HELOS
Dispersing Modules

- ★ RODOS/M
- ★ SUCELL
- ★ OASIS
- ★ VIBRI

- ★ ASPIROS
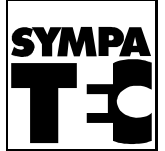- ★ INHALER
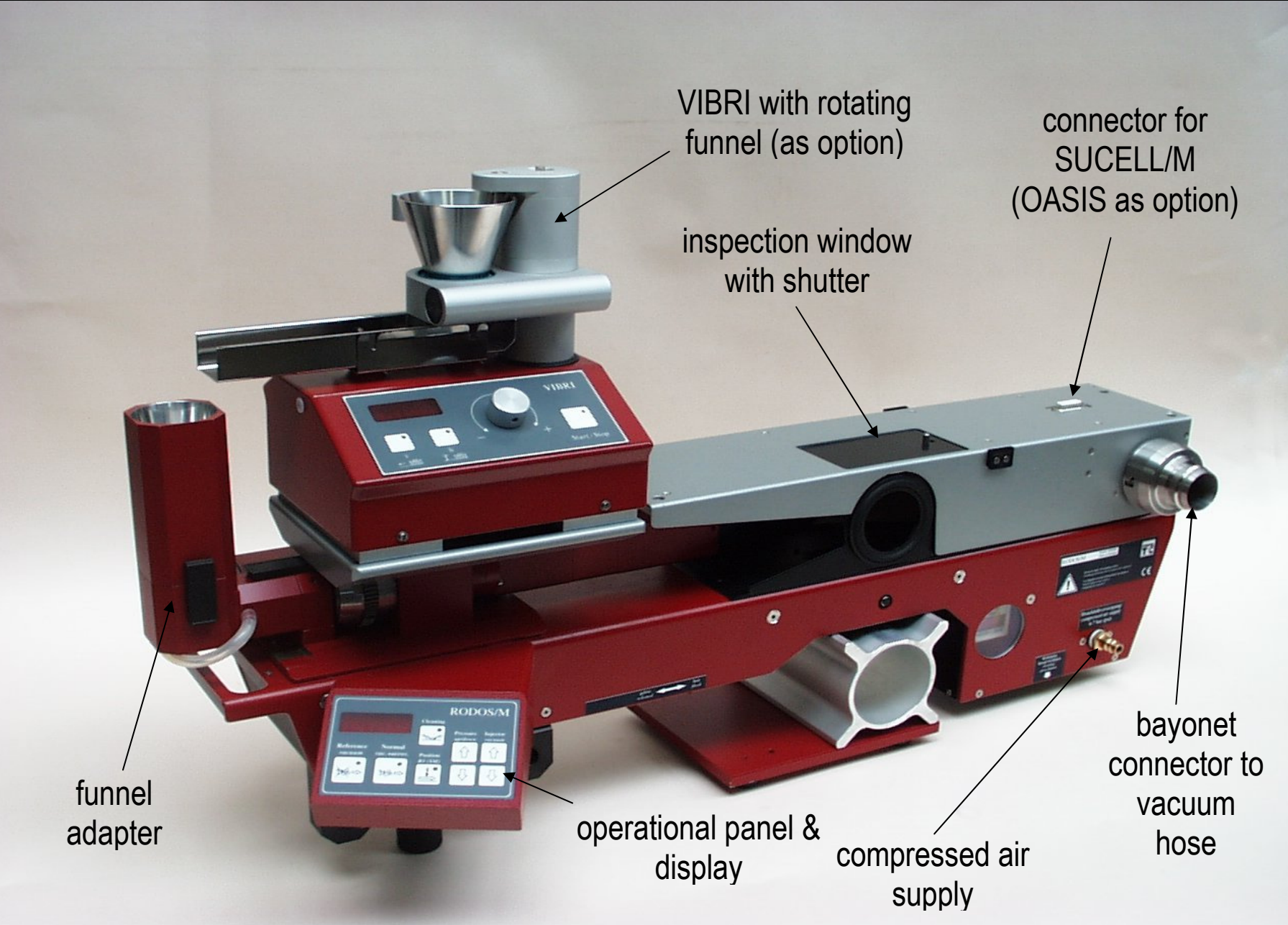- ★ SPRAYER
- ★ ROTOR

HST: Eskimo Nebula

RODOS/M

Automatic dry powder disperser

VIBRI with rotating funnel (as option)

connector for SUCELL/M (OASIS as option)

inspection window with shutter

VIBRI

RODOS/M

funnel adapter

operational panel & display
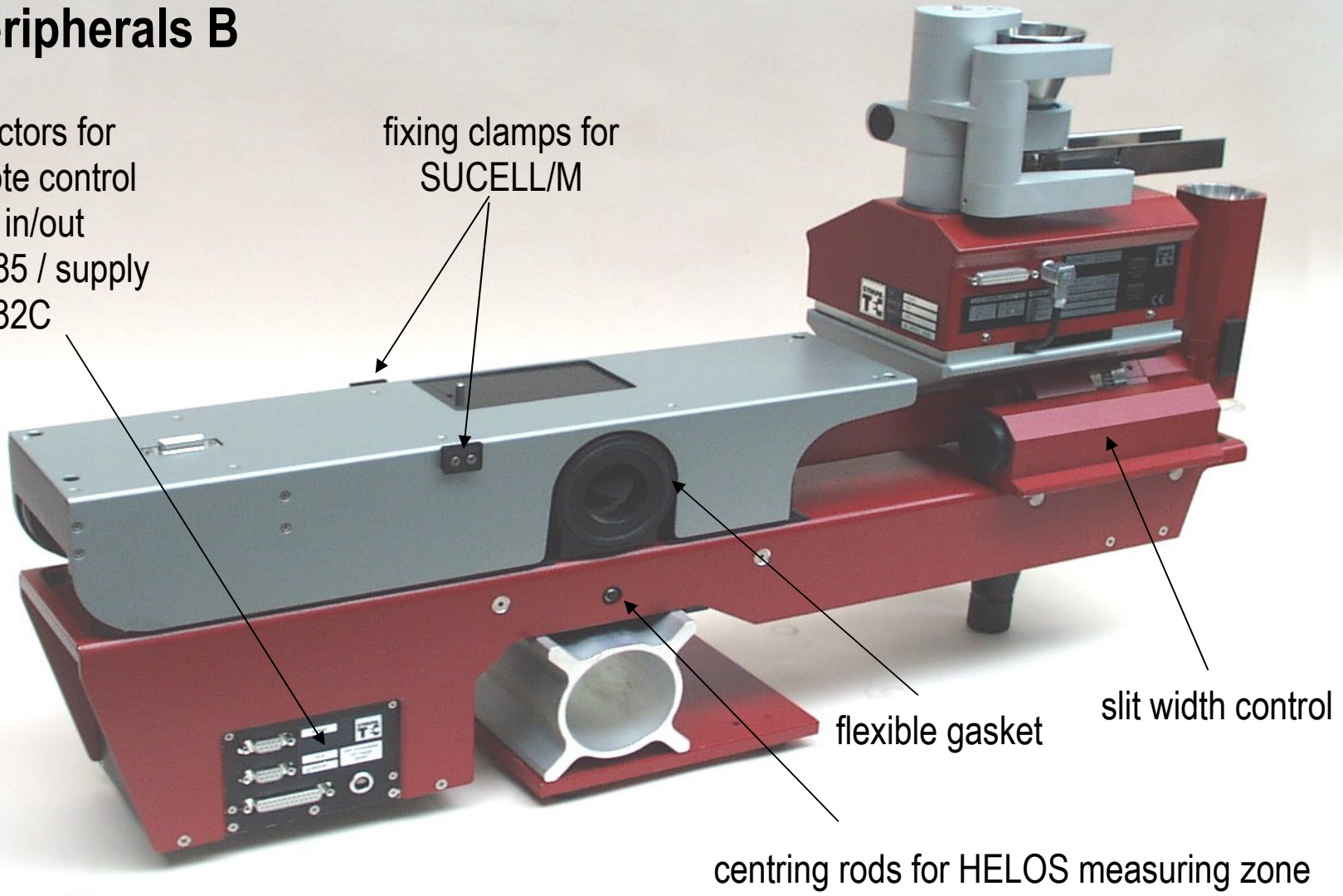
compressed air supply

bayonet connector to vacuum hose

RODOS/M
Peripherals B

connectors for
- remote control
- AUX in/out
- RS485 / supply
- RS232C

fixing clamps for
SUCELL/M

slit width control

flexible gasket

centring rods for HELOS measuring zone

Specifications: Standard Extent of Delivery

★ Housing

  ☆ Fits into standard measuring zone of HELOS/F- and A-series measuring ranges: R1 to R7

  ☆ Integrated operational panel for manual operation and status display

  ☆ Single plug connection to HELOS via 24V/RS485 connection

  ☆ Prepared for upgrade to OASIS

★ Dispersing system

  ☆ Dispersing line identical to RODOS

  ☆ Quick exchange of dispersing line with auto-detect-function for type of dispersing line

  ☆ Slit width control and monitoring of vacuum by software

  ☆ Automatic positioning of dispersing line with respect to measuring range, i.e. R1/R2 and R3 to R7 position

  ☆ Primary pressure control by software, 0 to 6 bar

  ☆ Integrated filters for compressed air

  ☆ Funnel adapter for VIBRI

★ Vacuum System

  ☆ Top cover with inspection window, swivelling for easy access to vacuum inlet

  ☆ Highly resistance inlet funnel (PA12) for long life times

  ☆ Bayonet connection to vacuum hose

  ☆ 2 blowers for cleaning of windows

- ★ Control
  - ☆ Fully automated, software controlled operation or manually via operational panel
  - ☆ Control of
    - ✳ Primary pressure (0 to 6 bar)
    - ✳ Injector position (R1, R2, R3 – R7)
    - ✳ Slit width (throughput) with vacuum monitoring
    - ✳ Vacuum cleaner via HELOS
  - ☆ RS485/RS232 interface
  - ☆ Remote control connector
  - ☆ Auxiliary inputs & outputs

- ★ Software
  - ☆ Supported by WINDOX 4.0

Options

- ★ Different dispersing lines:
  - ☆ 4 mm ∅
  - ☆ 6 mm ∅
  - ☆ 10 mm ∅
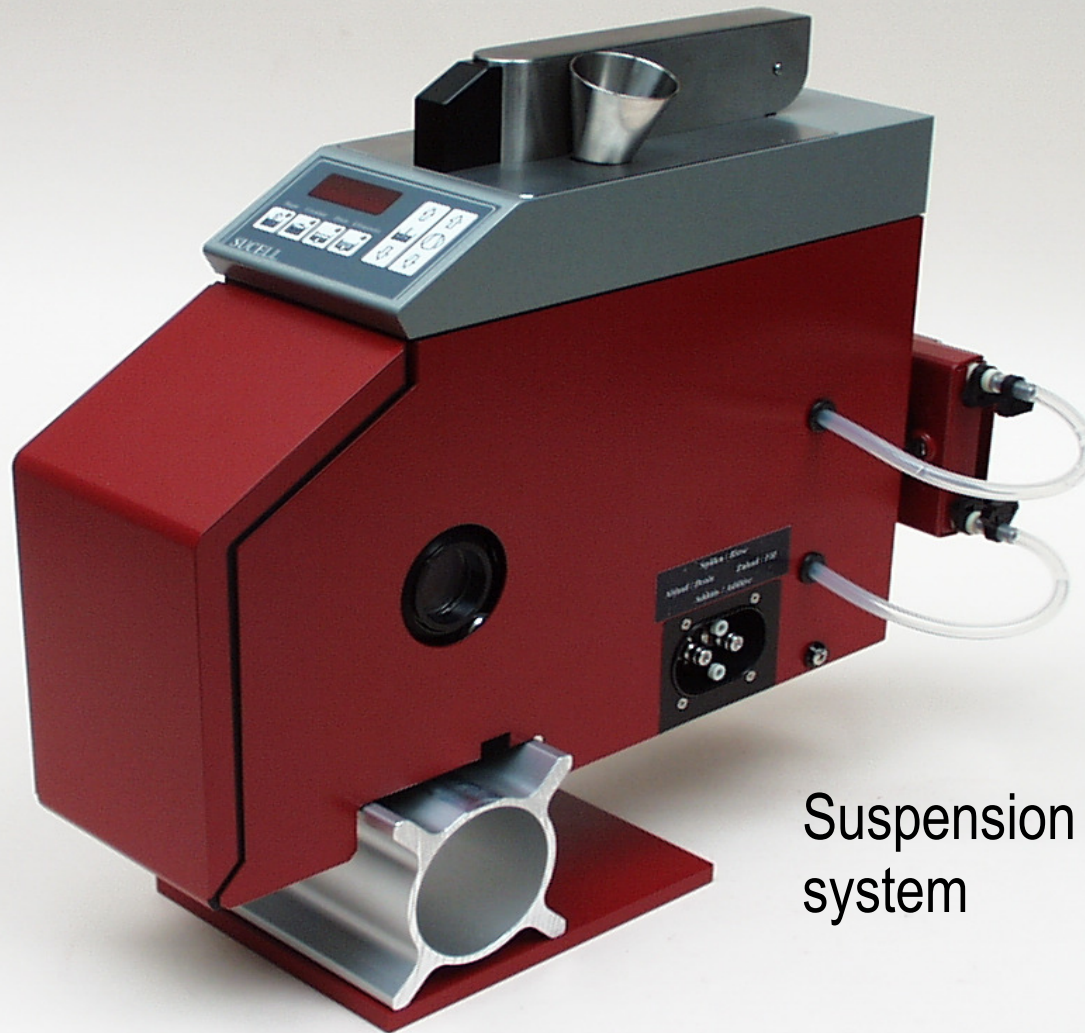
- ★ SUCELL/M for upgrade to OASIS

