KEYENCE

Programmable Logic Controller

KV Nano Series

Expanding Capabilities

KV Nano CONNECTOR

Connector type

KV Nano TERMINAL BLOCK

Terminal block type

KV Nano

KEYENCE makes it seamless.

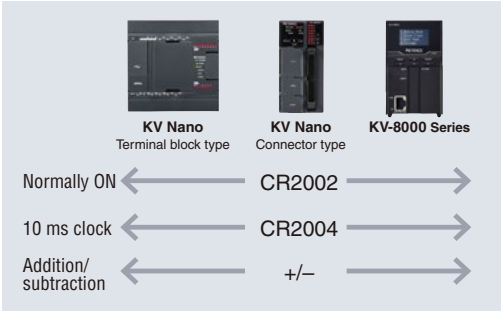
Seamlessness allows you to use any model you want. This ensures a comfortable environment where you can select the optimum PLCs according to your control targets and applications.

Conventional case

We know it is more costly, but we stick with large PLCs even for smaller applications because we don't want to learn a different set of instructions.

KEYENCE's solution Same instructions

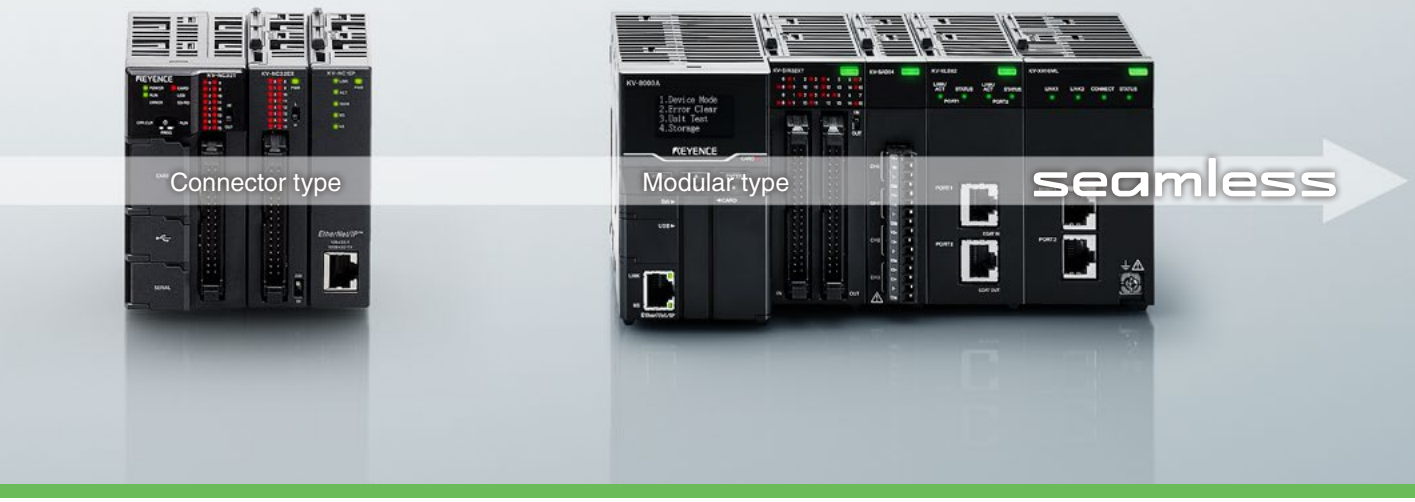
The same instructions can be used regardless of the product series, from frequently-used normally open contacts to PID and other application instructions. This eliminates the stress of using different instructions and ensures more comfortable programming.



All PLC models are programmed using the same version of software.

KV Nano connector

KV-8000 SERIES

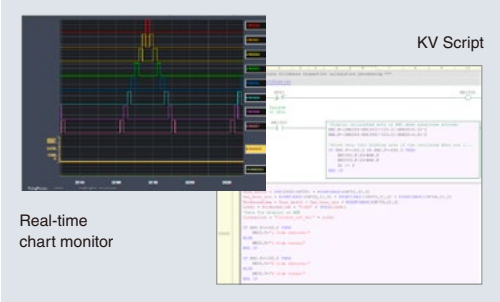


Conventional case

Since available software and functionality may vary depending on the PLC model, we need to keep many versions of programming software available and be mindful of the differences between them.

KEYENCE's solution Same software

The KV Nano not only uses the same software as other KV PLCs, but it also dispels the notion that programming methods cannot be consistent across different PLC models. You can still use functions like KV Script and real-time chart monitor, regardless of the PLC model.

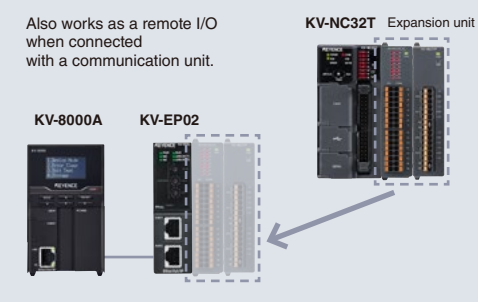


Conventional case

PLC hardware is tied to a particular series, which prevents us from using common hardware when using a variety of PLC series.

KEYENCE's solution Same hardware

The expansion unit of the KV Nano Series can not only be used for remote I/O but also works as a shared remote I/O with the KV-8000 Series. This allows you to use the same parts for large and small applications, resulting in cost reduction.



Connector type: Base unit — Many built-in functions

Base unit
32-point type
Input: 16 points, output: 16 points

Transistor (sink) output	KV-NC32T

Basic performance: 32k steps | Max. I/O: 256 | No. of units: 8
Interface: USB | Serial
Built-in functions: 3 positioning axes | High-speed counter: 3 channels | Interrupt input: 4 | Logging

Expansion unit — Lineup supporting wide range of applications

Input unit

Input unit
16-point type
European terminal block

DC input	KV-NC16EXE

Input unit
16-point type
MIL connector

DC input	KV-NC16EX

Input unit
32-point type
MIL connector

DC input	KV-NC32EX

Output unit

Output unit
8-point type
European terminal block

Relay output	KV-NC8ER

Output unit
16-point type
European terminal block

Transistor (sink) output	KV-NC16ETE
Transistor (source) output	KV-NC16ETPE

Output unit
16-point type
MIL connector

Transistor (sink) output	KV-NC16ET
Transistor (source) output	KV-NC16ETP

Output unit

Output unit
32-point type
MIL connector

Transistor (sink) output	KV-NC32ET
Transistor (source) output	KV-NC32ETP

I/O unit

I/O unit
32-point type
64-point type
MIL connector

* The photo shows the KV-NC16EXT.

DC input Transistor (sink) output Input 16 points Output 16 points	KV-NC16EXT
DC input Transistor (sink) output Input 32 points Output 32 points	KV-NC32EXT

Analog unit

A/D conversion unit
4-point type
European terminal block

Voltage/current input	KV-NC4AD

D/A conversion unit
2-point type
European terminal block

Voltage/current output	KV-NC2DA

Temperature input unit

Temperature input unit
4-point type
European terminal block

Thermocouple/ platinum resistance thermometer input	KV-NC4TP

EtherNet/IP™ unit

EtherNet/IP™ unit

EtherNet/IP™

Communication speed 100 Mbps	KV-NC1EP

Serial adapter

* Only one serial adapter can be connected to the base unit.

Serial adapter
RS-232C

RS-232C × 1	KV-NC10L

Serial adapter
RS-232C
RS-422A
RS-485

RS-232C × 1 RS-232C/422A/ 485 × 1	KV-NC20L

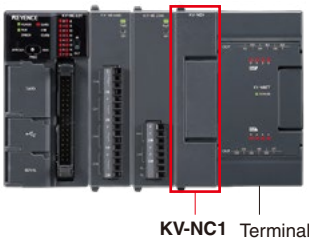
Connection conversion unit

Connection conversion unit
For terminal block type unit connection

Connector to Terminal block	KV-NC1

Connection example

By using the connection conversion unit, you can connect terminal block type expansion units. This allows you to select the optimum units when designing the system.



Communication unit

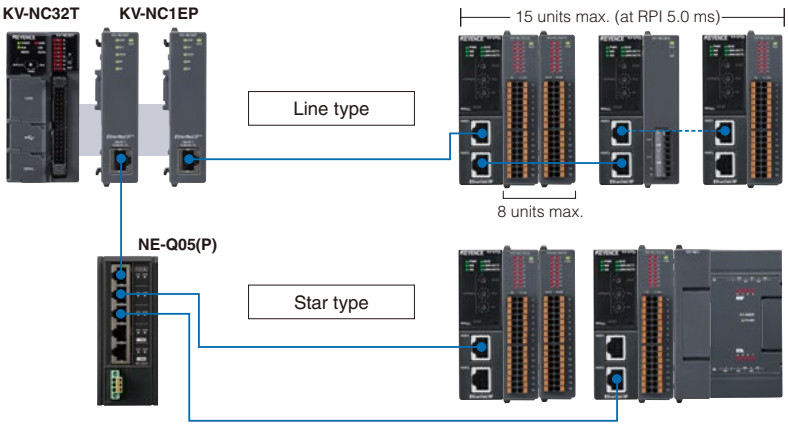
EtherNet/IP™ compatible
Communication unit

EtherNet/IP™

Communication speed 100 Mbps	KV-EP02

System configuration example

The KV-EP02 supports both line- and star-type connections. Since there are 2 ports, the unused port can be used as a switching hub to allow flexible wiring.



Terminal block type: Base unit — Simple lineup for easy selection

Base unit
14-point type
Input: 8 points, output: 6 points

AC	Relay	KV-N14AR
	Transistor (sink)	KV-N14AT
	Transistor (source)	KV-N14ATP
DC	Relay	KV-N14DR
	Transistor (sink)	KV-N14DT
	Transistor (source)	KV-N14DTP

Basic performance: 8k steps | Max. I/O: 128 | No. of units: 3
Interface: USB | Serial
Built-in functions: 2 positioning axes | High-speed counter: 2 channels | Interrupt input: 4

* Not compatible with KV-NC1EP

Base unit
24-point type
Input: 14 points, output: 10 points

AC	Relay	KV-N24AR
	Transistor (sink)	KV-N24AT
	Transistor (source)	KV-N24ATP
DC	Relay	KV-N24DR
	Transistor (sink)	KV-N24DT
	Transistor (source)	KV-N24DTP

Basic performance: 8k steps | Max. I/O: 256 | No. of units: 8
Interface: USB | Serial
Built-in functions: 2 positioning axes | High-speed counter: 2 channels | Interrupt input: 4

Base unit
40-point type
Input: 24 points, output: 16 points

AC	Relay	KV-N40AR
	Transistor (sink)	KV-N40AT
	Transistor (source)	KV-N40ATP
DC	Relay	KV-N40DR
	Transistor (sink)	KV-N40DT
	Transistor (source)	KV-N40DTP

Basic performance: 16k steps | Max. I/O: 256 | No. of units: 8
Interface: USB | Serial
Built-in functions: 3 positioning axes | High-speed counter: 3 channels | Interrupt input: 4

Base unit
60-point type
Input: 36 points, output: 24 points

AC	Relay	KV-N60AR
	Transistor (sink)	KV-N60AT
	Transistor (source)	KV-N60ATP

Basic performance: 16k steps | Max. I/O: 256 | No. of units: 8
Interface: USB | Serial
Built-in functions: 4 positioning axes | High-speed counter: 4 channels | Interrupt input: 4

Expansion unit Optional units to expand functionality

Input unit

Input unit
8-point type
Screw terminal block

DC input	**KV-N8EX**

Input unit
16-point type
Screw terminal block

DC input	**KV-N16EX**

I/O unit

I/O unit
16-point type
Screw terminal block
Input: 8 points, output: 8 points

Relay	**KV-N8EXR**
Transistor (sink)	**KV-N8EXT**

Output unit

Output unit
8-point type
Screw terminal block

* The photo shows the KV-N8ET.

Relay	**KV-N8ER**
Transistor (sink)	**KV-N8ET**
Transistor (source)	**KV-N8ETP**

Output unit
16-point type
Screw terminal block

Relay	**KV-N16ER**
Transistor (sink)	**KV-N16ET**
Transistor (source)	**KV-N16ETP**

Analog unit

Analog unit
3-point type
Screw terminal block
A/D conversion 2 points + D/A conversion 1 point

Voltage/ current input/ output	**KV-N3AM**

Connection conversion unit

Connection conversion unit
For connector type unit connection

Terminal block to Connector	**KV-N1**

Connection example

By using the connection conversion unit, you can connect connector type expansion units. This allows you to select the optimum units when designing the system.

Cassette

RS-232C
D-sub 9-pin
1 port

KV-N10L

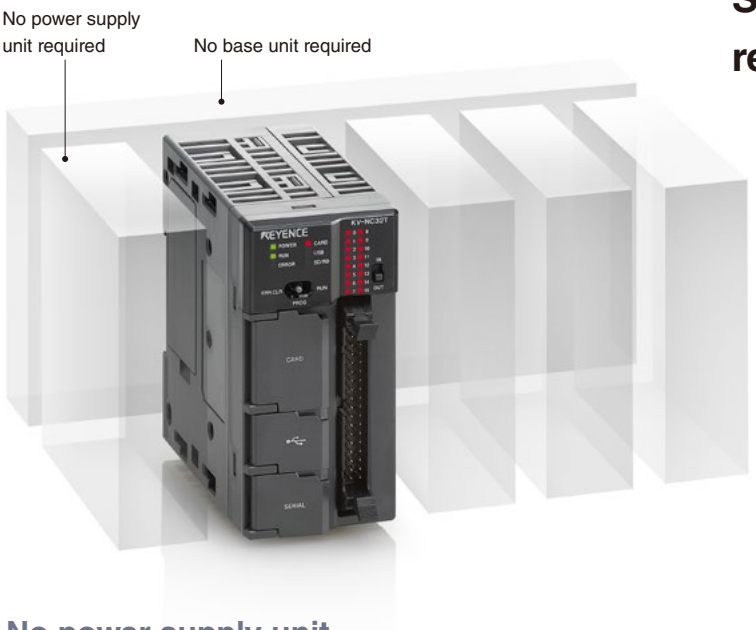
RS-422A/485
European terminal block
1 port

KV-N11L

Connector type

KV Nano connector

Space-saving while remaining practical

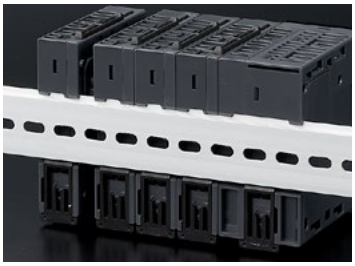


No power supply unit required

24 VDC power can be supplied directly from a control panel to the CPU unit, eliminating cost for a power supply unit.

Baseless structure

The CPU unit and expansion unit are connected through the connectors on the unit side. The connected units can be attached to a DIN rail, ensuring easy installation.



Built-in USB port

High-speed data transfer with a PC can be established with a commercial USB cable. Since a standard Type B cable is used, there is no need to purchase a cable separately.

Space saving

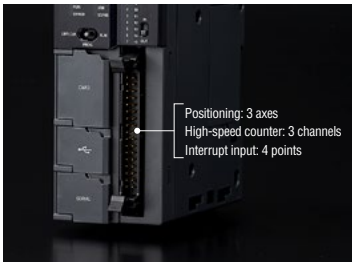
All of the base and expansion units are designed for space saving. This is useful when you want to make the control panel as small as possible.

SD card slot provided

You can save/read projects or log device data with an SD card. No additional unit, such as a data collection unit, is necessary.

Highly-functional I/O

The base unit itself has general I/O as standard. It can also be used as a positioning unit or a high-speed counter, which allows cost reduction.



