SC-FI Series

Frequency to Current Signal Conditioner

Flowmetrics, Inc.

“Where Quality is Measurable”

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Description:
The SC-FI is a two wire frequency to analog converter that converts a pulse rate input into a 4-20 mA output signal proportional to frequency or rate.

The input pulse rate is amplified and filtered by the input signal conditioning circuitry. Two forms of input signal conditioning are provided, one for magnetic pickups and the other being an isolated pulse input.

The amplified frequency signal is then converted to an analog signal using a precision frequency to analog converter.

The output stage derives it's power from the output current loop. The output stage converts the input signal into the desired output range. Multi-turn potentiometers provide for the necessary trimming of span and zero.

SPECIFICATIONS:

Operating Temperature
32° F (0°C) to 158° F (70°C)

High Level Pulse Input
Type: Opto-Isolated
Logic 1: 4-30 VDC
Logic 0: 0-1 VDC
Frequency Range: 0-10 kHz
Fault Protection: Reverse Polarity Protection
Over Voltage Protection: ± 30 VDC
Isolation Voltage: 500 V
Fast Transient Immunity: 500 V
Maximum Rise Time: No Limit
Maximum Fall Time: No Limit

Magnetic Pickup Input
Differential Input
Input Impedance: 10 kΩ
Frequency Response: 0-3500 Hz
Trigger Sensitivity: 30 mV p-p
Over Voltage Protection: ± 30 VDC

Frequency to Current Conversion
Range Selection: DIP Switch Selectable
Available Ranges: 150 Hz, 300 Hz, 600 Hz, 1200 Hz, 2500 Hz, 5000 Hz, 10,000 Hz
Factory Default: 1000 Hz

Analog Output
Accuracy: ± 0.1% Span (@ 20° C)
Output Type: Two Wire, Loop Powered
Range: 4-20 mA (10 - 50 mA optional)
Compliance Voltage: 10 to 40 VDC
Loop Burden: < 10 VDC (less than 500 Ω)
Trim Controls: Zero & Span, non-interacting
Span (20 mA) Trim Range: 50% to 100% of full scale
Linearity: < ±0.1% Span
Output Voltage Effect: < ± 0.002% Span/Volt
Temperature Effect: < 200 PPM/°C
Reverse Polarity Protected
Noise Content: < 0.2% Span
Response Time: 0.1 second (1 sec. jumper selectable)
Over-current Limiting: 35 mA
Output Loop Indicator: LED illuminates when output loop is powered by proper polarity and blinks proportionally to the input frequency.

Mounting Styles
DIN Rail Mount: Plastic enclosure with a snap fastener for fitting to DIN 46 277 and DIN EN 50 022 assembly rails.
NEMA 4X: 4.92” x 4.92” NEMA 4X Enclosure for wall mounting.
Explosion Proof: Aluminum enclosure for:
Class I, Division 1, Groups B, C & D
Class II, Division I, Groups E, F & G.

Typical Wiring Hookup

Magnetic Pickup Hookup

High Level Pulse Hookup
**INPUT & OUTPUT SETTINGS**

**REMOVING THE CASE:**
The case must be removed to change switch settings. To remove the case procede as follows:

Refer to FIGURE 1. Using finger tips, carefully pry the case away from the terminal blocks (as shown with dotted lines).

Pry far enough to release the restraining clips on both sides of the case.

Press up on terminal block with thumbs. The assembly will pop out allowing it to be removed from case.

**FIGURE 1:**

**OUTPUT ADJUSTMENTS:**
The unit has two potentiometers for adjustment. The upper potentiometer controls the 20mA setpoint and the lower potentiometer controls the 4mA setpoint (see Figure 2). The 4mA output range can be adjusted from 3mA to 5mA. The 20mA output range can be trimmed from 50% to 100% of the selected range. To adjust the output, initially turn the 20ma adjust 20 turns CW for starting position. Input 0 frequency and adjust the 4mA pot. Connect your maximum frequency and adjust the 20mA pot.

