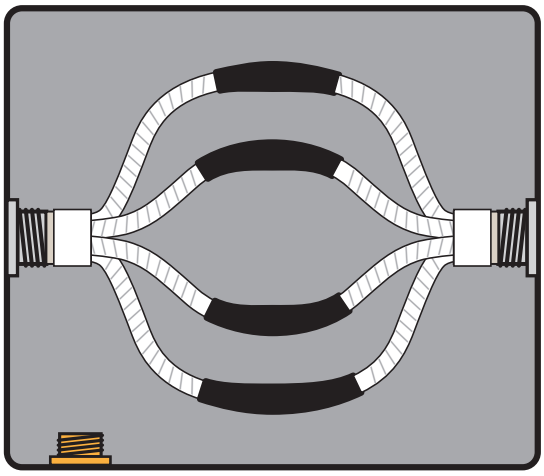
Installation Instructions for Lifeline® MC/RC90: Cable Splice Using Lifeline® Ceramifiable Tape

Technical Information Sheet #403

Classified by UL/ULC to UL 2196/ULC-S139 for two-hour installations For use with Lifeline® MC/RC90 Cables and Jacketed LSZH MC/RC90 Cables sizes 2 AWG to 750MCM, UL Electrical Circuit Integrity System (FHIT) No. 50 or UL Electrical Circuit Integrity System Certified for Canada (FHIT7) No. 51.



DESCRIPTION

The Lifeline® MC/RC90 Splice using Lifeline® ceramifiable tape and listed components to assemble the 2-hour fire rated splice system. In addition to Lifeline® Ceramifiable Tape, the splice system requires materials listed below. Please refer to UL FHIT No. 50 for USA installations or ULC FHIT7 No.51 for more details and read these instructions thoroughly before beginning installation.For technical support please contact Prysmian Cables and Systems USA at na.lifeline@prysmian.com.

GENERAL

Only use NEMA 4X stainless steel enclosures with mounting plate as specified in Table 3 for USA or Canada Installations, REMKE PowR-Teck™ stainless steel metal clad cable con-nectors and Thomas & Betts Blackburn® copper compres-sion connectors and other materials listed above. Support the Lifeline® MC/RC90 cable with a 2-piece clamp a maximum of 12 inches from the enclosure and every four feet thereafter. Do not add any other materials inside splice enclosure that are not included in these installation instructions. Cable splices are only to be performed on cable installed in horizontal orientation. Check the size of the enclosures and connectors prior to beginning installation. Recommended enclosure sizes for Lifeline® MC/RC90 cables are provided in Table 1 and Table 2, also reference REMKE PowR-Teck™ Metal Clad cable connector installation, DocNo 2-100102.

MATERIALS NEEDED

- Lifeline® Ceramifiable Tape, Part Number 593-0100-057
- REMKE PowR-Teck™ stainless steel metal clad cable connectors. Catalog numbers provided in Tables 1 and 2
- Stainless steel connector locking nuts
- UL listed NEMA 4X stainless steel enclosure with interior mounting panel. Enclosure model numbers and manufacturers are listed in Table 3. Enclosures manufactured by Resolve One and Selco can be used in USA, and Resolve One enclosures can be used in Canada.
- Eaton Crouse-Hinds DPE Brass Breather Drain, DPE1029S3
- Thomas & Betts Blackburn® Two-Way Splice Connectors. Catalog numbers provided in Table 4
- 3M™ Heavy Wall Heat Shrink Tubing ITCSN. Catalog numbers provided in Table 5
- 3M™ Glass Cloth Electrical Tape 69

TOOLS NEEDED

- Tubing cutter
- Wire stripping tool
- Large flat head screw driver
- Channel-lock pliers
- Stainless steel capable hole saw
- Heat Gun or Torch
- Small Steel Scale
- Utility knife
- Hammer
- Cable cutter
- Scissors
- Marker
- Crimping tool
- Tape Measure

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SPLICE TERMINAL INSTALLATION

