CNZHENBO 臻博机械 | MP Sonic
Welding and cutting system

NO. MP220228001

Instruction

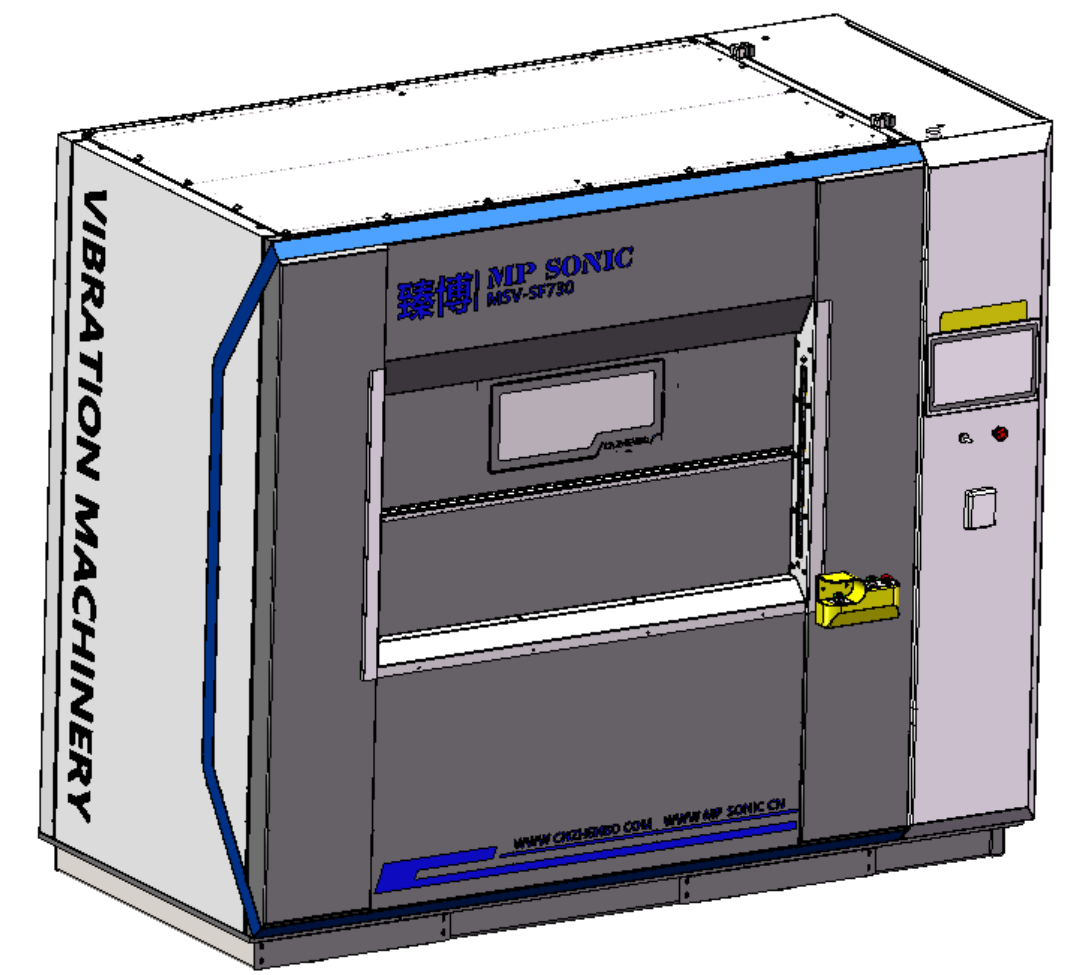
Linear Vibration Welding

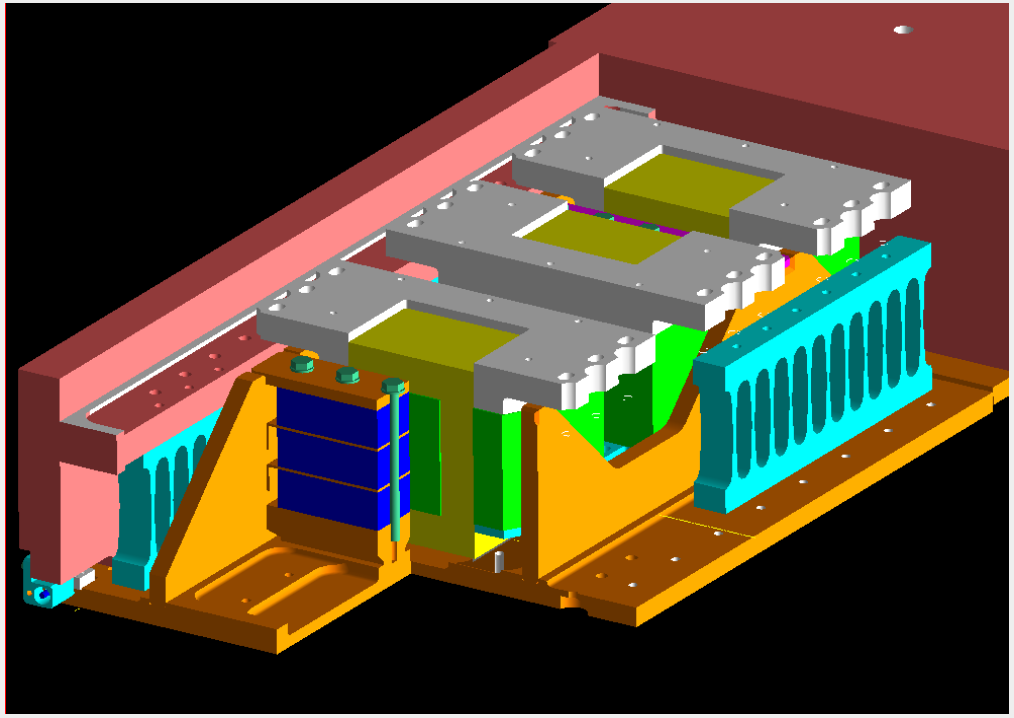
by CNZHENBO | MP Sonic

Zhejiang Zhenbo Precision Machinery Co.,Ltd

by Alex Lee

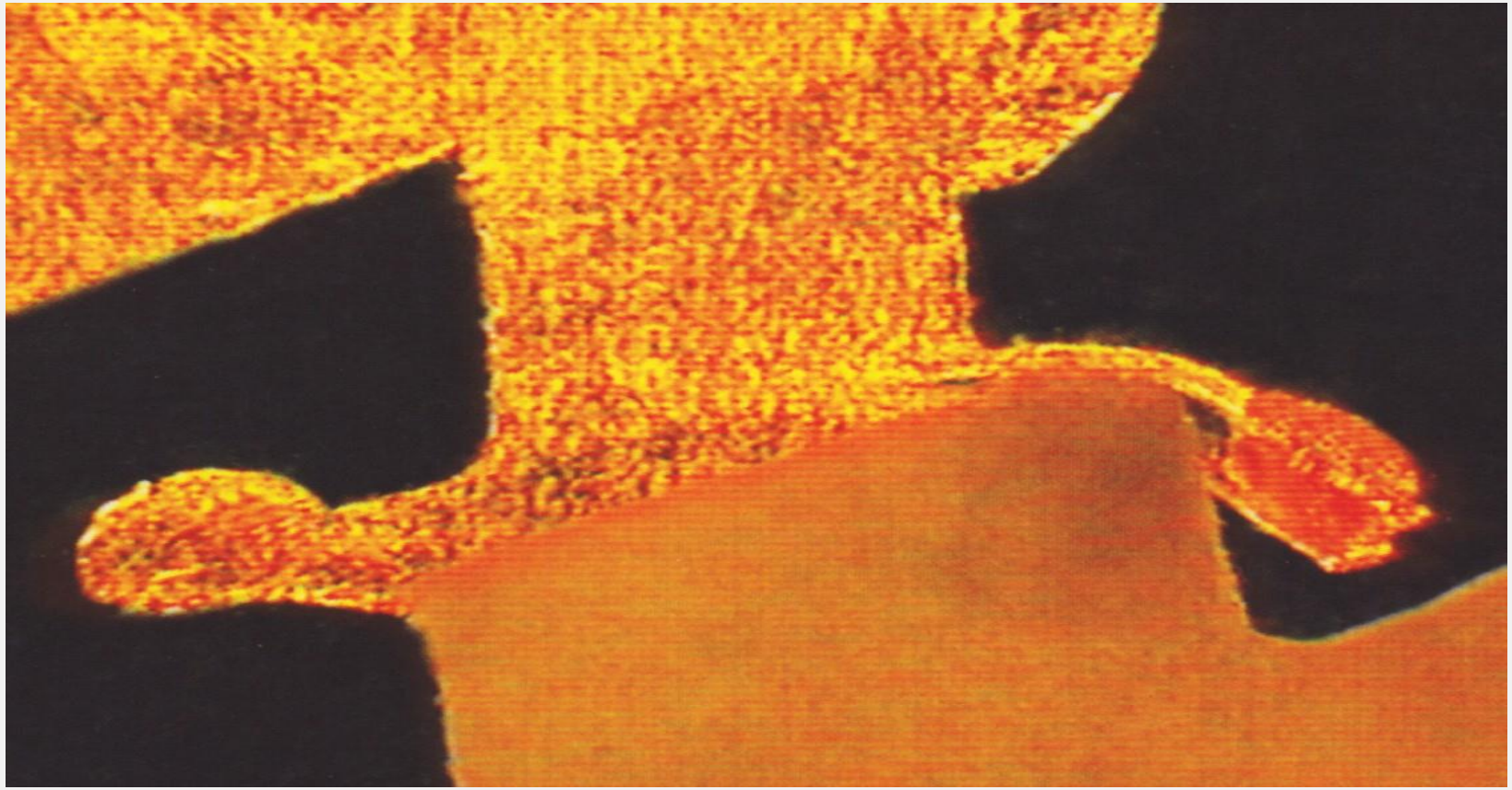
Liner vibration Working Modules





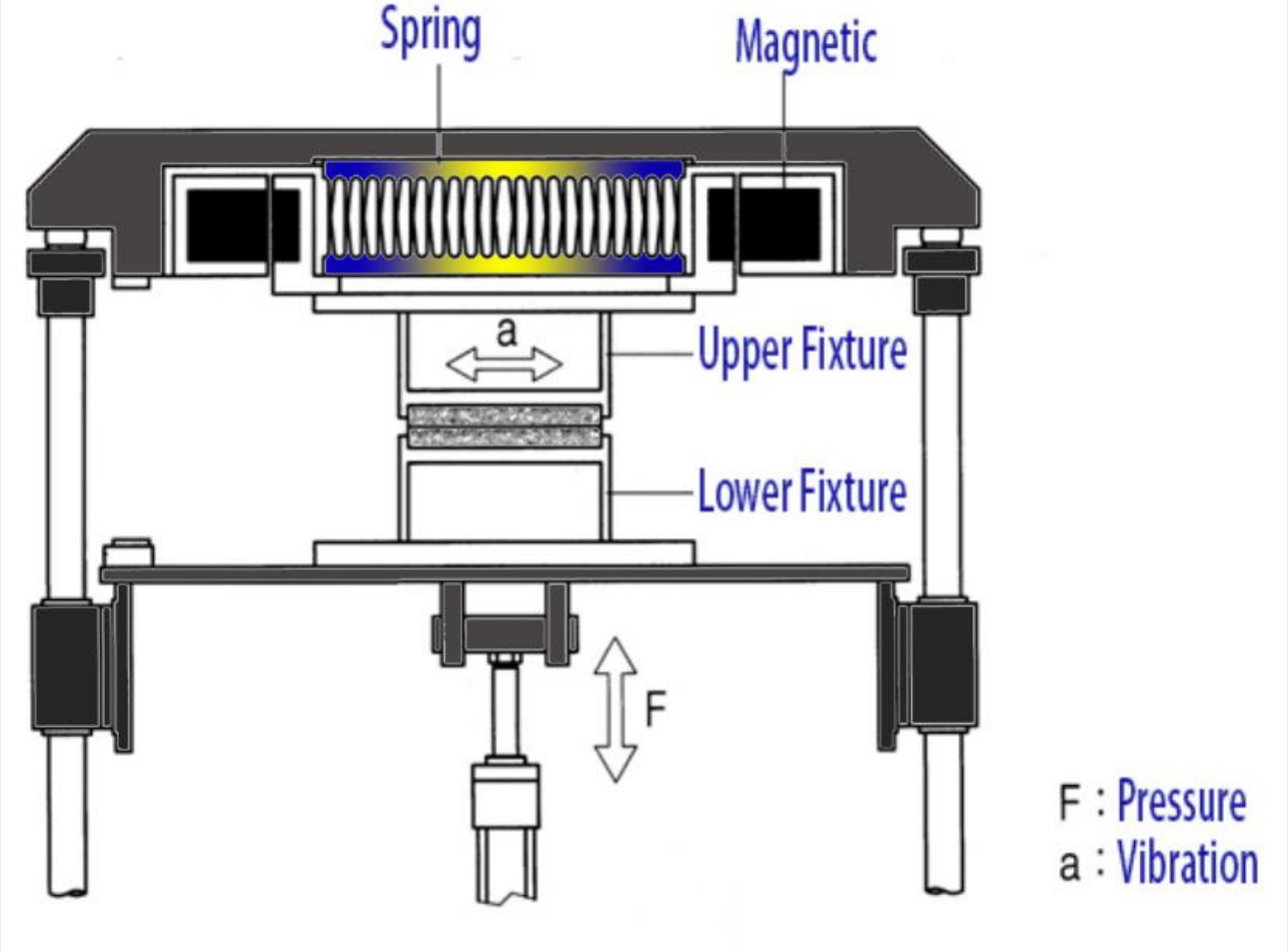
What is linear vibration welding

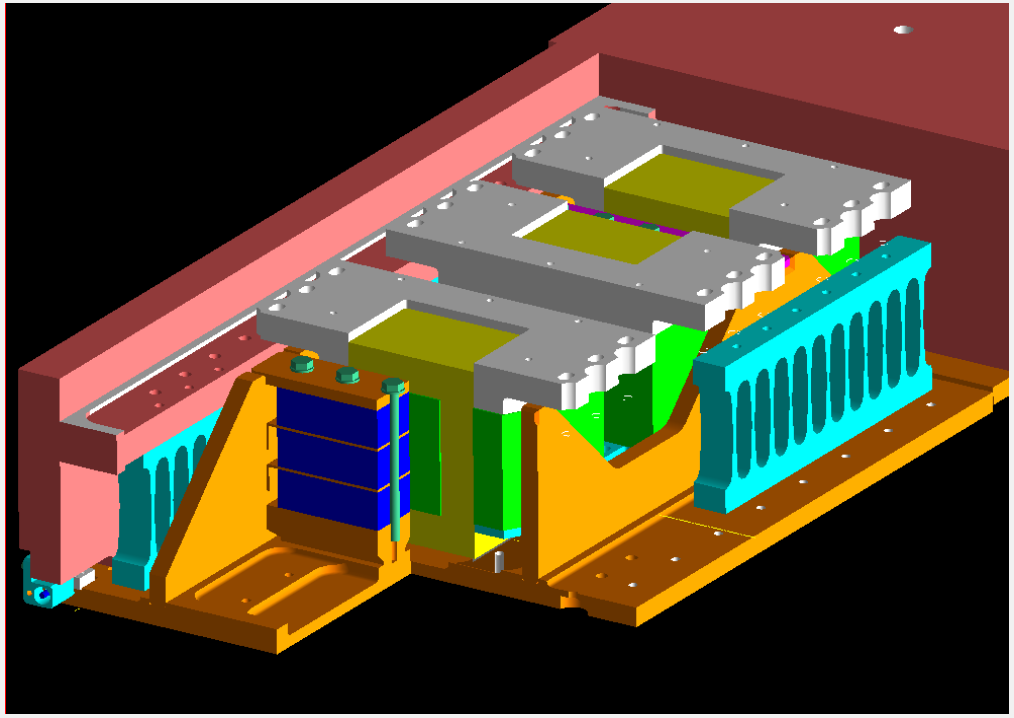
Linear vibration plastic welding is a kinds of friction plastic joining technology that one thermoplastic part half is hold with no moving while the other thermoplastic half is doing reciprocating motion (called as linear vibration) in fixed high frequency and vibration amplitude under pressure, through which heating energy is generated to melt thermoplastic material at the contacting surface. When the melting reach enough quantity, vibration stop and keep two plastic part halves together at the original relative position, until the molten thermoplastic material become resolidified and form joining.



