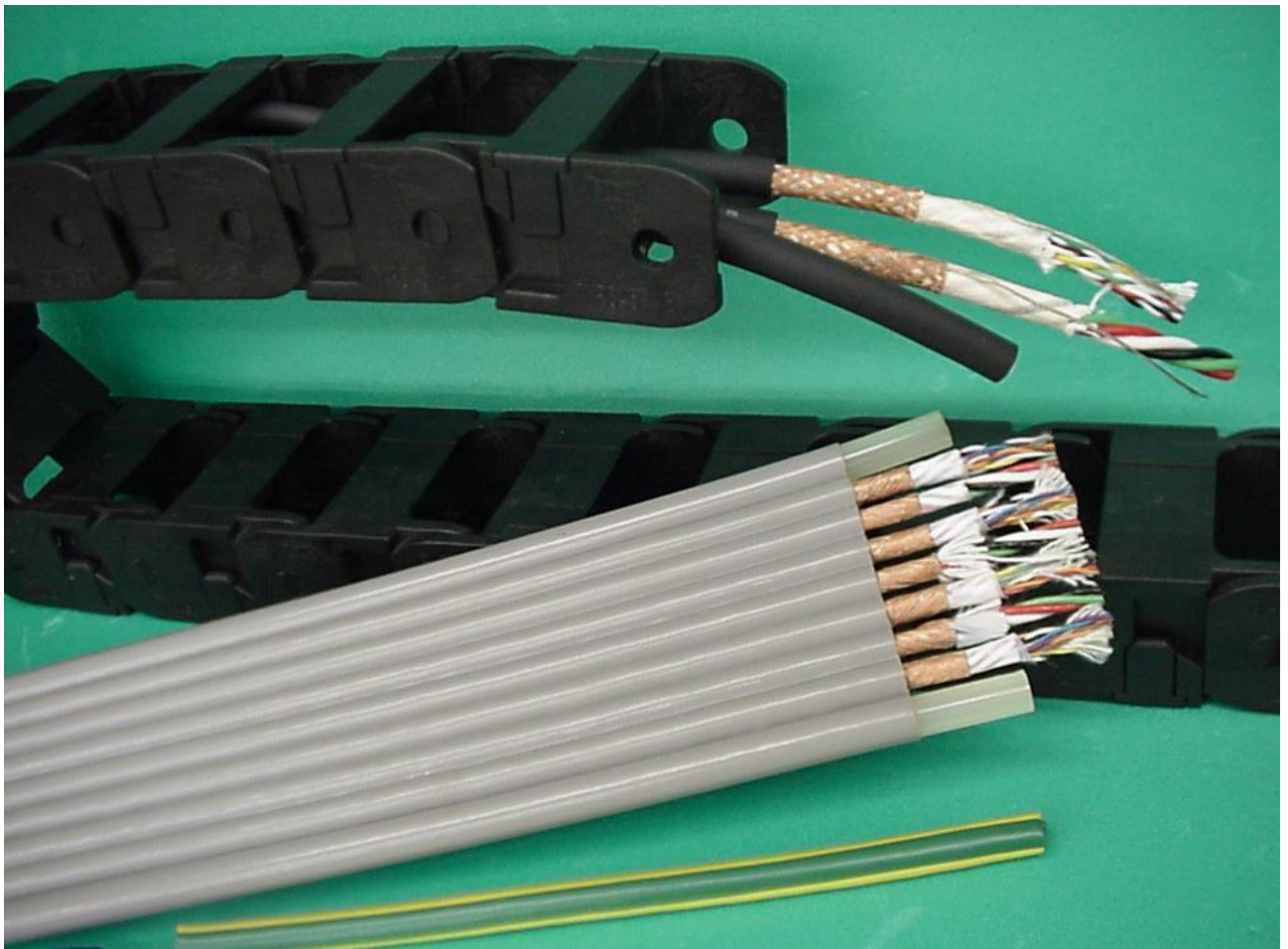


## Industrial Cable for Factory Automation



### Line up

- Multi core & multi pair cables  
for high flexure part.
- Heat bonded flat cables  
for high flexure part.
- Multi core PVC cables  
for fixed part.
- Large size PVC wire for power supply

Engineering Dept.  
Electronic Wires & Cable Business Unit  
Cable Materials Company.

