

Three Core Cables to BS 6622/BS 7835 APPLICATIONS

The three core cables are designed for distribution of electrical power with nominal voltage U_0/U ranging from 3.6/6.6KV to 19/33KV and frequency 50Hz. They are suitable for installation mostly in power supply stations, indoors and in cable ducts, outdoors, underground and in water as well as for installation on cable trays for industries, switchboards and power stations.

STANDARD

BS 6622

BS 7835 (LSZH Version)

CONSTRUCTION

Conductor	Plain annealed copper or aluminium complying with IEC 60228/BS 6360. Copper conductors shall be stranded (class 2) and aluminium conductors shall be either solid or stranded (class 2).
Conductor Screen	Extruded layer of semi-conducting cross-linkable compound is applied over the conductor and shall cover the surface completely. The minimum thickness is 0.3mm and the maximum resistivity shall not exceed 500 Ohm-m at 90°C.
Insulation	Insulation is of cross-linked polyethylene compound XLPE (GP8) conforming to BS 7655-1.3 or EPR (GP7), conforming to BS 7655-1.2.

TABLE 1. INSULATION THICKNESS

NOM. CROSS SECTION AREA	INSULATION THICKNESS AT NOMINAL VOLTAGE				
	3.8/6.6KV (UM=7.2KV)	6.35/11KV (UM=12KV)	8.7/15KV (UM=17.5KV)	12.7/22KV (UM=24KV)	19/33KV (UM=36KV)
MM ²	MM	MM	MM	MM	MM
70 – 185	2.5	3.4	4.5	5.5	8.0
240	2.6	3.4	4.5	5.5	8.0
300	2.8	3.4	4.5	5.5	8.0
400	3.0	3.4	4.5	5.5	8.0
Above 500	3.2	3.4	4.5	5.5	8.0

Insulation Screen	Extruded layer of semi-conducting cross-linkable compound is applied over the insulation. The extruded semi-conducting layer shall consist of bonded or cold strippable semi-conducting compound capable of removal for jointing or terminating. As an option, a semi-conducting tape may be applied over the extruded semi-conducting layer as a bedding for the metallic layer. The minimum thickness is 0.3 mm and the maximum resistivity is 500 Ohm-m at 90°C. The screen is tightly fitted to the insulation to exclude all air voids and can be easily hand stripped on site.
Inner Covering & Fillers	For cables with a collective metallic layer or cables with a metallic layer over each individual cores with additional collective metallic layers, semi-conducting inner covering and fillers shall be applied over the laid up cores. The inner covering is made of non hygroscopic material, except if the cable is to be made longitudinally watertight. The inner covering shall be extruded or lapped.

The approximate thickness of extruded inner coverings is given in Table 2:

TABLE 2. APPROXIMATE THICKNESS OF EXTRUDED INNER COVERINGS

FICTITIOUS DIAMETER OVER LAID UP CORES	APPROX. THICKNESS OF EXTRUDED INNER COVERING
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MM		MM
>	<	
-	25	1.0
25	35	1.2
35	45	1.4
45	60	1.6
60	80	1.8
80	-	2.0

*The approximate thickness of lapped inner coverings shall be 0.6mm.

Metallic Layer	The metallic layer shall be applied over each core or applied as a collective screen. The metallic screen shall consist of either copper tapes or a concentric layer of copper wires or a combination of tapes and wires. The metallic layer provides an earth fault current path, capable of withstanding fault current to earth of 1000A for one second at maximum temperature 160°C. Copper wires are applied over the conducting water blocking layer with a minimum diameter of 0.5mm. As an alternative, copper tape(s) with minimum thickness of 0.1mm can be applied with overlap. Total cross section of copper wire screen and copper tape screen layer are shown in Table 3a and 3b.
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TABLE 3A. TOTAL CROSS SECTION AND MAX. DC RESISTANCE OF COPPER WIRE SCREEN

