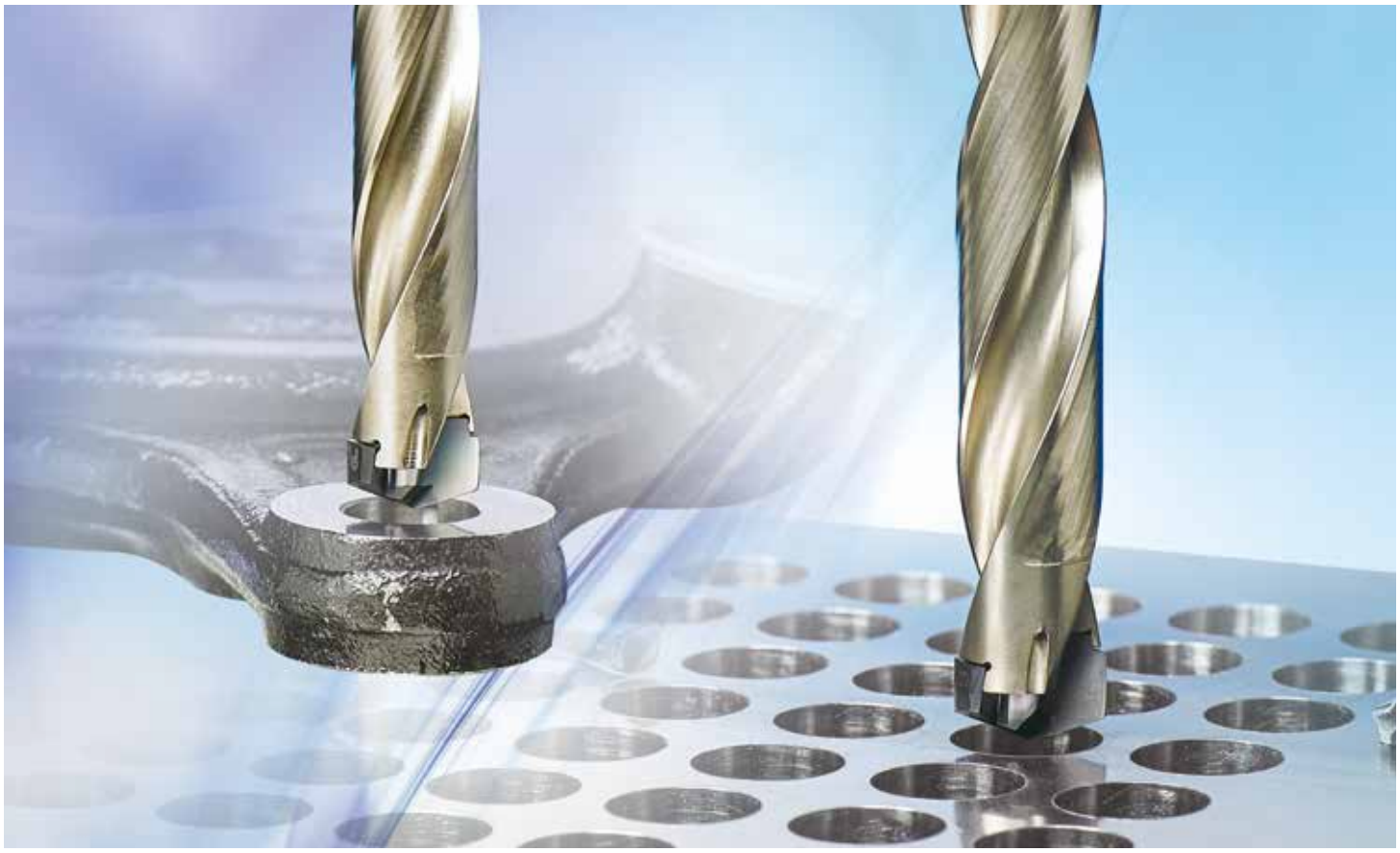
KORLOY
TECH-NEWS

Top solid Piercing Drill Cone

TPDC

Cone Shaped Head Indexable Drill

- **High Precision**
  High precision drilling available to the level of carbide solid drill
- **High Feed**
  High feed machining available through stable chip evacuation with optimized cutting edge & helical oil hole

