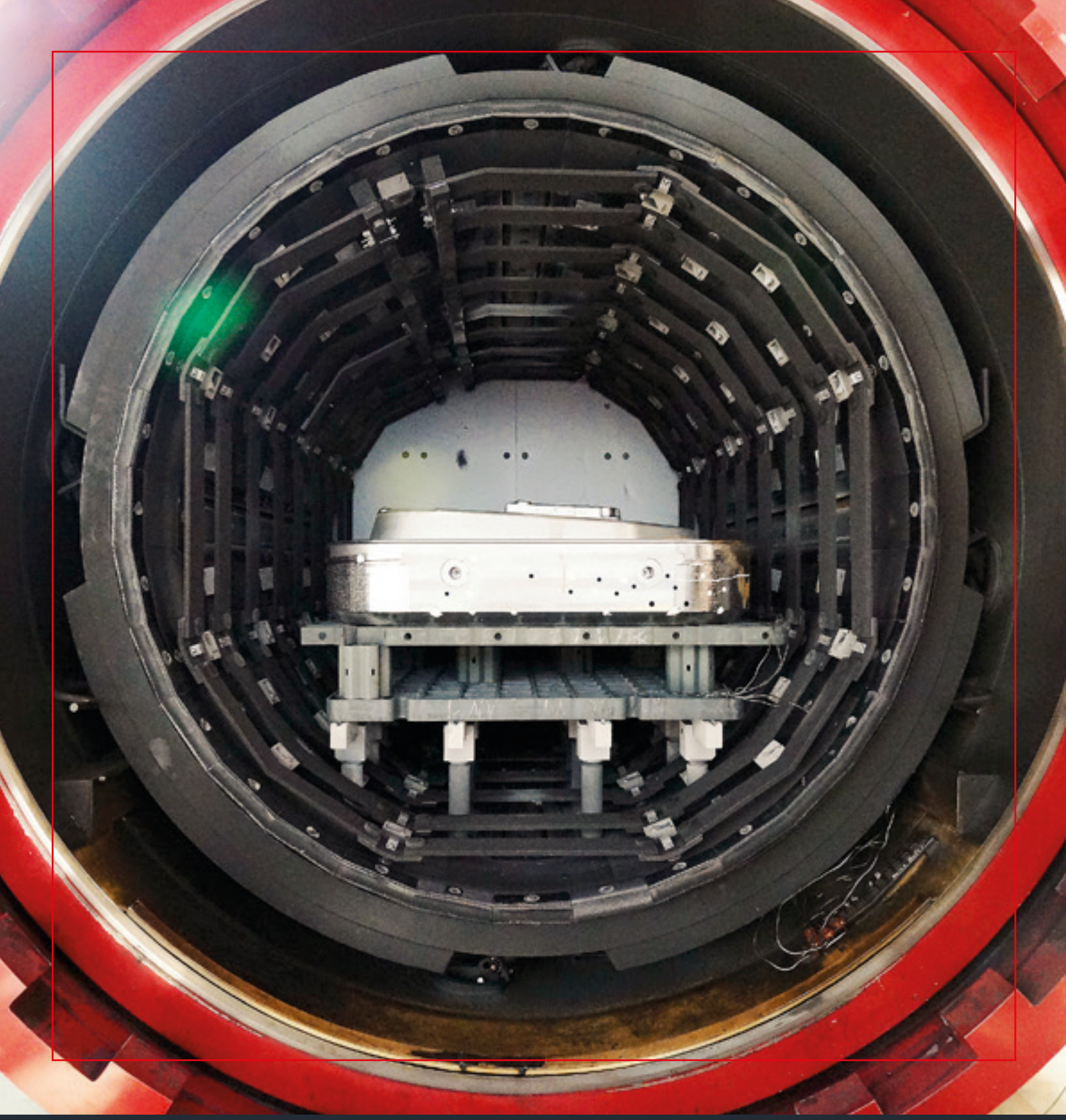


High-Performance Materials for

DIE CASTING

Edelstahlwerk Kind & Co.
GMH GRUPPE
Pure Performance

Premium tool steels, integrated heat treatment and application expertise for demanding die casting operations.

