

WATLOW FMHA 0600-0096-0000 High Density Input/Output Modules User Guide

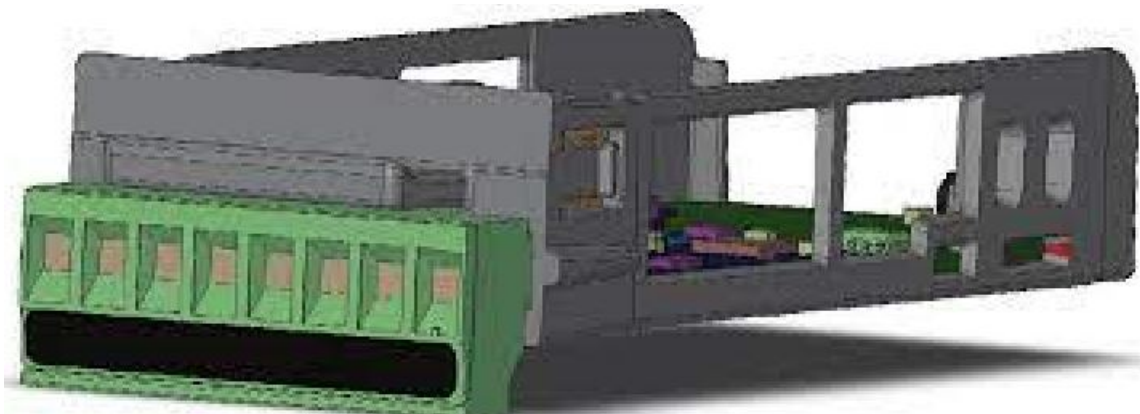
[Home](#) » [WATLOW](#) » WATLOW FMHA 0600-0096-0000 High Density Input/Output Modules User Guide 

Contents

- [1 WATLOW FMHA 0600-0096-0000 High Density Input/Output Modules](#)
- [2 Safety Information](#)
- [3 Available F4T/D4T Literature and Resources](#)
- [4 Installation and Wiring](#)
- [5 Input Connections](#)
- [6 Warranty](#)
- [7 Technical Assistance](#)
- [8 Specifications](#)
- [9 How to Reach Us](#)
- [10 Documents / Resources](#)
- [11 Related Posts](#)





WATLOW FMHA 0600-0096-0000 High Density Input/Output Modules



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.

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 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 number and type of inputs or outputs available to be connected in step 7.
2. Turn off 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 to 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 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 F4T/D4T.

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

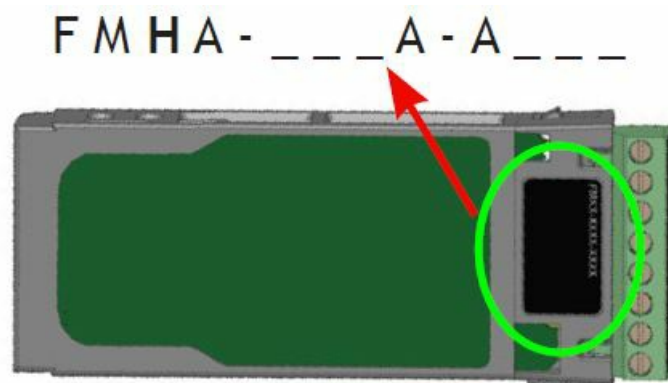
* Requires two adjacent slots

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.

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 to the right.



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 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 base enclosure with slot caps in empty slots.

CAUTION: Quencharc Note:

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.

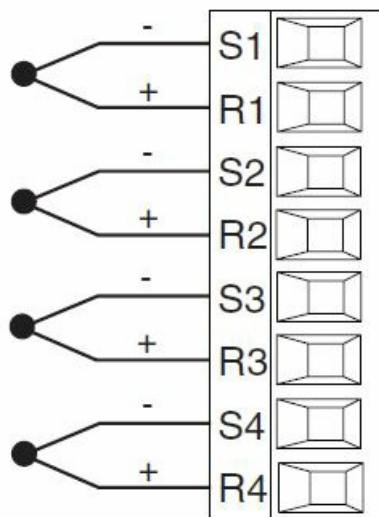
Note

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

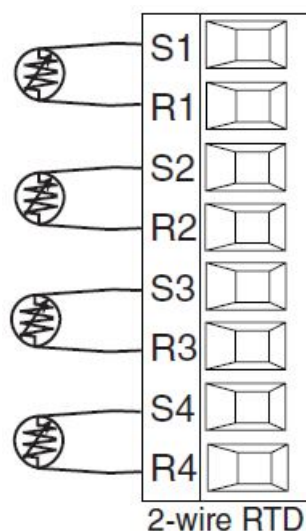
Thermocouple



FMHA – [R] A A A – A _ _ _

- Grounded or ungrounded sensors, greater than 20M Ω input impedance, 2k Ω source resistance max
- 3 μ A 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

