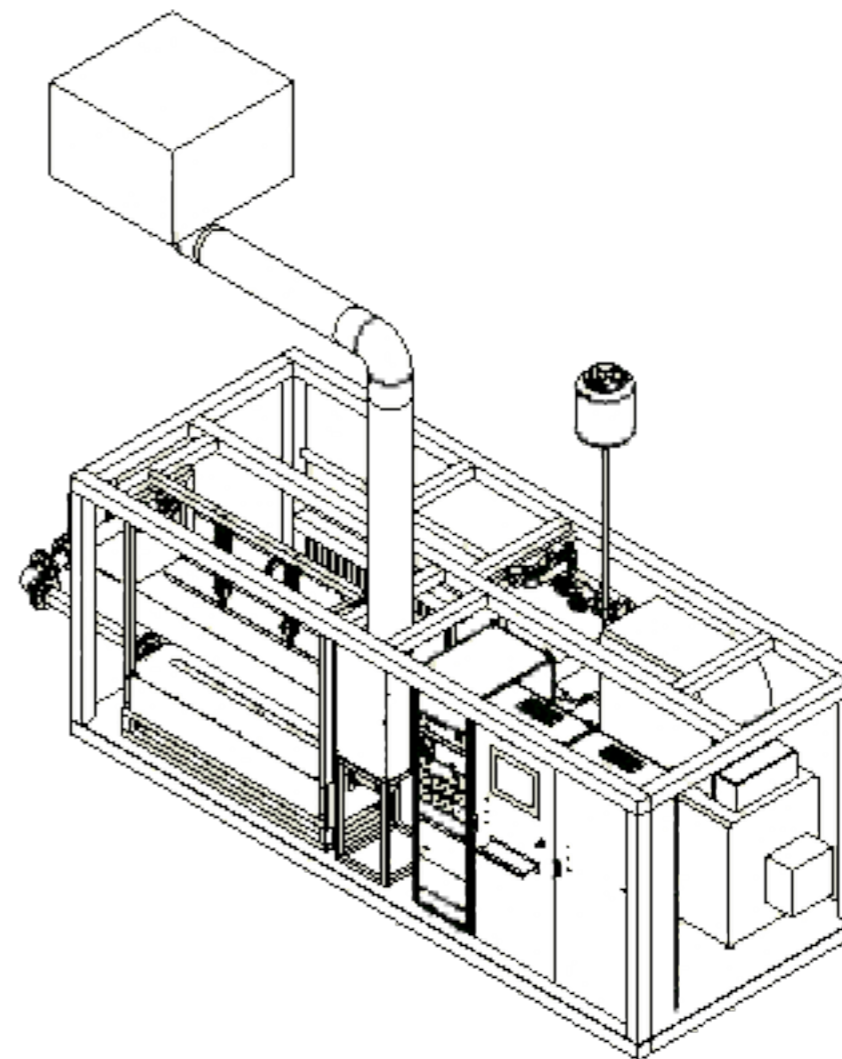


**SPHYNX Industrial**  
Reactor Systems for  
Test and Quality  
Monitoring of Power  
Plant Catalysts



Product Information

**SPHYNX Industrial**  
Reactor Systems for  
Test and Quality  
Monitoring of Power  
Plant Catalysts

SPHYNX  
solve the het cat puzzle  
strap your production process  
ensure product quality

**Designed for**

- *Screening of Catalysts under Industrial Exhaust Gas Conditions*
- *Reproducibility and Quality Monitoring*
- *Process optimization in power plant catalyst production*

**... testing of DeNOx Catalysts under Real Exhaust Gas Conditions**

## Introduction

SPHYNX allows automated parallel testing and quality monitoring of industrial catalyst monoliths/plates under real process conditions. A fine tunable realistic exhaust gas mixture is applied to a reactor loaded with catalyst samples.

In combination with downstream online analysis this shortens test cycle time by an order of magnitude comparing to standard manual tests and guarantees reliability and reproducibility in catalyst manufacturing processes. Extensive data logging and recording capability based on calibrated built-in measuring of all relevant process parameters ensures compliance to industry standards in product quality. The system performs activity and selectivity tests of representative catalyst monoliths/plates according to predefined, reproducible test programs. Variables such as temperature, space velocity and gas concentrations of the dosed contaminants can be programmed and varied.

The parameters which affect the catalyst (e.g. plates) reaction are precisely logged in a database and controlled by the system, guaranteeing reliable test results under the same conditions from sample to sample.

The SPHYNX system for testing power plant catalysts (e.g. plates) includes a reactor accommodating several catalyst plates, the gas or oil burner for producing the exhaust gas, the media supply periphery, a fan system for controlling the flow of the exhaust gas, the connected analysers with the periphery, a unit for ageing the catalyst plates in the exhaust stream, the control module consisting of PLC and a PC for experiment design, scheduling and data management.

