

ISO 9001

BUREAU VERITAS
Certification



FEC Cables (M) Sdn. Bhd.



Instrumentation Cables
300/500V

CORPORATE HISTORY

FEC Cables (M) Sdn. Bhd. was first established in 1967 and was previously known as Furukawa Electric Cables (M) Sdn. Bhd. In all the years until 2003, the company had been under the management and control of Furukawa Electric Co. Ltd. of Japan.

In 2003, the company was renamed FEC Cables (M) Sdn. Bhd. following the acquisition of its major equity stake by Permodalan Nasional Berhad, Malaysia's government-owned premier multi-billion dollar investment institution.

The Company had started a technical collaboration from world renowned cable manufacturer, The Furukawa Electric Co. Ltd Japan (Furukawa Japan).

FEC Cables has benefited enormously from the technical collaboration and the subsequent technology transfer with Furukawa Japan. FEC Cables inherited from Furukawa Japan not only its advanced technology and technical know-how but also the disciplines of producing quality products using material conforming to the international standards of manufacturing cables.

Today FEC Cables plays a prominent role as a forerunner in the cable industry.

FEC Cables has been actively involved in serving various industrial sectors, namely the power, telecommunications, construction as well as the oil and gas sectors.

INTRODUCTION OF COMPANY

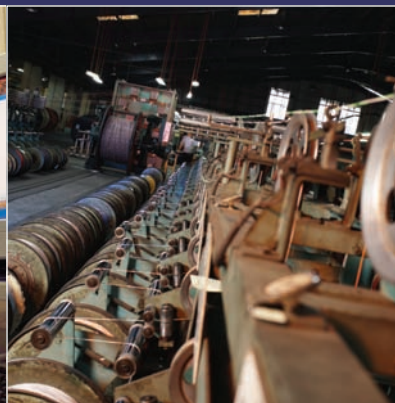
When there is talk of high quality electric wires and cables, the one company that comes to mind is FEC Cables (Malaysia) Sdn. Bhd. FEC is a subsidiary of Permodalan Nasional Berhad and was formerly known as Furukawa Electric Cables (M) Sdn. Bhd. Having established its Shah Alam plant in 1967 on a 7-acre site at the Shah Alam Industrial Estate, Furukawa has come a long way.

The technical collaboration with our Japanese counterpart, Furukawa Japan, has brought about an amazing success for us. In terms of quality, we have climbed the ladders of product manufacturing, steadily and successfully, pushing FEC towards the pinnacle of excellence.

Putting our customers' demands and needs as our number one priority, we opened our second plant in 1995, on a 27-acre freehold land site in Bukit Raja Industrial area, Klang. In our quest for excellence, we equip the plant with the latest technological aids for the manufacture of a wide range of low and medium voltage cables.

The certification of the ISO 9001 for both plants only proves that we do not compromise on quality and customer satisfaction. Our dedicated and hard-working employees are the backbone of our success. This was greatly helped by the state-of-the-art technology equipment which has led us towards excellence.

Moving towards a new century, we pledge to continually strive towards progressive and dynamic growth as FEC Cables continues its efforts in contributing to the development Malaysia.





Instrumentation Cables

Multipair Cable

Applicable Standards

BS 5308 Part 1 (Type 1 & Type 2)
 BS 6746 / BS 7655
 BS 6234
 BS 6360 (IEC 60228)
 BS 4066 Part 1 (IEC 60332-1) & IEC 60332-3 (if required)

Construction

Conductor	: Plain annealed copper wires according to BS 6360 (IEC 60228)
Insulation	: Polyethylene type 03 according to BS 6234 or equivalent compound
Colour code	: Refer to the Table 3
Pairing	: Cores twisted to pairs (two pairs cable can be manufactured as a quad for collective screen cables)
Binder	: Non-hygroscopic Polyester tape
Drain wire	: Tinned annealed copper wire 0.5mm ² (1/0.80mm)
Screen	: Aluminium/Polyester tape approx. 0.022mm thick over Drain wire
Bedding (Inner sheath)	: Polyethylene type 03 Black colour according to BS 6234 or equivalent compound
Armour	: Galvanized steel wires
Sheath/Oversheath	: PVC compound type TM1 Black colour according to BS 6746 / BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic compound (LSNHFR) to BS 4066 Part 1 & 3 (IEC 60332-1 & 3) if required.
Cable Identification	: Manufacturer's name and voltage

Application

For transmission of analogue and digital signals in and around process plants in dry and damp industrial areas.
 (Non-armoured cables : not recommended for underground burial)

Minimum Bending Radius

Non-armoured cable	- During operation	: 6 X Overall diameter
	- During installation	: 8 X Overall diameter
Armoured cable	- During operation	: 8 X Overall diameter
	- During installation	: 10 X Overall diameter

Temperature Rating

During operation	: -30°C up to +70°C
During installation	: -10°C up to +50°C

Abbreviations

- PE	: Polyethylene
- SLA	: Aluminium/Polyester tape collective screen
- SWA	: Steel wire armour
- PSLA	: Aluminium/Polyester tape pair screen
- PVC	: Polyvinyl Chloride

Multipair Cable
Table 1 Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-SLA (Non-armoured cable)			PE/PE/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	1	0.5	0.8	5.5	37	0.8	5.4	0.9	1.3	10	185
	2		0.8	6	53	0.8	6.1	0.9	1.3	10.5	215
	3		0.9	8.5	77	0.9	8.4	0.9	1.4	13	295
	5		1.1	10.5	120	1.1	10.6	0.9	1.4	15	395
	10		1.2	14	210	1.2	14.2	1.25	1.6	20	690
	15		1.2	17	295	1.2	16.9	1.25	1.6	22.5	855
	20		1.3	19.5	385	1.3	19.3	1.6	1.7	26	1180
	24		1.3	21	445	1.3	20.8	1.6	1.7	27.5	1310
	30		1.3	23	540	1.3	23.0	1.6	1.8	30	1495
0.50mm ² (7/0.30mm)	1	0.6	0.8	6	42	0.8	6	0.9	1.3	10.5	200
	2		0.8	7	60	0.8	6.8	0.9	1.3	11	235
	3		0.9	9.5	87	0.9	9.4	0.9	1.4	14	335
	5		1.1	12	135	1.1	12	0.9	1.5	17	450
	10		1.2	16	240	1.2	16.2	1.25	1.6	22	790
	15		1.3	19.5	340	1.3	19.4	1.6	1.7	26	1145
	20		1.3	22	435	1.3	22	1.6	1.8	29	1360
	24		1.3	24	505	1.3	23.9	1.6	1.8	30.5	1510
	30		1.5	26.5	640	1.5	26.7	1.6	1.9	33.5	1770
0.75mm ² (1/0.96mm)	1	0.6	0.8	6	47	0.8	6.1	0.9	1.3	10.5	210
	2		0.8	7	69	0.8	7	0.9	1.3	11.5	250
	3		0.9	9.5	100	0.9	9.6	0.9	1.4	14	350
	5		1.1	12.5	155	1.1	12.3	0.9	1.5	17	480
	10		1.2	16.5	280	1.2	16.6	1.25	1.6	22.5	840
	15		1.3	20	405	1.3	19.9	1.6	1.7	26.5	1225
	20		1.3	22.5	515	1.3	22.6	1.6	1.8	29.5	1465
	24		1.5	25	625	1.5	24.9	1.6	1.8	31.5	1660
	30		1.5	27.5	760	1.5	27.4	1.6	1.9	34.5	1910
0.75mm ² (7/0.37mm)	1	0.6	0.8	6.5	50	0.8	6.4	0.9	1.3	11	220
	2		0.8	7.5	74	0.8	7.3	0.9	1.4	12	265
	3		1.1	10.5	115	1.1	10.6	0.9	1.4	15	385
	5		1.2	13	175	1.2	13.2	1.25	1.5	18.5	615
	10		1.3	17.5	315	1.3	17.7	1.25	1.6	23	900
	15		1.3	21	440	1.3	21.1	1.6	1.7	27.5	1320
	20		1.5	24	580	1.5	23.9	1.6	1.8	30.5	1600
	24		1.5	26.5	680	1.5	26.4	1.6	1.9	33.5	1790
	30		1.7	29	825	1.7	29.1	1.6	1.9	36	2060

