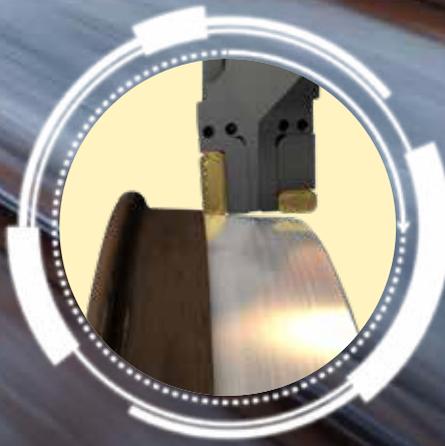
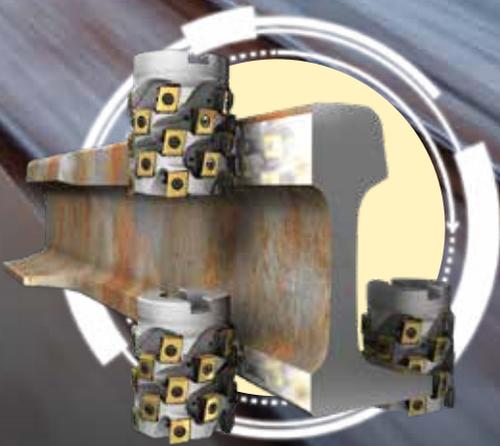




ISCAR'S MACHINING SOLUTIONS FOR THE RAILWAY INDUSTRY



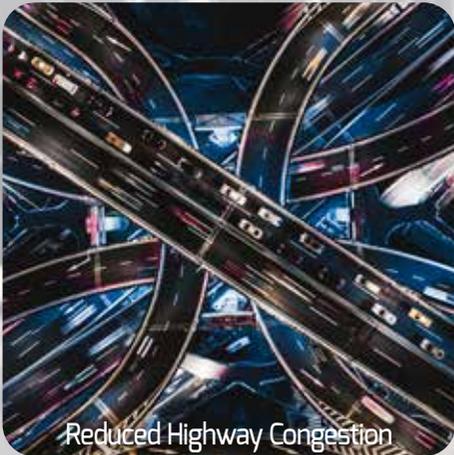


Railway Industry

ISCAR'S Solutions for the Railway Industry

The railway industry has played an important role in the past two decades becoming one of the leading means of transportation for freight and passengers. Ongoing investments in modern railway track infrastructure has opened a new edge to high-speed transportation mobility.

In addition, the environmental advantages offered in railway transportation is expanding railway traffic awareness. To keep up with the growing demands in this heavy metalworking industry, ISCAR has developed special machining expertise for railway components with innovative cutting tools and robust carbide grades.



Reduced Highway Congestion



Fuel Efficiency



Fewer Emissions



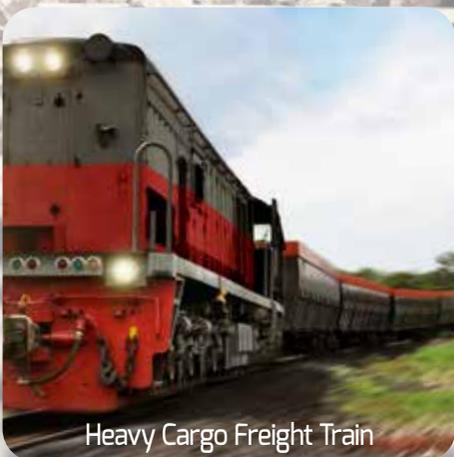
Diesel Locomotive (~200 Km/Hr.)



High Speed Train (~380 Km/Hr.)



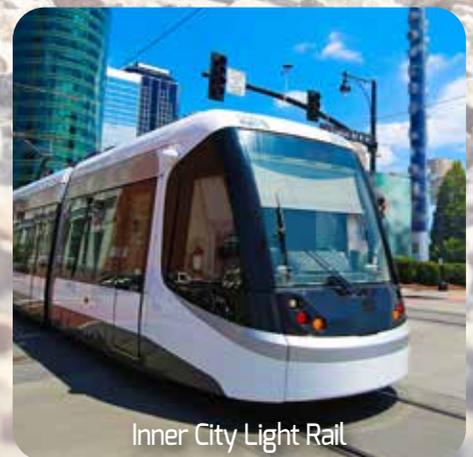
Electric Train



Heavy Cargo Freight Train



Underground Train



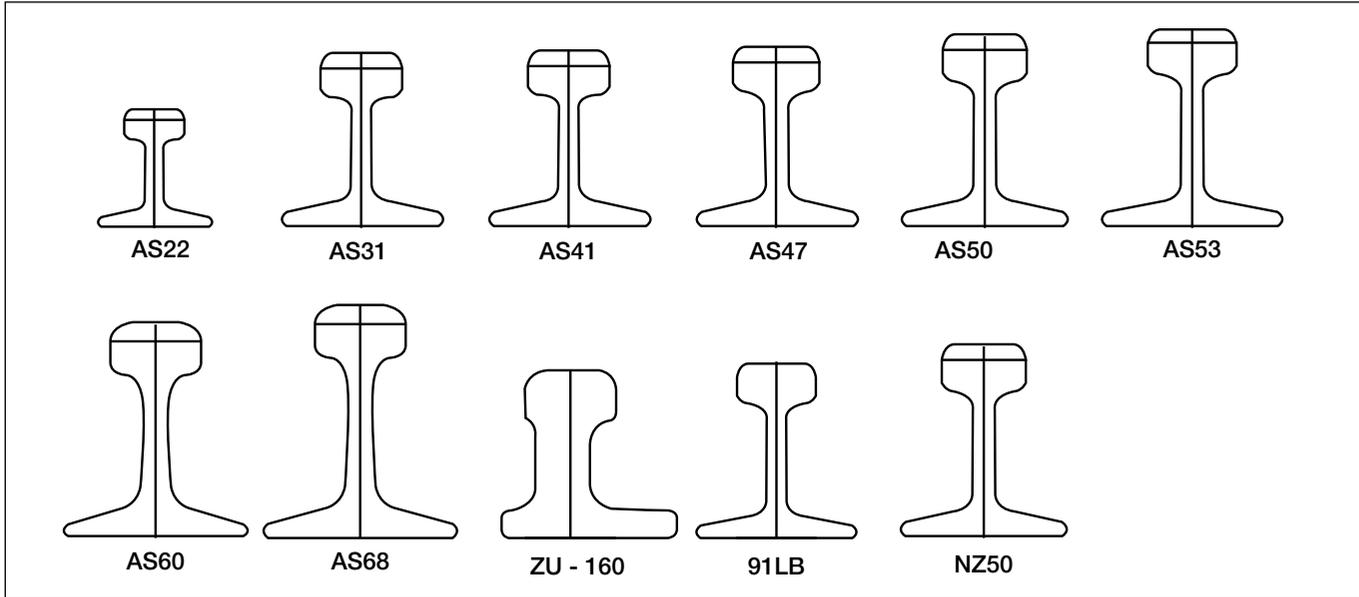
Inner City Light Rail



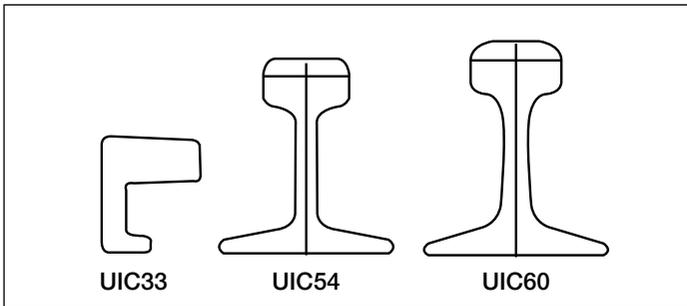
Railway Infrastructure

Typical Rail Profiles

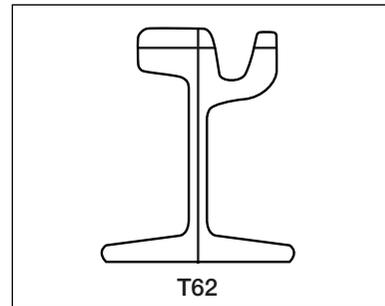
For inner city, long range cargo and passenger infrastructures



For switchers and crossing asymmetric rails



Tram rails



European Standard

Size: 60E1(UIC60), 55E1, 54E1(UIC54), 50E1, 49E1(S49), 50E2, 46E2(UC33), 54E2(UIC54E), 50E4, 50E6(U50), 56E1

American Standard

Size: 100RE, 115RE, 136RE, 90RA

Australian Standard

Size: 50kg, 53kg, 60kg, 66kg, 68kg, 73kg, 86kg, 89kg

British Standard

Size: 113A, 100A, 90A, 80A, 75A, 70A, 60A

Indian Standard

Size: 50, 60, 70, 80, 100, 120

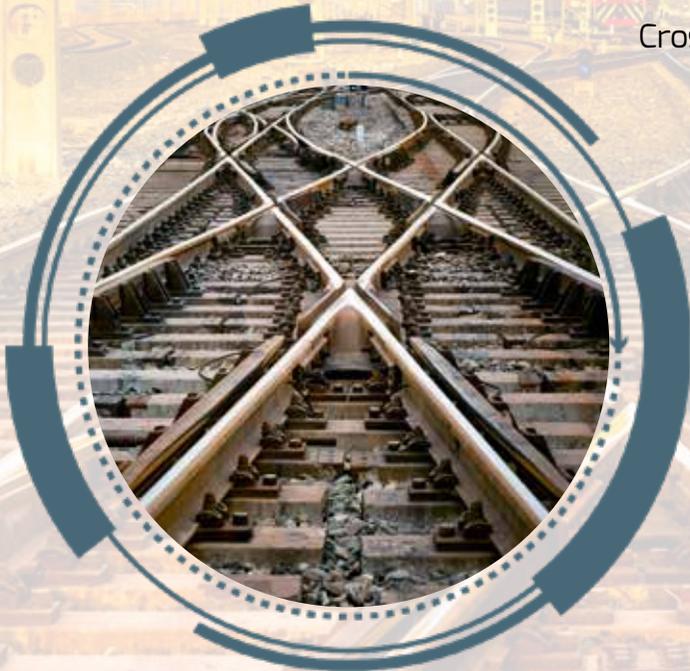
Japanese Standard

Size: 22kg, 30kg, 37A, 50n, CR73

Types of Railway Switchers and Separators



Crossover



Switch Diamond



Three-Way Switch



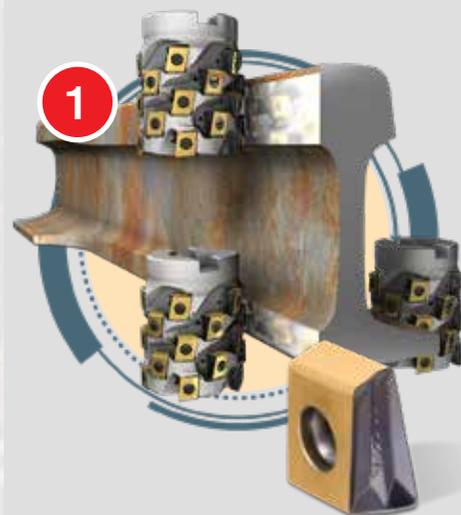
Switchers - Connecting Links UIC54

Shoulder Milling

ISCAR offers a standard line of cutters with different approach angles ranging from 22° up to 75°.

The connecting link blades are the running rails placed alongside the switch rails when in the closed position. They are designed with different profiles and moles to fit rail configurations. The connection link is usually manufactured from manganese steel and the production operation includes various types of profile milling.

HELITANG
T490 LINE



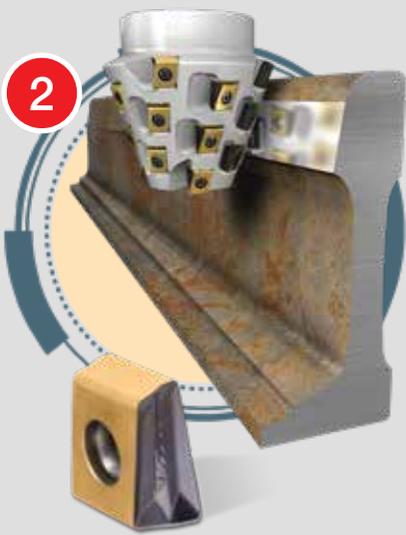
Shoulder Milling

Range: Ø20 - 125 mm

T490 extended flute cutters with rigidly clamped tangential four cutting edged inserts for machining side track profiles, switchers and separators.



