

# Extrusion welding of panels and pipes



Project:					Project no.:					Weathering		Protective measures	
Drawing no.:			Base material (manufacturer, type, batch, date):					1 = Sunny		1 = None			
Welder:			Welding filler (manufacturer, type, batch, date):					2 = Dry		2 = Screen			
Welding certificate no.: / valid until			Welding machine, make, type:					3 = Precipitation		3 = Tent			
Welding supervisor (3):			Year of construction / last machine examination:		Process variant according to DVS 2207-4:					4 = Wind		4 = Heating	

Date	Weld no.	Joining part thickness mm	Weld shape (symbol)	Welding shoe no.	Air volume l/min	Material temperature °C (1)	Hot gas temperature °C (2)	Welding speed cm/min	Ambient temperature °C	Semi-finished product temperature °C	Weathering (code no.)	Protective measures (code no.)	Visual evaluation

(1) Measured with a pricking thermometer at the extrudate outlet of the welding machine / welding device  
 (2) Measured in the middle of the nozzle outlet opening, 5 mm in the nozzle  
 (3) E.g. specialist for plastics welding according to DVS 2213

Remarks: e.g. less favourable conditions

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Date / signature of the welder

Date / signature of the welding supervisor

# Hot-gas welding of sheets and pipes

## Welding record sheet



Project name:		Project no.:	Weather	Protective measures
Drawing no.:	Base material (manufacturer, type, batch, date) form:		1 = sunny	1 = none
Welder:	Welding filler (manufacturer, type, batch, date):		2 = dry	2 = screen
Welding certificate no.: / valid until, issued by:	Welding equipment (make, type):		3 = precipitation	3 = tent
Welding inspector (2):	Nozzle(s):		4 = wind	4 = heating

Date	Construction detail	Weld no.	Joining part thickness mm	Weld shape (symbol)	Process WF, WZ	Air flow l/min	(1) Hot-gas temperature °C	Ambient temperature °C	Semi-finished product temp. °C	Weather (code no.)	Protective measures (code no.)	Visual assessment

(1) Measured in the middle of the nozzle exit aperture, 5 mm inside the nozzle

Remarks, e.g. adverse conditions

(2) e.g. plastic welding specialist as defined in DVS 2213

\_\_\_\_\_  
Date / welder signature

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Date / welding inspector signature

