

*PlasticPartner®  
Mr. Bushing®*



Shifting the future. Rolling the world.



**Precision Techniques for Bushings**  
**Turning Ideas**  
**Rolling Solutions**

State-of-Art production facilities, talent teams and strict quality system provide our customers with the assurance of quality parts, Just-in-time delivery and lowest costs, as well as sophisticated solutions to the demanding applications implemented by our R&D department.

Precision techniques of Turning and Rolling are where we started and also the future we continuously strive to keep improving and growing. No matter how complicated the applications are, our strong engineering ability and rich experience always give our customers the technical supports to figure out the best solution and achieve highest performance. High innovative strength, exemplary quality and absolute reliability make ec camtec a highly preferred partner – as early as the development and project phase.

At ec cam , no part is standard, they are all specially designed and created exactly to serve the individual requirement of the customers.

At ec cam , no order is too small, full flexibility is one of our biggest advantages, from the prototypes to OTS to PPAP, from ramp up to series production, we follow customer's steps and achieve mutual satisfaction on long terms.

At ec cam , no part is just okay, we only have good part or bad part in our dictionary. Zero-error is our philosophy –100-percent checking with integrated sorting technology for components that is especially safety-relevant before packaging.



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## Quality Systems:

ISO9001: 2008

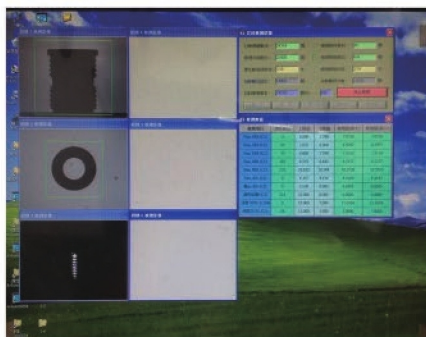
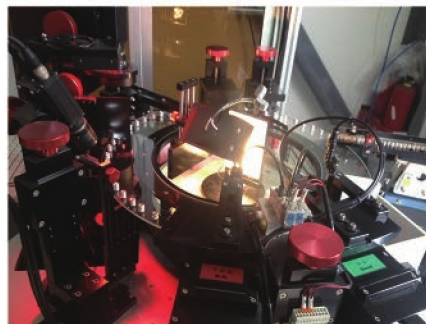
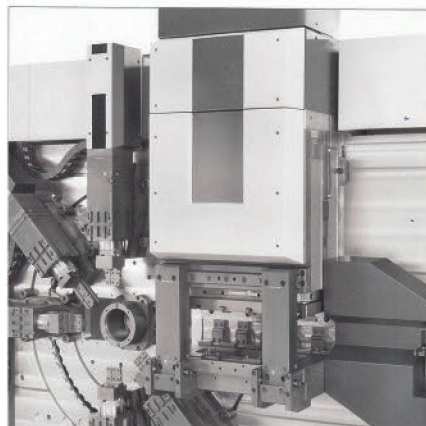
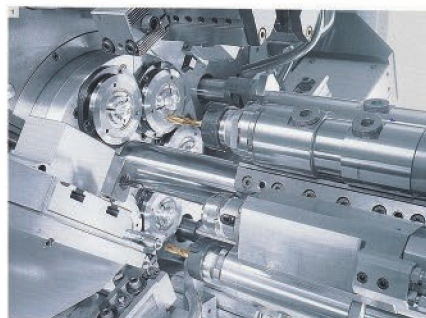
ISO/TS16949: 2009

ISO14001: 2004

BS OHSAS 18001: 2007



## Bushings – Make plastic stronger Ec cam – Your bushing specialist

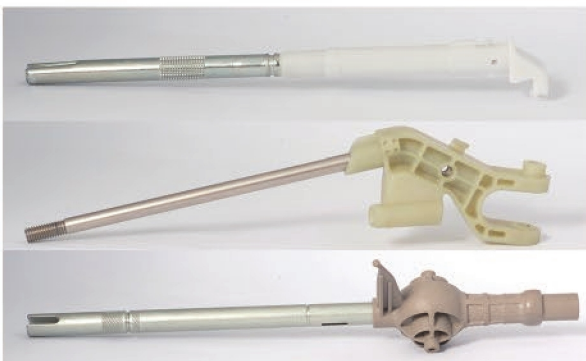


## The world of Bushings

Bushing, also known as Inserts, Compression Limiters, Collars, Sleeves or even called as Shift Levers on different applications and countries, widely used as the reinforcement and connection for plastic injection industry to satisfy the assembly demands, to gain amazing functions of Torque, Pull Out, Compressive Strength and quick fastening as well.

EC Cam is the very few companies in the world who successfully implemented the Rolling technology and Turning art together into the bushing manufacturing, to satisfy every possible demand of the customers for highly precise bushings.






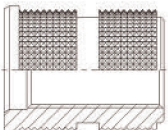
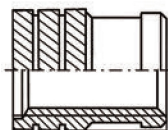
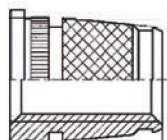
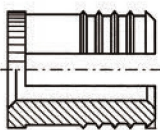
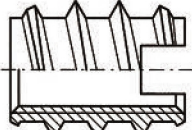
## Typical applications of our bushings



**German Quality**

**Created In China**

## Some bushing designs

Rolled Bushing				
				
Press-in Round	Press-in Oval	Mold-in Round	Mold-in Round+Groove	Mold-in Square
Turned Bushing				
				
Mold-in	Press-in	Heat-embedded	Self lock	Self Tapping



## Our concept

Bushings out of Rolling or Wrapping process are always having the well-recognized name as "compression limiters" according to the final functions.

