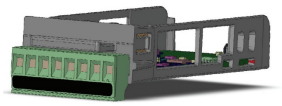
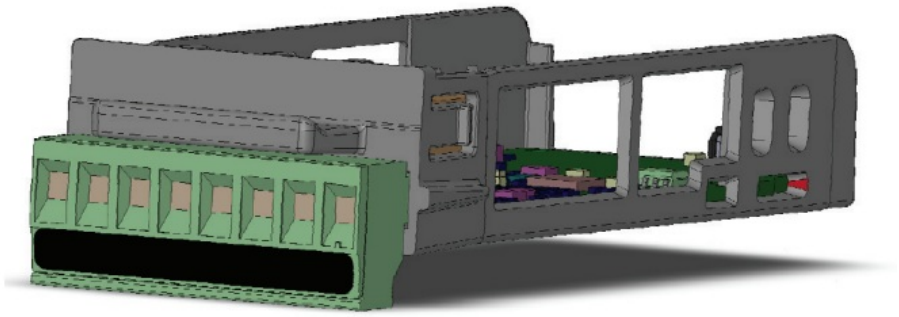


WATLOW FMHA High Density Input/Output Modules User Guide

Contents

WATLOW FMHA High-Density Input/Output Modules



1241 Bundy Boulevard., Winona, Minnesota USA 55987 **Phone:** +1 (507) 454-5300, Fax: +1 (507) 452-4507
http://www.watlow.com

Safety Information

- We use caution symbols where needed within this document to draw your at-tention 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** or Electrical • **WARNING** Shock Hazard	CAUTION – Warning or Hazard that needs further explanation than the label on the 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/D4T High Density (HD) Flex Modules and associated wiring.

Product Overview
Flex modules serve as the interface between real-world devices and the F4T/D4T system. The flex modules described in this document offer various input and output options and greater density (more than 1) than the standard flex modules. With the exception of the Dual SSR module, all of these modules can be placed in any available slot.

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).

Document Title and Part Number	Description
F4T Installation and Trou- be shooting User Guide, part number: 0600-0092-0000	Provides detailed specifications and information regarding mountin g 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 scree n). Includes detailed descriptions of all device features and parame ter settings.
D4T Installation and Trou- be shooting User Guide, part number: 0600-0107-0000	Provides detailed specifications and information regarding mountin g 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 th e 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 number and type of inputs or outputs available to be connected in step 7.
2. Turn off the device power.
3. Select a compatible base slot for the module. See the Flex Module-Slot Dependencies table below. If replacing a module, remove the old module.
4. Affix corresponding slot number labels (provided) to the module and the removable screw terminal block.
5. With the component side of the module facing right (viewing the F4T/D4T from the rear) insert the module into 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 in-put 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 F4T/D4T.

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

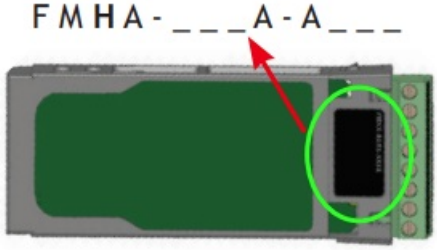
Flex Module - Slot Dependencies

Module Type	Slot #					
	1	2	3	4	5	6
Dual SSR * FMHA-K	Y	Y	N	Y	Y	N
Communications FMCA-(2)	N	N	N	N	N	Y
All Other Modules	Y	Y	Y	Y	Y	Y

Y = Allowed N = Not allowed
* Reguires two adjacent slots

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 before 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 to the right.



Wiring
Before 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 F4T/D4T, 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.

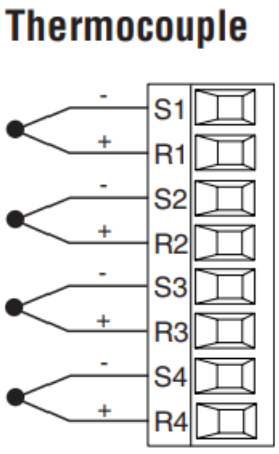
Note:
Modules IP10 when properly installed in a base enclosure with slot caps in empty slots.