Terminal block type

KV Nano

More features than typical small size PLC models

Built-in USB port

A standard Type B USB cable can be used for all KV Series models. There is no need to use different cables for different series or purchase special cables separately.

Built-in analog potentiometers

The base unit has 2 built-in analog potentiometers. Since their values are assigned to specific control memories, it is easy to make fine adjustments during debugging.

Extension cassette attachable

An extension cassette can be attached to the 14/24-point type unit and 2 extension cassettes to the 40/60-point type unit.

Expansion unit extension cable

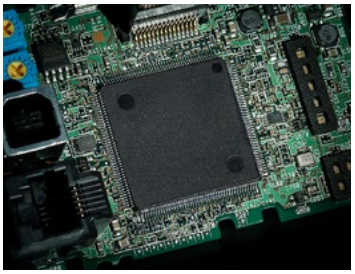
The OP-87581 extension cable extends the distance between units by 1 m 3.3'. You can design your system according to your desired layout.

Uncompromising speed and stability are core KV qualities

high-speed
3k steps
0.3 ms

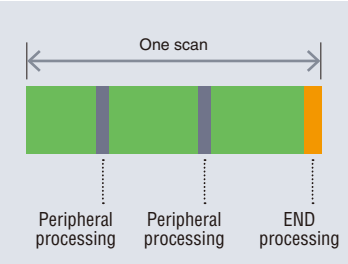
3k steps executed in 0.3 ms

This full 32-bit main CPU with a large capacity high-speed RAM and FPU (Floating point real number calculation unit) has achieved an LD instruction processing time of 50 ns. This is highly advantageous for systems that require high-speed processing.



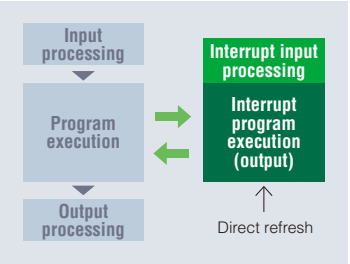
Variations in processing suppressed to 10 µs or less

The KV Nano suppresses variations in scan time by adjusting its processing while monitoring scans. In a constant scan time operation, variations are suppressed to 10 µs or less, which is the equivalent level of large-size PLCs.



Interrupt response speed of 100 µs or less

The interrupt input, a standard function of the KV Nano, has achieved a high-speed responsiveness of 100 us or less. Direct refresh operations can execute from an input to an output within a single scan.



→ **For even faster, ultra-high-speed control** KV-8000 SERIES

Basic instruction execution 0.96 ns

The KV-VELOCE X3, a special chip for ladder execution, has achieved ultra-high-speed processing. This allows for consistent performance in high-speed operations.

Ultra-high-speed CPU inner bus

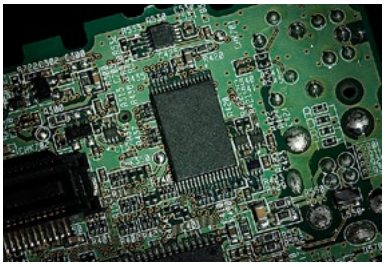
A CPU inner bus has been introduced to provide high-speed response. This, in combination with a bus for existing expansion units, enables high performance in systems that include existing hardware.

→ See "KV Series General Catalog" for details.

Minimum maintenance, maximum reliability

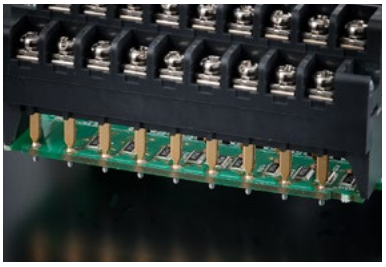
Battery-less

The adoption of nonvolatile FeRAM ensures device values and setting information are retained during power failures, without a battery. This eliminates problems due to lost device values as well as battery replacement work.



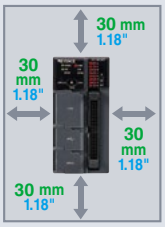
Overcurrent protection circuit for all points

To ensure high reliability, every transistor output is equipped with an overcurrent protection circuit. This prevents malfunction due to touching by mistake or damage caused by inrush current.



Minimum installation clearance of 30 mm 1.18"

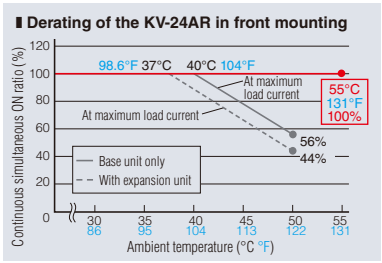
The optimized internal structure design has achieved the ability to endure high temperatures. The minimum installation clearance of 30 mm 1.18" allows the use of smaller control panels.

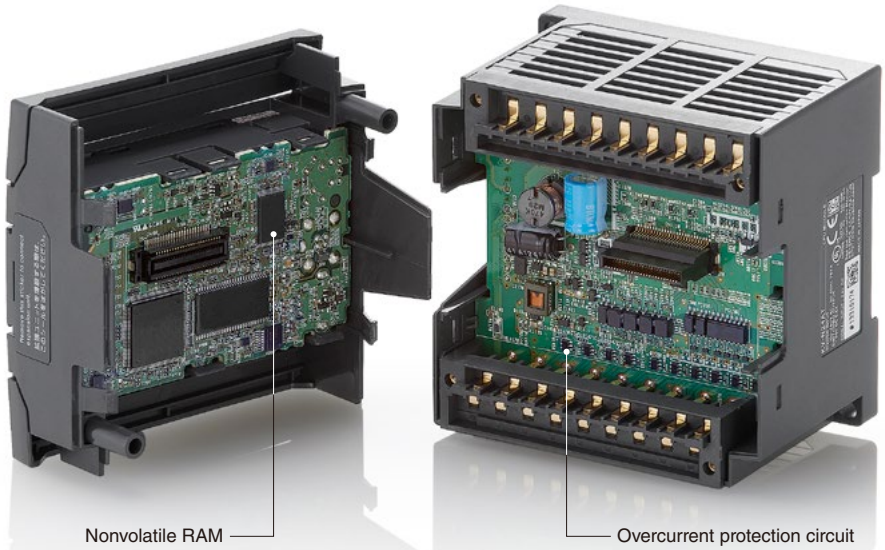


Effective for use in smaller control panels

No derating in any unit

Derating has been eliminated by designing a housing that endures high temperatures and self-generated heat. This results in reliable operation for long periods.

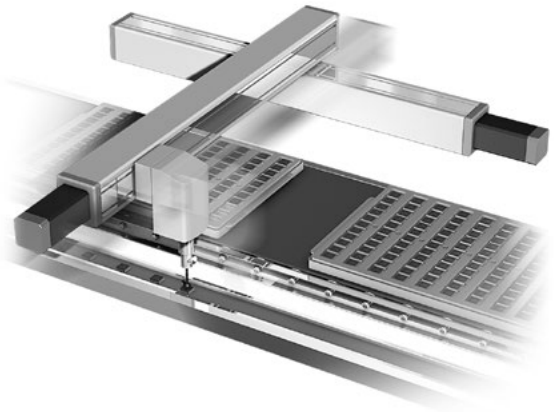




hardware

Built-in positioning function

Simple but full scale motor control now possible



high-spec

positioning function

max.4 axes

Quick start

50 μs

High-speed response

Min.0.3 ms

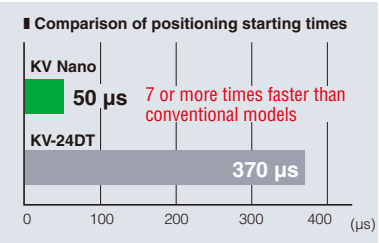
All axes

100 kHz output

High-speed specifications for positioning

[Quick start]

An ultra-quick start within 50 us has been developed to support systems that require high-speed performance. The high-speed performance of the base unit ensures improvements in the processing time for the entire system.



[High-speed response]

Ultra-fast responsiveness to speed changes or target coordinate changes ensures improvements in processing time and accuracy of positioning control.

[Output]

All units are capable of 100 kHz output, supporting 3 axes with the connector type and up to 4 axes with the terminal block type.

Suppressing variation in stop positions

When a stop sensor is used, dedicated input terminals suppress variation in the position of each stop. This improves the accuracy of stop positions.

Target coordinates/speed changeable during operation

Target coordinates and speed can be changed not only while operation is stopped but even during positioning. Moreover, there are dedicated instructions that allow easy and quick changes.

Target coordinate change

CHGTGT		
Unit No. #0	Axis No. #1	Target coordinates +1500

Speed change

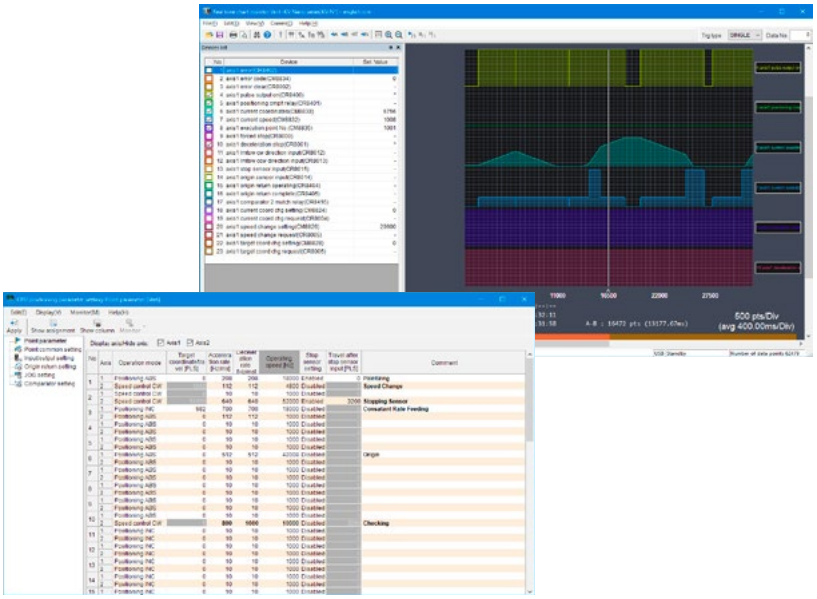
CHGSP		
Unit No. #0	Axis No. #3	Speed change value #8500

Various origin return modes

Various origin return modes are available such as a dog-type origin return and a press-against-type origin return, as well as a normal origin return mode and a Z-phase-based origin return.

Origin sensor startup	Dog type without Z phase
Origin sensor middle point	Dog type with Z phase
Origin sensor and Z phase	Dog type press-against

Easy programming and serious debugging



Dedicated point parameters

All positioning-related settings can be specified easily by just selecting parameters. Since all parameters have been assigned to CMs (control memories), they can be changed with a ladder program.

No	Axis	Operation mode	Target coordinate/travel [PLS]	Acceleration rate [Hz/ms]	Deceleration rate [Hz/ms]	Operating speed [Hz]	Stop sensor setting
1	1	Positioning ABS	0	208	208	18000	Enabled
	2	Speed control CW		112	112	4800	Disabled
2	1	Speed control CW		10	10	1000	Disabled
	2	Speed control CW		640	640	52000	Enabled
3	1	Positioning INC	982	700	700	18000	Disabled
	2	Positioning ABS	0	112	112	1000	Disabled
4	1	Positioning ABS	0	10	10	1000	Disabled
	2	Positioning ABS	0	10	10	1000	Disabled
5	1	Positioning ABS	0	10	10	1000	Disabled
	2	Positioning ABS	0	10	10	1000	Disabled
6	1	Positioning ABS	0	512	512	42008	Disabled
	2	Positioning ABS	0	10	10	1000	Disabled

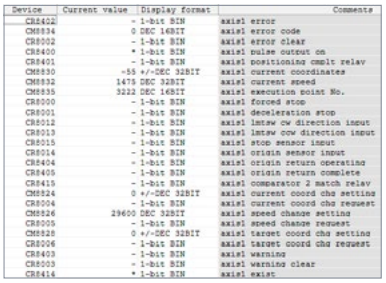
Many dedicated instructions

Instructions frequently used for positioning control have been provided as dedicated instructions. Programming can be finished easily in one line only, reducing programming man-hours.

PSTRT	Positioning
JOG	JOG Operation
ORG	Origin return
TCH	Teaching
HOME	Move to home position
CHGSP	Speed change
CHGTGT	Target coordinate change
RFSPS	Current value refresh

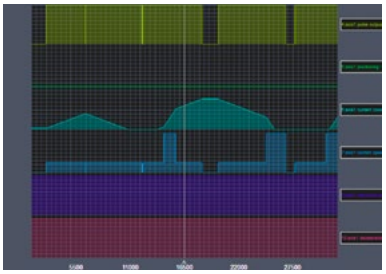
Built-in function monitor

A special monitoring window is available that can be used for debugging positioning control. The window shows device comments as well which greatly improves debugging efficiency.



Real-time chart monitor

You can monitor various items simultaneously on one screen, including the current coordinates, speed, and a positioning complete flag. When the real-time chart monitor is opened from the built-in function monitor, related devices are registered automatically.



For multi-axis control/synchronous control KV-8000 SERIES

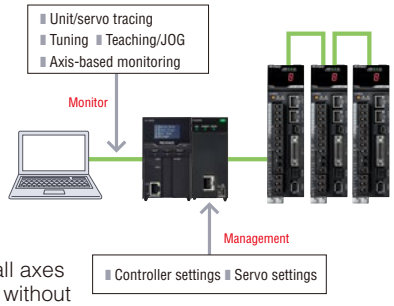
Motion control with a single unit

KV-X MOTION

Various operations from positioning control to synchronous control can be performed with a single unit. Interpolation control and synchronous control can be achieved in much the same way as performing positioning. The automatic ladder creation function also helps reduce design time.

MECHATROLINK

Connection with simplified wiring



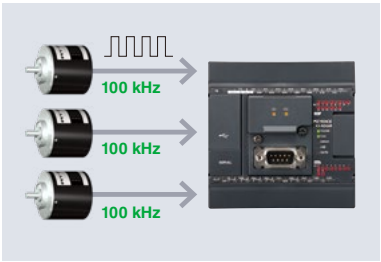
Finish connection with a single cable, without the need for complicated wiring. You can monitor all axes of the SV2 Series motors without needing to change cable connections.

→ See "KV-X MOTION General Catalog" for details.

Highly-functional and wizard-driven high-speed counter, similar to module-type PLCs

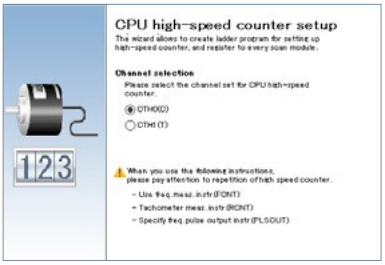
100 kHz input supported by all channels

All channels support high-speed pulse inputs of 100 kHz (phase difference: 50 kHz). The 32-bit resolution ensures highly precise control similar to modular-type PLCs.



High-speed counter setting wizard

A special setting wizard enables programming of the high-speed counter, which in the past required much time and labor. When the wizard is complete, a ladder program will be created automatically.



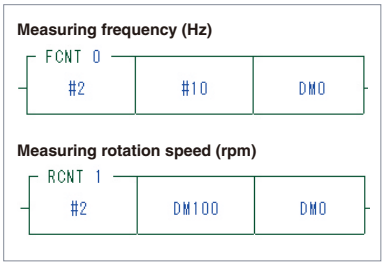
Various useful functions

The high-speed counter enables the use of various functions without being affected by scan time, resulting in high-speed processing equivalent to modular-type PLCs.

