STEERING KNUCKLE PISTON CYLINDER BLOCK STARTER PUMP CON-ROD POWER STEERING VALVE BODY SUSPENSION TRANSMISSION TURBO CHARGER GEAR MOTOR CYLINDER HEAD

E-MOBILITY

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IMC

The increasing attention to green solutions in the automotive market has generated a growing interest in electric engines. Electric vehicles can contribute to a considerable reduction of both polluting emissions and fuel consumption.
Mobility is changing very fast and ITTEDI has the technology and the know-how to support the customer in machining this new generation of components efficiently.

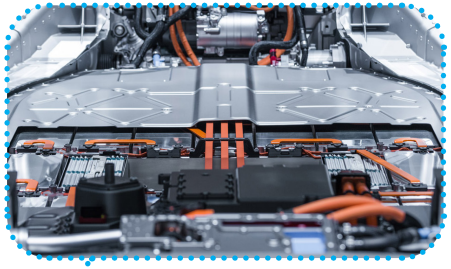
TOOLING SOLUTIONS

AUTOMOTIVE

CONTENTS

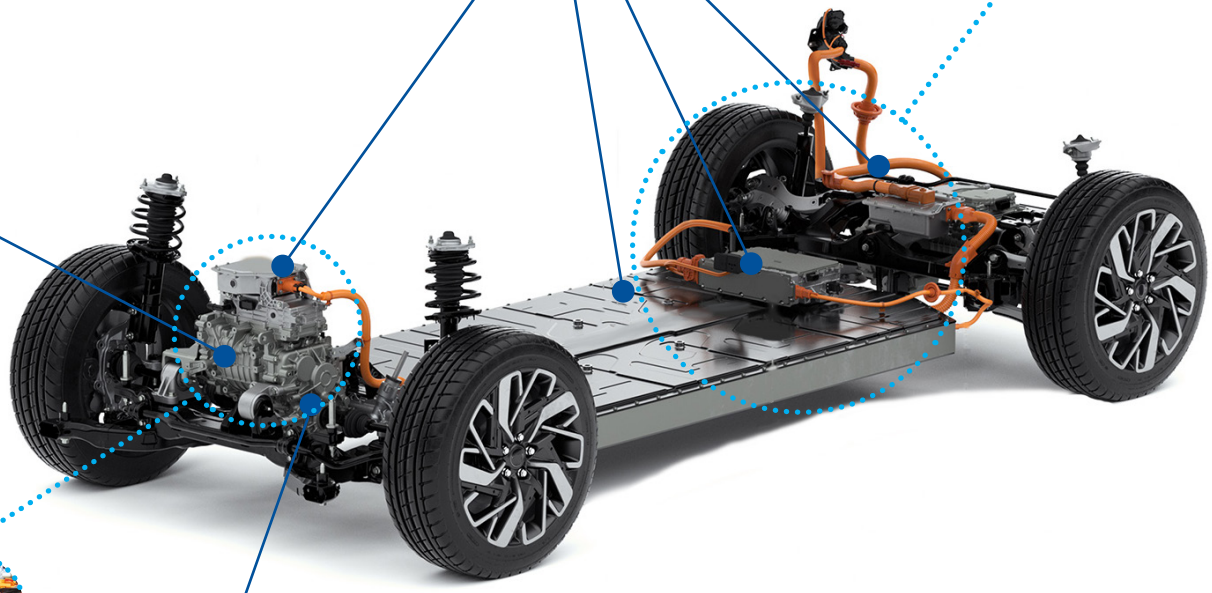
E-Vehicles

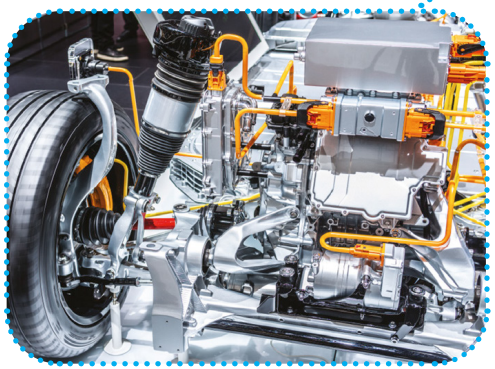
E-MOBILITY



Electronics & Supplies
(Pag. 19)

Motor Housing
(Pag. 5)





Transmission Housing
(Pag. 14)

The electrified drives for battery-electric vehicles and hybrid applications are composed of traditional components combined with an electric motor and power electronics. ITTEDI offer several options depending on customer's requirements and aiming to obtain the most productive and cost-effective solution.

AUTOMOTIVE

E-MOBILITY

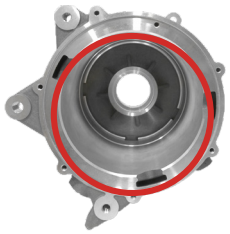
MOTOR HOUSINGS & TRANSMISSION HOUSING

Peculiarities

Two of the main components of e-vehicles - the stator housing and the transmission housing - need to be considered with a special approach: light weight, durability, precision, surface finish, geometrical tolerances have to be combined for each part.
As cutting in the hollow structure during machining operations of motor housing can cause big deformations; the right combinations of cutting parameters, cutting geometries and tool technology are the key factors for approaching this critical part in a reliable way.
The transmission housing can be compared with the conventional transmission of ICEV, where tight tolerances and thin structures must be taken into consideration.
The right geometry and the technical approach are essential to obtain good parts in an efficient way.