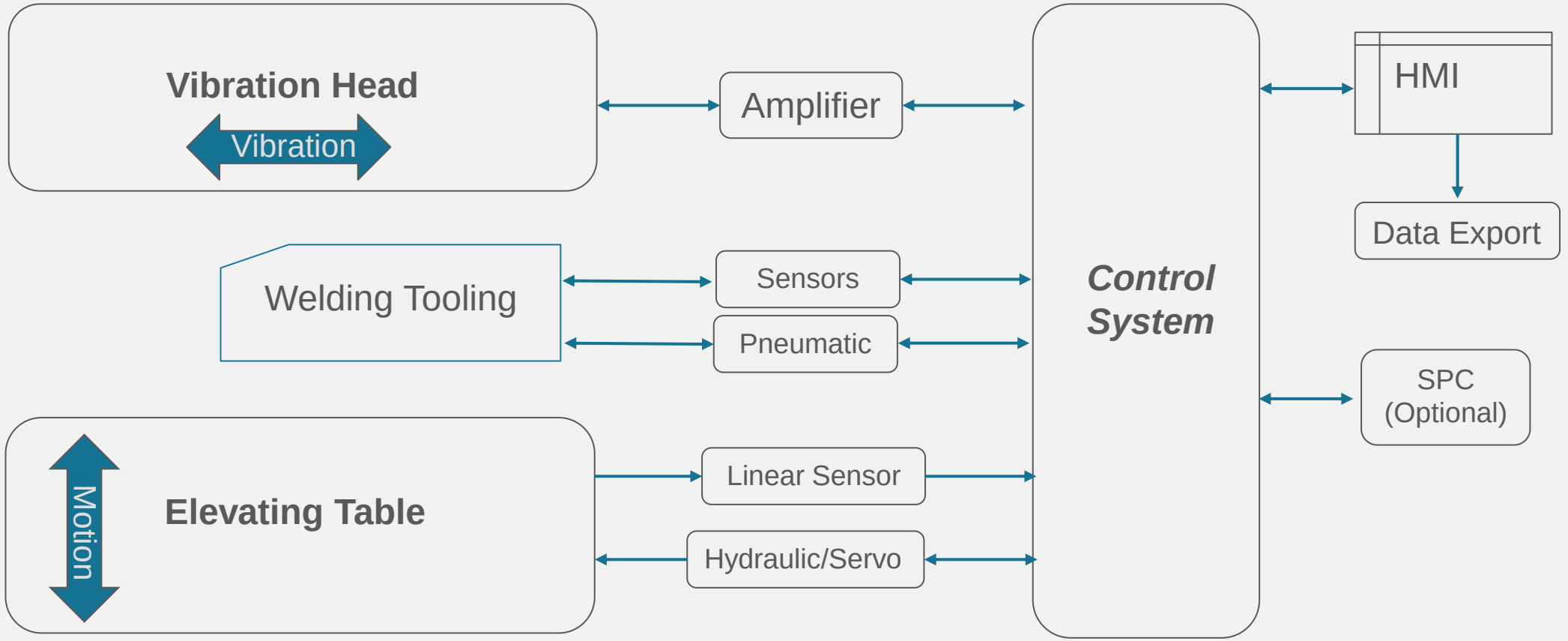
Linear Vibration Result

Liner vibration Working Modules

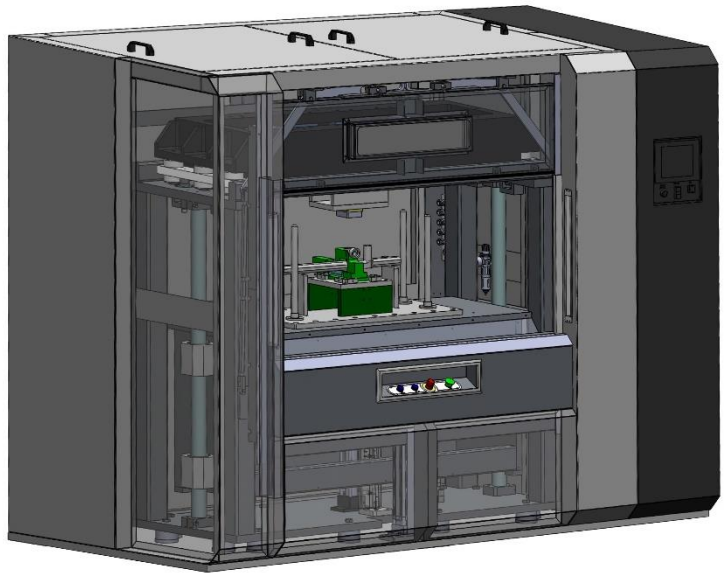


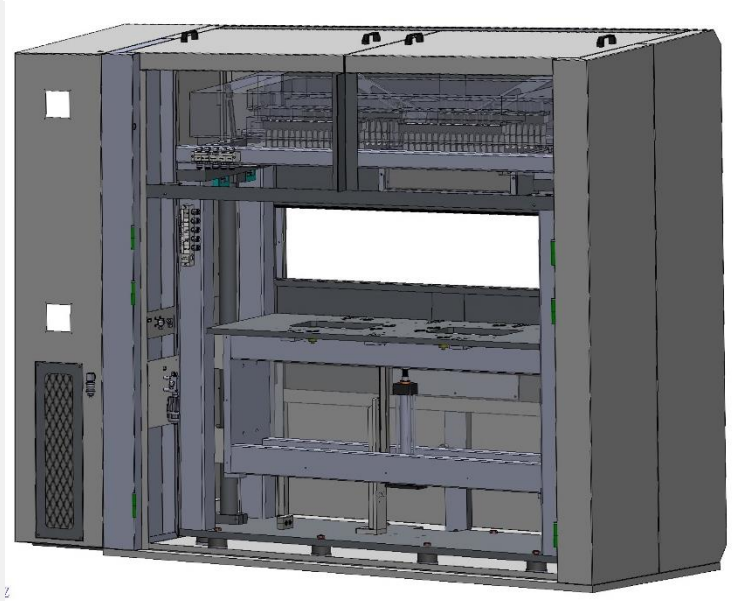


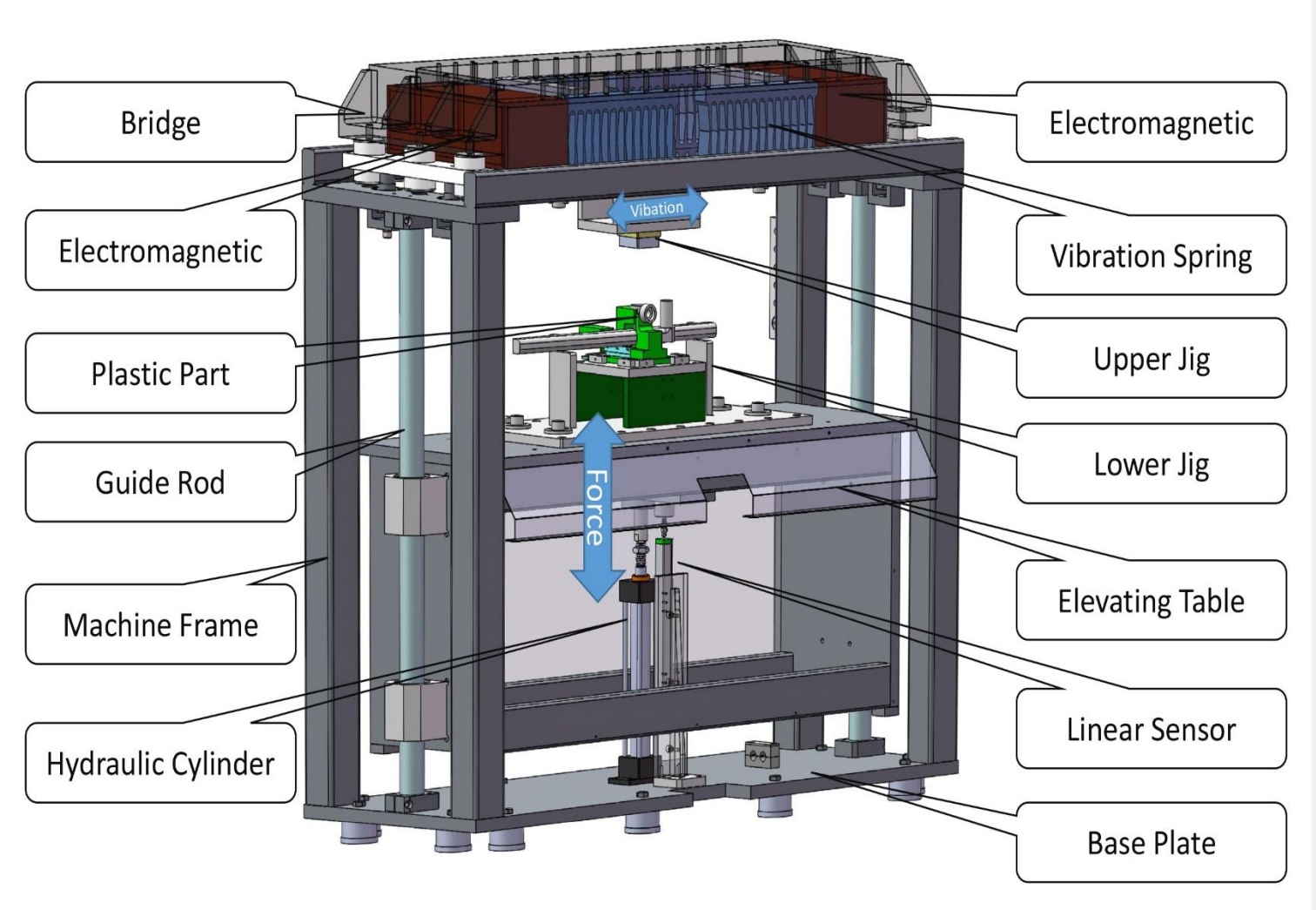
Liner vibration welding machine Working Principle



Liner vibration welding machine construction







1. Vibration System: Vibration Spring + Electromagnet + Amplifier

2. Forcing System: Servo Hydraulic System, or Pure Electrical Servo System

3. Control System: PLC+HMI+ETC

4. Pneumatic system: RFL, Solenoid valves, Vacuum, pressure gauges, etc

1. Consists of vibration springs and electromagnetics (E & I). When vibration thermoplastic welding operation, the spring reciprocating motion happens forced by the pulling energy from the electromagnets at two sides of the springs.

