MULTIPLEX

INTERCHANGEABLE INSERT DRILLING SYSTEM WITH INTERNAL COOLING

NEW

- extra long holders for drilling depth up to 20 x D
- holders with straight shank up to drilling diameter 102 mm

HARTNER

Precision Drilling Tools

MULTIPLEX – THE VERSATILE ALTERNATIVE

The interchangeable insert drilling system with internal cooling for especially high performance machining, for hole diameters from 9.7 to 102 mm.

The most important system advantages

- No re-grinding and re-coating costs. Only the insert is replaced.
- Quick insert change: Simply loosen two screws, remove worn insert, insert new blade, tighten screws – finished.
- Variable tool material, variable coating.
- Constant tool length, resulting in reduction of set-up time and therefore set-up costs.
  Pre-set-up time and re-setting no longer necessary with CNC machines and automatics.
- High performance machining and optimal tool life thanks to internal cooling and wear resistant inserts.
- Reduced storage costs because one holder can be applied for several insert diameters.

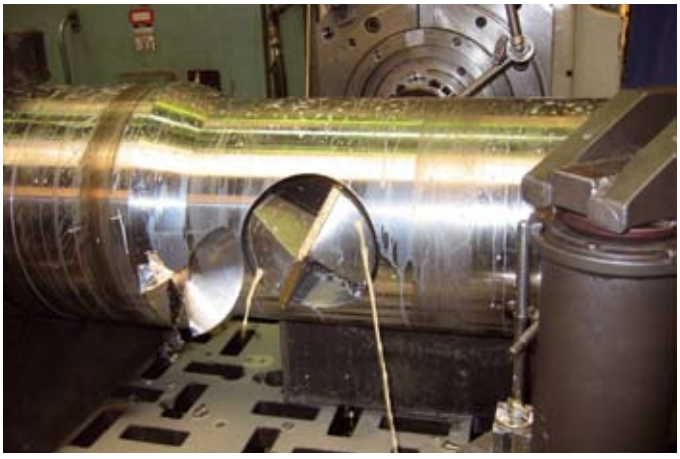
The holder range

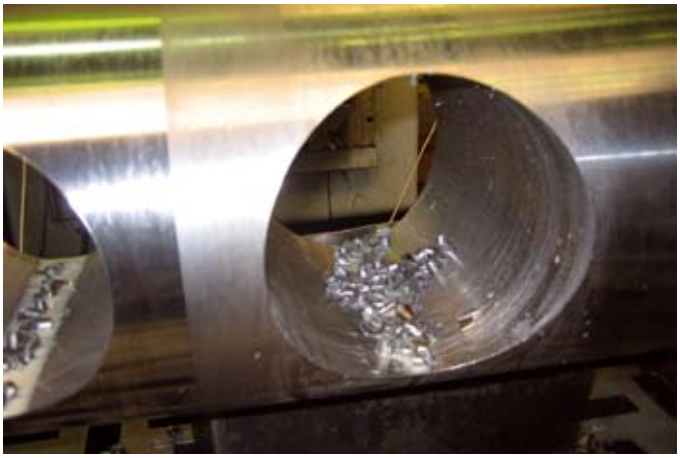
All holders offer internal coolant delivery. It ensures the coolant is transported directly to the cutting edges and provides total efficiency. Even high cutting rates are not a problem for the inserts. In addition, the internal cooling ensures optimal chip evacuation by washing the swarf out of the drilled hole thereby making the time consuming peckfeeding unnecessary.

The straight shank holders are available in the following lengths:

- short, for drilling depths 3 x D
- long, for drilling depths 5 x D
- extra long for drilling depths 7 x D
- extra length for drilling depths up to 20 x D

Standard taper and straight shank holders are hardened, nickel-plated and possess an optimised flute profile (<35 mm Ø) providing improved quality and chip evacuation.





Application example: Drilling into the solid with Ø 185.00 mm in material 34 CrNiMo with 1000 N/mm^2

THE MULTIPLEX HOLDER RANGE

The Multiplex-System offers a choice from different holders:

- Four straight shank holders for the drilling depths 3xD, 5xD and 7xD (Ø-range 9.80 - 65.00 mm) as well as an extra long version (Ø-range 11.71 - 102.00 mm).

Product No. **86612**	Page 8

Product No. **86622**	Page 9

Product No. **86624**	Page 9

Special program	Page 10 NEW

- One straight fluted holder for the application with countersink ring

Product No. **86750**	Page 17

- Two straight shank holders for stepped holes with a 90° or 180° step angle.

Product No. **86740**	Page 12

Product No. **86730**	Page 12

- Two Morse taper shank holders with axial coolant delivery, short or long design for the diameter range 9.70 to 25.40 mm. Design with radial coolant supply on request.

Product No. **86630**	Page 14

Product No. **86650**	Page 15

- Three Morse taper shank holders with radial coolant delivery via collar in short, long or extra long design for the diameter range 25.00 to 102.00 mm (axial coolant delivery by modification possible).

Product No. **86670**	Page 14

Product No. **86680**	Page 15

Special program	Page 16 NEW

THE MULTIPLEX INTERCHANGEABLE INSERTS

Wide choice

In order to achieve optimal machining results in all materials, Hartner's Multiplex system offers a wide choice of interchangeable inserts .

The following inserts are available:

- Solid carbide interchangeable insert with margin and TiN- and Fire-coating (product no. 86708/86702, up to Ø 35 mm)
- Solid carbide interchangeable insert without margin and TiN- and Fire-coating (product no. 86709/86701, up to Ø 35 mm)
- HSS-E interchangeable insert with chip breaker grooves and TiN- and FIRE-coating (product no. 86602/86609, up to Ø 25 mm)
- PM HSS-E interchangeable insert (MP05) with chip breaker grooves and AlTiN-coating (product no. 86609, > Ø 25 mm)

Please take note of our special geometries (page 6), delivery within approximately 3 weeks

In addition, the following bright finish carbide interchangeable inserts are available as stepped inserts for the stepped holder or countersink ring:

- Carbide step insert, carbide grade P20-P30. Suitable for steel and grey cast iron. (product no. 86850/86851/86852)
- Carbide step insert, carbide grade K10-K20. Suitable for grey cast iron, steel, al-alloys and Duroplastics. (product no. 86860/86861/86862)
- Carbide step insert for countersink ring, carbide grade K10-K20. Suitable for grey cast iron, steel, Al-alloys and Duroplastics (product no. 86703/86704)

Application range of inserts

The carbide inserts for the major cutting edge offer an extremely favourable ratio of toughness and hardness thanks to the special carbide grade of the insert. They are therefore especially resiliant against forces occurring during the drilling operation. Inserts without margins are especially suitable for materials with tensile strength of up to 600 N/mm², inserts with margins can be applied in materials with a tensile strength over 600 N/mm².

In addition, cobalt-alloyed molybdenum steel inserts are available for the machining of alloyed and un-alloyed steel and cast steel with a tensile strength up to 1100 N/mm², grey cast iron, malleable cast iron, spheroidal cast iron, sintered iron, nickel silver, bronze, brass as well as aluminium.

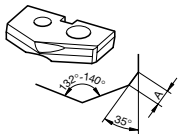
Special solutions to customer specific demands are available.
Please take note of our special geometries on page 6.

Insert coatings

In order to achieve the highest possible cutting speeds and tool life, inserts for the major cutting edges are TiN-, AlTiN+- or FIRE-coated. TiN is the most cost-efficient solution for standard applications. FIRE increases the efficiency of the insert in comparison with TiN-coated inserts and is suitable for applications under especially demanding conditions. The AlTiN+-coating of our MP05 insert offers high hot hardness and is especially suitable for difficult-to-machine materials. Additional coatings on request. See also page 19.

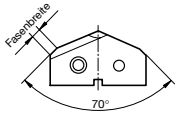
Point angle for insert diameter
≤ Ø 25.4 = 135°
> Ø 25.4 = 132°
> Ø 66.0 = 140°

Margin for carbide inserts Ø 9.7 - 35 mm and HSS-E inserts Ø 9.7 - 25.4 mm



Insert diameter	Margin A
Ø 9.8 - 13.4	0.25 ±0.05
Ø 13.5 - 18.9	0.30 ±0.05
Ø 19.0 - 25.4	0.35 ±0.05
Ø 25.5 - 35.0	0.40 ±0.05

Grinding instruction for point grinding for cast iron



Up to Ø mm	Land width mm	Tolerance mm	Clearance angle
35.00	1.0	± 0.2	8°
50.00	1.5	± 0.2	8°
80.00	2.0	± 0.2	8°
102.00	2.5	± 0.2	8°

Insert geometry

The Multiplex system's HSS-E and PM HSS interchange-able inserts are equipped with chip breakers and chip breaker grooves. Subsequently, they produce very short chips, easing chip evacuation.
The Multiplex system's short flute length gives the entire tool extreme rigidity, making it possible to apply high feed rates. In addition, it improves the self-centering characteristics.

Please note:
Because Multiplex tools are predominantly guided by the chisel edge, they are not suitable for the drilling of pre-cast or pre-drilled holes!

Further details can be found in the chapter "Important Notes" on page 19.

The MP05 interchangeable insert is made from PM HSS
Product No. 86609

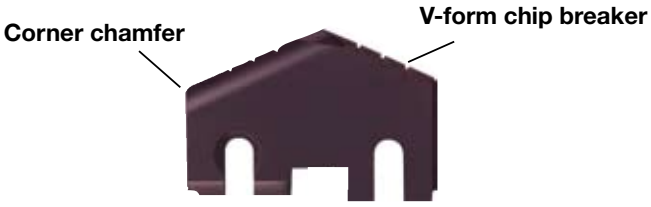
The insert has an optimised geometry and AlTiN-coating for an improved chip formation, longer tool life and re-duced wear.

The V-form chip breakers reduce the jamming of chips and therefore increase the tool life of the insert.

Application range:
Steel, stainless steel, cast iron, high heat resistant alloys, aluminium, non-ferrous alloys

Advantages:

- **Improved chip formation**
- **Increased tool life (thanks to corner chamfer) and reduced corner wear and reduced burr formation especially on 'break through'**
- **Improved heat dissipation and reduced wear thanks to corner chamfer**
- **Higher cutting speeds and longer tool life achievable thanks to new PM HSS-E (≤ Ø 66.0mm; > Ø 66,0 mm: HSS-E)**



SPECIAL GEOMETRIES

Special geometries in combination with different coatings from our program are available on request.
Please contact us, **delivery approximately 3 weeks.**

Form insert to customer's drawing (HSS-E/PM HSS-E or carbide).

NC insert (HSS-E/PM HSS-E or carbide) with 90° or 120°. (depending on Ø the 90° angle at the point is distorted)

Radius insert (HSS-E/PM HSS-E or carbide).

Stepped insert (HSS-E/PM HSS-E or carbide).

Aluminium geometry (carbide) for the application in non-ferrous metals and plastics.

Blind hole insert* (HSS-E/PM HSS-E) with center point.

Brass geometry (carbide) for the application in brass and similar materials.

Blind hole insert* (HSS-E/PM HSS-E) without center point.

Point grind for fiber plastics (carbide).

*** Please note when using blind hole inserts:**

- Application only with short holders.
- Pre-machining of bore hole with standard Multiplex insert (Ø of standard insert ≤ Ø of blind hole insert)
- Drilling in solid material is recommended only under special conditions.
- Please forward a drawing of bore hole to our technicians, if possible.

