



ЛК Программируемый логический контроллер (Резервирование — объединительная плата)

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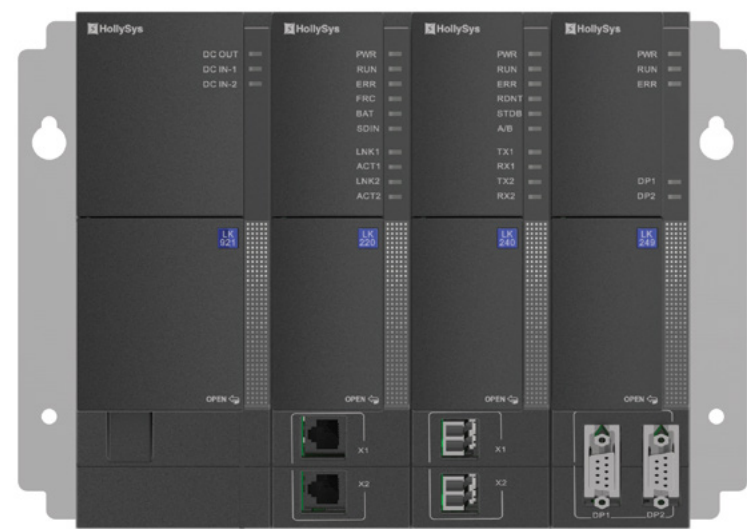
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ЛК ПРОГРАММИРУЕМЫЙ ЛОГИЧЕСКИЙ КОНТРОЛЛЕР



Описание

Крупномасштабный универсальный контроллер ЛК в качестве главного блока управления для средней и крупной системы ПЛК характеризуется высокой надежностью, высокой производительностью, быстрым реагированием. Широко используется в различных сценариях применения: метро, очистка воды, высококачественное оборудование, сложные машины и управление производственной линией. Контроллер и внешний резервный ввод-вывод составляют системы управления резервированием с полным сбором данных, логическими вычислениями, выполнением действий, взаимодействием человека с компьютером, обменом данными и другими функциями для реализации интеллектуальной автоматизации.

Системные характеристики

- **Высокая надежность**
 1. Двойная структура с резервированием стоек, включая резервирование питания, резервирование контроллера, резервирование сети.
 2. В режиме резервирования система может работать при возникновении неисправности.
- **Быстрое реагирование**
 1. Время переключения на резерв составляет 130 мс.
 2. Минимальное время планирования задач менее 100 мкс.
 3. Время отклика системы менее 200 мс.
- **Большая емкость**
 1. В одном сетевом сегменте можно добавить 122 пары управляющих станций.
 2. В Сеть с одним DP, можно добавить 116 ведомых устройств ввода-вывода.
 3. Емкость ввода-вывода, поддерживаемая системой, составляет более 10 000 точек.
- **Простота обслуживания**
 1. Инструмент для чтения журнала, в который записывается более 10 000 сообщений о ненормальной работе, сбоях и другой информации.
 2. Вы можете получить диагностическую информацию о каждом модуле системы через библиотеки инструкций информации о модуле и инструкций состояния системы.
 3. Каждый модуль поддерживает горячую замену.
 4. Обновление системы с помощью SD-карты или программного обеспечения AutoThink.
 5. Совместимость с существующими модулями ввода-вывода LK.

АППАРАТНЫЕ КОМПОНЕНТЫ И СТРУКТУРА

Сетевые соединения

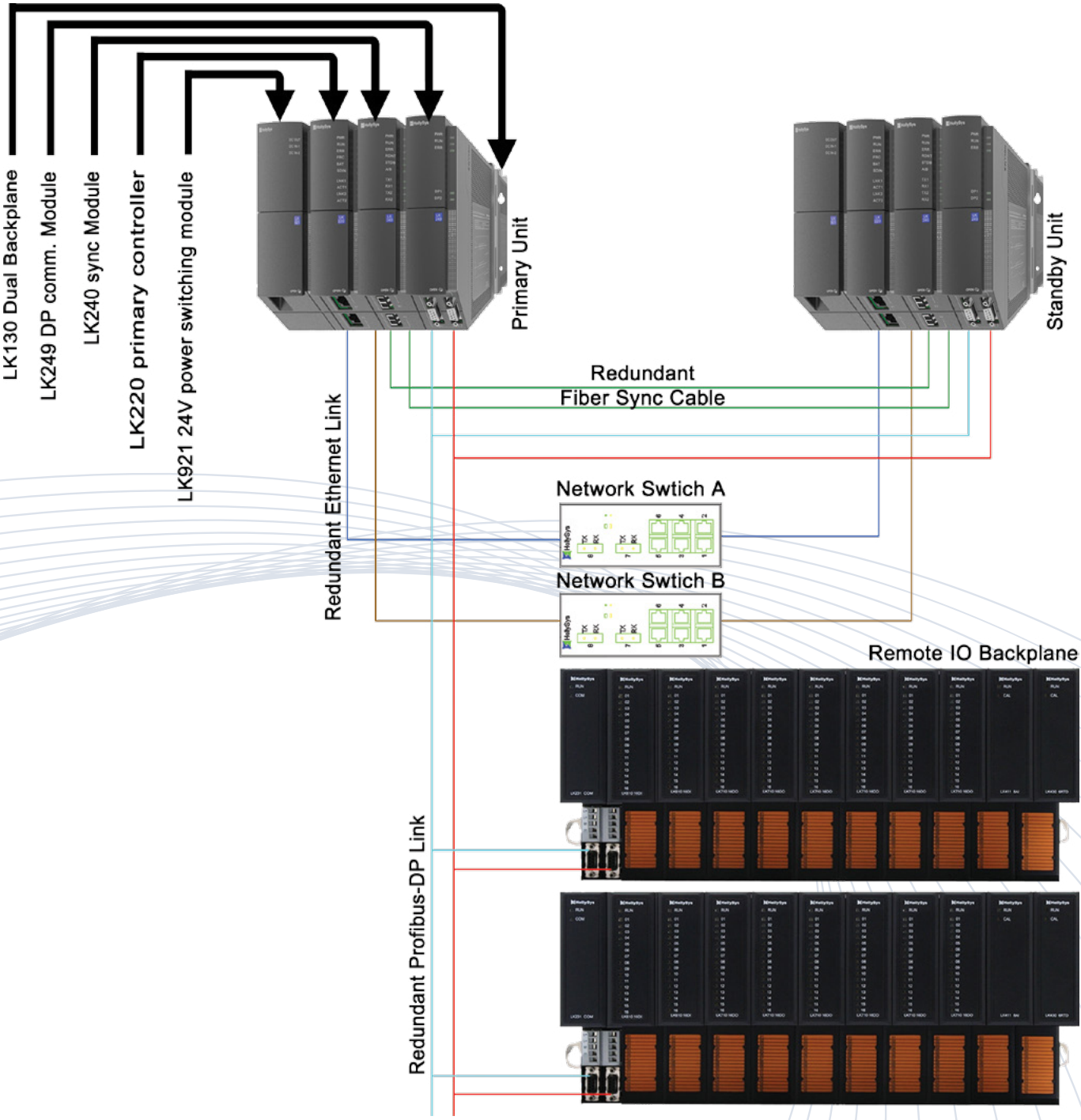


Рисунок 1.1 Сетевое подключение главного контроллера LK

Компоненты контроллера

Универсальная система контроллера LK имеет двойную раму с резервированием, универсальный контроллер устанавливается отдельно на двух стойках, соответственно серии А и серии В. Каждый контроллер состоит из следующих компонентов:



- ① LK921 Модуль переключения питания 24 В
- ② LK220 Ведущий модуль управления (резервирование)
- ③ LK240 Коммуникационный модуль резервирования
- ④ LK249 Коммуникационный модуль ведущей станции DP
- ⑤ LK130 4-слотовый модуль объединительной платы

Рисунок 1.2 Компоненты контроллера LK

LK921 Модуль переключения питания 24 В

Двойной вход 24 В постоянного тока преобразуется в один выход 24 В постоянного тока посредством обработки резервирования. Он обеспечивает резервный источник питания 24 В постоянного тока для объединительной платы с 4 слотами и источник питания для других модулей на объединительной плате.

LK220 Ведущий модуль управления (резервирование)

Главный модуль управления LK220 имеет резервную конфигурацию. Модуль содержит два интерфейса Ethernet 10/100 Мбит/с для подключения к программному компьютеру, для загрузки пользовательской программы и обновления контроллера. А также в качестве ведущей/ведомой станции Modbus TCP для связи с другими устройствами. Вы можете обновить контроллер и сохранить пользовательские файлы через слот для SD-карты на панели. Возможно изменение режима работы контроллера с помощью ключевого переключателя. В режиме резервирования два контроллера находятся в отношениях ведущий-ведомый, и главный переключается на ведомый, когда на ведущей станции возникает неисправность.

LK240 Коммуникационный модуль резервирования

Используется для подключения резервной связи между рамами А и В с помощью оптоволоконного кабеля.

LK249 Коммуникационный модуль ведущей станции DP

Модуль LK249 включает в себя два коммуникационных интерфейса DB9, подключенных к объединительной плате расширения LK117/LK118 кабелем DP, для установления соединения с модулем ввода-вывода. Модуль LK249 обменивается данными с главным модулем управления по шине на объединительной плате.

LK130 4-слотовый модуль объединительной платы

Он используется для установки главного модуля управления, модуля переключения питания 24 В и модуля расширения связи LK240, LK249, одновременно поддерживает как высокоскоростную локальную объединительную шину, так и шину PROFIBUS-DP для обмена данными между модулями.

Рисунки 1.3 и 1.4 - схема резервной системы LK с двумя источниками питания.

