



SOLID BODIES LINE



Ensat®

SELF-TAPPING INSERTS

 **Specialinsert**

Index

| DESCRIPTION | Page |
|--|------|
| Presentation | 3 |
| Materials and Applications | 4 |
| Features | 5 |
| Preparing the receiving hole | 6 |
| Tools Codes | 7 |
| Ensat® Series 302 | 8 |
| Ensat® Series 303 | 9 |
| Ensat® Series 305 | 10 |
| Ensat® Series 307 - 308 | 11 |
| Ensat® Series 309 | 12 |
| Ensat® Serie 317 - 318 | 13 |
| Ensat® Series 337 - 338 | 14 |
| Ensat® Series 347 - 348 | 15 |
| Ensat® Series 304 | 16 |
| Ensat® Series 304 assembly tools | 17 |
| Mubux® Series M 970 | 18 |
| Conversion table for metric/imperial threads | 19 |



Ensat® Features, applications and benefits.

The **Ensat®** is a self-tapping metal insert, with internal and external thread and slots or holes providing a tapping effect.

The **Ensat®** bush is installed into materials with low resistance (such as alloys, plastics and castings) requiring threaded seats with high specifications of resistance and wear.

They can also be used for re-tapping worn thread. The Ensats 302 bush (with tapping grooves) is ideal for use with most applications.

The **Ensat®** bush may create a slight self-locking effect with some materials.

If this is not required, we recommend the Ensats 307-308 series (with tapping holes), whose shape is ideal for materials that are particularly resistant to cutting.

The Ensats 307 series is short and compact and is particularly suitable for low thicknesses.

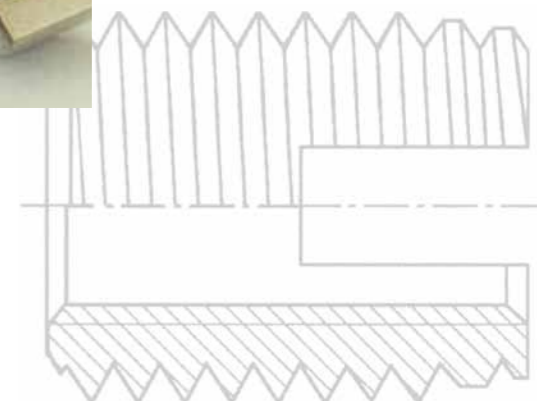
The **Ensat®** bush can be used for all machining and processing of plastics.

The **Ensat®** bush has a large cutting surface and therefore offers greater resistance to traction. It can be inserted into the finished item, which means higher

efficiency for machining centres and the elimination of positioning errors or material deposited in the thread.



A casting hole or tool with standard tolerances is all that is needed to fit **Ensat®** bushes. Its fast and easy fitting makes the system extremely cost effective.



Materials and Applications

| | Material | For applications on: | | | | | | |
|--------------------------|----------|----------------------|-------------------|--------|------------------------------------|-------------------|-----------------|------|
| | | Steel | Stainless steel * | Brass | Soft metal alloys | Hard metal alloys | Plastics Resins | Wood |
| Ensat® 302 | | Orange | Orange | Orange | Blue | Blue | Blue | Grey |
| Ensat® 303 | | Orange | Orange | Orange | Blue | Blue | Blue | Grey |
| Ensat® 305 | | Grey | Grey | Orange | Grey | Grey | Blue | Grey |
| Ensat® 307 Ensat® 308 | | Orange | Orange | Grey | Blue | Blue | Blue | Grey |
| Ensat® 309 | | Grey | Grey | Orange | Grey | Grey | Blue | Blue |
| Ensat® 317 Ensat® 318 | | Orange | Orange | Grey | Blue | Blue | Blue | Grey |
| Ensat® 337 Ensat® 338 | | Orange | Orange | Grey | Blue | Blue | Blue | Grey |
| Ensat® 347 Ensat® 348 | | Orange | Orange | Grey | Blue | Blue | Blue | Grey |
| Mubux® M970 | | Orange | Grey | Grey | Blue | Blue | Blue | Grey |
| Ensat® 304 | | Orange | Grey | Grey | WORN SPARK PLUG HOUSINGS IN MOTORS | | | |

* for ferritic and austenitic stainless steel, refer to the relative product data sheet for the available sizes.

Other materials, shapes and finishes available on request.

Features

APPLICATION

Ferrous and non-ferrous metals, light alloys, cast iron, brass, plastics, resins, soft thermoplastics, wood and derivatives, materials designed with threaded housings.

ASSEMBLY

Using specific hand-operated or machine tools.

MATERIAL

Steel, stainless steel, brass.

THREADING

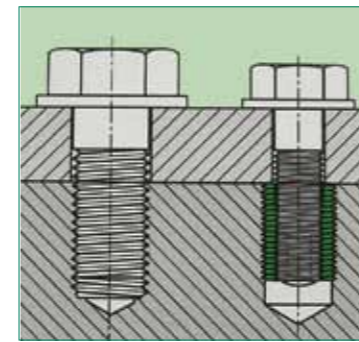
Metric ISO 6 H

TOLERANCES

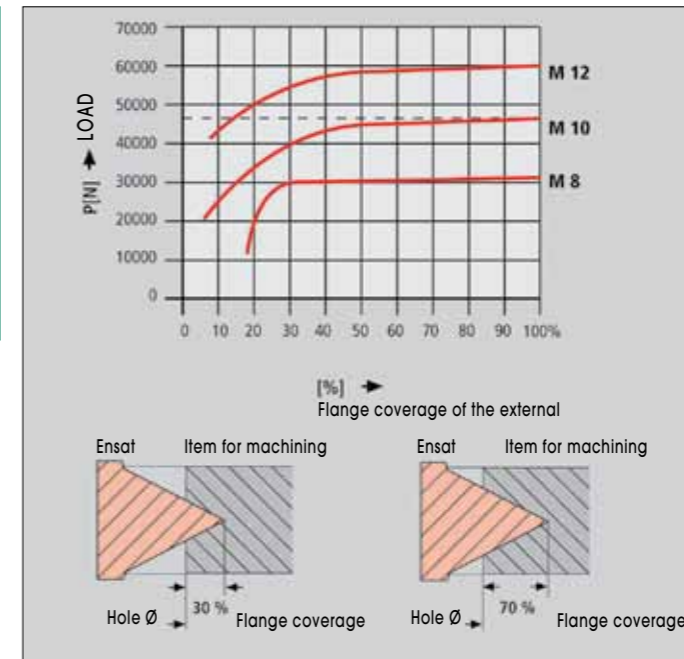
ISO 2768-m

SURFACE FINISH

Steel bushes: Galvanization.
Stainless steel bushes: natural state.
Brass bushes: natural state.

