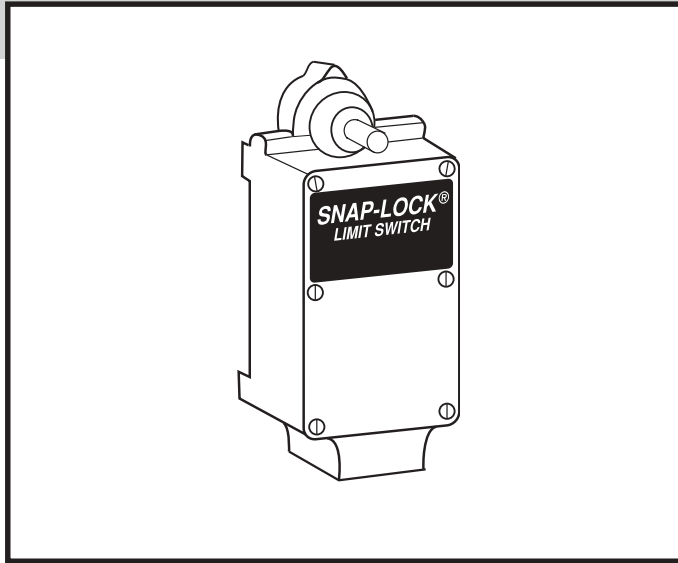


Nuclear Qualified Products



Limit Switches/ Receptacle Assembly... For Nuclear Environments

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast zinc housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Seismic and vibration resistant.
- Resists chemical spray.
- Three mounting styles.
- EA 180 has a positive lever latching mechanism.

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°30' increments through 173°.
- Adequate wiring space for nine conductors.
- Operating temperature 0° to 90°C.
- Short term exposure to 175°C.
- EA 180-302/402 has 10° or 6½ ° pre-travel, maximum travel 37°.
- Weight EA 180-302: 4.5 lbs.; EA 180-402: 5.5 lbs.
- DBE maximum test parameters — temperature 340°F, pressure 70 PSIG, radiation 204 megarads gamma.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.

FOR INSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA180 Series*

Series	Operation	Standard	Wide	Long
		EA180-		
EA180 Standard	CW	11302	21302	31302
	CCW	12302	22302	32302
	Maint.	13302	23302	33302
EA180 Short Travel	CW	14302	24302	34302
	CCW	15302	25302	35302
	Maint.	16302	26302	36302

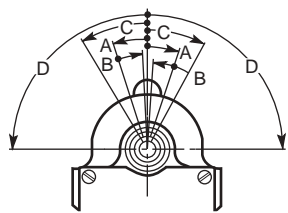
* For inside containment — see catalog EA170-XX302.

EA180 Series with Receptacle**

Series	Operation	Standard	Wide	Long
		EA180-		
EA180 Standard	CW	11402	21402	31402
	CCW	12402	22402	32402
	Maint.	13402	23402	33402
EA180 Short Travel	CW	14402	24402	34402
	CCW	15402	25402	35402
	Maint.	16402	26402	36402

** For outside containment — see catalog EA170-XX402.
Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.

Operational Data



Series EA180 - Standard

Direction of Rotation

- A. Trip Travel 10°
- B. Reset Travel 8°
- C. Recommended Travel 13°
- D. Total Travel 37°
- E. Torque to Trip (inch Lbs.) 21

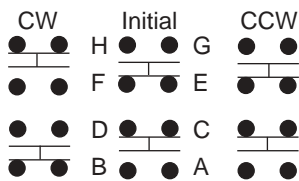
Series EA180 - Short Travel

- A. Trip Travel 6°30'
- B. Reset Travel 4°
- C. Recommended Travel 7°
- D. Total Travel 36°
- E. Torque to Trip (Inch Lbs.) 32

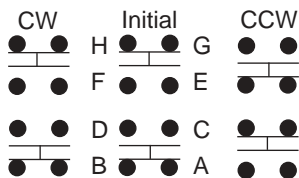
RETURN SPRING MOUNTED ON THIS SIDE OF SWITCH FOR "CCW" OPERATION. RETURN SPRING MOUNTED ON THIS SIDE OF SWITCH FOR "CW" OPERATION.

