

No. HM-0159 (TCM-0-039)		Date issued: September 28, 2000
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Title Subject: SUR Connector		Date revised: November 21, 2003
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This manual describes control points about harness assembling operation for insulation displacement connector (IDC) of SUR connector by using JST's fully automatic insulation displacement (ID) machine.

Refer to handling manual of ID machine for smooth operation as well.

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Appendix:

IDC Manual No.: HM-0061 R9 (TCM-0-002)  
Method of Measuring Termination Depth by Dial Depth Gauge

IDC Manual No.: HM-0062 R9 (TCM-0-005)  
Method of Measuring Wire Retention Force

Report: OT-0588 (SP-00006)  
SUR Connector Harness Photos Defect Limit and Defective Samples

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## 1. Composition and Parts Identification

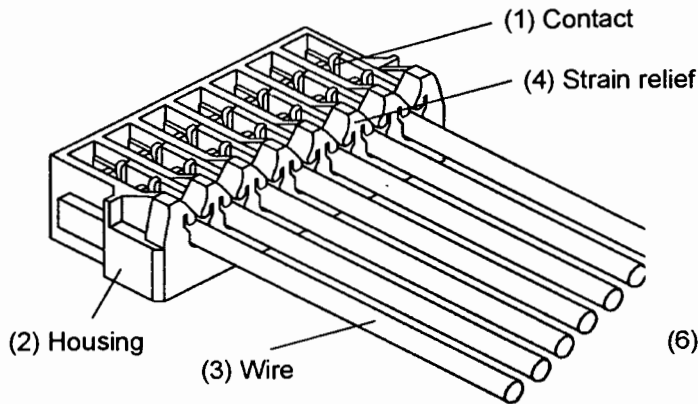


Fig.-1 SUR connector

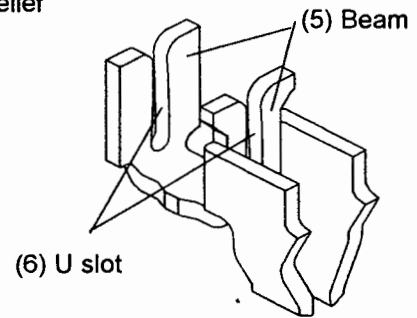


Fig.-2 Contact

- (4) Strain relief: ...Strain relief retains wire insulation to prevent from that external force loaded on wire affects U slot.
- (5) Beam: .....Two beams have an individual U slot construction.
- (6) U slot: .....It cuts wire insulation to contact with wire conductors electrically and mechanically.

## 2. Applicable Wire

### 2-1 Wire size, UL style and wire insulation outer diameter

Wire size	Material of insulation	Wire manufacturer	
		Sumitomo Electric Industries, Ltd.	Hitachi Cable, Ltd.
AWG #32	ETFE (Fluoroplastic)	UL1867 ( $\phi 0.38 \pm 0.02$ mm)	UL10064 ( $\phi 0.38 \pm 0.02$ mm)
	Halogen-free	UL10549 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)	UL10625 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)
AWG #36	Lead-free PVC	—	UL1571 ( $\phi 0.38 \pm 0.02$ mm)
	Halogen-free	UL10549 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)	UL10625 ( $\phi 0.38 \pm_{0.01}^{0.02}$ mm)

Note: Wire to be used should be checked for its applicability by JST.

2-2 Wire conductors:..... 7 stranded wire (Tin-plated copper alloy wire)

2-3 Packaging of wire: .... Wire is wound on P-10 bobbin, of JIS C3201 when automatic insulation displacement (ID) machine such as BCD-M5BP is used.

## 3. Applicable ID Tools

### 3-1 Hand press and pneumatic press

ID tools and model No.	ID applicator model No.
Hand press model No.: HPD-M2A	H2-SUR30ED-X
	H2A-SUR
Pneumatic press model No.: AP-2 and AP-2H	H2A-SUR

### 3-2 Automatic ID machine

Automatic high-speed multi-functional ID machine for discrete wires

Model No.: BCD-M5BP  
BCD-M5BE

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#### 4. Model Number, Housing Color and Applicable Wire Size

Model No.	Applicable wire
**SUR-32( )	AWG #32
**SUR-36( )	AWG #36

Note: No. of circuits in two-digit figure is indicated by asterisk. e.g.) 2 circuits.....02  
Housing color is indicated in parentheses: S.....Natural, L.....Lemon yellow

#### 5. Control Points of Terminating Operation

Check the following points to conduct an appropriate terminating operation.

