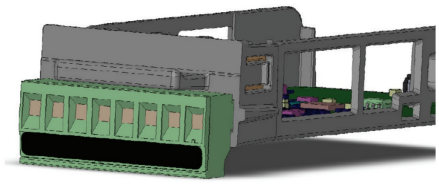
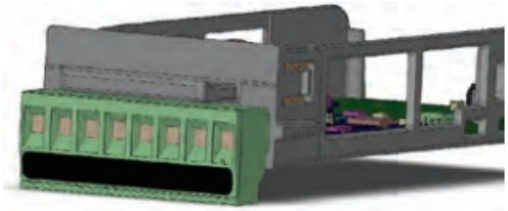


WATLOW F4T FMMA Mixed I-O Flex Module User Guide

Contents

F4T/D4T Flex Module
Quick Start Guide



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

WATLOW
Powered by Possibility

TOTAL CUSTOMER SATISFACTION 3 Year Warranty

ISO 9001 Registered Company Winona, Minnesota USA

0600-0097-0000 Rev. D Made in the U.S.A.

November 2016

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:

Symbol	Explanation
CAUTION WARNING or Electrical Shock Hazard	CAUTION – Warning or Hazard that needs further explanation than label on unit can provide. Consult QSG for further information.

Document Overview

The purpose of this Quick Start Guide (QSG) is to acquaint the user with the F4T 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.

Available F4T/D4T Literature and Resources

Document Title and Part Number	Description
F4T Installation and Troubleshooting User Guide, part number: 0600-0092-0000	Provides detailed specifications and information regarding mounting the base, flex module wiring and troubleshooting.
F4T Setup and Operations User Guide, part number: 0600-0093-0000	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.
D4T Installation and Troubleshooting User Guide, part number: 0600-0107-0000	Provides detailed specifications and information regarding mounting the base, flex module wiring and troubleshooting.
D4T Setup and Operations User Guide, part number: 0600-106-0000	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.

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.

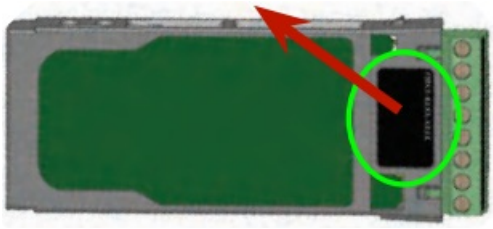
Note:
If the flex module is a replacement with the same part number and slot position, the controller uses it immediately when powered up. Otherwise, use Composer software to configure the F4T/D4T to expect and use the module.

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.

FM[**M, L**]A – _ _ _ A – A _ _ _



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.

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

Note:
Modules IP10 when properly installed in base enclosure with slot caps in empty slots.

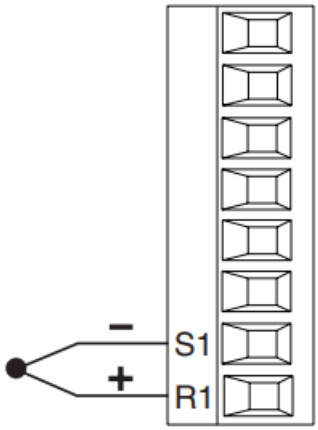
CAUTION:
Switching pilot duty inductive loads (relay coils, solenoids, etc.) with the mechanical relay, solid-state relay or open collector output options requires use of an R.C. suppressor for AC load or a diode for a DC load.

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

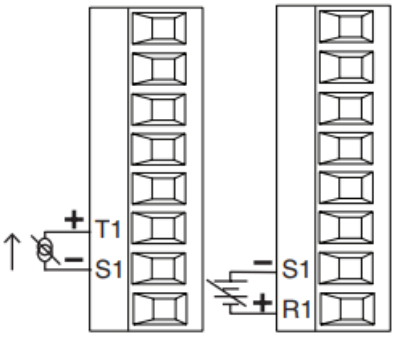
Thermocouple



FM [**M, L**] A – [**L, U, Y**] _ _ A – A _ _ _

- 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 S terminal
- To reduce errors, the extension wire for thermocouples must be of the same alloy as the thermocouple.