Contact Configuration:

For CW Switch



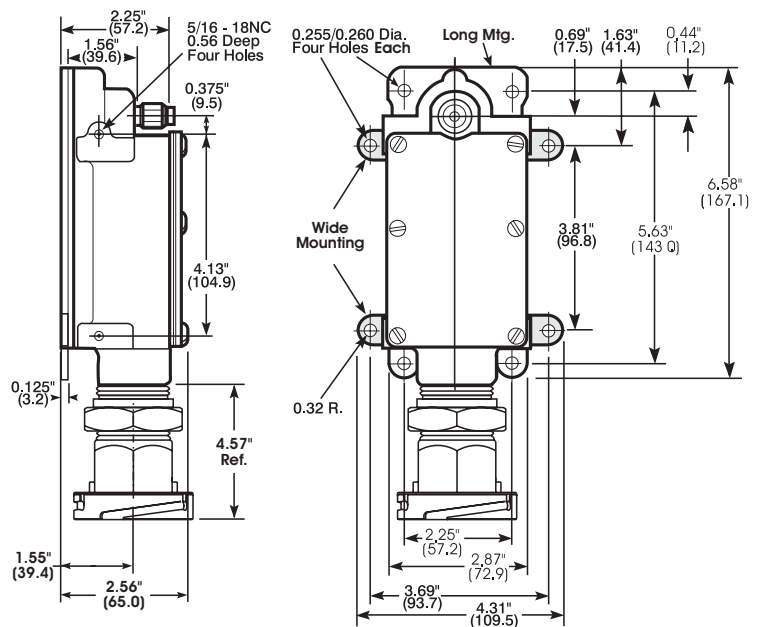
For CCW Switch



PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

Dimensions



LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

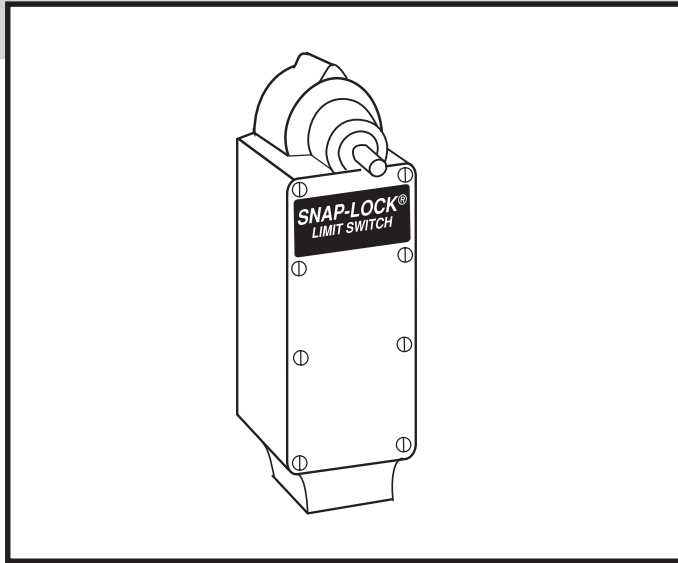
ADAPTORS: Straight and elbow adaptors are available for direct mounting into limit switches. See CD/EH700 Series Bulletin.



EA740 Series

Inside Containment Areas

Nuclear Qualified Products



Limit Switches/ Receptacle Assembly... For Nuclear Environments

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast bronze housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Pressure and radiation resistant
- Seismic and vibration resistant.
- Resists chemical spray.
- Three mounting styles.
- EA 740 has a cam action latching mechanism.

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°30' increments through 360°.
- Adequate wiring space for nine conductors.
- Rated at 21°C to 90°C.
- Short term exposure to 175°C.
- EA 740 has 18° pre-travel, maximum travel 90°.
- Weight EA 740: 4.3 lbs.; EA 740 with Receptacle: 5.3 lbs.
- DBE maximum test parameters — temperature 340°F, pressure 70 PSIG, radiation 204 megarads gamma.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.

