Automation™

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AP Automation Magnetic Arc Control Product Brochure

Magnetic Arc Control

Arc Positioning for Precise Shaping of the Weld Pool

With AP Automation Magnetic Arc Control Systems, you can precisely position, weave, or stabilize the welding arc in any pattern you require—the perfect solution for thick-to-thin material, wide weld joints, and high-speed TIG welding.

AP Automation Magnetic Arc Control Systems bolt directly onto your present torches, immediately improving both weld quality and productivity by:

- *Controlling Heat Distribution*
- *Minimizing Undercuts*
- *Reducing Porosity*
- *Improving Penetration*
- *Stirring the Weld Puddle*
- *Enabling Exceptional Welds of Difficult Joints*

Used for TIG, spray MIG, Plasma and Sub-Arc welding, controlling both magnetic and nonmagnetic metal welding applications.

For more information about Magnetic Arc Control, please visit www.ap-automation.com

MA-40 ARC PATTERN CONTROL

This unit adds a new dimension to magnetic arc control: pattern control. With the MA-40, the welding arc can be shaped, widened or narrowed as required. The rapid, controlled motion of the arc stirs the molten puddle for a noticeable reduction in porosity and improvement of the grain structure in the weld.

The MA-40 Control Unit provides two-axis magnetic arc control with independent amplitude and position control for each axis. A stabilize mode with amplitude and position control adjustments is also available for one-axis oscillation.

MA-20 ARC CONTROL

Our most popular controller, the MA-20 features a PWM power supply and adjustable oscilation speeds from 7 per minute to 30 per second. Independently controlled left and right dwell settings create a weave effect, allowing maximum flexibility when working with an uneven work piece. A Stabilize/Oscillate switch allows you to disable the speed and dwell controls while the position and amplitude controls remain operative. Final Taper gradually reduces magnetic field during welding down-slope.

MA-10 ARC STABILIZER

The MA-10 is strictly for arc stabilizing. It is used to compensate for magnetic arc blow and it is used to keep the arc coned in and stable in the weld zone. The MA-10 has a high and low range with adjustable gauss strength in each range. Polarity is selected with a front panel switch.

AP AUTOMATION MAGNETIC PROBES

All probes include simple, secure mounting brackets and quickly attach to most welding torches. Water-cooling hoses (where required) and probe cables are part of each probe assembly. See page 30 for controller/probe compatibility.

MP-100 PROBE

The MP-100 probe incorporates the latest magnetic technologies. Though similar to the MP-1 probe, the new MP-100 probe has a much higher gauss strength and three times the efficiency of the MP-1. Though it does not require water cooling, the MP-100 allows for optional water cooling. For added convenience and flexibility, it also features a detachable control cable. Single-axis probe adapts to conventional torches. A variety of return rings and tips are available for different configurations.

MP-2 PROBE

The dual-tip MP-2 slips over a conventional TIG torch and can be used either for cross-seam weaving or in-line weaving. In-line weave is primarily used in tube mills to preheat the tube, giving increased weld travel speeds.

MP-1 PROBE

The MP-1 is a single-tip, water-cooled probe that adapts to conventional torches. The MP-1 works well in tight clearances and is primarily used to weave the arc across the seam or to stabilize the arc.

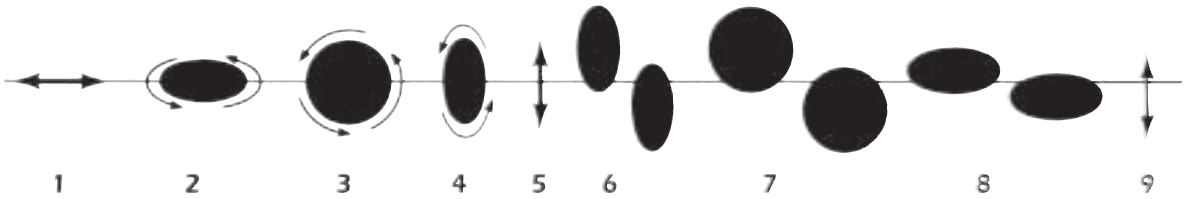
MP-22 PROBE

Use the MP-22 probe with the MA-20 control unit only. This twin-tip side-mount unit is capable of delivering the full 600 gauss magnetic field to the welding arc area. Though normally used in an air-cooled mode, if necessary, the MP-22 can also be water-cooled.