- Input capture function
- Interrupt based on comparator coincidence
- Comparator coincidence output
- Direct clock pulse output

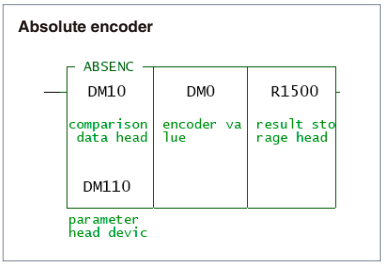
Frequency counter function

Input pulses are automatically converted into frequency (Hz) or rotational speed (rpm) and then stored into a DM (data memory). This eliminates the need for calculations using a ladder program, simplifying operation.



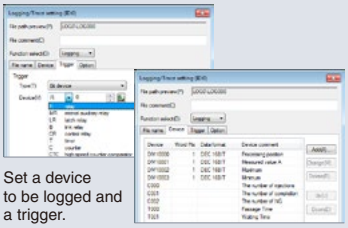
Cam switch function

A rotary encoder can be connected to provide an output at a specified position (angle). Up to 32 points of output positions can be set in units of 0.1 degrees. Both absolute and incremental encoders are supported.



Logging function

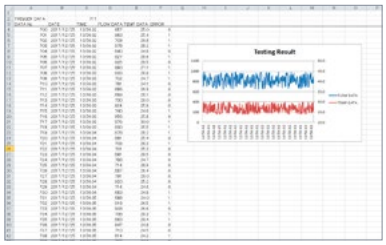
Device data can be logged to an SD card by completing just 2 steps. Logging triggers are flexible and can be issued not only periodically but also based on specific instructions.



Set a device to be logged and a trigger.

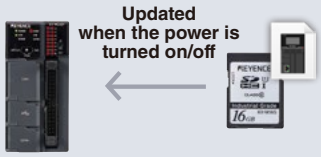
Trace function

The data before and after the occurrence of an event can be saved, which makes troubleshooting easy. The trace function can be used easily even without an SD card.



Auto loading function

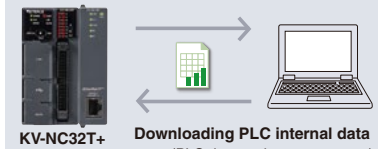
Programs can be saved to or loaded from an SD card. This allows for program changes to be made off-site and then transferred via the SD card.



Also possible by turning the device (CR) on/off

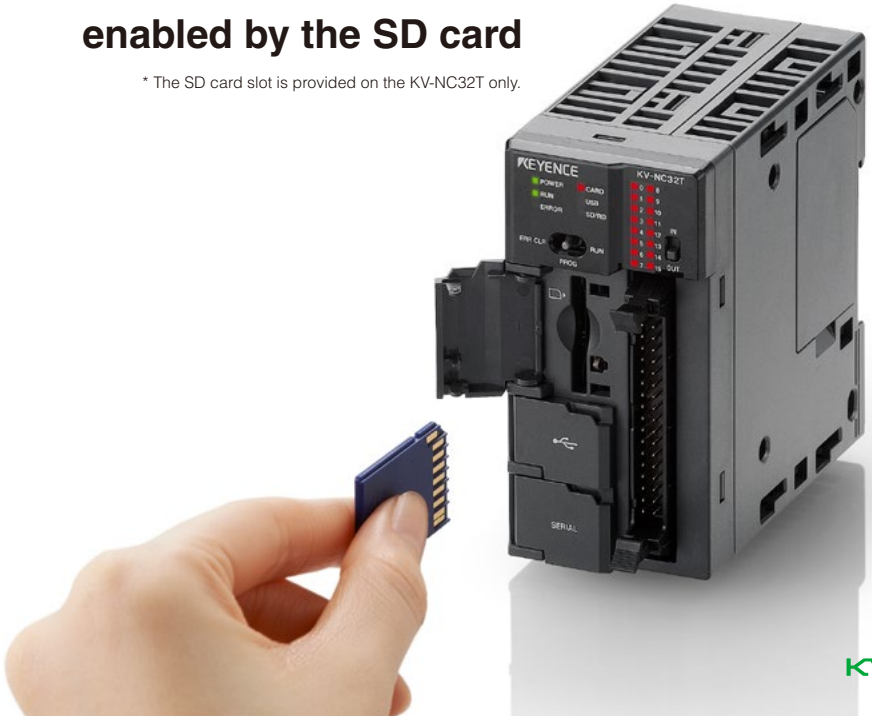
FTP client/server function

By using the KV-NC1EP, you can upload the data on an SD card to a PC in CSV format. This allows you to establish a traceability system easily.



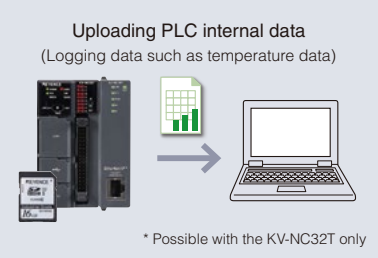
Easy-to-use applications enabled by the SD card

* The SD card slot is provided on the KV-NC32T only.



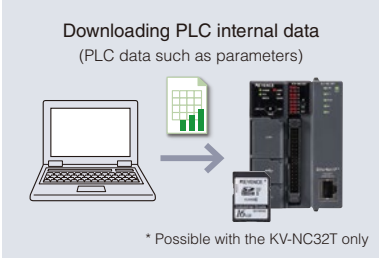
FTP client function

Data collected with the CPU's built-in logging function/trace function or the device values stored on an SD card can be uploaded to a PC in CSV format.



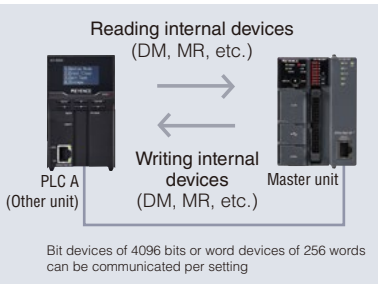
FTP server function

Setting files and parameters can be written from a PC to the SD card loaded in the PLC, which makes program changes easy.



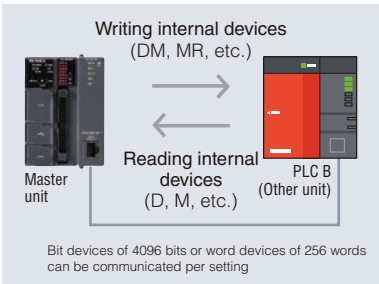
Simple PLC link function

In the past, linking to another PLC typically required a socket communication program. But now, an Ethernet-based PLC link can be established easily.



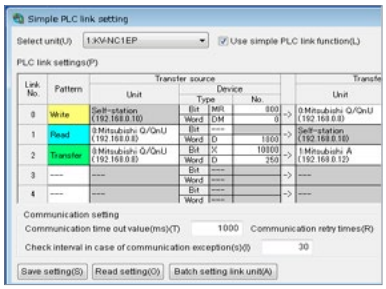
PLC link with units from other manufacturers

Not only is easy PLC link possible between KV models, but also with MC protocol-compatible PLCs from other manufacturers. This makes it easy to establish communication with an existing system.



Easy setup with the dedicated setting window

The PLC link can be established easily by just setting items in dedicated window. No ladder program is required for the link.



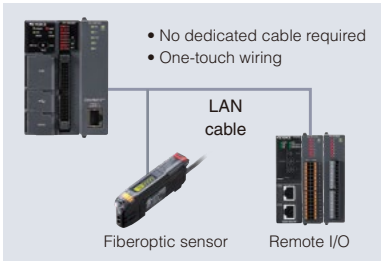
Easy-to-use PLC link via Ethernet for a wider range of applications

* Illustrative drawing

Sensors and remote I/O connected easily via Ethernet

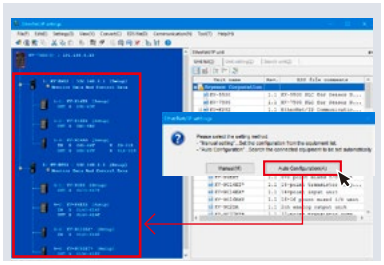
Simplified wiring with a LAN cable

Unlike with previous models, the PLC and a sensor can be connected quickly with a commercial LAN cable, saving hours normally spent on cable creation and wiring.



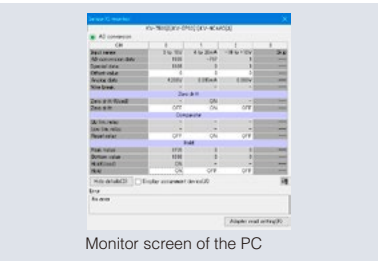
Connection without programming

Communication setup can be completed by just connecting the equipment, supplying power, and clicking the Auto Configuration button. There is no need for complicated communication programs or individual unit setup, saving many hours of work.



Various dedicated monitors

Dedicated remote I/O and sensor monitors are provided. KEYENCE's VT5 touch panel allows monitoring of equipment in a list without creating a screen. It is useful for identifying the cause of problems.

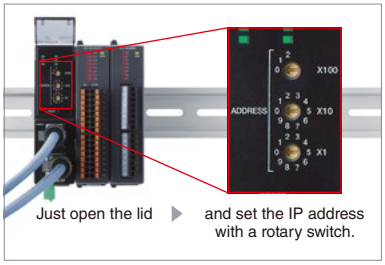

Monitor screen of the PC

Space saving

The industry's lowest profile case requires a minimal installation space. European terminal block-type models have an all-point common terminal. No external terminal block is necessary which leads to further space saving.

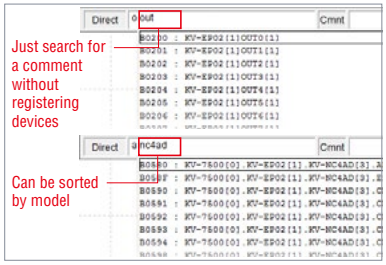
IP address setting with a rotary switch

IP addresses can be set with a built-in rotary switch on the communication unit. This ensures easy setting for anyone, using either software or hardware.



Device comment registration unnecessary

The comment information of configured devices is automatically registered. You can retrieve comments without using device numbers, resulting in a reduction of programming hours.



Advanced and easy analog control, similar to modular-type PLCs

High-speed conversion, high resolution and high accuracy

The conversion speed, resolution and conversion accuracy required for analog control has been achieved even for small to medium scale control. More complete control is now possible.

High-speed conversion	80 µs/channel
High resolution	1/4000
Overall accuracy	±0.3%

6 I/O ranges provided

A total of 6 I/O ranges, 4 for voltage and 2 for current, can be selected to allow connection of various external equipment.

Voltage range	Current range
-10 to 10 V 0 to 10 V 0 to 5 V 1 to 5 V	0 to 20 mA 4 to 20 mA

Averaging and other functions

You can not only specify time or count but also use a moving average. Since the average is calculated within the unit, it is not affected by scan time.

- Count/time/moving average
- Zero clip
- Comparator function
- Disconnection detection function

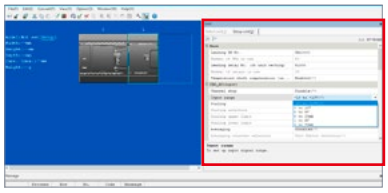
Temperature input unit KV-NC4TP

The KV-NC4TP connector type unit enables the use of inputs from a thermocouple or a platinum resistance thermometer.

* The KV-N1 is required when this unit is used with a terminal block type PLC.

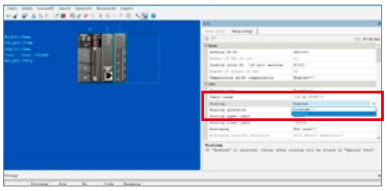
Unit Editor for easy configuration

All of the settings, such as the range of I/O signals and averaging, can be specified with the Unit Editor. No setting program is required.



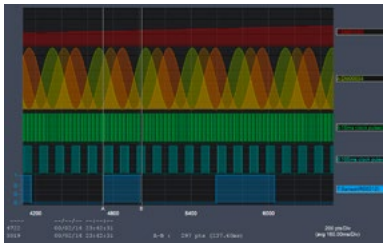
Scaling function

Values loaded from external equipment can be converted (scaled) to the desired values. This eliminates the need for a calculation program in the ladder program.



Real-time chart monitor

During debugging, you can monitor the change in values as a waveform. Data can be acquired for each scan time, which enables identification of instantaneous changes.

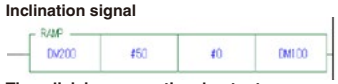


Useful instructions provided

Many useful instructions for analog control and temperature control have been provided to allow a wider range of controls.

PID with auto-tuning

Inclination signal



Time division proportional output

For higher speed and higher accuracy analog control

KV-8000 SERIES

Ultra-high-speed sampling of 10 µs

In accordance with the high-speed performance of the CPU unit, the conversion speed has been increased greatly to 10 µs/channel. The resolution has also been improved to 1/20000 to ensure high precision. This leads to higher production efficiency and improved quality.

KV-SAD04 **KV-SDA04**

Conversion speed 10 µs	Resolution 1/20000
Overall accuracy ±0.1%*1	Unit interrupt
Inter-unit synchronization	Buffering input

*1 At 25°C ±5°C 77°F ±9°F

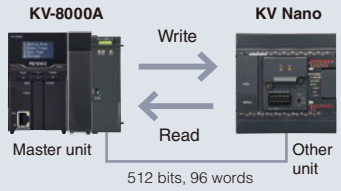
→ See "KV Series General Catalog" for details.

Increased functionality and Usability

Use serial for PLC link and Modbus communication

Link up to 16 units, 96 words

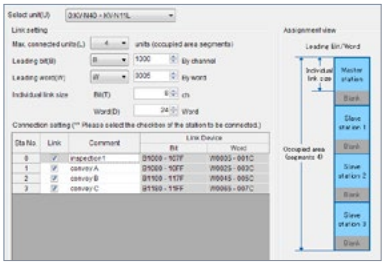
Distributed control or PLC link can be achieved through serial communication. An algorithm for minimizing the influence of ladder execution on serial communication processing ensures delays are eliminated in PLC links.



* Also possible with the KV Nano (connector type)

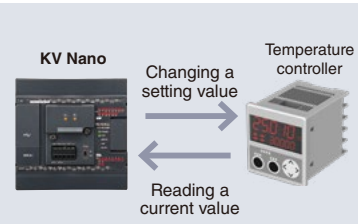
Serial PLC link setting

The dedicated setting window allows for setup of the serial PLC link without needing to reference the manuals. The setup items are shown in a list so that they can be easily checked.



Modbus master/slave function

Open network Modbus communication can be established easily. The function supports both the master function for controlling temperature controllers, etc. and the slave function for controlling touch panels or other equipment connected to the master.



* Also possible with the KV Nano (connector type)

Modbus trace function

A dedicated Modbus communication debugging function has been provided. The contents of commands and responses can be monitored without a protocol analyzer, so that many startup hours can be reduced.

easy connection
PLC link
Modbus communication

software
Easy-to-use software interface

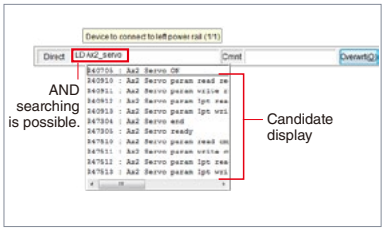
Ladder support software that can be operated intuitively

KV STUDIO

The KV Nano is compatible with KV STUDIO, the configuration software for the KV Series.
This allows you to utilize the same software for simple or complicated applications, making startup easier.

