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1 Scope of application

This supplement to the DVS 2208-1 technical code is intended to give the user of the technical codes for the heated tool welding of the PE, PE-X, PP, PVC, PVDF, PB and PA materials an overview of the requirements on tools, on necessary accessories and on devices.

The tools and devices addressed here are used for the following welding processes: sleeve welding with an incorporated heating element (HM), heated tool sleeve welding (HD) and heated tool butt welding (HS and IR). The processes for this purpose are described in the following technical codes: DVS 2207-1, DVS 2207-1 (Supplement 1), DVS 2207-6, DVS 2207-11, DVS 2207-12, DVS 2207-13, DVS 2207-15 and DVS 2207-16.

Special devices for particular applications are not addressed within the framework of this supplement.

2 General requirements and criteria

The quality of the welded joints is dependent on the qualification of the welders, on the suitability of the utilised machines and jigs, on the compliance with the technical codes for welding and the stipulations from the manufacturers as well as on the suitable tools and devices for the weld preparation and the welding execution.

In general, the following points must be fulfilled by the utilised tools and resources:

- The devices must be appropriate for the workshop or the building site.
- The functioning capacity must be guaranteed from -10°C to $+45^{\circ}\text{C}$.
- The devices must be service-friendly and repair-friendly. In particular, wear parts should be easy to replace.

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- The operating elements must be formed and arranged in such a way that any unintentional adjustment is prevented.
- A low weight of the device must be striven for.
- Subject to correct utilisation, the devices must offer the user safety from injuries of all kinds. Sharp edges on devices and accessories which may lead to injuries are not permissible.
- The statutory regulations for the execution of the devices must be complied with, e.g. the Machine Directive.
- The utilisation field must be taken into account according to the information from the manufacturers.

3 Tools for sleeve welding with an incorporated heating element**3.1 Rotational peeling devices (mechanical peeling devices)**

Rotational peeling devices serve exclusively to properly remove the oxide coat from the circumference of pipes as a preparatory measure for the welding. A distinction is made between universal and dimension-bound peeling devices.

The devices must be designed in such a way that flawless concentricity and a uniform chip of approx. 0.2 mm all around are guaranteed for the stipulated dimension range. The information from the fitting manufacturer must be observed.

Ovalities within stipulated tolerances must not affect the function of the device.

Requirements:

- Quick dimension change in the case of devices covering various dimensions.
- Flexible knife holder in order to compensate for any unevenness.
- Easy-running rollers and mechanical support equipment.
- Oil-free and grease-free in the working area.
- Operating instructions with care and maintenance indications (see Section 7).
- The device must permit processing beyond the area of the insertion depth and the length of the saddle fitting.

3.2 Holding jigs

Holding jigs allow the user to carry out the assembly with low stresses. They must be designed for the corresponding application, e.g. whether round or ring coil products are being processed.

Requirements:

- Guarantee of the firm positioning of the pipe.
- No impermissible damage to the pipe surface.
- Exact alignment of the pipe ends in order to assemble the fitting with low stresses.

3.3 Round pressing jigs

Jigs (e.g. from the ring coil) whose ovality is located outside the permitted tolerance according to the DVS 2207 technical code must be rounded in the welding area with the aid of round pressing

jigs. These must correspond to the diameter in question, must be able to apply the force for the round pressing and must not damage the pipe impermissibly while doing so.

Requirements:

- The welding area must be oil-free and grease-free.
- Large round pressing jigs must be executed with handles or lugs.

4 Tools for heated tool sleeve welding

4.1 Peeling and chamfering devices

Peeling and chamfering devices serve to properly calibrate the pipe end and to remove the oxide coat from the pipe circumference as a preparatory measure for the welding.

Ovalities within stipulated tolerances must not affect the function of the device.

Requirements:

- Oil-free and grease-free in the working area.
- Operating instructions with care and maintenance indications (see Section 7).
- The device must permit processing in the area of the insertion depth.

5 Tools for heated tool butt welding

5.1 Dollies

Dollies serve to improve the alignment of the pipes and to keep the movement forces low during the heated tool butt welding.

Dollies must be chosen or designed in such a way that:

- They do not damage the pipe surface.
- They are suitable for the pipe diameter in question.
- They include an indication of the load-bearing capacity.
- They guarantee a stable standing position.
- The rollers are easy to move – even when subjected to the maximum specified load-bearing capacity.
- If necessary, they are provided with grab handles or lugs for changing the position quickly.

6 Additional tools and devices

In principle, small tools and devices which are needed for the processing on the building site or in the workshop must be selected in such a way that an application appropriate for plastics is ensured.

6.1 Pipe cutting devices

With regard to pipe cutters, pipe shears or saws (manual or driven), it must be guaranteed that:

- They permit cuts at a right angle.
- They do not deform the pipe impermissibly.
- Cutting devices do not cause any material damage (e.g. hairline cracks).
- Cutting appropriate for plastics is possible (if at all possible, no smearing or cracking of the material).
- If at all possible, no oil or grease enters the welding zone.
- Electric devices comply with the statutory rules and regulations.

6.2 Hand-held scrapers and deburrers

These resources are utilised for the chamfering and deburring of pipe ends as well as for the machining off or retouching of scratches and grooves. The blades of the scrapers must have a stable shape and be in a flawless condition (e.g. no notches).

6.3 Welding bead removers

As a rule, it is not necessary to remove the welding bead for hydraulic or strength-related reasons. Moreover, the removal of the welding bead makes it more difficult to evaluate the weld.

Special applications (e.g. transport of extrapure media or relining processes) demand the removal of the external and/or internal welding bead on butt-welded piping. With regard to these tools (bead removers), it must be ensured that, during the removal of the bead, the pipe is not damaged (notches) and the wall thickness of the pipe in the area of the weld is not lower than the nominal wall thickness of the pipe. That can only be guaranteed with suitable devices specially developed for this purpose. The indications from the device manufacturer must be observed.

6.4 Temperature measuring devices

Calibrated surface measuring devices with a spring-mounted element and a contact area with a diameter of min. 10 mm must be utilised for measuring the temperature on the heated tool.

7 Service, maintenance and care

Tools and devices are also subject to maintenance and checking intervals.

For example, rotational peeling devices which are subject to constant use must be checked and, if necessary, repaired at least once per year by a specialist with the experience necessary for this purpose.

The checking cycles must be shortened in the case of high stresses.

8 Literature

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| DVS 2207-1 | Welding of thermoplastics; Heated tool welding of pipes, piping parts and panels made of PE-HD |
| DVS 2207-1 Supplement 1 | Welding of thermoplastics; Heated tool welding of pipes made of PE-X with piping parts made of PE-HD |
| DVS 2207-6 | Welding of thermoplastics; Non-contact heated tool butt welding of pipes, piping parts and panels – Processes, machines and parameters |
| DVS 2207-11 | Welding of thermoplastics; Heated tool welding of pipes, piping parts and panels made of PP |
| DVS 2207-12 | Welding of thermoplastics; Heated tool welding of pipes, piping parts and panels made of PVC-U |
| DVS 2207-13 | Welding of thermoplastics; Heated tool welding of pipes, piping parts and panels made of PVC-C |
| DVS 2207-14 | Welding of thermoplastics; Heated tool welding of pipes, piping parts and panels made of PVDF |
| DVS 2207-15 | Welding of thermoplastics; Heated tool welding of pipes and piping parts made of Polyamide 12 |
| DVS 2208-1 | Welding of thermoplastics; Machines and devices for the heated tool welding of pipes, piping parts and panels |

Operational safety ordinance (BetrSichV)