PURE PERFORMANCE

Engineered for process reliability under demanding production conditions.

Edelstahlwerk Kind & Co.
GMH GRUPPE
Pure Performance

OUR COMMITMENT

Reliable tooling behavior directly impacts productivity, process stability and manufacturing cost in die casting operations.

Unplanned tool changes, excessive rework and inconsistent casting quality increase downtime, reduce press availability and negatively affect production efficiency.

Since 1888, Kind & Co. has developed high-performance hot-work tool steels for demanding die casting applications – combining thermal shock resistance, high-temperature strength, toughness and wear resistance to support stable long-term production conditions.

We support the complete tooling value chain:
- premium tool steel production
- 3D forging
- machining
- vacuum hardening
- repair and rework services
- application engineering support

All under one responsibility.

OUR HPDC STEEL PORTFOLIO

The right steel for every challenge – from standard to extreme

Not every application needs the same steel. Kind & Co. provides a differentiated portfolio, so customers can match the material to the actual demands of each die insert – protecting critical areas while optimizing cost efficiency where possible.

Steel selection in high-pressure die casting depends on the balance between toughness, thermal shock resistance, surface quality requirements and insert geometry.

Kind & Co. will support the customer in choosing the best solution of steel grade and hardness level.

Increasing component complexity is redefining tooling requirements in die casting.

Gigacasting & structural components
Large structural castings generate extreme thermal and mechanical loads over long production cycles.

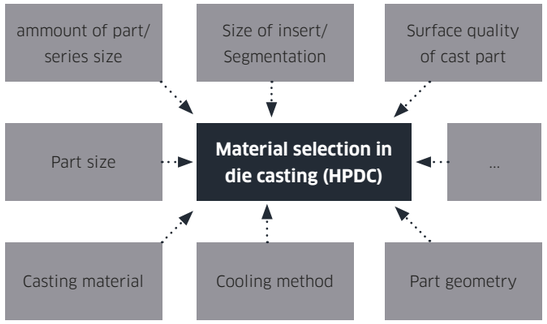
E-mobility components
Battery housings and power electronics require tight tolerances, reliable sealing surfaces and stable dimensional accuracy.

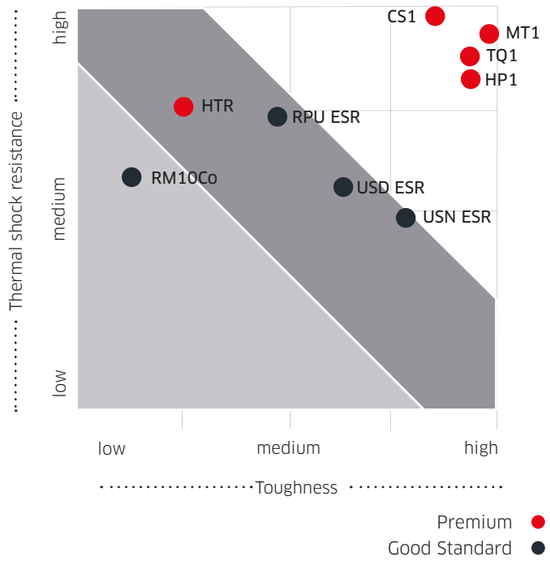
5G & telecommunications
High-performance aluminium castings for telecom applications demand excellent surface quality and positional precision.

Visible & painted surfaces
Consumer electronics and visible premium components require minimal rework and consistent surface quality.

Reduced cycle times
Higher injection velocities and more aggressive cooling increase thermal and mechanical stress on die inserts.

Advanced casting alloys
Modern aluminium and magnesium alloys require steels capable of maintaining stable properties under elevated thermal load.





From application requirements to material performance: the portfolio supports precise steel selection based on the actual stress profile of each die insert.