Схематические диаграммы

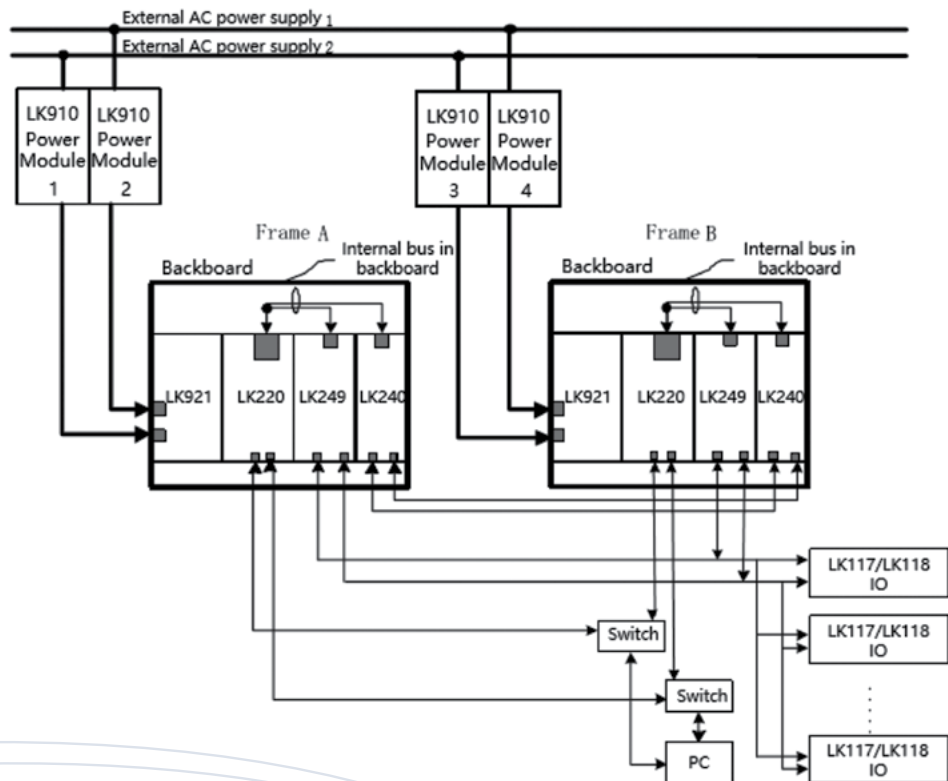


Рисунок 1.3 Схематическая диаграмма резервной системы универсального контроллера LK (1)

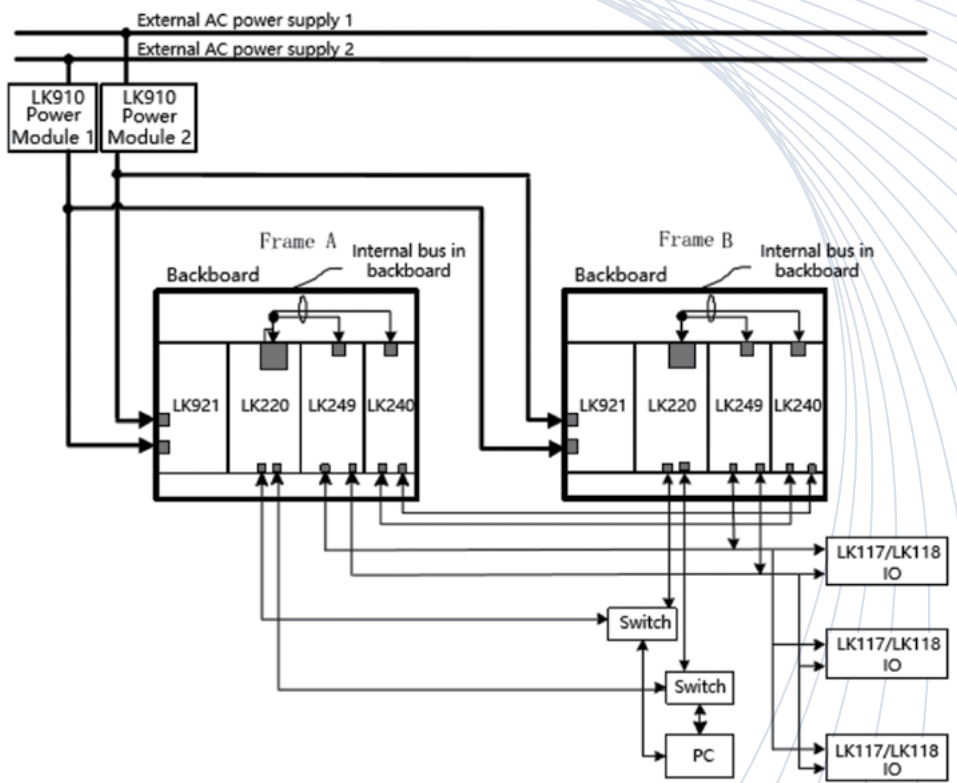


Рисунок 1.4 Схематическая диаграмма резервной системы универсального контроллера LK (2)

Список оборудования

Аппаратные продукты крупномасштабных ПЛК LK в основном включают главные модули управления, коммуникационные модули, модули ввода/вывода, объединительные платы и силовые модули.

Тип модели	Модель	Описание и спецификация	Ключ защиты
Кроссплата	LK117	Локальная объединительная плата, 11 слотов, 385 × 166 × 55,5 мм, с розетками DB9, для интерфейсов DP, поставляется с возможностью подключения к клеммам ввода-вывода	Нет
	LK118	Локальная объединительная плата, 5 слотов, 210 × 166 × 55 мм, с 9-контактными разъемами типа D для интерфейсов DP, со съемными клеммами ввода-вывода	Нет
	LK130	4-слотовая локальная объединительная плата, 235×166×44,3 мм, с 4 разъемами CPCI-контактов	Нет
Главный контроллер	LK220	667 МГц, битовая инструкция: 0,013 мс/К; программа: 10 МБ; область хранения 64 КБ, поддержка избыточности	Нет
Электропитание	LK921	Модуль переключения питания 24 В, входное напряжение: 20,4–29,8 В постоянного тока, с независимыми входными клеммами	Нет
	LK910	Модуль питания 24 В постоянного тока, входное напряжение: 110 В /220 В переменного тока, выходное напряжение: 24 В постоянного тока, мощность: 120 Вт, установлен на направляющей.	
Аналоговый вход - AI	LK411	8-канальный модуль аналоговых входов токового типа, 0~20 мА/4~20 мА	A1
	LK412	6-канальный модуль аналоговых входов, изолированный, 0~20 мА/4~20 мА/±10 В/0~5 В/0~10 В	A0
	LK430	6-канальный модуль аналоговых входов термосопротивления, PT100/200/500/1000, Ni100/120/200/500, Cu10/50	A2
	LK441	8-канальный модуль аналоговых входов - термопара (с компенсацией холодного спая) типа В/С/Е/Ј/К/Н/Р/Ѕ/Т, -12 мВ~+32 мВ (+78 мВ)	B1
Аналоговый выход - AO	LK511	4-канальный модуль аналоговых выходов, изолированный, 0~21 мА/4~20 мА	C1
Дискретный вход - DI	LK610	16-канальный модуль дискретных входов 24 В пост. ток	D0
Дискретный выход - DO	LK710	16-канальный модуль дискретных входов, выход MOSFET, емкость: 0,5 А, 10~30 В постоянный ток	E0
Коммуникационный модуль	LK232	Повторитель шины Profibus-DP с переключателями терминального сопротивления	A5
	LK233	Оптоэлектронный трансивер шины Profibus-DP	A5
	LK239	Модуль расширения связи ведущий/ведомый MODBUS, интерфейс RS232/RS485	F1
	LK240	Резервный модуль связи, двойной оптоволоконный интерфейс связи типа Lc	Нет
	LK249	Коммуникационный модуль ведущей станции DP, с розеткой DB9, поддерживающий горячее подключение	Нет
Аксессуары	LKA101	Соединительный модуль шины Profibus-DP	Нет
	LKA102	Модуль батареи блока питания LK220	Нет
	LKA103	Модуль емкостного блока питания LK220	Нет
	LKA104	Модуль соединителя шины Profibus-DP	Нет
	LKA105	Оптический кабель	Нет
	LKF003	Инструменты вращения для механического ключа объединительной платы	Нет
	LKC131	Пустой модуль	Нет
	LKC171	Крышка клеммной колодки	Нет

Таблица 1.1 Список аппаратных продуктов серии LK


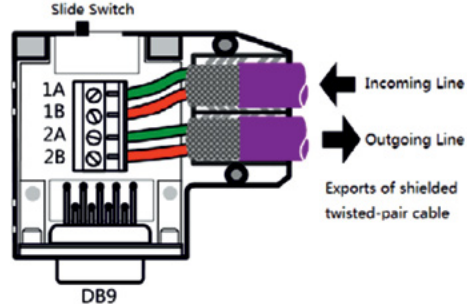
Соединительный кабель	Спецификации и назначение
	<p>LKA104 Соединитель шины Profibus-DP</p> <ul style="list-style-type: none">9-контактный разъем D-sub для двойного (входящего и исходящего) STPСогласующее сопротивление клемм, опция ползункового переключателяДля реализации передачи сигналов по шине Profibus-DP 

Таблица 1.2 Специальный коммуникационный кабель LK

Общие технические характеристики оборудования системы LK			
Электропитание	24 VDC	Напряжение питания	24VDC (-15%, +20%)
		Пульсация	<5%
		Защита от переплюсовки	Поддерживается
Электромагнитная совместимость	Антишум	Электростатический разряд	IEC61000-4-2 контактный разряд 4 кВ, воздушный разряд 8 кВ
		Защищенность от излучения радиочастотного поля	IEC61000-4-3 20 В/м (80 ~ 1000 МГц)
		Электрический переходный процесс	IEC61000-4-4 2 кВ
		Иммунитет к перенапряжению	IEC61000-4-5 2 кВ
		Кондуктивный иммунитет к радиочастотному полю	IEC61000-4-6 10 В
		Устойчивость к магнитным полям промышленной частоты	IEC61000-4-8 Напряженность стабильного и непрерывного магнитного поля 30 А/м
	Электромагнитное излучение	Излучаемые помехи	МЭК61131-2 30~230 МГц, квазипиковое значение менее 40 дБ (мкВ/м) 230~1000 МГц, квазипиковое значение менее 47 дБ (мкВ/м) 1~3 ГГц, квазипиковое значение менее 70 дБ (мкВ/м), среднее значение менее 56 дБ (мкВ) 3~6 ГГц, квазипиковое значение менее 80 дБ (мкВ/м), среднее значение меньше 60 дБ (мкВ)
		Кондуктивные помехи	МЭК61131-2 0,15~0,5 МГц, с квазипиковым значением менее 79 дБ (мкВ), при среднем значении менее 66 дБ (мкВ) 0,5~30 МГц, при квазипиковом значении менее 73 дБ (мкВ), при среднем значении менее 60 дБ (мкВ)
Экологическая адаптивность	Климатические условия	Температура эксплуатации	0°C + 60°C
		Рабочая влажность	10%~95%, без конденсата
		Высота над уровнем моря	0~2000 м
		Температура хранения	-40°C+70°C
		Влажность в месте хранения	10%~95%, без конденсата
	Механическая среда	Вибрации	IEC61131-2-4: 5=f=8.4, положение равно 1,7 мм 8.4=f=150, то ускорение свободного падения равно 0,5
		Воздействие	IEC61131-2-4: 15G, длительность: 11 мс
	Защита корпуса	Степень защиты корпуса	IEC60529 IP20

Таблица 1.3 Общие технические характеристики оборудования системы LK

MASTER CONTROL UNIT

LK130 4-Slot Backplane Module

LK130 is a 4-Slot backplane module for large-scale PLCs of the new-generation LK Series. It works with controllers and I/O modules of the new-generation LK Series. The module has 4 slots in total, which can be connected to power modules, CPU modules and communication extension modules.

