

Discrete Output Modules

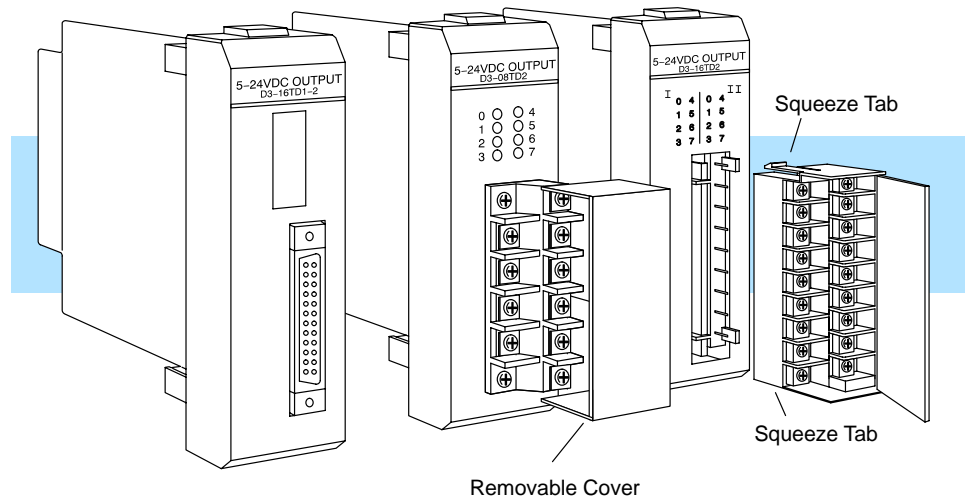
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Discrete Output Module Identification and Terminology

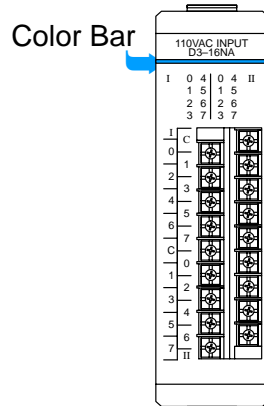
Discrete Output Module Status Indicators

This chapter contains I/O specification sheets for the DL305/FL305 discrete output modules. The following diagram shows the status indicator location for some of the most common discrete output modules.



Color Coding of I/O Modules

The DL305 family of I/O modules has a color coding scheme to help you identify whether the module is an input module, an output module or a special module. This is done through a color bar indicator located on the front of each module below the part number. The following color scheme is used.



Module Type

Discrete/Analog Output
Discrete/Analog Input
Other

Color Code

Red
Blue
White

Output Modules Selection

Your output module selection depends on the field devices used and system performance requirements. The output module specifications in this chapter list the information which is needed for choosing the correct module for a field device and to assure it meets the system requirements. The following list defines the specifications listed in this chapter.

Outputs Per Module	Indicates number of output points per module and designates current sinking, current sourcing, or either.
Commons Per Module	Number of commons per module and their electrical characteristics.
Operating Voltage	The operating voltage range of the output circuit.
Output Type	The output circuit can be a transistor, a triac, or a relay. The NPN or PNP transistor outputs are normally used in low voltage or high speed DC applications. Triac outputs are used in AC voltage applications. The Form A or C relay outputs are normally used where a wide voltage range is needed. Relay output modules are capable of carrying more current than a transistor or a triac output and can pass AC or DC voltages. The disadvantage of a relay module is the internal power consumption and the relay life expectancy.
Peak Voltage	Maximum voltage the output circuit can control.
AC Frequency	AC modules are designed to operating within a specific frequency range. 60 Hz is the standard AC frequency in the U.S., 50 Hz is common in other countries.
ON Voltage Drop	The voltage between the output point and common during an active ON with a load.
Maximum Current (Resistive)	The maximum current for an output with a resistive load.
Maximum Leakage Current	The maximum current of the output circuit during an OFF state.
Maximum Inrush Current	The maximum current over a short period of time during the OFF to ON transition of a output point. It is greater than the normal ON state current and depends on the field device electrical characteristics.
Minimum Load	The minimum load across the output's circuit for the circuit to operate properly.
Base Power Required	Power from the base power supply is used by the DL305 output modules and varies between different modules. The guidelines for using module power is explained in the power budget configuration section in chapter 4.
OFF to ON Response Time	The processing time the module requires to transition from an OFF to ON state.
ON to OFF Response Time	The processing time the module requires to transition from an ON to OFF state.
Terminal Type	Indicates whether the terminal type is a removable or non-removable connector or terminal.
Status Indicators	LEDs indicate the ON/OFF status of an input point. These LEDs are electrically located on either the logic side or the field device side of the output circuit.
Fuses	Indicates the current rating of the replaceable or non-replaceable fuse(s).
Relay Life	Amount of closures typical for a relay point before failure.
Weight	Indicates the weight of the module.

