VK7016 Ethernet/USB 16-CH DAQ

Hardware Manual V1.30

-VK7016 model

-VK7016-PRO model

Shenzhen VKinging Electronics Co.,Ltd

——Precision Accurate Fast Reliable

VK7016 Appliance：

- Multi-Card Data Acquisition
- High Resolution Signal Measurement
- Signal Trigger Acquisition System
- IoT Information System
- Differential Bridge Application Measurement

Directory

1. Products

1.1 Characteristics

VK7016 is an Ethernet-type/USB high-speed data acquisition card with 16-channel true differential input, 24-bit resolution, the highest single-channel sampling rate of 256ksps, 16-channel synchronisation totalling 4.096Msps, precision preamplification, Gigabit Ethernet transmission unit, and integrated IEPE/ICP hardware support. This product uses a number of high-precision 24-bit ADC unit and with the company's many years of accumulation of the development of the front differential amplifier module, making the product has a high speed, high resolution, high precision, ultra-low noise, high rejection ratio, a wide range of measurements, and low temperature drift, suitable for precision and high speed acquisition of a variety of occasions. Collector internal integration linux system, application layer interface is open to the user, can be flexible and easy to achieve embedded application redevelopment. The acquisition card supports Ethernet interface/USB interface communication, SD offline data storage, etc., and we also support highly customised services.

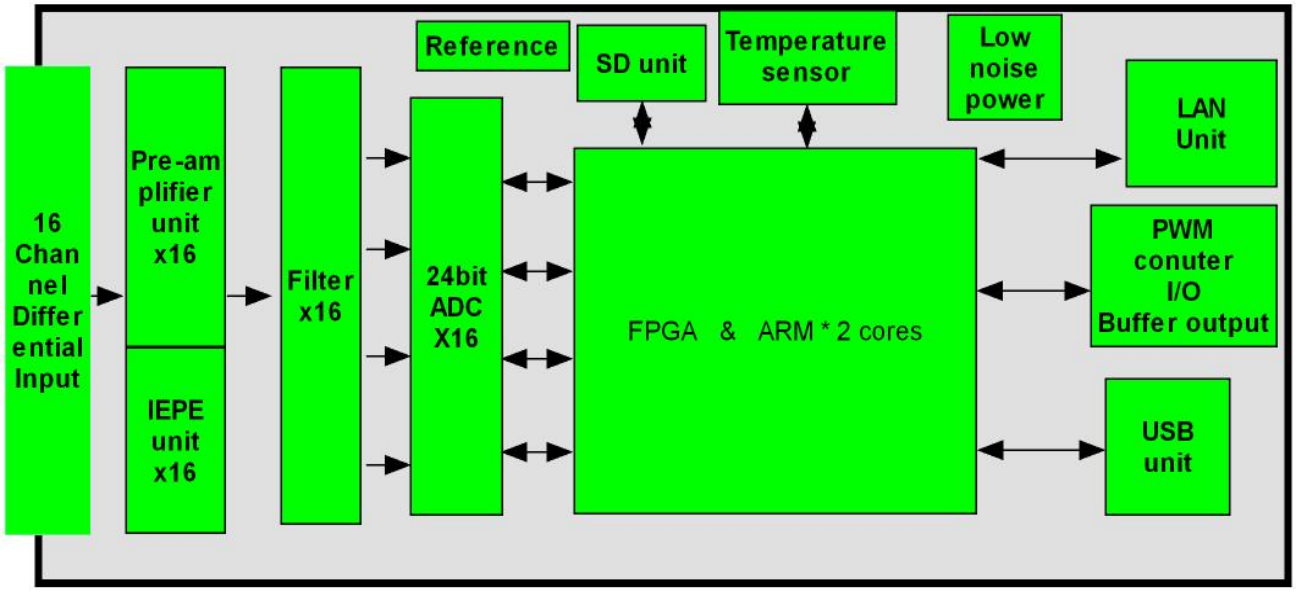
All components of VK7016 capture card are industrial grade, with full metal shielding, which can be adapted to the application of strong industrial interference, and has the advantages of moisture-proof, shock-proof and anti-interference.

1.2 List of characteristics

High precision and high resolution	24-bit resolution
Ultra-low noise pre-differential amplification	Minimum measurable uV
High-speed simultaneous acquisition	Maximum 256kS/s (256k points per second) for a single channel, 4.096MS/s for 16 channels.
Embedded in a Linux system	Algorithms can be embedded into the hardware to work independently, the application layer of the system is open to customers, convenient for secondary development.
Support SD storage	Online/offline/timed/conditionally triggered storage

IEPE/ICP Drive Receive	Supports 2/4mA ICP/IEPE standard sensors
Scope of transferees	0 ~± 10V Eight-step switching
Integration of 2 PWM outputs	16- Bit Adjustable PWM
2 DAC outputs	0 ~ +/-9V, 500kS/s

