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 backlash-free 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 industry
A wide range of supply parts such as wing mirrors, engines, transmissions

Household appliance and office machinery production
Vacuum cleaners, cameras, sun lamps, drills etc.

Electrical and laboratory supplies
Capacitors, radio and telecommunication systems, dental technology equipment.

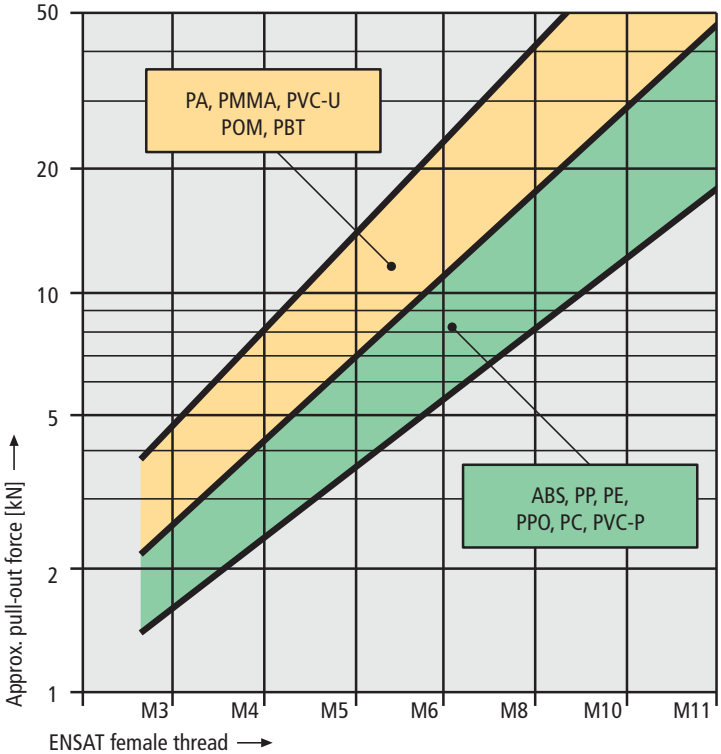
Plant and equipment construction
Flange connections etc.

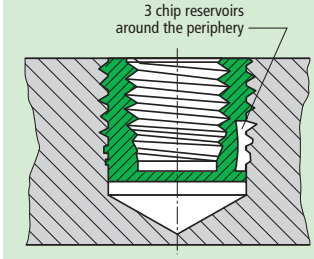
Sports equipment
Tennis rackets, ski bindings etc.

Product features

- Universal application for all types of plastic, thermoset plastics, thermoset plastics, PU/PUR foam, fibreglass reinforced plastics, 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 glass fibre reinforced plastics, 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 11





Ensat®-SBS 337/338
These cutting bores are shaped to serve as chip reservoirs. The chips created during the driving process are 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 15

The Ensat®
in the workpiece ...

Installation recommendation

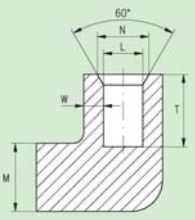
The Ensat should be processed appr. 0,1 - 0,2 mm recessed. After processing, the Ensat can be immediately subjected to load. If the component material permits subsidence of the Ensat under load, the Ensat can only execute an axial movement of 0,1 to 0,2 mm. In other words, the pretension of the screw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

Retaining hole

The receiving hole can be simply drilled or already provided for in the casting.

Countersinking the borehole is recommended in order to:

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

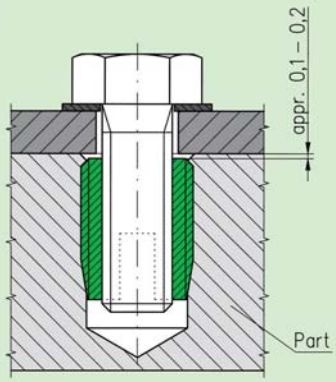


Design of moulded part and receiving hole

Guideline values for countersink:
N = (0,06 to 0,08 x E) +E

Material thickness:
Smallest admissible material thickness ≥ length of the Ensat.

