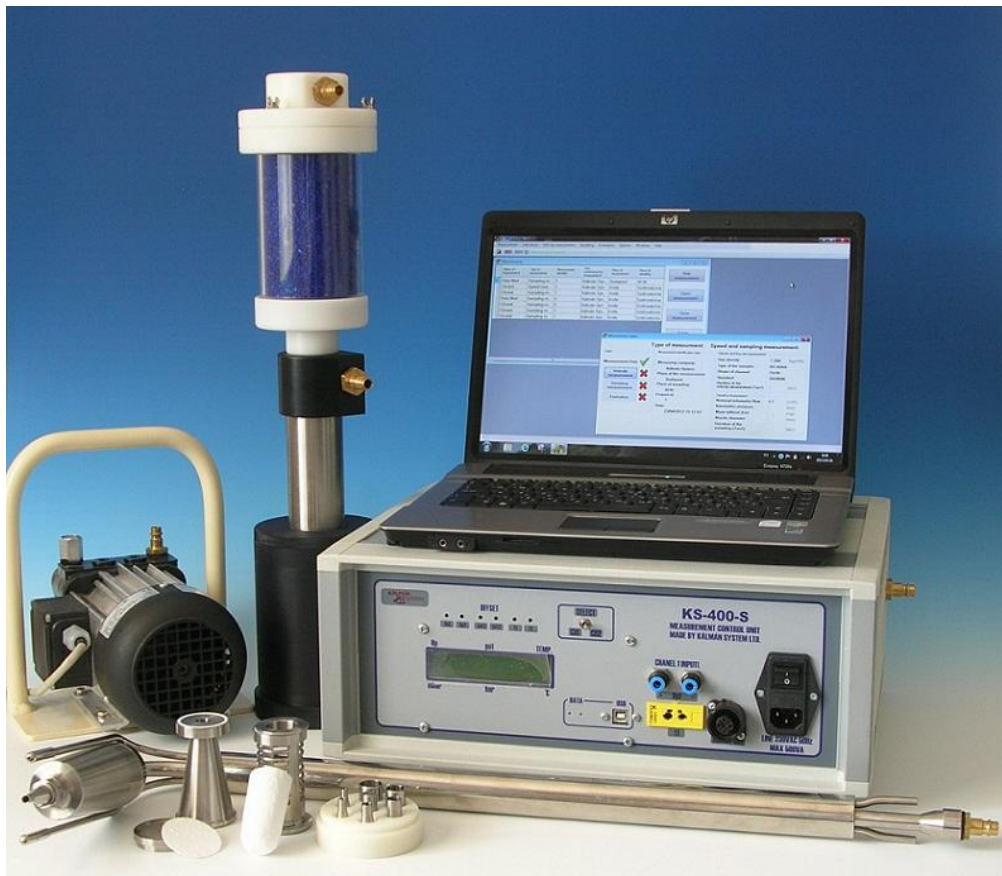


# MODEL KS-404

## PORTABLE, AUTOMATIC, ISOKINETIC AEROSOL / DUST SAMPLER MEASUREMENT CIRCUIT IN - STACK VERSION



### SPECIAL FEATURES

- ✓ The sampler probe can be used in different layouts (with different constructions of filters and/or with cascaded preseparator)
- ✓ Small size inner-space probe head, can be inserted through an opening of  $\varnothing 72$  [mm] in size.
- ✓ Extremely high dust storage capacity.
- ✓ Possibility of controlling the measurement from a distance of 30-50 [m] from the place of sampling
- ✓ Velocity measurement of the main gas flow simultaneously with the sampling.
- ✓ Probe shank integrated with static and total pressure probes.
- ✓ The measurement and the method confirm with the EN ISO 9096 standard and meet many international specifications.
- ✓ Automatic isokinetic measurement control by Windows-based AR-IZO 404 software.

## 1. Purpose

The **KS-400** type samplers are the automatic versions of the KS-100 type portable, emission type, partial gas flow measuring circuits. The **KS-400** family of samplers can be used for the determination of concentration of solid particles in flowing air or gas by means of isokinetic sampling.

The **KS-404** type portable measurement circuit of the partial gas flow emission sampler is suitable - in automatic operation mode - for isokinetic, continuously periodical, total or/and fractionated sampling of solid particles in circulating air or gas. The **KS-404** type probe has been designed with the utmost regard to the recommendations of the relevant **EN ISO 9096** and **EN 13284** standards.

The measurement of the partial gas stream is carried out by an annular chamber Venturi meter, which practically does not require maintenance; not like the often failing gasometer (due to the high pressure difference, the damaging of the filter and condensation).