FOR INSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA740 Series

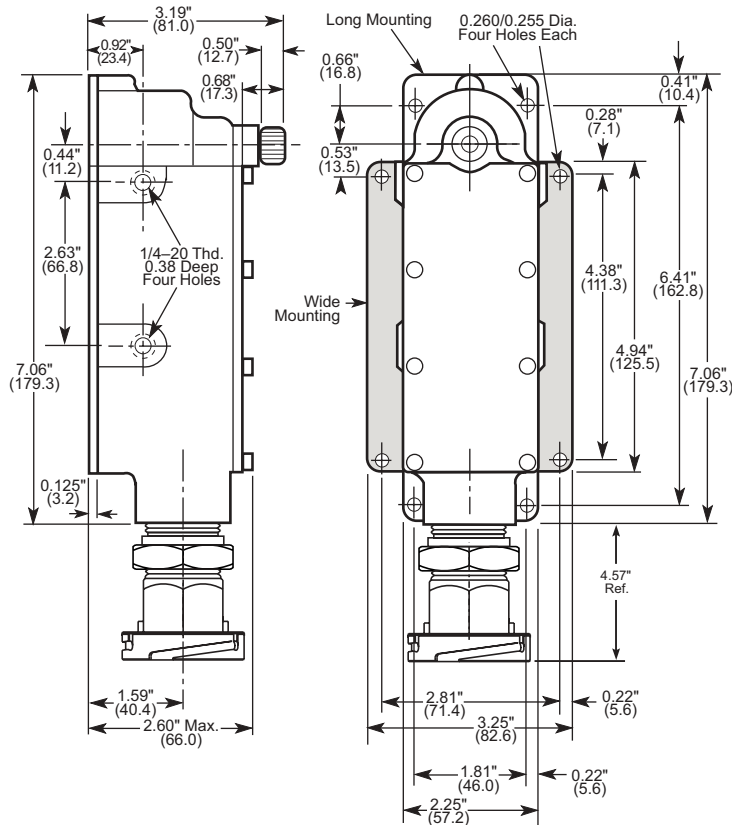
Series	Operation	Standard	Wide	Long
		EA740-		
EA740 Standard	CW	20000	50000	80000
	CCW	20001	50001	80001
	CW & CCW (B2 cam)	20100	50100	80100
EA740 Maint.	Maint. "M" Cam	26000	56000	86000
	Maint. "M7" Cam	26700	56700	86700

EA740 Series with Receptacle

Series	Operation	Standard	Wide	Long
		EA740-		
EA740 Standard	CW	20040	50040	80040
	CCW	20041	50041	80041
	CW & CCW (B2 cam)	20140	50140	80140
EA740 Maint.	Maint. "M" Cam	26040	56040	86040
	Maint. "M7" Cam	26740	56740	86740

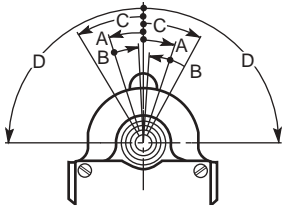
Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-19001.

Dimensions



Operational Data

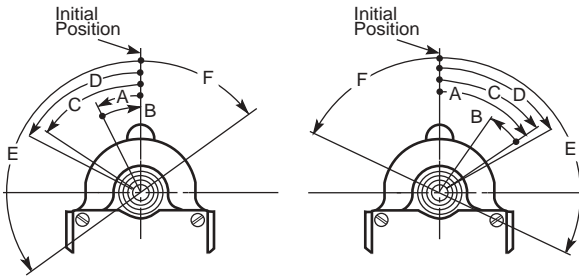
Standard Contacts



- A. Trip Travel 18°
- B. Reset Travel 14°
- C. Recommended Travel 30°
- D. Total Travel Available 90°
- Torque to Trip (inch Lbs.) 27
- 2 N.O. — 2 N.C.

For CW Switch			For CCW Switch			For CW & CCW Switch		
CW	Initial	CCW	CW	Initial	CCW	CW	Initial	CCW
● ●	H ● ●	G ● ●	● ●	H ● ●	G ● ●	● ●	H ● ●	G ● ●
● ●	F ● ●	E ● ●	● ●	F ● ●	E ● ●	● ●	F ● ●	E ● ●
● ●	D ● ●	C ● ●	● ●	D ● ●	C ● ●	● ●	D ● ●	C ● ●
● ●	B ● ●	A ● ●	● ●	B ● ●	A ● ●	● ●	B ● ●	A ● ●

Maintained Contacts & Lever Position



CCW Operating

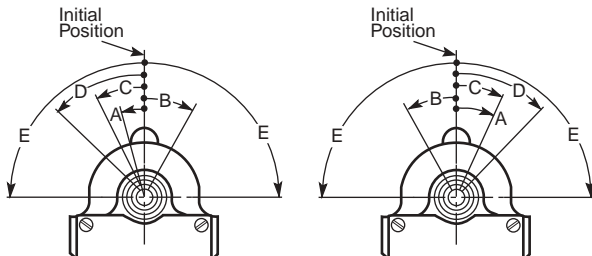
CW Operating

	CCW	CW
A. Trip Travel	25°	55°
B. Reset Travel	25°	22°
C. Min. Travel to Maintain	54°	55°
D. Recommended Travel	60°	60°
E. Total Travel	124°	116°
F. Overall Travel	56°	64°
G. Torque to Trip (inch Lbs.)	12	6

To change switch orientation from cam (left view) position to cam (right view) position, operate switch thru angle C. Remove lever and reset at initial position.

