

# INSTRUMENT CABLE



PT VOKSEL ELECTRIC Tbk.



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## INTRODUCTION



Instrument cables is still very much needed as a means of connecting, especially for systems of measurement, regulation or control, and for communication of equipment installed in the field with animated media in the control room.

PT Voksel Electric has built and made instrument, control and communication cables, which are intended to interconnect all types of instrumentation and communication equipment including telephone equipment whose functions are deemed necessary for safety and control.

These general cables instrumentation usually consist of conductors (plain or tinned annealed copper), insulated (Polyethylene (PE) or cross-linked polyethylene (XLPE) or other materials), laid up and provided with a taped wrapping or an innersheath, a covering formed from braided metal wires used to protect cable from external mechanical effects, and the last given an outer sheath.

## 1. TYPES OF INSTRUMENTATION CABLES

### OVERALL SCREENED CORES/PAIRS/TRIADS (ARMOURED & NON-ARMOURED)

Instrumentation Cables of such are overall screened to oppose static & crosstalk noise ensuring precise and flawless signals to be transmitted in excess of 100 millivolts in instrumentation and control applications.

Cables of this classification are mainly used for interconnections between sensors, monitors, and instruments where 100% shield effectiveness is ensured through our aluminium foil/PET shield with drain wires.

Non-Armoured instrumental Cables are used for indoor application while those with steel wire armouring are mostly used for direct underground burials.

### INDIVIDUAL & OVERALL SCREENED PAIRS/TRIADS (ARMOURED & NON-ARMOURED)

Where noise rejection is essential, individual shielded pairs or triads with an overall shield are recommended. To provide optimal protection from crosstalk and common mode interference, individual pairs & triads are separated from each other and each contains independent drain wires for grounding. These cables also come with an overall shield for additional electrostatic noise protection.

The various types of Instrumentation Cables manufactured may be insulated with our standard PVC, PE material or with our eco-friendly, non toxic, low smoke zero halogen flame retardant material with or without fire resistance characteristics.

Additionally, Voksel's Instrumentation Cables are available with standard or reduce flame propagation and low acid gas emission PVC sheath as well as low smoke zero halogen flame retardant material.

## 2. IDENTIFICATION OF CABLING ELEMENTS

### CORE IDENTIFICATION

- Multi Pair : Black with numbering

### PAIR IDENTIFICATION

- 1 Pair : Black & White
- Multi Pair : Black & white with numbering

### TRIAD IDENTIFICATION

- 1 Pair : Black, White & Red
- Multi Pair : Black, White & Red with numbering

## 3. APPLICATION

Generally used within industrial process manufacturing plant for control, communication, data (analog/digital) and voice transmission signals and service typically in industrial project, oil, gas & petrochemical industry.

- Industrial Signaling and process control circuit.
- Use in cable trays in conduit or for direct burial application.
- Steel Wire Armoured Instrumentation cables provide longitudinal strength for use as messenger cable or to support in vertical drops and provides against mechanical damage.

## 4. ELECTRICAL CHARACTERISTICS

### MAXIMUM MUTUAL CAPACITANCE VALUES

CONSTRUCTION	Conductor Size				
	0,5 mm <sup>2</sup> (pF/m)	0,75 mm <sup>2</sup> (pF/m)	1,0 mm <sup>2</sup> (pF/m)	1,5 mm <sup>2</sup> (pF/m)	2,5 mm <sup>2</sup> (pF/m)
Cables without Screens	75	75	75	85	85
Cables with Overall Screens only (except 1-pair, 2-pair, and 1-triad)	75	75	75	85	85
1-pair, 2-pair, and 1-triad Overall Screen and all cables with individually Screened Pairs	115	115	115	120	120

### MAXIMUM DC CONDUCTOR RESISTANCE AT 20°C

CONDUCTOR SIZE mm <sup>2</sup>	CONDUCTOR STRANDING No/mm	RESISTANCE AT 20°C MAXIMUM Ω/km
0,5	7/0,30	36,2
0,75	7/0,37	24,7
1,0	7/0,43	18,3
1,5	7/0,52	12,3
2,5	7/0,67	7,61

pF/m = pico Farads per metre

Ω/km = ohms per km

μH/Ω = micro Henrys per ohm

### MAXIMUM L/R RATIO

CONDUCTOR SIZE mm <sup>2</sup>	CONDUCTOR L/R RATIO (FOR ADJACENT CORES) μH/Ω
0,5	25
0,75	25
1,0	25
1,5	40
2,5	60

Amount of Halogen Acid Gas : Max. 17% (IEC 60754 - 1)  
 Limiting Oxygen Index (LOI) : Min. 30% (60332 - annex B)  
 Sunlight Resistance : UL 1581 section 1200

Oil Resistance : ICEA S-82-552  
 Flame Retardant : IEC 60332 - 1  
 Flame Propagation : IEC 60332-3 Cat. A,B, C

**CU / PE / OSCR / PVC FR**  
**CU / XLPE / OSCR / PVC FR**  
**CU / XLPE / OSCR / LSOH**

Stranded plain copper conductor

Polyethylene insulation (PE)

Core twisted in pairs

Colour coding for :

- pair : black/white, continuously numbered
- triad : black/white/red, continuously numbered

Screened pairs twisted in concentric layers

Overall screen of plastic bonded aluminium mylar tape with tinned copper drain wire

PVC outer sheath, flame retardant to IEC 60332-3C, black or blue colour.

**Available on request :** Tinned copper conductors, PVC, XLPE or EPR insulations, sheathing of LSOH, oil & hydrocarbon resistant, anti termite, anti rodent, and other special sheath performance.



**ELECTRICAL & TECHNICAL DATA**

Working Voltage	: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min			
	core/screen	: 1000V 50Hz 1 min			
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,3 mm <sup>2</sup>	1,5 mm <sup>2</sup>
	max 36,8 Ω/km	max 24,9 Ω/km	max 18,6 Ω/km	max 13,6 Ω/km	max 12,3 Ω/km
L/R Ratio	25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	40 μH/Ω
Insulation Resistance	: min. 5000 mΩ/km				
Mutual Capacitance at 800 Hz	: max. 100 nF/km				
Temperature Range, fixed	: -30°C to +70°C				
Minimum Bending Radius	: 7,5 x cable diameter				
Flame Retardancy	: IEC-60332-1				
Flame Propagation	: IEC-60332-3				

**DATA SHEET**

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Thickness of outer sheath (mm)	Overall Diameter	Cable Weight
				approx. ± 3 (mm)	approx. ± 5 Kg/km
1 x 2 x 0.5	7/0.3	0.6	0.9	6.4	49
2 x 2 x 0.5	7/0.3	0.6	1.0	9.4	93
4 x 2 x 0.5	7/0.3	0.6	1.1	11.2	136
6 x 2 x 0.5	7/0.3	0.6	1.1	13.2	184
8 x 2 x 0.5	7/0.3	0.6	1.2	14.5	232
10 x 2 x 0.5	7/0.3	0.6	1.3	17.9	292
12 x 2 x 0.5	7/0.3	0.6	1.3	17.9	324
16 x 2 x 0.5	7/0.3	0.6	1.4	20.1	425
20 x 2 x 0.5	7/0.3	0.6	1.5	22.4	516
24 x 2 x 0.5	7/0.3	0.6	1.6	25.7	616

