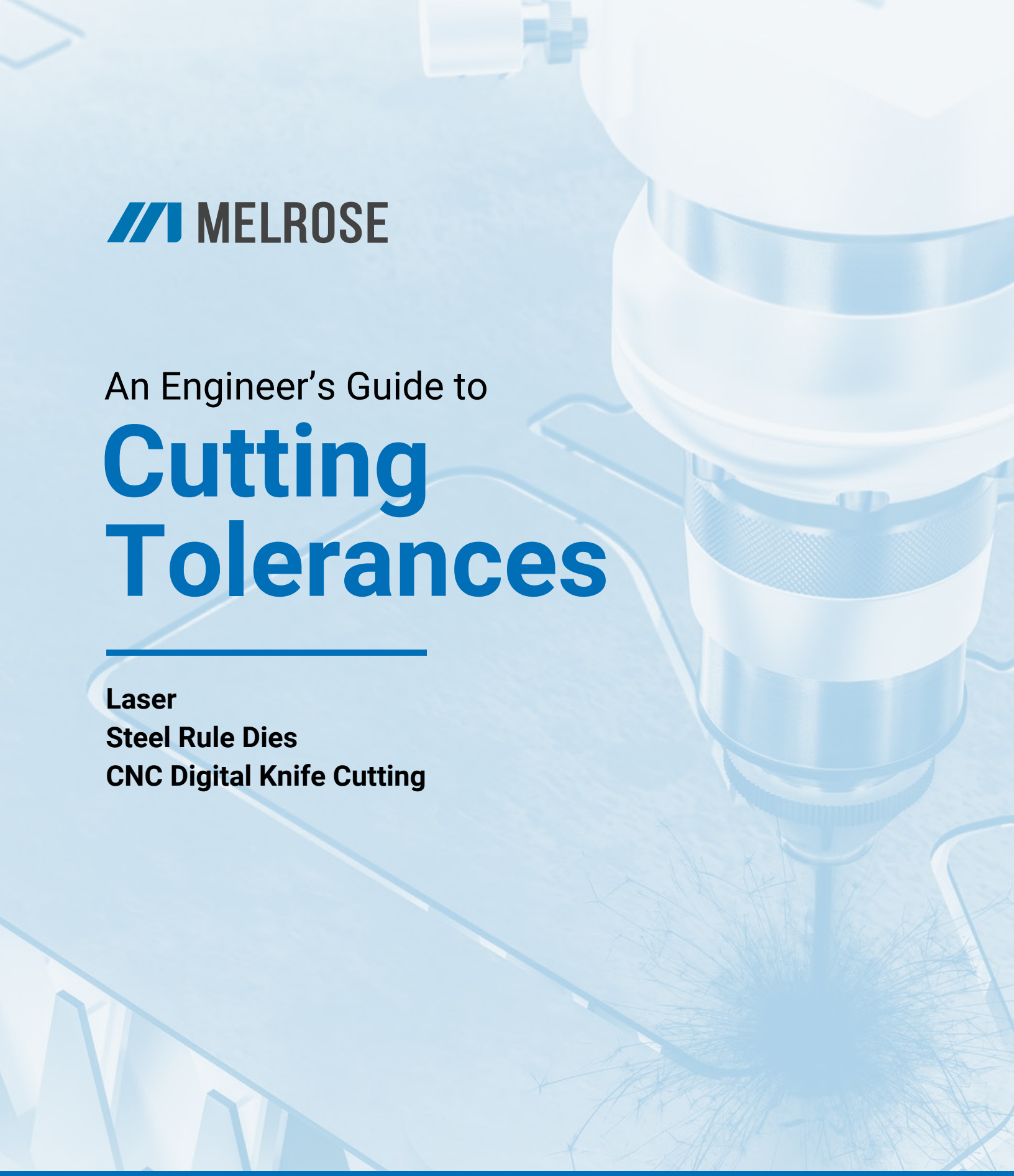
MELROSE

An Engineer's Guide to

Cutting Tolerances

Laser
Steel Rule Dies
CNC Digital Knife Cutting



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Technical Solutions Through Expertise & Partnership

Methods, Materials, and Tolerances

In manufacturing and fabrication, precision is critical to producing quality parts, especially when working with different materials and their respective properties.

