Press Release
June 2007

ARNOLD Fastening Systems SHINJO

Piercing nuts from Arnold & Shinjo in serial use by VW and Audi

Nearly all models from VW and Audi contain a multitude of PIAS punch nuts whose processing is part of the standardized system technology of Arnold & Shinjo.

Wherever detachable connections which must meet the high performance standards in the automotive industry are needed, the name of Arnold & Shinjo which has over 12 years of experience in this field, comes into play.

Punch nuts are mounted in different metal parts of cars: functional supports, holders, complete side panel frames, wheel houses, roof rails, antenna plates and many others.

Tailor-made system solutions

Due to the compact modular design of the tools and transport systems and the innovative A&S multi-distribution equipment, the car maker's installation needs, which are often quite complex, can be met.

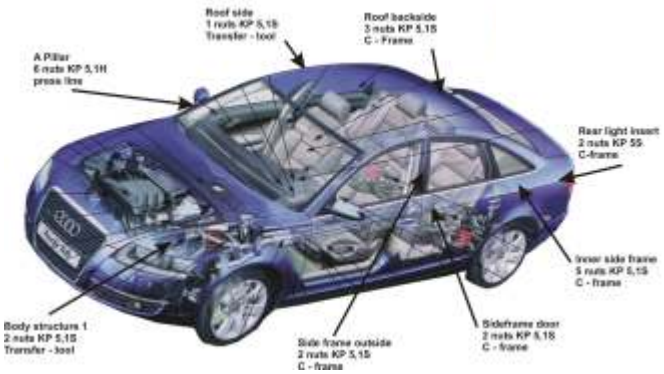
PIAS punch nuts and press bolts are handled by a standardized range of tools consisting of punch and press heads, dies and feeders, including the required control equipment. Tools and components are developed and custom-made if necessary.

In addition to this, complete processing systems, including presses, can be designed, made and delivered for deployment in serial production.

Basically, there are two areas in which punch nuts can be used:

- Directly in the punch or press tool
- In bodyshell or assembly work

PIAS PN® Piercing nut Sheet thickness: 0,6-2,5 mm Dimensions: M5 to M10 Property class: 8 Attribute: Moderate strength requirements	**PIAS HN® Piercing nut** Sheet thickness: 2,5-4,0 mm Dimensions: M5 to M12 Property class: 10 Attribute: High sheet strength
PIAS KP® Piercing nut Sheet thickness: 0,6-2,5 mm Dimensions: M5 to M12 Property class: 8 and 10 Attribute: Thin sheet, increased demand on torque	**RXM® Piercing nut** Sheet thickness: 0,75-2,5 mm Dimensions: M5 to M10 Property class: 10 Attribute: Nut of circular shape



Use of punch nuts in the punch or press tool

The traditional advantages of punch nuts and press bolts are shown, in particular, in the punch or press. The nuts and bolts are integrated in the production process of the metal panels. The panels leaving the machine already contain the connecting members. Several steps in production can be skipped and up to 30% processing costs saved. As processing is tool-specific, the position tolerances of the connecting members are guaranteed.

The feeders supply up to 400 nuts per minute for integration in the panels. For example, a follow-up tool with six punch heads can perform up to 65 strokes a minute.

Large tools in transfer presses or press lines punch in up to 30 nuts in one stroke. In this case, nuts are fed to the tool, as a rule, in two or four hoses. In the tool, the innovative Arnold & Shinjo-multi-divider device feeds nuts to each punch head as needed. This system allows a significant reduction of the number of interfaces to the tool and therefore requires less makeready time.

At **VW / Audi** also, punch nuts were first used in the press replacing the welded nut because it is more cost effective to produce individual parts as finished part. Welding is no longer required. The nuts are used in DQ800 presses, transfer presses with 5 operations, press lines and vacuum transfer presses.

Another major point, in addition to lower costs, is the process safety of the punch nut. For example, the process of threaded connections requiring documentation, e. g., airbag connections, cannot be fixed under industrial conditions. In welding, you can only see that current has been flowing. Where and how much and whether the weld is uniform, cannot be documented. Punching in the press allows documentation of the applied force by gauging end pressures.

