

## Safety Connection Systems

Bulletin Numbers 888D, 888R, 898D, 898R

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### Summary of Changes

This publication contains new and updated information as indicated in the following table.

Topic	Pages
Updated Dual-channel, N.C./N.O., No Enunciation product selection table.	7



## Overview

Allen-Bradley® Guardmaster® Safety Connection Systems are complete wiring solutions that are dedicated to machine safety. These quick disconnect-based systems consist of safety-wired t-ports and distribution boxes as well as patchcords and shorting plugs. Intended for use with dry-contact safety switches, safety connection systems provide flexible and reliable connections between safety interlock switches, E-stops, cable pull switches, and safety relays. While this system is ideal for use with these components, it is not suitable for use with light curtains, safety mats, or pressure sensitive safety edges.

Guardmaster safety connection systems are designed to:

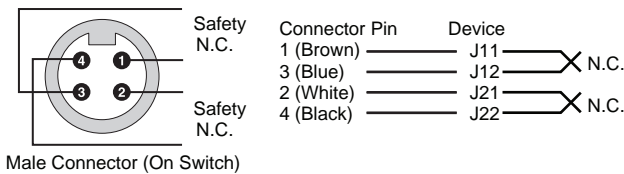
- Reduce installation cost
- Ease system expansion
- Simplify troubleshooting
- Promote system modularity
- Provide for Safety PLC input expansion
- Support systems up to Category 3 (per EN954-1)

Safety connection system layouts are available with or without enunciation capabilities. These layouts give you the option of direct feedback for the status of individual switches in the system. Enunciation systems use an auxiliary contact as input to tower lights, audible alarms, PLC input cards, and so on.

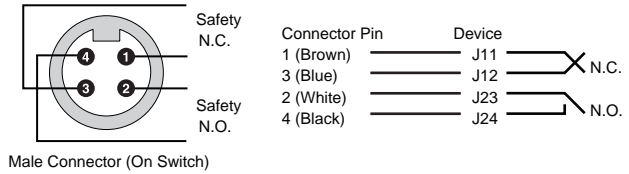
### Systems without Enunciation

As illustrated in [Figure 5](#) on [page 3](#), wiring systems for applications that do not require enunciation use a combination of patchcords, shorting plugs, safety-wired distribution boxes, and t-ports for series wiring of safety circuits. Distribution boxes for such an application are dual channel models with 2 N.C. or 1 N.C. + 1 N.O. contact configurations. See [Figure 1](#) and [Figure 2](#) for connector pin assignments.

**Figure 1 - Dual Channel 2 N.C.**



**Figure 2 - Dual Channel 1 N.C./1 N.O.**



**IMPORTANT** Shorting plugs must be used on all unused ports for the system to operate.

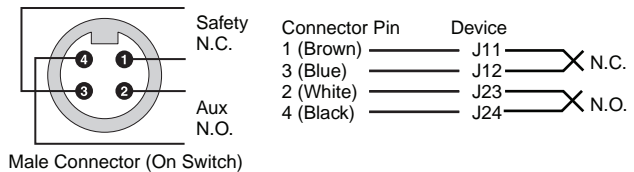
### Systems with Enunciation

As shown in [Figure 7](#) on [page 4](#), system layouts with enunciation require patchcords, shorting plugs and distribution boxes, which allow for series wiring of the safety circuits while providing a separate circuit for enunciation. Distribution boxes are offered for these applications in two contact configurations:

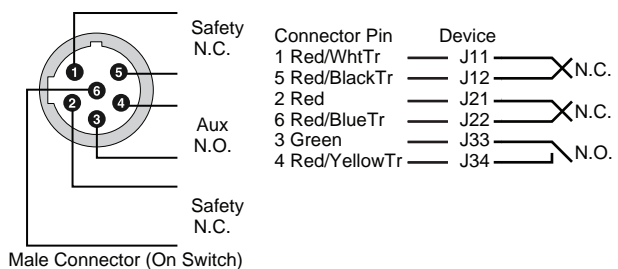
- Dual channel with 2 N.C.
- Single channel with 1 N.C.

Each type also provides a N.O. auxiliary contact that is interfaced with the enunciation device to provide visual or audible alarm indication. In addition, status indicators on the distribution boxes help with the troubleshooting of this system. See [Figure 3](#) and [Figure 4](#) for the associated connector pin configurations.

**Figure 3 - Single Channel 1 N.C./1 N.O.**



**Figure 4 - Dual Channel 2 N.C./1 N.O.**



**IMPORTANT** Shorting plugs must be used on all unused ports for the system to operate.

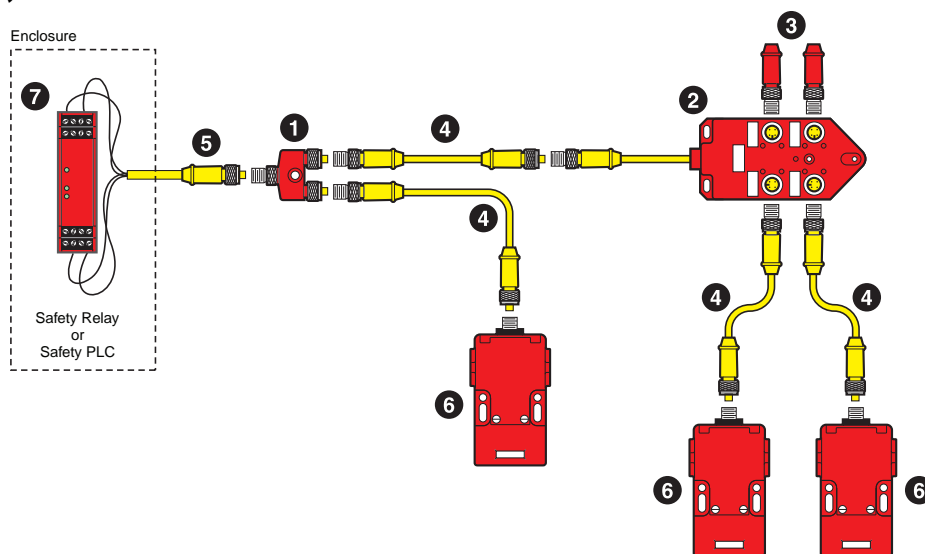
## Installation Considerations

Some important notes regarding safety connection systems:

