



HERON

DIGITAL RESISTANCE
WELDING

About FSPR Connection Technology And Equipment

VIEWPOINT SHARING

THE DEVELOPMENT OF ELECTRICAL VEHICLES WILL BRINGS OPPORTUNITIES

- EV will continue to bring the application of new materials and new process demand.
- the demand for join the cast aluminium with high strength steel will be more and more .
- more and more hot stamping steel will be applied to the EV body, and the projection welding will be challenge
- spot welding aluminium sheet will be challenge about the cap lifetime

FSPR Riveting Technology



Hot formed steel, aluminum, carbon fiber

Medium Frequency Resistance Welding Technology



Spot welding of aluminum alloy

Medium voltage capacitor energy storage projection welding technology



Projection welding of thermoforming steel

Resistance Diffusion Welding Technology



Coil terminal welding of motors, Resistance welding of conductive busbars

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HERON

**EXPERT IN
RESISTANCE
WELDING · CLINCH**



■ PART 1

**FSPR
RIVETING
TECHNOLOGY**

A New Riveting Process



ABOUT FSPR RIVETING TECHNOLOGY

FLUSH SELF-PIERCING RIVETING

The FSPR self-pierce riveting technology involves automatically feeding special rivets into the punch by means of special riveting equipment. During the stamping process, the material to be connected is punched and sheared and discharged out.

- Can rivet a variety of materials (such as high-strength aluminum alloy, thermoforming steel, carbon fiber), can achieve multi-layer riveting, the highest total thickness can reach 9.1mm;
- Good molding effect, can be used for appearance parts, punch can be pre-painted or plated, no convex hull after riveting is completed;
- Punching and riveting can be completed at one time, without pre-punching riveting holes;
- Can realize gas blowing type nail supply and clip type automatic nail supply, fast riveting beat and high efficiency;
- Stable shear force, tension force and riveting appearance;
- Strong anti-rust ability, the longest can pass the salt spray test 480 hours, special rivets can be extended according to the actual needs of anti-rust ability.

Servo actuator riveting unit
F04-000734



ABOUT FSPR RIVETING TECHNOLOGY

FSPR IS SUPERIOR TO SPR

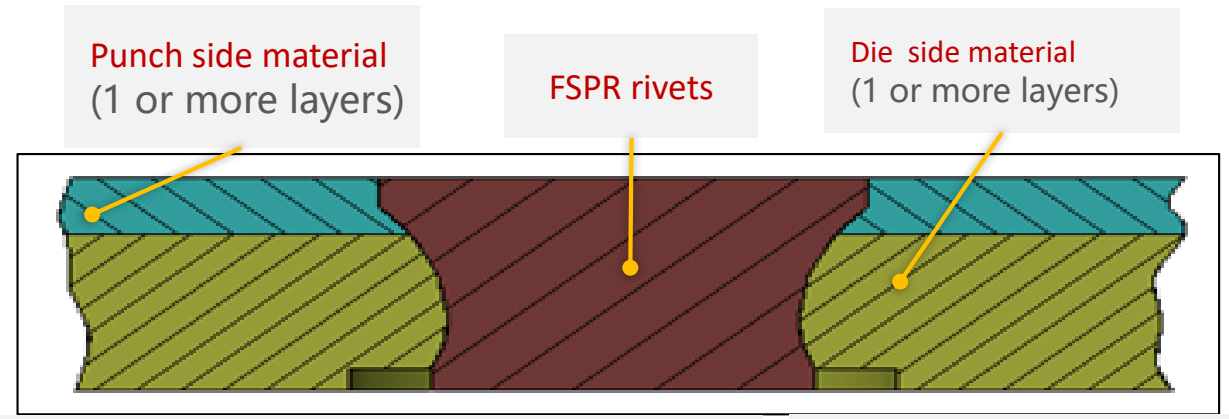
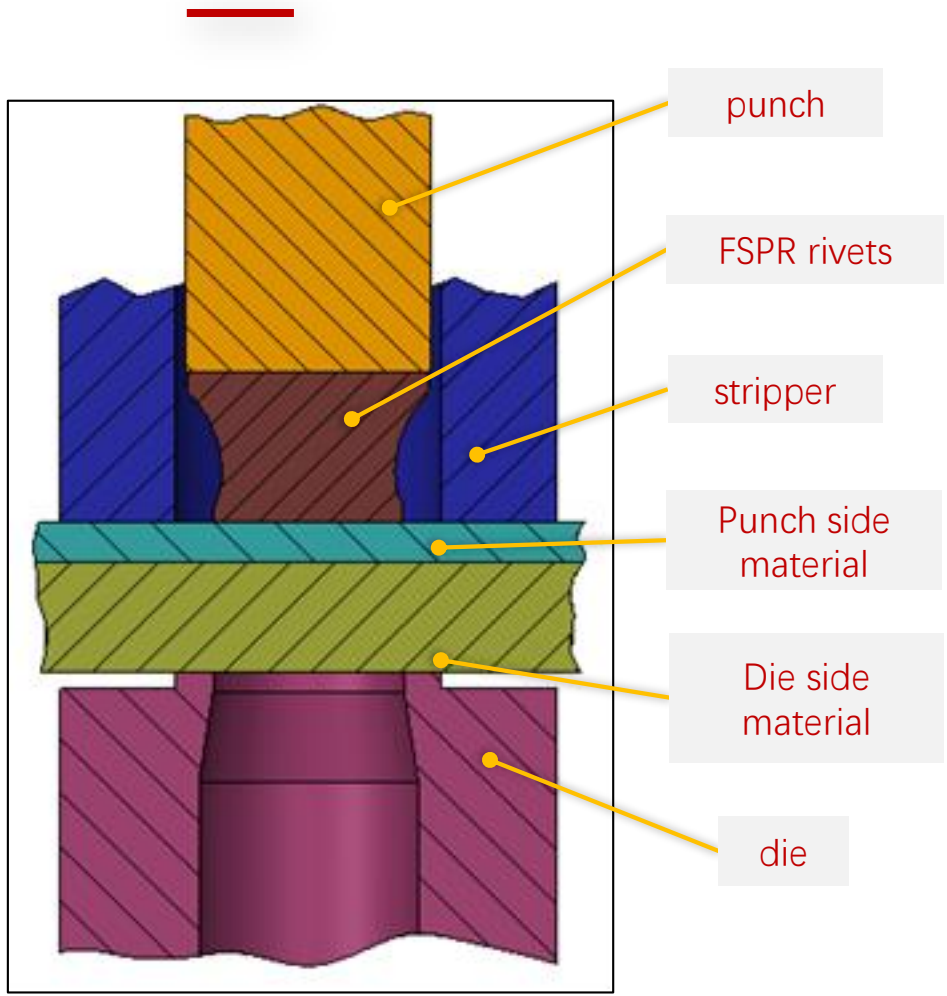
- ◆ FSPR has a greater range of adaptability to the elongation of the material, can be applied to materials with less than 10% elongation.
- ◆ FSPR also applies to the material with the mold thickness fluctuations and other adverse conditions, FSPR rivets will not be uneven thickness of the material caused by slippage, thus affecting the strength of the connection.
- ◆ FSPR can visualize whether the rivet is abnormal or not, and whether the connection is qualified or not.
- ◆ SPR belongs to the material tensile molding, while FSPR belongs to the material compression molding, the material will not crack after the riveting process is completed. Rivet molding process material cracking in essence is the expansion of cracks to the entire cross-section leading to the occurrence of fracture, and the expansion of cracks need to have a certain intensity of tensile stress during the section. If the material is subjected to compressive stress, the tip of the crack is not easy to extend the crack required tensile stress intensity, the crack can not be extended, the material will not occur damage.

Servo actuator riveting unit
F04-000734



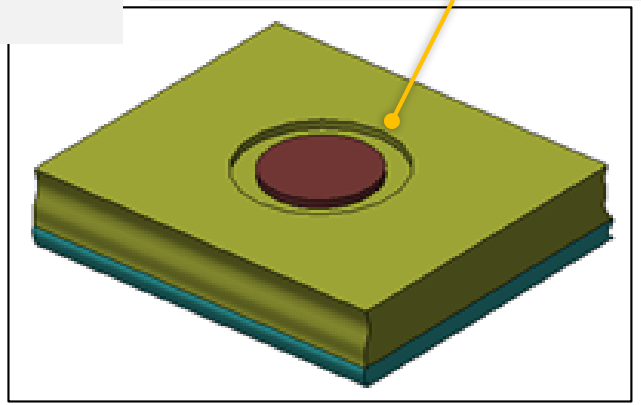
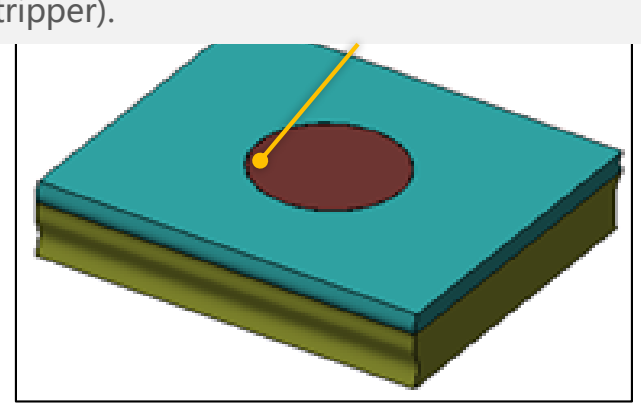
ABOUT FSPR RIVETING TECHNOLOGY

FSPR WORKING PRINCIPLE



The FSPR rivet is flush with the punch side material after the riveting is formed (here the surface has a peripheral ring embossment or no ring embossment, depending on the shape of the stripper).