MP-4 PROBE

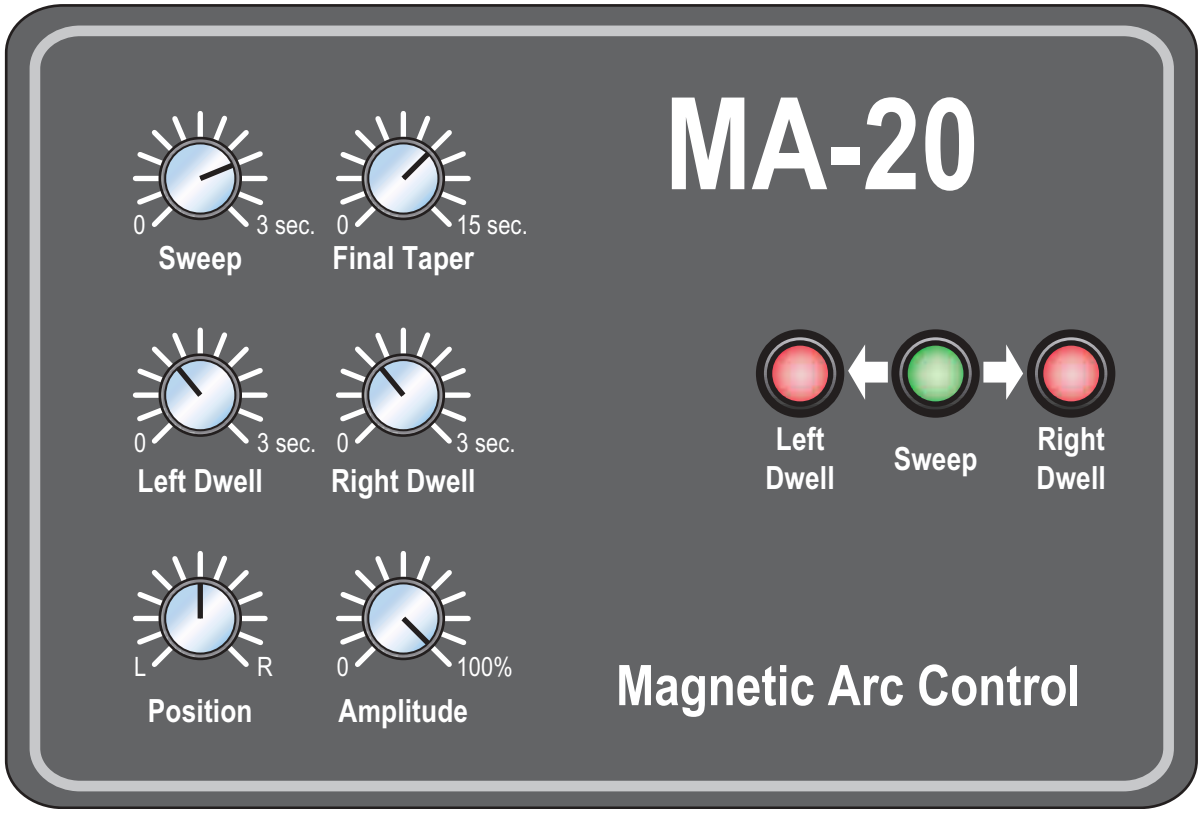
With four independently controlled magnetic coils, the MP-4 probe has the highest capacity for multiple arc and weld bead profiles. It is used with the MA-40 control unit only.

The AP Automation MA-40 Control Unit and MP-4 Probe provide the ability to shift the entire arc pattern relative to the weld seam with position controls, as shown below.