MOTOR HOUSING

Stator bore



Bearing holes

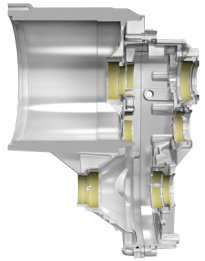
Main characteristics of the part:

- Highest precision requirements (IT6)
- Large amount of material to remove
- Thin walls and internal hollow spaces
- Highest reliability required
- High productivity required
- Big dimensions

TRANSMISSION HOUSING

Not assembly

Assembly



Main characteristics of the part:

- Highest precision requirements (IT6)
- Thin walls and internal hollow spaces
- Highest reliability required
- High productivity required
- Highest coaxiality required

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Motor Housing

AUTOMOTIVE

E-MOBILITY

MOTOR HOUSINGS

Roughing Bearing seat and Outside diameter

BORING

Multiple operations in the same tool is one of the trademarks of ITTEDI's solutions for increasing productivity. With this type of tools it is possible to combine different operations to reduce the cycle time.

The use of PCD and avant-garde ITTEDI's R&D department solutions allow to manufacture more and more performing tool in terms of number of operations simultaneously and longer tool life, offering solutions which increase productivity and cost-effectiveness.

- internal and external boring and reaming with interchangeble edges for grooving

MULTIFUNCTION

INTERNAL AND EXTERNAL BORING, REAMING AND GROOVING IN ONE TOOL

- internal and external boring with grooving by interpolation

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AUTOMOTIVE

E-MOBILITY

MOTOR HOUSINGS

Finishing Inside and Outside diameter

REAMING

The use of special PCD tools is a guarantee for achieving the typical qualitative and quantitative parameters of the automotive sector. ITTEDI is committed to providing its customers with technological solutions capable of achieving the highest levels of quality and stability.

Different solutions are available with blades, helicoidal or indexables cutting edges to achieve the highest stability and productivity

CENTERING MODULE

PADS & BLADE

PCD

- internal and external indexable reamer with guiding pads technology

CENTERING MODULE

MECHANICALLY CLAMPED

PCD

- external indexable reamer with tangential technology

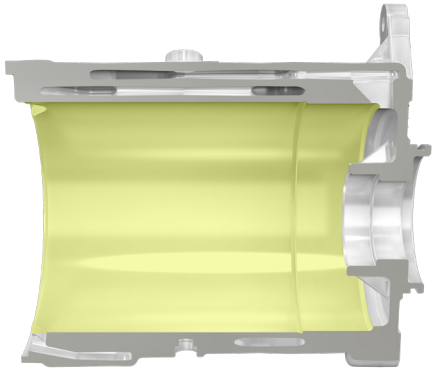
AUTOMOTIVE

E-MOBILITY

MOTOR HOUSINGS

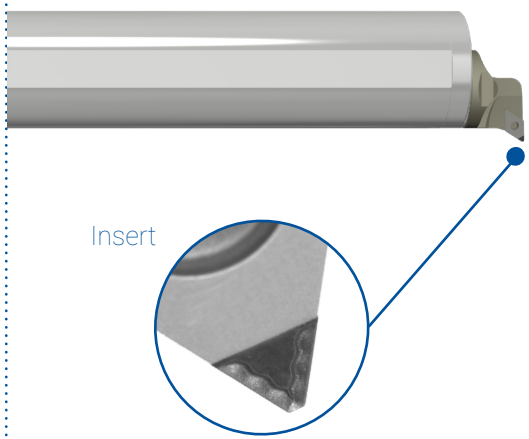
Roughing Stator bore

Different machining methods.



Simplicity, Productivity, Flexibility.
Several options for reducing cutting forces during the roughing operation.

TURNING



- conventional turning with PCD chip breaker

BORING

- conventional boring with indexable PCD cutting edges

MILLING

TEDIFEED

- climb milling by indexable tangential PCD inserts

TOOLING SOLUTIONS

AUTOMOTIVE

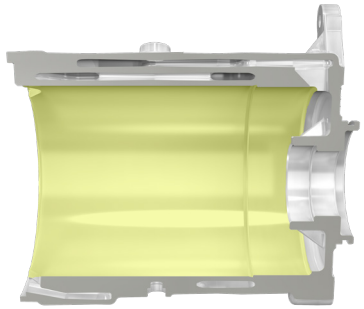
E-MOBILITY

MOTOR HOUSINGS

Semi-Finishing Stator bore

BORING

For a large tool diameter, innovative engineering solutions have been applied to minimize the tool weight and the spindle load; materials such as ***titanium*** and ***carbon fiber*** are used for the tool body, as well as the framework design. At the same time different solutions are studied also to allow the highest productivity.



