I/O Wiring and Specifications

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- I/O Module Wiring and Specifications
- Glossary of Specification Terms
- I/O Module Wiring diagrams
I/O Wiring Strategies

The DL405 system is very flexible and will work in many different wiring configurations. By studying this section before actual installation, you should find the best wiring strategy for your application. This will help to lower system cost, wiring errors, and avoid safety problems.

DL405 system circuitry is divided into three main regions separated by isolation boundaries, shown in the drawing below. Electrical isolation provides safety, so that a fault in one area does not damage another. A transformer in the power supply provides magnetic isolation between the primary and secondary sides. Opto-couplers provide optical isolation in Input and Output circuits. This isolates logic circuitry from the field side, where factory machinery connects. Note that the discrete inputs are isolated from the discrete outputs, because each is isolated from the logic side. Isolation boundaries protect the operator interface (and the operator) from power input faults or field wiring faults. When wiring a DL405 system, it is extremely important to avoid making external connections that connect logic side circuits to any other.

The next figure shows the physical layout of a DL405 system, as viewed from the front. In addition to the basic circuits covered above, AC-powered units include an auxiliary +24VDC power supply with its own isolation boundary. Since the supply output is isolated from the other three circuits, it can power input and/or output circuits!
In some cases, using the built-in auxiliary +24VDC supply can result in a cost savings for your control system. It can power combined loads up to 400 mA. Be careful not to exceed the current rating of the supply. If you are the system designer for your application, you may be able to select and design in field devices which can use the +24VDC auxiliary supply.

In most applications it will be necessary to power the input devices from one power source, and to power output loads from another source. Loads often require high-energy AC power, while input sensors use low-energy DC. If a machine operator is likely to come in close contact with input wiring, then safety reasons also require isolation from high-energy output circuits. It is most convenient if the loads can use the same power source as the DL405 system, and the input sensors can use the auxiliary supply, as shown to the left in the figure below.

If the loads cannot be powered from the system supply, then a separate supply must be used as shown to the right in the figure below.

A worst-case scenario, from a cost and complexity viewpoint, is an application which requires separate power sources for the DL405 system, input devices, and output loads. The example wiring diagram below on the right shows how this can work, but also that the auxiliary supply output is an unused resource.
This next section helps to provide a solid understanding of “sinking” and “sourcing” concepts. Use of these terms occurs frequently in input or output circuit discussions. It is the goal of this section to make these concepts easy to understand, further ensuring success in installation.

**Sinking** = provides a path to supply ground (–)

**Sourcing** = provides a path to supply source (+)

Sinking and sourcing terminology only applies to DC input and output circuits because of the reference to (+) and (–) polarities. Input and output points that are sinking or sourcing only can conduct current in only one direction. This means it is possible to connect the external supply and field device to the I/O point with current trying to flow in the wrong direction, and the circuit will not operate. However, you can successfully connect the supply and field device every time by understanding “sourcing” and “sinking.”

For example, the figure to the right illustrates a “sinking” input. To properly connect the external supply, we just have to connect it so the input provides a path to ground (–). Start at the DL405 system input terminal, follow through the input sensing circuit, exit at the common terminal, and connect the supply (–) to the common terminal. By adding the switch, between the supply (+) and the input, we have completed the circuit. Current flows in the direction of the arrow when the switch is closed.

By applying the circuit principle above to the four possible combinations of input/output sinking/sourcing types, you have the four circuits as shown below. The I/O module specifications at the end of this chapter list the input or output type.
In order for an I/O circuit to operate, current must enter at one terminal and exit at another. This means at least two terminals are associated with every I/O point. In the figure to the right, the Input or Output terminal is the *main path* for the current. One additional terminal must provide the *return path* to the power supply.

If there was unlimited space and budget for I/O terminals, then every I/O point could have two dedicated terminals as the figure above shows. However, providing this level of flexibility is not practical or even necessary for most applications. Most Input or Output points are in groups which share the return path (called *commons*). The figure to the right shows a group (or *bank*) of 4 input points which share a common return path. In this way, the four inputs require only five terminals instead of eight.

**NOTE:** In the circuit above, the current in the common path is 4 times any channel’s input current when all inputs are energized. This is important in output circuits where heavier gauge wire is sometimes necessary on commons.

Most DL405 input and output modules group their I/O points into banks that share a common return path. The best indication of I/O common grouping is on the wiring label, such as the one shown to the right. The miniature schematic shows two circuit banks with eight input points in each. The common terminal for each is labeled “CA” and “CB”, respectively.

In the wiring label example, the positive terminal of a DC supply connects to the common terminals. Some symbols you will see on the wiring labels, and their meanings are:

- AC supply
- DC supply
- AC or DC supply

![Input Switch](image1)

![Output Load](image2)
Connecting DC I/O to “Solid State” Field Devices

In the previous section on Sourcing and Sinking concepts, we explained that DC I/O circuits sometimes will only allow current to flow one way. This is also true for many of the field devices which have solid-state (transistor) interfaces. In other words, field devices can also be sourcing or sinking. When connecting two devices in a series DC circuit, one must be wired as sourcing and the other as sinking.

Solid State Input Sensors

Several DL405 DC input modules are flexible in that they detect current flow in either direction, so they can be wired as either sourcing or sinking. In the following circuit, a field device has an open-collector NPN transistor output. It sinks current from the input point, which sources current. The power supply can be the +24 auxiliary supply or another supply (+12 VDC or +24VDC), as long as the input specifications are met.

In the next circuit, a field device has an open-emitter PNP transistor output. It sources current to the input point, which sinks the current back to ground. Since the field device is sourcing current, no additional power supply is required.

Solid State Output Loads

Sometimes an application requires connecting an output point to a solid state input on a device. This type of connection is usually made to carry a low-level control signal, not to send DC power to an actuator.

Several of the DL405 DC output modules are the sinking type. This means that each DC output provides a path to ground when it is energized. In the following circuit, the output point sinks current to the output common when energized. It is connected to a sourcing input of a field device input.
In the next example a sinking DC output point is connected to the sinking input of a field device. This is different, because both the DL405 system output and field device input are sinking type. Since the circuit must have one sourcing and one sinking device, a sourcing capability is added to the system output by using a pull-up resistor. In the circuit below, connect $R_{\text{pull-up}}$ from the output to the DC output circuit power input.

**NOTE 1:** DO NOT attempt to drive a heavy load (>25 mA) with this pull-up method

**NOTE 2:** Using the pull-up resistor to implement a sourcing output has the effect of inverting the output point logic. In other words, the field device input is energized when the DL405 system output is OFF, from a ladder logic point-of-view. Your ladder program must comprehend this and generate an inverted output. Or, you may choose to cancel the effect of the inversion elsewhere, such as in the field device.

It is important to choose the correct value of $R_{\text{pull-up}}$. In order to do so, the nominal input current to the field device ($I_{\text{input}}$) when the input is energized needs to be identified. If this value is not known, it can be calculated as shown (a typical value is 15 mA). Then use $I_{\text{input}}$ and the voltage of the external supply to compute $R_{\text{pull-up}}$. Next calculate the power $P_{\text{pull-up}}$ (in watts), in order to size $R_{\text{pull-up}}$ properly.

\[
I_{\text{input}} = \frac{V_{\text{input (turn-on)}}}{R_{\text{input}}}
\]

\[
R_{\text{pull-up}} = \frac{V_{\text{supply}} - 0.7}{I_{\text{input}}} - R_{\text{input}}
\]

\[
P_{\text{pull-up}} = \frac{V_{\text{supply}}^2}{R_{\text{pull-up}}}
\]

The easiest way to drive a sinking input field device as shown below is to use a DC sourcing output module. The Darlington NPN stage will have about 1.5 V ON-state saturation, but this is not a problem with low-current solid-state loads.

**DL405 System DC Sourcing Output**

![Diagram of DL405 System DC Sourcing Output](image)
Four output modules in the DL405 I/O family feature relay outputs: D4–08TR, F4–08TRS–1, F4–08TRS–2, D4–16TR. Relays are best for the following applications:

- Loads that require higher currents than the solid-state outputs can deliver
- Cost-sensitive applications
- Some output channels need isolation from other outputs (such as when some loads require different voltages than other loads)

Some applications in which NOT to use relays:

- Loads that require currents under 10 mA
- Loads which must be switched at high speed or heavy duty cycle

Relay outputs in the DL405 output modules are available in two contact arrangements, shown to the right. The Form A type, or SPST (single pole, single throw) type is normally open and is the simplest to use. The Form C type, or SPDT (single pole, double throw) type has a center contact which moves and a stationary contact on either side. This provides a normally closed contact and a normally open contact.

Some relay output module’s relays share common terminals, which connect to the wiper contact in each relay of the bank. Other relay modules have relays which are completely isolated from each other. In all cases, the module drives the relay coil when the corresponding output point is on.

Relay contacts wear according to the amount of relay switching, amount of spark created at the time of open or closure, and presence of airborne contaminants. However, there are some steps you can take to help prolong the life of relay contacts:

- Switch the relay on or off only when the application requires it.
- If you have the option, switch the load on or off at a time when it will draw the least current.
- Take measures to suppress inductive voltage spikes from inductive DC loads such as contactors and solenoids (circuit given below).
Adding external contact protection may extend relay life beyond the number of contact cycles listed in the specification tables for relay modules. High current inductive loads such as clutches, brakes, motors, direct-acting solenoid valves, and motor starters will benefit the most from external contact protection.

The RC network must be located close to the relay module output connector. To find the values for the RC snubber network, first determine the voltage across the contacts when open, and the current through them when closed. If the load supply is AC, then convert the current and voltage values to peak values:

\[
C (\mu F) = \frac{I^2}{10} \quad R (\Omega) = \frac{V}{10 \times I^x} \quad \text{, where } x = 1 + \frac{50}{V}
\]

\[
C \text{ minimum } = 0.001 \ \mu F; \quad \text{the voltage rating of } C \text{ must be } \geq V, \ \text{non-polarized}
\]

\[
R \text{ minimum } = 0.5 \ \Omega, \ 1/2 \ W, \ \text{tolerance is } \pm 5\%
\]

For example; a relay contact drives a load at 120VAC, 1/2 A. Since this example has an AC power source, first, calculate the peak values:

\[
I_{\text{peak}} = I_{\text{rms}} \times 1.414 = 0.5 \times 1.414 = 0.707 \ \text{Amperes}
\]

\[
V_{\text{peak}} = V_{\text{rms}} \times 1.414 = 120 \times 1.414 = 169.7 \ \text{Volts}
\]

Now, finding the values of R and C:

\[
C (\mu F) = \frac{I^2}{10} = \frac{0.707^2}{10} = 0.05 \ \mu F, \ \text{voltage rating } \geq 170 \ \text{Volts}
\]

\[
R (\Omega) = \frac{V}{10 \times I^x} \quad \text{, where } x = 1 + \frac{50}{V}
\]

\[
x = 1 + \frac{50}{169.7} = 1.29 \quad R (\Omega) = \frac{169.7}{10 \times 0.707^{1.29}} = 16 \ \Omega, \ 1/2 \ W, \ \pm 5\%
\]

If the contact is switching a DC inductive load, add a diode across the load as near to load coil as possible. When the load is energized the diode is reverse-biased (high impedance). When the load is turned off, energy stored in its coil is released in the form of a negative-going voltage spike. At this moment the diode is forward-biased (low impedance) and shunts the energy to ground. This protects the relay contacts from the high voltage arc that would occur just as the contacts are opening.

For best results, follow these guidelines in using a noise suppression diode:

- DO NOT use this circuit with an AC power supply.
- Place the diode as close to the inductive field device as possible.
- Use a diode with a peak inverse voltage rating (PIV) at least 100 PIV, 3A forward current or larger. Use a fast-recovery type (such as Schottky type). DO NOT use a small-signal diode such as 1N914, 1N941, etc.
- Be sure the diode is in the circuit correctly before operation. If installed backwards, it short-circuits the supply when the relay energizes.
I/O Module Wiring and Specifications

Module Placement

Before wiring the I/O modules in your system to field devices, it’s very important to make sure each I/O module is in the right slot and base in the system. Costly wiring errors may be avoided by doing the following:

- Perform the power budget calculations for each base to verify the base power supply can power all the modules in the base.
- Whenever possible, keep modules with high voltage and current wiring away from sensitive analog modules.

