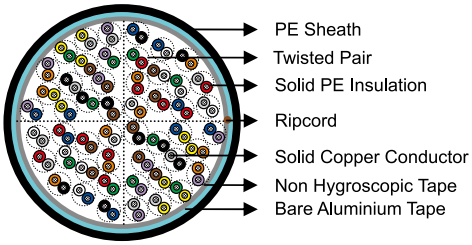
Solid PE Insulated & AP Sheathed (ALPETH) Air Core Cables to GR-421

APPLICATION

The cables are designed for use as subscriber distribution cables and as connection between central offices. The cables are suitable for installation in ducts, direct burial in the ground and also for aerial installation with integral suspension strand. An armoured option is offered for direct burial installations. A figure-8 self support option is offered for aerial installation.

STANDARDS

• Telcordia (Bellcore) GR-421

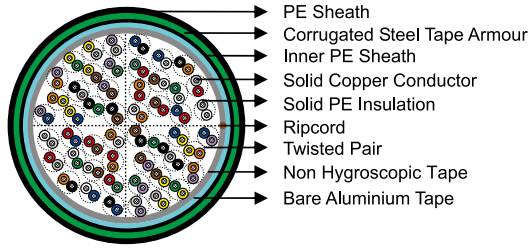


CONSTRUCTION

- **Conductors:** Solid annealed bare copper, 0.4/0.5/0.63/0.9mm, as per ASTM B-3/class 1 of IEC 60228.
- **Insulation:** Solid medium or high density polyethylene as per ASTM D 1248/IEC 60708.
- **Twisted Pairs:** Insulated conductors are twisted into pairs with varying lay length to minimize crosstalk.
- **Cabling Element:** Twisted Pairs.
- **Cable Core Assembly:** Cables with up to 400 pairs are composed of 25-pair units or 12/13-pair units; cables with over 400 pairs are composed of 50 or 100-pair units. Any extra pairs form a separate unit. Units are identified by colour coded binders. Construction is per GR-421 given in Cable Make Up Diagram.
- **Core Wrapping:** One or more non-hygroscopic polyester tapes are helically or longitudinally laid with an overlap. These tapes furnish thermal, mechanical as well as high dielectric protection between shielding and individual conductors.
- **Moisture Barrier:** A layer of bare aluminium tape (0.2mm/8mil) is applied longitudinally with overlap over the cable core to provide 100% electrical shielding coverage and ensures a barrier against water vapor. In cables with more than 200 pairs, the aluminum tape may be corrugated for improved cable flexibility.
- **Sheath:** Black low density polyethylene as per ASTM D 1248/IEC 60708, being able to withstand exposure to sunlight, temperature variations, ground chemicals and other environmental contaminants.
- **Ripcord:** Ripcord may be provided for slitting the sheath longitudinally to facilitate its removal.
- **Spare Pairs (optional):** Spare pairs may be incorporated for large pair cables.
- **Continuity Wire (optional):** One tinned copper drain wire may be longitudinally laid to ensure electrical continuity of the screen.

OPTIONAL CONSTRUCTION

- **Armoured Cable:** 0.15mm thick corrugated steel tape armour is applied with an overlap over an optional inner polye-



thylene sheath. An outer polyethylene sheath is applied over the armour.

- **Self-Support Cables:** A 7-strand galvanized steel strand is used as support wire. Black polyethylene sheath covers both core and support wire in a figure-8 construction.

ABBREVIATIONS

LAP (CAP): Copolymer coated aluminium tape + PE sheath
LAPSP (CAPSP): LAP sheath + steel tape armour + PE sheath
AP (ALPETH): Bare aluminium tape + PE sheath
PAP: PE inner sheath + bare aluminium tape + PE sheath
PASP: PE inner sheath + bare aluminium tape + steel tape armour + PE outer sheath
ASP (STAPETH): Bare aluminium tape + steel tape armour + PE outer sheath
CACSP: Copolymer coated aluminum tape + copolymer coated steel tape armour + PE outer sheath
LAPSP: Copolymer coated aluminum tape +PE inner sheath + steel tape armour + PE outer sheath
FIGURE 8 LAP: Copolymer coated aluminum tape + PE outer sheath + self supporting