- ★ Dosing systems
  - ☆ VIBRI & rotating funnel
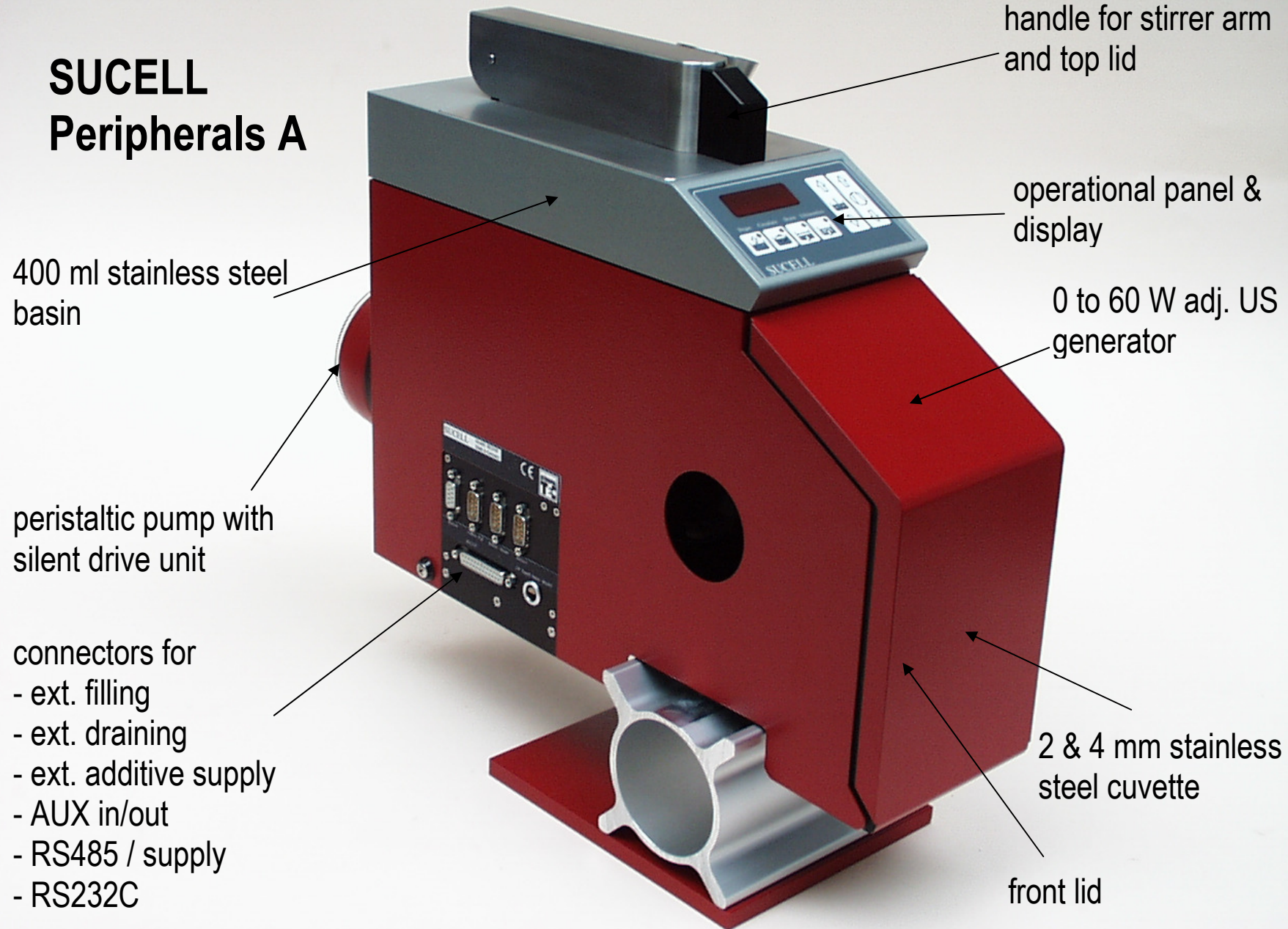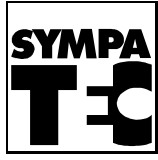 - ☆ ASPIROS

- ★ Vacuum systems (Nilfisk, Kärcher)

SUCELL

Suspension dispersing system

SUCELL
Peripherals A

handle for stirrer arm and top lid

operational panel & display

400 ml stainless steel basin

0 to 60 W adj. US generator

peristaltic pump with silent drive unit

connectors for
- ext. filling
- ext. draining
- ext. additive supply
- AUX in/out
- RS485 / supply
- RS232C

2 & 4 mm stainless steel cuvette

front lid

SYMPATEC

SUCELL
Peripherals B

top lid

sample inlet funnel

stirrers

"drop collector"

level sensors

filling & rinsing

additive

US transducer

"lid closed" activator

stirrer control

pump control

fill, circulate, drain, US buttons

Specifications: Standard Extent of Delivery

★ Housing

  ☆ Fits into standard measuring zone of HELOS/F- and A-series measuring ranges: R1 to R5

  ☆ Integrated operational panel for manual operation and status display

  ☆ Single plug connection to HELOS via 24V/RS485 connection

★ Basin

  ☆ 400 ml, stainless steel with "drop collector"

  ☆ 2 level sensors (empty, full)

  ☆ Fill, rinse, clean inlets

  ☆ US transducer

★ Top cover

  ☆ 2 stirrers, speed controlled, i.e. speed is independent of viscosity

  ☆ Stainless steel lid for basin

  ☆ Sample inlet funnel activates fountain if tilted

  ☆ Security switch stops stirrers when opened

★ Circulation

  ☆ Pump with silent drive unit, speed controlled

  ☆ New 3 position valve allows for
    - Filling
    - Circulation
    - Active (i.e. pumped) draining

  ☆ Flow through cuvette: 2 mm

- ★ Control
  - ☆ Fully automated, software controlled operation or manually via operational panel
  - ☆ Control of
    - ✳ Pump speed (0 to 100 %) and direction
    - ✳ Stirrer speed (0 to 100 %)
    - ✳ Fill, additive, fountain valves
    - ✳ US power: 0 to 60 W in 0.6 W = 1 % increments
  - ☆ RS485/RS232 interface

- ☆ Integrated US generator with variable output power 0 to 60 W
- ☆ External pumps, valves or level sensors
  - ✳ Filling
  - ✳ Draining
  - ✳ Additive
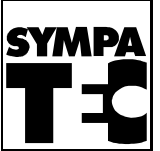 - ✳ Auxiliary inputs & outputs

- ★ Software
  - ☆ Supported from WINOX 4.0

Options

- ★ Viton ® hoses instead of silicone as standard

- ★ Fill container with pump & level sensor

- ★ Drain container with pump & level sensor

- ★ Additive container with pump & level sensor

OASIS

Combined dispersing system for dry and wet applications
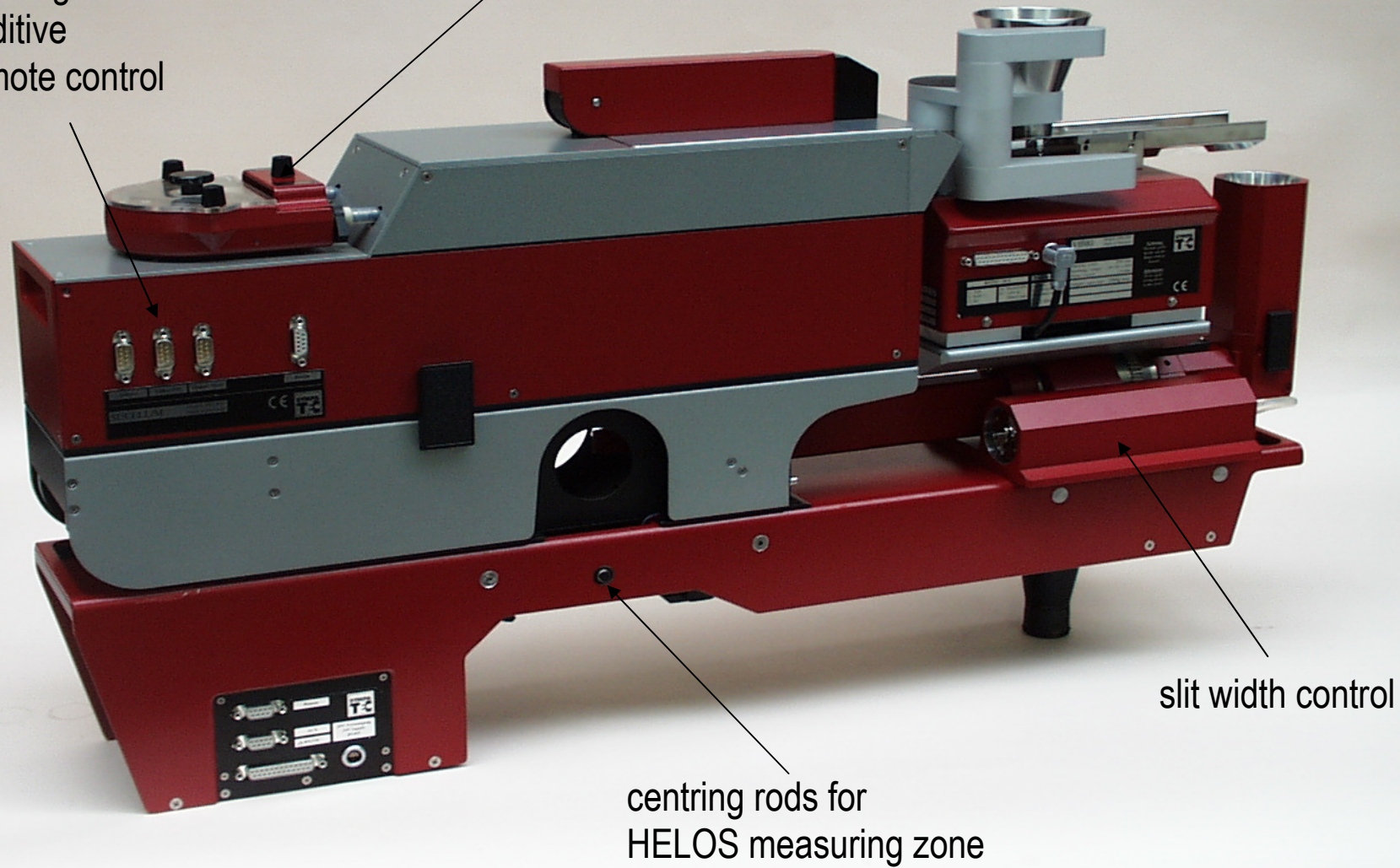
OASIS
Peripherals A

top lid

inlet funnel for SUCELL/M

pump

VIBRI with rotating funnel (as option)

funnel adapter

operational panel & display

bayonet connector to vacuum hose

compressed air supply

SYMPATEC

connectors for
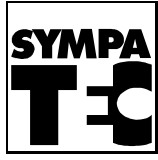- filling
- draining
- additive
- remote control
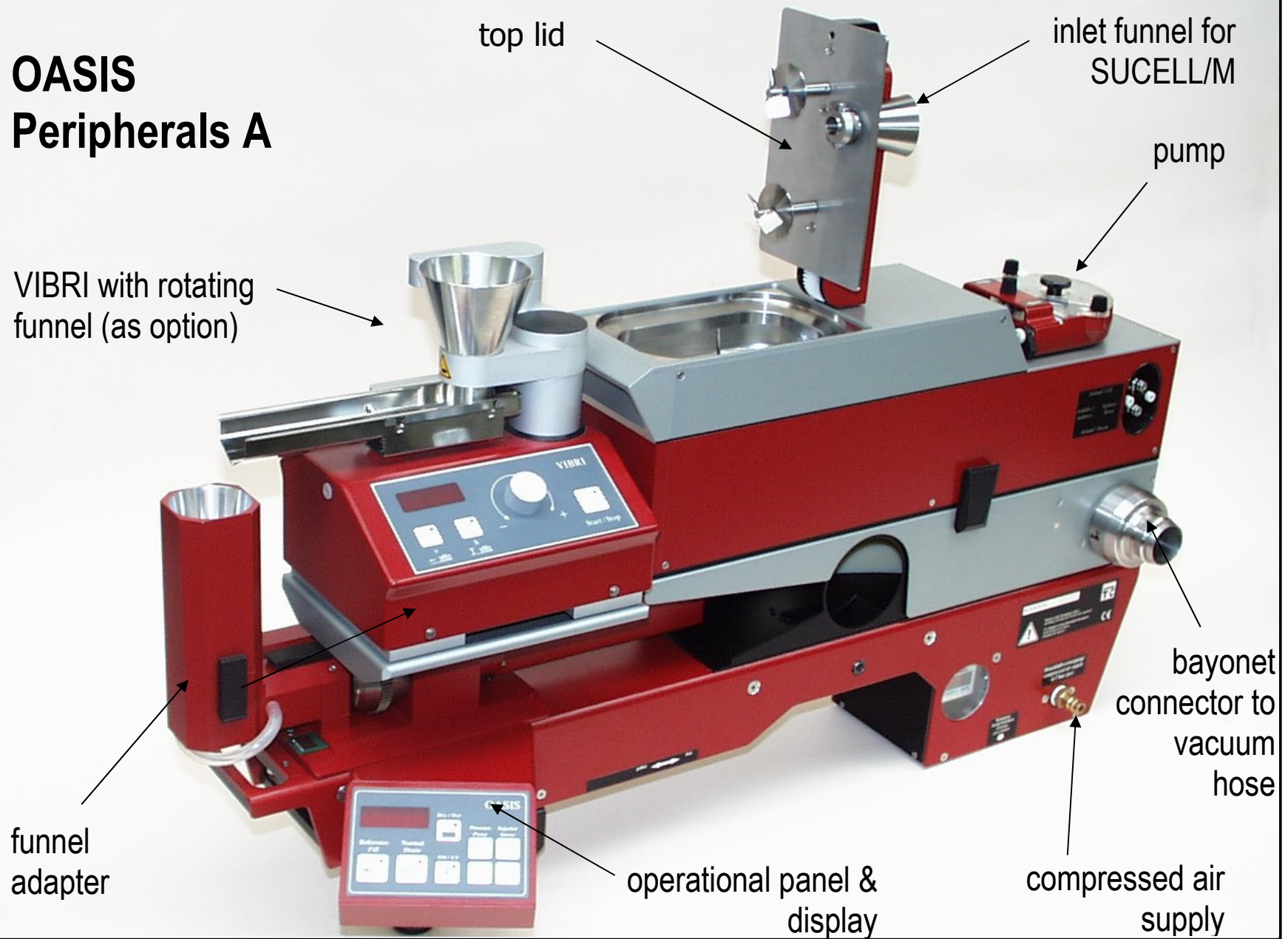
pump