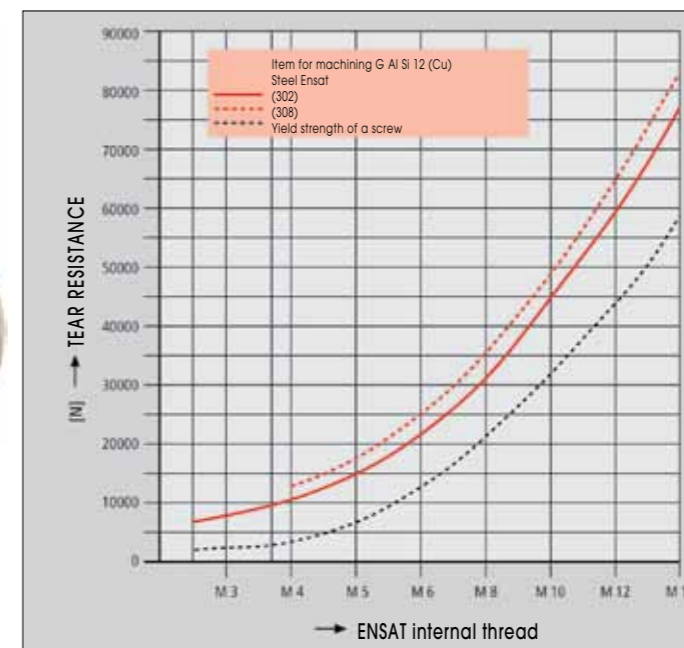


Ensat® bushes allow use of smaller sized screws or tension rods to achieve the same resistance to traction. The illustration shows two screw-connections with the same resistance to traction (note the smaller screw used with Ensat®).



Side coverage

With light alloys, Ensat® bushes provide maximum resistance to traction with just 30% of side coverage.



Resistance to traction

Ensat® bushes support high loads. For example, for use with light alloys, it is possible to reach higher resistance to traction at the stretching limit of the relative screw 8.8.

Preparing the receiving hole

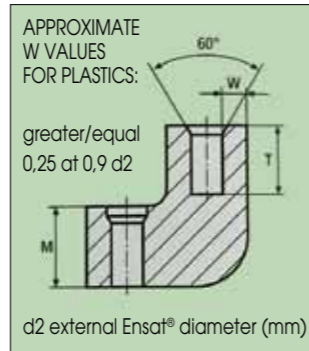
The receiving hole can be simply drilled or already provided for in the casting. It is generally not necessary to countersink the hole. However, we do recommend that you take care not to warp the workpiece surface when screwing in the **Ensata**.

Passing hole: the length of the **Ensata** must not exceed the thickness of the material (**M**).

Dummy hole: the minimum depth (**T**) is indicated in the datasheet for each product.

Hole walls: the minimum thickness required (**W**) depends on the envisaged load and the elasticity of the material where the **Ensata** bush is inserted.

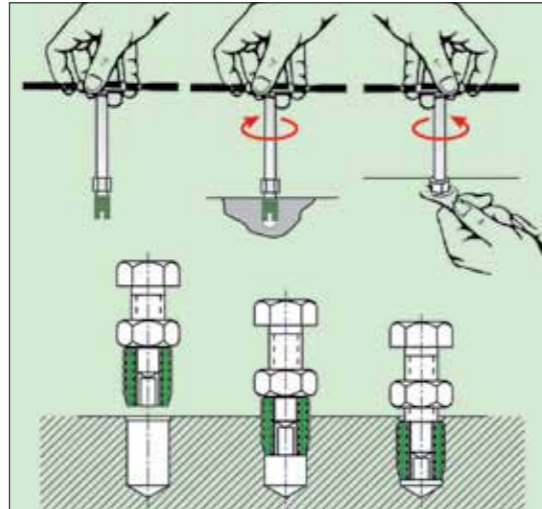
Hole diameter: hard, resistant materials require larger holes compared to soft, elastic materials.



The specifications are indicated on the datasheets for each product. The **Ensata** bush must be fitted at least 0,1-0,2 mm below the assembly surface. The perforation diameter is calculated according to the material and the **Ensata** bush. Larger holes mean easier insertion but can be detrimental for resistance to traction. Testing the assembly is therefore recommended.

Manual installation

Screw the **Ensata** onto the driving tool with the cutting slot or cutting bore pointing downwards. Drive in the **Ensata** until approx. 0,1 -0,2 mm below the surface of the workpiece. It's very important to keep the insert perpendicular to the workpiece during installation. Back out the driver tool holding the hex nut using a spanner until the lock breaks.



Tools

Use 610 manual tools and the use of a tap wrench and spanner. Use tool 620 or 621 for fitting on:

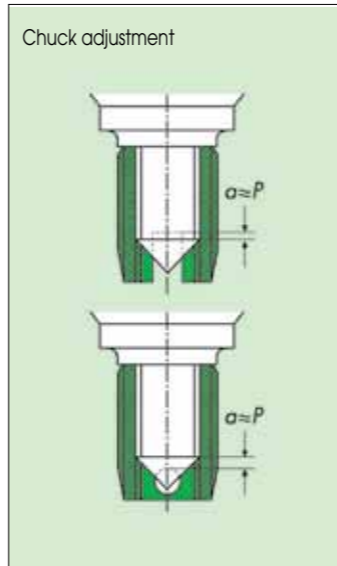
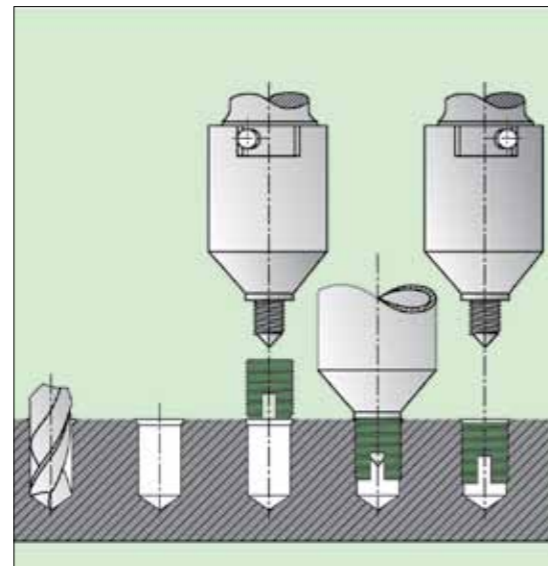
- tapping machines or machining centres; no guide; no advancement. Never pass the maximum moment;
- special hand-operated machines; stops in depth or return; lubrication only for materials resistant to cutting.

| INTERNAL THREAD | RPM (rounds per minute) | MAX TORQUE VALUES |
|-----------------|-------------------------|---------------------|
| M 2,5 / M3 | 650 - 900 | Ensata M 2,5 Nm 1,5 |
| M4 / M5 | 400 - 600 | Ensata M 3 Nm 2,5 |
| M6 / M8 | 280 - 400 | Ensata M 4 Nm 5,5 |
| M10 / M12 | 200 - 300 | Ensata M 5 Nm 10 |
| M14 / M16 | 150 - 200 | Ensata M 6 Nm 15 |
| M18 / M20 | 120 - 200 | Ensata M 8 Nm 28 |
| M22 / M24 | 100 - 160 | Ensata M 10 Nm 40 |
| M27 / M30 | 80 - 140 | Ensata M 12 Nm 60 |

Average values for RPM light alloys.

Ensata insertion by machine

Adjust the position of the chuck with respect to the bush. The **Ensata** machine tool must be fitted on tapping machines or drills with reverse travel. Put the receiving item into the correct position, respecting the common axis of the hole/chuck. Adjust the end limit so that the **Ensata** bush is 0,1-0,2 mm below the assembly surface after fitting. If there are any studs, they must rest on the bottom of the hole. Select the operating speed. At the beginning of the insertion stage, the body of the tool must have the insertion pin as shown



in the illustration. Screw about 3 turns of the **Ensata** bush onto the tool with the grooves or holes facing downwards. Bring the **Ensata** bush adjacent to the receiving item. The advancement and insertion will take place by inertia, without the need for automatic advancement. Change the direction of rotation to remove the tool. The advancement must be gradual to avoid the "hard" impact of the tool on the item as this could cause component breakage or be detrimental to the fastening.

