

GF Machining Solutions

+GF+

Application booklet

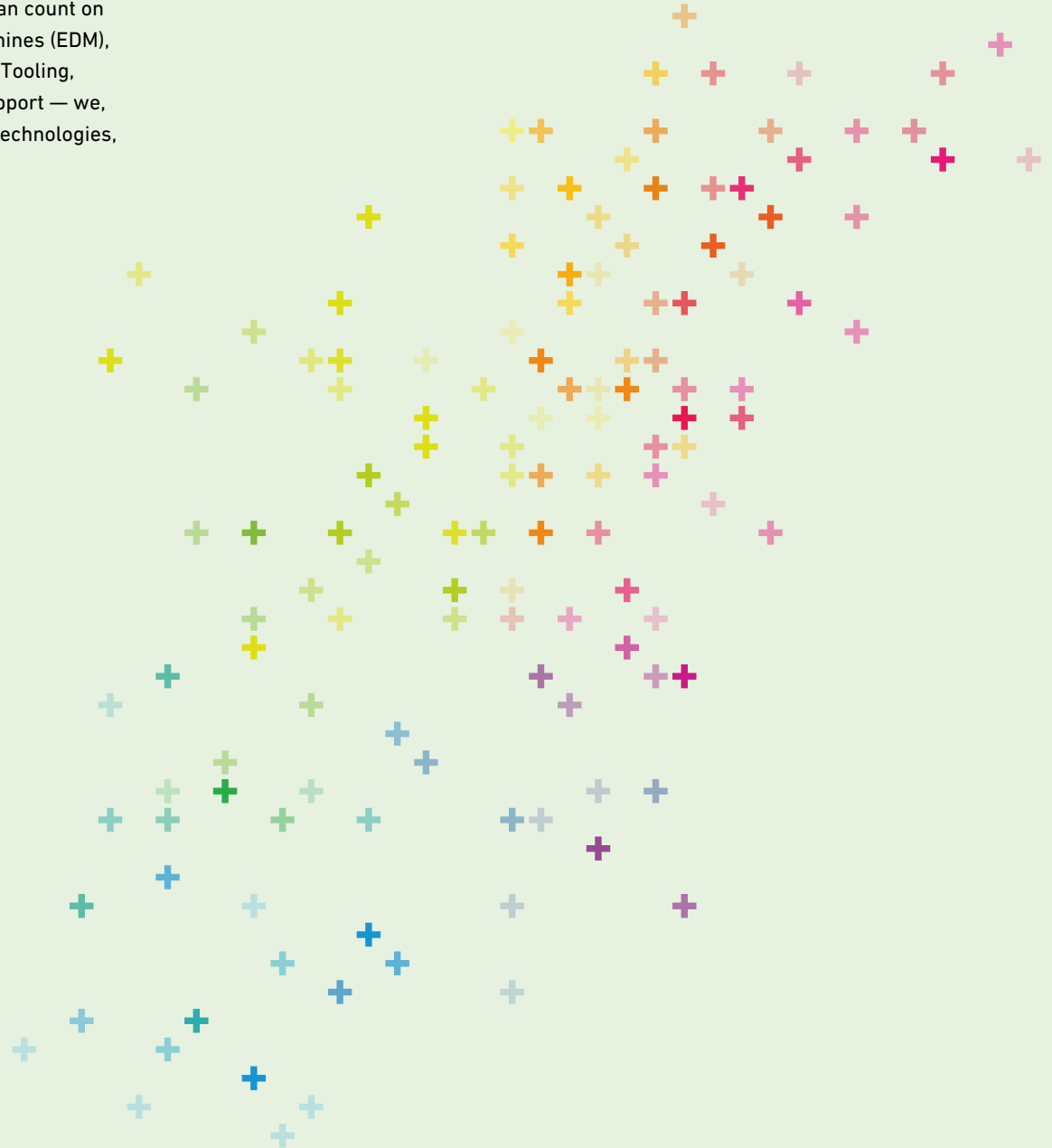
# Experience Laser texturing



**GF Machining Solutions: all about you**

When all you need is everything, it's good to know that there is one company that you can count on to deliver complete solutions and services. From world-class electrical discharge machines (EDM), Laser texturing and Additive Manufacturing through to first-class Milling and Spindles, Tooling, Automation and software systems — all backed by unrivalled customer service and support — we, through our AgieCharmilles, Microlution, Mikron Mill, Liechti, Step-Tec and System 3R technologies, help you raise your game and increase your competitive edge.

# Passion for Precision



# Experience Laser texturing

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# A new manufacturing era begins

Position your texturing operations for the future today with the AgieCharmilles LASER P series. Work digitally and stay on pace with the digital transformation and green manufacturing. These ecologically sound Laser texturing solutions help you seize new business opportunities, open up new innovation horizons, produce flawless quality, and achieve faster time to market.

## **Achieve faster time to market with less environmental impact**

Time to market is key: You need to shorten your manufacturing chain while speeding it up in order to get your innovations to market faster. Laser texturing technology gives you access to the texturing operations essential to shortening your lead time by efficiently producing your textures internally.

Environmental sustainability is a major issue today and beyond so governments are pushing chemical etchers to quickly adopt cleaner processes. GF Machining Solutions is committed to reducing its technologies' environmental impact, as demonstrated by our Laser texturing technology's cleaner, more efficient production of textured products. Laser texturing avoids the need for environment-polluting traditional methods that limit your design potential. Bet on a future technology right now.

## **Innovate without compromise**

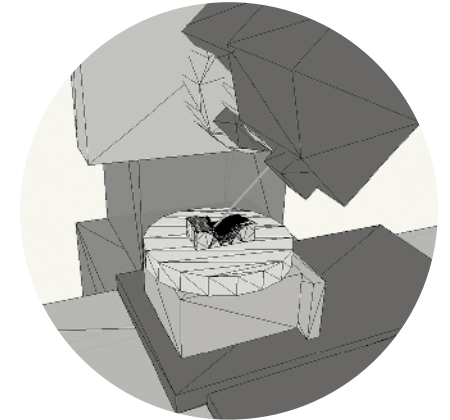
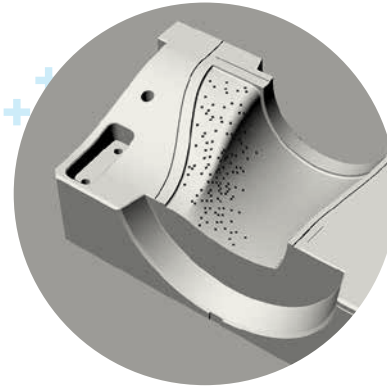
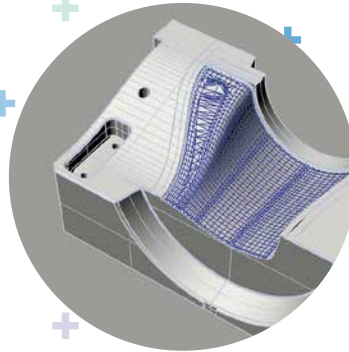
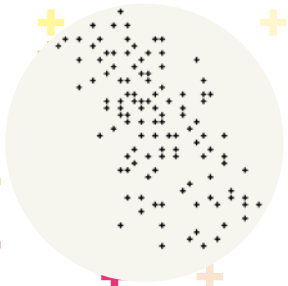
Say goodbye to conventional manufacturing limitations with a solution developed to reduce your technical and economic constraints. Be ready to propose new product designs with fewer limitations, and innovate with confidence as a more efficient technology is now able to reduce the cost-per-part gap between existing technologies while delivering higher quality. Experience a technology that eliminates guesswork in executing your distinct designs—even on complex 3D surfaces—and achieve the expected optimal results.

