

The  **Semblex PT[®]**

The Fastener **SOLUTION** for
Thermoplastics



 **Semblex**

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THE FASTENER SOLUTION FOR THERMOPLASTICS

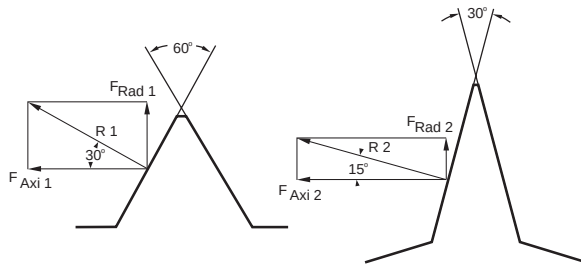
30° THREAD ANGLE

Reduces radial stresses

Provides increased thread depth

Lower installation torque

Improves material flow due to high axial component.



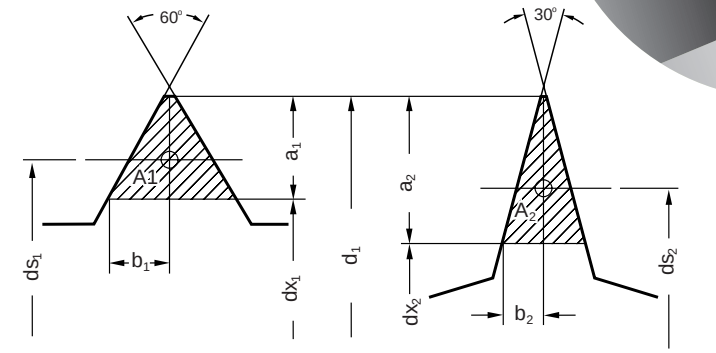
Resolution of Resultant Forces for the Same Volume Displacement

$$F_{Rad 1} = 0,500 R$$

$$F_{Axi 1} = 0,867 R$$

$$F_{Rad 2} = 0,259 R$$

$$F_{Axi 2} = 0,966 R$$



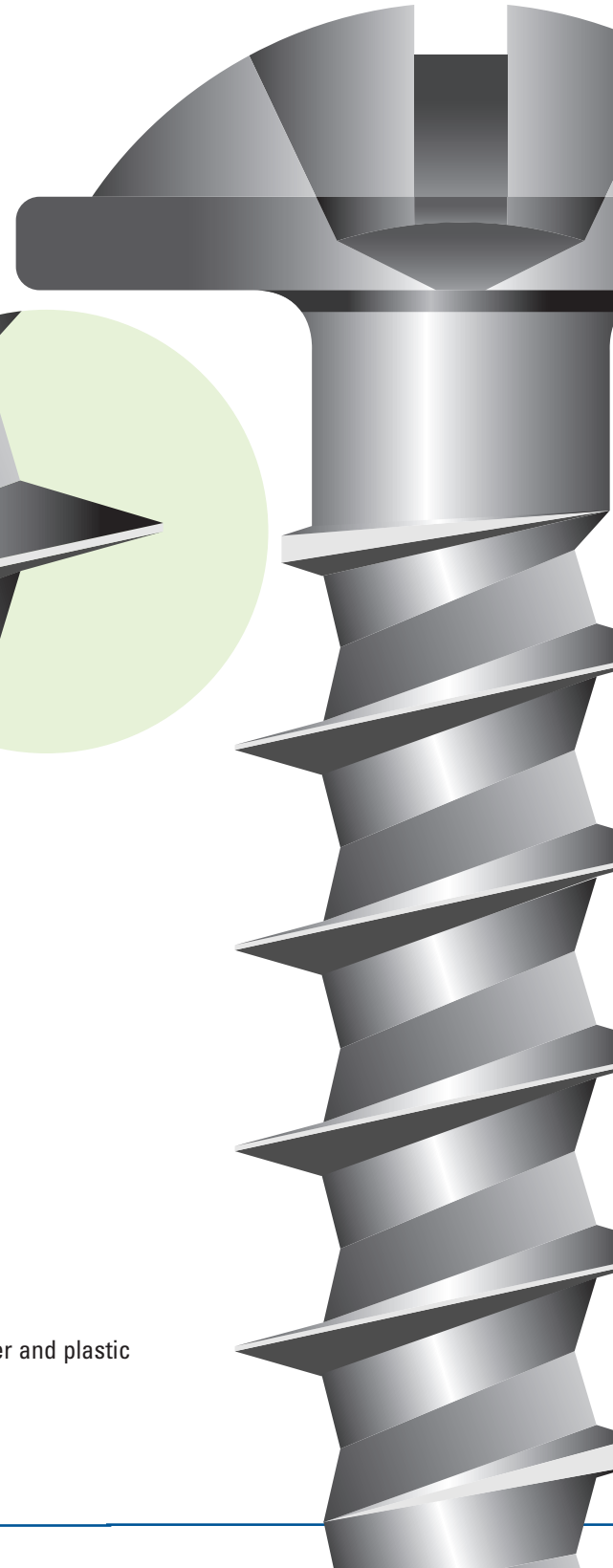
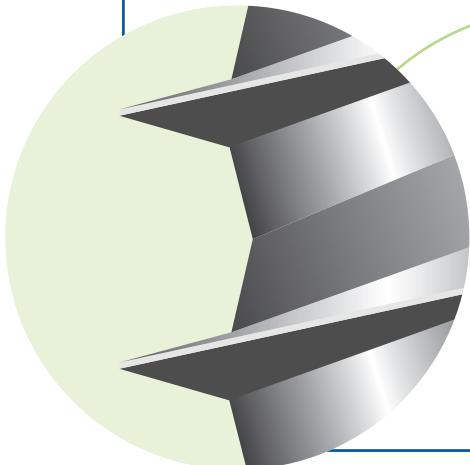
Although the volume displacement of both thread forms is identical, the installation torque of PT is lower, due to the reduction in lever arm.