ELECTRICAL PROPERTIES

Nominal Conductor Diameter	mm	0.4	0.5	0.63	0.9
Conductor Gauge Size	AWG	26	24	22	19
Maximum Average DC Resistance	Ω/km / Ω/mile	140/225	87/140	55/88.6	27.0/43.4
Maximum Individual DC Resistance	Ω/km / Ω/mile	144.2/232	89.5/144	56.5/91.0	28.0/45.0
Minimum Insulation Resistance @500V DC	MΩ·km / MΩ·mile	1600/1000	1600/1000	1600/1000	1600/1000
Maximum Average Resistance Unbalance	%	1.5	1.5	1.5	1.5
Maximum Individual Resistance Unbalance	%	5	5	5	5
Average Mutual Capacitance	nF/km / nF/kft	48.5-54.0 /14.8-16.5	48.5-54.0 /14.8-16.5	48.5-54.0 /14.8-16.5	48.5-54.0 /14.8-16.5
Maximum Individual Mutual Capacitance	nF/km / nF/kft	57/17.4	57/17.4	57/17.4	57/17.4
Maximum Individual Capacitance Unbalance pair-to-pair	pF/km / pF/kft	145/44	145/44	145/44	145/44
Capacitance Unbalance RMS pair-to-pair	pF/km / pF/kft	45/13.7	45/13.7	45/13.7	45/13.7
Maximum Individual Capacitance Unbalance pair-to-ground	pF/km / pF/kft	2625/800	2625/800	2625/800	2625/800
Maximum Average Capacitance Unbalance pair-to-ground	pF/km / pF/kft	574/175	574/175	574/175	574/175
Maximum Conductor Loop Resistance @20°C	Ω/km / Ω/mile	300/482	192/309	114/183.6	60/96.4
Impedance @1KHz	Ω	994	796	660	445
Impedance @100KHz	Ω	147	134	125	122
Impedance @512KHz	Ω	120	118	117	116
Impedance @1MHz	Ω	117	115	114	113
Maximum Average Attenuation @0.8KHz	dB/km / dB/kft	1.64/0.5	1.30/0.39	1.04/0.32	0.74/0.22

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Maximum Average Attenuation @1KHz	dB/km / dB/kft	1.68/0.51	1.35/0.41	1.08/0.33	0.76/0.23
Maximum Average Attenuation @3KHz	dB/km / dB/kft	3.18/0.97	2.52/0.77	2.01/0.61	1.42/0.43
Maximum Average Attenuation @150KHz	dB/km / dB/kft	11.4/3.47	8.3/2.53	6.2/1.89	4.4/1.34
Maximum Average Attenuation @772KHz	dB/km / dB/kft	24.3/7.4	19.4/5.9	15.4/4.7	10.8/3.3
Maximum Average Attenuation @1000KHz	dB/km / dB/kft	27.1/8.25	21.4/6.52	17.5/5.33	12.8/3.89
Dielectric Strength					
Conductor to Conductor (3secs)	V DC	2400	3000	4000	5000
Conductor to Screen (3secs)	V DC	10000	10000	10000	10000
Minimum EL Far-end Cross-talk-Mean Power Sum					
@150KHz	dB/305m / dB/kft	61	63	63	65
@772KHz	dB/305m / dB/kft	47	49	49	57
@1.6MHz	dB/305m / dB/kft	41	42	43	44
@3.15MHz	dB/305m / dB/kft	35	37	37	39
@6.3MHz	dB/305m / dB/kft	29	31	31	33
Minimum Far-end Cross-talk-Worst Pair Power Sum					
@150KHz	dB/305m / dB/kft	57	57	57	59
@772KHz	dB/305m / dB/kft	43	43	43	45
@1.6MHz	dB/305m / dB/kft	37	37	37	39
@3.15MHz	dB/305m / dB/kft	31	31	31	33
@6.3MHz	dB/305m / dB/kft	25	25	25	27
Minimum Near-end Cross-talk-Mean Power Sum					
@150KHz	dB/305m / dB/kft	58	58	58	58
@772KHz	dB/305m / dB/kft	47	47	47	47
@1.6MHz	dB/305m / dB/kft	43	43	43	43
@3.15MHz	dB/305m / dB/kft	38	38	38	38
@6.3MHz	dB/305m / dB/kft	34	34	34	34
Minimum Near-end Cross-talk-Worst Pair Power Sum					
@150KHz	dB/305m / dB/kft	53	53	53	53
@772KHz	dB/305m / dB/kft	42	42	42	42
@1.6MHz	dB/305m / dB/kft	38	38	38	38
@3.15MHz	dB/305m / dB/kft	33	33	33	33
@6.3MHz	dB/305m / dB/kft	29	29	29	29
Nominal Insulation Thickness	mm	0.175	0.2	0.26	0.3
Nominal Insulated Conductor Diameter	mm	0.75	0.9	1.15	1.5