Depth of the blind hole T:
see Works Standard sheets, page 8 to 27



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 depends on the planned stress level and the elasticity of the material into which the Ensat is screwed.
Guideline values for plastic:
W ≥ 0,25 to 0,9 E

In moulded parts made of glass fibre reinforced plastic, a high pull-out resistance is reached if the casting skin is removed in the receiving hole by drilling open.

Avoid any tilting between the Ensat and the screw – under the head or in the thread. For this reason, in the case of adjusting screws the Ensat is driven in to a depth of >=1 mm. Studs must be fixed against the floor surface of the blind hole.

Example

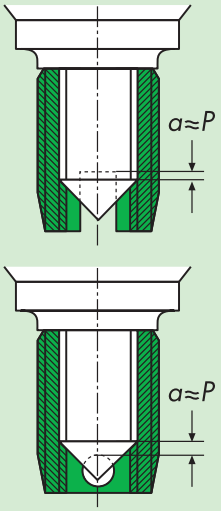
Female thread M8, recommended borehole diameter for

Ensat®-S 302:
10,9 to 11,2 mm
Ensat®-SB 307/308:
11,1 to 11,3 mm
(see Works Standard sheets)

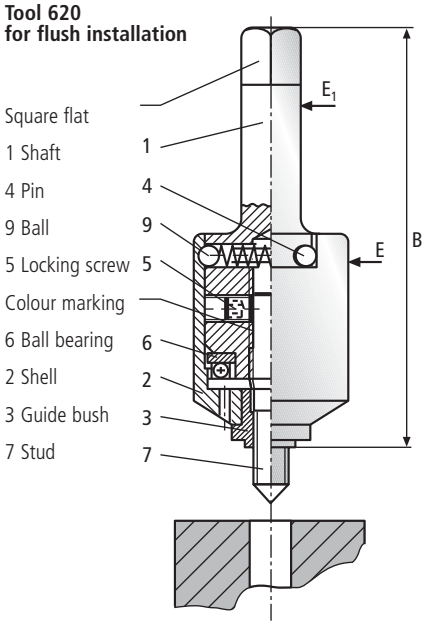
In case of processing problems (e.g. extreme screw-in torque levels), it is generally of no consequence to choose the next highest column for the diameter data. In case of doubt, it is worth testing this.

The correct length of the stud for the Ensat with cutting slot / cutting bore results from the pitch of the internal thread (see also illustration below; P=pitch of the internal thread).

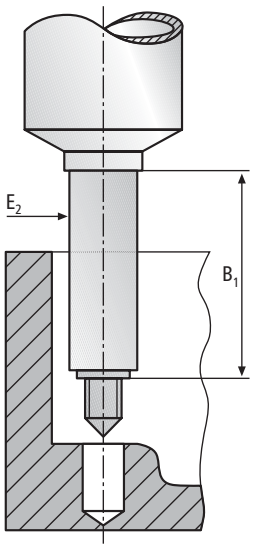
Ensat®– driving tools ...



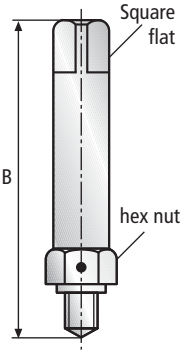
Tool 620
for flush installation



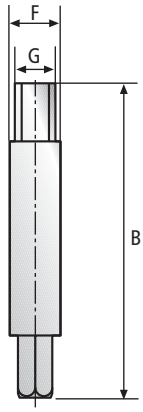
Tool 621
For deep receiving holes



Tool 610
for manual installation



Tool 6102
for Ensat-SBI



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. For short Ensats, grind down the thread of tool 610 accordingly.
- If you wish the Ensat to be driven deeper than 0,2 mm below the workpiece surface, screw off the guide bush (3) at the front.

