



Southwire®

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# Diesel Locomotive (DLO) Cable Overview





# DIESEL LOCOMOTIVE (DLO) CABLE

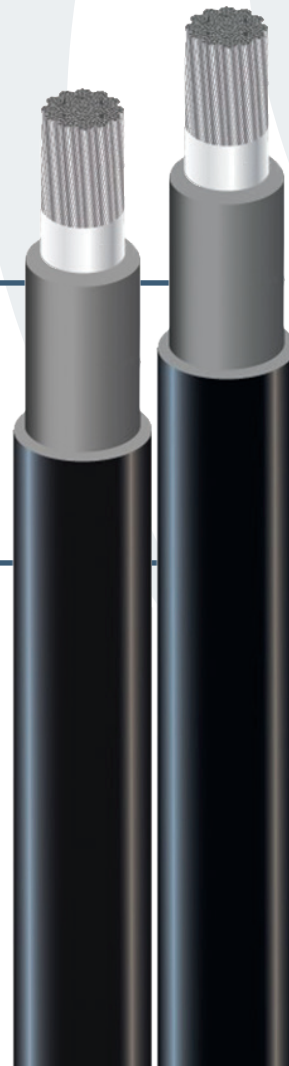
Developed in the early 1900s, Diesel Locomotive (DLO) cables were designed for wiring diesel-electric locomotive trains. These heavy duty 2kV cables were used as power-leads in traction motors and as open wiring to the diesel electric motors. Today, due to their rugged construction, these cables are not only used for their original purpose, wiring diesel trains, but are also used in drilling rigs, earth moving equipment, and a variety of other industrial applications.

## CONSTRUCTION

Southwire's Heavy-Duty Flexible Power Cable – DLO (HDFPC-DLO) - is manufactured with Flexible Stranded Rope-Lay, Class I Tinned Copper conductor, with a Thermoset Ethylene Propylene Diene Monomer (EPDM) insulation and Thermoset Chlorinated Polyethylene jacket (CPE).

## FEATURES

The cable is listed as RHH/RHW-2 for 2 kV in sizes 14 AWG through 1111 kcmil as per UL 44. The maximum continuous operating temperature, wet or dry, is 90°C in normal conditions, 130°C for emergency or overload, and 250°C in short circuit conditions. The cable also meets the cold bend tests at -40°C as per CSA C22.2 No. 38. HDFPC-DLO is oil, heat, flame, abrasion, and sunlight resistant.



## SPECIFICATIONS AND COMPLIANCES

- ASTM B3 Standard Specification for Soft or Annealed Copper Wire
- ASTM B33 Standard Specification for Tin-Coated Soft or Annealed Copper Wire
- ASTM B172 Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Copper Conductors
- UL 44 Thermoset-Insulated Wires and Cables
- UL 1685 Vertical-Tray Fire Propagation and Smoke Release Test (1/0 and Larger)
- UL 2806 Heavy Duty Flexible Power Cable (HDFPC-DLO)
- CSA C22.2 No. 38 Thermoset-Insulated Wires and Cables Type RW90
- ICEA S-95-658 (NEMA WC70) Power Cables Rated 2kV or Less for the Distribution of Electrical Energy
- IEEE 1202 FT4 Flame Test (70,000) BTU/hr Vertical Tray Test
- MSHA Approved



## DLO CABLE APPLICATIONS

When DLO cables are used as conductors for general wiring practices, in accordance with the NEC Article 310 based on their RHH/RHW-2 listing, the cables are subject to the same requirements as any other RHW insulated conductors. When DLO cables are used as conductors for general wiring practices, in accordance with the NEC® Article 310 based on their RHH/RHW-2 listing, the cables are subject to the same requirements as any other RHH/RHW rated conductors. Sizes 1/0 AWG and larger are rated for cable tray applications with flame retardant features.

## OTHER MAIN APPLICATIONS FOR DLO CABLES ARE:

- Railroad and mass transit car wiring
- General building wire RHH/RHW-2 as per UL 44
- Deep well submersible pump cable
- Petrochemical drilling rigs – Offshore and Onshore – MSHA
- Mining operations
- Wind turbines
- Battery power cable
- Control panel power distribution
- Earth moving equipment
- Heavy-duty flexible power cables
- Portable or fixed installations
- Leads for motors, generators, batteries, and jumper cables
- Solar farms



## SOUTHWIRE DLO CABLE PRINT LEGEND

SOUTHWIRE® xxx SIZE AWG (xxx mm<sup>2</sup>) EPR/CPE 2KV HDFPC-DLO TYPE RHH OR RHW-2 (-40°C) PR II SUN RES FOR CT USE (UL) E30117 (CSA LOGO) LL90458 RW90 EP 2KV (-40°C) EP/CPE TC FT4 --- P-07-KA100013-MSHA SEQUENTIAL FOOTAGE MARKS

## DLO CABLE AMPACITY TABLES

The below tables are representative of cables labeled with a UL listed insulation, such as type RHW-2, and are used outside the railroad industry. Some DLO cable sizes, such as 262kcmil, 535kcmil, and 777kcmil, are not in the National Electrical Code (NEC) tables. The interpolation of NEC tables may appear a logical solution for calculating ampacity but is important to perform thermal analysis calculations based on the Neher-McGrath Method because the ampacity values in the NEC tables are given as per this method.

