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Melt Temp Measurement Systems: Precision with every Degree

Do You Know Your Melt Temperature?

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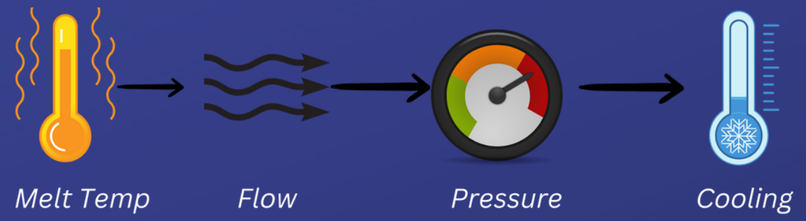
Why You Should Know Your Melt Temp-Injection Molding

4 Major Variables:



- Continuous product improvement
- High quality parts
- Melt Temp historically hard to measure until now
- 5 variable effect melt temp/input effects output
    1) external heater bands (barrel temp)
    2) screw RPM
    3) back pressure
    4) screw design
    5) residence time

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The MTMS Kit

- Fast-reading Pyrometer
- Proprietary Thermocouples (2)
- Purge Puck with Magnets
- Ring (H-13, 52-54Rc hardened steel)
- Insulated Purge Cups (one-time use, 50/kit)

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When To Use the MTMS Kit

- **Trouble Shooting**
- **PPAP/Medical Validations(Preproduction Approval Process) Establishes benchmarks**
- **Normalization from press to press**

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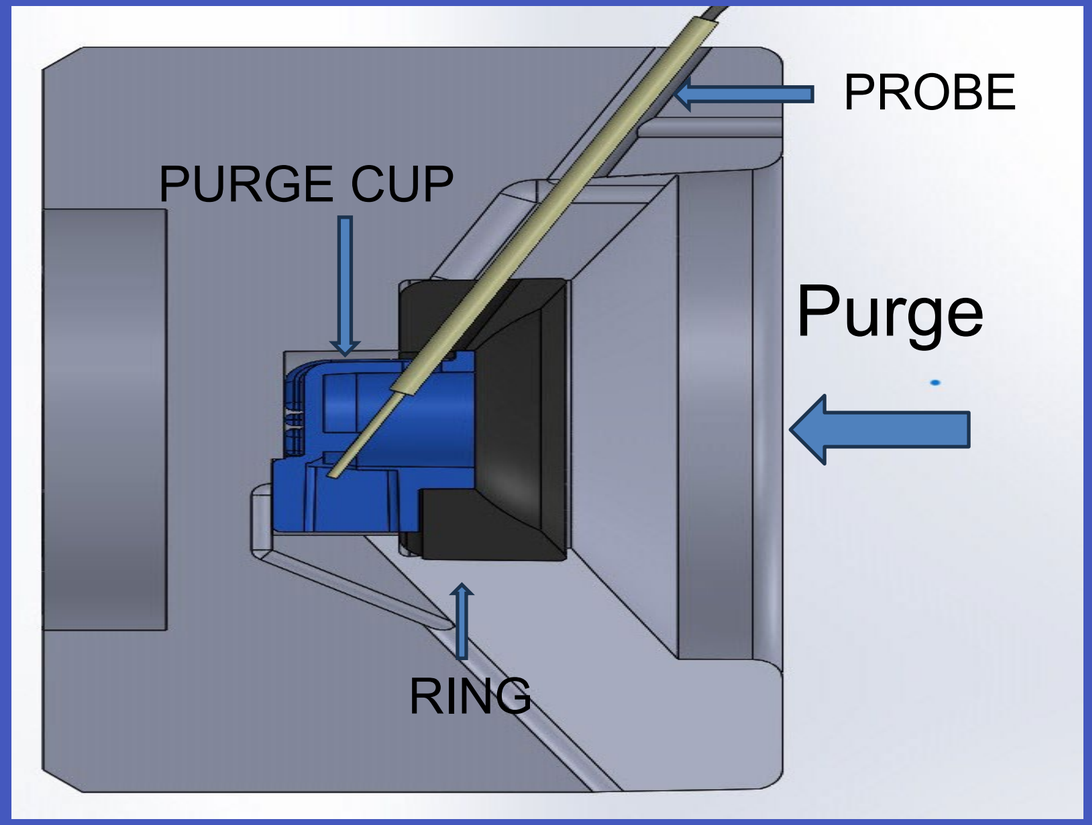

