

HAMMOND AND COMPANY

PRODUCTION LINE	CRANKSHAFT I	DRAWING SHEET	OP. No. 150
PART No.	SEE VARIANT SHEET	1 OF 1	OP. INCL. LEVEL
DESCRIPTION	BR400 CRANK-SHFT (8 CR.)		

DRILL PIN OIL HOLES (MVC 017/018/134)



TYPE I	CRANKSHAFT II	DRAWING SHEET	OP. No. 100.1
SEE VARIANT SHEET		1 OF 1	OP. INCL. LEVEL 3
P.C. CRANKSHAFT (4 CYCLE)			

DRILL ALL OIL HOLES



DEEP HOLE DRILLS



Hammond & Company was founded in London in 1939 by Charles Hammond and is now situated in Hemel Hempstead, Hertfordshire, close to Junction 8 of the M1 motorway.

**HAMMOND
AND COMPANY**

The business activity of the company was then, and is now, precision gauge and toolmaking. In more recent years however, we expanded into the specialised field of Deep Hole Drilling and are now the UK's leading manufacturer with an internationally acknowledged expertise.

A gauge making environment, state of the art purpose built machine tools and the latest CNC technology combine to ensure consistent quality control. Equally important is our policy towards customer service, both in terms of accurately scheduled deliveries and instantly available expertise.

DEEP HOLE DRILLING

Deep hole drilling is defined as a process of continuous, uninterrupted drilling by means of controlled chip formation and evacuation.

Only three factors are relative to achieving this definition: tool design, coolant delivery and feed rate.

There are various tool designs available, of which the most commonly used is the single fluted gun drill. Selecting the right tool for the job will depend on the importance of several possible requirements: diameter, depth, straightness, surface finish, diameter tolerance, penetration rate, cost per hole.

The best results are obtained when using a specially designed and dedicated deep hole drilling machine. However, if the capital cost cannot be justified, CNC, high volume and toolroom machines can be effectively employed particularly when it is desirable to perform additional operations to drilling.

Hammond and Company's engineering department will be pleased to discuss your application.

Gundrills

pages 4-6



Gun Reamers

page 9



Speedfeed

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Ventec

pages 13-15



CNC drilling

page 16

Coolant systems

page 17

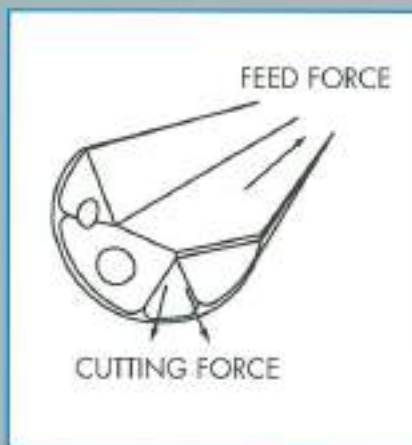
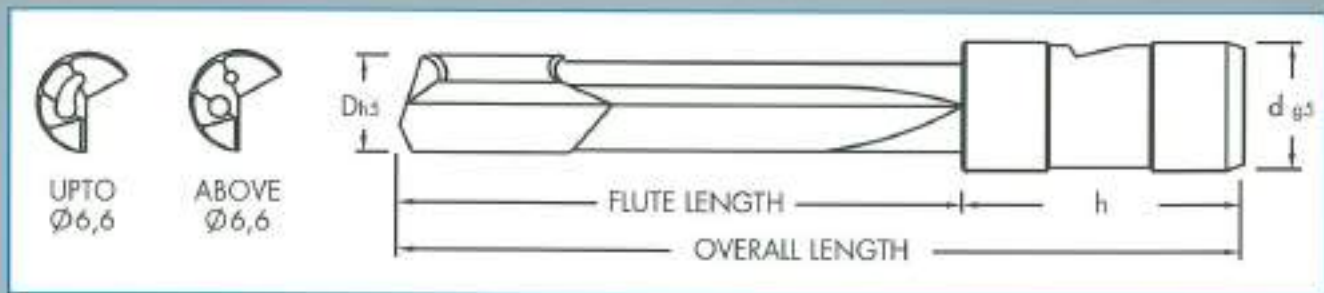
Product codes

page 18

DRILLING SYSTEMS



GUN DRILL DESIGN



A gundrill consists of three components: tungsten carbide cutting tip, hardened steel shank and a soft steel driver.

Before drilling commences the gundrill must be supported by a guide bush or pre-drilled start hole. Coolant is delivered directly to the cutting edges through the hollow shank and the chips are evacuated back along the V configuration of the tip and shank.

The periphery of the cutting tip is contoured in such a way as to provide both support pads and lubrication galleries. The forces generated by the single sided cutting action act directly on the support pads creating a burnished surface finish and size control down to IT7 tolerances.

DRIVER DESIGN

STYLE	REF	d	h	h1
 HAMMOND STANDARD	CA	16	40	
	CB	25	50	
	CC	35	60	
 AMERICAN STANDARD	AA	1/2"	38	26
	AB	3/4"	70	46
	AC	1.00"	70	55
	AD	1.25"	70	55
 EUROPEAN STANDARD	AE	1.50"	70	55
	AF	10	40	24
	AK	16	45	31
	AG	20	70	34
	AH	25	70	34
	AJ	32	70	34

STYLE	REF	d	h	h1
	AN	16	50	47
 WELDON	BF	16	48	24
	h2 BG	20	50	25
	17 BH	25	56	32
	19 BJ	32	60	36
	19 BK	40	70	40
	DG	10	60	M6X0.5
	DH	16	80	M10X1.0
	DK	25	100	M16X1.5
	DL	36	120	M25X1.5
	CH	16	112	T16-1.5
	CJ	20	126	T20-2.0
	CK	28	126	T28-2.0
	CL	36	162	T36-2.0

These are the most commonly used driver styles. Hammond & Company hold many more in stock and will always produce to customer's design.

When ordering please specify drill diameter, overall length, driver design and material to be cut.

See page 18 if you prefer to order by product code.

