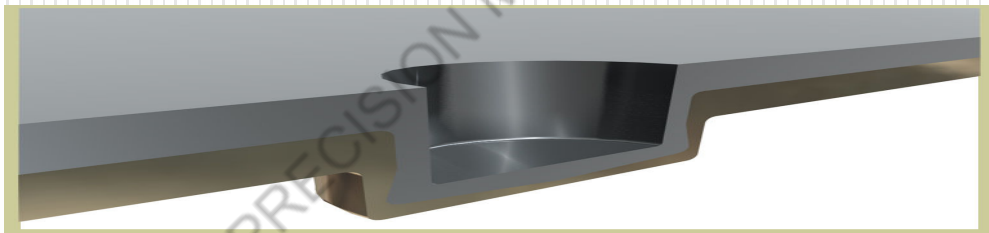




Clinching basics – an introduction to a new way of fastening metal.



26 Adams Blvd

Brantford , Ontario

Canada , N3S 7V2

519 759 5896 519 759 2948 (fax)

www.norlok.com

Company Profile

- Norlok Technology was founded in 1994 by our President, Quinn Smith. Quinn is recognized as one of the foremost authorities of clinching in North America. We are a Canadian company located about a hour from Toronto in Southern Ontario.
- Norlok has manufactured over a 1000 machines that are in use in more than 20 different countries around the world.
- We have been ISO 9001 registered since 1997 and our commitment to building quality machinery is second to none.
- With over 30 years of clinching design experience we have been 'Setting the Standards' in the sheet metal fastening market.
- We are committed to supplying innovative, cost effective clinching solutions.



Topics

- In this presentation we will discuss the following topics:
- Basics of Clinching
- Technical considerations
- Practical considerations
- Advantages of Clinching
- Types of machines

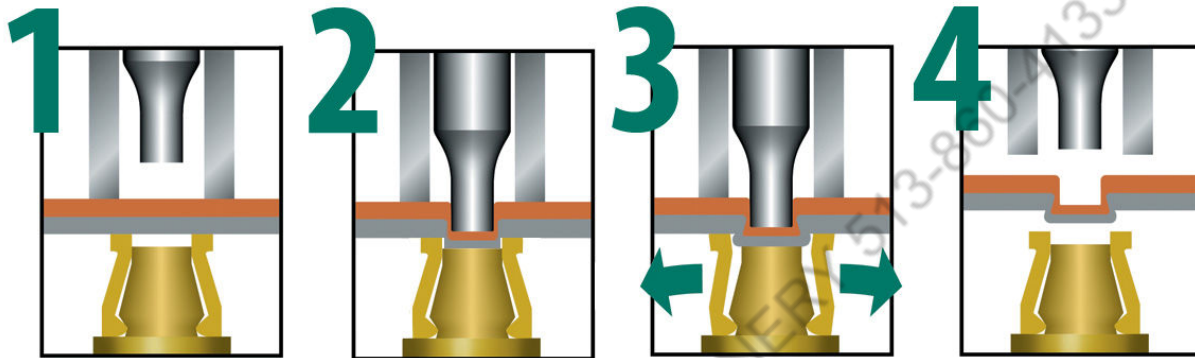


What is clinching?

- Clinching is a method of fastening two or more layers of metal together.
- Clinching uses a punch and die to fasten the material.
- Clinching uses no heat, rivets, screws or adhesives



How does it work?

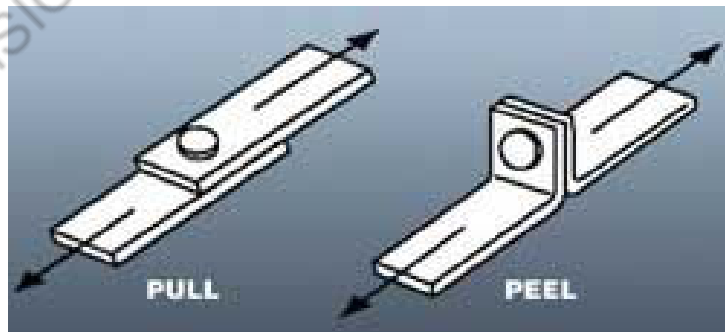


1. The tooling clamps the material between the punch and die.
2. The punch “draws” the material into the die.
3. The punch “squeezes” the material, opening the die and forming a lock.
4. The punch is “stripped” from the material, and the tooling opens.

