中国·太仓
China·Taicang
专注·专业
Concentrated and Professional

WRM-TECH

苏州西岩机械技术有限公司
Suzhou West Rock Machine Technology CO.,LTD

- 高动态精度技术 High dynamic precision technology
- 焊接品质控制技术 Welding quality control technology
- 全伺服摩擦焊技术 Full servo friction welding technology
- 高可靠性技术 High reliability technology
- 高自动化技术 High automation technology

摩擦焊接技术

FRICTION WELDING TECHNOLOGY

www. wrm-tech. com

WRM-TECH

苏州西岩机械技术有限公司
Suzhou West Rock Machine Technology CO.,LTD

客户的需求，就是我们的责任。
请拨打以下电话，我们竭诚为您服务。
Customers' needs are our responsibilities.
Please call us at the following phone numbers and we will serve you wholeheartedly.

技术支持专线：18006228055
Technical support line:

销售服务专线：18006228050
Sales service line:

Add：江苏太仓市北京西路6号(No.6 Beijing West Rd.Taicang City Jiangsu Province)
Post Code：215400
Tel：0512-53205880 Fax：0512-53205885
http://www.wrm-tech.com E-mail：wrm-tech@aliyun.com

设计、规格及颜色的变更恕不另行通知；实际表现会因产品要求及使用环境有所不同。
Design, specifications and color changes will not be noticed otherwise; the actual performance will be differentdue to the requirements of the product and the environment of the products in use.

2021年11月 November 2021 V3.0

公司简介
Company Profile

WRM-TECH

苏州西岩机械技术有限公司，是专注于旋转摩擦焊接技术的高新技术企业。

创新的高动态精度技术、焊接质量控制技术、全伺服摩擦焊接技术、高可靠性技术、高自动化技术等，引领产业技术进步。

产品技术广泛应用于汽车、工程机械、航空航天等诸多领域中机械零部件的摩擦焊接成形，为客户提升品质和效率，降低能耗和成本。

公司自创立之初，以“技术创新为核心，品质服务为己任，推动产业技术进步，提升客户竞争能力”为主旨，为客户提供完整的摩擦焊接技术解决方案。

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

Innovative high dynamic precision technology, welding quality control technology, full servo friction welding technology, high reliability technology, high automation technology, etc., lead the technological progress of the industry.

Product technology is widely used in the friction welding of mechanical parts in many fields such as automobiles, construction machinery, aerospace, etc., to improve quality and efficiency for customers, and reduce energy consumption and costs.

Since its inception, the company has taken "technological innovation as the core, quality service as its responsibility, promote industrial technological progress, and enhance customer competitiveness" as its main purpose to provide customers with complete friction welding technology solutions.

技术领域
Technical field

旋转摩擦焊接Rotary Friction Welding

- 直接驱动焊接 Direct drive welding
- 惯性焊接 Inertia welding
- 混合动力焊接 Hybrid welding
- 相位焊接 Pha se adjusting welding
- 伺服驱动焊接 Servo controlwelding
- 液压驱动焊接 Hydraulic control welding
- 径向焊接 Rad ial welding
- 立式焊接 Vertical type welding
- 双头焊接 Two type welding
- 全自动焊 接 Automation welding

线性摩擦焊接Linear Friction Welding

焊接试验和测试Welding Experiments And Test

根据客户的零件、材料、工艺、控制、配置、成本等需求，量身定制，提供摩擦焊接技术咨询、焊接试验和测试，为客户最大限度的节省开支、时间、人力、材料，将实现客户价值为先决条件。

Technical advice, welding experiments and tests concerning friction welding are provided according to customer's different needs as to parts, materials, technology, precision, efficiency, control, configuration and cost and so on, in order to save expense, time, labor and materials to the maximum for customers and make it a prerequisite to achieve customers’ value.

