| | | |
|---|---|---|
| ZVVZ ENVEN | **FILTER UNIT VS** | **TS 020601** |

Dimensions in mm, weights in kg, pressures in Pa.

These technical specifications apply to the power series of VS filter units (hereinafter referred to as the "filter units") designed to capture radioactive aerosols and iodine in the ventilation systems of nuclear power plants.
The technical specifications apply to filter units as a whole, their assembly parts and the individual functional elements. The power series is for flows of 2.000, 4.000, 8.000, 12.000 and 16.000 $m^3.h^{-1}$.
The technical specifications establish the main dimensions, weights, model and characteristics of the filter units.
They are intended for their design, ordering, manufacturing, testing, delivery, assembly and operation.

The technical specifications become effective on the date of approval by the parties mentioned on the approval sheet.

## 1. TERMINOLOGY

1.1 Individual basic assembly parts of the filter units are composed of the following:

- VSO fog eliminating filters to capture water fog and drops
- VSE electric heaters to heat up the filtered air for the purpose of reducing its relative humidity and reducing water condensation in other parts of the filter unit, especially on iodine filter sorbent
- VSP aerosol pre-filters, as the first stage of solid and liquid aerosol capture
- VSA high-efficiency aerosol filters, as the second stage of solid and liquid aerosol capture
- VSJ iodine filters to capture radioactive iodine and its compounds
- VSS1 and VSS2 inlet and outlet connection pieces to connect the iodine filter to other assembly parts of the filter units.

1.2 Other necessary assembly parts are composed of the following:

- VSN inlet and outlet adapters to connect the filter units to air piping.

1.3 Designation of individual assembly parts of the filter units is shown in fig. 1, page 12.

1.4 Functional elements of individual assembly parts of the filter units are composed of the following:

- Filter inserts for the VSO fog eliminating filter, which are renewable; their life expectancy is the same as the filter units, approximately 50 years
- Heating elements of the VSE electric heater have an alternative power output of 700 or 350 W according to the necessary power output of the heater
- Filter inserts for the VSP aerosol pre-filter, replaceable after clogging and achieving maximum allowable pressure loss
- Filter inserts for the VSA high-efficiency aerosol filter, replaceable after clogging and achieving maximum allowable pressure loss
- Layer of loose sorbent from the VSJ iodine filter; this filling is replaceable after reducing sorbent efficiency below the required values or at planned intervals; emptying is carried out by means of additional worm conveyor (special accessories, it must be specified in the order); thickness of sorbent layer is 250mm.

# 2. IN GENERAL

## 2.1 Application

2.1.1 The filter units ensure the efficient cleaning of air within the areas of nuclear power plants and air exhausted to the ambient environment under normal operating conditions and also in possible emergency situations. The filter units may be used as part of the inflow, outflow and circulation air-handling systems of nuclear power plants.

2.1.2 The filter units meet the requirements for enhanced fire safety. The individual filter chambers may be connected to fire-fighting equipment. Filter units are ranked among the selected equipment in accordance with Decree No. 132/2008 Coll., in safety class 3 or 2.

## 2.2 Description

2.2.1 The filter units are of modular type enabling combining the individual assembly parts according to the requirements for filtration quality and by type and concentration of adrift impurities or contaminants.

2.2.2 The operator installs and replaces the functional elements from the outer side of the casings, either manually or with an auxiliary device. For this purpose, all assembly parts are equipped with tight openings or doors.

2.2.3 In terms of direction of filtered medium flow and operator access, the filter units as well as the assembly parts are designed as right-hand (R) and left-hand (L) models. For electric VSE air heaters and VSN adapters, the model is not distinguished. These components may be used both for right-hand and for left-hand models of filter units.

2.2.4 From a constructional material point of view, the individual assembly parts of the filter units (except for VSN adapters) are made of stainless steel without any surface protection.

2.2.5 The filter units are assembled from individual required assembly parts on site. The individual parts of the filter unit are assembled one after another and interconnected by way of flange screw couplings. The filter units are anchored to the foundation (floor) by means of foundation screws. An example layout of the filter unit assembled from all the previously mentioned assembly parts, as a right-hand model, is shown in fig. 1 (a left-hand model is the opposite hand view).

2.2.6 Since the filtration requirements are different in the individual ventilation systems of nuclear power plants, an assembly of the respective filter unit from various assembly parts is possible.

2.2.7 The design of the assembly parts for filter units of all sizes and the design of their functional elements are shown in fig. 1 to Fig. 28

2.2.8 The filter unit is designed with respect to meeting seismic Category 1 for maximum design earthquake and the corresponding response spectrum in the locality in question.

2.2.9 The filter unit or its basic assembly parts are equipped with drain outlets for water and deactivation (decontamination) solutions. These drain outlets enable connection to the respective branch of "active" sewerage.

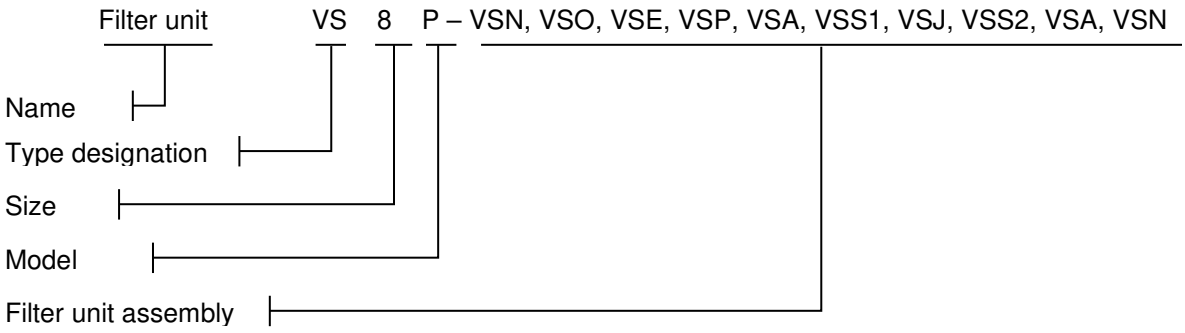
2.2.10 There is an electric air heater terminal board used to connect the electric heater to the electricity distribution system. The electric heater is equipped with an outdoor protective terminal. The VSE wiring diagram is shown in Fig. 31.

2.2.11 The filter unit or its assembly parts are equipped with adapters (screwing) used to connect the pressure loss checking and measuring instruments. If necessary, differential reading manometers or pressure transducers can be directly connected to such adapters as special filter accessories. In addition, the iodine filters are equipped with a thermometer well used to measure the temperature of the sorption layer and with sleeve pieces used to connect the supply hoses for pneumatic filling with sorbent when being replaced.

2.2.12 The filter unit is connected to air piping by means of VSN adapters (see Fig. 30). Inserting the hermetic closure in the front and back of the filter unit is recommended, which enables the filter unit to be put out of operation.

## 2.3 Designation

2.3.1 Example of designation of the filter unit of 8 size as right-hand model:




2.3.2 Analogously when ordering the individual assembly parts:

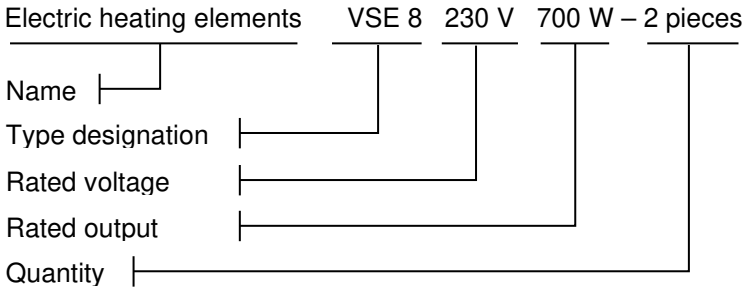
High-efficiency filter VSA 8 P

Electric air heater VSE 8

2.3.3 When ordering functional elements:

Filter inserts VSA 8 – 2 pieces

Sorbent VSJ 8 – full filling



### 2.4 Purchase Order technical information

2.4.1 Purchase Order data:

- Number of pieces
- Product name and type
- Capacity (rated air flow in $m^3.h^{-1}$)
- Model (right-hand or left-hand – designated by letters R or L, if distinguished, otherwise there is a dash in the designation)
- Filter unit assembly (including type of the required assembly parts in order from equipment input flange to its output flange; in case of iodine filter, including VSJ option).

2.4.2 Customer-specific requirements:

- Requirement for special accessories (differential manometers, pressure transducers)
- Special requirements for dimensions of adapters used to connect the parameter checking and measuring instruments
- Worm conveyor with accessory
- Other required accessories

2.4.3 When ordering functional elements only (as spare parts throughout the operation of filter units), the following shall be included in the Purchase Order:

- Element name and name of the assembly part (its specification)
- Number of functional elements (pcs, kg, full filling)

These functional elements are ordered separately.

## 3. TECHNICAL REQUIREMENTS

### 3.1 Main parameters and dimensions

3.1.1 The filter units must be in compliance with the technical specifications and the manufacturing documentation.

3.1.2 The power and dimensions series of filter units is composed of four sizes for rated air flows of 2.000, 4.000, 8.000, 12.000, 16.000 $m^3.h^{-1}$.

3.1.3 The main dimensions and weight of the filter units are given by calculation; for dimensions and weights of assembly parts used in the filter unit assembly see tab. 1.

3.1.4 The main dimensions and weight of filter unit assembly parts, i.e. filters of all types, electric air heaters and adapters are shown in tab. 1.

**The models and installation dimensions of adapters used to connect the parameter checking and measuring instruments, supply decontamination and regenerative solutions, condensate outlet are shown in**

3.1.5 fig. 2 to Fig. 6Fig. 6. The connection dimensions of flanges for the VSN adapters of the filter units are shown in Fig. 30.

3.1.6 The initial pressure loss of the filter units depends on the number and the type of used assembly parts. It does not exceed 2,000 Pa in full assembly at rated air flow. The initial pressure losses of individual assembly parts at rated air flow are as follows:

- VSO ..... 300 Pa
- VSP ..... 160 Pa
- VSA ..... 290 Pa
- VSJ ..... 900 Pa

3.1.7 Radioactive aerosol capture efficiency at rated flow is a minimum of 99.95%. The initial capture efficiency of radioactive iodine organic compounds is a minimum of 99.99%.

3.1.8 The value of permitted leakage for the shell of the filter units (after assembly) at a pressure difference of 2,000 Pa is a maximum 0.003% of rated air flow.

3.1.9 Filter insert efficiency of the VSA high-efficiency aerosol filters at the rated air flow of 4,000 $m^3.h^{-1}$ is a minimum of 99.99% per oil fog with particles 0.3 μm.

3.1.10 Filter insert efficiency of the VSP aerosol pre-filters VSP at the rated air flow of 4,000 $m^3.h^{-1}$ is a minimum of 75% per oil fog with particles 0.3 μm.

3.1.11 Sorption efficiency of the VSJ iodine filter at the rated air flow is a minimum of 99.99% per methyl iodide organic compounds 131.

3.1.12 Rated outputs of heating elements for individual sized electric air heaters as well as the outputs of such heaters are indicated in tab. 1. Three-phase current of 400 V/50 Hz is brought to the terminal board of the electric heater; supply voltage of heating elements is 230 V/50 Hz.

3.1.13 The value of permitted leakage for shells of all the assembly parts of the filter units as well as the clamping frames in aerosol filters is a maximum 0.003% of the rated air flow at a pressure difference of 2,000 Pa.

### 3.2 Characteristics

3.2.1 The filter units are designed for operation at the suction side of the fan and rated at 10 kPa vacuum.

3.2.2 Material and design of all filter unit parts permanently resist temperatures of +100°C, relative air humidity of 100%, and on a short-term basis (10 hours minimum), they resist steam-air mixtures with temperatures to +150°C inclusive.

3.2.3 The filter units meet the requirements for enhanced fire safety. None of the materials used in manufacturing their assembly parts and functional elements support combustion except sorbent with its ignition temperature exceeding + 330°C.

The used filter inserts in the pre-filter permanently resist temperatures of +250°C and the high-efficiency filter inserts permanently resist temperatures of +125°C, and on a short-term basis +185°C.

3.2.4 Filter unit surfaces enable decontamination with deactivation solutions and water washing. The material of the filter unit casings resists the effects of filtered mediums and captured impurities in all operating modes of the respective ventilation systems as well as the effects of common decontamination agents.

3.2.5 The filter units retain their functional capacity in normal operation for a minimum of 10,000 hours.

3.2.6 The filter units fulfil the conditions for equipment of seismic Category I for maximum design earthquakes (MDE) of 8° according to MSK 64.

3.2.7 The life time of stainless steel filter units is 50 years with the exception of replaceable functional elements, whose life time is dependent on operating conditions.

Tab. 1 Main parameters and dimensions

| | | VS 16 | VS 12 | VS 8 | VS 4 | VS 2 |
|---|---|---|---|---|---|---|
| **VSO** | Dimension l x w x h (mm) | 800 x 900 x 3100 | 800 x 900 x 2400 | 800 x 900 x 1680 | 800 x 900 x 960 | 800 x 900 x 960 |
| | Weight of casing (kg) without Inserts | 447 | 362 | 272 | 183 | 183 |
| | Weight of frame (kg) | - | - | - | 103 | 103 |
| | Height of centre of gravity (mm) | 1550 | 1200 | 840 | 480 | 480 |
| | Inserts - dimension (mm) | 710 x 346 x 83<br>710 x 366 x 83 | 710 x 346 x 83 | 710 x 346 x 83<br>710 x 326 x 83 | 710 x 326 x 83 | 710 x 326 x 83 |
| | - number (pcs) | 14+2 | 12 | 6+2 | 4 | 4 |
| | - weight of 1 pc (kg) | 8 | 8 | 8 | 8 | 8 |
| | Nozzles for - regeneration (pcs) | 25 | 21 | 17 | 13 | 13 |
| | - decontamination (pcs) | 16 | 12 | 8 | 4 | 4 |
| **VSE** | Dimension l x w x h (mm) | 500 x 900 x 3100 | 500 x 900 x 2400 | 500 x 900 x 1680 | 500 x 900 x 960 | 500 x 900 x 960 |
| | Weight of casing (kg) | 340 | 272 | 204 | 137 | 137 |
| | Weight of frame (kg) | - | - | - | 90 | 90 |
| | Height of centre of gravity (mm) | 1550 | 1200 | 840 | 480 | 480 |
| | Elements – number (pcs) | 4x9 | 3x9 | 2x9 | 1x9 | 1x9 |
| | Element output (W) | 700 | 700 | 700 | 700 | 700 |
| | Total heater output (W) | 25 200 | 18 900 | 12 600 | 6 300 | 6 300 |
| | Cross section of conductors between terminal boards ($mm^2$) | 6<br>(4 sekce) | 4<br>(3 sekce) | 2<br>(2 sekce) | -<br>(1 sekce) | -<br>(1 sekce) |
| | Cross section of conductors to elements ($mm^2$) | 2,5 | 2,5 | 2,5 | 2,5 | 2,5 |
| | Recommended supply cable | 5C x 10 | 5C x 6 | 5C x 4 | 5C x 2,5 | 5C x 2,5 |
| | Cable terminal – type | Pg 29 | Pg 21 | Pg 21 | Pg 16 | Pg 16 |
| | for cable with diameter (mm) | 18 – 25 | 13 – 18 | 13 – 18 | 10 – 14 | 10 – 14 |
| | Nozzles for decontamination (pcs) | 12 | 12 | 12 | 12 | 12 |
| **VSP**<br>**VSA** | Dimension l x w x h (mm) | 800 x 900 x 3100 | 800 x 900 x 2400 | 800 x 900 x 1680 | 800 x 900 x 960 | 800 x 900 x 960 |
| | Weight of casing (kg) without Inserts | 482 | 383 | 285 | 188 | 188 |
| | Weight of frame (kg) | - | - | - | 103 | 103 |
| | Height of centre of gravity (mm) | 1550 | 1200 | 840 | 480 | 480 |
| | Inserts - dimension (mm) | 610 x 610 x 292 | 610 x 610 x 292 | 610 x 610 x 292 | 610 x 610 x 292 | 610 x 610 x 292 |
| | - number (pcs) | 4 | 3 | 2 | 1 | 1 |
| | - weight of VSP 1 pc (kg) | 10 | 10 | 10 | 10 | 10 |
| | - weight of VSA 1 pc (kg) | 20 | 20 | 20 | 20 | 20 |
| | Nozzles for decontamination (pcs) | 13 | 13 | 13 | 13 | 13 |
| **VSJ** | Dimension of VSJ l x w x h (mm) | 2200 x 1800 x 2970 | 1700 x 1800 x 2970 | 1700 x 1800 x 2535 | 1700 x 968 x 2535 | 1700 x 968 x 1900 |
| | | | | | | |
| | Weight of casing (kg) without sorbent | 1605 | 1305 | 1190 | 755 | 635 |
| | Sorbent filling ($dm^3$) | 4 x 1000 | 4 x 740 | 4 x 570 | 2 x 570 | 2 x 400 |
| | Weight of sorbent (kg) | 2000 | 1480 | 1140 | 570 | 400 |
| **VSS** | Weight (kg) | 2x225 = 450 | 2 x 190 = 380 | 2 x 155 = 310 | 2 x 85 = 170 | 2 x 70 = 140 |
| **VSN** | Weight (kg) | 2x115 = 230 | 2 x 95 = 190 | 2 x 75 = 150 | 2 x 55 = 110 | 2 x 55 = 110 |
| **VS** total assembly | Dimension of VS l x w x h (mm) | 7040 x 1800 x 3260 | 6540 x 1800 x 2970 | 6540 x 1800 x 2535 | 6540 x 968 x 2535 | 6540 x 968 x 1900 |
| | | | | | | |
| | Weight of - unit (kg) without VSN | 4780 | 3860 | 3110 | 2480 | 2325 |
| | - sorbent (kg) | 2000 | 1480 | 1140 | 570 | 400 |
| | - total (kg) | 6780 | 5340 | 4250 | 3050 | 2725 |

### 3.3 Service level

3.3.1 The filter units are delivered dismantled. Sleeves for discharge piping and adapters for parameter checking and measuring for the individual filter types are blinded.

