

HOLEMAKING

Diameter Range

0.7874-1.6260"
20.0-41.3 mm

Bodies

Universal Shank

Length to Diameter Ratio

3xD
5xD
8xD

Geometries

LPA - Steel/General Purpose

LPC (Self-Centering) - NEW

LPF - Flat Bottom

Grade

IN2505

Materials

■ Steel
■ Cast Iron

SPADETWIST™



LPA



LPC

NEW



LPF

NEW

Self-Centering Geometry for Large Diameter Applications

- » Eliminates the need for piloting up to 8xD applications.
- » Excellent accuracy and phenomenal surface finish.
- » Improves cylindricity and straightness.
- » Unique rigid, quick change clamping system.



See it in
action! »



WINSPEED™
ADVANCED MACHINING

ingersoll-imc.com



Quick Change Replaceable Tip Drills For High Productivity In Large Diameter Holemaking

SpadeTwist, the big brother to the GoldTwist line, is a drilling line for large diameter hole applications. It features an optimized cutting edge generating high productivity and excellent performance.

A new self-centering tip eliminates the need to pilot up to 8xD applications, as Ingersoll's indexable **SpadeTwist** product line introduces the addition of the LPC geometry. The LPC (self-centering) geometry allows for direct drilling of +5xD applications without the need for piloting resulting in improved productivity along with providing superior hole accuracy and surface finish.

Features & Benefits

- Unique, rigid, quick change clamping system: no need to remove the insert screw from the holder to change the head, which reduces tool setting time and machine downtime.
- Two-effective design generates higher productivity than a conventional, large diameter, indexable insert drill.
- Asymmetrical pocket design: provides error proof mounting, close tolerance, $+.002/-0.000$, and excellent surface finish.
- Also available in special L:Ds and combination drill/chamfer.

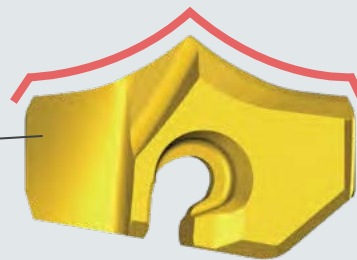
NEW

Unique LPC self-centering geometry:

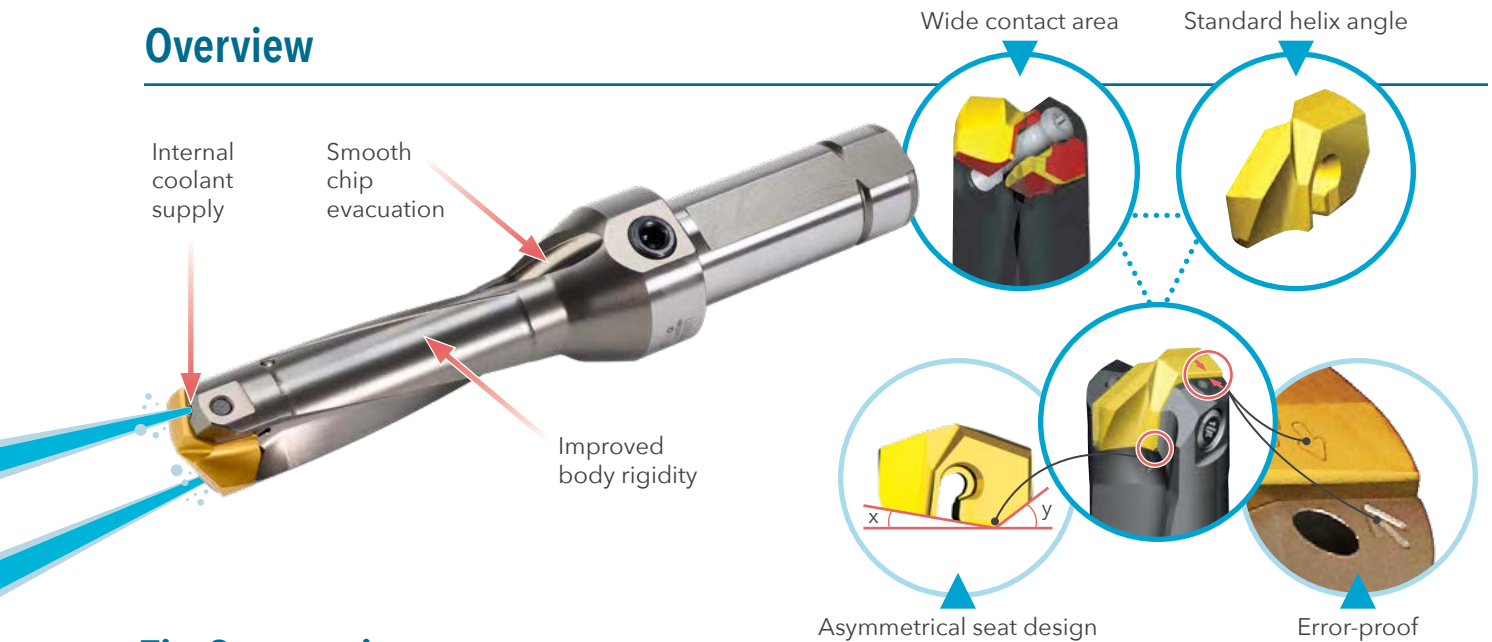
- » Excellent hole accuracy and superior surface finish.
- » Improved cylindricity and straightness.
- » .7874-1.374" (D20.0-D34.9 mm) diameter range.
- » Compatible with existing SpadeTwist bodies.
- » Tip indexing on machine reduces cycle times and lost spare parts.
- » Optimized for steel and cast iron applications.



Self-centering design

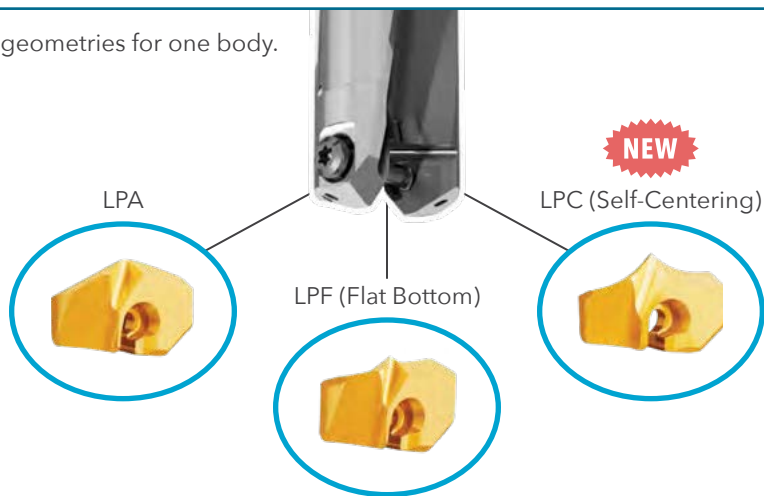


Overview



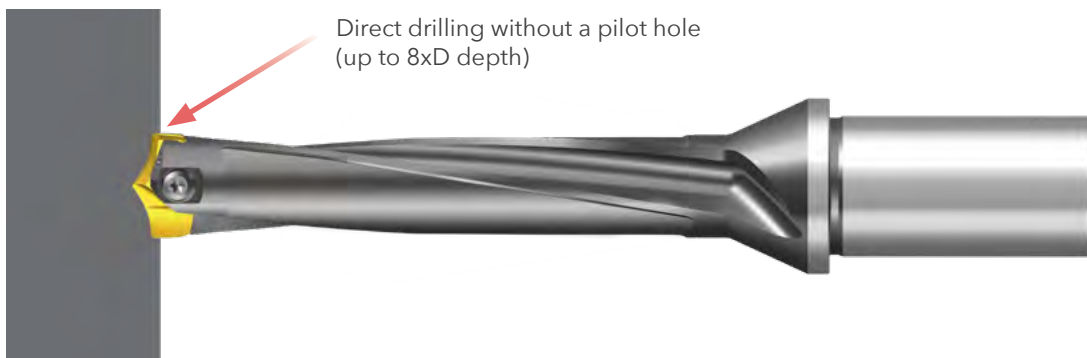
Tip Geometries

Three application-specific geometries for one body.