MECHANICAL AND THERMAL PROPERTIES

Temperature range during operation (fixed state): -30°C – +70°C

Temperature range during installation (mobile state): -20°C – +50°C

Minimum bending radius: 10 x Overall Diameter (unarmoured cables);15 x Overall Diameter (armoured cables)

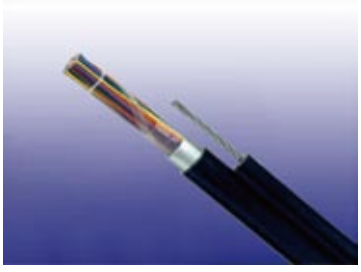
COLOUR CODE

Standard colour code is per GR-421 given in Colour Code Chart

DIMENSIONS AND WEIGHT

Solid PE Insulated and AP Sheathed (ALPETH) Air Core Cable to GR-421

Cable Code	Number of Pairs	Nominal Sheath Thickness mm/inch	Nominal Overall Diameter mm/inch	Nominal Weight kg/km / lbs/kft
0.4mm Conductor, 0.75mm Insulated Wire				
TP421-2Y(A)2Y-25P04	25	1.5/0.059	12.0/0.47	141/95
TP421-2Y(A)2Y-50P04	50	1.5/0.059	14.5/0.57	231/155
TP421-2Y(A)2Y-100P04	100	1.7/0.067	18.5/0.73	394/265
TP421-2Y(A)2Y-200P04	200	1.7/0.067	24.6/0.97	729/490
TP421-2Y(A)2Y-300P04	300	1.8/0.071	28.0/1.10	1034/695
TP421-2Y(A)2Y-400P04	400	1.9/0.075	33.0/1.30	1346/905
TP421-2Y(A)2Y-600P04	600	2.1/0.083	38.1/1.50	1964/1320
TP421-2Y(A)2Y-900P04	900	2.2/0.087	45.7/1.80	2931/1970
TP421-2Y(A)2Y-1200P04	1200	2.4/0.094	53.3/2.10	3868/2600
TP421-2Y(A)2Y-1500P04	1500	2.5/0.098	58.4/2.30	4791/3220
TP421-2Y(A)2Y-1800P04	1800	2.5/0.098	63.5/2.50	5713/3839
TP421-2Y(A)2Y-2000P04	2000	2.5/0.098	66.0/2.60	6348/4266
TP421-2Y(A)2Y-2100P04	2100	2.5/0.098	68.6/2.70	6636/4459
0.5mm Conductor, 0.9mm Insulated Wire				
TP421-2Y(A)2Y-25P05	25	1.5/0.059	13.2/0.52	195/131
TP421-2Y(A)2Y-50P05	50	1.5/0.059	16.5/0.65	330/222
TP421-2Y(A)2Y-100P05	100	1.7/0.067	21.8/0.86	590/396
TP421-2Y(A)2Y-200P05	200	1.7/0.067	28.0/1.10	1100/739
TP421-2Y(A)2Y-300P05	300	1.7/0.067	35.6/1.40	1620/1089
TP421-2Y(A)2Y-400P05	400	1.8/0.071	38.1/1.50	2120/1425
TP421-2Y(A)2Y-600P05	600	2.0/0.079	48.3/1.90	3120/2097
TP421-2Y(A)2Y-900P05	900	2.2/0.087	55.9/2.20	4580/3078
TP421-2Y(A)2Y-1200P05	1200	2.4/0.094	63.5/2.50	6070/4079
TP421-2Y(A)2Y-1500P05	1500	2.5/0.098	71.2/2.80	7530/5060
TP421-2Y(A)2Y-1600P05	1600	2.5/0.098	76.2/3.00	7700/5174
TP421-2Y(A)2Y-1800P05	1800	2.5/0.098	78.7/3.10	8985/6038
0.63mm Conductor, 1.15mm Insulated Wire				
TP421-2Y(A)2Y-25P063	25	1.5/0.059	15.5/0.61	275/185
TP421-2Y(A)2Y-50P063	50	1.5/0.059	20.1/0.79	476/320
TP421-2Y(A)2Y-100P063	100	1.7/0.067	28.0/1.10	885/595
TP421-2Y(A)2Y-200P063	200	1.7/0.067	38.1/1.50	1666/1120
TP421-2Y(A)2Y-300P063	300	1.7/0.067	43.2/1.70	2455/1650
TP421-2Y(A)2Y-400P063	400	1.8/0.071	48.3/1.90	3229/2170
TP421-2Y(A)2Y-600P063	600	1.9/0.075	58.4/2.30	4791/3220
TP421-2Y(A)2Y-900P063	900	2.1/0.083	71.2/2.80	7082/4759
TP421-2Y(A)2Y-1200P063	1200	2.2/0.087	81.3/3.20	9388/6308
0.9mm Conductor, 1.5mm Insulated Wire				
TP421-2Y(A)2Y-25P09	25	1.5/0.059	20.1/0.79	476/320
TP421-2Y(A)2Y-50P09	50	1.5/0.059	28.0/1.10	885/595
TP421-2Y(A)2Y-100P09	100	1.7/0.067	38.1/1.50	1651/1109
TP421-2Y(A)2Y-200P09	200	1.7/0.067	48.3/1.90	3199/2150
TP421-2Y(A)2Y-300P09	300	1.7/0.067	61.0/2.40	4746/3189



