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*R&T*  
*Project Manager*  
E&E Market



# EMDO MICRO PRESENTERS



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*New Business*  
*Development Manager*  
E&E Market



# DOMO AT A GLANCE



**2,150**



**€1.5 Bill.**



**10**  
**OPERATION SITES**



**6** **INNOVATION &**  
**TECHNICAL centres**

## MARKETS



**AUTOMOTIVE**



**INDUSTRIAL &**  
**CONSUMER**  
**GOODS**



**ELECTRIC &**  
**ELECTRONIC**

## POLYAMIDES

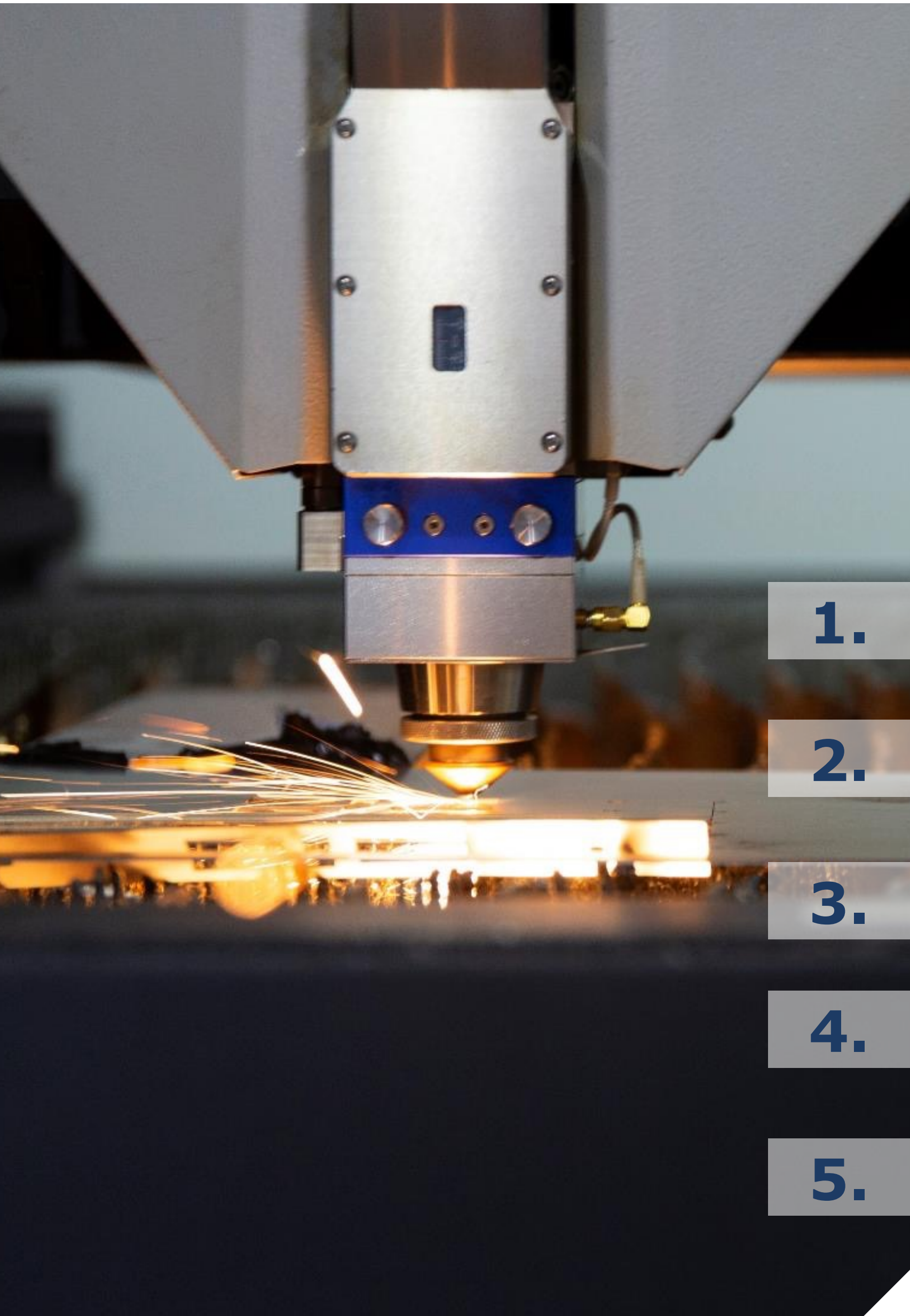
**PA 6   PA 6.6   PA 6.10   PA HT**

## TRADEMARKS

**TECHNYL®   DOMAMID®**  
**TECHNYL 4Earth®   ECONAMID®**

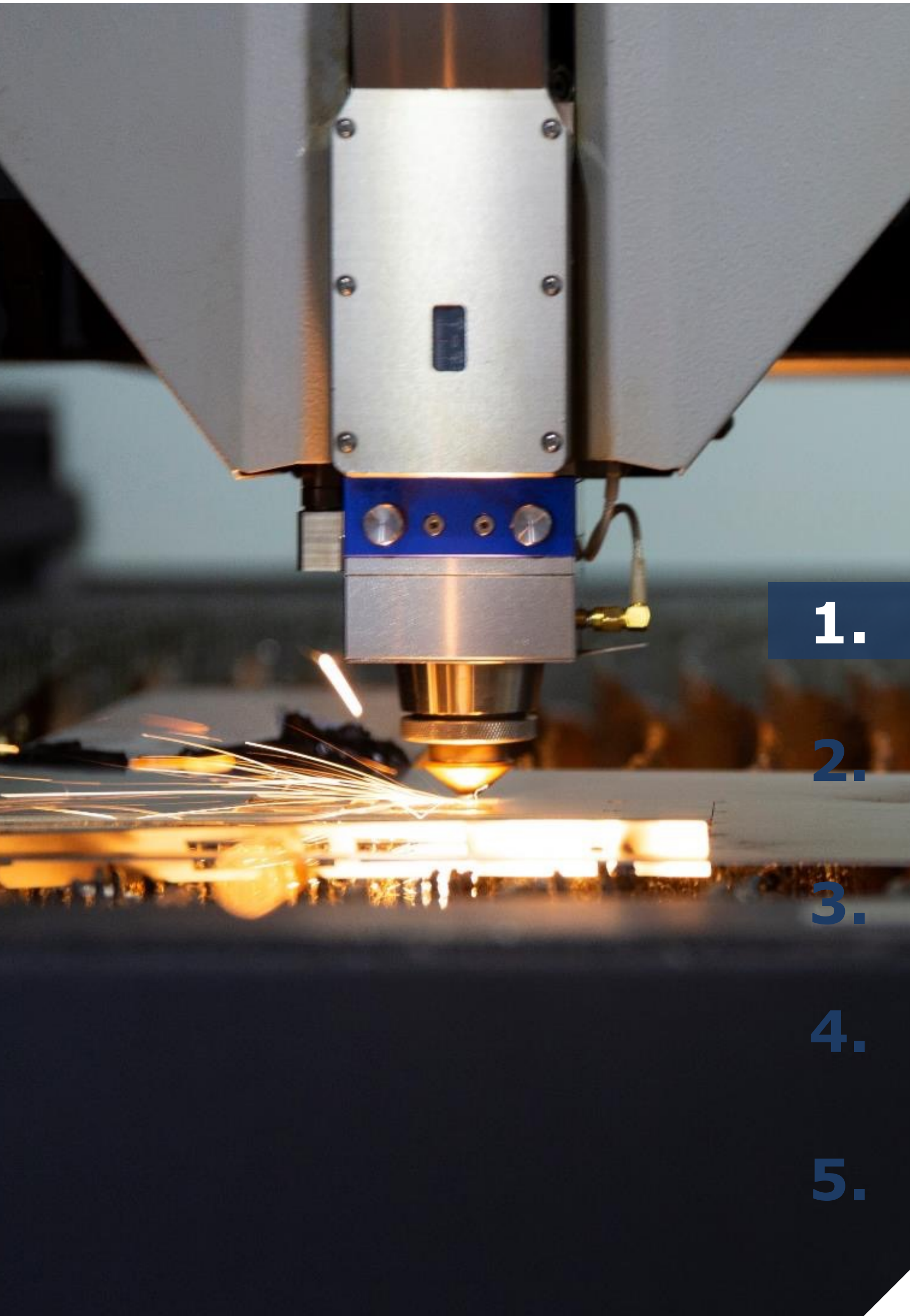


# **LASER MARKING TECHNOLOGIES & COMPETENCIES: A MARKET ENABLER FOR DOMO**



# SUMMARY

- 1. Laser-Marking:** a market & DOMO pillar
- 2. Laser operating principle and technologies**
- 3. DOMO laser park:** type, characteristics & parameters
- 4. How DOMO performs with lasers & products?**
- 5. DOMO laser offer & service**



# SUMMARY

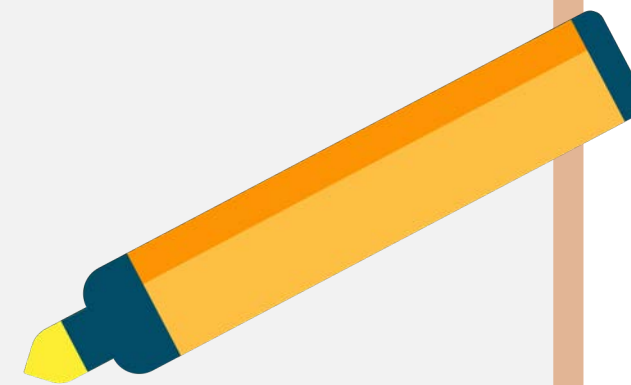
- 1. Laser-Marking: a market & DOMO pillar**
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# LASER-MARKING: A POWERFUL TECHNOLOGY

**Laser-Marking has benefits with respect  
to other industrial marking technics**



- ✓ **PERMANENT & DURABLE**
- ✓ **FAST**
- ✓ **PRECISE**
- ✓ **NO CONSUMABLES**
- ✓ **NO PRE-TREATMENT**



NON DURABLE MARKING

Vs.



