



ENGLISH

Model HRG

INSTALLATION, OPERATION & MAINTENANCE MANUAL



Before installation and operation, please read this manual and take note of all safety instructions. Wear required personal protective equipment during installation, operation, and maintenance. Use this product only if it is in good condition. Delta Controls Corporation is not liable for damage caused by improper or non-designated use.

Delta Controls Corporation reserves the right to modify technical data without prior notice.



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INSTALLATION

1. Components of the HRG Refractory Drilling System






NOTE

A brief video presentation of the steps of the complete nozzle preparation may be found at www.claustemp.com

				
HRG Drill Guide	Drill Bearings 24-430NY (lower) 24-431NY (upper)	Water Swivel Assembly 24-362ZZ	Core Drill 24-359AA	Drill Bit Extension 24-377AA
Bolts to the nozzle flange and guides the core drill to create a centered hole perpendicular to the flange.	These bearings center the core drill in the drill guide during drilling.	Attaches between the drill motor and the core drill to provide water to the interior of the drill for wet drilling.	22 inches (559 mm) long and 2.18 inches (55 mm) diameter core drill with diamond cutting matrix	Attaches between the water swivel and core drill. Used when the nozzle height plus refractory thickness is greater than 22 inches (559 mm). HRG Drilling Systems with the 'EXD' option have one or more of these extensions.

The following are other components of the Delta Controls Claus Thermal Reactor Thermocouple System referenced in this manual.

HTX, HTP, or HTV	HRW	HRS
		
Claus Thermal Reactor Thermocouple	Refractory Thermowell	Refractory Stop
Thermocouple assembly with mounting flange, body, flush connections, terminal enclosure housing and primary thermowell.	The large refractory thermowell collar rests in the refractory and protects the primary thermowell.	Installed on the nozzle prior to refractory installation to prevent castable from entering the nozzle.



2. Model Overview

The Delta Controls Model HRG Refractory Drilling System assures that the proper borehole will be created. The primary component is the Guide Assembly, which fastens to a 4 inch or 6 inch 150 or 300 class nozzle flange and features a guide tube extension that inserts down into the vessel nozzle to within approximately 1 inch (25 mm) of the refractory. The core drill with two nylon guide bearings is inserted into the guide tube which keeps the drill properly centered and aligned during the drilling. The proprietary diameter core drill has a very high diamond concentration and gives maximum footage and drilling speed in all types of wet drilling applications. The core bit is optimized at a high rpm (< 900 rpm).

Improper installation is the primary cause of failure of thermocouples installed in Claus Thermal Reactors. The main issue with the installation is the creation of the borehole through the refractory at the mounting nozzle. This hole must be of the proper inside diameter (ID), centered in the nozzle and perpendicular to the nozzle flange. Attempts to drill the hole by hand invariably produce inadequate results.

3. Pre-Installation

Prior to beginning the refractory drilling operation, it is important to examine the nozzle to verify that no insulating castable material has entered the base of the mounting nozzle and that the top (cold face) refractory surface is flush with the inside surface of the vessel shell [within about 0.25 inches (6 mm)]. This is important because certain components of the thermocouple system are built-to-order using the refractory thickness as a critical dimension. If the top surface of the refractory is not even with the inside of the vessel shell, the large outer HRW Refractory Well will then be positioned too high in the nozzle, likely resulting in breakage of the thermocouple due to mechanical interference as it is inserted into the nozzle. Any refractory extending into the base of the nozzle should be removed prior to drilling.

i NOTE

If the refractory installation has not yet begun, install the Delta Controls Model HRS Refractory Stop onto the flange and properly adjust it prior to beginning refractory work. The refractory stop will prevent castable material from entering the base of the nozzle.

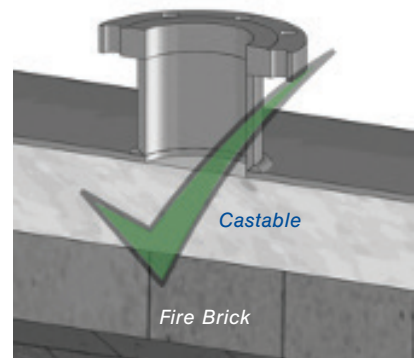
The base of the nozzle should appear as shown in illustration number “3” shown below.