OASIS Peripherals B

slit width control

centring rods for
HELOS measuring zone

OASIS
Peripherals C

inlet funnel

fill, drain, additive connections

VIBRI dosing

stirrers

basin

fountain
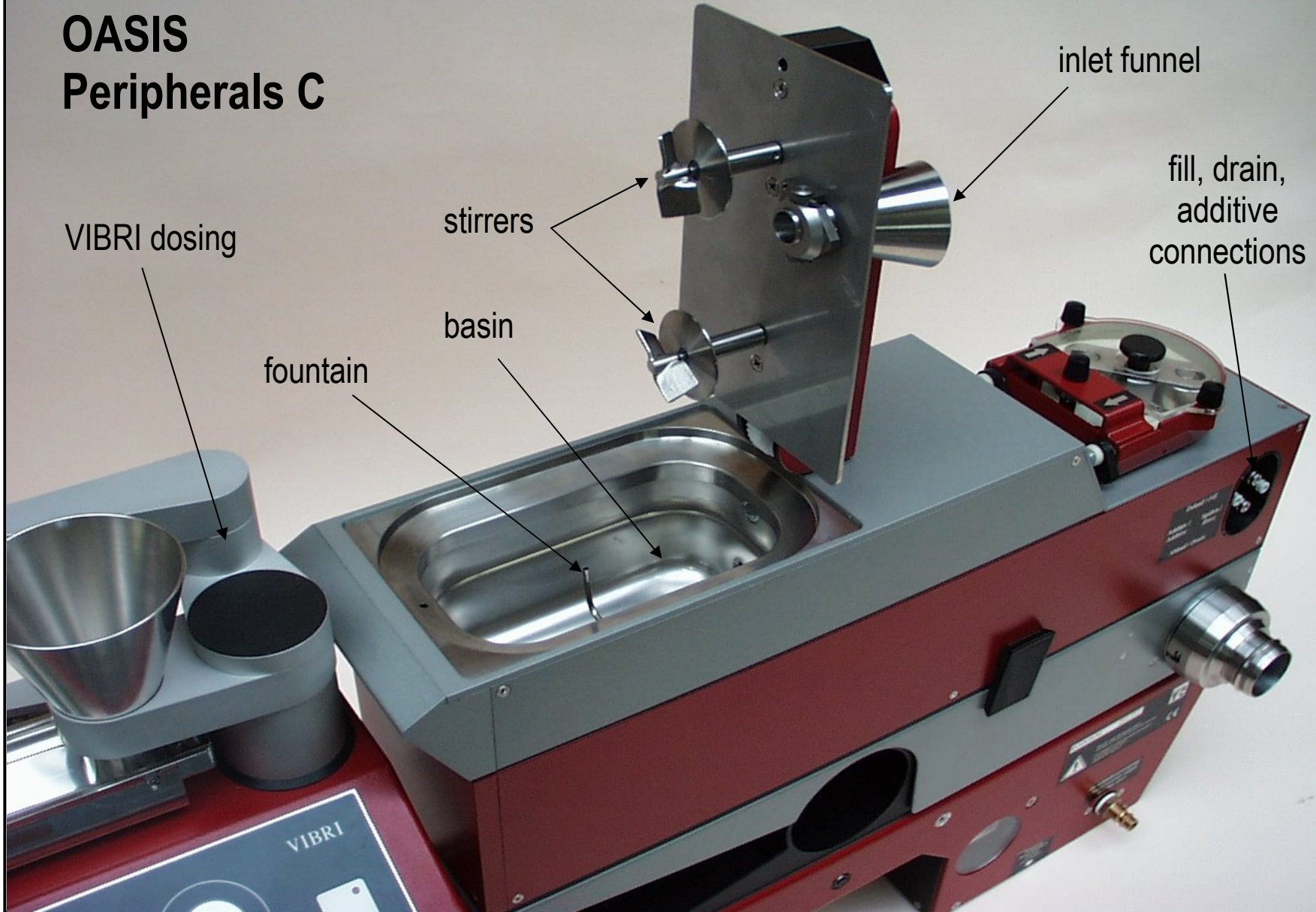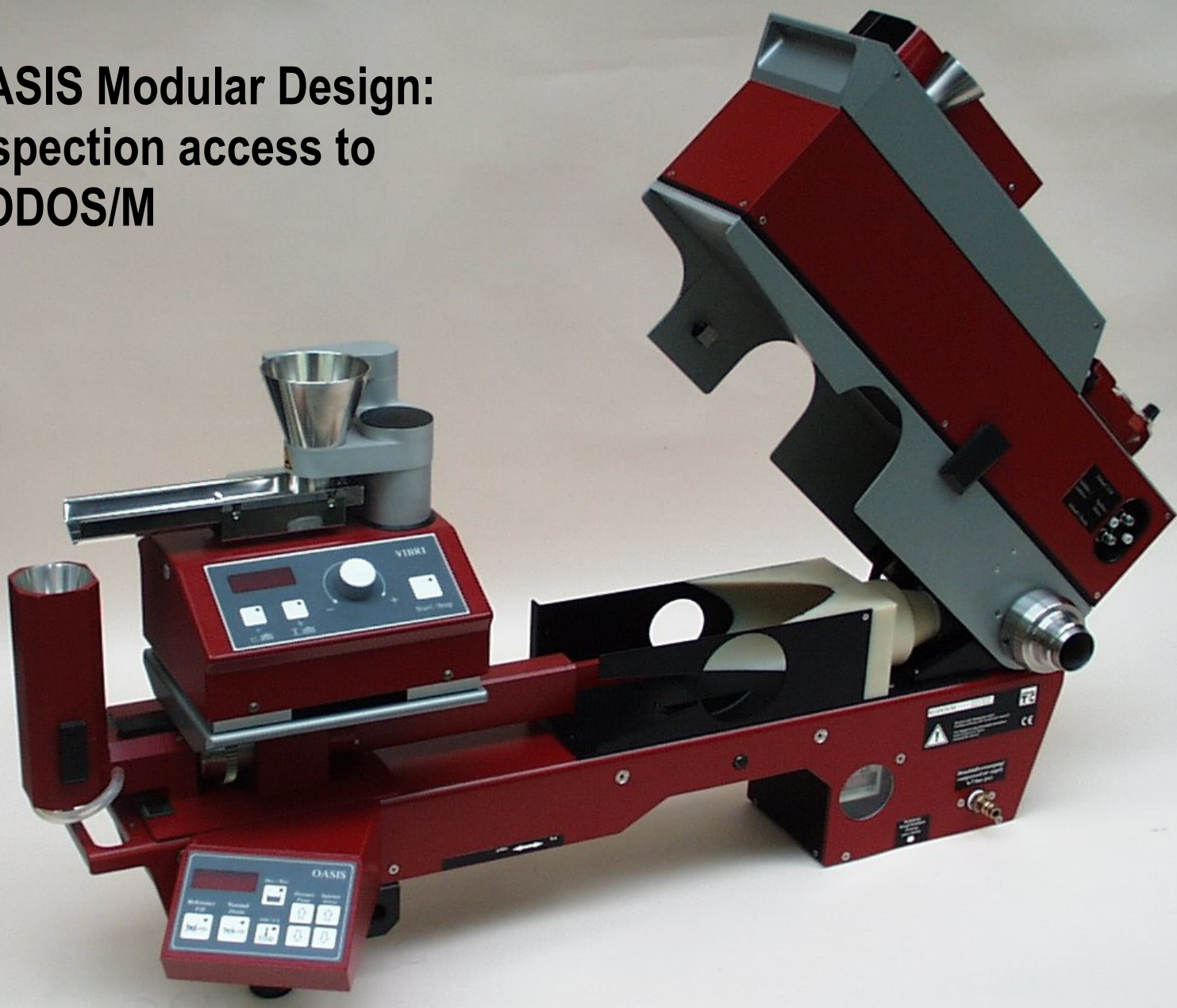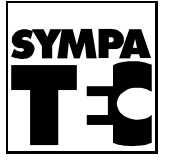
OASIS Modular Design:
Inspection access to
RODOS/M

Specifications

★ OASIS = RODOS/M + SUCELL/M

★ **Fully automated** dispersing system for *dry* and *wet* applications

★ Combines the advantages of both worlds:

    ☆ Superior performance of the *dry powder disperser RODOS*

        ✳ Dispersing capability from < 0.1 µm with unique dispersion principle

        ✳ R1 to R7, i.e. 0.1 µm to 3500 µm

        ✳ Micro samples (ASPIROS) to kilogram samples with

        ✳ Constant dosing device VIBRI

    ☆ Proven performance of the *well established SUCELL*

        ✳ Dispersing capability down to 0.1 µm with adjustable US agitation

        ✳ R1 to R5, i.e. 0.1 µm to 875 µm

★ OASIS realises two separate, proven dispersers in one instrument

★ Automatic switchover under software control, i.e.

No manual exchange of parts when changing from dry to wet !

Standard Extent of Delivery for RODOS/M

★ Housing

  ☆ Fits into standard measuring zone of HELOS/F- or A-series measuring ranges: R1 to R7

  ☆ Integrated operational panel for manual operation and status display

  ☆ Single plug connection to HELOS via 24V/RS485 connection

  ☆ Prepared for upgrade to OASIS

★ Dispersing system

  ☆ Dispersing line identical to RODOS

  ☆ Quick exchange of dispersing line with auto-detect-function for type of dispersing line

  ☆ Slit width control and monitoring of vacuum by software

  ☆ Automatic positioning of dispersing line with respect to measuring range, i.e. R1/R2 and R3 to R7 position

  ☆ Primary pressure controlled by software, 0 to 6 bar

  ☆ Integrated filters for compressed air

  ☆ Funnel adapter for VIBRI

★ Vacuum System

  ☆ Top cover with swivelling inspection window for easy access to vacuum inlet

  ☆ High resistance inlet funnel (PA12) for long life times

  ☆ Bayonet connection to vacuum hose

  ☆ 2 blowers for cleaning of windows

★ **Control**

☆ Fully automated, software controlled operation or manually via operational panel

☆ Control of

✱ Primary pressure (0 to 6 bar)

✱ Injector position (R1, R2, R3 – R7)

✱ Slit width (throughput) with vacuum monitoring

✱ Vacuum cleaner via HELOS

☆ RS485/RS232 interface

☆ Remote control connector

☆ Auxiliary inputs & outputs

★ **Software**

☆ Supported by WINDOX 4.0

Options

★ **Different dispersing lines:**

☆ 4 mm ∅

☆ 6 mm ∅

☆ 10 mm ∅

★ **With SUCELL/M for upgrade to OASIS**

★ **Dosing systems**

☆ VIBRI & rotating funnel

☆ ASPIROS

★ **Vacuum systems (Nilfisk, Kärcher etc.)**

Standard Extent of Delivery for SUCELL/M

★ Housing

  ✭ *Fits on top of RODOS/M* top cover of RODOS/M locks, when SUCELL/M is installed and the level sensors of SUCELL/M indicate the presence of liquid

  ✭ *Uses the operational panel of RODOS/M* for manual operation and status display

  ✭ *Auto-connect to RODOS/M* via bottom connector

★ Liquid Basin

  ✭ 400 ml, stainless steel with "drop collector"

  ✭ 2 level sensors (empty, full)

  ✭ Inlets for fill, rinse, clean

  ✭ US transducer

★ Top cover

  ✭ 2 stirrers, speed controlled, i.e. speed is independent of viscosity

  ✭ Stainless steel lid for basin

  ✭ Sample inlet funnel activates fountain if tilted

  ✭ Security switch stops stirrers when lid is opened

★ Circulation

  ✭ Pump with silent drive unit, speed controlled

  ✭ New 3 position valve allows for
- Filling
- Circulation
- Active (i.e. pumped) draining

  ✭ Flow through cuvette: 2 mm

★ Control

  ☆ Fully automated software controlled operation or manually via operational panel

  ☆ Control of

    ✳ Cuvette position (dry/wet)

    ✳ Pump speed (0 to 100 %) and direction

    ✳ Stirrer speed (0 to 100 %)

    ✳ Valves for fill, additive, fountain

    ✳ US power: 0 to 60 W in 0.6 W = 1 % increments

  ☆ Integrated US generator with variable output power 0 to 60 W

  ☆ External pumps, valves or level sensors

    ✳ Filling

    ✳ Draining

    ✳ Additive

    ✳ Auxiliary inputs & outputs

★ Software

  ☆ Supported from WINDOX 4.0 Rel.

Options

★ Viton® hoses instead of silicone

★ Fill container with pump & level sensor

★ Drain container with pump & level sensor

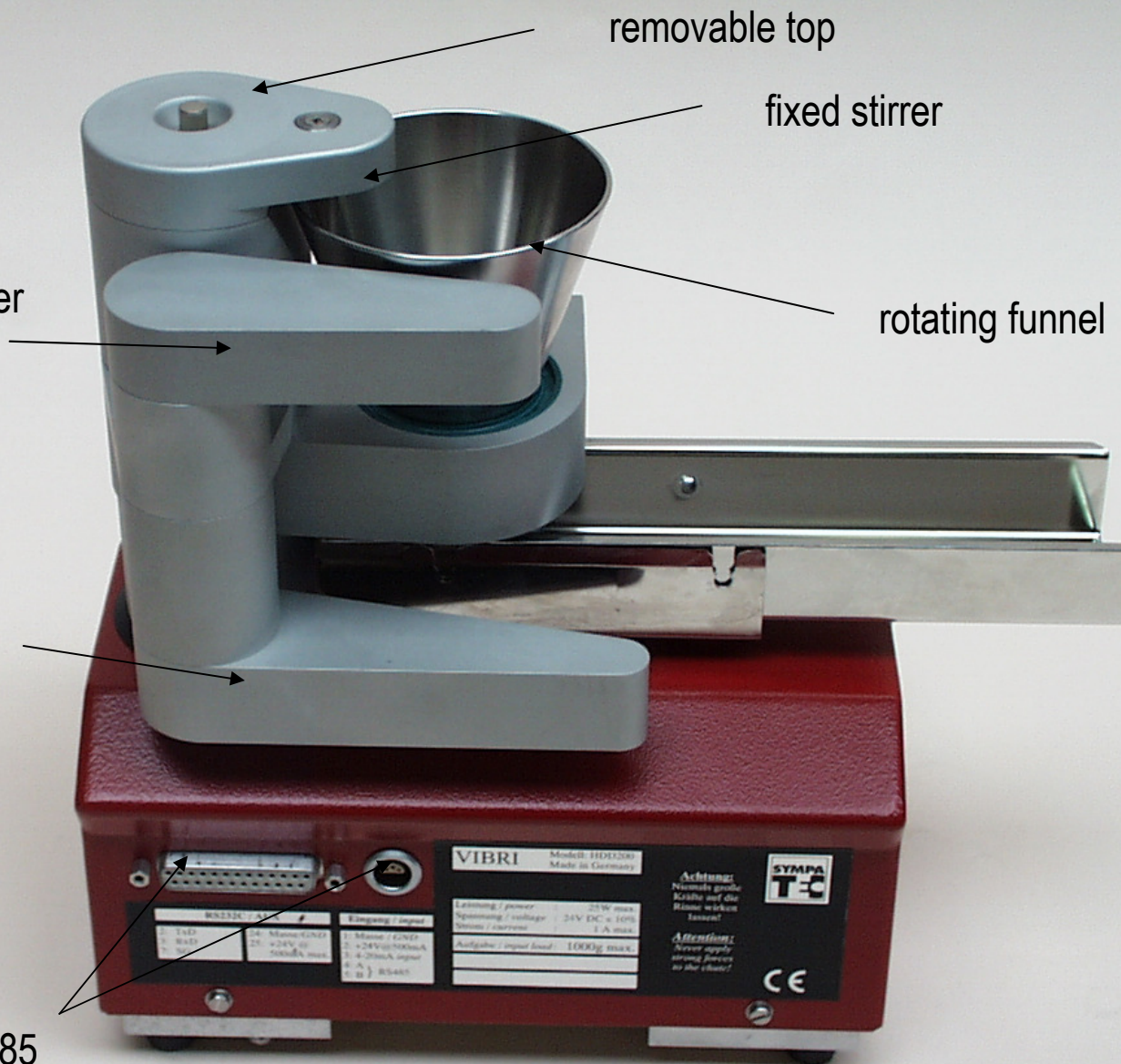★ Additive container with pump & level sensor

★ 4 mm flow through cuvette

VIBRI
with rotating funnel

**VIBRI
Peripherals**

removable top

fixed stirrer

rotating funnel
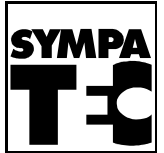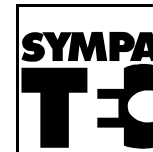
hammer for hopper
cleaning

hammer for
hute cleaning

connectors for:
- 24V supply/RS485
- RS232C

# Specifications

SYMPATEC

- ★ Applications (preferred)
  - ☆ *Coffee*
  - ☆ Sticky coarse materials

- ★ Housing
  - ☆ Fits to RODOS, RODOS/M, OASIS, GRADIS
  - ☆ Integrated operational panel for manual operation and status display
  - ☆ Single plug connection to HELOS via 24V/RS485 connection

- ★ Hopper
  - ☆ Rotating at about *28 rpm*
  - ☆ Capacity *150 cm³*
  - ☆ Clamp mechanism for easy exchange

- ★ Chute
  - ☆ Polished stainless steel with flat bottom

- ★ Cleaning
  - ☆ Double hammer system for hopper and chute

- ★ Control
  - ☆ Via RS485/RS232 interface
  - ☆ Amplitude of vibration, 0 to 100 %, *independent of loading*
  - ☆ Gap width *0.5 to 15 mm*, res. 0.1 mm
  - ☆ Hammer drivers
  - ☆ Rotation of funnel (on/off)

- ★ Software
  - ☆ Supported from WINDOX 3.4 Rel. 1

ASPIROS
Micro Dosing System

SYMPATEC
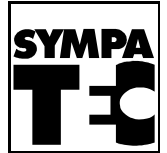
Automatic dosing of dry powders:

✓ Micro- to milligram samples

✓ Safe operation through capped glass tubes
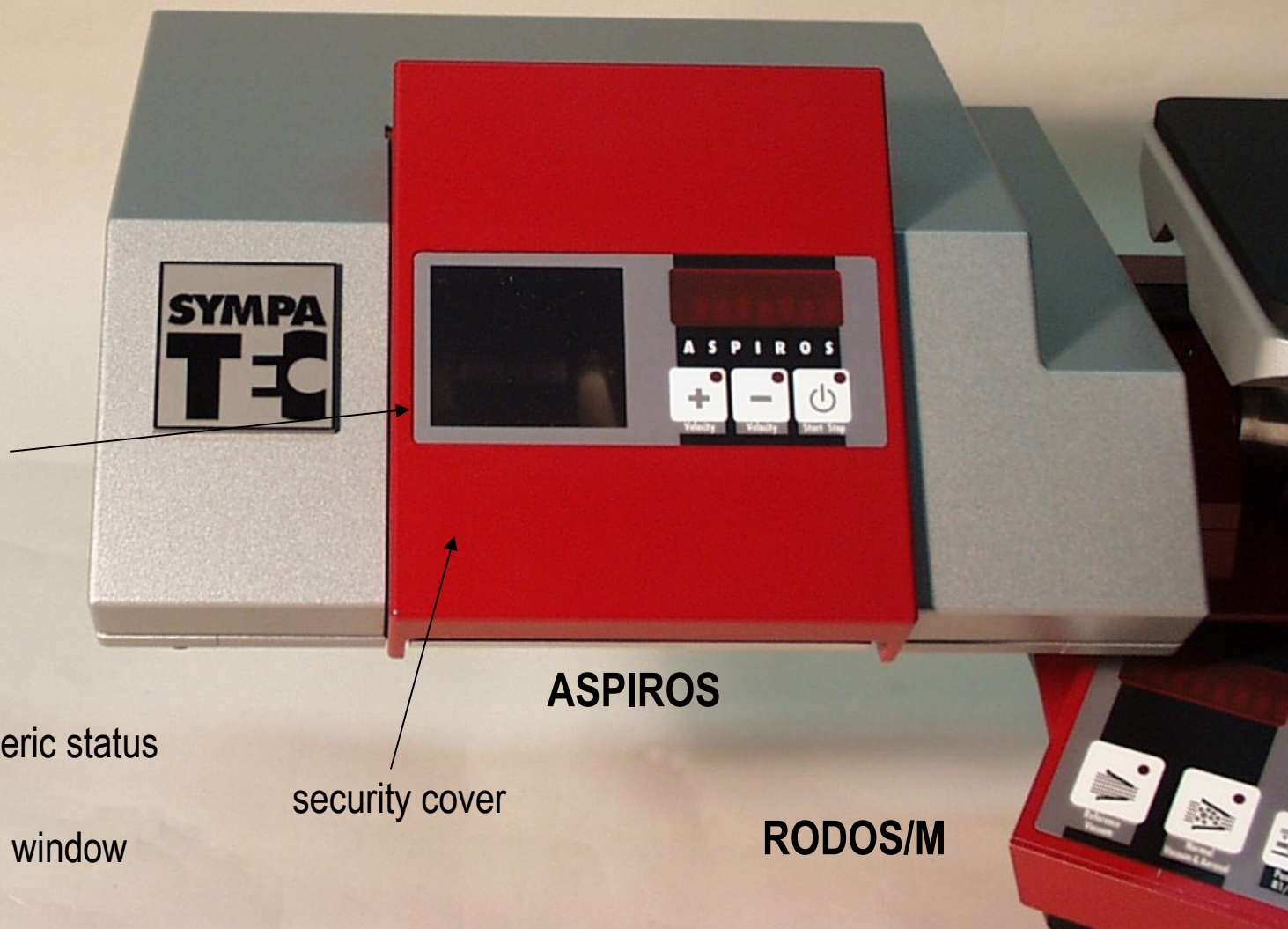(manual feed) with optional bar-code label

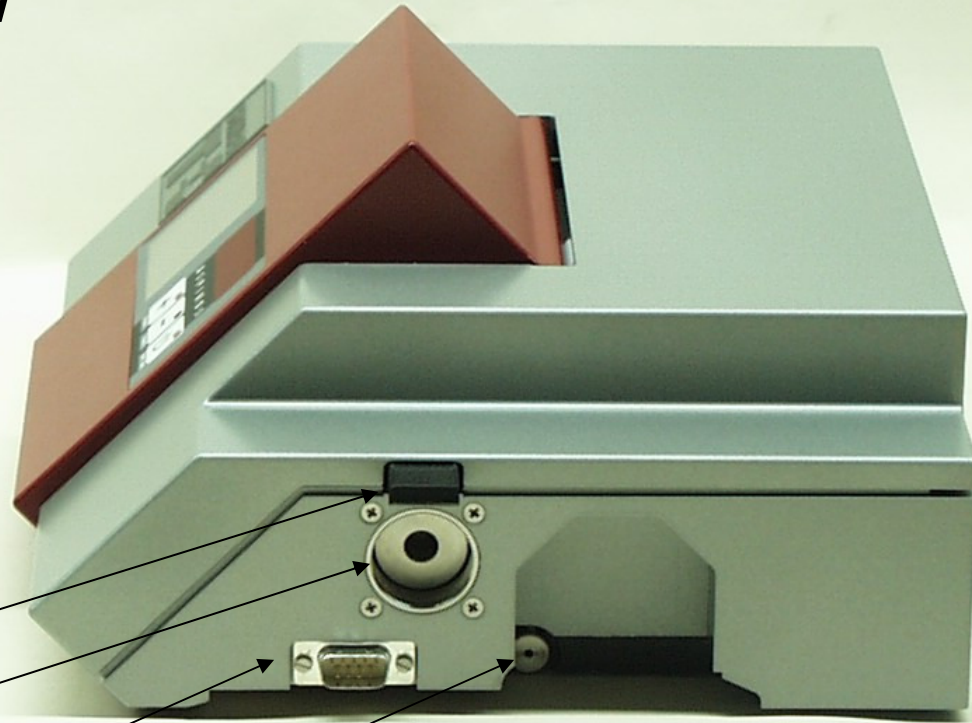✓ Optional bar-code reader

ASPIROS
Front view

Operational
panel with:

☆ Setting
   velocity
   ("+", "-")

☆ Start/stop

☆ Alphanumeric status
   display

☆ Inspection window

security cover

ASPIROS

RODOS/M

ASPIROS
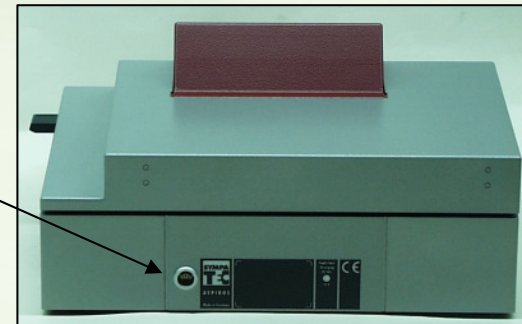## Side & rear view

Connections to
RODOS/M

☆ Fixing clamp

☆ To injector of
dispersing line

☆ Supply &
RS485

☆ To vacuum
meter

external supply &
RS485 for operation
with RODOS

ASPIROS
open for cleaning

sample cover

main cover

optional barcode reader

sensor for sample glass tubes

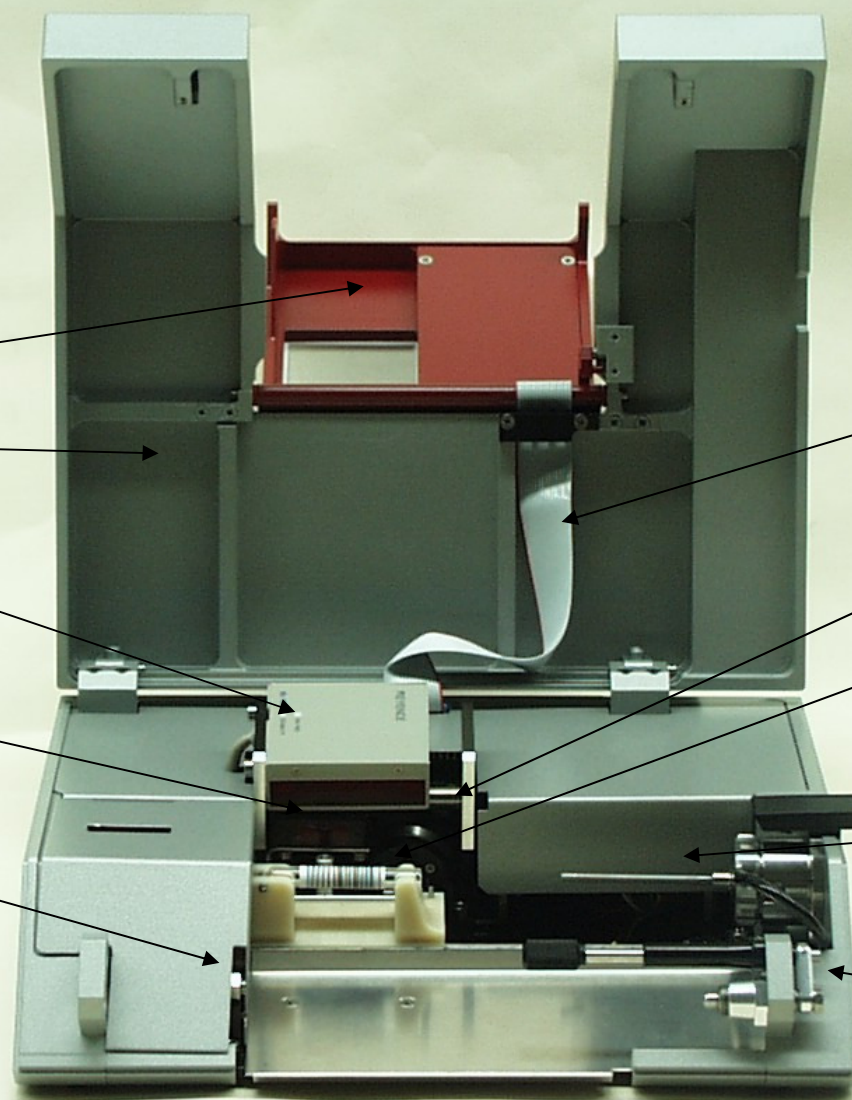security sensor and locking magnet
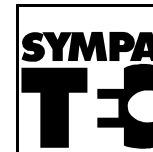
connection to operational panel

un-capper

sledge with sample glass tube

aspiration tube
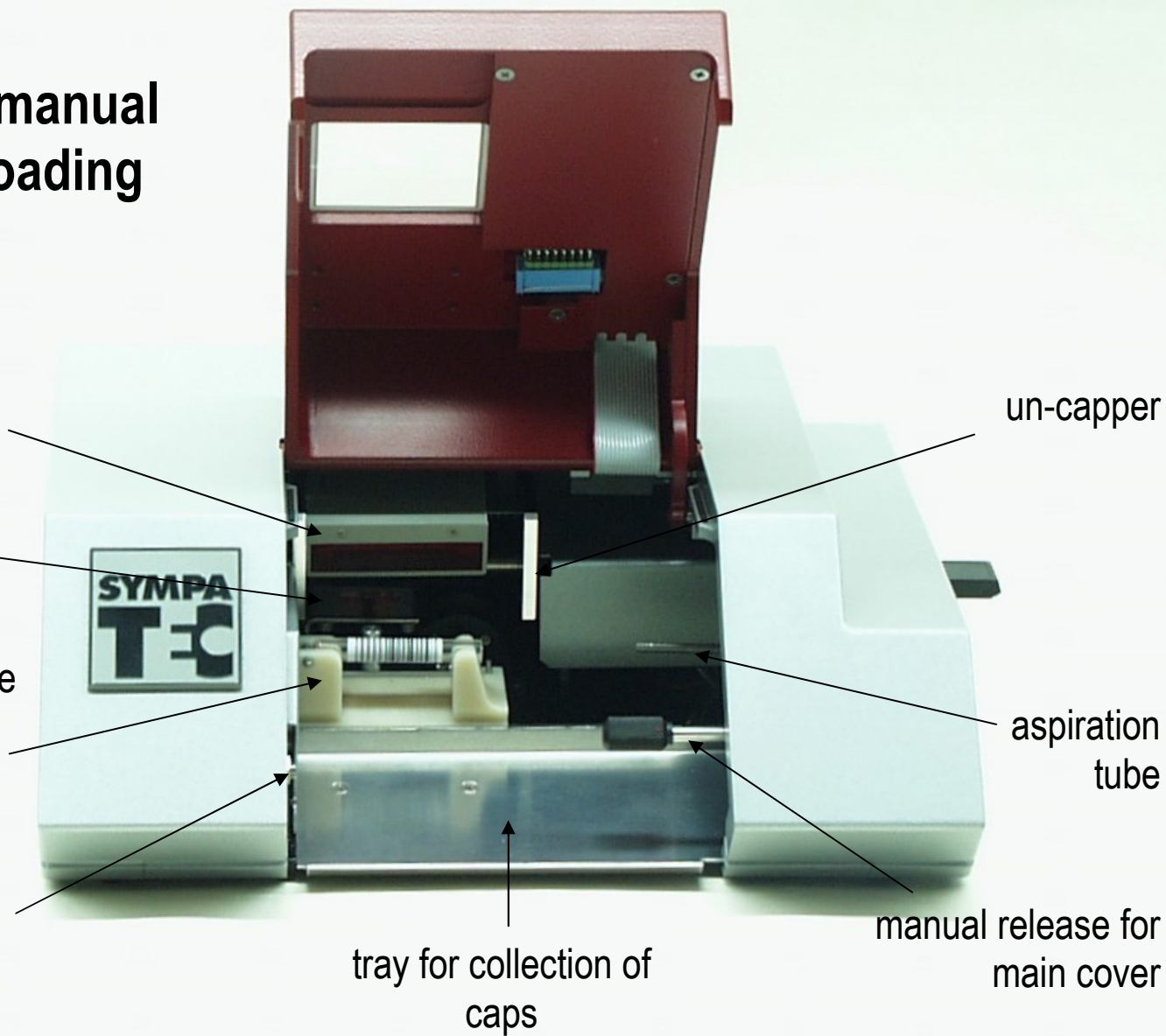
locking mechanism for main cover

ASPIROS
opened for manual loading/unloading

optional barcode reader

sensor for sample glass tube

sledge with sample glass tube & barcode

security sensor „cover closed" & locking magnet

un-capper

aspiration tube

manual release for main cover
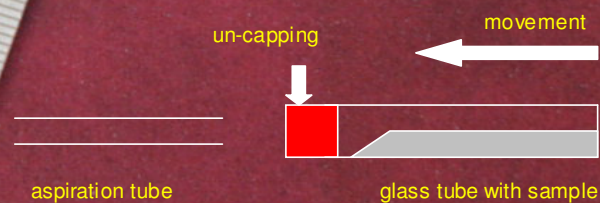
tray for collection of caps

ASPIROS
Sample Glass Tubes

- ✔ One way glass tubes → no cleaning
- ✔ Single-shot or magazine operation
- ✔ << 1 mg to about 1000 mg samples
- ✔ PTFE cap for safe storage & transport
- ✔ Automatic un-capping supported
- ✔ Optional sample identification via adhesive bar-code label

Operating Principle

un-capping

movement

aspiration tube

glass tube with sample

Specifications (ASPIROS Basic Unit)

SYMPATEC

★ Applications

  ☆ Controlled dosing of dry powders as accessory for RODOS, RODOS/M or OASIS
  ☆ Sample quantity: << 1 mg to about 1 g
  ☆ Pharmaceutical or toxic products
  ☆ R1 to R4, i.e. 0.1 µm to 350 µm

