



ALLUMINIO
ALUMINIUM
ALUMINIUM



FRESATURA LEGNO
MILLING CUTTERS FOR WOOD
FRÄSWERKZEUGE FÜR HOLZ



TORNERIA LEGNO
WOOD TURNING TOOLS
WERKZEUGE FÜR DREH-MASCHINEN



MATERIE PLASTICHE
PLASTIC MATERIALS
KUNSTSTOFFE



MATERIALI COMPOSITI
COMPOSITE MATERIALS
KOMPOSITMATERIALEN



ATTREZZATURE
EQUIPMENTS
AUSRÜSTUNGEN



SPECIALI
SPECIAL
SPEZIELL



RINALDI
UTENSILI DA TAGLIO - CUTTING TOOLS



**Rinaldi, qualità e innovazione
da oltre 40 anni.**

**Rinaldi, quality and innovation
for over 40 years.**

**Rinaldi, Qualität und Innovation
seit über 40 Jahren.**



Dasa-Rägister

EN ISO 9001:2008

IQ-1003-10



Cosa facciamo

La Rinaldi Srl fornisce in Italia e nel mondo utensili per la lavorazione di legno, metallo, plastiche, materiali compositi e attrezzature per lavorazioni speciali. La continua ricerca tecnologica e l'utilizzo di metalli duri ed acciaio delle nuove generazioni produttive, realizzati secondo le norme DIN/ISO 9000, permettono l'applicazione di nuove geometrie di taglio, ottima qualità del prodotto, affidabilità e costanza nel tempo. La Rinaldi Srl offre un accurato supporto tecnico, grazie all'esperienza provata del team di tecnici e al parco macchine di ultima generazione.

What we do

Rinaldi srl originally supplying with in Italy now expedite tools throughout the world. We manufacture tools for wood, metal, plastic, composite materials and equipment for special processes. Constant technological research and utilization of hard metal and steel for the new production generation, allow the application of new cutting geometries together with an excellent quality product, reliability and consistency over time. Manufactured according to DIN/ISO 9000 standards. Thanks to our valued team of highly experienced technicians and machines of the latest generation Rinaldi srl are able to provide technical support.

Was machen wir

Die Firma Rinaldi srl liefert in Italien und auf der ganzen Welt Werkzeuge für die Bearbeitung von Holz, Plastik, Kompositmaterialien, sowie Ausrüstungen für spezielle Bearbeitungen. Die ständige technologische Forschung und die Verwendung von Hartmetall und Stahl der jeweils neuesten Sorten, ausgeführt nach den Normen DIN/ISO 9000, erlauben die Anwendung von neuen Schneidgeometrien, verbunden mit bester Qualität, Zuverlässigkeit und Standzeit. Rinaldi srl bietet technischen Support dank der großen Erfahrung eines kompetenten Teams von Technikern und einen Maschinenpark der neuesten Generation.

LEGENDA



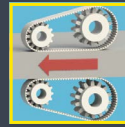
ALTRE MISURE SU RICHIESTA
OTHER DIMENSIONS ON REQUEST
ANDERE ABMESSUNGEN AUF ANFRAGE



ELEVATA VELOCITA' DI TAGLIO
HIGH CUTTING SPEED
HOHE VORSCHUBGESCHWINDIGKEIT



BUONA FINITURA
GOOD FINISH
GUTE FERTIGBEARBEITUNG



AVANZAMENTO MECCANICO
MECHANIC FEED
MECHANISCHER VORSCHUB



EVAQUAZIONE ELEVATA DEL TRUCIOLO VERSO L'ALTO
INCREASED UPWARD CHIP EJECTION
GROSSE SPÄNEABFÜHRUNG NACH OBEN



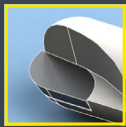
AFFILATURA DI TESTA AL CENTRO PER FORARE
ULTRA FAST DRILLING END
STIRNSEITIGER ANSCHLIFF ZUM EINBOHREN



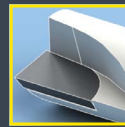
FORATURA E FRESATURA
COMBINATION DRILLING-MILLING
BOHR-FRÄSEN



METALLO DURO HW-K10
HW-K10 HARD METAL
HW-K10 HARTMETALL



INSERTI IN "PKD" RAGGIATI
"PKD" CUTTING PLATES WITH RADIUS
PKD - SCHNEIDEPLATTEN MIT RADIUS



INSERTI IN "PKD" DIRITTI
STRAIGHT "PKD" CUTTING PLATES
GERADE PKD-SCHNEIDEPLATTEN



LAPPATURA INTERNA ED ESTERNA
INSIDE AND OUTSIDE POLISHED FLUTE
POLIERTE SCHNEIDE AUF DER INNEN-UND AURENSEITE



VELOCITA' DI ROTAZIONE
RPM
DREHZAHL



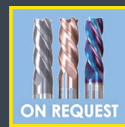
VELOCITA' DI ROTAZIONE
RPM
DREHZAHL



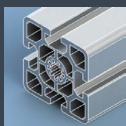
ROTAZIONE DESTRA
RIGHT-HAND ROTATION
RECHTSLAUF



ROTAZIONE DESTRA POSITIVA
RIGHT-HAND ROTATION POSITIVE SPIRAL
RECHTSLAUF MIT POSITIVER SPIRALE



RIVESTIMENTI A PAG. 22
COATINGS ON PAGE 22
BESCHICHTUNGEN AUF SEITE 22



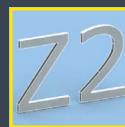
INDICATE PER PROFILATI E SCATOLATI
SUITABLE FOR ALUMINIUM PROFILES
FÜR ALUMINIUMPROFILIEN ANGEGEBEN



