






**Speed Measurement &
Over-speed Protection Module
AM721-S11
User manual
IM23H50-E**

Notices
<ul style="list-style-type: none"> ● The reproduction, transmission or use of this document or its contents is not permitted without express written authority. ● Information and specifications in this document are subject to change without notice. ● While information in this document is well edited and checked, mistake or omission may exist. Please don't hesitate to contact SUPCON if you have any question about this document. ● Please contact SUPCON via email "SMS@supcon.com" if you have any question.

Trademarks
<p>Trademarks or marks SUPCON, SPlant, Webfield, ESP-iSYS, MultiF, InScan, SupField are all registered, registering or using by Zhejiang SUPCON Technology Co., Ltd., which owns the properties of all trademarks or marks above. Without the written authority from Zhejiang SUPCON Technology Co., Ltd, no individual or company shall use any trademarks or marks above. We reserve the right to take legal action for any individual or company using trademarks or marks above illegally.</p>

Symbol Definition	
	WARNING: Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	RISK OF ELECTRICAL SHOCK: Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	ESD HAZARD: Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user.

Security& Caution Symbols

The following table lists Security& Caution symbols used on equipments.














No.	Symbol	Description
1		Direct current (DC)
2		Alternating current (AC)
3		Ground (Earth) terminal
4		Protective earth (ground) terminal
5		Reference ground (Earth) terminal
6		Frame or chassis
7		Equipotentiality
8		On (power)
9		Off (power)
10		Caution, risk of electric shock
11		Caution, hot surface
12		Caution, risk of danger
13		Electrostatic sensitive devices (ESD)

Table of Contents

Speed Measurement & Over-speed Protection Module AM721-S11.....	1
Section 1 Description.....	1
Section 2 Technical Specifications	2
Section 3 Usage Instruction	3
3.1 Signal Type.....	3
3.2 LED Indicator.....	3
3.3 Interface Features	3
3.4 Base/Terminal Board Selection	5
3.5 Special Function Block Instruction	5
Section 4 Application	8
4.1 Fault Diagnosis and Troubleshooting	8
Section 5 Revision.....	9

Speed Measurement & Over-speed Protection

Module AM721-S11

Section 1 Description

AM721-S11 is an intelligent module for speed measurement and over-speed protection for steam turbine control system. Used with terminal board TU711-R1100, it composes the speed measurement and over-speed protection I/O unit of the Digital Electro-Hydraulic Control System (DEH).

AM721-S11 can receive the electric signal from the magnetic resistance sensor to get the accurate speed of turbine. At the same time, it can receive the grid connected switch tripping signal and emergency shut-down signal, both of which are DI dry contact signals and commands from operator station, then the module will send out ON/OFF signal of over-speed protection and over-speed limit, which can drive over-speed protection electro-magnetic valve and emergency braking electro-magnetic valve by the relay and perform the over-speed limit and protection for the turbine.

AM721-S11 supports single network operation. It contains acceleration signal calculation function and can exchange data with the servo module directly to response to the single network operation control rapidly.

AM721-S11 has power swapping function, and can plug the module directly when the system power is on without any disturbance.

Section 2 Technical Specifications

Table 2-1 Technical Specifications

Parameter		Description
Model		AM721-S11
Power supply		24V DC (-10%~10%)
Temperature	Operating Temperature	-20℃~70℃
	Storage Temperature	-40℃~85℃
Humidity	Operating Humidity	10%RH~90%RH, No Vapor Condensation
	Storage Humidity	5%RH~95%RH, No Vapor Condensation
Redundancy		Not Support
AI	Frequency	1Hz~15kHz
	Signal Range	0.04V~50V (Peak-to-Peak Value*)
	Teeth Number	1~200 (Generally 60)
	Measurement Cycle	>100Hz 10ms
	Accuracy	±0.5 RPM**
	Isolation Voltage	Photoelectric Isolation of Field and System, 500V AC, 50Hz, 60s
DO, Relay (Normally Open)	Output Type	Relay Output
	Power Supply	24V (Redundant)
	Isolation Voltage	Photoelectric Isolation of Field and System, 500V AC, 50Hz, 60s
DI, Dry Contact	Input Type	Dry Contact
	Power Supply	24V Supply the Module
	Short Circuit Current of Input Loop	<4.5mA
	Input Impedance	5.0kΩ
	Isolation Voltage	Photoelectric Isolation of Field and System, 500V AC, 50Hz, 60s
	ON Resistance	<1 kΩ
	OFF Resistance	>100 kΩ



Tips:

*: according to the rotation speed measurement theory, the range of signal generated by the sensor increases with the rotation speed. The module will eliminate the signal of low range value and high frequency.