3.3.2 A part of the delivery includes the following:

a) The individual required assembly parts of the filter unit, without installed VSP and VSA filter inserts, and VSJ sorbent filling.

b) The VSN adapters are delivered with circular counter-flanges attached to the respective flanges of the necks of adapters with four screws and nuts. Blinding sheets of end flanges with measuring adapter used for casing pressure test.

c) Separate functional elements, i.e. VSP and VSA filter inserts, VSJ sorbent filling, are mounted after on-site filter unit assembly.

d) Checking instrument for quality control of the filter insertclamping to VSP and VSA

e) Connecting and sealing material. Each assembly part of the filter unit is delivered with connecting screws, nuts, washers and sealing.

f) Bearing frame with anchoring material (screws, nuts and washers).

g) Special accessories, if required in the Purchase Order.

- Differential reading manometers are delivered as special accessories for individual filter types. Respective manometer tubes (2 pcs) and sealing (4 pcs) as well as a manometer holder and attachment screws, nuts and washers (7 pcs each) are delivered together with each ordered manometer to attach the differential manometer to the filter casing.
- Worm conveyor with accesories for automatic discharging sorbent VSJ.
- Ejector with accesories for automatic charging sorbent VSJ.

h) Spare parts for warranty period. Spare heating elements and respective packing are delivered in 1 piece for each VSE electric air heater. In addition, spare rubber sealing (in tapes) used to seal the door is delivered in 1 piece for each VSA and VSP filter (preparing and bonding the sealing from the delivered material shall be assured by the user according to the respective sealing drawings).

   Spare electric heating elements to ensure further operation of the filter unit shall be ordered separately with respect to actual need for such elements after customer ordering.

i) Inserts for running the VSA filters behind the VSJ filter when filling it with sorbent, as one set with an EU 8 efficiency for all VSA filters.

j) Supporting frame for VS 2 and VS 4, for casings of VSO, VSE, VSP and VSA.

k) Accompanying technical documentation:

   - Certificate of product quality and completeness
   - technical specifications including Annexes 1 and 2
   - Certificates and reports of the results of type tests
   - Certificates and reports of the results of tests established by the technical specifications and the Quality Plan
   - Documentation of sub-deliveries
   - Other documentation agreed in the Contract

### 3.4 Information on the product

3.4.1 Each casing of assembly parts and each adapter and connecting part are labelled with the manufacturer's logo, type designation, capacity (of rated air flow), model (R or L), serial number and year of manufacture. In addition, the electric air heater label indicates electric parameters (voltage, frequency, input). There is a coloured arrow on the casings of assembly parts indicating the flow direction of the filtered medium. The casing of the electric heater is designated as electrical equipment.

3.4.2 The upper side of the filtered inserts frame of an aerosol filter is labelled with the manufacturer's logo, type designation, serial number and date of manufacture. In addition, the label indicates filtration parameters, i.e. air flow, filtration efficiency and pressure loss in a clean state. The direction of filtered air flow is indicated by an arrow.

3.4.3 The heating elements of electric air heaters are provided with an embossed manufacturer's logo, type designation and model, serial number and values of rated voltage and output.

## 4. METHODS OF CHECKS, TESTS, MEASUREMENTS

4.1 The filter units, their assembly parts and functional elements are subjected to the following checks, tests and measurements:

a) With the manufacturer:
- Check for compliance of the individual assembly parts and the functional elements with the manufacturing (drawing) documentation
- Leakage test of all assembly part shells of the filter units as well as leakage tests of clamping frames in aerosol filter casings – according to Annex 2 to these technical specifications
- Revision of VSE electric heater wiring
- Insulation resistance measurement and functional check of heating elements of electric air heaters

b) Post-assembly (on-site)
- Visual check of technical condition and completeness check of filter units and their components – according to the assembly drawing
- Leakage test of filter unit shells – according to Annex 2 to these technical specifications
- Revision of the filter unit's assembly parts electrical equipment
- Test of electric air heater (insulation resistance measurement of heating elements) and functional check
- Measurement of aerosol filter efficiency – according to Annex 2 to these technical specifications
- Measurement of iodine filter efficiency – according to Annex 2 to these technical specifications

c) In the course of operation
- Visual check of the technical condition of filter units and their components
- Periodic checks of the technical condition of filter units and their electrical equipment, and periodic measurement of efficiency within the meaning of Annex 2 to these technical specifications

4.2 Methods of checks and tests performed with the manufacturers are specified either in internal regulations and standards or they are a part of manufacturing documentation.

4.3 Methods of checks and tests of filter units for assembly and in operation are specified in Annex 2 to these technical specifications, which is a part of the delivery of filter hoses.

# 5. PACKAGING, TRANSPORT, ACCEPTANCE, STORAGE

## 5.1 Packaging

5.1.1 Filter casings, air heaters and transition pieces are packed in PE foil and tied with binding bands. Each package is labelled with the manufacturer's logo and type designation, serial number and year of manufacture.

5.1.2 The functional elements are delivered as follows:

- VSA and VSP filter inserts as single pieces in a PE package and stored in carton boxes
- Inserts for VSO fog eliminating filters as single pieces in a PE package and stored in wooden containers
- VSJ sorbent is stored in tight steel drums and PE bags and weighs 50kg.

5.1.3 Filter inserts for aerosol filters must be placed in boxes in such a way so that the stores of filtering material and separators are in a vertical position.

5.1.4 The cardboard transportation packages are labelled with the filter element type on all sides and additionally with the manufacturer's logo, serial number and date of manufacture on one side. The packages are labelled "Protect from humidity" and packages of filter inserts for aerosol filters are additionally labelled "Careful – fragile" and "This way up“.

5.1.5 The electric heating elements as spare parts are stored in cardboard packages, which are labelled with the manufacturer's logo, type and model of heating elements, serial number and date of manufacture. The packages are labelled "Protect from humidity".

5.1.6 Accessories, i.e. anchoring materials, connecting and sealing materials, are packed in a common box. The delivered instruments and special accessories are packed in a separate box (in separate boxes – packages). There will be lists of packed components and parts inserted into the boxes indicating the number of pieces. Content names will be indicated on each transportation box. Boxes (packages) are labelled "Protect from humidity" and the box/boxes storing instruments and special equipment are additionally labelled "Careful – fragile" and "This way up".

## 5.2 Transport

5.2.1 The filter casings, electric air heaters and adapters are transported on an open means of transport. The casings are transported in a horizontal position on their connecting flanges, except for VSJ iodine filters, which are transported in their functional position.

5.2.2 To move and load the individual assembly parts, they are equipped with lifting lugs. Handling is only possible by means of lifting equipment and ropes and/or chains fixed in the lifting lugs, while each part must be moved separately.

5.2.3 Protective covers may be used as protection against weather effects and contamination during transport.

5.2.4 The functional elements are transported in a covered, dry means of transport in a set position, if indicated on the package. They can be transported either separately or on pallets (in containers).

5.2.5 When transporting them, the cardboard boxes with VSA and VSP inserts may be placed at a maximum three levels above each other.

5.2.6 Handling of VSA and VSP filter inserts in transportation packages is possible either manually or by means of lifting mechanisms such as used transportation pallets or containers. When handling, enhanced care must be respected and handling is allowable only in a set position.

5.2.7 Other parts of the delivery shall be transported in their packages in a closed means of transport while observing the instructions specified on packages.

5.2.8 All transported parts must be fixed on the means of transport in a safe manner and secured against movement, fall and damage.

### 5.3 Acceptance

5.3.1 The scope and method of acceptance shall be in accordance with the rules agreed in the Contract between the supplier (manufacturer) and the customer.

5.3.2 A certificate of acceptance shall be issued.

### 5.4 Storage

5.4.1 All parts of the delivery are stored in their packages in dry, covered areas, secured against damage and weather effects. They are stored in a set position (same as during transport). The assembly parts (casings) of the filter units may be stored under shelter. Other parts may be stored in dry, covered areas (closed store).

5.4.2 Unless otherwise specified by the manufacturer, the cardboard boxes with VSA and VSP filter inserts may be stored at a maximum three levels above each other.

5.4.3 Sorbent in closed drums for iodine filters must not be stored together with dilutents, solvents and other organic-base volatile matters.

5.4.4 The functional elements are kept in their transportation packages until integration of the elements into the assembled filter units.

5.4.5 The storage period of filter inserts for aerosol filters is 5 years from the date of manufacture and 3 years from the date of manufacture for iodine filters sorbent. After expiration of the storage period, it is recommended verifying the functional capacity of the listed functional elements.

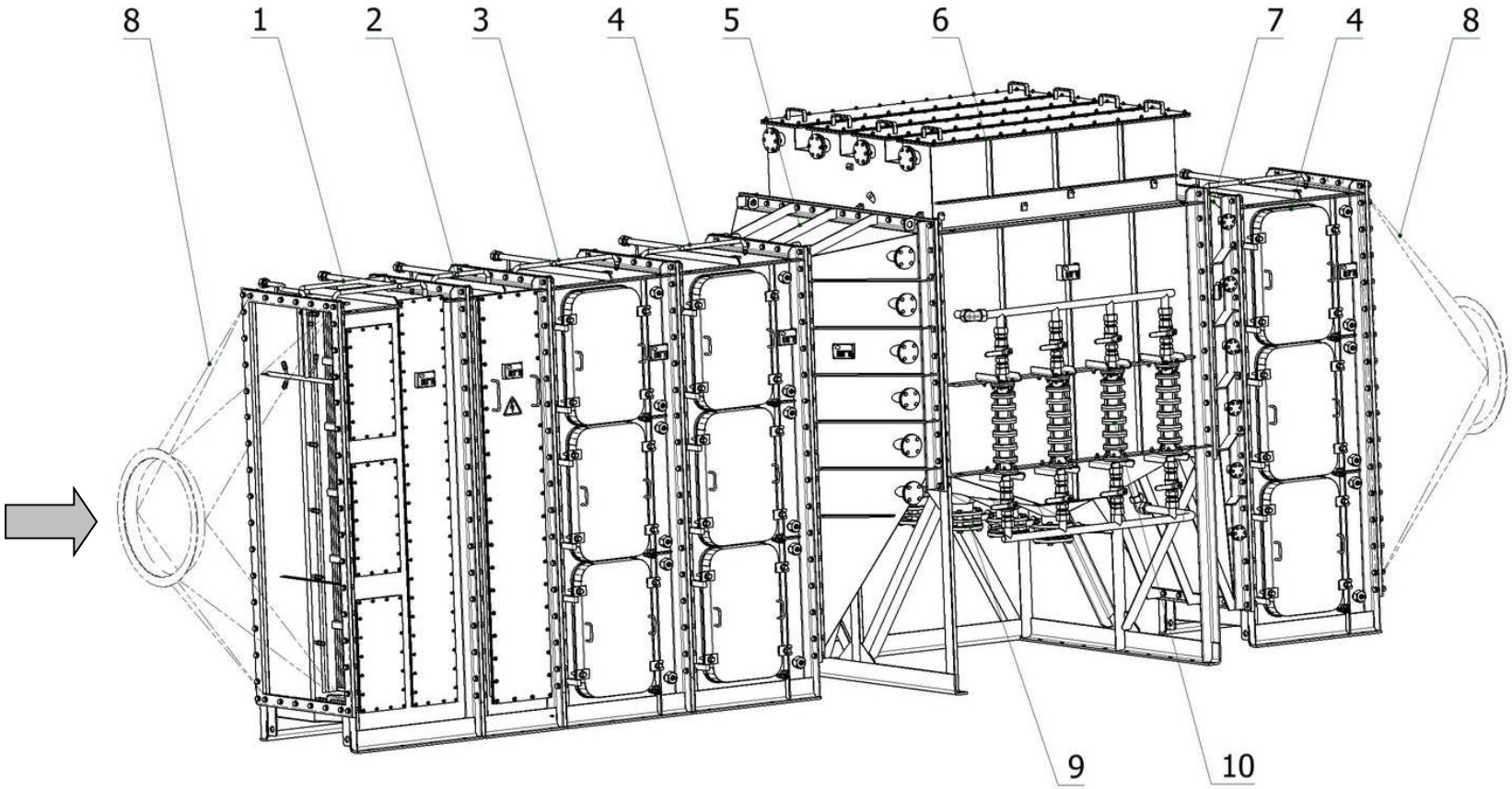
## 6. ASSEMBLY, OPERATION, SERVICE, MAINTENANCE

6.1 The installation, operation, service and maintenance instructions for the filter units are provided in Annex 1 to these technical specifications.

## 7. GUARANTEES

7.1 The filter units must be approved by the technical inspection of the supplier (manufacturer). The supplier (manufacturer) guarantees that the filter units comply with the requirements of these technical specifications provided that the customer (user) will observe all conditions established by these technical specifications.

7.2 The warranty period is defined by the Contract between the supplier (manufacturer) and the customer.




1. VSO fog eliminating filter
2. VSE electric heater
3. VSP aerosol pre-filter
4. VSA aerosol filter
5. VSS1 connecting part
6. VSJ iodine filter
7. VSS2 connecting part
8. VSN adapter
9. Gate valve
10. Measuring instrument

