International Standard 6570/2

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Natural gas — Determination of potential hydrocarbon liquid content — Part 2 : Weighing method

Gaz naturel — Détermination de la teneur en hydrocarbures liquides potentiels — Partie 2 : Méthode par pesée

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6570/2 was developed by Technical Committee ISO/TC 158, *Analysis of gases*, and was circulated to the member bodies in May 1982.

It has been approved by the member bodies of the following countries :

Australia	Germany, F.R.	South Africa, Rep. of
Belgium	Ireland	Thailand
Cuba	Italy	United Kingdom
Czechoslovakia	Korea, Rep. of	USSR
France	Mexico	

No member body expressed disapproval of the document.

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Natural gas — Determination of potential hydrocarbon liquid content — Part 2 : Weighing method

1 Scope and field of application

This part of ISO 6570 specifies a weighing method for the determination of the potential hydrocarbon liquid content of natural gas.

Weighing is carried out manually but any automatic weighing method can be used provided that the accuracy of the determination is not affected.

The principles of, and general requirements for, methods for the determination of the potential hydrocarbon liquid content are described in ISO 6570/1. An alternative volumetric method for the determination of potential hydrocarbon liquid content is specified in ISO 6570/3.

2 References

ISO 6570/1, *Natural gas — Determination of potential hydrocarbon liquid content — Part 1 : Principles and general requirements.*

ISO 6570/3, *Natural gas — Determination of potential hydrocarbon liquid content — Part 3 : Volumetric method.*

3 Principle

See ISO 6570/1.

The quantity of liquid accumulated during the measuring period is determined by comparing the mass of the condensate separator at the start and at the end of a measuring period.

In order to check the efficiency of separator, a checking filter (glass wool filter) may be installed downstream of the separator in the same thermostatically controlled bath. Experience has shown that this filter may be necessary when measurements are carried out immediately downstream of a pressure reducer in order to catch any fine mist which may be present.

4 Apparatus

WARNING — The apparatus shall comply with relevant safety regulations.

The general arrangement of the measuring installation is shown in figure 1.

The measuring installation shall meet the general requirements set out in ISO 6570/1.

The separator and filter specified in 4.1 and 4.3 respectively are intended for use at a maximum working pressure of 8 MPa. The actual equipment used shall have been tested to an appropriate higher maximum pressure in accordance with the requirements of national safety regulations and shown to be safe.

In addition, the following equipment is required.

4.1 Cooling coil and cyclone separator (see figure 2)

The sample shall be cooled to the desired measuring temperature by passing it through a coiled tube in a cooling bath. This cooling coil shall be of internal diameter 2 to 4 mm and length 2,5 m. (These dimensions have been chosen so that the gas has accurately assumed the temperature of the bath at the end of the coil when passed at a flow rate up to 1,5 m^3/h.)

NOTE — Unless otherwise specified, gas volumes are in cubic metres at 273,15 K and 101 325 Pa.

The cyclone separator, which is permanently connected to the cooling coil, shall have an inlet of diameter 1 mm in order to obtain sufficient centrifugal action as the sample enters the separator barrel. Provision can be made for measuring or recording the gas temperature in the barrel (see figure 3).

NOTE — The separator shown in figure 2 has been tested at pressures up to 25 MPa.

4.2 Glass wool filter (see figure 4)

The glass wool filter shall be packed with chemically pure, fine glass wool fibre. The glass wool block shall be compressed by means of a screw. The glass wool filter shall be immersed in the same bath as the cyclone separator. The line connecting the separator and glass wool filter shall be as short as possible.

NOTE — The filter shown in figure 4 has been tested at pressures up to 25 MPa.

4.3 Balance

A balance capable of weighing 2 kg with an accuracy of 0,01 g is required.

5 Sampling

The general conditions for representative sampling set out in ISO 6570/1 shall be complied with.

After the equipment has been connected and filled with gas to the operating pressure, check for leaks using a soap solution. When using a sample from a cylinder, it is advantageous to use nitrogen for checking leakage to conserve the sample gas.