**： ±1RPM@0~200RPM ±0.5RPM@200RPM~4000RPM

Section 3 Usage Instruction

3.1 Signal Type

Signal Type	Channel Number	Function
AI	1	Sine Wave Signal, Rotation Speed Measurement
DO, Relay (Normally Open)	1	103% Alarm Output
	1	110% Alarm Output
DI, Dry Contact	1	Grid Connected Switch Tripping Signal (When Tripping it is ON, or it is OFF)
	1	Emergency Shut-down Function(When Shut-down it is ON, or it is OFF)

3.2 LED Indicator

Table 3-1 LED Indicators in AM721-S11

LED Indicator	Fault (Red)	Status (Green)	Duplex (Green)	L-Bus (Green)	Supply (Green)
Description Status	Fault Indicator	Running Indicator	Work/Stand by Indicator	Communication Indicator	Power Supply of Channel Status Indicator
OFF	Normal	--	--	Communication Link Break	Abnormal
ON	Fault	Normal	Work	Normal	Normal
Flash	--	No Configuration	--	IP Conflicition	--

3.3 Interface Features

Interface circuit of the module is shown as the following figures. The terminal board TU711-R1100 can connect with three AM721-S11 modules. Figures below take the terminal corresponding to the No.1 module as example for connection instruction. Other details please refer to the *TU711-R1100 User Manual*.

The rotation speed signal input interface circuit is shown in Figure 3-1 V_{ISO} is the isolation power.

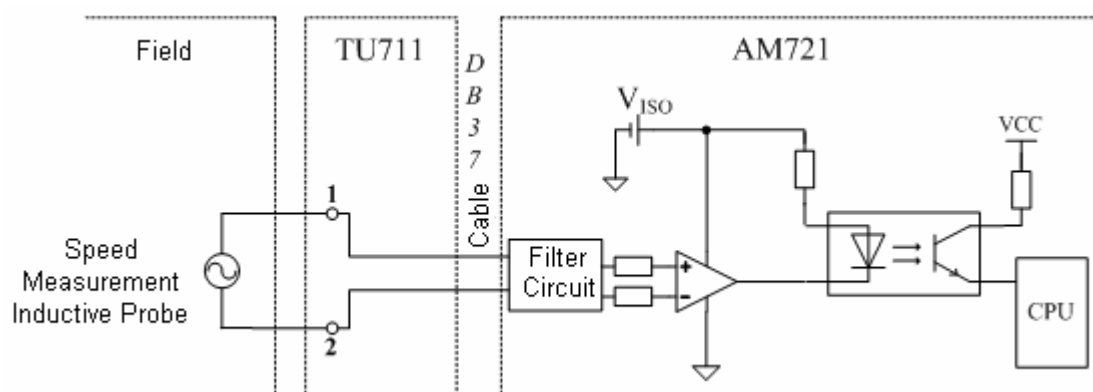


Figure 3-1 Rotation Speed Signal Input Interface Circuit

The grid connected switch tripping or emergency shut-down signal input interface circuit is shown in Figure 3-2. It connects with No.5 terminal and No.6 terminal when inputting signals like field grid connected switch tripping, and connects with No.7 terminal and No.8 terminal when inputting signals like field emergency shut-down.

