

Amphenol[®] Star-Line EX[®] Product Instructions



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- EX-15 Inline Receptacle
- EX-17 Panel Mount Receptacle
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- Assembly & Termination
- Mixing Instructions
- Potting Instructions



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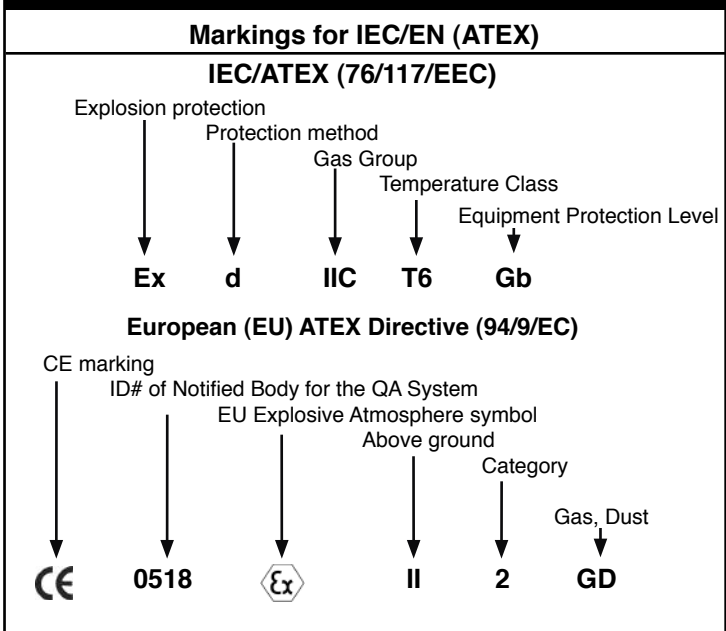
Star-Line EX® Hazardous Certification Information



Ingress Protection (IP) Ratings

First Number Protection against solid bodies	Second Number Protection against Liquids
0 No Protection	0 No Protection
1 Objects greater than 50mm	1 Vertically dripping water
2 Objects greater than 12mm	2 75 to 90 dripping water
3 Objects greater than 2.5mm	3 Sprayed water
4 Objects greater than 1mm	4 Splashed water
5 Dust-protected	5 Water jets
* 6 Dust-tight	6 Heavy Seas
	7 Temporary immersion
	* 8 Indefinite immersion

Hazardous Area Equipment Mark



Temperature Ratings

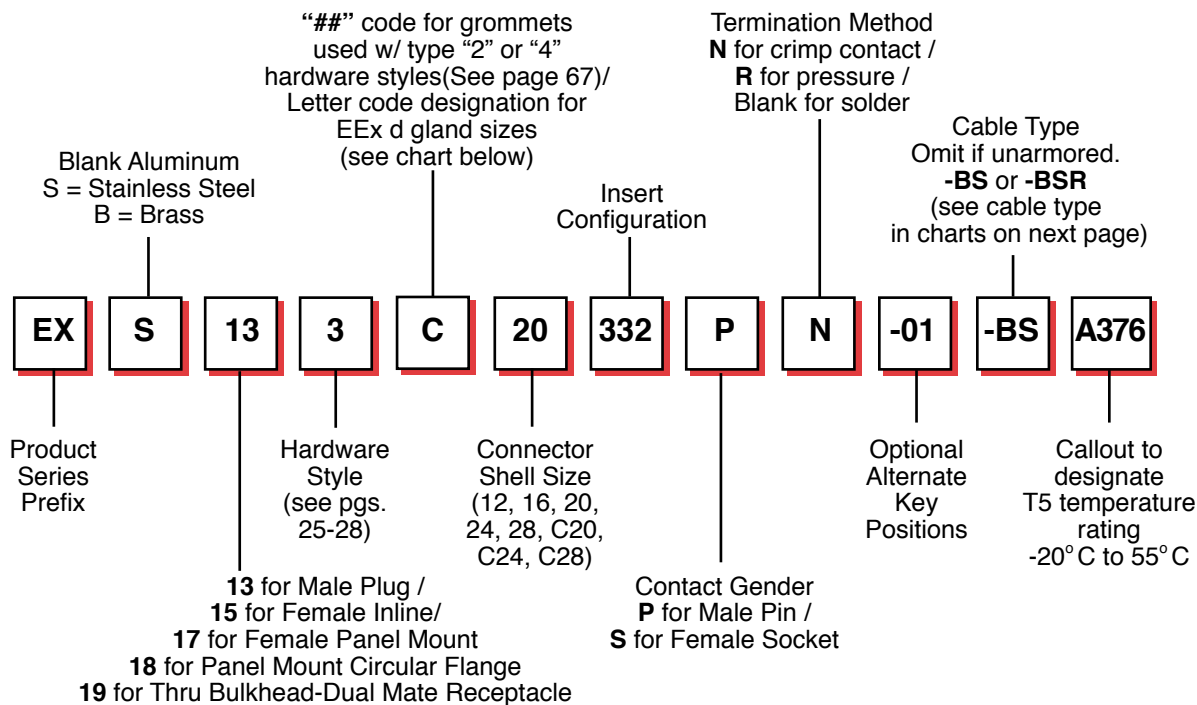
Surface Temperature	UEC, EU (Europe) USA (NEC 505) Canada
450 C (842 F)	T1
300 C (572 F)	T2
200 C (392 F)	T3
135 C (275 F)	T4
* 100 C (212 F)	T5
* 85 C (185 F)	T6

Note: Star-Line Ex® products certification denoted with a *.

HazLoc Hand Chart

Protection Method	IEC/EN (ATEX)						ATEX Category
	Ex Code	Gas		Ex Code	Dust		
Intrinsic Safety	ia ib ic	60079-11 60079-11 60079-11	Zone 0 Zone 1 Zone 2	iaD ibD	61241-11 61241-11	Zone 20 Zone 21	1 2 3
* Flameproof	d	60079-1					2
* Enclosure				tD	61241-1	Zone 20, 21 ,22	
Purge & Pressurization	px py pz	60079-2 60079-2 60079-2	Zone 1 Zone 1 Zone2				2 2 3
Pressurized				pD	612441-4	Zone 21, 22	
* Increased Safety	e	60079-7	Zone 1				2
Encapsulation	ma mb	60079-18 60079-18	Zone 0 Zone 1	maD mbD	61241-18 61241-18	Zone 20 Zone 21	1 2
Oil Immersion	o	60079-6	Zone 1				2
Powder Filled	q	60079-5	Zone 1				2
Non Incendive	nA, nC, nL, nR	60079-15	Zone 2				3
Rooms (draft)	p	60079-13	Zone 1				2
Optical Radiation	op..	60079-28	Zone 0				1
* General Requirements		60079-0			61241-0		
* Class. of Hazardous Areas		60079-1					
* Electrical Installations		60079-14					
Inspection & Maintenance		60079-17					

Code Logic Star-Line EX



Example:

EX-13-3-C-20-332PN

Male Plug with EEX gland for a cable with 0.95" 24.1mm O.D., 20ea #12awg/4mm² male contacts.

