

WRM-TECH

Suzhou West Rock Machine Technology Co., Ltd.

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Friction welding
Dedicated & Professional

WRM-TECH

Suzhou West Rock Machine Technology Co., Ltd.

- Dual servo friction welding technology
- High precision spindle technology
- High speed spindle and braking technology
- Self centering synchronous clamping technology
- After welding length control technology
- Angular positioning control technology
- Welding parameter monitoring technology
- Fully automatic loads/unloads technology

FRICITION WELDING

www.wrm-tech.com

Company Profile

WRM-TECH

Suzhou West Rock Machine Technology Co., Ltd. is a high-tech enterprise focusing on rotating friction welding.

With innovative high dynamic precision technology, welding quality control technology, full servo friction welding technology, high reliability technology, high automation technology, we lead the technological progress of the industry. Our machines are widely used in the friction welding of mechanical parts in many fields such as automobiles, construction machinery, aerospace etc.

Since its foundation, we have been providing complete friction welding technology solutions under the principles of "technological innovation as the core, quality service as responsibility, promotion of industrial technological progress, and improvement of customer competitiveness".

Technical field

Rotary Friction Welding

- Direct drive welding
- Inertia welding
- Hybrid welding
- Phase adjusting welding
- Servo controlwelding
- Hydraulic control welding
- Rad ial welding
- Vertical type welding
- Two type welding
- Automation welding

Linear Friction Welding

Welding Experiments And Test

Technical advice, welding experiments and tests according to customer's requirement to achieve maximum quality and cost efficiency for our customers.



Mission

To provide high quality products and services, connecting friction welding and the world.



Vision

To become the world's best friction welding technology service provider

Core Values

◆ Diligence

Diligence in Learning & in Thinking, diligence in Exploration & in Practice. Positive efforts, perseverance & establish a good professional quality.

◆ Respect

Respect for each other, respect for the facts, respect for the knowledge, respect for work efforts.

◆ Innovation

"Imagination is more important than knowledge, for knowledge is limited, and imagination sums up everything in the world, advances progress, and is the source of knowledge progress." - Albert Einstein

◆ Achievement

The achievements of our employees, our customers, our career and our society.

The weldability of friction welding schedule

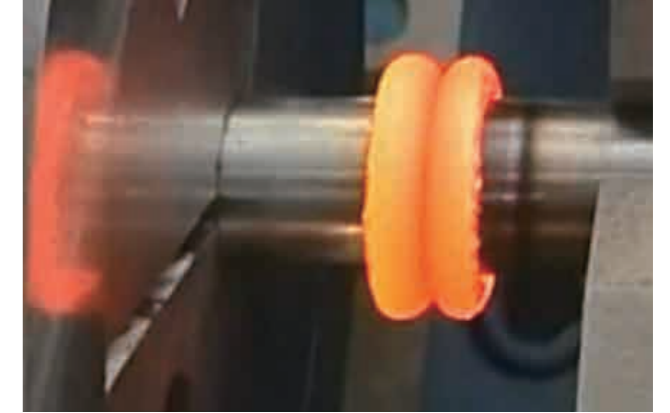
	Ferrous										Nonferrous metal															
	Carbon steel		Alloy steel			Special purpose steel			Cast & forged steel		Aluminium		Titanium, titanium alloy		Nickel alloys		Tungsten, molybdenum		Magnesium alloy		Other non-ferrous metals					
	Ordinary steel	Steel for mechanical structure	Steel for automobiles	Structural carbon steel pipe	Steel for pressure vessels	Chromium-molybdenum steel	Nichrome molybdenum steel	Manganese steel	Stainless steel	Heat-resistant steel	Tool steel	Bearing steel	Spring steel, others	Forged steel	Cast steel	Copper, copper alloys	Pure aluminium	Corrosion-resistant aluminium	High-strength aluminium	Other aluminium	Magnesium alloy	Tungsten, molybdenum	Nickel alloys	Titanium, titanium alloy	Alloy powder	Other non-ferrous metals
NONMETAL	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ferrous	Other non-ferrous metals	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Alloy powder	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Titanium, titanium alloy	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Nickel alloys	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Tungsten, molybdenum	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Magnesium alloy	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Aluminium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Other aluminium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	High-strength aluminium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Corrosion-resistant aluminium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Pure aluminium	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Copper, copper alloys	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cast and forged steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Cast steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Forged steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Special purpose steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Spring steel, others	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Bearing steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tool steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Heat-resistant steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Stainless steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Nonferrous metal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Alloy steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Carbon steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Structural carbon steel pipe	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Steel for automobiles	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Steel for mechanical structure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Ordinary steel	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

- High quality, High efficiency.
- Clean environmental protection, Energy conservation.
- Improvement of production efficiency; The saving of manufacturing costs.
- The optimization of the manufacturing process; The improvement of the utilization rate of raw materials.

