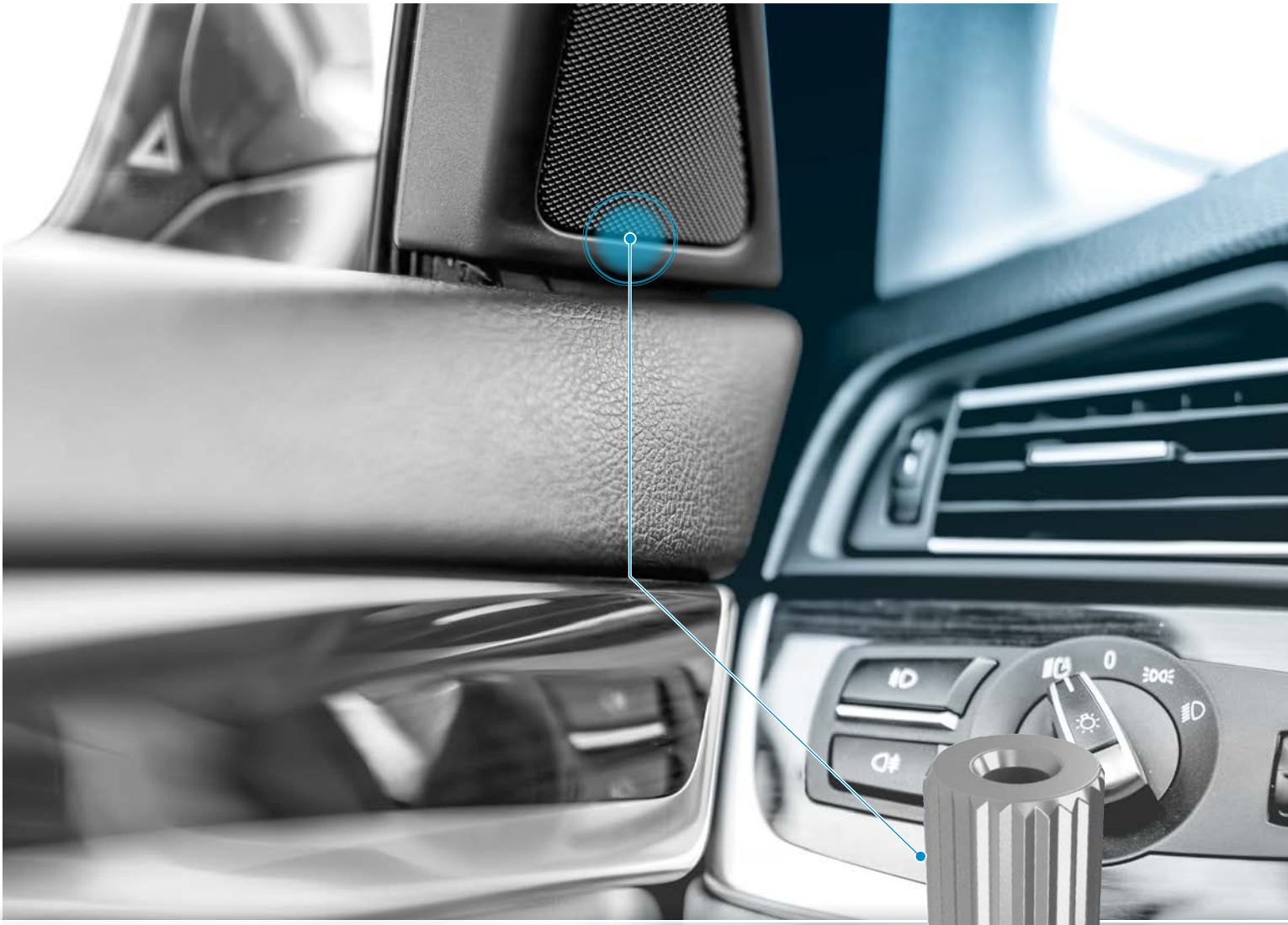
Version published 01/2017
www.arnold-fastening.com

