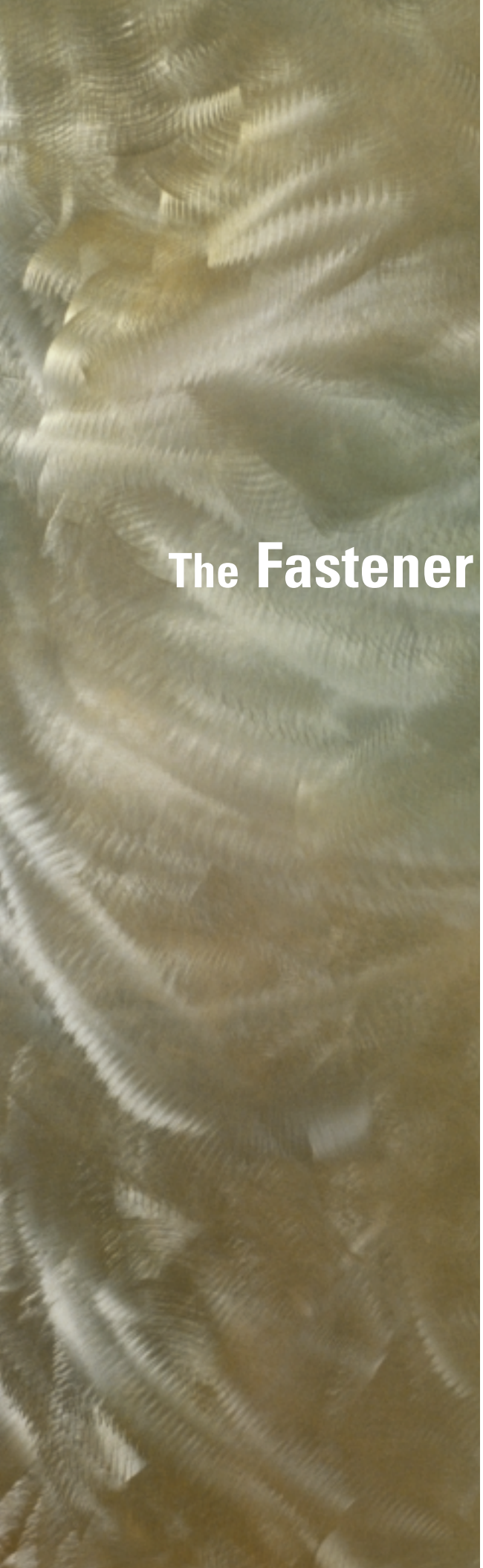


The Semblex PT®

The Fastener SOLUTION for Thermoplastics

SCREWS FOR PLASTICS

Semblex®

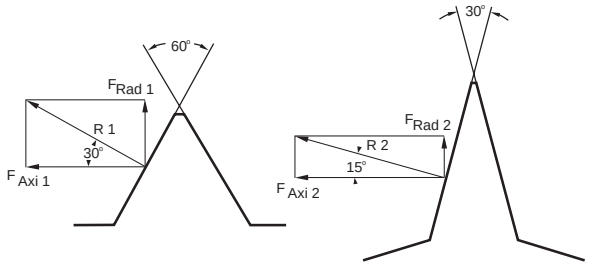
30° Thread Angle

Reduces radial stresses

Provides increased thread depth

Lower installation torque

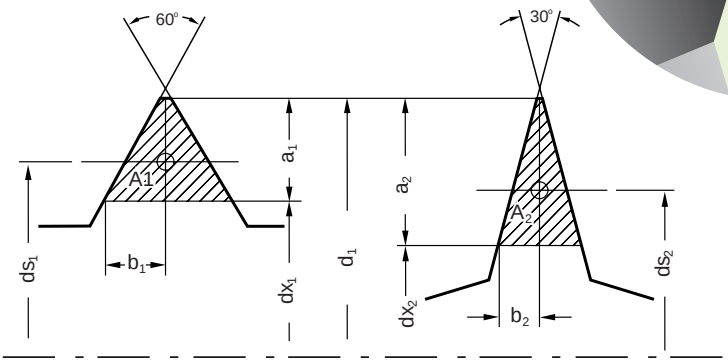
Improves material flow due to high axial component.



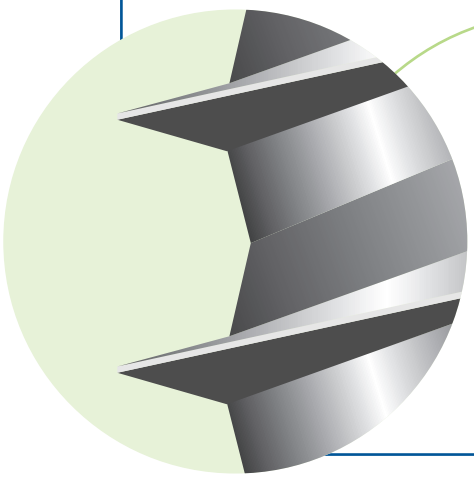
Resolution of Resultant Forces for the Same Volume Displacement

$F_{Rad\ 1} = 0{,}500\ R$ $F_{Rad\ 2} = 0{,}259\ R$

$F_{Axi\ 1} = 0{,}867\ R$ $F_{Axi\ 2} = 0{,}966\ R$



Although the volume displacement of both thread forms is identical, the installation torque of PT is lower, due to the reduction in lever arm.