## DATA SHEET

No of pairs x cross section	Conductor	Thickness of insulation	Thickness of outer sheath	Overall Diameter	Cable Weight
				approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 2 x 0.75	7/0.37	0.6	0.9	6.8	57
2 x 2 x 0.75	7/0.37	0.6	1.0	10.0	110
4 x 2 x 0.75	7/0.37	0.6	1.1	12.0	164
6 x 2 x 0.75	7/0.37	0.6	1.2	14.4	233
8 x 2 x 0.75	7/0.37	0.6	1.2	15.7	290
10 x 2 x 0.75	7/0.37	0.6	1.4	19.5	372
12 x 2 x 0.75	7/0.37	0.6	1.4	19.5	415
16 x 2 x 0.75	7/0.37	0.6	1.5	21.8	539
20 x 2 x 0.75	7/0.37	0.6	1.5	24.2	650
24 x 2 x 0.75	7/0.37	0.6	1.7	28.0	792
1 x 2 x 1	7/0.43	0.6	0.9	7.2	65
2 x 2 x 1	7/0.43	0.6	1.1	11.1	138
4 x 2 x 1	7/0.43	0.6	1.1	12.8	194
6 x 2 x 1	7/0.43	0.6	1.2	15.5	281
8 x 2 x 1	7/0.43	0.6	1.3	17.0	356
10 x 2 x 1	7/0.43	0.6	1.4	20.8	439
12 x 2 x 1	7/0.43	0.6	1.4	20.8	494
16 x 2 x 1	7/0.43	0.6	1.5	23.4	651
20 x 2 x 1	7/0.43	0.6	1.6	26.1	803
24 x 2 x 1	7/0.43	0.6	1.8	30.2	969
1 x 2 x 1.5	7/0.52	0.6	0.9	7.8	79
2 x 2 x 1.5	7/0.52	0.6	1.1	12.0	166
4 x 2 x 1.5	7/0.52	0.6	1.2	14.2	254
6 x 2 x 1.5	7/0.52	0.6	1.3	17.2	367
8 x 2 x 1.5	7/0.52	0.6	1.3	18.8	459
10 x 2 x 1.5	7/0.52	0.6	1.5	23.1	584
12 x 2 x 1.5	7/0.52	0.6	1.5	23.1	662
16 x 2 x 1.5	7/0.52	0.6	1.6	25.9	873
20 x 2 x 1.5	7/0.52	0.6	1.7	28.9	1070
24 x 2 x 1.5	7/0.52	0.6	1.9	33.4	1288

**DATA SHEET**

No of triads x cross section	Conductor	Thickness of insulation	Thickness of outer sheath	Overall Diameter	Cable Weight
				approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 3 x 0.5	7/0.3	0.6	0.9	6.7	58
2 x 3 x 0.5	7/0.3	0.6	1.0	10.4	118
4 x 3 x 0.5	7/0.3	0.6	1.1	12.4	176
6 x 3 x 0.5	7/0.3	0.6	1.1	14.9	250
8 x 3 x 0.5	7/0.3	0.6	1.3	16.5	323
10 x 3 x 0.5	7/0.3	0.6	1.4	20.2	400
12 x 3 x 0.5	7/0.3	0.6	1.4	20.2	448
16 x 3 x 0.5	7/0.3	0.6	1.5	22.6	582
20 x 3 x 0.5	7/0.3	0.6	1.6	25.3	723
24 x 3 x 0.5	7/0.3	0.6	1.7	29.0	855
1 x 3 x 0.75	7/0.37	0.6	0.9	7.1	68
2 x 3 x 0.75	7/0.37	0.6	1.1	11.5	150
4 x 3 x 0.75	7/0.37	0.6	1.1	13.3	216
6 x 3 x 0.75	7/0.37	0.6	1.2	16.1	313
8 x 3 x 0.75	7/0.37	0.6	1.3	17.7	400
10 x 3 x 0.75	7/0.37	0.6	1.5	21.9	508
12 x 3 x 0.75	7/0.37	0.6	1.5	21.9	572
16 x 3 x 0.75	7/0.37	0.6	1.6	24.6	751
20 x 3 x 0.75	7/0.37	0.6	1.7	27.4	923
24 x 3 x 0.75	7/0.37	0.6	1.8	31.5	1100
1 x 3 x 1	7/0.43	0.6	0.9	7.6	80
2 x 3 x 1	7/0.43	0.6	1.1	12.2	173
4 x 3 x 1	7/0.43	0.6	1.2	14.4	265
6 x 3 x 1	7/0.43	0.6	1.3	17.5	388
8 x 3 x 1	7/0.43	0.6	1.4	19.1	490
10 x 3 x 1	7/0.43	0.6	1.5	23.5	613
12 x 3 x 1	7/0.43	0.6	1.5	23.5	696
16 x 3 x 1	7/0.43	0.6	1.6	26.3	914
20 x 3 x 1	7/0.43	0.6	1.7	29.4	1125
24 x 3 x 1	7/0.43	0.6	1.9	34.0	1357
1 x 3 x 1.5	7/0.52	0.6	1.0	8.4	104
2 x 3 x 1.5	7/0.52	0.6	1.1	13.3	215
4 x 3 x 1.5	7/0.52	0.6	1.2	15.8	345
6 x 3 x 1.5	7/0.52	0.6	1.4	19.3	510
8 x 3 x 1.5	7/0.52	0.6	1.4	21.0	645



**CU / PE / OSCR / PVC / SWA / PVC FR**  
**CU / XLPE / OSCR / PVC / SWA / PVC FR**  
**CU / XLPE / OSCR / LSOH / SWA / LSOH**  
**CU / XLPE / OSCR / LSOH / SWB / LSOH**

Stranded plain copper conductor Polyethylene insulation (PE)  
Core twisted in pairs, pairs twisted in concentric layers,  
Colour coding for :

- pair : black/white, continuously numbered
- triad : black/white/red, continuously numbered

Polyester tape wrapping Overall screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped Bedding of Polyvinylchloride (PVC) Galvanized steel wire armour PVC outer sheath, flame retardant to IEC 60332-3, black or blue colour.

**Available on request :** Tinned copper conductors, PVC, XLPE or EPR insulations, sheathing of LSOH, oil & hydrocarbon resistant, anti termite, anti rodent, and other special sheath performance.



## ELECTRICAL & TECHNICAL DATA

Working Voltage	: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min			
	core/screen	: 1000V 50Hz 1 min			
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,3 mm <sup>2</sup>	1,5 mm <sup>2</sup>
	max 36,8 Ω/km	max 24,9 Ω/km	max 18,6 Ω/km	max 13,6 Ω/km	max 12,3 Ω/km
L/R Ratio	25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	40 μH/Ω
Insulation Resistance	: min. 5000 mΩ/km				
Mutual Capacitance at 800 Hz	: max. 100 nF/km				
Temperature Range, fixed	: -30°C to +70°C				
Minimum Bending Radius	: 10 x cable diameter				
Flame Retardancy	: IEC-60332-1				
Flame Propagation	: IEC-60332-3				

## DATA SHEET

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Steel wire Diameter (mm)	Thickness of outer sheath (mm)	Overall Diameter	Cable Weight
					approx. ± 3 (mm)	approx. ± 5 Kg/km
1 x 2 x 0.5	7/0.3	0.6	0.9	1.3	11.1	257
2 x 2 x 0.5	7/0.3	0.6	0.9	1.4	14.4	372
4 x 2 x 0.5	7/0.3	0.6	0.9	1.5	16.9	487
6 x 2 x 0.5	7/0.3	0.6	0.9	1.5	18.9	584
8 x 2 x 0.5	7/0.3	0.6	0.9	1.6	19.8	651
10 x 2 x 0.5	7/0.3	0.6	1.25	1.6	22.0	860
12 x 2 x 0.5	7/0.3	0.6	1.25	1.7	23.5	953
16 x 2 x 0.5	7/0.3	0.6	1.25	1.7	26.1	1139
20 x 2 x 0.5	7/0.3	0.6	1.25	1.8	28.3	1299
24 x 2 x 0.5	7/0.3	0.6	1.25	1.8	30.2	1443

**DATA SHEET**

No of pairs x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 2 x 0.75	7/0.37	0.6	0.9	1.3	11.5	273
2 x 2 x 0.75	7/0.37	0.6	0.9	1.4	15.2	412
4 x 2 x 0.75	7/0.37	0.6	0.9	1.5	17.8	544
6 x 2 x 0.75	7/0.37	0.6	1.25	1.6	20.9	785
8 x 2 x 0.75	7/0.37	0.6	1.25	1.6	21.7	860
10 x 2 x 0.75	7/0.37	0.6	1.25	1.7	23.5	978
12 x 2 x 0.75	7/0.37	0.6	1.25	1.7	24.9	1082
16 x 2 x 0.75	7/0.37	0.6	1.25	1.8	27.9	1310
20 x 2 x 0.75	7/0.37	0.6	1.25	1.8	30.1	1483
24 x 2 x 0.75	7/0.37	0.6	1.25	1.9	33.2	1898
1 x 2 x 1	7/0.43	0.6	0.9	1.4	12.1	296
2 x 2 x 1	7/0.43	0.6	0.9	1.5	16.1	457
4 x 2 x 1	7/0.43	0.6	0.9	1.6	18.7	596
6 x 2 x 1	7/0.43	0.6	1.25	1.6	22.0	866
8 x 2 x 1	7/0.43	0.6	1.25	1.6	22.8	953
10 x 2 x 1	7/0.43	0.6	1.25	1.7	24.7	1086
12 x 2 x 1	7/0.43	0.6	1.25	1.7	26.5	1232
16 x 2 x 1	7/0.43	0.6	1.25	1.8	29.5	1471
20 x 2 x 1	7/0.43	0.6	1.6	1.9	32.9	1909
24 x 2 x 1	7/0.43	0.6	1.6	2.0	35.7	2191
1 x 2 x 1.5	7/0.52	0.6	0.9	1.4	12.7	325
2 x 2 x 1.5	7/0.52	0.6	0.9	1.5	17.1	509
4 x 2 x 1.5	7/0.52	0.6	1.25	1.6	21.1	828
6 x 2 x 1.5	7/0.52	0.6	1.25	1.7	23.8	1010
8 x 2 x 1.5	7/0.52	0.6	1.25	1.7	24.7	1121
10 x 2 x 1.5	7/0.52	0.6	1.25	1.8	27.0	1318
12 x 2 x 1.5	7/0.52	0.6	1.25	1.8	28.7	1464
16 x 2 x 1.5	7/0.52	0.6	1.6	1.9	32.9	1979
20 x 2 x 1.5	7/0.52	0.6	1.6	2.0	36.2	2333
24 x 2 x 1.5	7/0.52	0.6	1.6	2.1	38.9	2636

