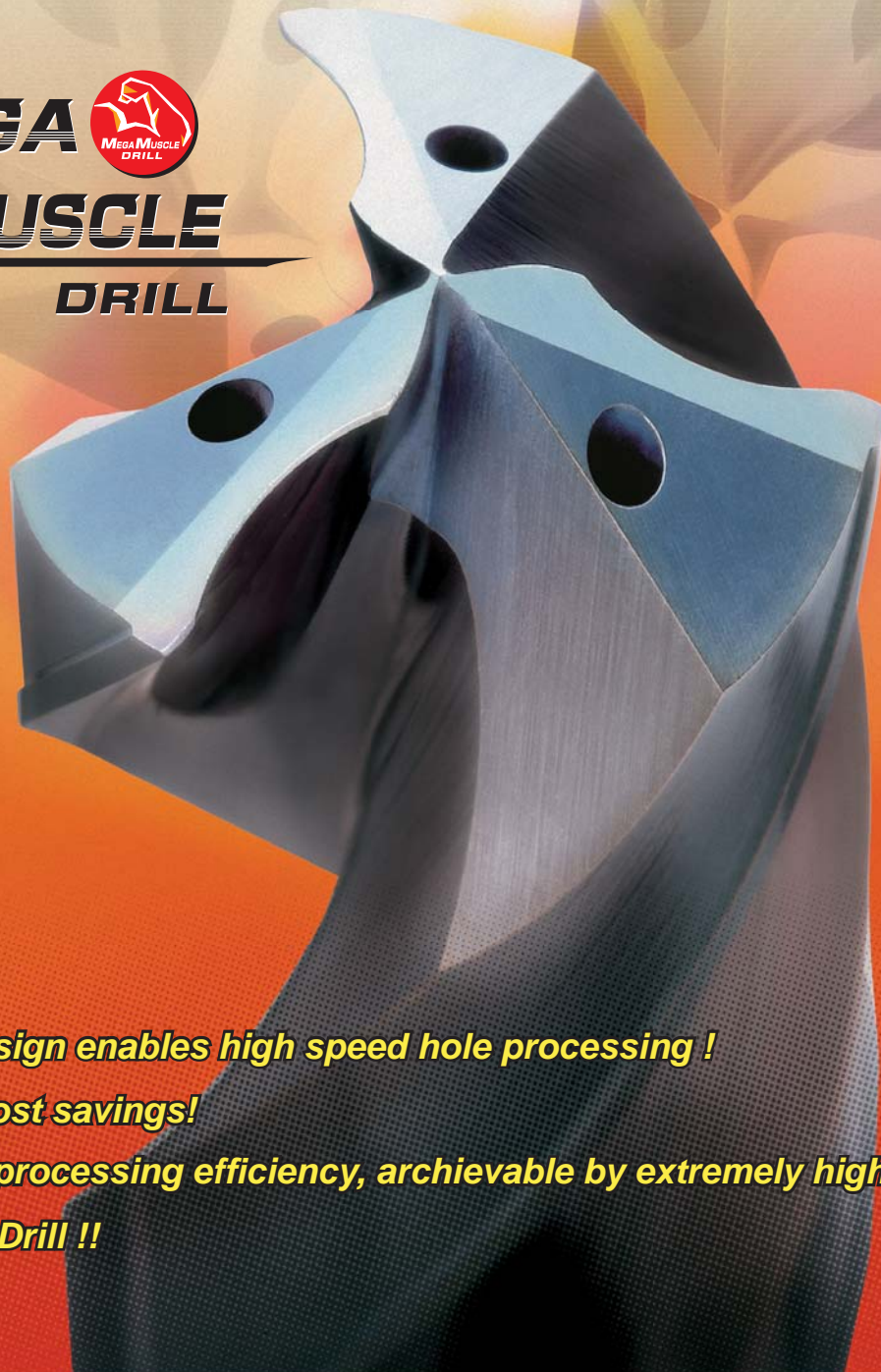




Coolant-Through, Three fluted, Carbide Drills

High Efficient Processing of Steel & Cast Irons
Drilling Feeds exceeding *1.000 mm/min!*

MEGA 
MUSCLE
DRILL



The 3 flute design enables high speed hole processing !