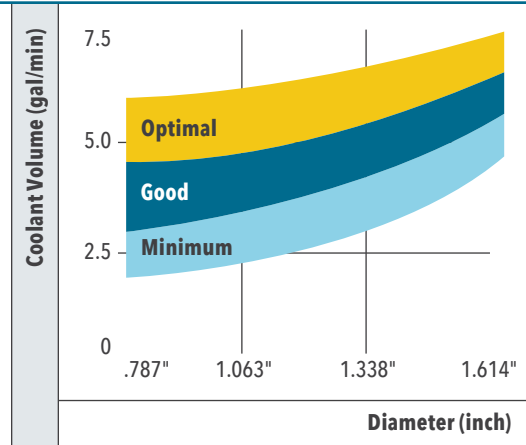
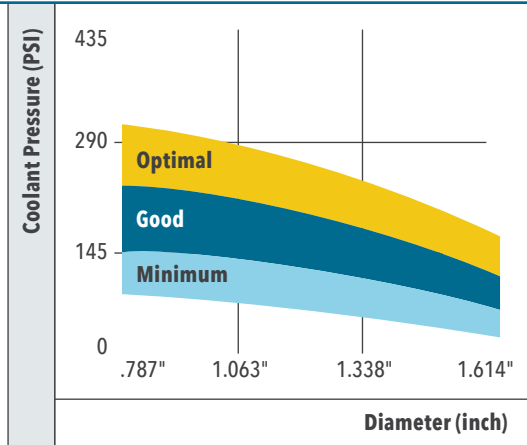


LPC Self-Centering Tip **NEW**

The self-centering design enables +5xD drilling without a pre-hole, resulting in reduced cycle times and enhanced productivity.



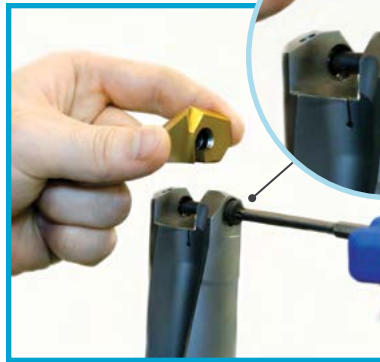
Recommended Coolant Pressure and Volume



Drill Head Changing Instructions



To unclamp, rotate the screw 3-5 times counterclockwise.



No need to remove the clamp from the body.

NOTE: See below for recommended torque.

Clamping Guide

SpadeTwist Locking Screw Torque Chart

Diameter (mm)	Torque (in*lb)
20.0- 21.9	40
22.0-23.9	40
24.0-25.9	40
26.0-27.9	44
28.0-29.9	48
30.0-31.9	53
32.0-34.9	53
35.0-37.9	53
38.0-41.0	62



For precise head clamping, press the tip down when tightening the screw - refer to the direction of the **blue arrow** (above).

NOTE: Replace clamping screws every 10 indexes.

Apply proper torque

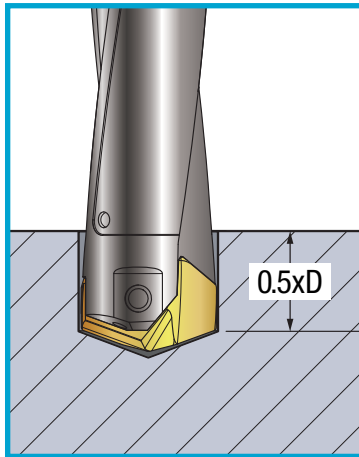


Perform a torque check



Recommended Procedure for Using 8xD Holders

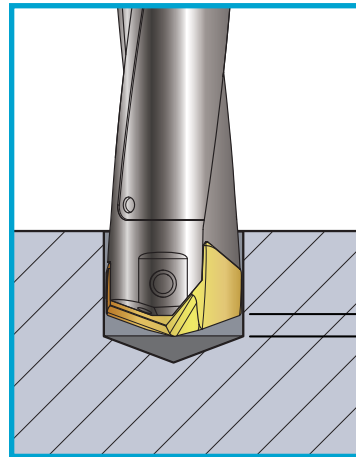
if not using LPC self-centering geometry



◀ STEP 1

Pre-hole drilling.

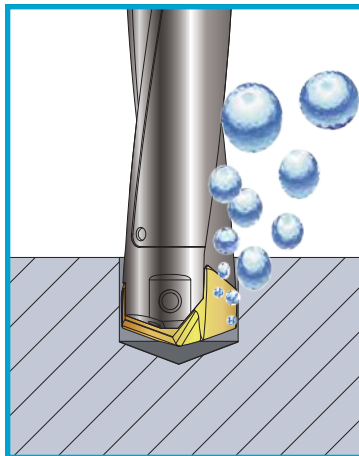
» Diameter (D) x 0.5
depth for 8xD



◀ STEP 2

Approach the pre-hole
at reduced speed
and feed.

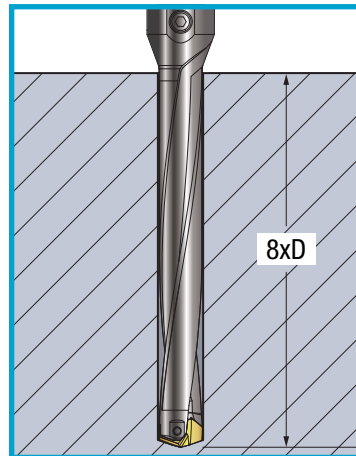
2-5 mm from the
bottom of the hole



◀ STEP 3

Activate the
cooling system.

» Dwell for 2-3 seconds



◀ STEP 4

After drilling, exit from
hole at reduced speed
and feed.

Case Study 1

Ingersoll		
Machine		Vertical machining center (Spindle: BT50)
Coolant		Internal (145 PSI)
Material		Alloy steel (SAE 4340)
Drill		LD2600130N6R01
Head		LPA2600R01 IN2505
Cutting Speed	V (SFM)	250
Feed Rate	F (IPR)	0.011
Hole Depth (inch)		5.12" (through hole)
Hole Size (inch)		1.0243-1.0246"
Surface Roughness (Ra)		36-50

Chip Shape



Surface Finish



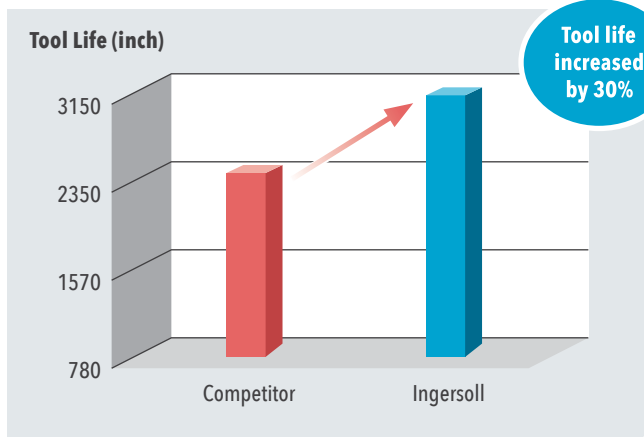
Case Study 2

Ingersoll		
Machine	Vertical machining center (Spindle : BT50)	
Coolant	Internal (145 PSI)	
Material	Alloy steel (SAE 4340)	
Drill	LD3800190N6R01	
Head	LPA3800R01 IN2505	
Cutting Speed	V (SFM)	250
Feed Rate	F (IPR)	0.016
Hole Depth (inch)	5.12" (through hole)	
Hole Size (inch)	1.4966-1.4972"	
Surface Roughness (Ra)	25-47	