使命 Mission

以高品质的产品和服务，
让世界摩擦并连接起来。

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

WRM-TECH

愿景 Vision

成为全球最好的
摩擦焊接技术服务商

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

核心价值观 Core Values

♦ 勤奋Diligence

勤于学习，勤于思考，勤于探究，勤于实践。
积极努力，坚持不懈，树立良好的职业素养。

Diligence in learning, diligence in thinking, diligence in inquiry, diligence in practice.
Positive efforts, perseverance, and establish a good professional quality.

♦ 尊重Respect

尊重对方，尊重事实，尊重知识，尊重付出。

Respect one another, respect for the facts, respect for knowledge, respect for labor.

♦ 创新Innovation

想像力比知识更重要，因为知识是有限的，而想像力概括着世界上的一切，推动着进步，
并且是知识进步的源泉。——爱因斯坦。

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. - Einstein.

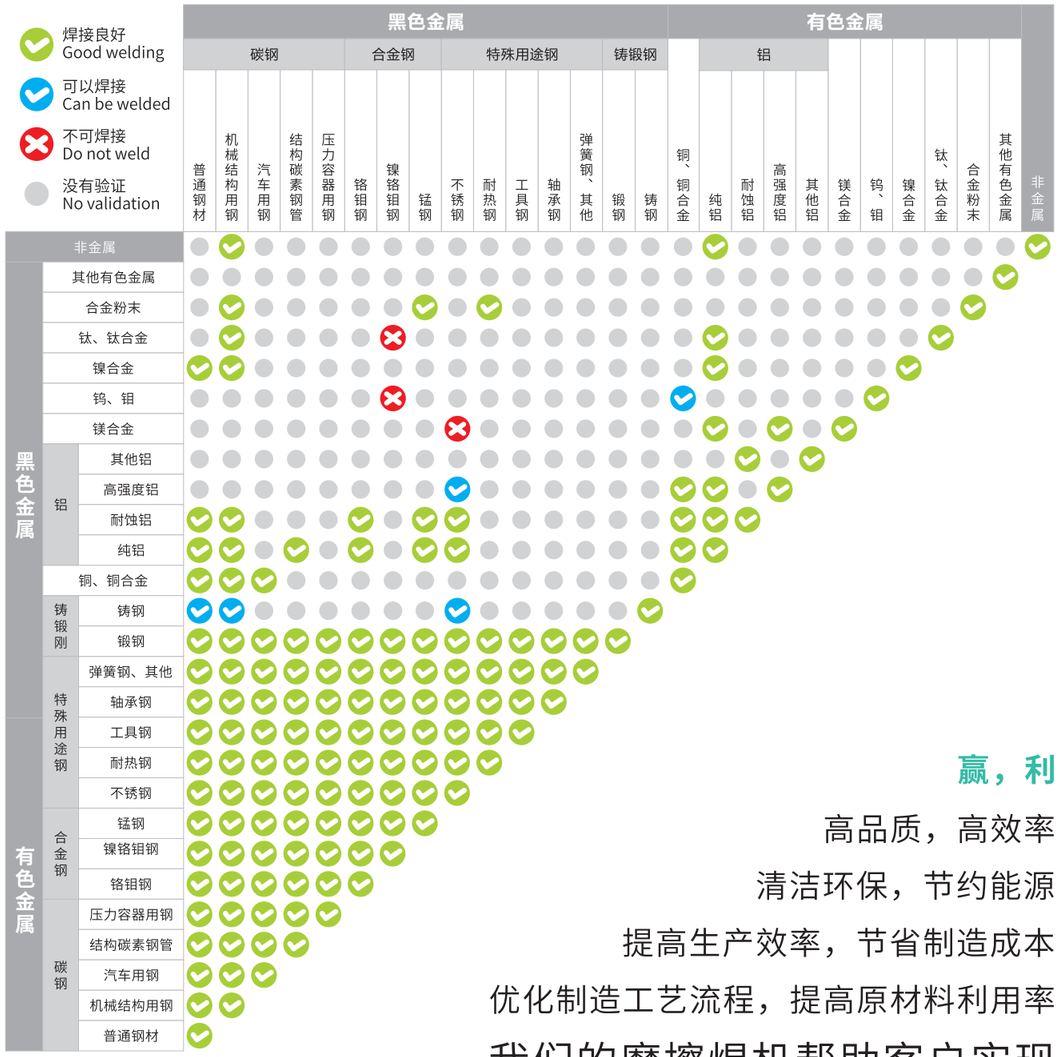
♦ 成就Achievement

成就员工，成就客户，成就事业，成就社会。

The achievements of our employees, our customers, our career and our Society

摩擦焊接可焊性一览表

The weldability of friction welding schedule



赢，利

高品质，高效率

清洁环保，节约能源

提高生产效率，节省制造成本

优化制造工艺流程，提高原材料利用率

我们的摩擦焊机帮助客户实现

Advantages and profits

High quality,High efficiency.