Tools Codes

| TOOL 610 FOR MANUAL INSTALLATION | TOOL 620 FOR MACHINE INSTALLATION | TOOL 621 FOR DEEP RECEIVING HOLES |
|----------------------------------|--|-----------------------------------|
| | <p>Set or exchange the stud. Pull off the shell (2) downwards off the shaft (1). Release the locking screw (5). Screw the stud (7) in or out. Yellow colour marking indicates the flattened surfaces for the locking screws. When assembling, tighten both screws (5) evenly. Insert the ball bearing (6). Push on the shell (2) until the ball stop locks into place. To ensure that the tool functions perfectly, it must be possible to easily rotate the shell.</p> | |

| TOOL FOR ENSAT® | CODE | L1 | SQUARE FLAT | HEX NUT | CODE | d1 | d2 | SQUARE FLAT | TOTAL LENGHT ca | CODE | L2 | d3 |
|-----------------|-------------|----|-------------|---------|-------------|----|------|-------------|-----------------|-------------|----|----|
| M 2,5 x 0,45 | 610 0025.00 | 55 | 5 | 7 | 620 0025.00 | 18 | 8 | 6,3 | 82 | 621 0025.00 | 40 | 7 |
| M 3 x 0,5 | 610 0030.00 | 55 | 5 | 7 | 620 0030.00 | 18 | 8 | 6,3 | 82 | 621 0030.00 | 40 | 7 |
| M 3,5 x 0,6 | 610 0035.00 | 55 | 5 | 7 | 620 0035.00 | 18 | 8 | 6,3 | 78 | 621 0035.00 | 40 | 7 |
| M 4 x 0,7 | 610 0040.00 | 60 | 5 | 7 | 620 0040.00 | 18 | 8 | 6,3 | 83 | 621 0040.00 | 40 | 7 |
| M 5 x 0,8 | 610 0050.00 | 75 | 8 | 13 | 620 0050.00 | 24 | 12,5 | 10 | 101 | 621 0050.00 | 50 | 9 |
| M 6 x 1 | 610 0060.00 | 75 | 8 | 13 | 620 0060.00 | 24 | 12,5 | 10 | 102 | 621 0060.00 | 50 | 10 |
| M 8 x 1,25 | 610 0080.00 | 75 | 8 | 13 | 620 0080.00 | 24 | 12,5 | 10 | 105 | 621 0080.00 | 50 | 12 |
| M10 x 1,5 | 610 0100.00 | 95 | 12,5 | 19 | 620 0100.00 | 32 | 16 | 12,5 | 131 | 621 0100.00 | 60 | 15 |
| M12 x 1,75 | 610 0120.00 | 95 | 12,5 | 19 | 620 0120.00 | 32 | 16 | 12,5 | 134 | 621 0120.00 | 60 | 18 |
| M14 x 2 | 610 0140.00 | 95 | 12,5 | 19 | 620 0140.00 | 50 | 25 | 20 | 166 | 621 0140.00 | 60 | 20 |
| M16 x 2 | | | | | 620 0160.00 | 50 | 25 | 20 | 166 | 621 0160.00 | 60 | 22 |
| M18 x 2,5 | | | | | 620 0180.00 | 50 | 25 | 20 | 166 | 621 0180.00 | 60 | 24 |
| M20 x 2,5 | | | | | 620 0200.00 | 58 | 25 | 20 | 195 | 621 0200.00 | 60 | 26 |
| M22 x 2,5 | | | | | 620 0220.00 | 58 | 25 | 20 | 195 | 621 0220.00 | 60 | 28 |
| M24 x 3 | | | | | 620 0240.00 | 70 | 30 | 25 | 220 | 621 0240.00 | 60 | 32 |
| M27 x 3 | | | | | 620 0270.00 | 70 | 30 | 25 | 220 | 621 0270.00 | 60 | 35 |
| M30 x 3,5 | | | | | 620 0300.00 | 70 | 30 | 25 | 220 | 621 0300.00 | 60 | 38 |

Dimensions expressed in mm. Other METRIC, UNC, UNF, WHITWORTH threads are available on demand.

The spindle code differs from the tool code changing the final digits 00 with the number 70.

Spare parts for the 610 manual tools are not provided.

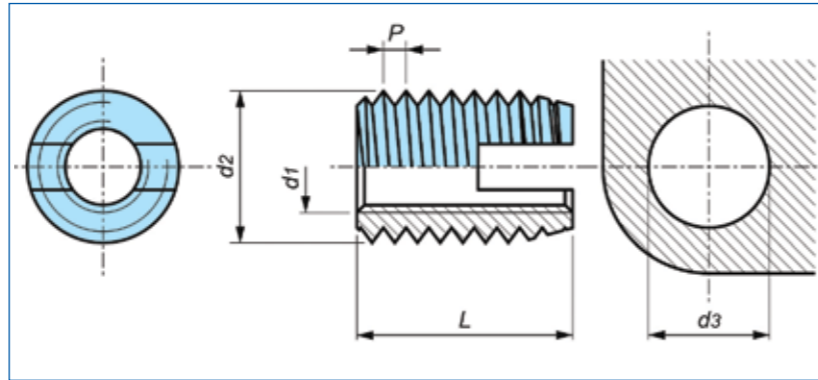
Example: spindle spare part M6X1 code 620 0060.70

Ensat® Series 302



Applications:
ferrous and no-ferrous
metals, light alloy,
cast iron, brass, plastic
materials, resins.

Assembly:
by special equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT L | APPOX. HOLE DIAMETER d 3 | | | MIN. HOLE DEPTH |
|----------------|-------------------------|----------------------------|------|----------------------|---|--|---|--------------------|
| | | d 2 | P | | Light alloy Rm < 250 < 150 HB Plastic | Light alloy Rm < 350 C. Iron < 200 HB Plastic Hard | Light alloy Rm > 350 C. Iron > 200 HB Brass, No-ferrous metal | |
| 302 0020.____* | M 2 | 4,5 | 0,5 | 6 | 4,1 | 4,1 - 4,2 | 4,2 - 4,3 | 8 |
| 302 0025.____* | M 2,5 | 4,5 | 0,5 | 6 | 4,1 | 4,1 - 4,2 | 4,2 - 4,3 | 8 |
| 302 0030.____* | M 3 | 5 | 0,5 | 6 | 4,6 | 4,6 - 4,7 | 4,7 - 4,8 | 8 |
| 302 0035.____* | M 3,5 | 6 | 0,75 | 8 | 5,4 | 5,5 - 5,6 | 5,6 - 5,7 | 10 |
| 302 0040.____ | M 4 | 6,5 | 0,75 | 8 | 5,9 - 6,0 | 6,0 - 6,1 | 6,1 - 6,2 | 10 |
| 302 0050.____ | M 5 | 8 | 1 | 10 | 7,2 - 7,3 | 7,3 - 7,5 | 7,5 - 7,6 | 13 |
| 302 0061.____ | M 6 | 9 | 1 | 12 | 8,2 - 8,3 | 8,3 - 8,5 | 8,5 - 8,6 | 15 |
| 302 0060.____ | M 6 | 10 | 1,5 | 14 | 8,8 - 9,0 | 9,0 - 9,2 | 9,2 - 9,4 | 17 |
| 302 0080.____ | M 8 | 12 | 1,5 | 15 | 10,8 - 11,0 | 11,0 - 11,2 | 11,2 - 11,4 | 18 |
| 302 0100.____ | M 10 | 14 | 1,5 | 18 | 12,8 - 13,0 | 13,0 - 13,2 | 13,2 - 13,4 | 22 |
| 302 0120.____ | M 12 | 16 | 1,5 | 22 | 14,8 - 15,0 | 15,0 - 15,2 | 15,2 - 15,4 | 26 |
| 302 0140.____ | M 14 | 18 | 1,5 | 24 | 16,8 - 17,0 | 17,0 - 17,2 | 17,2 - 17,4 | 28 |
| 302 0160.____ | M 16 | 20 | 1,5 | 22 | 18,8 - 19,0 | 19,0 - 19,2 | 19,2 - 19,4 | 27 |
| 302 0180.____ | M 18 | 22 | 1,5 | 24 | 20,8 - 21,0 | 21,0 - 21,2 | 21,2 - 21,4 | 29 |
| 302 0200.____ | M 20 | 26 | 1,5 | 27 | 24,8 - 25,0 | 25,0 - 25,2 | 25,2 - 25,4 | 32 |
| 302 0220.____ | M 22 | 26 | 1,5 | 30 | 24,8 - 25,0 | 25,0 - 25,2 | 25,2 - 25,4 | 36 |
| 302 0240.____ | M 24 | 30 | 1,5 | 30 | 28,8 - 29,0 | 29,0 - 29,2 | 29,2 - 29,4 | 36 |
| 302 0270.____ | M 27 | 34 | 1,5 | 30 | 32,8 - 33,0 | 33,0 - 33,2 | 33,2 - 33,4 | 36 |
| 302 0300.____ | M 30 | 36 | 1,5 | 40 | 34,8 - 35,0 | 35,0 - 35,2 | 35,2 - 35,4 | 46 |

