

# Fisher™ EHU Control Valves for Urea Plants

The Fisher EHU Series valve is specially designed for severe service applications in urea plants. These plants containing urea, ammonium carbamate and ammonia applications demand highly engineered valves in specialty alloys to provide long life in service. The EHU is engineered with specific features to provide long life and quick serviceability in the full range of applications found in urea synthesis processes.

The EHU valve body, bonnet and trim are available in several austenitic, super-austenitic and super-duplex stainless steels that are common in urea plants and are specified by some process licensors. Combined with a special urea service version of the industry-leading Fisher ENVIRO-SEAL™ live-loaded, low emissions packing, the EHU valve provides a design with maximum corrosion-resistance, friendly maintenance and protection against packing leaks.

To discuss available constructions, contact your Emerson sales office.

## Features

- **Forged Valve Body Design**-- EHU valves are designed with forged bodies to allow use of the highest grades of corrosion-resistant alloys, yield the longest life, and to facilitate full customization of the valves to fit each unique valve application.
- **Simple Maintenance**-- An optional removable bonnet and top-loaded plug of the EHU greatly improve maintainability by allowing top entry for simple removal and replacement of valve packing and plug/stem without having to completely remove the valve from the pipeline.
- **No Balance Seals**-- The unbalanced, contoured plug design eliminates any internal balance seals that may create crevice corrosion risks.

Figure 1. Fisher EHU Valve



Standard EHU Valve

EHU Valve with  
Optional Top-Entry  
Bonnet

- **Exceptional Packing Service Life**-- Fisher ENVIRO-SEAL live-loaded packing systems offer excellent stem sealing capabilities with robust packing rings. The EHU offers a double packing set to reduce abrasion wear. High-output Belleville springs provide consistent packing stress through many thermal cycles and also as packing wears, reducing the need for packing box adjustment and maintenance. Available in both PTFE and graphite configurations, the long life and reliability of these systems are designed to reduce maintenance costs and downtime.
- **One-Piece Plug and Stem**-- The plug and stem are machined from a single piece of material, eliminating any threaded joints, welds, and pins.

*(continued on page 3)*

**Specifications**

**Available Configurations**

EHU valve is a stem-guided, high-pressure, unbalanced angle valve, with a two-piece forged body design. It is available with a bonnet for top-entry access for trim maintenance, or as a bonnetless design

**Valve Body Sizes<sup>(2)</sup>**

NPS 2 through 12

**End Connection Styles<sup>(1,2)</sup>**

■ Lens Ring Flanges, ■ Flanged Ends: Ring-Type Joint (RTJ) or Raised-Face (RF) flanges according to ASME B16.5, and ■ EN flanges according to EN1092-1

**Maximum Inlet Pressures and Temperatures<sup>(1)</sup>**

As specified for the application. Valves can be rated in accordance with various ASME B16 or EN 1092 rating classifications

**Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4**

■ Class IV (standard), and ■ Class V (option)

**Flow Characteristic**

■ Linear, ■ Equal Percentage, and ■ Quick Opening

**Flow Direction**

Flow Up or Flow Down depending on application and installation

**Flow Coefficients**

Design as required

**Construction Materials<sup>(4)</sup>**

**Valve Body and Bonnet<sup>(1,2)</sup>**

■ S31603 (316L Urea Grade), ■ S31050 (25-22-2 SST), ■ S32906 Super Duplex SST (compare to Safurex<sup>®</sup>)

**Plug and Seat<sup>(1,2)</sup>**

■ S32550 Super Duplex SST with optional R31233 (Ultimet<sup>®</sup>) hard-facing, ■ HVD-1<sup>™</sup> super duplex SST, ■ S32906 super duplex SST (compare to Safurex), and ■ Zirconium<sup>(5)</sup>

**Stud and Nut**

■ SA193-B8M / SA194-8M, ■ SA-453 GR660 / SA194-Gr 7, ■ SA-193-B7 / SA194-2H

**Stem Guide Bushing**

PTFE / Carbon

**Valve Bonnet**

■ No bonnet (standard) and ■ Plain bonnet (option)

