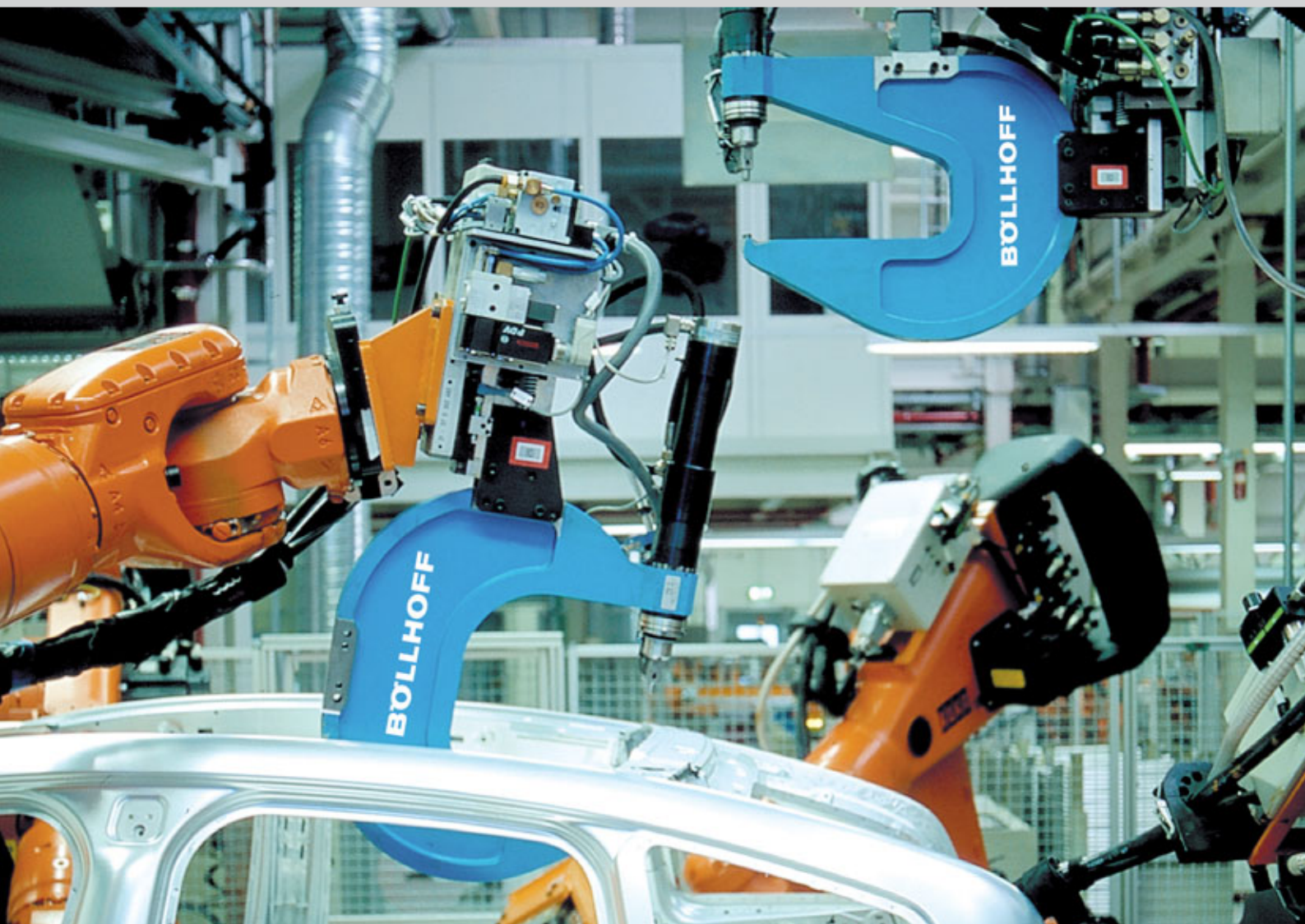


# Self-Pierce Rivet Technology

# RIVSET®



Self-Pierce Riveting Systems for Automatic Processing  
Flexible, economic and safe  
ABF/MBF/MTF

# BOLLHOFF

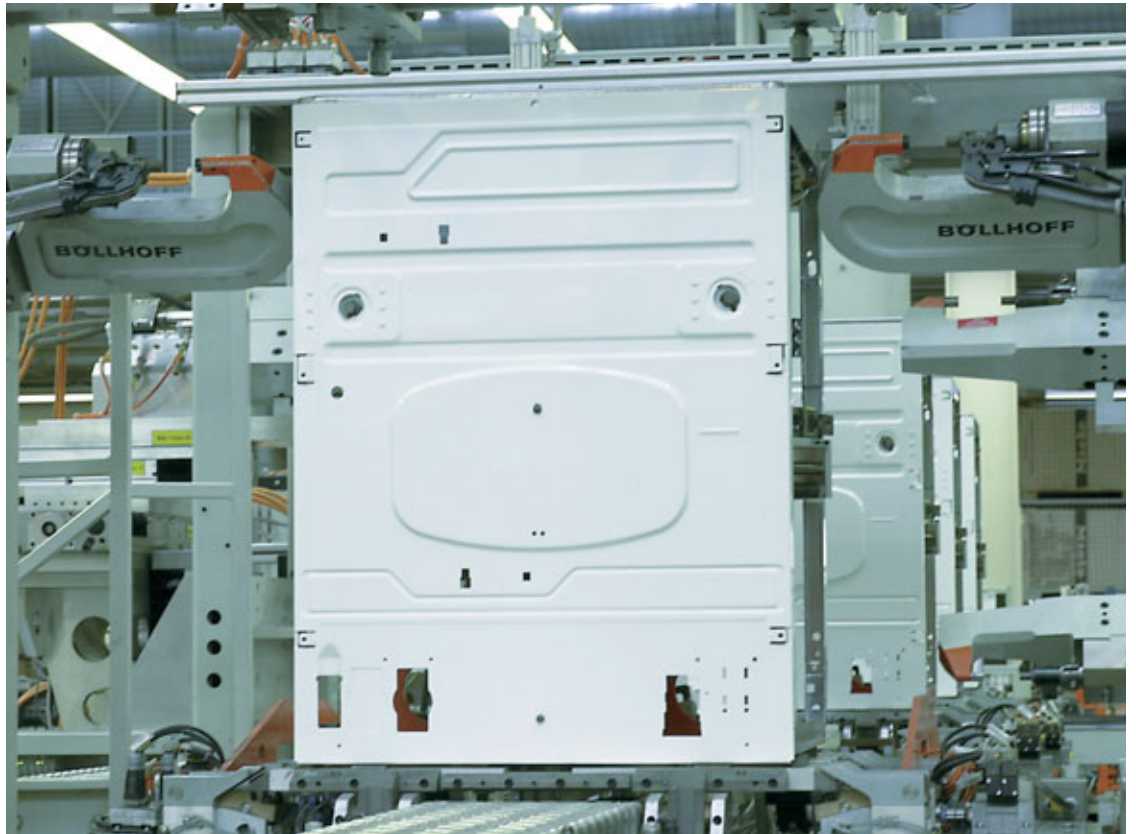


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### **Example of use:**

Processing of Loose Self-Pierce Rivets in Automated Washing Machine Manufacture



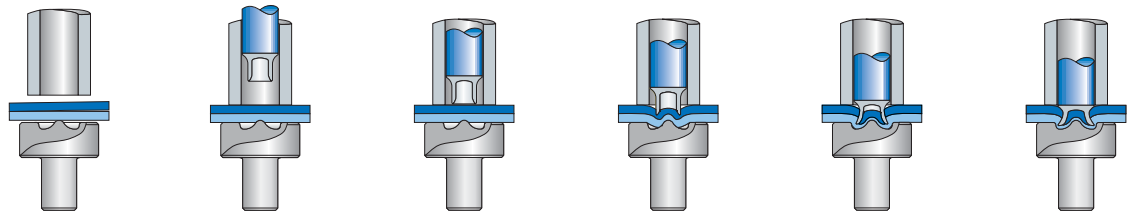
## The Concept

All manufacturing industry has to join materials together. The importance and use of mechanical joining methods has increased significantly in recent years.