1.3 System Block Diagrams

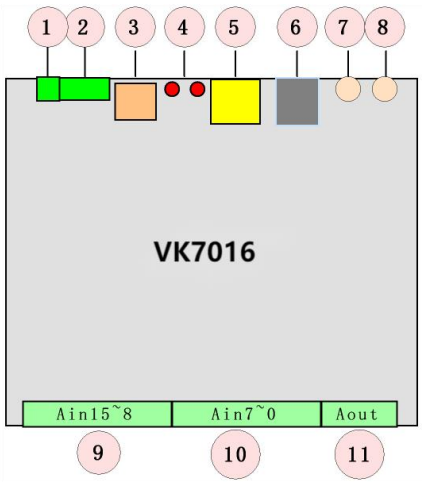


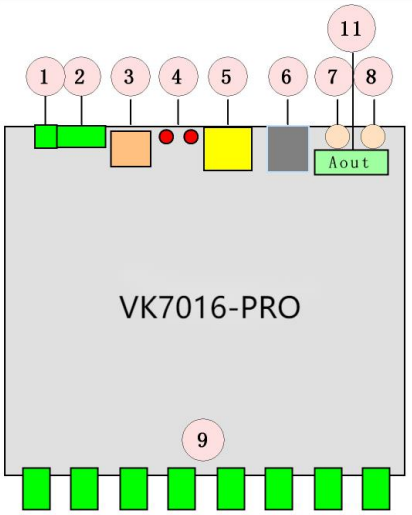
1.4 Port Functions

		Name	Functionality	Note
2	Digital IO Ports	VCC	Digital power supply 3.3V output to provide external drive current up to 100mA	
		DIO1	DIO1——Configured as a digital input/output port	
		DIO2/ PWM1	DIO2——Configured as a digital input/output port PWM1——Configured as a PWM output port	Function 2 choose 1
		DIO3/ PWM2	DIO3——Configured as a digital input/output port PWM2——Configured as a PWM output port	Function 2 choose 1
		DIO4/ CNT/ Ext Trig	DIO4——Configured as a digital input/output port CNT——Configured as a counter/frequency meter input port Ext Trig——Configuring externally triggered acquisition	Function 3 choose 1
		DGND	Digital land	
9 ~ 10	Analogue interfaces	AinX-	Negative analogue input, single-ended input mode by connecting AINX to AGND (VK7016-PRO is a single-ended BNC input).	Using AGND as a reference
		AinX+	Analogue input positive input	
11		AGND	Analogue	
		AoutX	Analogue voltage output	

2 Hardware parameters and interface description

2.1 Product port function description





1)8~24V power supply

2)Digital IO port SD

3)SD memory card

4)USB connection indicator

5)Gigabit LAN port

6)USB port

7)Synchronised signal input

8)Synchronised signal output

9)Analogue input interface

10)Analogue input interface

11)Analogue output interface

-VK7016 Model Number

9)

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ A7 -		+ A6 -		+ A5 -		+ A4 -		+ A3 -		+ A2 -		+ A1 -		+ A0 -	

10)

16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ A15 -		+ A14 -		+ A13 -		+ A12 -		+ A11 -		+ A10 -		+ A9 -		+ A8 -	

9)

DGND	DIO4 /CNT	DIO3 /PWM2	DIO2 /PWM1	DIO1	VCC

-VK7016-PRO Model Number

10)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH15	CH14	CH13	CH12	CH11	CH10	CH9	CH8	CH7	CH6	CH5	CH4	CH3	CH2	CH1	CH0

2.2 Integrated electrical parameters

sports event	unit (of measure)	typical value	Scope/Remarks
USB supply voltage	V	5	4.5~5.5
USB Current Limit	mA	200	
8-24V supply port voltage	V	8-24	5~40
8-24V supply port current	mA	400mA@12V 200mA@24V	
ADC analogue port input voltage	V		+/-10
ADC analogue signal input bandwidth	Hz	65K @ 0 档(+/-10V) 120K @ 1 档(+/-5V) 300K @ 2 档(+/-2.5V) 300K @ 3 档(+/-1V) 300K @ 4 档(+/-500mV) 200K @ 5 档(+/-100mV) 200K @ 6 档(+/-20mV)	
Digital port input VL low	V	0	-0.3~1
Digital port input VH high	V	3.3	2~5.5
Digital Port Output Voltage	V	3.3	3.2~3.4
Digital port output drive current (when output is high)	mA	10	
Digital port input absorption current (at 5V input voltage)	uA	170	
ADC Maximum Sample Rate	ksps		256ks(16-channel synchronisation)
Minimum Resolution Voltage	uV		0.1
DAC Analogue output resolution		16bit	
DAC Update Rate		500ks/s	
Aout Output Voltage	V		0 ~ +/-9V
PWM output frequency (DIO2/PWM1, DIO3/PWM2 ports)	Hz		0~100k
PWM duty cycle (DIO2/PWM1, DIO3/PWM2 ports)	%		0~100
Counter input maximum frequency	Hz		100K

(DIO4/CNT port)			
Counter input maximum count value		2^64th power	
Ethernet interface rate	Mb	1000	
Working temperature:	degrees centigrade		-40~ 85
Storage temperature	degrees centigrade		-40~ 105
Physical dimensions (LWH)	mm	190*150*50	Without connector length

2.3 Safe use of the absolute maximum

sports event	**unit (of measure)**	**numerical value**	
USB supply voltage:	V	-1~+6	* Exceeding the absolute maximum value may damage the device and cause irreversible damage.
ADC Analogue Port	V	-15V~+24V	
Digital Ports	V	-1V~+5V	
DAC output port	V	-15V~+15V	
Electrostatic input (ESD) on all ports	V	2000	

2.4 ADC analogue conversion unit

2.4.1ADCInput Detailed Electrical Parameters

sports event	unit (of measure)	typical case	Note
Common mode rejection ratio(CMRR)	dB	130	
Input Bias Current	nA	1	
Input bias voltage	uv	10	
Input Equivalent Voltage Noise	nVp-p	200	Maximum value is 400 when +-10V is selected for the input range.
Input equivalent current noise	pAp-p	1	Maximum value is 2
Equivalent Input Capacitance	pF	400	
input resistance	GΩ	1	
ADC Reference Accuracy		0.1%	
Overall maximum temperature drift of	ppm/℃	6	Maximum 2ppm/°C

ADC amplification acquisition unit			

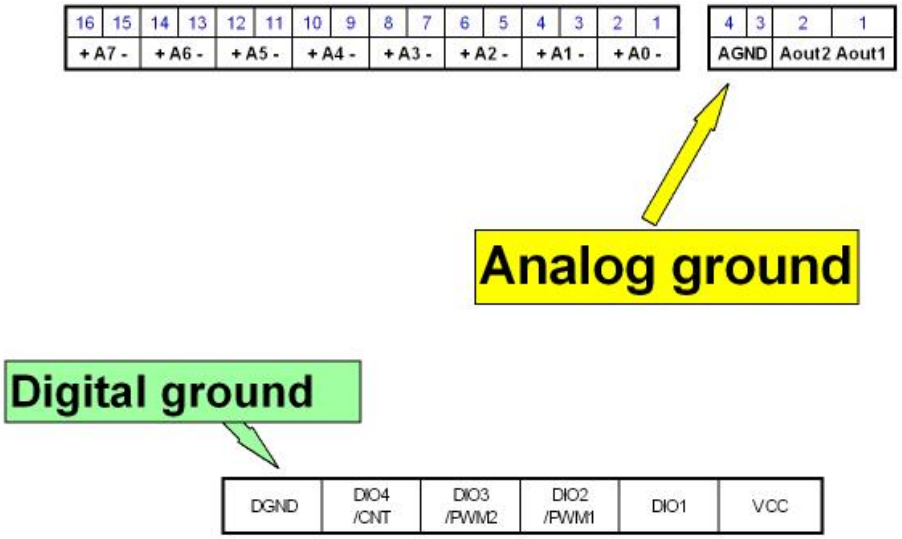
2.4.2Input Range vs Bottom Noise

Setting values(Program set)	Corresponding measuring range	background noise	Note
0	-10V~+10V	100uV	Test conditions: Sampling rate 1kS/s Input shorted to AGND
1	-5V~+5V	50uV	
2	-2.5V~+2.5V	20uV	
3	-1V~+1V	6uV	
4	-500mV~+500mV	4uV	
5	-100mV~+100mV	3uV	
6	-50mV~+50mV	3uV	
7	-20mV~+20mV	1.5uV	