Non binding dimensions, expressed in mm.

* Use only with soft materials otherwise the mandrel resistance could be insufficient.

Rm = ultimate tensile strenght N/mm²
HB = Brinell hardness

Other METRIC, UNC, UNF, WHITWORTH, threads are available on demand.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

STANDARD
 ON DEMAND

MATERIAL

| | | | | |
|----------------------------|--------|-------------|-------|-----|
| Steel | | | ----- | .16 |
| Ferritic stainless steel | 1.4105 | (Up to M16) | ----- | .40 |
| Austenitic stainless stell | 1.4305 | (Up to M20) | ----- | .50 |
| Brass | | (Up to M16) | ----- | .80 |

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural
Brass bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

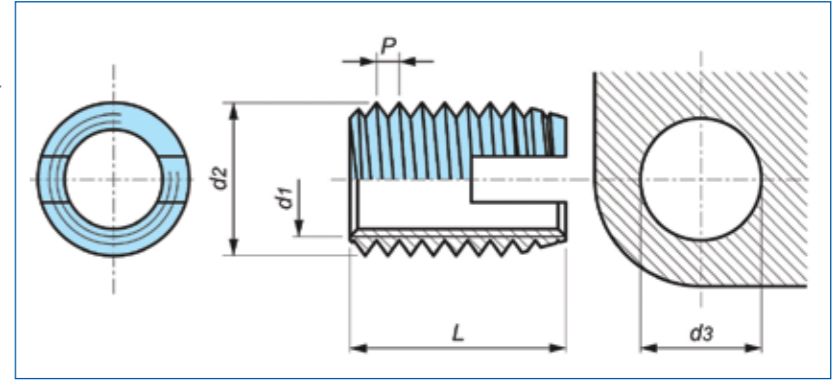
Self-tapping Ensat® series 302, M5 thread, zinc-plated steel:
302 0050.16

Ensat® Series 303



Applications:
ferrous and no-ferrous
metals, light alloy, cast
iron, brass, plastic
materials, resins.

Assembly:
by special equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT L | APPOX. HOLE DIAMETER d 3 | | | MIN. HOLE DEPTH |
|---------------|-------------------------|----------------------------|------|----------------------|-----------------------------|--|-------------------------------------|--------------------|
| | | d 2 | P | | Soft Materials Plastic | Brittle Materials Hard Plastic Light Alloy | Light Alloy No-ferrous Materials | |
| 303 0030.____ | M 3 | 4,5 | 0,5 | 6 | 4,0 - 4,1 | 4,1 - 4,2 | 4,2 - 4,3 | 8 |
| 303 0035.____ | M 3,5 | 5 | 0,6 | 6 | 4,5 - 4,6 | 4,6 - 4,7 | 4,7 - 4,8 | 8 |
| 303 0040.____ | M 4 | 6 | 0,7 | 6 | 5,3 - 5,4 | 5,5 - 5,6 | 5,6 - 5,7 | 8 |
| 303 0050.____ | M 5 | 7 | 0,8 | 8 | 6,3 - 6,4 | 6,5 - 6,6 | 6,6 - 6,7 | 10 |
| 303 0060.____ | M 6 | 8 | 1,0 | 10 | 7,1 - 7,2 | 7,3 - 7,5 | 7,5 - 7,6 | 13 |
| 303 0080.____ | M 8 | 10 | 1,25 | 12 | 8,6 - 8,8 | 8,9 - 9,2 | 9,2 - 9,4 | 15 |
| 303 0100.____ | M 10 | 12 | 1,5 | 15 | 10,6 - 10,8 | 10,9 - 11,2 | 11,2 - 11,4 | 18 |

Non binding dimensions, expressed in mm.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

| | | | | |
|----------------------------|--------|------------------------------------|-------|---------------|
| Steel | | | ----- | .16 |
| Ferritic stainless steel | 1.4105 | (Thread excluded M3,5) | ----- | .40 On demand |
| Austenitic stainless stell | 1.4305 | (Threads excluded M3,5 - M8 - M10) | ----- | .50 On demand |
| Brass | | (Threads excluded M3,5 - M8 - M10) | ----- | .80 On demand |

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural
Brass bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 303, M5 thread, zinc-plated steel:
303 0050.16

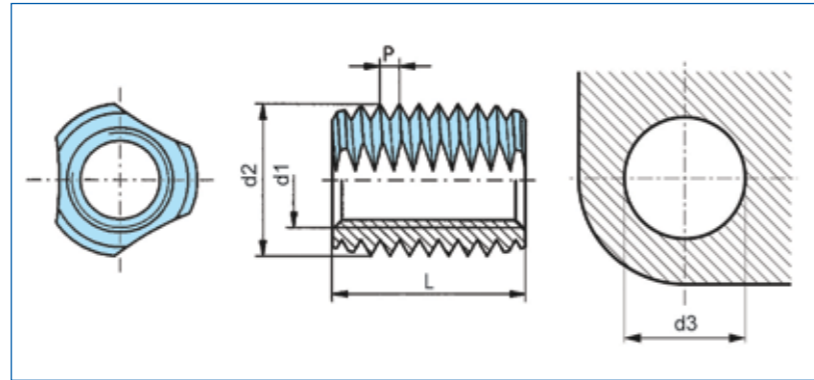
STANDARD
 ON DEMAND

Ensat® Series 305



Application:
soft thermoplastic
materials.

Assembly:
by special equipment.



| CODE | METRIC THREAD | SPECIAL EXTERNAL THREAD | | TOTAL LENGTH | APPROX. HOLE DIAMETER | MIN. HOLE DEPTH |
|-------------|------------------|----------------------------|------|-----------------|--------------------------|--------------------|
| | d 1 | d 2 | P | L | d 3 | |
| 305 0030.80 | M 3 | 5 | 0,5 | 6 | 4,6 - 4,7 | 7 |
| 305 0040.80 | M 4 | 6,5 | 0,75 | 8 | 6,0 - 6,1 | 9 |
| 305 0050.80 | M 5 | 8 | 1 | 10 | 7,3 - 7,4 | 11 |
| 305 0060.80 | M 6 | 10 | 1,5 | 14 | 9,0 - 9,2 | 15 |

Non binding dimensions, expressed in mm.