★ Sample preparation

  ☆ Easy preparation of samples: Glass tubes filled externally with the help of spatula (e.g. in a fume cupboard)
  ☆ Capped tubes for safe handling & storage
  ☆ Optional adhesive bar-code label for identification and parameter set-up prior to measurement, supports all standard codes, i.e. CODE 39®, Interleaved 2 of 5®, CODABAR®, Code 128®

★ Operation

  ☆ Manual feeding of the sample glass tubes into the transporting sledge

★ Safe operation

  ✳ Operation starts only when cover is closed
  ✳ Cover locks during operation
  ✳ Sample glass tube detection
  ✳ Automatic un-capping

  ☆ Optional bar-code identification for automatic definition of the measuring process
  ☆ Velocity controlled dosing
  ☆ Simplified cleaning
    ✳ Foldable safety cover
    ✳ All parts in contact with sample can easily be removed

★ Control

  ☆ Software via built in RS485 interface
  ☆ Manual via operational panel with alphanumeric display

★ Software

  ☆ Supported from WINDOX 4

INHALER

Introduction

- ★ Ranges of application

- ★ INHALER
  - ☆ Modular design
  - ☆ Realisation

- ★ Details of realisation
  - ☆ Central unit
  - ☆ Operation and display
  - ☆ Generation of vacuum
  - ☆ Accessories and extensions

- ★ Examples

- ★ Specifications

- ★ Conclusions

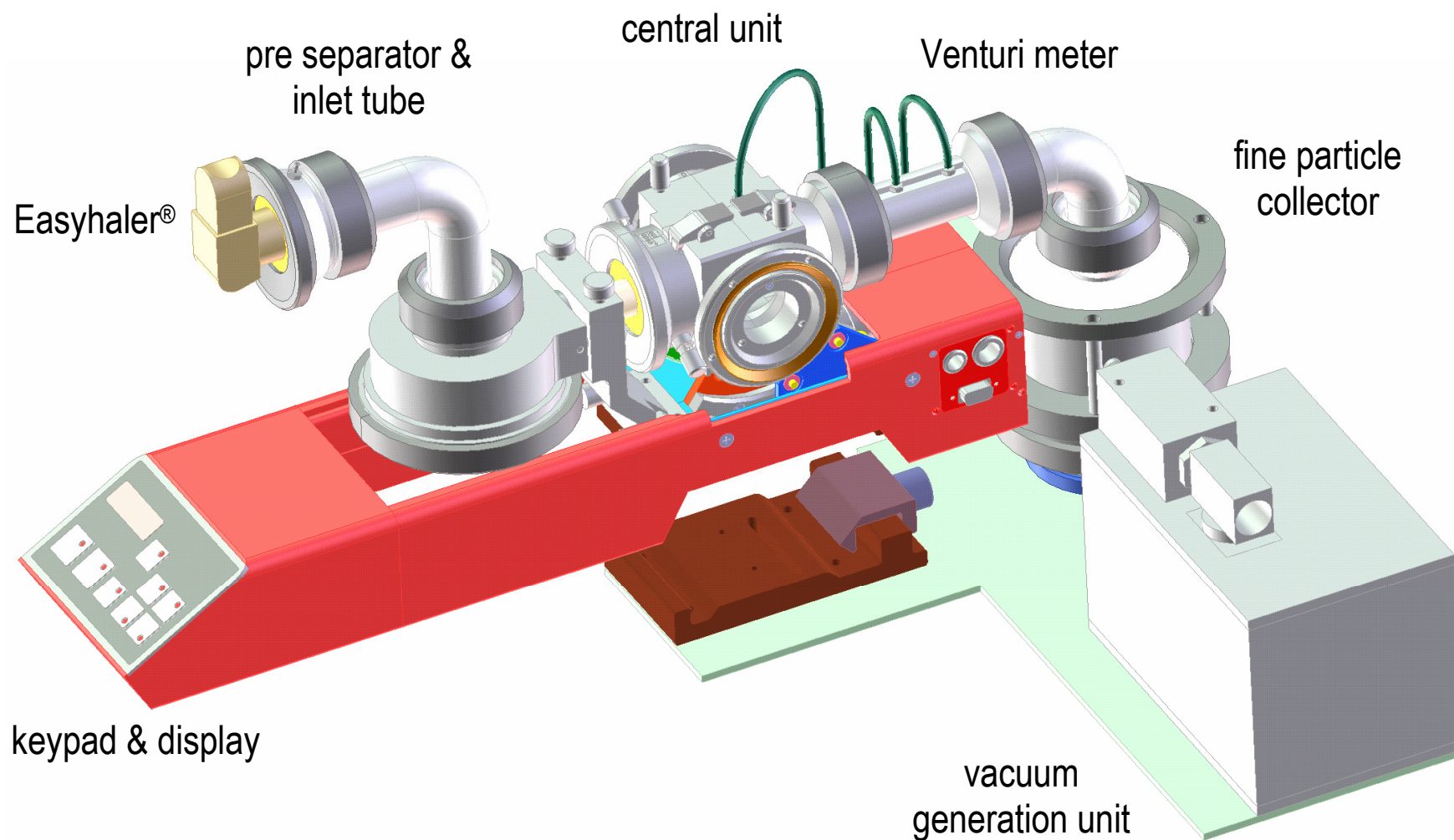# Ranges of Application

SYMPATEC

Modules available for:

✓ Dry Powder Inhaler (DPI's) with adhesive mixtures

✓ Dry Powder Inhaler (DPI's) with spherical pellets

✓ Propellant Gas Sprays (MDI's) w/o Spacer

✓ Propellant Gas Sprays (MDI's) incl. Spacer

✓ Nebuliser

Examples:

✳ Easyhaler
✳ Accuhaler
✳ Berotec Inhalette
✳ Foradil inhalation powder
✳ BDP Rotacaps
✳ BDP Rotadisk
✳ Budesonide Cyclocaps
✳ Pulmicort Turbohaler
✳ Flixotide Diskus
✳ Flixotide Rotadisk
✳ Lomudal Spinhaler
✳ Bulkinhaler
✳ Clickhaler
✳ Pulvinal Inhaler
✳ Taifun
✳ etc.

INHALER with typical modular set-up

pre separator &
inlet tube

central unit

Venturi meter

Easyhaler®

fine particle
collector

keypad & display

vacuum
generation unit

SYMPA TEC

Modular Structure of INHALER

SYMPATEC

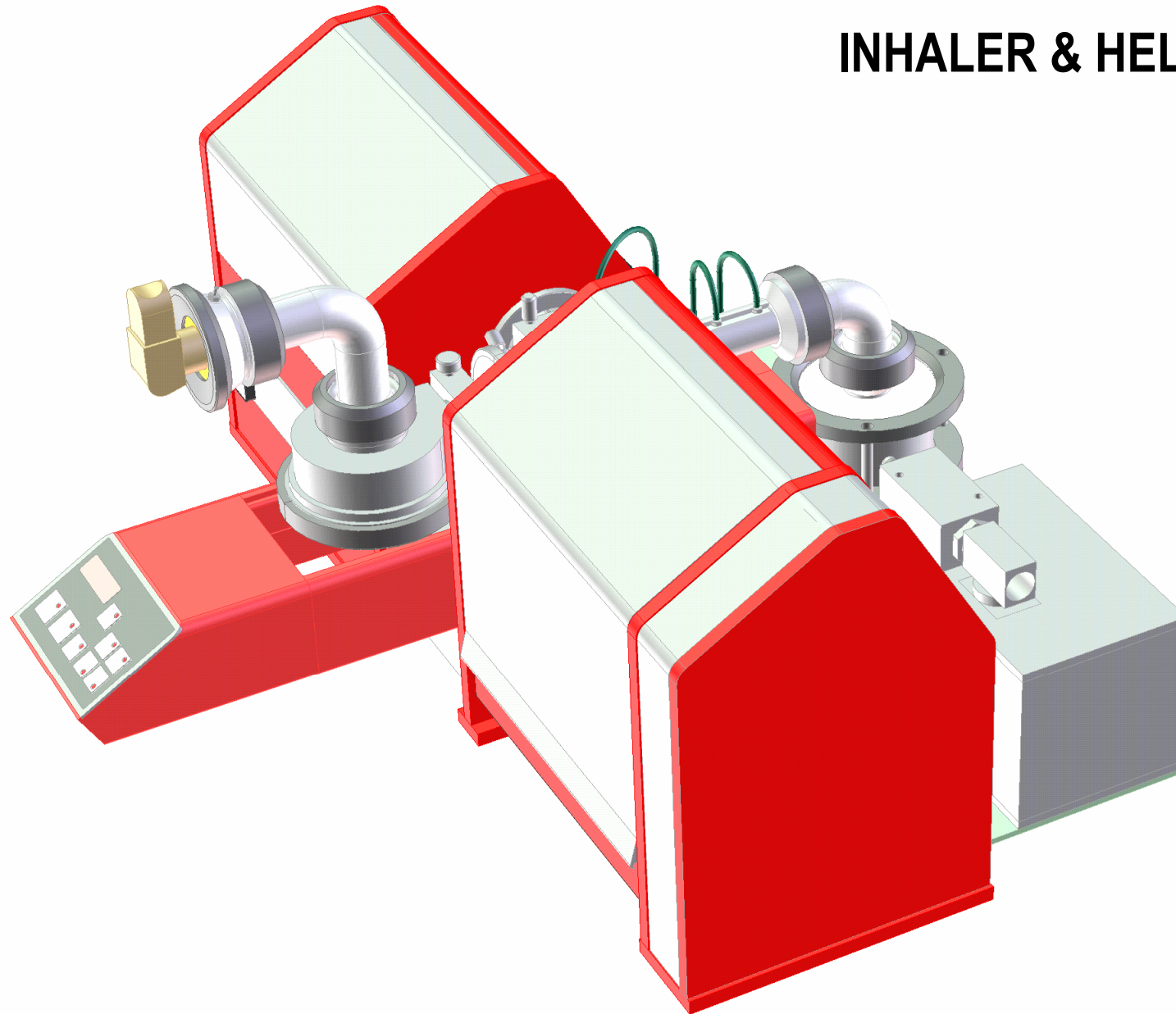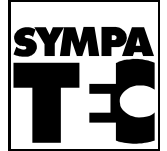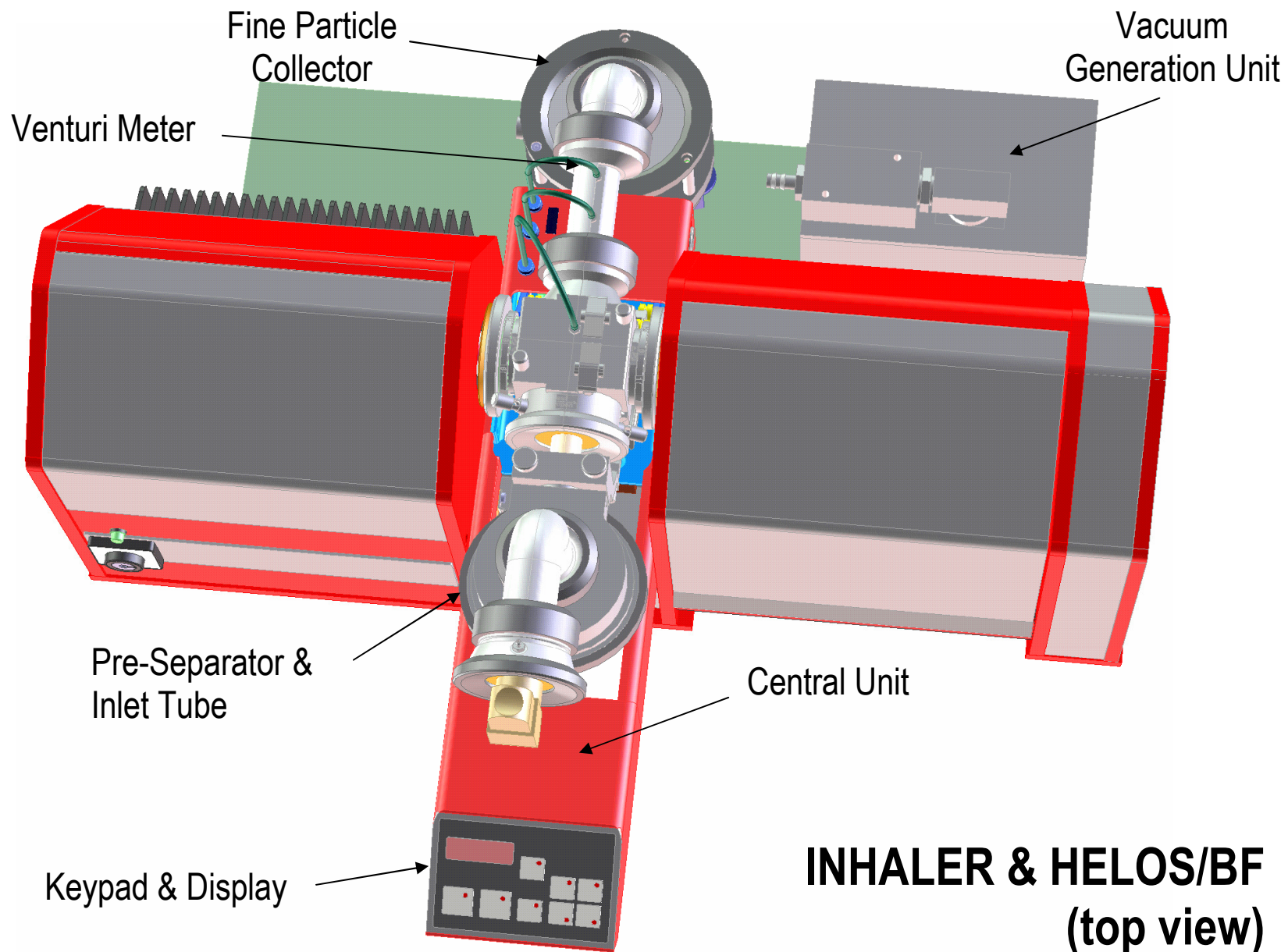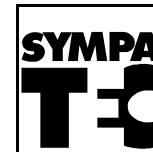| Part \ Application	Holder for Diskuss	Inlet Tube	Pre-Separator	Elongated F. Cyl.	Coarse Particle Trap	Central unit				Venturi Meter	Hose Conn.	Fine Particle Collect.	Wash Bottle	Vac. Generation
						IN	dP	SF	CF					
DPI's with adh. mixtures	☆	★	★			★		★	☆	★			★		★
DPI's with spherical pellets					★	★		★	☆	★			★		★
		☆	☆		★	★		★	☆	★			★		★
MDI's without spacer				☆		★				★	★	★		★	★
				☆		★				★	★		☆		★
MDI's with spacer						★		☆		★	★	★		★	★
						★		☆		★	★		☆		★
Nebulisers				☆	☆	★	☆			★	★	★		★	★
				☆	☆	★	☆			★	★		☆		★