For CW Switch			For CCW Switch		
CW	Initial	CCW	CW	Initial	CCW
● ●	H ● ●	G ● ●	● ●	H ● ●	G ● ●
● ●	F ● ●	E ● ●	● ●	F ● ●	E ● ●
● ●	D ● ●	C ● ●	● ●	D ● ●	C ● ●
● ●	B ● ●	A ● ●	● ●	B ● ●	A ● ●

Maintained Contacts — Lever Returned



CCW Operating

CW Operating

	CCW	CW
A. Trip Travel	16°	30°
B. Reset Travel	30°	26°
C. Min. Travel to Maintain	26°	30°
D. Recommended Travel	45°	45°
E. Total Travel	90°	90°
F. Torque to Trip (inch Lbs.)	16.5	15

To change switch orientation from cam (left view) position to cam (right view) position, operate switch thru angle B. Remove lever and reset at initial position.

For CW Switch			For CCW Switch		
CW	Initial	CCW	CW	Initial	CCW
● ●	H ● ●	G ● ●	● ●	H ● ●	G ● ●
● ●	F ● ●	E ● ●	● ●	F ● ●	E ● ●
● ●	D ● ●	C ● ●	● ●	D ● ●	C ● ●
● ●	B ● ●	A ● ●	● ●	B ● ●	A ● ●

Accessories

PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

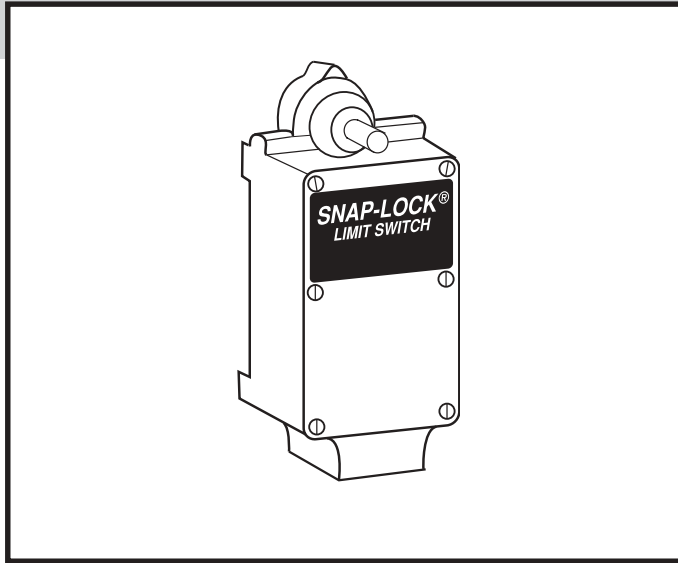
ADAPTORS: Straight and elbow adapters are available for direct mounting into limit switches. See CD/EH700 Series Bulletin.



EA170-302/402 Series

Outside Containment Areas

Nuclear Qualified Products



Limit Switches/ Receptacle Assembly... For Nuclear Environments

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972. For outside containment use only (mild environment).
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50, Appendix B, and ANSI N45.2, as applicable.
- Die-cast zinc housing.
- Stainless steel top cover and fasteners.
- Gold-plated contacts.
- High temperature components throughout.
- High temperature lubricants.
- Radiation resistant.
- Seismic and vibration resistant.
- Hose down, water resistant.
- Available with reverse shaft extension.
- Three mounting styles.
- EA 170 has a positive lever latching mechanism.

Continuous Current Rating 75-100% Power Factor*

125 VAC	20 AMPS*
250 VAC	15 AMPS*
480 VAC	10 AMPS*
600 VAC	5 AMPS*
125 VDC	5 AMPS
250 VDC	1.5 AMPS

Technical Data:

- Two normally open and two normally closed, NEMA form Z contact arrangement.
- Enclosure meets NEMA 1, 4 and 13 requirements for dust-tight, water-tight and oil-tight applications.
- Operating lever is adjustable in 7°/30' increments through 173°.
- Adequate wiring space for nine conductors.
- Operating temperature 0° to 90°C.
- EA 170-302/402 has 10° or 6½° pre-travel, maximum travel 37°.
- Weight EA 170-302: 3.5 lbs.; EA 170-402: 4.5 lbs.
- Maximum radiation-204 megarads gamma.
- 8-32 SEMS terminal screws.

Receptacle Data

- Qualified receptacle sealed in place.
- Qualified ring tongue terminal applied to leads.
- Every assembly tested before shipment.
- Qualified lead wires.
- Receptacle keyed for proper alignment of connector.
- All circuits wired.
- Circuits of receptacle identified the same as limit switch A, B, C, D, etc.

