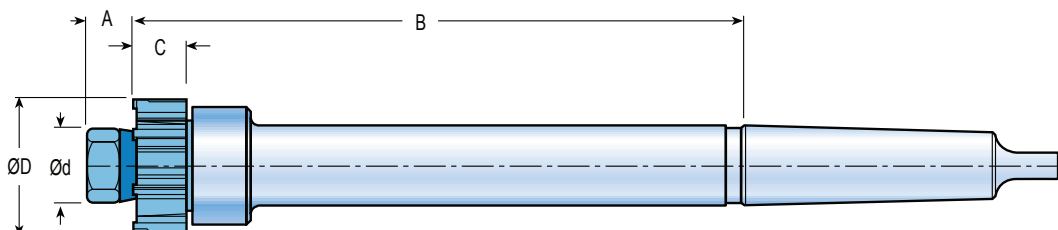


EXPANDING REAMERS WITH CUTTING RING

MT shank - LONG SERIES - Brazed carbide (from diameter 17,60 to 200,59 mm)

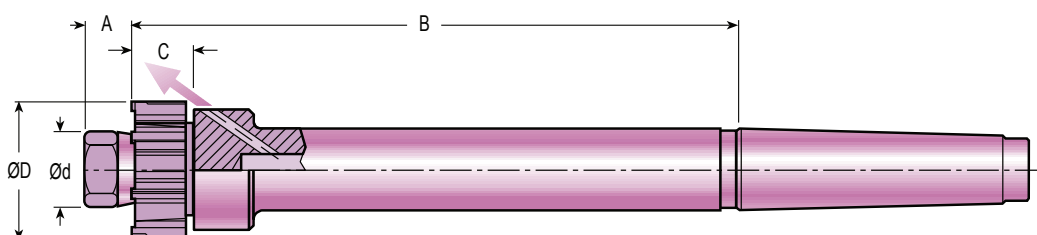
Series 2000

- through holes without through tool coolant
- Ø 17,60 ÷ 45,59



Series 4200

- through holes with radial through tool coolant
- Ø 17,60 ÷ 200,59



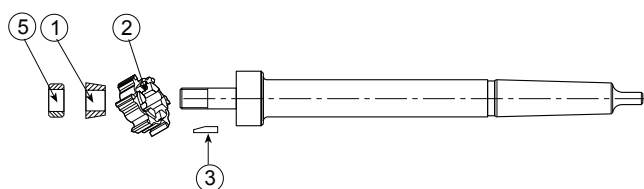
		Series 2000	Series 4200				
Ø D mm	Ø d mm	A mm	A mm	B mm	C mm	MT shank	Number of teeth
17,60 - 21,59	12	11	11	121	11	2	6
21,60 - 25,59	12	11	11	121	12	2	6
25,60 - 32,59	15,6	11	11	153	14	3	6
32,60 - 40,59	22	14	14	179	16	3	6
40,60 - 45,59	25,4	15	15	201	16	3	6
45,60 - 60,59	30	-	20,5	214	18,5	3	6
60,60 - 79,59	40	-	24,5	237	18,5	4	6
79,60 - 100,59	56	-	28,5	245	18,5	5	8
100,60 - 110,59	73,8	-	35,5	245	18,5	5	10
110,60 - 115,59	80,8	-	35,5	245	18,5	5	12
115,60 - 125,59	86,8	-	35,5	245	18,5	5	12
125,60 - 139,59	90,8	-	35,5	245	18,5	5	12
139,60 - 145,59	102,8	-	35,5	245	18,5	5	12
145,60 - 155,59	107,8	-	35,5	245	18,5	5	12
155,60 - 165,59	107,8	-	48,5	245	18,5	6	12
165,60 - 175,59	117,8	-	48,5	245	18,5	6	12
175,60 - 185,59	127,8	-	48,5	245	18,5	6	12
185,60 - 195,59	137,8	-	48,5	245	18,5	6	12
195,60 - 200,59	145,8	-	48,5	245	18,5	6	12