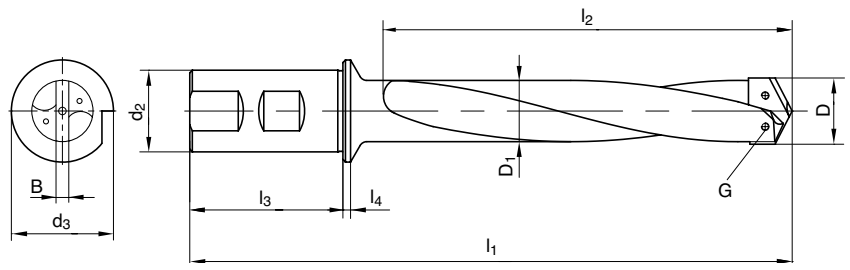
A MULTIPLEX SYSTEM SUMMARY

Which insert and which accessory is suitable for which holder? The following matrix provides an overview of the entire system:

	Straight shank					Stepped holder		Morse taper shank				
for	3xD	5xD	7xD	extra long		90°	180°	short, axial coolant delivery	long, axial coolant delivery	short, radial coolant delivery	short, radial coolant delivery	extra long, radial coolant delivery
accessories	**86612**	**86622**	**86624**		**86750**	**86730**	**86740**	**86630**	**86650**	**86670**	**86680**	
86602, HSS-E, interchangeable insert, TiN	●	●	●	●	●	●	●	●	●			
86608, HSS-E, interchangeable insert, Fire	●	●	●	●	●	●	●	●	●			
86609 PM HSS-E, interchangeable insert	●	●	●	●						●	●	
86708, carbide interch. insert, TiN, with margin	●	●	●	*	●	●	●	●	●	●	●	
86702, carbide interch. insert, Fire, with margin	●	●	●	*	●	●	●	●	●	●	●	
86709, carbide interch. insert, TiN, w/o margin	●	●	●	*	●	●	●	●	●	●	●	
86701, carbide interch. insert, Fire, w/o margin	●	●	●	*	●	●	●	●	●	●	●	
86850, indexable insert for stepped holder, bright						●	●					
86851, indexable insert for stepped holder, bright						●	●					
86852, indexable insert for stepped holder, bright						●	●					
86860, indexable insert for stepped holder, bright						●	●					
86861, indexable insert for stepped holder, bright						●	●					
86862, indexable insert for stepped holder, bright						●	●					
86703, indexable insert w/o chipbreaker for countersink ring					●							
86704, indexable insert with chipbreaker for countersink ring					●							
86807, Torx screw for stepped holder (index. insert)						●	●					
86807, Torx screw for straight/MT holder	●	●	●	●	●	●	●	●	●	●	●	●
86842, Torx screw driver for all holders	●	●	●	●	●	●	●	●	●	●	●	●
Coolant feed chuck with ISO taper acc. DIN 69871/cyl. mounting hole	●	●	●	●	●	●	●					
Coolant feed chuck with ISO taper acc. DIN 2080/cyl. mounting hole	●	●	●	●	●	●	●					
Coolant feed chuck with MT acc. DIN 228 B/cyl. mounting hole	●	●	●	●	●	●	●					
Coolant feed chuck with BT MAS/ cyl. mounting hole	●	●	●	●	●	●	●					
Bushing for coolant feed chuck with cyl. mounting hole	●	●	●	●	●	●	●					
86690, coolant del. pipe f. MT holder (with 82571+ 82578)										●	●	●
82571, coolant del. pipe for cool. del. collar 86690										●	●	●
82578, quick release pipe union f. 82571 w. 86690										●	●	●
86780, Countersink ring 90° for holder with guiding grooves					●							

* limited suitability

STANDARD RANGE STRAIGHT SHANK MULTIPLEX HOLDER



Shank dimensions to DIN 1835-B (Weldon) (for product no. 86612, 86622 and 86624)

Ø D mm	d_2 mm	d_3 mm	l_3 mm	l_4 mm
9.70-25.40	20	25	40	5.0
25.41-29.00	32	40	60	3.0
29.01-35.00	32	40	60	4.5
35.01-45.00	32	40	60	6.3
45.01-55.00	40	50	70	5.0
55.01-65.00	40	50	70	-

Two Torx screws are supplied with each holder

For dimensional drawing see "Shank dimensions Weldon", Lengths l_1 and l_2 incl. indexable insert.

*Attention: only for insert thickness 4 mm

86612 short, for drilling depths < 3 x D

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Holder-Ø D_1 mm	Width of slot B mm	Torx screws **86807**		Screw driver size	**Code no.**
					Size	Code-Nr.		
9.70 - 11.70	107	50.0	9.5	2.5	M 2x4	2.000	T 6	**09.500**
11.71 - 13.40	109	53.0	11.5	2.5	M 2x4	2.000	T 6	**11.500**
13.41 - 16.40	116	60.0	13.0	3.5	M 2.5x5	2.500	T 7	**13.000**
16.41 - 18.90	118	65.0	16.0	3.5	M 2.5x7	2.501	T 7	**16.000**
18.91 - 22.40	124	73.0	18.5	4.0	M 3x6	3.000	T 9	**18.500**
22.41 - 25.40*	127	78.0	22.0	4.0	M 3x8	3.001	T 9	**22.000**
25.41 - 29.00	178	105.0	24.0	5.0	M 3.5x10	3.500	T 15	**24.000**
29.01 - 35.00	178	108.0	28.0	5.0	M 3.5x10	3.500	T 15	**28.000**
35.01 - 45.00	223	152.0	34.0	7.0	M 4x15	4.001	T 20	**34.000**
45.01 - 55.00	233	152.0	44.0	7.0	M 4x15	4.001	T 20	**44.000**
55.01 - 65.00	233	152.0	54.0	7.0	M 4x15	4.001	T 20	**54.000**

For dimensional drawing see "Shank dimensions Weldon",
Lengths l_1 and l_2 incl. indexable insert.

*Attention: only for insert thickness 4 mm

86622 long, for drilling depths < 5 x D

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Holder-Ø D_1 mm	Width of slot B mm	Torx screws **86807**		Screw driver size	**Code no.**
					Size	Code-Nr.		
9.70 - 11.70	140	83.0	9.5	2.5	M 2x4	2.000	T 6	**09.500**
11.71 - 13.40	150	94.0	11.5	2.5	M 2x4	2.000	T 6	**11.500**
13.41 - 16.40	160	104.0	13.0	3.5	M 2.5x5	2.500	T 7	**13.000**
16.41 - 18.90	170	117.0	16.0	3.5	M 2.5x7	2.501	T 7	**16.000**
18.91 - 22.40	180	129.0	18.5	4.0	M 3x6	3.000	T 9	**18.500**
22.41 - 25.40*	180	131.0	22.0	4.0	M 3x8	3.001	T 9	**22.000**
25.41 - 29.00	240	166.0	24.0	5.0	M 3.5x10	3.500	T 15	**24.000**
29.01 - 35.00	240	170.0	28.0	5.0	M 3.5x10	3.500	T 15	**28.000**
35.01 - 45.00	280	210.0	34.0	7.0	M 4x15	4.001	T 20	**34.000**
45.01 - 55.00	290	210.0	44.0	7.0	M 4x15	4.001	T 20	**44.000**
55.01 - 65.00	290	210.0	54.0	7.0	M 4x15	4.001	T 20	**54.000**

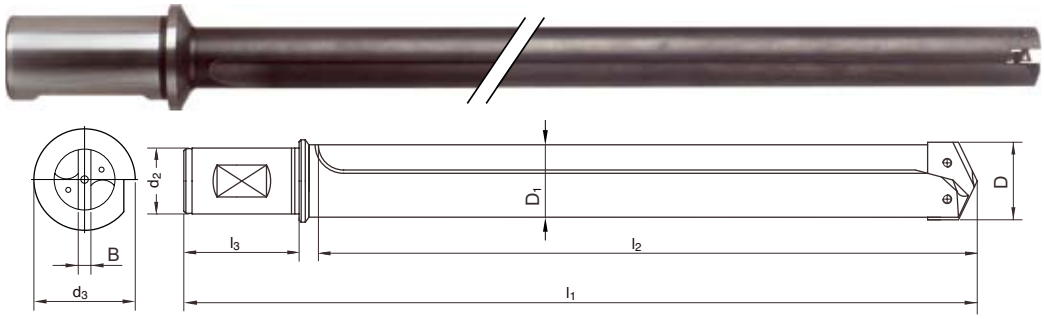
For dimensional drawing see "Shank dimensions Weldon",
Lengths l_1 and l_2 incl. indexable insert.

*Attention: only for insert thickness 4 mm

86624 extra long, for drilling depths < 7 x D

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Holder-Ø D_1 mm	Width of slot B mm	Torx screws **86807**		Screw driver size	**Code no.**
					Size	Code-Nr.		
9.70 - 11.70	180	123.0	9.5	2.5	M 2x4	2.000	T 6	**09.500**
11.71 - 13.40	190	134.0	11.5	2.5	M 2x4	2.000	T 6	**11.500**
13.41 - 16.40	210	155.0	13.0	3.5	M 2.5x5	2.500	T 7	**13.000**
16.41 - 18.90	220	168.0	16.0	3.5	M 2.5x7	2.501	T 7	**16.000**
18.91 - 22.40	250	199.0	18.5	4.0	M 3x6	3.000	T 9	**18.500**
22.41 - 25.40*	250	201.0	22.0	4.0	M 3x8	3.001	T 9	**22.000**
25.41 - 29.00	320	246.0	24.0	5.0	M 3.5x10	3.500	T 15	**24.000**
29.01 - 35.00	320	250.0	28.0	5.0	M 3.5x10	3.500	T 15	**28.000**
35.01 - 45.00	380	310.0	34.0	7.0	M 4x15	4.001	T 20	**34.000**
45.01 - 55.00	390	310.0	44.0	7.0	M 4x15	4.001	T 20	**44.000**
55.01 - 65.00	390	310.0	54.0	7.0	M 4x15	4.001	T 20	**54.000**

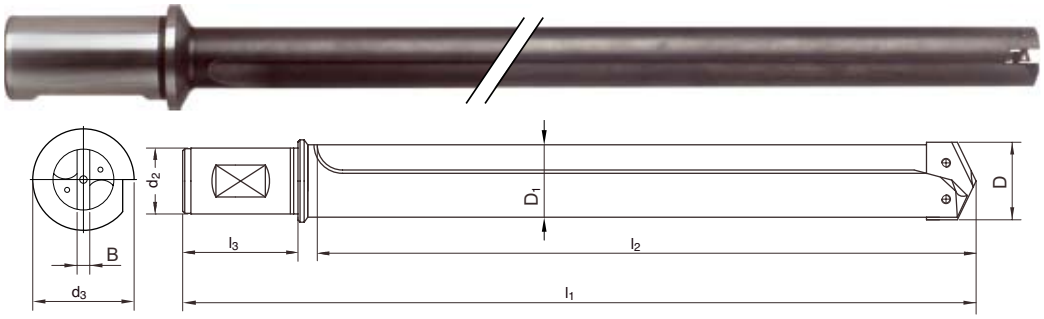
SPECIAL RANGE STRAIGHT SHANK MULTIPLEX HOLDER, STRAIGHT FLUTED



Shank dimensions see page 8, lengths l_1 and l_2 incl. indexable insert (sim. to Weldon)