6 Procedure

It is essential that the precautions specified in ISO 6570/1 are observed.

6.1 Cleaning of the separator

Carefully clean the cooling coil, the separator and, if used, the glass wool filter, internally and externally, and dry them before commencing the determination. For internal cleaning of filters which have already been used, washing with a solvent (pentane or any other solvent harmless to the O-ring joints) is suitable. For evaporation of residual cleaning solvents, hot air or gas may be used. Drying of the glass wool filter may require about 1 h ; drying of the separator may require 30 min. The cooling liquid in the temperature controlled bath shall be water with an added anti-freezing agent. Monoethylene glycol is a suitable anti-freezing agent and is easily removed from the external surfaces of the separator and filter prior to weighing.

6.2 Determination of the initial mass of the separator

After cleaning and drying, place the cooling coil, separator and glass wool filter in the cooling bath and connect them to the measuring installation.

When they have assumed the temperature of the bath (after about 10 min), bring the pressure of the gas in the separator to the measuring pressure.

This can be done very accurately by starting at a slightly higher pressure and then venting as much gas as required via the gas-meter until the pressure gauge shows the desired measuring pressure.

When no excess pressure is available, the separator and filter shall be weighed at a pressure slightly lower than the measuring pressure.

Close the inlet and outlet valves of the cooling coil, separator and glass wool filter.

Disconnect the separator, cooling coil and glass wool filter, including the valves, remove them from the bath and immerse them in a tank containing clean water, in order to wash off the anti-freezing agent and also to check for gas leakage.

Clean the outsides, remove the cooling coil, separator and glass wool filter from the bath and dry. Determine the mass of the cooling coil and separator containing gas and the mass of the filter containing gas.

6.3 Determination

Replace the cooling coil, separator and glass wool filter in the cooling bath and connect them to the measuring installation. Allow the gas to flow through the measuring installation at a flow rate which should usually be between 0,5 and 1,5 m^3/h. It is preferable to pass at least 10 m^3 of gas through the installation or to collect at least 1 g of liquid.

When sufficient gas has been passed, stop the flow and ensure that the static gas pressure in the installation is equal to the pressure at which the mass of the cooling coil and separator was determined. Close the valves.

Disconnect the cooling coil, separator and glass wool filter, wash them in water, clean and dry the outsides in the same manner as in 6.2. Determine the mass of the cooling coil and separator, and the mass of the glass wool filter. The difference between the recorded masses of the glass wool filter should not be more than 2 % of the difference between the recorded masses of the cooling coiling and separator.

7 Expression of results

The potential hydrocarbon liquid content at the measured pressure and temperature is given by the formula

$$\frac{m_2 - m_1}{V}$$

where

m_1 is the mass, in grams, of the cooling coil and separator containing sample gas, before the determination;

m_2 is the mass, in grams, of the cooling coil and separator after the determination;

V is the volume, in cubic metres, at 273,15 K and 101 325 Pa of the sample gas passed though the apparatus during the measuring period.

NOTE — At the end of the measurement, less gas is contained by the cooling coil and separator than at the beginning, since part of the gas

has been displaced by liquid. This should be taken into account by calculating the actual mass of liquid collected using the formula

$$m_c = \frac{\Delta m}{1 - \frac{\varrho_g}{\varrho_c}}$$

where

m_c is the actual mass of condensate collected;

Δm is the increase in mass of the cooling coil and the separator;

ϱ_g is the density of the gas at the measuring pressure;

ϱ_c is the density of the condensate.

The correction has only a limited influence on the final result, and, therefore, for calculating the correction, approximate values of the densities of the gas and condensate may be used.

8 Determination of water formation

If the amount of water formed under the measuring conditions is such that no hydrate formation occurs, it can be determined as follows.

Carry out two determinations in parallel, using a drying tube in one and not in the other (see subclause 6.4 of ISO 6570/1). The difference in mass between the two tubes after the test gives the amount of water formed under the measuring conditions.

If the gas composition is sufficiently stable, the determination may be carried out consecutively instead of in parallel.

