output		Non-isolated	
	Between analogue input channels		Non-isolated	-
Minimum load resistance	Voltage		-	1 kΩ
Maximum load resistance	Current		-	600 Ω
Internal current consumption			120 mA or less	
Weight			Approx. 200 g	

*1 For the possible measuring range for out-of-range input, refer to "A/D and D/A conversion table" in "KV-N3AM User's Manual."
*2 When temperature drift correction is used, a temperature drift correction time of 80 µs is added regardless of the number of channels used. The number of channels used is the total for both A/D conversion and D/A conversion.

CC-Link unit

Master/local unit

KV-CL20

CC-Link V2

Hardware	Transmission speed: 10 Mbps	Trunk line length: 1200 m
	Input: 896 points* Output: 896 points	Input: 128 words Output: 128 words
Functions	Remote I/O	PLC link
Mode	Master station	Local station

* Maximum number of link points per local station

DeviceNet™ unit

Master/slave unit

KV-DN20

DeviceNet™

Hardware	Transmission speed: 500 kbps	Trunk line length: 500 m
	Input: 128 words* Output: 128 words	
Functions	Remote I/O	PLC link
Mode	Master mode	Slave mode
	Master & slave mode	

* Maximum number of link points per slave

KL-LINK unit

Master unit

KL-N20V

KL-LINK

Hardware	Transmission speed: 5 Mbps	Trunk line length: 1200 m
	Input/Output: 128 words	
Functions	Remote I/O	PLC link
Mode	Remote I/O mode	PLC link mode

Remote I/O Unit

Input time constant switching

24 V/5 V switching

5-digit digital display

Resolution: 1/12000

Screw terminal block type I/O unit

Input: 16 points
KV-RC16BX

Input: 32 points
KV-RC32BX

Input: 8 points, Transistor output: 8 points
KV-RC8BXT

Transistor output: 16 points
KV-RC16BT

Transistor output: 32 points
KV-RC32BT

Input: 8 points, Relay output: 8 points
KV-RC8BXR

Relay output: 16 points
KV-RC16BR

Input: 16 points,
Transistor output: 16 points
KV-RC16BXT

CC-Link

Screw terminal block type analogue unit

Analogue input 4 ch **KV-RC4AD**
[Input range] 0 to 5 V, 1 to 5 V, ±5 V, 0 to 10 V, ±10 V, 0 to 20 mA, 4 to 20 mA

Analogue output 4 ch **KV-RC4DA**
[Output range] 0 to 5 V, 1 to 5 V, 0 to 10 V, ±10 V, 0 to 20 mA, 4 to 20 mA

CC-Link

Screw terminal block type (B type)

Input: 16 points
KL-16BX

Transistor output: 16 points
KL-16BT

Relay output: 16 points
KL-16BR

Input: 8 points
Transistor output: 8 points
KL-8BXT

Input: 8 points
Relay output: 8 points
KL-8BXR

Screw terminal block type (BL type)

Input: 8 points
KL-8BLX

Transistor output: 8 points
KL-8BLT

Relay output: 8 points
KL-8BLR

Connector type (C type)

Input: 16 points
KL-16CX

Input: 32 points
KL-32CX

Transistor output: 16 points
KL-16CT

Transistor output: 32 points
KL-32CT

Screw terminal block type analogue unit

Analogue input 4 ch
KL-4AD
[Input range] 0 to 5 V, 1 to 5 V, 0 to 10 V, ±10 V, 0 to 20 mA, 4 to 20 mA

Analogue output 2 ch
KL-2DA
[Output range] 0 to 5 V, 1 to 5 V, 0 to 10 V, ±10 V, 0 to 20 mA, 4 to 20 mA

High-performance remote data input unit

Direct current input unit
KL-DC1A
[Input range] 0 to 20 mA, ±10 mA, ±100 mA, ±1 A, ±10 A

Direct voltage input unit
KL-DC1V
[Input range] 0 to 10 V, ±10 V, ±100 V

Remote temperature control unit
KL-2TF

Load cell measurement unit
KL-LC1

Electricity measurement unit
KL-WH1

KL-LINK

Specifications - CC-Link unit

Model	KV-CL20
CC-Link supported version	If acting as master station: Ver. 2.00, If acting as local station: Ver. 2.00/Ver. 1.10
Maximum number of connected units	For master station, 64
Number of occupied stations	For local station, 1 to 4 stations
Maximum number of link points per system	Remote input and output (RLY): 9440 points, Remote register (DM): Reading 2048 words/Writing 2048 words
Communication standard	Compliant with CC-Link Ver. 1.10
Connection topology	Multidrop
Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Connection cable	Ver. 1.10-compatible CC-Link dedicated cable (pair cables of twisted 3-core threads with shield: OP-79426, OP-79427)
Maximum cable total length (Maximum communication distance)	Varies depending on communication speed 156 kbps: 1200 m, 625 kbps: 900 m, 2.5 Mbps: 400 m, 5 Mbps: 160 m, 10 Mbps: 100 m
Operating station	Master station, master station (duplex), standby master station, local station
Operation mode	Online mode, offline mode, line test 1 mode, line test 2 mode
Transmission mode	Cyclic transmission, transient transmission
Internal current consumption	170 mA or less (supplied from the CPU unit)
Weight	Approx. 170 g

Specifications - CC-Link remote I/O unit

CC-Link supported version	Ver. 2.00/Ver. 1.10 Remote I/O station
Number of occupied stations	1 station
Power voltage	11.4 to 26.4 VDC
Internal current consumption	KV-RC16BX: At 11.4 V: 140 mA or less, At 26.4 V: 70 mA or less KV-RC32BX: At 11.4 V: 160 mA or less, At 26.4 V: 80 mA or less KV-RC16BT: At 11.4 V: 120 mA or less, At 26.4 V: 60 mA or less KV-RC32BT: At 11.4 V: 150 mA or less, At 26.4 V: 70 mA or less KV-RC8BXT: At 11.4 V: 120 mA or less, At 26.4 V: 60 mA or less KV-RC16BXT: At 11.4 V: 150 mA or less, At 26.4 V: 80 mA or less KV-RC16BR: At 11.4 V: 390 mA or less, At 26.4 V: 150 mA or less KV-RC8BXR: At 11.4 V: 230 mA or less, At 26.4 V: 110 mA or less
Weight	KV-RC16BX: Approx. 250 g, KV-RC32BX: Approx. 250 g, KV-RC16BT: Approx. 250 g, KV-RC32BT: Approx. 250 g, KV-RC8BXT: Approx. 250 g, KV-RC16BXT: Approx. 250 g, KV-RC16BR: Approx. 290 g, KV-RC8BXR: Approx. 260 g

Specifications - CC-Link remote I/O unit (transistor output)

Output mode	Transistor output (sink type)
Rated load voltage	12/24 VDC
Range of used load voltage	10.2 to 26.4 VDC
Outer supplied power of output part	10.2 to 26.4 VDC
Output load current	0.5 A/point, 5 A/unit total*
Leaked current at OFF	0.1 mA or less
Maximum decreased voltage at ON	0.3 V (TYP) or less, 0.6 V (MAX) or less
Output response time (OFF to ON)	0.1 ms or less
Output response time (ON to OFF)	1.0 ms or less
Insulation	Photocoupler insulation

* 4 A/unit in total for KV-RC8BXT only.

Specifications - CC-Link remote I/O unit (input)

Item	24 V mode	12 V mode*1	5 V mode*2
Max. rated input	26.4 VDC	26.4 VDC	
Input voltage	24 VDC, Approx. 5.3 mA	12 VDC, Approx. 2.5 mA	5 VDC, Approx. 0.9 mA
Max. ON voltage	19 V	3.0 V	2.5 V
Max. ON current	-	-	
Maximum OFF voltage	-	1.0 V	0.8 V
Maximum OFF current	2.0 mA	-	
Input impedance	4.3 kΩ	4.3 kΩ	
Insulation mode	Photocoupler insulation	Photocoupler insulation	
Input time constant*3 (switching mode)	0.2 ms, 1.5 ms, 10 ms		

*1 In 12 V mode, only KV-RC8BXT and KV-RC16BXT are selectable. *2 In 5 V mode, only KV-RC16BX, KV-RC32BX and KV-RC8BXR are selectable. *3 Set at 10 ms if signal of contact points is input.