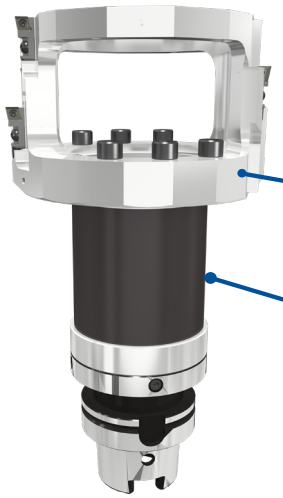
- High process productivity
- Lightweight tooling solutions
- Optimal cutting forces and chip management

Lightweight technology for process stability and appropriate PCD cutting technology ensuring low cutting forces and a perfect chip control.

CENTERING MODULE
MECHANICALLY CLAMPED
PCD
LIGHT TECHNOLOGY

- light tool body with indexable PCD cutting edges.

CENTERING MODULE
MECHANICALLY CLAMPED
PCD
LIGHT TECHNOLOGY



- ultralight tool technology which adopts CFRP body and titanium head with PCD curtridges.

MONOBLOCK
MECHANICALLY CLAMPED
PCD
LIGHT TECHNOLOGY

- ultralight tool with framework steel body and indexable PCD tangential inserts and cartridges.

AUTOMOTIVE

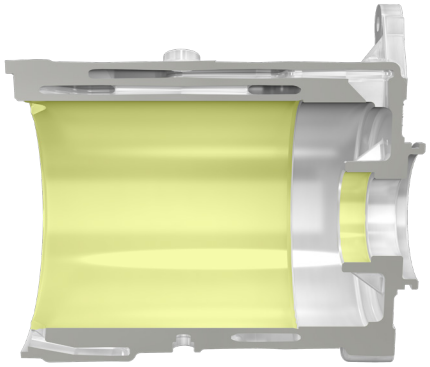
E-MOBILITY

MOTOR HOUSING

Finishing Stator bore and Bearing seat

REAMING

The tools developed for this application are studied to achieve the most critical geometries and technical requirements.



ITTEDI fine boring tools are designed with the best technology to ensure low cutting forces, high performance and a reliable process.

OPTION 1

CENTERING MODULE

PADS & BLADE

PCD

- conventional tool tech with guiding pads and PCD adjustable cutting blades.

OPTION 2

CENTERING MODULE

PADS & BLADE

PCD

LIGHT TECHNOLOGY

- ultra light tool with steel body, guiding pads and PCD adjustable cutting edges.

AUTOMOTIVE

E-MOBILITY

MOTOR HOUSINGS

Finishing Stator bore and Bearing seat

The tools have to work where the heart of the electric motor is located guaranteeing high process stability and quality surface.

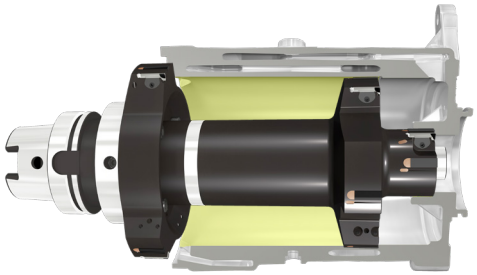
REAMING

LIGHT TECHNOLOGY

OPTION 1

Examples of machining diameters:

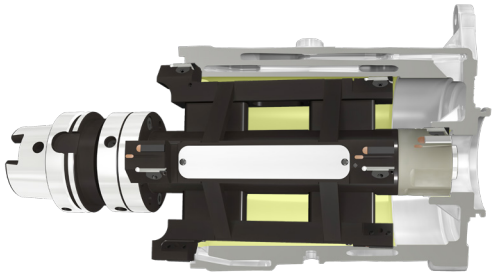
- ø73N6 PCD blade Z=1
- ø178.4$^{(0/+0.05)}$ PCD blades Z=3
- ø183H7 PCD blades Z=3



OPTION 2

Examples of machining diameters:

- ø68N6 PCD blade Z=1
- ø178$^{(0/+0.05)}$ PCD blades Z=4
- ø193H6 PCD blades Z=4



AUTOMOTIVE

E-MOBILITY

MOTOR HOUSINGS

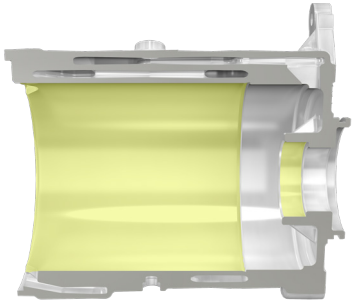
Finishing Stator bore and Bearing seat with Additive Technology

REAMING

LIGHT TECHNOLOGY

ADDITIVE TECHNOLOGY

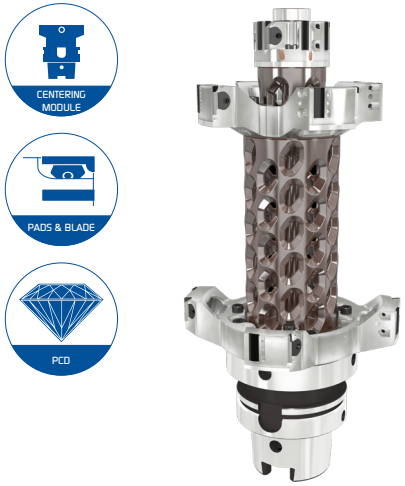
Ultralight tool with high performance. Thanks to the innovative technology of 3D metal printing, high standard requirements in terms of lightness, chip control and accuracy are constantly achieved.