The sampling measurement circuit - **KS-404** - is built with respect to the latest environmental protection regulations and on the basis of user requirements. All details of the isokinetic sampling is controlled, supervised and documented by PC. The control tests were carried out in our own development laboratory and at the Department of Fluid Mechanics of the Budapest University of Technology and Economics and in the Institute of Environmental Management.

The **KS-404** sampler probe with thermometer ( **Figure 1.** ) has four different constructions:

- Thimble filter Ø26×60 [mm] "A" **Figure 2.**
- Quartz wool and plane filter Ø43 [mm] "B" **Figure 2.**
- Plane filter Ø43 [mm] "C" **Figure 3.**
- Preseparator PM10 "D" **Figure 4.** or the KS-220 cascaded impactor (PM<sub>10</sub> /PM<sub>2,5</sub> /PM<sub>1</sub>)



**Figure 1.**



**Figure 2.**



**Figure 3.**



**Figure 4.**

The type **KS-404** measurement circuit is also suitable for the gravimetric determination of concentration of solid particles and dust in flowing gases and air, with simultaneous measurement and continuously periodical supervision of the temporal changes of the flow rate of the main gas flow and of the sampled medium - gas or air.

## 2. Short technical description

Due to the pressure difference generated by the vacuum pump the sampled gas or the partial gas flow enters the sampler through a short suction nozzle, passes through the filter in the probe head, travels through the sampling pipe, the exhaust hose, the moisture separator, the drying tower and the Venturi meter, and through the outlet of the vacuum pump it runs into the outer environment. Practically the total dust, solid content of the sampled gas settles in the filter.

The dynamic pressure **Dp1** in the vicinity of the nozzle (a quantity proportional to the air/gas flow velocity **w1**) is transmitted to the **KS-400-S control unit** by the total and static pressure exhaust probes. The adjustment of the velocity of the air **w1**  $\approx$  **w2** in the suction nozzle – as a requirement of isokinetic sampling - is solved automatically by a Danfoss frequency converter which provides a signal proportional to the number of revolutions on the basis of the reference data **Dp1, pst1, fl**.

The main parts of the measurement circuit are shown in **Figure 5**. Within the cladding tube beside the pipe of the partial gas flow there are two pressure exhaust probes – static and dynamic pressure – and (as an option) a thermometer probe cladding tube.

Depending on the size of the measuring gap the sampling pipe can be ordered in both bended and straight form.

Type of the heatable probe head and probe shaft: **KS-107-H / KS-407-H**.