- To help maintain that only authorized personnel can access the connections, safety distribution boxes should be mounted in the guarded area as defined in the risk assessment for the application.
- The safety connection system is designed to simplify the installation of safety devices—it does not control the safety circuit.
- Since the safety circuits are wired in series, shorting plugs must be installed in all unused distribution box ports in order for the system to operate.

## Layout without Enunciation

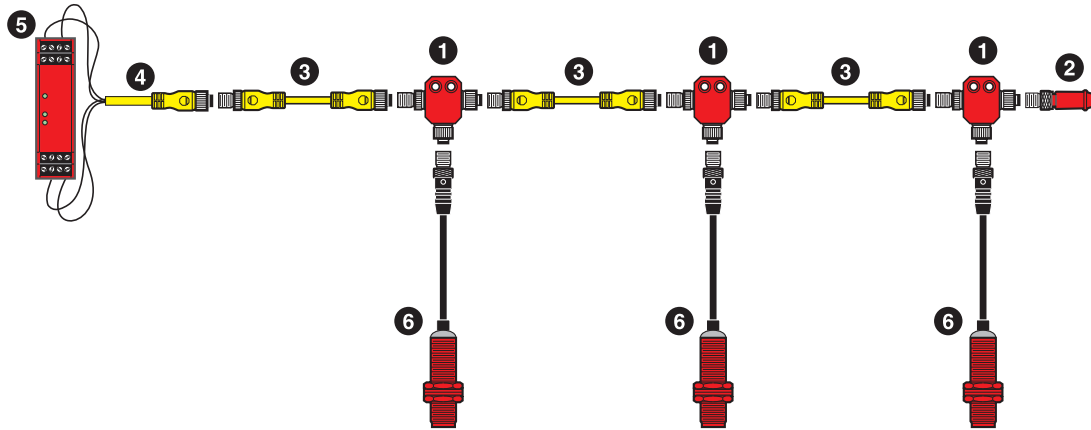
Figure 5 - Example Layout without Enunciation



Item	Description
1	Safety-wired splitter/t-port
2	Safety-wired distribution box
3	Shorting plug
4	Device patchcord
5	Device cordset
6	Safety switch with QD
7	Safety relay

## SensaGuard Units Wired in Series without Enunciation

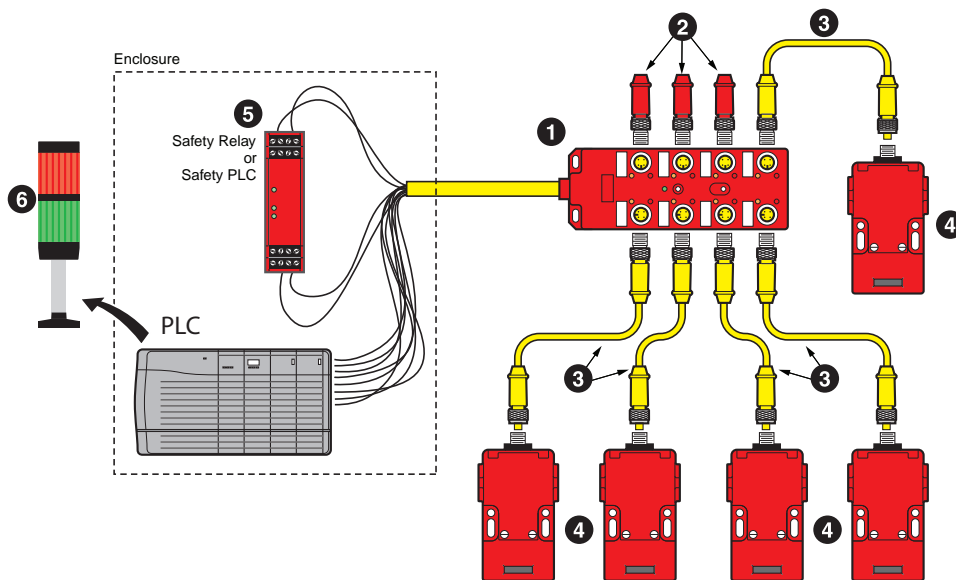
Figure 6 - Example Layout — SensaGuard™ Units Wired in Series without Enunciation



Item	Description
1	Safety-wired splitter/t-port
2	Shorting plug
3	Device patchcord
4	Device cordset
5	Safety relay
6	SensaGuard switch with QD

## Example Layout with Enunciation

Figure 7 - Example Layout with Enunciation



Item	Description
1	Safety-wired distribution box
2	Shorting plug
3	Device patchcord
4	Safety switch with QD
5	Safety relay
6	Tower light