CUTTING HEAD CONTOURS

C1 (Order code **A**)

HAMMOND STANDARD
GENERAL PURPOSE



C2

(Order code **C**)

CAST IRON



C3

(Order code **E**)

GUN BORING



C4

(Order code **D**)

CRANKSHAFTS
ANGULAR HOLES
ALUMINIUM



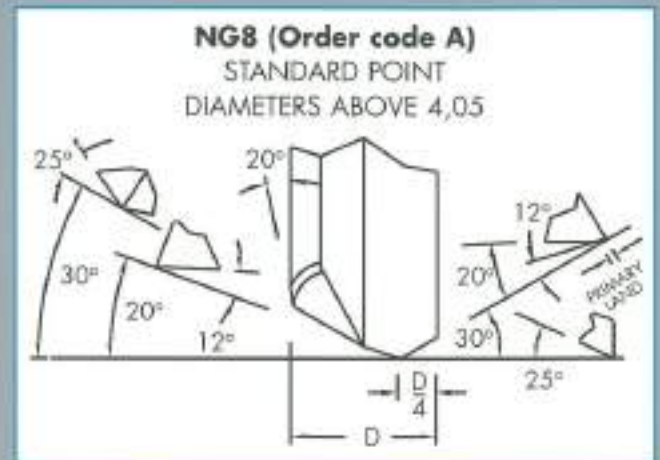
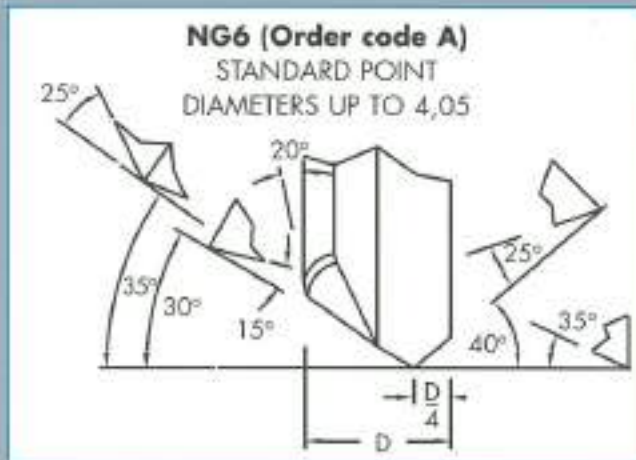
TUBULAR SHANK DIMENSIONS



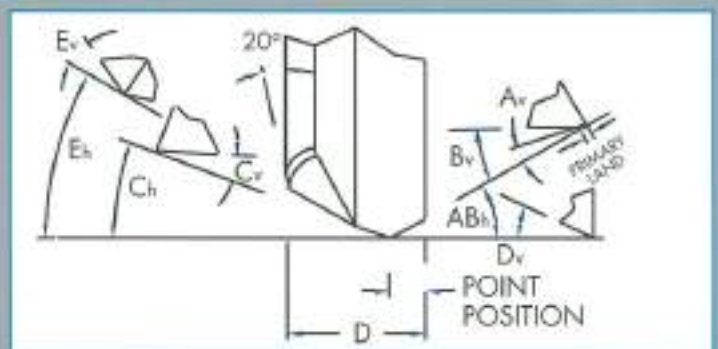
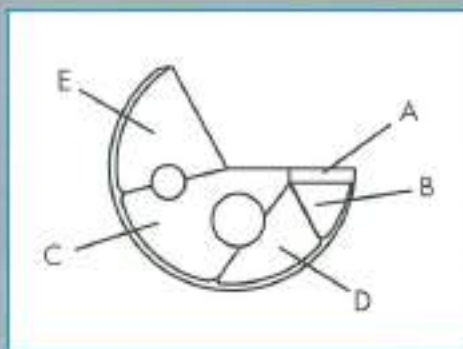
Hammond gundrill shanks are manufactured from high quality chrome molybdenum steel and are designed to achieve maximum coolant flow, chip clearance and torsional rigidity.

$\varnothing D$ RANGE	$\varnothing \text{TUBE}$	$\varnothing D$ RANGE	$\varnothing \text{TUBE}$	$\varnothing D$ RANGE	$\varnothing \text{TUBE}$
2,35-2,49	2,15	5,75-5,99	5,50	12,60-12,99	12,20
2,50-2,64	2,30	6,00-6,19	5,70	13,00-13,89	12,60
2,65-2,79	2,45	6,20-6,49	5,90	13,90-14,19	13,40
2,80-2,99	2,60	6,50-6,89	6,20	14,20-14,89	13,70
3,00-3,14	2,80	6,90-7,29	6,60	14,90-15,89	14,40
3,15-3,39	2,95	7,30-7,59	7,00	15,90-16,89	15,30
3,40-3,64	3,20	7,60-7,99	7,30	16,90-17,89	16,20
3,65-3,84	3,45	8,00-8,39	7,60	17,90-18,89	17,20
3,85-3,99	3,65	8,40-8,89	8,00	18,90-19,89	18,20
4,00-4,19	3,80	8,90-9,19	8,50	19,90-20,89	19,20
4,20-4,49	4,00	9,20-9,89	8,80	20,90-22,99	20,20
4,50-4,74	4,25	9,90-10,69	9,50	23,00-24,99	22,20
4,75-4,99	4,50	10,70-10,99	10,30	25,00-26,99	24,20
5,00-5,24	4,75	11,00-11,69	10,60	27,00-28,99	26,20
5,25-5,49	5,00	11,70-11,99	11,30	29,00-33,50	28,20
5,50-5,74	5,25	12,00-12,59	11,60		

CUTTING GEOMETRY



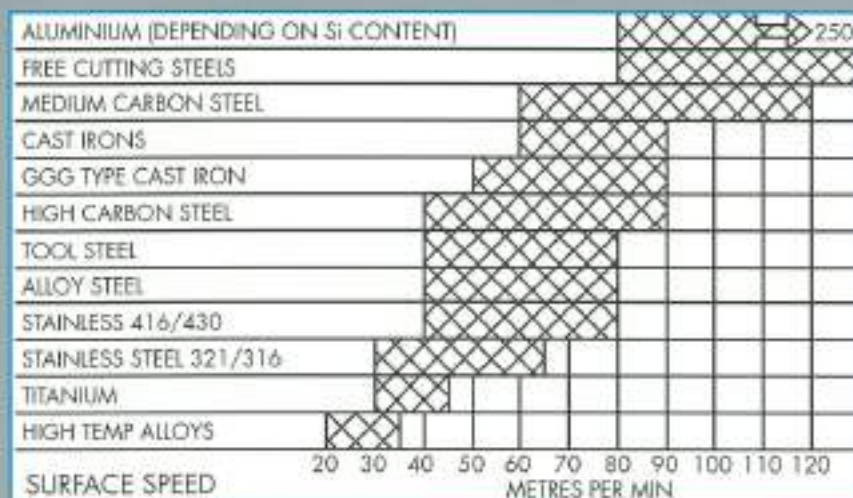
HAMMOND RECOMMENDED GEOMETRY FOR VARIOUS MATERIALS



DRILL DIA.	PRIMARY LAND	CHAMFER AT 20°
∅3,0 to 12,0	0,4 - 0,6	0,4 - 0,6
∅12,0 to 25,0	0,6 - 0,8	0,6 - 0,8
∅25,0 to 32,0	0,8 - 1,2	0,8 - 1,2