## DATA SHEET

No of triads x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 3 x 0.5	7/0.3	0.6	0.9	1.3	11.6	259
2 x 3 x 0.5	7/0.3	0.6	0.9	1.4	15.3	416
4 x 3 x 0.5	7/0.3	0.6	0.9	1.5	17.4	521
6 x 3 x 0.5	7/0.3	0.6	0.9	1.6	19.9	657
8 x 3 x 0.5	7/0.3	0.6	1.25	1.6	21.8	864
10 x 3 x 0.5	7/0.3	0.6	1.25	1.7	25.8	1077
12 x 3 x 0.5	7/0.3	0.6	1.25	1.7	25.8	1124
16 x 3 x 0.5	7/0.3	0.6	1.25	1.8	28.2	1337
20 x 3 x 0.5	7/0.3	0.6	1.25	1.9	30.9	1554
24 x 3 x 0.5	7/0.3	0.6	1.6	2.0	35.8	2069
1 x 3 x 0.75	7/0.37	0.6	0.9	1.4	12.2	289
2 x 3 x 0.75	7/0.37	0.6	0.9	1.5	16.2	461
4 x 3 x 0.75	7/0.37	0.6	0.9	1.5	18.3	585
6 x 3 x 0.75	7/0.37	0.6	1.25	1.6	21.7	866
8 x 3 x 0.75	7/0.37	0.6	1.25	1.7	23.4	1002
10 x 3 x 0.75	7/0.37	0.6	1.25	1.8	27.5	1238
12 x 3 x 0.75	7/0.37	0.6	1.25	1.8	27.5	1302
16 x 3 x 0.75	7/0.37	0.6	1.25	1.8	30.0	1547
20 x 3 x 0.75	7/0.37	0.6	1.6	1.9	33.6	2010
24 x 3 x 0.75	7/0.37	0.6	1.6	2.0	38.1	2383
1 x 3 x 1	7/0.43	0.6	0.9	1.4	12.7	315
2 x 3 x 1	7/0.43	0.6	0.9	1.5	17.2	517
4 x 3 x 1	7/0.43	0.6	0.9	1.5	19.2	654
6 x 3 x 1	7/0.43	0.6	1.25	1.6	23.0	976
8 x 3 x 1	7/0.43	0.6	1.25	1.7	24.6	1121
10 x 3 x 1	7/0.43	0.6	1.25	1.8	29.1	1395
12 x 3 x 1	7/0.43	0.6	1.25	1.8	29.1	1478
16 x 3 x 1	7/0.43	0.6	1.6	1.9	32.7	1975
20 x 3 x 1	7/0.43	0.6	1.6	2.0	36.2	2342
24 x 3 x 1	7/0.43	0.6	1.6	2.1	40.6	2743
1 x 3 x 1.5	7/0.52	0.6	0.9	1.4	13.3	350
2 x 3 x 1.5	7/0.52	0.6	0.9	1.5	18.3	583
4 x 3 x 1.5	7/0.52	0.6	1.25	1.6	21.5	891
6 x 3 x 1.5	7/0.52	0.6	1.25	1.7	24.8	1152
8 x 3 x 1.5	7/0.52	0.6	1.25	1.7	26.6	1347

**CU / PE / ISCR / OSCR / PVC FR**  
**CU / XLPE / ISCR / OSCR / PVC FR**  
**CU / XLPE / ISCR / OSCR / LSOH**

Stranded plain copper conductor  
 Polyethylene insulation ( PE )  
 Core twisted in pairs  
 Colour coding for :  
 -pair : black/white, continuously numbered  
 -triad : black/white/red, continuously numbered

Individual screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped Screened pairs twisted in concentric layers  
 Overall screen of plastic bonded aluminium mylar tape with tinned copper drain wire PVC outer sheath, flame retardant to IEC 60332-3, black or blue colour

**Available on request :** Tinned copper conductors, PVC, XLPE or EPR insulations, sheathing of LSOH, oil & hydrocarbon resistant, anti termite, anti rodent, and other special sheath performance



**ELECTRICAL & TECHNICAL DATA**

Working Voltage	: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min			
	core/screen	: 1000V 50Hz 1 min			
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,3 mm <sup>2</sup>	1,5 mm <sup>2</sup>
	max 36,8 Ω/km	max 24,9 Ω/km	max 18,6 Ω/km	max 13,6 Ω/km	max 12,3 Ω/km
L/R Ratio	25 µH/Ω	25 µH/Ω	25 µH/Ω	40 µH/Ω	40 µH/Ω
Insulation Resistance	: min. 5000 m Ω/km				
Mutual Capacitance at 800 Hz	: max. 100 nF/km				
Temperature Range, fixed	: -30°C to +70°C				
Minimum Bending Radius	: 7,5 x cable diameter				
Flame Retardancy	: IEC-60332-1				
Flame Propagation	: IEC-60332-3				

**DATA SHEET**

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Thickness of outer sheath (mm)	Overall Diameter	Cable Weight
				approx. ± 3 (mm)	approx. ± 5 Kg/km
2 x 2 x 0.5	7/0.3	0.6	1.0	11.1	113
4 x 2 x 0.5	7/0.3	0.6	1.1	13.0	173
6 x 2 x 0.5	7/0.3	0.6	1.2	15.8	244
8 x 2 x 0.5	7/0.3	0.6	1.3	17.3	304
10 x 2 x 0.5	7/0.3	0.6	1.3	20.7	398
12 x 2 x 0.5	7/0.3	0.6	1.4	21.4	451
16 x 2 x 0.5	7/0.3	0.6	1.5	24.0	573
20 x 2 x 0.5	7/0.3	0.6	1.6	26.7	700
24 x 2 x 0.5	7/0.3	0.6	1.7	30.1	840

## DATA SHEET

No of pairs x cross section	Conductor	Thickness of insulation	Thickness of outer sheath	Overall Diameter	Cable Weight
				approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 2 x 0.75	7/0.37	0.6	1.1	12.8	152
4 x 2 x 0.75	7/0.37	0.6	1.2	14.1	207
6 x 2 x 0.75	7/0.37	0.6	1.3	17.1	294
8 x 2 x 0.75	7/0.37	0.6	1.3	18.9	368
10 x 2 x 0.75	7/0.37	0.6	1.4	22.5	480
12 x 2 x 0.75	7/0.37	0.6	1.4	23.3	548
16 x 2 x 0.75	7/0.37	0.6	1.6	26.1	699
20 x 2 x 0.75	7/0.37	0.6	1.7	29.1	856
24 x 2 x 0.75	7/0.37	0.6	1.7	32.9	1029
2 x 2 x 1	7/0.43	0.6	1.1	13.6	172
4 x 2 x 1	7/0.43	0.6	1.2	15.0	240
6 x 2 x 1	7/0.43	0.6	1.3	18.3	341
8 x 2 x 1	7/0.43	0.6	1.4	20.3	445
10 x 2 x 1	7/0.43	0.6	1.4	24.0	560
12 x 2 x 1	7/0.43	0.6	1.5	24.9	640
16 x 2 x 1	7/0.43	0.6	1.6	28.0	821
20 x 2 x 1	7/0.43	0.6	1.7	31.2	1007
24 x 2 x 1	7/0.43	0.6	1.8	35.2	1220
2 x 2 x 1.5	7/0.52	0.6	1.1	15.0	210
4 x 2 x 1.5	7/0.52	0.6	1.3	16.5	302
6 x 2 x 1.5	7/0.52	0.6	1.4	20.4	448
8 x 2 x 1.5	7/0.52	0.6	1.4	22.5	565
10 x 2 x 1.5	7/0.52	0.6	1.5	26.6	713
12 x 2 x 1.5	7/0.52	0.6	1.6	27.6	819
16 x 2 x 1.5	7/0.52	0.6	1.7	31.0	1054
20 x 2 x 1.5	7/0.52	0.6	1.8	34.6	1298
24 x 2 x 1.5	7/0.52	0.6	1.9	39.1	1572