Special dimensions, different from standard range

Hole-Ø D mm	Total length l1 mm	Flute length l2 mm	Holder-Ø D1 mm	Torx screws **86807**		Width of Slot B	Order-number
				Size	Code-Nr.		
11.71 - 13.40	159.0	103	11.5	M 2x4	2.000	2.5	**333003951**
11.71 - 13.40	179.0	123	11.5	M 2x4	2.000	2.5	**333003952**
13.41 - 16.40	198.5	144	13.0	M 2.5x5	2.500	3.5	**333003953**
13.41 - 16.40	238.5	184	13.0	M 2.5x5	2.500	3.5	**333003954**
13.41 - 16.40	318.5	264	13.0	M 2.5x5	2.500	3.5	**333010526**
15.00 - 16.40	95.0	40	14.5	M 2.5x5	2.500	3.5	**333006111**
15.00 - 16.40	125.0	70	14.5	M 2.5x5	2.500	3.5	**333006112**
15.00 - 16.40	178.5	124	14.5	M 2.5x5	2.500	3.5	**333006114**
15.00 - 16.40	198.5	144	14.5	M 2.5x5	2.500	3.5	**333006115**
15.00 - 16.40	238.5	184	14.5	M 2.5x5	2.500	3.5	**333003955**
15.00 - 16.40	268.5	214	14.5	M 2.5x5	2.500	3.5	**333003956**
15.00 - 16.40	398.5	344	14.5	M 2.5x5	2.500	3.5	**333010527**
16.41 - 18.90	260.5	209	16.0	M 2.5x7	2.501	3.5	**333003957**
16.41 - 18.90	295.5	244	16.0	M 2.5x7	2.501	3.5	**333003958**
16.41 - 18.90	410.5	359	16.0	M 2.5x7	2.501	3.5	**333010533**
18.91 - 22.40	304.0	255	18.5	M 3x6	3.000	4.0	**333003959**
18.91 - 22.40	344.0	295	18.5	M 3x6	3.000	4.0	**333003960**
18.91 - 22.40	464.0	415	18.5	M 3x6	3.000	4.0	**333010538**
22.41 - 25.40*	285.0	237	22.0	M 3x8	3.001	4.0	**333008888**
22.41 - 25.40*	345.0	297	22.0	M 3x8	3.001	4.0	**333003961**
22.41 - 25.40*	385.0	337	22.0	M 3x8	3.001	4.0	**333003962**
22.41 - 25.40*	535.0	487	22.0	M 3x8	3.001	4.0	**333019545**
25.41 - 29.00	343.0	270	23.0	M 3x8	3.001	5.0	**333007963**
25.41 - 29.00	433.0	360	23.0	M 3x8	3.001	5.0	**333003963**
25.41 - 29.00	503.0	430	23.0	M 3x8	3.001	5.0	**333003964**
25.41 - 29.00	683.0	610	23.0	M 3x8	3.001	5.0	**333010548**
29.01 - 35.00	393.0	321	28.0	M 3.5x10	3.500	5.0	**333006118**
29.01 - 35.00	473.0	401	28.0	M 3.5x10	3.500	5.0	**333003965**
29.01 - 35.00	553.0	481	28.0	M 3.5x10	3.500	5.0	**333003966**
29.01 - 35.00	763.0	691	28.0	M 3.5x10	3.500	5.0	**333010551**
33.20 - 36.00**	148.0	77	33.0	M 3.5x10	3.500	5.0	**333006119**
33.20 - 36.00**	173.0	102	33.0	M 3.5x10	3.500	5.0	**333006120**
33.20 - 36.00**	223.0	152	33.0	M 3.5x10	3.500	5.0	**333010552**
33.20 - 36.00**	273.0	202	33.0	M 3.5x10	3.500	5.0	**333006121**
33.20 - 36.00**	393.0	322	33.0	M 3.5x10	3.500	5.0	**333006122**



Shank dimensions see page 8, lengths l_1 and l_2 incl. indexable insert (sim. to Weldon)

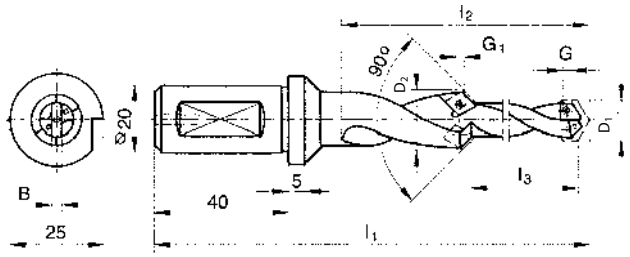
Special dimensions, different from standard range

Hole-Ø D mm	Total length l1 mm	Flute length l2 mm	Holder-Ø D1 mm	Torx screws **86807**		Width of Slot B	Order-number
				Size	Code-Nr.		
33.20 - 36.00**	503.0	432	33.0	M 3.5x10	3.500	5.0	**333003967**
33.20 - 36.00**	603.0	532	33.0	M 3.5x10	3.500	5.0	**333003968**
33.20 - 36.00**	823.0	752	33.0	M 3.5x10	3.500	5.0	**333010553**
35.01 - 45.00	457.0	387	34.0	M 4x15	4.001	7.0	**333003969**
35.01 - 45.00	607.0	537	34.0	M 4x15	4.001	7.0	**333003970**
45.01 - 55.00	467.0	387	44.0	M 4x15	4.001	7.0	**333003971**
45.01 - 55.00	617.0	537	44.0	M 4x15	4.001	7.0	**333003972**
55.01 - 65.00	467.0	387	54.0	M 4x15	4.001	7.0	**333003973**
55.01 - 65.00	617.0	537	54.0	M 4x15	4.001	7.0	**333003974**
65.01 - 78.00	230.0	155	63.0	M 5x20	5.000	9.0	**333017372**
65.01 - 78.00	340.0	265	63.0	M 5x20	5.000	9.0	**333017374**
65.01 - 78.00	620.0	545	63.0	M 5x20	5.000	9.0	**333017375**
78.01 - 90.00	240.0	155	77.0	M 5x20	5.000	9.0	**333017376**
78.01 - 90.00	350.0	265	77.0	M 5x20	5.000	9.0	**333017377**
78.01 - 90.00	630.0	545	77.0	M 5x20	5.000	9.0	**333017378**
78.01 - 90.00	240.0	155	89.0	M 5x20	5.000	9.0	**333017379**
90.01 - 102.00	350.0	265	89.0	M 5x20	5.000	9.0	**333017380**
90.01 - 102.00	630.0	545	89.0	M 5x20	5.000	9.0	**333017381**

*Attention: only for insert thickness 4 mm
** insert thickness 5 mm

Delivery within appr. 2 weeks

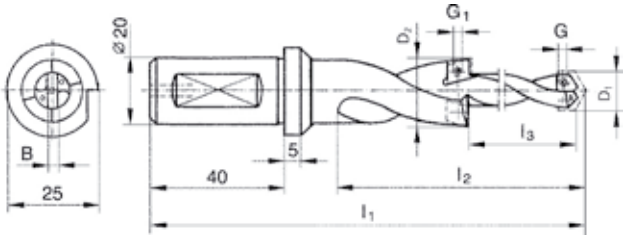
STANDARD RANGE STRAIGHT SHANK MULTIPLEX HOLDER



86740 for stepped holes, 90° step angle

For	Body-Ø d2 mm	Step-Ø d1 mm	Total length l1 mm	Flute length l2 mm	Step length l3 mm	Width of slot B mm	Code-No.
M 12	16	10.2	118	57	30.0	2.5	**16.000**
M 14	20	12.0	128	69	34.5	2.5	**20.000**
M 16	21	14.0	133	74	38.5	3.5	**21.000**
M 18	21	15.5	133	74	38.5	3.5	**21.001**
M 20	24	17.5	145	88	47.5	3.5	**24.000**

Step drill for the efficient production of hole and countersink in one operation. For the production of tapping size holes to DIN 336, sheet 1, and countersinks to DIN-ISO 273, medial tolerance. Step angle 90°. Each holder is supplied with 4 Torx screws.



86730 for stepped holes, 180° step angle

For	Body-Ø d2 mm	Step-Ø d1 mm	Total length l1 mm	Flute length l2 mm	Step length l3 mm	Width of slot B mm	Code-No.
M 10	18.0	11.0	120	59	23	2.5	**18.000**
M 12	20.0	13.5	128	69	27	3.5	**20.000**
M 14	24.0	15.5	140	81	31	3.5	**24.000**
M 16	26.0	17.5	148	91	35	3.5	**26.000**
M 18	30.0	20.0	157	102	39	4.0	**30.000**
M 20	33.0	22.0	167	112	43	4.0	**33.000**

Step drill for the efficient production of hole and countersink in one operation. For the production of clearance holes to DIN-ISO 273 and screw head angles form H, J and K. Medial tolerance to DIN 74, part 2. Step angle 180°. Each holder is supplied with 4 Torx screws.

ACCESSORIES SPECIFICALLY FOR STRAIGHT SHANK MULTIPLEX HOLDERS FOR STEPPED HOLES

86807 Torx screws for stepped holder, step angle 90°

For holder number	Torx screws for boring insert G	Order number	Torx screws for step insert G1	Order number
86740 16.000	M 2 x 4	**86807** 2.000	M 2 x 4	**86807** 2.000
86740 20.000	M 2 x 4	**86807** 2.000	M 2.5 x 5	**86807** 2.500
86740 21.000	M 2.5 x 5	**86807** 2.500	M 2.5 x 5	**86807** 2.500
86740 21.001	M 2.5 x 5	**86807** 2.500	M 2.5 x 5	**86807** 2.500
86740 24.000	M 2.5 x 7	**86807** 2.501	M 2.5 x 5	**86807** 2.500

86807 Torx screws for stepped holder, step angle 180°

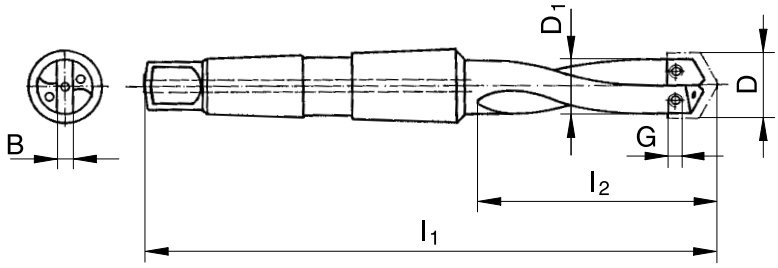
For holder number	Torx screws for boring insert G	Order number	Torx screws for step insert G1	Order number
86730 18.000	M 2 x 4	**86807** 2.000	M 2 x 4	**86807** 2.000
86730 20.000	M 2.5 x 5	**86807** 2.500	M 2 x 4	**86807** 2.000
86730 24.000	M 2.5 x 5	**86807** 2.500	M 2.5 x 5	**86807** 2.500
86730 26.000	M 2.5 x 7	**86807** 2.501	M 2.5 x 7	**86807** 2.501
86730 30.000	M 3 x 6	**86807** 3.000	M 4 x 9	**86807** 4.000
86730 33.000	M 3 x 6	**86807** 3.000	M 4 x 9	**86807** 4.000

Indexable inserts for stepped holders

Carbide grade P20-P30	Carbide grade K10-K20	For holder order number	Hole and countersink for thread size
86850 42.040	**86860** 42.040	**86730** 18.000	M 10
ISO-EPMW 040204	ISO-EPMW 040204	**86730** 20.000	M 12
		86740 16.000	M 12
86851 62.040	**86861** 62.040	**86730** 24.000	M 14
ISO-EPMT 060204	ISO-EPMT 060204	**86730** 26.000	M 16
		86740 20.000	M 14
		86740 21.000	M 16
		86740 21.001	M 18
		86740 24.000	M 20
86852 83.040	**86862** 83.040	**86730** 30.000	M 18
ISO-EPMT 08M304	ISO-EPMT 08M304	**86730** 33.000	M 20