Relay Arc Suppression – DC and AC Applications

FL305 High Current Relay Output Module Arc Suppression This application note describes the addition of external contact protection to high current isolated relay output modules. It supplements the wiring information for the F3-08TRS-1 and F3-08TRS-2 relay output modules.

Adding external contact protection may extend a relays life beyond the number of operations listed. High current inductive loads such as clutches, brakes, motors, direct acting solenoid valves, and motor starters will benefit the most from external contact protection.

Resistor and Capacitor Selection

$$C (\mu F) = I^2 / 10$$

$$R (\Omega) = V / 10 I^x \quad \text{where } x = (1 + 50 / E)$$

Use peak AC values for I and V, see "Peak Voltage and Current" below.
Where I = Amperes of load current immediately prior to opening of contacts.
Where E = Source voltage immediately prior to closing of contacts.

$$R \text{ minimum} = 0.5 \Omega, 1/2 W$$

$$C \text{ minimum} = 0.001 \mu F, \text{ the voltage rating of } C \text{ must be } \geq E$$

Resistor Tolerance For $E < 70V$, R may be 3 times indicated value.
For $70V < E < 100V$, R may be $\pm 50\%$ indicated value.
For $100V < E < 150V$, R may be $\pm 10\%$ indicated value.
For $E > 150V$, R may be $\pm 5\%$ indicated value.

Peak Voltage and Current The following equations can be used to determine I_{peak} and V_{peak} :

$$\begin{aligned} I_{peak} &= I_{rms} / .707 & \text{Alternating Current} \\ V_{peak} &= V_{rms} / .707 \end{aligned}$$

$$I_{peak} = I_{ave} / .636 \quad \text{DC Rectified Alternating Current}$$

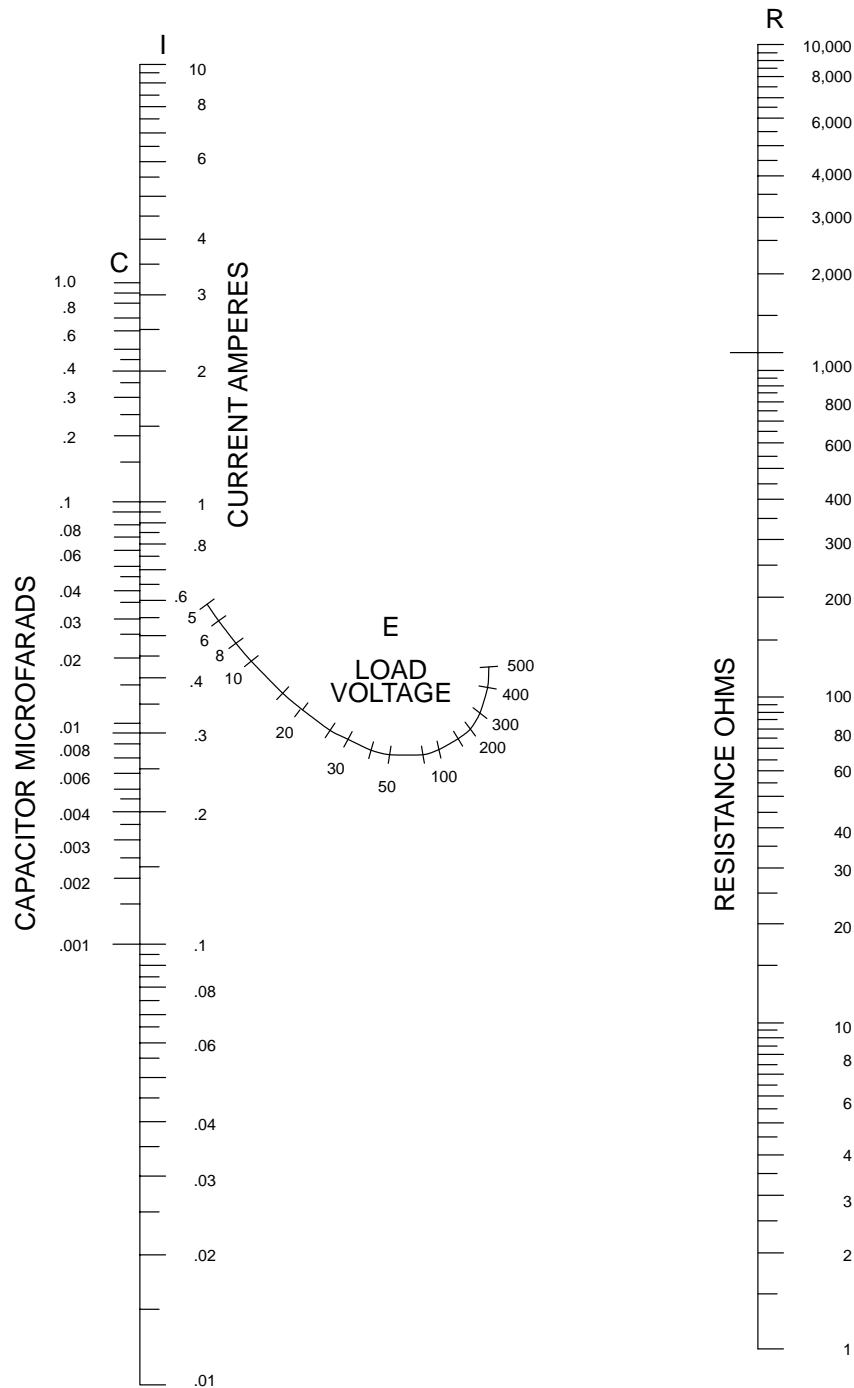
Adding Contact Protection If the contact is switching a DC inductive load, add a diode across the load as near to load coil as possible. Add the RC network across the relay contacts as close to the relay as possible.