Clean environmental protection,Energy conservation.

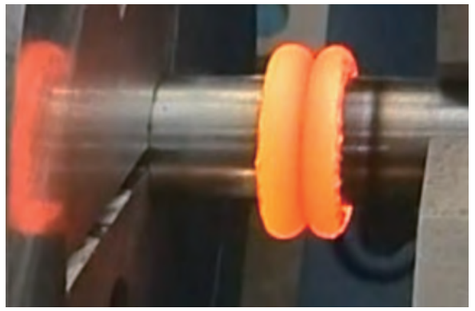
Improvement of production efficiency,The saving of manufacturing costs.

The optimization of the manufacturing process.,The improvement of the utilization rate of raw materials .

Our friction welding machines help customers achieve.

摩擦焊接技术

Friction Welding Technoligy



摩擦焊接是一种固态结合焊接工艺过程，两个被焊工件做相对运动或旋转，在压力下对接，由接触面摩擦产生热量，使焊件材料从接触面塑性地相互渗透而融合，这种工艺过程不需要填料、焊丝和保护气体。摩擦焊接技术以节能、省材、优质、高效无污染的技术特点，已在航空航天、兵器、石油钻探、船舶、汽车及机器制造等领域获得越来越多的应用。

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 thefriction 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 technicalcharacteristics of energy saving, high quality, high efficiency and free pollution, has been applied more and more often in the fields of aerospace, weapons, oil drilling, shipbuilding, automobile and machine manufacturing and so on.

旋转摩擦焊机 Rotating friction welding

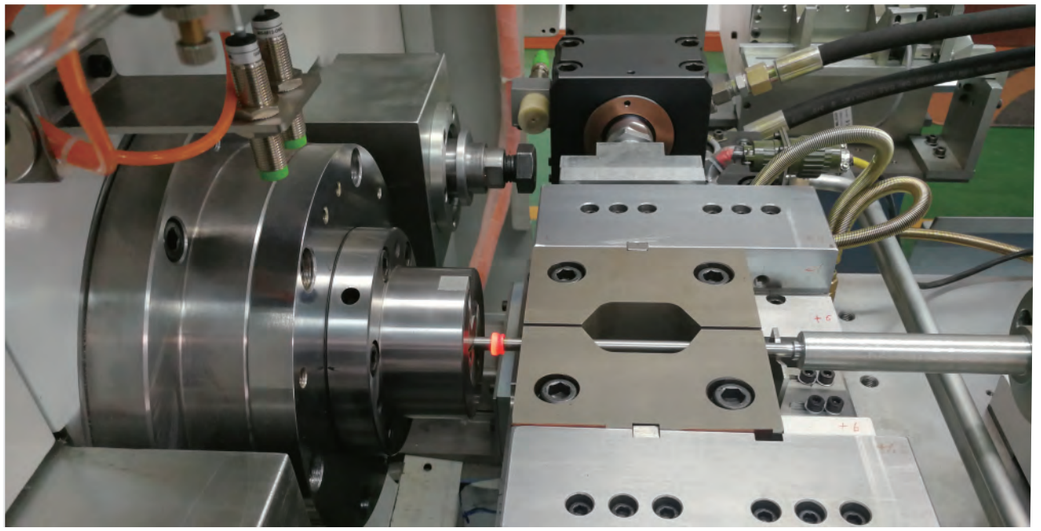
一个零件进行旋转，另一个零件固定，在轴向力的作用下，由接触面摩擦产生热量，旋转停止并施加顶锻力，使焊件材料从接触面塑性地相互渗透而融合。