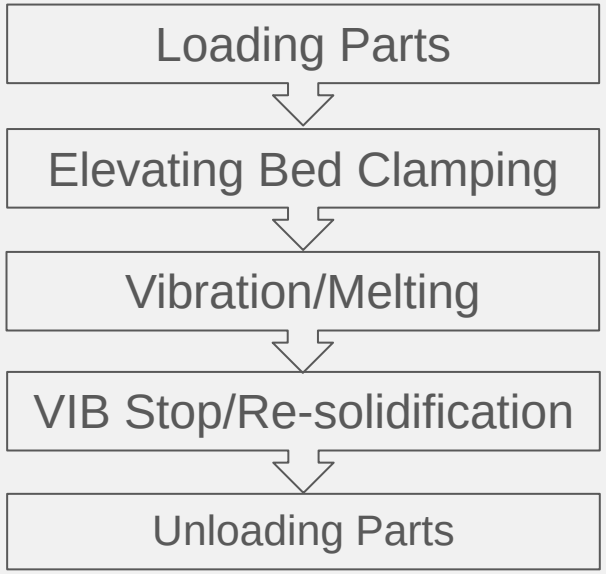
2. The Frequency of Mechanical Resonance: depends on the elasticity coefficient K & the total weight including that of the upper jig;

3. Vibration Frequency: depends on the AC current frequency to the electromagnetics at two sides.

Vibration welding operation process

CNZHENBO 臻博机械 | MP Sonic Welding and cutting system

1. Hold plastic parts by upper jig and lower jig;
2. Force plastic parts together by mechanical pressure;
3. vibration system starts working, friction happens between plastic parts at contacting area (welding area) generating heat;
4. Plastic parts is molten at welding area by vibration friction;
5. Vibration stop when plastic welding is ready, two plastic parts move back to its original position in precision of ±0.1mm;
6. Keep two parts pressed together under pressure, the molten material of two parts infiltrate to each other and re-solidified;
7. Welding finished, manual unload the welded part.



Initial Operation Process

Step 1. Connect electric source and air source

Step 2. Turn on the air valve (the doors should be close at this moment)

Step 3. Turn on the breaker inside the electric control cabinet

Step 4. Turn the master power switch (Key Power Switch) clockwise to turn on machine control power

Step 5. Turn on the hydraulic system on manual page

Step 6. Load jigs (refer to “Jig loading instruction”)

Step 7. Open the front door on manual page

Step 8. Ascend the jig bed on manual page

Step 9. Auto frequency tuning

Step 10. Set welding parameters

Step 11. Trial welding in Auto Mode

Step 12. Trial welding to get the best welding parameters for a part

Step 13. Store the parameters (formula)

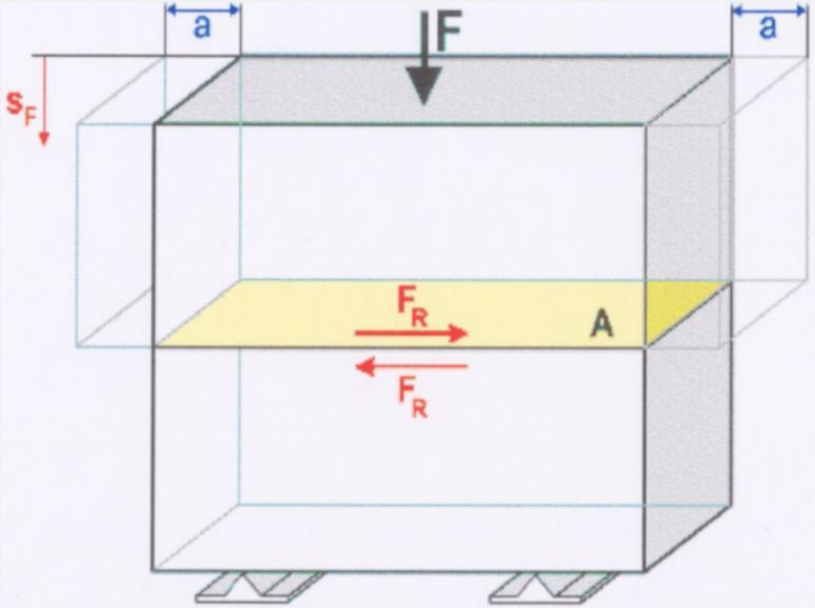
Step 14. Do welding production by the best welding parameters

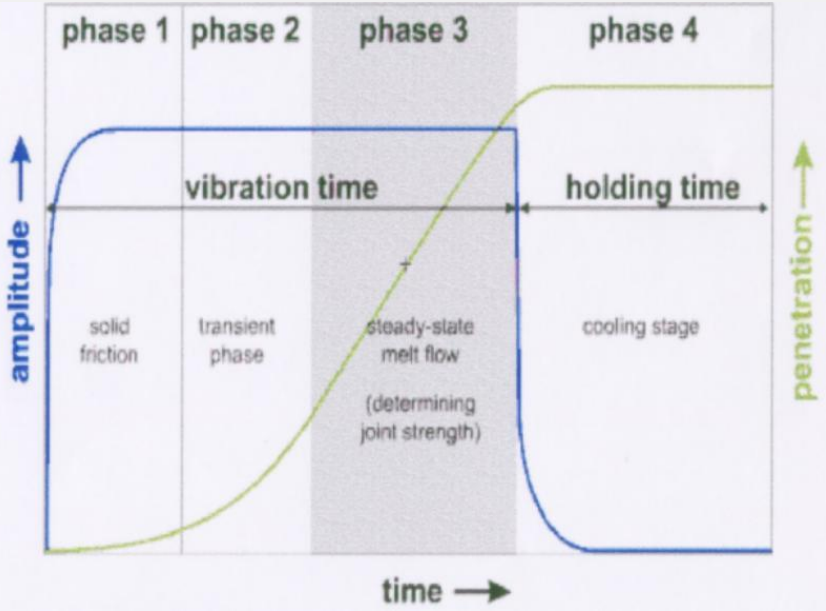
Phase 1. Dry friction: Friction starts to melt material;

Phase 2. Melt generation: molten material begins flashing out;

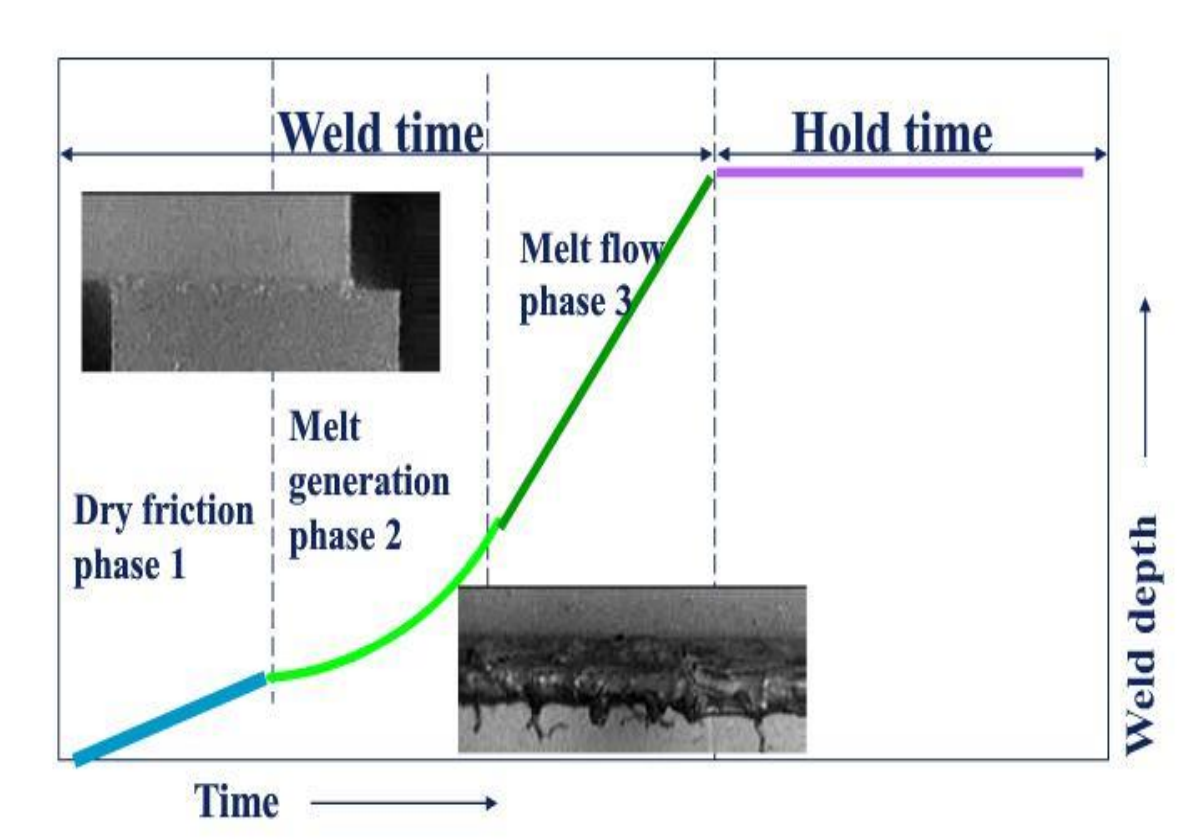
Phase 3. Steady-state Melt Flow: melt quantity is even with flow quantity. It determines the joining strength;

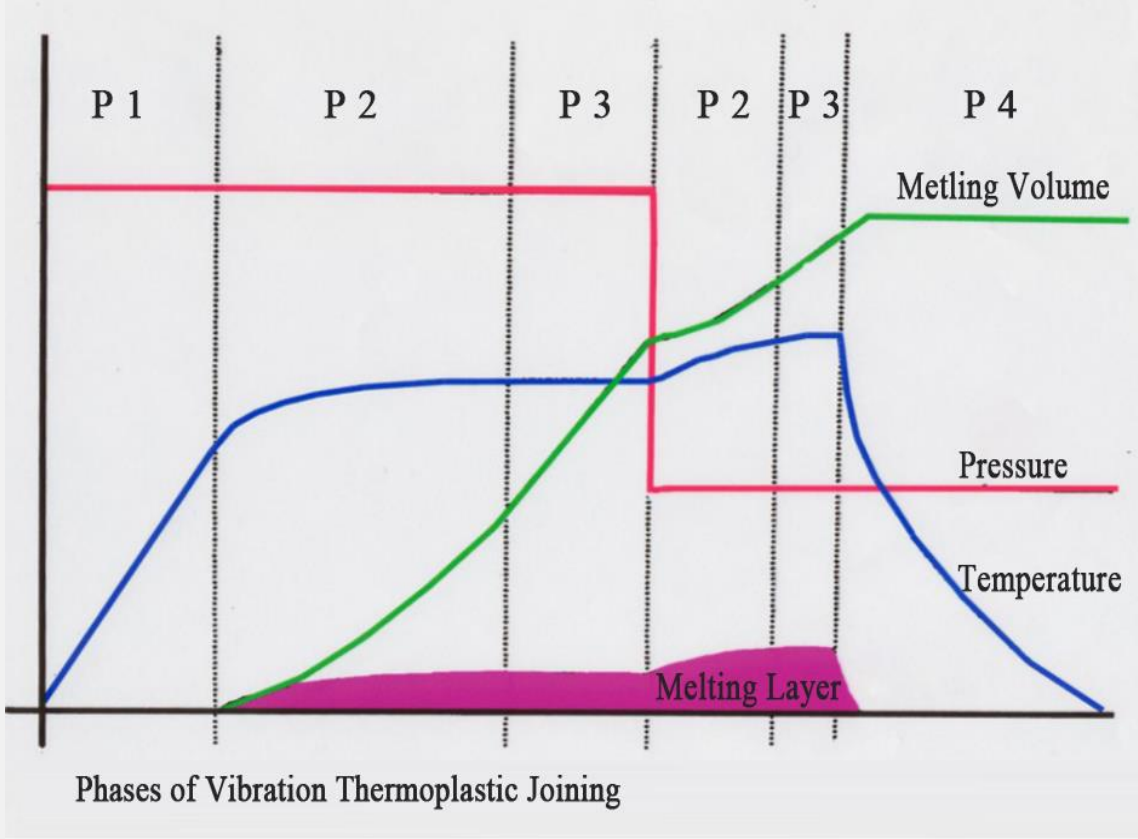
Phase 4. Holding: vibration stop and hold thermoplastic parts keeping they pressed together under high pressure until it become re-solidified at the joining surface.





Phases of Vibration Welding

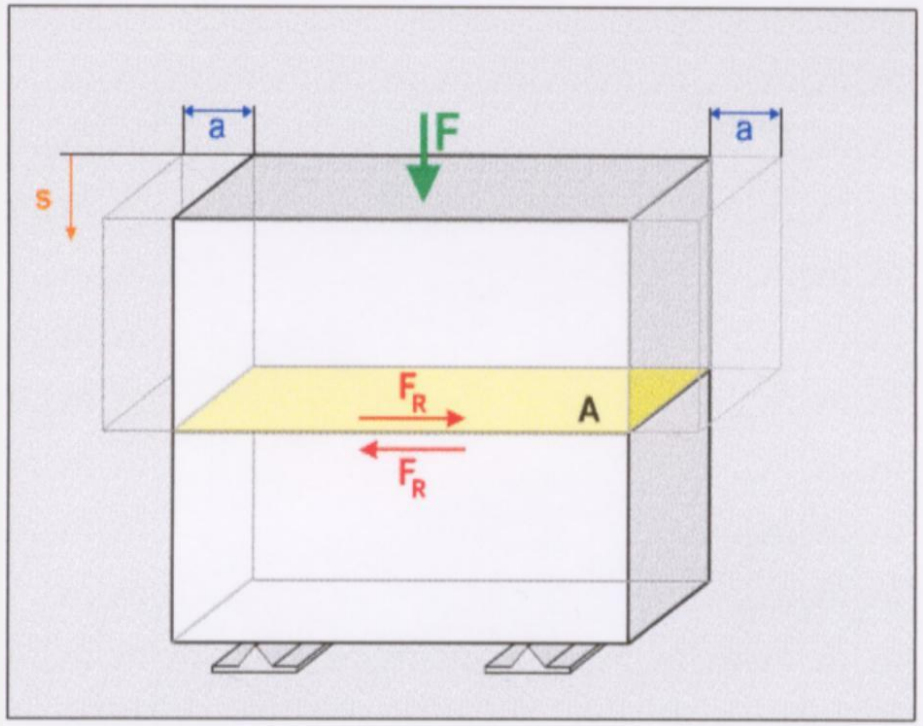




Phases of Vibration Thermoplastic Joining

Liner vibration welding parameters

* E = P(N/㎡)・V(m/min)・T (Sec)・Cosθ
  P : Pressure
  V : Friction Speed
* V = 4.45・a・f
  V : Friction Speed(mm/Sec)
  a : amplitude(mm)
  f : Frequency(Hz)



- Variable Machine Parameters:
  Joining force--F
  Amplitude--A
  Frequency--Fr
  Vibration Time--Tv (Time control)
  Welding Penetration--Ss (Penetration Control)
  Holding Time—Th

- Resulting Process Parameters:
  Joining Pressure--p=F/A (Interface A)
  Friction force--Fr
  Penetration—s resp. welding time tF

To gain a good vibration welding result with scientific operation, physical modelling is essential. To make final decision, it necessary to consider the vibration welding machine parameters and resulting process parameters.