Our objective is to provide our customers with the best Value, for optimum performance at the lowest installed cost. To achieve this objective, our sales strategy focuses on the application engineering approach.

Starting with an analysis of your needs and objectives, our application engineers propose the best rolled bushings for the application. Consideration is not only given to the rolled bushing but also to the specifications of the components to be assembled and potential assembly problems.

The versatility of the our rolled bushings makes it the ideal component part to meet the specific engineering and economic objectives of plastic assemblies. Giving us your idea for a rolled bushing, we are ready to assist you with complete solution including diameter, length, duty, material, tolerance, coating and configuration as well.

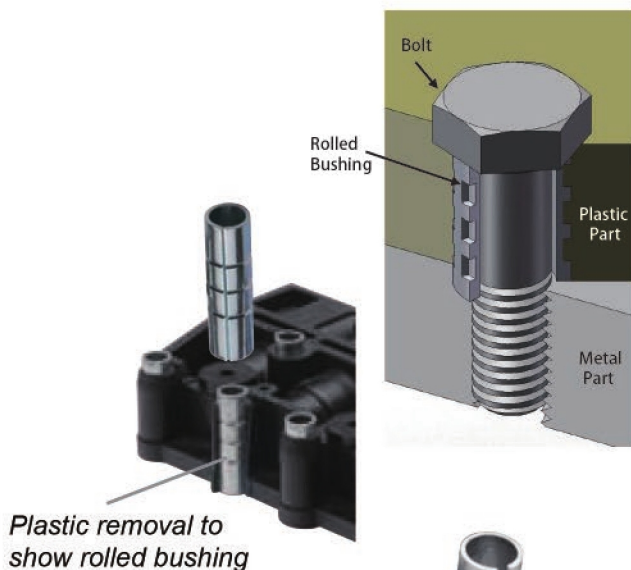


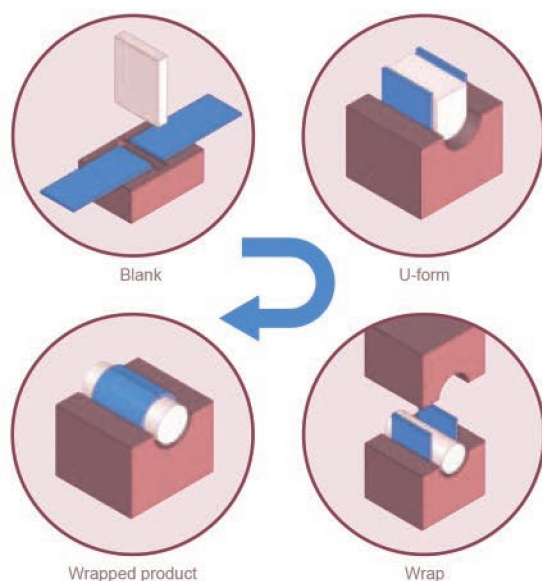
## What Rolled Bushing provides

Plastic components are fixed into or onto the vehicle or component using screws.

Rolled Bushings ensure that the normal force of the screw is limited with respect to the plastic component's permissible load, and in doing so, they protect the components from damage.

Rolled Bushings are developed according to the demands placed on them. As such, only limited costs arise for special tools. Rolled Bushing can be molded in place or inserted after injection molding. Installation can take place manually or automatically. As the production takes place in a self-developed special forming process, etc. Rolled Bushings offer an affordable alternative to tubular or machined parts.



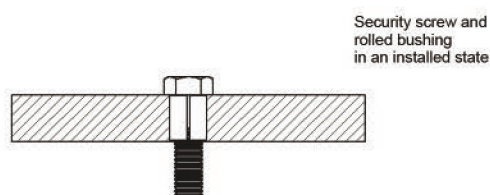
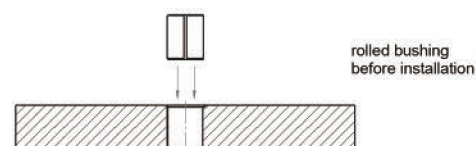
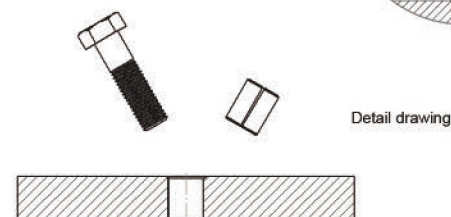
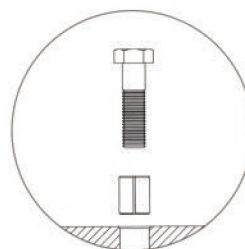


**There are many ways of achieving your objective. Success though, is a matter of taking the right route.**

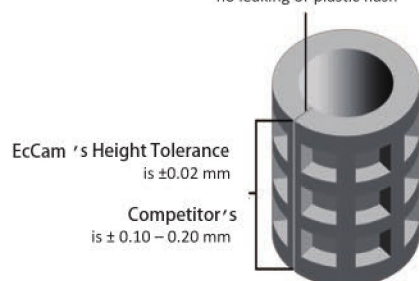
The route we take is the rolling process. To ensure that we are meeting your needs quickly, we have thoroughly thought through this process and have completely refined it. Many of the machined parts, deep drawn parts and tube sections that are currently used can simply be replaced through designs that are more flexible and less expensive. Many companies are amazed at what there is still to discover in their production departments and that production still takes place using the wrapping method.