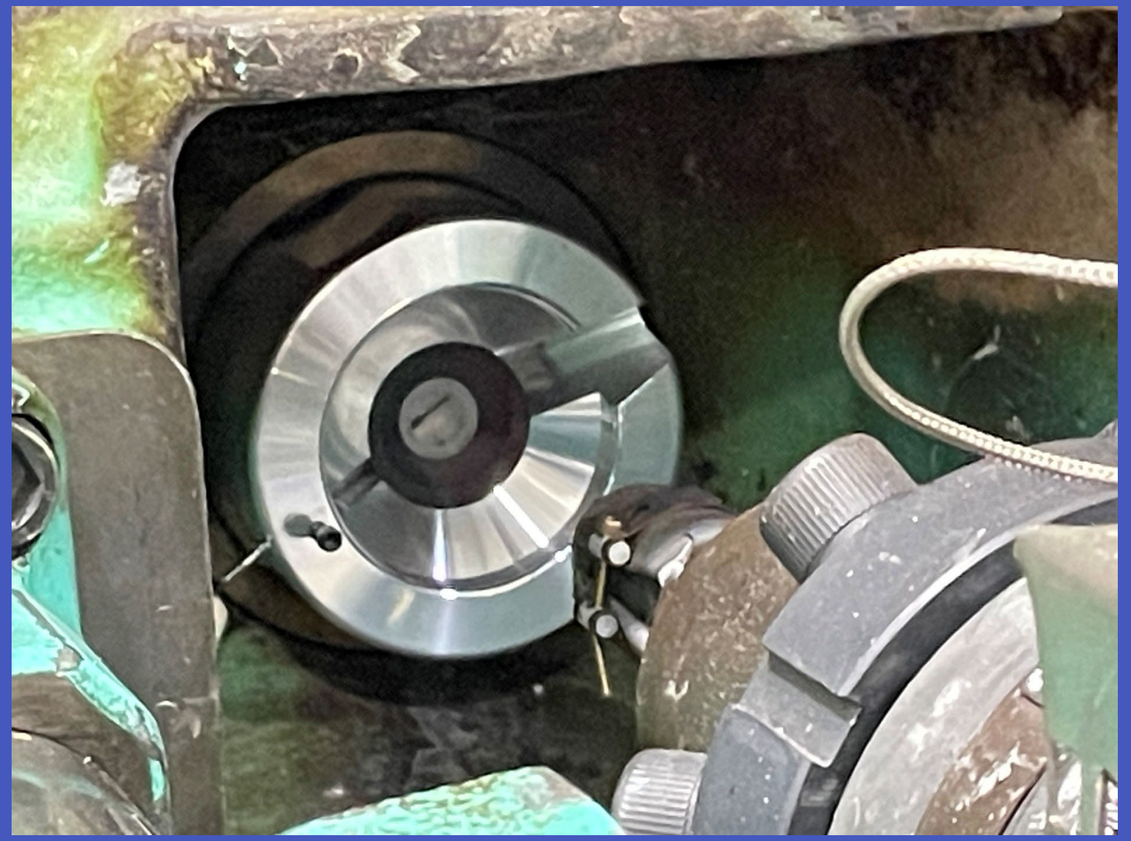

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