

Compact Programmable Logic Controller with Built-in Display Visual KV Series

Industry First Visual PLC



User-Friendly Designed with the user in mind, the Visual KV is a high-speed compact unit. It features the industry's first built-in access window and includes an AC power supply model and operator interface panel.

High Speed Scan Time

Ultra Small Size

Complete Product Line

AC/DC, Transistor (NPN/PNP)/Relay 12 base units/8 expansion units



Built-in Operator Interface PLC &



No PC or Handheld Programmer Required to Monitor Operation or Make Minor Changes





The Visual KV CPU features a built-in display (Access Window) that allows the PLC's data to be checked upon start-up and during modification or changeover.

Access Window Allows Information to be Conveniently Available

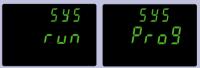
When checking or changing some device values the PLC does not need to be connected to either a PC or handheld programmer.



When making precise on-line adjustments to internal devices, such as a timer, while the PLC is operating.



When you need to stop the PLC and check the program without connecting to a PC or handheld programmer.



Other Functions

Key Lock Function

The Visual KV features a key lock function to prevent accidental changes to the settings.

Error Message Function

Error codes are immediately displayed on the LCD. With a conventional PLC, the PLC had to be connected to a handheld

programmer in order to determine the error code.



User Message Function

With a simple ladder program, a flashing LED display message (No.0 to 255) can appeal, indicating a user error code.



User Friendly Operator Panel



Ladder Comment Display-Allows you to easily check, change or detect abnormalities.



In addition to having the same functions as the Visual KV PLC's Access Window, the operator panel displays comments generated by a ladder program. This easy to use display features a variety of functions.



Displays operational instruction messages.

The Operator Panel Provides Features of a Full Scale Display

The on-screen feedback digital trimmer allows workers to make adjustments without stopping the production line.

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PROCESS	SPEED 1	25

At a glance, the status of registered customized switches F1 to F4 and lamps 1 to 4 can be confirmed.

LED1:	MOTOR	A RUN
LED2:	MOTOR	B RUN
LED3:	RLY 25	96
LED4:	RLY 25	

Input and output status of the I/O terminals can be monitored.

RLY 00000	Η.		 	 	
(I/O-IN)					
RLY 00100	H.,				
(1/0-IN)					

Built-In Operator Convenience Fund

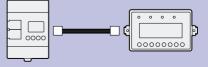
Beep function

The KV-D20 features a beep function to provide audio cues to workers.

Functions —

Display customization

Workers can choose from various display options to create a customized, easy-to-see display. A modular cable completes the connection.

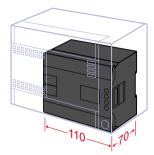


World's Smallest Design

2/3rd the size of conventional AC type PLCs

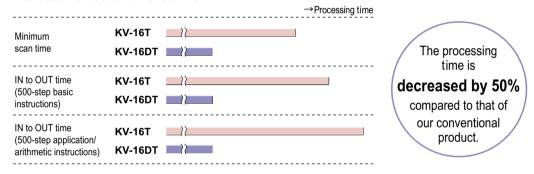
The new AC version 40 I/O KV is 2/3rd the size of conventional PLCs. The slender design not only saves mounting space, but allows the entire system including the distribution panel and the control box to be downsized.

(*For AC types that use screw-type terminal blocks)



World's Fastest Class

The fastest processing among products of this class. The minimum scan time is 140 s and the minimum instruction execution time is 0.7 s.



Industry First Design Patent pending

The PLC has a 2-colour backlit LCD(5 digits x 3), that is used for display functions.

NO

Typical Applications







Displays the current and preset values of the counter or timer.

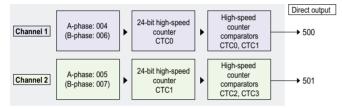
Serves as a handheld programmer when changing the preset value.

Displays the error code.

Practical Functions

2-Channel High Speed Counters

The Visual KV base unit incorporates 2-channel, 2 phase high-speed counters and high-speed counter comparators. This allows direct connection with a rotary encoder and counting input from the encoder. The Visual KV can be used for various applications, such as speed measurement and high speed interval counting; by utilizing the input capture functions, that automatically saves input values to the 4 interrupt inputs during high-speed counting.



