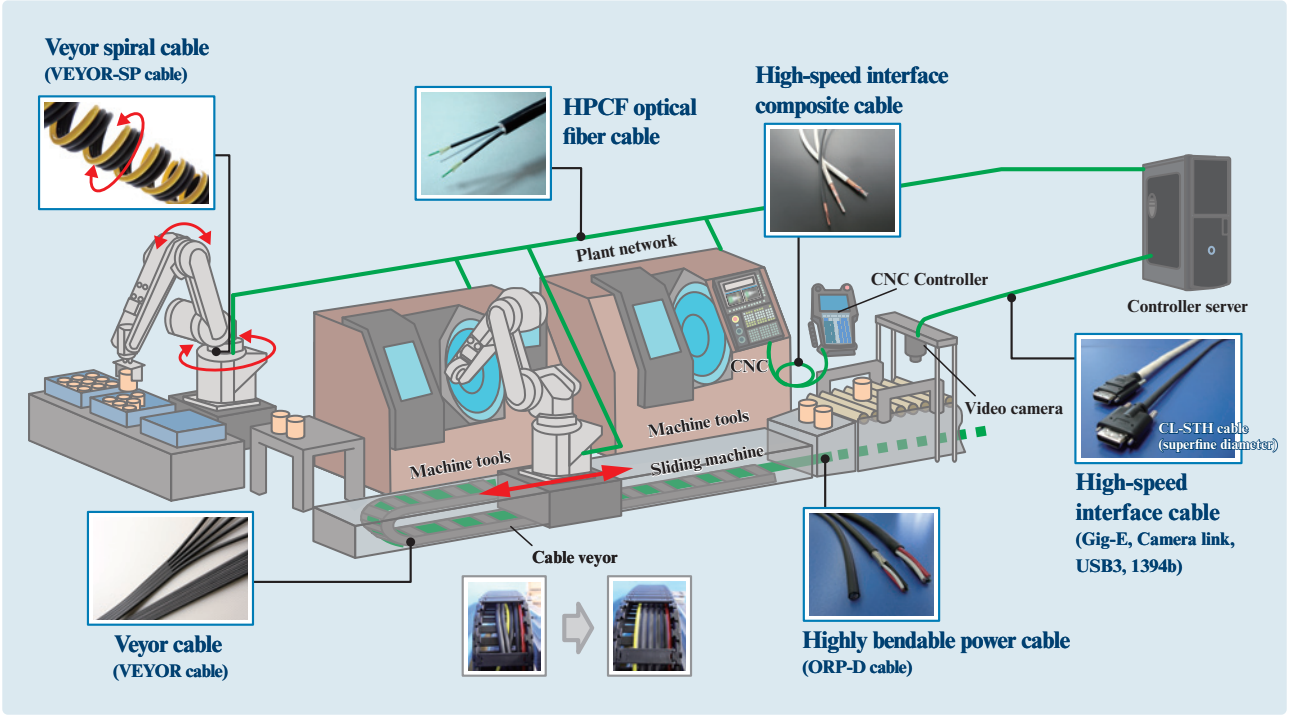
Selection guide for OKI robot cables and movable products

With excellent durability and noise resistance maintained.
Provided with excellent characteristics for supporting robot control.

Fully-prepared test environment for robots and moving applications.

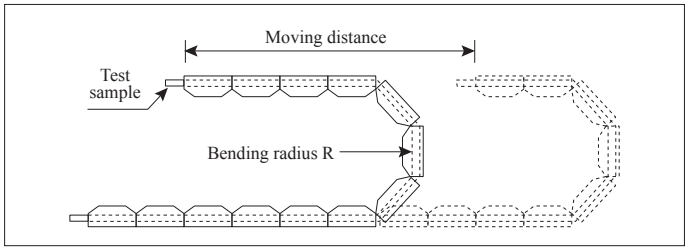
Oki Electric Cable conducts its unique in-house test on all motions of robot equipment including bending and twisting to check for high-quality signal transmission capability with almost no fluctuation in electrical characteristics as well as for no wire disconnection.

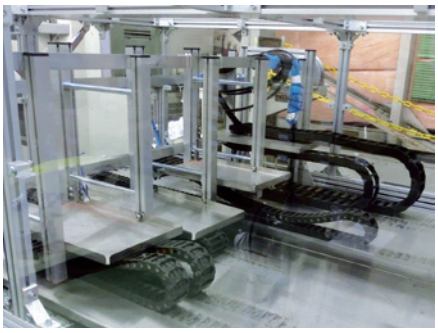


Technical data durability test of cables for moving parts

For cables for moving parts requiring high durability, Oki Electric Cable performs quality assessment through our specific durability tests.

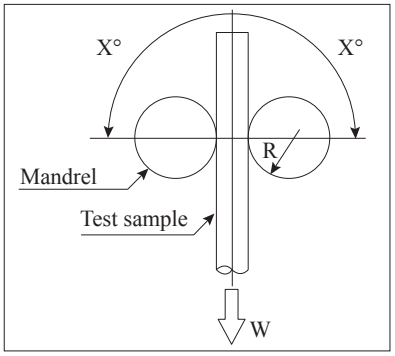
Example of sliding and bending test (cable bare)



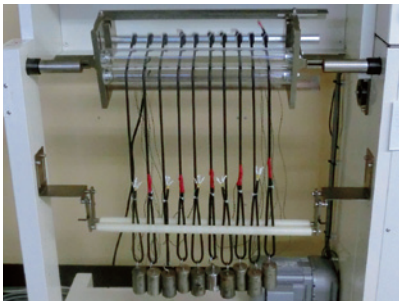


External dimension mm ϕ	30 or less	9 or less
Moving distance mm	1,500	350
Moving speed times/min.	15 (max.)	80 (max.)
Bending radius R mm	60 to 200	20 to 60
Count	One back and forth	

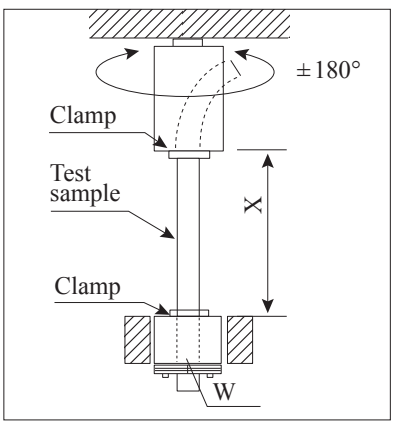
Example of swiveling and bending test



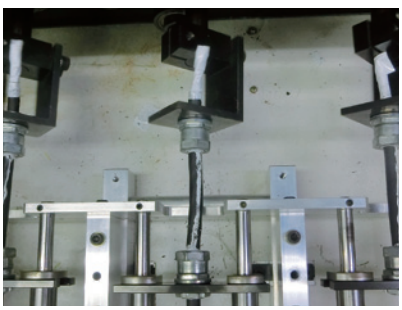
Bending radius R mm	10 to 50
Bending angle X degrees	±60, ±90
Bending speed times/min.	60 (max.)
Count	One back and forth



Example of twisting test



Twisted angle degrees	±180 (fixed)
Span X mm	300, 500
Twisting speed times/min.	15 (max.)
Count	One back and forth



Highly bendable robot cable

ORP cable series

Fixed | Torsion | Swinging bending | Sliding bending

UL 758 Style 2464 80˚C 300 V

Our unique special elastomer is used to insulate the core wire.
Suitable for all robot moving parts.

