DATA SHEET

LG Programmable Logic Controller

MASTER-K120S Series

LG Industrial Systems

- **When using LGIS equipment, thoroughly read this datasheet and associated manuals introduced in this datasheet. Also pay careful attention to safety and handle the module properly.**
- **Keep this datasheet within easy reach for quick reference.**

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LG constantly endeavors to improve our products so that information in this datasheet is subjected to change without notice.

10310000382

Safety Instructions

- To Prevent injury and property damage, following these instructions.
- Incorrect operation due to ignoring instructions will cause harm or damage, the seriousness of which is indicated by following symbols

⚠Warning — This symbol indicates the possibility of death or serious injury

⚠Caution — This symbol indicates the possibility of injury or damage to property

- The meaning of each symbol in this datasheet and on your equipment is as follows.

⚠ This is the safety alert symbol.
Read and follow instructions carefully to avoid dangerous situation.

This symbol alerts the user to the presence of “dangerous voltage” inside the product that might cause harm or electric shock.
means paying attention because of danger of electrical shock.

- Store this datasheet in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

⚠Warning

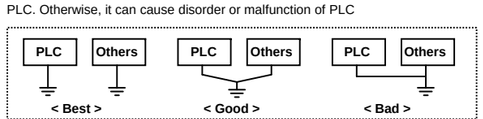
- Do not contact the terminals while the power is applied.
  Risk of electric shock and malfunction.
- Protect the product from being gone into by foreign metallic matter.
  Risk of fire, electric shock and malfunction.

⚠Caution

- Be sure to check the rated voltage and terminal arrangement for the module before wiring work.
  Risk of electric shock, fire and malfunction.
- Tighten the screw of terminal block with the specified torque range.
  If the terminal screw looses, it can cause fire and electric shock.
- Use the PLC in an environment that meets the general specifications contained in this datasheet.
  Risk of electrical shock, fire, erroneous operation and deterioration of the PLC.
- Be sure that external load does not exceed the rating of output module.
  Risk of fire and erroneous operation.
- Do not use the PLC in the environment of direct vibration
  Risk of electrical shock, fire and erroneous operation.
- Do not disassemble, repair or modify the PLC.
  Risk of electrical shock, fire and erroneous operation.
- When disposing of PLC, treat it as industrial waste.
  Risk of poisonous pollution or explosion.

Precautions for use

- Do not Install other places except PLC controlled place.
- Make sure that the FG terminal is grounded with class 3 grounding which is dedicated to the PLC. Otherwise, it can cause disorder or malfunction of PLC



- Connect expansion connector correctly when expansion module are needed,
- Do not detach PCB from the case of the module and do not modify the module.
- Turn off power when attaching or detaching module.
- Cellular phone or walkie-talkie should be farther than 30cm from the PLC
- Input signal and communication line should be farther than minimum 100mm from a high-tension line and a power line in order not to be affected by noise and magnetic field.

Before handling the product

Before using the product, read the datasheet and the User’s manual through to the end carefully in order to use the product efficiently.

Name	Code
KGLWIN (Programming software)	10310000345
MASTER-K (Instruction & Programming)	10310000346
MASTER-K120S User’s manual	10310000381

1. Introduction

This data sheet provides brief information about characteristics, configuration, and usage of MASTER-K120S Series.

2. General Specifications

No	Item	Specifications				Standard
1	Operating temperature	0 ~ 55℃ (32 ~ 131°F)				
2	Storage temperature	-25 ~ 70℃ (-13 ~ 158°F)				
3	Operating Humidity	5 ~ 95%RH, non-condensing				
4	Storage humidity	5 ~ 95%RH, non-condensing				
5	Vibration	Occasional vibration				IEC61131-2
		Frequency	Acceleration	Amplitude	Sweep count	
		10≤f<57 Hz	-	0.075 mm	10 times in each direction for X, Y, Z	
		57 ≤f≤150 Hz	9.8 ㎨ {1G}	-		
		Continuous vibration				
		Frequency	Acceleration	Amplitude		
		10≤f∠57 Hz	-	0.035 mm		
		57≤f≤150 Hz	4.9 ㎨{0.5G}	-		
6	Shocks	* Maximum shock acceleration: 147 ㎨ {15G} * Duration time :11 ms * Pulse wave: half sine wave pulse (3 times in each of X, Y and Z directions)				IEC61131-2
7	Noise immunity	Square wave impulse noise	±1,500 V			
		Electrostatic discharge	Voltage :4kV(contact discharge)			IEC61131-2 IEC1000-4-2
		Radiated electromagnetic field	27 ~ 500 MHz, 10 V/m			IEC61131-2 IEC1000-4-3
		Fast transient & Burst noise	Severity Level	All power modules	Digital I/Os (Ue ≥ 24 V)	Digital I/Os (Ue<24V) Analog I/Os Comm. I/Os
			Voltage	2 kV	1 kV	0.25 kV
8	Atmosphere	Free from corrosive gases and excessive dust				
9	Altitude for use	Up to 2,000m				
10	Pollution degree	2 or lower				
11	Cooling method	Self-cooling				