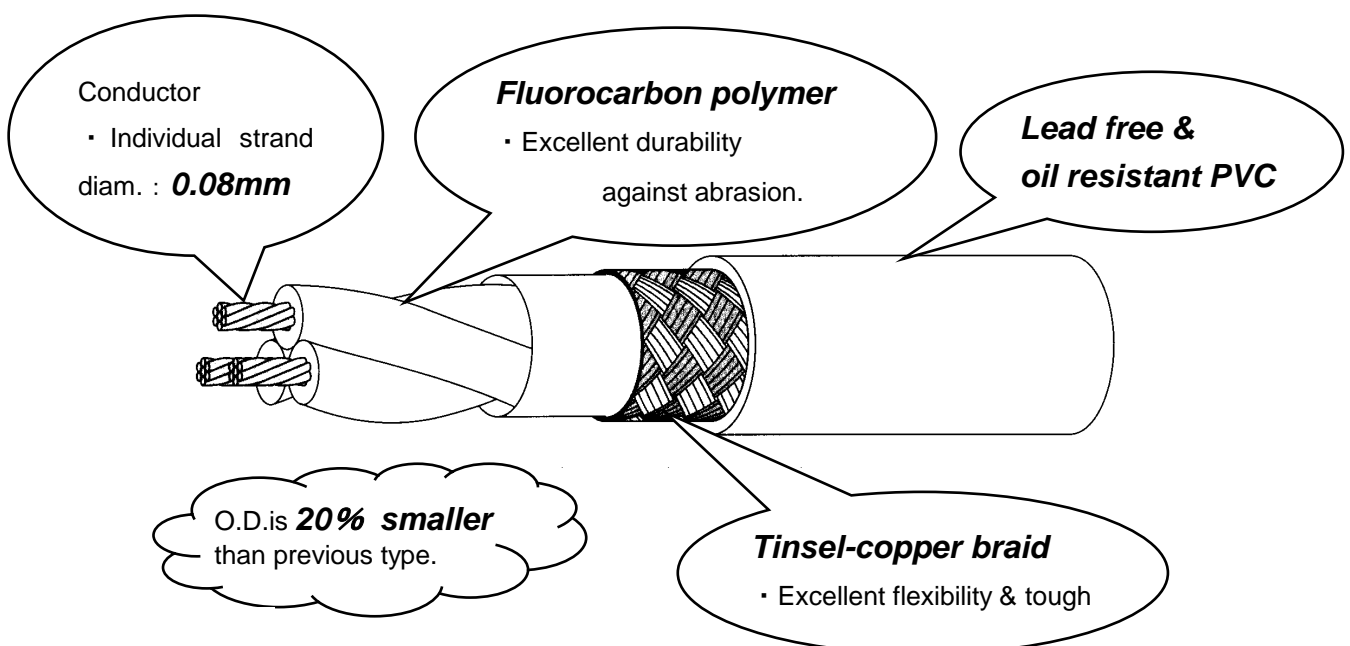
**Hitachi Metals, Ltd.**

This data is lined up our cable for industrial machinery.

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No	Use	Rating voltage	No. of cond.	Size	P/N	Page
1	Flexure part	The feature of <b>HITACHI FA-FLEX</b>				1
2		300 V	2~20 pairs 2~20 cond.	28~23AWG (0.09~0.3mm <sup>2</sup> )	UL2464-SX(FLEX) UL2464(FLEX)	2
3		600 V	2~6 cond.	20~14AWG (0.5~2mm <sup>2</sup> )	UL2570-SX(FLEX) UL2570(FLEX)	3
4		Heat bonded flat cable			UL21545-SX RA-COFHV-SX	4
5		Flexible performance & shielding effect				5
6	Fixed part	600 V	1 cond.	8~4/0AWG (8~110mm <sup>2</sup> )	UL1283 TEW UL1284 TEW	6
7		300 V	2~4 cond.	24~10AWG (0.2~5.5mm <sup>2</sup> )	UL2464-SB TR-64 UL2464-SB TEW	7
8		600 V	2~4 cond.	22~10AWG (0.3~5.5mm <sup>2</sup> )	UL2586-SB TEW UL2586 TEW	8
9	Current carrying capacity					9

### The feature of **"HITACHI FA-FLEX"** for high flexure part



**“FA-FLEX” for flexure part**

UL2464-SX(FLEX)

UL2464(FLEX)

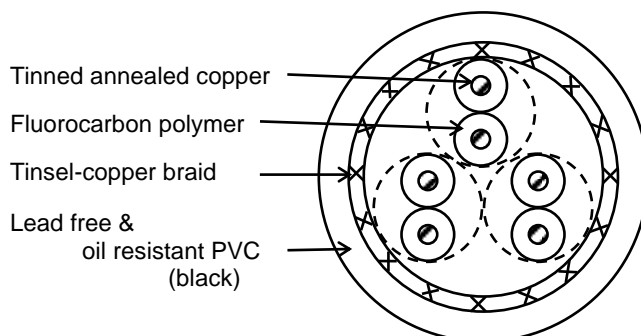
Rating : 80°C, 300V

Standard : UL 758

Hitachi Specification : SP23-90812A

## ◆ Size variation

Conductor			Ins. dia.. (mm)	Max.cond. resistance (Ω/km)
AWG (Size)	Stranding (No./mm)	Dia. (mm)		
28 (0.09mm <sup>2</sup> )	19/0.08	0.40	0.80	220
26 (0.15mm <sup>2</sup> )	30/0.08	0.51	0.91	139
25 (0.2mm <sup>2</sup> )	40/0.08	0.58	0.98	105
23 (0.3mm <sup>2</sup> )	60/0.08	0.72	1.12	69.5

