



# The Ensat® – self-tapping threaded insert ...

Ensat® is a self-tapping threaded insert 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. These inserts are protected by German and also foreign patents.

The Ensat® 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 backlashfree fit with extreme loading capacity.

### Ensat®-3F 305

is a thread forming insert with 3 longitudinal grooves around its periphery

### Fields of application

The Ensat® is used throughout the whole of the metal and plastics processing industry.

- Automotive
- Household appliance and office machinery production
- Electrical and laboratory supplies
- Plant and equipment construction
- Sports and lifestyle equipment
- Railed vehicles industry

### Product features

- Universal application for all types of plastic, thermoset plastics, thermoset plastics, PU/PUR foam, Fibre-reinforced plastic (FRP), for hardwood and plywood, hard paper and metal.
- Maximum strength values in comparison to other systems. The diagram illustrates the withdrawing force in thermoplastic materials: In thermoset plastics and FRP, the values tend to be higher.
- Thin-walled Ensat® for restricted space conditions (residual wall thicknesses), and also suitable for screwing in using a thread tapping machine (same inside and outside pitch).

Slot version: WN 303,  
Three-hole version: WN 347/348  
page 16 and 17.

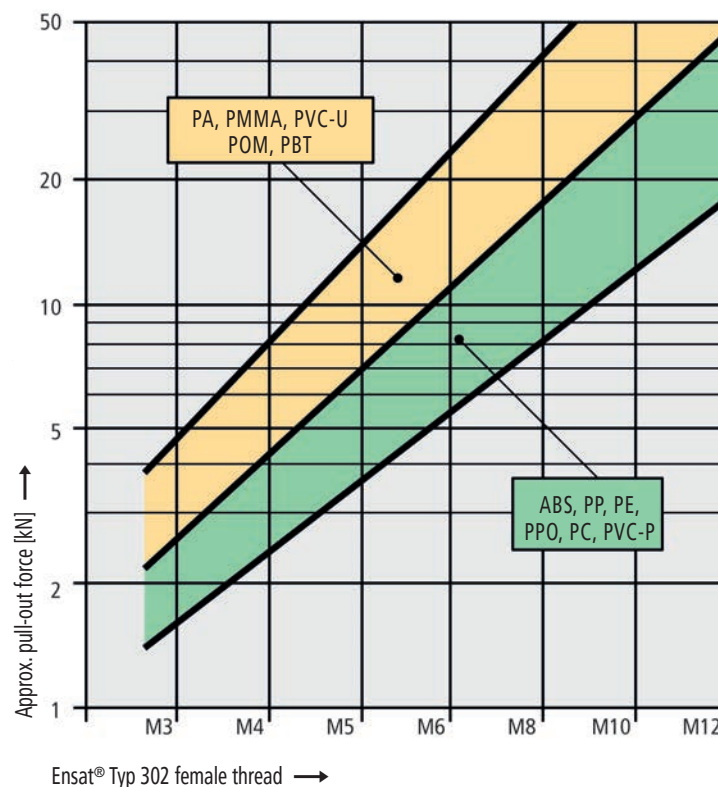


Fig. 2

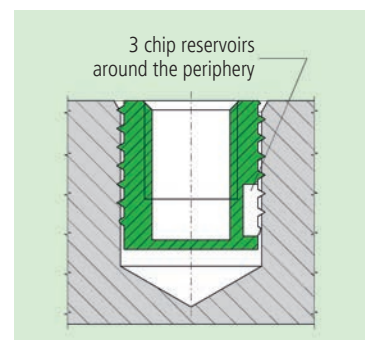


Fig. 3

### Ensat®-SBS 337/338

These cutting bores are shaped to serve as chip reservoirs. The chips created during the driving process stored here and cannot drop into sensitive equipment parts.

For additional sealing from below:  
Ensat® with closed floor  
Works standard 357/358.  
See publication no. 20, page 21.

# The Ensat® in the workpiece ...

## Installation recommendation

The Ensat® should be processed appr. 0,1 – 0,2 mm recessed (fig. 4). After processing, the Ensat® can be immediately subjected to load. If the component material permits subsidence of the Ensat® under load, the Ensat® can only execute an axial movement of 0,1 to 0,2 mm. In other words, the pretension of the screw union is largely retained, loosening of the screw connection under dynamic load is impeded.