Process

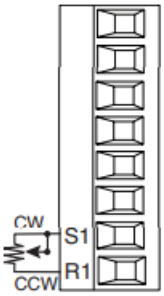


Milliamps Volts

FM [**M, L**] A – [**L, U**] _ _ A – A _ _ _

- 0 to 20mA @ 100Ω input impedance
- 0 to 10VÎ (dc) @ 20kΩ input impedance
- 0 to 50mVÎ (dc) @ 20MΩ input impedance
- Scalable

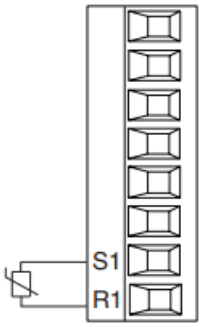
Potentiometer



FM [M, L] A – [L, U] _ _ A – A _ _ _

- Potentiometer: 0 to 1.2kΩ

Thermistor

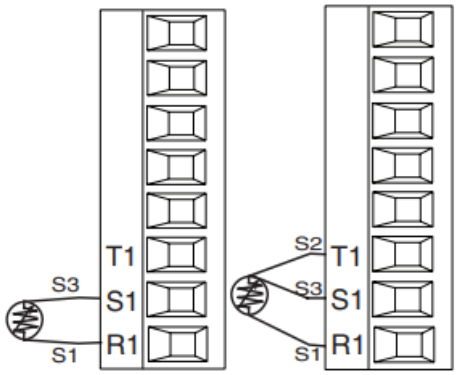


FM [M, L] A – [M, T] _ _ A – A _ _ _

- > 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	Base R @ 25 ºC	Alpha Technics	Beta Therm	YSI
Curve A	2.252k	Curve A	2.2k3A	004
Curve B	10k	Curve A	10k3A	016
Curve C	10k	Curve C	10k4A	006
Custom	Use Steinhart-Hart equation coefficients (A, B and C) from thermistor manufacturer corresponding to the terms of the Steinhart-Hart equation: $1 / T = A + B\ln(R) + C (\ln(R))^3$			

RTD



2-wire RTD 3-wire RTD

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.

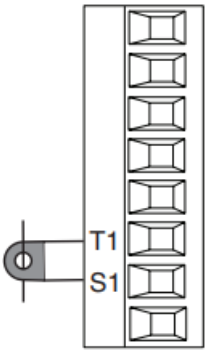
FM [**M, L**] A – [**L, U, Y***] _ _ A – A _ _ _

- 2- or 3-wire platinum, 100 and 1kΩ @ 32°F (0°C) calibration to DIN curve (0.00385 Ω/Ω/°C)
- RTD excitation current of 0.09 mA typical. Each ohm of lead resistance may affect the reading by 2.55°C for a 100Ω platinum sensor or 0.25°C for a 1kΩ sensor.
- For 3-wire RTDs, the S1 lead (usually white) must be connected to R1.

* This option does not support 3-wire RTDs

Lead Wire Resistance Each Wire for 2-Wire RTDs	
AWG	**Ohms/1000ft**
14	2.575
16	4.094
18	6.510
20	10.35
22	16.46
24	26.17
26	41.62
28	66.17

