

Application

Type P is a flexible offshore and marine power cable to IEEE 1580, dual certified to UL 1309 / CSA 245 as Type X110 and rated 0.6/1 kV at +110 °C. It has soft annealed flexible stranded tinned copper conductors to IEEE 1580 Table 11, cross-linked flame-retardant polyolefin (XLPO) insulation, a black arctic-grade thermosetting jacket, a basket-weave bronze wire armour and an overall black arctic-grade thermosetting sheath. It is designed for the demanding environments of offshore drilling and energy production facilities: the high strand count makes the cable markedly more flexible and more resistant to vibration than Type MC, IEC-specification or commercial cables. The jacket resists oil, abrasion, chemicals and sunlight and the outer sheath additionally resists drilling mud. The cable is available unarmoured, armoured (B) or armoured and sheathed (BS); only the armoured and sheathed construction is suitable for use in Class I Division 1 and Zone 1 environments. This sheet covers the two-, three-, four- and five-conductor power range; the single-conductor range of the same family is rated 600 V or 2 kV and the multi-conductor control range is a separate sheet.



CONSTRUCTION

Conductor	Soft annealed flexible stranded tinned copper acc. to IEEE 1580 Table 11. Strand counts per size are listed in the conductor table.
Insulation	Cross-linked, flame-retardant polyolefin (XLPO), meeting the requirements for Type P of IEEE 1580 and Type X110 of UL 1309 / CSA 245.
Core colours	2 cores black, white; 3 cores black, white, red; 4 cores black, white, red, green; 5 cores black, white, red, green, orange. From 1/0 AWG upwards the cores carry printed phase identification.
Jacket	Black, arctic-grade, flame-retardant thermosetting compound, resistant to oil, abrasion, chemicals and sunlight, meeting UL 1309 / CSA 245 and IEEE 1580.
Armour (B and BS)	Basket-weave wire armour acc. to IEEE 1580 and UL 1309 / CSA 245; bronze as standard, tinned copper available on request.
Sheath (BS)	Black, arctic-grade, flame-retardant thermosetting compound over the armour, resistant to oil, drilling mud, abrasion, chemicals and sunlight, meeting UL 1309 / CSA 245 and IEEE 1580. A sheath resistant to ester-based drilling mud acc. to NEK 606 is available.
Earthing conductor	In the three- and four-conductor constructions an uninsulated earth conductor can be incorporated on a make-to-order basis; the sizes offered are listed in the conductor table. Not listed for the two- and five-conductor constructions.

ELECTRICAL & THERMAL PROPERTIES

Rated voltage Uo/U	0.6/1 kV.
Standard	IEEE 1580 Type P; UL 1309 / CSA 245 Type X110; conductors acc. to IEEE 1580 Table 11.
Max. conductor temperature	+110 °C.
Classification society ratings	Highest ampacity ratings: ABS +100 °C, DNV +95 °C, Lloyd's Register +95 °C, Transport Canada +95 °C.
Cold durability	Exceeds the CSA cold bend and cold impact tests (-40 °C / -35 °C).
Flame-retardant	Acc. to IEC 60332-3 Category A and IEEE 1202.
Hazardous areas	Suitable for use in Class I Division 1 and Zone 1 environments in the armoured and sheathed (BS) construction only. NEC Article 337 additionally requires termination with fittings listed for the location.
Approvals	American Bureau of Shipping (ABS); Det Norske Veritas (DNV); Lloyd's Register of Shipping (LRS); Transport Canada; United States Coast Guard; UL listed as marine shipboard cable; CSA listed as marine shipboard cable.
Reaction to fire (CPR)	Outside the scope of EN 50575 (shipboard / offshore cable; not a construction product for permanent installation in construction works).

INSTALLATION DATA

Min. bending radius, unarmoured	6 × outer diameter (IEEE 45).
Min. bending radius, armoured (B)	8 × outer diameter (IEEE 45).
Min. bending radius, armoured and sheathed (BS)	8 × outer diameter (IEEE 45 and IEC 60092).
Reference conditions for the ampacities	+110 °C and +100 °C acc. to IEEE Std 45 at 45 °C ambient, single bank per hanger (multiply by 0.8 when double banked); +95 °C acc. to Table 4/3C.10 of the 1997 ABS MODU rules at 45 °C ambient. For free-air ratings the IEEE Std 45 values may be divided by 0.85.
Four-conductor ampacities	Based on one conductor not acting as a normal current-carrying conductor (e.g. an earthed neutral or an earth conductor).

DIMENSIONS & TECHNICAL DATA

Three constructions: unarmoured, armoured (B, bronze braid as outer layer) and armoured and sheathed (BS, bronze braid with an overall sheath). Nominal cross-sections, strand counts and resistances per size are in the conductor table.

