DORMER PRAMET

FORCE LINE

HIGH PERFORMANCE
SOLID CARBIDE DRILLS

2020

DORMER

FORCE

FORCE X

HIGH PERFORMANCE CARBIDE DRILLS

VERSATILE PRODUCTION DRILLS FOR A WIDE RANGE OF MATERIALS

FORCE X carbide drills are developed for high performance machining applications in a wide variety of work-materials such as Carbon and Alloy Steels up to 1500 MPa and Cast-Iron. FORCE X drills also perform well in Stainless Steel and Aluminium making them an ideal first choice for subcontract machining companies.

FEATURES & BENEFITS

- CTW™ - Unique Flute Construction with a continuously thinned web and rolled heel design.
- Modified 4-Facet Split Point with large secondary chisel edge angle.
- Premium micrograin carbide substrate with TiAlN coating.
- 3xD and 5xD options available in solid and coolant-feed variants.
- 8xD with coolant-feed.

COMPARED TO CONVENTIONAL DRILLS FORCE X ARE:

- **Outstandingly economical** – with easier and multiple regrinding capabilities which significantly increase the total tool life.
- **Consistently high quality and performance** – with excellent positional accuracy and swarf control, ensures superior quality hole tolerance and surface finish.
- **More productive** – with high drilling speeds and prolonged tool-life.

RANGE DETAILS

3XD

R457
coolant-feed

R458
solid

- 3.00 – 20.00 mm
- 1/8 – 3/4 inch, N30 – N1, A – Z

5XD

R453
coolant-feed

R454
solid

- 3.00 – 20.00 mm
- 1/8 – 3/4 inch, N30 – N1, A – Z

8XD

R459
coolant-feed

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

FORCE X

HIGH PERFORMANCE CARBIDE DRILLS

MACHINING EXAMPLE

			Free Machining Steel	Alloy Steel	Gray Iron
Workpiece			1.0718 (11SMnPb30)	1.6582 (34CrNiMo6)	0.6025 (GG-25)
Hardness		HB	180	325	215
Tensile strength		MPa	620	1120	260
Diameter		mm	8 (R4578.0)	8 (R4598.0)	8 (R4538.0)
Hole depth		mm	3xD (24)	8xD (64)	5xD (40)
Cutting speed	v_c	m/min	207	73	77
Feed	f	mm/rev	0.26	0.14	0.26
Coolant			Emulsion 8% through coolant	Emulsion 8% through coolant	Emulsion 8% through coolant

FORCE M

HIGH PERFORMANCE CARBIDE DRILLS

HIGH VOLUME PRODUCTION DRILLS FOR STAINLESS STEEL

FORCE M carbide drills have been engineered to provide the highest performance and process reliability when drilling Stainless steels and Heat resistant super alloys. FORCE M drills are ideal for applications where it is necessary to drill a large number of holes with high and constant accuracy.

FEATURES & BENEFITS

- CTW - Unique Flute Construction with a continuously thinned web and rolled heel design.
- S-Shape 4-Facet Split Point with precise thin edge honing and strong outer corner design.
- Premium micrograin carbide substrate with TiAlN coating.
- 3xD and 5xD with coolant-feed.
- 8xD with coolant-feed available upon request.

COMPARED TO CONVENTIONAL DRILLS FORCE M PROVIDE:

- **Reliable performance** – with a smooth cutting action to prevent onset of work-hardening and built up edge.
- **Optimized productivity** – with excellent chip-management and a better force distribution to allow high penetration rates.
- **Exceptional tool life** – with stronger corner and cutting edges to withstand deformation wear.

RANGE DETAILS

3XD

R467
coolant-feed

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

5XD

R463
coolant-feed

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

NEW 8XD

R469
coolant-feed

Available upon request

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

FORCE M

HIGH PERFORMANCE CARBIDE DRILLS

MACHINING EXAMPLE

			Ferritic SST	Austenitic SST	High Alloy SST
Workpiece			1.4104 (AISI 430F)	1.4401 (AISI 316)	1.4501 (Super DUPLEX)
Hardness		HB	220	200	240
Tensile strength		MPa	700	750	770
Diameter		mm	8 (R4678.0)	8 (S-R4698.0)	8 (R4638.0)
Hole depth		mm	3xD (24)	8xD (64)	5xD (40)
Cutting speed	v_c	m/min	99	74	57
Feed	f	mm/rev	0.16	0.14	0.12
Coolant			Emulsion 8% through coolant	Emulsion 8% through coolant	Emulsion 8% through coolant

FORCE N

NEW

HIGH PERFORMANCE CARBIDE DRILLS

HIGH PENETRATION RATE DRILLS FOR ALUMINIUM

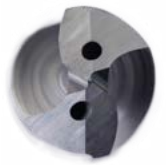
FORCE N carbide drills are recommended for high speed drilling operations in wrought and cast aluminium alloys. The flute and cutting geometry are specifically designed to break the swarf into small manageable chips to enhance chip-evacuation. FORCE N drills provide superior performance and tool life for mid-high volume manufacturing companies.

FEATURES & BENEFITS

- Special web thinning with higher than standard helix angle.
- Unique geometry with convex cutting edges and 4-facet self-centering point.
- Premium micrograin carbide substrate with bright finish.
- 5xD and 8xD with coolant-feed available upon request.

COMPARED TO CONVENTIONAL DRILLS FORCE N DELIVER:

- **Superior performance** – with high drilling speeds and long tool life.
- **Economical solution** – which can be used across all types of aluminium from soft through to abrasive grades
- **Optimized process** – designed to reduce thrust force improving hole quality and reducing exit burr which occurs when drilling soft materials



RANGE DETAILS

NEW

5XD

R445

coolant-feed

Available upon request

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

NEW

8XD

R448

coolant-feed

Available upon request

- 3.00 – 16.00 mm
- 1/8 – 5/8 inch

Up to NEW

12XD

Longer lengths available upon request

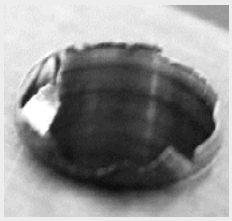
FORCE N

NEW

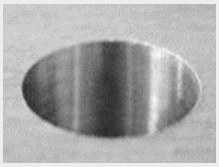
HIGH PERFORMANCE CARBIDE DRILLS

MACHINING EXAMPLE

			Wrought Aluminium	Cast Aluminium
Workpiece			AW 2024-O (3.1355)	A242.0
Hardness		HB	50 HB	75 HB
Tensile strength		MPa	200 MPa	220 Mpa
Diameter		mm	8 mm (R4458.0)	8 mm (S-R4488.0)
Hole depth		mm	5xD (40 mm)	8xD (64 mm)
Cutting speed	v_c	m/min	357 m/min	374 m/min
Feed	f	mm/rev	0.80 mm/rev	0.33 mm/rev
Coolant			Emulsion 8% through coolant	Emulsion 8% through coolant

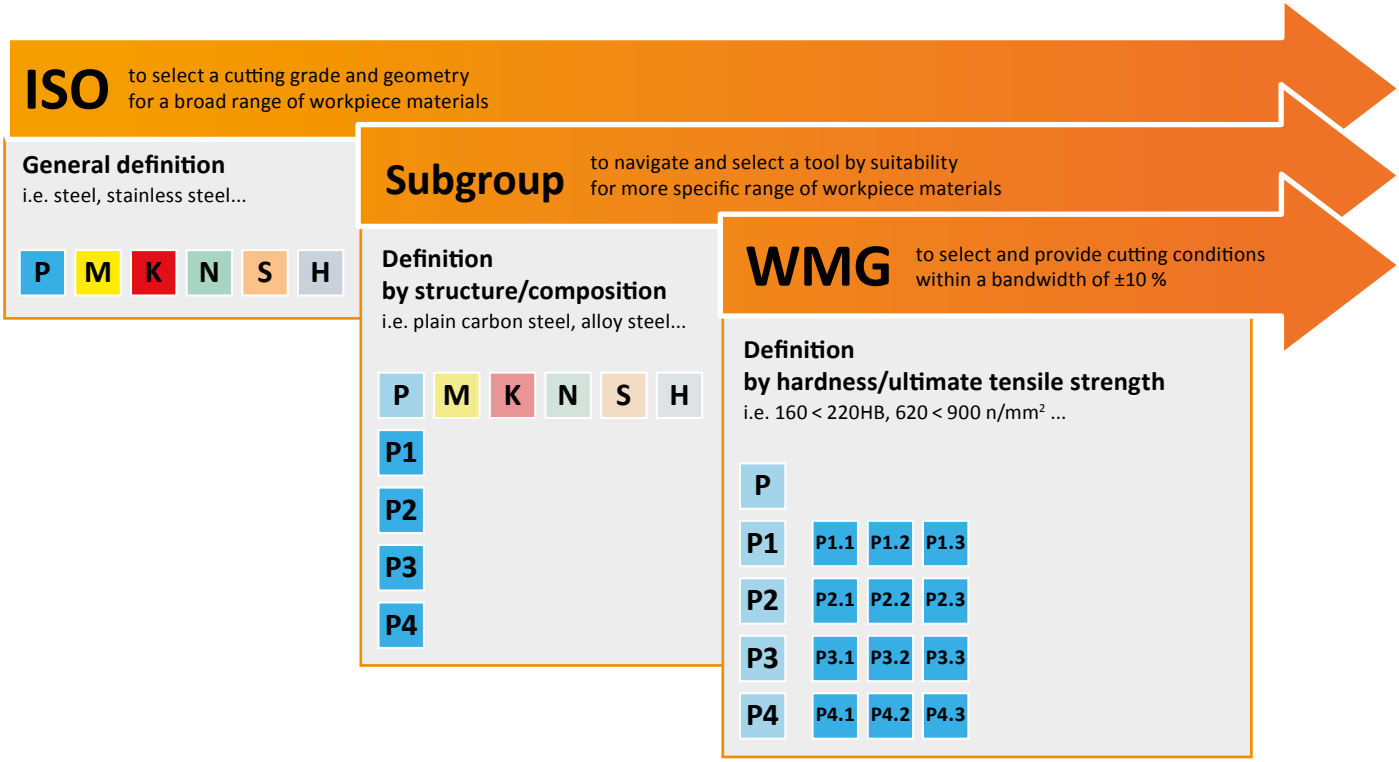


Exit burr with conventional drill



Exit burr with FORCE N drill

WORKPIECE MATERIAL GROUPS (WMG)



ABOUT DORMER PRAMET'S WORKPIECE MATERIAL CLASSIFICATION

Workpiece material groups ("WMG") are used to support easy and reliable selection of the right cutting tool and starting values for machining conditions in particular applications.
Dormer Pramet classifies workpiece materials into six differently coloured groups;

- **Blue**: Steel and cast steel (P-group)
- **Yellow**: Stainless steel (M-group)
- **Red**: Cast iron (K-group)
- **Green**: Non-ferrous metals (N-group)
- **Orange**: High-temperature alloys (S-group)
- **Grey**: Hardened materials (H-group)

Each of these are divided into subgroups on the basis of their structure and/or composition. For example, P-group steel and cast steel is split into four subgroups, namely;

- P1 – **Free machining steel**
- P2 – **Plain carbon steel**
- P3 – **Alloy steel**
- P4 – **Tool steel**

A final division includes material properties, such as hardness and ultimate tensile strength. This is to provide our customers with a complete tool recommendation, including starting values for cutting speed and feed.
The table on the next page includes a description of each workpiece material group, as well as examples of commonly used designations.

ISO			WMG (Workpiece Material Groups)	Ultimate tensile strength Mpa [N/mm²]	Old Dormer AMG	Old Pramet ISO
P	P1	P1.1	Free machining sulfurized carbon steel with a hardness of < 220 HB	≤ 760	1.1	P1
		P1.2	Free machining sulfurized and phosphorized carbon steel with a hardness of < 180 HB	≤ 620	1.1	P1
		P1.3	Free machining sulfurized/phosphorized and leaded carbon steel with a hardness of < 160 HB	≤ 550	1.1	P1
	P2	P2.1	Plain low carbon steel containing < 0.25%C with a hardness of < 180 HB	≤ 620	1.2	P2
		P2.2	Plain medium carbon steel containing < 0.55%C with a hardness of < 240 HB	≤ 830	1.3	P2
		P2.3	Plain high carbon steel containing > 0.55%C, with a hardness of < 300 HB	≤ 1030	1.5	P3
	P3	P3.1	Alloy steel with a hardness of < 180 HB	≤ 620	1.4	P3
		P3.2	Alloy steel with a hardness of 180 – 260 HB	> 620 ≤ 900	1.4	P3
		P3.3	Alloy steel with a hardness of 260 – 360 HB	> 900 ≤ 1240	1.5	P4
	P4	P4.1	Tool steel with a hardness of < 26 HRC	≤ 900	1.4	P3
		P4.2	Tool steel with a hardness of 26 – 39 RC	> 900 ≤ 1240	1.5	P4
		P4.3	Tool steel with a hardness of 39 – 45 HRC	> 1250 ≤ 1450	1.6	H1
M	M1	M1.1	Stainless steel, ferritic with a hardness of < 160 HB	≤ 520	2.1	M1
		M1.2	Stainless steel, ferritic with a hardness of 160 – 220 HB	> 520 ≤ 700	2.1	M1
	M2	M2.1	Stainless steel, martensitic with a hardness of < 200 HB	≤ 670	2.3	M2
		M2.2	Stainless steel, martensitic with a hardness of 200 – 280 HB	> 670 ≤ 950	2.3	M2
		M2.3	Stainless steel, martensitic with a hardness of 280 – 380 HB	> 950 ≤ 1300	2.4	M2
	M3	M3.1	Stainless steel, austenitic with a hardness of < 200 HB	≤ 750	2.2	M3
		M3.2	Stainless steel, austenitic with a hardness of 200 – 260 HB	>750 ≤ 870	2.2	M3
		M3.3	Stainless steel, austenitic with a hardness of 260 – 300 HB	> 870 ≤ 1040	2.2	M3
	M4	M4.1	Stainless steel, austenitic-ferritic or super-austenitic with a hardness of < 300 HB	≤ 990	2.3	M4
		M4.2	Stainless steel, precipitation hardening austenitic with a hardness of 300 – 380 HB	≤ 1320	2.4	M4
K	K1	K1.1	Gray iron, ferritic or ferritic-pearlitic with a hardness of < 180 HB	≤ 190	3.1	K1
		K1.2	Gray iron, ferritic-pearlitic or pearlitic with a hardness of 180 – 240 HB	> 190 ≤ 310	3.2	K1
		K1.3	Gray iron, pearlitic with a hardness of 240 – 280 HB	>310 ≤ 390	3.2	K1
	K2	K2.1	Malleable iron, ferritic with a hardness of < 160 HB	≤ 400	3.3	K2
		K2.2	Malleable iron, ferritic or pearlitic with a hardness of 160 – 200 HB	> 400 ≤ 550	3.3	K2
		K2.3	Malleable iron, pearlitic with a hardness of 200 – 240 HB	> 550 ≤ 660	3.4	K2
	K3	K3.1	Ductile (nodular/spheriodal) iron, ferritic with a hardness of < 180 HB	≤ 560	3.3	K3
		K3.2	Ductile (nodular/spheriodal) iron, ferritic or pearlitic with a hardness of 180 – 220 HB	> 560 ≤ 680	3.3	K4
		K3.3	Ductile (nodular/spheriodal) iron, pearlitic with a hardness of 220 – 260 HB	> 680 ≤ 800	3.4	K4
	K4	K4.1	Austenitic cast iron with a hardness of < 180 HB	≤ 610		
		K4.2	Austenitic cast iron with a hardness of 180 – 240HB	> 610 ≤ 840		
		K4.3	Austempered ductile iron with a hardness of 240 – 280 HB	> 840 ≤ 980		
		K4.4	Austempered ductile iron with a hardness of 280 – 320 HB	> 980 ≤ 1130		
		K4.5	Austempered ductile iron with a hardness of 320 – 360 HB	> 1130 ≤ 1280		
	K5	K5.1	Vermicular, compacted graphite iron with a hardness of < 180 HB			
		K5.2	Vermicular, compacted graphite iron with a hardness of 180 – 220 HB			
		K5.3	Vermicular, compacted graphite iron with a hardness of 220 – 260 HB			
N	N1	N1.1	Pure aluminium and wrought aluminium alloys with a hardness of < 60 HB	≤ 240	7.1	N1
		N1.2	Wrought aluminium alloys with a hardness of 60 – 100 HB	> 240 ≤ 400	7.1	N1
		N1.3	Wrought aluminium alloys with a hardness of 100 – 150 HB	> 400 ≤ 590	7.2	N2
	N2	N2.1	Cast aluminium alloys with a hardness of < 75 HB	≤ 240	7.3	N1
		N2.2	Cast aluminium alloys with a hardness of 75 – 90 HB	> 240 ≤ 270	7.3	N1
		N2.3	Cast aluminium alloys with a hardness of 90 < 140 HB	> 270 ≤ 440	7.3	N2
	N3	N3.1	Free-cutting copper-alloys materials with excellent machining properties		6.3	N3
		N3.2	Short-chip copper-alloys with good to moderate machining properties		6.2	N3
		N3.3	Electrolytic copper and long-chip copper-alloys with moderate to poor machining properties		6.1	N4
	N4	N4.1	Thermoplastic polymers		8.1	
		N4.2	Thermosetting polymers		8.2	
		N4.3	Reinforced polymers or composites		8.3	
S	S1	S1.1	Titanium or titanium alloys, with a hardness of < 200 HB	≤ 660	4.1	S1
		S1.2	Titanium alloys, with a hardness of 200 – 280 HB	> 660 ≤ 950	4.2	S1
		S1.3	Titanium alloys, a hardness of 280 – 360 HB	> 950 ≤ 1200	4.3	S1
	S2	S2.1	High-temperature Fe-based alloys with a hardness of < 200 HB	≤ 690		S2
		S2.2	High-temperature Fe-based alloys with a hardness of 200 – 280 HB	> 690 ≤ 970		S2
	S3	S3.1	High-temperature Ni-based alloys with a hardness of < 280 HB	≤ 940	5.2	S3
		S3.2	High-temperature Ni-based alloys with a hardness of 280 – 360 HB	> 940 ≤ 1200	5.3	S3
	S4	S4.1	High-temperature Co-based alloys with a hardness of < 240HB	≤ 800		S4
		S4.2	High-temperature Co-based alloys with a hardness of 240 – 320 HB	> 800 ≤ 1070		S4
H	H1	H1.1	Chilled cast iron with a hardness of < 400 HB			
	H2	H2.1	Hardened cast iron with a hardness < 55 HRC			H2
		H2.2	Hardened cast iron with a hardness > 55 HRC			H2
	H3	H3.1	Hardened steel with a hardness of < 51 HRC		1.7	H3
		H3.2	Hardened steel with a hardness of 51 – 55 HRC		1.7	H3
	H4	H4.1	Hardened steel with a hardness of 55 – 59 HRC		1.8	H4
		H4.2	Hardened steel with a hardness of > 59 HRC		1.8	H4