Case Study 3

		Competitor	Ingersoll
Machine		Vertical machining center (Spindle : BT50)	
Coolant		Internal (145 PSI)	
Material		Alloy steel (SAE 4340)	
Drill		1.0236", 5xD	LD2600130N6R01
Head		1.0236", head type	LPA2600R01 IN2505
Cutting Speed	V (SFM)	300	
Feed Rate	F (IPR)	0.016	
Hole Depth (inch)		5.12" (through hole)	

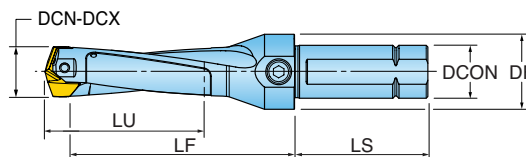


Drilling Coolant



3xD • Series LD

UNIVERSAL TYPE SHANK



Part Number	DCN Cutting Dia. Min.	DCX Cutting Dia. Max.	SSC Seat Size Code	LU Usable Length	LF Functional Length	LS Shank Length	DCON Shank Dia.	DF Flange Dia.
	INCH (MM)	INCH (MM)						
LD2000060N5R01	0.7874 (20.0 mm)	0.8228 (20.9 mm)	20	2.485	3.937	3.15	1.000	1.260
LD2100063N5R01	0.8268 (21.0 mm)	0.8622 (21.9 mm)	21	2.610	4.074	3.15	1.000	1.260
LD2200066N5R01	0.8661 (22.0 mm)	0.9016 (22.9 mm)	22	2.733	4.212	3.15	1.000	1.260
LD2300069N5R01	0.9055 (23.0 mm)	0.9409 (23.9 mm)	23	2.858	4.350	3.15	1.000	1.260
LD2400072N6R01	0.9449 (24.0 mm)	0.9803 (24.9 mm)	24	2.981	4.882	3.15	1.250	1.771
LD2500075N6R01	0.9843 (25.0 mm)	1.0282 (25.9 mm)	25	3.107	5.020	3.15	1.250	1.771
LD2600078N6R01	1.0236 (26.0 mm)	1.0590 (26.9 mm)	26	3.236	5.150	3.16	1.250	1.772
LD2700081N6R01	1.0630 (27.0 mm)	1.0984 (27.9 mm)	27	3.362	5.280	3.16	1.250	1.772
LD2800084N6R01	1.1024 (28.0 mm)	1.1378 (28.9 mm)	28	3.485	5.429	3.16	1.250	1.772
LD2900087N6R01	1.1417 (29.0 mm)	1.1772 (29.9 mm)	29	3.610	5.559	3.16	1.250	1.772
LD3000090N6R01	1.1811 (30.0 mm)	1.2165 (30.9 mm)	30	3.733	5.704	3.16	1.250	1.772
LD3100093N6R01	1.2205 (31.0 mm)	1.2559 (31.9 mm)	31	3.859	5.834	3.16	1.250	1.772
LD3200096N6R01	1.2598 (32.0 mm)	1.2953 (32.9 mm)	32	3.982	6.176	3.16	1.250	1.772
LD3300099N6R01	1.2992 (33.0 mm)	1.3346 (33.9 mm)	33	4.105	6.309	3.16	1.250	1.772
LD3400102N6R01	1.3386 (34.0 mm)	1.3740 (34.9 mm)	34	4.233	6.437	3.16	1.250	1.772
LD3500105N6R01	1.3780 (35.0 mm)	1.4134 (35.9 mm)	35	4.353	6.588	3.16	1.250	1.772
LD3600108N6R01	1.4173 (36.0 mm)	1.4528 (36.9 mm)	36	4.473	6.724	3.16	1.250	1.772
LD3700111N6R01	1.4567 (37.0 mm)	1.4921 (37.9 mm)	37	4.532	6.850	3.16	1.250	2.165
LD3800114N6R01	1.4961 (38.0 mm)	1.5315 (38.9 mm)	38	4.727	7.001	3.16	1.250	2.165
LD3900117N6R01	1.5354 (39.0 mm)	1.5709 (39.9 mm)	39	4.851	7.133	3.16	1.250	2.165
LD4000120N6R01	1.5748 (40.0 mm)	1.6496 (41.9 mm)	40-41	4.980	7.259	3.16	1.250	2.165

Hardware

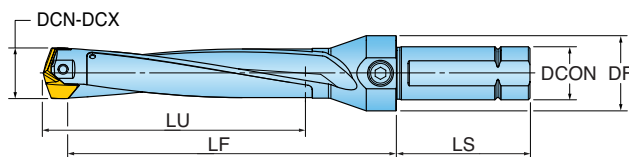
Drill Body						
	Locking Screw	Torque Spec (inches-lbs)	Driver Bit	Driver Handle	Flange Plug	Brass Coolant Plug
LD-200-210-3D	TS40178D25	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-220-230-3D	TS40198D28	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-240-250-3D	TS40210D3	40	BLD T20/S7	SW6-T Short	PP04-01	PF-0013
LD-260-270-3D	TS50230D3	44	BLD T20/S7	SW6-T Short	PP04-01	PF-0013
LD-280-290-3D	TS50250D35	48	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-300-310-3D	TS60265D4	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-320-340-3D	TS60285D42	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-350-370-3D	TS60320D5	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-380-400-3D	TS80340D6	62	BLD T25/S7	SW6-T Short	PP04-01	PF-0013

Drilling Coolant



5xD • Series LD

UNIVERSAL TYPE SHANK



Part Number	DCN Cutting Dia. Min.	DCX Cutting Dia. Max.	SSC Seat Size Code	LU Usable Length	LF Functional Length	LS Shank Length	DCON Shank Dia.	DF Flange Dia.
	INCH (MM)	INCH (MM)						
LD2000100N5R01	0.7874 (20.0 mm)	0.8228 (20.9 mm)	20	4.059	5.512	3.15	1.000	1.260
LD2100105N5R01	0.8268 (21.0 mm)	0.8622 (21.9 mm)	21	4.263	5.728	3.15	1.000	1.260
LD2200110N5R01	0.8661 (22.0 mm)	0.9016 (22.9 mm)	22	4.465	5.945	3.15	1.000	1.260
LD2300115N5R01	0.9055 (23.0 mm)	0.9409 (23.9 mm)	23	4.669	6.161	3.15	1.000	1.260
LD2400120N6R01	0.9449 (24.0 mm)	0.9803 (24.9 mm)	24	4.871	6.771	3.15	1.250	1.771
LD2500125N6R01	0.9843 (25.0 mm)	1.0282 (25.9 mm)	25	5.075	6.988	3.15	1.250	1.771
LD2600130N6R01	1.0236 (26.0 mm)	1.0590 (26.9 mm)	26	5.283	7.197	3.16	1.250	1.772
LD2700135N6R01	1.0630 (27.0 mm)	1.0984 (27.9 mm)	27	5.488	7.406	3.16	1.250	1.772
LD2800140N6R01	1.1024 (28.0 mm)	1.1378 (28.9 mm)	28	5.690	7.633	3.16	1.250	1.772
LD2900145N6R01	1.1417 (29.0 mm)	1.1772 (29.9 mm)	29	5.894	7.843	3.16	1.250	1.772
LD3000150N6R01	1.1811 (30.0 mm)	1.2165 (30.9 mm)	30	6.096	8.066	3.16	1.250	1.772
LD3100155N6R01	1.2205 (31.0 mm)	1.2559 (31.9 mm)	31	6.300	8.275	3.16	1.250	1.772
LD3200160N6R01	1.2598 (32.0 mm)	1.2953 (32.9 mm)	32	6.501	8.695	3.16	1.250	1.772
LD3300165N6R01	1.2992 (33.0 mm)	1.3346 (33.9 mm)	33	6.703	8.908	3.16	1.250	1.772
LD3400170N6R01	1.3386 (34.0 mm)	1.3740 (34.9 mm)	34	6.910	9.114	3.16	1.250	1.772
LD3500175N6R01	1.3780 (35.0 mm)	1.4134 (35.9 mm)	35	7.109	9.344	3.16	1.250	1.772
LD3600180N6R01	1.4173 (36.0 mm)	1.4528 (36.9 mm)	36	7.308	9.558	3.16	1.250	1.772
LD3700185N6R01	1.4567 (37.0 mm)	1.4921 (37.9 mm)	37	7.515	9.764	3.16	1.250	2.165
LD3800190N6R01	1.4961 (38.0 mm)	1.5315 (38.9 mm)	38	7.719	9.993	3.16	1.250	2.165
LD3900195N6R01	1.5354 (39.0 mm)	1.5709 (39.9 mm)	39	7.922	10.204	3.16	1.250	2.165
LD4000200N6R01	1.5748 (40.0 mm)	1.6496 (41.9 mm)	40-41	8.130	10.409	3.16	1.250	2.165