Resistor and Capacitor Nomogram

The nomogram shown below affords a convenient method of selecting the proper contact protection for P & B relays used in F3-08TRS-1 and F3-08TRS-2 modules.

Example: Use a current (I) of 1.0 ampere and a voltage (E) of 50 volts.

Capacitance (C) in microfarads is found directly on the left side scale, opposite 1.0 amperes as 0.1. Resistance (R) in ohms is obtained using a straight edge. Locate 1.0 amperes (I) on the left side scale and 50 volts (E) on the center scale. Place the straightedge on these points. The junction of the straight edge and the right side determines R. In this example R is equal to 5.0 ohms.



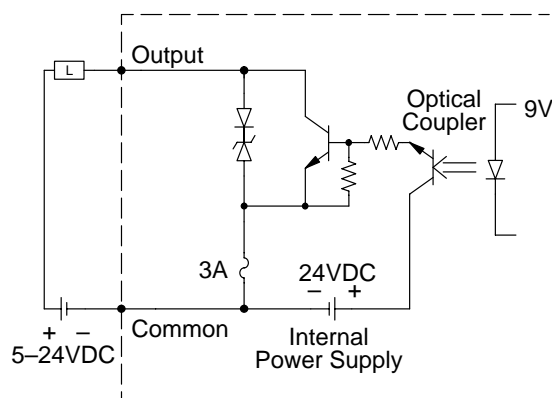
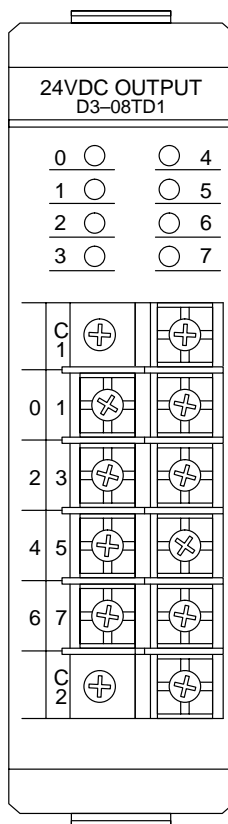
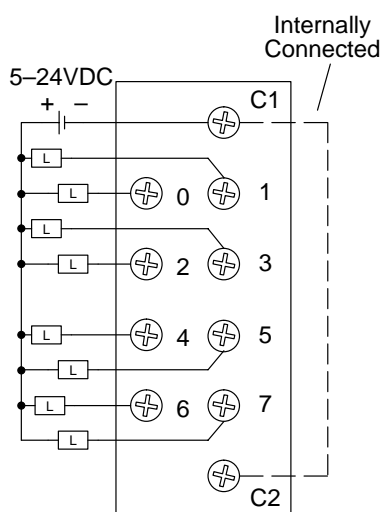
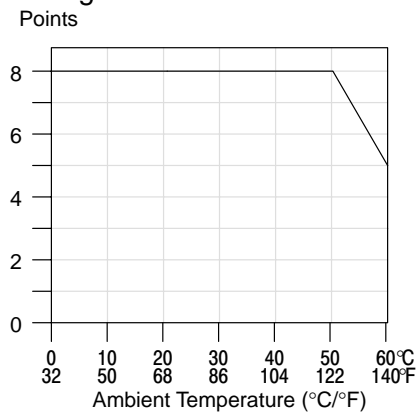
- (1) $C = I^2 / 10$ microfarads
 (2) $R = E / 10 I^x$ ohms