## **Work digitally: Answer your manufacturing challenges**

Digital transformation is under way and Laser texturing overcomes the limitations of manual and traditional methods to drive your surface texturing transformation. Defeat the daily challenges of difficult-to-realize designs and quality deviations, and tackle functional surfaces in order to seize new business opportunities. We understand your concerns: Our Laser texturing technology helps you keep pace in an ever-changing manufacturing world.



# Enhancing your manufacturing process



## Fast, accurate surface calculation

Fast, accurate and easy surface calculation is built into our Laser solutions, saving you time and increasing your productivity.

## Fully digitized process

GF Machining Solutions' Laser technology uses a fully digital process for five axis texturing and engraving. Our smart mapping solution manages random and overlapped textures to provide continuity of your design when it is applied to the end product.

# LASER P 400

Simplify your production of small parts and boost your quality while benefiting from great manufacturing agility. The LASER P 400 U series is made specifically for efficient production of small parts. This scalable concept offers you the flexibility to anticipate your future needs: Start with a standard machine configuration with a nanosecond Laser and be positioned—as your business grows—to add a femtosecond laser to achieve perfect Laser texturing and blasting operations.



# Secure your part production future today

## Boost your manufacturing flexibility

Be ready to quickly jump into the next manufacturing opportunity with a compact, multi-process solution that is adaptable to your application needs. With our solution, you get the success-triggering advantage of having a machine that's ready to move from one type of 3D job to another. At the same time, with this series large working area, you can expand your application possibilities, and its small footprint maximizes your productivity per square meter.

## Innovate without compromises

Increase your design possibilities and quality and expand your product design horizons today by getting a solution that allows you to engrave and texture a wider range of materials without recast layer or burrs: Our AgieCharmilles LASER P 400 U's ultra-short-pulsed femtosecond Laser puts uncompromising innovation within your reach. Furthermore, you can achieve perfect machining for years to come with our Protect and Secure contracts to keep your femtosecond Laser solution operating at highest efficiency.

## Increase your manufacturing efficiency

Efficiency is a key contributor to optimized total cost of ownership (TCO), fast return on investment (ROI) and overall margin, and this series' Automation readiness puts you on the path to achieving all three. You can count on our Automation solutions to reduce machine downtime and minimize your risks of staff turnover and human error, while maintaining the highest level of production quality.

## Simplify and secure your part manufacturing

Simplify your production process to save time and money by having process stability and uniform quality across every design reproduction. With our fully digital solution, you'll easily overcome the challenges of conventional machining methods and get on the fast track to executing small geometries with fewer manufacturing steps.



# Simplify your process with smart surfaces

## YOUR BENEFITS

Substitute grit blasting and acid etching with a clean, digital process

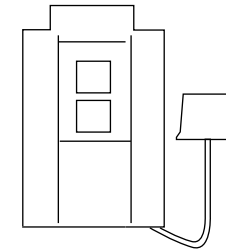
Simplify your process and reduce costs with a repeatable process leaving no surface residue



Dental Implant Screw

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400 U



## PERFORMANCE RESULTS

Market segment	Medical
Material	Titanium Grade 5
Laser (Type/Power)	Femto 20 W FP
Characteristics	Machining time 3 min



# Save machining, setup and inspection time

## YOUR BENEFITS

Avoid need for manual sand blasting to speed up your production

Limit production inspection to one piece per lot compared to a systematic inspection process