1. Wrong. Castable has entered the nozzle.



2. Wrong. Castable completely fills the nozzle.



3. Wrong. Castable is flush with the inside of the reactor shell.



4. Preparation

After preparing the work site, the following must be secured:

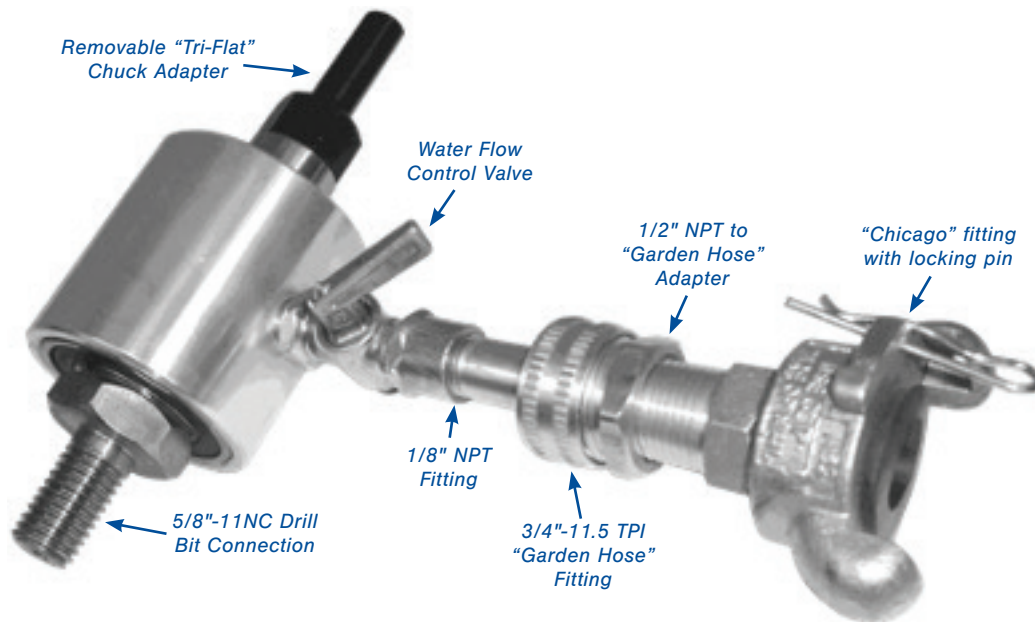
- A. **Either an electric or pneumatic drill motor or grinder** that is fitted with either a 1/2" chuck or a 5/8"-11NC male threaded shaft.
 - The drill motor should be fitted with an auxiliary side handle to maintain a firm grip in the event the drill bit would bind or stall.
 - If the drill/grinder is set up for the 5/8"-11NC thread, the tri-flat chuck adapter must be removed from the water swivel adapter. This is easily done using two adjustable wrenches. This exposes the 5/8"-11NC female thread in the top shaft of the water swivel adapter. Otherwise, the water swivel adapter is fitted with the tri-flat shaft that fits a 1/2" drill chuck.
- B. **The water and electric/pneumatic power** connections must be brought to the site.
- C. **Two sets of flange studs / nuts** to attach the drill guide flange to the nozzle flange.

i NOTE

For use on a 6" 300# flange, standard flange studs/nuts cannot be used. Instead, two 3/8" x 2-3/4" bolts with a special sleeve and nuts/washers (included with the 6" 300# flange installations) must be used to connect the two slots in the outer edge of the drill guide flange to two corresponding vessel flange bolt holes. The sleeve is used inside the flange bolt hole to center the 3/8" bolt which aids in centering the drill guide assembly on the vessel flange.

- D. **Hand tools:** adjustable wrenches for the attachment of flange nuts and bolts and pliers for hose fittings.
- E. **Water Connection:** The water swivel adapter is fitted with a flow control valve and a variety of adapters and connectors as shown on the next page. Use the appropriate adapters to connect to the water supply.