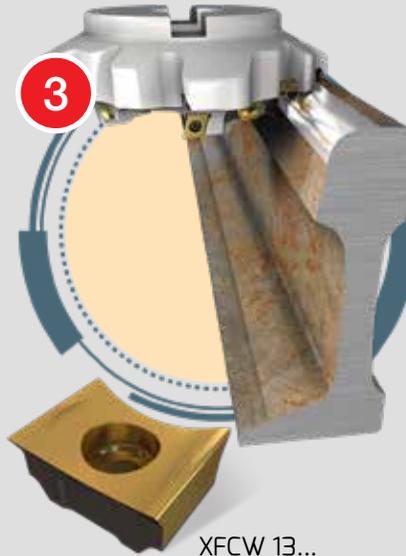
HELITANG
T490 LINE



Shoulder Milling

Special T472 tapered extended flute cutters with rigidly clamped tangential four cutting edged inserts for machining top tapered track profiles, switchers and separators. ISCAR offers a standard line of cutters with different approach angles ranging from 22° up to 75°.

TANGMILL
TANGENTIAL LINE

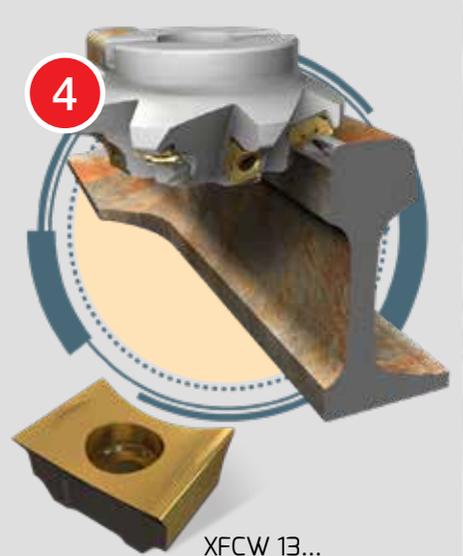


Shoulder Milling

Special concave profile extended flute cutters with rigidly clamped tangential inserts for machining top radius profiles, switchers and separators.



TANGMILL
TANGENTIAL LINE



Shoulder Milling

Special concave profile extended flute cutters with rigidly clamped tangential inserts for machining top radius profiles, switchers and separators.





Connecting Links

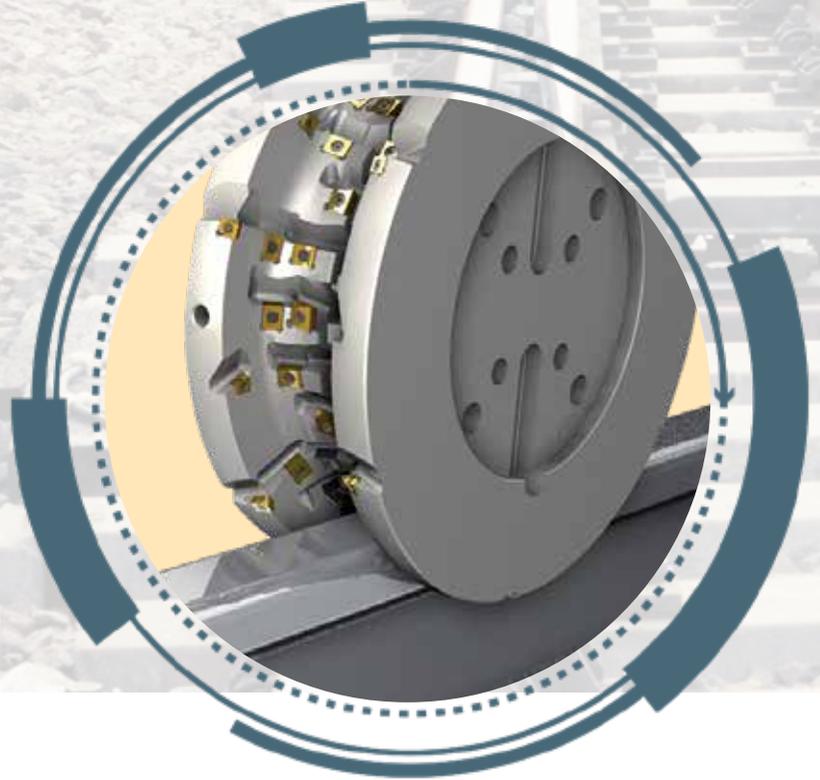
TANGMILL
TANGENTIAL LINE



Rough Milling

Special face mount web slotting cutters for machining steel crossings and transition rails made of alloy manganese. The cutter's positive rake cutting action dramatically reduces forces and improves tool consistency in difficult-to-clamp rail shapes while providing a smooth cut and eliminating hard finishing applications.

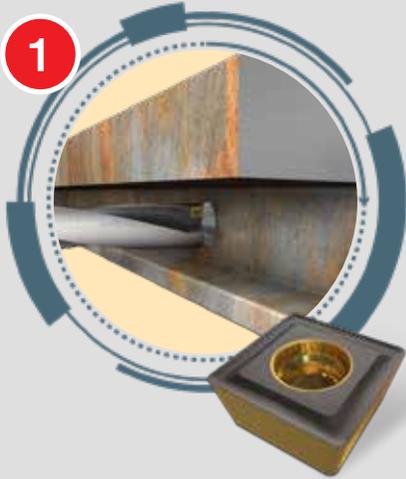
Especially Tailored
By ISCAR



Connecting Links UIC33

DR-TWIST
INDEXABLE DRILL LINE

HELITANG
T490 LINE



Drilling

Range: Ø12 - 80 mm

Drills with spiral coolant channels and a strong cutter body with excellent resistance to torsion and very efficient chip evacuation.

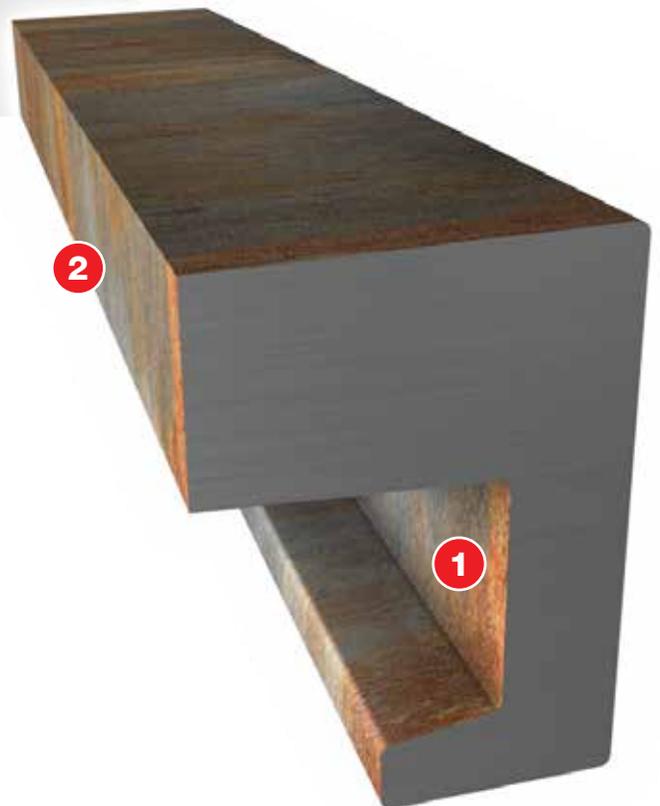


Shoulder Milling

Range: Ø20 - 125 mm

T490 extended flute cutters with rigidly clamped tangential inserts for machining switchers and separators.

The UIC33 rail is a common part which is produced to keep the wheel in correct alignment when approaching a switch.

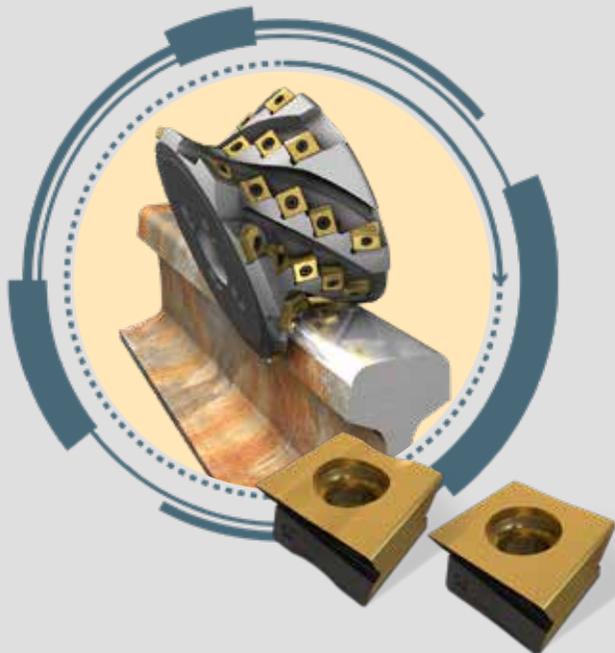




Switchers - Connecting Links

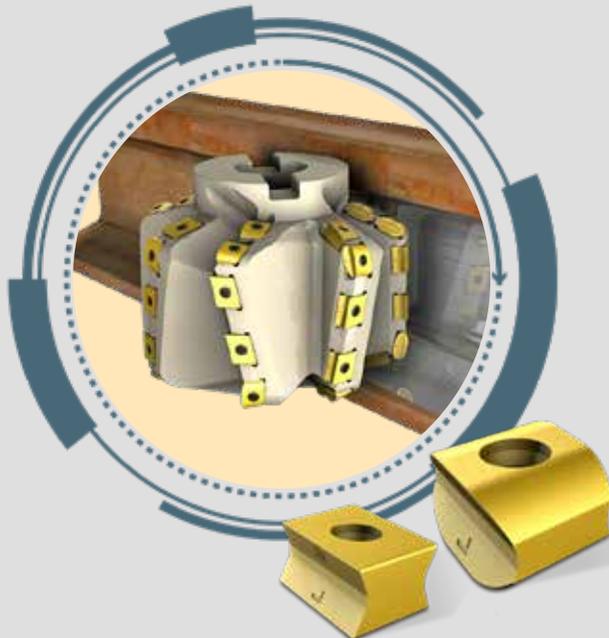
TANGMILL

HELITANG
T490 LINE



Tangential Cutters

Special concave profile extended flute cutters with rigidly clamped tangential inserts positioned on an angular spindle axis for smooth machining of switchers and separators.



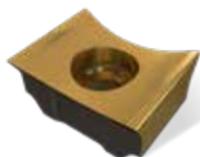
Switcher/Separator Milling

Special spherical extended flute cutters with rigidly clamped tangential inserts for machining switchers and separator shoulders. Their unique design, with a combination of left and right flutes, assures minimum vibrations and smooth cutting.



XFCW 1307...R130

*2 cutting edges.



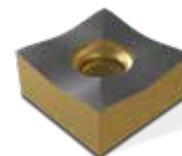
SNHT 1205...R10.0

SNHT 1205...R13.0

SNHT 1205...R15.0

SNHT 1205...R20.0

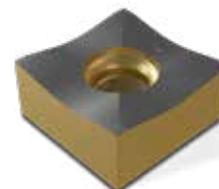
*4 cutting edges.



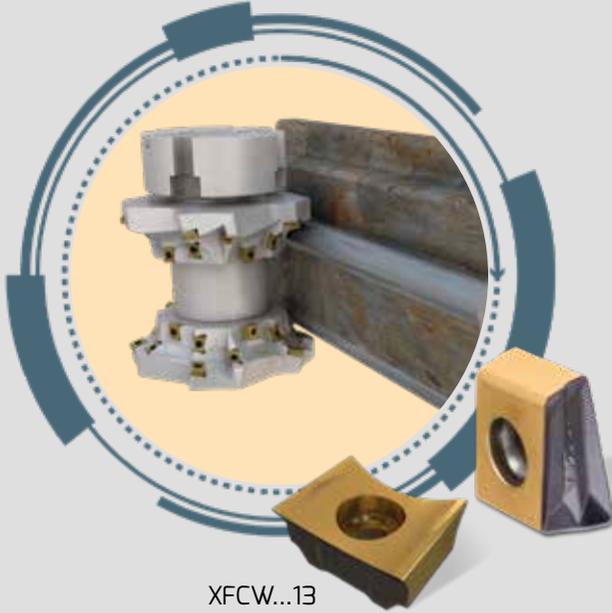
SNHT 1608...R13

SNHT 1608...R16

*4 cutting edges.