Cores × size	Unarmoured Ø (mm)	Unarmoured (kg/km)	Armoured (B) Ø (mm)	Armoured (B) (kg/km)	Armoured and sheathed (BS) Ø (mm)	Armoured and sheathed (BS) (kg/km)
2 × 16 AWG	8.9	132	10.1	182	13.7	338
2 × 14 AWG	9.7	125	10.9	216	14.2	304
2 × 12 AWG	11.4	165	12.7	265	16.0	359
2 × 10 AWG	11.7	217	13.0	378	17.0	427
2 × 8 AWG	15.5	390	16.8	391	19.9	689
2 × 6 AWG	17.3	537	18.5	653	22.7	936
2 × 4 AWG	22.5	897	23.7	1037	28.4	1380
2 × 1/0 AWG	31.6	1784	32.8	2079	37.5	2551
2 × 4/0 AWG	39.6	3540	41.8	3537	47.7	4561
3 × 16 AWG	9.4	119	10.6	205	14.5	366
3 × 14 AWG	10.2	153	11.5	249	15.2	339
3 × 12 AWG	11.3	205	12.6	311	16.5	409
3 × 10 AWG	12.4	275	13.7	390	17.5	497

Cores × size	Unarmoured Ø (mm)	Unarmoured (kg/km)	Armoured (B) Ø (mm)	Armoured (B) (kg/km)	Armoured and sheathed (BS) Ø (mm)	Armoured and sheathed (BS) (kg/km)
3 × 8 AWG	16.3	470	17.5	591	20.8	793
3 × 6 AWG	18.7	668	19.9	813	24.4	1092
3 × 4 AWG	24.1	1122	25.4	1283	30.1	1649
3 × 2 AWG	27.9	1606	29.2	1799	34.2	2216
3 × 1 AWG	31.2	2046	32.5	2256	37.0	2694
3 × 1/0 AWG	33.9	2481	35.2	2700	39.9	3214
3 × 2/0 AWG	37.7	3069	39.0	3390	42.8	3768
3 × 3/0 AWG	39.6	3658	40.9	4270	46.4	4329
3 × 4/0 AWG	44.8	4758	46.1	4753	52.5	6003
3 × 262 kcmil	50.9	5798	52.2	6299	57.4	7179
3 × 313 kcmil	53.3	6353	54.6	6668	60.3	7532
3 × 373 kcmil	57.1	7296	58.4	7835	64.8	9416
3 × 444 kcmil	60.4	9255	61.7	9061	68.1	10929
3 × 535 kcmil	68.6	10832	69.8	11484	77.3	12350
3 × 646 kcmil	73.2	12056	74.6	13204	83.7	14641
3 × 777 kcmil	80.6	14996	81.9	15760	90.3	17187
4 × 16 AWG	11.0	144	12.3	238	15.7	330
4 × 14 AWG	11.1	188	12.4	292	16.5	390
4 × 12 AWG	13.1	299	14.4	368	17.0	475
4 × 10 AWG	14.9	397	16.1	537	20.0	682
4 × 8 AWG	18.0	558	19.3	728	23.6	994
4 × 6 AWG	20.2	838	21.5	984	26.4	1298
4 × 4 AWG	26.4	1336	27.9	1586	32.9	1893
4 × 2 AWG	30.3	2021	31.5	2197	37.4	2580
4 × 1 AWG	34.8	2578	36.1	2704	40.9	3307
4 × 1/0 AWG	37.3	3039	38.6	3390	45.1	3932
4 × 2/0 AWG	40.9	4040	42.2	4177	48.6	5121
4 × 3/0 AWG	45.4	4813	46.6	4960	53.4	5627
4 × 4/0 AWG	50.4	6017	51.7	6512	58.5	7377
4 × 262 kcmil	56.0	6993	57.2	7517	63.5	8326
4 × 313 kcmil	59.1	8194	60.3	8749	65.7	9462
4 × 373 kcmil	62.9	9550	64.1	10139	72.1	12307
4 × 444 kcmil	67.9	11209	69.2	12007	77.6	13224
4 × 535 kcmil	76.8	14337	78.1	14657	86.8	16028
4 × 646 kcmil	81.7	17263	82.9	17620	91.2	19190
5 × 18 AWG	11.3	165	12.6	269	16.1	369
5 × 16 AWG	11.9	174	13.2	277	16.3	375
5 × 14 AWG	12.2	228	13.4	341	17.5	455
5 × 12 AWG	14.2	353	15.5	469	18.9	627
5 × 10 AWG	15.7	472	17.0	598	20.4	786
5 × 8 AWG	19.6	665	20.8	856	25.8	1131
5 × 6 AWG	23.2	1064	24.5	1234	29.0	1585
5 × 4 AWG	29.0	1714	30.2	2186	34.7	2311
5 × 2 AWG	34.3	2351	35.6	2728	40.8	3121
5 × 1 AWG	38.4	2976	39.6	3686	45.7	3857
5 × 1/0 AWG	41.1	3441	42.4	3839	49.1	4451

Cores × size	Unarmoured Ø (mm)	Unarmoured (kg/km)	Armoured (B) Ø (mm)	Armoured (B) (kg/km)	Armoured and sheathed (BS) Ø (mm)	Armoured and sheathed (BS) (kg/km)
5 × 2/0 AWG	46.3	4781	47.5	5216	54.3	5896
5 × 4/0 AWG	54.6	6554	55.9	7072	62.4	7832