For DC. For AC, use peak values
 Where $x = (1 + 50/E)$

D3-08TD1, 24 VDC Output Module

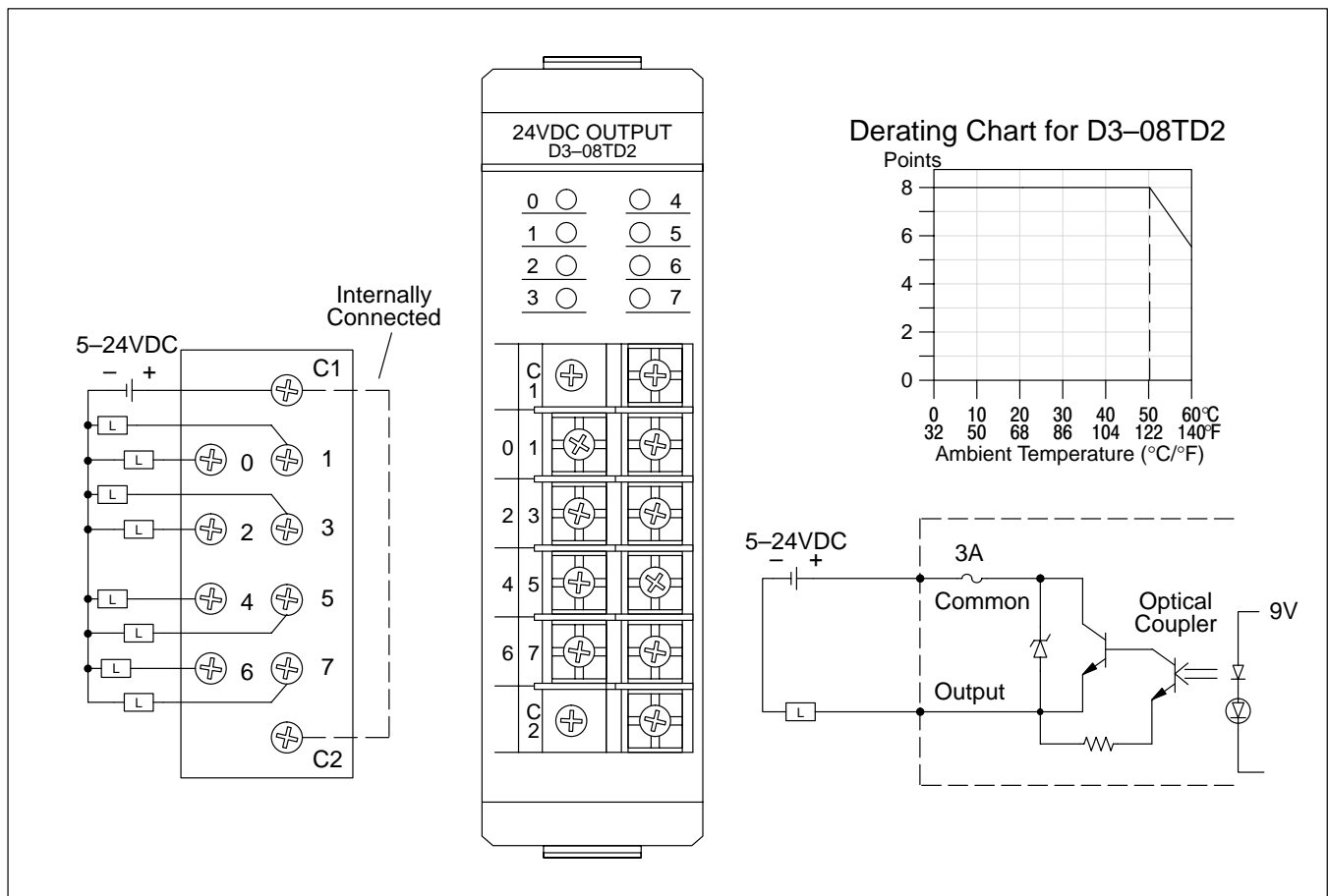
Outputs per module	8 (current sinking)	Minimum load	1 mA
Commons per module	2(internally connected)	Base power required	9V 20 mA Max 24V 3mA/pt. (24mA Max)
Operating voltage	5-24VDC	OFF to ON response	0.1 ms
Output type	NPN (open collector)	ON to OFF response	0.1 ms
Peak voltage	45VDC	Terminal type	Non-removable
AC frequency	N/A	Status indicators	Logic Side
ON voltage drop	0.8V @ 0.5A	Weight	4.2 oz. (120 g)
Max current	0.5A / point 1.8 / common	Fuses	(2) One 3A per common Non-replaceable
Max leakage current	0.1 mA @ 40VDC		
Max inrush current	3A / 20ms 1A / 100ms		