Specific requirements for special tool:

With **F.E.M.** (Finite Element Method) analysis we can calculate the parameters of the tools like cutting forces, natural frequencies of the system and the flexibility under axial force/torsional load.

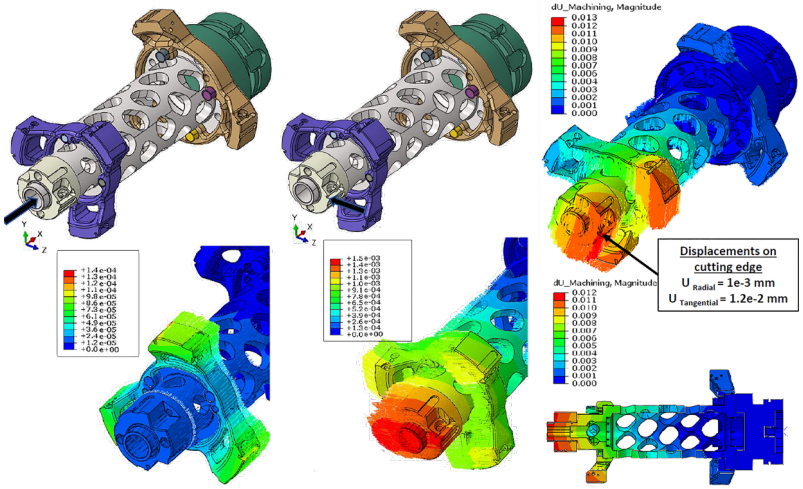
OPTION 3



LIGHT TECHNOLOGY

ADDITIVE TECHNOLOGY

- light additive tool technology with a perfect shape for chip control with guiding pads and PCD adjustable blades



- Static axial FEM analysis
- Static radial FEM analysis
- Dynamic radial FEM analysis

AUTOMOTIVE

MOTOR HOUSINGS

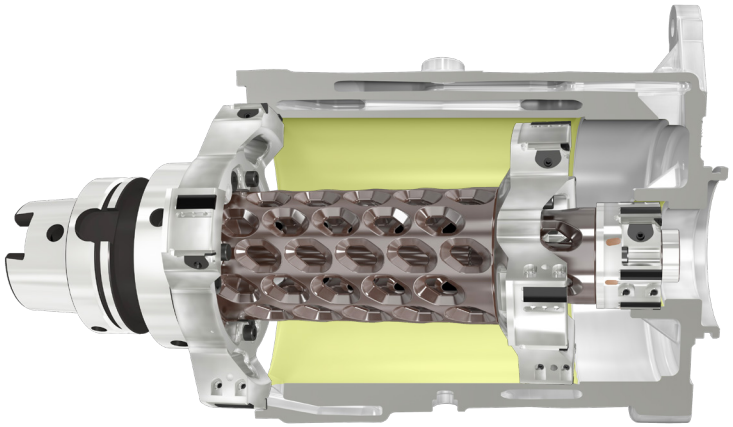
Finishing Stator bore and Bearing seat
Additive Technology

E-MOBILITY

OPTION 3

Examples of machining diameters:

- ø68N6 PCD blade Z=2
- ø172H7 PCD blades Z=4
- ø195.7H6 PCD blades Z=4



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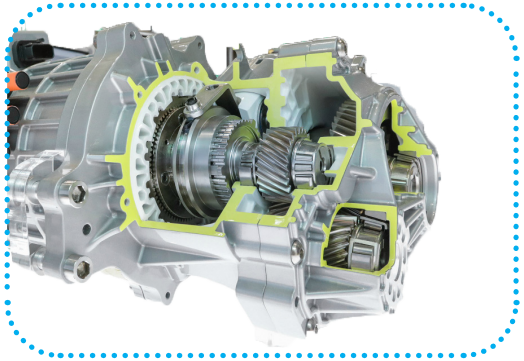
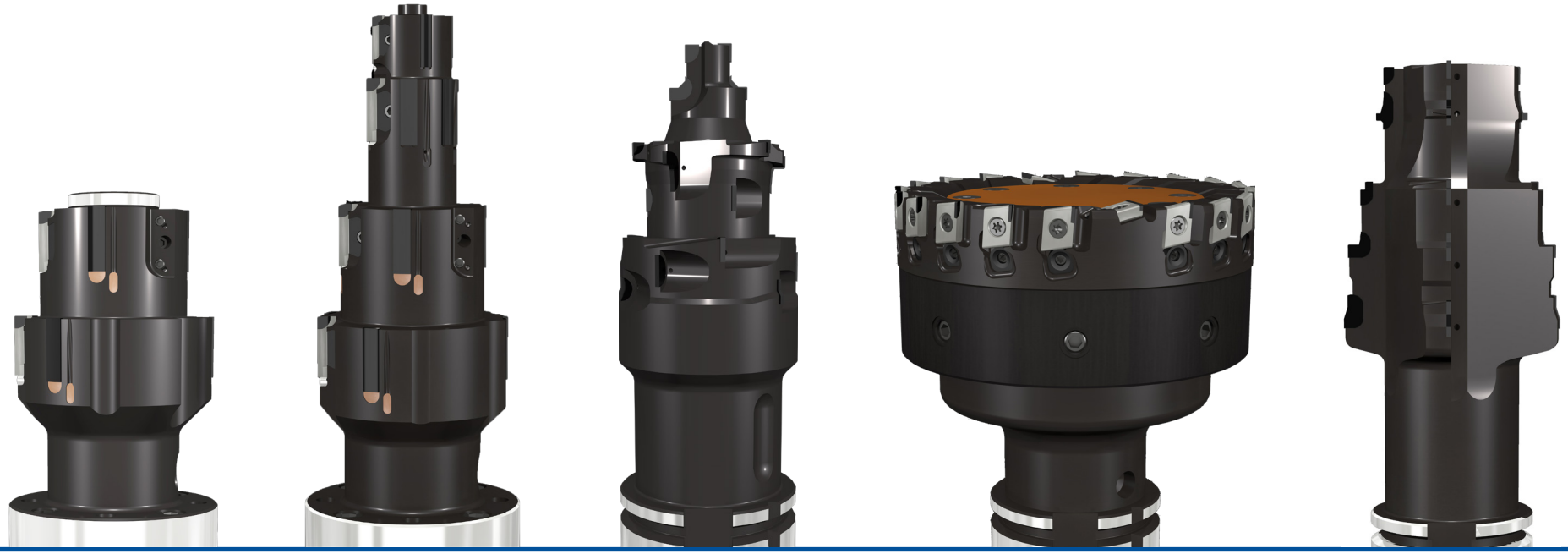


Transmission Housing



AUTOMOTIVE

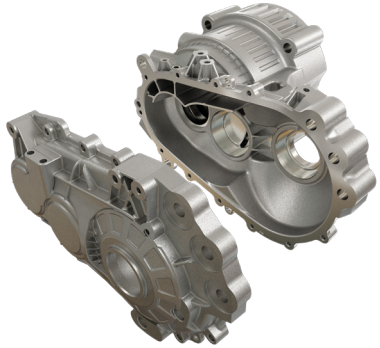
E-MOBILITY

TRANSMISSION HOUSINGS

Milling Surfaces

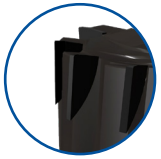
MILLING

With a variety of PCD or CBN inserts, the milling line guarantees the best cycle time, surface finish quality and performance.



Milling approach with ITTEDI standard tools, standard geometries with very high cost-effective results and superior productivity.

BRZ LINE



SCAN ME

- Brazed PCD cutting edges

TEDIMILL

SCAN ME

- Indexable PCD cartridges

TEDIFEED

SCAN ME

- Indexable tangential PCD inserts

TEDI SFEED

SCAN ME

- Mini indexable PCD cartridge

AUTOMOTIVE

E-MOBILITY

TRANSMISSION HOUSINGS

Bearing Seat roughing

BORING

Roughing operations are crucial and the capacity to offer different technical approaches according to the workpiece and CNC machine structure, are key factors to get a stable and productive process.

Based on the workpiece structure and its clamping fixture stability, ITTEDI has the right solution for the best approach to the part ensuring the most realiable and productive process.

OPTION 1

-Flexibility-

MONOBLOCK

BRAZED TOOL

PCD

BRZ LINE

SCAN ME

- Helicoidal milling cutter with brazed PCD cutting edges ideal to approach thin structures

OPTION 2

-Performance-

MONOBLOCK

BRAZED TOOL

PCD

- Brazed PCD cutting edges as high productivity option

OPTION 3

-Indexability-

MONOBLOCK

MECHANICALLY CLAMPED

PCD

- Indexable PCD cutting edges for cost-effectively

TOOLING SOLUTIONS

AUTOMOTIVE

E-MOBILITY

TRANSMISSION HOUSINGS

REAMING

Bearing Seat finishing (Before assembling)

Surface quality, tight tolerance and thin structures: starting from these key parameters ITTEDI's tooling solutions are focused to achieve the best result in therms of productivity and stability. The most appropriate cutting technology is chosen in order to produce the best cost-effective solution.

- Highest precision requirements (IT6/IT7)
- Highest process reliability
- High process productivity

Based on the customer's request and according to the workpiece requirements, ITTEDI can machine precise seats with different solutions.