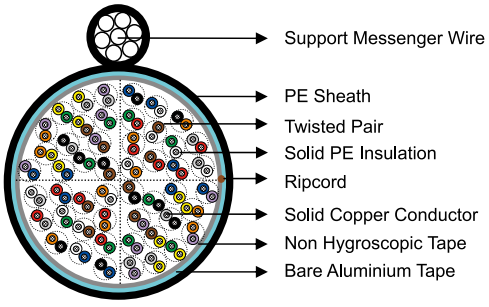
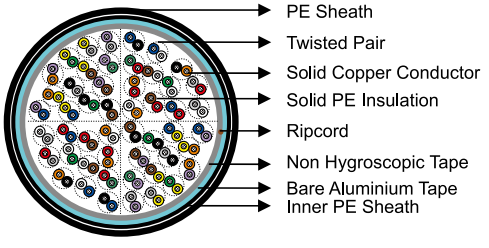


Fig 8 Solid PE Insulated & AP Sheathed (Alpeth) Air Core Cable to GR-421

Cable Code	Number of Pairs	Support Messenger Wire Diameter mm/inch	Nominal Sheath Thickness mm/inch	Nominal Overall Dimension mm/inch	Nominal Weight kg/km / lbs/kft
0.4mm Conductor, 0.75mm Insulated Wire					
TP421-2Y(A)2Y-25P04-SS	25	7/6.35 / 7/0.25	1.5/0.059	14.2/0.56	379/255
TP421-2Y(A)2Y-50P04-SS	50	7/6.35 / 7/0.25	1.5/0.059	16.8/0.66	469/315
TP421-2Y(A)2Y-100P04-SS	100	7/6.35 / 7/0.25	1.7/0.067	20.6/0.81	632/425
TP421-2Y(A)2Y-200P04-SS	200	7/6.35 / 7/0.25	1.7/0.067	25.4/1.00	952/640
TP421-2Y(A)2Y-300P04-SS	300	7/6.35 / 7/0.25	1.8/0.071	30.5/1.20	1257/845
0.5mm Conductor, 0.9mm Insulated Wire					
TP421-2Y(A)2Y-25P05-SS	25	7/6.35 / 7/0.25	1.5/0.059	16.0/0.63	431/290
TP421-2Y(A)2Y-50P05-SS	50	7/6.35 / 7/0.25	1.5/0.059	19.3/0.76	565/380
TP421-2Y(A)2Y-100P05-SS	100	7/6.35 / 7/0.25	1.7/0.067	24.6/0.97	826/555
TP421-2Y(A)2Y-200P05-SS	200	7/6.35 / 7/0.25	1.7/0.067	30.5/1.20	1317/885
0.63mm Conductor, 1.15mm Insulated Wire					
TP421-2Y(A)2Y-25P063-SS	25	7/6.35 / 7/0.25	1.5/0.059	17.8/0.70	513/345
TP421-2Y(A)2Y-50P063-SS	50	7/6.35 / 7/0.25	1.5/0.059	22.4/0.88	714/480
TP421-2Y(A)2Y-100P063-SS	100	7/6.35 / 7/0.25	1.7/0.067	30.5/1.20	1116/750
0.9mm Conductor, 1.5mm Insulated Wire					
TP421-2Y(A)2Y-25P09-SS	25	7/6.35 / 7/0.25	1.5/0.059	22.4/0.88	714/480
TP421-2Y(A)2Y-50P09-SS	50	7/6.35 / 7/0.25	1.5/0.059	30.5/1.20	1108/745