3 Precautions for use

3.1 Ground is divided into digital and analogue ground

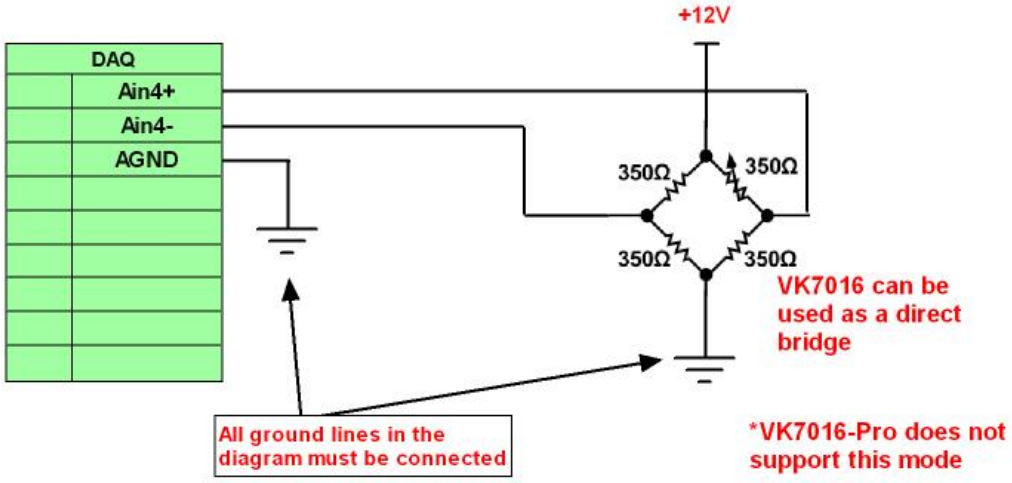
The ADC acquisition side is used in conjunction with the analogue ground (AGND), thus avoiding digital interference from the digital input to the analogue input.



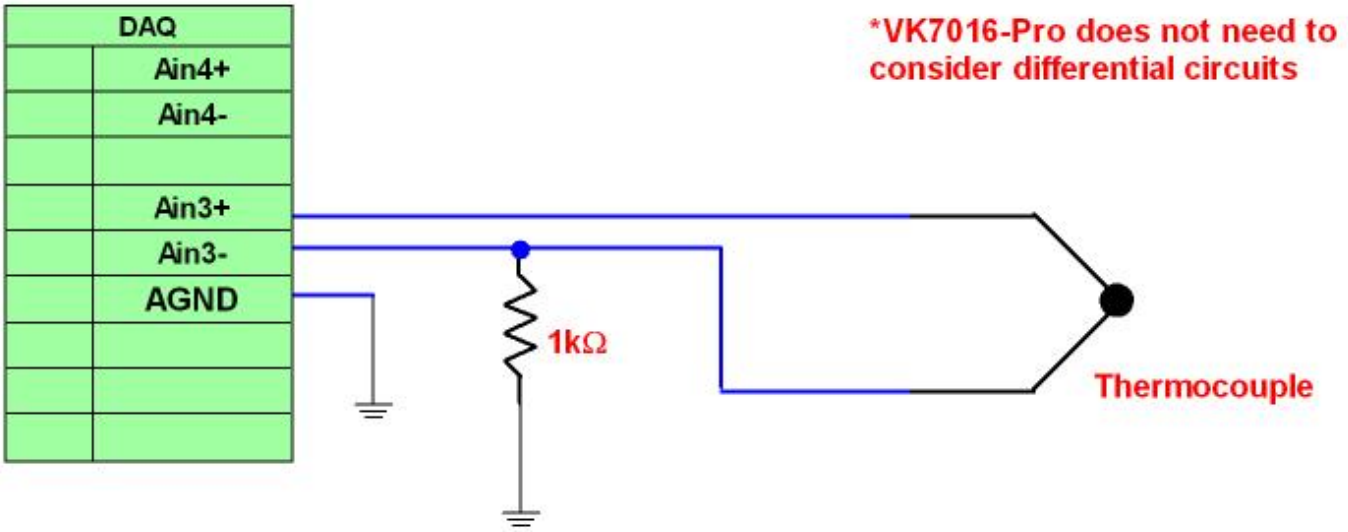
3.2 Differential mode of ADC inputs

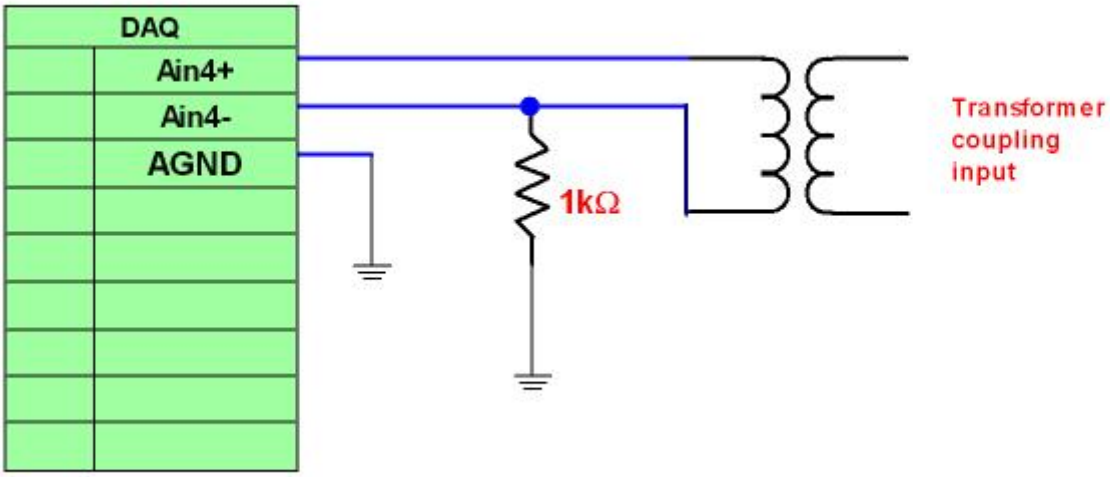
The differential method is the least noisy input method and effectively suppresses all kinds of common mode interference. However, care must be taken to provide the input with the correct input loop. Correct common