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Incorporates a 30kHz, 2 phase, 24-bit counter and eliminates the need

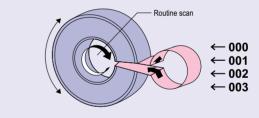
for an additional high-speed counter.



4 High Speed Interrupt Inputs

When an interrupt input occurs, the routine scanning is suspended and the interrupt inputs are immediately processed with a response time of only 10 s.The Visual KV is optimal for fast sensor input on high-speed lines.





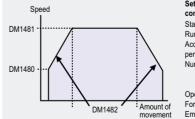
The Visual KV is unmatched in cost and performance, even when evaluated as only a 4 interrupt unit.

Simple Ramping Control Function

The Visual KV incorporates a positioning control function similar to expensive units for application practicality and cost reduction.

Incorporates a single-axis stepper motor control independent of the highspeed counter function that allows a motor up to 50kHz to be controlled.

> The simple positioning control stepper function can be activated by just inputting the setting values into the specific data memories.



Setting items for the positioning control function (x-axis) Start-up frequency (Hz) : DM1480 Run frequency (Hz) · DM1481 Acceleration/deceleration period (ms) : DM1482 Number of output pulses (high order): DM1485 (low order): DM1484 Operation start relay : 2310 Forced slowdown stop relay : 2308 Emergency stop relay : 2309

Only 1-line of ladder logic is needed to create the positioning control function.

0002 #01000 →	\rightarrow DW \succ	#03000 < DW ≻- DM1482		#34464 → DW >- DM1484	
Start-up frequency 1 kHz	Run frequency 5 kHz	Acceleration/ deceleration period 3 sec	outpu	ber of t pulses).000	

The Visual KV base unit can control

stepper motors?

Frequency Counter Function

Measures the rotational frequency of a gear or rotary encoder without complicated programming.

To achieve this measurement, simply input the frequency counting period into the specified data memory using a real number in "ms". The measured result is automatically input into the specified data memory. The measured result can be displayed on the Access Window.

The frequency of the gear revolutions can be displayed.

Specified Frequency Pulse Output Function

Without complicated programming, pulses with a specified frequency (16 to 50000Hz) can be output. Just input the frequency (Hz) into the specified data memory using a real number. The pulses with the specified frequency are then output from the output (501). The function allows multi-step speed control, as shown to the right.

The preset speed of a motor can be manually changed by simply using the Access Window. This feature is ideal for systems that require frequent setting changes or fine adjustments.



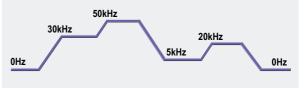
The Visual KV can be used as a simple stepper motor controller by setting the output frequency on the Access Window.*

Synchronization Control Function A single Visual KV unit enables synchronization control.

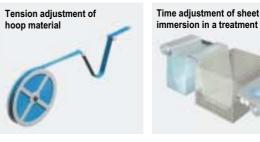
Pulses with a measured frequency can be output* by combining the frequency counter function with the specified-frequency pulse output.

Easily controls motor speed.

Complicated multi-step ramp up-and-down control is possible.



Applications



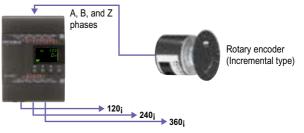
immersion in a treatment bath



Synchronization control

Cam Switch Function Serves as a simple cam switch.

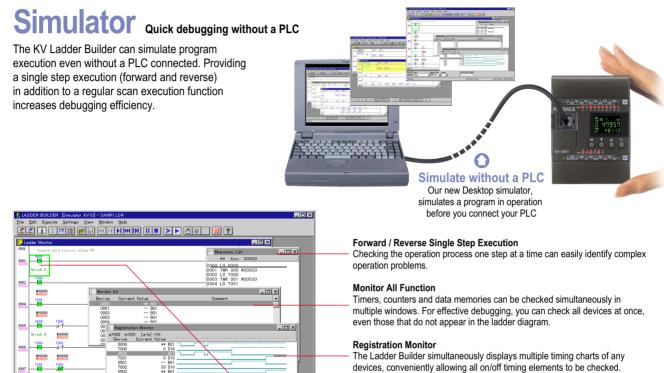
An operation similar to that of a Cam can be achieved by combining an inexpensive rotary encoder with the Visual KV. Connect the rotary encoder to the Visual KV and input the desired angles into the specified data memories. The relays can then be turned on or off at the specified angles (up to 32 points, in increments of 1 degree.) This Function of the Visual KV can be utilized as an alternative to an expensive Cam switch in order to reduce overall costs.