**Packing Arrangements**

ENVIRO-SEAL live-loaded packing

See table 3 for options

**Temperature Capabilities<sup>(1)</sup>**

Trim Combinations: See table 1

Bolting: See table 2

Packing: See figure 5

**Yoke Boss Diameter Sizes Available for Actuator Mounting**

■ 3-9/16 inch (90mm), ■ 5 inch or 5H (127mm), and ■ 7 inch (179mm)

**Options**

■ Valve body steam tracing<sup>(5)</sup>, and ■ Packing flushing connections<sup>(5)</sup>

1. Do not exceed the pressure or temperature limits listed in the valve specification sheet or nameplate, nor any applicable code or standard limitations.  
 2. Consult your [Emerson sales office](#) for additional options.  
 3. Intermediate rating above CL2500 available upon request. PN ratings also available per pressure requirements of EN1092-1. Consult your Emerson sales office for more information.  
 4. EN material options available upon request. Consult your Emerson sales office for more information.  
 5. For more information, contact your Emerson sales office.

## Features (cont.)

- **Simple Trim Configuration**-- Metal sealing joints and no gaskets in the trim eliminate potential corrosion risks in urea plant applications.
- **Available Body Heat Tracing and Packing Flushing Connections**-- To avoid crystallization of urea in the body and packing box, which can lead to packing damage, steam tracing connections are available on both the main body and the packing. Flushing connections are available in the packing.
- **Rugged Stem Guiding**-- The EHU features a heavy-duty guide bushing for stem stability.
- **Custom Design Capability**-- Urea Plant applications have fundamentally the same technology with slight differences among licensors. These differences lead to specific performance characteristics that require special control valve constructions. EHU valves can be custom-configured with special flow characteristics and actuator/valve response characteristics to meet particular plant specifications.

Figure 2. Fisher EHU Valve

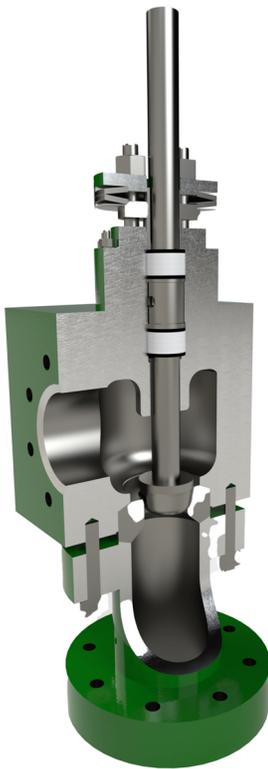
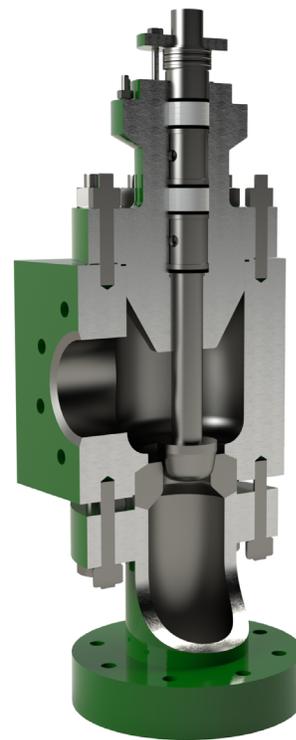
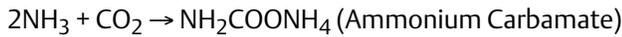


Figure 3. Fisher EHU Valve with Optional Top-Entry Bonnet

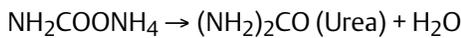


# Urea Synthesis Loop

The urea formation process involves two reactions. The primary one is the formation of ammonium carbamate, wherein carbon dioxide reacts with ammonia at high pressure. The reactants are kept at elevated pressures in order to avoid any disassociation of carbamate back into Ammonia and Carbon dioxide.



Secondly, ammonium carbamate is subjected to a dehydration process to form the urea.



These reactions take place in the urea reactor. Liquid ammonia is pumped to the reactor along with compressed carbon dioxide. The urea reactor is typically maintained at a pressure around 140 barg (2000 psi), and temperatures around 185° C (365° F). The reactor effluent will contain urea, significant amount of carbamate, water, and excess ammonia.

The reactor effluent flows to the stripper. The stripper helps in stripping out the unreacted carbamate, ammonia and carbon dioxide from the urea with the help of CO2 as stripping agent.