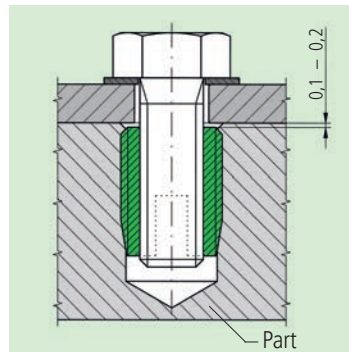


Fig. 4

## Example:

Female thread M8, recommended borehole diameter for

**Ensats®-S 302:**

10,9 to 11,2 mm

**Ensats®-SB 307/308:**

11,1 to 11,3 mm

(see Works Standard sheets)

In case of processing problems (e.g. extreme screw-in torque levels), it is generally of no consequence.

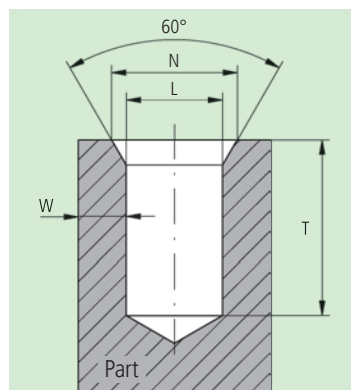
In case of doubt, it is worth testing this.

## Retaining hole

The receiving hole (L, fig. 5) can be simply drilled or already provided for in the casting.

Countersinking (N) the borehole (fig. 5) is recommended in order to:

- Prevent the workpiece surface from being raised
- Permit screwing in to a greater depth
- Ensure improved initial cutting characteristics



### Guideline values for countersink:

$$N = 0,06 \text{ to } 0,08 \times E + E$$

### Material thickness:

Smallest admissible material thickness  $\geq$  length of the Ensat®

### Depth of the blind hole T:

see Works Standard sheets, page 11 to 20

E = Outside diameter of the Ensat® [mm]

Fig. 5

## Borehole diameter

Brittle, tough and hard materials call for a larger borehole than soft or elastic materials. For guideline values, see the table above.

## Edge distance

The smallest still admissible edge distance W (fig. 5) depends on the planned stress level and the elasticity of the material into which the Ensat® is screwed.

Guideline values for plastic:

$$W \geq 0,25 \text{ to } 0,9 E$$

For moulding parts made of additionell plastic, the Ensat® achieved, due to the greater effective shearing area, a higher pullout strength as a direct screw coupling in the same application.

# Ensat® – driving tools...

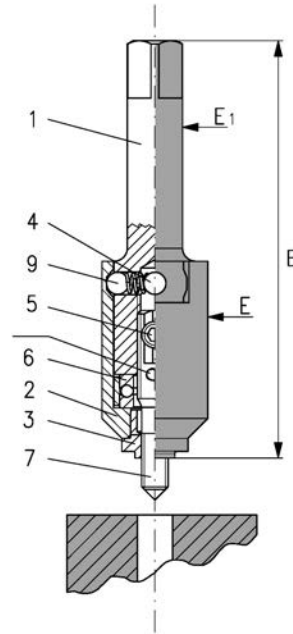
On this page, you can configure the optimum tool for your application. A configuration is provided in the following as an illustrative example.

The article number is composed of two sequences of numbers and starts with the tool shank (fig. 8) which should be selected in accordance with your output.

Also encrypted in this number are the special versions for thin-walled Ensat® (620 1 and 621 1) and for very high driving torques (622 0 and 623 0) which are available as standard only as a square shank. Other non-standard geometries can be evaluated as standard besides the tools illustrated. The second sequence of numbers in the table (fig. 9) indicates the thread code of the female thread. The tightened dimensions of the tools are shown on the next page.

