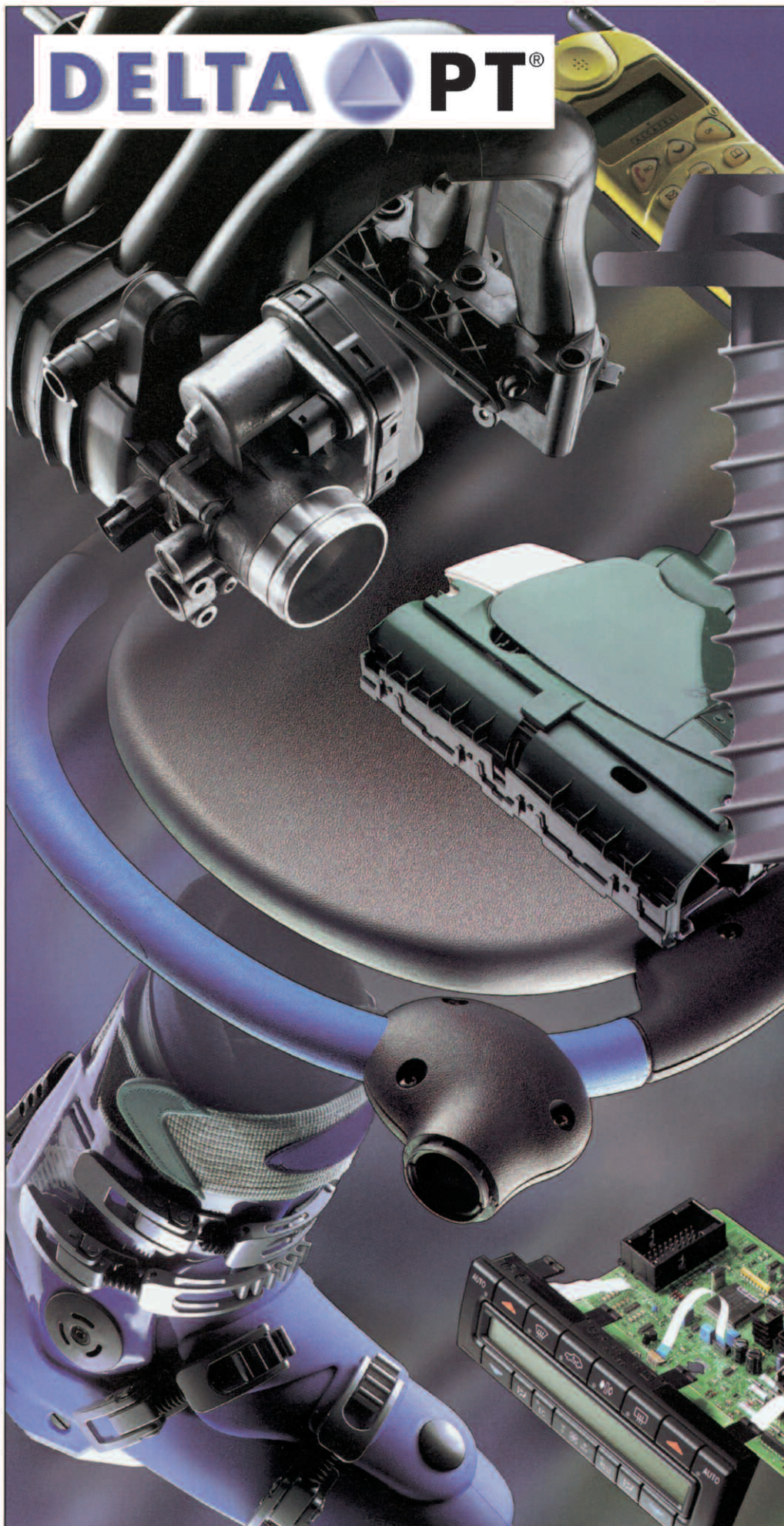


DELTA  **PT**®

 **Semblex**



Semblex
DELTA PT®
Screw

***The Fastener
Solution***

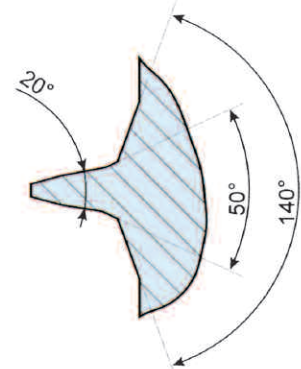
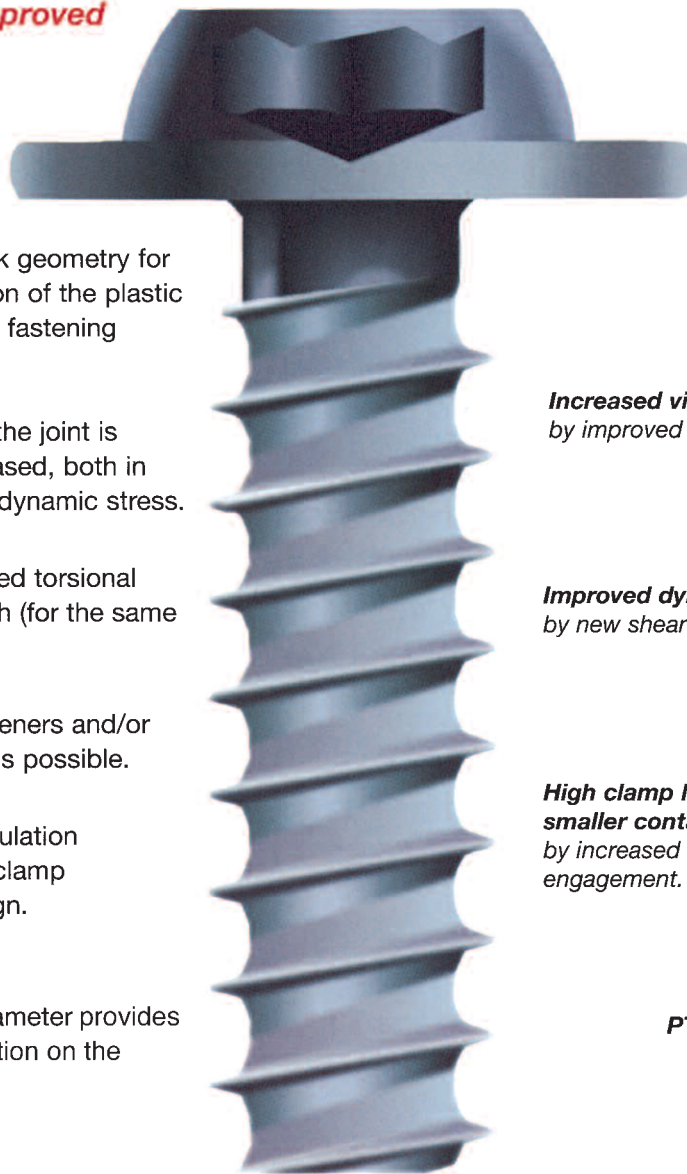


The Semblex Delta PT® offers the well-known benefits of the PT® Screw

- minimum radial tension
- optimum pitch, high non-reversibility of the thread
- optimum material flow

Calculated for improved performance!

- New designed flank geometry for a better deformation of the plastic material during the fastening process.
- The service life of the joint is substantially increased, both in case of static and dynamic stress.
- Up to 50% improved torsional and tensile strength (for the same nominal diameter).
- Use of shorter fasteners and/or smaller diameters is possible.
- The Delta PT® calculation program allows a clamp load oriented design.
- Increased head diameter provides better load distribution on the contact area.

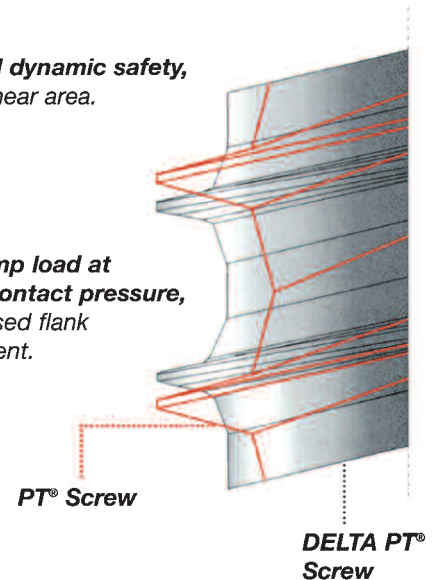


- All dimensions are for reference only
Flank geometry

Increased vibrational safety
by improved pitch.