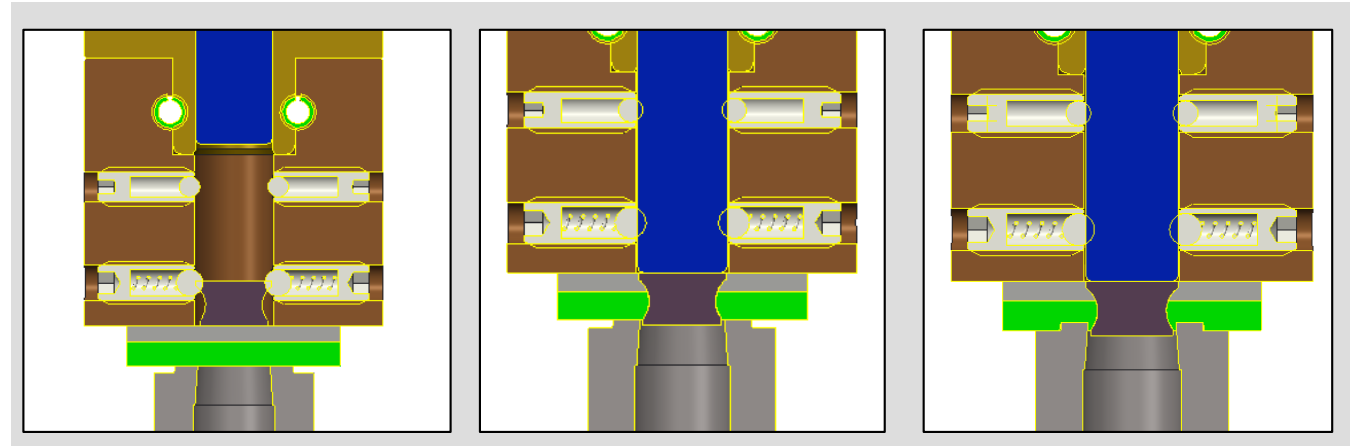
The FSPR rivet is flush with the die side material after the riveting is formed (here the surface has a peripheral ring embossment)



ABOUT FSPR RIVETING TECHNOLOGY

FSPR RIVETING CHARACTERISTICS

1. The thickness of the lowest plate is at least 1/3 of the total thickness of the plate combination
2. High hardness material is on the punch side, low hardness material is on the die side.
3. Thin plate is on the punch side, thick plate is on the die side.
4. The maximum material strength of the upper plate is up to 1800MPa, the harder the upper plate is, the softer and thicker the lower plate needs to be.
5. The maximum material strength of the lower plate without heat treatment cannot exceed 600MPa.



Press workpiece

Embed rivets

Extrusion forming

The FSPR process involves joining a variety of materials together through the use of a specially designed fastener, and the type of base material being riveted can be metallic, or non-metallic. Metallic sheets can be cast aluminum, aluminum alloys, copper alloys, titanium alloys (on the punch side), hot formed steel (on the punch side), high strength steel (on the punch side), galvanized sheets, and color coated sheets. The non-metallic material can be carbon fiber (middle layer). This connection process does not need to pre-drill holes, has the advantages of one-time molding, fast molding beat, good connection effect, stable strength, etc., and can be used together with the structural adhesive connection process.

ABOUT FSPR RIVETING TECHNOLOGY

FSPR RIVETING PROCESS

Press workpiece stage

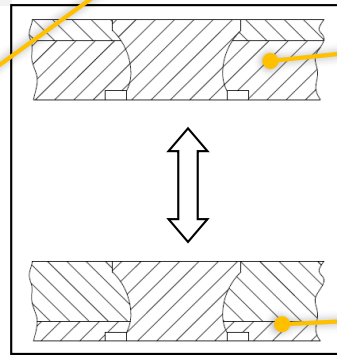
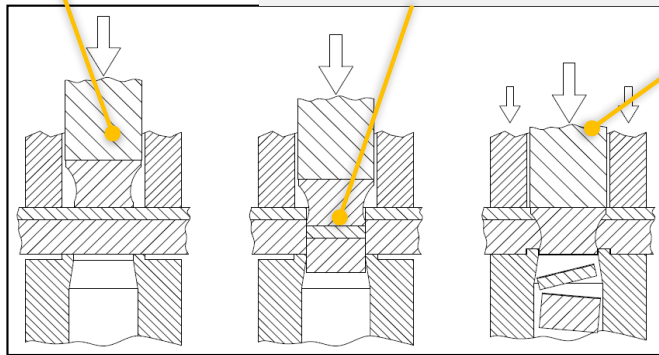
The stripper pre-press workpiece while FSPR rivet is fed into the lower press channel of die.

Embed FSPR rivet stage

Punch is pressurized downward and the FSPR rivet is punched and embedded in the workpiece.

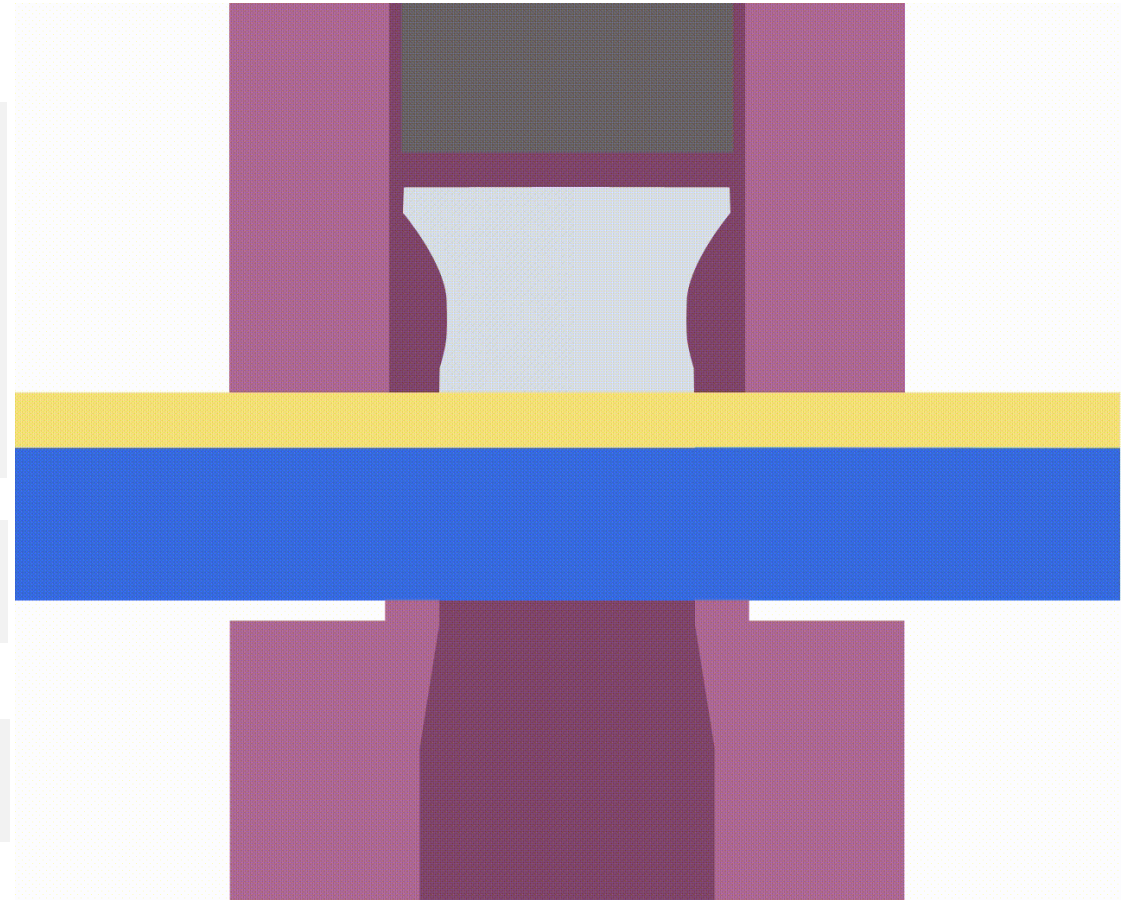
Workpiece material extrusion molding stage

The punch continues to be pressurized while the stripper is pressurized and the FSPR rivet is fully embedded into the workpiece, while the workpiece material is extruded into the "dovetail" area in the middle of the FSPR rivet.