Hardware

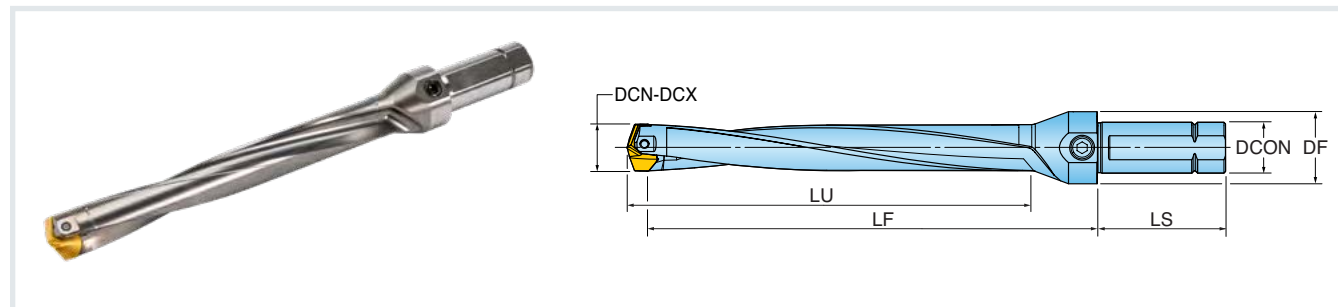
Drill Body						
	Locking Screw	Torque Spec (inches-lbs)	Driver Bit	Driver Handle	Flange Plug	Brass Coolant Plug
LD-200-210-5D	TS40178D25	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-220-230-5D	TS40198D28	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-240-250-5D	TS40210D3	40	BLD T20/S7	SW6-T Short	PP04-01	PF-0013
LD-260-270-5D	TS50230D3	44	BLD T20/S7	SW6-T Short	PP04-01	PF-0013
LD-280-290-5D	TS50250D35	48	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-300-310-5D	TS60265D4	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-320-340-5D	TS60285D42	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-350-370-5D	TS60320D5	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-380-400-5D	TS80340D6	62	BLD T25/S7	SW6-T Short	PP04-01	PF-0013

Drilling Coolant



8xD • Series LD

UNIVERSAL TYPE SHANK



Part Number	DCN Cutting Dia. Min.	DCX Cutting Dia. Max.	SSC Seat Size Code	LU Usable Length	LF Functional Length	LS Shank Length	DCON Shank Dia.	DF Flange Dia.
	INCH (MM)	INCH (MM)						
LD2000160N5R01	0.7874 (20.0 mm)	0.8228 (20.9 mm)	20	6.422	7.875	3.15	1.000	1.260
LD2100168N5R01	0.8268 (21.0 mm)	0.8622 (21.9 mm)	21	6.744	8.208	3.15	1.000	1.260
LD2200176N5R01	0.8661 (22.0 mm)	0.9016 (22.9 mm)	22	7.064	8.543	3.15	1.000	1.260
LD2300184N5R01	0.9055 (23.0 mm)	0.9409 (23.9 mm)	23	7.386	8.878	3.15	1.000	1.260
LD2400192N6R01	0.9449 (24.0 mm)	0.9803 (24.9 mm)	24	7.706	9.606	3.15	1.250	1.772
LD2500200N6R01	0.9843 (25.0 mm)	1.0282 (25.9 mm)	25	8.028	9.941	3.15	1.250	1.772
LD2600208N6R01	1.0236 (26.0 mm)	1.0590 (26.9 mm)	26	8.348	10.276	3.15	1.250	1.772
LD2700216N6R01	1.0630 (27.0 mm)	1.0984 (27.9 mm)	27	8.670	10.61	3.15	1.250	1.772
LD2800224N6R01	1.1024 (28.0 mm)	1.1378 (28.9 mm)	28	8.990	10.945	3.15	1.250	1.772
LD2900232N6R01	1.1417 (29.0 mm)	1.1772 (29.9 mm)	29	9.312	11.287	3.15	1.250	1.772
LD3000240N6R01	1.1811 (30.0 mm)	1.2165 (30.9 mm)	30	9.633	11.614	3.15	1.250	1.772
LD3100248N6R01	1.2205 (31.0 mm)	1.2559 (31.9 mm)	31	9.955	11.949	3.15	1.250	1.772
LD3200256N6R01	1.2598 (32.0 mm)	1.2953 (32.9 mm)	32	10.275	12.284	3.15	1.250	1.772
LD3300264N6R01	1.2992 (33.0 mm)	1.3346 (33.9 mm)	33	10.597	12.718	3.15	1.250	1.772
LD3400272N6R01	1.3386 (34.0 mm)	1.3740 (34.9 mm)	34	10.919	12.953	3.15	1.250	1.772
LD3500280N6R01	1.3780 (35.0 mm)	1.4134 (35.9 mm)	35	11.238	13.288	3.15	1.250	1.772
LD3600288N6R01	1.4173 (36.0 mm)	1.4528 (36.9 mm)	36	11.560	13.622	3.15	1.250	1.772
LD3700296N6R01	1.4567 (37.0 mm)	1.4921 (37.9 mm)	37	11.882	14.153	3.15	1.250	2.165
LD3800304N6R01	1.4961 (38.0 mm)	1.5315 (38.9 mm)	38	12.201	14.488	3.15	1.250	2.165
LD3900312N6R01	1.5354 (39.0 mm)	1.5709 (39.9 mm)	39	12.523	14.823	3.15	1.250	2.165
LD4000320N6R01	1.5748 (40.0 mm)	1.6496 (41.0 mm)	40	12.845	15.157	3.15	1.250	2.165

Hardware

Drill Body						
	Locking Screw	Torque Spec (inches-lbs)	Driver Bit	Driver Handle	Flange Plug	Brass Coolant Plug
LD-200-210-8D	TS40178D25	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-220-230-8D	TS40198D28	40	BLD T20/S7	SW6-T Short	PP02-01	PF-0012
LD-240-250-8D	TS40210D3	40	BLD T20/S7	SW6-T Short	PP04-01	PF-0013
LD-260-270-8D	TS50230D3	44	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-280-290-8D	TS50250D35	48	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-300-310-8D	TS60265D4	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-320-340-8D	TS60285D42	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-350-370-8D	TS60320D5	53	BLD T25/S7	SW6-T Short	PP04-01	PF-0013
LD-380-400-8D	TS80340D6	62	BLD T25/S7	SW6-T Short	PP04-01	PF-0013

