

INDUSTRIAL



Instrument Cable Technology

Instrumentation cables are required to transmit 'clean' signals within industrial environments, often where there is a high level of electromagnetic interference through potentially hazardous areas. In order to achieve accurate process control, it is important that signals to and from machines are uncorrupted.

The challenge: Noise rejection

Common Mode noise occurs due to a difference in potential between conductors used for earthing the system at different locations. This potential difference causes currents to flow in the conductors of screens of the cable, which interfere with the signal. This type of noise is normally prevented by using a common earth for all parts of the system, preferably at the equipment end, to which all circuits and screens are connected.

Crosstalk is the transfer of signal from one pair to another in the same cable due to electromagnetic and/or electrostatic effects. This is reduced by making the lay lengths with which the pairs are twisted differ between adjacent pairs, so that in a long length of cable each conductor is subject to the same influence from every other conductor and any induced noise is cancelled.

The pairs and triples of Olex Dekoron® cables are twisted to a lay length of not more than 75mm for single pair and single triple cable. In the multipair overall screened cables the lays are staggered to minimise the crosstalk.

Electromagnetically induced noise is due to an induced e.m.f. in the signal-carrying conductor due to an alternating magnetic field such as that existing around a conductor carrying a heavy electric current. Although such currents are generally at 50Hz, which can be filtered out in the equipment, harmonics of very much higher frequencies can be produced, particularly where electric motors and welding plants are in use.

Electrostatically induced noise is due to an induced e.m.f. in the signal-carrying conductor due to the capacitance between it and

another conductor. The most effective method of reducing interference of electrostatic and electromagnetic origin is to form the two wires carrying the instrument into a twisted pair. This ensures the voltages induced in the two wires are approximately equal and opposite, so that they cancel each other out.

Additional protection against electrostatic interference is achieved by the use of a total coverage conducting screen.

The solution: Olex Dekoron® design

Olex Dekoron® screened instrumentation cables are screened with a tape of aluminium-coated polyester film. For multipair applications where electrostatic crosstalk is likely, such as where some pairs operate at higher potential than others, cables are available with the pairs individually screened with aluminium-coated polyester films. All screens in cables are provided with a tinned annealed copper drain wire to equalise potential along the screen and to allow easy connection to earth. Individual screens are electrically separated from each other by a polyester separator tape to prevent circulating currents which could cause common mode noise.

Transmission characteristics

The low conductor resistance, inductance and capacitance of Dekoron® make it ideal for direct current and alternating current frequencies up to 10kHz, distances of up to 10 kilometres and low-medium speed digital transmission.

For frequencies exceeding 10kHz or for high speed data transmission over long distances, Dekoron® cables can be supplied with low loss insulation materials subject to special order.

Intrinsic safety

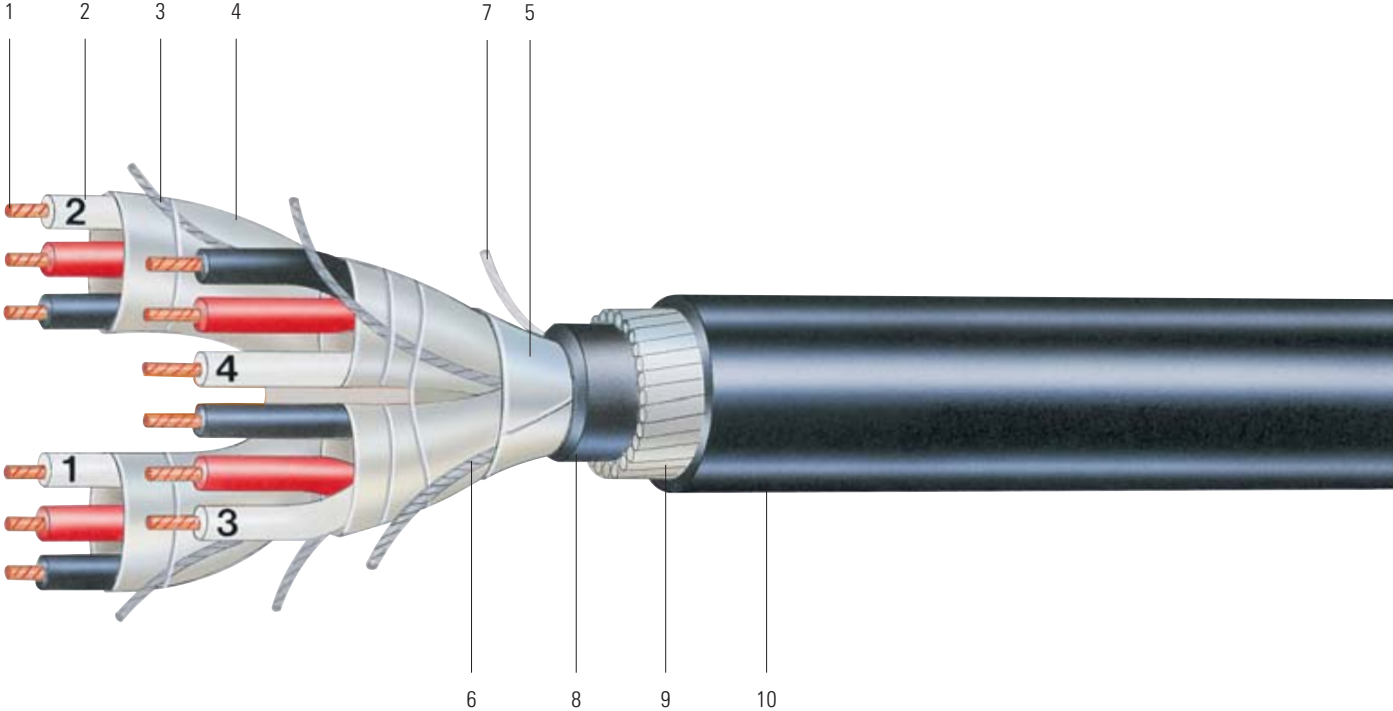
The identification colour light blue is specified for the sheathing of cables containing intrinsically safe circuits. Olex Dekoron® cables can be supplied with a light blue instead of a black sheath, subject to special order.