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## ◆ Overall Dia. 【Multi pair with shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)		28 (0.09mm <sup>2</sup> )		26 (0.15mm <sup>2</sup> )		25 (0.2mm <sup>2</sup> )		23 (0.3mm <sup>2</sup> )	
No. of pairs	2	5.7	(40)	6.1	(40)	6.3	(44)	6.9	(51)
	3	5.9	(45)	6.4	(45)	6.6	(50)	7.2	(60)
	4	6.3	(50)	6.8	(51)	7.1	(60)	7.7	(71)
	5	6.7	(58)	7.3	(59)	7.6	(70)	8.3	(85)
	6	7.1	(64)	7.7	(67)	8.0	(75)	8.8	(95)
	7	7.5	(70)	8.1	(75)	8.6	(85)	9.4	(110)
	8	8.0	(77)	8.7	(85)	9.1	(100)	10.1	(125)
	10	8.8	(90)	9.7	(105)	10.2	(120)	11.3	(150)
	12	9.9	(110)	10.7	(125)	11.3	(140)	13.0	(190)
	15	9.7	(115)	10.6	(130)	11.2	(155)	12.8	(205)
	18	10.1	(130)	11.1	(145)	11.8	(175)	13.4	(235)
	20	10.6	(140)	11.7	(160)	12.4	(190)	14.1	(255)

Note 1. Overall Dia. of non-shielded cable is 0.6mm smaller than shielded one.

2. Core Identification : Page 3 see table 1

3. Unit length : 100m

4. Current carrying capacity : Page 9 see table 8.

## ◆ Overall Dia. 【Multi core without shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)		28 (0.09mm <sup>2</sup> )		26 (0.15mm <sup>2</sup> )		25 (0.2mm <sup>2</sup> )		23 (0.3mm <sup>2</sup> )	
No. of cond.	2	3.7	(15)	4.0	(20)	4.1	(20)	4.4	(25)
	3	3.9	(18)	4.1	(22)	4.3	(24)	4.6	(30)
	4	4.1	(20)	4.3	(25)	4.5	(28)	4.9	(35)
	5	4.3	(23)	4.6	(28)	4.8	(32)	5.1	(40)
	6	4.5	(25)	4.9	(32)	5.1	(37)	5.5	(45)
	7	4.8	(29)	5.1	(36)	5.4	(41)	5.8	(50)
	8	5.0	(31)	5.4	(40)	5.7	(46)	6.2	(60)
	9	5.4	(36)	5.8	(45)	6.1	(51)	6.6	(65)
	10	5.5	(38)	6.0	(48)	6.3	(55)	6.9	(70)
	12	6.1	(45)	6.6	(56)	6.9	(65)	7.6	(83)
	15	5.9	(47)	6.4	(60)	6.7	(71)	7.4	(92)
	20	6.4	(58)	7.0	(75)	7.4	(90)	8.1	(115)

Note 1. Overall Dia. of shielded cable is 0.6mm bigger than non-shielded one.

2. Core Identification : Page 3 see table 2

3. Unit length : 100m

4. Current carrying capacity : Page 9 see table 7.

**“FA-FLEX” for flexure part**UL2570-SX(FLEX)  
UL2570(FLEX)

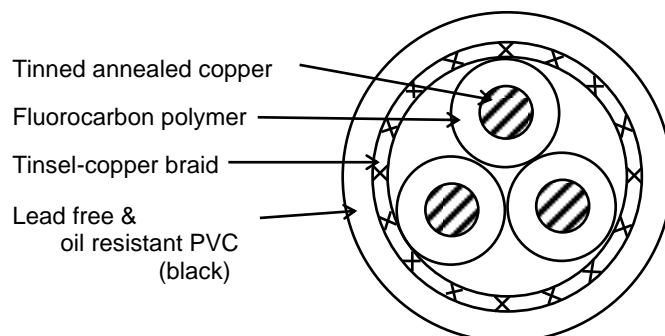
Rating : 80°C, 600V

Standard : UL 758

Hitachi Specification : SP23-90813A

## ◆ Size variation

Conductor			Ins. dia. (mm)	Max.cond. resistance (Ω/km)
AWG (Size)	Stranding (No./mm)	Dia. (mm)		
20 (0.5mm <sup>2</sup> )	104/0.08	0.94	1.44	40.1
18 (0.75mm <sup>2</sup> )	7/24/0.08	1.25	1.81	25.0
16 (1.25mm <sup>2</sup> )	7/38/0.08	1.71	2.27	16.1
14 (2mm <sup>2</sup> )	7/60/0.08	2.15	2.87	10.2

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## ◆ Overall Dia. 【Shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)		20 (0.5mm <sup>2</sup> )	18 (0.75mm <sup>2</sup> )	16 (1.25mm <sup>2</sup> )	14 (2mm <sup>2</sup> )
No. of cond.	2	5.6 (51)	6.4 (53)	7.3 (75)	8.5 (115)
	3	5.9 (59)	6.7 (65)	7.6 (90)	8.9 (140)
	4	6.2 (67)	7.1 (80)	8.2 (110)	9.7 (175)
	5	6.6 (76)	7.6 (95)	8.9 (130)	10.5 (210)
	6	7.1 (87)	8.2 (110)	9.6 (155)	11.4 (240)

- Note 1. Core Identification : Page 3 see table 2  
2. Unit length : 100m  
3. Current carrying capacity : Page 9 see table 7.

