The following excerpt are pages from the North American Product Technical Guide, Volume 2: Anchor Fastening, Edition 21.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines.
US&CA: https://submittals.us.hilti.com/PTGVol2/

To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am – 6:00pm CST.
US: 877-749-6337 or HNATechnicalServices@hilti.com
CA: 1-800-363-4458, ext. 6 or CATechnicalServices@hilti.com

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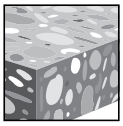
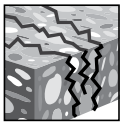
3.3.13 HDI-P TZ DROP-IN ANCHORS

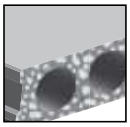
PRODUCT DESCRIPTION

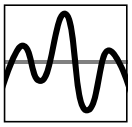
HDI-P TZ Flush anchors

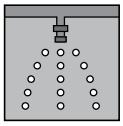
Anchor System		Features and Benefits
	Carbon steel HDI-P TZ	• Drop-in anchor with optimized length for reliable fastenings in post-tensioned cable concrete slabs • Suitable for uncracked and cracked concrete including seismic areas • Productive installation with HDI-P TZ automatic setting tool with hammer drill • Used with Hilti Dust Removal System (DRS) for compliance with Table 1 of OSHA 1926.1153 regulations for silica dust exposure • Shallow drilling for fast installations • Easy installation with Auto Setting Tool • Lip provides flush installation, consistent anchor depth, and easy rod alignment • Auto Setting Tool includes stop drill bit and setting tool, no tool change necessary
	Auto-setting tool HDI-P TZ	
	Hand-setting tool HDI-P TZ	


Uncracked concrete


Cracked concrete


Hollow core concrete


Seismic design categories A-F


Fire sprinkler listings

Approvals/Listings	
ICC-ES (International Code Council)	ESR-4236 in concrete per ACI 318 Ch. 17 / ACI 355.2 / ICC-ES AC193
City of Los Angeles	2017 LABC Supplement (within ESR-4236)
Florida Building Code	2017 FBC Supplement (within ESR-4236)
FM (Factory Mutual)	Pipe hanger components for automatic sprinkler systems for 3/8 (4-inch nominal pipe diameter)
UL (Underwriters Laboratory)	Pipe hanger equipment for fire protection services for 3/8 (4-inch nominal pipe diameter)

MATERIAL SPECIFICATIONS

HDI-P TZ drop-in anchors are manufactured from carbon steel with zinc plating per DIN EN ISO 4042 A2K.

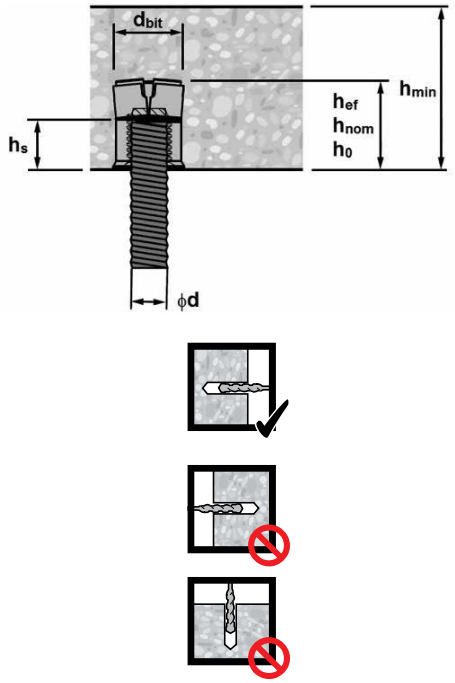
INSTALLATION PARAMETERS

Table 1 — Hilti HDI-P TZ setting information

Setting information	Symbol	Unit	Nominal anchor size / internal thread dia. (in)	
			3/8	
Internal thread diameter	d	in.	3/8	
Nominal bit diameter	d_{bit}	in.	9/16	
Nominal embedment	h_{nom}	in. (mm)	3/4 (19)	
Hole depth in base material	h_0	in. (mm)	3/4 (19)	
Effective embedment	h_{ef}	in. (mm)	3/4 (19)	
Thread engagement length	h_a	in. (mm)	3/8 (10)	
Maximum installation torque for threaded element	T_{max}	ft-lb (Nm)	5 (7)	
Minimum base material thickness — concrete	h_{min}	in. (mm)	2-1/2 (64)	4 (102)
Minimum edge distance — concrete	c_{min}	in. (mm)	6 (152)	2-1/2 (64)
Minimum anchor spacing — concrete	s_{min}	in. (mm)	8 (203)	3 (76)
Minimum base material thickness — hollow core concrete panels	h_{min}	in. (mm)	1/3/8 (35)	
Minimum edge distance — hollow core concrete panels	c_{min}	in. (mm)	6 (152)	
Minimum anchor spacing — hollow core concrete panels	s_{min}	in. (mm)	8 (203)	