Coatings on request

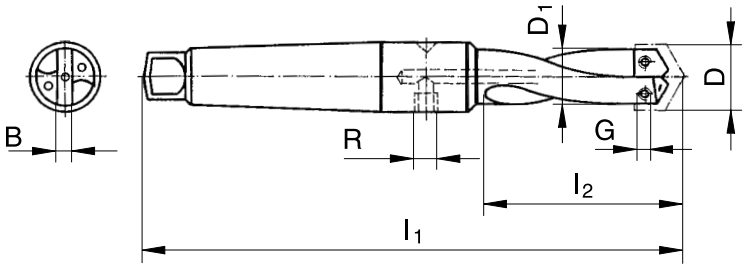
STANDARD RANGE MORSE TAPER SHANK MULTIPLEX HOLDERS



*Attention: only for insert thickness 4 mm

86630 short, axial coolant delivery, radial coolant delivery on request

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Morse taper	Holder-Ø d_1 mm	Width of slot B mm	Torx screws **86807**		Screw driver size	**Code-No.**
						Size	Code-No		
9.70 - 11.70	139	56	2	9.5	2.5	M 2x4	2.000	T 6	**09.500**
11.71 - 13.40	141	58	2	11.5	2.5	M 2x4	2.000	T 6	**11.500**
13.41 - 16.40	148	63	2	13.0	3.5	M 2.5x5	2.500	T 7	**13.000**
16.41 - 18.90	150	67	2	16.0	3.5	M 2.5x7	2.501	T 7	**16.000**
18.91 - 22.40	178	76	3	18.5	4.0	M 3x6	3.000	T 9	**18.500**
22.41 - 25.40*	181	80	3	22.0	4.0	M 3x8	3.001	T 9	**22.000**



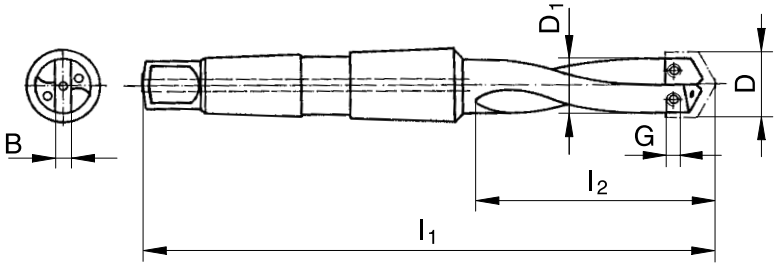
- holder ≥ Ø 63 mm straight fluted
- morse taper 5 for cotter retention

* plate thickness 5 mm

86670 short, radial coolant delivery, axial coolant delivery on request

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Morse taper	Holder-Ø d_1 mm	Width of slot B mm	R	Torx screws **86807**		Screw driver size	**Code-No.**
							Size	Code-No		
25.01 - 29.00*	279	108	4	24	5	G 1/4"	M 3.5x10	3.500	T 15	**24.000**
29.01 - 35.00	279	108	4	28	5	G 1/4"	M 3.5x10	3.500	T 15	**28.000**
35.01 - 45.00	324	152	4	34	7	G 1/4"	M 4x15	4.001	T 20	**34.000**
45.01 - 55.00	324	152	4	44	7	G 1/4"	M 4x15	4.001	T 20	**44.000**
55.01 - 65.00	324	152	4	54	7	G 1/4"	M 4x15	4.001	T 20	**54.000**
65.01 - 78.00	436	216	5	63	9	G 1/2"	M 5x20	5.000	T 20	**63.000**
78.01 - 90.00	436	216	5	77	9	G 1/2"	M 5x20	5.000	T 20	**77.000**
90.01 - 102.00	436	216	5	89	9	G 1/2"	M 5x20	5.000	T 20	**89.000**

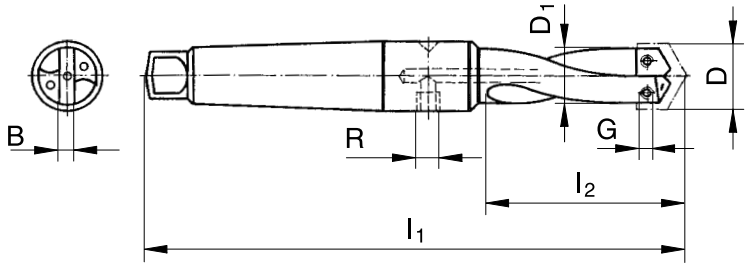
STANDARD RANGE MORSE TAPER SHANK MULTIPLEX HOLDERS



*Attention: only for insert thickness 4 mm

86650 long, axial coolant delivery, radial coolant delivery on request

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Morse taper	Holder-Ø d_1 mm	Width of slot B mm	Torx screws **86807**		Screw driver size	**Code-No.**
						Size	Code-No		
9.70 - 11.70	186	103	2	9.5	2.5	M 2x4	2.000	T 6	**09.500**
11.71 - 13.40	191	108	2	11.5	2.5	M 2x4	2.000	T 6	**11.500**
13.41 - 16.40	210	125	2	13.0	3.5	M 2.5x5	2.500	T 7	**13.000**
16.41 - 18.90	218	135	2	16.0	3.5	M 2.5x7	2.501	T 7	**16.000**
18.91 - 22.40	258	156	3	18.5	4.0	M 3x6	3.000	T 9	**18.500**
22.41 - 25.40*	266	165	3	22.0	4.0	M 3x8	3.001	T 9	**22.000**



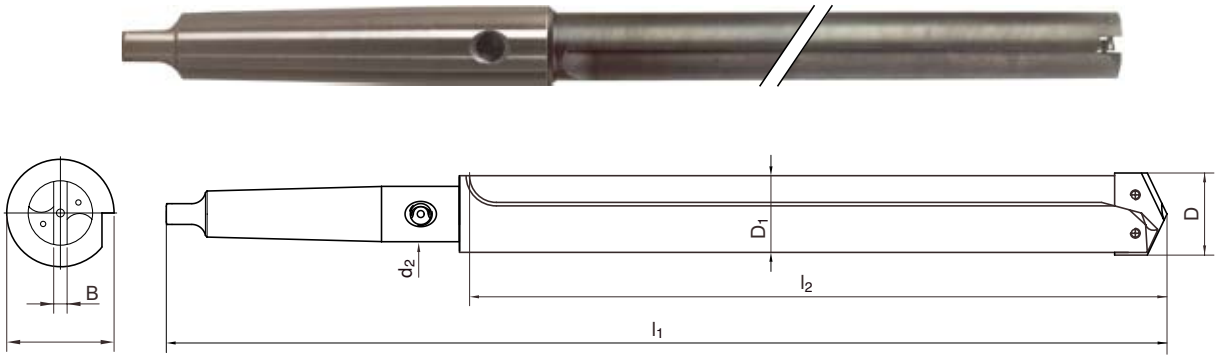
- holder ≥ Ø 63 mm straight fluted
- morse taper 5 for cotter retention

* plate thickness 5 mm

86680 long, radial coolant delivery, axial coolant delivery on request

Hole Ø-range D mm	Total length l_1 mm	Flute length l_2 mm	Morse taper	Holder-Ø d_1 mm	Width of slot B mm	R	Torx screws **86807**		Screw driver size	**Code no.**
							Size	Code-Nr.		
25.01 - 29.00*	379	208	4	24	5	G 1/4"	M 3.5x10	3.500	T 15	**24.000**
29.01 - 35.00	379	208	4	28	5	G 1/4"	M 3.5x10	3.500	T 15	**28.000**
35.01 - 45.00	429	257	4	34	7	G 1/4"	M 4x15	4.001	T 20	**34.000**
45.01 - 55.00	429	257	4	44	7	G 1/4"	M 4x15	4.001	T 20	**44.000**
55.01 - 65.00	429	257	4	54	7	G 1/4"	M 4x15	4.001	T 20	**54.000**
65.01 - 78.00	536	316	5	63	9	G 1/2"	M 5x20	5.000	T 20	**63.000**
78.01 - 90.00	536	316	5	77	9	G 1/2"	M 5x20	5.000	T 20	**77.000**
90.01 - 102.00	536	316	5	89	9	G 1/2"	M 5x20	5.000	T 20	**89.000**

SPECIAL RANGE MORSE TAPER SHANK MULTIPLEX HOLDERS

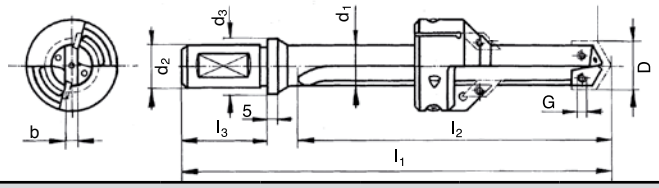


Special dimensions, different from standard range

Hole Ø-range D mm	Total length l1 mm	Flute length l2 mm	Morse taper	Holder-Ø D1 mm	Torx screws **86807**		Width of slot B mm	**Order-No.**
					Size	Code-No		
35.01 - 45.00	716	545	4	34	M 4x15	4.001	7	**333017389**
45.01 - 55.00	716	545	4	44	M 4x15	4.001	7	**333017392**
55.01 - 65.00	716	545	4	54	M 4x15	4.001	7	**333017395**
65.01 - 78.00	766	545	5	63	M 5x20	5.000	9	**333017398**
78.01 - 90.00	766	545	5	77	M 5x20	5.000	9	**333017401**
90.01 - 102.00	766	545	5	89	M 5x20	5.000	9	**333017404**

Delivery within 2 weeks

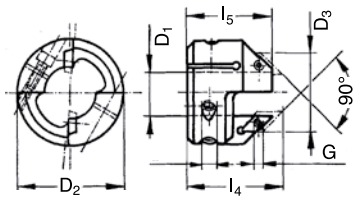
STANDARD RANGE STRAIGHT SHANK MULTIPLEX HOLDER WITH COUNTERSINK RING



Holder with guiding grooves for countersink ring (without ring and inserts) for drilling and de-burring, chamfering or countersinking in one step, e.g. for tapping size holes to DIN 336.

86750 for application with countersink ring 86780

Ø D mm	d1 mm	d2 mm	d3 mm	l1 mm	l2 mm	l3 mm	b mm	Torx-screw **86807**		Screw driver for Torx	**Code-No.**
								Size	Code-No.		
9.70-11.7	9.500	20.000	25.000	151.50	93.00	40.00	2.50	M 2 x 4	2.000	T6	**9.500**
11.71-13.4	11.500	20.000	25.000	156.50	100.00	40.00	2.50	M 2 x 4	2.000	T6	**11.500**
13.41-16.4	13.000	20.000	25.000	175.00	119.00	40.00	3.50	M 2.5 x 5	2.500	T7	**13.000**
16.41-18.9	16.000	20.000	25.000	183.00	129.00	40.00	3.50	M 2.5 x 7	2.501	T7	**16.000**
18.91-22.4	18.500	20.000	25.000	200.50	149.00	40.00	4.00	M 3 x 6	3.000	T9	**18.500**
22.41-25.4	22.000	20.000	25.000	208.50	159.00	40.00	4.00	M 3 x 8	3.001	T9	**22.000**



Countersink ring for holder with guiding grooves (without inserts), 90° step angle. For drilling and de-burring, chamfering or countersinking in one step, e.g. tapping size holes to DIN 336. The countersink ring bears 2 carbide inserts. It is infinitely variable in axial plane and clamped by 2 screws. The 2 guiding grooves secure the countersink ring against rotating. 2 large recesses at the inner diameter of the countersink ring - along the flutes of the holder - ensure optimal chip removal. For steel and cast steel (alloyed and unalloyed), grey cast iron, malleable cast iron, spheroidal graphite iron, bronze brass etc.