**DATA SHEET**

No of triads x cross section	Conductor	Thickness of insulation	Thickness of outer sheath	Overall Diameter	Cable Weight
				approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 3 x 0.5	7/0.3	0.6	1.1	11.3	130
4 x 3 x 0.5	7/0.3	0.6	1.2	14.0	212
6 x 3 x 0.5	7/0.3	0.6	1.3	16.8	305
8 x 3 x 0.5	7/0.3	0.6	1.3	17.6	373
10 x 3 x 0.5	7/0.3	0.6	1.4	19.5	456
12 x 3 x 0.5	7/0.3	0.6	1.4	21.2	537
16 x 3 x 0.5	7/0.3	0.6	1.5	24.1	691
20 x 3 x 0.5	7/0.3	0.6	1.6	26.9	861
24 x 3 x 0.5	7/0.3	0.6	1.7	29.2	1021
2 x 3 x 0.75	7/0.37	0.6	1.1	12.1	153
4 x 3 x 0.75	7/0.37	0.6	1.2	15.3	265
6 x 3 x 0.75	7/0.37	0.6	1.3	18.1	371
8 x 3 x 0.75	7/0.37	0.6	1.3	19.0	458
10 x 3 x 0.75	7/0.37	0.6	1.4	21.0	559
12 x 3 x 0.75	7/0.37	0.6	1.5	22.9	663
16 x 3 x 0.75	7/0.37	0.6	1.6	26.2	867
20 x 3 x 0.75	7/0.37	0.6	1.7	29.0	1062
24 x 3 x 0.75	7/0.37	0.6	1.8	31.6	1260
2 x 3 x 1	7/0.43	0.6	1.1	12.9	177
4 x 3 x 1	7/0.43	0.6	1.2	16.3	309
6 x 3 x 1	7/0.43	0.6	1.4	19.4	440
8 x 3 x 1	7/0.43	0.6	1.4	20.4	548
10 x 3 x 1	7/0.43	0.6	1.5	22.6	671
12 x 3 x 1	7/0.43	0.6	1.5	24.5	788
16 x 3 x 1	7/0.43	0.6	1.7	28.1	1036
20 x 3 x 1	7/0.43	0.6	1.8	31.2	1278
24 x 3 x 1	7/0.43	0.6	1.9	34.0	1518
2 x 3 x 1.5	7/0.52	0.6	1.2	14.2	222
4 x 3 x 1.5	7/0.52	0.6	1.3	18.0	392
6 x 3 x 1.5	7/0.52	0.6	1.4	21.4	559
8 x 3 x 1.5	7/0.52	0.6	1.5	22.5	701
10 x 3 x 1.5	7/0.52	0.6	1.6	24.9	858
12 x 3 x 1.5	7/0.52	0.6	1.6	27.2	1024
16 x 3 x 1.5	7/0.52	0.6	1.8	31.1	1339
20 x 3 x 1.5	7/0.52	0.6	1.9	34.5	1651
24 x 3 x 1.5	7/0.52	0.6	2.0	37.6	1961

**CU / PE / ISCR / OSCR / PVC / SWA / PVC FR**  
**CU / XLPE / ISCR / OSCR / PVC / SWA / PVC FR**  
**CU / XLPE / ISCR / OSCR / LSOH / SWA / LSOH**  
**CU / XLPE / ISCR / OSCR / LSOH / SWB / LSOH**

Stranded plain copper conductor

Polyethylene insulation (PE)

Core twisted in pairs

Colour coding for :

- pair : black/white, continuously numbered
- triad : black/white/red, continuously numbered

Individual screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped, polyester tape wrapping Screened pairs twisted in concentric layers

Overall screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped, polyester tape wrapping Bedding of polyvinylchloride (PVC)

Galvanized steel wire armour PVC outer sheath, flame retardant to IEC 60332-3C, black or blue colour

**Available on request :** Tinned copper conductors, PVC, XLPE or EPR insulations, sheathing of LSOH, oil & hydrocarbon resistant, anti termite, anti rodent, and other special sheath performance



## ELECTRICAL & TECHNICAL DATA

Working Voltage	: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min			
	core/screen	: 1000V 50Hz 1 min			
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,3 mm <sup>2</sup>	1,5 mm <sup>2</sup>
	max 36,8 Ω/km	max 24,9 Ω/km	max 18,6 Ω/km	max 13,6 Ω/km	max 12,3 Ω/km
L/R Ratio	25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	40 μH/Ω
Insulation Resistance	: min. 5000 m Ω/km				
Mutual Capacitance at 800 Hz	: max. 100 nF/km				
Temperature Range, fixed	: -30°C to +70°C				
Minimum Bending Radius	: 10 x cable diameter				
Flame Retardancy	: IEC-60332-1				
Flame Propagation	: IEC-60332-3				

## DATA SHEET

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Steel wire Diameter (mm)	Thickness of outer sheath (mm)	Overall Diameter	Cable Weight
					approx. ± 3 (mm)	approx. ± 5 Kg/km
2 x 2 x 0.5	7/0.3	0.6	0.9	1.4	15.2	414
4 x 2 x 0.5	7/0.3	0.6	0.9	1.5	18.0	554
6 x 2 x 0.5	7/0.3	0.6	1.25	1.6	21.0	801
8 x 2 x 0.5	7/0.3	0.6	1.25	1.6	21.7	864
10 x 2 x 0.5	7/0.3	0.6	1.25	1.7	23.7	1005
12 x 2 x 0.5	7/0.3	0.6	1.25	1.7	25.1	1105
16 x 2 x 0.5	7/0.3	0.6	1.25	1.8	27.9	1319
20 x 2 x 0.5	7/0.3	0.6	1.25	1.8	30.2	1508
24 x 2 x 0.5	7/0.3	0.6	1.6	1.9	33.3	1918

**DATA SHEET**

No of pairs x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 2 x 0.75	7/0.37	0.6	0.9	1.5	16.1	458
4 x 2 x 0.75	7/0.37	0.6	0.9	1.5	18.9	605
6 x 2 x 0.75	7/0.37	0.6	1.25	1.6	22.1	872
8 x 2 x 0.75	7/0.37	0.6	1.25	1.7	23.1	971
10 x 2 x 0.75	7/0.37	0.6	1.25	1.7	25.0	1118
12 x 2 x 0.75	7/0.37	0.6	1.25	1.7	26.6	1240
16 x 2 x 0.75	7/0.37	0.6	1.25	1.8	29.6	1481
20 x 2 x 0.75	7/0.37	0.6	1.6	1.9	33.1	1925
24 x 2 x 0.75	7/0.37	0.6	1.6	2.0	35.9	2206
2 x 2 x 1	7/0.43	0.6	0.9	1.5	16.9	494
4 x 2 x 1	7/0.43	0.6	0.9	1.6	20.0	673
6 x 2 x 1	7/0.43	0.6	1.25	1.7	23.6	986
8 x 2 x 1	7/0.43	0.6	1.25	1.7	24.5	1089
10 x 2 x 1	7/0.43	0.6	1.25	1.7	26.4	1244
12 x 2 x 1	7/0.43	0.6	1.25	1.8	28.3	1393
16 x 2 x 1	7/0.43	0.6	1.6	1.9	32.3	1878
20 x 2 x 1	7/0.43	0.6	1.6	2.0	35.6	2213
24 x 2 x 1	7/0.43	0.6	1.6	2.1	38.2	2495
2 x 2 x 1.5	7/0.52	0.6	0.9	1.5	18.1	563
4 x 2 x 1.5	7/0.52	0.6	1.25	1.6	22.1	890
6 x 2 x 1.5	7/0.52	0.6	1.25	1.7	25.3	1128
8 x 2 x 1.5	7/0.52	0.6	1.25	1.7	26.3	1256
10 x 2 x 1.5	7/0.52	0.6	1.25	1.8	28.6	1456
12 x 2 x 1.5	7/0.52	0.6	1.25	1.9	30.7	1634
16 x 2 x 1.5	7/0.52	0.6	1.6	2.0	35.5	2261
20 x 2 x 1.5	7/0.52	0.6	1.6	2.1	38.6	2595
24 x 2 x 1.5	7/0.52	0.6	1.6	2.1	41.3	2928