## How the system works

A lot of plastic components are used in the automotive sector, which have to be screwed into the car. As the normal forces of screws in a tightened state can exceed the permissible surface pressure of plastic, we recommend that rolled bushings are used.



Less than 0.04 mm gap ensures no leaking or plastic flash  
no leaking or plastic flash



## Quality comparison between ours and others

**EC Cam adopts high-tech precision rolling process in house to achieve accurate tolerance:**

Tolerance	Ec Cam	Competitors
Gap	0.04mm max	0.1mm min
Inside diameter	0.05mm	0.10-0.20mm
Outside diameter	0.05mm	0.10-0.30mm
Height	0.02mm	0.10-0.20mm
Roundness	0.02mm	0.20mm
Paralism	0.05	0.20mm
Perpendicularity	0.05	0.20mm



## Press-In



Rolled bushing  
not bevelled



Rolled bushing  
with an interlinking lock



Rolled bushing  
in an oval shape



Rolled bushing  
with bevels



Rolled bushing  
with a recess

### The problem:

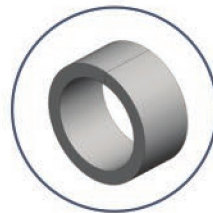
Plastic components without rolled bushings are destroyed during fastening as a result of the necessary screwing forces.

### The solution:

Rolled bushings are non-threaded inserts designed to protect plastic parts from loads created by the tightening of bolts. The load causes compression which can lead to cracking and creep due to tightening torque. Ec cam offers an extensive line of cost saving rolled bushings. Multiple design options in rolled bushings combined with our dedicated team allows your product to incorporate different shapes, materials, features and overall cost saving.



## Mold-in



Rolled bushing  
round



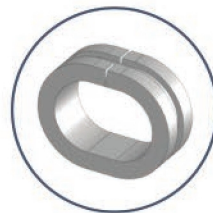
Rolled bushing  
round with an outer groove



Rolled bushing  
in an oval shape



Rolled bushing  
with a recess



Rolled bushing  
oval with an outer groove



Rolled bushing  
with self clinch \*



Rolled bushing  
with locking \*

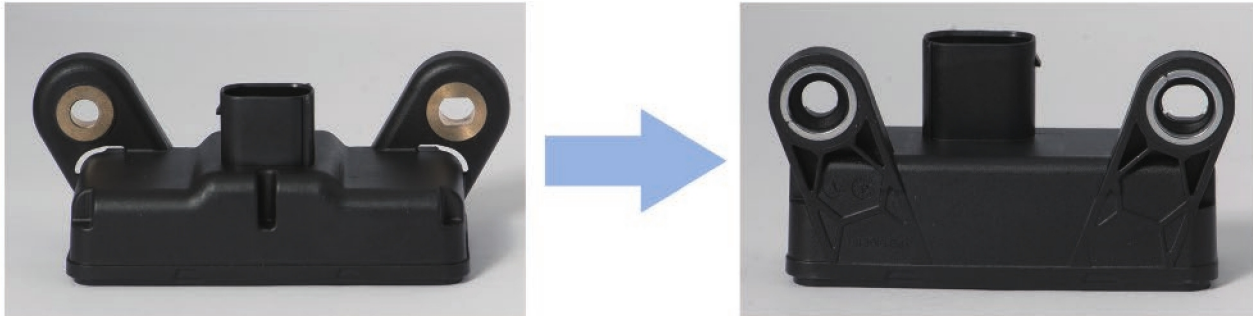
**\*) protected by numerous national and international patents.**

**Material:** carbon steel as DC01-C390, ST37-2, C1050, stainless steel as A2/A4, or any strips materials like Aluminum are also possible upon request.

**Corrosion protection:** Zinc Plated, Phosphate coated, ZnNi coated



## Application: Cluster housing for ABS system

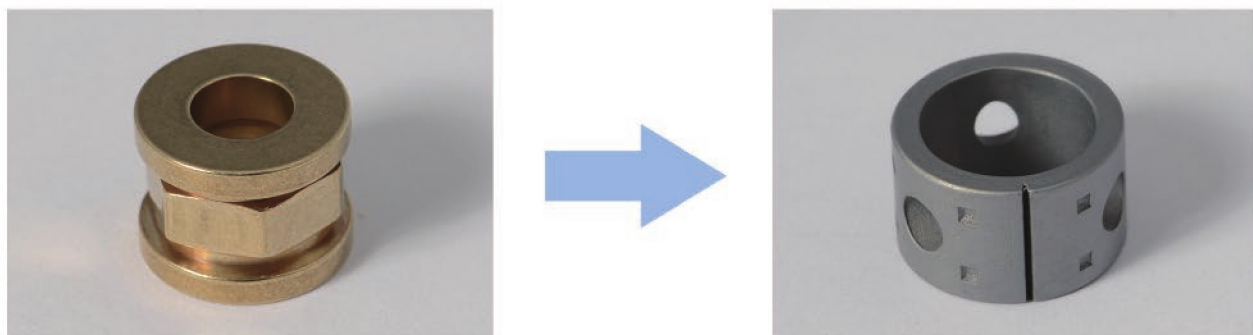


A manufacturer of automotive ABS system approached ec camitec seeking a cost effective alternative to a machined brass bushing. Preferred method of installation was molded in. Bushings were required to protect the integrity of the plastic case when bolting to the mating component. Two bushings were required per housing, and customer specified the retention values of the bushings.