9 Sources of error

In addition to the sources of error mentioned in ISO 6570/1, those of particular concern to the weighing method are as follows :

9.1 Gas leakage

Gas leakage may arise from the liquid separator during the time-lapse between disconnecting and weighing. This leakage may sometimes become noticeable by a continuous decrease in mass during weighing.

9.2 Bath liquid

Insufficient drying or cleaning are sources of errors because the bath liquid will then adhere to the liquid separator and cause errors in weighing.

9.3 Wet gas

Condensation of water vapour in the system causes error, and the water dew point should, therefore, always be measured before commencing a determination. If necessary, a drying tube shall be installed as described in ISO 6570/1.

10 Test report

The test report shall include the following information :

a) a reference to this part of ISO 6570;

b) all the information necessary for the complete identification of the sample;

c) the results obtained;

d) details of any operations not specified in this part of ISO 6570, or ISO 6570/1, or regarded as optional, together with details of any incidents likely to have affected the results.

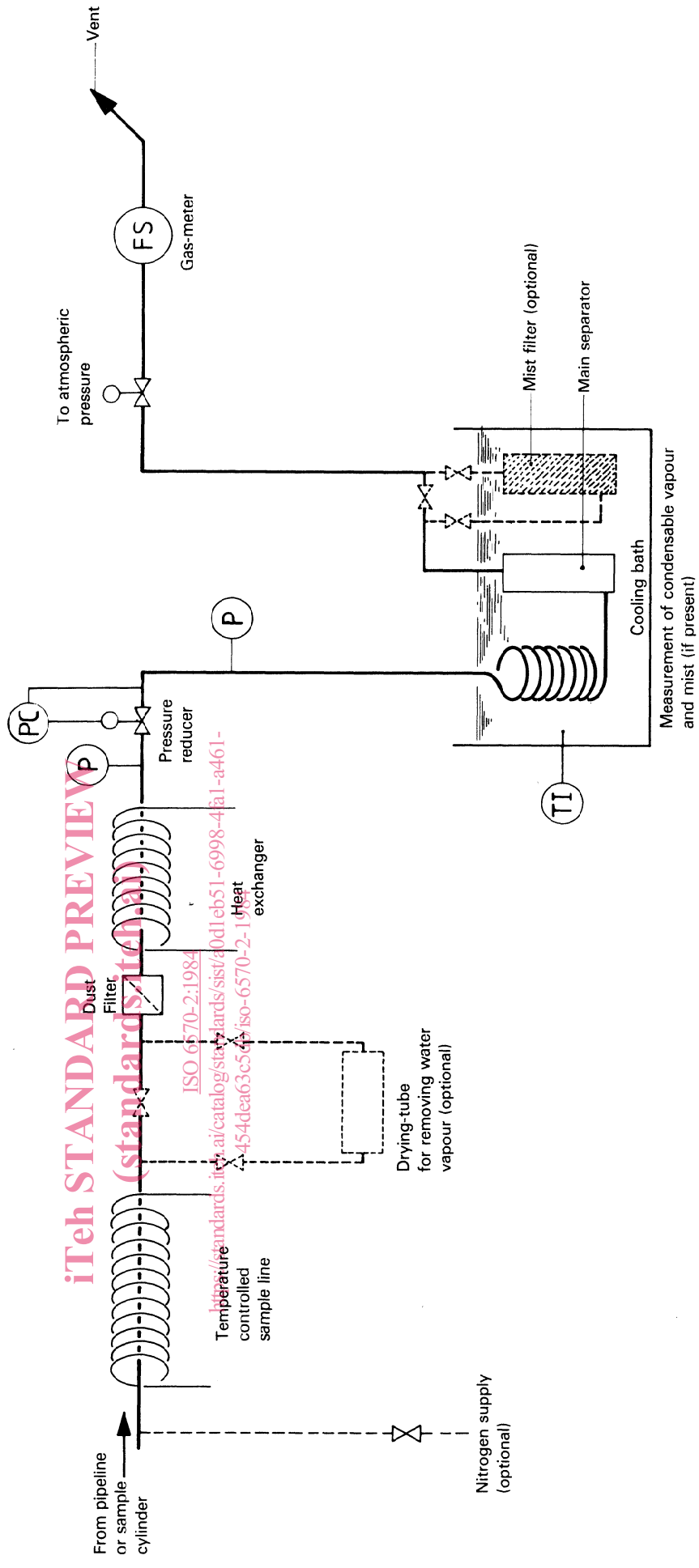
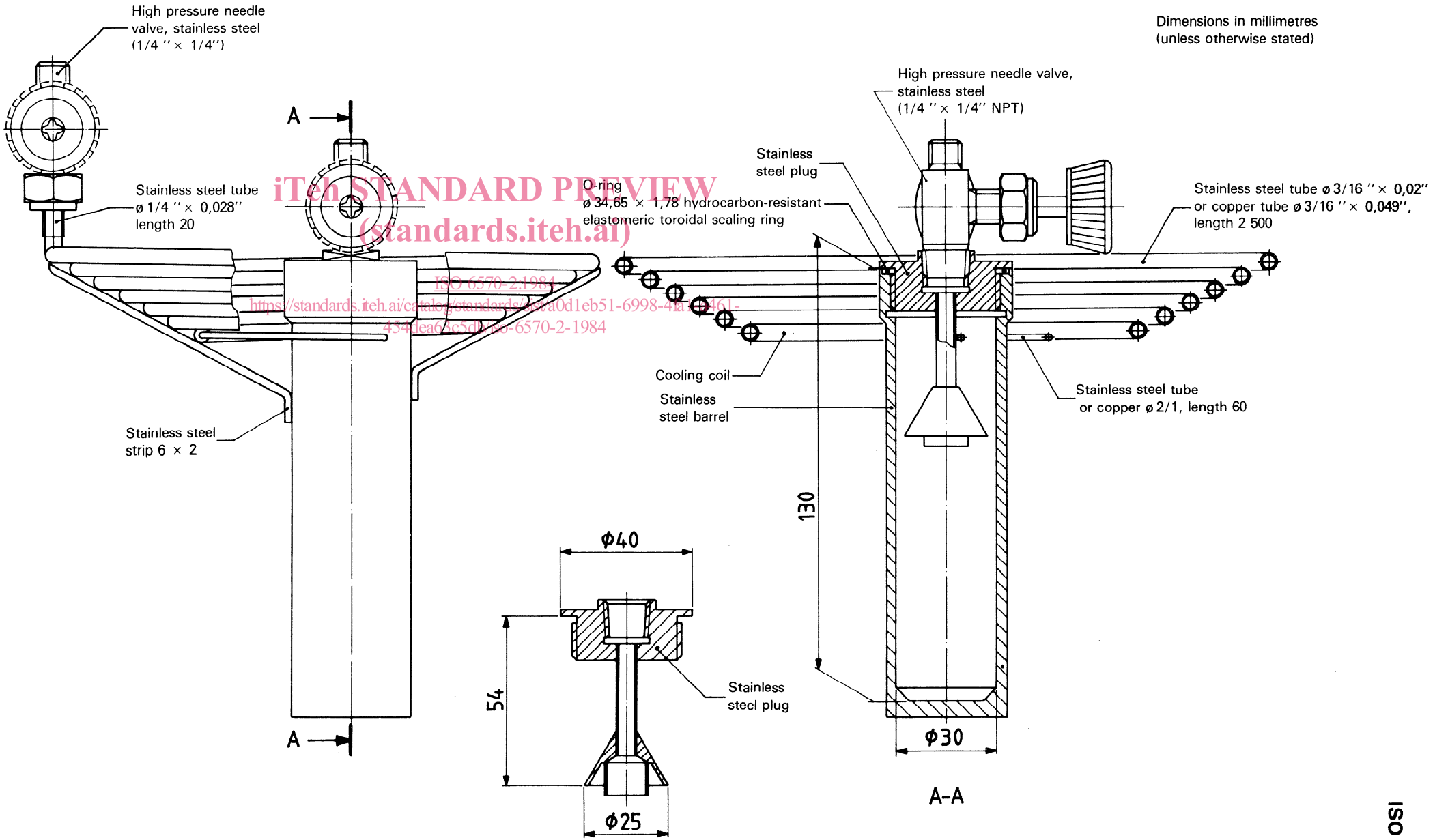