For **SI:** 1 inch = 25.4mm, 1 ft-lb = 1.356 Nm

Figure 1 — Hilti HDI-P TZ installation parameters



DESIGN DATA IN CONCRETE PER ACI 318

ACI 318 Chapter 17 Design

The design tables in Tables 2 to 4 are Hilti Simplified Design Tables. The load values were developed using the design parameters and variables of ICC Evaluation Services ESR-4236 and the equations within ACI 318 Chapter 17 as amended by ICC-ES AC193. The strength design capacities calculated from the tables below are to be compared to the factored loads determined from strength design load combinations. For a detailed explanation of the Hilti Simplified Design Tables, refer to Section 3.1.8. Data tables from ESR-4236 are not contained in this section, but can be found at www.hilti.com or www.icc-es.org.

Table 2 — Hilti HDI-P TZ design strength based on concrete failure modes in uncracked concrete per ACI 318 14 Ch. 17 [1,2,3,4,5]

Nominal anchor diameter in.	Nominal embed. in. (mm)	Tension (lesser of concrete breakout / pullout) - φN_n				Shear (lesser of concrete breakout or pryout) - φV_n			
		f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
3/8	3/4 (19)	310 (1.4)	340 (1.5)	395 (1.8)	485 (2.1)	350 (1.6)	385 (1.7)	445 (2.0)	545 (2.4)

Table 3 — Hilti HDI-P TZ design strength based on concrete failure modes in cracked concrete per ACI 318 14 Ch. 17 [1,2,3,4,5,6,7]

Nominal anchor diameter in.	Nominal embed. in. (mm)	Tension (lesser of concrete breakout / pullout) - φN_n				Shear (lesser of concrete breakout or pryout) - φV_n			
		f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
3/8	3/4 (19)	190 (0.8)	200 (0.9)	220 (1.0)	255 (1.1)	250 (1.1)	270 (1.2)	315 (1.4)	385 (1.7)

The following footnotes apply to both Table 2 and 3:

1 See Section 3.1.8.6 of the Anchor Tech Guide Ed. 17 to convert design strength value to ASD value.
2 Linear interpolation between concrete compressive strengths is not permitted.
3 Tabular values are for a single anchor with a minimum edge distance of 6-1/2-in (166mm) and a minimum spacing of 8-in (204mm). For a 6-in (153mm) edge distance multiply uncracked concrete tension and shear values by 0.92. No reduction needed for cracked concrete.
4 Compare to the steel values in Table 4. The lesser of the values is to be used for the design.
5 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.68. For all-lightweight, λ_a = 0.60.
6 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.74.
7 No additional reduction needed for seismic shear for concrete breakout or pryout failure. See Section 3.1.8.7 of the Anchor Tech Guide Ed. 17 for additional information on seismic applications.

Table 4 — Hilti HDI-P TZ design strength based on steel failure per ACI 318 Ch. 17 [1,2,3]

Nominal anchor diameter in.	Steel strength of HDI-P TZ anchor			Steel strength of ASTM A36 threaded rod		
	Tensile[4] φN_{sa} lb (kN)	Shear[5] φV_{sa} lb (kN)	Seismic Shear[6,9] φV_{sa} lb (kN)	Tensile[4] $\varphi N_{sa,rod}$ lb (kN)	Shear[7] $\varphi V_{sa,rod}$ lb (kN)	Seismic Shear[8,9] $\varphi V_{sa,rod,eq}$ lb (kN)
3/8	4,065 (18.1)	585 (2.6)	585 (2.6)	3,370 (15.0)	1,885 (8.4)	1,320 (5.9)

