Signal Conditioning Module Application Notes 2018

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1. The Function of signal conditioning module

1.1 Eliminate the interference from the multi-point grounding design

Lots of automated instruments, control units and actuators are applied for monitoring and control in the industrial production process. Due to the potential difference between the potential references of each instruments which caused by multiple-point grounding design, signal distortion happens in the transmission process. With the isolated signal conditioning module, the signal distortion caused by grounding loop would be effectively avoided.

1.2 Isolation and anti-interference

Low-voltage devices are frequently used to measure and control high-voltage, high-current analog applications. If there is no electrical isolation between analog and digital circuits, the energy in the high power circuits may destroy the system and cause a safety incident. The signal conditioning modules isolate the field ends and the monitoring center, improve the CMRR of the high common-mode voltage system to keep the system from being damaged by the lightning surge and ensure the human safety.

1.3 Signal Conversion & Long Distance Transmission

In the PLC & DCS system, various signals collected by the sensors in the field ends need to be converted into industrial standard signals for transmission. Normally, the signal transmission capability of the sensor is very weak, which requests signal conversion such as converting the voltage signal into a current signal to improve the signal anti-interference ability. And the long-distance transmission ability and facilitates interface compatibility are improved. On the other hand, it is convenient to use the signal conditioning module to convert and transfer the signal between the monitoring center and the actuators for improving the stability of the signal transmission.

1.4 Achieve differential signal input and improve load capacity

As the differential signal is highly immune to external EMI, it has stronger anti-interference ability in the long-distance transmission. In addition to differential signal, the signal conditioning module can also receives the common mode signal and isolates it to a differential signal for transmission to improve the load capacity. Moreover, the signal conditioning module can be applied for signal interface matching, signal distribution and isolation purpose.

2. Introduction of the signal conditioning module

The signal conditioning module is also called an isolation transmitter. It is a module that converts analog signals such as dc voltage signal, current signal and resistance signal into different isolated signal type. Linearity, accuracy, bandwidth, isolation withstand voltage and signal distortion are very important in this process. Engineers can choose a proper part according to the application. Designed with the unique magneto electric isolation technology, our signal conditioning module has small signal distortion, and factory default(zero and full scale) calibration have been set. Unlike optocoupler isolation which causes light decay during long-term use that

can lead to poor linearity and zero drift, our signal conditioning module does not have this problem and it is stable, safe and reliable.

2.1 Active High Precision TxxxxP Series

The TxxxxP series adopts four-isolation technology. The input signal port, output signal port, input power port and output power port are all isolated. The basic principle block diagram is as below:

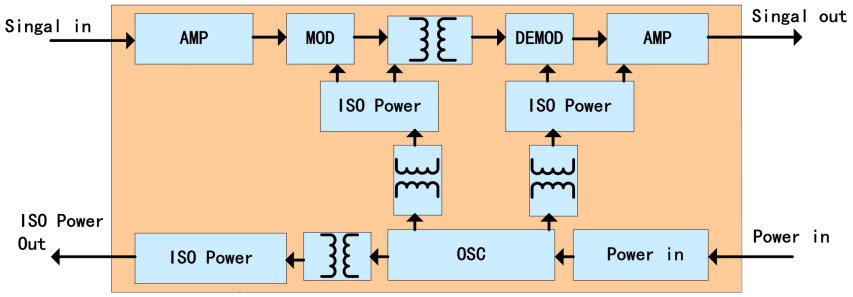


Fig 1. TxxxP series

TxxxxP series signal conditioning module provides different solutions according to the type of input signal such as voltage/current signal and mV voltage signal.