## ◆ Overall Dia. 【Non-shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)		20 (0.5mm <sup>2</sup> )	18 (0.75mm <sup>2</sup> )	16 (1.25mm <sup>2</sup> )	14 (2mm <sup>2</sup> )
No. of cond.	2	5.0 (33)	5.8 (45)	6.7 (62)	7.9 (90)
	3	5.3 (41)	6.1 (57)	7.0 (80)	8.3 (115)
	4	5.6 (50)	6.5 (70)	7.6 (100)	9.1 (145)
	5	6.0 (58)	7.0 (85)	8.3 (120)	9.9 (180)
	6	6.5 (67)	7.6 (100)	9.0 (140)	10.8 (210)

- Note 1. Core Identification : Page 3 See table 2  
2. Unit length : 100m  
3. Current carrying capacity : Page 9 see table 7.

**Color code**

Table 1 Core Identification for multi pair

No. of pair.	Ins. color		No. of pair.	Ins. color	
	1 <sup>st</sup> . core	2 <sup>nd</sup> . core		1 <sup>st</sup> .core.	2 <sup>nd</sup> .core.
1	Black	Brown	11	Brown	Orange
2		Red	12		Yellow
3		Orange	13		Green
4		Yellow	14		Blue
5		Green	15		Violet
6		Blue	16		Gray
7		Violet	17		White
8		Gray	18	Red	Orange
9		White	19		Yellow
10	Brown	Red	20		Green

Table 2 Core Identification for multi core

No. of core	Ins. color.	No. of core	Ins. color.
1	Black	11	Black
2	White	12	White
3	Red	13	Red
4	Green	14	Green
5	Yellow	15	Yellow
6	Brown	16	Brown
7	Blue	17	Blue
8	Orange	18	Orange
9	Gray	19	Gray
10	Violet	20	Violet

# Heat bonded flat cable/For flexure part

UL21545-SX

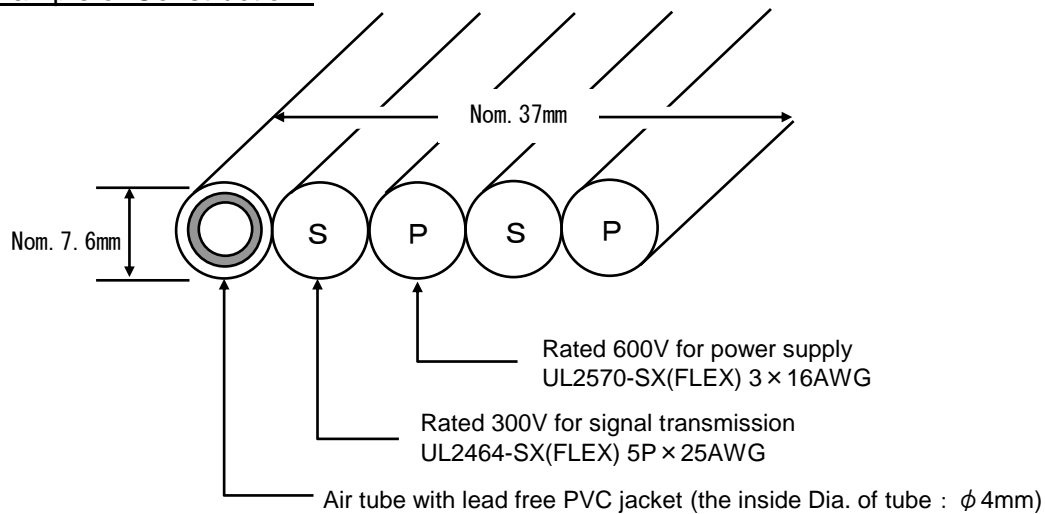
RA-COFHV-SX

## ◆ Features

- (1) Various multi conductor-cable can be bonded together.
- (2) Flat cables with bonded air-tubes are available.
- (3) UL recognized (UL Subject 764)
- (4) Heat bonding makes no surface adhesion.
- (5) Compact wiring without bearing caterpillar. (In case of short stroke)
- (6) For Clean-room cables are available.

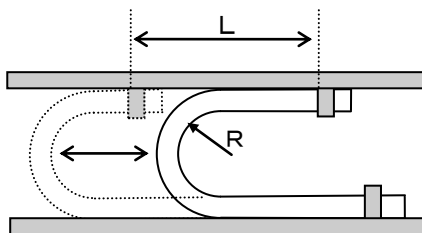
**LEAD FREE**

## ◆ Example of Construction



Note) The material of air tube is soft-polyamide.