## Safety Wired T-port



Dual-channel, No Enunciation

### Specifications

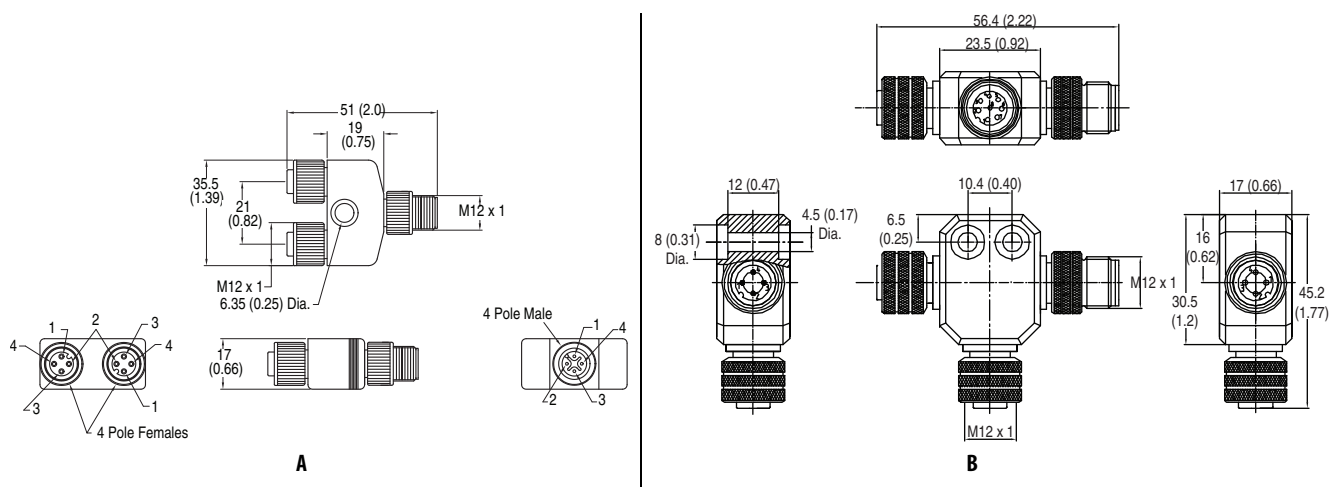
Attribute	Value
Connector Shell Material	Epoxy-coated zinc
Contact Material	Brass, gold over nickel plating
O-ring Material	Fluoroelastomer
Enclosure Type Rating	IP67, NEMA 6P
Operating Temperature	-20...+105 °C (-13...+221 °F)

### Product Selection

Face View of Female	Rating	Face View of Male	Configuration	Wiring	Dimensions	Housing Material	Connector Insert Material	Cat. No.
	10...30V DC 3 A		2 N.C.		A	Red PUR	PUR	898D-43LY-D4
			1 N.O. & 1 N.C.		A	Red PUR	PUR	898D-43KY-D4
			For use with SensaGuard switches only		B	Black PVC	Polyamide	898D-438Y-D8

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



# Safety Wired Distribution Boxes

## Dual-channel, N.C., No Enunciation



### Specifications

Attribute	Value
Housing Material	Red PBT
Connector Insert Material	PBT
Connector Shell Material	Nickel-plated brass
Contact Material	Gold-plated palladium/nickel
Cable Outer Diameter	9.8 mm (0.39 in.)
Cable Type	Oil-resistant yellow PVC jacket, 22 AWG conductors
Enclosure Type Rating	IP67
Operating Temperature	-20...+105 °C (-13...+221 °F)

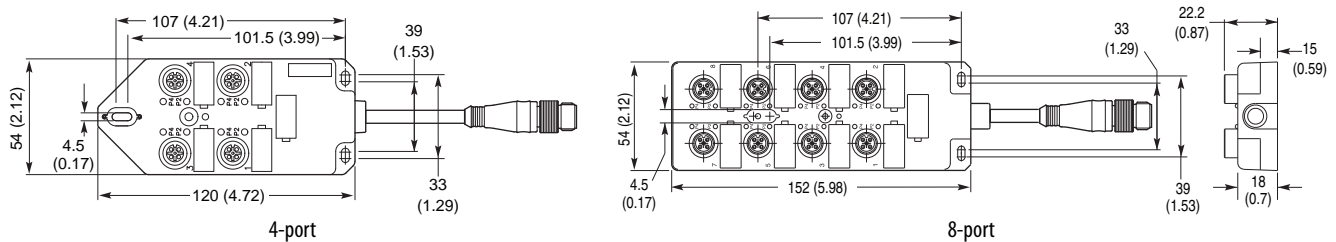
### Product Selection

Face View of Female	Ports	Illuminated	Rating	Face View of Male	Cable Length	Cat. No.
	4	No status indicator	10...30V DC		0.2 m (8 in.)	898D-44LT-DM4
	8					898D-48LT-DM4
Shorting plug for unused ports						898D-41LU-DM
Patchcord, straight to straight DC Micro						889D-F4ACDM-x <sup>(1)</sup>

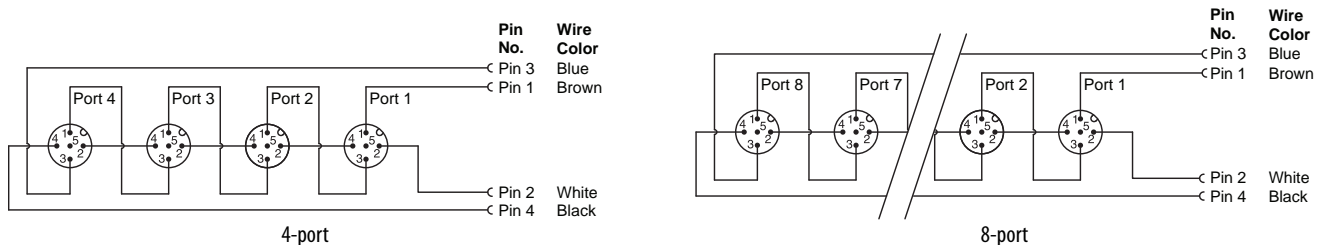
(1) The x represents the length in meters (1, 2, 3, 5, 10 standard).