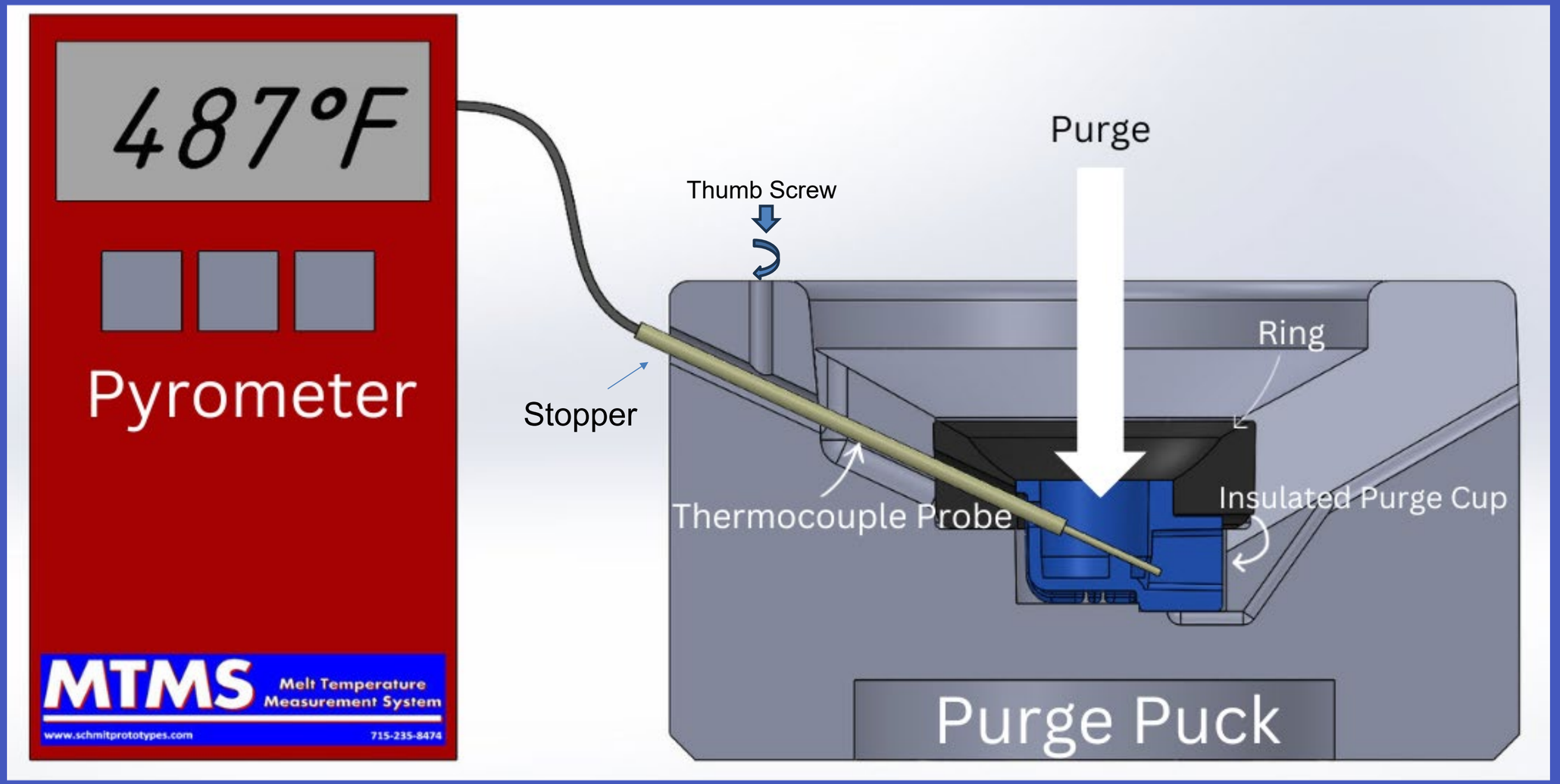

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Puck Installed Against Locating Ring