The need to accommodate changes in environmental legislation has led to the use of new design concepts and materials. Development programmes have improved mechanical joining into a highly cost effective method of construction and assembly.

The trend is towards the use of lightweight assemblies, galvanised and coated steels, high strength steels, aluminium and plastics and combinations of these materials. As an example, in the Sheet Metalworking Industry the use of the Self-Pierce Rivet mechanical joining technique is found to be a cost effective alternative to conventional joining processes.

Self-Pierce riveting is a process for the high strength mechanical joining of similar or combinations of materials whereby several layers can be joined without problem.



## The advantages of Self-Pierce Riveting at a Glance

### The Joint

- High strength
- Visual checks possible
- Reproducible
- No pre-drilling
- Impervious to liquids and gas
- For various metal and non-metallic materials
- For various material thickness
- For various material strengths

### The System

- Safe, always correctly located supply
- Rapid automatic processing
- Simple, comfortable, operator friendly operation
- Automated process monitoring possible (as an option)



- Economical
- Reliable

- Flexible
- Environmentally safe

## Advantages as compared with more traditional joining methods e.g. Spot Welding and Blind Riveting:

### Material Mix

- Many material combination options are possible (type of material and thickness)
- Coated metallic materials can be joined (using metallic, organic or inorganic coatings)
- Interim layers e.g. plastic or adhesive, are process-compatible

### Environmental sustainability

- No harmful fumes or gases produced during production process
- Low noise
- Low energy consumption
- No waste (e.g. splash)

### Process reliability

- Controllable process
- Joint can be checked without damage, (NDT)
- No thermal load on joining zone
- Simple to operate
- No pre/post-treatment required e.g. no pre-cleaning or subsequent removal of spray deposits from the area around the joint
- Does not damage or overheat alloy materials

### Functionality

- The process is ideal for automation and integration into other production operations (e.g. assembly processes).
- Rivet elements can assume other functions depending on design
- Short set-up times

## The RIVSET® ABF Self-Pierce Rivet system

### *The system*

For more than 10 years we have been an innovative market leader with our RIVSET® Self-Pierce Riveting Systems for the fitting of loose fed rivets in volume manufacturing plants in the automobile construction and white goods industries. We work closely with our customers to meet the dynamic market conditions and have moved one step further with the new RIVSET® ABF system:

In addition to our already well-known high performance products, the system that we describe has a number of pioneering innovations:

All the principal components of the RIVSET® ABF Self-Pierce Rivet system are in self-contained modules and you, the user, play a large part in determining how they are combined. It is possible to locate the drive modules, the control and the separation and feed of the RIVSET® Self-Pierce Rivets at separate locations in your manufacturing plant. In particular, this arrangement enables the operations staff to have ready access to the system (e.g. to refill it with rivets), which, using the standard compact design, is in protected cells.

The new RIVSET® ABF Self-Pierce Riveting system can also save process cycle time and therefore costs, with its "partial reverse stroke" variant, programmable for individual riveting points. Only the opening distance actually needed for the setting tool to proceed to the next riveting point is enabled, rather than the total opening distance. Used in conjunction with our active Axis Compensator you can thus achieve maximum production speed.

With this new generation RIVSET® ABF Self-Pierce Riveting system, it is also possible to process two different types of rivet such as 5 x 5 mm + 5 x 7 mm or 3 x 4 mm + 3 x 5 mm on one or two setting tools. This too means that you need less production space, which in certain circumstances can result in lower investment costs. This option is particularly suitable for low to medium volume manufacture of components in a robot cell.

For aluminium components in particular, it is important that the pre-clamping force of the setting cylinder is set exactly to the correct value. If the force is too low the material may distort affecting the quality of the joint. If it is too high, undesirable coining effects on the surface of aluminium may result. For this reason we have designed the control system to be able to program both the pre-clamping force and the setting force individually for each separate riveting point.



## The RIVSET® ABF Self-Pierce Rivet system



### *Additional advantages*

- Flexible arrangement of system components using our modular design for optimum space usage.  
Operating terminal, control cabinet, hydraulics and feed unit can be installed separately from each other
- Rapid cycle times enabled by partial reverse stroke
- Process supervision with display of process curve showing rivet setting pressure and punch travel
- All components are produced for the modular system and are readily interchangeable
- Two lengths of rivet having the same diameter can be processed safely in one system
- Operation with two alternately working setting tools
- Setting tools can be individually centred to ensure a consistently high joint quality over long periods

## The RIVSET® ABF Self-Pierce Rivet system

### The RIVSET® ABF Self-Pierce Rivet system is suitable for

- Operation on a robot (C-frame mounted on the robot arm)
- Operation with robots (stationary C-frame, robot handles the workpiece)
- Integration in a processing plant / special machine
- Manual operation.

Whichever of the above options you choose for your manufacturing requirements, the RIVSET® ABF Self-Pierce Riveting system is a self-contained functional unit.

For example, we can supply the equipment for manual operation with a foot switch or two-handed actuation as desired. The provisions of health and safety at work will always be the determining factors here.

To install the equipment you need factory air and a power supply. For integration with a higher-level control unit or a robot we offer Interbus S, Profibus or I/O based communications.

We can discuss alternative configurations with you at the time you design your process line.

### *Process safety and ease of maintenance*

Whichever variant of the RIVSET® ABF Self-Pierce Riveting system chosen, our online process supervision ensures that the quality of your production remains consistent. Increasing demands on quality management require transparent documentation of process data. An industrial PC with integral hard disk is available for this purpose and even if the power supply suddenly fails, no important data is lost.

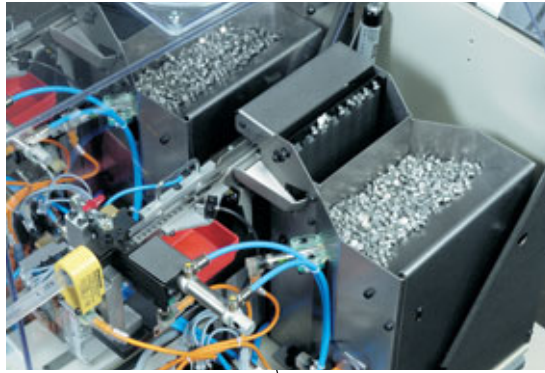
Another new feature is rivet length monitoring which inhibits errors at the feed device and is done outside the protected area. It is thus possible to prevent rivets of the wrong design being introduced into the process.

Furthermore, the RIVSET® Self-Pierce Riveting system "notes" whether a component is present. This guards against possible damage to dies, pressure pistons and components and reduces scrap in your manufacturing process, as well as helping to keep repair time and costs under control.

When servicing and repairs are done, the critical factor is plant idle/down time. All system components are arranged in assemblies that can be simply and rapidly replaced when the need arises. This saves you the work and expense of repairs on the line and during the production.

Our RIVSET® ABF Self-Pierce Riveting system places you at the cutting edge of high technology. A Siemens S7 SPS controls our system, which in conjunction with our Windows NT-based IPC is a true top-level product of hardware construction. The clear user interface and ease of operation via the large integral touch screen on the control terminal are completely new in Self-Pierce Rivet technology. Diagnosis is easily understood with error messages displayed on the touch screen and help text in the language of your country, thus simplifying fault location during the manufacturing process.