Expanding reamers
with adjustment in front
of the cutting ring

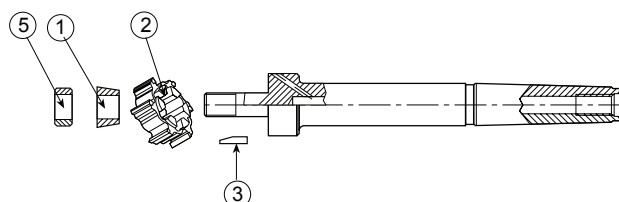
EXPANDING REAMERS WITH CUTTING RING

SPARE PARTS

Series 2000 - Ø 17,60 ÷ 45,59



Series 4200 - Ø 17,60 ÷ 200,59



	series 2000	series 4200	series 2000 - 4200	series 2000 - 4200	series 2000 - 4200
ØD mm	Complete mandrel without cutting ring	Complete mandrel without cutting ring	Conical ring 1	Ring nut or nut 5	Drive pin 3
17,60 - 21,59	2000-MC-010	4200-MC-010	2010-AC-010	2000-DA-010	2000-CO-010
21,60 - 25,59	2000-MC-020	4200-MC-020	2010-AC-010	2000-DA-010	2000-CO-020
25,60 - 29,59	2000-MC-030	4200-MC-030	2010-AC-020	2000-DA-020	2000-CO-030
29,60 - 32,59	2000-MC-030	4200-MC-030	2010-AC-020	2000-DA-020	2000-CO-030
32,60 - 36,59	2000-MC-040	4200-MC-040	2010-AC-030	2000-DA-060	2000-CO-040
36,60 - 40,59	2000-MC-040	4200-MC-040	2010-AC-030	2000-DA-060	2000-CO-040
40,60 - 45,59	2000-MC-050	4200-MC-050	2010-AC-040	2000-DA-090	*
45,60 - 49,59	-	4200-MC-060	2010-AC-050	2000-GH-880	2000-CO-060
49,60 - 55,59	-	4200-MC-070	2010-AC-050	2000-GH-880	2000-CO-070
55,60 - 60,59	-	4200-MC-070	2010-AC-050	2000-GH-880	2000-CO-070
60,60 - 65,59	-	4200-MC-080	2010-AC-060	2000-GH-900	2000-CO-080
65,60 - 70,59	-	4200-MC-080	2010-AC-060	2000-GH-900	2000-CO-080
70,60 - 79,59	-	4200-MC-090	2010-AC-060	2000-GH-900	2000-CO-090
79,60 - 90,59	-	4200-MC-100	2010-AC-070	2000-GH-920	2000-CO-090
90,60 - 100,59	-	4200-MC-110	2010-AC-070	2000-GH-920	2000-CO-090
100,60 - 110,59	-	4200-MC-120	2060-BU-010	2000-GH-095	2000-CO-090
110,60 - 115,59	-	4200-MC-130	2060-BU-020	2000-GH-095	2000-CO-090
115,60 - 120,59	-	4200-MC-140	2060-BU-030	2000-GH-095	2000-CO-090
120,60 - 125,59	-	4200-MC-150	2060-BU-030	2000-GH-095	2000-CO-090
125,60 - 132,59	-	4200-MC-160	2060-BU-040	2000-GH-095	2000-CO-100
132,60 - 139,59	-	4200-MC-170	2060-BU-040	2000-GH-095	2000-CO-100
139,60 - 145,59	-	4200-MC-180	2060-BU-050	2000-GH-095	2000-CO-100
145,60 - 155,59	-	4200-MC-190	2060-BU-060	2000-GH-095	2000-CO-110
155,60 - 165,59	-	4200-MC-200	2060-BU-070	2000-GH-120	2000-CO-110
165,60 - 175,59	-	4200-MC-210	2060-BU-080	2000-GH-120	2000-CO-110
175,60 - 185,59	-	4200-MC-220	2060-BU-090	2000-GH-120	2000-CO-120
185,60 - 195,59	-	4200-MC-230	2060-BU-100	2000-GH-120	2000-CO-120
195,60 - 200,59	-	4200-MC-240	2060-BU-110	2000-GH-120	2000-CO-120

② Cutting ring

*Series 2000 drive pin 2000-CO-050 - *Series 4200 drive pin 2000-CO-060

TECHNICAL INFORMATION AND CUTTING PARAMETERS STANDARD SPEED REAMING

Hard metal brazed carbide (our ref. H.M.)

MATERIAL TO WORK	N / mm ²	Reamer Ø mm	STOCK ALLOWANCE Ø mm	SURFACE SPEED m / min	FEED mm / rev	LUBRICANT
Mild Steel Unalloyed Low alloyed Structural steel Fused Metal	Up to 600	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,40 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	7 - 15	0,15 - 0,30 0,25 - 0,50 0,30 - 0,80 0,60 - 1,00 0,60 - 1,20 0,80 - 1,50	Emulsible oil Cutting oil
	Greater than 600	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	6 - 10	0,10 - 0,30 0,20 - 0,40 0,30 - 0,60 0,40 - 0,80 0,50 - 0,90 0,60 - 1,20	Emulsible oil Cutting oil
Alloy steel Stainless steel	400 - 1000	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	4 - 8	0,10 - 0,30 0,20 - 0,40 0,30 - 0,60 0,40 - 0,80 0,50 - 0,90 0,60 - 1,20	Emulsible oil Cutting oil
Strongly alloy steel Steel with manganese	800 - 1500	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	3 - 6	0,10 - 0,20 0,15 - 0,40 0,30 - 0,50 0,30 - 0,70 0,40 - 0,80 0,50 - 1,00	Emulsible oil Cutting oil
Grey cast iron Spheroidal cast iron (pearlitic) Malleable cast iron	Up to 200HB Greater than 200 HB	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,30 0,30 - 0,40 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	≤ 200 HB 15 - 30 > 200 HB 10 - 20	0,20 - 0,50 0,40 - 0,60 0,60 - 1,20 0,75 - 1,50 0,80 - 1,60 1,00 - 1,80	Oil Emulsible oil Cutting oil
Spheroidal cast iron (ferritic)	300 - 700	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	8 - 12	0,15 - 0,30 0,40 - 0,60 0,50 - 1,00 0,75 - 1,50 0,80 - 1,60 1,00 - 1,80	Emulsible oil Cutting oil
Copper and alloys Brass	Up to 500	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,25 0,15 - 0,25 0,25 - 0,40 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	10 - 18	0,15 - 0,40 0,20 - 0,60 0,25 - 0,90 0,40 - 1,10 0,50 - 1,20 0,60 - 1,50	Emulsible oil
Bronze Bronze phosphorous	Up to 600	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,25 0,15 - 0,25 0,25 - 0,40 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	10 - 20	0,15 - 0,40 0,25 - 0,60 0,50 - 0,80 0,60 - 1,00 0,70 - 1,10 0,80 - 1,20	Emulsible oil Cutting oil
Alluminium and light alloys	Up to 500	Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,2 0,15 - 0,3 0,20 - 0,4 0,30 - 0,4 0,35 - 0,5 0,40 - 0,5	15 - 30	0,20 - 0,40 0,30 - 0,60 0,40 - 1,00 0,75 - 1,50 0,80 - 1,60 0,90 - 1,80	Emulsible oil Oil Cutting oil
Titanium and alloys		Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	5 - 8	0,15 - 0,30 0,20 - 0,40 0,30 - 0,50 0,40 - 0,60 0,60 - 0,80 0,80 - 1,20	Emulsible oil Cutting oil
Syntetic materials		Up to 10 10 - 22 22 - 40 40 - 50 50 - 70 70 - 100	0,10 - 0,20 0,15 - 0,25 0,20 - 0,30 0,30 - 0,40 0,35 - 0,50 0,40 - 0,50	15 - 30	0,20 - 0,50 0,40 - 0,80 0,50 - 1,40 0,80 - 1,50 0,90 - 1,60 1,00 - 1,80	Compressed air Dry Emulsible oil