Specifications - CC-Link remote I/O unit (relay output)

Rated voltage	240 VAC/24 VDC
Rated output current	240 VAC/24 VDC, 2 A/point, 4 A/1 common
ON resistance	50 mΩ or less
ON delay time	10 ms or less
OFF delay time	10 ms or less
Insulation	Relay insulation

Specifications - CC-Link remote analogue unit

Model		KV-RC4AD	KV-RC4DA
CC-Link supported version		Ver. 2.00/Ver. 1.10 Remote device station	
Number of occupied stations		When Ver. 2.00: 2 times 1 station, when Ver. 1.10: 2 stations	
Analogue I/O point		Input: 4 points	Output: 4 points
Analogue I/O range (resolution)		Input voltage: -10 to +10 V (0.83 mV 1/24000) 0 to 10 V (0.83 mV 1/12000) -5 to +5 V (0.42 mV 1/24000) 0 to 5 V (0.42 mV 1/12000) 1 to 5 V (0.42 mV 1/9600) Input current: 0 to 20 mA (1.67 µA 1/12000) 4 to 20 mA (1.67 µA 1/9600)	Output voltage: -10 to +10 V (0.83 mV 1/24000) 0 to 10 V (0.83 mV 1/12000) 0 to 5 V (0.42 mV 1/12000) 1 to 5 V (0.42 mV 1/9600) Output current: 0 to 20 mA (1.67 µA 1/12000) 4 to 20 mA (1.67 µA 1/9600)
Input resistance		Voltage: 1 MΩ*, Current: 250 Ω	-
Conversion speed		200 µs/ch	
Conversion precision	25°C ±5°C	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.
	0 to 60°C	Voltage: ±0.2% of F.S. Current: ±0.2% of F.S.	Voltage: ±0.3% of F.S. Current: ±0.3% of F.S.
Insulation mode		Photocoupler, Non-insulation between channels	
Others		Absolute max. input: Voltage: ±15 V, Current: 30 mA Universal (trigger) input Input signal: NPN open collector, contact point signal without voltage Max. ON voltage: 0.8 V or less, Max. OFF current: 0.1 mA or less Insulation mode: Photocoupler insulation Universal output Output form: Transistor (sink) Rated load: 24 VDC, 0.5 A Leak current at OFF: 100 µA or less Residual voltage at ON: 0.8 V or less Response time: OFF to ON: 20 µs or less, ON to OFF: 200 µs or less Insulation mode: Photocoupler insulation	Min. load resistance: Voltage: 1 kΩ Max. load resistance Current: 400 Ω
Internal current consumption		210 mA or less	240 mA or less
Weight		Approx. 200 g	

* 500 kΩ when common is used

■ Specifications - DeviceNet™ unit

Model		KV-DN20	
Communication protocol		Compliant with DeviceNet™	
Connection topology		Multidrop method	
Transmission speed		500 kbps, 250 kbps, 125 kbps	
Transmission media		5 dedicated cables (2 for signal system, 2 for power supply, 1 for shield line)	
Maximum main cable length		Thick cable	500 m (Transmission speed: 125 kbps), 250 m (Transmission speed: 250 kbps), 100 m (Transmission speed: 500 kbps)
		Thin cable	100 m (All transmission speeds)
Maximum number of connected nodes		64 (including master, slave, configurator)	
Master mode	Connected pieces per network	Max. 64	
	Type of communication	I/O communication (Poll/Bit-Strobe/COS/Cyclic) Explicit message communication	
	Type and size of assigned devices	Relay or data memory (indicated per block) max. size (per block) [For relaying: Input 64 ch, Output 64 ch; For data memory: Input 200 words, Output 200 words] × 2 blocks	
	Assignment method of device	Auto configuration (Fixed or assigned with front end) and manual assignment	
	Slave connection pieces per unit	Max. 63	
	Maximum number of I/O per slave	Input: 2048 points (128 words), Output: 2048 points (128 words)	
	Data length of message communication	Sending: 106 bytes, Receiving: 110 bytes	
Slave mode	Connected pieces per network	Max. 64	
	Type of communication	I/O communication (Poll) Explicit message communication	
	Type and size of assigned devices	Relaying or data memory, Max. size for relay: Input 64 ch, Output 64 ch; For data memory: Input 128 words, Output 128 words	
Internal current consumption		Internal circuit: 24 VDC, 45 mA or less (supplied by CPU unit), Communication circuit: 24 VDC 25 mA or less (supplied by communication connector)	
Weight		Approx. 150 g	

■ Specifications - KL-LINK unit

Model	KL-N20V			
Communication speed	5 Mbps	2.5 Mbps	625 kbps	156 kbps
Maximum cable length	50 m	120 m	500 m	1200 m
Communication medium	Dedicated cable (shield line with 2-core threads)			
Maximum number of connected child stations	97	129	129	129
Amount of communication data	Max. 2048 (128 words)			
Communication cycle time*	2.88 ms/2048 points			
Internal current consumption	80 mA or less			
Weight	Approx. 100 g			

* Communication speed: 5 Mbps

■ Specifications - KL-LINK remote I/O unit

Power voltage	10.8 to 26.4 VDC
Internal current consumption	KL-8BLX: 80 mA or less, KL-16BX: 75 mA or less, KL-16CX: 75 mA or less KL-32CX: 120 mA or less, KL-8BLT: 80 mA or less, KL-8BLR: 170 mA or less KL-16BT: 90 mA or less, KL-16BR: 310 mA or less, KL-16CT: 90 mA or less KL-32CT: 140 mA or less, KL-8BXT: 130 mA or less, KL-8BXR: 250 mA or less
Weight	KL-8BLX: Approx. 130 g, KL-16BX: Approx. 140 g, KL-16CX: Approx. 70 g KL-32CX: Approx. 110 g, KL-8BLT: Approx. 130 g, KL-8BLR: Approx. 160 g KL-16BT: Approx. 140 g, KL-16BR: Approx. 210 g, KL-16CT: Approx. 70 g KL-32CT: Approx. 100 g, KL-8BXT: Approx. 170 g, KL-8BXR: Approx. 190 g

■ Specifications - KL-LINK remote I/O unit (Transistor output)

Output mode	Transistor (sink)
Rated load voltage	5 to 26.4 VDC (power supply between VC-C)
Rated output current	0.5 A/point (24 V or more voltage applied between VC-C)
Residual voltage at ON	0.8 V or less
Leakage current at OFF	100 µA or less
ON delay time	25 µs or less
OFF delay time	200 µs or less
Insulation mode	Photocoupler insulation

■ Specifications - KL-LINK remote I/O unit (Input)

Item	24 V mode	5 V mode
Max. rated input	26.4 VDC	
Input voltage	24 VDC, 5.3 mA	5 VDC, 0.9 mA
Minimum ON voltage	19 V	2.5 V
Maximum OFF current	2 mA	-
Maximum OFF voltage	-	0.8 V
Input impedance	4.3 kΩ	
Insulation mode	Photocoupler insulation	
Input time constant* (switching mode)	10 µs, 2.5 ms, 5 ms, 10 ms	

* Set 10 ms to input signal of contact points.

■ Specifications - KL-LINK remote I/O unit (Relay output)

Rated voltage	250 VAC/30 VDC
Rated output current	2 A/point (inductive load), 4 A/point (resistance load)
	4 A/All common
ON resistance	50 mΩ or less
ON delay time	10 ms or less
OFF delay time	10 ms or less
Insulation mode	Relay insulation

■ Specifications - KL-LINK remote analogue unit

Model		KL-4AD	KL-2DA
Analogue I/O point		Input: 4 points	Output: 2 points
Analogue I/O range (resolution)		Input voltage: -10 to +10 V (2.5 mV 1/8000) 0 to 10 V (2.5 mV 1/4000) 0 to 5 V (1.25 mV 1/4000) 1 to 5 V (1 mV 1/4000) Input current: 0 to 20 mA (5 µA 1/4000) 4 to 20 mA (4 µA 1/4000)	Output voltage: -10 to +10 V (2.5 mV 1/8000) 0 to 10 V (2.5 mV 1/4000) 0 to 5 V (1.25 mV 1/4000) 1 to 5 V (1 mV 1/4000) Output current: 0 to 20 mA (5 µA 1/4000) 4 to 20 mA (4 µA 1/4000)
Input resistance		Voltage: 1 MΩ, Current: 250 Ω	-
Conversion speed		High-speed mode: 200 µs/ch, average mode: 1.6 ms/ch	250 µs/ch
Conversion precision	25°C	Average mode: ±0.2% of F.S. High-speed mode: ±0.5% of F.S.	±0.2% of F.S.
	0 to 60°C	Average mode: ±0.4% of F.S. High-speed mode: ±0.7% of F.S.	±0.4% of F.S.
Insulation mode		Photocoupler, Non-insulation between channels	
Others		Absolute max. input: Voltage: ±15 V, Current: 30 mA	Max. load resistance: Current: 400 Ω, Min. load resistance: Voltage: 1 kΩ
Power voltage		24 VDC ±10%	
Internal current consumption		150 mA or less	190 mA or less
Weight		Approx. 180 g	

■ Specifications - KL-LINK high-performance remote data input unit - Direct current input unit

Model		KL-DC1A				
Number of channels		1 ch				
Sampling cycle		In normal mode: 1 ms (1000 times/s), In high precision mode: 100 ms (10 times/s)				
Input range		0 to 20 mA (Range 1)	±10 mA (Range 2)	±100 mA (Range 3)	±1 A (Range 4)	±10 A (Range 5)
Resolution	Normal	0.01 mA (1/2000)	0.001 mA (1/20000)	0.01 mA (1/20000)	0.1 mA (1/20000)	1 mA (1/20000)
	High accuracy	0.0001 mA (1/200000)	0.0001 mA (1/200000)	0.001 mA (1/200000)	0.01 mA (1/200000)	0.1 mA (1/200000)
Input impedance		10 Ω	10 Ω	1 Ω	0.1 Ω	10 mΩ
Measurement precision (25 ±5°C)		±0.2% of F.S. ±1 digit	±0.2% of F.S. ±1 digit	±0.2% of F.S. ±1 digit	±0.3% of F.S. ± 1 digit	±0.5% of F.S. ±1 digit*
Measurement precision (0 to 50°C)		±0.6% of F.S. ±1 digit	±0.6% of F.S. ±1 digit	±0.6% of F.S. ±1 digit	±0.7% of F.S. ±1 digit	±0.9% of F.S. ±1 digit*
Power voltage		24 VDC ±10%				
Internal current consumption		170 mA or less				
Weight		Approx. 350 g				