1 See Section 3.1.8.6 of the Anchor Tech Guide Ed. 17 to convert design strength value to ASD value.
2 Steel strength in tension and shear determined from the lesser of the HDI-P TZ or the inserted threaded rod.
3 Hilti HDI-P TZ anchors are considered a brittle steel element. ASTM A36 threaded rod is considered a ductile steel element.
4 Tensile $\varphi N_{sa} = \varphi A_{se,N} f_{uta}$ as noted in ACI 318 Ch. 17.
5 Shear values for HDI-P TZ determined by static shear tests with $\varphi V_{sa} \le \varphi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Ch. 17.
6 Seismic shear values for HDI-P TZ determined by seismic shear tests with $\varphi V_{sa} < \varphi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Ch. 17.
7 Shear values for threaded rod determined by $\varphi V_{sa,rod} = \varphi\ 0.60\ A_{se,V} f_{uta}$ as noted in ACI 318 Ch. 17.
8 Seismic shear values for threaded rod determined by $\varphi V_{sa,rod,eq} = \varphi\ 0.70\ V_{sa,rod}$.
9 See Section 3.1.8.7 of the Anchor Tech Guide Ed. 17 for additional information on seismic applications

DESIGN DATA IN CONCRETE PER CSA A23.3

CSA A23.3 Annex D Design

Limit State Design of anchors is described in the provisions of CSA A23.3 Annex D for post-installed anchors tested and assessed in accordance with ACI 355.2 for mechanical anchors and ACI 355.4 for adhesive anchors. Tables 8 and 9 in this section contains the Limit State Design tables that are based on the published loads in ICC Evaluation Services ESR-4236 and converted for use with CSA A23.3 Annex D. Tables 5 to 7 below are Hilti Simplified Design Tables which are pre-factored resistance tables based on the design parameters and variables in Tables 8 and 9. All the figures in the previous ACI 318 14 Chapter 17 design section are applicable to Limit State Design and the tables will reference these figures.

For a detailed explanation of the tables developed in accordance with CSA A23.3 Annex D, refer to Section 3.1.8. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.ca.

Table 5 — Hilti HDI-P TZ factored resistance based on concrete failure modes in uncracked concrete per CSA A23.3 Annex D [1,2,3,4,5]

Nominal anchor diameter in.	Nominal embed. in. (mm)	Tension (lesser of concrete breakout / pullout) - N_r				Shear (lesser of concrete breakout or pryout) - V_r			
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	3/4 (19)	325 (1.5)	365 (1.6)	400 (1.8)	460 (2.1)	380 (1.7)	425 (1.9)	465 (2.1)	540 (2.4)

Table 6 — Hilti HDI-P TZ factored resistance based on concrete failure modes in cracked concrete per CSA A23.3 Annex D [1,2,3,4,5,6,7]

Nominal anchor diameter in.	Nominal embed. in. (mm)	Tension (lesser of concrete breakout / pullout) - N_r				Shear (lesser of concrete breakout or pryout) - V_r			
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	3/4 (19)	195 (0.9)	210 (0.9)	220 (1.0)	245 (1.1)	270 (1.2)	300 (1.3)	330 (1.5)	380 (1.7)

The following footnotes apply to both Table 5 and 6:

1 See Section 3.1.8.6 of the Anchor Tech Guide Ed. 17 to convert design strength value to ASD value.
2 Linear interpolation between concrete compressive strengths is not permitted.
3 Tabular values are for a single anchor with a minimum edge distance of 6-1/2-in (166mm) and a minimum spacing of 8-in (204mm). For a 6-in (153mm) edge distance multiply uncracked concrete tension and shear values by 0.92. No reduction needed for cracked concrete.
4 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.68. For all-lightweight, λ_a = 0.60.
5 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.74.
6 No additional reduction needed for seismic shear for concrete breakout or pryout failure. See Section 3.1.8.7 of the Anchor Tech Guide Ed. 17 for additional information on seismic applications.

Table 7 — Hilti HDI-P TZ factored resistance based on steel failure per CSA A23.3 Annex D [1,2,3]

Nominal anchor diameter in.	Steel strength of HDI-P TZ anchor			Steel strength of ASTM A36 threaded rod		
	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[6,9] $V_{sar,eq}$ lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[7] V_{sar} lb (kN)	Seismic Shear[8,9] $V_{sar,eq}$ lb (kN)
3/8	3,720 (16.5)	540 (2.4)	540 (2.4)	3,055 (13.6)	1,720 (7.7)	1,200 (5.3)