How strong is it?

- The strength of a Clinch joint depends on the thickness and type of the material.
- There are two ways to measure joint strength.

- Pull strength:
- Peel strength:



- Pull is always stronger than peel.

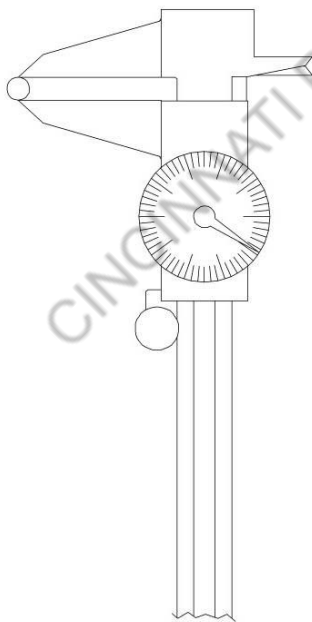
Clinch strengths

- The stronger and thicker the material, the stronger the Clinch.
- These are typical strengths for mild steel (for a 0.18" diameter punch).

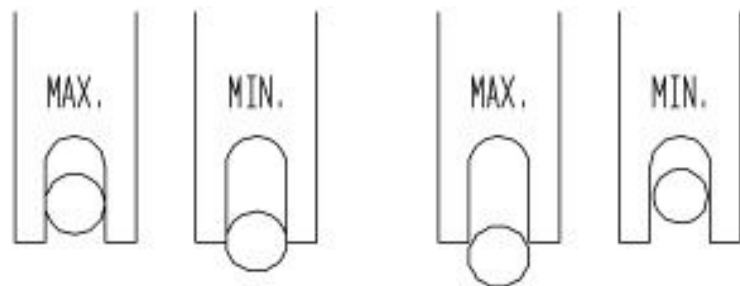
Thickness	Pull(lbs)	Peel(lbs)
0.010"	210	35
0.020"	285	70
0.030"	325	85
0.040"	400	120
0.050"	430	150
0.060"	475	175
0.070"	550	225

How do you measure Clinch strength?

- You can pull the joint apart in a pull tester (destructive test).
- You can measure the diameter of the “mushroom” diameter (non-destructive).



Measuring the “mushroom” diameter using callipers or a “Go / No-Go gauge.



What can be fastened?

- Mild steel, aluminium, copper, and brass up to 0.075” (14g) can be fastened with a Medium Duty machine (0.18” diameter punch).
- Heavier materials up to 0.135” (12g) can be fastened with a Heavy Duty Machine (0.25” diameter punch).
- A HD machine makes a Clinch that is larger and stronger than a MD machine (approximately twice as strong).

What about other materials?

- Pre-painted materials are ideal for being fastened by Clinching.
- All materials mention so far can be fastened with a round punch and die.
- Hard materials like Stainless Steel, and high carbon steel can be fastened with a rectangular punch and die (called a “lance” punch and die).

Technical considerations: The die (part 1):

- There are two types of bladed dies:
- Round dies (three and four blades) are used for drawable materials (like mild steel and aluminum).
- Rectangular dies (two blades) are used for hard materials (materials that do not draw very well) such as stainless steel.

Technical considerations: The die (part 2):

- The die consists of a body, a set of blades and an elastomer.
- The anvil depth relates to the material thickness – the thicker the material, the deeper the anvil depth.
- Typical anvil depth for 22gauge material is 0.040”.
- Die blades must be free to move outwards and must be kept clean (so they will close easily).

Technical considerations: The die (part 3):

- There is another type of clinch die that has no moving parts (mainly used by a company called Tox).
- Although it has no moving parts it does have some disadvantages:
 - it requires more punch force to clinch.
 - it is prone to fill with contamination.
 - it does not work very well with hard materials.
- Most clinching companies use a bladed type of die (one with moving parts).

Technical considerations: The punch (part 1):

- The punch is used to push the material into the die.
- The tip of the punch is not sharp, but has rounded corners (to prevent shearing).
- Mild steel generally requires a punch tip radius (PTR) of 0.015”.
- Aluminum and thick materials require a PTR of 0.020”.
- Some thin materials will require a smaller PRT of 0.010”.