NOTE: Please refer to the applicable Base Controller User manual for the power budget requirements and worksheets.

I/O Module Status Indicators

The diagram below shows the status indicator location for common I/O modules.

Color Coding of I/O Modules

The DL405 family of I/O modules have a color-coded stripe on the front bezel to help identify whether the module type is input, output, or special module. The color code description is listed below:

<table>
<thead>
<tr>
<th>Module Type</th>
<th>Color Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrete/Analog Output</td>
<td>Red</td>
</tr>
<tr>
<td>Discrete/Analog Input</td>
<td>Blue</td>
</tr>
<tr>
<td>Other</td>
<td>White</td>
</tr>
</tbody>
</table>
Wiring a Module with a Terminal Block

You must first remove the front cover of the module prior to wiring. To remove the cover depress the bottom tab of the cover and tilt the cover up to loosen from the module.

All DL405 I/O module terminal blocks are removable for your convenience. To remove the terminal block loosen the retaining screws and lift the terminal block away from the module. When you return the terminal block to the module make sure the terminal block is tightly seated. Be sure to tighten the retaining screws. You should also verify the loose terminal block LED is off when system power is applied.

**WARNING:** For some modules, field device power may still be present on the terminal block even though the system is turned off. To minimize the risk of electrical shock, disconnect all field device power before you remove the connector.
The 32 point and 64 point modules use a different style of connector due to the increased number of I/O points. There are two types of connectors used with the higher density modules. One is a D-shell connector, which requires soldering. The other is a ribbon cable type of connector which simply crimps onto a ribbon cable.

For the 64 point modules, you must either use ribbon cable connectors, or special solder type connectors designed specifically for the 64 point modules. Order part number D4–IO3264S, which includes 2 solder-type connectors in the pack, or order D4–IO32R, which contains 2 ribbon cable type connectors in the pack.

**NOTE:** For another alternative wiring solution, consider using Automationdirect.com’s ZIPlink Connection systems. The ZIPlink cables plug directly into a Automationdirect.com I/O module. The opposite end is connected to a ZIPlink connector module. Please refer to our catalog for more information on these products.
Both types of connectors are available from Automationdirect.com. These same connectors are also available from other Fujitsu Microelectronics, Inc. Use the following part numbers to order these connectors.

**Automationdirect.com Part Numbers**
- D4–IO3264R — Ribbon cable connectors, 2 in a pack. Can be used on either 32 point or 64 point modules.
- D4–IO3264S — Solder type connector, 2 in a pack. Can be used on either 32 point or 64 point modules.

**Fujitsu Part Numbers**
For connectors made by Fujitsu, you may contact Fujitsu at the following address:
Fujitsu Microelectronics, Inc.
Electronic Components Division
3545 North First Street
San Jose, CA 95134–1804 USA
408–922–9000
- FCN–367J040–AU/F, or –AG/F — 32 / 64 point ribbon cable connector
- FCN–361J040–AU, or –AG — 32 / 64 point solder type connector
(AU connectors use gold over palladium plating. AG connectors use silver plating.)

If you wish to use a terminal block with your 32 or 64 point module, here is a partial list of vendors who can provide the parts you will need to build the configuration shown earlier consisting of a ribbon cable, a ribbon cable connector and a terminal block.

**Vendors**

<table>
<thead>
<tr>
<th>Vendors</th>
<th>Address</th>
<th>Phone Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>3M Electronic Products Division</td>
<td>6801 River Place Blvd. Austin, TX 78726–9000 800–225–5373</td>
<td></td>
</tr>
<tr>
<td>DuPont Connector Systems</td>
<td>Barley Mill Plaza Wilmington, DE 19898–0019 800–237–2374</td>
<td></td>
</tr>
<tr>
<td>Augat/RDI</td>
<td>525 Randy Rd. Carol Stream, IL 60188 708–682–4100</td>
<td></td>
</tr>
<tr>
<td>Phoenix Contacts Products</td>
<td>P.O. Box 4100 Harrisburg, PA 17111–0100 717–944–1300</td>
<td></td>
</tr>
<tr>
<td>AMP Incorporated</td>
<td>P.O. Box 3608 Harrisburg, PA 17105–3608 717–564–0100</td>
<td></td>
</tr>
<tr>
<td>Thomas &amp; Betts Electronics Div.</td>
<td>200 Executive Center Drive Greenville, SC 29616 803–676–2900</td>
<td></td>
</tr>
<tr>
<td>Cooper Industries, Belden Div.</td>
<td>P.O. Box 1980 Richmond, IN 47375 317–983–5200</td>
<td></td>
</tr>
<tr>
<td>Weidmuller, Inc.</td>
<td>821 Southlake Blvd. Richmond, VA 23236 804–794–2877</td>
<td></td>
</tr>
<tr>
<td>Newark Electronics</td>
<td>4108 North Ravenswood Ave. Chicago, IL 60640 312–784–5100</td>
<td>(Newark Electronics is a distributor for all of the above product manufacturers except for Phoenix Contacts Products)</td>
</tr>
</tbody>
</table>
### Ribbon Cable

The chart below lists cables which can be used to connect the terminal block with a 32 I/O module. The cables are 40 conductors with a .050" pitch PVC stranded ribbon cable.

<table>
<thead>
<tr>
<th>Description/Type</th>
<th>Vendor</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gray / 26 AWG</td>
<td>3M</td>
<td>3801 / 40</td>
</tr>
<tr>
<td>Gray / 26 AWG</td>
<td>Belden</td>
<td>9L260 40</td>
</tr>
<tr>
<td>Gray / 28 AWG</td>
<td>Belden</td>
<td>9L280 40</td>
</tr>
<tr>
<td>Gray / 28 AWG</td>
<td>DuPont</td>
<td>76825–040</td>
</tr>
<tr>
<td>Gray / 28 AWG</td>
<td>AMP</td>
<td>499116–5</td>
</tr>
<tr>
<td>Color coded / 26 AWG</td>
<td>3M</td>
<td>3811 / 40</td>
</tr>
<tr>
<td>Color coded / 28 AWG</td>
<td>Belden</td>
<td>9R280 40</td>
</tr>
<tr>
<td>Color coded / 28 AWG</td>
<td>DuPont</td>
<td>76177–040</td>
</tr>
</tbody>
</table>

### Ribbon Cable Connectors

The ribbon cable connectors listed below are for attaching the ribbon cable to the terminal block. The cables are all .100" x .100" 2 x20 female ribbon connectors with a center bump.

<table>
<thead>
<tr>
<th>Description/Type</th>
<th>Vendor</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector</td>
<td>3M</td>
<td>3417–7640</td>
</tr>
<tr>
<td>Strain Relief</td>
<td>3M</td>
<td>3448–3040</td>
</tr>
<tr>
<td>Connector</td>
<td>3M</td>
<td>3417–7640</td>
</tr>
<tr>
<td>Strain Relief</td>
<td>3M</td>
<td>3448–3040</td>
</tr>
<tr>
<td>Connector (pre-assembled)</td>
<td>3M</td>
<td>89140–0103–T0</td>
</tr>
<tr>
<td>Strain Relief</td>
<td>3M</td>
<td>3448–89140</td>
</tr>
<tr>
<td>Connector (with strain relief)</td>
<td>Thomas &amp; Betts</td>
<td>622–4041</td>
</tr>
<tr>
<td>Connector (pre-assembled)</td>
<td>AMP</td>
<td>746286–9</td>
</tr>
<tr>
<td>Strain Relief</td>
<td>AMP</td>
<td>499252–1</td>
</tr>
<tr>
<td>Connector (with strain relief)</td>
<td>DuPont</td>
<td>66902–240</td>
</tr>
<tr>
<td>Connector (with strain relief)</td>
<td>Molex</td>
<td>15–29–9940</td>
</tr>
</tbody>
</table>

### Interface Terminal Block

Below are terminal blocks which can be used to transition a 40 conductor ribbon cable to 40 discrete field wires. The terminal block features are: 2 x 20 .100" x .100" pin center (male) connector head terminals (.2” centers) accepting 22–12 AWG, no fuses.

<table>
<thead>
<tr>
<th>Description/Type</th>
<th>Vendor</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Mount</td>
<td>Weidmuller</td>
<td>RI–40A /914897</td>
</tr>
<tr>
<td>Rail Mount</td>
<td></td>
<td>RI–40A /914908</td>
</tr>
<tr>
<td>Rail Mount</td>
<td>Phoenix Contacts</td>
<td>FLKM 40 / 2281076</td>
</tr>
<tr>
<td>Special Mount</td>
<td>Augat/RDI</td>
<td>2M40FC</td>
</tr>
</tbody>
</table>

(DIN rail compatible) includes ribbon connector
I/O Wiring and Specifications

I/O Wiring Checklist

Use the following guidelines when wiring the I/O modules in your system.

Step 1 – Note the limits to the size of wire the modules can accept. The table below lists the maximum AWG for each module type. Smaller AWG is acceptable to use for each of the modules.

<table>
<thead>
<tr>
<th>Module type</th>
<th>Maximum AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 point</td>
<td>12</td>
</tr>
<tr>
<td>16 point</td>
<td>14</td>
</tr>
<tr>
<td>32 point – common</td>
<td>20</td>
</tr>
<tr>
<td>32 point – other</td>
<td>24</td>
</tr>
<tr>
<td>64 point</td>
<td>24 (requires ribbon cable)</td>
</tr>
<tr>
<td>F4–08THM–X</td>
<td>10 (Thermocouple wire)</td>
</tr>
</tbody>
</table>

Note: 12 AWG Type TFFN or Type MTW can be used on 8pt. modules. 14 AWG Type TFFN or Type MTW can be used on 16pt. modules.

Step 2 – Always use a continuous length of wire. Do not splice wires to attain a needed length.

Step 3 – Use the shortest possible wire length.

Step 4 – Where possible use wire trays for routing.

Step 5 – Avoid running wires near high energy wiring.

Step 6 – Avoid running input wiring close to output wiring where possible.

Step 7 – To minimize voltage drops when wires must run a long distance, consider using multiple wires for the return lines.

Step 8 – Where possible avoid running DC wiring in close proximity to AC wiring.

Step 9 – Avoid creating sharp bends in the wires.

Step 10 – IMPORTANT! To help avoid having a module with a blown fuse, we suggest you add external fuses to your I/O wiring. A fast blow fuse, with a lower current rating than the I/O module fuse can be added to each common, or a fuse with a rating of slightly less than the maximum current per output point can be added to each output.

NOTE: For modules which have soldered-in or non-replaceable fuses, we recommend that you return your module to us and let us replace your blown fuse(s) since disassembling the module will void the warranty.
The following table lists the available DL405 input modules.

<table>
<thead>
<tr>
<th>DL405 Input Module Type</th>
<th>Number of Input Points</th>
<th>DC Current Sink Input</th>
<th>DC Current Source Input</th>
<th>AC Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4–16ND2</td>
<td>16</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–16ND2F</td>
<td>16</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–32ND3–1</td>
<td>32</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–32ND3–2</td>
<td>32</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–64ND2</td>
<td>64</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–08NA</td>
<td>8</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–16NA (–1)</td>
<td>16</td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–16NE3</td>
<td>16</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>F4–08NE3S</td>
<td>8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>D4–08ND3S</td>
<td>8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

The following table lists the available DL405 output modules. Specifications begin after the input modules’ specifications.