Derating Chart for D3-08TD1



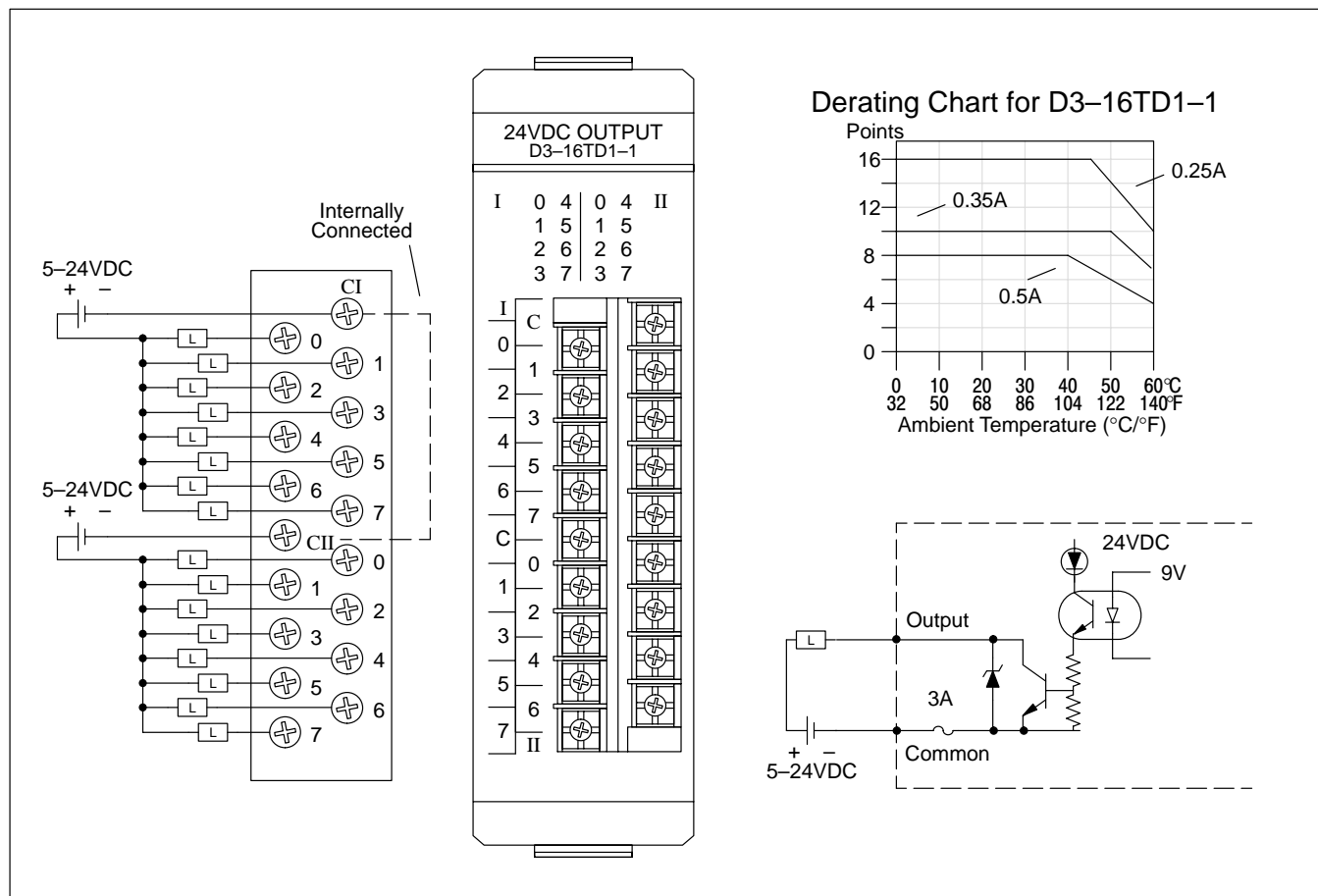
D3-08TD2, 24 VDC Output Module

Outputs per module	8 (current sourcing)	Minimum load	1 mA
Commons per module	2 (internally connected)	Base power required	9V 30 mA Max 24V N/A
Operating voltage	5–24VDC	OFF to ON response	0.1 ms
Output type	NPN Transistor (emitter follower)	ON to OFF response	0.1 ms
Peak voltage	40VDC	Terminal type	Non-removable
AC frequency	N/A	Status indicators	Logic Side
ON voltage drop	1V @ 0.5A	Weight	4.2 oz. (120 g)
Max current	0.5A / point 1.8A / common	Fuses	(2) One 3A per common Non-replaceable
Max leakage current	0.1 mA @ 24VDC		
Max inrush current	3A / 20ms 1A / 100ms		