RTD

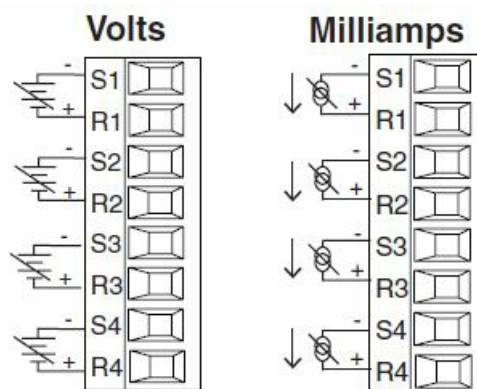


FMHA – [R] A A A – A _ _ _



- Platinum, 100 and 1k Ω @ 32°F (0°C) calibration to DIN curve (0.00385 $\Omega/\Omega/^{\circ}\text{C}$)
- RTD excitation current of 0.09mA typical. Each ohm of lead resistance may affect the reading by 2.55°C for a 100 Ω platinum sensor or 0.25°C for a 1k Ω 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

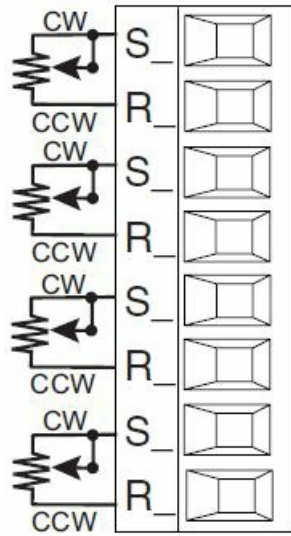
Process



FMHA – [R] A A A – A

- 0 to 20mA @ 100 Ω input impedance
- 0 to 10V  (dc) @ 20k Ω input impedance
- 0 to 50mV  (dc) @ 20M Ω input impedance
- Scalable

