

Q116-0000



ACTIONI/Q® Q116

AC Powered RTD Input Limit Alarm

Provides Relay Contact Closures
at a Preset RTD Input Level



- Field Configurable Input Ranges
- TouchCAL™ Technology
- Setpoints Programmable HI or LO and Failsafe or Non-Failsafe
- DIN Rail Mounting with IQRL
- Universal AC Power 85 to 265 VAC
- SnapLoc™ Plug-in Terminals
- ASIC Technology

Description

The ActionI/Q model Q116 is a DIN rail mount, RTD input limit alarm with dual setpoints and two contact closure outputs. The field configurable input and alarm functions offer flexible setpoint capability. There are up to eight temperature ranges available for each RTD type to ensure accuracy and maximize setpoint resolution.

The Q116 is configurable as a single or dual setpoint alarm, with HI or LO trips and failsafe or non-failsafe operation. Also included are adjustable deadbands (up to 100% of full scale input) for each setpoint and a universal AC power supply which accepts any voltage between 85 and 265VAC.

TouchCAL Technology

Action has simplified setpoint calibration. Using a pushbutton instead of potentiometers, improvements in calibration resolution are realized due to the elimination of the potentiometer's mechanical variability.

For calibration, simply input the signal level of the desired trip and press the pushbutton to store it in non-volatile memory. Deadband is entered the same way with another pushbutton press to store.

Diagnostic LEDs

The Q116 is equipped with three front panel LEDs. The green LED is a dual function LED labeled IN, which indicates line power and input signal status. Active AC power is indicated by the illuminated LED. If this LED is off, check AC power and wiring connections. If the input signal is 7% above or below the configured input range the green LED will flash at 8Hz or 4Hz, respectively.

The two red LEDs indicate the relay state of each setpoint. An illuminated red LED indicates the tripped condition for the respective setpoint.

Output

The Q116 is equipped with two SPDT (form C) relays, rated at 120VAC or 28VDC at 5 amperes. Each of these relays is independently controlled by the field configurable setpoint and deadband.

Operation

The Q116 limit alarm setpoints can be configured for HI or LO, failsafe or non-failsafe operation. Each of the setpoints has a respective HI or LO deadband. In a tripped condition, the setpoint is exceeded and the appropriate red LED will illuminate. The trip will reset only after the process falls below the HI deadband or rises above the low deadband (see Figure 1). For proper deadband operation, the HI setpoint must be set above the LO setpoint. In failsafe operation, the relay is energized when the process is below the HI setpoint or above the LO setpoint (opposite for non-failsafe). In the failsafe mode, a power failure results in an alarm state output.

Dynamic Deadband

Circuitry in the Q116 prevents false trips by repeatedly sampling the input. The input must be beyond the setpoint for 100 milliseconds, uninterrupted, to qualify as a valid trip condition. Likewise, the input must fall outside the deadband and remain there for 100 milliseconds to return the alarm to an untripped condition. This results in a “dynamic deadband” —based on time— in addition to the normal deadband.

Configuration

Unless otherwise specified, the factory presets the Model Q116 as follows:

- Input: Platinum (100 ohm)
- Range: 0 to 250°C
- Output: Dual, SPDT
- Trip: A: HI; B: LO
- Failsafe: No
- Deadband: A, B: 0.25%

The AC power input accepts any AC source between 85 and 265VAC.

Note: An I/Q Rail is required to power the modules. See ordering information.

For other I/O ranges, refer to Tables 1 through 4 and reconfigure switches SW1 and SW2 for the desired input type, range and function.

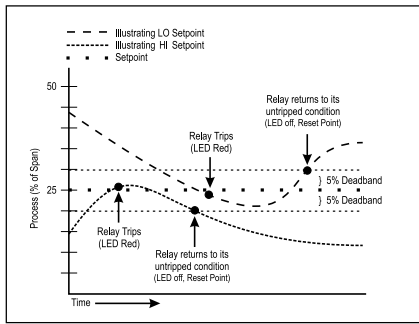


Figure 1: Limit alarm operation and effect of deadband.

WARNING: Do not change switch settings with power applied. Severe damage will result!

1. With the module removed from the rail and not powered, snap off the face plate by lifting the right edge away from the heatsink. Slide the heat sink off the module. Note the input switches (SW1 & SW2) are located under the heatsink. Set positions 1 through 8 on "SW2" and position 8 on SW1 for RTD type (see Tables 1 & 4).
2. Set position 1 through 4 of input range switch "SW1" for the desired RTD type and input temperature range (Table 3).
3. Set position 5 and 6 of input range switch "SW1" to ON (Closed) for a HI trip setpoint or OFF (Open) for a LO trip setpoint (Figure 6 & Table 2).
4. Set position 7 of input range switch "SW1" to ON (Closed) for non-failsafe operation or OFF (Open) for failsafe operation (e.g., alarm trips on power failure).