Other METRIC, UNC, UNF, WHITWORTH, threads are available on demand.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

Brass _____ .80

FINISHING

Natural

TOLERANCES

ISO 2768 -m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 305, M5 thread, brass bushing:
305 0050.80

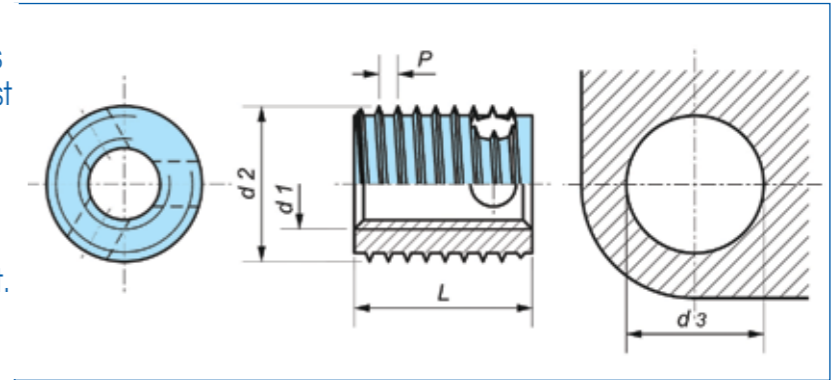
STANDARD
 ON DEMAND

Ensat® Series 307 - 308



Applications:
ferrous and no-ferrous
metals, light alloy, cast
iron, plastic
materials, resins.

Assembly:
by special equipment.



| CODE | METRIC THREAD | SPECIAL EXTERNAL THREAD | | TOTAL LENGTH | APPROX. HOLE DIAMETER d 3 | | | MIN. HOLE DEPTH |
|--------------------------------|------------------|----------------------------|------|-----------------|---|--|---|--------------------|
| | | d 2 | P | | Light alloy Rm < 250 < 150 HB Plastic | Light alloy Rm < 350 C. Iron < 200 HB Hard Plastic | Light alloy Rm > 350 C. Iron > 200 HB Brass, No-ferrous metal | |
| 307 0030.____ 308 0030.____ | M 3 | 5 | 0,6 | 4 6 | 4,6 - 4,7 | 4,7 | 4,7 - 4,8 | 6 8 |
| 307 0035.____ 308 0035.____ | M 3,5 | 6 | 0,8 | 5 8 | 5,5 - 5,6 | 5,6 | 5,6 - 5,7 | 7 10 |
| 307 0040.____ 308 0040.____ | M 4 | 6,5 | 0,8 | 6 8 | 6,0 - 6,1 | 6,1 | 6,1 - 6,2 | 8 10 |
| 307 0050.____ 308 0050.____ | M 5 | 8 | 1 | 7 10 | 7,4 - 7,5 | 7,5 - 7,6 | 7,6 - 7,7 | 9 13 |
| 307 0060.____ 308 0060.____ | M 6 | 10 | 1,25 | 8 12 | 9,3 - 9,4 | 9,4 - 9,5 | 9,5 - 9,6 | 10 15 |
| 307 0080.____ 308 0080.____ | M 8 | 12 | 1,5 | 9 14 | 11,1 - 11,2 | 11,2 - 11,3 | 11,3 - 11,5 | 11 17 |
| 307 0100.____ 308 0100.____ | M 10 | 14 | 1,5 | 10 18 | 13,1 - 13,2 | 13,2 - 13,3 | 13,3 - 13,5 | 13 22 |
| 307 0120.____ 308 0120.____ | M 12 | 16 | 1,75 | 12 22 | 15,0 - 15,1 | 15,1 - 15,2 | 15,2 - 15,4 | 15 26 |
| 307 0140.____ 308 0140.____ | M 14 | 18 | 2 | 14 24 | 17,0 - 17,1 | 17,1 - 17,2 | 17,2 - 17,4 | 17 28 |
| 307 0160.____ 308 0160.____ | M 16 | 20 | 2 | 14 24 | 19,0 - 19,1 | 19,1 - 19,2 | 19,2 - 19,4 | 17 28 |

Non binding dimensions, expressed in mm.

Rm = ultimate tensile strength N/mm²
HB = Brinell hardness

Other METRIC, UNC, UNF, WHITWORTH, threads are available on demand.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

Steel

Ferritic stainless steel 1.4105 (Up to M14) _____ .16
Austenitic stainless steel 1.4305 (Up to M12) _____ .40
_____ .50

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 308, M5 thread, zinc-plated steel:
308 0050.16

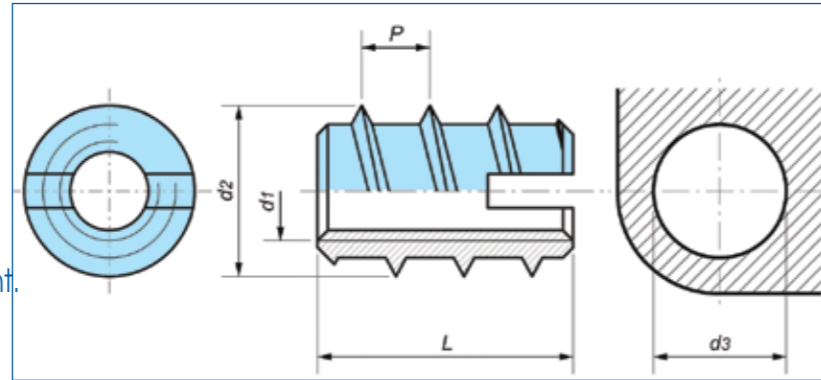
STANDARD
 ON DEMAND

Ensat® Series 309



Application:
soft thermoplastic
materials, wood
and its derived
products.

Assembly:
by special equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT L | APPROX. HOLE DIAMETER d 3 | | MIN. HOLE DEPTH |
|-------------|-------------------------|----------------------------|-----|----------------------|------------------------------|---------------|--------------------|
| | | d 2 | P | | Soft Material | Hard Material | |
| 309 0025.80 | M 2,5 | 5 | 1,6 | 6 | 3,5 | 3,6 - 3,8 | 8 |
| 309 0030.80 | M 3 | 5,5 | 1,6 | 6 | 4,1 | 4,2 - 4,3 | 9 |
| 309 0035.80 | M 3,5 | 6,5 | 1,6 | 8 | 4,6 | 4,7 - 4,8 | 10 |
| 309 0040.80 | M 4 | 7 | 2,5 | 10 | 5,1 | 5,2 - 5,3 | 13 |
| 309 0050.80 | M 5 | 9 | 3 | 12 | 6,6 | 6,7 - 6,9 | 15 |
| 309 0060.80 | M 6 | 10 | 4 | 14 | 7,6 | 7,7 - 7,9 | 17 |
| 309 0080.80 | M 8 | 13 | 4 | 20 | 9,9 | 10,1 - 10,3 | 23 |
| 309 0100.80 | M 10 | 16 | 5 | 23 | 12,4 | 12,6 - 12,8 | 26 |
| 309 0120.80 | M 12 | 19 | 5 | 26 | 15,4 | 15,6 - 15,8 | 30 |
| 309 0140.80 | M 14 | 22 | 5 | 26 | 18,4 | 18,6 - 18,8 | 30 |
| 309 0160.80 | M 16 | 24 | 5 | 26 | 20,4 | 20,6 - 20,8 | 30 |

