Manufacturer's Instructions for Lifeline® Power Cables

Lifeline® RHW-2 or RW90 One-Hour Fire Resistive Cables BreathSaver® XW Phenolic Conduit

Technical Information Sheet #301J

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This Technical Information Sheet (TIS) covers Lifeline® RHW-2 or RW90 Cables: UL Certified and Listed One Hour Fire Resistive Cable for use in BreathSaver® XW Phenolic Conduit

APPLICATIONS

Lifeline® Power Cables have been qualified and listed to the demanding requirements of UL 2196 and ULC S139, Tests for Fire Resistive Cables, and are UL Listed Type RHW-2 or RW90.

Lifeline® Power Cables meet various industry code requirements (NFPA 70, NFPA 72, NFPA 101 and NFPA 130) for fire resistance according to UL Standards 2196 and ULC S139 when selected and installed per applicable codes including federal, state, local and municipal rules, laws and regulations as well as Electrical Circuit Integrity System 25D (FHIT 25D and FHIT7 25D). Note that Authorities Having Jurisdiction (AHJ) should be consulted for approval prior to cable purchase and installation.

REQUIREMENTS

1) **Codes / Laws / Regulations**
   Selection and installation compliance is dependent on the applicable issue of any codes or addendums which covers the use of Lifeline® RHW-2 or RW90 Cables, Fire Resistive Cables.

2) **UL Electrical Circuit Integrity System #25D (FHIT 25D and FHIT7 25D)**
   The most current listing details and supporting information applicable to Lifeline® Cables' fire resistive rating classification can be obtained from UL's UL Product IQ website by searching for keywords: "FHIT 25D and FHIT7 25D".

3) **Manufacturer's Instructions – TIS #301J**
   All Lifeline® Cable products are covered by specific datasheets and supporting Technical Information Sheets that provide the user with information to properly select and install Lifeline® Cables in a reliable and trouble-free manner. Do not hesitate to contact your Lifeline® Cable representative should you have any questions.

INSTALLATION PARAMETERS

1) **Cable: Lifeline® RHW-2 or RW90**
   Code compliant cable certified as one-hour fire resistive with 480 volts utilization per testing according to UL 2196 / ULC S139 and listed in FHIT 25D and FHIT7 25D respectively. Appropriate cable selection is required for systems requiring a fire resistive rating.

2) **Fire Resistive Cable System**
   Code compliant conduit system which meets the following requirements:

   a. Installations must use BreathSaver® XW Phenolic Conduit with optional ResolveOne NEMA 4XEnclosures as pull boxes with BreathSaver® XW Phenolic conduit assembly components.

   Lifeline cables shall be installed in dedicated raceway. For easier installation Polywater LZ pulling lubricant may be used.

   No substitute components are allowed.

   b. Conduit assemblies shall be secured to a fire rated structure comprised of steel or other fire rated components proven to meet the required fire resistance ratings (i.e. one hour). Conduit shall be secured to structure using steel two-piece single-bolt pipe clamps. Clamps shall be 1-1/4 in. wide with minimum 14-gauge thickness.

   c. Maximum support spacing of BreathSaver® XW Phenolic Conduit shall not exceed 5ft.

   d. Minimum conduit bend radius is 12 inches.

   e. When enclosures are used, two-piece steel clamps shall be used to secure conduit connectors and conduit within one foot from conduit connector.

3) **Conduit Sizing**
   Lifeline® RHW-2 or RW90 datasheet issued October 2021 provides cable diameters and conduit fill which shall be used in lieu of the typical National Electrical Code maximum conduit fill requirements.

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4) PULL BOXES

If pull boxes are used, enclosure size shall be at least 8 times the raceway trade size in accordance with National Electric Code article 314.28.

ResolveOne 4X JIC style JHFX series enclosures shall be used. Order model number comprised of AB-R prefix followed by two digit height, width and depth dimensions JHFX, 3 or 4 to describe finish polish, T304 for grade of stainless steel, and HT suffix denoting high temperature gasket.