Multipair Cable

Table 1 (Cont'd) Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-SLA (Non-armoured cable)			PE/PE/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
1.0mm ² (1/1.13mm)	1	0.6	0.8	6.5	55	0.8	6.4	0.9	1.3	11	225
	2		0.8	7.5	83	0.8	7.4	0.9	1.4	12	275
	3		1.1	10.5	125	1.1	10.6	0.9	1.4	15	405
	5		1.2	13	195	1.2	13.2	1.25	1.5	18.5	635
	10		1.2	17.5	345	1.2	17.7	1.25	1.7	23.5	945
	15		1.3	21.5	500	1.3	21.3	1.6	1.8	28	1380
	20		1.5	24.5	665	1.5	24.5	1.6	1.8	31.5	1675
	24		1.5	26.5	775	1.5	26.6	1.6	1.9	33.5	1900
30	1.5	29.5	945	1.5	29.3	1.6	2.0	36.5	2210		
1.0mm ² (7/0.53mm)	1	0.6	0.8	6.5	58	0.8	6.7	0.9	1.3	11	235
	2		0.8	8	88	0.8	7.8	0.9	1.4	12.5	290
	3		1.1	11	135	1.1	11.2	0.9	1.5	16	435
	5		1.2	14	210	1.2	14	1.25	1.5	19.5	675
	10		1.3	19	375	1.3	18.9	1.6	1.7	25.5	1170
	15		1.3	22.5	535	1.3	22.5	1.6	1.8	29.5	1485
	20		1.5	26	710	1.5	26	1.6	1.9	33	1815
	24		1.5	28	830	1.5	28.2	1.6	1.9	35	2035
30	1.7	31.5	1040	1.7	31.5	2.0	2.0	39.5	2640		
1.5mm ² (7/0.53mm)	1	0.6	0.8	7.5	73	0.8	7.3	0.9	1.4	12	265
	2		0.9	8.5	115	0.9	8.7	0.9	1.4	13.5	335
	3		1.2	12.5	180	1.2	12.5	1.25	1.5	18	595
	5		1.2	15.5	270	1.2	15.4	1.25	1.6	21	790
	10		1.3	21	500	1.3	20.9	1.6	1.8	27.5	1380
	15		1.5	25.5	735	1.5	25.3	1.6	1.9	32.5	1815
	20		1.5	28.5	950	1.5	28.7	2.0	2.0	36.5	2200
	24		1.7	31.5	1145	1.7	31.6	2.0	2.0	39.5	2780
30	1.7	35	1400	1.7	34.9	2.0	2.1	43	3215		

Multipair Cable
Table 2 Individual Pair Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-PSLA (Non-armoured cable)			PE/PE/SWA/PVC-PSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	2	0.5	0.9	9.5	81	0.9	9.4	0.9	1.4	14	320
	3		1.1	10.5	105	1.1	10.4	0.9	1.4	15	355
	5		1.2	12.5	155	1.2	12.6	1.25	1.5	18	560
	10		1.2	17.5	280	1.2	17.5	1.25	1.7	23.5	825
	15		1.3	19.5	375	1.3	19.7	1.6	1.7	26.5	1135
	20		1.3	22	470	1.3	22.1	1.6	1.8	29	1320
	24		1.5	25.5	600	1.5	25.6	1.6	1.9	32.5	1580
	30		1.5	27	700	1.5	27.1	1.6	1.9	34	1735
0.50mm ² (7/0.30mm)	2	0.6	1.1	11	100	1.1	10.9	0.9	1.5	15.5	380
	3		1.1	11.5	120	1.1	11.6	0.9	1.5	16.5	410
	5		1.2	14	175	1.2	14.2	1.25	1.6	20	625
	10		1.3	20	330	1.3	20.0	1.6	1.8	27	1105
	15		1.5	23	450	1.5	22.8	1.6	1.8	29.5	1320
	20		1.5	25.5	565	1.5	25.5	1.6	1.9	32.5	1540
	24		1.5	29	700	1.5	29.1	1.6	1.9	36	1795
	30		1.7	31.5	835	1.7	31.3	2.0	2.1	39.5	2290
0.75mm ² (1/0.96mm)	2	0.6	1.1	11	110	1.1	11.2	0.9	1.5	16	390
	3		1.1	12	135	1.1	11.9	0.9	1.5	16.5	425
	5		1.2	14.5	200	1.2	14.5	1.25	1.6	20	660
	10		1.3	20.5	380	1.3	20.5	1.6	1.7	27	1160
	15		1.3	23	495	1.3	22.9	1.6	1.8	29.5	1370
	20		1.5	26	655	1.5	26.1	1.6	1.9	33	1650
	24		1.5	30	805	1.5	29.8	1.6	1.9	37	1920
	30		1.7	32	970	1.7	32.0	2.0	2.0	40	2435
0.75mm ² (7/0.37mm)	2	0.6	1.1	12	120	1.1	11.8	0.9	1.5	16.5	410
	3		1.2	12.5	150	1.2	12.7	1.25	1.5	18	555
	5		1.2	15.5	215	1.2	15.3	1.25	1.6	21	700
	10		1.3	21.5	410	1.3	21.6	1.6	1.7	28	1230
	15		1.5	24.5	560	1.5	24.6	1.6	1.8	31.5	1485
	20		1.5	27.5	710	1.5	27.6	1.6	1.9	34.5	1765
	24		1.7	32	905	1.7	31.9	2.0	2.0	40	2370
	30		1.7	34	1050	1.7	33.9	2.0	2.1	42	2625

Multipair Cable

Table 2 (cont'd) Individual Pair Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-PSLA (Non-armoured cable)			PE/PE/SWA/PVC-PSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
1.0mm ² (1/1.13mm)	2	0.6	1.1	12	130	1.1	11.8	0.9	1.5	16.5	410
	3		1.2	13	160	1.2	12.8	1.25	1.5	18.5	570
	5		1.2	15.5	235	1.2	15.4	1.25	1.6	21	725
	10		1.3	22	455	1.3	21.8	1.6	1.8	28.5	1285
	15		1.5	25	625	1.5	24.8	1.6	1.9	32	1580
	20		1.7	28	815	1.7	28.2	2.0	2.0	36	2135
	24		1.7	32	1005	1.7	32.1	2.0	2.0	40	2475
1.0mm ² (7/0.43mm)	2	0.6	1.2	12.5	145	1.2	12.7	1.25	1.5	18	550
	3		1.2	13.5	175	1.2	13.4	1.25	1.5	19	600
	5		1.2	16	255	1.2	16.2	1.25	1.6	22	765
	10		1.3	23	485	1.3	23.0	1.6	1.8	30	1375
	15		1.5	26	670	1.5	26.2	1.6	1.9	33	1665
	20		1.5	29.5	850	1.5	29.4	1.6	2.0	36.5	1980
	24		1.7	34	1080	1.7	34.0	2.0	2.1	42	2650
1.5mm ² (7/0.53mm)	2	0.6	1.2	14	180	1.2	13.8	1.25	1.6	19.5	615
	3		1.2	14.5	220	1.2	14.7	1.25	1.6	20.5	680
	5		1.3	18	335	1.3	18.0	1.6	1.7	24.5	1035
	10		1.5	26	650	1.5	25.8	1.6	1.9	33	1630
	15		1.7	29.5	900	1.7	29.3	2.0	2.0	37.5	2250
	20		1.7	33	1145	1.7	32.8	2.0	2.1	41	2660
	24		2.0	38	1460	2.0	38.1	2.0	2.2	46.5	3220
30	2.0	40.5	1715	2.0	40.4	2.5	2.5	50.5	4020		

Multipair Cable

Table 3 Colour code (Pair identification)

Pair No.	a-wire	b-wire	Pair No.	a-wire	b-wire
1	Black	Blue	16	Black	Orange
2	Black	Green	17	Blue	Orange
3	Blue	Green	18	Green	Orange
4	Black	Brown	19	Brown	Orange
5	Blue	Brown	20	White	Orange
6	Green	Brown	21	Red	Orange
7	Black	White	22	Black	Yellow
8	Blue	White	23	Blue	Yellow
9	Green	White	24	Green	Yellow
10	Brown	White	25	Brown	Yellow
11	Black	Red	26	White	Yellow
12	Blue	Red	27	Red	Yellow
13	Green	Red	28	Orange	Yellow
14	Brown	Red	29	Black	Grey
15	White	Red	30	Blue	Grey

Note:

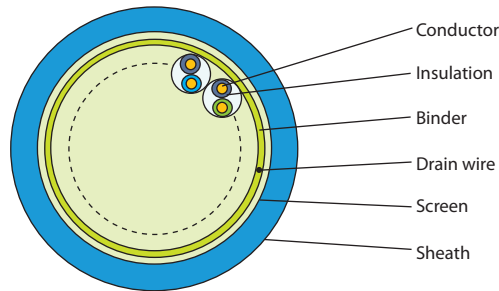
Colour code for Two-pair cable(one quad) : Black, Blue, Green, Brown (colour coded in clockwise order of rotation)

Table 4 Electrical characteristics

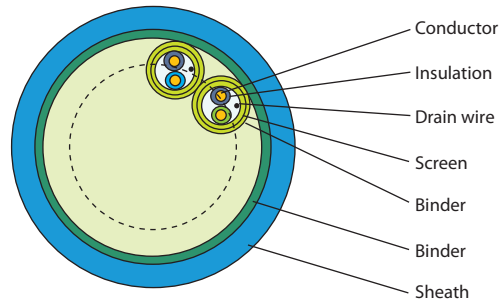
Electrical requirements		Conductor size	mm ² (no./mm)	0.5 (1/0.80)	0.5 (7/0.30)	0.75 (1/0.96)	0.75 (7/0.37)	1.0 (1/1.13)	1.0 (7/0.43)	1.5 (7/0.53)
Conductor resistance at 20°C		(Ω/km)	Max.	36.8	36.7	25.0	25.0	18.4	18.5	12.3
Insulation resistance at 20°C		(MΩ.km)	Min.	5000						
Mutual capacitance at 1 kHz		(nF/km)	Max.							120
- Collective screen : one-pair & two-pair cable				115						
: all other cable				75						
- Individual screen				115						120
Capacitance unbalance at 1kHz		(pF/250m)	Max.	250						
Inductance/Resistance ratio, L/R		(μH/Ω)	Max.	25						40
Voltage test for 1 minute	core to core	(kV)		1						
	core to screen	(kV)		1						