Improved dynamic safety,
by new shear area.

High clamp load at smaller contact pressure,
by increased flank engagement.



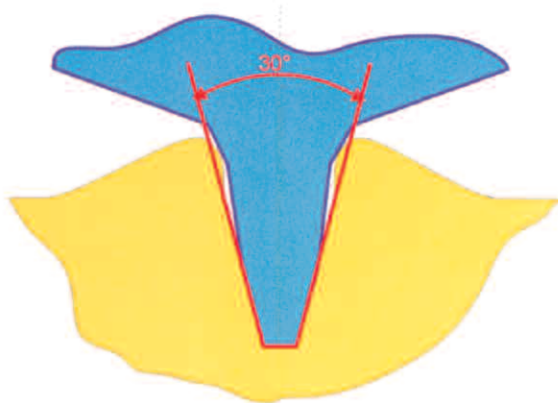
PT® Screw

DELTA PT® Screw

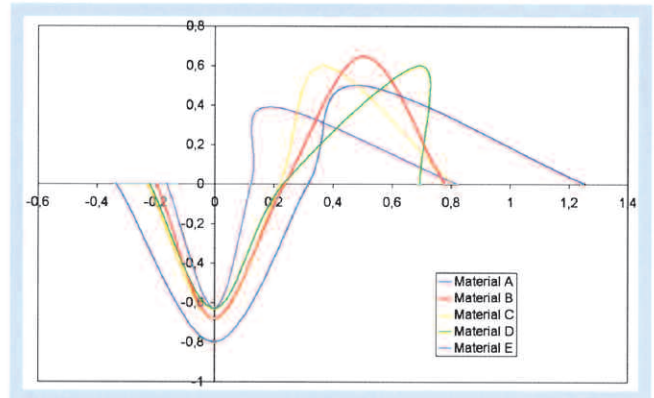
Threaded flank supports material deformation

Optimum thread forming without any material damage, by newly developed flank design.

By means of detailed analysis of the material disposition while thread-forming, it was possible to create an optimal flank geometry. During material deformation, lowest resistance can be observed, which prevents friction-inflicted heating.



- Comparison of flank angles**
- PT® thread flank
 - Delta PT® thread flank
 - Thermoplastic material



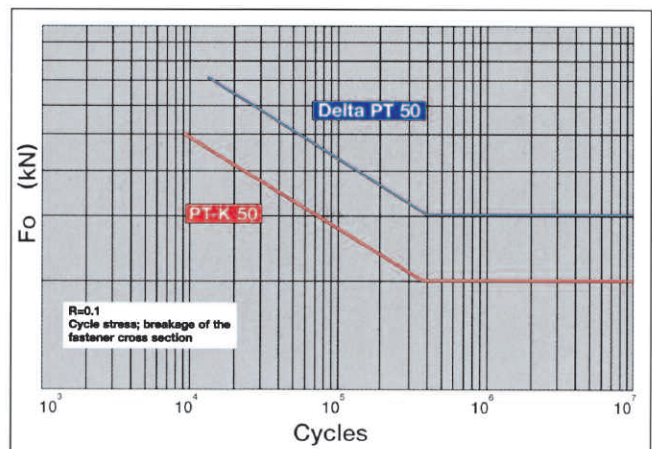
Optimum thread design by analysis of the built-up curves.

Increased dynamic safety

Improved dynamic safety by new shear area.

The permanent strength of the fastener cross section was essentially improved by an extended core diameter and an optimum thread design.

To further increase the dynamic safety, the thread teeth were stabilized which led to an improved safety against flank breakage. The improved pitch allows a better flank engagement and provides better conditions against stress fracture of the thread flank.



Cycle stress by PT® and Delta PT®; breakage of the fastener cross section

Up to 50% improved tensile and torsion strength

The enlarged shear area increases the tensile and torsion strength. As a result of this, even high-filled thermoplastics will reach improved clamp loads and tightening torques.