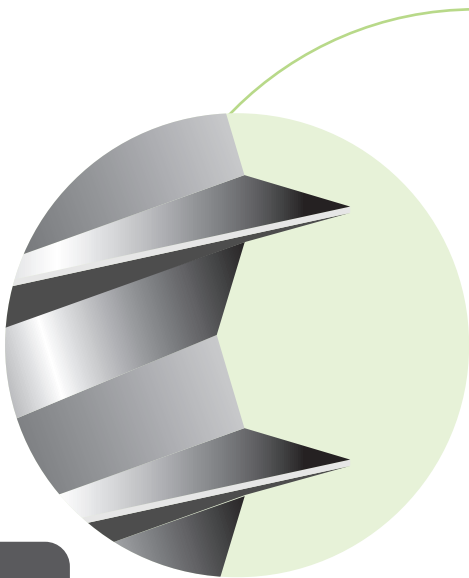
OPTIMUM PITCH

Resists vibrational loosening

Provides optimum non-reversibility

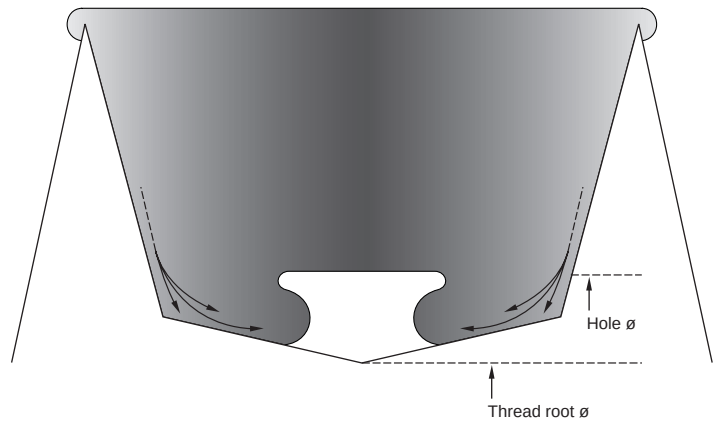
Balances load ratio between fastener and plastic





PROFILED THREAD ROOT

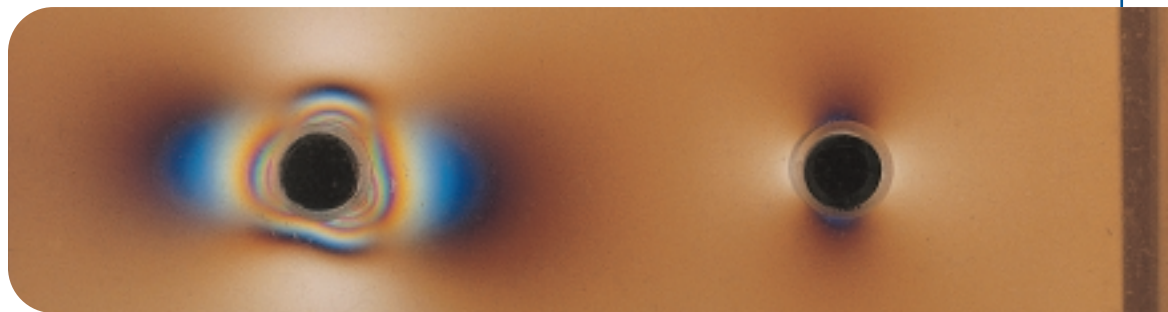
Maximum resistance to relaxation
Improved retention of clamp load
Prevents material jam



