DC Input Dual SPDT Alarm Trips

API 1090 DIN
API 1090 DD

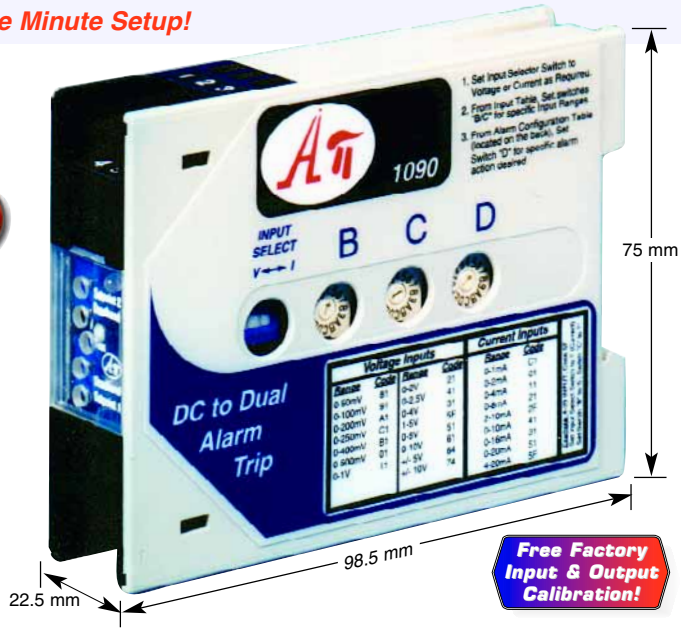
DC Input

Input: ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
Outputs: ***Two7 Amp SPDT Relays***

Field Selectable
One Minute Setup!

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***
- ***Compact 22.5 mm Wide DIN Package***
- ***Operates on Wide Ranges of AC or DC Power***

LIFETIME WARRANTY



Applications

- **Process Limit Backup Alarm**
- **Tank Level Alarm**
- **Over, Under, Out-of-Range Alarm**

Specifications

Input Ranges

	Minimum	Maximum
Voltage:	0-50 mVDC	±10 VDC
Current:	0-1 mADC	0-20 mADC

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

Input Impedance
Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

Input Voltage Burden
1.0 VDC typical at 20 mA

Input Protection, Common Mode
750 VDC or 750 VAC_p

Input Loop Power Supply
12 VDC±10%, regulated, 25 mA max. Max. ripple <1.5 V_{p-p}

LoopTracker
Variable brightness LED indicates input loop level and status

Relay Output
Two SPDT relays, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load

CAUTION: External contact protection such as an RC snubber is recommended for inductive loads.

Setpoint
12 turn potentiometer adjustable from 0 to 100% of span

Deadband
Adjustable from 1.0 to 100% of span, 12 turn potentiometer

Functional Test/Reset Button
Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

Response Time
70 milliseconds typical

Ambient Temperature Range and Temperature Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

Case Material
Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

Power
API 1090 DIN Any AC source 80 to 265 VAC 50/60 Hz, 2 W max. or any DC source 48 to 300 VDC, 2 W max.
API 1090 DD 9 to 30 VDC, 2 W maximum

Description and Features

The **API 1090 DIN** and **API 1090 DD** accept a DC voltage or current input and two independent SPDT alarm outputs via relay contacts when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relays independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton can be used to verify the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy duty relay contacts allow the module to directly control high capacity loads. The alarm outputs can be configured in the field for HI/HI, LO/LO, HI/LO or LO/HI operation, latching or non-latching, and normal or reverse acting (also referred to as fail-safe or non-fail-safe). Front-accessible, multi-turn potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoints from 0 to 100%.

Also standard on the **API 1090 DIN** and **API 1090 DD** is a 12 VDC regulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 1090 DIN** and **API 1090 DD** are designed to mount on an industry-standard DIN rail. The narrow 22.5 mm wide DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density.

Models, Options & Accessories

Free Setup—Specify input range and output range

API 1090 DIN Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 80-265 VAC or 48-300 VDC