86780 Countersink ring for holder 86750

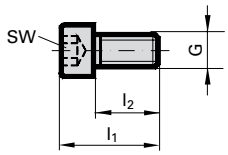
D1 mm	D2 mm	D3 mm	l4 mm	l5 mm	Torx-screw **86807**		Screw driver for Torx	**Code-No.**
					Size	Code-No.		
9.500	27.000	20.100	32.90	31.00	M 2.5 x 5	2.500	T7	**9.500**
11.500	30.000	22.400	32.90	31.00	M 2.5 x 5	2.500	T7	**11.500**
13.000	34.000	24.000	34.90	33.00	M 2.5 x 5	2.500	T7	**13.000**
16.000	38.000	27.200	35.90	34.00	M 2.5 x 5	2.500	T7	**16.000**
18.500	43.000	29.800	35.90	34.00	M 2.5 x 5	2.500	T7	**18.500**
22.000	46.000	33.000	36.90	35.00	M 2.5 x 5	2.500	T7	**22.000**

Interchangeable inserts for holder 86780
86703: neutral (1)
86704: right hand (2)

(1) without chipbreaker
(2) with chipbreaker

86703/86704 Inserts

ISO-description	**Code-No.**
XPEW100202	**7.000**



Clamping screw for countersink ring 86780

86836 Clamping screw

G	l1 mm	l2 mm	SW	**Code-No.**
M 4	17.00	12.00	3.00	**4.000**
M 4	21.00	16.00	3.00	**4.001**
M 5	21.00	16.00	4.00	**5.000**
M 5	26.00	20.00	4.00	**5.001**
M 6	26.00	20.00	5.00	**6.000**

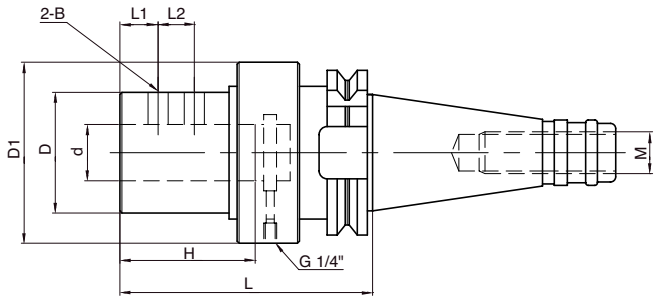
ACCESSORIES

86807 Torx screws for all insert holders except stepped holders

Size	Order no.	Torx-Size
M 2 x 4	**86807** 2.000	T6
M 2.5 x 5	**86807** 2.500	T7
M 2.5 x 7	**86807** 2.501	T7
M 3 x 6	**86807** 3.000	T9
M 3 x 8	**86807** 3.001	T9
M 3.5 x 10	**86807** 3.500	T15
M 4 x 9	**86807** 4.000	T15
M 4 x 15	**86807** 4.001	T20
M 5 x 20	**86807** 5.000	T20

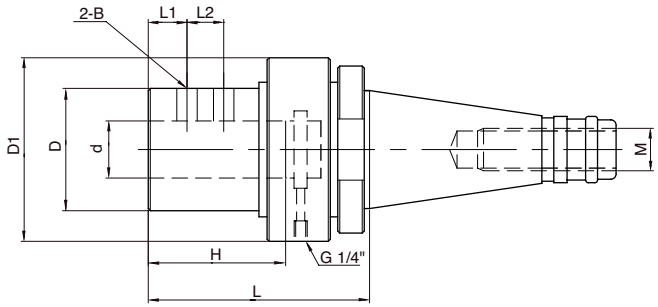
86842 screw driver for Torx screws

Screw driver size	Order no.
T 6	**86842** 2.000
T 7	**86842** 2.500
T 9	**86842** 3.000
T 15	**86842** 3.500
T 20	**86842** 4.000



Coolant feed chuck with ISO taper according DIN 69871 and cylindrical mounting hole

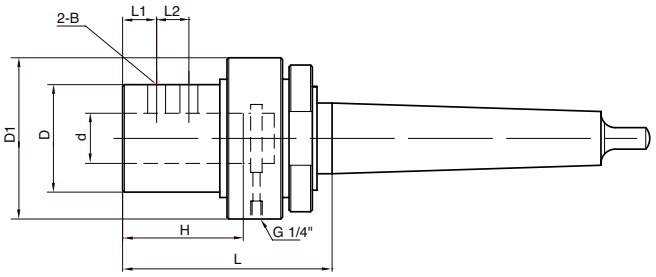
Type	d mm	L mm	D mm	D1 mm	H mm	L1 mm	L2 mm	2 B	M	Order No.
SK40-20	20	110	50	78	50	20	*	M12	M16	**333007046**
SK40-32	32	130	65	88	70	20	20	M14	M16	**333007047**
SK50-20	20	105	50	78	50	20	*	M12	M24	**333007048**
SK50-32	32	125	65	98	70	20	20	M14	M24	**333007049**
SK50-40	40	135	65	98	80	20	25	M16	M24	**333007050**



Coolant feed chuck with ISO taper according DIN 2080 and cylindrical mounting hole

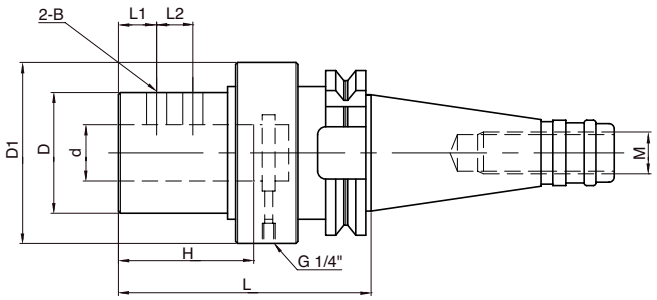
Type	d mm	L mm	D mm	D1 mm	H mm	L1 mm	L2 mm	2 B	M	Order No.
SK40-20	20	90	50	78	50	20	*	M12	M16	**333007051**
SK40-32	32	110	65	88	70	20	20	M14	M16	**333007052**
SK50-20	20	90	50	78	50	20	*	M12	M24	**333007053**
SK50-32	32	105	65	98	70	20	20	M14	M24	**333007054**
SK50-40	40	120	65	98	80	20	25	M16	M24	**333007055**

ACCESSORIES



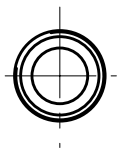
Coolant feed chuck with MT according DIN 228B and cylindrical mounting hole

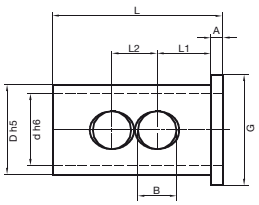
Type	d mm	L mm	D mm	D1 mm	H mm	L1 mm	L2 mm	2 B	M	Order No.
MK4-20	20	80	50	78	50	20	*	M12	-	**333007056**
MK4-32	32	100	65	88	70	20	20	M14	-	**333007057**
MK5-20	20	80	50	78	50	20	*	M12	-	**333007058**
MK5-32	32	100	65	88	70	20	20	M14	-	**333007059**
MK5-40	40	110	75	98	80	20	25	M16	-	**333007060**
MK6-20	20	85	50	78	50	20	*	M12	-	**333007061**
MK6-32	32	105	65	88	70	20	20	M14	-	**333007062**
MK6-40	40	120	75	98	80	20	25	M16	-	**333007063**



Coolant feed chuck with BT MAS403 and cylindrical mounting hole

Type	d mm	L mm	D mm	D1 mm	H mm	L1 mm	L2 mm	2 B	M	Order No.
BT40-20	20	105	50	78	50	20	*	M12	M16	**333007064**
BT40-32	32	125	65	88	70	20	20	M14	M16	**333007065**
BT50-20	20	120	50	78	50	20	*	M12	M24	**333007066**
BT50-32	32	135	65	96	70	20	20	M14	M24	**333007067**
BT50-40	40	145	65	96	80	20	25	M16	M24	**333007068**

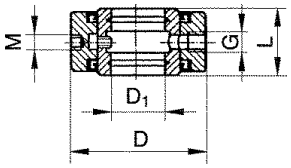




Bushing for coolant feed chuck with cylindrical mounting hole

Outer-Ø Inner-Ø	D	d	L	L1	L2	A	D1	B	Order No.
Ø 40 / Ø 20	40	20	75	20	*	5	49	M12	**333007075**
Ø 40 / Ø 25	40	25	75	20	25	5	49	M14	**333007076**
Ø 40 / Ø 32	40	32	75	20	25	5	49	M12	**333007077**
Ø 32 / Ø 20	32	20	65	20	*	5	49	M14	**333007078**
Ø 32 / Ø 25	32	25	65	20	20	5	49	M16	**333007079**

Pic. similar



86690 coolant delivery collar for holder series 86670 and 86680 (without screw fitting)

For Morse taper holder	D mm	D1 mm	L mm	M mm	G	Order no.
MK 4	80	31.75	45	M 10	G 1/4“	**86690** 31.750
MK 5	127	63.50	60	M 12	G 1/2“	**86690** 63.500

Pic. similar

82571 coolant delivery pipe for 86690

Nom. tube Ø	Thread Ø mm	Length mm	G		Suitable for order no.	Order no.
1/4"	13.160	200	G 1/4“		86690 31.750	**82571** 13.160
1/2"	20.960	200	G 1/2“		86690 63.500	**82571** 20.960

Pic. similar

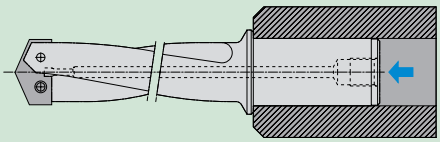
82578 quick release pipe union

Max. operating pressure P in bar	Material	Hose stem mm	G		Suitable for order no.	Order no.
60	Messing	9	G 1/4“		82571 13.160	**82578** 9.000
40	Messing	13	G 1/2“		82571 20.960	**82578** 13.000

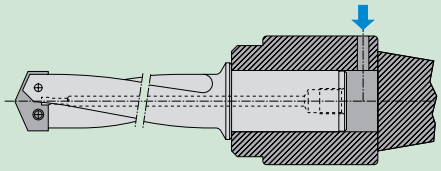
THE COOLANT DELIVERY

Every Multiplex holder is equipped with an internal coolant system guaranteeing an optimal delivery of the coolant or the lubricant respectively to the cutting edges during horizontal as well as vertical drilling operations and subsequently improving tool life. In addition, the coolant ensures an optimised chip evacuation from the hole.
The type of coolant delivery is dependent on the shank design:

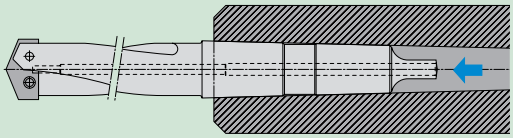
Coolant delivery bore on the end face of the shank
For **static** and **rotary** tools:
Axial coolant delivery through the tool holder.
For straight shank holders and hole-Ø 10 to 102 mm.
Holder product no. 86612/86622/86624/86730/86740/86750
and extra length holders



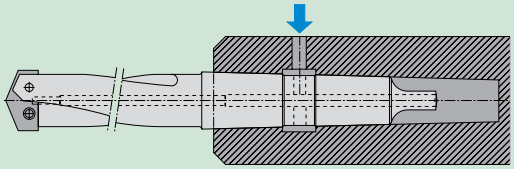
Coolant delivery bore on the surface of the shank with delivery chuck
For **rotary** tools:
Radial coolant delivery through the coolant delivery chuck.
For straight shank holders and hole-Ø 10 to 102 mm.
Holder product no. 86612/86622/86624/86730/86740/86750
and extra length holders
Kühlmittelzuführfutter SK40/50 auf zyl. und MK4/5/6 auf zyl.



