

Model HRG

Installation, Operation and Maintenance Manual








Delta Controls
CORPORATION

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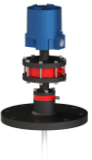


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Components of the HRG Refractory Drilling System

Model or P/N	Description	Notes
24-359AA	 Core Drill	22" (558mm) long, 2.18" (55 mm) diameter core drill with diamond cutting matrix
24-362ZZ	 Water Swivel Assembly	Attaches between the drill motor and the core drill to provide water to the interior of the drill for wet drilling.
HRG	 Drill Guide	Bolts to the nozzle flange and guides the core drill to create a centered hole perpendicular to the flange.
24-430NY (lower) 24-431NY (upper)	 Drill Bearings	These bearings center the core drill in the drill guide during drilling.
24-377AA	 Drill Extension	Attaches between the water swivel and core drill. Used when the nozzle height + refractory thickness is greater than 22" (559mm). HRG Drilling Systems with the –EX option have one or more of these extensions.

The following are other components of the HTP/HTX Claus Thermal Reactor Thermocouple System referenced in this manual.

HTP HTX		Claus Thermal Reaction Furnace Thermocouple	Thermocouple assembly with mounting flange, purge connections, terminal enclosure, housing, and element well. Models HTP and HTX are identical in operation, installation, and performance with only slight differences in dimensions.
HRW	HTP  HTX	Refractory Well	The large refractory well rests on the refractory and protects the element well.
HRS		Refractory Stop	Installed on the nozzle prior to refractory installation to prevent castable from entering the nozzle.

Spare Parts – Model HRG Refractory Drilling System

Item	Part Number	Description
1	24-359AA	Drill Bit, Diamond Matrix, 2.18" Diameter
2	24-431NY	Bearing, Upper, Sleeve Type Nylon with Flange Collar
3	24-430NY	Bearing, Lower, Sleeve Type Nylon
4	24-377AA	Extension, Drill Bit, 12" length

MODEL HRG REFRACTORY DRILLING SYSTEM

Improper installation is the primary cause of failure of thermocouples installed in Claus Thermal Reaction Furnaces. The main issue with the installation is the creation of the "bore-hole" through the refractory at the mounting nozzle. This hole **must** be of the proper ID, centered in the nozzle and perpendicular to the nozzle flange. Attempts to drill the hole 'by hand' invariably produce inadequate results.

The Delta Controls **Model HRG** Refractory Drilling System assures that the proper hole will be created. The primary component is the Guide Assembly, which fastens to a 4" or 6" 150 or 300 class nozzle flange and features a guide tube extension that inserts down into the vessel nozzle to within approximately 50 mm (2") of the refractory. A core drill with two nylon guide bearings is inserted into the guide tube which keeps the drill properly centered and aligned during the drilling.

Before Installation

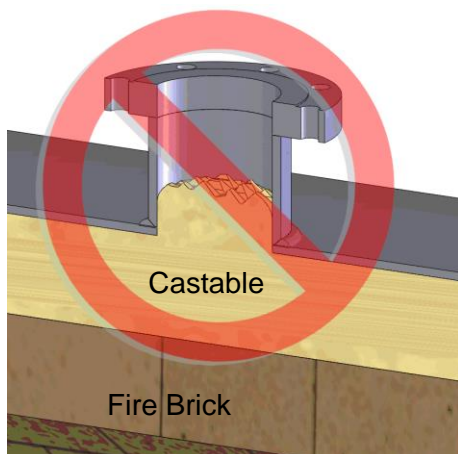
Prior to beginning the refractory drilling operation, it is important to examine the nozzle to verify that no insulating castable material has entered the base of the mounting nozzle and that the top (cold face) refractory surface is flush with the inside surface of the vessel shell (within about 6 mm (1/4"). 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.

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.

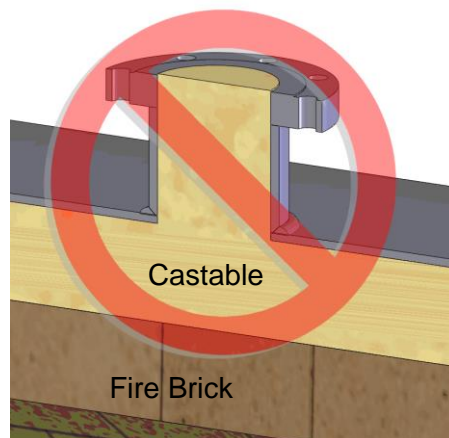
A brief animated presentation of the steps of the complete nozzle preparation may be found at