## DATA SHEET

No of triads x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 3 x 0.5	7/0.3	0.6	0.9	1.5	16.0	456
4 x 3 x 0.5	7/0.3	0.6	0.9	1.5	18.8	614
6 x 3 x 0.5	7/0.3	0.6	1.25	1.6	21.9	881
8 x 3 x 0.5	7/0.3	0.6	1.25	1.6	22.7	973
10 x 3 x 0.5	7/0.3	0.6	1.25	1.7	24.8	1131
12 x 3 x 0.5	7/0.3	0.6	1.25	1.7	26.4	1264
16 x 3 x 0.5	7/0.3	0.6	1.25	1.8	29.4	1515
20 x 3 x 0.5	7/0.3	0.6	1.6	1.9	32.8	1963
24 x 3 x 0.5	7/0.3	0.6	1.6	2.0	35.6	2254
2 x 3 x 0.75	7/0.37	0.6	0.9	1.5	16.8	501
4 x 3 x 0.75	7/0.37	0.6	0.9	1.6	20.0	694
6 x 3 x 0.75	7/0.37	0.6	1.25	1.7	23.5	1002
8 x 3 x 0.75	7/0.37	0.6	1.25	1.7	24.4	1126
10 x 3 x 0.75	7/0.37	0.6	1.25	1.7	26.3	1280
12 x 3 x 0.75	7/0.37	0.6	1.25	1.8	28.2	1450
16 x 3 x 0.75	7/0.37	0.6	1.6	1.9	32.1	1931
20 x 3 x 0.75	7/0.37	0.6	1.6	2.0	35.5	2310
24 x 3 x 0.75	7/0.37	0.6	1.6	2.0	37.9	2576
2 x 3 x 1	7/0.43	0.6	0.9	1.5	17.7	550
4 x 3 x 1	7/0.43	0.6	1.25	1.6	21.7	885
6 x 3 x 1	7/0.43	0.6	1.25	1.7	24.7	1104
8 x 3 x 1	7/0.43	0.6	1.25	1.7	25.7	1255
10 x 3 x 1	7/0.43	0.6	1.25	1.8	27.9	1445
12 x 3 x 1	7/0.43	0.6	1.25	1.8	29.7	1609
16 x 3 x 1	7/0.43	0.6	1.6	1.9	34.0	2178
20 x 3 x 1	7/0.43	0.6	1.6	2.0	37.5	2592
24 x 3 x 1	7/0.43	0.6	1.6	2.1	40.3	2935
2 x 3 x 1.5	7/0.52	0.6	0.9	1.5	18.9	624
4 x 3 x 1.5	7/0.52	0.6	1.25	1.7	23.4	1028
6 x 3 x 1.5	7/0.52	0.6	1.25	1.7	26.6	1297
8 x 3 x 1.5	7/0.52	0.6	1.25	1.8	27.8	1486
10 x 3 x 1.5	7/0.52	0.6	1.25	1.8	30.1	1706
12 x 3 x 1.5	7/0.52	0.6	1.6	1.9	33.1	2145
16 x 3 x 1.5	7/0.52	0.6	1.6	2.0	37.4	2658
20 x 3 x 1.5	7/0.52	0.6	1.6	2.1	40.8	3116
24 x 3 x 1.5	7/0.52	0.6	2.0	2.2	44.7	3861

## TCU/MT/XLPE/OSCR/LSOH

Stranded tinned copper conductor Flame barrier of glass Mica Tape Cross-linked Polyethylene Insulation ( XLPE ) Core twisted In pairs, pairs twisted in concentric layers

Colour coding for :

-pair : black/white, continuously numbered

-triad : black/white/red, continuously numbered

Polyester tape wrapping

Overall Screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx.

25% overlapped Low Smoke Zero Halogen compound outer sheath,

color : orange or red

### Application

For the transmission of digital signals and measuring data in safety area, where the maintenance of circuit integrity in case of fire is required. This cable is suitable for fixed indoor installations.



## ELECTRICAL & TECHNICAL DATA

Working Voltage		: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min				
	core/screen	: 1000V 50Hz 1 min				
Conductor Resistance		0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>
		max 36.8 Ω/km	max 24.9 Ω/km	max 18.6 Ω/km	max 12.3 Ω/km	max 7.6 Ω/km
L/R Ratio		25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	60 μH/Ω
Insulation Resistance		: min. 5000 m Ω/km				
Mutual Capacitance at 1000Hz	Single Pair	max. 115 nF/km				
	2 to 4 Pairs	90 nF/km			102 nF/km	
	above 4 Pairs	75 nF/km			85 nF/km	
Capacitance unbalance		: max. 500 pF/ 500m				
Inductance		: max. 1 mH/km				
Temperature Range, fixed		: -30°C to +90°C				
Minimum Bending Radius		: 8 x cable diameter				
Circuit Integrity		: IEC-60332-1				
Flame Retardancy		: IEC-60332-3				
Fire Resistancy		: IEC-60331				
Smoke Density		: IEC-61034-1 and 2				
Acid Gas Emmission		: IEC-60754-2				
Halogen Content		: IEC-60754-1				

## DATA SHEET

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Thickness of outer sheath (mm)	Outer Diameter (mm)	Weight approx. Kg/km
1 x 2 x 0.5	7/0.3	0.6	0.9	8.7	65
2 x 2 x 0.5	7/0.3	0.6	1.1	13.6	132
4 x 2 x 0.5	7/0.3	0.6	1.2	17.3	208
6 x 2 x 0.5	7/0.3	0.6	1.4	20.4	295
8 x 2 x 0.5	7/0.3	0.6	1.4	21.4	349
10 x 2 x 0.5	7/0.3	0.6	1.5	23.8	424
12 x 2 x 0.5	7/0.3	0.6	1.6	26.0	487
16 x 2 x 0.5	7/0.3	0.6	1.7	29.6	643
20 x 2 x 0.5	7/0.3	0.6	1.9	33.0	788
24 x 2 x 0.5	7/0.3	0.6	2.0	36.0	922

## DATA SHEET

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Thickness of outer sheath (mm)	Outer Diameter (mm)	Weight approx. Kg/km
1 x 2 x 0.75	7/0.37	0.6	1.0	8.7	78
2 x 2 x 0.75	7/0.37	0.6	1.1	13.6	147
4 x 2 x 0.75	7/0.37	0.6	1.3	17.3	249
6 x 2 x 0.75	7/0.37	0.6	1.4	20.4	338
8 x 2 x 0.75	7/0.37	0.6	1.4	21.4	408
10 x 2 x 0.75	7/0.37	0.6	1.5	23.8	501
12 x 2 x 0.75	7/0.37	0.6	1.6	26.0	595
16 x 2 x 0.75	7/0.37	0.6	1.7	29.6	760
20 x 2 x 0.75	7/0.37	0.6	1.9	33.0	943
24 x 2 x 0.75	7/0.37	0.6	2.0	36.0	1117
1 x 2 x 1	7/0.43	0.6	1.0	9.1	86
2 x 2 x 1	7/0.43	0.6	1.2	14.5	172
4 x 2 x 1	7/0.43	0.6	1.3	18.1	278
6 x 2 x 1	7/0.43	0.6	1.4	21.5	388
8 x 2 x 1	7/0.43	0.6	1.5	22.8	484
10 x 2 x 1	7/0.43	0.6	1.6	25.3	592
12 x 2 x 1	7/0.43	0.6	1.7	27.6	701
16 x 2 x 1	7/0.43	0.6	1.8	31.4	896
20 x 2 x 1	7/0.43	0.6	1.9	34.8	1094
24 x 2 x 1	7/0.43	0.6	2.0	37.9	1290
1 x 2 x 1.5	7/0.52	0.6	1.0	9.7	102
2 x 2 x 1.5	7/0.52	0.6	1.2	15.6	207
4 x 2 x 1.5	7/0.52	0.6	1.4	19.7	351
6 x 2 x 1.5	7/0.52	0.6	1.5	23.3	485
8 x 2 x 1.5	7/0.52	0.6	1.5	24.5	597
10 x 2 x 1.5	7/0.52	0.6	1.6	27.2	732
12 x 2 x 1.5	7/0.52	0.6	1.7	29.7	870
16 x 2 x 1.5	7/0.52	0.6	1.9	34.0	1133
20 x 2 x 1.5	7/0.52	0.6	2.0	37.7	1387
24 x 2 x 1.5	7/0.52	0.6	2.2	41.3	1663
1 x 2 x 2.5	7/0.67	0.7	1.1	11.2	140
2 x 2 x 2.5	7/0.67	0.7	1.3	17.8	274
4 x 2 x 2.5	7/0.67	0.7	1.5	22.5	473
6 x 2 x 2.5	7/0.67	0.7	1.6	26.8	670
8 x 2 x 2.5	7/0.67	0.7	1.7	28.3	838
10 x 2 x 2.5	7/0.67	0.7	1.8	31.4	1028
12 x 2 x 2.5	7/0.67	0.7	1.9	34.2	1215
16 x 2 x 2.5	7/0.67	0.7	2.1	39.2	1590
20 x 2 x 2.5	7/0.67	0.7	2.3	43.7	1976
24 x 2 x 2.5	7/0.67	0.7	2.4	47.7	2350