Dekoron® Instrumentation Cable Construction

- 1. Plain annealed copper conductor.
- 2. Primary insulation is V-90RP which provides excellent physical and electrical properties. Colour coded and numbered for easy identification.
- 3. Tinned copper drain wire for pair shield. Provides ease of terminating shield.
- 4. Individual pair shields are aluminium/polyester tape. Gives additional protection against static, noise, common mode noise and crosstalk.
- 5. Overall shield comprises aluminium/polyester tape for initial protection against noise. The helically applied laminate tape shield provides 100 percent coverage while allowing a smaller

- OD than braid-shielded products and permits longer length. Ease of termination and freedom from insulation puncture (such as with broken braid ends). Adjacent shields are electrically isolated and tested in combinations.
- 6. Tinned copper drain wire for overall shield provides ease of terminating shield.
- 7. Ripcord simplifies field strip back without damage from cutting tools.
- 8. Outer V-90RP sheath or bedding for armour.
- 9. Galvanised steel wire armour (optional).
- 10. Outer V-90RP sheath.



Dekoron[®] Instrumentation Cable Characteristics

Physical

Conductor size	AWG	Conductor stranding	Nominal conductor diameter	Nominal insulation thickness	Nominal core diameter	Nominal screen thickness	Drain wire stranding
mm ²		no/mm	mm	mm	mm	mm	no/mm
0.5	20	7/0.30	0.9	0.4	1.7	0.009	7/0.20
1.5	16	7/0.50	1.5	0.4	2.2	0.009	7/0.20

Electrical

Conductor size	Conductor resistance at 20°C each wire	Nominal voltage rating	Maximum current rating	Mutual capacitance cond to cond unscreened	Mutual capacitance cond to cond screened	Capacitance both wires cond to screen screened	L/R ratio at 1000Hz
mm ²	Ohm/100m	a.c./d.c.	Amperes	nF/100m	nF/100m	nF/100m	μH/Ohm
0.5	3.84	110/150	3	8.5	14.5	24.0	15.7
1.5	1.36	110/150	13	11.0	20.0	30.0	36.5

Conductor size	Induction at 1000Hz	Characteristic impedance at 1000Hz unscreened	Characteristic impedance at 1000Hz screened	Crosstalk attenuation between pairs @ 1000Hz unscreened	Crosstalk attenuation between pairs @ 1000Hz screened	Attenuation @ 1000Hz between 600 Ohm terminations unscreened	Attenuation @ 1000Hz between 600 Ohm terminations screened
mm ²	μH/100m	Ohm	Ohm	dB/100m	dB/100m	dB/100m	dB/100m
0.5	110	450	350	100	125	0.09	0.11
1.5	95	350	260	–	–	0.07	0.09

Testing

Insulation integrity verified by spark test at 6kV a.c.

H.V. test on cable: between conductors and conductors to screen at 2kV a.c. for 1 minute.

Colour code

Pairs: Black and white. Each pair is numbered.