Calibration

1. After configuring the DIP switches, connect the input to a calibrated RTD source or a resistance decade box and apply power.

Note: For best results, calibration should be performed in the operating environment, mounted on a DIN rail, allowing at least one hour for thermal equilibrium of the system.

2. After applying power to the unit all three LEDs will flash for approximately 10 seconds. Adjust the input signal level for the Relay "A" setpoint. The green LED should be on. Press and hold the CAL button for 4 seconds (until the red LED starts flashing) to enter the calibration mode. The green LED will be on and the red Relay "A" LED will be flashing.

Note: If the green LED is flashing, the input is out of range (i.e. 7 % above or below the configured range). Check to make sure the input signal is within the DIP switch configuration range. Double check the DIP switch settings.

3. Setpoint "A": Input the desired trip level for Relay "A" and push the CAL button. The green LED and the red Relay "A" LED will be flashing. Note that the green LED will stop flashing when the input drops below a high setpoint or rises above a low setpoint.

4. Deadband "A": For minimum deadband (approximately 0.25%), press and hold the CAL button for 4 seconds. For high setpoints, lower the input level to the desired deadband point and push the CAL button. For low setpoints, increase the input level (green LED

turns off) to the desired deadband level and push the CAL button. The green LED will be on and the red Relay "B" LED will be flashing.

5. Setpoint "B": Input the desired trip level for Relay "B" and push the CAL button. The green and the red Relay "B" LED will be flashing. Note that the green LED will stop flashing when the input drops below a high setpoint or rises above a low setpoint.

6. Deadband "B": For minimum deadband (approximately 0.25%), press and hold the CAL button for 4 seconds. For high setpoints, lower the input level (green LED turns off) to the desired deadband point and push the CAL button. For low setpoints, increase the input level to the desired deadband level and push the CAL button. The green LED will be on and both the red LEDs will be flashing.

7. Press the CAL button once again to exit the calibration mode. Check the setpoint and deadband to validate calibration.

Relay Protection and EMI Suppression

When switching inductive loads, maximum relay life and transient EMI suppression is achieved using external protection (see Figures 2 and 3). Place all protection devices directly across the load and minimize all lead lengths. For AC inductive loads, place a properly rated MOV across the load in parallel with a series RC snubber. Use a 0.01 to 0.1mF pulse film capacitor (foil polypropylene recommended) of sufficient voltage, and a 47 ohm 1/2W carbon resistor. For DC inductive loads, place a diode across the load (PRV > DC supply, 1N4006 recommended) with (+) to cathode and (-) to anode (the RC snubber is an optional enhancement). For AC inductive loads, place a properly-rated MOV across the load in parallel with a series RC snubber. Use a 0.01 to 0.1mF pulse film capacitor (foil polypropylene recommended) with (+) to cathode and (-) to anode (the RC snubber is an optional enhancement).

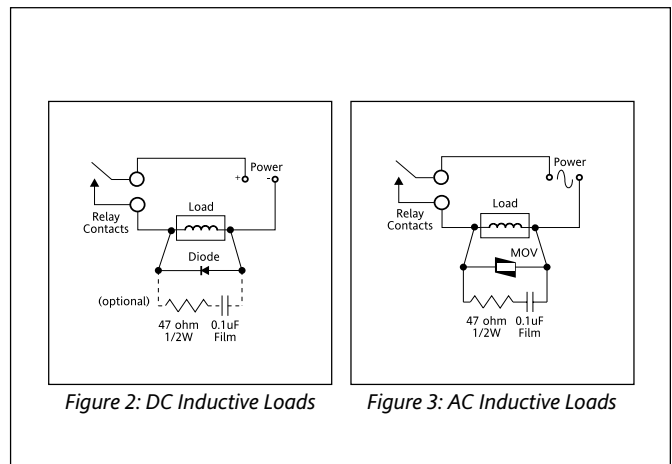


Figure 2: DC Inductive Loads

Figure 3: AC Inductive Loads

Table 1: RTD Input Type

RTD Input Type	Selector SW2					
	1	2	3	4	5	6
Cu10	■					■
Pt100, Cu100				■		
Pt500, NiFe604	■	■				
Pt1000		■				
Ni120				■		

Key: ■ = 1 = ON or Closed

Table 2: Setpoint Function

Setpoint Function	Selector SW1		
	5	6	7
Trip "B" HI	■		
Trip "A" HI		■	
Non-Failsafe			■