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

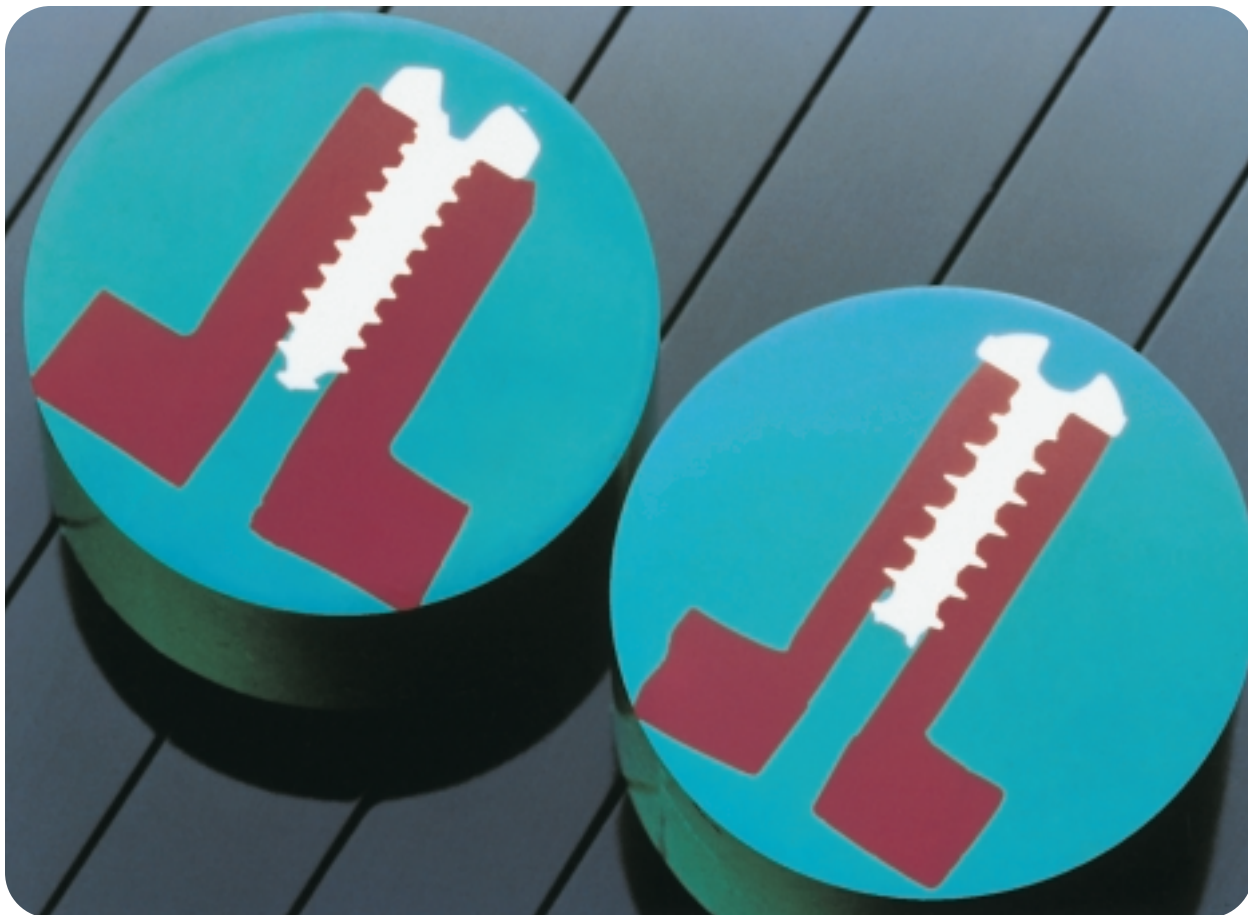
Semblex PT® Screw

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.

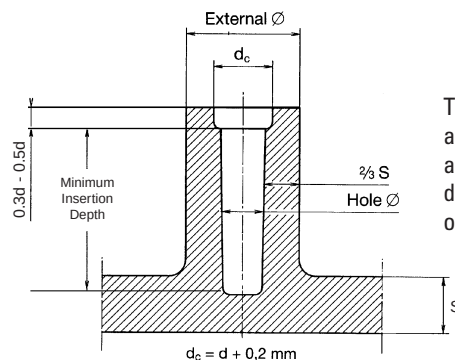


Thinner bosses translate into lower overall product costs.