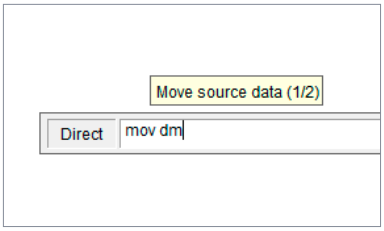
RT (Real Time) edit Ver. UP

By directly entering a device comment or buffer memory comment during command entry, the comment will be displayed as a candidate. This enables programming without the need for a manual. The search capability has been improved through the addition of AND searches.



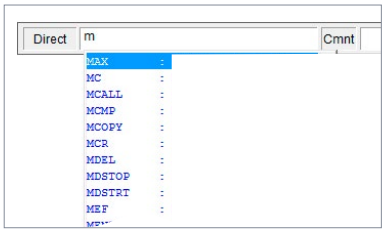
Operand entry guidance

The description of necessary operands to be input is displayed as guidance. You can use instructions during programming without referring to manuals even when you use them for the first time.



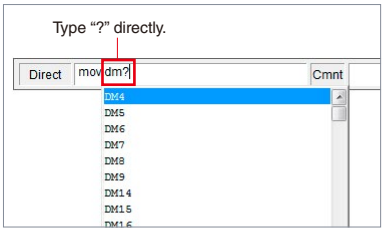
Display of instruction candidates

The list of instructions starting with the character you entered is displayed. You can write even unfamiliar instructions without referring to manuals.



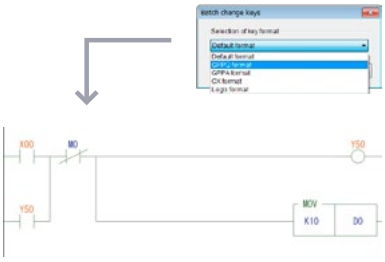
Unused device search

When "?" is added after a device number, unused devices on the program are displayed as input candidates. This eliminates the need to check usage status.



Customizable keys

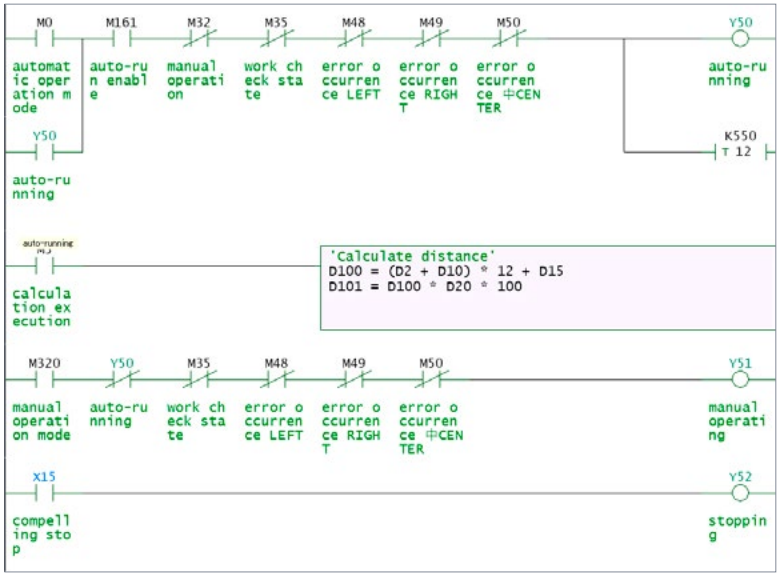
Even if you are used to using different ladder software, switching to this software is easy and intuitive. Users can specify their own keyboard operations by assigning unique shortcut keys.



Windows®-style operation

The basic operation follows Windows®-style operation. Programming proceeds in a familiar way.

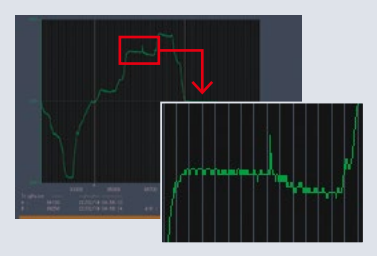
Comfortable operation based on your intuition and style



Even instantaneous changes will not be missed by Real-time chart monitor

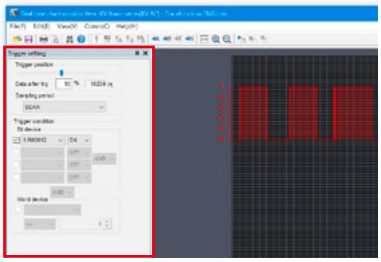
Instantaneous changes detectable

Device data is stored in the CPU memory and then loaded to a PC. Even instantaneous changes which are normally overlooked can be recognized reliably.



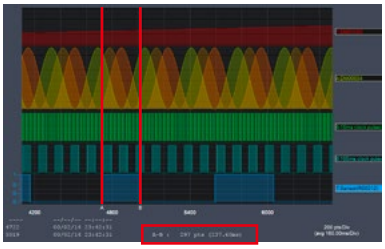
Trace function

The trace function captures data before and after the occurrence of an event, which is useful for troubleshooting. The cycle can be set for each scan.



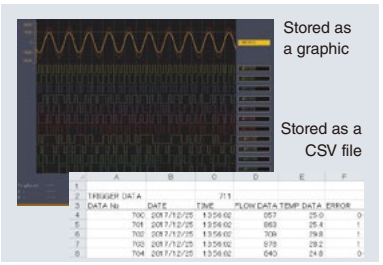
Time measurement by cursor control

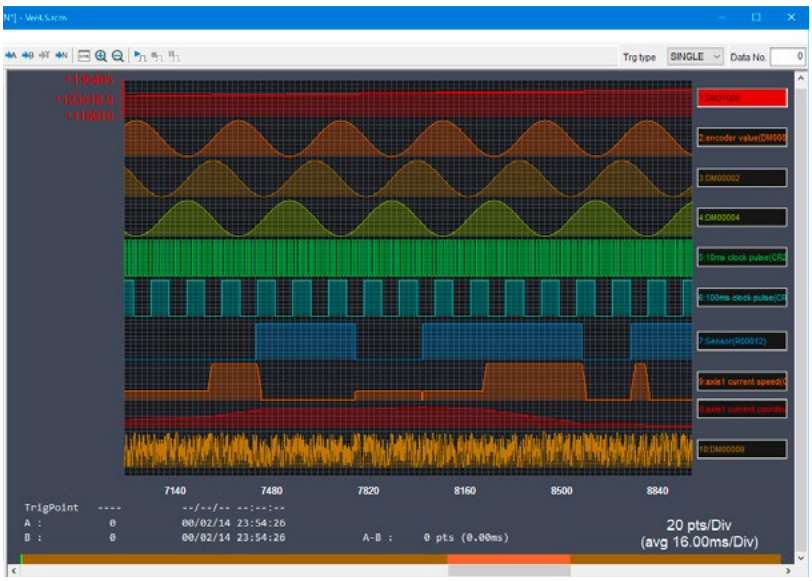
The time between any two points, such as pulse duration time, can be measured in milliseconds. This function can be used to check the actual takt time of processing that requires high speed operation.



Two storage formats available

Two storage patterns are available: As a waveform display or as a CSV file. Data can be stored in accordance with applications.



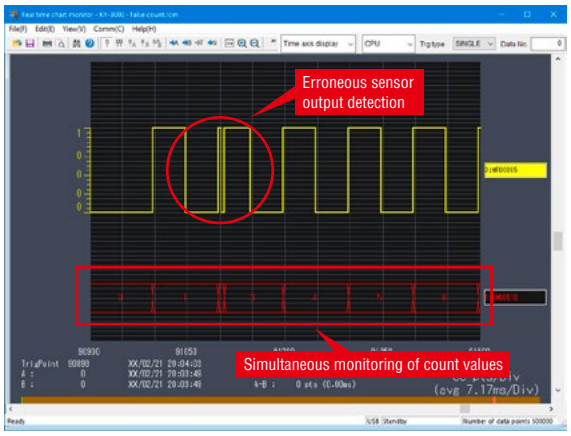


8 words and 16 bits can be monitored simultaneously

Real-time chart monitor applications

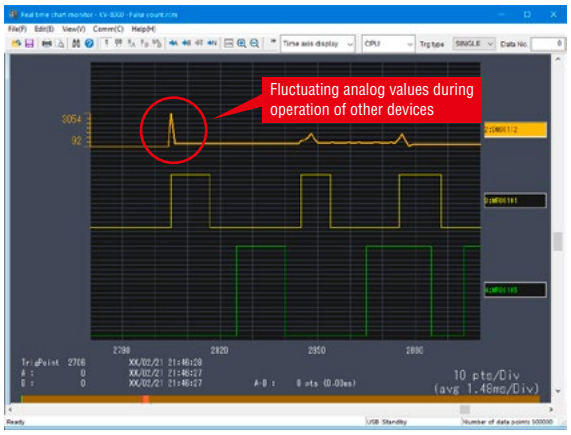
Erroneous sensor output detection

In the event of a problem with a sensor signal count, symptoms that previously required an oscilloscope to check can now be identified.



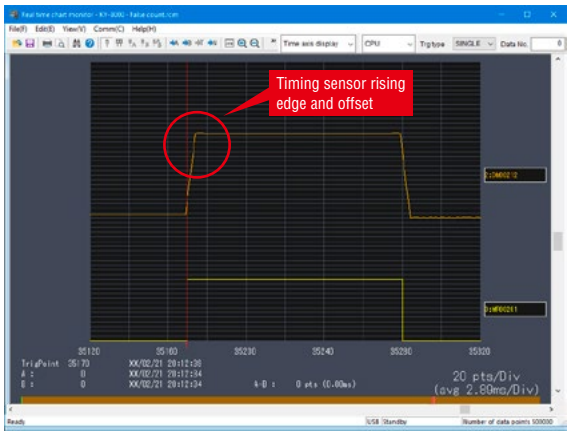
Detection of malfunctions due to the influence of other devices

When a problem occurs with a captured analog value, monitoring the bit and word data at the same time makes it easy to determine the cause.

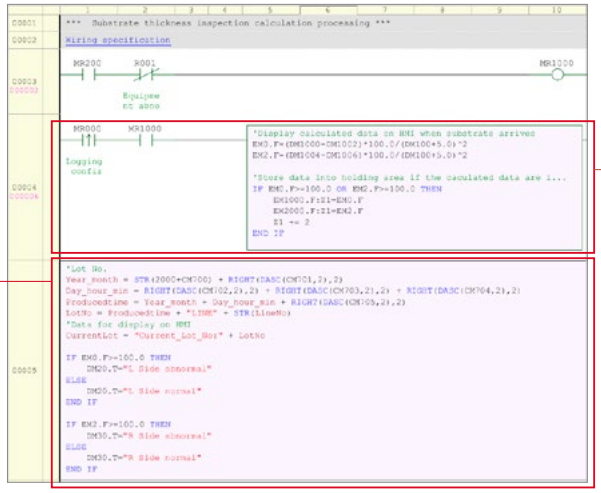


Timing deviation detection

Even if a malfunction occurs due to timing discrepancies between bits or with controls that use bit signals to acquire analog values, finding the cause is easy.



KV Script allows for easy programming of calculations, conditional branching, and more

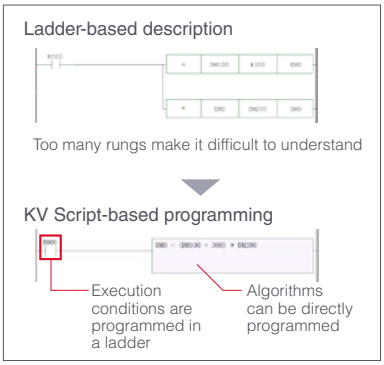


Box script
Condition execution script that allows execution conditions to be described with a ladder.

Area script
Regular execution script with no execution conditions.

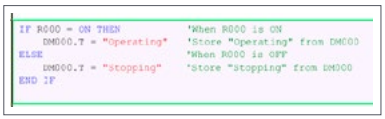
Directly programmable algorithms

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



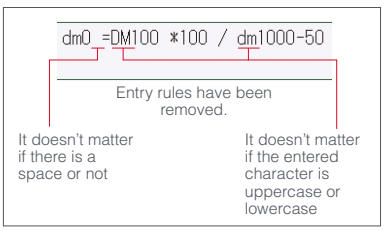
Description of control statements

Unlike with ladder programming, syntaxes and various functions required for advanced processing can be described concisely.



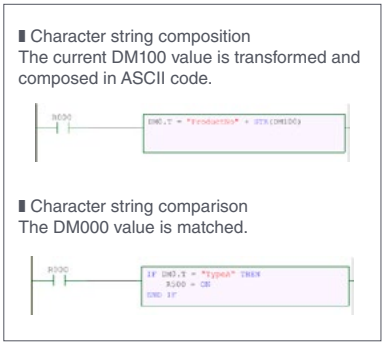
“Ambiguous entry” for intuitive programming

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



Easy processing of strings

Character strings that are difficult to process using ladder language can be utilized as-is. Like algorithms, character strings can be easily composed and compared, and users can compose them without considering the number of devices or ASCII codes which allows for intuitive understanding of the details.



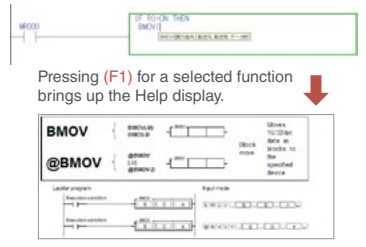
Function Input Guidance

Even if you can't remember a function, simply press the shortcut keys (Ctrl + Space) and enter a few letters to show a list of functions starting with the entered text.

[Ctrl]+[Space]
A list of functions is displayed. (When an alphabetical letter is entered, a narrowing-down search is carried out.)

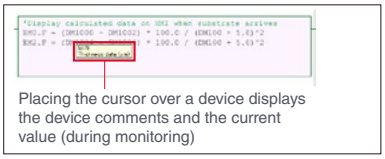
Manual Search Function

To provide quick access to information on how to use an inserted function, press the shortcut key (F1) to view the manual of the relevant function.



Tool tip monitor

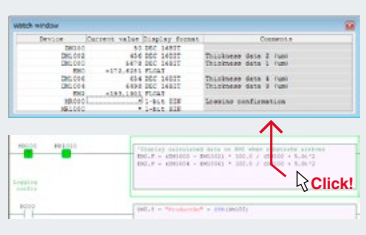
Simply placing the cursor over the device during monitoring displays the device comments and current values, so monitoring a device is easy.