Non binding dimensions, expressed in mm.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

Brass ----- .80

FINISHING

Natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 309, M5 thread, brass bushing:
309 0050.80

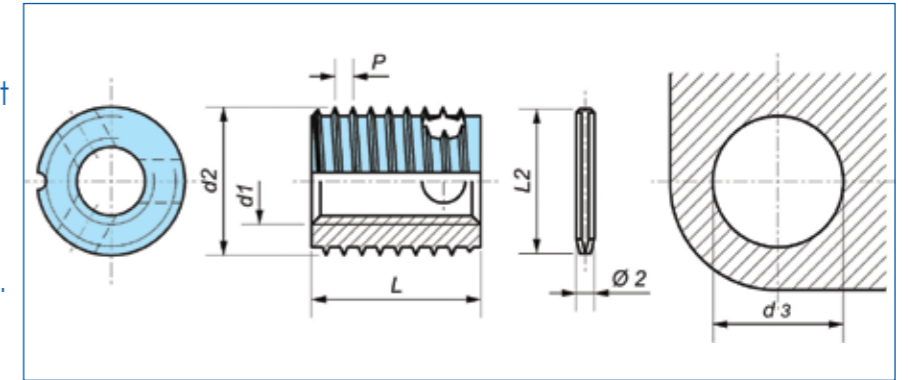
STANDARD
 ON DEMAND

Ensat® Series 317 - 318



Applications:
ferrous and no-ferrous
metals, light alloy, cast
iron, plastic
materials, resins.

Assembly:
by special equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT | | APPROX. HOLE DIAMETER d 3 | | | MIN. HOLE DEPTH |
|---------------|-------------------------|----------------------------|------|-----------------|----|---|--|---|--------------------|
| | | d 2 | P | L | L2 | Light alloy Rm < 250 < 150 HB Plastic | Light alloy Rm < 350 C. Iron < 200 HB Hard Plastic | Light alloy Rm > 350 C. Iron > 200 HB Brass, No-ferrous metal | |
| 317 0040.____ | M 4 | 6,5 | 0,8 | 6 | 4 | 6,0 - 6,1 | 6,1 - 6,1 | 6,1 - 6,2 | 8 |
| 318 0040.____ | | | | 8 | 6 | | | | 10 |
| 317 0050.____ | M 5 | 8 | 1 | 7 | 4 | 7,4 - 7,5 | 7,5 - 7,6 | 7,6 - 7,7 | 9 |
| 318 0050.____ | | | | 10 | 6 | | | | 13 |
| 317 0060.____ | M 6 | 10 | 1,25 | 8 | 6 | 9,3 - 9,4 | 9,4 - 9,5 | 9,5 - 9,6 | 10 |
| 318 0060.____ | | | | 12 | 10 | | | | 15 |
| 317 0080.____ | M 8 | 12 | 1,5 | 9 | 6 | 11,1 - 11,2 | 11,2 - 11,3 | 11,3 11,5 | 11 |
| 318 0080.____ | | | | 14 | 10 | | | | 17 |
| 317 0100.____ | M 10 | 14 | 1,5 | 10 | 6 | 13,1 - 13,2 | 13,2 - 13,3 | 13,3 - 13,5 | 13 |
| 318 0100.____ | | | | 18 | 16 | | | | 22 |
| 317 0120.____ | M 12 | 16 | 1,75 | 12 | 10 | 15,0 - 15,1 | 15,1 - 15,2 | 15,2 - 15,4 | 15 |
| 318 0120.____ | | | | 22 | 16 | | | | 26 |
| 317 0140.____ | M 14 | 18 | 2 | 14 | 10 | 17,0 - 17,1 | 17,1 - 17,2 | 17,2 - 17,4 | 17 |
| 318 0140.____ | | | | 24 | 16 | | | | 28 |
| 317 0160.____ | M 16 | 20 | 2 | 14 | 10 | 19,0 - 19,1 | 19,1 - 19,2 | 19,2 - 19,4 | 17 |
| 318 0160.____ | | | | 24 | 16 | | | | 28 |

Non binding dimensions, expressed in mm.

Rm = ultimate tensile strenght N/mm²
HB = Brinell hardness

Other METRIC, UNC, UNF, WHITWORTH, threads are available on demand.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

Steel ----- .16
Ferritic stainless steel 1.4105 ----- .40
Austenitic stainless stell 1.4305 ----- .50

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 318, M5 thread, zinc-plated steel:
318 0050.16

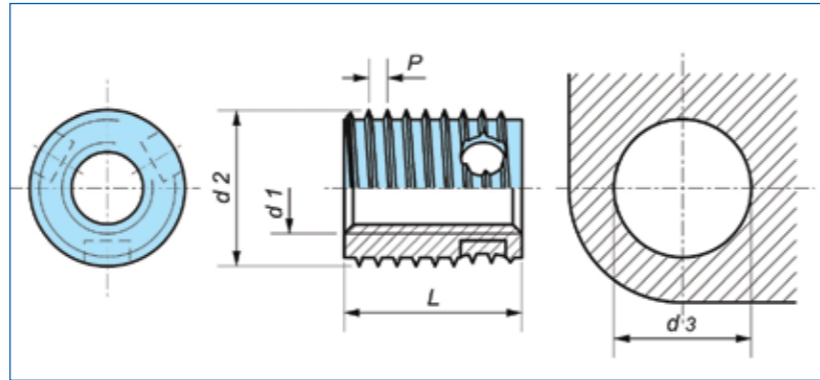
STANDARD
 ON DEMAND

Ensat® Series 337 - 338



Applications:
ferrous and no-ferrous
metals, light alloy,
cast iron, plastic
materials, resins.

Assembly:
by special equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT L | APPROX. HOLE DIAMETER d 3 | | | MIN. HOLE DEPTH |
|---------------|-------------------------|----------------------------|------|----------------------|---|--|---|--------------------|
| | | d 2 | P | | Light alloy Rm < 250 < 150 HB Plastic | Light alloy Rm < 350 C. Iron < 200 HB Hard Plastic | Light alloy Rm > 350 C. Iron > 200 HB Brass, No-ferrous metal | |
| 337 0030.____ | M 3 | 5 | 0,6 | 4 | 4,6 - 4,7 | 4,7 - 4,7 | 4,7 - 4,8 | 6 |
| 338 0030.____ | | | | 6 | | | | 8 |
| 337 0035.____ | M 3,5 | 6 | 0,8 | 5 | 5,5 - 5,6 | 5,6 - 5,6 | 5,6 - 5,7 | 7 |
| 338 0035.____ | | | | 8 | | | | 10 |
| 337 0040.____ | M 4 | 6,5 | 0,8 | 6 | 6,0 - 6,1 | 6,1 - 6,1 | 6,1 - 6,2 | 8 |
| 338 0040.____ | | | | 8 | | | | 10 |
| 337 0050.____ | M 5 | 8 | 1 | 7 | 7,4 - 7,5 | 7,5 - 7,6 | 7,6 - 7,7 | 9 |
| 338 0050.____ | | | | 10 | | | | 13 |
| 337 0060.____ | M 6 | 10 | 1,25 | 8 | 9,3 - 9,4 | 9,4 - 9,5 | 9,5 - 9,6 | 10 |
| 338 0060.____ | | | | 12 | | | | 15 |
| 337 0080.____ | M 8 | 12 | 1,5 | 9 | 11,1 - 11,2 | 11,2 - 11,3 | 11,3 - 11,5 | 11 |
| 338 0080.____ | | | | 14 | | | | 17 |
| 337 0100.____ | M 10 | 14 | 1,5 | 10 | 13,1 - 13,2 | 13,2 - 13,3 | 13,3 - 13,5 | 13 |
| 338 0100.____ | | | | 18 | | | | 22 |
| 337 0120.____ | M 12 | 16 | 1,75 | 12 | 15,0 - 15,1 | 15,1 - 15,2 | 15,2 - 15,4 | 15 |
| 338 0120.____ | | | | 22 | | | | 26 |
| 337 0140.____ | M 14 | 18 | 2 | 14 | 17,0 - 17,1 | 17,1 - 17,2 | 17,2 - 17,4 | 17 |
| 338 0140.____ | | | | 24 | | | | 28 |
| 337 0160.____ | M 16 | 20 | 2 | 14 | 19,0 - 19,1 | 19,1 - 19,2 | 19,2 - 19,4 | 17 |
| 338 0160.____ | | | | 24 | | | | 28 |

Non binding dimensions, expressed in mm.