**Fig. 1 General assembly of a VS filter unit, solid right-hand model – description of individual parts**

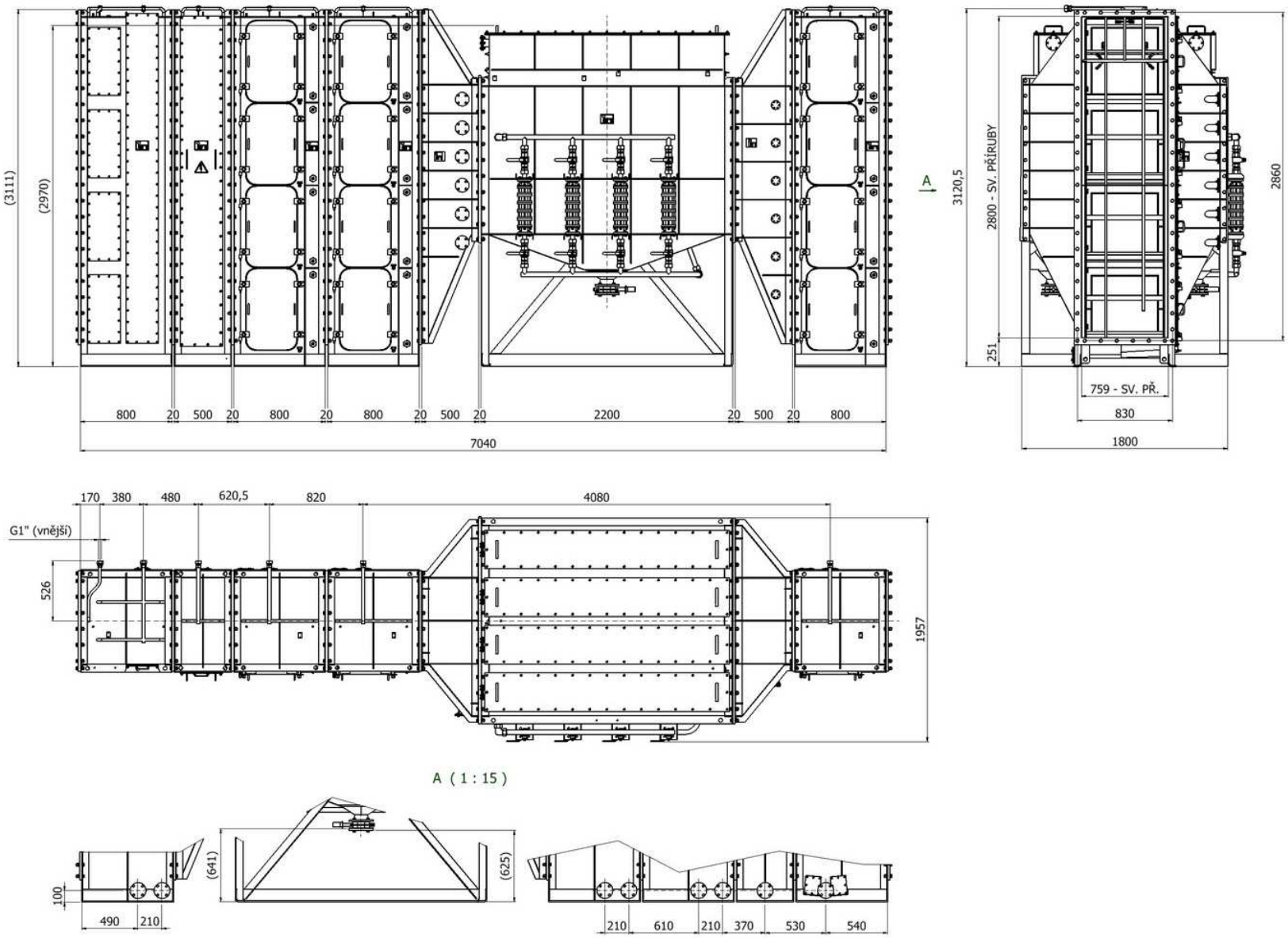



**Fig. 2 Main dimensions of a VS 16 filter unit, solid right-hand model**

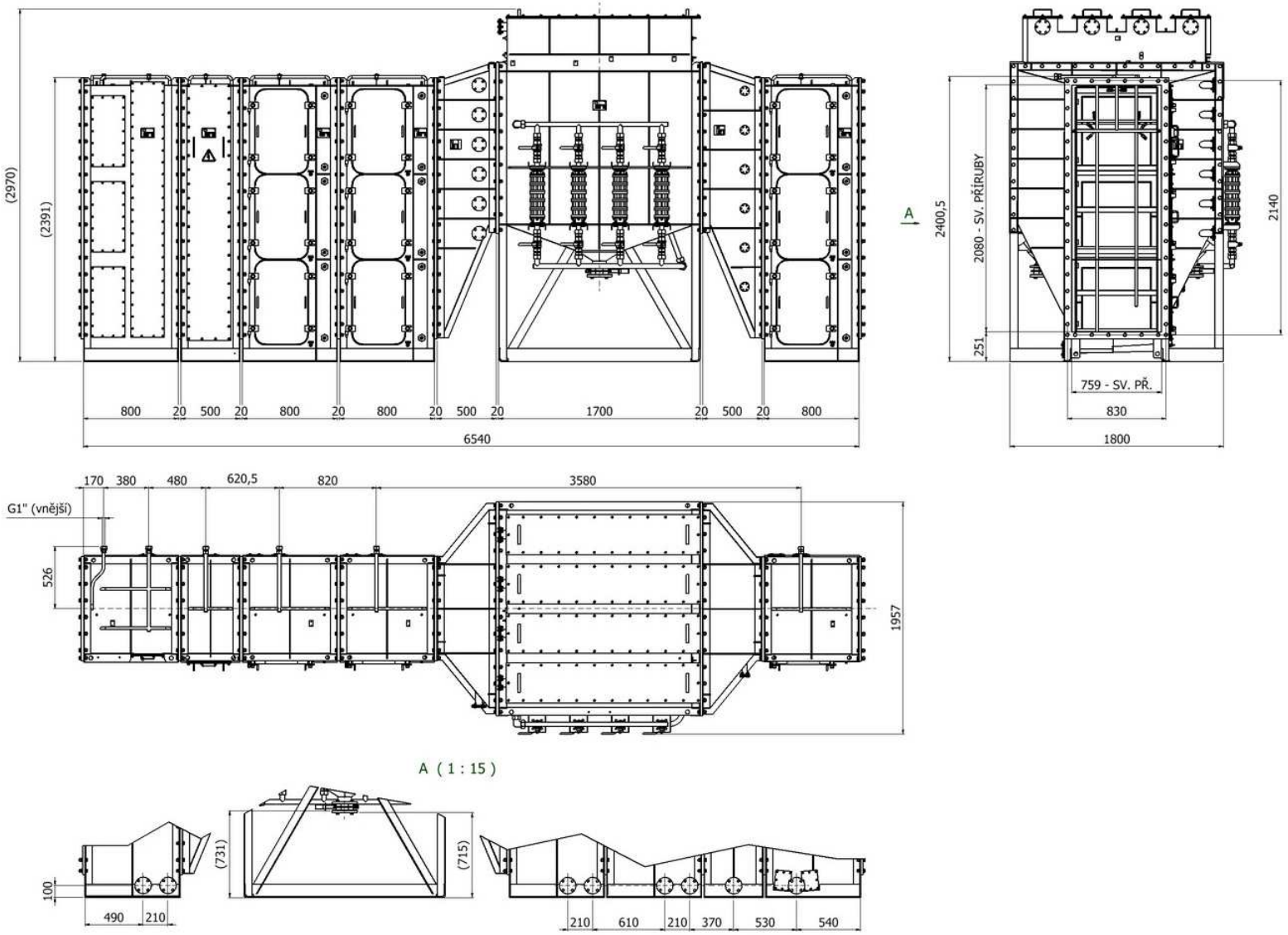



**Fig. 3 Main dimensions of a VS 12 filter unit, solid right-hand model**

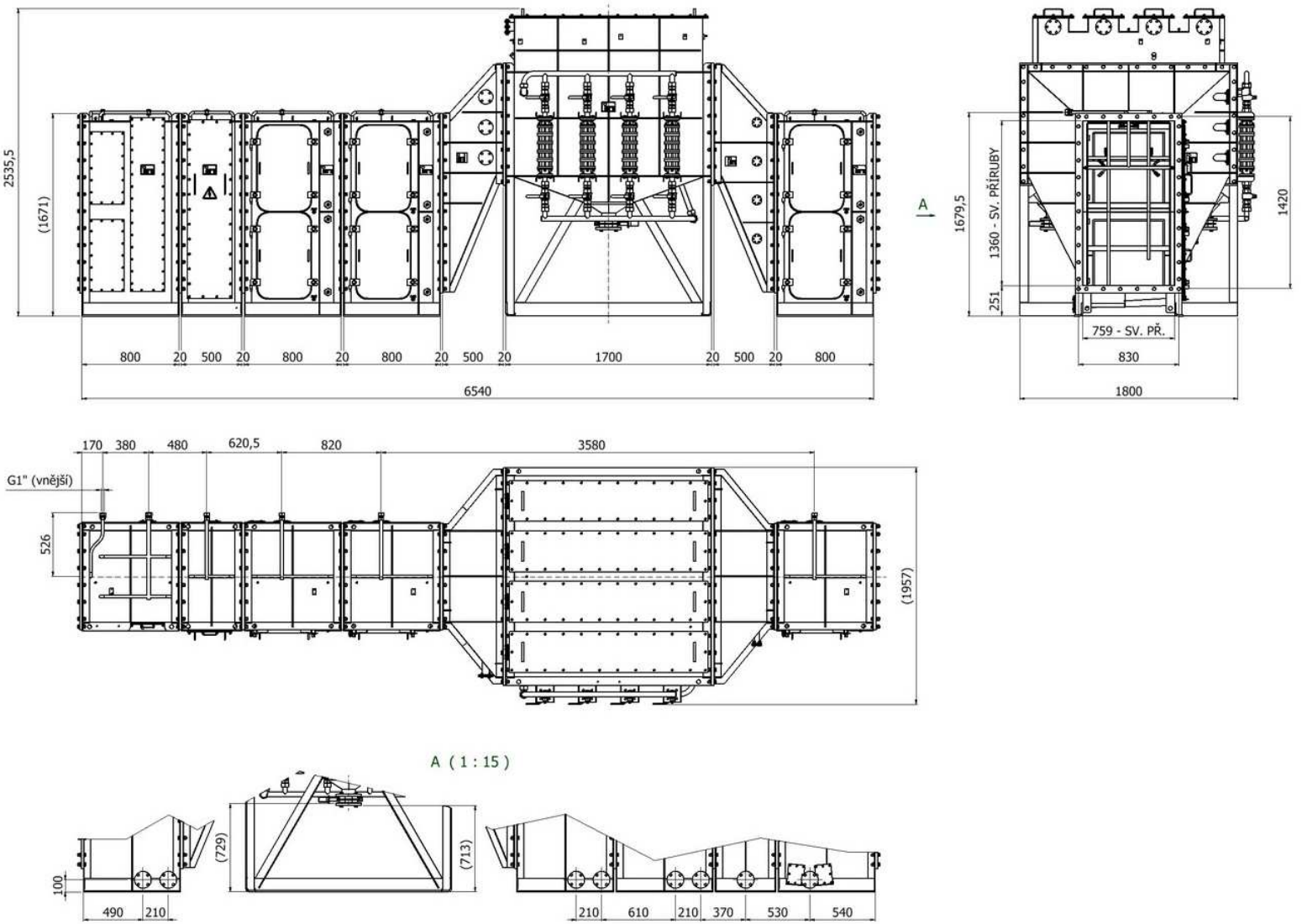



**Fig. 4 Main dimensions of a VS 8 filter unit, solid right-hand model**

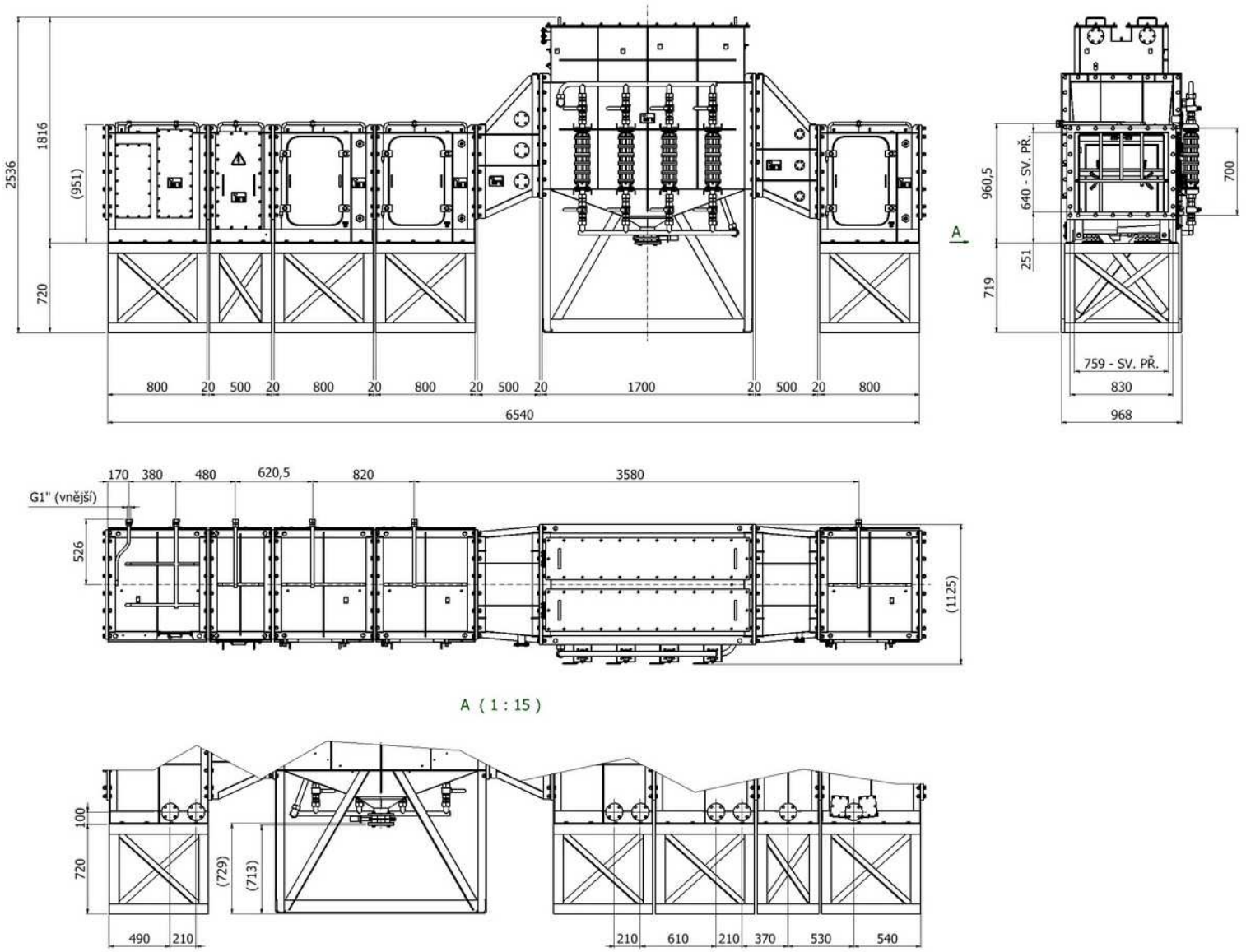



**Fig. 5 Main dimensions of a VS 4 filter unit, solid right-hand model**

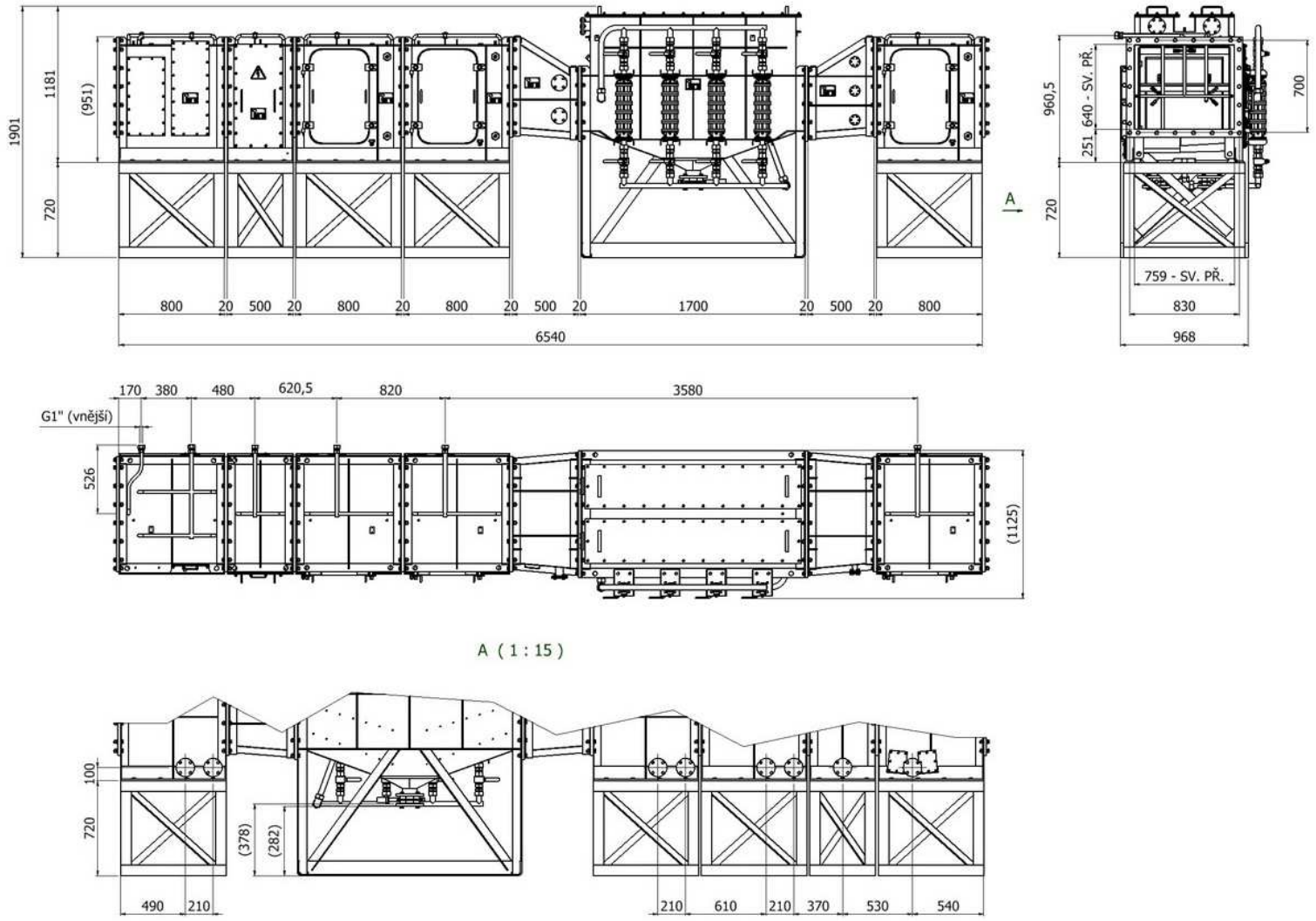



**Fig. 6 Main dimensions of a VS 2 filter unit, solid right-hand model**

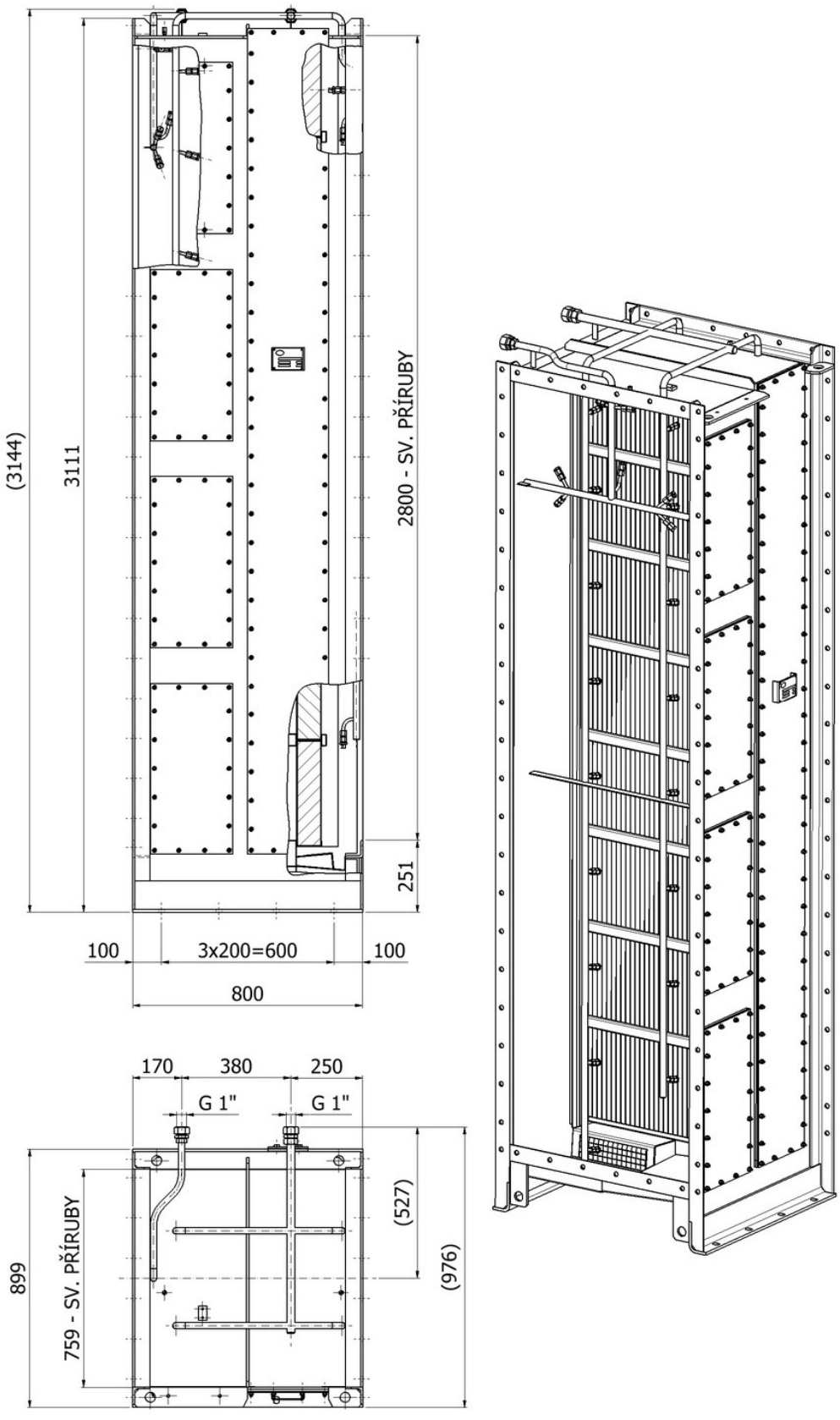