EX-15-4-1620-332SN

Female Inline with basket weave grip for a cable with 0.95" 24.1mm O.D., 20ea #12awg/4mm² female contacts.

EX-17-1-20-332SN

Female Panel Mount, 20ea #12awg/4mm² female contacts.

EX-13-3-C-16-22PR-BS

Male Plug with EEX gland for an armored cable with 1.25"/31.75mm O.D., 4ea #4awg/25mm² male contacts.

EX-17-3-C-16-22SR-BS

Female Panel Mount with cable adapter with and EEX gland for an armored and sheathed cable.

For Amphenol Star-Line product insert de-rating information per the National Electric Code, please consult



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PRODUCT CERTIFICATIONS



Certificate Number: SIRA 03ATEX1101X



Cert. No.: IECEX SIR 10.0064X



North American Hazloc Listing
Consult Factory for Listing No



GOST-R Cert. No. POCC MX.AM96.B00012



(TUV) Brasil Cert. No. TUV 11.0147X



File Number: E184393



CSA Listed



Member: International
Association of Drilling Contractors



The Starline product family carries all of the industry standard approvals ranging from ATEX and IECEX to UL and CSA.



Starline EX offers a full range of hardware styles including the use of EX rated cable glands, mechanical clamps and gland nuts.



EEx d Cable Types

EEx d Cable Gland Size Code	Unarmored Cable No deviation if Unarmored		Armored & Sheathed Cable -BS				Armored & Sheathed with reduced bore -BSR	
			UA		Standard		OD-Reduced	
	Min	Max	Min	Max	Min	Max	Min	Max
A1	.1575 (4.0)	.3307 (8.4)	.1339 (3.4)	.3307 (8.4)	.3543 (9.0)	.5315 (13.5)	.2638 (6.7)	.4055 (10.3)
A2	.2835 (7.2)	.4606 (11.7)	.2835 (7.2)	.4606 (11.7)	.4528 (11.5)	.6299 (16.0)	.3701 (9.4)	.4921 (12.5)
A	.3780 (9.6)	.5512 (14.0)	.3701 (9.4)	.5512 (14.0)	.6102 (15.5)	.8307 (21.1)	.4724 (12.0)	.6929 (17.6)
B	.5315 (13.5)	.7874 (20.0)	.5315 (13.5)	.7874 (20.0)	.7992 (20.3)	1.079 (27.4)	.6614 (16.8)	.9409 (23.9)
C	.7677 (19.5)	1.035 (26.3)	.7677 (19.5)	1.035 (26.3)	1.051 (26.7)	1.339 (34.0)	.9134 (23.2)	1.201 (30.5)
C2	.9055 (23.0)	1.268 (32.2)	.9055 (23.0)	1.268 (32.2)	1.299 (33.0)	1.598 (40.6)	1.126 (28.6)	1.425 (36.2)
D	1.110 (28.2)	1.504 (38.2)	1.106 (28.1)	1.504 (38.2)	1.551 (39.4)	1.839 (46.7)	1.370 (34.8)	1.669 (42.4)
D2	1.307 (33.2)	1.736 (44.1)	1.303 (33.1)	1.736 (44.1)	1.799 (45.7)	2.094 (53.2)	1.618 (41.1)	1.909 (48.5)
E	1.547 (39.3)	1.972 (50.1)	1.543 (39.2)	1.969 (50.0)	2.051 (52.1)	2.343 (59.5)	1.870 (47.5)	2.157 (54.8)
E2	1.839 (46.7)	2.205 (56.0)	1.839 (46.7)	2.205 (56.0)	2.299 (58.4)	2.591 (65.8)	2.118 (53.8)	2.409 (61.2)
F	2.059 (52.3)	2.441 (62.0)	2.051 (52.1)	2.441 (62.0)	2.551 (64.8)	2.843 (72.2)	2.370 (60.2)	2.677 (68.0)
F2	2.287 (58.1)	2.677 (68.0)	2.283 (58.0)	2.677 (68.0)	2.799 (71.1)	3.071 (78.0)	2.618 (66.5)	2.890 (73.4)
G	2.453 (62.3)	2.835 (72.0)	2.449 (62.2)	2.835 (72.0)	3.031 (77.0)	3.307 (84.0)	–	



Amphenol offers an extensive line of explosion proof and general duty cable glands. Consult Amphenol Industrial Operations and ask for new catalog 12-055, Amphenol Cable Glands and Cord Grips.



Star-Line EX Plug with EX Gland



Cables can be designed with a custom overmold to any Amphenol cylindrical connector for any industrial application. Consult Amphenol Industrial Operations for further information.

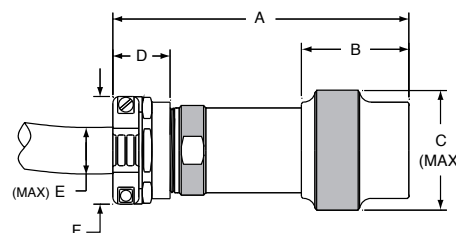


Hardware

*Notes: For "C" length inserts, add 1/2" to both dimensions "A" & "B".

Plug with Mechanical Clamp (POTTING REQUIRED) EX-13-2 Style

Dimension Shell	A*	B*	C	D	E	F
12	7-7/16 (189)	3-9/16 (91)	2-1/8 (54)	2 (51)	15/16 (24)	2-3/8 (60)
16	9-1/2 (241)	3-9/16 (91)	2-5/8 (67)	2-1/16 (52)	1-7/16 (37)	3 (76)
20	9-9/16 (243)	3-9/16 (91)	3-1/8 (79)	2-1/8 (54)	1-15/16 (49)	3-3/4 (95)
24	9-5/8 (245)	3-9/16 (91)	3-5/8 (92)	2-3/16 (56)	2-7/16 (62)	4-1/2 (114)
28	9-11/16 (246)	3-9/16 (91)	4-1/8 (105)	2 1/4 (57)	2-7/8 (73)	5-1/8 (130)

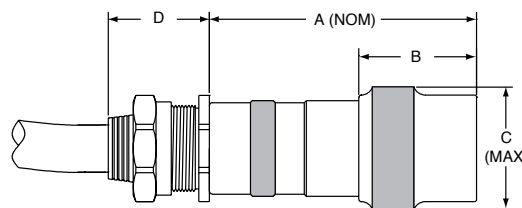


Plug with EEx d Gland (POTTING IS NOT REQUIRED) EX-13-3 Style

Note: □□ Dimension varies according to cable gland. Detailed cable dimensions and type required.