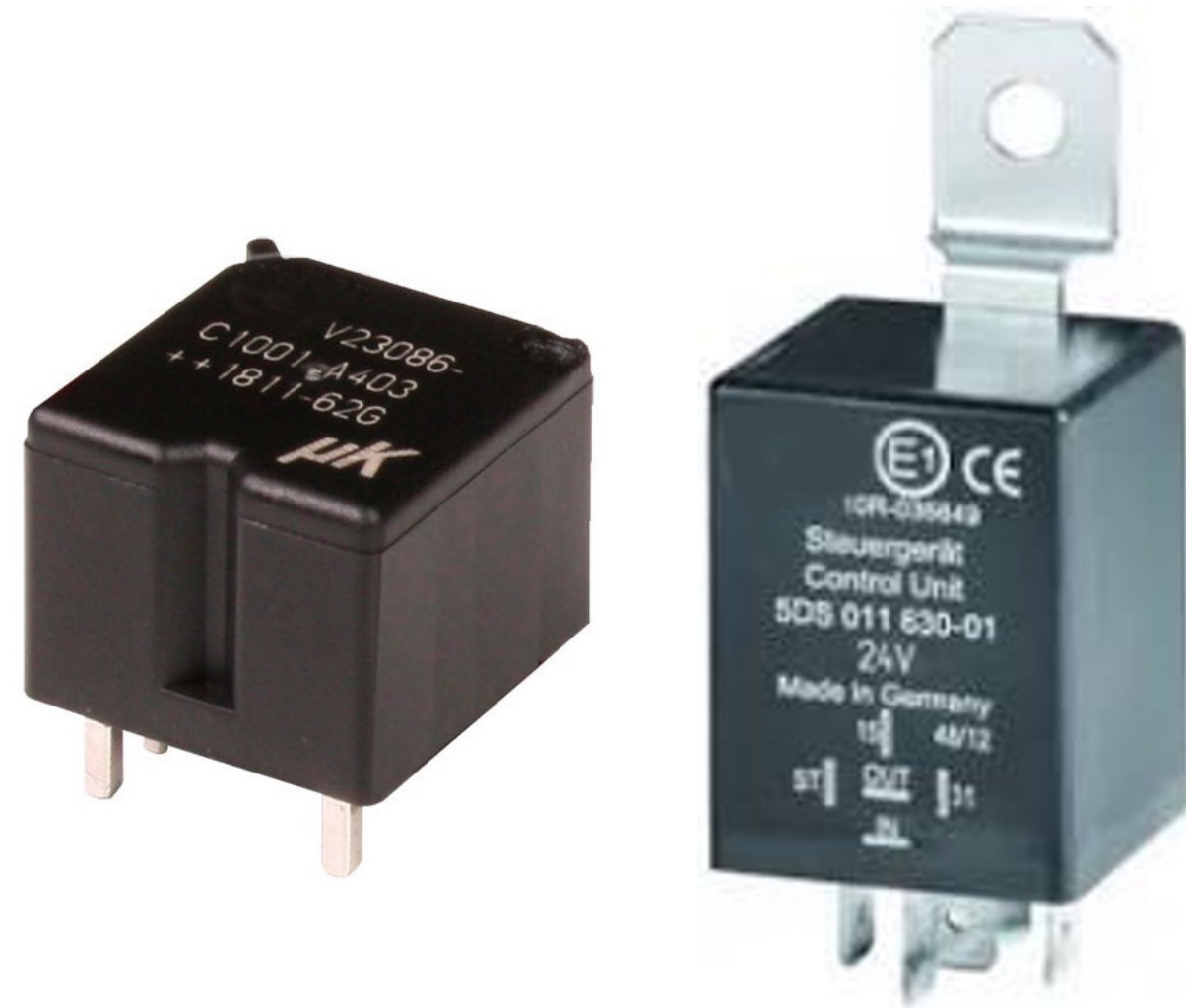
DURABLE MARKING

# LASER-MARKING: A MULTI-MARKETS REQUIREMENT

**Laser-Marking is requested by all markets** (existing & new) we are serving.



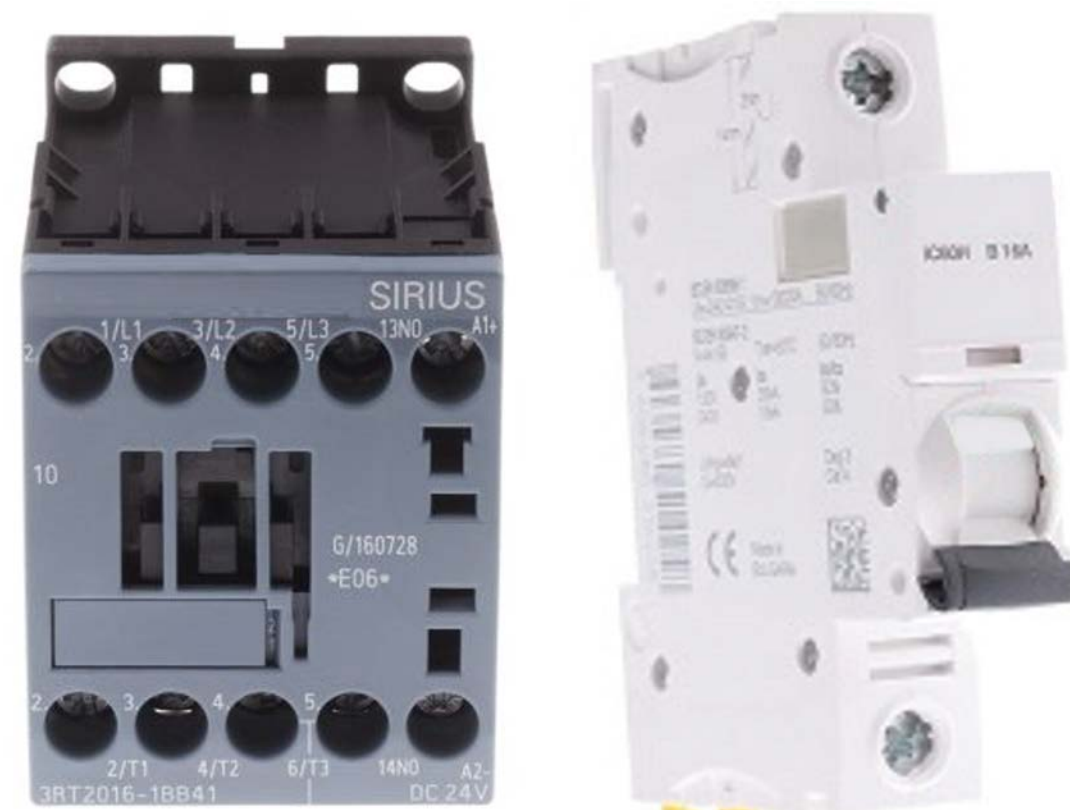
## AUTOMOTIVE



**Applications:**  
Sensors, Relays...



## E&E



**Applications:**  
Mini-circuit breakers, contactors,  
MCCB,...



## E-MOBILITY



**Applications:**  
High voltage connectors,  
Charging plugs...

# LASER-MARKING: A MULTI-PURPOSE FUNCTIONNALITY

**Laser-markability is materials functionality enabling to provide consistent writings for multi-purpose targets.**

## TRACABILITY



1-dimensional barcode



QR Code

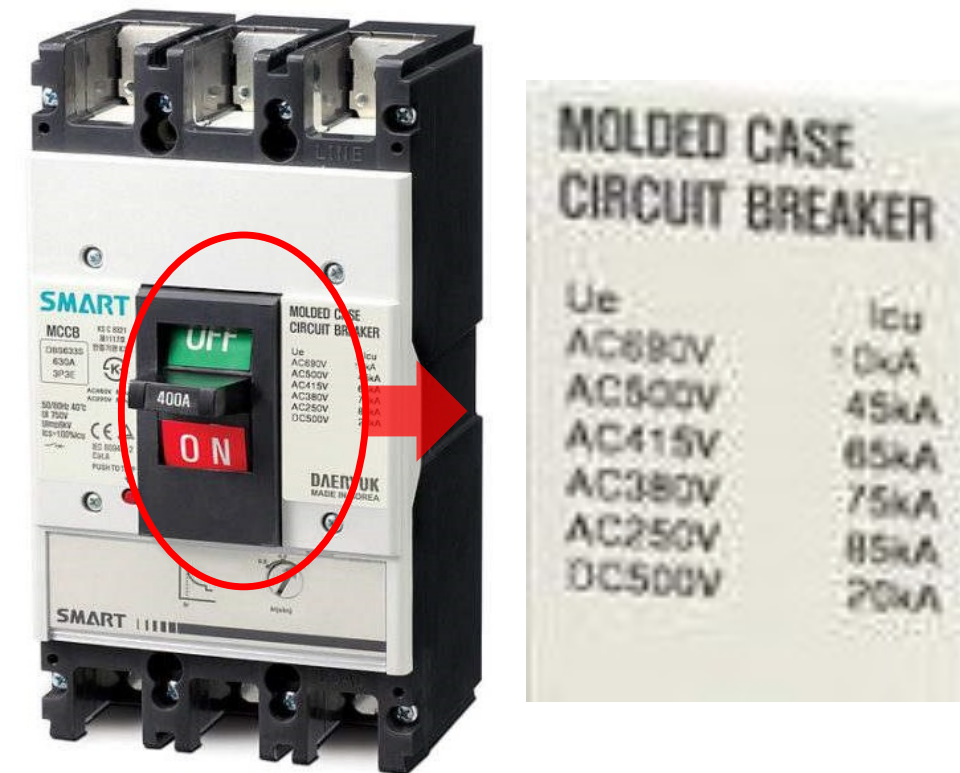


Data Matrix Code

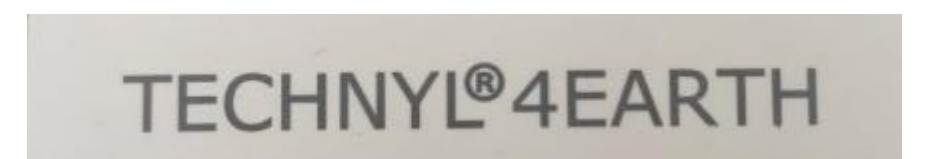
## CERTIFICATION



## INFORMATION



## TRADE NAMES



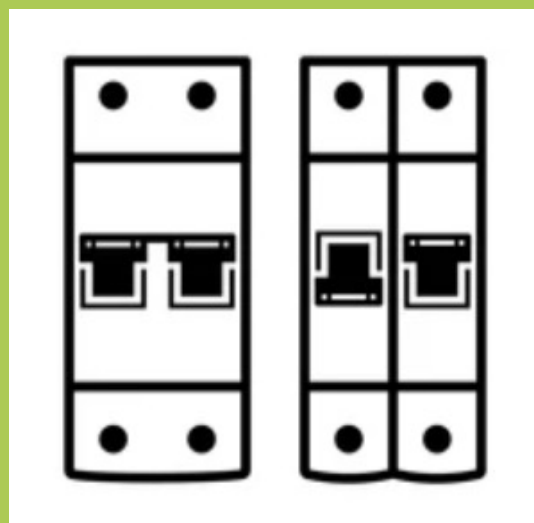


# LASER-MARKING: AN “HIDDEN” REQUIREMENT

**Laser-Marking requirements are often the last mentioned in an high extensive list**



- **New MCB development**
- **New product requirements**

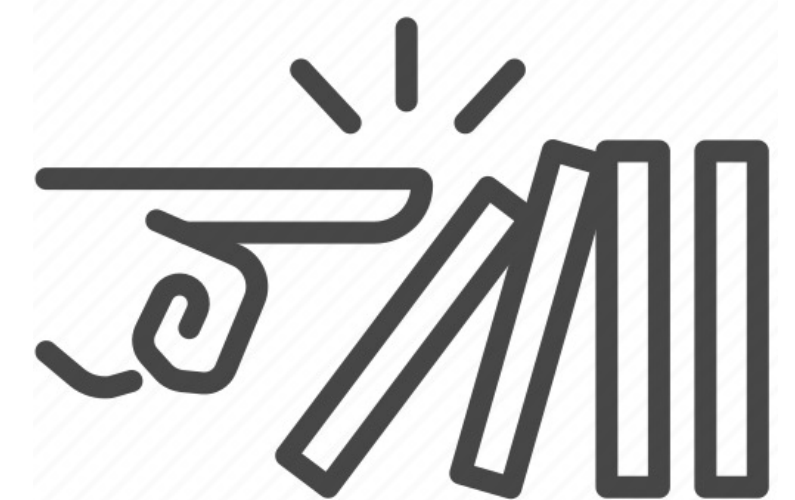


- 1. RECIPE** requirements (Polymer, Flame retardant, fille...)