Key: ■ = 1 = ON or Closed

Table 3: Input Range

RTD Input Range	Selector SW1				Resistance (Ohms)
Pt100, 500, 1000 (alpha = 0.00385)	1	2	3	4	*Pt100
0 to 50 _i C (32 to 122 _i F)	■	■	■		100 to 119.4
-50 to 50 _i C (-58 to 122 _i F)	■	■			
0 to 100 _i C (32 to 212 _i F)			■	■	100 to 138.5
-100 to 100 _i C (-148 to 212 _i F)			■		60.2 to 138.5
0 to 250 _i C (32 to 482 _i F)	■	■	■		100 to 194.1
-200 to 250 _i C (-328 to 482 _i F)	■	■			18.5 to 194.1
0 to 550 _i C (32 to 1022 _i F)	■	■	■	■	100 to 297.4
0 to 850 _i C (32 to 1562 _i F)	■	■	■	■	100 to 390.3
Cu10	1	2	3	4	Cu10
25 to 70 _i C (77 to 158 _i F)	■	■	■		
-30 to 70 _i C (-22 to 158 _i F)	■	■			7.876 to 11.74
25 to 120 _i C (77 to 248 _i F)			■	■	10.0 to 13.67
-70 to 120 _i C (-94 to 248 _i F)			■		6.318 to 13.67
25 to 260 _i C (77 to 500 _i F)	■	■	■		10.0 to 19.116
-200 to 260 _i C (-328 to 500 _i F)	■	■			1.058 to 19.116
Cu100	1	2	3	4	Cu100
25 to 75 _i C (77 to 167 _i F)	■	■	■		100 to 115.5
-25 to 75 _i C (-13 to 167 _i F)	■	■			80.7 to 115.5
25 to 150 _i C (77 to 302 _i F)	■		■		100 to 148.3
-100 to 150 _i C (-148 to 302 _i F)	■		■		51.3 to 148.3
25 to 260 _i C (77 to 500 _i F)	■	■	■		100 to 191.2
-200 to 260 _i C (-328 to 500 _i F)	■	■			10.6 to 191.2
Ni120	1	2	3	4	Ni120
-30 to 30 _i C (-22 to 86 _i F)			■	■	99.4 to 142.1
-80 to 30 _i C (-112 to 86 _i F)			■		66.6 to 142.1
-30 to 100 _i C (-22 to 212 _i F)	■	■	■		
-30 to 200 _i C (-22 to 392 _i F)	■	■	■		99.4 to 303.5
-30 to 320 _i C (-22 to 608 _i F)	■	■	■		99.4 to 471.2
NiFe604	1	2	3	4	NiFe604
-40 to 0 _i C (-40 to 32 _i F)	■	■	■		499.1 to 604.0
-40 to 50 _i C (-40 to 122 _i F)	■		■		499.1 to 751.8
-200 to 50 _i C (-328 to 122 _i F)	■		■		245.3 to 751.8
-200 to 100 _i C (-328 to 212 _i F)	■		■		245.3 to 917.3
-200 to 240 _i C (-328 to 464 _i F)	■	■			245.3 to 1475.6

Key: ■ = 1 = ON or Closed

*Resistance values for Pt500 and Pt1000 are 5 and 10 times the resistance of Pt100, respectively.