The T/F_v-diagram shows the occurring failure with respect to torque and clamp load. In addition, a straight line (yellow) marks the limit of thread stripping and a second straight line (orange) shows the limit with respect to boss deformation in case of pressure. The curves of the diagram indicate the point of screw breakage. The black line for assembly represents the ratio between torque and clamp load.

Optimum pitch:

high clamp load at smaller contact pressure by means of high flank engagement

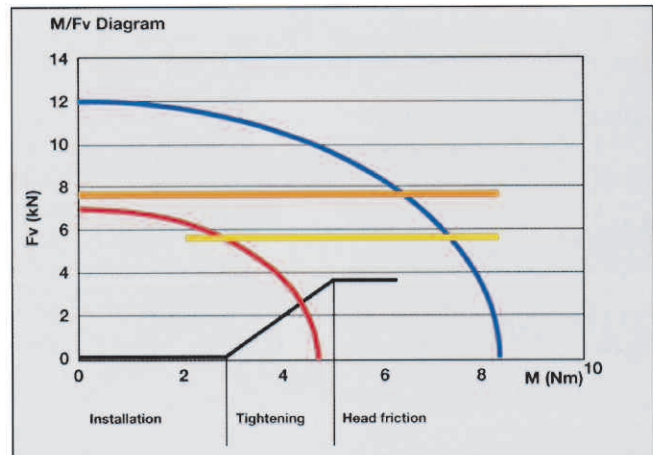
The optimum helix angle was developed by optimizing the relation between the highest possible clamp load at low contact pressure in the plastic material. Due to the optimum pitch, a higher flank coverage at equal installation depth can be achieved. If necessary, installation depths can be reduced. The optimum helix angle leads to a joint of high dynamic safety.

Reduction of fastener length and/or diameter

The following example shows that with equal flank engagement, which is due to a smaller pitch, a smaller installation depth can be achieved.

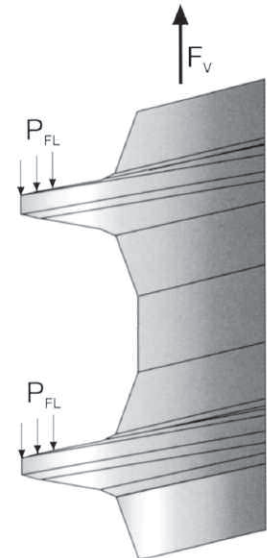
With the given flank engagement A_{fl} , the required installation depth d_i can be calculated. A comparison of breaking torques shows that the Delta PT® with a smaller diameter provides better results than the PT® Screw.

The comparison between Delta PT® and PT® shows: **when using the Delta PT®, a shorter screw can be employed at same clamp load.**



- Assembly line
- Screw breakage DELTA PT®
- Screw breakage PT fastener

$$P_{FL} = \frac{F_v}{(d_1^2 - d^2) \left(\frac{\pi}{4}\right) \left(\frac{d_i}{p}\right)}$$



	A _{fl}	p	d	d _i	T _B
	mm ²	mm	mm	mm	Nm
Delta PT® 40	35	1.40	3.20	11.75	5.70
Delta PT® 50	35	1.72	4.00	9.88	8.36
K 50	35	2.24	4.00	13.24	4.70

Key:

- A_{fl} = flank engagement
- p = pitch
- d₁ = external thread diameter
- d = hole diameter
- d_i = eff. installation depth
- T_B = breaking torque
- P_{FL} = surface pressure
- F_v = clamp load



Calculation program

Next to the improved engineering features, a calculation program was developed for the Delta PT® Screw which offers the advantage of a foregoing dimensioning of the joint.

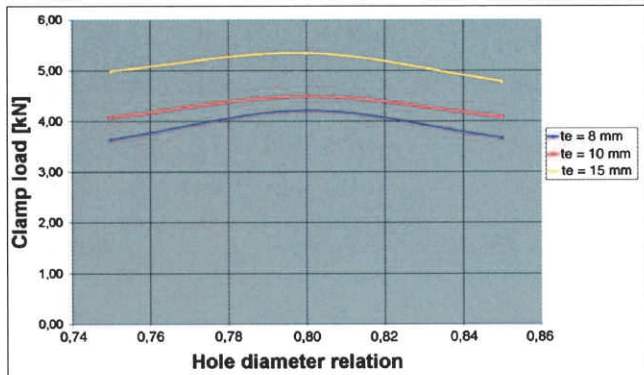
The calculation program aids in the dimensioning of the fastener, assists in determining the load carrying ability and forecasting the life of the joint.