  - 2. REGULATIVE** certification (RoHS, REACH...)
  - 3. APPLICATIVE** certification (UL Yellow Card, EN 544545...)
  - 4. PHYSICAL** properties (Density, Granulometry...)
  - 5. FIRE** performances (UL 94 V0, GWFI 960°C...)
  - 6. ELECTRICAL** performances (CTI PLC 0)
  - 7. THERMAL** performances (VICAT, HDT, Ball Pressure...)
  - 8. MECHANICAL** performances (E-Modulus, Strain at break...)
  - 9. DIMENSIONAL** performances (Water uptake, Tg...)
  - 10. COLOR** target (RAL target, tolerances...)
- &
- 11. LASER-PRINTABILITY** (UV, IR, CO<sub>2</sub>...)

**FORGOTTEN**

**INACURRATE**

**UNDERATTED**

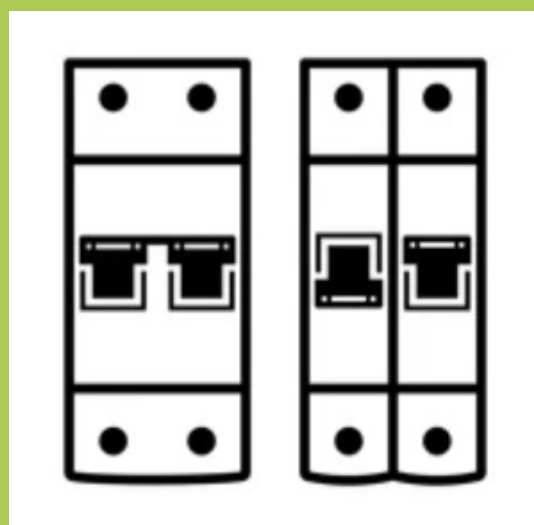


# LASER-MARKING: AN IMPACTFUL REQUIREMENT

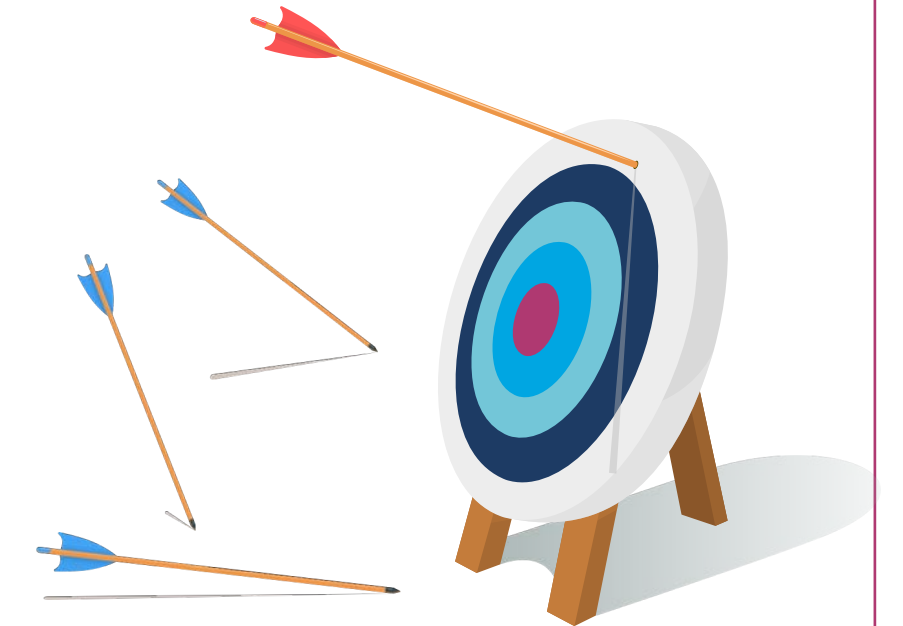
**Non accurate Laser-Marking selection being detrimental to the overall development**



- **New MCB development**
- **New product requirements**



- 1. RECIPE** requirements (Polymer, Flame retardant, fille...)
  - 2. REGULATIVE** certification (RoHS, REACH...)
  - 3. APPLICATIVE** certification (UL Yellow Card, EN 544545...)
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- &
- 11. LASER-PRINTABILITY** (UV, IR, CO<sub>2</sub>...)