Diameter: 0,1 to 0,2 mm smaller than the Ensat receiving hole.

For mounting the thin-walled Ensat (Page 11), modified guide bushes should be used. (available on request)

Dimensions [mm]

For Ensat	Tool 620 Article-no.							Square SW D	Length ≈ B	Tool 621 Article-no.			Manual assembly tool Article-no.	Length ≈ B	Square SW D	Collar Sw D	For Ensat-SBI	Tool 6102 Machine/Hand Article-no.	Length ≈ B	Square SW G	Shank Ø F
			Whitworth	UNC	UNF	E	E1				B1	E2									
M 2	-	620 000 020	-	-	-	18	8	6,3	78	621 000 020	40	7	610 000 020	55	5	7	M 2	-	-	-	-
M 2,5	-	620 000 025	-	-	-	18	8	6,3	78	621 000 025	40	7	610 000 025	55	5	7	M 2,5	-	-	-	-
M 3	Nr. 4	620 000 030	-	620 000 604	620 000 704	18	8	6,3	78	621 000 030	40	7	610 000 030	55	5	7	M 3	-	-	-	-
M 3,5	Nr. 6	620 000 035	-	620 000 606	620 000 706	18	8	6,3	78	621 000 035	40	7	610 000 035	60	5	7	M 3,5	-	-	-	-
M 4	Nr. 8	620 000 040	-	620 000 608	620 000 708	18	8	6,3	78	621 000 040	40	7	610 000 040	60	5	7	M 4	610 200 040	80	4,9	6
M 5	Nr. 10	620 000 050	-	620 000 610	620 000 710	24	12,5	10	95	621 000 050	50	9	610 000 050	75	8	13	M 5	610 200 050	90	6,2	8
M 6	1/4"	620 000 060	620 000 525	620 000 625	620 000 725	24	12,5	10	95	621 000 060	50	10	610 000 060	75	8	13	M 6	610 200 060	100	8	10
M 8	5/16"	620 000 080	620 000 531	620 000 631	620 000 731	24	12,5	10	95	621 000 080	50	12	610 000 080	75	8	13	M 8	610 200 080	100	8	10
M 10	3/8"	620 000 100	620 000 537	620 000 637	620 000 737	32	16	12,5	118	621 000 100	60	15	610 000 100	95	12,5	19	M 10	610 200 100	110	9	12
M 12	7/16"	620 000 120	620 000 544	620 000 644	620 000 744	32	16	12,5	118	621 000 120	60	18	610 000 120	95	12,5	19	M 12	610 200 120	125	11	14
M 14	1/2"	620 000 140	620 000 550	620 000 650	620 000 750	50	25	20	145	621 000 140	60	20	610 000 140	95	12,5	19	M 14	-	-	-	-
M 16	5/8"	620 000 160	620 000 562	620 000 662	620 000 762	50	25	20	145	621 000 160	60	22	-	-	-	-	M 16	-	-	-	-
M 18	-	620 000 180	-	-	-	50	25	20	145	621 000 180	60	24	-	-	-	-	M 18	-	-	-	-
M 20	-	620 000 200	-	-	-	58	25	20	169	621 000 200	60	26	-	-	-	-	M 20	-	-	-	-
M 22	-	620 000 220	-	-	-	58	25	20	169	621 000 220	60	28	-	-	-	-	M 22	-	-	-	-
M 24	-	620 000 240	-	-	-	70	30	25	198	621 000 240	60	32	-	-	-	-	M 24	-	-	-	-
M 27	-	620 000 270	-	-	-	70	30	25	198	621 000 270	60	35	-	-	-	-	M 27	-	-	-	-
M 30	-	620 000 300	-	-	-	70	30	25	198	621 000 300	60	38	-	-	-	-	M 30	-	-	-	-

Tools 620 and 621 also fit within the coloured lines for other thread dimensions, if the guide bush and stud are exchanged

Machine installation ...