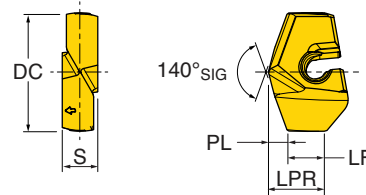
Drilling

Coolant



Series LPA

GENERAL PURPOSE TIPS



Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	S Thickness	Grade IN2505
	INCH (MM)						
LPA2000R01	0.7874 (20.00 mm)	20	0.122	0.380	0.257	0.236	•
LPA2040R01	0.8031 (20.40 mm)	20	0.125	0.380	0.255	0.236	•
LPA2050R01	0.8071 (20.50 mm)	20	0.126	0.380	0.254	0.236	•
LPA2064R01	0.8125 (20.64 mm)	20	0.127	0.380	0.253	0.236	•
LPA2100R01	0.8268 (21.00 mm)	21	0.130	0.380	0.250	0.236	•
LPA2150R01	0.8465 (21.50 mm)	21	0.133	0.380	0.247	0.236	•
LPA2200R01	0.8661 (22.00 mm)	22	0.135	0.415	0.280	0.256	•
LPA2222R01	0.8748 (22.20 mm)	22	0.136	0.415	0.279	0.256	•
LPA2250R01	0.8858 (22.50 mm)	22	0.138	0.415	0.277	0.256	•
LPA2300R01	0.9055 (23.00 mm)	23	0.142	0.415	0.273	0.256	•
LPA2350R01	0.9252 (23.50 mm)	23	0.145	0.415	0.270	0.256	•
LPA2380R01	0.9370 (23.80 mm)	23	0.147	0.415	0.267	0.256	•
LPA2400R01	0.9449 (24.00 mm)	24	0.147	0.424	0.277	0.276	•
LPA2450R01	0.9646 (24.50 mm)	24	0.150	0.424	0.273	0.276	•
LPA2460R01	0.9685 (24.60 mm)	24	0.151	0.424	0.272	0.276	•
LPA2500R01	0.9843 (25.00 mm)	25	0.154	0.424	0.270	0.276	•
LPA2540R01	1.0000 (25.40 mm)	25	0.156	0.424	0.267	0.276	•
LPA2550R01	1.0039 (25.50 mm)	25	0.158	0.424	0.266	0.276	•
LPA2570R01	1.0118 (25.70 mm)	25	0.159	0.424	0.265	0.276	•
LPA2590R01	1.0197 (25.90 mm)	25	0.161	0.424	0.263	0.276	•
LPA2600R01	1.0236 (26.00 mm)	26	0.159	0.455	0.296	0.315	•
LPA2610R01	1.0276 (26.10 mm)	26	0.160	0.455	0.295	0.315	•
LPA2620R01	1.0315 (26.20 mm)	26	0.160	0.455	0.294	0.315	•
LPA2630R01	1.0354 (26.30 mm)	26	0.161	0.455	0.294	0.315	•
LPA2640R01	1.0394 (26.40 mm)	26	0.162	0.455	0.293	0.315	•
LPA2650R01	1.0433 (26.50 mm)	26	0.163	0.455	0.292	0.315	•
LPA2660R01	1.0472 (26.60 mm)	26	0.163	0.455	0.291	0.315	•
LPA2670R01	1.0512 (26.70 mm)	26	0.164	0.455	0.291	0.315	•
LPA2680R01	1.0511 (26.80 mm)	26	0.165	0.455	0.290	0.315	•
LPA2690R01	1.0591 (26.90 mm)	26	0.166	0.455	0.289	0.315	•
LPA2700R01	1.0630 (27.00 mm)	27	0.166	0.455	0.289	0.315	•
LPA2710R01	1.0669 (27.10 mm)	27	0.167	0.455	0.288	0.315	•
LPA2720R01	1.0709 (27.20 mm)	27	0.168	0.455	0.287	0.315	•
LPA2730R01	1.0748 (27.30 mm)	27	0.168	0.455	0.286	0.315	•
LPA2740R01	1.0787 (27.40 mm)	27	0.169	0.455	0.286	0.315	•
LPA2750R01	1.0827 (27.50 mm)	27	0.170	0.455	0.285	0.315	•
LPA2760R01	1.0866 (27.60 mm)	27	0.171	0.455	0.284	0.315	•
LPA2770R01	1.0906 (27.70 mm)	27	0.171	0.455	0.283	0.315	•
LPA2780R01	1.0945 (27.80 mm)	27	0.172	0.455	0.283	0.315	•

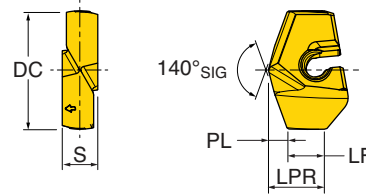
Drilling

Coolant



Series LPA (continued)

GENERAL PURPOSE TIPS

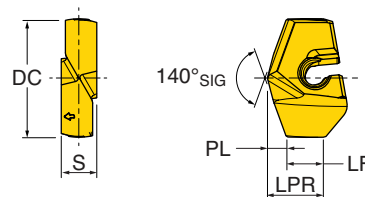


Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	S Thickness	Grade IN2505
	INCH (MM)						
LPA2790R01	1.0984 (27.90 mm)	27	0.173	0.455	0.282	0.315	•
LPA2800R01	1.1024 (28.00 mm)	28	0.171	0.462	0.291	0.335	•
LPA2810R01	1.1063 (28.10 mm)	28	0.172	0.462	0.290	0.335	•
LPA2820R01	1.1102 (28.20 mm)	28	0.173	0.462	0.290	0.335	•
LPA2830R01	1.1142 (28.30 mm)	28	0.173	0.462	0.289	0.335	•
LPA2840R01	1.1181 (28.40 mm)	28	0.174	0.462	0.288	0.335	•
LPA2850R01	1.1220 (28.50 mm)	28	0.175	0.462	0.287	0.335	•
LPA2860R01	1.1250 (28.60 mm)	28	0.176	0.462	0.287	0.335	•
LPA2870R01	1.1299 (28.70 mm)	28	0.176	0.462	0.286	0.335	•
LPA2890R01	1.1378 (28.90 mm)	28	0.178	0.462	0.284	0.335	•
LPA2900R01	1.1417 (29.00 mm)	29	0.178	0.462	0.284	0.335	•
LPA2910R01	1.1457 (29.10 mm)	29	0.179	0.462	0.283	0.335	•
LPA2920R01	1.1496 (29.20 mm)	29	0.180	0.462	0.282	0.335	•
LPA2930R01	1.1535 (29.30 mm)	29	0.181	0.462	0.282	0.335	•
LPA2940R01	1.1575 (29.40 mm)	29	0.181	0.462	0.281	0.335	•
LPA2950R01	1.1614 (29.50 mm)	29	0.182	0.462	0.280	0.335	•
LPA2970R01	1.1693 (29.70 mm)	29	0.183	0.462	0.279	0.335	•
LPA2980R01	1.1732 (29.80 mm)	29	0.184	0.462	0.278	0.335	•
LPA2990R01	1.1772 (29.90 mm)	29	0.185	0.462	0.277	0.335	•
LPA3000R01	1.1811 (30.00 mm)	30	0.184	0.557	0.373	0.354	•
LPA3010R01	1.1850 (30.10 mm)	30	0.185	0.557	0.372	0.354	•
LPA3020R01	1.1890 (30.20 mm)	30	0.185	0.557	0.371	0.354	•
LPA3030R01	1.1929 (30.30 mm)	30	0.186	0.557	0.371	0.354	•
LPA3050R01	1.2008 (30.50 mm)	30	0.187	0.557	0.369	0.354	•
LPA3060R01	1.2047 (30.60 mm)	30	0.188	0.557	0.369	0.354	•
LPA3070R01	1.2087 (30.70 mm)	30	0.189	0.557	0.368	0.354	•
LPA3080R01	1.2126 (30.80 mm)	30	0.190	0.557	0.367	0.354	•
LPA3090R01	1.2165 (30.90 mm)	30	0.190	0.557	0.366	0.354	•
LPA3100R01	1.2205 (31.00 mm)	31	0.191	0.557	0.366	0.354	•
LPA3110R01	1.2244 (31.10 mm)	31	0.192	0.557	0.365	0.354	•
LPA3120R01	1.2283 (31.20 mm)	31	0.192	0.557	0.364	0.354	•
LPA3130R01	1.2323 (31.30 mm)	31	0.193	0.557	0.364	0.354	•
LPA3140R01	1.2362 (31.40 mm)	31	0.194	0.557	0.363	0.354	•
LPA3150R01	1.2402 (31.50 mm)	31	0.195	0.557	0.362	0.354	•
LPA3160R01	1.2441 (31.60 mm)	31	0.195	0.557	0.361	0.354	•
LPA3170R01	1.2480 (31.70 mm)	31	0.196	0.557	0.361	0.354	•