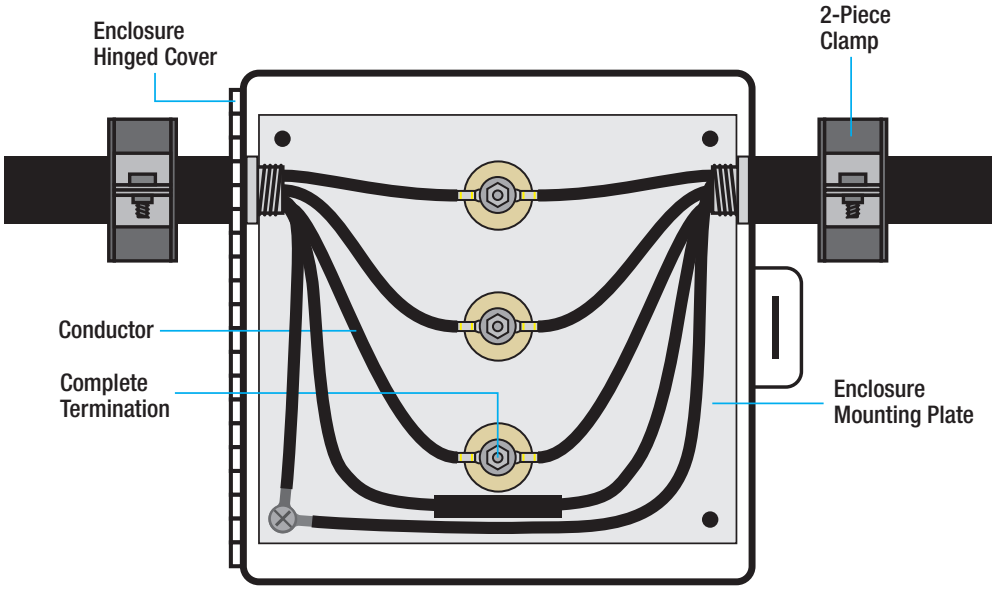
Example:

An installation with 3/4 inch BreathSaver® XW Phenolic conduit requires an enclosure for pull box that is 6 inches across and ResolveOne AB-R060604JHFX3T304HT enclosure is the minimum size that shall be used.

Breather/Drain – Eaton Crouse – Hinds breather drain part number DPR102953 may be installed on the bottom of pull box enclosure.

5) SPLICES

Ceramic stand-off splices may be used to splice conductors. Compression connector butt splices may be used for ground and neutral conductors. Ground conductors may also be spliced and terminated enclosure grounding stud. Please refer to FHIT or FHIT7 No. 25D for more details . Read these instructions thoroughly before beginning intallation.



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5.1) Ceramic Stand-off Splice Kit:

The Lifeline® Splice Kit, part number CUS60220 contains components required to assemble the 1-hour fire rated splice system. Lifeline® Splice Kit(s) with contents listed below:

- 0.25"-20 X 1.5" Stainless steel stud x1
- 0.25"-20 Nut, stainless steel x2
- 0.25" Belleville spring washer, stainless steel 884lb flattening load x1
- 0.25" x 0.75" Flat washer, stainless steel x2
- 0.24" x 0.38" Silicone o-ring x1
- 1" x 1" Grade L5 ceramic, round, female treaded standoff x1
- 0.25"-20 X 0.5" Stainless steel bolt x1
- 0.25" x 0.5" Stainless steel split washer x1
- Thomas & Betts Blackburn® copper compression connectors, straight barrel, one-hole lug x2

5.2) Materials not included in Lifeline® Splice Kit:

The Lifeline® Splice Kit, part number CUS60220 contains components required to assemble the 1-hour fire rated splice system. Lifeline® Splice Kit(s) with contents listed below:

- UL Listed Resolve One NEMA 4X stainless steel enclosure with mounting plate
- Sta-Kon Cat. No. 2C-10 Compression Connector for 12AWG and 10AWG wire
- Sta-Kon Cat. No. C10-10 Ring Terminal for 12AWG and 10AWG wire
- 3M ITCSN-0400 Heat Shrink Tubing
- Breather/Drain- Eaton Crouse- Hinds P/N DPR1029S3

5.3) Materials not included in Lifeline® Splice Kit:

- Wire stripping tool
- Utility knife
- Wire cutter
- Crimping tool
- Drill and 1/4 inch drill bit
- Tape Measure or ruler
- Two 7/16 inch wrenches
- Marker
- Heat Gun (only for compression connector butt splice)

5.4) Enclosure shall be Resolve One Stainless Steel NEMA 4X large enough to permit installation of ceramic stand-off splice terminals. Minimum on center spacing of terminal for energized conductors is 1-3/4 inch on between terminals and 1-3/8 inch from terminal to enclosure wall; neutral and ground conductors terminals should be a minimum of 1-1/4 inch from other ground or neutral terminals and minimum of one inch from enclosure wall. Minimum enclosure size in based on number of ceramic splice terminals installed and for installations with three energized circuits with ground and neutral conductors also terminated using ceramic splice terminals the following minimum enclosure sizes are recommended.

Table 1 - Splice Enclosure Sizing

Number of Ceramic Stand-off Terminals	Enclosure (W x H x D)	ResolveOne Model Number
3	8 x 8 x 4	AB-R080804JHFX3T304HT
4	8 x 8 x 4	AB-R080804JHFX3T304HT
5	10 x 10 x 4	AB-R100104JHFX3T304HT
6	10 x 12 x 4 [1] 12 x 10 x 4 [2]	AB-R101204JHFX3T304HT [1] AB-R121004JHFX3T304HT [2]
7	10 x 12 x 4 [1] 12 x 10 x 4 [2]	AB-R101204JHFX3T304HT [1] AB-R121004JHFX3T304HT [2]

[1] Enclosure for Horizontal installation
[2] Enclosure for vertical installation

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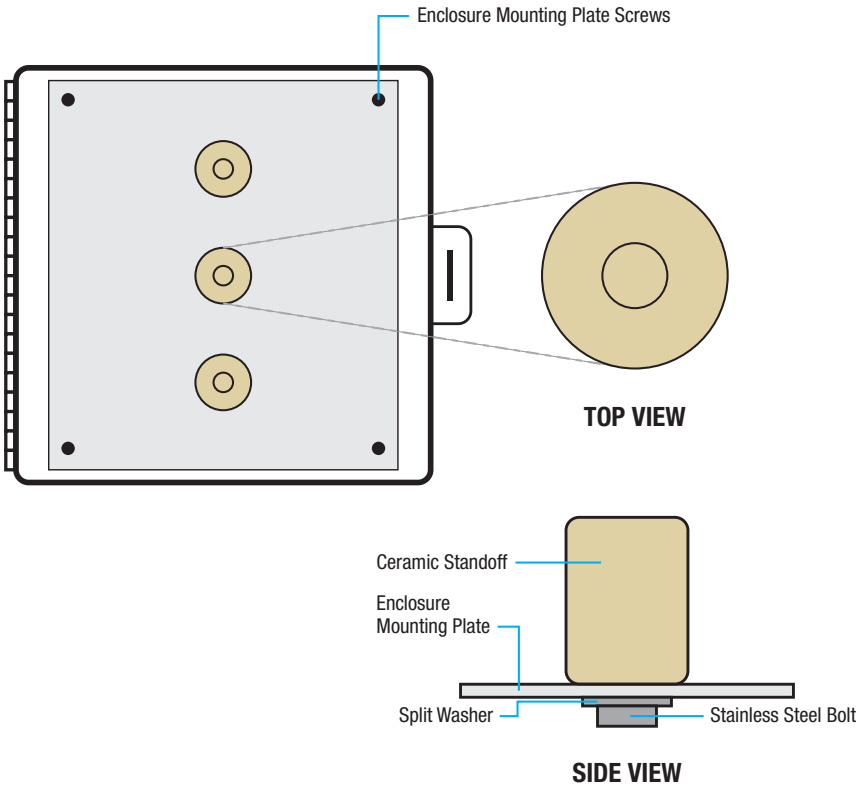
5.5) Prepare enclosure for installation by cutting holes for conduit connections and optional drain. All holes should be located to avoid interference with enclosure hasp and cover clamps. Holes may be cut with hole saw or punch with holes for connectors appropriately sized for connector trade size and 7/8 inch for optional drain.