<table>
<thead>
<tr>
<th>DL405 Output Module Type</th>
<th>Number of Output Points</th>
<th>DC Current Sink Output</th>
<th>DC Current Source Output</th>
<th>AC Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4–08TD1</td>
<td>8</td>
<td>✔</td>
<td></td>
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</tr>
<tr>
<td>F4–08TD1S</td>
<td>8</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4–16TD1</td>
<td>16</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4–16TD2</td>
<td>16</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–32TD1</td>
<td>32</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–32TD1–1</td>
<td>32</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4–32TD2</td>
<td>32</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–64TD1</td>
<td>64</td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>D4–08TA</td>
<td>8</td>
<td>✔</td>
<td></td>
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<tr>
<td>D4–16TA</td>
<td>16</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4–08TR</td>
<td>8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>F4–08TRS–1</td>
<td>8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>F4–08TRS–2</td>
<td>8</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>D4–16TR</td>
<td>16</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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### I/O Wiring and Specifications

#### Special Input Module Chart

<table>
<thead>
<tr>
<th>Specification</th>
<th>F4–08THM–n</th>
<th>F4–08RTD</th>
</tr>
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<tbody>
<tr>
<td>Channels</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>Type E: $-270/1000^\circ C (-450/1832^\circ F)$</td>
<td>Pt100Ω: $-200.0/850.0^\circ C (-328/562^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type J: $-210/760^\circ C (-350/1390^\circ F)$</td>
<td>Pt100Ω: $-200.0/595.0^\circ C (-328/1103^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type K: $-270/1370^\circ C (-450/2500^\circ F)$</td>
<td>jPt100Ω: $-38.0/450.0^\circ C (-36/842^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type R: $0/1768^\circ C (-32/2543^\circ F)$</td>
<td>Cu. 25Ω, Cu. 10Ω: $-200.0/250.0^\circ C (-328/500^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type S: $0/1768^\circ C (-32/2543^\circ F)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type T: $0/1768^\circ C (-32/2543^\circ F)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type C: $0/2320^\circ C (-32/4208^\circ F)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type B: $141/1820^\circ C (286/3594^\circ F)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type P: $-99/1395^\circ C (-146/2543^\circ F)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-1$: 0 to 50mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-2$: 0 to 100mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-3$: 0 to 25mV</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
<td>15 bit (1 in 32768)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>$\pm 1^\circ C$ type J,K,E,T thermocouples</td>
<td>$\pm 0.2%$ at $25^\circ C (77^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>$\pm 3^\circ C$ type R,S,B,C,P thermocouples</td>
<td></td>
</tr>
</tbody>
</table>

#### Special Input Module Chart

<table>
<thead>
<tr>
<th>Specification</th>
<th>F4–08THM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>8</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>Type J: $-190/760^\circ C (-310/1400^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type E: $-210/1000^\circ C (-346/1832^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type K: $-150/1372^\circ C (-238/2502^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type R: $65/1768^\circ C (149/3214^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type S: $65/1768^\circ C (149/3214^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type T: $-230/400^\circ C (-382/752^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type B: $529/1820^\circ C (984/3308^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type N: $-70/1300^\circ C (-94/2372^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type C: $65/2320^\circ C (149/4208^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type C: $65/2320^\circ C (149/4208^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>Type C: $65/2320^\circ C (149/4208^\circ F)$</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bit (1 in 65535)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>$\pm 3^\circ C$ (excluding thermocouple error)</td>
</tr>
</tbody>
</table>

#### Analog Input Module Chart

<table>
<thead>
<tr>
<th>Specification</th>
<th>F4–04AD</th>
<th>F4–04ADS</th>
<th>F4–08AD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>0–20 mA, 4–20 mA, 1–5V, 0–5V, 0–10V, ±5V, ±10V</td>
<td>0–20 mA, 4–20 mA, 1–5V, 0–5V, 0–10V, ±5V, ±10V</td>
<td>0–20 mA, 4–20 mA, 1–5V, 0–5V, 0–10V, ±5V, ±10V</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Input Type</td>
<td>Single ended</td>
<td>Isolated</td>
<td>Single ended</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>$\pm 0.4%$ at $25^\circ C (77^\circ F)$</td>
<td>$\pm 0.4%$ at $25^\circ C (77^\circ F)$</td>
<td>$\pm 0.3%$ at $25^\circ C (77^\circ F)$</td>
</tr>
<tr>
<td></td>
<td>$\pm 0.55%$ at 0° to 60° C (32° to 140° F)</td>
<td>$\pm 0.7%$ at 0° to 60° C (32° to 140° F)</td>
<td>$\pm 0.5%$ at 0° to 60° C (32° to 140° F)</td>
</tr>
</tbody>
</table>
## Analog Output Module Chart

<table>
<thead>
<tr>
<th>Specification</th>
<th>D4–02DA</th>
<th>F4–04DA</th>
<th>F4–04DA–1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>4–20 mA, 1–5V, 0–10V</td>
<td>4–20 mA, 0–5V, 0–10V, ±5V, ±10V</td>
<td>4–20mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Independent</td>
<td>Single ended</td>
<td>Single ended</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.2% at 25°C (77°F)</td>
<td>±0.5% at 60°C (unipo.)</td>
<td>±0.1 % at 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.7% at 60°C (bipol.)</td>
<td>±0.8% at 60°C (curr.)</td>
<td>±0.3 % at 0 to 60°C (32 to 140°F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification</th>
<th>F4–04DA–2</th>
<th>F4–08DA–1</th>
<th>F4-16DA-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>0–5V, 0–10V, ±5V, ±10V</td>
<td>4–20mA</td>
<td>4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Single ended</td>
<td>Single ended</td>
<td>Single ended</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.2 % at 25°C (77°F)</td>
<td>±0.4% at 0° to 60°C (32° to 140°F)</td>
<td>±0.2 % at 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.4% at 0° to 60°C (32° to 140°F)</td>
<td>±0.4 % at 0° to 60°C (32° to 140°F)</td>
<td>±0.4 % at 0° to 60°C (32° to 140°F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specification</th>
<th>F4–04DAS–1</th>
<th>F4–08DA–2</th>
<th>F4-16DA-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>4</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>4–20 mA</td>
<td>0–5v, 0–10v</td>
<td>0–5v, 0–10v, Combination of both</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bit (1 in 65536)</td>
<td>12 bit (1 in 4096)</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Single ended</td>
<td>Single ended</td>
<td>Single ended</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.07 % at 25°C(77°F)</td>
<td>±0.2% at 25°C (77°F)</td>
<td>±0.2 % at 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.18% at 0° to 60°C (32° to 140°F)</td>
<td>±0.4 % at 0° to 60°C (32° to 140°F)</td>
<td>±0.4 % at 0° to 60°C (32° to 140°F)</td>
</tr>
</tbody>
</table>
## Glossary of Specification Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs or Outputs Per Module</td>
<td>Indicates number of electrical input or output points per module and designates current sinking, current sourcing, or either.</td>
</tr>
<tr>
<td>Commons Per Module</td>
<td>Number of electrical commons per module. A common is a connection to an input or output module which is shared by multiple I/O circuits. It is usually in the return path to the power supply of the I/O circuit.</td>
</tr>
<tr>
<td>Input Voltage Range</td>
<td>The operating voltage range of an input circuit, measured from an input point to its common terminal, when the input is ON.</td>
</tr>
<tr>
<td>Output Voltage Range</td>
<td>The output voltage range of an output circuit, measured from an output point to its common terminal, when the output is OFF.</td>
</tr>
<tr>
<td>Peak Voltage</td>
<td>Maximum voltage allowed for an input or output circuit for a short duration.</td>
</tr>
<tr>
<td>AC Frequency</td>
<td>AC modules are designed to operate within a specific frequency range.</td>
</tr>
<tr>
<td>ON Voltage Level</td>
<td>The minimum voltage level at which an input point will turn ON.</td>
</tr>
<tr>
<td>OFF Voltage Level</td>
<td>The maximum voltage level at which an input point will turn OFF.</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>The electrical resistance measured between an input point and its common point. Since this resistance is non-linear, it may be listed for various input currents.</td>
</tr>
<tr>
<td>Input Current</td>
<td>Typical operating current for an active (ON) input.</td>
</tr>
<tr>
<td>Minimum ON Current</td>
<td>The minimum current for the input circuit to operate reliably in the ON state.</td>
</tr>
<tr>
<td>Maximum OFF Current</td>
<td>The maximum current for the input circuit to operate reliably in the OFF state.</td>
</tr>
<tr>
<td>Minimum Load</td>
<td>The minimum load current required for an output circuit to operate properly.</td>
</tr>
<tr>
<td>External DC Required</td>
<td>Some output modules require external power for the output circuitry.</td>
</tr>
<tr>
<td>On Voltage Drop</td>
<td>Sometimes called “saturation voltage”, it is the voltage measured from an output point to its common terminal when the output is ON, at max. load.</td>
</tr>
<tr>
<td>Maximum Leakage Current</td>
<td>The maximum current a connected maximum load will receive when the output point is OFF.</td>
</tr>
<tr>
<td>Maximum Inrush Current</td>
<td>The maximum current used by a load for a short duration upon an OFF to ON transition of an output point. It is greater than the normal ON state current and is characteristic of inductive loads in AC circuits.</td>
</tr>
<tr>
<td>Base Power Required</td>
<td>The +5VDC power from the base required to operate the module. Be sure to observe the base power budget calculations.</td>
</tr>
<tr>
<td>OFF to ON Response</td>
<td>The time the module requires to process an OFF to ON state transition.</td>
</tr>
<tr>
<td>ON to OFF Response</td>
<td>The time the module requires to process an ON to OFF state transition.</td>
</tr>
<tr>
<td>Status Indicators</td>
<td>The LEDs that indicate the ON/OFF status of an input or output point. These LEDs are electrically located on the logic (CPU) side of the I/O interface circuit.</td>
</tr>
<tr>
<td>Terminal Type</td>
<td>Indicates whether the module’s connector is removable or non-removable.</td>
</tr>
<tr>
<td>Weight</td>
<td>Indicates the weight of the module.</td>
</tr>
<tr>
<td>Fuses</td>
<td>Protective device for an output circuit, which stops current flow when current exceeds the fuse rating current. It may be replaceable or non-replaceable, or located externally or internally.</td>
</tr>
</tbody>
</table>
## D4–08ND3S DC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>8 (sink/source)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>8 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>20–52.8VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>52.8VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt;18 V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt;7V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>4.8 KΩ</td>
</tr>
<tr>
<td>Input current @ 24 / 48 VDC</td>
<td>5 mA / 10 mA</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>3.5 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>100 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>3–10 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>3–12 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8 oz. (250 g)</td>
</tr>
</tbody>
</table>

## D4–16ND2 DC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>16 (current sourcing)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>10.2–26.4VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>26.4VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt;9.5VDC</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt;4.0 VDC</td>
</tr>
<tr>
<td>Input impedance</td>
<td>3.2 KΩ @ 12VDC 2.9 KΩ @24VDC</td>
</tr>
<tr>
<td>Input current @ 12 / 24VDC</td>
<td>3.8 mA / 8.3 mA</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>3.5 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1–7 ms (2.3 typical)</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>2–12 ms (4.6 typical)</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8 oz. (250 g)</td>
</tr>
</tbody>
</table>

### Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
<th>Ambient Temperature (°C/°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>120</td>
</tr>
<tr>
<td>5</td>
<td>140</td>
</tr>
<tr>
<td>6</td>
<td>160</td>
</tr>
<tr>
<td>7</td>
<td>180</td>
</tr>
<tr>
<td>8</td>
<td>200</td>
</tr>
</tbody>
</table>

### Optical Isolator Current Flow

- **D4–08ND3S**
- **D4–16ND2**

Current sourcing configuration shown
### D4–16ND2F DC Input

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>16 (current sourcing)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>10.2–26.4VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>26.4VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 9.5VDC</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 4.0VDC</td>
</tr>
<tr>
<td>Input impedance</td>
<td>3.2 KΩ @ 12VDC</td>
</tr>
<tr>
<td></td>
<td>2.9 KΩ @ 24VDC</td>
</tr>
<tr>
<td>Input current @ 12 / 24 VDC</td>
<td>3.8 mA / 8.3 mA</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>3.5 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>1 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8 oz. (250 g)</td>
</tr>
</tbody>
</table>

### D4–16SIM Input Simulator

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>8 or 16, selectable</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA Max</td>
</tr>
<tr>
<td>Terminal type</td>
<td>None</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8 oz. (250 g)</td>
</tr>
</tbody>
</table>

#### Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
<th>Derating Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

#### Current Flow

- **10.2–26.4 VDC**
- **12–24VDC**

- **Common**
- **To LED**
- **Optical Isolator**

#### Switches

**D4–16SIM**

8 or 16 input point selection switch is located on the back of the module.