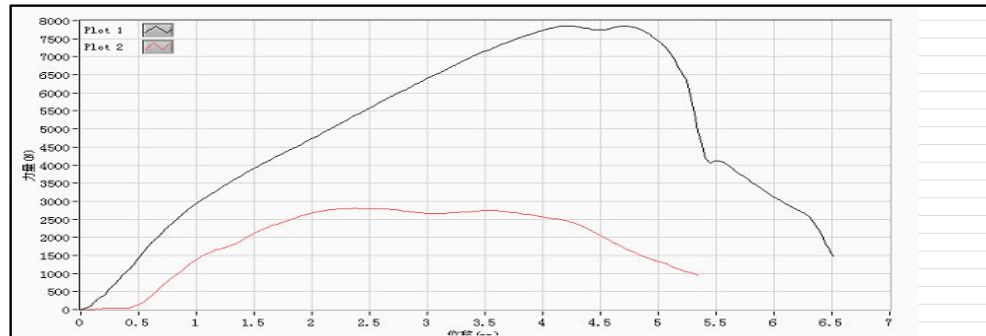
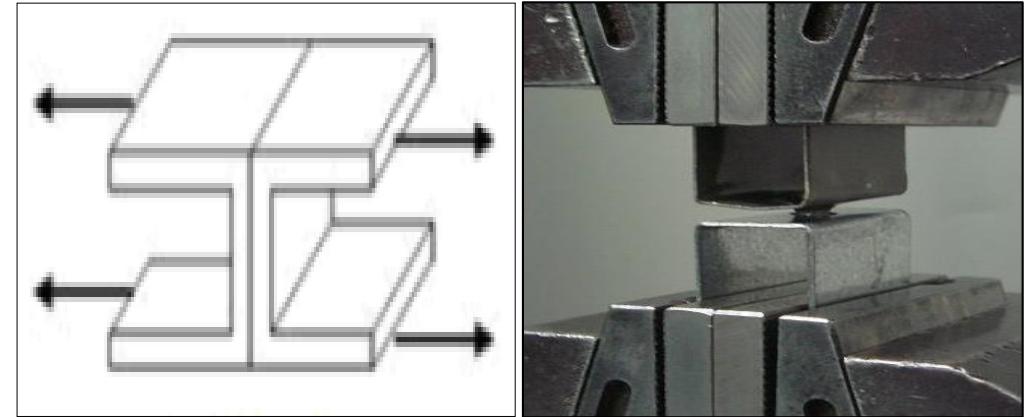
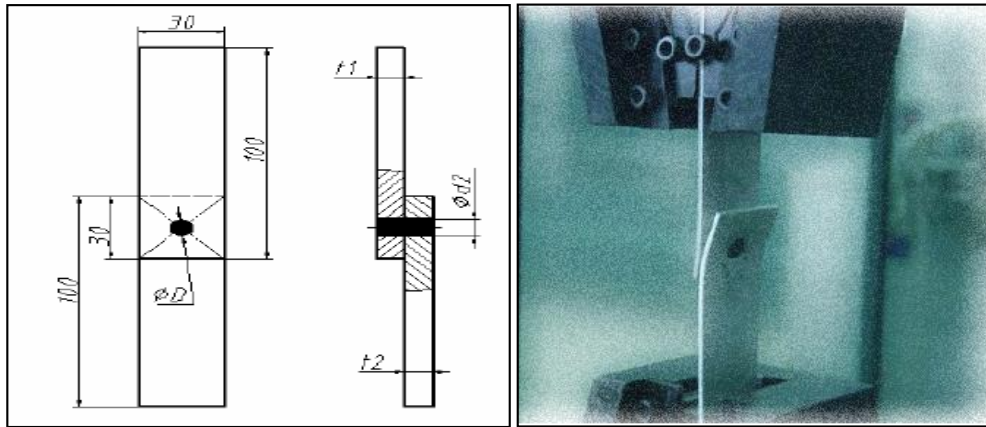
Thin plate is on the punch side

Thick plate is on the die side

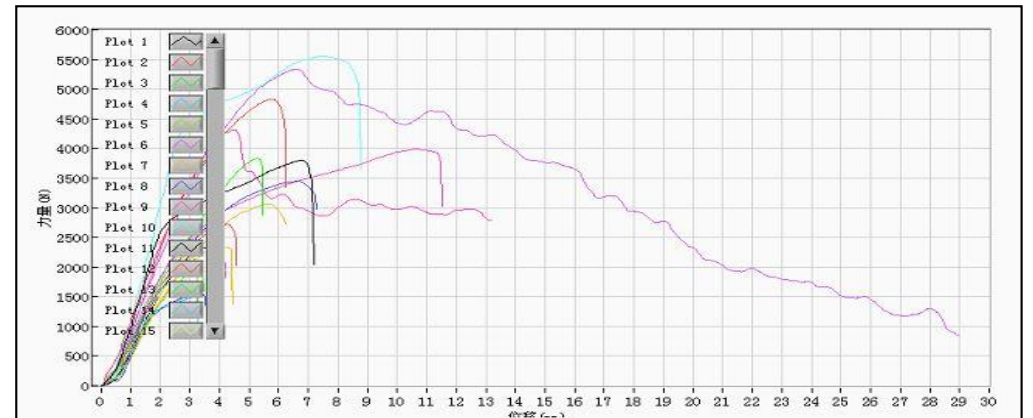


ABOUT FSPR RIVETING TECHNOLOGY

Shear Resistance Testing



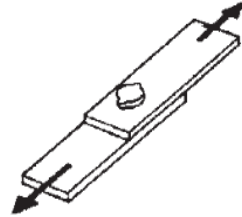
No.	最大力(N)	最大力点的位移(mm)	拉伸强度(kPa)	最大力伸长率(%)	面积(mm ²)	标距(mm)
1	7861.011	4.188	196525.274	8.375	40	50
2	2798.818	2.372	69970.455	4.743	40	50



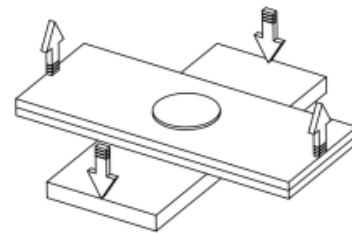
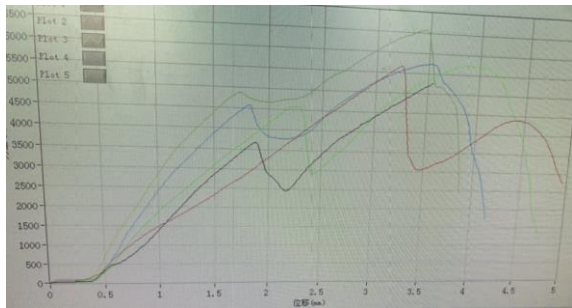
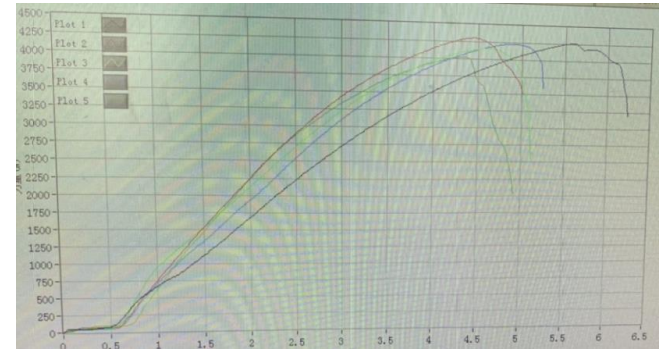
Tensile Resistance Testing

ABOUT FSPR RIVETING TECHNOLOGY

Shear Resistance Testing



Shear



Cross pull



Tensile Resistance Testing

TEST FAILURE CONDITION

STEEL AND ALUMINIUM----FSPR



Shear and Tensile destruction test

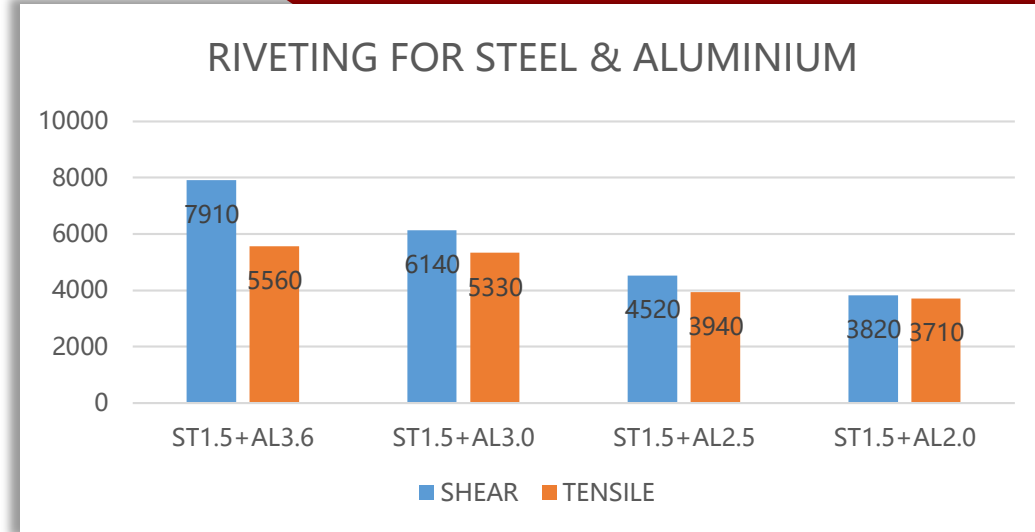
1. Shear test: the rivet is dislodged from the flexible plate or pulled apart at the point of riveting on the flexible plate.
2. Tensile test: the rivet is dislodged from the side of the flexible plate.