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 summation of 2 values (addition)
	–	Calculate difference of 2 values (subtraction)
	*	Calculate 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)
	>	Greater than
	>=	Greater than or equal to (above)
	=	Equal to (equivalent)
	<>	Unequal to (non-equivalent)
Assign	=	Substitute the right into the left
	+=	Right plus Left
	-=	Right minus Left
	*=	Right multiplied by Left
	/=	Left is divided by Right
Character string	+, &	Connect 2 character strings
Logic	AND	Logical multiplication of 2 values (AND)
	OR	Logical addition of 2 values (OR)
	XOR	EOR logic of 2 values
	NOT	Calculate logical not value

Control Statement

Type	Control statement	Description

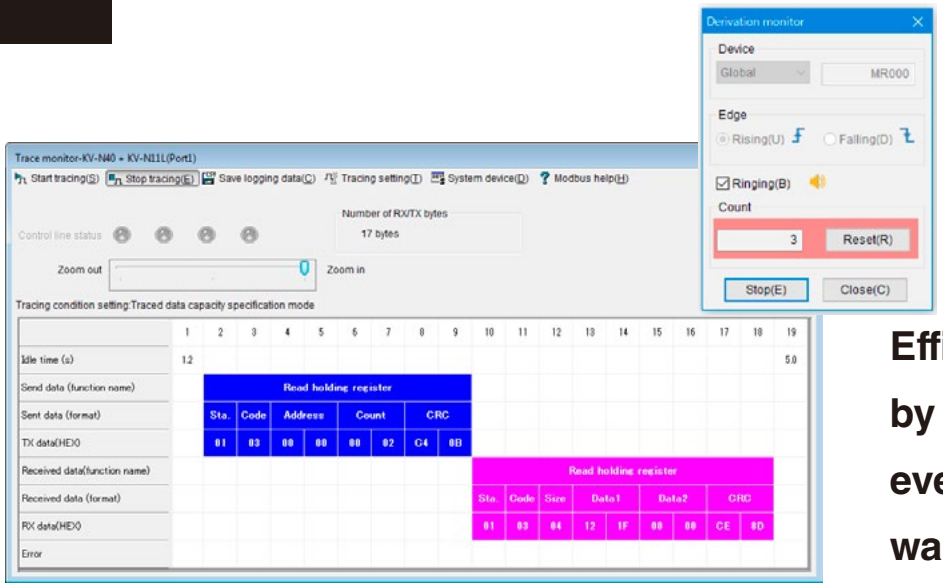
Conditional branch	IF statement	IF <Conditional equation 1> THEN
		(If the condition 1 is true, executed)
		ELSE IF <Conditional equation 2> THEN
		(If the condition 2 is true, executed)
		ELSE IF <Conditional equation 3> THEN
		(If the condition 3 is true, executed)
		ELSE
		(If all the conditions are not true, executed)
		END IF

	SELECT statement	SELECT CASE <Device comparison> CASE <Condition 1> (When equal to condition 1, executed) CASE <Condition 2><Condition 3> (When equal to condition 2 or condition 3, executed) CASE <Condition 4> T0 <Condition 5> (When condition 4 and condition 5 are met, executed) CASE IS <Comparison> <Condition 6> (When the comparison with 6 is true, executed) CASE ELSE (When equal to none of the conditions, executed) END SELECT
	MC statement	MC <Conditional equation> THEN (If the condition is true, executed) MCR
Loop control	FOR statement	FOR <Loop condition> (When the loop condition is met, loop is executed) NEXT
	WHILE statement	WHILE <Conditional equation> (When the loop condition is met, loop is executed) END WHILE
	DO statement	DO (Until the condition is met, loop is executed) UNTIL <Conditional equation>

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 -3.4E+38 ≤ n ≤ -1.2E-38 n = 0 +1.2E-38 ≤ n ≤ +3.4E+38 (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

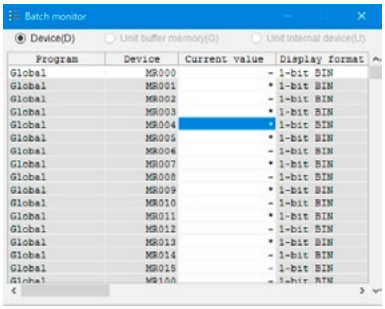
* .U can be omitted when programming.
Word device without postfixes handled as 16-bit unsigned data.



Efficient debugging by visualizing everything you want to see

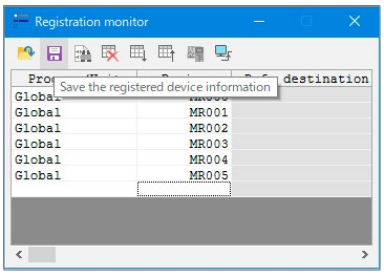
Batch monitor

You can improve efficiency by not only monitoring all devices together but also by turning them on/off directly and writing values into DMs. It is also possible to open several windows simultaneously.



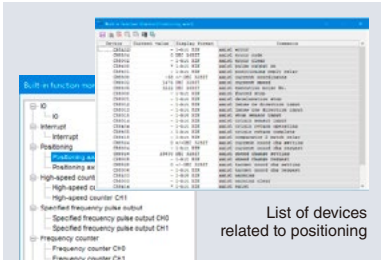
Registration monitor

You can monitor or write values of desired devices. By saving the registered devices, you can quickly monitor them during debugging without registering them every time.



Built-in function monitor

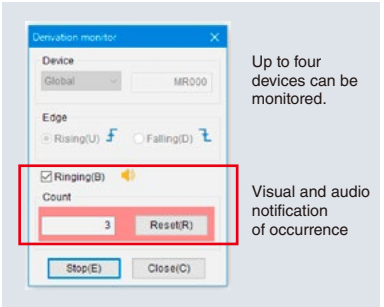
A dedicated monitor screen for built-in functions such as positioning or high-speed counting has been provided. There is no need to register devices during debugging.



List of devices related to positioning

Derivation monitor

The derivation monitor enables you to check the rising and falling edges of signals, something that is difficult to do with conventional monitors. This eliminates the need to add debugging programs.



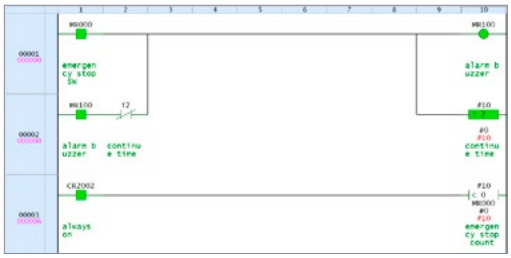
Up to four devices can be monitored.

Visual and audio notification of occurrence

More comfortable debugging environment

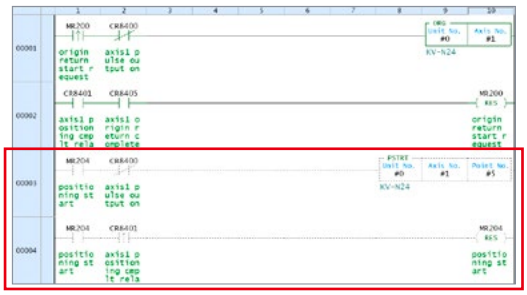
Simulation function

You can simulate operation on the PC without using an actual PLC. The registration monitor and batch monitor can also be used to perform debugging.



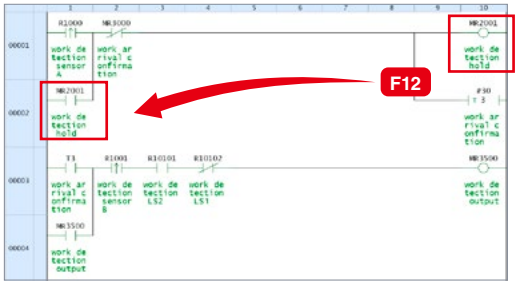
Line invalidation

A section of code that you want to disable temporarily during debugging can be invalidated with a single operation. Re-enabling the code is also accomplished easily.



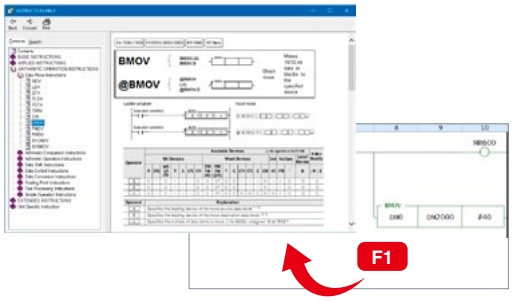
F12: Contact coil jump

Every time the F12 key is pressed, the cursor jumps to the next contact (coil) of the same device number. This is useful for troubleshooting during debugging.



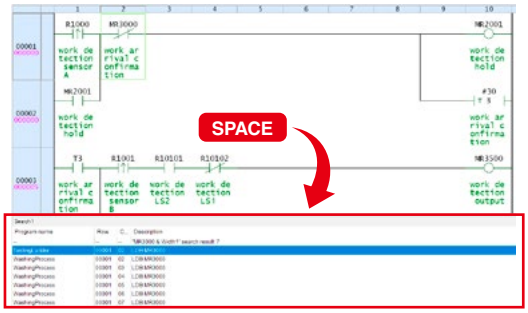
F1: Instruction help function

The description of a selected instruction can be displayed with a single button-press. This allows you to quickly find information without searching through multiple documents.



One-key cross reference

The points at which the selected device is used are listed with a single operation. Moreover, you can jump to the corresponding program section by clicking the item in the search result.



SPECIFICATIONS (Connector type)

Performance specifications - Base unit

Model		KV-NC32T
Calculation control method		Program storage method
I/O control method		Refresh method
Programming language		Expanded ladder, KV Script, mnemonic
Number of instructions		Basic instruction: 81 types and 182 instructions, Application instruction: 39 types and 56 instructions Calculation instruction: 123 types and 311 instructions, Expansion instruction: 92 types and 141 instructions Total: 335 types and 690 instructions
Instruction execution speed	Basic instruction	50 ns minimum
	Application instruction	170 ns minimum
Program capacity		32k steps
Maximum number of attachable I/O units		8
Maximum number of I/O points (excluding the base unit I/O)		256
Input relay	R	Total of 9600 points 1 bit (R000 to R59915)
Output relay		
Internal auxiliary relay		
Link relay	B	8192 points 1 bit (B0 to B1FFF)
Internal auxiliary relay	MR	9600 points 1 bit (MR000 to MR59915)
Latch relay	LR	3200 points 1 bit (LR000 to LR19915)
Control relay	CR	1440 points 1 bit (CR000 to CR8915)
Timer	T	512 points 32 bits (T0 to T511)
Counter	C	256 points 32 bits (C0 to C255)
Data memory	DM	32768 points 16 bit (DM0 to DM32767)
Link register	W	16384 points 16 bit (W0 to W3FFF)
Temporary memory	TM	512 points 16 bit (TM0 to TM511)
High-speed counter	CTH	3 points (CTH0 to CTH2)
		32-bit automatic reset counter*1 (Input response: 100 kHz per single phase, 50 kHz per phase difference)*2
High-speed counter comparator	CTC	6 points (CTC0 to CTC5)
		32 bits, two points per high-speed counter
Index register	Z	12 points 32 bit (Z01 to Z12)
Control memory	CM	9000 points 16 bit (CM0 to CM8999)
Positioning pulse output		3 axes
		Maximum output frequency: 100 kHz
Base unit I/O		Input: 16 points output: 16 points Input common: 1 point Output common: 1 point
Number of comments/ labels stored in main unit	Device comment	20000
		When a maximum-length ladder program is written with no labels.
	Label	28000
		When a maximum-length ladder program is written with no device comments.
Power off hold function	Program memory	Flash ROM can be rewritten 10000 times
	Device*3	Nonvolatile RAM
Clock function		±60 seconds/month (at 25°C 77°F)
Self-diagnosis function		CPU error, RAM error, and other problems

*1 You can also configure the settings so that automatic reset is not used.
*2 Only open collectors are supported. Line drivers are not supported.
*3 You can set the target device by clicking "CPU system setting" and then "Power off holding" in KV STUDIO.

General specifications - Base unit

Model	KV-NC32T				
Power voltage	24 VDC (+10%/-15%)				
Internal current consumption	KV-NC32T: 260 mA				
Ambient temperature	0 to 55°C 32 to 131°F (no freezing)*1				
Storage temperature	–25 to +75°C –13 to +167°F				
Ambient humidity	5 to 95% RH (no condensation)				
Withstand voltage	1500 VAC for 1 minute, between power supply terminal and I/O terminals and between all external terminals and case (1000 VAC for 1 minute, between power supply terminal and output terminals for the transistor output type expansion I/O unit)				
Noise immunity	1500 V peak-to-peak or more, pulse duration 1 µs, 50 ns (based on noise simulator) Conforms to IEC standards (IEC61000-4-2/3/4/6)				
Vibration resistance	Conforms to JIS B 3502 and IEC61131-2	Intermittent vibration			Scan times
		Frequency	Acceleration	Amplitude	10 times (100 minutes) in each of the X, Y, and Z directions
		5 to 9 Hz	–	3.5 mm 0.14"	
		9 to 150 Hz	9.8 m/s² 32.2'/s²	–	
		Continuous vibration			
		Frequency	Acceleration	Amplitude	
		5 to 9 Hz	–	1.75 mm 0.07"	
		9 to 150 Hz	4.9 m/s² 16.1'/s²	–	
Shock resistance	Acceleration: 150 m/s² 492.1'/s², application time: 11 ms, three times in each of the X, Y, and Z directions				
Insulation resistance	50 MΩ or more (500 VDC megger used to perform measurements between power supply terminal and input terminals, and between all external terminals and case)				
Operating environment	As little dust and corrosive gas as possible				
Operating altitude	2000 m 6561.7' or less				
Overvoltage category	I				
Pollution degree	2				
Weight	Approx. 220 g				

*1 The temperature below the unit center (30 mm 1.18") inside a control panel.

Input specifications - Base unit

Model	KV-NC32T	
Input type	General input	High-speed A-phase and B-phase input
Relay number	R000 to R009 (10 points)	R010 to R015 (6 points)
Input mode	24 VDC input (open collector)	
Maximum input voltage	26.4 VDC	
Rated input voltage	24 VDC (5.3 mA*1)	24 VDC (6.5 mA*1)
Minimum ON voltage	19 VDC	
Maximum OFF current	1.5 mA	
Common point mode	All points/1 common (1 terminal)	
Circuit delay time*2	OFF to ON: Max. 30 µs (Typ. 3.5 µs) ON to OFF: Max. 50 µs (Typ. 15 µs)	OFF to ON: Max. 2 µs (Typ. 1.1 µs) ON to OFF: Max. 2 µs (Typ. 0.3 µs)
Input time constant*2	Normal: 10 ms, When the HSP instruction is used: 10 µs When CR2305 is turned ON: 10 µs to 10 ms, eight-level switching is possible (set with CM1620). Can also be set from the Unit Editor. Delay by input time constant	
Response frequency	–	Single phase: 100 kHz, phase difference: 50 kHz, 24 V ±10%, Duty 50%

Input time constant setting	Digital filter
10 µs	1.6 to 2 µs
20 µs	9 to 12 µs
110 µs	90 to 93 µs
500 µs	300 to 400 µs
1 ms	800 to 900 µs
2.5 ms	2.3 to 2.4 ms
5 ms	4.0 to 4.5 ms
10 ms	9 to 9.5 ms

*1 Reference value of input current.
*2 The input response time corresponding to the input time constant can be calculated as shown below.
(Response time) = (Circuit delay of the input circuit) + (Delay by the digital filter)
Example: Maximum response time when the input time constant is set to 10 µs
OFF to ON: 2 µs (circuit delay) + 2 µs (digital filter) = 4 µs
ON to OFF: 2 µs (circuit delay) + 2 µs (digital filter) = 4 µs
Example: Maximum response time when the input time constant is set to 500 µs
OFF to ON: 30 µs (circuit delay) + 400 µs (digital filter) = 430 µs
ON to OFF: 50 µs (circuit delay) + 400 µs (digital filter) = 450 µs

Output specifications - Base unit

Model	KV-NC32T	
Input type	General output	High-speed output
Relay number	R506 to R515 (10 points)	R500 to R505 (6 points)
Output mode	MOSFET (N-ch) output	
Rated load	30 VDC, 0.2 A (1.6 A/common)	30 VDC, 0.3 A (1.6 A/common)
Maximum OFF voltage	30 VDC	
Leakage current when OFF	100 µA or less	
Residual voltage when ON	0.6 VDC or less	
Common point mode	16 points/1 common (Common to high-speed output)	16 points/1 common (Common to general output)
ON/OFF response time	OFF to ON: 100 µs (load of 1 mA or more) ON to OFF: 200 µs (load of 1 mA or more)	OFF to ON: 2 µs (load of 7 mA or more) ON to OFF: 5 µs (load of 7 mA or more)
Overcurrent protection	Protection provided for each common*1	
Output frequency	–	100 kHz (7 to 100 mA load)

*1 If an overcurrent occurs, 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.