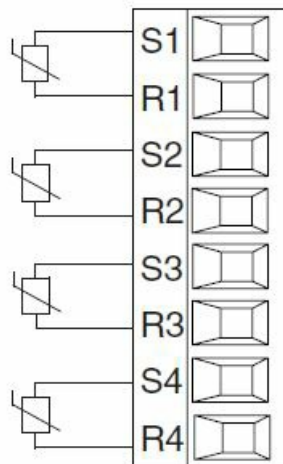
Potentiometer



FM [M, L] A – [C, L, Y, R] __ A – A

- Potentiometer: 0 to 1.2k Ω

Thermistor

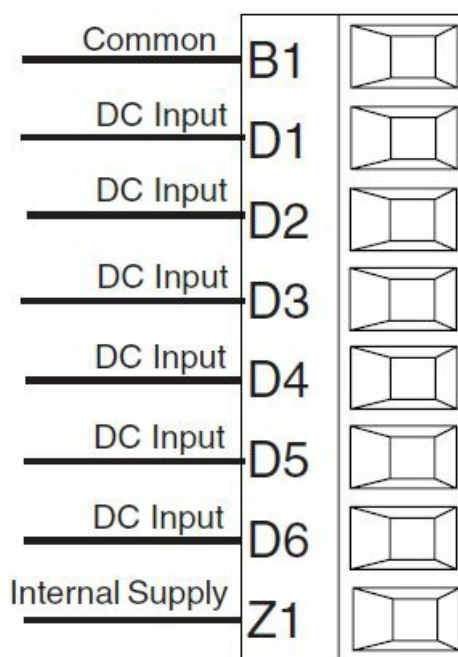


FMHA – [P] A A A – A _ _ _

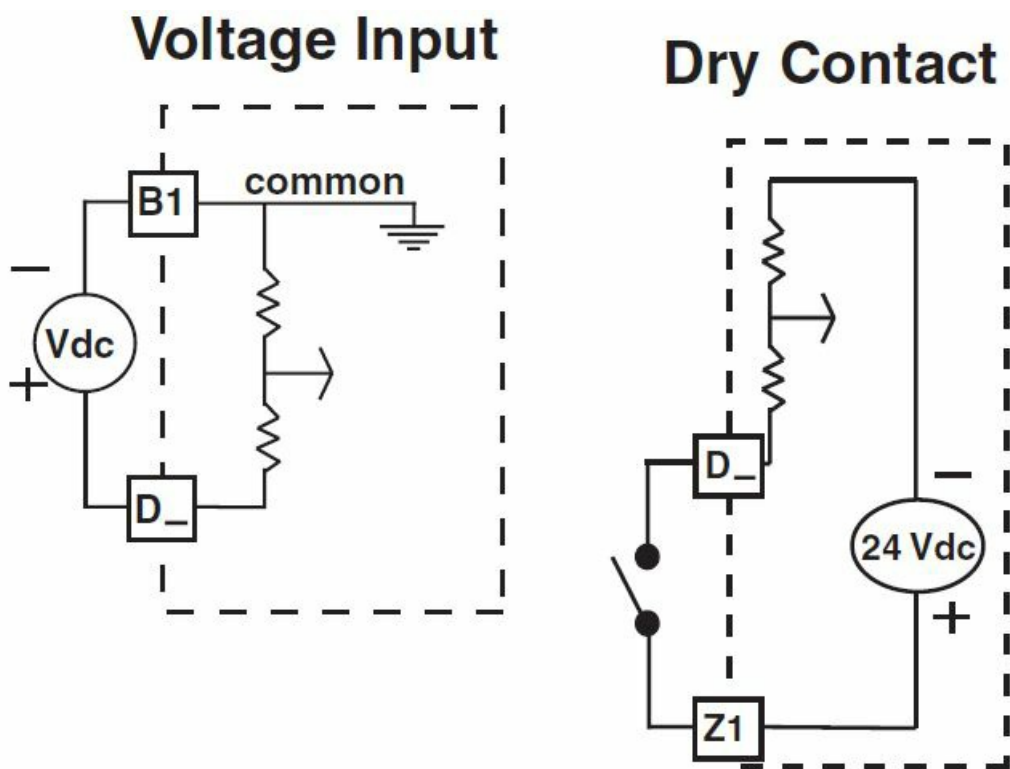
- >20M Ω input impedance
- 0 to 40k Ω , 0 to 20k Ω , 0 to 10k Ω , 0 to 5k Ω
- 2.252k Ω and 10k Ω base at 77°F (25°C)
- User-selectable curves for Alpha Technics, Beta THERM and YSI
- User-scaling support for Steinhart-Hart coefficients

Thermistor Curve Setting	Base R @ 25 °C	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: $1 / T = A + B \ln(R) + C (\ln(R))^3$			









Six Digital Inputs






- Voltage
 - Max. input 36V at 3mA
 - Input inactive when $\leq 2V$
 - Input active when $\geq 3V$ at 0.25mA
- Dry Contact
 - Input inactive when $\geq 500\Omega$
 - Input active when $\leq 100\Omega$
 - Max. short circuit 13mA



