songhyun TMC



FINE-Route®

Cable for electrical equipment of
ship & mobile & offshore unit

IEC 60092-350, 353, 376

ENTERPRISE WITH DREAM, HOPE, AND FUTURE







TMC Co., Ltd has been pursuing innovation in technology and products for marine, oil and gas industry.

For 20 years TMC has had a single-minded focus on delivering superior customer services with specialized marine and offshore cable solutions.

The operational excellence of TMC is underpinned by its products with the best quality and the flexibility to meet specific requirements that makes us the world's most experienced marine and offshore cable manufacturer.

Company History

1991 Establishment of Seojin Industry Co.,Ltd.
1998 ISO 9001 Certification by LRQA (Quality)
2004 ISO 14001 Certification by LRQA (Environment & Quality)
2005 Changed the name of company to TMC Co.,Ltd.
2006 Won the 30 million USD Export Tower Award granted by the Ministry of Knowledge Economy
2006 Earned recognition by Hyundai Mipo Dockyard Co., Ltd. as one of the excellent suppliers.
2007 Won the 70 million USD Export Tower Award granted by the Ministry of Knowledge Economy
2007 Received the High quality supplier Certification from DSME
2007 Achieved Korean world-class product award 2007
2008 Won the 100 million USD Export Tower Award granted by the Ministry of Knowledge Economy
2008 OHSAS 18001 Certification by LRQA (for Health, Safety and Environment)
2009 Awarded the Q-Mark as a Silver grade for Offshore Cable supplier by Samsung Heavy Industries
2010 Awarded the Best Supplier for Offshore & Marine Cable by Ocean Rig
2010 Earned recognition by DSME as one of the excellent supplier
2011 Awarded the Best Supplier for Offshore & Marine Cable by Stena Sphere
2011 KEPIC Certification by KEA (Manufacture of Class 1E cable)
2012 Won the 200 million USD Export Tower Award granted by the Ministry of Knowledge Economy

Certificates

- Type Approval Certification for shipboard cables : ABS, BV, CCS, DNV, GL, KR, LR, NK and RINA
- Type Approval Certification for NEK 606(2004) offshore cables : ABS, DNV and LR
- Type Approval Certification by ABS for offshore cables and listed on ETL
- Type Approval Certification for Passenger ships cables : ABS, DNV,LR, BV and CCS
- Obtained Patent of Paint Resistant Shipboard Cables (Patent N0. 10-0627241)
- Type Approval Certification for IEEE1580 Type P cables : ABS and DNV and listed on ETL
- Type Approval Certification for LNG Carrier cables : ABS, DNV, LR and BV
- Gost-R Certification for NEK 606(2004) offshore cables by GOSSTANDART
- Type Approval Certification for Marine Optical Fiber Cables : ABS and DNV


TMC





Code Designation

Symbols of number of core and main use

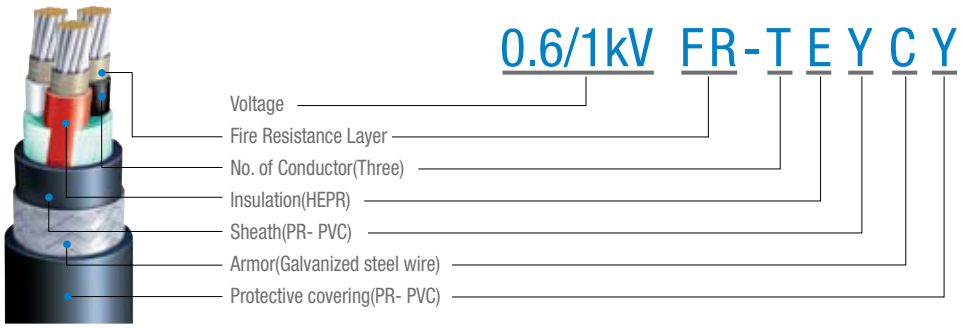
FR	Fire resistance	**5**	Five core for power and lighting
S	Single core for power and lighting	**6**	Six core for power and lighting
D	Double core for power and lighting	**10**	Ten core for power and lighting
T	Three core for power and lighting	**M**	Multi core for control and signal
F	Four core for power and lighting	**TT**	Telephone and instrumentation

Symbols of material

Insulation		Sheath		Armoring		Protective Covering		Others	
E	HEPR	**Y**	PR- PVC	**C**	Galvanized steel wire	**Y**	PR- PVC	**S**	Common shield
				CB	Copper alloy wire			**-S**	Individual shield
								E	Earth wire

Note PR-PVC : Paint Resistant PVC

Example



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Cable Type		Rated voltage	Shield (Screen)	Unarmored cables	Armored & PVC Sheath cables[2]	Page
LV Power & Lighting Cable	Flame Retardant	0.6/1kV[1]	Non	SEY	SEYCBY	06 ~ 08
				DEY	DEYCY	
				TEY	TEYCY	
				DEYE	DEYCYE	
				FEY	FEYCY	
				5EY	5EYCY	
				6EY	6EYCY	
				10EY	10EYCY	
			Common	SEYS	SEYCBYS	09 ~ 10
				DEYS	DEYCYS	
				TEYS	TEYCYS	
				FEYS	FEYCYS	
	Fire Resistance	0.6/1kV	Non	FR-DEY	FR-DEYCY	11 ~ 12
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Control & Instrumentation Cable	Flame Retardant	250V	Non	MEY	MEYCY	15
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			Non	TTEY	TTEYCY	17
			Common	TTEYS	TTEYCYS	18
			Individual	TTEY-S	TTEYCY-S	19
	Fire Resistance	250V	Non	FR-MEY	FR-MEYCY	20
			Common	FR-MEYS	FR-MEYCYS	21
			Non	FR-TTEY	FR-TTEYCY	22
			Common	FR-TTEYS	FR-TTEYCYS	23
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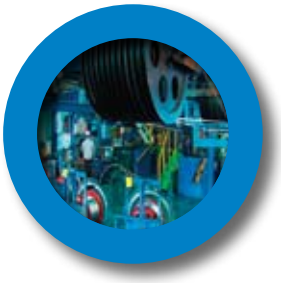
Remarks
1) 0.6/1kV means rated voltage of cable. 0.6kV : Ground voltage (a.c.) 1kV : Line voltage (a.c.)
2) Only installed for hazardous area.





LV Power & Lighting Cable





Flame Retardant

0.6/1kV SEY, DEY, TEY, DEYE, FEY, 5EY, 6EY, 10EY

0.6/1kV SEYCBY, DEYCY, TEYCY, DEYCYE, FEYCY, 5EYCY, 6EYCY, 10EYCY **06 ~ 08**

0.6/1kV SEYS, DEYS, TEYS, FEYS

0.6/1kV SEYCBYS, DEYCYS, TEYCYS, FEYCYS **09 ~ 10**

Fire Resistance

0.6/1kV FR-DEY, 0.6/1kV FR-TEY, 0.6/1kV FR-5EY

0.6/1kV FR-DEYCY, 0.6/1kV FR-TEYCY, 0.6/1kV FR-5EYCY **11 ~ 12**

0.6/1kV FR-DEYS, 0.6/1kV FR-TEYS

0.6/1kV FR-DEYCYS, 0.6/1kV FR-TEYCYS **13**

Flame retardant

LV Power & Lighting Cable



Cable Designation

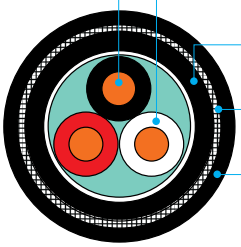
0.6/1kV SEY, DEY, TEY, DEYE, FEY, 5EY, 6EY, 10EY

0.6/1kV SEYCBY, DEYCY, TEYCY, DEYCYE, FEYCY, 5EYCY, 6EYCY, 10EYCY

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30°C / -30°C)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90°C

Construction



Sectional view	Classification	Code	Construction detail
	Conductor	**S** (D,T,F,5,6,10)	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	**E**	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C** (CB)	- 1C : Braid of copper alloy wires (-CB type) 2C and more : Braid of galvanized steel wires (-C type) - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		

No. of cores	Without Earth core	With Earth core
1C	Black	-
2C	Black, White	-
3C / 2C+E	Black, White, Red	Black, White, G/Y
4C / 3C+E	Black, White, Red, Green	Black, White, Red, G/Y
5C / 4C+E	Black No. on white insulation	Black, White, Red, Green, G/Y
Multi-core	Black No. on white insulation	Black No. on white insulation, G/Y

Note. 1. For single core cable, the armor should be used of copper alloy wire as non-magnetic material in order to avoid current loops according to clause 3.26 of IEC 60092-352

FINE-Route®
IEC 60092-350, 353, 376

0.6/1kV SEY, 0.6/1kV SEYCBY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	SEY		Dia. of wire for armor	Thickness of outer sheath	SEYCBY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				SEY	SEYCBY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1	1.5	7	1.7	0.7	1.1	5.5	0.5	0.3	1.0	9.2	0.6	12.2	1,010	3,500	50	130
	2.5	7	2.2	0.7	1.1	5.9	0.5	0.3	1.0	9.6	0.6	7.56	850	3,500	60	150
	4	7	2.7	0.7	1.2	6.7	0.5	0.3	1.0	10.4	0.6	4.70	700	3,500	80	180
	6	7	3.3	0.7	1.2	7.2	0.5	0.3	1.0	10.9	0.6	3.11	600	3,500	110	210
	10	7	4.2	0.7	1.2	8.2	0.5	0.3	1.0	11.9	0.7	1.84	480	3,500	150	270
	16	7	5.3	0.7	1.3	9.4	0.6	0.3	1.0	13.1	0.7	1.16	390	3,500	220	360
	25	7	6.6	0.9	1.3	11.2	0.6	0.3	1.0	14.9	0.7	0.734	400	3,500	330	490
	35	7	7.9	0.9	1.4	12.6	0.7	0.3	1.0	16.3	0.8	0.529	350	3,500	440	620
	50	19	9.1	1.0	1.4	14.1	0.7	0.3	1.0	17.8	0.8	0.391	330	3,500	580	770
	70	19	11.0	1.1	1.5	16.3	0.8	0.3	1.0	20.0	0.9	0.270	300	3,500	810	1,030
	95	19	12.9	1.1	1.6	18.4	0.9	0.3	1.1	22.3	1.0	0.195	260	3,500	1,080	1,340
	120	37	14.5	1.2	1.7	20.4	0.9	0.3	1.1	24.3	1.0	0.154	250	3,500	1,350	1,630
	150	37	16.2	1.4	1.8	22.6	1.0	0.3	1.2	26.7	1.1	0.126	270	3,500	1,650	1,980
	185	37	18.0	1.6	1.8	24.8	1.0	0.3	1.3	29.1	1.2	0.100	270	3,500	2,050	2,410
	240	61	20.6	1.7	2.0	28.1	1.1	0.3	1.3	32.4	1.3	0.0762	250	3,500	2,660	3,070
	300	61	23.1	1.8	2.1	30.9	1.2	0.4	1.4	35.9	1.4	0.0607	240	3,500	3,300	3,850