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



### Wiring Diagrams



## Dual-channel, N.C./N.O., No Enunciation



### Specifications

Attribute	Value
Housing Material	Red PBT
Connector Insert Material	PBT
Connector Shell Material	Nickel-plated brass
Contact Material	Gold-plated palladium/nickel
Cable Outer Diameter	9.8 mm (0.39 in.)
Cable Type	Oil-resistant yellow PVC jacket, 22 AWG conductors
Enclosure Type Rating	IP67
Operating Temperature	-20...+105 °C (-13...+221 °F)

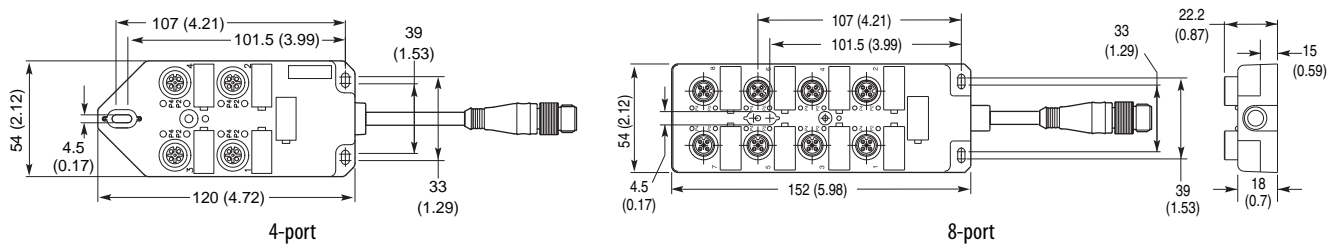
### Product Selection

Face View of Female	Ports	Illuminated	Rating	Face View of Male	Cable Length	Cat. No.
	4	No status indicator	10...30V DC		0.2 m (8 in.)	898D-44KT-DM4
	8					898D-48KT-DM4
Shorting plug for unused ports						898D-41KU-DM
Patchcord, straight to straight DC Micro						889D-F4ACDM-x <sup>(1)</sup>

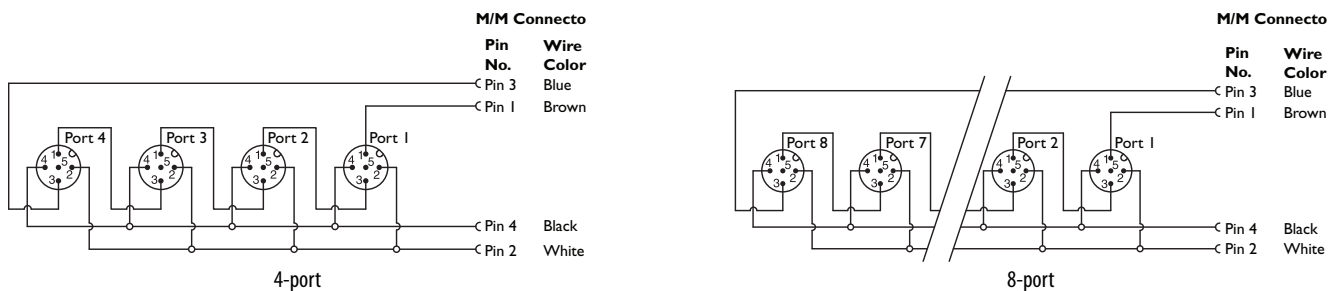
(1) The x represents the length in meters (1, 2, 3, 5, 10 standard).

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



### Wiring Diagrams



## Single-channel, N.C. plus Individual N.O. Enunciation



### Specifications

Attribute	Value
Housing Material	Red PBT
Connector Insert Material	PBT
Connector Shell Material	Nickel-plated brass
Contact Material	Gold-plated palladium/nickel
Cable Outer Diameter	9.8 mm (0.39 in.)
Cable Type	Oil-resistant yellow PVC jacket, (12) 18 AWG conductors
Enclosure Type Rating	IP67
Operating Temperature	-20...+105 °C (-13...+221 °F)

### Product Selection

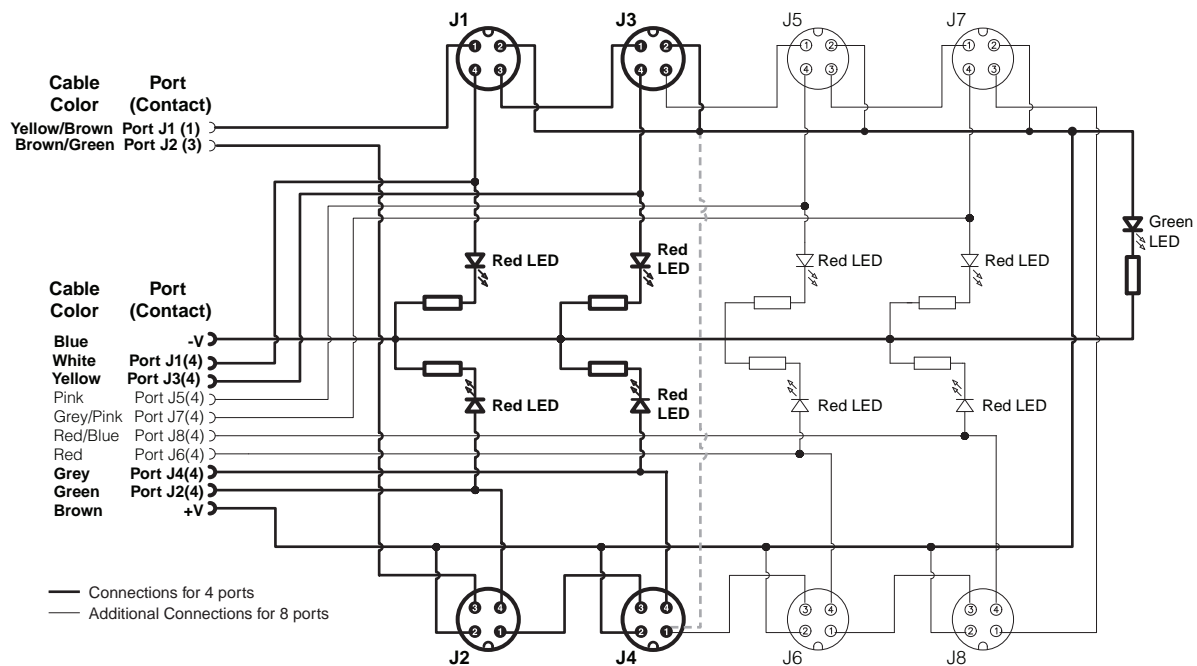
Face View of Female	Ports	Illuminated	Rating	Face View of Male	Cable Length	Cat. No.
	4	Status indicators	10...30V DC	Cable	5 m (16.4 ft)	898D-P44JT-A5
	8				10 m (32.8 ft)	898D-P44JT-A10
	4				5 m (16.4 ft)	898D-P48JT-A5
	8				10 m (32.8 ft)	898D-P48JT-A10
Shorting plug for unused ports						898D-41KU-DM
Patchcord, straight to straight DC Micro						889D-F4ACDM-x <sup>(1)</sup>