Conductor data per size

Size	Equivalent c.s.a. (mm ²)	No. of strands	DC R @25°C (Ω/km)	AC R @110°C, 60 Hz (Ω/km)	Opt. earthing cond., 3- and 4-core (AWG)
18 AWG	0.96	19	24.1	32	-
16 AWG	1.32	19	15.1	20.1	-
14 AWG	2.08	19	9.54	12.7	-
12 AWG	3.3	19	5.99	7.95	-
10 AWG	5.23	37	3.78	5.02	-
8 AWG	7.57	37	2.32	3.08	-
6 AWG	12.49	61	1.46	1.94	8
4 AWG	21.11	133	0.984	1.31	6
2 AWG	33.51	133	0.604	0.801	6
1 AWG	42.79	209	0.482	0.64	6
1/0 AWG	54.45	266	0.384	0.512	6
2/0 AWG	70.01	323	0.305	0.41	4
3/0 AWG	85.57	418	0.243	0.328	4
4/0 AWG	108.91	532	0.19	0.262	3
262 kcmil	132.25	646	0.157	0.22	3
313 kcmil	159.06	777	0.131	0.184	3
373 kcmil	189.36	925	0.112	0.154	2
444 kcmil	227.23	1110	0.0919	0.135	1
535 kcmil	272.68	1332	0.0787	0.115	1
646 kcmil	325.7	1591	0.0656	0.0984	1/0
777 kcmil	393.87	1924	0.0525	0.0853	1/0

Current-carrying capacity (A)

Cores × size	+110 °C	+100 °C	+95 °C
2 × 16 AWG	20	19	20
2 × 14 AWG	33	31	27
2 × 12 AWG	43	40	32
2 × 10 AWG	53	49	43
2 × 8 AWG	69	64	58
2 × 6 AWG	91	85	77
2 × 4 AWG	118	110	103
2 × 1/0 AWG	213	199	184
2 × 4/0 AWG	329	307	285
3 × 16 AWG	17	16	16
3 × 14 AWG	27	25	22
3 × 12 AWG	33	31	27
3 × 10 AWG	44	41	36
3 × 8 AWG	56	52	48
3 × 6 AWG	75	70	64
3 × 4 AWG	99	92	85
3 × 2 AWG	131	122	113
3 × 1 AWG	153	143	131
3 × 1/0 AWG	176	164	152
3 × 2/0 AWG	201	188	175
3 × 3/0 AWG	234	218	202
3 × 4/0 AWG	270	252	235
3 × 262 kcmil	315	294	267
3 × 313 kcmil	344	321	299
3 × 373 kcmil	387	361	334
3 × 444 kcmil	440	411	372
3 × 535 kcmil	463	443	418
3 × 646 kcmil	553	516	470
3 × 777 kcmil	602	562	529
4 × 16 AWG	17	16	16
4 × 14 AWG	27	25	22
4 × 12 AWG	33	31	27
4 × 10 AWG	44	41	36
4 × 8 AWG	56	52	48
4 × 6 AWG	75	70	64
4 × 4 AWG	99	92	85
4 × 2 AWG	131	122	113
4 × 1 AWG	153	143	131
4 × 1/0 AWG	176	164	152
4 × 2/0 AWG	201	188	175
4 × 3/0 AWG	234	218	202
4 × 4/0 AWG	270	252	235
4 × 262 kcmil	315	294	267
4 × 313 kcmil	344	321	299
4 × 373 kcmil	387	361	334
4 × 444 kcmil	440	411	372

Cores × size	+110 °C	+100 °C	+95 °C
4 × 535 kcmil	463	443	418
4 × 646 kcmil	553	516	470
5 × 18 AWG	11	10	11
5 × 16 AWG	14	13	13
5 × 14 AWG	21	20	18
5 × 12 AWG	27	25	22
5 × 10 AWG	35	33	29
5 × 8 AWG	45	42	38
5 × 6 AWG	60	56	51
5 × 4 AWG	79	74	68
5 × 2 AWG	105	98	90
5 × 1 AWG	122	114	105
5 × 1/0 AWG	140	131	122
5 × 2/0 AWG	161	150	140
5 × 4/0 AWG	216	202	188

Outer diameters and weights are nominal manufacturer values and are subject to a ±5 % manufacturing tolerance. The equivalent c.s.a. per size is the manufacturer's value for its stranded conductor, not the nominal AWG cross-section (18 AWG: 19 strands of 0.0100 inch, 0.96 mm²; nominal 0.82 mm²). Please note that in 16 AWG the weights do not rise consistently with size or with conductor count (2 × 16 AWG is heavier than 2 × 14 AWG, and 4 × 16 AWG lighter than 3 × 16 AWG); these figures are reproduced as published. For 2 × 4/0 AWG, 3 × 4/0 AWG and 3 × 444 kcmil the armoured (B) weight is lower than the unarmoured weight; these figures are also reproduced as published. For 3 × 535 kcmil at +110 °C we state the lower four-conductor value of 463 A; at every other size the three- and four-conductor ratings are equal. All values are indicative and non-binding.