OPTION 1

-Productivity-

CENTERING MODULE
BRAZED TOOL
PCD

- Multifunctional tool for high productivity with brazed PCD cutting edges

OPTION 2

-Wear compensation-

CENTERING MODULE
BRAZED TOOL
PCD

- PCD brazed cutting edges with mechanical wear compensation system

OPTION 3

-Stability-

CENTERING MODULE
PADS & BLADE
PCD

- High stability with PCD guiding pads and PCD cutting blades

AUTOMOTIVE

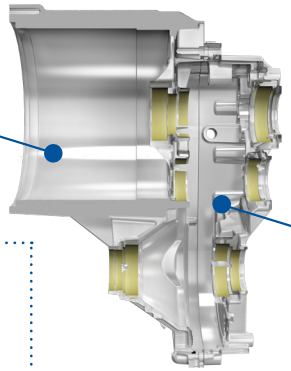
E-MOBILITY

TRANSMISSION HOUSINGS

Bearing Seat finishing (After assembling)

Warranty of the coaxiality and geometric quality when the part has to be machined assembly.

REAMING



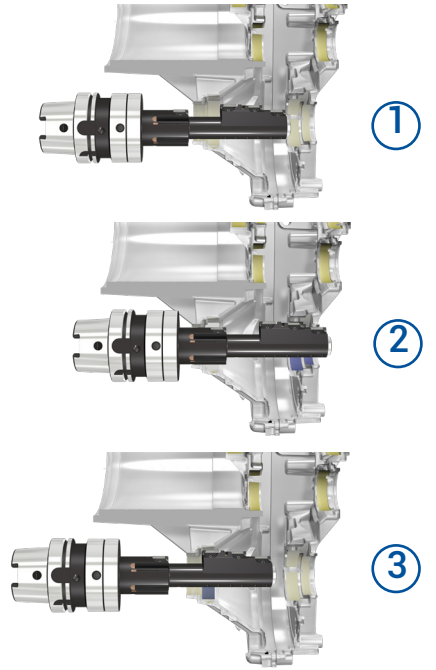
- Highest precision requirements (IT6/IT7)
- Highest coaxiality

Once the parts are assembled, the tight concentricity between the bearings seat diameters is guaranteed by the ITTEDI's reaming solution with Push & Pull technology.

- Push & Pull technology for a superior coaxiality of assembly

MACHINING SEQUENCE:

1. The tool goes inside the part specifically oriented without rotation.
2. When the tool axis is aligned with the part axis, the spindle rotation starts; the front diameters are machined by pushing; the back diameters are machined by pulling.
3. The tool goes outside the part without rotation once it is correctly aligned.



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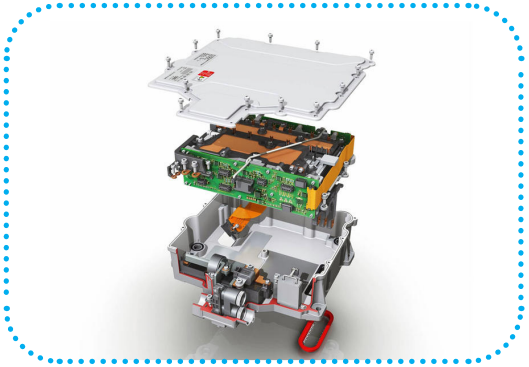
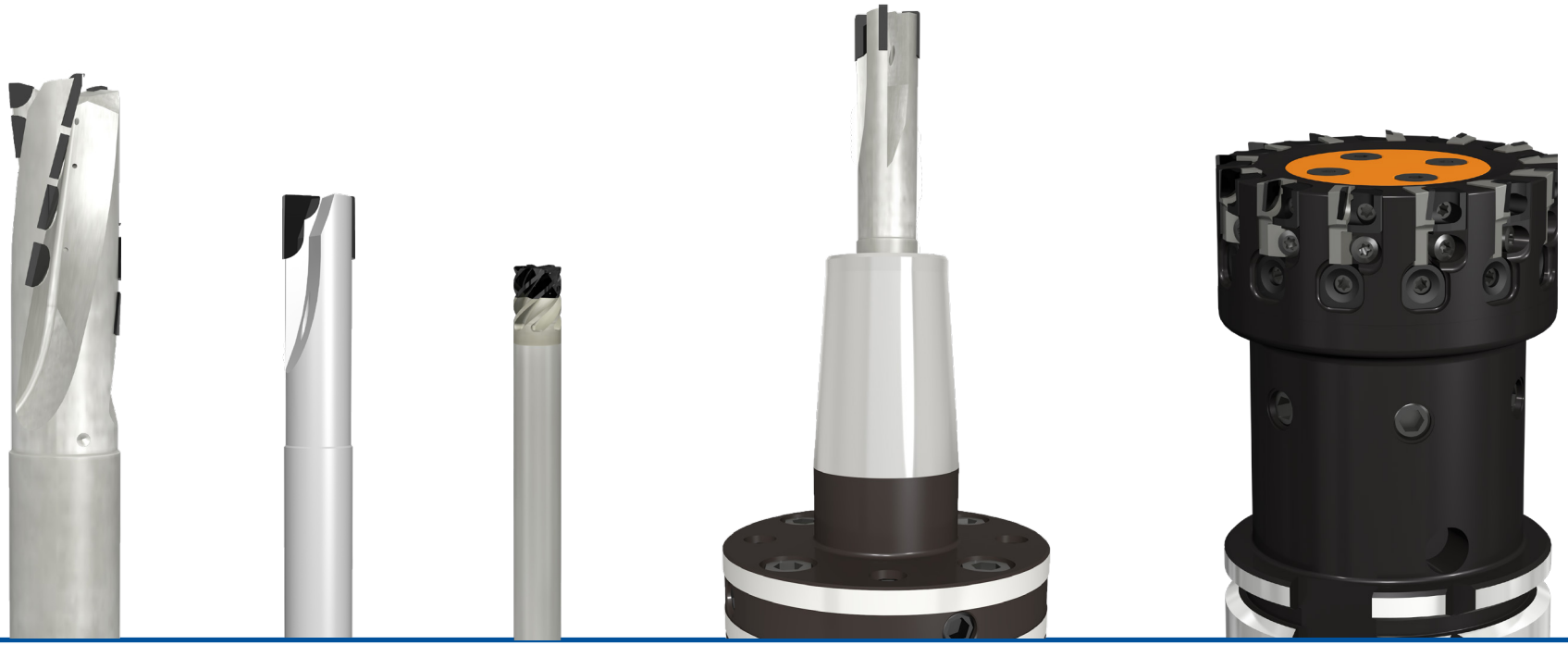