Table 1. List of TxxxxP Series

Series	Input Signal	Output Signal	ISO Power
TxxxxP	0~20mA, 0~10V	0~20mA, 0~10V	Support
TxxxxAP	±10V	4~20mA, 0~10V	Support
TxxxxCP	±10V	±20mA, ±10V	Support
TMxxxxP	0~100mV	0~20mA, 0~10V	N/A
TMxxxxAP	±100mV	4~20mA, 0~10V	N/A
TMxxxxCP	±200mV	±10V	N/A

2.2 Active high precision TExxxxN series

The TExxxxN series uses two-isolation technology, also known as detective signal conditioning module. The output signal port and the input power port share the same ground, and the input signal share the same ground with the output power port. The external zero and full-scale adjustment pins are available to meet the special demand of customers. The basic principle block diagram is as below:

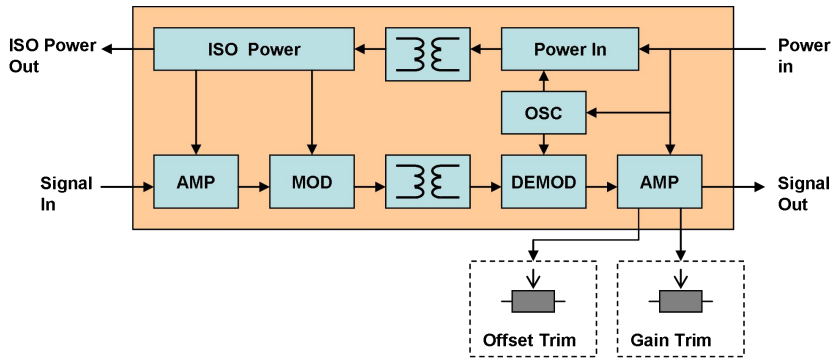


Fig 2.TExxxxN Series

TExxxxN series signal conditioning module provide different solutions according to the type of input signal such as voltage/current signal and mV voltage signal.

Table 2. List of TExxxxN Series

Series	Input Signal	Output Signal	ISO Power
TExxxxN	4~20mA，0~10V	0~10V	Support
TExxxxAN	±10V	0~10V	N/A
TExxxxCN	±10V	±10V	N/A
TEMxxxxAN	±100mV	0-5V	N/A
TEMxxxxCN	±200mV	±10V	N/A

2.3 Active high precision TFxxxxN series

The TFxxxxN series uses two-isolation technology, also known as output signal conditioning module. The output signal is common grounded with the power output port, and the input signal is common grounded with the power input port. The external zero and full-scale adjustment pins is as below:

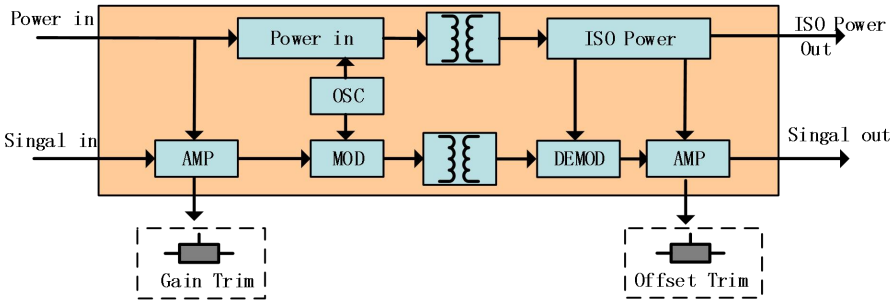


Fig 3. TF Series

TFxxxxN series signal conditioning module provides a variety of solutions as below according to different types of input signals and output signals:

Table 3. List of TExxxxN Series

Model	Input Signal	Output Signal	ISO Power
TFxxxxN	0~10V	0~20mA，0~10V	Support
TFxxxxGN	0~5V	±10V	N/A
TFWxxxN	PWM（0-100）	0~20mA，0~10V	N/A

2.4 Passive high precision signal conditioning module series

The T1100L series adopts a unique electromagnetic isolation technology, which can transmit the 4~20mA signal of the two-wire equipment to the secondary equipment for detection. With the loop power technology, the module gets power from the Input loop or output loop to support the pre-stage two-wire equipment. Receiving 0/4~20mA current signal from the two-wire equipment and transmit to the back-end detection equipment. The basic principle block diagram is as below:

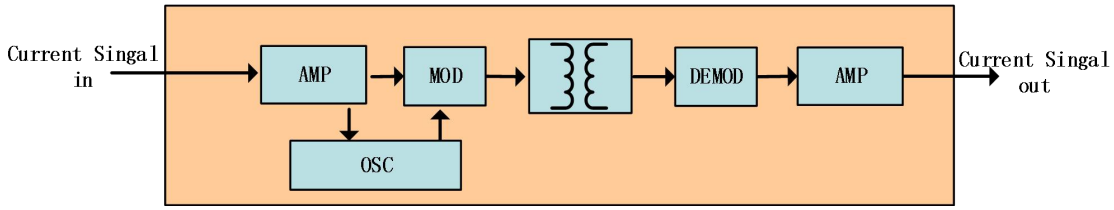


Fig 4. Passive Series

The passive signal conditioning module provides a variety of solutions as below, according to whether it supports loop power mode or not.

Table 4. List of Passive Series

Model	Input Signal	Output Signal	Loop-powered
T1100L	4~20mA	4~20mA	Support
T1100L-F	4~20mA	4~20mA	N/A

2.5 Two-wire instrument isolated interface TxxxL series

The two-wire instrument interface isolation module uses high-efficiency loop power technology to power the sensors in the field, and convert the voltage signal or PWM signal transmitted from the sensors into a standard current signal output which is applicable to Hart protocol. The module solves the problem of power supply and signal conversion of the intelligent two-wire instruments in field. The basic principle block diagram is as follows:

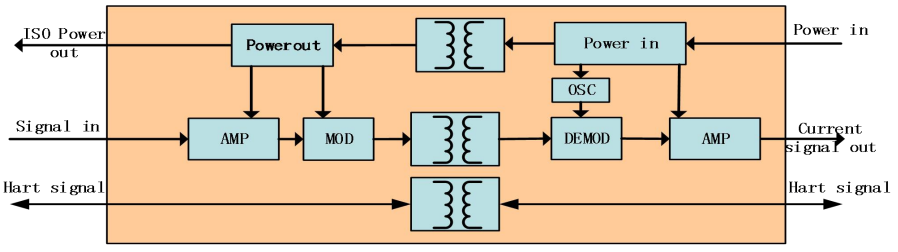


Fig 5. Txxx(H) L Series

With different type of input signal and whether Hart protocol is required, the module provides solutions as below:

Table 5. List of Txxx(H) L

Model	Input Signal	Output Signal	Hart Protocol
TxxxL	0~2.5V	3.7~22mA	N/A
TxxxHL	0~2.5V	3.7~22mA	Support
TWxxxHL	PWM（0~100%）	4~20mA	Support

3. The typical application of the signal conditioning module

3.1 The typical application of signal acquisition

The signal acquisition & control system includes signal acquisition interface, signal transmission interface, communication interface, power supply interface, and signal processing system. The MCU cannot directly process the signal from sensors such as pressure, position, speed, temperature, flow, humidity, sound and light, graphic recognition and other signals. Therefore, the conversion of the signal from sensors is a must to the MCU. Our signal conditioning module not only provides a complete signal acquisition and signal transmission isolation solution, but also converts, isolates and transfers the power signal of the field sensor and the execution power signal of the field actuator.