Boss design for Semblex Delta PT® Screws

The criteria for the optimum hole diameter is to achieve the maximum clamp load during stripping. It is more dependent on the thread pitch than on the material and the installation depth. The most favorable hole diameter is:

$$d = 0.8 \times d_1$$

In order not to be too far away from this optimum, the value as a function of the E-module should not fall under $0.8 d_1$ and should not be more than $0.88 d_1$.



Hole diameter for Semblex Delta PT® Screws.

In principle, the boss design should correspond to the following design recommendation.

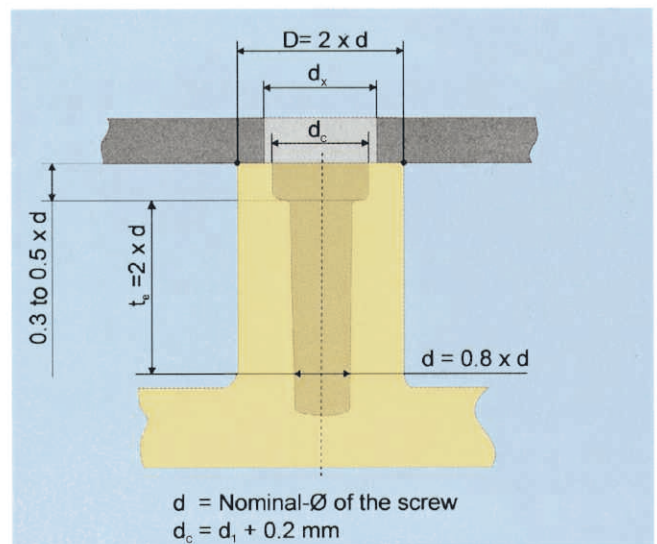
The counterbore is of special importance, as it ensures a favorable edge stress, thus preventing boss cracking. In addition, the counterbore acts as guide during setting and initial thread forming.

The prerequisite for a safe screw joint is the functional design of the components.

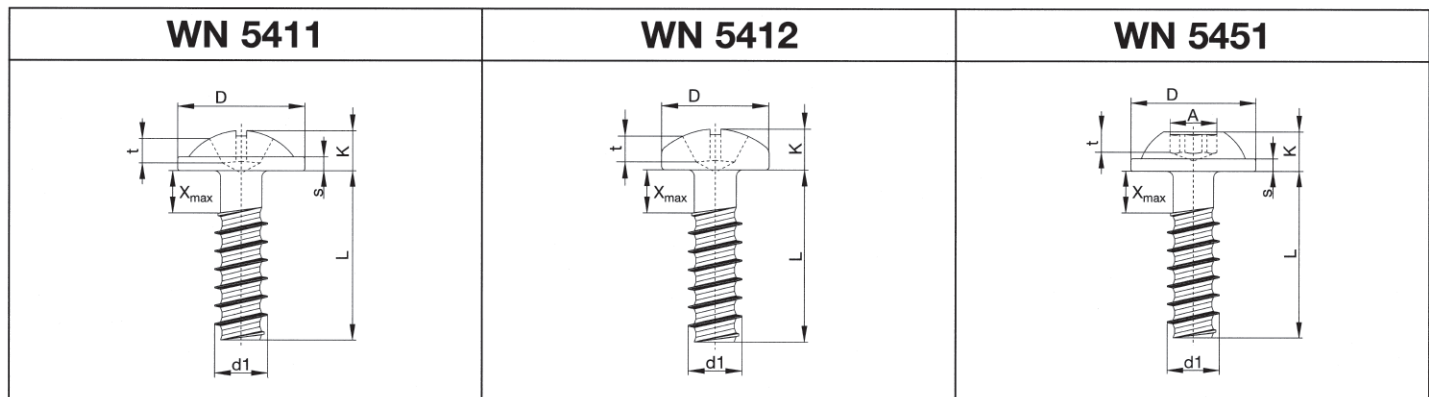
Design recommendations have been worked out on the basis of laboratory tests. In practical operations, variations of these recommendations may occur due to:

- processing conditions of the material,
- design of the injection molding tool,
- distance to the injection point,
- the formation of welding lines,
- local textures caused by additives and fillings,
- materials often show different structures.