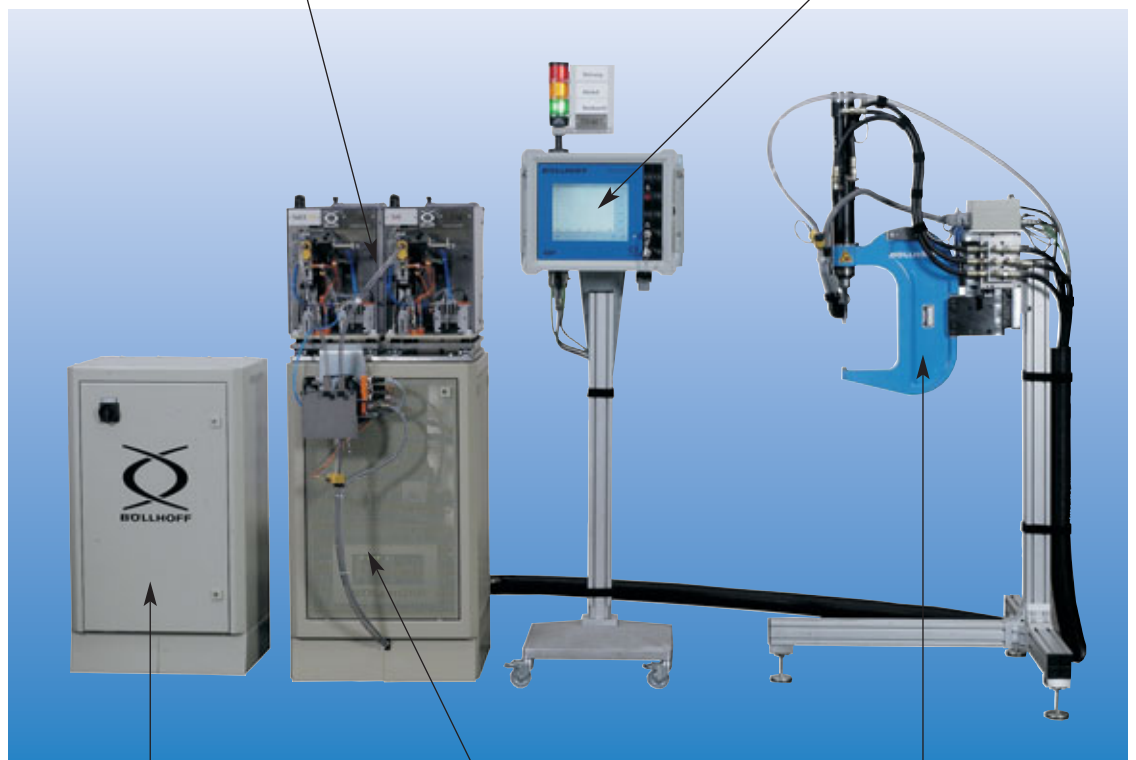
## Description of the system



Feed unit



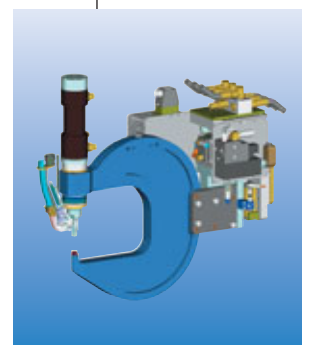
Control terminal



Control cabinet



Power supply



Setting tool

## System components of the RIVSET® ABF Self-Pierce Rivet system

### Power supply

- Compact hydraulics with proportional pressure valves to regulate the pre-clamping and setting pressure individually for every joining point
- Integral oil spill pan
- Optional cabinet
- Optional with rolls



### Control cabinet

- System control using Siemens S7 (other version can be available on request)
- Central plug connector for connecting individual components and any higher-level plant control or robot
- Communication with a robot or a higher-level control is via Interbus S, Profibus or I/O as desired
- Stackable cabinet
- Optional with rolls



### Feeding unit

- Advanced design "Step Feeder" with linear escapement for minimal impacting preventing rivet coating damage
- Built on a base plate, with optional telescope rail for access
- One or two feeding units built as required on the hydraulic cabinet, control cabinet or separately, as required





## System components of the RIVSET® ABF Self-Pierce Rivet system

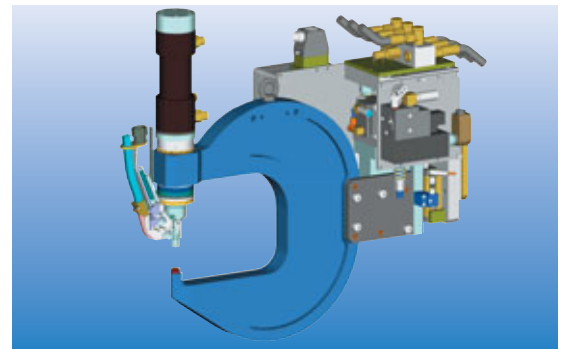
### Control terminal

- Industrial PC with Windows NT-based user interface. Integral process control in the form of a force-displacement curve display
- Operated via touch screen
- Integral Ethernet interface for networking with a host computer
- Help function with detailed illustrated fault description on the screen



### Setting tool

- C-frame designed for the component and application
- Wide selection of setting cylinders with different strokes
- Setting cylinder with a pre-clamping function
- Different setting heads for the best possible access to the place to be joined
- Optional Axis Compensator for robot applications
- Options available – please enquire



### Whole system concept

All system components can be combined and located as desired. The length of the connecting leads only limits the distances between the components. The maximum distance between the feed unit and the Self-Pierce Rivet tool is 15 m (hose length), between power supply and Self-Pierce Rivet tool 20 m (hose length).

### Variants of the Self-Pierce Rivet system

#### RIVSET® ABF S

Standard system for processing one type of rivet with one setting tool.

#### RIVSET® ABF T

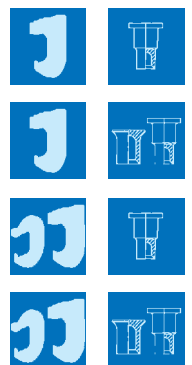
Variant for processing two types of rivet of the same diameter with one setting tool.

#### RIVSET® ABF SA

Variant for processing one type of rivet with two setting tools in alternation.

#### RIVSET® ABF TA

Variant for processing two types of rivet with two setting tools in alternation.



The setting tools can also be operated with a Tool Changer system if required; the supply leads can also be integrated. However particular attention should be paid to the layout of these supply leads.

### Goods supplied

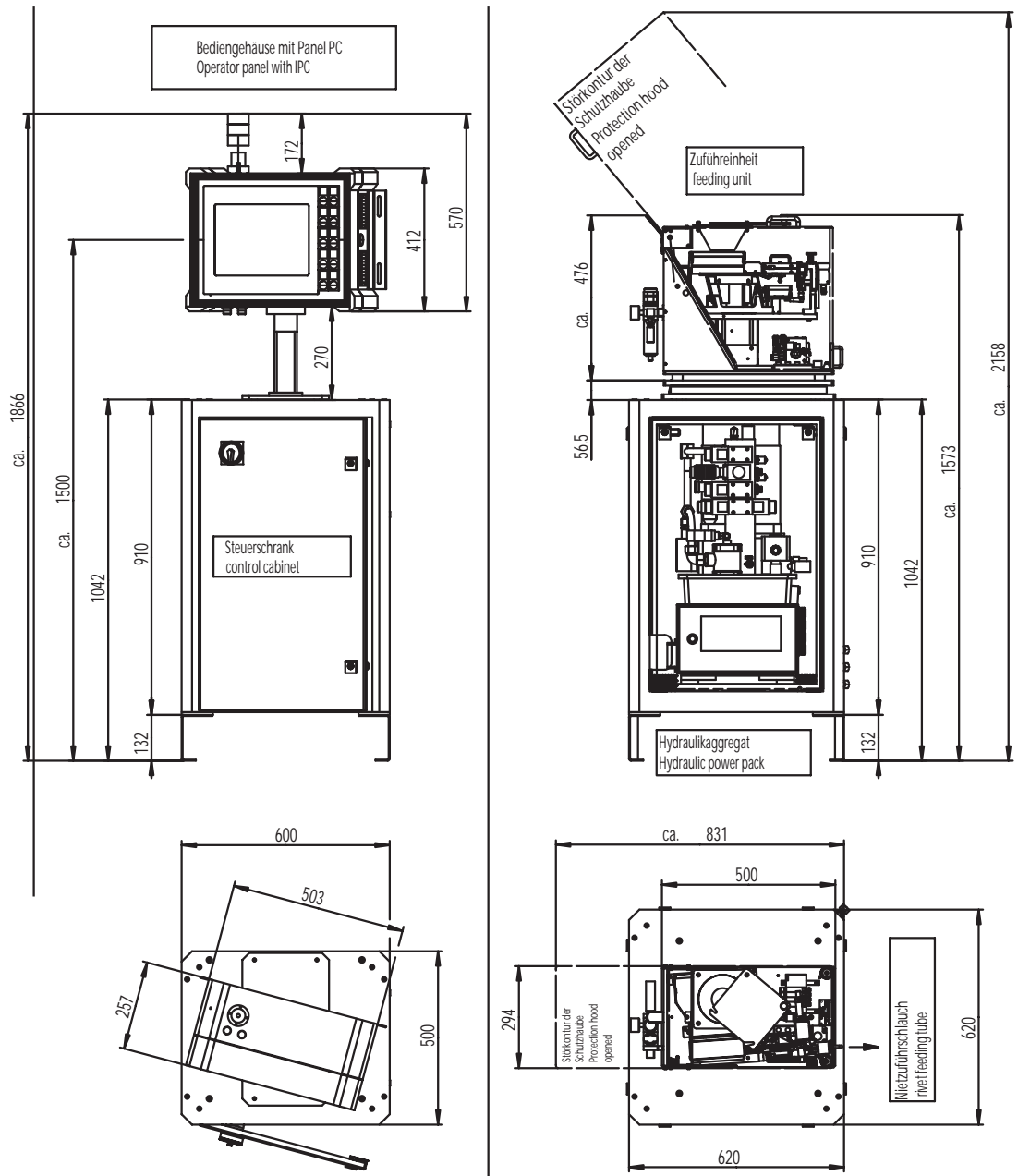
The system consists of the components listed above and is delivered ready for use. (Plug-and-Play solution). Before delivery a riveting function test is carried out in our factory and the factory settings are documented. The documentation includes the measurements of the setting tool.