4.1 Water Swivel Adapter Assembly



4.2 Use of Water in Drilling

A small amount of water is supplied to the inside of the drill using a swivel adapter / flow control valve connected to a water supply hose. Drilling the hole with water promotes fast drilling and extends the life of the drill by preventing overheating of the diamond matrix. The required water flow is very small. Prior to inserting the drill into the guide, adjust the flow via the use of the water flow control valve; the flow should be the minimum continuous flow stream above a drip (approximately 60 ml/min or 1 GPH). A higher flow is acceptable.

i NOTE

Check with the refractory contractor to determine the compatibility of the mortar.
Drilling the hole without the use of water is possible, but drilling will be much slower and may require more than one core drill.

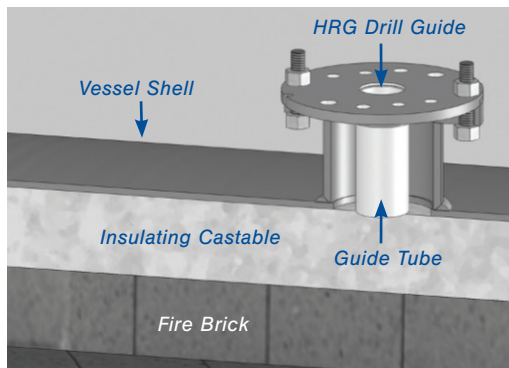
4.3 Drill Bit Extensions

If the vessel nozzle height plus the refractory thickness is greater than 22 inches (559 mm), a drill extension (Model option 'EXD') will be needed to completely drill through the refractory.

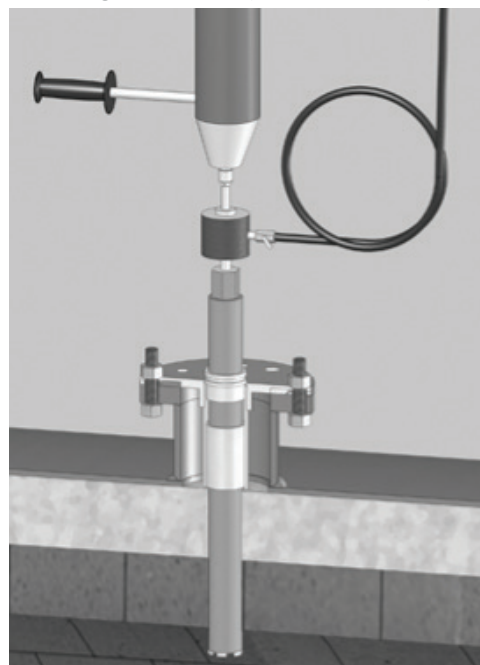
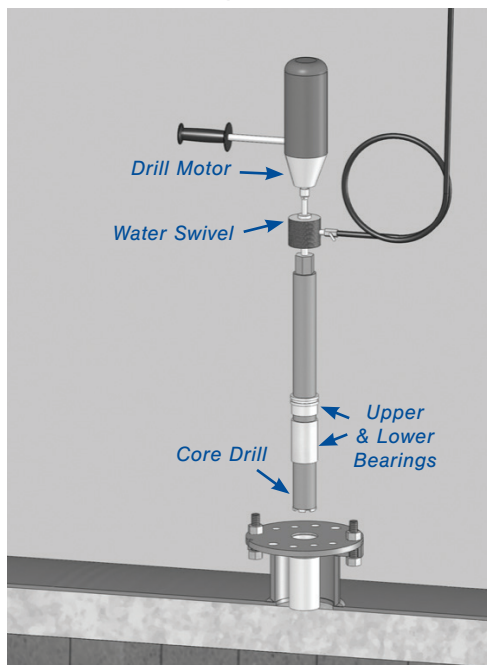


5. Using the HRG Drilling System

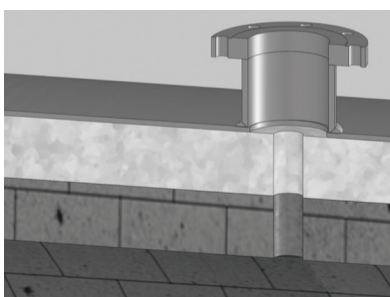
- A. Place Drill Guide on the Nozzle Flange and align it centered on the flange. Using two stud/nuts, tighten snugly (do not over tighten). The guide tube should not contact the refractory surface.