## DATA SHEET

No of triads x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Thickness of outer sheath (mm)	Outer Diameter (mm)	Weight approx. Kg/km
1 x 3 x 0.5	7/0.3	0.6	1.0	8.7	82
4 x 3 x 0.5	7/0.3	0.6	1.3	17.4	270
8 x 3 x 0.5	7/0.3	0.6	1.4	21.6	454
12 x 3 x 0.5	7/0.3	0.6	1.6	26.2	662
16 x 3 x 0.5	7/0.3	0.6	1.7	29.9	854
20 x 3 x 0.5	7/0.3	0.6	1.9	33.3	1057
24 x 3 x 0.5	7/0.3	0.6	2.0	36.3	1251
1 x 3 x 0.75	7/0.37	0.6	1.0	9.2	95
4 x 3 x 0.75	7/0.37	0.6	1.3	18.4	318

## TCU/MT/XLPE/OSCR/LSOH/SWA/LSOH TCU/MT/XLPE/OSCR/LSOH/SWB/LSOH

Stranded tinned copper conductor Flame barrier of glass Mica Tape Cross-linked Polyethylene insulation ( XLPE ) Core twisted in pairs, pairs twisted in concentric layers

Colour coding for :

- pair : black/white, continuously numbered
- triad : black/white/red, continuously numbered

Polyester tape wrapping Overall Screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped Bedding of Low Smoke Zero Halogen compound Galvanized steel wire armoured Low Smoke Zero Halogen compound outer sheath, color : orange or red

### Application

For the transmission of digital signals and measuring data in safety area, where the maintenance of circuit integrity in case of fire is required. This cable is suitable for fixed indoor installations.



## ELECTRICAL & TECHNICAL DATA

Working Voltage		: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min				
	core/screen	: 1000V 50Hz 1 min				
Conductor Resistance		0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>
		max 36.8 Ω/km	max 24.9 Ω/km	max 18.6 Ω/km	max 12.3 Ω/km	max 7.6 Ω/km
L/R Ratio		25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	60 μH/Ω
Insulation Resistance		: min. 5000 m Ω/km				
Mutual Capacitance at 1000Hz	Single Pair	max. 115 nF/km				
	2 to 4 Pairs	90 nF/km			102 nF/km	
	above 4 Pairs	75 nF/km			85 nF/km	
Capacitance unbalance		: max. 500 pF/500m				
Inductance		: max. 1 mH/km				
Temperature Range, fixed		: -30°C to +90°C				
Minimum Bending Radius		: 8 x cable diameter				
Circuit Integrity		: IEC-60332-1				
Flame Retardancy		: IEC-60332-3-22				
Fire Resistancy		: IEC-60331-21				
Smoke Density		: IEC-61034-1 and 2				
Acid Gas Emmision		: IEC-60754-2				
Halogen Content		: IEC-60754-1				

## DATA SHEET

No of pairs x cross section [mm <sup>2</sup> ]	Conductor [mm]	Thickness of insulation [mm]	Steel wire Diameter [mm]	Thickness of outer sheath [mm]	Overall Diameter	Cable Weight
					approx. ± 3 [mm]	approx. ± 5 Kg/km
1 x 2 x 0.75	7/0.37	0.6	0.9	1.4	13.5	324
2 x 2 x 0.75	7/0.37	0.6	0.9	1.5	18.0	511
4 x 2 x 0.75	7/0.37	0.6	1.25	1.6	21.1	758
6 x 2 x 0.75	7/0.37	0.6	1.25	1.7	24.4	961
8 x 2 x 0.75	7/0.37	0.6	1.25	1.7	26.0	1086
10 x 2 x 0.75	7/0.37	0.6	1.25	1.9	30.9	1354
12 x 2 x 0.75	7/0.37	0.6	1.25	1.9	30.9	1414
16 x 2 x 0.75	7/0.37	0.6	1.6	2.0	34.8	1893
20 x 2 x 0.75	7/0.37	0.6	1.6	2.1	38.5	2221
24 x 2 x 0.75	7/0.37	0.6	2.0	2.2	44.0	2874

**DATA SHEET**

No of pairs x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 2 x 1	7/0.43	0.6	0.9	1.4	13.9	346
2 x 2 x 1	7/0.43	0.6	0.9	1.5	18.7	551
4 x 2 x 1	7/0.43	0.6	1.25	1.6	21.9	816
6 x 2 x 1	7/0.43	0.6	1.25	1.7	25.5	1053
8 x 2 x 1	7/0.43	0.6	1.25	1.8	27.3	1120
10 x 2 x 1	7/0.43	0.6	1.6	1.9	33.1	1684
12 x 2 x 1	7/0.43	0.6	1.6	1.9	33.1	1756
16 x 2 x 1	7/0.43	0.6	1.6	2.0	36.7	2104
20 x 2 x 1	7/0.43	0.6	1.6	2.1	40.3	2455
24 x 2 x 1	7/0.43	0.6	2.0	2.3	46.3	3204
1 x 2 x 1.5	7/0.52	0.6	0.9	1.4	14.5	376
2 x 2 x 1.5	7/0.52	0.6	0.9	1.6	19.9	616
4 x 2 x 1.5	7/0.52	0.6	1.25	1.7	23.3	924
6 x 2 x 1.5	7/0.52	0.6	1.25	1.7	26.9	1175
8 x 2 x 1.5	7/0.52	0.6	1.25	1.8	28.9	1361
10 x 2 x 1.5	7/0.52	0.6	1.6	2.0	35.7	1952
12 x 2 x 1.5	7/0.52	0.6	1.6	2.0	35.7	2049
16 x 2 x 1.5	7/0.52	0.6	1.6	2.1	39.2	2441
20 x 2 x 1.5	7/0.52	0.6	2.0	2.2	43.9	3136
24 x 2 x 1.5	7/0.52	0.6	2.0	2.4	50.0	3764
1 x 2 x 2.5	7/0.67	0.7	0.9	1.5	16.0	447
2 x 2 x 2.5	7/0.67	0.7	1.25	1.6	22.5	850
4 x 2 x 2.5	7/0.67	0.7	1.25	1.7	25.7	1114
6 x 2 x 2.5	7/0.67	0.7	1.25	1.8	30.1	1456
8 x 2 x 2.5	7/0.67	0.7	1.6	1.9	33.2	1896
10 x 2 x 2.5	7/0.67	0.7	1.6	2.1	40.0	2407
12 x 2 x 2.5	7/0.67	0.7	1.6	2.1	40.0	2550
16 x 2 x 2.5	7/0.67	0.7	2.0	2.2	44.9	3374
20 x 2 x 2.5	7/0.67	0.7	2.0	2.4	50.0	4033
24 x 2 x 2.5	7/0.67	0.7	2.0	2.6	57.5	5239