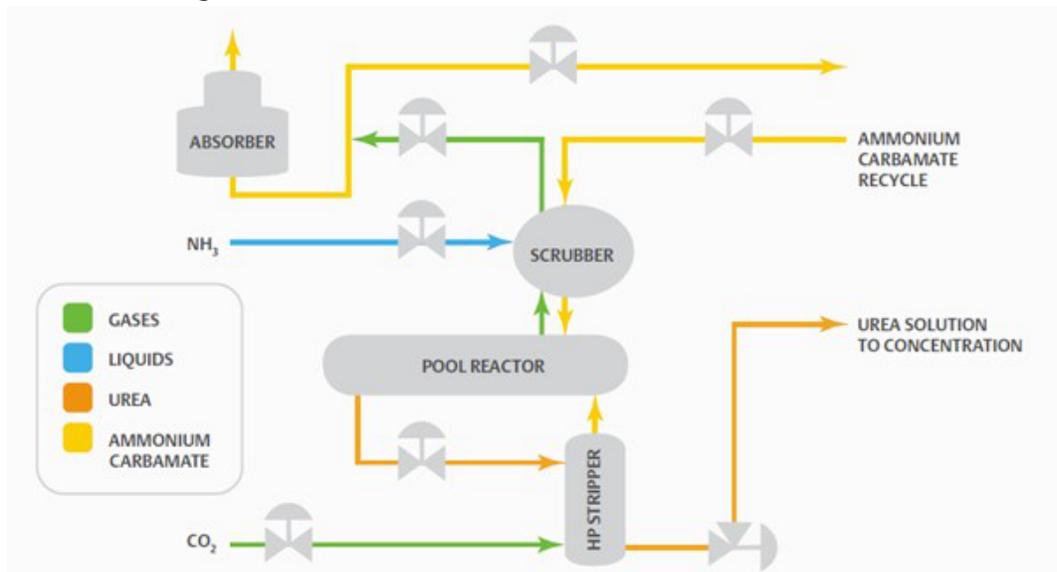
The stripper assembly will have parallel tubes which will be heated externally by steam. The reactor effluent enters from the top whereas the stripping agent Carbon dioxide enters the stripper at the bottom, counter-current to the effluent.

With the aid of heat produced by the steam around the tubes, the carbamate will be decomposed to ammonia and carbon dioxide.

As a result, only the urea solution leaves the stripper, and the flow is controlled by Urea Letdown Valve. All the other gases (Ammonia and Carbon dioxide) are carried out the top.

The gas stream then enters the Carbamate condenser along with some ammonia, recycled carbamate solution from Scrubber and a small stream of reactor effluent to avoid any solid carbamate deposition in the condenser. A partial condensation will be completed in the condenser and the mixture is then allowed to enter the bottom of the reactor, thereby completing the cycle.

Figure 4. Process Diagram



**Table 1. Construction Materials and Temperature Capabilities for Parts Other than Valve Body<sup>(1)</sup>**

| PART                | MATERIAL                          | MAXIMUM TEMPERATURE CAPABILITIES |             |
|---------------------|-----------------------------------|----------------------------------|-------------|
|                     |                                   | C°                               | F°          |
| Valve Plug and Stem | S32550                            | -29 to 260                       | -20 to 500  |
|                     | S32550 with R31233 seat and guide |                                  |             |
|                     | S32906                            |                                  |             |
|                     | HVD-1                             |                                  |             |
| Seat Ring           | S32550                            | -29 to 260                       | -20 to 500  |
|                     | S32550 with R31233 seat and guide |                                  |             |
|                     | S32906                            |                                  |             |
|                     | HVD-1                             |                                  |             |
| Stem Guide Bushing  | PTFE / carbon                     | -73 to 232                       | -100 to 450 |

1. Contact your [Emerson sales office](#) for additional options.

**Table 2. Temperature Capabilities of Valve Body Joint and Bonnet Bolting<sup>(1)</sup>**

| VALVE BODY AND BONNET MATERIAL | STUDS / NUTS     | MAXIMUM TEMPERATURE CAPABILITIES |            |
|--------------------------------|------------------|----------------------------------|------------|
|                                |                  | C°                               | F°         |
| 316L Urea Grade (316L Mod)     | B8M / 8M         | -29 to 260                       | -20 to 500 |
|                                | S66286 Grade 660 |                                  |            |
| S31050 (25-22-2)               | B8M / 8M         |                                  |            |
|                                | S66286 Grade 660 |                                  |            |
| S32906                         | B7 / 2H          |                                  |            |