Table 4: Excitation Type

RTD Excitation	SW1	SW2
3-wire RTD	8	7 8
4-wire RTD		

Key: ■ = 1 = ON or Closed

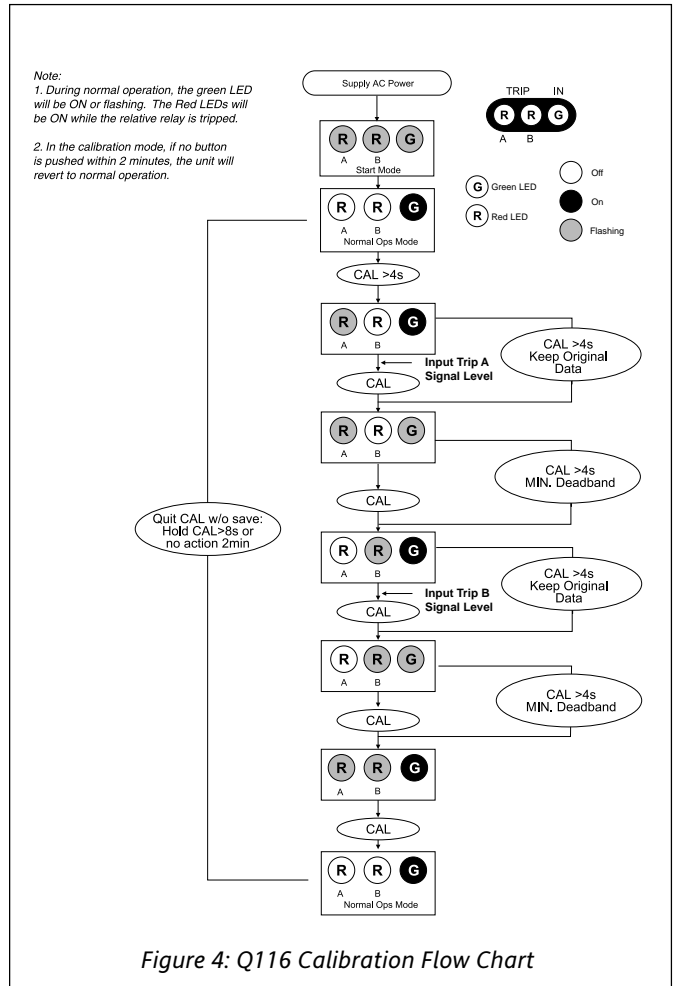


Figure 4: Q116 Calibration Flow Chart

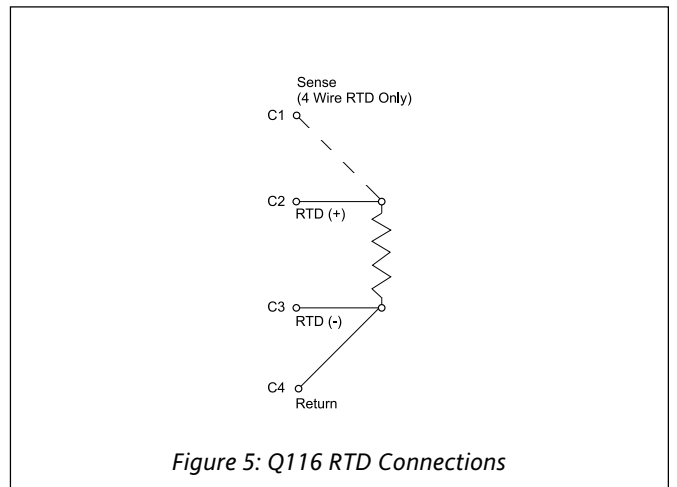


Figure 5: Q116 RTD Connections

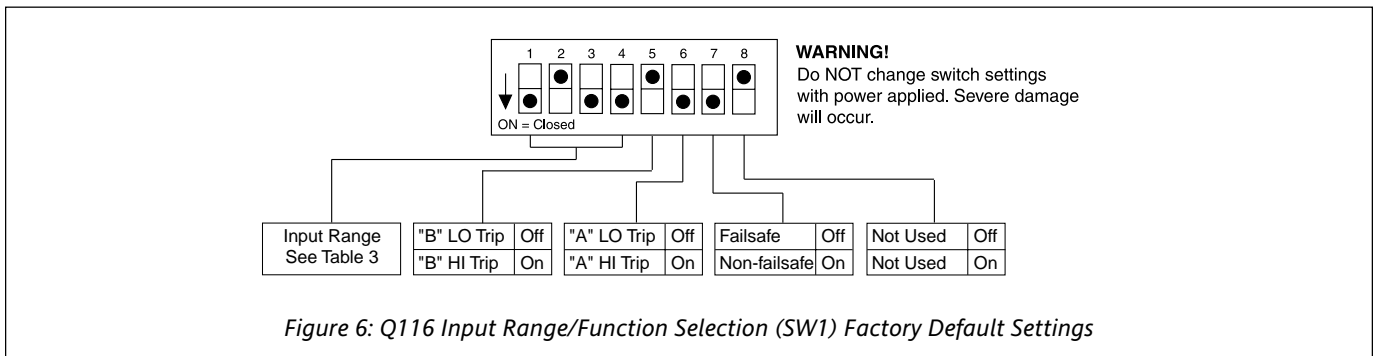


Figure 6: Q116 Input Range/Function Selection (SW1) Factory Default Settings

Specifications

Sensor Types:

Pt100, Pt500, Pt1000 (0.00385Ω/Ω/°C); Cu10, Cu100; Ni120, NiFe604

Sensor Connection: 3-wire.

Input Ranges: see Table 1.

Excitation Current (Maximum):

<2mA for Pt100, Pt500, Pt1000, Ni120, Cu100 or NiFe604

<10mA for Cu10

Leadwire Resistance:

40% of base sensor resistance or 100 ohms (whichever is less), maximum per lead.