1 Mounting Enclosure

a) Prepare enclosure holes for Remke connectors. Holes should be located at or above the vertical middle of enclosure wall and offset as needed to ensure clearance necessary between connector body and enclosure components such as cover, clamps, hasp, or hinge. Cut holes with appropriately sizes hole saw.

b) Prepare enclosure hole for Breather/Drain. Hole should be located on bottom of enclosure and positioned to ensure clearance between Breather/ Drain and enclosure cover, clamps. Cut hole with 7/8 inch hole saw.

c) Remove sharp edges from holes and any cutting clean oil or metal chips from enclosure.

d) Mount enclosure to fire rated support structure using 3/8 inch or larger steel bolts.

2 Securing Cable

a) Install REMKE PowR-Teck™ Metal Clad cable connectors and secure using stainless steel locking nut according to REMKE manufacturers installation Doc No. 2-100102.

b) Remove copper armor from cable using tubing cutter while being careful not to cut into cable inner jacket. For multi-conductor cables it is recommended to remove armor for length equal to two inches greater than enclosure width to ensure sufficing length of conductors is available for terminating. For single conductor cables the recommended armor strip length is half the box width plus 2 inches.

c) Cut off and remove outer filler and polyester tape where these components exit the armor.

d) When cables have overall LSZH jacket it should be stripped for length specified in REMKE manufacturers installation Doc No. 2-100102

e) Insert the Lifeline® MC/RC90 cable through connector and into enclosure. Bend excess conductor length out enclosure opening and take care not to damage the cable when pushing into enclosure.

f) Tighten REMKE connector gland nuts according to REMKE manufacturers installation Doc No. 2-100102.

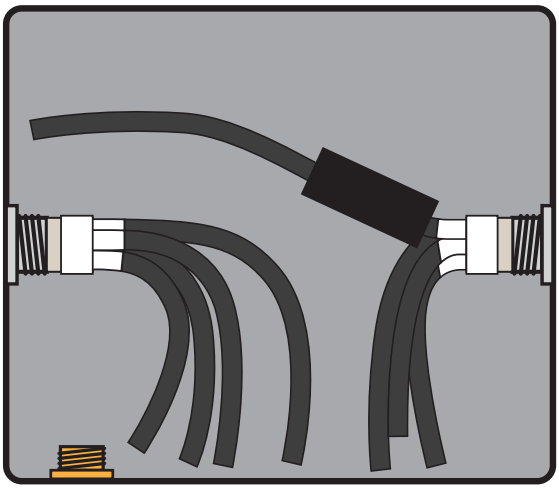
3 Termination

a) For multi-conductor cables remove the inner jacket to 1 inch from the MC connector while taking care not to nick or cut conductor insulation.

b) Apply four wraps around jacket 3M 69 tape over inner jacket. For multi-conductor cables the edge of tape is aligned with edge of inner jacket, one inch form connector hub and for single conductor cables the tape edged shall be one inch from connector hub.

c) For multi-conductor cables apply four wraps of 3M 69 tape around each conductor immediately after conductors exit inner jacket.

d) Install pre-cut length of heat shrink tubing over one side of conductor pair to be spliced. Determine where splice will be positioned within enclosure, allowing at least 1.25 inches of excess conductor within enclosure when splice is completed and enough length for heat shrink tubing to remain until ready for installation over connector. It is recommended to splice conductors located near back of enclosure first to permit access to all conductors installation.



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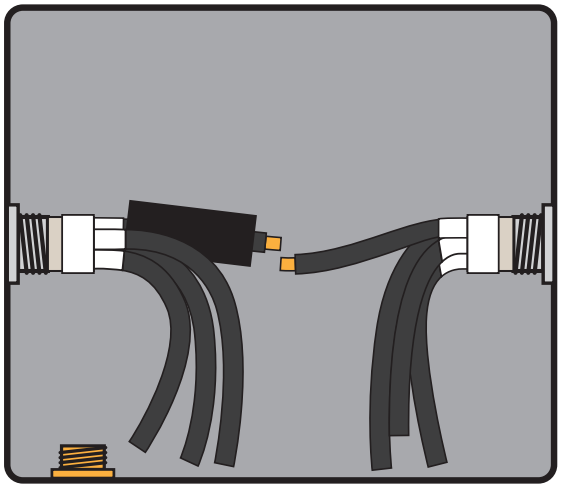
3 Termination (Continued)

