

# Signal conditioning module

TxxxxHL-F Series

MORNSUN®

Two-wire Self-Powered signal conditioning module with HART



## FEATURES

- Convert voltage to current and offer isolated power output
- Self-powered, no external supply required
- High accuracy (0.1% F.S.)
- High linearity (0.1% F.S.)
- High isolation voltage(2KVAC/1mA/60s)
- Small size: SIP9 (26\*9.5\*12.5mm)
- Extremely low temperature drift:50ppm/°C
- Operating temperature range: -40° C ~ +85° C
- High ESD protection(±4KV)
- HART compatible

TxxxxHL-F is a specific with HART smart field instruments launched signal conditioning modules. The isolation module is designed for transmitting the input voltage signal to the output isolation current that the value is a standard 4~20mA through output loop-powered, the module can offer a isolation micro-power for the pre-devices. The module also has an integrated HART signal channel, according to the recommended solutions, it can realize the Half duplex communication of The field and control area, which greatly reduce the wiring cost between the field and the control area.

The module adopts unique electromagnetic isolation mode and high performance level after. The module achieves the function of transmitting voltage signal to a 4 ~ 20mA standard signal isolation accurately conversion, which be used in a variety of instruments analog input port (such as PLC, DCS systems, etc.) to match.

In addition, this module has extremely small form factor (SIP9) and excellent temperature drift characteristics (at -40 °C ~ +85 °C operating temperature range drift is less than 50PPM / °C), this module can bear 2KVAC isolation voltage between the input and output.

## Selection Guide

Part No.	Loop powered voltage (VDC)	Input Signal(VDC)	Output Signal(mA)	Isolation Power Output (VDC)
TS107HL-F-2.5	10~24	0.5~2.5	4~20	3.3
TS106HL-F-2.5	10~24	0.5~2.5	4~20	5

Notes: Customization products are available if required.

## Input Specifications

Item	Operating Conditions	Value
Input Power Supply	Loop Power supply	See selection guide
	Max. supply voltage	30V(modules work with 30V power supply for long time, or at no-load condition maybe damaged by over-heat)
Input	Input signal	See selection guide
	Input impedance	≥ 10M Ω
	Overload	≤ 5V

## Output Specifications

Item	Operating Conditions	Value
Isolation Power	Output voltage	See selection guide
	Output voltage accuracy	TA=25°C
	Max. load current	TA=25°C
	Short circuit protection	Continuous, auto-recovery
Output	Output signal	See selection guide
	Load capacity	$RL \leq (V_{in} - 10) / 0.02 \Omega$ , $V_{in}$ is supply voltage
	Load regulation	24V Power supply, 0~600 Ω load
	Ripple & noise	250 Ω / 0.01 μF load

## Transmission Specifications

Item	Operating Conditions	Value
Zero Offset		0.1%F.S.
Transmission Error		0.1%F.S.

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Temperature Drift	Operating temperature range of -40 to +85° C	≤50ppm/°C
Communication	Vp-p≤250mV	Support bidirectional transmission of HART signal frequency
HART Signal Transmission Gain		0.8~1.0

## General Specifications

Item	Operating Conditions	Value
Electric Isolation		Two-terminal isolation(input and output are mutually isolated)
Isolation voltage	testing for 1 minute, leakage current <1mA, humidity <70%	2.0KVAC
Insulation Resistance	500VDC	≥100MΩ
Operating Temperature		-40℃~+85℃
Transportation and Storage Temperature		-50℃~+105℃
Max Casing Temperature	Ta=25℃,24V Power supply, 250Ω load	≤50℃
Environment		The presence of dust, fierce vibration, impulsion and corrosive gas may cause damage to the product.

## Physical Specifications

Casing Material	WH8100-F (1)
Package	SIP9
Weight	8g(Typ.)
Cooling	Free convection

## EMC Specifications

EMI	Conducted Emission	CISPR22/EN55022	CLASS A	
	Radiated Emission	CISPR22/EN55022	CLASS A	
EMS	Electrostatic Discharge	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	EFT	IEC/EN61000-4-4	Two-wire loop port ±1KV(line to ground) (see Fig. 4 for recommended circuit)	perf. Criteria B
	Surge Immunity	IEC/EN61000-4-5	Two-wire loop port ±1KV(line to ground) (see Fig. 4 for recommended circuit)	perf. Criteria B

## User Instruction

1. Please read the instructions carefully before operating.
2. Do not use the product in hazardous areas.
3. Power supply must be DC input, 220V AC power supply is prohibited.
4. Do not dismount and assemble the product without permission to avoid failure or malfunction of equipment.

### After-sales service

1. Ex-factory inspection and quality control have been strictly conducted for the product; if there occurs abnormal operation or possibility of failure of internal module, please contact the local sales channel or our technical support.

2. 3 years warranty.

