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OWNER'S MANUAL

VULCALOY IMMERSION HEATERS

TYPE 1789

1 - DESCRIPTION :

These VULCALOY immersion heaters consist of 3 heating pins installed on a triangular flange with sealed connections.

The connecting terminals are protected by a sealed insulating removable swivelling box which is insensitive to mechanical shocks and corrosive chemicals.

These heaters are particularly designed for heating aqueous liquids up to :

:	110°C,
:	10 bar (tested for 15 bar),
:	440 V nominal,
:	45 KW.

2 - TECHNICAL CHARACTERISTICS :

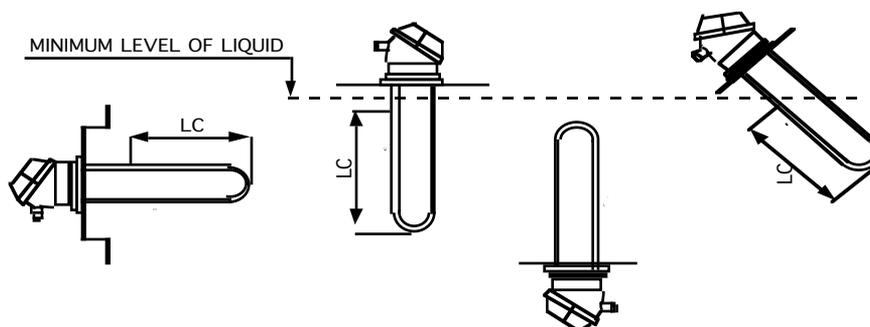
Consult our VULCALOY manual and drawing 1789 for standard heaters or the specific drawing for special heaters.

3 - INSTALLATION AND CONNECTION :

3 - 1 - BEFORE INSTALLATION : Check that :

- The operating conditions do not exceed the limits mentioned in paragraph 1.
- You have :
 - either the screw-type adapter (dia. 77 x 200, 2 1/2" BSP) for replacement of a screw type immersion heater,
 - or the welding type immersion heater for a new installation (the accessories form part of our supplies).
- Its installation is designed so that the heating length (Lc) is always submerged when the heater is energized. Vertical installations (particularly head up) or oblique installations are difficult. It is preferable to plan a set-up so that a possible air or vapour pocket can be emptied automatically.

For installation on a tap, the nonheating length should be slightly greater than the length of the tap sleeve.



- The seal is in place and compatible with the heated product at the operating temperature under consideration.
- The power supply voltage corresponds to the voltage for which the immersion heater has been designed (the individual voltages of the pins is marked on the flange). For particular couplings, see paragraph 3.3.

NOTE :

be Mainly in special applications (such as heating of aqueous, acid, basic or chloric solutions) check that the materials composing the immersion heater and its load (w/cm²) are compatible with the fluids to be heated, depending on the operating conditions (if necessary, do not hesitate to consult our technical department).

To limit the heating elements furring, the safety system must allow a sudden cut of the electric supply during one minute every 4 hours

3 - 2 - **INSTALLATION :**

- When possible, choose the horizontal set-up :
In this case, for dimensions $A > 1000$ mm, installation and removal will be simplified if a supporting guide or cradle are provided, designed to prevent damage to the sheathing. This support will also compensate for the overhang of the heating elements. It is advisable to calculate its length as $2/3$ of dimension A.
- Do not forget the seal on the circuit side at installation and check its position at tightening.
- The same holds good for the box seal on the terminal side flange. (For standard heaters the box is factory mounted).
- If the tank is heat-lagged, leave free space around the box for free circulation of the air. We advise you to use our weldable adapter which allows for a heat-lag thickness up to 65 mm.
- Since the box can be freely positioned, as far as possible keep the compression gland down.
- For heating by circulation in a closed circuit, provide the safety devices required by the regulations, particularly meant to prevent overpressure in case of overheating (valve, bleed valves, expansion chamber, etc.).

3 - 2 - 1 - **First installation :**

Using the welding type adapter (VULCANIC accessory : P/N 1789.97 or 96), horizontal installation to be selected whenever possible.