★ preferred part

☆ optional part

dP = differential Pressure

SF = Sheath Flow
CF = Counter Flow

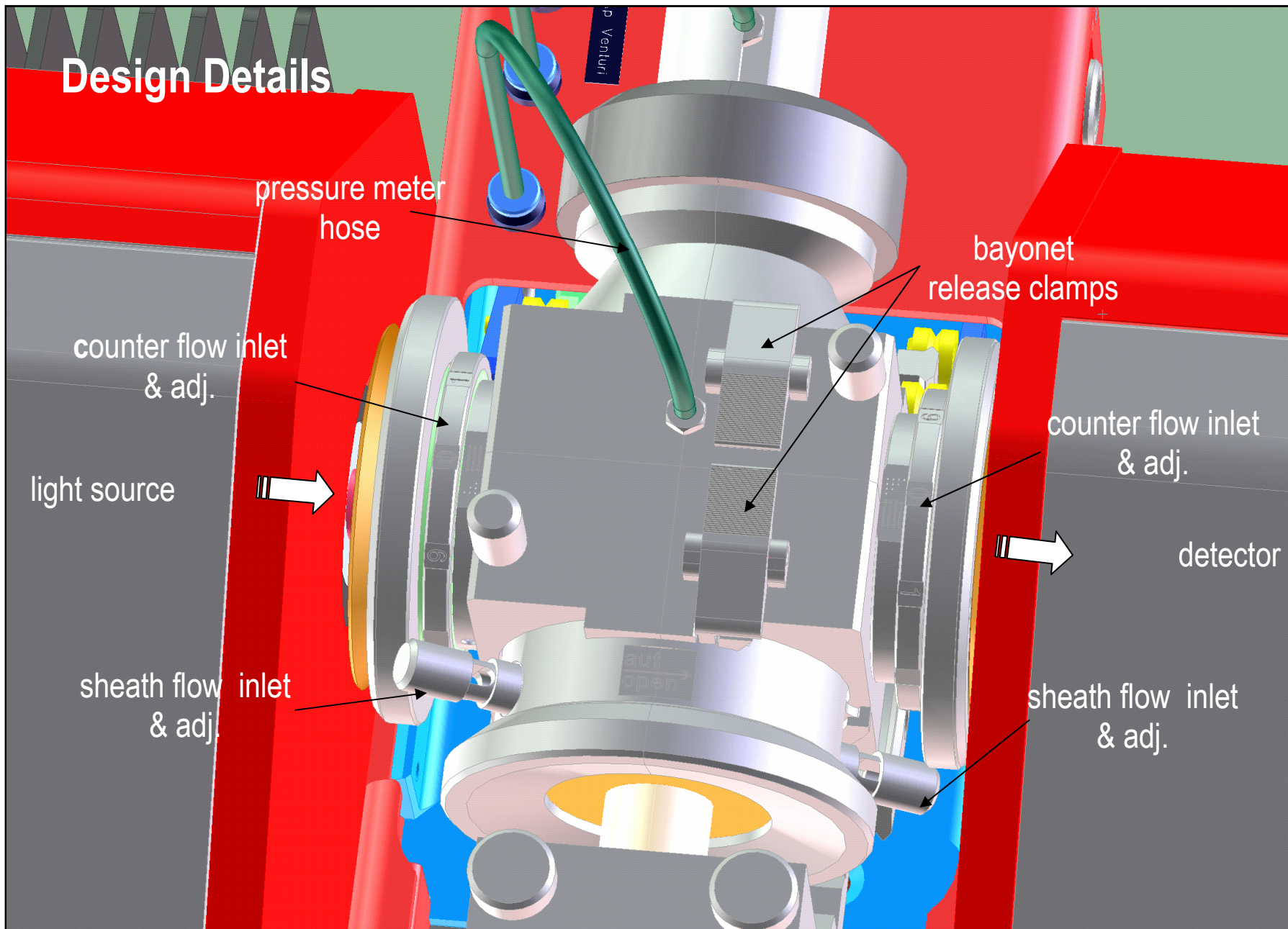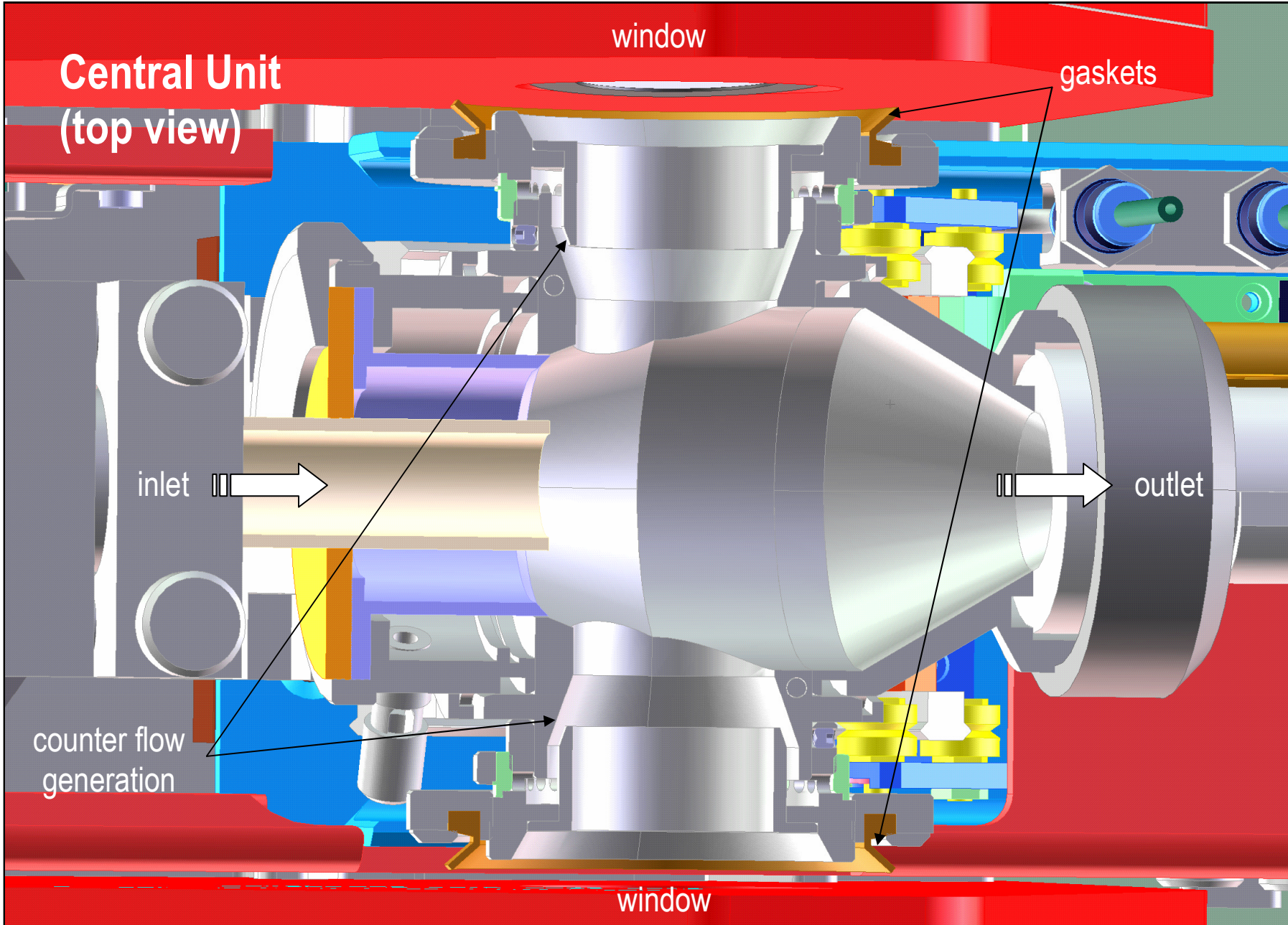IN = Inclination Angle

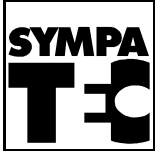# INHALER & HELOS/BF

Fine Particle
Collector

Venturi Meter

Vacuum
Generation Unit

Pre-Separator &
Inlet Tube

Central Unit

Keypad & Display

**INHALER & HELOS/BF
(top view)**

SYMPA
TEC

Design Details

pressure meter hose

bayonet release clamps

counter flow inlet & adj.

light source

counter flow inlet & adj.

detector

sheath flow inlet & adj.

sheath flow inlet & adj.

SYMPATEC

Central Unit
(top view)

window

gaskets

inlet

outlet

counter flow
generation

window

Central Unit
Measurement Chamber

quick release screws

adapter flange

cylinder or coarse particle trap

swivel rail block

SYMPATEC

Central Unit
Measurement Chamber

pressure meter connection

angle detector

swivel rail

swivel drive unit

Keypad & Display

INHALER
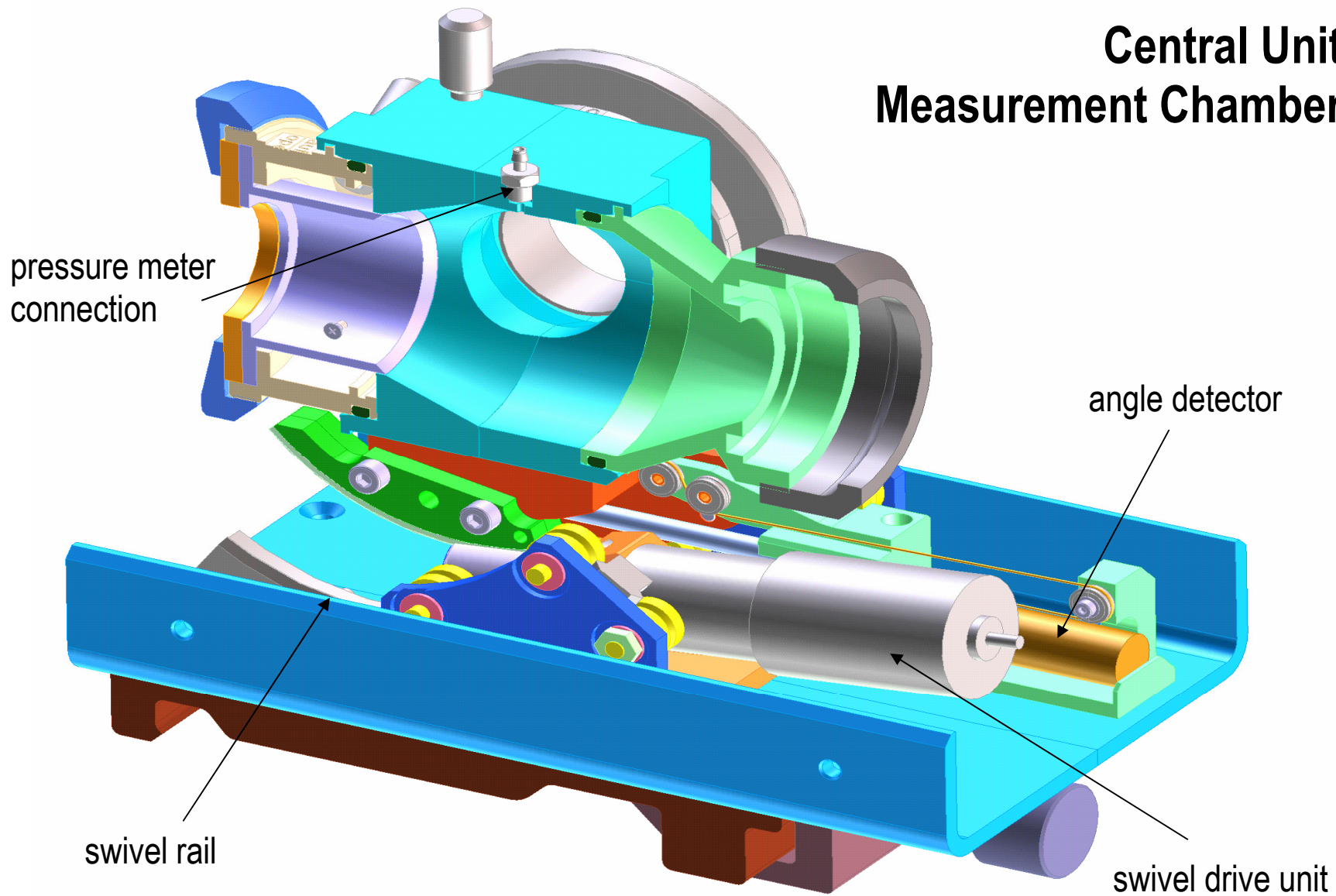
Display
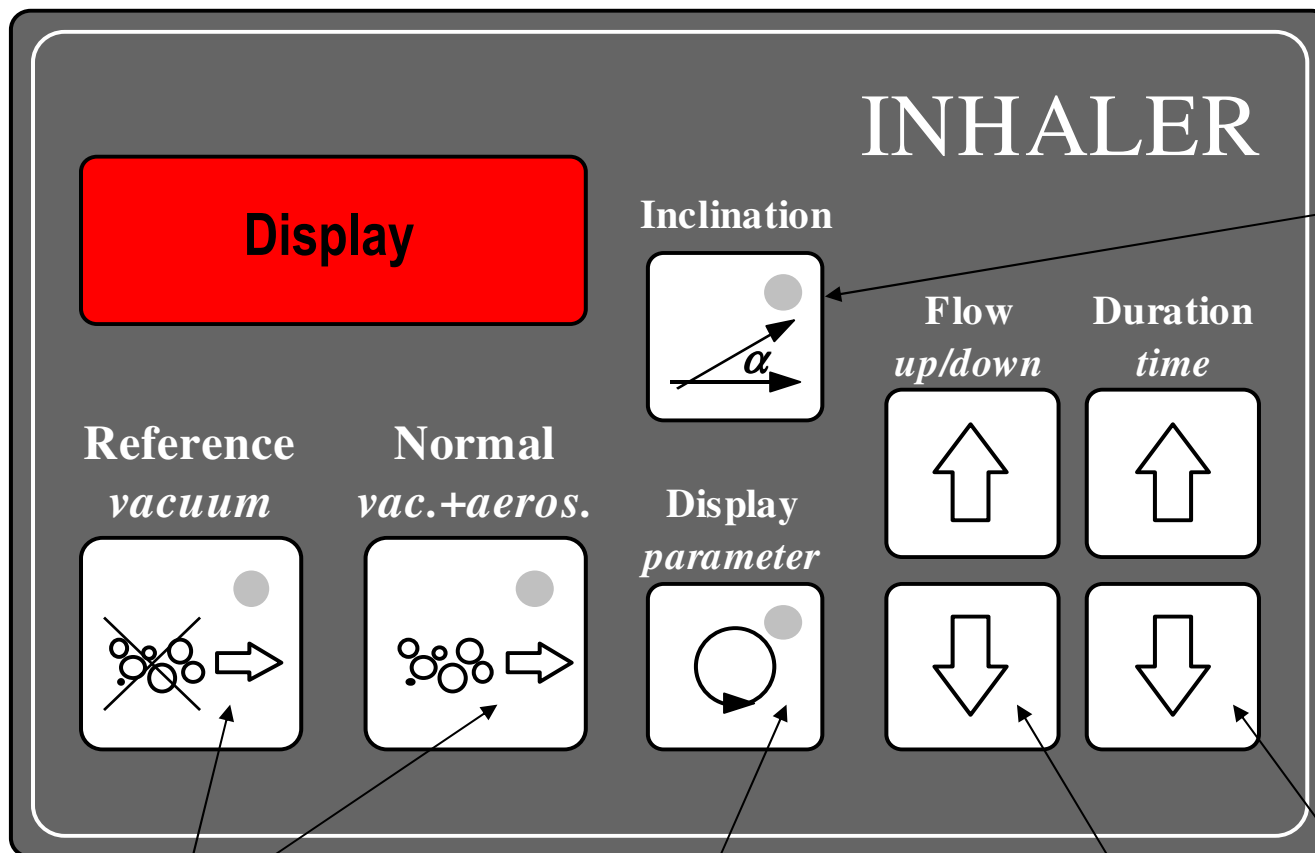
Inclination

inclination adj.
(combined with
flow up/down)