### Applied circuit

Please refer to Isolated Transmitter Application Notes

## Design Reference

### 1. Typical application

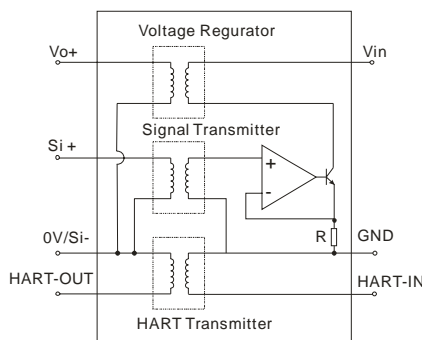


Fig. 1 signal conditioning module functional diagram

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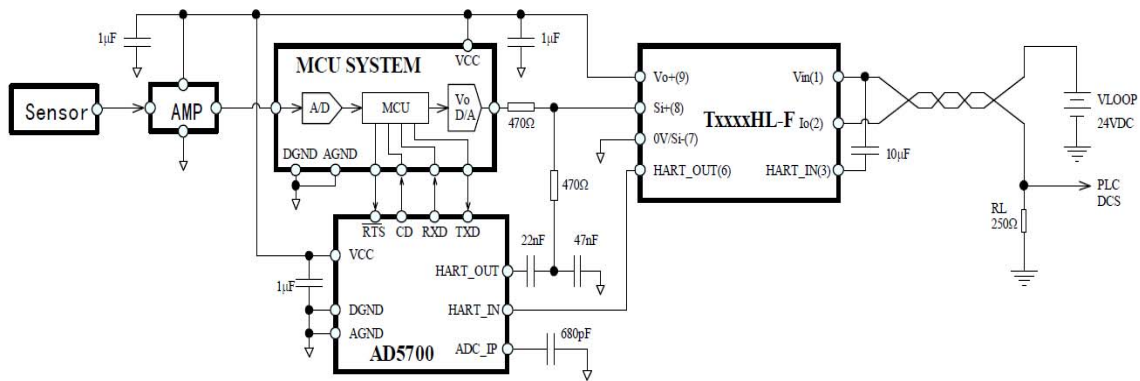


Fig. 2 field area HART communication application

### Description

Fig.2 shows a typical application of the Signal conditioning module TxxxxHL-F. MCU system, HART modem IC AD5700 and the signal conditioning module TxxxxHL-F work together for the communication between smart field devices and control systems .

### The transmission of analog signal

As Fig.2, the signal conditioning module taking energy from the output current Loop to supply its internal dissipation, at the same time , it could provide one isolated power Vo +, for the MCU system and the other smart field devices . The Analog signal comes from sensor, after the AMP module, it is received by the MCU system, when the signal is output from the MCU system, it should be a voltage signal that match with the Signal conditioning module TxxxxHL-F at the range of voltage, at last, the voltage signal is converted to standard 4 ~ 20mA signal within the two-wire current loop.

### HART send

the signal conditioning module TxxxxHL-F didn't provides a single channel for HART signal transmitting from field area to control systems, but a common channel with analog signal. With a few external components, the signal which come from MCU, is modulated and added into the analog signal, and they will be send to control systems together. The peak voltage of HART signal must be consider before communication, the peak voltage of the Hart Signal that output by AD5700 is too high to match the range of TxxxxHL (500mV typically, see the datasheet of AD5700 for details ) , two external capacities of 22nF and 47nF is recommended to drop Voltage.

### HART detect

Working with a external 10 μ F capacity, TxxxxHL-F can detect HART signal which is contained in the two-wire loop-circuit by the HART\_IN PIN (PIN 3) . After the condition of TxxxxHL-F, HART signa has been Transmitted to field area, at last, HART signal is demodulated by IC AD5700, for the reading of MCU. By the way, HART signal could not be demodulated by IC AD5700 if its amplitude is lower then the value of specification (100mV typically, see the datasheet of AD5700 for details ) . In this condition, the peak voltage of HART signal which is send by control system should be upgraded.

### Application without HART

The hole system which shown in Fig.2 , provides a solution for the Transmitting of the sensor signal to the 4 ~ 20mA standard current signal and the HART communicating between smart field devices and control systems, what's more, all the connections between field area and control area are only two analog wires, therefore, lowe cost for systems is possible. In the control systems, a resistor RL should be concluded for the detecting of common instruments. If the function of HART communicating is not necessary, please remove the HART modem IC A5700 in the system, and do not connect the HART\_IN PIN and HART\_OUT PIN of TxxxxHL-F into any circuits.