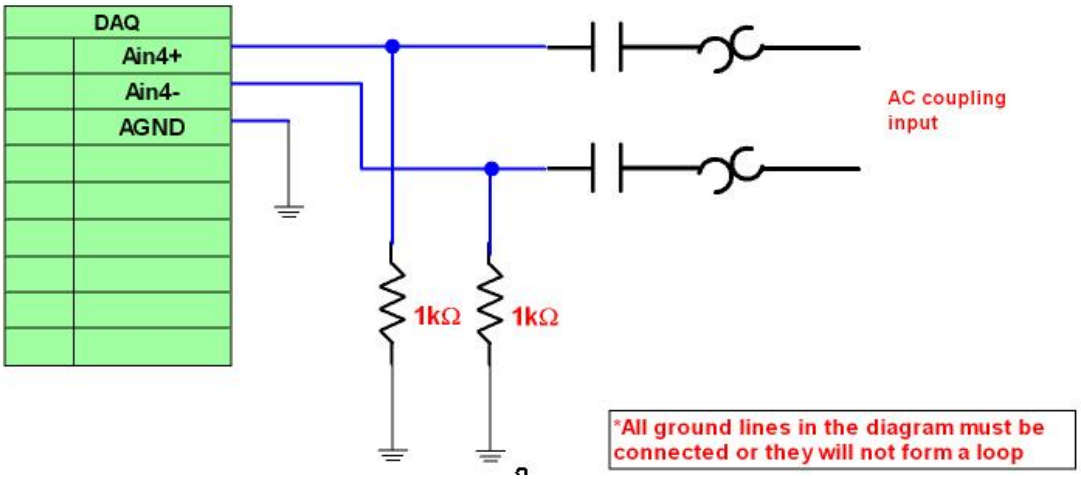
ground is the first step in securing the input loop.



If the inputs do not share a common ground, you can create an input return path in the following way. (Software set to Differential input mode)

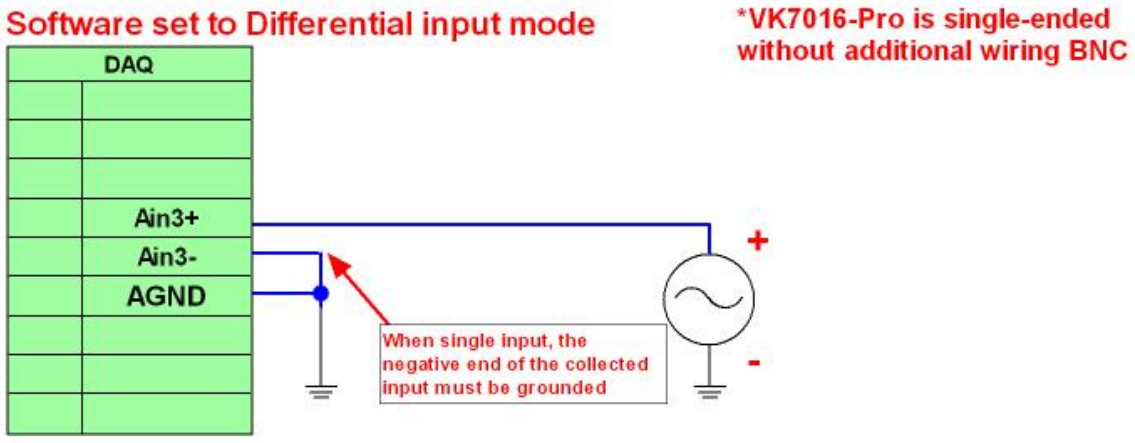


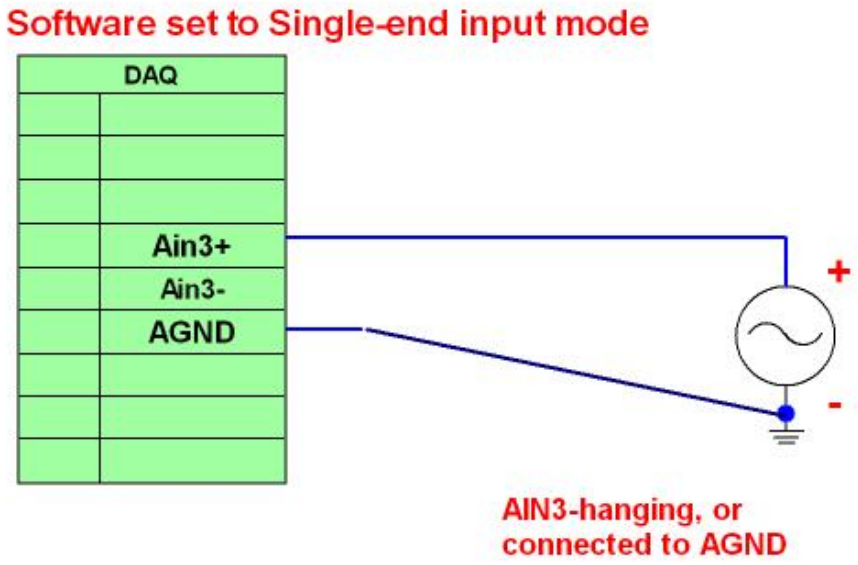




3.3 Application of Single-Ended Inputs for ADC Inputs

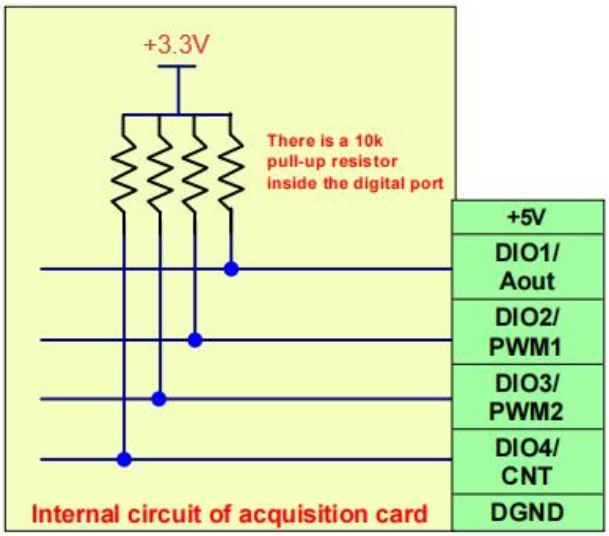
When the input is a single signal terminal input, the negative end of the differential input must be grounded. When this capture card is used to capture non-differential signals, it can also perform well with a high rejection ratio, and can eliminate the noise introduced by the ground line very well.