Technical considerations: The punch (part 2):

- There are three different punch diameters depending on material thickness and the strength of joint required.
- Medium Duty (MD) punches are the most common and are approx .18" Ø and are used for materials 0.075" to 0.010" thick.
- Heavy Duty (HD) punches are .25" Ø and are used for thick material up to 0.135" thick. A HD joint is typically twice as strong as an equivalent MD joint.
- Light Duty (LD) punches are .12" Ø and are used for thin materials up to .032" thick. LD joints are typically half as strong as a MD joint

Technical considerations: Clinch failures (part 1):

- Clinch joints can fail one of two ways:
- Pull failure is where the joint pulls apart leaving a “male” and “female” parts.
- Shear failure where the joint fails by shearing a hole in the punch side material.

CINCINNATI PRECISION MACHINERY 513-860-4133

Technical considerations: Clinch failures (part 2):

- **Pull failures are caused by:**
- Not enough clinching force.
(check the press)
- Incorrect die (too shallow).
(use a deeper die)
- Incorrect punch (ptr too big).
(change the punch)
- Material too hard.
(check the material)

Technical considerations: Clinch failures (part 3):

- **Shear failures are caused by:**
- Incorrect die (too deep).
(use a shallower die)
- Incorrect punch (ptr too small).
(change the punch)
- Material too brittle.
(check the material – aluminum can sometimes have this problem)

Practical considerations

- The material must be able to be “drawn” or formed. Most materials can be fastened with a round, leak proof clinch. Some hard materials (stainless steel, high carbon steels) must be fastened with a rectangular (“lance”) clinch.
- Some existing parts may have to be redesigned to allow clinching.
- Long reach parts require larger clinching machines.
- Clinching requires access to both sides of the material.
- Clinching machines must be well made and resist deflection.

What are the advantages of clinching?

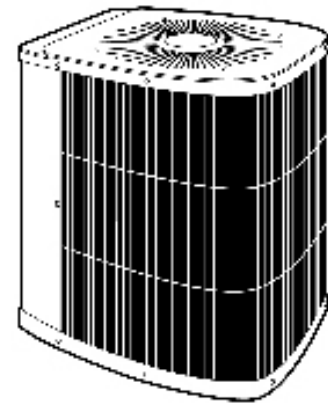
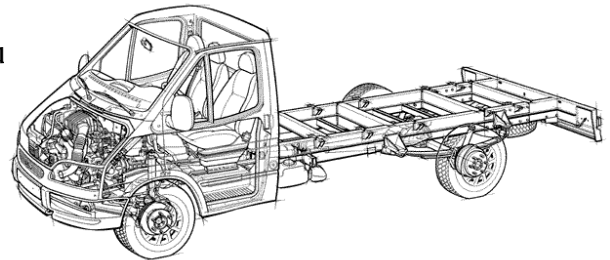
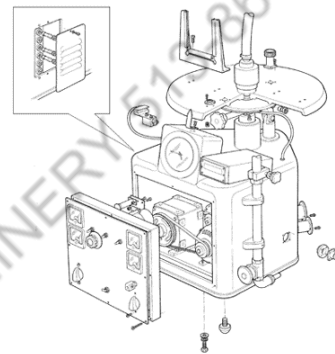
- Fasten dissimilar materials, pre-painted, coated, or multiple layers of material from 32g to 10g thick.
- Clean joint. No burrs, sparks, fumes, screws, rivets or other fasteners to worry about.
- Can fasten pre-painted and coated materials with no re-work required (no heat to burn coating).
- Environmentally friendly (less energy, no fumes).
- Creates a strong, consistent joint
- Clinching has been tested and approved by independent institutes and laboratories for several different industries.
- Clinching is fast, 60/90 cycles per minute standard.
- Clinching uses long-life tooling and eliminates staples, rivets, screws and other fasteners.
- Clinching is very user & maintenance friendly and requires very little training for operators.

Clinching limitations

- Clinching works best when the two layers are similar in thickness.
- The thick layer should be on the punch side (indented side) if possible.
- Clinching does not produce a flat, smooth joint, and is not suitable for contact with food.
- It is difficult to reach a long way into a small diameter tube.
- Clinching cannot fasten plastics.

Where is clinching being used?