## Tool for accessible retaining boreholes (short)

- 1 Shank
- 4 Stop pin
- 9 Ball
- 5 Fixing screw
- 6 Ball bearing
- 2 Shell
- 3 Guide bush
- 7 Stud



## Tool for deep located retaining boreholes (long)

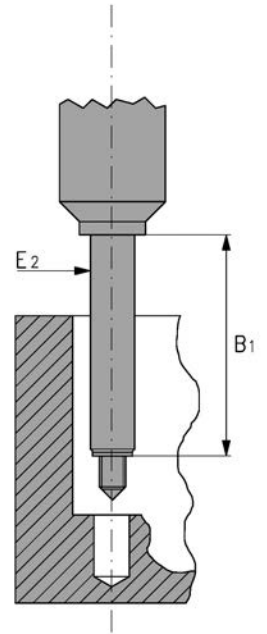


Fig. 6

The right length of the threaded pin for the Ensat® with cutting slot or with cutting bore is calculated from the pitch of the female thread (see also Fig. below;  $P$  = pitch of the female thread).

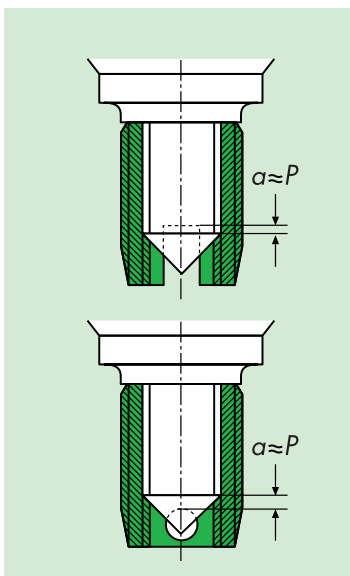


Fig. 7

### Setting or exchanging the stud

- Pull the shell (2) downwards off the shank (1).
- Release the locking screws (5).
- Screw the stud (7) in or out. Yellow colour marking indicates 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. For the tool to function perfectly, the shell must be very easy to rotate. Shorten the thread of tool 610 accordingly for short Ensat®.
- Unscrew the guide bush (3) at the front if the Ensat® is to be installed deeper than 0.2 mm under the surface of the workpiece. Diameter: 0.1 to 0.2 mm smaller than Ensat® retaining hole.

For mounting thin-walled Ensat® (page 17), special guide bushes must be used (tools 620 1 and 621 1).

### Conditions for flawless tool function

- Locking and unlocking the tool on the Ensat® surface is guaranteed by a thrust bearing (6).
- The stop pins (4) execute the impact at the shell (2) which unlocks the tool.
- Wear at the stud (7) can result in unlocking problems.

The components are also offered as single parts to allow you to carry out your own repairs to the tool.

Simply give us a call.

# Ensat® – driving tools...



**Example:**

You wish to insert an Ensat® 308 000 050. 110. For the installation process, you have selected a driving tool with spindle hexagon socket to DIN ISO 1173 and have to mount the insert into a deep positioned borehole.

Shank:

**636 0...**

(long for deep positioned borehole)

Thread code:

**...00 050...**

(for thread M5)

Suffix numbers:

**.... 000**

(with always the same tools)