## The RIVSET® ABF Self-Pierce Rivet system

### Technical data

<b>Dimensions</b>	Electric cabinet W x H x D	600 x 1045 x 500 mm
	Operator panel with indicator lamp, W x H x D approx.	505 x 720 x 260 mm
	Hydraulic power pack in cabinet	620 x 1045 x 620 mm
	Feeding unit	500 x 495 x 300 mm
<b>Weight</b>	Self-Pierce riveting setting tool incl. axis compensator depending on C-frame size	approx. 50 – 200 kg gross
	Electric cabinet with operating panel	approx. 140 kg gross
	Hydraulic power pack in cabinet	
	a) with one feeding unit	280 kg
	b) with two feeding units	320 kg
<b>Hydraulic system</b>	Hydraulic oil	HLP 32 DIN 51524
	Operating pressure, max.	250 bar
	Return-flow pressure, max.	5 bar
	Continuous flow rate	23 l/min
	Fill volume	26 l
	Motor speed	1450 min <sup>-1</sup>
	Motor output	5.5 kW
<b>Compressed air</b>	Compressed air piping	3/4 "
	Compressed air connection	1/4 "
	Air consumption, approx.	6.5 NL/riveting
	Air supply	6 bar
<b>Energy supply</b>	Electric connection	3 x 400 V, 230 V, 50 Hz
(with hydraulic power pack)	Current consumption	12 A
	Fuse protection	16 A
<b>Cycle time</b>	"Start riveting" until "Ready to restart"	2 – 3.5 s
<b>Noise emission</b>	Self-Pierce riveting tool	< 75 dB (A)
at a distance of 1 m at a	Hydraulic power pack	< 75 dB (A)
height of 1.60 m	Feeding unit	< 80 dB (A)
<b>Ambient temperature</b>	in operation	+ 15°C – + 40°C
	in storage	– 10°C – + 60°C

# The RIVSET® ABF Self-Pierce Rivet system



## The RIVSET® MBF/MTF Self-Pierce Rivet system

### *The system*

This system has been developed for efficient processing of Self-Pierce Rivets where high quality joints are required together with process control.

The RIVSET® MBF/MTF processing system has been developed primarily for the manual volume production of components.

The design has incorporated the possibility that several different materials may have to be joined to a component. An integral final force and displacement supervision/monitoring system shows the user directly if the setting parameters have been achieved and therefore that the joint has been correctly made.

To confirm the correct result has been achieved even where different materials are concerned, 10 different values can be programmed and selected for the various alternatives.

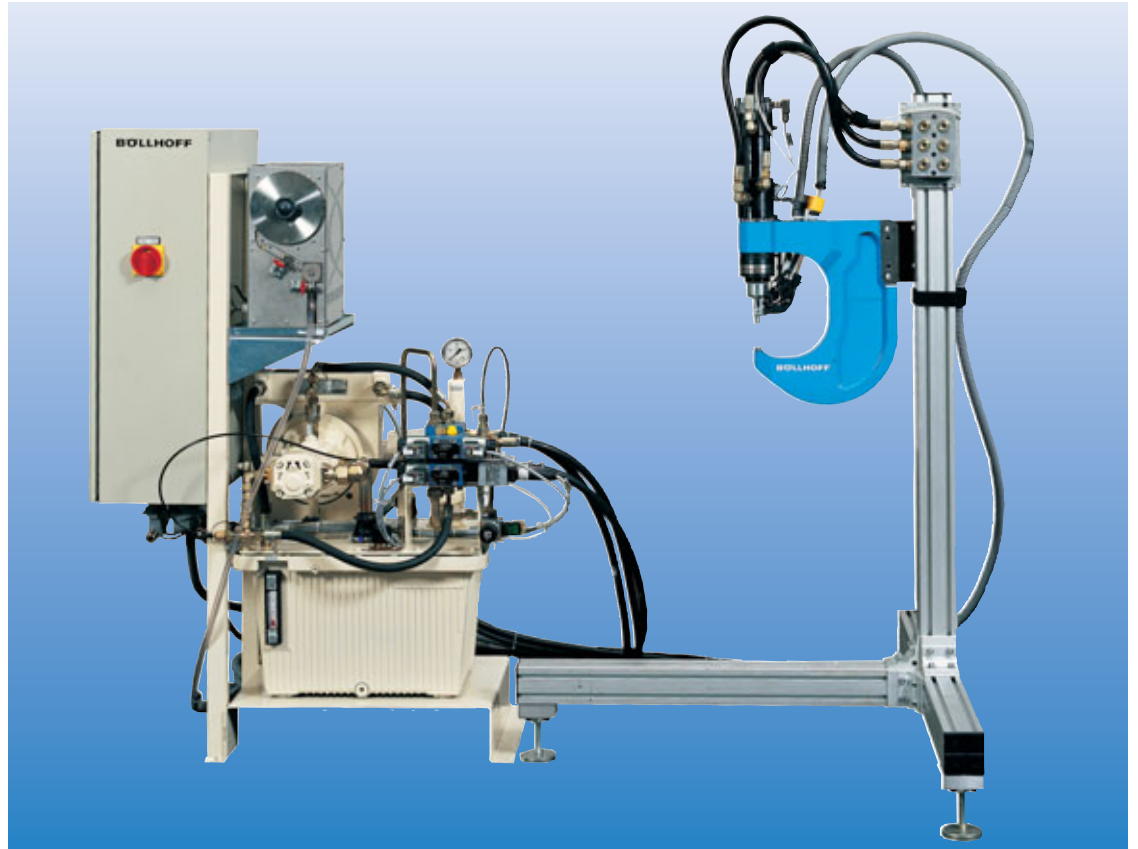
A programmed workpiece detection system helps prevent damage to the setting tool caused by incorrect use. It prevents the start of the riveting process if there is no material between the punch and the die.

The Self-Pierce Riveting process can be started by a two-handed device or a foot switch, as required. The machine thus has the advantage that the setting tool can be brought up to the component without actuating the riveting process. In this way accurate positioning of the point of joining can be guaranteed.