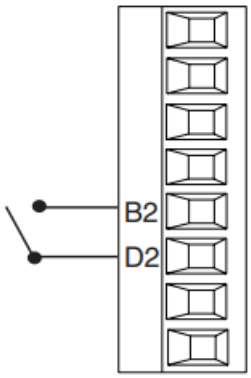
Current Transformer



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

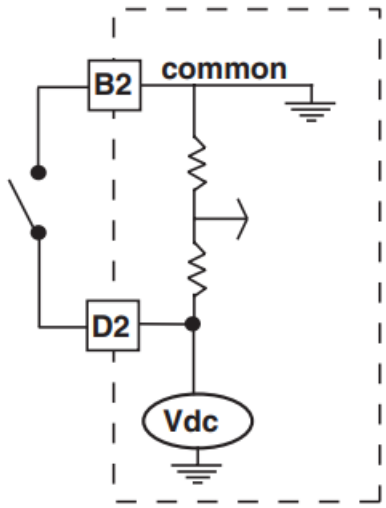
Digital Input



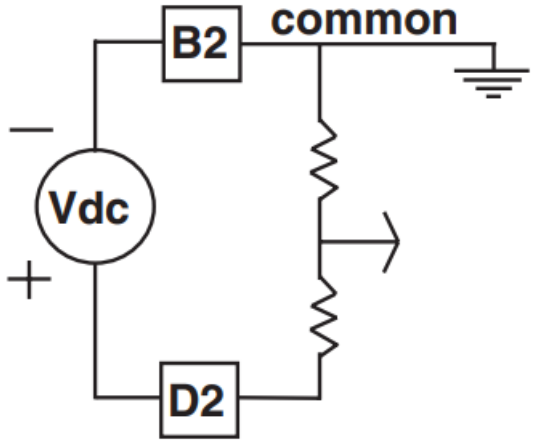
FMLA – **Y E B** A – A _ _ _

- Update rate 10Hz
- Dry Contact
  – Input inactive when ≥ 500Ω
  – Input active when ≤ 100Ω
  – Max. short circuit 13mA
- Voltage
  – Max. input 36V at 3mA
  – Input inactive when ≤ 2V
  – Input active when ≥ 3V at 0.25mA

Dry Contact

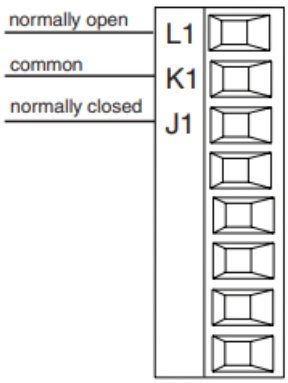


Voltage Input

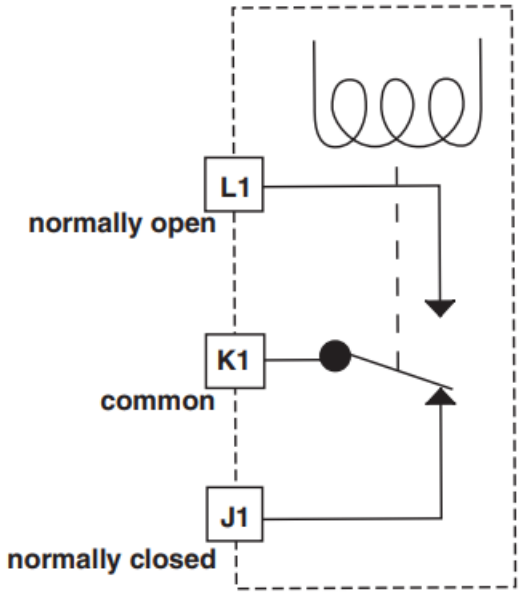


Output Connections

Mechanical Relay, Form C



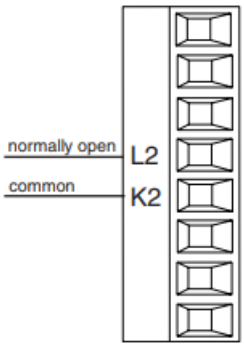
FM [**M, L***] A – _ [**E**] _ A – A _ _ _



- 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).

Note:
For part number **FMLA-_EBA-A** _ _ _ output 1 is fixed as the limit output.
* Not available in the D4T.