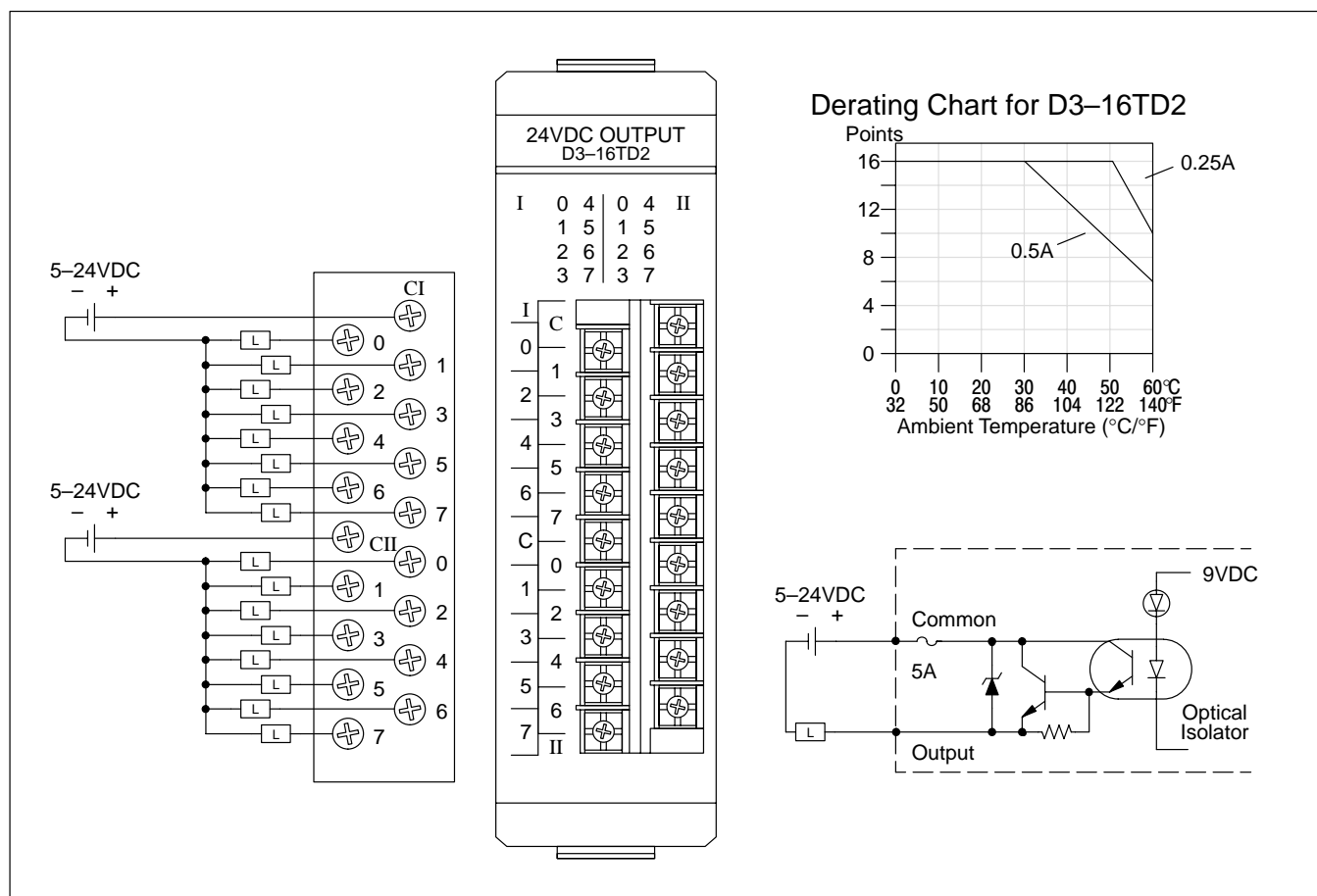
D3-16TD1-1, 24 VDC Output Module

Outputs per module	16 (current sinking)	Minimum load	1 mA
Commons per module	2 (internally connected)	Base power required	9V (40 mA Max) 3mA+2.3mA/ON pt. 24V 6 mA/ON pt. (96 mA Max)
Operating voltage	5-24VDC	OFF to ON response	0.1 ms
Output type	NPN transistor (open collector)	ON to OFF response	0.1 ms
Peak voltage	45VDC	Terminal type	Removable
AC frequency	N/A	Status indicators	Logic Side
ON voltage drop	2V @ 0.5A	Weight	5.6 oz. (160 g)
Max current	0.5A/ point 2A/ common	Fuses	(2) One 3A per common Non-replaceable
Max leakage current	0.1mA @ 40VDC		
Max inrush current	3A / 20 ms 1A / 100 ms		