*: A motor driver is required separately.

oftware

"Ladder Builder for KV" ensures fast, easy programming and efficient desktop debugging.



Ladder Simulator Allows Verification of Diagram Execution

By clicking an element in the ladder diagram, the simulator quick screen appears allowing the elements to set or reset.

Number Bit Radiz • 0000 1 • 2 • na 1002

Editor Easy Editing Using Windows" Functions



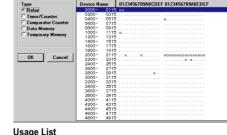
Instruction Selection Window

Set Auto Save

Auto Save

The user-friendly design allows data to be entered from a keyboard or mouse. You can specify a device or command from a drop down menu, eliminating errors. For programming purposes you can also enter the symbol directly by typing the command.

OK

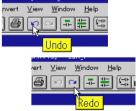


When creating Ladder diagrams the usage list automatically

tracks and displays addresses that have been used.



The Ladder Builder automatically backs-up the program at pre-determined intervals. This protects the data from being lost due to a power loss or system crash.



UNDO Function

The Ladder Builder for KV enables efficient editing. If you accidentally delete an instruction, you can undo the action simply by clicking the undo button.

Monitor Real time monitoring without machine stoppage

Cancel

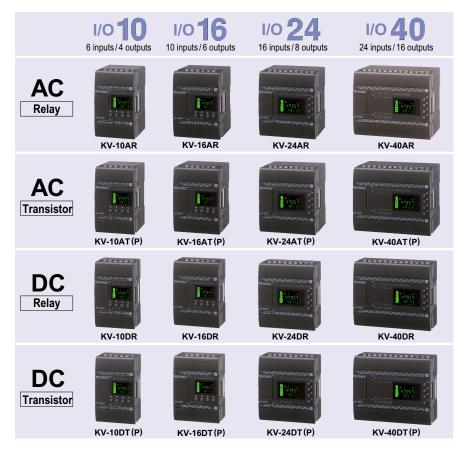
Perform Every 5

Minutes

Ladder diagram and element on/off status can be monitored in real time. In addition, timing charts can also be monitored simultaneously.

System Variations

Fully equipped with Access Windows, 16 types of base unit with various special functions, such as positioning control and high-speed counters, are available.



Expansion Units

Base

Units

An expansion unit can be mounted up to 300mm away from an adjacent unit. 8 types of I/O expansion unit permit a flexible layout.



The "Special Mini Display" provides basic display functions at a low cost.

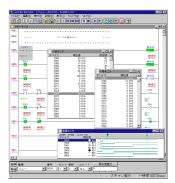
KV-D20 Operator Panel

4 function switches and 4 indicators can be customized and preset as desired. Comments on the ladder diagram can be displayed. The KV-D20, with practical functions, is a cost saving system component.



Ladder Builder Software KV-H6WU2 (Windows)

Ladder programming created for the conventional KV Series can be utilized with the Visual KV.



Handheld programmer with a memory card slot KV-P3E-01

The handheld programmer can be used to easily transfer and save ladder diagrams. (The M-2 and M-3 memory cards are available separately.)