The elimination of brass offers the most significant cost savings. Steel can provide the necessary strength at a much lower cost. Rolled Bushings can be manufactured of low or high carbon steel and delivered soft or hard dependant upon fastener grade. Method of manufacture is the second component of cost that can be reduced. Machining or cutting operations are typically more expensive than forming. The best way to reduce the customer's cost was to convert them from the machined brass component to a roll formed steel rolled bushing.

**Ec Cam** Engineering designed a rolled steel bushing to meet the customer's specific requirements. The rolled bushing was designed with a closed seam to ensure that plastic could not migrate to the ID where it may interfere with bolt installation. Wall thickness was selected to provide columnar strength sufficient to resist the compressive load of a Class 9.8 bolt. Three holes on the wall were added about the part's circumference and centered. The host material went into the cavity during the molding process that yields high resistance to lateral movement.

**Ec cam's** rolled bushings provided a substantial cost reduction while meeting all of the performance requirements. Rolled bushings are typically designed to function with Class 9.8 bolts. A variety of finishes can be provided to meet specific requirements. The retention design provides excellent resistance to lateral movement at significantly less cost than machined components with similar features. Steel complies with current environmental standards/content restrictions.



60%lighter, 80% cost saving.

## *Art of Turning*

Precision turning technology was widely used for bushings, where a internal thread is required or a very special configuration is need or special material is needed like aluminum alloy or in any other cases when the rolling process fails to meet with the targeted function.

Bushings with threads also have a well known description as **Threaded Inserts**, whilst there're plenty of the bushings without threads enjoy a general name as inserts or simply as bushings or another meaningful names like "**shift levers**" for certain specific industry.

Bushings also can be assorted into different family groups by how the bushings will be placed or worked or assembled in plastic / rubber, in general bushings can be in the categories of **mold-in, press-in, and screw-in**.

At our plant in Nantong China, we produce turned bushings using efficient production methods. A team of qualified and highly motivated staff guarantees a consistent, high standard of production.

State-of-the-art automation lines including Multi-spindle turning machines, CNC turning lathe, Working centers, deburring machines, ultra-sonic cleaning equipments and so on, manufacture around the clock in a precise and high standard of quality. The efficient and low-cost production of large-scale product series is one of the strengths on which we have based our success.

But our high-volume production output in no way compromises flexibility. We are able to quickly and efficiently produce even small batches of bushings to the customers.



## World of Turned Bushings

**Mold-in:** Installed during the molding process, the bushings are located in the mold cavity by core pins. When the mold opens, the core pins are withdrawn leaving the bushings permanently encapsulated in the plastic section.

Installing the bushings during the molding process eliminates the need for secondary steps or installation equipment.



**Press-in** Insert the bushing with pilot start downwards into the receiving hole and press in with the hand lever or a small press. Never knock in bushing with a hammer.

The bushing achieves outstanding pull- out resistance if inserted into moulded components immediately after removal from the mould, when the component has not yet fully cooled down.



### For Heat / Ultrasonic embedding

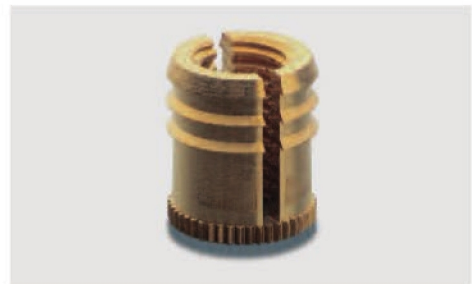
Installed by means of ultra- sonic or heat transfer. This causes the plastic to soften so that it flows into the knurl profile of the bushings. On subsequent cooling, a firm seat is obtained which is capable of withstanding high loads.

The pull-out resistance is generally higher than is the case with mould-in components, and depends on the plastic, the size of the receiving hole, the wall thickness, the edge distance and the correct setting of the installation equipment.



**Self Locking** Pressed into the receiving hole, during which process the segments bend inwards.

When inserting the screw, the segments resume their original shape, in which process the external profile becomes anchored in the hole wall. The residual tension acts to lock the screw in place.



**Screw-in** Screwed into a pre-formed or pre-drilled receiving hole and so automatically taps its own thread into the hole wall.

This ensures a backlash- free fit with extreme loading capacity



**Materials available as** free cutting steel, case-hardened steel, stainless steel, brass, aluminum alloy.

## Mold-in Turned Bushings

The mold-in bushings were widely used in plastic injection process to achieve higher proof load and torque properties, with thread or without, usually with knurling/ groove / recess design.

## Product features

Higher mechanical properties  
No additional assembly time.