Do not forget the triangular adapter before welding the coupling ring.

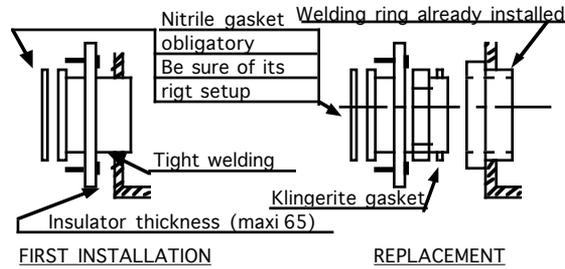
3 - 2 - 2 - **Replacement of the screw type immersion heater (dia. 77 x 200, 2 1/2" BSP) :**
(VULCANIC accessory : P/N 1789.98, 88, 99 or 89)

Screw on the adapter (corresponding to the diameter and pitch of the welding type ring in place) after installation of the klingerit seal and tighten with an open ended wrench.

If a sleeve is used : check that its length is not more than that of the non-heating length of the inversion heater to be installed, less 50 mm (to avoid heating inside this sleeve).

NOTE : The first seal has a pressure adhesive surface to be applied against the adapter after removing the protective paper.

- : You are recommended to restrict the torque applied to tighten the securing nuts to 1.5 m x kg, particularly when using flanges or seals other than those recommended by VULCANIC (excessive distortion of the flange would compromise the impermeability).



3 - 3 - CONNECTION :

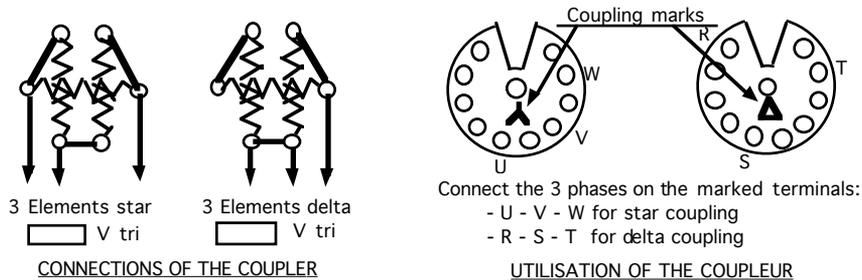
3 - 3 - 1 - Three-phase supply :

- The electrical connection of these VULCALOY immersion heaters to a 3-phase supply has been made very simple and fast while reducing to a minimum the risk of wiring errors. In fact, the "Y - DELTA" coupler allows for a Y or DELTA connection by simply turning over the coupler.

This coupler is fitted with a polarizing key which allows only one position. When the coupler has been installed, the type of coupling is indicated by a sign on the visible face :

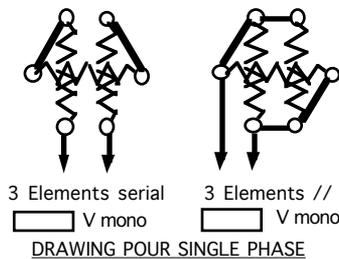
On the "Y - DELTA" coupler : Y = Stat
: Δ = delta

The three terminals to be connected are clearly marked on the coupler.



3 - 3 - 2 - Single-phase supply :

Remove the "Y-DELTA" coupler and make one of the connections indicated in the drawing opposite.



IMPORTANT NOTES

- On the flange of each immersion heater are marked :
 - the nominal power of the immersion heaters which is equal to 3 times the power of a pin supplied at its nominal voltage.
 - The voltage in the form : xxx/yyy :
 - : where xxx is the nominal voltage of each pin and
 - : yyy is the 3-phase voltage for the Y coupling
(hence $yyy = 3^{1/2}.xxx$)

For high powers (beyond 24 KW in general) the voltage is in the form xxx V 3 Ph and requires a delta coupling to obtain the nominal power.