**Test numbers  
INCREASE**

**Time  
INCREASE**

**Performances  
LOSS**

# LASER MARKING: A STRONG DOMO FOCUS & STRENGTH

**+ 10  
years**

of **investment**  
on **laser technologies**  
& **competencies**

## EQUIPMENTS



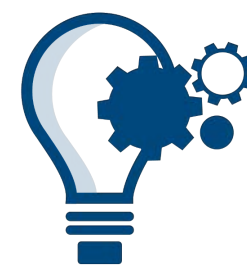
- laser technologies **investment**
- laser technologies **comparison**

## MATERIALS

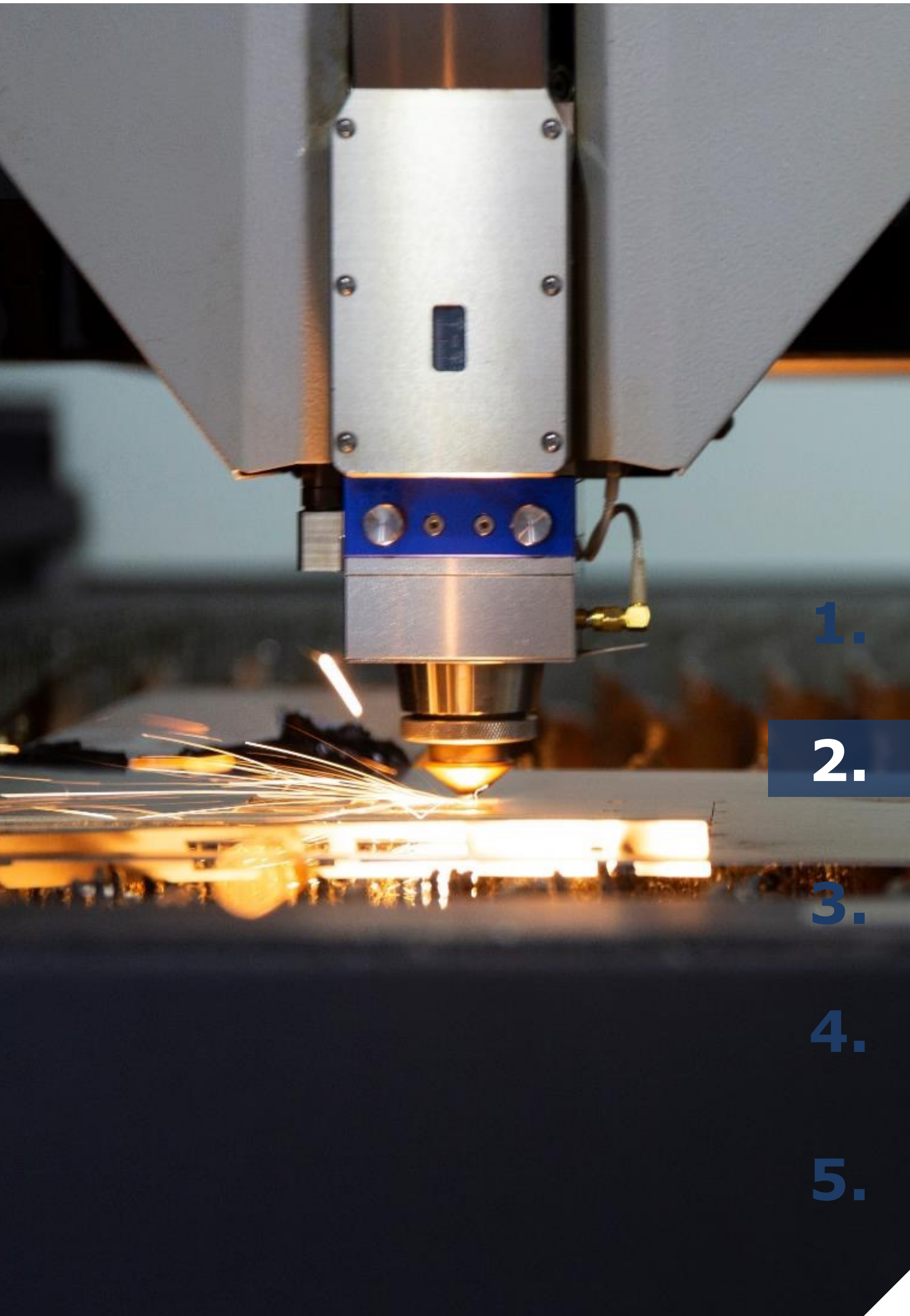


- **laser** performances
- **global** performances

## INNOVATION



- **upfront technologies** offer
- **new laser additives** inquiry & testing



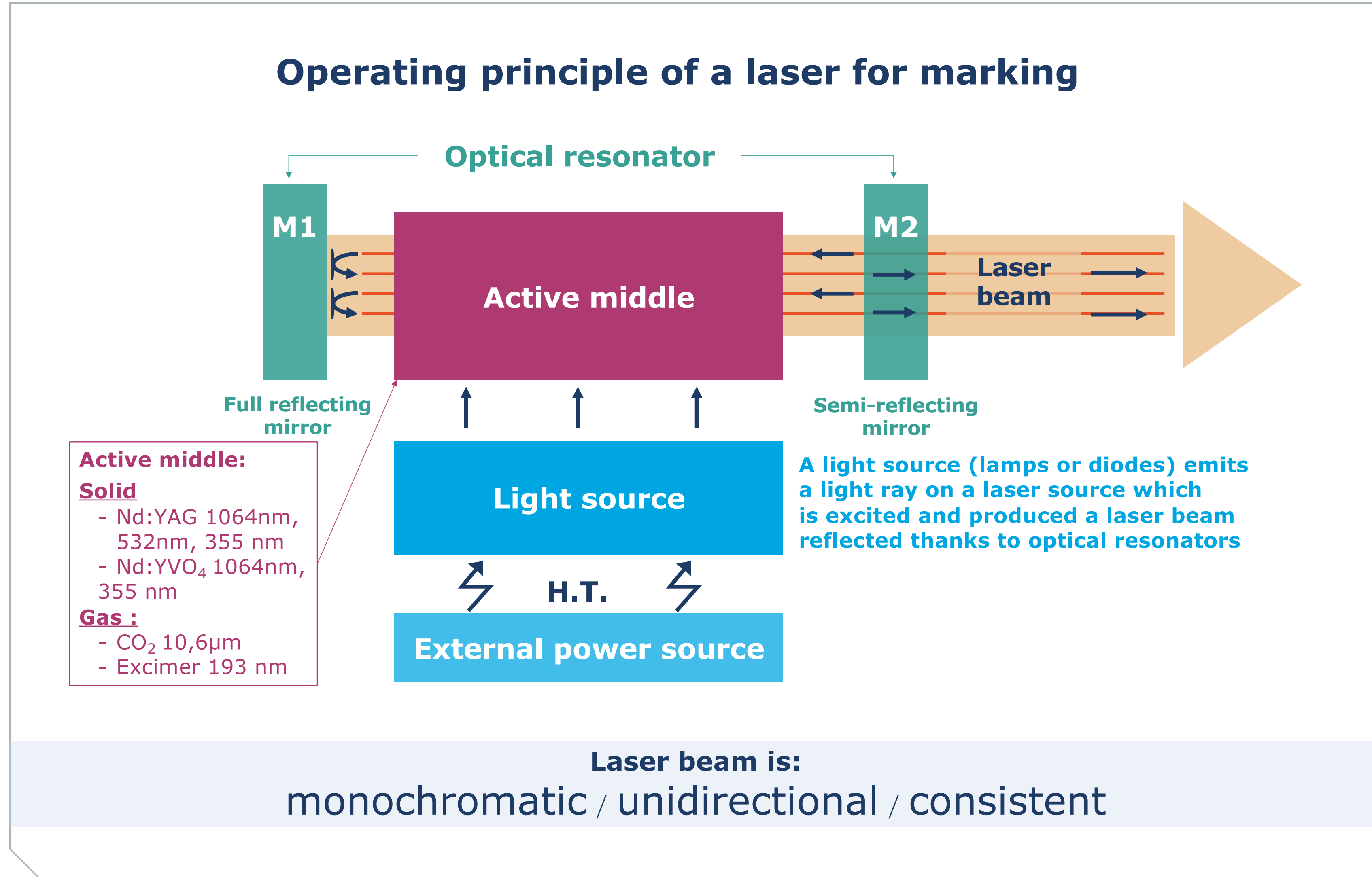
# SUMMARY

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# LASER MARKING

by **S**timulated  
of **E**mission  
**R**adiation

## Operating principle of a laser for marking

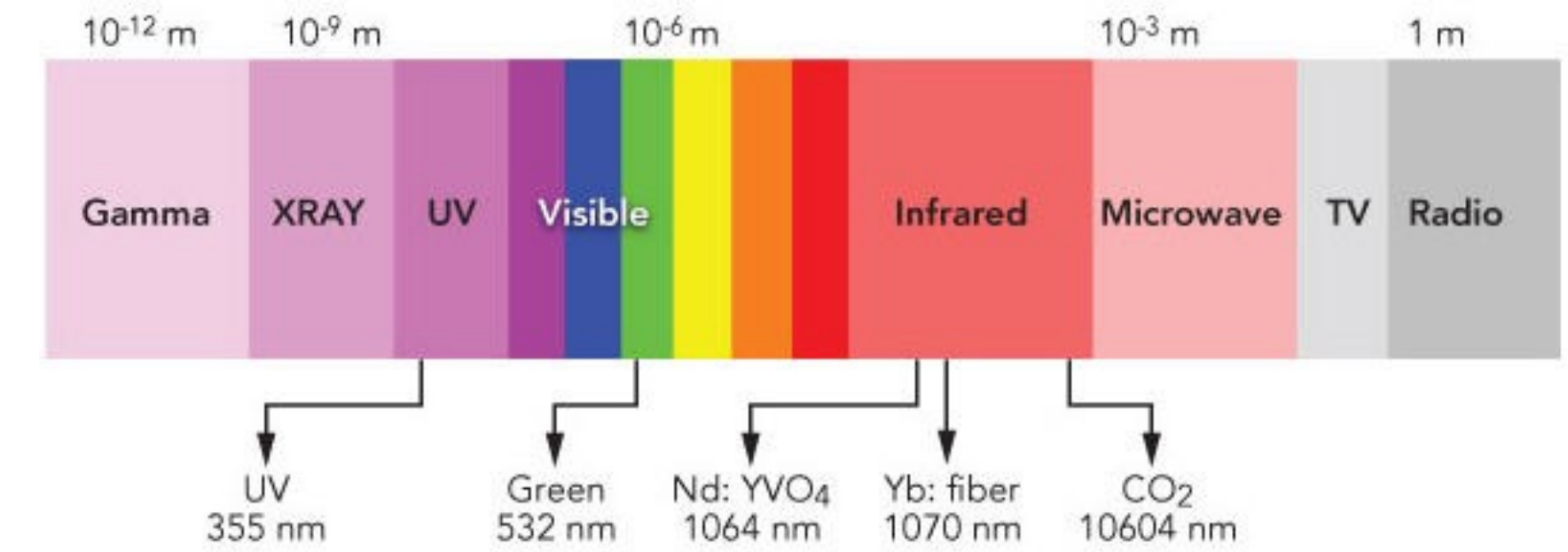


For information

The use of diode lasers instead of flash lamps as optical pump sources for solid state lasers (YAG) offers significant advantages such as higher efficiency and longer life time. The lamps need replacement after approximately 200 hours when operated continuously. Diode laser pump sources allow longer life (20,000 hr), but diodes technology is more expensive.