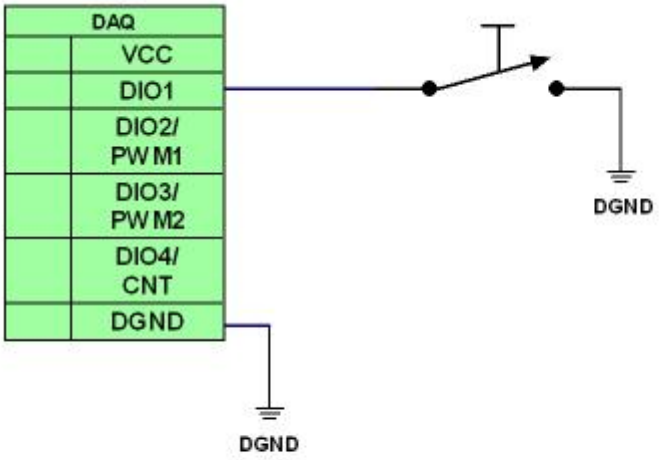
3.4 Digital port as input application

When the capture card is used as an input, its internal pull-up resistor can be used more conveniently.



3.5 Key Input Usage

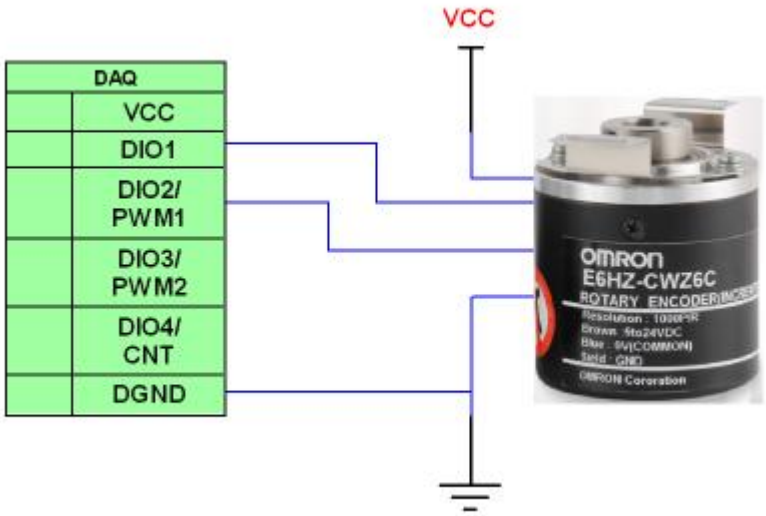
When the capture card is used as an input, its internal pull-up resistor can be used more conveniently.



*All ground lines in the diagram must be connected or they will not form a loop

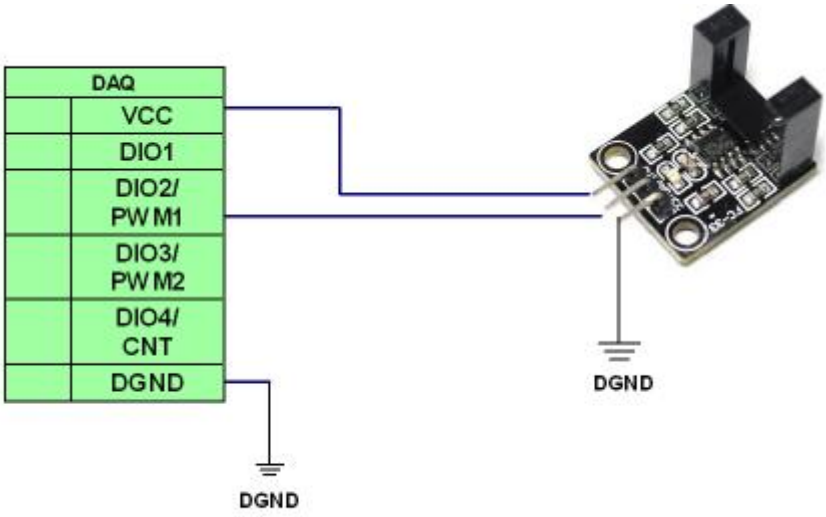
3.6 Connecting to use a hardware digital encoder

The card has two built-in digital encoder units, DIO1/DIO2, DIO3/DIO4.

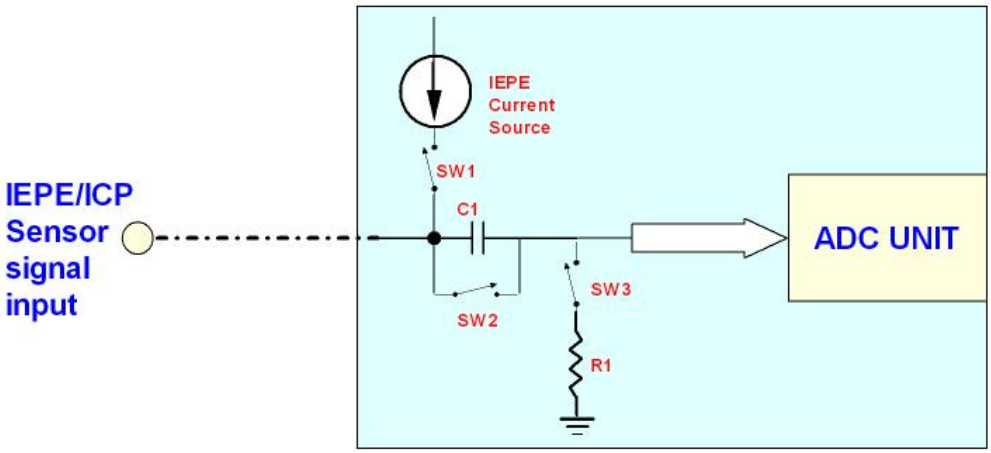


3.7 Powering the Sensor Input Using the Internal 5V Supply

When the capture card is used as an input, its internal pull-up resistor can be used more conveniently.