(1) The x represents the length in meters (1, 2, 3, 5, 10 standard).

### Approximate Dimensions

See 8-port dimensions on [page 6](#).

### Wiring Diagrams





## 8-pin, Two OSSD Signals Per Port, M23 Main Connector



### Specifications

Attribute	Value
Certifications	UL Recognized and CSA Certified
Material	Red Pocan
Connector Insert Material	PBT
Receptacle Shell Material	Zinc die-cast with nickel plating
Contact Material	Gold-plated palladium/nickel
Main Connector Style	19-pin M23
Enclosure Type Rating	IP67; 1200 psi washdown
Operating Temperature	-20...+90 °C (-4...+194 °F)

### Product Selection

Face View of Female	Ports	Illuminated	Rating	Face View of Male	Cat. No.
	4	PNP status indicator	10...30V DC		898D-P84RT-M19
	8				898D-P88RT-M19
8-pin shorting plug					898D-81RU-DM
8-pin field attachable connector-straight					871A-TS8-DM1
Sealing caps					1485A-M12
Labels					1492-MS9X20
Device patchcords (straight to straight)					889D-F8ABDM-x <sup>(1)</sup>
Homerun patchcord for 4- or 8-port (right-angle female to straight male)					889M-R19RMMU-x <sup>(1)</sup>
Homerun cordset for 4- or 8-port (right-angle female to flying leads)					889M-R19RM-x <sup>(1)</sup>

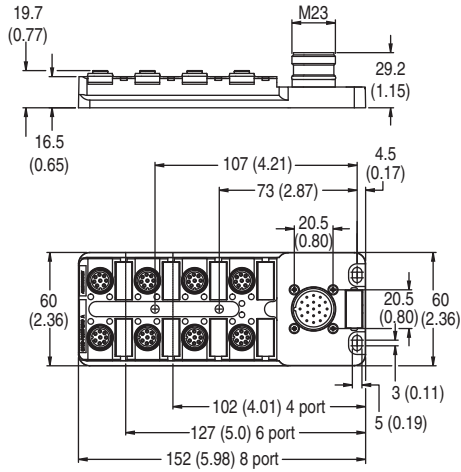
(1) The x represents the length in meters (1, 2, 3, 5, 10 standard).

### Pinout

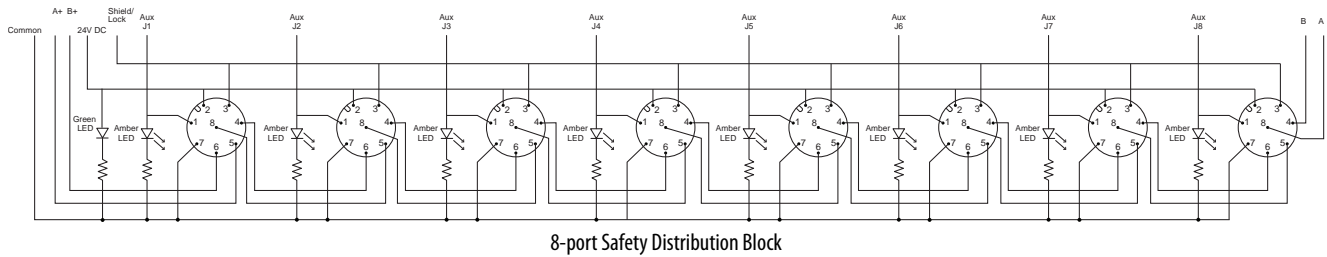
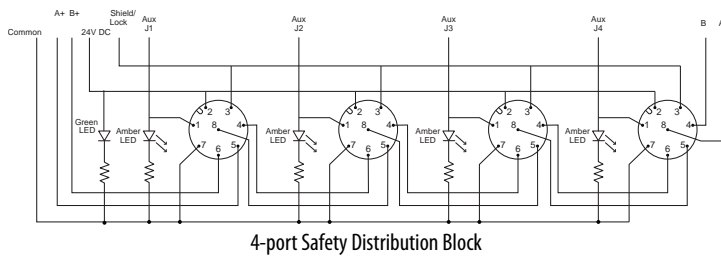
Device Connection		Main Connection		
4-port (2 OSSD)	8-port (2 OSSD)	Description	Color	M23 Connector (Male 19-pin)
(+) All Ports Pin 2	(+) All Ports Pin 2	+24V DC	Brown	19
(-) All Ports Pin 7	(-) All Ports Pin 7	Common	Blue	6
Ground	Ground	Ground	Green/Yellow	12
Pin 5	Pin 5	Safety A (OSSD)	Pink	17
Pin 8	Pin 8	Safety A+ (OSSD)	Red	2
Pin 6	Pin 6	Safety B (OSSD)	Gray	3
Pin 4	Pin 4	Safety B+ (OSSD)	Yellow	16
Port 1 Pin 1	Port 1 Pin 1	Aux J1	Gray/Pink	7
Port 2 Pin 1	Port 2 Pin 1	Aux J2	Red/Blue	4
Port 3 Pin 1	Port 3 Pin 1	Aux J3	White/Green	8
Port 4 Pin 1	Port 4 Pin 1	Aux J4	Brown/Green	14
—	Port 5 Pin 1	Aux J5	White/Yellow	9
—	Port 6 Pin 1	Aux J6	Yellow/Brown	13
—	Port 7 Pin 1	Aux J7	White/Gray	10
—	Port 8 Pin 1	Aux J8	Gray/Brown	18
Pin 3	Pin 3	Lock Command	Black	11