Liner vibration welding operation parameters

- Time: 1. Vibration Time
  2. Holding Time
- Pressure: 1. Vibration Pressure
  2. Holding Pressure
- Vibration Amplitude
- Vibration Frequency
- Welding Depth

- it can reduce vibration time if apply higher amplitude, but the time choice points to gain the perfect welding performance will be reduced relatively;
- High amplitude is not good for some material such as PBT,NORYL, etc;
- It requests high amplitude if the vibration direction is along with shorter side of plastic parts;
- Over-high amplitude will result in weak welding strength;
- When melting reach stable, it should reduce amplitude to gain high welding strength.

Liner vibration welding operation parameters--Frequency

Vibration frequency should be set according to material and geometric shape of plastic parts;

- Low frequency (90~120Hz)
  -Amplitude: 2~4mm(P - P)
  -For parts in big size, big length or thin parts;

- High frequency(210~280Hz)
  -Amplitude: 0.6 ~2mm(P-P)
  -It is suitable for welding requests small tolerance and less flash;
  -It can do the welding of different plastic material, and save welding time.

- Super high frequency (300~365Hz)
  -Amplitude: 0.3~1.2mm
  -For challenging welding requirement including clean welding and parts with big bevel angle, limited space for amplitude and challenging material.
  -High precision control, high efficiency, high stability & low consumption.

There is no big effect to welding strength by different frequency.

Liner vibration welding operation parameters—Time & Depth

- Time of vibration;
- Concerned to productive;
- Affect the thickness of melting layer (affect strength);
- It is a time length for X direction and Y direction of vibration surface synchronously reach the highest welding strength;
- Vibration time will be reduced if plastic parts has been added with strengthening material;
- To gain the highest welding strength in the shortest vibration time.

- Welding depth affects welding strength deeply;
- It can judge the welding result according to the depths graphics of the welding chart;
- For welding between two different material, it should set big welding depth.

Liner vibration welding operation parameters--Pressure

Welding pressure is a critical factor affecting welding strength and precision. Mutiple-phases pressure adjustment affects crystalline resin

1) Friction Pressure: the pressure for the beginning of vibration (high pressure);

2) Welding Pressure: the pressure when even condition (1/2 of the friction pressure value). It affect welding strength much;

3) Fusing Pressure: to ensure enough melting layer, it should apply low pressure. High pressure resulting in sharp decreasing of welding strength.

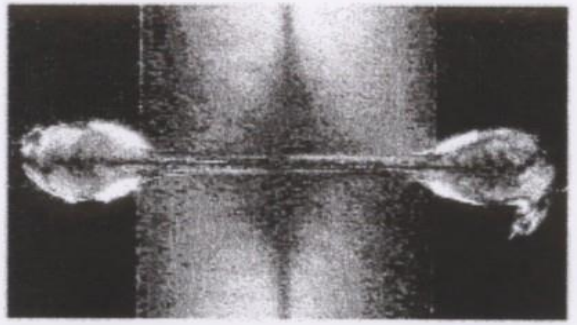
4) If water is consisted in Lynon material, the welding pressure should be higher than the vapor pressure.

5)the wider welding line is, the higher pressure is requested, while, the bigger the welding line height is, the higher the pressure is requested.

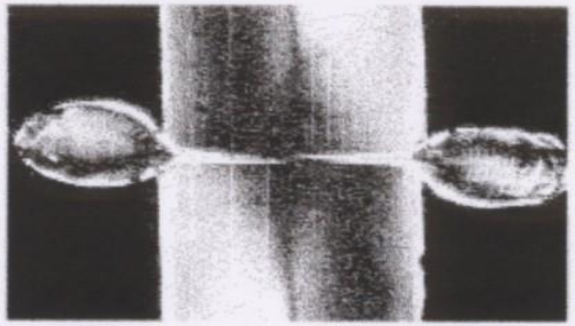
* Lower welding pressure: suitable for material in lower melting point;
* High welding pressure: it can reduce welding time, suitable for welding engineering plastic;
* Increase pressure: will generate much flash and reduce welding strength;
* Down adjust pressure in time after melting: can ensure thick melting layer and welding strength (provide enough space for vertical flow direction for material molecule).

Welding pressure for different material & result by different pressure

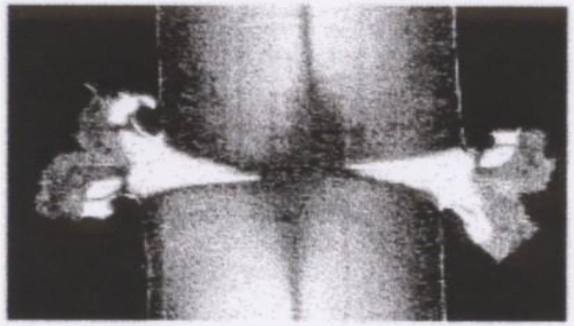
Material	Pressure (N/mm^2)
ABS	1~2
PA6	0.5~3
PA66	0.5~3
PE-HD	0.5~8
PMMA	1~2
POM	1~4
PP-H	0.5~4
PPE+SB	2~6
PS	1~4
SAN	1~2



Low joining pressure
0.5 MPa (t_v=10 s)



Medium joining pressure
2.0 MPa (t_v=4.0 s)



High joining pressure
8.0 MPa (t_v=1.0 s)

- Moisture absorbing material should be dried enough before welding, and it should be welded under high pressure to offset the pressure of water vapor;

- If two different kinds of material welding, the difference of melting points between two machine should be no bigger than 38℃, and the two material molecular structure should be similar;

- Over-deep welding line design will affect melting layer and will increase the time spent in melting & resolidifying.

1) Construction Design of plastic part

2) Melting Temperature of material

3) Strength of thermoplastic part

4) Characteristics of different material

5) Humidity of thermoplastic material

6) Fluidity of molten thermoplastic material

7) Resin additive to thermoplastic material

Liner vibration welding operation parameters

1. Available to weld plastic parts in complex geometric shape design;
2. Ability for thermoplastic joining in big measurement which is over than ultrasonic welding ability;
3. High welding strength and airtightness resulted from vibration welding, the welding is reliable;
4. Two or more cavities welding per stroke is available;
5. No request of additional agent for plastic parts welding assembly;
6. No fumes, emissions or consumables generated during vibration thermoplastic weld, no pollution to environment;
7. Perfect welding performance to damped thermoplastic material or that with high percentage of additive;
8. Low power consumption: Only power consumption when vibration oscillation;
9. Short welding cycle time, high operation efficiency;
10. Easy achieve welding phases control, the setting is easy;
11. Vibration welding is available to most thermoplastic material;
12. Low tooling manufacturing cost.

Liner vibration welding operation parameters

CNZHENBO 臻博机械 | MP Sonic Welding and cutting system

Hot Platen Welding
Long melting time
High power consumption
Melton material sticking on hot platen
Easy case metamorphism to plastic material under high temperature
Pollution cased

Spin Friction Welding
Low machine & tooling cost
Limited by plastic parts geometric design
Difficult in positioning
Can weld only one parts in one welding cycle;

Ultrasonic Welding
short welding cycle time
low cost
Limited in material range
Limited in thermoplastic parts geometric design and measurement

Laser Welding
High cost in equipment
High cost of maintenance
Limit to material
Pollution cased

Stick by Glue or Other Solvent
Long process time
Difficulty in carrying & process
Pollution cased to environment
Requests spent in problem of prescription, space taken up and spar parts, etc.

Factors limit to vibration welding

- Bevel angle at welding surface at vibration oscillation direction, normally can not bigger than 10 degree for traditional VW technique and 45 degree to super-high frequency VW;
- Requests high hardness to holdout the oscillation strength of vibration welding;
- Melting flow impact the welding outlook, and scrap easily generated, especially exist welding result by traditional VW.

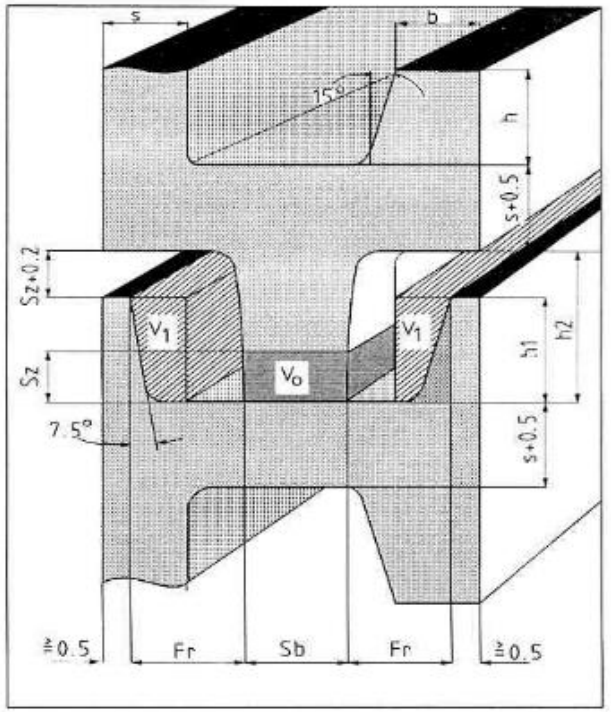
- Measurement of welding line;
- The parts holding design at vibration oscillation direction;
- At least 1/2 width of joining area should be supported by vibration welding fixture;
- At least 0.8mm space for the moving distance of oscillation (120Hz:1.8mm);
- Reinforcement at vibration direction:(0.8mm * 2) + α(above2mm)
  Side: aobve1mm;
  Reinforcement for 120Hz welding : about twice of that for 240Hz welding;
- Space for melting flow: melting volume*20~30%。
- Design angle reinforcement to avoid shake at vibration direction;
- Consider the deformation after molding;
- Ensure that the surface slope at vibration direction no over than 10 degree.