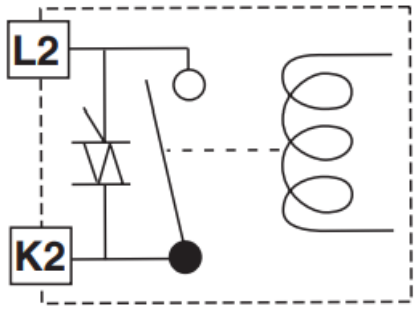
NO-ARC Relay, Form A



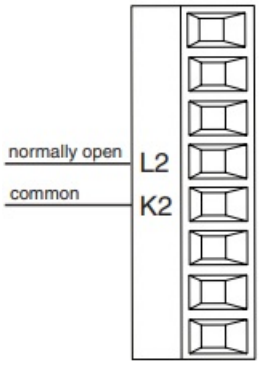
FMMA – _ _ **H** A – A _ _ _

- 12A at 122°F (50°C), 85 to 264V~ (ac) resistive load only
- 2,000,000 cycle rating for rated load
- 100mA minimum load
- 2mA maximum off state leakage
- Do not use on dc loads.

- Output does not supply power
- Do not drive another relay or solenoid with this output type

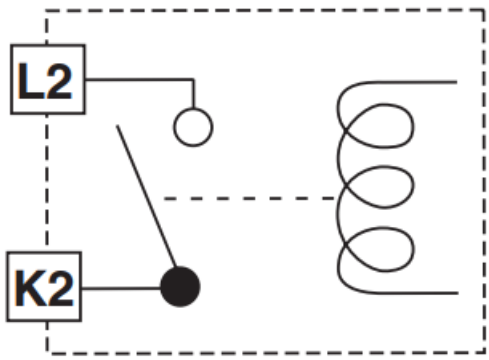


Mechanical Relay, Form A



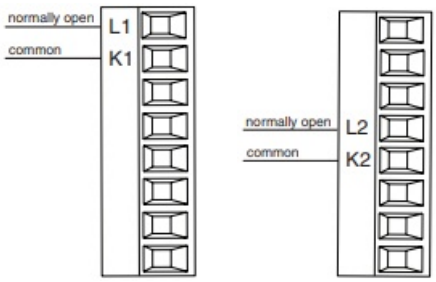
FM [**M, L**] A – _ _ J A – A _ _ _

- 5A at 240V~ (ac) or 30V⎓ (dc) maximum resistive load
- 20mA at 24V minimum inductive load
- 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).



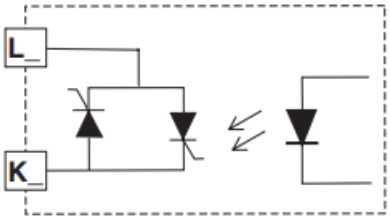
Note:
For part number FM**L**A-_ _ **J** A-A _ _ _ output 2 is fixed as the limit output.

Solid-State Relay, Form A

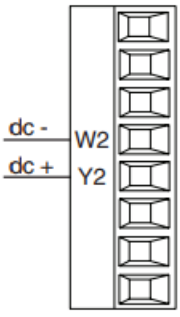


FMMA – _ [**K**] [**K**] A – A _ _ _

- 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)