Z1



MAGGIORE FINITURA SUPERFICIALE
HIGHER FINISH
BESSERE FERTIGBEARBEITUNG



Z2



RIDOTTO ATTRITO DURANTE LA LAVORAZIONE
REDUCED FRICTION
REDUZIERTER REIBUNGSWIDERSTAND



Z3



ALLUMINIO
ALUMINIUM
ALUMINIUM

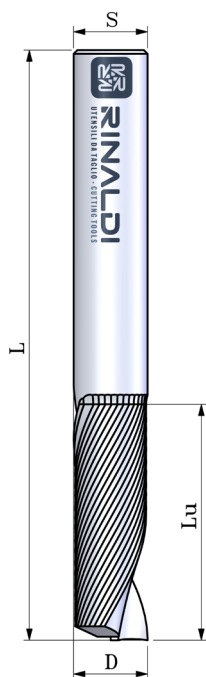
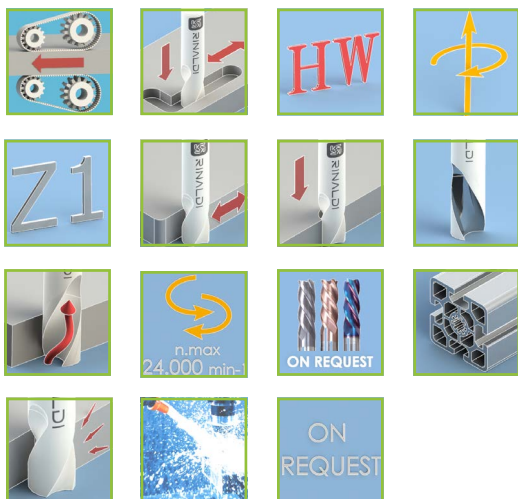
AL1A



Frese elicoidali in HW integrale

HW milling cutters

VHW-Fräser



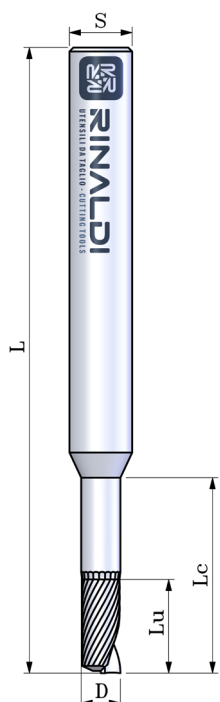
CODICE	D	L	Lu	S
AL1A-02-06-03	2	50	6	3
AL1A-02-08-03	2	50	8	3
AL1A-025-08-03	2,5	50	8	3
AL1A-025-08-06	2,5	60	8	6
AL1A-03-08-06	3	50	8	3
AL1A-03-10-06	3	60	10	6
AL1A-04-12-04	4	50	12	4
AL1A-04-12-06	4	50	12	6
AL1A-04-16-06	4	50	16	6
AL1A-05-12-05	5	50	14	5
AL1A-05-12-06	5	50	14	6
AL1A-05-20-06	5	60	20	6
AL1A-06-14-06	6	50	16	6
AL1A-06-20-06	6	60	20	6
AL1A-06-25-06	6	60	25	6
AL1A-08-20-08	8	80	20	8
AL1A-08-25-08	8	100	25	8
AL1A-08-35-08	8	100	35	8
AL1A-10-25-10	10	100	25	10
AL1A-10-35-10	10	100	35	10
AL1A-10-45-10	10	100	45	10
AL1A-12-25-12	12	100	25	12
AL1A-12-35-12	12	100	35	12
AL1A-12-45-12	12	100	45	12
AL1A-14-35-14	14	100	35	14
AL1A-14-45-14	14	100	45	14
AL1A-16-35-16	16	100	35	16
AL1A-16-45-16	16	100	45	16

AL1AL



Frese elicoidali in HW integrale serie lunga con gambo scaricato

HW Milling cutters long execution, necked
VHW Fräser lange Ausführung mit Freischliff



CODICE	D	L	Lu	S	Lc
AL1AL-02-06-03	2	50	6	3	10
AL1AL-025-08-06	2,5	60	8	6	12
AL1AL-03-10-06	3	60	10	6	15
AL1AL-03-10-06	3	80	10	8	25
AL1AL-04-10-06	4	60	10	6	15
AL1AL-04-10-08	4	80	10	8	25
AL1AL-05-10-06	5	50	10	6	15
AL1AL-05-10-08	5	80	10	8	25
AL1AL-06-10-06	6	80	10	6	25
AL1AL-06-10-08	6	80	10	8	25
AL1AL-08-20-08	8	80	20	8	35
AL1AL-08-25-08	8	100	25	8	50
AL1AL-10-25-10	10	100	25	10	35
AL1AL-10-35-10	10	100	35	10	50
AL1AL-12-25-12	12	100	25	12	35
AL1AL-12-35-12	12	100	35	12	50
AL1AL-14-35-14	14	100	35	14	50
AL1AL-16-35-16	16	100	35	16	50