FACET DESCRIPTION	NG4 ALUMINIUM (Order code B)		NG13 CAST IRON (Order code E)		NG80 FLAT BOTTOM (Order code G)	
	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
A OUTER PRIMARY	+15°	+15°	+40°	+12°	+1°	+12°
B OUTER SECONDARY	+14,5°	+20°	+39,5°	+25°	+1°	+20°
C INNER RELIEF	-20°	+15°	-20°	+12°	-	-
D FRONT CLEARANCE	0°	+25°	0°	+35°	-	-
E OIL DUB-OFF	-25°	-15°	-25°	-12°	25°	-12°
POINT POSITION	D/4		D/4		D/2	

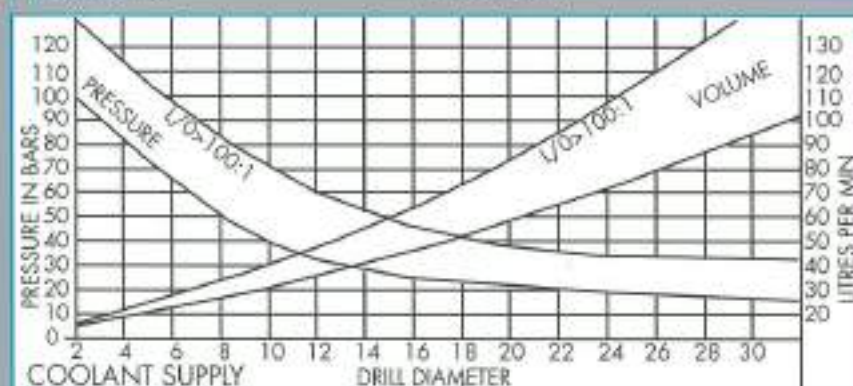
FACET DESCRIPTION	NG82 SUPER ALLOYS (Order code H)		NG86 WOOD GRIND (Order code K)		NG90 MALLEABLE MATL (Order code L)	
	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
A OUTER PRIMARY	+42°	+14°	+30°	+20°	+20°	+20°
B OUTER SECONDARY	+41,5°	+25°	-	-	-	-
C INNER RELIEF	-17°	+14°	-20°	+20°	-20°	+20°
D FRONT CLEARANCE	0°	+30°	0°	+30°	0°	+25°
E OIL DUB-OFF	-22°	-15°	-25°	-15°	-25°	-15°
POINT POSITION	D/5		D/3,5		D/3,5	



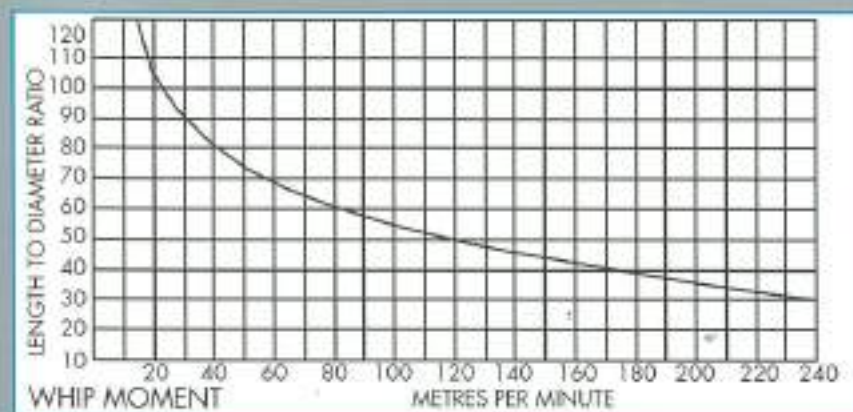
Gun drills operate at relatively high cutting speeds with low feeds per revolution. Approximate starting values are shown in the charts on this page.



Feed rates are critical to chip formation. The values shown here may need to be adjusted for optimum results.



Reliable chip evacuation and good surface finish can only be ensured if sufficient coolant volume and pressure are available.



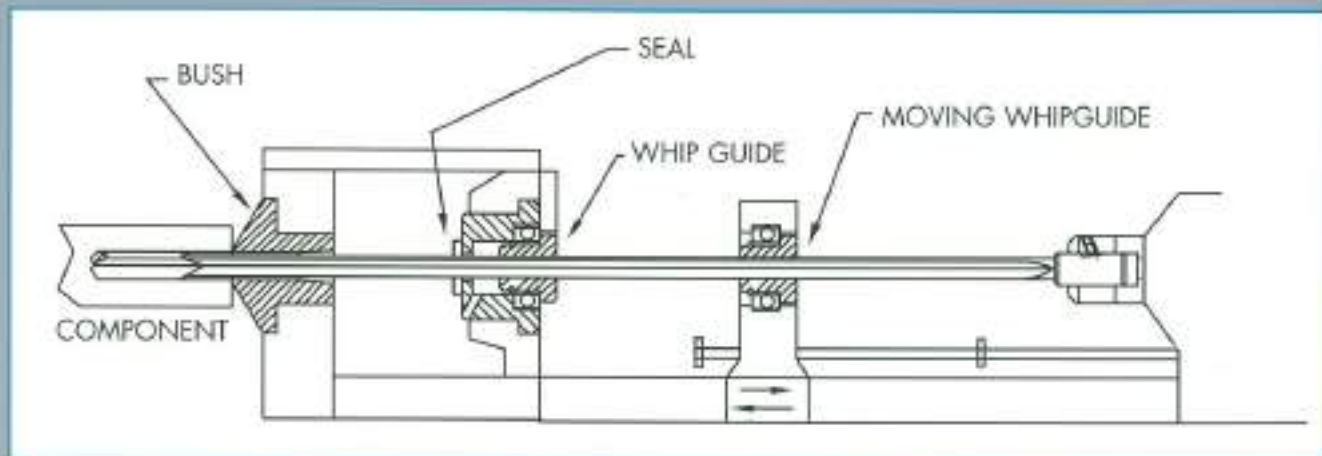
GUNDRILL WHIP MOMENT

To establish the maximum length to diameter ratio of an unsupported drill for any given surface speed, trace the surface speed to the intersection of the curve and read off the L/D ratio on the vertical scale.

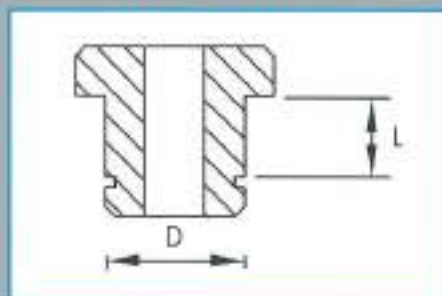
Example:

Using a gun drill at 100 metres/min, the L/D ratio is 55:1 therefore for a dia. 10.0 gun drill the maximum unsupported shank length is 550mm.