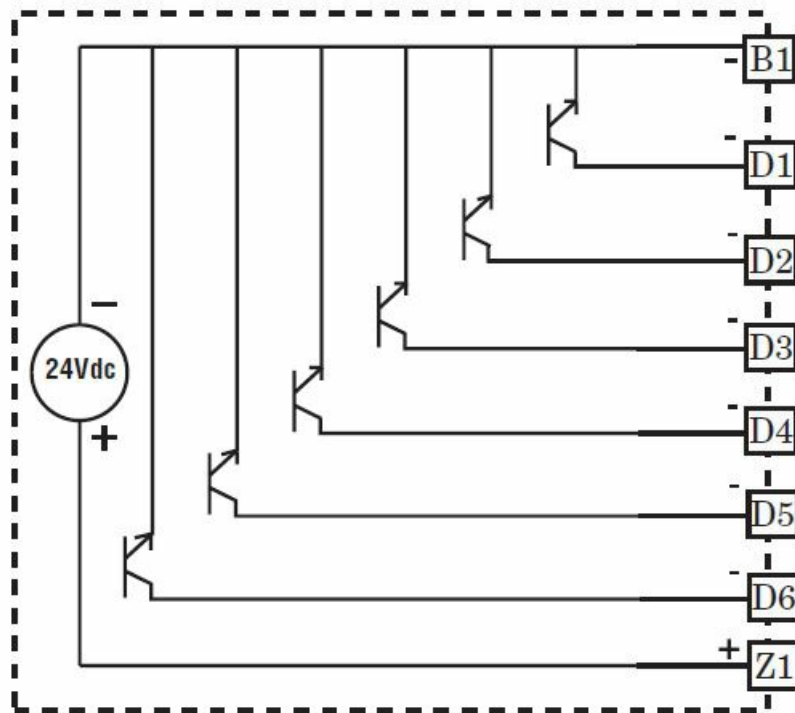
Six Digital Outputs

	Common	B1	
open collector/switched dc		D1	
open collector/switched dc		D2	
open collector/switched dc		D3	
open collector/switched dc		D4	
open collector/switched dc		D5	
open collector/switched dc		D6	
Internal Supply		Z1	

Open Collector

- Maximum switched open collector voltage is 32V  (dc)
- 400mA, maximum open circuit voltage of 25V  (dc), typical 8V  (dc) at 80mA
- Maximum output sink current per output is 1.5A (external class 2 or SELV* supply required)
- Total sink current for all outputs not to exceed 8A
- Do not connect outputs in parallel
- Safety Extra Low Voltage

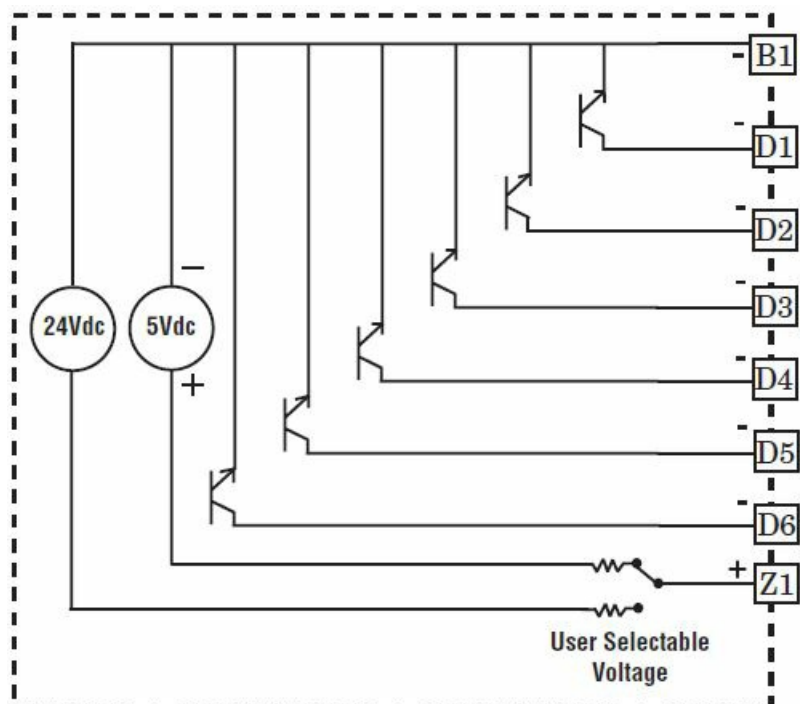
Open Collector Outputs



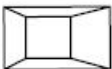
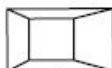
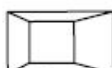
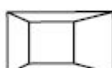




Switched DC


- User selectable voltage, 5V $\overline{\text{dc}}$ (dc) at 130mA or 19 to 22V $\overline{\text{dc}}$ (dc) at 80mA