FOR OUTSIDE CONTAINMENT AREAS SWITCHES SHOULD BE SPECIFIED AS FOLLOWS:

EA170 Series*

Series	Operation	Standard	Wide	Long
		EA170-		
EA170 Standard	CW	11302	21302	31302
	CCW	12302	22302	32302
	Maint.	13302	23302	33302
EA170 Short Travel	CW	14302	24302	34302
	CCW	15302	25302	35302
	Maint.	16302	26302	36302
EA170 Standard Reverse Shaft	CW	41302	51302	61302
	CCW	42302	53302	62302
	Maint.	43302	53302	63302
EA170 Short Travel Reverse Shaft	CW	44302	54302	64302
	CCW	45302	55302	65302
	Maint.	46302	56302	66302

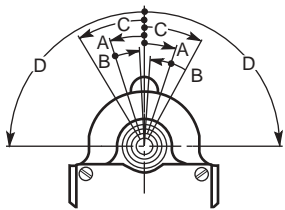
* For inside containment — see catalog EA180-XX302.

EA170 Series with Receptacle**

Series	Operation	Standard	Wide	Long
		EA170-		
EA170 Standard	CW	11402	21402	31402
	CCW	12402	22402	32402
	Maint.	13402	23402	33402
EA170 Short Travel	CW	14402	24402	34402
	CCW	15402	25402	35402
	Maint.	16402	26402	36402
EA170 Standard Reverse Shaft	CW	41402	51402	61402
	CCW	42402	53402	62402
	Maint.	43402	53402	63402
EA170 Short Travel Reverse Shaft	CW	44402	54402	64402
	CCW	45402	55402	65402
	Maint.	46402	56402	66402

** For inside containment — see catalog EA180-XX402. Male Receptacle Assemblies may be ordered separately. Please order part number EC290-19001.

Operational Data



Series EA170NUC - Standard
Direction of Rotation

- A. Trip Travel 10°
- B. Reset Travel 8°
- C. Recommended Travel 13°
- D. Total Travel 37°
- E. Torque to Trip (Inch Lbs.) 23
- F. Weight Approx. 3.5 Lbs.

Series EA170NUC - Short Travel

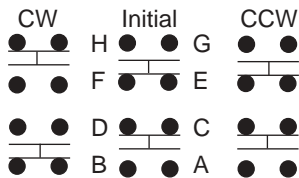
- A. Trip Travel 6°30'
- B. Reset Travel 4°
- C. Recommended Travel 7°
- D. Total Travel 36°
- E. Torque to Trip (Inch Lbs.) 32
- F. Weight Approx. 3.5 Lbs.

Series EA170NUC - Reverse Shaft
(CW OPERATION SHOWN)
VIEWED FROM TOP COVER
Direction of Rotation

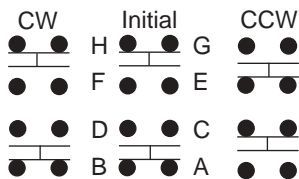
- A. Trip Travel 10°
- B. Reset Travel 8°
- C. Recommended Travel 13°
- D. Total Travel 38°
- E. Torque to Trip (Inch Lbs.) 23
- F. Weight Approx. 3.5 Lbs.

Contact Configuration:

For CW Switch



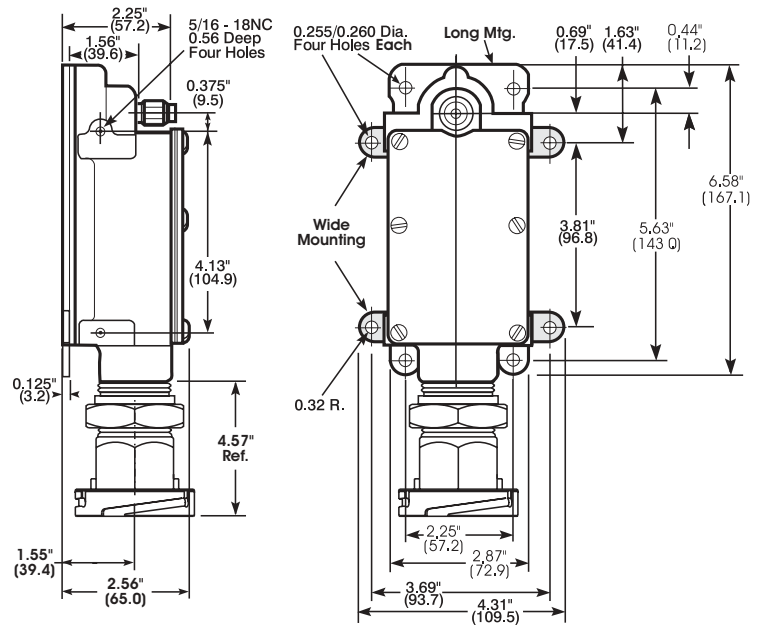
For CCW Switch



PLUG-IN CABLES: Cable lengths for the above Switch/ Receptacle Assemblies should be ordered with specific cable lengths as follows . . .

Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100

Dimensions



LEVERS: For use inside containment area, levers with bronze arms and beryllium copper rollers are recommended.

Note: Levers must be ordered as separate item. For information request Lever Bulletin EL.

ADAPTORS: Straight and elbow adaptors are available for direct mounting into limit switches. See CD/EH700 Series Bulletin.



EC290 (4-Pin)



Description:

NAMCO nuclear connectors, designed for fast easy disconnect connect operation, dramatically reduce the exposure of personnel to radiation. They maintain the sealed integrity of limit switches and other devices such as solenoid valves, transmitters, etc. by eliminating the need to disassemble and rewire the devices during required maintenance.

All units have a minimum life of 10 years under intense radiation and combine the following product features.

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50 Appendix B, and ANSI N45.2, as applicable.

Nuclear Qualified Products

4 Pin Receptacle/Plug-In Quick Connector Systems

Tested and Qualified for Containment Areas
and Other Harsh Environments

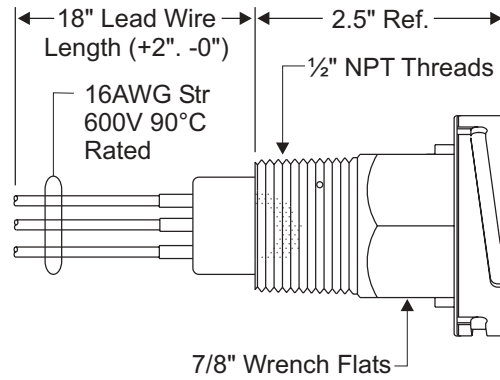
- Connector keyed for quick positive one way connection.
- Bayonet style connection, positive visual locking indicator
- Radiation resistant elastometer materials.
- Flexible wire to eliminate kinking and fatigue failure.
- Leakproof to DBE environments including LOCA and HELB conditions — e.g., steam, vapors, pressures up to 80 PSIG and chemical sprays.
- Four wired pins.
- Cable lengths available from 20 feet.
- Seismic and vibration resistant.

EC290 (4-Pin)

Nuclear Qualified Products

EC290-34001 Receptacle Features

Male Receptacle Assemblies may be ordered separately.
Please order part number EC290-34001.



EC290-44xxx Cable Features

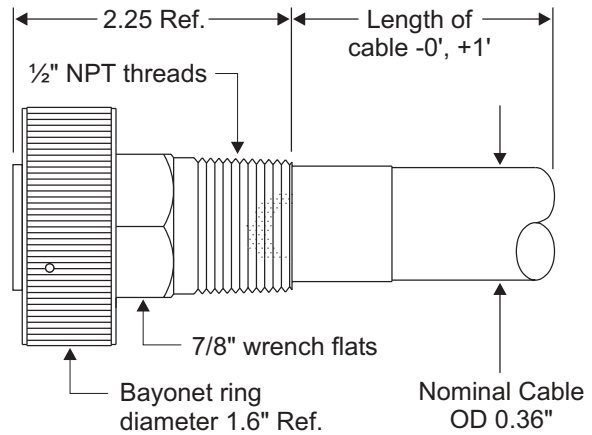
600V/90°C rated 4 conductor 16 AWG stranded nuclear grade cable has excellent resistance to radiation, heat, mechanical abuse, flame, weathering, most oils, acids and alkalies.

Cable meet requirements of IEEE Std. 383" type test of Class IE electronic cables.

Plug-In Cable

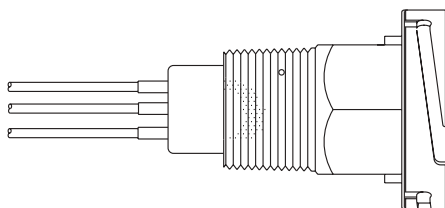
Cable lengths for the above Receptacle Assemblies should be ordered with specific cable lengths between 20 and 100 feet lengths as follows:

Plug-In Cables	
Length	EC290-
20 Ft.	44020
25 Ft.	44025
30 Ft.	44030
35 Ft.	44035
50 Ft.	44050
100 Ft.	44100

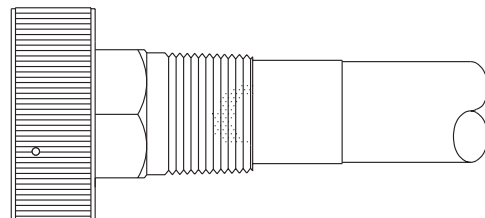
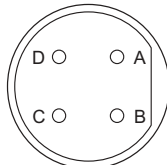


Receptacle Side

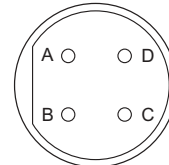
Plug Side



FRONT VIEW
PIN SIDE



FRONT VIEW
PLUG



Qualification test report QTR-500 documenting Namco's testing of receptacle connector and cable is available.