HELITANG
T490 LINE



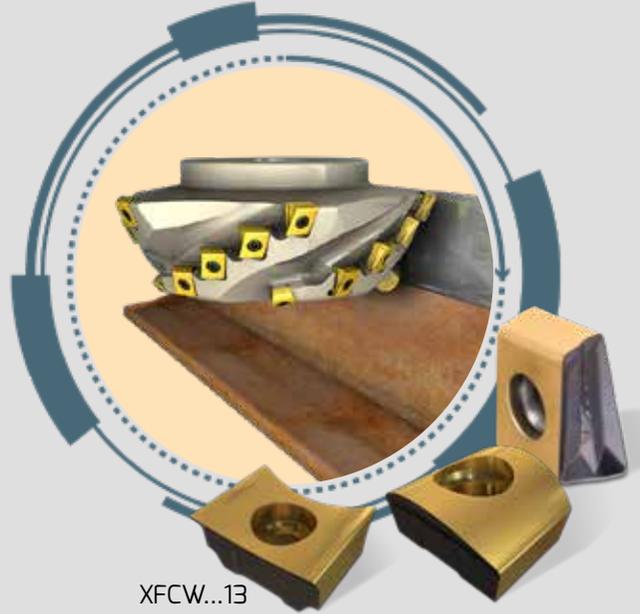
XFCW...13

Shoulder Milling

Special concave profile extended flute cutters with tangential inserts for switcher profiling.



HELITANG
T490 LINE



XFCW...13

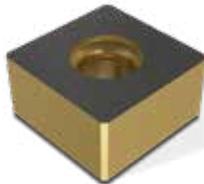
Tapered Switcher Blade Machining

Specially tapered extended flute cutters with helical flutes for high metal chip removal and rigidly clamped tangential inserts for machining top tapered track profiles, switchers and separators.



SNHX 1608...

*4R.H.+4L.H. cutting edges.



LNAT 1306...R15.0

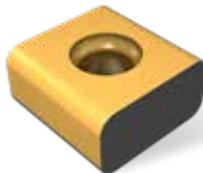
*2 cutting edges.



SNHX 160812...

SNHX 160820...

*2R.H.+2L.H. cutting edges.



SNHX 1608...R100

SNHX 1608...R140

SNHX 1608...R200

*2 cutting edges.



SNHX 1608...R05

SNHX 1608...R07

SNHX 1608...R10

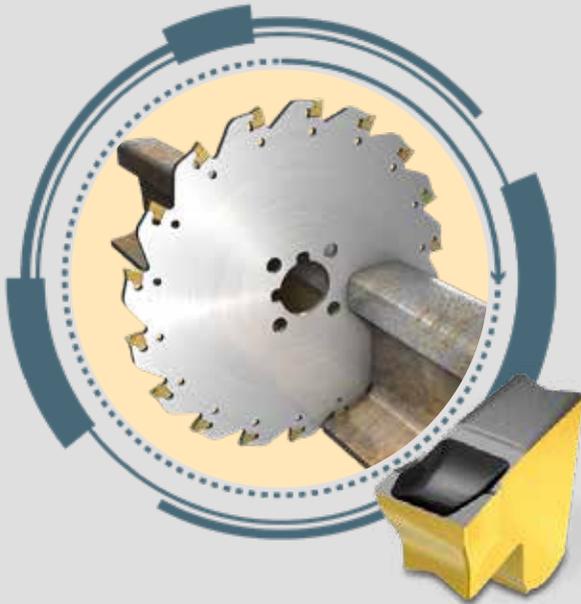
*2R.H.+2L.H. cutting edges.





Connecting Links

TANG-GRIP
PARTING LINE

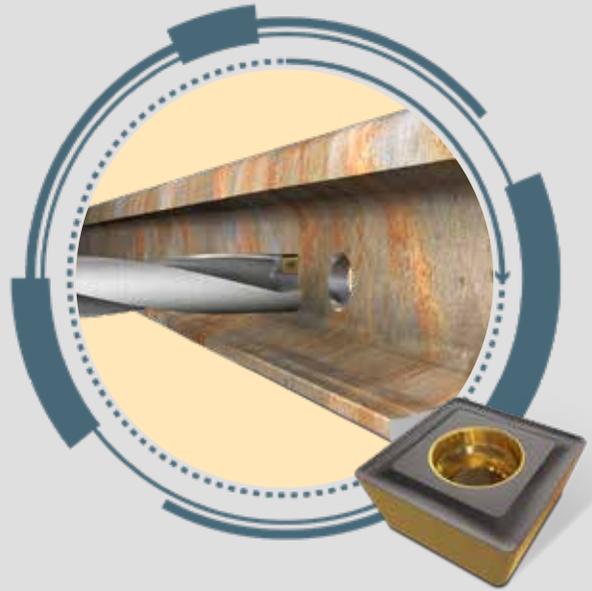


Slitting

Range: Ø100 - 160 mm

Indexable slotting cutters with tangentially mounted inserts and a unique clamping design for durable parting.

DR-TWIST
INDEXABLE DRILL LINE



Drilling

Range: Ø12 - 80 mm

Drills with spiral coolant channels and a strong cutter body with excellent resistance to torsion and very efficient chip evacuation.

HELITANG
T490 LINE

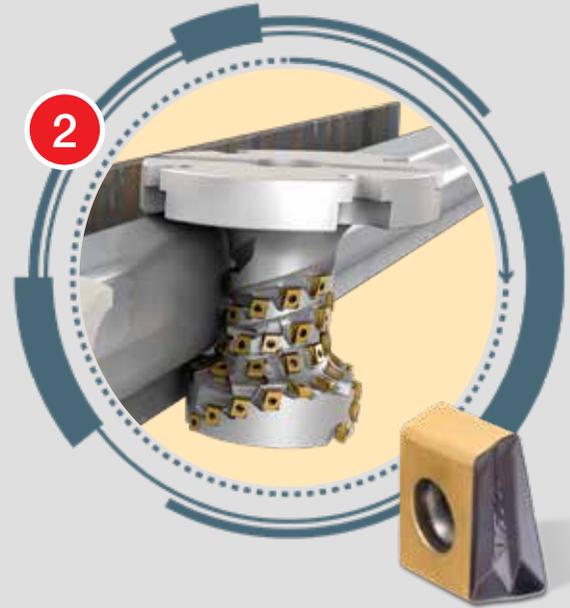


Shoulder Milling

Special profile extended flute cutters with rigidly clamped tangential inserts for machining switchers and separators.

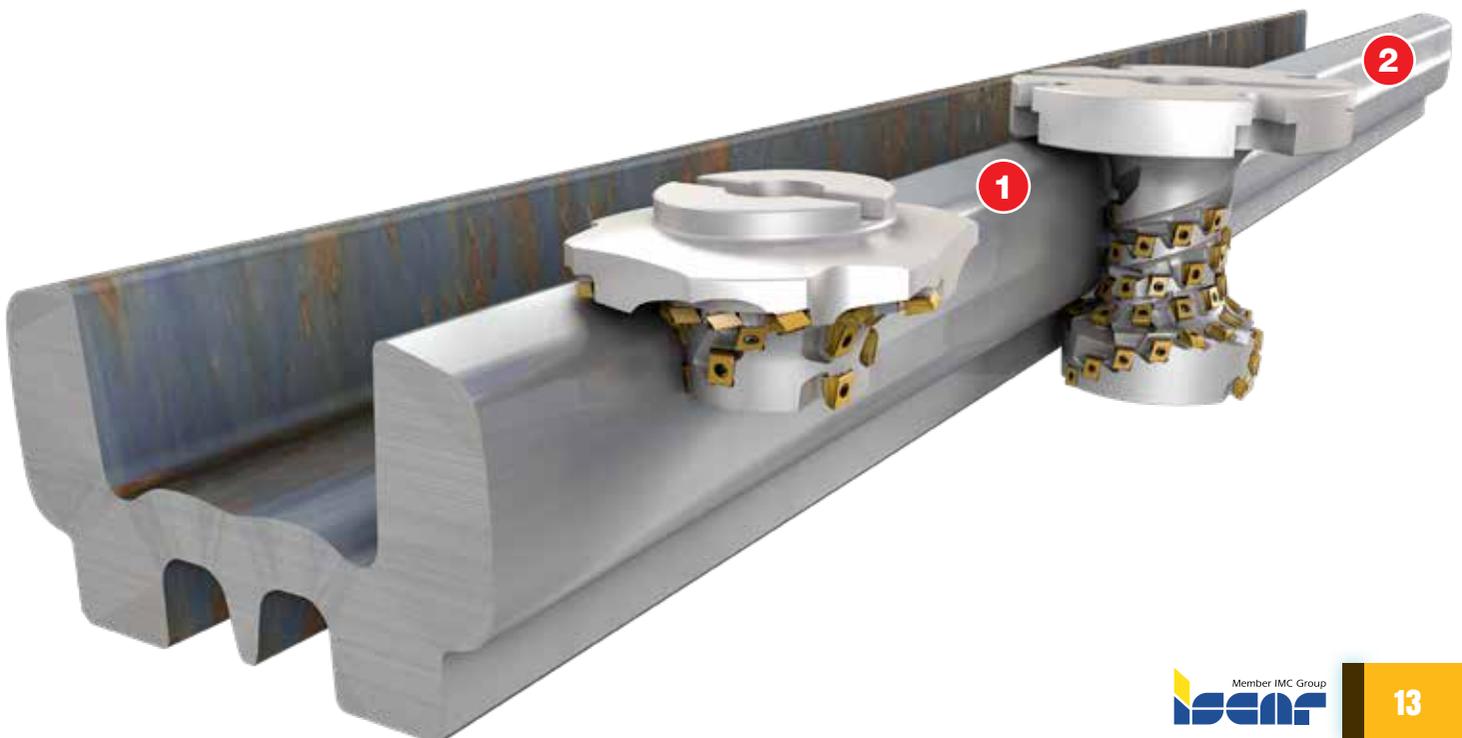


HELITANG
T490 LINE



Shoulder Milling

Special profile extended flute cutters with rigidly clamped tangential inserts for machining switchers and separators.

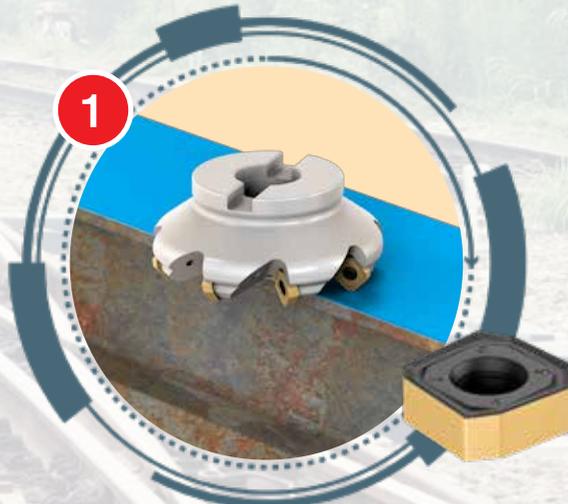




Connecting Link Type E61

The connecting link blades are the running rails placed alongside the switch rails when in the closed position. They are designed with different profiles and moles to fit rail configurations. The connection link is usually manufactured from manganese steel and the production operation includes various types of profile milling.