## ◆ Data of bending test



Standard speed : 30 times a minute

Bending radius :  $R = 50$  mm

Stroke :  $L = 300$  mm

### 【Test result】

After 10,000,000 cycles, no breakage occur in conductor.

## ◆ Capability

- (1) Max. No. of cables : 20
- (2) Max. width of bonded cable : 120mm
- (3) Max. dia. of each round cable : 14mm

## Flexible performance of "HITACHI FA-FLEX"

### (1) Bending test condition

FA-FLEX cable shall be fixed in the apparatus as shown in Fig.1. One end is fixed, another end is moved regular stroke;300mm. All conductors connected in series, and check the total conductor resistance. The CR shall not increase more than 20 % of initial CR.

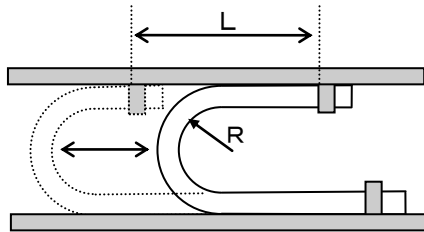


Fig. 1 Bending test

★Caution★

Flexible performance is changed by wiring method and clamp manner.

### (2) Test result

"FA-FLEX" cables passed 10,000,000 cycles by our testing.

※ Bending radius;  $R=6D$  ( $D$  : Overall Dia.)  
Standard speed : 30 times a minute

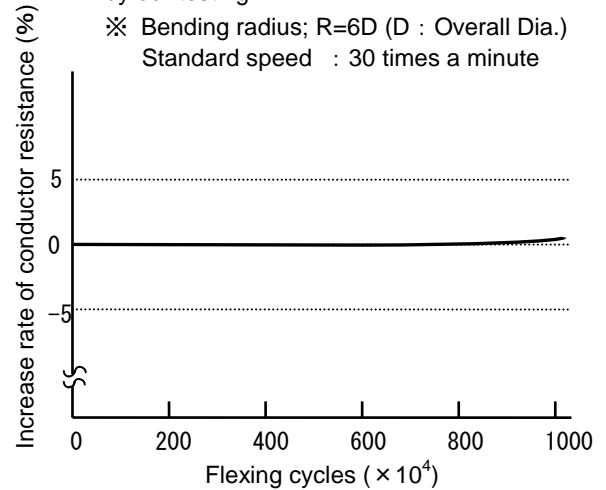
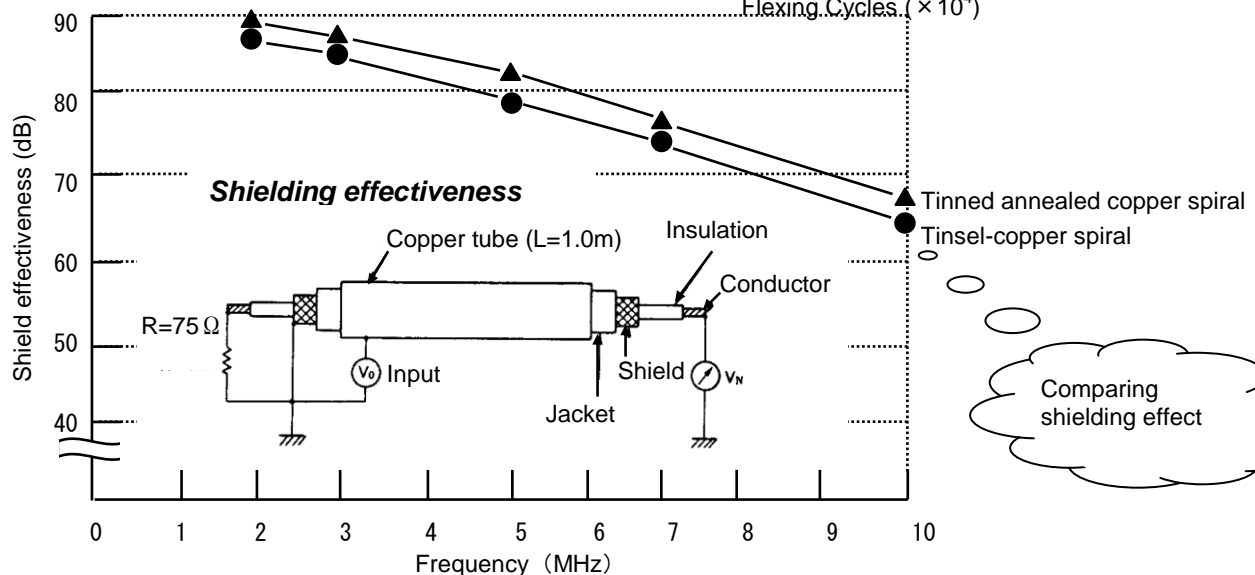
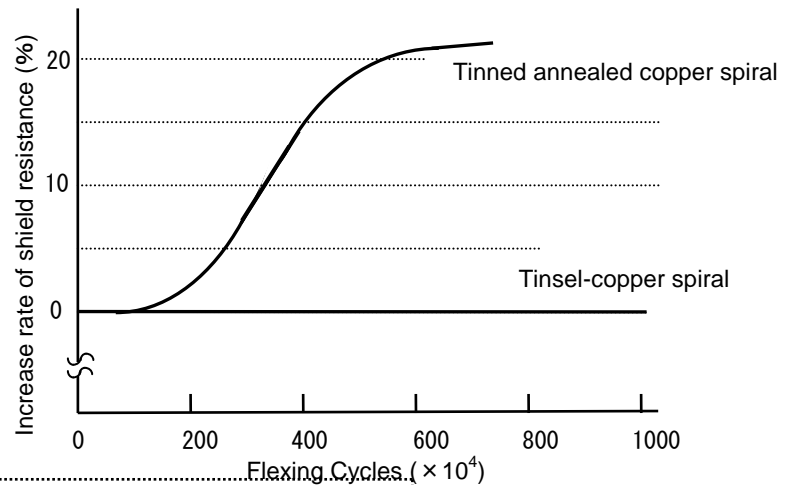


