

Self-Clinching Stud

SELF-CLINCHING STUDS

Self-clinching studs are installed by placing them in properly sized holes in the sheets and squeezing into place with any standard press. The squeezing action embeds the head of the stud into the sheet. The metal displaced by the head flows smoothly and evenly around the ribs and into the annular groove - creating a flushhead assembly and securely locking the stud into the sheet with high torque-out and pushout resistances.

PT-FH (flush-head) studs are available in aluminium, steel or stainless steel. They are also available unthreaded on special order.

PT-FH4 (flush-head) Studs for stainless steel are designed to provide strong threads in stainless steel sheets as thin as 1mm. The type is designed for use in stainless steel sheets with a hardness of 92 or less on the Rockwell "B" scale.

PT-TFH (non-flush) Studs are for sheets as thin as 0.51mm. They may also be used in thicker sheets where flush head studs are not required. TFH studs are installed in the sheets in the same way as flush-head studs; however, different punches and anvils are required. When installed, the TFH stud will be securely locked into the thin sheet with ample torque-out and pushout resistances. The stud head will not be flushed but will project above the sheet surface approximately 0.64mm.

PT-HFH (heavy-duty) Studs replace weld studs with easier installation at lower costs. The large stud head which projects above the sheet material distributes the axial tightening force over a large area thereby improving pull through resistance.

PT-HFHB (heavy-duty BUSBAR) Studs are ideal for applications which demand superior electrical/mechanical attachment points. Phosphor bronze studs offer twice the conductivity of carbon steel studs.

PT-TPS Pilot Pins satisfy a wide range of positioning, pivot and alignment applications. The chamfered end makes mating hole location easy.

STUD SELECTOR GUIDE

STUD TYPE	APPLICATION REQUIRES						
	FLUSH-HEAD	HEAVY DUTY	SHEET THICKNESS AS THIN AS 0.51MM	SUPERIOR ELECTRICAL CONDUCTIVITY	INSTALLATION INTO STAINLESS STEEL SHEETS	SUPERIOR CORROSION RESISTANCE	UNTHREADED STUD/PIN
PT-FH	*						
PT-FHS	*					*	
PT-FH4	*				*		
PT-TFH			*				
PT-TFHS			*			*	
PT-HFH		*					
PT-HFHB		*		*		*	
PT-HFHS		*				*	
PT-TPS	*					*	*

STUD TYPE	(1) THREADS	FASTENER MATERIALS				STANDARD FINISHES			OPTIONAL FINISH(2)	FOR USE IN SHEET HARDNESS				
	EXTERNAL ANSIB1.1, 2A ANSI/ ASME B1.13M6G	HEAT-TREATED CARBON STEEL	300 SERIES STAINLESS STEEL	PHOSPHOR BRONZE	400 SERIES STAINLESS STEEL	NO FINISH (3)	TYPE III,ZINC PLATED, 5mm,COLORLESS	PASSIVATED AND/OR TESTED PER ASTM A380	TYPEII ZINC PLATED, 5M, YELLOW	HRB 55/ HB 83 OR LESS	HRB 70/ HB125 OR LESS	HRB 80/ HB 150 OR LESS	HRB 85/ HB 165 OR LESS	HRB 92/ HB 195 OR LESS
PT-FH	*	*					*	*			*			
PT-FHS	*		*					*		*				
PT-FH4	*				*			*						*
PT-TFH	*	*					*	*			*			
PT-TFHS	*		*					*		*				
PT-HFH	*	*					*	*					*	
PT-HFHB	*			*		*			*					
PT-HFHS	*		*					*		*				
PT-TPS			*					*		*				
Part Number Codes for Finishes						X	ZI	None	ZC					

(1) For plated studs, Class 2A/6g, the maximum major and pitch diameter, after plating, may equal basic sizes and be gauged to Class 3A/4h.

(2) Special order with additional charge.

(3) Part numbers for aluminium studs have no finish suffix.