Supporting Modules:

- Power Modules: LK920 or LK921
- Controller: LK220
- Communication Extension Modules: LK240, LK249, LK248

Module Composition



Figure 2.1 LK130 Backplane Schematic Diagram

The backplane slots successively from left to right are as follows:

1. Power Module Slot
2. CPU Module Slot
3. Extension Module Slot 1
4. Extension Module Slot 2

The corresponding modules can be inserted into the Power Module Slot and the CPU Module Slot. The Extension Module Slots 1 and 2 support supporting communication modules.

The LK130 backplane supports the PCIE bus and the RS485 bus, exchanging the data between each module via the PCIE bus. The RS485 bus exchanges the status diagnosis information on each module.

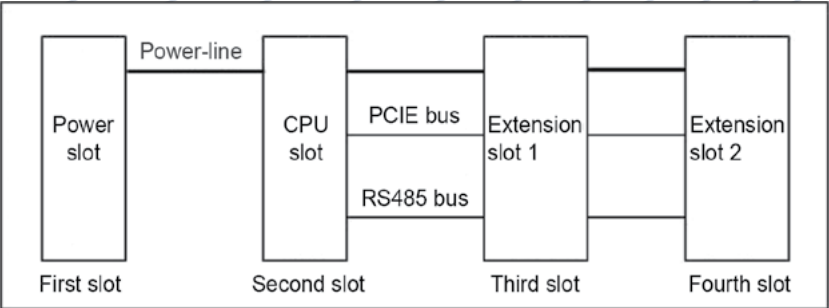


Figure 2.2 Internal Structure Schematic Diagram of LK130 Module

Technical Specifications for LK130 4-Slot Backplane Module	
Interface	
Number of Slots	4
Physical Property	
Installation Pattern	Install via a screw hole
Module Dimension (W×H×D)	235mm × 166mm × 44.3mm

LK921 24V Power Switching Module

The LK921 module is a redundancy power module for the large-scale LK PLC. It can convert two 24VDC inputs into a 24VDC output, which is powered to master control module, redundancy communication module and DP master station communication module via the LK130 backplane.

Features:

- Input Voltage: 12~30VDC
- Input short circuit protection
- Support hot plug
- Support anti-reverse insert



Figure 2.3 LK921 Module Schematic Diagram

Status Indication

Name	Function	Colour	Status	Description
DCIN-1	Indication of Input Power Supply 1	Yellow	On	Input Power Supply 1 works regularly.
			Off	Input Power Supply 1 fails.
DCIN-2	Indication of Input Power Supply 2	Yellow	On	Input Power Supply 2 works regularly.
			Off	Input Power Supply 2 fails.
DCOUT	Indication of Output Supply Power	Green	On	The output supply power works regularly.
			Off	The output supply power fails.

Technical Specifications for 24V Power Switching Module	
Power Input	
Quantity	2
Input Voltage	12~30 VDC
Power Output	
Quantity	1
Input/Output Voltage Drop	No more than 1V (based on a single -channel current of 2A)
Physical Property	
Installation Pattern	Backplane slot
Protection Key Position	None
Module Dimension (W×H×D)	62.7mm × 166mm × 152mm
Environmental Condition	
Ambient Temperature for Operation	0°~60°C
Ambient RH for Operation	10%~95%, with no condensation
Storage Temperature	-40~70°C
Storage RH	10%~95%, with no condensation
Working Altitude	No more than 2000m (IEC_11631-2-2007 P30)
Storage Altitude	No higher than 3000m (no more than 70kPa barometric pressure) (IEC_11631-2-2007)

LK220 Master Control Module (Redundancy)

LK220 is the master control module of PLC. It is the core for PLC operation and control, capable of raw data input, data operation and new data output. The master controller realizes man-machine interaction with the master control room via Ethernet. The master controller realizes interaction with the redundancy, communication and I/O module data via the internal bus.

Up to 116 I/O slave stations are available, with the address range of 10~125. The supported I/O points no less than 10,000.

Features:

- Support storage via Flash and SD card
- Support dual Ethernet ports
- Support TCP/IP and Modbus-TCP Protocols
- To support the backplane bus
- Support hot plug
- Support SD card update
- Support power fail safeguard

As shown in Figure 2.4, the CPU module panel is provided with:

- 10 LED indicator lamps, indicating the running status of the CPU module in real time
- 1 key switch, switching the working pattern of the CPU module (RUN, PRG, REM)
- Mounting groove for SD cards
- Power fail safeguard battery/capacitance box
- Two Ethernet ports



Figure 2.4 Appearance of LK220 Module

Interface Specification

The LK220 main controller has two Ethernet interfaces. The Ethernet interface adopts a standard RJ45 receptacle, with a communication rate of 10/100 Mbps, taking STP as the transmission medium. The LK220 main controller is connected to the programmable computer via Ethernet to download or update the user program.

Key Switch

It can set the current CPU operation pattern via the key switch. The LK220 CPU module has three working patterns: RUN, PRG and REM patterns. It can select the REM pattern as the default by make a selection via the key switch. The key switch can be pulled out in RUN, REM, PRG patterns.

Key Position	Mode Type	Definition
RUN	Running Mode	CPU can execute the user program, but cannot modify it nor operate it via AutoThink.
REM (Remote)	Remote Control Pattern	A user can control the program to run and stop, modify the user program and conduct operations including Froce, Reset and Write-in, etc.
PRG (Program)	Program Mode	CPU can stop executing the user program and cannot run the program via the software. It can modify the user program and conduct operations including Froce, Reset and Write-in, etc.

The three working modes are specified in details below:
The main controller changes the CPU IEC running status by toggling the key switch, with the IEC running status of the slave controller keeping pace with that of the main controller. For example, when toggling the key switch of the main controller to the PRG position and IEC operation stops, IEC operation of the slave controller also stops even if the key switch of the controller is not at the PRG position.

Backup Battery

The front panel of the LK220 module is provided with a backup battery slot. The user can choose to insert the LKA102 battery power box or the LKA103 capacitance power box. The backup battery can provide power fail safeguard for the real-time clock data. Upon the power loss of the CPU module, the real-time clock data can still be kept. The Max. Power fail safeguard period for battery power supply is 1 year. The Max. Power fail safeguard period for capacitance power supply is 7 days. In case of low battery, BAT indicator lamp shall give an alarm. Check the battery regularly and replace it timely, ensuring that power fail safeguard can work well.

Status Indication

Name	Function	Colour	Status	Description	Combined Indication of Indicator Lamps
PWR	Indication of power supply	Yellow	On	The power supply is normal	
			Off	The power supply fails or no power.	
RUN	Indication of operating pattern	Green	On	There is a project but not run.	
			Slow flashing	There is a project and running.	
			Off	There is no projects.	
ERR	Indication of module failure	Red	On	The module fails.	
			Slow flashing	The module is powered up or restarted, in initialization.	
			Off	There is no failures	
FRC	Forced indication	Green	On	With force data	All indicator lamps flash slowly: updating the firmware. All indicator lamps flash quickly: restoring factory settings
			Off	With no force data	
BAT	Indication of battery status	Yellow	On	The battery capacity is full, in normal operation	
			Off	The battery is not installed or the battery capacity is lower than 90% of the ratings, thus requiring replacement	
SDIN	Indication of SD cards	Green	On	The SD card has been inserted	
			Slow flashing	Reading/writing the data on SD cards	
			Off	No SD cards has been inserted	
LNK1	Indication of connecting Ethernet Interface 1	Green	On	Ethernet Interface 1 has been connected successfully	
			Off	Ethernet Interface 1 has not been connected yet	
ACT1	Indication of receiving and sending data via Ethernet Interface 1	Yellow	Slow flashing	Ethernet Interface 1 is receiving and sending data	
			Off	Ethernet Interface 1 is not receiving and sending data	
LNK2	Indication of connecting Ethernet Interface 2	Green	On	Ethernet Interface 2 has been connected successfully	
			Off	Ethernet Interface 2 has not been connected yet	
ACT2	Indication of receiving and sending data via Ethernet Interface 2	Yellow	Slow flashing	Ethernet Interface 2 is receiving and sending data	
			Off	Ethernet Interface 2 is not receiving and sending data	

Technical Specifications for LK220 Redundancy Communication Module	
Operating Speed	
CPU Model	XC7Z015 667MHz
Execution Speed of Commands	Typical value 2.5DMIPS/MHz
Memory	
NOR FLASH	32MB (16MB for the system, 16MB for users)
DDR	512MB, 800Mbps, bit width 32
MRAM	512KB
SD card	Up to 32GB
Ethernet	
10/100M	2-channel Dual network interfaces in redundancy, supporting the TCP/IP protocol
Real-Time Clock	
Data Format	YY:MM:DD:HH:MM:SS, BCD code
Clock Precision	No more than 1 minute/month @25°C
PCIE Bus	
Communication Speed with a load capacity	Meet PCIE (1.0) interface 2.5Gb/S 4-channel×1
Debugging Interface	
RS232	2-channel
Rate	115200bps
Protection Rating	
Protection Rating	IP20
Hot-Swappable	
Hot Plug	Support hot-plug of the module and the SD card

Technical Specifications for LK220 Redundancy Communication Module	
Scale of Single System	
IO Capacity	The support supports no less than 10,000 I/O.
Configuration Capacity	
Input Variable Area (Area I)	The Max. space is 128KB
Output Variable Area (Area Q)	The Max. space is 128KB
Global Variable Area (Area G)	The Max. space is 5MB
Free Variable Areas (Zone M)	The Max. space is 5MB
Retain Area (Area R)	The Max. space is 64kB
Specified Register Area (Area S)	The space is fixed to be 2KB
Power Supply	
Input voltage	19.4~28.8 VDC
Module Dissipation (max)	300 mA @24 VDC
Backup Battery	Based on battery/capacitance power supply
Dual-machine Redundancy	
Dual-machine Redundancy	Support dual-machine redundancy
Starting Time	
Time from the moment when the module is powered on to the moment when the user's project begins	≤40 s
Physical Property	
Installation Pattern	Backplane slot
Module Dimension (W×H×D)	44.7mm × 166mm × 152mm
Weight	

LK249 DP Master Station Communication Module

LK249 is a DP master station communication module for large-scale PLC of the new-generation LK Series. The module has 2 DB9 communication interfaces, supporting **PROGAUT** Profibus-DP master station communication protocol. It can be connected up to 124 slave stations and support hot plugging. The module is connected to the LK130 backplane module via the CPCI high-speed connector.

