# Praxair's Star™ Gases – Argon;
# Praxair's HeliStar™ A-25, A-50 and A-75 – Argon / Helium Blends;
# Praxair's HydroStar™ H-5 – Argon / Hydrogen Blend;

For GTAW (TIG Welding) of Carbon Steel, Stainless Steel, Aluminum and Other Non-Ferrous Materials



Argon, helium, argon/helium and argon/hydrogen blends are used for a variety of TIG (gas tungsten arc) welding applications. Base material type and thickness, and the desired welding speed influence gas selection. The primary component in the shielding gas is to protect the tungsten electrode from oxidation. The DCEN or DCSP (electrode is negative polarity) power connection is used for carbon steel welding; AC with high frequency is recommended for aluminum.

Argon is recommended for manual welding of all materials. Its easy arc starting characteristics allows excellent control of arc voltage even as arc length varies with manual operations.

Helium is used to join thick plate and metals that rapidly conduct heat such as aluminum and copper. Helium's high thermal conductivity creates a hotter, broader arc for higher welding speeds and deeper penetration. Arc starting and stability is not as good as argon. Increased gas flow rates and larger diameter electrodes must be used with helium shielding.

Praxair's HeliStar™ argon/helium gas blends are used where increased heat input to the base material (helium) is desired while maintaining favorable arc starting and stability characteristics (argon).

The HydroStar™ argon/hydrogen blends from Praxair are primarily used with austenitic stainless steels (300 series) and other nickel alloys. Severe weld porosity and cracking may occur if used to join aluminum, copper and most carbon steels. Hydrogen increases the thermal conductivity of the gas blend while providing a reducing atmosphere to improve weld puddle wetting and weld bead cleanliness. Significant increases in travel speed can also be attained. Additions of 2-5% are typically used for manual welding; higher percentages (10-15%) are used in mechanized applications.

| Product Features | Benefits |
|---|---|
| Argon:<br>• Best arc stability/cleaning action. | • First choice for TIG welding/good arc starting.<br>• Maximum cleaning action (aluminum). |
| Helium:<br>• Greater heat input. | • Improved puddle fluidity and welding speed.<br>• Better control of bead shape and distortion. |
| Praxair's HeliStar A-25, A-50 and A-75:<br>• Balanced characteristics. | • Good arc starting and increased heat input.<br>• Deeper penetration as helium content increases. |
| Praxair's HydroStar H-5:<br>• Higher heat input.<br>• Reducing atmosphere. | • Excellent bead shape and appearance.<br>• Higher travel speeds on stainless steel; less distortion.<br>• Excellent as a purge gas. |

## Typical Applications

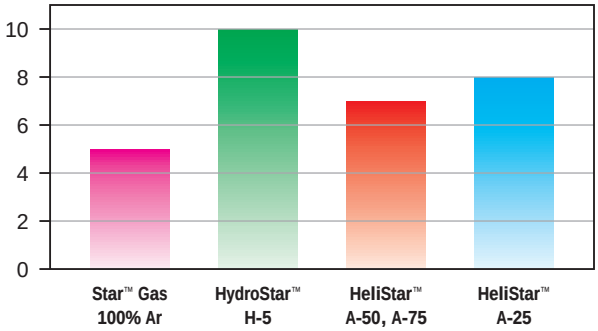
| Argon | Praxair's HeliStar blends | Praxair's HydroStar blends |
|---|---|---|
| • Mild Steel | • Aluminum Ladders | • Stainless Steel Tubing |
| • Light Gauge Material | • Aluminum Boats | • Stainless Steel Food Equipment |
| • Thin aluminum | • Copper Transformer Coils | • Railings<br>• Aerospace Components |

## Performance Characteristics

Illustrated below are comparisons between shielding gas blends used to make TIG fusion welds on carbon steel plates.

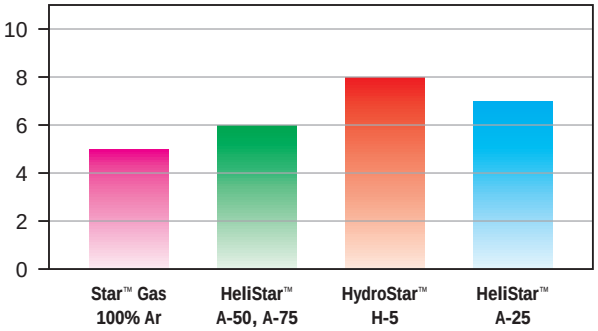
They are intended to provide suggestions for gas blend selection based on the criteria indicated.

**Travel Speed - SS*** (10 = most, 1 = least)

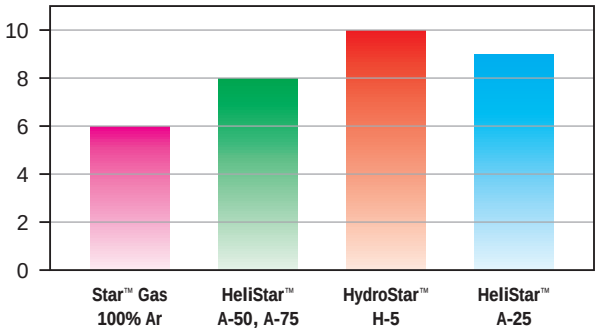



***TIG Fusion Weld - 70 A, 10-13 V**

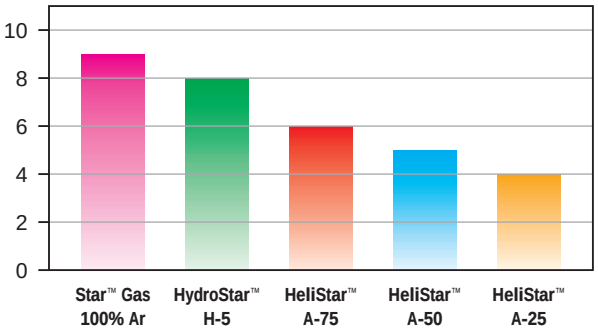
**Penetration** (10 = most, 1 = least)




**Bead Shape** (10 = best, 1 = least)




**Arc Starting/Arc Stability** (10 = best, 1 = least)




**Note:** The selection of the appropriate shielding gas can become quite complex due to the large variety of operating conditions (base metal, chemistry and thickness, metal transfer, wire selection, welding position, etc). Please consult with your Praxair representative for the best option available for your application.

## Welding Conditions Selection Table – Typical TIG Weld With Filler Rod

1/16 - 1/8" plain carbon or stainless steel; 1/16" tungsten electrode

| Shielding Gas | Current level (amps) | Voltage (volts) |
|---|---|---|
| Argon | 80-150 | 11-13 |
| Praxair's HeliStar A-75 | 80-150 | 13-15 |
| Praxair's HeliStar A-50 | 80-150 | 15-17 |
| Praxair's HydroStar H-5 | 80-150 | 12-14 |

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