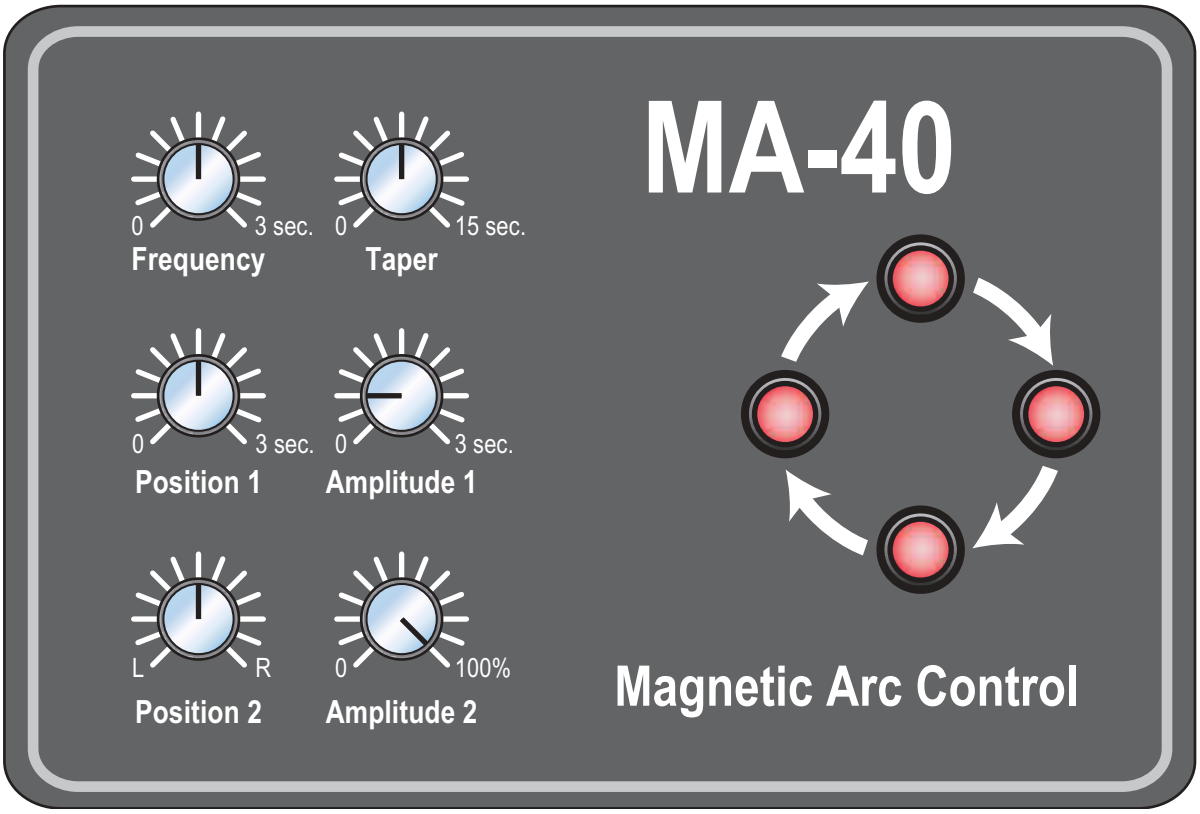


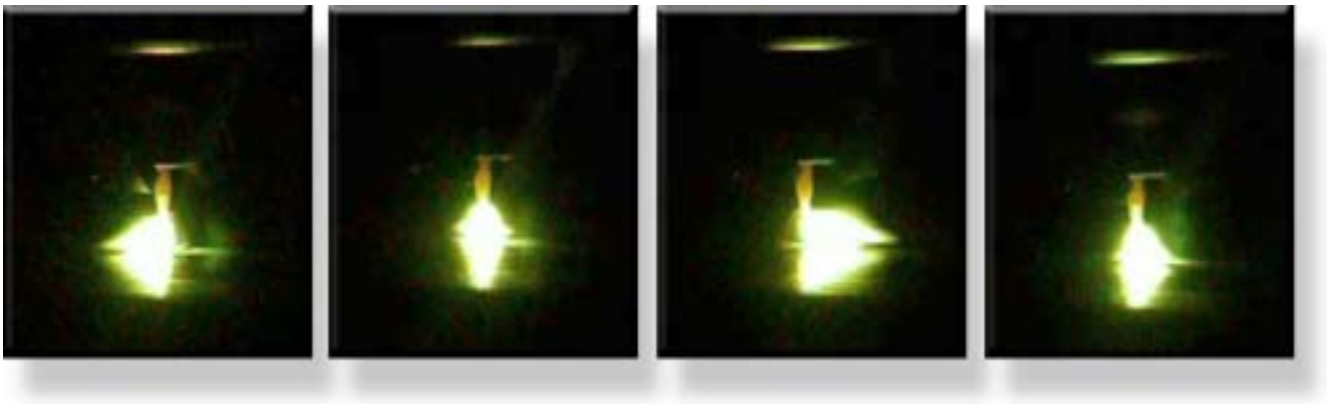
1. *Straight line oscillation along seam*
2. *Elliptical pattern along seam — symmetrical*
3. *Circular pattern —symmetrical*
4. *Elliptical pattern across seam — symmetrical*
5. *Straight line oscillation across seam*
6. *Elliptical pattern across seam — offset*
7. *Circular pattern — offset*
8. *Elliptical pattern along seam — offset*
9. *Straight line oscillation across seam — offset*

Control Panels and Arc Control Examples



The MA-20 and the MP-100 weave a continuous, 300-amp arc across a weld seam, allowing uniform penetrationin this wide, V-prep, tube-to-tube weld joint.