Series LPA (continued)

GENERAL PURPOSE TIPS

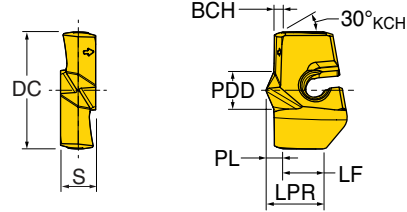


Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	S Thickness	Grade IN2505
	INCH (MM)						
LPA3180R01	1.2500 (31.80 mm)	31	0.197	0.557	0.360	0.354	•
LPA3190R01	1.2559 (31.90 mm)	31	0.197	0.557	0.359	0.354	•
LPA3200R01	1.2598 (32.00 mm)	32	0.196	0.572	0.376	0.374	•
LPA3210R01	1.2638 (32.10 mm)	32	0.197	0.572	0.375	0.374	•
LPA3220R01	1.2677 (32.20 mm)	32	0.197	0.572	0.375	0.374	•
LPA3230R01	1.2717 (32.30 mm)	32	0.198	0.572	0.374	0.374	•
LPA3240R01	1.2756 (32.40 mm)	32	0.199	0.572	0.373	0.374	•
LPA3250R01	1.2795 (32.50 mm)	32	0.200	0.572	0.372	0.374	•
LPA3260R01	1.2835 (32.60 mm)	32	0.200	0.572	0.372	0.374	•
LPA3270R01	1.2874 (32.70 mm)	32	0.201	0.572	0.371	0.374	•
LPA3280R01	1.2913 (32.80 mm)	32	0.202	0.572	0.370	0.374	•
LPA3290R01	1.2953 (32.90 mm)	32	0.203	0.572	0.370	0.374	•
LPA3300R01	1.2992 (33.00 mm)	33	0.203	0.572	0.369	0.374	•
LPA3330R01	1.3120 (33.30 mm)	33	0.205	0.572	0.367	0.374	•
LPA3350R01	1.3189 (33.50 mm)	33	0.207	0.572	0.365	0.374	•
LPA3400R01	1.3386 (34.00 mm)	34	0.210	0.572	0.362	0.374	•
LPA3410R01	1.3425 (34.10 mm)	34	0.211	0.572	0.361	0.374	•
LPA3450R01	1.3583 (34.50 mm)	34	0.214	0.572	0.358	0.374	•
LPA3490R01	1.3740 (34.90 mm)	34	0.217	0.572	0.355	0.374	•
LPA3492R01	1.3748 (34.92 mm)	34	0.217	0.572	0.355	0.374	•
LPA3500R01	1.3780 (35.00 mm)	35	0.214	0.652	0.438	0.413	•
LPA3550R01	1.3976 (35.50 mm)	35	0.218	0.652	0.434	0.413	•
LPA3570R01	1.4055 (35.70 mm)	35	0.219	0.652	0.433	0.413	•
LPA3600R01	1.4173 (36.00 mm)	36	0.221	0.652	0.431	0.413	•
LPA3650R01	1.4370 (36.50 mm)	36	0.225	0.652	0.427	0.413	•
LPA3700R01	1.4567 (37.00 mm)	36	0.229	0.652	0.423	0.413	•
LPA3730R01	1.4685 (37.30 mm)	37	0.231	0.652	0.421	0.413	•
LPA3750R01	1.4764 (37.50 mm)	36	0.232	0.652	0.420	0.413	•
LPA3800R01	1.4961 (38.00 mm)	38	0.233	0.669	0.437	0.433	•
LPA3810R01	1.5000 (38.10 mm)	38	0.233	0.669	0.436	0.433	•
LPA3850R01	1.5157 (38.50 mm)	38	0.236	0.669	0.433	0.433	•
LPA3890R01	1.5315 (38.90 mm)	38	0.239	0.669	0.430	0.433	•
LPA3900R01	1.5354 (39.00 mm)	39	0.240	0.669	0.429	0.433	•
LPA3950R01	1.5551 (39.50 mm)	39	0.243	0.669	0.426	0.433	•
LPA3970R01	1.4173 (39.70 mm)	39	0.245	0.669	0.424	0.433	•
LPA4000R01	1.5748 (40.00 mm)	40	0.247	0.669	0.422	0.433	•
LPA4050R01	1.5945 (40.00 mm)	40	0.251	0.669	0.419	0.433	•
LPA4100R01	1.6142 (41.00 mm)	41	0.254	0.669	0.415	0.433	•
LPA4130R01	1.6259 (41.30 mm)	41	0.256	0.669	0.413	0.433	•



Series LPF

FLAT BOTTOM TIPS



Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	BCH Chamfer Length	PDD Drill Point Dia.	S Thickness	Grade IN2505
	INCH (MM)								
LPF2000R01	0.7874 (20.00 mm)	20	0.083	0.397	0.314	0.027	0.236	0.236	•
LPF2050R01	0.8071 (20.50 mm)	20	0.083	0.397	0.314	0.027	0.236	0.236	•
LPF2064R01	0.8125 (20.64 mm)	20	0.083	0.397	0.314	0.027	0.236	0.236	•
LPF2100R01	0.8267 (21.00 mm)	20	0.083	0.397	0.314	0.027	0.236	0.236	•
LPF2150R01	0.8465 (21.50 mm)	20	0.083	0.397	0.314	0.027	0.236	0.236	•
LPF2200R01	0.8661 (22.00 mm)	22	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2222R01	0.8750 (22.22 mm)	22	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2250R01	0.8858 (22.50 mm)	22	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2300R01	0.9055 (23.00 mm)	23	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2350R01	0.9252 (23.50 mm)	23	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2381R01	0.9374 (23.81 mm)	23	0.089	0.419	0.330	0.027	0.260	0.256	•
LPF2400R01	0.9449 (24.00 mm)	24	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2450R01	0.9645 (24.50 mm)	24	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2500R01	0.9842 (25.00 mm)	25	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2540R01	1.0000 (25.40 mm)	25	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2550R01	1.0039 (25.50 mm)	25	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2570R01	1.0118 (25.70 mm)	25	0.096	0.422	0.326	0.027	0.283	0.275	•
LPF2600R01	1.0236 (26.00 mm)	26	0.098	0.494	0.396	0.027	0.307	0.315	•
LPF2650R01	1.0433 (26.50 mm)	26	0.098	0.494	0.396	0.027	0.307	0.315	•
LPF2700R01	1.0630 (27.00 mm)	27	0.098	0.494	0.396	0.027	0.307	0.315	•
LPF2750R01	1.0827 (27.50 mm)	27	0.098	0.494	0.396	0.027	0.307	0.315	•
LPF2800R01	1.1024 (28.00 mm)	28	0.105	0.487	0.382	0.027	0.331	0.334	•
LPF2850R01	1.1220 (28.50 mm)	28	0.105	0.487	0.382	0.027	0.331	0.334	•
LPF2900R01	1.1417 (29.00 mm)	29	0.105	0.487	0.382	0.027	0.331	0.334	•
LPF2950R01	1.1614 (29.50 mm)	29	0.105	0.487	0.382	0.027	0.331	0.334	•
LPF3000R01	1.1811 (30.00 mm)	30	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3016R01	1.1875 (30.16 mm)	30	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3050R01	1.2008 (30.50 mm)	30	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3100R01	1.2205 (31.00 mm)	31	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3150R01	1.2402 (31.50 mm)	31	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3175R01	1.2500 (31.75 mm)	31	0.111	0.573	0.462	0.027	0.354	0.354	•
LPF3200R01	1.2598 (32.00 mm)	32	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3250R01	1.2795 (32.50 mm)	32	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3300R01	1.2992 (33.00 mm)	33	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3350R01	1.3189 (33.50 mm)	33	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3400R01	1.3386 (34.00 mm)	34	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3450R01	1.3583 (34.50 mm)	34	0.117	0.584	0.467	0.027	0.378	0.374	•
LPF3492R01	1.3748 (34.92 mm)	34	0.117	0.584	0.467	0.027	0.378	0.374	•