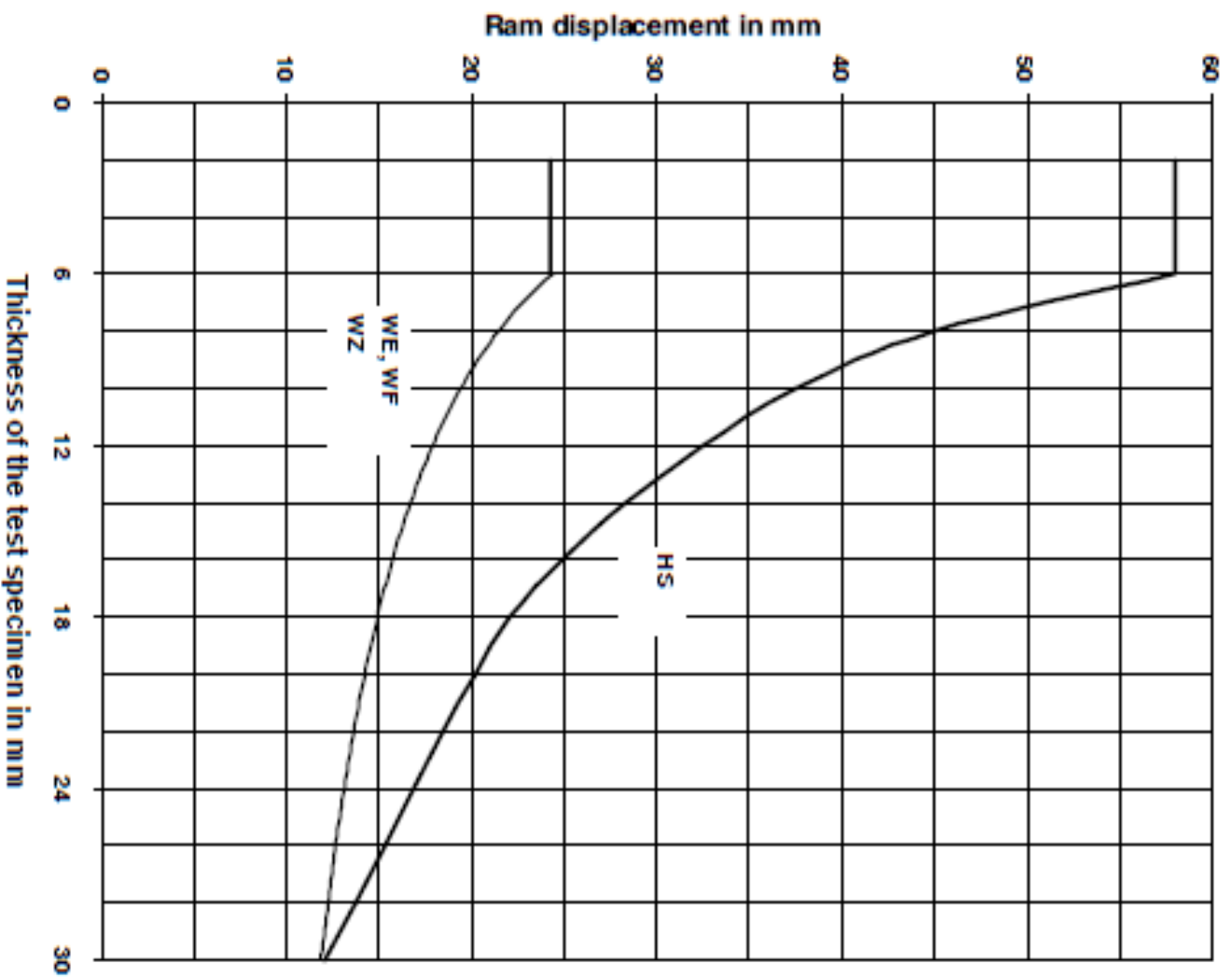


Figure 7. Minimum ram displacement for PE-HD (PE 63, PE 80, PE 100).