- To calculate the resulting power, remember that it varies with the square of the voltage. As an example, consult the following table for standard immersion heaters :

POSSIBLES POWERS AND LOADS ACCORDING COUPLING RING POSITION FOR STANDARDIZED VULCALOY													
W/Cm ² kW		Nominals powers and voltage (kW et v)											
		230/400 V TRI											
		3	4,5	6	9	12	15	18	21	24	30	36	45
Dissipated power in kW and load in W/Cm ²	COUPLING // 230 V MONO	12	12	12	12	12	12	12	12	12	10	4	4
	COUPLING // 400 V MONO	FORBIDDEN											
	COUPLING SERIAL 230 V MONO	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	0,4	0,4	0,4
	COUPLING SERIAL 400 V MONO	4	4	4	4	4	4	4	4	4	1,3	1,3	1,3
		1	1,5	2	3	4	5	6	7	8	3,3	4	5
WARNING : HIGT INTENSITY													

RECOMMENDATIONS

- Take care to connect the ground terminal at the centre of the coupler to the installation earth.
- Tighten the connections on the heating elements.
- When selecting the connecting cable, make allowance for a temperature in the box about 20 to 50°C higher than the external ambient temperature.
- We strongly recommend installation of a thermostat or safety controller, distinct from the main control device, and irreversibly cutting off the power supply on detection of overheating.

4 - SETTING INTO SERVICE PROCEDURES :

4 - 1 - PRECAUTIONS TO BE TAKEN BEFORE SETTING INTO SERVICE :

Heating of a liquid in natural convection :

In no case should the immersion heater be energized without the heating section being totally immersed (the installation of a level control is strongly recommended, a degassing valve or a manual bleeding device is necessary).

The thermostat or safety controller has been set to a temperature slightly higher than the operating temperature.

Heating of a liquid or gas in forced convection :

In no case should be immersion heater be energized unless the minimum calculated flow is ensured (the installation of a flow controller is strongly recommended ; a bleed valve is often indispensable for liquids).

Check that the whole heating length is bathed by the fluid.

The thermostat or safety controller has been set to a temperature higher than the operating temperature.

4 - 2 - SETTING INTO SERVICE :

Switch on the immersion heater. Immediately check that the line current is in conformity with the calculations and set the control devices accordingly.

After stabilization of the nominal operating temperature :

- manually cut off the safety thermostat (or controller) and set it about 10°C above this value, without however exceeding the boiling point of the fluid at the pressure under consideration,
- for heating of a liquid or gas with forced convection, check that a drop in the flow below the minimum obtained by the heat exchange calculations necessarily switches off the heating.

4 - 3 - SWITCHING OFF THE INSTALLATION (forced convection) :

For heating of a liquid and particularly of a gas, with forced convection, it is necessary to maintain the flow of fluid for a few minutes after the immersion heater has been switched off in order to eliminate the heat accumulated in the heating elements.

Under certain conditions, non-observance of this rule could lead to damage to the immersion heater or its environment, or even danger to the user.

5 - MAINTENANCE :

After 50 hours of operation :

.Check that all the connections are tight.

Every six months :

.Same operation as the previous paragraph.

At least once a year, more frequently It required :

.For heating of liquids, disassemble the immersion heater and clean the heating elements carefully if sludge or fur has been deposited on them (risk of considerably shortening the lifetime of the heating elements by obstruction of heat exchange with the liquid).

.If necessary, remove the sludges formed at the bottom of the tank (or heater).

.After assembly of the immersion heater, observe the setting into service instructions in paragraph 4.

6 - GUARANTEE

The guarantee is in conformity with the inter-union agreement of (french) Electrical Equipment Manufacturers.

Taking into account the number of tests performed by our quality control department during manufacture and before forwarding, the probability of fallure of our equipment is very low.

We guarantee conformity of our equipment and the surface treatment, if any, as defined in our documents.

However, we do not cover damage resulting from :

- operation at voltages more than 5 % higher than the nominal voltage,
- wear due to lack of maintenance, shocks, clumsiness or inexperience of the user,
- corrosion (including that due to sanitary water) or furring (unless covered by a particular contract extending the guarantee),

because of the diversity of the parameters involved which escape our control.