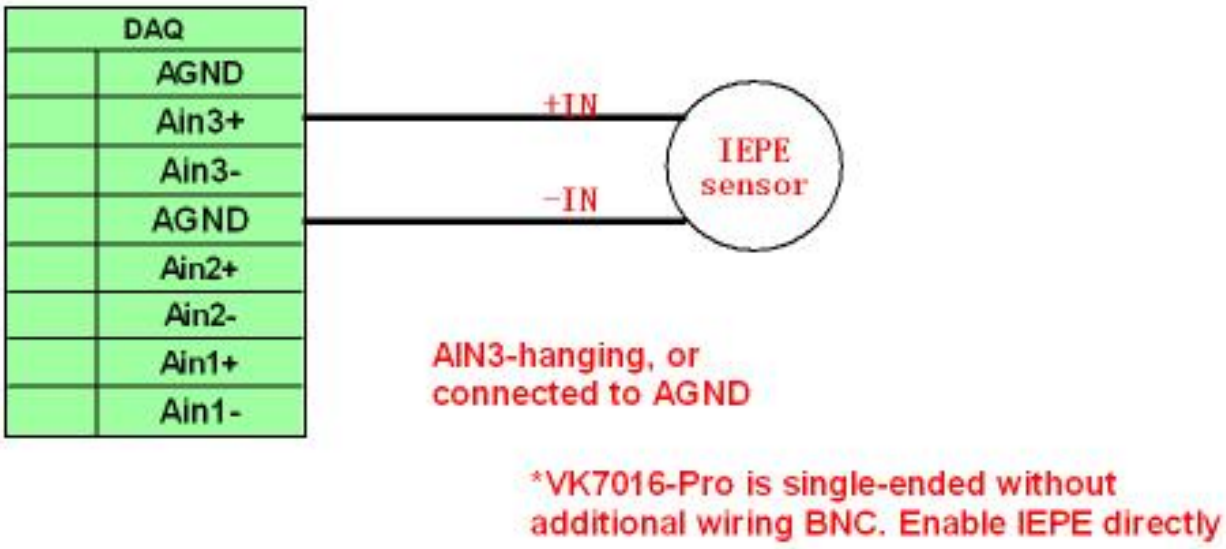
3.8 IEPE model description



- This capture card has integrated IEPE/ICP hardware support.
- The capture card integrates a 24V power supply unit, a constant current driver and a receiver unit, and each channel can be individually switched to the commonly used "Analogue Input Mode" or "IEPE Mode" through software settings.
- In IEPE mode, the output is 24V 4mA (2mA compatible), and the relative ADC input is AC-coupled.
- 16 channels can be independently switched controllable.
- differential input connection can further reduce transmission interference.
-

3.9 Input port to IEPE sensor

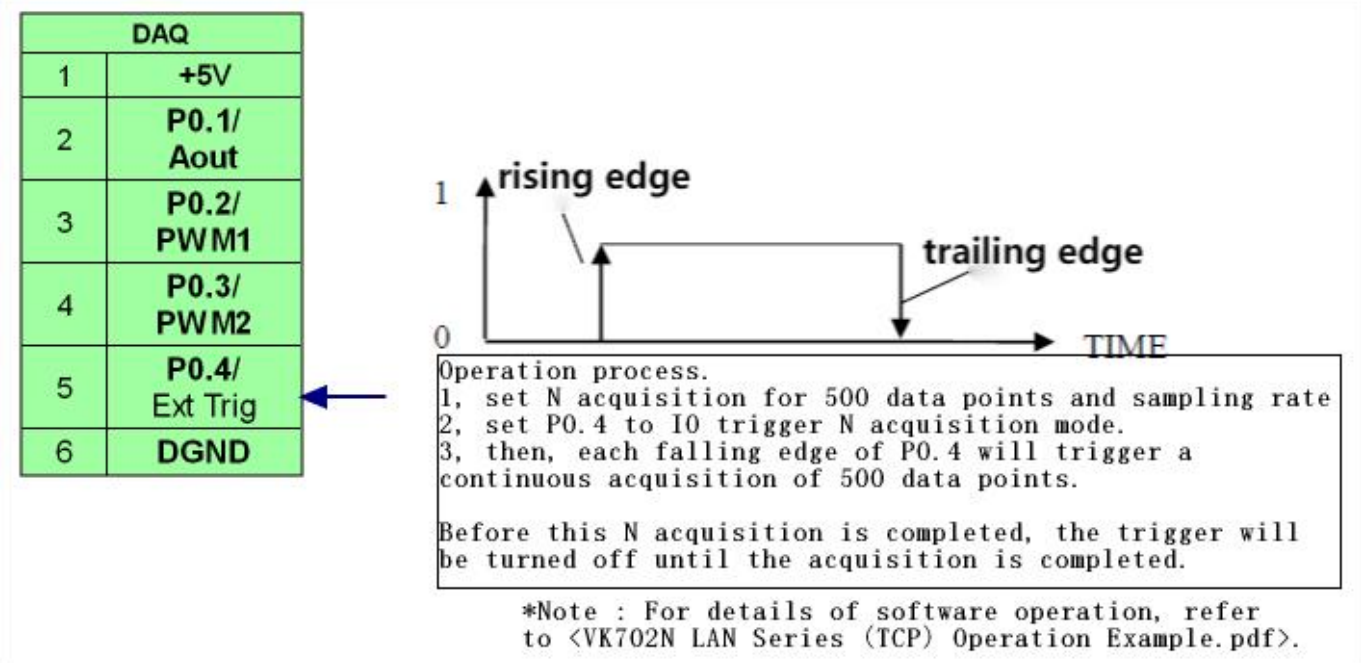
When connecting an IEPE sensor, AGND is used as the negative input and AIN+ is used as the positive input (*The corresponding input needs to be set to IEPE MODE in the software).