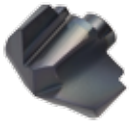


KORLOY

Improved productivity through excellent chip control and stable chip flow

Cone Shaped Head Indexable Drill

TPDC 3D / 5D / 8D



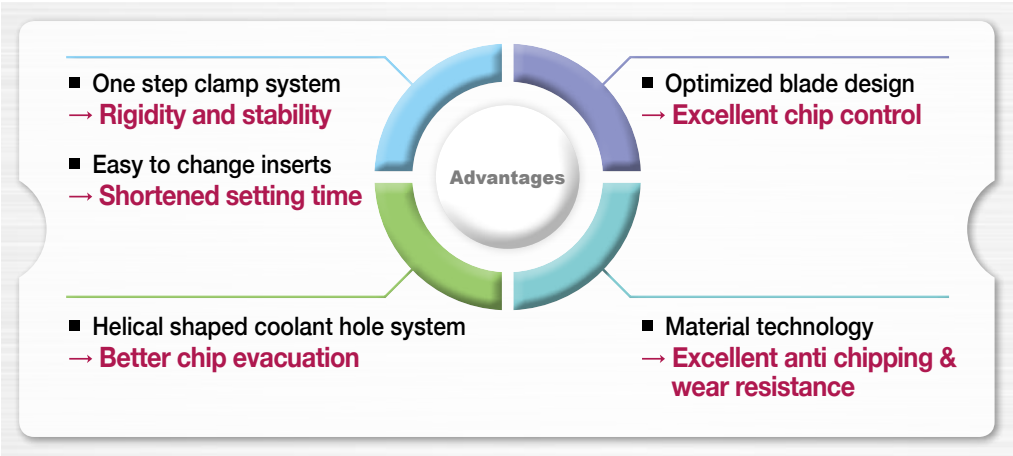
Insert

As for existing indexable drills for general purpose, there was problem with low productivity and poor machining precision due to chip shape and poor chip evacuation when machining tough material such as mild steel and forged steel.

In order to solve this problem, blade design and coolant hole system has upgraded to make it possible to get good chip geometry and stable chip flow in any material of workpieces. As a result, productivity has been improved than that of previous indexable drills for general purpose, with availability in high speed and high feed machining.

On top of that, the One step clamp system applied to **TPDC** for easy and quick tool change. This clamping design allows to change inserts while the holder is attached on the machine in a shortened setting time.
Better stability and sustainability are now possible with this system.

TPDC inserts guarantee excellent anti chipping and wear resistance by ultra fine substrate and multi layer coating.
Not only that, special surface treatment on the holders improves durability and chip flow.



Code System

[Holder]

TPD	C	5D	-	150	20	-	75
Top solid Piercing Drill	Insert type C : Cone type	Aspect ratio(L/D) 3D, 5D, 8D		Drill dia. 150 : Ø15.0	Shank dia. 20 : Ø20		Flute length (mm)

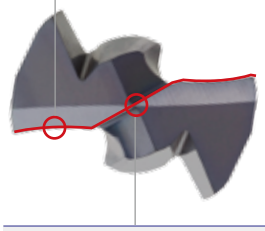
[Insert]

TPD	1500	-	C	P
Top solid Piercing Drill	Drill dia. 1500 : Ø15.00		Insert type C : Cone type	Machining area P : Steel, Universal M : Stainless steel K : Cast iron N : Aluminium C : Carbon fiber Reinforced plastic

Features of TPDC

- **Clamping design**
  - One step clamp system → Increased stability
  - Clamping system allowing to change inserts while the holder is attached on the machine → Shortened setting time
- **Optimized blade design**
  - Excellent chip control → Possibility to use for various types of workpieces
- **Helical shaped coolant hole system**
  - Wide chip pocket area secured → Better lubrication + chip flow improved
- **Material technology**
  - Ultra fine substrate + Multi layer coating applied → Excellent anti chipping & wear resistance