www.claustemp.com

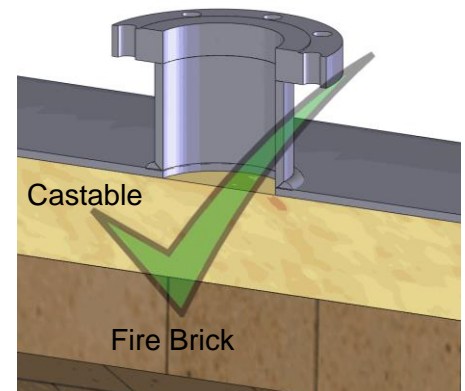
The base of the nozzle should appear as shown in illustration number "3" shown below.



1. Wrong. Castable has entered the nozzle.



2. Wrong. Castable completely fills the nozzle.

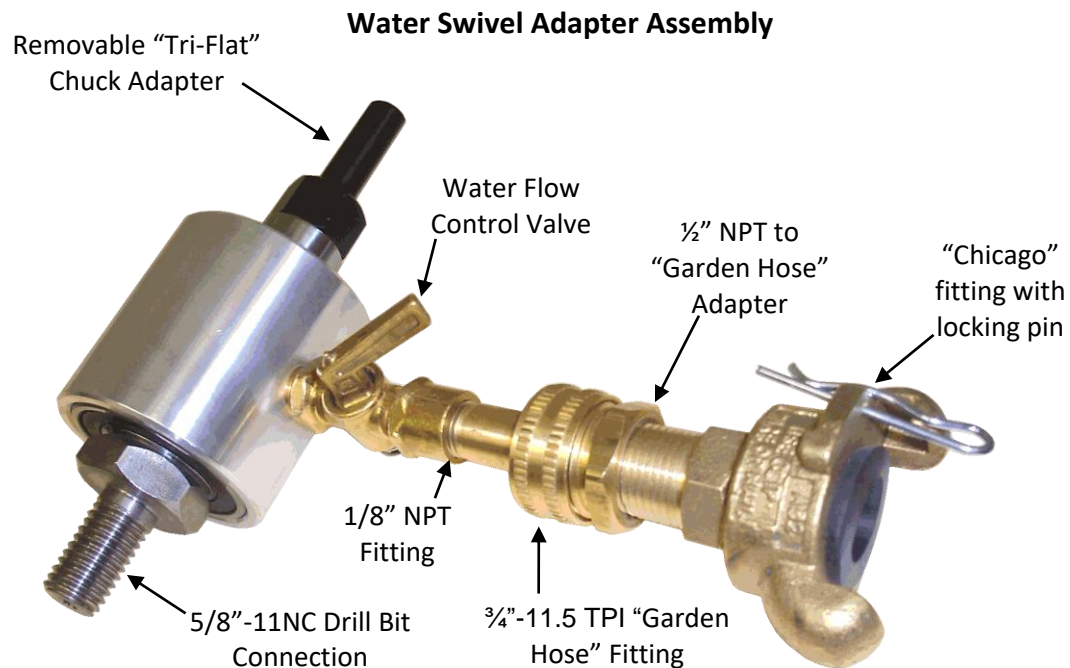


3. Correct. Castable is flush with the inside of the reactor shell.

Preparation

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

1. **Either an electric or pneumatic drill motor or grinder** that is fitted with either a ½" 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. The water swivel adapter is fitted with the tri-flat shaft that fits a ½" drill chuck. 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.
2. **The water and electric/pneumatic power** connections must be brought to the site.
3. **Two sets of flange studs / nuts** to attach the drill guide flange to the nozzle flange. (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 of the drill guide assembly on the vessel flange.)
4. **Hand tools:** adjustable wrenches for the attachment of flange nuts and bolts and pliers for hose fittings.
5. **Water Connection** - The water swivel adapter is fitted with a flow control valve and a variety of adapters and connectors as shown below. Use the appropriate adapters to connect to your water supply.