Rm = ultimate tensile strenght N/mm²
HB = Brinell hardness

Other METRIC, UNC, UNF, WHITWORTH, threads are available on demand.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

| | | | |
|----------------------------|--------|-------|-----|
| Steel | | ----- | .16 |
| Ferritic stainless steel | 1.4105 | ----- | .40 |
| Austenitic stainless stell | 1.4305 | ----- | .50 |

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 338, M5 thread, zinc-plated steel:
338 0050.16

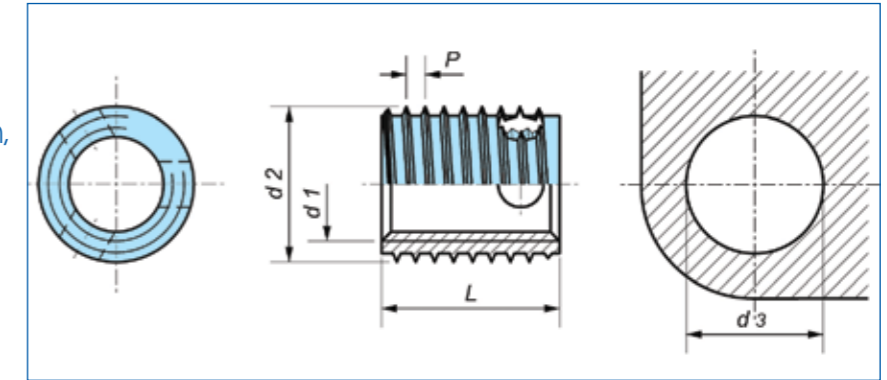
STANDARD
 ON DEMAND

Ensat® Serie 347 - 348



Applications:
ferrous and
no-ferrous metals,
light alloy, cast iron,
plastic materials,
resins.

Assembly:
by special
equipment.



| CODE | METRIC THREAD d 1 | SPECIAL EXTERNAL THREAD | | TOTAL LENGHT L | APPROX. HOLE DIAMETER d 3 | | MIN. HOLE DEPTH |
|---------------|-------------------------|----------------------------|------|----------------------|------------------------------|---------------------|--------------------|
| | | d 2 | P | | Plastic | Metal - Light alloy | |
| 347 0040.____ | M 4 | 6 | 0,7 | 6 | 5,4 - 5,6 | 5,6 - 5,7 | 8 |
| 348 0040.____ | | | | 8 | | | 10 |
| 347 0050.____ | M 5 | 6,5 | 0,8 | 7 | 6,0 - 6,1 | 6,1 - 6,2 | 9 |
| 348 0050.____ | | | | 10 | | | 13 |
| 347 0060.____ | M 6 | 8 | 1 | 8 | 7,4 - 7,6 | 7,5 - 7,7 | 10 |
| 348 0060.____ | | | | 12 | | | 15 |
| 347 0080.____ | M 8 | 10 | 1,25 | 9 | 9,3 - 9,5 | 9,4 - 9,6 | 11 |
| 348 0080.____ | | | | 14 | | | 17 |
| 347 0100.____ | M 10 | 12 | 1,5 | 10 | 11,1 - 11,3 | 11,2 - 11,5 | 13 |
| 348 0100.____ | | | | 18 | | | 22 |
| 347 0120.____ | M 12 | 14 | 1,75 | 12 | 13,1 - 13,3 | 13,2 - 13,5 | 15 |
| 348 0120.____ | | | | 22 | | | 26 |

Non binding dimensions, expressed in mm.

In order to use correctly the products, we suggest to carry out some preliminary assembly tests to determine the right hole.

MATERIAL

| | | | |
|----------------------------|--------|-------|-----|
| Steel | | ----- | .16 |
| Ferritic stainless steel | 1.4105 | ----- | .40 |
| Austenitic stainless stell | 1.4305 | ----- | .50 |

FINISHING

Steel bushings: zinc-plated
Stainless steel bushings: natural

TOLERANCES

ISO 2768 - m

THREADING d1

ISO 6 H Metric

EXAMPLE

Self-tapping Ensat® series 348, M5 thread, zinc-plated steel:
348 0050.16

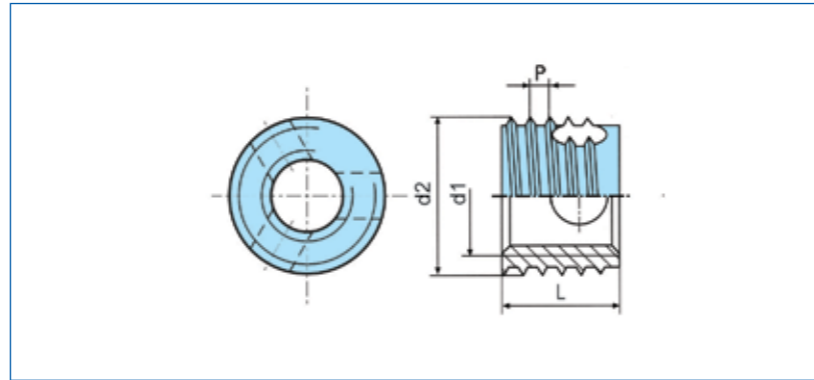
STANDARD
 ON DEMAND

Ensat® Series 304



Application:
for the repair of torn
and damaged spark
plug retaining threads
in engines.

Assembly:
by special equipment.



| CODE | EXTERNAL SPECIAL THREAD | | | THREAD | | LENGHT L | Ø HOLE (1) |
|-------------|-------------------------|------|-------|--------|------|-------------|---------------|
| | d 1 | P | DIN | d 2 | P | | |
| 304 0140.16 | 14 | 1,25 | 72502 | 17,7 | 1,25 | 9 | 17,0 |
| 304 0141.16 | 14 | 1,25 | 72502 | 17,7 | 1,25 | 15 | 17,0 |
| 304 0180.16 | 18 | 1,5 | 72501 | 21,7 | 1,25 | 9 | 21,0 |

Guidelines values for normal applications.
(1) Deviations, depending on the strenght of the cylinder head alloy
+0,1 mm

MATERIAL
Steel

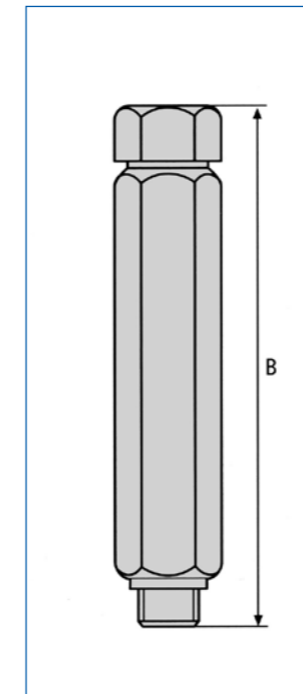
FINISHING
Zinc-plated

EXAMPLE
Spark plug insert with internal thread A = M14 x 1,25 mm, length B = 9 mm
made of hardened zinc plated steel:
304 0140.16