Electronics & Supplies

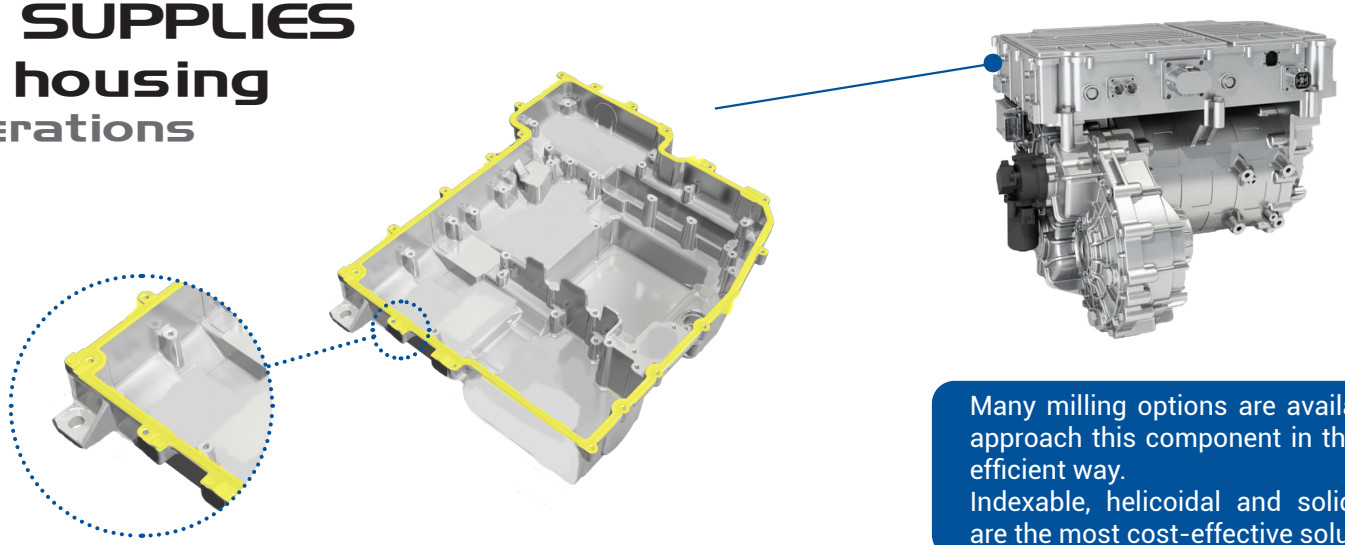


TOOLING SOLUTIONS

AUTOMOTIVE

E-MOBILITY

ENERGY SUPPLIES
Inverter housing
Milling operations



Many milling options are available to approach this component in the most efficient way.
Indexable, helicoidal and solid tools are the most cost-effective solutions.