TECHNICAL INFORMATION AND CUTTING PARAMETERS HIGH SPEED & HIGH FEED REAMING

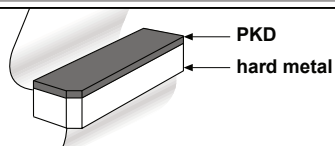
Hard metal brazed carbide coated TiN - TiCN - TiAlN (our ref. TIN - TIC - TIA)
Cermet brazed carbide (our ref. AVC)

*AVC reamers are available coated TiN, TiCN or TiAlN

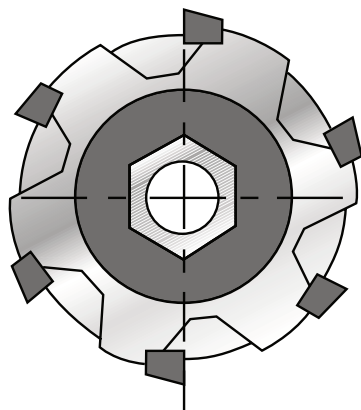
MATERIAL TO WORK	N / mm ²	Reamer Ø mm	STOCK ALLOWANCE Ø mm	H.M. coated TiN - TiCN TiAlN	CERMET AVC *	Lead-in A,G	Lead-in E,N,M
				SURFACE SPEED m / min	SURFACE SPEED m / min	FEED mm / rev	FEED mm / rev
Mild Steel	Up to 600	up to 10	0,08 - 0,15	60 - 80	90 - 300	0,20 - 0,40	0,30 - 0,60
Unalloyed		10 - 18	0,15 - 0,25			0,40 - 0,60	0,40 - 1,00
Low alloyed		18 - 40	0,15 - 0,30			0,50 - 0,80	0,60 - 1,20
Structural steel		40 - 80	0,20 - 0,40			0,50 - 1,00	0,80 - 1,60
Fused Metal	Greater than 600	over 80	0,25 - 0,50	40 - 70	80 - 200	0,80 - 1,50	1,00 - 2,20
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
	400 - 1000	40 - 80	0,20 - 0,40	30 - 50	60 - 150	0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
	800 - 1500	18 - 40	0,15 - 0,30	15 - 30	60 - 120	0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
	Up to 200HB	10 - 18	0,15 - 0,25	50 - 70		0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
	Greater than 200 HB	up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
	300 - 700	over 80	0,25 - 0,50	30 - 50	60 - 120	0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
	Up to 500	40 - 80	0,20 - 0,40	100 - 200		0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
	Up to 600	18 - 40	0,15 - 0,30	80 - 160	100 - 300	0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
	Up to 500	10 - 18	0,15 - 0,25	100 - 200		0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15	20-60		0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00
		up to 10	0,08 - 0,15			0,20 - 0,40	0,30 - 0,50
		10 - 18	0,15 - 0,25			0,30 - 0,60	0,30 - 0,80
		18 - 40	0,15 - 0,30			0,40 - 0,70	0,40 - 1,00
		40 - 80	0,20 - 0,40			0,50 - 0,80	0,60 - 1,40
		over 80	0,25 - 0,50			0,80 - 1,20	1,00 - 2,00

HIGH SPEED FOR ALUMINIUM REAMING

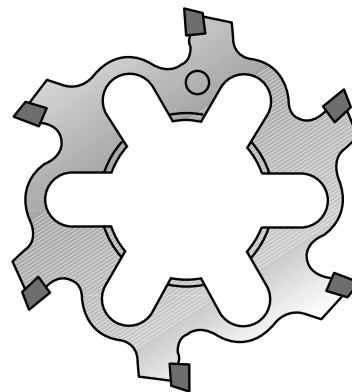
Aluminium with silicon greater than 10% - brazed carbide with PKD