Optimal blade design
- Improved chip control and wear resistance



Overlap thinning
- Excellent centering and penetration

Surface treatment
- Good durability

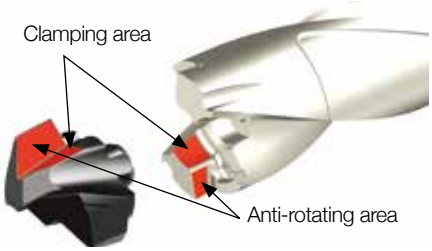
Flute polishing
- Better chip flow

High helix angle
- Low cutting load and good machinability

Helical shaped coolant hole system
- Chip flow improved

Features of Clamping System

One Step Clamp System
→ Easy and quick tool change with good repeatability



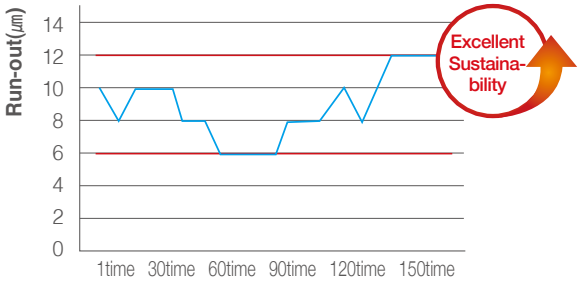
- **Clamping area** : Easy and fast tool change
- **Anti-rotating area** : Performs as a stopper
- Clamping and anti-rotating area make an acute angle to prevent insert rotation while machining

Durability test

- Workpiece: SCM440(HRC22)
- Cutting conditions: Drill dia.(mm) = Ø15.0, vc(m/min) = 90, fn(mm/rev) = 0.25, ap(mm) = 60, wet
- Tools: Insert TPD1500CP(PC5335), Holder TPDC5D-15020-75

→ After using 40 inserts, the setting run-out remains below 15㎛

Sustainability test



No. of clampings

→ After clamping 150 times, the drill run-out remains

Cutting Performance

[TPDC]

[Competitor]

Alloy steel (SCM440, HRC22)

- Workpiece: Part of machine
- Cutting conditions: Drill dia.(mm) = Ø19.0, vc(m/min) = 100, fn(mm/rev) = 0.3, ap(mm) = 90, wet
- Tools: Insert TPD1900CP (PC5335) Holder TPDC5D-19025-95

TPDC	57.6m(640Hole)
Competitor	52.8m(586Hole)

1.1 times more

Lubricative multi layer coating prevents chipping on cutting edges.

[TPDC]

[Competitor]

- Long chip due to wear of cutting edge
- Poor chip control

Carbon steel (SM490A, HRC20)

- Workpiece: Part of welding machine
- Cutting conditions: Drill dia.(mm) = Ø19.0, vc(m/min) = 100, fn(mm/rev) = 0.2, ap(mm) = 90, wet
- Tools: Insert TPD1900CP (PC5335) Holder TPDC5D-19025-95

TPDC	17.3m(192Hole)
Competitor	8.5m(94Hole)

2 times more

Optimized blade design secures better chip flow and chip geometry.

[TPDC]

[Competitor]

Carbon steel (SM45C, HRC19)

- Workpiece: Part of machine
- Cutting conditions: Drill dia.(mm) = Ø17.0, vc(m/min) = 110, fn(mm/rev) = 0.25, ap(mm) = 80, wet
- Tools: Insert TPD1700CP (PC5335) Holder TPDC5D-17020-85

TPDC	30.6m(382Hole)
Competitor	20.4m(255Hole)

1.5 times more

Lubricative multi layer coating enhances wear resistance.

