FERROFLEX BELT SPLICE PROCEDURE

INSTRUCTIONS FOR

HOT SPLICING

OF FERROFLEX BELTING

HIGH TENSION FINGERSPLICE

Version

2.1

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1. INTRODUCTION

In this splicing instruction we trust that the knowledge of outlining and cleaning the belt is common to the splicer. However we have to take notice that the Ferroflex belt is only to be cleaned with benzine.

This splice instruction applies to Ferroflex belts of quality RA, RE, RS, Betahete, BVX, ROS and Deltahete. For Ferroflex ROS quality first read the special ROS instructions on page 11.

When in doubt, please contact our Application Engineering Department on +31 (0) 512 585 555.

2. MATERIALS

Because the splice is the weakest spot in a conveyor belt, it is essential to make the splice with greatest possible accuracy. This can be best achieved by making the splice using the correct materials and by following the step by step procedures as described in this document.

The following names are used for the splicing materials:

Dundisol:	Solution to enhance tack	black liquid
Dunlofol:	Unvulcanised adhesion (skim) rubber	sheet
Insertion strips:	Reinforced unvulcanised adhesion (skim) rubber	strips
Duncover:	Unvulcanised cover rubber	sheet

Additional instructions and/or materials may be provided separately for specific belt types/constructions.

All splicing materials have a limited shelf life. Splice material past its expiry date should not be used. Each component of the splice kit is marked with an expiry date. These dates should always be checked prior to commencing splicing.

Splice kits stored at ambient temperature of approx. 20°C have a shelf life as indicated by the expiry date. Splice kits should be kept in a cold room below 10°C for an extended shelf life.

3. VULCANISATION REQUIREMENTS AND TOOLS

The first step in making a good quality splice is preparing the work area so that it is efficient, well lit, clean and adequately protected. Outside installations should be protected by a shelter against adverse weather conditions. Inside installations should be cleaned of excessive dust (especially overhead), have good lighting and protected against dripping water.

The edges of the platen must be parallel to the direction of the belt run travel.

A splicing table extending at least 2m from each end of the bottom platen and 25mm wider than the belt should be constructed. In addition, a separate table of sufficient size should be constructed on which to prepare the rubber splice components. The splicing table must be level or 5mm lower than the platen surface.

The vulcanising press must be large enough to cure the splice in one heat with a minimum 100mm overlap onto the original belt cover at each end of the splice and should be 100mm wider than the belt width.

For multi platen vulcanising presses, use two solid platens to cover the entire area top and bottom with a minimum overlap of 50mm on each end.

The vulcanising press must be capable of a curing pressure on the belt surface of 6 - 10 bar (87 - 145psi).

The curing temperature must be accurately controlled between 150ºC and 155ºC (300ºF and 310ºF) except for the Deltahete quality. The curing temperature for Deltahete belting is between 155ºC and 160ºC (310ºF and 320ºF). The curing temperature must be accurately controlled over the whole platen area to +/-5ºC during heating and curing. For this reason, vulcanising presses with thermostats must be carefully checked for functionality and monitored continuously with thermocouples to ensure they are operating properly. The thermocouples should be strategically placed over the surface of both top and bottom platens. Over cure and/or under cure do not provide sufficiently strong splices. The curing time starts when a temperature of 150ºC is reached or 155ºC for Deltahete.

Refer to table 2 for vulcanising times.

SUGGESTED TOOLS:

- press: length: splice length + 200 mm
  width: belt width + 100 mm to accommodate belt and edge bars
  pressure: 6 - 10 bar
  temperature: minimum 150°C (155°C for Deltahete), preferably with forced cooling
- three wooden work boards, of at least 2 m long and width adjusted to belt width
- 4 U-clamps to fix the belt to the boards
- chalk cord for aligning purposes
- 2 edge bars: length: splice length +0.6m, width: 100 mm, thickness: 0.8-1.5 mm below belt thickness
- 2 sash-clamps to tension the edge bars firmly to the belt edges
- oscillating knife (Fein or similar) to remove the cover
- sharpening tool for knives
- Stanley knives
- cord cutter / nibbler
- flat roller and stitch roller
- grinding tool with variable speed
- pinchers to remove cover
- thickness gauge
- two thermometers with gauges to insert between belt and heating plate
- two thermometers to measure temperature inside heating plates

4. BELT PREPARATION

In figure 1 you will find a schematic drawing of the building of the splice, the dimensions corresponding to the letters are found in table 1.