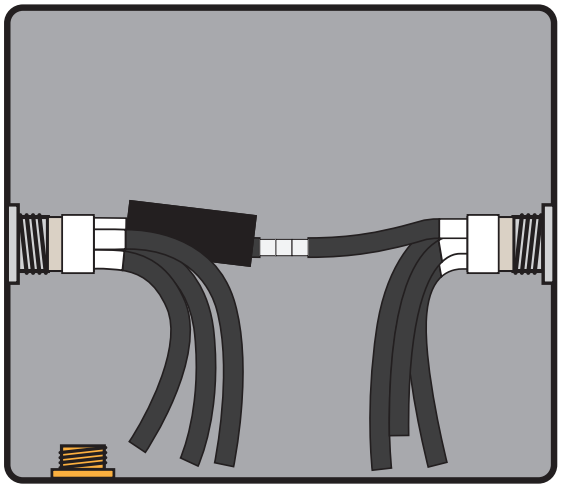
e) Cut conductors to be spliced with consideration for the desired splice location.

f) Strip to expose conductor for length required to properly fit the connector. The strip length depends on wire size and connector length and should be half the overall length of connector. This will insure conductor fully inserts into connector and minimal conductor is exposed outside connector.

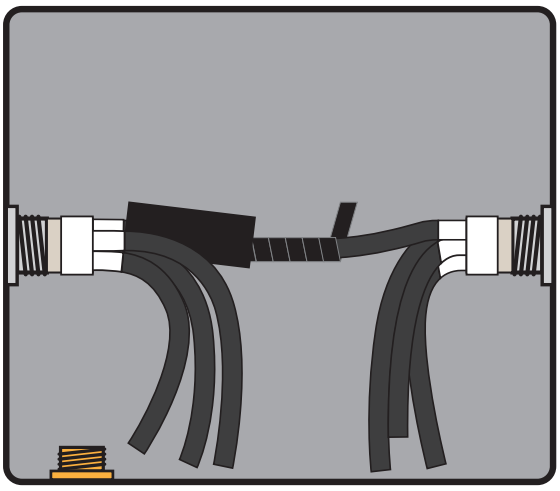
g) Apply reference mark on multi conductor insulation or single conductor cable inner jacket one inch from the stripped end. This mark will be used to determine proper position of heat shrink tubing.



h) Install compression connector over exposed conductor ends and crimp with correct color-coded die.

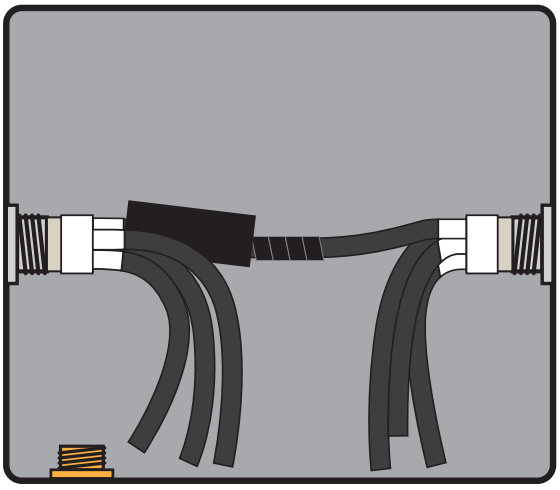


i) Cut strip of Lifeline® Ceramifiable tape and wrap connector at 45-degree angle with 50 percent overlap. Start wrapping over insulation with leading edge of tape aligned with one side of connector, continue wrapping until other side of connector is reached, and connector is covered by tape two layers thick.



j) Inspect tape to ensure it has proper coverage and tear free wrap. Wrinkles occurring during wrapping may be compressed smooth by hand.

k) Remove excess Lifeline® Ceramifiable tape so only compression connector is covered by tape. Excess can be carefully removed by circumferentially cutting with utility knife at each side of connector. When done the connector should be covered with two layers of Lifeline® Ceramifiable tape and there should be one inch from each side of the Lifeline® Ceramifiable tape to reference marks previously applied.



