

VK701 USB 24-bit Data Acquisition Card

Hardware Manual V1.30



Shenzhen VKing Electronics Co.,Ltd

—Precision Accurate Fast Reliable

VK701 USB Applications:

- Weak Signal Measurement Acquisition
- High resistance differential signal measurement
- High-division resolution signal measurement
- ◆ Multi-signal simultaneous acquisition

Directory

VK701 USB 24-bit Data Acquisition Card	1
Hardware Manual V1.30	1
VK701 USB Applications:	1
1. Product Introduction	3
1.1 Characteristics	3
1.2 List of characteristics	3
1.3 System block diagram	4
1.4 Port Functions	4
2. Hardware parameters and interface description	5
2.1 Product Port Function Description	5
2.2 Integrated electrical parameters	5
2.3 Safe use of the absolute maximum	6
2.4 ADC analogue conversion unit	7
3. caveat	8
3.1 Ground is divided into digital and analogue ground	8
3.2 Differential mode of ADC input	8
3.3 Application of single-ended input for ADC input	9
3.4 Application of digital ports as inputs	10
3.5 Key Input Use	11
3.6 Uses internal 5V power supply to power sensor inputs	11
3.7 Any digital port can be connected to a digital temperature sensor.	12
3.8 Digital port for digital temperature and humidity sensors (SI7021 only) ..	12
3.9 Measurement of strong interference signals	12
3.10 IEPE Description of the model	13
3.11 Input port to IEPE sensor	14
4. Quick installation and easy testing	14
4.1 Installation of driver and test software	14
4.2 Simple use of test software for testing	15
5. Advanced: Brief description of programming and development	15
6. External dimensions and installation	16
7. Common Problems and Troubleshootin	17
8. After and Warranty	18
9. Edition and Revision History	18

1. Product Introduction

1.1 Characteristics

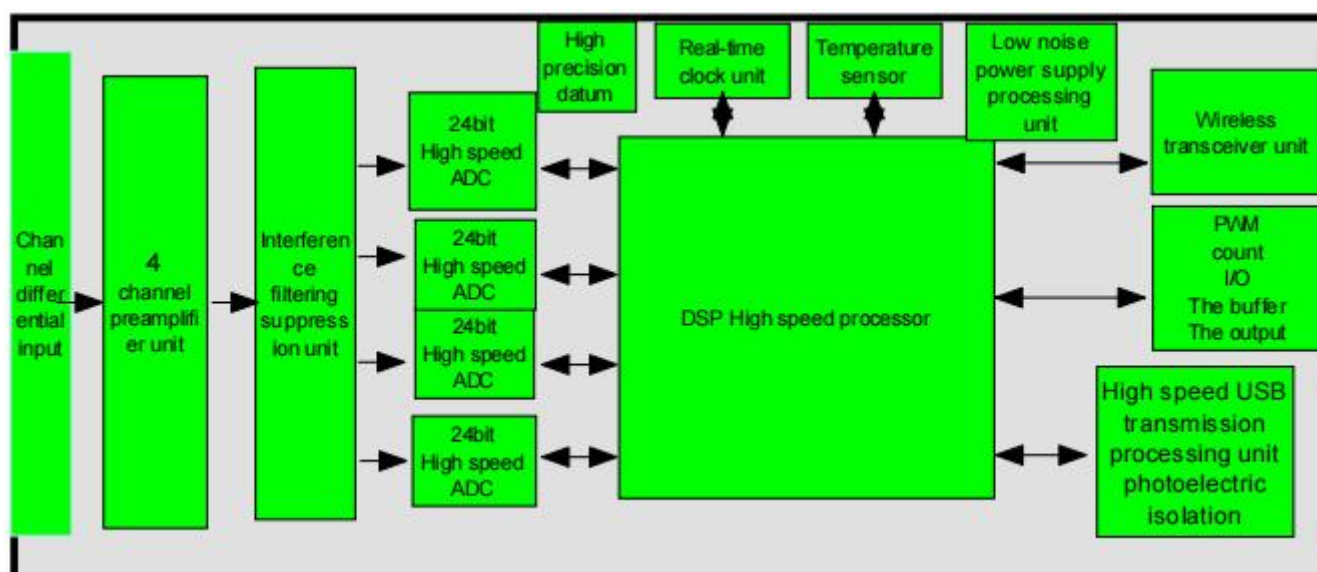
VK701 is a USB-type high-speed data acquisition card with 4-channel true differential input, 24-bit resolution, maximum sampling rate of 400ksps, precision preamplification, and USB optoelectronic isolation. This product uses a number of high-precision 24-bit ADC unit and with the company's many years of accumulation of the development of the front differential amplification module, making the product has a high speed rate, high resolution, high precision, ultra-low noise, high rejection ratio, wide measurement range, low temperature drift advantages, suitable for precision and high speed rate acquisition of various occasions. Acquisition card expansion for the series version, optional LAN type: LAN version see VK701N, WIFI high-speed transmission type see VK701W.