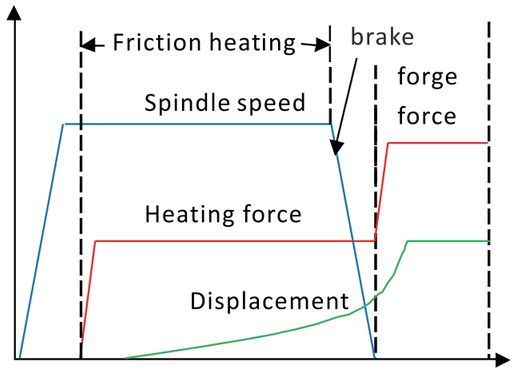
The part which is rotating is fixed by the other part. Under the action of the axial force, heat is generated by the friction of the contact surfaces. When rotation stopsthe forging force is applied so that the welding materials are mutually penetrated and integrated from the contact surface.

直接驱动摩擦焊机 Direct Drive Friction Welding

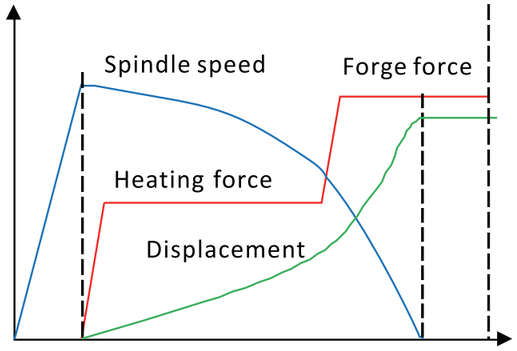
摩擦焊接所需的能量是在预定的时间内通过直接连接驱动电机来获得的。一个工件装在电机驱动的旋转装置上，另一个工件固定不旋转。电机驱动的工件以预定恒速旋转，然后要焊接的两个工件轴向压在一起，开始摩擦产生热量，当这种摩擦持续一段预定时间或达到预定轴向缩短量时，将旋转驱动电机脱开，并快速制动。旋转停止后，顶锻轴向力在一段预定时间内保持恒定或增加。

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.





直接驱动摩擦焊接 Direct Drive Friction Welding



惯性摩擦焊接 Inertia Friction Welding

惯性摩擦焊机 Inertia Friction Welding

摩擦焊接所需的能量主要由焊机上储存的旋转动能来提供。一个工件连接到飞轮上，另一个工件固定不旋转。将飞轮加速到预定转速以储存焊接所需的能量，然后驱动电机脱开并用焊接轴向摩擦力把两个工件轴向压在一起，开始摩擦产生热量，随着飞轮速度的降低，旋转飞轮所储存的动能转变为焊接截面摩擦所产生的热能而散失。在旋转停止之前可增加顶锻轴向力，在旋转停止后，顶锻轴向力在一段预定时间内保持恒定。

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.