3. Performance Specifications

Item		Specification(Standard Type)				Remark
		K7M-DR(T)20U	K7M-DR(T)30U	K7M-DR(T)40U	K7M-DR(T)60U	
Operation method		Cyclic operation of stored program Interrupt task operation				
I/O Control method		Scan synchronized batch processing method (Refresh method) Direct method by instruction				
Program language		Ladder Diagram, Instruction List				
Number of Instruction	Basic	30				
	App.	277				
Processing Time		Basic Instruction : 0.1 ㎲/Step				
Program memoryCap.		7kstep				
I/O Points		20	30	40	60	
Data Area	P	P000 ~ P63F				I/O Relay
	M	M000 ~ M191F				Internal Relay
	K	K000 ~ K31F				Keep Relay
	L	L000 ~ L63F				Link Relay
	F	F000 ~F63F				Special Relay
	T	100ms : T000 ~ T191(192 Point), 10ms : T192 ~ T250(59Point) 1ms : T251 ~ T255(5Point) Adjustable boundary area by parameter setting				Timer

Item		Specification(Standard Type)				Remark
		K7M-DR(T)20U	K7M-DR(T)30U	K7M-DR(T)40U	K7M-DR(T)60U	
Data Area	C	C000 ~ C255				Counter
	S	S00.00 ~ S99.99				Step Relay
	D	D0000 ~ D4999				Data Register
Operating Mode		RUN, STOP, PAUSE, DEBUG				
Self-diagnostic functions		Watch dog timer, memory error detection, I/O error Detection, etc				
Memory backup at power down		Latch area setting by basic parameter				
No. of Max. extension		3				
Weight(g)		520	540	660	850	
Internal function	PID Control function	Auto tuning by instruction, PWM Operation 8 PID control loops, Anti-Windup, SV-Ramp, Delta MV				
	Cnet I/F function	MASTER-K Dedicated protocol support MODBUS protocol support User defined protocol support No protocol mode — RS-232C, RS-485				Share a port With KGL-WIN
	HSC Func-tion: speed	1 Phase 100 kHz 2Ch. / 20kHz 2Ch. 2 Phase 50 kHz 1Ch. / 10kHz 1Ch.				
	HSC Func-tion: Mode	1 pulse operation Mode : Increment count by program 1 pulse operation Mode : Increment/decrement count by phase B pulse input 2 pulse operation Mode : Increment/decrement count by input pulse 2 pulse operation Mode : Increment/decrement count by difference of phase				
	Addi-tional Func-tion	Internal/External preset, Latch counter Interrupt operation by data comparison, zone comparison, RPM calculation, Ring Counter				
	Pulse catch	8 points : 2points for 10us and 6points for 50us				
	Posi-tion-ing: Basic	Control axis : 2 axes Control method : PTP, speed control Control unit : Pulse Positioning data : 20 data per axis Positioning mode : End/Keep/Continous, Single/Repeat				**DRT Type Only**
	Posi-tion-ing: Posi-tioning	Positioning method : Absolute/Incremental Positioning address : -2,147,483,648 ~ 2,147,483,647 Speed : Max. 100kpps(Setting range : 5 ~ 100,000) Accel./Decel. Method : Trapezoidal mathod				
	Posi-tion-ing: Return to Origin	Origin detection when approximate origin turns off. Origin detection after declaration when approx. origin off Origin detection by approximate origin				
	Posi-tion-ing: JOG	Setting range: 5 ~ 100,000(High/Low speed)				
	External Interrupt	8 Points : 2points for 10us and 6points for 50us				
	Input filter	0 ~ 1000 ms (adjustable)				