VK701 capture card adopts all-metal shielding, which can be adapted to the application of industrial interference strong occasions, 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 preamplification	Measures down to 0.1uV
High-speed synchronised acquisition	Up to 100ksps (100k dots per second) for a single channel, 400ksps for 4 channels
Scope of transferees	0 ~ ± 10V
Counting/Frequency Measurement	Counting or frequency measurement
Integration of 1 DAC output	0~3.3V Analogue
Integration of 2 PWM outputs	16- Bit Adjustable PWM
Supports temperature and humidity measurement	Digital Temperature and Humidity Sensors
USB Optical Isolation	Electrical isolation
Metal shielded enclosure	High anti-interference capability

1.3 System block diagram



1.4 Port Functions

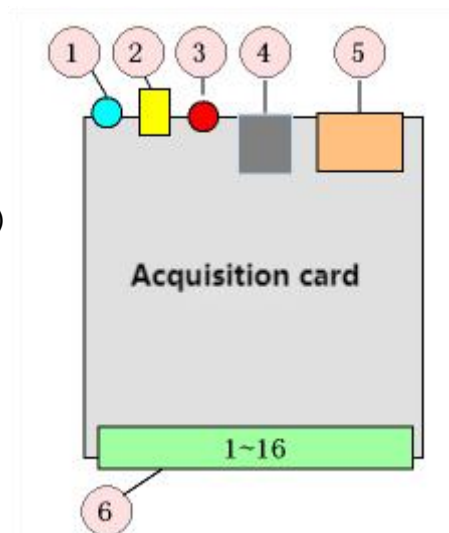
Port number	Name	Functionality	Note
1	+5V	Digital power supply 5V for digital power supply, can provide up to 50mA load current	
2	P0.1/Aout	Digital power supply 5V for digital power supply, can provide up to 50mA load current	Function 2 choose 1(*Note 1)
3	P0.2/PWM 1	DIO 2 - configured as a digital input/output port PWM 1 - configured as a PWM output port	Function 2 choose 1(*Note 2)
4	P0.3/PWM 2	DIO 3——configured as a digital input/output port PWM2——configured as a PWM output port	Function 2 choose 1(*Note 2)
5	P0.4/CNT	DIO 4——configured as a digital input/output port CNT —— Configured as a counter/frequency meter input port Ext Trig—— Configure external trigger acquisition (falling edge trigger)	Function 3 choose 1(*Note 3)
6	DGND	Digital Terrestrial	
7	Ain4+	Channel 4 analogue input positive input	If the analogue side of the acquisition is connected to the ground of the digital side, digital interference may be introduced, thus reducing the accuracy of the acquisition.
8	Ain4-	Negative input for analogue input on channel 4, shorted to AGND in single-ended input mode	
9	AGND	Analogue	
10	Ain3+	Channel 3 analogue input positive input	
11	Ain3-	Negative input for analogue input on channel 3, shorted to AGND in single-ended input mode	
12	AGND	Analogue	
13	Ain2+	Channel 2 analogue input positive input	
14	Ain2-	Negative input for 2nd analogue input, shorted to AGND in	

		single-ended input mode	
15	Ain1+	Channel 1 analogue input positive input	
16	Ain1-	Negative input for analogue input on channel 1, shorted to AGND in single-ended input mode	

2. Hardware parameters and interface description

2.1 Product Port Function Description

- 1) Acquisition status indicator
- 2) Wireless acquisition transmitting antenna (reserved for wireless version)
- 3) USB connection indicator
- 4) USB port
- 5) Extended application selection terminals
- 6) Input and output interfaces, menu as shown in Fig.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+5V	P0.1 Aout	P0.2 PWM	P0.3 PWM	P0.4 CNT	DGND	+ Ain4 -	AGND	+ Ain3 -	AGND	+ Ain2 -	+ Ain1 -				

2.2 Integrated electrical parameters

Sports Event	unit (of measure)	Typical values	Scope/Remarks
USB supply voltage	V	5	4.5~5.5
USB power supply current	mA	50	30~100
ADC Analogue Port Input Voltages	V		+/-10
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	uA	170	

voltage)			
Digital port (p0.4) triggered acquisition		下降沿触发	
ADC Maximum sampling rate	ksps		100(4-channel synchronisation)
Minimum Resolution Voltage (Input range selection -1mV~+1mV)	uV		0.1
Aout Output Voltage	V		0~3.3
PWM output frequency (P0.2/PWM1、P0.3/PWM2 port)	Hz		0~100k
PWM duty cycle (P0.2/PWM1、P0.3/PWM2 port)	%		0~100
Counter input maximum frequency (P0.4/CNT port)	Hz		100K
Counter input maximum count value		2^64 次方	
Working temperature:	degrees centigrade		-40~ 85
Storage temperature	degrees centigrade		-40~ 105
Physical dimensions (LWH)	mm	112*80*24	Without connector length