两种焊接方式的对比 The comparison of two welding processes

		直接驱动Direct Drive	惯性Inertia
1	热影响区 Heat affected zone	较宽 wider	相对较窄 Relatively narrow
2	焊接时间 Welding time	较长 longer	相对较短 Relatively short
3	焊接范围 Welding range	较宽 Wider	相对较窄，不同零件更换飞轮 Relatively narrow, different parts replace the flywheel
4	焊接参数 Welding parameters	较多 More	较少，容易控制 Fewer, easily controlled
5	主轴转速 Spindle speed	较低 Lower	高 High
6	主轴制动 Spindle braking	需要 Needed	不需要 Not needed
7	适用零件 Applicable parts	棒、管 Bar stock、Tube	超硬材料、大直径薄壁管 Superhard materialse、Large diameter thin wall pipe

我们的摩擦焊接技术
Our friction welding technology

Fast 更快

- Spindle speed maximum 24000rpm
  主轴转速
- Fast moving speed maximum 400mm/s
  快速移动速度

Precise 更精确

- Highly dynamic precision technology
  高动态精度技术
- Precise process control technology
  精确的过程控制技术

Productive 更高效

- Develop and implement cost effective complete solutions with high process reliability.
  开发和实施成本效益高、工艺可靠性高的完整解决方案

Secure 更安全

- Implement all round safety measures for human, machine, environment, etc.
  对人/机器/环境等实施全方位的安全措施

Reliable 更可靠

- Robust components designed for a long service life
  高质量设计和制造，延长使用年限
- Maintenance-free technology requires minimal maintenance
  多种免维护技术，减少维护量

我们拥有在摩擦焊机行业积累了丰富经验的工程师团队
We are a team formed by experienced engineers in friction welding industry.

焊接品质控制技术
Welding quality control technology

1 即使是超短(<1秒)焊接过程，我们的超精细控制技术，过程细节控制的很精确；

2 采用时间模式或位移模式或双重模式，对摩擦阶段进行灵活控制，这取决于零件材料和截面特性；

3 根据不同需求，控制缩短量或控制焊件总长，焊前和焊后的零件长度均可以进行测量；

4 焊接长度补偿技术，更加适用于焊件总长偏差要求极高的需求；

5 焊接参数监视系统，全面记录过程参数的实际值，与边界数据进行实时对比，评价品质的好坏(OK/NG)；

6 焊接过程参数的变化，用曲线展现，设置边界包络线，自观的显示焊接参数的准确性。

长期稳定的焊接品质，
取决于焊接过程参数的精确稳定控制。

全伺服摩擦焊接技术
Full servo friction welding technology

摩擦焊主轴的旋转和制动:伺服控制
摩擦焊工艺轴的过程控制:伺服控制
零件夹持:伺服控制
} 双伺服 } 全伺服

液压型和伺服型摩擦焊工艺轴的对比

	液压型摩擦焊接工艺轴	伺服型摩擦焊接工艺轴
1.架构	1)液压油缸+液压系统，普通液压阀控制压力和速度	
	2)液压油缸+液压系统，比例阀控制压力和速度，无压力传感器，开环控制	1)滚珠丝杠+伺服电机+伺服驱动器，无力传感器，开环控制
	3)液压油缸+液压系统，比例阀控制压力和速度，配置压力传感器，闭环(PID)控制	2)滚珠丝杠+伺服电机+ 伺服驱动器，配置力传感器，闭环(PID) 控制
	4)液压油缸+伺服液压系统，伺服泵和伺服电机控制压力和速度，配置压力传感器，闭环(PID) 控制	
2.摩擦过程中力的稳定性	液压油温的波动，管路的泄露，油液的清洁度，比例阀的品质等，直接影响摩擦过程中力的稳定性	没有液压型对力的影响因素，很容易实现摩擦过程中力的稳定性
3.位移控制精度	一般	精确
4.品质稳定性	所采用的架构有关，稳定性较差	长期稳定
5.维护性	较差，比例阀对油液的清洁度很挑剔，滤芯要经常更换，油液也要定期更新，密封件易失效要经常更换，漏油损耗也要补充，要求客户具备较高的维护能力，维护成本高	几乎免维护，维护成本低
6.效率	滑台快移速度50 ~ 200mm/s,过快的速度会导致油泵排量过大，发热量也大，较高的加减速会出现冲击	滑台快移速度200 ~ 400mm/s,是很容易实现的，很高的加减速特性响应很快，控制自如，冲击很小
7.节能	液压泵加电机，其机械效率为85~90%，加上管路及热损失等，综合能效为50%左右，而且还要控制油温而配置冷却装置，能效很低	滚珠丝杠加伺服电机，其机械效率为90%以上，传动系统损失小，综合能效可达90%，无需冷却装置

