

No.; SP05-31-91734

Date ; Mar. 7, 2005

SPECIFICATION

for

ETFE INSULATED PVC SHEATHED
FLEXIBLE CABLE FOR INDUSTRIAL ROBOTS

[Code : RBT 2-H/105(SB)]

Quantity _____

Your Ref. No. _____

Our Ref. No. _____

Signed by

Eizo Koishi

Eizo Koishi

Manager

*Electronic & Automotive products Group
Electric wires & cable production Div
Engineering Dept.*

Hitachi Cable, Ltd.

Issue and revision record

[illegible]

1. Scope

This specification covers ETFE Insulated heat resistant PVC sheathed flexible cable, which is reference to manufacturer's standard.

2. Rating

Voltage rating: Refer to each table, Temperature rating: 105°C

3. Construction and material

The construction and material of cable shall be in accordance with table 1 and figure 1.

Table 1

| Item | Characteristics |
|-----------------|---|
| Conductor | Stranded flexible conductor consisting of tinned annealed copper wires. |
| Insulation | ETFE Nominal thickness shall be shown in the. table 2. Ave. thickness : not less than 90% of the nominal thickness Min. thickness : not less than 80% of the nominal thickness |
| Identification | By the color of the insulation as shown in the figure 2. |
| Cabling | The core shall be cabled. Suitable binder shall be applied. Suitable fillers may be applied at manufacture's discretion, if necessary. |
| Shielding braid | Shielding braid shall consist of staple fiber and annealed copper wires. |
| Sheath | Black heat resistant PVC compound (Rated: 105°C) Nominal thickness shall be shown in the. table 2. Ave. thickness : not less than 90% of the nominal thickness Min. thickness : not less than 85% of the nominal thickness |
| Marking | Manufacture's name, year of manufacture and "RBT" shall be printed on the surface of sheath. |

4. Test

The following tests shall be performed prior to delivery.

- (1) Check of construction and dimension
- (2) High voltage test
- (3) Measurement of insulation resistance
- (4) Measurement of conductor resistance

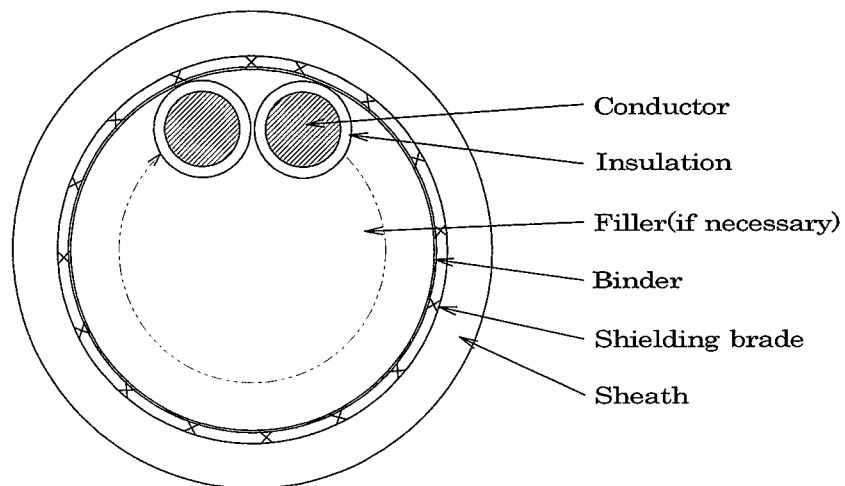


Figure 1. : Cross section of cable

Table 2.1 Dimensions and electrical properties(2~6 ×0.3 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|-------------------------------------|-----|-----|-----|-----|
| Rating | | — | 105℃, 60V | | | | |
| Number of core | | — | 2 | 3 | 4 | 5 | 6 |
| Conductor | Nominal cross-section area | mm ² | 0.3 | | | | |
| | Construction | No./mm | 60/0.08 | | | | |
| | Diameter(Approx.) | mm | 0.7 | | | | |
| Nominal thickness of insulation | | mm | 0.15 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Approx. diameter of completed cable | | mm | 4.8 | 5.0 | 5.3 | 5.6 | 5.9 |
| Approx. weight of completed cable | | kg/km | 30 | 35 | 40 | 46 | 55 |
| Max. conductor resistance(20℃) | | Ω/km | 67.8 | | | | |
| Test voltage | | — | To withstand A.C. 500V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 1 500 | | | | |