##### 5-1 Check ID machine operates properly.

Refer to handling manual of ID machine before conducting an operation.

##### Main check points

##### ① Automatic ID machine

- Check operation sequence is normal.
- Check bowl-feeder and straight-chute run normal.
- Check wire tension is appropriate.
- Check wire measuring system operates accurately.
- Check connector set position is normal.

5-2 Check connector size fits to wire size.

5-3 Check wire color and wire length conform to drawing.

5-4 Check termination depth is applicable. (Refer to item 6 "Termination Depth.")

5-5 Check wire retention force satisfies specified value. (Refer to item 7 "Wire Retention Force.")

5-6 Check termination appearance is good. (Refer to item 8 "Termination Appearance.")

5-7 Check whether connectors with different circuit No. or wire size used in previous operation do not remain in bowl-feeder or straight-chute of automatic ID machine.

5-8 Conduct periodically cleaning, and remove wire chips and connector cutting residues.

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## 6. Termination Depth

Applicable termination depth is stated below.

### 6-1 Termination appearance

Wire position must be under the protrusion of strain relief of connector as shown in Fig.-3. Rigid condition of wire insulation and connector may cause wrinkle on wire insulation at strain relief part of connector as shown in Fig.-4. If wrinkle is found, check wire retention force referring to item 7 "Wire Retention Force." When measured wire retention force satisfies specified value mentioned in item 7, termination is good.

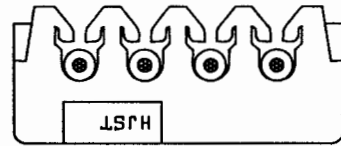


Fig.-3



Fig.-4 (Example of wrinkling)

### 6-2 Wire conditions at termination part (U slot part)

After termination, cut off diagonally shaded area (strain relief and housing wall) of housing as shown in Fig.-5 and pick up connector contact having terminated wire with pliers. Then, carefully take wire out of contact U slot, holding wire as shown in Fig.-6.

Check terminated part of wire at U slot. When termination is conducted properly, wire insulation at terminated part remains as shown in Fig.-7.

Note: Conduct observation right after taking wire out of U slots of contact without delay due to elasticity of wire insulation.

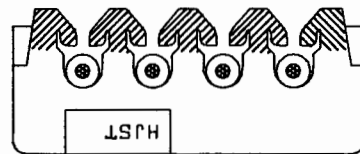


Fig.-5

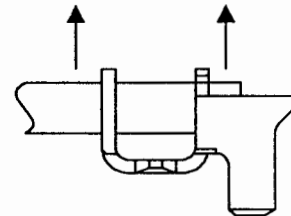


Fig.-6

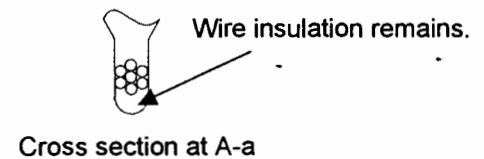
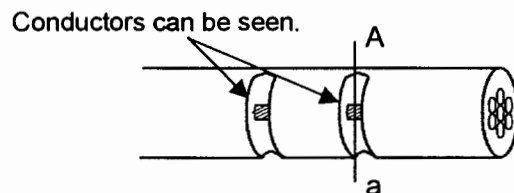


Fig.-7

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### 6-3 Termination depth dimension (Reference value)

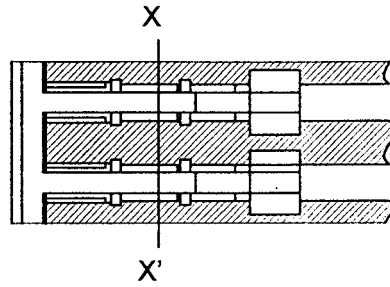


Fig.-8

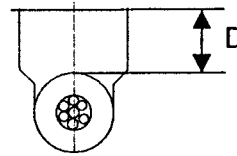


Fig.-9

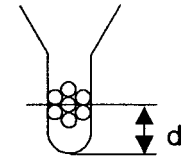


Fig.-10

Measure termination depth dimension "D" in Fig.-9 at X-X' part in Fig.-8, where is in the middle part of two U slots and a flattened part pressed by termination punch, and check it satisfies specified value in below table.

#### Termination depth dimension "D"

Wire size	Termination depth
AWG #32	0.37 $\pm_{0.02}^{0.03}$ mm
AWG #36	0.36 $\pm 0.04$ mm

Above table is applied when wire insulation outer diameter is as shown below.