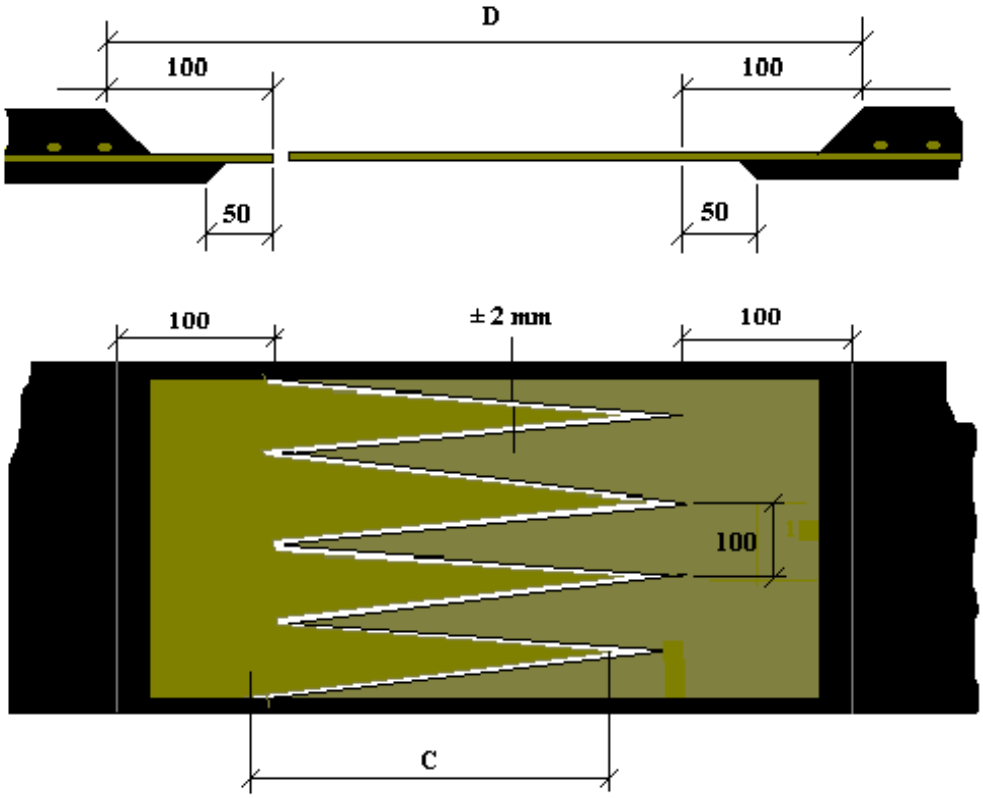

Figure 1: Schematic drawing of the building of the splice. Dimensions in mm.

- Cut the belt end perpendicular.
- Cut the top cover under an angle of 45º at distance A of the belt end.
- Remove the top cover (including transversal cords) over a length A (see table 1 and figure 2).
- Cut the bottom cover under an angle of 45º at distance B of the belt end.
- Remove the bottom cover (if applicable, including transversal cords) over a length B (see table 1 and figure 2).
- Draw the fingers on the belt end, according table 1 and fig. 1, starting on the centreline of the belt. Note: Make sure that the outside fingers trail in the direction of belt travel.
- Cut the fingers .
- Buff the skimmed belt ends on top and bottom about 30 mm over the 45º- angle cut, to provide a good adhesion of the rubber to the steel cords, the brass-coating of the steel cords is not allowed to be damaged.
- Brush the belt end and apply a single thin layer of solution.

  Please take notice of the following differences with Ferroflex belts in Deltahete quality:
  - Make sure that the solution **never** touches the existing cover rubber.
  - Apply a single layer solution **as thin as possible**.

- Prepare the other belt end the same way. Make sure the fingers of both belt ends match each other.

Belt type	A Top cover (mm)	B Bottom cover (mm)	C Finger length (mm)	D Approx. splice length (mm)
F 500	500	450	400	650
F 630	600	550	500	760
F 800	730	680	630	900
F 1000	900	850	800	1070
F 1250	1100	1050	1000	1280
F 1600	1350	1300	1250	1550
F 2000	1700	1650	1600	1900

Table 1: Splice dimensions.