GUN DRILL ACCESSORIES



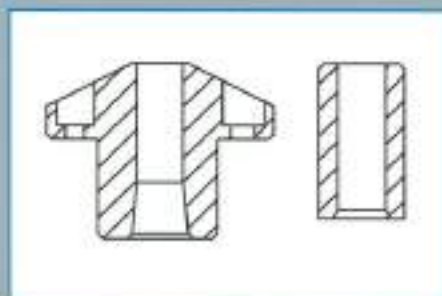
POLYURETHANE WHIPGUIDES



D	L
17,0	10
30,0	13

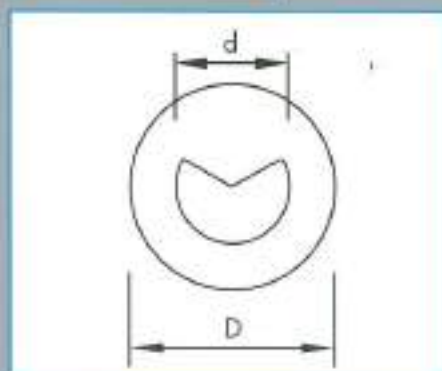
When ordering please specify the tip diameter of the drill

START BUSHES



Manufactured to order

CHIP DEFLECTORS



TYPE	D	d RANGE
A	19,12	3,17 TO 6,34
B	24,40	6,35 TO 9,51
C	31,75	9,52 TO 15,86
D	37,72	15,87 TO 19,04
E	44,25	19,05 TO 25,39
F	50,85	25,40 TO 31,74

When ordering please specify the tip diameter of the drill. The d range has a size to suit each diameter of tube.

GUN REAMER



Single and multi flute coolant fed Gun Reamers.
 Re-grindable. Excellent bore straightness, surface finish, roundness and diameter adherence.
 Primarily used in the Automotive, Aerospace and Marine industries for reaming valve guides.
 Manufactured to customer's specification.
 Diameter range $\varnothing 5,0$ to $\varnothing 20,0$



VALVE GUIDE REAMING

PROTEN



Fast penetration drills manufactured to customer's specification.
 Micro-grain carbide tips, high speed steel shanks and drivers to suit customer's toolholder.
 Four facet re-grindable point geometry.
 Diameter range $\varnothing 6,0$ to $\varnothing 20,0$. Hole depths up to 25:1.

SOLID CARBIDE



Straight fluted, coolant fed drills manufactured from twin hole tungsten carbide rod.
 Four facet re-grindable point geometry.
 Manufactured to order, step drills available.
 Diameter range $\varnothing 6,0$ to $\varnothing 20,0$. Hole depths up to 10:1.

SPEEDFEED DRILLS



The Speedfeed drill is a twin fluted, carbide tipped coolant fed drill.

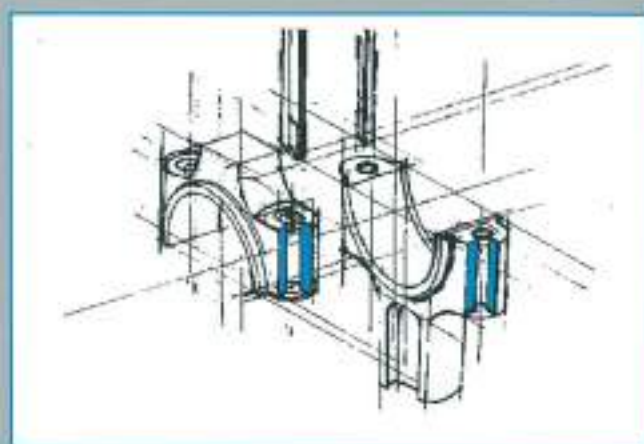
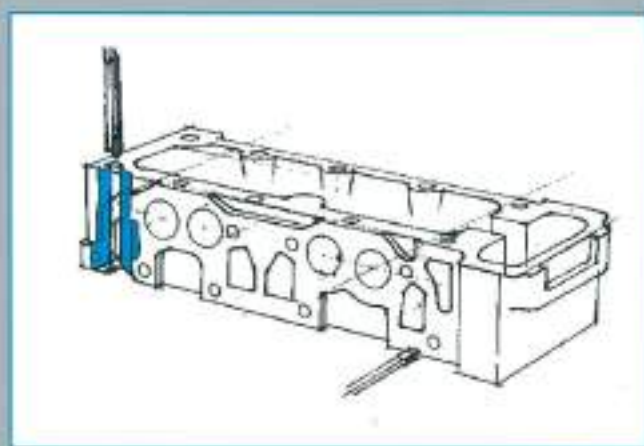
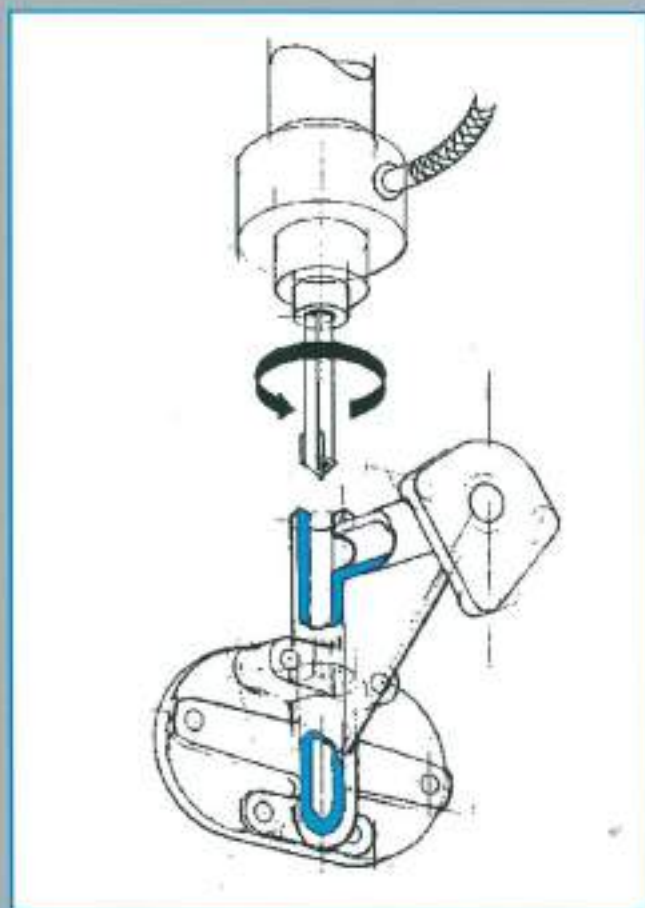
The micro grain solid carbide tip is multi regrindable.