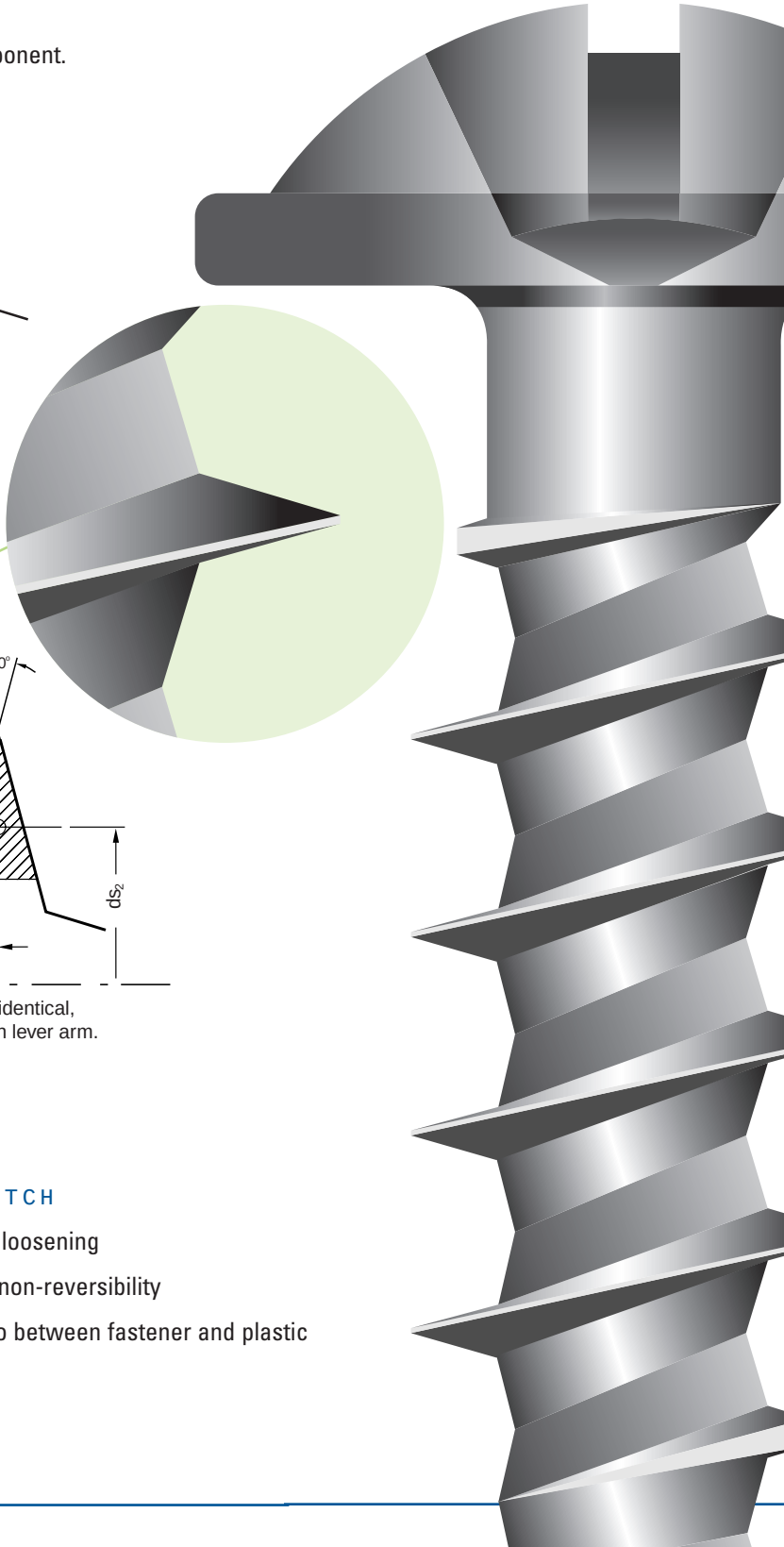


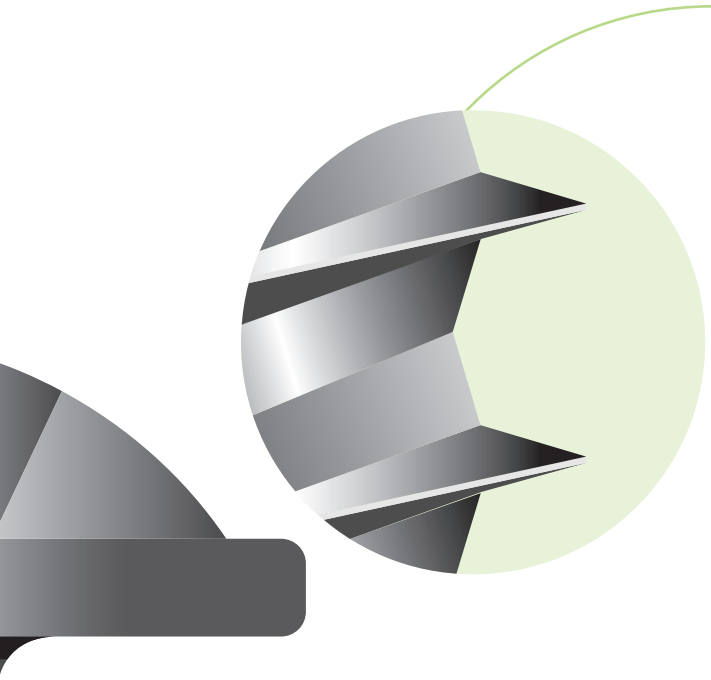
Optimum Pitch

Resists vibrational loosening

Provides optimum non-reversibility

Balances load ratio between fastener and plastic



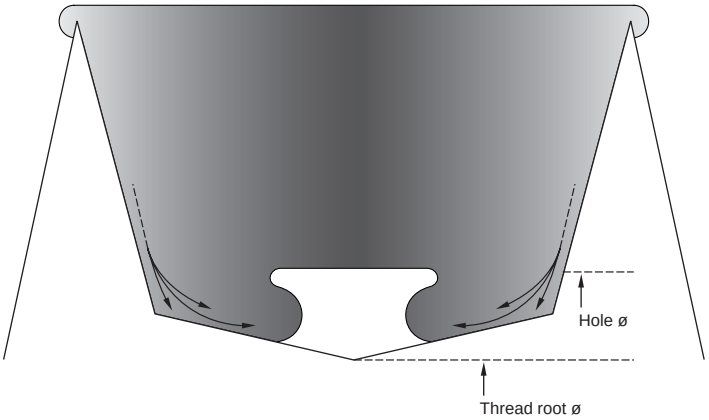


Profiled Thread Root

Maximum resistance to relaxation

Improved retention of clamp load

Prevents material jam