Switched DC / Open Collector

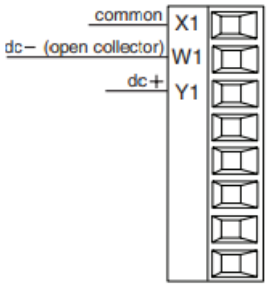


Switched DC

- 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

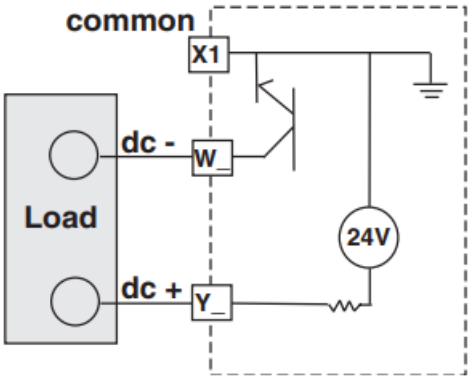
Open Collector



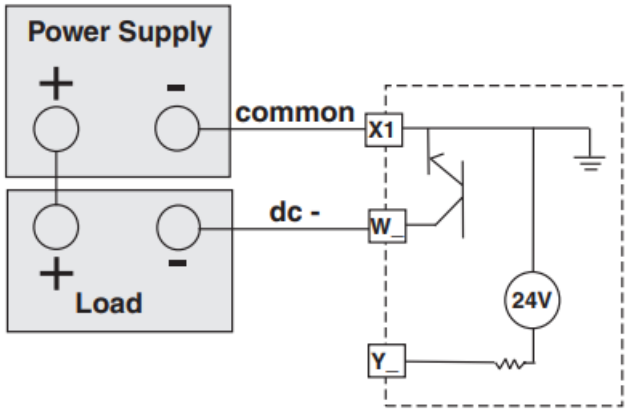
- 100mA maximum output current sink
- 30V⎓ (dc) maximum supply voltage
- Any switched dc output can use the common terminal.
- Use an external class 2 or Safety Extra Low Voltage (SELV) power supply to control a dc load, with the load positive to the positive of the power supply, the load negative to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

FM [**M, L**] A – _ [**C**] [**C**] A – A _ _ _

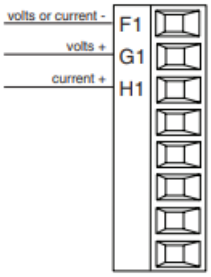
Switched DC



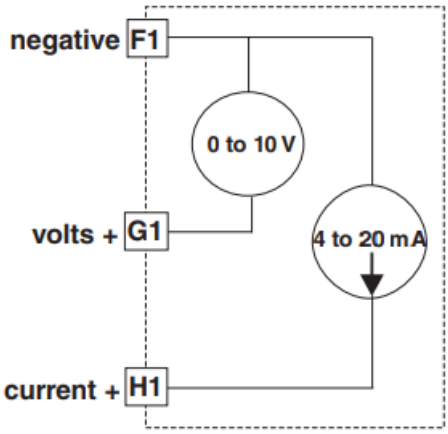
Open Collector



Universal Process



FMMA – _ **F** _ A – A _ _ _



- 0 to 20mA ±30µA into 800Ω 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.

Symbol	Explanation
	Unit is compliant with European Union directives. See Declaration of Conformity for further details on directives and standards used for compliance.
	Unit has been reviewed and approved by Factory Mutual as a Temperature Limit Device per FM Class 3545 standard. See: **www.fmglobal.com**
	Unit has been reviewed and approved by CSA International for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: **www.csa-international.org**
	Recognized component UL Files E185611 Process Control Equipment and E43684 Automatic Temperature Sensing Control Integrated Equipment, see conditions of acceptability.

Specifications

Input Type	Max Error @ 25 Deg C	Accuracy Range		Operating Range		Units
		Low	High	Low	High	
*J	±1.75	0	750	-210	1200	Deg C
*K	±2.45	-200	1250	-270	1371	Deg C
*T (-200 to 350)	±1.55	-200	350	-270	400	Deg C
N	±2.25	0	1250	-270	1300	Deg C
*E	±2.10	-200	900	-270	1000	Deg C
R	±3.9	0	1450	-50	1767	Deg C
S	±3.9	0	1450	-50	1767	Deg C
B	±2.66	870	1700	-50	1816	Deg C
C	±3.32	0	2315	0	2315	Deg C
D	±3.32	0	2315	0	2315	Deg C
*RTD, 100Ω	±2.00	-200	800	-200	800	Deg C
RTD, 1kΩ	±2.00	-200	800	-200	800	Deg C
mV	±0.05	0	50	– – –	– – –	mV
Volts	±0.01	0	10	– – –	– – –	Volts
mAdc	±0.02	2	20	– – –	– – –	mA DC
mAac	±5	-50	50	– – –	– – –	mA AC
Potentiometer 1k range	±1	0	1000	– – –	– – –	Ohms