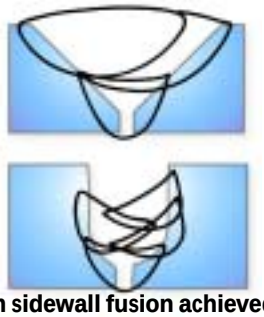




The MA-40 and the MP-4 move the arc in an eliptical pattern, refining and compressing the weld grain structure.

Magnetic Arc Control—Problem Solver

AP Automation Magnetic Arc Control Systems solve the five main problem areas of automatic arc welding. The sound welds achieved by magnetic arc control are particularly essential when fabricating exotic alloys, and when the end product is subjected to elevated temperature, high pressure, and unusual stress or vibration.

Problem	*Solution*	
 **Arc blow or wander causes misplaced bead and lack of penetration.**		**Magnetic arc control directs and shapes the arc, controlling heat distribution and penetration between the segments being joined to yield consistent, uniform welds.**
 **Large gap causes excessive drop-through and root-side undercut.**	 **Uniform penetration achieved with magnetic arc control.**	
 **Sharp crevices in butt weld.**		**Magnetic arc control sweeps the arc back and forth across the weld line, directing the required amount of heat to the weld edges, and both widening and flattening the head.**
 **Flat fillet with sharp crevices on both members.**	 **Minimized undercutting with magnetic arc control.**	
 **Lack of fusion in V and U-grooves.**	 **Uniform sidewall fusion achieved with magnetic arc control.**	**In multi-pass groove joints, magnetic arc control oscillates the arc in the groove, directing the heat to the desired position for uniform sidewall fusion.**
 **Typical porosity caused by gases generated in melted base metal.**	 **Sound welds achieved with magnetic arc control.**	**Magnetic arc control stirs the arc, helping to eliminate bubbles and porosity in the weld.**
 **Insufficient heat on thick member prevents proper penetration and fusion to thin member.**	 **Uniform penetration on thick and thin members, no undercutting with magnetic arc control.**	**With Magnetic arc control, you can specify the proportion of time the arc spends on either side of the weld seam. When joining members of different cross sections, magnetic arc control makes it easy to place the arc exactly where it is needed – penetrating the thick wall adequately while preventing undercutting on the thin wall.**

Magnetic Arc Control Systems are used in these industries:

- *Tube and Pipe Mills*
- *Fuel Tanks & Pressure Vessels*
- *Military*
- *Multi-pass Pipe Welding*
- *Repetitive TIG or Plasma Manufacturing*

Actual Jobs:

Stainless Tube Mill

Using two MA-40 magnetic arc controls and two MP-4 probes, the TIG arc is compressed and oscillated to reduce arc drag and porosity. Increased penetration, consistent seam fusion and very high travel speeds were achieved using the first arc for preheating (oscillating the arc longitudinally) and the second arc for compressing the arc for full penetration welding.

V-Prep Joint on Steel Flange

An MP-1 magnetic probe is used in conjunction with precision wire feed to create a wide weave patterned weld bead, which has equally deep penetration on both sides. The magnetic arc oscillator eliminated the need for a mechanical oscillator.