Wire size	Material of insulation	Wire manufacturer	
		Sumitomo Electric Industries, Ltd.	Hitachi Cable, Ltd.
AWG #32	ETFE (Fluoroplastic)	UL1867 ( $\phi 0.38 \pm 0.02$ mm)	UL10064 ( $\phi 0.38 \pm 0.02$ mm)
	Halogen-free	UL10549 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)	UL10625 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)
AWG #36	Lead-free PVC	—	UL1571 ( $\phi 0.38 \pm 0.02$ mm)
	Halogen-free	UL10549 ( $\phi 0.39 \pm_{0.01}^{0.02}$ mm)	UL10625 ( $\phi 0.38 \pm_{0.01}^{0.02}$ mm)

Note: Contact JST for the use of UL style other than above mentioned.

Regarding measurement of termination depth dimension, refer to appendix IDC Manual No. HM-0061 R9 (TCM-0-002) "Method of Measuring Termination Depth by Dial Depth Gauge."

Termination depth dimension for ID connector is a similar control points to crimp height for crimp type connectors, but it is totally different in principle.

As crimp height of crimp type connector varies, a coefficient of deformation of wire conductors changes enormously, and electrical and mechanical connection to connector is much affected so that crimp height is one of important crimp operation control points.

On the other hand, U slot dimensions of ID connector varies as per wire size, and connection between wire conductors and connector is decided according to U slot dimension.

Therefore, control of termination depth dimension is to manage the position where wire conductors are located in U slot. This is the concept of termination depth dimensions.

The reason as a reference value for values of termination depth is that termination depth measuring the distance between surface levels of terminated wire insulation vinyl and connector housing is affected by hardness of wire to be used and its wire insulation outer diameter. Accordingly, a value of termination depth is a reference value not an absolute value.

Exact termination depth is to measure "d" between bottom of slot and position of center core wire of wire conductors as shown in Fig.-10; however, JST specifies termination depth dimension "D" in Fig.-9 instead of "d" by measuring conditions of wire conductors in U slot and wire retention force to facilitate a time-consuming work of measuring "d" as a daily control.

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### 6-4 Shallow termination depth.....Insufficient termination

When termination is insufficient,

- ① Wire insulation is not located under protrusions of strain relief as shown in Fig.-11 and Fig.-12.

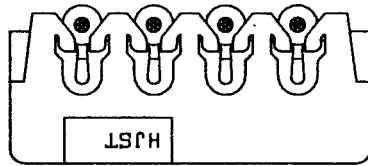


Fig.-11

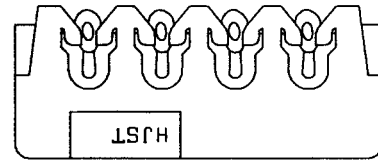
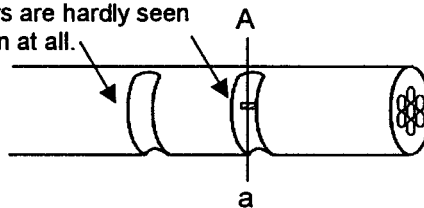


Fig.-12

- ② Wire conductors in U slot are hardly seen or not seen at all as shown in Fig.-13.

Conductors are hardly seen or not seen at all.



Cross section at A-a

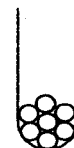
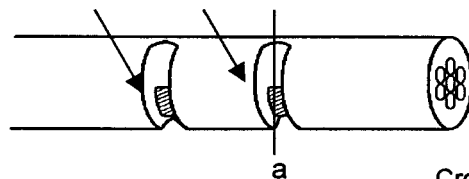
Fig.-13

### 6-5 Deep termination depth.....Excessive termination

When termination is excessive,

- ① Wire insulation is cut at the bottom of U slot and wire conductors are seen as shown in Fig.-14.
- ② Punching flaws caused by termination punch appear on flange of housing as shown in Fig.-15.