Switched DC Outputs

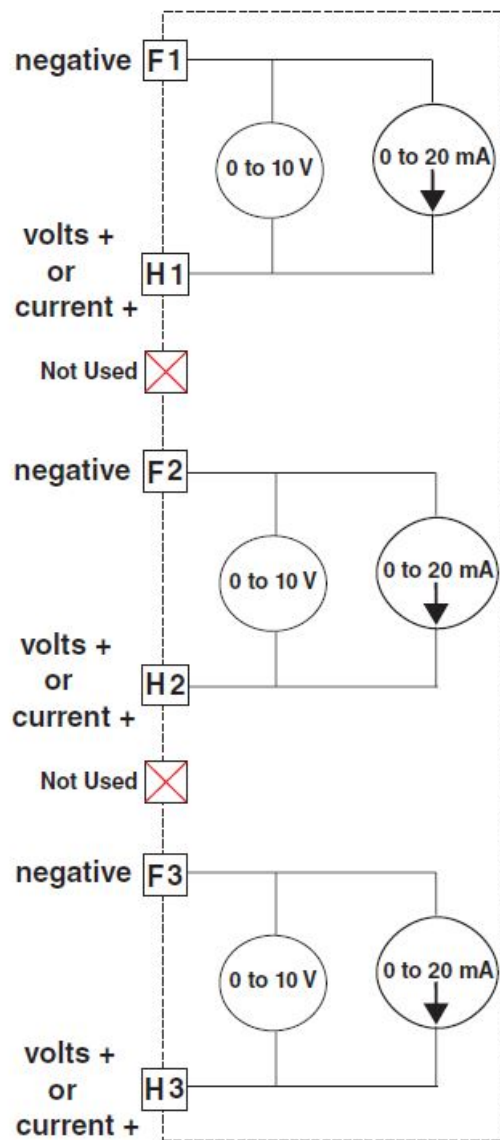


Tri-Process/Retransmit Outputs

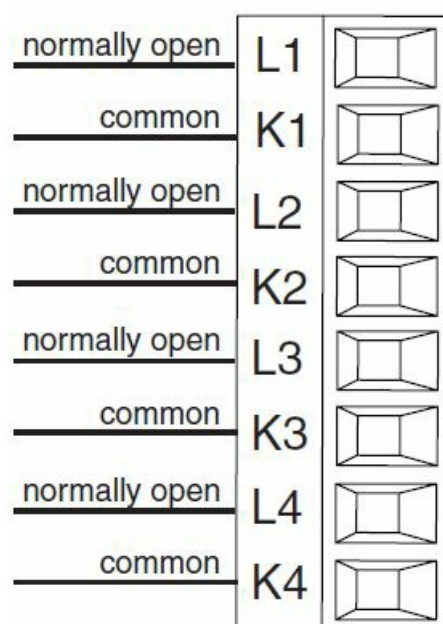
<u>volts - / current -</u>	F1	
<u>volts + / current +</u>	H1	
		
<u>volts - / current -</u>	F2	
<u>volts + / current +</u>	H2	
		
<u>volts - / current -</u>	F3	
<u>volts + / current +</u>	H3	

- 0 to 20mA into 400Ω maximum load
- 0 to 10V  (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 retransmit or control

FMHA – [F] A A A – A _ _ _



Four Mechanical Relays, Form A

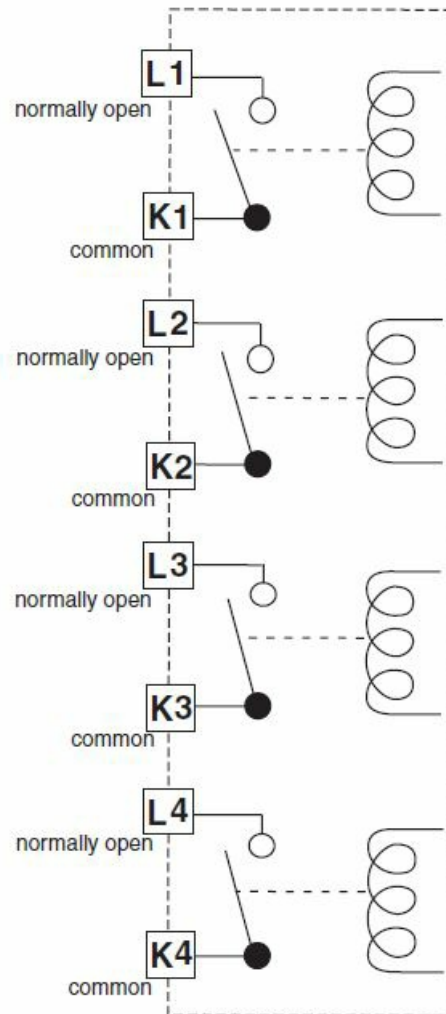


- 5A at 240V_A (ac) or 30V (dc) maximum resistive load
- 20mA at 24V minimum load









- 125 VA pilot duty @ 120/240V \ddot{A} (ac), 25 VA at 24V \ddot{A} (ac)
- 100,000 cycles at rated load
- Output does not supply power.
- For use with ac or dc
- See Quencharc note (page 4)

Note

Not 60730 compliant.