Switch position is indicated by the LEDs above the input switches.
## I/O Wiring and Specifications

### D4–32ND3–1, 24VDC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>32 (sink/source)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>4 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>20–28VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>30VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 19 V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 10 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>4.8 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>1.6 mA</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>3.5 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>1.6 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>2–10 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>2–10 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable, 40 pin conn.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>6.6 oz. (190 g)</td>
</tr>
</tbody>
</table>

### D4–32ND3–2 5–12VDC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>32 (sink/source)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>4 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>4.75–13.2VDC (TTL, CMOS)</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>15VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 4 V (use pullup R for TTL in)</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 2 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>1.6 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>3.1 mA @ 5V, 7.5 mA @ 12V</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>1.8 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>0.8 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1–4 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>1–4 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable, 40 pin conn.</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>6.6 oz. (190 g)</td>
</tr>
</tbody>
</table>

### Derating Chart

![Derating Chart Diagram](image-url)

**24VDC Input**
- A/C: 0 4 0 4 0 4 0 4
- B/D: 2 6 2 6 2 6 2 6

**5–12VDC Input**
- A/C: 0 4 0 4 0 4 0 4
- B/D: 2 6 2 6 2 6 2 6

**Ambient Temperature (°F)**
- 32–50
- 56
- 68
- 104
- 120
- 140

**Current Flow**
- Use Display Select switch to view A0–A7, B0–B7 or (C0–C7, D0–D7) Current sinking config. shown

**Notes**
- Use Display Select switch to view A0–A7, B0–B7 or (C0–C7, D0–D7) Current sinking config. shown
## D4–64ND2, 24 VDC Input Module

<table>
<thead>
<tr>
<th>Module Location</th>
<th>CPU base only *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>64 (current sourcing)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>8 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>20 – 28 VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>30 VDC</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 20 V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 13 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>4.8 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>5.0 mA @ 24 VDC</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>3.6 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>2.6 mA</td>
</tr>
<tr>
<td>Base power required</td>
<td>5V</td>
</tr>
<tr>
<td>External power required</td>
<td>300 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>24VDC ± 10%, 320mA max</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>2.5 ms (typical)</td>
</tr>
<tr>
<td>Terminal type</td>
<td>2, Removable 40 pin connectors (sold separately)</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>7.8 oz. (220 g)</td>
</tr>
</tbody>
</table>

Since there are only 32 LEDs on the module, you can only display the status for 32 points at one time. In the A - B position the status of the first group of 32 input points (A0–A17, B0–B17) are displayed (connector 1). In the C - D position the status of the second group of 32 input points (C0–C17, D0–D17) are displayed (connector 2).

* Module location – this module placement is restricted to the local base on DL430/DL440 systems. It may also be placed in expansion bases in DL450 systems that are using the new (–1) bases.
### D4–08NA 110–220VAC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>8</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>80–265VAC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>265VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 70V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 30 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>12 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>8.5 mA @ 100VAC 20 mA @ 230VAC</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>5 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>2 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>100 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>5–30 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>10–50 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.4 oz. (240 g)</td>
</tr>
</tbody>
</table>

### D4–16NA 110VAC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>16</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>80–132VAC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>132VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 70V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 20 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>8 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>14.5 mA @ 120VAC</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>7 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>2 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>5–30 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>10–50 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>9.5 oz. (270 g)</td>
</tr>
</tbody>
</table>

### Derating Chart

- **Ambient Temperature (°C/°F)**
- **Input Voltage Range**
  - 110–220VAC
  - 80–265VAC

![Derating Chart Diagram](chart.png)
### D4–16NA–1 220VAC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>16</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>187–238VAC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>265VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 150V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 40 V</td>
</tr>
<tr>
<td>Input impedance</td>
<td>22 KΩ</td>
</tr>
<tr>
<td>Input current</td>
<td>10.0 mA @ 220VAC</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>7 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>2 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>5–30 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>10–50 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>9.5 oz. (270 g)</td>
</tr>
</tbody>
</table>

#### Derating Chart

<table>
<thead>
<tr>
<th>Ambient Temperature (°C/°F)</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°C/32°F</td>
<td>0</td>
</tr>
<tr>
<td>10°C/50°F</td>
<td>4</td>
</tr>
<tr>
<td>20°C/68°F</td>
<td>8</td>
</tr>
<tr>
<td>30°C/86°F</td>
<td>12</td>
</tr>
<tr>
<td>40°C/140°F</td>
<td>16</td>
</tr>
</tbody>
</table>

#### Schematic Diagram
### D4-16NE3 12–24VAC/DC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>16 (sink/source)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>10.2–26.4VAC/VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>37.5VAC/VDC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 9.5V</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 3.0V</td>
</tr>
<tr>
<td>Input impedance @ 12V/24V</td>
<td>3.2 KΩ / 2.9 KΩ</td>
</tr>
<tr>
<td>Input current @ 12V/24V</td>
<td>3.8 mA / 8.3 mA</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>4 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>1.5 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>150 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>5–40 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>10–50 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>8.8 oz. (250 g)</td>
</tr>
</tbody>
</table>

### F4-08NE3S 90–150VAC/DC Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs per module</td>
<td>8 (sink/source)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>8 (isolated)</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>90–150 VAC/VDC</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>350 peak &lt; 1ms</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage level</td>
<td>&gt; 90 VDC / 75VAC</td>
</tr>
<tr>
<td>OFF voltage level</td>
<td>&lt; 60 VDC / 45VAC</td>
</tr>
<tr>
<td>Input impedance @ 12V/24V</td>
<td>22 KΩ</td>
</tr>
<tr>
<td>Input current @ 12V/24V</td>
<td>5.5 mA @ 120V</td>
</tr>
<tr>
<td>Minimum ON current</td>
<td>4 mA</td>
</tr>
<tr>
<td>Maximum OFF current</td>
<td>2 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>90 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>8 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>15 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>9 oz. (256 g)</td>
</tr>
</tbody>
</table>

### Derating Chart

- **D4-16NE3 12–24VAC/DC Input**
  - Ambient Temperature (°C/°F)
  - Points
  - Current sourcing configuration shown

- **F4-08NE3S 90–150VAC/DC Input**
  - Ambient Temperature (°C/°F)
  - Points
  - Current sourcing configuration shown
### D4-08TD1 12–24 VDC Output

- **Outputs per module**: 8 (current sinking)
- **Commons per module**: 2 internally connected
- **Operating voltage**: 10.2–26.4VDC
- **Output type**: NMOS FET (open drain)
- **Peak voltage**: 40VDC
- **ON voltage drop**: 0.5VDC @ 2A, 0.2 VDC @1A
- **Max current (resistive)**: 2A / point, 5A / common
- **Max inrush current**: 12A for 10 ms, 6A for 100 ms
- **Minimum load**: 0.2mA
- **Base power required 5V**: 150mA max
- **External DC required**: 24VDC ±10% @35 mA
- **OFF to ON response**: 1 ms
- **ON to OFF response**: 1 ms
- **Terminal type**: Removable
- **Weight**: 8.4 oz. (240 g)
- **Fuses (non-replaceable)**: 1 (7A) per common

### F4-08TD1S 24–150 VDC Isolated Out

- **Outputs per module**: 8 (current sinking)
- **Commons per module**: 4 (isolated)
- **Operating voltage**: 24–150VDC
- **Output type**: MOS FET
- **Peak voltage**: 200 VDC, <1mS
- **ON voltage drop**: 1VDC @ 2A
- **Max current**: 2A / point, 4A / common
- **Max inrush current**: 5 μA
- **Max leakage current**: 30A /1ms, 6A / 10ms, 3A / 100ms
- **Minimum load**: N/A
- **Base power required 5V**: 295 mA max
- **External DC required**: None
- **OFF to ON response**: 25 μs
- **ON to OFF response**: 25 μs
- **Terminal type**: Removable
- **Weight**: 10 oz. (282 g)
- **Fuses (non-replaceable)**: 1 (3A) per output

#### Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
<th>Output Current 1.25A/point</th>
<th>Output Current 2A/point (5A/common)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Internal Connections

- Internally connected commons
- 24VDC to commons
- Input to commons
- Output to LED
- Supply to optical isolator

---
### D4-16TD1 5-24 VDC Output

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>16 (current sinking)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 internally connected</td>
</tr>
<tr>
<td>Operating voltage / peak</td>
<td>4.5–26.4 VDC, 40 VDC Peak</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN Open collector</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>0.5V @ 0.5A, 0.2V @ 0.1A</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.5A / point, 3A / common</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.1mA @ 40VDC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>2A for 10 ms, 1A for 100 ms</td>
</tr>
<tr>
<td>Minimum load</td>
<td>0.2mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>200mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>24VDC ±10% @125mA</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>0.5 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>0.5 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>9.5 oz. (270 g)</td>
</tr>
<tr>
<td>Fuses (non-replaceable)</td>
<td>1 (5A) per common</td>
</tr>
</tbody>
</table>

### D4-16TD2, 12–24 VDC Output

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>16 (current sourcing)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Operating voltage / peak</td>
<td>10.2–26.4 VDC, 40 VDC Peak</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN Emitter Follower</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>1.5 VDC @ 0.5A</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.5A / point, 3A / common @ 50°C, 2.5A / common @ 60°C</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.1mA @ 40 VDC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>2A for 10 ms, 1A for 100 ms</td>
</tr>
<tr>
<td>Minimum load</td>
<td>0.2mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>400mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>None</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>1 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>9.8 oz. (280 g)</td>
</tr>
<tr>
<td>Fuses (non-replaceable)</td>
<td>1 (5A) per common</td>
</tr>
</tbody>
</table>

### Derating Chart

**5-24 VDC Output**

- **Output Current**
  - 0.35A/point
  - 0.5A/point (3A/common)

**12-24 VDC Output**

- **Output Current**
  - 0.3A/point
  - 2.5A/common

**Ambient Temperature (°C/°F)**

- 0 to 100 °C (32 to 212 °F)
## D4–32TD1, 5–24VDC Output

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>32 (current sinking)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>4 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>4.75–26.4 VDC</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN Open Collector</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>36 VDC</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>0.6 VDC @ 0.2A</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.2A / point, 1.6A / common</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.1mA @ 36 VDC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>1A for 10 ms, 0.5A for 100 ms</td>
</tr>
<tr>
<td>Minimum load</td>
<td>0.1mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>250mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>24VDC ±10%, 140mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>0.1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>0.1 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>6.7 oz. (190 g)</td>
</tr>
<tr>
<td>Fuses</td>
<td>None</td>
</tr>
</tbody>
</table>

### Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
<th>Derating Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Output current 0.1A / point</td>
</tr>
<tr>
<td>28</td>
<td>Output current 0.2A / point</td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### I/O Wiring and Specifications

<table>
<thead>
<tr>
<th>Points</th>
<th>5–24VDC Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>A-B C-D</td>
</tr>
<tr>
<td>1</td>
<td>1 5 1 5</td>
</tr>
<tr>
<td>2</td>
<td>2 6 2 6</td>
</tr>
<tr>
<td>3</td>
<td>3 7 3 7</td>
</tr>
<tr>
<td>4</td>
<td>4 0 4</td>
</tr>
</tbody>
</table>

## D4–32TD1–1, 5–15VDC Output

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>32 (current sinking)</td>
</tr>
<tr>
<td>Commons per module</td>
<td>4 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>5–15 VDC</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN Open Collector (w / pullup)</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>16.5 VDC</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>0.4 VDC @ 0.1A</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.09A/pt, 0.72A/com, 2.88A/ mod.</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.01mA @ 16.5 VDC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>0.5A for 10ms, 0.2A for 100ms</td>
</tr>
<tr>
<td>Minimum load</td>
<td>0.1mA</td>
</tr>
<tr>
<td>Base power req., 5V</td>
<td>250mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>5–15VDC ±10%, 700mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>0.1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>0.1 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>6.7 oz. (190 g)</td>
</tr>
<tr>
<td>Fuses</td>
<td>None</td>
</tr>
</tbody>
</table>

### Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
<th>Derating Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>Output current 0.015A / point</td>
</tr>
<tr>
<td>28</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### I/O Wiring and Specifications

<table>
<thead>
<tr>
<th>Points</th>
<th>5–15VDC Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C</td>
<td>A-B C-D</td>
</tr>
<tr>
<td>1</td>
<td>1 5 1 5</td>
</tr>
<tr>
<td>2</td>
<td>2 6 2 6</td>
</tr>
<tr>
<td>3</td>
<td>3 7 3 7</td>
</tr>
<tr>
<td>4</td>
<td>4 0 4</td>
</tr>
</tbody>
</table>

### Optical Isolator

- V+ to LED
- 1.5K Optical Isolator
- Common
- To LED
**D4–32TD2, 12–24 VDC Output Module**

<table>
<thead>
<tr>
<th>Outputs per module</th>
<th>32 (current sourcing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commons per module</td>
<td>4 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>10.8–26.4 VDC</td>
</tr>
<tr>
<td>Output type</td>
<td>PNP Open Collector</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>30 VDC</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>0.6 VDC @ 0.2A</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.2A / point</td>
</tr>
<tr>
<td></td>
<td>1.0A / common</td>
</tr>
<tr>
<td></td>
<td>4.0A / module</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.01mA @ 26.4 VDC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>500 mA for 10 ms</td>
</tr>
<tr>
<td>Minimum load</td>
<td>0.2mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>350mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>10.8–26.4VDC</td>
</tr>
<tr>
<td></td>
<td>1A / common including load</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>&lt; 0.2 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>&lt; 0.2 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>6.7 oz. (190 g)</td>
</tr>
<tr>
<td>Fuses</td>
<td>None</td>
</tr>
</tbody>
</table>

**Derating Chart for D4–32TD2**

Only 16 status points can be displayed at one time on the front of the module. In the A - B position the status of the first group of 16 output points (A0–A7, B0–B7) is displayed. In the C - D position the status of the second group of 16 output points (C0–C7, D0–D7) is displayed.
### D4–64TD1, TTL/CMOS/5–24 VDC Output Module

<table>
<thead>
<tr>
<th>Module Location</th>
<th>CPU base only *</th>
<th>Minimum load</th>
<th>0.1mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>64 (current sinking)</td>
<td>Base power required 5V</td>
<td>800mA max</td>
</tr>
<tr>
<td>Commons per module</td>
<td>8 (isolated)</td>
<td>External DC required</td>
<td>24VDC ±10%, (800mA + 50mA per common) 7.0A total max</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>4.75–26.5 VDC</td>
<td>OFF to ON response</td>
<td>&lt; 0.1 ms</td>
</tr>
<tr>
<td>Output type</td>
<td>NPN Open Collector</td>
<td>ON to OFF response</td>
<td>&lt; 0.2 ms</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>36 VDC</td>
<td>Terminal type</td>
<td>2, Removable 40-pin connectors (sold sep.)</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>0.6 VDC @ 0.1A</td>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>0.1A / point 1.0A / common 8.0A / module</td>
<td>Weight</td>
<td>7.4 oz. (210 g)</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>0.01mA @ 36 VDC</td>
<td>Fuses</td>
<td>None</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>0.1A @ 36 VDC</td>
<td>700mA for 100 ms</td>
<td></td>
</tr>
</tbody>
</table>

Only 32 status points can be displayed at one time on the front of the module. In the A - B position the status of the first group of 32 output points (A0–A17, B0–B17) are displayed (connector 1). In the C - D position the status of the second group of 32 output points (C0–C17, D0–D17) are displayed (connector 2).

* Module location – this module placement is restricted to the local base on DL430/DL440 systems. It may also be placed in expansion bases in DL450 systems that are using the new (–1) bases.

---

**Derating Chart**

<table>
<thead>
<tr>
<th>Points</th>
<th>Current Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>0.1A / point</td>
</tr>
<tr>
<td>32</td>
<td>0.1A</td>
</tr>
<tr>
<td>16</td>
<td>0.1A</td>
</tr>
<tr>
<td>8</td>
<td>0.1A</td>
</tr>
<tr>
<td>4</td>
<td>0.1A</td>
</tr>
<tr>
<td>2</td>
<td>0.1A</td>
</tr>
<tr>
<td>1</td>
<td>0.1A</td>
</tr>
</tbody>
</table>

**Wiring per 32pts. using EXT 24VDC Connector**

- **Wiring per 32pts. with 24V on Connector**
- **Wiring per 32pts. using EXT 24VDC Connector and 5–26VDC Load Supply**

**Connector Pins**

- **5-24VDC OUTPUT**
- **S-24VDC**
- **S-5V**
- **S-12V**
- **S-24V**
- **S-32V**
- **S-48V**
- **S-64V**

**Ambient Temperature (°C)**

- 0°C to 40°C

**Current Flow**

- Internally Connected
- 24VDC
- 5–24VDC

**To LED**

- **Optical Isolator**
- **Connector**
- **24VDC Ext.**

---

**I/O Wiring and Specifications**

---

3–31
### D4–08TA, 18–220VAC Output

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>8</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>15–265VAC</td>
</tr>
<tr>
<td>Output type</td>
<td>SSR (triac)</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>265VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>1.5VAC @ 2A</td>
</tr>
<tr>
<td>Max current</td>
<td>2A / point, 5A / com. @ 30°C</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>5mA @ 265VAC</td>
</tr>
<tr>
<td>Min load</td>
<td>10 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>250 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>1 ms +1/2 AC cycle</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>11.6 oz. (330 g)</td>
</tr>
<tr>
<td>Fuses (non-replaceable)</td>
<td>1 (8A) per common</td>
</tr>
</tbody>
</table>

#### Derating Chart

- **Output Current**
  - 0.25A/point (2A/common)
  - 0.35A/point (5A/common)

### D4–16TA, 18–220VAC Output

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>16</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>15–265VAC</td>
</tr>
<tr>
<td>Output type</td>
<td>SSR (triac)</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>265VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>ON voltage drop</td>
<td>1.5 VAC @ 0.5A</td>
</tr>
<tr>
<td>Max current</td>
<td>0.5A / pt, 3A / common @ 45 °C</td>
</tr>
<tr>
<td>Max leakage current</td>
<td>4mA @ 265VAC</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>15A for 10 ms, 10A for 100 ms</td>
</tr>
<tr>
<td>Min load</td>
<td>10 mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>450 mA max</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>1 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>1 ms +1/2 AC cycle</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>12.2 oz. (350 g)</td>
</tr>
<tr>
<td>Fuses (non-replaceable)</td>
<td>1 (5A) per common</td>
</tr>
</tbody>
</table>

#### Derating Chart

- **Output Current**
  - 0.25A/point (2A/common)
  - 0.35A/point (5A/common)
D4–08TR, Relay Output

Outputs per module: 8 relays
Commons per module: 2 (isolated)
Operating voltage: 5–30VDC / 5–250VAC
Output type: Form A (SPST–NO)
Peak voltage: 30VDC / 256VAC
AC frequency: 47–63 Hz
Max current (resistive): 2A / point, 5A / common
Max inrush current: 2A
Min load: 5mA
Max leakage current: 0.1mA @ 265VAC
Min leakage current: 0.1mA @ 265VAC
Base power required: 550mA max
External DC required: None
OFF to ON response: 12 ms
ON to OFF response: 12 ms
Terminal type: Removable
Status indicators: Logic Side
Weight: 9.1 oz. (260 g)
Fuses (non-replaceable): 1 (8A) per common

F4–08TRS–1, Relay Output

Outputs per module: 8 relays
Commons per module: 8 (isolated)
Operating voltage: 12–30VDC, 12–125VAC, 125–250VAC
Output type: 4, Form C (SPDT), 4, Form A (SPST–NO)
Peak voltage: 30VDC / 250VAC @10A
AC frequency: 47–63 Hz
Max current (resistive): 10A / point, 40A / module
Max inrush current: 10A
Min load: 100mA @12 VDC
Base power required: 575mA max
External DC required: None
OFF to ON response: 7 ms
ON to OFF response: 9 ms
Terminal type: Removable
Status indicators: Logic Side
Weight: 13.2 oz. (374 g)
Fuses (non-replaceable): 1 (10A/125V) per common

Typical Relay Life (Operations)

<table>
<thead>
<tr>
<th>Maximum Resistive or Inductive Inrush Load Current</th>
<th>Operating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A resistive</td>
<td>120K</td>
</tr>
<tr>
<td>2A inductive</td>
<td>30K</td>
</tr>
<tr>
<td>0.5A resistive</td>
<td>80K</td>
</tr>
<tr>
<td>0.5A inductive</td>
<td>200K</td>
</tr>
</tbody>
</table>

Derating Chart

<table>
<thead>
<tr>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

Output Current: 1.25A/point
Output Current: 2A/point (5A/common)

Maximum DC voltage rating is 120 VDC @ 0.5A, 30,000 cycles typical. Motor starters up to and including NEMA size 3 can be used with this module.
### F4–08TRS–2, Relay Output

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>8 relays</td>
</tr>
<tr>
<td>Commons per module</td>
<td>8 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>12–30VDC, 12–250VAC</td>
</tr>
<tr>
<td>Output type: Form C (SPDT), Form A (SPST–NO)</td>
<td></td>
</tr>
<tr>
<td>Peak voltage</td>
<td>30VDC / 250VAC @5A</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>5A / point, 40 A / module</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>10A</td>
</tr>
<tr>
<td>Minimum load</td>
<td>100mA @ 12 VDC</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>575mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>None</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>7 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>9 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>13.8 oz. (390 g)</td>
</tr>
<tr>
<td>Fuses, (user replaceable)</td>
<td>1 (10A, 250V) per common</td>
</tr>
<tr>
<td></td>
<td>19379–K–10A Wickman</td>
</tr>
</tbody>
</table>

**Typical Relay Life (Operations)**

<table>
<thead>
<tr>
<th>Maximum Resistive or Inductive Inrush Load Current</th>
<th>Operating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0A</td>
<td>28VDC</td>
</tr>
<tr>
<td>3.0A</td>
<td>120VAC</td>
</tr>
<tr>
<td>0.5A</td>
<td>240VAC</td>
</tr>
<tr>
<td>0.5A resistive</td>
<td>50 K</td>
</tr>
<tr>
<td>1A resistive</td>
<td>125K</td>
</tr>
<tr>
<td>1A inductive</td>
<td>300K</td>
</tr>
<tr>
<td>0.5A inductive</td>
<td>&gt;2M</td>
</tr>
<tr>
<td>1A inductive</td>
<td>&gt;1M</td>
</tr>
</tbody>
</table>

**Derating Chart**

- Output Current: 5A / point (40A / module)
- Maximum DC voltage: 120 VDC @ 0.5A, 30,000 cycles typical.
- Motor starters up to and including NEMA size 3 can be used with this module.