Leadwire Effect:

Less than 1% of full scale over entire leadwire resistance range.

Input Protection:

Normal Mode: Withstands ±5VDC.

Common Mode (Input to Ground): 1800VDC, max.

LED Indicators:

Input Range (Green)

>110% input: 8Hz flash

<-10% input: 4Hz flash

Setpoint (Red)

Tripped: Solid red

Safe: Off

Limit Differential (Deadband): 0.25% to 100% of span

Response Time:

Dynamic Deadband: Relay status will change when proper setpoint/process condition exists for 100msec.

Normal Mode (analog filtering): <250mSec, (10-90%)

Setpoints:

Effectivity: Setpoints adjustable over 100% of the selected input span

Repeatability (constant temp.): ±0.2% of full scale

Ordering Information

Models & Accessories

Specify (model number)

- 1) **Q116-0000**
- 2) Specify I/QRail type and quantity (required)
- 3) Accessories: (see Accessories)
- 4) Optional Custom Factory Calibration: Specify **C620** with desired input, setpoint and deadband.

Accessories

Action/Q series modules mount on standard TS32 (model MD02) or TS35 (model MD03) DIN rail. In addition, the following accessories are available:

MD02	TS32 DIN rail
MD03	TS35 x 7.5 DIN rail
IQRL-2002	2 Position I/QRail & DIN rail
IQRL-2004	4 Position I/QRail & DIN rail
IQRL-2008	8 Position I/QRail & DIN rail

Terminal	Connection	Terminal	Connection
A1	Relay A, N.O.	C3	RTD Input (-)
A2	Relay A, Common	C4	RTD Input Return
A3	Relay A, N.C.	C5	Not Used
A4	Relay B, N.O.	C6	Not Used
A5	Relay B, Common	P1	AC Power (Hot)
A6	Relay B, N.C.	P2	Not Used
C1	RTD Input Sense	P3	Not Used
C2	RTD Input (+)	P4	AC Power (Neutral)

Stability:

Line Voltage: ±0.01%/%, max.

Temperature: ±0.05% of full scale/°C, max.

Common Mode Rejection:

DC to 60Hz: 120dB

>60Hz: 100dB

Isolation: 1800VDC between contacts, input and power

ESD Susceptibility: Capable of meeting IEC 801-2 level 3(8KV)

Humidity (Non-Condensing):

Operating: 15 to 95% @45°C

Soak: 90% for 24 hours @65°C

Temperature Range:

Operating: -15 to 55°C (5 to 131°F)

Storage: -25 to 75°C (-13 to 158°F)

Power: 2.5W max.; 100 to 240VAC ±10%; 50-400Hz

Relay Contacts:

2 SPDT (2 form C) Relays, 1 Relay per setpoint

Current Rating (resistive):

120VAC: 5A; 240VAC: 2A; 28VDC: 5A

Material: Gold flash over silver alloy

Electrical Life: 10⁵ operations at rated load

Note: External relay contact protection is required for use with inductive loads.

Mechanical Life: 10⁷ operations

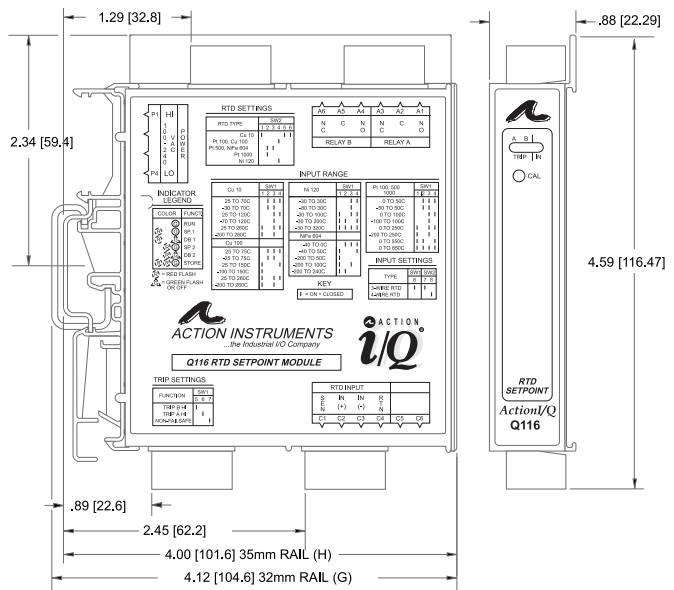
Weight: 0.56lbs.

Agency Approvals:

CSA certified per standard C22.2 (File No LR 42272).

UL recognized per standard UL 508 (File No E99775).

Dimensions



Eurotherm

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