BOSS DESIGN RECOMMENDATIONS FOR



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 (Nylon 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 environmental 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.

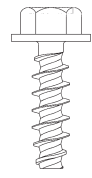
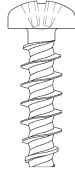
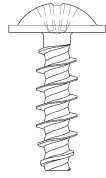
WN 1411

WN 1412

WN 1413

WN 1446

WN 1447



NOMINAL Ø

K 3 0

K 3 5

K 4 0

K 5 0

K 6 0

K 7 0

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 $L > 3 \cdot d$

3.0

3.5

4.0

5.0

6.0

7.0

Length $L \leq 3 \cdot d$

1.5

1.8

2.0

2.5

3.0

3.5

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

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

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

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

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

WN 1411
ROUND WASHER HEAD

WN 1412

WN 1413
FLAT HEADWN 1446
HEX HEADWN 1447
HEX WASHER HEAD

d= Nominal PT® Diameter

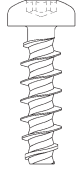
All Dimensions are for reference purposes only, unless otherwise specified.

WN 1451

WN 1452

WN 1423

WN 1453



NOMINAL Ø		K 30	K 35	K 40	K 50	K 60	K 70	K 80	K 100
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
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
WN 1451 ROUND WASHER HEAD		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
WN 1452 PAN HEAD	Penetration depth min.	1.00	1.10	1.30	1.50	1.75	2.20	2.60	2.60
		T 10	T 10	T 20	T 20	T 25	T 30	T 40	T 40
WN 1453 OVAL HEAD	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 1423 FLAT 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
WN 1453 OVAL HEAD		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
WN 1453 OVAL HEAD	Penetration depth min.	1.00	1.10	1.30	1.50	1.75	2.20	2.60	2.60
		T 10	T 10	T 20	T 20	T 25	T 30	T 40	T 40
WN 1453 OVAL HEAD	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
WN 1453 OVAL HEAD	Crown height ref.	0.75	0.90	1.00	1.25	1.50	1.80	2.00	2.00
		10 IP	15 IP	20 IP	25 IP	30 IP	40 IP	40 IP	40 IP
WN 1453 OVAL HEAD	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
WN 1453 OVAL HEAD		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
WN 1453 OVAL HEAD	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
WN 1423 FLAT HEAD		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
WN 1423 FLAT HEAD	Penetration depth min.	0.85	0.95	1.30	1.30	1.60	2.25	2.25	2.55
		T 8	T 15	T 20	T 20	T 30	T 40	T 40	T 50
WN 1423 FLAT HEAD	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

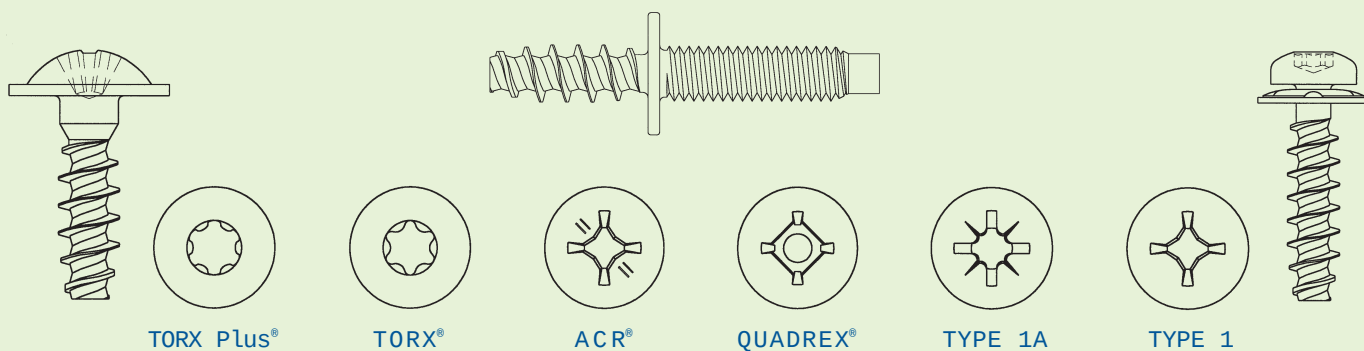
All Dimensions are for reference purposes only, unless otherwise specified.