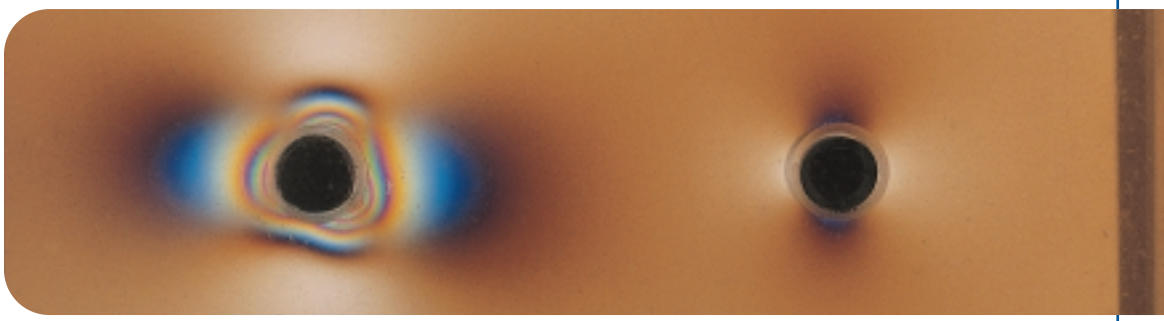
Round Cross Section

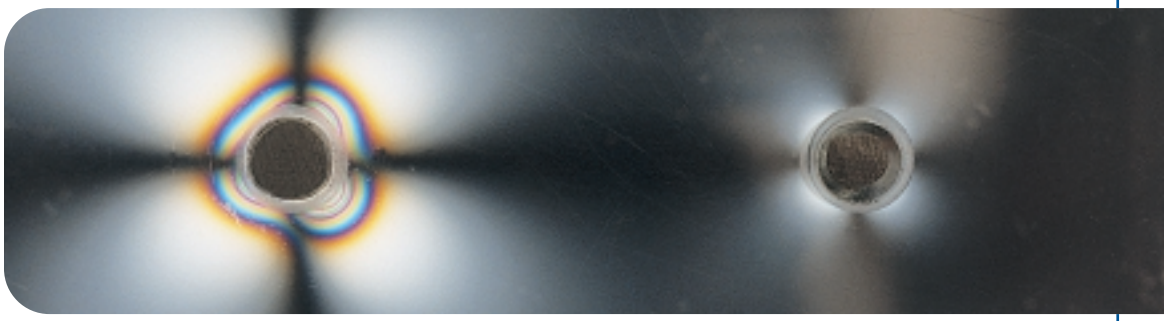
Even distribution of forces

Elimination of high stress concentrations

Improved resistance to stripping

The ability of the Semblex PT® Screw to reduce and control stresses greatly increases the performance over conventional thread forming screws for plastics.