Our friction welding machines help customers achieve.

Friction Welding Technology

Friction welding is a solid-state bonding process. The two welding parts that are doing relative movement or rotation, are butted under pressure. Heat is generated by the friction of the contact surfaces so that the welding materials are mutually penetrated and integrated from the contact surface. In this process packing, welding wire and shielding gas are not required. Friction welding technology which has the technical characteristics of energy saving, high quality, high efficiency and free pollution, has been applied more and more often in the fields of aerospace, weapons, oil driving, shipbuilding, automobile and machine manufacturing and so on.



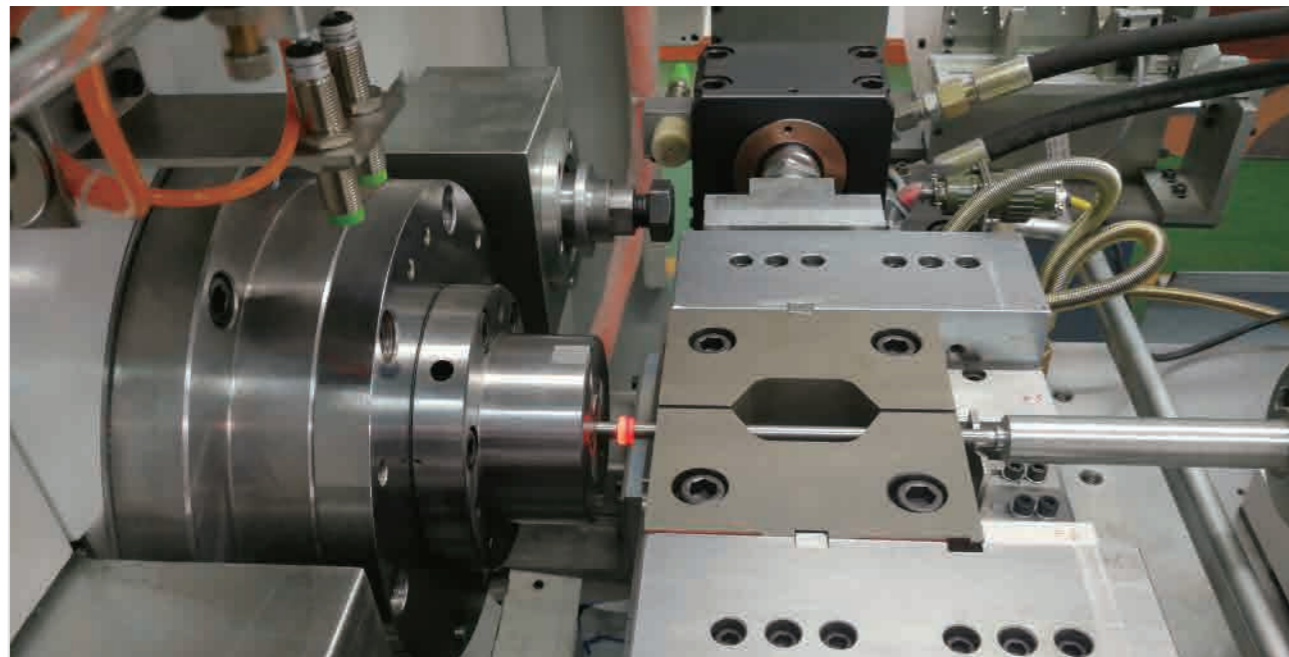
Rotating friction welding

One part is rotating while the other part is fixed during friction welding. Under the action of the axial force, heat is generated by the friction of the contact surfaces. When rotation stops the forging force is applied so that the welding materials are mutually penetrated and integrated from the contact surface.