Multipair Cable : Cross-Sectional Of Cable

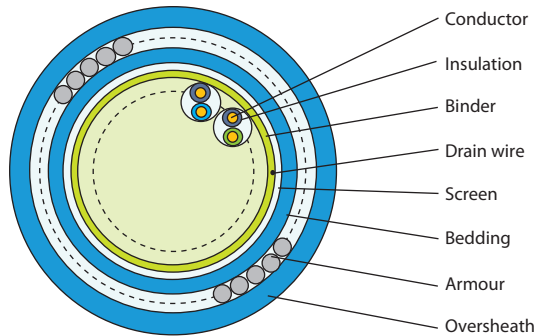
PE/PVC-SLA COLLECTIVE SCREEN (NON-ARMoured CABLE)



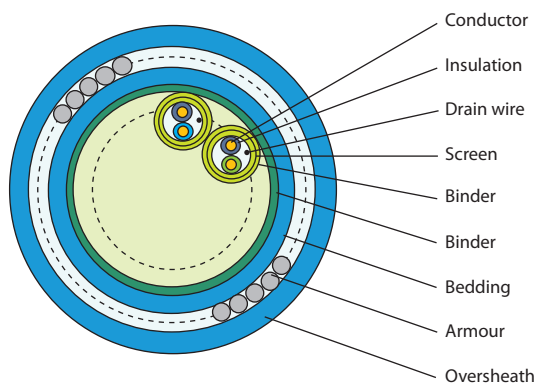
PE/PVC-PSLA INDIVIDUAL PAIR SCREEN (NON-ARMoured CABLE)



PE/PE/SWA/PVC-SLA COLLECTIVE SCREEN (ARMoured CABLE)



PE/PE/SWA/PVC-PSLA INDIVIDUAL PAIR SCREEN (ARMoured CABLE)



Multitriple Cable

Applicable Standards

BS 5308 Part 1 (Type 1 & Type 2)
 BS 6746/ BS 7655
 BS 6234
 BS 6360 (IEC 60228)
 BS 4066 Part 1 (IEC 60332-1) & IEC 60332-3 (if required)

Construction

Conductor	: Plain annealed copper wires according to BS 6360 (IEC 60228)
Insulation	: Polyethylene type 03 according to BS 6234 or equivalent compound
Colour code	: Refer to the Table 7
Tripling	: Cores twisted to triples
Binder	: Non-hygroscopic Polyester tape
Drain wire	: Tinned annealed copper wire 0.5mm ² (1/0.80mm)
Screen	: Aluminium/Polyester tape approx. 0.022mm thick over Drain wire
Bedding (Inner sheath)	: Polyethylene type 03 Black colour according to BS 6234 or equivalent compound
Armour	: Galvanized steel wires
Sheath/Oversheath	: PVC compound type TM 1 Black colour according to BS 6746 / BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic compound (LSNHFR) to BS 4066 Part 1&3 (IEC 60332-1&3) if required.
Cable Identification	: Manufacturer's name and voltage

Application

For transmission of analogue and digital signals in and around process plants in dry and damp industrial areas.
 (Non-armoured cables : not recommended for underground burial)

Minimum Bending Radius

Non-armoured	- During operation	: 6 X Overall diameter
	- During Installation	: 8 X Overall diameter
Armoured cable	- During operation	: 8 X Overall diameter
	- During Installation	: 10 X Overall diameter

Temperature Rating

During operation	: -30°C up to +70°C
During Installation	: -10°C up to +50°C

Abbreviations

- PE	: Polyethylene
- SLA	: Aluminium/Polyester tape collective screen
- SWA	: Steel wire armour
- PSLA	: Aluminium/Polyester tape pair screen
- PVC	: Polyvinyl chloride

Multitrip Cable

Table 5 Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-SLA (Non-armoured cable)			PE/PE/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	1	0.5	0.8	5.5	44	0.8	5.6	0.9	1.3	10	195
	2		1.1	9.5	100	1.1	9.7	0.9	1.4	14.5	340
	3		1.1	10.5	115	1.1	10.3	0.9	1.4	15	375
	5		1.2	12.5	175	1.2	12.5	1.25	1.5	18	570
	10		1.3	17.5	325	1.3	17.5	1.6	1.7	24	1010
	15		1.3	19.5	435	1.3	19.5	1.6	1.8	26.5	1190
	20		1.5	22.5	570	1.5	22.3	1.6	1.9	29.5	1430
0.50mm ² (7/0.30mm)	1	0.6	0.8	6.5	51	0.8	6.3	0.9	1.3	10.5	220
	2		1.1	11	110	1.1	11	0.9	1.5	16	390
	3		1.1	11.5	135	1.1	11.6	0.9	1.5	16.5	425
	5		1.2	14	200	1.2	14.2	1.25	1.6	20	650
	10		1.3	20	380	1.3	20	1.6	1.7	26.5	1140
	15		1.5	22.5	520	1.5	22.7	1.6	1.8	29.5	1380
	20		1.7	26	680	1.7	25.8	2.0	1.9	33.5	1860
0.75mm ² (1/0.96mm)	1	0.6	0.8	6.5	57	0.8	6.4	0.9	1.3	11	225
	2		1.1	11	125	1.1	11.2	0.9	1.5	16	405
	3		1.1	12	155	1.1	11.9	0.9	1.5	16.5	450
	5		1.2	14.5	235	1.2	14.5	1.25	1.6	20	695
	10		1.3	20.5	445	1.3	20.5	1.6	1.8	27.5	1235
	15		1.5	23.5	615	1.5	23.3	1.6	1.8	30	1495
	20		1.7	26.5	810	1.7	26.5	2.0	1.9	34.5	2015
0.75mm ² (7/0.37mm)	1	0.6	0.8	6.5	61	0.8	6.7	0.9	1.3	11	235
	2		1.1	12	135	1.1	11.8	0.9	1.5	16.5	430
	3		1.2	13	175	1.2	12.8	1.25	1.5	18.5	575
	5		1.2	15.5	255	1.2	15.3	1.25	1.6	21	735
	10		1.3	21.5	485	1.3	21.7	1.6	1.8	28.5	1310
	15		1.5	24.5	670	1.5	24.7	1.6	1.9	31.5	1600
	20		1.7	28	880	1.7	28.1	2.0	2.0	36	2160
1.0mm ² (1/1.13mm)	1	0.6	0.8	7	68	0.8	6.8	0.9	1.3	11	245
	2		1.1	12	150	1.1	11.9	0.9	1.5	16.5	445
	3		1.2	13	190	1.2	12.8	1.25	1.5	18.5	595
	5		1.2	15.5	285	1.2	15.4	1.25	1.6	21	770
	10		1.3	22	545	1.3	21.8	1.6	1.8	28.5	1375
	15		1.5	25	765	1.5	24.9	1.6	1.9	32	1710
	20		1.7	28.5	1000	1.7	28.3	2.0	2.0	36.5	2305
1.0mm ² (7/0.43mm)	1	0.6	0.8	7	72	0.8	7.1	0.9	1.3	11.5	255
	2		1.2	13	165	1.2	12.8	1.25	1.5	18.5	570
	3		1.2	13.5	205	1.2	13.6	1.25	1.6	19.5	640
	5		1.2	16.5	305	1.2	16.3	1.25	1.6	22	815
	10		1.5	23.5	605	1.5	23.6	1.6	1.9	30.5	1505
	15		1.5	26.5	815	1.5	26.4	1.6	1.9	33.5	1815
	20		1.7	30	1070	1.7	30.0	2.0	2.0	38	2450
1.5mm ² (7/0.53mm)	1	0.6	0.8	8	92	0.8	7.8	0.9	1.4	12.5	290
	2		1.2	14	210	1.2	14	1.25	1.6	19.5	660
	3		1.2	15	265	1.2	14.9	1.25	1.6	20.5	735
	5		1.3	18	410	1.3	18.2	1.6	1.7	25	1110
	10		1.5	26	805	1.5	26	1.6	1.9	33	1795
	15		1.7	29.5	1125	1.7	29.5	2.0	2.0	37.5	2490
	20		1.9	33.5	1475	1.9	33.5	2.0	2.1	41.5	2995