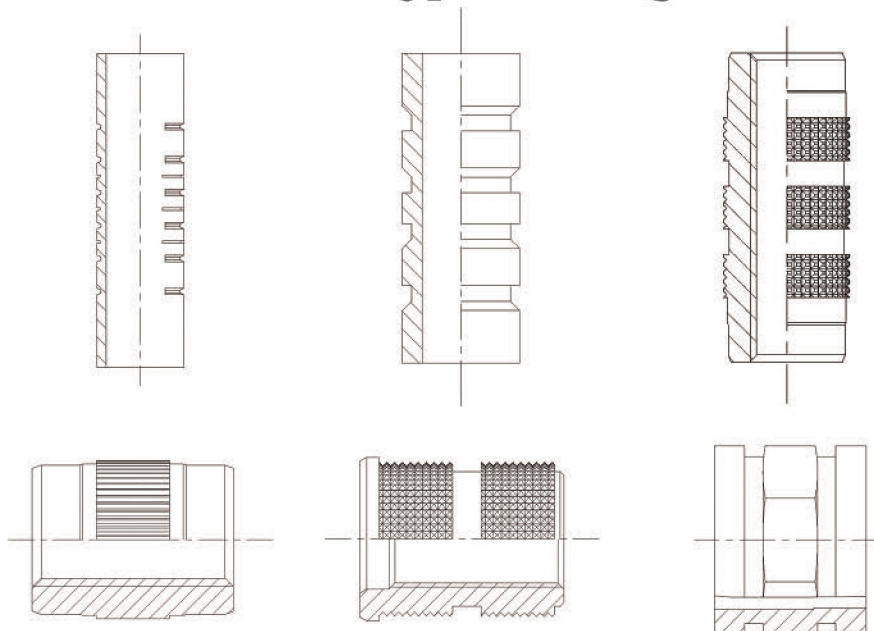
## Installation

Installed during the molding process, the bushings are located in the mold cavity by core pins. When the mold opens, the core pins are withdrawn leaving the bushings permanently encapsulated in the plastic section.

Installing the bushings during the molding process eliminates the need for secondary steps or installation equipment.



## Several typical designs





## Press-in Turned Bushings

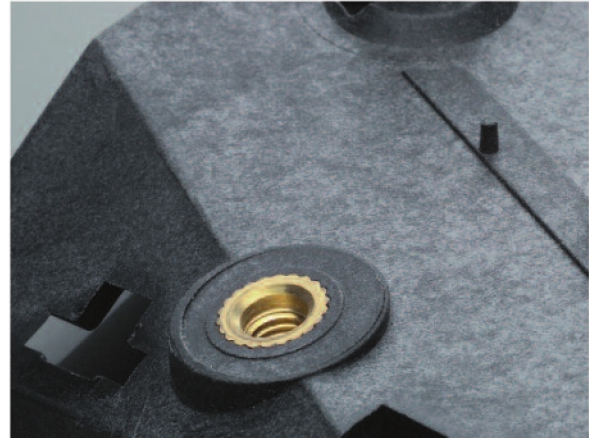
These Press-In threaded bushings are with multiple helically knurled rings, a tapered anchorage profile and a pilot end for easy push in.

## Field of application

For all molded parts made of hard plastic.

## Product features

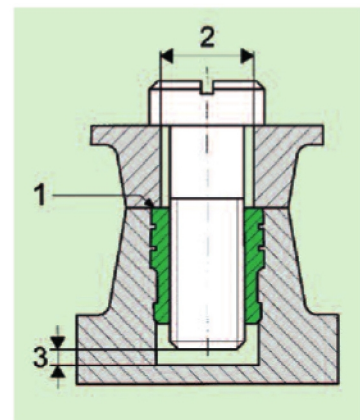
- Fast and easy to install. A special pilot end prevents insertion problems.
- Relatively small diameter and mini-mal installation length
- Particularly cost-effective



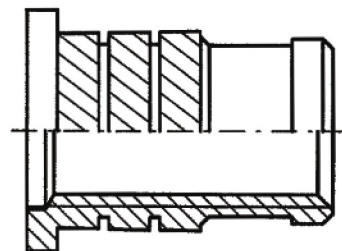
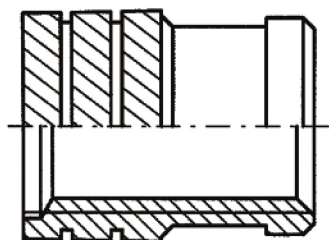
## Installation

Insert the bushing with pilot start downwards into the receiving hole and press in with the hand lever or a small press. Never knock in bushing with a hammer.

The bushing achieves outstanding pull- out resistance if inserted into molded components immediately after removal from the mould, when the component has not yet fully cooled down.



## Several typical designs





## Press-in bushing for heat or ultrasonic embedding

These bushings are threaded inserts with a graduated opposing herringbone knurl on the outside and a pilot end for problem-free insertion.

Its unique shape has been tailored to the requirements of the material and was developed especially for insertion into plastic components by means of ultrasonic vibration or heat transfer.

### Product features

Short insertion time and the problem-free production. Also suitable for thin-wall thicknesses, elimination of material tension.

The firm seating is largely insensitive to borehole tolerances and material shrinkage.

### Field of application

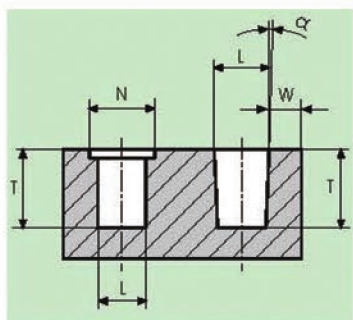
For all molded parts made of thermoset plastics.