- B. Assemble the core drill to the water swivel. Apply lubricant (not supplied) to threads before assembly.
- C. Establish proper water flow, insert the core drill in the guide and begin drilling the hole. (Note: Ensure the lower bearing is inserted into the guide tube, and the upper bearing is secure in the guide flange.) Maintain consistent pressure on the drill for efficient coring. Periodically check and adjust the water flow.



- D. Remove the core drill and drill guide after penetrating through the first layer of refractory. Remove the refractory core piece. Re-assemble the guide flange on the nozzle and proceed coring the next layer of refractory. Repeat for multiple refractory layers..

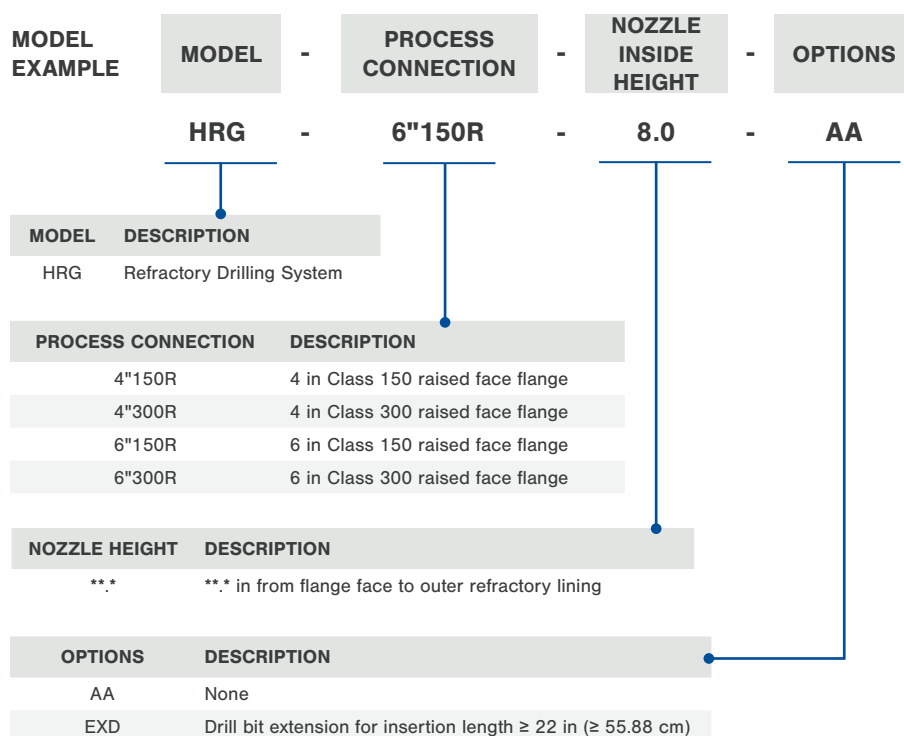


SPECIFICATIONS

6. Specifications

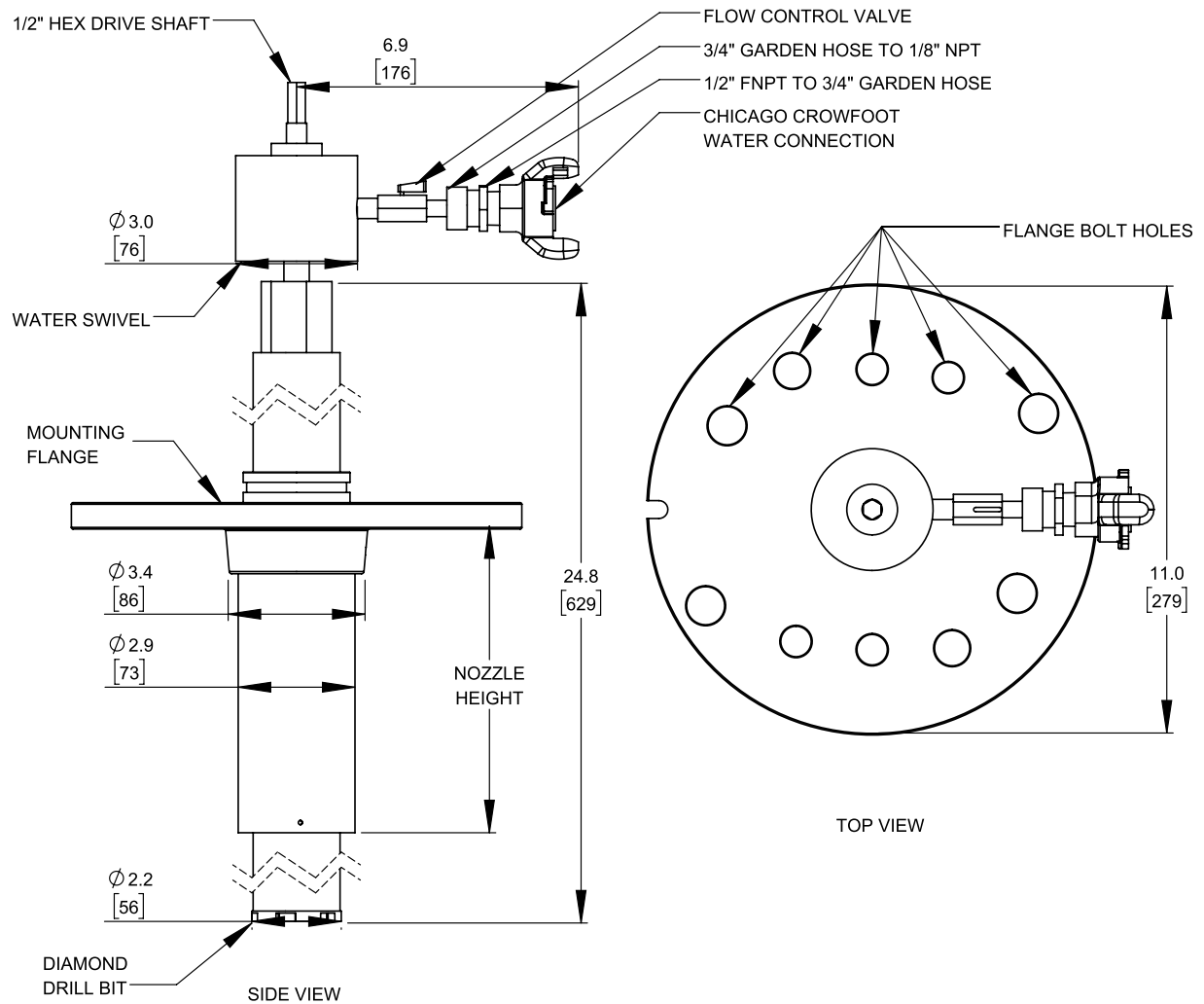
Flange Size:	ANSI 4 in Class 150 to 6 in Class 300 DIN 90 to 175 mm
Nozzle Inside Diameter:	≥ 3.44 in (≥ 87 mm)
Nozzle Height and Refractory Thickness:	≤ 22 in (559 mm) (option EXD if longer)
Refractory Thickness:	≤ 22 in (559 mm)
Hole Size:	2.20 in (56 mm)
Drill Bit:	Diamond core type, requires water flushing
Water Swivel:	0.625 - 11 TPI to 0.5 in tri-shaft drill drive shaft, 0.75 in - 11 NH Female Hose connector, flow control valve, quarter turn hose coupling
Drill Bit Extension (Length as Required):	12 in (300 mm), ≥ 24 in (600mm)

Model Numbering System





Model HRG Dimensional Drawing



Contact Us

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Delta Controls Corporation

585 Fortson Street, Shreveport, Louisiana 71107

Phone: 1-318-424-8471 / Email: inquiry@deltacnt.com

www.deltacnt.com/contact/



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