SELF-CLINCHING FLUSH-HEAD STUDS

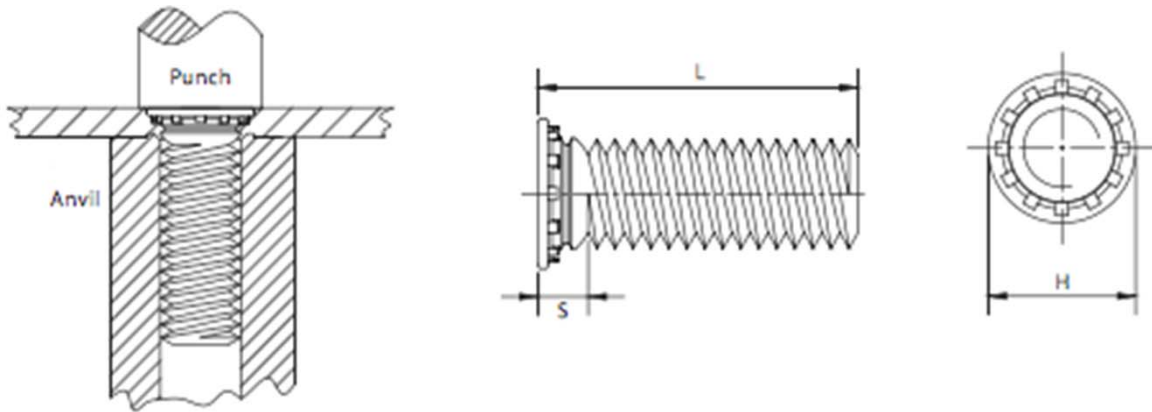
PT-FH / FHS



All dimensions are in millimeters

THREAD SIZE X PITCH	TYPE		THREAD CODE	LENGTH CODE "L"±0.4 (LENGTH CODE IN MILLIMETERS)											MIN SHEET THICKNESS	HOLE SIZE IN SHEET +0.080 -0.000	MAX HOLE IN ATTACHED PARTS	H ± 0.4	S MAX	MIN DIST HOLE C/L TO EDGE
	CARBON STEEL	STAINLESS STEEL		6	8	10	12	15	18	/	/	/	/							
M2.5 X 0.45	PT-FH	PT-FHS	M2.5	6	8	10	12	15	18	/	/	/	/	1	2.5	3.1	4.1	1.95	5.4	
M3 X 0.5	PT-FH	PT-FHS	M3	6	8	10	12	15	18	20	25	/	/	1	3	3.6	4.6	2.1	5.6	
M3.5 X 0.6	PT-FH	PT-FHS	M3.5	6	8	10	12	15	18	20	25	30	/	1	3.5	4.1	5.3	2.25	6.4	
M4 X 0.7	PT-FH	PT-FHS	M4	6	8	10	12	15	18	20	25	30	35	1	4	4.6	5.9	2.4	7.2	
M5 X 0.8	PT-FH	PT-FHS	M5	/	8	10	12	15	18	20	25	30	35	1	5	5.6	6.5	2.7	7.2	
M6 X 1	PT-FH	PT-FHS	M6	/	/	10	12	15	18	20	25	30	35	1.6	6	6.6	8.2	3	7.9	
M8 X 1.25	PT-FH	PT-FHS	M8	/	/	/	12	15	18	20	25	30	35	2.4	8	8.6	9.6	3.7	9.6	

INSTALLATION



- PT-FH Carbon Steel: for steel panel with hardness HRB≤80
- PT-FHS Carbon Steel: for aluminium panel, steel panel and brass panel with hardness HRB≤70

SELF-CLINCHING FLUSH-HEAD STUDS

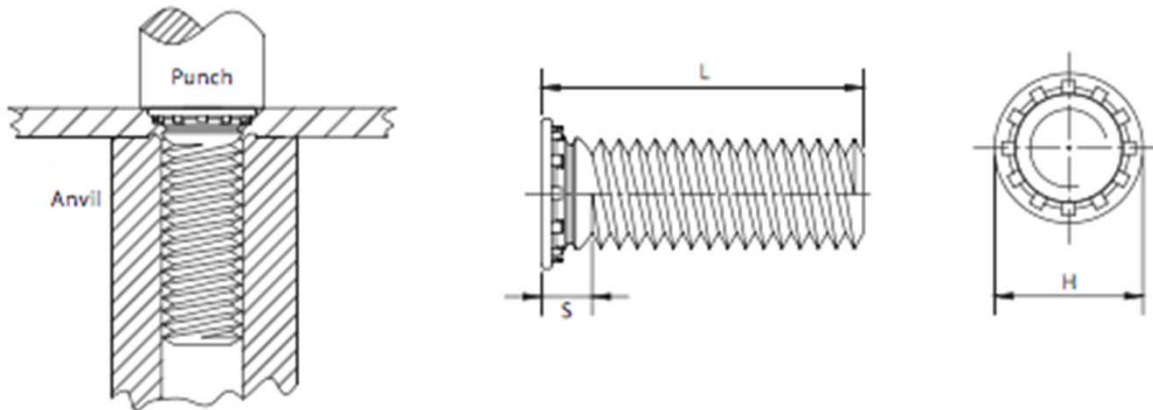
PT-FH4



All dimensions are in millimeters

THREAD SIZE X PITCH	TYPE	THREAD CODE	LENGTH CODE "L"±0.4 (LENGTH CODE IN MILLIMETERS)									MIN SHEET THICKNESS	HOLE SIZE IN SHEET +.080-.000	MAX HOLE IN ATTACHED PARTS	H ± 0.4	S MAX	MIN DIST HOLE C/L TO EDGE	
			6	8	10	12	15	18	20	25	NA							NA
M3 X 0.5	PT-FH4	M3	6	8	10	12	15	18	20	25	NA	NA	1 - 2.4	3	3.6	4.6	2.1	5.6
M4 X 0.7	PT-FH4	M4	6	8	10	12	15	18	20	25	30	35	1 - 2.4	4	4.6	5.9	2.4	7.2
M5 X 0.8	PT-FH4	M5	/	8	10	12	15	18	20	25	30	35	1 - 2.4	5	5.6	6.5	2.7	7.2
M6 X 1	PT-FH4	M6	/	/	10	12	15	18	20	25	30	35	1.6 - 3	6	6.6	8.2	3	7.9

INSTALLATION



- PT-FH4 Hardened stainless steel: for stainless steel panel with hardness HRB≤92

