

Smart warmth. Clean electricity.

Representation of function and component overview

Leonardo FC40A

September 06, 2021 | COR



1. Product description

functionality

The fuel cell heating device Leonardo FC40A is a natural gas operated micro-CHP device based on fuel cells for the generation of heat and electricity.

The integrated reformer converts natural gas into hydrogen and carbon monoxide, which are then electrochemically converted into electricity in the stack module.

The FC40A is preset for operation with natural gas E, which can be converted to natural gas LL.

The built-in high-efficiency circulation pump conveys the heating water heated by the fuel cell into any hydraulic circuit, which is usually integrated into the heating system via a system separation. Depending on the system configuration, this heating water can be used for room heating and for DHW heating.

The FC40A is operated in a heat-controlled manner. The integrated energy manager regulates the fuel cell module in an energy-optimized way. there are no operating options for the customer directly on the heater. The system can be switched on and off, 2 LEDs indicate the current operation as well as a possible .. error message. Setting and operation for the specialist takes place via a web-based program.

In order to ensure that the FC40A can be used economically and ecologically, all of the heat generated in the fuel cell heater should be used. Under full load, the FC heating generates 36 kWh of electrical energy and between 55 and 77 kWh of heat per day. The latter can be throttled by the system to 17kWh per day (minimum load point). If this heat cannot be drawn on the consumption side, the FC40A switches off automatically.

HEXIS recommends the use of the FC40A only if the design heat load of the building is 20kW, based on the annual load profile of a residential building. The FC40A switches itself off in summer or outside the heating season. Year-round operation is possible if 17kWh of heat are required per day through the provision of domestic hot water. This corresponds to at least six permanent residents.

2. Function and components of the Fuel Cell Application (FCA)

Overall system

3 bar safety valve

Status and fault LED

Burner control

Gas valve

ERS - Electronic ratio supervision

Generator circuit pump

Exhaust fan

Desulfurization cartridge

ON / OFF switch

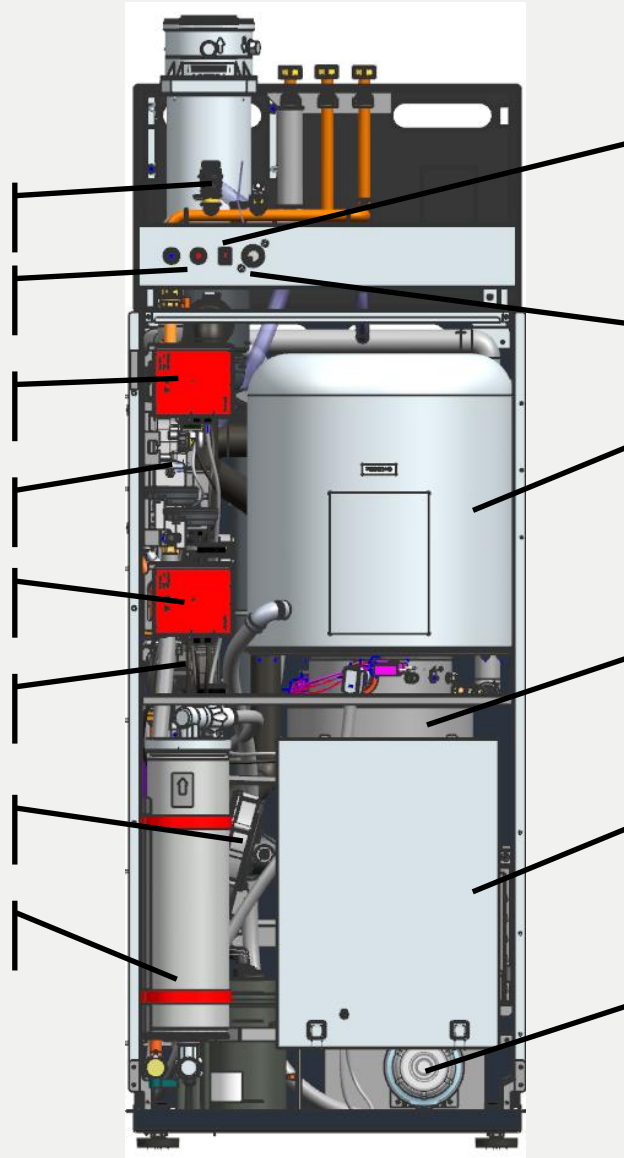
manometer

Stack module isolation

Exhaust gas heat exchanger

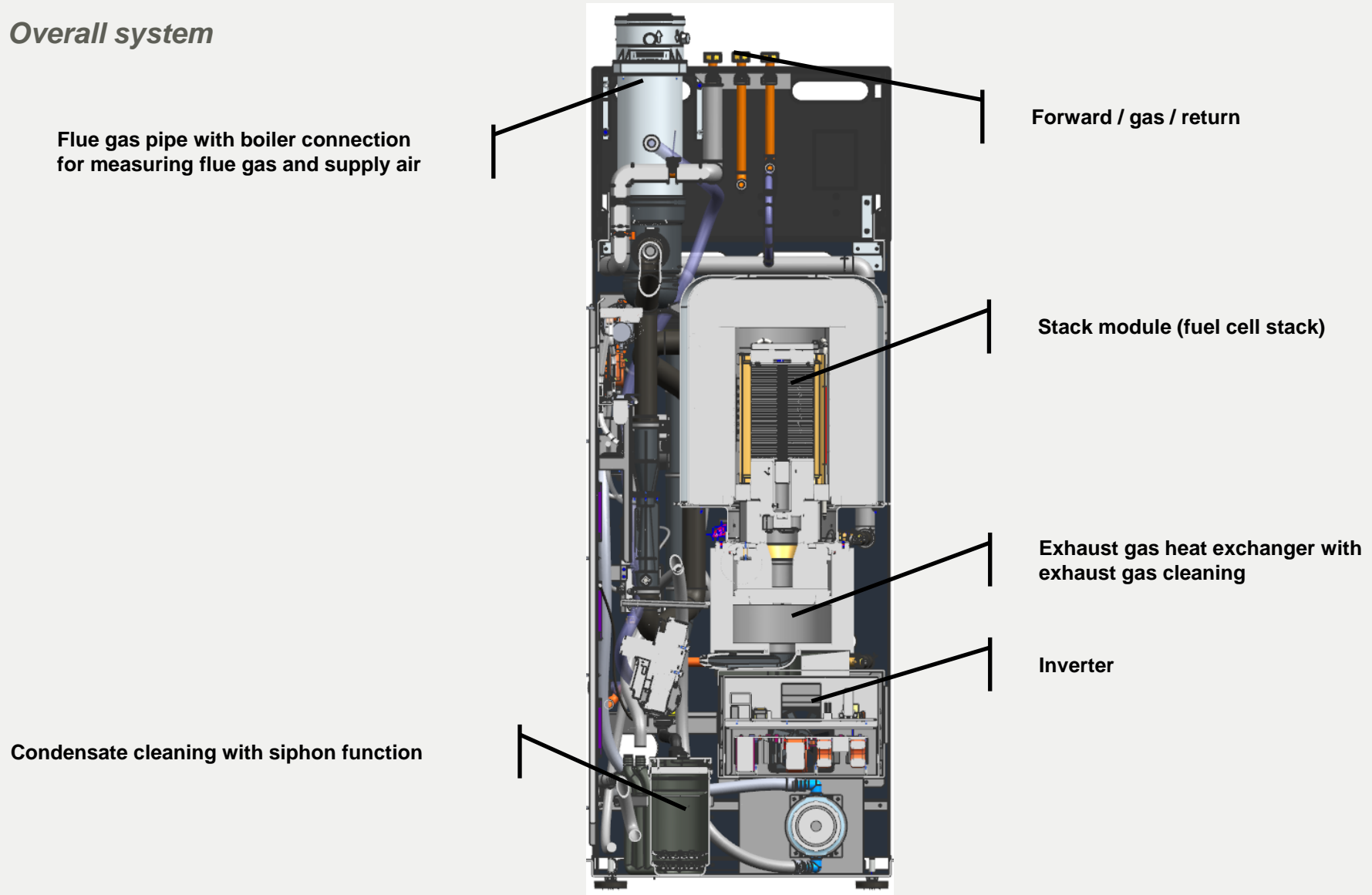
Control electronics, behind it an inverter