Cervical fusion plate  
by Laser

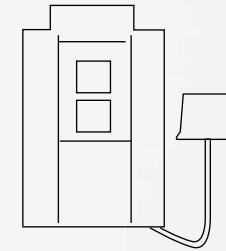


Perfect homogeneity

Set up in seconds

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400 U



## PERFORMANCE RESULTS

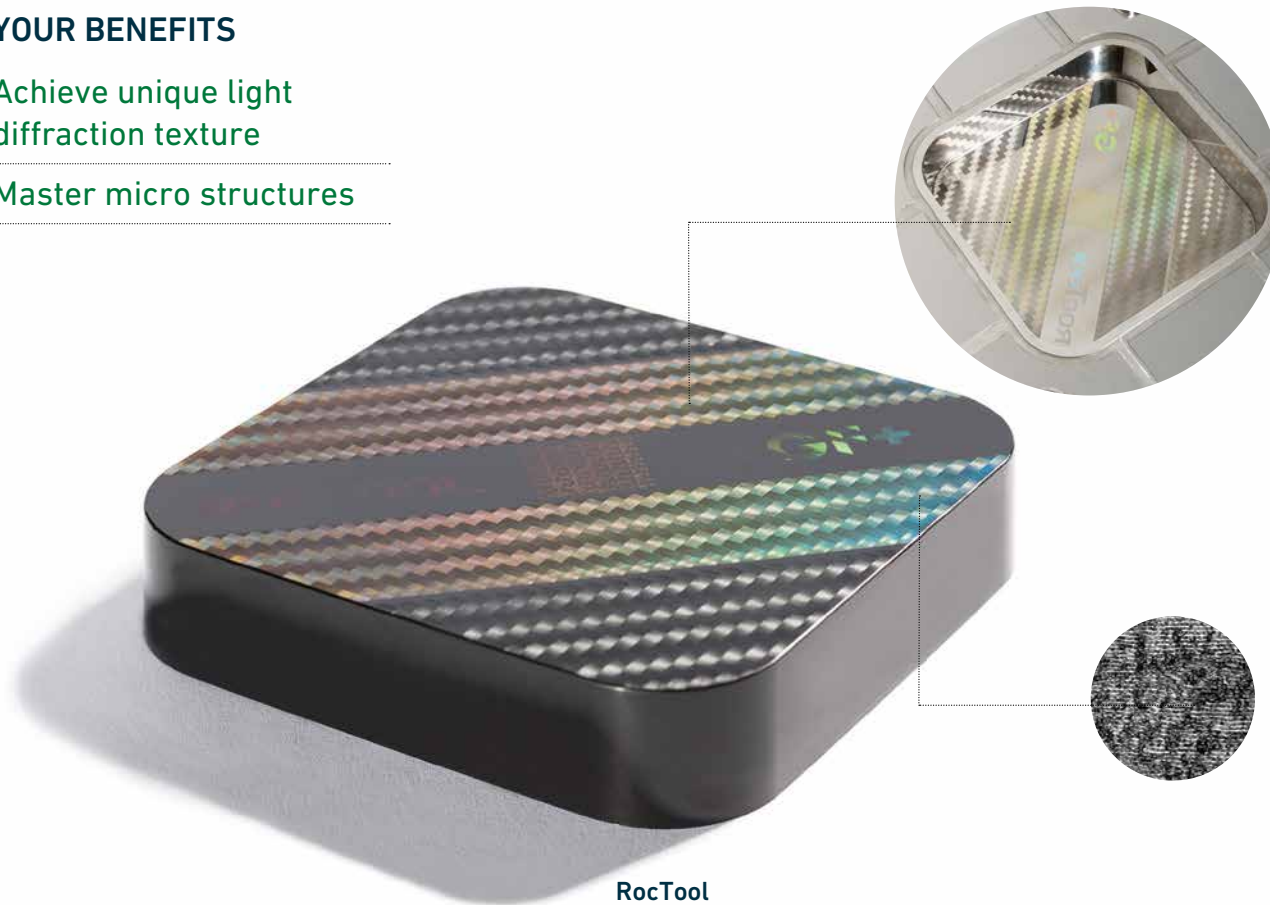
Market segment	Medical
Material	Titanium
Laser (Type/Power)	Nano IR 50 W
Characteristics	Machining time (S size) 10 min

# Dare to propose new design possibilities

## YOUR BENEFITS

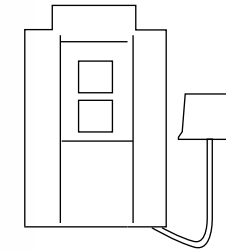
Achieve unique light diffraction texture

Master micro structures



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400



## PERFORMANCE RESULTS

Market segment	ICT
Material	Steel
Laser (Type/Power)	Dual Laser femto IR 20 W FP and Nano IR 30 W FP in the same solution
Characteristics	Carbon 37 min Logo 9 min

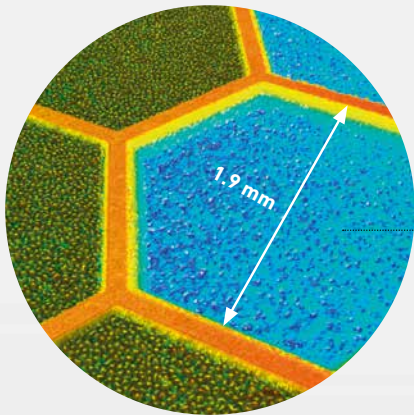
# Achieve higher quality in a single set up

## YOUR BENEFITS

Boost your quality with the combination of Laser blasting and deep black

Execute your work in a single setup

Achieve a perfect repeatability



Watch face

From femto to nano Laser

0.7"