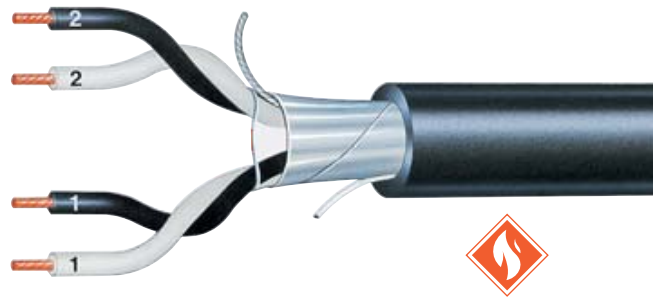
Triples: Black, white and red. Each triple is numbered.

Availability

This catalogue provides details of the standard range of instrumentation cables. Generally, these are stock items, however some items may be subject to minimum production runs. Enquire at any Olex sales office to obtain the status of any particular item.



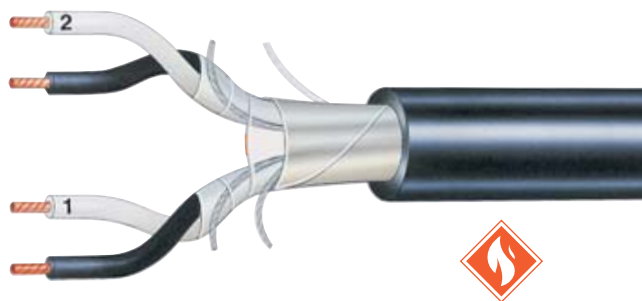
Dekoron[®] Instrumentation Unscreened & O'all Screened Pairs



Construction Plain annealed copper conductor, V-90RP PVC insulated, twisted pairs, unscreened or overall screened with aluminium polyester tape plus tinned copper drain wire, rip cord, V-90RP PVC sheathed.

Pairs	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm) screened					
1	5.2	31	0.07	3.5	IEB183AA001
2	7.8	47	0.14	6.3	IEC183AA002
4	8.4	50	0.28	9.4	IEC183AA004
6	10.0	60	0.42	13	IEC183AA006
8	11.2	67	0.56	17	IEC183AA008
10	12.5	75	0.70	21	IEC183AA010
12	13.4	80	0.84	24	IEC183AA012
16	15.1	91	1.12	31	IEC183AA016
20	16.8	101	1.40	38	IEC183AA020
24	18.1	109	1.68	45	IEC183AA024
36	22.0	132	2.52	66	IEC183AA036
50	25.6	153	3.50	90	IEC183AA050
Conductor 1.5mm² (7/0.50mm) screened					
1	6.6	40	0.21	6.0	IEB184AA001
2	9.9	60	0.42	11	IEC184AA002
4	10.9	65	0.84	18	IEC184AA004
6	13.0	78	1.26	26	IEC184AA006
8	14.6	88	1.68	33	IEC184AA008
10	16.3	98	2.10	41	IEC184AA010
12	17.5	105	2.52	48	IEC184AA012
16	20.0	120	3.36	63	IEC184AA016
20	22.3	134	4.20	79	IEC184AA020
24	24.1	145	5.04	93	IEC184AA024
36	29.2	175	7.56	137	IEC184AA036
50	34.2	205	10.50	188	IEC184AA050
Conductor 1.5mm² (7/0.30mm) unscreened					
1 Pair	6.4	39	0.21	5.6	IEA184AA001

Dekoron® Instrumentation Individually & O'all Screened Pairs

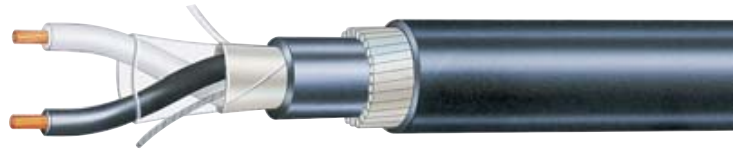


Construction Plain annealed copper conductor, V-90RP PVC insulated, twisted pairs, individually and overall screened with aluminium polyester tape plus tinned copper drain wire, rip cord, V-90RP PVC sheathed.