Features

- Available in a wide range of types (sliding, swinging, and twisting) for all robot movements.
- Excellent flexibility, which makes routing easier.
- Quick delivery available for your desired volume starting from 10 m (1 m units).

Specifications

Material/configuration

Conductor	Tin-plated, soft copper, twisting cable
Insulator	Special elastomer
Insulator identification	By (Table 1)
Shielding	Tin-plated, soft copper cable; braided
Sheath material (sheath color)	Oil-proof PVC (black matte)

Usage environment

Application	Fixed and moving parts between equipment and within equipment indoors
Operation temperature range	-10 to 80˚C

Line-up

Shielding	Twisted pair type
Without shielding	Conductor size: 0.2 to 0.5 sq. mm Number of pairs:1 to 20
With shielding	Conductor size: 0.2 to 0.5 sq. mm Number of pairs:1 to 20

Applicable standards

UL758 Style 2464 (Rating: 80˚C, 300 V)

Build-to-order manufacturing of UL listing (CL 3) standard-compliant products is available.

Sheath labeling

ORP □ SQ △△ OKI ELECTRIC CABLE AWM 2464 80C 300V VW-1

□ : Conductor cross-sectional area (mm^2) 0.2/0.3/0.5 △△ : Without shielding: No indication/With shielding: −SB

Special characteristics

Electrical performance

Conductor cross-sectional area	Conductor resistance Ω /km (20˚C)	Insulator resistance MΩ -km (20˚C)	Withstand voltage V·1 minute interval
0.2 sq. mm (AWG25)	105 or less	100 or more	AC 2000
0.3 sq. mm (AWG23)	72 or less	100 or more	AC 2000
0.5 sq. mm (AWG21)	44 or less	100 or more	AC 2000

Mobility

Mode	Performance	Test conditions
Sliding bending	100 million times or more	Bend radius R: about 6 times the outer diameter of the cable Sliding speed: 70 times per minute Movement distance: 350 mm
Swinging bending	20 million times or more	Bend radius R: about 8 times the outer diameter of the cable Bend angle: ±90° Bend speed: 40 times per minute Load: 4.9 N Count: one round trip is one count
Torsion	20 million times or more	Torsion angle: ±180° Torsion speed: 70 times per minute Interval X: 500 mm

Note. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Display of product name

- Without shielding: ORP (1) SQ × (2) P (2464)
- With shielding: ORP (1) SQ × (2) P (SB) (2464)

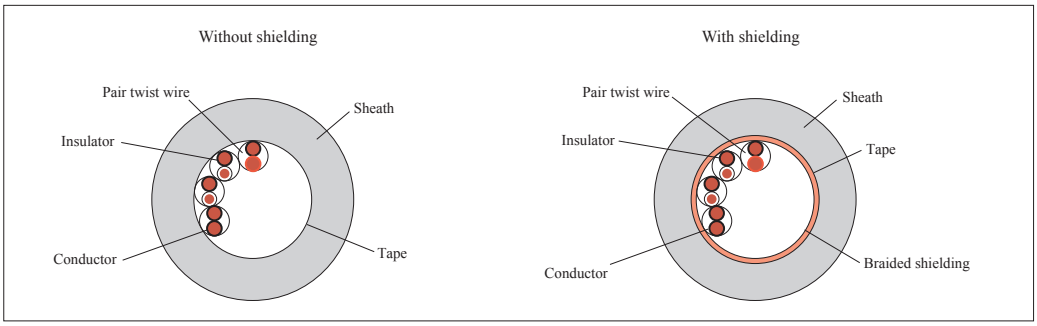
(1): Conductor sq. mm (mm^2) (2): Number of pairs
(See the chart below.)

Construction

Conductor			Core wire diameter mm	(2) Number of pairs	Without shielding		With shielding		Permitted electric current* A (30˚C)
(1) sq. mm	AWG size	Configuration			Outer diameter mm	Approximate weight kg/km	Outer diameter mm	Approximate weight kg/km	
0.2	25	40/0.08	1.0	1	3.9	19	4.4	26	4.0
				2	5.7	34	6.2	47	3.1
				3	6.2	43	6.7	56	2.7
				4	6.4	47	6.9	61	2.4
				5	7.2	59	7.7	77	2.2
				6	7.7	69	8.2	84	2.1
				8	8.8	90	9.3	110	1.9
				10	10.5	120	11.0	145	1.7
				15	11.0	145	11.5	170	1.5
				20	12.0	180	12.5	210	1.3
0.3	23	60/0.08	1.25	1	4.4	24	4.9	34	5.5
				2	6.6	45	7.1	60	4.3
				3	7.1	57	7.6	73	3.7
				4	7.9	71	8.4	89	3.3
				5	8.5	82	9.0	105	3.0
				6	9.3	98	9.8	125	2.8
				8	10.7	125	11.2	150	2.5
				10	12.2	155	12.7	185	2.4
				15	13.6	210	14.1	250	2.0
				20	15.2	260	15.7	300	1.8
0.5	21	100/0.08	1.5	1	5.0	32	5.5	46	7.8
				2	7.9	62	8.4	80	6.0
				3	8.5	84	9.0	110	5.2
				4	9.5	105	10.0	125	4.7
				5	10.6	125	11.1	150	4.3
				6	11.2	145	11.7	175	4.0
				8	13.4	195	13.9	230	3.6
				10	15.8	260	16.3	300	3.4
				15	16.7	320	17.2	360	2.9
				20	19.1	420	19.6	460	2.6

*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)



(Table 1) Wire-pair configuration table

Corresponding no.	Insulation body color	
	No.1 core wire	No.2 core wire
1	Blue	White
2	Yellow	Brown
3	Green	Black
4	Red	Gray
5	Purple	Orange
6	Blue	Brown
7	Yellow	Black
8	Green	Gray
9	Red	Orange
10	Purple	White

Corresponding no.	Insulation body color	
	No.1 core wire	No.2 core wire
11	Blue	Black
12	Yellow	Gray
13	Green	Orange
14	Red	White
15	Purple	Brown
16	Blue	Gray
17	Yellow	Orange
18	Green	White
19	Red	Brown
20	Purple	Black

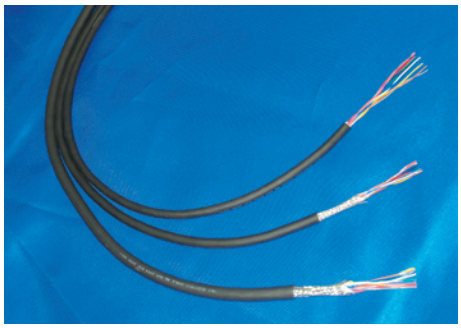
Small-diameter, highly bendable robot cable

ORP slim cable series

Fixed | Torsion | Swinging bending | Sliding bending

UL 758 Style 2464 80˚C 300 V

Designed as a small-diameter model of the ORP cable series.
Our unique special elastomer is used to insulate the core wire.
Suitable for all robot moving parts.