Wire insulation is cut and wire conductors are seen. A



Cross section at A-a

Punching flaws

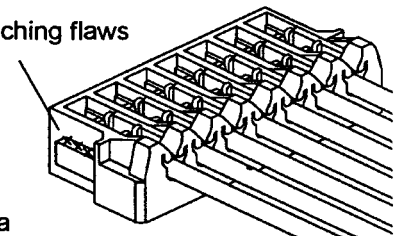


Fig.-14

Fig.-15

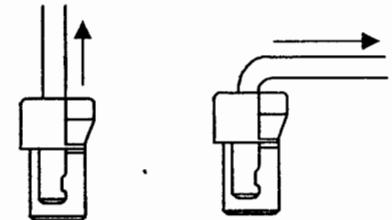
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## 7. Wire Retention Force

Pull termination wire one by one in the direction of arrow in Fig.-16 and measure force by a push-pull gauge, etc. when wire comes off contact. (Wire retention force)  
Then, check that measured wire retention force satisfies value specified in below table.

Refer to appendix manual No. HM-0062 R9 (TCM-0-005) "Method of Measuring Wire Retention Force" for how to measure wire retention force.

Wire size	Material of insulation	Parallel direction	Perpendicular direction
AWG #32	ETFE	6N min.	2N min.
	Halogen-free	6N min.	1.5N min.
AEG #36	Lead-free PVC	4N min.	1.5N min.
	Halogen-free	4N min.	1.5N min.



Parallel

Perpendicular

Fig.-16

## 8. Termination Appearance

Inspect the following points after termination.

8-1 Punching flaws on housing caused by termination punch.....Housing must be free from flaws.  
When connector set position deviates to pitch direction, scratches and deformation caused by termination punch may appear at the "XXX" marked area of housing as shown in Fig.-17.

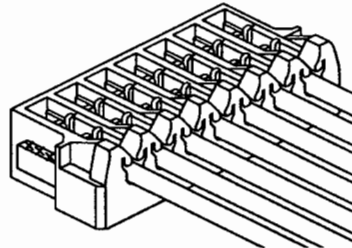


Fig.-17

8-2 Flaws and deformation at beams of contact.....Beams must be free from flaws and deformation.  
When connector set position deviates to wire axis direction, scratches and deformation caused by termination punch may appear at beams of contact as shown in Fig.-18.  
In this case, not only contact but also termination die may be damaged.

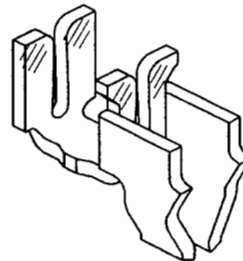


Fig.-18

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8-3 Exposure of wire conductors around beams of contact.....Wire conductors must not be exposed. When connector set position deviates to wire axis direction, wire conductors may expose in front or back of beams of contact as shown in Fig.-19. However, as special wire with thin insulation is used, wire conductors may slightly expose even if connector is set properly, therefore, refer to attached defect limit.

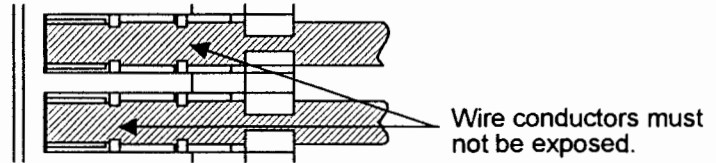


Fig.-19

8-4 Gap between housing wall and wire tip (Wire protruding length)  
Gap "G" between housing wall and wire tip in Fig.-20 should be 0.2 mm max.

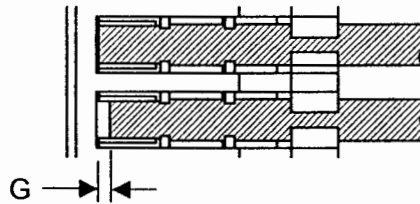
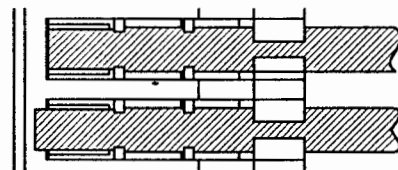


Fig.-20

8-5 Overrun of wire.....Wire must not overrun.  
When wire tension is not adequate, overrun of wire may appear as shown in Fig.-21.



Wire overruns from this end surface: Defective

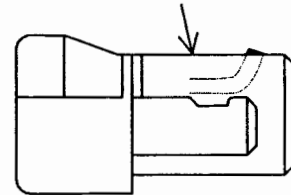


Fig.-21

8-6 Deviation of insulation displacement center.....Deviation of insulation displacement center must not happen.

When connector set position or wire deviates to pitch direction, termination punch, wire and U slots do not align so that insulation displacement center deviate as shown in Fig.-22 and Fig.-23.