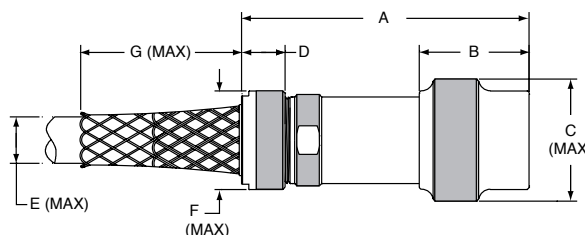
Gland is included with the connector.

Dimension Shell	A*	B*	C	Gland Thread
12	6-1/16 (154)	3-9/16 (91)	2-1/8 (54)	M25
16	8-1/16 (205)	3-9/16 (91)	2-5/8 (67)	M40
20	8-1/16 (205)	3-9/16 (91)	3-1/8 (79)	M50
24	8-1/16 (205)	3-9/16 (91)	3-5/8 (92)	M63
28	8-1/16 (205)	3-9/16 (91)	4-1/8 (105)	M75



Plug with Basketweave Cable Grip (POTTING REQUIRED) EX-13-4 Style

Dimension Shell	A*	B*	C	D	E	F	G
12	6-1/16 (154)	3-9/16 (91)	2-1/8 (54)	1-1/4 (32)	15/16 (24)	1-9/32 (33)	8 (203)
16	8-1/16 (205)	3-9/16 (91)	2-5/8 (67)	1-1/4 (32)	1-7/16 (37)	1-25/32 (45)	10-1/2 (267)
20	8-1/16 (205)	3-9/16 (91)	3-1/8 (79)	1-1/4 (32)	1-15/16 (49)	2-9/32 (58)	14-1/2 (368)
24	8-1/16 (205)	3-9/16 (91)	3-5/8 (92)	1-1/4 (32)	2-7/16 (62)	2-25/32 (71)	17-1/2 (445)
28	8-1/16 (205)	3-9/16 (91)	4-1/8 (105)	1-1/4 (32)	2-7/8 (73)	3-9/32 (83)	19 (483)

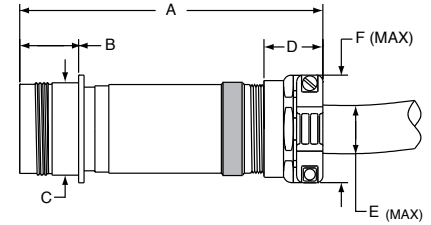


*Notes: For "C" length inserts, add 1/2" to both dimensions "A" & "B".

In-line Receptacle with Mechanical Clamp (POTTING REQUIRED)

EX-15-2 Style

Dimension Shell	A*	B*	C	D	E	F
12	7 (178)	1-7/16 (37)	1-1/2 (38)	2 (51)	15/16 (24)	2-3/8 (60)
16	9-1/16 (230)	1-7/16 (37)	2 (51)	2-1/16 (52)	1-7/16 (37)	3 (76)
20	9-1/8 (232)	1-7/16 (37)	2-1/2 (64)	2-1/8 (54)	1-15/16 (49)	3-3/4 (95)
24	9-3/16 (233)	1-7/16 (37)	3 (76)	2-3/16 (56)	2-7/16 (62)	4-1/2 (114)
28	9-1/4 (235)	1-7/16 (37)	3-1/2 (89)	2-1/4 (57)	2-7/8 (73)	5-1/8 (130)



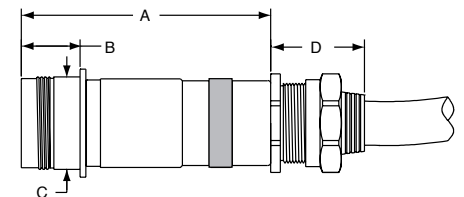
In-line Receptacle with EEx d Gland (POTTING IS NOT REQUIRED)

EX-15-3 Style

Note:  Dimension varies according to cable gland. Detailed cable dimensions and type required.

Gland is included with the connector.

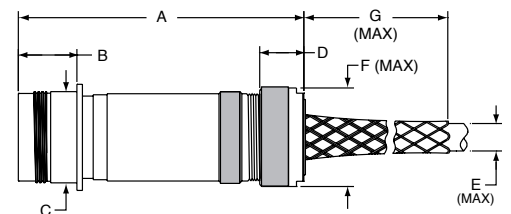
Dimension Shell	A*	B*	C	Gland Thread
12	5-5/8 (143)	1-7/16 (37)	1-1/2 (38)	M25
16	7-5/8 (194)	1-7/16 (37)	2 (51)	M40
20	7-5/8 (194)	1-7/16 (37)	2-1/2 (64)	M50
24	7-5/8 (194)	1-7/16 (37)	3 (76)	M63
28	7-5/8 (194)	1-7/16 (37)	3-1/2 (89)	M75



In-line Receptacle with Basketweave Cable Grip (POTTING REQUIRED)

EX-15-4 Style

Dimension Shell	A*	B*	C	D	E	F	G
12	6-1/4 (159)	1-7/16 (37)	1-1/2 (38)	1-1/4 (32)	15/16 (24)	1-9/32 (33)	8 (203)
16	8-1/4 (210)	1-7/16 (37)	2 (51)	1-1/4 (32)	1-7/16 (37)	1-25/32 (45)	10-1/2 (267)
20	8-1/4 (210)	1-7/16 (37)	2-1/2 (64)	1-1/4 (32)	1-15/16 (49)	2-9/32 (58)	14-1/2 (368)
24	8-1/4 (210)	1-7/16 (37)	3 (76)	1-1/4 (32)	2-7/16 (62)	2-25/32 (71)	17-1/2 (445)
28	8-1/4 (210)	1-7/16 (37)	3-1/2 (89)	1-1/4 (32)	2-7/8 (73)	3-9/32 (83)	19 (483)





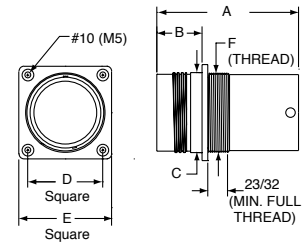
STAR-LINE EX®

*Notes: For "C" length inserts, add 1/2" to both dimensions "A" & "B".