Non-Round Thread Forming Screw

Semblex PT® Screw

The Semblex PT®

SCREWS FOR PLASTICS

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

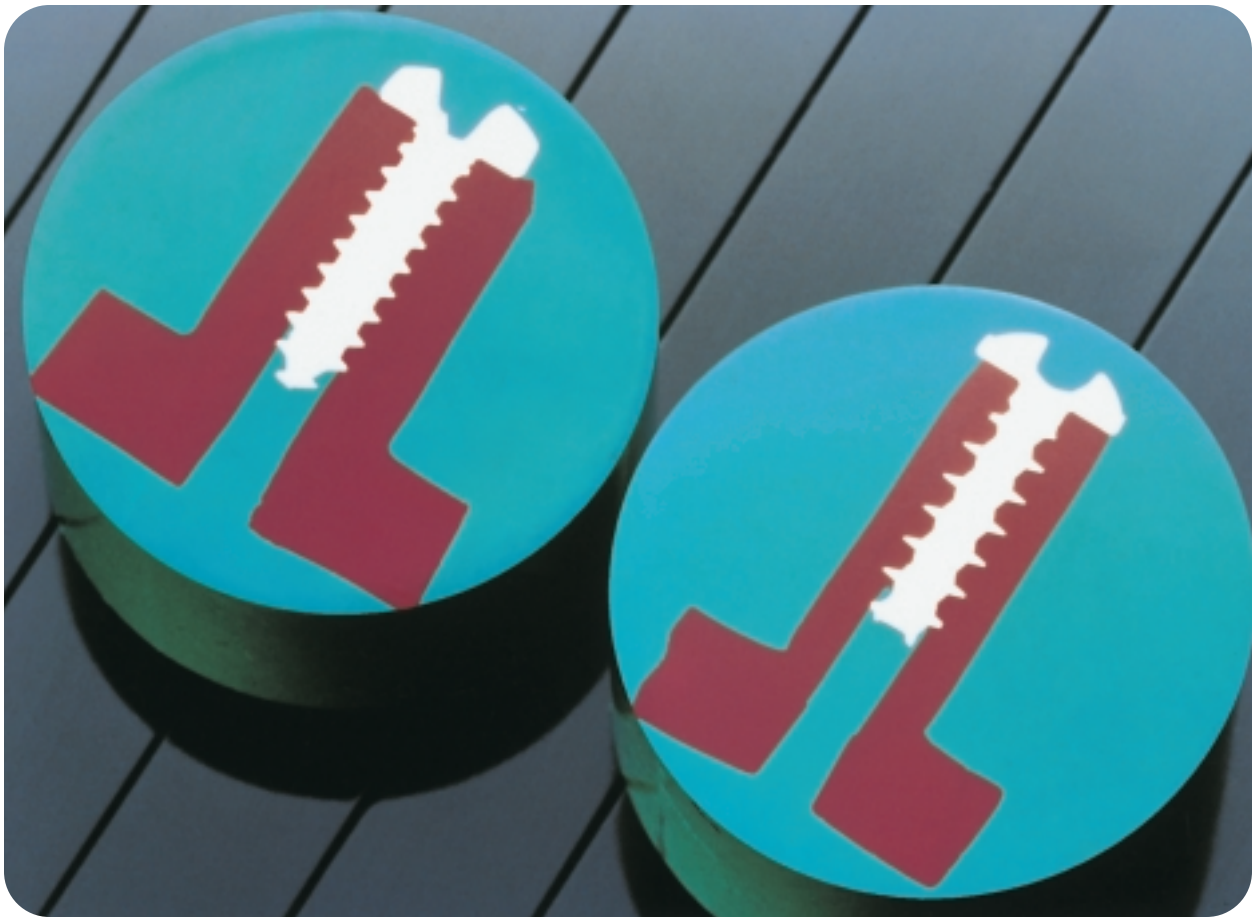
Allows for elimination of threaded inserts

Allows for thinner boss design

Reduces molded material required

Shorter injection mold cycle times

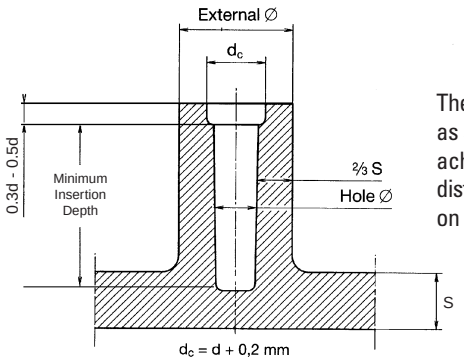
Sleek thread profile minimizes assembly stresses and cracking.



Thinner bosses translate into lower overall product costs.

BOSS DESIGN RECOMMENDATIONS FOR The Semblex PT®

Through a series of laboratory tests and field service feedback, some general recommendations can be made. For specific application concerns, contact Semblex Engineering.



The use of a counterbore, as shown is crucial to achieving a favorable distribution of stresses on the boss edges.

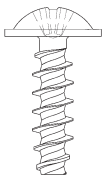
DESIGN RECOMMENDATION — d=NOMINAL PT® DIAMETER

Material	Hole Ø	External Ø	Minimum Insertion depth
ABS (Acrylonitrile-Butadiene-Styrene)	0.80 x d	2.00 x d	2.00 x d
ABS/PC Blend	0.80 x d	2.00 x d	2.00 x d
ASA (Acrylic-Styrene-Acrylonitrile)	0.78 x d	2.00 x d	2.00 x d
PA 4.6 (Nylon 4/6)	0.73 x d	1.85 x d	1.80 x d
PA 4.6 –GF 30 (Nylon 4/6-30% Glass Filled)	0.78 x d	1.85 x d	1.80 x d
PA 6 (Nylon 6)	0.75 x d	1.85 x d	1.70 x d
PA 6– GF 30 (Nylon 6-30% Glass Filled)	0.80 x d	2.00 x d	1.90 x d
PA 6.6 (Nyon 6/6)	0.75 x d	1.85 x d	1.70 x d
PA 6.6 – GF 30 (Nylon 6/6-30% Glass Filled)	0.82 x d	2.00 x d	1.80 x d
PBT (Polybutylene-Terephthalate)	0.75 x d	1.85 x d	1.70 x d
PBT – GF 30 (Polybutylene-Terephthalate-30% Glass Filled)	0.80 x d	1.80 x d	1.70 x d
PC* (Polycarbonate)	0.85 x d	2.50 x d	2.20 x d*
PC – GF* (Polycarbonate-30% Glass Filled)	0.85 x d	2.20 x d	2.00 x d*
PE-LD (Polyethylene-Low Density)	0.70 x d	2.00 x d	2.00 x d
PE-HD (Polyethylene-High Density)	0.75 x d	1.80 x d	1.80 x d
PET (Polyethylene-Terephthalate)	0.75 x d	1.85 x d	1.70 x d
PET – GF 30 (Polyethylene-Terephthalate-30% Glass Filled)	0.80 x d	1.80 x d	1.70 x d
POM	0.75 x d	1.95 x d	2.00 x d
PP (Polypropylene)	0.70 x d	2.00 x d	2.00 x d
PP – GF 30 (Polypropylene-30% Glass Filled)	0.72 x d	2.00 x d	2.00 x d
PP – TF 20 (Polypropylene-20% Talc Filled)	0.72 x d	2.00 x d	2.00 x d
PPO* (Polypropylene-Oxide)	0.85 x d	2.50 x d	2.20 x d
PS (Polystyrene)	0.80 x d	2.00 x d	2.00 x d
PVC (hard)(Polyvinyl-Chloride)	0.80 x d	2.00 x d	2.00 x d
PEEK	0.85 x d	2.00 x d	2.00 x d
SAN (Styrene-Acrylonitrile)	0.77 x d	2.00 x d	1.90 x d