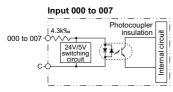


Specifications

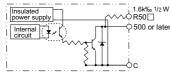
General specifications

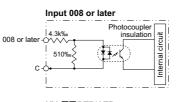
		incations				
Model		AC type KV-10AT(P)/AR KV-16AT(P)/AR KV-24AT(P)/AR KV-40AT(P)/AR	DC type KV-10DT(P)/DR KV-16DT(P)/DR KV-24DT(P)/DR KV-40DT(P)/DR			
Power supply		100 to 240 VAC (-10%)	24 VDC (-10%)			
AC power current consumption		KV-10AT(P)/AR: 0.4 A KV-16AT(P)/AR: 0.5 A KV-24AT(P)/AR: 0.6 A KV-40AT(P)/AR: 0.7 A	_			
AC power factor	unit	60%	—			
Output voltage	13	24 VDC (-10%)				
Output capacity (Including the internal current consumption and current consumption of expansion units.)	Base	KV-10AT(P)/AR: 0.4 A KV-16AT(P)/AR: 0.6 A KV-24AT(P)/AR: 0.6 A KV-40AT(P)/AR: 0.7 A	_			
Allowable instantaneous interruption time		40 ms max.	2 ms max.			
		KV-16AR/DR: 120 mA max. KV-7 KV-24AR/DR: 140 mA max. KV-2	10AT(P)/DT(P): 80(85) mA max. 16AT(P)/DT(P): 90(100) mA max. 24AT(P)/DT(P): 100(105) mA max. 40AT(P)/DT(P): 120(130) mA max.			
Internal current consumption (converted into 24 VDC value)		KV-E8X: 25 mA max. KV-E16X: 35 mA max. KV-E8T(P): 40 mA max. KV-E16T(P): 60(70) mA max. KV-E8R: 70 mA max. KV-E16R: 110 mA max. KV-E4XR: 45 mA max. KV-E4XT(P): 30 mA max.				
	Others		panel: 60 mA max. grammer: 65 mA max.			
Ambient temperatu	ire	0 to +50¡C, 0 to +4	45¡C (KV-P3E-01)			
Relative humidit	y	35 to	85%			
Ambient storage temperature	9	-20 to	+70¡C			
Withstand voltag	ge	1,500 VAC for 1 minute (Between power terminal and I/O terminals, and between external terminals and housing)				
Noise immunity		1,500 Vp-p min., pulse width: 1 s, 50 ns (by noise simulator) Conforming to EN standard (EN55011-2/-3/-4/-6)				
Shock		150 m/s ² (15 G), working time: 11 ms, in X, Y and Z directions, 2 times respectively				
Vibration		2 hours respectively (1 G ma	amplitude in X, Y and Z directions, ax. when attached to DIN rail)			
Insulation resistance		50 M‰ min. (Between power terminal and I/O terminals, and between external terminals and housing, measured with 500 VDC megohmmeter)				
Environmental restrictions		No excessive dust	or corrosive gases			
Weight		KV-16AR: Approx. 300 g, H KV-24AR: Approx. 350 g, H KV-40AR: Approx. 450 g, H KV-10DR: Approx. 150 g, H KV-16DR: Approx. 190 g, H KV-24DR: Approx. 240 g, H	 (V-10AT(P): Approx. 240 g, (V-24AT(P): Approx. 290 g, (V-24AT(P): Approx. 320 g, (V-40AT(P): Approx. 420 g, (V-10DT(P): Approx. 150 g, (V-16DT(P): Approx. 220 g, (V-24DT(P): Approx. 220 g, 			
		KV-40DR: Approx. 330 g, H	KV-40DT(P): Approx. 290 g			