		HM	HM	HM	HM	HM	HM	HM	HM	HM	HM
		DIN 6537 K	DIN 6537 K	DIN 6537 L	DIN 6537 L	DORMER	DIN 6537 K	DIN 6537 L	DORMER	DORMER	DIN 6537 L
		3XD	3XD	5XD	5XD	8XD	3XD	5XD	8XD	5XD	8XD
		140°	140°	140°	140°	140°	140°	140°	140°	130°	130°
		TiAlN	TiAlN	TiAlN	TiAlN	TiAlN	TiAlN	TiAlN	TiAlN		
		DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA	DIN 6535 HA
		CTW	CTW	CTW	CTW	CTW	CTW	CTW	CTW	N	N
		FORCE X	FORCE X	FORCE X	FORCE X	FORCE X	FORCE M	FORCE M	FORCE M	FORCE N	FORCE N
		R458	R457	R454	R453	R459	R467	R463	R469*	R445*	R448*
		3.00 - 20.00	3.00 - 20.00	3.00 - 20.00	3.00 - 20.00	3.00 - 16.00	3.00 - 16.00	3.00 - 16.00	3.00 - 16.00	3.00 - 16.00	3.00 - 16.00
									NEW	NEW	NEW
ISO 513		13	13	18	18	21	27	30	33	37	40
P	P1	■	■	■	■	■					
	P2	■	■	■	■	■					
	P3	■	■	■	■	■					
	P4	■	■	■	■	■					
M	M1	◪	◪	◪	◪	◪	■	■	■		
	M2	◪	◪	◪	◪	◪	■	■	■		
	M3	◪	◪	◪	◪	◪	■	■	■		
	M4	◪	◪	◪	◪	◪	■	■	■		
K	K1	■	■	■	■	■					
	K2	■	■	■	■	■					
	K3	■	■	■	■	■					
	K4	■	■	■	■	■					
	K5	■	■	■	■	■					
N	N1	■	■	■	■	■				■	■
	N2	■	■	■	■	■				■	■
	N3	■	■	■	■	◪					
	N4										
S	S1	◪	■	◪	■		■	■	■		
	S2						◪	◪	◪		
	S3						◪	◪	◪		
	S4						◪	◪	◪		
H	H1	■	■	■	■						
	H2	■	■	■	■						
	H3	■	■	■	■						
	H4	■	■	■	■						

HM

	Ø (D) [mm]											
	1	2	3	4	5	6	8	10	12	15	16	20
D	0,016	0,038	0,053	0,060	0,068	0,078	0,098	0,119	0,130	0,149	0,155	0,188
E	0,017	0,043	0,062	0,071	0,080	0,092	0,115	0,140	0,150	0,173	0,180	0,215
F	0,018	0,050	0,073	0,084	0,095	0,109	0,138	0,165	0,178	0,202	0,210	0,248
G	0,019	0,056	0,084	0,096	0,109	0,126	0,160	0,190	0,205	0,231	0,240	0,280
T	0,015	0,028	0,040	0,050	0,060	0,070	0,090	0,110	0,130	0,160	0,170	0,190
U	0,026	0,048	0,070	0,080	0,090	0,107	0,140	0,170	0,200	0,223	0,230	0,240
V	0,038	0,069	0,100	0,115	0,130	0,153	0,200	0,250	0,280	0,310	0,320	0,340
W	0,049	0,089	0,130	0,150	0,170	0,200	0,260	0,330	0,380	0,418	0,430	0,450
X	0,056	0,103	0,150	1,180	0,210	0,250	0,330	0,420	0,480	0,533	0,550	0,580
Y	0,068	0,124	0,1080	0,220	0,260	0,317	0,430	0,550	0,700	0,700	0,700	0,740
Z	0,094	0,172	0,250	0,325	0,400	0,533	0,800	1,000	1,100	1,175	1,200	1,200
mm / REV ± 25%												

$$n = \frac{V_c \times 1000}{\pi \times D}$$

$$Vf = n \times fn$$

* Available upon request

■ Excellent for Application

◪ Good for Application

FORCE X

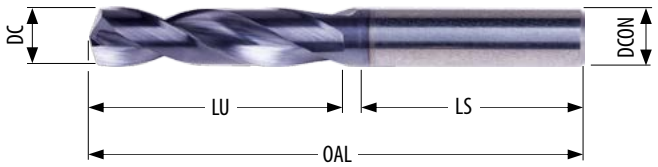
R458 Force X Drill 3×D
R457 Force X Drill Oil Feed 3×D

R458	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2
	■143	■160	■166	■122	■108	■95	■106	■86	■72	■63	■54	■44	◪60	◪51	◪54	◪44	◪37	◪33	◪28
	M3.3	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2
	◪26	◪24	◪21	■88	■65	■49	■78	■64	■51	■70	■54	■43	■65	■49	■36	■30	■26	■73	■55
	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	S1.1	S1.2	S1.3	H1.1	H2.1	H2.2	H3.1	H3.2	H4.1
	■42	■200	■150	■100	■246	■222	■160	■298	■176	■88	◪44	◪36	◪32	■45	■26	■24	■30	■24	■20
	H4.2																		
	■17																		

R457	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2
	■179	■200	■207	■153	■135	■119	■133	■107	■90	■79	■67	■55	◪75	◪64	◪67	◪55	◪46	◪41	◪35
	M3.3	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2
	◪32	◪30	◪26	■110	■81	■61	■98	■80	■64	■87	■67	■54	■81	■61	■45	■38	■32	■91	■69
	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3	S1.1	S1.2	S1.3	H1.1	H2.1	H2.2	H3.1	H3.2	H4.1
	■53	■250	■188	■125	■308	■277	■200	■373	■220	■110	■55	■45	■40	■56	■33	■30	■37	■30	■25
	H4.2																		
	■21																		

R458	HM	DIN 6537 K	3XD	140°	TiAlN	DIN 6535HA	CTW											
R457	HM	DIN 6537 K	3XD	140°	TiAlN	DIN 6535HA	CTW											

DORMER



R458	R457
	
FORCE X	FORCE X
3.00 - 20.00	3.00 - 20.00

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R458	R457
	3.00	0.1181	20	62	36	6	R4583.0	R4573.0
	3.10	0.1220	20	62	36	6	R4583.1	R4573.1
1/8	3.18	0.1250	20	62	36	6	R4581/8	R4571/8
	3.20	0.1260	20	62	36	6	R4583.2	R4573.2
30	3.26	0.1283	20	62	36	6	R458N30	
	3.30	0.1299	20	62	36	6	R4583.3	R4573.3
	3.40	0.1339	20	62	36	6	R4583.4	R4573.4
29	3.45	0.1360	20	62	36	6	R458N29	
	3.50	0.1378	20	62	36	6	R4583.5	R4573.5
28	3.57	0.1406	20	62	36	6	R458N28	
9/64	3.57	0.1406	20	62	36	6	R4589/64	R4579/64
	3.60	0.1417	20	62	36	6	R4583.6	R4573.6

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R458	R457
27	3.66	0.1441	20	62	36	6	R458N27	
	3.70	0.1457	20	62	36	6	R4583.7	R4573.7
26	3.73	0.1469	24	66	36	6	R458N26	R457N26
25	3.80	0.1496	24	66	36	6	R4583.8	R4573.8
24	3.86	0.1520	24	66	36	6	R458N24	R457N24
	3.90	0.1535	24	66	36	6	R4583.9	R4573.9
23	3.91	0.1539	24	66	36	6	R458N23	
5/32	3.97	0.1563	24	66	36	6	R4585/32	R4575/32
22	3.99	0.1571	24	66	36	6	R458N22	
	4.00	0.1575	24	66	36	6	R4584.0	R4574.0
21	4.04	0.1591	24	66	36	6	R458N21	
	4.05	0.1594	24	66	36	6		R4574.05
20	4.09	0.1610	24	66	36	6	R458N20	
	4.10	0.1614	24	66	36	6	R4584.1	R4574.1
	4.20	0.1654	24	66	36	6	R4584.2	R4574.2
19	4.22	0.1661	24	66	36	6	R458N19	R457N19
	4.30	0.1693	24	66	36	6	R4584.3	R4574.3
18	4.31	0.1697	24	66	36	6	R458N18	
11/64	4.37	0.1719	24	66	36	6	R45811/64	R45711/64
17	4.39	0.1728	24	66	36	6	R458N17	R457N17
	4.40	0.1732	24	66	36	6	R4584.4	R4574.4
	4.50	0.1772	24	66	36	6	R4584.5	R4574.5
16	4.50	0.1772	24	66	36	6	R458N16	
15	4.57	0.1799	24	66	36	6	R458N15	R457N15
	4.60	0.1811	24	66	36	6	R4584.6	R4574.6
14	4.62	0.1819	24	66	36	6	R458N14	R457N14
13	4.70	0.1850	24	66	36	6	R4584.7	R4574.7
3/16	4.76	0.1875	28	66	36	6	R4583/16	R4573/16
	4.80	0.1890	28	66	36	6	R4584.8	R4574.8
12	4.80	0.1890	28	66	36	6	R458N12	
11	4.85	0.1909	28	66	36	6	R458N11	
	4.90	0.1929	28	66	36	6	R4584.9	R4574.9
10	4.92	0.1937	28	66	36	6	R458N10	
9	4.98	0.1961	28	66	36	6	R458N9	R457N9
	5.00	0.1969	28	66	36	6	R4585.0	R4575.0
	5.05	0.1988	28	66	36	6		R4575.05
8	5.06	0.1992	28	66	36	6	R458N8	
	5.10	0.2008	28	66	36	6	R4585.1	R4575.1
7	5.11	0.2010	28	66	36	6	R458N7	
13/64	5.16	0.2031	28	66	36	6	R45813/64	R45713/64
6	5.18	0.2039	28	66	36	6	R458N6	
	5.20	0.2047	28	66	36	6	R4585.2	R4575.2
5	5.22	0.2055	28	66	36	6	R458N5	
	5.30	0.2087	28	66	36	6	R4585.3	R4575.3
4	5.31	0.2091	28	66	36	6	R458N4	R457N4
	5.40	0.2126	28	66	36	6	R4585.4	R4575.4
3	5.41	0.2130	28	66	36	6	R458N3	
	5.50	0.2165	28	66	36	6	R4585.5	R4575.5
7/32	5.56	0.2188	28	66	36	6	R4587/32	R4577/32
	5.60	0.2205	28	66	36	6	R4585.6	R4575.6
2	5.61	0.2209	28	66	36	6	R458N2	R457N2
	5.70	0.2244	28	66	36	6	R4585.7	R4575.7
1	5.79	0.2280	28	66	36	6	R458N1	
	5.80	0.2283	28	66	36	6	R4585.8	R4575.8
	5.90	0.2323	28	66	36	6	R4585.9	R4575.9
A	5.94	0.2339	28	66	36	6	R458A	R457A
15/64	5.95	0.2344	28	66	36	6	R45815/64	R45715/64
	6.00	0.2362	28	66	36	6	R4586.0	R4576.0
B	6.05	0.2380	34	79	36	8	R458B	R457B
	6.05	0.2382	34	79	36	8		R4576.05
	6.10	0.2402	34	79	36	8	R4586.1	R4576.1
C	6.15	0.2421	34	79	36	8	R458C	R457C
	6.20	0.2441	34	79	36	8	R4586.2	R4576.2
D	6.25	0.2461	34	79	36	8	R458D	R457D

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R458	R457
	6.30	0.2480	34	79	36	8	R4586.3	R4576.3
1/4	6.35	0.2500	34	79	36	8	R4581/4	R4571/4
E	6.35	0.2500	34	79	36	8	R458E	R457E
	6.40	0.2520	34	79	36	8	R4586.4	R4576.4
	6.50	0.2559	34	79	36	8	R4586.5	R4576.5
F	6.53	0.2571	34	79	36	8	R458F	R457F
	6.60	0.2598	34	79	36	8	R4586.6	R4576.6
G	6.63	0.2610	34	79	36	8	R458G	R457G
	6.70	0.2638	34	79	36	8	R4586.7	R4576.7
17/64	6.75	0.2656	34	79	36	8	R45817/64	R45717/64
H	6.76	0.2661	34	79	36	8	R458H	R457H
	6.80	0.2677	34	79	36	8	R4586.8	R4576.8
	6.90	0.2717	34	79	36	8	R4586.9	R4576.9
I	6.91	0.2720	34	79	36	8	R458I	R457I
	7.00	0.2756	34	79	36	8	R4587.0	R4577.0
J	7.04	0.2772	34	79	36	8	R458J	
J	7.04	0.2772	41	79	36	8		R457J
	7.10	0.2795	41	79	36	8	R4587.1	R4577.1
K	7.14	0.2811	41	79	36	8	R458K	R457K
9/32	7.14	0.2813	41	79	36	8	R4589/32	R4579/32
	7.20	0.2835	41	79	36	8	R4587.2	R4577.2
	7.30	0.2874	41	79	36	8	R4587.3	R4577.3
L	7.37	0.2902	41	79	36	8	R458L	R457L
	7.40	0.2913	41	79	36	8	R4587.4	R4577.4
M	7.49	0.2949	41	79	36	8	R458M	R457M
	7.50	0.2953	41	79	36	8	R4587.5	R4577.5
19/64	7.54	0.2969	41	79	36	8	R45819/64	R45719/64
	7.60	0.2992	41	79	36	8	R4587.6	R4577.6
N	7.67	0.3020	41	79	36	8	R458N	R457N
	7.70	0.3031	41	79	36	8	R4587.7	R4577.7
	7.80	0.3071	41	79	36	8	R4587.8	R4577.8
	7.90	0.3110	41	79	36	8	R4587.9	R4577.9
5/16	7.94	0.3125	41	79	36	8	R4585/16	R4575/16
	8.00	0.3150	41	79	36	8	R4588.0	R4578.0
O	8.03	0.3161	47	89	40	10	R458O	R457O
	8.05	0.3169	47	89	40	10		R4578.05
	8.10	0.3189	47	89	40	10	R4588.1	R4578.1
	8.20	0.3228	47	89	40	10	R4588.2	R4578.2
P	8.20	0.3228	47	89	40	10	R458P	R457P
	8.30	0.3268	47	89	40	10	R4588.3	R4578.3
21/64	8.33	0.3281	47	89	40	10	R45821/64	R45721/64
	8.40	0.3307	47	89	40	10	R4588.4	R4578.4
Q	8.43	0.3319	47	89	40	10		R457Q
	8.50	0.3346	47	89	40	10	R4588.5	R4578.5
	8.60	0.3386	47	89	40	10	R4588.6	R4578.6
R	8.61	0.3390	47	89	40	10	R458R	R457R
	8.70	0.3425	47	89	40	10	R4588.7	R4578.7
11/32	8.73	0.3438	47	89	40	10	R45811/32	R45711/32
	8.80	0.3465	47	89	40	10	R4588.8	R4578.8
S	8.84	0.3480	47	89	40	10	R458S	R457S
	8.90	0.3504	47	89	40	10	R4588.9	R4578.9
	9.00	0.3543	47	89	40	10	R4589.0	R4579.0
T	9.09	0.3579	47	89	40	10	R458T	R457T
	9.10	0.3583	47	89	40	10	R4589.1	R4579.1
23/64	9.13	0.3594	47	89	40	10	R45823/64	R45723/64
	9.20	0.3622	47	89	40	10	R4589.2	R4579.2
	9.30	0.3661	47	89	40	10	R4589.3	R4579.3
U	9.35	0.3681	47	89	40	10	R458U	
	9.40	0.3701	47	89	40	10	R4589.4	R4579.4
	9.50	0.3740	47	89	40	10	R4589.5	R4579.5
3/8	9.53	0.3750	47	89	40	10	R4583/8	R4573/8
V	9.58	0.3772	47	89	40	10	R458V	R457V
	9.60	0.3780	47	89	40	10	R4589.6	R4579.6
	9.70	0.3819	47	89	40	10	R4589.7	R4579.7