API 1090 DD Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 9-30 VDC

Options—Add to end of model number

U Conformal coating for moisture resistance

Accessories—Order as a separate line item

API TK36 DIN rail, 35 mm W x 39" L, aluminum

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API 1090 DIN
API 1090 DD

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

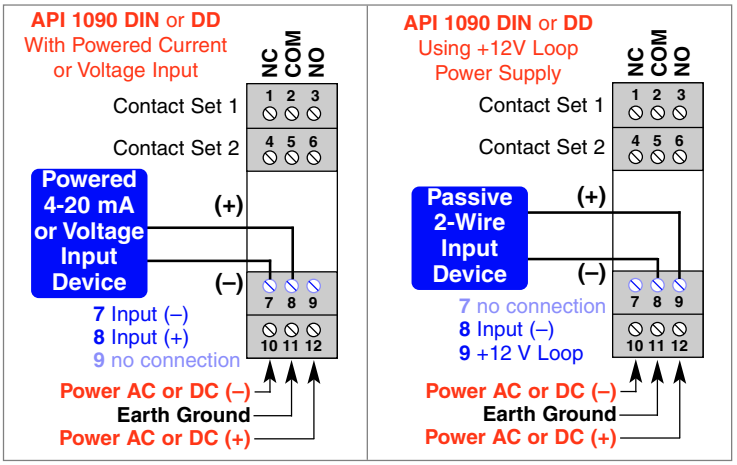
Power Input Terminals – API module power requirements are indicated on the side label. Connect power to terminals 10 and 12. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive signal (+) is connected to terminal 8 and the negative (–) is connected to terminal 7.

Using the 12 VDC Power Supply with a Passive Signal Input – This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically, the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

Relay Output Terminals – Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common).

WIRING EXAMPLES



RANGE SELECTION

The API 1090 DIN input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1090 DIN. Set switches A, B, C and D accordingly.

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current) B = **5** C = **F** D = **6**

VOLTAGE Inputs Set switch A to "V"		CURRENT Inputs Set switch A to "I"		ALARM CONFIGURATION			
Range	Switches B C	Range	Switches B C	SP1/SP2	Latch	Action	Switch D
0-50 mV	8 1	0-1 mA	C 1	HI/LO	No	Normal	6
0-100 mV	9 1	0-2 mA	0 1	HI/LO	No	Reverse	E
0-200 mV	A 1	0-4 mA	1 1	HI/LO	Yes	Normal	2
0-250 mV	C 1	0-8 mA	2 1	HI/LO	Yes	Reverse	A
0-400 mV	B 1	2-10 mA	2 F	HI/HI	No	Normal	4
0-500 mV	0 1	0-10 mA	4 1	HI/HI	No	Reverse	C
±50 mV	A 4	0-16 mA	3 1	HI/HI	Yes	Normal	0
±100 mV	B 4	0-20 mA	5 1	HI/HI	Yes	Reverse	8
0-1 V	1 1	4-20 mA	5 F	LO/LO	No	Normal	7
0-2 V	2 1			LO/LO	No	Reverse	F
0-2.5 V	4 1			LO/LO	Yes	Normal	3
0-4 V	3 1			LO/LO	Yes	Reverse	B
1-5 V	5 F			LO/HI	No	Normal	5
0-5 V	5 1			LO/HI	No	Reverse	D
0-10 V	6 1			LO/HI	Yes	Normal	1
±5 V	6 4			LO/HI	Yes	Reverse	9
±10 V	7 4						

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

SETUP

Setpoint Control – The multi-turn potentiometers (one for each setpoint) allow the operator to adjust the level at which each alarm is activated. These controls are adjustable from 0 to 100% of the input range.

Deadband Control – These potentiometers allow the alarm trip and reset windows to be adjusted symmetrically about the setpoint from 1 to 100% of the span for each setpoint. This allows the operator to fine tune the point at which each alarm trips and resets. It is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

Test Switch – The functional Test pushbutton toggles the alarm status independent of the input when depressed. It verifies the alarm and system operation without having to alter the input signal.

OPERATION

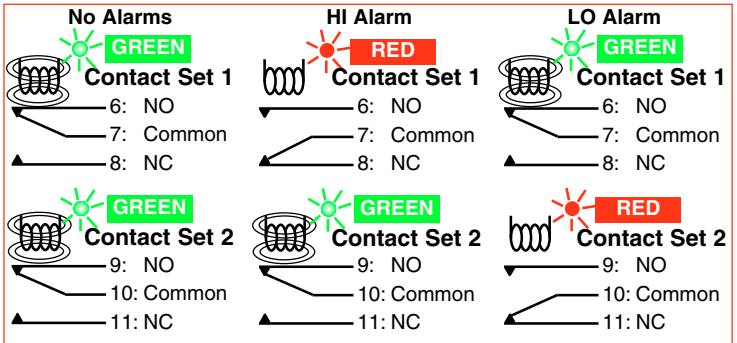
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, this may indicate a problem with module power or signal input wiring.