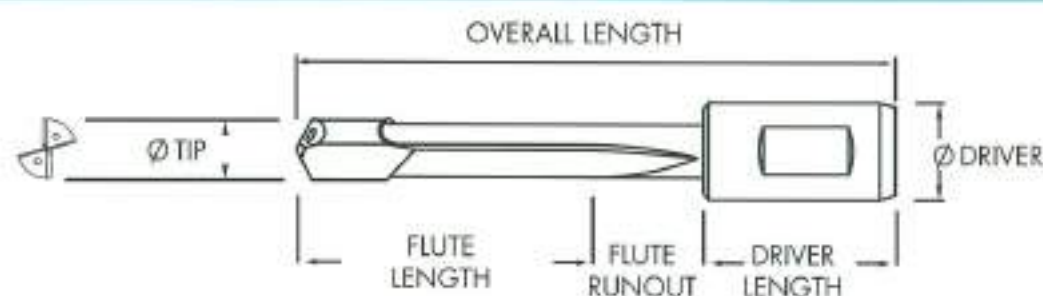
The tubular shank is formed and heat treated from high quality chrome molybdenum steel into an overlapping figure of eight cross section.

The maximum flute length is 500 mm subject to the application being suitable. (Please discuss new applications with Hammond & company's technical department).

Re-grinding with an SS-46 fixture assures continued performance and can be accomplished on a standard tool and cutter grinder. A re-grinding service is available at our Hemel Hempstead factory.

- Carbide tipped
- Multi-regrindable
- $\varnothing 5,0$ to $\varnothing 30,0$
- Up to 25:1 length diameter
- High penetration rates
- Good size control and surface finish





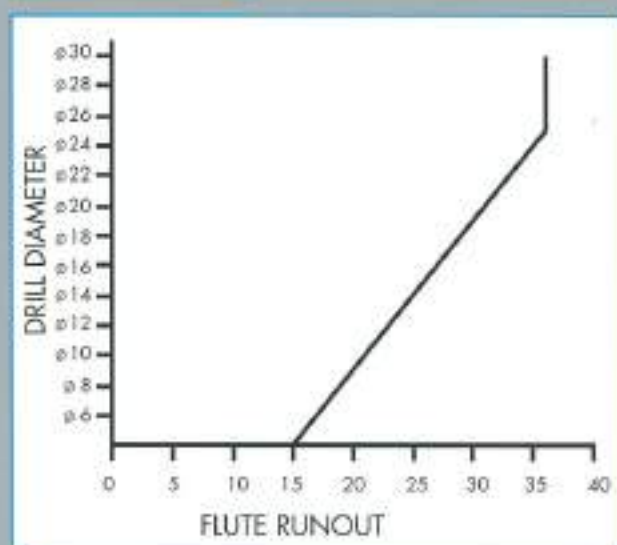
ORDERING INFORMATION

Please specify: Drill diameter

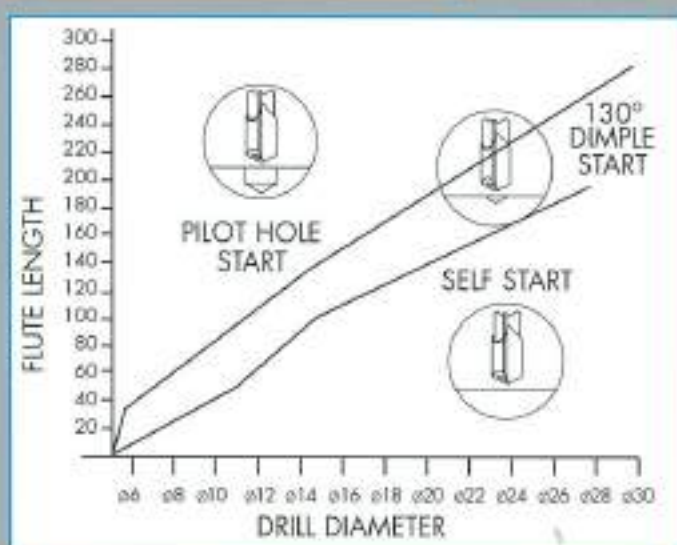
Flute length (depth of hole + 1,5 diameters)

Driver code (see below, if driver is not listed please give details).

FLUTE RUNOUT



HOLE STARTING INSTRUCTIONS



DRIVER STYLES

DRIVER STYLES	REF	d	h	h1	h2
HAMMOND STANDARD 	FA	16	40		
	FB	25	50		
	FC	35	60		
WELDON 	GC	16	48	24	
	GD	20	50	25	
	GE	25	56	32	17
	GF	32	60	36	19
	JF	40	70	40	19

DRIVER STYLES	REF	d	h	h1	h3
SANDVIK TYPE 	JD	16	48	34	40
	FF	20	48	34	40
	FG	25	53	38	45
	FH	32	55	38	45
GUNDRILL TYPE 	FT	10	40	24	
	GU	16	45	31	
	FV	20	70	34	
	FW	25	70	34	
	FX	32	70	34	

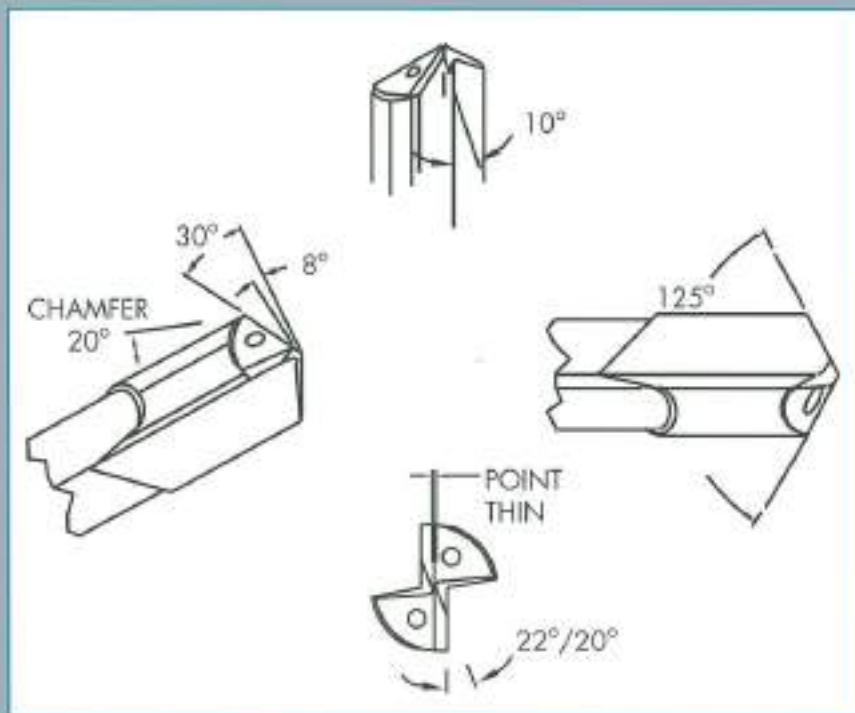
These are the most commonly used driver styles. Hammond & company hold many more in stock and will always produce to customer's design.