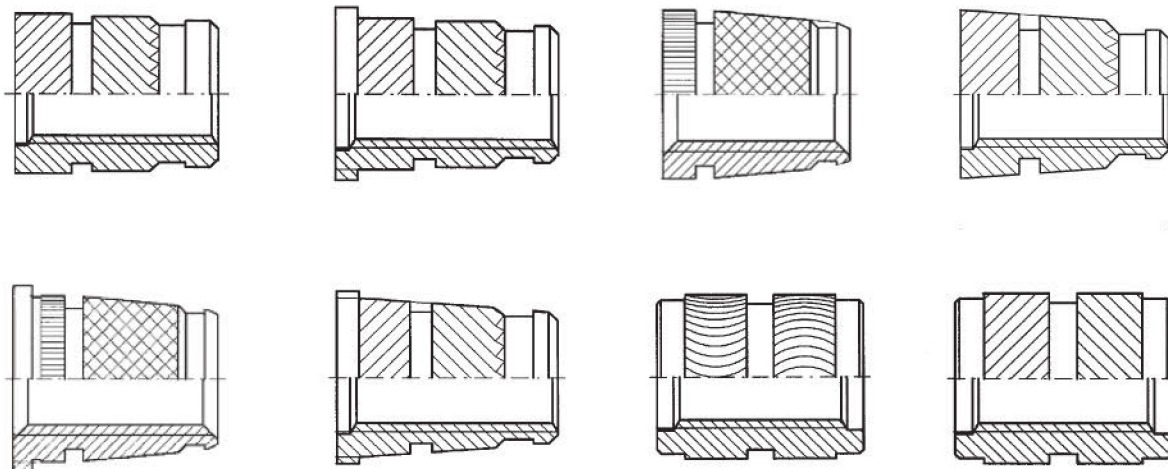
### Installation

The bushings are installed by means of ultrasonic or heat transfer. This causes the plastic to soften so that it flows into the knurl profile of the bushings. On subsequent cooling, a firm seat is obtained which is capable of withstanding high loads.

The pull-out resistance is generally higher than in the case with mould-in components, and depends on the plastic, the size of the receiving hole, the wall thickness, the edge distance and the correct setting of the installation equipment.



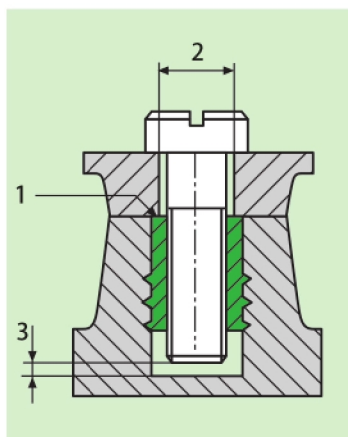
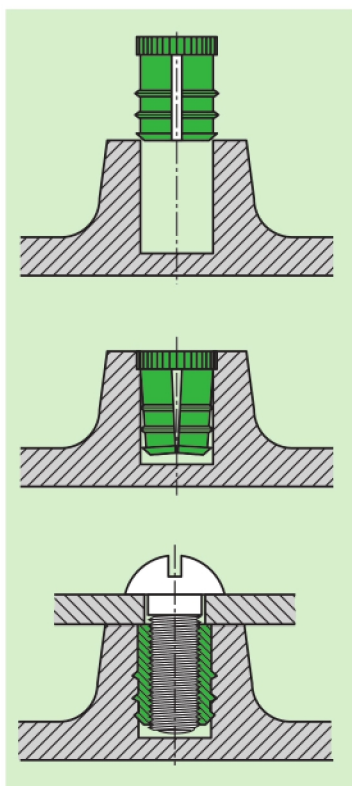
### Several typical designs





## Self locking Turned Bushings

These bushings are a threaded insert with different external profiles, which guarantee optimum anchorage in all types of moulded plastic components



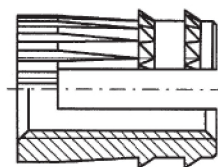
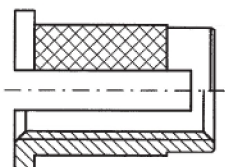
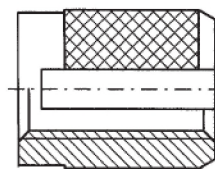
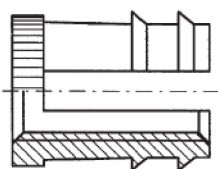
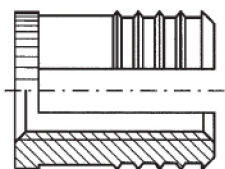
### Product features

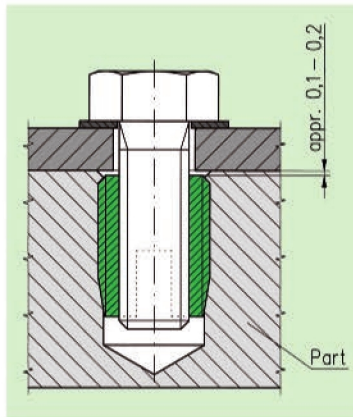
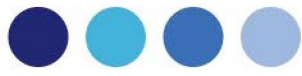
- Unbeatably short installation times
- Screw is secured automatically against loosening
- Cost savings for locking elements

### Installation

The bushing is pressed into the receiving hole, during which process the segments bend inwards. When inserting the screw, the segments resume their original shape, in which process the external profile becomes anchored in the hole wall. The residual tension acts to lock the screw in place.

## Several typical designs





## Screw-in Turned Bushings

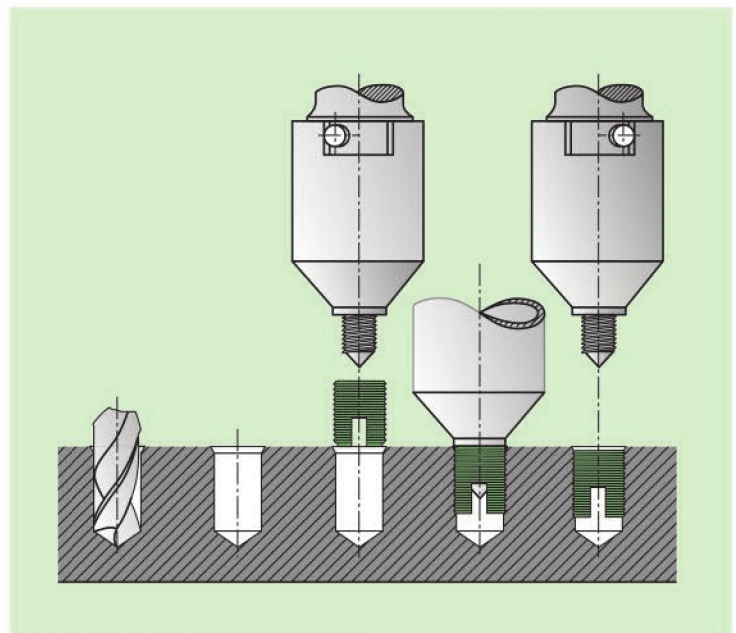
Self-tapping threaded bushings with external and internal threads, cutting slots or cutting bores.