Item		Specification(Economic Type)				Remark
		K7M-DR10UE	K7M-DR14UE	K7M-DR20UE	K7M-DR30UE	
Operation method		Cyclic operation of stored program Interrupt task operation				
I/O Control method		Scan synchronized batch processing method (Refresh method) Direct method by instruction				
Program language		Ladder Diagram, Instruction List				
Number of Instruction	Basic	30				
	Application	269				
Processing Time		Basic Instruction : 0.4 ㎲/Step				
Program memoryCap.		2kstep				
I/O Points		10	14	20	30	
Data Area	P	P000 ~ P63F				I/O Relay
	M	M000 ~ M191F				Internal Relay
	K	K000 ~ K31F				Keep Relay
	L	L000 ~ L63F				Link Relay
	F	F000 ~F63F				Special Relay
	T	100ms : T000 ~ T191(192 Point), 10ms : T192 ~ T250(59Point) 1ms : T251 ~ T255(5Point) Adjustable boundary area by parameter setting				Timer
	C	C000 ~ C255				Counter
	S	S00.00 ~ S99.99				Step Relay
	D	D0000 ~ D4999				Data Register
Operating Mode		RUN, STOP, PAUSE				
Self-diagnostic functions		Watch dog timer, memory error detection, I/O error Detection, etc				
Memory backup at power down		Latch area setting by basic parameter				
No. of Max. extension		2				
Weight(g)		360	370	500	510	
Internal function	Cnet I/F function	MASTER-K Dedicated protocol support MODBUS protocol support User defined protocol support No protocol mode — RS-232C, RS-485				Share a port With KGL-WIN RS-485 is available on K7M-DR10/14UE only
	Pulse catch	4 points for 50us				
	External Interrupt	4 Points for 50us				
	Input filter	0 ~ 1000 ms (adjustable)				

4. Operation Processing Method

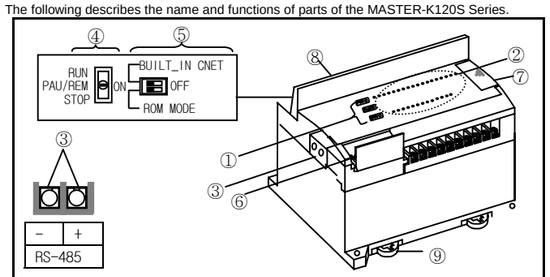
1) Cyclic operation
A PLC program is sequentially executed from the first step to the last step, which is called scan. This sequential processing is called cyclic operation. Cyclic operation of the PLC continues as long as conditions do not change for interrupt processing during program execution.
2) Time driven interrupts operation method
In time driven interrupt operation method, operations are processed not repeatedly but at every preset interval. In the MASTER-K120S CPU module, interval can be set to between 0.01 ~ 60 seconds. This operation is used to process operation with a constant cycle

3) Event driven interrupts operation method

If a situation occurs which is requested to be urgently processed during execution of a PLC program, this operation method processes immediately the operation which corresponds to interrupt program. The signal, which informs those urgent conditions to the CPU module, is called interrupt signal.

5. Parts Name and Descriptions

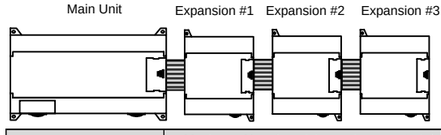
The following describes the name and functions of parts of the MASTER-K120S Series.



No.	Name		Function
①	CPU Status LED	PWR LED	Indicates of the power status. • On : normal state • Off : abnormal state or off
		RUN LED	Indicates the operation status of the CPU. • On : When the CPU operates with the mode setting switch in the local or remote RUN • Off : When the followings occur ▶ the voltage is not normally supplied to the CPU ▶ the mode setting switch is in the stop or pause ▶ An error which makes operation stop is detected
		ERR LED	Indicates the operation status of the CPU. • Flicker : An error is detected by self diagnostic during operation • Off : When the CPU is normal state
②	Input/Output LED		Indicates the input/output status
③	RS-485 Connector		• 2 pin connector for 485 communication
④	The mode setting Switch		Sets the operation mode of the CPU. • RUN : Program operation is executed • STOP : Program operation is stopped • PAU / REM ▶ PAUSE : Program operation is temporarily stopped ▶ REMOTE Used for the remote operation
⑤	Built-in Cnet On/Off setting Dip switch		• For detailed direction for use, refer to the MK120S user's manual chapter 5 • Rom mode switch must be set to 'Off'
⑥	RS-232C Connector		• 9 pin connector for KGLWIN and Cnet
⑦	For Extension connector cover		• the connector which mounted extension unit cover
⑧	Terminal block cover		• the protection cover for external wiring
⑨	The hook for DIN rail		• The hook for DIN rail

6. I/O No. Allocation Method

1) I/O No. Allocation is granting address to unit & module for output/input data



Mounting Module	Maximum No. of module can be mounted		Remark
	Standard type	Economic type	
Expansion I/O module	3	2	
A/D conversion module	3	Not available	
Analog timer module	3	Not available	
Communication module	1	1	

2) The following is method I/O number allocation.