Panel Mount Receptacle (POTTING REQUIRED) EX-17-1 Style

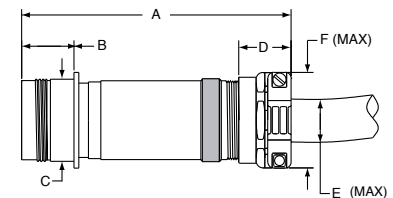


Dimension Shell	A*	B*	C	D	E	F
12	4 7/16	1.765	1-1/2 (38)	1.654 (42)	2-1/4 (57)	M40
16	4 7/16	1.765	2 (51)	2.047 (52)	2-5/8 (67)	M50
20	4 7/16	1.765	2-1/2 (64)	2.441 (62)	3 (76)	M63
24	4 7/16	1.765	3 (76)	2.835 (72)	3-1/2 (89)	M75
28	4 7/16	1.765	3-1/2 (89)	3.228 (82)	4 (102)	M90



Fixed In-Line Receptacle with Mechanical Clamp (POTTING REQUIRED) EX-17-2 Style

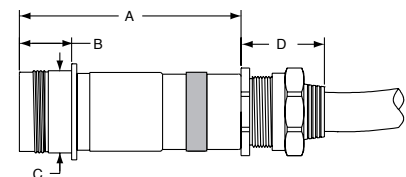
Dimension Shell	A*	B*	C	D	E	F
12	7 (178)	1-7/16 (27)	1-1/2 (38)	2 (51)	5/16 (24)	2-3/8 (60)
16	9-1/16 (230)	1-7/16 (27)	2 (51)	2-1/16 (52)	1-7/16 (37)	3 (76)
20	9-1/8 (229)	1-7/16 (27)	2-1/2 (64)	2-1/8 (54)	1-15/16 (49)	3-3/4 (95)
24	9-3/16 (233)	1-7/16 (27)	3 (76)	2-3/16 (56)	2-7/16 (62)	4-1/2 (114)
28	9-1/4 (235)	1-7/16 (27)	3-1/2 (89)	2-1/4 (57)	2-7/8 (73)	5-1/8 (130)



Fixed In-Line Receptacle with EEx d Gland (POTTING IS NOT REQUIRED) EX-17-3 Style

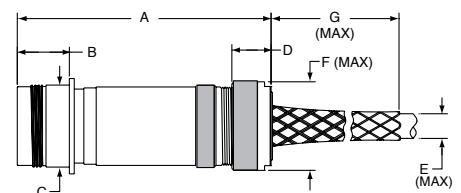
Note: Dimension varies according to cable gland. Detailed cable dimensions and type required. Gland is included with the connector.

Dimension Shell	A*	B*	C	Gland Thread
12	5-5/8 (143)	1-7/16 (37)	1-1/2 (38)	M25
16	7-7/8 (194)	1-7/16 (37)	2 (51)	M40
20	7-7/8 (194)	1-7/16 (37)	1-1/2 (64)	M50
24	7-7/8 (194)	1-7/16 (37)	3 (76)	M63
28	7-7/8 (194)	1-7/16 (37)	3-1/2 (89)	M75



Fixed In-Line Receptacle with Basketweave Cable Grip (POTTING REQUIRED) EX-17-4 Style

Dimension Shell	A*	B*	C	D	E	F	G
12	6-1/4 (159)	1-7/16 (27)	1-1/2 (38)	1-1/4 (32)	15/16 (24)	1-9/32 (33)	8 (203)
16	8-1/4 (210)	1-7/16 (27)	2 (51)	1-1/4 (32)	1-7/16 (37)	1-25/32 (45)	10-1/2 (267)
20	8-1/4 (210)	1-7/16 (27)	2-1/2 (64)	1-1/4 (32)	1-15/16 (49)	2-9/32 (58)	14-1/2 (368)
24	8-1/4 (210)	1-7/16 (27)	3 (76)	1-1/4 (32)	2-7/16 (62)	2-25/32 (71)	17-1/2 (445)
28	8-1/4 (210)	1-7/16 (27)	3-1/2 (89)	1-1/4 (32)	2-7/8 (73)	3-9/32 (83)	19 (483)





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Description of equipment

The Star-line EX series of connectors is comprised of metallic bodied plug and receptacle shells, to form in-line cable connections. Externally the main bodies are fitted with suitably certified cable glands. Internally the main bodies each contain an insulator insert fitted with solder or pressure type contacts of either a pin or socket variety. The plug and receptacle shells together form an in-line connector. When connected together they form a spigotted flamepath and are mechanically interlocked by means of a threaded nut retained by a grub screw.

Additionally, the receptacle connector is available in a bulkhead mounted version that contains an externally threaded flamepath for mounting to certified EX enclosures with suitable internal mating thread. This variety of bulkhead mount connector, must be internally potted, as described within this document.

The range is comprised of seven body (forms) sizes, each with a number of pin/socket size combinations between 1 and 143 contacts. The connector shell size, pin configuration and rating are reflected in the individual type designations.

Design Options are described below and include, alternative keying options, and pin or sleeve contacts in either the plug or receptacle bodies.

Part Number Code Logic: EX(a) - (b) - (c) - (d)- (e) - (f)(g)(h)(j) - (k)

Connector series type designation	EX
Shell material (a)	Aluminium (default, omit code) B-Brass S-Stainless steel
Shell configuration (b)	13- Inline Receptacle, w/ accompanying blanking cap 15- Inline Plug, w/ accompanying blanking cap. 17 - Flange Mount Receptacle, w/ accompanying blanking cap. 18 - Circular Bulkhead Mount Receptacle, w/ cap.
Cable Adapter style (c)	1- Bulkhead Mount (w/ potting adapter; requires potting) 2- Mechanical Clamp (requires potting) 3- Threaded for use with EX certified Gland 4- Basketweave Grip (requires potting)
Grommet ID (d)	See catalog for available sizes and codes
Shell Size (e)	12, 16, 20, C20, 24, C24, 28, C28
Contact Insulation (f)	See catalog for configurations
Contact Gender (g)	P - Pin, S - Socket
Termination Style (h)	N - Crimp, R - Pressure
Insert Rotation (j)	Normal (default, omit code) For alternates, refer to catalog
Planned Additions (k)	Certified Variations



Star-Line EX[®]