Direct Drive Friction Welding

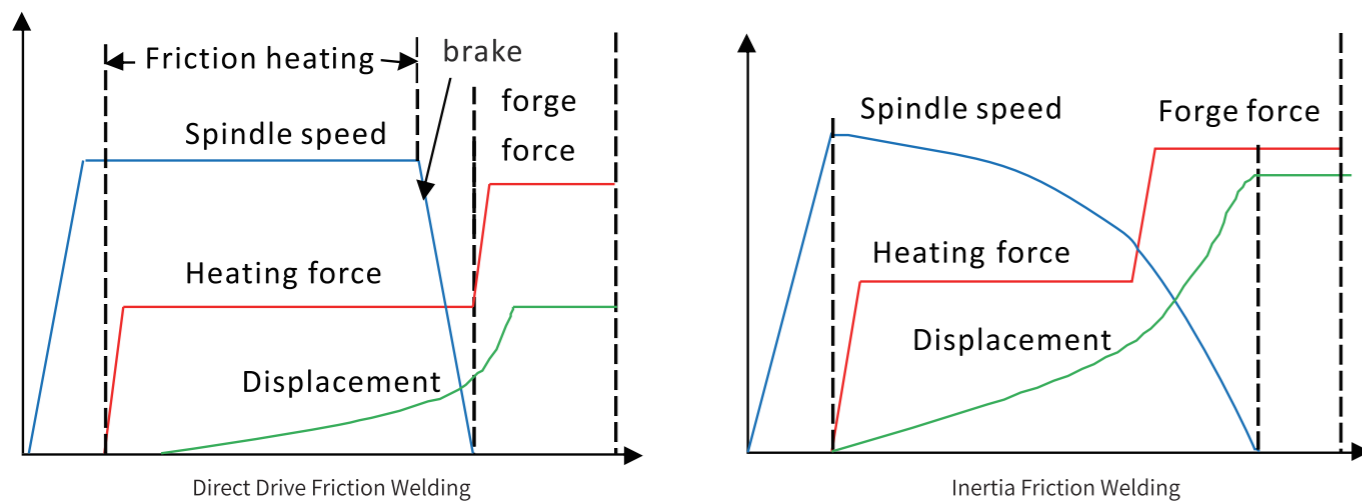
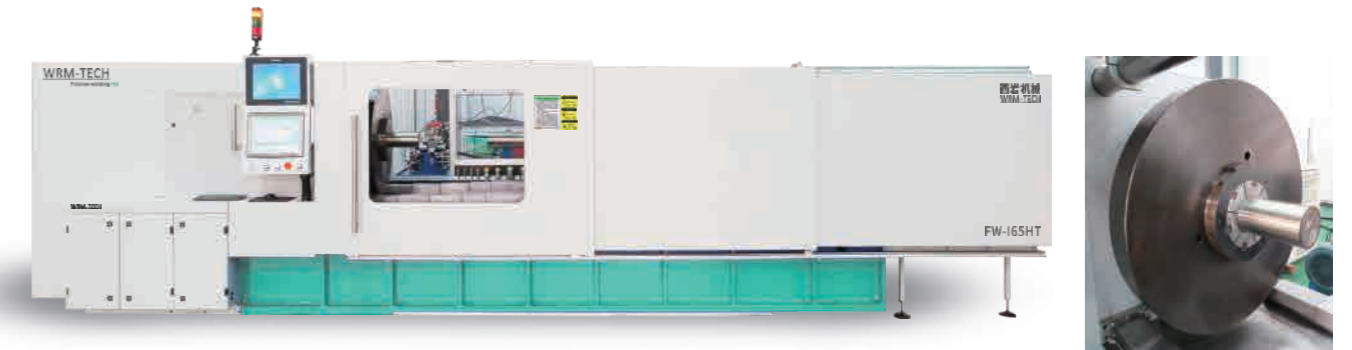
The energy required by friction welding is obtained by connecting the drive motor directly during a predetermined period of time. A workpiece is mounted on a motor-driven rotating device and the other does not rotate. The motor-driven workpiece is rotated at a predetermined constant speed and then the two workpieces to be welded are axially pressed together to start the friction to generate heat. When the friction continues for a predetermined time or reaches a predetermined axial shortening amount, the rotary drive motor is opened and fast braked. After the rotation is stopped, the upset axial force remains constant or increased for a predetermined period of time.



Inertia Friction Welding

The energy required for friction welding is mainly provided by the rotational kinetic energy stored on the welder. A workpiece is connected to the flywheel and the other does not rotate. The flywheel is accelerated to a predetermined rotational speed to store the energy required for the welding, and then the motor is disengaged and the axial friction of the two workpieces is pressed together by the welding axial friction to start the friction to generate heat. As the flywheel speed decreases, the stored kinetic energy is converted into the heat generated by the welding section friction and is lost.