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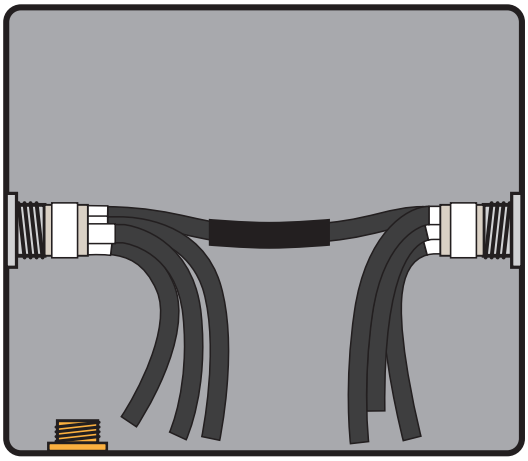
3 Termination (Continued)

l) Slide heat shrink tubing over wrapped connector and verify connector is centered under tubing based on reference marks previously placed on conductor insulation. When installing shrink tubing care should be taken to not damage or move Ceramifiable wrap. Tubing is sized to slide freely over the wrapped connector. However, care must be taken when conductors are bent leading into the compression connector; when this occurs tubing must be bent and guided over taped compression connector. For difficult installations the polyester separator tape supplied with Ceramifiable tape may be placed longitudinally over wrapped connector to protect wrap from damage during tubing installation. If the polyester tape is used as aid during tubing installation it needs to be removed prior to shrinking the tube.

m) Shrink tubing with heat gun or torch.



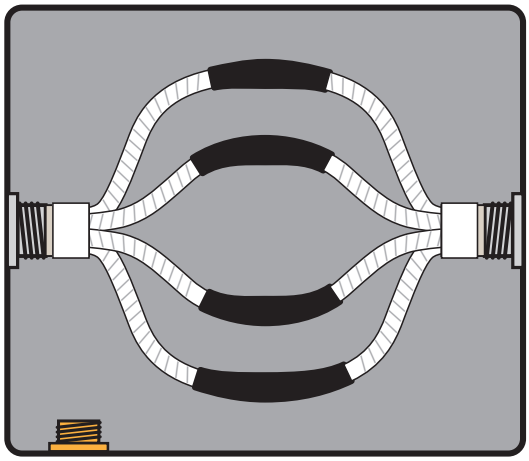
n) Apply four layers 3M 69 glass tape with 50% overlap between heat shrink tubing and tape applied in previous steps. In many applications there will be not enough room within enclosure to apply tape directly from roll and tape will need to be cut into strips for application. When applied as multiple strips, edges of each section should overlap the previous by a quarter inch.

   i) Start wrapping with tape overlapped on tape applied in step 3b for single conductor cables or step 3c for multiconductor cables and apply with 50% overlap until edge of heat shrink tubing is reached.

   ii) Apply second layer starting at heat shrink tubing to tape applied in steps 3b or 3c.

   iii) Repeat two previous steps to complete four 3M 69 tape wraps.

o) Repeat steps 3d through 3n on remaining conductors.



4 Finishing Steps

a) Inspect splices to ensure proper installation of previous steps.

b) Install Breather/Drain in bottom of enclosure.

c) Remove any scraps of material from inside enclosure.

d) Close enclosure cover and secure clamps.

e) Secure the cable within 12 inches of the enclosure using steel 2-piece conduit clamps.