Bi-Color Alarm LED – Provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

Alarm Relays – In the normal mode of operation (failsafe), the relay coil is energized in a non-alarm condition and de-energized in an alarm condition. This will create an alarm condition if the module loses power. For a normal acting, non-latching configuration, the alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the alarm condition no longer exists.

For a reverse acting alarm (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition no longer exists.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.



API 1025 G Alarm States with Normal Action HI/LO Alarms

CALIBRATION

The input ranges are factory calibrated and no field calibration is required.

To calibrate the alarm section, set the deadband control to the minimum. Set the signal source to a reference that represents the desired trip point. Adjust the setpoint control to the point at which the relay changes state form a non-alarm to an alarm condition. The deadband will be 1.0% of span in this case.

If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and the output to verify system operation.

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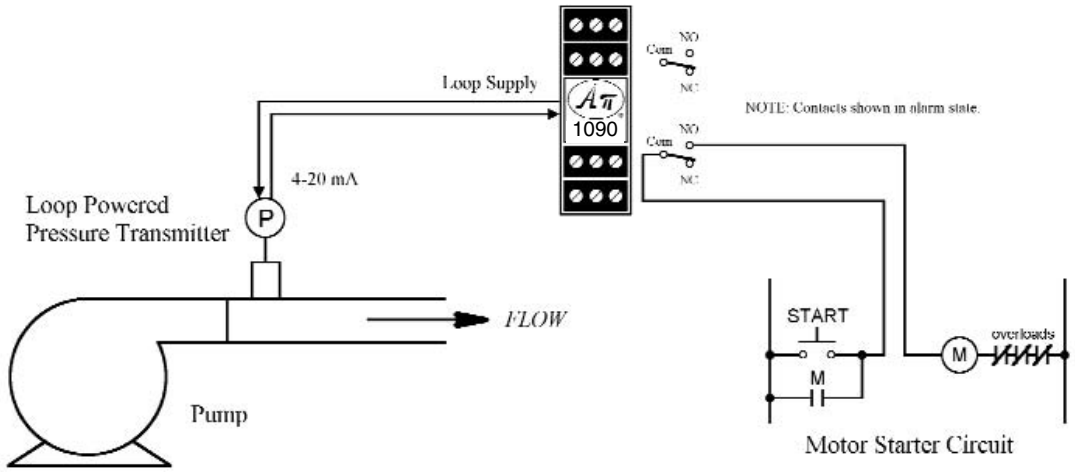
Pumping System High Pressure Shutdown

PROBLEM

High head pressure is causing pump failures. If the pressure exceeds a preset limit, the pump must be shut down. A manual reset is necessary to restart pump.

SOLUTION

A loop powered pressure transducer is installed at the discharge side of the pump. The pressure transducer is connected to an **API 1090 DIN** DC Input, Field Selectable Single Setpoint Alarm module.



The **API 1090 DIN** provides the loop power for the 4-20 mA pressure transducer from its built-in loop excitation supply. The setpoint is adjusted to the high pressure limit. The relay contacts are wired in series with the motor starter such that if the pressure is not below the setpoint, the pump will be stopped. It is necessary to press the START push button to restart the pump. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

Relay Protection and EMI Supression

When using Api alarm module relays to switch inductive loads, maximum relay life and transient EMI suppression is achieved by using external protection. All external protection devices should be placed directly across the load and all leads lengths should be kept to a minimum length.

For AC inductive loads (see Figure 1), place a properly rated MOV across the load in parallel with a series RC snubber. A good RC snubber consists of a 0.1 µF polypropylene capacitor of sufficient voltage and a 47 Ohm ½ Watt carbon film resistor.

For DC inductive loads (see Figure 2), place a diode across the load (1N4006 recommended) being sure to observe proper polarity. Use of an RC snubber is an optional enhancement.

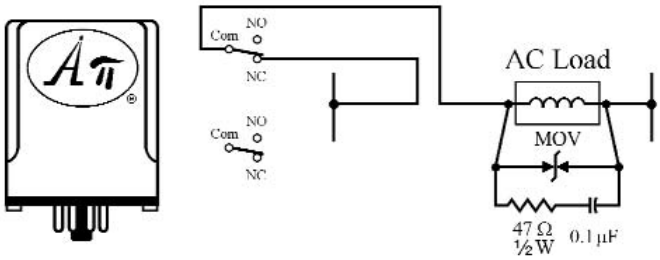


Figure 1: AC inductive loads.