5.6) Ceramic Stand-Off Installation

Enclosures should be prepared for splice before cable is pulled into raceway by mounting panel with ceramic stand-offs as follows:

- Drill 0.25 inch diameter holes through enclosure mounting plate to mount stand-offs. Holes should be centered vertically in the enclosure for horizontal cable installations and centered horizontally in the enclosure for vertical cable installations. For energized conductors holes should be spaced a minimum of 1-3/4 inch on center between terminals and 1-3/8 inch on center from terminal to enclosure wall and for neutral and ground conductors the center of holes should be a minimum of 1-1/4 inch from other ground or neutral terminals and minimum of 1 inch from enclosure wall.
- Remove any sharp edges and clean away any oil or metal shavings from enclosure and mounting plate.
- Attach the ceramic standoff to the mounting plate using the bolt and split washer, hand tighten holding bolt with wrench and turning ceramic standoff.
- Insert the mounting plate back into the enclosure and secure using screws provided with enclosure



5.7) Cable Installation

Pull cables into conduit leaving enough excess wire in enclosure to route within enclosure, a minimum 12 inches excess is recommended. Once cables are pulled into conduit individual conductors should not be pulled into enclosure or pushed into raceway.

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5.8) Termination

Build splice terminal following steps below:

a) Screw the stud into the ceramic standoff, finger tight the full depth of the ceramic standoff hole.

b) Install on the silicone O-ring.

c) Screw a nut on the stud until slightly compressing the O-ring.

d) Install flat stainless-steel washer.

e) Position conductors to the terminals using an arrangement that minimizes crossed conductors, does not violate minimum bend radius of 8x conductor OD, and maintains an air gap between conductor and enclosure. The arrangement shall have ½ inch minimum excess conductor length to ensure conductors are not under tension.

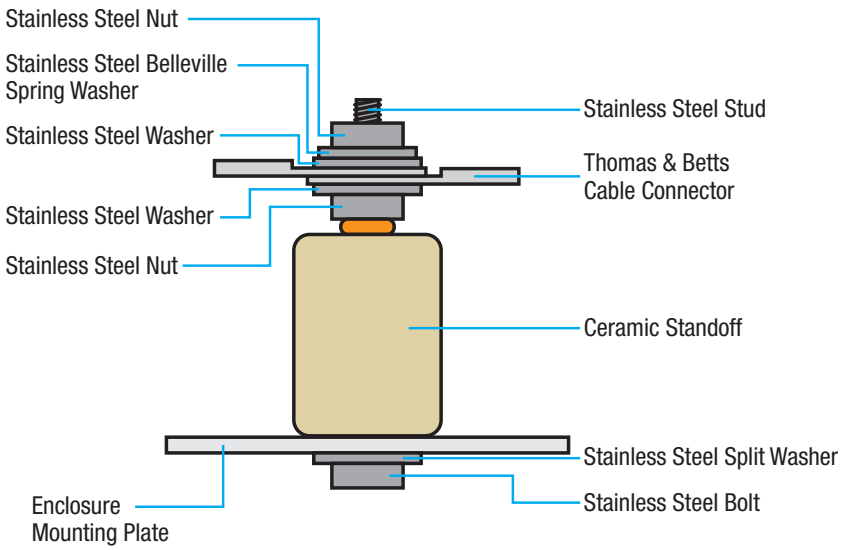
f) With arrangement determined cut conductor and strip 3/8 inch of insulation from wire. Install T&B one-hole lug on conductor and verify fit on termination stud. Crimp lug in accordance with T&B compression installation guidelines on wire in same orientation it will be when installed on stud to avoid twisting conductor being terminated.