* -5 A to 5 A input

■ Specifications - KL-LINK high-performance remote data input unit - Direct current input unit

Model		KL-DC1V		
Number of channels		1 ch		
Sampling cycle		In normal mode: 1 ms (1000 times/s), In high precision mode: 100 ms (10 times/s)		
Input range		0 to 10 V (Range 1)	±10 V (Range 2)	±100 V (Range 3)
Resolution	Normal	0.001 V (1/10000)	0.001 V (1/20000)	0.01 V (1/20000)
	High accuracy	0.0001 V (1/100000)	0.0001 V (1/200000)	0.001 V (1/200000)
Input impedance		1 MΩ	1 MΩ	4 MΩ
Measurement precision (25 ±5°C)		±0.1% of F.S. ±1 digit	±0.1% of F.S. ±1 digit	±0.2% of F.S. ±1 digit
Measurement precision (0 to 50°C)		±0.5% of F.S. ±1 digit	±0.5% of F.S. ±1 digit	±0.6% of F.S. ±1 digit
Power voltage		24 VDC ±10%		
Internal current consumption		170 mA or less		
Weight		Approx. 350 g		

■ Specifications - KL-LINK high-performance remote data input unit - Electricity measurement unit

Model	KL-WH1
Phase wire	3-phase 3-wire, single-phase 2-wire, single-phase 3-wire
Input voltage/measured frequency	100 to 220 VAC (sine wave)/45 to 65 Hz
Power failure memory	Non-volatility memory (valid electricity amount and invalid electricity amount)
Integrated value cleared	Clearing order by key switch on front surface, control input terminal, or KL
Current measurement	External current sensors (CT: 3 types for 50 A, 100 A, 250 A) are available as options, and current is set using a switch
Measured items	Demand value, instant valid electricity, instant invalid electricity, valid electricity, invalid electricity, interphase voltage, interphase current, power rate, frequency
Power voltage	100 to 220 VAC ±10%, 50/60 Hz
Internal current consumption	10 VA or less
Weight	Approx. 400 g

■ Specifications - KL-LINK high-performance remote data input unit - Load cell input unit

Model		KL-LC1			
Number of channels		1 ch			
Range switching		Setting: Setting switch, Connection: Connecting terminal differs by range			
Sensor power		5 V ±5% (30 mA or less)/10 V ±5% (30 mA or less): Setting selection by setting switch			
Conformed sensor		350 Ω			
Sampling cycle		1 ms (1000 times/s)			
Input range sensor power	Input range	Range 1	Range 2	Range 3	Range 4
	5 V	-2.5 to +2.5 mV	-5.0 to +5.0 mV	-10.0 to +10.0 mV	-15.0 to +15.0 mV
	10 V	-5.0 to +5.0 mV	-10.0 to +10.0 mV	-20.0 to +20.0 mV	-30.0 to +30.0 mV
Resolution	5 V	0.5 µV (1/10000)	1.0 µV (1/10000)	2.0 µV (1/10000)	3.0 µV (1/10000)
	10 V	0.5 µV (1/20000)	1.0 µV (1/20000)	2.0 µV (1/20000)	3.0 µV (1/20000)
Linearity drift (0 to 50°C)		±0.2% of F.S. ±1 digit			
Zero drift (0 to 50°C)		±0.4% of F.S. ±1 digit			
Power voltage		24 VDC ±10%			
Internal current consumption		230 mA or less			
Weight		Approx. 350 g			

■ Specifications - KL-LINK remote temperature control unit

Model	KL-2TF	
Number of temperature input points	2 ch	
Input*	Thermocoupler	Platinum temperature measuring resistor
Temperature sensor types	K, J, T, E, R, B, N, S, W5Re/W26Re	JPt100, Pt100
Indicated accuracy	±0.3% of F.S. ±1 digit (at 25°C ±5°C), ±0.7% of F.S. ±1 digit (at 0 to 60°C)	
Sampling cycle	125 ms/ch (250 ms/2 ch)	
Control period	1 to 100 seconds	
Operation mode	PID control (with auto-tuning and 3 mode stabiliser function installed), Heat/cool PID control (with auto-tuning and 3 mode stabiliser function installed), ON/OFF control	
Power voltage	24 VDC ±10%	
Internal current consumption	160 mA or less	
Weight	Approx. 210 g	

* Can be set for each channel.

Basic instructions

Type	Mnemonics	Description
Contact	LD	Connects the device to the power rail as an NO contact
	LDB	Connects the device to the power rail as an NC contact
	AND	Connects a device in series as an NO contact
	ANB	Connects a device in series as an NC contact
	OR	Connects a device in parallel as an NO contact
	ORB	Connects a device in parallel as an NC contact
	LDP	Connects the device to the power rail as an NO contact that turns ON for one scan only when the lookup relay is ON
	LDPB	Connects the device to the power rail as an NC contact that turns ON for one scan only when the lookup relay is ON
	LDF	Connects the device to the power rail as an NO contact that turns ON for one scan only when the lookup relay is OFF
	LDFB	Connects the device to the power rail as an NC contact that turns ON for one scan only when the lookup relay is OFF
	ANP	Connects the device in series as an NO contact that turns ON for one scan only when the lookup relay is ON
	ANPB	Connects the device in series as an NC contact that turns ON for one scan only when the lookup relay is ON
	ANF	Connects the device in series as an NO contact that turns ON for one scan only when the lookup relay is OFF
	ANFB	Connects the device in series as an NC contact that turns ON for one scan only when the lookup relay is OFF
	ORP	Connects the device in parallel as an NO contact that turns ON for one scan only when the lookup relay is ON
	ORPB	Connects the device in parallel as an NC contact that turns ON for one scan only when the lookup relay is ON
	ORF	Connects the device in parallel as an NO contact that turns ON for one scan only when the lookup relay is OFF
	ORFB	Connects the device in parallel as an NC contact that turns ON for one scan only when the lookup relay is OFF
Bit contact	BLD	Connects the specified bit of a lookup word device to the power rail as an NO contact
	BLDB	Connects the specified bit of a lookup word device to the power rail as an NC contact
	BAND	Connects the specified bit of a lookup word device in series as an NO contact
	BANB	Connects the specified bit of a lookup word device in series as an NC contact
	BOR	Connects the specified bit of a lookup word device in parallel as an NO contact
	BORB	Connects the specified bit of a lookup word device in parallel as an NC contact
Comparison contact	LD=	Connects the device to the power rail as an NO contact that turns ON in the condition A = B
	LD<	Connects the device to the power rail as an NO contact that turns ON in the condition A < B
	LD>	Connects the device to the power rail as an NO contact that turns ON in the condition A > B
	LD<=	Connects the device to the power rail as an NO contact that turns ON in the condition A < = B
	LD>=	Connects the device to the power rail as an NO contact that turns ON in the condition A > = B
	LD<>	Connects the device to the power rail as an NO contact that turns ON in the condition A < > B
	AND=	Connects the device in series as an NO contact that turns ON in the condition A = B
	AND<	Connects the device in series as an NO contact that turns ON in the condition A < B
	AND>	Connects the device in series as an NO contact that turns ON in the condition A > B
	AND<=	Connects the device in series as an NO contact that turns ON in the condition A < = B
	AND>=	Connects the device in series as an NO contact that turns ON in the condition A > = B
	AND<>	Connects the device in series as an NO contact that turns ON in the condition A < > B
	OR=	Connects the device in parallel as an NO contact that turns ON in the condition A = B
	OR<	Connects the device in parallel as an NO contact that turns ON in the condition A < B
	OR>	Connects the device in parallel as an NO contact that turns ON in the condition A > B
	OR<=	Connects the device in parallel as an NO contact that turns ON in the condition A < = B
	OR>=	Connects the device in parallel as an NO contact that turns ON in the condition A > = B
	OR<>	Connects the device in parallel as an NO contact that turns ON in the condition A < > B
Output	OUT	Outputs the previous state
	OUB	Inverts and outputs the previous state
	SET	Turns the target relay ON, and holds it in this state
	RES	Turns the target relay OFF
	KEEP	Sets (holds ON state) or resets (turns OFF) the target relay according to the SET/RES input condition
	DIFU	Turns a target relay ON for one scan at the up edge of the previous state
	DIFD	Turns a target relay ON for one scan at the down edge of the previous state
	ONDL	Sets ON delay operation of the target relay
	OFDL	Sets OFF delay operation of the target relay
	SHOT	Operates the target relay as a one-shot timer
	FLIK	Uses the target relay as a flicker circuit
	ALT	Sets the target relay for alternate operation
Bit output	BOUT	Outputs the previous state to the specified bit of the word device
	BOUB	Inverts and outputs the previous state to the specified bit of the word device
	BSET	Turns the specified bit of the word device ON, and holds this state
	BRES	Turns the specified bit of the word device OFF
Timer/ counter	TMR	32-bit 100 ms subtraction type ON delay timer
	TMH	32-bit 10 ms subtraction type ON delay timer
	TMS	32-bit 1 ms subtraction type ON delay timer
	TMU	32-bit 10 μs subtraction type ON delay timer
	C	32-bit addition counter
	OUTC	32-bit addition counter
	ITVL	Pulse measurement/DM value measurement
	UDC	32-bit increment/decrement counter
	UDT	32-bit increment/decrement timer
Connection/ end	END	End of main routine program
	ENDH	Sequence program end
	CON	Serial connection of an output instruction
	MPS	Stores the previous state
	MRD	Reads the content stored by the MPS instruction
	MPP	Clears the content stored by the MPS instruction
	ANL	Serial connection of contact block
	ORL	Parallel connection of contact block
	INV	Inverts the previous ON/OFF state before this instruction
	MEP	Only 1 scan period is ON on the up edge of the previous execution condition
	MEF	Only 1 scan period is ON on the down edge of the previous execution condition
Direct I/O	RFSX	Refreshes the states of specified number of input relays
	RFSY	Refreshes the states of the specified number of output relays