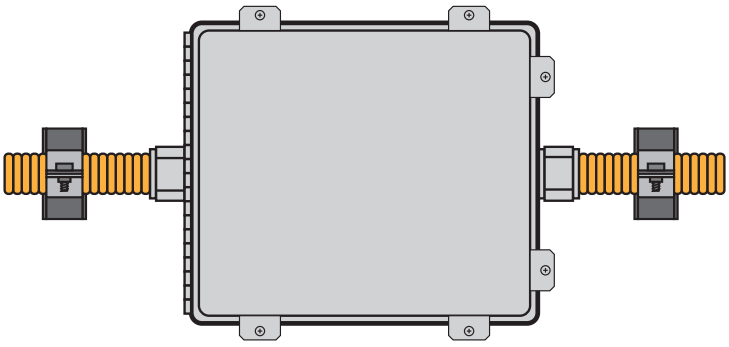


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Table 1[1] Non-Jacketed Lifeline MC/RC90 Cable

LIFELINE® Part Number	Conductor Size (AWG/MCM)	Number of Conductor	Nominal Core Diameter (in)	Nominal Armor Diameter (in)	Remke Connector (Cat. No.)	Remke Connector Hub Size (in)	Recommended Enclosure Size[2] (W x H x D)
LMC03002	2AWG	3	1.07	1.40	RTKSS-125-9-H-LNSS	1.25	10 x 10 x 4
LMC04002	2AWG	4	1.18	1.57	RTKSS-125-10-H-LNSS	1.25	10 x 10 x 4
LMC03001	1AWG	3	1.24	1.77	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMC04001	1AWG	4	1.37	1.77	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMC011/0	1/0AWG	1	0.65	0.90	RTKSS-075-5-H-LNSS	0.75	10 x 10 x 4
LMC031/0	1/0AWG	3	1.33	1.77	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMC041/0	1/0AWG	4	1.47	1.83	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMC012/0	2/0AWG	1	0.69	0.96	RTKSS-075-5-H-LNSS	0.75	10 x 10 x 4
LMC032/0	2/0AWG	3	1.41	1.83	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMC042/0	2/0AWG	4	1.56	1.98	RTKSS-150-13-H-LNSS	1.50	12 x 12 x 6
LMC013/0	3/0AWG	1	0.74	1.08	RTKSS-075-6-H-LNSS	0.75	10 x 10 x 4
LMC033/0	3/0AWG	3	1.52	1.98	RTKSS-200-14-H-LNSS	2.00	16 x 16 x 6
LMC043/0	3/0AWG	4	1.69	2.15	RTKSS-200-15-H-LNSS	2.00	16 x 16 x 6
LMC014/0	4/0AWG	1	0.80	1.20	RTKSS-100-7-H-LNSS	1.00	12 x 12 x 4
LMC034/0	4/0AWG	3	1.64	2.15	RTKSS-200-15-H-LNSS	2.00	16 x 16 x 6
LMC044/0	4/0AWG	4	1.82	2.27	RTKSS-200-16-H-LNSS	2.00	16 x 16 x 6
LMC01250	250MCM	1	0.87	1.27	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMC03250	250MCM	3	1.81	2.27	RTKSS-200-16-H-LNSS	2.00	16 x 16 x 6
LMC04250	250MCM	4	2.00	2.48	RTKSS-200-18-H-LNSS	2.00	20 x 20 x 6
LMC01300	300MCM	1	0.93	1.27	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMC01350	350MCM	1	0.98	1.35	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMC03350	350MCM	3	2.04	2.48	RTKSS-250-19-H-LNSS	2.50	20 x 20 x 6
LMC04350	350MCM	4	2.26	2.73	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMC01400	400MCM	1	1.03	1.40	RTKSS-125-9-H-LNSS	1.25	12 x 12 x 4
LMC03400	400MCM	3	2.13	2.73	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMC04400	400MCM	4	2.37	2.79	RTKSS-300-21-H-LNSS	3.00	24 x 24 x 8
LMC01500	500MCM	1	1.11	1.57	RTKSS-125-10-H-LNSS	1.25	12 x 12 x 4
LMC03500	500MCM	3	2.31	2.79	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMC04500	500MCM	4	2.57	3.08	RTKSS-300-22-H-LNSS	3.00	24 x 24 x 8
LMC01600	600MCM	1	1.22	1.77	RTKSS-150-12-H-LNSS	1.50	14 x 14 x 4
LMC03600	600MCM	3	2.54	3.08	RTKSS-300-22-H-LNSS	3.00	24 x 24 x 8
LMC04600	600MCM	4	2.83	3.35	RTKSS-350-24-H-LNSS	3.50	28 x 28 x 8
LMC01750	750MCM	1	1.32	1.77	RTKSS-150-12-H-LNSS	1.50	14 x 14 x 4