Features

- About 20% flatter than ORP cables.
- Available in a wide range of types (sliding, swinging, and twisting) for all robot movements.
- Excellent flexibility, which makes routing easier.
- Quick delivery available for your desired volume starting from 10 m (1 m units).

Specifications

Material/configuration

Conductor	Tin-plated, soft copper, twisting cable
Insulator	Special elastomer
Insulator identification	According to (Table 1) and (Table 2)
Shielding	Tin-plated, soft copper cable; braided
Sheath material (sheath color)	Oil-proof PVC (black matte)

Usage environment

Application	Fixed and moving parts between equipment and within equipment indoors
Operation temperature range	-10 to 80˚C

Line-up

Shielding	Twisted pair type	Layer-twisted type
Without shielding	Conductor size: 0.1 to 0.3 sq. mm Number of pairs: 1 to 10	Conductor size: 0.1 to 0.3 sq. mm Number of core wires: 3 to 10
With shielding	Conductor size: 0.1 to 0.3 sq. mm Number of pairs: 1 to 10	–

Applicable standards

UL758 Style 2464 (Rating: 80˚C, 300 V)

Build-to-order manufacturing of UL listing (CL 3) standard-compliant products is available.

Sheath labeling

ORP-SL □ SQ △△ OKI ELECTRIC CABLE AWM 2464 80C 300V VW-1 ####

□ : Conductor cross-sectional area (mm^2) 0.1/0.2/0.3 △△ : Without shielding: No indication/With shielding: −SB ####: Lot No.

Special characteristics

Electrical performance

Conductor cross-sectional area	Conductor resistance Ω/km (20˚C)	Insulator resistance MΩ-km (20˚C)	Withstand voltage V·1 minute interval
0.1 sq. mm (AWG28)	205 or less	100 or more	AC 2000
0.2 sq. mm (AWG25)	102 or less	100 or more	AC 2000
0.3 sq. mm (AWG23)	68 or less	100 or more	AC 2000

Mobility

Mode	Performance	Test conditions
Sliding bending	100 million times or more	Bend radius R: about 6 times the outer diameter of the cable Sliding speed: 70 times per minute Movement distance: 350 mm
Swinging bending	20 million times or more	Bend radius R: about 8 times the outer diameter of the cable Bend angle: ±90° Bend speed: 40 times per minute Load: 4.9 N Count: one round trip is one count
Torsion	20 million times or more	Torsion angle: ±180° Torsion speed: 70 times per minute Interval X: 500 mm

Note. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Twisted pair type

Display of product name

- Without shielding: ORP-SL (1) SQ × (2) P (2464)
- With shielding: ORP-SL (1) SQ × (2) P (SB) (2464)

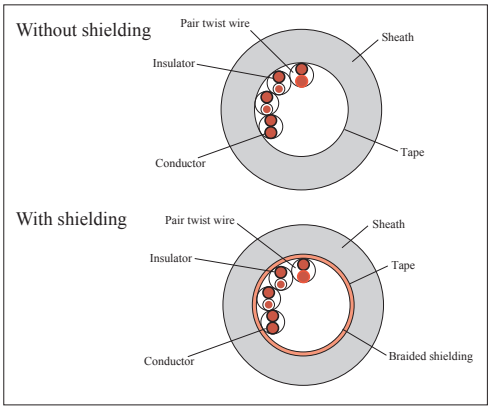
(1): Conductor sq. mm (mm^2) (2): Number of pairs
(See the chart below.)

Construction

Conductor			Core wire diameter mm	(2) Number of pairs	Without shielding		With shielding		Permitted electric current* A (30˚C)
(1) sq. mm	AWG size	Configuration			Outer diameter mm	Approximate weight kg/km	Outer diameter mm	Approximate weight kg/km	
0.1	28	49/0.05	0.74	1	3.3	13	3.8	21	2.4
				2	4.4	20	4.8	30	1.8
				3	4.7	23	5.1	34	1.6
				4	5.0	27	5.4	38	1.4
				5	5.3	32	5.7	43	1.3
				6	5.6	36	6.0	48	1.2
				7	5.6	39	6.0	50	1.2
				8	6.0	43	6.4	56	1.1
				10	6.6	52	7.0	66	1.0
0.2	25	102/0.05	0.93	1	3.7	17	4.2	25	3.8
				2	5.0	27	5.4	37	3.0
				3	5.3	34	5.7	45	2.6
				4	5.7	39	6.3	51	2.3
				5	6.1	47	6.5	60	2.1
				6	6.6	54	7.1	69	2.0
				7	6.6	58	7.1	73	1.9
				8	7.1	65	7.6	80	1.8
				10	7.8	80	8.2	97	1.7
0.3	23	108/0.06	1.09	1	4.0	20	4.4	28	5.2
				2	5.5	36	5.9	44	4.0
				3	5.9	42	6.4	54	3.5
				4	6.3	51	6.7	64	3.2
				5	6.9	61	7.3	76	2.9
				6	7.4	72	7.8	87	2.7
				7	7.4	78	7.8	94	2.5
				8	8.0	88	8.4	105	2.4
				10	8.8	110	9.2	130	2.3

*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)



(Table 1) Wire-pair configuration table

Corresponding no.	Insulation body color	
	No.1 core wire	No.2 core wire
1	Blue	White
2	Yellow	Brown
3	Green	Black
4	Red	Gray
5	Purple	Orange
6	Blue	Brown
7	Yellow	Black
8	Green	Gray
9	Red	Orange
10	Purple	White

Layer-twisted

Display of product name

- ORP-SL (1) SQ × (2) C (2464)

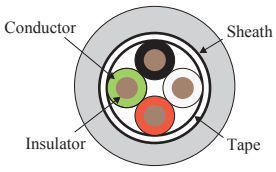
(1): Conductor sq. mm (mm^2) (2): Number of core wires
(See the chart below.)