1 See Section 3.1.8.6 of the Anchor Tech Guide Ed. 17 to convert design strength value to ASD value.
2 Steel strength in tension and shear determined from the lesser of the HDI-P TZ or the inserted threaded rod.
3 Hilti HDI-P TZ anchors are considered a brittle steel element. ASTM A36 threaded rod is considered a ductile steel element.
4 Tensile $N_{sar} = A_{se,N}\ \varphi_s\ f_{uta}$ as noted in CSA A23.3 Annex D.
5 Shear values for HDI-P TZ determined by static shear tests with $V_{sar} \le 0.6\ A_{se,V}\ \varphi s\ f_{uta}$ R as noted in CSA A23.3 Annex D.
6 Seismic shear values for HDI-P TZ determined by seismic shear tests with $V_{sar,eq} \le 0.60\ A_{se,V}\ \varphi_s\ f_{uta}$ R as noted in CSA A23.3 Annex D.
7 Shear values for threaded rod determined by $V_{sar} = 0.6\ A_{se,V}\ \varphi_s\ f_{uta}$ R as noted in CSA A23.3 Annex D.
8 Seismic shear values for threaded rod determined by $V_{sar,rod,eq} = 0.70\ V_{sar,rod}$.
9 See Section 3.1.8.7 of the Anchor Tech Guide Ed. 17 for additional information on seismic applications.

Table 8 — Design information, Hilti HDI-P TZ, in accordance with CSA A23.3[1]

Setting information	Symbol	Unit	Nominal anchor size/internal thread dia. (in)	Ref
			3/8	CSA A23.3
Anchor O.D.	d_a	in. (mm)	0.561 (14.25)	
Effective embedment	h_{ef}	in. (mm)	3/4 (19)	
Steel embed. material resistance factor for reinforcement	φ_s	-	0.85	8.4.3
Resistance modification factor for tension, steel failure modes [2,3]	$R_{s,N}$	-	0.70	D.5.3 b)
Min. specified yield strength	f_{ya}	psi (N/mm²)	70,400 (484)	
Min. specified ultimate strength	f_{uta}	psi (N/mm²)	88,000 (605)	
Effective-cross sectional steel area in tension	$A_{se,N}$	in² (mm²)	0.071 (45.8)	
Factored steel resistance in tension [4]	N_{sa}	lb (kN)	6,250 (27.8)	D.6.1.2 Eq. D.2
Concrete material resistance factor	φ_c	-	0.65	8.4.2
Anchor category	-	-	1	D.5.3 c)
Resistance modification factor for tension, concrete failure [3]	$R_{c,N}$	-	0.60	
Coeff. for factored conc. breakout resistance, uncracked concrete	$k_{c,uncr}$	in-lb (SI)	24 (10.0)	D.6.2.2
Coeff. for factored conc. breakout resistance, cracked concrete	$k_{c,cr}$	in-lb (SI)	17 (7.1)	D.6.2.2
Modification factor for anchor resistance, tension, uncracked conc. [5]	$\psi_{c,N}$	-	1.0	D.6.2.6
Critical edge distance	c_{ac}	in. (mm)	6 (152)	
Factored pullout resistance in 20 MPa uncracked concrete [6]	$N_{pr,uncr}$	lb (kN)	N/A	D.6.3.2
Factored pullout resistance in 20 MPa cracked concrete [6]	$N_{pr,cr}$	lb (kN)	495 (2.2)	D.6.3.2
Factored pullout resistance in 20 MPa cracked concrete, seismic [6]	$N_{pr,eq}$	lb (kN)	490 (2.2)	D.6.3.2
Resistance modification factor for shear, steel failure modes [2,3]	$R_{s,V}$	-	0.65	D.5.3 b)
Factored steel resistance in shear [7]	V_{sa}	lb (kN)	975 (4.3)	D7.1.2
Factored steel resistance in shear, seismic [7]	$V_{sa,eq}$	lb (kN)	975 (4.3)	
Resistance modification factor for shear, concrete failure modes [3]	$R_{c,V}$	-	0.70	
Coefficient for pryout resistance	k_{cp}	-	1.0	D.7.3