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R458	R457
	9.80	0.3858	47	89	40	10	R4589.8	R4579.8
W	9.80	0.3858	47	89	40	10	R458W	R457W
	9.90	0.3898	47	89	40	10	R4589.9	R4579.9
25/64	9.92	0.3906	47	89	40	10	R45825/64	R45725/64
	10.00	0.3937	47	89	40	10	R45810.0	R45710.0
	10.05	0.3957	55	102	45	12		R45710.05
X	10.08	0.3969	55	102	45	12	R458X	R457X
	10.10	0.3976	55	102	45	12	R45810.1	R45710.1
	10.20	0.4016	55	102	45	12	R45810.2	R45710.2
Y	10.26	0.4039	55	102	45	12	R458Y	R457Y
	10.30	0.4055	55	102	45	12	R45810.3	R45710.3
13/32	10.32	0.4063	55	102	45	12	R45813/32	R45713/32
	10.40	0.4094	55	102	45	12	R45810.4	R45710.4
Z	10.49	0.4130	55	102	45	12	R458Z	R457Z
	10.50	0.4134	55	102	45	12	R45810.5	R45710.5
	10.60	0.4173	55	102	45	12	R45810.6	R45710.6
	10.70	0.4213	55	102	45	12	R45810.7	
27/64	10.72	0.4219	55	102	45	12	R45827/64	R45727/64
	10.80	0.4252	55	102	45	12	R45810.8	R45710.8
	10.90	0.4291	55	102	45	12	R45810.9	
	11.00	0.4331	55	102	45	12	R45811.0	R45711.0
	11.10	0.4370	55	102	45	12	R45811.1	
7/16	11.11	0.4375	55	102	45	12	R4587/16	R4577/16
	11.20	0.4409	55	102	45	12	R45811.2	R45711.2
	11.30	0.4449	55	102	45	12	R45811.3	R45711.3
	11.40	0.4488	55	102	45	12	R45811.4	R45711.4
	11.50	0.4528	55	102	45	12	R45811.5	R45711.5
29/64	11.51	0.4531	55	102	45	12	R45829/64	R45729/64
	11.60	0.4567	55	102	45	12	R45811.6	R45711.6
	11.70	0.4606	55	102	45	12	R45811.7	
	11.80	0.4646	55	102	45	12	R45811.8	R45711.8
	11.90	0.4685	55	102	45	12	R45811.9	
15/32	11.91	0.4688	55	102	45	12	R45815/32	R45715/32
	12.00	0.4724	55	102	45	12	R45812.0	R45712.0
	12.05	0.4744	60	107	45	14		R45712.05
	12.10	0.4764	60	107	45	14	R45812.1	R45712.1
	12.20	0.4803	60	107	45	14	R45812.2	R45712.2
31/64	12.30	0.4844	60	107	45	14	R45831/64	R45731/64
	12.50	0.4921	60	107	45	14	R45812.5	R45712.5
	12.70	0.5000	60	107	45	14	R45812.7	R45712.7
1/2	12.70	0.5000	60	107	45	14	R4581/2	R4571/2
	12.80	0.5039	60	107	45	14	R45812.8	R45712.8
	13.00	0.5118	60	107	45	14	R45813.0	R45713.0
33/64	13.10	0.5156	60	107	45	14	R45833/64	R45733/64
	13.30	0.5236	60	107	45	14	R45813.3	R45713.3
17/32	13.49	0.5313	60	107	45	14	R45817/32	R45717/32
	13.50	0.5315	60	107	45	14	R45813.5	R45713.5
	13.80	0.5433	60	107	45	14	R45813.8	R45713.8
35/64	13.89	0.5469	60	107	45	14	R45835/64	R45735/64
	14.00	0.5512	60	107	45	14	R45814.0	R45714.0
	14.25	0.5610	65	115	48	16	R45814.25	R45714.25
9/16	14.29	0.5625	65	115	48	16	R4589/16	R4579/16
	14.50	0.5709	65	115	48	16	R45814.5	R45714.5
37/64	14.68	0.5781	65	115	48	16	R45837/64	R45737/64
	14.80	0.5827	65	115	48	16	R45814.8	R45714.8
	15.00	0.5906	65	115	48	16	R45815.0	R45715.0
19/32	15.08	0.5938	65	115	48	16	R45819/32	R45719/32
	15.10	0.5945	65	115	48	16	R45815.1	R45715.1
	15.30	0.6024	65	115	48	16	R45815.3	R45715.3
39/64	15.48	0.6094	65	115	48	16	R45839/64	R45739/64
	15.50	0.6102	65	115	48	16	R45815.5	R45715.5
	15.80	0.6220	65	115	48	16	R45815.8	R45715.8
5/8	15.88	0.6250	65	115	48	16	R4585/8	R4575/8
	16.00	0.6299	65	115	48	16	R45816.0	R45716.0

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R458	R457
41/64	16.27	0.6406	73	123	48	18	**R45841/64**	**R45741/64**
	16.50	0.6496	73	123	48	18	**R45816.5**	**R45716.5**
21/32	16.67	0.6563	73	123	48	18	**R45821/32**	**R45721/32**
	17.00	0.6693	73	123	48	18	**R45817.0**	**R45717.0**
43/64	17.07	0.6720	73	123	48	18	**R45843/64**	**R45743/64**
11/16	17.46	0.6874	73	123	48	18	**R45811/16**	**R45711/16**
	17.50	0.6890	73	123	48	18	**R45817.5**	**R45717.5**
	17.80	0.7008	73	123	48	18	**R45817.8**	
45/64	17.86	0.7031	73	123	48	18	**R45845/64**	**R45745/64**
	18.00	0.7087	73	123	48	18	**R45818.0**	**R45718.0**
23/32	18.26	0.7189	79	131	50	20	**R45823/32**	**R45723/32**
	18.50	0.7283	79	131	50	20	**R45818.5**	**R45718.5**
47/64	18.65	0.7343	79	131	50	20	**R45847/64**	**R45747/64**
	18.80	0.7402	79	131	50	20		**R45718.8**
	19.00	0.7480	79	131	50	20	**R45819.0**	**R45719.0**
	19.05	0.7500	79	131	50	20	**R4583/4**	
3/4	19.05	0.7500	79	131	50	20		**R4573/4**
	19.50	0.7677	79	131	50	20	**R45819.5**	**R45719.5**
	19.80	0.7795	79	131	50	20	**R45819.8**	**R45719.8**
	20.00	0.7874	79	131	50	20	**R45820.0**	**R45720.0**

R454 Force X Drill 5×D
R453 Force X Drill Oil Feed 5×D

R454

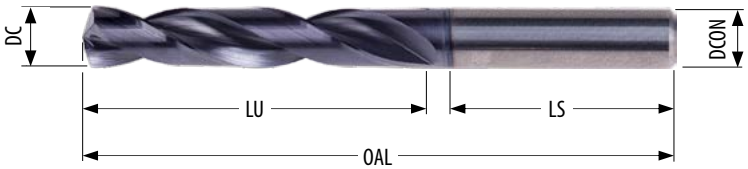
P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2
■134	■150	■155	■115	■101	■89	■100	■80	■68	■59	■50	■41	◪56	◪48	◪50	◪41	◪35	◪31	◪26
M3.3	**M4.1**	**M4.2**	**K1.1**	**K1.2**	**K1.3**	**K2.1**	**K2.2**	**K2.3**	**K3.1**	**K3.2**	**K3.3**	**K4.1**	**K4.2**	**K4.3**	**K4.4**	**K4.5**	**K5.1**	**K5.2**
◪24	◪23	◪20	■83	■61	■46	■74	■60	■48	■65	■50	■41	■61	■46	■34	■29	■24	■68	■52
K5.3	**N1.1**	**N1.2**	**N1.3**	**N2.1**	**N2.2**	**N2.3**	**N3.1**	**N3.2**	**N3.3**	**S1.1**	**S1.2**	**S1.3**	**H1.1**	**H2.1**	**H2.2**	**H3.1**	**H3.2**	**H4.1**
■40	■188	■141	■94	■231	■208	■150	■280	■165	■83	◪41	◪34	◪30	■42	■25	■23	■28	■23	■19
H4.2																		
■16																		

R453

P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2
■170	■190	■197	■145	■128	■113	■126	■102	■86	■75	■64	■52	◪71	◪61	◪64	◪52	◪44	◪39	◪33
M3.3	**M4.1**	**M4.2**	**K1.1**	**K1.2**	**K1.3**	**K2.1**	**K2.2**	**K2.3**	**K3.1**	**K3.2**	**K3.3**	**K4.1**	**K4.2**	**K4.3**	**K4.4**	**K4.5**	**K5.1**	**K5.2**
◪30	◪29	◪25	■105	■77	■58	■93	■76	■61	■83	■64	■51	■77	■58	■43	■36	■30	■86	■66
K5.3	**N1.1**	**N1.2**	**N1.3**	**N2.1**	**N2.2**	**N2.3**	**N3.1**	**N3.2**	**N3.3**	**S1.1**	**S1.2**	**S1.3**	**H1.1**	**H2.1**	**H2.2**	**H3.1**	**H3.2**	**H4.1**
■50	■238	■179	■119	■293	■263	■190	■354	■209	■105	■52	■43	■38	■53	■31	■29	■35	■29	■24
H4.2																		
■20																		

R454	HM	DIN 6537 L	5XD	140°	TiAlN	DIN 6535HA	CTW™			
R453	HM	DIN 6537 L	5XD	140°	TiAlN	DIN 6535HA	CTW™			

DORMER



R454	R453
	
FORCE X	***FORCE X***
3.00 - 20.00	3.00 - 20.00

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R454	R453
	3.00	0.1181	28	66	36	6	**R4543.0**	**R4533.0**
	3.10	0.1220	28	66	36	6	**R4543.1**	**R4533.1**
1/8	3.18	0.1250	28	66	36	6	**R4541/8**	**R4531/8**
	3.20	0.1260	28	66	36	6	**R4543.2**	**R4533.2**
30	3.26	0.1283	28	66	36	6		**R453N30**
	3.30	0.1299	28	66	36	6	**R4543.3**	**R4533.3**
	3.40	0.1339	28	66	36	6	**R4543.4**	**R4533.4**
29	3.45	0.1360	28	66	36	6	**R454N29**	**R453N29**
	3.50	0.1378	28	66	36	6	**R4543.5**	**R4533.5**
28	3.57	0.1406	28	66	36	6	**R454N28**	**R453N28**
9/64	3.57	0.1406	28	66	36	6	**R4549/64**	**R4539/64**
	3.60	0.1417	28	66	36	6	**R4543.6**	**R4533.6**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R454	R453
27	3.66	0.1441	28	66	36	6	R454N27	R453N27
	3.70	0.1457	28	66	36	6	R4543.7	R4533.7
26	3.73	0.1469	36	74	36	6	R454N26	R453N26
25	3.80	0.1496	36	74	36	6	R4543.8	R4533.8
24	3.86	0.1520	36	74	36	6	R454N24	R453N24
	3.90	0.1535	36	74	36	6	R4543.9	R4533.9
23	3.91	0.1539	36	74	36	6	R454N23	R453N23
5/32	3.97	0.1563	36	74	36	6	R4545/32	R4535/32
22	3.99	0.1571	36	74	36	6	R454N22	R453N22
	4.00	0.1575	36	74	36	6	R4544.0	R4534.0
21	4.04	0.1591	36	74	36	6	R454N21	R453N21
	4.05	0.1594	36	74	36	6		R4534.05
20	4.09	0.1610	36	74	36	6	R454N20	R453N20
	4.10	0.1614	36	74	36	6	R4544.1	R4534.1
	4.20	0.1654	36	74	36	6	R4544.2	R4534.2
19	4.22	0.1661	36	74	36	6	R454N19	R453N19
	4.30	0.1693	36	74	36	6	R4544.3	R4534.3
18	4.31	0.1697	36	74	36	6	R454N18	R453N18
11/64	4.37	0.1719	36	74	36	6	R45411/64	R45311/64
17	4.39	0.1728	36	74	36	6	R454N17	R453N17
	4.40	0.1732	36	74	36	6	R4544.4	R4534.4
	4.50	0.1772	36	74	36	6	R4544.5	R4534.5
16	4.50	0.1772	36	74	36	6	R454N16	R453N16
15	4.57	0.1799	36	74	36	6	R454N15	R453N15
	4.60	0.1811	36	74	36	6	R4544.6	R4534.6
14	4.62	0.1819	36	74	36	6	R454N14	R453N14
13	4.70	0.1850	36	74	36	6	R4544.7	R4534.7
3/16	4.76	0.1875	44	82	36	6	R4543/16	R4533/16
12	4.80	0.1890	44	82	36	6	R4544.8	R453N12
11	4.85	0.1909	44	82	36	6	R454N11	R453N11
	4.90	0.1929	44	82	36	6	R4544.9	R4534.9
10	4.92	0.1937	44	82	36	6	R454N10	R453N10
9	4.98	0.1961	44	82	36	6	R454N9	R453N9
	5.00	0.1969	44	82	36	6	R4545.0	R4535.0
	5.05	0.1988	44	82	36	6		R4535.05
8	5.06	0.1992	44	82	36	6	R454N8	R453N8
	5.10	0.2008	44	82	36	6	R4545.1	R4535.1
7	5.11	0.2010	44	82	36	6	R454N7	R453N7
13/64	5.16	0.2031	44	82	36	6	R45413/64	R45313/64
6	5.18	0.2039	44	82	36	6	R454N6	R453N6
	5.20	0.2047	44	82	36	6	R4545.2	R4535.2
5	5.22	0.2055	44	82	36	6	R454N5	R453N5
	5.30	0.2087	44	82	36	6		R4535.3
4	5.31	0.2091	44	82	36	6	R454N4	R453N4
	5.40	0.2126	44	82	36	6		R4535.4
3	5.41	0.2130	44	82	36	6	R454N3	R453N3
	5.50	0.2165	44	82	36	6	R4545.5	R4535.5
7/32	5.56	0.2188	44	82	36	6	R4547/32	R4537/32
	5.60	0.2205	44	82	36	6	R4545.6	R4535.6
2	5.61	0.2209	44	82	36	6	R454N2	R453N2
	5.70	0.2244	44	82	36	6	R4545.7	R4535.7
1	5.79	0.2280	44	82	36	6	R454N1	R453N1
	5.80	0.2283	44	82	36	6	R4545.8	R4535.8
	5.90	0.2323	44	82	36	6		R4535.9
A	5.94	0.2339	44	82	36	6	R454A	R453A
15/64	5.95	0.2344	44	82	36	6	R45415/64	R45315/64
	6.00	0.2362	44	82	36	6	R4546.0	R4536.0
B	6.05	0.2380	53	91	36	8	R454B	R453B
	6.05	0.2382	53	91	36	8		R4536.05
	6.10	0.2402	53	91	36	8	R4546.1	R4536.1
C	6.15	0.2421	53	91	36	8	R454C	R453C
	6.20	0.2441	53	91	36	8	R4546.2	R4536.2
D	6.25	0.2461	53	91	36	8	R454D	R453D
	6.30	0.2480	53	91	36	8	R4546.3	R4536.3