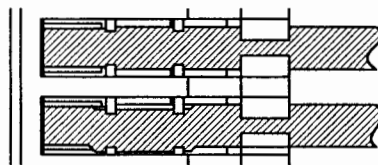
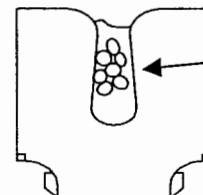


Fig.-22



Wire conductors do not contact with the right side of U slot.

Fig.-23



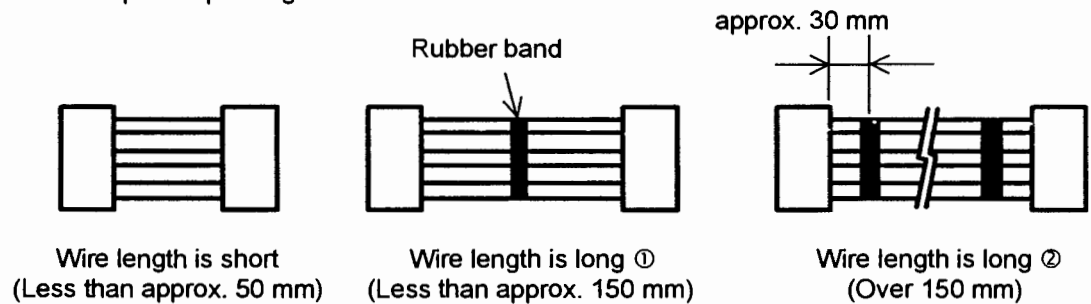
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## 9. Packing and Labeling

### 9-1 Packing method

- ① When wire length is long,  
Bundle harnesses with a rubber band per unit quantity (example: 50 sets, 100 sets) to prevent them from getting entangled with each other, and put it in a carton box.  
(Bundle them with rubber band approx. 30 mm away from connector.)  
Harness should be packed in a small box to prevent from damage, etc.
- ② When wire length is short,  
Package harnesses in a small box per unit quantity and then put small boxes in a carton box.  
Harness should be packed in a small box with cushion sheet, etc. to prevent from damage, and so on.

- Examples of packing



### 9-2 Labeling

Conduct the following labeling on a small box and a carton box respectively according to agreement with each customer about labeling.

- Example:
- ① Harness model No.
  - ② Quantity
  - ③ Product lot No.
  - ④ Manufactured date

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## 10. Harness Inspection

Inspect the following points.

Inspection points	Inspection method	Requirements
(1) • Harness dimensions • Wire strip length	• Verification with drawings • Caliper (or a scale)	• Satisfy drawing dimensions.
(2) Wire to be used • Wire color • Wire size • UL style, etc.	• Verification with drawings • Visual inspection	• Wire colors conform to drawings. • Wire size and UL style conform to drawings.
(3) Termination depth • Wire conditions • Termination depth dimensions	See item 6 Termination Depth	Termination depth dimension "D"
(4) Wire retention force	See item 7 Wire Retention Force	Satisfy specified value stated in Table of item 7 Wire Retention Force.
(5) Punching flaws on housing caused by termination punch.	Observe terminated housing visually or by stereomicroscope. See item 8-1 Punching flaws on housing caused by termination punch.	Housing must be free from punching flaws caused by termination punch.
(6) Flaws and deformation at beams of contact.	Observe terminated contact beam visually or by stereomicroscope. See item 8-2 Flaws and deformation at beams of contact.	Contact beams must be free from scratches and deformation.
(7) Wire conductors expose around contact beams.	Observe conditions of wire conductors around contact beams visually or by stereomicroscope. See item 8-3 Exposure of wire conductors around beams of contact.	Wire conductors must not be exposed.
(8) Gap between housing wall and wire tip	Measure by a gauge, projector. See item 8-4 Gap between housing wall and wire tip.	Gap: 0.2 mm max.
(9) Overrun of wire	Observe wire tip visually or by stereomicroscope. See item 8-5 Overrun of wire.	Wire must not overrun.
(10) Deviation of insulation displacement center	Observe terminated wire visually or by stereomicroscope. See item 8-6 Deviation of insulation displacement center.	See attached report of defect limit and defective samples.

Refer to attached report No. OT-0588 "SUR Connector Harness Photos Defect Limit and Defective Samples."

## 11. Other Precautions

Be sure to conduct termination operation under the condition that wire is set in all circuits. When even one wire is not set and termination is conducted, such condition affects the adjacent circuits, so that strain relief may break.

If wire omitted condition is necessary (i.e. pin omitted condition of crimping connector), cut wire of relevant circuit after terminating all circuits.