EC290 (9-Pin)



Description:

NAMCO nuclear connectors, designed for fast easy disconnect-connect operation, dramatically reduce the exposure of personnel to radiation. They maintain the sealed integrity of limit switches and other devices such as solenoid valves, transmitters, etc. by eliminating the need to disassemble and rewire the switches during required maintenance.

All units have a minimum life of 10 years under intense radiation and combine the following product features.

Features:

- Qualified to IEEE Standards 344-1975, 323-1974, and 382-1972.
- Manufactured to a quality assurance program designed to meet the requirements of 10CFR50 Appendix B, and ANSI N45.2, as applicable.

Nuclear Qualified Products

9 Pin Receptacle/Plug-In Quick Connector Systems

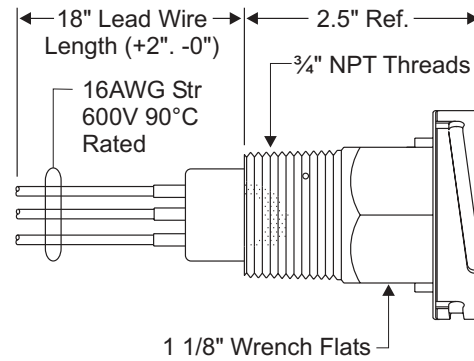
Tested and Qualified for Containment Areas
and Other Harsh Environments

- Connector keyed for quick positive one-way connection.
- Bayonet style connection, positive visual locking indicator.
- Radiation-resistant elastomer materials.
- Flexible wire to eliminate kinking and fatigue failure.
- Leakproof to DBE environments including LOCA and HELB conditions — e.g., steam, vapors, pressures up to 80 PSIG and chemical sprays.
- Nine wired pins: Eight leads plus ground wire for EA740/EA180/EA170 Series.
- Cable lengths available from 20 feet.
- Seismic and vibration resistant.

NAMCO

EC290-19001 Receptacle Dimensional Data

Male Receptacle Assemblies may be ordered separately. Please order part number EC290-19001.



EC290-29xxx Cable Features

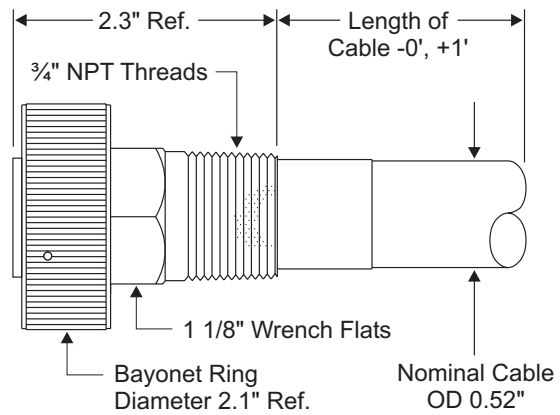
600V/90°C rated 9 conductor 16 AWG stranded nuclear grade cable has excellent resistance to radiation, heat, mechanical abuse, flame, weathering, most oils, acids and alkalies.

Cable meet requirements of IEEE Std. 383" type test of Class IE electrical cables.

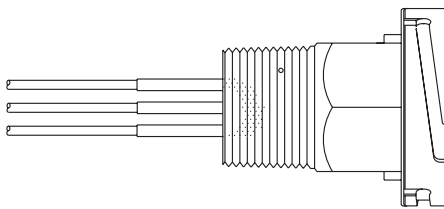
Plug-In Cable

Cable lengths for the Plug-In Cable Assemblies should be ordered with specific cable lengths between 20 and 100 feet lengths as follows:

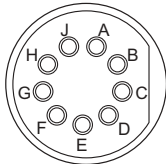
Plug-In Cables	
Length	EC290-
20 Ft.	29020
25 Ft.	29025
30 Ft.	29030
35 Ft.	29035
50 Ft.	29050
100 Ft.	29100



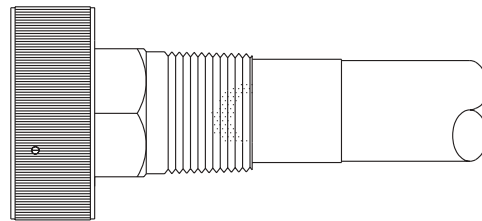
Receptacle Side



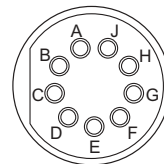
FRONT VIEW
PIN SIDE



Plug Side



FRONT VIEW
PLUG



Qualification test report QTR-500 documenting Namco's testing of receptacle connector and cable is available.