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R454	R453
1/4	6.35	0.2500	53	91	36	8	R4541/4	R4531/4
E	6.35	0.2500	53	91	36	8	R454E	R453E
	6.40	0.2520	53	91	36	8	R4546.4	R4536.4
	6.50	0.2559	53	91	36	8	R4546.5	R4536.5
F	6.53	0.2571	53	91	36	8	R454F	R453F
	6.60	0.2598	53	91	36	8	R4546.6	R4536.6
G	6.63	0.2610	53	91	36	8	R454G	R453G
	6.70	0.2638	53	91	36	8	R4546.7	R4536.7
17/64	6.75	0.2656	53	91	36	8	R45417/64	R45317/64
H	6.76	0.2661	53	91	36	8		R453H
	6.80	0.2677	53	91	36	8	R4546.8	R4536.8
	6.90	0.2717	53	91	36	8	R4546.9	R4536.9
I	6.91	0.2720	53	91	36	8	R454I	R453I
	7.00	0.2756	53	91	36	8	R4547.0	R4537.0
J	7.04	0.2772	53	91	36	8	R454J	R453J
	7.10	0.2795	53	91	36	8	R4547.1	R4537.1
K	7.14	0.2811	53	91	36	8	R454K	R453K
9/32	7.14	0.2813	53	91	36	8	R4549/32	R4539/32
	7.20	0.2835	53	91	36	8		R4537.2
	7.30	0.2874	53	91	36	8	R4547.3	R4537.3
L	7.37	0.2902	53	91	36	8	R454L	
	7.40	0.2913	53	91	36	8	R4547.4	R4537.4
M	7.49	0.2949	53	91	36	8	R454M	R453M
	7.50	0.2953	53	91	36	8	R4547.5	R4537.5
19/64	7.54	0.2969	53	91	36	8	R45419/64	R45319/64
	7.60	0.2992	53	91	36	8	R4547.6	R4537.6
N	7.67	0.3020	53	91	36	8	R454N	R453N
	7.70	0.3031	53	91	36	8	R4547.7	R4537.7
	7.80	0.3071	53	91	36	8	R4547.8	R4537.8
	7.90	0.3110	53	91	36	8	R4547.9	R4537.9
5/16	7.94	0.3125	53	91	36	8	R4545/16	R4535/16
	8.00	0.3150	53	91	36	8	R4548.0	R4538.0
O	8.03	0.3161	61	103	40	10	R454O	R453O
	8.05	0.3169	61	103	40	10		R4538.05
	8.10	0.3189	61	103	40	10	R4548.1	R4538.1
	8.20	0.3228	61	103	40	10	R4548.2	R4538.2
P	8.20	0.3228	61	103	40	10	R454P	R453P
	8.30	0.3268	61	103	40	10		R4538.3
21/64	8.33	0.3281	61	103	40	10	R45421/64	R45321/64
	8.40	0.3307	61	103	40	10	R4548.4	R4538.4
Q	8.43	0.3319	61	103	40	10		R453Q
	8.50	0.3346	61	103	40	10	R4548.5	R4538.5
	8.60	0.3386	61	103	40	10	R4548.6	R4538.6
R	8.61	0.3390	61	103	40	10	R454R	R453R
	8.70	0.3425	61	103	40	10	R4548.7	R4538.7
11/32	8.73	0.3438	61	103	40	10	R45411/32	R45311/32
	8.80	0.3465	61	103	40	10	R4548.8	R4538.8
S	8.84	0.3480	61	103	40	10	R454S	R453S
	8.90	0.3504	61	103	40	10	R4548.9	R4538.9
	9.00	0.3543	61	103	40	10	R4549.0	R4539.0
T	9.09	0.3579	61	103	40	10	R454T	R453T
	9.10	0.3583	61	103	40	10	R4549.1	R4539.1
23/64	9.13	0.3594	61	103	40	10	R45423/64	R45323/64
	9.20	0.3622	61	103	40	10		R4539.2
	9.30	0.3661	61	103	40	10	R4549.3	R4539.3
U	9.35	0.3681	61	103	40	10	R454U	R453U
	9.40	0.3701	61	103	40	10	R4549.4	R4539.4
	9.50	0.3740	61	103	40	10	R4549.5	R4539.5
3/8	9.53	0.3750	61	103	40	10	R4543/8	R4533/8
V	9.58	0.3772	61	103	40	10	R454V	R453V
	9.60	0.3780	61	103	40	10	R4549.6	R4539.6
	9.70	0.3819	61	103	40	10	R4549.7	R4539.7
	9.80	0.3858	61	103	40	10	R4549.8	R4539.8
W	9.80	0.3858	61	103	40	10	R454W	R453W

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R454	R453
	9.90	0.3898	61	103	40	10	**R4549.9**	**R4539.9**
25/64	9.92	0.3906	61	103	40	10	**R45425/64**	**R45325/64**
	10.00	0.3937	61	103	40	10	**R45410.0**	**R45310.0**
	10.05	0.3957	70	118	45	12		**R45310.05**
X	10.08	0.3969	70	118	45	12	**R454X**	**R453X**
	10.10	0.3976	70	118	45	12	**R45410.1**	**R45310.1**
	10.20	0.4016	70	118	45	12	**R45410.2**	**R45310.2**
Y	10.26	0.4039	70	118	45	12	**R454Y**	**R453Y**
	10.30	0.4055	70	118	45	12	**R45410.3**	**R45310.3**
13/32	10.32	0.4063	70	118	45	12	**R45413/32**	**R45313/32**
	10.40	0.4094	70	118	45	12	**R45410.4**	**R45310.4**
Z	10.49	0.4130	70	118	45	12	**R454Z**	**R453Z**
	10.50	0.4134	70	118	45	12	**R45410.5**	**R45310.5**
	10.60	0.4173	70	118	45	12	**R45410.6**	**R45310.6**
27/64	10.72	0.4219	70	118	45	12	**R45427/64**	**R45327/64**
	10.80	0.4252	70	118	45	12		**R45310.8**
	11.00	0.4331	70	118	45	12	**R45411.0**	**R45311.0**
7/16	11.11	0.4375	70	118	45	12	**R4547/16**	**R4537/16**
	11.20	0.4409	70	118	45	12	**R45411.2**	**R45311.2**
	11.30	0.4449	70	118	45	12		**R45311.3**
	11.40	0.4488	70	118	45	12	**R45411.4**	**R45311.4**
	11.50	0.4528	70	118	45	12	**R45411.5**	**R45311.5**
29/64	11.51	0.4531	70	118	45	12	**R45429/64**	**R45329/64**
	11.60	0.4567	70	118	45	12	**R45411.6**	**R45311.6**
	11.80	0.4646	70	118	45	12	**R45411.8**	**R45311.8**
15/32	11.91	0.4688	70	118	45	12	**R45415/32**	**R45315/32**
	12.00	0.4724	70	118	45	12	**R45412.0**	**R45312.0**
	12.05	0.4744	76	124	45	14		**R45312.05**
	12.10	0.4764	76	124	45	14	**R45412.1**	
	12.20	0.4803	76	124	45	14	**R45412.2**	**R45312.2**
31/64	12.30	0.4844	76	124	45	14	**R45431/64**	**R45331/64**
	12.50	0.4921	76	124	45	14	**R45412.5**	**R45312.5**
	12.70	0.5000	76	124	45	14	**R45412.7**	**R45312.7**
1/2	12.70	0.5000	76	124	45	14	**R4541/2**	**R4531/2**
	12.80	0.5039	76	124	45	14	**R45412.8**	**R45312.8**
	13.00	0.5118	76	124	45	14	**R45413.0**	**R45313.0**
33/64	13.10	0.5156	76	124	45	14	**R45433/64**	**R45333/64**
	13.30	0.5236	76	124	45	14		**R45313.3**
17/32	13.49	0.5313	76	124	45	14	**R45417/32**	**R45317/32**
	13.50	0.5315	76	124	45	14	**R45413.5**	**R45313.5**
	13.80	0.5433	76	124	45	14	**R45413.8**	**R45313.8**
35/64	13.89	0.5469	76	124	45	14	**R45435/64**	**R45335/64**
	14.00	0.5512	76	124	45	14	**R45414.0**	**R45314.0**
	14.25	0.5610	82	133	48	16	**R45414.25**	**R45314.25**
9/16	14.29	0.5625	82	133	48	16	**R4549/16**	**R4539/16**
	14.50	0.5709	82	133	48	16	**R45414.5**	**R45314.5**
37/64	14.68	0.5781	82	133	48	16	**R45437/64**	**R45337/64**
	14.80	0.5827	82	133	48	16	**R45414.8**	**R45314.8**
	15.00	0.5906	82	133	48	16	**R45415.0**	**R45315.0**
19/32	15.08	0.5938	82	133	48	16	**R45419/32**	**R45319/32**
	15.10	0.5945	82	133	48	16	**R45415.1**	**R45315.1**
	15.30	0.6024	82	133	48	16		**R45315.3**
39/64	15.48	0.6094	82	133	48	16	**R45439/64**	**R45339/64**
	15.50	0.6102	82	133	48	16	**R45415.5**	**R45315.5**
	15.80	0.6220	82	133	48	16	**R45415.8**	**R45315.8**
5/8	15.88	0.6250	82	133	48	16	**R4545/8**	**R4535/8**
	16.00	0.6299	82	133	48	16	**R45416.0**	**R45316.0**
41/64	16.27	0.6406	91	143	48	18	**R45441/64**	**R45341/64**
	16.50	0.6496	91	143	48	18	**R45416.5**	**R45316.5**
21/32	16.67	0.6563	91	143	48	18	**R45421/32**	**R45321/32**
	17.00	0.6693	91	143	48	18	**R45417.0**	**R45317.0**
43/64	17.07	0.6720	91	143	48	18	**R45443/64**	**R45343/64**
11/16	17.46	0.6874	91	143	48	18	**R45411/16**	**R45311/16**
	17.50	0.6890	91	143	48	18	**R45417.5**	**R45317.5**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R454	R453
	17.80	0.7008	91	143	48	18	**R45417.8**	**R45317.8**
45/64	17.86	0.7031	91	143	48	18	**R45445/64**	**R45345/64**
	18.00	0.7087	91	143	48	18	**R45418.0**	**R45318.0**
23/32	18.26	0.7189	99	143	48	20		**R45323/32**
23/32	18.26	0.7189	99	153	50	20	**R45423/32**	
	18.50	0.7283	99	153	50	20	**R45418.5**	**R45318.5**
47/64	18.65	0.7343	99	153	50	20	**R45447/64**	**R45347/64**
	19.00	0.7480	99	153	50	20	**R45419.0**	**R45319.0**
3/4	19.05	0.7500	99	153	50	20	**R4543/4**	**R4533/4**
	19.50	0.7677	99	153	50	20	**R45419.5**	**R45319.5**
	19.80	0.7795	99	153	50	20	**R45419.8**	**R45319.8**
	20.00	0.7874	99	153	50	20	**R45420.0**	**R45320.0**

R459 Force X Drill Oil Feed 8×D

R459	P1.1	P1.2	P1.3	P2.1	P2.2	P2.3	P3.1	P3.2	P3.3	P4.1	P4.2	P4.3	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2
	■143	■160	■166	■122	■108	■95	■106	■86	■72	■63	■54	■44	◪60	◪51	◪54	◪44	◪37	◪33	◪28
	M3.3	M4.1	M4.2	K1.1	K1.2	K1.3	K2.1	K2.2	K2.3	K3.1	K3.2	K3.3	K4.1	K4.2	K4.3	K4.4	K4.5	K5.1	K5.2
	◪26	◪24	◪21	■88	■65	■49	■78	■64	■51	■70	■54	■43	■65	■49	■36	■30	■26	■73	■55
	K5.3	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3	N3.1	N3.2	N3.3									
	■42	◪200	◪150	■100	■246	■222	■160	◪298	◪176	◪88									