Unmatched cost savings!

Unbelievable processing efficiency, achievable by extremely high feed rates.

Mega Muscle Drill !!

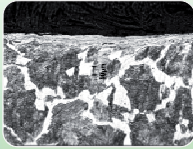


Three concepts differentiate the TRS series from two-flute & conventional drills



Higher Precision

- Better tapping process from improved pilot holes
- Reamer-less drilling can be achieved



Reduced Work Hardening

- Optimal conditions for thread making
- Improved tool life for succeeding cutting tools



Improved Feed Rate

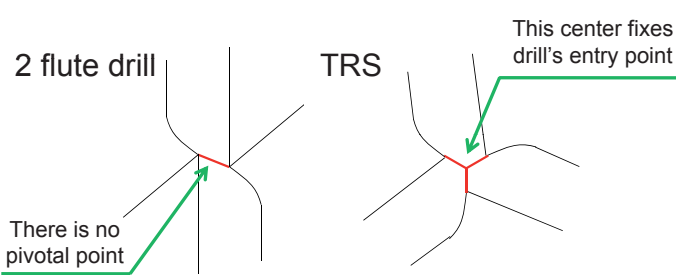
- The higher the feed rate, the more the output
- Reduced cost per unit



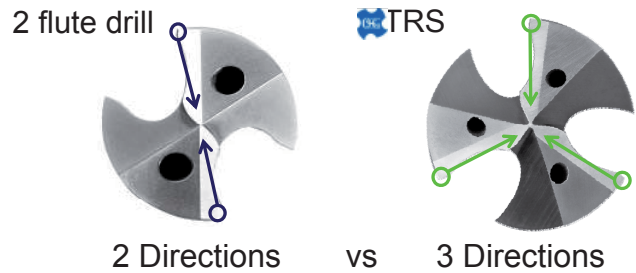
Higher Precision !

There are 2 keys to High Precision Drilling

1. Good biting properties to minimize deflection



2. Stable guide to keep the drilling process straight.

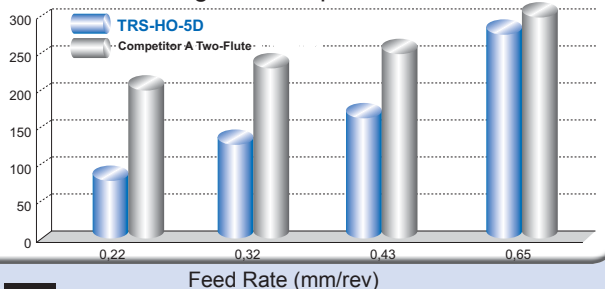


WDI Coating

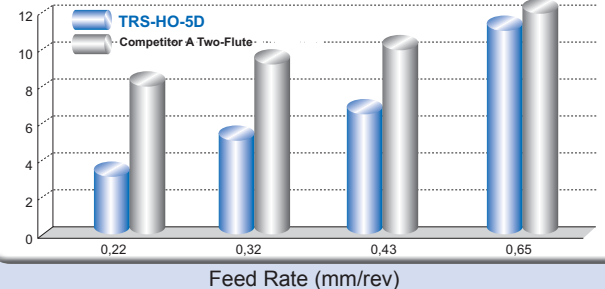
The WDI coating is effective in high feed drilling

■ Comparison of the amount of work hardening versus feed per revolution in carbon steel.

• Work hardening rate comparison



• Work hardening layer depth comparison





Improved feed rate !

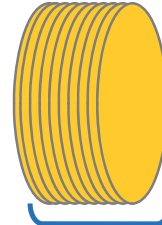
If we needed to drill 10mm through hole...

TRS will complete the process in 10 revolutions with feed rate of 1mm/rev.