Carbon steel (SM45C, HRC40)

- Workpiece: Part of machine
- Cutting conditions: Drill dia.(mm) = Ø18.0, vc(m/min) = 60, fn(mm/rev) = 0.15, ap(mm) = 65, wet
- Tools: Insert TPD1800CP (PC5335) Holder TPDC5D-18025-90

TPDC	10.0m(153Hole)
Competitor	8.5m(130Hole)

1.2 times more

Lubricative multi layer coating enhances wear resistance.

Cutting Performance

Chip control

Optimized blade design secures **better chip geometry**.

- Workpiece: SM490A(HRC20)
- Cutting conditions: Drill dia.(mm) = Ø19.0, vc(m/min) = 90, fn(mm/rev) = 0.25, ap(mm) = 90, wet
- Tools: Insert TPD1900CP (PC5335), Holder TPDC5D-19025-95

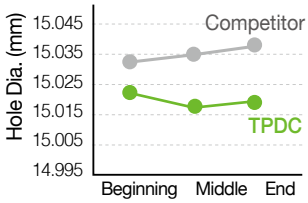
[TPDC]

[Competitor]

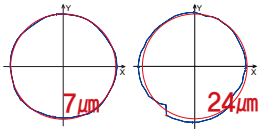
Machining precision

Optimized blade design and overlap thinning **improve precision**.

- Workpiece: SCM440(HRC22)
- Cutting conditions: Drill dia.(mm) = Ø15.0, vc(m/min) = 100, fn(mm/rev) = 0.2, ap(mm) = 60, wet
- Tools: Insert TPD1500CP (PC5335), Holder TPDC5D-15025-75



[Roundness]

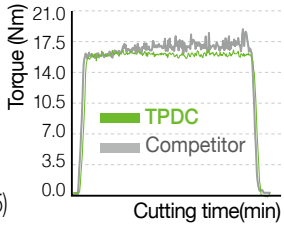


[TPDC] [Competitor]

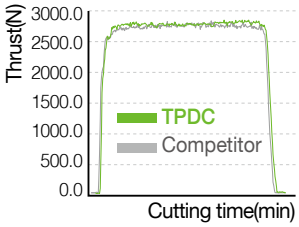
Cutting load

High helix angle and helix shaped coolant hole system **lower cutting loads and improve uniformity**.

- Workpiece: SM45C(HRC19)
- Cutting conditions: Drill dia.(tmm) = Ø15.0, vc(m/min) = 90, fn(mm/rev) = 0.25, ap(mm) = 60, wet
- Tools: Insert TPD1500CP (PC5335), Holder TPDC5D-15025-75



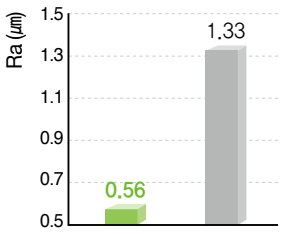
[Torque]

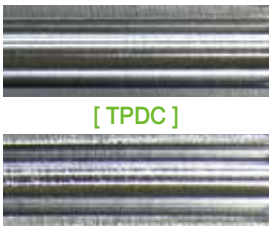


[Thrust]

Surface roughness

- Workpiece: SCM440(HRC22)
- Cutting conditions: Drill dia.(mm) = Ø19.0, vc(m/min) = 100, fn(mm/rev) = 0.2, ap(mm) = 90, wet
- Tools: Insert TPD1900CP (PC5335), Holder TPDC5D-19025-95




[TPDC]

[Competitor]