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

Note:
Wire size and torque for screw terminations:

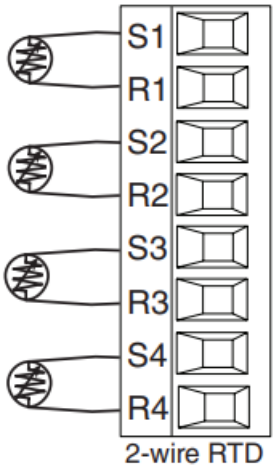
- 0.0507 to 3.30 mm2 (30 to 12 AWG) single-wire termination or two 1.31 mm2(16 AWG)
- 0.57 Nm (5.0 lb.-in.) torque

Input Connections



Input Connections (cont.)

RTD

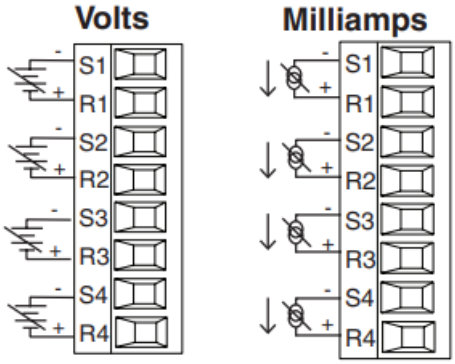


2-wire RTD

- Platinum, 100 and 1kΩ @32°F (0°C) calibration toDIN curve (0.00385 Ω/Ω/°C)
- RTD excitation current of0.09mA typical. Each ohmof lead resistance may affect the reading by 2.55°Cfor a 100Ω platinum sensoror 0.25°C for a 1kΩ sensor(see table to right)

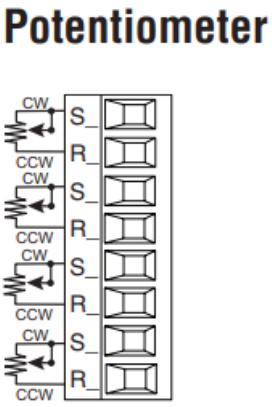
AWG	Ohms/ 1000ft
14	2.575
16	4.094
18	6.510
20	10.35
22	16.46
24	26.17
26	41.62
28	66.17

Process



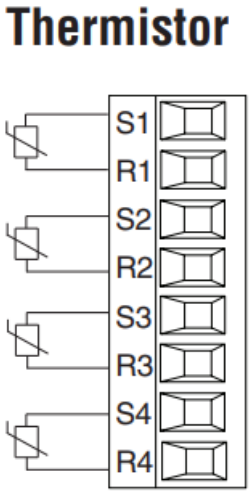
- 0 to 20mA @ 100Ω input impedance
- 0 to 10VÎ (dc) @ 20kΩ input impedance

- 0 to 50mVÎ (dc) @ 20MΩ input impedance
- Scalable



- Potentiometer: 0 to 1.2kΩ

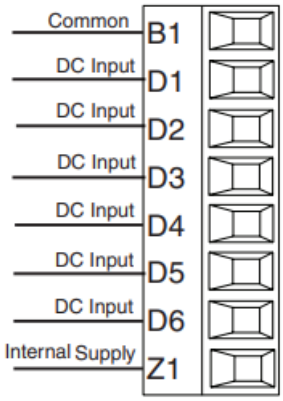
Input Connections (cont.)



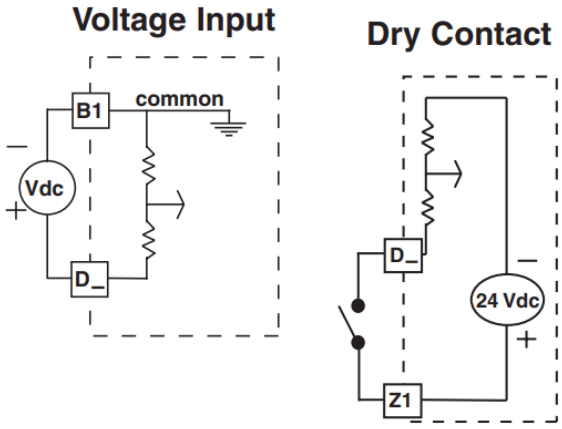
- >20MΩ input impedance
- 0 to 40kΩ, 0 to 20kΩ, 0 to 10kΩ, 0 to 5kΩ
- 2.252kΩ and 10kΩ base at 77°F (25°C)
- User-selectable curves for Alpha Technics, Beta THERM andYSI
- User-scaling support for Steinhart-Hart coefficients