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Purge Process

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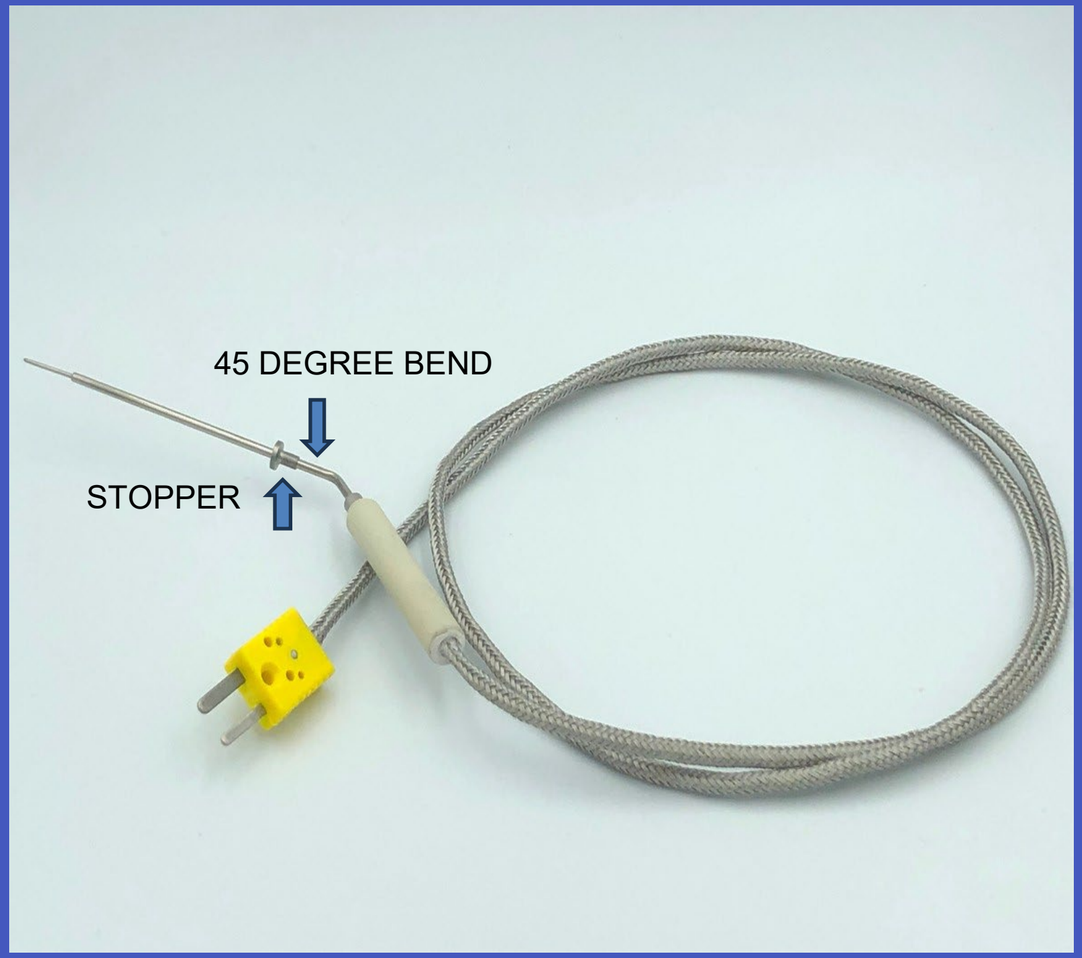
Thermocouple Probe



- Custom engineered for the MTMS Kit Designed for rapid heat transfer before the polymer solidifies/skins
- Built-in stopper for precise positioning Type (K)
- .080 inch diameter at base
- .040 inch at tip for fast response
- 45-degree bend to fit into mold press
- MUST USE THIS PROBE!

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Pyrometer

- Fast Response 3x/second
- Captures & holds peak temperature Reliable
- MUST BE SET TO K MODE ON THE PYROMETER

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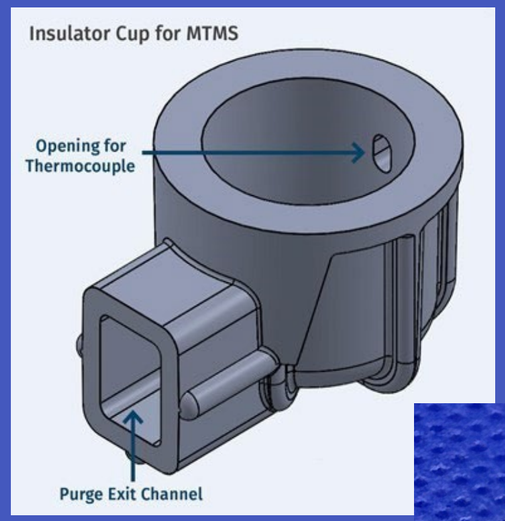
Insulated Purge Cups



- Opening diameter for thermocouple probe
- One-time use only
- Engineered hinged door
- Designed for <u>precise</u> thermocouple probe positioning
- Made from polymer with lowest heat transfer
- Cup inslulates before polymer cools/skins