Fig. 2 Increase rate of conductor resistance

## Performance of tinsel-copper shield (Compare with tinned annealed copper)

Comparing Increase rate of shield resistance



Comparing shielding effect

**600V rating wire/Fixed part**

UL1283 TEW

UL1284 TEW

Rating : 105°C, 600V

Standard : UL 758 / CSA C22.2 No.127

Hitachi Specification : SP23-90842 for G(Y) color

SP23-90769 for except G(Y) color

Use : Internal Wiring of Appliances and fixed part.

**LEAD FREE**

## ◆ Construction

UL STYLE No.	Conductor			Ins. dia. (mm)	Max.cond. resistance (Ω/km)	Current carrying capacity (A)	Approx. mass (kg/km)	Ins. color and stock item						
	AWG (Size)	Stranding (No./No./mm)	Dia. (mm)					R	W	Bl	G	Y	Br	G(Y)
1283	8 (8mm <sup>2</sup> )	7/24/0.26	4.30	7.54	2.37	83	124	●	●	●	●	●	●	●
	6 (14mm <sup>2</sup> )	7/38/0.26	5.30	8.54	1.49	111	178	●	●	●	●	●		●
	4 (22mm <sup>2</sup> )	7/60/0.26	6.80	10.04	0.948	150	268	●	●	●	●	●		●
	2 (35mm <sup>2</sup> )	19/35/0.26	8.70	11.94	0.600	203	397	●	●	●	●	●		●
1284	1 (44mm <sup>2</sup> )	19/44/0.26	9.74	14.04	0.475	238	520			●	●			
	1/0 (55mm <sup>2</sup> )	19/55/0.26	10.90	15.20	0.380	276	632			●	●			
	2/0 (70mm <sup>2</sup> )	19/70/0.26	12.27	16.57	0.299	322	785			●	●			
	4/0 (110mm <sup>2</sup> )	37/57/0.26	15.44	19.74	0.188	436	1200			●	●			

Note 1. G(Y) : Green color with two yellow stripe marking. Green coverage of ins. surface is 30-70%.

2. Unit length : 153m, ● : Stock item.

3. Other colors are available.

4. Current carrying capacity calculated on condition that single cable wired in free air at ambient temperature 40degree C.  
If many wires are bundled, current carrying capacity have to multiply adjustable factor as table 3.

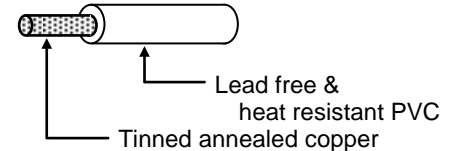


Table 3 Adjustable factor in bundle wiring

No. of bundled cables	1	2	3	4	5	6
Adjustable factor ; F	1.00	0.75	0.65	0.58	0.53	0.49

Table 4 Color code

Core Identification	R	W	Bl	G	Y	Br	G(Y)
Ins. color	Red	White	Black	Green	Yellow	Brown	Green (Yellow)

**300V rating/Fixed part**

UL2464-SB TR-64

UL2464-SB TEW

Rating : 80°C, 300V

Standard : UL 758 / CSA C22.2 No.127

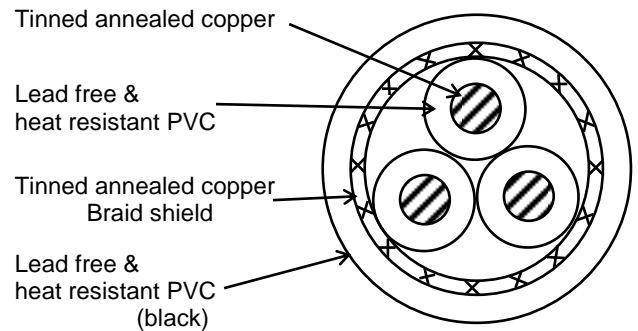
Hitachi Specification : SP23-90838

Use : Internal Wiring of Appliances and fixed part.