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 the thermistor manufacturer corresponding to the terms of the Steinhart-Hart equation: $1 / T = A + B\ln(R) + C\ (\ln(R))^3$			

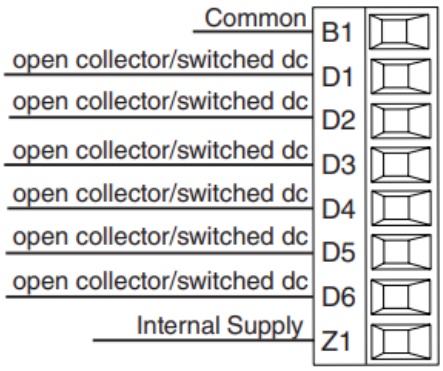
Six Digital Inputs



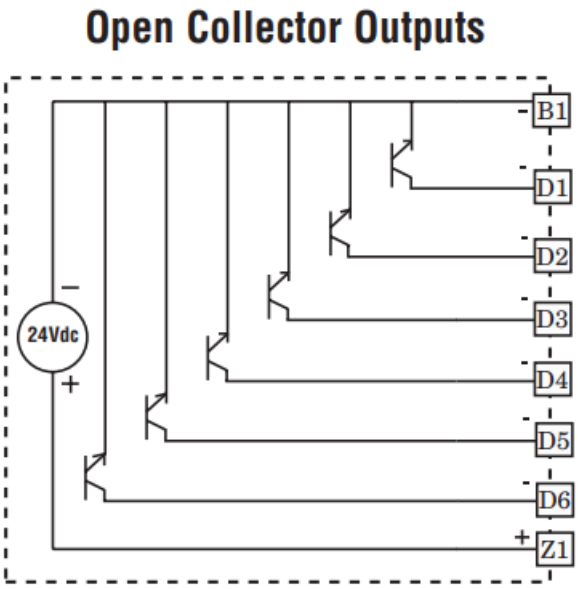
- Voltage
  - Max. input 36V at3mA
  - Input inactive when≤ 2V
  - Input active when ≥3V at 0.25mA
- Dry Contact
  - Input inactive when≥ 500Ω
  - Input active when≤ 100Ω
  - Max. short circuit13mA



Output Connections

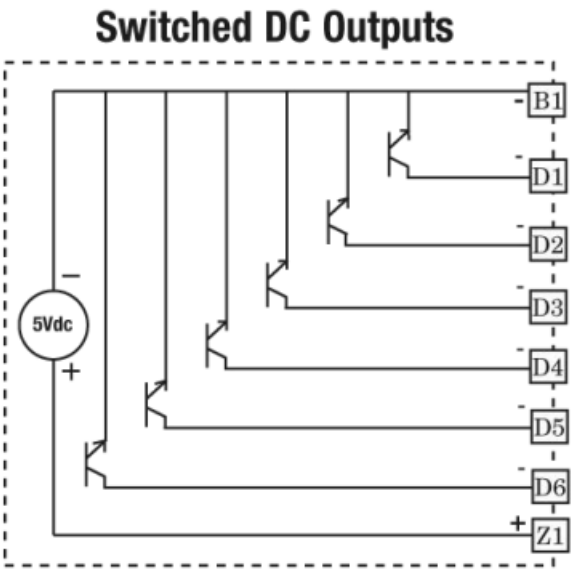


Open Collector



- Maximum switched open collector voltage is 32VÎ (dc)
- 400mA, maximum open circuit voltage of 25VÎ (dc), typical8VÎ (dc) at 80mA
- Maximum output sink current per output is1.5A (external class2 or SELV* supply required)
- Total sink current for outputs not to exceed 8A
- Do not connect outputs in parallel
    - Safety Extra LowVoltage