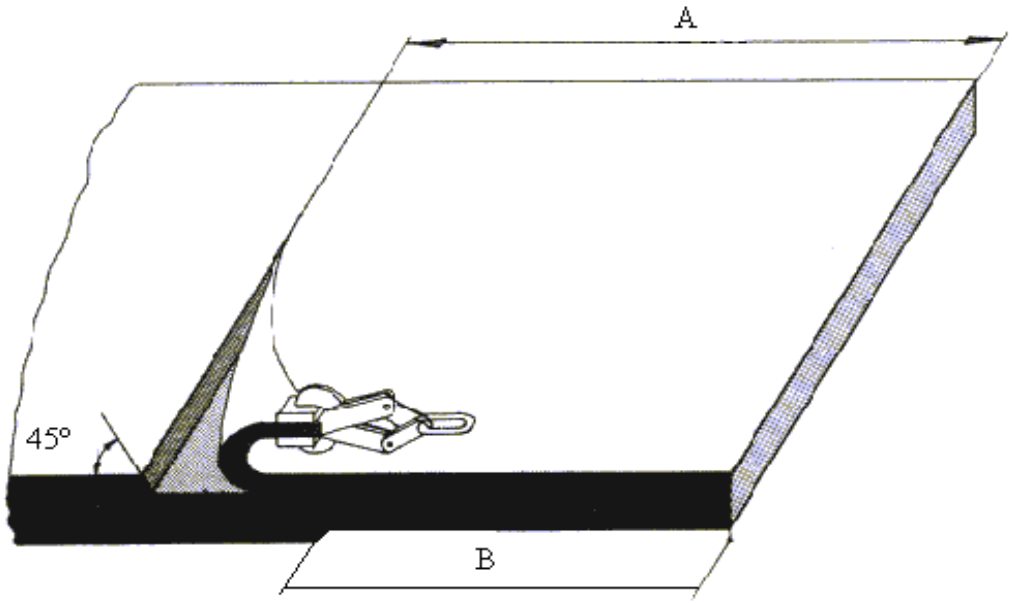

Figure 2: Removing the covers (including transversal cords)

5. PREPARATION OF THE SPLICE

- Align the two belt ends with approx. 2 mm distance between the fingers (see figure 1).
- Prepare the bottom cover to fit the dimensions of the splice (see figure 3). The thickness of the new bottom cover should be equal the thickness of the removed bottom cover or +0.5 mm. Apply solution to build up the bottom cover.

  Please take notice of the following differences with Ferroflex belts in Deltahete quality:
  - Before using rubbers they should always have solution applied, except for any cover chamfers.
  - Wait until the solution is almost dry but still tacky.
  - The solution should never touch the existing cover rubber!

- Place the insertion strip in transverse direction on the Duncover. The length of the insertion strips should equal to the width of the belt's steel carcass. The gap around the insertion strips should be filled with Duncover.

- The bottom cover side consists of:
  - bottom cover: Duncover (1)
  - insertion strips (2)
  - skim rubber: Dunlofol (3)

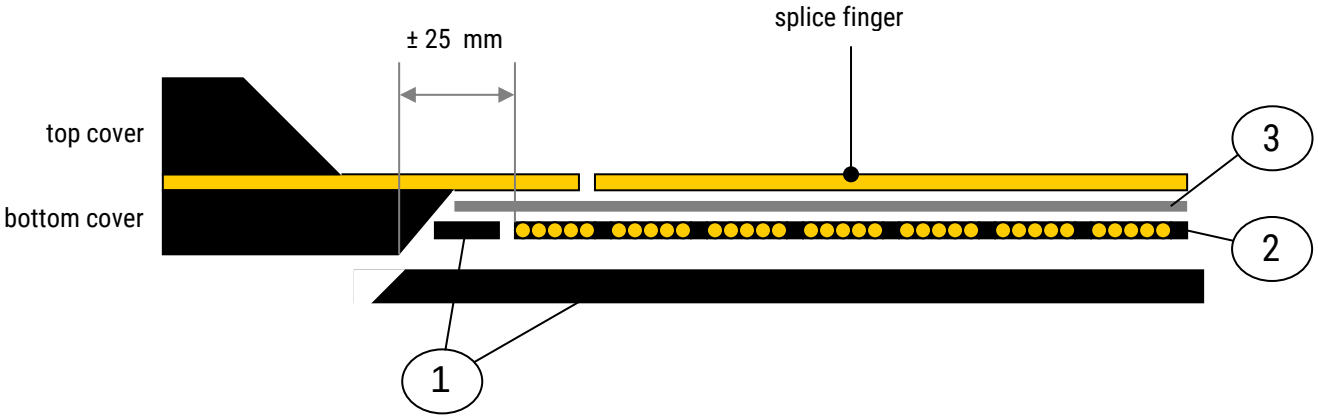

Figure 3. Building of the bottom cover

- Put the bottom cover in place.
- Apply a thin layer of solution on top of the bottom cover and wait until tacky.
- Put the fingers of both belt ends in place.