As shown in Figure 2.5, the LK249 module panel is provided with 5 LED indicator lamps, indicating the running status of the LK249 module in real time.



Figure 2.5 LK249 Module Schematic Diagram

Status Indication

Name	Function	Colour	Status	Description
PWR	Indication of power supply	Yellow	On	The power supply works regularly.
			Off	The power fails/not powered on
RUN	Indication of operating pattern	Green	Slow flashing	The module is working properly.
			On/Off	The module fails.
ERR	Indication of module failure	Red	On	The module appearance fails.
			Off	The module is free of failures.
DP1	Indication of data sending/receiving via DP Communication Interface 1	Green	Slow flashing	DP Communication Interface 1 is sending/receiving data
			On/Off	DP Communication Interface 1 does not send/receive data
DP2	Indication of data sending/receiving via DP Communication Interface 2	Green	Slow flashing	DP Communication Interface 2 is sending/receiving data
			On/Off	DP Communication Interface 2 does not send/receive data

- Slow flashing: with a frequency of 1Hz
- Quick flashing: with a frequency of 4Hz

Technical Specifications for LK249 Redundancy Communication Module	
Processor	
CPU Model	LPC2214
FPGA Model	EP4CGX30CF23I7N
Memory	
SRAM	Off-chip memory, 512KB, bit width 32
DP Bus	
Number of Channels	2
Physical Interface	1 double-layer DB9 receptacle
Communication Rate	187.5kbps, 500 kbps, 1.5M bps
PCIE Bus	
Communication Speed	Meet PCIE(1.0) interface
with a load capacity	1-channel X1
Transmission Speed	2.5GB/sec
Protection Rating	
Protection Rating	IP20
Hot-Swappable	
Hot Plug	Support
Power Supply	
Input voltage	24VDC (-15 to +20%)
Module Dissipation (max)	200mA @24VDC
Dual-network Redundancy	
Dual-network Redundancy	The DP bus supports redundancy
Starting Time	
Time from the moment when the module is powered on to the moment when initialization is done	≤10 s
Isolated and voltage withstand	
Channel-to-system	RS485: 500VAC, 1min, with a leakage current of no more than 5mA
Insulation resistance	Above 10M in normal state (Temperature: +25°C±2°C, RH: 30%±5%, with no condensation)
Physical Property	
Installation Pattern	Backplane slot
Module Dimension (W×H×D)	44.7mm × 166mm ×152mm
Weight	

LK240 Redundancy Communication Module

LK240 is the redundancy communication module in the large-scale PLC redundancy system. It is the dedicated module for data synchronization between the main frame and the slave frame in the redundancy system. Redundancy communication between the main frame and the slave frame can be realized via respective redundancy communication modules by taking optical fiber as the medium. It is connected to the LK130 backplane module via the bus connector.

Features:

- Determine the master/slave mechanism
- Support gigabit optical fiber communication
- Support 2-channel fiber interfaces
- Support hot plug
- Support anti-reverse insert



Figure 2.6 LK240 Module Schematic Diagram

As shown in Figure 2.6, the LK240 module panel is provided with:

- 10 LED indicator lamps, indicating the running status of the LK240 module in real time.
- 1 DIP switch, setting Series A/B of the current CPU.
- Two fiber interfaces

Status Indication

Name	Function	Colour	Status	Description
PWR	Indication of power supply	Yellow	On	The power supply is normal
			Off	The power supply fails.
RUN	Indication of operating pattern	Green	On/Off	The firmware does not work regularly.
			Slow flashing	The firmware works regularly.
ERR	Indication of module failure	Red	On	The module fails.
			Off	The module is free of failures.
RDNT	Indication of redundancy communication	Green	On/Off	Redundancy communication fails.
			Slow flashing	Redundancy communication work regularly.
STDB	Indication of master-slave status of CPUs	Green	On	The current CPU is in standby mode
			Off	The current CPU is in running mode
			Slow flashing	The master-slave status is not determined.
A/B	Indication of Machine A/B	Green	On	The current CPU is Machine A
			Off	The current CPU is Machine B
TX1	Indication of data sent via Fiber Interface 1	Green	Slow flashing	Fiber Interface 1 is sending data
RX1	Indication of data received via Fiber Interface 1	Green	Slow flashing	Fiber Interface 1 is receiving data
TX2	Indication of data sent via Fiber Interface 2	Green	Slow flashing	Fiber Interface 2 is sending data
RX2	Indication of data received via Fiber Interface 2	Green	Slow flashing	Fiber Interface 2 is receiving data

- Slow flashing: with a frequency of 1Hz
- Quick flashing: with a frequency of 4Hz

Technical Specifications for LK240 Redundancy Communication Module	
Processor	
CPU Model	LPC2214
FPGA Model	EP4CGX75CF23I7N
Memory	
SRAM	Off-chip memory, 512KB, bit width 32
Fiber Interface	
Number of Channels	2
Interface Type	LC type
Media Redundancy	Support
PCIe Bus	
Communication Speed	Meet PCIe(1.0) interface, 2.5Gb/S
with a load capacity	1-channel X1
Protection Rating	IP20
Hot Plug	Support
Power Supply	
Input voltage	24VDC (-15 to +20%)
Module Dissipation (max)	250mA @24VDC
System Performance	
Redundancy Performance	The redundant switching time is no more than 130 ms
Starting Time	
Time from the moment when the module is powered on to the moment when initialization is done	≤10 s
Physical Property	
Installation Pattern	Backplane slot
Module Dimension (W×H×D)	44.7mm × 166mm × 152mm
Weight	
Environmental Condition	
Ambient Temperature for Operation	0°C~60°C
Storage Temperature	-40~70°C
Ambient RH for Operation	10%~95%, with no condensation
Storage RH	10%~95%, with no condensation
Working Altitude	No more than 2000m (IEC_11631-2-2007 P30)
Storage Altitude	No higher than 3000m (no more than 70kPa barometric pressure) (IEC_11631-2-2007)

IO UNIT

LK910 24VDC Power Module

LK910 with an output short circuit protection, automatic recovery after the power fault is eliminated. An output status inquiry function, state switch is turned off when the power output is normal, otherwise off. Provide the interface for remote diagnosis power state. LK910 modular design, the overall structure of aluminum materials, strong anti-seismic and anti-interference ability.

Features:

- Input Voltage: 100VAC ~ 120VAC / 200 ~ 240VAC, switch selection
- Output Voltage: 24VDC
- Input-output isolation
- Rated Power: 120W
- 1 + 1 redundancy
- Output short circuit protection
- Output over-temperature protection
- Output overload / overvoltage protection
- Output status inquiry

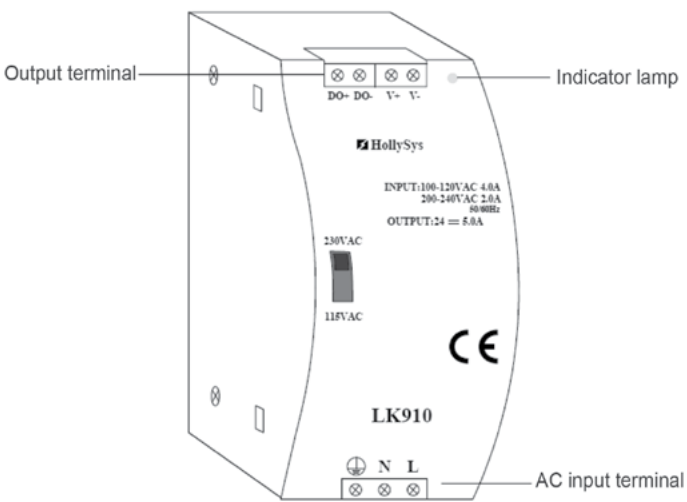



Figure 3.1 LK910 Wiring Terminals and Indicator Lamp

Technical Specifications for LK910 24VDC Power Module		
Input		
Input voltage range	100 VAC~240 VAC	
Input frequency range		47 Hz~63 Hz
Output		
Rated output	24 VDC±5%	
Rated output current	5 A	
rated power	120 W	
Ripple (Including noise)	<240 mV	
Load adjusting rate	<±5%	
Voltage adjusting rate	<±2%	
Step load characteristics	<±5%@ the load sudden change from 20% to 70%, stable time<50 ms	
Conversion efficiency	>80%	
Maintaining time	220VAC input, 70% load, the output not less than 95% rated voltage with maintaining 30 ms ater the power off	
Cooling method	Natural cooling	
1+1 parallel redundancy	support	
Output overload protection	105%~150%, automatically recovery after eliminating the overload	
Output overvoltage protection	120%~140% rated voltage	
Output short circuit protection	Output short circuit fault protection, power automatically recovery after fault is eliminated	
Power fault state output	The state switch is turned on when power is normal, otherwise off. state switch is isolated with power	
Ouput state indicate	Indicator lights is on when ouput is normal	

Technical Specifications for LK910 24VDC Power Module	
Insulation	
Insulation resistance	Input and shell: 500 VDC, >100 MΩ
Input and output: 500 VDC, >100 MΩ	Output and shell: 500 VDC, >100 MΩ
Dielectric Voltage withstand	Input and shell:1500 Vrms, 1 min., leakage current<10 mA Input and output: 3000 Vrms, 1 min., leakage current <10 mA Output and shell: 500 Vrms, 1 min., leakage current <20 mA
Physical Property	
Module Dimension (W×H×D)	65.5mm × 125.2mm × 100mm
Installation Pattern	Standard rail mounting
Standards and Certification	
Safety certification	UL508,TUVEN60950, CE
EMC	EN55022/EN55011classB
	EN61000-4-2/3/4/5/6/8/11
	EN61000-3-2/3
	EN61000-6-2
	ENV50204

LK117 11-Slot Extension Backplane

The extension backplane can only be installed with a common module. As shown in Figure 3.2, Slot 1 is the communication module slot, installed with a LK-dedicated communication module; Slots 2~11 is an I/O CPU module slot, installed with a common I/O module of the DP bus interface. Each terminal block corresponds to an I/O module, directly connecting to the field signal via an I/O cable.