Air filter for CPO air



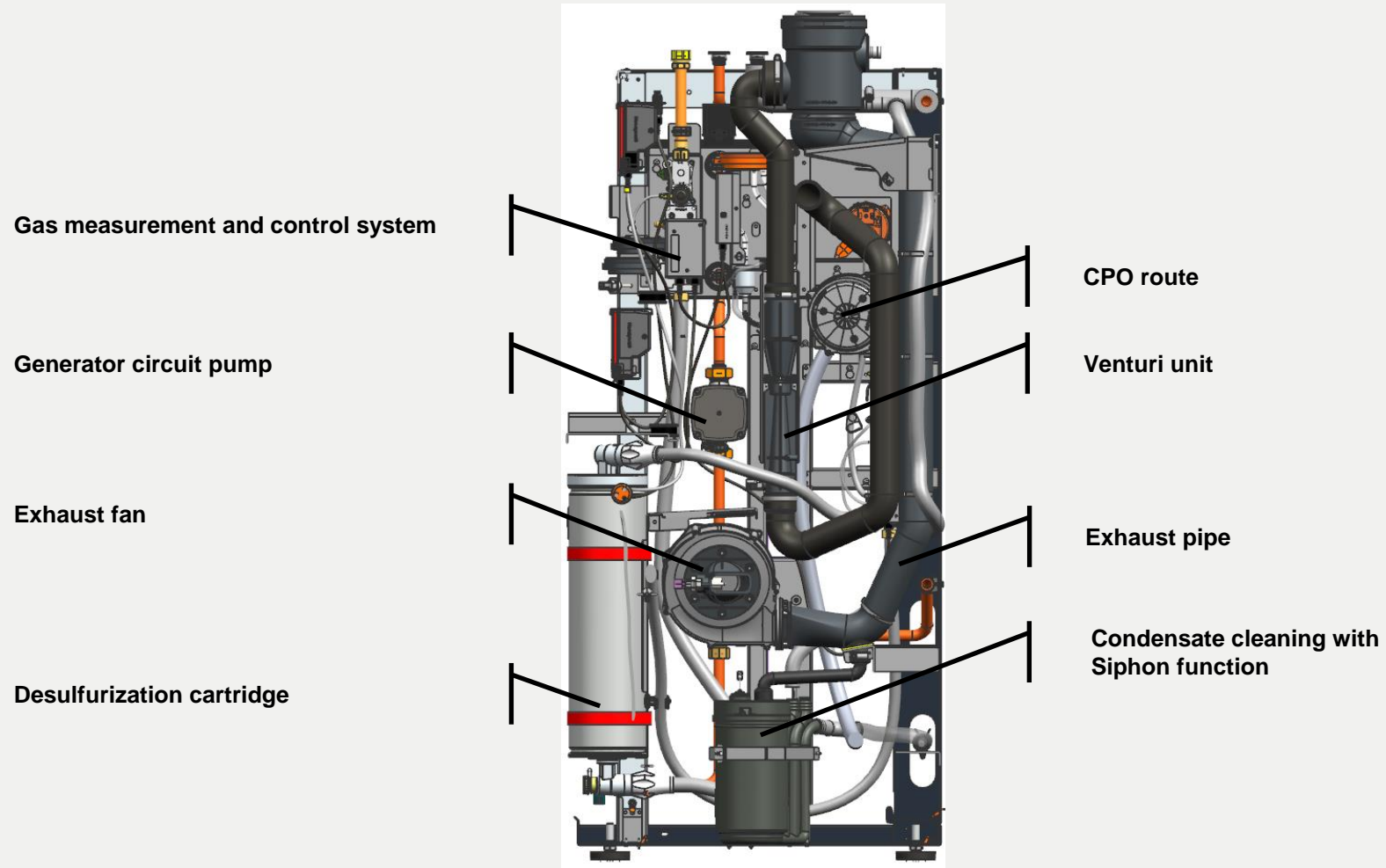
2. Function and components of the Fuel Cell Application (FCA)