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Ring

- Made of H-13 steel and hardened to 52-54Rc hold purge cups in place
- Provides a hardened radiused seat for the nozzle to seat
- Provides a precise flow path for the material to flow over the thermocouple probe tip

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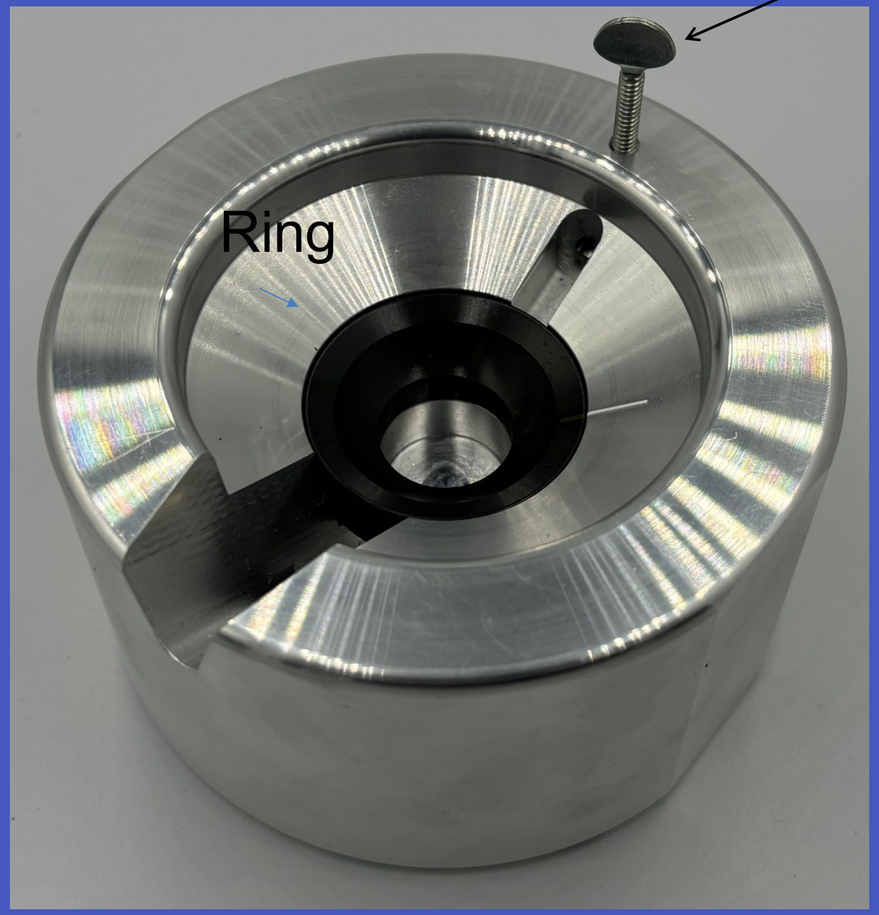
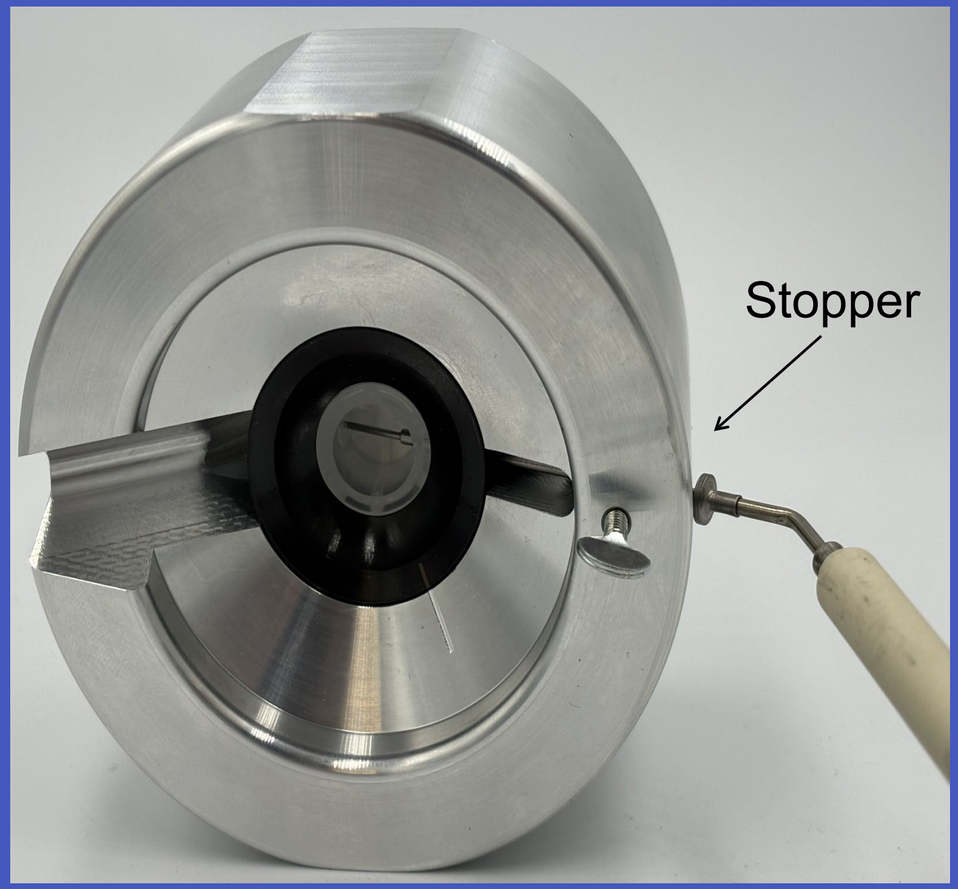
Thumb Screw: Holds pyrometer in place/fast removal