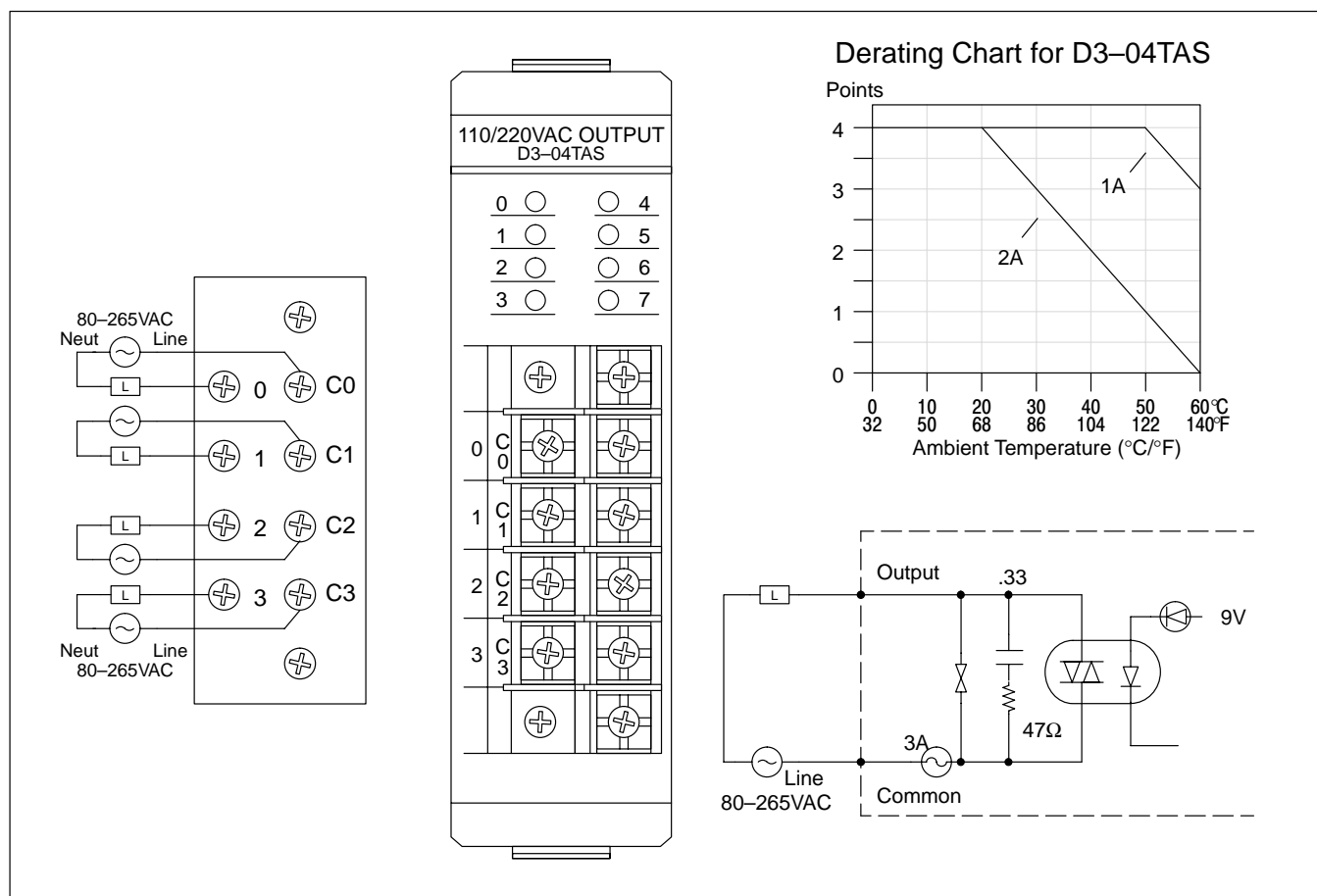
D3-16TD2, 24 VDC Output Module

Outputs per module	16 (current sourcing)	Minimum load	1 mA
Commons per module	2 (isolated)	Base power required	9V 7.5 mA/ON pt. (180 mA Max) 24V N/A
Operating voltage	5–24VDC	OFF to ON response	0.1 ms
Output type	NPN transistor (emitter follower)	ON to OFF response	1 ms
Peak voltage	40VDC	Terminal type	Removable
AC frequency	N/A	Status indicators	Logic Side
ON voltage drop	1.5V @ 0.5A	Weight	7.1 oz. (210 g)
Max current	0.5A / point 3A common	Fuses	(2) One 5A per common Non-replaceable
Max leakage current	0.01 mA @ 40VDC		
Max inrush current	3A / 20ms 1A / 100ms		



D3-04TAS, 110-220 VAC Output Module

Outputs per module	4	Minimum load	10 mA
Commons per module	4 (isolated)	Base power required	9V 12 mA Max 24V N/A
Operating voltage	80-265VAC	OFF to ON response	1 ms Max
Output type	Triac	ON to OFF response	10 ms Max
Peak voltage	265 VAC	Terminal type	Non-removable
AC frequency	47-63 Hz	Status indicators	Logic Side
ON voltage drop	1.5 VAC @ 2A	Weight	6.4 oz. (180 g)
Max current	2A / point 2A / common	Fuses	(4) One 3A per common User replaceable