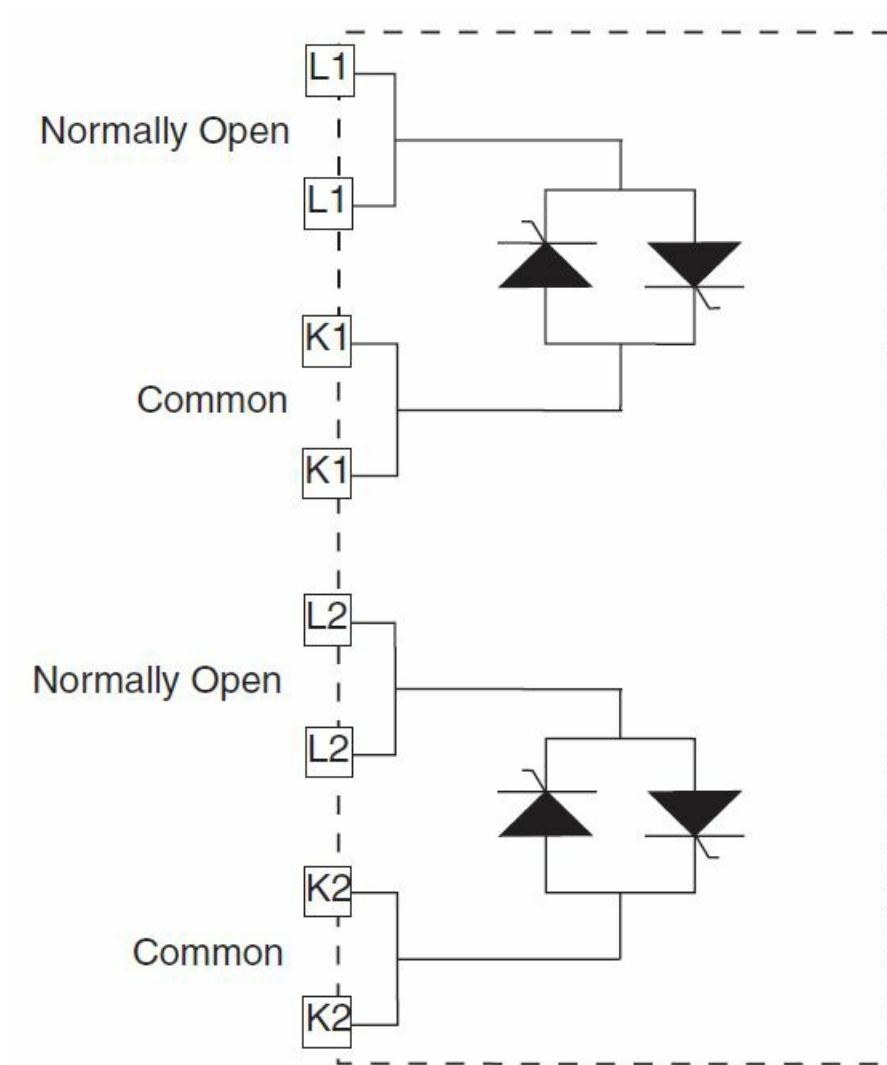


Dual 10A Solid-State Relays, Form A

normally open	L1	
normally open	L1	
common	K1	
common	K1	
normally open	L2	
normally open	L2	
common	K2	
common	K2	

- 10A at 20 to 264V \bar{A} (ac) maximum resistive load
- 10A per output at 240V \bar{A} (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 105 μ A
- Output does not supply power
- Do not use on dc loads.
- Requires two slots

FMHA – [K] A A A – A _ _ _











Note

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

Note

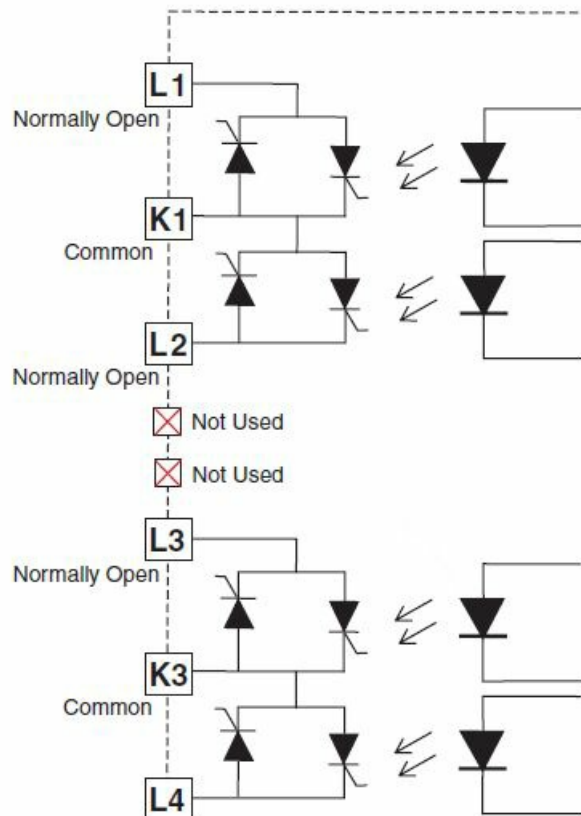
Not 60730 compliant.