Pairs	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm)					
2	8.1	49	0.14	7.3	IED183AA002
4	10.4	62	0.28	12	IED183AA004
6	12.2	73	0.42	17	IED183AA006
8	13.9	84	0.56	22	IED183AA008
10	14.6	88	0.70	26	IED183AA010
12	16.0	96	0.84	31	IED183AA012
16	18.0	108	1.12	39	IED183AA016
20	20.1	120	1.40	48	IED183AA020
24	21.9	131	1.68	57	IED183AA024
36	26.3	158	2.52	83	IED183AA036
50	30.6	184	3.50	112	IED183AA050
Conductor 1.5mm² (7/0.50mm)					
2	10.3	62	0.42	13	IED184AA002
4	13.4	81	0.84	22	IED184AA004
6	16.1	97	1.26	32	IED184AA006
8	18.2	109	1.68	40	IED184AA008
12	20.9	125	2.52	57	IED184AA012
16	23.9	143	3.36	75	IED184AA016
20	26.5	159	4.20	92	IED184AA020
24	29.0	174	5.04	110	IED184AA024
36	35.1	210	7.56	162	IED184AA036
50	40.8	245	10.50	220	IED184AA050



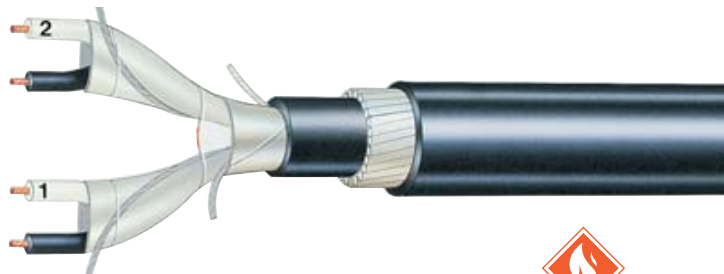
Dekoron[®] Instrumentation Overall Screened SWA Pairs



Construction Plain annealed copper conductor, V-90RP PVC insulated, twisted pairs, overall screened with aluminium polyester tape plus tinned copper drain wire, rip cord, PVC bedding, steel wire armour, V-90RP PVC sheathed.

Pairs	Nominal over bedding mm	Nominal over armour mm	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm)							
2	7.4	9.2	11.4	137	2.3	25	IEG183AA002
4	8.0	9.8	12.0	144	2.4	28	IEG183AA004
6	9.4	11.2	13.6	164	2.8	36	IEG183AA006
8	10.6	12.4	14.8	178	3.1	42	IEG183AA008
10	11.7	13.5	16.1	193	3.4	48	IEG183AA010
12	12.6	14.4	17.0	204	3.6	54	IEG183AA012
16	14.3	16.1	18.9	227	4.2	65	IEG183AA016
20	15.8	18.3	21.1	253	6.4	86	IEG183AA020
24	17.1	19.6	22.7	272	6.9	97	IEG183AA024
36	20.5	23.0	26.3	316	8.2	127	IEG183AA036
50	23.9	26.4	29.9	359	9.5	160	IEG183AA050
Conductor 1.5mm² (7/0.50mm)							
1	6.2	8.0	10.2	123	2.0	22	IEF184AA001
2	9.4	11.2	13.6	163	2.8	34	IEG184AA002
4	10.3	12.1	14.5	174	3.1	42	IEG184AA004
6	12.2	14.0	16.6	199	3.6	55	IEG184AA006
8	13.8	15.6	18.2	219	4.0	65	IEG184AA008
10	15.2	17.7	20.6	247	6.2	87	IEG184AA010
12	16.5	19.0	22.1	265	6.7	99	IEG184AA012
16	18.8	21.3	24.4	292	7.5	119	IEG184AA016
20	20.8	23.3	26.6	319	8.3	140	IEG184AA020
24	22.6	25.1	28.6	344	9.0	161	IEG184AA024
36	27.7	30.2	34.4	413	11.0	223	IEG184AA036
50	32.3	35.5	39.7	477	16.4	307	IEG184AA050

Dekoron® Instrumentation Ind. & O'all Screened SWA Pairs

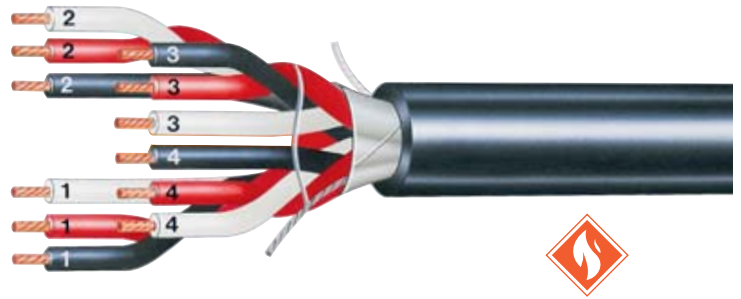


Construction Plain annealed copper conductor, V-90RP PVC insulated, twisted pairs individually & overall screened with aluminium polyester tape plus tinned copper drain wire, rip cord, PVC bedding, steel wire armour, V-90RP PVC sheathed.