Thumb Screw: Holds thermocouple in place. Important to install probe all the way to stopper!





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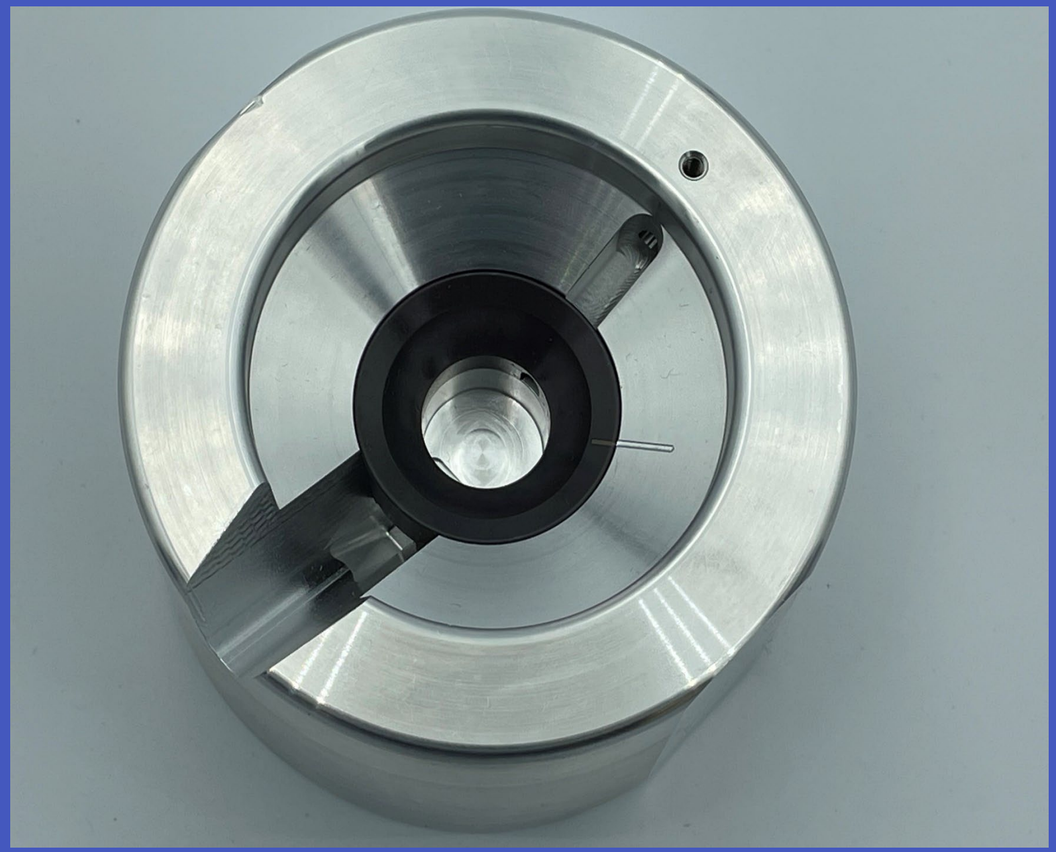
New Alignment Feature for Puck/Ring for easy insertion