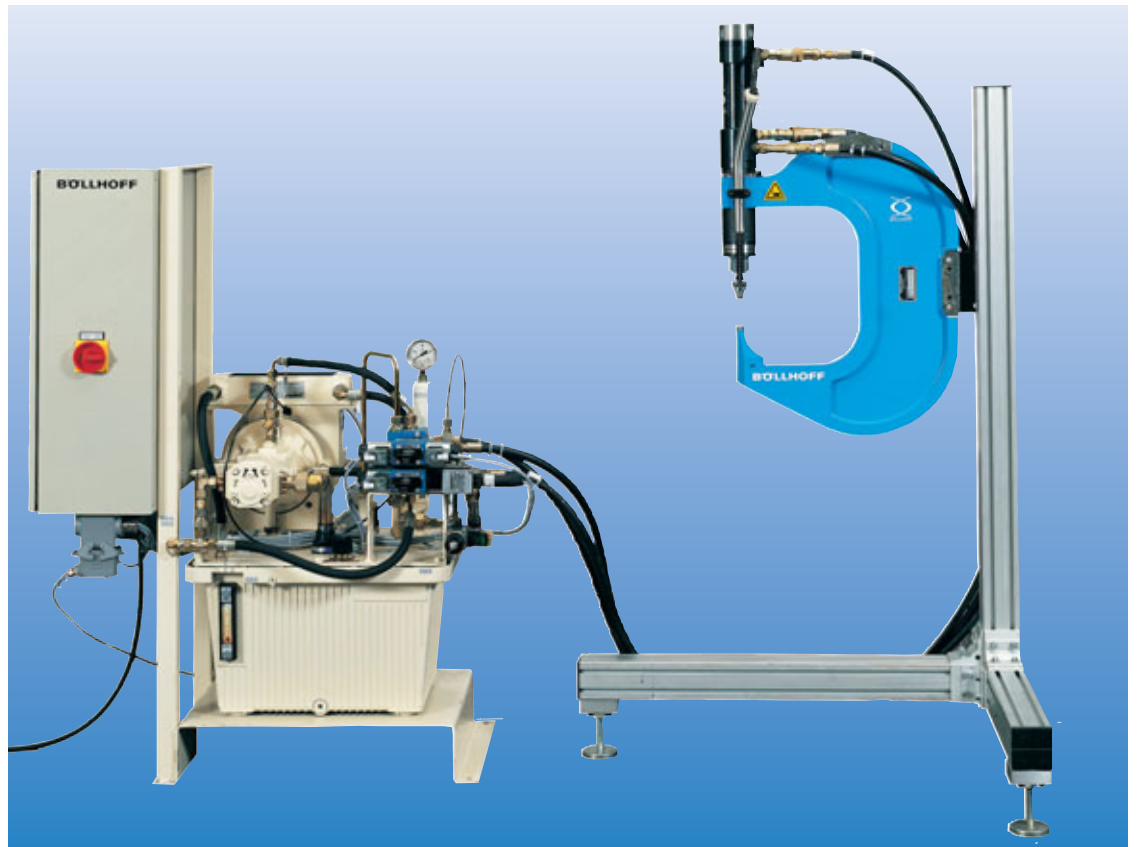
The setting tool can be brought up to the component, or alternatively the component can be brought up to the tool.

You can thus choose whether you would like to work with loose (blow feed) rivets with the RIVSET® MBF or with the RIVSET® MTF and rivets stored on a tractor tape.

The RIVSET® MBF Self-Pierce Rivet system



The RIVSET® MTF Self-Pierce Rivet system





## The RIVSET® MBF/MTF Self-Pierce Rivet system

### *The Böllhoff RIVSET® MBF/MTF Self-Pierce Rivet system is suitable for*

- Manual operation.
- Integration in a processing plant
- Operation on a robot (C-frame mounted on the robot arm as option with MBF only)

### *Economical and user-friendly*

Wherever the degree of automation in a process has to be kept low, but the greatest importance is placed on quality and availability, our RIVSET® Self-Pierce Riveting system is ideal.

The automatic blow feeding of loose rivets in the RIVSET® MBF makes this system particularly suitable for use in small processing plants. In this case communication with a higher-level control or a robot is via I/Os. Manual operation is also simplified by the loose rivet feed and availability is increased.

RIVSET® MTF is at home wherever high flexibility and different types of rivet play a part. As the rivets are fed via a tractor belt the equipment can be rapidly converted for a different rivet type.

The setting head guarantees safe, reliable transport of all sizes of rivet. To ensure faultless operation the systems are fitted with workpiece detection that prevents riveting without material. Thus tool breakage resulting from incorrect operation is largely eliminated.

The quality of the joint can be checked on every riveting cycle by the integral final position monitor.

This shows whether the punch displacement and punch force have reached the set values. This "Operating Window" can be pre-programmed for 10 different types of materials and called up on the system by means of a selector switch.

The setting force is set automatically to each selected value using a programmable pressure control valve. These characteristics make RIVSET® MBF/MTF particularly suited to short and medium runs and prototyping.

## *Advantages*

- No riveting without material, therefore no broken tools
- Setting force can be set separately for different pairs of materials
- Process supervision: Final force and displacement with tolerance window
- Compact design
- Operating terminal can be moved out of the control cabinet
- Freely selectable pause between placing the pre-clamping and setting the Self-Pierce Rivet – improved riveting result
- Setting head can be inched forward and back to assist positioning of the workpiece

## RIVSET® MBF/MTF System components

### Supply unit

- Hydraulic unit with proportional valve for variable setting pressure
- System control via Siemens S7-200
- Control cabinet with plug connector, all terminations are via plug and socket
- Compact design, requires little space
- Max. 15 m supply to the setting tool



### Operating panel

- Operator Panel 7 – mobile hand operating unit with up to 10 m of cable to the control cabinet
- Emergency stop and reset function
- Clear text display



### Rivet feed

#### RIVSET® MTF

- Stored Self-Pierce Rivets on tractor belt are fed through the indexing head
- Safe and reliable transport of rivets including those of the smallest dimensions
- Few wear parts, very easy to service and maintain



#### RIVSET® MBF

- Loose rivets fed automatically via a drum separator/blow feed system
- High availability
- Maximum hose length between the separator and setting tool is 10 m

The operating terminal and drum separator/blow feed system can be separated from the power supply unit and located individually. The maximum distance between the feed unit and the Self-Pierce Rivet tool is 10 m (hose length), between power supply and Self-Pierce Rivet tool 15 m (hose length).



## RIVSET® MBF/MTF System components

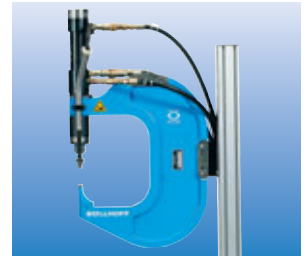
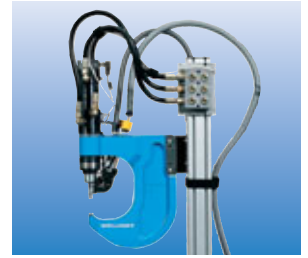
### Setting head

#### RIVSET® MBF

- Rivets supplied automatically
- Large selection of setting heads for optimum accessibility
- C-frame designed for the application
- Various setting cylinders with different strokes
- Setting cylinder with pre-clamping function

#### RIVSET® MTF

- C-frame designed for the application
- Various setting cylinders with different strokes
- Setting cylinder with hold-down function
- Large selection of nose inserts for optimum accessibility
- Tractor belt guide



### Accessories

The systems are supplied with foot switch or two-handed actuation to workers' protection rules. We can also offer you accessories for our systems on request. Do not hesitate to enquire if you need special versions or aids to manual operation.

We can create the best process and equipment for you from the large number of variants of our components.

## Variants of the Self-Pierce Rivet system

#### RIVSET® MBF

System for processing loose Self-Pierce Rivets with one setting tool.

#### RIVSET® MBF T

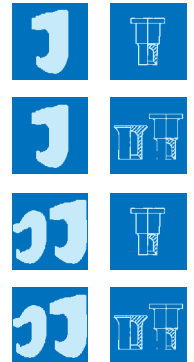
System for processing loose Self-Pierce Rivets with two setting tools working alternately. Both setting tools can be used for different types of rivet.

#### RIVSET® MTF

System for processing Self-Pierce Rivets stored on a belt band with one setting tool.

#### RIVSET® MTF T

System for processing Self-Pierce Rivets stored on a belt band with two setting tools in alternation.



On systems with two setting tools, the setting pressure and material pairs can be pre-selected separately. When the tool concerned is operating the supply unit automatically sets the pre-selected parameters.