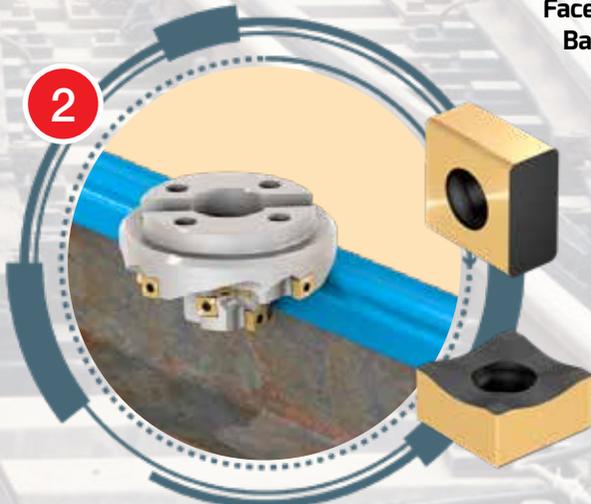




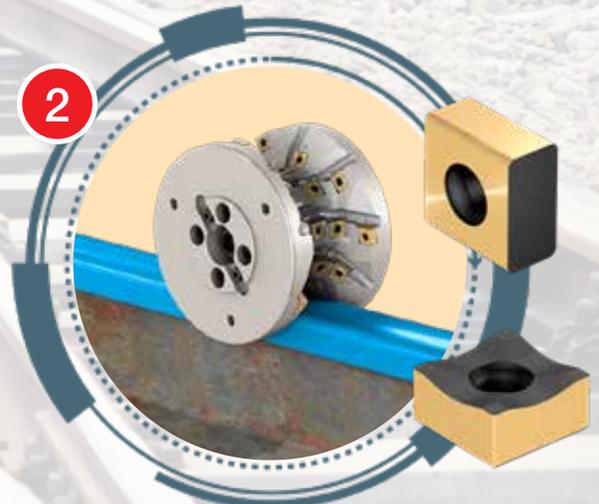
OPTION 1

Face Milling Rail Base Section

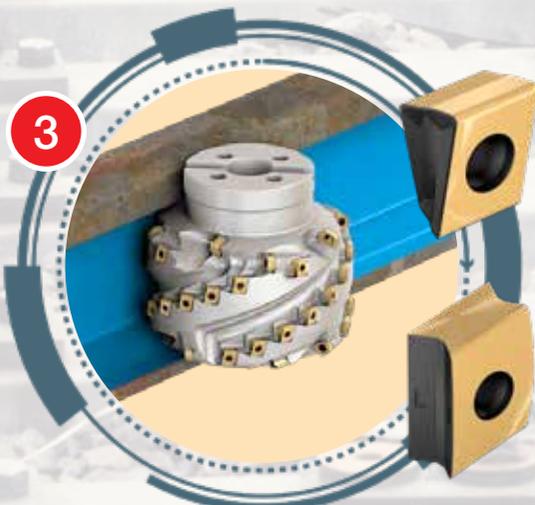
OPTION 2



Milling Rail Head Section



Milling Rail Head Section



Milling Web Section



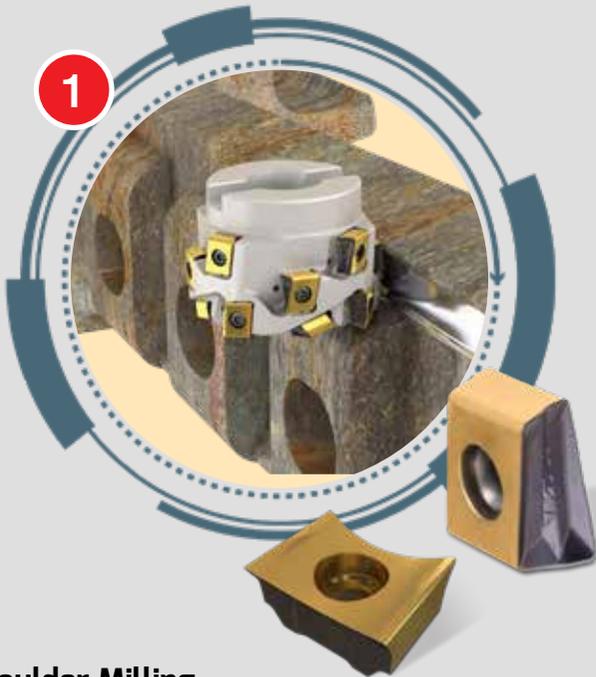
Milling Base Section



Switchers

HELITANG
T490 LINE

HELITANG
T490 LINE



Shoulder Milling

Special T490 extended milling cutters with rigidly clamped tangential four cutting edged inserts for machining switchers and separator shoulders.



Shoulder Milling

Special or concave profile extended flute cutters with tangentially clamped inserts for machining top and bottom filter track profiles, switchers and separators.

The switcher, also known as the frog, refers to the crossing point of two rails. This can be assembled by several appropriately cut and bent pieces of rail or can be a single casting of alloy manganese steel. ISCAR offers a wide range of standard and specially designed mills and drills for the production of switchers.

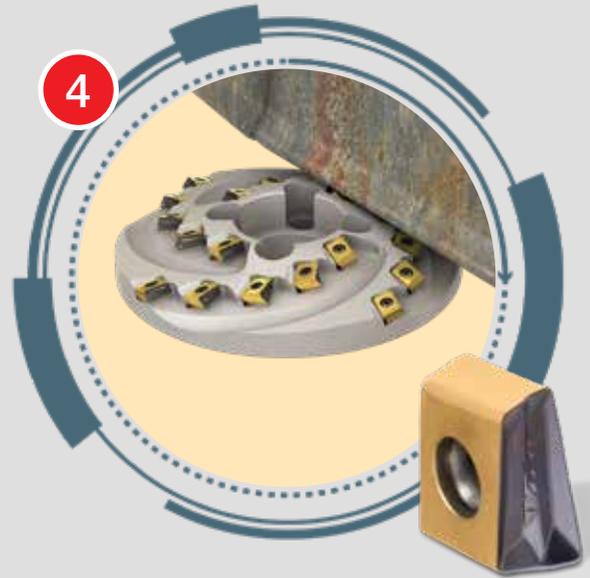
HELITANG
T490 LINE



Shoulder Milling

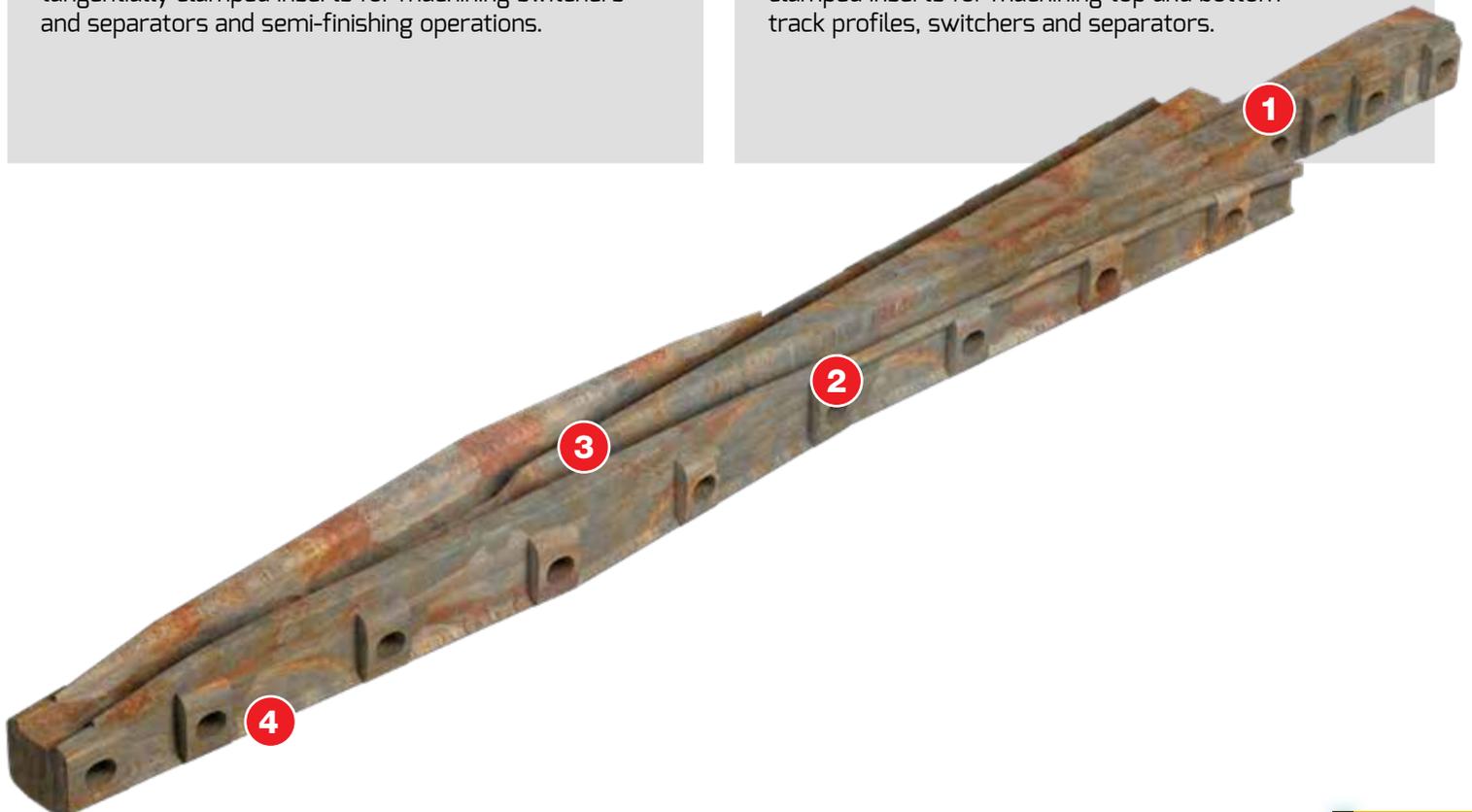
Special T479 tapered extended flute cutters with tangentially clamped inserts for machining switchers and separators and semi-finishing operations.

HELITANG
T490 LINE



Shoulder Milling

Special T414 tapered cutters with tangentially clamped inserts for machining top and bottom track profiles, switchers and separators.





Switchers

HELIDO
800 LINE

HELITANG
T490 LINE



Face Milling

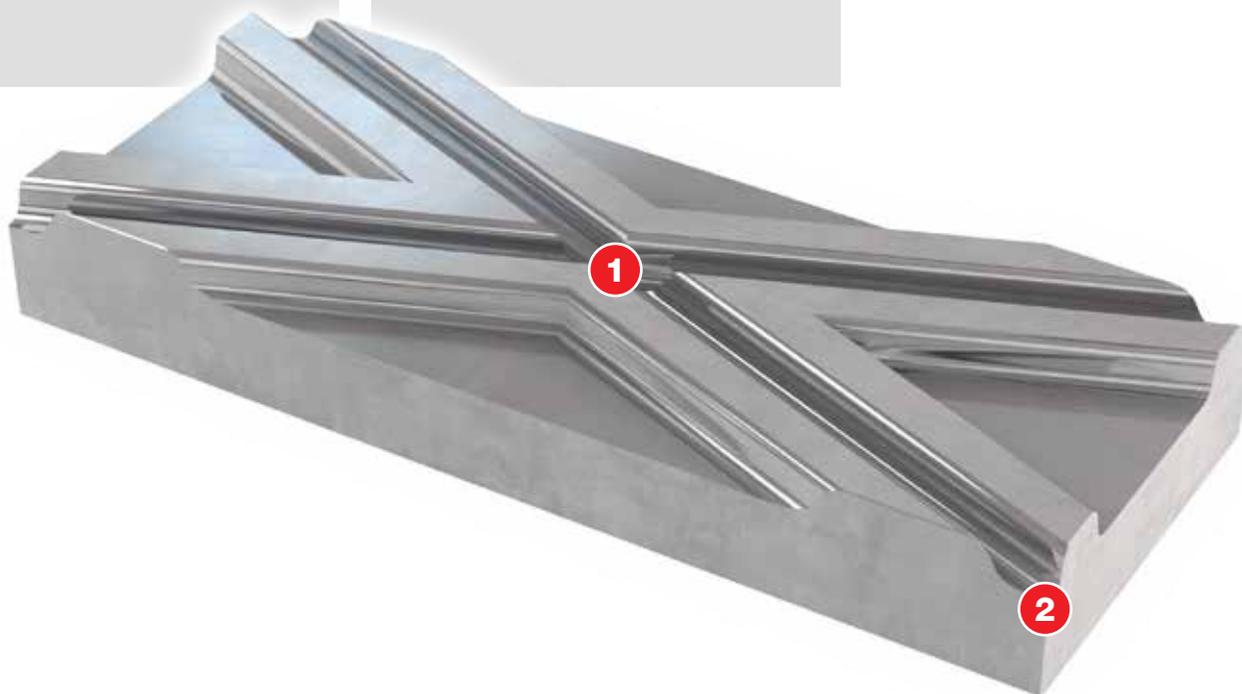
Range: Ø50 - 315 mm

45° face milling cutters carrying square or octagonal double-sided inserts with 8 and 16 cutting edges for roughing operations at an 8 mm depth of cut.