## LASER TECHNOLOGIES

# USED IN PLASTIC INDUSTRY



### 3 main laser technologies used by our customers:

#### YAG Laser (1064nm)

Laser technology mainly used by **Automotive customers**

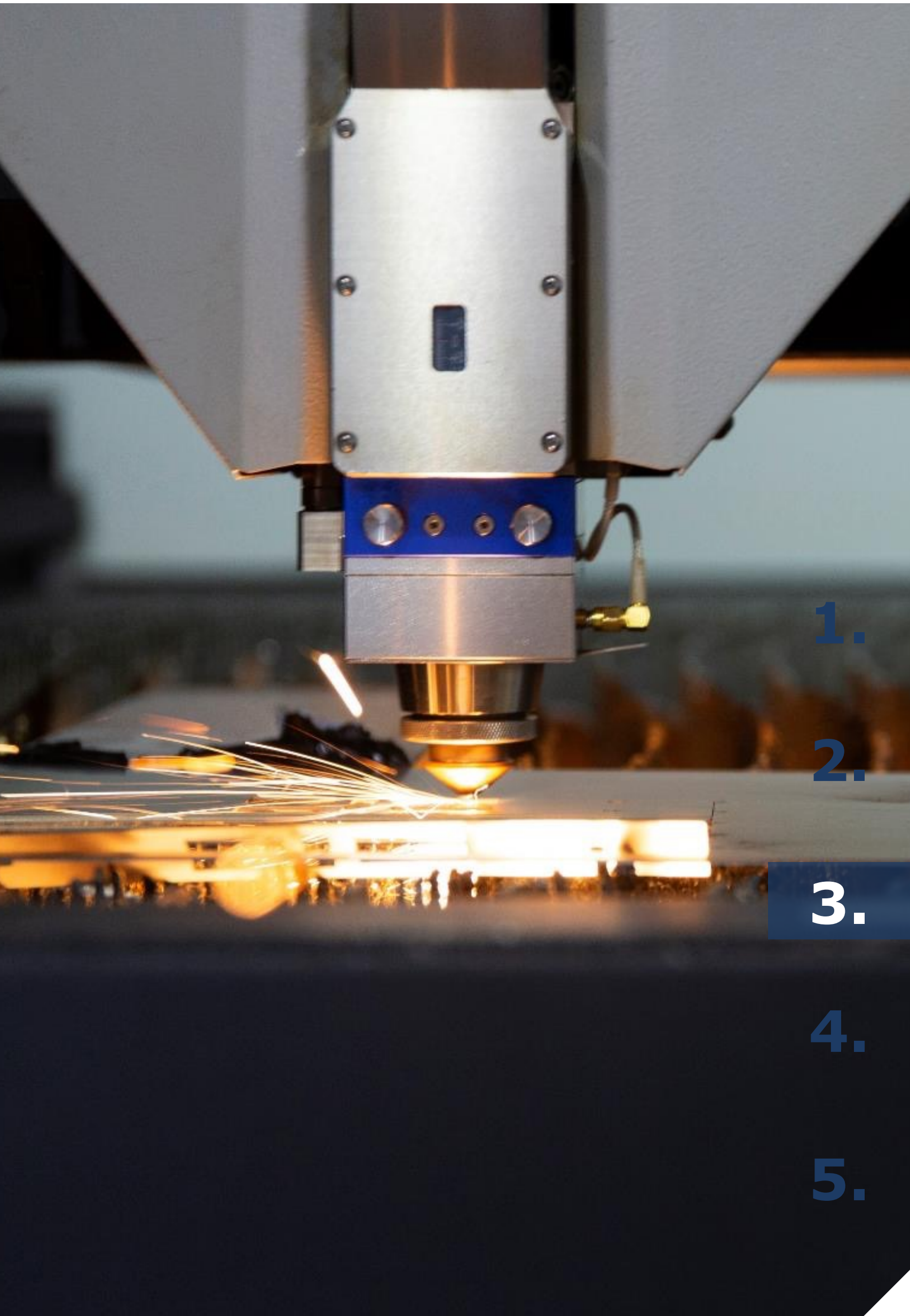
Some **E&E customers**

#### UV Laser (355nm)

Laser technology mainly used by **E&E customers**

#### Green & Pico Green Laser (532nm)

Laser technology under investigation at **E&E customers**



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# OUR LASERS



## TRUMPF LASER TM 3020

- Wave length: **1064 nm (IR)**
- Active middle: **Nd: YAG**
- Power max: **5,5 w**
- Frequency range: **1-100 kHz**
- Speed range: **1-5000mm/s**



## TRUMPF LASER TM 6330

- Wave length: **355 nm (UV)**
- Active middle: **Nd: YVO4**
- Power max: **2,2 w**
- Frequency range: **1-120 kHz**
- Speed range: **1-10000mm/s**



## ROFIN/ COHERENT LASER Powerline 532-10

- Wave length: **532 nm (Green)**
- Active middle: **Nd: YAG (Pico)**
- Intensity Max: **8,5A**
- Frequency range: **200-800kHz**
- Speed range: **1-10000mm/s**

**NEW**



# MAIN LASER FACTORS

Laser contrast is...

...dependent on **product**  
but not only

...dependent on **technology used**  
but not only

...**not universal** whatever  
conditions applied

Contrast achieved or targeted is a function of  
**3 main factors combined together**

Laser marking contrast

=

f ( technology used \* product \* laser marking conditions )

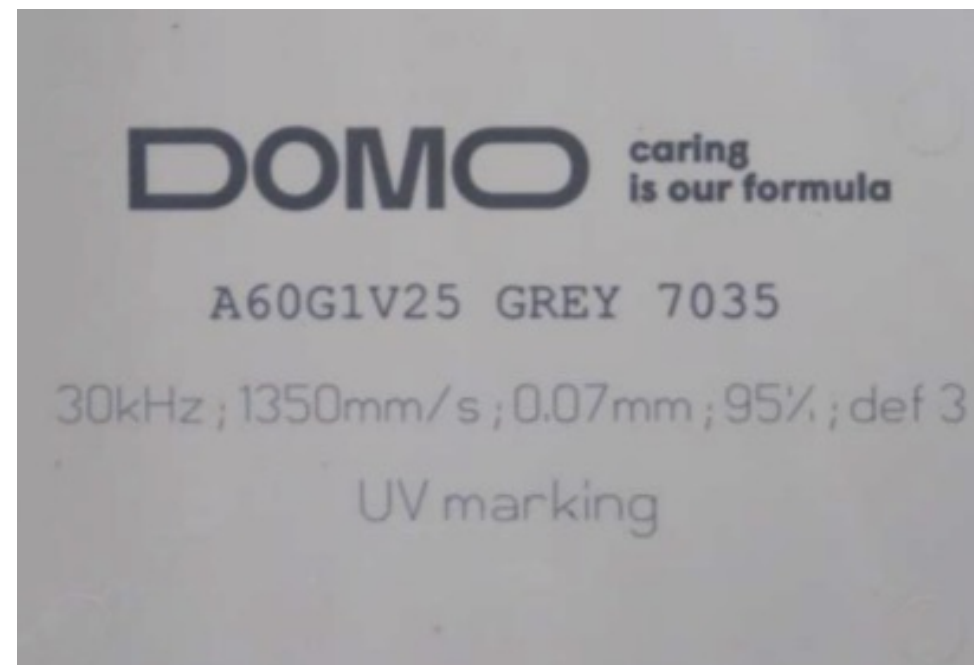
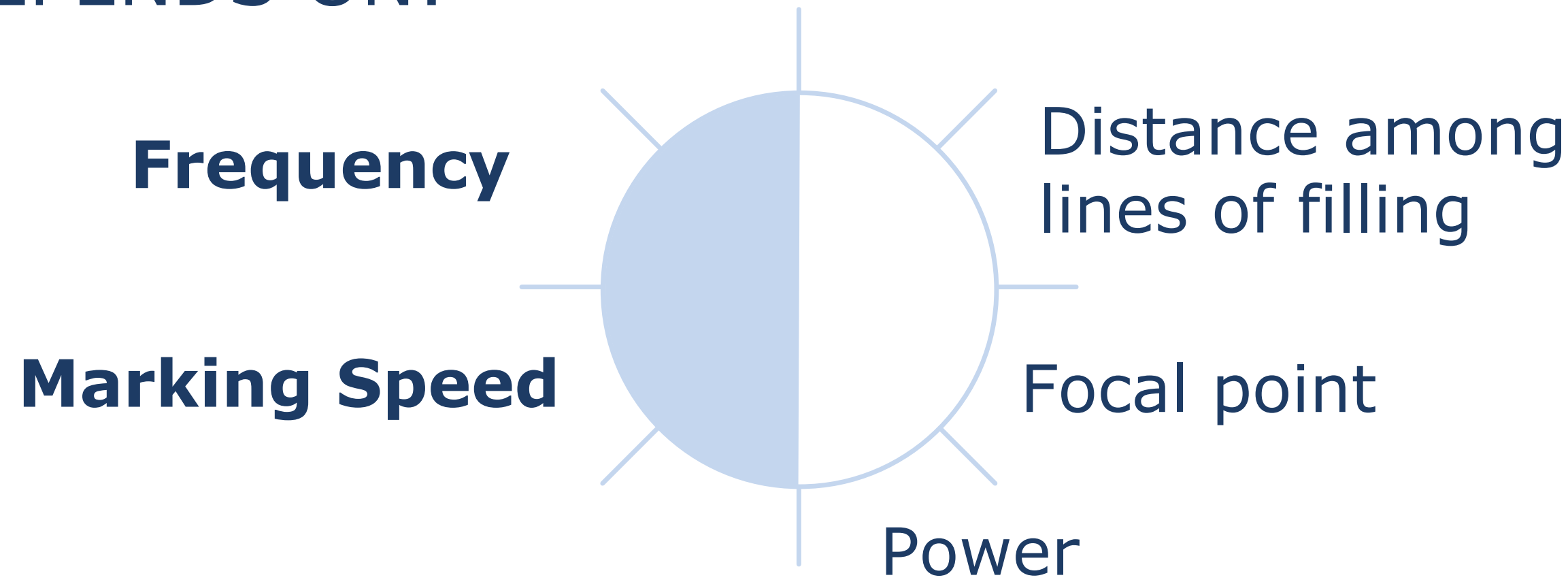
**Key to define  
at customer  
level technology  
used**  
(UV, YAG 1064,  
YAG 532 )