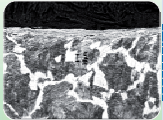
Conventional Drill, on the other hand, will require 100 revolutions at 0.1mm/rev feed rate



10 revolutions = 10mm

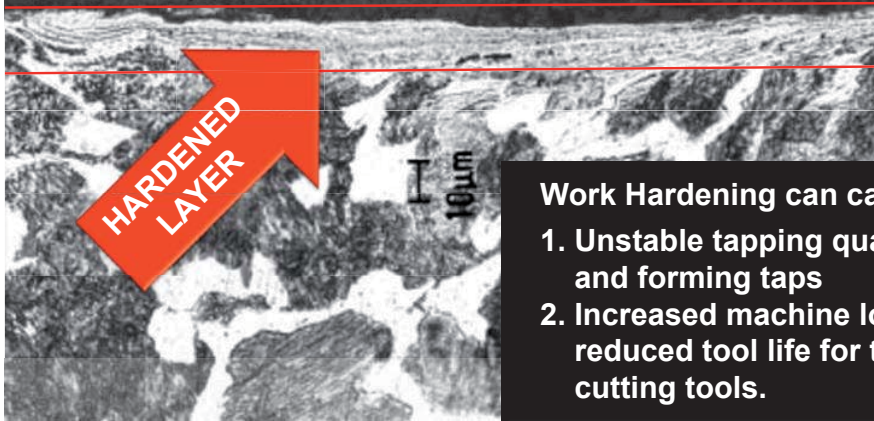


10 revolutions = 1.0mm



Reduced work hardening !

The cause of Many Machining Problems is Work Hardening



Work Hardening can cause :

1. Unstable tapping quality for both cutting and forming taps
2. Increased machine load that often result in reduced tool life for the drill and succeeding cutting tools.

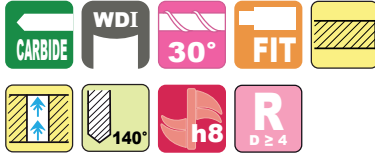
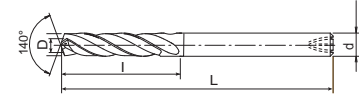
Tool	TRS-HO-5D ø10,8
Work Material	S50c (DIN CK50) (AISI 1050)
Drilling Speed	100m/min (2.950min ⁻¹)
Feed	Variable (See chart)
Depth of Hole	25mm (Through)
Coolant	Water Soluble
Machine	Horizontal Machining Center

	TRS-5D		Competitor A Two-Flute	
	Work Hardening Level	Work Hardening Depth	Work Hardening Depth	Work Hardening Depth
Feed Rate	(Hv0,1)	(µm)	(Hv0,1)	(µm)
f=0,22mm/rev	120	3	220	8
f=0,32mm/rev	120	5	240	9
f=0,43mm/rev	185	6,5	265	10
f=0,65mm/rev	220	11	295	12

These graphs shows the level and depth of work hardening in carbon steel when comparing the Mega Muscle drill versus 2 fluted drills. The amount of feed per revolution ranges from 0.22 to 0.65mm/rev . Regardless of the number of flutes, work hardening has the tendency to increase with the increase of the feed rate. It can be noted, when the same feed rate is applied to both drills, the 3 fluted type has a much lower work hardening effect. 3 fluted drills always achieve lower work hardening rates when compared to 2 fluted drills. Thus, it is best practice to keep the work hardening as low as possible when secondary operations such as tapping or reaming are required. The Mega Muscle Drill offers this process stability, reducing the burden of the taps and reamers increasing their tool life.



R thinning



● To ensure a stable flow of coolant, there is a groove on the bottom of the shank

● On some drills, the coating may have some discoloration. This does not pose any performance problems.