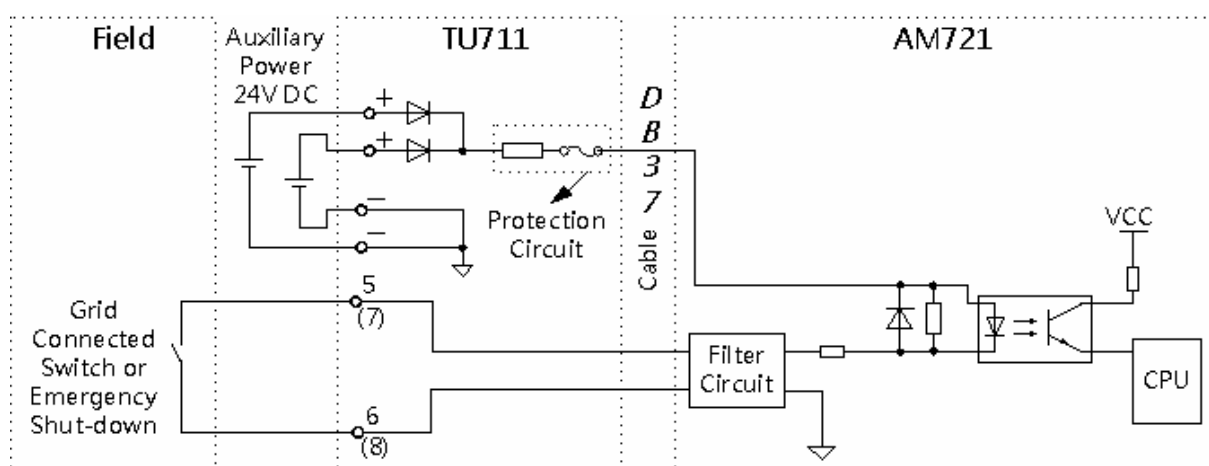


Figure 3-2 Grid Connected Switch Tripping or Emergency Shut-down Signal Input Interface Circuit

Select two of the three alarm output interface circuit is shown in Figure 3-3. It connects with No.27 terminal and No.28 terminal when over-speed 103% protection “select two of the three” outputting, and connects with No.31 terminal and No.32 terminal when over-speed 110% protection “select two of the three” outputting.