GRADE OVERVIEW

Brand label	Material properties	Application
CS1 – Premium	Premium surface performance – up to 54 HRC, for parts where the casting surface quality defines success.	Visible parts, painted surfaces, consumer electronics, 5G components, sealing areas
TQ1 – Premium	Excellent toughness for the most demanding conditions – large structural tools, battery housings, minimal quantity spraying.	Large structural components, EV battery housings, tools under very high flow rates
MT1 – Premium	Next-generation premium HPDC steel. Maximum toughness and superior through-hardenability, even in gigacasting sizes.	Gigacasting, large structural inserts, extreme toughness, e-mobility components
HP1 – Premium	Balanced toughness, wear resistance and dimensional stability with optimized cost efficiency.	Cooling fins, sealing surfaces, medium inserts with high load requirements
TC1 – Premium	Highest thermal conductivity within the Kind & Co. portfolio for improved heat management and reduced cycle times.	High-thermal-load inserts, chill blocks, fast solidification requirements
HTR – Premium	Excellent thermal shock resistance, high-temp strength, and high thermal conductivity in a remelted ESR grade.	Locally highly loaded areas – cooling blocks, inserts under intense thermal stress
RPU ESR	Increased thermal shock resistance and high-temp strength for demanding standard applications.	Motor housings, consumer goods, long production runs, ejector pins, shot sleeves
USN ESR	USN European-standard ESR hot-work steel – high toughness and good high-temperature strength.	Al-, Mg-, and Zn-alloy die casting – inserts and die plates across many applications
USD ESR	Global standard ESR grade – prevalent in non-European markets.	Al-, Mg-, and Zn-alloy die casting – standard applications

The result: material solutions tailored to operational requirements, manufacturing efficiency and long-term tooling stability across the HPDC process.

CS1
Surface quality & dimensional precision

Premium material solution for visible surfaces, sealing areas and demanding dimensional tolerances.

Supports:
- high surface quality
- dimensional consistency
- reduced rework in visible or painted components

TQ1
Excellent toughness

Designed for extreme thermal and mechanical loading in structural tools, battery housing applications and high-flow-rate casting conditions.

Supports:
- high fracture toughness
- stable tool life under aggressive cooling conditions
- improved resistance to local stress cracking

MT1
Gigacasting performance

Outstanding toughness and superior hardenability for large-format structural inserts and demanding gigacasting environments.

Supports:
- homogeneous hardness in large cross-sections
- resistance against premature cracking
- stable material behavior under extreme thermal and mechanical load

HP1
Cost-efficient premium performance

HP1 – Cost-efficient premium performance
Balanced toughness, wear resistance and dimensional stability for demanding medium-size inserts.

Supports:
- stable tooling behavior
- cost-efficient operation
- reliable dimensional accuracy in serial production

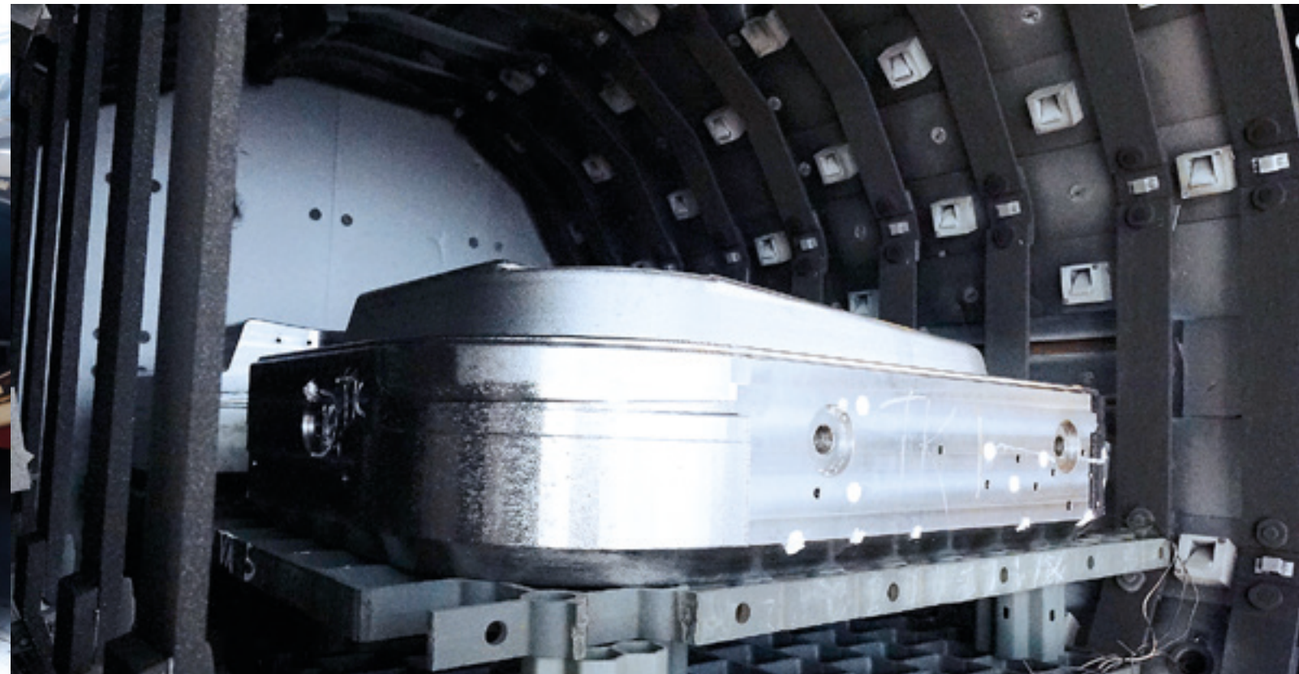
Premium properties require equally controlled forging, hardening and tempering processes.