A continuous process of further development has brought about a number of major improvements to product characteristics. The bushing is screwed into a pre-formed or pre-drilled receiving hole and so automatically taps its own thread into the hole wall. This ensures a backlash-free fit with extreme loading capacity

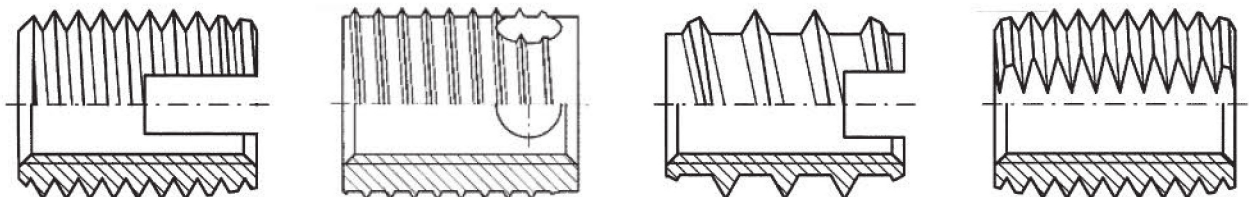
## Field of applications

Universal application for all types of plastic, thermoset plastics, thermoforming plastics, PU/PUR foam, fibreglass reinforced plastics.

## Installation

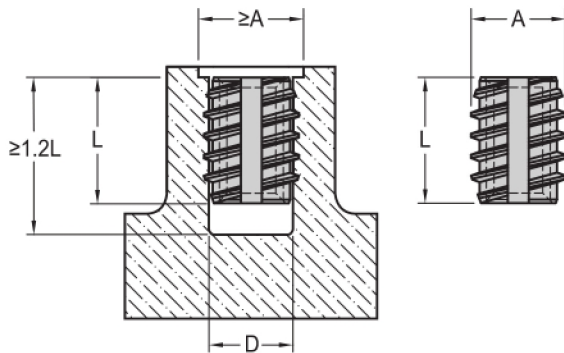


## Several typical designs





## Design Guidelines

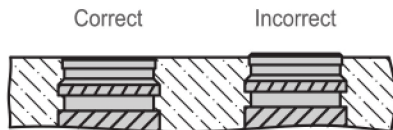


**Holes** for post-mold installed Bushings should always be deeper than the length of the bushing. For Screw-in Bushings, a minimum depth of 1.2 times the Bushing length is recommended. For other Bushings, the recommended depth is the Bushing length plus two (2) Bushing thread pitches. The assembly screw should never bottom out on the hole, as jack-out would result.

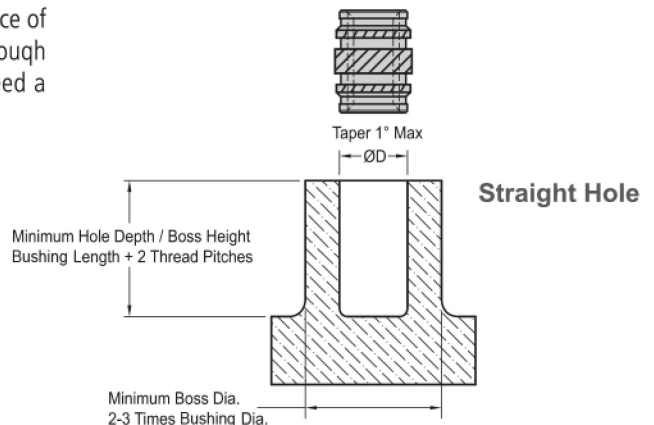
**Counterbores** are recommended for Screw-in Bushing holes. This reduces the risk of flaking. The outside diameter of the counterbore should be equal to or larger than the outside diameter of the Screw-in Bushing. The depth should be one thread pitch. For all other post-mold installed Bushings, a countersink or counterbore is not recommended. The Bushing Pilot needs the hole edge to align the Bushing axially square to the hole.

**Correct hole size** is critical. Larger holes decrease performance. Smaller holes induce undesirable stresses and potential cracks in the plastic. Undersized holes may also result in flash at the hole edge. The recommended holes need to be reviewed if fillers are used. If the filler content is equal to or greater than 15%, it is suggested to increase the hole 0.08mm, and if the content is equal to or greater than 35%, the suggested hole increase is 0.15mm. For intermediate contents interpolation is suggested. Due to the great variety of fillers and plastics and combinations thereof.

**Molded holes** are preferred over drilled holes. The strong, denser surface of the molded hole increases performance. Core pins should be large enough to allow for shrinkage. For straight holes, the taper should not exceed a 1° included angle. Tapered holes should have an 8° included angle.



