

Instructions

11-E086-35-880

August 1980

Water cooled crystal holder accessory

Code number 11-E086-35-000

The water cooled crystal holder is an essential accessory for the film thickness monitors FTM2 and FTM3, housing the monitor crystal and protecting it from heat and electric fields.

Data

Crystal	6MHz Nickel plated copper with stainless steel cover; Edwards specification 07-D311-00-083.
Enclosure	Aperture 6.4mm diameter defines exposed area of crystal.
Mounting	One leadthrough, body diameter 26.7mm. O-ring seal, VIT0215, code number 08-H021-06-025 (packet of 5).
Leak rate	Less than 10^{-9} l sec ⁻¹ .
Cooling water	12 l h ⁻¹ at 2.75 bar; maximum supply temperature 30°C. Temperature of outflow must not exceed 60°C. Stainless steel 0.75mm mesh filter fitted in flow connexion.
Weight	450 g approx.

Installation

Read this section before starting the installation.

Inside the vacuum chamber, the installation is simple in principle, but not always in practice. The object is to mount the monitor crystal where it will receive the evaporant in the same way as the substrates to be coated, but careful precautions may be needed to achieve this reliably and without hazard to the apparatus or operator.

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The crystal is mounted in a metal enclosure which is cooled by water flowing at about 0.25 lmin^{-1} . An aperture (6.4 mm diameter) defines the area of the crystal which is exposed and receives the evaporant. This face of the crystal is earthed via the enclosure. The crystal and the connecting leads from the back of the crystal are completely screened by the enclosure and the copper tubing which encloses the lead to the baseplate lead-through, where the screening is completed by a vacuum-tight coaxial connector.

HAZARDS

An Edwards water cooled crystal holder gives excellent protection against the electrical and thermal hazards discussed below.

Electrical Some vacuum chamber accessories could induce voltages into the monitor crystal and its leads sufficient to burn out the protective devices in the monitor oscillator. A further possible cause of induced voltages is the inadvertent short circuiting to earth and resultant arcing of any HT supply within the chamber. It is important to maintain the HT insulation in good condition and to keep HT leads well spaced from metal objects.

Thermal Heat from any source in the chamber can affect the monitor crystal frequency and steps should be taken to minimize temperature changes during the deposition process. This is achieved by using a water cooled enclosure around the monitor crystal; it ensures that the heat acquired from the deposited film is quickly absorbed. It also largely protects the crystal from radiant heat from the evaporant source and the substrate heater.

An evaporation source heater shield is also useful and can be fabricated from thin molybdenum or stainless steel sheet which can usually be supported by the heater clamp nut. Two holes will be needed in the shield: a fixing hole and another immediately above the evaporant. The diameter and position of the latter hole must be determined so that the passage of the evaporated vapour to both crystal and substrate is unobstructed. The shield should preferably be in good thermal contact with the chamber base.

Monitor Crystal Installation The crystal support should in all cases meet the following requirements:

1. The crystal must be located in a definite, reproducible position relative to the evaporant source and the substrates, preferably at the same distance as the substrates from the source.
2. The crystal position should preferably be adjustable over a small range to facilitate setting up.
3. The holder should be accessible so that the crystal can easily be inserted or withdrawn.
4. The face of the crystal should preferably be at right angles to the line of sight to the evaporant source.
5. The cooling water pipes and the electrical connexions should be securely supported.

Crystal Position If reproducible results are to be achieved, the crystal must be mounted in a fixed position relative to the evaporant source and the substrates, so that when a new crystal is fitted the geometry is not changed.

The position chosen should, as far as possible, be representative of the positions occupied by all the substrates in each batch to be coated.

The distance from the evaporant source is important, because the mass deposited (on a given area) is inversely proportional to the square of the distance from the source. An increase of 5% in the distance will therefore cause a decrease of 10% in the mass deposited.

The crystal face should also be at right angles to the line-of-sight to the evaporant source, because the effective area of the crystal presented to the source is proportional to the cosine of the angle of incidence of the evaporant.

Electrical Connexions The crystal has two connexions, 'live' and earth. The centre conductor of the coaxial lead is live, the sheath is earthed.

The side of the crystal which receives the evaporant must be earthed. This condition is satisfied by the Edwards water-cooled crystal holder.

Mechanical assembly

1. Remove the nut and collar from the leadthrough of the accessory.
2. Check that the O-ring is well seated in the flange groove.
3. Locate the leadthrough in one of the blank positions in the baseplate of the vacuum chamber. Fit the collar and nut; tighten to give a leak-tight and mechanically secure joint.
4. Position the crystal holder where required by gently bending or expanding the spiral copper tubes, if necessary.
5. Two tapped holes (M3 thread) with screws are provided in the head of the crystal holder. These may be employed to attach a support bracket from a convenient fixture for extra rigidity.
6. Use the flexible tube supplied to connect the water inlet pipe (marked with a groove) and the outlet pipe into the water line systems of the coating unit. See figure 1.
7. Secure the flexible tubes with the hose clips supplied.
8. Connect the flexible electrical lead to the monitor oscillator of the film thickness monitor.