The upset axial force can be increased before the rotation is stopped, and the upset axial force remains constant for a predetermined period of time after the rotation is stopped.



The comparison of two welding processes

Items	Direct Drive	Inertia
Heat affected zone	wider	Relatively narrow
Welding time	longer	Relatively short
Welding range	Wider	Relatively narrow, different parts replace the flywheel
Welding parameters	More	Fewer, easily controlled
Spindle speed	Lower	High
Spindle braking	Needed	Not needed
Applicable parts	Bar stock Tube	Superhard material Large diameter thin wall pipe

Our friction welding technology

Fast

- Spindle speed maximum 160000 rpm
- Fast moving speed maximum 400mm/s

Precise

- Highly dynamic precision technology
- Precise process control technology

Productive

- Develop and implement cost effective complete solutions with high process reliability.

Secure

- Implement all round safety measures for human, machine, environment, etc.

Reliable

- Robust components designed for a long service life
- Maintenance-free technology requires minimal maintenance



We are a team formed by experienced engineers in friction welding industry.

Welding quality control technology

1 / Even in the ultra-short (<1 second) welding process, our ultra-fine control technology controls the details of the process very accurately;

2 / Use time mode or displacement mode or dual mode to flexibly control the friction phase, depending on the part material and section properties;

3 / According to different needs, control the shortening amount or control the total length of the weldment, the length of the parts before and after welding can be measured;

4 / The welding length compensation technology is more suitable for the extremely high requirements of the total length deviation of the weldment;

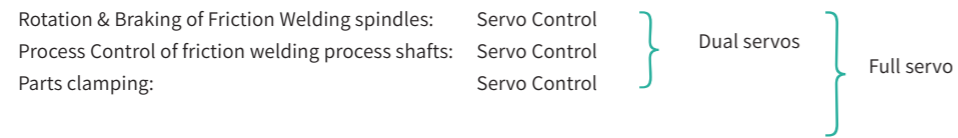
5 / The welding parameter monitoring system comprehensively records the actual value of the process parameters, compares it with the boundary data in real time, and evaluates the quality (OK/NG);

6 / The changes of welding process parameters are displayed with curves, and the boundary envelope is set to display the accuracy of welding parameters.

Long-term stable welding quality depends on precise and stable control of welding process parameters.



Full servo friction welding technology



Comparison of hydraulic and servo friction welding process shafts

Item	Hydraulic control	Servo control
Architecture	1)Hydraulic cylinder + hydraulic system, common valve to control pressure and speed	
	2)Hydraulic cylinder + hydraulic system, proportional valve controls pressure and speed, no pressure sensor, open-loop control	1)Ball screw + servo motor + servo driver, force sensor, open loop control
	3)Hydraulic cylinder + hydraulic system, proportional valve to control pressure & speed, equipped with pressure sensor, closed-loop (PID)	
	4)Hydraulic cylinder + servo hydraulic system, servo pump and servo motor control pressure and speed, equipped with pressure sensor, closed-loop (PID) control	2)Ball screw + servo motor + servo driver, equipped with force sensor, closed-loop (PID) control
Stability of forces during friction	Fluctuation of hydraulic oil temperature, leakage of pipeline, cleanliness of oil, quality of proportional valve, etc., directly affect the stability of force during friction	There is no hydraulic influence on the force, and it is easy to achieve the stability of the force during friction
Displacement control accuracy	Generally	Accurate
Quality stability	The architecture used is related; stability is poor	Long-term stability
Maintainability	Poor, the proportional valve is very picky about the cleanliness of the oil, the filter element should be replaced frequently, and the oil should be updated regularly. High maintenance cost	Virtually maintenance-free, low maintenance costs
Efficiency	The fast moving speed of the slide table is 50 ~ 200mm/s. Too fast speed will cause the oil pump displacement to be too large, and the heat generation will also be large. Higher acceleration and deceleration will cause shock.	The fast moving speed of the slide table is 200 ~ 400mm/s, which is easy to achieve. The high acceleration and deceleration response is very fast, the control is free, and the impact is small.
Energy saving	Hydraulic pump plus motor, its mechanical efficiency is 85-90%, plus pipeline and general loss, the comprehensive energy efficiency is about 50%, and the oil temperature and BBS cooling are very low	Hydraulic pump plus motor, efficiency is 85-90%, plus pipeline and general loss, the comprehensive energy efficiency is about 50%, and the oil temperature and BBS cooling are very low