**FIGURE 2:**

**INPUT FREQUENCY RANGE SETTINGS:**
The appropriate range is selected by turning “ON” the corresponding switch.

<table>
<thead>
<tr>
<th>Range</th>
<th>Switch # “ON”</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-150Hz</td>
<td>1</td>
</tr>
<tr>
<td>0-300Hz</td>
<td>2</td>
</tr>
<tr>
<td>0-600Hz</td>
<td>3</td>
</tr>
<tr>
<td>0-1200Hz</td>
<td>4*</td>
</tr>
<tr>
<td>0-2500Hz</td>
<td>5</td>
</tr>
<tr>
<td>0-5000Hz</td>
<td>6</td>
</tr>
<tr>
<td>0-10000Hz</td>
<td>7</td>
</tr>
</tbody>
</table>

* Factory Default. The unit is setup at the factory for the range 0-1000Hz.

**RESPONSE TIME SETTING:**
Switch #8 controls the output response time.

<table>
<thead>
<tr>
<th>Switch #8</th>
<th>Response Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>0.1 second</td>
</tr>
<tr>
<td>ON</td>
<td>1 second</td>
</tr>
</tbody>
</table>

Turn switch #8 ON to provide damping of the output resulting in a 1 second response time.

**LED INDICATOR:**
The SC-FI has a LED which indicates the status of the unit. The table below describes the 3 states for the LED.

<table>
<thead>
<tr>
<th>LED STATUS:</th>
<th>MEANING:</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>The unit is off.</td>
</tr>
<tr>
<td>ON (constant)</td>
<td>The unit is loop powered.</td>
</tr>
<tr>
<td>BLINKING</td>
<td>The unit is receiving an input frequency. The LED will blink at a rate proportional to the input frequency. (The LED may appear to be constant at high input frequencies)</td>
</tr>
</tbody>
</table>
Description:
The SC-FI with option "L" is a two wire frequency to analog converter that converts a pulse rate input into a 4-20 mA output signal proportional to frequency or rate.

The SC-FI with option "L" is intended for use with lower full scale input frequencies. Full scale frequencies of 15 Hz to 2000 Hz are possible. The unit includes both a contact closure input and an opto-isolated input. Output response time is selectable 1 or 10 seconds.

The amplified frequency signal is then converted to an analog signal using a precision frequency to analog converter.

The output stage derives its power from the output current loop. The output stage converts the input signal into the desired output range. Multi-turn potentiometers provide for the necessary trimming of span and zero.

SPECIFICATIONS:

Operating Temperature
32° F (0°C) to 158°F (70°C)

High Level Pulse Input
Type: Opto-Isolated
Logic 1: 4-30 VDC
Logic 0: 0-1 VDC
Frequency Range: 0-10 kHz
Fault Protection: Reverse Polarity Protection
Isolation Voltage: 500 V
Fast Transient Immunity: 500 V
Maximum Rise Time: No Limit
Maximum Fall Time: No Limit

Contact Closure Input
Sensor Compatibility: Requires an isolated, contact closure
Maximum Contact Voltage: 12 mA
Nominal Pullup Resistance: 47 Kohm to 5 Vdc
Frequency Range: 0-100 kHz

Frequency to Current Conversion
Range Selection: DIP Switch Selectable
Available Ranges: 30 Hz, 60 Hz, 120 Hz, 240 Hz, 480 Hz, 960 Hz, 1920 Hz
Factory Default: 100 Hz

Simplified Block Diagram

Analog Output
Accuracy: ± 0.1% Span (@ 20° C)
Output Type: Two Wire, Loop Powered
Range: 4-20 mA (10 - 50 mA optional)
Compliance Voltage: 10 to 40 VDC
Loop Burden: < 10 VDC (less than 500 Ω)
Trim Controls: Zero & Span, non-interacting
Span (20 mA) Trim Range: 50% to 100% of full scale
Linearity: < ±0.1% Span
Output Voltage Effect: < ±0.002% Span/Volt
Temperature Effect: < 200 PPM/C°
Reverse Polarity Protected
Noise Content: < 0.2% Span
Response Time: 1 second (10 sec. jumper selectable)
Over-current Limiting: 35 mA
Output Loop Indicator: LED illuminates when output loop is powered by proper polarity and blinks proportionally to the input frequency.

Mounting Styles
DIN Rail Mount: Plastic enclosure with a snap fastener for fitting to DIN 46 277 and DIN EN 50 022 assembly rails.
NEMA 4X: 4.92" x 4.92" NEMA 4X Enclosure for wall mounting.
Explosion Proof: Aluminum enclosure for:
Class I, Division 1, Groups B, C & D
Class II, Division I, Groups E, F & G.