**LEAD FREE**

## ◆ Size variation

CSA TYPE	Conductor			Ins. dia. (mm)	Max.cond. resistance (Ω/km)
	AWG (Size)	Stranding (No./mm)	Dia. (mm)		
TR-64	24 (0.2mm <sup>2</sup> )	11/0.16	0.61	1.43	91.6
	22 (0.3mm <sup>2</sup> )	17/0.16	0.76	1.58	59.3
	20 (0.5mm <sup>2</sup> )	26/0.16	0.94	1.76	38.4
	18 (0.75mm <sup>2</sup> )	43/0.16	1.21	2.03	23.8
	16 (1.25mm <sup>2</sup> )	26/0.26	1.53	2.35	14.9
TEW	14 (2mm <sup>2</sup> )	41/0.26	1.92	3.54	9.52
	12 (3.5mm <sup>2</sup> )	65/0.26	2.42	4.04	6.15
	10 (5.5mm <sup>2</sup> )	104/0.26	3.07	4.69	3.80



## ◆ Overall Dia. 【Shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)		No. of core						Core Identification			
		2			3		4				
24	(0.2mm <sup>2</sup> )	●	5.3	(40)	●	5.5	(45)	●	5.9	(50)	Page 8 Table 5
22	(0.3mm <sup>2</sup> )	●	5.6	(45)	●	5.9	(50)	●	6.3	(60)	
20	(0.5mm <sup>2</sup> )	●	6.0	(55)	●	6.2	(60)	●	6.7	(70)	
18	(0.75mm2)	●	6.5	(65)	●	6.8	(75)	●	7.3	(95)	Page 8 Table 6
16	(1.25mm2)	●	7.1	(80)	●	7.5	(95)	●	8.1	(120)	
14	(2mm <sup>2</sup> )		9.5	(130)	●	10.1	(165)	●	11.0	(205)	
12	(3.5mm <sup>2</sup> )		10.5	(170)		11.1	(215)		12.2	(265)	
10	(5.5mm <sup>2</sup> )		11.8	(225)	●	12.5	(295)	●	13.7	(370)	

Note 1. Unit length : 153m, ● : Stock item.

2. Current carrying capacity : Page 9 see table 9.

**600V rating/Fixed part**

UL2586-SB TEW

UL2586 TEW

Rating : 105°C, 600V

Standard : UL Subject 758 / CSA C22.2 No.127

Hitachi Specification : SP23-90843

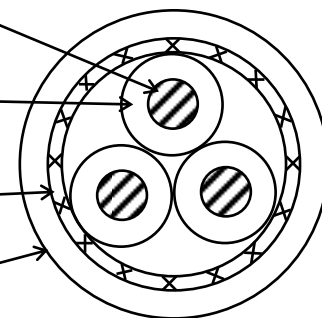
Use : Internal Wiring of Appliances and fixed part.

**LEAD FREE**

## ◆ Size variation

Conductor			Ins. dia. (mm)	Max. cond. resistance (Ω/km)
AWG (Size)	Stranding (No./mm)	Dia. (mm)		
22 (0.3mm <sup>2</sup> )	17/0.16	0.76	2.38	59.3
20 (0.5mm <sup>2</sup> )	26/0.16	0.94	2.56	38.4
18 (0.75mm <sup>2</sup> )	43/0.16	1.21	2.83	23.8
16 (1.25mm <sup>2</sup> )	54/0.18	1.53	3.15	14.9
14 (2mm <sup>2</sup> )	41/0.26	1.92	3.54	9.52
12 (3.5mm <sup>2</sup> )	65/0.26	2.42	4.04	6.15
10 (5.5mm <sup>2</sup> )	104/0.26	3.07	4.69	3.80

Tinned annealed copper

Lead free &  
heat resistant PVCTinned annealed copper  
Braid shieldLead free &  
heat resistant PVC  
(black)

## ◆ Overall Dia. 【Shielded type】/(Approx. mass)

unit : mm, (kg/km)

AWG (Size)	No. of core					
	2		3		4	
22 (0.3mm <sup>2</sup> )	●	7.2 (65)	●	7.6 (75)	●	8.2 (90)
20 (0.5mm <sup>2</sup> )	●	7.6 (70)	●	8.0 (85)	●	8.6 (100)
18 (0.75mm <sup>2</sup> )	●	8.1 (85)	●	8.6 (100)	●	9.3 (125)
16 (1.25mm <sup>2</sup> )	●	8.7 (100)	●	9.2 (125)	●	10.1 (155)
14 (2mm <sup>2</sup> )		9.5 (135)		10.1 (160)		11.0 (200)
12 (3.5mm <sup>2</sup> )		10.5 (165)		11.2 (210)		12.2 (260)
10 (5.5mm <sup>2</sup> )		11.8 (220)		12.6 (290)		13.8 (350)

- Note 1. Overall dia. of non-shielded cable is 0.6mm smaller than shielded one.  
 2. Core Identification : Page 8 See table 3  
 3. Unit length : 100m, ● : Stock item  
 4. Current carrying capacity : Page 9 see table 10.