For Additional Materials Contact Semblex Engineering

**Where materials are known to be sensitive to enviromental stress cracking, ageing tests should be carried out, as recommended by the material manufacturer.*

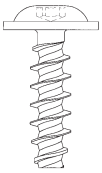
****This information is provided and intended to be used only as a guideline, actual application conditions may vary.**

	WN 1411	WN 1412	WN 1413	WN 1446	WN 1447
					

	Nominal Ø			K30	K35	K40	K50	K60	K70
	Major diameter, d			3.0	3.5	4.0	5.0	6.0	7.0
	Core diameter			1.7	1.9	2.2	2.7	3.2	3.7
	Thread pitch			1.34	1.57	1.79	2.24	2.69	3.14
	Thread Run-Out	Length L>3•d		3.0	3.5	4.0	5.0	6.0	7.0
		Length L≤3•d		1.5	1.8	2.0	2.5	3.0	3.5
WN 1411 Round Washer Head	Head diameter			6.0	7.0	8.0	10.0	12.0	14.0
	Total head height			2.1	2.4	2.5	3.2	4.0	4.6
	Washer thickness			0.7	0.8	0.9	1.1	1.3	1.5
	Type 1 Cross Recess	driver size		#1	#2	#2	#2	#3	#3
	penetration depth		min.	1.15	1.07	1.33	1.98	2.24	2.84
			max.	1.61	1.70	1.96	2.61	2.90	3.50
	Type 1A Cross Recess	driver size		#1	#2	#2	#2	#3	#3
	penetration depth		min.	1.26	1.08	1.40	2.01	2.27	2.91
			max.	1.51	1.54	1.86	2.47	2.73	3.37
WN 1412	Head diameter			5.3	6.1	7.0	8.8	10.5	12.3
	Head height			2.0	2.5	2.7	3.4	4.0	4.5
	Type 1 Cross Recess	driver size		#1	#2	#2	#2	#3	#3
	penetration depth		min.	1.19	1.23	1.51	2.12	2.44	3.00
			max.	1.65	1.86	2.14	2.75	3.10	3.66
	Type 1A Cross Recess	driver size		#1	#2	#2	#2	#3	#3
	penetration depth		min.	1.36	1.26	1.62	2.23	2.57	3.14
			max.	1.61	1.72	2.08	2.67	3.03	3.61
WN 1413 Flat Head	Head diameter			5.5	7.3	8.4	9.3	11.3	13.6
	Head height			1.3	1.9	2.2	2.2	2.7	3.3
	Type 1 Cross Recess	driver size		#1	#2	#2	#2	#2	#3
	penetration depth		min.	1.10	1.33	1.59	2.04	2.59	3.02
			max.	1.56	1.96	2.22	2.67	3.22	3.68
	Type 1A Cross Recess	driver size		#1	#2	#2	#2	#2	#3
	penetration depth		min.	1.20	1.47	1.70	2.06	2.60	3.01
			max.	1.45	1.93	2.16	2.52	3.06	3.47
WN 1446 Hex Head	Width across flats			5.0	5.5	7.0	8.0	10.0	10.0
	Hex height			1.5	2.3	2.3	3.0	3.5	4.8
WN 1447 Hex Washer Head	Width across flats			5.0	5.5	5.5	7.0	8.0	8.0
	Hex height			2.3	2.8	2.8	3.5	4.2	5.0
	Washer diameter			6.5	7.0	8.0	10.0	12.0	14.0
	Washer thickness			0.6	0.7	0.8	0.8	1.0	1.2

d= Nominal PT® Diameter

All Dimensions are for reference purposes only, unless otherwise specified.