### D4–16TR, Relay Output

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs per module</td>
<td>16 relays</td>
</tr>
<tr>
<td>Commons per module</td>
<td>2 (isolated)</td>
</tr>
<tr>
<td>Operating voltage</td>
<td>5–30VDC / 5–250VAC</td>
</tr>
<tr>
<td>Output type</td>
<td>Form A (SPST–NO)</td>
</tr>
<tr>
<td>Peak voltage</td>
<td>30VDC / 256VAC</td>
</tr>
<tr>
<td>AC frequency</td>
<td>47–63 Hz</td>
</tr>
<tr>
<td>Max current (resistive)</td>
<td>1A / point, 5A / common</td>
</tr>
<tr>
<td>Max inrush current</td>
<td>4A</td>
</tr>
<tr>
<td>Minimum load</td>
<td>5mA</td>
</tr>
<tr>
<td>Base power required 5V</td>
<td>1000mA max</td>
</tr>
<tr>
<td>External DC required</td>
<td>None</td>
</tr>
<tr>
<td>OFF to ON response</td>
<td>10 ms</td>
</tr>
<tr>
<td>ON to OFF response</td>
<td>10 ms</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Removable</td>
</tr>
<tr>
<td>Status indicators</td>
<td>Logic Side</td>
</tr>
<tr>
<td>Weight</td>
<td>10.9 oz. (310 g)</td>
</tr>
<tr>
<td>Fuses (non-replaceable)</td>
<td>1 (8A) per common</td>
</tr>
</tbody>
</table>

**Typical Relay Life (Operations)**

<table>
<thead>
<tr>
<th>Maximum Resistive or Inductive Inrush Load Current</th>
<th>Operating Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A resistive</td>
<td>30VDC</td>
</tr>
<tr>
<td>1A inductive</td>
<td>125VAC</td>
</tr>
<tr>
<td>0.5A resistive</td>
<td>250VAC</td>
</tr>
<tr>
<td>0.5A inductive</td>
<td>&gt;1M</td>
</tr>
</tbody>
</table>

**Derating Chart**

- Output Current: 0.5A / point
- Maximum DC voltage: 500 VDC @ 0.5A, 10,000 cycles typical.
- Motor starters up to and including NEMA size 3 can be used with this module.

---

**Sample Relay Output Circuit (1 of 4)**

- Common
- NO
- NC

---

**Sample Relay Output Circuit (1 of 4)**

- Common
- NO
- NC

---

**Sample Relay Output Circuit (1 of 4)**

- Common
- NO
- NC
### F4–04AD 4–Channel Analog Input

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4</td>
</tr>
<tr>
<td>Input Type</td>
<td>Single-ended or differential</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>0–5, 1–5, 0–10, ±5, ±10 VDC, 0–20, 4–20 mA.</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (0 to 4095), unipolar 13 bit (±4095), bipolar</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>20 MΩ minimum, voltage input 250 Ω, 1/2W, ±0.1%, 25 ppm/°C current input</td>
</tr>
<tr>
<td>Max. Continuous Overload</td>
<td>±50 VDC, voltage input, ±45 mA, current input</td>
</tr>
<tr>
<td>Recommended External Fuse</td>
<td>0.032A, Series 217 fast acting, current inputs</td>
</tr>
<tr>
<td>Common Mode Voltage Range</td>
<td>±10V maximum</td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.025% of span (±1 count maximum, unipolar)</td>
</tr>
<tr>
<td>Input Stability</td>
<td>±1/2 count</td>
</tr>
<tr>
<td>Cross Talk</td>
<td>–80 dB, 1/2 count maximum</td>
</tr>
<tr>
<td>Full Scale Calibration Error</td>
<td>±12 counts maximum, voltage input</td>
</tr>
<tr>
<td></td>
<td>±16 counts maximum, at 20.000 mA current input</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±1 count maximum, voltage input</td>
</tr>
<tr>
<td></td>
<td>±2 counts maximum, at 4.000 mA current input</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>0.4% maximum @25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>0.55% maximum @0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>&lt;6 ms per selected channel</td>
</tr>
<tr>
<td>Noise Rejection Ratio</td>
<td>Normal mode: –3 dB @ 50 Hz, –6 dB / octave</td>
</tr>
<tr>
<td></td>
<td>Common mode: –70 dB, DC to 12 kHz</td>
</tr>
<tr>
<td>PLC Update Rate</td>
<td>4 channel per scan max.</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>16 or 32 (X) input points</td>
</tr>
<tr>
<td>16 or 32-bit mode</td>
<td>12 data bits, 4 bits optional for two’s complement mode, 4 channel select bits, 12 bits unused in 32 bit mode</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>85 mA (power from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24 VDC, ±10%, 100 mA, class 2</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32° to 140° F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>–20 to 70°C (−4° to 158° F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10 MΩ, 500 VDC</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
NOTE 1: Shields should be grounded at the signal source.
NOTE 2: Unused channels should be shorted for best noise immunity.
NOTE 3: When a differential input is not used, 0V should be connected to C of the channel.

F4–04AD 4–Channel Analog Input Module

User Supply 21.6 – 26.4 VDC
Class 2
## F4–04ADS 4–Channel Isolated Analog Input

### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>0–5V, 0–10V, 1–5V, ±5V, ±10V, 0–20 mA, 4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Conversion Method</td>
<td>Successive approximation</td>
</tr>
<tr>
<td>Input Type</td>
<td>Differential</td>
</tr>
<tr>
<td>Max. Common Mode Voltage</td>
<td>±750V peak continuous transformer isolation</td>
</tr>
<tr>
<td>Noise Rejection Ratio</td>
<td>Common mode: −100 dB at 60Hz</td>
</tr>
<tr>
<td>Active Low-Pass Filtering</td>
<td>−3 dB at 20Hz, −12 dB per octave</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>250Ω ±0.1%, 1/2W current input 200KΩ voltage input</td>
</tr>
<tr>
<td>Absolute Maximum Ratings</td>
<td>±45 mA, current input, ±100V, voltage input</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>1 mS per selected channel</td>
</tr>
<tr>
<td>Linearity Error</td>
<td>±1 count (0.025% of full scale) maximum</td>
</tr>
<tr>
<td>Full Scale Calibration Error</td>
<td>±8 counts maximum ($V_{in} = 20$ mA)</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±8 counts maximum ($V_{in} = 4$ mA)</td>
</tr>
</tbody>
</table>

### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>4 channel per scan max.</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>12 binary data bits, 4 active channel indicator bits</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±100 ppm / °C maximum full scale (including maximum offset)</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>270 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24 VDC, ±10%, 120 mA, class 2</td>
</tr>
<tr>
<td>Recommended Fuse</td>
<td>0.032 A, Series 217 fast-acting, current inputs</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>
F4–04ADS 4–Channel Isolated Analog Input Module

Wiring Diagram

NOTE 1: Shields should be grounded at the signal source.
NOTE 2: Unused channels should have V & C & R of the channels jumpered together.

See NOTE 1

CH1
Voltage Transmitter

See NOTE 2

CH3
2-wire 4–20mA Transmitter

CH2 Not Used

CH4
2-wire 4–20mA Transmitter

User Supply

21.6 - 26.4 VDC

Analog switch

250 ohms

0–10VDC

0–5VDC

+10VDC

+5VDC

4–20mA

+–
# F4–08AD 8–Channel Analog Input

## Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8, single ended (one common)</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>0–5V, 0–10V, 1–5V, ±5V, ±10V, 0–20 mA, 4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Active Low-pass Filtering</td>
<td>-3 dB at 20Hz, -12 dB per octave</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>250 ohms ±0.1%, 1/2W current input &gt;20 Megohms voltage input, 1 Megohm minimum</td>
</tr>
<tr>
<td>Absolute Maximum Ratings</td>
<td>± 45 mA, current input</td>
</tr>
<tr>
<td></td>
<td>± 75V, voltage input</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>0.4ms per channel (module conversion)</td>
</tr>
<tr>
<td></td>
<td>1 ms per selected channel minimum (CPU)</td>
</tr>
<tr>
<td>Linearity Error (End to End)</td>
<td>± 1 count (0.025% of full scale) maximum</td>
</tr>
<tr>
<td>Input Stability</td>
<td>± 1/2 count</td>
</tr>
<tr>
<td>Full Scale Calibration Error (Offset error not included)</td>
<td>± 12 counts maximum, voltage input</td>
</tr>
<tr>
<td></td>
<td>± 12 counts maximum, @ 20mA current input</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>± 2 counts maximum, unipolar voltage input</td>
</tr>
<tr>
<td></td>
<td>± 4 counts maximum, bipolar voltage input</td>
</tr>
<tr>
<td></td>
<td>± 4 counts maximum, 4 mA current input</td>
</tr>
</tbody>
</table>

## General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>8 Channel per scan max.</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>16 (X) input points total</td>
</tr>
<tr>
<td></td>
<td>12 binary data bits, 3 active channel bits,</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>75 mA (power from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>18–30 VDC, 90 mA, class 2</td>
</tr>
<tr>
<td>Recommended Fuse</td>
<td>0.032 A, Series 217 fast-acting, current inputs</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>± 50 ppm / °C maximum full scale (including maximum offset change of 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20 to 70°C (−4°F to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>

One count in the specification table is equal to one least significant bit of the analog data (1 in 4096).
F4–08AD 8–Channel Analog Input Module

NOTE 1: Shields should be grounded at the signal source.
NOTE 2: Unused channels should be connected to 0V or have current jumpers installed.

More than one external power supply can be used (see channel 8).
If the power supply common of an external power supply is not connected to 0V on the module, then the output of the external transmitter must be isolated. To avoid “ground loop” errors, recommended 4–20mA transmitter types are:

2 or 3 wire: Isolation between input signal and power supply.
4 wire: Isolation between input signal, power supply, and 4–20mA output.
# D4–02DA 2–Channel Analog Output

**Output Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>2 (independent)</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>0–10V, 1–5V, 4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Single ended</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>0.5Ω maximum, voltage output</td>
</tr>
<tr>
<td>Output Current</td>
<td>5 mA maximum, voltage output</td>
</tr>
<tr>
<td>Load Impedance</td>
<td>550Ω max., 5.0Ω min., current output, 2KΩ minimum, voltage output</td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.1% maximum</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±70 ppm / °C maximum</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.2% maximum at 25°C</td>
</tr>
<tr>
<td>Conversion Method</td>
<td>Integration</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>Start of scan, 30μS + one scan</td>
</tr>
</tbody>
</table>

**General Module Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>1 or 2 channels per scan</td>
</tr>
<tr>
<td>Digital Output Points</td>
<td>32 (Y) output points</td>
</tr>
<tr>
<td></td>
<td>12 binary data bits per channel (24 bits total with 8 unused bits)</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>250 mA (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24VDC, ±10%, 300 mA, class 2</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10 MΩ, 500 VDC</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>
D4–02DA 2–Channel Analog Output Module

NOTE 1: Shields should be connected to the 0V terminal of the module or power supply.

NOTE 2: Unused voltage and current outputs should remain open (no connections).

Channel 1 is wired for current output
User Load: 5 to 550 ohms
Shielded

See NOTE 2

Channel 2 is wired for voltage output
User Load: 2K ohms or greater
Shielded

User Supply: 21.6 – 26.4 VDC

24V DC 0.3A
CLASS 2
### F4–04DA 4–Channel Analog Output

<table>
<thead>
<tr>
<th>Output Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>0–5V, 0–10V, ±5V, ±10V, 4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4096)</td>
</tr>
<tr>
<td>Conversion Method</td>
<td>Successive Approximation</td>
</tr>
<tr>
<td>Output Type</td>
<td>Single ended, 1 common</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>0.2Ω typical, voltage output</td>
</tr>
<tr>
<td>Load Impedance</td>
<td>2KΩ minimum, voltage output 0Ω minimum, current output</td>
</tr>
<tr>
<td>Maximum Load / Voltage</td>
<td>680Ω/18V, 1KΩ/24V, 1.5KΩ/36V, current output</td>
</tr>
<tr>
<td>Voltage Output Current</td>
<td>5 mA sink or source</td>
</tr>
<tr>
<td>Short-Circuit Current</td>
<td>15 mA typical, voltage output</td>
</tr>
<tr>
<td>Linearity Error</td>
<td>±1 count (± 0.025%) maximum</td>
</tr>
<tr>
<td>Gain Calibration Error</td>
<td>±8 counts maximum, voltage output −8 to +11 counts maximum, current output</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±2 counts maximum, voltage output −5 to +9 counts maximum, current output</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>5 μs maximum, settling time 0.3 ms maximum, digital out to analog out</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Module Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>16 point (Y) outputs, 12 bits binary data, 4 channel select bits</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>120 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24 VDC, 100 mA, class 2 ±10% (add 20 mA for each current loop used)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±50 ppm / °C maximum full scale ±25 ppm / °C maximum offset</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>

One count in the specification table is equal to one least significant bit of the analog data value (1 in 4096).
F4–04DA 4–Channel Analog Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V terminal of the module or power supply.
NOTE 2: Unused voltage and current outputs should remain open (no connections).
### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4, single ended (one common)</td>
</tr>
<tr>
<td>Output Range</td>
<td>4–20 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Outputs sink 4-20 mA from external supply</td>
</tr>
<tr>
<td>External Load Resistance</td>
<td>0Ω minimum</td>
</tr>
<tr>
<td>Maximum Loop Supply</td>
<td>30 VDC</td>
</tr>
<tr>
<td>Peak Output Voltage</td>
<td>40 VDC (clamped, transient suppressed)</td>
</tr>
<tr>
<td>Maximum Load / Power Supply</td>
<td>620Ω/18V, 910Ω/24V, 1200Ω/30V</td>
</tr>
<tr>
<td>Linearity Error (best fit)</td>
<td>±1 count (±0.025%) maximum</td>
</tr>
<tr>
<td>Gain Calibration Error</td>
<td>±5 counts maximum</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±3 counts maximum</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.1% @ 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.3% @ 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>100 μs maximum, settling time</td>
</tr>
<tr>
<td></td>
<td>2.0 ms maximum, digital out to analog out</td>
</tr>
</tbody>
</table>

### General Module Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>16 point (Y) outputs, 12 bits binary data and 4 active channel bits</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>70 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>21.6–26.4 VDC, 75 mA, class 2 (add 20 mA for each current loop used)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±57 ppm / °C full scale calibration range (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–04DA–1 4–Channel Analog Current Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V terminal of the module terminal block.