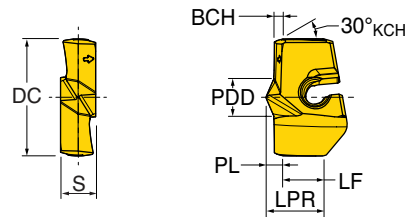
Drilling

Coolant



Series LPF (continued)

FLAT BOTTOM TIPS



Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	BCH Chamfer Length	PDD Drill Point Dia.	S Thickness	Grade IN2505
	INCH (MM)								
LPF3500R01	1.3780 (35.00 mm)	35	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3550R01	1.3976 (35.50 mm)	35	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3600R01	1.4173 (36.00 mm)	36	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3650R01	1.4370 (36.50 mm)	36	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3700R01	1.4567 (37.00 mm)	37	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3750R01	1.4764 (37.50 mm)	37	0.126	0.663	0.537	0.027	0.413	0.413	•
LPF3800R01	1.4961 (38.00 mm)	38	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF3810R01	1.5000 (38.10 mm)	38	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF3850R01	1.5157 (38.50 mm)	38	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF3900R01	1.5354 (39.00 mm)	39	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF3950R01	1.5550 (39.50 mm)	39	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF4000R01	1.5748 (40.00 mm)	40	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF4050R01	1.5945 (40.50 mm)	40	0.135	0.672	0.537	0.027	0.449	0.433	•
LPF4100R01	1.6142 (41.00 mm)	41	0.135	0.672	0.537	0.027	0.449	0.433	•

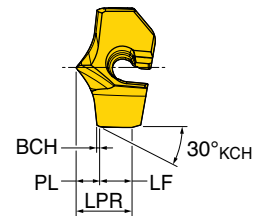
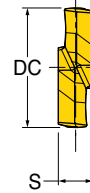
Drilling

Coolant



Series LPC **NEW**

SELF-CENTERING TIPS



Part Number	DC Cutting Diameter	SSC Seat Size Code	PL Point Length	LPR Proj. Length	LF Funct. Length	BCH Chamfer Length	S Thick.	Grade IN2505
	INCH (MM)							
LPC2000R01	0.7874 (20.00 mm)	20	0.179	0.408	0.229	0.033	0.236	•
LPC2050R01	0.8071 (20.50 mm)	20	0.180	0.400	0.220	0.033	0.236	•
LPC2064R01	0.8125 (20.64 mm)	20	0.180	0.398	0.218	0.033	0.236	•
LPC2100R01	0.8268 (21.00 mm)	21	0.181	0.392	0.211	0.033	0.236	•
LPC2150R01	0.8465 (21.50 mm)	21	0.182	0.383	0.201	0.033	0.236	•
LPC2200R01	0.8661 (22.00 mm)	22	0.193	0.437	0.244	0.033	0.256	•
LPC2222R01	0.8750 (22.22 mm)	22	0.194	0.435	0.240	0.033	0.256	•
LPC2250R01	0.8858 (22.50 mm)	22	0.194	0.429	0.235	0.033	0.256	•
LPC2300R01	0.9055 (23.00 mm)	23	0.195	0.420	0.225	0.033	0.256	•
LPC2350R01	0.8252 (23.50 mm)	23	0.196	0.412	0.216	0.033	0.256	•
LPC2381R01	0.9375 (23.81 mm)	23	0.197	0.408	0.211	0.033	0.256	•
LPC2400R01	0.9449 (24.00 mm)	24	0.208	0.441	0.233	0.033	0.276	•
LPC2450R01	0.9646 (24.50 mm)	24	0.209	0.433	0.224	0.033	0.276	•
LPC2500R01	0.9843 (25.00 mm)	25	0.210	0.424	0.214	0.033	0.276	•
LPC2540R01	1.0000 (25.40 mm)	25	0.211	0.419	0.208	0.033	0.276	•
LPC2550R01	1.0039 (25.50 mm)	25	0.212	0.417	0.205	0.033	0.276	•
LPC2600R01	1.0236 (26.00 mm)	26	0.223	0.513	0.290	0.033	0.315	•
LPC2620R01	1.0320 (26.20 mm)	26	0.224	0.511	0.287	0.033	0.315	•
LPC2650R01	1.0433 (26.50 mm)	26	0.224	0.505	0.281	0.033	0.315	•
LPC2700R01	1.0630 (27.00 mm)	27	0.225	0.497	0.272	0.033	0.315	•
LPC2750R01	1.0827 (27.50 mm)	27	0.226	0.489	0.263	0.033	0.315	•
LPC2800R01	1.1024 (28.00 mm)	28	0.225	0.510	0.285	0.033	0.335	•
LPC2850R01	1.1220 (28.50 mm)	28	0.226	0.502	0.276	0.033	0.335	•
LPC2860R01	1.1260 (28.60 mm)	28	0.227	0.502	0.275	0.033	0.335	•
LPC2900R01	1.1417 (29.00 mm)	29	0.227	0.494	0.267	0.033	0.335	•
LPC2950R01	1.1614 (29.50 mm)	29	0.228	0.486	0.258	0.033	0.335	•
LPC2990R01	1.1772 (29.90 mm)	29	0.229	0.480	0.251	0.033	0.335	•
LPC3000R01	1.1811 (30.00 mm)	30	0.239	0.600	0.361	0.033	0.354	•
LPC3010R01	1.1850 (30.10 mm)	30	0.240	0.599	0.359	0.033	0.354	•
LPC3020R01	1.1890 (30.20 mm)	30	0.240	0.597	0.357	0.033	0.354	•
LPC3050R01	1.2008 (30.50 mm)	30	0.240	0.591	0.351	0.033	0.354	•
LPC3100R01	1.2205 (31.00 mm)	31	0.241	0.583	0.342	0.033	0.354	•
LPC3150R01	1.2402 (31.50 mm)	31	0.242	0.575	0.333	0.033	0.354	•
LPC3170R01	1.2480 (31.70 mm)	31	0.243	0.572	0.330	0.033	0.354	•
LPC3180R01	1.2520 (31.80 mm)	31	0.243	0.571	0.328	0.033	0.354	•
LPC3190R01	1.2559 (31.90 mm)	31	0.243	0.569	0.326	0.033	0.354	•
LPC3200R01	1.2598 (32.00 mm)	32	0.253	0.614	0.361	0.033	0.374	•
LPC3250R01	1.2795 (32.50 mm)	32	0.254	0.606	0.352	0.033	0.374	•
LPC3300R01	1.2992 (33.00 mm)	33	0.255	0.597	0.342	0.033	0.374	•
LPC3330R01	1.3110 (33.30 mm)	33	0.256	0.593	0.337	0.033	0.374	•
LPC3350R01	1.3189 (33.50 mm)	33	0.256	0.589	0.333	0.033	0.374	•
LPC3400R01	1.3386 (34.00 mm)	34	0.257	0.581	0.324	0.033	0.374	•
LPC3450R01	1.3583 (34.50 mm)	34	0.258	0.573	0.315	0.033	0.374	•
LPC3490R01	1.3740 (34.90 mm)	34	0.259	0.567	0.308	0.033	0.374	•