Flow *up/down*   **Duration** *time*

Reference *vacuum*   **Normal** *vac.+aeros.*

Display *parameter*
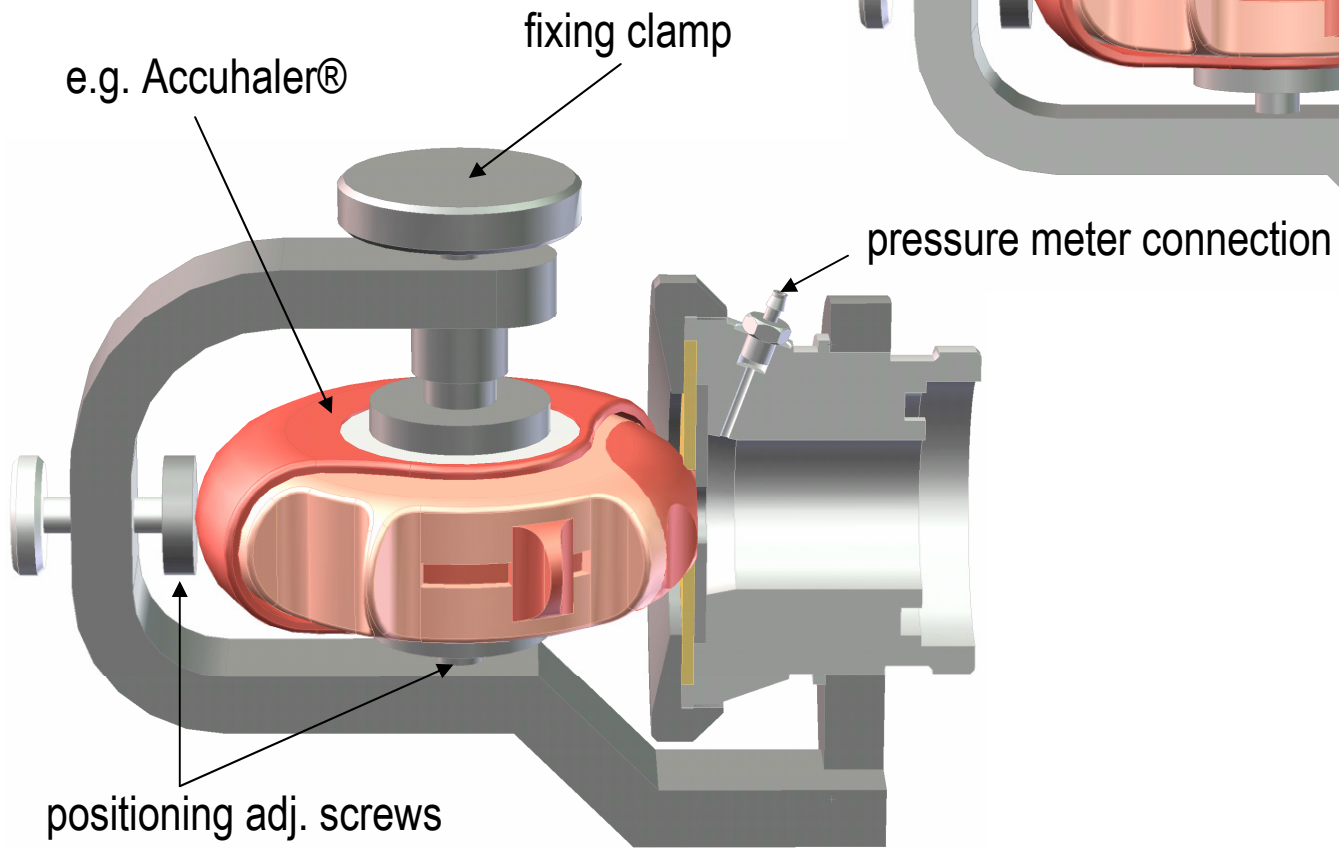
measurement
control keys

parameter select
(for display)

flow adj.

duration adj.

Accessories & Extension

Holder for Discus (as option)

fixing clamp

e.g. Accuhaler®

pressure meter connection
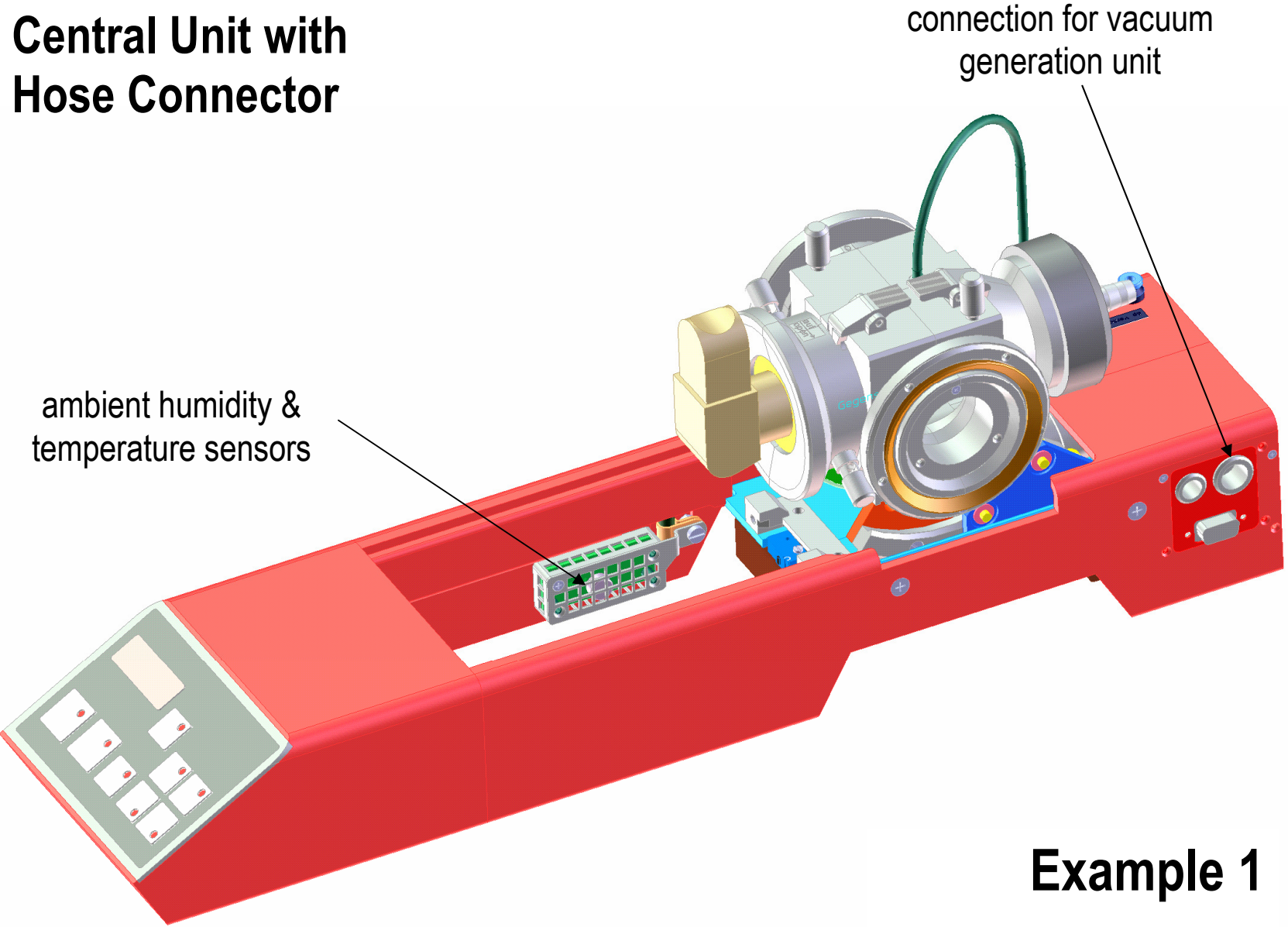
positioning adj. screws

SYMPATEC

Wash Bottle (standard)

Content: 100 ml

Throughput: 0 to 50 l/min

Efficiency: 30 to 80 % @ 2 µm

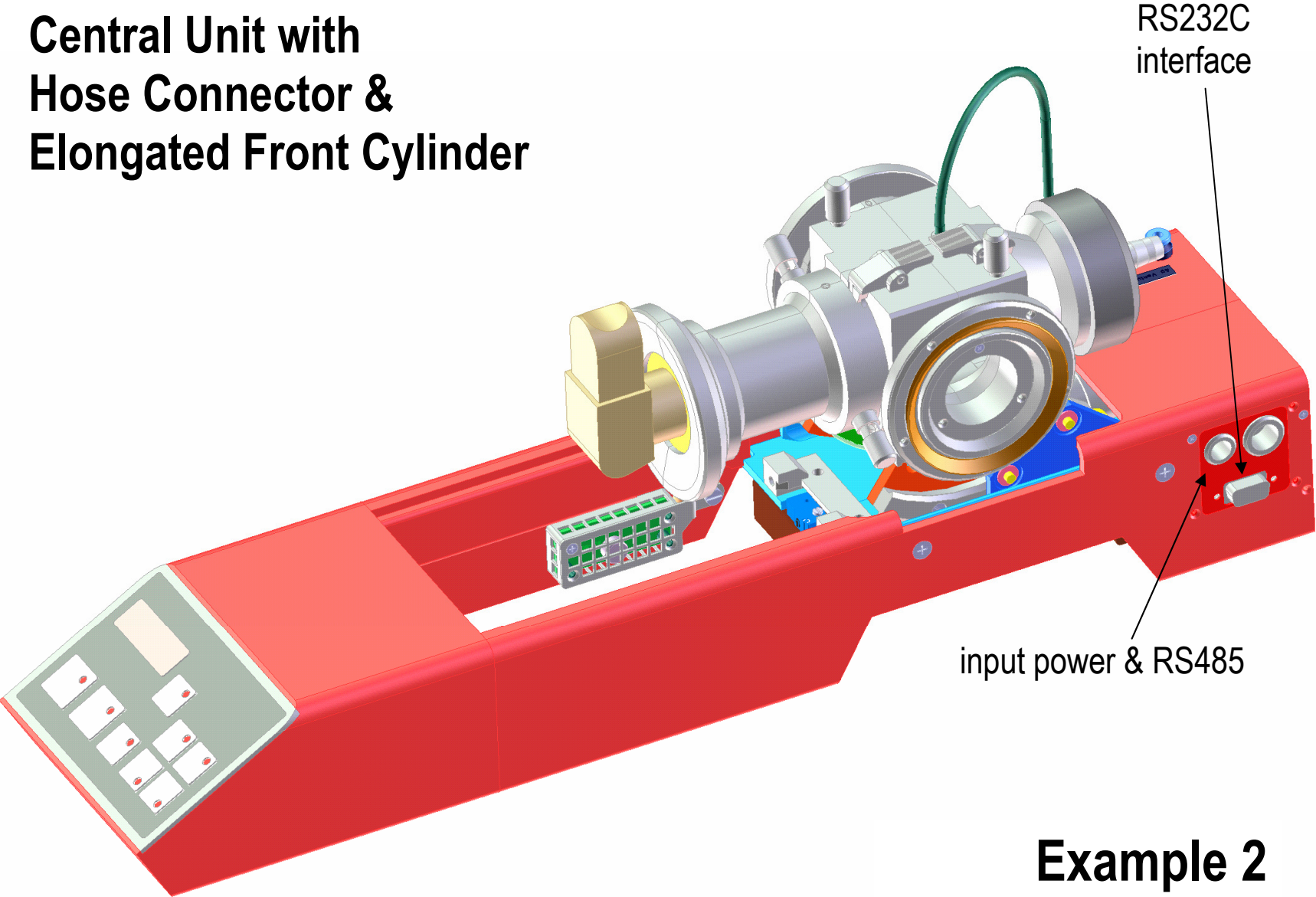# Central Unit with
Hose Connector
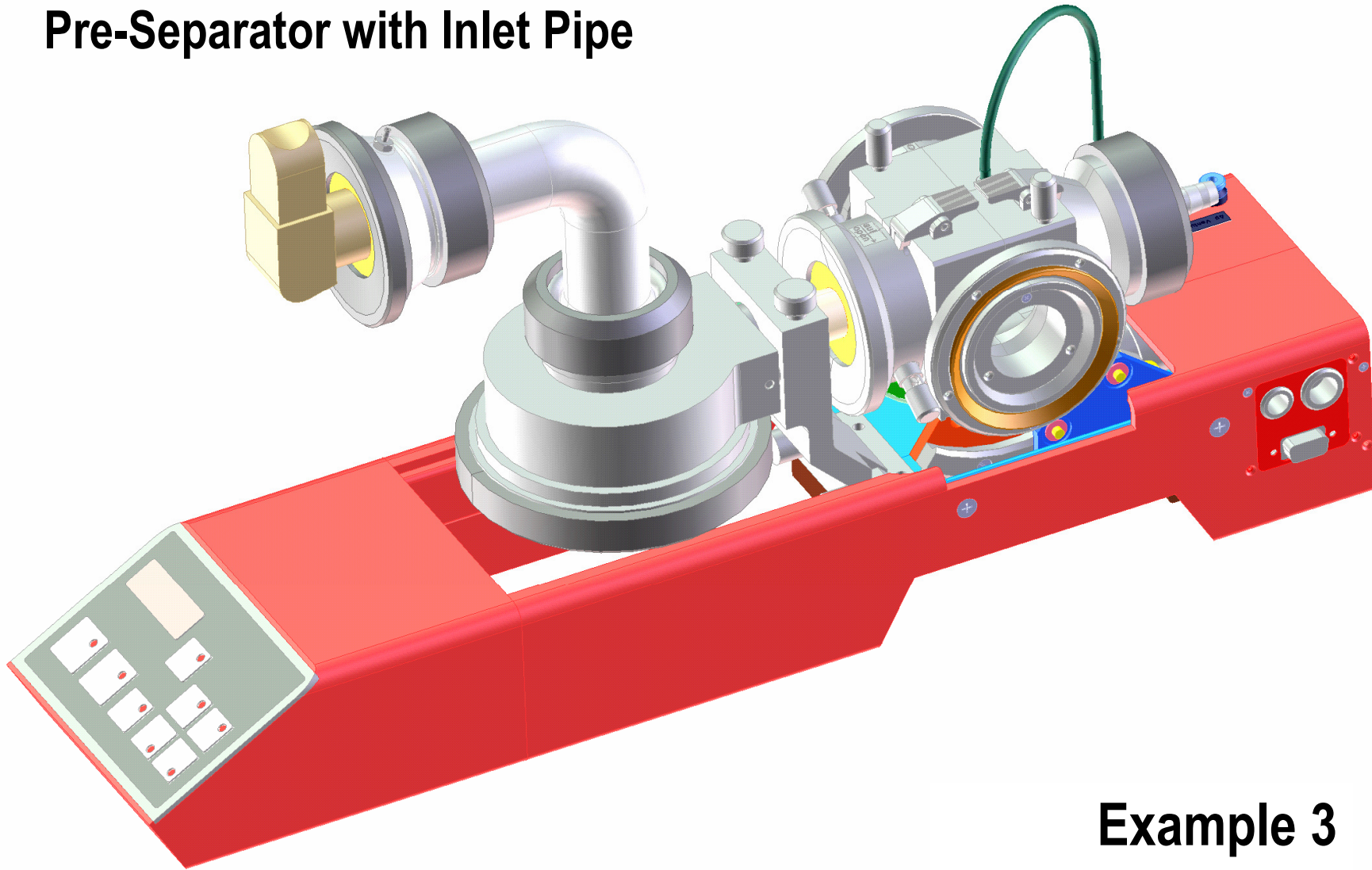
connection for vacuum
generation unit

ambient humidity &
temperature sensors
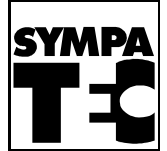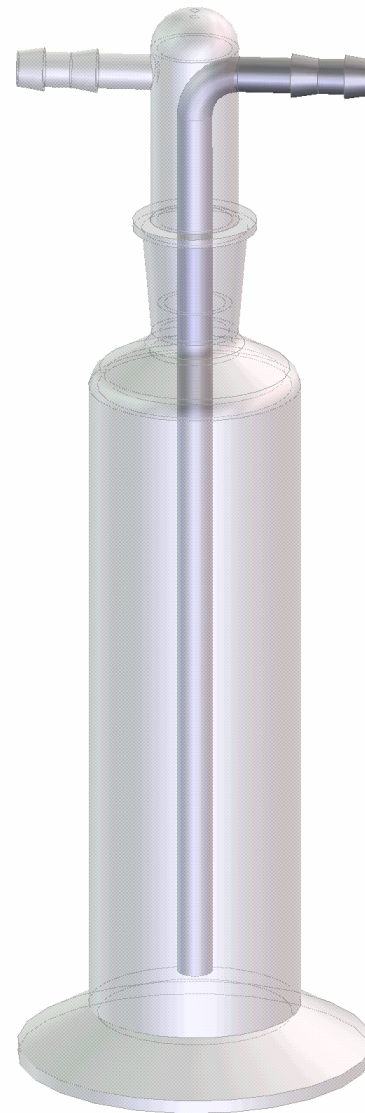
Example 1