**Fig. 7 Main dimensions of a VSO 16 fog eliminating filter, right-hand model with decontamination**

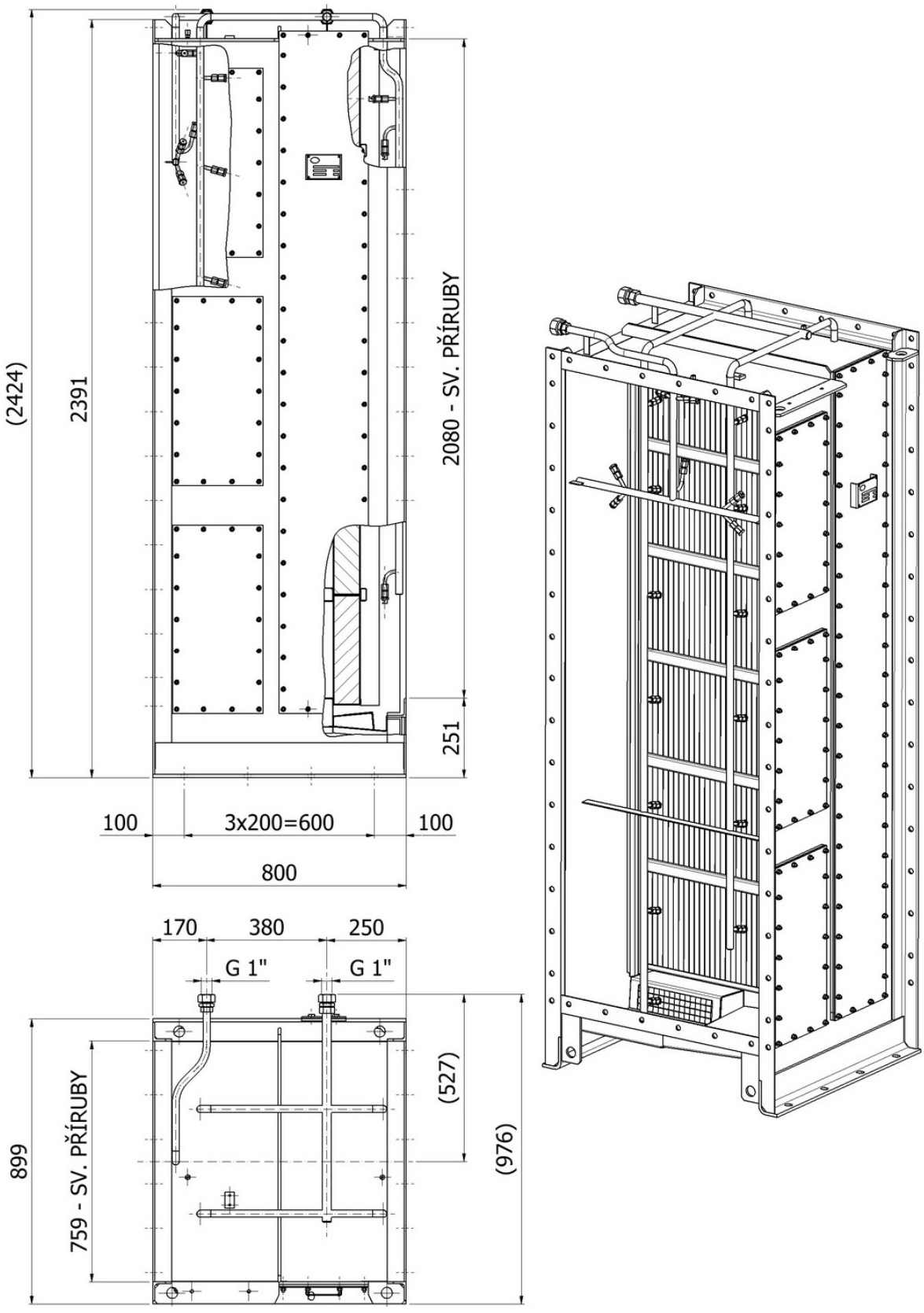



**Fig. 8 Main dimensions of a VSO 12 fog eliminating filter, right-hand model with decontamination**

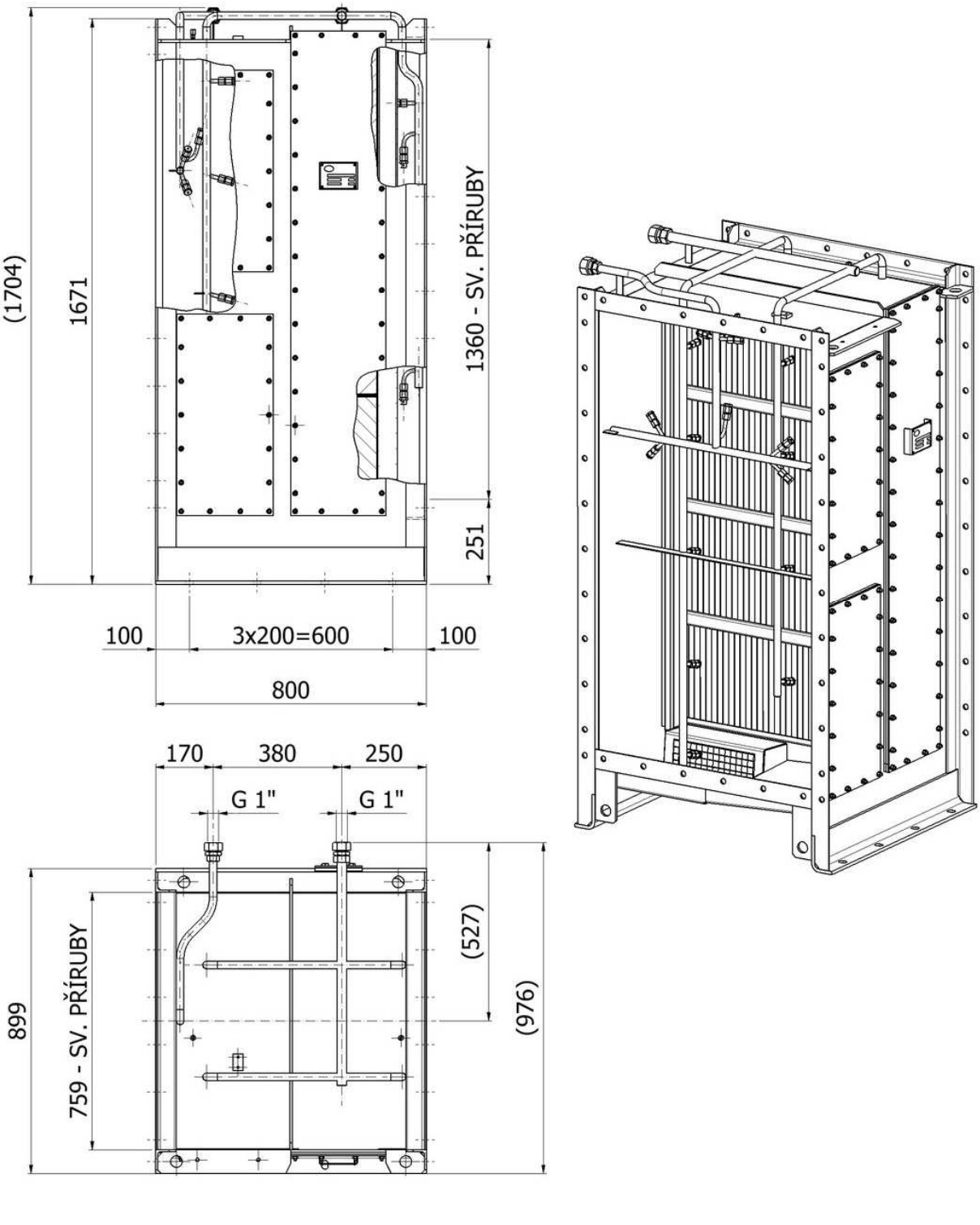



**Fig. 9 Main dimensions of a VSO 8 fog eliminating filter, right-hand model with decontamination**

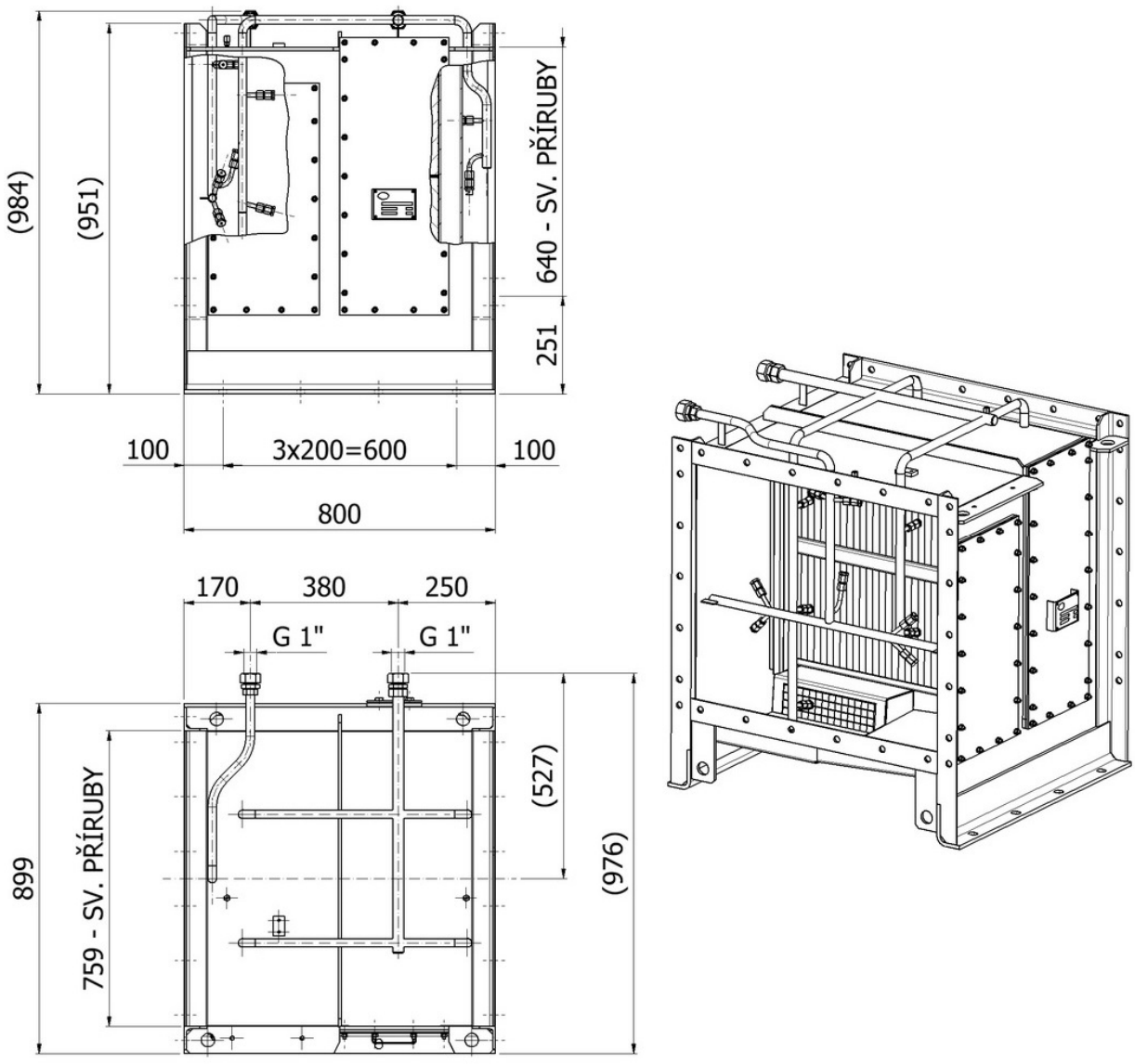



**Fig. 10 Main dimensions of a VSO 4 (2) fog eliminating filter right-hand model with decontamination**

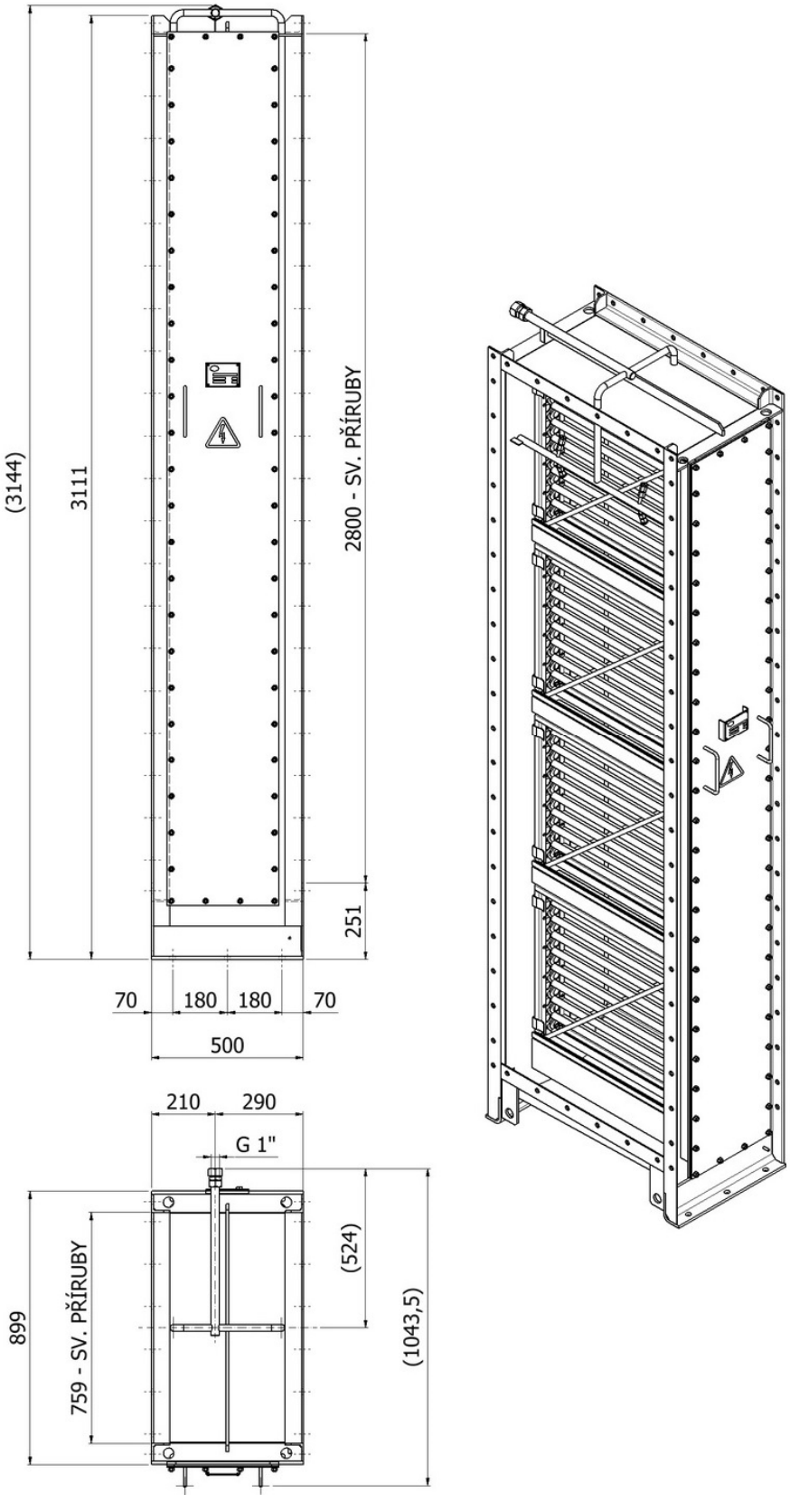



**Fig. 11 Main dimensions of a VSE 16 electric heater, right-hand model with decontamination**

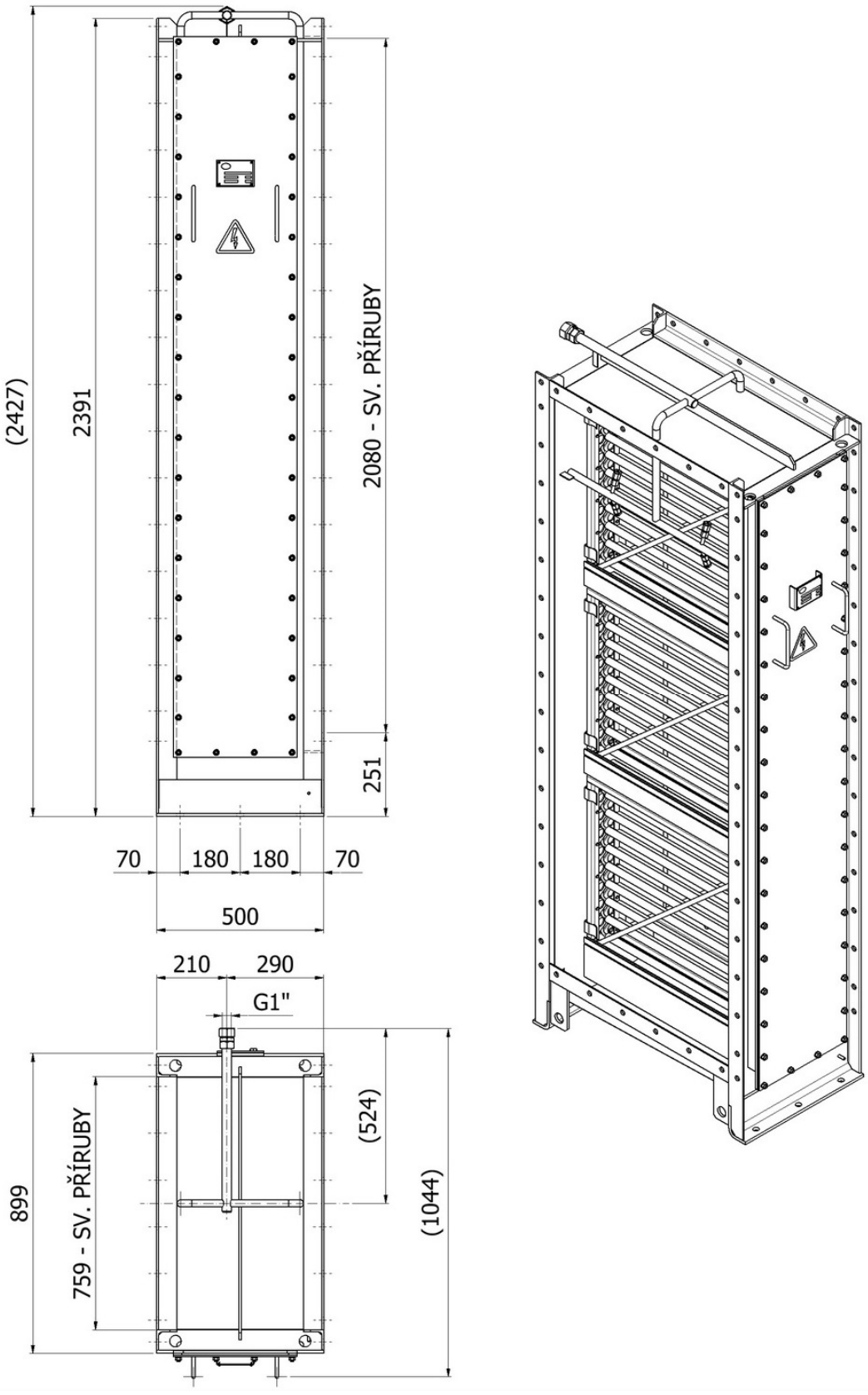