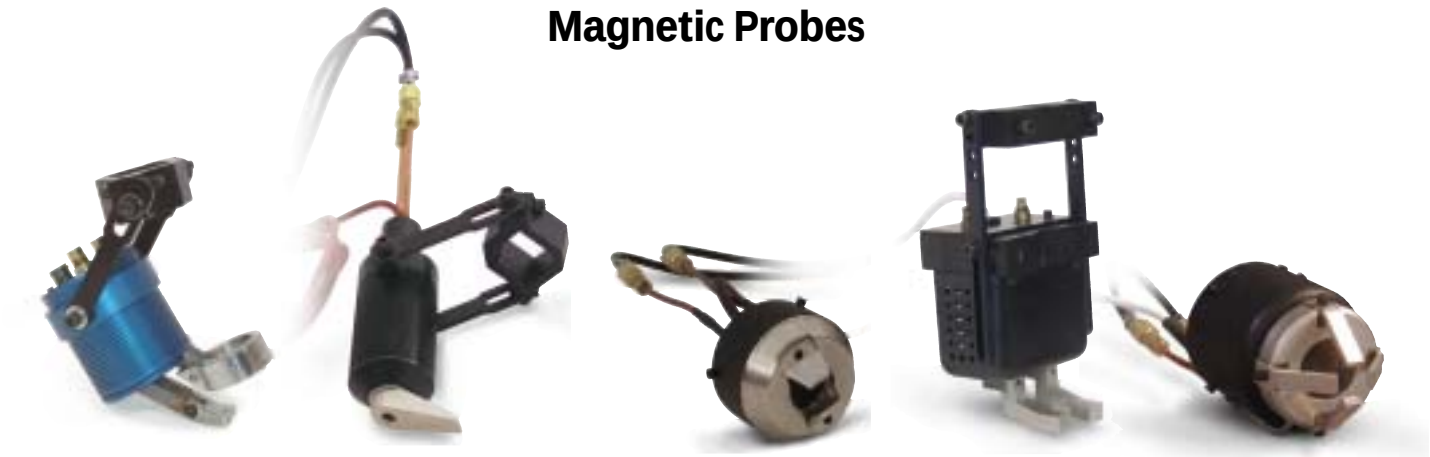
Product Specifications

AP Automation Magnetic Arc Controls easily interface with all of the major manufacturers of welding equipment. They are fully compatible with all Cyclomatic™ equipment.

Control Units

Model	Dimensions (in.)	Sweep Frequency	Sweep Amplitude	Arc Position	Dwell Ratio	Dwell Control	Shaping	Final Taper	Shipping Weight
MA-10 Arc Stabilizer	9x9.5x3.5	NA	NA	Proportional to arc length (approx. ratio 1:1)	NA	NA	NA	NA	9 lbs
MA-20 Arc Control	9.75x4x11.75	0-30 osc/sec	Proportional to arc length (approx. ratio 1:1)	Proportional to arc length (approx. ratio 1:1)	1:1 to 100:1 on either side of weld seam	Independently variable left and right	NA	0-15 sec	12 lbs
MA-40 Arc Pattern Control	9.75x4x11.75	0-30 osc/sec	Independent adjustment for each axis, proportional to arc length (approx ratio 1:1)	Independent adjustment for each axis, proportional to arc length (approx ratio 1:1)	NA	NA	1:1 to 100:1 on either axis, proportional to arc length (approx ratio 1:1) For oscillating and eliptical patterns	0-15 sec	12 lbs