FACE MILLING

MONOBLOCK
MECHANICALLY CLAMPED
PCD

TENIFEED

SCAN ME

- ITTEDI standard line

SHOULDERING

STANDARD HOLDER
BRAZED TOOL
PCD

- Helical Milling

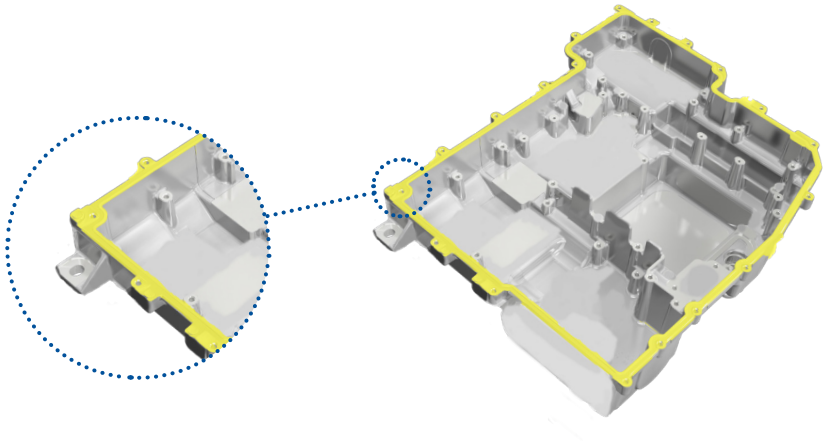
SLOTTING

STANDARD HOLDER
BRAZED TOOL
PCD

- Solid PCD mill

INVERTER HOUSINGS

Other operations



The R&D team of ITTEDI studies the best productive options for any application, from boring to contouring to OD applications.

CONTOURING

- Finishing spigot's shape

REAMING

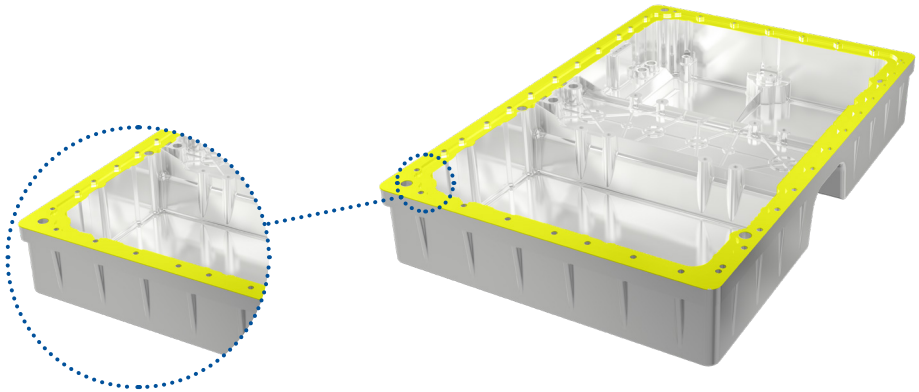
- High feed solutions with brazed PCD cutting edges

TOOLING SOLUTIONS

AUTOMOTIVE

E-MOBILITY

BATTERY HOUSINGS
Milling operations



High productive lines with long tool life are strategic to approach such a type of components.

FACE MILLING

MONOBLOCK

MECHANICALLY CLAMPED

PCD

TEDI SPEED

SCAN ME

- ITTEDI standard line with indexable PCD cartridges

END MILLING

STANDARD HOLDER

BRAZED TOOL

PCD

SCAN ME

- Micro line solid PCD mill.

SHOULDERING

MONOBLOCK

BRAZED TOOL

PCD

BRZ LINE

SCAN ME

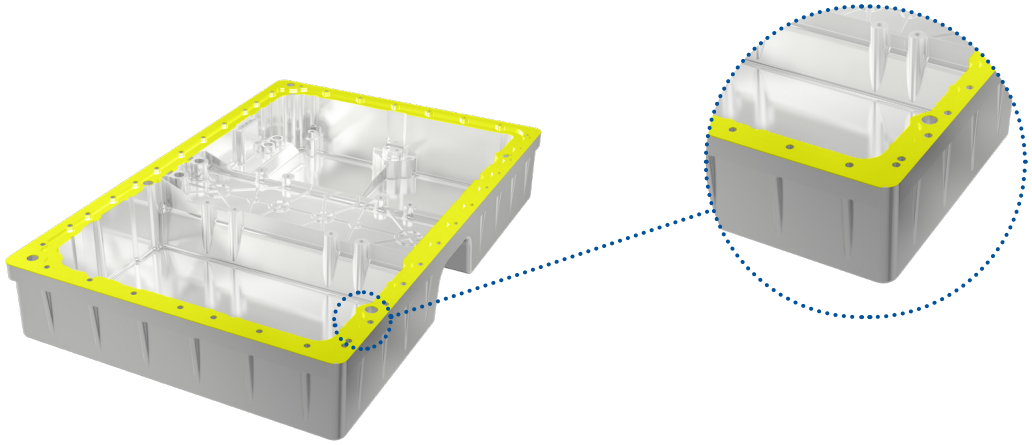
- Helicoidal mill with brazed PCD cutting edges (for unstable parts)

AUTOMOTIVE

E-MOBILITY

BATTERY HOUSINGS

Other operations



ITTEDI's customized tools, standard lines and semistandard lines, are the solutions which can machine the complete range of these parts with extremely high performance levels.

DRILLING

MONOBLOCK

MULTIFUNCTION

PCD

- Multifunctional tools with PCD brazed cutting edges

REAMING

MONOBLOCK

BRAZED TOOL

PCD

SCAN ME

- Standard and Semi Standard Reamers line with PCD brazed cutting edges

STEERING KNUCKLE
PISTON
CYLINDER BLOCK
STARTER
PUMP
CON-ROD
E-MOBILITY
POWER STEERING
VALVE BODY
SUSPENSION
TURBO CHARGER
CYLINDER HEAD
TRANSMISSION
GEAR MOTOR

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