Machine driving process

1. Precisely position the workpiece to ensure that the hole and machine spindle are in exact alignment (do not tilt). Set the machine to the precise driving depth (appr. 0,1 – 0,2 mm below the surface of the workpiece).

2. Turn the machine to clockwise rotation. At the start of the driving process, the rotatable external shell of the tool must be resting against the external visible stop pins in such a way that it is driven by the pins in the clockwise direction.

3. Feed the Ensat towards the tool **(slot or cutting bore facing downwards)** and grip for the duration of 2 to 4 revolutions.

4. Actuate the operating lever of the machine until the Ensat cuts into the borehole. The remainder of the driving process takes place without actuating the feed.

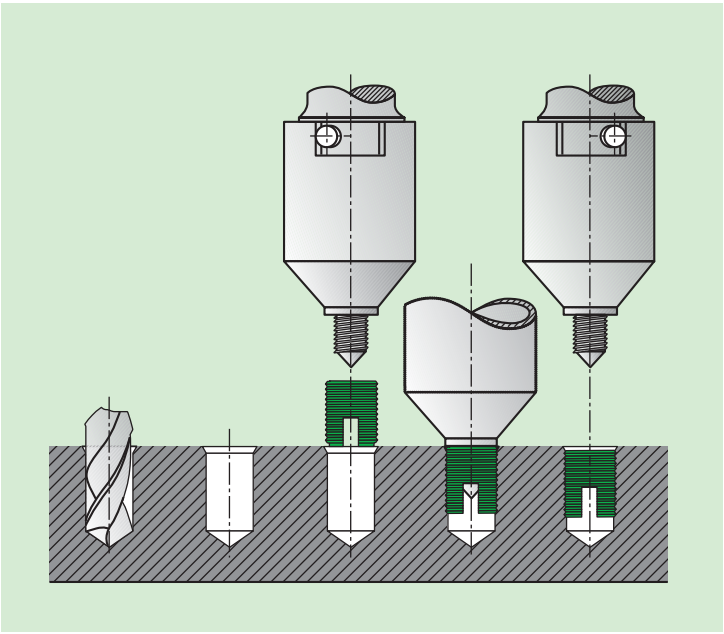
5. Switch on the reversing function. Always avoid setting the tool down hard on the workpiece, as this can lead breaking of both the tool and the Ensat.
Excessively hard contact of the tool can damage the play-free fit of the Ensat and so reduce the pull-out strength. If necessary, the driving speed may have to be adapted in line with the necessary reversal time.

Machine installation takes place with production tool 620 or 621, integrated in a:

- **Thread tapping machine**
- **Use a drill press** fitted with a reversing tapping attachement or a tapping machine which is not pitch controlled.
  Important: Never exceed the maximum admissible driving torque.
- **Special manual machine** with bit stop and reversing system.

For large-scale series:

- **Single or multiple installation machines**
  with pneumatic or electric drive, semi or fully automatic (CNC).
  Attention of different pitches.



Torque M
The maximum admissible torque depends on:
1. The axial load capacity of the tool stud
2. The pressure resistance capacity of the Ensat in the axial direction.

Recommended speed values for plastic:

Ensat® Internal thread	Speed [min^{-1}]
M 2,5 / M 3	800 - 1300
M 4 / M 5	600 - 900
M 6 / M 8	400 - 700
M 10 / M 12	300 - 450
M 14 / M 16	240 - 350
M 18 / M 20	180 - 300
M 22 / M 24	160 - 250
M 27 / M 30	140 - 200

Guideline value for installation torque

Ensat® M 2,5	1,5 Nm
Ensat® M 3	2,5 Nm
Ensat® M 4	5,5 Nm
Ensat® M 5	10 Nm
Ensat® M 6	15 Nm
Ensat® M 8	28 Nm
Ensat® M 10	40 Nm
Ensat® M 12	60 Nm