g) Repeat step above with other conductor to be spliced on same terminal.

h) With lugs of conductors to be splice on terminal stud install remaining termination components in order shown:
- Flat stainless-steel washer
- Belleville spring washer with point of cone facing away from flat washer
- Stainless steel nut

i) Turn stud counter clock-wise to loosen ½ turn and mark to end of stud so rotation can be seen when termination nut is tightened. Hold the bottom nut with one wrench and turn the top nut to tighten until Belleville washer is flattened. If mark on stud rotates during tightening turn bottom nut to compensate.

j) Repeat above steps to connect all terminals



SIDE VIEW

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5.9) Compression Connector Butt Splices

Neutral and ground conductors may be spliced using T&B Sta-kon Cat. No. 2C-10 compression connector covered with 3M ITCSN heat shrink tubing.

a) Determine arrangement to run wires that minimizes crossed wires. Ground and neutral wires may rest against enclosure and it is recommended to run conductors along sides and bottom of enclosure.

b) Select location for splice, cut wires, and strip 3/8 inch of insulation from wires.

c) Cut 3M ITCSN-0400 heat shrink tubing to minimum length of 2.25 inches and install over one conductor to be spliced.

d) Install Sta-kon 2C-10 compression connector and crimp on conductor.

e) Mark insulation to identify where ends of heat shrink tubing should be with compression connector centered under tubing.

f) Position heat shrink tubing over splice and heat to shrink down on insulation.

5.10) Compression Connector Terminal Ring

Ground conductors may be spliced using T&B Sta-kon Cat. No. C10-10 compression terminal ring connector on enclosure stud.

a) Identify stud location within enclosure that conductor are to connect and determine arrangement to run wires that minimizes crossed wires. Ground wires may rest against enclosure and it is recommended to run conductors along sides and bottom of enclosure.

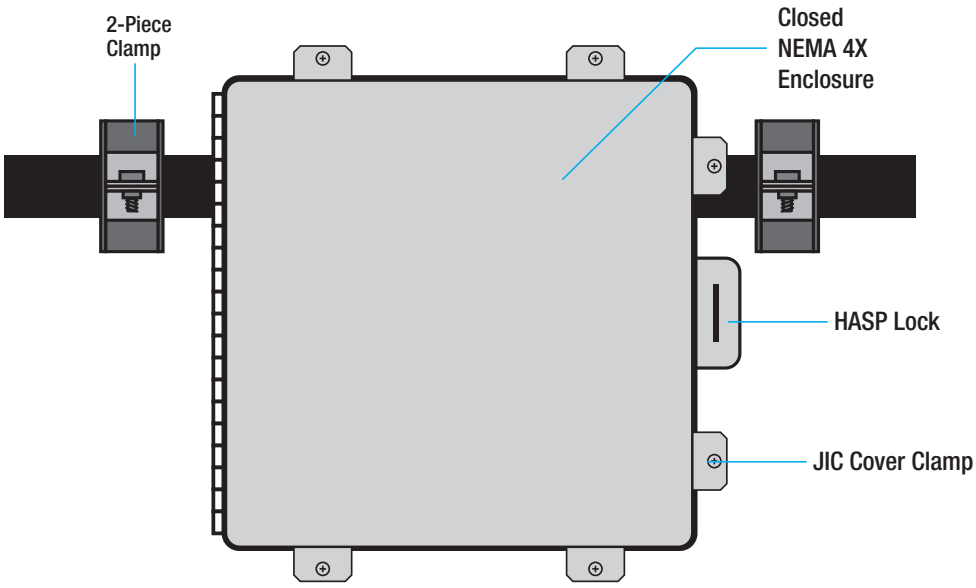
b) Select location for splice, cut wires, and strip 3/8 inch of insulation from wires.