Construction

Conductor			Core wire diameter mm	(2) Number of core wires	Outer diameter mm	Approximate weight kg/km	Permitted electric current* A (30˚C)
(1) sq. mm	AWG size	Configuration					
0.1	28	49/0.05	0.74	3	3.6	15	2.1
				4	3.8	17	1.8
				5	4.0	19	1.7
				6	4.2	22	1.6
				7	4.3	23	1.5
				8	4.4	25	1.4
				10	4.8	29	1.3
0.2	25	102/0.05	0.93	3	4.0	20	3.3
				4	4.2	23	3.0
				5	4.5	27	2.8
				6	4.8	31	2.6
				7	4.9	33	2.4
				8	5.1	37	2.3
				10	5.5	43	2.1
0.3	23	108/0.06	1.09	3	4.3	24	4.5
				4	4.6	29	4.0
				5	4.9	34	3.8
				6	5.3	39	3.5
				7	5.4	43	3.3
				8	5.6	48	3.2
				10	6.1	56	2.9

*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)



Note) Contact us regarding cables with shielding.

(Table 2) Core wire configuration table

Core wire no.	Insulator body color
1	Black
2	White
3	Red
4	Green
5	Yellow
6	Brown
7	Blue
8	Gray
9	Orange
10	Purple

Highly bendable robot cable for power sources

ORP-D cable series

Fixed | Torsion | Swinging bending | Sliding bending

UL 758 Style 2586 105˚C 600 V

Power/drive cable of the ORP cable series.
Supports a 600 V rating while having the small diameter of a 300 V rating product.

Features

- Employs our unique special elastomer insulation to balance both excellent mobility and low-cost.
- Supports a 600 V rating while having the small diameter of a 300 V rating product! Compatibility with standard 300 V rated cables is guaranteed.
- Because of their excellent flexibility and routing, optimal for small devices with limited mounting space and troublesome wiring.
- Quick delivery available for your desired volume starting from 10 m (1 m units).

Specifications

Material/configuration

Conductor	Tin-plated, soft copper, twisting cable
Insulator	Special elastomer
Insulator identification	By (Table 1)
Shielding	Tin-plated, soft copper cable; braided
Sheath material (sheath color)	Oil-proof PVC (black matte)

Usage environment

Application	Fixed and moving parts between equipment and within equipment indoors
Operation temperature range	-10 to 105˚C

Line-up

Shielding	Layer-twisted type
Without shielding	Conductor size: 0.5 to 5.5 sq. mm Number of core wires: 2 to 10
With shielding	Conductor size: 0.5 to 5.5 sq. mm Number of core wires: 2 to 10

Applicable standards

UL758 Style 2586 (Rating: 105˚C, 600 V)
Build-to-order manufacturing of UL listing (CL 3) standard-compliant products is available.

Sheath labeling

ORP-D □ SQ △△ OKI ELECTRIC CABLE AWM 2586 105C 600V VW-1 ####

□ : Conductor cross-sectional area (mm^2) 0.5/0.75/1.25/2/3.5/5.5 △△ : Without shielding: No indication/With shielding: −SB ####: Lot No.

Special characteristics

Electrical performance

Conductor cross-sectional area	Conductor resistance Ω /km (20˚C)	Insulator resistance MΩ -km (20˚C)	Withstand voltage V·1 minute interval
0.5 sq. mm (AWG21)	40 or less	100 or more	AC 2000
0.75 sq. mm (AWG19)	26 or less	100 or more	AC 2000
1.25 sq. mm (AWG17)	16 or less	100 or more	AC 2000
2 sq. mm (AWG15)	9.3 or less	100 or more	AC 2000
3.5 sq. mm (AWG12)	5.3 or less	100 or more	AC 2000
5.5 sq. mm (AWG10)	3.4 or less	100 or more	AC 2000

Mobility

Mode	Performance	Test conditions
Sliding bending	100 million times or more	Bend radius R: about 6 times the outer diameter of the cable Sliding speed: 70 times per minute Movement distance: 350 mm
Swinging bending	20 million times or more	Bend radius R: about 8 times the outer diameter of the cable Bend angle: ±90° Bend speed: 40 times per minute Load: 4.9 N Count: one round trip is one count
Torsion	20 million times or more	Torsion angle: ±180° Torsion speed: 70 times per minute Interval X: 500 mm

Note. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Display of product name

- Without shielding: ORP-D (1) SQ × (2) C (2586)
- With shielding: ORP-D (2) SQ × (2) C (SB) (2586)

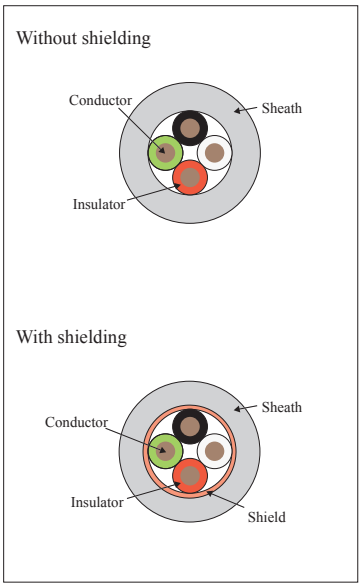
(1): Conductor sq. mm (mm^2) (2): Number of core wires
(See the chart below.)

Construction

Conductor			Core wire diameter mm	(2) Number of core wires	Without shielding		With shielding		Permitted electric current* A (30°C)
(1) sq. mm	AWG size	Configuration			Outer diameter mm	Approximate weight kg/km	Outer diameter mm	Approximate weight kg/km	
0.5	21	100/0.08	1.52	2	5.3	34	5.7	45	9.2
				3	5.5	41	5.9	53	8.0
				4	5.9	49	6.3	61	7.2
				5	6.3	58	6.7	72	6.7
				6	6.8	66	7.2	83	6.2
				8	8.0	90	8.4	110	5.6
				10	8.9	110	9.3	130	5.1
0.75	19	150/0.08	1.73	2	5.7	41	6.1	53	12.0
				3	5.9	51	6.3	62	10.5
				4	6.4	63	6.8	75	9.4
				5	6.9	74	7.3	88	8.7
				6	7.4	87	7.8	105	8.1
				8	8.8	120	9.3	145	7.3
				10	9.7	145	10.3	175	6.7
1.25	17	7/36/0.08	2.20	2	6.6	58	7.0	72	17.3
				3	7.0	75	7.4	89	15.1
				4	7.5	92	7.9	110	13.5
				5	8.1	110	8.7	135	12.6
				6	8.8	130	9.3	155	11.7
				8	10.5	180	11.1	210	10.6
				10	11.6	220	12.1	250	9.7
2	15	7/57/0.08	2.60	2	7.4	79	7.8	94	23.6
				3	7.8	105	8.2	120	20.6
				4	8.5	130	9.0	155	18.4
				5	9.2	155	9.7	185	17.2
				6	10.0	185	10.5	220	15.9
				8	12.0	250	12.5	290	14.4
				10	13.2	310	13.7	350	13.2
3.5	12	7/64/0.10	3.40	2	9.3	125	9.8	155	35.5
				3	9.8	165	10.3	195	30.9
				4	10.7	210	11.2	240	27.6
				5	11.9	270	12.4	280	25.8
				6	12.9	290	13.4	330	23.9
				8	15.5	430	16.0	470	21.6
				10	16.9	510	17.4	560	19.8
5.5	10	7/100/0.10	4.15	2	11.2	190	11.7	220	48.7
				3	11.8	250	12.3	280	42.4
				4	12.9	290	13.4	320	38.0
				5	14.3	390	14.8	430	35.4
				6	15.5	470	16.0	510	32.9
				8	18.6	620	19.1	670	29.7
				10	20.5	760	21.0	820	27.2