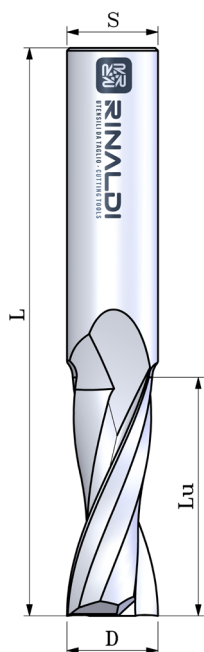
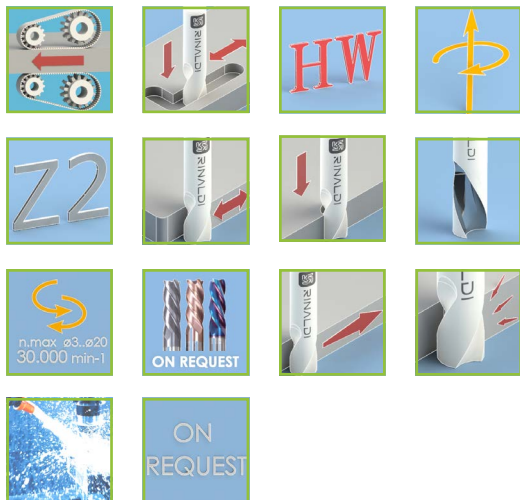
AL2A



Frese elicoidali in HW integrale

HW milling cutters

VHW-Fräser

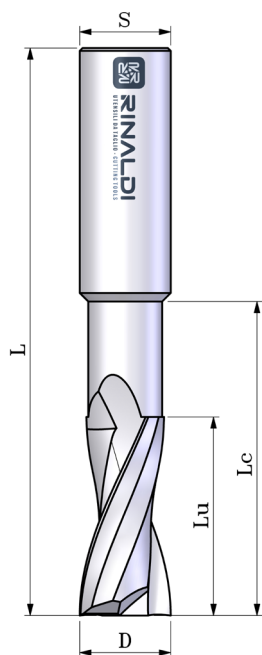
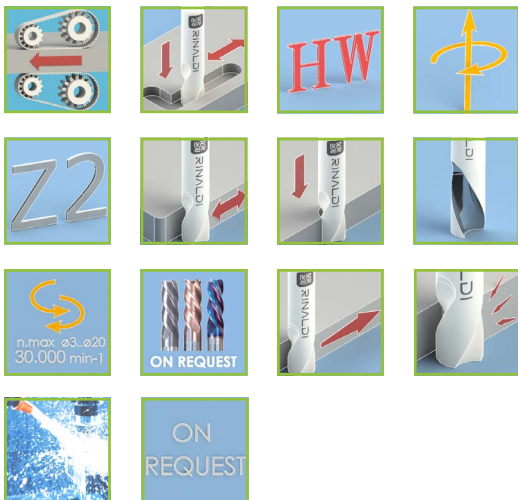


CODICE	D	L	Lu	S
AL2A-03-10-03	3	50	10	3
AL2A-03-10-06	3	60	10	6
AL2A-04-12-04	4	50	12	4
AL2A-04-12-06	4	60	12	6
AL2A-04-16-06	4	60	16	6
AL2A-05-14-05	5	50	14	5
AL2A-05-14-06	5	60	14	6
AL2A-05-20-06	5	60	20	6
AL2A-06-15-06	6	60	15	6
AL2A-06-20-06	6	60	20	6
AL2A-06-25-06	6	60	25	6
AL2A-08-20-08	8	80	20	8
AL2A-08-25-08	8	100	25	8
AL2A-08-35-08	8	100	35	8
AL2A-10-25-10	10	100	25	10
AL2A-10-35-10	10	100	35	10
AL2A-10-45-10	10	100	45	10
AL2A-12-25-12	12	100	25	12
AL2A-12-35-12	12	100	35	12
AL2A-12-45-12	12	100	45	12
AL2A-14-35-14	14	100	35	14
AL2A-14-45-14	14	100	45	14
AL2A-16-35-16	16	100	35	16
AL2A-16-45-16	16	100	45	16
AL2A-16-55-16	16	110	55	16
AL2A-16-65-16	16	130	65	16
AL2A-20-55-20	20	110	55	20
AL2A-20-65-20	20	130	65	20

AL2AL

Frese elicoidali in HW integrale serie lunga con gambo scaricato

HW Milling cutters long execution, necked
VHW Fräser lange Ausführung mit Freischliff



CODICE	D	L	Lu	S	Lc
AL2AL-03-10-06	3	60	10	6	20
AL2AL-04-12-06	4	60	12	6	25
AL2AL-05-14-06	5	60	14	6	25
AL2AL-05-14-08	5	80	14	8	30
AL2AL-06-15-06	6	60	15	6	25
AL2AL-06-15-08	6	80	15	8	30
AL2AL-08-25-08	8	100	25	8	45
AL2AL-10-25-10	10	100	25	10	45
AL2AL-12-25-12	12	100	25	12	45
AL2AL-14-35-14	14	100	35	14	50
AL2AL-16-35-16	16	100	35	16	50
AL2AL-16-65-16	16	130	65	16	80
AL2AL-20-35-20	20	110	35	20	60
AL2AL-20-65-20	20	130	65	20	80

AL2ALT



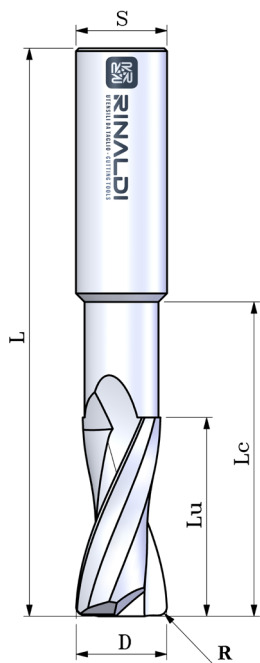
Frese elicoidali in HW integrale torica serie lunga con gambo scaricato