NOMINAL CROSS-SECTION OF CABLES	TOTAL CROSS SECTION					MAX. DC RESISTANCE OF COPPER WIRE SCREEN AT 20°C
	3.8/6.6KV (UM=7.2KV)	6.35/11KV (UM=12KV)	8.7/15KV (UM=17.5KV)	12.7/22KV (UM=24KV)	19/33KV (UM=36KV)	
MM ²	MM ²					Ω
70	16	16	16	16	16	1.19
95	16	16	16	16	16	1.19
120	16	16	16	16	16	1.19
150	25	25	25	25	25	0.759
185	25	25	25	25	25	0.759
240	25	25	25	25	25	0.759
300	25	25	25	25	25	0.759
400	35	35	35	35	35	0.271
500	35	35	35	35	35	0.271
630	35	35	35	35	35	0.271

TABLE 3B. TOTAL CROSS SECTION AND MAX. DC RESISTANCE OF COPPER TAPE SCREEN (0.1MM)

NOMINAL CROSS-SECTION OF CABLES	TOTAL CROSS SECTION & MAX DC RESISTANCE									
	CROSS SECTION	RESISTANCE AT 20°C	CROSS SECTION	RESISTANCE AT 20°C	CROSS SECTION	RESISTANCE AT 20°C	SECTION	RESISTANCE AT 20°C	CROSS SECTION	RESISTANCE AT 20°C
MM ²	MM ²	Ω	MM ²	Ω	MM ²	Ω	MM ²	Ω	MM ²	Ω
70	6.6	2.616	7.23	2.380	8.02	2.145	8.7	1.967	10.5	1.075
95	7.3	2.369	7.91	2.174	8.71	1.975	9.4	1.824	11.2	1.075
120	8.0	2.153	8.64	1.991	9.43	1.823	10.2	1.694	12.0	1.075
150	8.5	2.013	9.19	1.871	9.99	1.722	10.7	1.606	12.5	0.688
185	9.4	1.838	9.88	1.741	10.82	1.590	11.4	1.509	13.2	0.688
240	10.4	1.656	10.96	1.569	11.76	1.463	12.5	1.378	14.3	0.688
300	11.4	1.508	11.84	1.452	12.64	1.361	13.4	1.287	15.2	0.688
400	12.6	1.362	12.92	1.332	13.71	1.254	14.4	1.192	16.2	0.491
500	13.9	1.237	14.34	1.199	15.14	1.136	15.5	1.110	17.7	0.491
630	15.3	1.121	16.68	1.031	16.57	1.038	17.3	0.995	19.1	0.491

Separation Sheath (for armoured cable)	The separation sheath comprises a layer of extruded PVC, PE or LSZH. The nominal thickness is calculated by $0.02Du + 0.6\text{mm}$ where Du is the fictitious diameter under the sheath in mm. The nominal separation sheath thickness shall not be less than 1.2mm.
Armour (for armoured cable)	The armour consists of galvanized steel wire applied over the inner covering with diameter specified as in Table 4.

TABLE 4. ARMOUR WIRE DIAMETER

FICTITIOUS DIAMETER UNDER THE ARMOUR		ARMOUR WIRE DIAMETER
MM		MM
>	<	
-	25	1.6
25	35	2.0
35	60	2.5
60	-	3.15

Over Sheath

Overall sheath comprises a layer of extruded either PVC type 9 conforming to BS 7665-4.2 or MDPE type TS2 conforming to BS 7655-10.1; LSZH can be offered as an option. The over sheath is normally black in colour. When a DC voltage test is to be performed on the over sheath, a semi-conducting layer such as graphite coating shall be applied over the surface of the extruded over sheath. The nominal over sheath thickness is calculated by $0.035D+1$ where D is the diameter immediately under the over sheath in mm. For cables with the over sheath not applied over the armour, the nominal over sheath thickness shall not be less than 1.4mm. And for cables with over sheath applied over the armour, the nominal over sheath thickness shall not be less than 1.8mm.