Deep Shouldering (Contour)

Special T479 full profile cutters for machining switchers and semi-finishing operations.



Slide Plate

HELIDO
490 LINE

TANGMILL
TANGENTIAL LINE

TANGMILL
TANGENTIAL LINE



Slot Milling

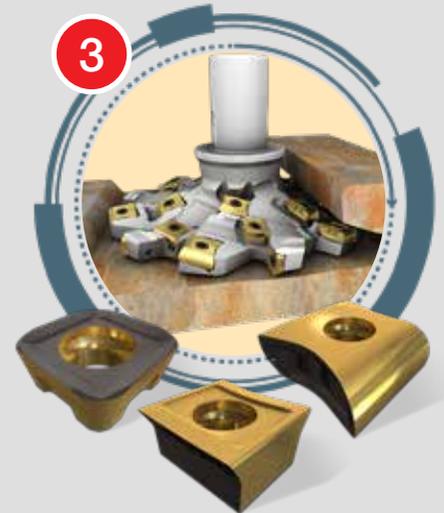
Range: Ø25 - 100 mm

H490 is an extended flute cutter characterized by radially clamped double-sided rectangular inserts with 4 helical cutting edges available in 09 /12 /17 mm sizes.



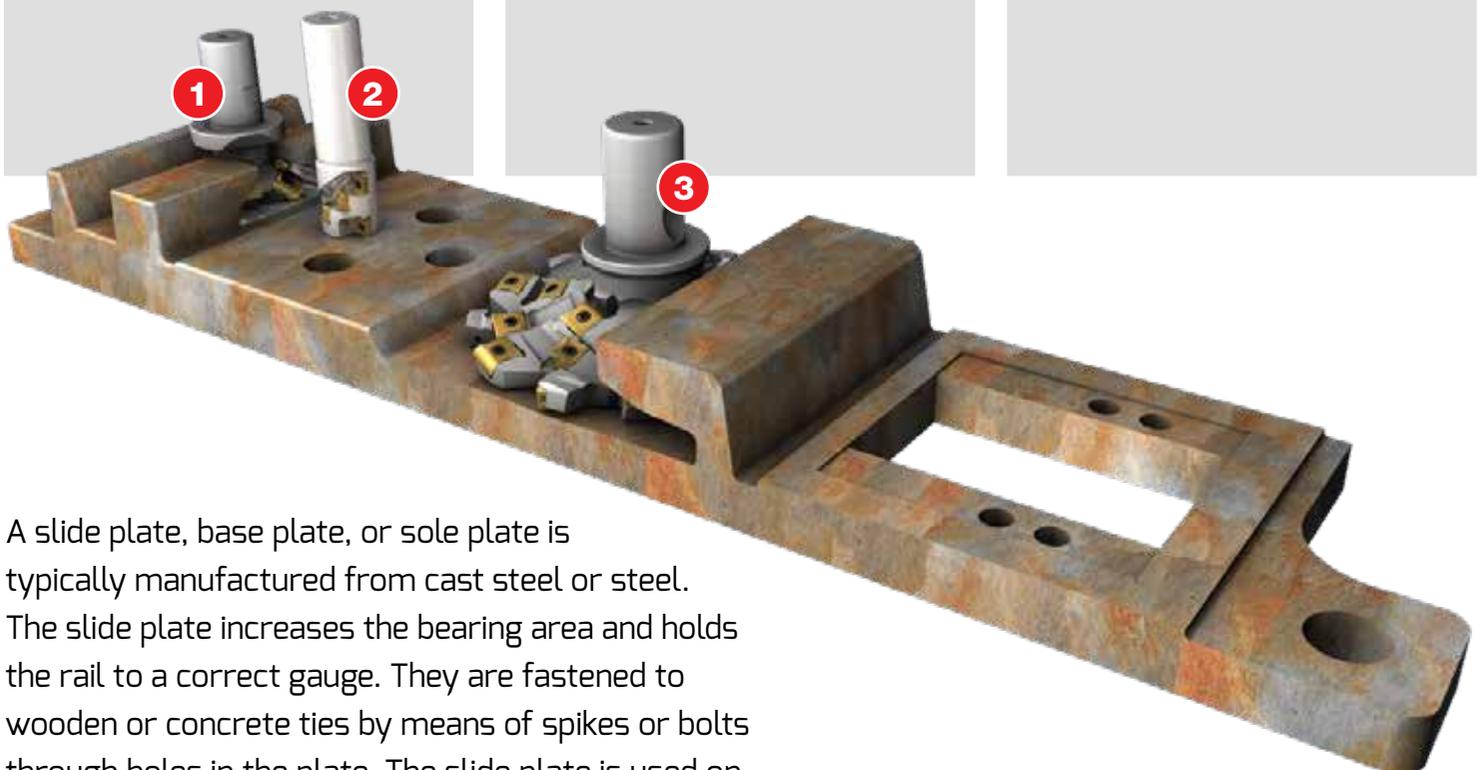
Profile Slot Milling

Special tangential slot milling cutters for machining profile slots and grooves on rail track connecting links.



Profile Slot Milling

Special tangential slot milling cutters for machining profile slots and grooves on side plates and connecting links.



A slide plate, base plate, or sole plate is typically manufactured from cast steel or steel. The slide plate increases the bearing area and holds the rail to a correct gauge. They are fastened to wooden or concrete ties by means of spikes or bolts through holes in the plate. The slide plate is used on rail tracks between the flanged T-rail and crossies.



New Wheel Production

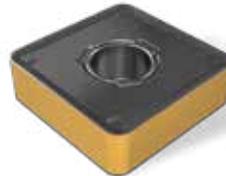
ISOTURN

Round inserts and special **CAMFIX** holders with a screw and top lever for robust clamping.

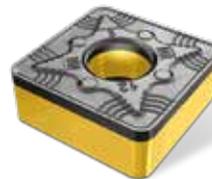


ISOTURN

Special **CAMFIX** holders with a screw and top lever for roughing and finishing boring operations.



SNMM19125-R4P



SNMM19125-NR





1

Roughing Application



2

Finishing Application



3

Finishing Application



4

Rough Rim Turning



5

Roughing and Finishing Combi-Bore



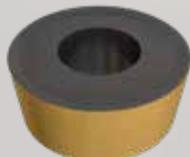
New Wheels Turning

Round Inserts

For Roughing and Finishing Operations and Machining Rim and Web Areas



RCMT 1204MO-M3P-R
Screw clamped Insert



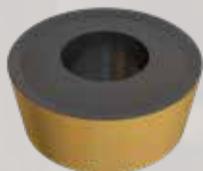
RCMT 16-14 (MO)
Screw clamped Insert



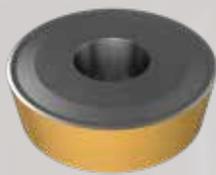
RCMT 16-M3P-R (MO)
Screw clamped Insert



RCMT 16-SR (MO)
Screw clamped Insert



RCMT 20-14 (MO)
Screw clamped Insert



RCMT 20-M3P-R (00)
Lever clamped Insert



RCMT 25-SR (MO)
Screw clamped Insert



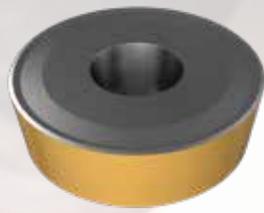
RCMX 25-NR (00)
Lever clamped Insert



RCMX 25-M3P-R (00)
Lever clamped Insert



RCMX 32-NR (MO)
Screw Clamped Insert



RCMX 32-M3P-R (00)
Lever clamped Insert



RCMX 32-R3P-R (00)
Lever clamped Insert

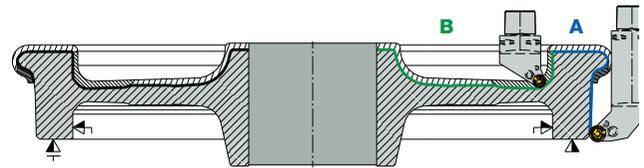
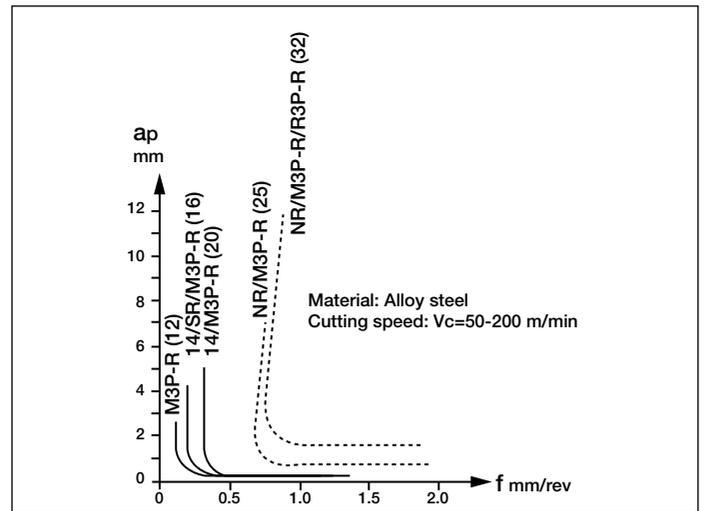
Cutting data by area:

Area	Vc	f
A	70 - 200 m/min	0.5 - 2.0 mm/rev
B	50 - 100 m/min	0.5 - 1.5 mm/rev

Depth of cut according to M3P-R (12) chipbreaker geometry:

14 / SR / M3P-R (16)	0.3 - 3.5 mm
14 / M3P-R (20)	1.5 - 7.0 mm
NR / M3P-R (25)	2.5 - 7.0 mm
NR / M3P-R/R3P-R (32)	3.0 - 12 mm

In case of worn wheels with skid flats, built-up shelled tread or thermal cracks, reduce the cutting speed to **ISCAR's** recommended minimum machining speed. High carbon wheels should be machined at **ISCAR's** recommended low range cutting speed. Feeds should be optimized within the recommended range per chipformer and actual chip formation.



Wheels steel requirements according to UIC812-3 and EN 13262

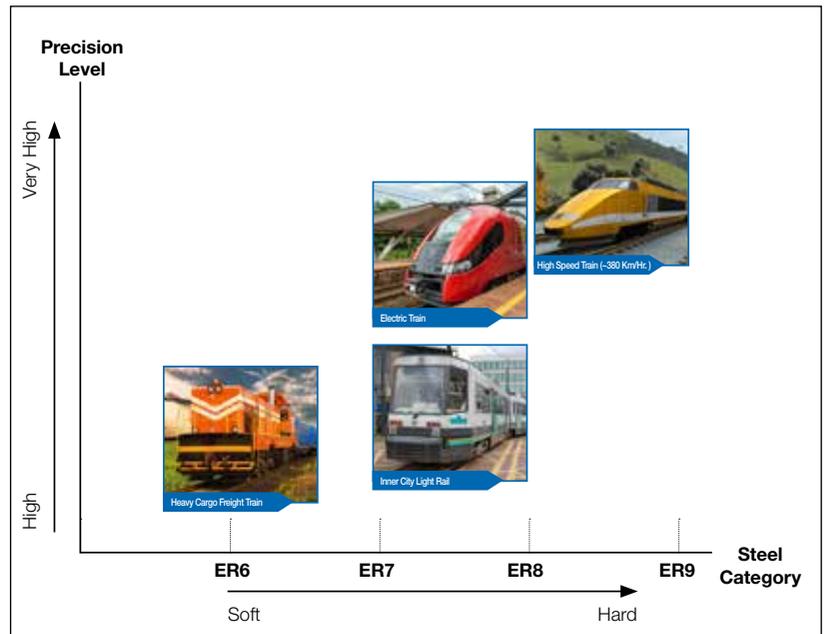
Wheels material

The majority of wheel types (95%) are made of rolled steel, while other types are made of cast steel material standards in hardnesses which range from ER1 to ER9. Five steel categories, ER6, ER7, ER8, ER8 and ER9 are defined as common types. This standard can also apply to light rail and tramway applications.