0.6/1kV DEY, 0.6/1kV DEYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	DEY		Dia. of wire for armor	Thickness of outer sheath	DEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				DEY	DEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.5	7	1.7	0.7	1.3	9.1	0.6	0.3	1.0	12.8	0.7	12.2	1,010	3,500	100	230
	2.5	7	2.2	0.7	1.3	9.9	0.6	0.3	1.0	13.6	0.7	7.56	850	3,500	130	260
	4	7	2.7	0.7	1.3	11.1	0.6	0.3	1.0	14.8	0.7	4.70	700	3,500	170	320
	6	7	3.3	0.7	1.4	12.3	0.7	0.3	1.0	16.0	0.8	3.11	600	3,500	230	390
	10	7	4.2	0.7	1.5	14.5	0.7	0.3	1.0	18.2	0.8	1.84	480	3,500	340	530
	16	7	5.3	0.7	1.5	16.5	0.8	0.3	1.1	20.4	0.9	1.16	390	3,500	480	700
	25	7	6.6	0.9	1.7	20.5	0.9	0.3	1.2	24.6	1.0	0.734	400	3,500	750	1,030
	35	7	7.9	0.9	1.8	23.1	1.0	0.3	1.2	27.2	1.1	0.529	350	3,500	990	1,300
	50	19	9.1	1.0	1.9	26.3	1.1	0.3	1.3	30.6	1.2	0.391	330	3,500	1,300	1,660
	70	19	11.0	1.1	2.1	30.7	1.2	0.4	1.4	35.7	1.4	0.270	300	3,500	1,820	2,330
	95	19	12.9	1.1	2.2	34.7	1.3	0.4	1.5	39.9	1.5	0.195	260	3,500	2,420	3,020
	120	37	14.5	1.2	2.3	38.5	1.5	0.4	1.6	43.9	1.6	0.154	250	3,500	3,010	3,680
	150	37	16.2	1.4	2.5	42.9	1.6	0.4	1.7	48.5	1.8	0.126	270	3,500	3,710	4,480
	185	37	18.0	1.6	2.7	47.7	1.7	0.4	1.8	53.5	1.9	0.100	270	3,500	4,610	5,490

Flame retardant

LV Power & Lighting Cable

0.6/1kV TEY(=DEYE), 0.6/1kV TEYCY(=DEYCYE)

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	TEY, DEYE		Dia. of wire for armor	Thickness of outer sheath	TEYCY, DEYCYE		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				TEY DEYE	TEYCY DEYCYE
No.	mm^2	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
3	1.5	7	1.7	0.7	1.3	9.6	0.6	0.3	1.0	13.3	0.7	12.2	1,010	3,500	130	260
	2.5	7	2.2	0.7	1.3	10.4	0.6	0.3	1.0	14.1	0.7	7.56	850	3,500	160	300
	4	7	2.7	0.7	1.4	11.9	0.7	0.3	1.0	15.6	0.8	4.70	700	3,500	230	390
	6	7	3.3	0.7	1.4	13.0	0.7	0.3	1.0	16.7	0.8	3.11	600	3,500	300	470
	10	7	4.2	0.7	1.5	15.4	0.8	0.3	1.0	19.1	0.9	1.84	480	3,500	450	650
	16	7	5.3	0.7	1.6	17.7	0.8	0.3	1.1	21.6	0.9	1.16	390	3,500	660	890
	25	7	6.6	0.9	1.7	21.8	1.0	0.3	1.2	25.9	1.1	0.734	400	3,500	1,020	1,320
	35	7	7.9	0.9	1.8	24.6	1.0	0.3	1.3	28.9	1.2	0.529	350	3,500	1,360	1,700
	50	19	9.1	1.0	2.0	28.2	1.1	0.3	1.3	32.5	1.3	0.391	330	3,500	1,800	2,190
	70	19	11.0	1.1	2.1	32.7	1.3	0.4	1.5	37.9	1.4	0.270	300	3,500	2,510	3,080
	95	19	12.9	1.1	2.3	37.2	1.4	0.4	1.6	42.6	1.6	0.195	260	3,500	3,390	4,040
	120	37	14.5	1.2	2.5	41.5	1.5	0.4	1.7	47.1	1.7	0.154	250	3,500	4,230	4,980
	150	37	16.2	1.4	2.6	46.0	1.7	0.4	1.8	51.8	1.9	0.126	270	3,500	5,190	6,040
	185	37	18.0	1.6	2.8	51.2	1.8	0.4	1.9	57.2	2.0	0.100	270	3,500	6,470	7,430

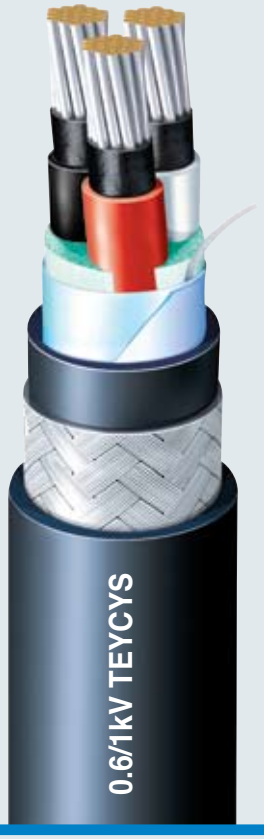
0.6/1kV FEY, 0.6/1kV FEYCY / 0.6/1kV 5EY, 0.6/1kV 5EYCY / 0.6/1kV 6EY, 0.6/1kV 6EYCY / 0.6/1kV 10EY, 0.6/1kV 10EYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	F(5, 6, 10)EY		Dia. of wire for armor	Thickness of outer sheath	F(5, 6, 10)EYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				FEY 5EY 6(10)EY	FEYCY 5EYCY 6(10) EYCY
No.	mm^2	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
4	1.5	7	1.7	0.7	1.3	10.4	0.6	0.3	1.0	14.1	0.7	12.2	1,010	3,500	160	290
	2.5	7	2.2	0.7	1.3	11.3	0.6	0.3	1.0	15.0	0.8	7.56	850	3,500	200	350
	4	7	2.7	0.7	1.4	13.0	0.7	0.3	1.0	16.7	0.8	4.70	700	3,500	290	460
5	1.5	7	1.7	0.7	1.3	11.3	0.6	0.3	1.0	15.0	0.8	12.2	1,010	3,500	190	330
	2.5	7	2.2	0.7	1.4	12.6	0.7	0.3	1.0	16.3	0.8	7.56	850	3,500	250	410
	4	7	2.7	0.7	1.4	14.2	0.7	0.3	1.0	17.9	0.8	4.70	700	3,500	350	530
6	1.5	7	1.7	0.7	1.4	12.4	0.7	0.3	1.0	16.1	0.8	12.2	1,010	3,500	220	380
	2.5	7	2.2	0.7	1.4	13.6	0.7	0.3	1.0	17.3	0.8	7.56	850	3,500	290	470
	4	7	2.7	0.7	1.5	15.6	0.8	0.3	1.0	19.3	0.9	4.70	700	3,500	410	610
10	1.5	7	1.7	0.7	1.5	15.7	0.8	0.3	1.0	19.4	0.9	12.2	1,010	3,500	350	550
	2.5	7	2.2	0.7	1.6	17.5	0.8	0.3	1.1	21.4	0.9	7.56	850	3,500	470	700
	4	7	2.7	0.7	1.7	20.1	0.9	0.3	1.1	24.0	1.0	4.70	700	3,500	670	940

Flame retardant

LV Power & Lighting Cable With common shield

FINE-Route®
IEC 60092-350, 353, 376



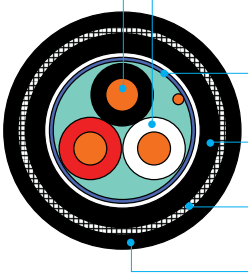
Cable Designation

0.6/1kV SEYS, DEYS, TEYS, FEYS
0.6/1kV SEYCBYS, DEYCYS, TEYCYS, FEYCYS

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction



Classification	Code	Construction detail
Conductor	S(D,T,F)	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
Insulation	E	- HEPR as per IEC 60092-351
Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
Common shield	S	- 1C : Tinned copper wire braid 2C and more : AL/PS Tape + Drain wire (1.0mm²) - A suitable tape may be applied on the common shield
Sheath	Y	- Paint resistant PVC as per IEC 60092-359
Armor (option)	C (CB)	- 1C : Braid of copper alloy wires (-CB type) 2C and more : Braid of galvanized steel wires (-C type) - Minimum Coverage density is 90%
Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
Core identification		

No. of cores	Without Earth core	With Earth core
1C	Black	-
2C	Black, White	-
3C / 2C+E	Black, White, Red	Black, White, G/Y
4C / 3C+E	Black, White, Red, Green	Black, White, Red, G/Y

Note. 1. For single core cable, the armor should be used of copper alloy wire as non-magnetic material in order to avoid current loops according to clause 3.26 of IEC 60092-352.

Flame retardant

LV Power & Lighting Cable With common shield

0.6/1kV SEYS, 0.6/1kV SEYCBYS

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	SEYS		Dia. of wire for armor	Thickness of outer sheath	SEYCBYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				SEYS	SEYCBYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1	1.5	7	1.7	0.7	1.2	6.7	0.5	0.3	1.0	10.4	0.6	12.2	1,010	3,500	80	180
	2.5	7	2.2	0.7	1.2	7.1	0.5	0.3	1.0	10.8	0.6	7.56	850	3,500	90	200
	4	7	2.7	0.7	1.2	7.7	0.5	0.3	1.0	11.4	0.6	4.70	700	3,500	110	230
	6	7	3.3	0.7	1.2	8.2	0.5	0.3	1.0	11.9	0.7	3.11	600	3,500	140	260
	10	7	4.2	0.7	1.3	9.4	0.6	0.3	1.0	13.1	0.7	1.84	480	3,500	200	330
	16	7	5.3	0.7	1.3	10.4	0.6	0.3	1.0	14.1	0.7	1.16	390	3,500	270	410
	25	7	6.6	0.9	1.4	12.4	0.7	0.3	1.0	16.1	0.8	0.734	400	3,500	390	570
	35	7	7.9	0.9	1.4	13.6	0.7	0.3	1.0	17.3	0.8	0.529	350	3,500	510	690
	50	19	9.1	1.0	1.5	15.3	0.8	0.3	1.0	19.0	0.9	0.391	330	3,500	650	860
	70	19	11.0	1.1	1.6	17.5	0.8	0.3	1.1	21.4	0.9	0.270	300	3,500	900	1,140
	95	19	12.9	1.1	1.6	19.4	0.9	0.3	1.1	23.3	1.0	0.195	260	3,500	1,180	1,450
	120	37	14.5	1.2	1.7	21.4	0.9	0.3	1.2	25.5	1.1	0.154	250	3,500	1,450	1,760
	150	37	16.2	1.4	1.8	23.6	1.0	0.3	1.2	27.7	1.1	0.126	270	3,500	1,770	2,100
	185	37	18.0	1.6	1.9	26.0	1.1	0.3	1.3	30.3	1.2	0.100	270	3,500	2,180	2,560
	240	61	20.6	1.7	2.0	29.1	1.2	0.3	1.4	33.6	1.3	0.0762	250	3,500	2,800	3,240
	300	61	23.1	1.8	2.1	31.9	1.3	0.4	1.4	36.9	1.4	0.0607	240	3,500	3,450	4,020

0.6/1kV DEYS, 0.6/1kV DEYCYS / 0.6/1kV TEYS, 0.6/1kV TEYCYS / 0.6/1kV FEYS, 0.6/1kV FEYCYS

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	D(T, F)EYS		Dia. of wire for armor	Thickness of outer sheath	D(T, F)EYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				DEYS TEYS FEYS	DEYCYS TEYCYS FEYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.5	7	1.7	0.7	1.3	9.3	0.6	0.3	1.0	13.0	0.7	12.2	1,010	3,500	120	240
	2.5	7	2.2	0.7	1.3	10.1	0.6	0.3	1.0	13.8	0.7	7.56	850	3,500	140	280
	4	7	2.7	0.7	1.3	11.3	0.6	0.3	1.0	15.0	0.8	4.70	700	3,500	190	340
	6	7	3.3	0.7	1.4	12.5	0.7	0.3	1.0	16.2	0.8	3.11	600	3,500	240	410
3	1.5	7	1.7	0.7	1.3	9.8	0.6	0.3	1.0	13.5	0.7	12.2	1,010	3,500	140	270
	2.5	7	2.2	0.7	1.3	10.6	0.6	0.3	1.0	14.3	0.7	7.56	850	3,500	180	320
	4	7	2.7	0.7	1.4	12.1	0.7	0.3	1.0	15.8	0.8	4.70	700	3,500	240	400
	6	7	3.3	0.7	1.4	13.2	0.7	0.3	1.0	16.9	0.8	3.11	600	3,500	310	490
4	1.5	7	1.7	0.7	1.3	10.6	0.6	0.3	1.0	14.3	0.7	12.2	1,010	3,500	170	310
	2.5	7	2.2	0.7	1.3	11.5	0.6	0.3	1.0	15.2	0.8	7.56	850	3,500	220	370
	4	7	2.7	0.7	1.4	13.2	0.7	0.3	1.0	16.9	0.8	4.70	700	3,500	300	470
	6	7	3.3	0.7	1.5	14.6	0.7	0.3	1.0	18.3	0.8	3.11	600	3,500	400	590