Multitriples Cable
Table 6 Individual Triple Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PE/PVC-TSLA (Non-armoured cable)			PE/PE/SWA/PVC-TSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	2	0.5	1.1	10.5	110	1.1	10.6	0.9	1.4	15	365
	3		1.1	11	130	1.1	11.2	0.9	1.5	16	415
	5		1.2	13.5	200	1.2	13.7	1.25	1.5	19	630
	10		1.3	19.5	375	1.3	19.3	1.6	1.7	26	1120
	15		1.3	21.5	500	1.3	21.5	1.6	1.8	28.5	1330
	20		1.5	24.5	655	1.5	24.5	1.6	1.9	31.5	1595
0.50mm ² (7/0.30mm)	2	0.6	1.1	12	125	1.1	11.9	0.9	1.5	16.5	425
	3		1.1	12.5	150	1.1	12.6	0.9	1.5	17.5	465
	5		1.2	15.5	230	1.2	15.4	1.25	1.6	21	715
	10		1.3	22	435	1.3	21.8	1.6	1.8	28.5	1285
	15		1.5	25	600	1.5	24.9	1.6	1.8	31.5	1540
	20		1.7	28.5	785	1.7	28.3	2.0	1.9	36	2085
0.75mm ² (1/0.96mm)	2	0.6	1.1	12	140	1.1	12.1	0.9	1.5	17	445
	3		1.2	13	180	1.2	13.1	1.25	1.5	18.5	595
	5		1.2	16	265	1.2	15.8	1.25	1.6	21.5	760
	10		1.3	22.5	505	1.3	22.4	1.6	1.8	29	1355
	15		1.5	25.5	695	1.5	25.5	1.6	1.9	32.5	1675
	20		1.7	29	915	1.7	29.0	2.0	2.0	37	2260
0.75mm ² (7/0.37mm)	2	0.6	1.2	13	160	1.2	13	1.25	1.5	18.5	565
	3		1.2	14	195	1.2	13.8	1.25	1.5	19.5	620
	5		1.2	16.5	285	1.2	16.6	1.25	1.6	22.5	805
	10		1.5	24	570	1.5	24.1	1.6	1.8	31	1475
	15		1.5	27	755	1.5	26.9	1.6	1.9	34	1775
	20		1.7	30.5	990	1.7	30.6	2.0	2.0	38.5	2400
1.0mm ² (1/1.13mm)	2	0.6	1.2	13	170	1.2	13.1	1.25	1.5	18.5	585
	3		1.2	14	210	1.2	13.9	1.25	1.5	19.5	650
	5		1.2	17	315	1.2	16.8	1.25	1.6	22.5	840
	10		1.5	24	630	1.5	24.2	1.6	1.8	31	1555
	15		1.5	27	850	1.5	27.1	1.6	1.9	34	1885
	20		1.7	31	1115	1.7	30.9	2.0	2.0	39	2525
1.0mm ² (7/0.43mm)	2	0.6	1.2	13.5	185	1.2	13.7	1.25	1.5	19	610
	3		1.2	14.5	225	1.2	14.6	1.25	1.6	20.5	690
	5		1.2	17.5	340	1.2	17.7	1.25	1.6	23.5	885
	10		1.5	25.5	675	1.5	25.6	1.6	1.9	32.5	1655
	15		1.5	28.5	910	1.5	28.7	1.6	2.0	36	2020
	20		1.7	32.5	1195	1.7	32.6	2.0	2.1	41	2710
1.5mm ² (7/0.53mm)	2	0.6	1.2	15	230	1.2	15	1.25	1.6	20.5	705
	3		1.2	16	290	1.2	16	1.25	1.6	21.5	790
	5		1.3	19.5	450	1.3	19.6	1.6	1.7	26	1210
	10		1.5	28	885	1.5	28.2	1.6	1.9	35	1960
	15		1.7	32	1235	1.7	32	2.0	2.1	40	2725
	20		1.9	36.5	1620	1.9	36.4	2.0	2.3	45	3315

Multitriple Cable

Table 7 Colour code (Triple identification)

Type of triple	a-wire	b-wire	c-wire
1	Black	White	Red
2	Black	White	Green
3	Black	White	Yellow
4	Black	White	Brown
5	Black	White	Blue
6	Black	White	Orange

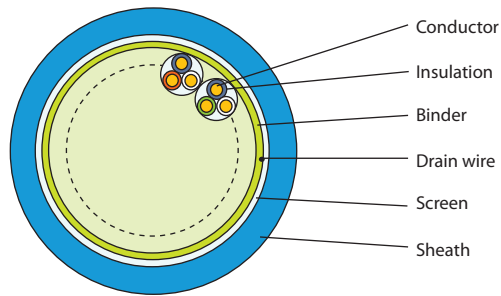
No. of triple	Typr of triple		
	center	1 st layer	2 nd layer
1	1	-	-
2	-	1,2	-
3	-	1~3	-
5	-	1~5	-
10	-	1,2	1~6,2,3
15	-	1~4	1~6,2~6
20	1	1~6	1~6,2~6,3,4

Table 8 Electrical characteristics

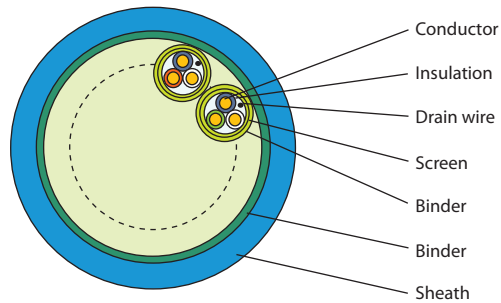
Electrical requirements		Conductor size	mm ² (no./mm)	0.5 (1/0.80)	0.5 (7/0.30)	0.75 (1/0.96)	0.75 (7/0.37)	1.0 (1/1.13)	1.0 (7/0.43)	1.5 (7/0.53)	
Conductor resistance at 20°C	(Ω/km)	Max.		36.8	36.7	25.0	25.0	18.4	18.5	12.3	
Insulation resistance at 20°C	(MΩ.km)	Min.	5000								
Mutual capacitance at 1 kHz	(nF/km)	Max.									
- Collective screen : one-triple cable											120
: all other cables											85
- Individual screen										120	
Inductance/Resistance ratio, L/R	(μH/Ω)	Max.	25								40
Voltage test for 1 minute	core to core (kV)		1								
	core to screen (kV)		1								

Multitriples Cable : Cross-Sectional Of Cable

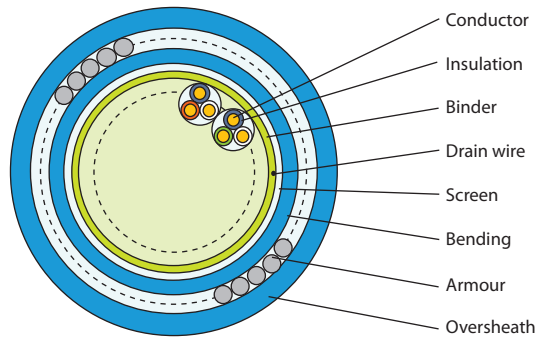
PE/PVC-SLA COLLECTIVE SCREEN (NON-ARMoured CABLE)



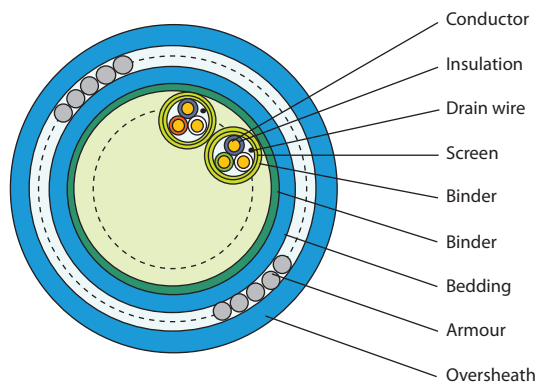
PE/PVC-TSLA INDIVIDUAL TRIPLE SCREEN (NON-ARMoured CABLE)



PE/PE/SWA/PVC-SLA COLLECTIVE SCREEN (ARMoured CABLE)



PE/PE/SWA/PVC-TSLA INDIVIDUAL TRIPLE SCREEN (ARMoured CABLE)



Multipair Cable

Applicable Standards

BS 5308 Part 2 (Type 1 & Type 2)
 BS 6746/ BS 7655
 BS 6360 (IEC 60228)
 BS 4066 Part 1 (IEC 60332-1) & IEC 60332-3 (if required)

Construction

Conductor	:	Plain annealed copper wires according to BS 6360 (IEC 60228)
Insulation	:	PVC compound type T11 according to BS 6746/ BS 7655
Colour code	:	White and Black (numbering on White core)
Pairing	:	Cores twisted to pairs (two pair cable can be manufactured as a quad for collective screen cables)
Binder	:	Non-hygroscopic Polyester tape
Drain wire	:	Tinned annealed copper wire 0.5mm ² (1/0.80mm)
Screen	:	Aluminium/Polyester tape approx. 0.022mm thick over Drain wire
Bedding (Inner sheath)	:	PVC compound type TM1 Black colour according to BS 6746/ BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic compound (LSNHFR) to BS 4066 Part 1&3 (IEC 60332-1&3) if required.
Armour	:	Galvanized steel wires
Sheath/Oversheath	:	PVC compound type TM 1 Black colour according to BS 6746 / BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic compound (LSNHFR) to BS 4066 Part 1&3 (IEC 60332-1&3) if required.
Cable Identification	:	Manufacturer's name and voltage

Application

For transmission of analogue and digital signals in and around process plants in dry and damp industrial areas.
 (Non-armoured cables : not recommended for underground burial)

Minimum Bending Radius

Non-armoured	- During operation	: 6 X Overall diameter
	- During Installation	: 8 X Overall diameter
Armoured cable	- During operation	: 8 X Overall diameter
	- During Installation	: 10 X Overall diameter

Temperature Rating

During operation	: -30°C up to +70°C
During Installation	: -10°C up to +50°C

Abbreviations

- PVC	: Polyvinyl chloride
- SLA	: Aluminium/Polyester tape collective screen
- SWA	: Steel wire armour
- PSLA	: Aluminium/Polyester tape pair screen