NOTE 2: Unused current outputs should remain open (no connections).

Typical User Wiring

See NOTE 1

Internal module circuitry

4–20mA curr. sinking

D/A

CH1 +I

CH1 –I

CH2 +I

CH2 –I

CH3 +I

CH3 –I

CH4 +I

CH4 –I

0V

24V

Internal DC/DC Converter

User Supply

18–30 VDC

Optional 2nd

User Supply

21.6 – 26.4 VDC

75 mA

Add 20mA for each 4–20mA loop powered from the module.
## F4–04DA–2 4–Channel Analog Voltage Output

### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Channels</strong></td>
<td>4, single ended (one common)</td>
</tr>
<tr>
<td><strong>Output Ranges</strong></td>
<td>0–5, 0–10, ±5, ±10 VDC</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td><strong>Load Impedance</strong></td>
<td>2KΩ minimum</td>
</tr>
<tr>
<td><strong>Load Capacitance</strong></td>
<td>0.01 μF maximum</td>
</tr>
<tr>
<td><strong>Voltage Output Current</strong></td>
<td>5.0 mA sink or source</td>
</tr>
<tr>
<td><strong>Short-circuit Current</strong></td>
<td>15 mA typical</td>
</tr>
<tr>
<td><strong>Linearity Error (end to end)</strong></td>
<td>±1 count (±0.025%) maximum</td>
</tr>
<tr>
<td><strong>Offset Calibration Error</strong></td>
<td>±3 counts maximum, unipolar</td>
</tr>
<tr>
<td><strong>Full Scale Calibration Error</strong></td>
<td>±8 counts maximum, (offset error included)</td>
</tr>
<tr>
<td><strong>Maximum Inaccuracy</strong></td>
<td>±0.2% @ 25°C (77°F)</td>
</tr>
<tr>
<td><strong>Conversion Time</strong></td>
<td>5 μs maximum, settling time</td>
</tr>
<tr>
<td><strong>Digital Output Points Required</strong></td>
<td>16 point (Y) outputs, 12 bits binary data, 4 active channel bits or 2 active channel bits and 1 sign bit for bipolar</td>
</tr>
<tr>
<td><strong>Power Budget Requirement</strong></td>
<td>90 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>21.6–26.4 VDC, 90 mA, class 2 (outputs fully loaded)</td>
</tr>
<tr>
<td><strong>Accuracy vs. Temperature</strong></td>
<td>±57 ppm / °C full scale calibration change (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td><strong>Relative Humidity</strong></td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td><strong>Environmental air</strong></td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td><strong>Shock</strong></td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td><strong>Noise Immunity</strong></td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>

### General Module Specifications
F4–04DA–2 4–Channel Analog Voltage Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V terminal of the module or power supply.

NOTE 2: Unused voltage outputs should remain open (no connections).

User Wiring

Internal module circuitry

21.6 – 26.4 VDC
90mA

0V

Internal DC/DC Converter
## F4–04DAS–1 4–Channel 4–20mA Isolated Analog Output

### Output Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>4, isolated current sourcing</td>
</tr>
<tr>
<td>Output Ranges</td>
<td>4–20mA current</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bit (1 in 65536)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Outputs source 4–20 mA from external supply</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>±750V continuous, channel to channel, channel to logic</td>
</tr>
<tr>
<td>Load Impedance</td>
<td>0Ω – 1375Ω</td>
</tr>
<tr>
<td>Loop Supply</td>
<td>12–32VDC</td>
</tr>
<tr>
<td>Output Loop Compliance</td>
<td>Vin–2.5V</td>
</tr>
<tr>
<td>Max. Load/Power Supply</td>
<td>375Ω/12V, 975Ω/24V, 1375Ω/32V</td>
</tr>
<tr>
<td>PLC Update Rate</td>
<td>1 channel per scan min., 4 per scan max.</td>
</tr>
<tr>
<td>Linearity Error (end to end) and Relative Accuracy</td>
<td>±10 count (±0.015%) maximum</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±13 counts (±0.02%)</td>
</tr>
<tr>
<td>Gain Calibration Error</td>
<td>±32 counts maximum, (offset error included)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.07% @ 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.18% @ 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>3ms to 0.1% of full scale</td>
</tr>
</tbody>
</table>

### General Module Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>32 point (Y) outputs, 16 bits binary data, 2 channel identification bits and 1 output enable</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>60 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>50 mA per channel</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±50 ppm / °C full scale calibration change (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–04DAS–1 4–Channel 4–20mA Isolated Analog Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V.
NOTE 2: Load must be within compliance voltage.
NOTE 3: For non–isolated outputs, connect all 0V’s together (0V1 .......0V4) and connect all +V’s together (+V1 .......+V4).

User Wiring

Transmitter Supply 12–32VDC

CH1
0–1375Ω

Note 2

Transmitter Supply 12–32VDC

CH2
0–1375Ω

Note 2

Transmitter Supply 12–32VDC

CH3
0–1375Ω

Note 2

Transmitter Supply 12–32VDC

CH4
0–1375Ω

Note 2

Internal module circuitry

D/A

4mA–20mA

0V1

+V1

–I1

+I1

0V2

+V2

–I2

+I2

0V3

+V3

–I3

+I3

0V4

+V4

–I4

+I4

ANALOG OUTPUT

4 CHANNELS

F4–04DAS–1

100Ω

100Ω

100Ω

100Ω
## F4–08DA–1 8–Channel Analog Current Output

### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8, single ended (one common)</td>
</tr>
<tr>
<td>Output Range</td>
<td>4–20 mA current</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Outputs sink 4–20 mA from external supply</td>
</tr>
<tr>
<td>Peak Output Voltage</td>
<td>40 VDC (no transient voltage suppression)</td>
</tr>
<tr>
<td>External Load Resistance</td>
<td>0–480Ω at 18V, 220–740Ω at 24V, 1550–1760Ω at 48V</td>
</tr>
<tr>
<td>Maximum Loop Supply</td>
<td>48 VDC (with load resistance in proper range)</td>
</tr>
<tr>
<td>Crosstalk</td>
<td>−70 dB, ± 1 count maximum</td>
</tr>
<tr>
<td>Linearity Error (end-to-end) and Relative Accuracy</td>
<td>± 1 count maximum</td>
</tr>
<tr>
<td>Full Scale Calibration Error (offset error included)</td>
<td>± 8 counts maximum (20mA at 25°C)</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>± 3 counts maximum (4mA at 25°C)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>± 0.2% at 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>± 0.4% at 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>400 μs maximum, for full scale change 2.25 to 4.5 mS for digital output to analog out</td>
</tr>
</tbody>
</table>

### General Module Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>16 point (Y) outputs, 12 bits binary data, 3 bits channel select, 1 bit output enable</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>90 mA at 5 VDC (supplied by base power supply)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>21.6-26.4 VDC, 100 mA, class 2 (add 20 mA for each current loop used)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>± 57 ppm / °C full scale calibration range (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–08DA–1 8–Channel Analog Current Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V of the User Power Supply at the module terminal block.

NOTE 2: Unused current outputs should remain open (no connections).

Typical User Wiring

- CH1, CH2, CH3, CH4, CH5, CH6, CH7, CH8
  - Current Output: 0–1K ohms
  - Current Output: 0–1K ohms
  - Current Output: 0–1K ohms

- Current Output: 4–20mA current sinking (same)
- Current Output: 4–20mA curr. sinking

- 16–48 VDC Optional Loop Supply
- User Supply: 21.6 – 26.4 VDC 100mA

Add 20mA for each 4–20mA loop powered from this supply.
# F4–08DA–2 8–Channel Analog Current Output

<table>
<thead>
<tr>
<th>Output Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Channels</strong></td>
<td>8, single ended (one common)</td>
</tr>
<tr>
<td><strong>Output Range</strong></td>
<td>0–5VDC, 0–10VDC</td>
</tr>
<tr>
<td><strong>Resolution</strong></td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td><strong>Output Type</strong></td>
<td>OVoltage Sourcing 10mA maximum</td>
</tr>
<tr>
<td><strong>External Load Resistance</strong></td>
<td>1kΩ maximum /10kΩ minimum</td>
</tr>
<tr>
<td><strong>Crosstalk</strong></td>
<td>−70 dB, ±1 count maximum</td>
</tr>
<tr>
<td><strong>Linearity Error (end-to-end) and Relative Accuracy</strong></td>
<td>±1 count maximum (10VDC at 25°C)</td>
</tr>
<tr>
<td><strong>Full Scale Calibration Error (offset error included)</strong></td>
<td>±6 counts maximum (10VDC at 25°C)</td>
</tr>
<tr>
<td><strong>Offset Calibration Error</strong></td>
<td>±3 counts maximum (0VDC at 25°C)</td>
</tr>
<tr>
<td><strong>Maximum Inaccuracy</strong></td>
<td>±0.2% at 25°C (77°F) ±0.4% at 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td><strong>Conversion Time</strong></td>
<td>400 μs maximum, for full scale change 4.5 to 9 mS for digital output to analog out</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Module Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Digital Output Points Required</strong></td>
<td>16 point (Y) outputs, 12 bits binary data, 3 bits channel select, 1 bit output enable</td>
</tr>
<tr>
<td><strong>Power Budget Requirement</strong></td>
<td>80 mA at 5 VDC (supplied by base power supply)</td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>21.6-26.4 VDC, 150 mA, class 2 (add 20 mA for each current loop used)</td>
</tr>
<tr>
<td><strong>Accuracy vs. Temperature</strong></td>
<td>±57 ppm /°C full scale calibration range (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td><strong>Storage Temperature</strong></td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td><strong>Relative Humidity</strong></td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td><strong>Environmental Air</strong></td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td>MIIL STD 810C 514.2</td>
</tr>
<tr>
<td><strong>Shock</strong></td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td><strong>Noise Immunity</strong></td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–08DA–2 8–Channel Analog Voltage Output Module

NOTE 1: Shields should be connected to the 0V terminal of the User Power Supply at the module terminal block.