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



### Wiring Diagrams



- TIP**
- When light curtain is used, connect the receiver to J1 connector only.
  - Do not connect 24V DC to "A+" (pin 2) and "B+" (pin 16) on the M23 cordset when using a light curtain.
  - Check system response time when using a light curtain.

## 8-port, Dual-channel (2 N.C.) plus Individual N.O. Enunciation



### Specifications

Attribute	Value
Housing Material	Red PBT
Connector Insert Material	PBT
Connector Shell Material	Nickel-plated brass
Contact Material	Gold-plated palladium/nickel
Cable Outer Diameter	9.8 mm (0.39 in.)
Cable Type	Oil-resistant yellow PVC jacket, (6) 19 AWG conductors, and (8) 22 AWG conductors
Enclosure Type Rating	IP67
Operating Temperature	-20...+105 °C (-13...+221 °F)

### Product Selection

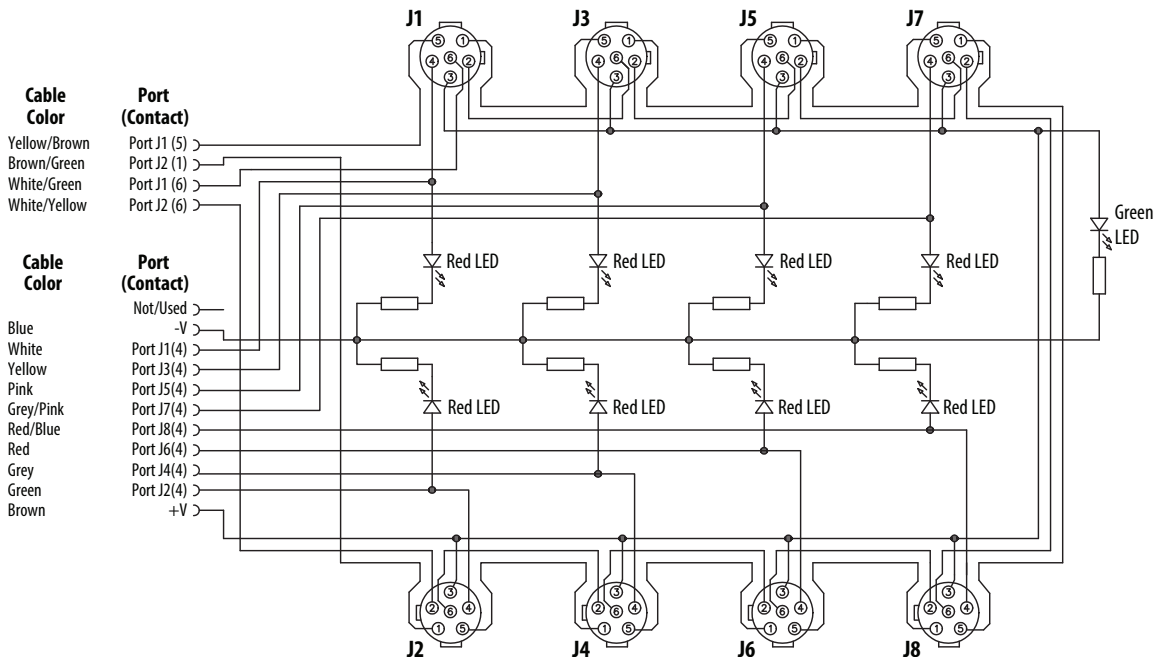
Face View of Female	Ports	Illuminated	Rating	Face View of Male	Cable Length	Cat. No.
	8	Status indicators	10...30V DC	Cable	5 m (16.4 ft)	898R-P68MT-A5
					10 m (32.8 ft)	898R-P68MT-A10
Shorting plug for unused ports						898R-61MU-RM
Patchcord, straight to straight DC Micro						889R-F6ECRM-x <sup>(1)</sup>

(1) The x represents the length in meters (1, 2, 3, 5, 10 standard).

### Approximate Dimensions

See 8-port dimensions on [page 6](#).