Specifications - Built-in serial port

Type			Built-in port
Interface	Communication standard		RS-232C
	Connection		Modular connector
Transmission specifications	Transmission rate		1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
	Transmission method		Full 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
	Transmission distance		15 m 49.2'
	Number of transmission units		1
Indication			Common between SD/RD SD: (green) RD: (red) The color may appear as orange during transmission.

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 point mode	16 points/1 common (2 terminals)*1		16 points/1 common (2 terminals)*2		32 points/1 common (2 terminals)*1	
Input time constant (four-level switching)						
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	

Input time constant setting	OFF to ON		ON to OFF	
	Typ.	Max.	Typ.	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

*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 (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 when OFF	–	100 µA or less		
Residual voltage when ON	–	0.6 VDC or less		
ON resistance	50 mΩ or less	–		
Common point mode	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)		
Response time: 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 cycles or more (20 cycles/minute) Mechanical: 20000000 cycles 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 COM terminals of the KV-NC16ET(P), KV-NC16ET(P)E and KV-NC32ET(P) are shorted internally.
*3 The KV-NC8ER has four terminals for each of C0 and C1 respectively, which are shorted internally. (C0 and C1 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) or 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 MOSFET (N-ch) output for the sink output type; and MOSFET (P-ch) output for the source output type.
*7 The rated load per common terminal is 1.6 A for the KV-NC16ET(P) or KV-NC32ET(P) and 3.2 A for the KV-NC16ET(P)E.

SPECIFICATIONS (Connector type)

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		32
	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: 25 µs; OFF to ON Typ. 10 µs, Max. 50 µs; ON to OFF Typ. 50 µs, Max. 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		32
	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 Rated load of each common is 1.6 A.

Specifications - Temperature input unit

Model	KV-NC4TP	
Number of inputs*1	4	
Input	Thermocouple	Platinum resistance thermometer
Input range	K: -270.0 to 1372.0°C -454 to 2501.6°F J: -210.0 to 1200.0°C -346 to 2192°F T: -270.0 to 400.0°C -454 to 752°F E: -270.0 to 1000.0°C -454 to 1832°F N: -270.0 to 1300.0°C -454 to 2372°F R: -50.0 to 1768.0°C -58 to 3214.4°F S: -50.0 to 1768.0°C -58 to 3214.4°F B: 0.0 to 1820.0°C 32 to 3308°F WRe5-26: 0.0 to 2315.0°C 32 to 4199°F	Pt100: -200.0 to 850.0°C -328 to 1562°F JPt100: -200.0 to 600.0°C -328 to 1112°F
Overall accuracy	±(0.2% of F.S. +1°C 1.8°F) (at 25°C ±5°C 77°F ±9°F) ±(0.4% of F.S. +1°C 1.8°F) (at 0 to 55°C 32 to 131°F)	±0.2% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.4% of F.S. (at 0 to 55°C 32 to 131°F)
Allowable wiring resistance	–	100 Ω max./wire (no variation allowed among three wires)
Conversion speed	125 ms/channel	
Isolation method	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	
Special functions	Channel skip, disconnection detection, averaging (time average, count average, moving average), special data offset, peak-/bottom-hold, alarm, abnormal input setting	
Internal current consumption	40 mA or less	
Weight	Approx. 110 g	

*1 Individual setting is possible for each channel.

Specifications - A/D & D/A conversion unit

Model			KV-NC4AD	KV-NC2DA
Conversion			A/D conversion	D/A conversion
Analog input points			4 (single end)	2
Analog input range/ resolution	Voltage	-10 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 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)	±0.3% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)
		With temperature compensation	±0.3% of F.S. (at 0 to 55°C 32 to 131°F)	
	Current	Without temperature compensation	±0.4% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.6% of F.S. (at 0 to 55°C 32 to 131°F)	±0.3% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)
		With temperature compensation	±0.4% of F.S. (at 0 to 55°C 32 to 131°F)	
Input resistance	Voltage		5 MΩ	–
	Current		250 Ω	–
Absolute maximum input	Voltage		±15 V	–
	Current		±30 mA	–
Isolation method	Between analog input and CPU		Isolated (photocoupler, transformer)	
	Between analog input channels		No isolation	
Minimum load resistance	Voltage		–	1 kΩ
Maximum load resistance	Current		–	600 Ω
Special functions			Input range switching, temperature fluctuation compensation enabling/disabling, channel skip, scaling, special data offset, peak-/bottom-hold, zero clip, zero shift, comparator, averaging (time-specified, count-specified, moving average), disconnection detection,	output range switching, output data offset, scaling, error hold, upper/lower limit alarm, output limit, channel skip, output in PROG mode

*1 When the temperature fluctuation compensation is used, the temperature fluctuation compensation time of 80 µs will be added regardless of the number of channels being used.

Specifications - EtherNet/IP™ unit (communication specifications)

Model				KV-NC1EP
CIP service	Cyclic communication	No. of connections		64*5
		RPI (communication cycle)		0.5 to 10000 ms (0.5 ms increments) Setting is possible for each connection. (Data is updated on the line at specified cycles, independent of the number of nodes.)
		Transmission trigger	Output to adapter	Cyclic
			Input from adapter	Cyclic/Change Of State*1
		Allowable band for cyclic communication	(at 504 Byte)	6000 (pps)*2
			(at 1444 Byte)	3000 (pps)*2
		Maximum number of refresh words		8000 words
		Maximum data size for 1 connection*3		504 bytes or 1444 bytes
		Multicast filtering function*4		Provided (IGMP client function)
	Message communication	Class3 (connected type)	Server	No. of connections: 64*6
		UCMM (unconnected type)	Client	No. of simultaneous messages: 32
			Server	No. of simultaneous messages: 96
EtherNet/IP™ conformance test				Conforming to CT10

*1 Communication can be established with equipment that outputs data in the "Change Of State" method (send data when any change occurs). The KV-NC1EP cannot output data in the Change Of State method.
*2 Abbreviation of "Packet Per Second," meaning the number of packets that can be sent/received in a second.
*3 The simultaneity of data in the connection is guaranteed. When 505 bytes or more are used, the equipment to be used must support Large Forward Open (CIP option specification).
*4 The KV-NC1EP has the IGMP client function that allows filtering of unnecessary multicast packets when the Ethernet switch supporting IGMP Snooping is used.
*5 The number of connection may exceed 64 where the KV-NC1EP is connected with the multicast of cyclic communication from the originator. The operation of the KV-NC1EP, however, is guaranteed up to 64 connections.
*6 The value 64 indicates the total connections including those used by the cyclic communication function. Even when the total connection exceeds 64, the operation of the KV-NC1EP is guaranteed up to 64 connections.

Specifications - EtherNet/IP™ unit (performance specifications)

Model	KV-NC1EP		
Function name	No. of sockets		Port No.
	TCP	UDP	
PC application*1	8	0	8500 (can be set within the range between 1 and 65535)
Upper link communication*2 *3	Total: 15	1	8501 (can be set within the range between 1 and 65535)
MC protocol communication*2 *3		1	5000 (can be set within the range between 1 and 65535)*4
VT5/VT3 connection	0	1	8502 (can be set within the range between 1 and 65535)
FTP server	4	–	20, 21
Automatic clock data adjustment	–	1	123
DNS	–	1	53
FTP client	2	–	20, 21 (can be set within the range between 1 and 65535)
Simple PLC link	–	1	5001 (can be set within the range between 1 and 65535)
EtherNet/IP™ cyclic communication function	Total: 320	1	2222
EtherNet/IP™ message communication function		1	44818
Internal current consumption	90 mA or less		
Weight	Approx. 110 g		

*1 KV STUDIO
*2 TCP sockets and UDP socket can be used simultaneously.
*3 Up to 15 TCP sockets can be used in total.
*4 Port numbers can be assigned individually to TCP and UDP sockets.

Specifications - Serial communication adapter

Model			KV-NC10L	KV-NC20L		
Port			–	Port1	Port2	
Interface	Communication standard		RS-232C		RS-422A RS-485 (4-wire)	RS-485 (2-wire)
	Connection		D-sub 9-pin		European terminal block	
Transmission specifications	Transmission rate		1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps			
	Transmission method		Full duplex			Half duplex
	Data format	Start bit	1 bit			
		Data bits	7 bits, 8 bits			
		Stop bits	1 bits, 2 bits			
	Error detection	Parity	Even, odd, none			
	RS/CS flow control		Enabled, disabled		–	
	Transmission distance		15 m 49.2'		Extendable up to 1200 m 3937.0'	
	Number of transmission units		1		32	
	Electrical termination (Terminator)		–	Set with the switch on the front panel of the main unit		
Indication			SD (orange), RD (orange)			
Weight			Approx. 100 g	Approx. 110 g		

SPECIFICATIONS (Terminal block type)

Performance specifications - Base unit

Model		KV-N14xx	KV-N24xx	KV-N40xx	KV-N60xx
Calculation control method		Program storage method			
I/O control method		Refresh method			
Programming language		Expanded ladder, KV Script, mnemonic			
Number of instructions		Basic instruction: 81 types and 182 instructions, Application instruction: 39 types and 56 instructions Calculation instruction: 123 types and 311 instructions, Expansion instruction: 92 types and 141 instructions, Total: 335 types and 690 instructions			
Instruction execution speed	Basic instruction	50 ns minimum			
	Application instruction	170 ns minimum			
Program capacity		8k steps		16k steps	
Maximum number of attachable I/O units		3	8		
Maximum number of I/O points (excluding the base unit I/O)		128	256		
Input relay Output relay Internal auxiliary relay	R	Total of 9600 points 1 bit (R000 to R59915)			
Link relay	B	8192 points 1 bit (B0 to B1FFF)			
Internal auxiliary relay	MR	9600 points 1 bit (MR000 to MR59915)			
Latch relay	LR	3200 points 1 bit (LR000 to LR19915)			
Control relay	CR	1440 points 1 bit (CR000 to CR8915)			
Timer	T	512 points 32 bit (T0 to T511)			
Counter	C	256 points 32 bit (C0 to C255)			
Data memory	DM	32768 points 16 bit (DM0 to DM32767)			
Link register	W	16384 points 16 bit (W0 to W3FFF)			
Temporary memory	TM	512 points 16 bit (TM0 to TM511)			
High-speed counter	CTH	2 points (CTH0 to CTH1)		3 points (CTH0 to CTH2)	4 points (CTH0 to CTH3)
		32-bit automatic reset counter*1 (Input response: 100 kHz per single phase, 50 kHz per phase difference)*2			
High-speed counter comparator	CTC	4 points (CTC0 to CTC3)		6 points (CTC0 to CTC5)	8 points (CTC0 to CTC7)
		32 bits, two points per high-speed counter			
Index register	Z	12 points 32 bit (Z01 to Z12)			
Control memory	CM	9000 points 16 bit (CM0 to CM8999)			
Positioning pulse output*3		2 axes		3 axes	4 axes
		Maximum output frequency: 100 kHz (KV-NxxxT(P) only)			
Base unit I/O		Input: 8 points, output: 6 points Input common: 1 point Output common: 4 points (R type) 1 point (T/TP type)	Input: 14 points, output: 10 points Input common: 1 point Output common: 5 points (R type) 1 point (T/TP type)	Input: 24 points, output: 16 points Input common: 1 point Output common: 6 points (R type) 2 points (T/TP type)	Input: 36 points, output: 24 points Input common: 1 point Output common: 8 points (R type) 3 points (T/TP type)
Number of comments/ labels stored in main unit	Device comment	10000	20000		
		When a maximum-length ladder program is written with no labels.			
	Label	14000	28000		
		When a maximum-length ladder program is written with no device comments.			
Power off hold function	Program memory	Flash ROM can be rewritten 10000 times			
	Device*4	Nonvolatile RAM			
Self-diagnosis function		CPU error, RAM error, and other problems			

*1 You can also configure the settings so that automatic reset is not used.
*2 Only open collectors are supported. Line drivers are not supported.
*3 The relay output types (KV-NxxxR) do not have the positioning pulse output function.
*4 You can set the target device by clicking "CPU system setting" and then "Power off holding" in KV STUDIO.

General specifications - Base unit

Model	KV-N14Ax/N24Ax/N40Ax/N60Ax	KV-N14Dx/N24Dx/N40Dx
Power supply type	AC power supply type	DC power supply type
Power voltage	100 to 240 VAC (+10%/-15%)	24 VDC (+10%/-15%)
Output power supply voltage	24 VDC (±10%; output capacity: 0.6 A)	–
Internal current consumption	KV-N14AR: 76 VA, KV-N14AT(P): 75 VA, KV-N24AR: 79 VA, KV-N24AT(P): 76 VA, KV-N40AR: 86 VA, KV-N40AT(P): 82 VA, KV-N60AR: 91 VA, KV-N60AT(P): 85 VA (* The VA values are calculated with a power factor of 30%.)	KV-N14DR: 160 mA, KV-N14DT(P): 150 mA, KV-N24DR: 190 mA, KV-N24DT(P): 160 mA, KV-N40DR: 280 mA, KV-N40DT(P): 250 mA
Ambient temperature	0 to 55°C 32 to 131°F (no freezing)*1 *2	
Storage temperature	–25 to +75°C –13 to +167°F	
Ambient humidity	5 to 95% RH (no condensation)*1	
Withstand voltage	1500 VAC for 1 minute, between power supply terminal and I/O terminals and between all external terminals and case	
Noise immunity	1500 V peak-to-peak or more, pulse duration 1 µs, 50 ns (based on noise simulator), IEC standard compliant (IEC61000-4-2/3/4/6)	
Vibration resistance*3	Conforms to JIS B 3502 and IEC61131-2 Intermittent vibration: Frequency 5 to 9 Hz, Amplitude 3.5 mm 0.14"; Frequency 9 to 150 Hz, Acceleration 9.8 m/s² 32.2'/s² Continuous vibration: Frequency 5 to 9 Hz, Amplitude 1.75 mm 0.07"; Frequency 9 to 150 Hz, Acceleration 4.9 m/s² 16.1'/s² Scan times: 10 times (100 minutes) in each of the X, Y, and Z directions	
Shock resistance	Acceleration: 150 m/s² 492.1'/s², application time: 11 ms, three times in each of the X, Y, and Z directions	
Insulation resistance	50 MΩ or more (500 VDC megger used to perform measurements between power terminal and input terminals, and between all external terminals and case)	
Operating environment	As little dust and corrosive gas as possible	
Operating altitude	2000 m 6561.7' or less	
Overvoltage category	AC: II, DC: I	
Pollution degree	2	
Weight	KV-N14AR: Approx. 430 g, KV-N14AT(P): Approx. 420 g, KV-N24AR: Approx. 500 g, KV-N24AT(P): Approx. 470 g, KV-N40AR: Approx. 660 g, KV-N40AT(P): Approx. 620 g, KV-N60AR: Approx. 820 g, KV-N60AT(P): Approx. 750 g	KV-N14DR: Approx. 350 g, KV-N14DT(P): Approx. 330 g, KV-N24DR: Approx. 420 g, KV-N24DT(P): Approx. 390 g, KV-N40DR: Approx. 580 g, KV-N40DT(P): Approx. 530 g

*1 The range guaranteed as a system (excluding items specially noted for the units and cassettes).
*2 The temperature below the unit center (30 mm 1.18") inside a control panel.
*3 These specifications correspond to situations in which the unit is mounted on a DIN rail and in which the unit is mounted on the panel directly.