Figure 1 — General arrangement of measurement installation



NOTES

1 When sulfurous gas is tested, the cooling coil should be made of stainless steel.

2 Maximum mass 1 100 g.

Figure 2 — Example of cooling coil with cyclone separator

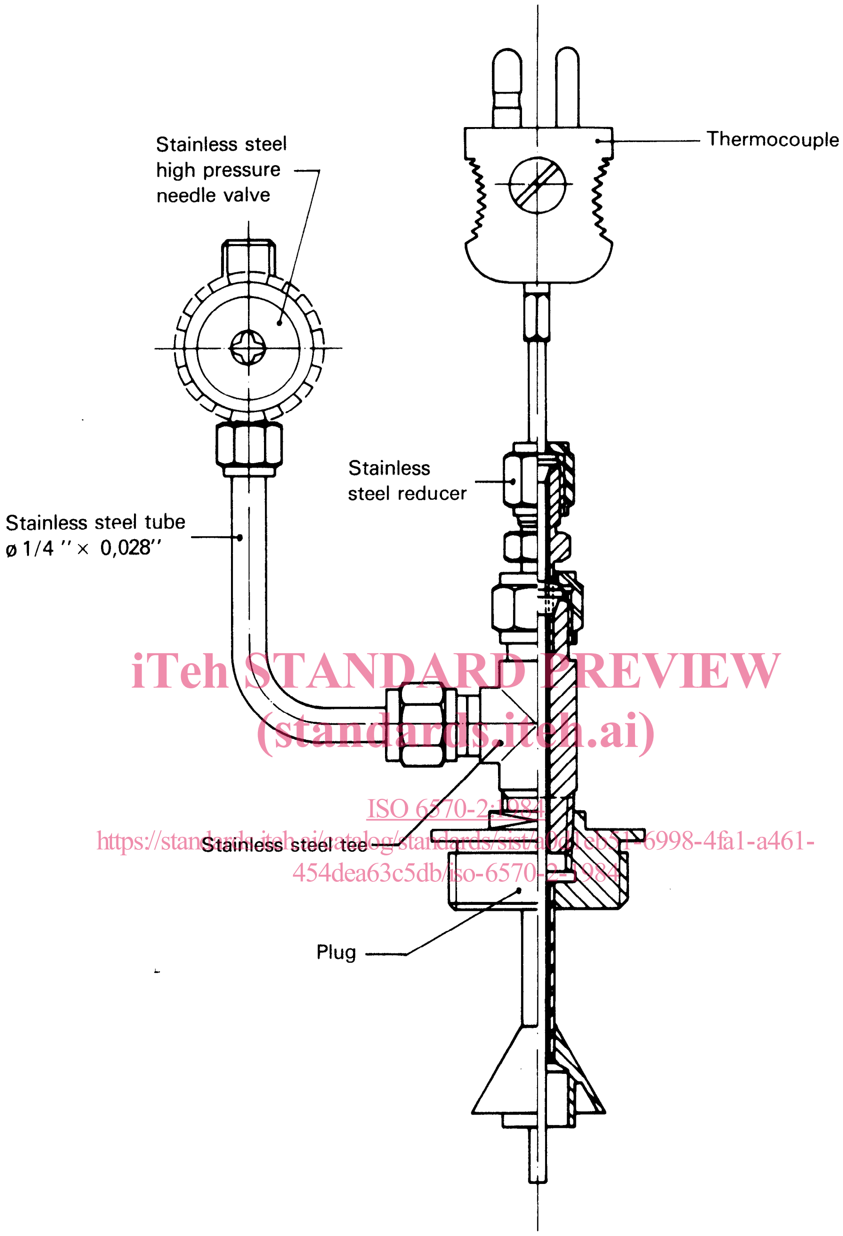
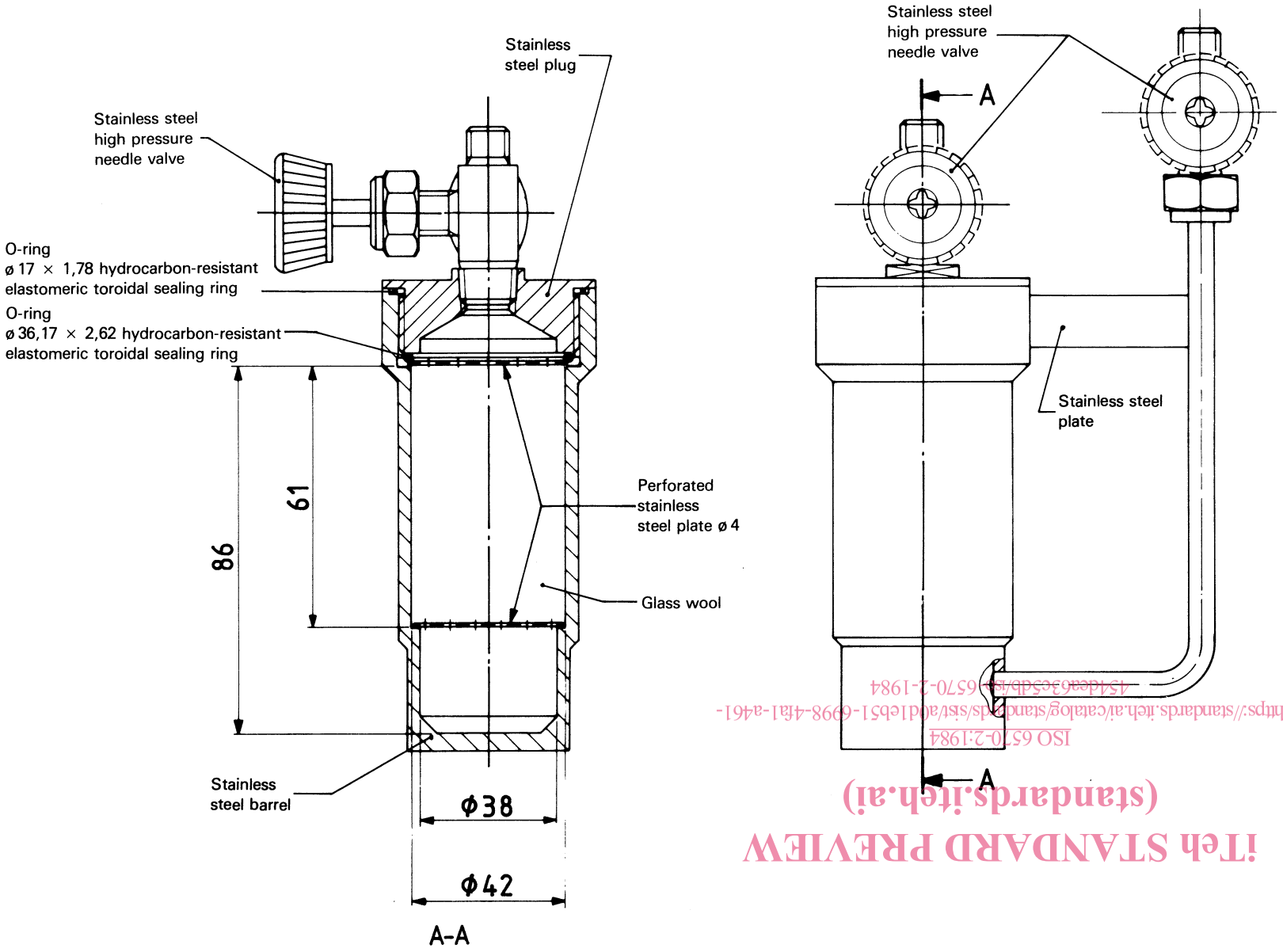


Figure 3 — Example of cyclone separator outlet with thermometer inlet



NOTE — Maximum mass 1 100 g.

Figure 4 — Example of glass wool filter