PHYSICAL PROPERTIES

Operating Temperature	up to 90°C
Temperature Range	-5°C (PVC or LSZH sheath); -20°C (PE sheath)
Short Circuit Temperature	250°C (short circuit duration up to 5 seconds)
Bending Radius	12 x OD

TABLE 5. NOMINAL /OPERATING /TEST VOLTAGES

RATED VOLTAGE UO/U	OPERATING VOLTAGE (UM)	TESTING VOLTAGE (RMS)
3.8/6.6KV	7.2KV	15KV
6.35/11KV	12KV	25.5KV
8.7/15KV	17.5KV	35KV
12.7/22KV	24KV	51KV
19/33KV	36KV	76KV

THREE CORE 3.8/6.6KV (UM=7.2KV)

Dimensional Data

NOM. CROSS-SECTION AREA	NOM. INSULATION THICKNESS	COPPER WIRE SCREEN AREA	COPPER TAPE SCREEN AREA	NOM. BEDDING THICKNESS	NOM. ARMOUR WIRE DIAMETER	NOM. SHEATH THICKNESS	APPROX. OVERALL DIAMETER	APPROX. WEIGHT	
								CU	AL
MM ²	MM	MM ²	MM ²	MM	MM	MM	MM	KG/KM	
70	2.5	16	6.6	1.3	2.5	2.6	55.0	6570	5240
95	2.5	16	7.3	1.4	2.5	2.7	58.9	7760	5890
120	2.5	16	8.0	1.5	2.5	2.8	62.1	8810	6510
150	2.5	25	8.5	1.5	2.5	2.9	65.8	10110	7310
185	2.5	25	9.4	1.6	2.5	3.0	69.5	11520	7960
240	2.6	25	10.4	1.7	2.5	3.2	75.9	1392	9140

									0	
300	2.8	25	11.4	1.8	3.15	3.5	83.1	1740	1162	0
400	3.0	35	12.6	2.0	3.15	3.7	93.0	2190	1398	0

Electrical Data

NOM. CROSS-SECTION AREA	D C RESISTANCE CU / AL	A C RESISTANCE CU / AL	SHORT CIRCUIT RATING OF CONDUCTOR CU / AL 1 SEC	CAPACITANCE	CHARGING CURRENT	SHORT CIRCUIT RATING OF SCREEN 1 SEC		CURRENT RATINGS							
						COPPER WIRE	COPPER TAPE	REACTANCE	INDUCTANCE	GROUND		DUCT		AIR	
										CU	AL	C	A	C	A
MM ²	MΩ/M	MΩ/M	KA	PF/M	MA/M	KA	MΩ/M	NH/M	A	A	A	A	A	A	A
70	268/443	343/568	9.8/6.3	383	0.46	1.96	0.96	97	310	255	195	215	165	270	210
95	193/320	248/410	13.3/8.5	432	0.52	1.96	1.06	92	290	300	230	255	200	330	250
120	153/253	196/325	17.2/11.0	474	0.57	1.96	1.17	89	280	340	265	290	225	375	295
150	124/206	159/265	21.2/13.5	511	0.61	3.06	1.25	87	280	380	295	330	255	430	330
185	99.1/164	128/211	26.6/17.0	562	0.67	3.06	1.37	86	270	430	335	370	290	490	385
240	75.4/125	98/161	34.9/22.3	602	0.72	3.06	1.52	83	260	490	380	425	335	570	450
300	60.1/100	80/130	43.8/28.0	622	0.75	3.06	1.67	82	260	540	435	470	375	650	510
400	47.0/77.8	64/102	57.3/36.6	648	0.78	4.29	1.84	80	250	590	480	520	420	700	570