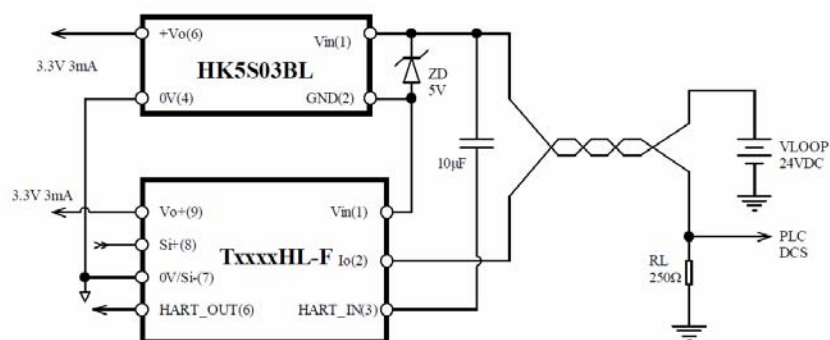


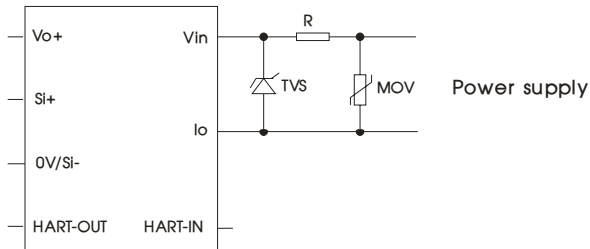
Fig. 3 Power capacity expansion program of field area

### Description

Fig.3 shows another typical application of TxxxHL-F, in order to expand the power supply to field area, a power module HK5S03BL is added into the system.

As Fig.3 shows, the capacity of TxxxHL-F power supplying is 3mA, so it is with HK5S03BL, so there are two powers the field area, two the capacity of power supplying up to 6mA.

### 2. Recommended EMC circuit

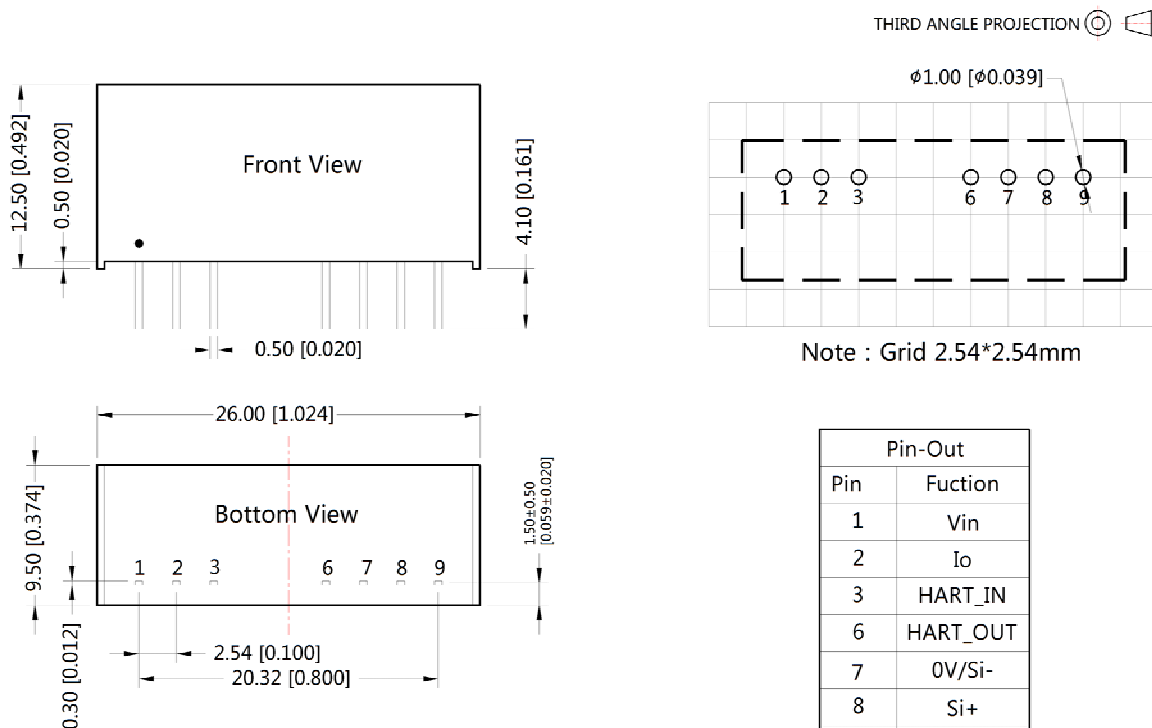


Components	Recommended parameters
MOV	7D560K
R	12 $\Omega$ /2W
TVS	SMBJ30A

Fig. 4 EMC recommended circuit

3. For more information please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

## Dimensions and Recommended Layout



Note:

Unit :mm[inch]

Pin section tolerances : $\pm 0.10[\pm 0.004]$

General tolerances: $\pm 0.25[\pm 0.010]$

Notes:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number: 58240002;
2. Unless otherwise specified, data in this datasheet should be tested under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75% when inputting nominal voltage and outputting rated load;
3. All index testing methods in this datasheet are based on our Company's corporate standards;
4. The performance indexes of the product models listed in this datasheet are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technician for specific information;
5. We can provide product customization service;
6. Specifications of this product are subject to changes without prior notice.

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