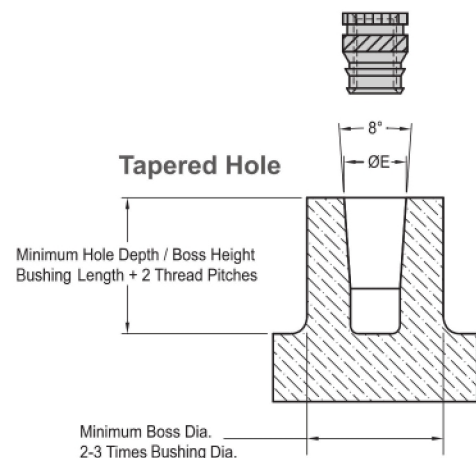
Top Of Bushing Should Be Flush With Surface.  
Bushing Should Never Protrude From Host Part.



**Tapered holes** reduce installation time and ensure proper alignment of the Bushing to the hole. Only tapered Bushings should be used in tapered holes. Easier release from the core Pin is an additional benefit.

Bushing performance is affected by the plastic boss diameter and/or wall thickness. Generally the **optimum wall thickness** or **boss diameter** is two (2) to three (3) times the Bushing diameter with the relative multiple decreasing as the Bushing diameter increases. The wall thickness has to be enough to avoid bulging during installation, and for boss diameters to be strong enough for the recommended assembly screw installation torque. Poor knit lines will cause failures and reduced Bushing performance.

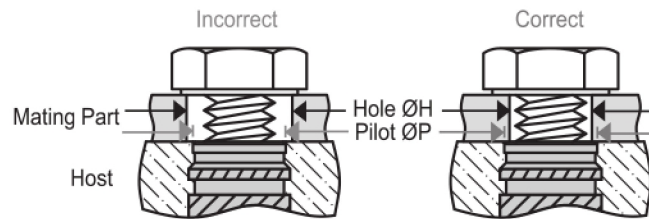
Post-mold installed Bushings that are **cold-pressed** into the hole require larger boss diameters and/or wall thickness to withstand the greater stresses induced during installation. Installing the Bushings while the plastic is still warm from the molding process generally eliminates this need.



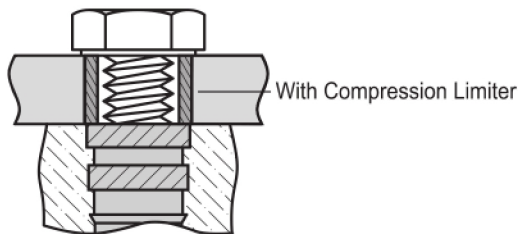


## Design Guidelines

●The **diameter of the clearance hole in the mating component** is very important. The bushing and not the plastic must carry the load. The hole in the mating component must be larger than the outside diameter of the assembly screw but smaller than the pilot or face diameter of the bushing. This prevents jack-out. If a larger hole in the mating component is required for alignment purposes, a headed bushing should be considered. bushings should be installed flush for no more than 0.15mm above the hole).



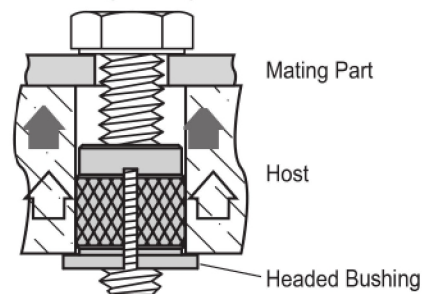
Hole In Mating Part Must Be Smaller Than Bushing Pilot Diameter In Host To Prevent The Bushing From Pulling Through The Assembly – Known As “Jack-Out”.



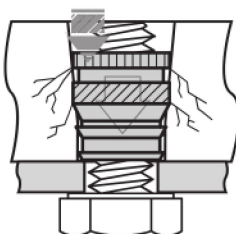
●If the mating component is plastic, the use of a **Compression Limiter** Should be considered to maintain the preload of the threaded joint. In order for the Compression Limiter to work properly, it should abut the bushing so that the bushing, and not the plastic, carries the load.

●The **assembly screws for self lock bushings** have to be long enough to fully penetrate the bushings by at least two threads to achieve full expansion.

Pull-Through Configuration



**Tapered Bushings** should **NOT** be used in pull-through applications or in thin walled bosses as this will cause cracking of the plastic.



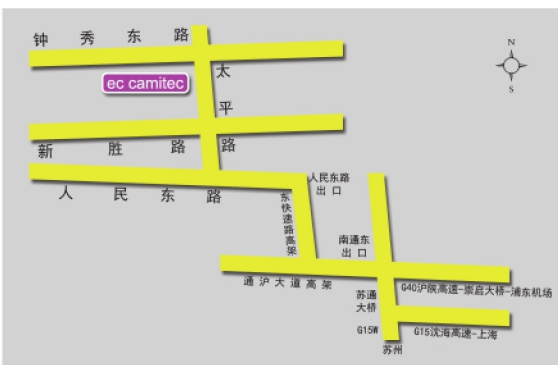
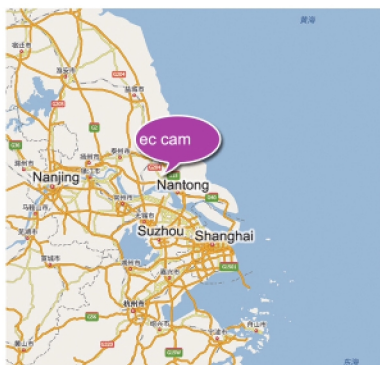
●Bushing heads Provide a larger bearing surface and a conductive surface if this is a requirement. The head also facilitates Plastic flow into the Upper knurls and a rooves for Heat/Ultrasonic bushings. In high load applications, locating the head opposite the load in a **pull-through configuration** warrants design Consideration.



# Global Presence



**Your Reliable Bushing Solution With Highest Performance.**



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