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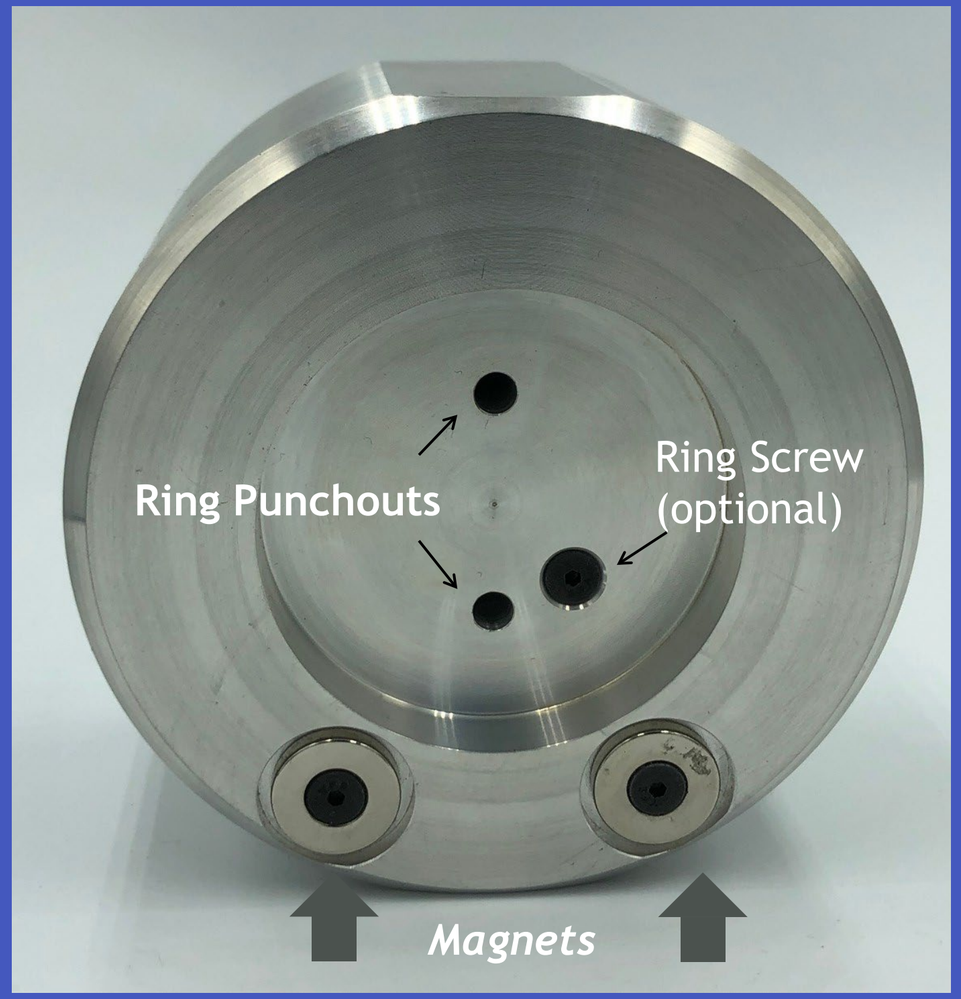
Purge Puck

Back Side



Magnets attach puck to locating ring

Front Side

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How The MTMS Kit Works

- MTMS is based on two major principles. The first is to keep the purge molten by using the patented insulated purge cup, which keeps the heat or BTUs in the cup and prevents skinning. This allows the temperature to be measured more accurately.
- The second major principle is to position the thermocouple probe in the effective flow path of the material or purge. This also has a wiping action over the thermocouple probe which eliminates skinning. The precise positioning of the thermocouple also eliminates human error and gives you a more repeatable and accurate melt temperature.