Familiarization & Assembly Information

1. Read manufacturer's assembly instructions before actually starting to assemble connectors. Besides the matter of instruction on correct procedures, there are two important reasons for this preliminary step: To identify the various component parts, and to check for any missing parts.
2. Cut cable jackets and sheathing squarely and to correct length, using only wire strippers that have been approved for the operation. In preparing the individual wires in cables and harnesses for assembly, make allowances in length for reaching the outermost circle of contact cavities in the conductors. The insulation should be cut progressively longer as they extend out from the center of the cable or harness to assure sufficient length.
3. Follow chart on page 34 covering maximum cable stripping lengths for effective cable gland or grommet sealing. All conductors should be fit into contact wire wells correctly. A practice layout should be done so that the assembler can oversee what the finished will look like when finished.
4. Some cables that will be used will have a basket weave type of armor under the outer jacket (sheath) and over the inner jacket. Since many regulatory entities require that the armor be grounded at least at the source end, it is beneficial to ground the armor via a spare contact within the connector. Following the removal of sufficient amount of outer jacket (see chart on page 34) ample amount of the armor can be clipped away, but not all. An adequate amount should remain in order that a small cross-section conductor, short in length, be woven into the remaining armor weave and either soldered or covered with mastic impregnated heat shrink, creating an intimate bond to the armor. At the opposite end of the short piece of wire a contact should be crimped and inserted into the insert.
5. Use only correctly sized and ingress protected certified glands or sealing grommets to assure resistance to moisture and other contaminants.
6. Use only the proper crimping tools that have been set or calibrated with precision gages.
7. Make certain that all contacts are the correct size before attempting to assemble in insert cavities. This point is particularly important when both power and control types of contacts are used in the same connector.
8. Be sure that ground contacts (when applicable) are correctly located.
9. Seat all contacts properly so that they will not be damaged or become disengaged during connector mating operations.
10. Use only the proper insertion tools and be sure that they are aligned axially when pushing contact into their fully seated position.
11. When inserts have more cavities than conductors, plug unused cavities with furnished contacts.
12. After all terminated contacts are inserted in their respective cavities and inspected (detailed on page 34), the cable adapter or insert clamp nut should be tightened with a wrench. (detailed on page 37).
13. When handling cables, use adequate support to prevent damage to the internal wires. Exd glands are intended for sealing purposes and should not be used as a cable grip.
14. If for any reason terminated conductors have to be removed from an insert because of an assembly error or change in circuitry, be sure to remove the cable gland or cable adapter first before extracting the contact and reinserting it.
15. If one of the connector poles is a ground wire, make sure that it is grounded properly before the connector actually is engaged.
16. When connectors having the same configuration are to be mounted close together, different or alternate keying arrangements should be used to prevent mismatching and possible damage to the electrical system.
17. Always inspect all aspects of connector assembly operations before putting connectors into actual operation.
18. Crimping and terminating of conductors to contacts must be done carefully. Make certain that wire strands are fully bottomed in contact-wells by checking through inspection hole provided (Detailed on page 34).
19. Never try to straighten bent contacts. Straightening cannot be done properly and the plating on contacts very likely will be marred. This will result in a high resistance connection and will expose the base material to possible corrosion.
20. Each assembly operator should be his own inspector. Worn, damaged, or defective tools should be reported immediately to foreman and supervisors. Assembly operators should be indoctrinated with this attitude and made to understand the importance of always guarding quality. Assembly workmanship is a significant factor in terminating the quality of multiple contact connectors. Quality cannot be "inspected" into connectors; it must be "built-in" during each and every assembly operation.



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Star-Line EX® Cable Types

It is the responsibility of the specifier/user to select the appropriate cable to be used with the EX Star-Line connector system. The specifier/user should favor the use of cables constructed with flexible conductors (IEC class 5 or higher/ICEA type H or higher) as well as a flexible armor type (basket weave) if required. Armor systems such as those identified in IEC 92-3 or IEEE455 or UL1309 are recommended. An impervious jacket should always be furnished over the armor. IEC/BS cables such as armored with SWA (X), tape(Z), and NEC style cables such as 'interlocked' or MC are not recommended with the EX connector system.

The armor system should be grounded at the source point. Periodically the specifier/user should investigate the need for armor grounding (earthing) within the plug or in-line connector itself. In addition to the weaving of the armor grounding conductor, soldering and/or heat shrink and/or strong adhesive electrical takes, and/or 'tension banding' should be applied on the armor and conductor to insure a permanent bond. The armor grounding wire should be terminated (solder or crimp) to an appropriate sized contact, and inserted into the connector insert.

The armor system should not be confused or associated with shielding which is employed with instrumentation/telecommunication cables. Shielding for pairs/triads have their own individual drain wires which should be terminated onto dedicated contacts. These drain wires should be insulated with heat shrink within the connector body to prevent contact with other drain wires or pair/triad shield faces. The above procedure does not apply to single conductor cables, i.e., 444-1111mcm (150mm-500mm), or multiconductor power or control cables.

Single conductor Cables Periodically single conductor cables will be required in an armored and sheathed construction.

Since there is no armor grounding contact path provided within the connector assembly, a suitable external method must be employed. It is recommended that a small strip of outer jacket be cut away a reasonable distance from the entrance to the cable gland of the connector. A durable insulated conductor with a cross section not smaller than #14awg/4mm should be bonded to the exposed armor. Protective tapes or heat or cold shrink (3M PST) should be applied to protect this bonding point. The opposite end of this grounding conductor should be terminated at the corresponding receptacles' panel via one of the receptacles' fastening screws or a dedicated grounding lug or bar. In an 'in-line' configuration, a mirror image of the above should be used with a simple mating point in close proximity to the connector set.

In summary the specifier/user should be versed in acceptable applications that are allowed by the regulatory/certifying bodies having jurisdiction. Periodic inspection of this grounding arrangement should be implemented.

All connectors are furnished with a protective cover. In actuality this cover is viewed as a critical part of the connector. The cover is compared to a cover on a flameproof (Exd) enclosure. Absence of the cover voids the Ex certification. The covers should not be viewed as an incidental protection to the external elements, but a required component of a hazardous certified device. When the connectors are plugged together the covers can be screwed into each other to protect the threads from damage. When the connectors are not mated, it is required that the covers be installed and the set screws on the covers be fully driven into the body of the connector. Replacement covers and 'NYLOK' set screws are available on request.

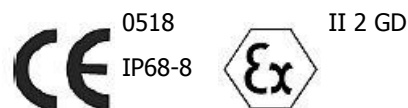
SIRA Product Labeling Information

Information below must be attached to connectors via non-removable label.

Amphenol
Sidney NY 13838 USA

Star-Line, Size Ref

Work Order Number; Date Code; Facility
Code



Sira 03ATEX1101X & IECEx SIR 10.0064X

"Max volts, Max amp, Current rating per pin"

DO NOT SEPARATE WHEN ENERGIZED

Marking for all connectors used in standard (+40°C max.) ambient:

Ex d IIC T6 Gb (Inline Plugs and Receptacles)
Ex tb IIIC T80°C Db IP68 (Inline Plugs and Receptacles)
Ex de IIC T6 Gb (Panel mount receptacle filled w/ cement)
Ex tb IIIC T80°C Db IP68 (Panel mount receptacle filled w/ cement)
 $-20^{\circ}\text{C} \leq T_{\text{amb}} \leq +40^{\circ}\text{C}$

Marking for inline connectors, used in +55°C max. ambient: (INCREASED TEMP RANGE ONLY ALLOWABLE FOR CONNECTORS (EX-13-3, EX-15-3, EX-17-3) EMPLOYING SUITABLE EX CERTI- FIED GLANDS. THIS MARKING IS NOT APPLICABLE FOR CE- MENTED CONFIGURATIONS)

Ex d IIC T5 Gb (Inline Plugs and Receptacles)
Ex tb IIIC T95°C Db IP68 (Inline Plugs and Receptacles)
 $-20^{\circ}\text{C} \leq T_{\text{amb}} \leq +55^{\circ}\text{C}$



The following instructions apply to equipment covered by certificate numbers:

Sira 03ATEX1101X & IECEx SIR 10.0064X

The equipment may be used with flammable gases and vapours with apparatus group(s) IIA, IIB, & IIC and with temperature classes T6, T5, T4, T3, T2 & T1.