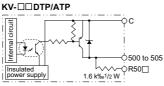
Input/output circuit of base unit



KV- 🗆 🗆 DT/AT

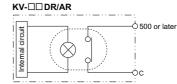






Performance specifications

	enormance	specifications					
	hmetic operation trol method	Stored program method					
I/O	control method	Refresh method					
Programming language		Ladder diagram and expanded ladder diagram					
Instruction types		Basic instruction: 28, Application instruction: 22, Arithmetic instruction: 26, Interrupt instruction: 4					
Min	imum scan time	140 s min.					
	truction cessing time	Basic instruction: 0.7 s min., Application instruction: 6.4 s. min.					
		2,000 steps (KV-10					
Pro	gram capacity	4,000 steps (KV-24					
	kimum number of ansion units	8 (7 for KV-40 🗆 🗆)					
Number of I/O points (including 16 to 40 I/O points of basic unit)		16 to 152 points (when expansion units are connected)					
Inte	ernal utility relay	2,560 points: 1000 to 1915 and 3000 to 17915					
Spe	ecial utility relay	160 points: 2000 to 2915					
Data	a memory (16 bits)	2,000 words: DM 0000 to DM1999					
Temporary data memory (16 bits)		32 words: TM00 to TM31					
Timer/counter		0.1-s timer: TMR (0 to 6553.5 s), 0.01-s timer: TMH (0 to 655.35 s), 0.001-s timer: TMS (0 to 65.535 s), UP counter: C, Up/down counter: UDC					
Dig	ital trimmer	2 trimmers (set in access window)					
	h-speed counter	2 counters of 30 kHz, 2-phase high-speed counter (0 to 65535 count) *1					
	h-speed counter nparator	4 comparators (2 for each high-speed counter) Direct output allowed					
	sitioning htrol function	Independent 1 axis, 50 kHz max.					
Me	mory switch	16					
<u>q</u>	Program memory	Flash ROM, rewritable 100,000 times or more					
Program memory Data memory, counter, internal utility relay (Retention devices are set by MEMSW instruction.)		Data retained for 2 months min. with electrical double-layer capacitor (at 25¡C), Data can be backed up with EEP ROM in all models.					
Sel	f-diagnosis	CPU and RAM errors					
	nber of contact nments	1,000 max. contact comments can be saved.					
*1. 24-bit setting is available.							



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Input specifications of base unit

Model	KV-10 🗆 🗆	KV-16□□	KV-24□□	KV-40 🗆 🗆				
No. of inputs	6	10	16	24				
Input common	CC	COM is connected internally.						
Maximum input rating	26.4 VDC							
Input voltage *1	24 VDC, 5.3 mA/5 VDC, 1.0 mA							
Input time constant	10 ms (Typical) 10 s when HSP instruction is used Variable in 7 steps from 10 s to 10 ms while special utility relay 2813 is ON (Set by DM1940)							
Interrupt input response	10 s (Typical)							
High-speed counter input response	30 kHz (24V–10%)							

Output specifications of basic unit

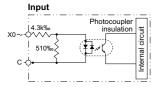
Model	KV-10 🗆 T	KV-16 □ T	KV-24□T	KV-40 □ T	KV-10□R	KV-16□R	KV-24□R	KV-40 □ R
No. of outputs	4	6	8	16	4	6	8	16
Output common		1 cor	nmon		Each con	nmon term	inal is inde	pendent.
Output type	Transis	tor outpu	ıt (NPN c	r PNP)		Relay	output	
Rated load		30 VDC 0.3 A (503 and other) 0.1 A (500 to 502)				A (Induo	30 VDC tive load)
Peak load current	0.2 A (500 to 502) 1 A (Other)			5 A				
Relay service life		_			100,000 Me	times or n echanical	service life nore (20 ti service li mes or m	mes/min) fe:
Relay replacement	t Not allowed							
Output frequency	50 kHz (500 to 502)					-	_	
Built-in serial resistance	1.6 k%	1.6 k‰ 1/2W (R500 to R502)					_	

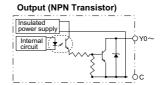
*1. Inputs 000 to 007 can be changed to 5 V input.