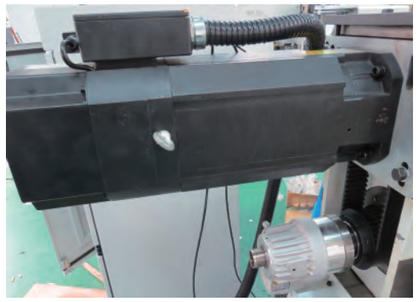
技术支持
Technical Support

01 设备选型
02 摩擦焊接头设计
03 样件焊接
04 强度测试
05 金相分析
06 个性化设计
07 “交钥匙”工程

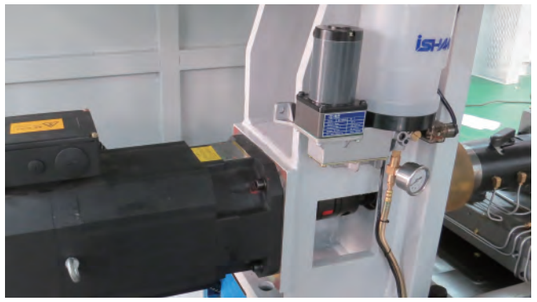
创新设计---高动态精度技术

Innovative Design—High dynamic precision technology

FW-D1HT-Servo 中空充钠气门全自动摩擦焊机
FW-D1HT-Servo Hollow sodium fully automatic valvewelding machine



主轴旋转的伺服控制
Servo control of spindle rotation



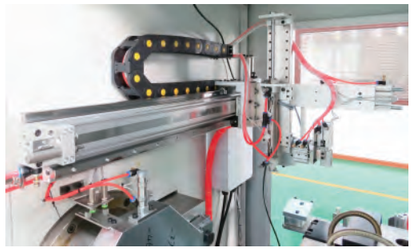
推力的伺服控制
Servo control of forge force

高精度自定心同步夹持系统
High accuracy self centering synchronous clamping system

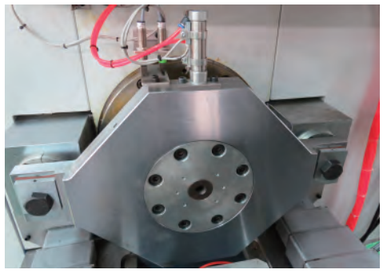
精心制造---高可靠性技术

Carefully Manufactured—High reliability technology

高精度主轴
High precision spindle



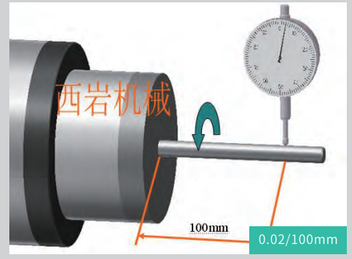
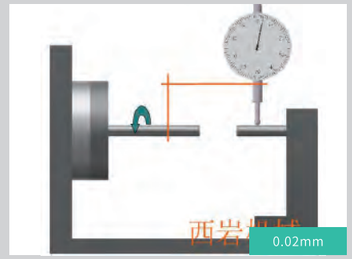
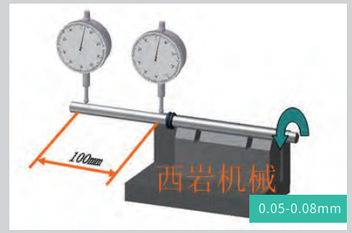
自动上下料
Automatic loading and unloading