Fitting the crystal

1. Remove the cover from the water cooled enclosure; gently spring the cover free of the two small dimples and slide off the cover.
2. Remove the metal can from the crystal unit, but avoid touching the crystal itself.
3. The two contact pins on the crystal mount fit into the socket in the water cooled enclosure.
4. The crystal is offset on its base; insert it so that the face is directed towards the aperture in the water-cooled block.
5. Hold the crystal unit by the ends of its base. Tilt it to engage the pins in the socket and gently press them home.
6. Replace the cover on the enclosure.

List of fittings required for attachment to E610 coater

	Code numbers
4 Hose clips type '00'	11-A224-26-101
2 Dowty seals $\frac{3}{8}$ inch BSP	11-H035-04-003
1 Nylon reinforced PVC tube length 4m	11-H015-02-011
2 Parallel male stud brass nozzles $\frac{3}{8}$ inch BSP	11-H035-02-046

List of fittings required for attachment to E306A coater

	Code numbers
4 Hose clips type '00'	11-A224-26-101
1 Nylon reinforced PVC tube length 4m	11-H015-02-011
2 Brass nozzles with swivel nut	11-H035-02-560
2 Brass equal tees	11-E006-01-016

COMMUNICATION WITH EDWARDS

Any communication relating to the subject of these instructions should be addressed to Edwards High Vacuum or to the supplier from whom it was purchased.

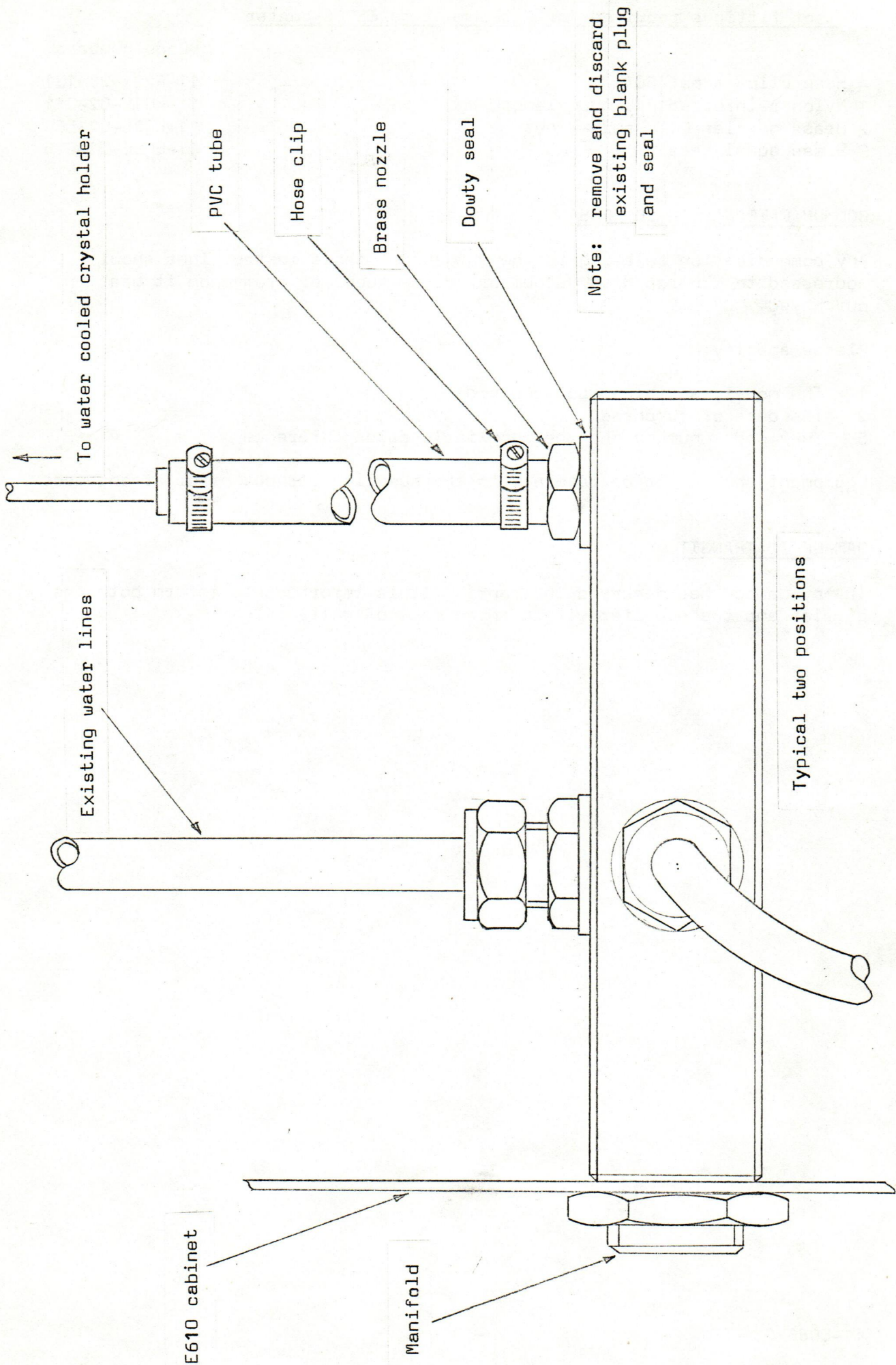
Please specify:

- 1 The model, serial number and code
- 2 The date of purchase
- 3 Your order number and the supplier's sales reference

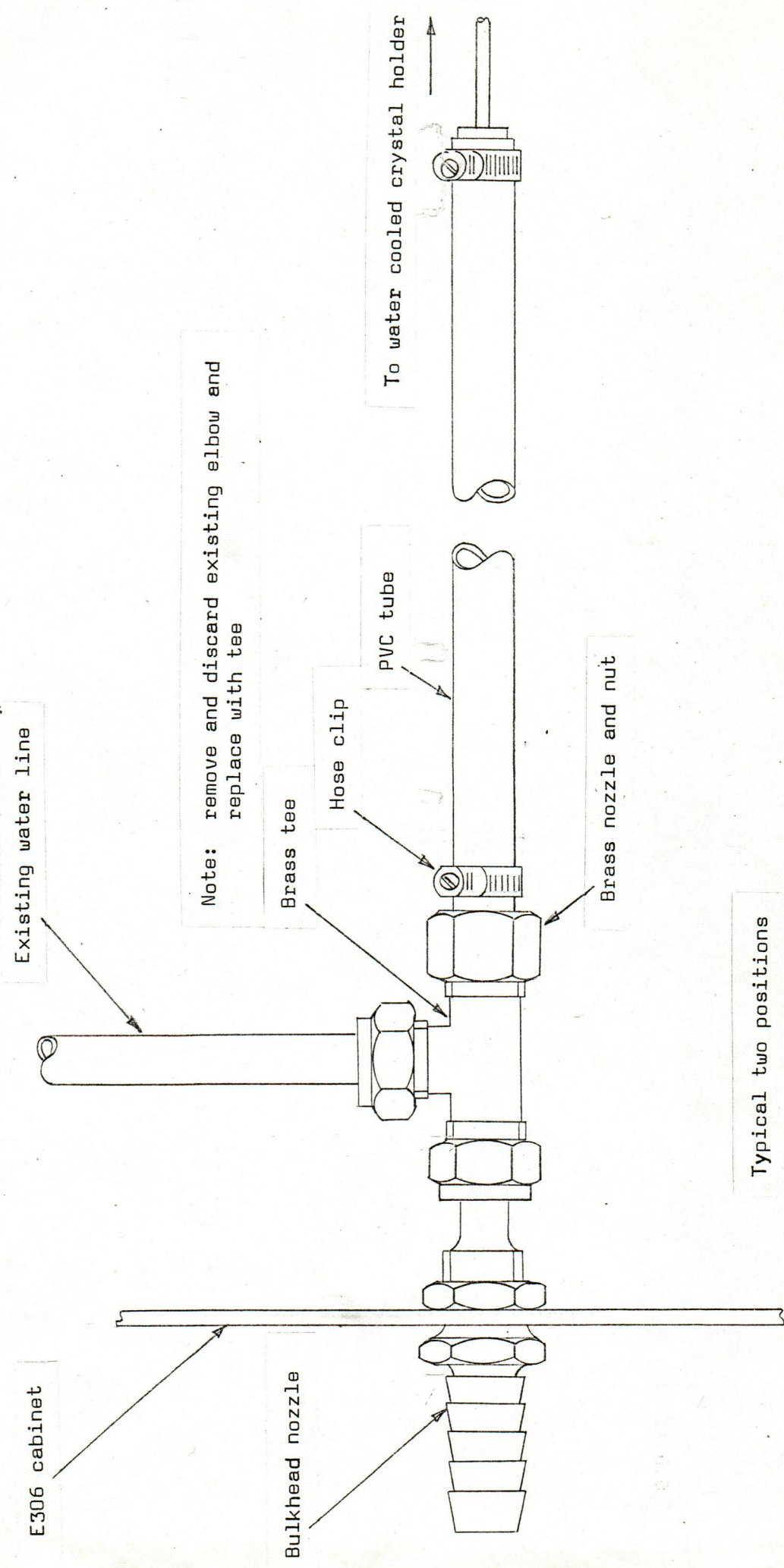
Equipment should not be returned to the supplier without prior arrangement.

DAMAGE IN TRANSIT

If any damage has occurred in transit, it is important to inform both the carrier and the supplier within three days of delivery.



Water cooling assembly for E610 cooler



Existing water line

Note: remove and discard existing elbow and replace with tee

Brass tee

Hose clip

PVC tube

Brass nozzle and nut

To water cooled crystal holder

E306 cabinet

Bulkhead nozzle

Typical two positions

Water cooled crystal holder for E306A coater