Typical User Wiring

User Supply 21.6 – 26.4 VDC 150mA

Internal DC/DC Converter
## F4–16DA–1 16–Channel Analog Current Output

### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>16, single ended (one common)</td>
</tr>
<tr>
<td>Output Range</td>
<td>4–20 mA current</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Outputs sink 4–20 mA from external supply</td>
</tr>
<tr>
<td>Peak Output Voltage</td>
<td>40 VDC (no transient voltage suppression)</td>
</tr>
<tr>
<td>External Load Resistance</td>
<td>0–480Ω @ 18V, 220–740Ω @ 24V, 1550–1760Ω @ 48V</td>
</tr>
<tr>
<td>Maximum Loop Supply</td>
<td>48 VDC (with load resistance in proper range)</td>
</tr>
<tr>
<td>Crosstalk</td>
<td>−70 dB, ±1 count maximum</td>
</tr>
<tr>
<td>Linearity Error (end-to-end)</td>
<td>±1 count maximum (20mA at 25°C)</td>
</tr>
<tr>
<td>and Relative Accuracy</td>
<td></td>
</tr>
<tr>
<td>Full Scale Calibration Error</td>
<td>±8 counts maximum (20mA at 25°C)</td>
</tr>
<tr>
<td>(offset error included)</td>
<td></td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>±3 counts maximum (4mA at 25°C)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>±0.2% @ 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>±0.4% @ 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>400 μs maximum, for full scale change 4.5 to 9 mS for digital output to analog out</td>
</tr>
</tbody>
</table>

### General Module Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>32 point (Y) outputs, 2 sets each of 12 bits binary data, 3 bits channel select, 1 bit output enable</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>90 mA @ 5 VDC (supplied by base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>21.6 – 26.4 VDC, 100 mA, class 2 (add 20 mA for each current loop used)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>±57 ppm / °C full scale calibration range (including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–16DA–1 16–Channel Analog Current Output Module

Wiring Diagram

NOTE 1: Shields should be connected to the 0V of the User Power Supply at the module terminal block.

NOTE 2: Unused current outputs should remain open (no connections).

Typical User Wiring

- CH1: 0–1K ohms
- CH2: 0–1K ohms
- CH3: 0–1K ohms
- CH4: 0–1K ohms
- CH5: 0–1K ohms
- CH6: 0–1K ohms
- CH7: 0–1K ohms
- CH8: 0–1K ohms
- CH9: 0–1K ohms
- CH10: 0–1K ohms
- CH11: 0–1K ohms
- CH12: 0–1K ohms
- CH13: 0–1K ohms
- CH14: 0–1K ohms
- CH15: 0–1K ohms
- CH16: 0–1K ohms

Internal module circuitry
4–20mA current sinking
(same)

18–48 VDC Optional Loop Supply
User Supply 21.6 – 26.4 VDC 100mA

Add 20mA for each 4–20mA loop powered from this supply

Converter
Current Output
Current Output
Current Output
Current Output
Current Output
4mA–20mA (same)
4mA–20mA (same)
4mA–20mA (same)
4mA–20mA (same)
4mA–20mA (same)
4mA–20mA (same)

Internal DC/DC Converter

24 VDC 30mA
0V
0V
0V
0V
## F4–16DA–2 16–Channel Analog Voltage Output

### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>16, single ended (one common)</td>
</tr>
<tr>
<td>Output Range</td>
<td>0–5VDC, 0–10VDC</td>
</tr>
<tr>
<td>Resolution</td>
<td>12 bit (1 in 4095)</td>
</tr>
<tr>
<td>Output Type</td>
<td>Voltage Sourcing 10mA maximum</td>
</tr>
<tr>
<td>External Load Resistance</td>
<td>1kΩ maximum /10kΩ minimum</td>
</tr>
<tr>
<td>Crosstalk</td>
<td>~70 dB, ± 1 count maximum</td>
</tr>
<tr>
<td>Linearity Error (end-to-end) and</td>
<td>± 1 count maximum (10VDC at 25°C)</td>
</tr>
<tr>
<td>Relative Accuracy</td>
<td></td>
</tr>
<tr>
<td>Full Scale Calibration Error</td>
<td>± 6 counts maximum (10VDC at 25°C)</td>
</tr>
<tr>
<td>Offset Calibration Error</td>
<td>± 3 counts maximum (0VDC at 25°C)</td>
</tr>
<tr>
<td>Maximum Inaccuracy</td>
<td>± 0.2% at 25°C (77°F)</td>
</tr>
<tr>
<td></td>
<td>± 0.4% at 0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>400 μs maximum, for full scale change</td>
</tr>
<tr>
<td></td>
<td>4.5 to 9 mS for digital output to analog out</td>
</tr>
</tbody>
</table>

### General Module Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Output Points Required</td>
<td>32 point (Y) outputs,</td>
</tr>
<tr>
<td></td>
<td>two sets each of 12 bits binary data,</td>
</tr>
<tr>
<td></td>
<td>3 bits channel select, 1 bit output enable</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>80 mA at 5 VDC (supplied by base power supply)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>21.6-26.4 VDC, 150 mA, class 2</td>
</tr>
<tr>
<td></td>
<td>(add 20 mA for each current loop used)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>± 57 ppm / °C full scale calibration range</td>
</tr>
<tr>
<td></td>
<td>(including maximum offset change, 2 counts)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 60°C (32 to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20 to 70°C (−4 to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3-304</td>
</tr>
</tbody>
</table>
F4–16DA–2 16–Channel Analog Voltage Output Module

NOTE 1: Shields should be connected to the 0V terminal of the User Power Supply at the module terminal block.

Typical User Wiring

User Supply 21.6 – 26.4 VDC 275mA
# F4–08THM 8–Channel Thermocouple Input

## Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8, differential inputs</td>
</tr>
<tr>
<td>Input Ranges</td>
<td>Type J: –190/760 °C, –310/1400 °F</td>
</tr>
<tr>
<td></td>
<td>Type E: –210/1000 °C, –346/1832 °F</td>
</tr>
<tr>
<td></td>
<td>Type K: –150/1372 °C, –238/2502 °F</td>
</tr>
<tr>
<td></td>
<td>Type R: 65/1768 °C, 149/3214 °F</td>
</tr>
<tr>
<td></td>
<td>Type S: 65/1768 °C, 149/3214 °F</td>
</tr>
<tr>
<td></td>
<td>Type T: –230/400 °C, –382/752 °F</td>
</tr>
<tr>
<td></td>
<td>Type B: 529/1820 °C, 984/3308 °F</td>
</tr>
<tr>
<td></td>
<td>Type N: –70/1300 °C, –94/2372 °F</td>
</tr>
<tr>
<td></td>
<td>Type C: –65/2320 °C, –146/4208 °F</td>
</tr>
<tr>
<td>Display Resolution</td>
<td>± 0.1 °C or ± 0.1 °F</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>1 MΩ</td>
</tr>
<tr>
<td>Absolute Maximum Ratings</td>
<td>Fault-protected input, ± 50 VDC</td>
</tr>
<tr>
<td>Cold Junction Compensation</td>
<td>Automatic</td>
</tr>
<tr>
<td>Conversion Time</td>
<td>100 ms per channel, minimum</td>
</tr>
<tr>
<td>Linearity Error</td>
<td>± 0.05 °C maximum, ± 0.01 °C typical</td>
</tr>
<tr>
<td>Full Scale Calibration Error</td>
<td>± 13 counts typical, ± 33 counts max.</td>
</tr>
<tr>
<td>Maximum Inaccuracy*</td>
<td>± 0.02% @ 25 °C</td>
</tr>
</tbody>
</table>

## General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>8 channel per scan max.</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>16 (X) input points, including 2 channel ID bits, 4 diagnostic bit</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>110 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>60 mA maximum, 18 to 26.4 VDC</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0° to 60° C (32° to 140° F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>–20° to 70° C (–4° to 158° F)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>± 57 ppm / °C maximum full scale</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>
F4–08THM 8–Channel Thermocouple Input Module

Note 1: Terminate shields at the respective signal source.
Note 2: Leave unused channels open (no connection).

Internal Module Wiring

See Note 1

Examples of differential Thermocouple wiring

Examples of grounded Thermocouple wiring

User Supply

24VDC+ 10% Class 2

A/D

Analog Switch

COM

CH1

CH3

CH4

CH5

CH8

CH1+

CH2+

CH3+

CH4+

CH5+

CH6+

CH7+

CH8+

COM

24V

0V

THERMOCOUPLE INPUT
8 CHANNELS
F4–08THM

24V @40mA

Internal Module Wiring
## F4–08THM–n 8–Channel Thermocouple Input

### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8, differential inputs</td>
</tr>
</tbody>
</table>
| Input Ranges                | Type E: −270/1000 °C, −450/1832 °F  
|                            | Type J: −210/760 °C, −350/1390 °F  
|                            | Type K: −270/1370 °C, −450/2500 °F  
|                            | Type R: 0/1768 °C, 32/3214 °F  
|                            | Type S: 0/1768 °C, 32/3214 °F  
|                            | Type T: −270/400 °C, −450/752 °F  
|                            | Type C: 60/2320 °C, 149/4208 °F  
|                            | Type B: 529/1820 °C, 984/3594 °F  
|                            | Type P: −99/1395 °C, −146/2543 °F  
| Resolution                 | 12 bit (1 in 4096) |
| Input Impedance             | 27KΩ DC |
| Absolute Maximum Ratings    | Fault-protected input, 130 Vrms or 100 VDC |
| Cold Junction Compensation  | Automatic |
| Conversion Time             | 15ms per channel, minimum  
|                            | 1 channel per CPU scan |
| Converter Type              | Successive approximation |
| Linearity Error             | ± 1 count (0.03% of full scale) maximum |
| Full Scale Calibration Error| 0.35% of full scale |
| Maximum Inaccuracy*         | ± 1 °C type J,K,E,T thermocouples  
|                            | ± 3 °C type R,S,B,C,P thermocouples |

* Maximum Inaccuracy is guaranteed for temperatures above −220°C for types E, T, J, and K, and above +100°C for types R and S.

### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>8 channel per scan max.</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>16 (X) input points, including 12 binary data bits, 3 channel ID bits, 1 sign bit</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>120 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>External Power Supply</td>
<td>24 VDC ± 10%, 50 mA current</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0° to 60° C (32° to 140° F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20° to 70° C (−4° to 158° F)</td>
</tr>
<tr>
<td>Accuracy vs. Temperature</td>
<td>± 57 ppm / °C maximum full scale</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>
**F4–08THM–n 8–Channel Thermocouple Input Module**

Note 1: Terminate shields at the respective signal source.
Note 2: Leave unused channels open (no connection).
## F4–08RTD 8–Channel RTD Input

### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>8 differential inputs</td>
</tr>
<tr>
<td>Display Resolution</td>
<td>±0.01 °C, ±0.01 °F (±3276.7)</td>
</tr>
<tr>
<td>Resolution</td>
<td>15-bit (1 in 32768)</td>
</tr>
<tr>
<td>Absolute Maximum Ratings</td>
<td>Fault-protected input, ±22 VDC</td>
</tr>
<tr>
<td>Converter Type</td>
<td>Charge balancing, 24-bit</td>
</tr>
<tr>
<td>Sampling Rate</td>
<td>160 msec per channel</td>
</tr>
<tr>
<td>Temperature Drift</td>
<td>±5 ppm per °C (maximum)</td>
</tr>
<tr>
<td>Common Mode Range</td>
<td>0–5 VDC</td>
</tr>
<tr>
<td>Linearity Error</td>
<td>±0.05°C maximum, ±0.01°C typical</td>
</tr>
<tr>
<td>Full Scale Calibration</td>
<td>±1°C</td>
</tr>
</tbody>
</table>

### General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLC Update Rate</td>
<td>8 Channels/Scan max. DL440/DL450 CPUs, 1 Channel/Scan max. DL430 CPU</td>
</tr>
<tr>
<td>Digital Input Points Required</td>
<td>32 (X) input points, 16 binary data bits, 3 channel ID bits, 8 fault bits</td>
</tr>
<tr>
<td>Power Budget Requirement</td>
<td>80 mA @ 5 VDC (from base)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C to 60°C (32°F to 140°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>−20°C to 70°C (−4°F to 158°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5 to 95% (non-condensing)</td>
</tr>
<tr>
<td>Environmental Air</td>
<td>No corrosive gases permitted</td>
</tr>
<tr>
<td>Vibration</td>
<td>MIL STD 810C 514.2</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL STD 810C 516.2</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>NEMA ICS3–304</td>
</tr>
</tbody>
</table>
F4–08RTD 8–Channel RTD Input Module

Notes:
1. The three wires connecting the RTD to the module must be the same type and length. Do not use the shield or drain wire for the third connection.
2. If a RTD sensor has four wires, the extra plus (+) sense wire should be left unconnected as shown.