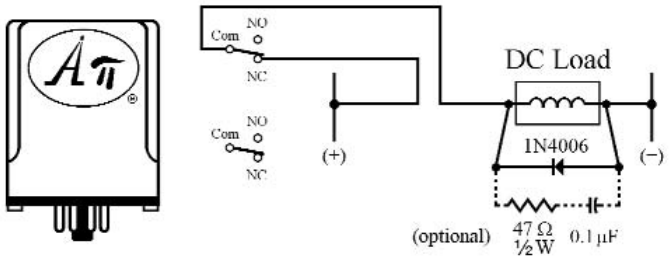


Figure 2: DC inductive loads.

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Frequently Asked Questions

1. **Do you recommend placing a fuse at the power input (115 VAC) for protection?**
   It is not required, but if desired, a ½ Amp Fast Blow fuse can be used for each module.

2. **We are using many different types of your signal conditioners, and wish to protect the inputs and outputs from short circuits and over voltage. How can we achieve this?**
   Applying a short circuit to any of the signal input terminals will not affect the modules. Exposing the signal input to high voltage will damage the unit but using a zener diode, due to its resistance value, will cause the input range to need recalibrating. Try a Varistor or TransZorb®. Do NOT under any circumstances short circuit the signal output, the unit can be damaged.

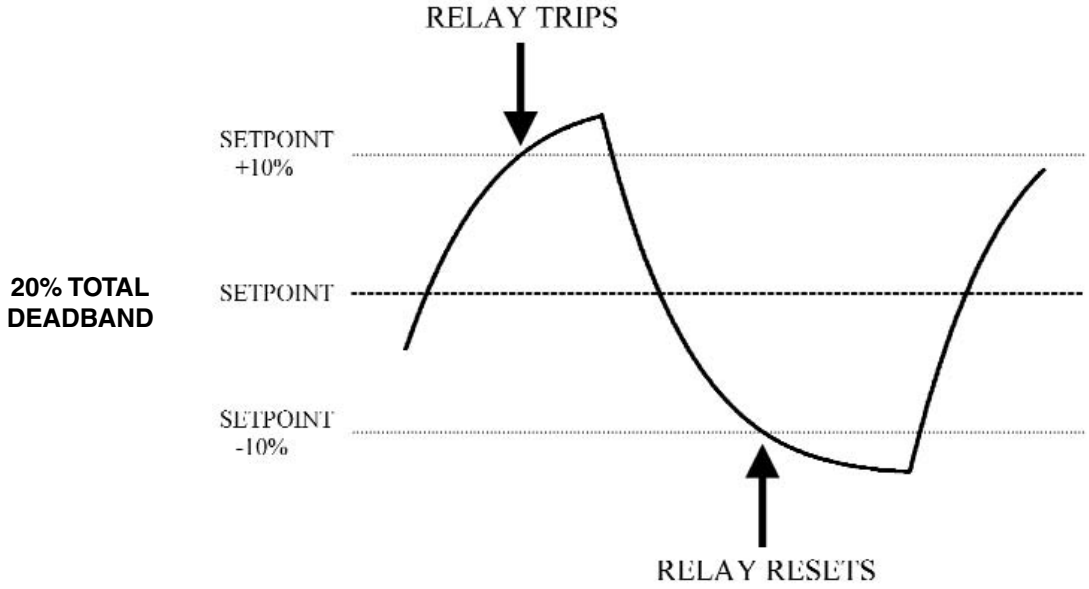
3. **Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**
   For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

4. **What are the relay contacts rated for in your alarm output modules for a motor load?**
   For inductive loads, our relay contacts are rated for 3.5 Amps Inductive at 250 VAC or 30 VDC.

5. **We have a relay alarm output and would like to adjust the set point for 5 VDC input and the reset point for 4 VDC input. How do we adjust the set point pot and the deadband pot to do this?**
   The deadband is the difference in the input signal between the points at which the relay energizes and de-energizes. The midpoint between the set and reset points is 4.5 VDC. Turn the deadband pot fully counterclockwise for minimum deadband. With a 4.5 VDC input signal, turn the set point pot until the relay changes state. Then, increase the the input signal to 5 VDC. Turn the deadband pot clockwise until the relay changes state.

6. **We have a 4-20 mA input and require 4 set points at the output. Do you have a product for this?**
   Yes, you can connect 2 of our **API 1020 G** units in series in the 4-20 mA input loop since the input impedance for current is 50 ohms and the drop is very low.

7. **What is Deadband?**
   Deadband is the range through which an input can be varied without initiating an observable response. Deadband is usually expressed in percent of span.
   EXAMPLE: A 20% total deadband is applied to the setpoint of a monitored parameter. The relay will trip and reset to its untripped state as indicated in the following graph.



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