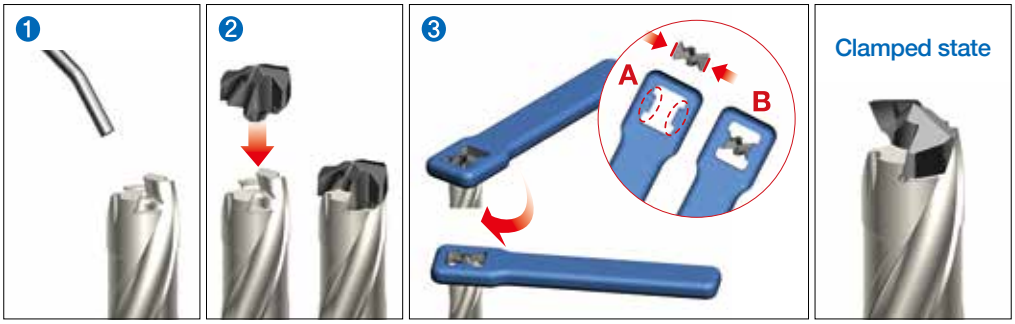
Recommended Cutting Condition

- In case of 8D, reduce the cutting condition 40~50% lower than above after machining the beginning of hole(1.5D).
- In case of interrupted machining, reduce the feed to 0.1~0.15 arround the interrupted part.

Workpiece				Grade	vc	fn(Depth of cut = 3D, 5D) m/rev	
ISO	Workpiece		HB		m/min	Ø12.00~Ø15.99	Ø16.00~Ø19.99
P	Carbon steel	Low carbon steel	80~120	PC5335	110(80~140)	0.15~0.30	0.20~0.35
		High carbon steel	180~280	PC5335	100(70~130)	0.15~0.30	0.20~0.35
	Alloy steel	Low alloy steel	140~260	PC5335	110(80~140)	0.18~0.35	0.23~0.38
		Low pre-hardened steel	200~400	PC5335	75(50~100)	0.18~0.35	0.23~0.38
		High alloy steel	260~320	PC5335	70(50~90)	0.18~0.30	0.20~0.35
		High pre-hardened steel	300~450	PC5335	60(40~80)	0.18~0.30	0.20~0.35

How to Make Good Insert Clamping

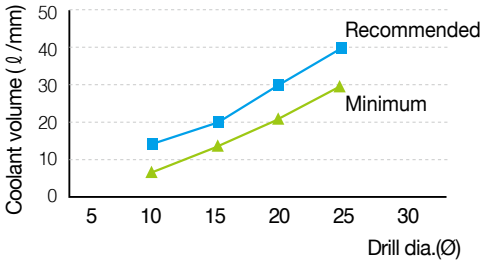
① Clean the mounting seat with air or cloth.
② Put an insert on the holder.
③ A part of wrench and B part of insert must be parallel to each other before clamp the insert.
Turn the wrench clockwise to finish clamping.

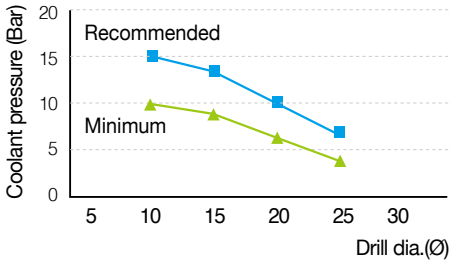


Coolant Tip

- Workpiece SCM440(HRC22)
- Cutting conditions vc(m/min) = 100, wet

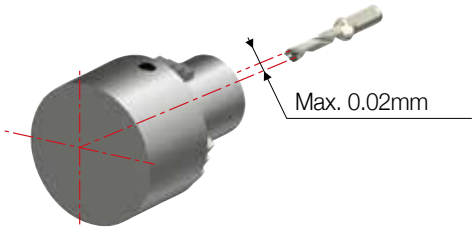
The data of the graph could be changed depending on workpiece and cutting condition.



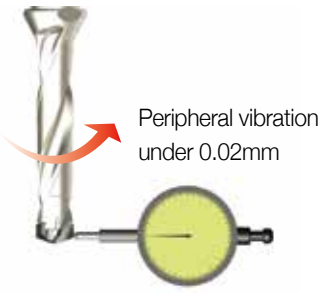


Precautions When Setting

Follow this picture when setting to make the best condition of TPDC.