*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)



(Table 1) Core wire configuration table

Core wire no.	Insulator body color
1	Black
2	White
3	Red
4	Green
5	Yellow
6	Brown
7	Blue
8	Gray
9	Orange
10	Purple

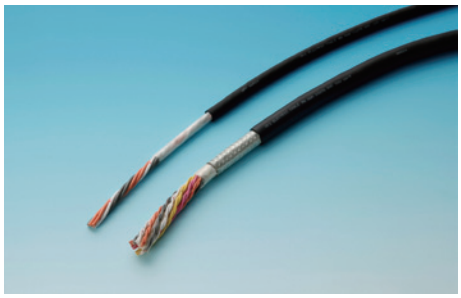
All-purpose robot cable

ORV cable series

Fixed
Swinging bending | Sliding bending

UL 758 Style 20276 80˚C 30 V

Using heat-resistant PVC to insulate the core wires makes them suitable for robot moving parts (excluding torsion).



Features

- Making the conductor a small-diameter wire improves the bending characteristics, which make this cable optimal for use in the moving parts of robots and other devices. (*Cannot be used for torsion load applications.)
- Oil-proof materials are used in the cable coating.
- Environmentally friendly. Compliant with the RoHS directive.

Specifications

Material/configuration

Conductor	Tin-plated, soft copper, twisting cable
Insulator	Heat-resistant PVC
Insulator identification	According to (Table 1) and (Table 2)
Shielding	Tin-plated, soft copper cable; braided
Sheath material (sheath color)	Oil-proof PVC (black matte)

Usage environment

Application	Fixed and moving parts between equipment and within equipment indoors
Operation temperature range	-10 to 80˚C

Line-up

Shielding	Twisted pair type	Layer-twisted type
Without shielding	–	Conductor size: 0.25 to 0.59 sq. mm Number of core wires: 2 to 40
With shielding	Conductor size: 0.25 to 0.59 sq. mm Number of pairs: 1 to 10	–

Applicable standards

UL758 Style 20276 (Rating: 80˚C, 30 V)

Sheath labeling

ORV AWG □ △△ OKI ELECTRIC CABLE AWM 20276 80C 30V VW-1

□ : Conductor size (AWG) 24/22/20 △△ : Without shielding: No indication/With shielding: −SV

Special characteristics

Electrical performance

Conductor cross-sectional area	Conductor resistance Ω/km (20˚C)	Insulator resistance MΩ-km (20˚C)	Withstand voltage V·1 minute interval
0.25 sq. mm (AWG24)	98 or less	10 or more	AC 500
0.35 sq. mm (AWG22)	63 or less	10 or more	AC 500
0.59 sq. mm (AWG20)	40 or less	10 or more	AC 500

Mobility

Mode	Performance	Test conditions
Sliding bending	10 million times or more	Bend radius R: about 6 times the outer diameter of the cable Sliding speed: 70 times per minute Movement distance: 350 mm
Swinging bending	10 million times or more	Bend radius R: about 8 times the outer diameter of the cable Bend angle: ±90° Bend speed: 40 times per minute Load: 4.9 N Count: one round trip is one count

Note. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Display of product name

- Multi-core cable without shielding: ORV-AWG (1) × (2) C (20276) (1): AWG size (2): Number of core wires (See the chart below.)
- Multi-pair cable with shielding: ORV-AWG (1) × (2) P (S) (20276) (1): AWG size (2): Number of pairs (See the chart below.)

Construction

Multi-core cable without shielding

Conductor			Core wire diameter mm	(2) Number of core wires	Outer diameter mm	Approximate weight kg/km	Permitted electric current* A (30˚C)
sq. mm	(1) AWG size	Configuration					
0.25	24	48/0.08	1.3	2	4.6	28	5.0
				3	4.9	29	4.3
				4	5.3	35	3.9
				5	5.9	41	3.6
				6	6.3	48	3.3
				8	7.2	60	3.0
				10	7.8	69	2.8
				12	7.8	76	2.6
				16	8.6	97	2.3
				20	9.7	105	2.2
				30	11.2	165	1.8
				40	12.8	220	1.6
0.35	22	72/0.08	1.5	2	5.0	29	6.5
				3	5.2	34	5.6
				4	5.6	42	5.0
				5	6.4	51	4.7
				6	6.8	59	4.4
				8	7.9	76	3.9
				10	8.5	87	3.6
				12	8.6	96	3.3
				16	9.4	125	3.0
				20	10.5	150	2.8
				30	12.2	220	2.4
				40	14.4	290	2.2
0.59	20	119/0.08	1.8	2	5.6	38	8.4
				3	5.9	47	7.3
				4	6.3	56	6.6
				5	7.2	69	6.1
				6	7.7	81	5.7
				8	9.0	105	5.1
				10	9.9	125	4.7
				12	9.9	140	4.4
				16	10.9	180	3.9
				20	12.9	230	3.7

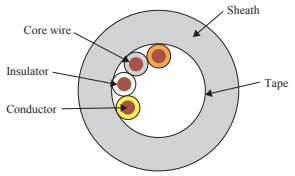
Multi-pair cable with shielding

Conductor			Core wire diameter mm	(2) Number of pairs	Outer diameter mm	Approximate weight kg/km	Permitted electric current* A (30˚C)
sq. mm	(1) AWG size	Configuration					
0.25	24	48/0.08	1.3	1	5.3	37	5.0
				2	6.4	56	3.9
				3	7.3	68	3.3
				4	7.9	80	3.0
				5	8.9	105	2.8
				6	9.5	120	2.6
				7	10.1	135	2.4
				8	11.1	155	2.3
				10	11.1	165	2.2
0.35	22	72/0.08	1.5	1	5.7	43	6.5
				2	6.8	64	5.0
				3	8.1	89	4.4
				4	8.7	105	3.9
				5	9.4	125	3.6
0.59	20	119/0.08	1.8	1	6.3	54	8.4
				2	7.7	85	6.6