**Fig. 12 Main dimensions of a VSE 12 electric heater, right-hand model with decontamination**

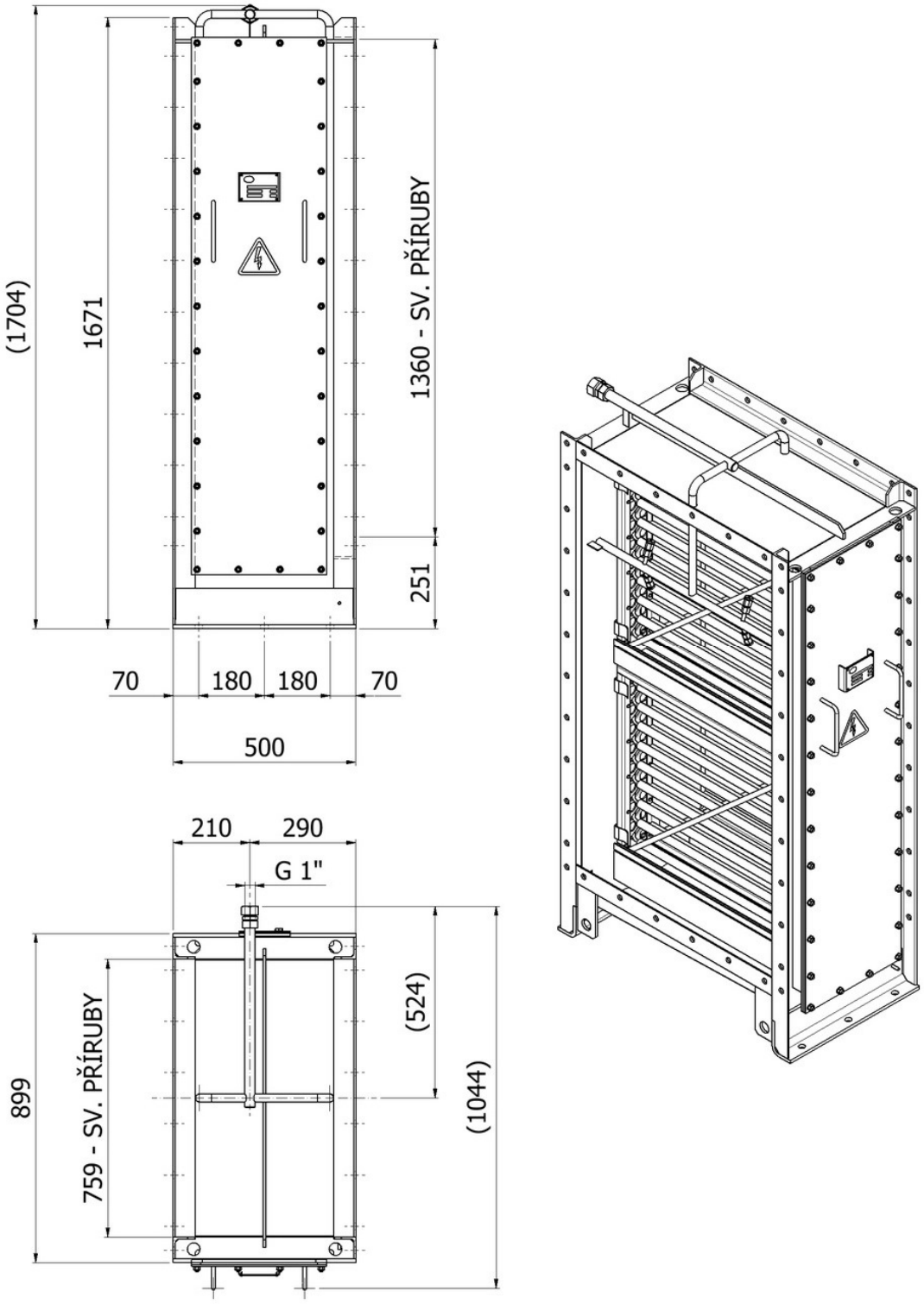



**Fig. 13 Main dimensions of a VSE 8 electric heater, right-hand model with decontamination**

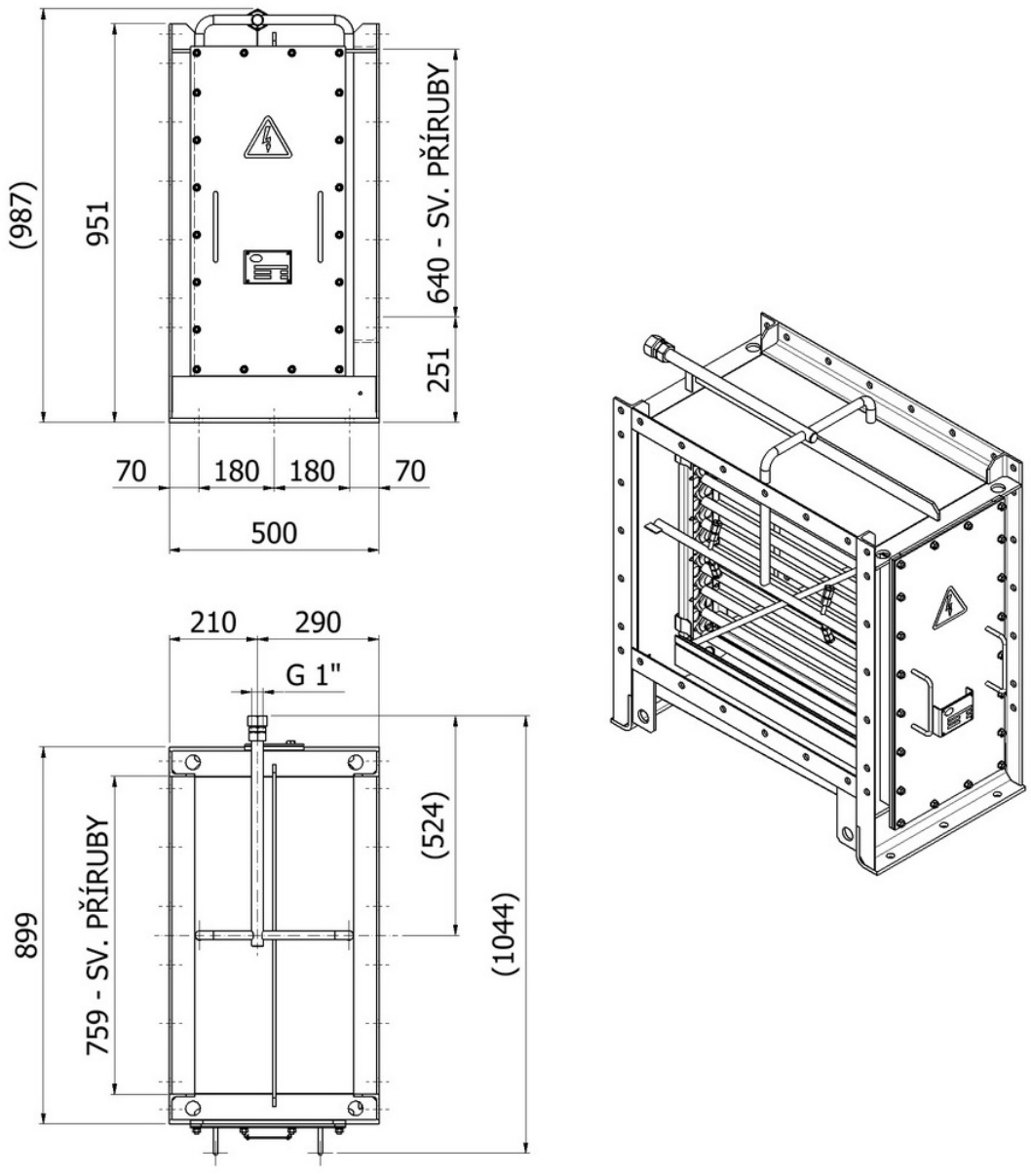



**Fig. 14 Main dimensions of a VSE 4 (2) electric heater, right-hand model with decontamination**

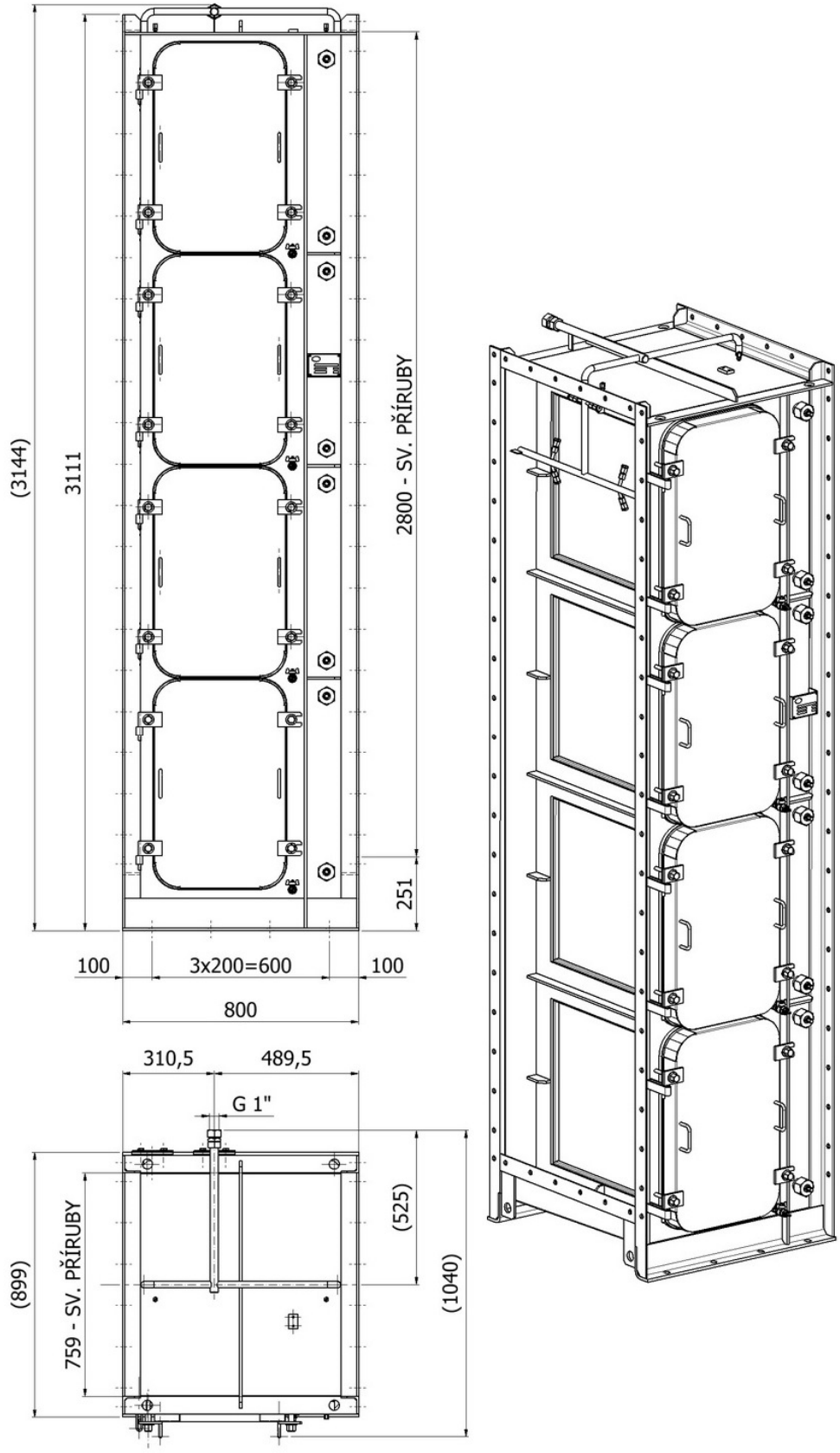



**Fig. 15** **Main dimensions of a VSA 16 aerosol filter, right-hand model with decontamination**
(Main dimensions of a VSP 16 pre-filter, right-hand model with decontamination)

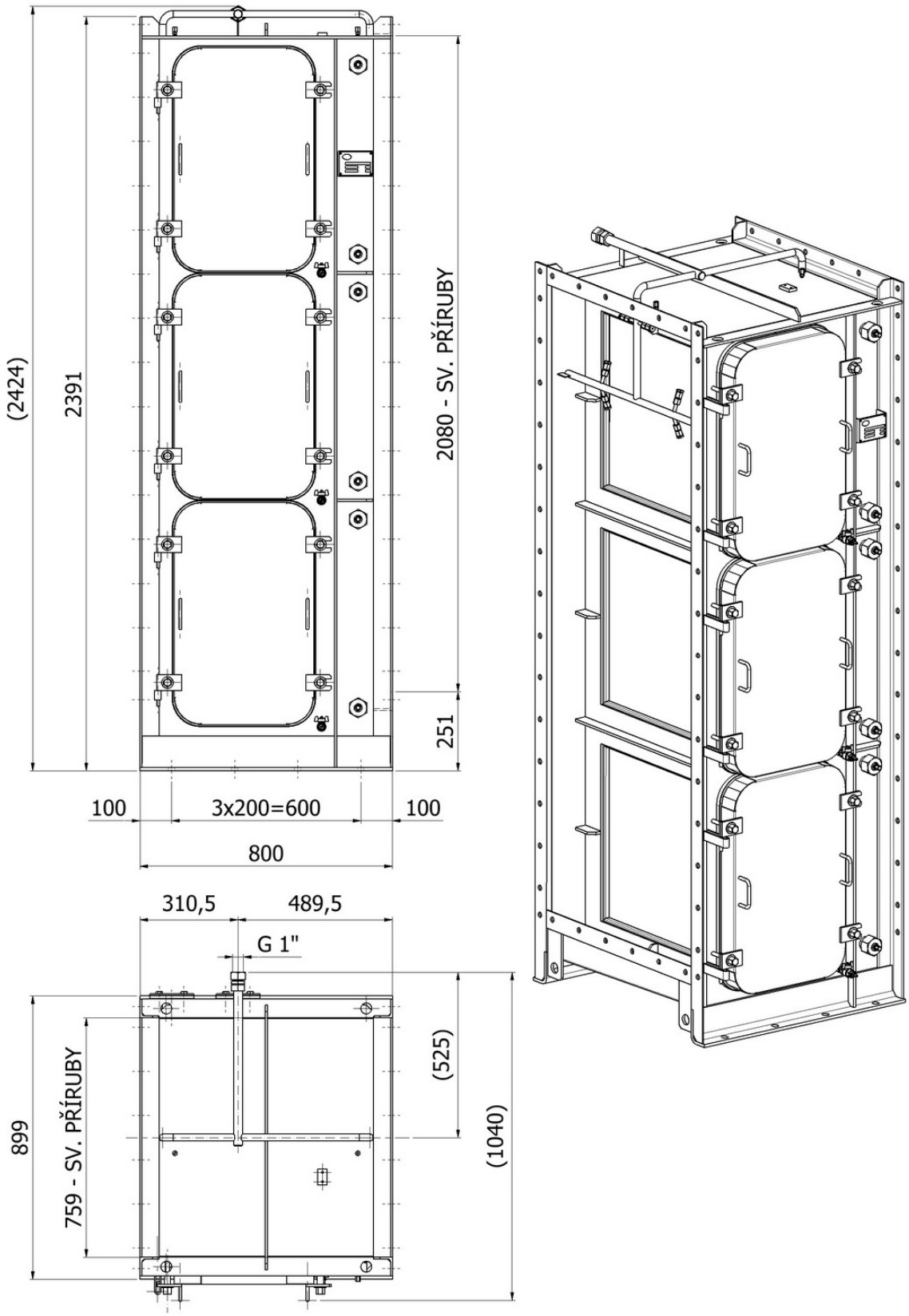



**Fig. 16** **Main dimensions of a VSA 12 aerosol filter, right-hand model with decontamination**
(Main dimensions of a VSP 12 pre-filter, right-hand model with decontamination)