THE RESULT

TESTING DATA

STEEL AND ALUMINIUM----FSPR

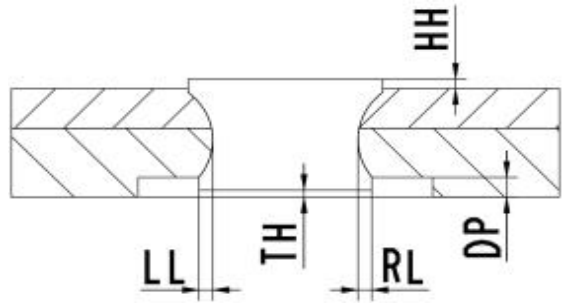


FSPR data reference of thermoformed steel + rolled aluminum plate

FSPR rivet model	die spec.	steel mm	aluminum mm	shear N	tensile N
11HBZ-B	AO-060-R11	ST t=1.5	3.6	7,910	5,560
9HZ-B	AO-060-R09	ST t=1.5	3.0	6,140	5,330
6DHBZ-B	AO-060-R06	ST t=1.5	2.5	4,520	3,940
6DHBZ-B	AO-060-R06	ST t=1.5	2.0	3,820	3,710
6DHBZ-B	AO-060-R06	ST t=1.5	2.0	3,810	3,680

METALLOGRAPHIC ANALYSIS

STEEL AND ALUMINIUM----FSPR

	Depth of Press	DP
	Left/Right Interlock width	LL/RL
	Rivet Head Height	HH
	Rivet Tail Height	TH
	$(LL-RL /2)$	$(LL-RL /2)$



Measurement points:

1. Measure the 4 dimensions shown on the left to monitor riveting quality;
2. The material to be riveted is held tightly to the rivet and the gap is minimized to achieve optimum riveting strength; the size of the gap is determined by the ductility of the material and the relative hardness of the materials to be joined.

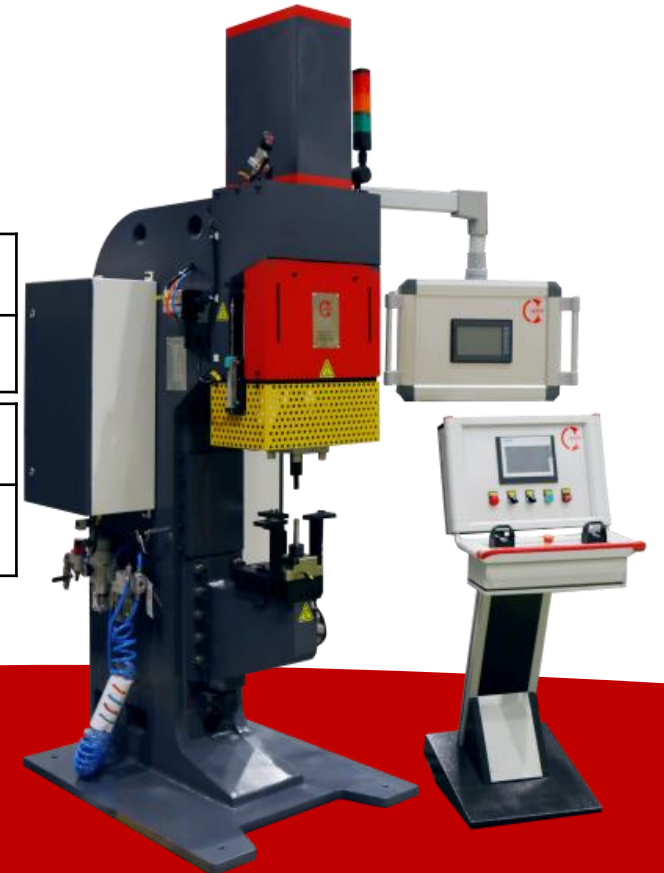
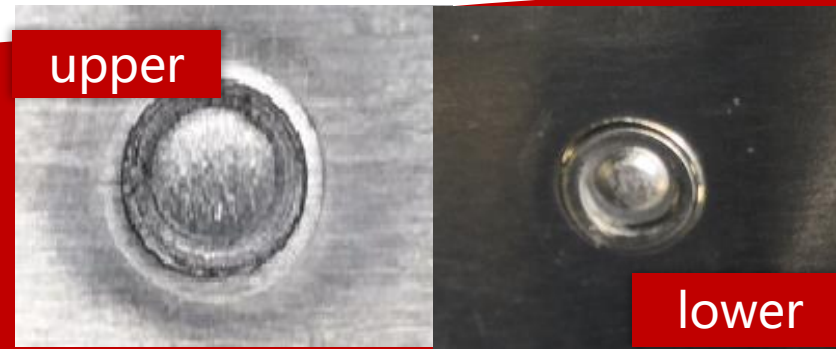
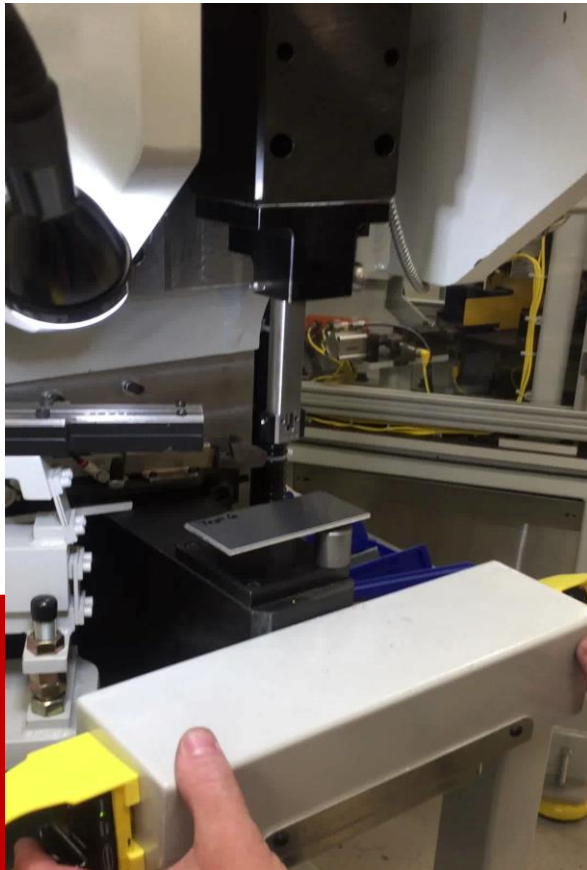
THE RESULT

TEST METHODS AND EFFECTS

ALUMINIUM AND ALUMINIUM---FSPR

The Result

1.2mm	upper	aluminium alloy
1.5mm	lower	aluminium alloy
1.5mm	upper	aluminium alloy
1.2mm	lower	aluminium alloy



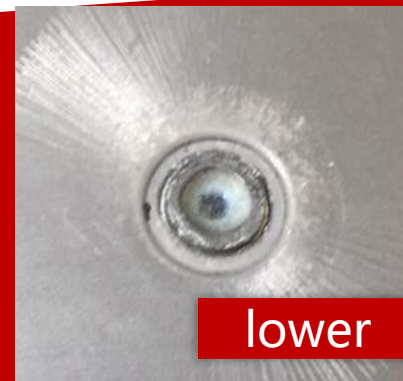
TEST METHODS AND EFFECTS

ALUMINIUM AND STEEL---FSPR



The Result

1.3mm	upper	hot forming steel
1.57mm	lower	aluminium alloy



TEST METHODS AND EFFECTS

ALUMINIUM AND STEEL AND CARBON FIBER---FSPR



The Result

1.2mm	upper	hot forming steel
2.3mm	middle	carbon fibre
1.2mm	lower	aluminium alloy