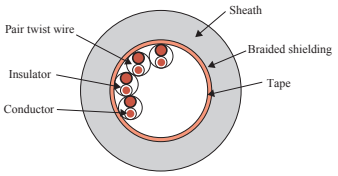
*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)

Multi-core cable without shielding



Multi-pair cable with shielding



(Table 1) Configuration of multi-core cable without shielding

Core wire no.	Insulator body color	1 pitch Dot mark	Dot mark color	Core wire no.	Insulator body color	1 pitch Dot mark	Dot mark color
1	Orange	-	Red	21	Orange	- - -	Red
2	Orange	-	Black	22	Orange	- - -	Black
3	Gray	-	Red	23	Gray	- - -	Red
4	Gray	-	Black	24	Gray	- - -	Black
5	White	-	Red	25	White	- - -	Red
6	White	-	Black	26	White	- - -	Black
7	Yellow	-	Red	27	Yellow	- - -	Red
8	Yellow	-	Black	28	Yellow	- - -	Black
9	Pink	-	Red	29	Pink	- - -	Red
10	Pink	-	Black	30	Pink	- - -	Black
11	Orange	- -	Red	31	Orange	- - - -	Red
12	Orange	- -	Black	32	Orange	- - - -	Black
13	Gray	- -	Red	33	Gray	- - - -	Red
14	Gray	- -	Black	34	Gray	- - - -	Black
15	White	- -	Red	35	White	- - - -	Red
16	White	- -	Black	36	White	- - - -	Black
17	Yellow	- -	Red	37	Yellow	- - - -	Red
18	Yellow	- -	Black	38	Yellow	- - - -	Black
19	Pink	- -	Red	39	Pink	- - - -	Red
20	Pink	- -	Black	40	Pink	- - - -	Black

(Table 2) Configuration of multi-pair cable with shielding

Corresponding no.	Insulator body color	1 pitch Dot mark	Dot mark color	
			No.1 core wire	No.2 core wire
1	Orange	-	Red	Black
2	Gray	-	Red	Black
3	White	-	Red	Black
4	Yellow	-	Red	Black
5	Pink	-	Red	Black
6	Orange	- -	Red	Black
7	Gray	- -	Red	Black
8	White	- -	Red	Black
9	Yellow	- -	Red	Black
10	Pink	- -	Red	Black

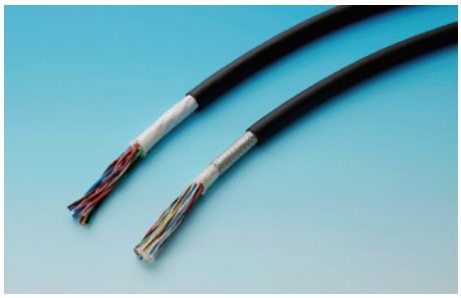
Heat-resistant, highly bendable robot cable

ORF cable series

Fixed | Torsion | Swinging bending | Sliding bending

UL 758 Style 2517 105˚C 300 V

Using fluorine material to insulate the core wires makes them suitable for all robot moving parts.



Features

- Making the conductor a small-diameter wire and using fluoride resin as the insulator improve the bending characteristics, which make this cable optimal for use in moving parts of robots and other devices.
- Oil-proof materials are used in the cable coating.
- Environmentally friendly. Compliant with the RoHS directive.

Specifications

Material/configuration

Conductor	Tin-plated, soft copper, twisting cable
Insulator	Fluorine resin
Insulator identification	By (Table 1)
Shielding	Tin-plated, soft copper cable; braided
Sheath material (sheath color)	Oil-proof PVC (black matte)

Usage environment

Application	Fixed and moving parts between equipment and within equipment indoors
Operation temperature range	-10 to 105˚C

Line-up

Shielding	Twisted pair type
Without shielding	Conductor size: 0.2 to 0.5 sq. mm Number of pairs: 1 to 20
With shielding	Conductor size: 0.2 to 0.5 sq. mm Number of pairs: 1 to 20

Applicable standards

UL758 Style 2517 (Rating: 105˚C, 300 V)

Sheath labeling

OKI ELECTRIC CABLE AWM 2517 105C 300V VW-1 ORF □ SQ △△

□ : Conductor cross-sectional area (mm^2) 0.2/0.3/0.5 △△ : Without shielding: No indication/With shielding: −SB

Special characteristics

Electrical performance

Conductor cross-sectional area	Conductor resistance Ω /km (20˚C)	Insulator resistance MΩ -km (20˚C)	Withstand voltage V·1 minute interval
0.2 sq. mm (AWG25)	105 or less	1500 or more	AC 2000
0.3 sq. mm (AWG23)	72 or less	1500 or more	AC 2000
0.5 sq. mm (AWG21)	44 or less	1500 or more	AC 2000

Mobility

Mode	Performance	Test conditions
Sliding bending	50 million times or more	Bend radius R: about 6 times the outer diameter of the cable Sliding speed: 70 times per minute Movement distance: 350 mm
Swinging bending	20 million times or more	Bend radius R: about 8 times the outer diameter of the cable Bend angle: ±90° Bend speed: 40 times per minute Load: 4.9 N Count: one round trip is one count
Torsion	20 million times or more	Torsion angle: ±180° Torsion speed: 70 times per minute Interval X: 500 mm

Note. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Display of product name

- Without shielding: ORF- (1) × (2) P (2517)
- With shielding: ORF- (1) × (2) P (SB) (2517)

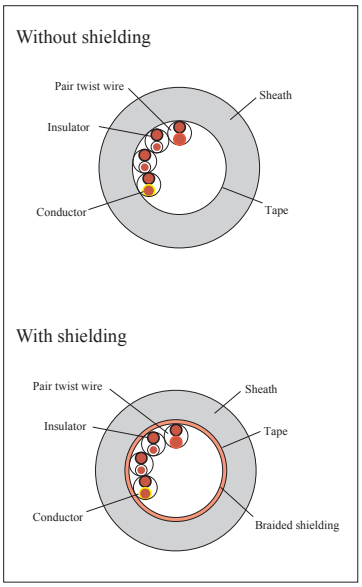
(1): Conductor sq. mm (mm^2) (2): Number of pairs
(See the chart below.)