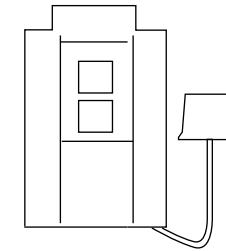
Perfect texture profile

Digital technology

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400 U

Dual Laser



## PERFORMANCE RESULTS

Market segment Watchmaking industry

Material Stainless steel

Laser (Type/Power) Femto IR 20 W FP and Nano IR 30 W FP in the same solution

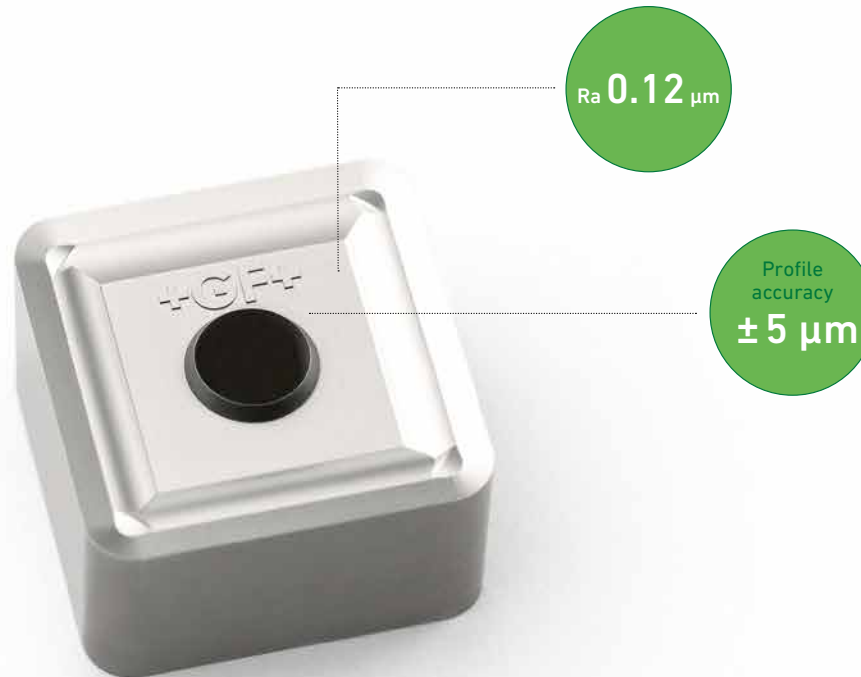
Characteristics Machining time 22 min

# Simplify your machining process

## YOUR BENEFITS

Avoid cutting tools and electrode production

Get the right profile accuracy and right surface finish on a single operation

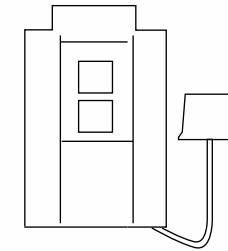


Hard metal tool insert

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400

Laser Flexipulse



## PERFORMANCE RESULTS

Market segment Cutting tools

Material Carbide H40S

Laser (Type/Power) Femto IR 20 W FP

Characteristics Machining time 6h

# Get the highest quality—faster

## YOUR BENEFITS

Speed up  
your operations

Reduce number of  
electrodes and cutting  
tools required

Extend punch lifetime  
with a higher punch  
quality



Hard metal  
tool insert

Radius 11  $\mu\text{m}$

Surface finish  
Ra 0.1  $\mu\text{m}$

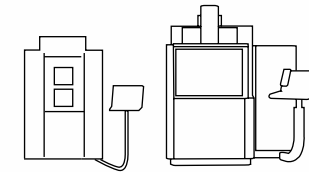
Shorter  
roughing  
operation

More than  
50%  
less  
electrodes

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400 – roughing

AgieCharmilles FORM S 350 – finishing



## PERFORMANCE RESULTS

Market segment    Cutting tools

Material    Carbide H40S

Laser (Type/Power)    Nano 30 W FP

Characteristics    Machining time 5h15

# Boost your operations

## YOUR BENEFITS

Simplify your three dimensional engraving operations

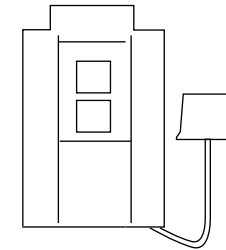
Boost your productivity, realize marking and engraving operations on the same solution

Embossing dies



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400



## PERFORMANCE RESULTS

Market segment	Watch industry	
Material	Hardened Steel	
Laser (Type/Power)	Femto 20 W FP	
Characteristics	Machining time	4h
	Max depth	0.2 mm



# Master geometrical surface for new lighting generation

## YOUR BENEFITS

Substitute manual operations to boost quality

Boost automotive R&D possibilities with Laser texturing's freedom of design

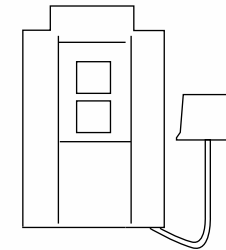
Digressive texture depth

Automotive lighting lens

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 400 U

No burr



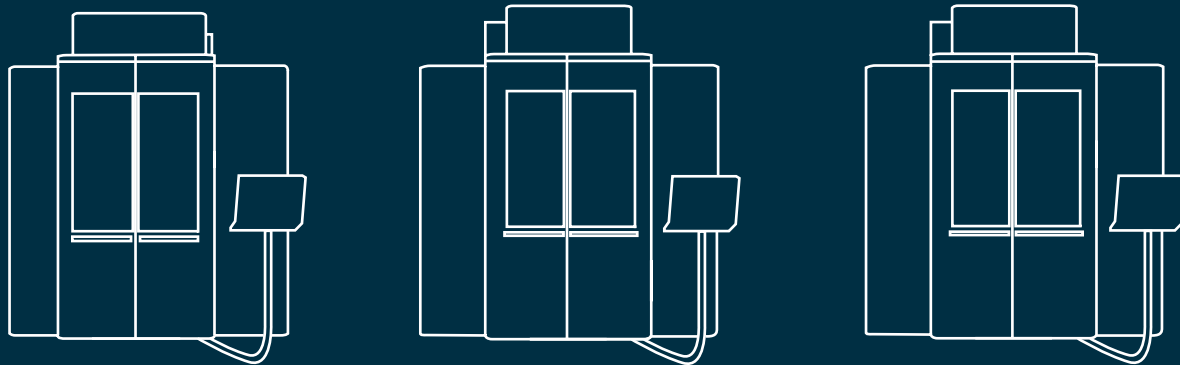
## PERFORMANCE RESULTS

Market segment	Automotive
Material	Stainless steel
Laser (Type/Power)	Femto IR 20 W FP
Characteristics	Machining time 18 min Max. texture depth 12 µm

# LASER P

## 600/1000/1200 U

Experience the technology: Reduce non-quality risks, gain true design freedom and simplify your processes with a fully digital, green, technology. With our Automation-ready, multi-process solution at your disposal, you'll be set to respond to new surface texturing demands with quality and higher productivity.



# Enter the world of digital texturing

## Get the first part right

Ramp up your quality, innovate and limit deviation risks with our unique, all-in-one, patented software package designed to help you think and create without limitations—and perfectly reproduce your original idea on the very first part. Control your design from preparation to execution and achieve the quality you expect, and easily, quickly apply incomparably high-quality textures with Smartpatch. And, whatever your part size, you'll effortlessly execute homogenous blasted surfaces, right where you want them, without the deviation risks posed by manual processes.

## Boost your texturing possibilities

Offer innovative, precise textures due to this solution's unique combination of software and hardware. This series' cast iron structure ensures repeatable quality, productivity and accuracy to sharpen your competitive edge. Be ready to answer automotive's positive mold texturing trends with the machine's combination of a tilting A axis (+135°/-50°) and increased Z axis travel embedded in the all-in-one Laser head.

## Accelerate your operations

Take your operations to the next level of agility: This series gives you the competitive advantage of being able to move from one type of job to another. Get all of the flexibility you need in order to capture new business opportunities with this solution's Automation readiness, so you can start profiting from Automation: Control your cost per part by loading production batches to save time and reduce the risk of human error.