2.3 Safe use of the absolute maximum

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

2.4 ADC analogue conversion unit

2.4.1 ADC Input Detailed Electrical Parameters

Sports Event	Unit (of measure)	Typical Case	Note
Differential Input Common Mode Rejection Ratio (CMRR)	dB	130	
Input Bias Current	nA	1	
Input Bias Voltages	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 (IECN)	pAp-p	1	Maximum value is 2
Equivalent Input Capacitance	pF	400	
Input Resistance	G Ω	1	
ADC Reference Accuracy		0.1%	
Overall maximum temperature drift of ADC amplification acquisition unit	ppm/°C	6	

2.4.2 Input Ranges vs. Bottom Noise

Set the value	Corresponding measuring range	Background noise	Note
0	-10V~+10V	0.3mV	ADC background noise is white noise, which is superimposed on the measurement result. (*Attachment 2)
1	-5V~+5V	0.1mV	
2	-2.5V~+2.5V	60uV	
3	-1V~+1V	25uV	
4	-500mV~+500mV	15uV	
5	-100mV~+100mV	6.5uV	
6	-20mV~+20mV	6uV	(White noise cannot be eliminated by hardware, only by software filtering.)
7	-1mV~+1mV	5uV	

2.4.3 Sample rate vs. effective resolution

sampling rate	effective resolution(*附 1)	note
1 ~ 4Ksps	21bit	The higher the sampling rate, the higher the noise of the ADC and the surrounding internal devices, and the lower the effective resolution (*Note2).
4K~15Ksps	20bit	
15k~35Ksps	19bit	
35k~64Ksps	17bit	
64k~100Ksps	16bit	

Attachment 1: Effective resolution is a characteristic of all ADCs: the last few bits of the ADC bounce back and forth, and the bits that don't bounce before them are the effective bits.

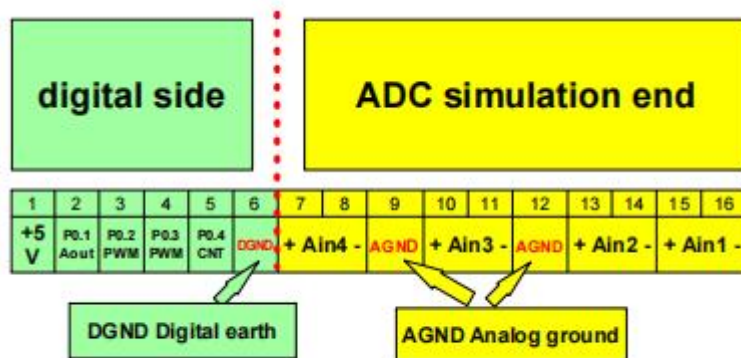
The bouncing bits are not random but normally distributed, so when using digital filtering can reflect the significance of the actual physical resolution of 24 bits.

Attachment 2: Signal acquisition should take into account both the ADC noise floor and the sampling rate corresponding to the effective resolution.

3. caveat

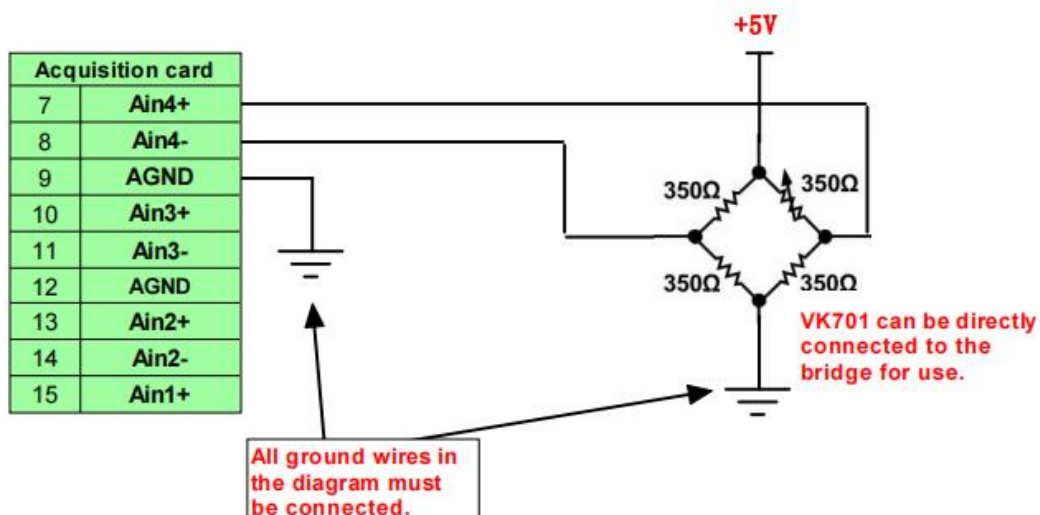
3.1 Ground is divided into digital and analogue ground

Input ports 1~6 are digital (including AOUT output) and 7~16 are analogue ports. When in use, the digital inputs and AOUT outputs, should be used in conjunction with the digital ground (DGND), while the ADC acquisition terminal is used in conjunction with the analogue ground (AGND), so as to avoid digital interference from the digital inputs to the analogue inputs.