Thus, speed related fastening tests should be carried out with initial samples.



Construction recommendation



How to specify:

Specification of an Semblex Delta PT® Screw diameter 4 mm and length 20 mm

a) with Semblex TORX PLUS®/AUTOSERT® drive according to WN 5451

Semblex Delta PT® Screw 40 x 20 WN 5451

b) with Z-cross recess according to WN 5411

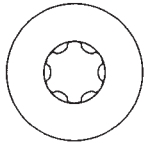
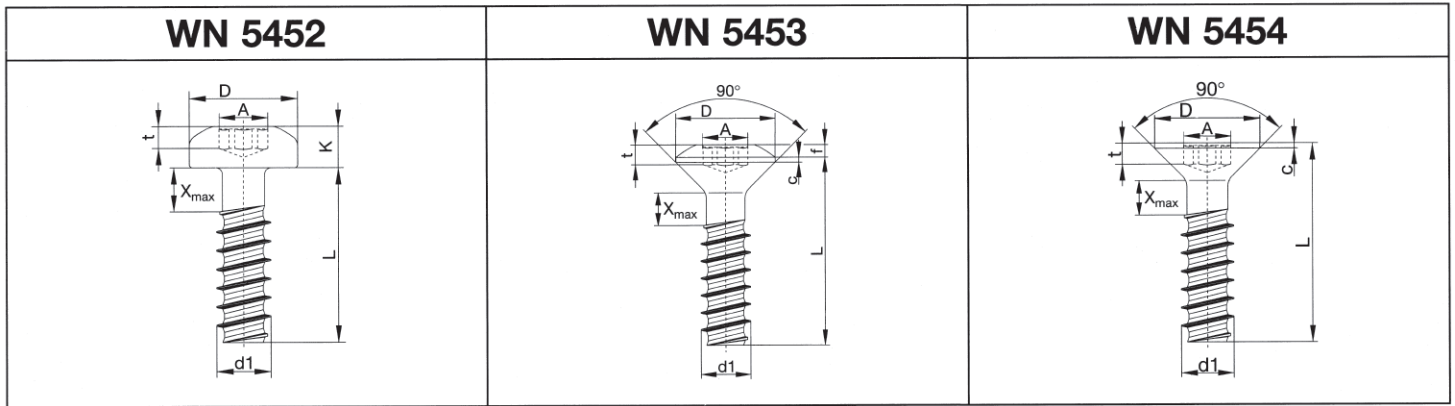
Semblex Delta PT® Screw Z 40 x 20 WN 5411

TYPE 1-cross recess TYPE 1A-cross recess

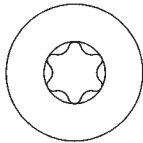


All cross recess and TORX drives are also available as combination drives.