Use of Water in Drilling

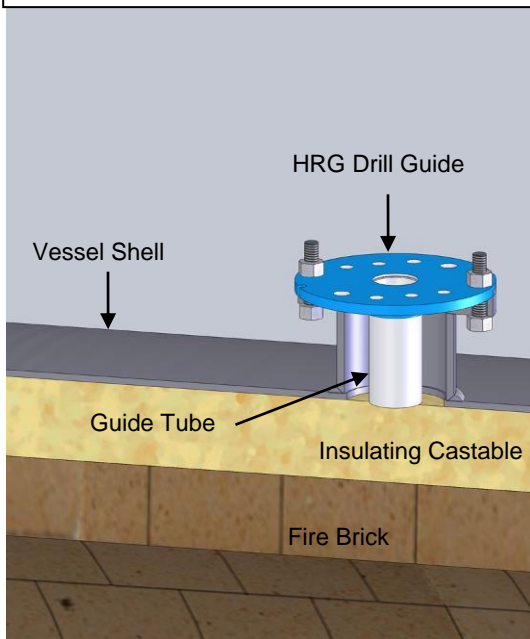
A small amount of water is supplied to the inside of the drill using a swivel adapter / flow valve connected to a water supply hose. Drilling the hole with water promotes fast drilling and extends the life of the drill by preventing overheating of the diamond matrix. The **required water flow** is very small – barely a trickle is needed. Prior to inserting the drill into the guide, adjust the flow via the use of the water valve; the flow should be the minimum continuous flow stream above a drip (approximately 60 ml/min or 1 GPH), but higher flow is acceptable. **NOTE:** Some refractory contractors will not permit the use of water as some types of heat-set mortar could be damaged by water. **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.

Drill Extensions

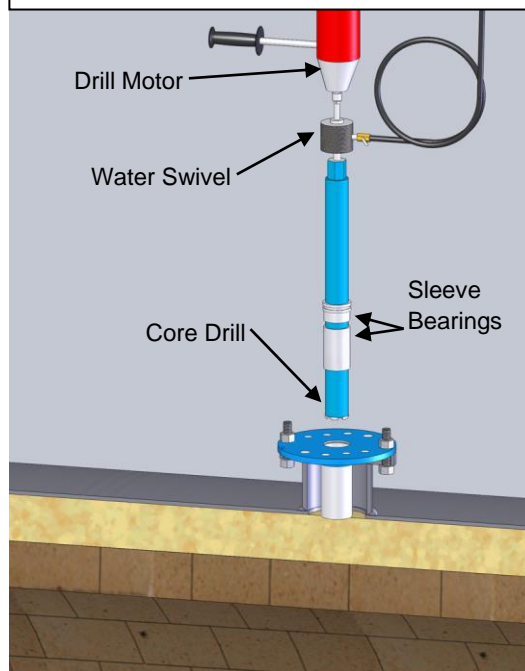
If the vessel nozzle height + refractory thickness is greater than 22 inches (550 mm), a drill extension (Model Suffix "EX") will be needed to completely drill through the refractory.

Using the HRG Drilling System

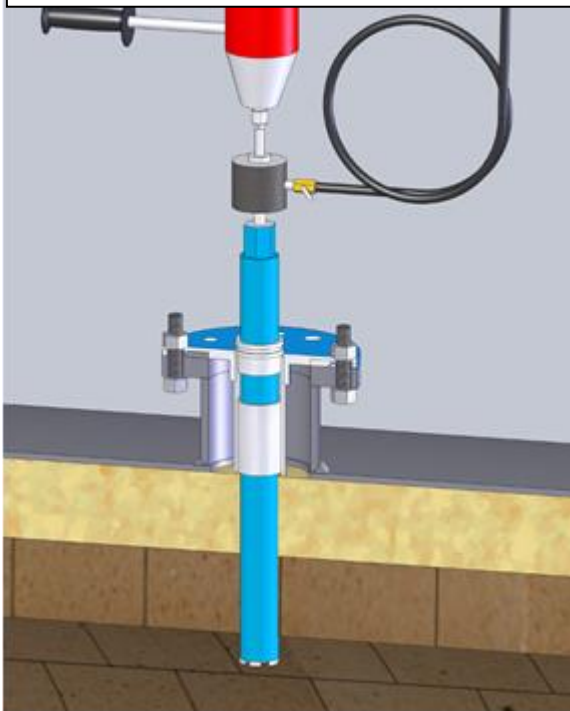
1. Place the Drill Guide on the Nozzle Flange and center it. Using two stud/nuts, tighten snugly (do not over tighten). The guide tube should not contact the refractory surface.



2. Establish proper water flow, insert the drill in the guide and begin drilling.



3. Drill the hole. (Note the position of the sleeve bearings in the guide tube.) Periodically check and adjust water flow



4. Remove the drill guide. The nozzle is ready for inspection and thermocouple installation.