SPEEDFEED SPECIFICATION

SPEEDFEED CUTTING DATA

MATERIAL	CUTTING SPEED M/MIN	FEED – mm PER REV			
		∅ 5 – 10	∅ 10 – 15	∅ 15 – 20	∅ 20 – 30
LOW CARBON STEEL	60 – 110	0.03 – 0.13	0.10 – 0.28	0.15 – 0.35	0.15 – 0.40
CAST IRON	40 – 80	0.06 – 0.24	0.10 – 0.40	0.20 – 0.45	0.30 – 0.50
ALUMINIUM (DIFFICULT TO CHIP)	80 – 160	0.03 – 0.10	0.04 – 0.15	0.06 – 0.20	0.08 – 0.30
ALUMINIUM CAST BRASS	110 – 220	0.06 – 0.30	0.10 – 0.35	0.20 – 0.50	0.30 – 0.50

POINT GEOMETRY



POINT THIN

DRILL DIA.	MIN	MAX
5,00 – 6,20	0,24	0,32
6,20 – 8,20	0,30	0,42
8,20 – 10,2	0,32	0,50
10,2 – 12,2	0,36	0,67
12,2 – 15,2	0,40	0,72
15,2 – 18,2	0,50	0,83
18,2 – 21,2	0,60	0,97
21,2 – 25,2	0,70	1,10
25,2 – 28,2	0,80	1,20
28,2 – 30,2	0,90	1,25

DRILL DIA.	CHAMFER AT 20°
5 – 10	0,4 – 0,6
10 – 20	0,6 – 0,8
20 – 30	0,8 – 1,2

The ideal method of re-grinding speedfeed drills is to use the Hammond re-grind fixture SS46; this ensures that both the tip diameter and the driver are concentric and on the same centre of rotation.

The cutting edges must be ground within 0,025 of each other and the centreline of the drill.



RE-GRIND FIXTURE

The problems of twist drilling deep holes are well known in the engineering industry. Drill wander, poor size control and surface finish, flank wear, binding and breakage are occupational hazards. The operation can be slow and inaccurate in the extreme.

An alternative is the use of Ventec drills which are designed to bring the benefits of gun drilling technology to conventional machine tools. Now for a relatively small outlay, it is possible to equip your machine shop with a system that provides a deep hole drilling capability, which in terms of speed and

accuracy, equates favourably with gun drilling. In operation the tool must be supported in a short pilot hole before drilling commences. Thereafter, penetration is continuous and depth to diameter ratios of up to 70:1 are achievable. The cutting forces created by the offset tip geometry act upon the carbide bearing pads, burnishing the workpiece and achieving fine surface and size control. It is this accuracy of dimensional control which is responsible for the excellent concentricity achieved by a Ventec drill. It has literally nowhere to go but forward.

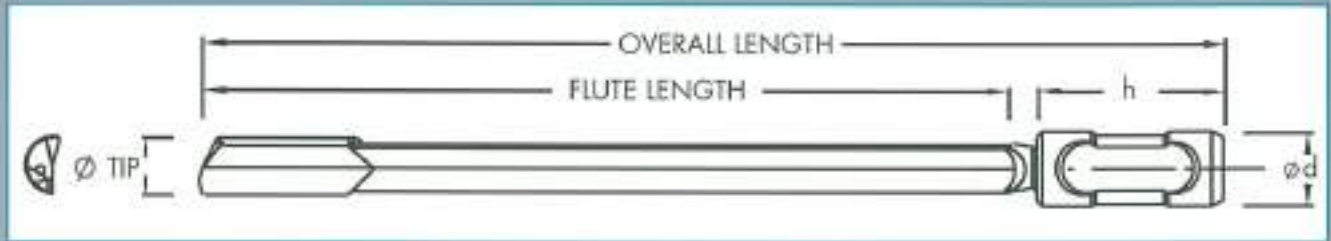
MOULD TOOL DRILLING



K3000A SPRAYMIST See page 17



VENTEC SPECIFICATION



ORDERING INFORMATION

Please specify the drill diameter and flute length.

The flute length should equal the hole depth plus 2 x D. This allows for re-grinding.

If holes are deeper than 30 diameters they should be drilled in 30:1 stages.

The driver size will be fitted according to the chart below.

DRIVERS

DRIVER STYLES	REF	TIP DIAMETER	ød	h	OVERALL LENGTH	
	VT1	CA	ø5,0 – 11,73	ø16	40	Flute length + 50,0
	VT2	CB	ø11,74 – 20,50	ø25	50	Flute length + 65,0
	VT3	CC	ø20,51 – 40,50	ø35	60	Flute length + 80,0

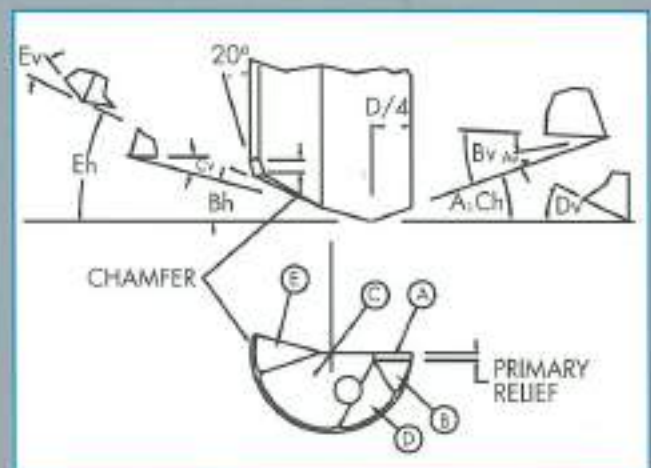
CUTTING DATA

MATERIAL	SURFACE SPEED Metres	FEED/REV ø6,0	FEED/REV ø8,0	FEED/REV ø10,0	FEED/REV ø15,0	FEED/REV ø20,0	FEED/REV ø30,0
High Temp Alloys	18	0,010	0,012	0,015	0,020	0,025	0,030
Stainless Steel Alloys	30	0,015	0,020	0,025	0,035	0,040	0,040
High Carbon Steel	38	0,015	0,020	0,030	0,040	0,050	0,050
Medium Carbon Steel	45	0,020	0,030	0,040	0,050	0,060	0,060
Low Carbon Steel	55	0,020	0,030	0,040	0,060	0,075	0,075
Cast Iron	35	0,040	0,060	0,100	0,130	0,150	0,180
Free Cutting Aluminium	75	0,040	0,060	0,100	0,130	0,150	0,180