Pairs	Nominal over bedding mm	Nominal over armour mm	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm)							
2	7.7	9.5	11.7	141	2.4	26	IEH183AA002
4	9.8	11.6	14.0	168	2.9	35	IEH183AA004
6	11.6	13.4	16.0	192	3.4	45	IEH183AA006
8	13.1	14.9	17.5	210	3.8	52	IEH183AA008
10	13.8	15.6	18.2	219	4.0	58	IEH183AA010
12	15.0	16.8	19.6	235	4.3	66	IEH183AA012
16	17.0	19.5	22.6	271	6.9	91	IEH183AA016
20	18.8	21.3	24.4	293	7.5	104	IEH183AA020
24	20.4	22.9	26.2	315	8.2	118	IEH183AA024
36	24.6	27.1	30.6	368	9.8	155	IEH183AA036
50	29.1	31.6	35.8	430	11.5	202	IEH183AA050
Conductor 1.5mm² (7/0.50mm)							
2	9.7	11.5	13.9	167	2.9	36	IEH184AA002
4	12.6	14.4	17.1	205	3.6	51	IEH184AA004
6	15.1	17.6	20.4	245	6.2	78	IEH184AA006
8	17.1	19.6	22.7	272	6.9	92	IEH184AA008
10	18.1	20.6	23.7	284	7.4	103	IEH184AA010
12	19.6	22.1	25.4	305	7.9	116	IEH184AA012
16	22.4	24.9	28.4	341	9.0	143	IEH184AA016
24	27.5	30.0	33.9	407	11.0	194	IEH184AA024



Dekoron[®] Instrumentation Triples



Construction Plain annealed copper conductor, V-90RP PVC insulated, twisted triples, unscreened or overall screened with aluminium polyester tape plus tinned copper drain wire, rip cord, V-90RP PVC sheathed.

Unscreened and Overall Screened Triples

Triples	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm) screened					
4	10.0	60	0.42	13	IGC183AA004
6	11.7	70	0.63	19	IGC183AA006
12	16.1	96	1.26	35	IGC183AA012
16	18.1	109	1.68	45	IGC183AA016
36	26.4	159	3.78	96	IGC183AA036
Conductor 1.5mm² (7/0.50mm) screened					
1	6.9	42	0.32	7.8	IGB184AA001
4	13.0	78	1.26	26	IGC184AA004
6	15.6	93	1.89	38	IGC184AA006
12	21.1	126	3.78	71	IGC184AA012
16	24.1	145	5.04	93	IGC184AA016
36	35.4	212	11.30	202	IGC184AA036
Conductor 1.5mm² (7/0.30mm) unscreened					
1 Triple	6.8	41	0.32	7	IGA184AA001

Individually and Overall Screened Triples

Conductor 0.5mm² (7/0.30mm) screened					
4	11.0	66	0.42	16	IGD183AA004
6	13.1	79	0.63	22	IGD183AA006
12	17.0	102	1.26	40	IGD183AA012
16	19.4	116	1.68	52	IGD183AA016
36	28.2	169	3.78	111	IGD183AA036
Conductor 1.5mm² (7/0.50mm) screened					
4	14.2	85	1.26	29	IGD184AA004
6	17.1	102	1.89	42	IGD184AA006
12	22.4	135	3.78	78	IGD184AA012
16	25.6	154	5.04	103	IGD184AA016
36	37.6	225	11.30	223	IGD184AA036

Overall Screened SWA Triples

Triples	Nominal diameter over bedding mm	Nominal diameter over armour mm	Nominal outside diameter mm	Minimum bending radius mm	Maximum pulling tension kN	Approximate mass kg/100m	Product code
Conductor 0.5mm² (7/0.30mm)							
4	9.4	11.2	13.6	164	2.8	36	IGG183AA004
12	15.0	16.8	19.7	236	4.3	70	IGG183AA012
16	17.1	19.6	22.7	272	6.9	97	IGG183AA016
Conductor 1.5mm² (7/0.50mm)							
1	6.6	8.4	10.6	127	2.0	24	IGF184AA001
4	12.2	14.0	16.6	199	3.6	55	IGG184AA004
12	19.8	22.3	25.6	307	8.0	132	IGG184AA012

Individually and Overall Screened SWA Triples

Conductor 0.5mm² (7/0.30mm)							
4	10.4	12.2	14.6	175	3.1	40	IGH183AA004
12	15.9	18.4	21.3	256	6.5	88	IGH183AA012
16	18.1	20.6	23.7	284	7.4	107	IGH183AA016
Conductor 1.5mm² (7/0.50mm)							
4	13.4	15.2	17.9	214	3.9	60	IGH184AA004
12	21.0	23.5	26.7	321	8.3	140	IGH184AA012