Item	Specification	Area	Remark
Main Unit	Input	P000 ~ P03F	64 Points Fixed
	Output	P040 ~ P07F	64 Points Fixed
Expansion #1	Input	P080 ~ P08F	16 Points Fixed
	Output	P090 ~ P09F	16 Points Fixed
Expansion #2	Input	P100 ~ P10F	16 Points Fixed
	Output	P110 ~ P11F	16 Points Fixed
Expansion #3	Input	P120 ~ P12F	16 Points Fixed
	Output	P130 ~ P13F	16 Points Fixed

-. Basically I/O allocation is fixed-point method and special module is not allocated

(The area which is not used can be used internal relay.)

7. Built-in High Speed Counter Function

1) Summary

The high-speed counter can count high frequency pulse which can not be proceed with the CPU counting instructions. It can be counting pulse which occurs from encoder or pulse generator.

2) Performance specifications

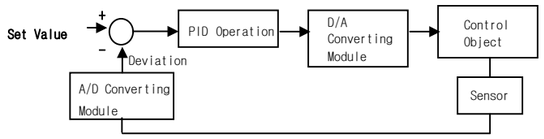
Item		Specification
Input signal	signal	A Phase , B Phase , Preset
	Signal level	DC24V
	Signal type	Voltage input
Counting range		-2,147,483,648 ~ 2,147,483,647(binary 32bits)
Max. counting speed		1Phase : 100 kHz 2Ch. or 20kHz 2Ch. 2Phase : 50 kHz 1Ch. or 10kHz 1Ch.
Counting method		Linear counter or Ring counter
Up/Down selection	1 Phase	B-Phase input
	2 Phase	Auto-select by phase difference of A and B Phase
Additional function		Internal or external preset, Latch counter Interrupt operation by data comparison, zone comparison. RPM calculation

8. PID Control Function

This chapter describes information about the built-in PID function of MASTER-K120S Series.(Max. 8 loops)

1) The characteristics of PID function of MASTER-K120S series as following

① The PID function is integrated into the CPU module. Therefore, all PID control action can be performed with instructions and parameter without any separated PID module.
② Velocity form and Positioning form are available.
③ P operation, PI operation, PID operation and On/Off operation can be selected easily.
④ The manual output (the user-defined forced output) is available.
⑤ By proper parameter setting, stable operation can be achieved regardless of external disturbance.
⑥ The operation scan time (the internal that PID controller gets a sampling data from actuator) is changeable for optimizing to the system characteristics.
⑦ PWM operation is supported
⑧ SV-Ramp, Delta-MV function is supported



PID Control system block diagram

2) Instructions for PID control

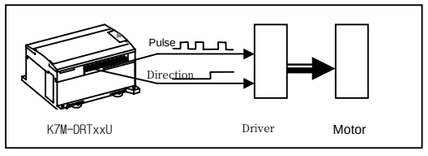
For the PID Operation of MASTER-K120S, there are two instructions, as follow.

No.	Instruction	Function
1	PID8	Perform the PID operation
2	PID8AT	Perform the auto tuning operation

9. Positioning function

1) Summary

The DRT Types of MASTER-K120S supports 2-axes of positioning function. The purpose of this function is to transfer moving object by setting speed from the current position and stop them on the setting position correctly. This chapter describes information about the built-in positioning function of MASTER-K120S Series.



2) Performance specifications

Item	Specification
Control axis	2axes
Control method	PTP, speed control
Control unit	pulse
Positioning data	20 data per axis
Positioning method	Absolute / Incremental
Speed limit	Max. 100kpps, Min. 5pps(unit of 1pps)
Positioning address	-2,147,483,648 ~ 2,147,483,647
Acceleration/ Deceleration method	Trapezoidal method(0 ~ 10,000ms)
Bias speed	5 ~ 100,000 pps
Rated load voltage	12V/24V
Operation method	Single / Repeat
Operation mode	End / Keep / Continous mode
Positioning function	Return to orizin JOG operation PWM output function

10. Internal communication function

1) Dedicated communication

MASTER-K120S series has built-in Cnet communication function, and it is possible that communicate with various external devices without separated Cnet I/F module. By using LGIS's dedicated protocol, user can read, write, and monitor memory devices of MASTER-K120S series.

Built-in Cnet of MASTER-K120S supports the following functions;

- Read single/continuous device
- Write single/continuous device
- Read the CPU status
- Register monitoring device
- Execute monitoring
- 1:1 connection between LG PLCs

2) User defined communication

User can define an user-defined protocol to communicate with other manufacturer's devices. By supporting user-defined protocol, MASTER-K120S series can communicate with various devices have their own protocol.