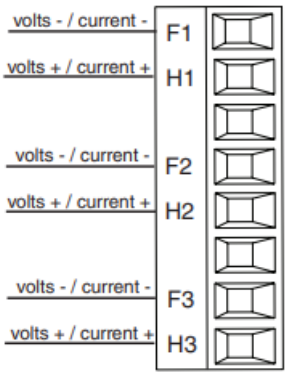
Switched DC



- 5VÎ (dc) at 130mA

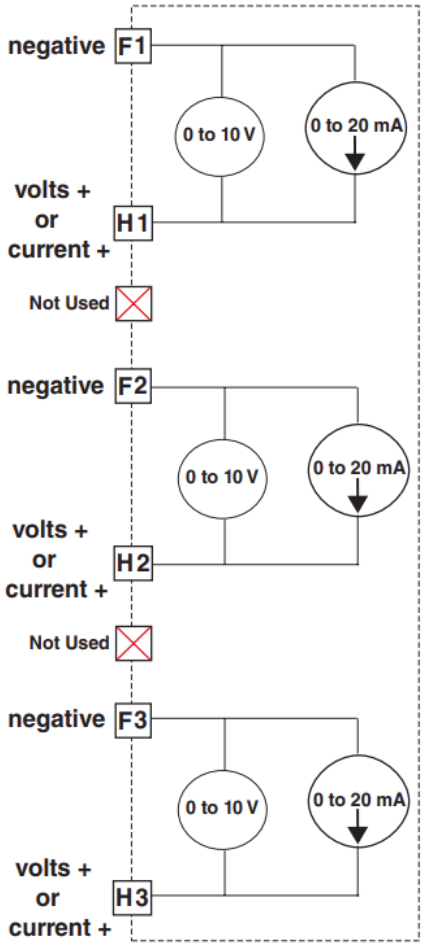
Output Connections (cont.)

Tri-Process/Retransmit Outputs

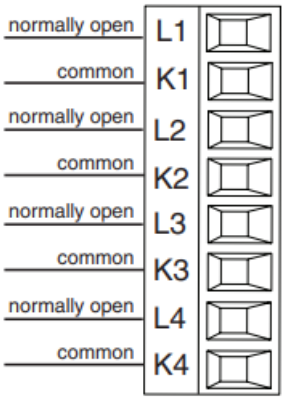


- 0 to 20mA into 400Ω maximum load
- 0 to 10VÎ (dc) into 4 kΩ minimum load
- Outputs are scalable
- Output supplies power
- Each output can be independently set for voltage or current
- Output may be used as a retransmit or control

FMHA – [F] A A A – A _ _ _

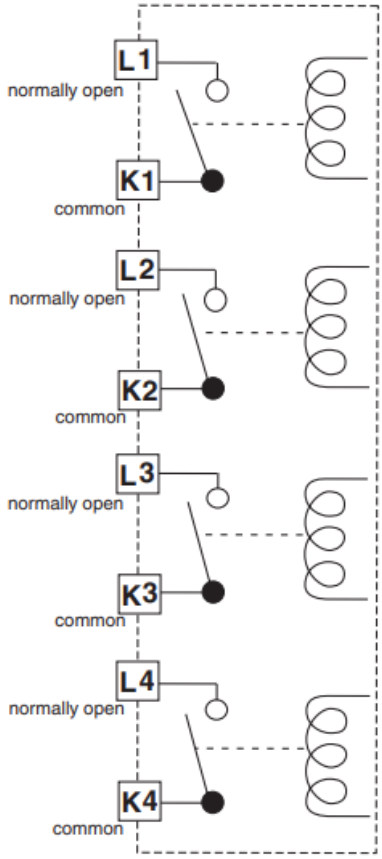


Four Mechanical Relays, Form A



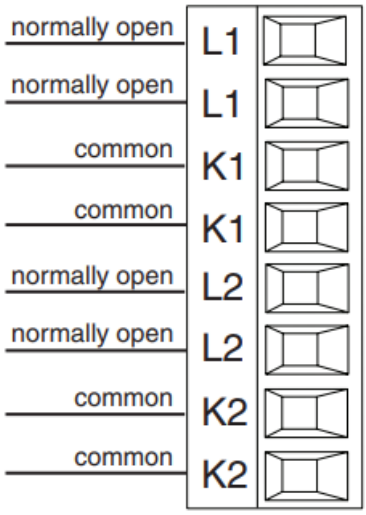
Note: Not 60730 compliant.

- 5A at 240VÅ (ac) or 30VÎ (dc) maximum resistive load
- 20mA at 24V minimum load
- 125 VA pilot duty @ 120/240VÅ (ac), 25 VA at 24VÅ (ac)
- 100,000 cycles at rated load
- The output does not supply power.
- For use with ac or dc
- See Quencharc note.