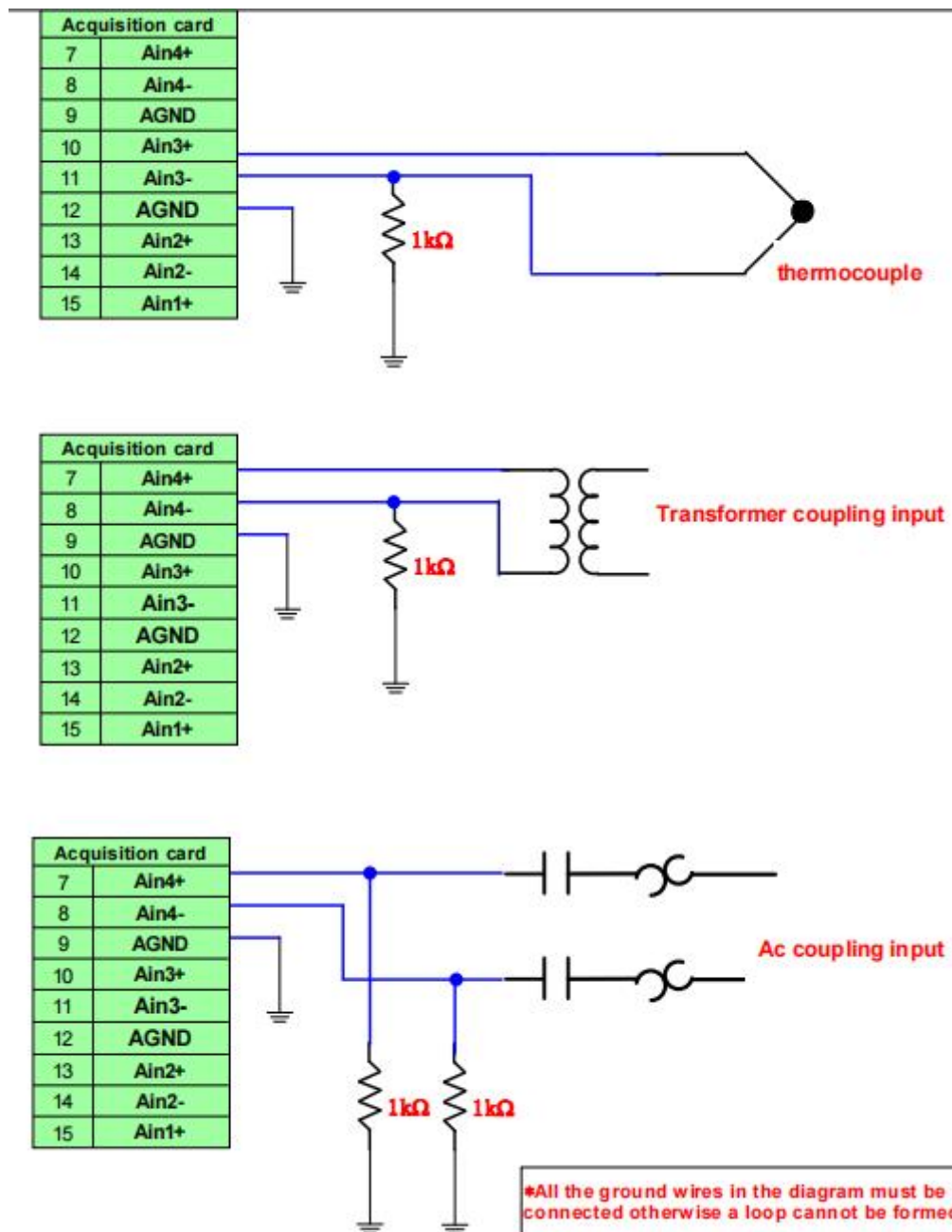


3.2 Differential mode of ADC input

The differential input division method is the least noisy input method and can effectively suppress all kinds of common mode interference. However, care must be taken to provide the correct input loop to the input. The correct common ground is the first step in ensuring the input loop.