[1] To ensure proper sizing of connectors and enclosures please check https://www.prysmian.com for the latest version of this document.

[2] Enclosure sizes used for splicing are based on 1-in-1-out scenario and must be sized in accordance with NFPA 70, Article 314.28 for USA installations or Canadian Electrical Code for Canada installations or with these instructions, whichever is larger. In case of splicing scenarios other than 1-in-1-out, please contact na.lifeline@prysmian.com for enclosure sizing.

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Table 2[1] Jacketed Lifeline MC/RC90 Cable

LIFELINE® Part Number	Conductor Size (AWG/MCM)	Number of Conductors	Nom. Core Diameter (in)	Nom. Armor Diameter (in)	Nom. Jacket Diameter (in)	Remke Connector (Cat. No.)	Remke Connector Hub Size (in)	Recommended Enclosure Size[2] (W x H x D)
LMCJ03002	2AWG	3	1.07	1.40	1.50	RTKSS-125-9-H-LNSS	1.25	10 x 10 x 4
LMCJ04002	2AWG	4	1.18	1.57	1.69	RTKSS-125-10-H-LNSS	1.25	10 x 10 x 4
LMCJ03001	1AWG	3	1.24	1.77	1.89	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMCJ04001	1AWG	4	1.37	1.77	1.89	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMCJ011/0	1/0AWG	1	0.65	0.90	1.00	RTKSS-075-5-H-LNSS	0.75	10 x 10 x 4
LMCJ031/0	1/0AWG	3	1.33	1.77	1.89	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMCJ041/0	1/0AWG	4	1.47	1.83	1.95	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMCJ012/0	2/0AWG	1	0.69	0.96	1.06	RTKSS-075-5-H-LNSS	0.75	10 x 10 x 4
LMCJ032/0	2/0AWG	3	1.41	1.83	1.95	RTKSS-150-12-H-LNSS	1.50	12 x 12 x 4
LMCJ042/0	2/0AWG	4	1.56	1.98	2.10	RTKSS-150-13-H-LNSS	1.50	12 x 12 x 6
LMCJ013/0	3/0AWG	1	0.74	1.08	1.18	RTKSS-075-6-H-LNSS	0.75	10 x 10 x 4
LMCJ033/0	3/0AWG	3	1.52	1.98	2.10	RTKSS-200-14-H-LNSS	2.00	16 x 16 x 6
LMCJ043/0	3/0AWG	4	1.69	2.15	2.27	RTKSS-200-15-H-LNSS	2.00	16 x 16 x 6
LMCJ014/0	4/0AWG	1	0.80	1.20	1.30	RTKSS-100-7-H-LNSS	1.00	12 x 12 x 4
LMCJ034/0	4/0AWG	3	1.64	2.15	2.27	RTKSS-200-15-H-LNSS	2.00	16 x 16 x 6
LMCJ044/0	4/0AWG	4	1.82	2.27	2.42	RTKSS-200-16-H-LNSS	2.00	16 x 16 x 6
LMCJ01250	250MCM	1	0.87	1.27	1.37	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMCJ03250	250MCM	3	1.81	2.27	2.42	RTKSS-200-16-H-LNSS	2.00	16 x 16 x 6
LMCJ04250	250MCM	4	2.00	2.48	2.63	RTKSS-200-18-H-LNSS	2.00	20 x 20 x 6
LMCJ01300	300MCM	1	0.93	1.27	1.37	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMCJ01350	350MCM	1	0.98	1.35	1.45	RTKSS-125-8-H-LNSS	1.25	12 x 12 x 4
LMCJ03350	350MCM	3	2.04	2.48	2.63	RTKSS-250-19-H-LNSS	2.50	20 x 20 x 6
LMCJ04350	350MCM	4	2.26	2.73	2.88	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMCJ01400	400MCM	1	1.03	1.40	1.50	RTKSS-125-9-H-LNSS	1.25	12 x 12 x 4
LMCJ03400	400MCM	3	2.13	2.73	2.88	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMCJ04400	400MCM	4	2.37	2.79	2.94	RTKSS-300-21-H-LNSS	3.00	24 x 24 x 8
LMCJ01500	500MCM	1	1.11	1.57	1.69	RTKSS-125-10-H-LNSS	1.25	12 x 12 x 4
LMCJ03500	500MCM	3	2.31	2.79	2.94	RTKSS-250-20-H-LNSS	2.50	20 x 20 x 6
LMCJ04500	500MCM	4	2.57	3.08	3.25	RTKSS-300-22-H-LNSS	3.00	24 x 24 x 8
LMCJ01600	600MCM	1	1.22	1.77	1.89	RTKSS-150-12-H-LNSS	1.50	14 x 14 x 4
LMCJ03600	600MCM	3	2.54	3.08	3.25	RTKSS-300-22-H-LNSS	3.00	24 x 24 x 8
LMCJ04600	600MCM	4	2.83	3.35	3.52	RTKSS-350-24-H-LNSS	3.50	28 x 28 x 8
LMCJ01750	750MCM	1	1.32	1.77	1.89	RTKSS-150-12-H-LNSS	1.50	14 x 14 x 4