SELF-CLINCHING NON-FLUSH STUDS

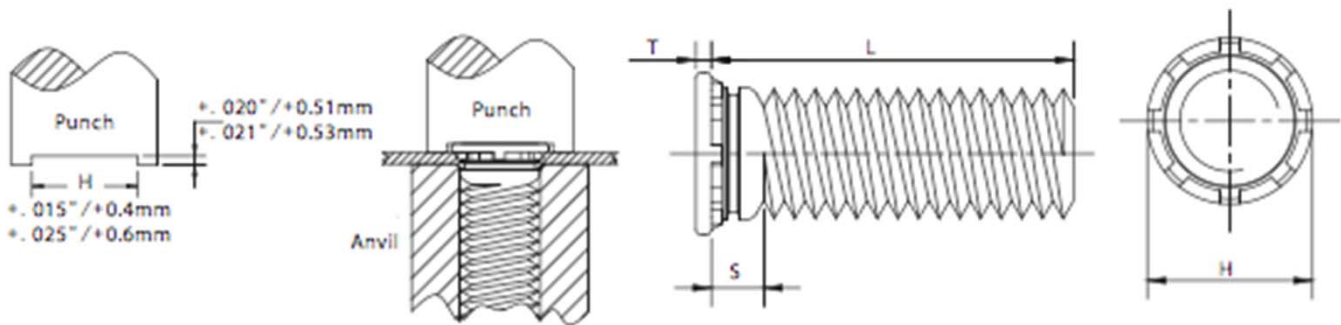
PT-TFH / TFHS



All dimensions are in millimeters

THREAD SIZE X PITCH	TYPE		THREAD CODE	LENGTH CODE "L"±0.4 (LENGTH CODE IN MILLIMETERS)										MIN SHEET THICKNES S	HOLE SIZE IN SHEET +.080 - .000	MAX HOLE IN ATTACHED PARTS	H ± 0.4	S MAX	T MAX	MIN DIST HOLE C/L TO EDGE
	CARBON STEEL	STAINLESS STEEL																		
M3 X 0.5	PT-TFH	PT-TFHS	M3	6	8	10	12	15	18	20	25	/	/	0.51	3	3.6	4.5	1.8	0.64	5.6
M4 X 0.7	PT-TFH	PT-TFHS	M4	/	8	10	12	15	18	20	25	30	35	0.51	4	4.6	5.8	1.8	0.64	7.2
M5 X 0.8	PT-TFH	PT-TFHS	M5	/	8	10	12	15	18	20	25	30	35	0.51	5	5.6	6.4	2.3	0.64	7.2

INSTALLATION



- PT-TFH Carbon steel: for steel panel with hardness HRB≤80
- PT-TFHS Stainless steel: for aluminium panel, steel panel and brass panel with hardness HRB≤70

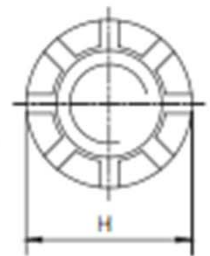
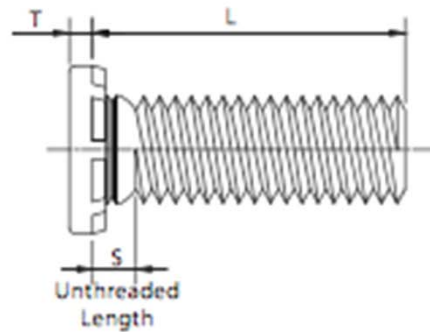
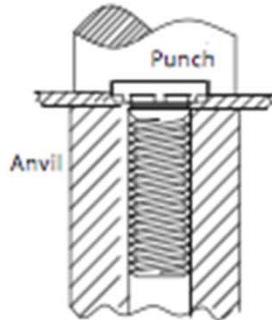
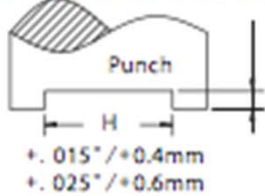


All dimensions are in millimeters

THREAD SIZE X PITCH	TYPE			THREAD CODE	LENGTH CODE "L"±0.4 (LENGTH CODE IN MILLIMETERS)							MIN SHEET THICKNESS S	HOLE SIZE IN SHEET +.130 -.000	MAX HOLE IN ATTACHED PARTS	H ± 0.4	S MAX	T MAX	MIN DIST HOLE C/L TO EDGE
	CARBON STEEL	STAINLESS STEEL	PHOSPHOR BRONZE		15	20	25	30	35	40	50							
M5 X 0.8	PT-HFH	PT-HFHS	PT-HFHB	M5	15	20	25	30	35	40	50	1.3	5	6.5	7.8	2.7	1.14	10.7
M6 X 1	PT-HFH	PT-HFHS	PT-HFHB	M6	15	20	25	30	35	40	50	1.5	6	7.5	9.4	2.8	1.27	11.5
M8 X 1.25	PT-HFH	PT-HFHS	PT-HFHB	M8	15	20	25	30	35	40	50	2	8	9.5	12.5	3.5	1.78	12.7
M10 X 1.5	PT-HFH	PT-HFHS	PT-HFHB	M10	15	20	25	30	35	40	50	2.3	10	11.5	15.7	4.1	2.29	13.7