### Wiring Diagrams



# Safety DC Micro and M12 Cordset



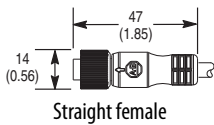
4-pin DC Micro Cordset  
18 and 22 AWG, Red PVC

## Specifications

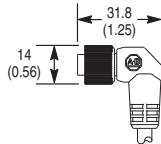
Attribute	Value
Certifications	UL Recognized and CSA Certified
Coupling Nut Material	Epoxy-coated zinc
Material	Molded oil-resistant PUR
Contact Material	Gold over nickel-plated brass
Cable Type	Oil-resistant PVC jacket, 18 & 22 AWG or 24 AWG conductors, 300V
Bend Radius	10x diameter
Cable Diameter	<ul style="list-style-type: none"> <li>4/c: 0.18 ± 0.01 mm (4.75 ± 0.25 in.)</li> <li>5/c: 0.230 ± 0.02 mm (5.84 ± 0.25 in.)</li> <li>8/c: 0.256 ± 0.01 mm (6.5 ± 0.25 in.)</li> <li>19/c: 0.475 ± 0.10 mm (12.06 ± 0.25 in.)</li> </ul>
Cable Rating	<ul style="list-style-type: none"> <li>4 &amp; 5/c (PUR): UL AWM style 20866 VW-1 80C 300V, CSA AWM A/B I/II 80C 300V FT1, UV oil and water-resistant</li> <li>8/c (PUR): UL AWM style 20866 90C 300V, CSA II A 90C 300V</li> <li>TPE: UL AWM style 20327 VW-1 105C 300V, CSA AWM A/B I/II 105C 300V FT1,</li> <li>UV oil- and water-resistant</li> </ul>
Enclosure Type Rating	IP67, NEMA 6P, 1200 psi (8270 kPa) washdown, IP69K
Temperature Rating	-20...+105 °C (-4...+221 °F)

## Approximate Dimensions

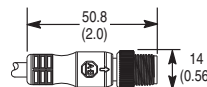
Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



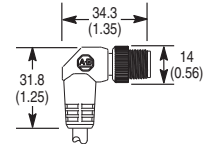
Straight female



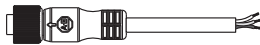
Right-angle female



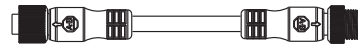
Straight male



Right-angle male



Cordset example



Patchcord example

## Pinout and Color Code

Face View Pinout			
4-pin	5-pin	8-pin	19-pin
<b>Female</b>	<b>Male</b>	<b>Female</b>	<b>Male</b>
1 Brown 2 White 3 Blue 4 Black 5 —	1 Brown 2 White 3 Blue 4 Black 5 Gray	1 White 2 Brown 3 Green 4 Yellow 5 Gray 6 Pink 7 Blue 8 Red	1 Violet 2 Red 3 Gray 4 Red/Blue 5 Green <sup>(1)</sup> 6 Blue <sup>(1)</sup> 7 Gray/Pink 8 White/Green 9 White/Yellow 10 White/Gray 11 Black 12 Green/Yellow 13 Yellow/Brown 14 Brown/Green 15 White 16 Yellow 17 Pink 18 Gray/Brown 19 Brown <sup>(1)</sup>

(1) 18 AWG

## Safety Wired Shorting Plug



### Specifications

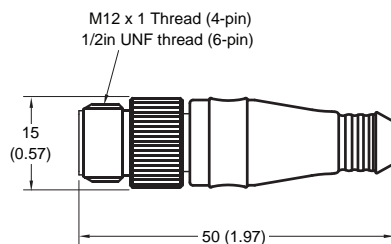
Attribute	Value
Connector Insert Material	PUR
Connector Shell Material	RED PVC
Contact Material	Brass, gold over nickel plating
O-ring Material	Fluoroelastomer
Enclosure Type Rating	IP67, NEMA 6P
Operating Temperature	-20...+105 °C (-13...+221 °F)

### Product Selection

Face View of Male	Rating	Configuration	Wiring	Coupling Nut Material	Cat. No.
	10...30V DC 4 A	2 N.C.	Pin 1 _____ Pin 2 _____ Pin 3 _____ Pin 4 _____	Epoxy-coated zinc	898D-41LU-DM
		1 N.O. & 1 N.C.	Pin 1 _____ Pin 2 — NA Pin 3 _____ Pin 4 — NA	Epoxy-coated zinc	898D-41KU-DM
		2 N.C. & 1 N.O.	Pin 1 _____ Pin 2 _____ Pin 3 — NA Pin 4 — NA Pin 5 _____ Pin 6 _____	Nickel-plated brass	898D-61MU-RM
		For use with SensaGuard-compatible t-ports only	Pin 1 <u>PWR</u> Pin 2 <u>OSSD 1+</u> Pin 3 <u>NA</u> Pin 4 <u>OSSD 2+</u>	Nickel-plated brass	898D-418U-DM
		2 OSSD	Pin 1 _____ Pin 2 _____ Pin 3 _____ Pin 4 _____ Pin 5 _____ Pin 6 _____ Pin 7 _____ Pin 8 _____	Nickel-plated brass	898D-81RU-DM2

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



## Receptacles, DC Micro



4-, 5-, 6-, or 8-pin

### Specifications

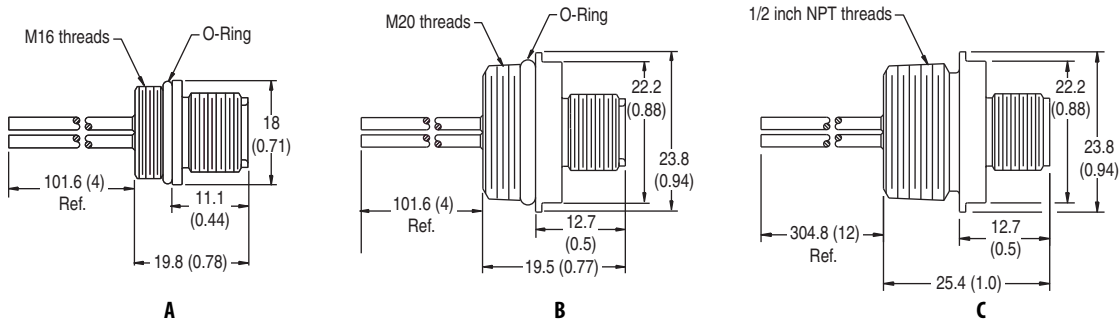
Attribute	Value
Connector Shell Material	Nickel-plated brass
Connector Insert Material	Nylon
Contact Type	Machined brass with gold over nickel plating
Wire Insulation	Oil-resistant PVC, 22 AWG stranded copper, 250V
Operating Temperature	-40...+105 °C (-40...+221 °F)
Enclosure Type Rating	NEMA 1, 3, 4, 6P and IEC IP68