Order no: **636 000 050.000**

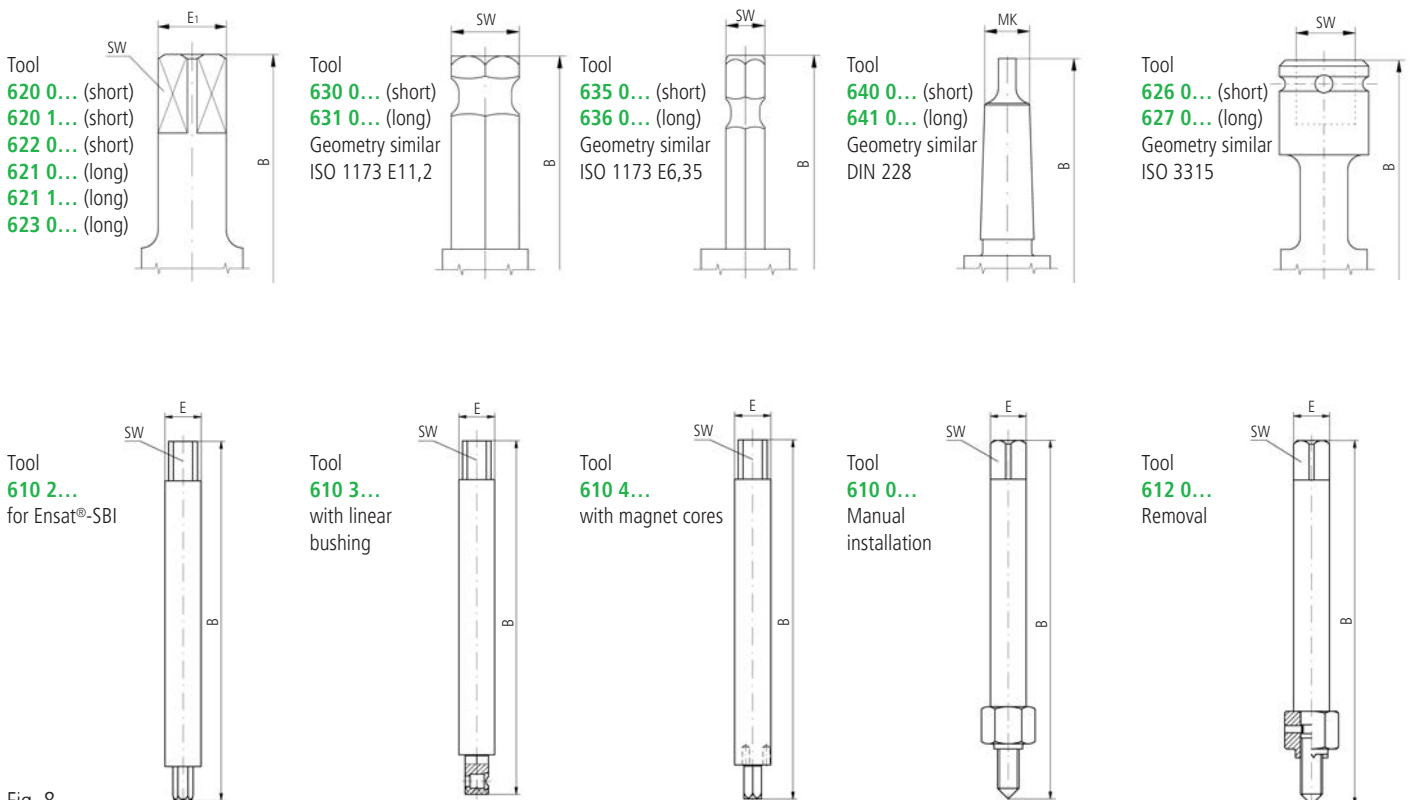


Fig. 8

Artikel-No.	For Ensaf®	M 2	M 2,5	M 3	M 3,5	M 4	M 5	M 6	M 8	M 10	M 12	M 14	M 16	M 18	M 20	M 22	M 24	M 27	M 30	
	Metrisch	...00 020.000	...00 025.000	...00 030.000	...00 035.000	...00 040.000	...00 050.000	...00 060.000	...00 080.000	...00 100.000	...00 120.000	...00 140.000	...00 160.000	...00 180.000	...00 200.000	...00 220.000	...00 240.000	...00 270.000	...00 300.000	
	Whitworth	—	—	—	—	—	—	...00 525.000	...00 531.000	...00 537.000	...00 544.000	...00 550.000	...00 562.000	—	—	—	—	—	—	
	UNC	—	—	...00 604.000	...00 606.000	...00 608.000	...00 610.000	...00 625.000	...00 631.000	...00 637.000	...00 644.000	...00 650.000	...00 662.000	—	—	—	—	—	—	
	UNF	—	—	...00 704.000	...00 706.000	...00 708.000	...00 710.000	...00 725.000	...00 731.000	...00 737.000	...00 744.000	...00 750.000	...00 762.000	—	—	—	—	—	—	
<b>Measurement table</b>																				
<b>Tool type 620 0... (short version), 620 1... (variant for thin-walled-ENSAT®) and 621 0... (long version), 621 1... (variant for thin-walled-ENSAT®)</b>																				
E <sub>1</sub>		8	8	8	8	8	12,5	12,5	12,5	16	16	25	25	25	25	25	30	30	30	
SW		6,3	6,3	6,3	6,3	6,3	10	10	10	12,5	12,5	20	20	20	20	20	25	25	25	
B		78	78	78	78	78	95	95	95	118	118	145	145	145	169	169	198	198	198	
B <sub>1</sub>		40	40	40	40	40	50	50	50	60	60	60	60	60	60	60	60	60	60	
E		18	18	18	18	18	24	24	24	32	32	50	50	50	58	58	70	70	70	
E <sub>2</sub>		7	7	7	7	7	9	10	12	15	18	20	22	24	26	28	32	35	38	
<b>Tool type 622 0... (short version, reinforced version for high installation torques) and 623 0... (long version, reinforced version for high installation torques)</b>																				
E		○	○	○	○	○	36	36	36	43	43	○	○	○	○	○	○	○	○	
<b>Tool type 630 0... (short version, hexagonal shaft) and 631 0... (long version hexagonal shaft)</b>																				