INSTALLATION

.035"-.036" (1032) 0.94mm-0.96mm (M5)
 .045"-.046" (0420) 1.14mm-1.16mm (M6)
 .063"-.064" (0518) 1.62mm-1.64mm (M8)
 .077"-.078" (0616) 2.1mm-2.12mm (M10)



- PT-HFH Carbon steel: for steel panel with hardness HRB≤85
- PT-HFHS Stainless steel: for aluminium panel, steel panel and brass panel with hardness HRB≤70
- PT-HFHB Phosphor bronze: for brass panel with hardness HRB≤55

FLUSH-MOUNTED PILOT PINS

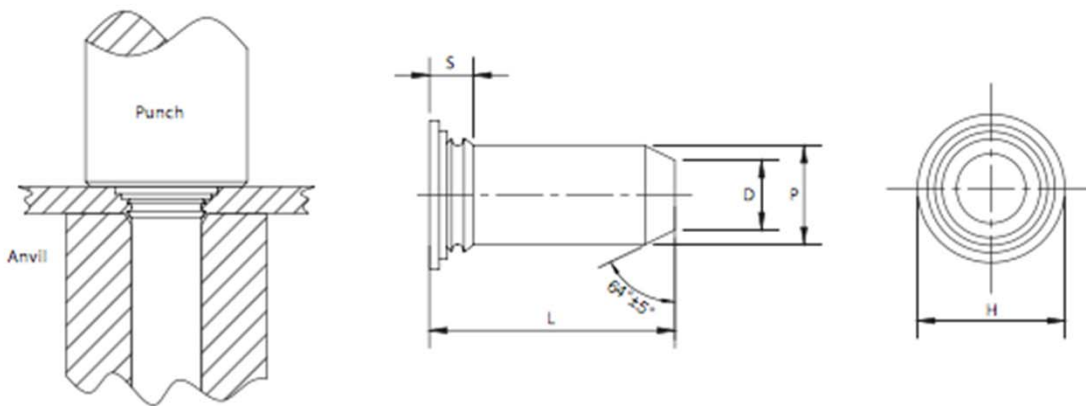
PT-TPS



All dimensions are in millimeters

PIN DIAMETER $P \pm 0.05$	TYPE	PIN DIAMETER CODE	LENGTH CODE "L" ± 0.4 (LENGTH CODE IN MILLIMETERS)					MIN SHEET THICKNESS	HOLE SIZE IN SHEET $+0.080 -$.000	D \pm 0.15	H \pm 0.4	S MAX	MIN DIST HOLE C/L TO EDGE
			8	10	12	16	NA						
3	PT-TPS	3MM	8	10	12	16	NA	1	3.5	2.05	5.2	2.29	6.4
4	PT-TPS	4MM	8	10	12	16	NA	1	4.5	2.82	6.12	2.29	7.1
5	PT-TPS	5MM	NA	10	12	16	20	1	5.5	3.53	7.19	2.29	7.6
6	PT-TPS	6MM	NA	NA	12	16	20	1	6.5	4.24	8.13	2.29	7.9

INSTALLATION



- PT-TPS Stainless steel: for aluminium panel, steel panel and brass panel with hardness HRB \leq 70

INSTALLATION

TYPES PT-FH / FHS / TFH / TFHS / THREADED STUDS

Self-clinching studs are installed by placing them in properly sized holes in the sheet material and squeezing them into place with any standard press.

All that is required is a flat or recessed punch and an anvil having a hole to clear the thread diameter so that force is applied between the top of the stud head and underside of the sheet material. The squeezing action forces the ribs of the stud into the sheet, displacing sheet material, causing it to fill the annular groove under the head of the stud.

The following information provides specifics with regard to stud installation.

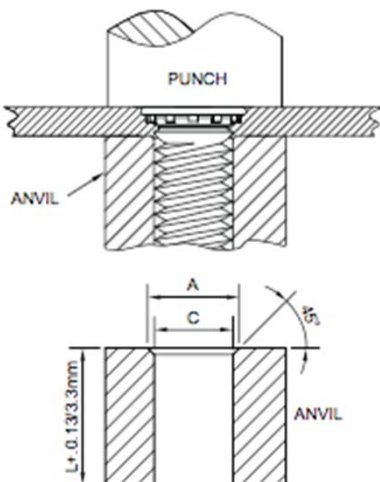
All dimensions are in millimeters

	THREAD CODE	ANVIL DIMENSIONS	
		A +0.1	C +0.08
METRIC	M2.5	3.1	2.53
	M3	3.6	3.03
	M3.5	4.1	3.53
	M4	4.6	4.03
	M5	5.6	5.03
	M6	6.6	6.03
	M8	8.6	8.03
	M10	-	10.03

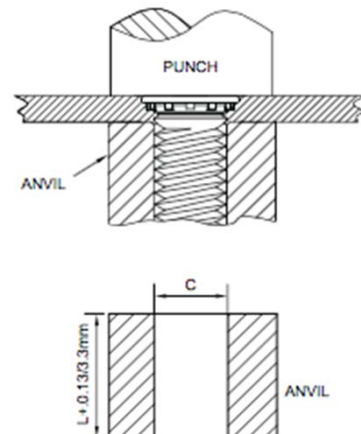
TYPE PT-FH / FHS THREADED STUDS

The illustrations below indicate suggested tooling for applying installation forces. In most cases, when using sheets 1.51mm and thicker, the anvil requires only a straight thru hole to accommodate the stud (see illustrations below for details). For sheets less than 1.51mm, the hole requires a countersink with dimension A at the top to provide for metal around the shank of the stud.