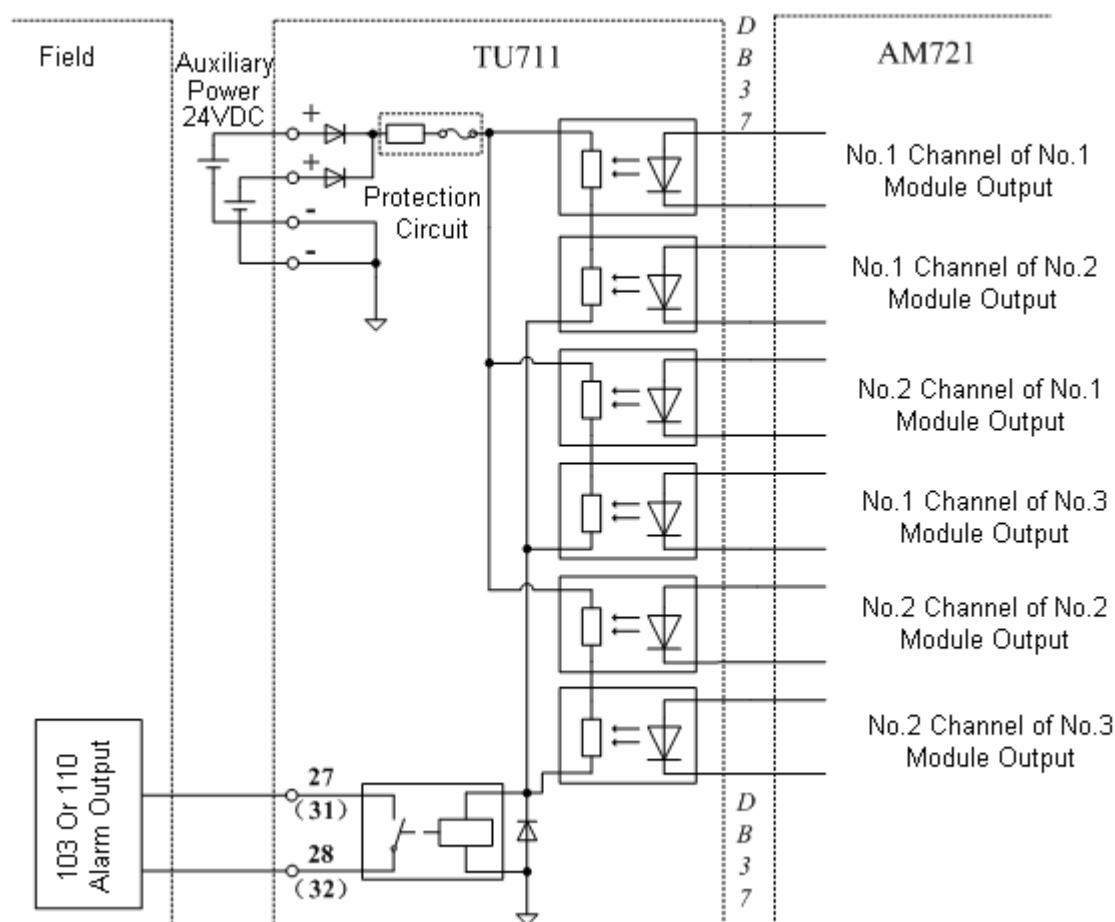


Figure 3-3 Alarm Output Interface Circuit of “Select Two of the Three”

3.4 Base/Terminal Board Selection

AM721-S11 connects with the field by TU711-R1100. One TU711-R1100 can connect with three AM721-S11 modules by DB37 cable.

Table 3-2 Base/ Terminal Board Selection for AM721-S11

Signal Connection	Module Operating Mode	Base Model	Terminal Board Model
Terminal Change-over	Single Module	MB745-S	TU711-R1100

3.5 Special Function Block Instruction

AM712-S11 should work with some special function blocks.

The SPEEDTST function block is shown as below, the hided pin can be changed in software.

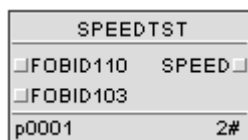


Figure 3-4 SPEEDTST Function Block

The parameters settings are shown as below.

Table 3-3 Parameter Instruction

Name	Type	Initial Value	Description	Parameter Property	Remarks
Basic Parameters					
Hardware Configuration					
NODE	USINT	0	Node Serial No. [0~7]	Configuration Parameter	-
RACK	USINT	0	Rack Serial No. [0~3]	Configuration Parameter	-
IOM	USINT	0	Module Serial No. [0~15]	Configuration Parameter	-
Extended Parameter					
Input Pin					
ENOVSPD	BOOL	OFF	Allow Machine Over-speed Experiment (OFF=Forbidden, ON=Allow)	Input Pin	-
FOBID110	BOOL	OFF	110 Protection Prohibit Sign (OFF=Start, ON=Forbidden)	Input Pin	Default Pin
FOBID103	BOOL	OFF	103 Limit Prohibit Sign (OFF=Start, ON=Forbidden)	Input Pin	Default Pin
Output Pin					
SPEED	REAL	0	Rotation Speed (RPS)	Output Pin	Default Pin
ACC	REAL	0	Acceleration (r/min/s)	Output Pin	-
110POUT	BOOL	OFF	110 Protection Output Status (OFF=Not Output, ON=Output)	Output Pin	-
103LMOUT	BOOL	OFF	103 Limit Output Status (OFF=Not Output, ON=Output)	Output Pin	-
TSTOVSPD	BOOL	OFF	Machine Over-speed Experiment Status (OFF=Not in Over-speed Experiment, ON= In Over-speed Experiment)	Output Pin	-
Operation Parameter					
ENFREQ	BOOL	OFF	Anti-interference Frequency Measurement Enable (OFF=Disable, ON=Enable)	Operation Parameter	-
103DO1	BOOL	OFF	103 Limit Output 1	Operation Parameter	-
103DO2	BOOL	OFF	103 Limit Output 2	Operation Parameter	-
110DO1	BOOL	OFF	110 Protection Output 1	Operation Parameter	-
110DO2	BOOL	OFF	110 Protection Output 2	Operation Parameter	-