EDP	D	L	l	d	Stock	Price	EDP	D	L	l	d	Stock	Price
8660500	5	80	25	5	●		8660960	9,6	106	48	10	●	
8660510	5,1	82	26	6	●		8660970	9,7	106	49	10	●	
8660540	5,4	82	27	6	●		8660980	9,8	106	49	10	●	
8660580	5,8	82	29	6	●		8660990	9,9	106	50	10	●	
8660600	6	82	30	6	●		8661000	10	106	50	10	●	
8660650	6,5	88	33	7	●		8661020	10,2	113	51	11	●	
8660680	6,8	88	34	7	●		8661030	10,3	113	52	11	●	
8660700	7	88	35	7	●		8661040	10,4	113	52	11	●	
8660710	7,1	94	36	8	●		8661050	10,5	113	53	11	●	
8660760	7,6	94	38	8	●		8661080	10,8	113	54	11	●	
8660800	8	94	40	8	●		8661100	11	113	55	11	●	
8660810	8,1	101	41	9	●		8661110	11,1	120	56	12	●	
8660820	8,2	101	41	9	●		8661120	11,2	120	56	12	●	
8660830	8,3	101	42	9	●		8661180	11,8	120	59	12	●	
8660840	8,4	101	42	9	●		8661190	11,9	120	60	12	●	
8660850	8,5	101	43	9	●		8661200	12	120	60	12	●	
8660860	8,6	101	43	9	●		8661250	12,5	128	63	13	●	
8660870	8,7	101	44	9	●		8661300	13	128	65	13	●	
8660880	8,8	101	44	9	●		8661350	13,5	134	68	14	●	
8660890	8,9	101	45	9	●		8661400	14	134	70	14	●	
8660900	9	101	45	9	●		8661450	14,5	140	73	15	●	
8660910	9,1	106	46	10	●		8661500	15	140	75	15	●	
8660920	9,2	106	46	10	●		8661600	16	145	80	16	●	
8660930	9,3	106	47	10	●		8661700	17	150	85	17	●	
8660940	9,4	106	47	10	●		8661800	18	155	90	18	●	
8660950	9,5	106	48	10	●								

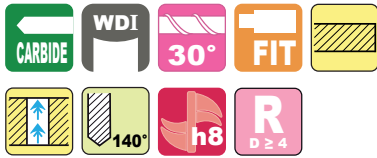
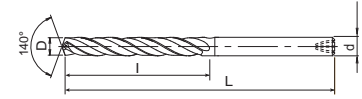
Different diameters and lengths are available as specials.
Also a special design for aluminium alloys are available upon request.

● Delivery from stock
○ Available on short notice

Applications - Anwendungen - Applicazioni - Applications - Applikation - Applikation - Aplicaciones - Применение								
C≤0.2%	0.25<C≤0.4%	C≥0.45%	SCM	-35 HRC	35-45 HRC	45-50 HRC	50-70 HRC	SUS
◎	◎	◎	◎	◎	○	○		○
SKD	GG	GGG	Cu	Al	AC	Ti	TiAl	Inc
	◎	◎					○	



R thinning



● To ensure a stable flow of coolant, there is a groove on the bottom of the shank

● On some drills, the coating may have some discoloration. This does not pose any performance problems.

EDP	D	L	l	d	Stock	Price	EDP	D	L	l	d	Stock	Price
8662500	5	95	45	5	●		8662980	9,8	136	79	10	●	
8662510	5,1	100	41	6	●		8663000	10	136	80	10	●	
8662520	5,2	100	42	6	●		8663030	10,3	146	83	11	●	
8662550	5,5	100	44	6	●		8663040	10,4	146	84	11	●	
8662580	5,8	100	47	6	●		8663050	10,5	146	84	11	●	
8662600	6	100	48	6	●		8663080	10,8	146	87	11	●	
8662620	6,2	109	50	7	●		8663100	11	146	88	11	●	
8662650	6,5	109	52	7	●		8663110	11,1	156	89	12	●	
8662680	6,8	109	55	7	●		8663200	12	156	96	12	●	
8662690	6,9	109	56	7	●		8663250	12,5	167	100	13	●	
8662700	7	109	56	7	●		8663300	13	167	104	13	●	
8662710	7,1	118	57	8	●		8663350	13,5	176	108	14	●	
8662730	7,3	118	59	8	●		8663400	14	176	112	14	●	
8662750	7,5	118	60	8	●		8663450	14,5	185	116	15	●	
8662760	7,6	118	61	8	●		8663500	15	185	120	15	●	
8662800	8	118	64	8	●		8663550	15,5	193	124	16	●	
8662820	8,2	128	66	9	●		8663600	16	193	128	16	●	
8662850	8,5	128	68	9	●		8663700	17	201	136	17	●	
8662880	8,8	128	71	9	●		8663750	17,5	209	140	18	●	
8662900	9	128	72	9	●		8663800	18	209	144	18	●	
8662950	9,5	136	76	10	●		8663850	18,5	217	148	19	●	
8662960	9,6	136	77	10	●								

Different diameters and lengths are available as specials.
Also a special design for aluminium alloys are available upon request.

