

Recommended Tools List

Essential Tools and Equipment for Installation

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I. Introduction

This tool list is prepared for Ningbo Hengyuan Precision Pipe Valve Technology Co., Ltd. as a reference for equipment selection in pipeline installation projects. The list covers HDPE pipe butt fusion welding, electrofusion welding, PVC pipe solvent cementing, and general installation tools – suitable for gas, water supply, drainage, chemical and other pipeline construction applications.

II. HDPE Pipe Butt Fusion Welding Tools

Butt fusion is the most common joining method for HDPE pipes, applicable for pipe diameters ≥ 63 mm. According to available references, the heating temperature range is 200- 235 ° C, pressure 0.07- 0.45 MPa, and heating time = wall thickness $\times$ 10 seconds.

No.	Tool / Equipment	Purpose	Recommended Specification
1	Butt Fusion Welding Machine (manual / hydraulic / automatic)	Heating and pressing PE pipe ends together	Select according to pipe diameter: 40- 160 mm portable, 63- 315 mm standard, 400- 1200 mm large
2	Heating Plate	Heating pipe ends to melting temperature	Temperature controllable 200- 240 ° C, smooth and clean surface
3	Facing Tool (planer / end facer)	Removing oxide layer and ensuring flat pipe ends	To be used with the welding machine
4	Pipe Cutter	Cutting pipes straight and perpendicular	Manual / electric, suitable up to 630 mm
5	Peeling Tool / Scraper	Removing surface oxide layer	Manual scraper or electric peeler
6	Clamping Jaws (clamps / holding inserts)	Fixing pipes on the welding machine	Matching the welding machine specifications
7	Pipe Supports / Roller Stands	Assisting pipe alignment, reducing friction	Adaptable to various pipe diameters
8	Hydraulic Pump (for hydraulic machines)	Providing welding pressure	Selected according to welding machine model

Main welding process: check and clean → clamp pipes → face ends → heat → join

(fuse) → cool.

III. HDPE Pipe Electrofusion Welding Tools

Electrofusion is suitable for pipe diameters 20- 315 mm, especially for confined spaces, repair work and locations where butt fusion cannot be used. According to ISO 12176 Part 4, modern electrofusion equipment should have data logging and GPS positioning functions.

No.	Tool / Equipment	Purpose	Recommended Specification
1	Electrofusion Control Unit (ECU)	Providing precise voltage / current to EF fittings	Universal type (32- 315 mm); barcode scanning ready
2	Electrofusion Fittings (couplers, reducers, etc.)	Pipe connection	DN20 – DN1200
3	Pipe Peeler (manual / electric)	Removing oxide layer (approx. 0.2 mm) from pipe surface	Manual / electric
4	Pipe Clamps / Alignment Clamps	Holding pipes, ensuring concentricity	Diameter - matched type
5	Rerounding Clamps	Correcting ovality of pipe ends	For oversized / eccentric pipes
6	Pipe Cutter (same as for butt fusion)	Cutting pipes straight	—
7	Barcode Scanner	Reading fitting parameters	Accessory of the welding unit
8	Data Logger	Recording welding parameters for quality assurance	Compliant with ISO standards

IV. PVC Pipe Solvent Cementing Tools

Solvent cementing is the most common joining method for PVC pipes (TS method). According to installation codes, the pipe end should be chamfered at 10- 15° , depth about 2.5 mm.

No.	Tool / Equipment	Purpose	Recommended Specification
1	Pipe Cutter	Cutting PVC pipes	Ratchet cutter / rotary cutter / electric saw
2	Chamfering Tool / Deburring Tool	Chamfering pipe end 10- 15° , removing burrs	Manual / electric
3	Sandpaper / Abrasive Cloth	Sanding the bonding area	120- 180 grit
4	Tape Measure / Ruler	Measuring dimensions	—
5	Marker Pen	Marking insertion depth	Oil- based permanent marker
6	Cleaning Cloth / Acetone	Cleaning the bonding area (oil, dust)	—
7	Solvent Cement	Applied on pipe outside and fitting inside	Low / medium / high viscosity, purple / clear optional
8	Cleaner / Primer	Pre- softening the bonding surface	Purple (code required) / clear

9	Applicator / Brush	Even application of primer and cement	Brush width approx. half of pipe diameter
10	Rubber Gloves	Hand protection	Nitrile / latex
11	Safety Goggles	Eye protection	—
12	Insertion Aid Tool	Assisting insertion of large- diameter pipes	For ≥ 65 mm: come-along / lever bar

****Key points for cementing:**** cut square → chamfer 10- 15° → clean and dry → apply primer (if required) → apply solvent cement → insert immediately with a 1/8- 1/4 turn → hold for 30 seconds → wipe off excess cement → allow to cure.

V. General Auxiliary Tools and Safety PPE

No.	Tool / Equipment	Purpose	Remarks
1	Flange Alignment Tool	Assisting flange alignment and connection	—
2	Torque Wrench	Tightening bolts	Control bolt pre- load
3	Spirit Level / Laser Level	Checking pipe slope and alignment	—
4	Marking Tool / Soapstone	Marking cutting positions	—
5	Pipe Inspection Camera (optional)	Checking weld quality	—
6	Power Source / Generator	Providing power for welding machines on site	—
7	Safety Helmet	Head protection	—
8	Cut- resistant Gloves / Heat- resistant Gloves	Protecting against cuts / burns	—
9	Safety Shoes	Protecting against falling objects and puncture	—
10	Dust Mask / Respirator	Protecting against fumes / organic vapours	For PVC cementing and PE thermal work
11	Fire Extinguisher	On- site fire protection	—

VI. Site Preparation and Environmental Requirements

Item	Requirement
Level working area	Ensure the construction area is firm and level
Support and alignment	Use enough roller supports to keep pipe centered with the welding machine
Ambient temperature	5 ° C to 40 ° C; if lower, use pre- heating / heated shelter
Wind protection	In strong wind, use wind screens
Pipe cleaning	Remove oil, mud, ice and frost
Lighting	Sufficient for night work
Quality inspection	Check weld bead uniformity – 100% visual; perform pressure tests

according to code |
| ****Three key factors for welding**** | Qualified welding machine + qualified pipes and fittings +
qualified operator |

VII. Common Problems and Corrective Actions

Problem	Possible Causes	Corrective Action
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Uneven weld bead	Pipe ends not flat or clamps misaligned	Re- face ends, correct clamp alignment
Insufficient bead height	Insufficient heating time / pressure	Calibrate heating temperature, increase heating time
Voids / porosity in weld	Pipe ends moist or oxide layer not removed	Dry pipes thoroughly, re - peel the surfaces
PVC joint slipping	Inadequate cement coverage or assembly too slow	Apply more cement, assemble faster
Leaking PVC joint	Not enough cement or insufficient curing time	Allow longer curing, apply extra cement

****Note:**** The tools and equipment listed above are standard recommendations. Final selection should be based on project pipe diameters, site conditions and customer requirements. For more detailed technical data, specifications or procurement lists, please contact the Technical Department of Ningbo Hengyuan Precision Pipe Valve Technology Co., Ltd.

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