Technical Support

- 01 Equipment selection
- 02 Friction Welded Head Design
- 03 Prototype welding
- 04 Strength test
- 05 Metallographic Analysis
- 06 Personalized design
- 07 "Turn-key" project



Innovative Design - High dynamic precision technology



FW-D1HT-Servo Hollow sodium fully automatic valvewelding machine



Servo control of spindle rotation



Servo control of forge force



High accuracy self centering synchronous clamping system

Carefully Manufactured - High reliability technology



High precision spindle

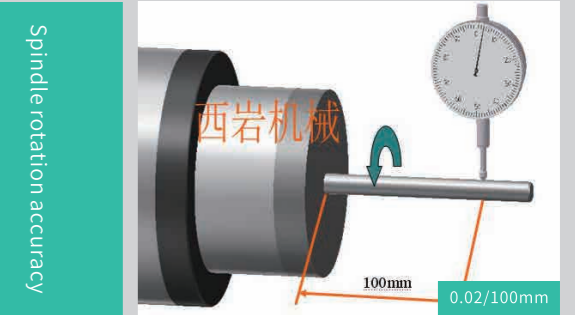


Automatic loading and unloading

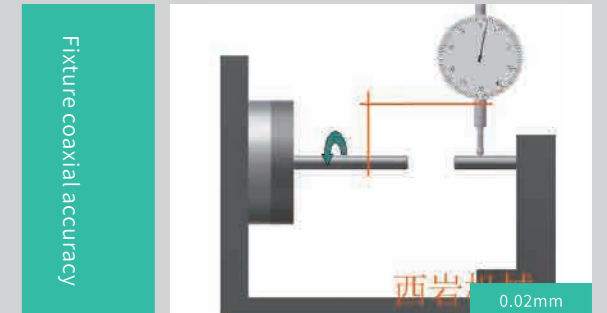


Automatic remove the flash

High dynamic accuracy



Spindle rotation accuracy



Fixture coaxial accuracy

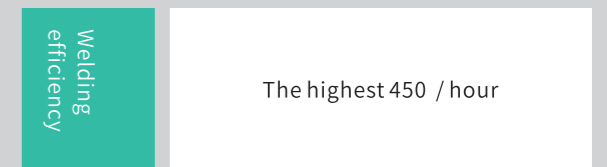


Coaxial after welding



Welding strength

Equal to or higher than the base metal

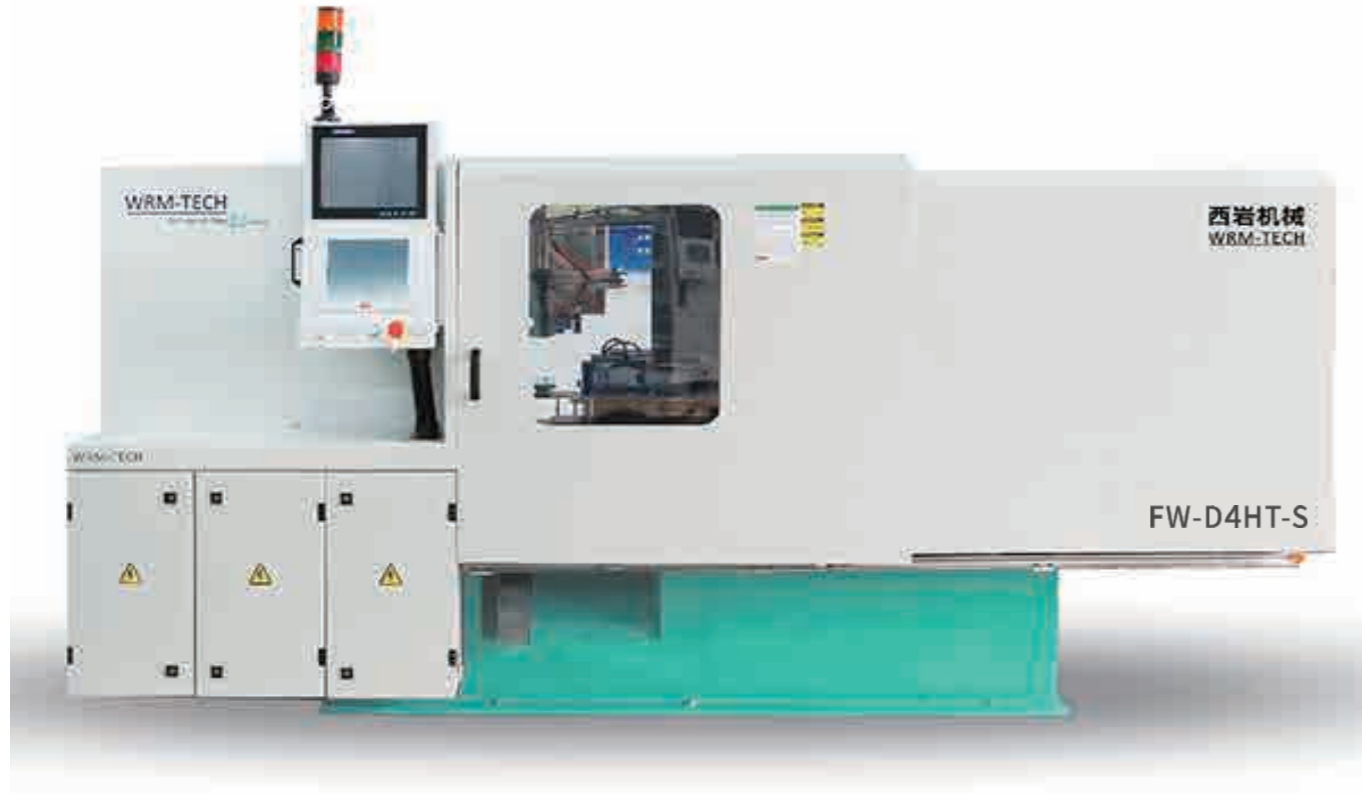


Welding efficiency

The highest 450 / hour

Innovative Design - High dynamic precision technology

Carefully Manufactured - High reliability technology



FW-D4HT-Servo
FW-D4HT-Servo Engine Valve Automatic Friction Welding Machine



Lubrication system



Oil temperature control system



Operation panel

摩擦焊接参数实时监控系统 WRM-TECH Friction Welding Technology

产品编号	生产日期	生产数量	合格数	废品数	废品率
17020270	2017-02-07	100	98	2	2.00%
17020270	2017-02-07	100	98	2	2.00%

CPK 过程能力指数	U10	U3000	CPk	U10	U3000	CPk	U10	U3000	CPk	U10	U3000	CPk
10:58:44	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00
10:58:44	255	255	1.00	255	255	1.00	255	255	1.00	255	255	1.00
10:58:44	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00
10:58:44	600	600	1.00	600	600	1.00	600	600	1.00	600	600	1.00
10:58:44	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00
10:58:53	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00
10:58:53	255	255	1.00	255	255	1.00	255	255	1.00	255	255	1.00
10:58:53	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00