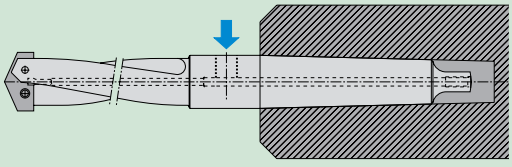
Coolant delivery bore in tang
For **static** and **rotary** tools:
Axial coolant delivery through the tool holder.
For Morse taper holders and hole-Ø 10 to 25 mm.
Holder product no. 86630/86650



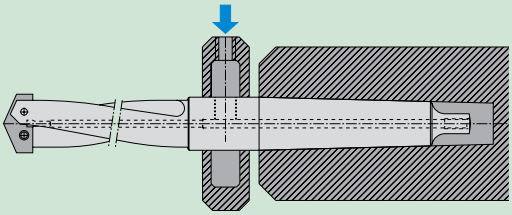
Lateral coolant delivery bore on Morse taper
For **static** tools:
Radial coolant delivery through the tool holder.
For Morse taper holders and hole-Ø 10 to 25 mm.
Holder on request



Lateral coolant delivery bore at seat of collar position
For **static** tools:
Coolant delivery via direct hose/pipe connection
with thread R1/4" and R1/2". For Morse taper holders with
seat for delivery collar for hole-Ø 25 to 102 mm.
Holder product no. 86670/86680 and extra length holders



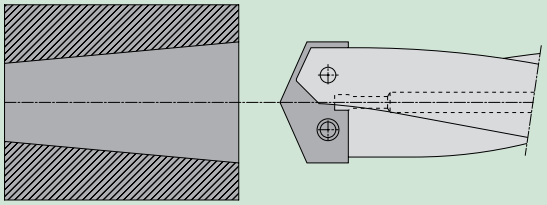
Lateral coolant delivery bore at seat of collar position
For **rotary** tools:
Radial coolant delivery through the delivery collar. For Morse taper
holders with collar running face for hole-Ø over 25 mm.
Holder product no. 86670/86680 and extra length holders



TIPS AND TRICKS

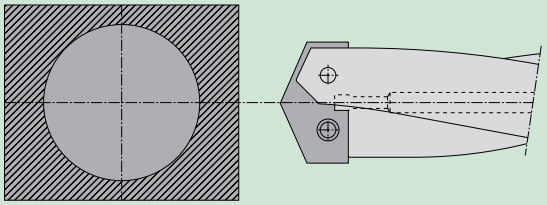
Drilling pre-drilled holes

Because the Multiplex system is guided predominantly by the chisel edge, it is not suitable for drilling pre-cast or pre-drilled holes. However, if the system is applied under the aforementioned conditions, the cutting parameters should be reduced.



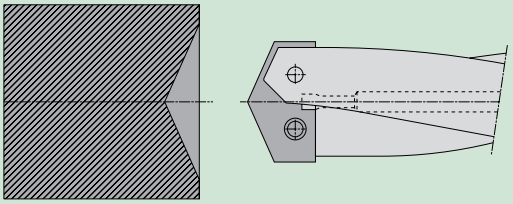
Interrupted cutting

The Multiplex system is not suitable for interrupted cutting (i.e. transverse holes that are larger than the drill diameter).



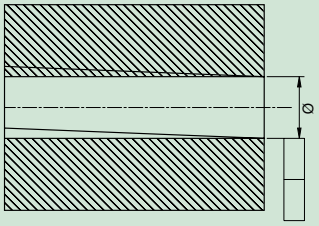
Centering

The inserts for the Multiplex system are web thinned. Therefore, centering is only necessary for larger drilling depths. If centering is necessary for technical reasons, the centering point angle must be equal or larger than the point angle of the insert.
The following applies: up to d = 25.4 mm = 135°
up to d = 66.0 mm = 132°
from d = 66.0 mm = 140°
A short holder (3xD) may also be applied for centering.



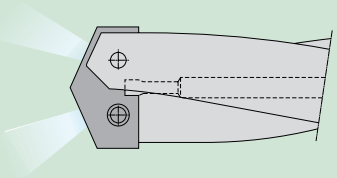
Drill running off center

A drill running off center can be due to several factors. An approximate value of 0.1-0.16 mm for drilling depths up to 7xD is accepted as the norm. In this case the shortest possible and therefore the most rigid holder type should be applied.



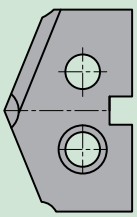
Coolant pressure

The coolant used with the Multiplex system is extremely important for the chip evacuation. It can be delivered at a pressure from approx. 5 bar. Generally, the following rule applies. The more coolant available, the better.
Through the use of coolant collars or coolant delivery chucks, the Multiplex system can also be applied on older machines with existing external cooling. One of our technical engineers will gladly find a solution to your specific application task.



Heavy cutting edge wear

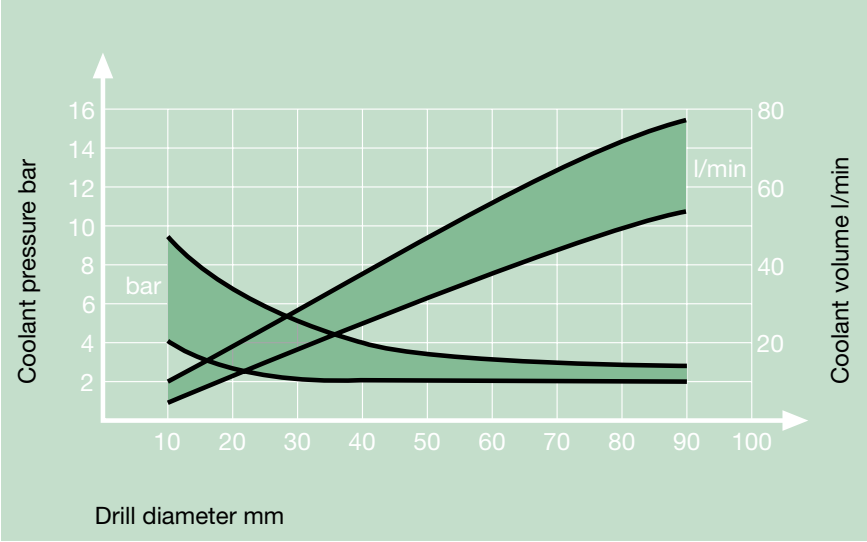
If heat has eroded the corners, the cutting speed is too high and must be reduced. Measure the unaffected diameter and re-calculate the cutting speed based on this new diameter. Subtract 10% from resulting speed and enter the value into the machine.



COOLING AGENTS

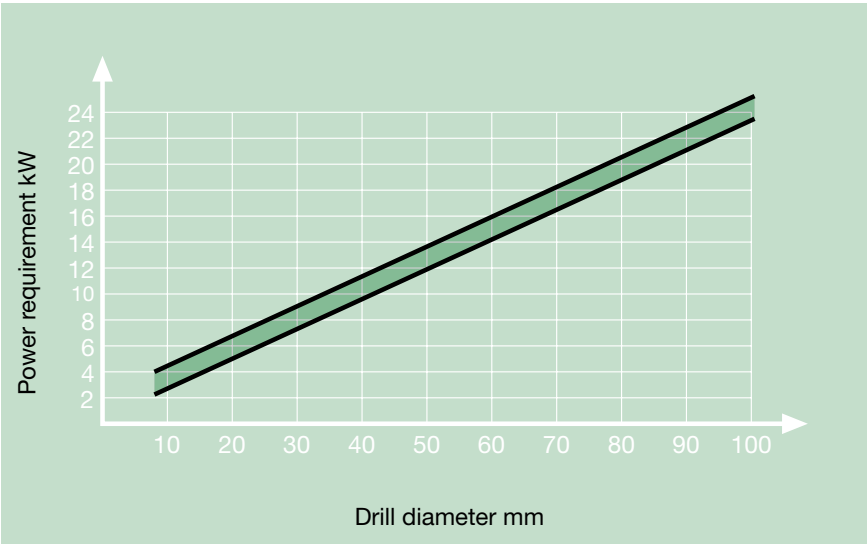
An efficient cooling agent is of extreme importance. Insufficient coolant pressure and volume can result in an unsatisfactory surface finish or tool breakage.
If possible, the size of solid particles in the coolant should not exceed 50 µm.

For the application of Multiplex tools with high speed steel or carbide inserts we recommend soluble oil as coolant applying the standard ratio of mixture of 1 : 20.
The coolant pressure and volume are more important than the composition of the soluble oil. An efficient cooling agent is therefore an important pre-requisite for sufficient cooling and lubrication.



MACHINE AND WORKPIECE

Only a rigid machine, spindle, workpiece and tool clamping make the application of carbide possible. Insufficient rigidity leads to vibrations or rapid corner wear of the drill during the production of through holes when the chisel edge exits the workpiece, resulting in reduced tool life or insert breakage.



HARD AND GLIDE COATINGS FOR ALL APPLICATIONS

With our 5 hard coatings and our glide coating MolyGlide we offer high performance tool coatings, optimizing the machining process in every todays workpiece material.

T TiN-coating (Titanium nitride)
Physical appearance: golden colour
Well proven, cost efficient all-round coating. Generally achieving performance increases. Surpassed in certain cases only by A-, C- and F-coatings.

A A-coating or TiAlN-coating (Titanium aluminium nitride)
Physical appearance: black-violet colour
A special coat for machining abrasive materials (cast iron, AlSi) and/or for working at high temperatures, i.e. in applications without coolant or with limited coolant facilities, such as deep or small diameter holes. Of importance is that the A-coat only achieves performance increases at higher machining rates.

C C-coating or TiCN-coating (Titanium carbon nitride)
Physical appearance: grey-violet colour
Brings considerable advantages in steel machining operations, interrupted cutting in difficult-to-machine materials or whenever demands as to hardness and toughness are above average.

F F-coating or FIRE-coating
Physical appearance: black-violet colour
Multilayer TiAlN-coat of gradational structure.
Allround coating achieving at least twice the performance of TiN. Combines the advantages of TiN, TiAlN and TiCN. Excellent, near ”fire resistant“ heat resistance. High toughness. FIRE plus MolyGlide - the ideal combination for dry and HSC machining.

M M-coating or MolyGlide®-coat based on MoS_2
Physical appearance: grey colour
Patented soft coating, glide coating, especially developed to improve chip transportation and eliminate built-up edge when machining Al-alloys. Combined with the hard coating FIRE, dry machining or minimal quantity lubrication can be achieved.

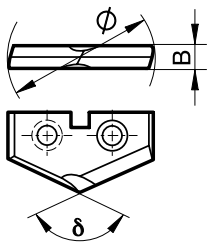
A Super A-coating oder AlTiN-coating (Aluminium titanium nitride)
Physical appearance: black-violet colour
Our well-proven A-coat on TiAlN basis has undergone continuous development. Optimising the structural, chemical and mechanical properties of the Super A-coating have resulted in an extremely high temperature hardness, very good oxidisation resistance as well as excellent coating adhesion. This coating is suitable for the machining of difficult-to-machine materials such as titanium-alloys, Inconel and hardened steels as well as for hard machining (>52HRC) and HSC.