The equipment is only certified for use in ambient temperatures in the range -20°C to +40°C and should not be used outside this range.

The product complies with the following standards:

Installation shall be carried out by suitably-trained personnel in accordance with the applicable code of practice **e.g.**

EN 60079-0:2006 (IEC 60079-0:2007 5th Ed)	General requirements for electrical apparatus for explosive gas atmospheres
EN 60079-1:2007 (IEC 60079-1:2007 6th Ed)	Electrical apparatus for explosive gas atmospheres - Part 1: Flameproof enclosures "d"
EN 60079-7:2007 (IEC 60079-7:2006 4th Ed)	Electrical apparatus for explosive gas atmospheres – Part 7: Increased safety "e"
EN 61241-0:2006 (IEC 61241-1:2004 1st Ed + Corr Nov 05)	General requirements for electrical apparatus for use in the presence of combustible dust
EN 61241-1:2004 (IEC 61241-1:2004 1st Ed)	Electrical apparatus for use in the presence of combustible dust. Protection by enclosures "tD"

EN/IEC 60079-14 or EN/IEC 61241-14. It is the end user's responsibility to ensure that the product, as specified and confirmed by the product label, is suitable for its intended application.

Inspection and maintenance of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. **EN/IEC 60079-17 or EN/IEC 61241-17.**

Repair of this equipment shall be carried out by suitably trained personnel in accordance with the applicable code of practice e.g. **EN/IEC 60079-19.**

Components to be incorporated into or used as replacement parts of the equipment shall be fitted by suitably trained personnel, using only components purchased from Amphenol or an Amphenol approved distributor. Any use of non-approved components/suppliers will invalidate the certification for that product.

The certification of this equipment relies upon the following materials used in its construction:

1. Connector Materials:

- (Standard Base Material) ASTM B211 or B221 Alloy 6061-T6, Aluminum (<7%Mg, <7%Ti),
- (Optional Base Material) ASTM 5640, Alloy 303, Stainless Steel,
- (Optional Base Material) ASTM B455, Alloy C38500, Brass.

2. Seal Materials:

- Buna Rubber w/ Durometer of 70 SHORE A.

If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection provided by the equipment is not compromised.

Aggressive substances: e.g. acidic liquids or gases that may attack metals, or solvents that may affect polymeric materials.

Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheets that it is resistant to specific chemicals.

SPECIAL CONDITIONS FOR SAFE USE/CONDITIONS OF CERTIFICATION

The following must be adhered to in full for safety and as to not invalidate product certification.

1. The panel mounted variants may be installed in suitably certified and dimensioned flameproof equipment providing that the certification of this flameproof equipment will allow such installation.
2. The panel mounted variants may be fitted in an increased safety enclosure when the free internal space is filled with epoxy resin and providing the certification of the enclosure will allow such installation. An electric strength test in accordance with EN 60079-7:2007 and IEC 60079-7:2007 Clause 7.1 will be performed on each unit after installation of the epoxy resin.
3. The Ex-18 range of panel-mounted variants may be installed in a suitably certified and dimensioned flameproof equipment providing that the certification of this flameproof equipment will allow such installation. They have the following dimensioned spigot joints and are suitable for Group IIA, IIB or IIC, dependent upon the associated apparatus entry dimensions.

Shell Size	Spigot diameter (mm)	Spigot length (mm)
12	39.90/39.85	46 (+/-1)
16	49.90/49.85	46 (+/-1)
20	62.90/62.85	46 (+/-1)
24	74.90/74.85	46 (+/-1)
28	89.90/89.85	46 (+/-1)

1. The Ex-18 range of receptacles shall only be used where the temperature at the point of entry in service on the associated enclosure is between -20°C to +70.2°C.
2. The Ex-18 range connector does not incorporate an external earth facility. It is the responsibility of the user or installer to ensure adequate earth continuity by means of guidance given within the manufacturer's installation instructions.

Star-Line EX® Connector Mating, Securement and Certification Compliance

The Starline EX series utilizes a traditional threaded (ACME) coupling scheme, with an additional enhancement. The coupling sleeve is part of an actual assembly. The assembly is comprised of a coupling sleeve, and two (2) grub screws (set screws). These set screws and their proper implementation, are a requirement of the Certificate of Conformity.

Once the connectors are mated, and the coupling nut has been tightened, it is a requirement that the Grub Screws both be tightened using a proper tool (allen key; supplied with connector). This prevents the coupling nut from backing off, and minimizes "unauthorized decoupling" of the mated connector pair. The Grub Screws would have to be intentionally loosened, in order for the coupling nut to be retracted, and the connectors unmated.

WARNING: Compliance with the Certificate of Conformity is satisfied when:

- 1) the male and female connectors are completely mated, and
- 2) the coupling sleeve is fully engaged, and
- 3) the grub screws are fully engaged, and
- 4) all the above are established before the circuit is energized.

WARNING: When circuits are de-energized, and the connectors, all plugs and receptacles, are un-mated, the respective flameproof blanking caps must be installed, and all grub screws secured. Flame-proof blanking caps are a part of the certification, and their use is required, to maintain flameproof workmanship of the connector halves independently, should the circuit be re-energized.