Tooling for sheet thickness less than 1.51mm with #2 thru #10/M3 thru M5 thread sizes and less than 2.4mm for 1/4" / M6 threads.



Tooling for sheet thickness 1.51mm and greater with #2 thru #10/M3 thru M5 thread sizes and 2.41mm and greater for 1/4" and 5/16" /M6 and M8 threads.



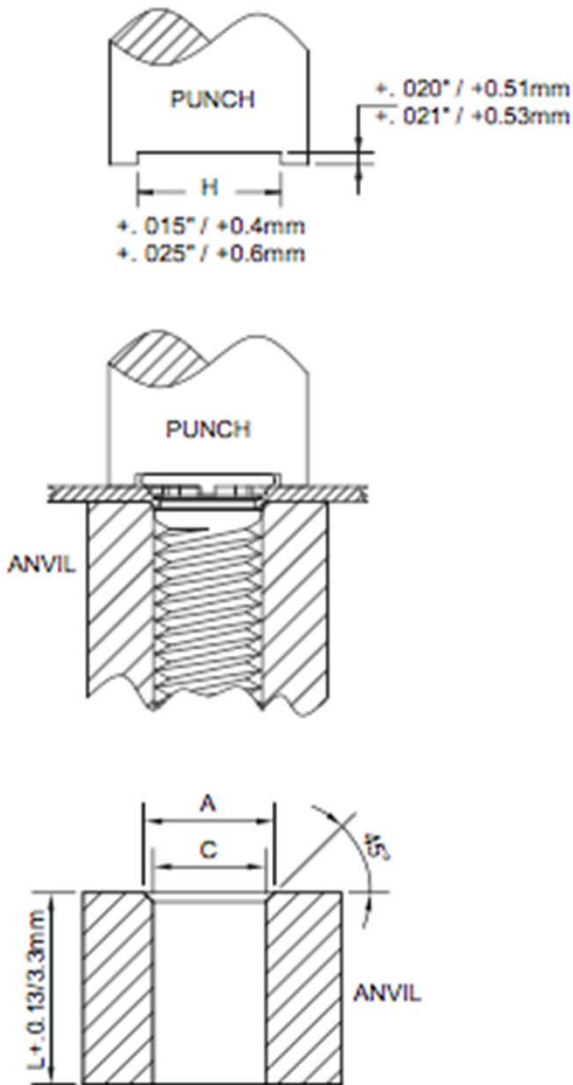
INSTALLATION

TYPE PT-TFH / TFHS NON-FLUSH STUDS

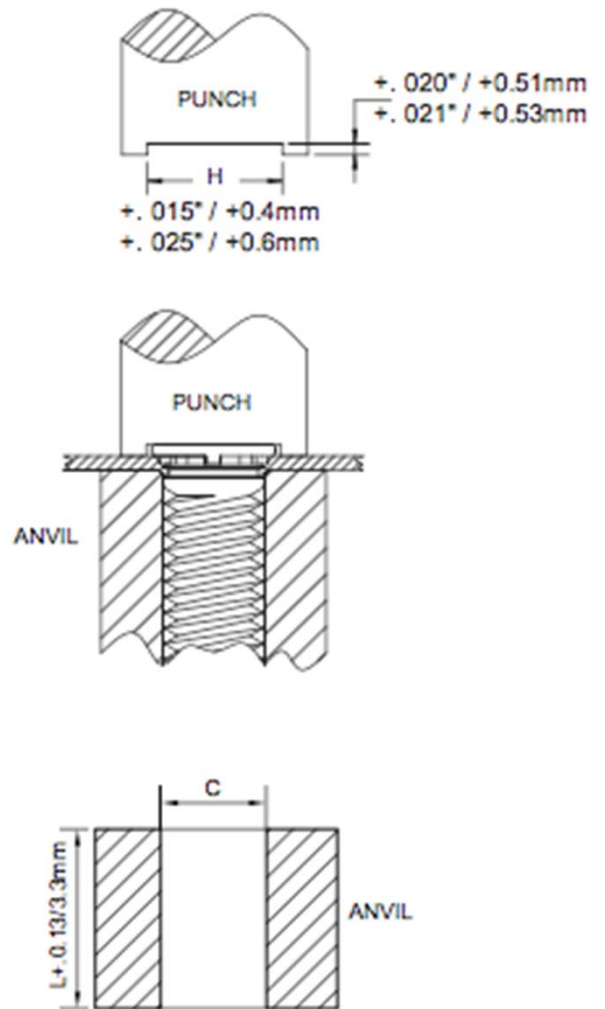
The illustrations below indicate suggested tooling for type PT-TFH studs. Note that for sheets 0.76mm and thicker, the anvil requires only a straight thru hole to accommodate the stud. For sheets less than 0.76mm down to 0.51mm, the hole requires a countersink with dimension A at the top to provide for metal flow around the shank of the stud.

The standard punch design below provides clearance for the stud head and reduces chances of over squeezing the head of the stud into the sheet metal. When installed, the stud head is not flush but will protrude approximately 0.64mm.