Table 2.2 Dimensions and electrical properties(8,10,12,16,20 ×0.3 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|-------------------------------------|-----|-----|-----|-----|
| Rating | | — | 105℃, 60V | | | | |
| Number of core | | — | 8 | 10 | 12 | 16 | 20 |
| Conductor | Nominal cross-section area | mm ² | 0.3 | | | | |
| | Construction | No./mm | 60/0.08 | | | | |
| | Diameter(Approx.) | mm | 0.7 | | | | |
| Nominal thickness of insulation | | mm | 0.15 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Approx. diameter of completed cable | | mm | 6.5 | 6.9 | 7.0 | 7.6 | 8.3 |
| Approx. weight of completed cable | | kg/km | 65 | 75 | 80 | 100 | 120 |
| Max. conductor resistance(20℃) | | Ω/km | 67.8 | | | | |
| Test voltage | | — | To withstand A.C. 500V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 1 500 | | | | |

Table 2.3 Dimensions and electrical properties(2~6 ×0.5 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|-----|-----|-----|-----|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 2 | 3 | 4 | 5 | 6 |
| Conductor | Nominal cross-section area | mm ² | 0.5 | | | | |
| | Construction | No./mm | 7/14/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.0 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 |
| Approx. diameter of completed cable | | mm | 6.5 | 6.8 | 7.3 | 7.8 | 8.6 |
| Approx. weight of completed cable | | kg/km | 55 | 65 | 75 | 90 | 105 |
| Max. conductor resistance(20℃) | | Ω/km | 42.3 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 500 | | | | |

Table 2.4 Dimensions and electrical properties(8,10,12,16,20 ×0.5 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|------|------|------|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 8 | 10 | 12 | 16 | 20 |
| Conductor | Nominal cross-section area | mm ² | 0.5 | | | | |
| | Construction | No./mm | 7/14/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.0 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.1 | 1.1 | 1.1 | 1.2 | 1.2 |
| Approx. diameter of completed cable | | mm | 9.8 | 10.5 | 11.0 | 12.0 | 13.5 |
| Approx. weight of completed cable | | kg/km | 130 | 150 | 170 | 215 | 255 |
| Max. conductor resistance(20℃) | | Ω/km | 42.3 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 500 | | | | |

Table 2.5 Dimensions and electrical properties(2~6 ×0.75 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|-----|-----|-----|-----|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 2 | 3 | 4 | 5 | 6 |
| Conductor | Nominal cross-section area | mm ² | 0.75 | | | | |
| | Construction | No./mm | 7/21/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.3 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.0 | 1.0 | 1.0 | 1.1 | 1.1 |
| Approx. diameter of completed cable | | mm | 6.9 | 7.3 | 7.9 | 8.7 | 9.3 |
| Approx. weight of completed cable | | kg/km | 65 | 75 | 90 | 110 | 130 |
| Max. conductor resistance(20℃) | | Ω/km | 28.2 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 000 | | | | |

Table 2.6 Dimensions and electrical properties(8,10,12,16,20 ×0.75 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|------|------|------|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 8 | 10 | 12 | 16 | 20 |
| Conductor | Nominal cross-section area | mm ² | 0.75 | | | | |
| | Construction | No./mm | 7/21/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.3 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.1 | 1.2 | 1.2 | 1.2 | 1.3 |
| Approx. diameter of completed cable | | mm | 11.0 | 11.5 | 12.0 | 13.0 | 14.5 |
| Approx. weight of completed cable | | kg/km | 165 | 195 | 215 | 270 | 335 |
| Max. conductor resistance(20℃) | | Ω/km | 28.2 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 000 | | | | |

Table 2.7 Dimensions and electrical properties(2~6 ×1.25 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|-----|-----|-----|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 2 | 3 | 4 | 5 | 6 |
| Conductor | Nominal cross-section area | mm ² | 1.25 | | | | |
| | Construction | No./mm | 7/36/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.7 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.0 | 1.0 | 1.1 | 1.1 | 1.1 |
| Approx. diameter of completed cable | | mm | 7.7 | 8.2 | 9.0 | 9.8 | 10.5 |
| Approx. weight of completed cable | | kg/km | 80 | 100 | 125 | 150 | 175 |
| Max. conductor resistance(20℃) | | Ω/km | 16.4 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 000 | | | | |