Whether it's **laser cutting**, **steel rule dies**, or **digital knife cutting**, each method offers unique capabilities that play a role in meeting tolerance requirements and ensuring efficiency.

The Melrose team created this overview to help you understand how materials, dimensions, and processes can impact your design decisions. Our goal is to help guide decisions that balance specifications, efficiency, and manufacturability through the entire product cycle: **Design > Prototype > Preprocessing > Full Production**.

LET'S GET STARTED!

These guidelines are simply a starting point.

Every project is different and Melrose is here to help you find the best solutions.

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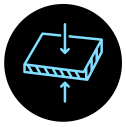
Factors Influencing Cutting Tolerances

Several factors can impact the cut part tolerances achievable with these cutting methods:

Material

Softness, density, and rigidity all play a role.



Thickness

Thicker materials often result in wider tolerances.

Tooling

The quality and sharpness of tools or lasers influence precision.

Operator Experience

Consistent set-up and handling procedures improve cut part tolerances.

Equipment

Stamping and laser cutting equipment can greatly influence tolerance results, with some newer technologies offering added capability and accuracy.

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GUIDELINES

Laser Cutting

Laser cutting is excellent for tight tolerances and intricate designs, but material properties can impact both dimensional performance and suitability.

BENEFITS

- Eliminates tooling costs.
- Tight tolerances (see table below).
- Rapid design iterations.
- Capable of processing a range of different materials.
- Fewer design constraints than traditional cutting processes, such as SRD or hard tooling.

LIMITATIONS

- Some materials are unsafe to cut due to fumes that are harmful to staff and equipment.
- Slower processing speeds when compared with tooling.
- Can cause discoloration of material due to the heat required for cutting.

MATERIALS

Soft and Firm Foams/Rubbers: Polyurethane, Polyester, Neoprene, Polyethylene, Silicone

Flexible and Rigid Plastics: Polyester, Polycarbonate, Acrylic, Polyethylene, Polystyrene, Acetal, Nylon, Polypropylene

Metals: Aluminum, Copper, Steel, Brass

Laser Cutting Dimensions	Rigid Films .002" - .250"	Metals .002" to .125"	Foams and Rubbers .030" to .250"
<6" (152.4mm)	Tol +/-.010" (.254mm)	Tol +/-.010" (.254mm)	Tol +/-.010" (.254mm)
6" (152.4mm) to 12" (304.8mm)	Tol +/-.015" (.381mm)	Tol +/-.015" (.381mm)	Tol +/-.015" (.381mm)
>12" (304.8mm) to 18" (457.2mm)	Tol +/-.018" (.457mm)	Tol +/-.018" (.457mm)	Tol +/-.018" (.457mm)
>18" (457.2mm) to 24" (609.6mm)	Tol +/-.020" (.508mm)	Tol +/-.020" (.508mm)	Tol +/-.020" (.508mm)
>24" (609.6mm)	Consult with your Melrose team		

Tighter tolerances and thicker materials can be supported, but require design review and collaboration between customer engineering and Melrose.

GUIDELINES

Steel Rule Dies

Steel rule dies provide a more efficient solution for higher volume production, when compared to laser cutting. Steel rule die tooling costs can be significantly lower than hard-tooling options with a much shorter lead time.

BENEFITS

- Low tooling costs.
- Good tolerance performance (see table below).
- Standard tooling lead time is typically 1-2 weeks.
- Capable of processing a range of different materials.
- Provides high levels of efficiency for larger production volumes.