Applied instructions

Type	Mnemonics	Description
Shift	SFT	Shift register operation
Step	STP	Step start
	STE	Step end
Stage processing	STG	Stage start
	JMP	Stage jump
	ENDS	Stage end
	W-ON	Holds the target relay ON when the previous status is ON and the detection relay is ON
	W-OFF	Holds the target relay ON when the previous status is ON and the detection relay is OFF
	W-UE	Holds the target relay ON when the previous status is ON and the detection relay is up-edge
	W-DE	Holds the target relay ON when the previous status is ON and the detection relay is down-edge
Flow	MC	Indicates the start of the master control
	MCR	Indicates the end of the master control
	CALL	Sub-routine call
	ECALL	Executes subroutine of specified module
	SBN	Sub-routine start
	RET	Sub-routine end
	FOR	Repeat start
	NEXT	Repeat block end
	BREAK	Repeat forced end
	CJ	At Execution Condition ON, jumps to LABEL instruction
	NCJ	At Execution condition OFF, jumps to LABEL instruction
	SCJ	Jumps to the LABEL instruction (1 scan ON delay)
	GOTO	Unconditionally jumps to LABEL instruction
	LABEL	Sets the jump destination of the CJ, NCJ, SCJ or GOTO instructions
Macro	MCALL	Executes sub-routine type macro
	MSTRT	Executes self-hold type macro
	MEND	Stops self-hold type macro
Function block	FB	Function block call
	FEND	Function block end
	FUN	Function call
Module	MDSTRT	Module execution start
	MDSTOP	Module execution stop
Index register	ZPUSH	Saves index register uniformly
	ZPOP	Reads index register uniformly
Indirect specification	ADRSET	Stores the address of indirect-specified device to a specified word device
	ADRINC	Increases device address by 1
	ADRDEC	Decreases device address by 1
	ADRADD	Adds the address
	ADRSUB	Subtracts the address
Unit program	UPSTRT	Starts the unit program
	UPSTOP	Forces the unit program to end
	UFSUS	Pauses the flow
	UFRSM	Restarts the flow
	UMALLOC	Acquires expansion unit buffer memory
Buffer memory	UREAD	Reads data of the expansion unit buffer memory
	UWRIT	Writes data to the expansion unit buffer memory
	UFILL	Writes the data in batch to the buffer memory in the expansion unit
File register	FRSET	Switches the current group No. of the file register to the specified No
	FRSTM	Writes the current values of the file register to the memory card
	FRLDM	Reads the data saved in memory card into the file register

Arithmetic operation instruction

Type	Mnemonics	Description
Data move	DW	Data transfer
	LDA	Transfers data to internal registers
	STA	Transfers data from internal register to transfer destination
	PLDA	Transfers data of specified bits from transfer source to internal register
	PSTA	Transfers data of specified bits from internal register to transfer destination
	TMIN	Transfers 32-bit numerical values set by the digital trimmer to an internal register
	MOV	Transfers data from transfer source to transfer destination
	BMOV	Block transfer data from source to destination
	FMOV	Batch transfer data from source to destination
	PMOV	Transfers information of any continuous bits of word device into the specified bits of specified word device
	BYLMOV	Swaps upper data to lower data and performs data transfer
	BYBMOV	Swaps lower data to upper data and performs data transfer
	RND	Stores 16-bit random data into transfer destination
Arithmetic/ Comparison Operation	ADD	Binary data addition
	SUB	Binary data subtraction
	MUL	Binary data multiplication
	DIV	Binary data division
	INC	Increment the target device value by 1
	DEC	Decrement the target device value by 1
	ROOT	Square-root operation
	POW	Exponential operation
	CMP	Data compare
	ZCMP	Zone compare
Logical operation	ANDA	Logic operation of internal register and logic AND data
	ORA	Logic operation of internal register and logical OR data
	EORA	Logic operation of internal register and exclusive OR (XOR) data
	ENRA	Logic operation of internal register and exclusive NOR data
	COM	Inverts bits
	NEG	Inverts sign
Data shift	SRA	Shifts bits of internal register right
	SLA	Shifts bits of internal register left
	ASRA	Shifts internal register arithmetic right
	ASLA	Shifts internal register arithmetic left
	RRA	Shifts bits of internal register right with carry
	RLA	Shifts bits of internal register left with carry
	RRNCA	Shifts bits of internal register right without carry
	RLNCA	Shifts bits of internal register left without carry
	WSR	Shifts word data toward larger device No.
	WSL	Shifts word data toward smaller device No.
	BSR	Shifts content of bit device toward larger device No.
	BSL	Shifts content of bit device toward smaller device No.
Data control	LIMIT	Upper and lower limit control
	BANDC	Dead band control
	ZONE	Zone control
	APR	Linear approximation
	RAMP	Outputs input value variation in a specified gradient
	TPOUT	Performs pulse output at a specific ON cycle and time
	LLFLT	Outputs input through the lag filter
Data conversion	TBCD	Converts binary to BCD
	TBIN	Converts BCD to binary
	MPX	Decodes 4-bit number to 16-bit number

Data conversion	DMX	Encodes 16-bit number to 4-bit number
	GRY	Converts binary code to grey code
	RGRY	Converts grey code to binary code
	DISN	Disperses word (16-bit) into nibble units (4-bit)
	UNIN	Unites the nibble units (4-bit) to word (16-bit)
	DISB	Disperses word (16-bit) into byte (8-bit)
	UNIB	Unites byte (8-bit) to word (16-bit)
	SWAP	Swaps the upper data and lower data
	BSWAP	Switches block units for upper data and lower data
	XCH	Exchanges data
	DECO	Decodes the numbers of the lower n bits of the internal register to 2^n bit binary data
	ENCO	Encodes the "1" (ON) positions of specified continuous n number of bit devices to an 8-bit numerical value
	ABS	Absolute value
	CPMSET	Creates CIP message
	CPMGET	Obtains CIP message
Floating point	FLOAT	Converts binary to floating real number
	INTG	Converts floating real number to binary
	DFLOAT	Converts binary to double-precision floating point real number
	DINTG	Converts double-precision floating point real number to binary
	DFTOF	Converts double-precision floating point real number to single-precision floating point real number
	FTODF	Converts single-precision floating point real number to double-precision floating point real number
	DISF	Disperses floating real number into mantissa/ exponent
	UNIF	Unites mantissa and exponent to floating real number
	EXP	Exponent operation
	LOG	Natural logarithm operation
	LOG10	Common logarithm operation
	RAD	Converts degree s(°) to radians (rad)
	DEG	Converts radians (rad) to degree (°)
	SIN	Calculates the sine (sin) value from the angle (rad)
	COS	Calculates the cosine (cos) value from the angle (rad)
	TAN	Calculates the tangent (tan) value from the angle (rad)
	ASIN	Calculates the angle (rad) from the sine (sin) value
	ACOS	Calculates the angle (rad) from the cosine (cos) value
	ATAN	Calculates the angle (rad) from the tangent (tan) value
	ATAN2	Calculates the angle in radians (rad) from the XY coordinates
Text processing	ASC	Converts binary to HEX ASCII code
	RASC	Converts HEX ASCII code to binary
	DASC	Converts binary to decimal ASCII code
	RDASC	Converts decimal ASCII code to binary
	HASC	Converts 16/32-bit unsigned binary to Hex ASCII
	RHASC	Converts Hex ASCII to 16/32-bit unsigned binary
	FASC	Converts floating real number to text string
	RFASC	Converts text string to floating real number
	SMOV	Transfers text string
	SADD	Adds text string
	SRGHT	Cuts a specified number of characters from the right end of a text string
	SLEFT	Cuts a specified number of characters from the left end of a text string
	SMID	Cuts part of a text string
	SRPLC	Replaces part of a text string with a specified text string
	SINS	Inserts a text string to be specified
	SDEL	Deletes a text string to be specified
	STRIM	Deletes end of text string
	SFIND	Searches for a specified text string from a text string
	SFINDN	Searches for a text string
	SCMP	Compares text string
	DISS	Disperses text string (byte units) into text strings (word units)
	UNIS	Unites text string (word units) into text strings (byte units)
	LEN	Detects text string length
	RCOM	Reads text string
	CPSASC	Converts CIP character string data
	RCPSASC	Performs reverse conversion of CIP character string data