THREE CORE 6.35/11KV (UM=12KV)
Dimensional Data

NOM. CROSS-SECTION AREA	NOM. INSULATION THICKNESS	COPPER WIRE SCREEN AREA	COPPER TAPE SCREEN AREA	NOM. BEDDING THICKNESS	NOM. ARMOUR WIRE DIAMETER	NOM. SHEATH THICKNESS	APPROX. OVERALL DIAMETER	APPROX. WEIGHT	
								CU	AL
MM ²	MM	MM ²	MM ²	MM	MM	MM	MM	KG/KM	
70	3.4	16	7.23	1.4	2.5	2.7	59.2	7200	5870
95	3.4	16	7.91	1.5	2.5	2.8	63.2	8420	6550
120	3.4	16	8.64	1.6	2.5	3.0	67.0	9580	7190
150	3.4	25	9.19	1.6	2.5	3.1	70.3	10830	8030
185	3.4	25	9.88	1.7	2.5	3.2	73.9	12290	8720

240	3.4	25	10.96	1.8	3.15	3.4	81.2	15620	10790
300	3.4	25	11.84	1.9	3.15	3.6	86.1	18030	12240
400	3.4	35	12.92	2.0	3.15	3.8	95.0	22350	14350

Electrical Data

NOM. CROSS-SECTION AREA	D C RESISTANCE CU / AL	A C RESISTANCE CU / AL	SHORT CIRCUIT RATING OF CONDUCTOR CU / AL 1 SEC	CAPACITANCE	CHARGING CURRENT	SHORT CIRCUIT RATING OF SCREEN 1 SEC		REACTANCE	INDUCTANCE	CURRENT RATINGS					
						COPPER WIRE	COPPER TAPE			GROUND		DUCT		AIR	
										CU	AL	CU	AL	CU	AL
MM ²	MΩ/M	MΩ/M	KA	PF/M	MA/M	KA		MΩ/M	NH/M	A	A	A	A	A	A
70	268/443	343/568	9.8/6.3	298	0.60	1.96	1.05	103	330	255	195	215	165	270	210
95	193/320	248/410	13.3/8.5	334	0.67	1.96	1.16	99	310	300	230	255	200	330	250
120	153/253	196/325	17.2/11.0	365	0.73	1.96	1.26	96	310	340	265	290	225	375	295
150	124/206	159/265	21.2/13.5	392	0.78	3.06	1.34	93	300	380	295	330	255	430	330
185	99.1/164	128/211	26.6/17.0	430	0.86	3.06	1.44	90	290	430	335	370	290	490	385
240	75.4/125	98/161	34.9/22.3	476	0.95	3.06	1.60	87	280	490	380	425	335	570	450
300	60.1/100	80/130	43.8/28.0	524	1.05	3.06	1.73	85	270	540	435	470	375	650	510
400	47.0/77.8	64/102	57.3/36.6	580	1.16	4.29	1.89	81	260	590	480	520	420	700	570

THREE CORE 8.7/15KV (UM=17.5KV)

Dimensional Data

NOM. CROSS-SECTION AREA	NOM. INSULATION THICKNESS	COPPER WIRE SCREEN AREA	COPPER TAPE SCREEN AREA	NOM. BEDDING THICKNESS	NOM. ARMOUR WIRE DIAMETER	NOM. SHEATH THICKNESS	APPROX. OVERALL DIAMETER	APPROX. WEIGHT	
								CU	AL
MM ²	MM	MM ²	MM ²	MM	MM	MM	MM	KG/KM	
70	4.5	16	8.02	1.5	2.5	2.9	64.6	8030	6700
95	4.5	16	8.71	1.6	2.5	3.0	68.2	9160	7330
120	4.5	16	9.43	1.7	2.5	3.1	71.7	10340	8030
150	4.5	25	9.99	1.7	2.5	3.2	75.4	11730	8930
185	4.5	25	10.82	1.8	3.15	3.4	80.6	14170	10570
240	4.5	25	11.76	1.9	3.15	3.6	86.6	16670	11810
300	4.5	25	12.64	2.0	3.15	3.7	91.3	19140	13340