SW		11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	11,11	—	—	—	—	—	
B		71	71	71	71	71	83	83	83	98	98	118	118	118	—	—	—	—	—	
<b>Tool type 635 0... (short version, hexagonal shaft) and 636 0... (long version, hexagonal shaft)</b>																				
SW		6,35	6,35	6,35	6,35	6,35	6,35	6,35	6,35	6,35	6,35	—	—	—	—	—	—	—	—	
B		66	66	66	66	66	78	78	78	93	93	—	—	—	—	—	—	—	—	
<b>Tool type 640 0... (short version, morse taper shaft) and 641 0... (long version, morse taper shaft)</b>																				
MK	MK0	MK0	MK0	MK0	MK0	MK0	MK2	MK2	MK2	MK3	MK3	MK4	MK4	MK4	MK4	MK4	MK4	MK4	MK4	
B		○	○	○	○	○	○	○	○	○	176,5	○	222,5	○	○	○	○	○	○	
<b>Tool type 626 0... (short version, square socket shank) and 627 0... (long version, square socket shank)</b>																				
SW		—	—	—	—	—	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	
B		—	—	—	—	—	94,5	94,5	94,5	117,5	117,5	140,5	140,5	140,5	168,5	168,5	197,5	197,5	197,5	
<b>Tool type 610 2..., 610 3... (from M 8), 610 4... (from M 6) – (for ENSAT® with hexagon socket)</b>																				
E		—	—	—	—	6	8	10	10	12	14	16	18	—	—	—	—	—	—	
B		—	—	—	—	80	90	100	100	110	125	125	125	—	—	—	—	—	—	
SW		—	—	—	—	4,9	6,2	8	8	9	11	12	15	—	—	—	—	—	—	
<b>Tool type 610 0..., 612 0... (manual driving tools)</b>																				
E		—	6	6	6	6	10	10	10	16	16	16	—	—	—	—	—	—	—	
B		—	55	55	60	60	75	75	75	95	95	95	—	—	—	—	—	—	—	
SW		—	5	5	5	5	8	8	8	12,5	12,5	12,5	—	—	—	—	—	—	—	

In order to obtain the length dimension of the extended tool versions, the specified dimensions B must be added in each case to the dimension B1.

○ = available on request

# Manual Ensats® - installation ...

Manual installation with driving tool and tap wrench:

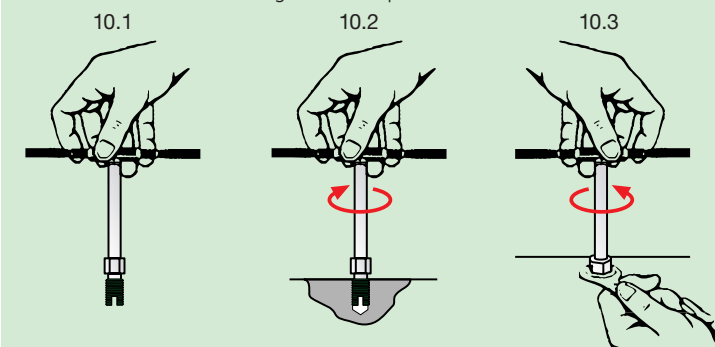


Fig. 10

Emergency installation using screw and nut:

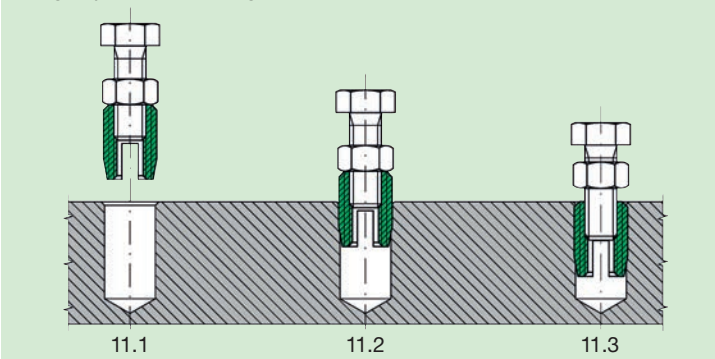


Fig. 11

## Manual Insertion Process

The manual insertion is usually carried out using the manual tool 610 0 ... via the female thread or in the case of the tools 610 2 ... using the hexagon socket. You can of course also use power tools for the manual assembly. If doing so, it needs to be ensured that the rotatable sleeve (2, see fig. 6) is in the corresponding correct position (see fig. 15 procedure description).

Image 10.1/11.1

Thread the Ensats®, cutting geometry (slit or bore) has to be pointing downward. Attention needs to be paid while doing so that the screw with nut does not face in the direction of the cutting geometry after locking with a counter nut, as the shavings are otherwise not discharged.

Image 10.2/11.2

Screw in the Ensats® until approx. 0.1-0.2 mm underneath the surface of the work piece like in image 4 (during temporary assembly using screw and nut, the Ensats® should be processed until flat). Vertical assembly must be ensured.

Image 10.3/11.3

Loosen the counter nut, otherwise the Ensats® could possibly become unscrewed. Subsequently screw out the screw/screw-in tool.



Fig. 12

# Machine Ensats® - installation...

## Machine driving process

1. Precisely position the workpiece so that the bore and machine spindle are at right angles to each other (do not tilt).  
Set the machine to the precise installation depth (appr. 0.1 to 0.2 mm below the surface of the workpiece see page 5).
2. Actuate the operating lever of the machine.  
The rotatable outer shell of the tool must be resting against the outer visible stop pins at the beginning of the turning process so that it is driven by the pins in the clockwise direction.
3. Feed the Ensats® towards the tool (slot or cutting hole facing downwards) and grip for the duration of 2 to 4 revolutions.
4. Continue to actuate the operating lever of the machine and to guide the tool to the hole until the Ensats® cuts into the borehole. The remainder of the driving process takes place without actuating the feed.
5. Switch on the reversing function (depending on the type and structure of the device, this takes place automatically by means of a limit switch / depth sensor). Avoid setting the tool down hard on the workpiece as this can lead to breakage of both the tool and the Ensats®. It can also damage the play-free fit of the Ensats® and so reduce the pull-out strength. If necessary, adapt the driving speed in line with the necessary reversal time.

Machine installation takes place using the driving tools illustrated on page 7, mounted in:

### 1. Thread tapping machine

### 2. Drill press

with reversing system by means of depth stop or thread cutting head. Without guide cartridge, without feed.  
Important: Do not exceed tightening torques.

### 3. Manual machine

With depth sensor and reversing system. See fig. 12.

### 4. Single or multiple installation machines

With pneumatic or electric drive; semi or fully automatic, computer controlled (CNC).  
Note different pitches.