Wheel Dimensions

Different types of trains have different wheels. The wheel diameters range between 400 - 1200 mm:

- Metro: 400 - 650 mm
- Heavy Cargo / Freight: 800 to 900 mm
- High speed: 900 to 1200 mm



Steel Category		Carbon Content (%)	Yield Strength (N/mm ²)	Tensile Strength (N/mm ²)	Elongation (%)	Notch Impact Energy	
UIC 812-3	EN 13262	UIC/EN	EN 13262	UIC/EN	UIC/EN	UIC 812-3 U-notch (RT)	EN 13262 V-notch (-20°C)
R6 T, E	ER6	≤0.48	≥500	780...900	≥15	≥15	≥12
R7 T, E	ER7	≤0.52	≥520	820...940	≥14	≥15	≥10
R8 T, E	ER8	≤0.56	≥540	860...980	≥13	≥15	≥10
R9 T, E	ER9	≤0.60	≥580	900...1050	≥12	≥10	≥8



Re-Turning Rail Wheel

ISOTURN



Rough Turning

Tools with two cartridges and tangentially mounted inserts for re-turning railroad wheels are able to machine the entire outer wheel profile in a single cut.

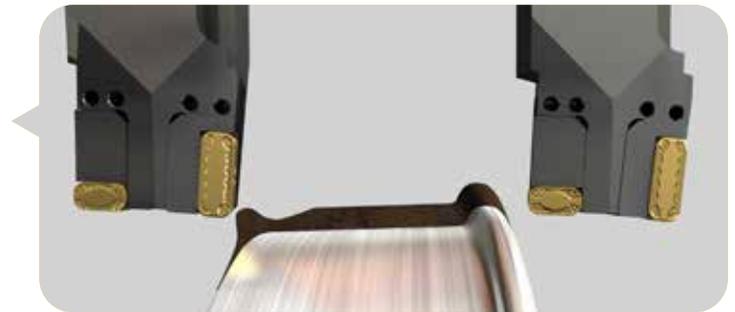
ISOTURN



Rough Turning

Longitudinal turning is performed with a 30 mm long and 4 mm corner radius tangentially clamped insert, positioned with its long side against the machining direction. This insert can handle large cutting depths for roughing or semi-finishing applications, depending on the outer wheel condition.

Portal CAM or CNC counter-wheel machines are used for re-turning wheelsets. Capable of simultaneously re-turning both left and right wheels while providing high profile accuracy and preserving the dimensions and profile of the wheels. The majority of wheel raw material is made of rolled steel and cast iron. The wheel's diameter varies from 400mm to 1200mm. ISCAR offers standard tools with interchangeable cartridges and tangential inserts, sizes 19 & 30mm, with a wide range of geometries and carbide grades for the wide spectrum of wheelset forms and sizes for re-turning.



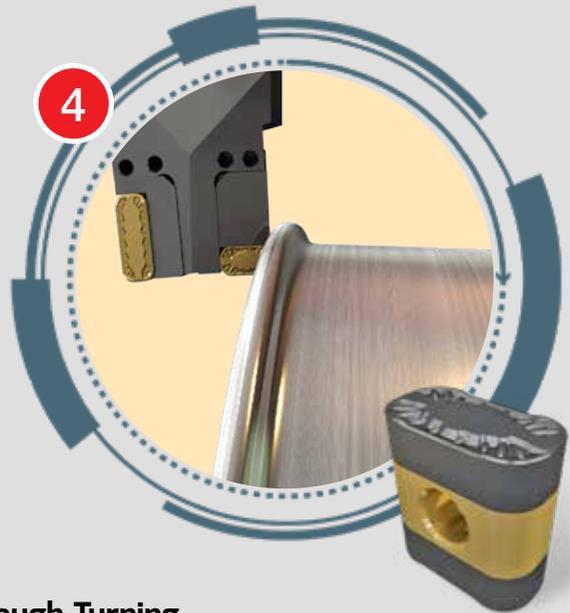
ISOTURN



Rough Turning

Machining depth can range from 0.3 mm to 12 mm depending on the outer wheel condition prior to re-conditioning. Large depths of cut are usually performed by several machining paths in order to prevent heavy loads and poor insert life.

ISOTURN



Rough Turning

A 19 mm long and 4 mm radius tangentially clamped insert positioned perpendicularly to the larger insert is used to machine the massively eroded rim zone.





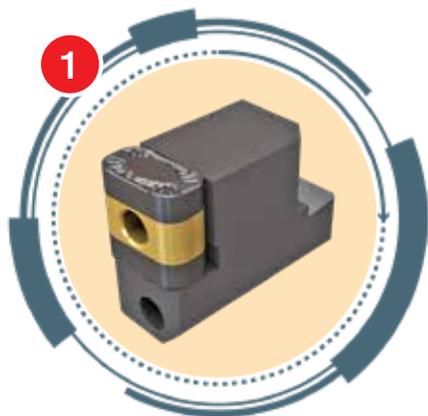
Re-Turning Rail Wheel

Inserts and Tools

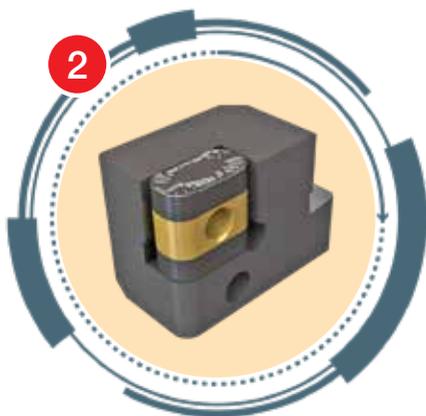
Toolholders and Cartridges for Under Floor Re-turning Lathes (Model 106 Thread Profile Machine)



Assembly and Spare Parts



PRWR/L 177-CA-19



PRWR/L 175-CA-19



PRWR/L 175-CA-30



Designation	Screw	Lever	Key
LNMX 191940	SR LCS 5	LR 5	HW 3.0
LNMX 301940			
CNMX 191140			

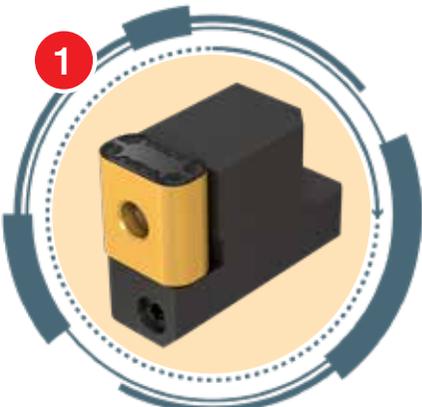




Conventional Wheel Lathe



CNC Portal Wheel Lathe



PRWR/L 177-CA-19



PRWR/L 177-CA-1911
CNMX 191140...



PRWR/L 175-CA-1911
CNMX 191140...





Chipformers and Grades



LNMX 191940-F3P
For finish operation



LNMX 191940-WF
For semi-finish operation



LNMX 191940-WM
For medium/
semi-finishing operations



LNMX 1919-WKR
For roughing operations
- Unstable conditions

CNMX 1911-M3P
For Medium operations



LNMX 301940-WM
For medium/
semi-finishing operations



LNMX 301940-WR
For roughing operations



LNMX 301940-WKR
For roughing operations
- Unstable conditions

Chip Formation at the Rim Curve



One of the common problems in wheel re-turning is chip formation during the back turning operation at the rim zone.

The WM chipformer (on the 30 mm insert) has been specifically designed to prevent long chip formation during rim turning.

Cutting Data

Speed	High ↑	P	Grade Recommendation
		IC8150	A very hard substrate with a cobalt enriched layer, improved MTCVD TiCN and a thick alpha Al ₂ O ₃ CVD coating. Features excellent thermal stability, resistance to chipping and plastic deformation. Recommended for high speed machining of steel at stable or slightly unstable conditions.
	↓ Low	IC8250	A tough substrate with a cobalt enriched layer combined with improved MTCVD TiCN and a thick alpha Al ₂ O ₃ CVD coating. Recommended for general use machining of steel in a wide range of conditions, featuring high toughness and resistance to chipping and plastic deformation.

Cutting Data Recommendations



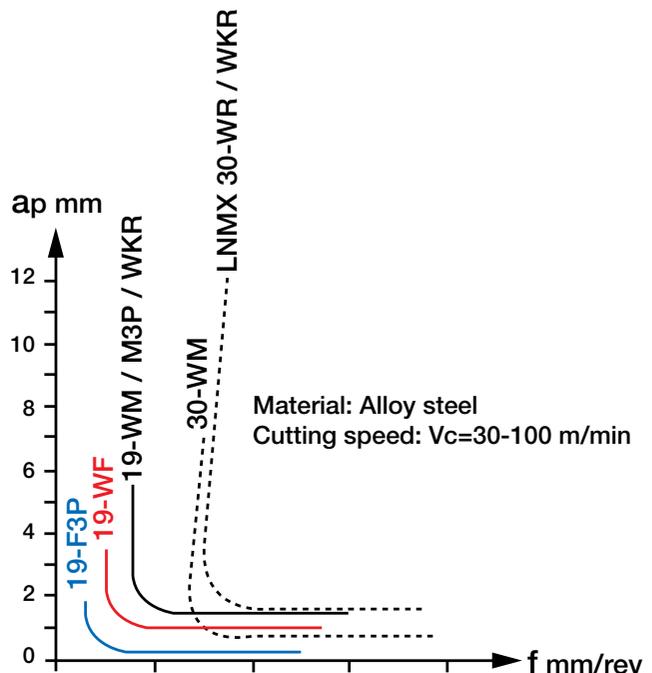
Cutting Data by Area:

Area	V _c	f
A	30 - 70 m/min	0.3 - 1.8 mm/rev
B	50 - 100 m/min	0.5 - 2.0 mm/rev
C	50 - 100 m/min	0.5 - 2.0 mm/rev

Depth of cut according to chipbreaker geometry:

F3P	0.20-1.50
WF	1.00-3.50
WM/M3P (19)	1.50-5.00
WKR (19)	3.00-6.00
WKR/WR (30)	3.00-12.00

In case of worn wheels with skid flats, built-up and shelled tread or thermal cracks, reduce the cutting speed to **ISCAR's** recommended minimum speed.
High carbon wheels should be machined at **ISCAR's** recommended low range cutting speed. Feeds should be optimized within the recommended range per chipformer and actual chip formation.





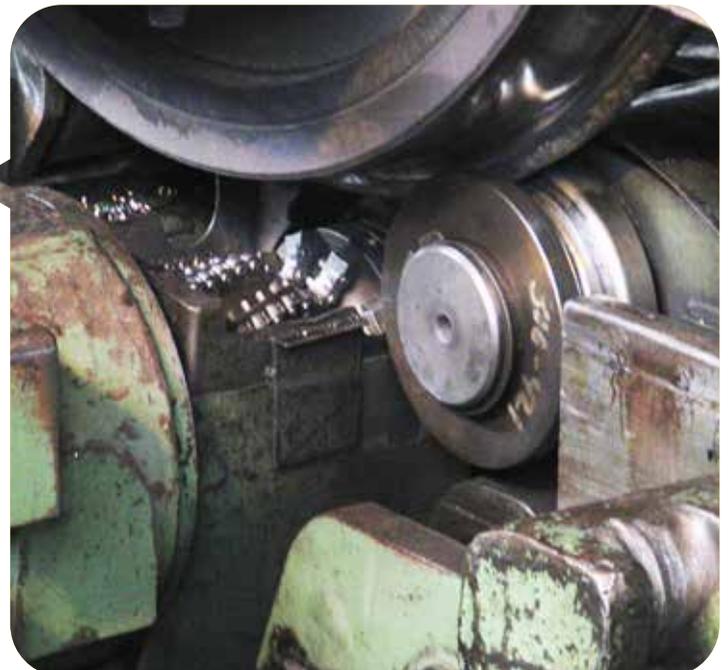
Under Floor Wheel Milling

Locomotive Re-Profiling Wheels

Underfloor, counter-wheel machines are used for locomotive wheel reprofiling. They are capable of simultaneously reprofiling both left and right wheels while providing high profile accuracy and preserving the dimensions and profile of the wheels. ISCAR offers specially designed mills with interchangeable cartridges for locomotive wheel reprofiling. The cutter is curvy's round RPMW 16 mill insert with a quick chip breaker.