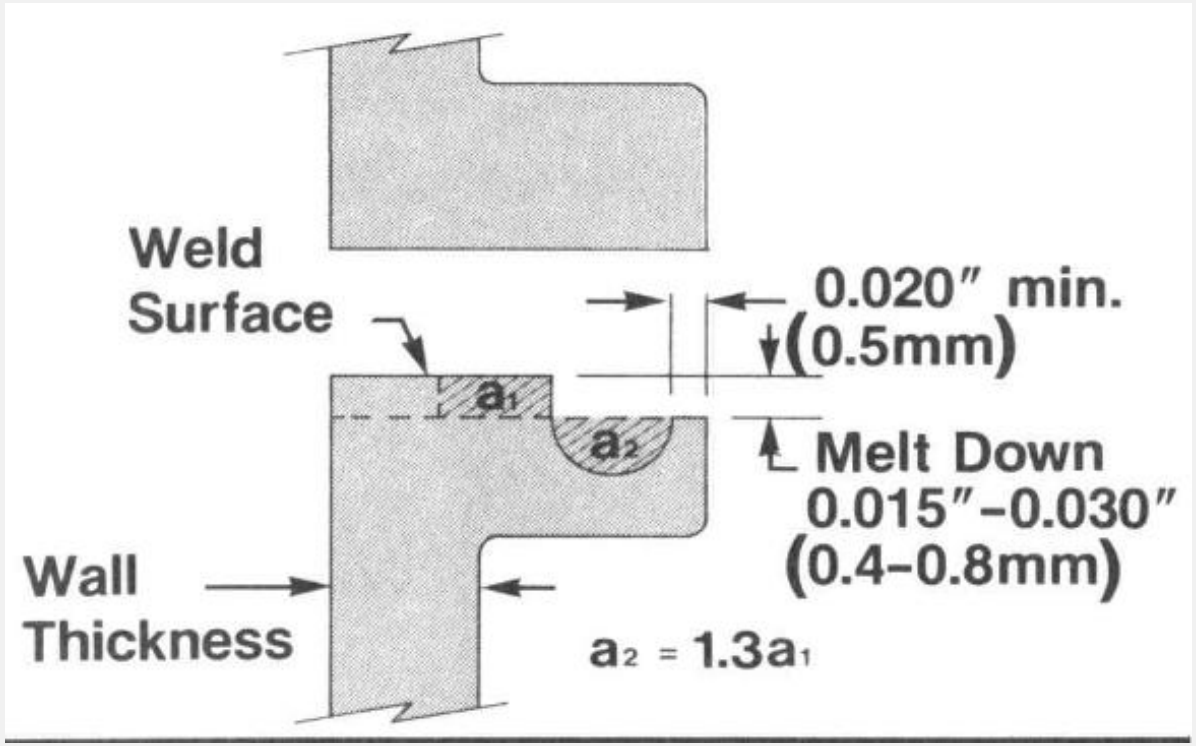
Welding design concept--Construction

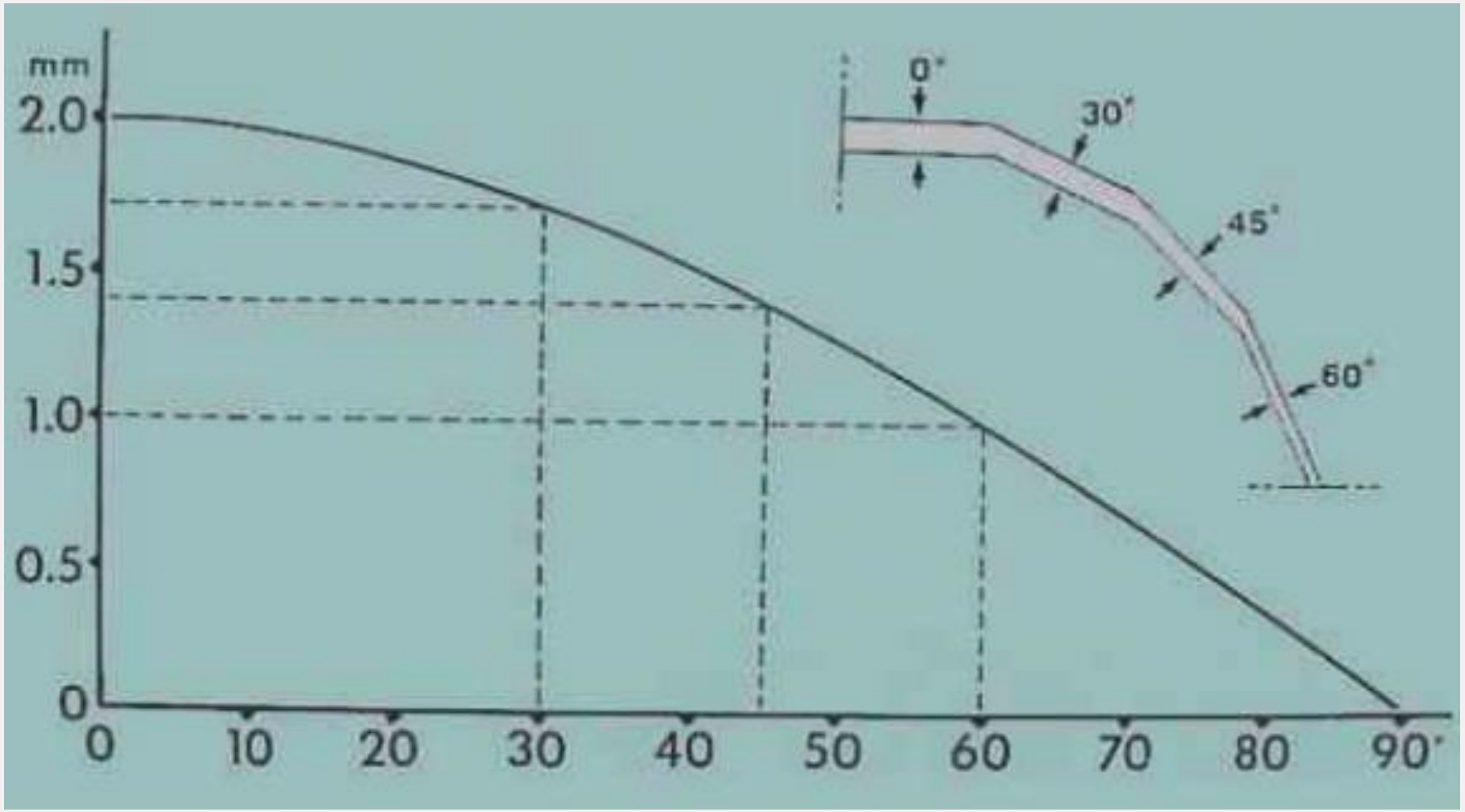
4.2.4 Exemplary design of a modified butt joint in the vibratory direction

This weld joint design is intended to cover up flash and debris by means of appropriate flash traps.

- S = Wall thickness
- S_z = Weld allowance about 0.5 – 1.5 mm
- h = Height of the retaining lugs
- h_1 = Groove depth about 2 mm
- h_2 = $h_1 + S_z + 0.2$ mm
- b = Width of retaining lugs about 1.2 mm
- V_1 = Flash section $\frac{V_o}{2}$
- V_o = Weld section
- Fr = Flash trap = V_1+20%

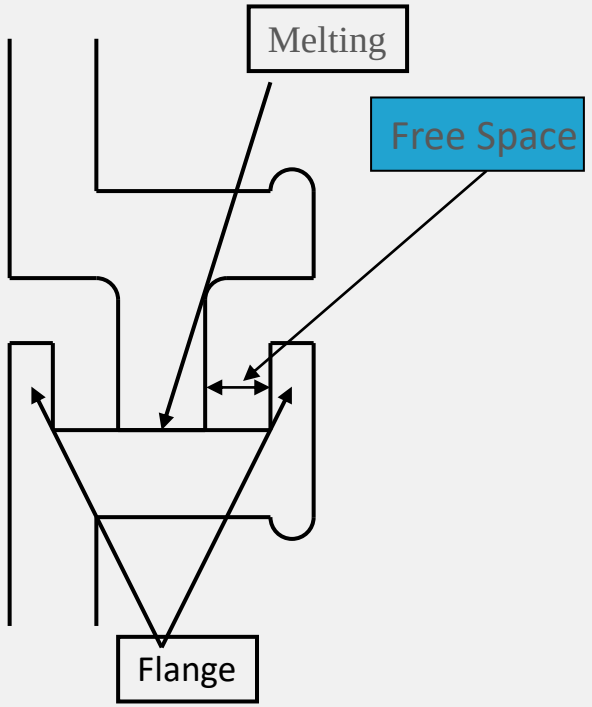


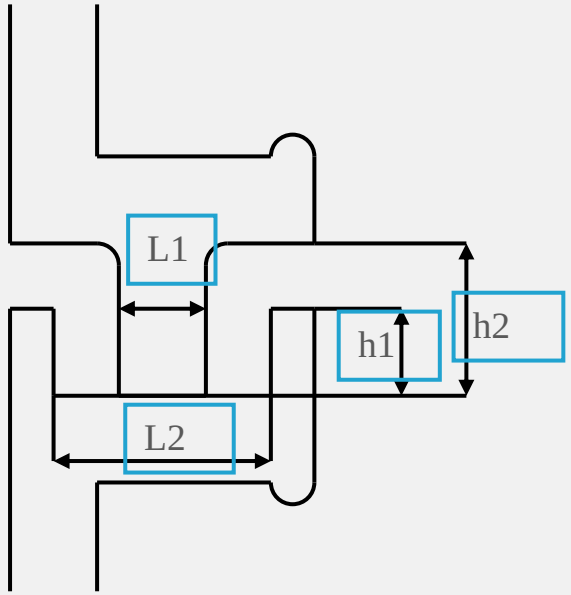


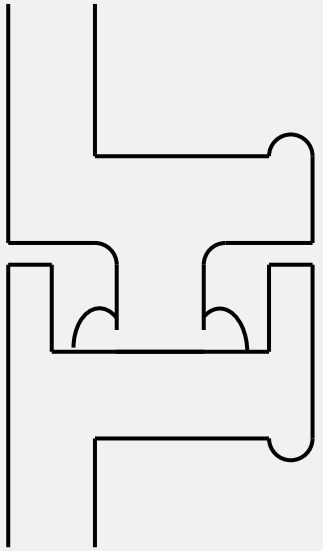


Amplitude

Bevel Angle

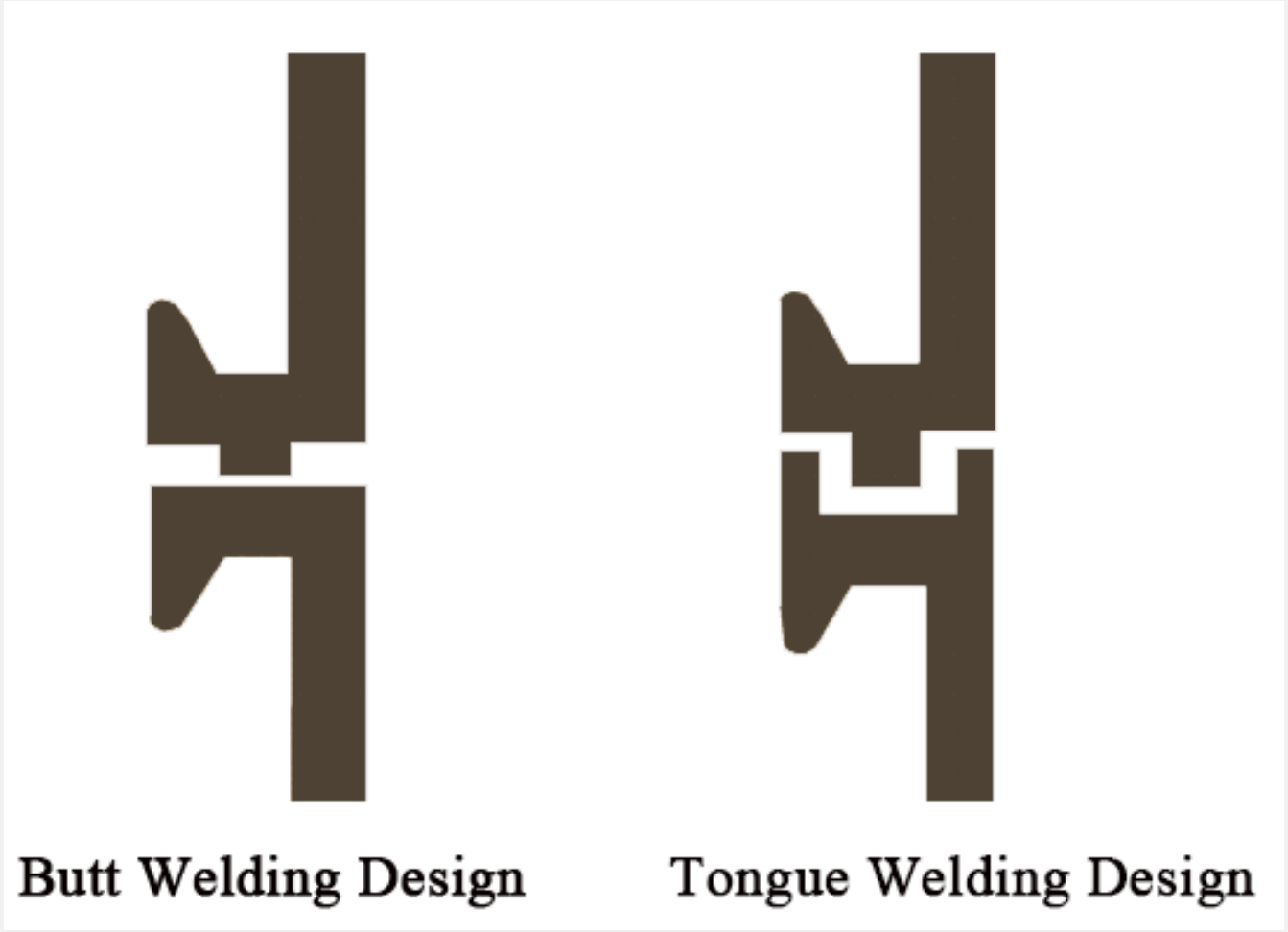


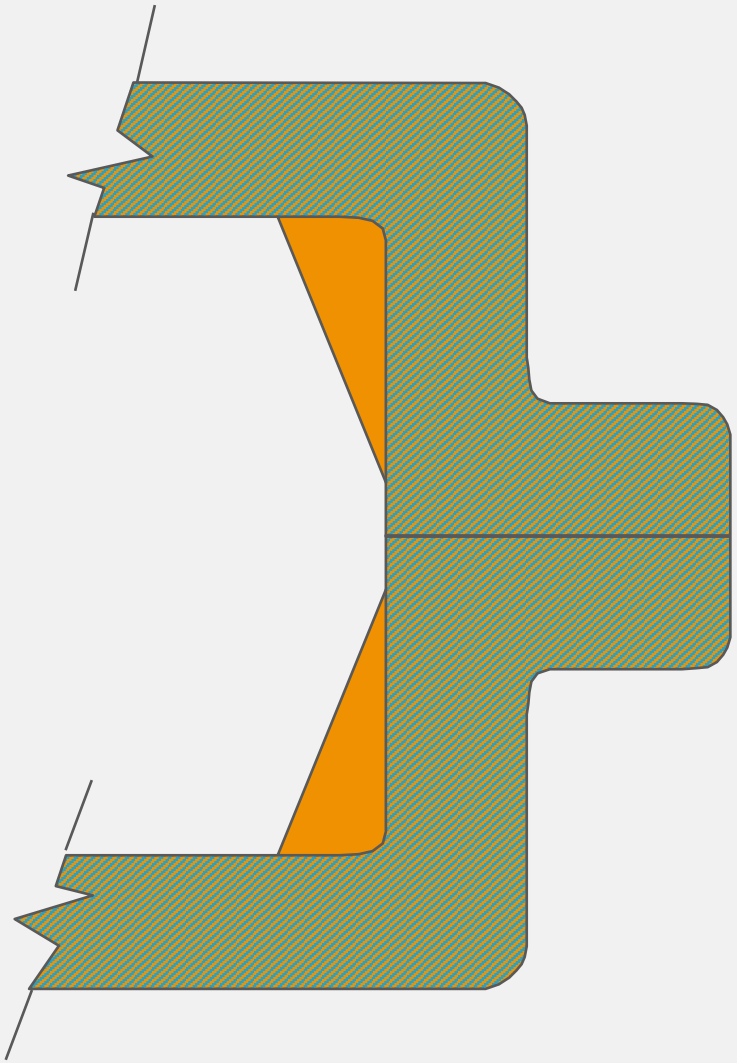




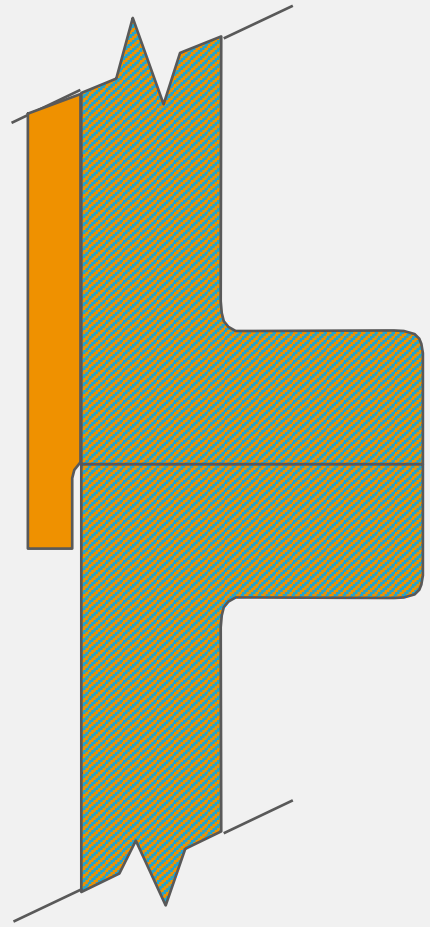
p = h2 −h1 −αα; Welding Margin (about 0.2mm)