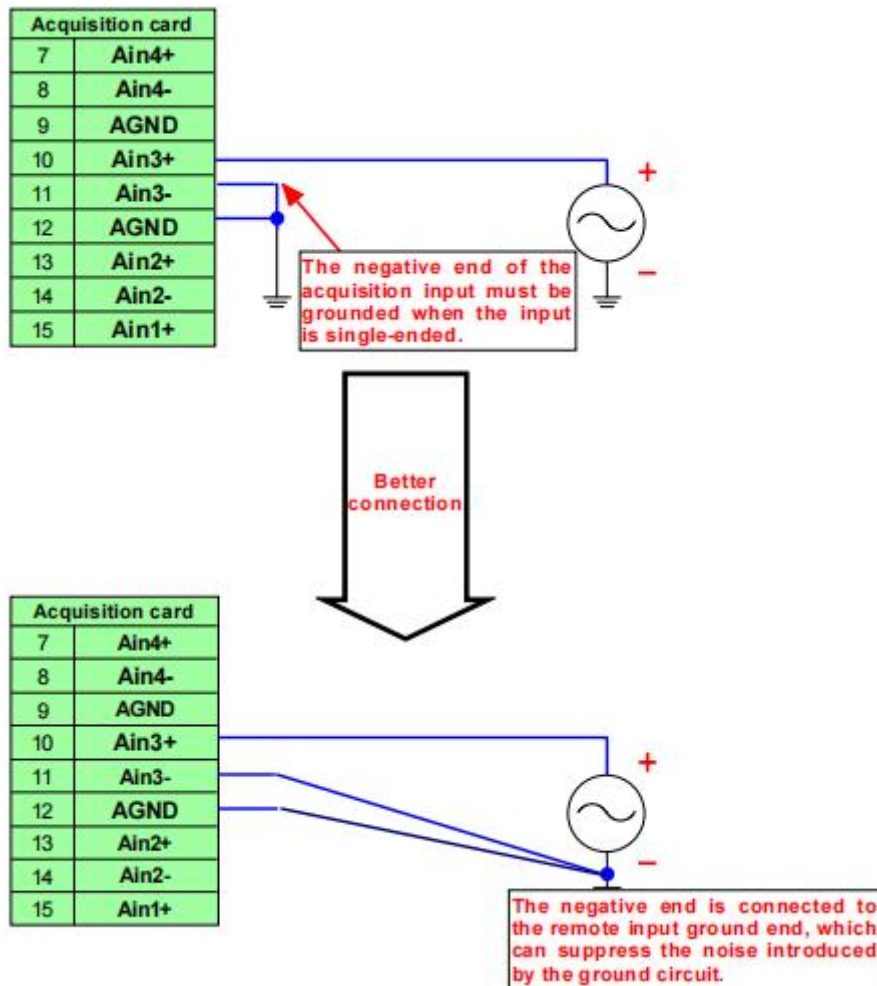
If the inputs do not share a common ground, you can refer to the following way to create an input return path.



3.3 Application of single-ended input for ADC input

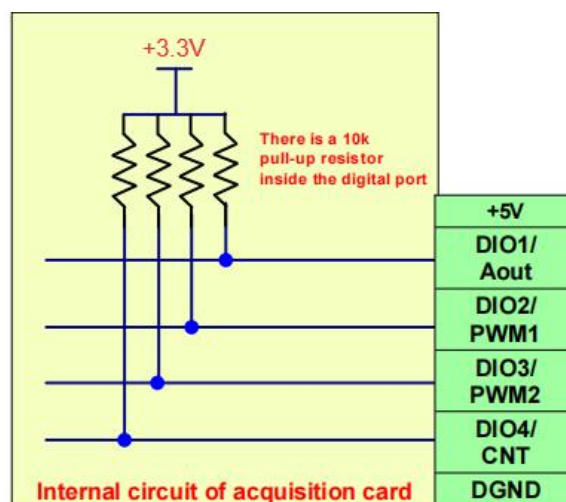
When the input is a single signal terminal input, the negative end of the differential input must be grounded.

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.



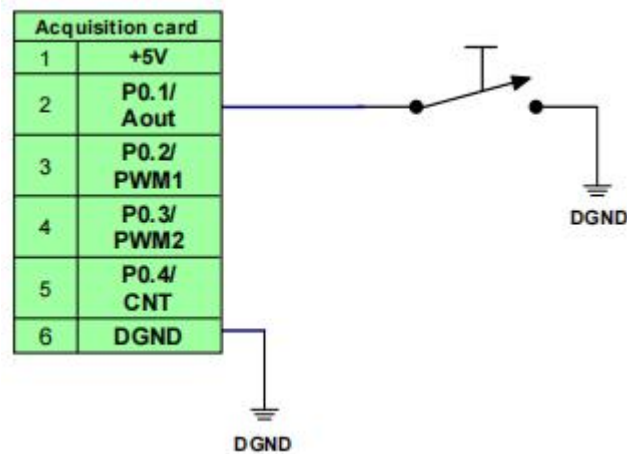
3.4 Application of digital ports as inputs

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



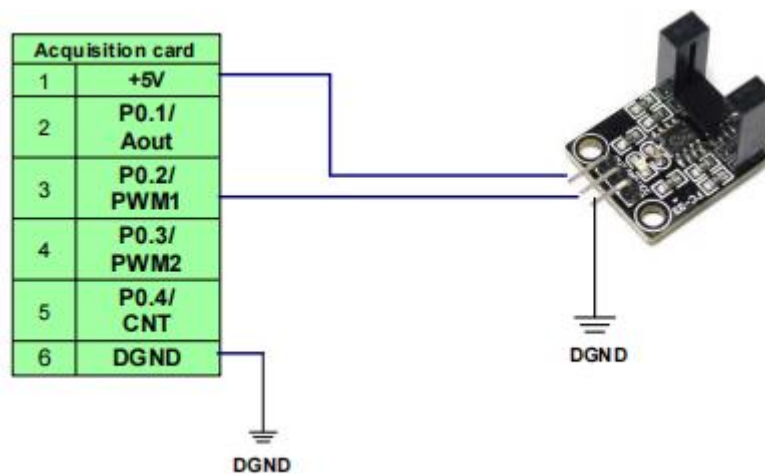
3.5 Key Input Use

When the capture card is used as an input, its internal pull-up resistor can be more convenient to use (* All earth wires in the diagram must be connected otherwise no loop can be formed)