Fire resistance

LV Power & Lighting Cable

FINE-Route®
IEC 60092-350, 353, 376



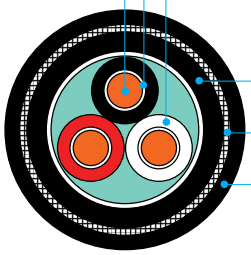
Cable Designation

0.6/1kV FR-DEY, 0.6/1kV FR-TEY, 0.6/1kV FR-5EY
0.6/1kV FR-DEYCY, 0.6/1kV FR-TEYCY, 0.6/1kV FR-5EYCY

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor	**D, T, 5**	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	**FR-**	- Mica/glass tape
	Insulation	**E**	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		

No. of cores	Without Earth core	With Earth core
1C	Black	-
2C	Black, White	
3C / 2C+E	Black, White, Red	Black, White, G/Y
4C / 3C+E	Black, White, Red, Green	Black, White, Red, G/Y
5C / 4C+E	Black No. on white insulation	Black, White, Red, Green, G/Y

Fire resistance

LV Power & Lighting Cable

0.6/1kV FR-DEY, 0.6/1kV FR-DEYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-DEY		Dia. of wire for armor	Thickness of outer sheath	FR-DEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				FR-DEY	FR-DEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.5	7	1.7	0.7	1.3	10.3	0.6	0.3	1.0	14.0	0.7	12.2	1,010	3,500	120	260
	2.5	7	2.2	0.7	1.3	11.1	0.6	0.3	1.0	14.8	0.7	7.56	850	3,500	150	300
	4	7	2.7	0.7	1.4	12.5	0.7	0.3	1.0	16.2	0.8	4.70	700	3,500	200	370
	6	7	3.3	0.7	1.4	13.5	0.7	0.3	1.0	17.2	0.8	3.11	600	3,500	250	430
	10	7	4.2	0.7	1.5	15.7	0.8	0.3	1.0	19.4	0.9	1.84	480	3,500	370	570
	16	7	5.3	0.7	1.6	17.9	0.8	0.3	1.1	21.8	1.0	1.16	390	3,500	520	760
	25	7	6.6	0.9	1.7	21.5	0.9	0.3	1.2	25.6	1.1	0.734	400	3,500	780	1,070
	35	7	7.9	0.9	1.8	24.1	1.0	0.3	1.2	28.2	1.1	0.529	350	3,500	1,020	1,350
	50	19	9.1	1.0	1.9	27.3	1.1	0.3	1.3	31.6	1.2	0.391	330	3,500	1,330	1,710
	70	19	11.0	1.1	2.1	31.7	1.3	0.4	1.4	36.7	1.4	0.270	300	3,500	1,860	2,390
	95	19	12.9	1.1	2.2	35.7	1.4	0.4	1.5	40.9	1.5	0.195	260	3,500	2,470	3,080
	120	37	14.5	1.2	2.4	39.7	1.5	0.4	1.6	45.1	1.7	0.154	250	3,500	3,070	3,770
	150	37	16.2	1.4	2.5	43.9	1.6	0.4	1.7	49.5	1.8	0.126	270	3,500	3,760	4,550
	185	37	18.0	1.6	2.7	48.7	1.8	0.4	1.9	54.7	1.9	0.100	270	3,500	4,670	5,590

0.6/1kV FR-TEY, 0.6/1kV FR-TEYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-TEY		Dia. of wire for armor	Thickness of outer sheath	FR-TEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				FR-TEY	FR-TEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
3	1.5	7	1.7	0.7	1.3	10.9	0.6	0.3	1.0	14.6	0.7	12.2	1,010	3,500	150	300
	2.5	7	2.2	0.7	1.4	11.9	0.7	0.3	1.0	15.6	0.8	7.56	850	3,500	190	350
	4	7	2.7	0.7	1.4	13.2	0.7	0.3	1.0	16.9	0.8	4.70	700	3,500	260	430
	6	7	3.3	0.7	1.5	14.5	0.7	0.3	1.0	18.2	0.8	3.11	600	3,500	340	520
	10	7	4.2	0.7	1.5	16.7	0.8	0.3	1.1	20.6	0.9	1.84	480	3,500	490	710
	16	7	5.3	0.7	1.6	19.0	0.9	0.3	1.1	22.9	1.0	1.16	390	3,500	700	950
	25	7	6.6	0.9	1.8	23.1	1.0	0.3	1.2	27.2	1.1	0.734	400	3,500	1,060	1,380
	35	7	7.9	0.9	1.9	25.9	1.1	0.3	1.3	30.2	1.2	0.529	350	3,500	1,410	1,770
	50	19	9.1	1.0	2.0	29.3	1.2	0.3	1.4	33.8	1.3	0.391	330	3,500	1,840	2,260
	70	19	11.0	1.1	2.2	34.0	1.3	0.4	1.5	39.2	1.5	0.270	300	3,500	2,580	3,160
	95	19	12.9	1.1	2.3	38.3	1.4	0.4	1.6	43.7	1.6	0.195	260	3,500	3,440	4,120
	120	37	14.5	1.2	2.5	42.6	1.6	0.4	1.7	48.2	1.7	0.154	250	3,500	4,290	5,060
	150	37	16.2	1.4	2.7	47.3	1.7	0.4	1.8	53.1	1.9	0.126	270	3,500	5,280	6,140
	185	37	18.0	1.6	2.9	52.4	1.9	0.4	2.0	58.6	2.1	0.100	270	3,500	6,560	7,570

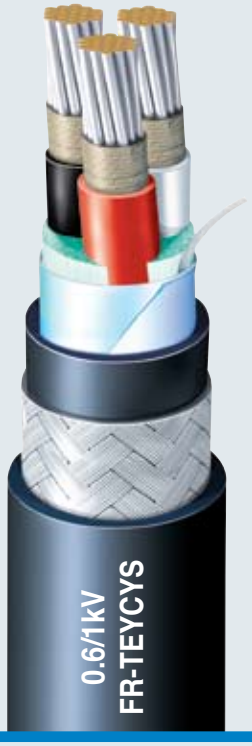
0.6/1kV FR-5EY, 0.6/1kV FR-5EYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-5EY		Dia. of wire for armor	Thickness of outer sheath	FR-5EYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				FR-5EY	FR-5EYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
5	1.5	7	1.7	0.7	1.4	13.1	0.7	0.3	1.0	16.8	0.8	12.2	1,010	3,500	230	400
	2.5	7	2.2	0.7	1.4	14.2	0.7	0.3	1.0	17.9	0.8	7.56	850	3,500	290	470
	4	7	2.7	0.7	1.5	16.0	0.8	0.3	1.0	19.7	0.9	4.70	700	3,500	400	600

Fire resistance

LV Power & Lighting Cable With common shield

FINE-Route®
IEC 60092-350, 353, 376



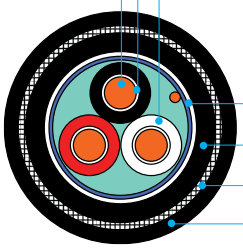
Cable Designation

0.6/1kV FR-DEYS, 0.6/1kV FR-TEYS
0.6/1kV FR-DEYCYS, 0.6/1kV FR-TEYCYS

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor	D,T	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	FR-	- Mica/glass tape
	Insulation	E	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Common shield	S	- AL/PS Tape + Drain wire (1.0mm²) - A suitable tape may be applied on the common shield
	Sheath	Y	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	C	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
	Core identification		

No. of cores	Without Earth core	With Earth core
2C	Black, White	
3C / 2C+E	Black, White, Red	Black, White, G/Y

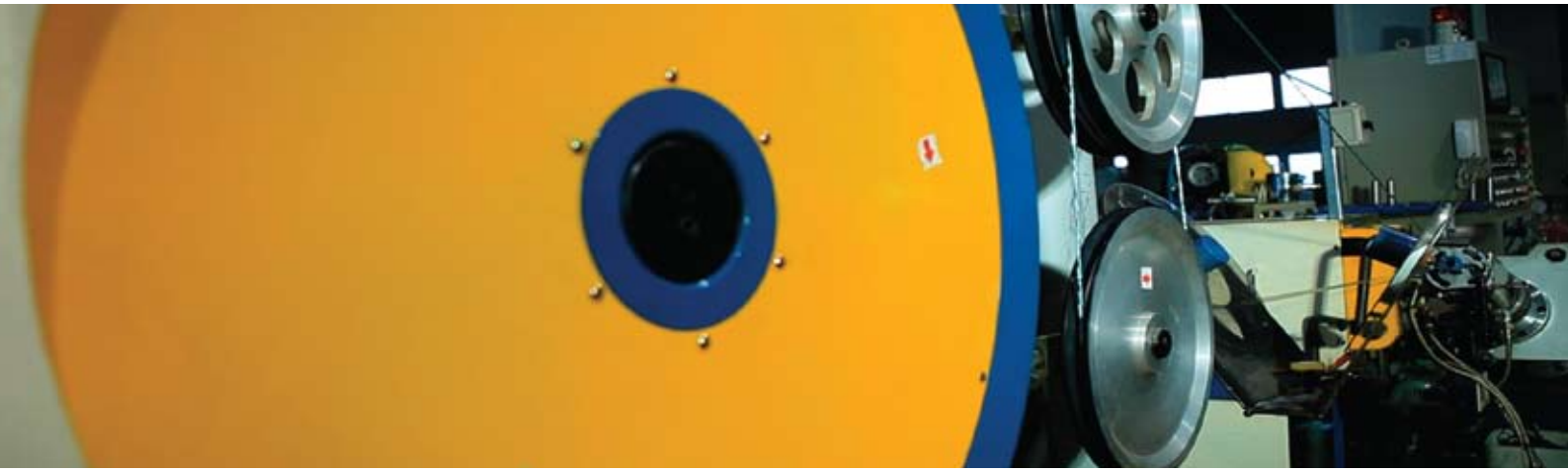
0.6/1kV FR-DEYS, 0.6/1kV FR-DEYCYS, 0.6/1kV FR-TEYS, 0.6/1kV FR-TEYCYS

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-D(T)EYS		Dia. of wire for armor	Thickness of outer sheath	FR-D(T)EYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-D(T)EYS	FR-D(T)EYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.5	7	1.7	0.7	1.3	10.5	0.6	0.3	1.0	14.2	0.7	12.2	1,010	3,500	140	280
	2.5	7	2.2	0.7	1.3	11.3	0.6	0.3	1.0	15.0	0.8	7.56	850	3,500	160	310
	4	7	2.7	0.7	1.4	12.7	0.7	0.3	1.0	16.4	0.8	4.70	700	3,500	220	380
	6	7	3.3	0.7	1.4	13.7	0.7	0.3	1.0	17.4	0.8	3.11	600	3,500	270	450
3	1.5	7	1.7	0.7	1.3	11.1	0.6	0.3	1.0	14.8	0.7	12.2	1,010	3,500	160	310
	2.5	7	2.2	0.7	1.4	12.1	0.7	0.3	1.0	15.8	0.8	7.56	850	3,500	210	370
	4	7	2.7	0.7	1.4	13.4	0.7	0.3	1.0	17.1	0.8	4.70	700	3,500	270	450
	6	7	3.3	0.7	1.5	14.7	0.7	0.3	1.0	18.4	0.9	3.11	600	3,500	350	540