HW Milling cutters long execution, necked with corner radius

VHW Fräser lange Ausführung mit Freischliff und Eckenradius



CODICE	D	L	Lu	S	Lc	R
AL2ALT-03-10-06	3	60	10	6	20	0,3
AL2ALT-04-12-06	4	60	12	6	25	0,5
AL2ALT-05-14-06	5	60	14	6	25	0,5
AL2ALT-05-14-08	5	80	14	8	30	0,5
AL2ALT-06-15-06	6	60	15	6	25	0,75
AL2ALT-06-15-08	6	80	15	8	30	0,75
AL2ALT-08-25-08	8	100	25	8	45	1
AL2ALT-10-25-10	10	100	25	10	45	1
AL2ALT-12-25-12	12	100	25	12	45	1
AL2ALT-14-35-14	14	100	35	14	50	1,5
AL2ALT-16-35-16	16	100	35	16	50	1,5
AL2ALT-16-65-16	16	130	65	16	80	1,5
AL2ALT-20-35-20	20	110	35	20	60	2
AL2ALT-20-65-20	20	130	65	20	80	2



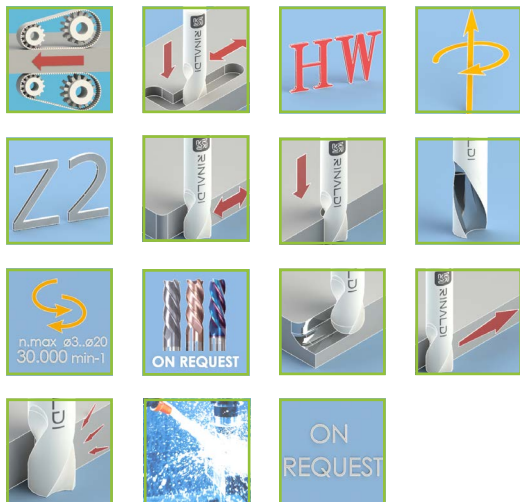
AL2ALS



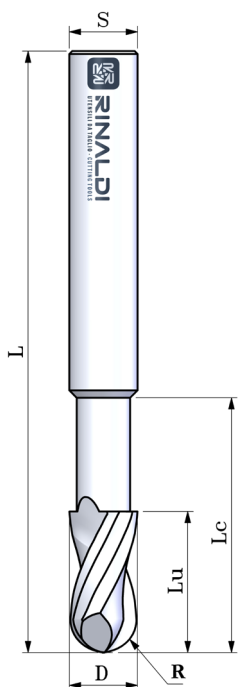
Frese elicoidali in HW integrale con raggio al vertice

HW milling cutters with top radius

VHW-Fräser mit Kopfradius



CODICE	D	L	Lu	S	Lc	R
ALZALS-03-10-06	3	60	10	6	20	1,5
ALZALS-04-12-06	4	60	12	6	25	2
ALZALS-05-14-06	5	60	14	6	25	2,5
ALZALS-05-14-08	5	80	14	8	30	2,5
ALZALS-06-15-06	6	60	15	6	25	3
ALZALS-06-15-08	6	80	15	8	30	3
ALZALS-08-25-08	8	100	25	8	45	4
ALZALS-10-25-10	10	100	25	10	45	5
ALZALS-12-25-12	12	100	25	12	45	6

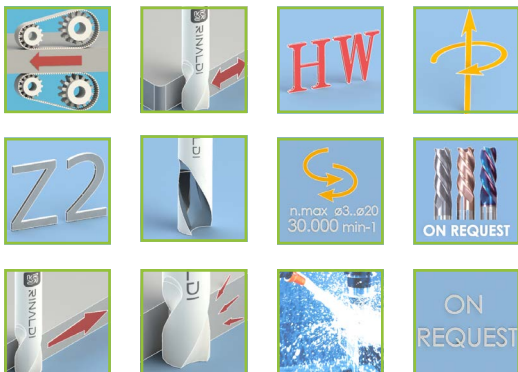


AL2AS

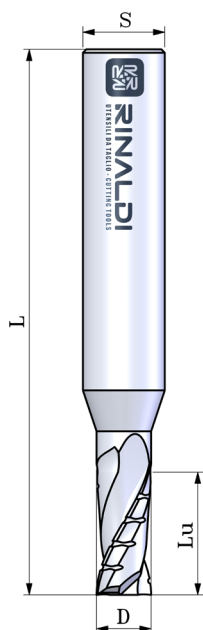


Frese elicoidali in HW integrale con rompitruciolo a finire

HW milling cutters with chip-breaker for finishing
VHW Fräser mit Schrupp-Schlichtprofil



CODICE	D	L	Lu	S
AL2AS-06-010	6	80	10	12
AL2AS-06-018	6	80	18	12
AL2AS-08-010	8	80	10	12
AL2AS-08-018	8	80	18	12
AL2AS-10-018	10	75	18	16
AL2AS-11-018	10	80	18	12
AL2AS-12-018	12	80	18	12



ALU2RA

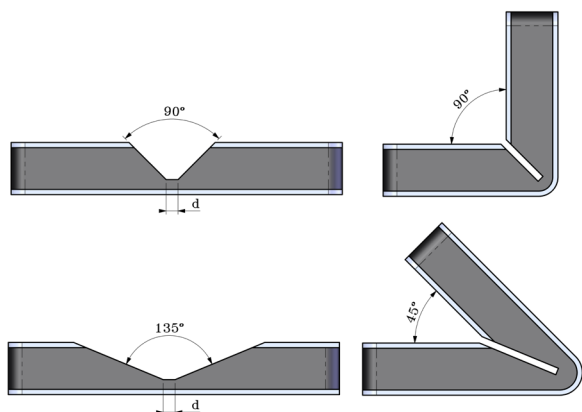
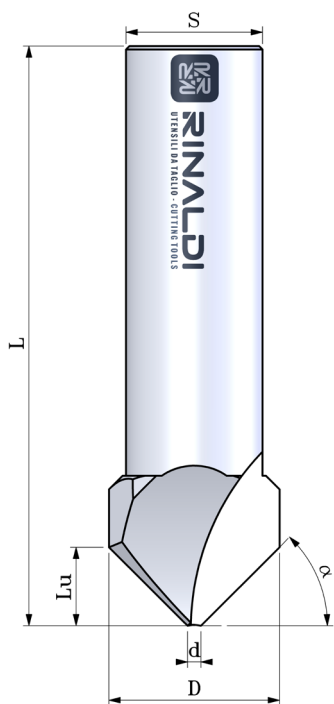
Frese in HW integrale per Alucobond-Dbond