Star-Line EX®

Assembly & Terminating Instructions

Cable Jacket & Wire Stripping

Shell Size	Contact Size AWG(mm)	Mod 1 (Solder Contact) Strip Lengths (mm)		Mod 1 (Pressure Contact) Strip Lengths (mm)		Mod 2 & 3 (Crimp Contact) Strip Lengths (mm)	
		Conductor	Jacket	Conductor	Jacket	Conductor	Jacket
12	18 (0.75mm)	7.2mm	99.2mm	-	90.5mm	11.5mm	90.5mm
	16 (1.5mm)	7.2mm	99.2mm	-	90.5mm	14.6mm	90.5mm
	12 (4.0mm)	8.7mm	99.2mm	17.5mm	90.5mm	15.5mm	90.5mm
	10 (6.0mm)	11.9mm	99.2mm	14.3mm	84.1mm	17.1mm	92.1mm
16	18 (0.75mm)	7.2mm	105.5mm	-	96.8mm	11.5mm	96.8mm
	16 (1.5mm)	7.2mm	105.5mm	-	96.8mm	14.6mm	96.8mm
	12 (4.0mm)	8.7mm	105.5mm	-	96.8mm	15.5mm	96.8mm
	10 (6.0mm)	11.9mm	105.5mm	-	90.5mm	17.1mm	98.4mm
	8 (10.0mm)	15.1mm	105.5mm	-	88.9mm	21.0mm	98.4mm
	4 (25.0mm)	16.7mm	105.5mm	17.5mm	87.3mm	23.0mm	101.6mm
20	18 (0.75mm)	7.2mm	118.2mm	-	109.5mm	11.5mm	109.6mm
	16 (1.5mm)	7.2mm	118.2mm	-	109.5mm	14.6mm	109.6mm
	12 (4.0mm)	8.7mm	118.2mm	-	109.5mm	15.5mm	109.6mm
	10 (6.0mm)	11.9mm	118.2mm	-	103.2mm	17.1mm	111.12mm
	8 (10.0mm)	15.1mm	118.2mm	-	101.6mm	21.0mm	111.12mm
	4 (25.0mm)	16.7mm	118.2mm	17.5mm	101.6mm	23.0mm	113.9mm
	1/0 (50.0mm)	18.3mm	118.2mm	19.1mm	98.4mm	31.0mm	115.2mm
	535MCM (240mm)	50.0mm	118.2mm	-	90.0mm	-	-
	777 MCM (400mm)	50.0mm	130.9mm	-	90.0mm	-	-
24/C24	18 (0.75mm)	7.2mm	130.9mm	-	122.2mm	11.5mm	-
	16 (1.5mm)	7.2mm	130.9mm	-	122.2mm	14.6mm	-
	12 (4.0mm)	8.7mm	130.9mm	-	122.2mm	15.5mm	-
	10 (6.0mm)	11.9mm	130.9mm	-	115.9mm	17.1mm	-
	8 (10.0mm)	15.1mm	130.9mm	-	114.3mm	21.0mm	-
	4 (25.0mm)	16.7mm	130.9mm	17.5mm	100.0mm	23.0mm	-
	1/0 (50mm)	18.3mm	130.9mm	19.1mm	117.5mm	31.0mm	-
	4/0 (120mm)	18.3mm	130.9mm	19.1mm	127.0mm	31.6mm	-
	535 MCM (240mm)	50.0mm	130.9mm	-	90.0mm	-	-
	777 MCM (400mm)	50.0mm	130.9mm	-	90.0mm	-	-
28/C28	18 (0.75mm)	7.2mm	137.3mm	-	125.6mm	11.5mm	-
	16 (1.5mm)	7.2mm	137.3mm	-	125.6mm	14.6mm	-
	12 (4.0mm)	8.7mm	137.3mm	-	125.6mm	15.5mm	-
	10 (6.0mm)	11.9mm	137.3mm	-	122.2mm	17.1mm	-
	8 (10.0mm)	15.1mm	137.3mm	-	120.7mm	21.0mm	-
	4 (25.0mm)	16.7mm	137.3mm	17.5mm	106.4mm	23.0mm	-
	1/0 (50mm)	18.3mm	137.3mm	19.1mm	123.8mm	31.0mm	-
	4/0 (120mm)	18.3mm	137.3mm	19.1mm	133.4mm	31.6mm	-
	350 MCM (185mm)	21.4mm	137.3mm	-	130.1mm	33.5mm	-



Star-Line EX®

Assembly & Terminating Instructions

Electrical Connectors with MOD I Inserts

The following table gives the wire sizes and cord/cable types to be used with the Star-line plugs, receptacles and cable connectors. The plugs and cable connectors are intended for connection to 3, 4 or 5 conductor cords/ cables depending on the contact insert configuration.

The cord sealing grips range for plugs and cord connectors is 1/8". For instance, if inside dia. of grommet is 3/4" it will seal and grip a cord dia. in the range of .750 dia. max. to .625 dia min. Inside diameter of grommets are in sixteenth of an inch increments.

Amperes Rating of Device	Conductor Size AWG	Type Cord/Cable
20	#14	S, SO
30	#12, #10	S, SO
60	#6, #4	W
100	#0, #1, #2	W
200	#3/0, #4/0	W

There are two types of contacts used in Mod I style inserts, one is solder, the other is pressure. The pressure contacts apply termination force via a set screw, and require being torque to values provided in the table below:

	20 amp. #12 contact	30 amp. #10 contact	40 amp. #8 contact	60 amp. #4 contact	100 amp. #1/0 contact	200 amp. #4/0 contact
Lb-in	N/A	15	25	20	50	100
N-M	N/A	1.7	2.8	2.3	5.7	11.3

A. Prepare end of cable by stripping jacket and insulation per tables shown on previous page. Remove any ridges or grooves by scarfing the edges to provide a smooth surface on the cable to insure good grommet sealing. Tin conductors to be soldered to within 1/16" of insulation. Use only resin flux for all soldering.

B. Slide the EX gland nut, cable grip, or anti-friction washer, grommet and cable adapter, over the cable in the order named. Be sure the right size EX gland or grommet has been selected to obtain a proper seal. See photo "YY".

C. Solder conductors in contacts, if solder type. TO ENSURE ENVIRONMENTAL SEALING, ALL CONTACTS MUST REMAIN IN PLACE EVEN IF EVERY ONE IS NOT BEING USED. The silicone insulation is heat resistant, but reasonable care must be exercised to prevent unnecessary heating. It is recommended that a DC induction soldering unit be used if possible. Do not use open flame soldering. It is recommended that heat shrink be applied over finished termination point.

D. Support the barrel assembly in a vise having smooth-faced jaws; with female receptacle have flange secured in vice for holding steady. The plug and receptacle keyways/keys are designed to withstand the assembly torque. See photo "MM".

E. Apply cable adaptor or insulation clamp nut by strap wrench, turning counterclockwise (left hand thread) until hand-tight. APPLY STRAP WRENCH TO CABLE ADAPTER OR INSULATION CLAMP AND TIGHTEN UNTIL IT SHOULDERS FULLY ON BARREL. Substantial resistance should be felt by assembler as he rotates adapter on final revolution. See photo "PP".

F. Slide Ex gland or grommet into cable adapter and engage either cable grip, or gland washer and gland nut. DRAW UP TIGHT WITH WRENCH. If mechanical clamp nut is used, tighten clamp screws as final step.



NOTE 1. Photo "YY" is an example of EX-13-3 Series Plug using Exd gland.



Star-Line EX[®]

Assembly & Terminating Instructions

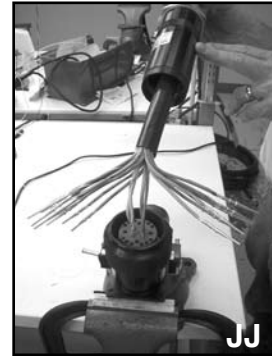
Electrical Connectors with MOD II Inserts

Individual contacts are crimped to their respective conductors outside of the connector where ample working space is available. The crimping operation can be done by hand or power operated tools. Reference page 86 of this catalog for proper tool information.

Terminated contacts are individually inserted into the insulation with a contact insertion tool. See photo "JJ". Contacts may be inserted and removed without degrading contact retention or environmental capability. The front rigid portion of the insert functions to stabilize and ensure positive alignment of the contacts.

Contact cavities are clearly numbered on the front and rear insert face to facilitate identification during assembly, inspection, and maintenance.

All contact cavities, whether used or not, **must be populated** in order to maintain certification and proper environmental sealing.