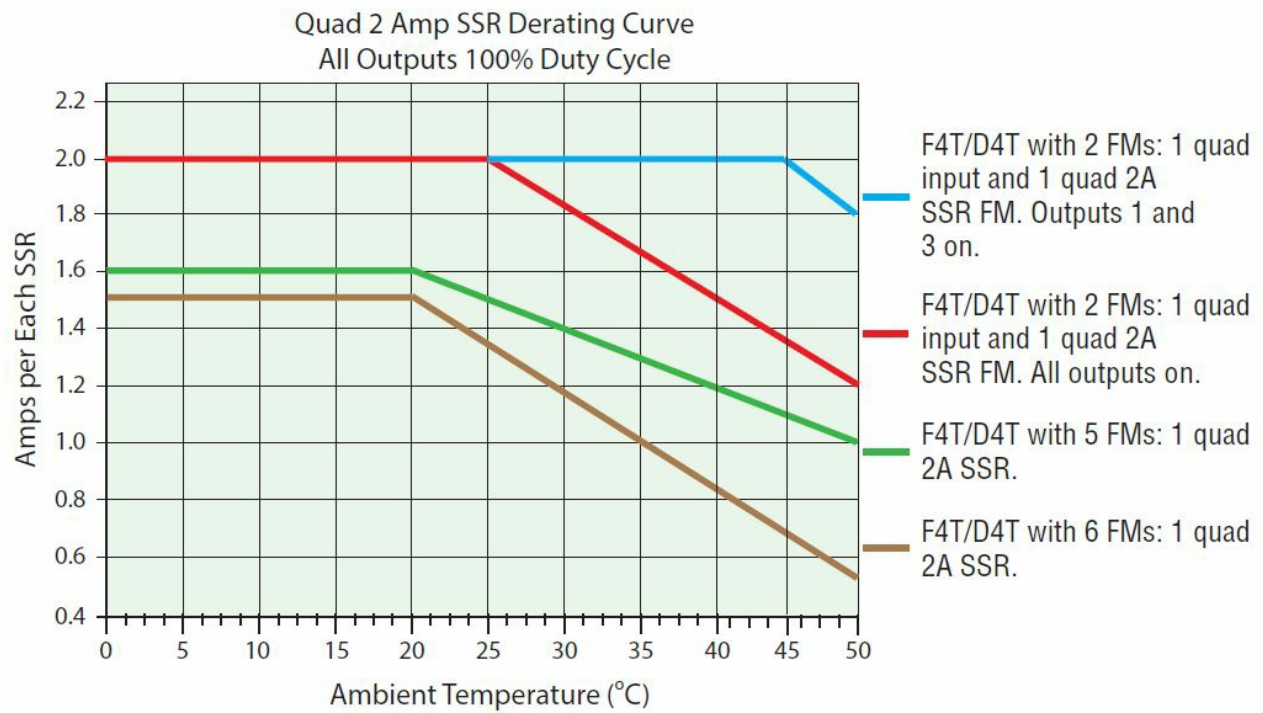
Four 2A Solid-State Relays, Form A

<u>normally open</u>	L1	
<u>common</u>	K1	
<u>normally open</u>	L2	
		
		
<u>normally open</u>	L3	
<u>common</u>	K3	
<u>normally open</u>	L4	

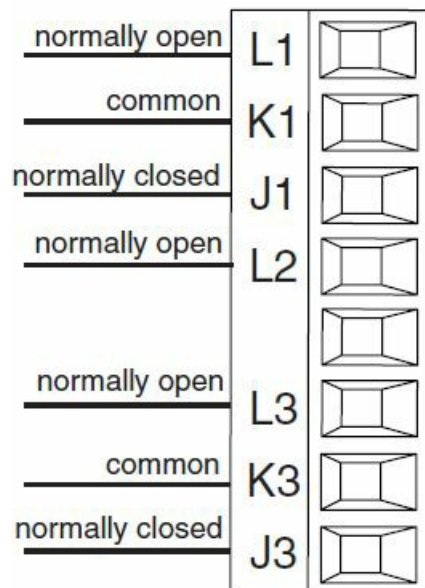
- 2A at 20 to 264V \hat{A} (ac) maximum resistive load
- 50 VA 120/240V \hat{A} (ac) pilot duty
- Optical isolation, without contact suppression
- Maximum off state leakage of 105 μ A
- Output does not supply power.
- Do not use on dc loads.
- N.O., COM, N.O wiring (shared common) between each set of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