HW Milling cutters for working Alucobond – Dibond

VHW Fräser für Alucobond – Dibond



CODICE	D	L	Lu	S	α	d
ALU2RA-25-115	25	85	11.5	20	45	2
ALU2RA-25-005	25	80	5	16	22.5	2
ALU2RA-12-005	12	60	5	12	45	2



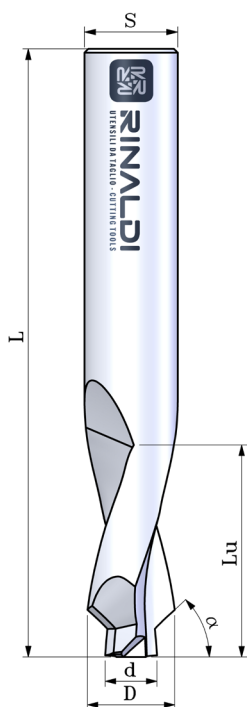
ALU2RB

Frese elicoidali in HW integrale per Alucobond-Dbond

HW Milling cutters for working Alucobond – Dibond
VHW Fräser für Alucobond – Dibond



CODICE	D	L	Lu	S	α	d
ALU2RB-12-025	12	80	25	12	45	7



DIA2A



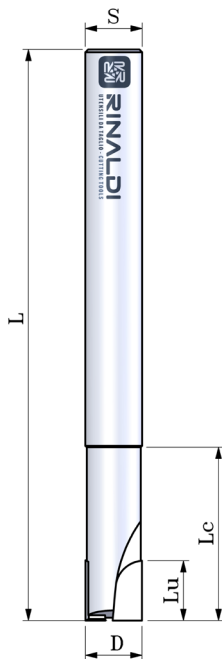
Frese con corpo in HW e inserti in PKD serie lunga con gambo scaricato

Milling cutters with HW body and PKD plates, long execution, necked
Fräser mit Körper aus HW und PKD Platten, Lange Ausführung mit Freischliff



ON
REQUEST

CODICE	D	L	Lu	S	Lc
DIA2A-04	4	80	6	4	30
DIA2A-06	6	80	8	6	30
DIA2A-08	8	80	10	8	30
DIA2A-10	10	100	10	10	30



DIA3A

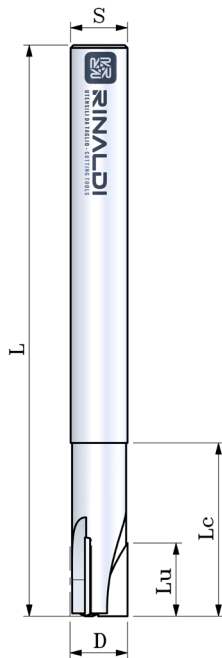


Frese con corpo in HW e inserti in PKD serie lunga con gambo scaricato

Milling cutters with HW body and PKD plates, long execution, necked
Fräser mit Körper aus HW und PKD Platten, Lange Ausführung mit Freischliff



CODICE	D	L	Lu	S	Lc
DIA3A-04	4	80	6	4	30
DIA3A-06	6	80	8	6	30
DIA3A-08	8	80	10	8	30
DIA3A-10	10	100	10	10	30

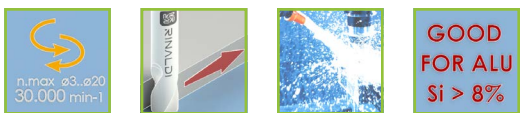
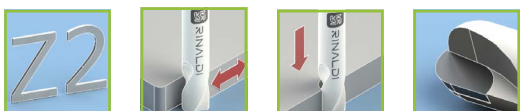


DIA2AS



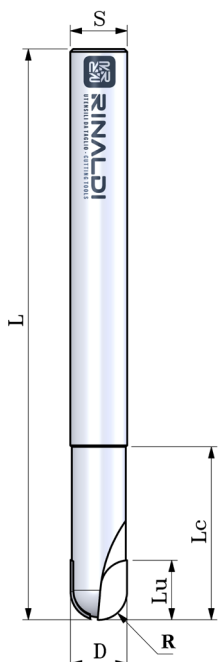
Frese con corpo in HW e inserti in PKD serie lunga con gambo scaricato

Milling cutters with HW body and PKD plates, long execution, necked
Fräser mit Körper aus HW und PKD Platten, Lange Ausführung mit Freischliff



ON
REQUEST

CODICE	D	L	Lu	S	Lc	R
DIA2AS-04	4	80	6	4	30	2
DIA2AS-06	6	80	8	6	30	3
DIA2AS-08	8	80	10	8	30	4
DIA2AS-10	10	100	10	10	30	5