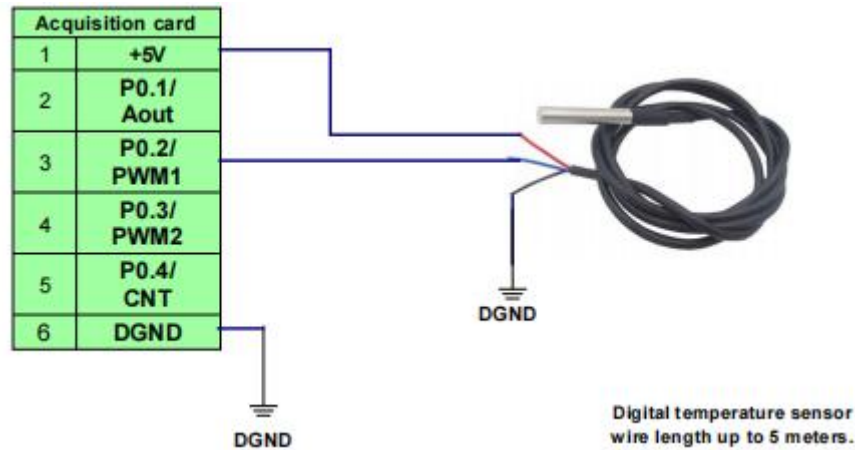


3.6 Uses internal 5V power supply to power sensor inputs

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

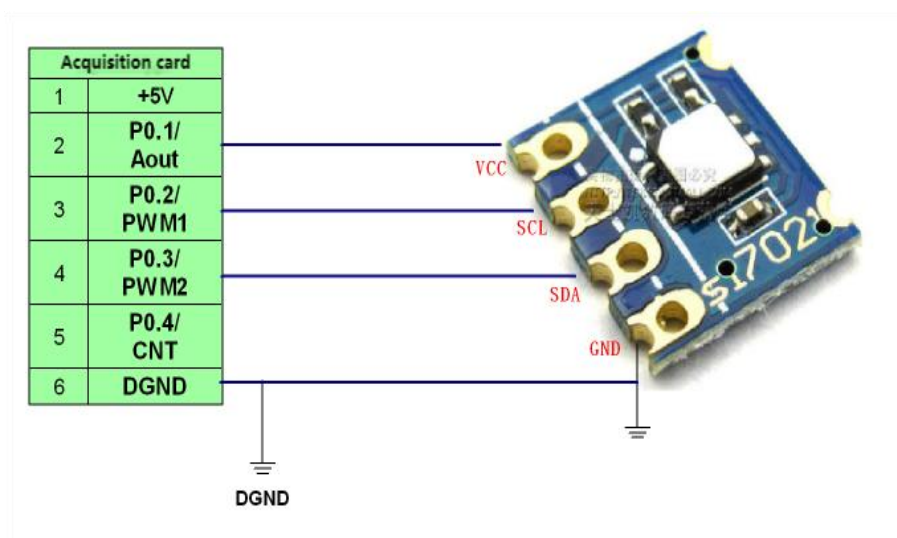


3.7 Any digital port can be connected to a digital temperature sensor.



Any digital port of the acquisition card can be equipped with an 18B20 digital temperature sensor to read out the temperature value directly, and the cable length of the digital temperature sensor can be up to 5 metres.

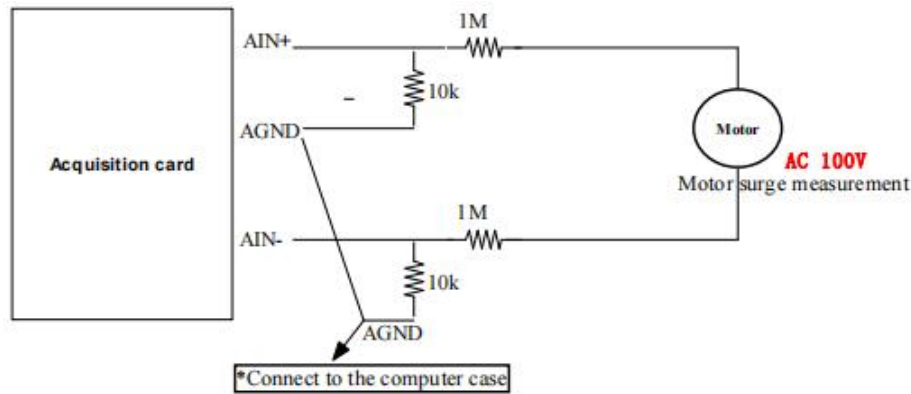
3.8 Digital port for digital temperature and humidity sensors (SI7021 only)



3.9 Measurement of strong interference signals

When the input signal is strong and carries interference, the interference can cause USB communication to be disconnected. This can be measured in the following way:

Increase the input buffer resistor (*Common ground between the computer and the source of interference, the interference signal does not pass through the USB cable, thus ensuring stable communication)