## Guideline speed values for light alloy:

Ensats® female thread	Speed rpm [min <sup>-1</sup> ]
M 2,5 / M 3	650 – 900
M 4 / M 5	400 – 600
M 6 / M 8	280 – 400
M 10 / M 12	200 – 300
M 14 / M 16	150 – 200
M 18 / M 20	120 – 200
M 22 / M 24	100 – 160
M 27 / M 30	80 – 140

Fig. 13

## Guideline values for driving torques:

Ensats® M 2,5	1,5 Nm
Ensats® M 3	2,5 Nm
Ensats® M 4	5,5 Nm
Ensats® M 5	10 Nm
Ensats® M 6	15 Nm
Ensats® M 8	28 Nm
Ensats® M 10	40 Nm
Ensats® M 12	60 Nm
Ensats® M 14	100 Nm
Ensats® M 16	160 Nm
Ensats® M 18	220 Nm
Ensats® M 20	310 Nm
Ensats® M 22	420 Nm
Ensats® M 24	530 Nm
Ensats® M 27	770 Nm
Ensats® M 30	1050 Nm

Fig. 14

## Torque M<sub>D</sub>

The maximum admissible torque is dependent on:

1. The axial load capacity of the tool stud
2. The pressure resistance capacity of the Ensats® in the axial direction

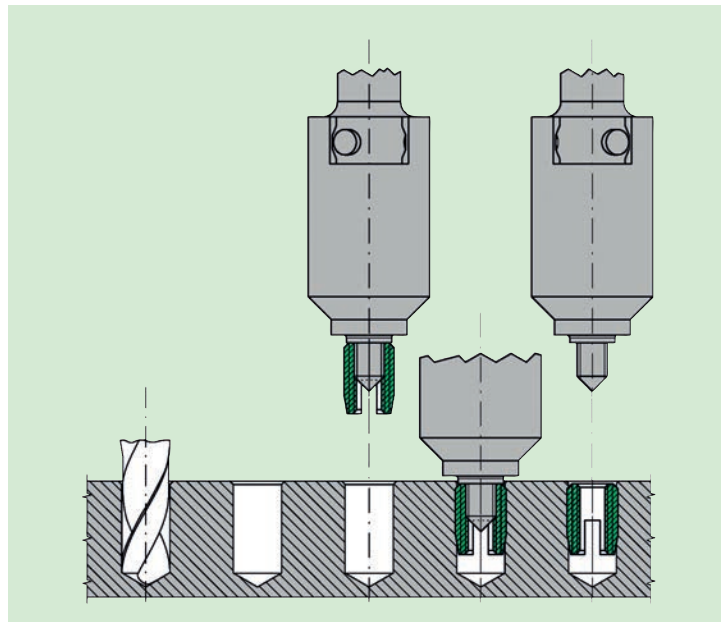
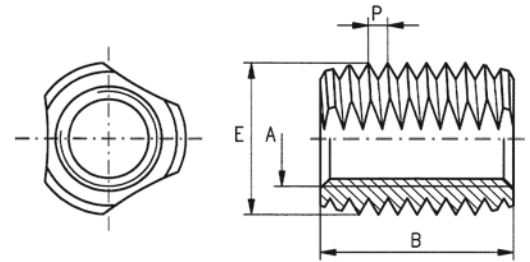


Fig. 15

**Application**

For the manufacture of wear-resistant screw fastenings capable of withstanding high loads in plastic, preferably thermosetting plastics.

The outside thread is interrupted by three longitudinal grooves which permit the Ensat®-3F to form the thread into the receiving hole.



Dimensions in mm

Article number	Internal thread	External thread		Length	Guideline values for receiving hole dia.		Minimum borehole depth for blind holes
	A	E	P		B	L	T
305 000 030.800	M 3	5	0,5	6	4,6 to 4,7	7	
305 000 040.800	M 4	6,5	0,75	8	6,0 to 6,1	9	
305 000 050.800	M 5	8	1	10	7,3 to 7,4	11	
305 000 060.800	M 6	10	1,5	14	9,0 to 9,2	15	

**Example for finding the article number**

Self-tapping threaded insert Ensat®-3F to Works Standard 305 with internal thread A = M5 made of brass:  
Ensat®-3F 305 000 050.800

**Materials**

Brass

Article-No. (**fourth** group of digits) ... .. 800

**Other materials, designs and finishes on request.**

**Tolerance**

ISO 2768-m

**Thread**

Internal thread A: as per ISO 6H  
External thread E: as per KKV standard  
Internal thread UNC, UNF, Whitworth on request