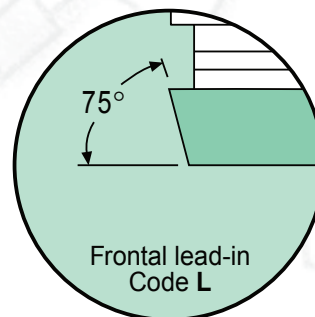
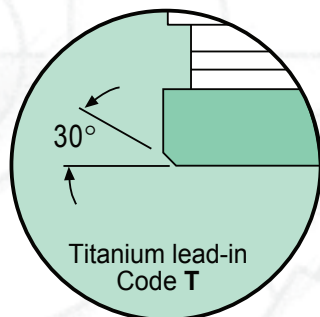
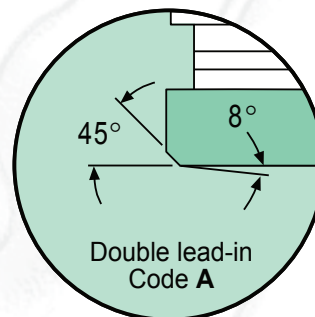
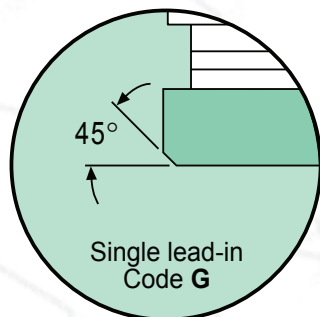
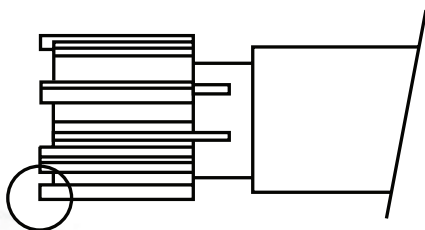
- Surface speed up to 1500 m/min.
- When using PKD reamers a machine tool with high rigidity and absolute precision is a minimum requirement.
- Each application must be assessed by our technical department.



Integral expanding reamer

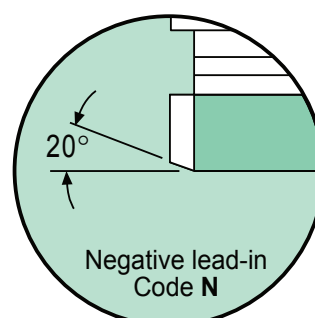
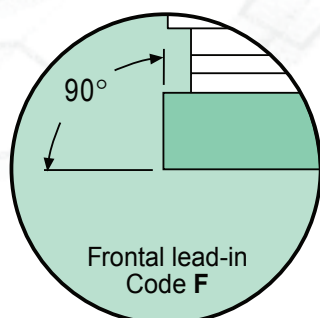


Cutting ring



"L" lead-in
to reduce the feed
of 40% compared
with the values
on pages 6-7

"F" lead-in
to reduce the feed
of 40% compared
with the values
on pages 6-7



"N" lead-in
ideal for through hole.
It is possible
to increase
the feed up to 100%
of the values
indicated
on pages 6-7

Approach angles

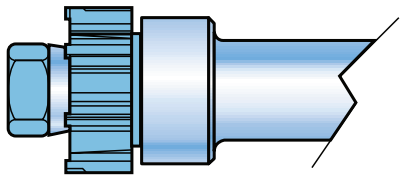
MATERIAL TO WORK	TENSILE STRENGTH	APPROACH ANGLE*
Iron and mild steel (C < 0,2%)	50 Kg / mm ²	G - A - E
Mild steel (C 0,2 < 0,3%)	60 Kg / mm ²	N - A - E
Mild steel (C 0,3 < 0,4%)	70 Kg / mm ²	N - A - E
Mild steel (C 0,4 < 0,5%)	80 Kg / mm ²	N - A - E
Alloy steel	≤ 80 Kg / mm ²	G - N - A - E
Alloy steel	90 Kg / mm ²	G - N - E
Alloy steel	100 Kg / mm ²	G - N - M
Alloy steel	> 100 Kg / mm ²	G - N - M
Stainless and refractory steel	from 50 Kg / mm ² to 90 Kg / mm ²	G - N - M
Grey, spheroidal and malleable cast iron	from 150 HB to 320 HB	G - N - E
Titanium and titanium alloy		T - E
Tempered steel	48 - 64 HRc	G - N - M
Pure copper		G - N - E
Electrolytic copper		G - N - E
Brass / Bronze		G - N - E
Aluminium alloy < 10% Si		G - A - E
Aluminium alloy > 11% Si		G - E
Magnesium alloy		G - A - E
Thermoplastic material		G - E
Thermosetting resins		G - E
Stiffened synthetic material		G - E

* Do not use negative lead-in on blind holes

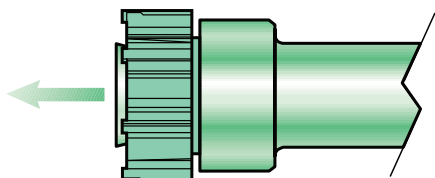
Negative lead-in "N" can be used on large range of materials: please apply to our technical department.

Usually ex-stock: - single lead-in G

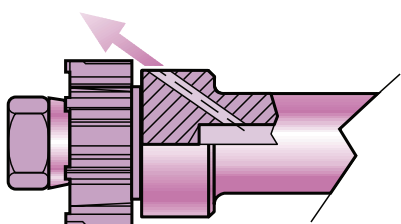
EXPANDING REAMERS WITH CUTTING RING



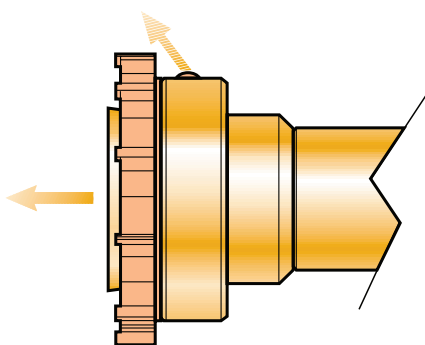
Expanding reamers without coolant



Expanding reamers with central through tool coolant (ideal application for blind holes)