Input/output specifications of expansion unit

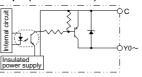
Input/output	Inj	put		Ou	tput		Input/output		
External connection method									
Model	KV-E8X	KV-E16X	KV-E8T(P)	KV-E16T(P)	KV-E8R	KV-E16R	KV-E4XT(P)/R		
Number of inputs	8	16			4				
Input common	4 points/	common		-	_		4 points/common		
Maximum input rating	26.4	VDC		-	_		26.4 VDC		
Input voltage	24 VDC	, 5.3 mA		-	_		24 VDC, 5.3 mA		
Minimum ON voltage	19	V		-			19 V		
Maximum OFF current	21	mA		-	_		2 mA		
Input impedance	4.3	k‰		-	_		4.3 k‰		
Input time constant (Changed in two steps by special utility relays 2609 to 2612)	For both rising (falling (ON → O 10 ms: 10 ms–20%	FF) operations,		-	_		For both rising (OFF \rightarrow ON) and falling (ON \rightarrow OFF) operations, 10 ms: 10 ms–20%, 10 s: 10 s–20%		
Number of outputs	-	_	8	16	8	16	4		
Output type	-	_	NPN (PNP) Transistor	R	elay	NPN (PNP) Transistor/Relay		
Output common	-	—	COM is connected internally.		4 points/common		4 points/common		
Rated load voltage	-	_	30 VDC		250 VAC/30 VDC, 2 A (Inductive load), 4 A (Resistive load)		30 VDC/, 250 VAC/30 VDC, 2 A (Inductive load), 4 A (Resistive load)		
Rated output current	-	_	0.5 (0.3) A/point		iductive load), e load), 4 A/common	0.5 (0.3) A/point/, 2 A/point (Inductive load) 4 A (Resistive load), 4 A/common		
ON resistance	-	_	-	_	50 m%	6 or less	— / 50 m‰ or less		
Leakage current at OFF	-	_	100 A	max.			100 A max./ —		
Residual voltage at ON	_	_	0.8 V	max.			0.8 V max./ —		
Rising operation time (OFF \rightarrow ON)	-	_		max.	10 ms max.		10 ms max.		50 s max./10 ms max.
Falling operation time (ON \rightarrow OFF)	-		250 s	max.	10 ms max.		250 s max./10 ms max.		
Relay service life	-	_	-	_	(20 tim	000 times or more nes/min), nillion times or more	Electrical: 100,000 times or more (20 times/min), Mechanical: 20-million times or more		
Relay replacement	-	_		_	Not a	allowed	— /Not allowed		
Weight	Approx. 100 g	Approx. 140 g	Approx. 100 g	Approx. 140 g	Approx. 130 g	Approx. 190 g	Approx. 100 g/Approx. 120 g		

Input/output circuit of expansion unit

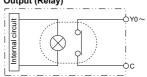




Output (PNP Transistor)



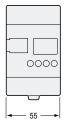
Output (Relay)

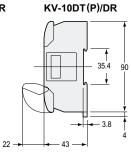


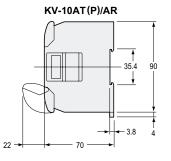
Dimensions

Base Units

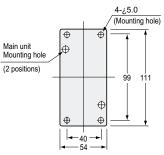
KV-10DT(P)/DR/AT(P)/AR



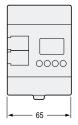




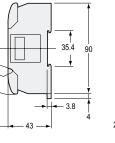
Mounting bracket OP-35345

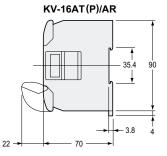


KV-16DT(P)/DR/AT(P)/AR

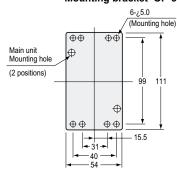


KV-16DT(P)/DR





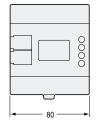
Mounting bracket OP-35346

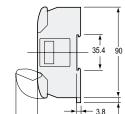


KV-24DT(P)/DR/AT(P)/AR

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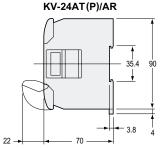
22 -