	WN 1451	WN 1452	WN 1423	WN 1453
				

	Nominal Ø		K30	K35	K40	K50	K60	K70	K80	K100
	Major diameter, d		3.0	3.5	4.0	5.0	6.0	7.0	8.0	10.0
	Core diameter		1.7	1.9	2.2	2.7	3.2	3.7	4.2	5.2
	Thread pitch		1.34	1.57	1.79	2.24	2.69	3.14	3.59	4.49
	Thread Run-Out	Length L>3•D	3.0	3.5	4.0	5.0	6.0	7.0	8.0	10.0
		Length L≤3•D	1.5	1.8	2.0	2.5	3.0	3.5	4.0	5.0
WN 1451 Round Washer Head	Head diameter		6.0	7.0	8.0	10.0	12.0	14.0	16.0	20.0
	Total head height		2.1	2.4	2.6	3.3	3.6	4.2	4.8	5.5
	Washer thickness		0.60	0.70	0.80	1.00	1.20	1.40	1.60	2.00
	TORX PLUS		10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP
	Recess diameter	ref.	2.82	3.35	3.94	3.94	4.52	5.61	6.76	6.76
	Penetration depth	min.	1.00	1.10	1.30	1.50	1.75	2.20	2.60	2.60
	TORX		T 10	T 10	T 20	T 20	T 25	T 30	T 40	T 40
	Recess diameter	ref.	2.82	2.82	3.94	3.94	4.52	5.61	6.76	6.76
	Penetration depth	min.	1.00	1.10	1.25	1.40	1.60	2.00	2.70	2.70
WN 1452 Pan Head	Head diameter		5.6	6.9	7.5	8.2	10.8	12.5	14.0	16.0
	Head height		2.1	2.3	2.6	2.9	3.8	4.4	5.0	6.0
	TORX PLUS		10 IP	15 IP	20 IP	20 IP	25 IP	30 IP	40 IP	40 IP
	Recess diameter	ref.	2.82	3.35	3.94	3.94	4.52	5.61	6.76	6.76
	Penetration depth	min.	1.00	1.10	1.30	1.50	1.75	2.20	2.60	2.60
	TORX		T 10	T 10	T 20	T 20	T 25	T 30	T 40	T 40
	Recess diameter	ref.	2.82	2.82	3.94	3.94	4.52	5.61	6.76	6.76
	Penetration depth	min	1.00	1.10	1.25	1.40	1.60	2.00	2.40	2.70
WN 1453 Oval Head	Head diameter		5.6	6.5	7.5	9.2	11.0	12.5	14.5	14.5
	Head height	ref.	1.3	1.5	1.8	2.1	2.5	2.8	3.3	2.3
	Crown height	ref.	0.75	0.90	1.00	1.25	1.50	1.80	2.00	2.00
	TORX PLUS		10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	40 IP	40 IP
	Recess diameter	ref.	2.82	3.35	3.94	4.52	5.61	6.76	6.76	6.76
	Penetration depth	min.	1.10	1.10	1.50	1.50	1.90	2.60	2.60	2.60
	TORX		T 10	T 15	T 20	T 25	T 30	T 40	T 40	T 40
	Recess diameter	ref.	2.82	3.35	3.94	4.52	5.61	6.76	6.76	6.76
	Penetration depth	min.	1.00	1.20	1.40	1.60	2.00	2.70	2.70	2.70
WN 1423 Flat Head	Head diameter		5.5	7.3	8.4	9.3	11.3	13.6	15.8	18.3
	Head height		1.3	1.9	2.2	2.2	2.7	3.3	3.9	4.2
	TORX PLUS		8 IP	15 IP	20 IP	20 IP	30 IP	40 IP	40 IP	50 IP
	Recess diameter	ref.	2.39	3.35	3.94	3.94	5.61	6.76	6.76	8.94
	Penetration depth	min.	0.85	0.95	1.30	1.30	1.60	2.25	2.25	2.55
	TORX		T 8	T 15	T 20	T 20	T 30	T 40	T 40	T50
	Recess diameter	ref.	2.39	3.35	3.94	3.94	5.61	6.76	6.76	8.94
	Penetration depth	min.	0.80	1.00	1.25	1.25	1.75	2.25	2.40	2.90

d= Nominal PT® Diameter

All Dimensions are for reference purposes only, unless otherwise specified.