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[2] Enclosure sizes used for splicing are based on 1-in-1-out scenario and must be sized in accordance with NFPA 70, Article 314.28 for USA installations or Canadian Electrical Code for Canada installation or with these instructions, whichever is larger. In case of splicing scenarios other than 1-in-1-out, please con-tact na.lifeline@prysmian.com for enclosure sizing.

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Table 3

NEMA 4X Enclosures

Enclosure (W x H x D)	Selco Mfg Model Number[3]	Resolve One Model Number[4]
10 x 10 x 4 - inch	NE4X-101004-F	AB-R101004JHFX3T304HT
12 x 12 x 4 - inch	NE4X-121204-F	AB-R121204JHFX3T304HT
14 x 14 x 4 - inch	NE4X-141404-F	AB-R141404HFX3T304HT
16 x 16 x 6 - inch	NE4X-161606-F	AB-R161606HFX3T304HT
20 x 20 x 6 - inch	NE4X-202006-F	AB-R202006HFX3T304HT
24 x 24 x 8 - inch	NE4X-242408-F	AB-R242408HFX3T304HT
28 x 28 x 8 - inch	NE4X-282808-F	AB-R282808HFX3T304HT

[3] Selco NEMA 4X Enclosures may only be used in 480 volt USA installations per FHIT No. 50.

[4] Resolve One NEMA 4X Enclosures may be used in both 480 volt USA installations per FHIT No. 50 and 600 volt Canada installations per FHIT7 No. 51.

Table 4

Thomas & Betts Blackburn® Copper Compression Connectors

Conductor Size (AWG/MCM)	Thomas & Betts Catalog Number
2	54507
1	54508
1/0	54509
2/0	54510
3/0	54511
4/0	54512
250	54513
300	54514
350	54515
400	54516
500	54518
600	54520
750	54523-TB

Table 5

3M™ Heavy Wall Heat Shrink Tubing ITCSN

Conductor Size (AWG/MCM)	3M™ Heat Shrink Tubing Catalog Number
2	ITCSN-0800
1	ITCSN-1100
1/0	ITCSN-1100
2/0	ITCSN-1100
3/0	ITCSN-1100
4/0	ITCSN-1100
250	ITCSN-1500
300	ITCSN-1500
350	ITCSN-1500
400	ITCSN-2000
500	ITCSN-2000
600	ITCSN-2000
750	ITCSN-2000

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