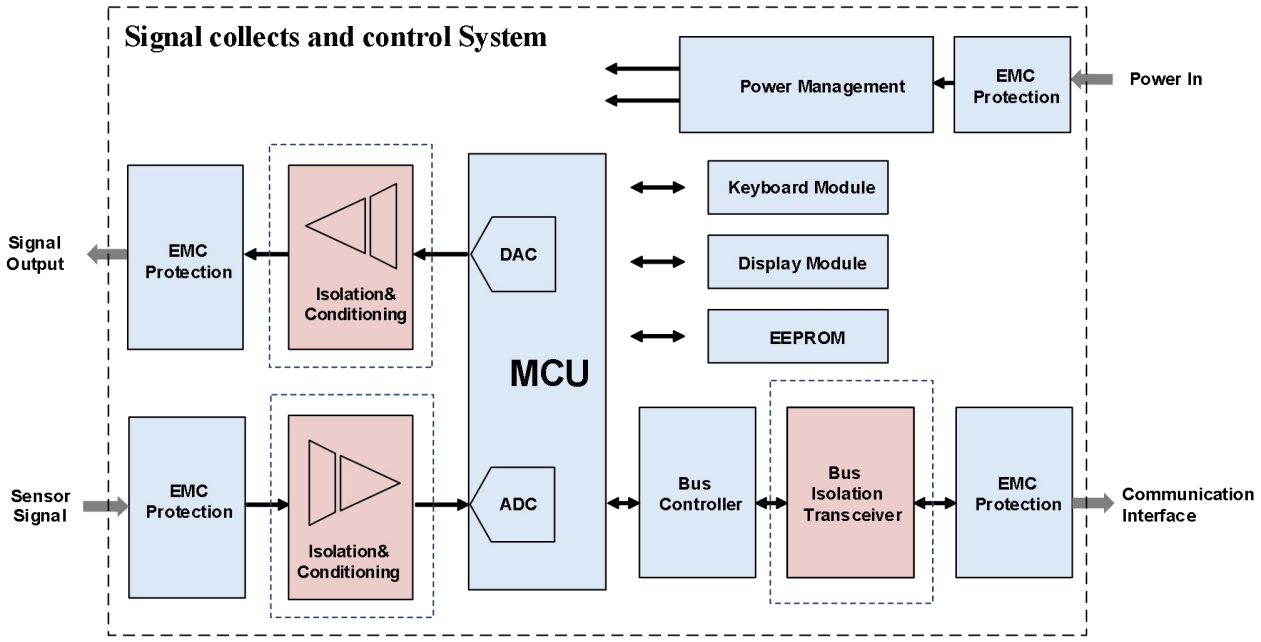


Fig 6. Typical Block Diagram of Signal Acquisition & Control System

3.2 The multi-channel signal acquisition interface circuit

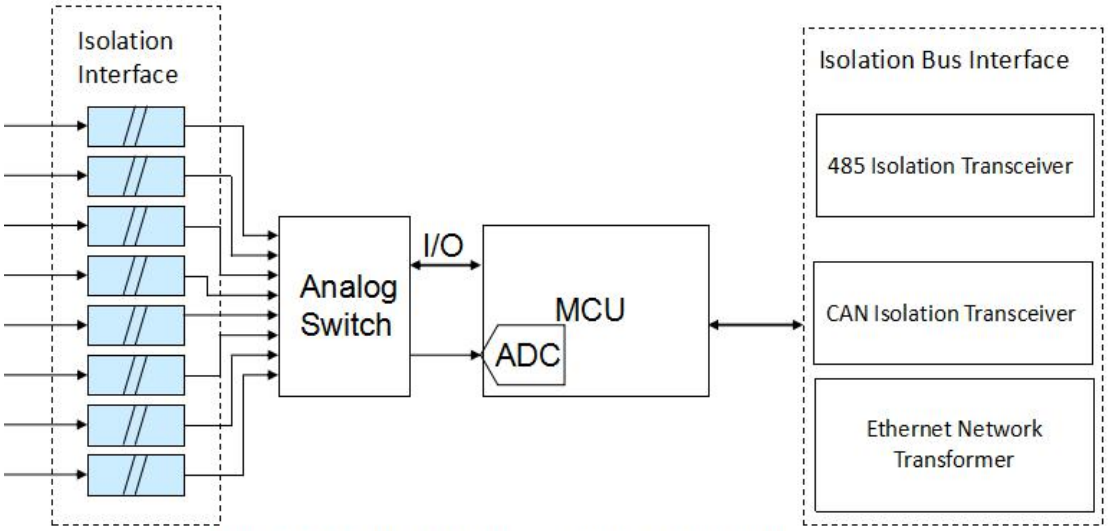