10:58:53	600	600	1.00	600	600	1.00	600	600	1.00	600	600	1.00
10:58:53	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00
10:59:00	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00	1800	1800	1.00
10:59:00	255	255	1.00	255	255	1.00	255	255	1.00	255	255	1.00
10:59:00	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00	1.8	1.8	1.00
10:59:00	600	600	1.00	600	600	1.00	600	600	1.00	600	600	1.00
10:59:00	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00	5.30	5.30	1.00

Welding parameter monitoring system

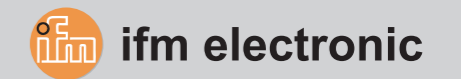


Welding curve



Hydraulic system

High reliability





FW-D2.5HT

D Series Direct Drive Friction Welding Machine

Direct Drive Friction Welding

Type	forge force KN	Welding capacity (bar diameter)		Welding capacity (length)		Spindle		Table Slide		weight ton
		Medium carbon ste-bar mm	Round-bar max mm	Rotating mm	Fixed side mm	speed Variable rpm	Stroke mm	Drive system		
FW-D0.5	5	2.5~5	7.5	150	280	12000	200	Servo	1.8	
FW-D1	10	4.5~8.5	11	150	280	6000	200	Servo hydraulic	1.8	
FW-D2	20	5~12	16	200	320	4000	200	Servo hydraulic	2	
FW-D2.5	25	5~14	18	200	320	3000	200	Servo hydraulic	2	
FW-D4	40	6~18	22	270	400	3000	240	Servo hydraulic	2.2	
FW-D6	60	8~22	28	270	400	3000	240	Servo hydraulic	2.2	
FW-D10	100	12~28	36	270	450	2500	320	Servo hydraulic	2.8	
FW-D12	120	14~31	39	270	450	2500	320	Servo hydraulic	2.8	
FW-D16	160	18~35	45	270	450	2500	320	Servo hydraulic	2.8	
FW-D20	200	22~40	50	340	500	2000	400	Servo hydraulic	4.8	
FW-D25	250	26~44	56	340	500	2000	400	Servo hydraulic	4.8	
FW-D32	320	28~50	64	340	600	1500	400	Servo hydraulic	7.5	
FW-D40	400	30~56	72	340	600	1500	400	hydraulic	7.5	
FW-D50	500	35~63	80	400	1500	1300	400	hydraulic	12	
FW-D65	650	38~72	91	400	1500	1300	400	hydraulic	12	
FW-D80	800	40~80	100	450	1800	1000	400	hydraulic	16	
FW-D100	1000	45~90	113	500	2000	800	460	hydraulic	22	
FW-D120	1200	50~100	124	500	2000	800	460	hydraulic	22	