Input specifications - Base unit

Model	KV-N14xx	KV-N24xx	KV-N40xx	KV-N60xx	KV-N14xx	KV-N24xx	KV-N40xx	KV-N60xx
Input type	General input				High-speed A-phase and B-phase input			
Relay number	R000 to R003 (4 points)	R000 to R003, R008 to R013 (10 points)	R000 to R007, R014 to R107 (18 points)	R000 to R007, R100 to R203 (28 points)*1	R004 to R007 (2 channels, 4 points in total)	R004 to R007 (2 channels, 4 points in total)	R008 to R013 (3 channels, 6 points in total)	R008 to R015 (4 channels, 8 points in total)
Input mode	24 VDC input (open collector)							
Maximum input voltage	26.4 VDC							
Rated input voltage	24 VDC (5.3 mA*2)				24 VDC (6.5 mA*2)			
Minimum ON voltage	19 VDC							
Maximum OFF current	1.5 mA							
Maximum OFF voltage	–							
Common point mode	All points/1 common (1 terminal)				Shared common for all points (shared with general input)			
Circuit delay time*3	OFF to ON: Max. 30 µs (Typ. 3.5 µs) ON to OFF: Max. 50 µs (Typ. 15 µs) * The values are as shown below for R108 to R203 of the KV-N60xx. OFF to ON: Max. 50 µs (Typ. 7 µs) ON to OFF: Max. 150 µs (Typ. 70 µs)				OFF to ON: Max. 2 µs (Typ. 1.1 µs) ON to OFF: Max. 2 µs (Typ. 0.3 µs)			
Input time constant*3	Normal: 10 ms, When the HSP instruction is used: 10 µs When CR2305 is turned ON: 10 µs to 10 ms, eight-level switching is possible (set with CM1620). Can also be set from the Unit Editor.							
Response frequency	–				Single phase: 100 kHz, phase difference: 50 kHz, 24 V ±10%, Duty 50%			

Input time constant setting	Digital filter
10 µs	1.6 to 2 µs
20 µs	9 to 12 µs
110 µs	90 to 93 µs
500 µs	300 to 400 µs
1 ms	800 to 900 µs
2.5 ms	2.3 to 2.4 ms
5 ms	4.0 to 4.5 ms
10 ms	9 to 9.5 ms

*1 The response time increases for R108 to R203.
*2 Reference value of input current.
*3 The input response time corresponding to the input time constant can be calculated as shown below. (Response time) = (Circuit delay of the input circuit) + (Delay by the digital filter)
Example: Maximum response time when the input time constant is set to 500 µs
OFF to ON: 30 µs (circuit delay) + 400 µs (digital filter) = 430 µs
ON to OFF: 50 µs (circuit delay) + 400 µs (digital filter) = 450 µs

Output specifications - Base unit (Transistor output type)

Model	KV-N14xT(P)	KV-N24xT(P)	KV-N40xT(P)	KV-N60xT(P)	KV-N14xT(P)	KV-N24xT(P)	KV-N40xT(P)	KV-N60xT(P)
Output type	General output				High-speed output			
Relay number	R504 to R505 (2 points)	R504 to R509 (6 points)	R506 to R515 (10 points)	R508 to R607 (16 points)	R500 to R503 (4 points)	R500 to R503 (4 points)	R500 to R505 (6 points)	R500 to R507 (8 points)
Output mode	MOSFET*1							
Rated load	30 VDC, 0.5 A							
Maximum OFF voltage	30 VDC							
Leakage current when OFF	100 µA or less							
Residual voltage when ON	0.8 VDC or less (with 0.5 A output), 0.6 VDC or less (with 0.3 A output)							
Common point mode	8 to 10 points/1 common							
ON/OFF response time	OFF to ON: 100 µs (load of 1 mA or more) ON to OFF: 200 µs (load of 1 mA or more)				OFF to ON: 2 µs (7 to 100 mA load) ON to OFF: 5 µs (7 to 100 mA load)			
Overcurrent protection	Protection provided for each common*2							
Output frequency	–				100 kHz (7 to 100 mA load)			

*1 MOSFET (N-ch) output for the sink output type; and MOSFET (P-ch) output for the source output type.
*2 If an overcurrent occurs, 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.

Output specifications - Base unit (Relay output type)

Model	KV-N14xR	KV-N24xR	KV-N40xR	KV-N60xR
Relay number	R500 to R505 (6 points)	R500 to R509 (10 points)	R500 to R515 (16 points)	R500 to R607 (24 points)
Output mode	Relay			
Rated load	250 VAC/30 VDC, 2 A			
ON resistance	50 mΩ or less			
Minimum applicable load	100 µA/100 mVDC			
Common point mode	2 to 4 points/1 common			
ON/OFF response time	10 ms or less			
Relay life	Electrical: 100000 cycles or more (20 cycles/minute) Mechanical: 20000000 cycles or more			
Relay replacement	Impossible			

Specifications - Built-in serial port

Type				Built-in port
Interface	Communication standard			RS-232C
	Connection			Modular connector
Transmission specifications	RS-232C	Transmission rate		1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
		Transmission method		Full 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
		Transmission distance		15 m 49.2'
		Number of transmission units		1
Indication				SD (green), RD (red)

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 point mode	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.

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 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 when OFF		–		100 µA or less	
Residual voltage when 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 point mode		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 cycles or more (20 cycles/minute) Mechanical: 20000000 cycles 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 case of the KV-N16ET(P).
*5 MOSFET (N-ch) output for the sink output type; and MOSFET (P-ch) output for the source output type.

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	
	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 point mode		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	Input impedance		4.3 kΩ	
Output	Number of outputs		8	
	Output mode		Relay	MOSFET (N-ch) (with overcurrent protection function)*4
	Rated load		250 VAC/30 VDC, 2 A	30 VDC, 0.5 A
	Leakage current when OFF		–	100 µA or less
	Residual voltage when 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 point mode		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: 20000000 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 output terminals for each of C1 and C2 respectively, 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.

Specifications - Analog I/O unit

Model			KV-N3AM	
Conversion			A/D conversion	D/A conversion
Number of points			2 (single end)	1
Analog I/O range and resolution	Voltage*1	-10 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 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)	±0.3% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)
		With temperature compensation	±0.3% of F.S. (at 0 to 55°C 32 to 131°F)	
	Current	Without temperature compensation	±0.4% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.6% of F.S. (at 0 to 55°C 32 to 131°F)	±0.3% of F.S. (at 25°C ±5°C 77°F ±9°F) ±0.5% of F.S. (at 0 to 55°C 32 to 131°F)
		With temperature compensation	±0.4% of F.S. (at 0 to 55°C 32 to 131°F)	
Input resistance	Voltage		5 MΩ	–
	Current		250 Ω	–
Absolute maximum input	Voltage		±15 V	–
	Current		±30 mA	–
Isolation method	Between analog I/O and CPU		Isolated (photocoupler, transformer)	
	Between analog input and output		Non-isolated	
	Between analog input channels		Non-isolated	–
Minimum load resistance	Voltage		–	1 kΩ
Maximum load resistance	Current		–	600 Ω
Special functions			Input range switching, temperature fluctuation compensation enabling/ disabling, channel skip, scaling, special data offset, peak-/bottom-hold, zero clip, zero shift, comparator, averaging (time-specified, count-specified, moving average), disconnection detection	Output range switching, output data offset, scaling, error hold, upper/lower limit alarm, output limit, channel skip, output in PROG mode
Internal current consumption			120 mA or less	
Weight			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 the temperature fluctuation compensation is used, the temperature fluctuation compensation time of 80 µs will be added regardless of the number of channels being used.

Specifications - Extension serial communication cassette

Model			KV-N10L	KV-N11L	
Interface	Communication standard		RS-232C	RS-422A/RS-485 (4-wire)	RS-485 (2-wire)
	Connection		D-sub 9-pin	European terminal block (cannot be removed or reconnected)	
Transmission specifications	Transmission rate		1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 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		Enabled, disabled	–	
	Transmission distance		15 m 49.2'	Extendable up to 1200 m 3937.0'*1	
	Number of transmission units		1	32*1	
	Electrical termination (Terminator)		–	Set with the switch on the front panel of the main unit	
Indication			SD (orange), RD (orange)		
Weight			Approx. 30 g		

*1 This varies depending on the model. For details, see the KV Nano Series "Serial Communication Function User's Manual."

General specifications - KV-EP02

Item	Specifications				
Power voltage	24 VDC (+10%/-15%)				
Ambient temperature	0 to +55°C 32 to 131°F (no freezing)*1 *2				
Ambient humidity	5 to 95% RH (no condensation)*1				
Ambient storage temperature	–25 to 75°C –13 to +167°F				
Ambient storage humidity	5 to 95% RH (no condensation)*1				
Operating environment	As little dust and corrosive gas as possible				
Operating altitude	2000 m 6561.7' or less				
Pollution degree	2				
Overvoltage category	I				
Noise immunity	1500 V peak-to-peak or more, pulse duration 1 µs, 50 ns (based on noise simulator) Conforms to IEC standards (IEC61000-4-2/3/4/6)				
Withstand voltage	1500 VAC for 1 minute, between power supply terminal and I/O terminals and between all external terminals and case (1000 VAC for 1 minute, between power supply terminal and output terminals for the transistor output type expansion I/O unit)				
Insulation resistance	50 MΩ or more (500 VDC megger used to perform measurements between power supply terminal and input terminals, and between all external terminals and case)				
Vibration resistance*3	Conforms to JIS B 3502 and IEC61131-2	Intermittent vibration			Scan times
		Frequency	Acceleration	Half amplitude	10 times (100 minutes) in each of the X, Y, and Z directions
		5 to 9 Hz	-	3.5 mm 0.14"	
		9 to 150 Hz	9.8 m/s² 32.2'/s²	-	
		Continuous vibration			
		Frequency	Acceleration	Half amplitude	
		5 to 9 Hz	-	1.75 mm 0.07"	
		9 to 150 Hz	4.9 m/s² 16.1'/s²	-	
Shock resistance*3	Acceleration: 150 m/s² 492.1'/s², application time: 11 ms, three times in each of the X, Y, and Z directions				
Internal current consumption*4	120 mA or less				
Weight	Approx. 130 g				

*1 The range guaranteed as a system.
*2 The temperature below the unit center (30 mm 1.18") inside a control panel.
*3 When mounted on a DIN rail
*4 The maximum current consumption when expansion units are included is 1.8 A.

EtherNet/IP™ communication specifications - KV-EP02

Item		Specifications
EtherNet/IP™ specifications	Supported functions	Cyclic communication
		Message communication (Explicit message communication) UCMM and Class 3 supported
	Number of connections	64
	RPI (communication cycle)	0.5 to 10000 ms (0.5 ms increments)
	Trigger	Cyclic
	Conformance test	Conforming to CT14

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

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	UTP or STP of category 3 or higher (STP is recommended)	UTP or STP of category 5 or higher (STP is recommended)
Maximum cable length*3	100 m 328.1'	100 m 328.1'
Maximum number of connectable hubs*4	4	2

*1 The 10 Mbps/100 Mbps MDI/MDI-X automatic switching function is 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 Ethernet switch.
*4 The number of connectable hubs is unlimited when an Ethernet switch is used.

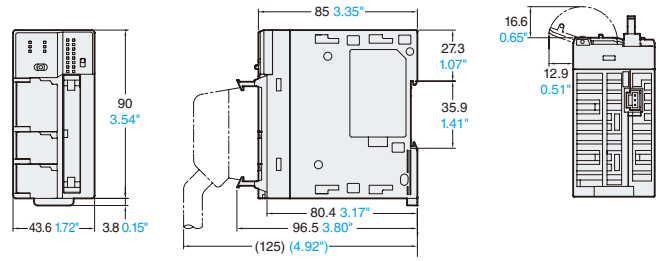
Operating environment

Item name/category	KV STUDIO
OS	Windows® 10/8 (including 8.1)/7(SP1 or higher)
Hard disk free space	3200 MB or more

DIMENSIONS

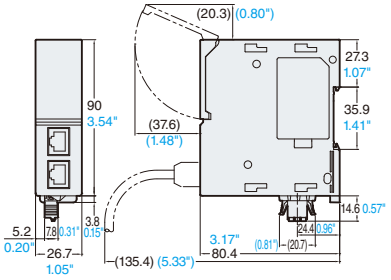
Base unit

KV-NC32T



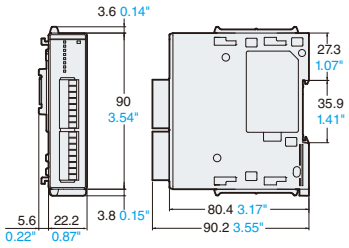
Communication unit

KV-EP02

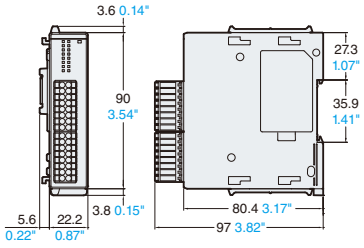


Expansion unit (European terminal block/MIL connector type)

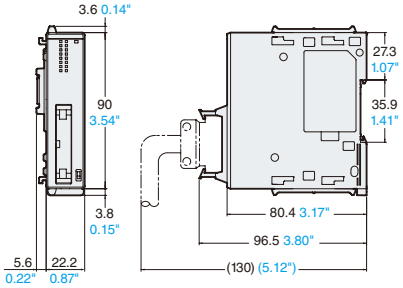
KV-NC8ER



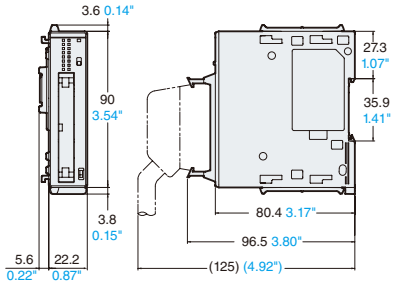
KV-NC16EXE/ET(P)E



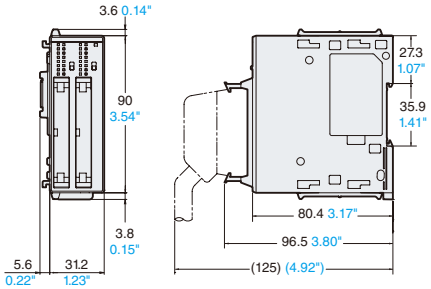
KV-NC16EX/ET(P)