Simple operation	CAL+	Operand3 Binary data addition operation
	CAL-	Operand3 Binary data subtraction operation
	CAL*	Operand3 Binary data multiplication operation
	CAL/	Operand3 Binary data division operation
	CAL&	Operand3 Logical AND operation
	CAL|	Operand3 Logical OR operation
	CAL^	Operand3 Exclusive OR operation
	CAL–	Operand2 Bit Inversion
	CAL>>	Operand2 Shift right
	CAL<<	Operand2 Shift left

Extended instructions

Type	Mnemonics	Description
Data processing	HKEY	Hex key data input
	SEG	Decodes for 7-segment display
	BCNT	Counts the number of ON bits in internal register
	DCNT	Counts the number of data of same value as internal register in data block
	SER	Detects device No. of data of same value as internal registers in a data block
	DSER	Searches the position of the device for storing data consistent with the specified data
	Max.	Searches maximum value in data block
	MIN	Searches minimum value in data block
	AVG	Calculates average value in data block
	WSUM	Total of binary data in specified range
	BSUM	Stores total of binary data (upper/lower 8 bits) in specified range to internal register
	CRC	Calculates CRC value
	ZRES	Resets specified range
	EXT	Extends 16-bit internal register to 32-bit internal register
	BCMP	Compares binary data in two specified ranges
	BCMPI	Compares binary data in specified range with specified binary data
	RND	Generates random number
	SORT	Arranges binary data
	SORTN	Splits and arranges binary data
Table processing	FIFOW	Writes FIFO data
	FIFOR	Reads FIFO data
	LIFOW	Writes LIFO data
	LIFOR	Reads LIFO data
	FWRIT	Overwrites data of data block
	FINS	Inserts data in data block
	FDEL	Deletes data in data block
Clock processing	WTIME	Writes time data to calendar timer
	SEC	Converts date/time format data to second format data
	RSEC	Converts second format data to date/time format data
	AJST	Adjusts calendar timer by ±30 seconds
Week contact	LDWK	Connects ON/OFF of specified week/hour/minute/ second ranges with power rail as NO contacts
	LDWKB	Connects ON/OFF of specified week/hour/minute/ second ranges with power rail as NC contacts
	ANDWK	Connects ON/OFF of specified week/hour/ minute/ second ranges as NO contacts in series
	ANDWKB	Connects ON/OFF of specified week/hour/minute/ second ranges as NC contacts in series
	ORWK	Connects ON/OFF of specified week/hour/ minute/ second ranges as NO contacts in parallel
	ORWKB	Connects ON/OFF of specified week/hour/ minute/ second ranges as NC contacts in parallel
Calendar contact	LDCAL	Connects ON/OFF of specified year/month/day ranges with power rail as NO contacts
	LDCALB	Connects ON/OFF of specified year/month/day ranges with power rail as NC contacts
	ANDCAL	Connects ON/OFF of specified year/month/day ranges as NO contacts in series
	ANDCALB	Connects ON/OFF of specified year/month/day ranges as NC contacts in series
	ORCAL	Connects ON/OFF of specified year/month/day ranges as NO contacts in parallel
	ORCALB	Connects ON/OFF of specified year/month/day ranges as NC contacts in parallel
Alarm	ARES	Clears alarm relay/alarm log

High-speed processing	HSP	Sets input time constant to 10 µs
	DI	Disables interrupt
	EI	Enables interrupt
	DIC	Sets interrupt disabled range
	INT	Executes interrupt
	RETI	Ends interrupt
	IEDGE	Sets detection conditions used for interrupt
	CTH	32-bit high-speed counter
	CTC	32-bit high-speed counter comparator
	RFSCTH	Updates the current value of high-speed counter CTH into the latest value
Positioning	PLSX	Starts X-axis positioning
	PLSY	Starts Y-axis positioning
	JOGX	X-axis inching operation
	JOGY	Y-axis inching operation
	ORGX	Zero return on X-axis
	ORGY	Zero return on Y-axis
	TCHX	Teaching X-axis
	TCHY	Teaching Y-axis
	HOMEX	Starts X-axis home position movement
	HOMEY	Starts Y-axis home position movement
	CHGSPX	Changes the operation speed on X-axis
	CHGSPY	Change the operation speed on Y-axis
	RFSPSX	Updates the current position and speed of X-axis to the latest values
	RFSPSY	Updates the current position and speed of Y-axis to the latest values
Cam switch	MCMP	Multi-stage comparator operation
	ABSENC	Cam switch operation by absolute encoder
	INCENC	Cam switch operation by incremental encoder
Frequency counter	FCNT	Measures pulse input frequency using CTH0
	RCNT	Measures the speed of rotation of pulse input using CTH0
	PLSOUT	Outputs pulse of frequency specified by CTH1
PID	PID	PID control
	PIDAT	Controls PID instructions with auto-tuning
Logging	LOGE	Enables logging with specified logging ID
	LOGD	Disables logging with specified logging ID
	TRGD	Captures data log with specified log ID
Operation recording	TRGR	Obtains the device recording data
Memory card	MWRIT	Writes device data to a memory card
	MREAD	Reads device data from a memory card
	MFREE	Obtains free space on a memory card
	MMKDIR	Creates directory on a memory card
	MRMDIR	Deletes a specified folder in a memory card
	MDEL	Deletes a specified file in a memory card
	MPRINT	Writes character strings to a file on a memory card
	MREADL	Reads a single line from a file on a memory card
	MCOPY	Copies a file on a memory card
	MMOV	Moves a file on a memory card
	MREN	Changes the name of a file on a memory card
	MFREEK	Obtains the amount of free space on a memory card in units of kilobytes
	MSTAT	Obtains the status of a file on a memory card
Access Window	AWNUM	Displays user message 1 on access window (value)
	AWMSG	Displays user message 2 on access window (text string)
	AWSHOW	Displays user message on access window
	AWHIDE	Clears user message displayed on the access window
Free operation counter	RFSFRC	Updates the current value of free operation counter to the latest value
Sensor setting instruction	SPRD	Reads sensor parameter
	SPWR	Writes sensor parameter
	SSVC	Executes sensor service
Cyclic communication refresh instruction	RFSCI	Cyclic communication input refresh
	RFSCO	Cyclic communication output refresh

Instructions available for KV-8000 only
Instructions available for KV-8000/7500/7300 only
Instructions available for KV-5500/5000/3000 only

* Some instructions may not be available for KV-5500/5000/3000 depending on the version of functions.
* Refer to the reference manual for instructions available for KV-700.

CPU unit

Classification	Item name	Model	Functions/Specifications	Reference
KV-8000 Series	CPU unit with built-in EtherNet/IP™ port	**KV-8000**	Program capacity: 1500 k steps, LD instruction processing speed: 0.96 ns, EtherNet/IP™ port, USB port (USB 2.0), CPU inner bus, Machine Operation Recorder function	P. 2 to 39
KV-7000 Series	CPU unit with built-in EtherNet/IP™ port	**KV-7500**	Program capacity: 1500 k steps, LD instruction processing speed: 0.96 ns EtherNet/IP™ port, USB port (USB 2.0), CPU inner bus	P. 40 to 41
	CPU unit with built-in serial port	**KV-7300**	Program capacity: 160 k steps, LD instruction processing speed: 0.96 ns RS-232C port, USB port (USB 2.0), CPU inner bus	
KV-5000/3000 Series	CPU unit with built-in EtherNet/IP™ port	**KV-5500**	Program capacity: 260 k steps, LD instruction processing speed: 10 ns EtherNet/IP™ port, USB port (USB 1.1), Built-in I/O (input 16 points/output 8 points)	P. 40 to 41
	CPU unit with built-in Ethernet port	**KV-5000**	Program capacity: 260 k steps, LD instruction processing speed: 10 ns Ethernet port, USB port (USB 1.1), Built-in I/O (input 16 points/output 8 points)	
	CPU unit with built-in serial port	**KV-3000**	Program capacity: 160 k steps, LD instruction processing speed: 10 ns RS-232C port, USB port (USB 1.1), Built-in I/O (input 16 points/output 8 points)	