## Quickly simplify your process

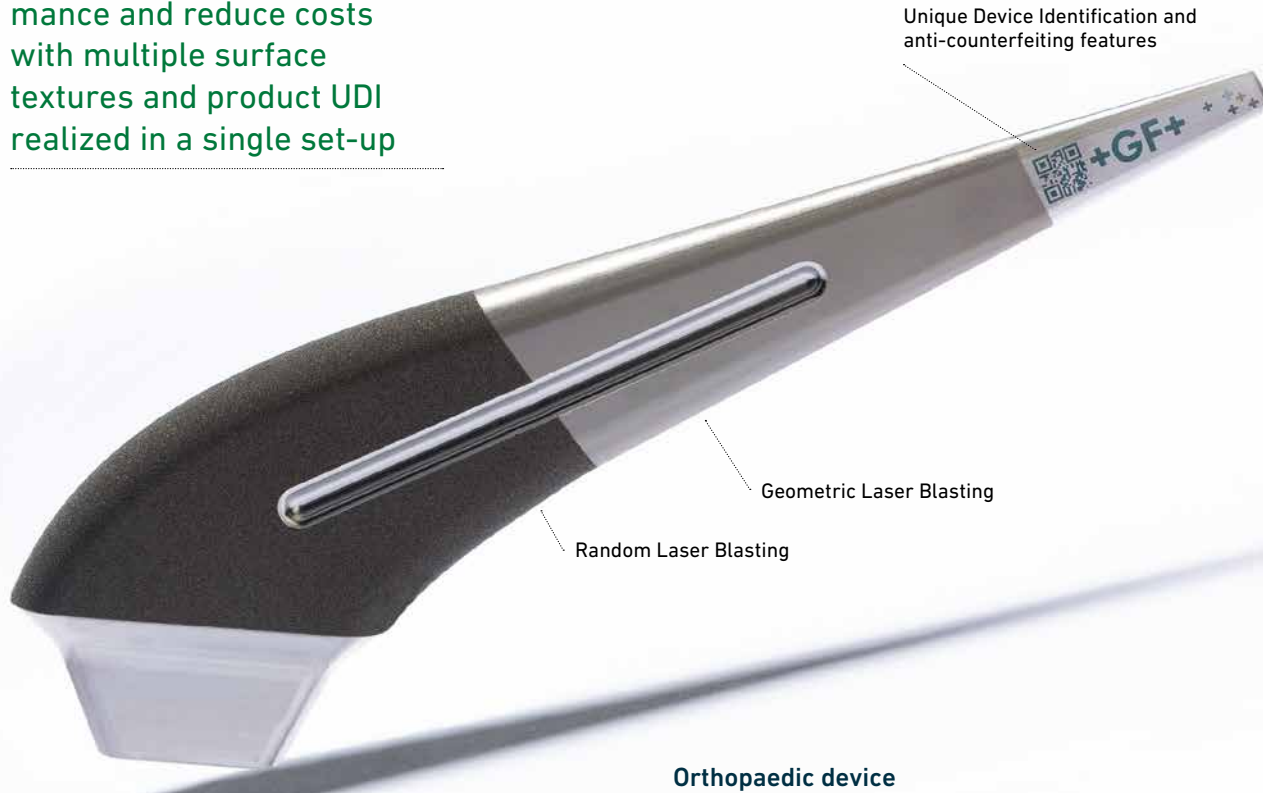
Process stability and uniform quality across every design reproduction is at your fingertips with our fully digital solution. Overcome the challenges of conventional surface texturing methods like sandblasting and chemical etching, thanks to Laser texturing's clear advantages. It allows you to texture molds without masking, hand polishing or third parties, and our unique and dedicated Laser Design software gives you Laser blasting capability and unmatched texturing. For example, our solution allows electrode-free engraving of simply molds to simplify your process.



# Drive Medical Implant Innovation

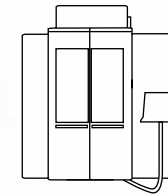
## YOUR BENEFITS

Increase product performance and reduce costs with multiple surface textures and product UDI realized in a single set-up



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 600 U



## PERFORMANCE RESULTS

Market segment	Medical
Material	Titanium Grade 5
Laser (Type/Power)	Nano IR 50 W
Characteristics	Machining time 1h12

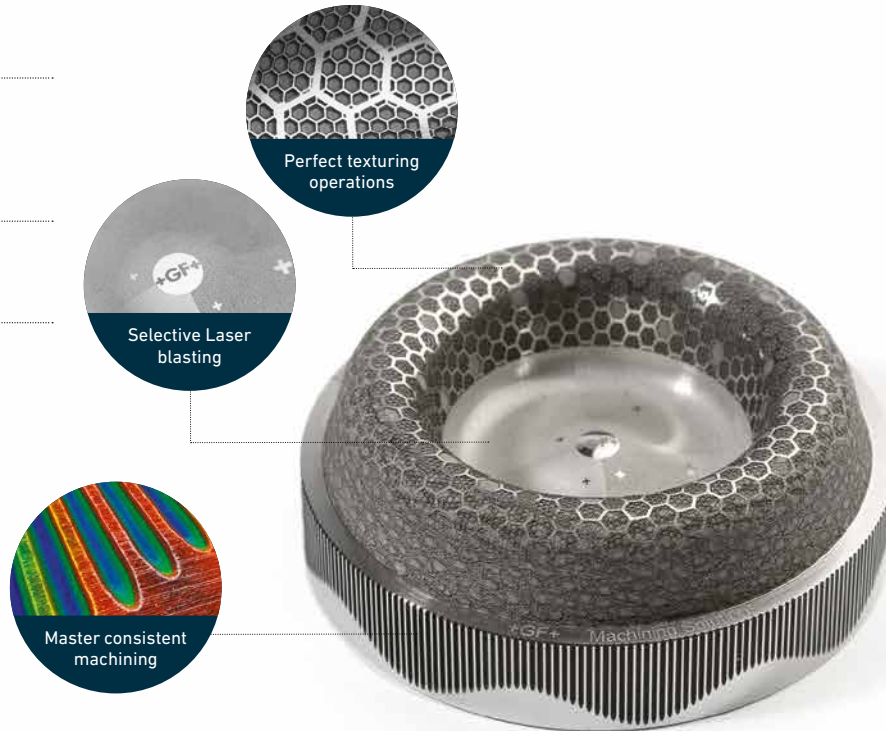
# One single solution advances your flexibility

## YOUR BENEFITS

Be flexible:  
execute multiple  
machining operations  
with the same solution

Master quality with  
100 percent digital  
technology

Achieve total freedom  
of design



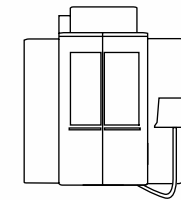
Volcano

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1000 U

Laser texturing, blasting, engraving  
and machining on the same part

All-in-one Laser software package



## PERFORMANCE RESULTS

Market segment	Demo part
Material	Stainless steel
Laser (Type/Power)	Nano IR 50 W
Characteristics	Max. depth 2 mm Ra 1.2 to 4.7 $\mu\text{m}$

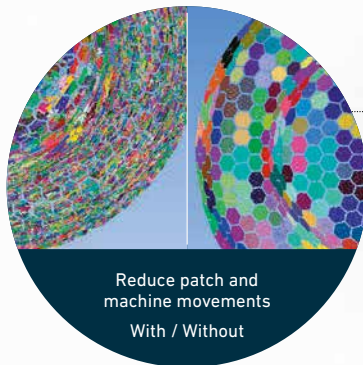
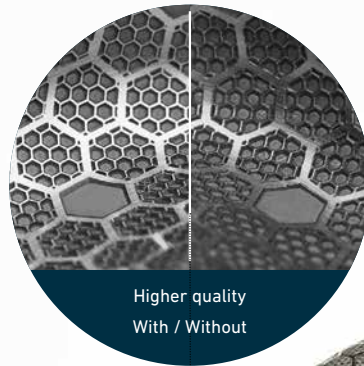
# Boost quality and productivity

## YOUR BENEFITS

Get unequaled texture quality

Avoid patch lines with smart tool path generation

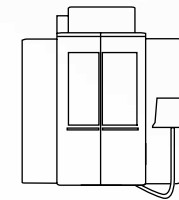
Boost productivity by up to 30 percent



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1000 U

Laser workstation with embedded Smartpatch innovation



## PERFORMANCE RESULTS

Market segment	Mold and dies
Material	Stainless steel
Laser (Type/Power)	Nano IR 50 W
Characteristics	
Without Smartpatch	10h38
With Smartpatch	7h25