Table 2.8 Dimensions and electrical properties(8,10,12,16,20 ×1.25 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|------|------|------|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 8 | 10 | 12 | 16 | 20 |
| Conductor | Nominal cross-section area | mm ² | 1.25 | | | | |
| | Construction | No./mm | 7/36/0.08 | | | | |
| | Diameter(Approx.) | mm | 1.7 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | 0.4 |
| Nominal thickness of sheath | | mm | 1.2 | 1.2 | 1.2 | 1.3 | 1.4 |
| Approx. diameter of completed cable | | mm | 12.5 | 13.5 | 13.5 | 15.5 | 17.5 |
| Approx. weight of completed cable | | kg/km | 230 | 270 | 305 | 390 | 495 |
| Max. conductor resistance(20℃) | | Ω/km | 16.4 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 2 000 | | | | |

Table 2.9 Dimensions and electrical properties(2~6 ×2 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|-----|------|------|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 2 | 3 | 4 | 5 | 6 |
| Conductor | Nominal cross-section area | mm ² | 2 | | | | |
| | Construction | No./mm | 7/57/0.08 | | | | |
| | Diameter(Approx.) | mm | 2.1 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | | |
| Nominal thickness of sheath | | mm | 1.1 | 1.1 | 1.1 | 1.1 | 1.2 |
| Approx. diameter of completed cable | | mm | 8.8 | 9.3 | 10.5 | 11.0 | 12.0 |
| Approx. weight of completed cable | | kg/km | 110 | 135 | 170 | 200 | 240 |
| Max. conductor resistance(20℃) | | Ω/km | 10.4 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 1 500 | | | | |

Table 2.10 Dimensions and electrical properties(8,10,12,16,20 ×2 mm²)

[Code : RBT 2-H/105(SB)]

| Item | | Unit | Specified value | | | | |
|-------------------------------------|----------------------------|-----------------|--------------------------------------|------|------|------|------|
| Rating | | — | 105℃, 600V | | | | |
| Number of core | | — | 8 | 10 | 12 | 16 | 20 |
| Conductor | Nominal cross-section area | mm ² | 2 | | | | |
| | Construction | No./mm | 7/57/0.08 | | | | |
| | Diameter(Approx.) | mm | 2.1 | | | | |
| Nominal thickness of insulation | | mm | 0.4 | | | | |
| Thickness of shield(Approx.) | | mm | 0.3 | | | 0.4 | |
| Nominal thickness of sheath | | mm | 1.3 | 1.3 | 1.3 | 1.4 | 1.5 |
| Approx. diameter of completed cable | | mm | 14.5 | 15.0 | 15.5 | 17.5 | 19.5 |
| Approx. weight of completed cable | | kg/km | 320 | 370 | 425 | 560 | 690 |
| Max. conductor resistance(20℃) | | Ω/km | 10.4 | | | | |
| Test voltage | | — | To withstand A.C. 2000V for 1 minute | | | | |
| Min. insulation resistance(20℃) | | MΩ·km | 1 500 | | | | |