TEST METHODS AND EFFECTS

FSPR BETWEEN DIFFERENT MATERIALS

galvanized
plate

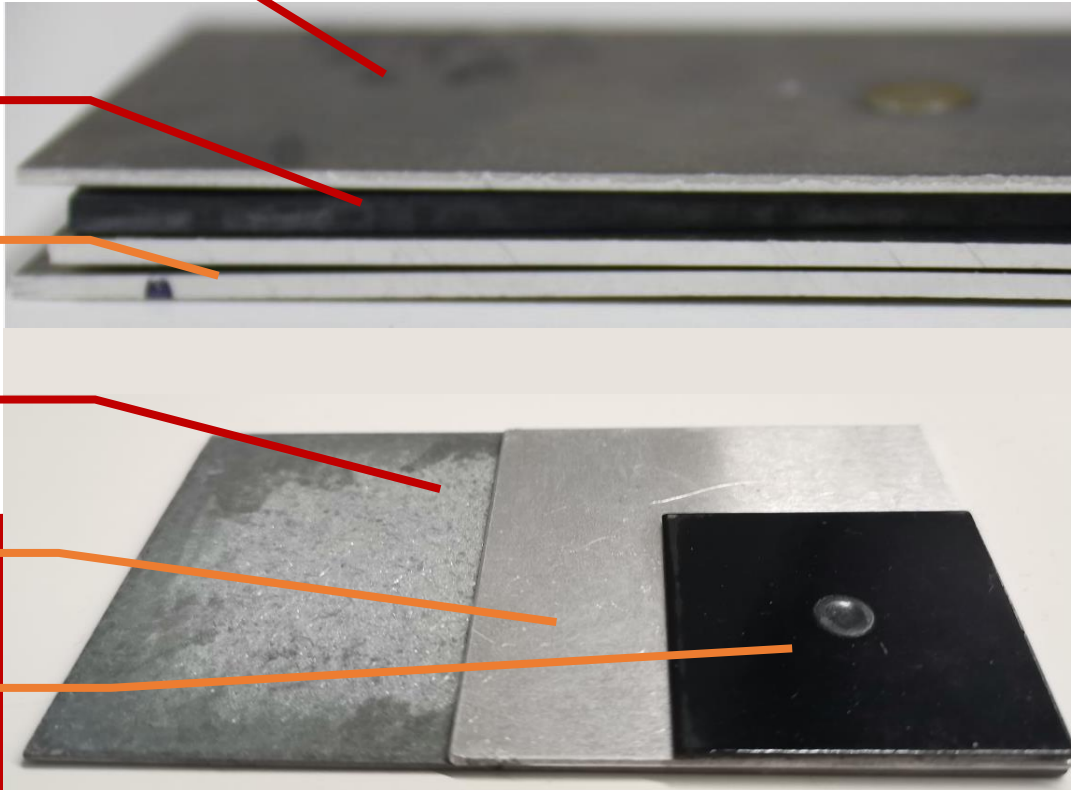
carbon fibre

aluminium
alloy

galvanized
plate

aluminium
alloy

spray-painted
sheet



■ PART 2

FSPR
PRODUCTS



STATIONARY TYPE RIVETING UNIT



**Air-over-oil
Riveting Unit**
ZMY-008-001



**Air-over-oil
Riveting Unit**
ZMY-008-007



**Servo Actuator
Riveting Unit**
ZMY-008-1T1A

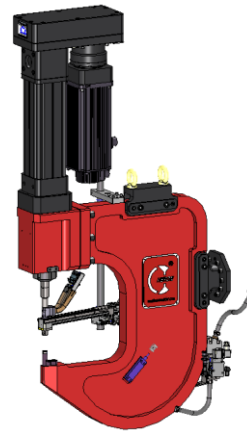


**Servo Actuator
Riveting Unit**
ZMY-008-1T1B

ROBOT RIVETING SYSTEM

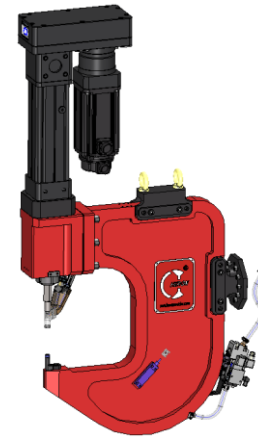


TD:300mm



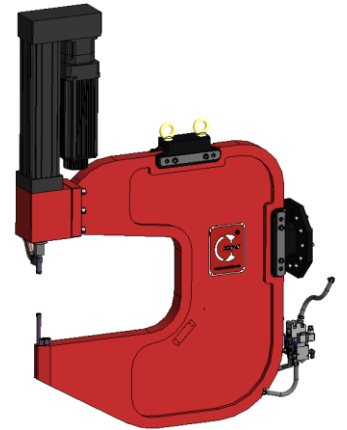
FSPR rivets feed
Waste collection
assembly

TD:400mm



FSPR electric
control system
type A

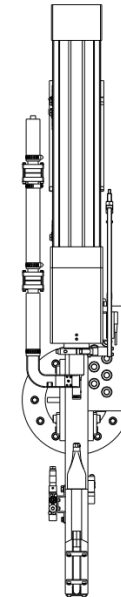
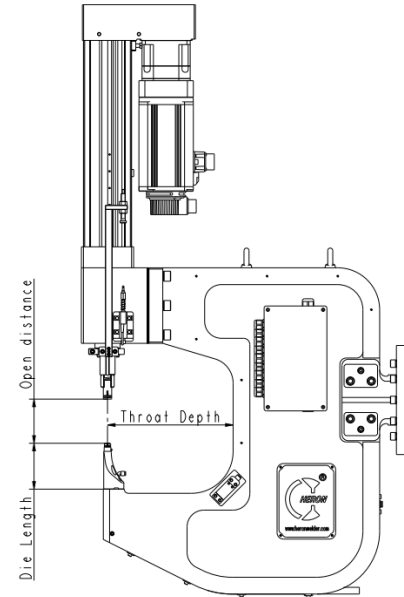
TD:500mm



FSPR electric
control system
type B

ROBOT RIVETING SYSTEM

Type	Deep throat (mm)	Open distance (mm)	Die Length (mm)
standard	150	140	110
	250	140	110
	300	140	110
	350	140	110
	400	140	110
	450	140	110



You will find here various choices for frames, shapes, throat depth and widths.

For more information, or to Customize your own clinching system, please visit:

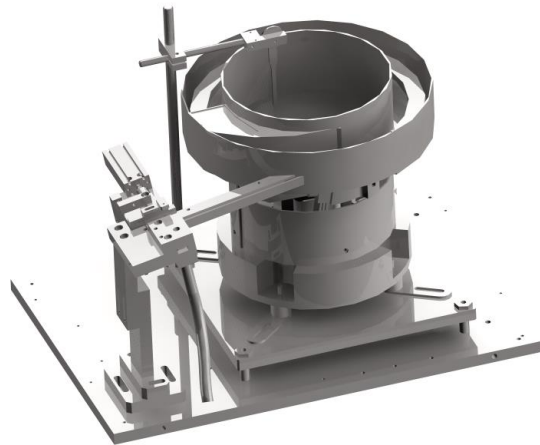
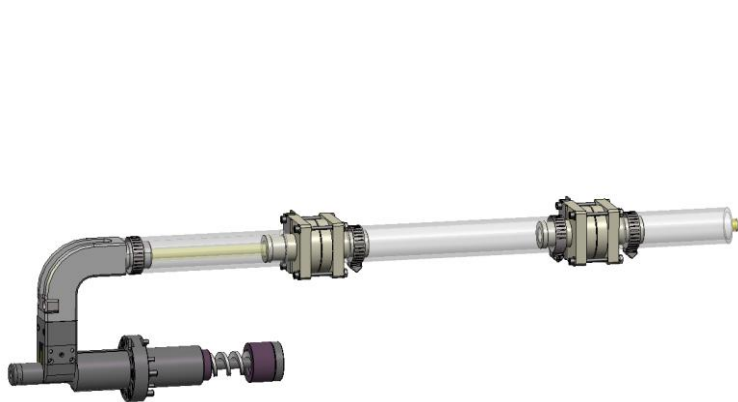
www.heronwelder.com



ROBOT RIVETING SYSTEM

FSPR Feeding System

This system is an automatic directional sorting feeding equipment. Its function is to vibrate the disordered rivets to be arranged neatly and accurately in accordance with the set direction to the riveting unit, including full material detection, in place detection and no material alarm and other functions.

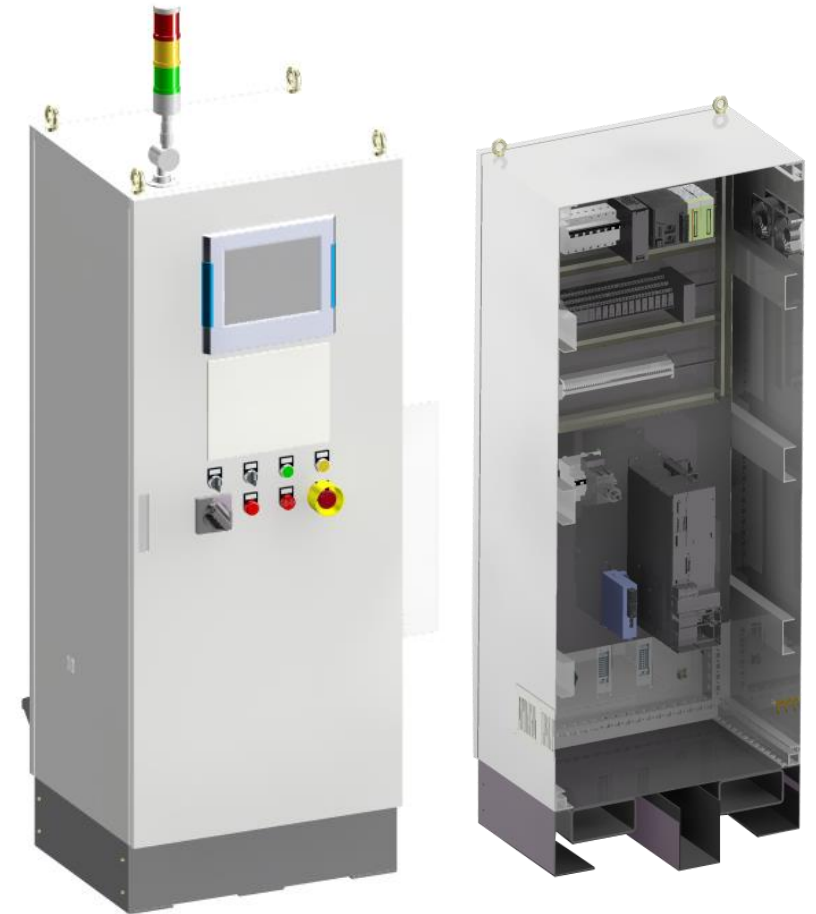


ROBOT RIVETING SYSTEM

Electric Control System

ZM6-080-XXX-D0 Controller

The control cabinet is well suited for the installation of electrical components for robotic riveting systems. Internal expansion is possible according to different customer needs, with maximum load capacity and structured cable management for all-round applications. The standard type of extraction and suction vents are used for temperature control inside the cabinet.