Max leakage current	7 mA @ 220VAC 3.5 mA @ 110VAC		
Max inrush current	20A for 16 ms 10A for 100 ms		

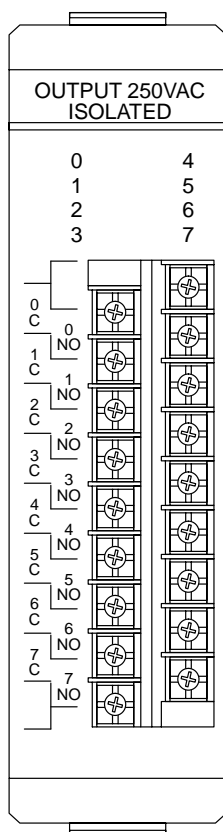
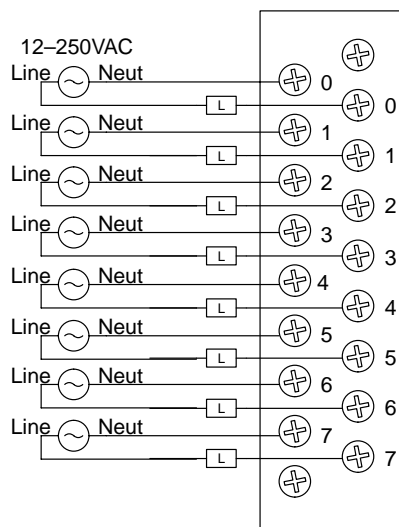


F3-08TAS, 250 VAC Isolated Output Module

Outputs per module	8 (500V point-to-point isolation)	Base power required	9V 10mA / ON pt. 80mA Max. 24V N/A
Commons per module	8 (isolated)	OFF to ON response	8 ms Max
Operating voltage	12–125 VAC 125–250 VAC requires external fuses	ON to OFF response	8 ms Max
Output type	SSR Array (TRIAC)	Terminal type	Removable
Peak voltage	400 VAC	Status indicators	Logic Side
AC frequency	47 – 440 Hz	Weight	N/A at press time
ON voltage drop	1 VAC @ 1A	Fuses BK/PCE-5 Bussman (One spare fuse included)	(8) fast blow One 5A (125V fast blow) per each circuit User replaceable
Max current	1A / point		
Max leakage current	10 μ A @ 240 VAC		
Max inrush current*	20A for 16 ms 3A for 100 ms		
Minimum load	0.5 mA		

*Fuse blows at 30 Amp surge

Motor starters up to and including a NEMA size 3 can be used with this module.



Derating Chart for F3-08TAS