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Advantages of the MTMS Kit

- **Low-Cost Purge:** MTMS $1.75 vs. probe-immersion purge at $10+ per purge on average
- **Safety:** No hands are in or near the purge during measurement
- **Eliminates Human Error:** No manual purge probe-immersion
- **Increases Production & Decreases Downtime:** Measures temperature in under 1 minute, and as low as 35 seconds
- **Repeatable** from press-to-press, operator-to-operator
- **Accurate within +/- 1%**
- **Heavy duty, long lasting thermocouple probe** designed for rapid heat transfer
- **Fast-reading pyrometer** 3x per second
- Patented **insulated purge cups designed for precise probe positioning** keeps the heat/BTUs in the cup and prevents skinning
- **Heavy duty purge cup ring** made from H-13, 52-54RC hardened steel holds purge cup in place and provides precise flow path for thermocouple probe tip
- **Sturdy purge puck with magnets**

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Important Items To Know

- **Locating Ring: Euro Map vs. SPE/Puck-machine down or add collar**
- **Polypropylene: lower readings but consistent**
- **Sampling: MTMS Kit vs. puddle purge**
- **Sample Size: >1 ounce**
- **Bending of probe ok**
- **Insulator cup is one-time use only**
- **Remove probe in under 1 minute**

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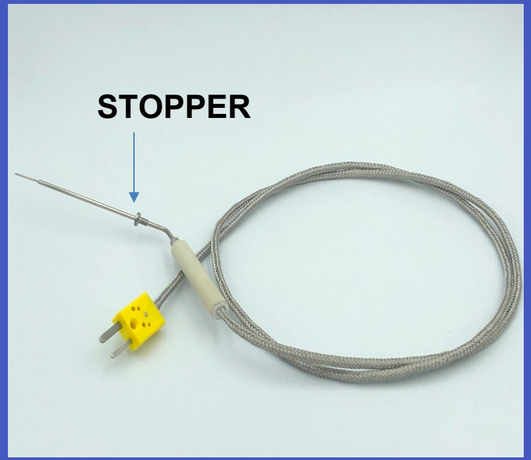
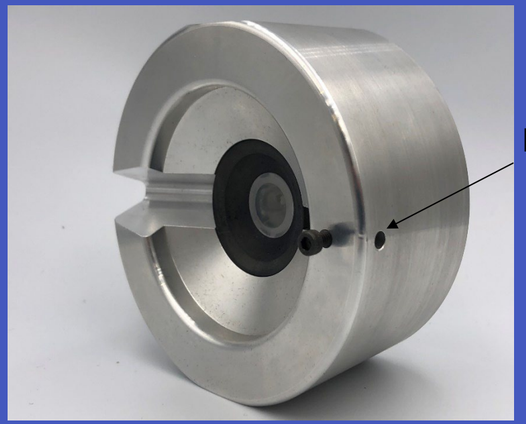
Important Items To Know (continued)

- *Inconsistent Readings:*
  - Wrong Thermocouple: Too slow
  - Wrong Pyrometer: Too slow
  - Thermocouple probe not inserted to stopper
  - Filler Materials <20% works
  - Pyrometer not set to Type K





Barrel Temperature is NOT Melt Temperature

- **Melt temperature determined by material supplier**
- **Barrel heater bands only account for 25-30% of the heat in the melt**
- **Majority of the heat comes from the screw RPM and backpressure through shear**
- **Screw design/type also induces shear into the melt**
- **Residence time**
- **Interactions between these variables for a specific resin to respond to shear will affect melt temperature**

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MTMS Kit/PEEK & Ultem

- **PEEK melts at 750° F**
- **Currently no safe way to measure PEEK**
- **Testing at Victrex Results April 2024:**
  - **Test 1: 751° F**
  - **Test 2: 758° F**
  - **Test 3: 757° F**

******Important to lock thermocouple probe in place******

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Hot Markets

- **Medical/Automotive: Testing/Documentation**
- **Nolato, Phillips Medisize, Boston Scientific**
- **More validity when doing PPAP and medical evaluations**

"I struggle with my team getting melt temps consistently and I'm so glad I came across your product. It appears to solve this problem and it saves time and money." Doug de los Angeles, Innovative Industries NW April 10th, 2024.

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