3) Modbus protocol

MASTER-K120S series includes Modbus protocol, and it is easy to connect with Modbus devices. (You don't need to write Modbus protocol as user-defined protocol)

4) No Protocol mode

MASTER-K120S series includes No protocol mode communication.

REMARK

1) Please refer the chapter 8 of MASTER-K120S user's manual for details of built-in Cnet I/F function of MASTER-K120S series.

11. Other Internal Functions

11.1 Pulse Catch Function

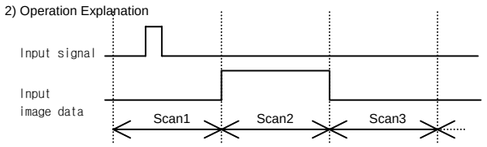
In the main unit, pulse catch input contact points are internalized. Through using this contact point short pulse signal, short as below, can be taken which can not be executed by general digital input..

1) Usage

When narrow width of pulse signal is input, a trouble occurs which can not be executed by general digital input, so the operation does not perform as user's intention. But in this case through pulse catch function even narrow interval of pulse signal as 10us Min. can be executed..

Specification	10us	50us	Remark
Standard Type	2points(P0 ~ P1)	6points(P2 ~ P7)	
Economic Type	None	4points(P0 ~ P3)	

2) Operation Explanation



Step	Execution contents
Scan1	CPU senses input when pulse signal, min. 10us, is input, then saves the status.
Scan2	Used to turn on the region of input image.
Scan3	Used to turn off the region of input image

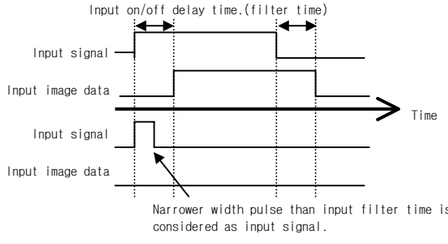
11.2 Input Filter Function

External input of MASTER-K120S selects input on/off delay time. From the range of 0-1000ms. Credibility secured system may be established by adjustment of input correction no. through using environment.

1) Usage

Input signal status affects to the credibility of system in where noise occurs frequently or pulse width of input signal affects as a crucial factor. In this case the user sets up the proper input on/off delay time, then the trouble by miss operation of input signal may be prevented because the signal which is shorter than set up value is not adopted

2) Operation Explanation



11.3 External interrupts function

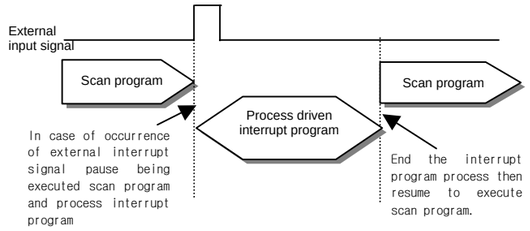
MASTER-K120S Series can perform max 4 ~ 8 points of external contact task by using input of main unit without special interrupt module.

1) Usage

This function is useful to execute a task program has been set to an external input signal.

Specification	10us	50us	Remark
Standard Type	2points(P0 ~ P1)	6points(P2 ~ P7)	
Economic Type	None	4points(P0 ~ P3)	

2) Operation Explanation

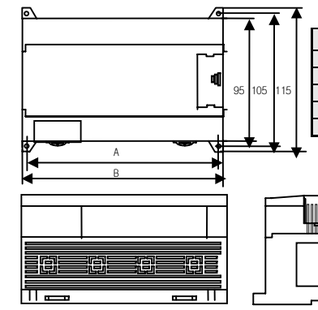


3) Function

- The Number of external interrupt is decreased by using other interrupt task(Time drive interrupt or HSC driven task).

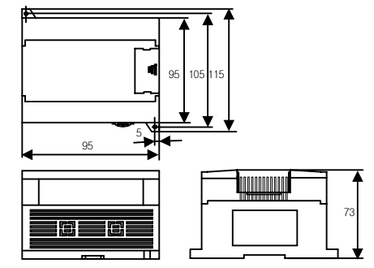
12. Dimension (mm)

1) Main Unit



Item	A	B
K7M-DR10/14UE	85	95
K7M-DR20/30UE	135	145
K7M-DR(T)20/30U		
K7M-DR(T)40U	165	175
K7M-DR(T)60U	215	225

2) Expansion Module



3) Expansion Module(Slim Type)

- G7E-DC08A, G7E-RY08A, G7F-DA2V, G7F-ADHB, G7F-RD2A