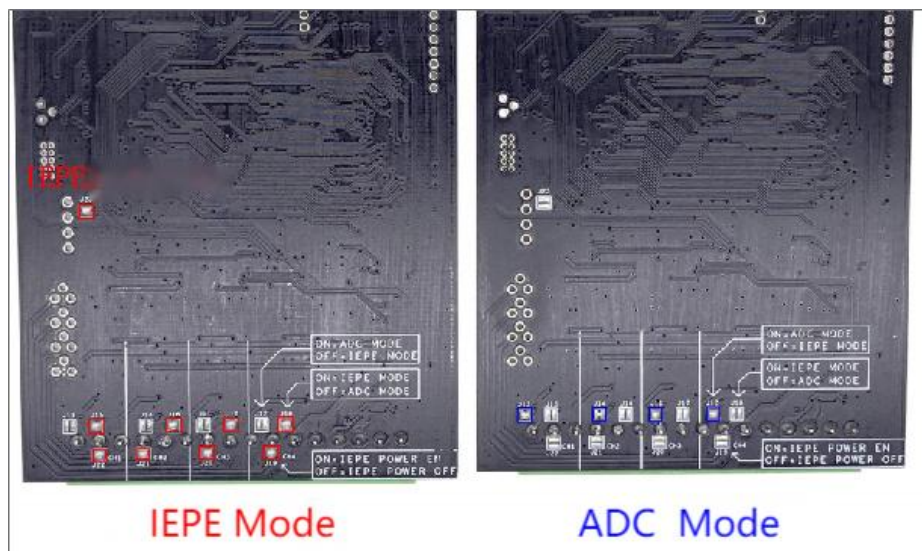


*Industrial applications: We do not recommend the use of USB type acquisition card in high demand industrial applications, because USB is mainly designed for convenience. Highly demanding industrial applications we recommend the use of LAN network port type, with strong anti-interference ability, can be transmitted over long distances to control the advantages of detailed reference to our official website.

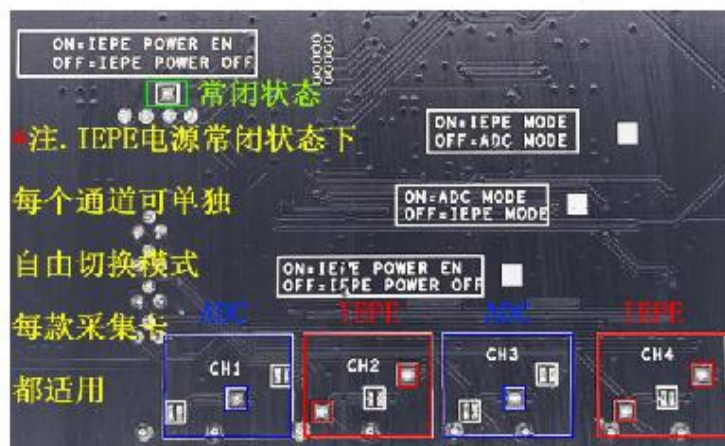
3.10 IEPE Description of the model

This acquisition card is available with optional IEPE function. The acquisition card with IEPE function will be integrated with 24V power supply unit, constant current driver and

The 4 channels can be individually set as normal ADC input or IEPE sensor access by hardware jumper, and the software selection method is not supported for the time being. The hardware jumper settings are as follows:

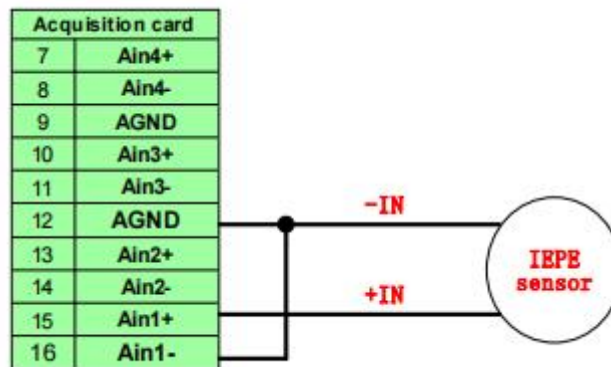


如下图说明，IEPE 电源开关跳线为常闭状态，每个通道自由切换模式



3.11 Input port to IEPE sensor

When connecting the IEPE sensor, connect AIN- and AGND together as the negative input and AIN+ as the positive input.



Power status indicator (next to USB port)

Acquisition status indicator (red and blue two-in-one LED)

- 1、Red and blue LED lights are all off state: normal acquisition is in progress
- 2、Blue light flashes non-stop: indicates that the sampling stop state, waiting for a new command to restart sampling, standby state
- 3, the red light will flash a little: is being collected if the sampling data overflow, or data errors
- 4、Red light is always on: indicates that the data can not be sent, or USB failure.

4. Quick installation and easy testing

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

4.1 Installation of driver and test software

Our accompanying test software is designed for evaluation testing purposes, and various development routines are provided in the package. Once installed, the test software is ready to run.