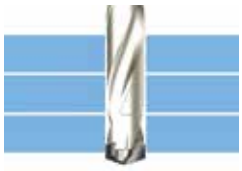
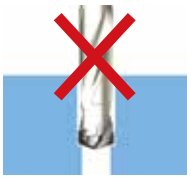


[Setting of the horizontal equipment]

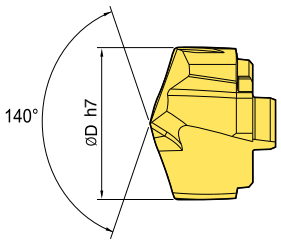


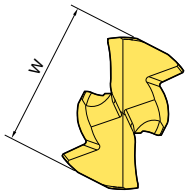
[Setting of the vertical equipment]

Precautions When Drilling

Ramping	Machining overlapped panels	Plunging	Boring
			
1. A slope inclined more than 6° is not allowed. 2. When entering, reduce the feed to 30~50%.	1. Space between panels affects chip evacuation problem. 2. Do not make space between panels.	Not allowed	Not allowed

Insert





(mm)

Designation		Drill dia. (ØD)	W	Grade	Holder	Wrench
TPDC	1200CP	12.0	11.4	PC5335	TPDC(3, 5, 8)D-12016-(36, 60, 96)	TPDC-W12
	1220CP	12.2		PC5335		
	1250CP	12.5		PC5335	TPDC(3, 5, 8)D-12516-(38, 63, 100)	
	1260CP	12.6		PC5335		
	1300CP	13.0	12.3	PC5335	TPDC(3, 5, 8)D-13016-(39, 65, 104)	TPDC-W13
	1350CP	13.5		PC5335	TPDC(3, 5, 8)D-13516-(41, 68, 108)	
	1400CP	14.0	13.4	PC5335	TPDC(3, 5, 8)D-14020-(42, 70, 112)	TPDC-W14
	1420CP	14.2		PC5335		
	1430CP	14.3		PC5335		
	1450CP	14.5		PC5335	TPDC(3, 5, 8)D-14520-(44, 73, 116)	
	1500CP	15.0	14.3	PC5335	TPDC(3, 5, 8)D-15020-(45, 75, 120)	TPDC-W15
	1550CP	15.5		PC5335		
	1600CP	16.0	15.3	PC5335	TPDC(3, 5, 8)D-16020-(48, 80, 128)	TPDC-W16
	1630CP	16.3		PC5335		
	1650CP	16.5		PC5335		
	1670CP	16.7		PC5335		
	1700CP	17.0	16.3	PC5335	TPDC(3, 5, 8)D-17020-(51, 85, 136)	TPDC-W17
	1750CP	17.5		PC5335		
	1770CP	17.7		PC5335		
	1800CP	18.0	17.3	PC5335	TPDC(3, 5, 8)D-18025-(54, 90, 144)	TPDC-W18
	1810CP	18.1		PC5335		
	1850CP	18.5		PC5335		
	1860CP	18.6		PC5335		
	1870CP	18.7		PC5335		
	1900CP	19.0	18.3	PC5335	TPDC(3, 5, 8)D-19025-(57, 95, 152)	TPDC-W19
	1920CP	19.2		PC5335		
	1950CP	19.5		PC5335		
	1970CP	19.7		PC5335		

※ Oder made items available

Recommended Torque per Wrench

(mm)

Designation	Drill dia.(ØD)	Torque(Nm)
TPDC-W12	12.0 ~ 12.9	2.5
TPDC-W13	13.0 ~ 13.9	2.5
TPDC-W14	14.0 ~ 14.9	2.5
TPDC-W15	15.0 ~ 15.9	2.5
TPDC-W16	16.0 ~ 16.9	2.5
TPDC-W17	17.0 ~ 17.9	3.5
TPDC-W18	18.0 ~ 18.9	3.5
TPDC-W19	19.0 ~ 19.9	3.5