ARNOLD®
BlueFastening Systems



Eco-Sert®

Aluminium inserts

- lightweight
- flexible
- durable
- stable
- environmentally friendly
- corrosion resistant

www.arnold-fastening.com

Aluminium inserts for challenging fastenings

As a general rule, aluminium inserts are mainly used for joining plastics. They are used to stiffen components (tube supports) or as the counterpart to a direct fastening. With the appropriate choice of geometry and alloy they obtain outstanding fastening results. The benefits of aluminium inserts as metal-metal fastenings become evident, particularly for components that are subject to vibration stress or where operating temperatures are high.

Product group

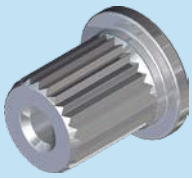
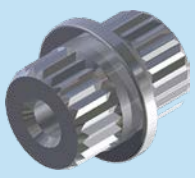
Aluminium inserts

The benefits of a trilobular cross-section

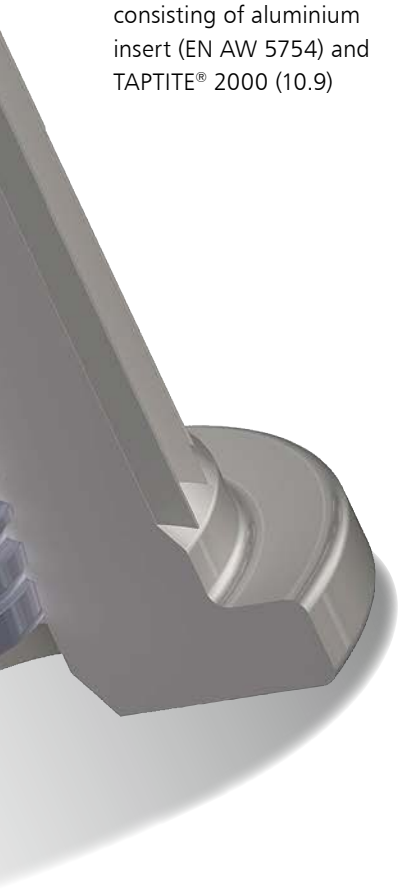
- approx. 35 % greater torsional torques compared with round-knurled inserts
- greater vibration resistance
- permits greater core hole tolerances when press-fitting

ARNOLD®
BlueFastening Systems

FASTENING PLASTICS

after moulding/in moulding	after moulding/in moulding	in moulding	in moulding
Variant 1 ARNOLD-Tripress® Standard	**Variant 2 ARNOLD-Tripress® with indent**	**Variant 3 ARNOLD-Tripress® with centre collar**	**Variant 4 ARNOLD-Tripress® with dual collar**
			

Fastening solution
consisting of aluminium insert (EN AW 5754) and TAPTITE® 2000 (10.9)

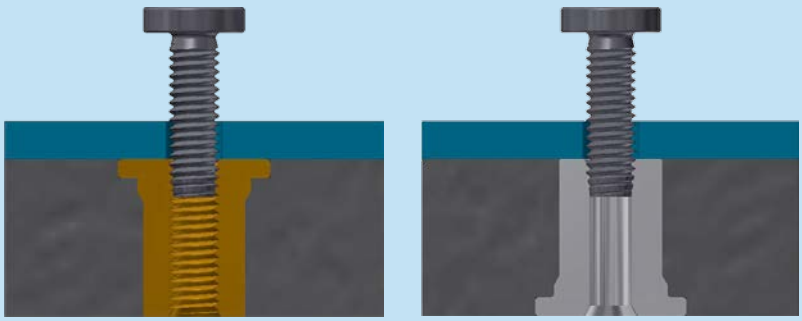


Direct fastening creates added value

The product range at ARNOLD UMFORMTECHNIK provides very many combination possibilities.
For example, using a TAPTITE® 2000 to tap directly into aluminium inserts, you can achieve outstanding fastening characteristics and also gain saving potential in overall fastening costs.

