F4T/D4T Flex Module
Quick Start Guide

Mixed Input / Output Modules
Control, Limit, Auxiliary and CT FM [M or L] A- _ _ _ A-A _ _ _

Safety Information
We use caution symbols where needed within this document to draw your attention to important operational and safety information.

A "CAUTION" safety alert appears with information that is important for protecting your equipment and performance. Be especially careful to read and follow all cautions that apply to your application.

A "WARNING" safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.

The electrical hazard symbol, (a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement. Further explanations follow:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTION</td>
<td>Warning or Hazard that needs further explanation than label on unit can provide. Consult QSG for further information.</td>
</tr>
<tr>
<td>WARNING or Electrical Shock Hazard</td>
<td>AVERTISSEMENT : mise en garde ou danger qui demande plus de précisions que l'information sur l'étiquette de l'unité. Consultez le manuel de l'utilisateur pour plus d'informations.</td>
</tr>
</tbody>
</table>

Document Overview
The purpose of this Quick Start Guide (QSG) is to acquaint the user with the F4T/D4T Flex Modules and associated wiring.

Product Overview
Flex modules add functionality, inputs and outputs to an F4T system. The flex modules described in this document offer various input and output options as well as a safety over/under temperature limit. Each module can include one analog input and up to two outputs. All of these modules can be placed in any available slot.

Installation and Wiring

To install the flex module:
1. Note the part number to determine the types of inputs and outputs available to be connected in step 7.
2. Turn off power to the controller.
3. Select a slot for the module. If replacing a module, remove the old module.
4. Affix corresponding slot number labels (provided) to the module and to the removable screw terminal block.
5. With the component side of the module facing right (viewing the controller from the rear) insert the module in to the slot until it latches.
6. Remove the screw terminal block from the module.
7. Wire field devices to the appropriate terminals. Wiring details for each input and output are provided in the following sections.
8. Reconnect the wired screw terminal block to the module. Be sure to reconnect the terminal block to the correct module.
9. Restore power to the controller.

Note:
If the flex module is a replacement with the same part number and slot position, the controller uses it immediately when powered up. Otherwise, use Composer software to configure the F4T/D4T to expect and use the module.

Module Characteristics
Description and Identification
Many of the modules appear to look alike at first glance, therefore, it is always recommended that the module part number be verified prior to plugging it into any of the available slots in a base. Each module is identified with a part number located on the back side of the assembly next to the screw terminal block, as displayed in the graphic above.

Wiring
Prior to wiring any of the I/O modules described in this document it is recommended that the warnings and notes listed below be reviewed.

CAUTION: |
To prevent damage to the controller, do not connect wires to unused terminals.

AVERTISSEMENT: Pour prévenir tout endommagement du régulateur, ne pas faire de raccordements à des bornes inutilisées.

Note:
Maintain electrical isolation between the analog input, digital input-outputs, switched dc/open collector outputs and process outputs to prevent ground loops.

Available F4T/D4T Literature and Resources
All of the user documents listed below can be found on the Watlow website: http://www.watlow.com. The Watlow Support Tools DVD can be acquired by contacting Watlow customer service (507-494-5300).

<table>
<thead>
<tr>
<th>Document Title and Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4T Installation and Troubleshooting User Guide, part number: 0600-0092-0000</td>
<td>Provides detailed specifications and information regarding mounting the base, flex module wiring and troubleshooting.</td>
</tr>
<tr>
<td>F4T Setup and Operations User Guide, part number: 0600-0093-0000</td>
<td>Explains how to configure and operate the device for an application using Composer software as well as the user interface (touch screen). Includes detailed descriptions of all device features and parameter settings.</td>
</tr>
<tr>
<td>D4T Installation and Troubleshooting User Guide, part number: 0600-0107-0000</td>
<td>Provides detailed specifications and information regarding mounting the base, flex module wiring and troubleshooting.</td>
</tr>
<tr>
<td>D4T Setup and Operations User Guide, part number: 0600-106-0000</td>
<td>Explains how to configure the datalogger for an application using the user interface and Composer software. Includes detailed descriptions of all data logger features and parameter settings.</td>
</tr>
</tbody>
</table>
Thermocouple


- Grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- 3µA open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S1 terminal.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

Note:

- Wire size and torque for screw terminations:
  - 0.0507 to 3.30 mm² (30 to 12 AWG) single-wire termination or two 1.31 mm² (16 AWG)
  - 0.57 Nm (5.0 lb.-in.) torque

Input Connections

Thermocouple


- Grounded or ungrounded sensors, greater than 20MΩ input impedance, 2kΩ source resistance max.
- 3µA open-sensor detection
- Thermocouples are polarity sensitive. The negative lead (usually red) must be connected to S1 terminal.
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

Note:

- Use of 2-wire RTDs adds error to the measurement based on wire lead length (see table). 3-wire auto compensates for wire resistance.