Control & Instrumentation Cable



Flame Retardant

250V MEY, 250V MEYCY 250V MEYS, 250V MEYCYS	**15 ~ 16**
250V TTEY, 250V TTEYCY 250V TTEYS, 250V TTEYCYS	**17 ~ 18**
250V TTEY-S, 250V TTEYCY-S	**19**



Fire Resistance

250V FR-MEY, 250V FR-MEYCY 250V FR-MEYS, 250V FR-MEYCYS	**20 ~ 21**
250V FR-TTEY, 250V FR-TTEYCY 250V FR-TTEYS, 250V FR-TTEYCYS	**22 ~ 23**
250V FR-TTEY-S, 250V FR-TTEYCY-S	**24**

Flame retardant

Control & Instrumentation Cable

FINE-Route®
IEC 60092-350, 353, 376



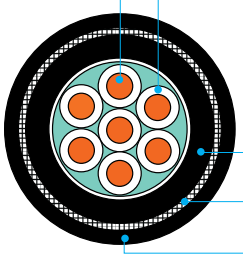
Cable Designation

250V MEY, 250V MEYCY

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

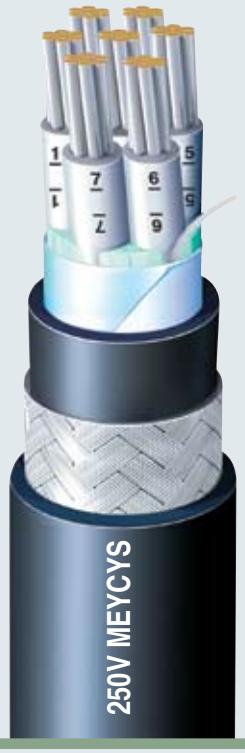
Sectional view	Classification	Code	Construction detail
	Conductor	M	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	E	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	Y	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	C	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black number on white insulation

250V MEY, 250V MEYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	MEY		Dia. of wire for armor	Thickness of outer sheath	MEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				MEY	MEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.0	7	1.4	0.5	1.2	7.5	0.5	0.3	1.0	11.2	0.6	19.3	920	1,500	70	180
4	1.0	7	1.4	0.5	1.2	8.5	0.6	0.3	1.0	12.2	0.7	19.3	920	1,500	110	220
7	1.0	7	1.4	0.5	1.3	10.1	0.6	0.3	1.0	13.8	0.7	19.3	920	1,500	160	300
12	1.0	7	1.4	0.5	1.4	13.1	0.7	0.3	1.0	16.8	0.8	19.3	920	1,500	260	430
19	1.0	7	1.4	0.5	1.5	15.3	0.8	0.3	1.0	19.0	0.9	19.3	920	1,500	380	580
27	1.0	7	1.4	0.5	1.6	18.3	0.8	0.3	1.1	22.2	1.0	19.3	920	1,500	530	770
37	1.0	7	1.4	0.5	1.7	20.5	0.9	0.3	1.2	24.6	1.0	19.3	920	1,500	700	980
44	1.0	7	1.4	0.5	1.8	23.1	1.0	0.3	1.2	27.2	1.1	19.3	920	1,500	840	1,150

Flame retardant

Control & Instrumentation Cable With Individual shield



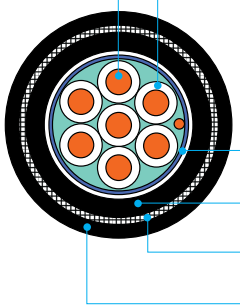
Cable Designation

250V MEYS, 250V MEYCYS

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor	M	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	E	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Common shield	S	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Sheath	Y	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	C	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black number on white insulation

250V MEYS, 250V MEYCYS

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	MEYS		Dia. of wire for armor	Thickness of outer sheath	MEYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				MEYS	MEYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.0	7	1.4	0.5	1.2	7.7	0.5	0.3	1.0	11.4	0.6	19.3	920	1,500	80	190
4	1.0	7	1.4	0.5	1.2	8.7	0.6	0.3	1.0	12.4	0.7	19.3	920	1,500	120	240
7	1.0	7	1.4	0.5	1.3	10.3	0.6	0.3	1.0	14.0	0.7	19.3	920	1,500	170	310
12	1.0	7	1.4	0.5	1.4	13.3	0.7	0.3	1.0	17.0	0.8	19.3	920	1,500	280	450
19	1.0	7	1.4	0.5	1.5	15.5	0.8	0.3	1.0	19.2	0.9	19.3	920	1,500	400	600
27	1.0	7	1.4	0.5	1.6	18.5	0.9	0.3	1.1	22.4	1.0	19.3	920	1,500	550	790
37	1.0	7	1.4	0.5	1.7	20.7	0.9	0.3	1.2	24.8	1.0	19.3	920	1,500	720	1,000
44	1.0	7	1.4	0.5	1.8	23.3	1.0	0.3	1.2	27.4	1.1	19.3	920	1,500	870	1,180
77	1.0	7	1.4	0.5	2.0	28.8	1.2	0.3	1.4	33.3	1.3	19.3	920	1,500	1,410	1,820

Flame retardant

Control & Instrumentation Cable

FINE-Route®
IEC 60092-350, 353, 376



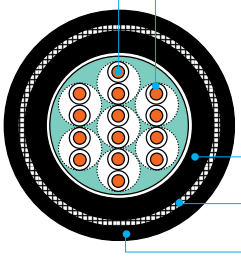
Cable Designation

250V TTEY, 250V TTEYCY

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

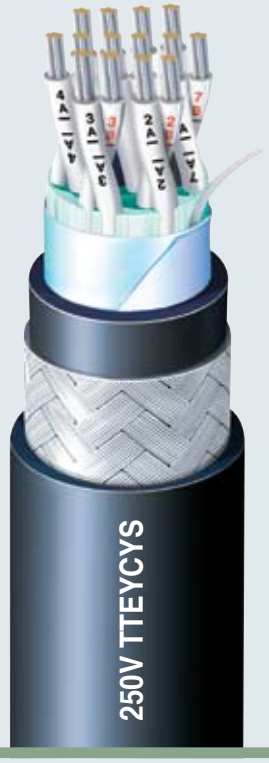
Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	**E**	- HEPR as per IEC 60092-351
	Twisting	**TT**	- Two Insulated cores shall be twisted together to form a pair
	Cabling		- Twisted pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Pairs : Black & Red number on white insulation ex)(1A, 1B),(2A, 2B) - 1T, 1Q : Black number on white insulation

250V TTEY, 250V TTEYCY

No. of Units	Conductor			Thickness of Insulation	Thickness of inner sheath	TTEY		Dia. of wire for armor	Thickness of outer sheath	TTEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				TTEY	TTEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1P	0.75	7	1.2	0.5	1.2	7.1	0.5	0.3	1.0	10.8	0.6	26.3	1,030	1,500	60	160
1T	0.75	7	1.2	0.5	1.2	7.4	0.5	0.3	1.0	11.1	0.6	26.3	1,030	1,500	80	180
1Q	0.75	7	1.2	0.5	1.2	8.0	0.5	0.3	1.0	11.7	0.7	26.3	1,030	1,500	90	200
2P	0.75	7	1.2	0.5	1.3	10.4	0.6	0.3	1.0	14.1	0.7	26.3	1,030	1,500	120	260
4P	0.75	7	1.2	0.5	1.4	11.9	0.7	0.3	1.0	15.6	0.8	26.3	1,030	1,500	180	330
7P	0.75	7	1.2	0.5	1.4	14.1	0.7	0.3	1.0	17.8	0.8	26.3	1,030	1,500	260	440
10P	0.75	7	1.2	0.5	1.5	16.9	0.8	0.3	1.1	20.8	0.9	26.3	1,030	1,500	370	590
14P	0.75	7	1.2	0.5	1.6	18.5	0.9	0.3	1.1	22.4	1.0	26.3	1,030	1,500	470	720
19P	0.75	7	1.2	0.5	1.7	20.0	0.9	0.3	1.1	23.9	1.0	26.3	1,030	1,500	600	860
24P	0.75	7	1.2	0.5	1.8	24.4	1.0	0.3	1.2	28.5	1.2	26.3	1,030	1,500	790	1,120

Flame retardant

Control & Instrumentation Cable With Individual shield



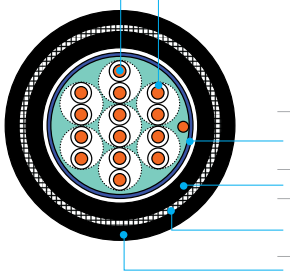
Cable Designation

250V TTEYS, 250V TTEYCYS

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	**E**	- HEPR as per IEC 60092-351
	Twisting	**TT**	- Two Insulated cores shall be twisted together to form a pair
	Cabling		- Twisted pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Common shield	**S**	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Pairs : Black & Red number on white insulation ex)(1A, 1B),(2A, 2B) - 1T, 1Q : Black number on white insulation

250V TTEYS, 250V TTEYCYS

No. of Units	Conductor			Thickness of Insulation	Thickness of inner sheath	TTEYS		Dia. of wire for armor	Thickness of outer sheath	TTEYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Tolerance			Nominal	Tolerance				TTEYS	TTEYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1P	0.75	7	1.2	0.5	1.2	7.3	0.5	0.3	1.0	11.0	0.6	26.3	1,030	1,500	70	170
1T	0.75	7	1.2	0.5	1.2	7.6	0.5	0.3	1.0	11.3	0.6	26.3	1,030	1,500	80	190
1Q	0.75	7	1.2	0.5	1.2	8.2	0.5	0.3	1.0	11.9	0.7	26.3	1,030	1,500	100	210
2P	0.75	7	1.2	0.5	1.3	10.6	0.6	0.3	1.0	14.3	0.7	26.3	1,030	1,500	130	270
4P	0.75	7	1.2	0.5	1.4	12.1	0.7	0.3	1.0	15.8	0.8	26.3	1,030	1,500	190	350
7P	0.75	7	1.2	0.5	1.5	14.5	0.7	0.3	1.0	18.2	0.8	26.3	1,030	1,500	280	470
10P	0.75	7	1.2	0.5	1.6	17.3	0.8	0.3	1.1	21.2	0.9	26.3	1,030	1,500	390	620
14P	0.75	7	1.2	0.5	1.6	18.7	0.9	0.3	1.1	22.6	1.0	26.3	1,030	1,500	490	740
19P	0.75	7	1.2	0.5	1.7	20.2	0.9	0.3	1.1	24.1	1.0	26.3	1,030	1,500	620	880
24P	0.75	7	1.2	0.5	1.8	24.6	1.0	0.3	1.3	28.9	1.2	26.3	1,030	1,500	810	1,160

Flame retardant

Control & Instrumentation Cable With Individual shield

FINE-Route®
IEC 60092-350, 353, 376



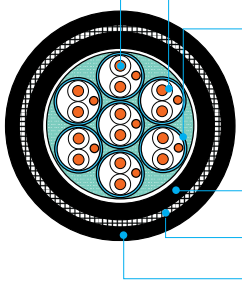
Cable Designation

250V TTEY-S, 250V TTEYCY-S

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Insulation	**E**	- HEPR as per IEC 60092-351
	Twisting	**TT**	- Two Insulated cores shall be twisted together to form a pair
	Individual shield	**-S**	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Cabling		- Individual shielded pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black & Red number on white insulation ex)(1A, 1B),(2A, 2B)