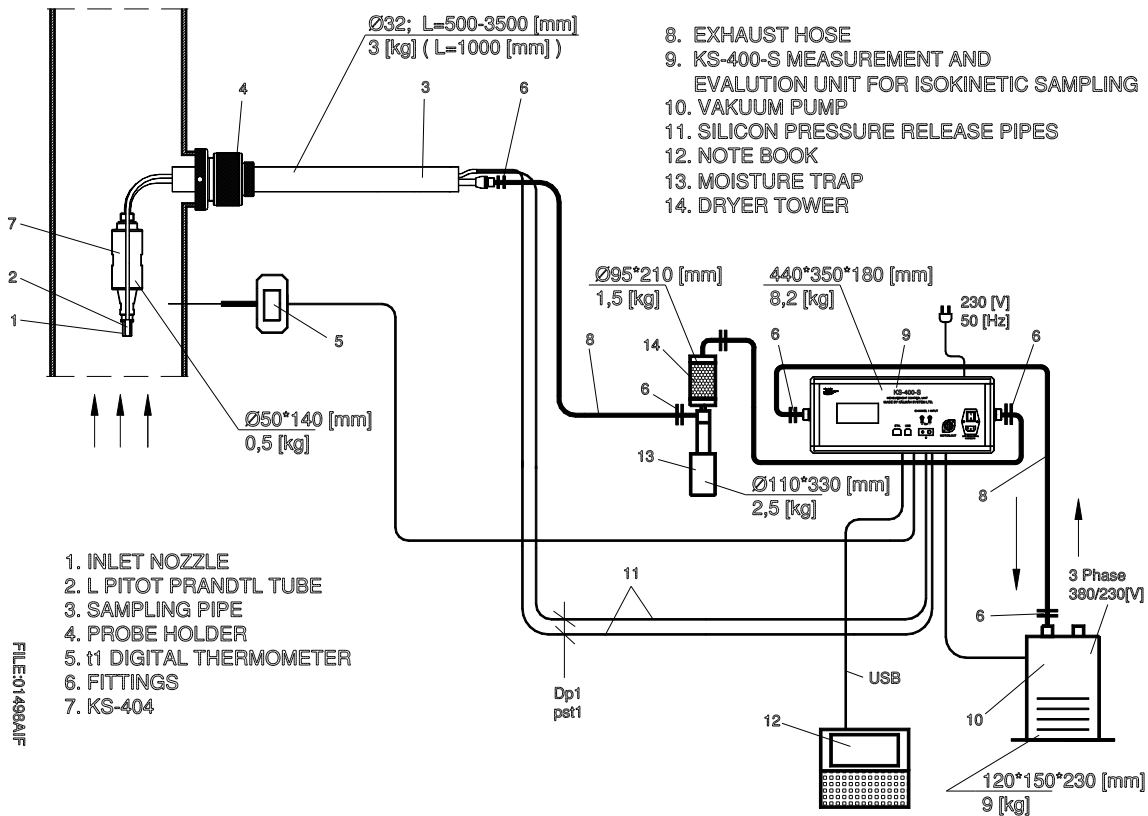


Figure 5.

The measurement control software AR-IZO 404 runs on Windows graphic platform ( **Figure 6.** ) with – for the purpose of easy-to-use handling – graphical buttons, pull-down menus and a help system supporting the control of the sampling procedure. The measured data can be saved, earlier measurements can be reloaded, measurement reports can be generated with the program.

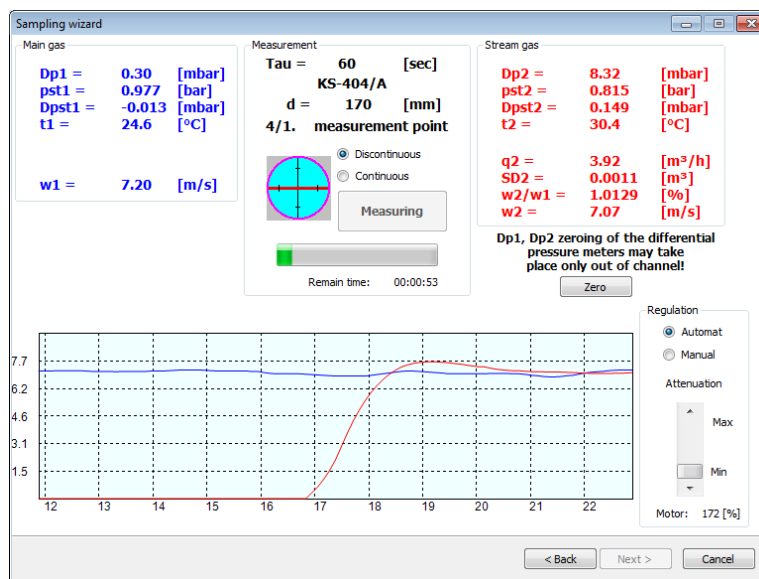


Figure 6.

Calibration of the sampling probe was – according to ISO 9096 ( D ) - carried out in the laboratory of the Fluid Mechanics Department of the Budapest University of Technology and Economics with the help of the vertical, recirculation type, open test section, GÖTTINGEN type wind tunnel which is used exactly for such calibration processes. Picture of the facility is shown in **Figure 7.**