**Key to select /  
develop a grade  
suitable for  
technology used**

**Key to obtain laser  
conditions to optimize**  
if needed product  
selected for a targeted  
contrast

# MAIN LASER FACTORS

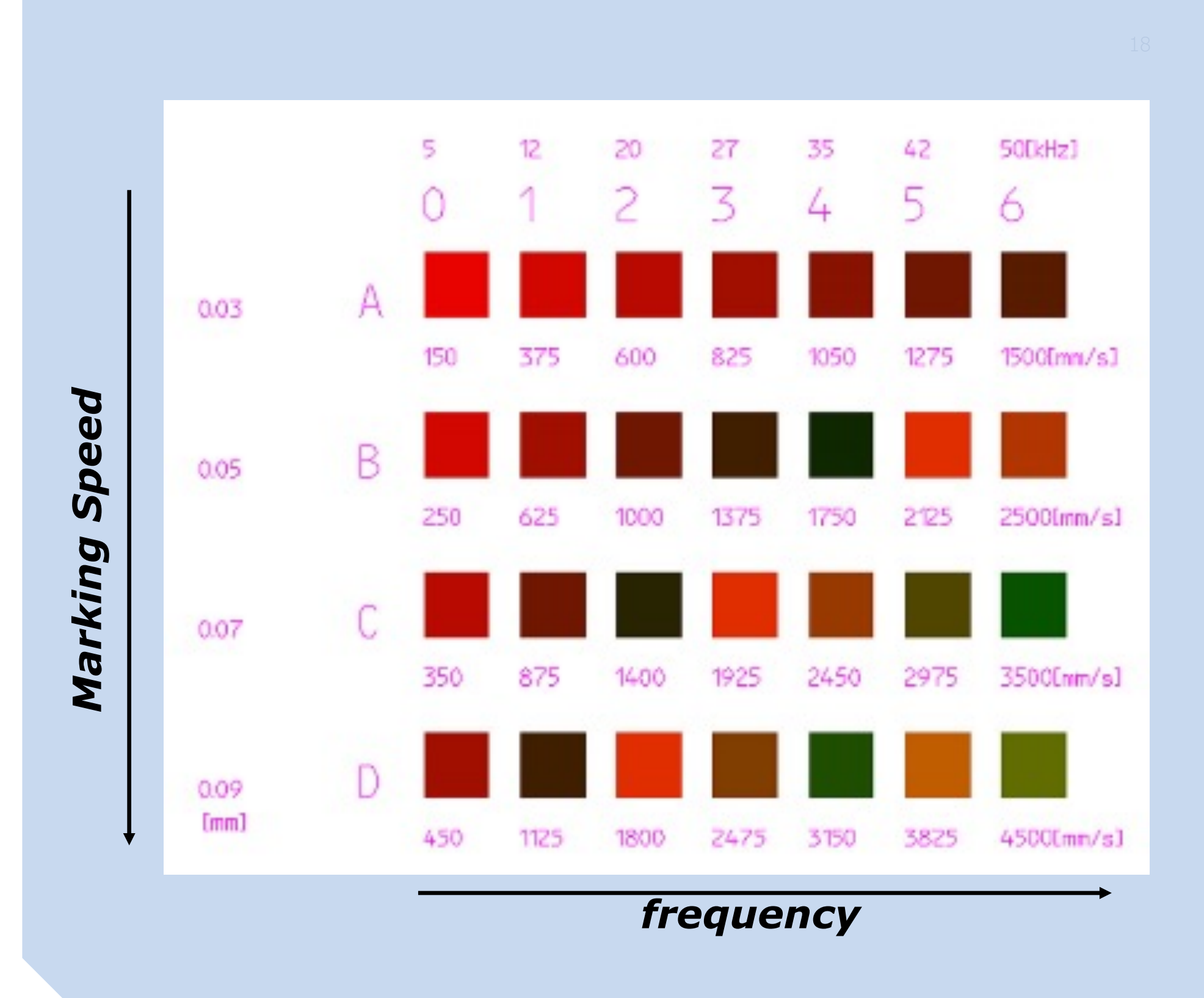
## LASER MARKING CONTRAST DEPENDS ON:



30KHz ; 1350mm/s ; 0,07mm ; 95% ; defocalisation 3mm



70KHz ; 4000mm/s ; 0,09mm ; 95% ; defocalisation 0



The higher the frequency, the higher the marking speed.

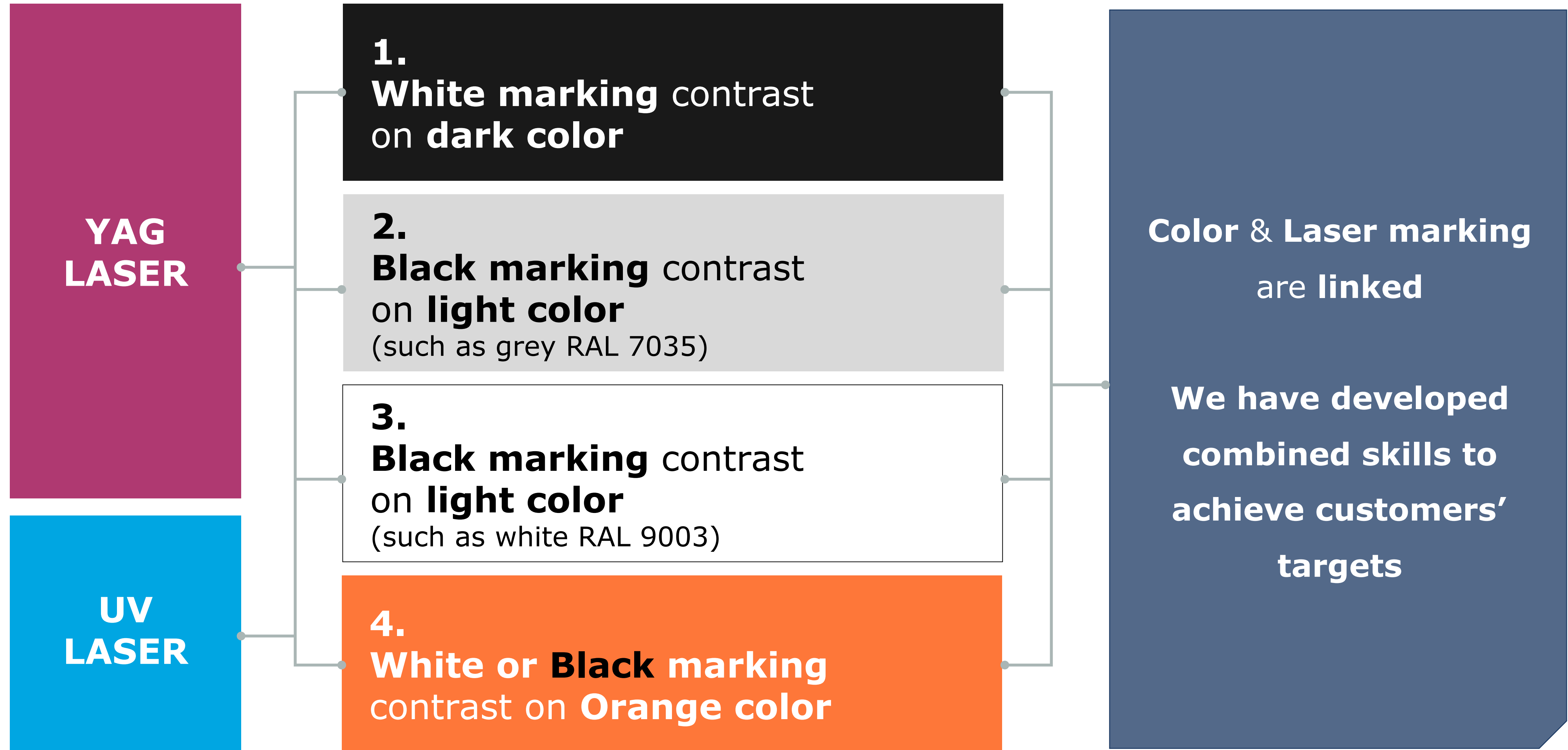
**Playing with the laser parameters is one way to strongly impact the laser marking quality.**



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# WHAT LASERS DO FOR PLASTICS?