**Color code**

Table 5 Core Identification

Core No.	Insulation color.
1	Black
2	White
3	Green (Yellow)
4	Red

Table 6 Core Identification

No. of core	Insulation color			
	No.1	No.2	No.3	No.4
4	Black	White	Red	Green
3	Black	White	Green	
2	Black	Red		

Note) Green(Yellow) : Green base with yellow stripe or spiral marking.

UL2464 : Spiral marking. Green coverage is 30-70%.

UL2586 : Stripe marking. 2 yellow lines. Green coverage is 30-70%.

## Current carrying capacity

The current carrying capacities are given by following tables. The following data is conditioned on single cable wiring in free air at ambient temperature 40degree C.

Table 7 Current carrying capacity of "FA-FLEX" cable for multi core type.

No. of core	Current carrying capacity [A]							
	28AWG (0.09mm <sup>2</sup> )	26AWG (0.15mm <sup>2</sup> )	25AWG (0.2mm <sup>2</sup> )	23AWG (0.3mm <sup>2</sup> )	20AWG (0.5mm <sup>2</sup> )	18AWG (0.75mm <sup>2</sup> )	16AWG (1.25mm <sup>2</sup> )	14AWG (2mm <sup>2</sup> )
2	3.5	4.6	5.4	6.9	9.6	13.0	17.4	23.4
3	3.0	3.8	4.5	5.8	8.1	11.0	14.7	19.8
4	2.6	3.4	4.0	5.2	7.3	9.9	13.2	17.9
5	2.4	3.2	3.7	4.7	6.7	9.1	12.3	16.6
6	2.3	3.0	2.5	4.5	6.4	8.6	11.3	15.8
7	2.2	2.8	3.3	4.2				
8	2.1	2.7	3.2	4.1				
9	2.0	2.6	3.1	4.0				
10	1.9	2.5	3.0	3.8				
12	1.8	2.4	2.8	3.7				
15	1.6	2.1	2.5	3.2				
20	1.5	1.9	2.3	2.9				

Table 8 Current carrying capacity of "FA-FLEX" cable for multi pair type.

No. of pair	Current carrying capacity [A]			
	28AWG (0.09mm <sup>2</sup> )	26AWG (0.15mm <sup>2</sup> )	25AWG (0.2mm <sup>2</sup> )	23AWG (0.3mm <sup>2</sup> )
2P	2.9	3.8	4.5	5.8
3P	2.4	3.2	3.8	4.8
4P	2.2	2.9	3.4	4.3
5P	2.0	2.7	3.1	4.0
6P	1.9	2.5	2.9	3.8
7P	1.8	2.4	2.8	3.6
8P	1.7	2.3	2.7	3.5
10P	1.6	2.2	2.5	3.3
12P	1.6	2.1	2.4	3.2
15P	1.4	1.8	2.2	2.8
18P	1.3	1.7	2.0	2.6
20P	1.3	1.7	2.0	2.5

Table 9 Current carrying capacity of "UL2464-SB" for fixed part.

AWG size	Current carrying capacity [A]		
	2 cores	3 cores	4 cores
24 (0.2mm <sup>2</sup> )	6.3	5.3	4.8
22 (0.3mm <sup>2</sup> )	8.0	6.9	6.2
20 (0.5mm <sup>2</sup> )	10.4	8.8	7.9
18 (0.75mm <sup>2</sup> )	13.7	11.7	10.5
16 (1.25mm <sup>2</sup> )	18.1	15.5	14.0
14 (2mm <sup>2</sup> )	24.7	21.4	19.3
12 (3.5mm <sup>2</sup> )	32.2	27.8	25.2
10 (5.5mm <sup>2</sup> )	43.1	37.3	33.7

Table 10 Current carrying capacity of "UL2586-SB" for fixed part.

AWG size	Current carrying capacity [A]		
	2 cores	3 cores	4 cores
22 (0.3mm <sup>2</sup> )	10.5	9.1	8.2
20 (0.5mm <sup>2</sup> )	13.4	11.7	10.5
18 (0.75mm <sup>2</sup> )	17.7	15.4	13.8
16 (1.25mm <sup>2</sup> )	23.2	20.1	18.2
14 (2mm <sup>2</sup> )	30.3	26.2	23.7
12 (3.5mm <sup>2</sup> )	39.5	34.2	30.9
10 (5.5mm <sup>2</sup> )	52.9	45.8	41.4

Note;

If many cables are bundled, current carrying capacity multiplied by adjustable factor;F as following table.

No. of bundled cables	1	2	3	4	5	6
Adjustable factor ; F	1.00	0.75	0.65	0.58	0.53	0.49