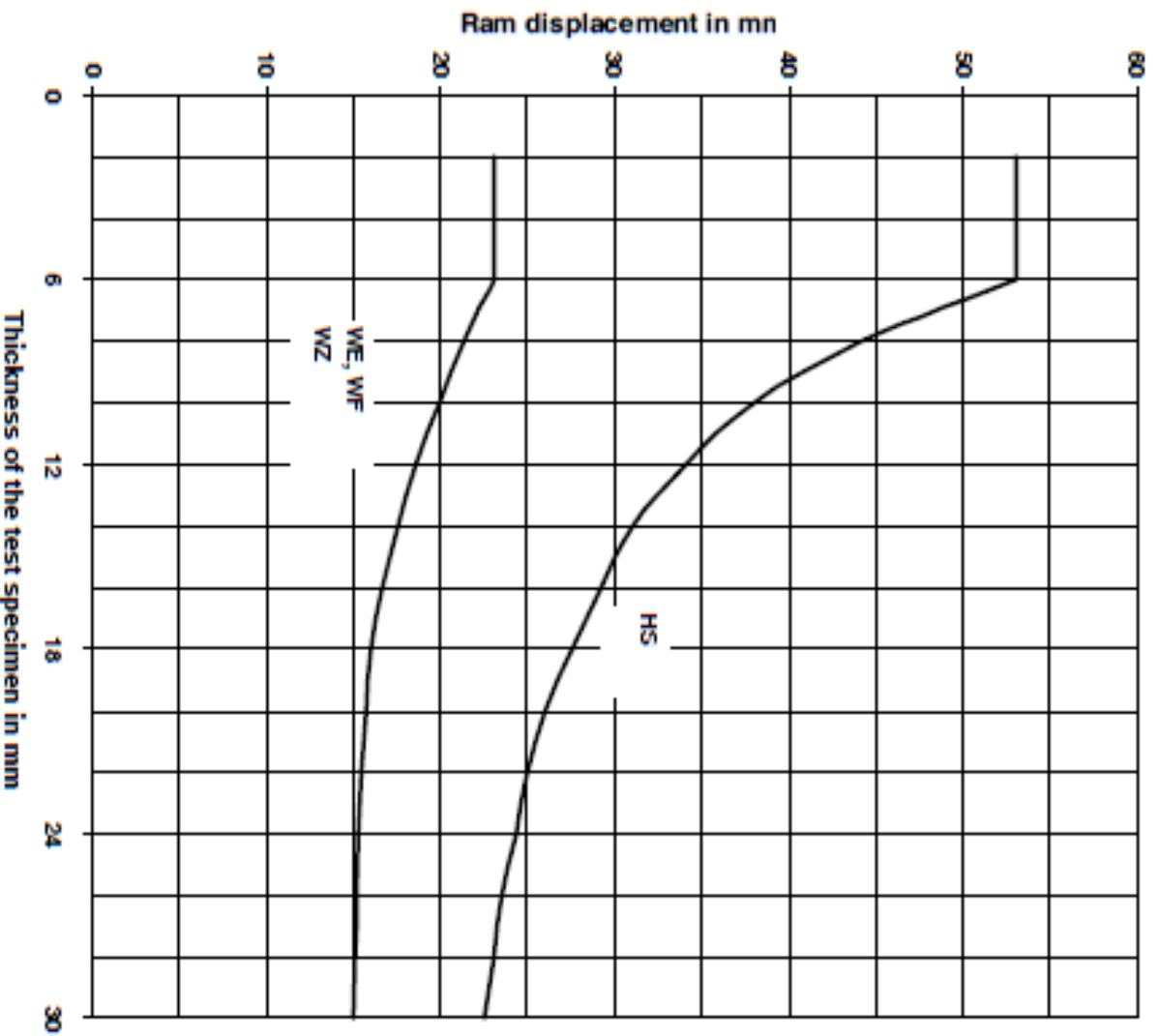


Figure 9. Minimum ram displacement for pp-2.

# PLASTICS IDENTIFICATION FLOW CHART

PLASTIC MATERIALS

SOFTENS

PRESS A HEATED METAL TIP AGAINST THE SAMPLE, DOES IT GO SOFT?

DOES NOT SOFTEN

THERMOSETTING

THERMOPLASTIC

FLOATS DROP A SMALL SAMPLE IN WATER

SINKS

BURN A SMALL SECTION OF THIS SAMPLE

SELF-EXTINGUISHING

CONTINUES TO BURN

POLYOLEFINS

BURN A SMALL SECTION OF THIS SAMPLE

ALL OTHERS

BURN A SMALL SECTION OF THIS SAMPLE

NO FLAMES

CONTINUES

MATERIAL OBSERVATIONS	Melamine Formaldehyde	Phenol Formaldehyde	Urea Formaldehyde
COLOUR OF FLAME	YELLOW WITH BLUE TIP	YELLOW	YELLOW WITH GREEN/BLUE EDGE
ODOUR	FISH LIKE	PHENOL	FORMALDEHYDE
OTHER CHARACTERISTICS	SWELLS & CRACKS	MAY OR MAY NOT BE SELF EXTINGUISHING	SWELLS & CRACKS

UNSATURATED POLYESTER	SILICONE	EPOXY
YELLOW WITH BLUE EDGES	BRIGHT YELLOW	YELLOW
FISH LIKE	PHENOL	PUNGENT AMINE
BLACK SMOKE WITH SOOT	CONTINUES TO BURN	BLACK SMOKE

TO BURN

SELF-EXTINGUISHING

DRIPS

DRIPS

DRIPS

YES

NO

YES

NO

YES

NO

MATERIAL	PE	PP	TPX	CTFE	FLOURO POLYMERS	PS	HIPS	SAN	ABS	PMMA	POM	Cellulosics	PET	Poly-Urethanes (TPUR)	NYLON	Poly-Sulphone	Poly-Carbonate	PPE	PVC
Observation																			
COLOUR OF FLAME	BLUE WITH YELLOW TIP	BLUE WITH YELLOW TIP	BLUE	DOES NOT BURN	DOES NOT BURN	YELLOW	YELLOW	YELLOW	YELLOW	YELLOW	YELLOW	YELLOW WITH SPARKS	YELLOW WITH BLUE EDGES	YELLOW	BLUE WITH YELLOW TIP	ORANGE	ORANGE OR YELLOW	ORANGE OR YELLOW	YELLOW WITH GREEN EDGES
ODOUR	PARAFFIN	ACRID OR DIESEL FUMES		ACETIC ACID		STYRENE ODOUR	STYRENE AND RUBBER	STYRENE AND BITTER	BITTER AND RUBBER	METHYLATED SPIRITS	FORMALDEHYDE	VINEGAR	BURNING RUBBER		BURNT WOOL OR HAIR	ODOUR OF SULPHUR	PHENOL	PHENOL	HYDROCHLORIC ACID
SPEED OF BURNING	FAST	SLOW	FAST	NOT APPLICABLE	NOT APPLICABLE	FAST	FAST	FAST	SLOW	FAST	SLOW	FAST	FAST	FAST	SLOW	FAST	SLOW	SLOW	DOES NOT BURN
OTHER FEATURES	SCRATCHES WITH FINGER NAIL	DOES NOT SCRATCH WITH FINGER NAIL	WATER CLEAR	NOT APPLICABLE	NOT APPLICABLE	DENSE SMOKE WITH SOOT	BLACK SMOKE WITH SOOT	BLACK SMOKE WITH SOOT	BLACK SMOKE WITH SOOT	NO SMOKE	NO SMOKE	BLACK SMOKE WITH SOOT	BLACK SMOKE WITH SOOT	SLIGHT BLACK SMOKE	BUBBLES AT FLAME FRONT	BLACK SMOKE WITH SOOT	BLACK SMOKE WITH SOOT	DIFFICULT TO IGNITE	WHITE ACRID SMOKE