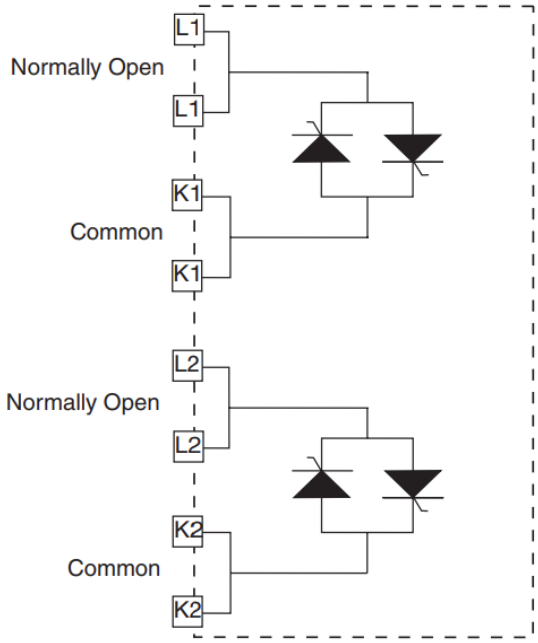


Output Connections (cont.)

Dual 10A Solid-State Relays, Form A



- 10A at 20 to 264VÅ (ac) maximum resistive load
- 10A per output at 240VÅ (ac), max. 20A per card at 122°F (50°C), max. 12A per card at 149°F (65°C)
- Opto-isolated, without contact suppression
- Maximum off-state leakage of 105µA
- Output does not supply power
- Do not use on dc loads.
- Requires two slots

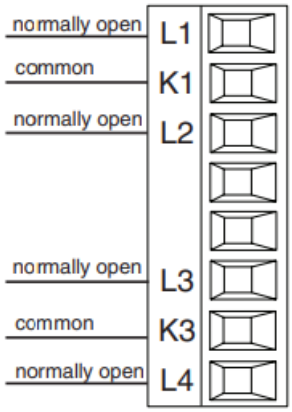


Note:
This module requires 2 slots, therefore it cannot be placed in slot 3 or 6.

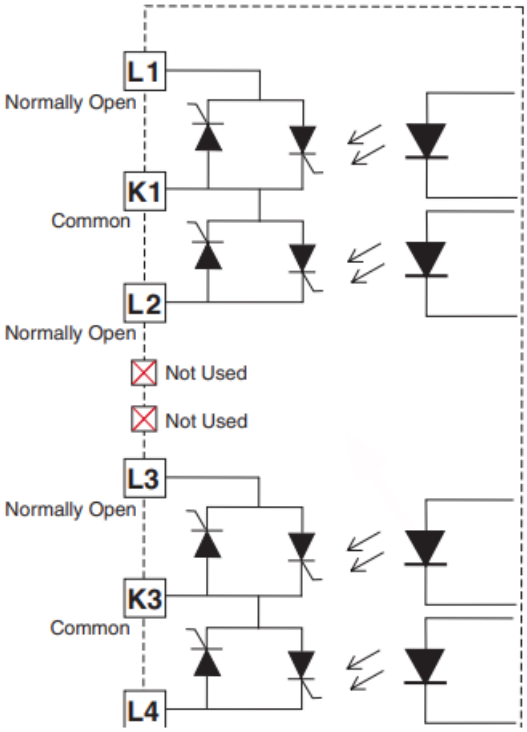
Note:
Not 60730 compliant.