Capable of simultaneously re-profiling both left and right wheels and provide high profile accuracy, preserving the dimensions of the wheels under various conditions.



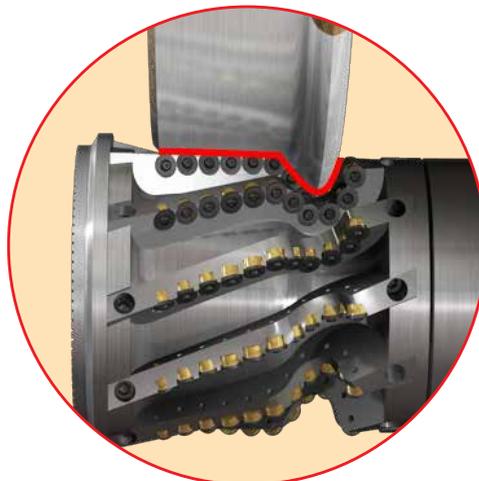


ROUND*MILL*

Special-type extended flute cutters carrying accurate round inserts for re-profiling locomotive wheels. Recommended for under floor machining.



RPMW 1609-PP-TM





Turning Rail Car Wheel Axles

DOVE IQ TURN
HEAVY DUTY LINE

ISOTURN

CUTGRIP



External Turning (Roughing)

A line of external and internal tools and large-sized inserts for heavy duty applications.



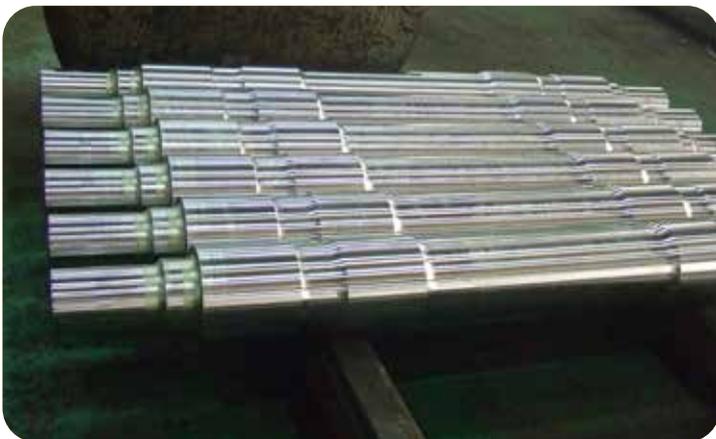
External Turning (Semi-Finishing)

Double-sided trigon wiper inserts for high surface finishing at high feed rates.

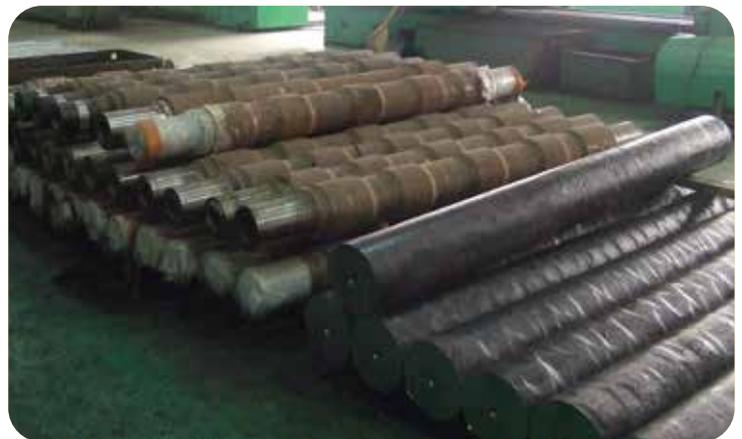


External Grooving

ISCAR groove-turn tools (GRIP) offer a surface quality far superior when turning with standard ISO tools as compared to grinding operations.



New Axles



Reconditioned Axles

ISOTURN

SUMOCHAM
CHAMDRILL LINE



Semi-Finishing

55° positive flank inserts for machining low carbon steel; recommended for semi-finish and finishing operations.



Drilling

Range: Ø6 - 32.9 mm
The **SUMOCHAM** drill family is the most productive and profitable solution in the hole making industry.

The rail bogie axle shaft is part of a wheelset railroad car axle wheel assembly. Rail axle shafts are made of forged and rolled heat-treated high strength steel. ISCAR offers standard turning, drills and mill threading tools for the production of rail axle shafts.





Machining Bogie Frames, Side A+B

HELIDO
890 LINE



Face Milling

Range: Ø50 - 315 mm.

Cutter: S0F45 D...-R18

Insert: S845 SNMU 1806ANR-MM

Insert: ONMU 070610-TR-MM

Helido 45° face milling cutters carry square or octagonal double-sided inserts with 8 and 16 cutting edges; recommended for roughing operations at an 8 mm depth of cut up.

HELIDO
890 LINE



Shoulder Milling

Range: Ø50 - 160 mm.

Cutter: S890 FSN D...- R13

Insert: S890 SNMU 1305 PNTR

Helido S890 face mills with square double-sided inserts; recommended for general milling applications at a 9 mm depth of cut.

SUMOCHAM
CHAMDRILL LINE

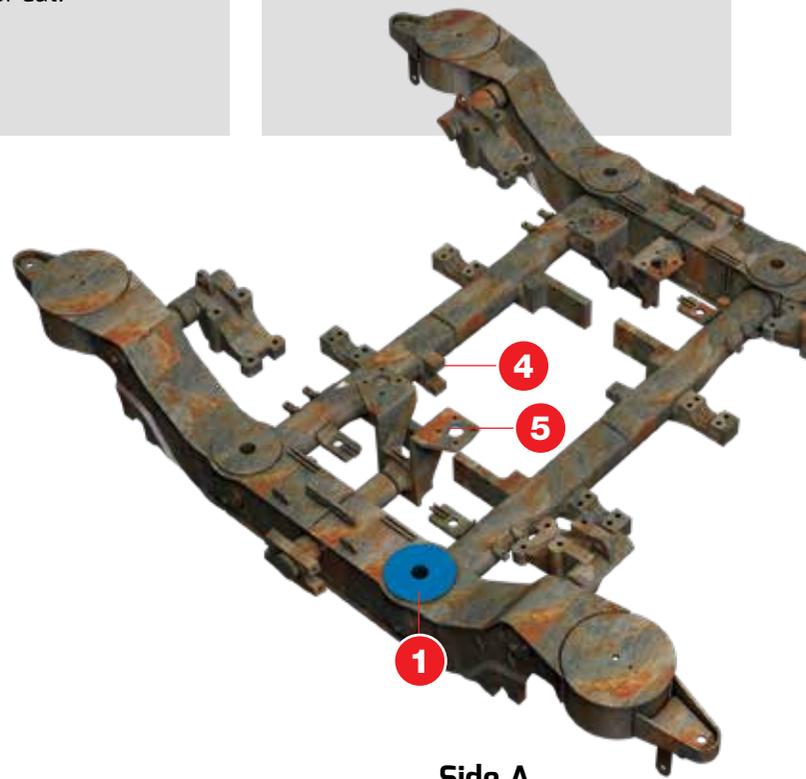


Drilling

Range: Ø6 - 32.9 mm

The **SUMOCHAM** drill family is the most productive and profitable solution in the hole making industry

The Bogie is a chassis or framework that carries a wheelset, which can take various forms in various modes of transport. It supports the rail vehicle body and stability on both straight and curved tracks. Usually, two bogies are fitted to each carriage, wagon, or locomotive. Some cars are designed for heavy loads have more axles per bogie. The bogie frames are usually fabricated from carbon steel.



Side A

HELITANG
T490 LINE



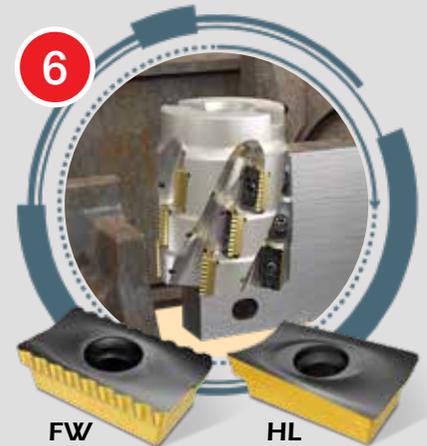
Shoulder Milling
Range: Ø25 - 250 mm.
Cutter: T490 ELN/FLN D...-13
Insert: T490 LNMT 1306 PNTR
The **HELITANG T490** Line is recommended for shouldering and slotting operations at a 12 mm depth of cut.

DR-TWIST
INDEXABLE DRILL LINE

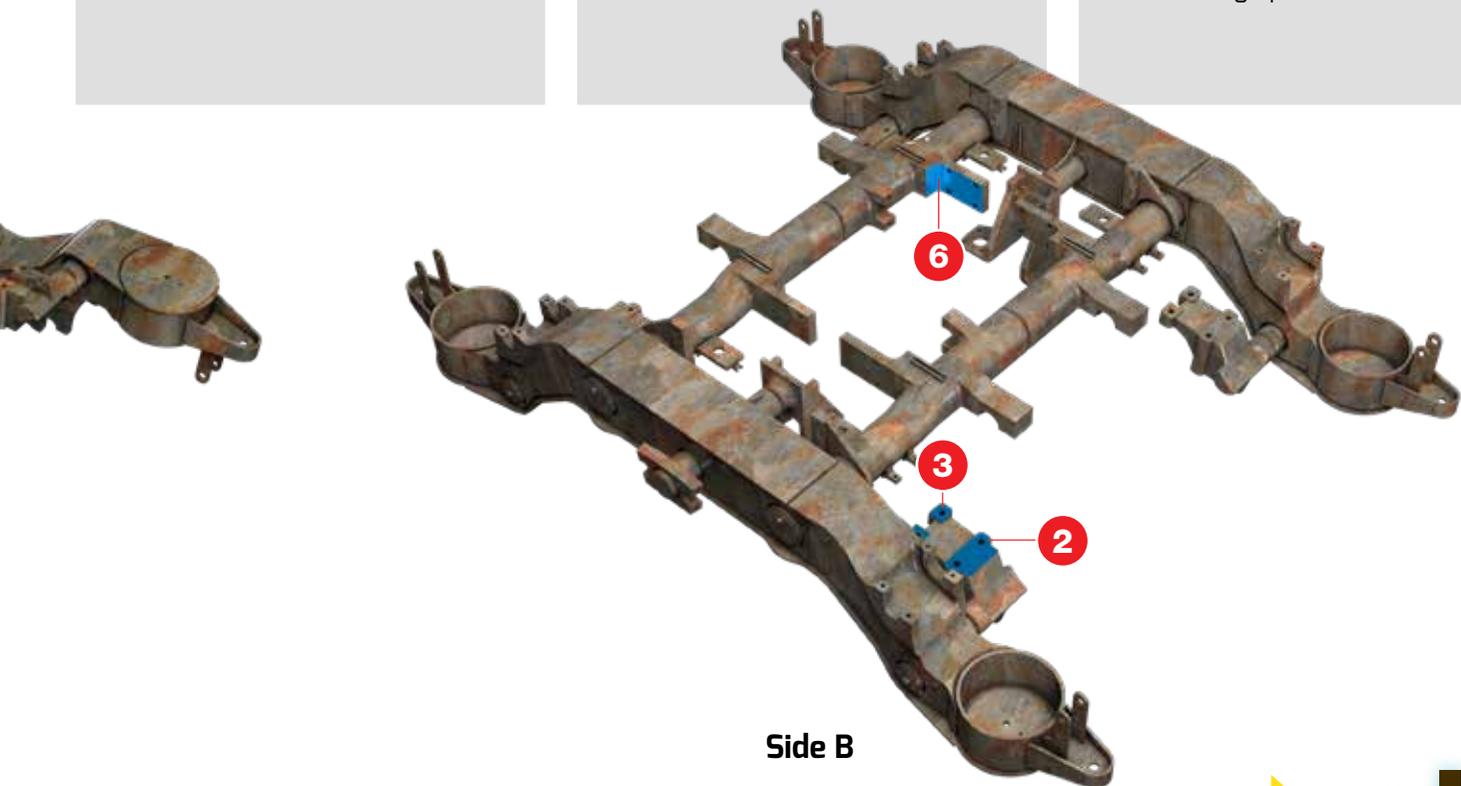


Drilling
Range: Ø12 - 80 mm
Drills designed with spiral coolant channels and a strong cutter body with excellent resistance to torsion and very efficient chip evacuation.