*NSF approved inputs

Thermistor Input				
Resistance Range	Max Error @ 25 Deg C	Accuracy Range		Units
		Low	High	
5k range	±5	0	5000	Ohms
10k range	±10	0	10000	Ohms
20k range	±20	0	20000	Ohms
40k range	±40	0	40000	Ohms

Series EZ-ZONE® Flex Modules

WATLOW Electric Manufacturing Company

ISO 9001since 1996. CE

Declares that the following products:

Designation:	**Series EZ-ZONE® Flex Modules**
Model Numbers:	FMLA-(LAJ, LCJ, LEJ, MAJ, MCJ, MEJ, YEB[1])A[1] -A[1] (A[1] ,F[1] ,B[1] ,G[1])X[1]X[1] FMMA-X[1](A[1], C[1] , E, F[1] ,K)(A[1], C[1] , H, J, K)A[1] -A[1] (A[1] ,F[1] ,B[1] ,G[1])X[1]X[1] FMHA-(R[1] ,P[1] ,C[1] ,F[1] ,B[1] ,J,K,L[1])A[1] A[1] A[1] -A[1] (A[1] ,F[1] ,B[1] ,G[1]) X[1]X[1] [1]FMCA-**X**AAA-A(A,F,B,G)**XX**; Note: X[1] = Any letter or number
Classification:	FMLA, FMMA and FMHA are Process Control modules, FMCA are Communication modules; Modules are Integrated Controls in either **EZ-ZONE®** CC, F4T or D4T Bases; Modules are IP10 when properly installed.
Rated Voltage and Frequency:	Relay, SSR or No-Arc Control outputs 24 to 240 V- (ac) 50/60 Hz, Switched DC, Process and communications; low voltage SELV
Rated Power Consumption:	See manual for de-rating at increased temperatures. No-arc relays 15A 1.C, Dual SSR module 1.C 10A each output, Mechanical relay 5A 125 VA, 25 VA at 24 V- (ac) 1.B, Discreet SSR 1/2A 1.C 20VA, Quad SSR 1.C 1.5A 50 VA, Hex I/O ELV 1.5A , all others SELV limited energy.

Flex Modules are considered components and have no function in and of themselves, it is only when installed in a **Watlow EZ-ZONE® CC, Series F4T or Series D4T** Base enclosure that they have useful function. Modules were tested as parts of these systems for compliance with the following directives.

2014/30/EU Electromagnetic Compatibility Directive

EN 61326-1:2013	**Electrical equipment for measurement, control and laboratory use – EMC requirements (Industrial Immunity, Class B Emissions).**

2014/35/EU Low-Voltage Directive

EN 61010-1:2010 All options compliant	Safety Requirements of electrical equipment for measurement, control and laboratory use. Part 1: General requirements
EN 60730-1:2011 **EN 60730-2-9:2010**	Automatic electrical controls for household and similar use – Particular requirements fo r temperature sensing controls.
[1] Food Service Compli ant options.	Only certain output options comply with 60730 spacing and dielectric requirements, se e order information for compatible models.

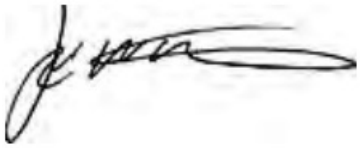
Compliant with 2011/65/EU RoHS2 Directive

Per 2012/19/EU W.E.E.E Directive  **Please Recycle Properly.**

See the Declarations of Conformity for **Watlow EZ-ZONE® CC, Series F4T and Series D4T** models for further details on standards used for compliance.

Joe Millanes
Name of Authorized Representative

Directory of Operations
Title of Authorized Representative



Signature of Authorized Representative

Winona, Minnesota, USA
Place of Issue

April 20, 2016
Date of Issue

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Documents / Resources

	WATLOW F4T FMMA Mixed I-O Flex Module [pdf] User Guide F4T, FMMA Mixed I-O Flex Module, I-O Flex Module, FMMA Mixed Module, Module, F4T Modu le

References

- Calcert
- Product Certification & Standards Development - CSA Group
- Commercial Property Insurance | FM Global