NOMINAL Ø		K 12	K 14	K 16	K 18	K 20	K 22	K 25
WN 1411 ROUND WASHER HEAD	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
		Length L≤3•d	0.6	0.7	0.8	0.9	1.0	1.1
	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
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
penetration depth		min.	0.40	0.47	0.55	0.70	0.64	0.74
		max.	0.60	0.77	0.85	1.00	1.10	1.20
Type 1A Cross Recess		driver size			#0	#0	#1	#1
penetration depth		min.	on request		0.55	0.90	0.82	0.92
	max.			0.80	0.95	1.07	1.17	
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
		max.			0.85	1.25	1.25	
	Type 1A Cross Recess	driver size			#0	#1	#1	#1
	penetration depth	min.			0.56	0.92	0.92	
	max.			0.81	1.17	1.17		
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
			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
						T6	T6	T6
WN 1452 PAN HEAD	Recess diameter	ref.				1.75	1.75	1.75
	Penetration depth	min.				0.50	0.70	0.70
	Head diameter		2.4	2.8	3.2	3.6	3.6	4.0
	Head height		0.9	1.0	1.1	1.3	1.5	1.4
			3 IP	5 IP	6 IP	6 IP	6 IP	8 IP
	Recess diameter	ref.	1.19	1.49	1.75	1.75	1.75	2.39
	Penetration depth	min.	0.40	0.50	0.50	0.50	0.65	0.65
WN 1423 FLAT HEAD			T3	T5	T6	T6	T6	T7
	Recess diameter	ref.	1.19	1.47	1.75	1.75	1.75	2.06
	Penetration depth	min.	0.40	0.50	0.50	0.50	0.70	0.70
	Head diameter					3.4	3.8	3.8
	Head height	ref.				0.8	0.9	0.8
			on request			6 IP	6 IP	8 IP
	Recess diameter	ref.				1.75	1.75	1.75
WN 1423 FLAT HEAD	Penetration depth	min.			0.50	0.50	0.65	
					T 6	T 6	T 6	
	Recess diameter	ref.				1.75	1.75	2.39
	Penetration depth	min.			0.50	0.50	0.70	

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.

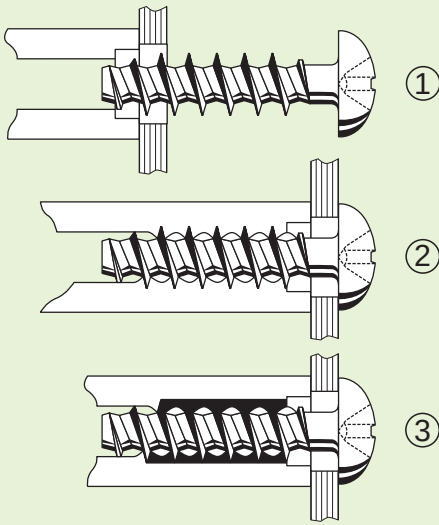
Finishes: All commercially available coatings.

TYPICAL PRODUCT RANGES

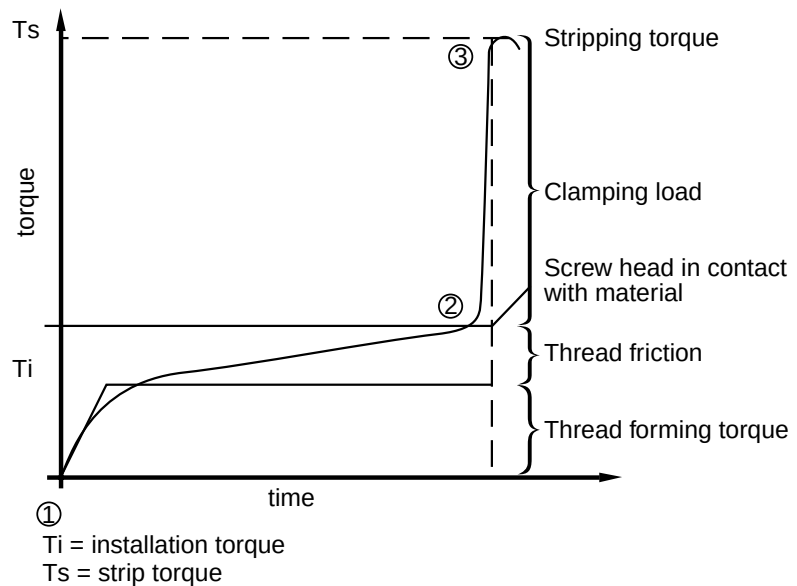
PT® Screw Size Length (mm)	K10	K12	K14	K16	K18	K20	K22	K25	K30	K35	K40	K50	K60	K70	K80	K100
3																
3,5																
4																
4,5																
5																
6																
7																
8																
10																
12																
14																
16																
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.



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