  Please take notice of the following differences with Ferroflex belts in Deltahete quality:
  - Before putting the fingers in place they should always have solution applied.
  - Wait until the solution is almost dry but still tacky.
  - The solution should **never** touch the existing cover rubber!

- Fill the gaps between the fingers with Dunlofol.
- Apply a thin layer of solution on top of the fingers and wait until tacky.

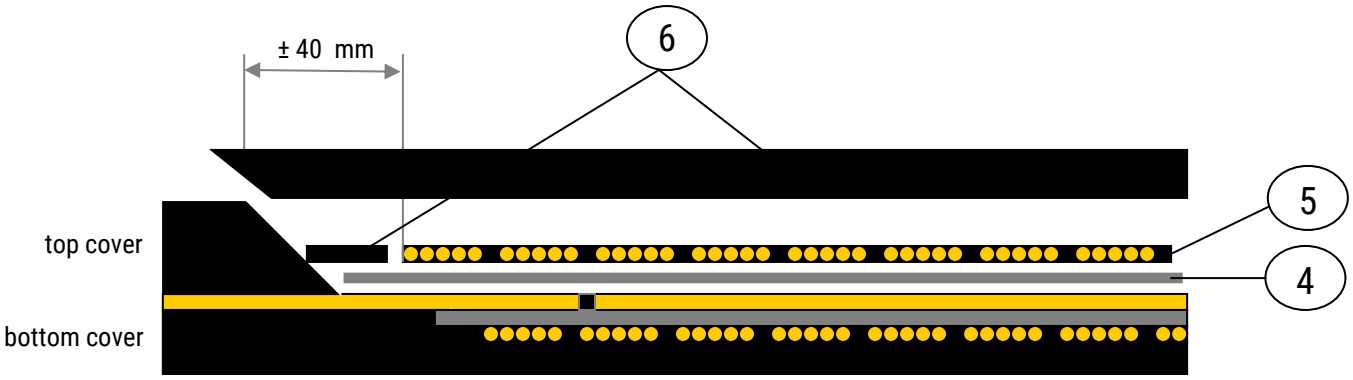

Figure 4. Building of the top cover

- The top cover side consists of:
  - top cover: Duncover (6)
  - insertion strips (5)
  - skim rubber: Dunlofol (4)

- Cover the splice with a layer of Dunlofol (see fig. 4, pos. 4) **Note**: The Dunlofol should not touch the existing cover rubber!
- Place the insertion strip in transverse direction on the Dunlofol (see fig. 4). The length of the insertion strips should equal the width of the steel carcass. The gap around the insertion strips should be filled with Duncover.
- Apply a thin layer of solution and allow to dry until tacky.

  Please take notice of the following differences with Ferroflex belts in Deltahete quality:
  - Wait until the solution is almost dry but still tacky.
  - The solution should **never** touch the existing cover rubber!

- Place the Duncover to fit the splice. The thickness of the total top cover should be 0.5 mm more than the thickness of the removed top cover.

6. VULCANISATION

Clamp both belt ends just outside the press to ensure that the belt ends do not move during vulcanisation.

Apply pressure. The pressure during vulcanisation must be minimal 6 bar (60 N/cm^2, 87 psi). See the temperature/time diagram for the exact pressure cycle. To improve flow of the splice materials and reduce air pockets, optionally stop heating the press for 5 minutes when both plates have reached 110ºC, then continue the heating cycle.

The vulcanisation temperature is between 150ºC and 155ºC. For Deltahete quality the vulcanisation temperature is between 155°C and 160°C.

The vulcanising time starts when a temperature of 150ºC (or 155°C for Deltahete) is reached (see figure 5).

