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DVS – DEUTSCHER VERBAND FÜR SCHWEISSEN UND VERWANDTE VERFAHREN E.V.

Thermocontact welding of thermoplastic films (polyolefins)

DVS
Technical Code
DVS 2219-2

Translation of the German edition from April 2005

Contents:

1 Scope of application

The technical code describes the machines and tools for the manufacturing of welds on films made of thermoplastics by means of thermocontact welding. This is an independent procedure for the joining of films.

2 Functional principle

The joining procedure (also called welding) is applicable to all thermoplastic films and is predominantly utilised for the processing of polyolefins. The actual joining process is based on the heating of the films right into the melting range with simultaneous pressing of the joining zone according to the exact contours while correspondingly complying with the welding parameters adapted to the films.

In the thermocontact procedure, it is predominantly identical films which are welded with each other. Films with meltable fibres of a similar type (non-wovens) are joined in rare cases.

The designation of the thermocontact (TC) procedure is derived from the type of the energy input needed for the joining until the joining weld is formed with direct or indirect contact of the thermoplastically fixable weld material using continuously heated welding tools (webs).

The procedure can be utilised for all thermoplastic films. Due to the one-sided energy input (however, particularly due to the two-sided energy input), the procedure can also be utilised on single-layer monofilms. This distinguishes it from simple sealing methods.

TC joining techniques are utilised because almost any weld configuration is possible, no matter whether for two-dimensional or three-dimensional articles – particularly with regard to the automatic manufacturing of highly leak-tight vessels with gas-tight or liquid-tight welds.

Another outstanding characteristic of TC joints relates to the configuration possibilities of the weld. Therefore, so-called ***pressed welds*** are always manufactured in the TC procedure while complying with the most important parameters such as the effective time (welding time), the web temperature and the pressure and while utilising adapted decorative welds.

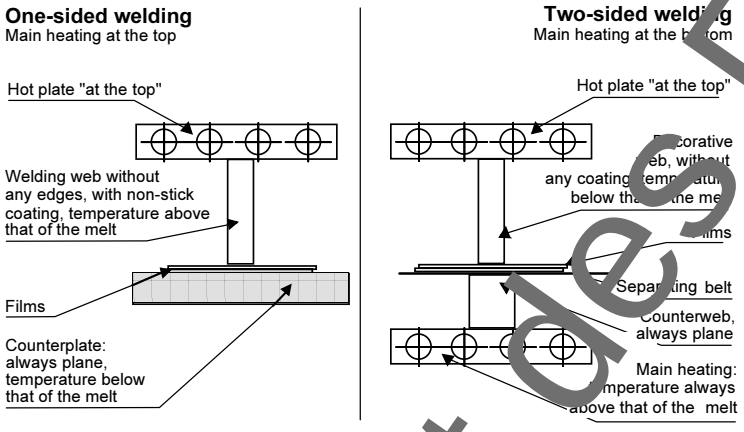

Figure 1. Principle: One-sided and two-sided welding.

DVS, Technical Committee, Working Group "Joining of Plastics"

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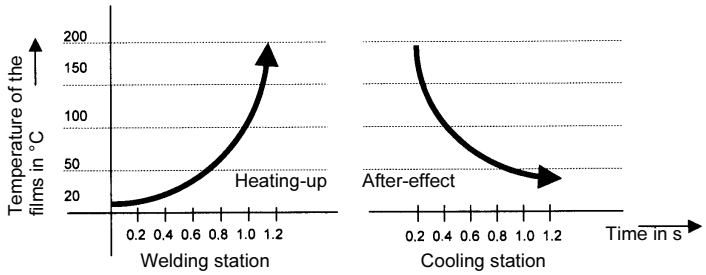

Figure 2. Example: Process times (heating-up and after-effect) in the case of the fabrication of ring binders.

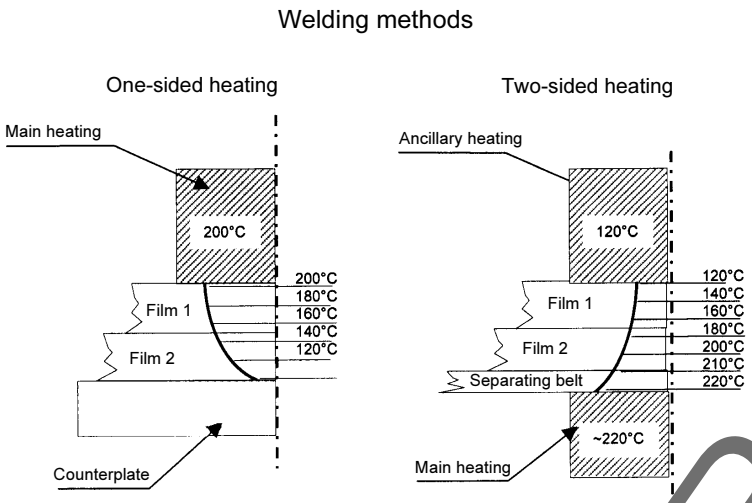

Figure 3. Heat transfer using the example of a polypropylene.

Depending on the application and the article, it is possible to utilise so-called combined webs which serve to produce not only a weld but also an adjacent predetermined breaking point for the subsequent detachment of the waste > *separating welding*.

3 Procedural description

Due to the continuously heated tools, the actual joining process can be carried out in two steps in most applications:

a) Heating-up phase of the **film layers** in the joining region right into the processing range, designated as the *welding time*, immediately followed by

b) a cooling phase, the so-called *after-effect time*. See Figure 2.

Since the TC procedure is principally applied in the fabrication of mass products in high-productivity automatic machines, both steps are coupled in the subsequent procedure so that these are carried out in the same rhythm with harmonised "process times" (welding + after-effect) in most cases.

In this respect, see Figure 7: Central section of a film welding installation.

4 Welding operation

In order to ensure that the welding results can be repeated exactly not only for individual applications but also for high-productivity installations in series fabrication with up to 300 cycles per minute, the welding stations must be fabricated in a precise design. The welding webs utilised in this case are combined welding tools in relation to the article and are assembled on electrically heated plates in a heat-locking form in order to guarantee a constant energy flux.

The films to be welded are introduced either into the cut-out or, as a film sheet, into the welding station. In this respect, the melting heat is supplied via the welding tools at a defined pressure and in a defined time at a constantly adjusted temperature (conduction). In the case of two-sided heating, a temperature loss must be expected during the heat transfer through the transport belt which also performs the task of separating the hot welding web and the films. The materials used for this are coverings in the case of stationary individual applications and endlessly manufactured sheets made of polyimide or PTFE glass fabric. A corrosion-resistant steel may also be utilised in special cases.