 The high-speed I/O module cannot be installed on the extension backplane.

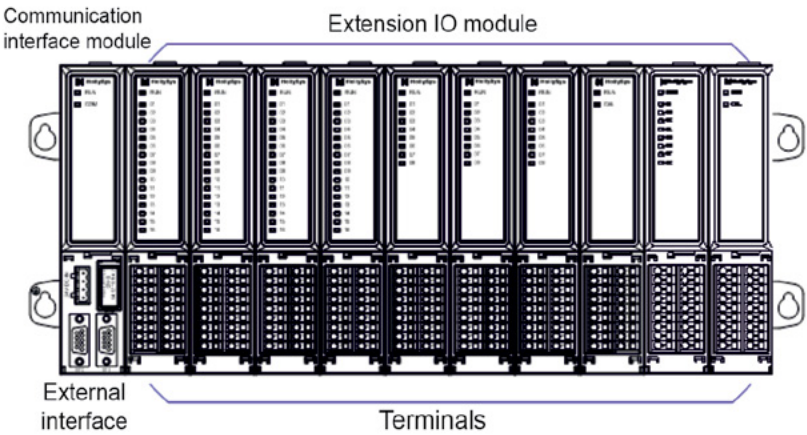


Figure 3.2 Structure of LK117 Backplane

As shown in Figure 3.3, the extension backplane supports the redundant DP bus. It provides the DP bus input and output interfaces and connects to the local backplane to extending the I/O points. In case of multiple extension backplane cascade connection, it shall better adopt serial connection, not allowed to connect multiple extension backplanes to a local backplane. The extension backplane does not provide the terminal matching resistance for the DP bus, with the matching resistance provided by the communication module.

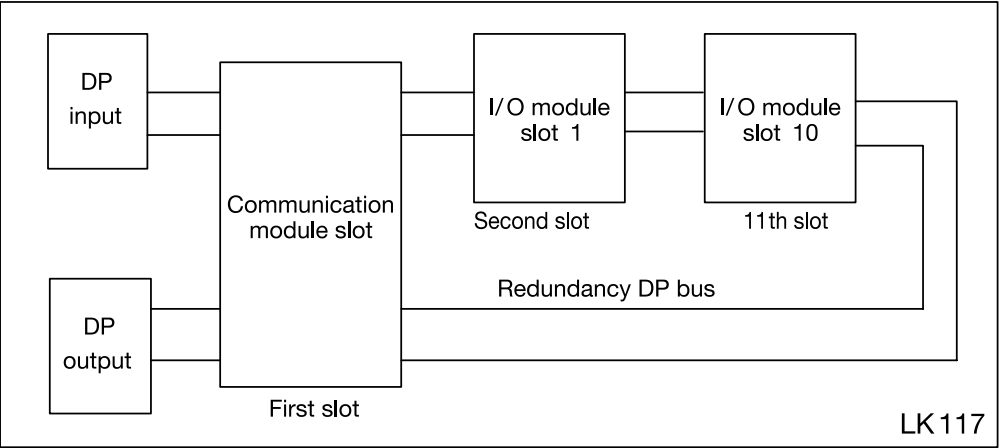


Figure 3.3 Internal Structure of Extension Backplane

Composition

- 1 communication slot, 10 I/O slots
- Dial code of the base address of the slave station
- Redundant Profibus-DP bus interface, DB9 hole receptacle
- To support the cascade connection of the extension backplane
- 24 VDC system power supply interface, 4-pin receptacle
- Shrapnel terminals, pluggable

Technical Specifications for LK117 11-Slot Extension Backplane	
Slot and Interface	
Number of Slots	11 slots (1 communication slot, 10 I/O slots)
Profibus-DP Interface	DB9, hole receptacle, receptacle duplex
System Power Supply Interface	4-pin receptacle, connected to 24 VDC system power supply
Isolated and Voltage Withstand	
Channel-to-channel	≥ 1000 VAC@1 min, leakage current: 5 mA
Channel-to-system	≥ 1000VAC@ 1min, leakage current: 5 mA
Electrical Specification	
Input voltage	24 VDC (-15%~20%) 24 VDC (-15%~20%)
Terminal Matching Resistance	None, can be provided by the communication module
Physical Property	
Installation Mode	Plane installation
Module Dimension (W×H×D)	385mm × 166mm × 55.5mm
Enclosure Protection Rating	IEC60529 IP20
Weight	1740 g


LK118 5-Slot Extension Backplane

The extension backplane can only be installed with a common module.

Composition:

- 1 communication slot, 4 I/O slots
- Dial code of the base address of the slave station
- Redundant Profibus-DP bus interface, 9-pin Type-D receptacle
- 24VDC system power supply interface, 4-pin receptacle
- To support the cascade connection of the extension backplane
- Shrapnel I/O terminals, pluggable

LK118 is a 5-slot extension backplane, as shown in Figure 3.4, from the left, Slot 1 is a communication module slot, installed with a communication module; Slots 2~5 are I/O module slots, installed with 4 common I/O modules of the DP bus interface. The corresponding terminal beneath the I/O module slot is used to connect the field I/O module.

 The high-speed I/O module cannot be installed on the extension backplane.

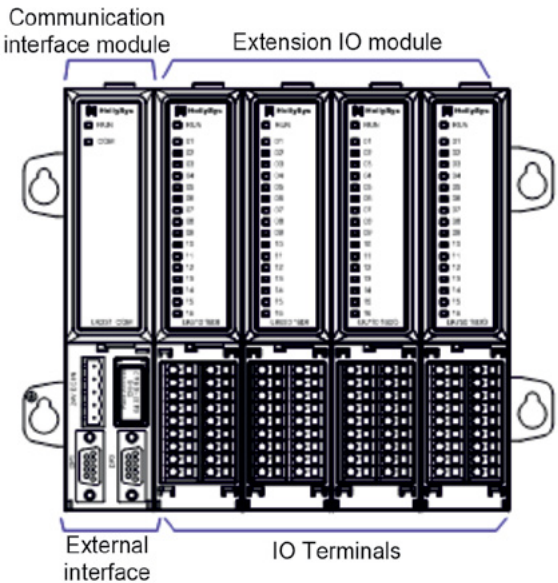


Figure 3.4 Structure of LK118 Backplane

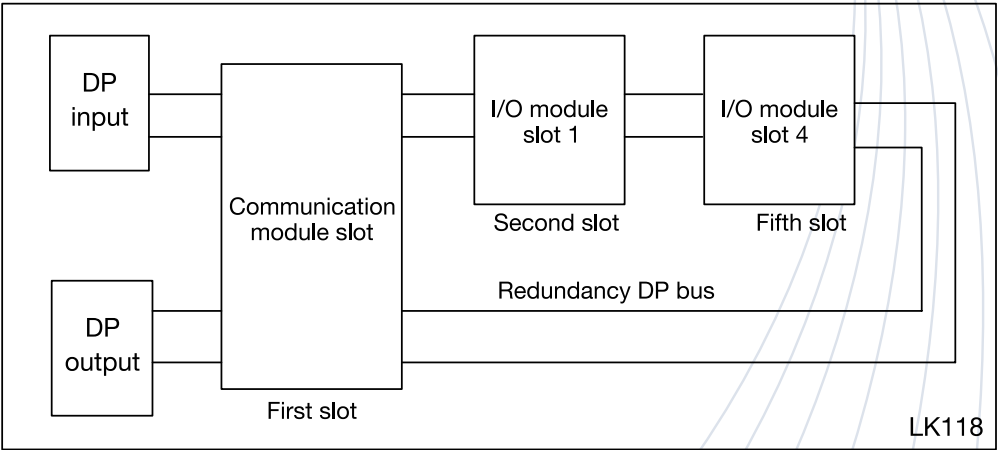


Figure 3.5 Internal Structure of LK118 Extension Backplane

Technical Specifications for LK118 5-Slot Extension Backplane	
Number of Slots	
Number of Slots	5 slots (1 communication slot, 4 I/O slots)
Profibus-DP Interface	DB9, hole receptacle, receptacle duplex
System Power Supply Interface	4-pin receptacle, connected to 24 VDC system power supply
Isolated and voltage withstand	
Channel-to-channel	≥500 VAC@1 min@5 mA
Channel-to-system	≥500 VAC@1 min@5 mA
Electrical Specification	
Input voltage	24 VDC (-15%~20%) 24 VDC (-15%~20%)
Terminal Matching Resistance	None, can be provided by the communication module
Physical Property	
Installation Mode	Plane installation
Module Dimension (W×H×D)	210mm × 166mm × 55mm
Enclosure Protection Rating	IEC60529 IP20
Weight	1740 g

LK232 Profibus-DP Bus Repeater Module

- Features:**
- To extend the physical length of the Profibus-DP bus
 - To isolate the two Profibus-DP buses
 - Installed on the extension backplane
 - To provide the terminal matching resistance for the Profibus-DP bus
 - Support hot plug



Technical Specifications for LK232 Profibus-DP Bus Repeater Module		
Backplane Power Supply		
Operating Voltage	20.4~28.8 VDC	
Power consumption	60 mA max.@24 VDC	
Isolation Voltage		
Network Segments 1 and 2	To test for 1 minute based on 500 VAC, with a leaking current 5 mA	
Communication		
Protocol	Profibus-DP	
Dual-network Redundancy	Support	
Communication rate	9.6 kbps, 19.2 kbps, 31.25 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps self-adapting	
Physical Property		
Indicator Lamp	RUN	Green
	COM	Yellow
Installation Mode	Slot Installation	
Installation Position	Communication slots of LK local backplane and extension backplane	
Protection Key	A5	
Module Dimension (W×H×D)	35mm × 100mm ×100mm	
Hot Plugging	Support	

LK233 Profibus-DP Bus Optoelectronic Transceiver

LK233 is the optoelectronic transceiver module of the Profibus-DP bus. It is applied to special engineering fields requiring protection against electromagnetic interference, lightning, chemical corrosion and long-distance transmission, etc. LK233 interconverts the opto-electronic transmission media of the DP bus network in the physical layer, extends the physical length of the DP bus, thus ensuring the security and validity of data transmission. The LK233 modules are used in pairs, realizing data exchange and communication between the CPU module and the remote I/O module.