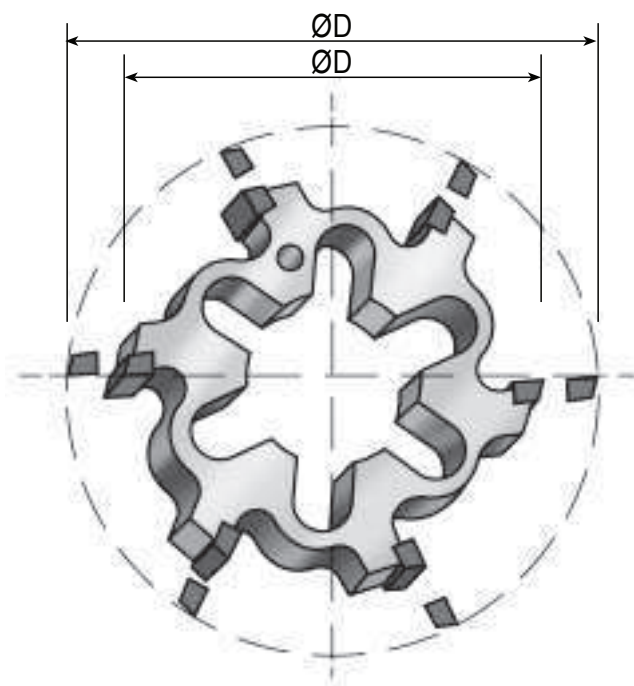
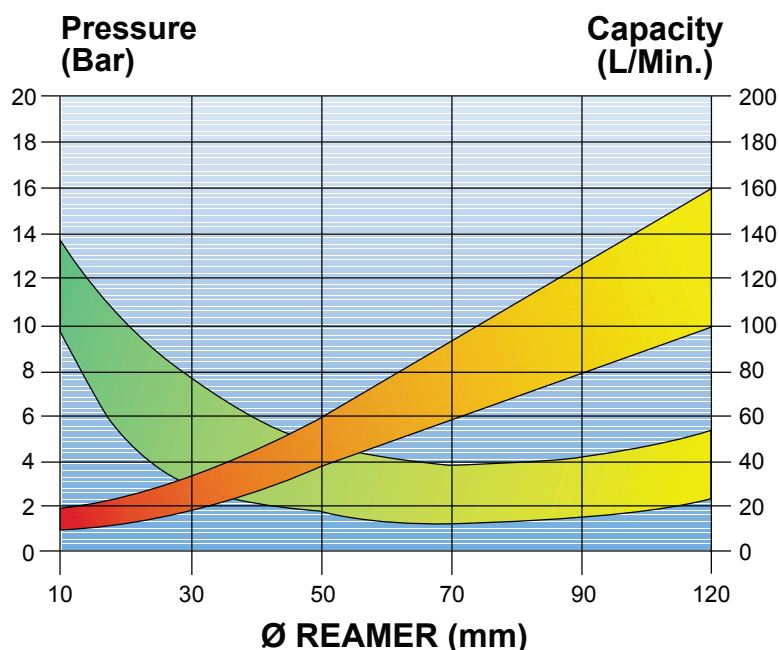


Expanding reamers with radial through tool coolant (ideal application for through holes)



Expanding reamers with central and radial through tool coolant

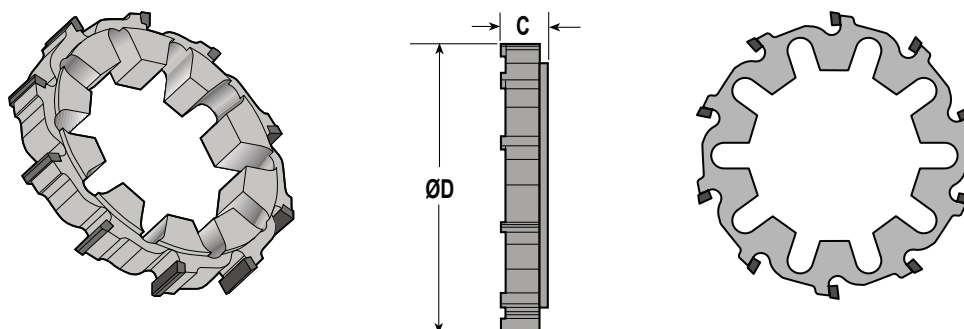
Recommended values for lubricants



The cutting rings can be expanded for recovering the starting diameter.

CUTTING RINGS

from diameter 17,60 to 200,59 mm



Ø D mm	C mm	Number of teeth
17,60 - 21,59	11	6
21,60 - 25,59	12	6
25,60 - 32,59	14	6
32,60 - 45,59	16	6
45,60 - 79,59	18,5	6
79,60 - 100,59	18,5	8
100,60 - 110,59	18,5	10
110,60 - 200,59	18,5	12

- The ALVAN® cutting rings are modular and compatible with all the reamers indicated on page 36 to 58.
- We guarantee a regrinding and re-brazing rapid service of the damaged cutting edges (consult our technical department).
- The cutting edges are in an asymmetric way to assure the best roundness of the hole (see page 74).
- Holes with restricted tolerances (ISO 5 and 6) can be supplied and the expansion assures a perfect holding of the reaming diameter.
- Lead-in: cutting rings with G lead-in are usually available from stock (see page 11-12-13).
- Diameters and tolerances: cutting rings of integer metric diameters with H7 tolerances are usually available from stock.
- The ALVAN® cutting rings are manufactured to the middle of the hole tolerance so they must be assembled and adjusted to the same diameter. It is important to comply with this direction in order to have a good working and life of the tool.
- LEFT HAND HELICAL FLUTES CUTTING RINGS from diameter 32,60 to 200,59 mm. ON REQUEST.