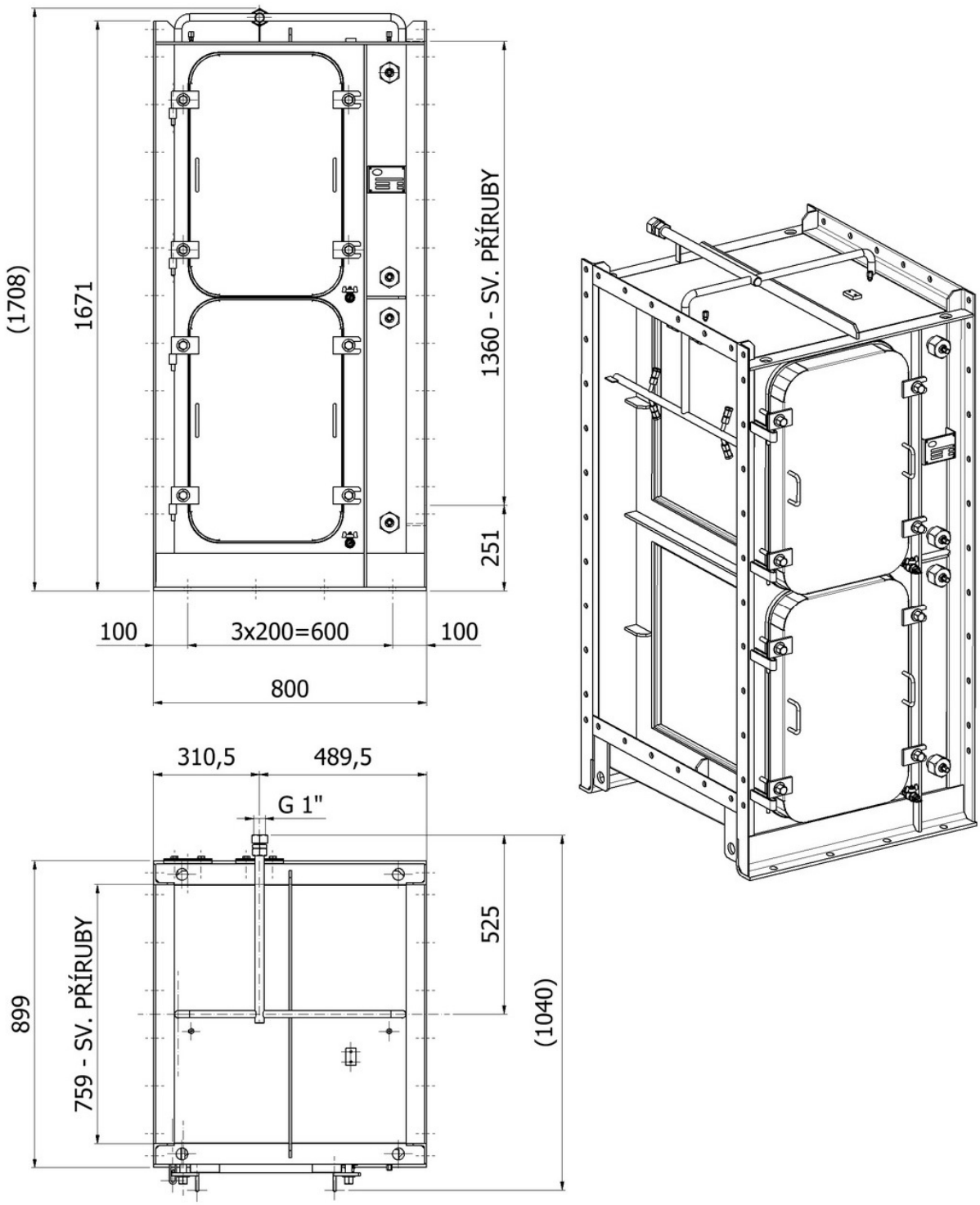



**Fig. 17** **Main dimensions of a VSA 8 aerosol filter, right-hand model with decontamination**
(Main dimensions of a VSP 8 pre-filter, right-hand model with decontamination)

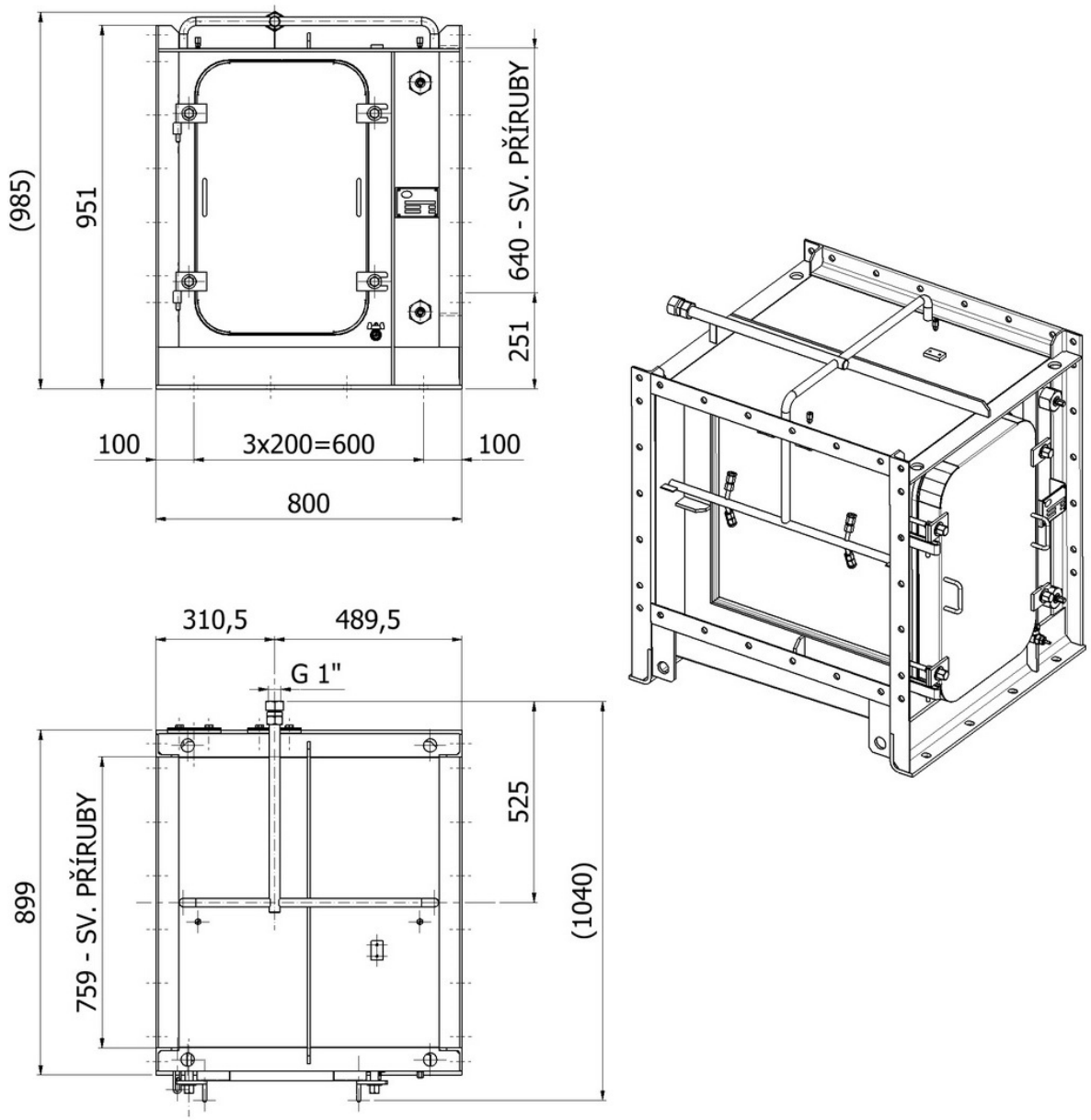



**Fig. 18** **Main dimensions of a VSA 4 (2) aerosol filter, right-hand model with decontamination**
(Main dimensions of a VSP 4 (2) pre-filter, right-hand model with decontamination)