250V TTEY-S, 250V TTEYCY-S

No. of Pairs	Conductor			Thickness of Insulation	Thickness of inner sheath	TTEY-S		Dia. of wire for armor	Thickness of outer sheath	TTEYCY-S		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				TTEY-S	TTEYCY-S
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2P	0.75	7	1.2	0.5	1.3	10.9	0.6	0.3	1.0	14.6	0.7	26.3	1,030	1,500	140	290
4P	0.75	7	1.2	0.5	1.4	13.0	0.7	0.3	1.0	16.7	0.8	26.3	1,030	1,500	220	390
7P	0.75	7	1.2	0.5	1.5	15.1	0.8	0.3	1.0	18.8	0.9	26.3	1,030	1,500	340	530
10P	0.75	7	1.2	0.5	1.6	18.8	0.9	0.3	1.1	22.7	1.0	26.3	1,030	1,500	480	730
14P	0.75	7	1.2	0.5	1.7	20.6	0.9	0.3	1.2	24.7	1.0	26.3	1,030	1,500	630	910
19P	0.75	7	1.2	0.5	1.8	22.7	1.0	0.3	1.2	26.8	1.1	26.3	1,030	1,500	810	1,120
24P	0.75	7	1.2	0.5	1.9	26.4	1.1	0.3	1.3	30.7	1.2	26.3	1,030	1,500	1,040	1,400

Fire resistance

Control & Instrumentation Cable



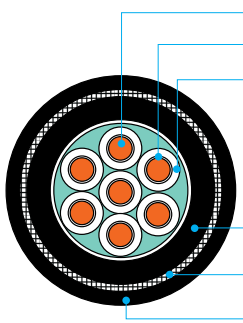
Cable Designation

250V FR-MEY, 250V FR-MEYCY

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor	**M**	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	**FR-**	- Mica/glass tape
	Insulation	**E**	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black number on white insulation

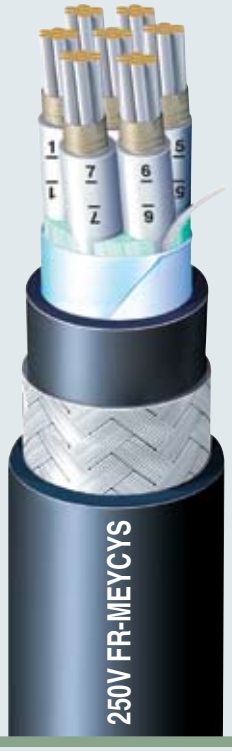
250V FR-MEY, 250V FR-MEYCY

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-MEY		Dia. of wire for armor	Thickness of outer sheath	FR-MEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-MEY	FR-MEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.0	7	1.4	0.5	1.2	8.5	0.6	0.3	1.0	12.2	0.7	19.3	920	1,500	90	200
4	1.0	7	1.4	0.5	1.3	9.9	0.6	0.3	1.0	13.6	0.7	19.3	920	1,500	130	260
7	1.0	7	1.4	0.5	1.4	11.8	0.7	0.3	1.0	15.5	0.8	19.3	920	1,500	190	350
12	1.0	7	1.4	0.5	1.5	15.3	0.8	0.3	1.0	19.0	0.9	19.3	920	1,500	310	510
19	1.0	7	1.4	0.5	1.6	18.0	0.8	0.3	1.1	21.9	1.0	19.3	920	1,500	460	690
27	1.0	7	1.4	0.5	1.7	21.5	0.9	0.3	1.2	25.6	1.1	19.3	920	1,500	640	930
37	1.0	7	1.4	0.5	1.8	24.2	1.0	0.3	1.2	28.3	1.1	19.3	920	1,500	830	1,160
44	1.0	7	1.4	0.5	1.9	27.3	1.1	0.3	1.3	31.6	1.2	19.3	920	1,500	1,010	1,390

Fire resistance

Control & Instrumentation Cable With common shield

FINE-Route®
IEC 60092-350, 353, 376



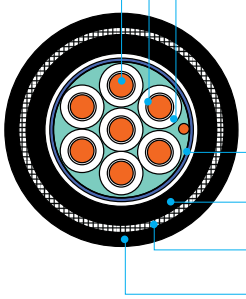
Cable Designation

250V FR-MEYS, 250V FR-MEYCYS

Application Standard

- Design guide : IEC 60092-350, -353
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor	**M**	- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	**FR-**	- Mica/glass tape
	Insulation	**E**	- HEPR as per IEC 60092-351
	Cabling		- Insulated conductors shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Common shield	**S**	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black number on white insulation

250V FR-MEYS, 250V FR-MEYCYS

No. of Cores	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-MEYS		Dia. of wire for armor	Thickness of outer sheath	FR-MEYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-MEYS	FR-MEYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2	1.0	7	1.4	0.5	1.2	8.7	0.6	0.3	1.0	12.4	0.7	19.3	920	1,500	100	220
4	1.0	7	1.4	0.5	1.3	10.1	0.6	0.3	1.0	13.8	0.7	19.3	920	1,500	140	280
7	1.0	7	1.4	0.5	1.4	12.0	0.7	0.3	1.0	15.7	0.8	19.3	920	1,500	210	360
12	1.0	7	1.4	0.5	1.5	15.5	0.8	0.3	1.0	19.2	0.9	19.3	920	1,500	330	530
19	1.0	7	1.4	0.5	1.6	18.2	0.8	0.3	1.1	22.1	1.0	19.3	920	1,500	470	710
27	1.0	7	1.4	0.5	1.7	21.7	1.0	0.3	1.2	25.8	1.1	19.3	920	1,500	660	950
37	1.0	7	1.4	0.5	1.8	24.4	1.0	0.3	1.2	28.5	1.2	19.3	920	1,500	860	1,180
44	1.0	7	1.4	0.5	1.9	27.5	1.1	0.3	1.3	31.8	1.3	19.3	920	1,500	1,040	1,420

Fire resistance

Control & Instrumentation Cable



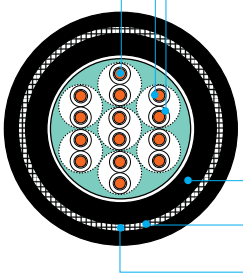
Cable Designation

250V FR-TTEY, 250V FR-TTEYCY

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	FR-	- Mica/glass tape
	Insulation	E	- HEPR as per IEC 60092-351
	Twisting	TT	- Two Insulated cores shall be twisted together to form a pair
	Cabling		- Twisted pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	Y	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	C	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Pairs : Black & Red number on white insulation ex)(1A, 1B),(2A, 2B) - 1T, 1Q : Black number on white insulation

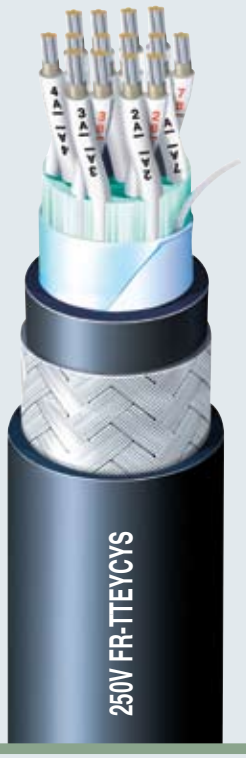
250V FR-TTEY, 250V FR-TTEYCY

No. of Units	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-TTEY		Dia. of wire for armor	Thickness of outer sheath	FR-TTEYCY		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-TTEY	FR-T TEYCY
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1P	0.75	7	1.2	0.5	1.2	8.1	0.5	0.3	1.0	11.8	0.7	26.3	1,030	1,500	80	190
1T	0.75	7	1.2	0.5	1.2	8.5	0.6	0.3	1.0	12.2	0.7	26.3	1,030	1,500	90	210
1Q	0.75	7	1.2	0.5	1.3	9.4	0.6	0.3	1.0	13.1	0.7	26.3	1,030	1,500	110	240
2P	0.75	7	1.2	0.5	1.4	12.3	0.7	0.3	1.0	16.0	0.8	26.3	1,030	1,500	150	310
4P	0.75	7	1.2	0.5	1.4	13.9	0.7	0.3	1.0	17.6	0.8	26.3	1,030	1,500	210	390
7P	0.75	7	1.2	0.5	1.5	16.8	0.8	0.3	1.1	20.7	0.9	26.3	1,030	1,500	330	550
10P	0.75	7	1.2	0.5	1.7	20.4	0.9	0.3	1.1	24.3	1.0	26.3	1,030	1,500	470	730
14P	0.75	7	1.2	0.5	1.7	22.1	1.0	0.3	1.2	26.2	1.1	26.3	1,030	1,500	590	880
19P	0.75	7	1.2	0.5	1.8	23.9	1.0	0.3	1.2	28.0	1.1	26.3	1,030	1,500	740	1,060
24P	0.75	7	1.2	0.5	2.0	29.4	1.2	0.3	1.4	33.9	1.3	26.3	1,030	1,500	1,000	1,420

Fire resistance

Control & Instrumentation Cable With common shield

FINE-Route®
IEC 60092-350, 353, 376



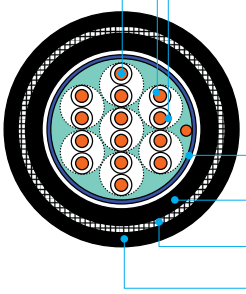
Cable Designation

250V FR-TTEYS, 250V FR-TTEYCYS

Application Standard

- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	FR-	- Mica/glass tape
	Insulation	E	- HEPR as per IEC 60092-351
	Twisting	TT	- Two Insulated cores shall be twisted together to form a pair
	Cabling		- Twisted pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Common shield	S	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Sheath	Y	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	C	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	Y	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Pairs : Black & Red number on white insulation ex)(1A, 1B),(2A, 2B) - 1T, 1Q : Black number on white insulation

250V FR-TTEYS, 250V FR-TTEYCYS

No. of Units	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-TTEYS		Dia. of wire for armor	Thickness of outer sheath	FR-TTEYCYS		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-TTEYS	FR-TTEYCYS
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
1P	0.75	7	1.2	0.5	1.2	8.3	0.5	0.3	1.0	12.0	0.7	26.3	1,030	1,500	90	200
1T	0.75	7	1.2	0.5	1.2	8.7	0.6	0.3	1.0	12.4	0.7	26.3	1,030	1,500	100	220
1Q	0.75	7	1.2	0.5	1.3	9.6	0.6	0.3	1.0	13.3	0.7	26.3	1,030	1,500	120	250
2P	0.75	7	1.2	0.5	1.4	12.5	0.7	0.3	1.0	16.2	0.8	26.3	1,030	1,500	160	330
4P	0.75	7	1.2	0.5	1.4	14.1	0.7	0.3	1.0	17.8	0.8	26.3	1,030	1,500	230	410
7P	0.75	7	1.2	0.5	1.6	17.2	0.8	0.3	1.1	21.1	0.9	26.3	1,030	1,500	350	580
10P	0.75	7	1.2	0.5	1.7	20.6	0.9	0.3	1.2	24.7	1.0	26.3	1,030	1,500	490	770
14P	0.75	7	1.2	0.5	1.7	22.3	1.0	0.3	1.2	26.4	1.1	26.3	1,030	1,500	610	910
19P	0.75	7	1.2	0.5	1.8	24.1	1.0	0.3	1.2	28.2	1.1	26.3	1,030	1,500	760	1,080
24P	0.75	7	1.2	0.5	2.0	29.6	1.2	0.3	1.4	34.1	1.3	26.3	1,030	1,500	1,020	1,440