Aluminium inserts

for press-fitting with no internal thread, compared with a turned brass insert with internal thread for hot mounting.



Note: The values shown are example parameters. Always determine specific values by carrying out tests on original production parts. Our Fastener Testing Centre is always happy to answer any further questions you may have.

Fastening properties

The list below shows the parameters for the various dimensions using variant 1 of the Eco-Sert® as an example. To a very great extent you can transfer the information to the other variants because of the Eco-Sert® modular system. The values stated for use in PA6.6 GF30 represent guideline values and should be checked on original production parts by carrying out screwdriving tests. With optimum layout, with the Eco-Sert® you can achieve a fully load-bearing screw connection. Our Fastener Testing Centre will be happy to arrange screwdriving tests on original parts.

Variant 1

For TAPTITE® with		M4	M5	M6
Pull-out force (kN)* of sleeve (Guideline values for use in PA6.6 GF30)***		min. 6,5 (9,0)	min. 10,5 (13,0)	min. 15,0 (17,5)
Breaking torque [Nm] of screw (no counter layer)** (Guideline values for use in PA6.6 GF30)***		min. 4,4 (7,0)	min. 9,3 (12,0)	min. 16,0 (20,0)
Breaking torque [Nm] of screw (with counter layer)** (Guideline values for use in PA6.6 GF30)***		min. 4,0 (6,5)	min. 9,3 (11,0)	min. 16,0 (19,0)
Twisting torque [Nm] of sleeve (Guideline values for use in PA6.6 GF30)***		- (10,0)	- (15,0)	- (22,5)

* Pull-out forces calculated on the basis of material parameters of aluminium insert and TAPTITE 2000® screw
** Torques based on minimum breaking torque for screws according to ISO 898 part 7.
*** We recommend carrying out screw driving tests on original production parts in order to ascertain the tightening specifications.
Example parameters for PA6.6 GF30 were ascertained in tests, and merely represent guideline values.

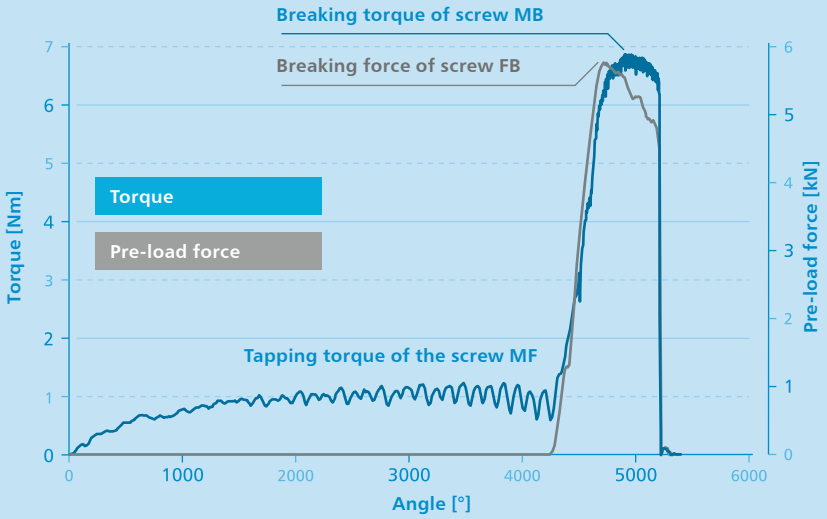
Eco-Sert® (variant 1) in EN AW 5754 alloy for TAPTITE 2000® M4

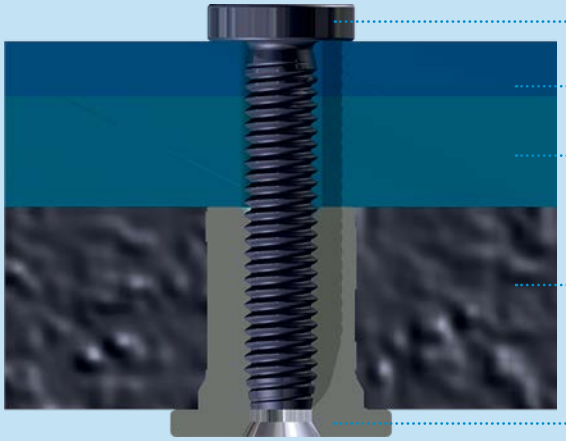
Aluminium insert compared with brass turned part