EXPANDING & FIXED REAMERS INSTRUCTIONS

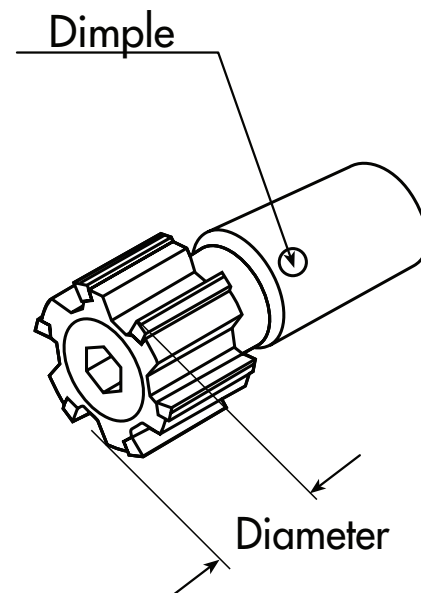
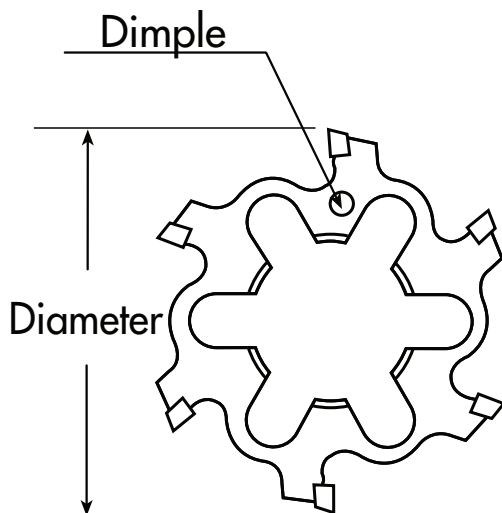
1) Diameter measurement

The diameter of the reamers and of the cutting rings is measured with a micrometer. We recommend the use of a comparator style micrometer with at least a $2\mu\text{m}$ resolution to avoid micro chipping of the cutting edges.

To allow setting of the reamer, two cutting edges are exactly 180° opposed. These are marked with a coloured dimple (see diagram below).

Measurement must be taken from the front of the cutting edges only.

The red dimple indicates that the tool has been ground with a single lead-in angle (code G), the blue dimple indicates a double lead-in angle (code A).



2) Tolerance

All the reamers are ground to the requested diameter and set to nominal tolerance for expanding reamers and $3/4$ of minimum tolerance for fixed reamers.

3) Expanding reamers adjustment

The adjustment must be made to compensate for wear to the cutting edges when the size reaches its lower tolerance.

This operation can be repeated several times until the surface finish of the hole deteriorates to an unacceptable level, then the reamer must be reground. The maximum expansion is about 1% of the diameter for the integral reamers and about 4% of the diameter for the cutting rings.

EXPANDING REAMERS INSTRUCTIONS

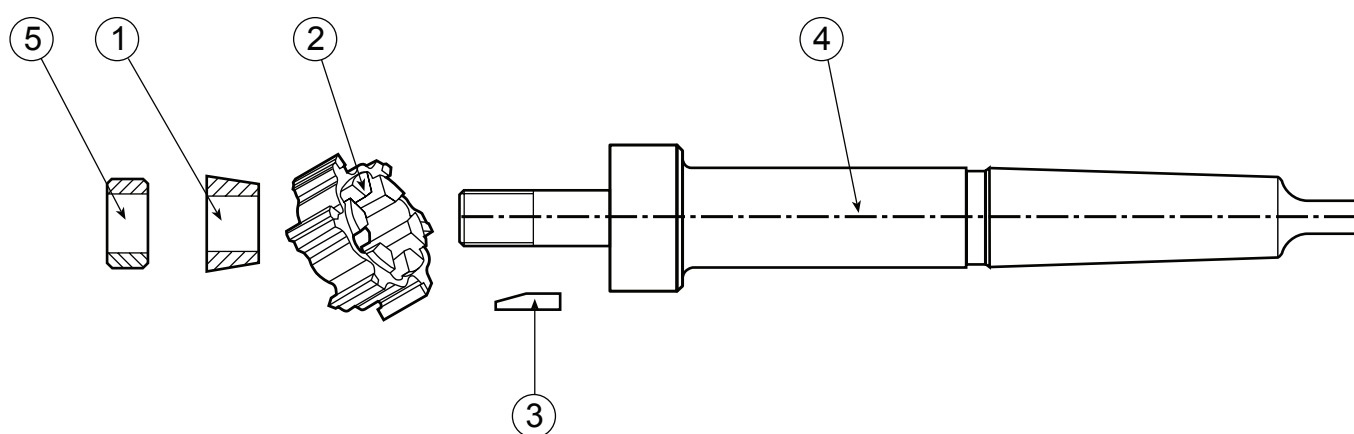
Assembly - Adjustment - Disassembly EXPANDING REAMERS WITH CUTTING RING with assembly and adjustment in the front

Series 2000-2010-2050 from diam. 17,60 to 100,59 mm

Series 4550-4500-4330 from diam. 17,60 to 100,59 mm

Series 4200-4250-4350 from diam. 17,60 to 200,59 mm

Series 4300 from diam. 17,60 to 60,59 mm



1) Assembly

Insert the cutting ring (item 2) on the mandrel (item 4) with the drive pins (item 3) assembled. Insert the conical ring (item 1). Screw the nut (item 5) and lock it manually: **the thread is left handed.**

We recommend lubricating the thread and the conical surface of contact between the cutting ring and the conical ring with antifriction Molycote grease.