1 Design information is taken from ICC-ES ESR-4236, dated July 2018, table 2, and converted for use with CSA A23.3 Annex D.
2 The HDI-P TZ is considered a brittle steel element as defined by CSA A23.3 Annex D Section D.2.
3 All values of R are applicable with the load combinations of CSA A23.3 Chapter 8. For concrete failure modes, no increase for Condition A is permitted.
4 $N_{sar} = N_{sa}\ \varphi_s\ R_{s,N}$ where N_{sa} tabular value above is precalculated from $A_{se,N}\ f_{uta}$.
5 For all design cases, $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.
6 For all design cases, $\psi_{c,P} = 1.0$. Tabular value for pullout resistance is for a concrete compressive strength of 20 MPa (2,900 psi). Pullout resistance for concrete compressive strength greater than 20 MPa (2,900 psi) may be increased by multiplying the tabular pullout resistance by $(f'_c / 20)^{0.35}$ for MPa or $(f'_c / 2{,}900)^{0.35}$ for psi. NA (not applicable) denotes that pullout strength does not need to be considered for design.
7 Shear and seismic shear tests are all performed in cracked concrete member per ICC-ES AC193 section 9.4 and 9.6 respectively. Value of $V_{sa(,eq)} < 0.6\ A_{se,V}\ f_{uta}$ for all cases. Multiply V_{sa} tabular value above by $\varphi_s\ R_{s,V}$ to get V_{sar} and $V_{sar,eq}$.

Table 9 - Steel design information for inserted threaded rod, in accordance with CSA A23.3[1]

Setting information	Symbol	Unit	Nominal anchor size / internal thread dia. (in)
			3/8
Nominal rod diameter	d_{rod}	in.	0.375
Steel embed. material resistance factor for reinforcement	φ_s	-	0.85
Resistance modification factor for tension, steel failure modes, ASTM A36 steel material [2]	$R_{s,N}$	-	0.80
Min. specified ult. strength, ASTM A36 steel material	f_{uta}	psi (MPa)	58,000 (400)
Rod effective cross-sectional area	$A_{se,rod}$	in.^{2} (mm^2)	0.0775 (50)
Factored steel resistance in tension ASTM A36 steel material [3]	$N_{sa,rod}$	lb (kN)	4,495 (20.0)
Factored steel resistance in tension, seismic ASTM A36 steel material [3]	$N_{sa,rod,eq}$	lb (kN)	4,495 (20.0)
Resistance modification factor for steel in shear ASTM A36 steel material [2]	$R_{sa,rod,V}$	-	0.75
Factored steel resistance in shear ASTM A36 steel material [4]	$V_{sa,rod}$	lb (kN)	2,695 (12.0)
Factored steel resistance, seismic ASTM A36 steel material [4]	$V_{sa,rod,eq}$	lb (kN)	1,885 (8.4)

1 Values provided for steel element material types, or equivalent, based on minimum specified strengths and calculated in accordance with CSA A23.3 14 Eq. D.2 and Eq. D.30, as applicable.

2 All values of R are applicable with the load combinations of CSA A23.3 Chapter 8. Values correspond to a ductile steel element.

3 $N_{sar,rod(eq)} = N_{sa,rod(eq} \varphi_s R_{s,N}$ where $N_{sa,rod(eq)}$ tabular value above is precalculated from $A_{se,rod} f_{uta}$. N_{sar} shall be the lower of $N_{sar,rod}$ or $N_{sar,HDI\text{-}P\ TZ}$ for static steel strength in tension; for seismic loads, $N_{sar,eq}$ shall be the lower of $N_{sar,rod,eq}$ or $N_{sar,eq}$, HDI-P TZ.

4 $V_{sar,rod(eq)} = V_{sa,rod(eq)} \varphi_s R_{s,V}$ where $V_{sa,rod}$ tabular value above is precalculated from 0.6 $A_{se,rod} f_{uta}$, and $V_{sa,rod,eq}$ must be taken as 0.7 $V_{sa,rod}$. V_{sar} shall be the lower of $V_{sar,rod}$ or $V_{sar,HDI\text{-}P\ TZ}$ for static steel strength in tension; for seismic loading, $V_{sar,eq}$ shall be the lower of $V_{sar,eq}$,rod or $V_{sar,eq,HDI\text{-}P\ TZ}$.

INSTALLATION INSTRUCTIONS

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.hilti.com or www.hilti.ca. Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

ORDERING INFORMATION

Description	Item number
Flush anchor HDI-P TZ 3/8"	2204029
HDI-P TZ 3/8" MC (1200 PCS / MC)	3596870
HDI-P TZ 3/8" (1/3 Pallet = 9600 PCS)	3596872
HDI-P TZ 3/8" Pallet	3597043
HDI-P TZ 3/8" (300) with auto set tool	3597044
HDI-P TZ 3/8" (600) with auto set tool	3597045
HDI-P TZ 3/8" (1200) with 3 auto set tools	3597046

Accessories

Description	Item number
Auto setting tool HDI-P TZ 3/8"	2204112
Setting tool HST HDI-P TZ 3/8"x20	2204110