Other expansion units

Classification/Item name		Model	Functions/Specifications	Supported series		Reference
				KV-8000/7000	KV-5000/3000	
I/O	Input Unit	**KV-B16XC**	16 points, 24/5 VDC switch, screw terminal block	✓	✓	P. 42 to 43
		KV-C32XC	32 points, 24/5 VDC switch, MIL connector 34 pins × 1	✓	✓	
		KV-C64XC	64 points, 24/5 VDC switch, MIL connector 34 pins × 2, compatible with 2-wire sensor	✓	✓	
	Output unit	**KV-B8RC**	8 points, relay (independent common), screw terminal block	✓	✓	P. 42 to 43
		KV-B16RC	16 points, relay, screw terminal block	✓	✓	
		KV-B16TC	16 points, transistor (sink), screw terminal block	✓	✓	
		KV-B16TD	16 points, MOSFET (sink), with overcurrent protection function, screw terminal block	✓	✓	
		KV-B16TCP	16 points, transistor (source), screw terminal block	✓	✓	
		KV-C32TC	32 points, transistor (sink), MIL connector 34 pins × 1	✓	✓	
		KV-C32TD	32 points, MOSFET (sink), with overcurrent protection function, MIL connector 34 pins × 1	✓	✓	
		KV-C32TCP	32 points, transistor (source), MIL connector 34 pins × 1	✓	✓	
		KV-C64TC	64 points, transistor (sink), MIL connector 34 pins × 2	✓	✓	
		KV-C64TD	64 points, MOSFET (sink), with overcurrent protection function, MIL connector 34 pins × 2	✓	✓	
		KV-C64TCP	64 points, transistor (source), MIL connector 34 pins × 2	✓	✓	
	High-speed I/O unit	**KV-SIR32XT**	32 inputs + 32 outputs, 24/5 VDC switch, MIL connector 40 pins × 2 Unit interrupt, Inter-unit synchronisation, with Overcurrent protection function	✓		P. 19, P. 42 to 43
	I/O unit	**KV-B8XTD**	8 inputs + 8 outputs, MOSFET (sink), with overcurrent protection function, screw terminal block	✓	✓	P. 42 to 43
		KV-C16XTD	16 inputs + 16 outputs, MOSFET (sink), with overcurrent protection function, MIL connector 34 pins × 1	✓	✓	
		KV-C32XTD	32 inputs + 32 outputs, MOSFET (sink), with overcurrent protection function, MIL connector 34 pins × 2	✓	✓	
Analogue	High-speed analogue input unit	**KV-SAD04**	Voltage, current input 4 ch, Conversion speed: 10 µs/ch, Resolution: 1/20000, Conversion precision: 0.1% (at 25°C), Unit interrupt compatible	✓		P. 20, P. 44 to 45
	A/D conversion unit	**KV-AD40V**	Voltage, current input: 4 ch, Conversion speed: 25 µs/ch, Resolution: 1/20000, Conversion precision: ±0.1% of F.S. (at 25°C)	✓	✓	P. 44 to 45
		KV-AD40	Voltage, current input: 4 ch, Conversion speed: 80 µs/ch, Resolution: 1/4000, Conversion precision: ±0.2% of F.S. (at 25°C)	✓	✓	
		KV-AD40G	Voltage, current input: 4 ch, Conversion speed: 80 µs/2 ch, 160 µs/4 ch, Resolution: 1/30000, Conversion precision: ±0.05% of F.S. (at 25°C)	✓	✓	
	High-speed analogue output unit	**KV-SDA04**	Voltage, current output 4 ch, Conversion speed: 10 µs/ch, Resolution: 1/20000, Conversion precision: 0.1% (at 25°C), unit interrupt, inter-unit synchronisation	✓		P. 20, P. 44 to 45
	D/A conversion unit	**KV-DA40V**	Voltage, current output: 4 ch, Conversion speed: 25 µs/ch, Resolution: 1/20000, Conversion precision: ±0.1% of F.S. (at 25°C)	✓	✓	P. 44 to 45
		KV-DA40	Voltage, current output: 4 ch, Conversion speed: 80 µs/ch, Resolution: 1/4000, Conversion precision: ±0.2% of F.S. (at 25°C)	✓	✓	
	A/D and D/A conversion unit	**KV-AM40V**	Voltage, current input: 2 ch + voltage, current output: 2 ch, Conversion speed: 80 µs/ch, Resolution: 1/8000, Conversion precision: ±0.2% of F.S. (at 25°C)	✓	✓	
Temperature	Multi-Input unit	**KV-TP40**	Thermocoupler and platinum temperature measuring resistor, voltage, current input: 4 ch, Conversion speed: 50 ms/4 ch, Insulation between channels	✓	✓	P. 44 to 45
	Temperature control unit	**KV-TF40**	Thermocoupler and platinum temperature measuring resistor input: 4 ch, PID auto-tuning	✓	✓	
Positioning/ Motion	Positioning/Motion unit with simplified wiring	**KV-XH04ML**	MECHATROLINK-III communication, 4-axis Position control, speed control, torque control, linear interpolation, arc interpolation, helical interpolation, synchronisation control, unit interrupt, inter-unit synchronisation	✓		P. 22 P. 46 to 47
		KV-XH16ML	MECHATROLINK-III communication, 16-axis Position control, speed control, torque control, linear interpolation, arc interpolation, helical interpolation, synchronisation control, minute control	✓		
		KV-ML16V	MECHATROLINK-II communication, 16-axis Position control, speed control, torque control, linear interpolation, arc interpolation, helical interpolation, synchronisation control, minute control	✓	✓	P. 46 to 47
	Pulse train positioning/ motion unit	**KV-MC20V**	2-axis pulse train Position control, linear interpolation, arc interpolation, helical interpolation, synchronisation control, minute control	✓	✓	
		KV-MC40V	4-axis pulse train Position control, linear interpolation, arc interpolation, helical interpolation, synchronisation control, minute control	✓	✓	
	Function extension unit	**KV-MX1**	Increment encoder input: 4 ch, absolute encoder input: 2 ch, 12 universal inputs + 12 universal outputs, SD card slot	✓	✓	
Positioning/ high-speed counter	High-speed positioning unit	**KV-SH04PL**	Pulse train, 4-axis, position control, linear interpolation, unit interrupt compatible	✓		P. 21, P. 48 to 49
	Communication positioning unit	**KV-LH20V**	Modbus RTU communication, max. 8 axes Manufacturers of compatible devices: KEYENCE; IAI Corporation; ORIENTAL MOTOR Co., Ltd.; SMC Corporation	✓	✓	P. 48 to 49
	High-speed counter unit	**KV-SSC02**	2 ch, Max. input frequency: 16 MHz (2-phase, 4-multiplication), Unit interrupt, Inter-unit synchronisation	✓		P. 21, P. 48 to 49
		KV-SC20V	2 ch, Max. input frequency: 4 MHz (2-phase, 4-multiplication)	✓	✓	P. 48 to 49