- Appliance Manufacturing
- Automotive Manufacturing
- Educational Institutions
- Electrical enclosures
- Furnace and Fireplace Manufacturer
- Furniture Manufacturers
- Garage and Overhead Door Manufactu
- Heating and Air Conditioning
- Metal Windows and Doors
- Paint Booth Manufacturing
- Roofing and Architectural Fabrication
- Sign and Display Manufacturing
(Reduced labor expenses by 80% in these operations).
- Steel Framing Industry & Construction
- Swimming Pool Manufacturers
- Trailer and Custom Truck Shops
- Vending Machine Manufacturing
- ..and anyone fabricating with sheet metal.



Why is Clinching better than spot welding?

- Clinching does not burn off the material coating – great for pre-painted and galvanized.
- Clinching is more consistent (no tips to clean).
- Clinching is faster (typically 60/90 cpm) and no material cleanup required.
- Safer – no sparks , dangerous fumes and EMF radiation.
- Clinching uses less energy and no water.
- Clinching can easily fasten steel and aluminium with no adjustments.

Why is Clinching better than riveting?

- Operator Safety: Clinching machines have a low force safety stroke.
- Clinching costs less because there are no rivets to purchase.
- Less waste – 5% rivets are wasted.
- No rivet feed mechanisms to jam.
- Clinching use less energy, because it takes energy to make a rivet - 100,000 rivets weigh 40 lbs and produce 60lbs of CO2
- In 10,000,000 cycles Clinching saves 2 tons of steel!

Why is Clinching better than screws?

- Operator Safety: No repetitive strain injuries.
- No sharp edges to injure operators.
- Clinching is much faster than screws – time and labour saving.
- Clinching costs less because there are no expensive screws to purchase.
- Less waste – 5% screws are wasted.
- In 10,000,000 cycles Clinching saves 10 tons of steel! That's a lot of energy saving.

Why is Clinching better than adhesives?

- Operator Health and Safety: no fumes and chemicals.
- Clinching is much faster than adhesives – time and labour saving.
- Clinching costs less because there are no expensive adhesives to purchase
- Less waste – 5% of adhesives are wasted.
- No environmentally damaging chemicals are introduced to the part.

Clinching machine types

- There are two basic types of Clinching machines.
- Large floor mounted machines, where the part can be brought to the machine.
- Small portable machines where the Clinching machine can be brought to the part.

Surelok II Clinching Machine (Floor mounted)



The Surelok II features:

- Built in safety stroke, standard on every machine.
- Simple tool adjustment and replacement.
- Air powered-no electrical hookup required.
- Will fasten 14g to 32g material.
- Small footprint.
- 18" or 25" throat for large parts.
- Laser pointer available.
- High speed option available – 60 cycles per minute standard.
- 3-year extended warranty available.
- Modular design and fully upgradeable.
- Custom frames available.
- Conforms to Canadian CSA Z432 standard for Safeguarding of Machinery.

“Watson” Clinching machine (Portable)



The Watson features:

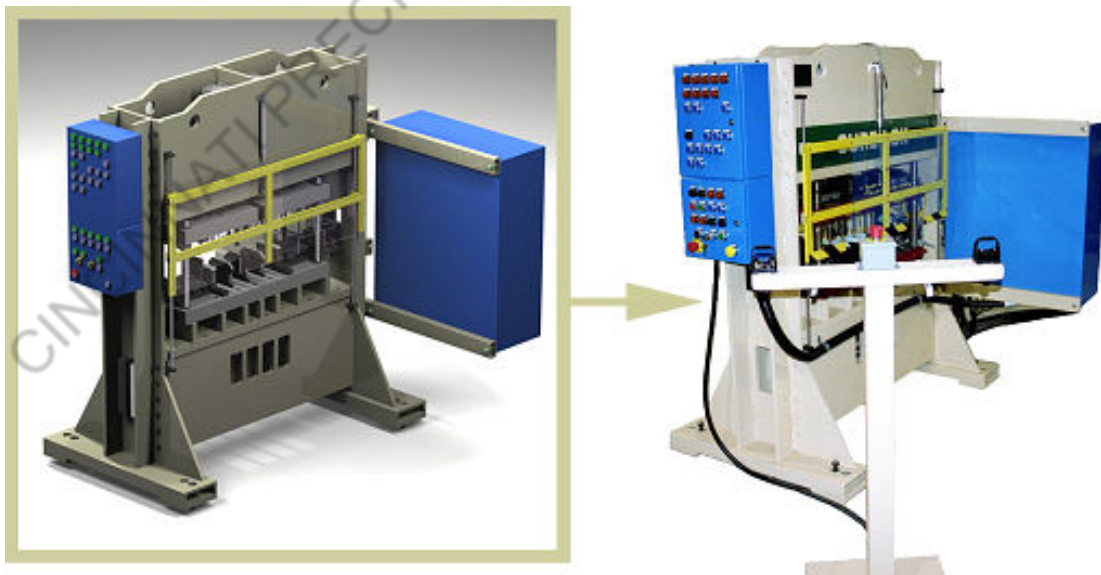
- Light weight, for greater portability.
- Will fasten 14g to 32g material.
- Includes hydraulic booster unit.
- Air powered, no electrical hookup required.
- Fast die change for various gauges of material.
- Customizable frames for special applications.
- Pressure-sensing power unit for consistent clinches.