Most of the wire and cable manufacturers' ampacity data is based on the table for single cables in air, but the more typical applications for these cables are three conductors in raceway, conduit, or direct buried. Ampacity for these applications can be found in NEC Table 310.16 for low voltage.

The ampacity of a DLO cable depends on its ability to dissipate heat without damage to the conductor or its EPDM rubber insulation. DLO cable ampacity is a function of the insulation temperature rating, the electrical resistance of the conductor material, the ambient temperature, and the ability of the insulated conductor to dissipate heat.

**Table 1 – Ampacity based in the NEC 2017 310.15(B)(16) conditions.**

The values from the thermal analysis at Conductor Temperature 75°C are included.

Cable Size	NEC 2017 310.15(B)(16) Ampacity at 75°C	DLO Ampacity at 75°C Thermal Analysis	Conduit(1) Diameter for the Thermal Analysis(inches)
12	25	28	2"
10	35	37	2"
8	50	51	3"
6	65	67	3"
4	85	87	3"
3	100	101	3"
2	115	116	3"
1	130	134	3"
1/0	150	153	3"
2/0	175	176	3"
3/0	200	201	3"
4/0	230	232	3"
250	255	267	4"
262	261*	274	4"
313	292*	303	4"

**Table 1 CONT – Ampacity based in the NEC 2017 310.15(B)(16) conditions.**

The values from the thermal analysis at Conductor Temperature 75°C are included.

Cable Size	NEC 2017 310.15(B)(16) Ampacity at 75°C	DLO Ampacity at 75°C Thermal Analysis	Conduit(1) Diameter for the Thermal Analysis(inches)
350	310	325	4"
444	355*	371	4"
500	380	396	4"
535	394*	409	4"
646	438*	469	5"
750	475	513	5"
777	483*	517	5"
800	490	530	5"
900	520	562	5"
929	527*	565	5"
1000	545	605	6"
1111	564*	641	6"

\*Interpolation values from NEC Table 310.15(B)(16)

(1) Conduit diameter has been increased to prevent issues with the Duct Fill and Jam Ratio.

**Table 2 – Ampacity based in the NEC 2017 310.15(B)(16) conditions.**

The values from the thermal analysis at Conductor Temperature 90°C are included

Cable Size	NEC 2017 310.15(B)(16) Ampacity at 90°C	DLO Ampacity at 90°C Thermal Analysis	Conduit(1) Diameter for the Thermal Analysis (inches)
12	30	32	2"
10	40	42	2"
8	55	57	3"
6	75	76	3"
4	95	99	3"
3	115	115	3"
2	130	131	3"
1	145	151	3"
1/0	170	173	3"
2/0	195	198	3"
3/0	225	227	3"
4/0	260	261	3"
250	290	301	4"
262	297*	309	4"
313	327*	342	4"
350	350	366	4"
444	400*	419	4"
500	430	448	4"
535	444*	463	4"
646	491*	530	5"
750	535	581	5"
777	545*	585	5"
800	555	606	5"
900	585	637	5"
929	593*	641	5"
1000	615	686	6"
1111	637*	728	6"

\*Interpolation values from NEC Table 310.15(B)(16)

(1) Conduit diameter has been increased to prevent issues with the Duct Fill and Jam Ratio.

**Table 3 – Ampacity based in the NEC 2017 310.15(B)(17) conditions.**

The values from the thermal analysis at Conductor Temperatures 75°C and 90°C are included.

Cable Size	NEC 2017 310.15(B)(17) Ampacity		DLO Ampacity Thermal Analysis	
	75°C	90°C	75°C	90°C
12	35	40	46	52
10	50	55	60	68
8	70	80	80	90
6	95	105	106	120
4	125	140	140	157
3	145	165	161	182
2	170	190	186	210
1	195	220	216	244
1/0	230	260	250	281
2/0	265	300	288	325
3/0	310	350	334	376
4/0	360	405	387	436
250	405	455	430	485
262	417*	468*	439	496
313	468*	527*	498	562
350	505	570	532	600
444	577*	651*	621	701
500	620	700	663	749
535	643*	725*	681	770
646	716*	808*	766	867
750	785	885	843	954
777	801*	903*	853	966
800	815	920	874	990
900	870	980	933	1058
929	888*	1001*	950	1078
1000	935	1055	986	1119
1111	992*	1119*	1028	1167

\*Interpolation values from NEC Table 310.15(B)(17)

### DLO CABLE BENDING RADIUS

During installation, DLO cables are bent or flexed according to the installation requirements. DLO cables are often bent around a curve in conduits, trays, or underground ducts. To prevent cable damage, cable standards associations, such as the Insulated Cable Engineers Association (ICEA), set requirements for minimum bend radius.

As per ICEA S-95-658 (NEMA WC70), the applicable minimum bend radii for non-shielded power cables without metallic sheaths or armor are:

Cable Overall Diameter (O.D.)	Multiplying Factor
Cable O.D. ≤ 1 inch	4D
1.001 inches ≤ Cable O.D. ≤ 2 inches	5D
Cable O.D. > 2 inches	6D

D = Cable overall diameter

### LUGS AND CONNECTORS

The major lug manufacturers like ILSCO, Burndy, and Thomas & Betts offer special lugs for fine stranded conductors such as DLO, welding, Type W, Type G, and Type G-GC cables.

**FOR MORE INFORMATION ON OUR DLO CABLE AND ALL OUR WIRE AND CABLE PRODUCTS, PLEASE VISIT [SOUTHWIRE.COM](http://SOUTHWIRE.COM)**



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