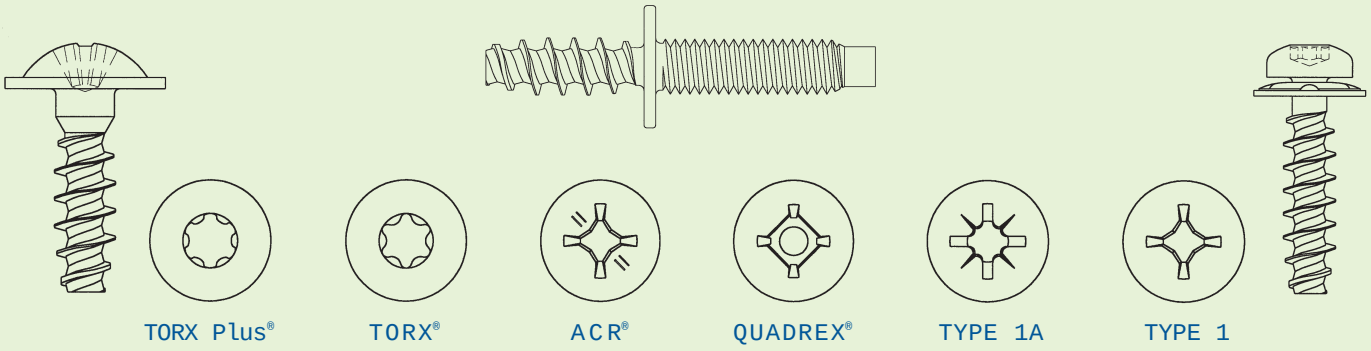
The Semblex PT® MINIATURE SCREWS

	Nominal Ø			K12	K14	K16	K18	K20	K22	K25
	Major diameter, d			1.2	1.4	1.6	1.8	2.0	2.2	2.5
	Core diameter			0.7	0.8	0.9	1.0	1.2	1.3	1.4
	Thread pitch			0.53	0.62	0.67	0.80	0.89	0.98	1.12
	Thread run-out	Length L>3•d		1.2	1.4	1.6	1.8	2.0	2.2	2.5
		Length L≤3•d		0.6	0.7	0.8	0.9	1.0	1.1	1.3
WN 1411 Round Washer Head	Head diameter							4.0	4.4	5.0
	Total head height							1.4	1.6	1.8
	Washer thickness							0.5	0.5	0.6
	Type 1 Cross Recess	driver size						#1	#1	#1
	penetration depth		min.	on request				0.51	0.68	0.82
			max.					0.97	1.14	1.28
	Type 1A Cross Recess	driver size						#1	#1	#1
	penetration depth		min.					0.73	0.86	1.01
			max.					0.98	1.11	1.26
WN 1412 Pan Head	Head diameter			2.2	2.4	2.6	3.2	3.5	3.9	4.4
	Head height			0.9	1.0	1.1	1.2	1.4	1.5	1.7
	Type 1 Cross Recess	driver size		#0	#0	#0	#0	#1	#1	#1
	penetration depth		min.	0.40	0.47	0.55	0.70	0.64	0.74	0.92
			max.	0.60	0.77	0.85	1.00	1.10	1.20	1.38
	Type 1A Cross Recess	driver size				#0	#0	#1	#1	#1
	penetration depth		min.	on request		0.55	0.90	0.82	0.92	1.08
			max.			0.80	0.95	1.07	1.17	1.33
WN 1413 Flat Head	Head diameter						3.0	3.8*	3.8*	4.7
	Head height						0.6	0.9	0.8	1.1
	Type 1 Cross Recess	driver size					#0	#1	#1	#1
	penetration depth		min.	on request			0.55	0.95	0.95	0.97
			max.				0.85	1.25	1.25	1.43
	Type 1A Cross Recess	driver size					#0	#1	#1	#1
	penetration depth		min.				0.56	0.92	0.92	1.09
			max.				0.81	1.17	1.17	1.34
WN 1451 Round Washer Head	Head diameter							4.0	4.5	5.0
	Head height							1.3	1.4	1.5
	Washer thickness							0.40	0.50	0.50
	TORXplus®			on request				6 IP	6 IP	6 IP
	Recess diameter		ref.					1.75	1.75	1.75
	Penetration depth		min.					0.50	0.65	0.65
	TORX®							T6	T6	T6
	Recess diameter		ref.					1.75	1.75	1.75
	Penetration depth		min.					0.50	0.70	0.70
WN 1452 Pan Head	Head diameter			2.4	2.8	3.2	3.6	3.6	4.0	4.2
	Head height			0.9	1.0	1.1	1.3	1.5	1.4	1.6
	TORXplus®			3 IP	5 IP	6 IP	6 IP	6 IP	6 IP	8 IP
	Recess diameter		ref.	1.19	1.49	1.75	1.75	1.75	1.75	2.39
	Penetration depth		min.	0.40	0.50	0.50	0.50	0.65	0.65	0.70
	TORX®			T3	T5	T6	T6	T6	T6	T7
	Recess diameter		ref.	1.19	1.47	1.75	1.75	1.75	1.75	2.06
	Penetration depth		min.	0.40	0.50	0.50	0.50	0.70	0.70	0.70
WN 1423 Flat Head	Head diameter						3.4	3.8	3.8	4.7
	Head height		ref.				0.8	0.9	0.8	1.1
	TORXplus®			on request			6 IP	6 IP	6 IP	8 IP
	Recess diameter		ref.				1.75	1.75	1.75	2.39
	Penetration depth		min.				0.50	0.50	0.65	0.70
	TORX®						T 6	T 6	T 6	T 8
	Recess diameter		ref.				1.75	1.75	1.75	2.39
	Penetration depth		min.				0.50	0.50	0.70	0.80

d= Nominal PT® Diameter

*Special recess due to #1 driver size

All Dimensions are for reference purposes only, unless otherwise specified.



Material: Carbon Steel, Through Hardened
Stainless Steel
Additional materials upon request.

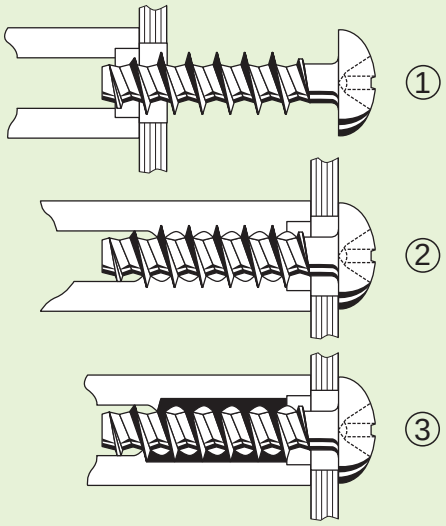
Finishes: All commercially available coatings.