Multipair Cable
Table 9 Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-SLA (Non-armoured cable)			PVC/PVC/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	1	0.5	0.8	5.5	39	0.8	5.4	0.9	1.3	10	195
	2		0.8	6	57	0.8	6.1	0.9	1.3	10.5	225
	3		0.9	8.5	83	0.9	8.4	0.9	1.4	13	315
	5		1.1	10.5	130	1.1	10.6	0.9	1.4	15	420
	10		1.2	14	230	1.2	14.2	1.25	1.6	20	730
	15		1.2	17	325	1.2	16.9	1.25	1.6	22.5	915
	20		1.3	19.5	425	1.3	19.3	1.6	1.7	26	1255
	24		1.3	21	495	1.3	20.8	1.6	1.7	27.5	1395
	30		1.3	23	600	1.3	23.0	1.6	1.8	30	1595
0.50mm ² (7/0.30mm)	1	0.6	0.8	6	45	0.8	6	0.9	1.3	10.5	205
	2		0.8	7	66	0.8	6.8	0.9	1.3	11	250
	3		0.9	9.5	96	0.9	9.4	0.9	1.4	14	355
	5		1.1	12	150	1.1	12	0.9	1.5	17	485
	10		1.2	16	270	1.2	16.2	1.25	1.6	22	845
	15		1.3	19.5	385	1.3	19.4	1.6	1.7	26	1220
	20		1.3	22	495	1.3	22	1.6	1.8	29	1460
	24		1.3	24	580	1.3	23.9	1.6	1.8	30.5	1625
	30		1.5	26.5	725	1.5	26.7	1.6	1.9	33.5	1915
0.75mm ² (1/0.96mm)	1	0.6	0.8	6	50	0.8	6.1	0.9	1.3	10.5	220
	2		0.8	7	75	0.8	7	0.9	1.3	11.5	265
	3		0.9	9.5	105	0.9	9.6	0.9	1.4	14	370
	5		1.1	12.5	170	1.1	12.3	0.9	1.5	17	510
	10		1.2	16.5	310	1.2	16.6	1.25	1.6	22.5	895
	15		1.3	20	450	1.3	19.9	1.6	1.7	26.5	1305
	20		1.3	22.5	575	1.3	22.6	1.6	1.8	29.5	1565
	24		1.5	25	695	1.5	24.9	1.6	1.8	31.5	1780
	30		1.5	27.5	850	1.5	27.4	1.6	1.9	34.5	2055
0.75mm ² (7/0.37mm)	1	0.6	0.8	6.5	54	0.8	6.4	0.9	1.3	11	230
	2		0.8	7.5	81	0.8	7.3	0.9	1.4	12	280
	3		1.1	10.5	125	1.1	10.6	0.9	1.4	15	410
	5		1.2	13	190	1.2	13.2	1.25	1.5	18.5	655
	10		1.3	17.5	345	1.3	17.7	1.6	1.7	24.5	1125
	15		1.3	21	490	1.3	21.1	1.6	1.8	28	1410
	20		1.5	24.5	650	1.5	23.9	1.6	1.8	31	1720
	24		1.5	26.5	765	1.5	26.4	1.6	1.9	33.5	1925
	30		1.7	29.5	955	1.7	29.1	2.0	2.0	37.5	2540

Multipair Cable

Table 9 (Cont'd) Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-SLA (Non-armoured cable)			PVC/PVC/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
1.0mm ² (1/1.13mm)	1	0.6	0.8	6.5	58	0.8	6.4	0.9	1.3	11	235
	2		0.8	7.5	89	0.8	7.4	0.9	1.4	12	290
	3		1.1	10.5	135	1.1	10.6	0.9	1.4	15	430
	5		1.2	13	210	1.2	13.2	1.25	1.5	18.5	670
	10		1.2	17.5	375	1.2	17.7	1.25	1.7	23.5	1010
	15		1.3	21.5	545	1.3	21.3	1.6	1.8	28	1465
	20		1.5	24.5	725	1.5	24.5	1.6	1.8	31.5	1790
	24		1.5	26.5	855	1.5	26.6	1.6	1.9	33.5	2030
30	1.5	29.5	1045	1.5	29.3	1.6	2.0	36.5	2365		
1.0mm ² (7/0.43mm)	1	0.6	0.8	6.5	62	0.8	6.7	0.9	1.3	11	245
	2		0.8	8	95	0.8	7.8	0.9	1.4	12.5	305
	3		1.1	11	145	1.1	11.2	0.9	1.5	16	465
	5		1.2	14	225	1.2	14	1.25	1.5	19.5	715
	10		1.3	19	415	1.3	18.9	1.6	1.7	25.5	1245
	15		1.3	22.5	590	1.3	22.5	1.6	1.8	29.5	1585
	20		1.5	26	785	1.5	26	1.6	1.9	33	1945
	24		1.5	28	925	1.5	28.2	1.6	1.9	35	2185
30	1.7	31.5	1155	1.7	31.5	2.0	2.0	39.5	2830		
1.5mm ² (7/0.53mm)	1	0.6	0.8	7.5	77	0.8	7.3	0.9	1.4	12	280
	2		0.9	8.5	125	0.9	8.7	0.9	1.4	13.5	355
	3		1.2	12.5	195	1.2	12.5	1.25	1.5	18	630
	5		1.2	15.5	295	1.2	15.4	1.25	1.6	21	840
	10		1.3	21	545	1.3	20.9	1.6	1.8	27.5	1465
	15		1.5	25.5	805	1.5	25.3	1.6	1.9	32.5	1940
	20		1.5	28.5	1040	1.5	28.7	1.6	2.0	36	2350
	24		1.7	31.5	1255	1.7	31.6	2.0	2.0	39.5	2965
30	1.7	35	1540	1.7	34.9	2.0	2.1	43	3435		

Multipair Cable
Table 10 Individual Pair Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-PSLA (Non-armoured cable)			PVC/PVC/SWA/PVC-PSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	2	0.5	0.9	9.5	85	0.9	9.4	0.9	1.4	14	335
	3		1.1	10.5	110	1.1	10.4	0.9	1.4	15	375
	5		1.2	12.5	165	1.2	12.6	1.25	1.5	18	590
	10		1.2	17.5	300	1.2	17.5	1.25	1.7	23.5	875
	15		1.3	19.5	405	1.3	19.7	1.6	1.7	26.5	1200
	20		1.3	22	510	1.3	22.1	1.6	1.8	29	1400
	24		1.5	25.5	650	1.5	25.6	1.6	1.9	32.5	1680
	30		1.5	27	760	1.5	27.1	1.6	1.9	34	1850
0.50mm ² (7/0.30mm)	2	0.6	1.1	11	105	1.1	10.9	0.9	1.5	15.5	400
	3		1.1	11.5	130	1.1	11.6	0.9	1.5	16.5	435
	5		1.2	14	190	1.2	14.2	1.25	1.6	20	665
	10		1.3	20	360	1.3	20.0	1.6	1.8	27	1175
	15		1.5	23	495	1.5	22.8	1.6	1.8	29.5	1410
	20		1.5	25.5	625	1.5	25.5	1.6	1.9	32.5	1655
	24		1.5	29	770	1.5	29.1	1.6	1.9	36	1925
	30		1.7	31.5	925	1.7	31.3	2.0	2.1	39.5	2455
0.75mm ² (1/0.96mm)	2	0.6	1.1	11	115	1.1	11.2	0.9	1.5	16	410
	3		1.1	12	140	1.1	11.9	0.9	1.5	16.5	450
	5		1.2	14.5	215	1.2	14.5	1.25	1.6	20	700
	10		1.3	20.5	405	1.3	20.5	1.6	1.7	27	1225
	15		1.3	23	540	1.3	22.9	1.6	1.8	29.5	1470
	20		1.5	26	710	1.5	26.1	1.6	1.9	33	1760
	24		1.5	30	875	1.5	29.8	1.6	1.9	37	2055
	30		1.7	32	1055	1.7	32.0	2.0	2.0	40	2600
0.75mm ² (7/0.37mm)	2	0.6	1.1	12	125	1.1	11.8	0.9	1.5	16.5	435
	3		1.2	12.5	160	1.2	12.7	1.25	1.5	18	585
	5		1.2	15.5	235	1.2	15.3	1.25	1.6	21	745
	10		1.3	21.5	445	1.3	21.6	1.6	1.8	28.5	1315
	15		1.5	24.5	615	1.5	24.6	1.6	1.9	31.5	1605
	20		1.7	28	800	1.7	28.0	2.0	2.0	36	2160
	24		1.7	32	985	1.7	31.9	2.0	2.0	40	2530
	30		2.0	34.5	1200	2.0	34.5	2.0	2.2	43	2905