● Delivery from stock
○ Available on short notice

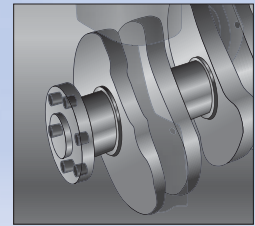
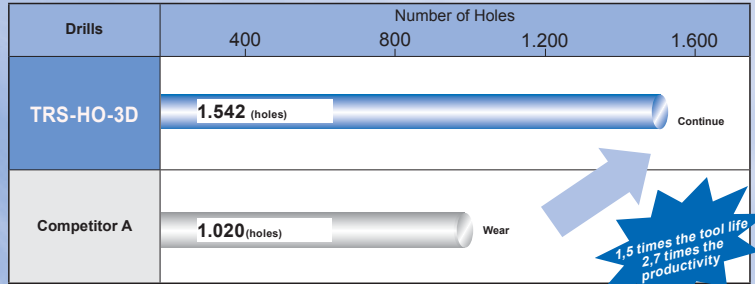
Applications - Anwendungen - Applicazioni - Applications - Applikation - Applikation - Aplicaciones - Применение								
C≤0.2%	0.25<C≤0.4%	C≥0.45%	SCM	-35 HRC	35-45 HRC	45-50 HRC	50-70 HRC	SUS
◎	◎	◎	◎	◎	○	○		○
SKD	GG	GGG	Cu	Al	AC	Ti	TiAl	Inc
	◎	◎					○	



Unmatched Processing Efficiency! Drilling feeds exceeding 1.000 mm/min !

■ Feed rates of $F = 1480\text{mm/min}$ were achieved in this crankshaft application (carbon steel)

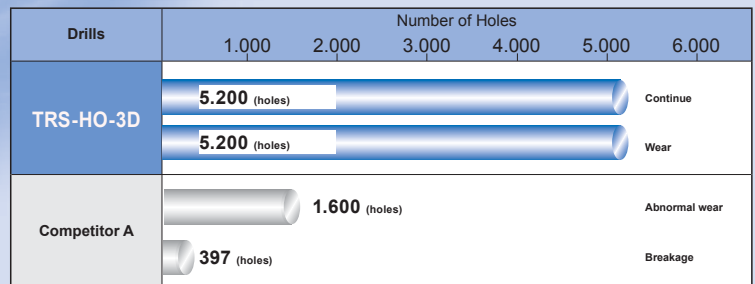
Tool	TRS-HO-3D $\varnothing 10,3$	Competitor A
Work Material	S50C [DIN CK50 AISI 1050]	
Drilling Speed	100m/min (2.950min ⁻¹)	
Feed	1.480mm/min (0,5mm/rev)	560mm/min 0,19mm/rev
Depth of Hole	24mm (Blind)	
Coolant	Water Soluble	
Machine	Horizontal Machining Center	



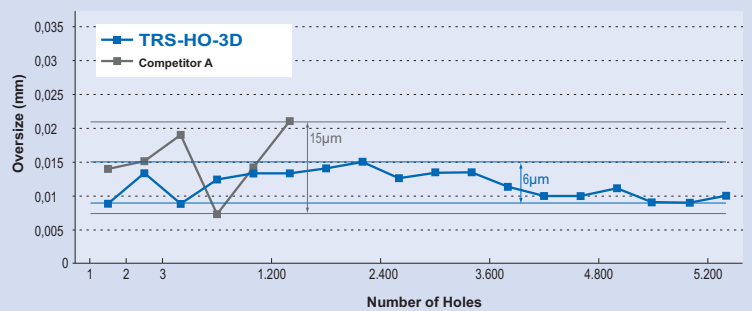
Example of the hole processing for the mounting holes on the crankshaft flywheel. The Mega Muscle Drill achieved 1.5 times the tool life and 2.7 times the productivity over Competitor A's 2 fluted drill. With the ability to control work hardening, one has the ability to extend tool life on secondary processes such as tapping, thus decreasing overall tooling and part cost per unit. For example, by lowering the cutting speed to 80m/min, tool life of the drill and all secondary process tools can be extended.