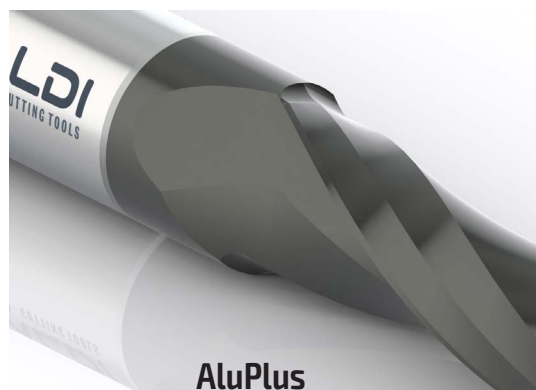


Rivestimenti

Rivestimenti per elicoidali in HW integrale per lavorazione Alluminio

Coatings for HW milling cutters for working Aluminium

Beschichtungen für VHW-Fräser für Aluminiumbearbeitung



Rivestimento "AluPlus"

Coating "AluPlus"

Beschichtung "AluPlus"

ON
REQUEST

- Elevata resistenza all'abrasione
- Elevata microdurezza
- Mantiene il filo tagliente
- Elevata scorrevolezza del truciolo
- Spessore rivestimento ridotto
- Basso coefficiente d'attrito
- Indicato per contenuto Si < 9%
- High wear resistance
- High microhardness
- Unimpaired sharpness of cutting edges
- Better chips evacuation
- Reduced coating thickness
- Low coefficient of friction
- Suitable for Si < 9%

- Hervorragenden Schutz gegen Abrasivverschleiß
- Hohe Mikrohärt
- Die Schneidkanten bleiben in voller Schärfe erhalten
- Spanfluss erleichtert
- Beschichtungsdicke reduziert
- Niedrigen Reibungskoeffizienten
- Geeignet für Si > 9%

Rivestimento "DLC" (Diamond Like Carbon)

Coating "DLC"

Beschichtung "DLC"

ON
REQUEST

- Prestazioni elevate ad alte T°
- Elevata microdurezza
- Lavori di finitura migliori
- Elevata scorrevolezza del truciolo
- Spessore rivestimento ridotto
- Elevata resistenza all'usura/abrasione
- Indicato per contenuto Si > 8%
- High performances at high temperatures
- High microhardness
- Improved surface quality
- Better chips evacuation
- Reduced coating thickness
- High abrasive wear resistance
- Suitable for Si > 8%

- Hohe Leistung bei hohen Temperaturen
- Hohe Mikrohärt
- Ausgezeichnete Oberflächenqualität
- Spanfluss erleichtert
- Beschichtungsdicke reduziert
- Hervorragenden Schutz gegen Abrasivverschleiß
- Geeignet für Si > 8%



Rivestimento "AluHard"

Coating "AluHard"

Beschichtung

ON
REQUEST

- Altissima stabilità termica
- Elevata resistenza all'usura e abrasione
- Elevata stabilità di processo
- Forze di taglio ridotte notevolmente
- Possibilità di lavorazioni a secco
- Elevata precisione
- Superficie molto liscia
- High performances at high temperatures
- High abrasive wear resistance
- Unimpaired sharpness of cutting edges
- Cutting forces significantly reduced
- Possibility to work without coolant
- High precision
- Very smooth surface

- Hohe Leistung bei hohen Temperaturen
- Hervorragenden Schutz gegen Abrasivverschleiß
- Die Schneidkanten bleiben in voller Schärfe erhalten
- Schnittkräfte deutlich reduziert
- Möglichkeit ohne Kühler zu arbeiten
- Hohe Präzision
- Sehr glatte Oberfläche

Attacchi uni 7738 e Din 1835

Shanks
Schäfte

ON
REQUEST

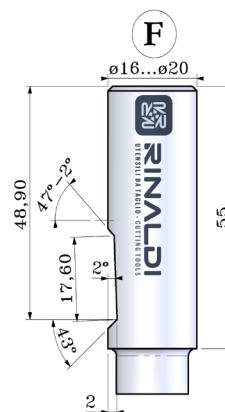
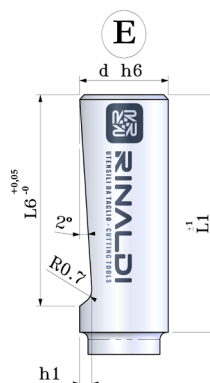
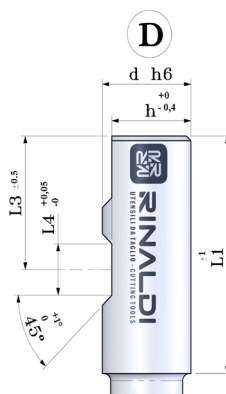
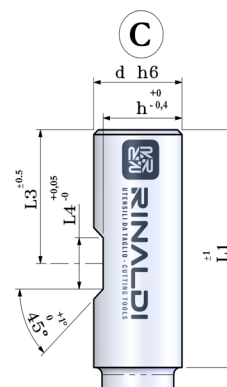
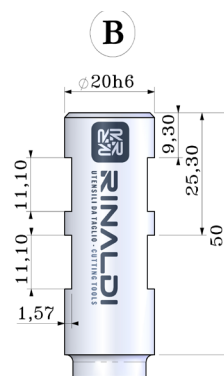
d	L1	L2	L3	L4	L5	L6	h1	h
4	28	-	-	-				
5	28	-	-	-				
6	36	13	18	4.2	-	28	1.2	4.8
8	36	13	18	5.5	-	-	-	6.6
10	40	13	20	7	-	28	1.2	8.4
12	45	13	22.5	9	-	35	1.5	10.4
16	48	13	24	10	-	35	1.5	14.2
20	50	16	25	11	-	43	1.75	18.2
25	56	16	32	12	17	43	1.75	23
32	60	16	36	14	19	43	1.75	30