400	4.5	35	13.71	2.1	3.15	4.0	100.0	23360	15410
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Electrical Data

NOM. CROSS-SECTION AREA	DC RESISTANCE CU/AL	AC RESISTANCE CU/AL	SHORT CIRCUIT RATING OF CONDUCTOR CU/AL 1 SEC	CAPACITANCE	CHARGING CURRENT	SHORT CIRCUIT RATING OF SCREEN 1 SEC		REACTANCE	INDUCTANCE	CURRENT RATINGS					
						COPPER WIRE	COPPER TAPE			GROUND		DUCT		AIR	
										CU	AL	CU	AL	CU	AL
MM ²	MΩ/M	MΩ/M	KA	PF/M	MA/M	KA	MΩ/M	NH/M	A	A	A	A	A	A	
70	268/443	343/568	9.8/6.3	240	0.65	1.96	1.17	110	350	255	195	215	165	270	210
95	193/320	248/410	13.3/8.5	267	0.73	1.96	1.27	105	330	300	230	255	200	330	250
120	153/253	196//325	17.2/11.0	291	0.79	1.96	1.38	102	320	340	265	290	225	375	295
150	124/206	159/265	21.2/13.5	312	0.85	3.06	1.46	98	310	380	300	330	255	430	330
185	99.1/164	128/211	26.6/17.0	340	0.93	3.06	1.58	95	300	430	335	370	290	490	385
240	75.4/125	98/161	34.9/22.3	375	1.02	3.06	1.72	91	290	490	380	425	335	570	450
300	60.1/100	80/130	43.8/28.0	411	1.12	3.06	1.85	89	280	540	435	470	375	650	510
400	47.0/77.8	64/102	57.3/36.6	454	1.24	4.29	2.00	84	270	590	480	520	420	700	570

THREE CORE 12.7/22KV (UM=24KV)

NOM. CROSS-SECTION AREA	NOM. INSULATION THICKNESS	COPPER WIRE SCREEN AREA	COPPER TAPE SCREEN AREA	NOM. BEDDING THICKNESS	NOM. ARMOUR WIRE DIAMETER	NOM. SHEATH THICKNESS	APPROX. OVERALL DIAMETER	APPROX. WEIGHT	
								CU	AL
MM ²	MM	MM ²	MM ²	MM	MM	MM	MM	KG/KM	
70	5.5	16	8.7	1.6	2.5	3.0	69.0	8710	7370
95	5.5	16	9.4	1.7	2.5	3.2	73.1	10000	8130

120	5.5	16	10.2	1.7	3.15	3.3	77.7	12040	9730
150	5.5	25	10.7	1.8	3.15	3.4	81.7	13550	10750
185	5.5	25	11.4	1.9	3.15	3.6	85.5	15150	11610
240	5.5	25	12.5	2.0	3.15	3.7	91.3	17710	12840
300	5.5	25	13.4	2.0	3.15	3.9	96.0	20170	14360
400	5.5	35	14.4	2.2	3.15	4.1	104.8	24520	16480