TPDC 3D / 5D / 8D

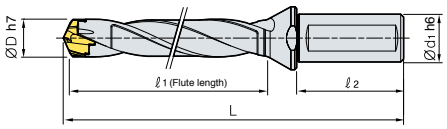


Fig. 1

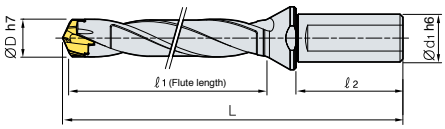


Fig. 2

(mm)

Designation		ØD	Ød	Ød1	ℓ1	ℓ2	L	Insert	Fig.
TPDC	3D-12016-36	12.00~12.49	16	20	36	48	99	TPD1200C□-1249C□	1
	3D-12516-38	12.50~12.99	16	20	38	48	101	TPD1250C□-1299C□	1
	3D-13016-39	13.00~13.49	16	20	39	48	103	TPD1300C□-1349C□	1
	3D-13516-41	13.50~13.99	16	20	41	48	105	TPD1350C□-1399C□	1
	3D-14016-42	14.00~14.49	16	20	42	48	106	TPD1400C□-1449C□	1
	3D-14516-44	14.50~14.99	16	20	44	48	107	TPD1450C□-1499C□	1
	3D-15020-45	15.00~15.99	20	25	45	50	113	TPD1500C□-1599C□	2
	3D-16020-48	16.00~16.99	20	25	48	50	117	TPD1600C□-1699C□	2
	3D-17020-51	17.00~17.99	20	25	51	50	120	TPD1700C□-1799C□	2
	3D-18025-54	18.00~18.99	25	33	54	56	132	TPD1800C□-1899C□	2
	3D-19025-57	19.00~19.99	25	33	57	56	135	TPD1900C□-1999C□	2
	5D-12016-60	12.00~12.49	16	20	60	48	123	TPD1200C□-1249C□	1
	5D-12516-63	12.50~12.99	16	20	63	48	126	TPD1250C□-1299C□	1
	5D-13016-65	13.00~13.49	16	20	65	48	129	TPD1300C□-1349C□	1
	5D-13516-68	13.50~13.99	16	20	68	48	132	TPD1350C□-1399C□	1
	5D-14016-70	14.00~14.49	16	20	70	48	134	TPD1400C□-1449C□	1
	5D-14516-73	14.50~14.99	16	20	73	48	136	TPD1450C□-1499C□	1
	5D-15020-75	15.00~15.99	20	25	75	50	143	TPD1500C□-1599C□	2
	5D-16020-80	16.00~16.99	20	25	80	50	149	TPD1600C□-1699C□	2
	5D-17020-85	17.00~17.99	20	25	85	50	154	TPD1700C□-1799C□	2
	5D-18025-90	18.00~18.99	25	33	90	56	168	TPD1800C□-1899C□	2
	5D-19025-95	19.00~19.99	25	33	95	56	173	TPD1900C□-1999C□	2
	8D-12016-96	12.00~12.49	16	20	96	48	159	TPD1200C□-1249C□	1
	8D-12516-100	12.50~12.99	16	20	100	48	163	TPD1250C□-1299C□	1
	8D-13016-104	13.00~13.49	16	20	104	48	168	TPD1300C□-1349C□	1
	8D-13516-108	13.50~13.99	16	20	108	48	173	TPD1350C□-1399C□	1
	8D-14016-112	14.00~14.49	16	20	112	48	176	TPD1400C□-1449C□	1
	8D-14516-116	14.50~14.99	16	20	116	48	180	TPD1450C□-1499C□	1
	8D-15020-120	15.00~15.99	20	25	120	50	188	TPD1500C□-1599C□	2
	8D-16020-128	16.00~16.99	20	25	128	50	197	TPD1600C□-1699C□	2
	8D-17020-136	17.00~17.99	20	25	136	50	205	TPD1700C□-1799C□	2
	8D-18025-144	18.00~18.99	25	33	144	56	222	TPD1800C□-1899C□	2
	8D-19025-152	19.00~19.99	25	33	152	56	230	TPD1900C□-1999C□	2

※ The shank is based on DIN6535 and ISO9677.

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