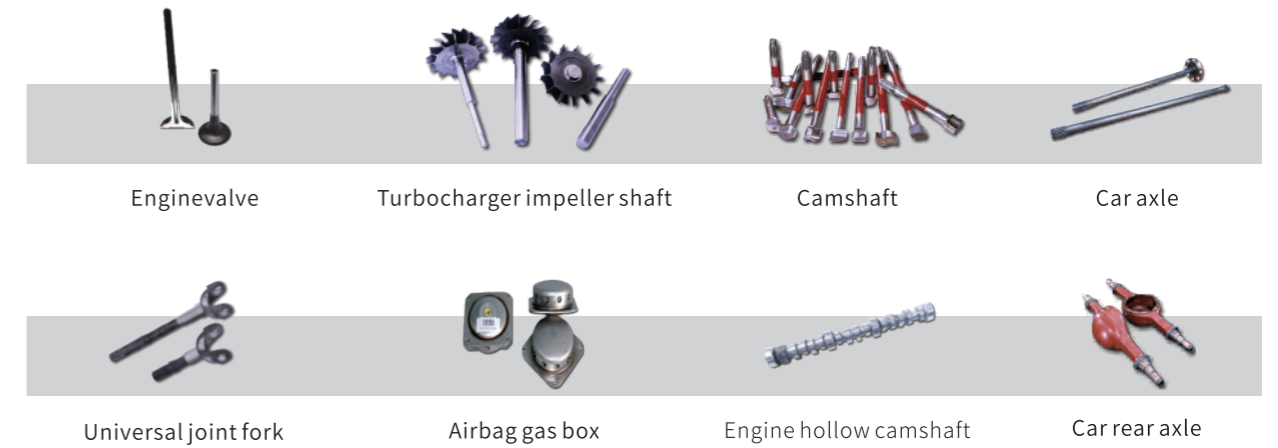
Optional configuration

- Welding parameter monitoring system
- Automatic loading and unloading device
- Remove the flash device
- Fully enclosed protection
- Phase control device
- Constant oil temperature control

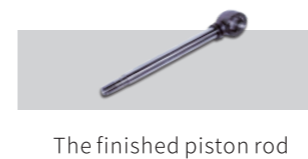
The application area and typical parts of friction welding