Tooling for sheet thickness less than 0.76mm down to 0.51mm.



Tooling for sheet thickness 0.76mm and greater.



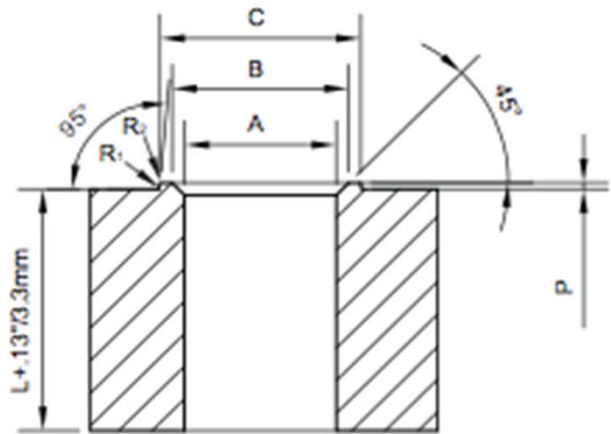
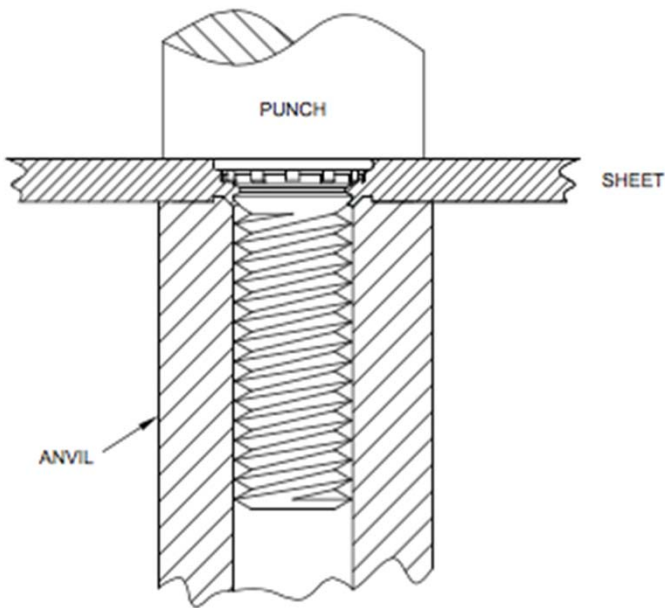
INSTALLATION

TYPE PT-FH4 STUDS FOR STAINLESS STEEL SHEETS

For type PT-FH4 studs, a special anvil with a raised ring is required to create a proper installation. The raised ring acts as a second displacer of the stainless sheet material, thereby ensuring that the annular groove is filled. The special anvils are available from stock or can be machined from suitable tool steel. A hardness of HRC 55 / HB 547 minimum is required to provide long anvil life. We recommend measuring the "P" dimension every 5000 installations to ensure that the anvil remains within specification.

All dimensions are in millimeters

METRIC	THREAD CODE	ANVIL DIMENSIONS					
	A +0.08	B ±.005	C ±.005	P ±.0025	R1 MAX	R2 MAX	
	M3	3.05	3.81	4.57	0.25	0.08	0.13
	M4	4.04	4.95	5.82	0.25	0.08	0.13
	M5	5.08	6.15	7.16	0.25	0.08	0.13
	M6	6.05	7.87	8.79	0.21	0.08	0.13

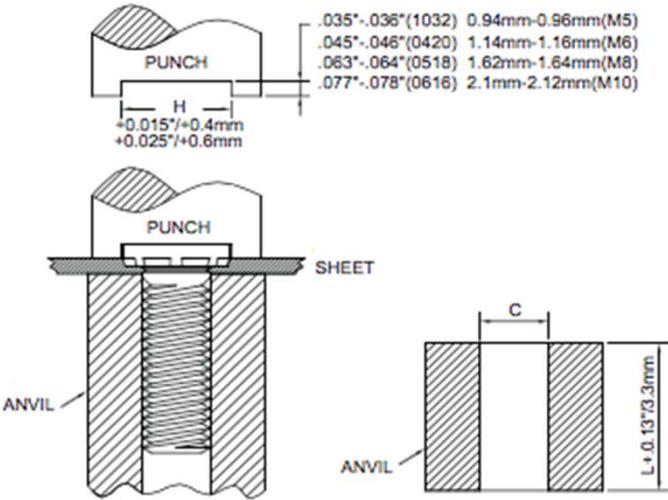


Recommended Installation Anvil

INSTALLATION

TYPE PT-HFH / HFHB / HFHS STUDS

Apply squeezing force on the punch sufficient only to embed the ribs on the head of the stud into the sheet. The illustration below indicates suggested tooling for Type PT-HFH self-clinching studs. The standard punch design provides clearance for the stud head and reduces chances of over squeezing.