TYPICAL PRODUCT RANGES

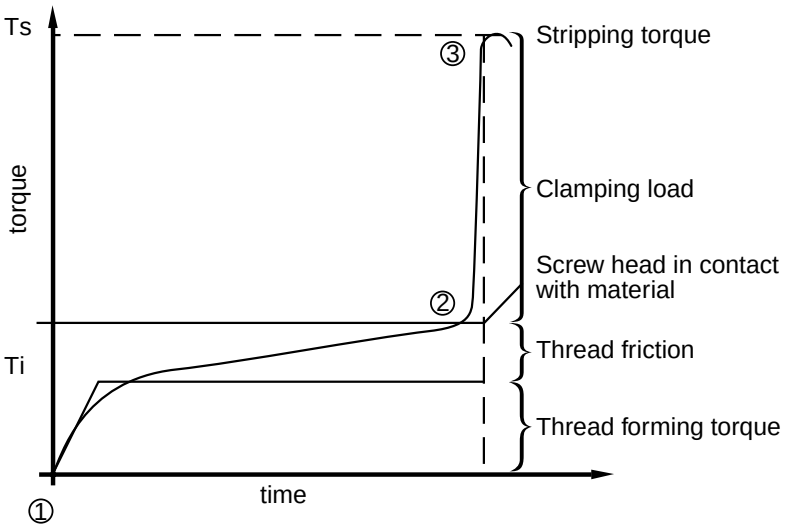
PT® Screw Size Length (mm)	K10	K12	K14	K16	K18	K20	K22	K25	K30	K35	K40	K50	K60	K70	K80	K100
3	■	■	■	■												
3,5	■	■	■	■												
4	■	■	■	■	■	■										
4,5	■	■	■	■	■	■	■									
5	■	■	■	■	■	■	■	■								
6	■	■	■	■	■	■	■	■	■							
7			■	■	■	■	■	■	■	■						
8			■	■	■	■	■	■	■	■	■					
10					■	■	■	■	■	■	■	■				
12					■	■	■	■	■	■	■	■	■			
14							■	■	■	■	■	■	■	■		
16							■	■	■	■	■	■	■	■	■	
18								■	■	■	■	■	■	■	■	
20								■	■	■	■	■	■	■	■	■
22								■	■	■	■	■	■	■	■	■
25								■	■	■	■	■	■	■	■	■
30									■	■	■	■	■	■	■	■
35										■	■	■	■	■	■	■
40											■	■	■	■	■	■
50												■	■	■	■	■
60													■	■	■	■
70														■	■	■
80															■	■

Longer lengths provided with partial thread.

The Assembly Profile



The following graph demonstrates a typical assembly profile.



Ti = installation torque
Ts = strip torque

Tightening Torque

Given the fact that relaxation and stress cracking tendencies increase with clamp load, it is recommended that the specific tightening torque should be the minimum required, rather than the maximum achievable.

Influence of Driver Speed

In addition to being aware of the effect excessive torque can have on the assembly, attention must also be paid to the driver speed. As the fastener is rotated, heat is generated within the assembly. This heat is instrumental in allowing the plastic to flow into the thread's root diameter, provided it is controlled.

When the speed becomes too high, excessive heat is created. This heat can then have a negative impact on the overall assembly profile.

Optimizing the Design

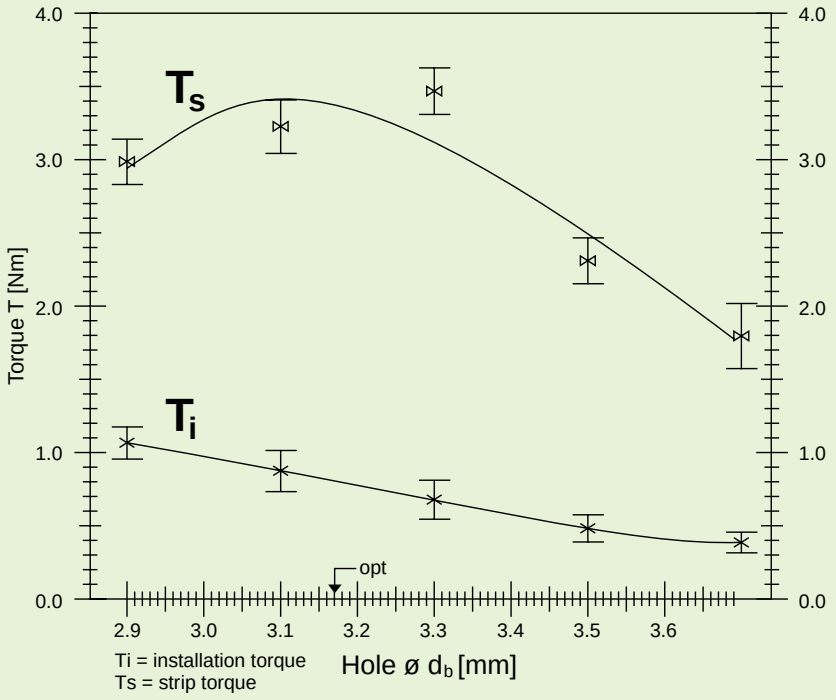
The graph to the right is an example of the relationship between torque and the hole diameter. The optimum hole diameter is selected based on the widest margin between the installation and strip torque.

Material: ABS

Fastener: K40 x 16 PT®
Torx Pan Head

Installation Depth: 8mm

Relationship between torque and installation



Ti = installation torque
Ts = strip torque