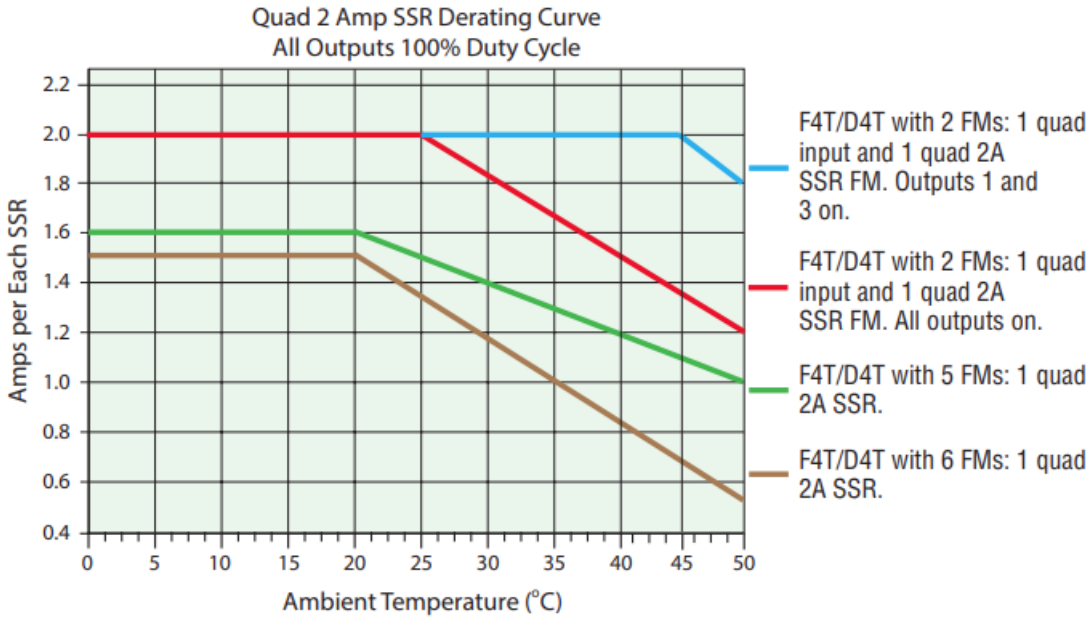
Output Connections (cont.)

Four 2A Solid-State Relays, Form A

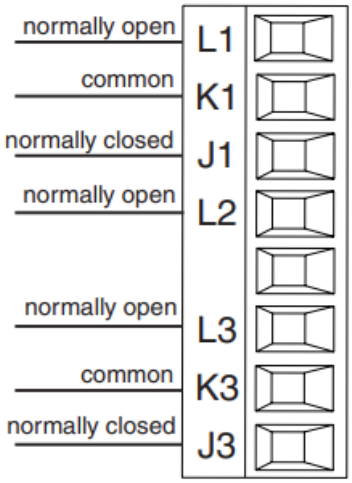


- 2A at 20 to 264VÅ (ac) maximum resistive load
- 50 VA 120/240VÅ (ac) pilot duty
- Optical isolation, without contact suppression
- Maximum off-state leakage of 105µA
- The output does not supply power.
- Do not use on dc loads.
- N.O., COM, N.O. wiring (shared common) between each set of outputs.
- See the derating curve below for maximum current output.

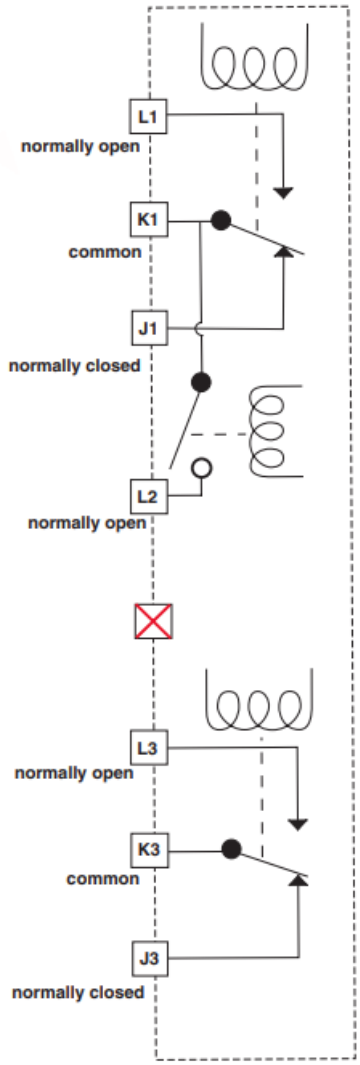




3 Mechanical Relays, 2 Form C, 1 Form A



- 5A at 24 to 240VÅ (ac) or 30V Î (dc) maximum resistive load
- 125 VA pilot duty 120/240VÅ (ac) 25 VA at 24VÅ (ac)
- Output does not supply power
- Form A relay shares common with one Form C relay.
- See Quencharc note



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) This F4T/D4T Quick Start Guide (QSG) is copyrighted by Watlow Electric Manufacturing Company, © November 2016 with all rights reserved.