2) Adjustment procedure

Turn the nut slowly, checking the diameter setting of the cutting ring with a micrometer, paying attention that the drive pins are in traction in the opposite direction to the cutting action of the reamer.

When the required diameter is achieved, the tool is ready for use.

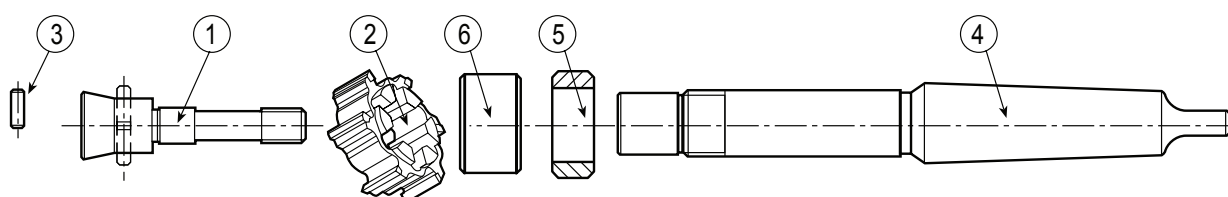
3) Disassembly

Unscrew the nut. Remove the components from the mandrel.

EXPANDING REAMERS INSTRUCTIONS

Assembly - Adjustment - Disassembly EXPANDING REAMERS WITH CUTTING RING with assembly and adjustment on the rear

Series 2500 - 2505 - 2530 - 2535 - 2550 - 2555
from diam. 17,60 to 45,59 mm



1) Assembly

Screw the nut (item 5) on the mandrel (item 4): **the thread is right handed.**

Insert the bush (item 6) on the mandrel.

Mount the cutting ring (item 2) onto the conical screw (item 1) and over the drive pins (item 3). Tighten the conical screw onto the mandrel, taking care that the contact surfaces are very clean. Look the screw to the torque setting stated in table 1. We recommend lubricating the thread and the conical surface of contact between the cutting ring and the conical ring with antifriction Molycote grease.

2) Adjustment procedure

Turn the nut slowly, checking the diameter setting of the cutting ring with a micrometer, paying attention that the drive pins are in tranction, in the opposite direction to the cutting action of the reamer. When the required diameter is achived, the tool is ready for use.

3) Disassembly

Loosen the nut and remove the screw. Remove the components from the mandrel.

**Use a dynamometric key to avoid
breaking the conical screw**

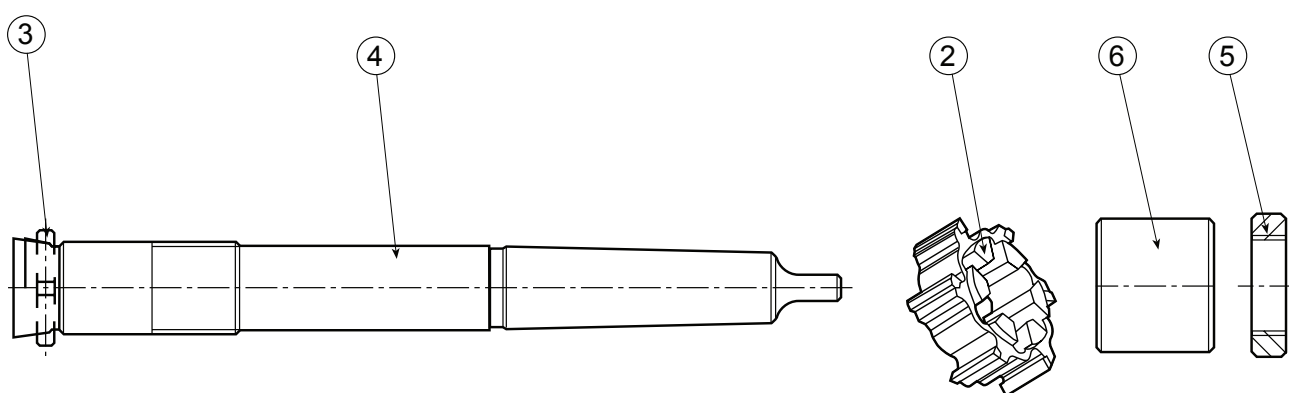
Diameter mm	Torque settings Kgm
18 - 25	1,4 - 1,6
26 - 32	2,2 - 2,5
33 - 40	3,6 - 4
41 - 45	4,6 - 5

table 1

EXPANDING REAMERS INSTRUCTIONS

Assembly - Adjustment - Disassembly
EXPANDING REAMERS WITH CUTTING RING
with assembly and adjustment on the rear

Series 2500 - 2505 - 2530 - 2535 - 2550 - 2555
from diam. 45,60 to 100,59 mm



1) Assembly

Mount the cutting ring (item 2) and the bush (item 6) onto the mandrel (item 4). Screw the ring nut (item 5) onto the mandrel and lock it manually: **the thread is right handed.**

We recommend lubricating the thread and the conical surface of contact between the cutting ring and the mandrel with antifriction Molycote grease.