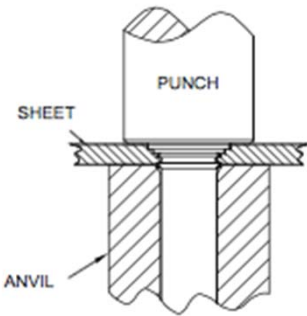
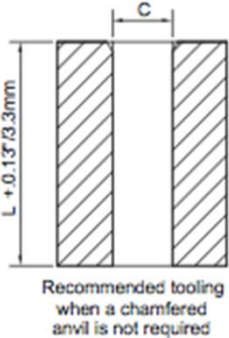
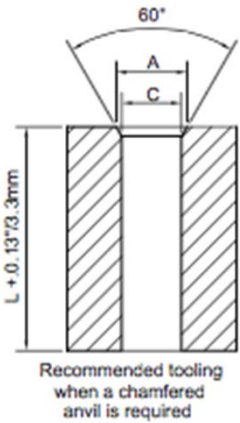
All dimensions are in millimeters

METRIC	THREAD CODE	ANVIL DIMENSIONS
		A +0.08
	M5	5.03
	M6	6.03
	M8	8.03
	M10	10.03

TYPES PT-TPS PILOT PINS

All dimensions are in millimeters

METRIC	PIN DIA. CODE	SHEET THICKNESS	ANVIL DIMENSIONS	
			A +0.05	C ±0.05
	3mm	1 - 1.7	3.88	3.13
		Over 1.7	(1)	
	4mm	1 - 1.7	4.88	4.13
		Over 1.7	(1)	
	5mm	1 - 1.8	5.89	5.13
		Over 1.8	(1)	
	6mm	1 - 1.9	6.89	6.13
		Over 1.9	(1)	



PERFORMANCE DATA

TYPES PT-FH / FHS / FLUSH-HEAD STUDS

The values reported here pertain only to the holding power of the stud to the sheet into which it is installed. These values in no way pertain to the axial strength of the threads., allowable tightening torque or design loading of an assembly. The values reported are anticipated destructive averages when all installation specifications and procedures are followed. When properly installed, self-clinching studs should perform better than the values given here.

	THREAD CODE	MAX. NUT TIGHTENING TORQUE (N-M) ⁽¹⁾	TYPE	TEST SHEET THICKNESS & MATERIAL	SHEET HARDNESS HRB	INSTALLATION (KN)	PUSHOUT (N)	TORQUE OUT (N-M)	PULL-THRU (N)
METRIC	M2.5	0.41	PT-FH	1.6mm ALUMINIUM	29	8.9	465	1.0	2600
			PT-FHS	1.6mm ALUMINIUM	29	11.6	465	0.8	1820
			PT-FH	1.5mm STEEL	59	11.1	740	1.0	2800
			PT-FHS	1.5mm STEEL	59	13.8	740	0.8	1820
	M3	0.74	PT-FH	1.6mm ALUMINIUM	29	12.9	600	1.7	3150
			PT-FHS	1.6mm ALUMINIUM	29	12.9	600	1.3	2570
			PT-FH	1.5mm STEEL	59	14.7	820	1.7	3840
			PT-FHS	1.5mm STEEL	59	14.7	820	1.3	2440
	M3.5	1.15	PT-FH	1.6mm ALUMINIUM	29	15.6	800	1.7	3780
			PT-FHS	1.6mm ALUMINIUM	29	15.6	800	1.7	3445
			PT-FH	1.5mm STEEL	59	22.3	1335	2.8	3780
			PT-FHS	1.5mm STEEL	59	22.3	1335	2.0	3445
	M4	1.7	PT-FH	1.6mm ALUMINIUM	29	20	975	2.9	4448
			PT-FHS	1.6mm ALUMINIUM	29	22.3	975	2.9	4180
			PT-FH	1.5mm STEEL	59	28.9	1780	4.2	5650
			PT-FHS	1.5mm STEEL	59	26.7	1780	2.9	4775
	M5	3.5	PT-FH	1.6mm ALUMINIUM	29	24.5	1070	3.5	5170
			PT-FHS	1.6mm ALUMINIUM	29	24.5	1070	3.5	4760
			PT-FH	1.5mm STEEL	59	33.4	2000	6.5	6270
			PT-FHS	1.5mm STEEL	59	32.5	2000	6.3	6000
M6	5.9	PT-FH	2.4mm ALUMINIUM	28	28.9	1660	7.3	10200	
		PT-FHS	2.4mm ALUMINIUM	28	28.9	1660	7.3	9090	
		PT-FH	2.2mm STEEL	46	44.5	2560	11.3	11300	
		PT-FHS	2.2mm STEEL	46	44.5	2560	10.1	10600	
M8	14.2	PT-FH	2.4mm ALUMINIUM	28	29.8	1910	11.3	10500	
		PT-FHS	2.4mm ALUMINIUM	28	29.8	1910	11.3	9540	
		PT-FH	2.2mm STEEL	46	44.5	2890	19.2	15450	
		PT-FHS	2.2mm STEEL	46	49.8	2890	17.5	13630	

(1) Maximum recommended tightening torques for aluminium studs are 60% of these values.