ROBOT RIVETING SYSTEM

HRC-670 Monitor

HRC-670 monitor can be used for real-time monitoring of riveting, press-fitting, assembly, spring testing and other processes, and form the correlation curve of force, displacement and time to detect and evaluate the production quality or production steps, which can ensure the quality of assembly and achieve defect-free production and assembly parts process. Widely used in the following production tasks:

- Clinching
- FSPR/SPR
- Press fitting
- Spring testing
- Fatigue testing

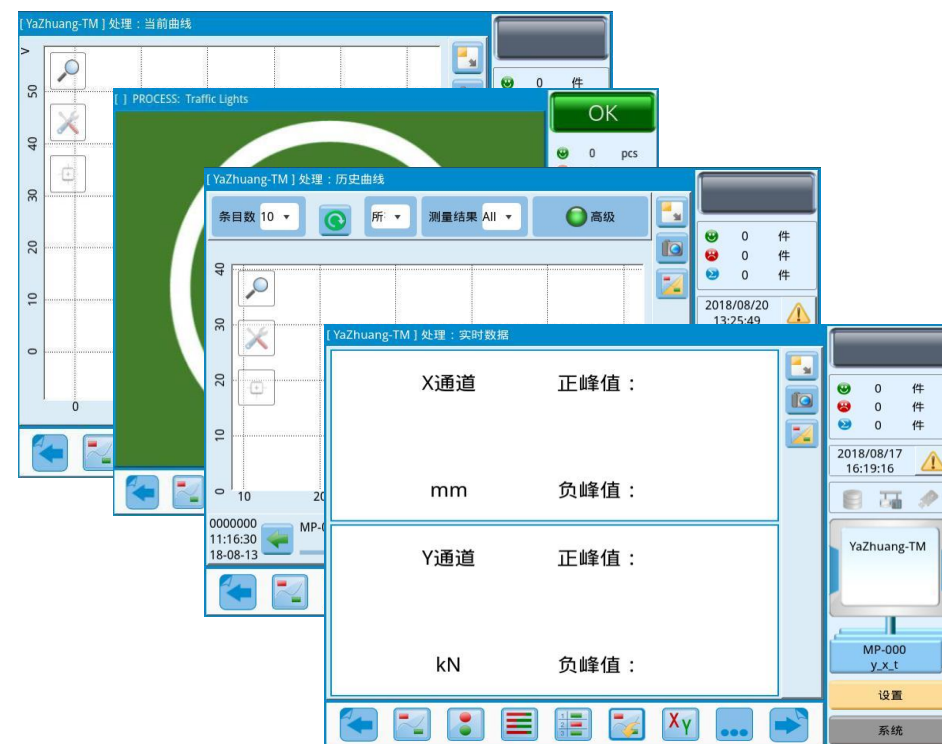


ROBOT RIVETING SYSTEM

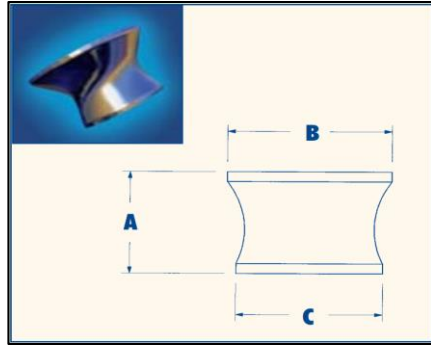
Measurement Interface

The HRC-670 operating interface is user-friendly, simple to operate and easy to use:

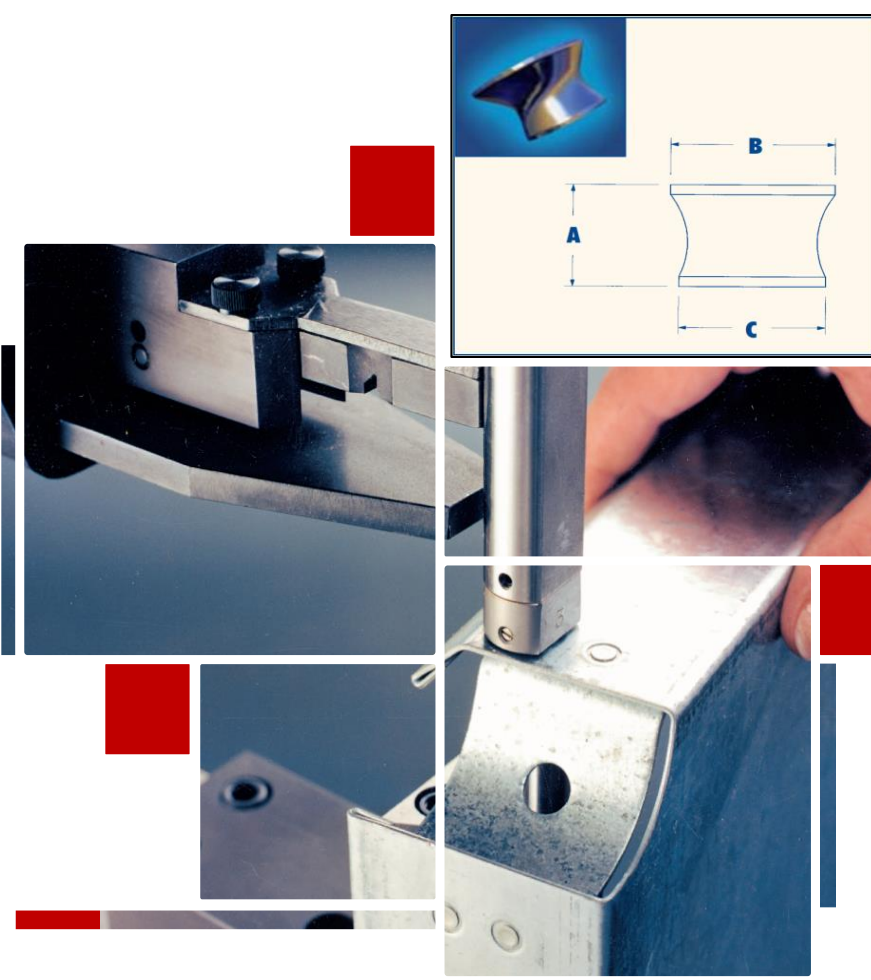
- Main interface
- Signal light page
- History curve page
- Real-time data page
-



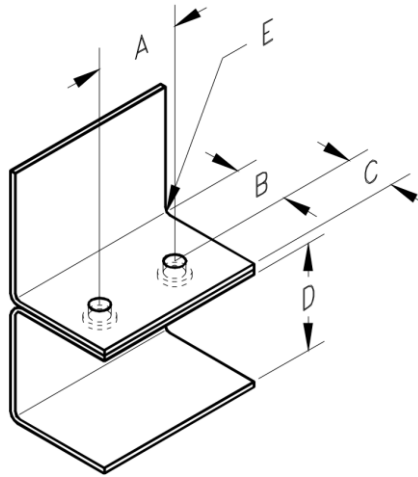
FSPR RIVETS ARE COMMONLY USED IN LIGHTWEIGHT CAR BODY



rivet name	rivet spec.	thickness of riveted material combination		height		upper dimension		lower dimension	
		recommended range of total thickness		A		B		C	
		min.	max.	INCH	MM	INCH	MM	INCH	MM
FSPR rivet(NO.8)	8HZ-B	2.6	4.2	0.165	4.2	0.280	7.1	0.250	6.3
FSPR rivet(NO.9)	9HZ-B	4.3	4.6	0.180	4.6				
FSPR rivet(NO.10)	10HZ-B	4.7	4.9	0.195	4.9				
FSPR rivet(NO.11)	11HZ-B	5.0	5.3	0.210	5.3				




FSPR RIVETS ARE COMMONLY USED IN LIGHTWEIGHT CAR BODY



Note:

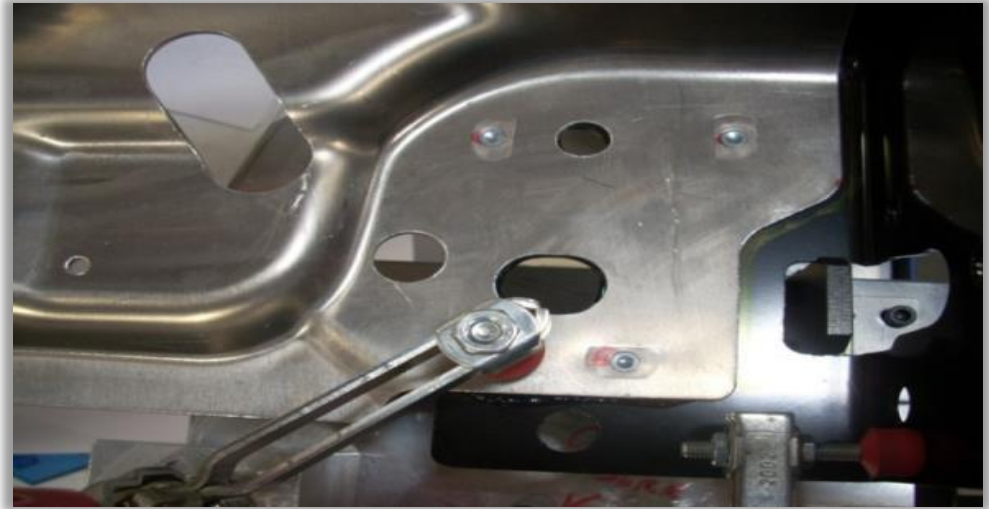
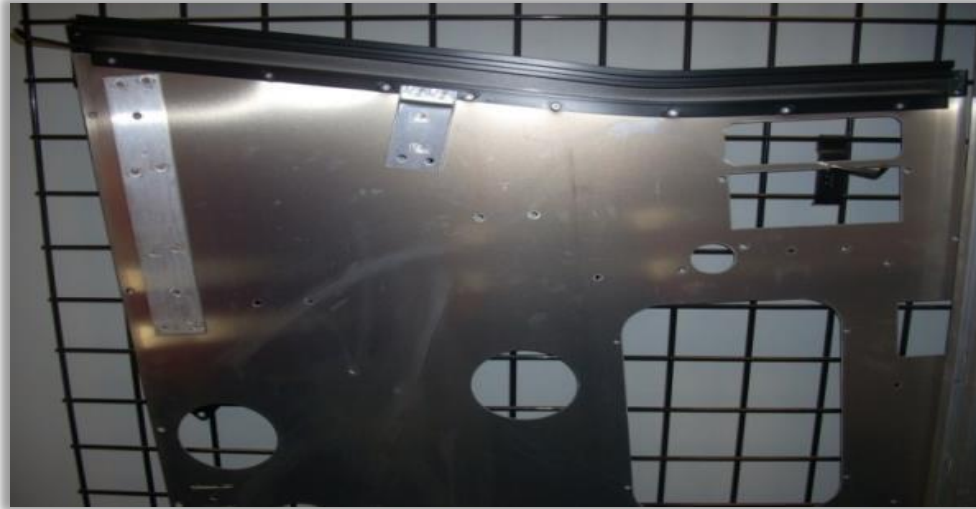
1. When the size of "E" increases, the size of B should be increased accordingly.
2. Unless otherwise specified, the values in the table are the minimum values required. The corresponding values in the table are the minimum values required, except in special cases.
3. The value of C in the table applies to ordinary mild steel, if riveting low elongation, brittle materials need to appropriately increase the value (* For example, the die size is about 10% elongation of aluminum, C value is greater than 15mm)
4. If the size of C increases, the size of D needs to be increased accordingly.