Typical Wiring Hookup (option "L")

Contact Closure Hookup
Flowmeter with Switch Closure Output

High Level Pulse Hookup

1• Magnetic pickup/Not Used
2• Magnetic pickup/Contact Closure In
3• Shield (common)
4• Opto-isolator In +
5• Opto-isolator In –
6• Shield (common)
7• Output +
8• Output –
9• Do Not Use
"L" Option INPUT & OUTPUT SETTINGS

REMOVING THE CASE:
The case must be removed to change switch settings. To remove the case proceed as follows:

Refer to FIGURE 1. Using finger tips, carefully pry the case away from the terminal blocks (as shown with dotted lines).

Pry far enough to release the restraining clips on both sides of the case.

Press up on terminal block with thumbs. The assembly will pop out allowing it to be removed from case.

FIGURE 1:

OUTPUT ADJUSTMENTS:
The unit has two potentiometers for adjustment. The upper potentiometer controls the 20mA setpoint and the lower potentiometer controls the 4mA setpoint (see Figure 2). The 4mA output range can be adjusted from 3mA to 5mA. The 20mA output range can be trimmed from 50% to 100% of the selected range. To adjust the output, initially turn the 20ma adjust 20 turns CW for starting position. Input 0 frequency and adjust the 4 mA pot. Connect your maximum frequency and adjust the 20 mA pot.

FIGURE 2:

RESPONSE TIME SETTING:
Switch #8 controls the output response time.

Switch #8  Response Time
OFF   1 second
ON    10 second

Turn switch #8 ON to provide damping of the output resulting in a 10 second response time.

LED INDICATOR:
The MS660 has a LED which indicates the status of the unit. The table below describes the 3 states for the LED.

LED STATUS: MEANING:
OFF The unit is off.
ON (constant) The unit is loop powered.
BLINKING The unit is receiving an input frequency. The LED will blink at a rate proportional to the input frequency. (The LED may appear to be constant at high input frequencies)

INPUT FREQUENCY RANGE SETTINGS:
The appropriate range is selected by turning “ON” the corresponding switch.

<table>
<thead>
<tr>
<th>Range:</th>
<th>Switch # “ON”</th>
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</thead>
<tbody>
<tr>
<td>0-30Hz</td>
<td>1</td>
</tr>
<tr>
<td>0-60Hz</td>
<td>2</td>
</tr>
<tr>
<td>0-120Hz</td>
<td>3*</td>
</tr>
<tr>
<td>0-240Hz</td>
<td>4</td>
</tr>
<tr>
<td>0-480Hz</td>
<td>5</td>
</tr>
<tr>
<td>0-960Hz</td>
<td>6</td>
</tr>
<tr>
<td>0-1920Hz</td>
<td>7</td>
</tr>
</tbody>
</table>

* Factory Default. The unit is setup at the factory for the range 0-100Hz.
Dimensions

**DIN Rail Mount**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.88 (98.5)</td>
<td></td>
</tr>
<tr>
<td>1.40 (35.5)</td>
<td></td>
</tr>
<tr>
<td>2.95 (75)</td>
<td></td>
</tr>
<tr>
<td>.89 (22.5)</td>
<td></td>
</tr>
</tbody>
</table>

**NEMA4X**

Mounting holes molded directly under cover screws. Max. screw head .29” (Typ. 4 places)

To access terminals, remove cover and 4 panel screws.

**Explosion Proof Enclosure**

3/4” NPT (2) HLS (feed thru hubs)

WARRANTY

This product is warranted against defects in materials and workmanship for a period of two (2) years from the date of shipment to Buyer.

The Warranty is limited to repair or replacement of the defective unit at the option of the manufacturer. This warranty is void if the product has been altered, misused, dismantled, or otherwise abused.

ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE EXCLUDED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

http://www.kep.com

**Decoding Part Number**

Example: SC-FI D ET

<table>
<thead>
<tr>
<th>Series</th>
<th>FI= Frequency to Current</th>
</tr>
</thead>
</table>

**Mounting:**

- B = Nema 4X
- C = Explosion Proof
- D = DIN Rail

**Options:**

- ET = Extended Temp (-20° to 85° C)
- L = Low Count Speed for Contact Closure Inputs
  - 50 = 10-50 mA output

**Accessories:** (add to end of part number)

- DR-4 = 4” DIN Rail