PERFORMANCE DATA

TYPE PT-FH4 STUDS

METRIC	THREAD CODE	MAX. NUT TIGHTENING TORQUE (N-M) ⁽¹⁾	TEST SHEET THICKNESS & MATERIAL	SHEET HARDNESS HRB	INSTALLATION (KN)	PUSHOUT (N)	TORQUE OUT (N-M)	PULL-THRU (N)
	M3	0.9	1.5mm STAINLESS STEEL	92	40	2220	1.8	3500
	M4	2.1	1.5mm STAINLESS STEEL	92	50	3210	6.5	8000
	M5	4.3	1.5mm STAINLESS STEEL	92	53	3575	10.7	10000
	M6	7.2	1.5mm STAINLESS STEEL	92	71	4200	15.9	14900

Performance values shown are typical for fasteners properly installed using raised ring tooling in good condition. We recommend replacing installation tooling when the height of the "P" dimension is reduced to 0.13mm due to wear. Reductions in performance may occur as the height of the protrusion wears. Variations in hole preparation, installation force, and sheet material type, thickness, and hardness will affect both performance and tooling life.

TYPE PT-TFH / TFHS NON-FLUSH STUDS

METRIC	THREAD CODE	MAX. NUT TIGHTENING TORQUE (N-M)	TYPE	TEST SHEET THICKNESS & MATERIAL	SHEET HARDNESS HRB	INSTALLATION (KN)	PUSHOUT (N)	TORQUE OUT (N-M)
	M3	0.74	PT-TFH	0.5mm ALUMINIUM	28	5.8	195	0.6
			PT-TFHS	0.5mm ALUMINIUM	28	5.3	195	0.6
			PT-TFH	0.6mm STEEL	52	12.5	300	1
			PT-TFHS	0.6mm STEEL	52	6.7	300	1
	M4	1.7	PT-TFH	0.5mm ALUMINIUM	28	12.5	250	0.7
			PT-TFHS	0.5mm ALUMINIUM	28	9.8	250	0.7
			PT-TFH	0.6mm STEEL	52	17.8	500	2.5
			PT-TFHS	0.6mm STEEL	52	13.4	500	2.5
	M5	3.5	PT-TFH	0.5mm ALUMINIUM	28	15.6	270	1.3
			PT-TFHS	0.5mm ALUMINIUM	28	13.4	270	1.3
			PT-TFH	0.6mm STEEL	52	26.7	670	3
			PT-TFHS	0.6mm STEEL	52	17.8	670	3

PERFORMANCE DATA

TYPE PT-HFH / HFHS / HFHB STUDS

METRIC	THREAD CODE	TYPE	MAX. NUT TIGHTENING TORQUE (N-M)	TEST SHEET THICKNESS & MATERIAL	SHEET HARDNESS HRB	(1) INSTALLATION (KN)	PUSHOUT (N)	TORQUE OUT (N-M)	(2) TENSILE STRENGTH (KN)
	M5	PT-HFH	4.4	1.5mm ALUMINIUM	15	13	800	5.4	12.8
		PT-HFH	4.4	1.5mm STEEL	65	26	1500	7.6	12.8
		PT-HFHS	4.4	1.62mm ALUMINIUM	35	12.4	800	5.4	7.3
		PT-HFHS	4.4	1.47mm STEEL	54	21.7	1500	6.4	7.3
		PT-HFHB	3.47	1.5mm COPPER CDA-110	28	15.6	1115	3.4	5.9
	M6	PT-HFH	10	1.5mm ALUMINIUM	43	29	1270	14	18.1
		PT-HFH	10	1.5mm STEEL	59	33	1750	14	18.1
		PT-HFHS	10	1.62mm ALUMINIUM	35	15.4	1270	11	10.3
		PT-HFHS	10	1.6mm steel	45	24.6	1750	11	10.3
PT-HFHB		5.9	1.5mm COPPER CDA-110	28	25.3	1600	6.7	8.3	
M8	PT-HFH	21.7	2.3mm ALUMINIUM	39	35.6	1700	30	32.9	
	PT-HFH	21.7	2.3mm STEEL	58	44.5	2200	30	32.9	
	PT-HFHS	21.7	2.23mm ALUMINIUM	44	24.4	1700	20	18.8	
	PT-HFHS	21.7	2.48mm STEEL	43	37.8	2100	20	18.8	
	PT-HFHB	14.3	3.2mm COPPER CDA-110	32	33	2250	15.3	15.1	
M10	PT-HFH	36.6	2.3mm ALUMINIUM	39	40	2445	36	52.2	
	PT-HFH	36.6	2.3mm STEEL	58	54	3470	49	52.2	
	PT-HFHS	36.6	2.3mm ALUMINIUM	44	33.3	2445	36	29.9	
	PT-HFHS	36.6	2.3mm STEEL	44	46.7	3470	36	29.9	
	PT-HFHB	28.5	3.2mm COPPER CDA-110	32	42	2500	25	24	

(1) Installation controlled by proper cavity depth in punch.

(2) Head size is adequate to ensure failure in threaded area.

PERFORMANCE DATA
TYPE PT-TPS PILOT PINS

	PIN DIA. CODE	TEST SHEET MATERIAL	SHEET HARDNESS HRB	INSTALLATION (KN)	PUSHOUT (N)
METRIC	3MM	ALUMINIUM	22	12	0.56
		STEEL	65	22	0.98
	4MM	ALUMINIUM	19	22	0.89
		STEEL	66	26,4	1.54
	5MM	ALUMINIUM	18	28,6	1.01
		STEEL	60	35,2	1.76
	6MM	ALUMINIUM	18	30,8	1.1
		STEEL	62	39,6	2.1



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