- Features:**
- To extend the transmission distance of the Profibus-DP bus
 - Dual redundant transmission
 - To support multi-mode glass fiber (6.25/150 um or 50/150 um), ST interface
 - To provide the terminal matching resistance
 - Installed in the I/O slot of local backplane or the extension backplane
 - Support hot plug

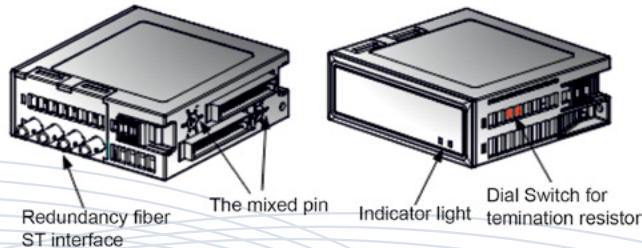


Figure 3.6 External View of LK233 Module

In the network system, upon each access of a LK233 module pair, a new network segment or link is created. LK233 can divide the Profibus-DP bus into multiple network segments. The optoelectronic transceiver module of the LK233 module requires no configuration. It can be used directly and occupies one I/O slot. It occupies one node in terms of electrical specification, without occupying a logic node. However, since the slave station addresses of the backplane are allocated in sequence, the LK233 module still occupies a slave station address.

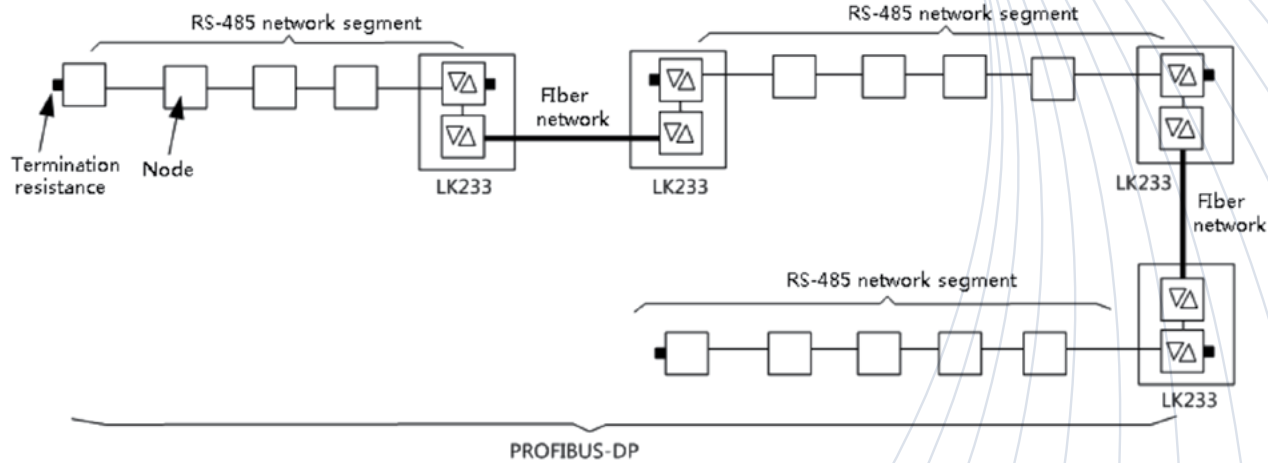


Figure 3.7 Network Topology Structure Connected with Optical Fiber

Technical Specifications for LK233 Profibus-DP Bus Optoelectronic Transceiver		
System Power		
Operating Voltage	20.4~28.8VDC	
Backplane Current	80 mA max.@24 VDC	
Port Characteristics		
Connector Type	ST (ceramic or plastic)	
Optical Fiber Type	62.5/125 um or 50/125 um multi-mode glass fiber	
Operating Wavelength	1300 nm	
Transmission Distance	0~5 km	
Drive Capability		
Load Capacity of Optic Terminals	To drive multi-mode glass fiber for up to 5km.	
Load Capacity of Electric Terminals	To drive up to 256 LK I/O modules	
Number of Cascade Connections	4-segment cascade connection (8 LK 233 modules in total, with a data delay of 1.2 us for every 2 LK233 modules)	
Communication		
Protocol	Profibus-DP	
Dual-network Redundancy	Support	
Communication rate	9.6 kbps, 19.2 kbps, 31.25 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps self-adapting	
Physical Property		
Fiber Interface	4 ST connectors	
Indicator Lamp	RUN	Green, an indicator lamp communicating with the CPU module
	COM	Yellow, an indicator lamp communicating with the I/O module
Installation Mode	Slot Installation	
Installation Position	I/O slots on the LK local backplane and the extension backplane	
Protection Key	A5	
Module Dimension	W×H×D = 35mm × 100mm × 100mm	
Hot Plugging	Support	

LK239 MODBUS Master/Slave Communication Extension Module

Features:

- Support the Profibus-DP slave station protocol
- To support the MODBUS master slave/slave station protocol
- To connect the LK CPU module and the external MODBUS master station/slave station
- Installed in the I/O slot
- Support hot plug

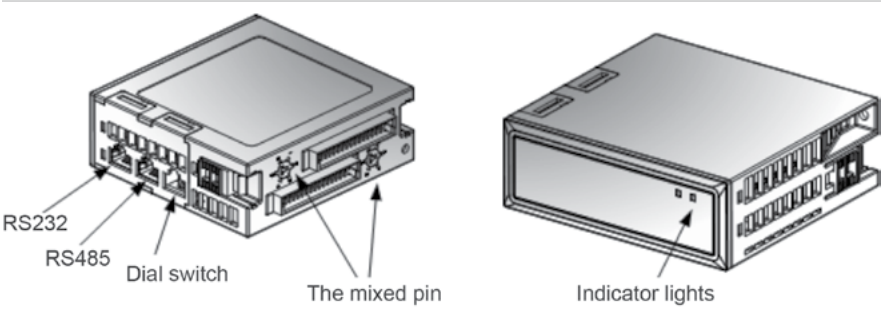


Figure 3.8 External View of LK239 Module

Technical Specifications for LK239 MODBUS Master/Slave Communication Extension Module		
System Power		
Operating Voltage		20.4~28.8 VDC
Backplane Current		80 mA max.@24 VDC
DP Communication Bus		
Protocol		Profibus-DP slave station protocol
Dual-network Redundancy		Support
Communication rate		9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps self-adapting
Medium		Led out to the backplane via an European connector
MODBUS Communication		
Protocol		MODBUS protocol
Transmission Mode and Frame Format		RTU
Physical Layer Interface		RS485 interface (RJ-45), RS232 interface (RJ-45), configuration selection
Function code supported		01, 02, 03, 04, 05, 06, 15, 16 (decimal)
Max. Number of Supported Slave Stations		28
Input/Output Data Length		Up to 244 bytes
Communication Rate		1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps (configuration selection)
Verification Mode		Odd parity check, even parity check, no check (configuration selection)
Master Slave Mode		To support the master and slave stations (configuration selection) Isolation Voltage between System and Communication Interface ≥500 VAC@1 min, leakage current: 5 mA
Physical Property		
Indicator Lamp	RUN (green)	Indicator lamp for Profibus-DP bus communication
	COM (yellow)	an indicator lamp communicating with the I/O module
Installation Mode		Slot Installation
Installation Position		I/O slot on the LK backplane
Protection Key		F1
Module Dimension (W×H×D)		35mm × 100mm × 100mm
Hot Plugging		Support
Weight		180 g

IO MODULE

LK610 16-Channel 24VDC Leaking Type Digital Input Module

Features:

- 16-contact leaking type input
- Field supply voltage: 10 VDC~31.2 VDC
- Field power loss detection
- Reverse supply protection
- Isolation between each field channel and the system
- Support the Profibus-DP slave station protocol
- Support hot plug



Technical Specifications for LK610 16-Channel 24 VDC Leaking Type Digital Input Module		
System Power		
Operating Voltage		20.4~27.6VDC
System Power Consumption		50 mA max.@24 VDC, excluding field power consumption
Input Channel		
Number of channels		16
Contact Type		Wet contact, leaking type input
Rated Voltage of Field Power Supply		24 VDC
Rated Current of Channel Closing-Opening		7±0.7 mA@24 VDC
Threshold Level	ON	10 VDC (2 mA) ~31.2 VDC (10 mA) 10 VDC (2 mA) ~31.2 VDC (10 mA)
	OFF	0~5 VDC (1.5 mA) 0~5 VDC (1.5 mA)
Dithering-removing Filter Time		1 ms, 3 ms, 5 ms, 10 ms, 15 ms, 20 ms, 25 ms, 30 ms optional for configuration
OFF→ON		1 ms, 3 ms, 5 ms, 10 ms, 15 ms, 20 ms, 25 ms, 30 ms optional for configuration
ON→OFF		
Reverse Protection		Max. reverse withstand voltage: 60 VDC.
Isolation Voltage between Field and System		500 VAC@1 min, leaking current: 5 mA
Failure Diagnosis and Hot Plug		
Field Power Loss Diagnosis		Bit2 in the diagnosis bytes (Bit0~Bit7) reported to the module is used to indicate the information on field power supply detection. When Bit2=1 indicates field power loss, then Bit2=0 indicates field power recovery. The field power failure diagnosis only reports once separately when a failure occurs and the fault recovered.
Hot Plugging		Support
Physical Property		
Protection Key		D0
Installation Position		LK local backplane or extension backplane
Dimensions (W×H×D)		35mm × 100mm × 100mm
Enclosure Protection Rating		IEC60529 IP20
Weight		180g