	T TiN-coating	A TiAlN-coating	A AlTiN-coating	C TiCN-coating	F FIRE-coating	M MolyGlide-coating
process	Tigelverd. oder Arc	Arc	Arc	Tigelverd. oder Arc	Arc	Magnetron
coating temperature (°C)	450°	450°	450°	450°	450°	< 200°
substrate	high speed steels, carbide, cermet	high speed steels, carbide, cermet	carbide	high speed steels, carbide, cermet	high speed steels, carbide, cermet	high speed steels, carbide, cermet
thickness (μm)	application orientated					
Schichtaufbau	Monolayer	Monolayer	Gradiert	Gradiert	Monolayer	Monolayer
layers	1	1	1	1	6	1
hardness (HV 0.05)	2300	3300	3500	3000	3300	20-50
heat transfer (kW/mK)	0.07	0.05	0.05	0.1	0.05	< 0.1
Reibungskoeffizient	0.7	0.5	0.6	0.4	0.5	0.2
application-temperature (°C)	600°	800°	900°	400°	800°	800°
colour	gold-gelb	rotviolett-anthrazit	bläulich-anthrazit	metallisch-grau	rotviolett-anthrazit	dunkelgrau
type of machining	universal	turning, drilling	universal	milling, drilling, especially tapping	universal, especially drilling	drilling, tapping reaming, milling
preferred machineable materials	universal	cast, GGG, AlSi	difficult to machine materials likeTi-alloys, CGI, Inconel and hardened steels	steel, high tensile materials, Inconel, Monell	universal	Al, AlSi, steel, special alloys
characteristics	cost effective	dry machining	hard machining (> 52 HRC), HSC machining	dry machining, MQL, interrupted cutting	wide application range	dry machining, MQL

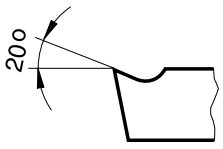
STANDARD RANGE SOLID CARBIDE INTERCHANGEABLE INSERTS WITH FACET POINT GRIND

Tool material		Solid carbide	Solid carbide	Solid carbide	Solid carbide
Product no.		86701	86702	86708	86709
		w/o margin	with margin	with margin	w/o margin
Surface finish		F	F	T	T
Dia-meter mm	Width mm				
10.00	2.5	●	●		
10.20	2.5	●	●	❍	
10.50	2.5	●	●		❍
11.00	2.5	❍	●		❍
11.11	2.5				❍
11.20	2.5				❍
11.50	2.5	●		●	
12.00	2.5	●	●		●
12.50	2.5	●	●		●
12.70	2.5				❍
12.75	2.5	●	●		❍
13.00	2.5	●	●	●	❍
13.50	3.5	●	●	❍	❍
13.75	3.5	❍	●		
14.00	3.5	●	●	●	●
14.10	3.5		●		
14.25	3.5	●			
14.50	3.5	●	●	❍	●
14.75	3.5	❍	❍		●
15.00	3.5	●	●	●	❍
15.50	3.5	●	●		
15.75	3.5	●			
15.88	3.5				❍
16.00	3.5	●		●	
16.25	3.5		●		❍
16.50	3.5	●	●	●	❍
16.67	3.5				❍
16.75	3.5	❍	❍	❍	
17.00	3.5	●	●	●	●
17.50	3.5	●	●	●	●
17.75	3.5	❍	●		❍
18.00	3.5	●	●	●	●
18.25	3.5	❍	●		❍
18.50	3.5	●	●	●	●
18.75	3.5		●		
19.00	4.0	●	●	●	●
19.50	4.0	●	●		●
19.75	4.0		●		❍
20.00	4.0	●	●	●	●
20.50	4.0	●	●	●	❍
20.64	4.0				❍
21.00	4.0	●	●	●	●
21.50	4.0	●	●		❍
22.00	4.0	●	●	●	●
22.30	4.0		●		
22.50	4.0			●	
22.75	4.0		●		
23.00	4.0	●	●	●	●
23.25	4.0				❍
23.50	4.0			●	
24.00	4.0	●		●	
24.25	4.0		❍		
24.50	4.0	●	●		●
24.75	4.0				❍
25.00	4.0	●	●	●	●
26.00	5.0	●	●	●	❍

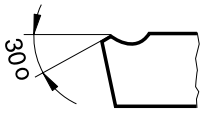
Tool material		Solid carbide	Solid carbide	Solid carbide	Solid carbide
Product no.		86701	86702	86708	86709
		w/o margin	with margin	with margin	w/o margin
Surface finish		F	F	T	T
Dia-meter mm	Width mm				
26.50	5.0		●		
27.00	5.0	●	●	❍	❍
28.00	5.0	●	●	●	●
29.00	5.0	●	●		
30.00	5.0	●	●	●	❍
31.00	5.0	●		❍	
32.00	5.0	●			
33.00	5.0	●	●		
34.00	5.0	●	●		
35.00	5.0	●	●		



≤ Ø 25.4 = 135°
> Ø 25.4 = 132°
> Ø 66.0 = 140°



without margins
for materials with a tensile strength up to approximately 600 N/mm²



with margins
for materials with a tensile strength over approximately 600 N/mm²

Please note:
Not mentioned intermedial diameters are available.
Please see the additional charges chapter in out main catalogue.

Surface finish: T TiN F FIRE ● Standard range ❍ Obsolete range

STANDARD RANGE HSS-E-/PM HSS-E-INTERCHANGEABLE INSERTS WITH CHIP BREAKER GROOVES

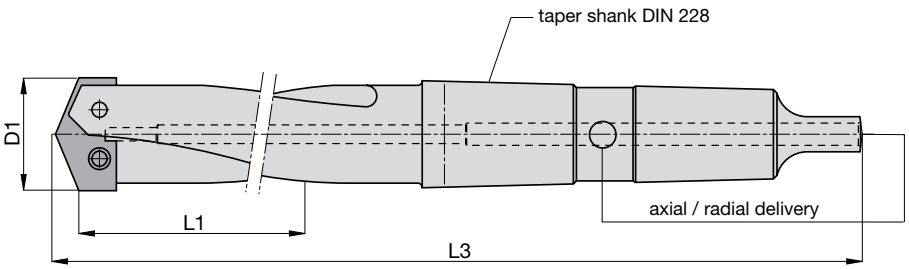
Tool material		HSS-E	HSS-E
Product no.		86602	86608
Surface finish		T	F
Dia-meter mm	Width mm		
10.00	2.5	●	●
10.20	2.5	●	
10.50	2.5		❍
11.00	2.5	●	❍
11.75	2.5		●
12.00	2.5	●	●
12.25	2.5	❍	
12.30	2.5	❍	
12.40	2.5	❍	
12.50	2.5	●	❍
12.75	2.5	●	
13.00	2.5	●	●
13.25	2.5	●	
13.50	3.5	●	●
13.75	3.5	●	
14.00	3.5	●	●
14.25	3.5	●	●
14.50	3.5	●	●
14.75	3.5	●	❍
15.00	3.5	●	●
15.25	3.5	❍	❍
15.30	3.5	●	
15.50	3.5	●	●
15.75	3.5	●	❍
16.00	3.5	●	●
16.50	3.5	●	●
16.75	3.5	●	
17.00	3.5	●	●
17.25	3.5	●	
17.50	3.5	●	●
17.75	3.5	●	
18.00	3.5	●	●
18.25	3.5	●	●
18.50	3.5	●	●
18.75	3.5	●	●
19.00	4.0	●	●
19.50	4.0	●	❍
19.75	4.0	●	●
20.00	4.0	●	●
20.25	4.0	●	❍
20.50	4.0	●	●
21.00	4.0	●	●
21.25	4.0	●	
21.50	4.0	●	❍
21.75	4.0	●	❍
22.00	4.0	●	●
22.50	4.0	●	●
23.00	4.0	●	●
23.50	4.0	●	●
24.00	4.0	●	●
24.50	4.0	●	●
24.75	4.0	❍	❍
25.00	4.0	●	●

Tool material		PM HSS-E
Product no.		86609
Surface finish		A
Dia-meter mm	Width mm	
25.00	5.0	●
25.50	5.0	●
26.00	5.0	●
26.50	5.0	●
27.00	5.0	●
28.00	5.0	●
29.00	5.0	●
29.50	5.0	●
30.00	5.0	●
31.00	5.0	●
32.00	5.0	●
33.00	5.0	●
34.00	5.0	●
35.00	5.0	●
36.00	7.0	●
37.00	7.0	●
38.00	7.0	●
39.00	7.0	●
40.00	7.0	●
41.00	7.0	●
42.00	7.0	●
43.00	7.0	●
44.00	7.0	●
45.00	7.0	●
46.00	7.0	●
47.00	7.0	●
48.00	7.0	●
49.00	7.0	●
50.00	7.0	●
51.00	7.0	●
52.00	7.0	●
53.00	7.0	●
54.00	7.0	●
55.00	7.0	●
56.00	7.0	●
57.00	7.0	●
58.00	7.0	●
59.00	7.0	●
60.00	7.0	●
62.00	7.0	●
64.00	7.0	●
65.00	7.0	●
68.00	9.0	●
70.00	9.0	●
74.00	9.0	●
75.00	9.0	●
80.00	9.0	●
82.00	9.0	●
84.00	9.0	●
85.00	9.0	●
88.00	9.0	●
90.00	9.0	●
100.00	9.0	●
102.00	9.0	●

Surface finish: T TiN F FIRE A AlTiN+ ● Standard range ❍ Obsolete range

WE CAN PROVIDE SPECIAL SOLUTIONS ON REQUEST
(PLEASE MARK WITH A CROSS ACCORDING TO YOUR REQUIREMENTS):

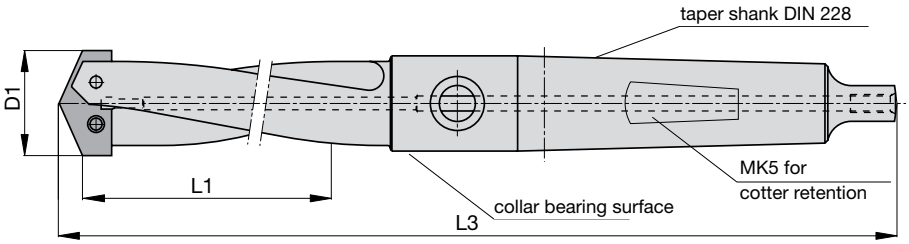
☐ **Morse taper shank holder**



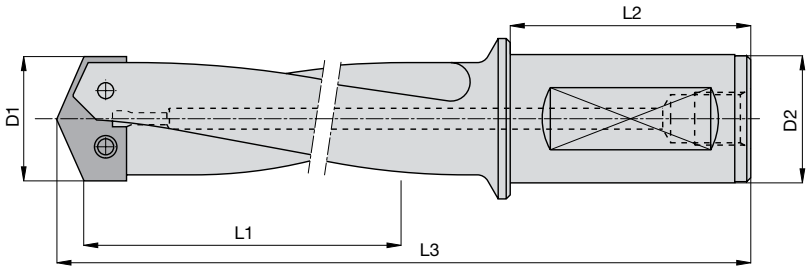
☐ **Morse taper shank holder with collar bearing surface for delivery collar product no. 86690**

☐ **with flat**

☐ **without flat**



☐ **Straight shank holder**



To supply a quote we also require the following data:

Hole diameter
(max. diameter of insert 190 mm) .....

Drilling depth L1 .....

Flute length .....

Total length
(up to approx. 1000 mm) .....

Shank diameter
(if Weldon shank) .....

Material to be machined .....

Coolant pressure .....

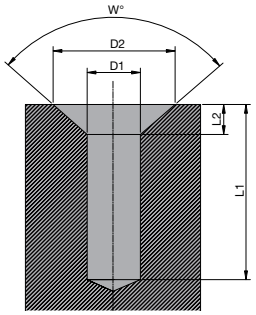
Quantity
(minimum order 2 units) .....