EH700 Series Adapters

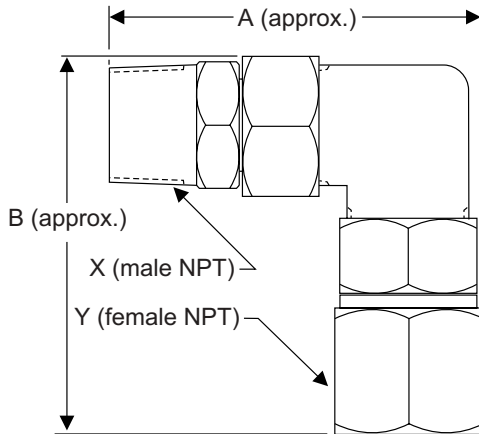


Nuclear Qualified Products

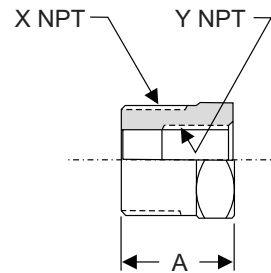
For use with EC290 Series 4 and 9 Pin Receptacle/Plug-In Quick Connector Systems

Adapters

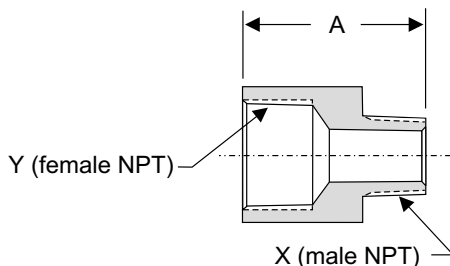
Namco's EC290 Series 4 pin and 9 pin connectors fit into 3/4" NPT and 1" NPT conduit entrances respectively. Namco has made available this line of adapters and elbow assemblies to allow adaptation to various size conduit openings and to help eliminate costly rework in limited access areas.



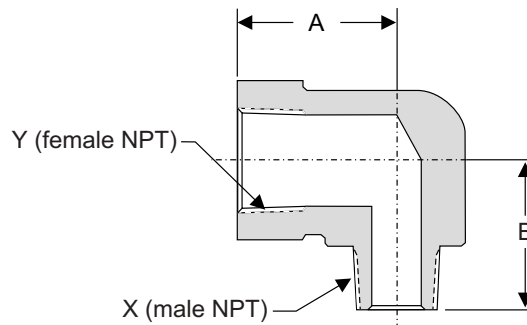
**Union Elbow Assembly
Detail #1**



**Reduced Bushing
Detail #2**



**Reducing Adapter
Detail #3**



**Reducing Street Elbow
Detail #4**

EH700 Series Adapters

Assembly #	Description	Detail	A	B	X	Y	
EH700-21600	Union Elbow Assembly	3/4" MPT x 1/2" FPT	1	3-1/4"	3-1/4"	3/4"	1/2"
EH700-21601	Union Elbow Assembly	1/2" MPT x 1/2" FPT	1	3-1/4"	3-1/4"	1/2"	1/2"
EH700-30100	Reducing Bushing	3/4" MPT x 1/2" FPT	2	1-5/8"	-	3/4"	1/2"
EH700-31601	Union Elbow Assembly	3/4" MPT x 1" FPT	1	3-1/2"	3-1/2"	3/4"	1"
EH700-31602	Union Elbow Assembly	3/4" MPT x 1" FPT	1	3-3/4"	4"	3/4"	1"
EH700-40100	Reducing Adapter	1" MPT x 1/2" FPT	3	1-3/8"	-	1"	1/2"
EH700-40200	Reducing Adapter	1" FPT x 3/4" MPT	3	2-3/16"	-	3/4"	1"
EH700-40400	Reducing Street Elbow	1" FPT x 3/4" MPT	4	1-15/16"	1-3/4"	3/4"	1"
EH700-41600	Union Elbow Assembly	1" MPT x 1/2" FPT	1	3-1/2"	3-3/8"	1"	1/2"
EH700-41602	Union Elbow Assembly	1" MPT x 1" FPT	1	4-1/8"	4"	1"	1"
EH700-40101	Reducing Bushing	1" MPT x 3/4" FPT	2	1-7/8"	-	1"	3/4"