LK710 16-Channel 10~30VDC Source Type Digital Output Module

Features:

- 16-Channel MOSFET source type output
- Output voltage range: 10 VDC~31.2 VDC
- Output readback diagnosis
- Field power loss detection
- Over Current Protection
- Fault mode output
- Isolation between the system and the field
- Programming mode output
- Support hot plug



Technical Specifications for LK710 16-Channel 10~30VDC Source Type Digital Output Module		
System Power		
Operating Voltage	20.4~27.6 VDC	
Backplane Current	130 mA max.@24 VDC	
Output Channel		
Number of channels	16-channel	
Output Switch	MOSFET	
Isolation Voltage	500 VAC@1 min. between the system and the field, leaking current: 5 mA	
Rated Output Voltage	24 VDC	
Output Voltage Range	10 VDC~31.2 VDC	
Rated output current	0.5 A@40°C&0.4 A@60°C (linear decrease) 8 A@40°C& 6.4 A@60°C (linear decrease)	
Each Point		
Each Module		
Surge Current at Each Point	1 A, duration: 10 ms, period: 2 s@60?	
Over Current Protection	A self-recovery fuse protection device is shared for every two points	
Min. Load Current	3 mA/Each Point	
Max. On-status Voltage Drop	250 mV@0.5 A	
Max. Off-status Leakage Current	1 mA/Each Point	
Output Delay Time	1 ms (Max.) 1 ms (Max.)	
OFF→ON		
ON→OFF		
Independent Configurable Fault Mode Output Value for Each Point	Output Hold (default), ON or OFF	
Independent Configurable Program Mode Output Value for Each Point	Output Hold (default), ON or OFF	
Failure Diagnosis and Hot Plug		
Field power loss detection	Field power loss: device diagnostic sampling word reporting 0x04; power loss recovery: reporting 0x00	
Hot Plugging	Support	
Physical Property		
Protection Key	E0	
Installation	LK local backplane or extension backplane	
Dimensions (W×H×D)	35mm × 100mm × 100mm	
Enclosure Protection Rating	IEC60529 IP20	
Weight	200 g	

LK411 8-Channel Current Type Analog Input Module

Basic Features:

- 8-Channel current input
- Applicable range: 0~20 mA/4~20 mA
- Max. measurable value: 0~20.58 mA/4~20.58 mA
- Field calibration
- Overrun alarm
- Over range alarm
- Open-circuit detection
- Isolation between the system and the field channel
- Support hot plug



Technical Specifications for LK411 8-Channel Current Type Analog Input Module		
System Power		
Power Voltage	20.4~27.6 VDC	
Power consumption	60 mA@24 VDC	
Input Channel		
Number of channels	8	
Range Code	70	71
Max. Measurable Range	0-20.58 mA	4-20.58 mA
Reported Data Format	0x0000~0xFFFF	0x0000~0xFFFF
ADC Resolution	16-bit	
Sampling Period (Full-channel Scanning Time)	<480 ms (with no software filtering)	
Input Impedance	243Ω	
Step Response Time	The time reaching to 90% of the target value is better than 1s	
Differential Mode Rejection Ratio	80 dB	
Common Mode Rejection Ratio	100 dB	
Measurement Accuracy	<0.1% F.S.@25°C	
Calibration Accuracy	<0.03% F.S.@25°C	
Calibration Period	12 months	
Temperature drift	±25 ppm/°C	
Isolation Voltage between Field and System	500 VAC@1 min, leaking current: 5 mA	
Failure Diagnosis and Hot Plug		
Over Range Alarm	When the signal exceeds the upper/lower limit of the range, the diagnosis byte then reports 0xA3/0xA2	
Overrun Alarm	When the signal range exceeds the upper/lower limit of the alarm, the diagnosis byte then reports 0xA7/0xA8	
Open-circuit Detection	When the channel is broken, the diagnosis then reports 0x06; when the fault recovered, it then reports 0xA0	
Hot Plugging	Support	
Physical Property		
Protection Key	A1	
Installation Position	LK local backplane or extension backplane	
Dimensions (W×H×D)	35mm × 100mm × 100mm	
Enclosure Protection Rating	IEC60529 IP20	
Weight	190 g	

LK412 6-Channel Isolation Analog Input Module

Features:

- 6-Channel analog input, inter-channel isolation
- Applicable ranges: 0~20 mA/4~20 mA/-10 V~10 V/0~10 V/0~5 V
- Max. measurable range: 0~20.58 mA/4~20.58 mA/-10.25 V~10.25 V/0~10.25 V/0~5.125 V
- Field calibration
- Overrun alarm
- Over range alarm
- Open-circuit detection
- Isolation between the system and the field channel
- Support hot plug



Technical Specifications for LK412 6-Channel Isolation Analog Input Module					
System Power					
Operating Voltage		20.4~27.6 VDC			
Power Consumption (max.)		150 mA@24 VDC			
Input Channel					
Number of channels		6			
Range Code		16		17	18
Max. Measurable Range	Voltage Signal	-10.25~0 V	0~10.25 V	0~10.25 V	0~5.125 V
	Data Format	32768~65,535	0~32,767	0~65,535	0~65,535
Range Code		70		71	
Max. Measurable Range	Current signal	0~20.58 mA		4~20.58 mA	
	Data Format	0~65,535		0~65,535	
Input Impedance	Voltage Signal	>1 MΩ			
	Current signal	250Ω			
ADC Resolution		16-bit			
Full-channel Scanning Time (with no software filtering)		<50 ms max			
Differential Mode Rejection Ratio		>60 dB			
Common Mode Rejection Ratio		>90 dB			
Measurement Accuracy		0.1% F.S.			
Repeatability precision		0.02% F.S.			
Calibration Accuracy (25?)		0.03% F.S.			
Calibration Period		12 months			
Step Response		The time reaching to 90% of the target value is better than 1 s			
Temperature Drift		±25 ppm/°C			
Failure Diagnosis and Hot Plug					
Calibration Data Error Detection		When powered on, if the calibration data is wrong, the device diagnosis byte then reports 0x02; if the data is correct, it then does not report			
Over range alarm		When the signal exceeds the upper/lower limit of the range, the diagnosis byte then reports 0xA3/0xA2			
Overrun alarm		When the signal exceeds the upper/lower limit of the alarm, channel the diagnosis byte then reports 0xA7/0xA8			
Open-circuit detection		When the channel is broken, the channel diagnosis byte then reports 0x06; when the fault recovered, it then reports 0xA0			
Hot Plugging		Support			

Technical Specifications for LK412 6-Channel Isolation Analog Input Module	
Isolated and Voltage Withstand	
Channel-to-system	To test for 1 minute based on 500 VAC, with a leaking current 5 mA
Channel-to-channel	To test for 1 minute based on 500 VAC, with a leaking current 5 mA
Physical Property	
Protection Key	A0
Installation Position	LK local backplane or extension backplane
Dimensions	W×H×D= 35mm×100mm×100mm
Enclosure Protection Rating	IEC60529 IP20
Weight	190 g

LK430 6-Channel Thermal Resistance Analog Input Module

Features:

- 6-Channel RTD input, in form of constant current source
- RTD measurement can report the temperature or resistance value
- RTD Type: Copper427, Chinese Cu, Nickel618, Nickel672, Platinum385, Platinum3916
- Resistance measurement range : 1~4020Ω
- Upper Limit Exceeded Alarm
- Lower Limit Exceeded Alarm
- Open-circuit detection
- Isolation between the system and the field
- Support hot plug
- Field calibration



Technical Specifications for LK430 6-Channel Thermal Resistance Type Analog Input Module			
System Power			
Power Voltage	20.4~27.6 VDC		
Power consumption	65 mA max.@24 VDC		
Input Channel			
Number of channels	6-channel		
Measurement Method	3-wire thermal resistance input, three-wire connection, constant current source measurement		
Thermal Resistance Type and Temperature Measurement Accuracy	Thermal Resistance Type Code	Temperature Measurement Range	Absolute Error
	Copper427: 10Ω Copper427: 10Ω	-200℃~260℃	1.4℃
	Chinese_Cu: 50Ω Chinese_Cu: 50Ω	-50℃~150℃	0.6℃
	Nickel618: 100Ω/120Ω/200Ω/500Ω Nickel618: 100Ω/120Ω/200Ω/500Ω	-60℃~250℃	0.9℃
	Nickel672: 120Ω Nickel672: 120Ω	-80℃~320℃	1.4℃
	Platinum385: 100Ω/200Ω/500Ω/1000Ω Platinum385: 100Ω/200Ω/500Ω/1000Ω	-200℃~870℃	1.3℃
	Platinum3916: 100Ω/200Ω/500Ω/1000Ω Platinum3916: 100Ω/200Ω/500Ω/1000Ω	-200℃~630℃	1.3℃
Resistance Measurement Range	1~4020Ω		
Resistance Measurement Accuracy	0.1% F.S.@25℃		
Sampling Period (Full-channel Scanning Time)	The measured data is a resistance value		

Technical Specifications for LK430 6-Channel Thermal Resistance Type Analog Input Module	
The measured data is a temperature value	Min.: 100 ms; Max: 1.5 s Min.: 150 ms; Max: 2 s
Differential Mode Rejection Ratio	60 dB@50 Hz
Common Mode Rejection Ratio	100 dB@50 Hz
Temperature drift	±50 ppm/°C
Calibration Accuracy	0.05% of resistance, full range
Calibration Period	12 months
Isolation Voltage between Field and System	500 VAC@1 min, leaking current: 5 mA
(0~65,535) Upload Data Format (0~65,535)	
Uploaded Resistance for Configuration Selection	65,535×(resistance value-Min. measurable resistance value in the range)/ full range resistance value
Uploaded Temperature for Configuration Selection	Acquisition temperature ×10+10000
Failure Diagnosis and Hot Plug	
Diagnosis Open-circuit detection Overrun alarm	When an open-circuit occurs, the diagnosis byte reports 0x06, with the value reported by the measured channel data optional for configuration When the signal range exceeds Upper Limit Value/Lower Limit Value, the diagnosis byte then reports 0x07/0x08
Hot Plugging	Support
Physical Property	
Protection Key	A2
Installation	LK local backplane or extension backplane
Dimensions (W×H×D)	35mm × 100mm × 100mm
Enclosure Protection Rating	IEC60529 IP20
Weight	180 g