Fire resistance

Control & Instrumentation Cable With Individual shield



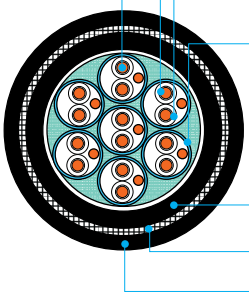
Cable Designation

250V FR-TTEY-S, 250V FR-TTEYCY-S

Application Standard

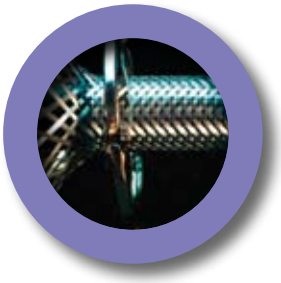
- Design guide : IEC 60092-350, -376
- Insulation material : IEC 60092-351, HEPR
- Sheath & Protective Covering material : IEC 60092-359, PVC (ST2)
- Flame retardant : IEC 60332-1
- Fire resistance : IEC 60331-21(90min)
  IEC 60331-1,-2(120min)
- Cold bend / impact : CSA 22.2 No.03 (-30℃ / -30℃)
- Paint resistant : Maker standard (Epoxy, Alkyd paint)
- Max. rated conductor temperature : 90℃

Construction

Sectional view	Classification	Code	Construction detail
	Conductor		- Stranded tinned annealed copper wires as per IEC 60228, Class 2
	Fire resisting layer	**FR-**	- Mica/glass tape
	Insulation	**E**	- HEPR as per IEC 60092-351
	Twisting	**TT**	- Two Insulated cores shall be twisted together to form a pair
	Individual shield	**-S**	- AL/PS Tape + Drain wire - A suitable tape may be applied on the common shield
	Cabling		- Individual shielded pairs shall be cabled - Flame retardant & non-hygroscopic fillers may be used - Suitable tape(s) may be applied on the cabled core - A Filler may be applied to obtain a circular Cable
	Sheath	**Y**	- Paint resistant PVC as per IEC 60092-359
	Armor (option)	**C**	- Braid of galvanized steel wires - Minimum Coverage density is 90%
	Protective Covering (option)	**Y**	- Paint resistant PVC as per IEC 60092-359
	Core identification		- Black & Red number on white insulation ex)(1A, 1B),(2A, 2B)

250V FR-TTEY-S, 250V FR-TTEYCY-S

No. of Pairs	Conductor			Thickness of Insulation	Thickness of inner sheath	FR-TTEY-S		Dia. of wire for armor	Thickness of outer sheath	FR-TTEYCY-S		Conductor Resistance (at 20°C) (Max.)	Insulation Resistance (at 20°C) (Min.)	Test Voltage	Cable Weight(Approx.)	
	Nominal Area	Min. Number of wires	Max. Dia.			Nominal Dia.	Toler-ance			Nominal	Toler-ance				FR-TTEY-S	FR-TTEYCY-S
No.	mm²	ea.	mm	mm	mm	mm	±mm	mm	mm	mm	±mm	Ω/km	MΩ - km	V/5min.	kg/km	kg/km
2P	0.75	7	1.2	0.5	1.4	12.8	0.7	0.3	1.0	16.5	0.8	26.3	1,030	1,500	170	340
4P	0.75	7	1.2	0.5	1.5	15.3	0.8	0.3	1.0	19.0	0.9	26.3	1,030	1,500	270	470
7P	0.75	7	1.2	0.5	1.6	17.8	0.8	0.3	1.1	21.7	1.0	26.3	1,030	1,500	410	650
10P	0.75	7	1.2	0.5	1.7	22.2	1.0	0.3	1.2	26.3	1.1	26.3	1,030	1,500	590	890
14P	0.75	7	1.2	0.5	1.8	24.4	1.0	0.3	1.2	28.5	1.2	26.3	1,030	1,500	770	1,090
19P	0.75	7	1.2	0.5	1.9	26.9	1.1	0.3	1.3	31.2	1.2	26.3	1,030	1,500	980	1,360
24P	0.75	7	1.2	0.5	2.1	31.6	1.2	0.4	1.4	36.6	1.4	26.3	1,030	1,500	1,280	1,810





Technical Data





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Technical Data

ELECTRICAL DATA

1. Current ratings for continuous

Nominal cross-sectional Area (mm^2)	Single core	Two core	Three core & four core
1	18	15	13
1.5	23	20	16
2.5	30	26	21
4	40	34	28
6	52	44	36
10	72	61	50
16	96	82	67
25	127	108	89
35	157	133	110
50	196	167	137
70	242	206	169
95	293	249	205
120	339	288	237
150	389	331	273
185	444	377	311
240	522	444	366
300	601	511	420

NOTES)

1. Maximum permissible service temperature of the conductor is 90℃
2. The current ratings given above are based on an ambient air temperature of 45℃
3. The current ratings given above are for 6 cables of less bunched or laid together in flat formation.
   When more than 6 cables are bunched or laid close together, the current ratings given above should be multiplied correction factor 0.85.
   In case of cables not being loaded simultaneously, consideration of the actual loading appertaining is permitted.
4. For cables with more than 4 core cables, the current ratings are given by the Formula;

$$I = \frac{I_1}{\sqrt[3]{N}}$$

Where, I_1 : Current for single core cable
N : Number of cores

No. of cores	1.0mm^2 (A)
2	14
4	11
7	9
12	8
19	7
27	6
37	5
44	5

5. Correction factors for various ambient air temperature

Maximum conductor Temperature	Correction for various ambient air temperature									
℃	35	40	45	50	55	60	65	70	75	80
90	1.10	1.05	1.00	0.94	0.88	0.82	0.74	0.67	0.58	0.47

FINE-Route®
IEC 60092-350, 353, 376

2. Capacitance, Inductance, Reactance, Impedance data

HEPR INSULATED 0.6/1kV CABLE (FLAME RETARDANT TYPE)

Nominal Area	Single core cable*)						Multi core cable					
	Capacitance C	Inductance L	Reactance X 50 Hz	Reactance X 60 Hz	Impedance Z at 50 Hz 90℃	Impedance Z at 60 Hz 90℃	Capacitance C	Inductance L	Reactance X 50 Hz	Reactance X 60 Hz	Impedance Z at 50 Hz 90℃	Impedance Z at 60 Hz 90℃
mm^2	μF/km	mH / km	Ω/km	Ω/km	Ω/km	Ω/km	μF/km	mH / km	Ω/km	Ω/km	Ω/km	Ω/km
1.5	0.263	0.540	0.170	0.203	15.557	15.558	0.343	0.322	0.101	0.121	15.557	15.557
2.5	0.317	0.501	0.158	0.189	9.641	9.642	0.391	0.300	0.094	0.113	9.640	9.640
4	0.370	0.470	0.148	0.177	5.995	5.996	0.435	0.284	0.089	0.107	5.994	5.994
6	0.455	0.439	0.138	0.165	3.968	3.969	0.500	0.266	0.084	0.100	3.966	3.967
10	0.545	0.404	0.127	0.152	2.350	2.351	0.569	0.253	0.080	0.096	2.348	2.348
16	0.687	0.377	0.119	0.142	1.484	1.486	0.676	0.240	0.075	0.091	1.481	1.482
25	0.649	0.357	0.112	0.135	0.943	0.946	0.676	0.242	0.076	0.091	0.939	0.940
35	0.730	0.342	0.108	0.129	0.683	0.687	0.715	0.236	0.074	0.089	0.679	0.680
50	0.787	0.327	0.103	0.123	0.509	0.514	0.758	0.233	0.073	0.088	0.504	0.506
70	0.856	0.314	0.099	0.118	0.358	0.364	0.834	0.229	0.072	0.086	0.352	0.355
95	0.994	0.303	0.095	0.114	0.266	0.274	0.910	0.224	0.070	0.084	0.258	0.263
120	1.032	0.296	0.093	0.112	0.217	0.226	0.944	0.222	0.070	0.084	0.208	0.213
150	0.971	0.294	0.092	0.111	0.188	0.198	0.910	0.224	0.070	0.084	0.178	0.184
185	0.983	0.289	0.091	0.109	0.160	0.171	0.927	0.224	0.070	0.084	0.149	0.156
240	1.032	0.283	0.089	0.107	0.135	0.147	-	-	-	-	-	-
300	1.097	0.280	0.088	0.106	0.120	0.134	-	-	-	-	-	-

*) Reactance for 1-conductor cables given at Three-foil formation

HEPR INSULATED 0.6/1kV CABLE (FLAME RETARDANT & FIRE RESISTANCE TYPE)

Nominal Area	Multi core cable					
	Capacitance C	Inductance L	Reactance X 50 Hz	Reactance X 60 Hz	Impedance Z at 50 Hz 90℃	Impedance Z at 60 Hz 90℃
mm^2	μF/km	mH / km	Ω/km	Ω/km	Ω/km	Ω/km
1.5	0.303	0.358	0.112	0.135	15.557	15.557
2.5	0.336	0.331	0.104	0.125	9.640	9.641
4	0.376	0.311	0.098	0.117	5.994	5.994
6	0.424	0.291	0.091	0.110	3.967	3.967
10	0.477	0.274	0.086	0.103	2.348	2.348
16	0.569	0.258	0.081	0.097	1.481	1.482
25	0.589	0.254	0.080	0.096	0.939	0.941
35	0.626	0.247	0.077	0.093	0.679	0.681
50	0.685	0.242	0.076	0.091	0.504	0.507
70	0.747	0.237	0.074	0.089	0.352	0.356
95	0.834	0.230	0.072	0.087	0.259	0.263
120	0.848	0.228	0.072	0.086	0.209	0.214
150	0.848	0.229	0.072	0.086	0.176	0.182
185	0.863	0.228	0.072	0.086	0.146	0.154

Technical Data

3. Short Circuit Current Ratings

The short circuit currents quoted here are for cables operating normally at maximum conductor temperature of 90℃.
HEPR insulation is actually capable of withstanding short-term temperature up to 250℃

T1 = 90, T2 = 250

Conductor	Short circuit currents (kA)													
Nominal Area mm^2	Duration of short circuit in second													
	0.03	0.05	0.07	0.1	0.14	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.5	1.3	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2
2.5	2.0	1.6	1.3	1.1	0.9	0.8	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3
4	3.2	2.5	2.1	1.8	1.5	1.3	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.6
6	4.9	3.8	3.2	2.7	2.3	1.9	1. 5	1.3	1.2	1.1	1.0	0.9	0.9	0.8
10	8.2	6.3	5.4	4.5	3.8	3.2	2.6	2.2	2.0	1.8	1.7	1.6	1.5	1.4
16	13.0	10.1	8.5	7.1	6.0	5.0	4.1	3.6	3.2	2.9	2.7	2.5	2.4	2.2
25	20.6	15.9	13.5	11.3	9.5	8.0	6.5	5.6	5.0	4.6	4.3	4.0	3.8	3.6
35	28.5	22.1	18.7	15.6	13.2	11.1	9.0	7.8	7.0	6.4	5.9	5.5	5.2	4.9
50	38.6	29.9	25.3	21.2	17.9	15.0	12.2	10.6	9.5	8.6	8.0	7.5	7.1	6.7
70	55.9	43.3	36.6	30.6	25.9	21.6	17.7	15.3	13.7	12.5	11.6	10.8	10.2	9.7
95	77.5	60.0	50.7	42.4	35.9	30.0	24.5	21.2	19.0	17.3	16.0	15.0	14.1	13.4
120	97.9	75.8	64.1	53.6	45.3	37.9	31.0	26.8	24.0	21.9	20.3	19.0	17.9	17.0
150	120.3	93.1	78.7	65.9	55.7	46.6	38.0	32.9	29.5	26.9	24.9	23.3	22.0	20.8
185	150.8	116.8	98.8	82.6	69.8	58.4	47.7	41.3	36.9	33.7	31.2	29.2	27.5	26.1
240	198.3	153.6	129.8	108.6	91.8	76.8	62.7	54.3	48.6	44.3	41.0	38.4	36.2	34.3
300	248.7	192.6	162.8	136.2	115.1	96.3	78.6	68.1	60.9	55.6	51.5	48.2	45.4	43.1
400	329.3	255.1	215.6	180.4	152.5	127.6	104.1	90.2	80.7	73.6	68.2	63.8	60.1	57.0
500	401.0	310.6	262.5	219.6	185.6	155.3	126.8	109.8	98.2	89.7	83.0	77.7	73.2	69.5