# Eliminate manual operations with digital solutions

## YOUR BENEFITS

Get full control of your surface characterization

Master surface finish to control your production quality

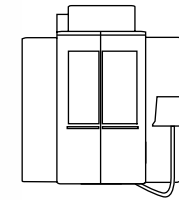
Up to Ra 0.4  $\mu\text{m}$

100% Digital technology

## APPLIED TECHNOLOGIES

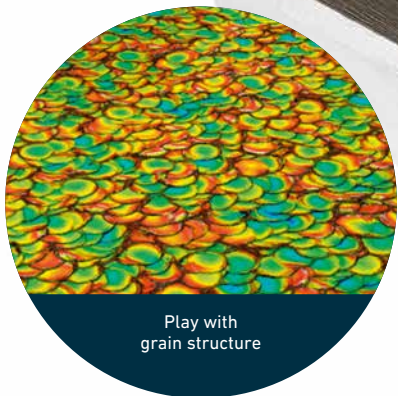
AgieCharmilles LASER P 1000 U

Patented Laser blasting operations



## PERFORMANCE RESULTS

Market segment	Demo part
Material	Stainless steel
Laser (Type/Power)	Nano IR 50 W
Characteristics	Average machining time 4 min per zones



Laser blasting ruler

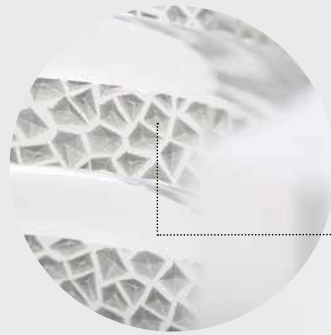
# Simplify your manufacturing steps and expand design possibilities

## YOUR BENEFITS

Be ready to realize the complete process in house—no subcontractor needed

Boost your productivity and quality with Smartpatch

Gain from unlimited texture possibilities to capture new business opportunities



Machining time  
**-25%**

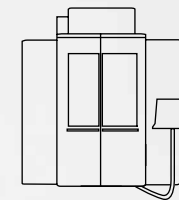


Blow mold

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1000 U

Smartpatch helps boost machining time



## PERFORMANCE RESULTS

Market segment    Packaging

Material            Aluminium

Laser (Type/Power)    Nano laser 100 W

### Characteristics

Texture depth max	0.25 mm
Machining time (side)	58 min
Machining time (bottom)	10 min

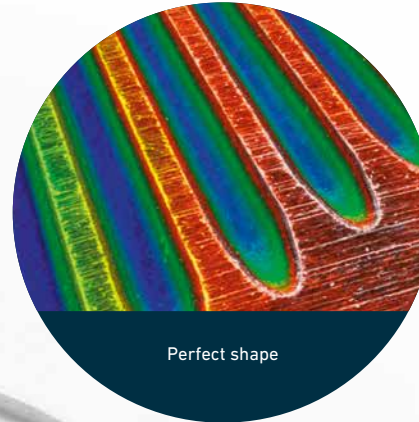
# Boost your productivity with one single setup

## YOUR BENEFITS

Simplify your process and avoid the need for additional machining steps

Master quality and achieve a consistent shape whatever the production volume

Propose innovative shapes and logos

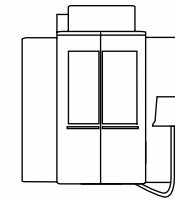


Cap mold by Laser



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1000 U



## PERFORMANCE RESULTS

Market segment	Packaging
Material	Stainless steel
Laser (Type/Power)	Nano IR 50 W
Characteristics	Machining time 1h58 (grooves and logo)

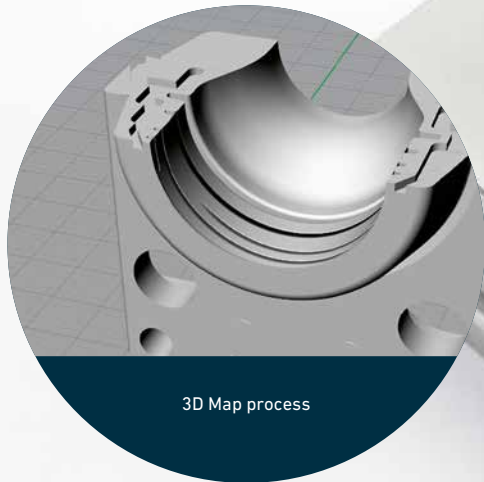
# Master quality with stable production output

## YOUR BENEFITS

Maintain consistent quality over the time with Laser technology

Easily reproduce your CAD files

Master profile accuracy with perfect bitmap generation

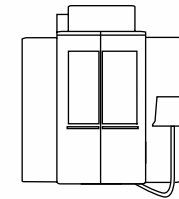


Neck ring



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1000 U



## PERFORMANCE RESULTS

Market segment	Packaging
Material	CX Stainless steel (from AM)
Laser (Type/Power)	Nano IR 50 W
Characteristics	Machining time 3h11

# Keep pace with new design trends—with quality

## YOUR BENEFITS

Propose additional rear light surface possibilities

Be confident on new design production, produce with higher process stability

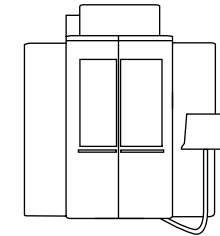
Be able to reproduce sharper details



Total freedom of surface design

## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1200 U



## PERFORMANCE RESULTS

Market segment	Automotive
Material	Stainless steel
Laser (Type/Power)	Nano IR 50 W
Characteristics	Maximum depth 0.5 mm Surface finish Ra 2.6 $\mu\text{m}$