Construction

Conductor			Core wire diameter mm	(2) Number of pairs	Without shielding		With shielding		Permitted electric current* A (30°C)
(1) sq. mm	AWG size	Configuration			Outer diameter mm	Approximate weight kg/km	Outer diameter mm	Approximate weight kg/km	
0.2	25	40/0.08	1.0	1	3.9	18	4.4	26	4.7
				2	5.7	34	6.2	46	3.7
				3	6.2	43	6.7	56	3.2
				4	6.4	47	6.9	61	2.9
				5	7.2	60	7.7	77	2.6
				6	7.7	70	8.2	85	2.4
				7	8.0	75	8.5	91	2.3
				8	8.8	89	9.3	110	2.2
				10	10.5	120	11.0	145	2.1
				12	11.5	135	12.0	175	1.9
				15	11.0	145	11.5	180	1.8
				20	12.0	190	12.5	220	1.6
0.3	23	3/20/0.08	1.3	1	4.5	24	5.0	34	6.6
				2	6.8	48	7.3	63	5.1
				3	7.3	58	7.8	74	4.4
				4	8.1	72	8.6	90	4.0
				5	8.7	86	9.2	110	3.6
				6	9.5	105	10.0	130	3.4
				7	10.0	110	10.5	135	3.2
				8	11.0	130	11.5	160	3.0
				10	12.5	170	13.0	210	2.9
				12	14.5	220	15.0	240	2.6
				15	14.0	230	14.5	270	2.4
				20	15.5	290	16.0	345	2.2
0.5	21	3/33/0.08	1.6	1	5.1	31	5.6	41	9.3
				2	7.9	64	8.4	83	7.3
				3	8.9	86	9.4	110	6.3
				4	9.8	110	10.5	140	5.7
				5	11.0	140	11.5	165	5.2
				6	11.5	150	12.5	195	4.8
				7	12.5	175	13.0	210	4.6
				8	13.5	200	14.0	240	4.3
				10	16.0	270	16.5	310	4.1
				12	17.5	290	18.0	340	3.7
				15	17.0	350	17.5	410	3.5
				20	19.5	460	20.0	510	3.1

*The permitted electric current value is calculated with a straight installation in air. It is not a guaranteed value.

Cross-section view (example)



(Table 1) Wire-pair configuration table

Corresponding no.	Insulation body color	
	No.1 core wire	No.2 core wire
1	Blue	White
2	Yellow	Brown
3	Green	Black
4	Red	Gray
5	Purple	Orange
6	Blue	Brown
7	Yellow	Black
8	Green	Gray
9	Red	Orange
10	Purple	White

Corresponding no.	Insulation body color	
	No.1 core wire	No.2 core wire
11	Blue	Black
12	Yellow	Gray
13	Green	Orange
14	Red	White
15	Purple	Brown
16	Blue	Gray
17	Yellow	Orange
18	Green	White
19	Red	Brown
20	Purple	Black

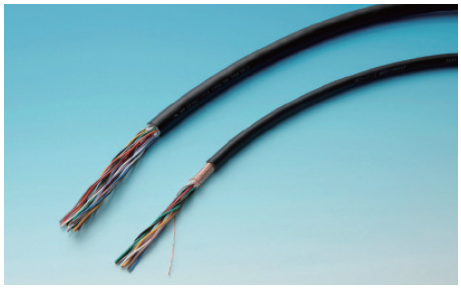
Super highly bendable robot cable

OR super cable

Fixed | Torsion | Swinging bending | Sliding bending

UL STYLE NO.21030 80˚C 300 V

Outline



- Super bending performance
  In order to greatly increase the bending performance, a newly developed special elastomer is used for the insulation.
  The excellent sliding performance, hardness, and toughness of this material realizes super bending performance which is one rank higher than that of a conventional high bending cable that uses fluorine-based insulation.
- Conductor
  The conductor uses a special copper alloy for improved bending resistance and twisting resistance.
- Sheath
  The sheath is made of polyurethane resin for improved wear resistance, mechanical toughness including resistance to exterior damage, and resistance to oil and chemicals. As a result, the cable is suitable for applications in the FA field where the working environmental conditions are severe.
- Braided shield
  A highly bendable type special shield material is used in order to improve the life of the shield. Also, this material is softer and more flexible than a general copper braided shield.
- Standards
  This cable uses a highly fire retardant polyurethane sheath, enabling it to be certified as conforming to the UL VW-1 fire retardant standard.

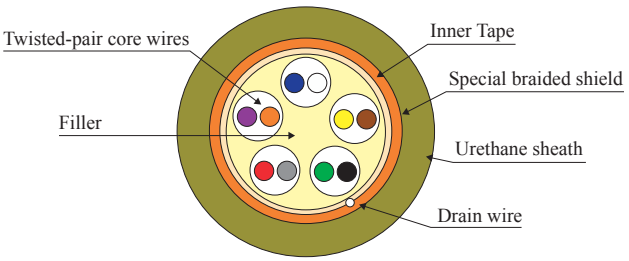
Applications

Used for many applications including industrial robots and automated machine tools, which require high bending resistance, twisting resistance, and sliding resistance.

Construction and order procedure

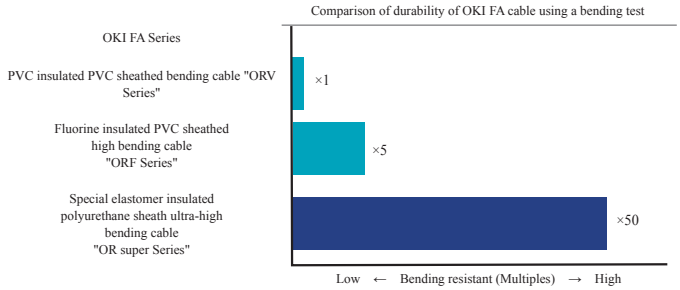
Core Numbers/Pair Numbers are requested upon order.

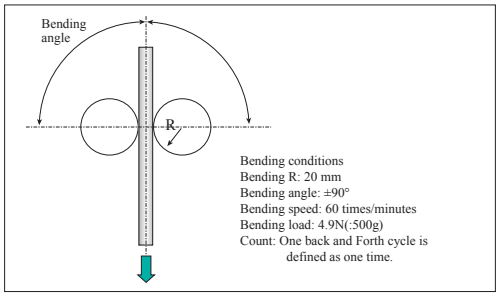
Core numbers/ Pair numbrs	Conductor	Shield
1.2.3.4.5.…10.20.…	AWG#25.#23.#21…	Yes/No



Remark:
The O.D. of the various types of cables that have a braided shield is 0.6mm larger than the corresponding types of cable that do not have a braided shield.If you wish to purchase cables of types other than those shown here, please contact our marketing department.

Bending performance





Wiring material for the wiring of moving parts inside devices

ORP-I series

Fixed | Swinging bending | Sliding bending

UL758 Style 11502 105˚C 600 V

These insulated wires feature a special elastomer insulator with proven performance track record in the "ORP Cable Series" and are suitable for the wiring of moving parts inside devices.

Features

- These wires are thinner than cables and allow a smaller bending radius, making them suitable for wiring in confined spaces.
- These wires use proprietary special elastomer insulator for excellent movability and excellent cost performance.
- These wires feature a small diameter while supporting 600 V rated voltage.
- Custom specifications including twisted pair cables, spiral processing and connector installation are also available based on customer requirements.