LK441 8-Channel Thermocouple (with cold junction compensation) Analog Input Module

Features:

- 8-Channel thermocouple or millivolt input
- Thermocouple type: B, E, J, K, R, S, T, N, C
- Range of millivolt signals: -12~32mV/-12~78mV
- Directly reported temperature value of a thermocouple signal type
- RTD cold junction temperature compensation
- Overrun alarm
- Over range alarm
- Open wire alarm
- Isolation between the system and the field
- Field calibration
- Support hot plug



Technical Specifications for LK441 8-Channel Thermocouple (with cold junction compensation) Analog Input Module	
System Power	
Operating Voltage	20.4~27.6 VDC
Power consumption	60 mA max. @ 24 VDC

Technical Specifications for LK441 8-Channel Thermocouple (with cold junction compensation) Analog Input Module		
Input channel		
Number of Input Channels	9 (8-channel thermocouple or millivolt signals, plus 1-channel RTD cold junction compensation)	
Signal type	B, C, E, J, K, N, R, S, T thermocouple or -12 mV~78 mV / -12 mV~32 mV	
Thermocouple Temperature Range	-12 mV~-+78 mV Range	-12 mV~-+ 32 mV Range
Type B	300~1820°C (572~3308°F)	
Type C	0~2315°C (32~4199°F)	0~1725°C (32~3137°F)
Type E	-270~1000°C (-454~1832°F)	-270~415°C (-454~779°F)
Type J	-210~1200°C (-346~2192°F)	-210~550°C (-346~1022°F)
Type K	-270~1372°C (-454~2502°F)	-270~725°C (-454~1337°F)
Type N	-270~1300°C (-454~2372°F)	-270~840°C (-454~1544°F)
Type R	-50~1768°C (-58~3215°F)	
Type S	-50~1768°C (-58~3215°F)	
Type T	-270~400°C (-454~752°F)	
Temperature Resolution of Thermocouple (B, C, E, J, K, N, R, S, T)	0.05°C (0.09°F)	0.03°C (0.05°F)
A/D Converter Resolution	16-bit	
Voltage Measurement Accuracy	0.1% F.S. @ 25°C	
Temperature Drift	±15 ppm/°C	
Differential Mode Rejection Ratio	60 dB	
Common Mode Rejection Ratio	100 dB	
Input Impedance	10 MΩ min.	
Sampling Period (Full-channel Scanning Time)	85 ms, 420 ms, 490 ms, 1500 ms, optional for configuration	
Setting Time	1 s max., in the ±1% error range of the full range	
Channel Bandwidth	15 Hz	
Voltage Calibration Accuracy	<0.04% F.S.@ 25°C	
Calibration Period	12 months	
Isolation Voltage between Field and System	500 VAC@1 min, leaking current: 5 mA	
Uploaded Data Format (0~65,535)		
Millivolt Range	65,535×(Millivolt Voltage+12)/Range	
Thermocouple range	Acquisition temperature ×10+10000	
Cold-conjunction Compensation Channel		
Implementation Method	To acquire the cold junction temperature of thermal resistance (RTD)	
Type of Thermal Resistance	Chinese_Cu 50 ohm, Pt385 100 ohm, Pt3916 100 ohm Chinese_Cu 50 ohm, Pt385 100 ohm, Pt3916 100 ohm	
Temperature Value Accuracy in Working Range (0~60°C)	Chinese_Cu 50 ohm	The absolute deviation is ±1.1°C
	Pt385 100 ohm	The absolute deviation is ± 0.7°C
	Pt3916 100 ohm	The absolute deviation is ± 0.8°C
Open-circuit detection	RTD open-circuit alarm	
Failure Diagnosis and Hot Plug		
Over range alarm ¹	When the signal exceeds the upper/lower limit of the range, the diagnosis byte then reports 0xA3/0xA2	
Overrun alarm	When the signal exceeds Upper Limit Value/Lower Limit Value that is set in the configuration, the diagnosis byte then reports 0xA7/0xA8	
Open-circuit detection ²	When an open-circuit occurs, the diagnosis byte reports 0xA6. The measured channel data reports the full-range value or the normal value prior to the open-circuit	
Open-circuit Detection of Cold Junction Compensation Thermal Resistance	When an open-circuit occurs to the RTD temperature compensation channel, Channel 9 diagnosis byte reports 0xA6, taking the normal value prior to the line brea as the compensated value	
Hot Plugging	Support	
Physical Property		
Protection Key	B1	
Installation Position	LK local backplane or extension backplane	
Dimensions	W×H×D= 35mm × 100mm × 100mm	
Enclosure Protection Rating	IEC60529 IP20	
Weight	180 g	

LK511 4-Channel Inter-channel Isolated Current Type Analog Output Module

Features:

- 4-channel current output, inter-channel isolation
- Output signal range: 4~20 mA/0~21 mA
- Electrical isolation between the channel and the system
- Fault mode output
- Programming mode output
- Self-diagnosis of the output readback channel
- Open-circuit detection
- Field calibration
- Support hot plug



Technical Specifications for LK511 4-Channel Inter-channel Isolated Current Type Analog Output Module			
System Power			
Operating Voltage		20.4~27.6 VDC	
Power		180 mA max.@24 VDC (that is, all the 4 channels output based on 20 mA)	
Output Channel			
Number of channels		4	
Range Code		68	69
Output Range		4~20 mA	0~21 mA
Output Data Format		0x0000~0xFFFF	0x0000~0xFFFF
Readback Data Format		0x00~0xFF	0x00~0xFF
Output Setup Time		<2 ms	
Load Capacity		750Ω max.	
DAC Resolution		12-bit	
Readback ADC Resolution		8-bit	
Channel Output Temperature Drift		50 ppm/°C	
Isolation Voltage between Channel and System		500 VAC@1 min, leaking current: 5 mA	
Isolation Voltage between Channels		500 VAC@1 min, leaking current: 5 mA	
Reset Output	Power On Reset (cold start)		0 mA
	Charged Reset (warm start)		Output Hold
Accuracy	Output	0~4 mA Range	0.6% F.S.
		4~21 mA Range	0.3% F.S.
Stability	Readback		In the 4~21 mA range; the 0~4 mA range is the readback dead zone, with the readback data in the range approximating to 4 mA
	Output		0.05% F.S.
	Readback		2.5% F.S.
Failure Diagnosis and Hot Plug			
Open-circuit detection		When the channel is broken (Configure Enable), the diagnosis then reports 0xA6; when the fault recovered, it then reports 0xA0	
Output Fault Detection		In case of a channel output fault (Configure Enable), the diagnosis then reports 0xB2; when the fault recovered, it then reports 0xA0	
Hot Plugging		Support	
Physical Property			
Protection Key		C1	
Installation Position		LK local backplane or extension backplane	
Dimensions		W×H×D= 35mm × 100mm × 100mm	
Enclosure Protection Rating		IEC60529 IP20	
Weight		200 g	

ACCESSORIES

LKA101/LKA104 Profibus-DP Bus Connector Module

LKA101/LKA104 is the Profibus-DP bus connector module. It switches the redundancy DP signal of the previous backplane to the next one. It provides the active terminal matching resistance for the Profibus-DP bus. The matching resistance is selected via the DIP switch. If the connector is at the end point of the bus, it must be connected to the matching resistance.

The DB9 plug of LKA101/LKA104 matches the DB9 receptacle on the backplane that is used as the DP communication extension interface. Each LKA101/LKA104 is installed with one receptacle. The LKA101/LKA104 modules are connected via the DP cable, which is fixed on the 4-position terminals.

Technical Specifications for LKA101/LKA104 Profibus-DP Bus Connector Module	
Terminal resistance	220Ω/390Ω, selected via the slide switch
Physical Property	
Installation Pattern	DB9 connection
Module Dimension (W×H×D)	55mm×52.47mm×16.5mm



Figure 4.1 External View of LKA101 Module



Figure 4.6 External View of LKA104 Module

LKA102 LK220 Battery Power Box Module

LKA102 provides the backup battery for RTC of the LK220 module. When LK220 is powered off, LKA102 supplies power to RTC via Springs A and C to keep RTC in the standby mode. The battery voltage is 3.0 V, the capacity is 1,000mAh, which can keep the typical standby value of RTC for 1 year.



Figure 4.3 LKA102 Module Schematic Diagram

Technical Specifications for LKA102 LK220 Battery Power Box Module	
Physical Property	
Installation Pattern	Clip
Protection key position	Rear right
Module Dimension (W×H×D)	55.5mm × 28mm × 14mm





LKA103 LK220 Capacitance Power Box Module

LKA103 provides the backup battery for RTC of the LK220 module. When LK220 is powered off, LKA103 supplies power to RTC via Springs A and C to keep RTC in the standby mode. The Max. Voltage for capacitance charging is 5.0V and the capacity is 0.94F. It can keep RTC in the standby mode for about 7 days when fully charged once.



Figure 4.5 LKA103 Module Schematic Diagram

Technical Specifications for LKA103 LK220 Capacitance Power Box Module	
Physical Property	
Installation Pattern	Clip
Protection key position	Rear right
Module Dimension (W×H×D)	55.5mm × 28mm × 14mm

Other Accessories	
<div>LKA105</div>  <div>LKA105 is optical fiber which used to connect the redundancy communication module in master/slave frame</div>	<div>LKC131</div>  <div>This is the dummy module without any electronic boards. It is used to fill in the unused LK module slots.</div>
<div>LKF003</div>  <div>LKF003 is the rotational tools for the backplane's mechanical key.</div>	<div>LKC171</div>  <div>This is the terminal cover to protect the terminal points.</div>

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