		Material
Aluminium insert		✓
Brass turned part		✗

Application example

The illustration below shows the screw fastening for a loudspeaker housing using an Eco-Sert® (variant 1) and a thread-forming screw.





TAPTITE 2000® M4 in steel (strength 10.9)

Loudspeaker housing in 1.5 mm steel

Clamping force load cell 10kN for screw driving trials

Plastic housing for loudspeaker holder material PP TV GF

Eco-Sert® (variant 1) in EN AW 5754 alloy for TAPTITE 2000® M4; Penetration depth min. 2 x screw diameter

Weight	Fitting the insert	Fitting the screw (thread-forming)	Overall fastening costs
✓	✓	✓	✓
✗	✗	✗	✗

✓ positive ✗ negative – neutral

Material

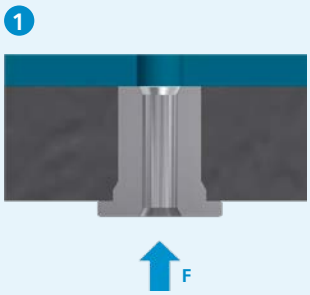
The customer's requirements profile is what determines the choice of suitable alloy. The following characteristics are important when making this choice: Thermal resistance, electrical conductivity, corrosion resistance, and strength.

Because aluminium is very versatile, it is possible to choose an alloy that is specific to the application.

	Material 1	Material 2
Tensile strength R_m	> 400 MPa	> 250 MPa
Elongation limit $R_{p0,2}$	> 350 MPa	> 200 MPa
Maximum operating temperature T	< 150 °C	< 80 °C
Density σ	2,7 g/cm²	2,7 g/cm²
Elasticity module E	69.000 MPa	70.500 MPa
Linear thermal expansion coefficient	23,1 x 10^{-6} K^{-1}	23,1 x 10^{-6} K^{-1}
Heat capacity	960 J/(kgK)	897 J/(kgK)
Heat conductivity	230 W/(mK)	132 W/(mK)

Fitting the screw

If the aluminium insert needs to be press-fitted, the component must be accessible from two sides. The fastener is then inserted using axial force effect (1.). Next, a thread-rolling screw (2.) can create the fastening from the opposite side with tapping torque MF, and can be screwed into the insert to a defined tightening torque MA (3.).



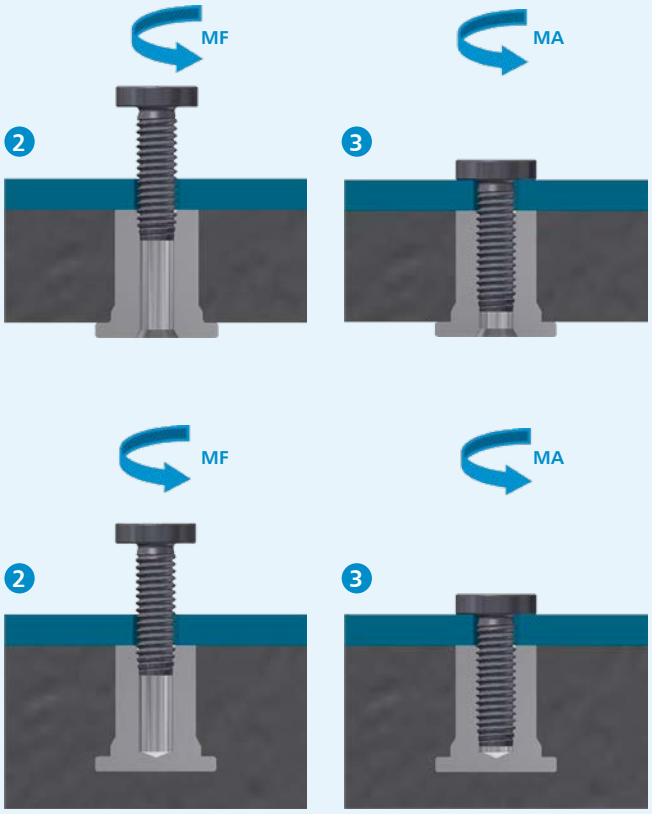
Embedded aluminium inserts are inserted when the component is produced (1.). So the insert's contour defines the resultant characteristics. Like the press-fitted insert, the embedded element can then be screwed in from the opposite side, also with a thread-forming screw, (2.) and then tightened to a defined torque (3.)