### Product Selection

Face View of Male	Wire Color	Wire Rating	Length [m (ft)]	Panel Mount Thread Size	Dimensions	Cat. No.
	1 Brown 2 White 3 Blue 4 Black	22 AWG 300V 3 A	0.1 (0.3)	M16 x 1	A	888D-M4AC9-4N
				M20 x 1.5	B	888D-M4AC8-4N
			0.3 (1)	1/2 inch-14 NPT	C	888D-M4AC1-0M3
	1 Brown 2 White 3 Blue 4 Black 5 Gray			M16 x 1	A	888D-M5AC9-4N
				M20 x 1.5	B	888D-M5AC8-4N
				1/2 inch-14 NPT	C	888D-M5AC1-0M3
	1 Red/White Tr 2 Red 3 Green 4 Red/Yellow Tr 5 Red/Black Tr 6 Red/Blue Tr	22 AWG 300V 3 A	0.1 (0.3)	M16 x 1	A	888R-M6AC9-4N
				M20 x 1.5	B	888R-M6AC8-4N
			0.3 (1)	1/2 inch-14 NPT	C	888R-M6AC1-0M3
	1 White 2 Brown 3 Green 4 Yellow 5 Gray 6 Pink 7 Blue 8 Red	24 AWG 36V DC/30V AC 1.5 A		0.1 (0.3)	M16 x 1	A
					M20 x 1.5	B

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



## Receptacles, AC Micro



### Specifications

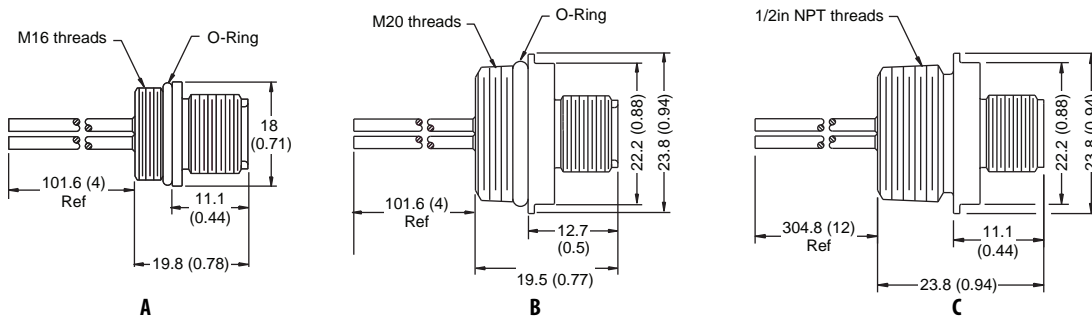
Attribute	Value
Certifications	UL Recognized and CSA Certified
Connector Shell Material	Nickel-plated brass
Connector Insert Material	Nylon
Contact Material	Gold-plated brass
Wire Insulation	Oil-resistant PVC, 22 AWG stranded copper, 300V
Operating Temperature	-40...+105 °C (-22...+221 °F)

### Product Selection

Face View of Male	Wire Color	Wire Rating	Length [m (ft)]	Panel Mount Thread Size	Dimensions	Cat. No.
	1 Red/White Tr	22 AWG 300V 3 A	0.1 (0.3)	M16 x 1	A	888R-M6AC9-4N
	2 Red			M20 x 1.5	B	888R-M6AC8-4N
	3 Green			1/2 inch-14 NPT	C	888R-M6AC1-1F
	4 Red/Yellow Tr					
	5 Red/Black Tr					
	6 Red/Blue Tr					

### Approximate Dimensions

Dimensions are shown in mm (in.). Dimensions are not intended to be used for installation purposes.



### Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, <a href="http://rok.auto/certifications">rok.auto/certifications</a> .	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at [rok.auto/literature](http://rok.auto/literature).

# Rockwell Automation Support

Use the following resources to access support information.

<b>Technical Support Center</b>	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	<a href="http://www.rockwellautomation.com/knowledgebase">www.rockwellautomation.com/knowledgebase</a>
<b>Local Technical Support Phone Numbers</b>	Locate the phone number for your country.	<a href="http://www.rockwellautomation.com/global/support/get-support-now.page">www.rockwellautomation.com/global/support/get-support-now.page</a>
<b>Direct Dial Codes</b>	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	<a href="http://www.rockwellautomation.com/global/support/direct-dial.page">www.rockwellautomation.com/global/support/direct-dial.page</a>
<b>Literature Library</b>	Installation Instructions, Manuals, Brochures, and Technical Data.	<a href="http://www.rockwellautomation.com/literature">www.rockwellautomation.com/literature</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Get help determining how products interact, check features and capabilities, and find associated firmware.	<a href="http://www.rockwellautomation.com/global/support/pcdc.page">www.rockwellautomation.com/global/support/pcdc.page</a>

## Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete the How Are We Doing? form at [http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002\\_-en-e.pdf](http://literature.rockwellautomation.com/idc/groups/literature/documents/du/ra-du002_-en-e.pdf).

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

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