2) Adjustment procedure

Turn the ring nut slowly, checking the diameter setting of the cutting ring with a micrometer, paying attention that the drive pins (item 3) are in traction in the opposite direction to the cutting action of the reamer.

When the required diameter is achieved, the tool is ready for use.

3) Disassembly

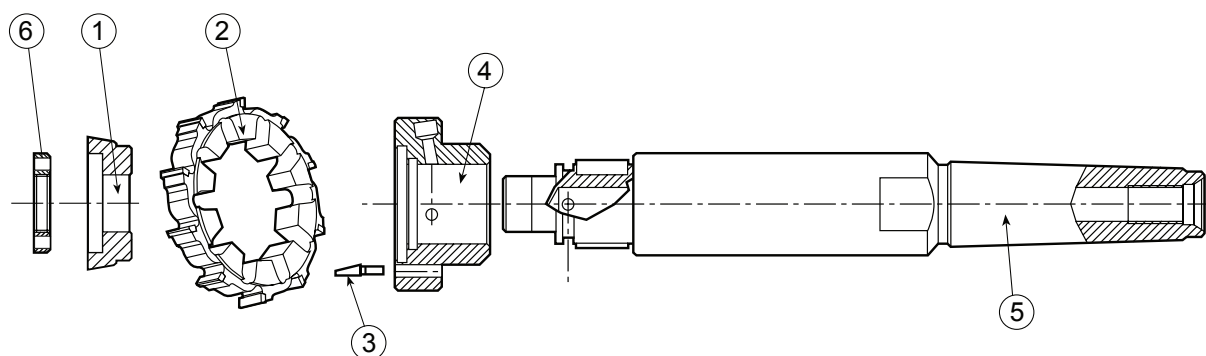
Unscrew the ring nut. Remove the components from the mandrel.

EXPANDING REAMERS INSTRUCTIONS

Assembly - Adjustment - Disassembly EXPANDING REAMERS WITH CUTTING RING with assembly and adjustment in the front

Series 4000 - 4050
from diam. 79,60 to 200,59 mm

Series 4100 - 4150
from diam. 79,60 to 200,59 mm



1) Assembly

With the drive pins (item 3) assembled, mount the flange (item 4) onto the mandrel (item 5). Assemble the cutting ring (item 2) so that the slot on the left side of the dimple is mounted onto the drive pins. Insert the conical ring (item 1). Screw the ring nut (item 6) onto the mandrel and tighten manually, so that the conical ring makes contact with the cutting ring: **the thread is left handed**. We recommend lubricating the thread and the conical surface of contact between the cutting ring and the conical ring with antifriction Molycote grease.

2) Adjustment procedure

Turn the ring nut slowly (using a pin spanner) checking the diameter setting of the cutting ring with a micrometer, paying attention that the drive pins are in traction, in the opposite direction to the cutting action of reamer. When the required diameter is achieved, the tool is ready for use.

3) Disassembly

Unscrew the ring nut. Remove the components from the mandrel.

EXPANDING REAMERS INSTRUCTIONS

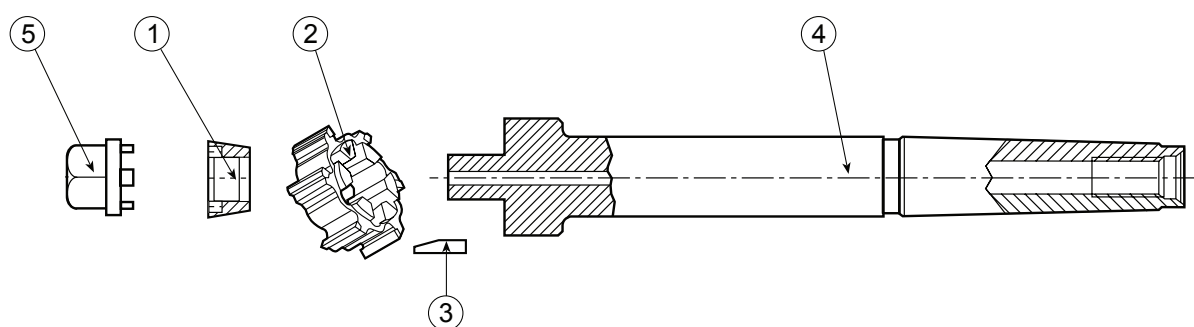
Assembly - Adjustment - Disassembly EXPANDING REAMERS WITH CUTTING RING with assembly and adjustment in the front

Series 2015 from diam. 17,60 to 100,59 mm

Series 4000 - 4050 from diam. 17,60 to 79,59 mm

Series 4355-4505-4555 from diam. 17,60 to 100,59 mm

Series 4305 from diam. 17,60 to 60,59 mm



1) Assembly

Mount the cutting ring (item 2) onto the mandrel (item 4) with the drive pins (item 3) assembled. Screw the conical ring nut onto the mandrel and lock it manually: **the thread is left handed.**

Lubricate the thread and the conical surface of contact between the cutting ring and the conical ring with antifriction Molycote grease.

2) Adjustment procedure

Turn the conical ring nut slowly using a pin spanner (item 5) supplied with reamers from diameter 17,60 to 40,59 mm, checking the diameter setting of the cutting ring with a micrometer. When the required diameter is achieved unscrew the conical ring until there is a click and the drive pins are in traction in the opposite direction to the cutting action of the reamer.

The reamer is ready for use.

3) Disassembly

Unscrew the conical ring nut. Remove the components from the mandrel.