STANDARD
 ON DEMAND

Ensat® Series 304 assembly tools

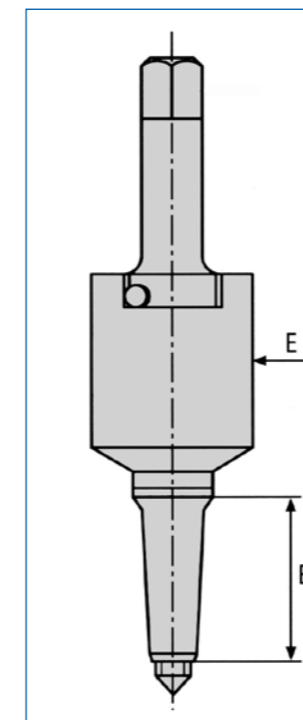
TOOLS 619 FOR MANUAL INSTALLATION



| CODE | TOOL FOR | SQUARE FLAT | LENGHT B ca |
|-------------|----------------------------|----------------|-------------------|
| 619 0140.00 | 304 0140.16 304 0141.16 | 22 | 100 |
| 619 0180.00 | 304 0180.16 | 22 | 100 |

Dimensions expressed in mm.

TOOLS 629 FOR MACHINE INSTALLATION



| CODE | TOOL FOR | MAX DIAMETER E | LENGHT B1 ca |
|-------------|----------------------------|----------------------|--------------------|
| 629 0146.00 | 304 0140.16 304 0141.16 | 50 | 72 |
| 629 0187.00 | 304 0180.16 | 50 | 73 |

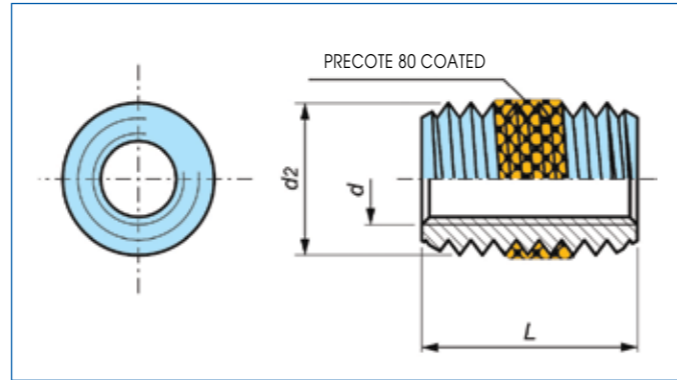
Dimensions expressed in mm.

Mubux® Series M 970



Application:
materials with suitable
threaded holes.

Installation by screwing



| CODE | TOTAL LENGTH L |
|------|----------------|
| 971 | 1 d |
| 972 | 1,5 d |
| 973 | 2 d |
| 974 | 2,5 d |

Non binding dimensions, expressed in mm.

| CODE | INTERNAL THREAD d | EXTERNAL THREAD d2 | STANDARD LENGTHS | | | |
|-------------|-------------------|--------------------|------------------|-------|-----|-------|
| | | | 1 d | 1,5 d | 2 d | 2,5 d |
| ___0030. __ | M 3 | M 5 | | 4,5 | 6 | |
| ___0040. __ | M 4 | M 6 | | 6 | 8 | 10 |
| ___0050. __ | M 5 | M 7 | | 7,5 | 10 | 12,5 |
| ___0060. __ | M 6 | M 8 | | 9 | 12 | 15 |
| ___0080. __ | M 8 | M 12 | | 12 | 16 | 20 |
| ___0100. __ | M 10 | M 14 | | 15 | 20 | 25 |
| ___0120. __ | M 12 | M 16 | 12 | 18 | 24 | 30 |

MATERIAL
Steel

FINISHING
Zinc-plated, _____,10
Precote 80 Coating _____,16

TOLERANCES
Length L ± 0,25

THREADING
Metric Internal ISO 6 H
Metric External

EXAMPLE
Threaded insert Mubux-M 970 series with internal thread M5, external thread M7 length 2d made of zinc plated steel and coated with precote 80:

Mubux-MO 973 000 050.16

| WORKPIECE: SHEAR STRENGTH N/mm² | TENSILE: STRENGTH OF SCREW (DIN) | RECCOMENDED LENGTH | | | | |
|---------------------------------|----------------------------------|--------------------|-------|-----|------------|-------|
| | | M 3 | M 4 | M 5 | M 6 - M 10 | M 12 |
| ≥ 70 | 4,8 | 2 d | 1,5 d | 2 d | 2 d | |
| ≥ 140 | 4,8 | 2 d | 1,5 d | 2 d | 1,5 d | 1 d |
| | 6,8 | 2 d | 1,5 d | 2 d | 1,5 d | 1,5 d |
| ≥ 210 | 8,8 | 2 d | 1,5 d | 2 d | 2 d | 2 d |
| | 6,8 | 2 d | 1,5 d | 2 d | 1,5 d | 1 d |
| | 8,8 | 2 d | 1,5 d | 2 d | 1,5 d | 1,5 d |
| ≥ 280 | 12,9 | 2 d | 1,5 d | 2 d | 1,5 d | 2 d |
| | 14,9 | 2 d | 2 d | 2 d | 2 d | 2,5 d |
| | 6,8 | 2 d | 1,5 d | 2 d | 1,5 d | 1 d |
| ≥ 280 | 8,8 - 12,9 | 2 d | 1,5 d | 2 d | 1,5 d | 1,5 d |
| | 14,9 | 2 d | 1,5 d | 2 d | 1,5 d | 2 d |

Example:
Shearing strength of the workpiece appr. 160 N/mm 2, screw M6, strength class 8.8
Recommended length: 2A = 2x6 mm = 12 mm.

STANDARD
 ON DEMAND

Conversion table for metric/imperial threads

| METRIC | | WHITWORTH | | UNC | | UNF | |
|------------------|--------|-----------|--------|------|----------|------|----------|
| CORRESPONDING TO | THREAD | CODE | THREAD | CODE | THREAD | CODE | THREAD |
| ___030. __ | M 3 | | | 604 | 4-40 | 704 | 4-48 |
| ___035. __ | M 3,5 | | | 606 | 6-32 | 706 | 6-40 |
| ___040. __ | M 4 | | | 608 | 8-32 | 708 | 8-36 |
| ___050. __ | M 5 | | | 610 | 10-24 | 710 | 10-32 |
| ___060. __ | M 6 | 525 | 1/4 | 625 | 1/4"-20 | 725 | 1/4"-28 |
| ___080. __ | M 8 | 531 | 5/16 | 631 | 5/16"-18 | 731 | 5/16"-24 |
| ___100. __ | M 10 | 537 | 3/8 | 637 | 3/8"-16 | 737 | 3/8"-24 |
| ___120. __ | M 12 | 544 | 7/16 | 644 | 7/16"-14 | 744 | 7/16"-20 |
| ___140. __ | M 14 | 550 | 1/2 | 650 | 1/2"-13 | 750 | 1/2"-20 |
| ___160. __ | M 16 | 562 | 5/8 | 662 | 5/8"-11 | 762 | 5/8"-18 |



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ISO 9001 - Cert. n° 0742

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