**Figure 7.**

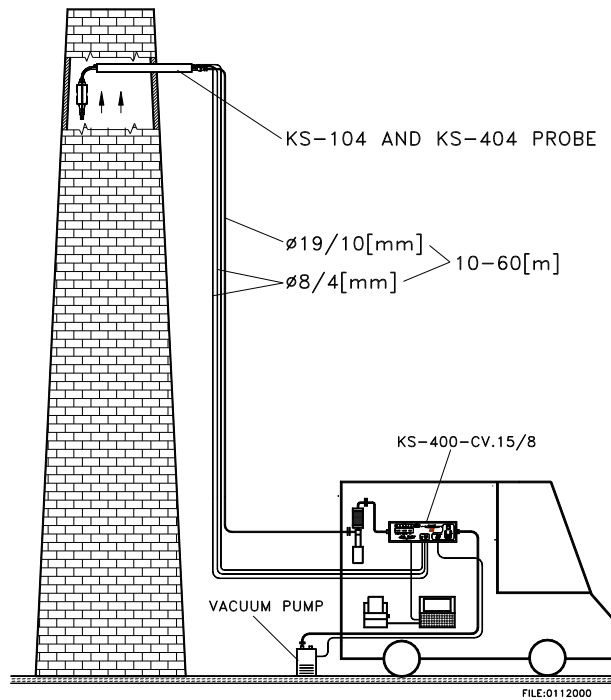
### 3. Technical data

- Nominal flow rate (A) thimble filter: 2,7 [m<sup>3</sup>/h]
- Nominal flow rate (B) quartz wool and plane filter: 1,7 [m<sup>3</sup>/h]
- Nominal flow rate (C) plane filter: 1,7 [m<sup>3</sup>/h]
- Max. dust concentration with (A) 200 [mg/m<sup>3</sup>]
- Min. dust concentration with (C) 1,0 [mg/m<sup>3</sup>]
- Nominal flow rate (D) preseparator and plane filter: 1,7 [m<sup>3</sup>/h]
- Measurement range: 1,0 to 5,0 [m<sup>3</sup>/h]
- Measurement range: 4 to 35 [m/s] standard
- Measurement range: 1,2 to 16 [m/s] optional
- Inlet nozzles: Ø4,5; 5,6; 7,6; 10,7; 14; 17 [mm]
- Thimble filter: Ø26×60 [mm],
- Plane filter: Ø43 [ mm ]
- Power supply 230 V ± 10 %
- Max. humidity 99 [%]
- Heated probe optional **KS-407-H model**
- Temperature of main gas flow t1 = 0-400 [°C]
- Temperature of partial gas flow t2 = 0-100 [°C]
- Weight **Figur 5.**

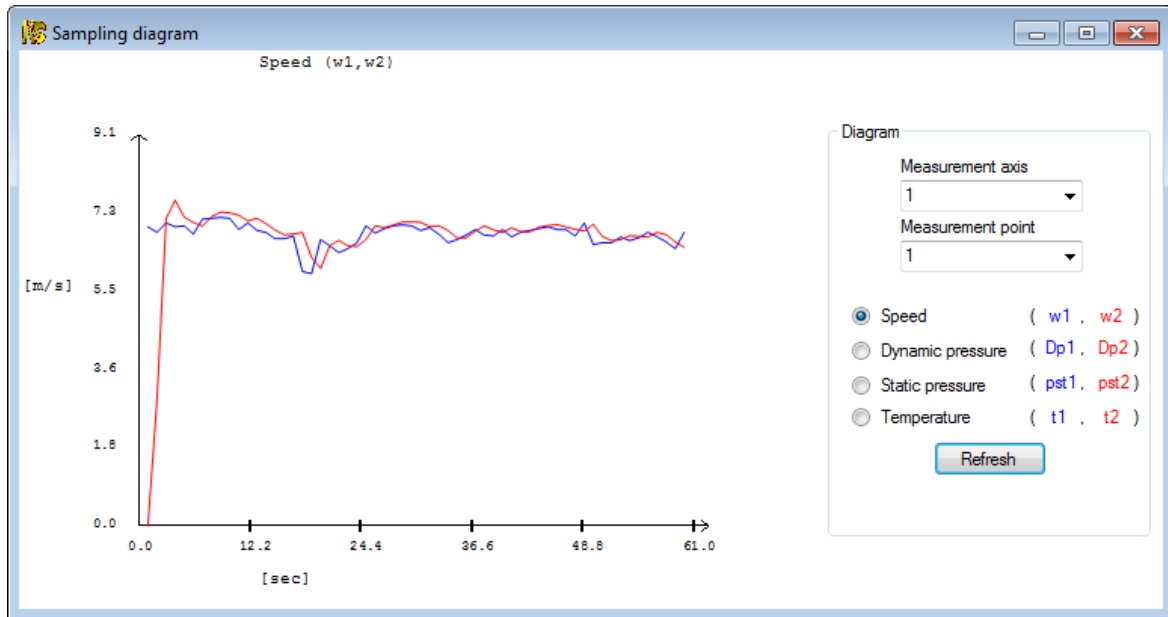
### ADDICION FOR INFO KS-404



### Probe safety equipment



### KS-404 measuring circuit in praxis



### SAMPLING DIAGRAM

The screenshot shows a software window titled "Leakage test". It is divided into two main sections. The left section, labeled "Motor", contains a "Start" button, a "Stop" button, a "Motor duty" slider set to "0%", and a note: "Maximum duty of the motor is 40%". The right section, labeled "Stream gas", displays four measurement values in red text: "Dp2 = 0,0 [mbar]", "pst2 = 0,0 [bar]", "t2 = 0,0 [°C]", and "q2 = 0,0 [m³/h]".

### LEAKAGE TEST