■ In the processing of carbon steel, feed rates of $F=1.480\text{mm/min}$ were achieved, with overall cutting lengths of 166m.

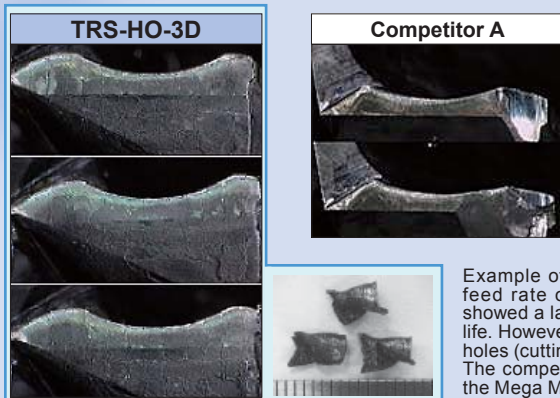
Tool	TRS-HO-3D $\varnothing 10,3$
Work Material	S50C [DIN CK50 AISI 1050]
Drilling Speed	100m/min (3.090 min ⁻¹)
Feed	1.480mm/min (0,48mm/rev)
Depth of Hole	32mm (Through)
Coolant	Water Soluble
Machine	Horizontal Machining Center



■ Changes in amount of hole oversize



■ Tool wear comparison







Example of carbon steel processing. Because of the high feed rate of 0.48mm/rev, the competitor company's drill showed a large variation in hole expansion as well as low tool life. However, the Mega Muscle Drill was able to achieve 5200 holes (cutting length 166m) with stable hole sizes. The competitor A's hole expansion ranged up to 15µm, while the Mega Muscle Drill had only a 6µm variation.



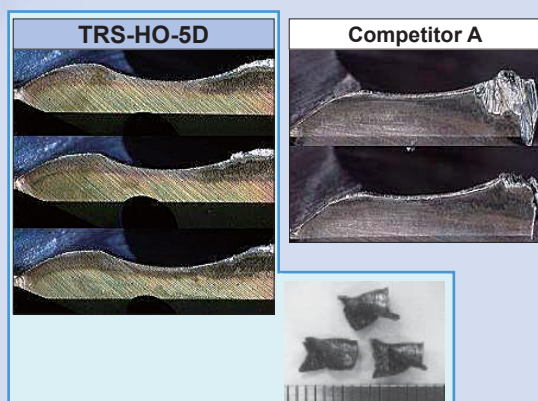
Unmatched Processing Efficiency! Drilling feeds exceeding 1.000 mm/min!

■ In the processing of alloy steel, feed rates of $F=1.140\text{mm/min}$ were achieved, with overall cutting lengths of 110m

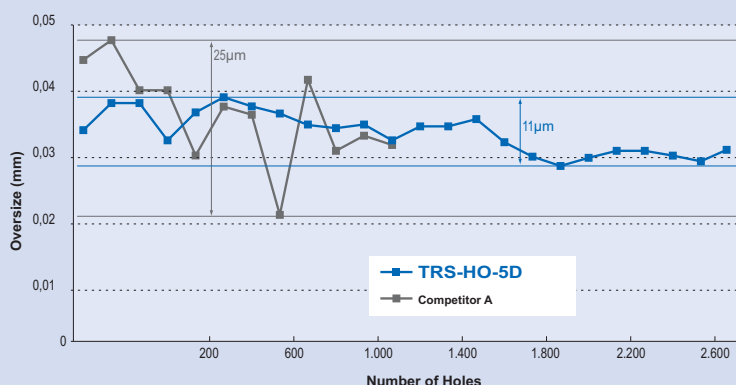
Tool	TRS-HO-5D $\varnothing 10,5$
Work Material	SCM440 (Alloy Steel)
Drilling Speed	80m/min (2.430min^{-1})
Feed	1.140mm/min ($0,47\text{mm/rev}$)
Depth of Hole	50mm (Through)
Coolant	Water Soluble
Machine	Horizontal Machining Center