Dimensional Data

Electrical Data

NOM. CROSS-SECTION AREA	D C RESISTANCE CU / AL	A C RESISTANCE CU / AL	SHORT CIRCUIT RATING OF CONDUCTOR CU / AL 1 SEC	CAPACITANCE	CHARGING CURRENT	SHORT CIRCUIT RATING OF SCREEN 1 SEC		REACTANCE	INDUCTANCE	CURRENT RATINGS					
						COPPER WIRE	COPPER TAPE			GROUND		DUCT		AIR	
										CU	AL	C U	A L	C U	A L
MM ²	MΩ/M	MΩ/M	KA	PF/M	MA/M	KA	MΩ/M	NH/M	A	A	A	A	A	A	
70	268/443	343/568	9.8/6.3	207	0.83	1.96	1.28	115	370	255	195	225	170	275	215
95	193/320	248/410	13.3/8.5	229	0.92	1.96	1.38	110	350	295	230	260	205	330	260
120	153/253	196/325	17.2/11.0	249	1.00	1.96	1.48	106	340	335	260	300	235	380	300
150	124/206	159/265	21.2/13.5	266	1.06	3.06	1.56	103	330	375	290	335	265	430	335
185	99.1/164	128/211	26.6/17.0	289	1.16	3.06	1.66	100	320	420	330	380	300	490	390
240	75.4/125	98/161	34.9/22.3	318	1.27	3.06	1.82	95	300	480	380	430	345	570	460
300	60.1/100	80/130	43.8/28.0	348	1.39	3.06	1.95	93	300	530	425	480	385	650	520
400	47.0/77.8	64/102	57.3/36.6	383	1.53	4.29	2.11	87	280	590	480	520	420	700	570

THREE CORE 19/33KV (UM=36KV)

Dimensional Data

NOM. CROSS-SECTION AREA	NOM. INSULATION THICKNESS	COPPER WIRE SCREEN AREA	COPPER TAPE SCREEN AREA	NOM. BEDDING THICKNESS	NOM. ARMOUR WIRE DIAMETER	NOM. SHEATH THICKNESS	APPROX. OVERALL DIAMETER	APPROX. WEIGHT	
								CU	AL
MM ²	MM	MM ²	MM ²	MM	MM	MM	MM	KG/KM	
70	8.0	16	10.5	1.8	3.15	3.5	82.5	11840	10440
95	8.0	16	11.2	1.9	3.15	3.6	86.4	13200	11350

120	8.0	16	12.0	2.0	3.15	3.7	89.9	14520	12190
150	8.0	25	12.5	2.0	3.15	3.8	93.6	16070	13280
185	8.0	25	13.2	2.1	3.15	3.9	97.3	17710	14090
240	8.0	25	14.3	2.2	3.15	4.1	103.2	20370	15460
300	8.0	25	15.2	2.3	3.15	4.3	108.2	22980	17210
400	8.0	35	16.2	2.4	3.15	4.5	116.8	27480	19450

Electrical Data

NOM. CROSS-SECTION AREA	D C RESISTANCE CU / AL	A C RESISTANCE CU / AL	SHORT CIRCUIT RATING OF CONDUCTOR CU / AL 1 SEC	CAPACITANCE	CHARGING CURRENT	SHORT CIRCUIT RATING OF SCREEN 1 SEC		REACTANCE	INDUCTANCE	CURRENT RATINGS					
						COPPER WIRE	COPPER TAPE			GROUND		DUCT		AIR	
										CU	AL	CU	AL	CU	AL
MM ²	MΩ/M	MΩ/M	KA	PF/M	MA/M	KA		MΩ/M	NH/M	A	A	A	A	A	A
70	268/443	343/568	9.8/6.3	159	0.95	1.96	1.54	127	400	255	195	225	170	275	215
95	193/320	248/410	13.3/8.5	175	1.05	1.96	1.64	121	390	295	230	260	205	330	260
120	153/253	196/325	17.2/11.0	189	1.13	1.96	1.75	117	370	335	260	300	235	380	300
150	124/206	159/265	21.2/13.5	201	1.21	3.06	1.83	113	360	375	290	335	265	430	335
185	99.1/164	128/211	26.6/17.0	217	1.30	3.06	1.93	109	350	420	330	380	300	490	390
240	75.4/125	98/161	34.9/22.3	237	1.42	3.06	2.09	104	330	480	380	430	345	570	460
300	60.1/100	80/130	43.8/28.0	258	1.55	3.06	2.21	101	320	530	425	480	385	650	520
400	47.0/77.8	64/102	57.3/36.6	282	1.69	4.29	2.37	96	290	590	480	520	420	700	570