Welding Process	Materials	Abbreviations	Material temperature <sup>1)</sup>	Hot gas temperature <sup>2)</sup>	Hot gas volume flow <sup>3)</sup>	Welding speed <sup>5)</sup>
			°C	°C	l/min	mm/min
Extrusion welding (WE)	High-density polyethylene	PE-HD <sup>4)</sup>	210 ... 230	210 ... 300	300	300
	Polypropylene, Types 1, 2, 3	PP-H; PP-B; PP-R	210 ... 240	210 ... 300	300	300
	Unplasticised polyvinyl chloride	PVC-U	190 ... 200	330 ... 360	300	300
	Impact resistant polyvinyl chloride	PVC-HI	170 ... 180	280 ... 340	300	300
	Chlorinated polyvinyl chloride	PVC-C	195 ... 205	300 ... 360	300	300
	Polyvinylidene fluoride	PVDF	240 ... 260	280 ... 350	300	300
	1) Measured with an insert thermometer at the extrudate outlet of the hand extruder.					
	2) Measured 5mm in the nozzle, in the centre of the nozzle opening.					
	3) Draw n-in cold air volume at the ambient pressure.					
	4) PE 63, PE 80, PE 100					
	5) Depending on the preheating					

Welding Process	Materials	Abbreviations	Hot gas temperature <sup>1)</sup>	Hot gas volume flow <sup>2)</sup>	Welding speed <sup>3)</sup>	Welding force (N) with wire ø	
			°C	l/min	mm/min	3mm	4mm
Free hand welding (WF)	High-density polyethylene	PE-HD <sup>4)</sup>	300 ... 320	40 ... 50	70 ... 90	8 ... 10	20 ... 25
	Polypropylene, Types 1, 2, 3	PP-H; PP-B; PP-R	305 ... 315	40 ... 50	60 ... 85	8 ... 10	20 ... 25
	Unplasticised polyvinyl chloride	PVC-U	330 ... 350	40 ... 50	110 ... 170	8 ... 10	20 ... 25
	Chlorinated polyvinyl chloride	PVC-C	340 ... 360	40 ... 50	55 ... 85	15 ... 20	20 ... 25
	Polyvinylidene fluoride	PVDF	350 ... 370	40 ... 50	45 ... 50	15 ... 20	25 ... 30
Draw welding (WZ)	High-density polyethylene	PE-HD <sup>4)</sup>	300 ... 340	45 ... 55	250 ... 350	15 ... 20	25 ... 35
	Polypropylene, Types 1, 2, 3	PP-H; PP-B; PP-R	300 ... 340	45 ... 55	251 ... 350	15 ... 20	25 ... 35
	Unplasticised polyvinyl chloride	PVC-U	350 ... 370	45 ... 55	252 ... 350	15 ... 20	25 ... 35
	Chlorinated polyvinyl chloride	PVC-C	370 ... 390	45 ... 55	180 ... 220	15 ... 25	30 ... 35
	Polyvinylidene fluoride	PVDF	365 ... 385	45 ... 55	200 ... 250	15 ... 25	30 ... 35
	Ethylene Chloro Tri Fluoro Ethylene	E/CTFE	350 ... 380	50 ... 60	220 ... 250	10 ... 15	N/A
	Fluorinated ethylene propylene	FEP	380 ... 390	50 ... 60	60 ... 80	10 ... 15	N/A
	Tetrafluorethylen Perfluormethylvinylether	MFA	395 ... 405	50 ... 60	60 ... 80	10 ... 15	N/A
	Perfluoroalkoxy alkanes	PFA	400 ... 410	50 ... 60	70	10 ... 15	N/A

1) Measured 5mm in the nozzle, in the centre of the nozzle opening.

2) Drawn-in cold air volume at the ambient pressure.

3) Depending on the welding filler material diameter and the welding groove geometry.

4) PE 63, PE 80, PE 100