Analytical results are matched to the sample ID numbers and correlated with the process parameters in the system process log database. An export function enables the generation of a clearly arranged \*.csv file including all necessary information about the test (sample number, reaction parameter, analytical results etc.)

## Applications

The system can be programmed to cover a wide range of applications and reaction conditions. One example is tests of catalysts with DeNOx reactions. In combination with a connected analysis device (e.g. CLD) the system can be used for quality control in production of power plant catalysts but also for the verification of the characteristics of newly developed catalysts. It is therefore a highly productive tool for both R&D and production quality management.

## System

### Gas & Liquid Feed Supply

Exhaust gas production: oil or gas burner

Flow control by a combination of a gas fan with a flow detector based on a venturi type orifice

Contaminants dosing to exhaust gas stream (e.g. NO, SO<sub>2</sub>, NH<sub>3</sub>) by individual electronic flow controller

This arrangement guarantees highly accurate flows.

### Heating & Temperature Control

The reaction chamber with the catalyst can be electrically heated.

Gas preheating is installed to ensure uniform and isothermal gas flow conditions before entering the reactor chamber.

Temperature is measured inside the reactor directly at the catalyst at different points. The temperature control is realized using an according control loop.

## SPHYNX Industrial Reactor Systems for Test and Quality Monitoring of Power Plant Catalysts

*SPHYNX Industrial – Testing of  
DeNOx Catalysts under Real  
Exhaust Gas Conditions*



## Specifications

The specifications presented are for the standard model, other systems can be built on request for specific applications.

### System Specifications

- > Reactor temperature 500°C maximum
- > Operating pressure: 990 mbar - atm
- > Different contaminants can be dosed (up to 4 gases)
- > Separate port for connecting a water vaporizer
- > Maximum wet gas flow rate 212 m<sup>3</sup>/h
- > Stainless steel reactor, can be automatically opened and closed
- > In the exhaust stream of the reactor catalyst plates can be aged

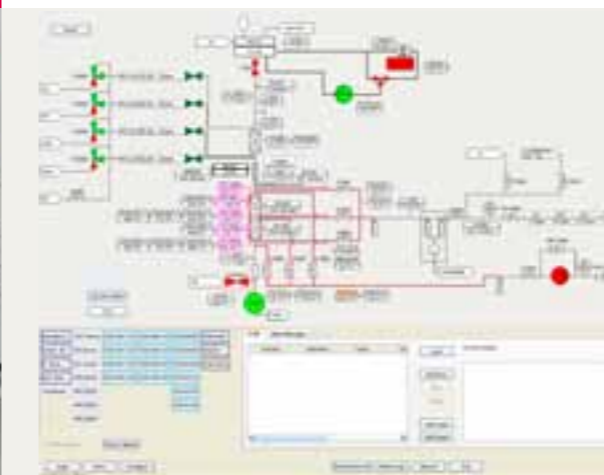
### Media Supplies

#### Standard Operating Limits

- > Maximum operating temperature 500°C
- > Working pressure: 990 mbar - atm
- > Maximum length catalyst: 750 mm
- > Maximum width: 70 mm
- > Gas flow rate max. 212 m<sup>3</sup>/h
- > Other flow ranges and operating limits on request

#### System Dimensions

- > Depth, Width, Height 1530 x 4120 x 2800 mm



### Reactor

The reactor is made from stainless steel and can be automatically opened and closed. The reactors allow catalytic tests on samples with a maximum length of 750 mm and a maximum width of 70 mm. For easy handling the reactor is sealed with a circular seal. With this configuration samples can be tested up to temperatures of 500 °C.

A separate reactor chamber in the exhaust gas stream is designed for ageing catalyst plates.

### Analysis

A branch before and after each catalyst holder is connected to the analysis device. The analysis lines are equipped with a gas chiller before entering the analyser, e.g. CLD for detecting NO<sub>x</sub>, or analysers for detecting oxygen and SO<sub>2</sub>. Sample information and results from the analysis devices are integrated within the process log database.

### Data Management & Automation

The entire system is controlled via a PLC in combination with a control PC for visualization, experiment programming and manual control. The graphical user interface allows manual operation and visual depiction of the system status. An integrated scheduling tool is provided for experimental planning. Process and sample data are stored in a MySQL database. Analysis results from the analysis devices are stored and matched to sample data. All process parameters can be viewed in tabular and graphical form during experiments. System status can be remotely monitored via a LAN connection using a standard web browser. All results can be exported.

### Safety

A programmable safety PLC is integrated within the system to manage alarms. Multiple alarm classes are featured, and the alarm settings and responses can be adapted to meet on-site safety regulations.