Solid PE Insulated & PAP Sheathed Air Core Cable to GR-421

Cable Code	Number of Pairs	Nominal Sheath Thickness		Nominal Overall Diameter mm/inch	Nominal Weight kg/km / lbs/kft
		Inner	Outer		
		mm/inch	mm/inch		
0.4mm Conductor, 0.75mm Insulated Wire					
TP421-2Y2Y(A)2Y-50P04	50	1.2/0.047	1.5/0.059	16.0/0.630	275/185
TP421-2Y2Y(A)2Y-100P04	100	1.2/0.047	1.5/0.059	20.0/0.787	446/300
TP421-2Y2Y(A)2Y-200P04	200	1.2/0.047	1.5/0.059	25.0/0.984	781/525
TP421-2Y2Y(A)2Y-400P04	400	1.2/0.047	1.5/0.059	34.0/1.34	1443/970
TP421-2Y2Y(A)2Y-600P04	600	1.6/0.063	2.0/0.079	40.0/1.57	2098/1410
TP421-2Y2Y(A)2Y-900P04	900	1.6/0.063	2.0/0.079	48.0/1.89	3043/2045
TP421-2Y2Y(A)2Y-1200P04	1200	1.6/0.063	2.0/0.079	54.0/2.13	4010/2695
0.5mm Conductor, 0.9mm Insulated Wire					
TP421-2Y2Y(A)2Y-25P05	25	1.2/0.047	1.5/0.059	16.0/0.630	251/169
TP421-2Y2Y(A)2Y-50P05	50	1.2/0.047	1.5/0.059	18.0/0.709	380/255
TP421-2Y2Y(A)2Y-100P05	100	1.2/0.047	1.5/0.059	23.0/0.906	640/430
TP421-2Y2Y(A)2Y-200P05	200	1.6/0.063	1.8/0.071	30.0/1.18	1146/770
TP421-2Y2Y(A)2Y-300P05	300	1.6/0.063	1.8/0.071	36.0/1.42	1682/1130
TP421-2Y2Y(A)2Y-400P05	400	1.6/0.063	2.0/0.079	41.0/1.61	2195/1475
TP421-2Y2Y(A)2Y-600P05	600	1.8/0.071	2.3/0.090	49.0/1.93	3215/2160
TP421-2Y2Y(A)2Y-900P05	900	2.0/0.079	2.5/0.098	59.0/2.32	4747/3190
TP421-2Y2Y(A)2Y-1200P05	1200	2.2/0.079	2.7/0.106	67.0/2.64	6198/4165
0.63mm Conductor, 1.15mm Insulated Wire					
TP421-2Y2Y(A)2Y-25P063	25	1.2/0.047	1.5/0.059	17.0/0.669	320/215
TP421-2Y2Y(A)2Y-50P063	50	1.2/0.047	1.5/0.059	22.0/0.866	535/360
TP421-2Y2Y(A)2Y-100P063	100	1.2/0.047	1.5/0.059	28.0/1.10	945/635
TP421-2Y2Y(A)2Y-200P063	200	1.6/0.063	2.0/0.079	37.0/1.46	1771/1190
TP421-2Y2Y(A)2Y-400P063	400	1.8/0.071	2.3/0.091	51.0/2.01	3363/2260
TP421-2Y2Y(A)2Y-600P063	600	2.0/0.079	2.5/0.098	62.0/2.44	5015/3370
0.9mm Conductor, 1.5mm Insulated Wire					
TP421-2Y2Y(A)2Y-25P09	25	1.2/0.047	1.5/0.059	21.0/0.827	528/355
TP421-2Y2Y(A)2Y-50P09	50	1.2/0.047	1.5/0.059	27.0/1.06	930/625
TP421-2Y2Y(A)2Y-100P09	100	1.6/0.063	2.0/0.079	36.0/1.42	1741/1170
TP421-2Y2Y(A)2Y-200P09	200	1.8/0.071	2.3/0.091	50.0/1.97	3319/2230