4 Acquisition Mode

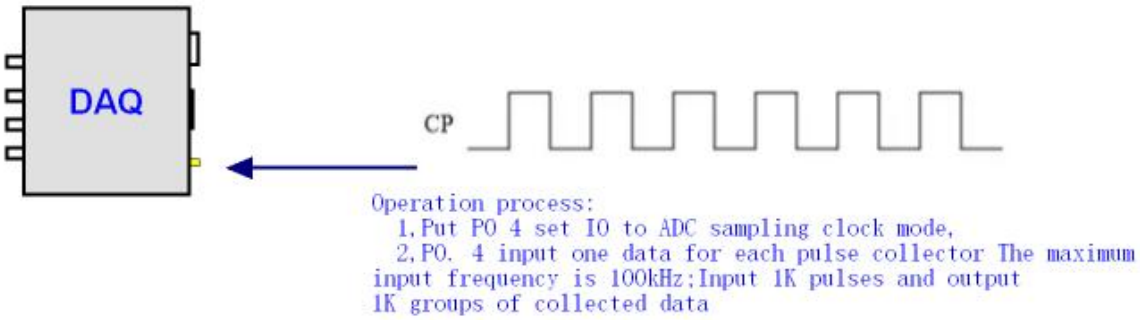
4.1 Externally Triggered Acquisition Mode

Triggered Acquisition - Mode 1: DIO4 triggers N acquisitions (N acquisitions = finite number of acquisitions)



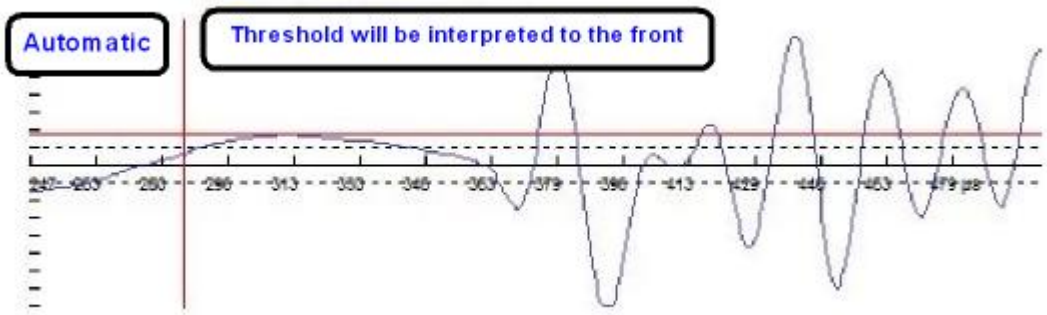
4.2 External Acquisition Clock Mode

Trigger Acquisition - Mode 2: SYNC is used as the acquisition clock input port for acquisition, one data point is acquired for each pulse (1 high and 1 low level for 1 pulse).



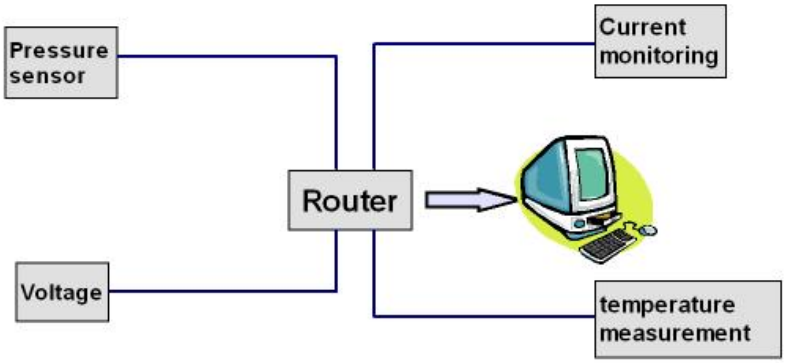
4.3 Analogue level-triggered acquisition mode

Trigger Acquisition - Mode 3: 16 input analogue input channels, use one of the channels as the trigger signal input, when the voltage value of the trigger channel meets the set voltage threshold condition, trigger acquisition starts to act.



4.4 Multiple front-end acquisitions can be made at the same time

This acquisition system supports one acquisition terminal to collect multiple acquisition front-ends for time-sharing, which can easily build a multi-point measurement and monitoring system, and one transceiver supports a maximum of 255 acquisition front-ends.



5 Quick installation and easy testing

Please go to our official website to download the information package directly www.vkinging.com

5.1 Installation of drivers and test software

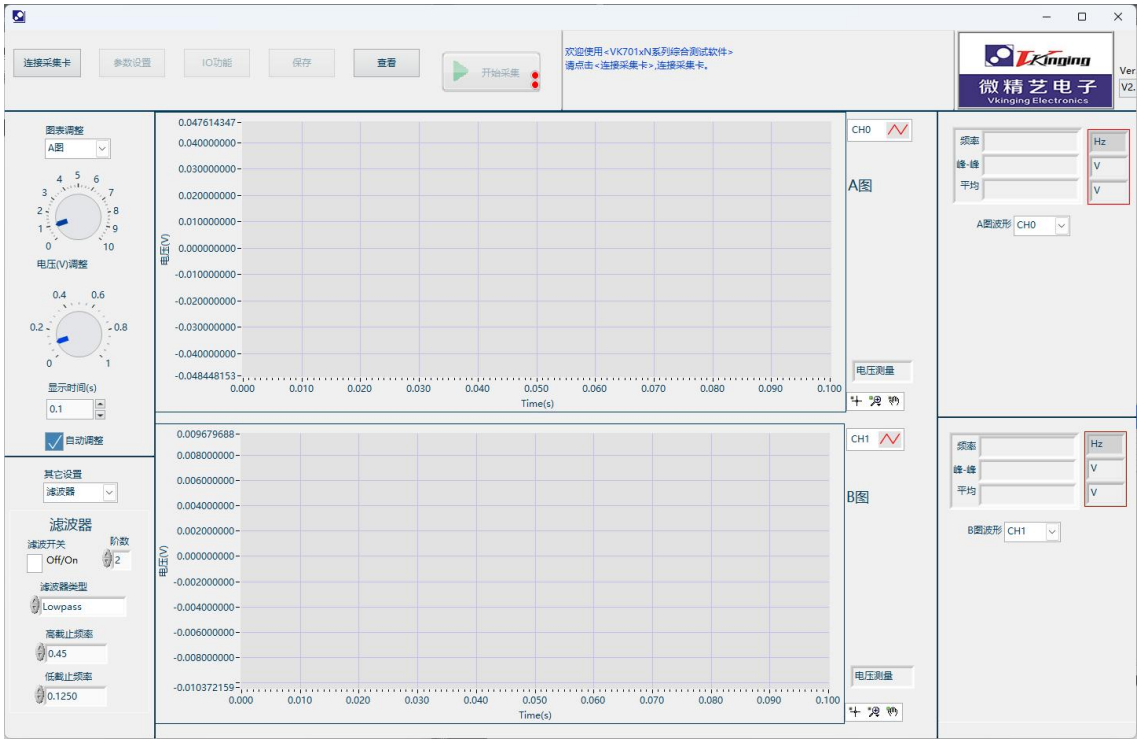
This collector can be used directly without driver installation.