Transverse slot
(if Morse taper) .....

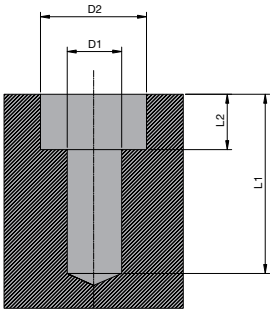
For further information please contact our technical department. Telephone +49 74 31/125-0

FOR SPECIAL STEPPED HOLES WE REQUIRE THE FOLLOWING DATA:

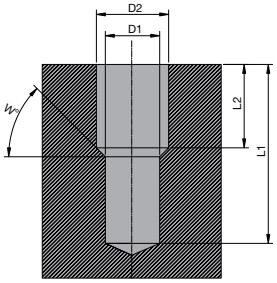
Step drill
for tapping size hole
with 90° step angle



Step drill
with 180° step angle



Stepped hole
with variable step angle



To supply a quote we also require the following data:

	Please mark with a cross above		
Hole form		**Angle W°**	
Diameter D1		**Material to be machined**	
Diameter D2			
Length L1			
Length L2			

or send us a drawing section that includes all the measurements required.

APPLICATION RECOMMENDATIONS FOR THE MULTI-PLEX INTERCHANGEABLE INSERT SYSTEM

Drill-Ø mm	Feed cloumn no.								
	1	2	3	4	5	6	7	8	9
	f(mm/U)								
10.00	0.0770	0.0900	0.1130	0.1440	0.1850	0.2350	0.2940	0.3620	0.4400
12.50	0.0910	0.1070	0.1340	0.1720	0.2200	0.2790	0.3500	0.4310	0.5230
16.00	0.1110	0.1300	0.1620	0.2080	0.2660	0.3380	0.4230	0.5210	0.6330
20.00	0.1310	0.1540	0.1930	0.2470	0.3160	0.4020	0.5030	0.6190	0.7520
25.00	0.1560	0.1830	0.2290	0.2930	0.3760	0.4780	0.5980	0.7360	0.8930
31.50	0.1870	0.2190	0.2740	0.3510	0.4500	0.5710	0.7150	0.8800	1.0680
40.00	0.2250	0.2640	0.3290	0.4220	0.5410	0.6870	0.8600	1.0590	1.2850
50.00	0.2670	0.3130	0.3910	0.5010	0.6430	0.8160	1.0220	1.2590	1.5270
63.00	0.3190	0.3750	0.4680	0.5990	0.7690	0.9760	1.2220	1.5050	1.8260
102.00	0.4000	0.4750	0.5900	0.7400	0.8500	0.1800	1.1500	1.5050	1.8260

Tools with **bold** feed column no. are preferred choice.

- with drilling depth > 7 x D reduce cutting rates by 20%!
- with drilling depth ≥ 7 x D pilot drilling is recommended.

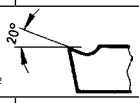
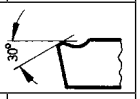
Material group	Material examples Bold = material no. to DIN EN	Tensile strength N/mm2	Hardness	Coolant
Common structural steels	**1.0035** S185, **1.0486** StE P275N, **1.0345** P235GH, **1.0425** P265GH	≤500		●
	1.0050 E295, **1.0070** E360, **1.8937** P500NH	>500-850		●
Free-cutting steels	**1.0718** 11SMnPb30, **1.0736** 115Mn37	≤850		●
	1.0727 46 S20, **1.0728** 60 S20, **1.0757** 46SPb20	850-1000		●
Unalloyed heat-treatable steels	**1.0402** C22, **1.1178** C30E	≤ 700		●
	1.0503 C45, **1.1191** C45E	700-850		●
	1.0601 C60, **1.1221** C60E	850-1000		●
Alloyed heat-treatable steels	**1.5131** 50MnSi4, **1.7003** 38Cr2, **1.7030** 28Cr4	850-1000		○
	1.5710 36NiCr6, **1.7035** 41Cr4, **1.7225** 42CrMo4	1000-1200		○
Unalloyed case hardened steels	**1.0301** C10, **1.1121** C10E	≤750		●
Alloyed case hardened steels	**1.7043** 38Cr4	850-1000		●
	1.5752 14NiCr14, **1.7131** 16MnCr5, **1.7264** 20CrMo5	1000-1200		●
Nitriding steels	**1.8504** 34CrAl6	≥850-1000		●
	1.8519 31CrMoV9, **1.8550** 34CrAlNi7	1000-1200		●
Tool steels	**1.1750** C75W, **1.2067** 102Cr6, **1.2307** 29CrMoV9	≤850		○
	1.2080 X210Cr12, **1.2083** X42Cr13, **1.2419** 105WCr6, **1.2767** X45NiCrMo4	850-1000		●
High speed steels	**1.3243** S 6-5-2-5, **1.3343** S 6-5-2, **1.3344** 61CrV4	≥650-1000		●
Spring steels	**1.5026** 55Si7, **1.7176** 55Cr3, **1.8159** 51CrV4		≤330 HB	●
Stainless steels, sulphured	**1.4005** X12CrS13, **1.4104** X14CrMoS17, **1.4105** X6CrMoS17, **1.4305** X8CrNiS18 9	≤850		●
austenitic	**1.4301** X5CrNi18 10, **1.4541** X6CrNiTi18 10, **1.4571** X6CrNiMoTi 17 12 2	≤850		●
martensitic	**1.4057** X17CrNi16-1, **1.4122** X39CrMo17-1, **1.4521** X2CrMoTi18 2	≤850		●
Hardened steels	–		≤40-48 HRC	●
			>48-60 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●
Cast iron	EN-GJL-100 ... EN-GJL-200 (previously GG10 ... GG20)		≤240 HB	○
	EN-GJL-250 ... EN-GJL-350 (previously GG25 ... GG45)		<300 HB	○
Spheroidal graphite and	EN-GJMW-350-4, EN-GJMB-550-4, EN-GJS-500-7 (previously GTW35, GTS55, GGG50)		≤240 HB	●
malleable cast iron	EN-GJMB-700-2, EN-GJS-700-2 (previously GTS70, GGG70)		<300 HB	●
Chilled cast iron	–		≤350 HB	●
Ti and Ti-alloys	**3.7024** Ti99,5, **3.7114** TiAl5Sn2,5, **3.7124** TiCu2	≤850		●
	3.7154 TiAl6Zr5, **3.7164** TiAl6V4, **3.7184** TiAl4Mo4Sn2,5, - TiAl8Mo1V1	850-1200		●
Al and Al-alloys	**3.0255** Al99,5, **3.2315** AlMgSi1, **3.3515** AlMg1	≤400		●
Al wrought alloys	**3.0615** AlMgSiPb, **3.1325** AlCuMg1, **3.3245** AlMg3Si, **3.4365** AlZnMgCu1,5	≤450		●
Al cast alloys ≤ 10 % Si	**3.2131** G-AlSi5Cu1, **3.2153** G-AlSi7Cu3, **3.2573** G-AlSi9	≤600		●
> 10 % Si	**3.2581** G-AlSi12, **3.2583** G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●
Magnesium alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450		○
Copper, low-alloyed	**2.0070** SE-Cu, 2.1020 CuSn6, **2.1096** G-CuSn5ZnPb	≤400		●
Brass, short-chipping	**2.0380** CuZn39Pb2, **2.0401** CuZn39Pb3, **2.0410** CuZn43Pb2	≤600		●
Brass, long-chipping	**2.0250** CuZn20, **2.0280** CuZn33, **2.0332** CuZn37Pb0,5	≤600		●
Bronze, short-chipping	**2.1090** CuSn7ZnPb, **2.1170** CuPb5Sn5, **2.1176** CuPb10Sn	≤600		●
	2.0790 CuNi18Zn19Pb	>600-850		●
Bronze, long-chipping	**2.0916** CuAl5, **2.0960** CuAl9Mn, **2.1050** CuSn10	≤850		●
	2.0980 CuAl11Ni, **2.1247** CuBe2	850-1000		●
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren		–	○
Thermoplastics	Plexiglas, Hostalen, Novodur, Makralon		–	○
Kevlar	Kevlar		–	○
Glass, carbon concentr. plastics	GFK/CFK		–	○

Coolant: ● soluble oil ● neat oil ○ air

HIGH SPEED STEEL INTERCHANGEABLE INSERTS

Tool material	HSS-E	HSS-E	PM HSS-E
Carbide description	–	–	–
Carbide grade	–	–	–
Surface finish	T	F	A
Product no.	86602	86608	86609
Ø-range	10…25	10…25	25…102
With HSS-E interchang. inserts			
T / F			
v_c m/min for **all** drilling depths	**Feed column no.** for all drilling depths		
40 – 48	**4**		
35 – 42	**4**		
50 – 60	**5**		
40 – 50	**5**		
40 – 45	**4**		
35 – 40	**4**		
30 – 35	**4**		
25 – 28	**3**		
22 – 25	**2**		
35 – 40	**3**		
25 – 28	**3**		
22 – 25	**2**		
22 – 25	**3**		
15 – 18	**2**		
26 – 28	**3**		
22 – 25	**2**		
12 – 18	**2**		
10 – 13	**2**		
20 – 23	**2**		
15 – 17	2		
15 – 20	2		
35 – 40	**4**		
35 – 40	**4**		
35 – 40	**4**		
28 – 33	**4**		
60 – 65	**5**		
80 – 85	**5**		
85 – 85	**5**		
70 – 70	**5**		
45 – 50	**4**		
45 – 50	**4**		
60 – 65	**5**		
45 – 50	**4**		
32 – 35	**5**		
40 – 45	**3**		
36 – 40	**3**		
28 – 32	**3**		
22 – 27	**3**		

CARBIDE INTERCHANGEABLE INSERTS

Tool material	Solid carbide	Solid carbide	Solid carbide	Solid carbide
Carbide description	H22	H22	H22	H22
Carbide grade	K20 - K40	K20 - K40	K20 - K40	K20 - K40
Surface finish	T	F	T	F
Product no.	86709	86701	86708	86702
Ø-range	10…35	10…35	10…35	10…35
Point grind	… w/o margins for materials with a tensile strength up to app. 600 N/mm² 		… with margins for materials with a tensile strength over 600 N/mm² 	
With solid carbide interch. inserts				
T / F				
v_c m/min for **all** drilling depths	**Feed column no.** for all drilling depths			
60 – 70	5			
55 – 65	4			
100 – 115	**4**			
95 – 105	**4**			
80 – 90	**4**			
80 – 90	**4**			
75 – 85	**3**			
70 – 80	**4**			
60 – 70	**3**			
85 – 95	4			
70 – 80	**4**			
55 – 65	**3**			
60 – 65	**3**			
50 – 55	**2**			
40 – 45	**3**			
35 – 40	**2**			
40 – 45	**2**			
35 – 40	**2**			
40 – 45	**2**			
25 – 30	2			
25 – 30	1			
100 – 120	**5**			
90 – 105	**4**			
80 – 90	**4**			
65 – 75	**3**			
25 – 30	**1**			
180 – 200	**5**			
160 – 180	5			
140 – 160	**5**			
130 – 150	**5**			
150 – 160	**5**			
70 – 80	4			
160 – 180	**5**			
110 – 120	4			
80 – 90	**5**			
65 – 75	**4**			
45 – 50	4			
35 – 40	4			
70 – 85	**3**			
70 – 85	**3**			
70 – 85	**3**			
70 – 85	**3**			

Surface finish: T TiN F FIRE A AlTiN

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Precision Drilling Tools