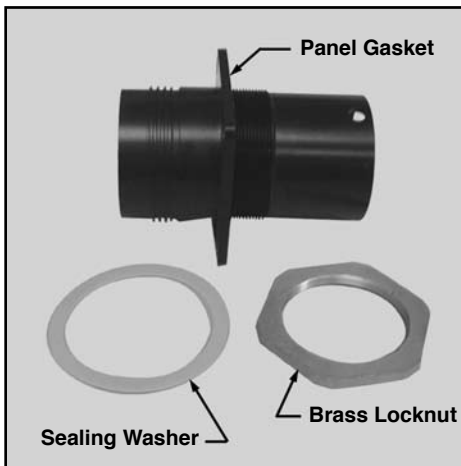
For Electrical Connectors with MOD III Inserts

Mod III connectors contain insulations that are factory installed and locked into position with a non-removable retaining ring. Each insulator assembly contains a resilient seal interposed between two rigid plastic insulators. Mod III contacts are rear insert-able and rear release-able for quick and easy circuit changes. Mod III contacts are retained in their respective cavities by means of collapsible metal collets. The main advantage of collet style retention are lower insertion forces, eliminating need for insertion tools, and higher retention forces. Contact cavities are clearly numbered on the front and rear insert face to facilitate identification during assembly, inspection, and maintenance. All contact cavities, whether used or not, **must be populated** in order to maintain certification and proper environmental sealing.

All connectors are shipped with the inserts factory installed in the barrel shell, and in the specified key position.

CRIMPING CONTACTS: Contacts are crimped outside of the connector with a proper tool. Check through the inspection hole in contact to make certain wires are fully bottomed in well before crimping.

Panel Mounting a Receptacle



1. The panel receptacle is comprised of two basic pieces. The first is the actual panel receptacle assembly, where the mating plug enters, and the second is the panel adapter/potting chamber.
2. Following the termination and/or insertion of the contacts into their representative cavities, the panel adapter is the firmly tightened all the way until travel ceases.
3. The potting step can then be completed. After the potting compound has hardened, the completed receptacle assembly can be installed into the enclosure.
4. The square panel gasket is furnished for installation on the outer surface of the enclosure behind the square flange. The sealing washer and brass locknut should be fully tightened with proper tools. Following this step four proper length 10mm screws should be installed into holes in corner of front flange. (Brass locknut is not required when threading receptacle assembly into a flameproof enclosure.
5. For all increased safety panel mount receptacles:
In accordance with EN50019:2000, Clause 7.1, the increased safety enclosure certificate must include the use of the device as well as an electric strength test on the finished assembly.
6. The panel mount variant shall be installed in a suitably certified and dimensioned flameproof equipment when it's certificate allows such installation.

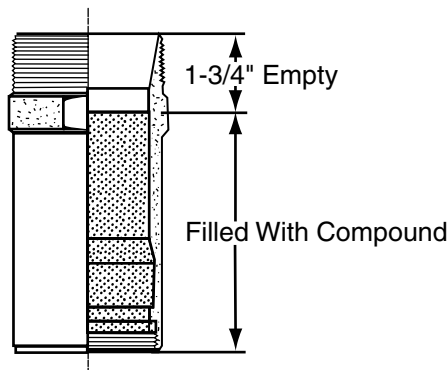
Star-Line EX® Potting Instructions

All cable adapters, other than ones suited for mating with an EX-certified gland, must be filled with encapsulant (potted). The material certified for use in filling this connector line is to be supplied by Amphenol Industrial part number 10- 838535. The user or installer shall consider the performance of these materials with regard to attack by aggressive substances that may be present in the hazardous area. This material is a two-component casting system with a 1:1 volumetric mix ratio. It has low exothermic qualities, peaking at only 102°F during cure. The material starts to harden in under 2 hours and fully cures at room temperature in 24. It can be quick cured in 2 hours at 140°F. The product is available in easy "mix & dispense" cartridges. More information is available by contacting:

Amphenol Industrial Operations, Technical Support
Phone: (520) 285-5130

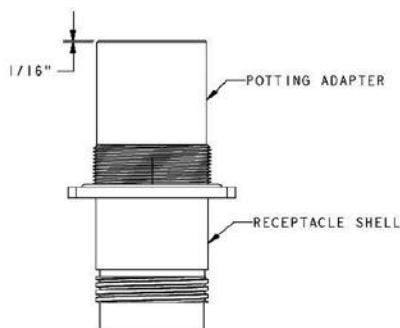
Filling Depths

The Cable Adapter should be filled with the encapsulant to the following levels:



Cable Adapter

- In-line cable adapters are filled to within one & three quarter inches (1¾") of the end of the adapter. The goal is to have all the volume filled without interrupting the cable grommet from seating when the strain relief nut is installed.



Panel Adapter (shown above)

- Bulkhead adapters should be filled to within 1/16" of the top.

Mixing Instructions

- CAUTION: Wear goggles or other eye protection during all operations.
- Remove the tape band from the mid-section of the cartridge.
- Squeeze cartridge slightly in area of the removed tape band to deform foil barrier.
- Push the threaded end of the mixing rod into small and fully threaded into its mating thread within the tube.
- Push the mixing rod to the bottom of cartridge and begin plunging the mixing rod, the full length of the cartridge, while rotating the mixing rod approximately 90° with each stroke. Mix for the total number of 50 strokes. A stroke is one complete in and out cycle. On the last stroke, mixing rod should be fully extended outward.
- Grasp the cartridge firmly at the neck of the tube, and unscrew the mixing rod by turning counterclock-wise approximately 3 turns. Remove mixing rod.
- Install nozzle and remove bottom cap.
- Load tube into a standard painters caulk gun.
- Pot connectors in mated condition to assure contact alignment.
- Potting not required when using Exd/Exe gland option for plugs and in-line receptacles.



Star-Line EX® Potting Instructions

Volume Chart

The following chart illustrates how much potting compound is needed per connector. This is based on fill lengths of 3-7/8" (in-line adapters) and 1-3/4" (Panel mount adapters) and the smallest allowable cable diameter included for each particular shell.

* Note: These volumes are estimated. Necessary volumes may vary depending on conductor count, insulation, and jacket thickness.

Shell Size	Approx. Cement usage in a 6" cable adapter* (Fluid Ounces)	Approx. Cement usage in a bulkhead adapter* (Fluid Ounces)
12	1.6	.5
16	3.5	1.1
20	6.1	2.1
24	9.0	3.3
28	11.1	4.5

Recommendations

It is recommended where possible, that when mated sets of connectors are potted that the connector with the female insert be potted first, allowed to set and then the male be potted while it is mated to the previously potted female connector. This will ensure that the male contacts will be seated or ~~aimed~~ properly at the female socket contact opposite it. The male contacts have a given amount of movement while not engaged, and if during initial potting procedures the male contacts are positioned beyond this movement range, they will not properly make contact with the socket contact.