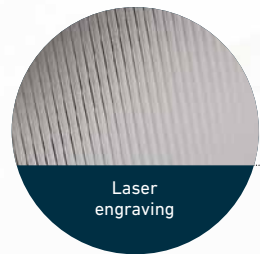


# Master your manufacturing process

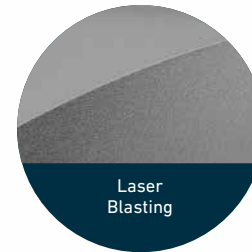
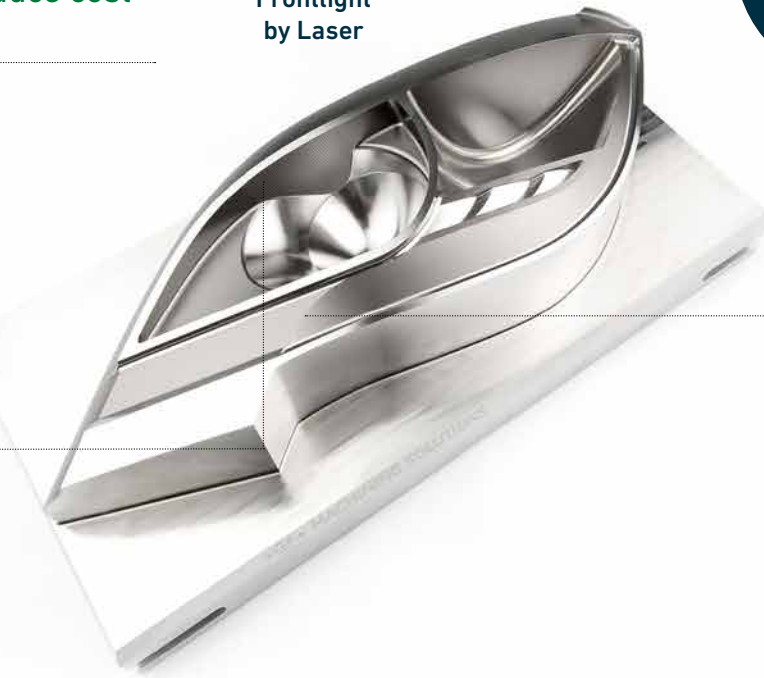
## YOUR BENEFITS

Optimize manufacturing process—no subcontracted operations needed

Substitution for manual technologies to reduce cost of non-quality



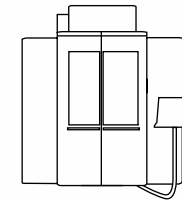
Frontlight by Laser



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1200 U

Laser blasting combined with Laser engraving



## PERFORMANCE RESULTS

Market segment Automotive

Material Stainless steel

Laser (Type/Power) Nano IR 50 W

### Characteristics

Machining time 12h34

Light guides 2h34



# Raise your brand's visibility

## YOUR BENEFITS

Design without limitations to boost your differentiation

Optimize your process and finish your sidewall on a single operation

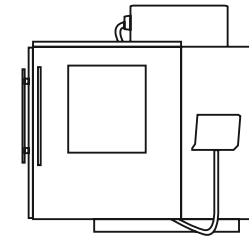
Easily reproduces your traditional design without cutting tools

Tire side wall



## APPLIED TECHNOLOGIES

AgieCharmilles LASER P 1200 U Dedicated

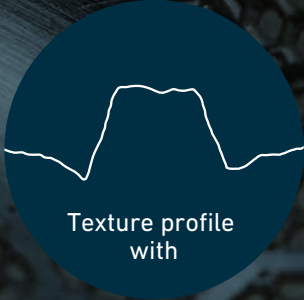


## PERFORMANCE RESULTS

Market segment	Automotive
Material	Stainless steel
Laser (Type/Power)	Nano IR 100 W

Characteristics	
Carbon	14h58
Logo	1h
Arrows	4h05
Safety letters	16 min





# Software revolutionizes Laser texturing to guarantee quality and productivity

**Significantly greater productivity—ranging from 20 to 40 percent depending on the application—and quality are among the cost-saving benefits reported by early adopters of GF Machining Solutions’ latest-generation GF Laser Workstation Software. Moreover, testing in the GF Division’s own application centers confirms that the optional software suite with Smartpatch technology can accelerate texturing speed by 30 percent compared to the speed of the same process without Smartpatch depending on the application.**

These gains in production efficiency and quality are made possible by the process intelligence engineered into GF Laser Workstation Software 1.8.0’s Smartpatch technology. With advanced generation of sections—or patches—of texture, it unites smart machining strategies, increased quality, and optimized productivity to move customers into the future. And advance Laser texturing as a manufacturing process.

In the highly competitive mold and die world, manufacturers can’t compromise on time or quality: They are under pressure to produce the highest quality textured surfaces on the first attempt in order to reduce turnaround time, manage costs, and maintain quality.

Laser texturing uses a Laser beam to create textures by removing workpiece material layer by layer in a non-polluting, no-contact way. Because it is a fully digital technology, Laser texturing can sustainably apply decorative textures, including complex geometries, over infinite iterations with highest repeatability: Virtually any design in a digital format can easily be applied to a 3D workpiece surface. And since the cutting tool is a Laser beam, tool wear and breakage are never an issue.

## **The challenge**

To date, even the most advanced Laser texturing solutions have forced manufacturers to make quality and/or productivity sacrifices, because most existing Laser texturing machines randomly apply textures to the workpiece surface, working from one area to the next to remove material in patches. Without a smart patching solution, productivity and quality are compromised due to inefficient texturing strategies and texturing errors induced by Laser head movement. Movement can induce position deviations from the desired texture design due to ambient thermal changes, resulting in undesirable lines along the perimeters of

patches and distorted textural details. These deviations lead to quality errors that are especially noticeable on very fine textures such as injection molded auto interiors, watches, and information and communications technology (ICT) products.