Welding Volume（L1×p） ＜ Internal Space((L2−L1)×h1)


Butt Welding Design
Tongue Welding Design

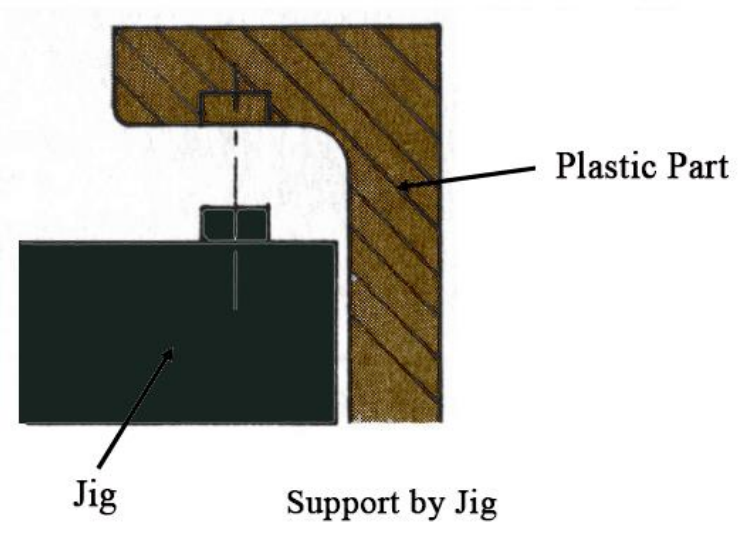


Internal Triangle Reinforcement

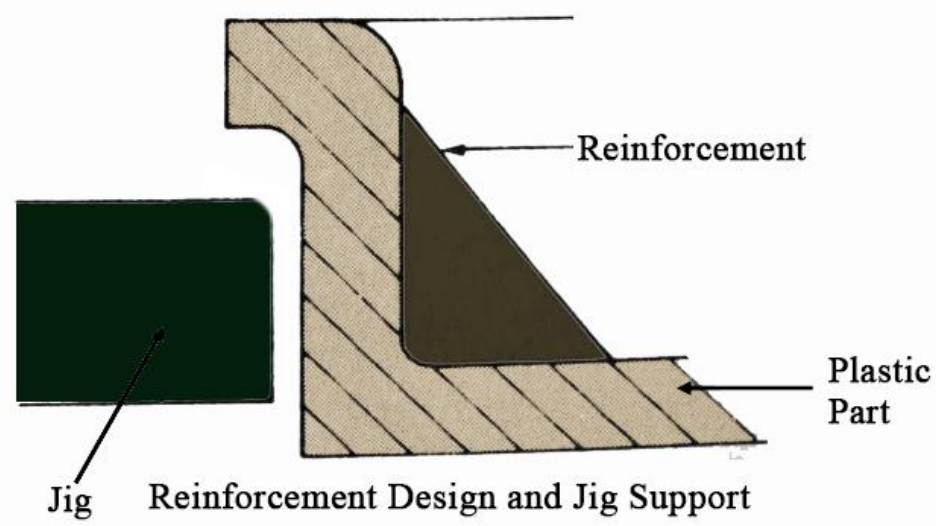


Internal Reinforcement

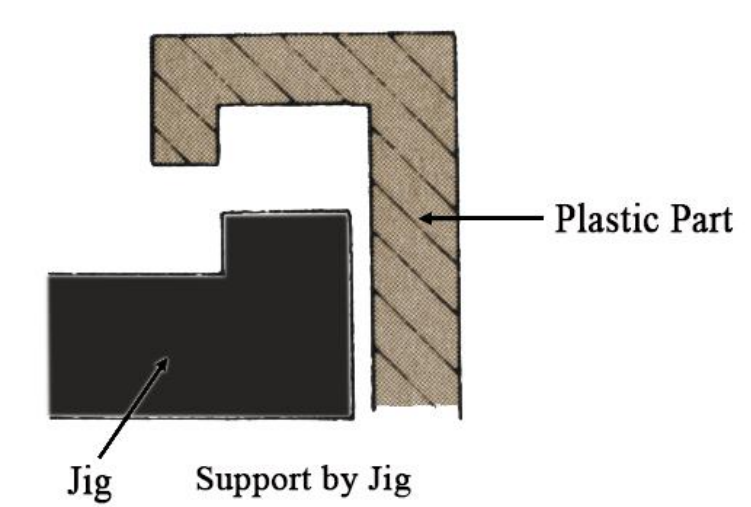
Welding design concept—Holding & Supporting



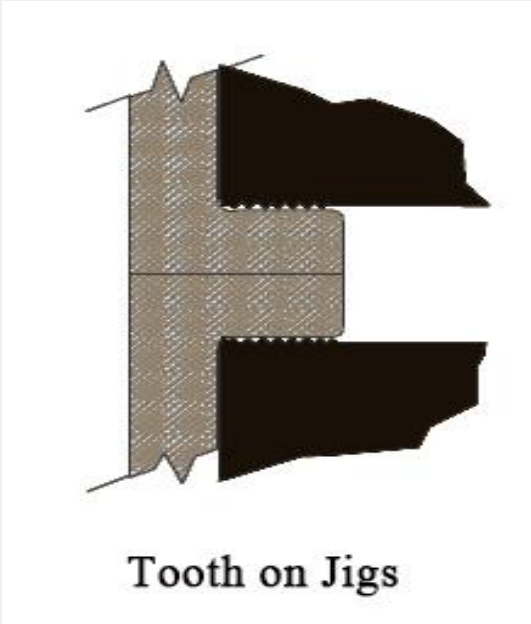
Support by Jig



Reinforcement Design and Jig Support



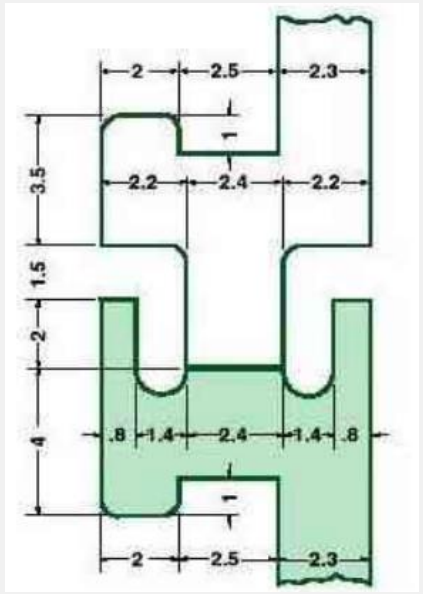
Support by Jig

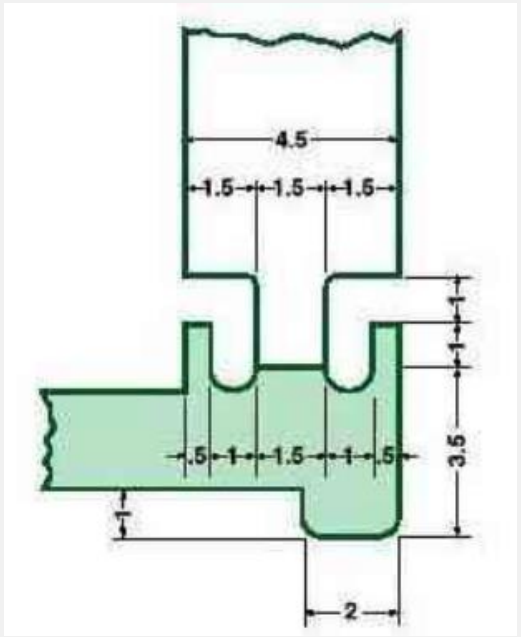


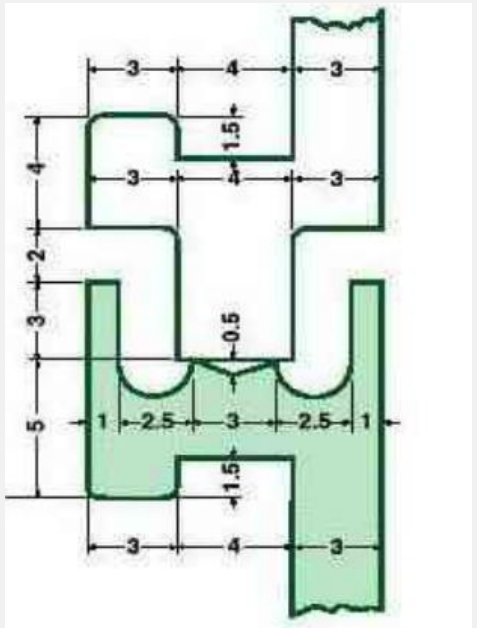
Tooth on Jigs

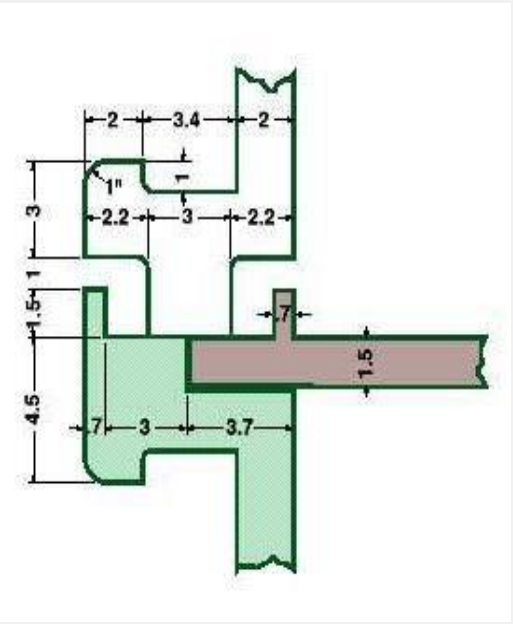
Welding design concept—Holding & Supporting

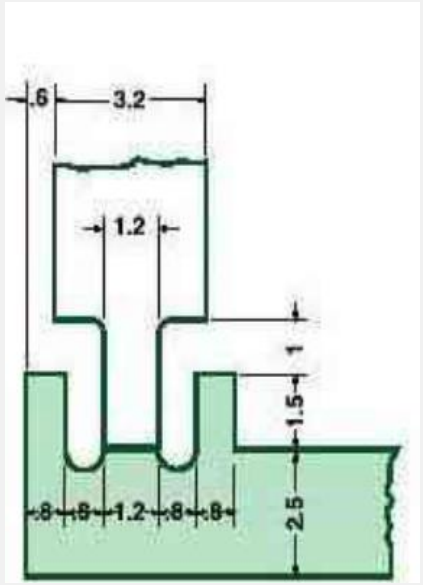
CNZHENBO 臻博机械 | MP Sonic Welding and cutting system