### Goods supplied

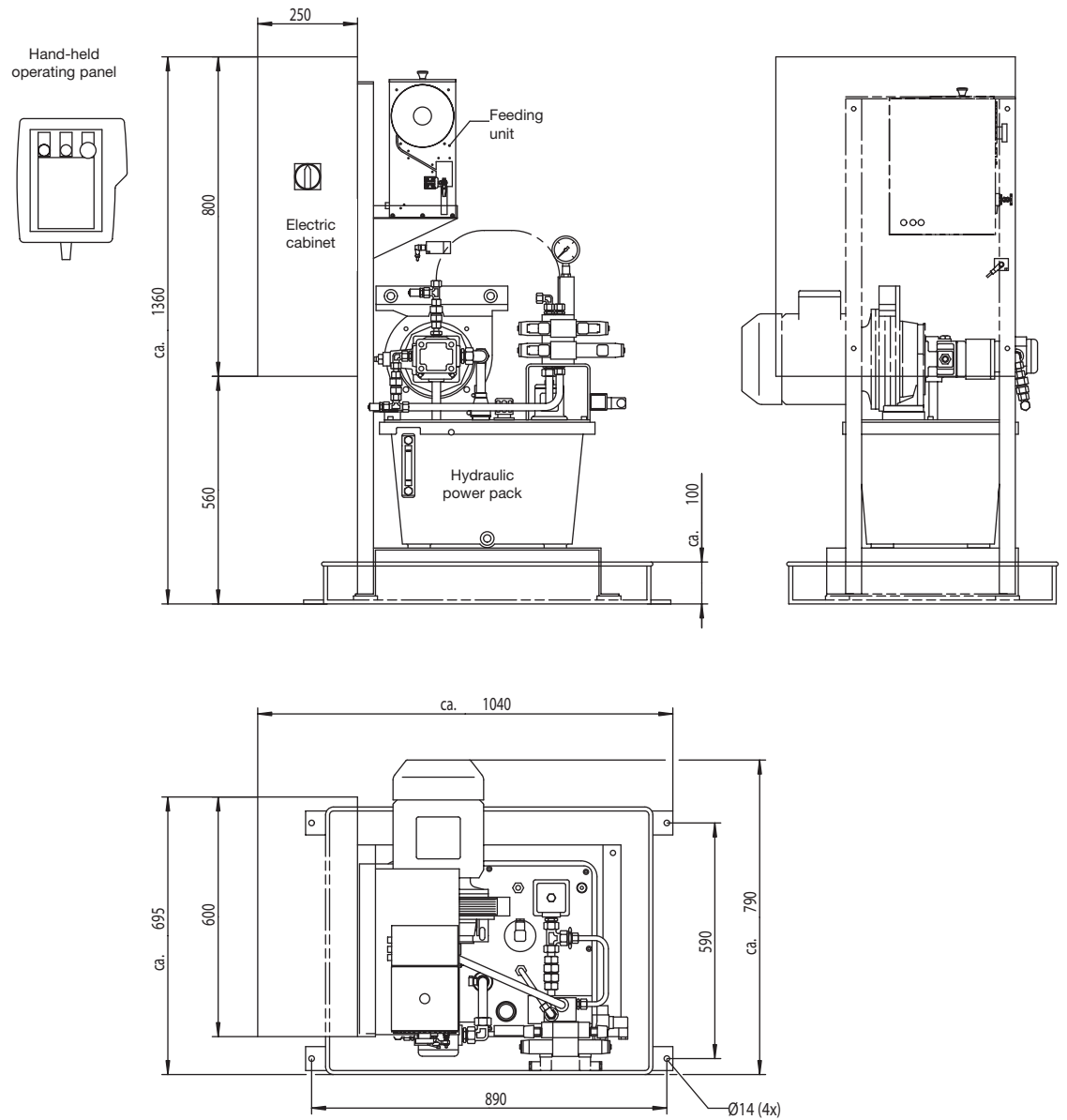
All systems are supplied in working order. The components listed above are included in the goods supplied. Before delivery a riveting function test is carried out in our factory and the factory settings are documented. If desired, our technical customer service installs the system on your premises and carries out commissioning. We are also happy to provide training for your operators and service engineers.

## The RIVSET® MBF Self-Pierce Rivet system

### Technical data

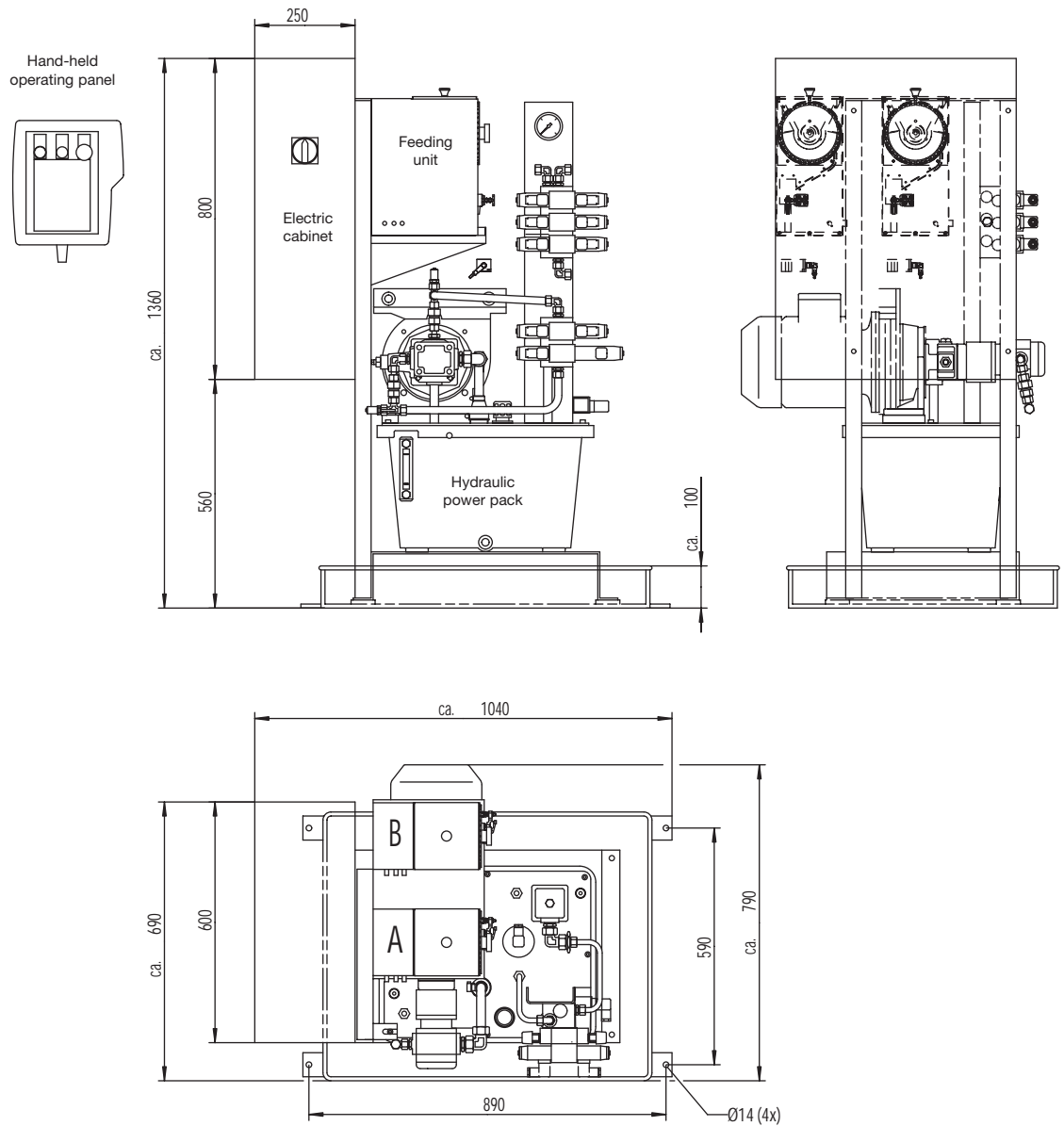
<b>Dimensions</b>	Electric cabinet, W x H x D	170 x 345 x 265 mm
	Supply unit with Feeding unit and hydraulic power pack, W x H x D	1035 x 1360 x 800 mm
<b>Weight</b>	Feeding unit, W x H x D	170 x 345 x 265 mm
	C-frame and hydraulic cylinder	50 – 200 kg gross
<b>Hydraulic system</b>	Electric cabinet with PLC, feeding unit and hydraulic power pack	approx. 260 kg brutto
	Hydraulic oil	HLP 32 DIN 51524
	Operating pressure, max.	250 bar
	Continuous flow rate (setting pressure)	23 l/min
	pre-clamping pressure	100 bar
	Fill volume	40 l
	Motor speed	1450 min <sup>-1</sup>
	Motor output	4 kW
<b>Air pressure</b>	Compressed air piping	3/4 "
	Compressed air connection	1/4 "
	Air consumption, approx.	6,5 NL/riveting
	Air supply	6 bar
<b>Energy supply</b> (with hydraulic power pack)	Electric connection	3 x 400 V, 230 V, 50 Hz
	Current consumption	12 A
	Fuse protection	16 A
	<b>Cycle time</b>	"Start riveting" until "Ready to restart"
<b>Noise emission</b> at a distance of 1 m at a height of 1.60 m	Self-Pierce riveting tool with C-frame	< 80 dB (A)
	Electric cabinet with feeding unit and hydraulic power pack	< 80 dB (A)
<b>Ambient temperature</b>	in operation	+ 15°C – + 40°C
	in storage	– 10°C – + 60°C