Name	Type	Initial Value	Description	Parameter Property	Remarks
EN3SW2	BOOL	OFF	"Select Two of the Three" Logic Experiment Enable (OFF=Closed, ON=Open)	Operation Parameter	-
Status Supervision					
TSTFREQ	BOOL	OFF	Anti-interference Frequency Measurement Status (OFF= Not in Anti-interference Frequency Measurement Status, ON= In Anti-interference Frequency Measurement Status)	Supervision Parameter	-
110FOBID	BOOL	OFF	110 Protection Prohibit Status (OFF= Not Forbidden, ON=Forbidden)	Supervision Parameter	-
103FOBID	BOOL	OFF	103 Limit Prohibit Status (OFF= Not Forbidden, ON=Forbidden)	Supervision Parameter	-
OILTRIP	BOOL	OFF	Grid Connected Switch Tripping Status (OFF=Not Tripping, ON=Tripping)	Supervision Parameter	-
EMSTOP	BOOL	OFF	Emergency Shut-down Action (OFF= Not in Emergency Shut-down, ON= Emergency Shut-down)	Supervision Parameter	-
SPD15BAD	BOOL	OFF	Rotation Speed Input 15V Power Supply Fault (OFF= Normal, ON=Fault)	Supervision Parameter	-
STP24BAD	BOOL	OFF	Emergency Shut-down 24V Power Supply Fault (OFF= Normal, ON=Fault)	Supervision Parameter	-
OIL24BAD	BOOL	OFF	Grid Connected Switch Tripping 24V Power Supply Fault (OFF= Normal, ON=Fault)	Supervision Parameter	-
TU24BAD	BOOL	OFF	Terminal Board 24V Power Supply Fault (OFF= Normal, ON=Fault)	Supervision Parameter	-
SUPLYBAD	BOOL	OFF	Auxiliary Power Connection Fault (OFF=Normal, ON=Fault)	Supervision Parameter	-
FAIL	BOOL	OFF	Speed Measurement Channel Fault (OFF=Normal, ON=Fault)	Supervision Parameter	-
CFGERR	BOOL	OFF	Configuration Fault Alarm	Supervision Parameter	-
COMERR	BOOL	OFF	Communication Fault	Supervision Parameter	-
ERR	BOOL	OFF	Function Block Alarm	Supervision Parameter	-
Alarm Enable and Shielding					
AOF	BOOL	OFF	Module Alarm Shielding	Operation Parameter	Parameter Upload
ENALM	UDINT	0x0	Alarm Enable	Alarm Parameter	Parameter Upload
FLAG	UDINT	0x0	Flag	Output Pin	-

Tips:


- The Module will increase the protection value from 110% to 112%.
 - Users are suggested to enable the 110% protection function, and set the FOBID110 as OFF.
-

-
- When ENFREQ is ON, and the SPEED is greater than 500, the clutter with acceleration than 500 can be filtered out, otherwise anti-interference frequency measurement is invalid. If the actual application of the scene acceleration is greater than 500, the anti-jamming frequency should be disabled.
-

Section 4 Application

4.1 Fault Diagnosis and Troubleshooting

1. If the Fault indicator is generally ON, the module has serious fault and should be replaced.
2. If the L-Bus indicator is OFF, users should check the communication connection, and if it is normal, the module has fault and should be replaced.
3. If the L-Bus indicator is flash, it has address confliction. Users should check the conflicted modules in the bus.
4. If the Supply indicator is OFF, please install module again. If the Supply indicator is also OFF, the module has fault and should be replaced.
5. If all indicators of the module are OFF after powered on, user should check the power connection. If it is normal, the module has fault and should be replaced.

Section 5 Revision

Table 5-1 Retrofit list of the version

Document Version	Applicable Module Version	Remarks
V1.0(20150121)	AM721-S11 V11.14.00 and later versions	
V1.1(20161116)	AM721-S11 V11.14.00 and later versions	Add code
V1.2(20170922)	AM721-S11 V11.14.00 and later versions	Modify some description