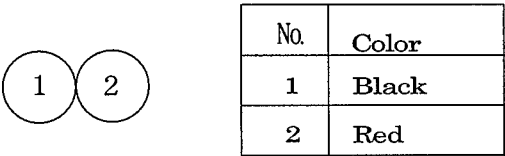


Figure 2.1 : Core identification for 2 cores

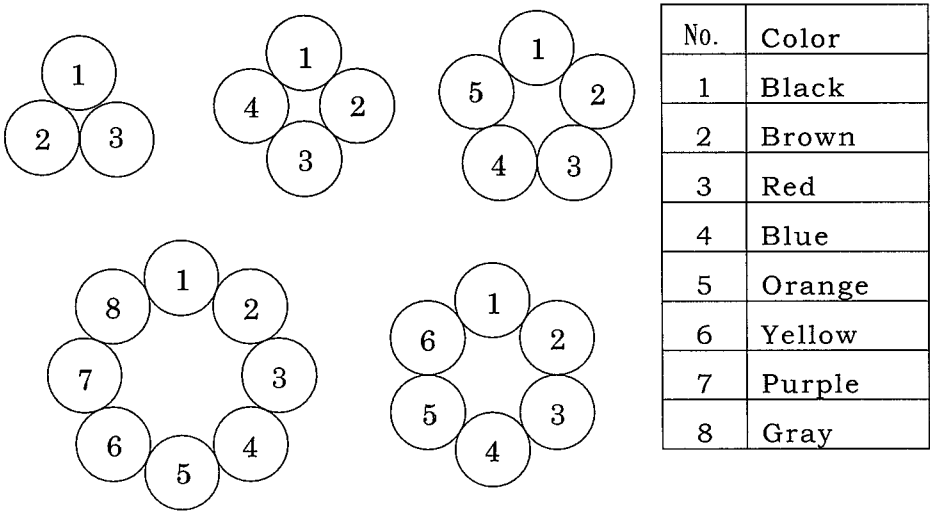


Figure 2.2. : Core identification for 3 ~ 8 cores

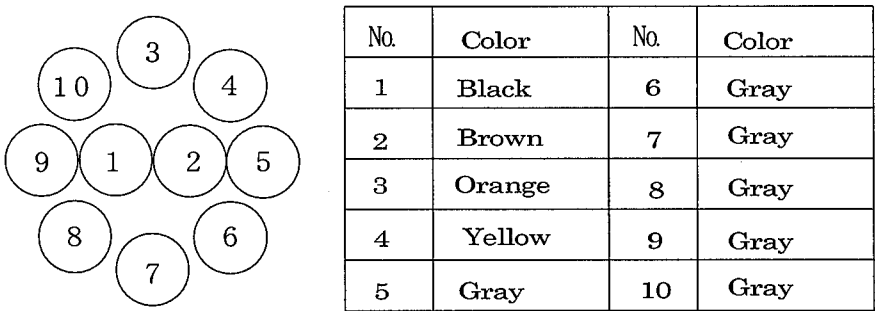


Figure 2.3. : Core identification for 10 cores

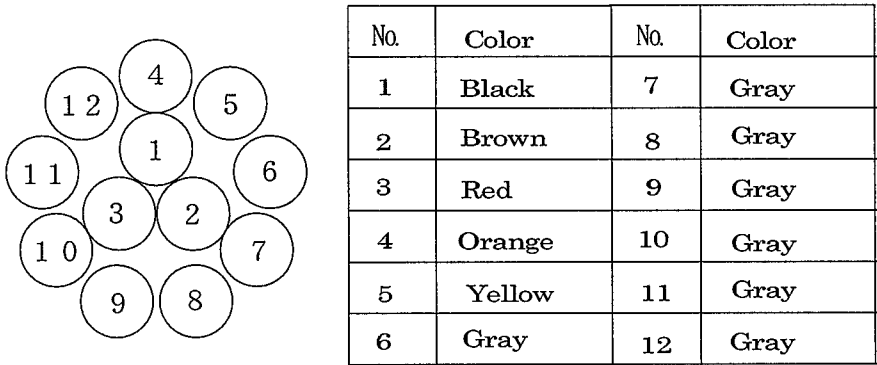
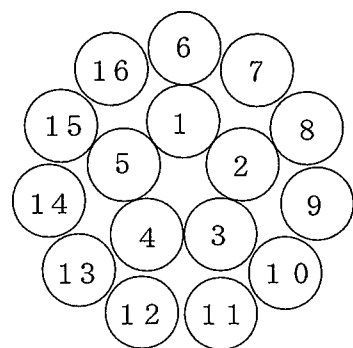
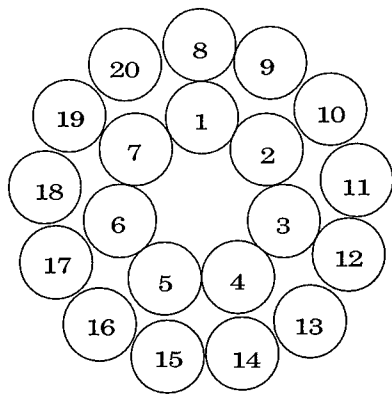


Figure 2.4. : Core identification for 12 cores



| No. | Color | No. | Color |
|-----|--------|-----|-------|
| 1 | Black | 9 | Gray |
| 2 | Brown | 10 | Gray |
| 3 | Red | 11 | Gray |
| 4 | Red | 12 | Gray |
| 5 | Red | 13 | Gray |
| 6 | Orange | 14 | Gray |
| 7 | Yellow | 15 | Gray |
| 8 | Gray | 16 | Gray |

Figure 2.5. : Core identification for 16 cores



| No. | Color | No. | Color |
|-----|--------|-----|-------|
| 1 | Black | 11 | Gray |
| 2 | Brown | 12 | Gray |
| 3 | Red | 13 | Gray |
| 4 | Red | 14 | Gray |
| 5 | Red | 15 | Gray |
| 6 | Red | 16 | Gray |
| 7 | Red | 17 | Gray |
| 8 | Orange | 18 | Gray |
| 9 | Yellow | 19 | Gray |
| 10 | Gray | 20 | Gray |

Figure 2.6. : Core identification for 20 cores