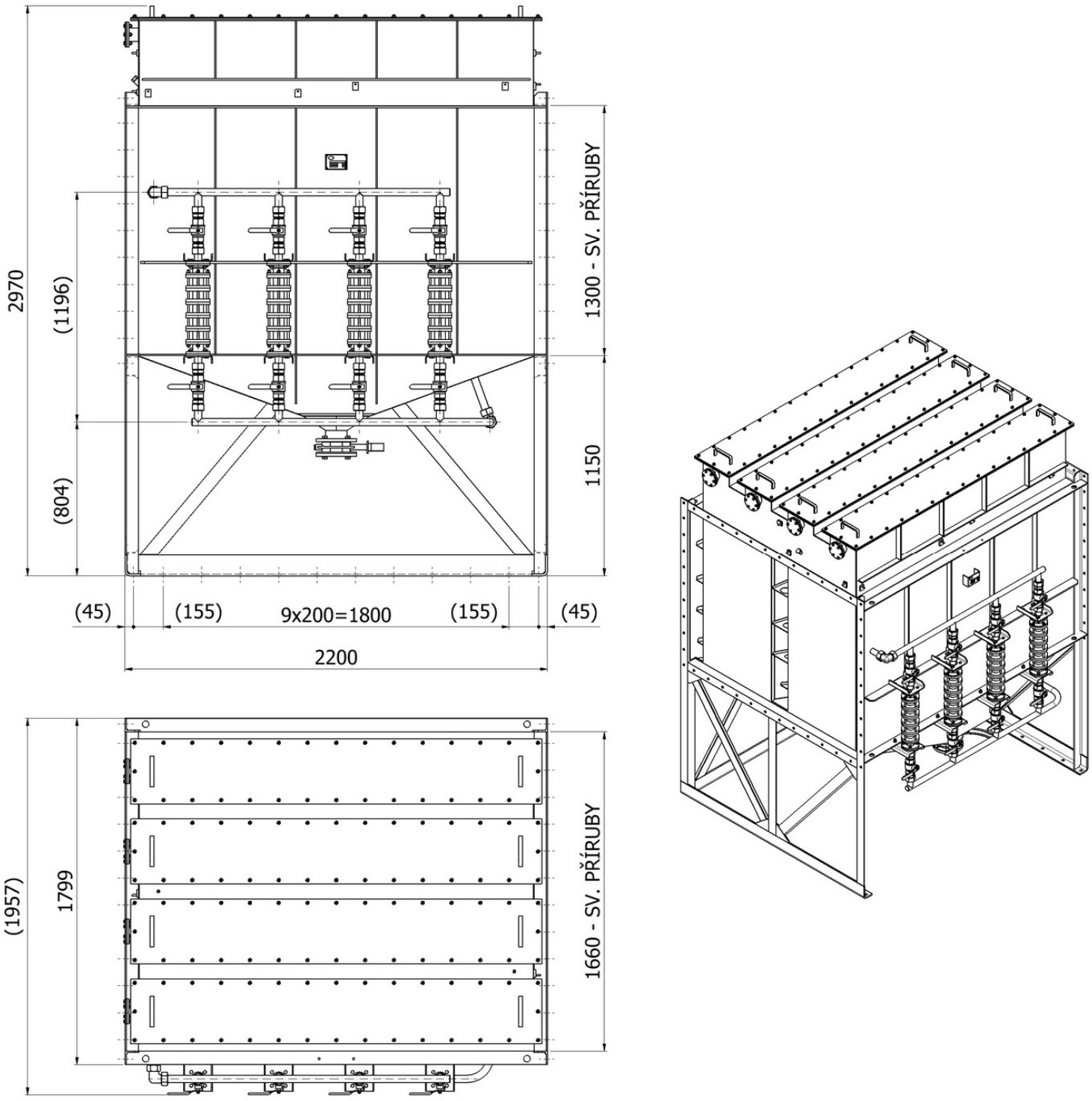



**Fig. 19 Main dimensions of a VSJ 16 iodine filter, solid right-hand model**

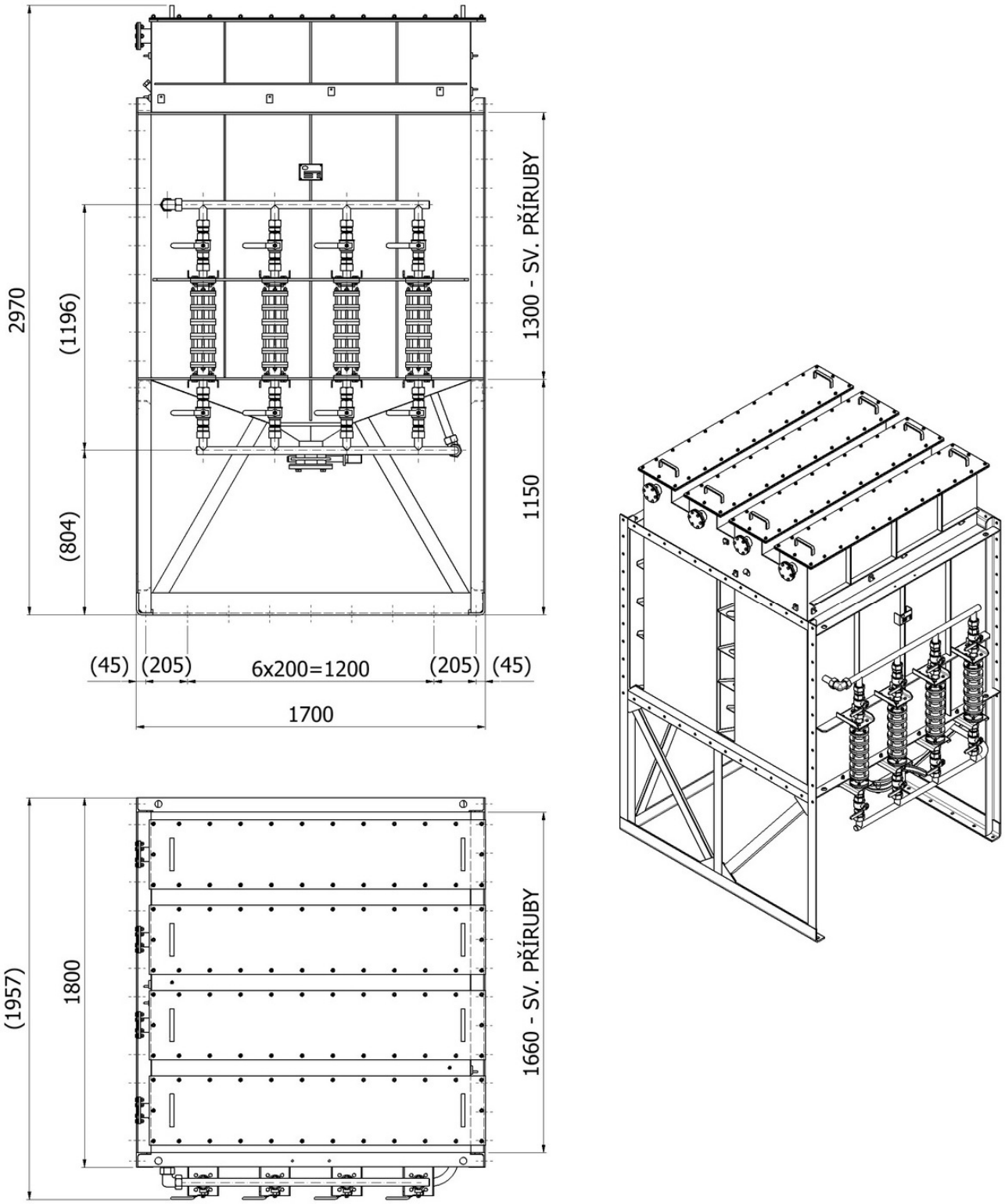



**Fig. 20 Main dimensions of a VSJ 12 iodine filter, solid right-hand model**

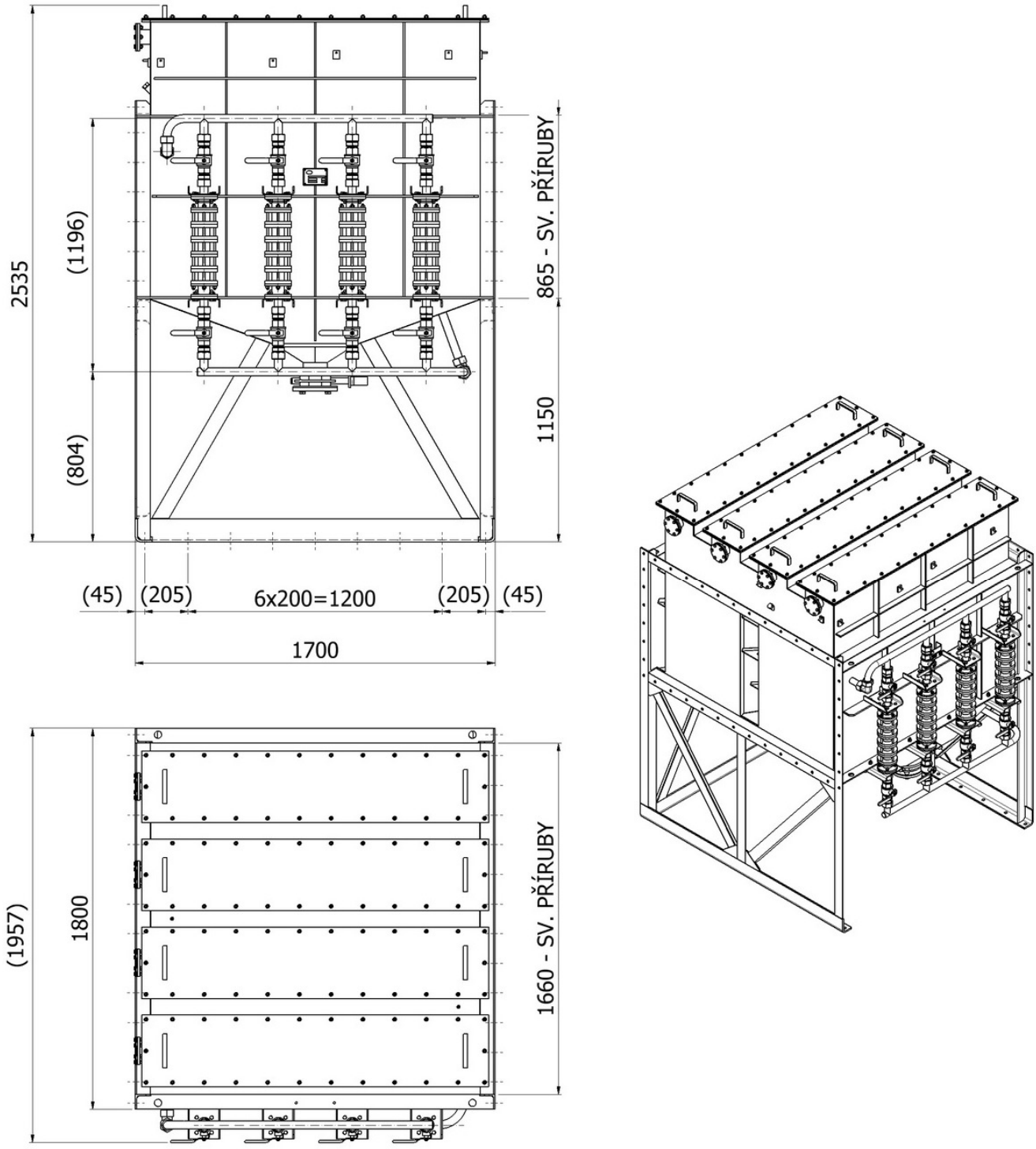



**Fig. 21 Main dimensions of a VSJ 8 iodine filter, solid right-hand model**

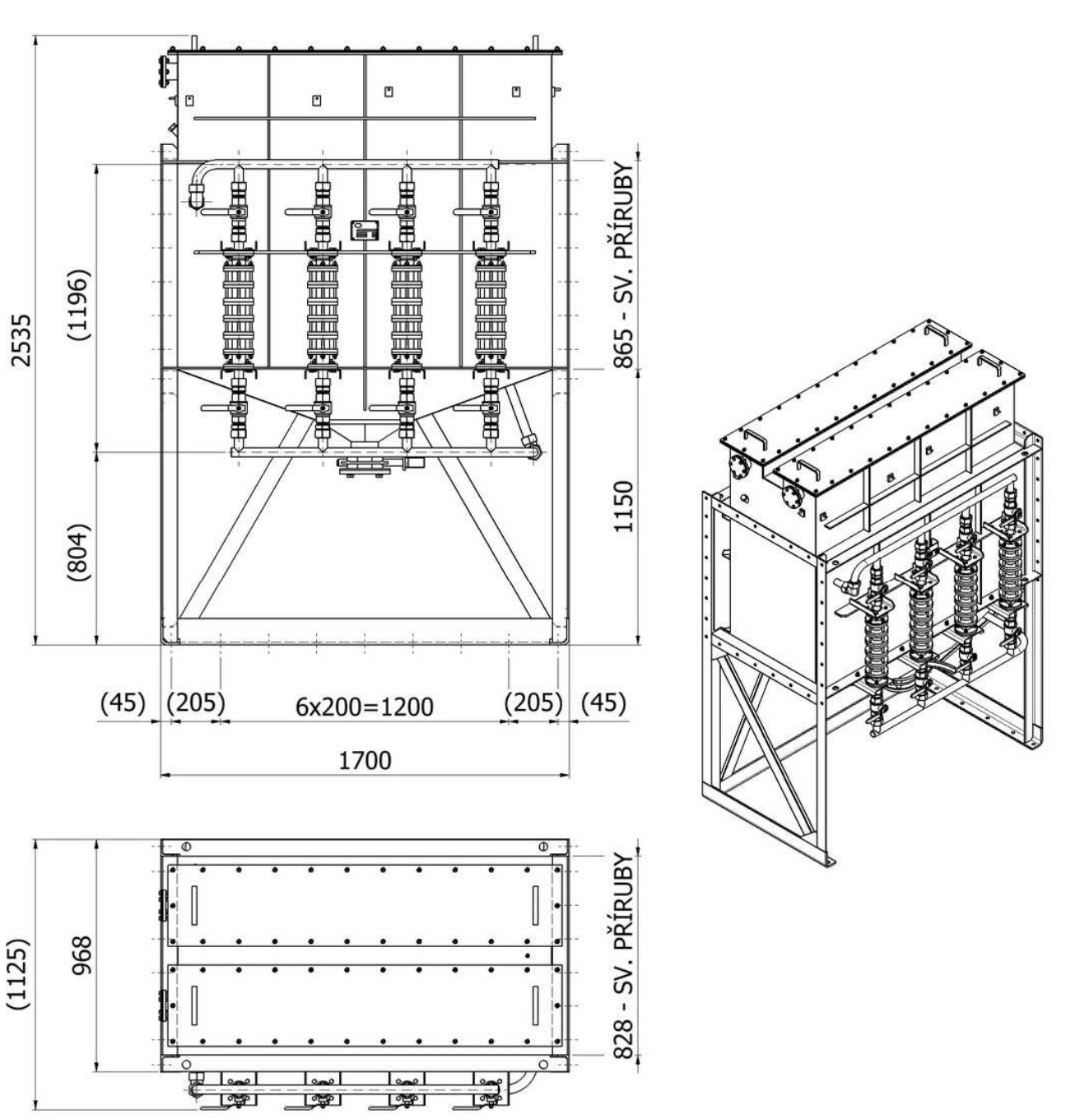



**Fig. 22 Main dimensions of a VSJ 4 iodine filter, solid right-hand model**

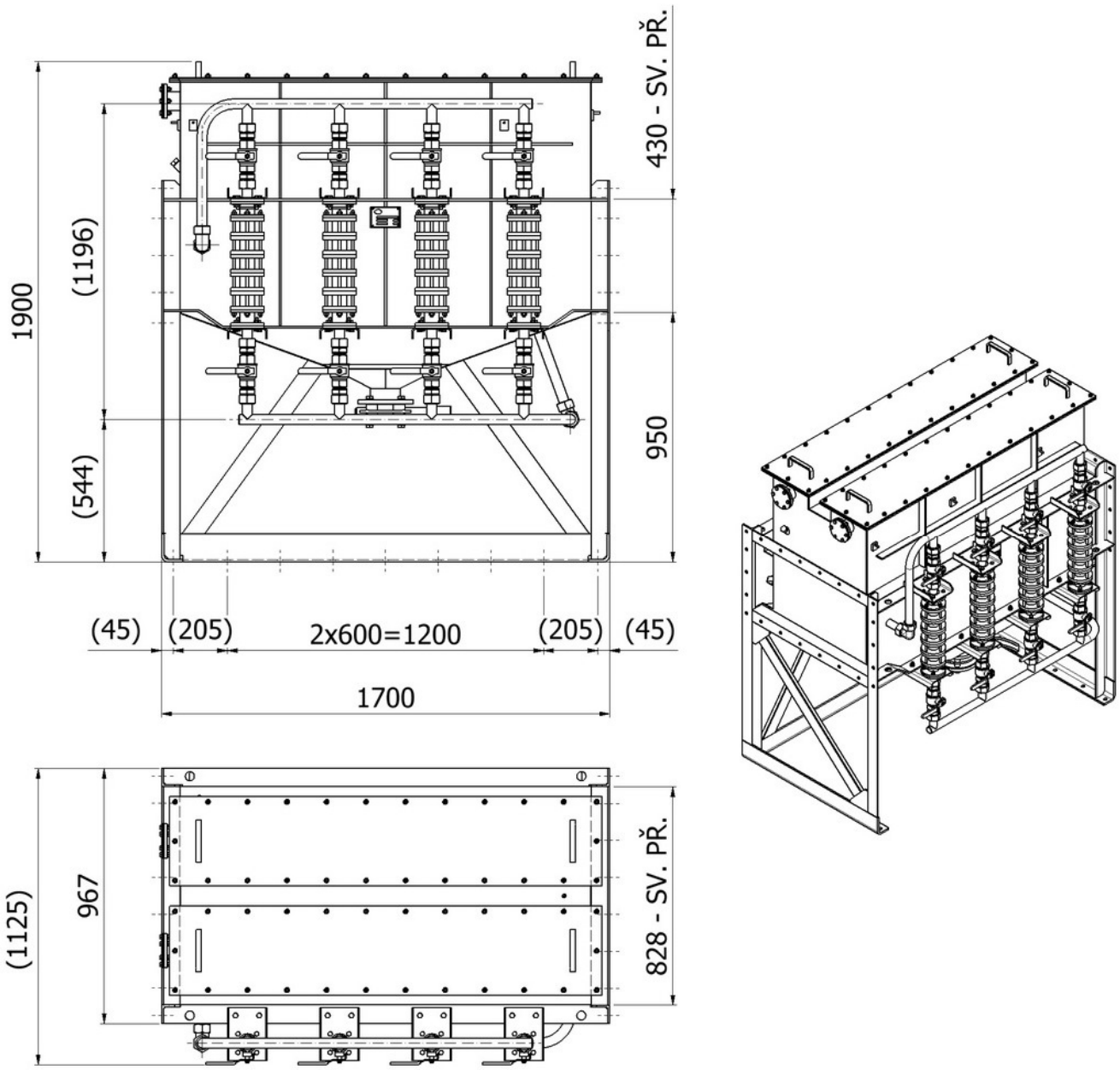



**Fig. 23 Main dimensions of a VSJ 2 iodine filter, solid right-hand model**

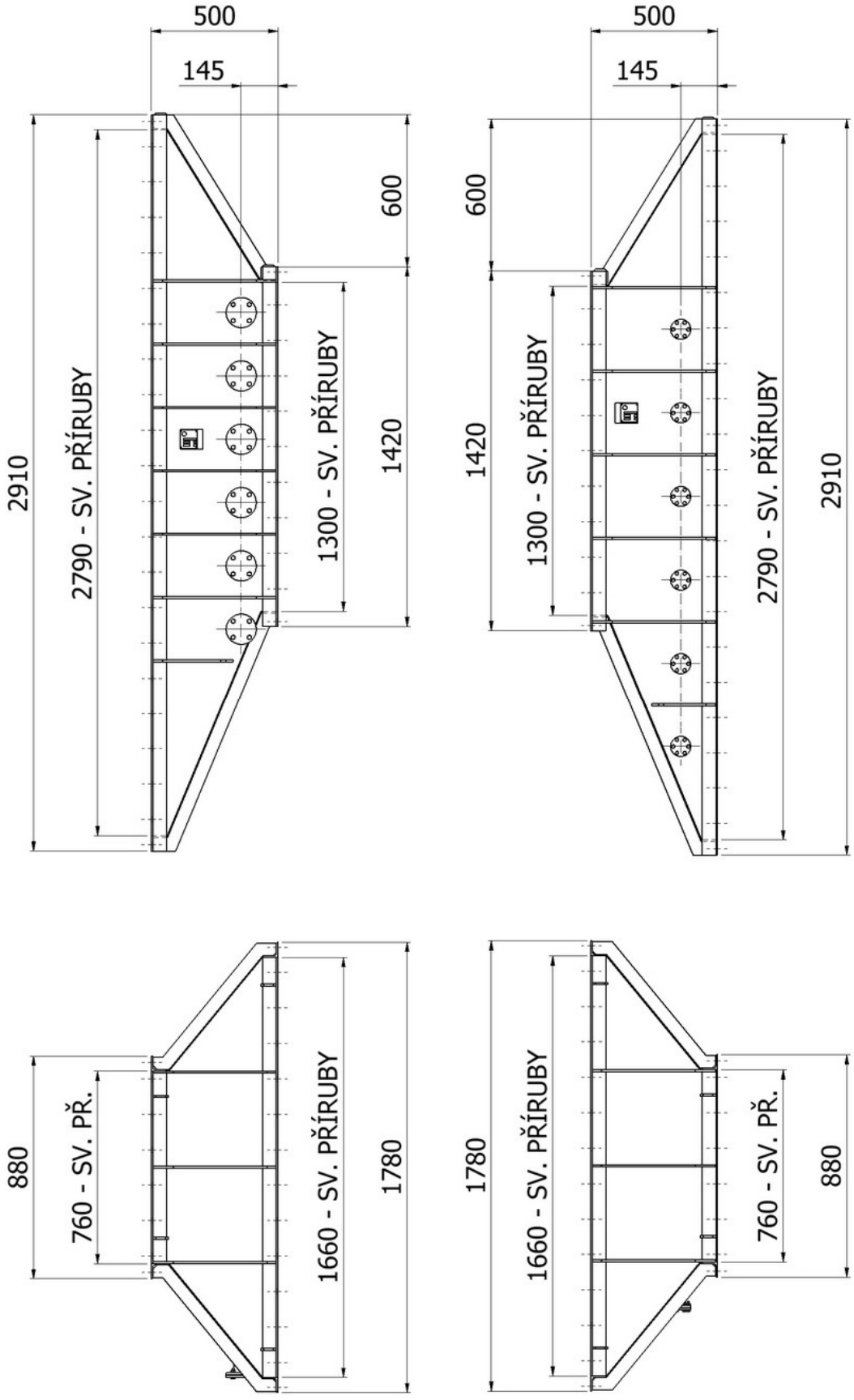



**Fig. 24 Main dimensions of the VSS 16 connecting parts, solid right-hand model**

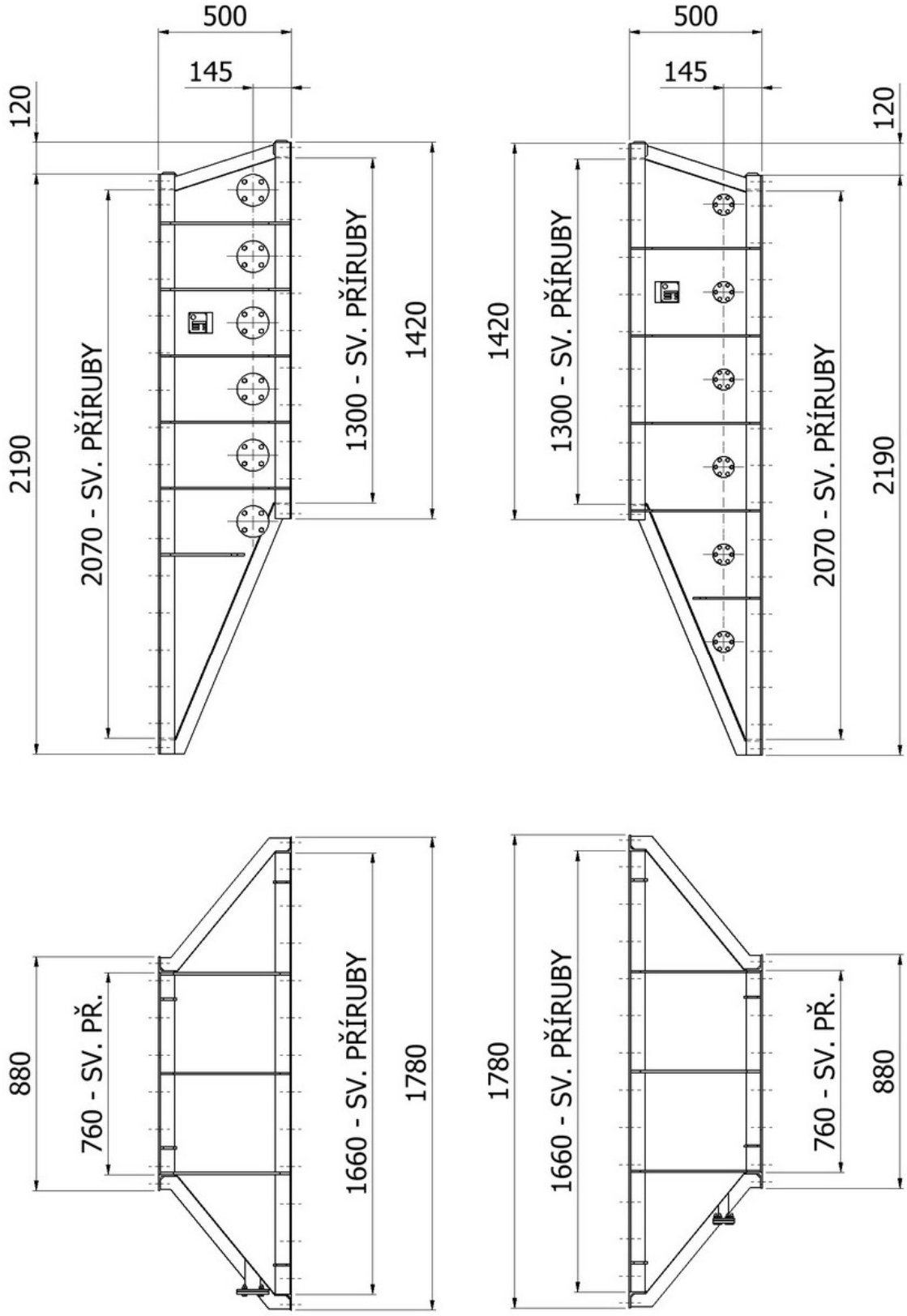



**Fig. 25 Main dimensions of the VSS 12 connecting parts, solid right-hand model**

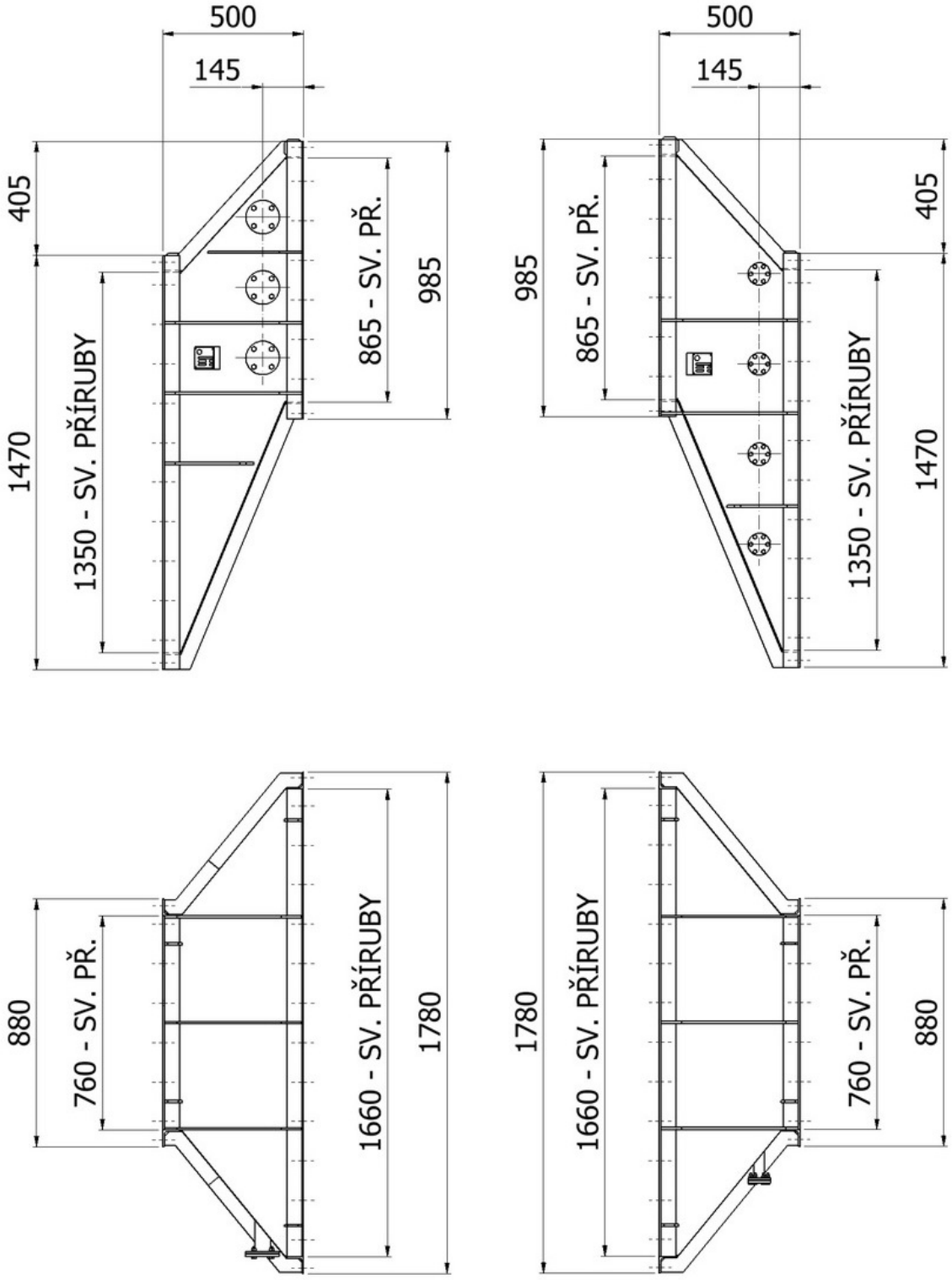



**Fig. 26 Main dimensions of the VSS 8 connecting parts, solid right-hand model**

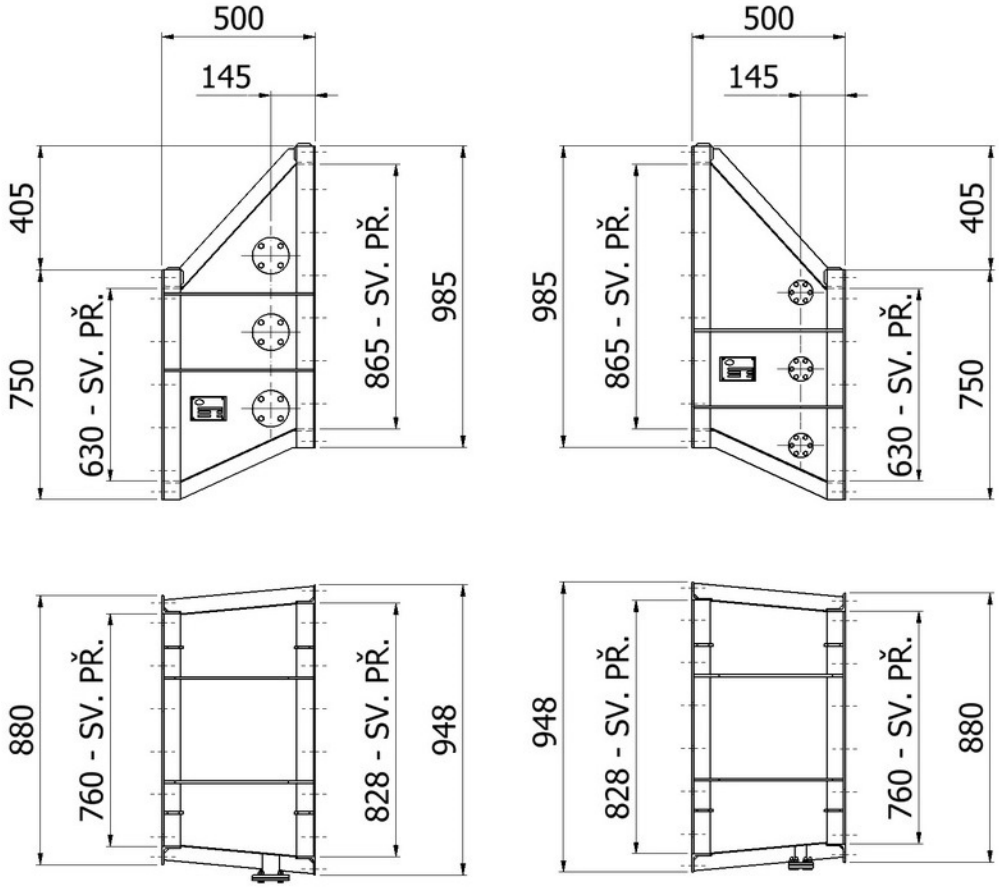



**Fig. 27 Main dimensions of the VSS 4 connecting parts, solid right-hand model**

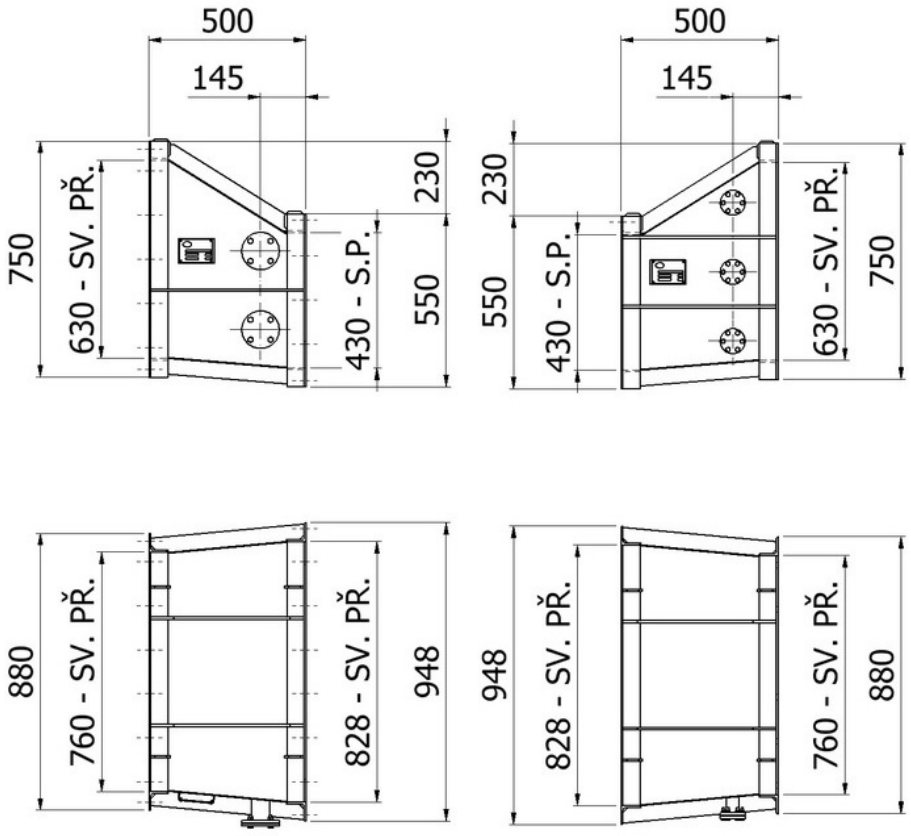
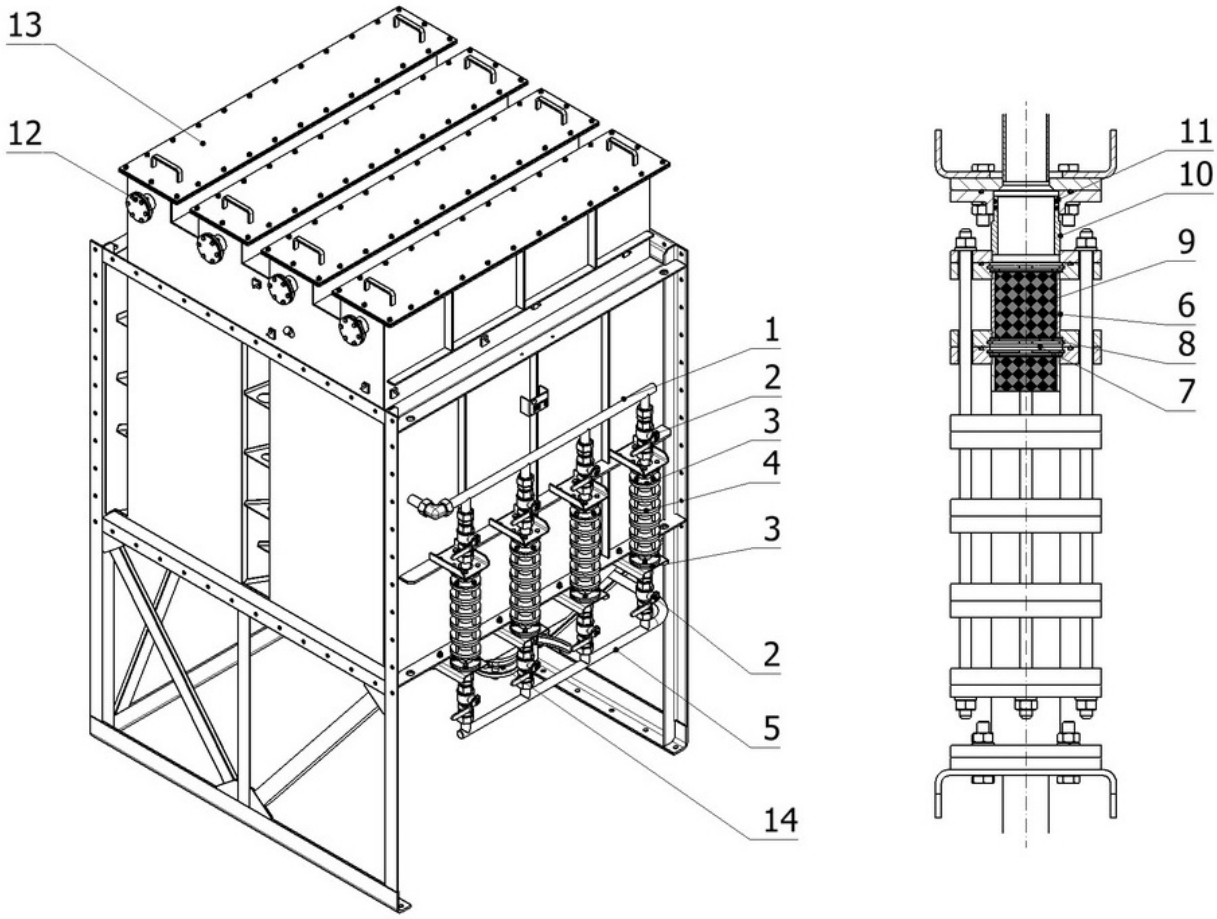
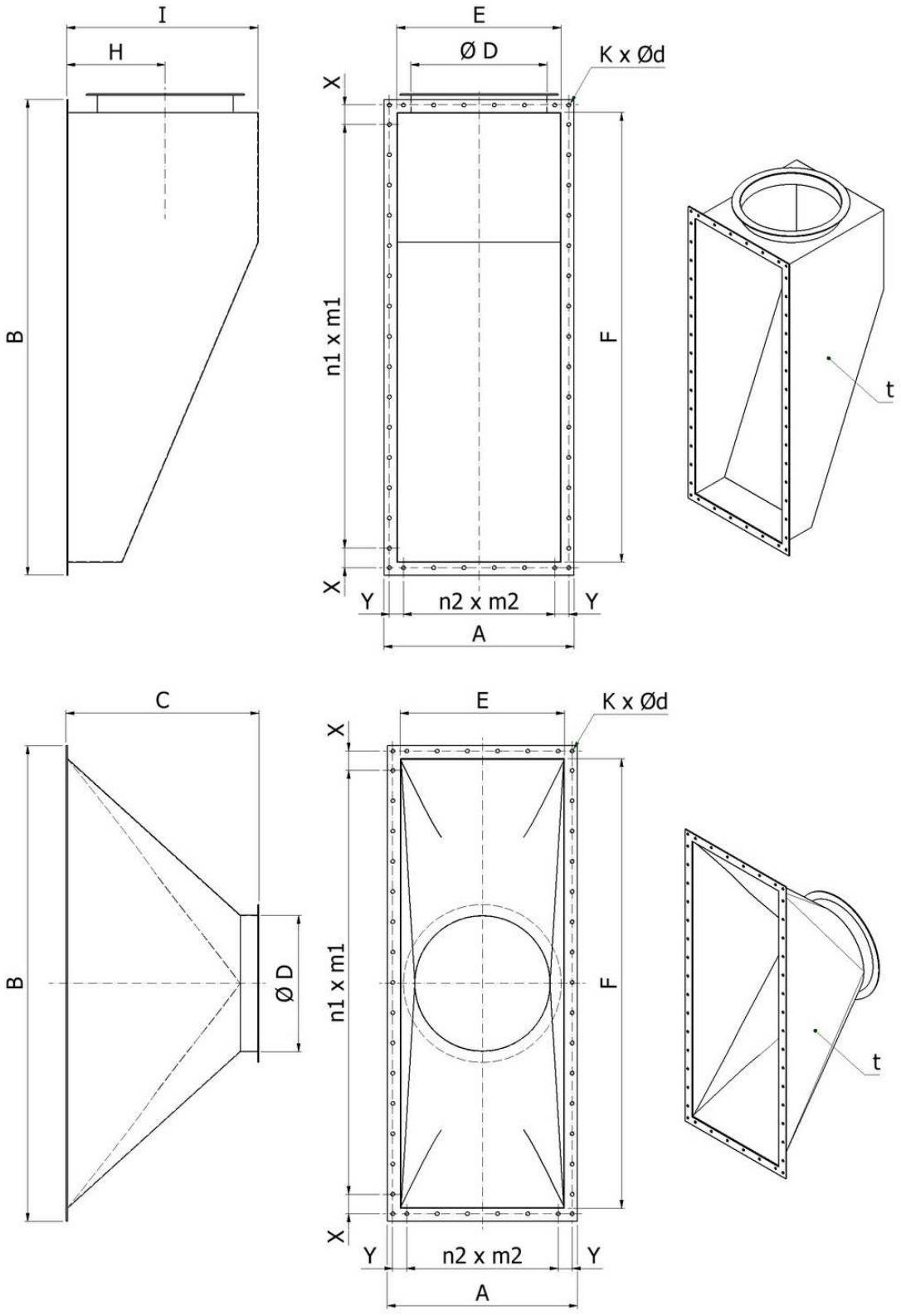