Seeger $\phi S \geq 14$

ON
REQUEST

Solo su richiesta
Only on request
Nur auf Anfrage



Utensili in pinza

S	Lp min
≤ 10	≥ 20
$10 < S < 25$	$S \times 2$
≥ 25	$S \times 1.8$

CODOLO	
A	CODOLO CILINDRICO LISCIO ($\phi \geq 14$ Seeger)
B	CODOLO CILINDRICO ATTACCO "MAKA"
C	CODOLO CILINDRICO CON UNICO PIANO DI TRASCINAMENTO (WELDON)
D	CODOLO CILINDRICO CON DOPPIO PIANO DI TRASCINAMENTO (WELDON)
E	CODOLO CILINDRICO CON PIANO INCLINATO
F	CODOLO CILINDRICO ATTACCO "HOMAG-WEEKE"

Nozioni tecniche

Technical information
Technische Informationen

Velocità di taglio

La velocità di taglio (VT) e' la distanza percorsa da un tagliente in un secondo (m/s) e si calcola con questa formula:

$$VT = \frac{D \times \pi \times n}{1000 \times 60} \quad (\text{m/s})$$

D = diametro dell'utensile [mm]
n = numero di giri [min-1]
 $\pi = 3,14$

Cutting speed

The cutting speed (VT) is the distance the cutting edge covers per second (m/s) and it is calculated with the following formula:

$$VT = \frac{D \times \pi \times n}{1000 \times 60} \quad (\text{m/s})$$

D=diameter of the tool (mm)
n= RPM (min -1)
 $\pi = 3,14$

Die Schnittgeschwindigkeit

Die Schnittgeschwindigkeit (VT) ist die zurückgelegte Distanz einer Schneide in einer Sekunde und wird durch die folgende Formel berechnet :

$$VT = \frac{D \times \pi \times n}{1000 \times 60} \quad (\text{m/s})$$

D=Werkzeugdurchmesser (mm)
n=Drehzahl (min -1)
 $\pi = 3,14$

Valori indicativi per le Velocita' di Taglio (VT m/s)

Materiale/ Material	frese HW (VT m/s)
Alluminio (fresatura in spallamento) Aluminum (Shoulder milling) Aluminium (Eckfräsen)	8
Alluminio (fresatura di cave) Aluminum (Slot milling) Aluminium (Fräsen von Nuten)	8
Alluminio (fresatura a tuffo) Aluminum (Plunge milling) Aluminium (Tauchfräsen)	5

Velocita' di Rotazione indicative (n=min-1)

Tipologia utensili/ Type of tools / Typologie der Werkzeuge	Nmax (min-1)
Frese HW ø3..ø20 HW milling cutters ø3..ø20 VHW Fräser ø3..ø20	30.000
Frese HW > ø20 HW milling cutters > ø20 VHW Fräser HW > ø20	24.000
Frese HW monotaglienti 1 flute HW milling cutters Fräser Z=1	24.000

Velocità di Avanzamento

La velocità di avanzamento (Va) dipende dal numero di giri dell'utensile, dal numero dei taglienti e dall'avanzamento dei taglienti.

Di regola per ridurre i tempi di lavorazione si imposta un valore e poi si aumenta la VA fino a che si è soddisfatti della finitura superficiale. I valori si possono calcolare con la formula:

$$Va = \frac{At \times Z \times n}{1000} \quad (\text{m/min})$$

At = avanzamento del tagliente [mm]
Z = numero dei taglienti
n = numero di giri [min-1]

Feeding speed

The feeding speed (Va) depends on RPM, the number of cutting edges and the chip load.

To reduce the machining time an estimated Va is usually set and then increased up to the achievement of a good finish. This value can be calculated with the following formula:

$$Va = \frac{At \times Z \times n}{1000} \quad (\text{m/min})$$

At = chip load (feed per cutting edge)
Z=number of cutting edges
N= RPM

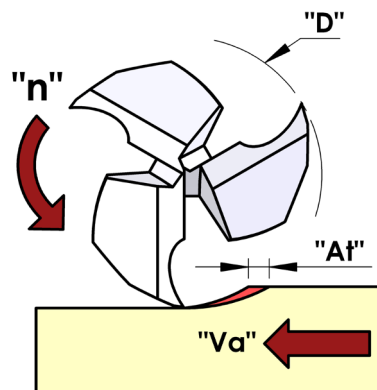
Vorschubgeschwindigkeit

Die Vorschubgeschwindigkeit (Va) hängt von der Drehzahl, von der Zähnezahl und vom Zahnvorschub ab.

Um die Bearbeitungszeit zu verkürzen, wird normalerweise einen Wert eingestellt und dann erhöht bis zum Erreichen eine gute Oberfläche. Man kann diese Werte durch die folgende Formel berechnen :

$$Va = \frac{At \times Z \times n}{1000} \quad (\text{m/min})$$

At = Zahnvorschub (mm)
Z= Zähnezahl
N= Drehzahl (Min-1)



0,3 - 0,8 mm = truciolo semplice
0,8 - 2,5 mm = truciolo semplice
2,5 - 5,0 mm = truciolo sgrassato

0,3 - 0,8 mm = Fine chip
0,8 - 2,5 mm = Fine chip
2,5 - 5,0 mm = Rough chip

0,3 - 0,8 mm = Feinschlichtspan
0,8 - 2,5 mm = Schlichtspan
2,5 - 5,0 mm = Schruppspan

Bilanciatura

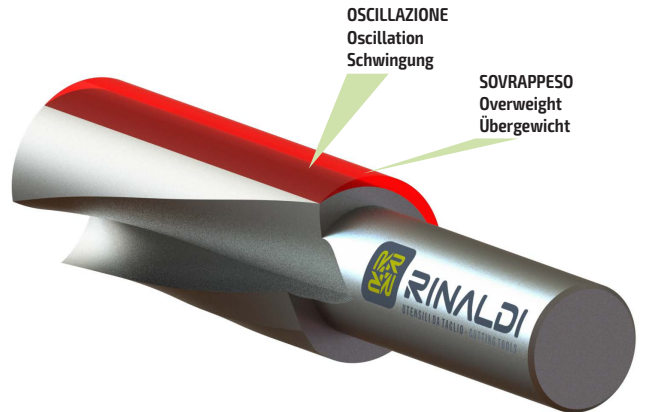
Balancing
Auswuchtung

La bilanciatura viene eseguita per ridurre gli stress meccanici, il rumore e migliorare la funzionalità dell'utensile.