Operating Guidelines • Series LPA Tips (General Purpose)

ISO	Material		Condition	Tensile Strength RM (N/mm ²)	Hardness HB	Matl. Group No.	Cutting Speed Vc (SFM)	Feed vs. Drill Diameter - IPR (inches/rev)*		
								Ø20-29.9 mm (.7874-1.1772")	Ø30-34.9 mm (1.1811-1.3740")	Ø35-41.9 mm (1.3800-1.6496")
P	Non-alloy steel and cast steel, free cutting steel	<0.25%C	Annealed	420	125	1	260-460	.012-.020	.012-.020	.014-.022
		≥0.25%C	Annealed	650	190	2	260-430			
		<0.55%C	Quenched/Tempered	850	250	3	260-400			
		≥0.55%C	Annealed	750	220	4	230-360			
			Quenched/Tempered	1000	300	5	165-300			
	Low alloy steel and cast steel (less than 5% alloying elements)		Annealed	600	200	6	260-400	.010-.018	.010-.018	.012-.020
				930	275	7	230-360			
			Quenched/Tempered	1000	300	8	165-300			
				1200	350	9	135-230			
	High alloy steel, cast steel, and tool steel		Annealed	680	200	10	165-300	.010-.014	.010-.014	.012-.016
			Quenched/Tempered	1100	325	11	130-265			
M	Stainless steel and cast stainless steel		Ferritic/Martensitic	680	200	12	130-230	.006-.012	.006-.012	.008-.014
			Martensitic	820	240	13	130-230			
			Austenitic	600	180	14	100-230			
K	Grey cast iron (GG)		Ferritic	-	160	15	300-600	.014-.022	.014-.022	.016-.024
			Pearlitic	-	250	16	265-460			
	Cast iron nodular (GGG)		Ferritic	-	180	17	300-600			
			Pearlitic	-	260	18	265-460			
	Malleable cast iron		Ferritic	-	130	19	300-525			
			Pearlitic	-	230	20	265-460			
N	Aluminum - wrought alloy		Not Cureable	-	60	21	300-725	.016-.024	.016-.024	.020-.028
			Cured	-	100	22	300-725			
	Aluminum - cast, alloyed	≤12% Si	Not Cureable	-	75	23	300-725			
			Cured	-	90	24	300-725			
		>12% Si	High Temperature	-	130	25	265-525			
	Copper alloys	>1% Pb	Free Cutting	-	110	26	300-725			
			Brass	-	90	27	300-725			
			Electrolitic Copper	-	100	28	300-725			
	Non-metallic		Duro/Fiber Plastics	-	-	29	-			
			Hard Rubber	-	-	30	-			
S	High temp alloys	Fe based	Annealed	-	200	31	100-200	.004-.008	.006-.010	.006-.010
			Cured	-	280	32	70-165			
		Ni or Co based	Annealed	-	250	33	70-165			
			Cured	-	350	34	70-165			
			Cast	-	320	35	70-165			
	Titanium, Ti alloys		-	Rm 400	-	36	70-165			
			Alpha+Beta Alloys Cured	Rm 1050	-	37	70-165			
H	Hardened steel		Hardened	-	55 HRC	38	70-165	.004-.008	.006-.010	.006-.010
			Hardened	-	60 HRC	39	70-165			
	Chilled cast iron		Cast	-	400	40	-	-	-	-
	Cast iron nodular		Hardened	-	55 HRC	41	-			

► *Feed rates are based on two effective - DO NOT DOUBLE

Operating Guidelines • Series LPF Tips (Flat Bottom)

ISO	Material	Condition	Tensile Strength RM (N/mm²)	Hardness HB	Matl. Group No.	Cutting Speed Vc (SFM)	Feed vs. Drill Diameter - IPR (inches/rev)*			
							Ø20-29.9 mm (.7874-1.1772")	Ø30-34.9 mm (1.1811-1.3740")	Ø35-41.9 mm (1.3800-1.6496")	
P	Non-alloy steel and cast steel, free cutting steel	<0.25%C	Annealed	420	125	1	260-460	.012-.020	.012-.020	.014-.022
		≥0.25%C	Annealed	650	190	2	260-430			
		<0.55%C	Quenched and tempered	850	250	3	260-400			
		≥0.55%C	Annealed	750	220	4	230-360			
			Quenched and tempered	1000	300	5	165-300			
	Low alloy steel and cast steel (less than 5% alloying elements)	Annealed	600	200	6	260-400	.010-.018	.010-.018	.012-.020	
		Quenched and tempered	930	275	7	230-360				
			1000	300	8	165-300				
			1200	350	9	135-230				
	High alloy steel, cast steel, and tool steel	Annealed	680	200	10	165-300	.010-.014	.010-.014	.012-.016	
		Quenched and tempered	1100	325	11	130-265				
K	Grey cast iron (GG)	Ferritic	-	160	15	300-600	.014-.022	.014-.022	.016-.024	
		Pearlitic	-	250	16	265-460				
	Cast iron nodular (GGG)	Ferritic	-	180	17	300-600				
		Pearlitic	-	260	18	265-460				
	Malleable cast iron	Ferritic	-	130	19	300-525				
		Pearlitic	-	230	20	265-460				

► *Feed rates are based on two effective - DO NOT DOUBLE

Operating Guidelines • Series LPC Tips (Self-Centering) NEW

ISO	Material	Condition	Tensile Strength RM (N/mm²)	Hardness HB	Matl. Group No.	Cutting Speed Vc (SFM)	Feed vs. Drill Diameter – IPR (inches/rev)		
							Ø20-29.9 mm (.7874-1.1772")	Ø30-34.9 mm (1.1811-1.3740")	
P	Non-alloy steel and cast steel, free cutting steel	<0.25%C	Annealed	420	125	1	260-460	.010-.018	.012-.020
		≥0.25%C	Annealed	650	190	2	260-430		
		<0.55%C	Quenched and tempered	850	250	3	260-400		
		≥0.55%C	Annealed	750	220	4	230-360		
			Quenched and tempered	1000	300	5	165-300		
	Low alloy steel and cast steel (less than 5% alloying elements)	Annealed	600	200	6	230-400	.008-.016	.010-.018	
		Quenched and tempered	930	275	7	230-360			
			1000	300	8	165-300			
			1200	350	9	130-230			
	High alloy steel, cast steel, and tool steel	Annealed	680	200	10	165-300	.008-.012	.010-.014	
		Quenched and tempered	1100	325	11	130-260			
K	Grey cast iron (GG)	Ferritic	-	160	15	300-530	.012-.020	.014-.022	
		Pearlitic	-	250	16	260-460			
	Cast iron nodular (GGG)	Ferritic	-	180	17	300-595			
		Pearlitic	-	260	18	260-460			
	Malleable cast iron	Ferritic	-	130	19	300-530			
		Pearlitic	-	230	20	260-460			

► NOTE: For deep hole drilling (+8xD), reduce the cutting parameters by 30%