## DATA SHEET

No of triads x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
1 x 3 x 0.75	7/0.37	0.6	0.9	1.4	14.0	355
4 x 3 x 0.75	7/0.37	0.6	1.25	1.6	22.8	881
8 x 3 x 0.75	7/0.37	0.6	1.25	1.8	28.6	1319
12 x 3 x 0.75	7/0.37	0.6	1.6	2.0	35.3	1999
16 x 3 x 0.75	7/0.37	0.6	1.6	2.1	38.8	2364
20 x 3 x 0.75	7/0.37	0.6	1.6	2.2	40.5	2744
24 x 3 x 0.75	7/0.37	0.6	2.0	2.3	49.1	3604
1 x 3 x 1	7/0.43	0.6	0.9	1.4	14.4	380
4 x 3 x 1	7/0.43	0.6	1.25	1.7	23.9	975
8 x 3 x 1	7/0.43	0.6	1.25	1.8	29.8	1445
12 x 3 x 1	7/0.43	0.6	1.6	2.0	36.9	2198
16 x 3 x 1	7/0.43	0.6	1.6	2.1	40.5	2598
20 x 3 x 1	7/0.43	0.6	2.0	2.2	45.4	3345
24 x 3 x 1	7/0.43	0.6	2.0	2.4	51.6	4015
1 x 3 x 1.5	7/0.52	0.6	0.9	1.4	15.1	419
4 x 3 x 1.5	7/0.52	0.6	1.25	1.7	25.4	1108
8 x 3 x 1.5	7/0.52	0.6	1.6	1.9	32.7	1883
12 x 3 x 1.5	7/0.52	0.6	1.6	2.1	39.4	2543
16 x 3 x 1.5	7/0.52	0.6	2.0	2.2	44.1	3350
20 x 3 x 1.5	7/0.52	0.6	2.0	2.3	49.0	3995
24 x 3 x 1.5	7/0.52	0.6	2.0	2.5	56.4	5191

### TCU/MT/XLPE/ISCR/OSCR/LSOH

Stranded tinned copper conductor Flame barrier of glass Mica Tape Cross-linked Polyethylene insulation [ XLPE ] Core twisted in pairs

Colour coding for  
 -pair : black/white, continuously numbered  
 -triad : black/white/red, continuously numbered

Individual screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped, polyester tape wrapping Screened pairs twisted In concentric layers Overall screen of plastic bonded aluminium mylar tape with tinned cooper drain wire, approx. 25% overlapped, polyester tape wrapping Low Smoke Zero Halogen compound outer sheath, color : orange or red

#### Application

For the transmission of analog signals and measuring data in safety area, where the maintenance of circuit integrity in case of fire is required. This cable is suitable for fixed indoor installations.



### ELECTRICAL & TECHNICAL DATA

Working Voltage		: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min				
	core/screen	: 1000V 50Hz 1 min				
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>	
	max 36.8 Ω/km	max 24.9 Ω/km	max 18.6 Ω/km	max 12.3 Ω/km	max 7.6 Ω/km	
L/R Ratio	25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	60 μH/Ω	
Insulation Resistance		: min. 5000 m Ω/km				
Mutual Capacitance at 1000Hz	Single Pair	max. 115 nF/km				
	2 to 4 Pairs	90 nF/km			102 nF/km	
	above 4 Pairs	75 nF/km			85 nF/km	
Capacitance unbalance		: max. 500 pF/500m				
Inductance		: max. 1 mH/km				
Temperature Range, fixed		: -30°C to +90°C				
Minimum Bending Radius		: 8 x cable diameter				
Circuit Integrity		: IEC-60332-1				
Flame Retardancy		: IEC-60332-3				
Fire Resistancy		: IEC-60331				
Smoke Density		: IEC-61034-1 and 2				
Acid Gas Emmision		: IEC-60754-2				
Halogen Content		: IEC-60754-1				

### DATA SHEET

No of pairs x cross section [mm <sup>2</sup> ]	Conductor [mm]	Thickness of insulation [mm]	Thickness of outer sheath [mm]	Overall Diameter	Cable Weight
				approx. ± 3 [mm]	approx. ± 5 Kg/km
2 x 2 x 0.5	7/0.3	0.6	1.2	14.1	160
4 x 2 x 0.5	7/0.3	0.6	1.3	17.5	251
6 x 2 x 0.5	7/0.3	0.6	1.4	20.8	349
8 x 2 x 0.5	7/0.3	0.6	1.4	21.8	419
10 x 2 x 0.5	7/0.3	0.6	1.5	24.1	505
12 x 2 x 0.5	7/0.3	0.6	1.6	26.4	606
16 x 2 x 0.5	7/0.3	0.6	1.8	30.3	792
20 x 2 x 0.5	7/0.3	0.6	1.9	33.6	966
24 x 2 x 0.5	7/0.3	0.6	2.0	36.6	1140



## DATA SHEET

No of pairs x cross section	Conductor	Thickness of insulation	Thickness of outer sheath	Overall Diameter	Cable Weight
				approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 2 x 0.75	7/0.37	0.6	1.2	14.8	177
4 x 2 x 0.75	7/0.37	0.6	1.3	18.5	287
6 x 2 x 0.75	7/0.37	0.6	1.5	22.1	407
8 x 2 x 0.75	7/0.37	0.6	1.5	23.2	492
10 x 2 x 0.75	7/0.37	0.6	1.6	25.8	605
12 x 2 x 0.75	7/0.37	0.6	1.7	28.1	714
16 x 2 x 0.75	7/0.37	0.6	1.8	32.0	914
20 x 2 x 0.75	7/0.37	0.6	2.0	35.7	1135
24 x 2 x 0.75	7/0.37	0.6	2.1	38.8	1331
2 x 2 x 1	7/0.43	0.6	1.2	15.5	195
4 x 2 x 1	7/0.43	0.6	1.4	19.6	329
6 x 2 x 1	7/0.43	0.6	1.5	23.2	455
8 x 2 x 1	7/0.43	0.6	1.5	24.4	556
10 x 2 x 1	7/0.43	0.6	1.6	27.1	682
12 x 2 x 1	7/0.43	0.6	1.7	29.5	803
16 x 2 x 1	7/0.43	0.6	1.9	33.9	1055
20 x 2 x 1	7/0.43	0.6	2.0	37.6	1291
24 x 2 x 1	7/0.43	0.6	2.2	41.1	1539
2 x 2 x 1.5	7/0.52	0.6	1.3	16.8	236
4 x 2 x 1.5	7/0.52	0.6	1.4	21.0	390
6 x 2 x 1.5	7/0.52	0.6	1.6	25.1	556
8 x 2 x 1.5	7/0.52	0.6	1.6	26.5	691
10 x 2 x 1.5	7/0.52	0.6	1.7	29.3	838
12 x 2 x 1.5	7/0.52	0.6	1.8	31.9	989
16 x 2 x 1.5	7/0.52	0.6	2.0	36.6	1296
20 x 2 x 1.5	7/0.52	0.6	2.1	40.6	1588
24 x 2 x 1.5	7/0.52	0.6	2.3	44.4	1896
2 x 2 x 2.5	7/0.67	0.7	1.3	19.0	301
4 x 2 x 2.5	7/0.67	0.7	1.5	24.0	518
6 x 2 x 2.5	7/0.67	0.7	1.7	28.8	749
8 x 2 x 2.5	7/0.67	0.7	1.8	30.5	943
10 x 2 x 2.5	7/0.67	0.7	1.9	33.8	1152
12 x 2 x 2.5	7/0.67	0.7	2.0	36.8	1360
16 x 2 x 2.5	7/0.67	0.7	2.2	42.1	1771
20 x 2 x 2.5	7/0.67	0.7	2.4	47.0	2207
24 x 2 x 2.5	7/0.67	0.7	2.5	51.2	2610



## DATA SHEET

No of triads x cross section  (mm <sup>2</sup> )	Conductor  (mm)	Thickness of insulation  (mm)	Thickness of outer sheath  (mm)	Overall Diameter	Cable Weight
				approx. ± 3  (mm)	approx. ± 5  Kg/km
2 x 3 x 0.5	7/0.3	0.6	1.2	14.9	188
4 x 3 x 0.5	7/0.3	0.6	1.3	18.6	308
8 x 3 x 0.5	7/0.3	0.6	1.5	23.4	538
12 x 3 x 0.5	7/0.3	0.6	1.7	28.3	779
16 x 3 x 0.5	7/0.3	0.6	1.8	32.3	1007
20 x 3 x 0.5	7/0.3	0.6	2.0	36.0	1248
24 x 3 x 0.5	7/0.3	0.6	2.1	39.2	1474
2 x 3 x 0.75	7/0.37	0.6	1.2	15.7	214
4 x 3 x 0.75	7/0.37	0.6	1.4	19.8	364
8 x 3 x 0.75	7/0.37	0.6	1.6	24.8	634
12 x 3 x 0.75	7/0.37	0.6	1.7	29.9	912
16 x 3 x 0.75	7/0.37	0.6	1.9	34.3	1195
20 x 3 x 0.75	7/0.37	0.6	2.0	38.0	1461
24 x 3 x 0.75	7/0.37	0.6	2.2	41.6	1750

## TCU/MT/XLPE/LSCR/OSCR/LSOH/SWA/LSOH TCU/MT/XLPE/OSCR/ISCR/LSOH/SWB/LSOH

Stranded tinned copper conductor Flame barrier of glass Mica Tape Cross-linked Polyethylene Insulation (XLPE) Core twisted in pairs

Colour coding for :

-pair : black/white, continuously numbered

-triad : black/white/red, continuously numbered

Individual screen of plastic bonded aluminium mylar tape with tinned copper drain wire approx. 25% overlapped, polyester tape wrapping Screened pairs twisted In concentric layers Overall screen of plastic bonded aluminium mylar tape with tinned copper drain wire, approx. 25% overlapped, polyester tape wrapping Bedding of Low Smoke Zero Halogen compound Galvanized steel wire armoured. Low Smoke Zero Halogen compound outer sheath, color : orange or red

### Application

For the transmission of analog signals and measuring data in safety area, where the maintenance of circuit integrity in case of fire is required. This cable is suitable for fixed indoor, outdoor and underground installations.