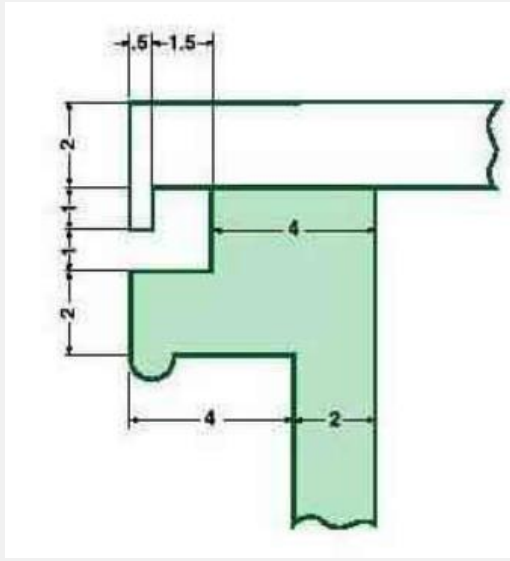


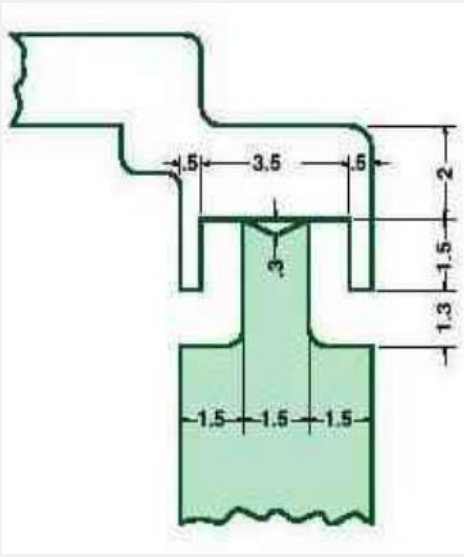


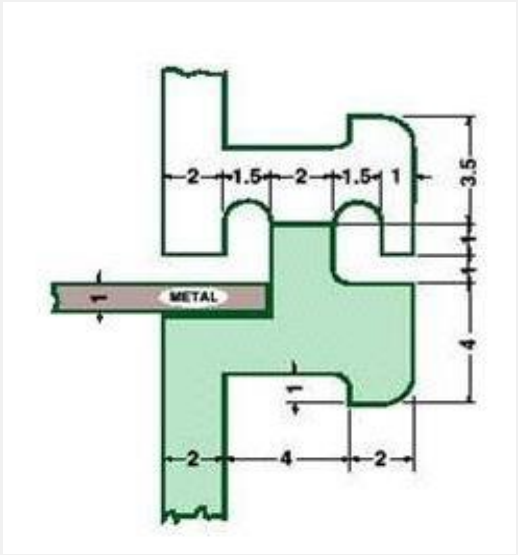






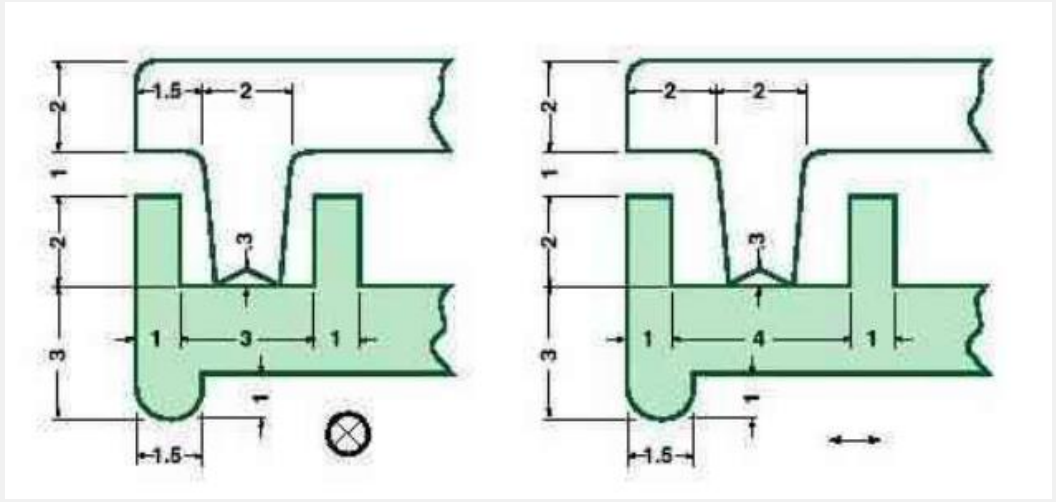


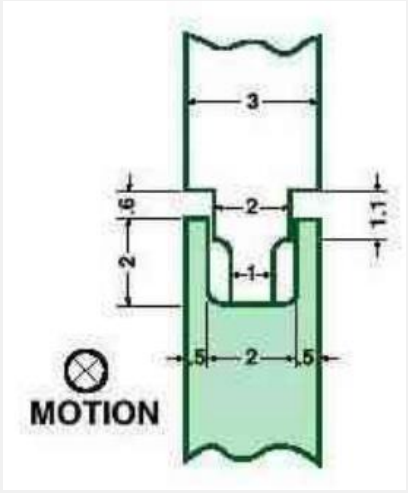


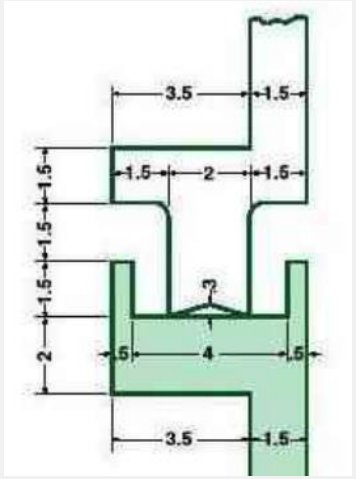


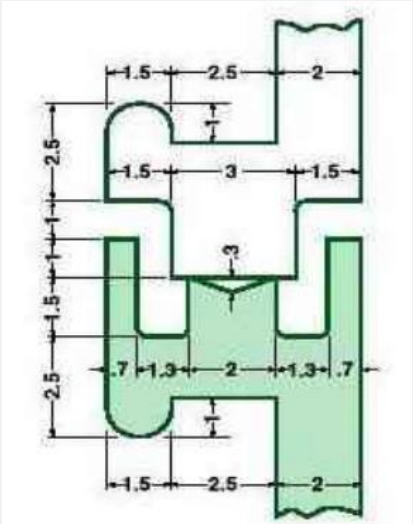
Liner vibration welding operation parameters

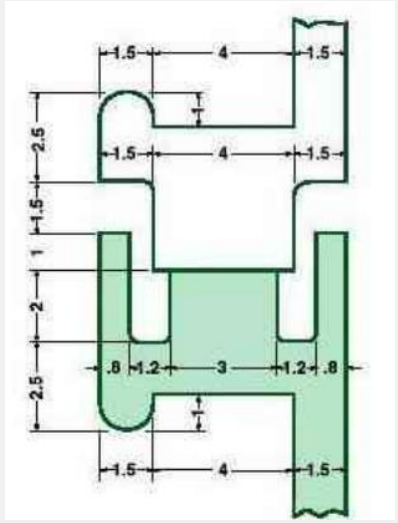
CNZHENBO 臻博机械 | MP Sonic Welding and cutting system

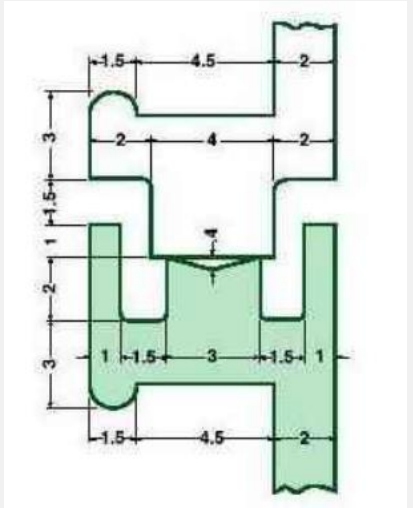


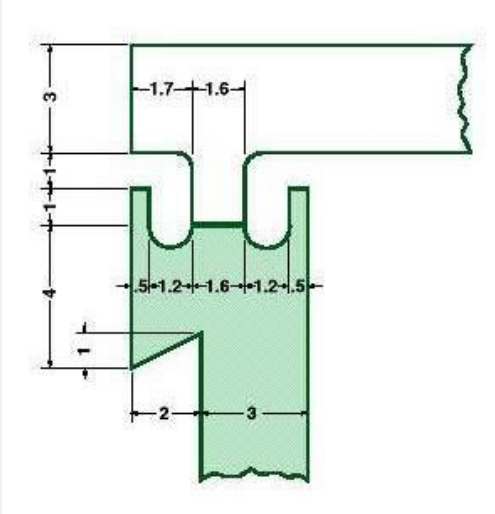




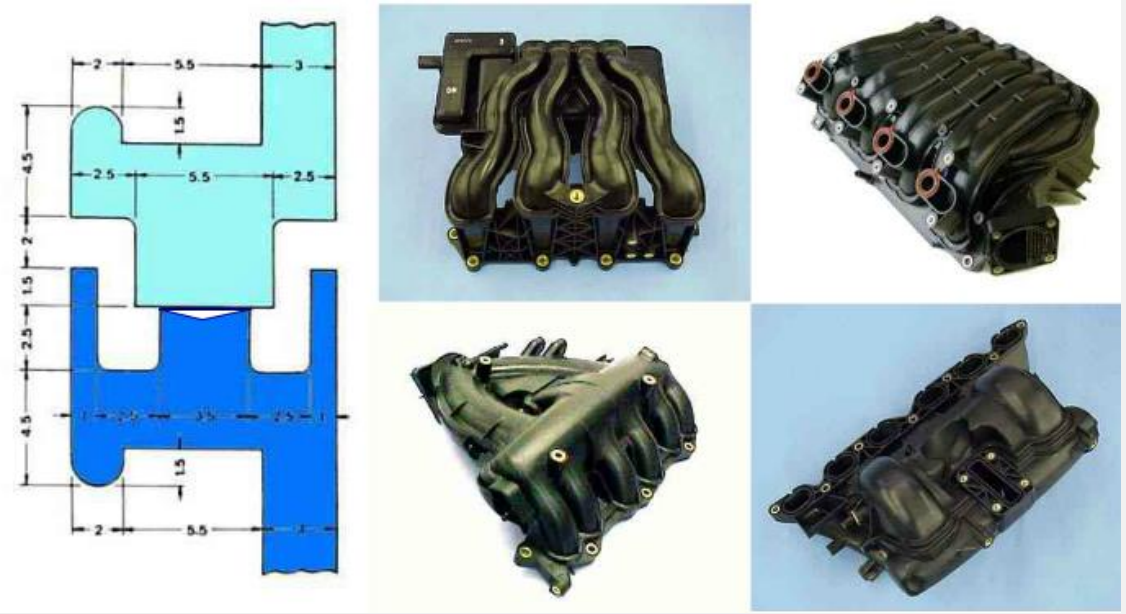


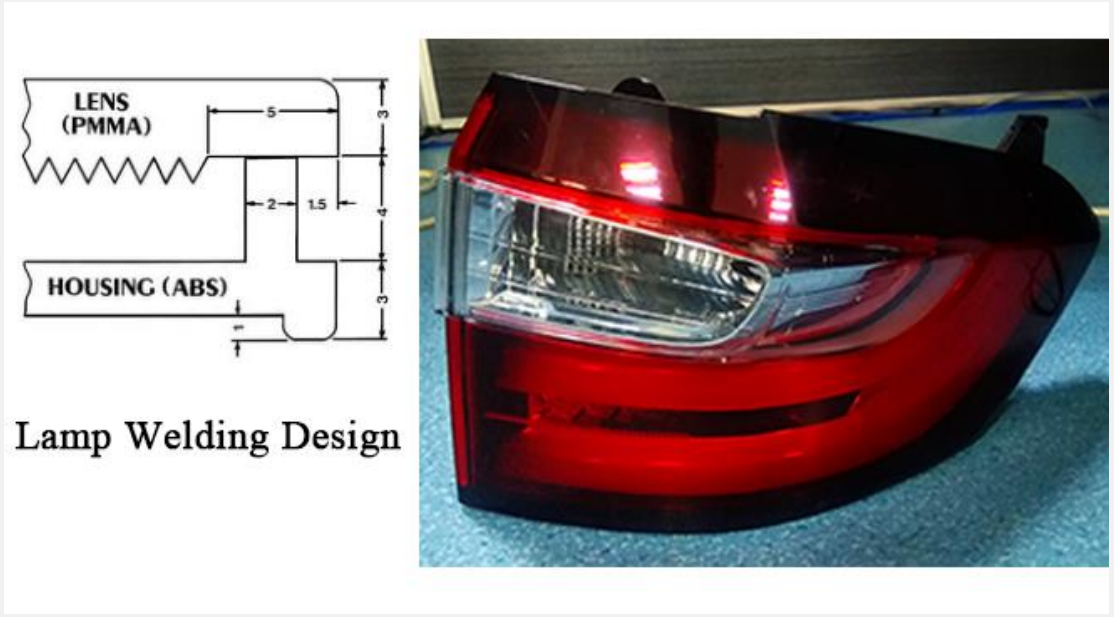






Liner vibration welding operation parameters





Lamp Welding Design

Joint Performance of Different Thermoplastic Material

CNZHENBO 臻博机械 | MP Sonic Welding and cutting system

THERMOPLASTICS 热塑性塑胶 / PRPPOSED WELDING METHOD 焊接方法		Ultrasonic 超声波焊接					Hot-plate 热板			Vibration 震动	Spin 旋转	Radio Freq. 高频
		Near filed welding 近距离	Far filed welding 远距离	Inserting 埋接	Staking 铆接	Spot welding 点焊	On contact 接触 * Low temp. 低温	On contact 接触 ** High temp. 高温	Non-contact 不接触 ***			
Acrylic/Styrene/Acrylonitrile(ASA)	丙烯酸 - 苯乙烯 - 丙烯	2-3	2 △	2	2	2	2-3	3	3	2	2	4
Acrylonireile/Butadiene/tyrene(ABS)	丙烯腈 - 丁二烯 - 苯乙烯（超不碎胶）	1	1 △	1-2	1	1	1-2	2	3	2	1-2	4
Cellulose Acetate(CA)	纤维	2	2-3 △	2	2-3	2	3-4	3-4	3-4	2	2	3-4
Methacrylate(Acrylic)(PMMA)	甲基丙烯酸酯（亚加力）	1-2	1-2 △	1-2	2	2	2	1	2-3	2-3	2	3-4
PA-Blends	尼龙混合物	3	3-4 △	3-4	3-4	3-4	2	3-4	3	2	2-3	4
PC-ABS-Blends	PC/ABS 混合物	2-3	3 △	3-4	3	2-3	2	3	3	2	2	4
PC-ABT-Blends	PC/ABT 混合物	2-3	3-4 △	3-4	3-4	2-3	2	3	3	2	2	4
Polyacetal(POM)	聚甲荃（赛钢）	2	2	2-3	2-3	2-3	1-2	2	2	2	2	4
polyamide(Nylon 6)	尼龙 6	2-3	2-3	2-3	2-3	2-3	3-4	3-4	2-3	1-2	1-2	3-4
polyamide(Nylon 6/6)	尼龙 6/6	2-2	2-3	2-3	3	3	2-3	2	2-3	1-2	2	3-4
polyamide-Copolymer(Nylon 6-3-T)	尼龙 6-3-T	2	2	2	2	2	2-3	3	3	2	2	3-4
Ploybutylene terephthalate(PBT)	聚丁烯酸脂	3molded parts 注塑件	2-3	2	2-3	2-3	3-4	3	3	2	2	4
		1foils 加薄胶膜										
Polycarbonate(PC)	聚碳酸酯（防弹胶）	2	2 △	2	2	2	2-3	2-3	2	2	1-2	4
Ploybutylene(PE)	聚乙烯（软胶）	3	4	3	3	2	1	2	3	3	2	4
Ploybutylene terephthalate(PET)	聚乙烯酸酯（宝特胶）	3molded parts 注塑件	2-3	2-3	3	3	3-4	3	3	2	2-3	4
		1foils 加薄胶膜										4
Ploybutylene oxide(PPO)	聚氧化亚苯	2	2 △	2-3	2-3	2-3	2	2	3	2	2	4
Ploybutylene sulifide(PPS)	聚硫苯	2	2	2	2	2	2	3	3	2	2	4
Ploybutylene (PP)	聚丙烯（百折胶）	3	4	3	3	2	1	2	3	2	2	4
Ploystyrene(PS)	聚苯乙烯（硬胶）	1	1 △	1	1	1	1	2	3	2	1-2	4
Ploysulfone(PSO)	聚佩	2	2	2-3	2-3	2	2-3	2-3	3	2	2	4
Ployvinyl chloride(PVC)	聚氯乙烯	2-3with foils 加薄胶膜	3 △	2-3	2-3	2-3	1-2	3	3-4	2-3	2	1
PP-EPDM-Blends	PP/EPDM 混合物	3	3-4 △	2-3	2-3	2	2	2-3	2-3	2	2	4
PPO-Blends	聚氧化亚苯混合物	3 with foils 加薄胶膜	3-4 △	3-4	3-4	3	2	2-3	2-3	2	2	4
Styrene/Butadiene(SB)	苯乙烯 - 丁二烯	1	1 △	2	2	1	3	3	3	2	1-2	4