The following section explains how Kind & Co.'s manufacturing and heat-treatment expertise support these material characteristics in demanding applications.

PERFORMANCE ENGINEERED FOR DEMANDING APPLICATIONS

Different die casting applications generate different combinations of thermal load, mechanical stress, dimensional requirements and surface expectations.

Kind & Co.'s premium HPDC grades are engineered to support specific operational and metallurgical requirements across the die casting process.



PROPRIETARY MANUFACTURING PROCESS

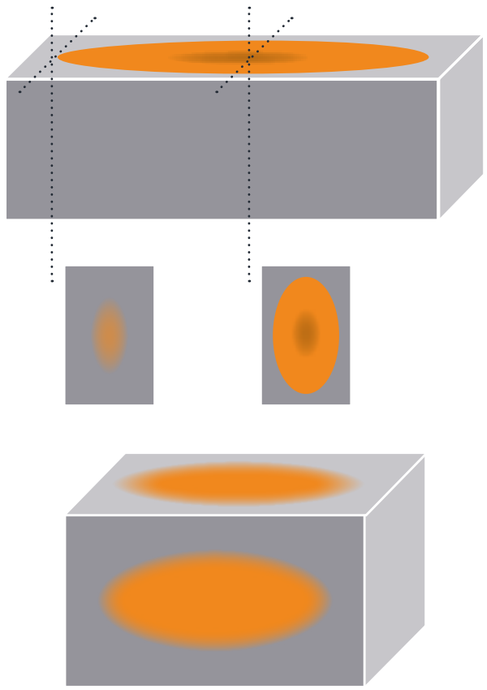
3D FORGING

Standard forging creates directional fibre structures that may reduce toughness consistency in large die inserts.
Kind & Co.'s proprietary 3D forging process improves isotropy and supports homogeneous material properties through controlled deformation in all spatial directions.

This results in:
- improved toughness distribution
- superior quenching conditions
- more homogeneous microstructure
- improved reliability in large and complex die inserts

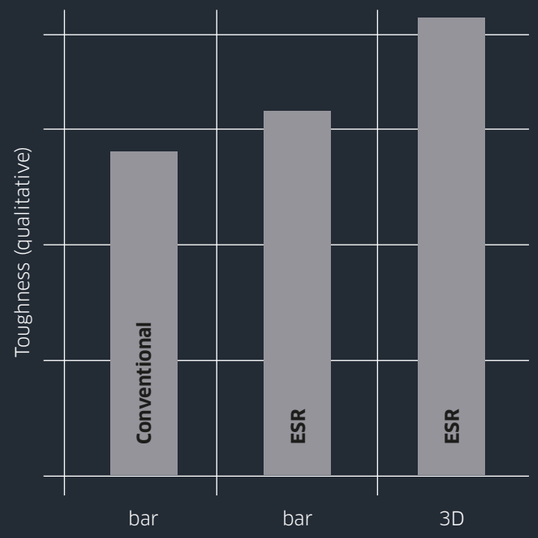
For demanding structural casting applications, 3D forging supports stable material behavior under extreme thermal and mechanical load.