## ELECTRICAL & TECHNICAL DATA

Working Voltage		: max. 500V				
Test Voltage	core/core	: 2000V 50 Hz 1 min				
	core/screen	: 1000V 50Hz 1 min				
Conductor Resistance	0,5 mm <sup>2</sup>	0,75 mm <sup>2</sup>	1,0 mm <sup>2</sup>	1,5 mm <sup>2</sup>	2,5 mm <sup>2</sup>	
	max 36.8Ω/km	max 24.9 Ω/km	max 18.6 Ω/km	max 12.3 Ω/km	max 7.6Ω/km	
L/R Ratio	25 μH/Ω	25 μH/Ω	25 μH/Ω	40 μH/Ω	60 μH/Ω	
Insulation Resistance		: min. 5000 m Ω/km				
Mutual Capacitance at 1000Hz	Single Pair	max. 115 nF/km				
	2 to 4 Pairs	90 nF/km			102 nF/km	
	above 4 Pairs	75 nF/km			85 nF/km	
Capacitance unbalance		: max. 500 pF/500m				
Inductance		: max. 1 mH/km				
Temperature Range, fixed		: -30°C to +90°C				
Minimum Bending Radius		: 8 x cable diameter				
Circuit Integrity		: IEC-60332-1				
Flame Retardancy		: IEC-60332-3				
Fire Resistancy		: IEC-60331				
Smoke Density		: IEC-61034-1 and 2				
Acid Gas Emmision		: IEC-60754-2				
Halogen Content		: IEC-60754-1				



## DATA SHEET

No of pairs x cross section (mm <sup>2</sup> )	Conductor (mm)	Thickness of insulation (mm)	Steel wire Diameter (mm)	Thickness of outer sheath (mm)	Overall Diameter	Cable Weight
					approx. ± 3 (mm)	approx. ± 5 Kg/km
2 x 2 x 0.75	7/0.37	0.6	0.9	1.5	19.2	570
4 x 2 x 0.75	7/0.37	0.6	1.25	1.6	22.5	847
6 x 2 x 0.75	7/0.37	0.6	1.25	1.7	26.2	1075
8 x 2 x 0.75	7/0.37	0.6	1.25	1.8	28.1	1236
10 x 2 x 0.75	7/0.37	0.6	1.6	1.9	34.1	1737
12 x 2 x 0.75	7/0.37	0.6	1.6	1.9	34.1	1811
16 x 2 x 0.75	7/0.37	0.6	1.6	2.0	37.9	2187
20 x 2 x 0.75	7/0.37	0.6	1.6	2.1	41.6	2539
24 x 2 x 0.75	7/0.37	0.6	2.0	2.3	48.3	3379



## DATA SHEET

No of pairs x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
2 x 2 x 1	7/0.43	0.6	0.9	1.6	20.1	614
4 x 2 x 1	7/0.43	0.6	1.25	1.7	23.5	915
6 x 2 x 1	7/0.43	0.6	1.25	1.8	27.5	1178
8 x 2 x 1	7/0.43	0.6	1.25	1.8	29.3	1340
10 x 2 x 1	7/0.43	0.6	1.6	2.0	36.2	1931
12 x 2 x 1	7/0.43	0.6	1.6	2.0	36.2	2018
16 x 2 x 1	7/0.43	0.6	1.6	2.1	39.8	2396
20 x 2 x 1	7/0.43	0.6	2.0	2.2	44.5	3076
24 x 2 x 1	7/0.43	0.6	2.0	2.4	50.7	3689
2 x 2 x 1.5	7/0.52	0.6	1.25	1.6	21.8	787
4 x 2 x 1.5	7/0.52	0.6	1.25	1.7	24.8	1015
6 x 2 x 1.5	7/0.52	0.6	1.25	1.8	29.1	1316
8 x 2 x 1.5	7/0.52	0.6	1.25	1.9	31.3	1526
10 x 2 x 1.5	7/0.52	0.6	1.6	2.1	38.6	2195
12 x 2 x 1.5	7/0.52	0.6	1.6	2.1	38.6	2307
16 x 2 x 1.5	7/0.52	0.6	1.6	2.2	42.5	2744
20 x 2 x 1.5	7/0.52	0.6	2.0	2.3	48.0	3584
24 x 2 x 1.5	7/0.52	0.6	2.0	2.5	54.1	4202
2 x 2 x 2.5	7/0.67	0.7	1.25	1.7	24.2	932
4 x 2 x 2.5	7/0.67	0.7	1.25	1.8	27.7	1239
6 x 2 x 2.5	7/0.67	0.7	1.6	1.9	33.3	1806
8 x 2 x 2.5	7/0.67	0.7	1.6	2.0	36.2	2133
10 x 2 x 2.5	7/0.67	0.7	2.0	2.2	44.0	2946
12 x 2 x 2.5	7/0.67	0.7	2.0	2.2	44.0	3104
16 x 2 x 2.5	7/0.67	0.7	2.0	2.3	49.0	3801
20 x 2 x 2.5	7/0.67	0.7	2.0	2.5	54.1	4462
24 x 2 x 2.5	7/0.67	0.7	2.5	2.7	62.6	5865

## DATA SHEET

No of triads x cross section	Conductor	Thickness of insulation	Steel wire Diameter	Thickness of outer sheath	Overall Diameter	Cable Weight
					approx. ± 3	approx. ± 5
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	Kg/km
4 x 3 x 0.75	7/0.37	0.6	1.25	1.7	24.6	987
8 x 3 x 0.75	7/0.37	0.6	1.25	1.9	31.0	1481
12 x 3 x 0.75	7/0.37	0.6	1.6	2.0	38.0	2217
16 x 3 x 0.75	7/0.37	0.6	1.6	2.1	41.8	2631
20 x 3 x 0.75	7/0.37	0.6	2.0	2.3	47.5	3741
24 x 3 x 0.75	7/0.37	0.6	2.0	2.4	53.3	4042
4 x 3 x 1	7/0.43	0.6	1.25	1.7	25.7	1080
8 x 3 x 1	7/0.43	0.6	1.6	1.9	33.1	1819
12 x 3 x 1	7/0.43	0.6	1.6	2.1	39.9	2438
16 x 3 x 1	7/0.43	0.6	2.0	2.2	44.7	3216
20 x 3 x 1	7/0.43	0.6	2.0	2.3	49.6	3812
24 x 3 x 1	7/0.43	0.6	2.0	2.5	57.1	4981
4 x 3 x 1.5	7/0.52	0.6	1.25	1.8	27.3	1226
8 x 3 x 1.5	7/0.52	0.6	1.6	2.0	35.7	2117
12 x 3 x 1.5	7/0.52	0.6	1.6	2.2	42.6	2808
16 x 3 x 1.5	7/0.52	0.6	2.0	2.3	48.3	3781
20 x 3 x 1.5	7/0.52	0.6	2.0	2.4	53.1	4415
24 x 3 x 1.5	7/0.52	0.6	2.5	2.7	61.7	5835
4 x 3 x 2.5	7/0.67	0.7	1.25	1.8	30.3	1486
8 x 3 x 2.5	7/0.67	0.7	1.6	2.1	39.9	2619
12 x 3 x 2.5	7/0.67	0.7	2.0	2.3	49.2	3917
16 x 3 x 2.5	7/0.67	0.7	2.0	2.5	54.4	4742