Custom Applications

Application: Garage doors.

Requirement: Increased production and use of pre-painted material.

Solution: Fully automated 4-clinch system with part positioning.



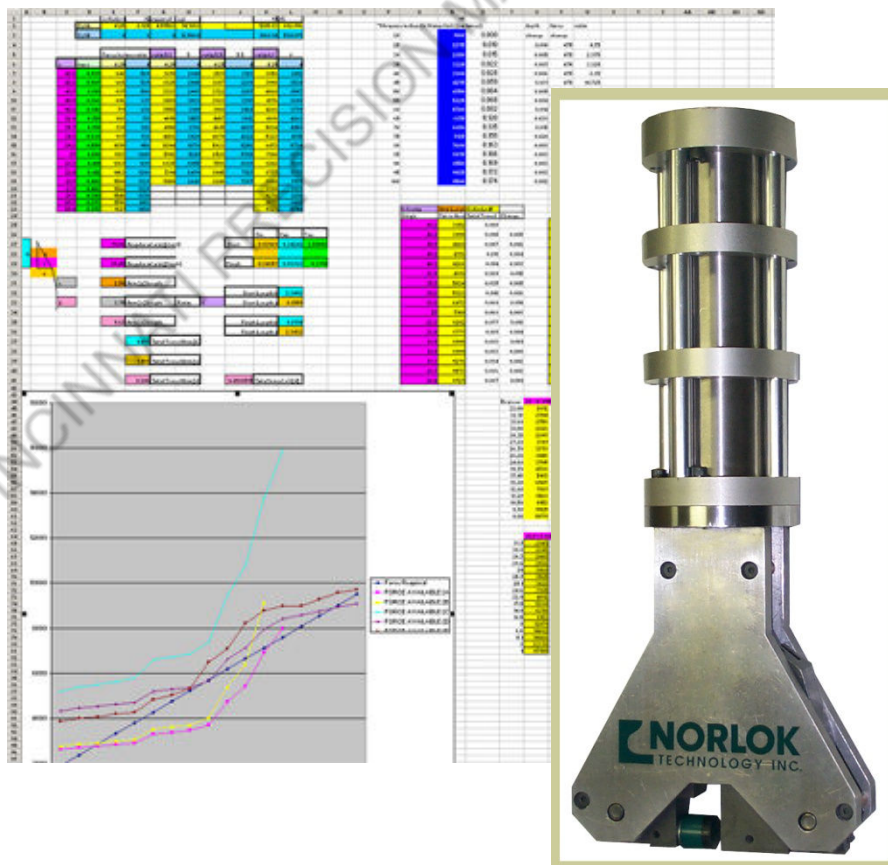
Research & Development

- Norlok constantly strives to develop solutions for existing & emerging markets.
- Recent developments include a modular, cost-effective system to produce 5, 10, 20 or more clinches at once. It is the best method for producing multiple clinches.



Research & Development

- Another example of our constant commitment to new products is the SF portable clinching unit. Designed to fasten standing flanges & seams, it is air powered (no hydraulics) and uses a special computer designed lever system to generate the power required for the clinch.



Summary

- Clinching is an efficient and cost effective replacement for spot welding and riveting.
- It is clean, safe and environmentally friendly.
- It is well suited to fastening pre-painted materials, and can be easily integrated into existing production environments