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4. Rdc, Rac and inductive voltage drop corfficient

HEPR INSULATED 0.6/1kV CABLE (FLAME RETARDANT TYPE)

Nominal Area	R-dc (at 20℃)	R-dc (at 90℃)	R-ac (at 90℃)	Inductive voltage drop coefficient						
				Dielectric power factor (at 60Hz & 90℃ Conductor temperature)						
mm²	Ω/km	Ω/km	Ω/km	100%	95%	90%	85%	80%	75%	70%
1.5	12.2	15.6	15.6	1.00	0.95	0.91	0.86	0.81	0.76	0.71
2.5	7.56	9.64	9.64	1.00	0.96	0.91	0.86	0.81	0.76	0.71
4	4.70	5.99	5.99	1.00	0.96	0.91	0.87	0.82	0.77	0.72
6	3.11	3.97	3.97	1.00	0.96	0.92	0.87	0.83	0.78	0.73
10	1.84	2.35	2.35	1.00	0.97	0.93	0.88	0.84	0.79	0.75
16	1.16	1.48	1.48	1.00	0.98	0.94	0.90	0.86	0.81	0.77
25	0.734	0.936	0.936	1.00	0.99	0.96	0.93	0.89	0.85	0.80
35	0.529	0.675	0.675	1.00	1.01	0.98	0.95	0.91	0.88	0.84
50	0.391	0.499	0.499	1.00	1.03	1.01	0.98	0.95	0.91	0.88
70	0.270	0.344	0.344	1.00	1.06	1.05	1.03	1.01	0.98	0.95
95	0.195	0.249	0.249	1.00	1.09	1.10	1.09	1.08	1.05	1.03
120	0.154	0.196	0.196	1.00	1.13	1.15	1.15	1.14	1.13	1.11
150	0.126	0.161	0.164	1.00	1.16	1.20	1.21	1.21	1.20	1.18
185	0.100	0.128	0.131	1.00	1.21	1.26	1.29	1.30	1.30	1.29
240	0.076	0.097	0.101	1.00	1.28	1.36	1.41	1.43	1.45	1.45
300	0.0607	0.0774	0.0820	1.00	1.35	1.46	1.53	1.57	1.60	1.62

HEPR INSULATED 0.6/1kV CABLE (FLAME RETARDANT & FIRE RESISTANCE TYPE)

Nominal Area	R-dc (at 20℃)	R-dc (at 90℃)	R-ac (at 90℃)	Inductive voltage drop coefficient						
				Dielectric power factor (at 60Hz & 90℃ Conductor temperature)						
mm²	Ω/km	Ω/km	Ω/km	100%	95%	90%	85%	80%	75%	70%
1.5	12.2	15.6	15.6	1.00	0.95	0.90	0.85	0.81	0.76	0.71
2.5	7.56	9.64	9.64	1.00	0.95	0.91	0.86	0.81	0.76	0.71
4	4.70	5.99	5.99	1.00	0.96	0.91	0.86	0.81	0.76	0.71
6	3.11	3.97	3.97	1.00	0.96	0.91	0.86	0.82	0.77	0.72
10	1.84	2.35	2.35	1.00	0.96	0.92	0.87	0.83	0.78	0.73
16	1.16	1.48	1.48	1.00	0.97	0.93	0.88	0.84	0.79	0.75
25	0.734	0.936	0.936	1.00	0.98	0.94	0.90	0.86	0.82	0.77
35	0.529	0.675	0.675	1.00	0.99	0.96	0.92	0.88	0.84	0.80
50	0.391	0.499	0.499	1.00	1.01	0.98	0.95	0.91	0.87	0.83
70	0.270	0.344	0.344	1.00	1.03	1.01	0.99	0.96	0.92	0.89
95	0.195	0.249	0.249	1.00	1.06	1.05	1.03	1.01	0.98	0.95
120	0.154	0.196	0.196	1.00	1.09	1.09	1.08	1.06	1.04	1.01
150	0.126	0.161	0.164	1.00	1.11	1.13	1.13	1.12	1.10	1.08
185	0.100	0.128	0.131	1.00	1.15	1.19	1.20	1.19	1.18	1.17

Technical Data

VOLTAGE RATING SELECTION

Selection cable for A.C systems

Supply system	Supply category	System voltage (kV)					Recommended (kV)	
		Phase to earth (Uo)		Phase to phase (U)		Maximum sustained voltage (Um)	IEC standard	BS standards
		Above	Up to and including	Above	Up to and including		U_o / U	U_o / U
3-Phase 4-Wire	A & B	-	0.15	-	0.25	0.28	0.15 / 0.25	0.15 / 0.25
		0.15	0.6	0.25	1	1.2	0.6 / 1	0.6 / 1
3-Phase 4-Wire	C	-	-	-	0.15	-	0.15 / 0.25	0.15 / 0.25
		-	-	0.15	0.6	-	0.6 / 1	0.6 / 1
3-Phase 3-Wire	A & B	-	0.15	-	0.25	0.28	0.15 / 0.25	0.15 / 0.25
		0.15	0.6	0.25	1	1.2	0.6 / 1	0.6 / 1
		0.6	1.9	-	3.3	3.6	1.8 / 3	1.9 / 3.3
		1.9	3.8	3.3	6.6	7.2	3.6 / 6	3.8 / 6.6
		3.8	6.35	6.6	11	12	6 / 10	6.35 / 11
		6.35	8.7	11	15	17	8.7 / 15	-
		8.7	12.7	15	22	24	12 / 20	12.7 / 22
3-Phase 3-Wire	C	-	-	-	0.15	-	0.15 / 0.25	0.15 / 0.25
		-	-	0.15	0.6	-	0.6 / 1	0.6 / 1
		-	-	0.6	1.9	-	1.8 / 3	1.9 / 3.3
		-	-	1.9	3.3	3.6	3.6 / 6	3.8 / 6.6
		-	-	3.3	6.6	7.2	6 / 10	6.35 / 11
		-	-	6.6	11	12	8.7 / 15	11 / 11
		-	-	11	15	17.5	12 / 20	12.7 / 22
2-Phase 3-Wire or 2-Phase 4-Wire	A & B	-	0.15	-	0.21	-	0.15 / 0.25	0.15 / 0.25
		0.15	0.6	-	0.84	-	0.6 / 1	0.6 / 1
2-Phase 3-Wire or 2-Phase 4-Wire	C	-	-	-	0.15	-	0.15 / 0.25	0.15 / 0.25
		-	-	0.15	0.a6	-	0.6 / 1	0.6 / 1
		-	-	0.6	1.9	-	1.8 / 3	1.9 / 3.3
1-Phase 3-Wire	A & B	-	0.15	-	0.25	0.28	0.15 / 0.25	0.15 / 0.25
		0.15	0.6	0.25	1	1.2	0.6 / 1	0.6 / 1
1-Phase 3-Wire	C	-	-	-	0.15	-	0.15 /0.25	0.15 / 0.25
		-	-	0.25	0.6	-	0.6 / 1	0.6 / 1
1-Phase 2-Wire or 1-Phase 1-Wire	C	-	-	-	0.15	-	0.15 /0.25	0.15 / 0.25
		-	-	0.15	0.6	-	0.6 / 1	0.6 / 1
		-	-	0.6	1.9	-	1.8 / 3	19. / 3.3
		-	-	1.9	3.3	3.6	3.6 / 6	3.8 / 6.6
		-	-	3.3	6.6	7.2	6 / 10	6.35 / 11
		-	-	6.6	11	12	8.7 / 15	-
		-	-	11	15	17.5	12 / 20	12.7 / 22

Note) The rated voltage of the cable for a given application shall be suitable for the operating condition in the system in which the cable is used. To facilitate the choice of the cable, the system are divided into the following three categories

Category A : This category comprises those systems in which any phase conductor than comes in contact with earth or an earth conductor, is automatically disconnected from the system within 1 minute.

Category B : This category comprises those systems in which, under fault conditions, are operated for a short time, not exceeding 8 hours on any occasion, faults in any year should not exceed 125 hours.

Category C : This category comprises all systems which do not fall into categories A and B.

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INSTALLATION RECOMMENDATIONS

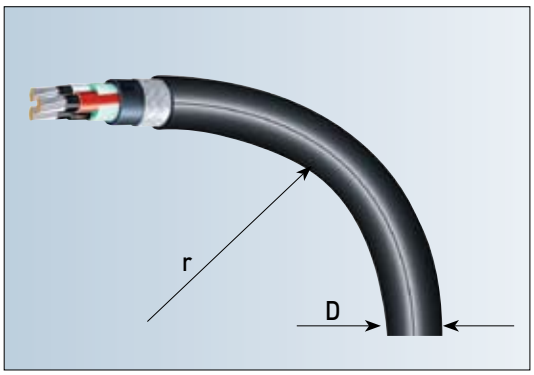
The following installation recommendations are in accordance with IEC regulation and practice.
Different regulations may apply in other countries.

1. Minimum cable bending radius

The bending radius for the installation of cables should be not less than the values given as follows;

Type of cable		Minimum bending radius
Up to 1.8/3kV	Unarmored or unbraided	
	D ≤ 25mm	4 X D
	D > 25mm	6 X D
	Metal braid screened or armored	6 X D
	Tape screened	8 X D
3.6/6kV above	Single core	12 X D
	3-core	9 X D

Notes) D : Overall diameter of cable



2. Installation temperature

Minimum recommended installation temperature for cables shall be -20℃.
But, if the ambient temperature were below -20℃, the cable should be installed after maintained at room temperature (about 15~25℃) for 24 hours or more.

3. Pulling tension

The cable pulling tension during installation can be estimated by means of the following formula:

p=5kg x total cross section of conductors in the armoured cable or,
p=2.5kg x total cross section of conductors in the unarmoured cable

Additional tension will be supplied from the braid and the insulation and sheathing compound.

Technical Data

4. Explosion risk areas

1) Areas

The areas on board are usually classified in two main categories with regards to the explosion risk :

▶ Hazardous areas : Areas in which explosive gas-air mixtures are, or may be expected to be,present in quantities such as to require special precautions for the construction and use of electrical apparatus.

▶ Safe areas(non-hazardous areas) : Areas n which explosive gas-air mixtures are not expected to be, present in quantities such as to required special precautions for the construction and use of electrical apparatus.

A hazardous area is divided into three zones :

▶ Zone 0 : in which an explosive gas-air mixture is continuously present or present for long periods.
▶ Zone 1 : in which an explosive gas-air mixture is likely to occur in normal operation
▶ Zone 2 : in which an explosive gas-air mixture is not likely to occur, and if occurs it will only exist for a short time

2) Installation of cables

▶ For cables to be used in zone 0 and zone 1, one of the following types of protection is required:
- A non-metallic outer sheath in combination with braiding or other metallic covering for earth fault detection and mechanical protection. A non-metallic outer sheath is, however, not required if the screen or armouring consists of a corrosion resistant bronze alloy.
- A lead sheathing in addition to further mechanical protection, for example armour braiding or non-metallic impervious sheath.
- For mineral insulated cables, a copper or stainless steel sheath.
- Single core cables in installations with A.C or D.C. current with a high ripple content should be of types without screen of armouring. where mechanical damage is possible, such cables should otherwise be mechanically protected or installed in ducts or similar.

▶ For installations in zone 2, cables without screen or armour can be used.