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Hightech for sheet metal

Piercing nuts from Arnold & Shinjo in serial use by VW and Audi

Use of punch nuts in bodyshell or assembly work

As a rule, the following possibilities exist for using the threaded connections in the bodyshell:

- Single presses with fixing of the part
- Single presses with flexible tool handling by robot or coordinate handling devices
- Robot-guided C frame press with processing tools and automatic nut feeding
- „Hard mechanized" special systems with several press elements

First use in bodyshell production with **VW / Audi** occurred when the press operation turned out to be insufficient, often with high-strength sheet metal.
A hard mechanized system with 5 fixed C frames was used for the car A column. Totally 5 nuts were punched in one operation.

The second step was to install the nuts in parts at several angular positions. The press operators said no to apply several slides simultaneously in one tool operation. The robot can approach the positions without problem.

As a third step, nuts were installed in a welded assembly: It is not necessary to fit punch heads to 2 or 3 tools, only one system is available in bodyshell.

As a consequence of this, there are no nut tolerances in the welded assembly. As the nut itself punches the hole, all nuts are positioned exactly in the part. Even if the positional tolerances throughout the part deviate by 0.2 0.3 mm, the hole pitches relative to each other are always the same.
The robot handles the part at all required positions.

In Golf V, 24 nuts are mounted in each bodyshell door, integrated in the door production line. The parts are handled by robot. In this way, nuts can be mounted in a press from outside, inside and at different angle positions in the door inside panel.

Arnold&Shinjo is a 100 percent subsidiary of the global Würth Group with 54,900 employees and 375 companies in 83 countries and global sales of over 7.74bn Euro.

Press solution example: Truck front end with 30 punch nuts in one stroke

Examples of press solutions with VW / Audi:

Roof part

Piercing nut system, integrated into press tooling

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Advantages of the bodyshell solution:

Several angle positions of the part are handled by the robot with ease; the C frame can be robot-guided. The part is put down on a fixture and the robot moves along the contour with the frame.

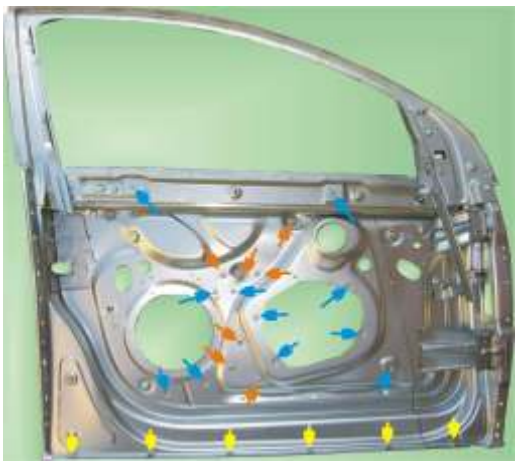
Welded assembly tolerances can be compensated if the parts are welded first and the nuts installed later.

It is possible to make the parts for the sedan and the station versions in one system or a supplier can make several parts in one machine system.

Overview of the use of Arnold & Shinjo piercing nuts by VW / Audi:

Audi Model	Components	Punch nuts per vehicle
A 3	A column, front roof rail, side panel, rear side panel frame, Quattro structural member, radiator tank holder	44 piercing nuts
A 4	side panel frame, side member closing part rear panel upper part, side part, side member, wheel house, traverse, roof rail radiator tank, structural member, A column, aerial sheet metal	54 piercing nuts
A 6	A column, side and rear roof rail, radiator tank, lamp insert, side panel frame, rear side part, outer side panel, side member closing part	72 piercing nuts
TT	Gear housing, eaves gutter	24 piercing nuts

Volkswagen Model	Components	Punch nuts per vehicle
Golf	Door panels front and rear, door sills front and rear, hatchback, bonnet	80 piercing nuts
Passat	Doors, hatchback, mudguard	40 piercing nuts


Volkswagen Golf door with 24 piercing nuts

.Several versions can be produced, for example, if nuts are needed in one model line and no nuts for another line.

VW /Audi carries out studies with each part to find which production method is the most favorable, from a cost and quality aspect.


Piercing nut processing in assembly area with robot handling

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