die	size	8-11#rivet
	A	16.5
	B	8.8
	C	8
	D	52
	E	0.8

Riveting quality specification:

1. Single nail riveted, not easily able to rotate the plate, there must be a certain degree of torsion (to prove that the sheet has been held tight rivets).
2. No plating off the surface of the rivets, no marks on the surface of the rivets, no imprints on the surface of the plate, no obvious warping of the plate.
3. When riveting the die should be completely pressed into the lower layer of plate material, the equipment monitoring curve should be within the standard control value.

FSPR TECHNOLOGY APPLICATION CASE--AUTOMOTIVE PARTS RIVETING



■ PART 3

ABOUT US



COMPANY OVERVIEW

Company Profile

- Founded in Guangzhou in **1991**
- More than 300 employees
- Factory with **54,000m²**
- More than **20 global customers**
- Full range of **resistance welding** products
- **Tog-L-Loc** and **FSPR** equipment
- With **automation production lines** in with appliance, compressor, low-voltage electrical manufacturing industries
- Heron manufactures our own controllers and transformers
- Full range of machine shop



COMPANY OVERVIEW

Corporate Culture

VISION

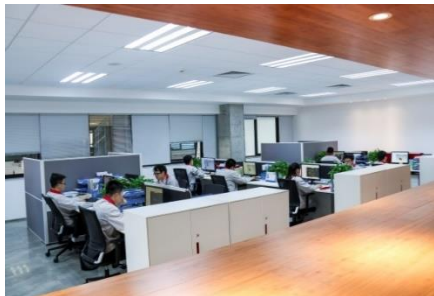
Become an internationally renowned brand in the resistance welding field.

CORE VALUE

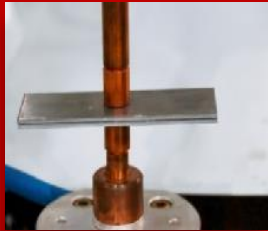
Growing together with our partners based on innovation and win-win cooperation.

MISSION

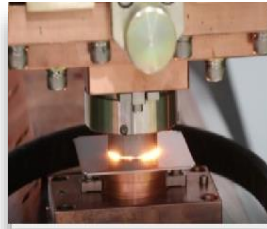
Innovate new technical processes to create value for our partners.



PRODUCT COVERAGE



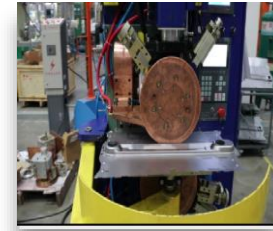
Spot Welding



**Projection
Welding**



Butt Welding



Seam Welding



**Resistance
Diffusion Welding**



**Resistance
Brazing**



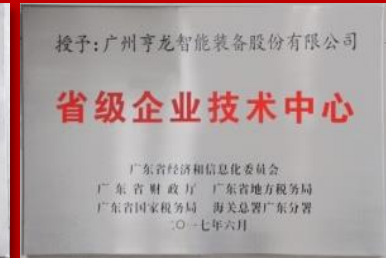
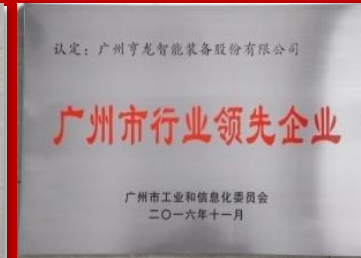
FSPR



**Tog-L-Loc
Lance-L-Loc**

COMPANY HONORS

- ✓ High-tech enterprise of Guangdong
- ✓ Tech giant company of Guangdong
- ✓ Guangdong Innovation pilot enterprise
- ✓ Guangdong Robot research enterprise
- ✓ Guangzhou artificial intelligence enterprise
- ✓ Guangzhou science and technology award certificate
- ✓ Guangdong famous Brand
- ✓ Intellectual property management system certificate
- ✓ Guangdong Heron intelligent welding engineering technology research center
- ✓ Guangzhou industry leading enterprises
- ✓ Provincial enterprise technology center



CORE ADVANTAGES

TECHNOLOGY

92 patents;

Invented industry-leading technology and process:

- MFDC
- CDW
- FSPR
- Reservoir Resistance Welding Process
- Brake Air Chamber Resistance Welding Process
- ...

MFDC inverter controller, welding transformer, current sensor.

QUALITY

- **ISO9001 Certificate;**
- Complete modern management system;
- Customer service system from pre-sales to after-sales .



TEAM

- Nearly 100 senior professional engineers;
- With over 60% employee working at Heron for 10 years or more

EXPERIENCE

- Founded in **1991**;
- **30+** years of welding experience;
- **6000+** cases;
- **10+** countries/regions.

TEAM ADVANTAGES

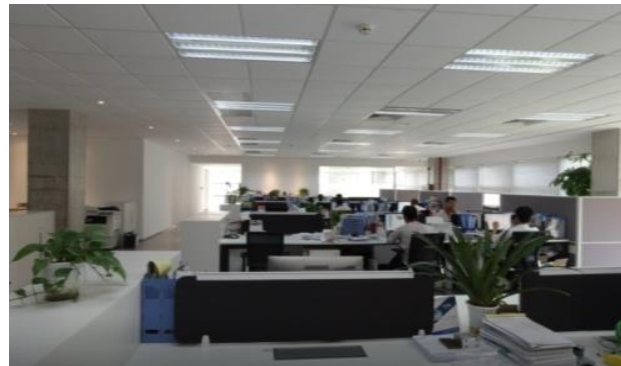


Bill Zou
Founder & Chairman

- ❑ Graduated from Harbin Institute of Technology majoring in welding in 1988;
- ❑ Member of Guangzhou Welding Expert Library
- ❑ Member of RWMA
- ❑ Executive Director of the Welding Society of the Automotive Engineering Association



R&D Team



Management Team



Sales Service Team

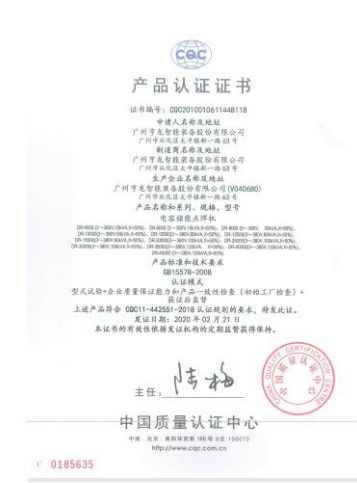
TEAM ADVANTAGES

CO-CREATION

Heron founded the Intelligent Resistance Welding Joint Laboratory in conjunction with the State Key Laboratory of Advanced Welding and Joining (Harbin Institute of Technology), which carries out research on proof of principle, conceptual design, key technology research, process test and reliability test according to the requirements of the company's product R&D strategy, and is especially effective in welding spatter and real-time quality control.



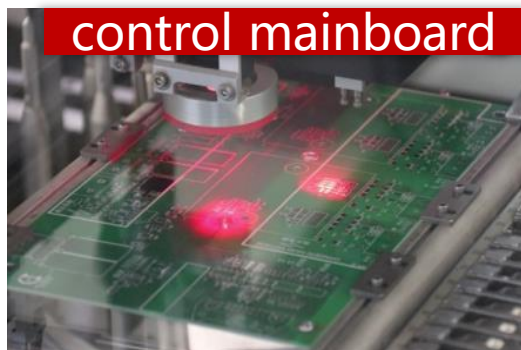
OUR ACHIEVEMENTS



- ✓ CE certification
- ✓ CQC certification
- ✓ 28 patents for inventions
- ✓ 59 items of utility models
- ✓ 5 items of appearance patents