Fig 7. DCS System AI Interface Isolation Application

3.3 The multi-channel transmission interface circuit

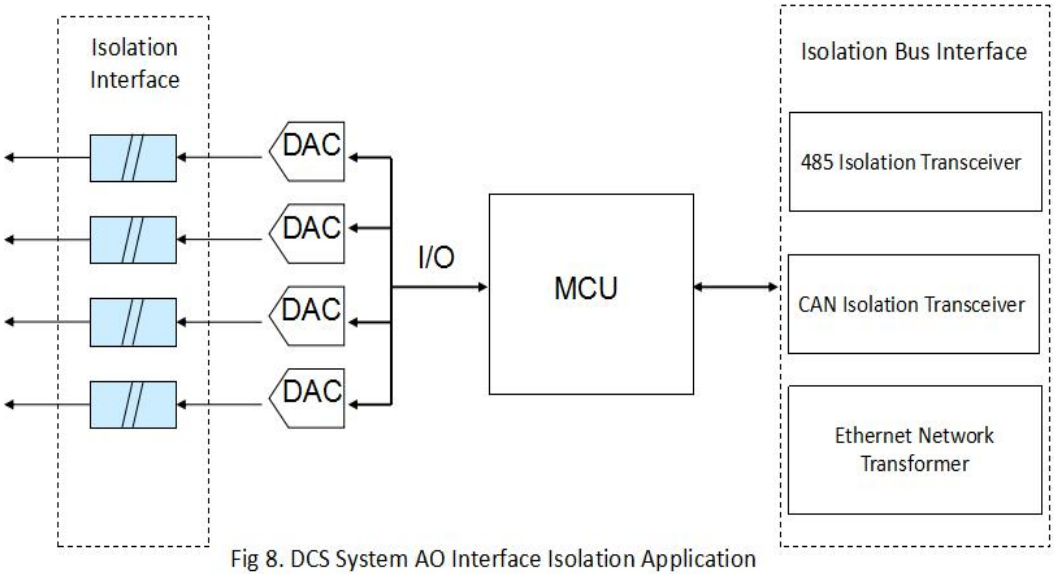
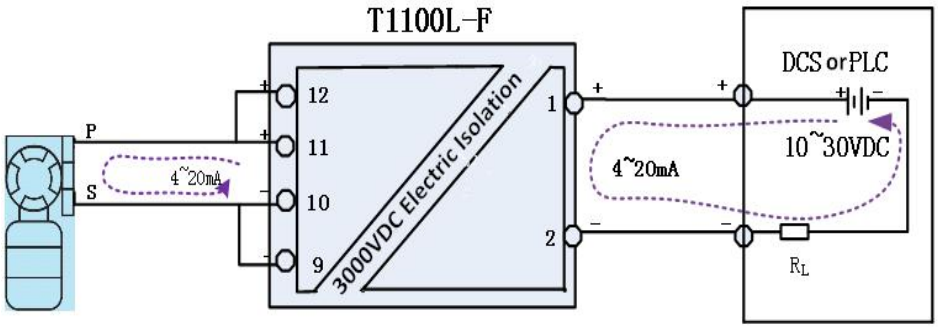
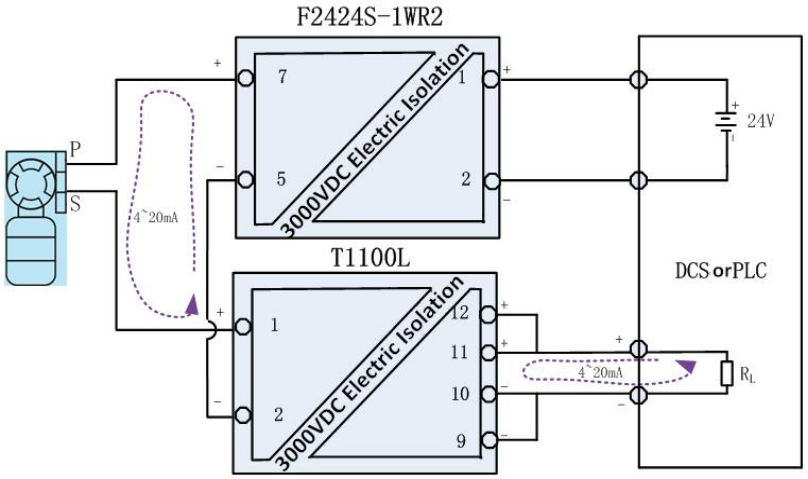