4.2 Simple use of test software for testing

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



5. Advanced: Brief description of programming and development

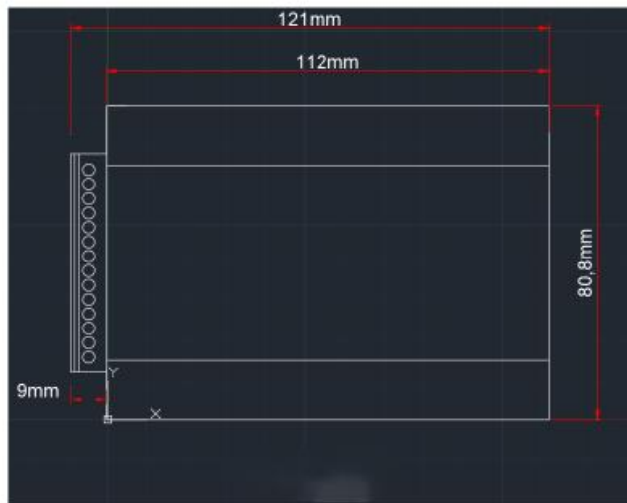
We provide DLL development mode, user configuration and development more convenient and concise.

This capture card 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.

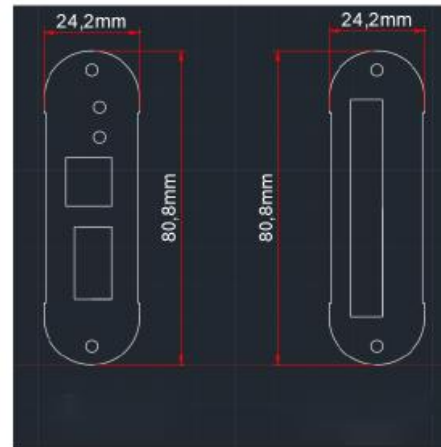
For more details, please refer to the folder "Programming Related" in our package.

6. External dimensions and installation

Normal version

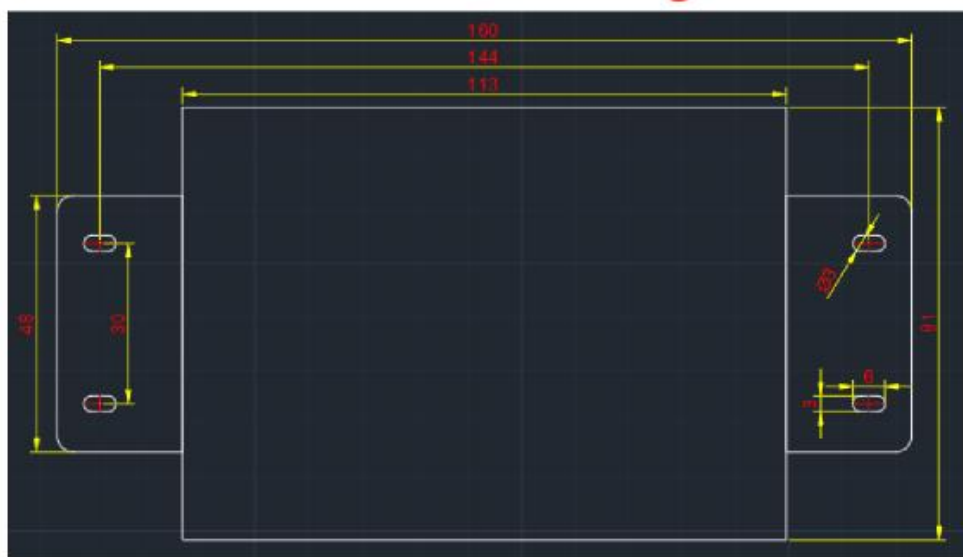


positively



lateral side

Version with mounting ears



7. 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 need to install the driver, please refer to the detailed steps in 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 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1, If the USB power supply is used, ensure the quality of the USB cable. If the voltage drop of the cable is too low, it may 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
Large temperature drift	<ol style="list-style-type: none"> 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.	<ol style="list-style-type: none"> 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 <p>If still can not be solved, please contact our after-sales personnel</p>	Usually caused by incorrect power supply
Issues related to the VK701x host computer software		Please refer to the VK701x Software User's Guide included in the packet.

8. After and Warranty

一. 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.

二. 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.

三. 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.

9. Edition and Revision History

Releases	Clarification	Times
V1.00	First version	2023.02.01
V1.10	Add some functions and related descriptions	2023.05.11
V1.20	Add SD storage related descriptions	2023.08.21
V1.30	Deletion of drafting errors	2023.11.13

Contact Us

Shenzhen Vkinging Electronic Co.,Ltd

Company Address : 19th Floor, Tongfang Centre Building, Haoxiang Road, Xinqiao Street, Bao'an District, Shenzhen, China

Company phone number: 0755-36932986

Sales Contacts: 13632611979 (Miss wang) Email: wln@vkinging.com

Technical Contacts: 13723462445 (MR Yao) Email: mike_yao@vkinging.com

after-sales service: 13713506352 (MR Wang) Email: wangbo@vkinging.com