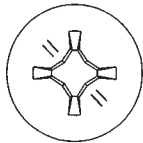
Delta PT®	Dimensions	18	20	22	25	30	35	40	45	50	60	70	80	100	
	Major diameter Ø	d ₁	↑	2.0	2.2	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	10.0
	Core diameter Ø	d ₂		1.36	1.51	1.72	2.09	2.45	2.81	3.17	3.53	4.26	4.98	5.70	7.15
	Thread pitch	p		0.78	0.85	0.95	1.12	1.29	1.46	1.63	1.80	2.14	2.48	2.82	3.50
	Thread run-out	x _{max}		1.0	1.1	1.3	1.5	1.8	2.0	2.3	2.5	3.0	3.5	4.0	5.0
WN 5411	Head diameter	D		4.5	5.0	5.5	6.5	7.5	9.0	10.0	11.0	13.5	15.5	↑	↑
	Head height	K		1.40	1.60	1.80	2.10	2.40	2.50	2.50	3.20	4.00	4.60	↑	↑
	Washer thickness	s		0.6	0.6	0.7	0.8	0.9	1.0	1.0	1.2	1.4	1.6	↑	↑
	Type 1 width	≈ m		2.28	2.44	2.55	2.86	3.45	4.15	4.15	4.76	6.42	6.98	↑	↑
	cross recess penetration depth	t min.		0.51	0.68	0.82	1.15	1.07	1.33	1.33	1.98	2.24	2.84	O	O
		t max.	O	0.97	1.14	1.28	1.61	1.70	1.96	1.96	2.61	2.90	3.50	N	N
	Type 1A width	≈ m	N			2.61	2.83	3.84	4.13	4.13	4.71	6.34	6.95		
		cross recess penetration depth	t min.				1.01	1.26	1.08	1.40	1.40	2.01	2.27	2.91	R
t max.	R					1.26	1.51	1.54	1.86	1.86	2.47	2.73	3.37	E	E
Driver size		E	1	1	1	1	2	2	2	2	3	3	Q	Q	
WN 5412	Head diameter	D	Q	3.5	3.9	4.4	5.3	6.1	7.0	7.5	8.8	10.5	12.3	U	U
	Head height	K	U	1.60	1.60	1.90	2.30	2.70	3.10	3.20	3.50	4.20	5.10	E	E
	Type 1 width	≈ m	E	2.32	2.40	2.56	2.85	4.02	4.25	4.25	4.85	6.53	7.05	S	S
	cross recess penetration depth	t min.	S	0.64	0.74	0.92	1.19	1.23	1.51	1.51	2.12	2.44	3.00	T	T
		t max.	T	1.10	1.20	1.38	1.65	1.86	2.14	2.14	2.75	3.10	3.66	↓	↓
	Type 1A width	≈ m				2.59	2.89	3.93	4.29	4.29	4.86	6.55	7.10	↓	↓
	cross recess penetration depth	t min.				1.08	1.36	1.26	1.62	1.62	2.23	2.57	3.14	↓	↓
t max.					1.33	1.61	1.72	2.08	2.08	2.67	3.03	3.61	↓	↓	
Driver size			1	1	1	1	2	2	2	2	3	3	↓	↓	
WN 5451	Head diameter	D		4.5	5.0	5.5	6.5	7.5	9.0	10.0	11.0	13.5	15.5	18.0	21.5
	Head height	K		1.6	1.6	1.9	2.3	2.7	3.1	3.2	3.5	4.2	5.1	5.6	6.6
	Washer thickness	s		0.6	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.6	1.8	2.2
	TORX PLUS® / AUTOSERT®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP	50 IP
	Penetration depth	t min.	↓	0.65	0.65	0.80	1.00	1.10	1.40	1.40	1.50	1.90	2.30	2.60	3.00