MILLSHRED
P290 LINE



Rough Shoulder Milling
Range: Ø25 - 100 mm
P290 is a family of extended flute cutters carrying inserts with 2 serrated cutting edges for rough and finishing operations and high overhang machining. The HL straight edged inserts are recommended for finishing operations.



Side B



Locomotive Power Train Engine

HELITANG
T465 LINE

TANGSLOT

HELITANG
T490 LINE



Rough Shoulder Milling

Range: $\varnothing 125 - 315$ mm

65° face milling cutters carrying tangentially clamped inserts with four 22 mm long cutting edges.



Slot Milling

Range: $\varnothing 80 - 250$ mm

Tangential slot milling cutters with cartridges carrying LNET12... tangential inserts with 4 cutting edges.

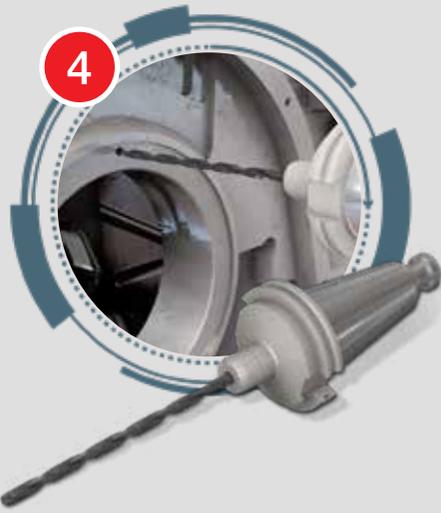


Deep Shoulder Milling

Range: $\varnothing 20 - 125$ mm

Extended flute cutters carrying T490 LNHT/MT 08/13... tangential inserts with 4 cutting edges for higher productivity.

SOLIDDRILL



Deep Drilling

Range: Ø5 - 10xD

Solid carbide drills with coolant holes and a drilling depth of 20xD.

SOLIDTHREAD

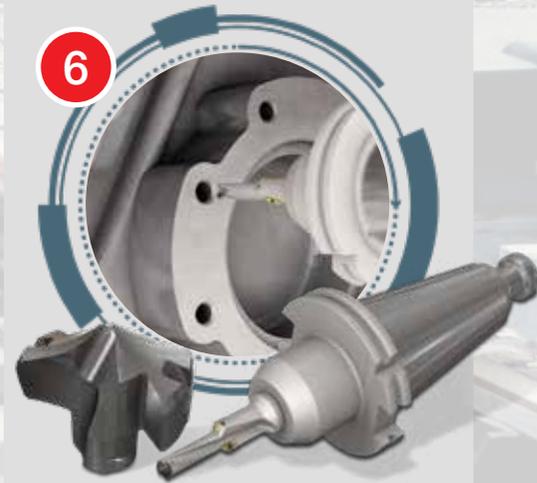


Thread Milling

Range: Ø4 - 20 mm

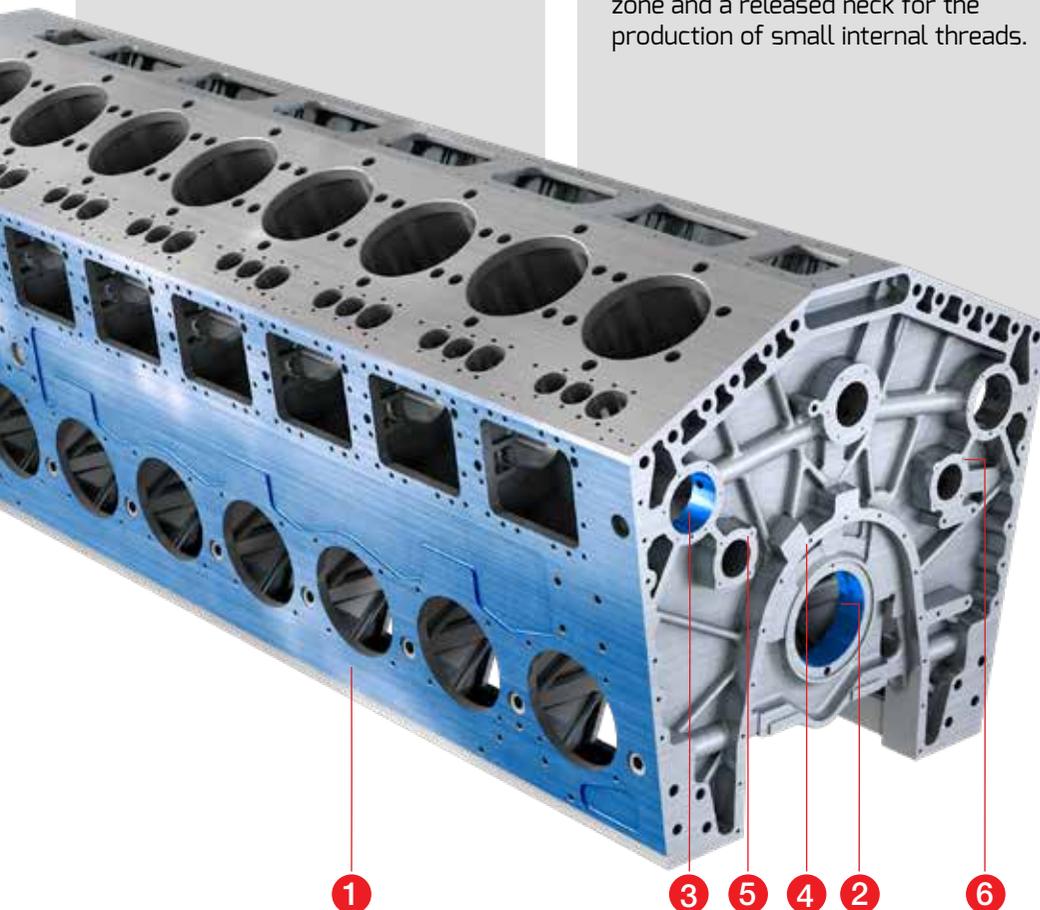
Solid carbide 3 flute threading endmills with a short 3-tooth cutting zone and a released neck for the production of small internal threads.

SUMOCHAM
CHAMDRILL LINE



Drilling and Chamfering

Special request indexable head drills with coolant holes.



1

3

5

4

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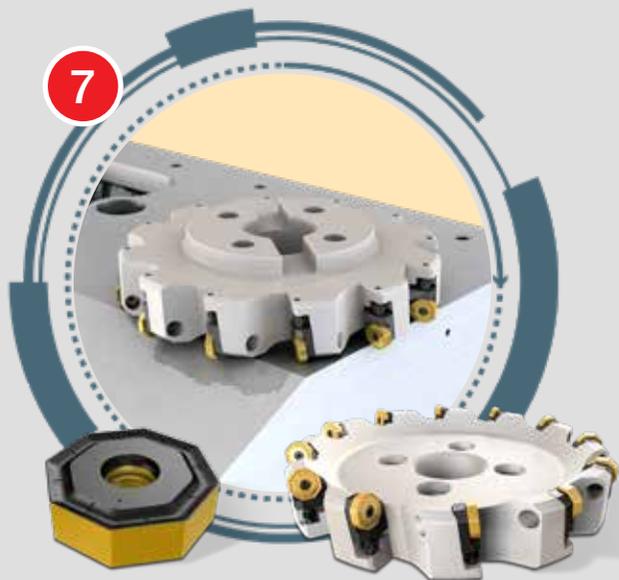
6



Locomotive Power Train Engine

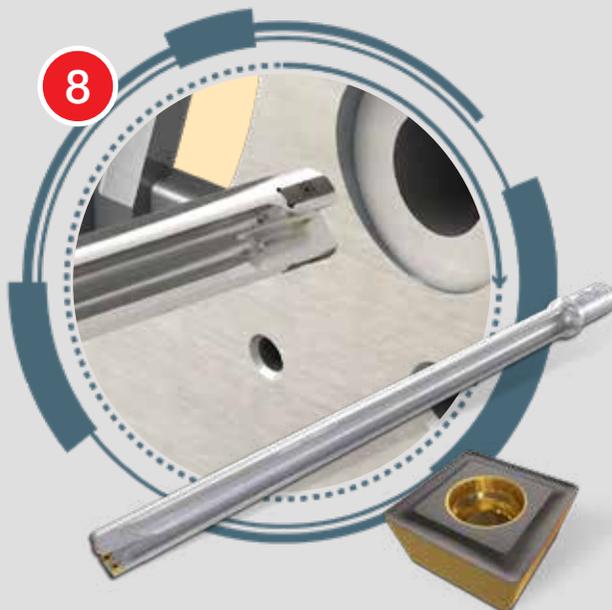
16MILL

ISCARDR-DH



Face Milling (Finish)

Special face milling cutters with adjustable cartridges carrying 16 cutting edged inserts for finishing operations.



Deep Drilling

Range: Ø25 - 65 mm

Deep drills for milling centers and lathe machines with a drilling ratio of up to 7x D.



BAYOT-REAM



High Feed and Speed Reaming

Range: Ø11.5 - 32 mm

Interchangeable solid carbide reaming heads with a quick change bayonet mechanism; recommended for high productivity and accuracy.

MILLTHREAD

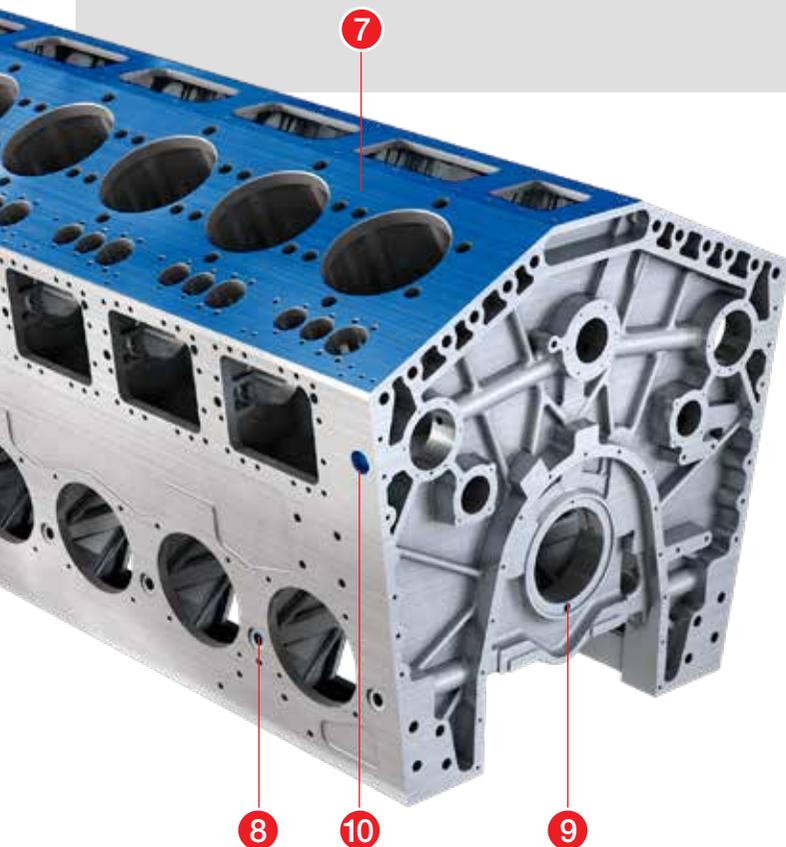


Threading

Range: Ø12 - 40 mm

Internal thread milling and external precision thread milling on CNC machines by use of helical interpolation performed with NC programming.

MILLTHREAD milling cutters, in addition to solid carbide cutters, are available with indexable thread milling inserts for any standard thread profile.





ISCAR'S MACHINING SOLUTIONS FOR THE
RAILWAY INDUSTRY