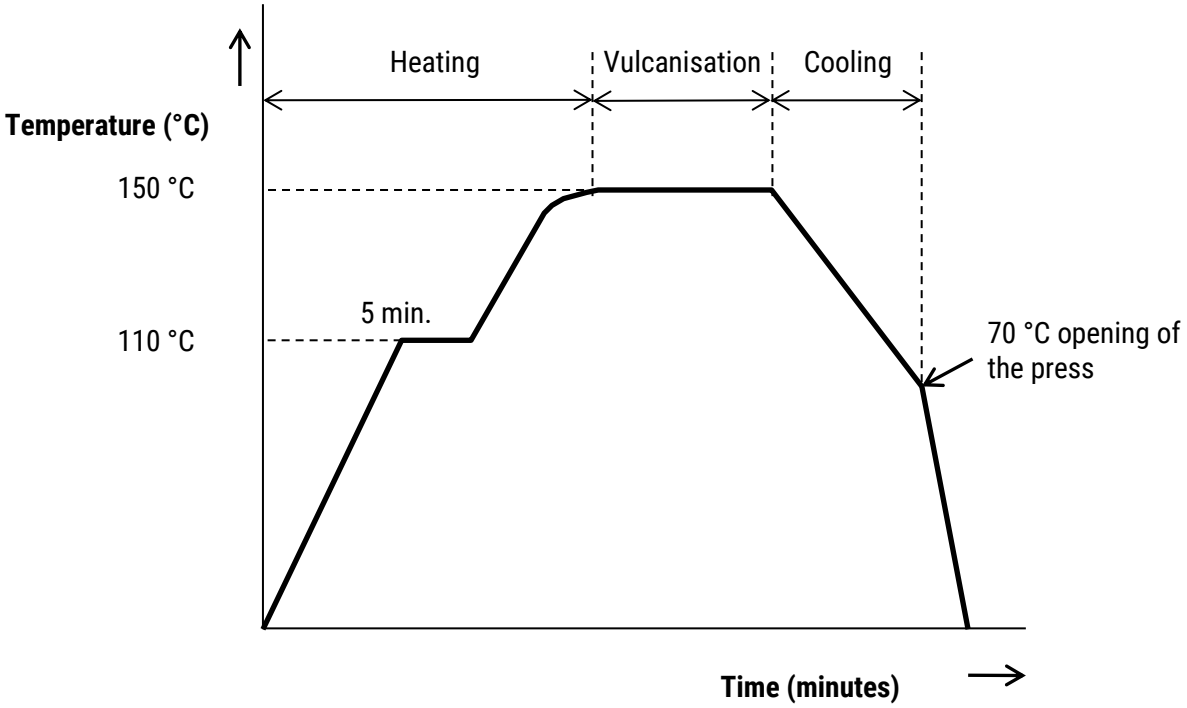

Figure 5: Temperature during vulcanisation

Refer to table 2 for vulcanising times.

Qualities	Belt thickness (mm)			
	up to 10	10 – 15	15 – 20	20 – 30
AA, RA, RS, RSW, RE, RES, RAS	20	25	30	40
Betahete, ROS	20	25	30	40
BV K, BV S	25	30	35	45
Deltahete	40	45	50	60

Table 2: Vulcanisation time in minutes for grades RA/RE/RS/Betahete/BVK/BVS/ROS and Deltahete

7. COOLING

When the splice has been vulcanised for the recommended time the power supply should be switched off. The press must cool down while still under pressure! When the cure is completed, water cool to 70ºC (160°F) and hold for 15 min before releasing the pressure. If no water cooling is available, allow to cool to 70ºC before releasing pressure. After this the press can be dismantled.

Any flash at the belt edges or at the transition of the covers should be trimmed off. The belt may be tensioned after the splice has reached the ambient temperature.

8. SPECIAL INSTRUCTIONS FOR FERROFLEX ROS SPLICING

- For belts with cover thickness superior to 6 mm it is advised to build up the covers beforehand.
- Cut the cover bias at an angle <30°.
- No solution on the cover bias and on top of original belt cover!
- No solution between the different cover-layers. If necessary, use solvent from the splice kit. Leave the solvent to dry before assembling the different layers.
- Minimal use of solution on the fingers (the solvent from the kit is to be used preferably). The splice should not be assembled when still wet.
- Grind the cover bias and top cover over 100 mm across the width.
- Grinding should be done in length direction to prevent small transverse cuts.
- The cover should not be burned during the grinding, so use a low speed grinding tool and apply limited force.
- Use a grinding disc with a grain between 60 and 80.

APPENDIX

Using foreign splicing materials with Dunlop belts

Where materials other than those of Dunlop are being used there are two important considerations:

NOTWITHSTANDING THE ABOVE REMARKS, DUNLOP CANNOT GUARANTEE THE COMPATIBILITY OF THE MATERIALS BEING USED AND IT IS THE CARE OF THE PROVIDER OR MANUFACTURER OF THE MATERIALS TO PROVIDE ANY GUARANTEE OR ASSURANCE THAT MAY BE REQUIRED BY THE BELT USER.

AND

THE CURE RATE OF MATERIALS MAY DIFFER CONSIDERABLY AND THE DUNLOP CURING PROCEDURE AND TEMPERATURES ARE NOT APPLICABLE.
THE PROVIDER OR MANUFACTURER OF THE MATERIALS BEING USED MUST SUPPLY A CURING PROCEDURE OR SPECIFIC TIME/TEMPERATURE CONDITIONS.

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