c) Install Sta-kon C10-10 compression connector and crimp on conductor.

d) Install connector on stud.

e) Install nut on stud and tighten to complete termination

5.11) Clean material scraps from inside enclosure and inspect wire to ensure there no damage occurred during installation. Close enclosure cover and secure with JIC coverclamps.



Lifeline® Power Cables: RHW-2 or RW90 Fire Resistive Cables in BreathSaver® XW Phenolic Conduit

UL 2196/ULC-S139 Certified Fire Resistive Cable for Survivability in a Fire

SPECIFICATIONS / RATINGS

- Listed to UL 44/CSA 22.2 No.38, Thermoset Insulated Wires and Cables, as the following type:

  – RHW-2, or RW90, 600 Volt, Rated 90°C Dry/90°C Wet
- Classified to UL 2196/ULC-S139, Standard for Tests for Fire Resistive Cables, for one-hour
- Electrical Circuit Integrity System (FHIT/ FHIT7) No. 25D of the UL Fire Resistance Directory for installations in BreathSaver® XW Phenolic conduit
- Sunlight Resistant
- FT4 Rated
- ST1
- IEEE 1202
- NFPA 70, NFPA 72, NFPA 101, NFPA 130

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RoHS COMPLIANT

DESIGN PARAMETERS

CONDUCTORS: Bare stranded copper, 12 AWG and 10 AWG

FIRE BARRIER: High Temperature Mica Tapes

INNER INSULATION: Ceramifiable silicone, Low Smoke Zero Halogen (LSZH)

OUTER INSULATION: Cross-linked polyolefin (XLPO), Low Smoke Zero Halogen

JACKET: Cross-linked polyolefin (XLPO), Low Smoke Zero

IDENTIFICATION:

ORIGIN USA PRYSMIAN GROUP MA P/N [######] [X]AWG ([Y] mm²) LIFELINE® c(UL)us RHW-2 or RW90 600V FT4 ST1 VW1 FT1 (UL) 2196/(ULC) S139 FHIT/7 25D FRR 1HR 480V UTILIZATION ([mm] [yr]) [2FT]

Notes: [#] is cable part number
[X] is cable size in AWG
[Y] is cable size in mm²

Table 2 - Cable Description

LIFELINE® Part Number	Conductor Size AWG	Number of Strands	Insulation Thickness		Overall Diameter		Approximate Weight		Ampacity[1]	
			in	mm	in	mm	lb/mft	kg/km	75°C	90°C
G30062	12	7	0.045	1.1	0.22	5.5	37	55	25*	30*
G30063	10	7	0.045	1.1	0.24	6.1	52	77	35*	40*

[1] Ampacities are based on Table 310.16 of the National Electrical Code (NEC) (NFPA 70-2020) for 3 current carrying conductors at 30°C ambient.

* Over current protection device limitations of Articles 240.4(D)(4) and (5) of National Electrical Code (NFPA 70) require 15amp overprotection for 12 AWG and 20amp overprotection for 10 AWG for uses not permitted in Articles 240.4(E) or (G).

The above dimensions are approximate and subject to normal manufacturing tolerances. Information subject to change without notice

Table 3 - Minimum Allowable Conduit Size

Minimum Allowable Conduit Size							
Conductor Size AWG	**1**	**2**	**3**	**4**	**5**	**6**	**7**
12	3/4	3/4	3/4	3/4	3/4	3/4	3/4
10	3/4	3/4	3/4	3/4	3/4	1	1

Cables may be installed in ¾ inch or 1-inch raceways with up to seven conductors and not exceeding 39% raceway fill ratio.

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