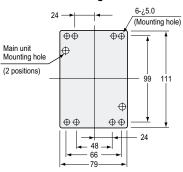


- 43

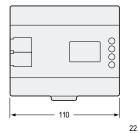
KV-24DT(P)/DR

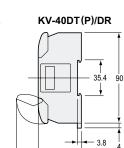


Mounting bracket OP-35347

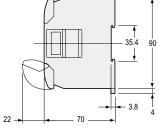


KV-40DT(P)/DR/AT(P)/AR



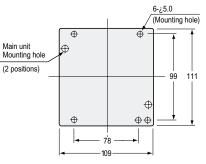


43



KV-40AT(P)/AR

Mounting bracket OP-35348



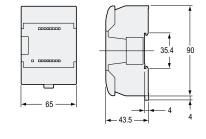


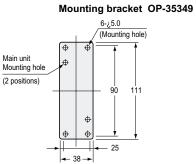


Expansion Units

KV-E8X/8T(P)/8R/4XT(P)/4XR KV-E16X/16T(P)/16R



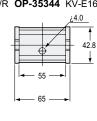


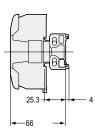


Expansion Units Spacer Patent pending

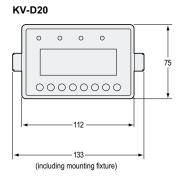
OP-35343 KV-E8X/T(P)/R, KV-E4XT(P)/R **OP-35344** KV-E16X/T(P)/R

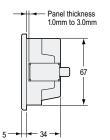




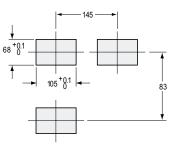


Operator Panel





Panel Cutout



New KV Series Model List

Category	Name	Model	Description		
	10-point AC type	KV-10AT(P)	6-point input/4-point NPN (PNP) transistor output		
	To-point AC type	KV-10AR	6-point input/4-point relay output		
	10-point DC type	KV-10DT(P)	6-point input/4-point NPN (PNP) transistor output		
	To-point DC type	KV-10DR	6-point input/4-point relay output		
	16 point AC ture	KV-16AT(P)	10-point input/6-point NPN (PNP) transistor output		
	16-point AC type	KV-16AR	10-point input/6-point relay output		
	16 point DC type	KV-16DT(P)	10-point input/6-point NPN (PNP) transistor output		
	16-point DC type	KV-16DR	10-point input/6-point relay output		
Basic unit		KV-24AT(P)	16-point input/8-point NPN (PNP) transistor output		
	24-point AC type	KV-24AR	16-point input/8-point relay output		
	24	KV-24DT(P)	16-point input/8-point NPN (PNP) transistor output		
	24-point DC type	KV-24DR	16-point input/8-point relay output		
		KV-40AT(P)	24-point input/16-point NPN (PNP) transistor output		
	40-point AC type	KV-40AR	24-point input/16-point relay output		
	10 11 100 1	KV-40DT(P)	24-point input/16-point NPN (PNP) transistor output		
	40-point DC type	KV-40DR	24-point input/16-point relay output		
		KV-E8X	8-point input		
Expansion unit		KV-E8T(P)	8-point NPN (PNP) transistor output		
	8-point type	KV-E8R	8-point relay output		
		KV-E4XT(P)	4-point input/4-point NPN (PNP) transistor output		
		KV-E4XR	4-point input/4-point relay input		
		KV-E16X	16-point input		
	16-point type	KV-E16T(P)	16-point NPN (PNP) transistor output		
		KV-E16R	16-point relay output		
Easy-to-set display	Operator panel	KV-D20	20 digits x 4 lines with customized switches/lamps (cable included)		
Extension cable for expansion unit	For all expansion units and adapters	OP-35361	For 300-mm extension		
	Spacer for 8-point expansion unit	OP-35343	Used to make an expansion unit flush with an AC power		
Expansion unit spacer	Spacer for 16-point expansion unit	OP-35344	type basic unit.		
	For 10-point basic unit	OP-35346			
	For 16-point basic unit	OP-35346			
Metal fixture for screw tightening	For 24-point basic unit	OP-35347	Used to directly mount the KV series with screws instead of a DIN rail.		
	For 40-point basic unit	OP-35348			
	For 8- to 16-point expansion unit	OP-35349			
	Handheld programmer	KV-P3E-01	Memory card slot, cable (OP-26487) included		
	Programming support software	KV-H6WU2	Windows version With simulator function, delivered in two 3.5-inch floppy disks (cable included)		
Programming	Cable/connector for PC/AT	OP-26487	For D-sub 9-pin, Basic unit-to-PC with programming		
	or compatibles	OP-26486	support software		
	Memory card	M-2	Saves/reads ladder programs via KV-P3E(01) s slot or Z-1 card reader/writer.		
		M-3	M-2: 24 programs max.,M-3: 48 programs max.		

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