## The RIVSET® MBF Self-Pierce Rivet system





## The RIVSET® MBF-TA Self-Pierce Rivet system

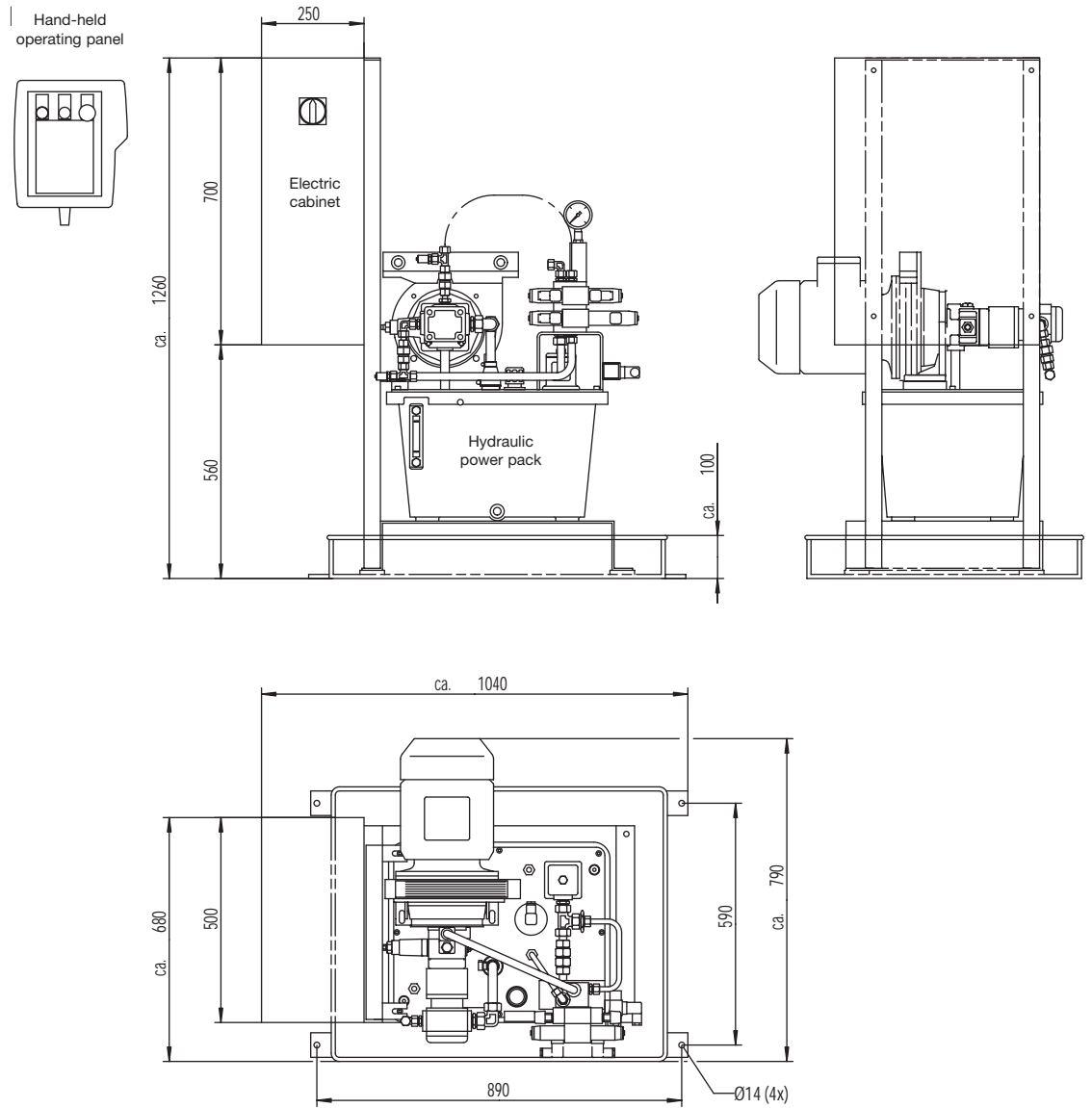


## The RIVSET® MTF Self-Pierce Rivet system

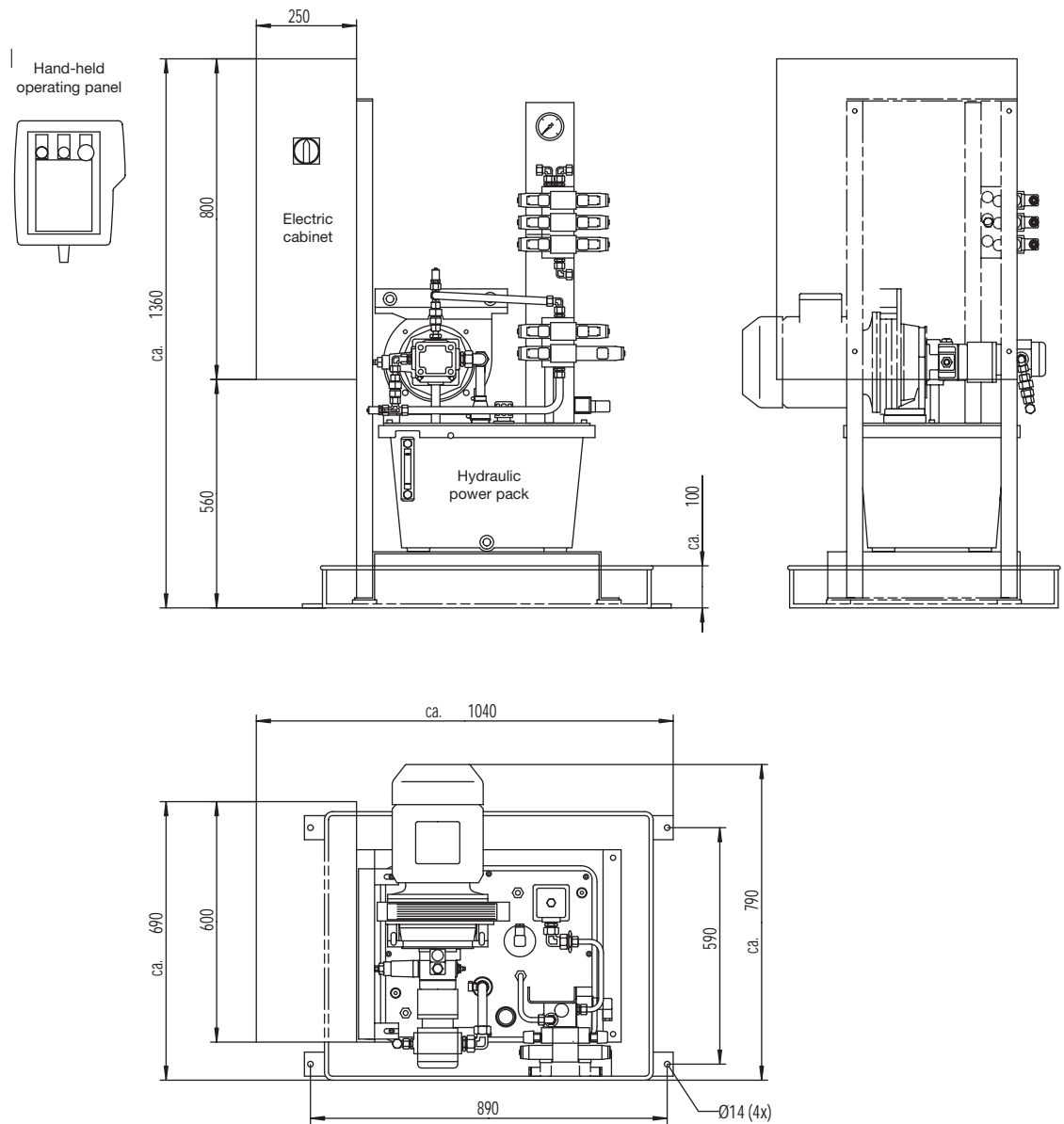
### Technical data

<b>Dimensions</b>	Electric cabinet with hydraulic power pack, W x H x D	1035 x 1260 x 800 mm
	Spool holder	Ø 340 x 100 mm
<b>Weight</b>	Bracket for spool holder	400 x 100 mm
	Self-Pierce riveting tool depending on C-frame size	50 – 200 kg gross
<b>Hydraulic system</b>	Electric cabinet with SPS, hydraulic power pack	250 kg gross
	Hydraulic oil	HLP 32 DIN 51524
	Operating pressure, max.	250 bar
	Continuous flow rate (setting pressure)	23 l/min
	Pre-clamping pressure, max.	100 bar
	Continuous flow rate (pre-clamping pressure)	14 l/min
<b>Compressed air</b>	Return flow pressure, max.	5 bar
	Fill volume	40 l
	Motor speed	1450 min <sup>-1</sup>
	Motor output	4 kW
	Compressed air piping	3/4 "
<b>Energy supply</b> (with hydraulic aggregate)	Compressed air supply	1/4 "
	Air consumption, approx.	6.5 NL/riveting
	Operating pressure	6 bar
<b>Cycle time</b>	Electric connection	400 V, 230 V, 50 Hz
	Current consumption	12 A
<b>Noise emission</b> at a distance of 1 m at a height of 1.60 m	Fuse protection	16 A
	"Start riveting" until "Ready to restart"	2 – 3.5 s
<b>Ambient temperature</b>	Self-Pierce riveting tool	< 75 dB (A)
	Electric cabinet with hydraulic power pack	< 75 dB (A)
<b>Ambient temperature</b>	in operation	+ 15°C – + 40°C
	in storage	– 10°C – + 60°C

## The RIVSET® MTF Self-Pierce Rivet system



## The RIVSET® MTF-TA Self-Pierce Rivet system



## Examples of use of RIVSET® Self-Pierce Rivet joints

### Automotive industry

#### Other examples:

- Wing/Bonnet
- Window cut-out
- Front Firewall
- Door cut-out
- Boot lid
- Floor Pan
- Strut housing

Audi A2 shell/  
Aluminium



### Automotive supporting industry

#### Other examples:

- Battery mounting
- Heat baffle plate
- Vehicle seat
- Wheel housing support
- Sliding roof

Flywheel/  
Steel



### Heating, air-conditioning, ventilation

#### Other examples:

- Vent pipe
- Air channels
- Ventilation flaps
- Heat exchanger

Vent pipe/  
Steel