Overall system



2. Function and components of the Fuel Cell Application (FCA)

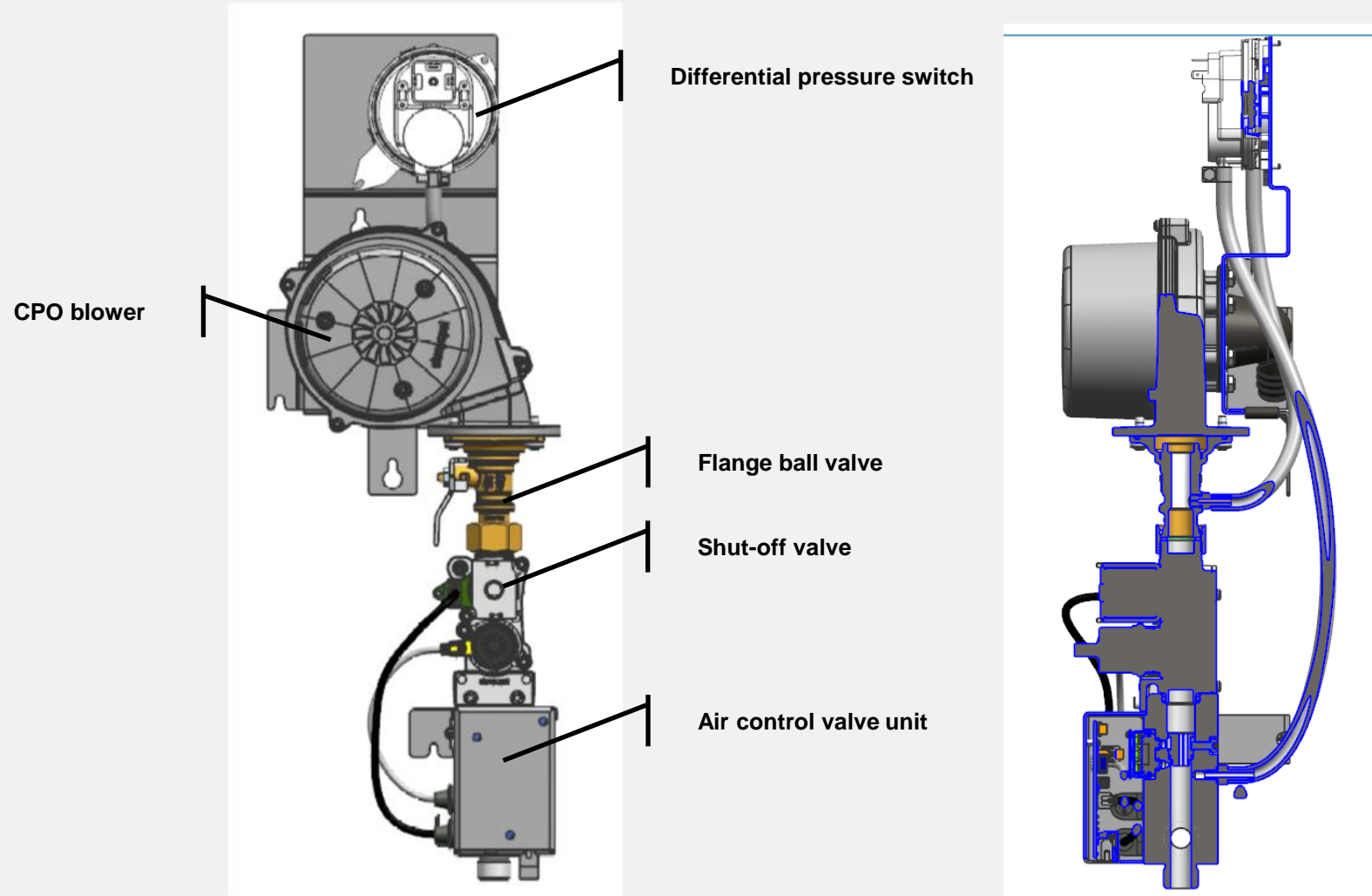
Overall system



2. Function and components of the Fuel Cell Application (FCA)

overview CPO air route

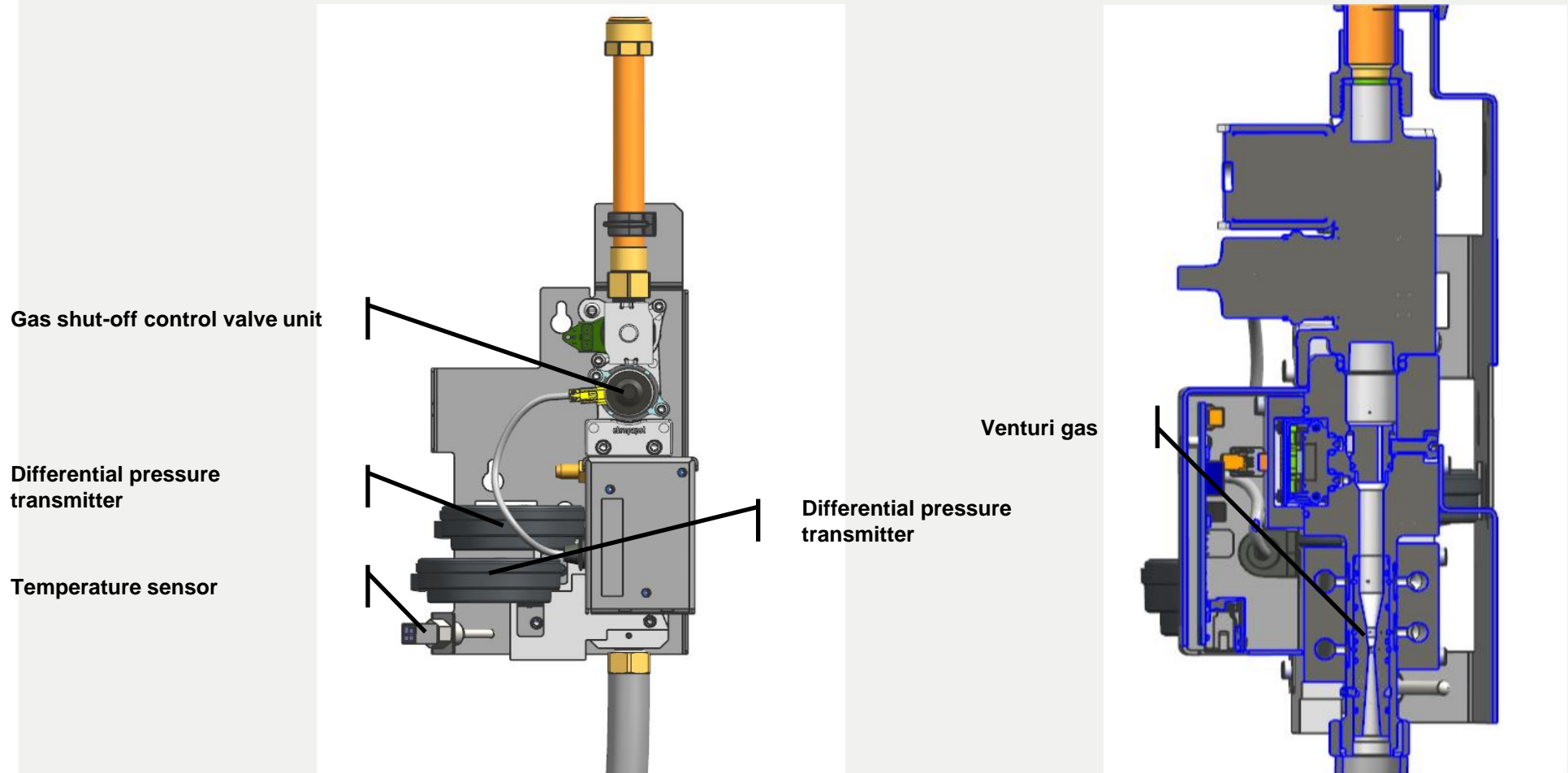
(Dosing line for the air, which is mixed with natural gas and becomes process gas in the reformer)



2. Function and components of the Fuel Cell Application (FCA)

Overview of gas measurement control system

(Dosing line for the natural gas, which is mixed with air and becomes process gas in the reformer)



2. Function and components of the Fuel Cell Application (FCA)

Overview of venturi unit

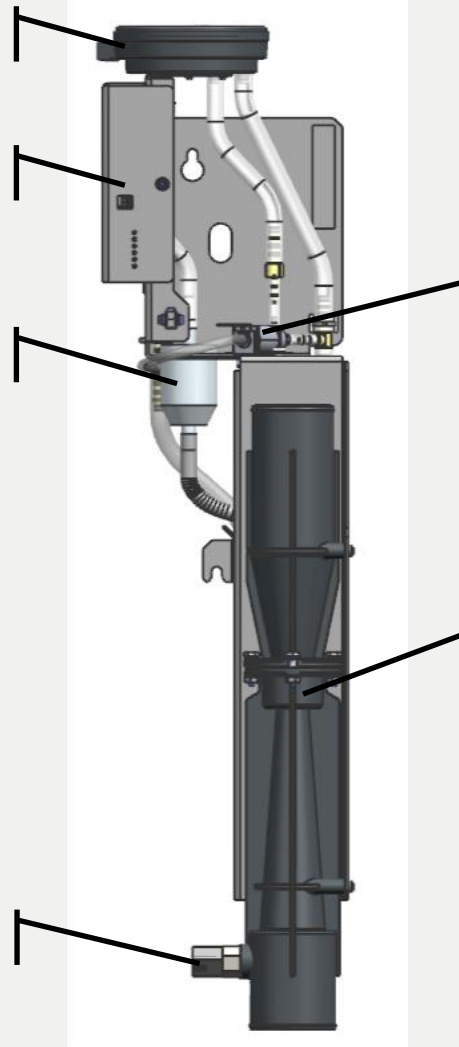
(Measuring section of the combustion air and ensuring $\lambda > 1.2$)

Differential pressure transmitter

Control electronics (Cath Air MFM) and air mass flow meter (covered)