5. Earthing of metal coverings of cables

1) General requirements

All metal coverings of cables, armouring or shielding shall be earthed. Earthing must be provided at both ends except for final sub-circuits where earthing at only one end(the supply end) is sufficient.
Earthing at one end is permitted where it is required for technical or safety reasons, control and instrumentation cables, mineral insulated cables, intrinsically safe circuits, control circuits etc.

Metal covering of single core cable for AC and single core cable for DC with ripple content exceeding 10% and having a current rating exceeding 20A is to be earthed at one and only.
when single core cables for AC and DC with ripple content higher than 10% are installed in or passing through hazardous areas, the metal screen or armour is to be earthed inside the hazardous area to avoid dangerous potential between screen armour and earthed part of the installation

2) Cross section of earth connections

Earth connections for metal coverings shall be carried out with conductors having cross sectional areas related to the cross sectional areas of the phase conductors and the current ratings of the cables, or at least the same cross sectional areas as the metal covering itself.

3) Earthing through metal clamps etc.

Metal coverings of cables may be earthed through clamps. The clamps must grip the metal covering of the cable and must be connected to the hull and provide a good conductive connection between the metal covering and the hull. The metal clamps must be corrosion resistant.

4) Earthing through cable glands

The metal coverings of cables may be earthed by means of glands intended for the purpose and so designed as to ensure an effective earth connection. The glands shall be firmly attached to, and in effective electrical contact with, a metal structure earthed in accordance with these regulations.

5) Earthing of metal pipes, conduits etc.

Metal pipes and cable conduits are to be earthed. Pipes and conduits may be earthed by being screwed into a metal enclosure, or by nuts in both sides of the wall of metallic enclosure, provided that the surface is clean and free from rust, scale or print.
Comments : For intrinsically safe circuits it is important to separate the earth conductor from the protective earthing. The resistance between a zener barrier earth and protective earth must be max.
1ohm and preferably less than. 0.1ohm to avoid that possible fault current does not lead to a potential increase in the system.

Technical Data

6. Fixing of cables

Cables are to be suitably fixed to the supports. In order to guard against the effects of electrodynamics forces developing on the occurrence of a short circuit, single core cables should be firmly fixed by using supports of a strength adequate to withstand forces corresponding to the values of prospective short circuit current.
The requirement concerning fixing can normally be fulfilled when the cables are clamped as follows:

- For cables entering enclosures and conduits the nearest clamp is to be placed at a minimum distance from the entry of 10 times the diameter the cable concerned from the entry.
- At other points the distance between the clamps must not exceed the in the following table:

External diameter of cable (mm)		Spacing of fixing points (mm)	
Above	Up to	Cables without Metal braid or armor	Cables with copper, bronze or steel braid or armor
-	8	200	250
8	13	250	300
12	20	300	350
20	30	350	400
30	-	400	450

7. Mechanical protection of cables

Cables are to be installed in such a way that they are not subject to damaging mechanical stressed.
where this can not be obtained the cables are to be protected. Unless the cable itself(for example armour or sheath) provides adequate protection the cables should be:

- Enclosed in suitable conduits or casings
- covered by steel pipes or profiles
- Steel pipes in which the cables are run

in areas where there is an exceptional risk of mechanical damage, for example in cargo hold area or different storage areas, the cables always have to be protected, even when the cables are armoured.
The thickness of the protective conduits must be at least 4mm.
The wall thickness of the protective conduit must be at least 2mm.
Cables lay on aluminum supports may have a corresponding protection of aluminum.
the thickness must be at least 4mm.
Metal casing used for mechanical protection of cables should be efficiently protected against corrosion.

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8. Installation of cables for fire properties

Cables must at least meet the flame retardant requirements. On board passenger ships, cargo-ships and mobile offshore units, where requirements are considered to be satisfied if the cables have characteristics complying withe the cable bunch test IEC-Publication 60332-3, or fire stops are installed in accordance with the following recommendations:When cable complying with single-cable test, but not the cable-bunch-test, are installed, fire stops are to be provided in enclosed or semi-enclosed spaces except for cargo rooms and tunnels in cargo areas.

a) For vertical cable runs
- with a max. distance between fire stops of two decks or 6 meters, unless installed in totally enclosed cable ducts
- at the main and emergency switchboard
- where cables enter into an engine control room
- at centralized control panels for propulsion machinery and essential auxiliaries
- at the entrance to cables ducts

b) For horizontal cable runs.
- Fire stops shall be as specified in item a) above but the maximum. distance between fire stops may be increased to 14m.

When choosing cable types special attention should be paid to reduce possible damage due to corrosion in case of a fire. Non-halogen free cables(materials)will give off corrosive gases during a fire.
The corrosion effect depends on the amount of halogens in the materials used.
Flame retardant cables are to give characteristics complying with the test requirements in IEC-Publication 60332-1, with amendments.
Fire resistant cables are to give characteristics complying with the requirements in IEC-Publication 60331.

9. Intrinsically safe installations

Cables and flexible cables for intrinsically safe circuits must have screen or similar of a conducting material and the outer sheath must be of an insulating material.
A non-metallic outer sheath is, however, not required if the screen or armour consists of a corrosion resistant bronze alloy. Where there is no danger of interference from the external electrical or magnetic fields, short flexible cables may be used without screen.

a) Associated equipment
Associated equipment(e.g.power supply units) shall be situated in a safe area or has protection as mentioned in "Explosion risk areas."

b) Connection of equipment
Within limitations laid down in 3., ordinary non-explosion protected equipment may be connected to intrinsically safe equipment, provided that it is designed to meet regulations in other respects.

c) Compliance with any limitations in the certificate
With intrinsically safe circuits special considerations must be given to ensure that the circuits characteristics (including connected equipment, cables, conductors etc.) satisfy any limitations in the test certificate.
Such limitations may be maximum values for capacitance and inductance etc.
It is pointed out there is a danger of damage to i.s equipment when using normal equipment for insulation testing

Technical Data

d) Adjacent location

Conductors for i.s safe circuits and conductors for non-i.s safe circuits shall not be run together in the same cable, flexible cable, conduit, cables bunch etc.

e) Protection against electrical and magnetic fields

Where i.s circuits are exposed to magnetic or electrical field that may destroy the intrinsic safety of the system. Precautions must be taken during installation. Such precautions may be:

- cables for i.s circuits and non-i.s circuits to be installed a minimum distance of 50mm apart. The minimum distance to heavy current cables using D.C with a high ripple content should be 300mm.
- cables for i.s circuits and non-i.s circuits to be separated panel of conducting material which is earthed.
- cables for i.s circuits to have effective transposition.

f) Marking

The marking may be a marking plate or by colour marking of the cables when using colour marking, the colour should be light blue.

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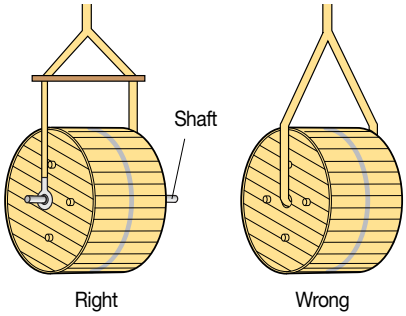
Handling, Installation Method & Notice

■ Loading & Transportation

1. In case of a crane

Should transport by using standard rope and a shaft which is put in the center of drum.

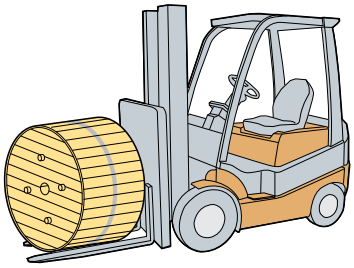
* Matters that requires attention
- Placing it even with the ground.
- Should move slowly and when it placedown, don't do sudden stop.



2. In case of a forklift

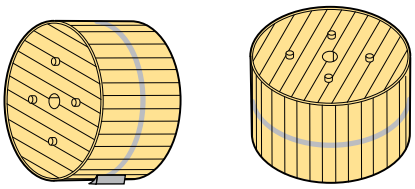
Drums should not be damaged by a forklift.

* Matters that requires attention:
- Place the drum on the center of a fork.
- The width of a fork should be longer than drum size.



■ Transportation and Unloading

*** Matters that requires attention while handling cables.**
- Don't lie drums down.
- Don't move it 20m longer when rolling it.
- Don't use gimlets or something like sharp when moving.
- Don't roll a damaged drum.
- Don't roll at projecting surface.
- Don't store drum near to stove and heater.



Check point while handling cables(Storage)

■ Storage

- Don't leave the protecting packing materials and outside package until remove it for setting up cables.
- Should construct a fence to protect against damages by moving machines.
- Keep it inside or in depository when safekeeping in long term.
  (For reference, drums and packages can stand against dry whether outside the house)
- Must seal both sides of cables remaining in the drums the cap and heat-contracting tube so that moisture doesn't soak in after finishing the removal of exterior packing materials and cutting and installing cables.

Certificates Approved



LRQA
Business Assurance

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

TMC Co., Ltd.
Seoul and Cheonan-si
Korea

has been approved by Lloyd's Register Quality Assurance to the following Quality Management System Standards:

ISO 9001:2008
KS Q ISO 9001:2009

The Quality Management System is applicable to:

Design and manufacture of shipboard cables, offshore cables, electrical cables and fiber optic cables.

This certificate is valid only in association with the certificate schedule bearing the same number on which the locations applicable to this approval are listed.

Approval
Certificate No: SEO 0981028

Original Approval: 2 December 1998
Current Certificate: 1 January 2011
Certificate Expiry: 31 December 2013

Issued by: LRQA Korea Ltd. for and on behalf of Lloyd's Register Quality Assurance Limited

Cert. of ISO 9001



LRQA
Business Assurance

CERTIFICATE OF APPROVAL

This is to certify that the Environmental Management System of:

TMC Co., Ltd.
368-7, Gasan-ri, Ibjang-myeon, Cheonan-si
Chungnam, 330-821, Korea

has been approved by Lloyd's Register Quality Assurance to the following Environmental Management System Standard:

ISO 14001:2004
KS I ISO 14001:2009

The Environmental Management System is applicable to:

Design and manufacture of shipboard cables, offshore cables, electrical cables and fiber optic cables.

Approval
Certificate No: SEO 0052017

Original Approval: 1 February 2006
Current Certificate: 1 February 2012
Certificate Expiry: 31 January 2015

Issued by: LRQA Korea Ltd. for and on behalf of Lloyd's Register Quality Assurance Limited

Cert. of ISO 14001



LRQA
Business Assurance

CERTIFICATE OF APPROVAL

This is to certify that the Occupational Health & Safety Management System of:

TMC Co., Ltd.
Cheonan-si, Chungnam
Korea

has been approved by Lloyd's Register Quality Assurance to the following specification:

OHSAS 18001:2007

The Occupational Health & Safety Management System is applicable to:

Design and manufacture of shipboard cables, off-shore cables, electrical cables and fiber optic cables.

Approval
Certificate No: SEO 6004071

Original Approval: 22 July 2008
Current Certificate: 22 July 2011
Certificate Expiry: 21 July 2014

Issued by: LRQA Korea Ltd. for and on behalf of Lloyd's Register Quality Assurance Limited

Cert. of OHSAS 18001

Class Type Approval

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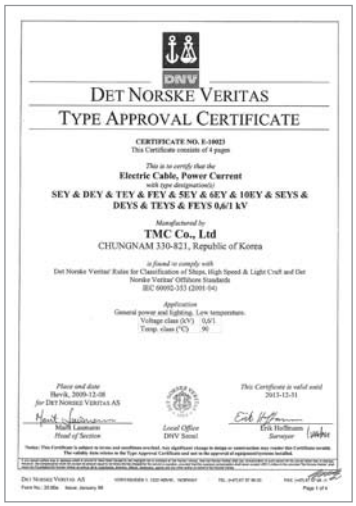

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