自动冲飞边
Automatic remove the flash

高动态精度

High dynamic accuracy

主轴回旋精度 Spindle rotation accuracy	
夹具同轴度 Fixture coaxial accuracy	
焊后同轴度 Coaxial after welding	
焊接强度 Welding strength	
焊接效率 Welding efficiency	最高450件/小时 The highest 450 / hour

创新设计---高动态精度技术

Innovative Design—High dynamic precision technology

FW-D4HT-Servo 发动机气门全自动摩擦焊机
FW-D4HT-Servo Engine Valve Automatic Friction Welding Machin

操作面板
Operation panel

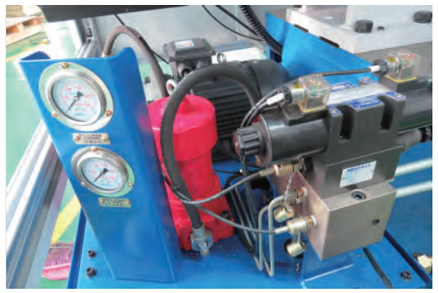
焊接参数监控系统
Welding parameter monitoring system

焊接曲线
Welding curve

精心制造---高可靠性技术

Carefully Manufactured—High reliability technology

润滑系统
Lubrication system



液压系统
Oil temperature control system

油温控制系统
Hydraulic system

高可靠性

High reliability

SIEMENS
MITSUBISHI
ifm electronic
HEIDENHAIN 海德汉
FESTO
SMC
FAG
NSK
Rexroth Bosch Group
KOMPASS
Schneider Electric

D系列直接驱动摩擦焊机

D Series Direct Drive Friction Welding Machine

FW-D2.5HT

D系列直接驱动摩擦焊机 Direct Drive Friction Welding

机型 Type	顶锻力 forge force	焊接能力（棒料直径） Welding capacity (bar diameter)		焊接能力（长度） Welding capacity (length)		主轴 Spindle	滑台移动 Table Slide		重量 weight
		中碳钢棒料 Medium carbon ste-bar	低碳钢 Round-bar max	旋转侧 Rotating	固定侧 Fixed side	转速 speed Variable	行程 Stroke	驱动方式 Drive system	
	KN	mm	mm	mm	mm	rpm	mm		ton
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

可选配置Optional configuration

- 焊接参数监控系统
  Welding parameter monitoring system
- 自动上下料装置
  Automatic loading and unloading device
- 去除飞边装置
  Remove the flash device
- 全封闭防护
  Fully enclosed protection
- 相位控制装置
  Phase control device
- 油温恒定控制
  Constant oil temperature control

WRM-TECH

摩擦焊接应用领域和典型零件

The application area and typical parts of friction welding

汽车行业
The automotive industry

发动机气门 Enginevalve
涡轮增压器叶轮轴 Turbocharger impeller shaft
凸轮轴 Camshaft
汽车半轴 Car axle

万向节叉 Universal joint fork
安全气囊产气盒 Airbag gas box
发动机中空凸轮轴 Engine hollow camshaft
汽车后桥 Car rear axle

工程机械行业
Construction machinery industry

成品活塞杆 The finished piston rod

石油行业
The oil industry

石油钻杆 The Oil drill pipe

电力行业
The power industry

铜铝接头 The Copper and aluminum fitting

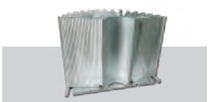
工具行业
Tool industry

切削刀具 The Cutting tool

印刷行业
Printing industry

胶辊 The rubber roller

IT行业
IT industry



散热器 The heat sink

水泵行业
Water pump industry

齿轮轴 The gear shaft

阀门行业
Valve industry

阀门 The valve

探矿行业
Prospecting industry

钻杆 The drill pipe

航空航天
Aerospace

发动机部件 Engine parts

摩托车行业
Motorcycle industry

减震器 The shock absorber