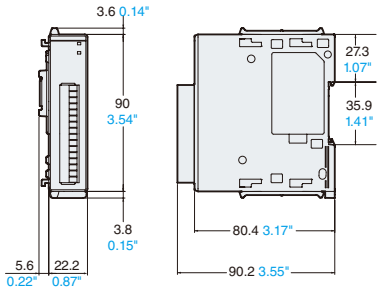
KV-NC32EX/ET(P)
KV-NC16EXT



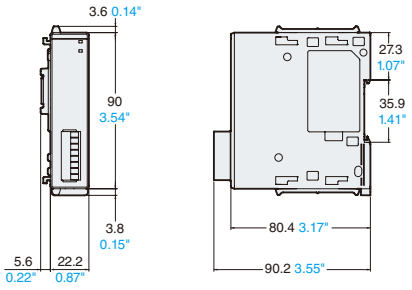
KV-NC32EXT



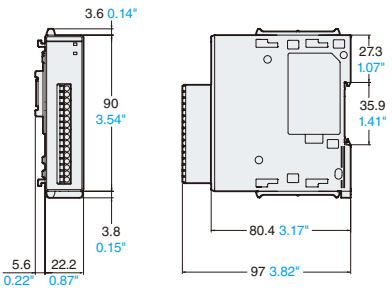
KV-NC4AD



KV-NC2DA

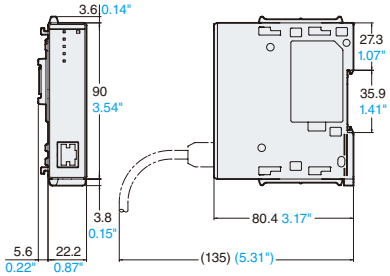


KV-NC4TP

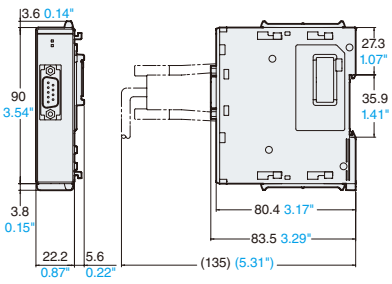


Serial communication adapter

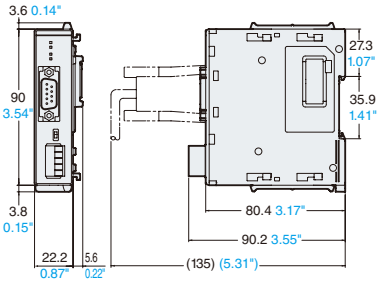
KV-NC1EP



KV-NC10L

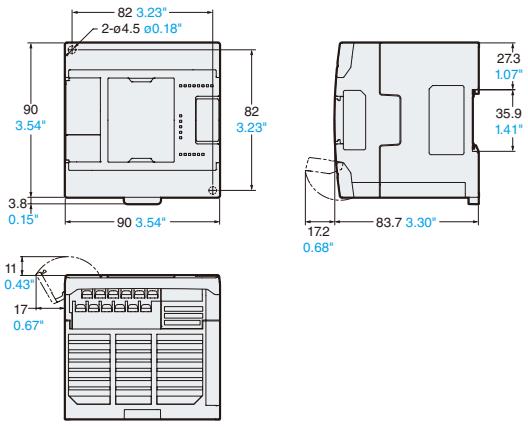


KV-NC20L

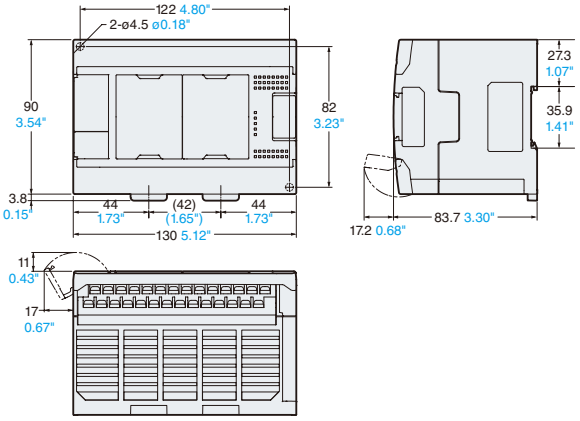


Base unit

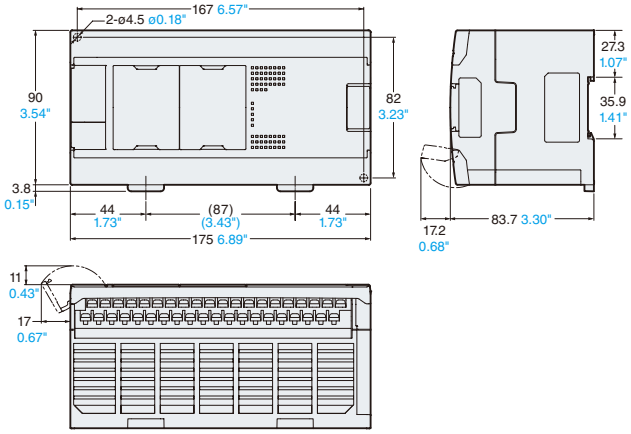
KV-N14AR/AT(P)/DR/DT(P)
KV-N24AR/AT(P)/DR/DT(P)



KV-N40AR/AT(P)/DR/DT(P)

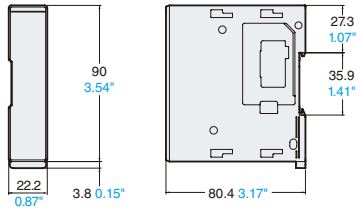


KV-N60AR/AT(P)

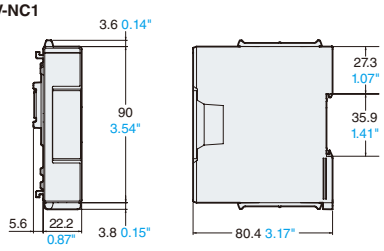


Connection conversion unit

KV-N1

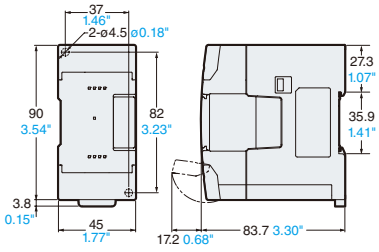


KV-NC1

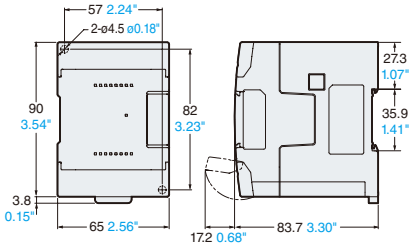


Expansion unit

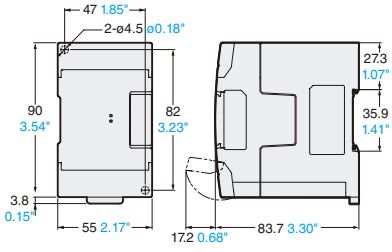
KV-N8EX/ET(P)



KV-N8ER/EXR/EXT
KV-N16EX/ER/ET(P)

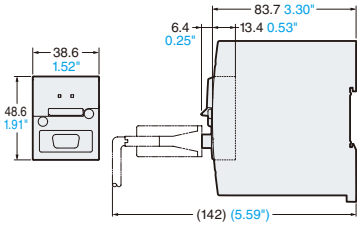


KV-N3AM

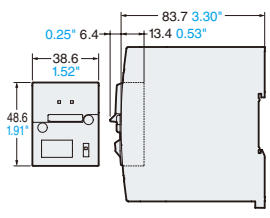


Extension cassette

KV-N10L

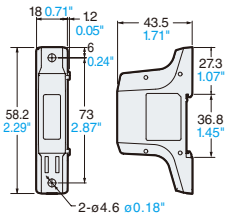


KV-N11L



Expansion unit extension cable

OP-87581



CAD DATA DOWNLOAD ▶ www.keyence.com/CADG

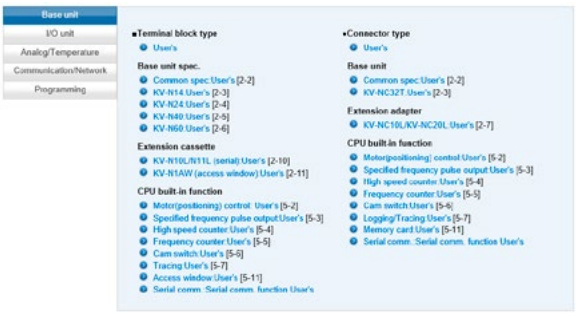
< Navigator > KV STUDIO

Various sample programs available

Sample programs are available for various applications from the KV-8000 Series to KV Nano. This ensures comfortable and efficient programming.

Built-in manuals

Related manuals are included in the software for quick reference. There is no need to download and manage them.



* To use the samples and manuals, select “Help (H)” > “Navigator (reference programs and technical information) (D)” in KV STUDIO.

LIST OF COMPONENTS

List of hardware (Connector type)

Item name/category		Model	Remark
Base unit	32-point DC power supply type	**KV-NC32T**	Input 16 points/output 16 points, transistor (sink) output, program capacity 32k steps
Expansion unit	Input	**KV-NC16EXE**	16 points, 5/24 VDC switchable, European terminal block
		KV-NC16EX	16 points, 5/24 VDC switchable, 20-pin MIL connector × 1
		KV-NC32EX	32 points, 5/24 VDC switchable, 34-pin MIL connector × 1
	Output	**KV-NC8ER**	8 points, relay output, European terminal block
		KV-NC16ETE	16 points, transistor (sink) output, European terminal block
		KV-NC16ETPE	16 points, transistor (source) output, European terminal block
		KV-NC16ET	16 points, transistor (sink) output, 20-pin MIL connector × 1
		KV-NC16ETP	16 points, transistor (source) output, 20-pin MIL connector × 1
		KV-NC32ET	32 points, transistor (sink) output, 34-pin MIL connector × 1
		KV-NC32ETP	32 points, transistor (source) output, 34-pin MIL connector × 1
	Input/output	**KV-NC16EXT**	Input 16 points/output 16 points, transistor (sink) output, 34-pin MIL connector × 1
		KV-NC32EXT	Input 32 points/output 32 points, transistor (sink) output, 34-pin MIL connector × 2
	A/D conversion	**KV-NC4AD**	Voltage/current input 4 channels, European terminal block
	D/A conversion	**KV-NC2DA**	Voltage/current output 2 channels, European terminal block
	Temperature input	**KV-NC4TP**	Thermocouple/platinum resistance thermometer multi-input 4 channels, European terminal block
	EtherNet/IP™	**KV-NC1EP**	EtherNet/IP™ supported, 100BASE-TX/10BASE-T supported, FTP client/server function
	Connection conversion unit	**KV-NC1**	For connecting terminal block type expansion units
Expansion adapter	Serial communication	**KV-NC10L**	1 port (RS-232C × 1 channel)
		KV-NC20L	2 ports (RS-232C × 1 channel, RS-232C/RS-422A/RS-485 × 1 channel)
Remote I/O	EtherNet/IP™ supporting communication unit	**KV-EP02**	2 ports, EtherNet/IP™, 100BASE-TX/10BASE-T
Network	EtherNet/IP™ supporting communication unit	**NU-EP1**	N-bus supported, PoE function
		DL-EP1	D-bus supported
	EtherNet/IP™ supported, 5 ports	**NE-Q05**	24 VDC, QoS supported
		NE-Q05P	24 VDC, QoS supported, PoE function
Option	SD memory card	**KV-M16G**	16 GB
		KV-M4G	4 GB
		KV-M1G	1 GB
	20-pin MIL connector	**OP-22185**	For KV-NC16Ex, standard contact included
	34-pin MIL connector	**OP-23139**	For KV-NC32T/KV-NC32Ex/KV-NCxxEXT, standard contact included, vertical
		OP-42224	For KV-NC32T/KV-NC32Ex/KV-NCxxEXT, standard contact included, slanted
	Contacts	**OP-22186**	For standard AWG22-24, 200 pieces
	Thin-wire contacts	**OP-30594**	For standard AWG26-28, 200 pieces
	Special crimping tool for MIL connectors	**OP-21734**	
	USB cable	**OP-35331**	Cable length 3 m 9.8'
	External USB port adapter	**KV-S2**	Cable length 1 m 3.3'

List of hardware (Terminal block type)

Item name/category		Model	Remark
Base unit	14-point AC power supply type	**KV-N14AR**	Input 8 points/output 6 points, relay output, program capacity 8k steps
		KV-N14AT	Input 8 points/output 6 points, transistor (sink) output, program capacity 8k steps
		KV-N14ATP	Input 8 points/output 6 points, transistor (source) output, program capacity 8k steps
	14-point DC power supply type	**KV-N14DR**	Input 8 points/output 6 points, relay output, program capacity 8k steps
		KV-N14DT	Input 8 points/output 6 points, transistor (sink) output, program capacity 8k steps
		KV-N14DTP	Input 8 points/output 6 points, transistor (source) output, program capacity 8k steps
	24-point AC power supply type	**KV-N24AR**	Input 14 points/output 10 points, relay output, program capacity 8k steps
		KV-N24AT	Input 14 points/output 10 points, transistor (sink) output, program capacity 8k steps
		KV-N24ATP	Input 14 points/output 10 points, transistor (source) output, program capacity 8k steps
	24-point DC power supply type	**KV-N24DR**	Input 14 points/output 10 points, relay output, program capacity 8k steps
		KV-N24DT	Input 14 points/output 10 points, transistor (sink) output, program capacity 8k steps
		KV-N24DTP	Input 14 points/output 10 points, transistor (source) output, program capacity 8k steps
	40-point AC power supply type	**KV-N40AR**	Input 24 points/output 16 points, relay output, program capacity 16k steps
		KV-N40AT	Input 24 points/output 16 points, transistor (sink) output, program capacity 16k steps
		KV-N40ATP	Input 24 points/output 16 points, transistor (source) output, program capacity 16k steps
	40-point DC power supply type	**KV-N40DR**	Input 24 points/output 16 points, relay output, program capacity 16k steps
		KV-N40DT	Input 24 points/output 16 points, transistor (sink) output, program capacity 16k steps
		KV-N40DTP	Input 24 points/output 16 points, transistor (source) output, program capacity 16k steps
	60-point AC power supply type	**KV-N60AR**	Input 36 points/output 24 points, relay output, program capacity 16k steps
		KV-N60AT	Input 36 points/output 24 points, transistor (sink) output, program capacity 16k steps
		KV-N60ATP	Input 36 points/output 24 points, transistor (source) output, program capacity 16k steps
Expansion unit	Input	**KV-N8EX**	8 points, 5/24 VDC switchable, screw terminal block
		KV-N16EX	16 points, 5/24 VDC switchable, screw terminal block
	Output	**KV-N8ER**	8 points, relay output, screw terminal block
		KV-N8ET	8 points, transistor (sink) output, screw terminal block
		KV-N8ETP	8 points, transistor (source) output, screw terminal block
		KV-N16ER	16 points, relay output, screw terminal block
		KV-N16ET	16 points, transistor (sink) output, screw terminal block
		KV-N16ETP	16 points, transistor (source) output, screw terminal block
	Input/output	**KV-N8EXR**	Input 8 points/output 8 points, relay output, screw terminal block
		KV-N8EXT	Input 8 points/output 8 points, transistor (sink) output, screw terminal block
	A/D conversion, D/A conversion	**KV-N3AM**	Voltage/current input 2 channels + Voltage/current output 1 channel
	Connection conversion unit	**KV-N1**	For connecting connector type expansion units
Extension cassette	Serial communication	**KV-N10L**	1 port (RS-232C × 1 channel)
		KV-N11L	1 port (RS-422A/RS-485 (4-wire)/RS-485 (2-wire) × 1 channel), European terminal block
Option	Extension cable	**OP-87581**	Cable length 1 m 3.3', width 2 cm 0.79"
	USB cable	**OP-35331**	Cable length 3 m 9.8'

Software

Classification	Item name	Model	Functions/Specifications
Programming support software	KV STUDIO Ver. 11 (US version)	**KV-H1A-DL**	Download version, Windows® 10/8/7-compatible, site license*

* 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.

Related Products

Programmable logic controller

KV-8000 SERIES

Modular type **KV-8000 Series**

Fusion of superior processing ability with the Machine Operation Recorder function

- Improved high-speed performance × responsiveness × synchronicity
- Freely customizable large-capacity CPU memory
- Records all the information before and after a problem occurs
- Equipped with an autonomous unit and a high-speed unit capable of utilizing the CPU unit's capabilities

Touch panel display

VT5 SERIES

Touch Panel Display **VT5 Series/ VT5-WX Series**
Windows® OS embedded **VT5-WX**
Large type: **VT5-X**, Medium, small type **VT5-W**

Advanced graphics and usability

- Incredible display performance with 16 million colors
- All sizes use high-resolution LCD
- Speech synthesis with multi-language support
- Automatic translation into multiple languages

KEYENCE

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

CONTACT YOUR NEAREST OFFICE FOR RELEASE STATUS

KEYENCE CORPORATION OF AMERICA

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KVNano-KA-C5-US 2021-2 611Q03