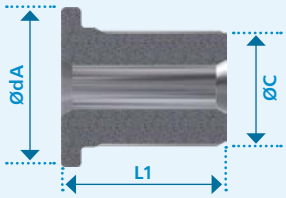
Design options and geometry

The correct choice of materials, combined with the geometric shape ensures the optimum transfer of force and – particularly when fastening plastics – good surface pressure. The Eco-Sert® range is based on a modular system for standard dimensions and geometry. All inserts are available with either a blind hole or a through-hole, so that you can make use of these elements anywhere. You also have a choice between an element with internal thread and a combination of insert and our thread-rolling TAPTITE 2000® screws for direct fastening. We are very happy to check with you how our Eco-Sert® elements will fit into your own application.

				
M4	✓	✓	✓	✗
M5	✓	✓	✓	✓
M6	✓	✓	✓	✓

✓ positive ✗ negative – neutral





Dimensions	M4	M5	M6
L1	10,20 mm	12,50 mm	14,80 mm
ØdA	10,00 mm	12,40 mm	14,70 mm
ØC	7,40 mm	9,20 mm	11,00 mm

Manufacturing feasibility

There are various options available to analyse your particular fastener. We can use FEM simulation to intensively examine the technical manufacturing feasibility for complex form and extruded parts. Our Fastener Express service is able to supply functional samples and prototypes in a short space of time. We can carry out trials on the fastenings at the ARNOLD Fastener Testing Center, using your original components.

ARNOLD®
BlueFastening Systems

www.arnold-fastening.com

The ARNOLD GROUP

Wherever customers need us.

The ARNOLD GROUP

With a foundation of many years of expertise in the production of intelligent fastening systems and very complex extruded parts, the ARNOLD GROUP has developed over a number of years into a comprehensive supplier and development partner for complex fastening systems. With our new positioning of "BlueFastening Systems" this development process will now continue under a united and harmonised structure. Engineering, fastenings, and functional parts, together with feeder processing systems, all from a single source – efficient, sustained and international.

ARNOLD FASTENING SYSTEMS
Rochester Hills
USA

ARNOLD TECHNIQUE FRANCE
Anneyron
France

ARNOLD UMFORMTECHNIK
Ernsbach
Germany

ARNOLD UMFORMTECHNIK
Dörzbach
Germany

ARNOLD FASTENERS SHENYANG
Shenyang
China

ARNOLD UMFORMTECHNIK GmbH & Co. KG
Carl-Arnold-Straße 25
D-74670 Forchtenberg-Ernsbach
T +49 7947 821-0
F +49 7947 821-111

ARNOLD FASTENING SYSTEMS Inc.
1873 Rochester Industrial Ct, Rochester Hills, MI 48309-3336, USA
T +1 248 997-2000
F +1 248 475-9470

ARNOLD TECHNIQUE FRANCE S.A.
4, rue St Didier
F-26140 Anneyron
T +33 475 313260
F +33 475 314440

ARNOLD FASTENERS (SHENYANG) Co., Ltd.
No. 119-2 Jianshe Road
CN-110122 Shenyang
T +86 2488 90633
F +86 2488 90999