R459	HM	DORMER	8XD	140°	TiAlN	DIN 6535HA	CTW™			

DORMER

R459

FORCE X

3.00 - 16.00

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R459
	3.00	0.1181	37	79	36	6	**R4593.0**
	3.10	0.1220	37	79	36	6	**R4593.1**
1/8	3.18	0.1250	37	79	36	6	**R4591/8**
	3.20	0.1260	37	79	36	6	**R4593.2**
	3.30	0.1299	37	79	36	6	**R4593.3**
	3.40	0.1339	37	79	36	6	**R4593.4**
	3.50	0.1378	37	79	36	6	**R4593.5**
9/64	3.57	0.1406	37	79	36	6	**R4599/64**
	3.60	0.1417	37	79	36	6	**R4593.6**
	3.70	0.1457	37	79	36	6	**R4593.7**
	3.80	0.1496	48	90	36	6	**R4593.8**
	3.90	0.1535	48	90	36	6	**R4593.9**
5/32	3.97	0.1563	48	90	36	6	**R4595/32**
	4.00	0.1575	48	90	36	6	**R4594.0**
	4.10	0.1614	48	90	36	6	**R4594.1**
	4.20	0.1654	48	90	36	6	**R4594.2**
	4.30	0.1693	48	90	36	6	**R4594.3**
11/64	4.37	0.1719	48	90	36	6	**R45911/64**
	4.40	0.1732	48	90	36	6	**R4594.4**
	4.50	0.1772	48	90	36	6	**R4594.5**
	4.60	0.1811	48	90	36	6	**R4594.6**
	4.70	0.1850	62	104	36	6	**R4594.7**
3/16	4.76	0.1875	62	104	36	6	**R4593/16**
	4.80	0.1890	62	104	36	6	**R4594.8**
	4.90	0.1929	62	104	36	6	**R4594.9**
	5.00	0.1969	62	104	36	6	**R4595.0**
	5.10	0.2008	62	104	36	6	**R4595.1**
13/64	5.16	0.2031	62	104	36	6	**R45913/64**
	5.20	0.2047	62	104	36	6	**R4595.2**
	5.30	0.2087	62	104	36	6	**R4595.3**
	5.40	0.2126	62	104	36	6	**R4595.4**
	5.50	0.2165	62	104	36	6	**R4595.5**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R459
7/32	5.56	0.2188	62	104	36	6	**R4597/32**
	5.60	0.2205	62	104	36	6	**R4595.6**
	5.70	0.2244	62	104	36	6	**R4595.7**
	5.80	0.2283	62	104	36	6	**R4595.8**
	5.90	0.2323	62	104	36	6	**R4595.9**
15/64	5.95	0.2344	62	104	36	6	**R45915/64**
	6.00	0.2362	62	104	36	6	**R4596.0**
	6.10	0.2402	84	126	36	8	**R4596.1**
	6.20	0.2441	84	126	36	8	**R4596.2**
	6.30	0.2480	84	126	36	8	**R4596.3**
1/4	6.35	0.2500	84	126	36	8	**R4591/4**
	6.40	0.2520	84	126	36	8	**R4596.4**
	6.50	0.2559	84	126	36	8	**R4596.5**
	6.60	0.2598	84	126	36	8	**R4596.6**
	6.70	0.2638	84	126	36	8	**R4596.7**
17/64	6.75	0.2656	84	126	36	8	**R45917/64**
	6.80	0.2677	84	126	36	8	**R4596.8**
	6.90	0.2717	84	126	36	8	**R4596.9**
	7.00	0.2756	84	126	36	8	**R4597.0**
	7.10	0.2795	84	126	36	8	**R4597.1**
9/32	7.14	0.2813	84	126	36	8	**R4599/32**
	7.20	0.2835	84	126	36	8	**R4597.2**
	7.30	0.2874	84	126	36	8	**R4597.3**
	7.40	0.2913	84	126	36	8	**R4597.4**
	7.50	0.2953	84	126	36	8	**R4597.5**
19/64	7.54	0.2969	84	126	36	8	**R45919/64**
	7.60	0.2992	84	126	36	8	**R4597.6**
	7.70	0.3031	84	126	36	8	**R4597.7**
	7.80	0.3071	84	126	36	8	**R4597.8**
	7.90	0.3110	84	126	36	8	**R4597.9**
5/16	7.94	0.3125	84	126	36	8	**R4595/16**
	8.00	0.3150	84	126	36	8	**R4598.0**
	8.10	0.3189	106	152	40	10	**R4598.1**
	8.20	0.3228	106	152	40	10	**R4598.2**
	8.30	0.3268	106	152	40	10	**R4598.3**
21/64	8.33	0.3281	106	152	40	10	**R45921/64**
	8.40	0.3307	106	152	40	10	**R4598.4**
	8.50	0.3346	106	152	40	10	**R4598.5**
	8.60	0.3386	106	152	40	10	**R4598.6**
	8.70	0.3425	106	152	40	10	**R4598.7**
11/32	8.73	0.3438	106	152	40	10	**R45911/32**
	8.80	0.3465	106	152	40	10	**R4598.8**
	8.90	0.3504	106	152	40	10	**R4598.9**
	9.00	0.3543	106	152	40	10	**R4599.0**
	9.10	0.3583	106	152	40	10	**R4599.1**
23/64	9.13	0.3594	106	152	40	10	**R45923/64**
	9.20	0.3622	106	152	40	10	**R4599.2**
	9.30	0.3661	106	152	40	10	**R4599.3**
	9.40	0.3701	106	152	40	10	**R4599.4**
	9.50	0.3740	106	152	40	10	**R4599.5**
3/8	9.53	0.3750	106	152	40	10	**R4593/8**
	9.60	0.3780	106	152	40	10	**R4599.6**
	9.70	0.3819	106	152	40	10	**R4599.7**
	9.80	0.3858	106	152	40	10	**R4599.8**
	9.90	0.3898	106	152	40	10	**R4599.9**
25/64	9.92	0.3906	106	152	40	10	**R45925/64**
	10.00	0.3937	106	152	40	10	**R45910.0**
	10.20	0.4016	128	180	45	12	**R45910.2**
	10.30	0.4055	128	180	45	12	**R45910.3**
13/32	10.32	0.4063	128	180	45	12	**R45913/32**
	10.40	0.4094	128	180	45	12	**R45910.4**
	10.50	0.4134	128	180	45	12	**R45910.5**
27/64	10.72	0.4219	128	180	45	12	**R45927/64**
	10.80	0.4252	128	180	45	12	**R45910.8**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R459
	11.00	0.4331	128	180	45	12	**R45911.0**
7/16	11.11	0.4375	128	180	45	12	**R4597/16**
	11.20	0.4409	128	180	45	12	**R45911.2**
	11.30	0.4449	128	180	45	12	**R45911.3**
	11.50	0.4528	128	180	45	12	**R45911.5**
29/64	11.51	0.4531	128	180	45	12	**R45929/64**
	11.80	0.4646	128	180	45	12	**R45911.8**
15/32	11.91	0.4688	128	180	45	12	**R45915/32**
	12.00	0.4724	128	180	45	12	**R45912.0**
	12.20	0.4803	151	202	48	14	**R45912.2**
31/64	12.30	0.4844	151	202	48	14	**R45931/64**
	12.50	0.4921	151	202	48	14	**R45912.5**
1/2	12.70	0.5000	151	202	48	14	**R4591/2**
	12.80	0.5039	151	202	48	14	**R45912.8**
	13.00	0.5118	151	202	48	14	**R45913.0**
33/64	13.10	0.5156	151	202	48	14	**R45933/64**
17/32	13.49	0.5313	151	202	48	14	**R45917/32**
	13.50	0.5315	151	202	48	14	**R45913.5**
35/64	13.89	0.5469	151	202	48	14	**R45935/64**
	14.00	0.5512	151	202	48	14	**R45914.0**
	14.25	0.5610	172	227	48	16	**R45914.25**
9/16	14.29	0.5625	172	227	48	16	**R4599/16**
	14.50	0.5709	172	227	48	16	**R45914.5**
37/64	14.68	0.5781	172	227	48	16	**R45937/64**
	15.00	0.5906	172	227	48	16	**R45915.0**
19/32	15.08	0.5938	172	227	48	16	**R45919/32**
	15.10	0.5945	172	227	48	16	**R45915.1**
39/64	15.48	0.6094	172	227	48	16	**R45939/64**
	15.50	0.6102	172	227	48	16	**R45915.5**
5/8	15.88	0.6250	172	227	48	16	**R4595/8**
	16.00	0.6299	172	227	48	16	**R45916.0**

FORCE *M*

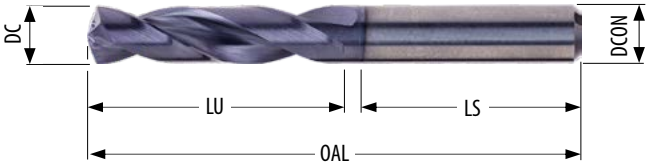
R467

Force M Drill Oil Feed 3×D

R467	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	M4.1	M4.2	S1.1	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2
	■117	■99	■104	■85	■71	■87	■75	■68	■60	■52	■55	■45	■40	◪60	◪56	◪45	◪40	◪35	◪32

R467 HM | DIN 6537 K | 3XD | 140° | TiAlN | DIN 6535HA | CTW™

DORMER



R467

FORCE M

3.00 - 16.00

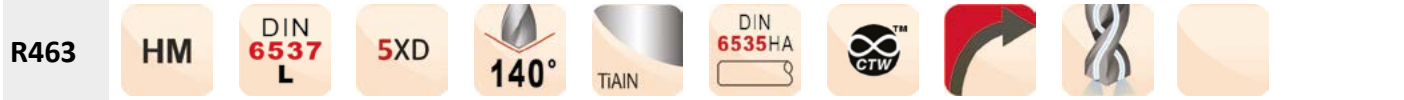
DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R467
	3.00	0.1181	20	62	36	6	**R4673.0**
	3.10	0.1220	20	62	36	6	**R4673.1**
1/8	3.18	0.1250	20	62	36	6	**R4671/8**
	3.20	0.1260	20	62	36	6	**R4673.2**
	3.30	0.1299	20	62	36	6	**R4673.3**
	3.40	0.1339	20	62	36	6	**R4673.4**
29	3.45	0.1360	20	62	36	6	**R467N29**
	3.50	0.1378	20	62	36	6	**R4673.5**
9/64	3.57	0.1406	20	62	36	6	**R4679/64**
	3.60	0.1417	20	62	36	6	**R4673.6**
	3.70	0.1457	20	62	36	6	**R4673.7**
	3.80	0.1496	24	66	36	6	**R4673.8**
	3.90	0.1535	24	66	36	6	**R4673.9**
5/32	3.97	0.1563	24	66	36	6	**R4675/32**
	4.00	0.1575	24	66	36	6	**R4674.0**
	4.05	0.1594	24	66	36	6	**R4674.05**
	4.10	0.1614	24	66	36	6	**R4674.1**
	4.20	0.1654	24	66	36	6	**R4674.2**
	4.30	0.1693	24	66	36	6	**R4674.3**
11/64	4.37	0.1719	24	66	36	6	**R46711/64**
	4.40	0.1732	24	66	36	6	**R4674.4**
	4.50	0.1772	24	66	36	6	**R4674.5**
	4.60	0.1811	24	66	36	6	**R4674.6**
	4.70	0.1850	24	66	36	6	**R4674.7**
3/16	4.76	0.1875	28	66	36	6	**R4673/16**
	4.80	0.1890	28	66	36	6	**R4674.8**
	4.90	0.1929	28	66	36	6	**R4674.9**
	5.00	0.1969	28	66	36	6	**R4675.0**
	5.05	0.1988	28	66	36	6	**R4675.05**
	5.10	0.2008	28	66	36	6	**R4675.1**
7	5.11	0.2010	28	66	36	6	**R467N7**
13/64	5.16	0.2031	28	66	36	6	**R46713/64**
	5.20	0.2047	28	66	36	6	**R4675.2**
5	5.22	0.2055	28	66	36	6	**R467N5**
	5.30	0.2087	28	66	36	6	**R4675.3**
	5.40	0.2126	28	66	36	6	**R4675.4**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R467
	5.50	0.2165	28	66	36	6	**R4675.5**
7/32	5.56	0.2188	28	66	36	6	**R4677/32**
	5.60	0.2205	28	66	36	6	**R4675.6**
	5.70	0.2244	28	66	36	6	**R4675.7**
	5.80	0.2283	28	66	36	6	**R4675.8**
	5.90	0.2323	28	66	36	6	**R4675.9**
15/64	5.95	0.2344	28	66	36	6	**R46715/64**
	6.00	0.2362	28	66	36	6	**R4676.0**
	6.05	0.2382	34	79	36	8	**R4676.05**
	6.10	0.2402	34	79	36	8	**R4676.1**
	6.20	0.2441	34	79	36	8	**R4676.2**
	6.30	0.2480	34	79	36	8	**R4676.3**
1/4	6.35	0.2500	34	79	36	8	**R4671/4**
	6.40	0.2520	34	79	36	8	**R4676.4**
	6.50	0.2559	34	79	36	8	**R4676.5**
	6.60	0.2598	34	79	36	8	**R4676.6**
	6.70	0.2638	34	79	36	8	**R4676.7**
17/64	6.75	0.2656	34	79	36	8	**R46717/64**
	6.80	0.2677	34	79	36	8	**R4676.8**
	6.90	0.2717	34	79	36	8	**R4676.9**
	7.00	0.2756	34	79	36	8	**R4677.0**
	7.10	0.2795	41	79	36	8	**R4677.1**
9/32	7.14	0.2813	41	79	36	8	**R4679/32**
	7.20	0.2835	41	79	36	8	**R4677.2**
	7.30	0.2874	41	79	36	8	**R4677.3**
	7.40	0.2913	41	79	36	8	**R4677.4**
	7.50	0.2953	41	79	36	8	**R4677.5**
19/64	7.54	0.2969	41	79	36	8	**R46719/64**
	7.60	0.2992	41	79	36	8	**R4677.6**
	7.70	0.3031	41	79	36	8	**R4677.7**
	7.80	0.3071	41	79	36	8	**R4677.8**
	7.90	0.3110	41	79	36	8	**R4677.9**
5/16	7.94	0.3125	41	79	36	8	**R4675/16**
	8.00	0.3150	41	79	36	8	**R4678.0**
	8.05	0.3169	47	89	40	10	**R4678.05**
	8.10	0.3189	47	89	40	10	**R4678.1**
	8.20	0.3228	47	89	40	10	**R4678.2**
	8.30	0.3268	47	89	40	10	**R4678.3**
21/64	8.33	0.3281	47	89	40	10	**R46721/64**
	8.40	0.3307	47	89	40	10	**R4678.4**
	8.50	0.3346	47	89	40	10	**R4678.5**
	8.60	0.3386	47	89	40	10	**R4678.6**
	8.70	0.3425	47	89	40	10	**R4678.7**
11/32	8.73	0.3438	47	89	40	10	**R46711/32**
	8.80	0.3465	47	89	40	10	**R4678.8**
	8.90	0.3504	47	89	40	10	**R4678.9**
	9.00	0.3543	47	89	40	10	**R4679.0**
	9.10	0.3583	47	89	40	10	**R4679.1**
23/64	9.13	0.3594	47	89	40	10	**R46723/64**
	9.20	0.3622	47	89	40	10	**R4679.2**
	9.30	0.3661	47	89	40	10	**R4679.3**
	9.40	0.3701	47	89	40	10	**R4679.4**
	9.50	0.3740	47	89	40	10	**R4679.5**
3/8	9.53	0.3750	47	89	40	10	**R4673/8**
	9.60	0.3780	47	89	40	10	**R4679.6**
	9.70	0.3819	47	89	40	10	**R4679.7**
	9.80	0.3858	47	89	40	10	**R4679.8**
	9.90	0.3898	47	89	40	10	**R4679.9**
25/64	9.92	0.3906	47	89	40	10	**R46725/64**
	10.00	0.3937	47	89	40	10	**R46710.0**
	10.05	0.3957	55	102	45	12	**R46710.05**
	10.10	0.3976	55	102	45	12	**R46710.1**
	10.20	0.4016	55	102	45	12	**R46710.2**
	10.30	0.4055	55	102	45	12	**R46710.3**

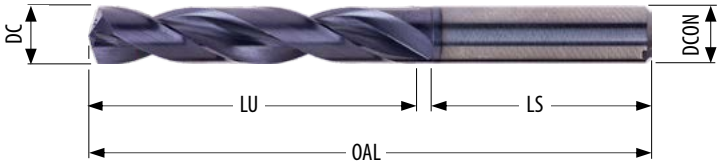
DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R467
13/32	10.32	0.4063	55	102	45	12	**R46713/32**
	10.40	0.4094	55	102	45	12	**R46710.4**
	10.50	0.4134	55	102	45	12	**R46710.5**
	10.60	0.4173	55	102	45	12	**R46710.6**
27/64	10.72	0.4219	55	102	45	12	**R46727/64**
	10.80	0.4252	55	102	45	12	**R46710.8**
	10.90	0.4291	55	102	45	12	**R46710.9**
	11.00	0.4331	55	102	45	12	**R46711.0**
7/16	11.11	0.4375	55	102	45	12	**R4677/16**
	11.20	0.4409	55	102	45	12	**R46711.2**
	11.30	0.4449	55	102	45	12	**R46711.3**
	11.40	0.4488	55	102	45	12	**R46711.4**
	11.50	0.4528	55	102	45	12	**R46711.5**
29/64	11.51	0.4531	55	102	45	12	**R46729/64**
	11.60	0.4567	55	102	45	12	**R46711.6**
	11.80	0.4646	55	102	45	12	**R46711.8**
15/32	11.91	0.4688	55	102	45	12	**R46715/32**
	12.00	0.4724	55	102	45	12	**R46712.0**
	12.05	0.4744	60	107	45	14	**R46712.05**
	12.10	0.4764	60	107	45	14	**R46712.1**
	12.20	0.4803	60	107	45	14	**R46712.2**
31/64	12.30	0.4844	60	107	45	14	**R46731/64**
	12.50	0.4921	60	107	45	14	**R46712.5**
	12.70	0.5000	60	107	45	14	**R46712.7**
1/2	12.70	0.5000	60	107	45	14	**R4671/2**
	12.80	0.5039	60	107	45	14	**R46712.8**
	13.00	0.5118	60	107	45	14	**R46713.0**
33/64	13.10	0.5156	60	107	45	14	**R46733/64**
	13.30	0.5236	60	107	45	14	**R46713.3**
17/32	13.49	0.5313	60	107	45	14	**R46717/32**
	13.50	0.5315	60	107	45	14	**R46713.5**
	13.80	0.5433	60	107	45	14	**R46713.8**
35/64	13.89	0.5469	60	107	45	14	**R46735/64**
	14.00	0.5512	60	107	45	14	**R46714.0**
	14.25	0.5610	65	115	48	16	**R46714.25**
9/16	14.29	0.5625	65	115	48	16	**R4679/16**
	14.50	0.5709	65	115	48	16	**R46714.5**
37/64	14.68	0.5781	65	115	48	16	**R46737/64**
	14.80	0.5827	65	115	48	16	**R46714.8**
	15.00	0.5906	65	115	48	16	**R46715.0**
19/32	15.08	0.5938	65	115	48	16	**R46719/32**
	15.10	0.5945	65	115	48	16	**R46715.1**
	15.30	0.6024	65	115	48	16	**R46715.3**
39/64	15.48	0.6094	65	115	48	16	**R46739/64**
	15.50	0.6102	65	115	48	16	**R46715.5**
	15.80	0.6220	65	115	48	16	**R46715.8**
5/8	15.88	0.6250	65	115	48	16	**R4675/8**
	16.00	0.6299	65	115	48	16	**R46716.0**

R463 Force M Drill Oil Feed 5×D

R463	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	M4.1	M4.2	S1.1	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2
	■111	■94	■99	■81	■67	■83	■71	■65	■57	■49	■52	■43	■38	◪57	◪53	◪43	◪38	◪33	◪30