**Fig. 28 Main dimensions of the VSS 2 connecting parts, solid right-hand model**




1. Supply pipe
2. Shut-off wheel valve
3. Detachable flange
4. Sampler
5. Drainage pipe
6. Sampler body
7. Lock ring
8. Screen
9. Sorbent
10. Flange
11. O-ring
12. Filter filler neck
13. Filter cover
14. Valve

**Fig. 29 Description of the VSJ iodine filter measuring cell**




| TYPE | A | B | C | D | E | F | H | I | K | n | m | n | m | X | Y | d | t |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VSN 16 | 859 | 2900 | 880 | 630 | 759 | 2800 | 450 | 880 | 56 | 19 | 140 | 5 | 140 | 100 | 65 | 18 | 2,5 |
| VSN 12 | 859 | 2180 | 880 | 630 | 759 | 2080 | 450 | 880 | 46 | 14 | 140 | 5 | 140 | 90 | 65 | 18 | 2,5 |
| VSN 8 | 859 | 1460 | 880 | 630 | 759 | 1360 | 450 | 880 | 32 | 9 | 140 | 5 | 140 | 80 | 65 | 18 | 2,5 |
| VSN 4 | 859 | 740 | 880 | 630 | 759 | 640 | 450 | 880 | 26 | 4 | 140 | 5 | 140 | 70 | 65 | 18 | 2,5 |
| VSN 2 | 859 | 740 | 880 | 630 | 759 | 640 | 450 | 880 | 26 | 4 | 140 | 5 | 140 | 70 | 65 | 18 | 2,5 |

**Fig. 30 Main installation dimensions of VSN connecting parts with straight and side neck**

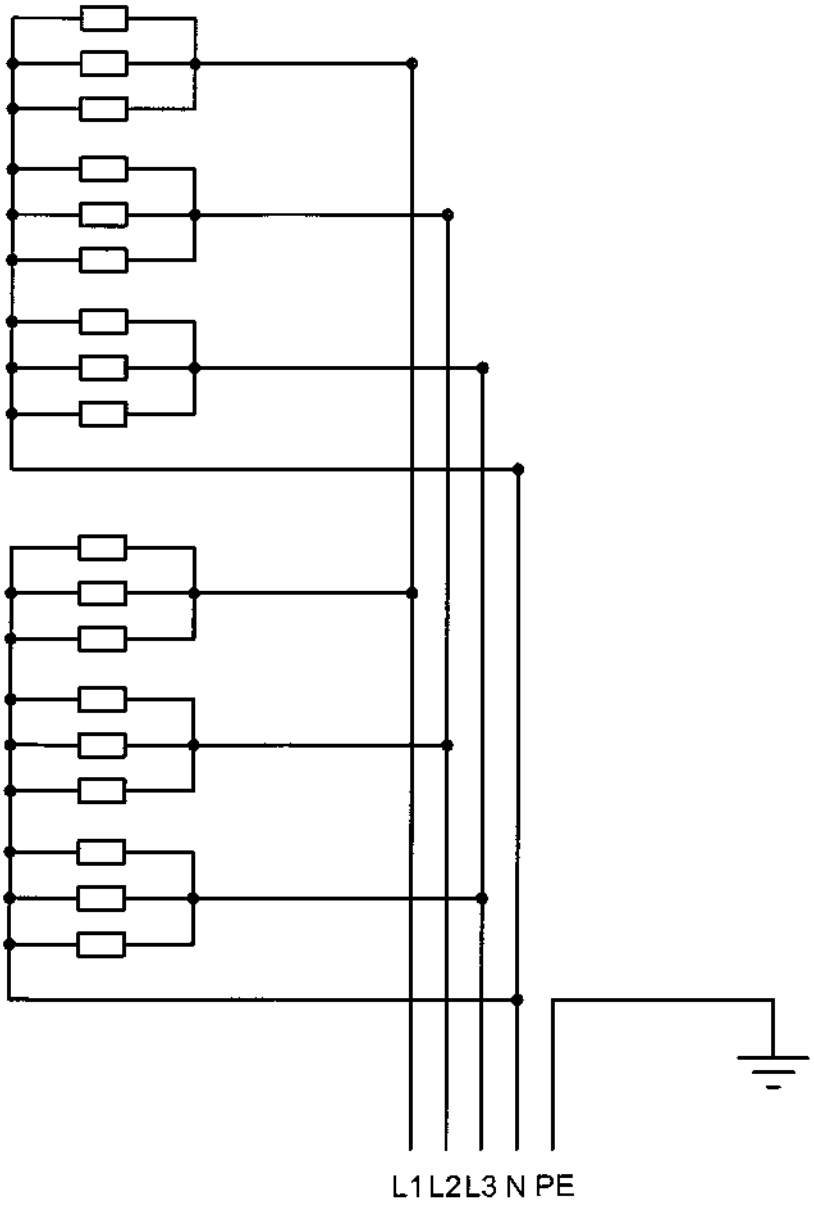



**Fig. 31 Wiring of VSE heaters (diagram)**

## LIST OF FIGURES

# TABLE OF CONTENTS



## List of Annexes