Drills	Number of Holes					
	500	1.000	1.500	2.000	2.500	3.000
TRS-HO-5D	2.600 (holes)  Wear					
	2.200 (holes)  Wear					
Competitor A	1.075 (holes)  Breakage					
	1.000 (holes)  Breakage					

■ Tool wear comparison







■ Changes in amount of hole oversize



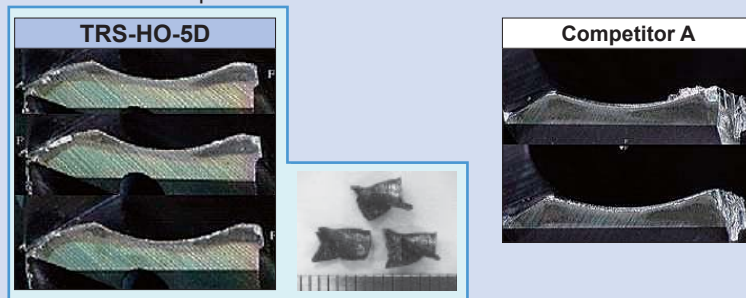
Example of hole processing in alloy steel. At high feed machining of 0.47mm/rev , Competitor A's drill was found to be unstable in hole size as well as having low tool life. However, the Mega Muscle Drill exceeded 2200 (cutting length 110m) holes of tool life, limited by normal wear, thus decreasing overall tooling and part cost per unit. When comparing the hole expansion values, Competitor A was found to have a large variation of up to $25\mu\text{m}$. While the Mega Muscle Drill had up to $11\mu\text{m}$.

■ Feed rates of $F=1.010\text{mm/min}$ were achieved in 30HRC alloy steel.

Tool	TRS-HO-5D $\varnothing 10,8$
Work Material	SCM440 (30HRC) (Alloy Steel)
Drilling Speed	70m/min (2.060min^{-1})
Feed	1.010mm/min ($0,49\text{mm/rev}$)
Depth of Hole	50mm (Through)
Coolant	Water Soluble
Machine	Horizontal Machining Center

Drills	Number of Holes					
	500	1.000	1.500	2.000	2.500	3.000
TRS-HO-5D	2.000 (holes)  Wear					
	1.700 (holes)  Wear					
Competitor A	174 (holes)  Breakage					
	300 (holes)  Abnormal wear					

■ Tool wear comparison



Example of hole processing in 30HRC alloy steel. At high feed drilling rates such as 0.49mm/rev , the Competitor A's product shows abnormal wear and premature breakage. After the drilling of 1700 holes, the wear of the Mega Muscle drill was stable, thus allowing for more regrinds and processing time per drill, reducing the overall process cost.