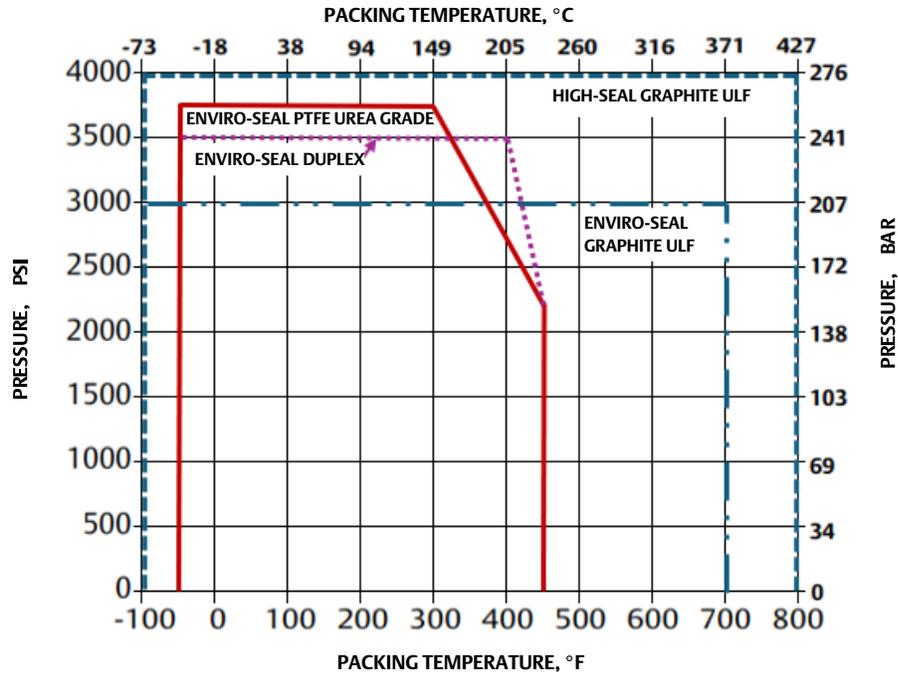
1. As applicable. Contact your [Emerson sales office](#) for additional options.

**Table 3. Packing Material Options<sup>(1)</sup>**

| PACKING TYPE                               | MATERIALS   |
|--|---|
| ENVIRO-SEAL Urea Grade Double PTFE Packing | Upper: Carbon-filled or Glass-filled PTFE V-Ring with Graphite Guide Bushings |
|  | Lower: Braided PTFE, with PTFE Lubrication                                    |
| ENVIRO-SEAL GRAPHITE ULF Packing           | Single Graphite Packing with PTFE Washers                                     |
| ENVIRO-Seal Duplex                         | Upper: Carbon-filled or Glass-filled PTFE V-Ring with Graphite Guide Bushings |
|  | Lower: Graphite with PTFE Washers   |

1. Contact your [Emerson sales office](#) for additional options.

Figure 5. Application Guidelines for EHU Packing



## Ordering Information

When ordering, specify:

1. Type of application
2. Controlled fluid, fluid specific gravity, and fluid phase at inlet and outlet of the valve
3. Maximum, normal, and minimum fluid flow rate
4. Inlet pressure and outlet pressure, or inlet pressure and pressure drop for each operating case
5. Fluid inlet temperature for each operating case
6. Shutoff classification required
7. Maximum pressure drop at shutoff
8. Design pressure and temperature, if different from operating conditions
9. Inlet and outlet pipeline size and schedule or thickness
10. Valve end connection type (Lens Ring, RJ, RTJ, etc.) and design standard or specification
11. Steam tracing connections, if applicable: Pipe size, end connection type, pressure rating, and temperature
12. If replacing an existing valve, supply the installed face-to-face dimensions and flow direction
13. Any applicable codes and standards required for the particular valve application

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