### Sheet metalworking industry

#### Other examples:

- Corner reinforcements
- Lights
- Escalators
- Protective covers
- Housings
- Garage doors
- Containers

Corner reinforcement for transport container/  
Aluminium

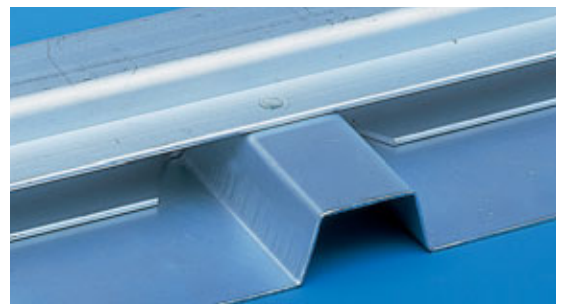


### Construction and construction-related trades

#### Other examples:

- Wall cladding
- Structural components
- Prefabricated house building
- Silo construction

Wall cladding/  
Aluminium





# Böllhoff International

## North Europe

Wilhelm Böllhoff GmbH & Co. KG, Bielefeld  
Böllhoff GmbH, Bielefeld with branches  
in Bielefeld, Braunschweig, Burgau, Dormagen,  
Leipzig, Munich, Nuremberg and Stuttgart,  
Böllhoff Verbindungstechnik GmbH, Bielefeld  
Böllhoff Systemtechnik GmbH & Co. KG, Bielefeld,  
Böllhoff Schraubtechnik GmbH, Bielefeld  
Böllhoff Produktion GmbH & Co. KG, Bielefeld and Sonnewalde,  
Germany

Böllhoff Fastenings Ltd., Birmingham, Great Britain

## South-West Europe

Böllhoff Oталu s. a., La Ravoire,  
Böllhoff Usinec s. a., Paris,  
France

Böllhoff S.P.R.L., Aalst, Belgium

Böllhoff s.r.l., Mailand, Italy

Böllhoff s.a., Madrid, Spain

## South-East Europe

Böllhoff GmbH, Linz, Austria

Böllhoff Kft, Székesfehérvár, Hungary

Böllhoff s. r. o., Prag, Czech-Republic

Böllhoff s.r.l., Bors, Romania

Bimex-Böllhoff\*, Łańcut and Lipno, Poland

Böllhoff-Master\*, Russia

## North America

Böllhoff RIVNUT® Inc., Kendallville, Indiana, USA

Böllhoff Inc., Ontario, Canada

Böllhoff S.A. de C.V., Mexico City, Mexico

## South America

Böllhoff Adm. e Part. Ltda., Jundiaí,  
Böllhoff Service Center Ltda., São Paulo, Porto Alegre and Curitiba  
Arquimedes Participacoes S.A, Jundiaí,  
MollerTech Böllhoff Ltda.\*, Jundiaí and Curitiba,  
Böllhoff Neumayer Industrial Ltda.\*, Jundiaí,  
Brazil

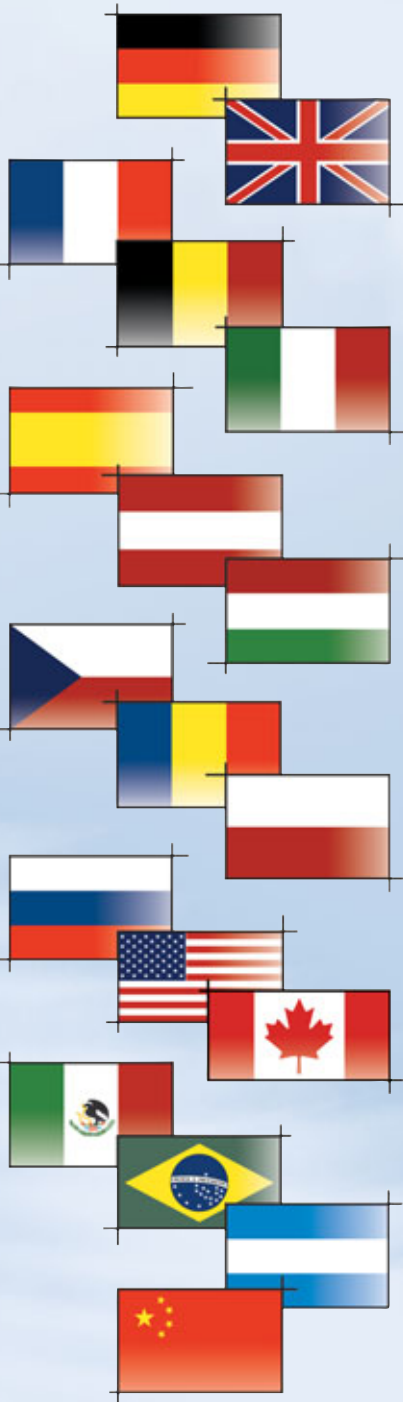
Böllhoff S.A., Buenos Aires, Argentina

## South-East Asia

Böllhoff Trading Company, Shanghai, China (VR)

\*Joint-Ventures

In addition to Böllhoff companies in these 18 countries, the company has a network of agents and dealers serving an international customer base on major industrial markets world-wide.



# BÖLLHOFF

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