MULTIDIRECTIONAL DEFORMATION FOR IMPROVED ISOTROPY



Controlled deformation in all spatial directions supports more homogeneous material properties and improved toughness consistency in large die inserts.

TOUGHNESS COMPARISON BY FORGING ROUTE



Improved isotropy and toughness consistency support stable long-term die integrity under demanding thermal and mechanical load.

HEAT TREATMENT & PROCESS CAPABILITY

Long-term tooling stability depends not only on steel selection, but also on controlled hardening and tempering processes.

Kind & Co.'s integrated heat-treatment capability supports homogeneous hardness distribution, high toughness and stable material behavior across demanding HPDC applications.

Large-format vacuum hardening capability
To support increasingly large and complex die-casting applications, Kind & Co. has expanded its vacuum hardening capability for structural and gigacasting inserts.

Operational benefits
- Reliable hardening of large inserts up to 2500 mm
- Improved hardness consistency across complex geometries
- Optimized cooling control for demanding cross-sections
- Stable material properties under high thermal and mechanical load
- Compliance with NADCA and OEM specifications

Key specifications
- Usable dimensions: 1200 × 1200 × 2500 mm
- Maximum width: 1600 mm
- Maximum height: 1400 mm
- Maximum batch weight: 8000 kg
- Quenching pressure: 15 bar
- Cooling capacity: 650 kW
- Heating capacity: 600 kW
- Standards compliance: NADCA and GM specifications

HARDENING RECOMMENDATION

For optimal toughness properties, Kind & Co. recommends triple tempering of components.
Recommended hardening parameters:

Brand label	Hardening temperature in °C	Soaking time in minutes
CS1	1030	60
TQ1	1010	60
MT1	1030	45
HP1	1020	60
HTR	1060	60
USN ESR	1000	45
USD ESR	1020	45
RPU ESR	1030	45
RM10Co	1130	45

Controlled hardening parameters support consistent toughness, dimensional stability and reliable material properties across different HPDC applications.

LOW PRESSURE DIE CASTING (LPDC)

Stable thermal behavior for demanding LPDC applications

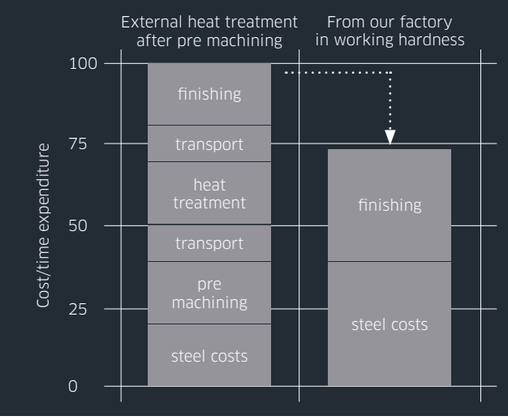
LPDC applications require controlled heat dissipation, dimensional stability and reliable long-term tooling integrity under repeated thermal cycling.

Alloy	**Aluminium Magnesium**			
Application	combustion engine power train	light-alloy rims		structural parts in automobiles
		top cores	bottom cores	
Tooling characteristics	• medium-sized parts • complex geometry	• large-sized discs • simple geometry	• large-sized discs • complex design • visible part: highest surface requirements • tight radii	• large-sized castings • complex design • different cross-sections • high surface requirements
Specific stress	• high thermal stress • high mechanical stresses	• high thermal stress	• high thermal stress • high mechanical stresses • long contact times • intensive cooling, partly by water	• high thermal stress • high mechanical stresses • long contact times • intensive cooling
Typical failure pattern	• abrasion by blasting material • erosion • tempering effects • distortion	• erosion • tempering effects	• abrasion by blasting material • erosion • tempering effects • distortion • crack formation from radii and screw holes	• abrasion by blasting material • erosion • tempering effects • distortion • risk of crack formation at cross section transitions
Materials	**USN 32-38 HRC**	**USN 32-38 HRC**	**USD ESR 34-40 HRC**	**USN ESR 34-40 HRC**
	USD ESR 34-40 HRC	**USD 32-38 HRC**	**RPU ESR 34-40 HRC**	**RPU ESR 34-40 HRC**
	RPU ESR 34-40 HRC	**RPU 32-38 HRC**	**TQ 1 36-42 HRC**	**TQ 1 36-42 HRC**

● Premium
● Good Standard

Material selection in LPDC applications depends on the interaction between thermal load, component geometry, cooling intensity and expected tooling life.