# WHAT IN TERMS OF FORMULATIONS?

Generally, in a formulation,  
we can put:

**1 laser marking additive.**

OR

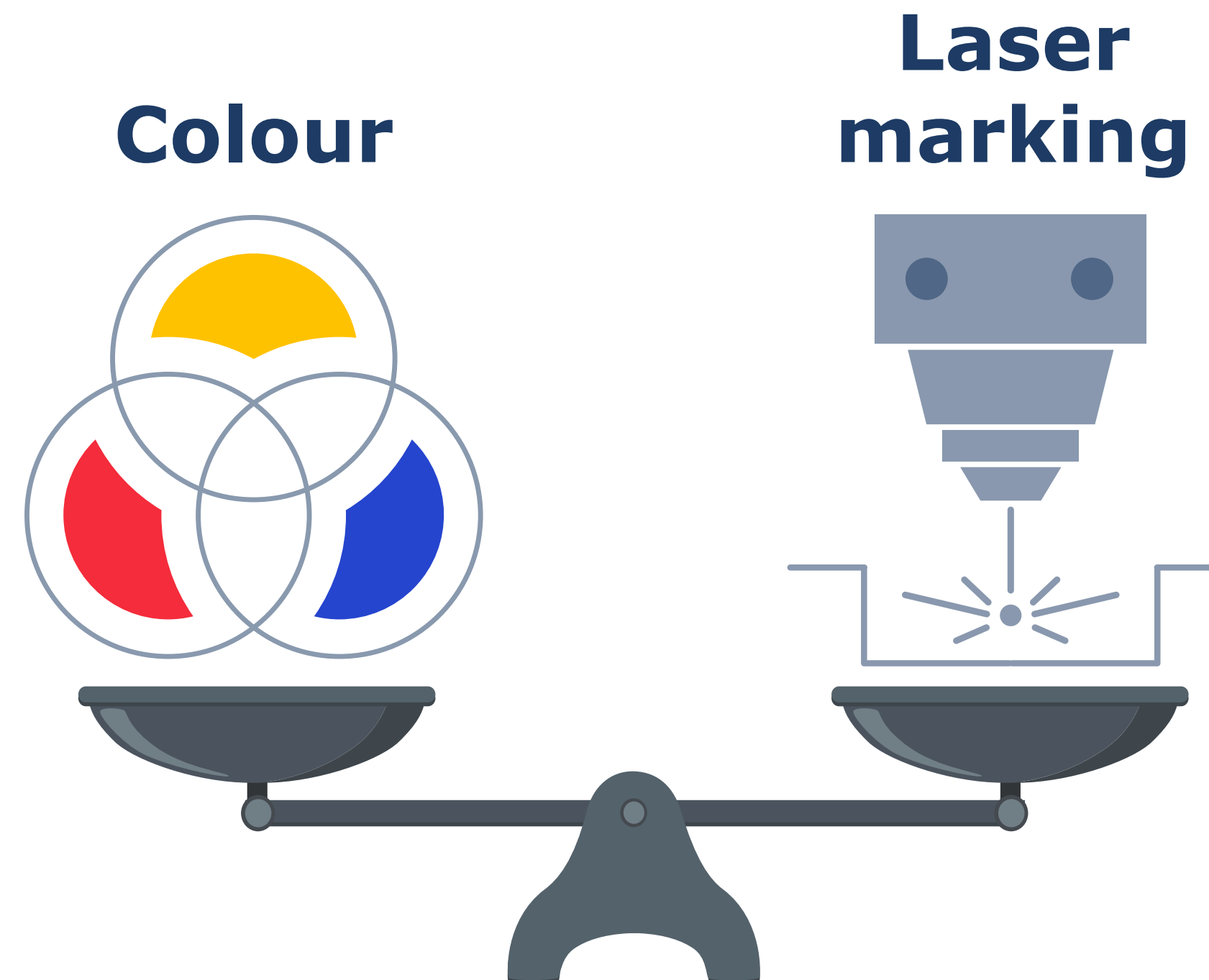
**1 pigment allowing for the LM.**

Its quantity defines the contrast achieved.  
This pigment is either black or white  
and has an impact on the colour.

AND

**Several other pure colour  
pigments**

to reach the colour target and to compensate for  
the coloured LM additive.



Not only LM and colour have  
to be taken into account  
when formulating  
a material. LM additives can:

**Have an impact on  
the mechanical properties.**

**Be under surveillance**  
for regulation and HSE reasons.

Show **different laser marking  
process window.**

Be **more or less expensive**  
price.

**DOMO has one expert who combines  
laser marking and colour matching expertises.**

# OVERVIEW OF EXPERTISE & SOLUTIONS OFFER

## Automotive market



## Electric and electronic market



## E-Mobility market (Auto + FR + Orange colour)



**We are able  
to laser mark:**

- ▶ **All our polyamide range:**  
PA6 – PA66 – PAHT – Recycled PA6 – Recycled PA66
- ▶ **Materials in different colours:**  
Black – Grey – White – Orange
- ▶ **Our products with different technologies:**  
UV – IR – Pico green

# E-MOBILITY TREND: **TECHNYL ORANGE GRADES** FROM DOMO

## What we have already available in our marketing stock:

- **Technyl J 60X1 V30 Orange 2701**
- **AF 60SX V30 Orange 2688** (XA 1573 Orange 2688)
- **A 219 V30 Orange 2702** (XA 1722 Orange 2702)
- **C 50H2 Orange 2704** (XC 1734 Orange 2704)

## For this product range, we are able to:



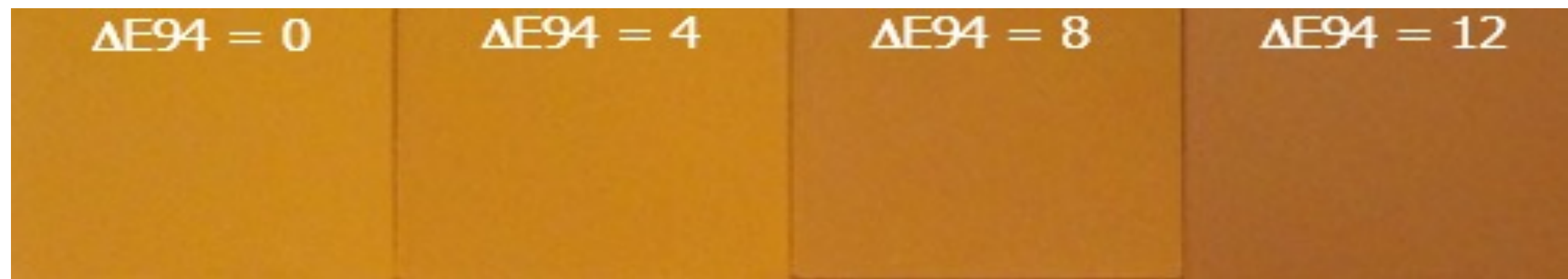
- **IR and UV laser markable.**
- **Develop all shades of Orange.**
- **Develop non FR and FR solutions.**
- **Develop up-to high temperature polyamide materials.**
- **Provide retention of the colour after thermal ageing.**



# E-MOBILITY TREND: TECHNYL ORANGE GRADES FROM DOMO

**Stabilized Orange PA products: solutions that optimize the colour retention**

Scale chosen internally:



Very slightly brownish color

Visible brown undertone but still orange

Brown color but orange still visible

		100°C		120°C		140°C	
		DE94=4	DE94=12	DE94=4	DE94=12	DE94=4	DE94=12
PA66 30% GF	Not stabilized	750h	>1000h	150h	600h	25h	150h
	Current stabilization	>1000h	>1000h	800h	>1000h	150h	>1000h
	Optimized stabilization	>1000h	>1000h	>1000h	>1000h	250h	>1000h