Symbol	Explanation
	The 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 CSA Inter- national for use as Temperature Indicating-Regulating Equipment per CSA C22.2 No. 24. See: www.csa-inter-national.org
	Recognized component UL Files E185611 Process Control Equipment and E43684 Automatic Temperature Sensing Control Integrated Equipment, see conditions of ac ceptability.

Specifications

Input Type	Max Error @ 2 5 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
F (PTII)	±2.34	0	1343	0	1343	Deg	C

Input Type	Max Error @ 25 Deg C	Accuracy Range		Operating Range						Units
		Low	High	Low			High			
*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
Potenti- ometer 1k range	±1	0	1000	–	–	–	–	–	–	Ohms

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

Declaration of Conformity

Declares that the following products:

- **Designation:** Series EZ-ZONE®Flex ModulesModel Numbers: FMLA-(LAJ, LCJ, LEJ, MAJ, MCJ, MEJ, YEB1)A1-A1(A1,F1,B1,G1)X1X1FMMA-X1(A1,C1, E, F1, K)(A1,C1,H,J,K)A1-A1(A1,F1,B1,G1)X1X1FMHA-(R1,P1,C1,F1,B1,J,K,L1)A1A1A1-A1(A1,F1,B1,G1)X1X11FMCA-XAAA-A(A,F,B, G)XX; Note: X1= Any letter or numberClassification: FMLA, FMMA and FMHA are Process Controlmodules, FMCAare Communicationmodules; Modules are Integrated Controlsin either EZ-ZONE®CC, F4Tor D4TBases; Modules are IP10when properly installed.Rated Voltage and Frequency: Relay, SSR or No-Arc Control outputs 24 to240 V~ (ac)50/60 Hz, Switched DC, Process and communications; low voltage SELVRated Power Consumption: See manual for de-rating increased temperatures. No-arc relays 15A1.C, Dual SSR module 1. C 10A each output, Mechanical relay 5A125 VA,25 VA at 24 V~ (ac)1.B, Discreet SSR 1/2A1.C 20VA, Quad SSR 1.C 1.5A50 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 inaWatlowEZ-ZONE®CC, Series F4Tor Series D4TBase enclosure that they have a useful function. Modules were tested as parts of these systems for

compliance with the following directives.

2014/30/EUElectromagnetic Compatibility Directive
Electrical equipment for measurement, control and laboratory use –EMC requirements (Industrial Immunity, Class B Emissions).

2014/35/EULow-Voltage Directive

- **EN 61010-1:2010**
  - Safety Requirements of electrical equipment for measurement All options compliant; control and All options compliant laboratory use. Part 1: General requirements
- **EN 60730-1:2011**
  - Automatic electrical controls for household and similar use – Particular
- **EN 60730-2-9:2010**
  - requirements for temperature sensing controls.
- **'Food Service**
  - Only certain output options comply with 60730 spacing and dielectric
- **Compliant options.**
  - requirements, see 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	Winona, Minnesota, USA
Name of Authorized Representative	Place of Issue
Directory of Operations	April 20, 2016
Title of Authorized Representative	Date of Issue

Signature of Authorized Representative

How to Reach Us

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Manufacturing Support: 1-800-4WATLOW

- Email: **info@watlow.com**
- Website: **www.watlow.com**

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- Tel: +1 (314) 878-4600
- Fax: +1 (314) 878-6814

Asia and Pacific
Watlow Singapore Pte Ltd.20 Kian Tech Lane 4th FloorSingapore – 627854Tel: +65 6773 9488 **Fax:** +65 6778 0323 **Email:** info@watlow.com.sg **Website:** www.watlow.com.sg

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Documents / Resources

	WATLOW FMHA High Density Input/Output Modules [pdf] User Guide FMHA High Density Input Output Modules, FMHA, High Density Input Output Modules, Density Input Output Modules, Input Output Modules, Output Modules, Modules

References

- national.org at Directnic
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- Globaler Lieferant von industriellen elektrischen thermischen Lösungen | Watlow
- Proveedor internacional de soluciones térmicas eléctricas industriales | Watlow
- Fournisseur mondial de solutions thermiques électriques industrielles | Watlow
- Global Supplier of Industrial Electric Thermal Solutions | Watlow
- User Manual

Manuals+, Privacy Policy