■ Other expansion units

Classification/Item name			Model	Functions/Specifications	Supported series		Reference
					KV-8000/7000	KV-5000/3000	
Network	Ethernet unit		**KV-XLE02**	2 ports; EtherNet/IP™, EtherCAT® (slave), CC-Link IE Field (intelligent device station), and PROFINET (device) compatible; 1000BASE-T/100BASE-TX/10BASE-T; PLC link Function; PROTOCOL STUDIO mode; FTP client/server function; unit interrupt; inter-unit synchronisation	✓		P. 23 P. 50 to 53
			KV-LE21V	100BASE-TX/10BASE-T, FTP client/server function	✓	✓	
	EtherNet/IP™ unit		**KV-EP21V**	EtherNet/IP™ compatible 100BASE-TX/10BASE-T, FTP client/server function	✓	✓	
	FL-net unit		**KV-FL20V**	FL-net (OPCN-2) Ver. 2.00 compatible, 100BASE-TX/10BASE-T	✓	✓	
	Serial communication unit		**KV-XL202**	2 ports (RS-232C), PLC link Function, PROTOCOL STUDIO mode, Modbus master/slave, unit interrupt, inter-unit synchronisation	✓		
			KV-XL402	2 ports (RS-422A/485), PLC link Function, PROTOCOL STUDIO mode, Modbus master/slave, unit interrupt, inter-unit synchronisation	✓		
			KV-L21V	2 ports (RS-232C × 1 port + RS-232C/422A/485 × 1 port), Modbus master/slave	✓	✓	
	High-speed multi-link unit		**KV-LM21V**	High-speed multi-link (for connection to VT Series), serial PLC link	✓	✓	
	KL-LINK unit		**KL-N20V**	Communication speed 5 Mbps, remote I/O mode, PLC link mode	✓	✓	P. 58 to 61
	CC-Link unit		**KV-CL20**	CC-Link Ver. 2.0, communication speed 10 Mbps, master station, master station (duplex), standby master station, local station	✓	✓	
	DeviceNet™ unit		**KV-DN20**	Communication speed 500 kbps, master mode, slave mode, master & slave mode	✓	✓	
Remote I/O	EtherNet/IP™	Communication unit	**KV-EP02**	2 ports, EtherNet/IP™, 100BASE-TX/10BASE-T	✓	✓	P. 54 to 57
		I/O Unit (Connector)	**KV-NC16EXE**	16 inputs, 5/24 VDC switch, European terminal block	✓	✓	P. 25, P. 54 to 57
			KV-NC16EX	16 inputs, 24/5 VDC switch, MIL connector 20 pins × 1	✓	✓	
			KV-NC32EX	32 inputs, 24/5 VDC switch, MIL connector 34 pins × 1	✓	✓	
			KV-NC8ER	8 outputs, relay output, European terminal block	✓	✓	
			KV-NC16ETE	16 outputs, transistor (sink) output, European terminal block	✓	✓	
			KV-NC16ETPE	16 outputs, transistor (source) output, European terminal block	✓	✓	
			KV-NC16ET	16 outputs, transistor (sink) output, MIL connector 20 pins × 1	✓	✓	
			KV-NC16ETP	16 outputs, transistor (source) output, MIL connector 20 pins × 1	✓	✓	
			KV-NC32ET	32 outputs, transistor (sink) output, MIL connector 34 pins × 1	✓	✓	
			KV-NC32ETP	32 outputs, transistor (source) output, MIL connector 34 pins × 1	✓	✓	
			KV-NC16EXT	16 inputs/16 outputs, transistor (sink) output, MIL connector 34 pins × 1	✓	✓	
			KV-NC32EXT	32 inputs/32 outputs, transistor (sink) output, MIL connector 34 pins × 2	✓	✓	
		I/O Unit (Terminal block)	**KV-N8EX**	8 inputs, 24/5 VDC switch, screw terminal block	✓	✓	
			KV-N16EX	16 inputs, 24/5 VDC switch, screw terminal block	✓	✓	
			KV-N8ER	8 outputs, relay output, screw terminal block	✓	✓	
			KV-N8ET	8 outputs, transistor (sink) output, screw terminal block	✓	✓	
			KV-N8ETP	8 outputs, transistor (source) output, screw terminal block	✓	✓	
			KV-N16ER	16 outputs, relay output, screw terminal block	✓	✓	
			KV-N16ET	16 outputs, transistor (sink) output, screw terminal block	✓	✓	
			KV-N16ETP	16 outputs, transistor (source) output, screw terminal block	✓	✓	
			KV-N8EXR	Input 8 points/output 8 points, relay output, screw terminal block	✓	✓	
			KV-N8EXT	8 inputs/8 outputs, transistor (sink) output, screw terminal block	✓	✓	
		Analogue Unit (Connector/ Terminal block)	**KV-NC4AD**	Analogue input; Voltage, current input: 4 ch; Conversion speed: 80 µs/ch; Resolution: 1/4000; Conversion precision: 0.3% (at 25°C ±5°C); European terminal block	✓	✓	
			KV-NC2DA	Analogue output; Voltage, current output: 2 ch; Conversion speed: 80 µs/ch; Resolution: 1/4000; Conversion precision: 0.3% (at 25°C ±5°C); European terminal block	✓	✓	
			KV-N3AM	Analogue I/O; Voltage, current input: 2 ch / Voltage, current output: 1 ch; Conversion speed: 80 µs/ch; Resolution: 1/4000; Conversion precision: 0.3% (at 25°C ±5°C); Screw terminal block	✓	✓	
		Temperature Input Unit	**KV-NC4TP**	Temperature input: thermocouple/platinum resistance thermometer 4 ch, conversion speed: 125 ms/ch, European terminal block	✓	✓	
		Connection conversion unit	**KV-NC1**	For connecting screw terminal block type expansion units	✓	✓	
	KL-LINK	I/O Unit	**KL-8BLX**	8 inputs, 24/5 VDC switch, screw terminal block	✓	✓	P. 58 to 61
			KL-16BX	16 inputs, 24/5 VDC switch, screw terminal block	✓	✓	
			KL-16CX	16 inputs, 24/5 VDC switch, MIL connector 26 pins × 1 (included)	✓	✓	
			KL-32CX	32 inputs, 24/5 VDC switch, MIL connector 26 pins × 2 (included)	✓	✓	
			KL-8BLR	8 outputs, relay, screw terminal block	✓	✓	
			KL-8BLT	8 outputs, transistor (sink), screw terminal block	✓	✓	
			KL-16BR	16 outputs, relay, screw terminal block	✓	✓	
			KL-16BT	16 outputs, transistor (sink), screw terminal block	✓	✓	
			KL-16CT	16 outputs, transistor (sink), MIL connector 26 pins × 1 (included)	✓	✓	
			KL-32CT	32 outputs, transistor (sink), MIL connector 26 pins × 2 (included)	✓	✓	
			KL-8BXR	8 inputs + 8 outputs, relay, screw terminal block	✓	✓	
			KL-8BXT	8 inputs + 8 outputs, transistor (sink), screw terminal block	✓	✓	
		Analogue Unit	**KL-4AD**	Voltage, current input: 4 ch; resolution: 1/4000; with 4-digit 7 segment display	✓	✓	
			KL-2DA	Voltage, current output: 2 ch; resolution: 1/4000; with 4-digit 7 segment display	✓	✓	
			KL-DC1A	Direct current input: 1 ch; resolution: 1/200000; with 4-digit 7 segment display	✓	✓	
			KL-DC1V	Direct current input: 1 ch; resolution: 1/200000; with 4-digit 7 segment display	✓	✓	
		Temperature control unit	**KL-2TF**	Thermocouple/platinum resistance thermometer input: 2 ch	✓	✓	
		Load cell unit	**KL-LC1**	Load cell input: 1 ch; resolution: 1/20000; with 4-digit 7 segment display	✓	✓	
		Power unit	**KL-WH1**	Electricity amount measurement: 1 ch, with 4-digit 7 segment display	✓	✓	
	CC-Link	I/O Unit	**KV-RC16BX**	16 inputs, 24/5 VDC switch, screw terminal block	✓	✓	
			KV-RC32BX	32 inputs, 24/5 VDC switch, screw terminal block	✓	✓	
			KV-RC16BR	16 outputs, relay, screw terminal block	✓	✓	
			KV-RC16BT	16 outputs, transistor (sink), screw terminal block	✓	✓	
			KV-RC32BT	32 outputs, transistor (sink), screw terminal block	✓	✓	
			KV-RC8BXR	8 inputs + 8 outputs, relay, screw terminal block	✓	✓	
			KV-RC8BXT	8 inputs + 8 outputs, transistor (sink), screw terminal block	✓	✓	
			KV-RC16BXT	16 inputs + 16 outputs, transistor (sink), screw terminal block	✓	✓	
		Analogue Unit	**KV-RC4AD**	Voltage, current input: 4 ch; resolution: 1/12000; with 5-digit 7 segment display	✓	✓	
			KV-RC4DA	Voltage, current output: 4 ch; resolution: 1/12000; with 5-digit 7 segment display	✓	✓	

Other expansion units

Classification	Item name	Model	Functions/Specifications	Supported series		Reference
				KV-8000/7000	KV-5000/3000	
Network	Communication unit	**NU-EP1**	N-bus compatible, PoE function	✓	✓	-
		DL-EP1	D-bus supported	✓	✓	
	EtherNet/IP™ compatible Ethernet switch	**NE-Q05P**	5 ports, 24 VDC, QoS function, PoE function	✓	✓	-
		NE-Q05	5 ports, 24 VDC, QoS function	✓	✓	
Power supply	AC Power Supply Unit with Error Output	**KV-PU1**	Output capacity: 1.8 A Relay output - Rated load: 24 VDC, 0.5 A	✓		P. 40 to 41
	AC Power Unit	**KV-U7**	Output capacity: 1.8 A		✓	P. 40 to 41
Error output	Error output unit	**KV-DR1**	Relay output Rated load: 24 VDC, 0.5 A		✓	P. 40 to 41
Wireless communication	Bluetooth unit	**KV-BT1**	Bluetooth® Ver2.0 + EDR, Communication distance: 10 m		✓	P. 40 to 41
Bus extension	Extension unit	**KV-EB1**	3 layers (when 1-m extension cable is used, max. 48 units are connectable) 2 layers (when 2-m extension cable is used, max. 32 units are connectable)	✓	✓	-

Camera units, others

Classification	Item name	Model	Functions/Specifications	Supported series			Reference
				KV-8000	KV-7000	KV-5000/3000	
Camera	Camera input unit	**KV-CA02**	2 ports	✓			P. 8 to 11, P. 38 to 39
	Compact standard camera	**KV-CA1H**	Colour camera, Resolution: 640 (H) × 480 (V), Frame rate: 10/30/120 fps	✓			
	Wide field and high-resolution camera	**KV-CA1W**	Colour camera, Resolution: 1280 (H) × 960 (V), Frame rate: 10/30 fps	✓			
	Camera cable	**KV-C5**	Cable length: 5 m	✓			
		KV-C10	Cable length: 10 m	✓			
		KV-C20	Cable length: 20 m	✓			

Software

Classification	Type	Item name	Model	Functions/Specifications
Programming support software	Downloadable	KV STUDIO Ver. 11 (Global version)	**KV-H1G-DL**	Windows 10/8/7-compatible, site licence*
		KV STUDIO Ver. 11	**KV-H1J-DL**	Windows 10/8/7-compatible, site licence*
	Packaged (DVD-ROM)	KV STUDIO Ver. 11 (Global version)	**KV-H11G**	Windows 10/8/7-compatible, site licence*
		KV STUDIO Ver. 11	**KV-H11J**	Windows 10/8/7-compatible, site licence*
Data collection/ monitoring software	Downloadable	KV COM+ for Excel	**KV-DH1-DL**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ for Excel (5 licences)	**KV-DH1-DL5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ Library	**KV-DH1L-DL**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ Library (5 licences)	**KV-DH1L-DL5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ for Excel (English version)	**KV-DH1E-DL**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ for Excel (5 licences, English version)	**KV-DH1E-DL5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ Library (English version)	**KV-DH1LE-DL**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ Library (5 licences, English version)	**KV-DH1LE-DL5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
	Packaged (CD-ROM)	KV COM+ for Excel	**KV-DH1**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ for Excel (5 licences)	**KV-DH1-5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ Library	**KV-DH1L**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ Library (5 licences)	**KV-DH1L-5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ for Excel (English version)	**KV-DH1E**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ for Excel (5 licences, English version)	**KV-DH1E-5**	Windows 10/8/7/Vista/XP-compatible, 5 licences
		KV COM+ Library (English version)	**KV-DH1LE**	Windows 10/8/7/Vista/XP-compatible, 1 licence
		KV COM+ Library (5 licences, English version)	**KV-DH1LE-5**	Windows 10/8/7/Vista/XP-compatible, 5 licences

* Through user registration, the software can be used by multiple persons associated with the office (including factories, business offices, and sales offices) that purchased the software.