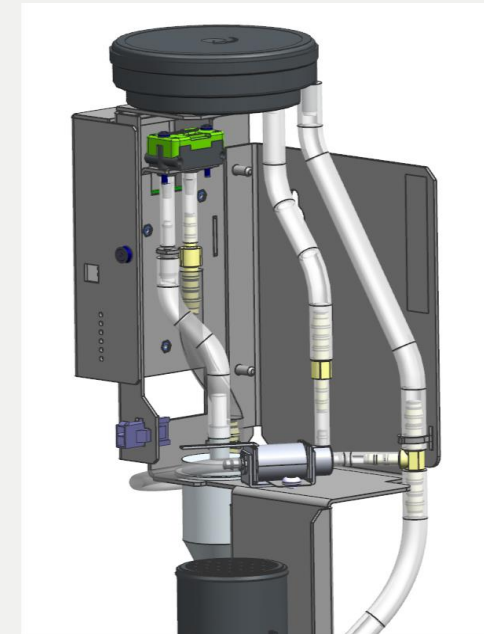
Air filter

Air temperature measurement



3/2 way valve for test differential pressure transmitter

Venturi unit

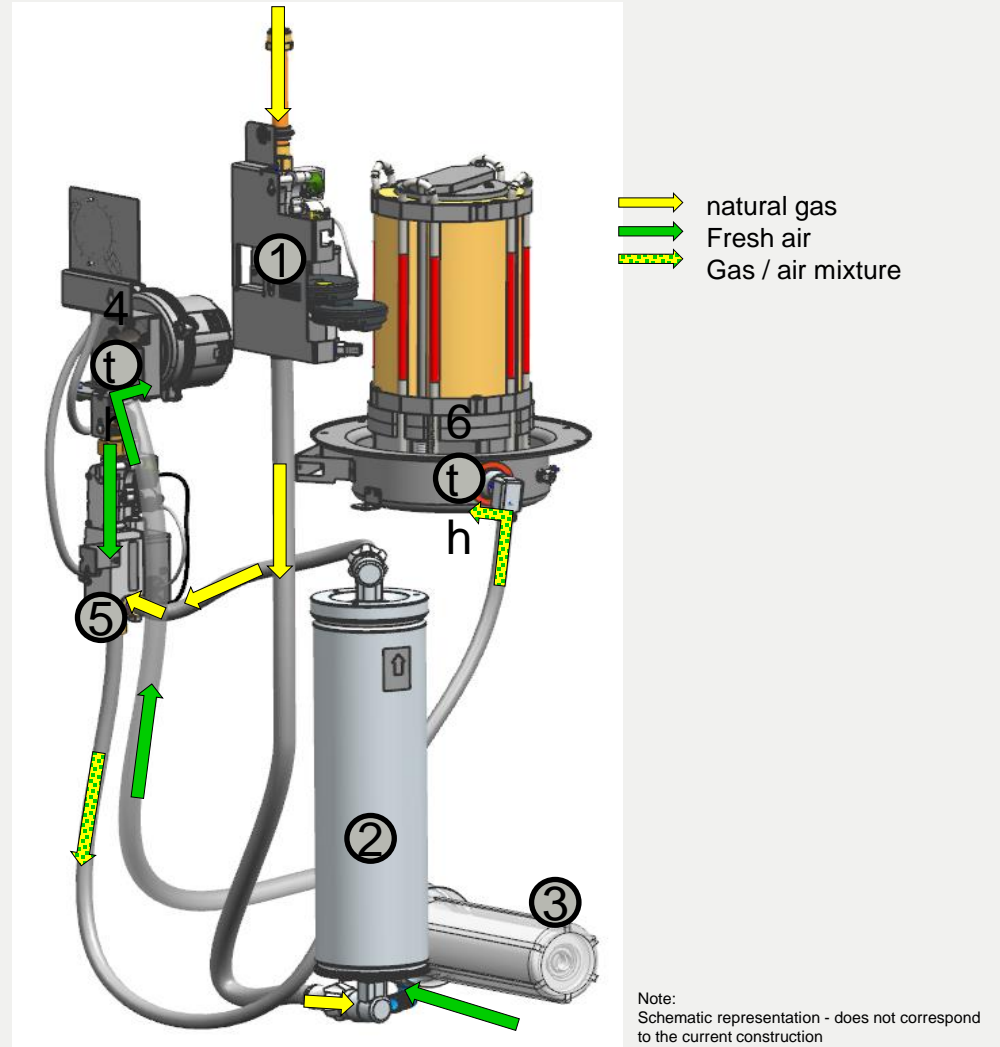


2. Function and components of the Fuel Cell Application (FCA)

Functional illustration of the gas-air line including the fuel cell stack

Function:

1. Natural gas is dosed in the gas measuring and control system.
2. The gas is then freed from all sulfur components by means of cold desulfurization.
3. An air filter removes particles from the air.
4. Air is dosed in the CPO section depending on the amount of gas in a ratio of lambda 0.27.
5. At this mixing point, gas and air meet and are mixed on the way into the stack module.
6. The catalyst in the stack module converts the natural gas / air mixture into hydrogen (H_2) and carbon monoxide (CO).



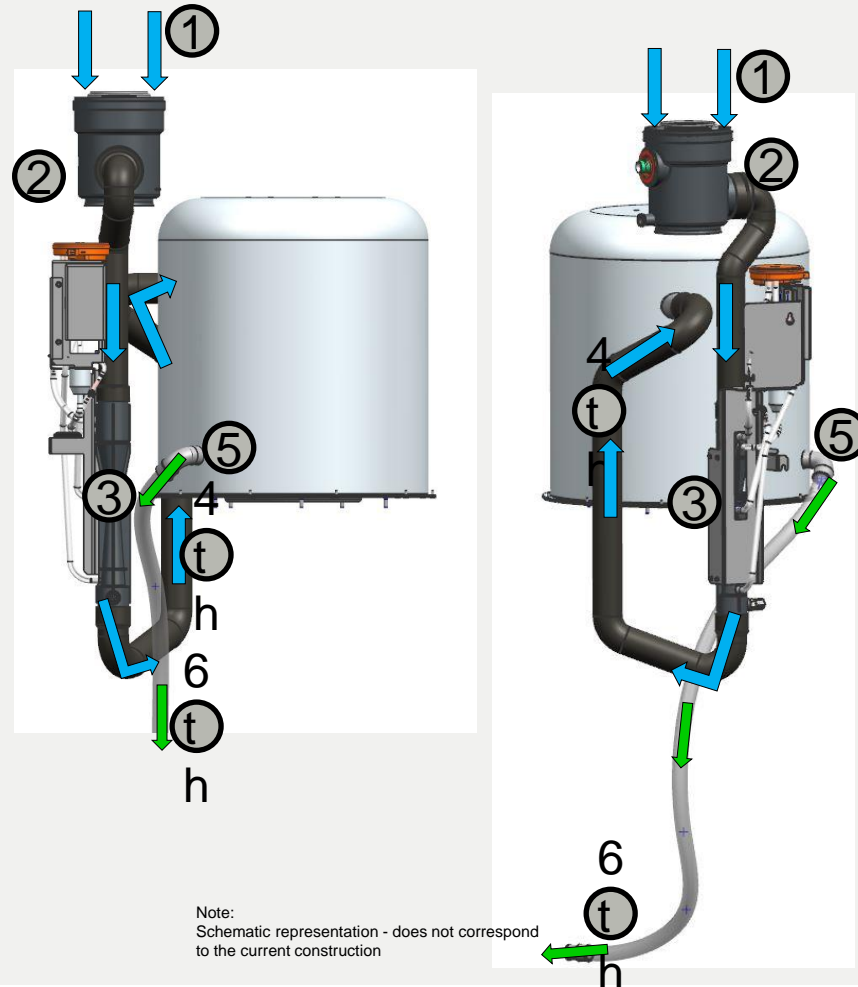
2. Function and components of the Fuel Cell Application (FCA)