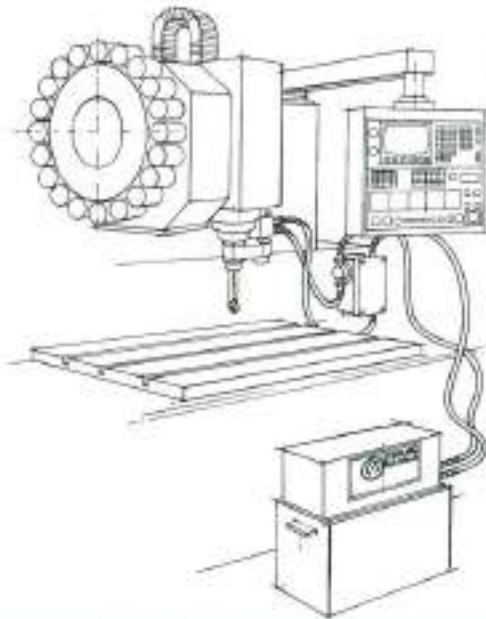
CLAMPING METHOD				
	HORIZ	VERT	HORIZ	VERT
A	+20°	+15°	+22°	+13°
B	+19,5°	+20°	+21,5°	+18°
C	-15°	+15°	-13°	+16°
D	0°	+25°	0°	+25°
E	-18°	-14°	-20°	-12°

Note: Good surface finish required on faces A, C and Chamfer.

DRILL DIA.	PRIMARY RELIEF	CHAMFER AT 20°
ø5-ø12	0,4 – 0,6	0,4 – 0,6
ø12-ø25	0,6 – 0,8	0,6 – 0,8
ø25-ø40	0,8 – 1,2	0,8 – 1,2

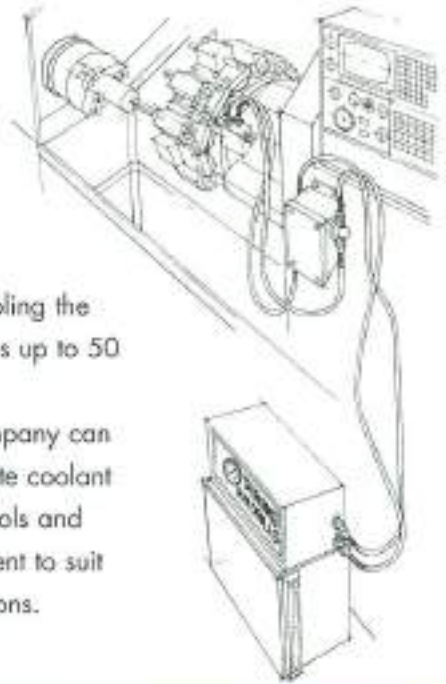


DEEP DRILLING ON CNC MACHINES

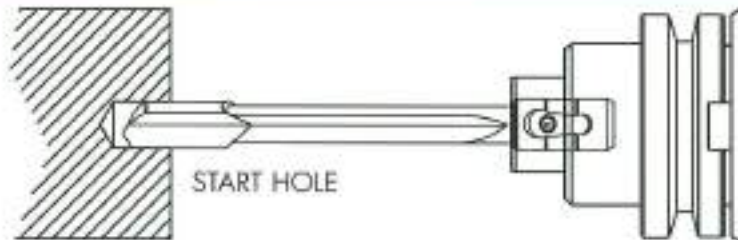


Modern CNC Machines are usually equipped with an adequate coolant supply enabling the deep drilling of holes up to 50 times diameter.

Hammond & company can also supply complete coolant delivery systems, tools and toolholding equipment to suit most CNC applications.

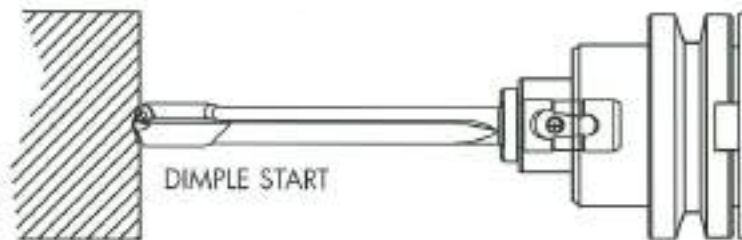


GUNDRILL ø3,0-32,0



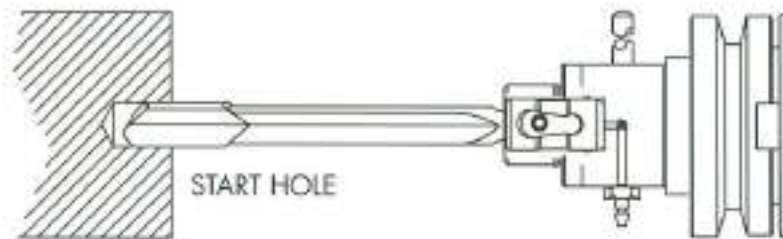
Gundrills are recommended where size control and concentricity are essential.

SPEEDFEED DRILL ø5,0-30,0



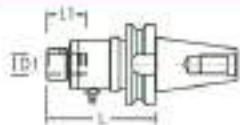
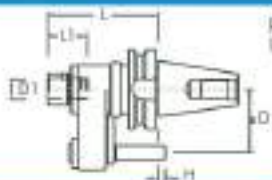
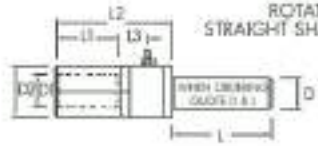
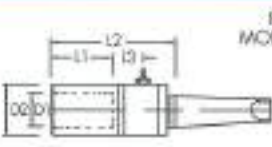



Speedfeed drills are recommended for cast iron, aluminium and softer steels where fast penetration is essential.

VENTEC DRILL ø5,0-40,0




Ventec drills using spraymist are recommended when the machine tool does not have a suitable coolant supply. The hole produced will be of similar quality to a gun drilled hole.

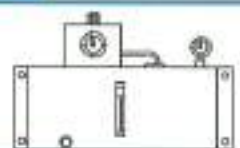
TOOLHOLDERS

 <p>ROTATING INT. TAPER</p>	PART NO.	ROTATING TOOL HOLDER 17/24 TAPER MANUAL CONNECTION						
	VT29	Available in BT, DIN and CAT Bore diameter (D1) 10, 20, 25, 32, 35 and 40 Manufactured to order						
 <p>ROTATING INT. TAPER</p>	PART NO.	ROTATING TOOL HOLDER 17/24 TAPER AUTOMATIC CONNECTION & LOADING						
	VT39	Available in BT, DIN and CAT Bore diameter (D1) 10, 20, 25, 32, 35 and 40 B & H dimensions to suit. Manufactured to order						
 <p>ROTATING STRAIGHT SHANK</p>	PART NO.	D1	L1	L2	D2	L3	D Max	
	VT616	16	40	85	32	24	16	
	VT625	25	50	109	46	31	25	
	VT635	35	60	119	58	28	32	
 <p>ROTATING MORSE TAPER</p>	PART NO.	No MORSE TAPER	D1	L1	L2	D2	L3	
	VT516/1	No1	16	40	89	32	24	
	VT525/2	No2	25	50	113	46	31	
	VT525/3	No3	25	50	113	46	31	
	VT525/4	No4	35	60	123	58	28	
 <p>STATIONARY</p>	PART NO.	D1	L1	L2	D2	L3		
	VT316	16	40	55	33	47		
	VT325	25	50	70	46	60		
	VT335	35	60	80	58	70		
 <p>CENTRE LATHE</p>	PART NO.	D1	L1	A	B	C	E	F
	VT225	25	50	9	19	41	19	37
	VT235	35	60	14	22,5	53,5	25	50,5
 <p>REDUCTION SLEEVE</p>	PART NO.	D1	D2	L				
	VT25/16	16	25	50				
	VT25/20	20	25	50				
	VT35/25	25	35	60				