Magnetic Probes

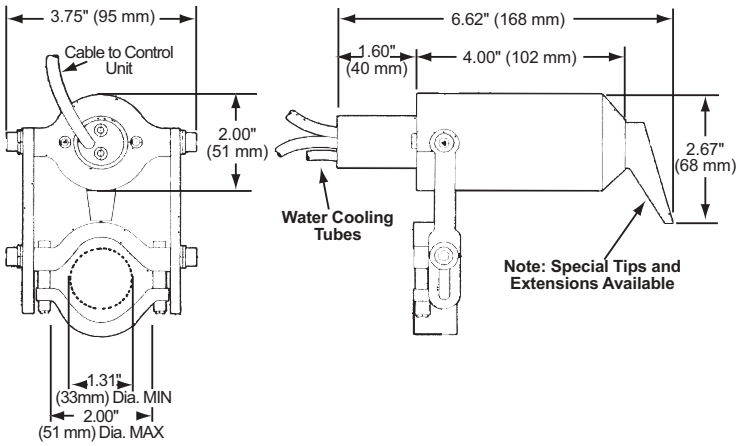


MP-100 **MP-1** **MP-2** **MP-22** **MP-4**

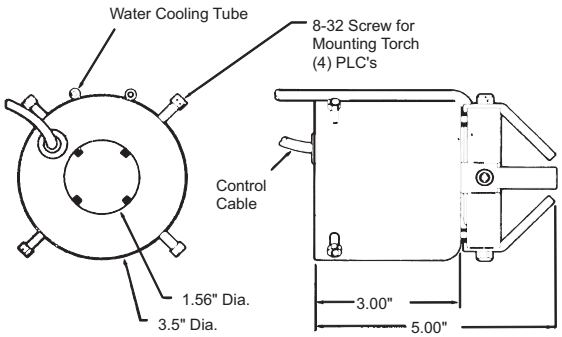
Model	Max. Field Strength	Cable Length	Shipping Weight	Controller Compatibility
MP-1 Probe	300 gauss max.	8 ft.	5 lbs.	MA-10, MA-20
MP-2 Probe	300 gauss max.	8 ft.	4 lbs.	MA-10, MA-20
MP-22 Probe	600 gauss max.	10 ft.	7 lbs.	MA-20 only
MP-4 Probe	300 gauss max.	8 ft.	5 lbs.	MA-40 only
MP-100 Probe	600 gauss max.	8 ft.	4 lbs.	MA-10, MA-20

Magnetic Probe Dimensions

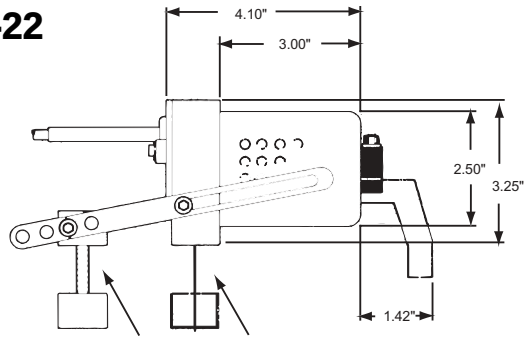
MP-1

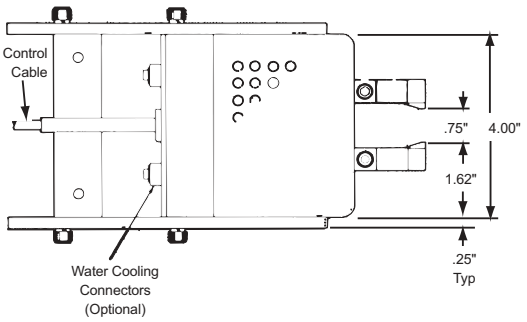


MP-4

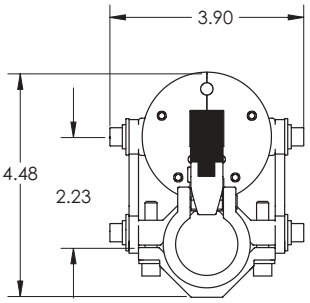


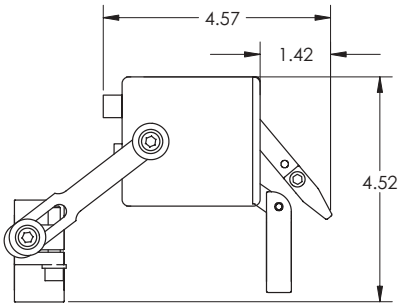
MP-22

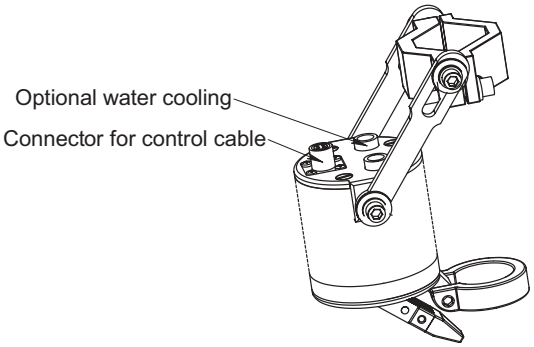




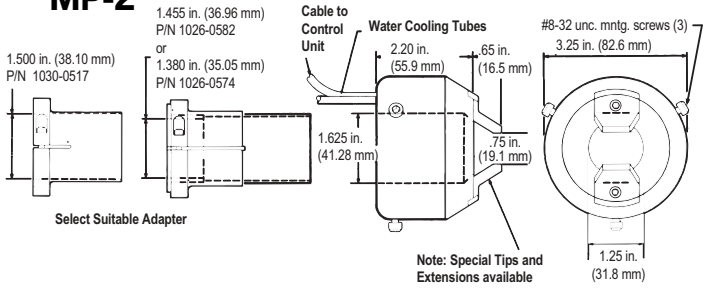
MP-100







MP-2



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