Fig 8. DCS System AO Interface Isolation Application

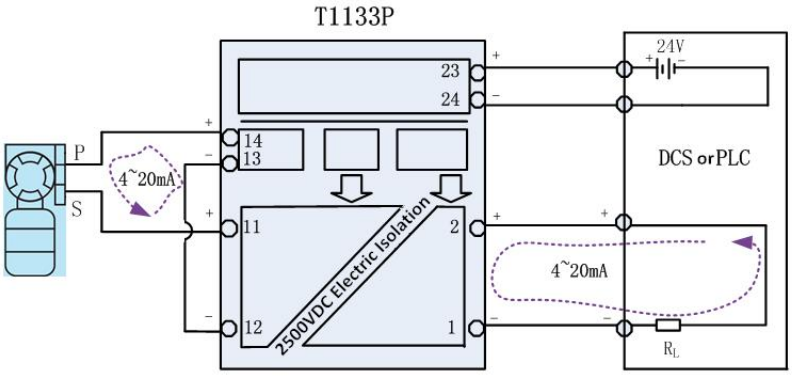
3.4 The wiring diagram of two-wire signal acquisition interface circuit



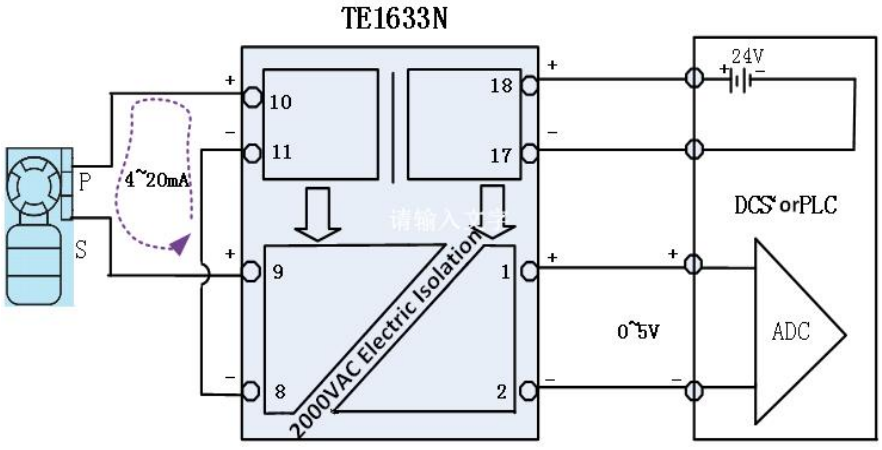
Sample One - the wiring diagram of the Passive Series Conditioning Module



Sample Two - the wiring diagram of the Passive Series Conditioning Module



Sample One - the wiring diagram of the Active Series Conditioning Module



Sample Two - the wiring diagram of the Active Series Conditioning Module

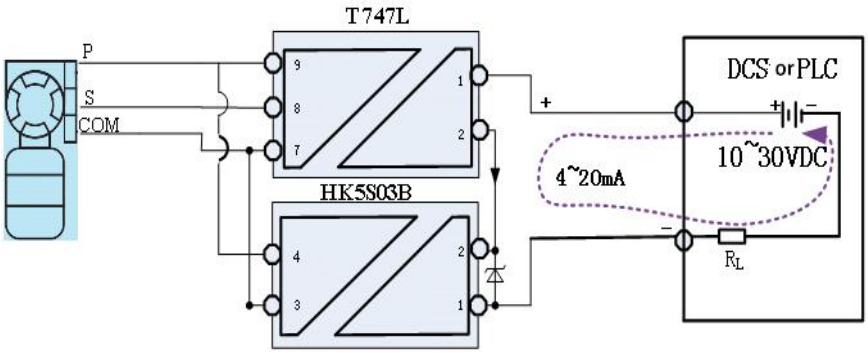


Fig 9. The wiring diagram of the two-wire instrument interface module