Recommended Drilling Conditions

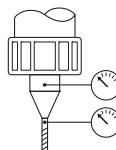
TRS-HO-3D/5D

Vc	Mild Steels - Low Carbon Steels		Carbon Steels		Alloys Steels	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
	80 ~ 120 m/min		80 ~ 120 m/min		60 ~ 90 m/min	
Ø						
5	6.400	0,18 ~ 0,25	6.400	0,18 ~ 0,25	4.800	0,18 ~ 0,25
6	5.300	0,21 ~ 0,30	5.300	0,21 ~ 0,30	4.000	0,21 ~ 0,30
7	4.500	0,25 ~ 0,35	4.500	0,25 ~ 0,35	3.400	0,25 ~ 0,35
8	4.000	0,28 ~ 0,40	4.000	0,28 ~ 0,40	3.000	0,28 ~ 0,40
9	3.500	0,32 ~ 0,45	3.500	0,32 ~ 0,45	2.700	0,32 ~ 0,45
10	3.200	0,35 ~ 0,50	3.200	0,35 ~ 0,50	2.400	0,35 ~ 0,50
11	2.900	0,39 ~ 0,55	2.900	0,39 ~ 0,55	2.200	0,39 ~ 0,50
12	2.700	0,42 ~ 0,60	2.700	0,42 ~ 0,60	2.000	0,42 ~ 0,54
13	2.400	0,46 ~ 0,65	2.400	0,46 ~ 0,65	1.800	0,46 ~ 0,59
14	2.300	0,49 ~ 0,70	2.300	0,49 ~ 0,70	1.700	0,49 ~ 0,63
16	2.000	0,48 ~ 0,72	2.000	0,48 ~ 0,72	1.500	0,48 ~ 0,64
18	1.800	0,54 ~ 0,81	1.800	0,54 ~ 0,81	1.300	0,54 ~ 0,72

TRS-HO-3D/5D

Vc	Alloys Steels		Cast Iron		Ductile Cast Iron	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
	60 ~ 90 m/min		80 ~ 120 m/min		60 ~ 100 m/min	
Ø						
5	4.800	0,18 ~ 0,25	6.400	0,18 ~ 0,30	5.100	0,18 ~ 0,25
6	4.000	0,21 ~ 0,30	5.300	0,21 ~ 0,36	4.200	0,21 ~ 0,30
7	3.400	0,25 ~ 0,35	4.500	0,25 ~ 0,42	3.600	0,25 ~ 0,35
8	3.000	0,28 ~ 0,40	4.000	0,28 ~ 0,48	3.200	0,28 ~ 0,40
9	2.700	0,32 ~ 0,45	3.500	0,32 ~ 0,54	2.800	0,32 ~ 0,45
10	2.400	0,35 ~ 0,50	3.200	0,35 ~ 0,60	2.500	0,35 ~ 0,50
11	2.200	0,39 ~ 0,50	2.900	0,39 ~ 0,66	2.300	0,39 ~ 0,55
12	2.000	0,42 ~ 0,54	2.700	0,42 ~ 0,72	2.100	0,42 ~ 0,60
13	1.800	0,46 ~ 0,59	2.400	0,46 ~ 0,78	2.000	0,46 ~ 0,65
14	1.700	0,49 ~ 0,63	2.300	0,49 ~ 0,84	1.800	0,49 ~ 0,70
16	1.500	0,48 ~ 0,64	2.000	0,56 ~ 0,80	1.600	0,48 ~ 0,72
18	1.300	0,54 ~ 0,72	1.800	0,63 ~ 0,90	1.400	0,54 ~ 0,81

1. The indicated speeds and feeds are for **water soluble oil**.
2. Suitable cutting fluid is water-emulsifiable high density oil (less than 20 times dilution).
3. When using non-water soluble oil or water-emulsifiable (over 20times dilution), reduce drilling speed by 30%.
4. When inserting a drill into the machine, use a collet that does not have any scratches or dust located within internal bore. Also, **reduce deflection of drill to less than 0.02mm**.
5. Fasten the work material to reduce the possibility of work deformation, deflection of machined surface, or vibration.
6. A clogged oil hole can lead to a breakage. Make sure that a filter is attached to the oil feeder.



OSG EUROPE s.a. TOOL COMMUNICATION OSG CORPORATION

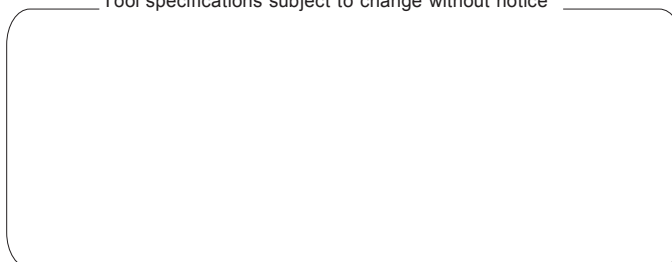
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www.osgeurope.com



Tool specifications subject to change without notice



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EURTRS-HO-3D(5D)08R11a