Reduced process steps through integrated hardening capability



ADDITIONAL CASTING APPLICATIONS & COMPLETE CAPABILITY

Beyond HPDC: Supporting demanding casting applications across multiple processes

While high-pressure die casting remains the primary focus of demanding structural and high-volume applications, Kind & Co. also supports low-pressure die casting, gravity die casting and related tooling applications requiring stable thermal behavior, dimensional accuracy and long tool life.

Different casting processes generate different thermal cycles, solidification behavior and tooling stress profiles. Our material portfolio and heat-treatment expertise support stable tooling behavior across a wide range of casting applications.

Typical LPDC applications supported by Kind & Co.
- wheel production
- structural aluminium components
- cylinder heads
- suspension components
- housings with demanding dimensional requirements

Key material requirements in LPDC
- thermal fatigue resistance
- dimensional stability
- reliable heat conductivity
- resistance against thermal cracking
- stable hardness over long production cycles

GRAVITY DIE CASTING & SPECIAL APPLICATIONS

Stable tooling behavior under varying thermal loads

For gravity die casting and specialized casting applications, tooling behavior depends on the balance between toughness, thermal conductivity and wear resistance.

Kind & Co. supports:
- aluminium gravity casting
- magnesium casting applications
- prototype and low-volume tooling
- highly loaded local insert areas
- thermal management components

ONE SOURCE. COMPLETE CAPABILITY.

From raw material to hardened die insert, Kind & Co. supports the full tooling value chain under one responsibility.

SERVICES INCLUDE

- black and bright bar stock
- 3D-forged components
- machining to drawing
- vacuum hardening
- repair and rework services
- technical application support

Steel production → 3D forging → Machining → Vacuum hardening → Finished insert → Repair & rework support

APPLICATION ENGINEERING SUPPORT

Our engineering teams support:
- steel selection
- heat treatment optimization
- tooling performance analysis
- failure investigation
- process-oriented material recommendations

Integrated process capability helps reduce interfaces, simplify coordination and support reliable long-term tooling stability.

PURE PERFORMANCE means combining metallurgy, process expertise and application understanding to support reliable tooling performance across demanding casting applications.

TECHNICAL REFERENCE

Machining Recommendations

Recommended machining parameters for standard and premium grades.
Final parameters should be adjusted according to local machining conditions, tooling setup and component geometry.

LATHE Cemented Carbide	Condition	Cutting speed Vc in m/min	Feed Fz in mm	Cutting depth ap in mm
Standard	annealed	140-200	0,40-0,90	3-10
	quenched and tempered	50-90	0,25-0,70	2-6
Premium	annealed	100-160	0,40-0,90	3-8
	quenched and tempered	30-70	0,25-0,70	2-5

FACE MILLING rounded cutter plate	Condition	Cutting speed Vc in m/min	Feed Fz in mm	Cutting depth ap in mm
Standard	annealed	120-180	0,25-0,50	2-5
	quenched and tempered	50-90	0,20-0,30	2-5
Premium	annealed	150-200	0,20-0,50	2-4
	quenched and tempered	30-70	0,20-0,30	2-4

DRILLING Solid carbide	Condition	Cutting speed Vc in m/min	Feed Fz in mm
Standard	annealed	60-100	0,15-0,30
	quenched and tempered	40-60	0,10-0,25
Premium	annealed	50-90	0,10-0,25
	quenched and tempered	40-60	0,10-0,25

DRILLING Indexable insert	Condition	Cutting speed Vc in m/min	Feed Fz in mm
Standard	annealed	180-220	0,10-0,20
	quenched and tempered	50-80	0,05-0,25
Premium	annealed	120-180	0,10-0,20
	quenched and tempered	40-60	0,05-0,25

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