Our accompanying test software is for evaluation testing purposes, and various development routines are provided in the package.

The test software can be run directly after installation.

5.2 Easy to use test software for testing

We have test software, you can test the hardware directly.
The following picture shows the interface of the software:



For more specific instructions on how to use the test software, please refer to the Test Software User's Guide included in our packages.

6 Advanced: Brief description of programming and development

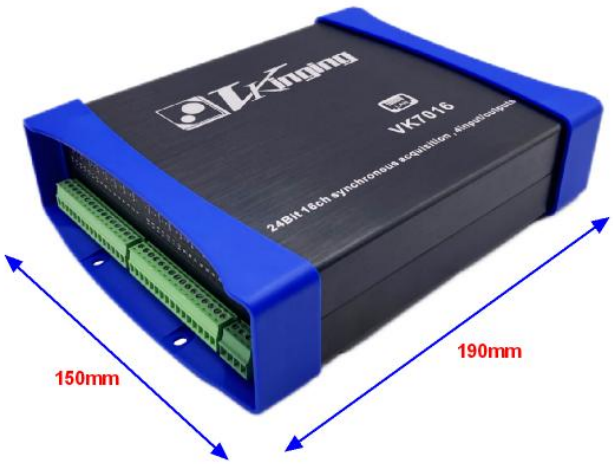
Collector sampling standard TCP/IP protocol development, a variety of communication methods are suitable for this standard, please refer to our TCP/IP protocol. We also provide DLL development mode, user configuration and development more convenient and concise.

This collector can be used across a variety of platforms, in addition we provide a variety of routines and Win7/8/10/11/Linux/Android development routines.

For more details, please refer to the "programme development related" folder in our package.

7 External dimensions and installation

7.1 VK7016 Physical Dimensions



7.2 VK7016-PRO Physical Dimensions

8 Common Problems and Troubleshooting

Description of the problem	Methods of elimination	Other notes
USB Driver Installation	Firstly, connect the computer with USB, make sure the indicator light is on. Then operate the computer, right-click on my computer -> click on Management -> Device Manager -> Port, to see if you can see the VKxx capture card word driver, if not, you need to install the driver, detailed steps, please refer to the package "USB driver installation instructions"!	
USB connection has a serial port but cannot communicate	A new serial port will appear when plugged in, confirm if a new serial port appears. If there is a new serial port then make sure If there is a new serial port, make sure the serial port number and baud rate are correct.	The default virtual serial port baud rate is 9600
USB plugged in cannot display the serial port	1， part of the WIN7 system is optimised for the lack of relevant files. 2， individual computer system files are missing, please replace a computer or other operating systems and then test to confirm 3， Rule out poor contact with the USB cable or USB cable quality problems, replace a cable test.	
No response after USB power up	1, if using USB power supply, ensure the quality of USB wire. If the voltage drop of the wire is too low, it will also cause the USB power supply and communication abnormality. At this time, please replace the USB cable test to confirm. 2, you can use the green power supply dedicated seat 8~24V power supply.	Troubleshooting: Use a multimeter to measure whether the 5V output of the IO terminal is 5V output to
USB easily disconnected	If there is strong interference in the neighbourhood, the USB may disconnect, which is determined by the transmission characteristics of the USB. It is recommended to replace the LAN Ethernet communication method	LAN is recommended for industrial applications
LAN cannot communicate	1, please confirm the IP address and port, check the IP of the local computer to make sure it is in the same network segment. 2, Make sure the light on the Ethernet cradle is blinking normally. If the light is not on, check the quality of the cable 3、Check the connection by other communication methods.	Network cable length support up to 100m
Multiple LAN card communication abnormality	1, the IP address between different cards can not be the same, otherwise it will be conflict 2, whether there are other computers or devices within the network occupy the same IP 3，Check whether there is a possibility of duplicated MAC address	
SD offline mode is not	1， Confirm whether SD mode is set successfully 2， Check whether SD card format is correct	Please refer to our related materials to

available	3， Can be formatted to confirm whether SD is normal	use
Large temperature drift	1， confirm whether the power supply is normal and stable 2， exclude whether it still exists after resetting the hardware 3， exclude the possibility of sensor causes 4， Replace the sensor channel, compare and confirm the exclusion	
Indicator light is off.	1, to confirm the power-up is correct, available USB power or switch to the dedicated port power 2, to confirm whether all the indicators do not light up If still can not be solved, please contact our after-sales personnel	Usually caused by incorrect power supply
VK7016 upper computer software related issues		Please refer to the VK7016-7018 Software User's Guide included in the packet.

9 After Sales & Warranty

One:Warranty:

The company with the attached warranty documents or directly affixed to the back of the equipment on the warranty sticker, to provide a one-year full warranty service, product warranty 10 years.

1 by our technical staff to confirm the initial product quality problems for the company, the customer will return to the product, within 3 days we confirm the maintenance and send back

2. If it is confirmed that the user is caused by improper use, we communicate with both sides to confirm that we will charge a certain amount of related costs.

Second:maintenance:

All of our products are provided with 10 years of free maintenance services, the first year of free warranty thereafter, such as the need to replace components in the maintenance process, then only the cost of components charged.

Third:exchange:

For new product failures the company provides three months of free replacement service, customers should first send back the faulty product in the form of logistics or express delivery, the company receives another new product back to the customer. Our company bears the freight cost of returning the product to the customer.

10 Edition and Revision History

Releases	Clarification	Times
V1.00	First version	2023.02.01
V1.10	Add LORA function and related description	2023.05.11
V1.20	Add SD storage related descriptions	2023.08.21
V1.30	Remove LORA and RS485 writing errors.	2023.11.13

Contact Us

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