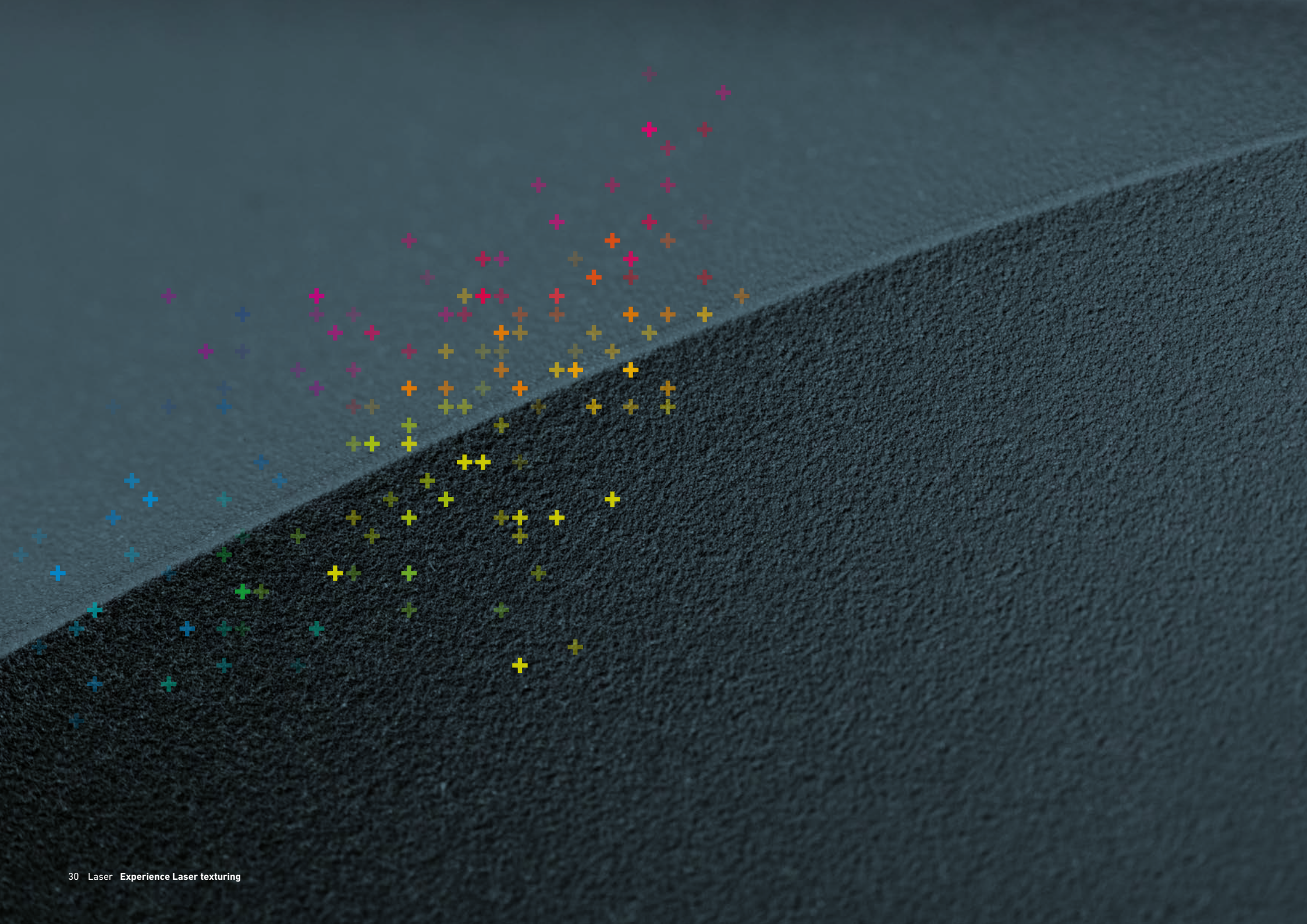
## **The solution**

To establish the revolutionary quality- and productivity-enhancing advantages of Smartpatch, GF Machining Solutions’ developed a highly demanding stainless steel demo part featuring a complex honeycomb texture. Without Smartpatch, this workpiece required 30 times more patches; with the solution, a customer can produce the same workpiece with 30 times fewer machine movements than with a program generated by standard methods.

Smartpatch detects “pockets” where the texture can be unlinked and its details can be realized in a single movement. Upon detecting a pocket, the machine makes a patch around it and executes all of its layers. Random application of textures becomes a thing of the past as Laser head movement is minimized, delivering high-quality results at highest efficiency. Another quality-advancing benefit is the solution’s ability to avoid patching lines and perfectly respect the desired geometry of the workpiece.

These results are confirmed by industrial users. Market leader reported that the smart Laser patching solution benefited 50 percent of his production over a six-month period. A Laser texturing and cast parts repair services provider reported that Smartpatch increased his five-axis texturing productivity by 20 percent and his three-axis engraving productivity by 40 percent.





# Pushing the technological boundaries with Laser blasting

**The appeal of Laser blasting—bombarding a workpiece with up to thousands of Laser points per square millimeter to create a homogenous surface finish—is obvious: The process is fully digital, non-polluting and no machinery makes contact with the workpiece. GF Machining Solutions, already the market reference in surface standardization by electrical discharge machining (EDM), today leads the way to the future with its revolutionary 3D Laser surface texturing, laying the foundation for truly functional 3D Laser texturing.**

In terms of surface characterization on machined workpieces, surface roughness—expressed as roughness average (Ra)—is insufficient for conditions which may present proper roughness but leave much to be desired in terms of optical appearance. Laser blasting, which uses a pulsed fiber Laser to literally bombard a workpiece surface with Laser energy, delivers unsurpassed homogeneity of machined surface and extreme regularity of surface characteristics.

## **The challenges**

Despite the appeal of Laser structuring, the programming can be difficult and time-consuming, depending on application complexity. With the introduction of Laser blasting capabilities included with its all-in-one Laser workstation software and, more specifically, in Laser Design, the GF Division revolutionized the world of surface structuring. Laser Design is a computer aided manufacturing (CAM) software package specially dedicated to GF Machining Solutions' Laser machines to create machining programs for Laser textures, including Laser blasting. The operator tells the AgieCharmilles Laser texturing machine the position of the grain, its density, and the organization of the Laser points to be applied to workpiece surface. This makes it extremely simple to import a computer-aided design (CAD) file, transform it to a 3D map and apply the desired, pre-mapped texture to the workpiece. Laser Design then tells the AgieCharmilles Laser texturing machine the density of the Laser points to be applied to the workpiece surface. Many programming hours are saved.

Process stability and uniform quality across every design reproduction are also significant challenges posed by conventional surface texturing methods like sandblasting. Sandblasting's productivity-impeding drawbacks in mold and die applications include its inexactness,

making repeatability and homogeneity impossible; Its manual nature can result in inconsistent quality and scrapped parts, and finding and using the right grain of sand; masking portions of the workpiece and—often—the need for a third-party sandblaster, adding days to the finishing process. With GF Machining Solutions AgieCharmilles Laser texturing solutions, a mold can be textured in two days—no masking, hand polishing or third parties required.

## **The solution**

Complete control of the texturing process is beyond the capabilities of conventional texturing methods, resulting in the risk of human error, scrapped molds, or poor-quality end products. GF Machining Solutions' Pattern Texturing Laser (PTL) surface characterization overcomes those issues by taking into account a wide variety of spatial and hybrid parameters, including average groove width (Rsm), texture aspect ratio (Str) and interfacial area ratio (Sdr). By controlling these surface characteristics, Laser blasting can ensure perfect homogeneity and regularity, making it a revolutionary solution.

GF Machining Solutions' Laser advances are expected to enable a revolution in functional surface textures by, for example, generating the best surface finish according to both the characteristics of a mold and the injection material. This increased process control will make it possible to boost productivity and end-product quality.

GF Machining Solutions' ongoing applied research is already demonstrating that appropriately selected Laser structures can reduce injection cycle times with several types of plastic without compromising surface quality.

## At a glance

We enable our customers to run their businesses efficiently and effectively by offering innovative Milling, EDM, Laser, Additive Manufacturing, Spindle, Tooling and Automation solutions. A comprehensive package of Customer Services completes our proposition.

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