Functional representation of the combustion air path

Function:

1. Fresh air comes into the exhaust pipe through the annular gap of the concentric exhaust system.
2. The inlet air is cleaned by the filter built into the hose inlet and directed to the Venturi unit.
3. The venturi unit measures the air flow.
4. The air is then fed into the stack module insulation behind which the stack module is located.
5. The air for the CPO air section is branched off from the stack module insulation and is therefore already somewhat preheated.
6. then passed through a very fine air filter for the CPO section (part of the gas-air section p. 14)

➡ Fresh air
➡ Preheated air for CPO range

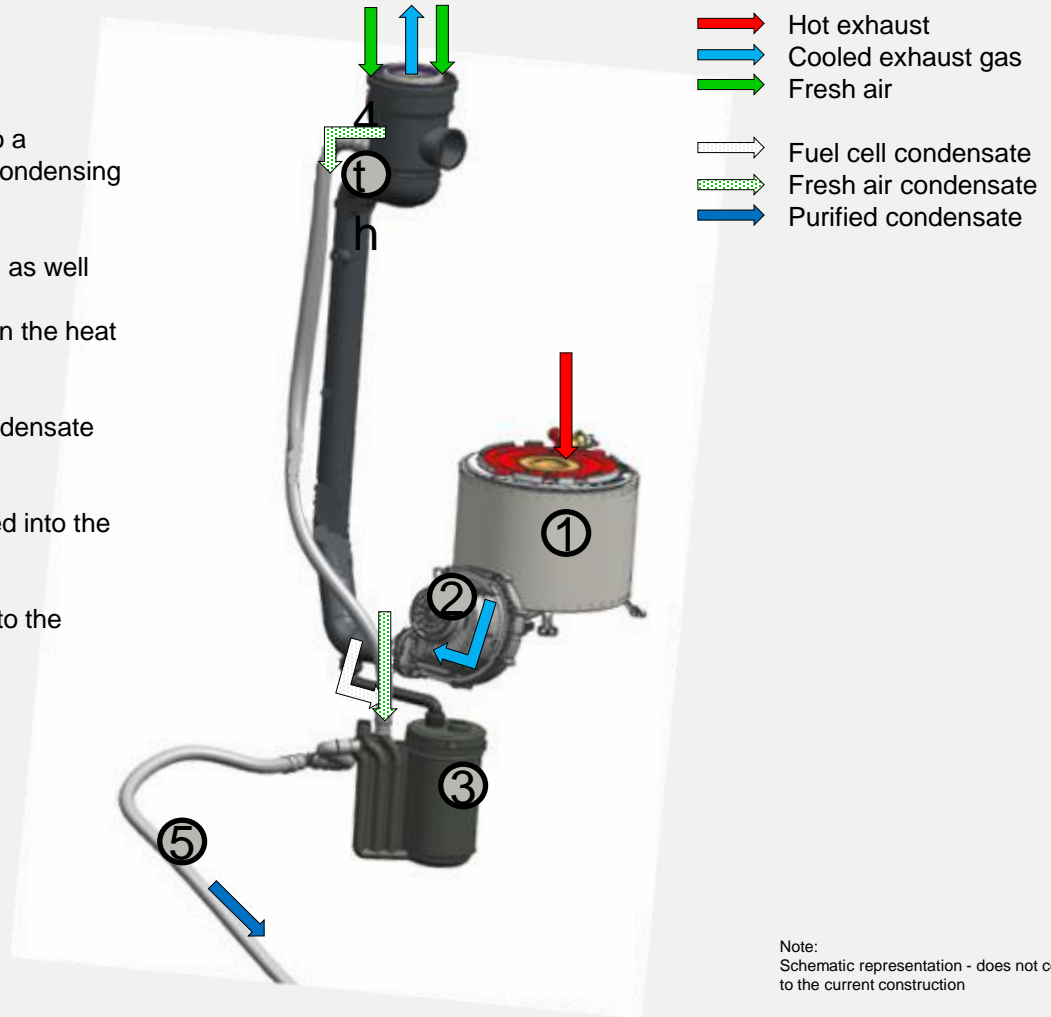


2. Function and components of the Fuel Cell Application (FCA)

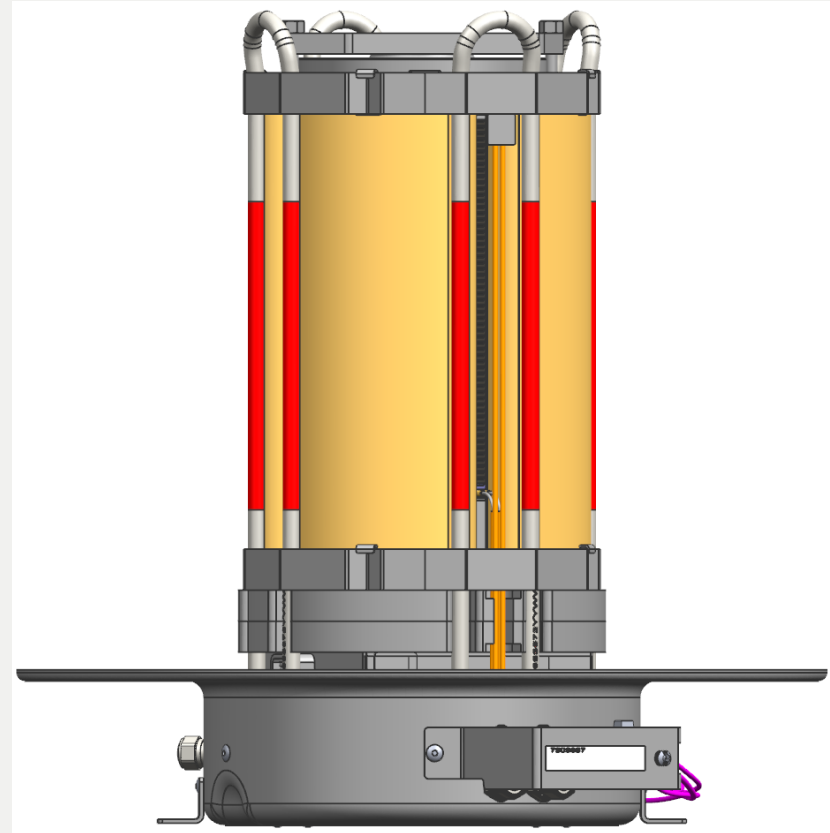
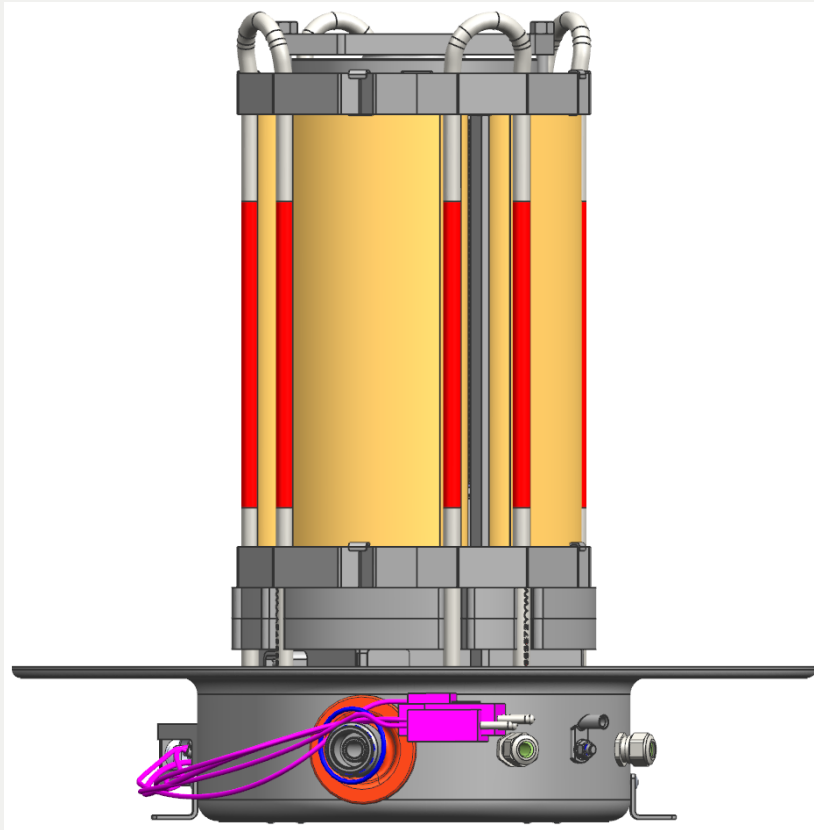
Functional representation of the flue gas and condensate line