RE-GRIND FIXTURES

	PART NO.	VENTEC RE-GRIND FIXTURE
	VT100	GUN DRILL RE-GRIND FIXTURE
	VT101	SPEEDFEED RE-GRIND FIXTURE

PUMPS

	PART NO.	VENTEC SPRAYMIST UNIT 5 LITRES
	K2000A	VENTEC SPRAYMIST UNIT 15 LITRES
	K3000A	HIGH PRESSURE COOLANT PUMP

HIGH PRESSURE COOLANT

The **K4000** Series High Pressure Pump can transform your machine to give a deep hole drilling capability equal to a purpose built Gun Drilling Machine.

Coolant is utilised from the machine's existing coolant tank. To control coolant temperature the machine tool should have a tank capacity of at least 300 litres.

K4000 Pumps can cope with debris and swarf up to 500 microns. However, to prevent debris collecting or catching in the transfer pipes or drill coolant holes a magnetic strainer on the pump inlet is essential. For smaller drills and holes with fine surface finish requirements good quality filtration is a must. Suitably enclosed guarding is required to contain the high-pressure coolant.

For gun drilling operations, a soluble oil with high-pressure additives mixed to a 10%–15% solution or a good quality gundrilling type mineral oil should be used.

The maximum output of the K4000 pump is 26 litres/min at 70bar (1000psi).

The output from the pump can be controlled by a solenoid valve which diverts the coolant to the drill or back to the tank. This can be activated by the machine's "M" codes.



If the machine does not have a suitable coolant capacity, we can supply the pump mounted vertically into a 300 litres Auxiliary Coolant Tank fitted with an integral float switch, sight glass, magnetic strainer and safety overflow. The float switch controls a free standing scavenge pump which in turn controls the fluid level in the auxiliary tank. The solenoid valve can also be mounted on this unit, giving the flexibility to being able to move the unit from machine to machine.

SPRAYMIST

The **K2000A** and **K3000A** spray mist units can be quickly fitted to most machine tools to give a deep hole drilling capability; they are portable and require only to be connected to the factory compressed air supply. The **Ventec drilling system** works in the following way. A 3:1 air driven pump situated inside the spraymist unit pressurises a 10% solution of a special emulsion oil; the oil is atomised by the compressed air at an adjustable sprayjet head and delivers the resulting mist mixture into the toolholder and through the **Ventec drill**. At the cutting face the mist mixture expands as it exits the hole in the carbide tip producing a refrigerating effect. The heat from the cutting process evaporates the water content of the mist leaving high lubricity oil to lubricate the burnishing pads of the cutting tip. The compressed air ejects the chips back along the drill flute and out of the hole.

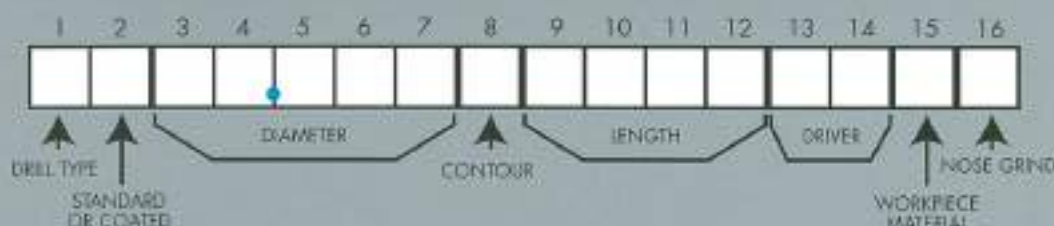
The incoming air pressure should be 5,5–8,5 Bar (80–125psi). The coolant pressure should be set 3–5 Bar (45–75psi) above this pressure. The mist flow should be adjusted until a light mist is visible at the commencement of drilling. During the drilling cycle a trickle of fluid should just be noticeable returning along the drill shank and slightly wetting the face of the workpiece. To achieve optimum results the Ventec cutting oil mixing instructions must be followed exactly.

We also offer a range of standard and custom built Coolant Fed Toolholders (see page 15) and a service to design and retrofit High Pressure coolant transfer systems to most CNC Lathes and Machining Centres.



PRODUCT CODES

DRILL PART NO. SYSTEM (METRIC)



FIELD 1 DRILL TYPE

- G Gun drill
- E Gun reamer
- F Speedfeed
- S Speedbit
- V Vortec
- P Proten
- X Special

FIELD 2 STANDARD OR COATED

- M Standard
- C Coated

FIELDS 3-7 DIAMETER (Decimal point is between fields 4 & 5, size to three decimal places)

FIELD 8 CONTOUR (Gun drills only. All other drills are 'A')

- A ---- C1 Standard
- C ---- C2 Cast iron
- D ---- C3 Gun boring
- E ---- C4 Crankshafts, Aluminium > dia ø4,0
- X Special

FIELDS 9-12 LENGTH (No decimal point)

- Gun drills Overall length
- Gun reamer Overall length
- Speedfeed Flute length
- Vortec Flute length
- Speedbit Flute length

FIELDS 13&14 DRIVER TYPE (See separate list for driver codes)

- ND No driver
- BT Bitip
- RD Reduction
- RG Re-grind
- MO Modification

FIELD 15 WORKPIECE MATERIAL

- A Steel/Non ferrous
- H Cast Iron
- T Cast Iron (high phosphorus content)
- M Stainless steel, High-Si content aluminium

FIELD 16 NOSE GRINDS

- A NG6/NG8 Standard
- B NG9 Aluminium
- E NG13 Cast Iron
- F NG73 Stick
- G NG80 Flat bottom
- H NG82 Inconel
- J NG83 Crankshaft
- K NG86 Wood
- X Special

EXAMPLE

G M 0 8 0 0 0 A 0 4 0 0 C A A F

Gun drill, NonCoated, ø8.0, 94 carbide, 400 e.c.f. C-A Driver ø 16x40, to cut steel, stick nose grind