Multipair Cable

Table 10 (Cont'd) Individual Pair Screen

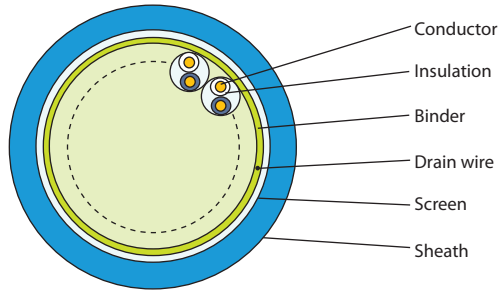
Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-PSLA (Non-armoured cable)			PVC/PVC/SWA/PVC-PSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
1.0mm ² (1/1.13mm)	2	0.6	1.1	12	135	1.1	11.8	0.9	1.5	16.5	435
	3		1.2	13	170	1.2	12.8	1.25	1.5	18.5	600
	5		1.2	15.5	255	1.2	15.4	1.25	1.6	21	765
	10		1.3	22	485	1.3	21.8	1.6	1.8	28.5	1360
	15		1.5	25	670	1.5	24.8	1.6	1.9	32	1680
	20		1.7	28	880	1.7	28.2	2.0	2.0	36	2265
	24		1.7	32	1080	1.7	32.1	2.0	2.0	40	2625
30	2.0	34.5	1320	2.0	34.7	2.0	2.2	43	3025		
1.0mm ² (7/0.43mm)	2	0.6	1.2	12.5	155	1.2	12.7	1.25	1.5	18	575
	3		1.2	13.5	185	1.2	13.4	1.25	1.5	19	635
	5		1.2	16	275	1.2	16.2	1.25	1.6	22	810
	10		1.3	23	525	1.3	23.0	1.6	1.8	30	1455
	15		1.5	26	725	1.5	26.2	1.6	1.9	33	1780
	20		1.5	29.5	925	1.5	29.4	1.6	2.0	36.5	2115
	24		1.7	34	1170	1.7	34.0	2.0	2.1	42	2825
30	2.0	36.5	1425	2.0	36.7	2.0	2.2	45	3225		
1.5mm ² (7/0.53mm)	2	0.6	1.2	14	185	1.2	13.8	1.25	1.6	19.5	650
	3		1.2	14.5	235	1.2	14.7	1.25	1.6	20.5	720
	5		1.3	18	355	1.3	18.0	1.6	1.7	24.5	1090
	10		1.5	26	700	1.5	25.8	1.6	1.9	33	1730
	15		1.7	29.5	965	1.7	29.3	2.0	2.0	37.5	2385
	20		1.7	33	1235	1.7	32.8	2.0	2.1	41	2830
	24		2.0	38	1570	2.0	38.1	2.0	2.2	46.5	3435
30	2.0	40.5	1850	2.0	40.4	2.5	2.4	50	4245		

Table 11 Electrical characteristic

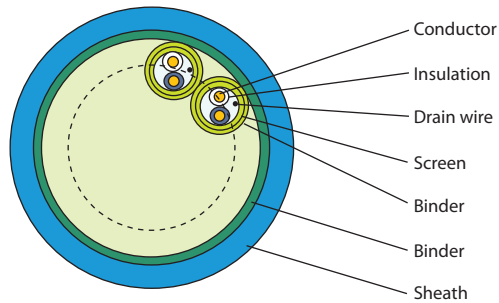
Electrical requirements	Conductor size	mm ² (no./mm)	Conductor size							
			0.5 (1/0.80)	0.5 (7/0.30)	0.75 (1/0.96)	0.75 (7/0.37)	1.0 (1/1.13)	1.0 (7/0.43)	1.5 (7/0.53)	
Conductor resistance at 20°C	(Ω/km)	Max.	36.8	36.7	25.0	25.0	18.4	18.5	12.3	
Insulation resistance at 20°C	(MΩ.km)	Min.	25							
Mutual capacitance at 1kHz	(nF/km)	Max.	250							
Capacitance between any core or screen at 1kHz	(nF/km)	Max.	450							
Inductance/Resistance ratio, L/R	(μH/Ω)	Max.	25							40
Test voltage for 1 minute	core to core (kV)		1							
	core to screen (kV)		1							

Multipair Cable Cross : Sectional Of Cable

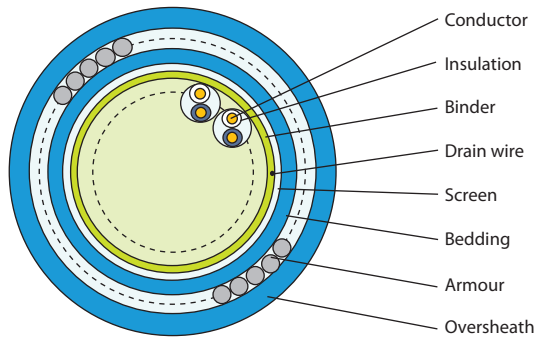
PVC/PVC-SLA COLLECTIVE SCREEN (NON-ARMoured CABLE)



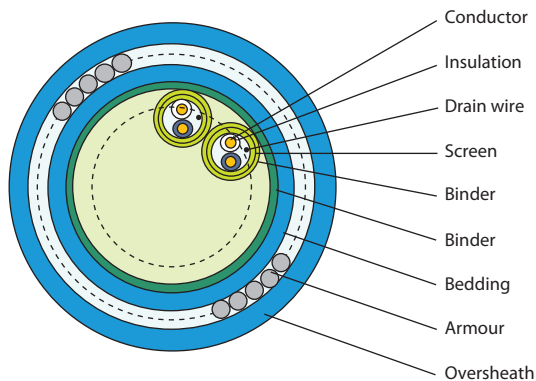
PVC/PVC-PSLA INDIVIDUAL PAIR SCREEN (NON-ARMoured CABLE)



PVC/PVC/SWA/PVC-SLA COLLECTIVE SCREEN (ARMoured CABLE)



PVC/PVC/SWA/PVC-PSLA INDIVIDUAL PAIR SCREEN (ARMoured CABLE)



Multitriple Cable

Applicable Standards

BS 5308 Part 2 (Type 1 & Type 2)
 BS 6746 / BS 7655
 BS 6360 (IEC 60228)
 BS 4066 Part 1 (IEC 60332-1) & IEC 60332-3 (if required)

Construction

Conductor	:	Plain annealed copper wires according to BS 6360 (IEC 60228)
Insulation	:	PVC compound type T11 according to BS 6746/ BS 7655
Colour code	:	White, Black and Red (numbering White core)
Tripling	:	Cores twisted to triples
Binder	:	Non-hygroscopic Polyester tape
Drain wire	:	Tinned annealed copper wire 0.5mm ² (1/0.80mm)
Screen	:	Aluminium/Polyester tape approx. 0.022mm thick over Drain wire
Bedding (Inner sheath)	:	PVC compound type TM1 Black colour according to BS 6746/ BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic compound (LSNHFR) to BS 4066 Part 1&3 (IEC 60332-1&3) if required.
Armour	:	Galvanized Steel wires
Sheath/Oversheath	:	PVC compound type TM1 Black colour according to BS 6746/BS 7655, Flame retardant to BS 4066 Part 1 (IEC 60332-1) or Low smoke, Non-halogen and Flame retardant thermoplastic Compound (LSNHFR) to BS 4066 Part 1&3 (IEC 60332-1&3) if required.
Cable identification	:	Manufacturer's name and voltage

Application

For transmission of analogue and digital signals in and around process plants in dry and damp industrial areas.
 (Non-armoured cables : not recommended for underground burial)

Minimum Bending Radius

Non-armoured cable	:	During operation	: 6 X Overall diameter
	:	During installation	: 8 X Overall diameter
Armoured cable	:	During operation	: 8 X Overall diameter
	:	During installation	: 10 X Overall diameter

Temperature Rating

During operation	:	-30°C up to +70°C
During installation	:	-10°C up to +50°C

Abbreviations

- PVC : Polyvinyl chloride
- SLA : Aluminium/Polyester tape collective screen
- SWA : Steel wire armour
- TSLA : Aluminium/Polyester tape triple screen