# SUSTAINABILITY TREND: RECYCLED GRADES FOR AUTOMOTIVE AND E&E MARKETS

▼ Unique and broad offer of PA polymers from post-industrial wastes ▼



**Broad offer of compound grades under development:**

- HFFR grades: Organo-phosphorous & Red Phosphorous
- Non FR

- UL certifications on-going
- From light to dark colours

# SUSTAINABILITY TREND: RECYCLED GRADES FOR AUTOMOTIVE AND E&E MARKETS



## Example of product: Technyl A1E 218 V30 BK

- Recycled PA66
- 30% glass fibers
- Non FR
- UV and IR laser markable

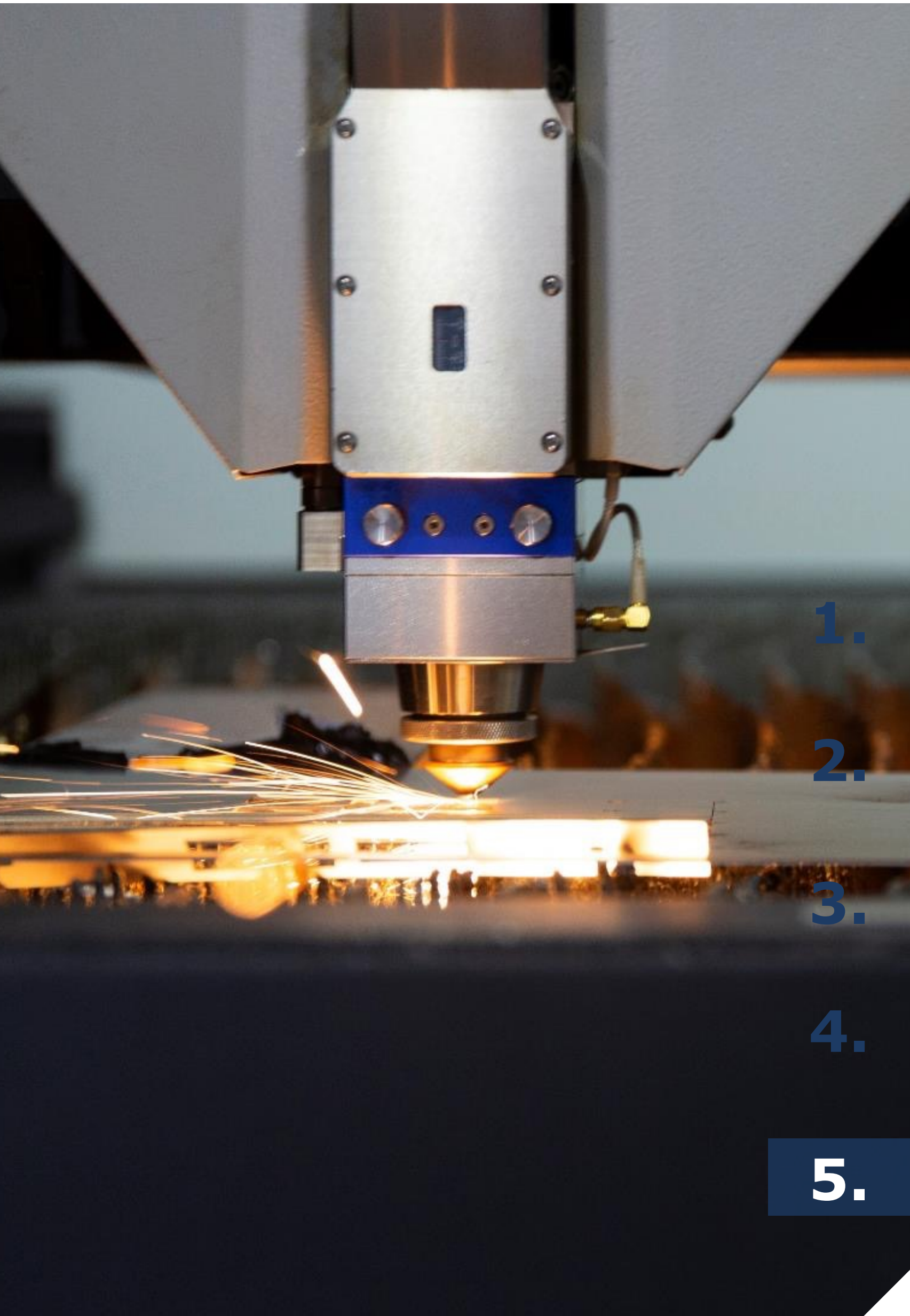


## Example of product: Technyl A1E 60G1 V25 WT 9001 LPU

- Recycled PA66
- 25% glass fibers
- FR
- UV laser markable
- Will be UL certified for all colours

For this product range,  
we are able to:

- IR and UV laser markable
- Develop from black to white colour.
- Develop FR and non FR solutions.
- Develop PA6 and PA66-based materials.
- Provide Life Cycle Analyses and CO2 footprints on our grades.



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# LASER MARKING: A DOMO SERVICE & SUPPORT

## 3 main outcomes for our customers

### TIME



- **right first time**  
(reduced number of development loops)
- **development time**  
(reduced via internal investigation)

### SUPPORT



- **opened laboratory**  
(for problem testing & solving)
- **opened competencies**  
(for technology/conditions selection)

### MATERIALS



- **extended products portfolio**
- **innovation** through new additives scouting

# MATERIALS : PART OF OUR E&E OFFER



**Our existing HFFR laser range: FR(30) + FR(40)**

**UV (355 nm)**

**YAG (1064<sup>+</sup> nm)**

**UL94 V-0  
GWFI 960°C**

- J 60X1 V30 Grey 2653 LPU
- J 60X1 V30 White 9003 LPU
- J 60X1 V30 Orange 2701 LPU
- AF 60 SX V30 Grey 7035 LPU
- A 60G1 V30 Grey 7035 LPU
- A 60G1 V25 Grey 7035 LPU
- S 60X1 V30 White 2656 LPU

- J 60X1 V30 Grey 2682 LP
- J 60X1V30 Black (LP)
- A4E 60G1 V30 Black (LP)
- A 60G1 V30 Black (LP)
- S 60X1 V30 Grey 7016 (LP)
- A 50X1 Grey 2610 LP
- A 50X1 Grey 2670 LP

**UL94 V-2  
GWFI 960°C**

- C 52G1 V20 Grey 7035 LPU
- C 52G1 V20 White 9003 LPU
- C 52G1 MX25 Grey 7035 LPU
- C 52G1 MX25 White 9003 LPU

- C 52G1 V25 Grey 2225 LP

**+ Many others products for**



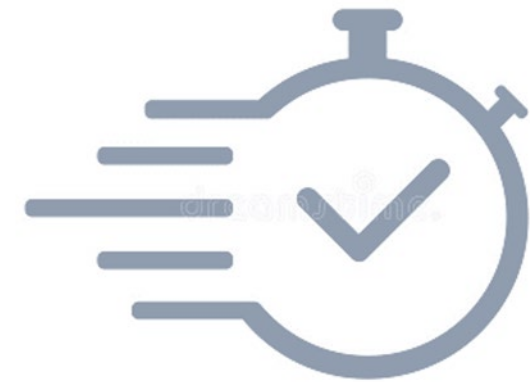
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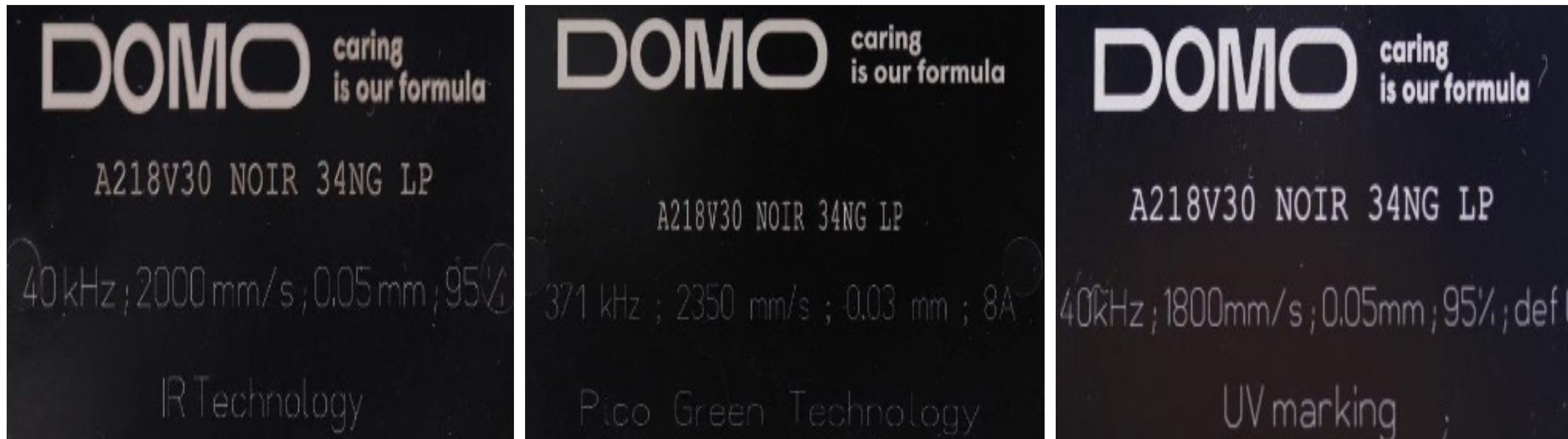
**non listed here!**

# SUPPORT & SERVICE: OUR PRODUCTS DATABASE

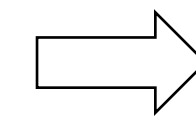
**a laser-marking database is available showcasing more than > 80 grades**



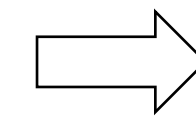
**Contrast** assessment  
**Technology** assessment  
**Product** assessment



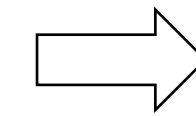
IR (1064 NM)	PG (532 NM)	UV (355 NM)
52,2	66,3	60,17
26,05	40,15	34,02



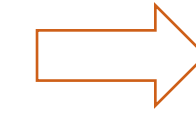
Laser filled characters



Grade name



Fine laser characters



3 laser technologies



L\* marking measure



DL\* marking vs. color

**A dedicated,  
skilled &  
well-equipped team  
to fastly  
& successfully  
laser-marked  
your innovation**



THANK YOU  
FOR YOUR  
ATTENTION





## LASER MARKING

**TISE**  
**RVICE**

Q

### **Dr Xavier Couillens**

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