Function:

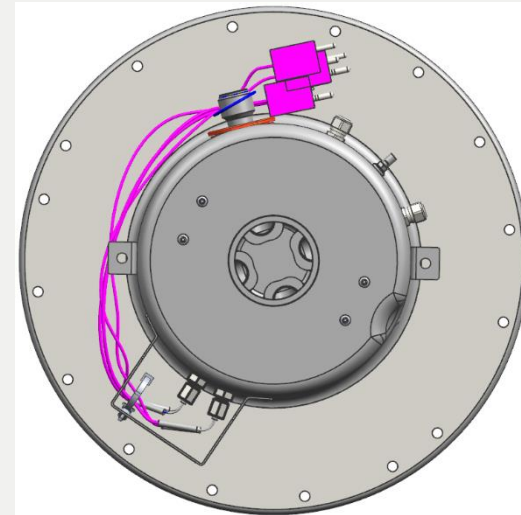
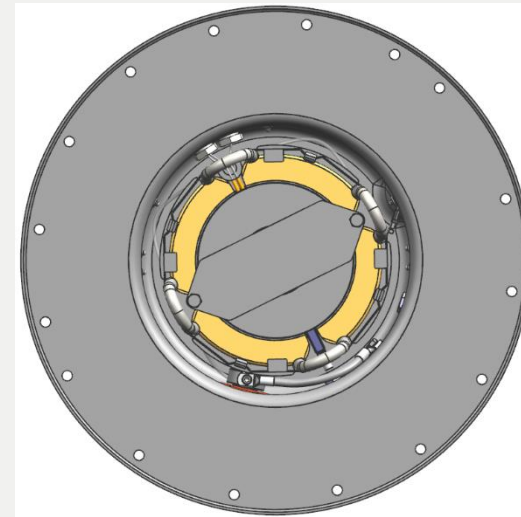
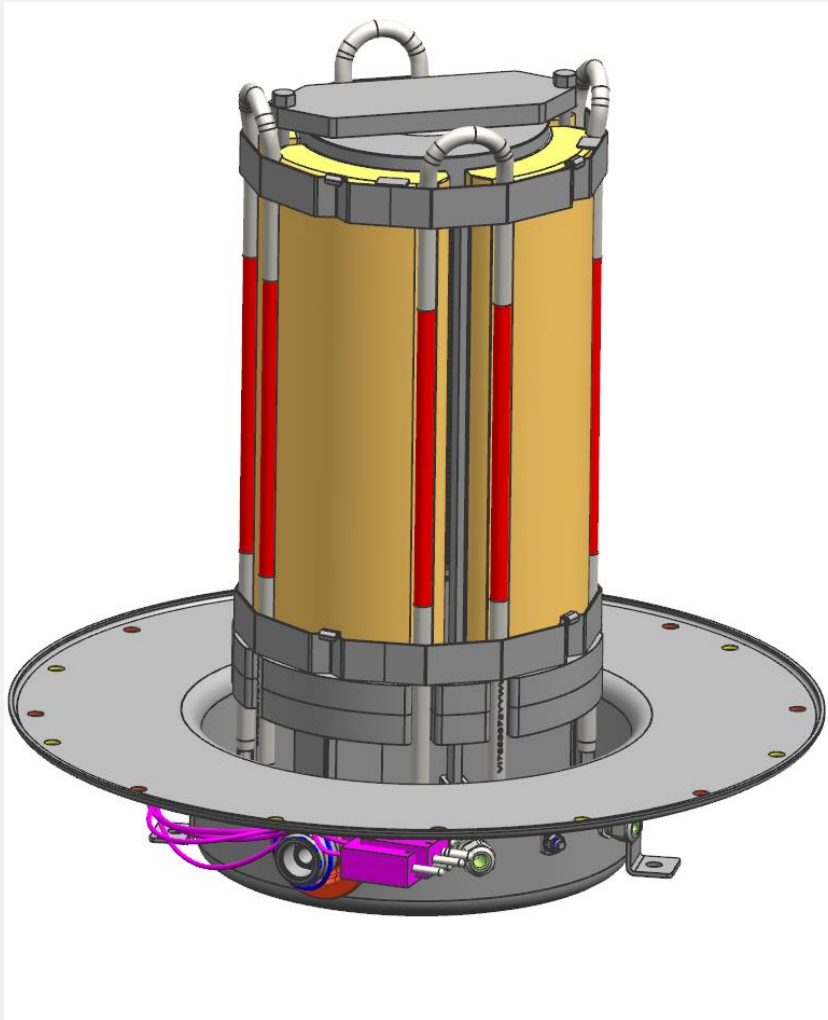
1. Hot exhaust gas from the fuel cell module is cooled to a maximum of 95 ° C in the heat exchanger using the condensing principle
2. The exhaust fan creates a vacuum in the cpl. Air path as well as in the fuel cell module. The humid exhaust gas and the condensate created in the heat exchanger are passed through the exhaust gas fan.
3. Chromium is removed from the condensate. This condensate cleaning also serves as a siphon.
4. Any condensed humidity from the supply air is also fed into the condensate cleaning system.
5. Completely cleaned condensate, which corresponds to the discharge conditions, is discharged via this.