LIMITATIONS

- Limited thicknesses and types of materials it can cut.
- Some cut designs and part geometries are not compatible.

MATERIALS

Soft and Firm Foams/Rubbers: Polyurethane, Polyester, Neoprene, Polyethylene, Silicone, Vinyl

Flexible and Rigid Plastics: Polyester, Polycarbonate, Polyethylene, Polystyrene, Acetal, Nylon, Polypropylene

Metals: Aluminum

Laser Cutting Dimensions	Rigid Films .002" - .020"	Metals .002" to .020"	Foams and Rubbers .030" to .250"
<6" (152.4mm)	Tol +/-.010" (.254mm)	Tol +/-.020" (.508mm)	Tol +/-.015" (.508mm)
6" (152.4mm) to 12" (304.8mm)	Tol +/-.015" (.381mm)	Tol +/-.025" (.635mm)	Tol +/-.020" (.635mm)
>12" (304.8mm) to 18" (457.2mm)	Tol +/-.018" (.457mm)	Tol +/-.030" (.762mm)	Tol +/-.025" (.762mm)
>18" (457.2mm) to 24" (609.6mm)	Tol +/-.020" (.508mm)	Tol +/-.035" (.889mm)	Tol +/-.030" (.889mm)
>24" (609.6mm)	Consult with your Melrose team		

Tighter tolerances and thicker materials can be supported, but require design review and collaboration between customer engineering and Melrose.

GUIDELINES

CNC Digital Knife Cutting

Digital knife cutting provides precision and design flexibility across a range of materials. Unlike laser cutting, which vaporizes the material, digital knife cutting provides a digital solution without some of the issues associated with burning material.

BENEFITS

- Eliminates tooling costs.
- Good tolerance performance (see table below).
- Rapid design iterations.
- Capable of processing a range of different materials.
- Fewer design constraints than traditional cutting processes such as SRD or hard tooling.

LIMITATIONS

- Some materials are too thick and/or rigid to cut.
- Slower processing speeds when compared with tooling.

MATERIALS

Soft and Firm Foams/Rubbers: Polyurethane, Polyester, Neoprene, Polyethylene, Silicone, Vinyl

Flexible and Rigid Plastics: Polyester, Polycarbonate, Vinyl, Polyethylene, Polystyrene, Polypropylene

Metals: None. Melrose recommends laser or tooling solutions when cutting metals.

Laser Cutting Dimensions	Rigid Films .002" - .020"	Foams .030" to .250" (Soft to Firm)	Rubbers .030" to .250" (Soft to Med)
<6" (152.4mm)	Tol +/-.010" (.254mm)	Tol +/-.010" (.254mm)	Tol +/-.010" (.254mm)
6" (152.4mm) to 12" (304.8mm)	Tol +/-.015" (.381mm)	Tol +/-.015" (.381mm)	Tol +/-.015" (.381mm)
>12" (304.8mm) to 18" (457.2mm)	Tol +/-.018" (.457mm)	Tol +/-.018" (.457mm)	Tol +/-.018" (.457mm)
>18" (457.2mm) to 24" (609.6mm)	Tol +/-.020" (.508mm)	Tol +/-.020" (.508mm)	Tol +/-.020" (.508mm)
>24" (609.6mm)	Consult with your Melrose team		

Tighter tolerances and thicker materials can be supported, but require design review and collaboration between customer engineering and Melrose.

Melrose Nameplate & Label Co. delivers engineered solutions for industrial manufacturing, specializing in custom-printed and die-cut components. With decades of expertise, we ensure seamless ordering, technical precision, and 100% quality. We are committed to innovation, efficiency, and problem-solving for every customer's unique needs.

How Can We Help?

Understanding the tolerences achievable with laser cutting, steel rule dies, and CNC digital knife cutting is critical to selecting the right process for your material and application. Each method has its strengths and limitations, which is why Melrose invests so much in working with engineers in the early stages of their part designs.

Contact us to get started

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