Option list

Classification	Related models	Overview	Model	Accessory	Remarks
CPU unit	KV-8000/7500/7300/ 5500/5000/3000	SD memory card	**KV-M16G**		16 GB
			KV-M4G		4 GB
			KV-M1G		1 GB
	KV-8000/7500/7300/ 5500/5000/3000/700	End unit	**OP-84203**	✓*1	-
	KV-8000/7500/7300	Backup battery	**KV-B1**		For calendar timer saving, mounted to battery case on front of CPU
	KV-5500/5000/3000	Backup battery	**OP-51604**	✓	Connect with connector in battery case of CPU bottom
		MIL connector 40 pins	**OP-22184**		Equipped with a standard contact Vertical type
		MIL slim connector 40 pins	**OP-51404**		Equipped with a standard contact Diagonal type
	KV-700	Expanded memory	**OP-42138**		4 MB, mounted on the expansion slot on the side of CPU unit
		Backup battery	**OP-42139**	✓	Connect with connector in battery case of CPU top
		MIL connector 20 pins	**OP-22185**		Equipped with a standard contact
	KV-5500/5000/3000	Contact	**OP-22186**		For standard AWG22-24, 200 pieces
		Fine line contact	**OP-30594**		For fine line AWG26-28, 200 pieces
		Pressure-welding tool dedicated for MIL connectors	**OP-21734**		-
Software	Common	USB cable	**OP-35331**		Cable length: 3 m
		Modular cable	**OP-26487**		6-core threads modular 2.5 m (Combination with OP-26486 or OP-26485)
		D-Sub 25 pin connector	**OP-26485**		Combination with OP-26487
		D-Sub 9 pin connector	**OP-26486**		For DOS/V (Combination with OP-26487)
		External USB port adapter	**KV-S2**		Cable length: 1 m
I/O	KV-SIR32	MIL connector 40 pins	**OP-22184**		Equipped with a standard contact Vertical type
		MIL slim connector 40 pins	**OP-51404**		Equipped with a standard contact Diagonal type
	KV-C32	MIL connector 34 pins	**OP-23139**		Equipped with a standard contact Vertical type
	KV-C32/C64	MIL slim connector 34 pins	**OP-42224**		Equipped with a standard contact Diagonal type
	Common	Contact	**OP-22186**		For standard AWG22-24, 200 pieces
		Fine line contact	**OP-30594**		For fine line AWG26-28, 200 pieces
		Pressure-welding tool dedicated for MIL connectors	**OP-21734**		-
	Screw terminal block unit	Small-size Y terminal	**OP-42221**		100 pieces
Temperature control	KV-TF40	Current sensor (CT)	**OP-6694**		For heater wire breaking alarm
Positioning/motion/ high-speed counter	KV-SH04PL/SSC02 KV-MC20V/MC40V/MX1	MIL connector 40 pins	**OP-22184**		Equipped with a standard contact Vertical type
		MIL slim connector 40 pins	**OP-51404**		Equipped with a standard contact Diagonal type
	KV-SC20V	MIL connector 34 pins	**OP-23139**		Equipped with a standard contact Vertical type
		MIL slim connector 34 pins	**OP-42224**		Equipped with a standard contact Diagonal type
	KV-ML16V	MIL connector 20 pins	**OP-22185**		Equipped with a standard contact
	KV-MX1	MIL connector 14 pins	**OP-27284**		Equipped with a standard contact
		SD memory card	**KV-M1G**		1 GB
	Common	Contact	**OP-22186**		For standard AWG22-24, 200 pieces
		Fine line contact	**OP-30594**		For fine line AWG26-28, 200 pieces
		Pressure-welding tool dedicated for MIL connectors	**OP-21734**		-
CC-Link	CC-Link, all models	Dedicated communication cable	**OP-79426**		CC-Link Ver. 1.10 compatible, 20 m cable
			OP-79427		CC-Link Ver. 1.10 compatible, 100 m cable
KL-LINK	KL-16C/32C	MIL connector 26 pins	**OP-30593**	✓	Equipped with a standard contact
		Contact	**OP-22186**		For standard AWG22-24, 200 pieces
		Fine line contact	**OP-30594**		For fine line AWG26-28, 200 pieces
		Pressure-welding tool dedicated for MIL connectors	**OP-21734**		-
	KL-16C/32C/16B KL-8BXT/R KL-4AD/2DA	Slim mounting bracket	**OP-30588**		Space-saving mounting bracket (vertical direction)
		Flat mounting bracket	**OP-30589**		Used for mounting screw
		Joint cable for child station	**OP-30590**		Power and communication lines can be connected at a single touch even when several devices are used in one place.
	KL-8BXR	Relay substrate for replacement (8 ch)	**OP-33011**		For KL-8BXR
	KL-16BR	Relay substrate for replacement (16 ch)	**OP-30595**		For KL-16BR
	KL-8BL	Joint cable for I/O unit	**OP-32985**		Power and communication lines can be connected at a single touch even when several devices are used in one place.
	KL-8BLR	Relay set for replacement	**OP-33010**		For KL-8BLR, relay 5 pieces + pull-out tool
	KL-2TF	Current sensor (CT)	**OP-6694**		For heater wire breaking alarm
	KL-DC1A KL-DC1V KL-LC1 KL-WH1	Attachment for panel mounting	**OP-51667**		2 mounting brackets attached
	KL-WH1	Current sensor (CT) 50 A	**OP-51674**		Current sensor for KL-WH1, 50 A
		Current sensor (CT) 100 A	**OP-51675**		Current sensor for KL-WH1, 100 A
		Current sensor (CT) 250 A	**OP-66851**		Current sensor for KL-WH1, 250 A
	KL, all models	Dedicated communication cable	**OP-30591**		KPEV-SB (1P) 0.75 mm^2 20 m
			OP-30592		KPEV-SB (1P) 0.75 mm^2 100 m
		Adapter for joint cable	**KL-B1**		KL series joint cable
		T-type branch unit	**KL-T1**		T-type branch unit for KL
Decentralised system configuration	KV-EB1	Extension cable: 2 m	**OP-42141**		Can use 1 per system
		Extension cable: 1 m	**OP-42142**		Can use 2 per system
Connection conversion	KV-8000/7500/7300	Bus-connected unit	**KV-7000C**	✓*2	For connection of a KV-5000/3000 Series expansion unit, with end unit
Camera	KV-CA1H/CA1W	Mounting adapter	**OP-88386**		Mounting head
		Adjustable bracket	**OP-88387**		For pole-mounting

*1 KV-7500/7300/5500/5000/3000 only *2 KV-7500/7300 only

RELATED PRODUCTS

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- All sizes use high resolution LCD
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- Automatic translation into multiple languages

Frequently Asked Questions

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SAFETY INFORMATION
Please read the instruction manual carefully in order to safely operate any KEYENCE product.

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AUSTRIA
Phone: +43 (0)2236 378266 0

BELGIUM
Phone: +32 (0)15 281 222

BRAZIL
Phone: +55-11-3045-4011

CANADA
Phone: +1-905-366-7655

CHINA
Phone: +86-21-5058-6228

CZECH REPUBLIC
Phone: +420 220 184 700

FRANCE
Phone: +33 1 56 37 78 00

GERMANY
Phone: +49-6102-3689-0

HONG KONG
Phone: +852-3104-1010

HUNGARY
Phone: +36 1 802 7360

INDIA
Phone: +91-44-4963-0900

INDONESIA
Phone: +62-21-2966-0120

ITALY
Phone: +39-02-6688220

JAPAN
Phone: +81-6-6379-2211

KOREA
Phone: +82-31-789-4300

MALAYSIA
Phone: +60-3-7883-2211

MEXICO
Phone: +52-55-8850-0100

NETHERLANDS
Phone: +31 (0)40 206 6100

PHILIPPINES
Phone: +63-(0)2-8981-5000

POLAND
Phone: +48 71 368 61 60

ROMANIA
Phone: +40 (0)269 232 808

SINGAPORE
Phone: +65-6392-1011

SLOVAKIA
Phone: +421 (0)2 5939 6461

SLOVENIA
Phone: +386 (0)1 4701 666

SWITZERLAND
Phone: +41 (0)43 455 77 30

TAIWAN
Phone: +886-2-2721-8080

THAILAND
Phone: +66-2-369-2777

UK & IRELAND
Phone: +44 (0)1908-696-900

USA
Phone: +1-201-930-0100

VIETNAM
Phone: +84-24-3772-5555

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