List of Symbols 符号代表：1=very good 非常好 2=good 良好 3=limited 尚可 4=not possible 不可能

=Exhaust fan recommended 建议加排气扇
△ =Energy director recommended 建议焊接面加焊线
=Knurl faced horn recommended 建议焊头表面刻滚花纹
=Shear joint recommended 建议焊接面造剪切面

* Hot plate temperature up to 290°C，Heat platens incontact with parts to be welded. 热板温度达到 290°C，热板要与工件接触。
** Hot plate temperature above 290°C，many applications with temperature ranges above 340°C ,Heat platens incontact with parts to be welded. 热板温度在 290°C以上，热板要与工件接触，很多次实例都要用约 340°C范围温度。
*** Temperature ranges from 400°C to 650°C .NO contact between heat platens and parts to be welded. 热板温度在 400°C -650°C，热板与工件不用接触。

Joint Performance of Different Thermoplastic Material

Amorphous Resin	Joining Performance	Crystalline Resin	Joining Performance
ABS	E	POM (Polyacetal)	E
ABS/PC ALLOY(Cycoloy-800)	E	Fluorine-containing resin	G-F
PMMA (Acrylic)	E	A thermoplastic polyester	E
CA,CAB,CAP	E	PE (Polyethylene)	G-F
Improved PPO(Noryl)	E	PMP (Polymethylpentene)	E
PA(Polyamide-Imide)	G	PPS(Polyphenylene sulfide)	G
PC (Polycarbonate)	E	PP (Polypropylene)	E
PS(Polystyrene)	E		
PSF/PSU (Polysulfone)	E		
SAN , NAS , ASA	G	remark：E. Excellent; G. Good; F. Fault	

1) Fault concerned to vibration welding process

Fault Fild	Fault Phenomenon	Source of Fault	Solution
Over Welding	.Over volume of melted material flow	. Over-long vibration time	. reduce vibrition time
	Products measurement becomes smaller after welding	. Over deep welding . Wrong welding desing (Melting flow design)	. Reduce the welding depth . improve the welding area and welding design
Welding is not enough	. Weak elding strength . Measurement at welding area become bigger	.Vibration time is not enough .Welding depth is not enough .Impacted by low friction coefficient	. Increase vibration time . Increase welding depth . change thermoplastic material
Welding performance is not stable	. over-volume of melting flow around welding area	. Plastic parts distortion or fault in moulding . Ireggular welding area or joining line.	. Check mouled plastic parts condition . Check moulding condition
	. Joining strength is not enough after welding	. The matching condition between plastic parts and jig is not good	. Modify vibration welding tooling if necessary . Check and ensure jig condition . Check and ensure moulded parts geometric condition
	. Fault in leakage test	. Folding in joining line outforward	. Reinforce the wall of plastic parts; Add U-type clip design

		. Weak support by jigs (Polyurethane)	. Improve vibration welding tooling to keep plastic wall from distrotion outward; . Reinforce the support at critical area; . If vibration jig distorted along the longer side direction, please reinforce the rigidity of jig; . Check if there is related replacement bewteen plastic parts and jigs during vibration welding; . Check and ensure the positioning between upper jig and lower jig.
		The measurement tolerance of plastic parts geometric shape	. Check plasstic parts measurement;
			. Check the moulding condition.
			. Adjust the measurement toleranve of plastic parts.
		Demoulding agent is sticki on the surface of welding area	. Check and ensure right moulding process; . Clean agent by detergent at welding area; . Change demoulding method if necessary.
		Additive material	Reduce the volume of additive (redyce by 10~20% per time and check the result)

Metling flow	Too much melting flow around welding area	. Defect in melting flow design.	. Redesign the melting flow slot
		. Over welding.	. refer to the solution to over-long vibration time
		. Fault in welding location.	. Inspect injection condition.
Plastic dislocation after welding	. Dislocation at terminal of plastic parts.	. Parts wall distorte outward during vibration welding.	. Add reinforcement to injection plastic parts; . Add U-type clip design to plastic parts at related welding area.
		. Erro free tolerance or unqualified injection moulding.	. Mange free tolerance; . Check and ensure injection moulding condition.
		. Relative dislocation bewteen upper jig and lower jig.	. redress vibration jigs.
		. Welding pressure is over-high.	. Add reinforcement to injection plastic parts; . Adjust vibration welding parameters.

Welding performance is not stable	Weak welding strength cased due to bad thermoplastic parts	Difference cased by multi-cavities moulding.	. Check and analysis the difference between unqualified parts; . Inspect the free tolerance of plastic parts; . Check the wearing condition of injection mould; . Inspect the moulding condition.
		.Recycled or low quality thermoplastic material used.	. Change the recycled material percentage; . Apply material in higher quality.
		.Problem in additive supply system.	. Inespect the injection condition.
		. Material used in low fusibility or incompatibility.	. Confirm together with thermoplastic material suppliers.
		. Plastic with heavy moisture (eg. nylon)	. Weld parts as soon as possible once injection moulding; . Do dry processment before welding.
		. Low compressed air pressure.	. Increase the outpur pressure of air compressor; . Apply suitable air tank.

2) Fault converned to thermoplastic parts design

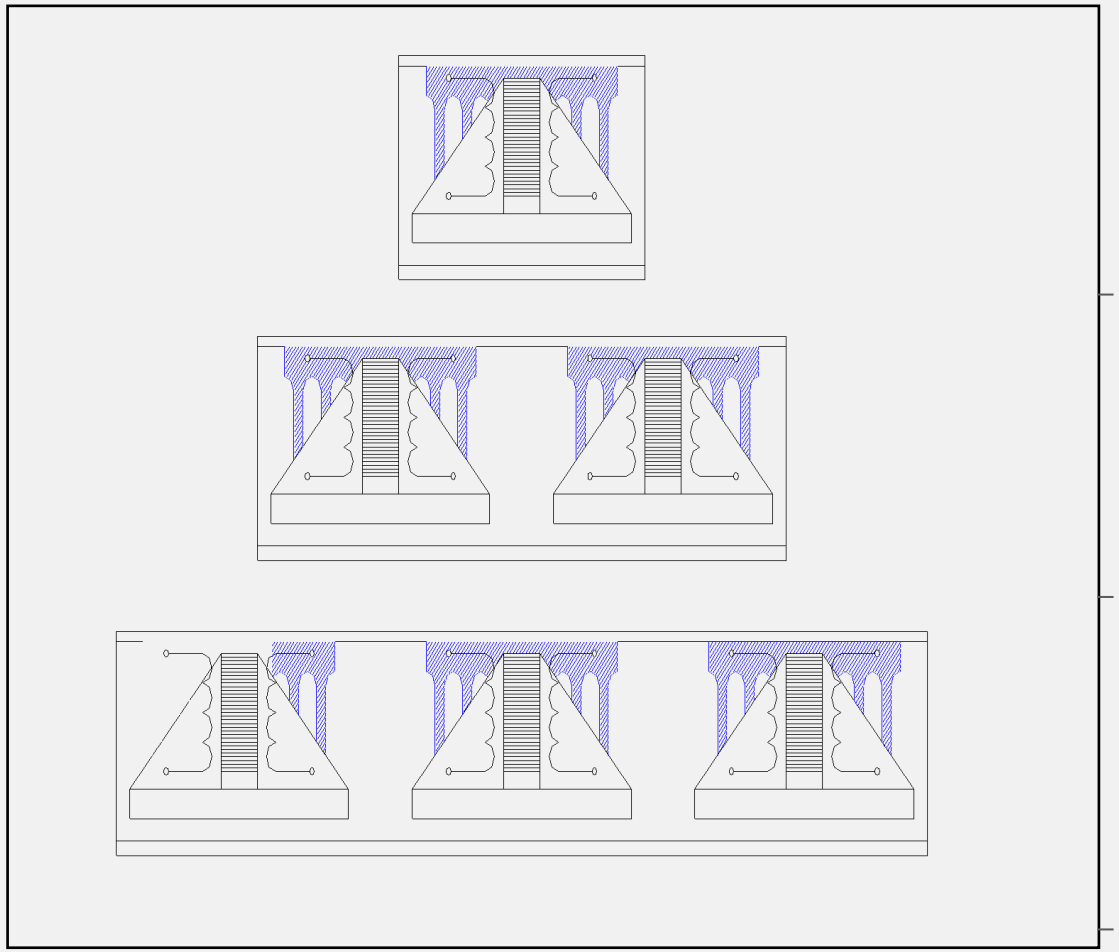
Fault	Source of Fault	Solution
Accssories inside parts damaged	. Over-long vibration time.	. refer to the solution to over-long vibration time.
	. Unreasonable location design of accessories inside plastic parts (too close to vibration welding location).	. Redesign the location of accssories inside of plastic parts; . Design clapboard between the accessories and wall of plastic parts.
Non-welding area around welding place is welded or damaged.	. Over-long vibration time.	. refer to the solution to over-long vibration time.
	. Internal stress remain along with plastic parts.	. Check and ensure moulding condition; . Improve plastic part design.
	. Over-high welding pressure.	. Reduce welding pressure and improve plastic part design.
Welding happens between to inside accessories and plastic parts.	. The accessoies is in the same material with welding plastic parts.	. Ensure the material of each parts/accessory; . Lubricate the accessories inside parts; . Improve plastic part design.
Hurt or pressure mark on plastic parts surface.	.Inaccurate positioning of plastic parts in jigs;	. Check and ensure the jig suport the plastic parts well; . Check and ensure the matching between plastic parts and vibrtion tooling; . Improve plastic part design.
	. Parts shifts during vibration welding.	.Improve vibration jig design to ensure the parts positioning.

Fault	Source of Fault	Solution
Welded thermoplastic products is lose from vibration welding jig.	Thermoplastic parts has not been located in right position	Improve the vibration welding tooling design.
	Deformation of jig	Design reinforcement to vibration welding jig.
	Error in measurement tolerance of thermoplastic parts	Control the moulding measurement of thermoplastic parts.
Always low vibration amplitude and weak output.	Vibration module or frequency converter / amplifier error.	1. Check and ensure the position of thermoplastic parts; 2. Check and ensure if there is lose or crack on vibration module. 3. Test frequency convertor.

Fault	Source of Fault	Solution
Over Melting	Over high friction energy heating at welding area; excessive energy concentration at welding are.	1. Reduce pressure 2. Reduce vibration time 3. Reduce vibration amplitude
Melting not enough	Friction heating energy is not enough	1. Increase pressure. 2. Increase vibration time. 3. Increase vibration amplitude.
	Jig loose	adjust or improve vibration welding tooling
Irregular welding surface	Deformation of thermoplastic parts (Didtortion)	1. Check and ensure thermoplastic part mensurement 2. Ensure molding condition 3. Increase pressure for vibration welding
	Deformation fo thermoplastic part wall	Design reinforcement to wall of thermoplastic parts;
	Problem in Horizontal welding	1. Cheng position to avoiding deformation; 2. Apply tooling holding parts;
	The two thermoplastic parts are not parallel with each other at the welding surface	1. Check and ensure thermoplastic part mensurement; 2. Adjust the lower vibration welding tooling position if necessary; 3. Ensure the pressure value during vibration welding
	Thermoplastic parts is loose (not held in position tightly)	1. Ensure the critical area is held steadily; 2. Adjust the position.

Fault	Source of Fault	Solution
Hurt the surface of thermoplastic part.	Tolerance of degomeic shape of themoplastic parts	1. Ensure the tolerance of thermoplastic parts; 2. Check and ensure the wearing condition inside cavities of vibration weldong jigs; 3. Check and ensure the molding condition.
	Recycled thermoplastic material used	1. Reduce the ratio of recycled thermoplastic matal used; 2. Check and ensure the quality recycled thermoplastic material.
	Uneven distribution of additive	1. Check and ensure the molding condition. 2. Ensure the storing condition after molding.
	Error joning surface cased	1. Adjust and ensure the condin of vibration welding jigs; 2. Apply new welding design.
	Two thermoplastic parts can not match well	Check and ensure the measurement of thermoplastic parts and moulding condition
	Thermoplastic parts and vibration jig matching error, the surfance or coating of thermoplastic parts it hurt.	1. Check and ensure the loactiong; 2. Ensure that the jig material is suitable for thermoplastic parts condition; 3. If vacuum is applied in upper jig, please check and ensure the vacuum suction condition at related area; 4. Apply clip-type holding if necessary; 5. Keep jig clean.
	Hurt at back of welding surface	1. Reduce welding time; 2. Reduce welding pressure; 3. Increase the thickness of thermoplastic parts.

Frequency：90-360 Hz



25 kg.
(1) x 25 Kg.

50 kg.
(2) x 25 Kg.

75 kg.
(3) x 25 Kg.

CNZHENBO 臻博机械 | MP Sonic
Welding and cutting system

Thanks

Tel :+86-577-61517751
Fax :+86-577-61517750
Mob:+86 15918523336
Email :alex.lee@mp-sonic.com; alexlee2696@163.com
Add :No.289, Weiqi Road, Yueqing Economic Development Zone, Wenzhou, China
Web:www.cnzhenbo.com; www.mp-sonic.cn