Multitriples Cable
Table 12 Collective Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-SLA (Non-armoured cable)			PVC/PVC/SWA/PVC-SLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	1	0.5	0.8	5.5	47	0.8	5.6	0.9	1.3	10	205
	2		1.1	9.5	105	1.1	9.7	0.9	1.4	14.5	360
	3		1.1	10.5	125	1.1	10.3	0.9	1.4	15	395
	5		1.2	12.5	190	1.2	12.5	1.25	1.5	18	605
	10		1.3	17.5	360	1.3	17.5	1.6	1.7	24	1070
	15		1.3	19.5	480	1.3	19.5	1.6	1.8	26.5	1270
	20		1.5	22.5	630	1.5	22.3	1.6	1.9	29.5	1535
0.50mm ² (7/0.30mm)	1	0.6	0.8	6.5	55	0.8	6.3	0.9	1.3	10.5	230
	2		1.1	11	120	1.1	11	0.9	1.5	16	415
	3		1.1	11.5	150	1.1	11.6	0.9	1.5	16.5	455
	5		1.2	14	225	1.2	14.2	1.25	1.6	20	695
	10		1.3	20	425	1.3	20	1.6	1.7	26.5	1220
	15		1.5	22.5	590	1.5	22.7	1.6	1.8	29.5	1495
	20		1.7	26	770	1.7	25.8	2.0	1.9	33.5	2010
0.75mm ² (1/0.96mm)	1	0.6	0.8	6.5	61	0.8	6.4	0.9	1.3	11	235
	2		1.1	11	135	1.1	11.2	0.9	1.5	16	430
	3		1.1	12	170	1.1	11.9	0.9	1.5	16.5	480
	5		1.2	14.5	255	1.2	14.5	1.25	1.6	20	740
	10		1.3	20.5	490	1.3	20.5	1.6	1.8	27.5	1315
	15		1.5	23.5	680	1.5	23.3	1.6	1.8	30	1610
	20		1.7	26.5	895	1.7	26.5	2.0	1.9	34.5	2165
0.75mm ² (7/0.37mm)	1	0.6	0.8	6.5	66	0.8	6.7	0.9	1.3	11	250
	2		1.1	12	145	1.1	11.8	0.9	1.5	16.5	460
	3		1.2	13	190	1.2	12.8	1.25	1.5	18.5	610
	5		1.2	15.5	280	1.2	15.3	1.25	1.6	21	790
	10		1.3	21.5	535	1.3	21.7	1.6	1.8	28.5	1405
	15		1.5	24.5	750	1.5	24.7	1.6	1.9	31.5	1730
	20		1.7	28	980	1.7	28.1	2.0	2.0	36	2330
1.0mm ² (1/1.13mm)	1	0.6	0.8	7	72	0.8	6.8	0.9	1.3	11	255
	2		1.1	12	160	1.1	11.9	0.9	1.5	16.5	470
	3		1.2	13	205	1.2	12.8	1.25	1.5	18.5	630
	5		1.2	15.5	310	1.2	15.4	1.25	1.6	21	820
	10		1.3	22	595	1.3	21.8	1.6	1.8	28.5	1460
	15		1.5	25	835	1.5	24.9	1.6	1.9	32	1835
	20		1.7	28.5	1100	1.7	28.3	2.0	2.0	36.5	2470
1.0mm ² (7/0.43mm)	1	0.6	0.8	7	78	0.8	7.1	0.9	1.3	11.5	265
	2		1.2	13	180	1.2	12.8	1.25	1.5	18.5	600
	3		1.2	13.5	225	1.2	13.6	1.25	1.6	19.5	680
	5		1.2	16.5	335	1.2	16.3	1.25	1.6	22	870
	10		1.5	23.5	665	1.5	23.6	1.6	1.9	30.5	1615
	15		1.5	26.5	905	1.5	26.4	1.6	1.9	33.5	1955
	20		1.7	30	1190	1.7	30	2.0	2.0	38	2635
1.5mm ² (7/0.53mm)	1	0.6	0.8	8	100	0.8	7.8	0.9	1.4	12.5	305
	2		1.2	14	225	1.2	14	1.25	1.6	19.5	695
	3		1.2	15	290	1.2	14.9	1.25	1.6	20.5	780
	5		1.3	18	445	1.3	18.2	1.6	1.7	25	1180
	10		1.5	26	875	1.5	26	1.6	1.9	33	1915
	15		1.7	29.5	1230	1.7	29.5	2.0	2.0	37.5	2660
	20		1.9	33.5	1615	1.9	33.5	2.0	2.1	41.5	3220

Multitrip Cable

Table 13 Individual Triple Screen

Conductor size	No. of pair	Insulation thickness Nom. (mm)	PVC/PVC-TSLA (Non-armoured cable)			PVC/PVC/SWA/PVC-TSLA (Armoured cable)					
			Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)	Bedding thickness Nom. (mm)	Diameter over bedding Approx. (mm)	Armour wire diameter Nom. (mm)	Sheath thickness Nom. (mm)	Overall diameter Approx. (mm)	Weight Approx. (kg/km)
0.50mm ² (1/0.80mm)	2	0.5	1.1	10.5	105	1.1	10.6	0.9	1.4	15	390
	3		1.1	11	140	1.1	11.2	0.9	1.5	16	440
	5		1.2	13.5	215	1.2	13.7	1.25	1.5	19	665
	10		1.3	19.5	405	1.3	19.3	1.6	1.7	26	1180
	15		1.3	21.5	545	1.3	21.5	1.6	1.8	28.5	1415
	20		1.5	24.5	715	1.5	24.5	1.6	1.9	31.5	1705
0.50mm ² (7/0.30mm)	2	0.6	1.1	12	135	1.1	11.9	0.9	1.5	16.5	450
	3		1.1	12.5	165	1.1	12.6	0.9	1.5	17.5	495
	5		1.2	15.5	250	1.2	15.4	1.25	1.6	21	765
	10		1.3	22	480	1.3	21.8	1.6	1.8	28.5	1370
	15		1.5	25	665	1.5	24.9	1.6	1.8	31.5	1660
	20		1.7	28.5	875	1.7	28.3	2.0	1.9	36	2240
0.75mm ² (1/0.96mm)	2	0.6	1.1	12	150	1.1	12.1	0.9	1.5	17	470
	3		1.2	13	190	1.2	13.1	1.25	1.5	18.5	630
	5		1.2	16	285	1.2	15.8	1.25	1.6	21.5	810
	10		1.3	22.5	545	1.3	22.4	1.6	1.8	29	1440
	15		1.5	25.5	760	1.5	25.5	1.6	1.9	32.5	1790
	20		1.7	29	1000	1.7	29.0	2.0	2.0	37	2415
0.75mm ² (7/0.37mm)	2	0.6	1.2	13	170	1.2	13	1.25	1.5	18.5	595
	3		1.2	14	210	1.2	13.8	1.25	1.5	19.5	660
	5		1.2	16.5	310	1.2	16.6	1.25	1.6	22.5	860
	10		1.5	24	620	1.5	24.1	1.6	1.8	31	1575
	15		1.5	27	835	1.5	26.9	1.6	1.9	34	1910
	20		1.7	30.5	1095	1.7	30.6	2.0	2.0	38.5	2575
1.0mm ² (1/1.13mm)	2	0.6	1.2	13	180	1.2	13.1	1.25	1.5	18.5	615
	3		1.2	14	225	1.2	13.9	1.25	1.5	19.5	690
	5		1.2	17	340	1.2	16.8	1.25	1.6	22.5	890
	10		1.5	24	680	1.5	24.2	1.6	1.8	31	1650
	15		1.5	27	925	1.5	27.1	1.6	1.9	34	2015
	20		1.7	31	1215	1.7	30.9	2.0	2.0	39	2695
1.0mm ² (7/0.43mm)	2	0.6	1.2	13.5	195	1.2	13.7	1.25	1.5	19	645
	3		1.2	14.5	245	1.2	14.6	1.25	1.6	20.5	730
	5		1.2	17.5	370	1.2	17.7	1.25	1.6	23.5	945
	10		1.5	25.5	735	1.5	25.6	1.6	1.9	32.5	1765
	15		1.5	28.5	1000	1.5	28.7	1.6	2.0	36	2165
	20		1.7	32.5	1310	1.7	32.6	2.0	2.1	41	2905
1.5mm ² (7/0.53mm)	2	0.6	1.2	15	245	1.2	15	1.25	1.6	20.5	755
	3		1.2	16	310	1.2	16	1.25	1.6	21.5	835
	5		1.3	19.5	485	1.3	19.6	1.6	1.7	26	1280
	10		1.5	28	955	1.5	28.2	1.6	1.9	35	2090
	15		1.7	32	1340	1.7	32	2.0	2.1	40	2900
	20		1.9	36.5	1760	1.9	36.4	2.0	2.3	45	3550

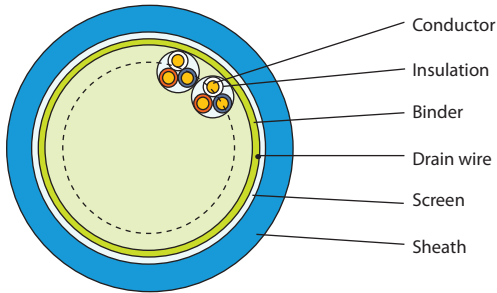
Multitriples Cable

Table 14 Electrical characteristics

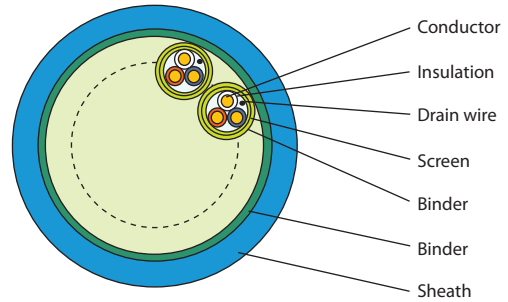
Electrical requirements		Conductor size	mm ² (no./mm)	0.5 (1/0.80)	0.5 (7/0.30)	0.75 (1/0.96)	0.75 (7/0.37)	1.0 (1/1.13)	1.0 (7/0.43)	1.5 (7/0.53)
Conductor resistance at 20°C	(Ω/km)	Max.		36.8	36.7	25.0	25.0	18.4	18.5	12.3
Insulation resistance at 20°C	(MΩ.km)	Min.	25							
Mutual capacitance at 1kHz	(nF/km)	Max.	250							
Inductance/Resistance ratio, L/R	(μH/Ω)	Max.	25							
Test voltage for 1 minute	core to core (kV)		1							
	core to screen (kV)		1							

Multitriples Cable - Cross-Sectional Of Cable

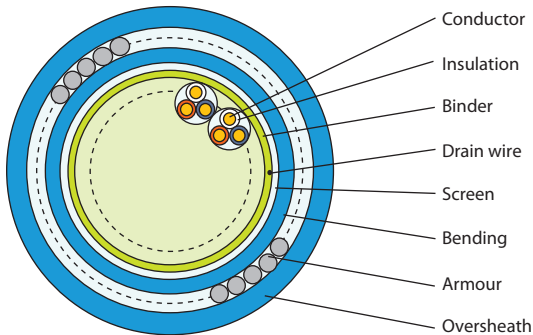
PVC/PVC-SLA COLLECTIVE SCREEN (NON-ARMoured CABLE)