Current Transformer

FMMA - C _ _ A - A _ _ 

- Input range is 0 to 50mA (ac).
- Current transformer part number: 16-0246
- 100Ω input impedance
- Response time: 1 second maximum
- Accuracy +/-1mA typical

Potentiometer


- Potentiometer: 0 to 1.2kΩ

Thermistor


- > 20MΩ input impedance
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- User-selectable curves for Alpha Technics, Beta THERM and YSI
- User-scaling support for Steinhart-Hart coefficients

Thermistor Curve Setting

<table>
<thead>
<tr>
<th>Thermistor Curve Setting</th>
<th>Base R @ 25 °C</th>
<th>Alpha Technics</th>
<th>Beta Therm</th>
<th>YSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curve A</td>
<td>2.252k</td>
<td>Curve A</td>
<td>2.2k3A</td>
<td>004</td>
</tr>
<tr>
<td>Curve B</td>
<td>10k</td>
<td>Curve A</td>
<td>10k3A</td>
<td>016</td>
</tr>
<tr>
<td>Curve C</td>
<td>10k</td>
<td>Curve C</td>
<td>10k4A</td>
<td>006</td>
</tr>
</tbody>
</table>

Custom

Use Steinhart-Hart equation coefficients (A, B and C) from thermistor manufacturer corresponding to the terms of the Steinhart-Hart equation:

\[
\frac{1}{T} = A + B \ln(R) + C (\ln(R))^3
\]
Output Connections (cont.)
Mechanical Relay, Form A


- 5A at 240V~ (ac) or 30V= (dc) maximum resistive load
- Requires a minimum load of 20mA at 24V
- 125 VA pilot duty at 120/240V~ (ac), 25 VA at 24V~ (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- For use with ac or dc
- See Quencharc note (page 4).

Output Connections (cont.)
Mechanical Relay, Form A


- 0.5A at 149°F (65°C) to 1A at 50°F (10°C), 24 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- Opto-isolated, without contact suppression
- Maximum off state leakage of 105µA
- Output does not supply power
- Do not use on dc loads
- See Quencharc note (page 4)

Output Connections (cont.)
Solid-State Relay, Form A

FMMA - _ [K] [K] A - A

- 0.5A at 149°F (65°C) to 1A at 50°F (10°C), 24 to 264V~ (ac) maximum resistive load
- 20 VA 120/240V~ (ac) pilot duty
- Opto-isolated, without contact suppression
- Maximum off state leakage of 105µA
- Output does not supply power
- Do not use on dc loads
- See Quencharc note (page 4)

Output Connections (cont.)
Switched DC / Open Collector


Switched DC
- 30mA dc maximum supply current
- Short circuit limited to < 50mA
- 22 to 32V= (dc) open circuit voltage
- Use dc- and dc+ to drive external solid-state relay.
- DIN-A-MITE compatible

Open Collector
- 100mA maximum output current sink
- 30V= (dc) maximum supply voltage
- Any switched dc output can use the common terminal.
- Use an external class 2 or Safety Extra Low Voltage (SELV) power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to the open collector and common to the power supply negative.

Output Connections (cont.)
Universal Process

FMMA - _ [F] A - A

- 0 to 20mA ±30µA into 8000 maximum load with 5µA nominal resolution
- 0 to 10V= (dc) ±15mV into 1 kΩ minimum load with 2.5mV nominal resolution
- Scalable
- Output supplies power
- Cannot use voltage and current outputs at same time
- Output may be used as retransmit or control
- Temperature stability 100ppm/°C

Warranty
F4T/D4T Flex modules are manufactured by ISO 9001 registered processes and are backed by a three-year warranty to the first purchaser for use, providing that the modules have not been misapplied.

Technical Assistance
To get assistance from Watlow:
- Contact a local representative: see last page
- Email: wintechsupport@watlow.com
- Call: +1 (507) 494-5656 from 7 a.m. to 5 p.m. Central Standard Time (CST)

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### Specifications

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Max Error @ 25 Deg C</th>
<th>Accuracy Range</th>
<th>Operating Range</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>J</em></td>
<td>±1.75</td>
<td>Low 750 High -210</td>
<td>Low 1200 High 1200</td>
<td>Deg C</td>
</tr>
<tr>
<td><em>K</em></td>
<td>±2.45</td>
<td>-200 1250 -270 1371</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>T (-200 to 350)</td>
<td>±1.15</td>
<td>-350 350 -270 400</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>±2.25</td>
<td>1250 270 1300</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td><em>E</em></td>
<td>±2.10</td>
<td>-200 900 -270 1000</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>±3.9</td>
<td>1450 -50 1767</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>±3.9</td>
<td>1450 -50 1767</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>±2.66</td>
<td>870 1700 1816</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>±3.32</td>
<td>2315</td>
<td>Deg C</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>±3.32</td>
<td>2315</td>
<td>Deg C</td>
<td></td>
</tr>
</tbody>
</table>

### Thermistor Input

<table>
<thead>
<tr>
<th>Resistance Range</th>
<th>Max Error @ 25 Deg C</th>
<th>Accuracy Range</th>
<th>Operating Range</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>5k range</td>
<td>±5</td>
<td>0 5000</td>
<td>Ohms</td>
<td></td>
</tr>
<tr>
<td>10k range</td>
<td>±10</td>
<td>0 10000</td>
<td>Ohms</td>
<td></td>
</tr>
<tr>
<td>20k range</td>
<td>±20</td>
<td>0 20000</td>
<td>Ohms</td>
<td></td>
</tr>
<tr>
<td>40k range</td>
<td>±40</td>
<td>0 40000</td>
<td>Ohms</td>
<td></td>
</tr>
</tbody>
</table>

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