FMHA – [L] A A A – A _ _ _



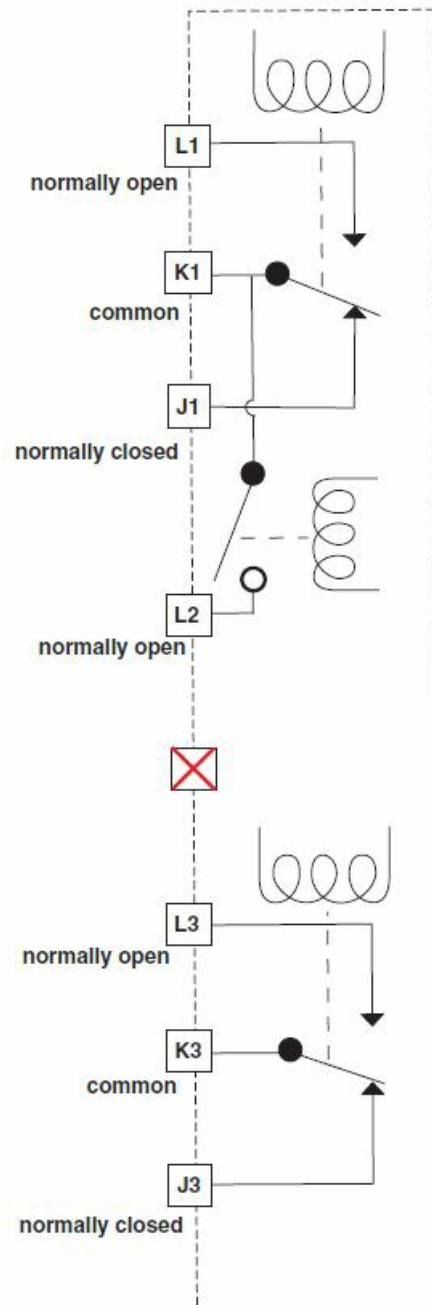


3 Mechanical Relays, 2 Form C, 1 Form A



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

FMHA – [B] A A A – A _ _ _



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
	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 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 @ 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

- NSF approved inputs

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

- WATLOW Electric Manufacturing Company ISO 9001 since 1996.
- 1241 Bundy Blvd. Winona, MN 55987 USA
- Designation: Series EZ-ZONE@Flex Modules Model 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 number Classification: FMLA, FMMA and FMHA are Process Control modules, FMCA are Communication modules; Modules are Integrated Controls in either EZ-ZONE@CC, F4Tor D4TBases; 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 increase in 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 F4Tor Series D4TBase 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

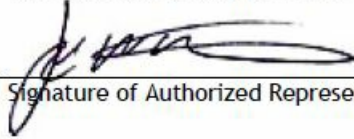
- EN 60730-1:2011 EN 60730-2-9:2010 Food Service Compliant options. Automatic electrical controls for household and similar
- use –Particular requirements for temperature sensing controls. Only certain output options comply with 60730 spacing and dielectric requirements, see order information for compatible models.

Compliant with 2011/65/EURoHS2 Directive

- Per 2012/19/EU W.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

Director of Operations
Title of Authorized Representative



Signature of Authorized Representative

Winona, Minnesota, USA
Place of Issue

April 20, 2016
Date of Issue

How to Reach Us

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- Website: www.watlow.com
- From outside the USA and Canada:
- Tel: +1 (314) 878-4600
- Fax: +1 (314) 878-6814

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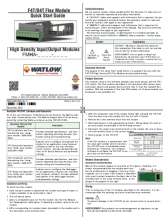
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Documents / Resources

	<p>WATLOW FMHA 0600-0096-0000 High Density Input/Output Modules [pdf] User Guide FMHA 0600-0096-0000 High Density Input Output Modules, FMHA 0600-0096-0000, High Density Input Output Modules, Density Input Output Modules, Input Output Modules, Output Mo dules, Modules</p>
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