Specifications

Material/configuration

Conductor	Tin-plated annealed copper twisted-pair cables
Insulator	Special elastomer (Color: Red, Black, Blue, White, Yellow, Green, Yellow/Green with spiral mark)

Usage environment

Application	Fixed and moving parts indoor and inside devices
Operation temperature range	-10 to 105˚C

Applicable standards

UL758 Style 11502 (Rating: 105˚C, 600 V)

Note 1. UL-compliant but no surface printing.

Mobility

Mode	Performance	Test conditions
Swinging bending	1 million times or more	Bending radius R: Approx. 15-fold of outer insulation radius Bending angle: ±90° Load: 4.9 N Bend speed: 40 times per minute Count: one round trip is one count

Note 2. Under Oki test conditions and methods. For details, see page 3.
These values are for reference only and are not guaranteed values.

Line-up

Display of product name

- ORP-I (1) (11502) (2)

(1): Conductor sq. mm (mm^2)
(2): Insulator color symbol Red: R, Black:K, Blue:B, White:W, Gray: S, Green: G, Yellow/Green with spiral mark: Y/G

Construction

sq. mm	AWG size	Conductor configuration piece(s) / piece(s) / mm	Outer diameter of conductor mm	Outer diameter of insulator mm	Conductor resistance Ω /km (20˚C)	Insulator resistance MΩ-km (20˚C)	Withstand voltage V·1 minute interval	Approximate weight kg/km	Minimum bending radius* mm	Permitted electric current** A (30˚C)
0.2	25	40/0.08	0.58	1.00	98 or less	100	AC2000	3	6	6.3
0.3	23	60/0.08	0.75	1.25	66 or less			4	8	8.4
0.5	21	100/0.08	0.92	1.52	40 or less			7	9	12.0
0.75	19	150/0.08	1.13	1.73	26 or less			9	11	15.5
1.25	17	7/36/0.08	1.50	2.20	16 or less			15	13	22.5
2	15	7/57/0.08	1.90	2.60	9.3 or less			22	16	30.5
3.5	12	7/64/0.1	2.60	3.40	5.7 or less			38	21	46.0
5.5	10	7/100/0.1	3.35	4.15	3.6 or less			58	25	63.3

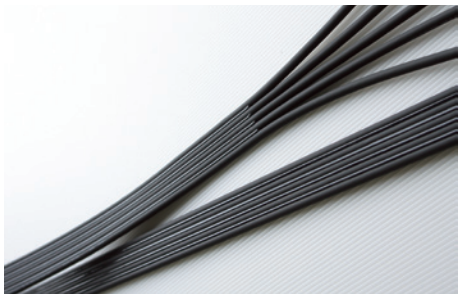
*The minimum bending radius is a recommended value to ensure safe operation.
**The allowable current is a value calculated based on midair single-cable wiring at ambient temperature of 30˚C, not a guaranteed value. When binding electrical wires, calculate the value using the following formula:
Allowable current value when bound (30˚C) = Allowable current value per wire (30˚C) × (the number of bound wires)$^{-0.3623}$

High-grade sliding parallel cable

VEYOR-CABLE

Fixed
Swinging bending
Sliding bending

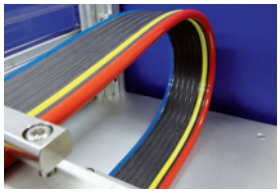
Adhering highly bendable robot cables in parallel gives this parallel cable both flexibility and excellent sliding durability.
In addition to cables, we support a wide range of manufacturing, including adhesion with air tubes and fiber optic cables.
We offer custom products to satisfy your demands.



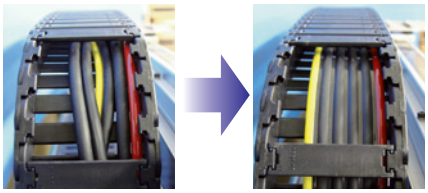
Features

- A special elastomer adhesive is used to offer both flexibility and toughness.
- Can be adhered cables with different outer diameters.
- Adhesion sections and non-adhesion sections are configurable in any size. Cable forking and bending during use is easy.
- We offer quick delivery for custom orders starting with a single cable.

Uses and application examples

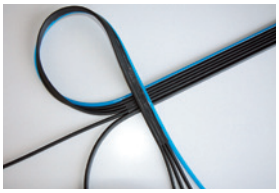


Carrier-less wiring



Wiring within cable carrier

Small space wiring of twisting shaft



Adjustable wiring to match the mounting environment

Specifications

Cable	According to your specifications. • Adhesion of cables with different outer diameters is available. • Cables with PVC and urethane coatings are available. • Support for combinations with tubes and optical fibers in place of cables is available.
Adhesive	Elastomer-type adhesive
Number of adhesions	Up to maximum width of 150 mm
Adhesion length mm	Maximum 5500 (Consult us separately for lengths exceeding this.)

Construction example

Information regarding short-term delivery and small lots

When you order from the following cable and tube combinations, we offer quick delivery starting from a single cable.

- ORP cable series
- ORP slim cable series
- ORP-D cable series
- SYM cable series
- C5E (S-HFR) series
- Urethane tube (dia. 4 to 10 mm) (black or blue)

Spiral cable

Fixed | Expansion/contraction | Torsion | Swinging bending

Processing movable cables and VEYOR cables into a spiral shape provides a wide range of usage scenarios, from use in flexible sections to twisting and bending uses. We offer custom support, from cable design in accordance with your demands to the processing of curl cords.

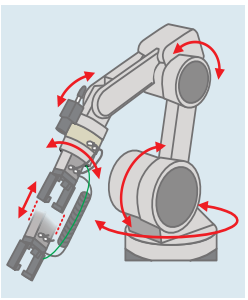
(VEYOR–CABLE processing example)

Features

- Can be mounted in small spaces of flexible sections, twisting sections, and bending sections of moving equipment.
- Using movable cable with excellent durability results in excellent durability.
- The strength of impact resilience can also be adjusted to meet your demands. Including cables, we offer specifications that match your purposes.
- Processing using adhesion-processed VEYOR-CABLE is also available.
- Support requests for terminal processing, such as attaching connectors, is also available.

Uses and application examples

- Flexible sections, twisting sections, and bending sections of industrial machines and robots.
- Measures to improve the movement durability of cables in flexible sections.



Specifications

Cable	According to your specifications. A range from robot cables to flexible cable and adhesion-processed VEYOR-CABLE of custom designs is also available.
Curl length mm	500 or less *Consult us for lengths exceeding 500.
Curl diameter mm	10 to 60 *Depends on the cable diameter and your desired flexibility strength.
Straight length m	Can be configured freely.

Construction example