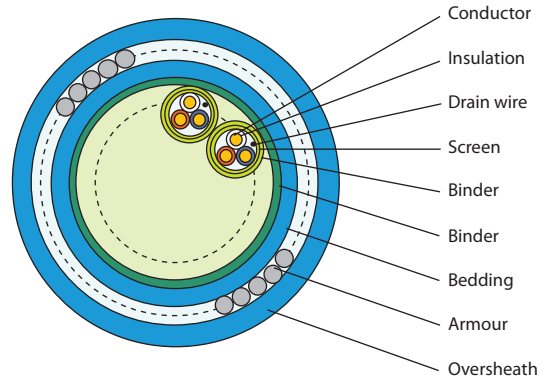
PVC/PVC-TSLA INDIVIDUAL TRIPLE SCREEN (NON-ARMoured CABLE)



PVC/PVC/SWA/PVC-SLA COLLECTIVE SCREEN (ARMoured CABLE)



PVC/PVC/SWA/PVC-TSLA INDIVIDUAL TRIPLE SCREEN (ARMoured CABLE)



Accreditations

LAMPIRAN PENDAFTARAN 1/1

PETRONAS

NAMA SYARIKAT : FURUKABA ELECTRIC CABLES (M) SDN BHD (907263-W)
 NO BUKUKAN : L-007263-W
 TEMPOH SAH PENDAFTARAN : 20 November 2003 - 19 November 2004
 SYARAT KHAS PENDAFTARAN : Sama seperti di Lampiran Lesen 1

BIDANG-BIDANG PENDAFTARAN PETRONAS

(Approved PETRONAS registration categories)

KOD (Code)	FURUKABAHAN (Description)	SEKELAH OPERASI (Class of Operation)	STATUS (Status)
A. PEI ELECTRICAL	02 Cable	011 Power - General	Manufacturer
B. PEI ELECTRICAL	02 Cable	014 Instrument - General	Manufacturer
C. PEI ELECTRICAL	02 Cable	017 Telecommunication - General	Manufacturer
*** TAMBAH ***			

Amirul Johanson

Pegawai
Jabatan Penerimaan dan Pendaftaran
Bahagian Tender dan Kontrak Kumpulan

LAMPIRAN PENDAFTARAN 1/1

PETRONAS

NAMA SYARIKAT : FURUKABA ELECTRIC CABLES (M) SDN BHD (907263-W)
 NO BUKUKAN : L-007263-W
 TEMPOH SAH PENDAFTARAN : 20 November 2003 - 19 November 2004
 SYARAT KHAS PENDAFTARAN : Syarikat dikehendaki mengemukakan Laporan Kawangan Tahunan yang telah dibuat bagi tahun berakhir 30 Jun 2003 sebelum 1 Januari 2004 dan bukannya "Annual Return" berdasarkan perlembagaan. Kawangan tersebut akan diserahkan dalam "List of Licensed Registrars Companies (LLRC) PETRONAS".

BIDANG-BIDANG LESEN

(Approved license categories)

KOD (Code)	FURUKABAHAN (Description)	SEKELAH OPERASI (Class of Operation)	NAMA PROJEK KATEGORI (Project Name)	STATUS (Status)
A. PEI ELECTRICAL	02 Cable	011 Power - High	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	012 Power - Flame Retardant	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	017 Power - Fire Retardant	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	015 Instrument - Flame Retardant	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	016 Instrument - Fire Retardant	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	018 Telecommunication - Flame Retardant	Manufacturer	-
A. PEI ELECTRICAL	02 Cable	019 Telecommunication - Fire Retardant	Manufacturer	-

Amirul Johanson

Pegawai
Jabatan Penerimaan dan Pendaftaran
Bahagian Tender dan Kontrak Kumpulan

PETRONAS

L 01879

LESEN MEMBEKAL PERALATAN/MEMBERI PERKHIDMATAN KEPADA SYARIKAT-SYARIKAT CARIGALI DAN PENGUJIAN MINYAK-GAS DI MALAYSIA

Pada menandakan kuasa kuasa yang diberi oleh Seksyen 7, Akta Kawangan Petrolam, 1974 dan mengikut Peraturan 5, Peraturan-Peraturan Petrolam, 1974, yang ditetapkan kepada saya oleh YAB Perdana Menteri Malaysia, saya dengan ini mengeluarkan lesen dibawah Peraturan 3, Peraturan-Peraturan Petrolam ini bagi tujuan di atas kepada :-

Tarikh : 20 November 2003

FURUKABA ELECTRIC CABLES (M) SDN BHD (907263-W)
 PERSEMAMAN RAJA MUDA, P.O. BOX 7006
 40700 SHAH ALAM
 SELANGOR

Berikut-butir Lesen adalah seperti berikut :-
 Nomor Lesen : L-007263-W
 Tempoh Sah Lesen : 20 November 2003 - 19 November 2004
 Yuran Lesen : RM 1000.00
 Bidang pembekal/perkhidmatan : Seperti di Lampiran 'BIDANG-BIDANG LESEN'.
 Syarat-syarat Khas yang dikenakan ke atas Lesen ini :-
 Bertaklif kepada syarat khas seperti di lampiran berikutan.
 Syarat-syarat Am Lesen ini adalah seperti yang tertera di muka sebelah.

Amirul Johanson

Pegawai Besar
Bahagian Tender dan Kontrak Kumpulan
Dip. Presiden
Pendaftaran Nasional (Berhad)
Petronas - Pengawal Lesen Hekselatan/Perkhidmatan Lesen Gas (D) Sektor Bekalan, Sektor "Tender Lesen".

BVQI

Certification
Awarded to

FEC CABLES (M) SDN BHD
 Preserian Raju Mada, P.O. Box 7006
 40000 Shah Alam, Selangor Darul Ehsan,
 Malaysia

BVQI certify that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

ISO 9001:2000

Scope of supply

- DESIGN, MANUFACTURE AND SALES OF:-
- UNDERGROUND AND OVERHEAD PVC AND XLPE LOW VOLTAGE POWER CABLES
- TELECOMMUNICATION CABLES
- FIRE RESISTANT CABLES
- CONTROL CABLES
- INSTRUMENTATION CABLES
- FLEXIBLE WIRES

Original Approval Date: **22 September 2006**
 Subject to the continued satisfactory operation of the organization's Management System.
 The certificate is valid until: **26 May 2009**
 The audit the certificate validity you may contact BVQI Malaysia.
 Further information regarding the scope of the certificate and the applicability of the management system requirements may be obtained by contacting the organization.

Date: **26 September 2006**
 Certificate Number: **199658/A**

Issuing Office Address:
 Level 03, Avenue 2, Preserian
 Jalan Preserian, Preserian
 40000 Shah Alam
 Malaysia

Managing Office Address:
 Tingkat 10, Preserian, Preserian
 40000 Shah Alam, Selangor
 Malaysia

SIRIM

TEST REPORT

REPORT NO: EL2001218 PAGE: 1 OF 5

This report is NOT a Quality Assurance Certificate (QAC) or Approval Permit. This report refers only to samples submitted by the client to SIRIM QAS Sdn. Bhd. and tested by SIRIM QAS Sdn. Bhd. This report shall not be reproduced, except in full and shall not be used for advertising purposes by any means or forms without written consent from Executive Director SIRIM QAS Sdn. Bhd.

Issued by : Electrotechnical Testing Section
 Issue date : 14 APR 2001
 Product : FLAME RETARDANT COMMUNICATION CABLE
 Reference Standard : IEC 60332-3 : 1992
 Method of test

Applicant : Furukaba Electric Cable (M) Sdn. Bhd.
 Preserian Raju Mada
 40000 Shah Alam, Selangor
 Malaysia

Manufacturer : Furukaba Electric Cable (M) Sdn. Bhd.

Description of sample: Size : 10 pairs x 0.5 mm (24 AWG)
 Rated voltage : 300/500 V
 Conductor : Solid plain annealed copper wire
 Insulation : Polyethylene (PE)
 Drain wire : Solid tinned annealed copper wire
 Collective sheath : Aluminium/polyester tape
 Overbraid : Low smoke non-halogen flame retardant (LSNHFR)

Date received : 23 March 2001
 Job No. : 61TSD0748(CT)

Approved Signatures:
(Signature) (LIM CHENG HONG) Technical Executive
(Signature) (JOHN TEO, POSE) Senior Manager
 Electrotechnical Testing Section
 SIRIM QAS Sdn. Bhd.



FEC Cables (M) Sdn. Bhd.
(7293-W)

Factory 1 :

Persiaran Raja Muda, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia.

(P.O. Box 7006, 40700 Shah Alam)

Tel : 603-5519 1110/3/4, 5519 1258, 5519 5814/5/7

Fax : 603-5519 1296

Factory 2 :

No. 16, Jalan Keluli 2, Bukit Raja Industrial Area, 40150 Klang, Selangor Darul Ehsan, Malaysia.

Tel : 603-3343 5837/9/40, 3343 7727

Fax : 603-3343 5843, 3343 9262

Sales Office :

Persiaran Raja Muda, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia.

(P.O. Box 7006, 40700 Shah Alam)

Tel : 603-5519 1110 (Hotline)

Fax : 603-5519 1296, 5513 8688

Website : www.furukawa.com.my

e-mail : sales@fecm.com.my

www.fec.com.my