2. Function and components of the stack module functional unit (SFE) *SFE: 3D views*

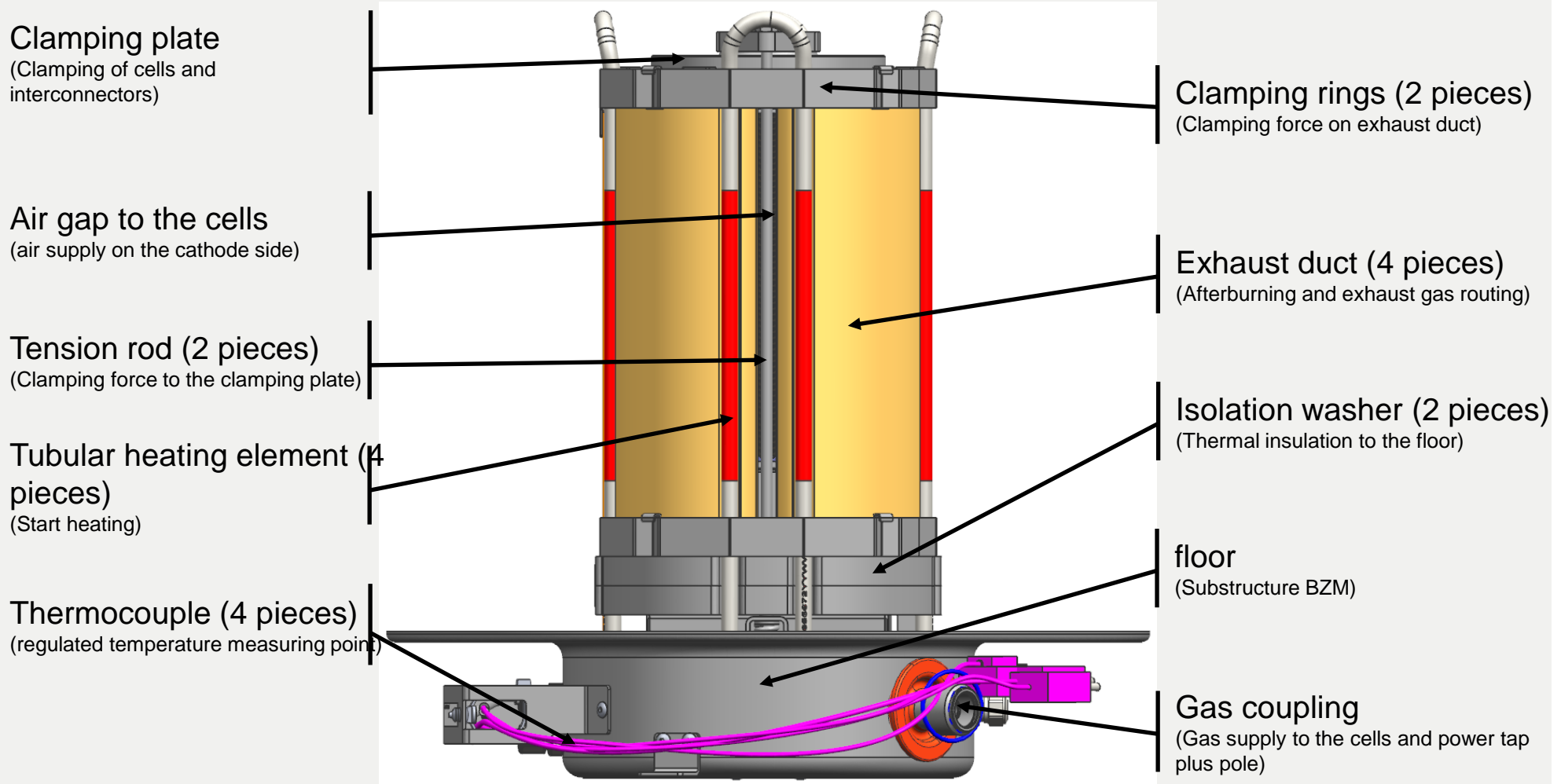


2. Function and components of the stack module functional unit (SFE) *SFE: 3D views*



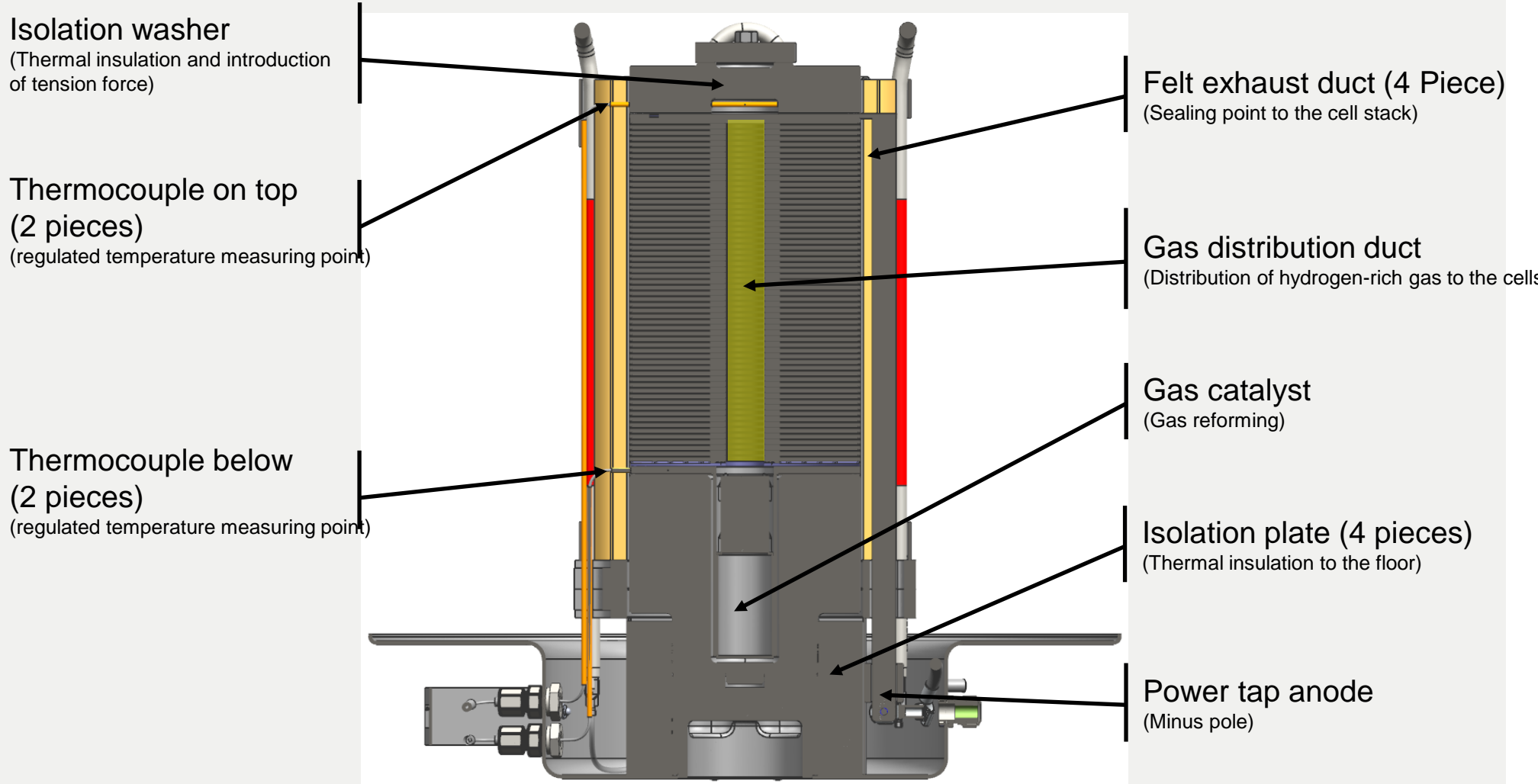
2. Function and components of the stack module functional unit