OWN R&D AND MANUFACTURING

Control Mainboard



Controller

OWN R&D AND MANUFACTURING

Electric Actuator

Screw
Inspection



Electric Actuator Bearing
Pressing and Testing



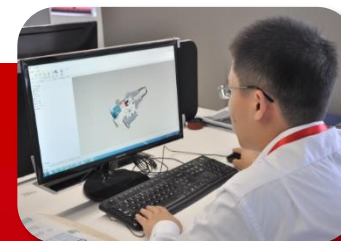
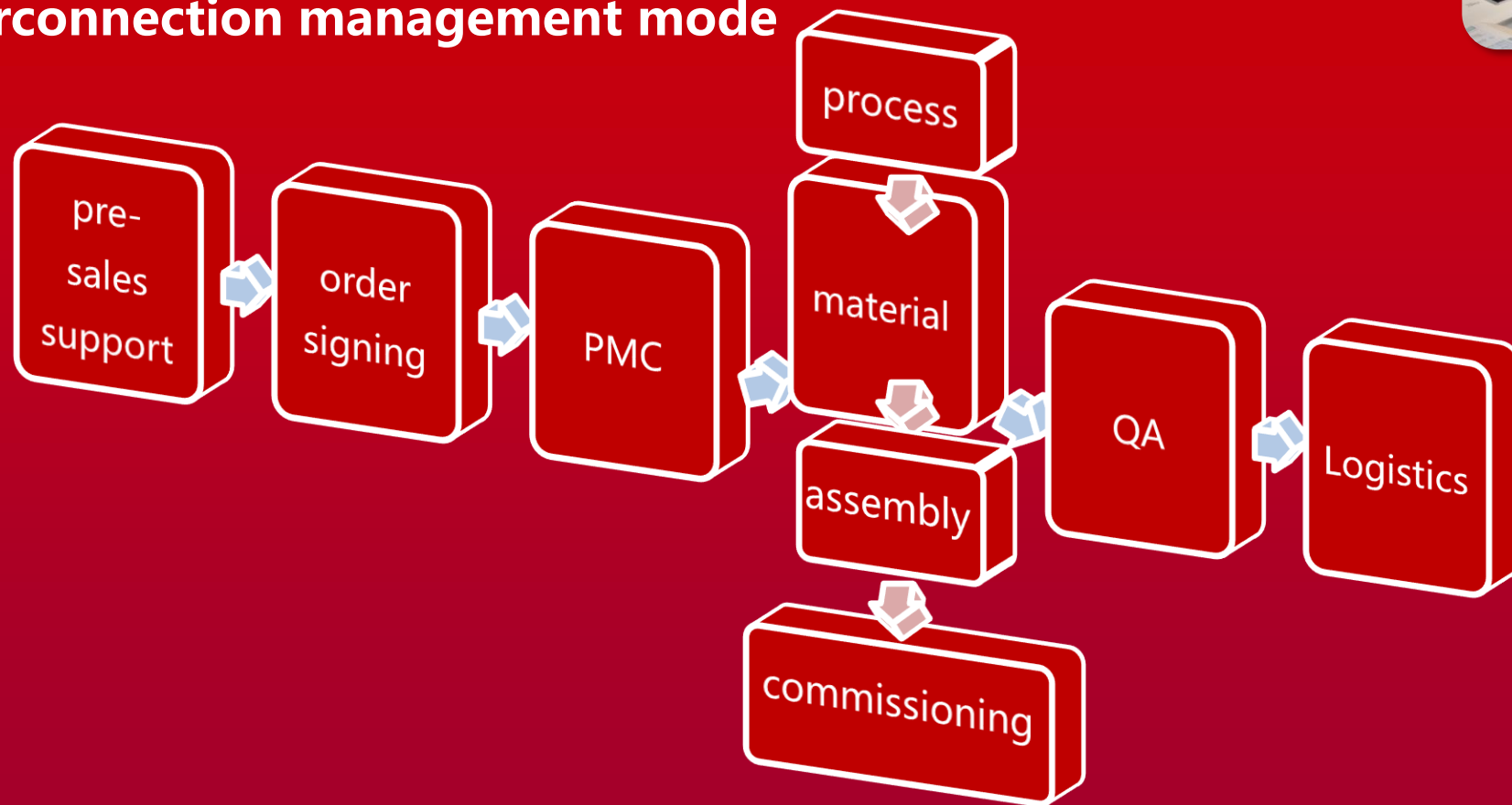
Electric Actuator Assembly



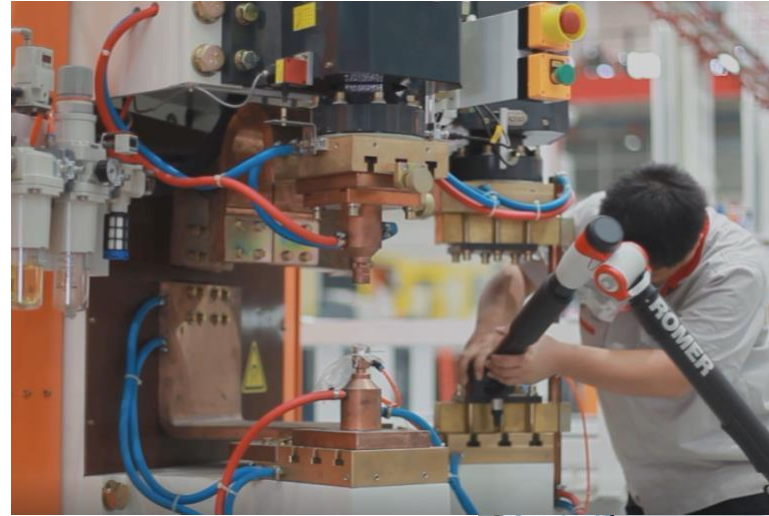
QUALITY ASSURANCE



ERP,PDM,CRM,OA
Interconnection management mode

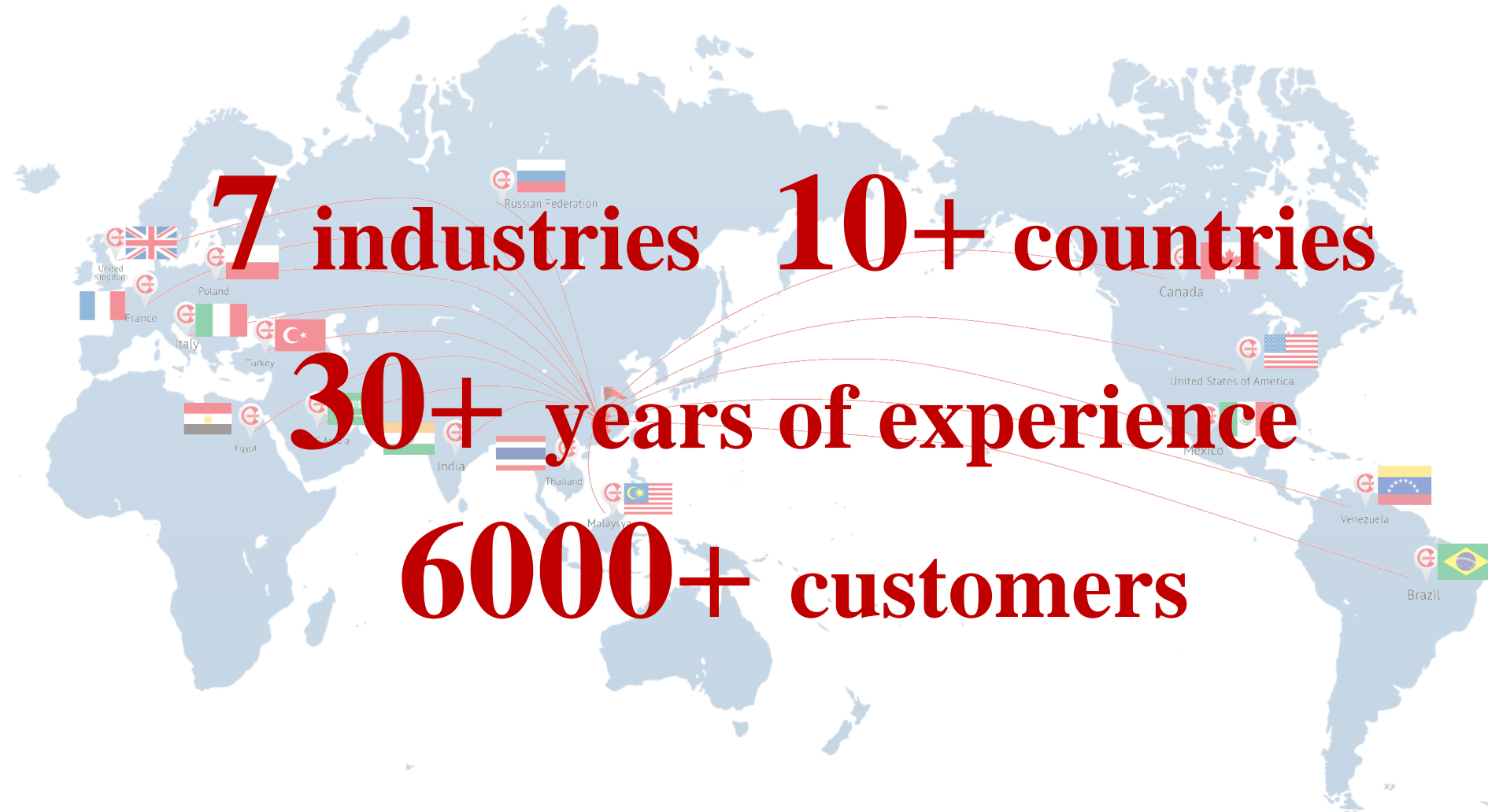


COMPLETE QUALITY ASSURANCE SYSTEM



ISO9001

RICH EXPERIENCE



OUR CUSTOMERS

Auto body manufacturing industry



Auto-part manufacturing industry



Motor manufacturing industry



OUR CUSTOMERS

Compressor Manufacturing industry



Low voltage electrical manufacturing industry



Appliance and hardware manufacturing industry





HERON IS ALWAYS HERE FOR YOU !



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