DORMER



R463

FORCE M

3.00 - 16.00

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R463
	3.00	0.1181	28	66	36	6	**R4633.0**
	3.10	0.1220	28	66	36	6	**R4633.1**
1/8	3.18	0.1250	28	66	36	6	**R4631/8**
	3.20	0.1260	28	66	36	6	**R4633.2**
	3.30	0.1299	28	66	36	6	**R4633.3**
	3.40	0.1339	28	66	36	6	**R4633.4**
29	3.45	0.1360	28	66	36	6	**R463N29**
	3.50	0.1378	28	66	36	6	**R4633.5**
9/64	3.57	0.1406	28	66	36	6	**R4639/64**
	3.60	0.1417	28	66	36	6	**R4633.6**
	3.70	0.1457	28	66	36	6	**R4633.7**
	3.80	0.1496	36	74	36	6	**R4633.8**
	3.90	0.1535	36	74	36	6	**R4633.9**
5/32	3.97	0.1563	36	74	36	6	**R4635/32**
	4.00	0.1575	36	74	36	6	**R4634.0**
	4.05	0.1594	36	74	36	6	**R4634.05**
	4.10	0.1614	36	74	36	6	**R4634.1**
	4.20	0.1654	36	74	36	6	**R4634.2**
	4.30	0.1693	36	74	36	6	**R4634.3**
11/64	4.37	0.1719	36	74	36	6	**R46311/64**
	4.40	0.1732	36	74	36	6	**R4634.4**
	4.50	0.1772	36	74	36	6	**R4634.5**
	4.60	0.1811	36	74	36	6	**R4634.6**
	4.70	0.1850	36	74	36	6	**R4634.7**
3/16	4.76	0.1875	44	82	36	6	**R4633/16**
	4.80	0.1890	44	82	36	6	**R4634.8**
	4.90	0.1929	44	82	36	6	**R4634.9**
	5.00	0.1969	44	82	36	6	**R4635.0**
	5.05	0.1988	44	82	36	6	**R4635.05**
	5.10	0.2008	44	82	36	6	**R4635.1**
7	5.11	0.2010	44	82	36	6	**R463N7**
13/64	5.16	0.2031	44	82	36	6	**R46313/64**
	5.20	0.2047	44	82	36	6	**R4635.2**
5	5.22	0.2055	44	82	36	6	**R463N5**
	5.30	0.2087	44	82	36	6	**R4635.3**
	5.40	0.2126	44	82	36	6	**R4635.4**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R463
	5.50	0.2165	44	82	36	6	**R4635.5**
7/32	5.56	0.2188	44	82	36	6	**R4637/32**
	5.60	0.2205	44	82	36	6	**R4635.6**
	5.70	0.2244	44	82	36	6	**R4635.7**
	5.80	0.2283	44	82	36	6	**R4635.8**
	5.90	0.2323	44	82	36	6	**R4635.9**
15/64	5.95	0.2344	44	82	36	6	**R46315/64**
	6.00	0.2362	44	82	36	6	**R4636.0**
	6.05	0.2382	53	91	36	8	**R4636.05**
	6.10	0.2402	53	91	36	8	**R4636.1**
	6.20	0.2441	53	91	36	8	**R4636.2**
	6.30	0.2480	53	91	36	8	**R4636.3**
1/4	6.35	0.2500	53	91	36	8	**R4631/4**
	6.40	0.2520	53	91	36	8	**R4636.4**
	6.50	0.2559	53	91	36	8	**R4636.5**
	6.60	0.2598	53	91	36	8	**R4636.6**
	6.70	0.2638	53	91	36	8	**R4636.7**
17/64	6.75	0.2656	53	91	36	8	**R46317/64**
	6.80	0.2677	53	91	36	8	**R4636.8**
	6.90	0.2717	53	91	36	8	**R4636.9**
	7.00	0.2756	53	91	36	8	**R4637.0**
	7.10	0.2795	53	91	36	8	**R4637.1**
9/32	7.14	0.2813	53	91	36	8	**R4639/32**
	7.20	0.2835	53	91	36	8	**R4637.2**
	7.30	0.2874	53	91	36	8	**R4637.3**
	7.40	0.2913	53	91	36	8	**R4637.4**
	7.50	0.2953	53	91	36	8	**R4637.5**
19/64	7.54	0.2969	53	91	36	8	**R46319/64**
	7.60	0.2992	53	91	36	8	**R4637.6**
	7.70	0.3031	53	91	36	8	**R4637.7**
	7.80	0.3071	53	91	36	8	**R4637.8**
	7.90	0.3110	53	91	36	8	**R4637.9**
5/16	7.94	0.3125	53	91	36	8	**R4635/16**
	8.00	0.3150	53	91	36	8	**R4638.0**
	8.05	0.3169	61	103	40	10	**R4638.05**
	8.10	0.3189	61	103	40	10	**R4638.1**
	8.20	0.3228	61	103	40	10	**R4638.2**
	8.30	0.3268	61	103	40	10	**R4638.3**
21/64	8.33	0.3281	61	103	40	10	**R46321/64**
	8.40	0.3307	61	103	40	10	**R4638.4**
	8.50	0.3346	61	103	40	10	**R4638.5**
	8.60	0.3386	61	103	40	10	**R4638.6**
	8.70	0.3425	61	103	40	10	**R4638.7**
11/32	8.73	0.3438	61	103	40	10	**R46311/32**
	8.80	0.3465	61	103	40	10	**R4638.8**
	8.90	0.3504	61	103	40	10	**R4638.9**
	9.00	0.3543	61	103	40	10	**R4639.0**
	9.10	0.3583	61	103	40	10	**R4639.1**
23/64	9.13	0.3594	61	103	40	10	**R46323/64**
	9.20	0.3622	61	103	40	10	**R4639.2**
	9.30	0.3661	61	103	40	10	**R4639.3**
	9.40	0.3701	61	103	40	10	**R4639.4**
	9.50	0.3740	61	103	40	10	**R4639.5**
3/8	9.53	0.3750	61	103	40	10	**R4633/8**
	9.60	0.3780	61	103	40	10	**R4639.6**
	9.70	0.3819	61	103	40	10	**R4639.7**
	9.80	0.3858	61	103	40	10	**R4639.8**
	9.90	0.3898	61	103	40	10	**R4639.9**
25/64	9.92	0.3906	61	103	40	10	**R46325/64**
	10.00	0.3937	61	103	40	10	**R46310.0**
	10.05	0.3957	70	118	45	12	**R46310.05**
	10.10	0.3976	70	118	45	12	**R46310.1**
	10.20	0.4016	70	118	45	12	**R46310.2**
	10.30	0.4055	70	118	45	12	**R46310.3**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R463
13/32	10.32	0.4063	70	118	45	12	**R46313/32**
	10.40	0.4094	70	118	45	12	**R46310.4**
	10.50	0.4134	70	118	45	12	**R46310.5**
	10.60	0.4173	70	118	45	12	**R46310.6**
27/64	10.72	0.4219	70	118	45	12	**R46327/64**
	10.80	0.4252	70	118	45	12	**R46310.8**
	10.90	0.4291	70	118	45	12	**R46310.9**
	11.00	0.4331	70	118	45	12	**R46311.0**
7/16	11.11	0.4375	70	118	45	12	**R4637/16**
	11.20	0.4409	70	118	45	12	**R46311.2**
	11.30	0.4449	70	118	45	12	**R46311.3**
	11.40	0.4488	70	118	45	12	**R46311.4**
	11.50	0.4528	70	118	45	12	**R46311.5**
29/64	11.51	0.4531	70	118	45	12	**R46329/64**
	11.60	0.4567	70	118	45	12	**R46311.6**
	11.80	0.4646	70	118	45	12	**R46311.8**
15/32	11.91	0.4688	70	118	45	12	**R46315/32**
	12.00	0.4724	70	118	45	12	**R46312.0**
	12.05	0.4744	76	124	45	14	**R46312.05**
	12.20	0.4803	76	124	45	14	**R46312.2**
31/64	12.30	0.4844	76	124	45	14	**R46331/64**
	12.50	0.4921	76	124	45	14	**R46312.5**
	12.70	0.5000	76	124	45	14	**R46312.7**
1/2	12.70	0.5000	76	124	45	14	**R4631/2**
	12.80	0.5039	76	124	45	14	**R46312.8**
	13.00	0.5118	76	124	45	14	**R46313.0**
33/64	13.10	0.5156	76	124	45	14	**R46333/64**
	13.30	0.5236	76	124	45	14	**R46313.3**
17/32	13.49	0.5313	76	124	45	14	**R46317/32**
	13.50	0.5315	76	124	45	14	**R46313.5**
	13.80	0.5433	76	124	45	14	**R46313.8**
35/64	13.89	0.5469	76	124	45	14	**R46335/64**
	14.00	0.5512	76	124	45	14	**R46314.0**
	14.25	0.5610	82	133	48	16	**R46314.25**
9/16	14.29	0.5625	82	133	48	16	**R4639/16**
	14.50	0.5709	82	133	48	16	**R46314.5**
37/64	14.68	0.5781	82	133	48	16	**R46337/64**
	14.80	0.5827	82	133	48	16	**R46314.8**
	15.00	0.5906	82	133	48	16	**R46315.0**
19/32	15.08	0.5938	82	133	48	16	**R46319/32**
	15.10	0.5945	82	133	48	16	**R46315.1**
	15.30	0.6024	82	133	48	16	**R46315.3**
39/64	15.48	0.6094	82	133	48	16	**R46339/64**
	15.50	0.6102	82	133	48	16	**R46315.5**
	15.80	0.6220	82	133	48	16	**R46315.8**
5/8	15.88	0.6250	82	133	48	16	**R4635/8**
	16.00	0.6299	82	133	48	16	**R46316.0**

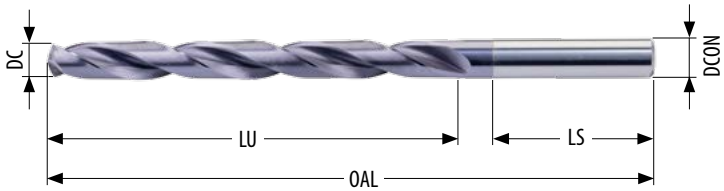
R469

Force M Drill Oil Feed 8xD

R469	M1.1	M1.2	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3	M4.1	M4.2	S1.1	S1.2	S1.3	S2.1	S2.2	S3.1	S3.2	S4.1	S4.2
	■94	■79	■83	■68	■57	■70	■60	■54	■48	■42	■44	■36	■32	◪48	◪45	◪36	◪32	◪28	◪26

R469									
	HM	DORMER	8XD	140°	TiAlN	DIN 6535HA	CTW™		

DORMER



R469

FORCE M

3.00 - 16.00

*All items available upon request

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R469*
	3.00	0.1181	37	79	36	6	**R4693.0**
	3.10	0.1220	37	79	36	6	**R4693.1**
1/8	3.18	0.1250	37	79	36	6	**R4691/8**
	3.20	0.1260	37	79	36	6	**R4693.2**
	3.30	0.1299	37	79	36	6	**R4693.3**
	3.40	0.1339	37	79	36	6	**R4693.4**
	3.50	0.1378	37	79	36	6	**R4693.5**
9/64	3.57	0.1406	37	79	36	6	**R4699/64**
	3.60	0.1417	37	79	36	6	**R4693.6**
	3.70	0.1457	37	79	36	6	**R4693.7**
	3.80	0.1496	48	90	36	6	**R4693.8**
	3.90	0.1535	48	90	36	6	**R4693.9**
5/32	3.97	0.1563	48	90	36	6	**R4695/32**
	4.00	0.1575	48	90	36	6	**R4694.0**
	4.10	0.1614	48	90	36	6	**R4694.1**
	4.20	0.1654	48	90	36	6	**R4694.2**
	4.30	0.1693	48	90	36	6	**R4694.3**
11/64	4.37	0.1719	48	90	36	6	**R46911/64**
	4.40	0.1732	48	90	36	6	**R4694.4**
	4.50	0.1772	48	90	36	6	**R4694.5**
	4.60	0.1811	48	90	36	6	**R4694.6**
	4.70	0.1850	62	104	36	6	**R4694.7**
3/16	4.76	0.1875	62	104	36	6	**R4693/16**
	4.80	0.1890	62	104	36	6	**R4694.8**
	4.90	0.1929	62	104	36	6	**R4694.9**
	5.00	0.1969	62	104	36	6	**R4695.0**
	5.10	0.2008	62	104	36	6	**R4695.1**
13/64	5.16	0.2031	62	104	36	6	**R46913/64**
	5.20	0.2047	62	104	36	6	**R4695.2**
	5.30	0.2087	62	104	36	6	**R4695.3**
	5.40	0.2126	62	104	36	6	**R4695.4**
	5.50	0.2165	62	104	36	6	**R4695.5**
7/32	5.56	0.2188	62	104	36	6	**R4697/32**
	5.60	0.2205	62	104	36	6	**R4695.6**
	5.70	0.2244	62	104	36	6	**R4695.7**
	5.80	0.2283	62	104	36	6	**R4695.8**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R469*
	5.90	0.2323	62	104	36	6	**R4695.9**
15/64	5.95	0.2344	62	104	36	6	**R46915/64**
	6.00	0.2362	62	104	36	6	**R4696.0**
	6.10	0.2402	84	126	36	8	**R4696.1**
	6.20	0.2441	84	126	36	8	**R4696.2**
	6.30	0.2480	84	126	36	8	**R4696.3**
1/4	6.35	0.2500	84	126	36	8	**R4691/4**
	6.40	0.2520	84	126	36	8	**R4696.4**
	6.50	0.2559	84	126	36	8	**R4696.5**
	6.60	0.2598	84	126	36	8	**R4696.6**
	6.70	0.2638	84	126	36	8	**R4696.7**
17/64	6.75	0.2656	84	126	36	8	**R46917/64**
	6.80	0.2677	84	126	36	8	**R4696.8**
	6.90	0.2717	84	126	36	8	**R4696.9**
	7.00	0.2756	84	126	36	8	**R4697.0**
	7.10	0.2795	84	126	36	8	**R4697.1**
9/32	7.14	0.2813	84	126	36	8	**R4699/32**
	7.20	0.2835	84	126	36	8	**R4697.2**
	7.30	0.2874	84	126	36	8	**R4697.3**
	7.40	0.2913	84	126	36	8	**R4697.4**
	7.50	0.2953	84	126	36	8	**R4697.5**
19/64	7.54	0.2969	84	126	36	8	**R46919/64**
	7.60	0.2992	84	126	36	8	**R4697.6**
	7.70	0.3031	84	126	36	8	**R4697.7**
	7.80	0.3071	84	126	36	8	**R4697.8**
	7.90	0.3110	84	126	36	8	**R4697.9**
5/16	7.94	0.3125	84	126	36	8	**R4695/16**
	8.00	0.3150	84	126	36	8	**R4698.0**
	8.10	0.3189	106	152	40	10	**R4698.1**
	8.20	0.3228	106	152	40	10	**R4698.2**
	8.30	0.3268	106	152	40	10	**R4698.3**
21/64	8.33	0.3281	106	152	40	10	**R46921/64**
	8.40	0.3307	106	152	40	10	**R4698.4**
	8.50	0.3346	106	152	40	10	**R4698.5**
	8.60	0.3386	106	152	40	10	**R4698.6**
	8.70	0.3425	106	152	40	10	**R4698.7**
11/32	8.73	0.3438	106	152	40	10	**R46911/32**
	8.80	0.3465	106	152	40	10	**R4698.8**
	8.90	0.3504	106	152	40	10	**R4698.9**
	9.00	0.3543	106	152	40	10	**R4699.0**
	9.10	0.3583	106	152	40	10	**R4699.1**
23/64	9.13	0.3594	106	152	40	10	**R46923/64**
	9.20	0.3622	106	152	40	10	**R4699.2**
	9.30	0.3661	106	152	40	10	**R4699.3**
	9.40	0.3701	106	152	40	10	**R4699.4**
	9.50	0.3740	106	152	40	10	**R4699.5**
3/8	9.53	0.3750	106	152	40	10	**R4693/8**
	9.60	0.3780	106	152	40	10	**R4699.6**
	9.70	0.3819	106	152	40	10	**R4699.7**
	9.80	0.3858	106	152	40	10	**R4699.8**
	9.90	0.3898	106	152	40	10	**R4699.9**
25/64	9.92	0.3906	106	152	40	10	**R46925/64**
	10.00	0.3937	106	152	40	10	**R46910.0**
	10.20	0.4016	128	180	45	12	**R46910.2**
	10.30	0.4055	128	180	45	12	**R46910.3**
13/32	10.32	0.4063	128	180	45	12	**R46913/32**
	10.40	0.4094	128	180	45	12	**R46910.4**
	10.50	0.4134	128	180	45	12	**R46910.5**
27/64	10.72	0.4219	128	180	45	12	**R46927/64**
	10.80	0.4252	128	180	45	12	**R46910.8**
	11.00	0.4331	128	180	45	12	**R46911.0**
7/16	11.11	0.4375	128	180	45	12	**R4697/16**
	11.20	0.4409	128	180	45	12	**R46911.2**
	11.30	0.4449	128	180	45	12	**R46911.3**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R469*
	11.50	0.4528	128	180	45	12	**R46911.5**
29/64	11.51	0.4531	128	180	45	12	**R46929/64**
	11.80	0.4646	128	180	45	12	**R46911.8**
15/32	11.91	0.4688	128	180	45	12	**R46915/32**
	12.00	0.4724	128	180	45	12	**R46912.0**
	12.20	0.4803	151	202	48	14	**R46912.2**
31/64	12.30	0.4844	151	202	48	14	**R46931/64**
	12.50	0.4921	151	202	48	14	**R46912.5**
1/2	12.70	0.5000	151	202	48	14	**R4691/2**
	12.80	0.5039	151	202	48	14	**R46912.8**
	13.00	0.5118	151	202	48	14	**R46913.0**
33/64	13.10	0.5156	151	202	48	14	**R46933/64**
17/32	13.49	0.5313	151	202	48	14	**R46917/32**
	13.50	0.5315	151	202	48	14	**R46913.5**
35/64	13.89	0.5469	151	202	48	14	**R46935/64**
	14.00	0.5512	151	202	48	14	**R46914.0**
	14.25	0.5610	172	227	48	16	**R46914.25**
9/16	14.29	0.5625	172	227	48	16	**R4699/16**
	14.50	0.5709	172	227	48	16	**R46914.5**
37/64	14.68	0.5781	172	227	48	16	**R46937/64**
	15.00	0.5906	172	227	48	16	**R46915.0**
19/32	15.08	0.5938	172	227	48	16	**R46919/32**
	15.10	0.5945	172	227	48	16	**R46915.1**
39/64	15.48	0.6094	172	227	48	16	**R46939/64**
	15.50	0.6102	172	227	48	16	**R46915.5**
5/8	15.88	0.6250	172	227	48	16	**R4695/8**
	16.00	0.6299	172	227	48	16	**R46916.0**