(SFE) *SFE: components*



2. Function and components of the stack module functional unit

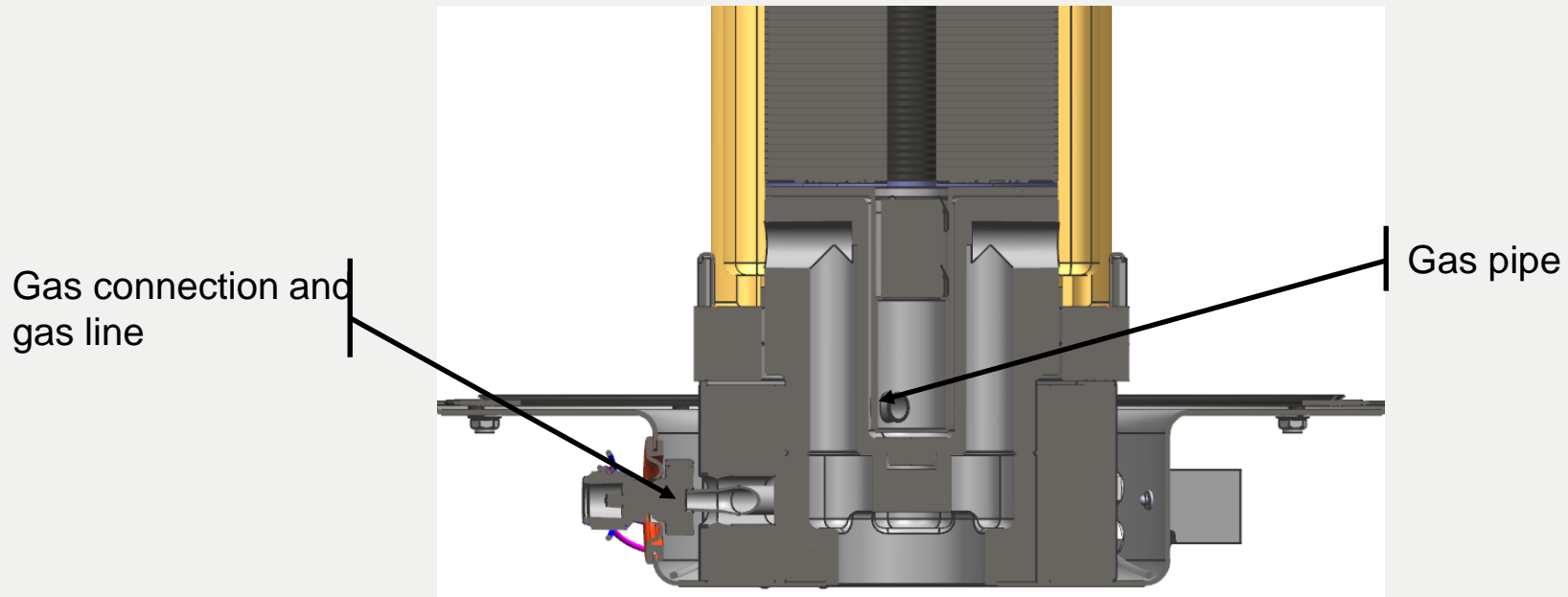
(SFE) *SFE: components*



2. Function and components of the stack module functional unit (SFE)

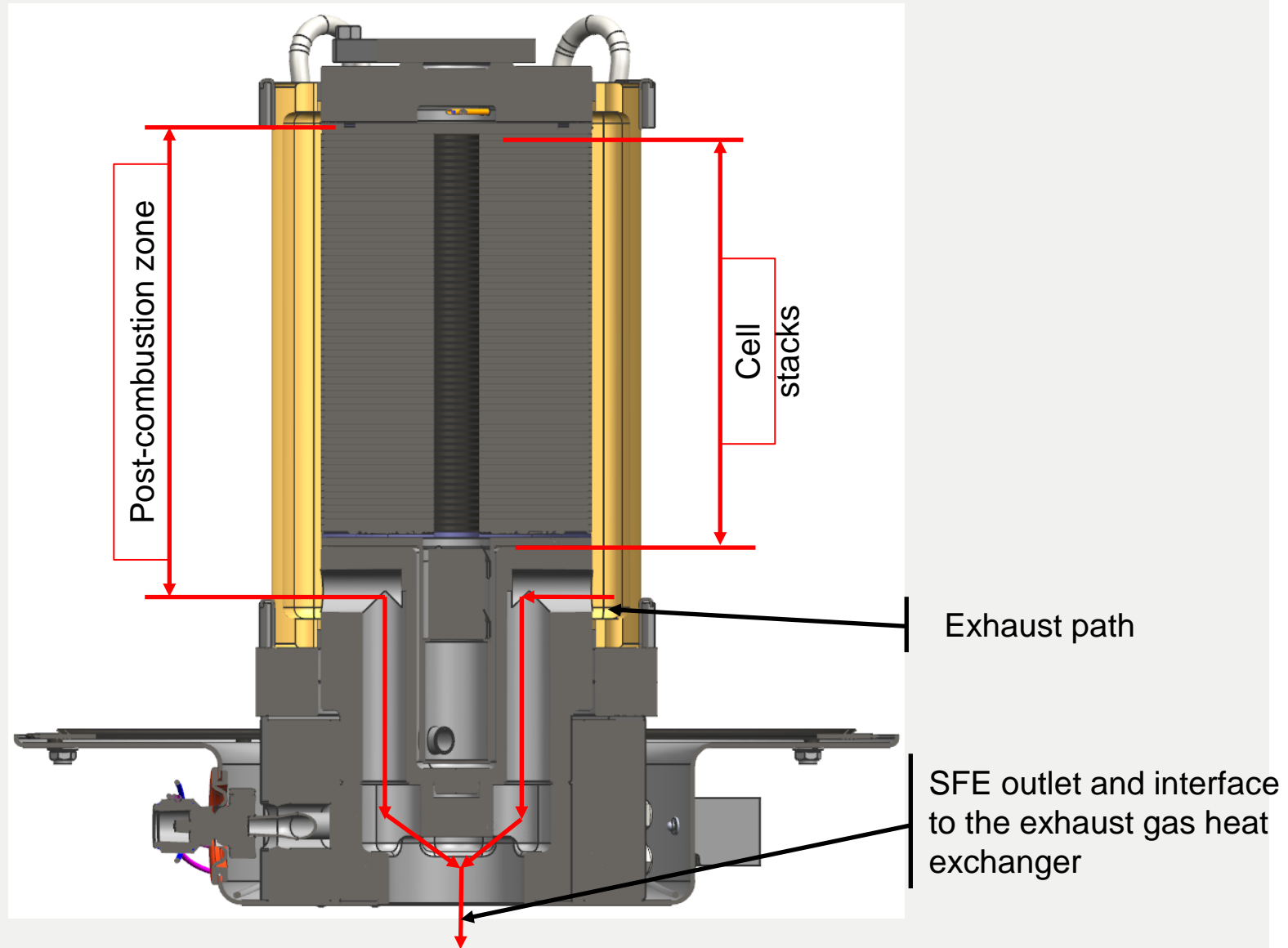
SFE: components

outdated photo, update
will take place in week
33/21



2. Function and components of the stack module functional unit (SFE)

SFE: components



3. Essential accessories

functionality

A CO and a CH4 sensor are included with the system as necessary accessories.

These sensors must be installed in the installation room and connected to the fuel cell heater by means of a signal line. The signal lines are installed in the heater and must be pulled out and connected to the sensors.

The sensors are supplied with power externally and not from the fuel cell heater.

The two sensors are not part of the device and have a corresponding approval.



**Thanks very much
for your attention**

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