The automotive industry



Construction machinery industry



The finished piston rod



The oil industry



The Oil drill pipe



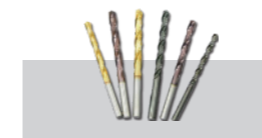
The power industry



The Copper and aluminum fitting



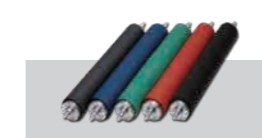
Tool industry



The Cutting tool



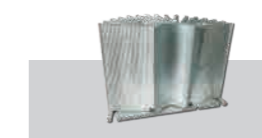
Printing industry



The rubber roller



IT industry



The heat sink



Water pump industry



The gear shaft



Valve industry



The valve



Prospecting industry



The drill pipe



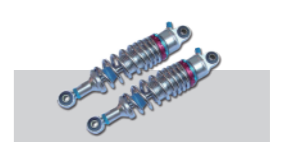
Aerospace



Engine parts



Motorcycle industry

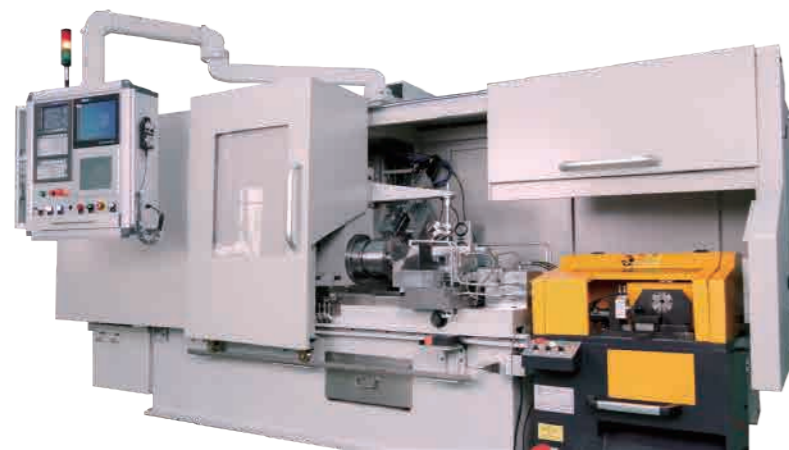


The shock absorber

Welding Equipment Display

Airbag gas generators

- Model: FW-D10VT-S
- Application: friction welding of upper and lower shells of airbag gas generators;
- Type : Vertical double servo model;
- Maximum upset force : 100KN;
- Spindles speed : 2500rpm;
- Industrial robot loading and unloading;
- Pre-weld parts inspection.

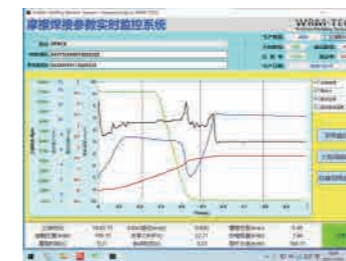


Copper terminals and aluminum columns (aluminum wire)

- Model:FW-D6HS-S;
- Application: automotive wiring harness copper terminals and aluminum columns (aluminum wire);
- Maximum upset force : 60KN;
- Maximum welding area : 230mm²;
- The equipment integrates automatic vehicle end face system , end face visual inspection system.

MGG in ACR technology of active control coiler

- Model:FW-D1.5HT-S
- Application : Friction welding of MGG in active
- Control retractor ACR technology;
- Type : Horizontal double servo model;
- Spindle speed:12000rpm;
- Table speed:300mm/s;
- Welding time:1s;
- Force sensors measure the applied force in real time;
- Integrated tube end laser cleaning and visual inspection , welding front jump detection;
- Phase welding , phase angle visual inspection;
- Automatic loading and unloading.



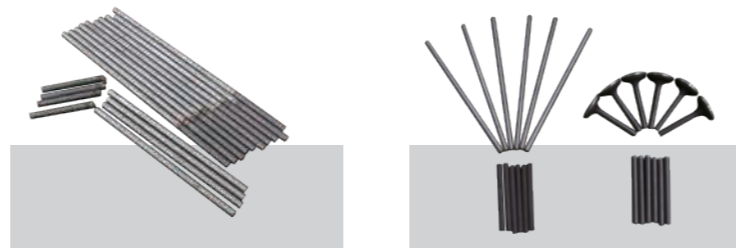
Item	Unit	Value	Unit	Value
力包峰值2	NO	2.22	NO	7.64
力包峰值1	NO	1.85	NO	7.50
力包峰值3	NO	1.82	NO	5.85
力包峰值4	NO	1.88	NO	6.38

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Bimetallic solid exhaust valves

- Model:FW-D4HTS FW-D6HT-S
- Type : Doubles servo model
- Application: Friction welding of bimetallic solid exhaust valves of automotive diesel engines;
- Spindle speed : 3000rpm;
- Table speed : 300mm/s;
- Welding cycle : 12s/piece;
- Online flushing remove;
- Fully automatic loading and unloading;
- It can be configured with an tempering furnace to remove stress directly after welding.



Turbine and rotor shafts for turbochargers

- Model:FW-D12HT-S
- Application : Friction welding of turbine and rotor shafts for turbochargers;
- Maximum upset force : 120KN;
- Maximum spindle speed : 2500rpm;
- Automatic loading and clamping of turbines with complex structures;
- Automatic removal of flash after welding;
- Integrated industrial robot automatic loading and unloading;
- Tempering after welding;
- Automatic identification and sorting of welding process parameters OK/NG . etc
- No one intervenes in the whole production process.



Shock absorber hollow piston rod

- Model:FW-D6HT-S;
- Type : Double servo model
- Application : Friction welding machine specially designed for shock absorber hollow piston rod, consists of two friction welding machines , the first welding pipe and left terminal , the second welding right terminal , and the two welding machines are connected for transmission.
- High degree of automation , high post-welding accuracy;
- Spindle speed : 3000rpm;
- Table speed : 300mm/s;
- Row frame manipulator automatic loading and unloading.