FORCE *N*

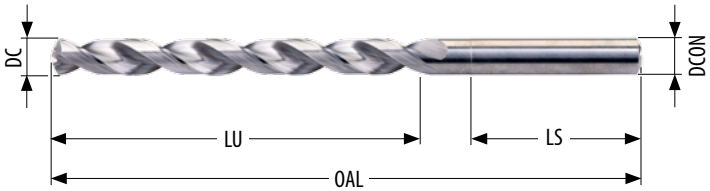
R445

Force N Drill Oil Feed 8xD

R445	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3
	■303	■229	■152	■374	■336	■242

R445 HM DORMER 5XD 130° DIN 6535HA N

DORMER



R445

***FORCE** N*

3.00 - 16.00

*All items available upon request

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R445*
	3.00	0.1181	28	66	36	6	**R4453.0**
	3.10	0.1220	28	66	36	6	**R4453.1**
1/8	3.18	0.1250	28	66	36	6	**R4451/8**
	3.20	0.1260	28	66	36	6	**R4453.2**
	3.30	0.1299	28	66	36	6	**R4453.3**
	3.40	0.1339	28	66	36	6	**R4453.4**
29	3.45	0.1360	28	66	36	6	**R445N29**
	3.50	0.1378	28	66	36	6	**R4453.5**
9/64	3.57	0.1406	28	66	36	6	**R4459/64**
	3.60	0.1417	28	66	36	6	**R4453.6**
	3.70	0.1457	28	66	36	6	**R4453.7**
	3.80	0.1496	36	74	36	6	**R4453.8**
	3.90	0.1535	36	74	36	6	**R4453.9**
5/32	3.97	0.1563	36	74	36	6	**R4455/32**
	4.00	0.1575	36	74	36	6	**R4454.0**
	4.05	0.1594	36	74	36	6	**R4454.05**
	4.10	0.1614	36	74	36	6	**R4454.1**
	4.20	0.1654	36	74	36	6	**R4454.2**
	4.30	0.1693	36	74	36	6	**R4454.3**
11/64	4.37	0.1719	36	74	36	6	**R44511/64**
	4.40	0.1732	36	74	36	6	**R4454.4**
	4.50	0.1772	36	74	36	6	**R4454.5**
	4.60	0.1811	36	74	36	6	**R4454.6**
	4.70	0.1850	36	74	36	6	**R4454.7**
3/16	4.76	0.1875	44	82	36	6	**R4453/16**
	4.80	0.1890	44	82	36	6	**R4454.8**
	4.90	0.1929	44	82	36	6	**R4454.9**
	5.00	0.1969	44	82	36	6	**R4455.0**
	5.05	0.1988	44	82	36	6	**R4455.05**
	5.10	0.2008	44	82	36	6	**R4455.1**
7	5.11	0.2010	44	82	36	6	**R445N7**
13/64	5.16	0.2031	44	82	36	6	**R44513/64**
	5.20	0.2047	44	82	36	6	**R4455.2**
5	5.22	0.2055	44	82	36	6	**R445N5**
	5.30	0.2087	44	82	36	6	**R4455.3**
	5.40	0.2126	44	82	36	6	**R4455.4**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R445*
	5.50	0.2165	44	82	36	6	**R4455.5**
7/32	5.56	0.2188	44	82	36	6	**R4457/32**
	5.60	0.2205	44	82	36	6	**R4455.6**
	5.70	0.2244	44	82	36	6	**R4455.7**
	5.80	0.2283	44	82	36	6	**R4455.8**
	5.90	0.2323	44	82	36	6	**R4455.9**
15/64	5.95	0.2344	44	82	36	6	**R44515/64**
	6.00	0.2362	44	82	36	6	**R4456.0**
	6.05	0.2382	53	91	36	8	**R4456.05**
	6.10	0.2402	53	91	36	8	**R4456.1**
	6.20	0.2441	53	91	36	8	**R4456.2**
	6.30	0.2480	53	91	36	8	**R4456.3**
1/4	6.35	0.2500	53	91	36	8	**R4451/4**
	6.40	0.2520	53	91	36	8	**R4456.4**
	6.50	0.2559	53	91	36	8	**R4456.5**
	6.60	0.2598	53	91	36	8	**R4456.6**
	6.70	0.2638	53	91	36	8	**R4456.7**
17/64	6.75	0.2656	53	91	36	8	**R44517/64**
	6.80	0.2677	53	91	36	8	**R4456.8**
	6.90	0.2717	53	91	36	8	**R4456.9**
	7.00	0.2756	53	91	36	8	**R4457.0**
	7.10	0.2795	53	91	36	8	**R4457.1**
9/32	7.14	0.2813	53	91	36	8	**R4459/32**
	7.20	0.2835	53	91	36	8	**R4457.2**
	7.30	0.2874	53	91	36	8	**R4457.3**
	7.40	0.2913	53	91	36	8	**R4457.4**
	7.50	0.2953	53	91	36	8	**R4457.5**
19/64	7.54	0.2969	53	91	36	8	**R44519/64**
	7.60	0.2992	53	91	36	8	**R4457.6**
	7.70	0.3031	53	91	36	8	**R4457.7**
	7.80	0.3071	53	91	36	8	**R4457.8**
	7.90	0.3110	53	91	36	8	**R4457.9**
5/16	7.94	0.3125	53	91	36	8	**R4455/16**
	8.00	0.3150	53	91	36	8	**R4458.0**
	8.05	0.3169	61	103	40	10	**R4458.05**
	8.10	0.3189	61	103	40	10	**R4458.1**
	8.20	0.3228	61	103	40	10	**R4458.2**
	8.30	0.3268	61	103	40	10	**R4458.3**
21/64	8.33	0.3281	61	103	40	10	**R44521/64**
	8.40	0.3307	61	103	40	10	**R4458.4**
	8.50	0.3346	61	103	40	10	**R4458.5**
	8.60	0.3386	61	103	40	10	**R4458.6**
	8.70	0.3425	61	103	40	10	**R4458.7**
11/32	8.73	0.3438	61	103	40	10	**R44511/32**
	8.80	0.3465	61	103	40	10	**R4458.8**
	8.90	0.3504	61	103	40	10	**R4458.9**
	9.00	0.3543	61	103	40	10	**R4459.0**
	9.10	0.3583	61	103	40	10	**R4459.1**
23/64	9.13	0.3594	61	103	40	10	**R44523/64**
	9.20	0.3622	61	103	40	10	**R4459.2**
	9.30	0.3661	61	103	40	10	**R4459.3**
	9.40	0.3701	61	103	40	10	**R4459.4**
	9.50	0.3740	61	103	40	10	**R4459.5**
3/8	9.53	0.3750	61	103	40	10	**R4453/8**
	9.60	0.3780	61	103	40	10	**R4459.6**
	9.70	0.3819	61	103	40	10	**R4459.7**
	9.80	0.3858	61	103	40	10	**R4459.8**
	9.90	0.3898	61	103	40	10	**R4459.9**
25/64	9.92	0.3906	61	103	40	10	**R44525/64**
	10.00	0.3937	61	103	40	10	**R44510.0**
	10.05	0.3957	70	118	45	12	**R44510.05**
	10.10	0.3976	70	118	45	12	**R44510.1**
	10.20	0.4016	70	118	45	12	**R44510.2**
	10.30	0.4055	70	118	45	12	**R44510.3**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R445*
13/32	10.32	0.4063	70	118	45	12	**R44513/32**
	10.40	0.4094	70	118	45	12	**R44510.4**
	10.50	0.4134	70	118	45	12	**R44510.5**
	10.60	0.4173	70	118	45	12	**R44510.6**
27/64	10.72	0.4219	70	118	45	12	**R44527/64**
	10.80	0.4252	70	118	45	12	**R44510.8**
	10.90	0.4291	70	118	45	12	**R44510.9**
	11.00	0.4331	70	118	45	12	**R44511.0**
7/16	11.11	0.4375	70	118	45	12	**R4457/16**
	11.20	0.4409	70	118	45	12	**R44511.2**
	11.30	0.4449	70	118	45	12	**R44511.3**
	11.40	0.4488	70	118	45	12	**R44511.4**
	11.50	0.4528	70	118	45	12	**R44511.5**
29/64	11.51	0.4531	70	118	45	12	**R44529/64**
	11.60	0.4567	70	118	45	12	**R44511.6**
	11.80	0.4646	70	118	45	12	**R44511.8**
15/32	11.91	0.4688	70	118	45	12	**R44515/32**
	12.00	0.4724	70	118	45	12	**R44512.0**
	12.05	0.4744	76	124	45	14	**R44512.05**
	12.20	0.4803	76	124	45	14	**R44512.2**
31/64	12.30	0.4844	76	124	45	14	**R44531/64**
	12.50	0.4921	76	124	45	14	**R44512.5**
1/2	12.70	0.5000	76	124	45	14	**R4451/2**
	12.70	0.5000	76	124	45	14	**R44512.7**
	12.80	0.5039	76	124	45	14	**R44512.8**
	13.00	0.5118	76	124	45	14	**R44513.0**
33/64	13.10	0.5156	76	124	45	14	**R44533/64**
	13.30	0.5236	76	124	45	14	**R44513.3**
17/32	13.49	0.5313	76	124	45	14	**R44517/32**
	13.50	0.5315	76	124	45	14	**R44513.5**
	13.80	0.5433	76	124	45	14	**R44513.8**
35/64	13.89	0.5469	76	124	45	14	**R44535/64**
	14.00	0.5512	76	124	45	14	**R44514.0**
	14.25	0.5610	82	133	48	16	**R44514.25**
9/16	14.29	0.5625	82	133	48	16	**R4459/16**
	14.50	0.5709	82	133	48	16	**R44514.5**
37/64	14.68	0.5781	82	133	48	16	**R44537/64**
	14.80	0.5827	82	133	48	16	**R44514.8**
	15.00	0.5906	82	133	48	16	**R44515.0**
19/32	15.08	0.5938	82	133	48	16	**R44519/32**
	15.10	0.5945	82	133	48	16	**R44515.1**
	15.30	0.6024	82	133	48	16	**R44515.3**
39/64	15.48	0.6094	82	133	48	16	**R44539/64**
	15.50	0.6102	82	133	48	16	**R44515.5**
	15.80	0.6220	82	133	48	16	**R44515.8**
5/8	15.88	0.6250	82	133	48	16	**R4455/8**
	16.00	0.6299	82	133	48	16	**R44516.0**

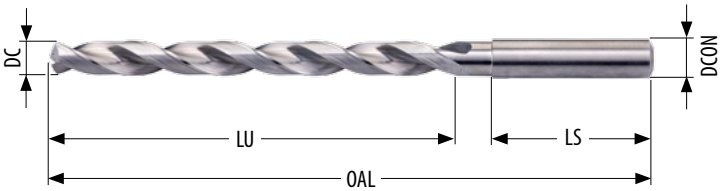
R448

Force N Drill Oil Feed 8xD

R448	N1.1	N1.2	N1.3	N2.1	N2.2	N2.3
	■357	■269	■179	■440	■395	■285

R448 | HM | DIN 6537 L | 8XD | 130° | DIN 6535HA | N

DORMER



R448

***FORCE** N*

3.00 - 16.00

*All items available upon request

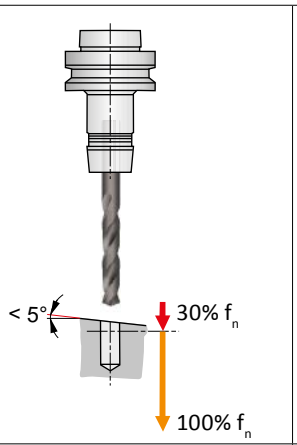
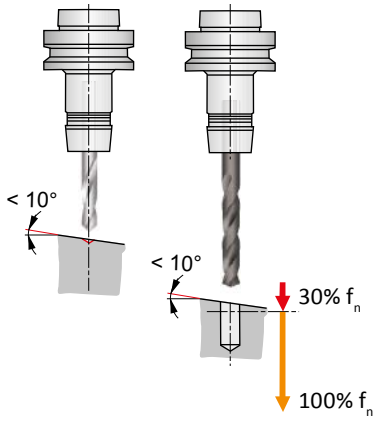
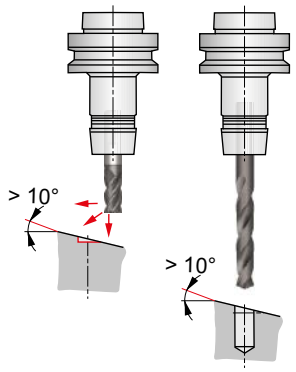
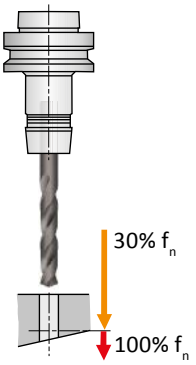
DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R448*
	3.00	0.1181	37	79	36	6	**R4483.0**
	3.10	0.1220	37	79	36	6	**R4483.1**
1/8	3.18	0.1250	37	79	36	6	**R4481/8**
	3.20	0.1260	37	79	36	6	**R4483.2**
	3.30	0.1299	37	79	36	6	**R4483.3**
	3.40	0.1339	37	79	36	6	**R4483.4**
	3.50	0.1378	37	79	36	6	**R4483.5**
9/64	3.57	0.1406	37	79	36	6	**R4489/64**
	3.60	0.1417	37	79	36	6	**R4483.6**
	3.70	0.1457	37	79	36	6	**R4483.7**
	3.80	0.1496	48	90	36	6	**R4483.8**
	3.90	0.1535	48	90	36	6	**R4483.9**
5/32	3.97	0.1563	48	90	36	6	**R4485/32**
	4.00	0.1575	48	90	36	6	**R4484.0**
	4.10	0.1614	48	90	36	6	**R4484.1**
	4.20	0.1654	48	90	36	6	**R4484.2**
	4.30	0.1693	48	90	36	6	**R4484.3**
11/64	4.37	0.1719	48	90	36	6	**R44811/64**
	4.40	0.1732	48	90	36	6	**R4484.4**
	4.50	0.1772	48	90	36	6	**R4484.5**
	4.60	0.1811	48	90	36	6	**R4484.6**
	4.70	0.1850	62	104	36	6	**R4484.7**
3/16	4.76	0.1875	62	104	36	6	**R4483/16**
	4.80	0.1890	62	104	36	6	**R4484.8**
	4.90	0.1929	62	104	36	6	**R4484.9**
	5.00	0.1969	62	104	36	6	**R4485.0**
	5.10	0.2008	62	104	36	6	**R4485.1**
13/64	5.16	0.2031	62	104	36	6	**R44813/64**
	5.20	0.2047	62	104	36	6	**R4485.2**
	5.30	0.2087	62	104	36	6	**R4485.3**
	5.40	0.2126	62	104	36	6	**R4485.4**
	5.50	0.2165	62	104	36	6	**R4485.5**
7/32	5.56	0.2188	62	104	36	6	**R4487/32**
	5.60	0.2205	62	104	36	6	**R4485.6**
	5.70	0.2244	62	104	36	6	**R4485.7**
	5.80	0.2283	62	104	36	6	**R4485.8**

DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R448*
	5.90	0.2323	62	104	36	6	**R4485.9**
15/64	5.95	0.2344	62	104	36	6	**R44815/64**
	6.00	0.2362	62	104	36	6	**R4486.0**
	6.10	0.2402	84	126	36	8	**R4486.1**
	6.20	0.2441	84	126	36	8	**R4486.2**
	6.30	0.2480	84	126	36	8	**R4486.3**
1/4	6.35	0.2500	84	126	36	8	**R4481/4**
	6.40	0.2520	84	126	36	8	**R4486.4**
	6.50	0.2559	84	126	36	8	**R4486.5**
	6.60	0.2598	84	126	36	8	**R4486.6**
	6.70	0.2638	84	126	36	8	**R4486.7**
17/64	6.75	0.2656	84	126	36	8	**R44817/64**
	6.80	0.2677	84	126	36	8	**R4486.8**
	6.90	0.2717	84	126	36	8	**R4486.9**
	7.00	0.2756	84	126	36	8	**R4487.0**
	7.10	0.2795	84	126	36	8	**R4487.1**
9/32	7.14	0.2813	84	126	36	8	**R4489/32**
	7.20	0.2835	84	126	36	8	**R4487.2**
	7.30	0.2874	84	126	36	8	**R4487.3**
	7.40	0.2913	84	126	36	8	**R4487.4**
	7.50	0.2953	84	126	36	8	**R4487.5**
19/64	7.54	0.2969	84	126	36	8	**R44819/64**
	7.60	0.2992	84	126	36	8	**R4487.6**
	7.70	0.3031	84	126	36	8	**R4487.7**
	7.80	0.3071	84	126	36	8	**R4487.8**
	7.90	0.3110	84	126	36	8	**R4487.9**
5/16	7.94	0.3125	84	126	36	8	**R4485/16**
	8.00	0.3150	84	126	36	8	**R4488.0**
	8.10	0.3189	106	152	40	10	**R4488.1**
	8.20	0.3228	106	152	40	10	**R4488.2**
	8.30	0.3268	106	152	40	10	**R4488.3**
21/64	8.33	0.3281	106	152	40	10	**R44821/64**
	8.40	0.3307	106	152	40	10	**R4488.4**
	8.50	0.3346	106	152	40	10	**R4488.5**
	8.60	0.3386	106	152	40	10	**R4488.6**
	8.70	0.3425	106	152	40	10	**R4488.7**
11/32	8.73	0.3438	106	152	40	10	**R44811/32**
	8.80	0.3465	106	152	40	10	**R4488.8**
	8.90	0.3504	106	152	40	10	**R4488.9**
	9.00	0.3543	106	152	40	10	**R4489.0**
	9.10	0.3583	106	152	40	10	**R4489.1**
23/64	9.13	0.3594	106	152	40	10	**R44823/64**
	9.20	0.3622	106	152	40	10	**R4489.2**
	9.30	0.3661	106	152	40	10	**R4489.3**
	9.40	0.3701	106	152	40	10	**R4489.4**
	9.50	0.3740	106	152	40	10	**R4489.5**
3/8	9.53	0.3750	106	152	40	10	**R4483/8**
	9.60	0.3780	106	152	40	10	**R4489.6**
	9.70	0.3819	106	152	40	10	**R4489.7**
	9.80	0.3858	106	152	40	10	**R4489.8**
	9.90	0.3898	106	152	40	10	**R4489.9**
25/64	9.92	0.3906	106	152	40	10	**R44825/64**
	10.00	0.3937	106	152	40	10	**R44810.0**
	10.20	0.4016	128	180	45	12	**R44810.2**
	10.30	0.4055	128	180	45	12	**R44810.3**
13/32	10.32	0.4063	128	180	45	12	**R44813/32**
	10.40	0.4094	128	180	45	12	**R44810.4**
	10.50	0.4134	128	180	45	12	**R44810.5**
27/64	10.72	0.4219	128	180	45	12	**R44827/64**
	10.80	0.4252	128	180	45	12	**R44810.8**
	11.00	0.4331	128	180	45	12	**R44811.0**
7/16	11.11	0.4375	128	180	45	12	**R4487/16**
	11.20	0.4409	128	180	45	12	**R44811.2**
	11.30	0.4449	128	180	45	12	**R44811.3**

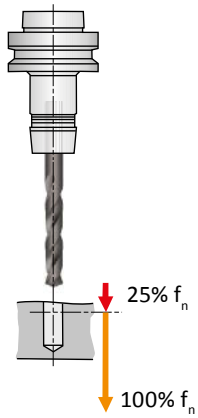
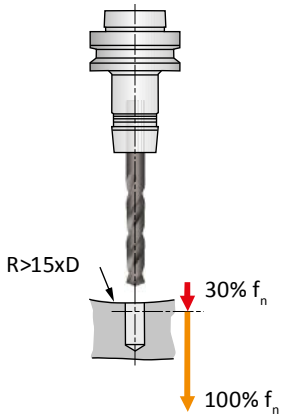
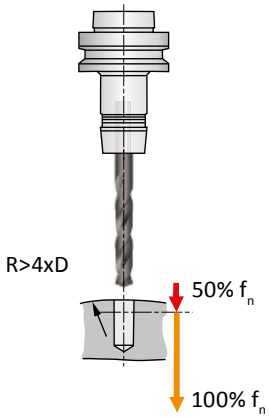
DC [inch]	DC [mm]	DC decimal [inch]	LU [mm]	OAL [mm]	LS [mm]	DCON [mm]	R448*
	11.50	0.4528	128	180	45	12	**R44811.5**
29/64	11.51	0.4531	128	180	45	12	**R44829/64**
	11.80	0.4646	128	180	45	12	**R44811.8**
15/32	11.91	0.4688	128	180	45	12	**R44815/32**
	12.00	0.4724	128	180	45	12	**R44812.0**
	12.20	0.4803	151	202	48	14	**R44812.2**
31/64	12.30	0.4844	151	202	48	14	**R44831/64**
	12.50	0.4921	151	202	48	14	**R44812.5**
1/2	12.70	0.5000	151	202	48	14	**R4481/2**
	12.80	0.5039	151	202	48	14	**R44812.8**
	13.00	0.5118	151	202	48	14	**R44813.0**
33/64	13.10	0.5156	151	202	48	14	**R44833/64**
17/32	13.49	0.5313	151	202	48	14	**R44817/32**
	13.50	0.5315	151	202	48	14	**R44813.5**
35/64	13.89	0.5469	151	202	48	14	**R44835/64**
	14.00	0.5512	151	202	48	14	**R44814.0**
	14.25	0.5610	172	227	48	16	**R44814.25**
9/16	14.29	0.5625	172	227	48	16	**R4489/16**
	14.50	0.5709	172	227	48	16	**R44814.5**
37/64	14.68	0.5781	172	227	48	16	**R44837/64**
	15.00	0.5906	172	227	48	16	**R44815.0**
19/32	15.08	0.5938	172	227	48	16	**R44819/32**
	15.10	0.5945	172	227	48	16	**R44815.1**
39/64	15.48	0.6094	172	227	48	16	**R44839/64**
	15.50	0.6102	172	227	48	16	**R44815.5**
5/8	15.88	0.6250	172	227	48	16	**R4485/8**
	16.00	0.6299	172	227	48	16	**R44816.0**

TECHNICAL INFORMATION

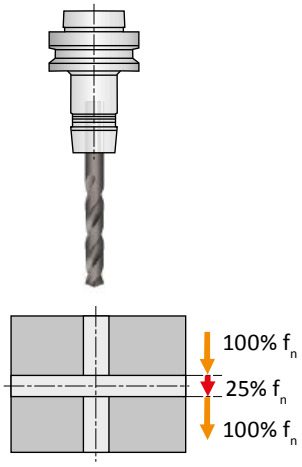
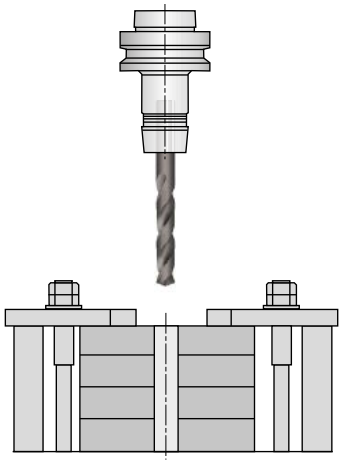
DRILLING INCLINED SURFACES

			
Enter with reduced feed	**Spot** before drilling **Enter** with reduced feed	**Mill** a flat surface before drilling	**Exit** with reduced feed

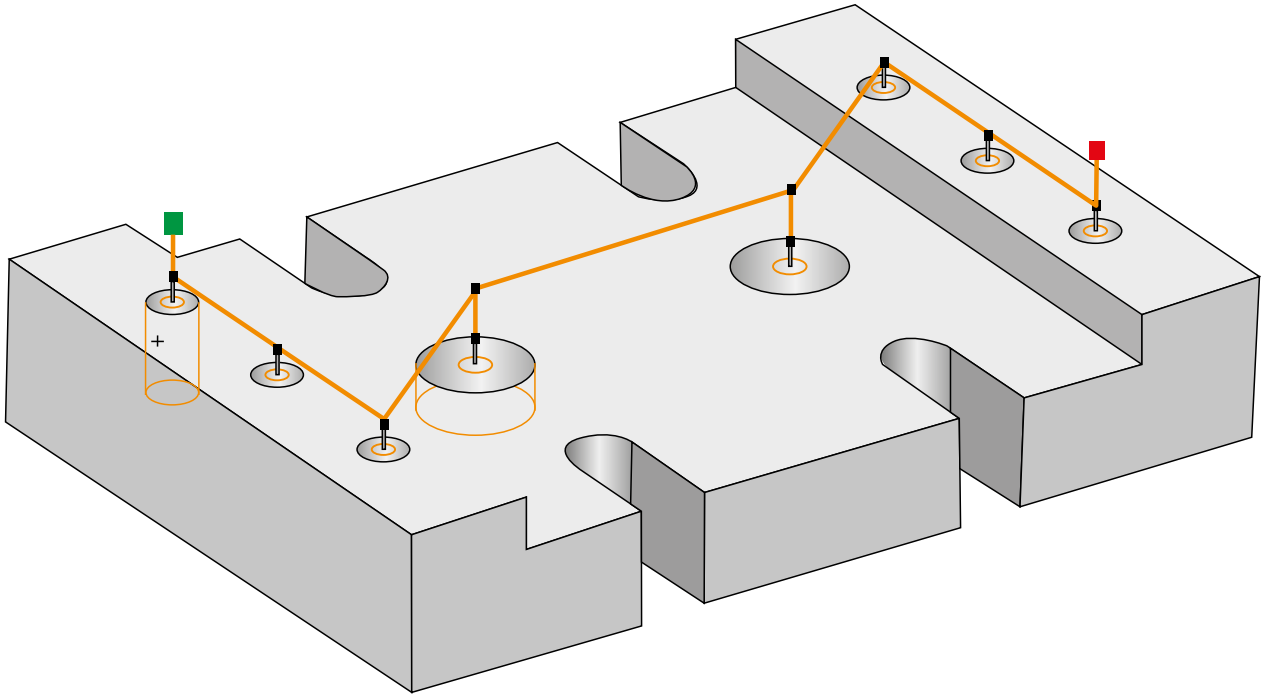
DRILLING IRREGULAR SURFACES

		
Reduce feed	**Reduce** feed	**Reduce** feed

DRILLING IRREGULAR SURFACES

		
Reduce feed	**Use** industrial paper (approx. 0.5-1 mm thick) placed between the plates	This operation is **NOT** recommended

SPOT HOLE

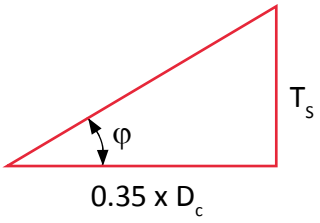


With the increasing accuracy offered by high-performance drills, spot drilling is not as common as it used to be. However, when you need to ensure accurate hole location and avoid drill deflection it offers a highly effective solution. Spot drilling is a particularly recommended operation prior to deep hole drilling.

Spot drills are designed to be extremely rigid to precisely spot a hole for a twist drill. The primary purpose of a spot drill to make a “dimple” in the workpiece so that the twist drill does not deflect and “walk” off-center and the hole is drilled in the correct location.

Ideally, the spot drill diameter should be about 70% of the size of your final drill diameter. The drilling depth can be calculated by using the following formula, in which Dc = the diameter of the final drill (not the spot drill).

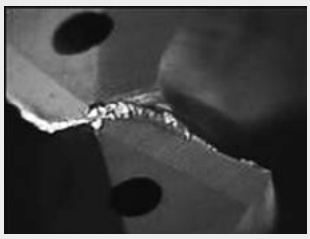
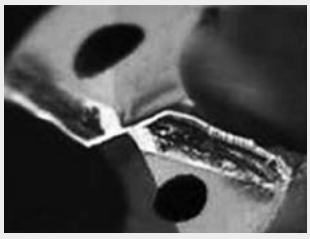
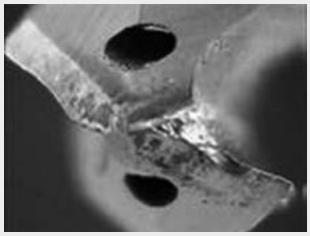
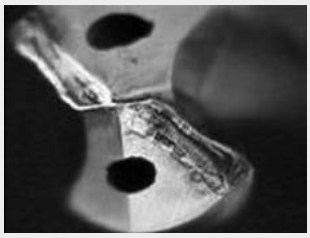
$$T_S = 0.35 \times D_c \times \tan \varphi$$



Recommended spot drill for FORCE Drills is the R125!

PRACTICAL MACHINING RECOMMENDATIONS

FAILURE MODES

PROBLEM	CAUSE	SOLUTION
Built Up Edge 	1. Too low cutting speed and edge temperature 2. Too large neg. land 3. No coating 4. Too low percentage of oil in the cutting fluid	1. Increase cutting speed or use external cutting fluid 2. Sharper cutting edge 3. Coating on the edge 4. Increase the percentage of oil in the cutting fluid
Chipping on Outer Corners 	1. Unstable fixturing 2. TIR too large 3. Intermittent cutting 4. Insufficient cutting fluid (Thermal cracking) 5. Unstable tool holding	1. Check fixture 2. Check radial run-out 3. Lower the feed 4. Check cutting fluid supply 5. Check the tool holder
Excess Wear on Cutting Edge 	1. Cutting speed too high 2. Feed too low 3. Grade too soft 4. Lack of cutting fluid	1. Lower the cutting speed 2. Increase the feed 3. Change to harder grade 4. Check for proper cutting fluid supply
Chipping on Cutting Edges 	1. Unstable conditions 2. Maximum allowed wear exceeded 3. Grade too hard	1. Check the setup 2. Replace drill sooner 3. Change to softer grade
Excess Wear on Cylindrical Lands 	1. TIR too large 2. Cutting fluid too weak 3. Cutting speed too high 4. Abrasive material	1. Check the radial runout 2. Use neat oil or stronger emulsion 3. Lower cutting speed 4. Change to harder grade
Excess Wear on Chisel Edge 	1. Cutting speed too low 2. Feed too high 3. Chisel edge too small	1. Increase cutting speed 2. Lower feed 3. Check dimensions

SIMPLY RELIABLE

As a professional you can judge the quality of work by just looking at the chip. Our chip is a clean and uncomplicated shape that in itself tells a story. It is a clear and consistent signal and that's why we use it as a symbol for being **Simply Reliable**.

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