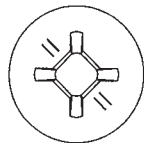
TORX Plus®



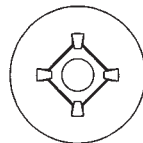
TORX®



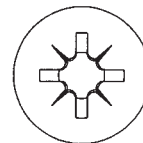
**ACR®
PHILLIPS II®**



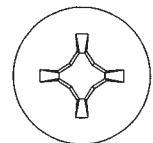
**PHILLIPS
SQUARE-DRIV®**



QUADREX®



TYPE 1A



TYPE 1

Delta PT®	Dimensions		18	20	22	25	30	35	40	45	50	60	70	80	100
	Major diameter Ø	d ₁	↑	2.0	2.2	2.5	3.0	3.5	4.0	4.5	5.0	6.0	7.0	8.0	10.0
	Core diameter Ø	d ₂		1.36	1.51	1.72	2.09	2.45	2.81	3.17	3.53	4.26	4.98	5.70	7.15
	Thread pitch	p		0.78	0.85	0.95	1.12	1.29	1.46	1.63	1.80	2.14	2.48	2.82	3.50
	Thread run-out	X _{max}		1.0	1.1	1.3	1.5	1.8	2.0	2.3	2.5	3.0	3.5	4.0	5.0
WN 5452	Head diameter	D	↑	3.5	3.9	4.4	5.3	6.1	7.0	7.5	8.8	10.5	12.3	14.1	17.0
	Head height	K	O	1.6	1.6	1.9	2.3	2.7	3.1	3.2	3.5	4.2	5.1	5.6	6.6
	TORX Plus® / AUTOSERT®		N	6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP	50 IP
		A		1.75	1.75	2.40	2.80	3.35	3.95	3.95	4.50	5.60	6.75	6.75	8.95
	Penetration depth	t min.	R	0.65	0.65	0.80	1.00	1.10	1.40	1.40	1.50	1.90	2.30	2.60	3.00
WN 5453	Head diameter	D	E	4.0	4.4	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	20.0
	Flat on head	c	max. Q	0.35	0.35	0.55	0.55	0.65	0.70	0.70	0.75	0.85	0.90	0.95	1.10
		≈ f	U	0.40	0.40	0.50	0.70	0.80	1.00	1.00	1.20	1.20	1.30	1.40	1.60
	TORX Plus® / AUTOSERT®		E	6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP	50 IP
		A	S	1.75	1.75	2.40	2.80	3.35	3.95	3.95	4.50	5.60	6.75	6.75	8.95
Penetration depth	t min.	T	0.65	0.65	0.80	1.00	1.10	1.40	1.40	1.50	1.90	2.30	2.60	3.00	
WN 5454	Head diameter	D	↓	4.0	4.4	5.0	6.0	7.0	8.0	9.0	10.0	12.0	14.0	16.0	20.0
	Flat on head	c	max.	0.35	0.35	0.55	0.55	0.65	0.70	0.70	0.75	0.85	0.90	0.95	1.10
	TORX Plus® / AUTOSERT®			6 IP	6 IP	8 IP	10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP	50 IP
		A		1.75	1.75	2.40	2.80	3.35	3.95	3.95	4.50	5.60	6.75	6.75	8.95
Penetration depth	t min.	↓	0.50	0.50	0.70	0.75	0.95	1.10	1.25	1.25	1.50	2.25	2.40	3.00	

Material:

Through hardened steel.
Other materials available on request.

Finishes:

All commercially available coatings.
Other finishes available on request.

Special Configurations			
<p>Special configurations are available. Please contact the Semblex application engineers to realize your multifunctional designs.</p>			



PT® FAMILY OF PRODUCTS

The  Semblex PT®



DESIGN FOR MANUFACTURING
DESIGN FOR ASSEMBLY

BENEFITS

- Reduces radial stresses
- Lower installation torque
- Natural resistance to relaxation
- Minimizes clamp load loss
- High Resistance to pullout forces
- Provides repeat assembly
- Allows for elimination of threaded inserts
- Allows for thinner boss design
- Reduces molded material required
- Shorter injection mold cycle times

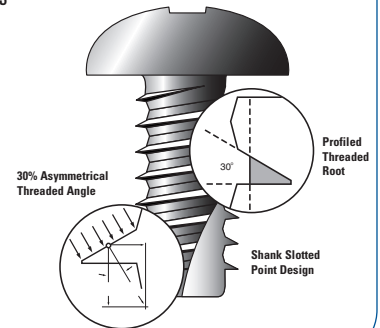


Sleek thread profile minimizes assembly stresses and cracking.

The  Semblex DURO PT®

FOR THERMOSET PLASTICS

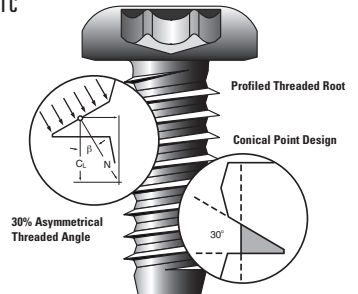
- Lower drive torque
- Less material displacement
- Improved resistance to stripping
- High strip to drive torque ratios
- Improved vibration resistance
- Repeat installation
- Greatly reduces boss expansion and cracking
- Greater pullout strength



The  Semblex PT®, TYPE DG

FOR DIE CASTINGS AND HIGHLY REINFORCED THERMOPLASTIC

- High strip resistance due to asymmetrical thread flank
- Improved vibration resistance
- Greater pullout strength
- Point design allows for improved assembly
- No additional locking features required



Engineering Specifications for PT®,
Duro PT® and PT® Type DG at
www.semblex.com



Providing Fastening SolutionsSM

199 West Diversey Avenue / Elmhurst, IL 60126

Phone: (800) 323-1736 / (630) 833-2880

Fax: (630) 941-8440

www.semblex.com

Email: sales@semblex.com