Sbilanciamento U (g*mm/Kg)
Specifica lo sbilanciamento residuo ammissibile per gli utensili integrali

Massima velocità ammissibile $n_{max}(\min-1)$
Specifica la velocità di rotazione massima dell'utensile che non deve mai essere superata

Tipo di utensile	grado $G=e_{per}$ ISO 1940-1	Formula	Spiegazione Formula
Utensili integrali	16	$U=1,5279 * 10^3 * 1/n_{max}$	Il valore di 1,5279 e' dato da : $e_{per} * n * 10^3 * 60/2 * \pi$
Utensili complessi e tutti gli utensili con massa <1Kg	40	$U=3,8197 * 10^3 * 1/n_{max}$	Il valore di 3,8197 e' dato da : $e_{per} * n * 10^3 * 60/2 * \pi$



Effetti della sbilanciatura

- La sbilanciatura produce oscillazioni / vibrazioni
- Peggiora qualità di superficie
- Limitazione del massimo numero di giri
- Danni all'albero o al motore
- Usura dei taglienti più elevata
- Formazione di ruggine nelle posizioni di taglio

Effects of unbalance

- Unbalance causes oscillations and vibrations
- Worse surface quality
- Limitation of the maximum RPM
- Damages to the spindle or motor
- Increased wear of cutting edges
- Formation of rust on the cutting edges

Auswirkungen der unwucht

- Unwucht bewirkt Schwingungen und Vibrationen
- Schlechtere Oberflächenqualität
- Verringerung der maximalen Drehzahl
- Schaden an der Spindel oder Motor
- Erhöhter Schneidverschleiß
- Rostbildung an den Schneiden

Balancing is performed to reduce mechanical stress, noise and to improve the functionality of the tools.

Unbalance U (g*mm/Kg)
Permissible residual specific unbalance for solid tools

Maximum Rpm $n_{max}(\min-1)$
Specifies the maximum RPM of the tool which must never be exceeded

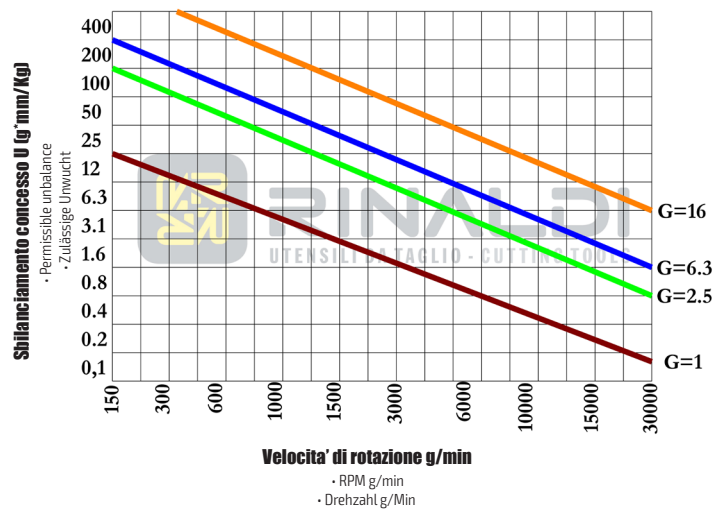
Type Of Tool	grade $G=e_{per}$ ISO 1940-1	Formula	Explanation Of The Formula
Solid tools	16	$U=1,5279 * 10^3 * 1/n_{max}$	the value of 1,5279 it is given by : $e_{per} * n * 10^3 * 60/2 * \pi$
Complex tools and all tools with mass <1 kilo	40	$U=3,8197 * 10^3 * 1/n_{max}$	the value of 3,8197 it is given by : $e_{per} * n * 10^3 * 60/2 * \pi$

Diagramma della tolleranza di bilanciatura

Balancing tolerance diagram
Diagramm von Auswuchtteranz

Grado di bilanciatura "G" mm/secondo

- Grade of balancing "G" mm/ second
- Grad von Auswuchtung "G" mm/Sekunede



Auswuchtung wird durchgeführt, um mechanische Spannungen zu verringern, Lärm zu reduzieren und die Funktionalität des Werkzeuges zu verbessern

Unwucht U (g*mm/Kg)
Zulässige spezifische Restunwucht für massive Werkzeuge

Maximale Drehzahl $n_{max}(\min-1)$
Gibt die maximale Drehzahl des Werkzeuges, die niemals überschritten werden darf

Werkzeugtyp	grad $G=e_{per}$ ISO 1940-1	Formel	Erklärung Der Formel
Massive Werkzeuge	16	$U=1,5279 * 10^3 * 1/n_{max}$	Der Wert 1,5279 wird wie folgt berechnet: $e_{per} * n * 10^3 * 60/2 * \pi$
Komplexe Werkzeuge und alle Werkzeuge mit Massen <1 Kilo	40	$U=3,8197 * 10^3 * 1/n_{max}$	Der Wert 3,8197 wird wie folgt berechnet : $e_{per} * n * 10^3 * 60/2 * \pi$



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