Central Unit with
Hose Connector &
Elongated Front Cylinder

RS232C
interface

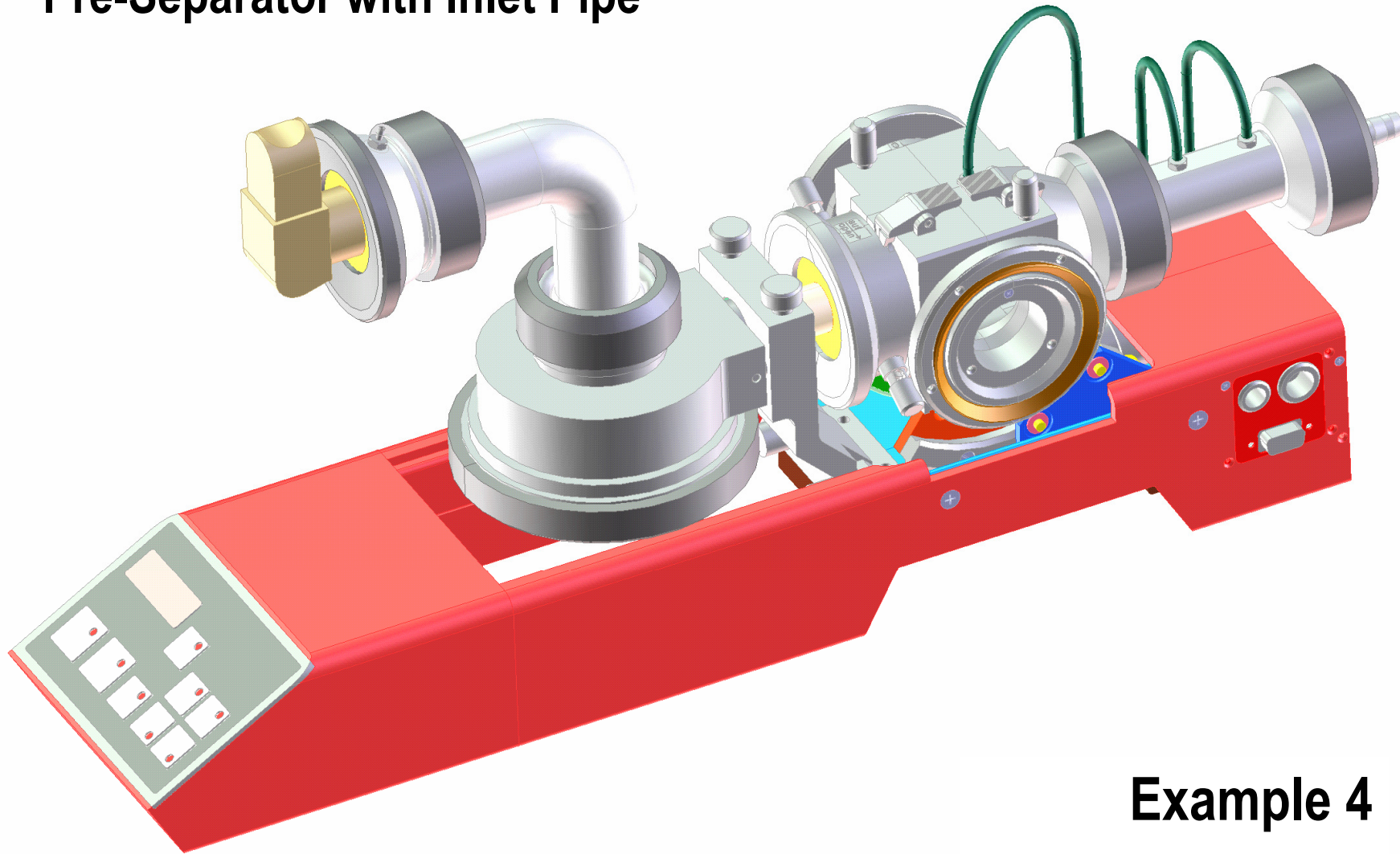input power & RS485

Example 2

Central Unit with Hose Connector & Pre-Separator with Inlet Pipe
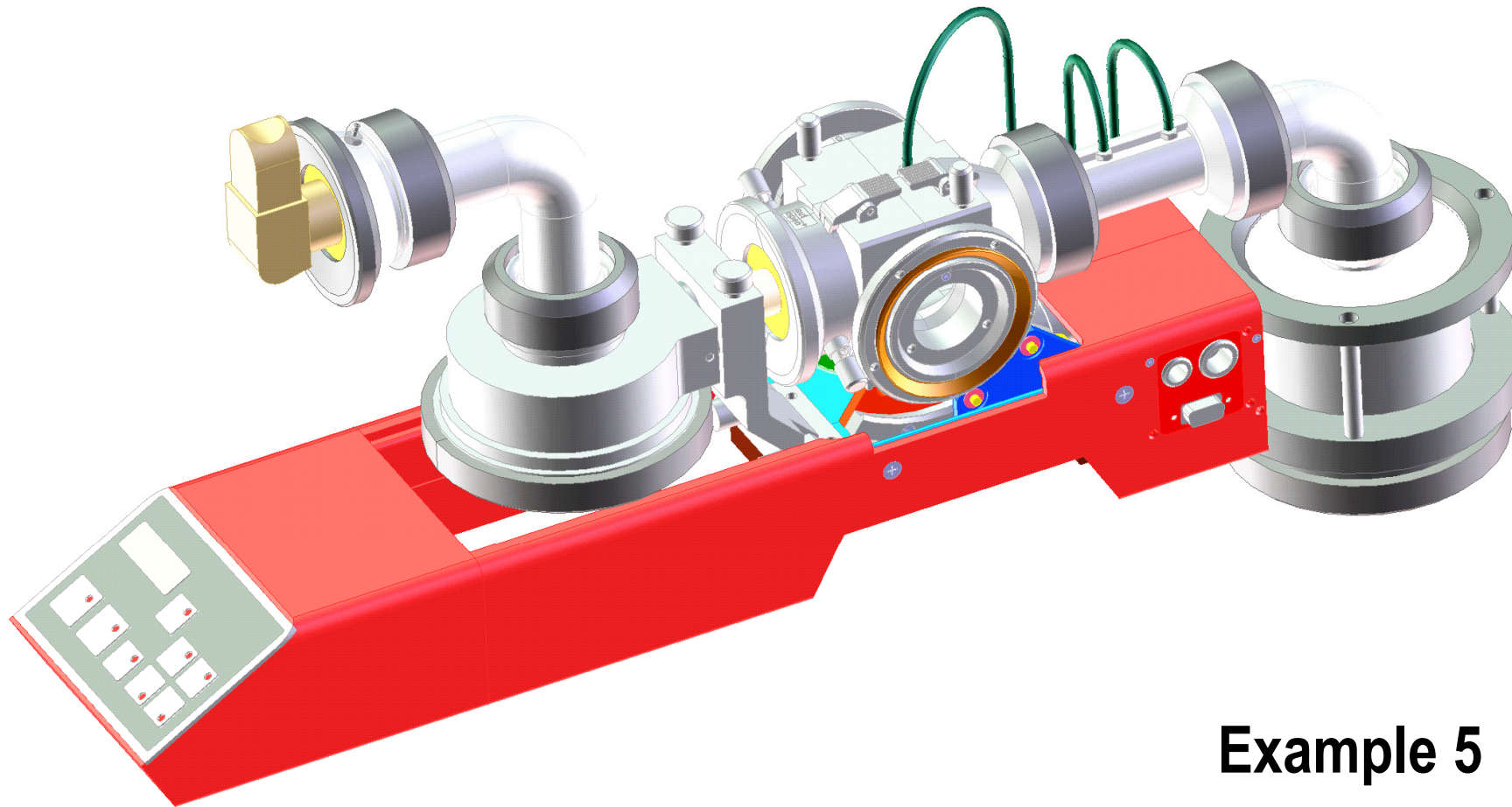

Example 3

Central Unit with Venturi Meter and Hose Connector & Pre-Separator with Inlet Pipe

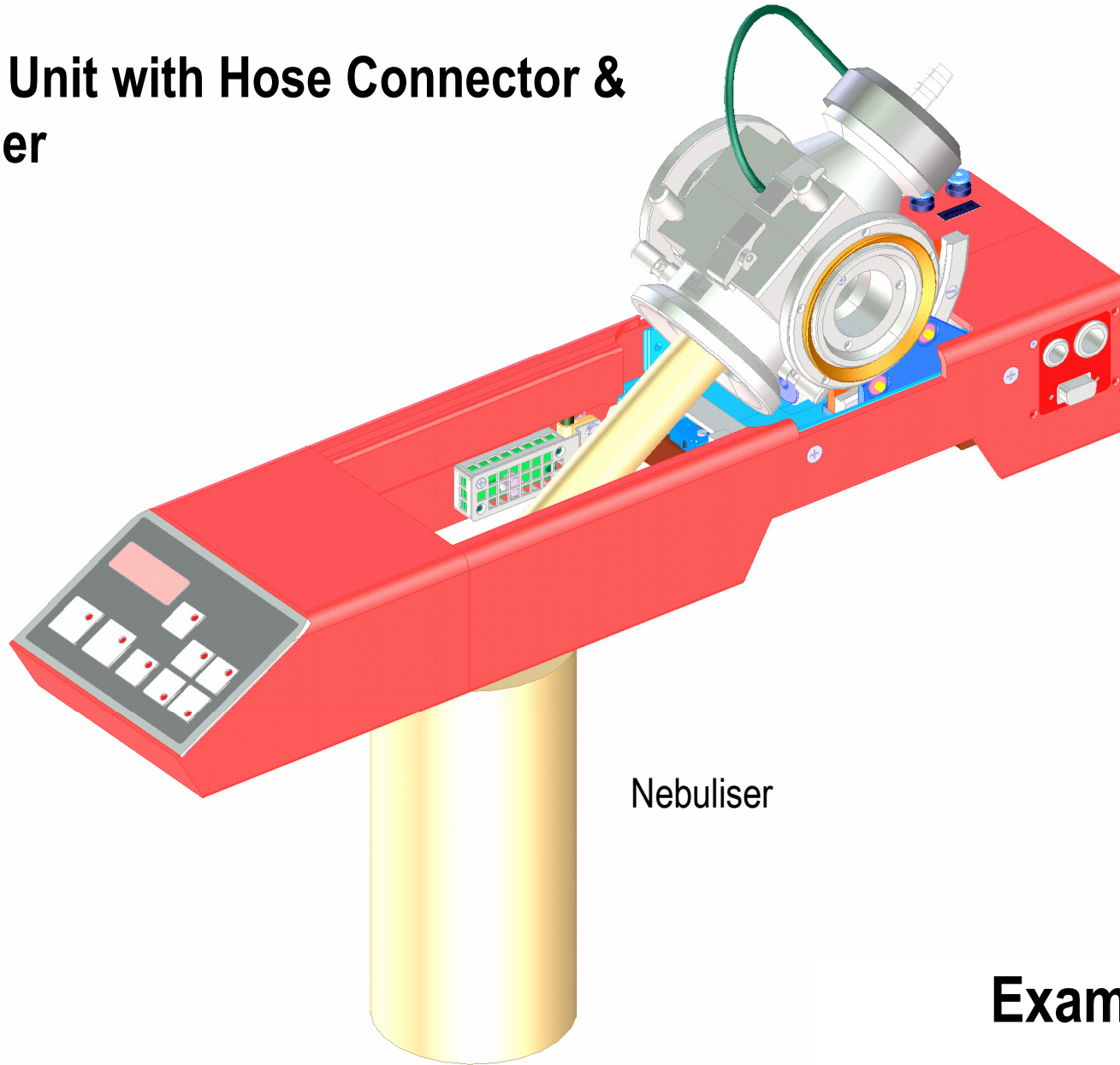

Example 4

Central Unit with Venturi Meter, Elbow, Fine Particle Collector & Pre-Separator with Inlet Pipe

SYMPATEC

Example 5

Central Unit with Hose Connector & Nebuliser

Nebuliser

Example 6

Specifications

★ Central Unit

   ☆ Ambient temperature measurement: 0° to 50 °C, 0.1 °C res., PT100 Class A

   ☆ Ambient relative humidity: 0 % to 100 %, non condensing, ±2 %

   ☆ Absolute pressure: 0 to 1 bar (0 to 15 psi), 0.3 mbar res.

   ☆ Differential pressure (Venturi):   0 to 0.3 bar (0 to 5 psi), 0.1 mbar res.

   ☆ Inclination angle: 0 to 45°, 0.1° res.

★ Vacuum Attachment

   ☆ Pump: Leybold SOGEVAC SV40, 1100 W,
                               40 m³/h nom

   ☆ Throughput: 0 to 200 l/min

★ Fine Particle Collector

   ☆ Throughput: 0 to 150 l/min @ about 90 % efficiency

★ Wash Bottle

   ☆ Throughput: 0 to 50 l/min @ about 30 to 80 % eff.

Configuration

Standard

★ Central Unit
  ☆ Plug-in module for HELOS
  ☆ Measurement chamber, swiveable 0..45° with adapter flange
  ☆ Counter & sheath flow adjustment
  ☆ Temperature, humidity, pressure & inclination angle measurement
  ☆ Built-in controller with keyboard & display and RS485 interface

★ Hose Connector

★ Wash Bottle

★ Vacuum Attachment
  ☆ Valve cascade
  ☆ Pump & valve control

★ Hose & Cable Set, Manual D/GB

Option

★ Pump Leybold SOGEVAC SV40

★ Venturi Meter

★ Fine Particle Collector
  ☆ Elbow for Venturi meter (short)
  ☆ Elbow for central unit (long)
  ☆ Collector unit

★ Pre-Separator
  ☆ Inlet tube
  ☆ Pressure meter port
  ☆ Holder

★ Elongation Cylinder
  ☆ Bayonet fastening
  ☆ Sheath flow Inlets (2x)
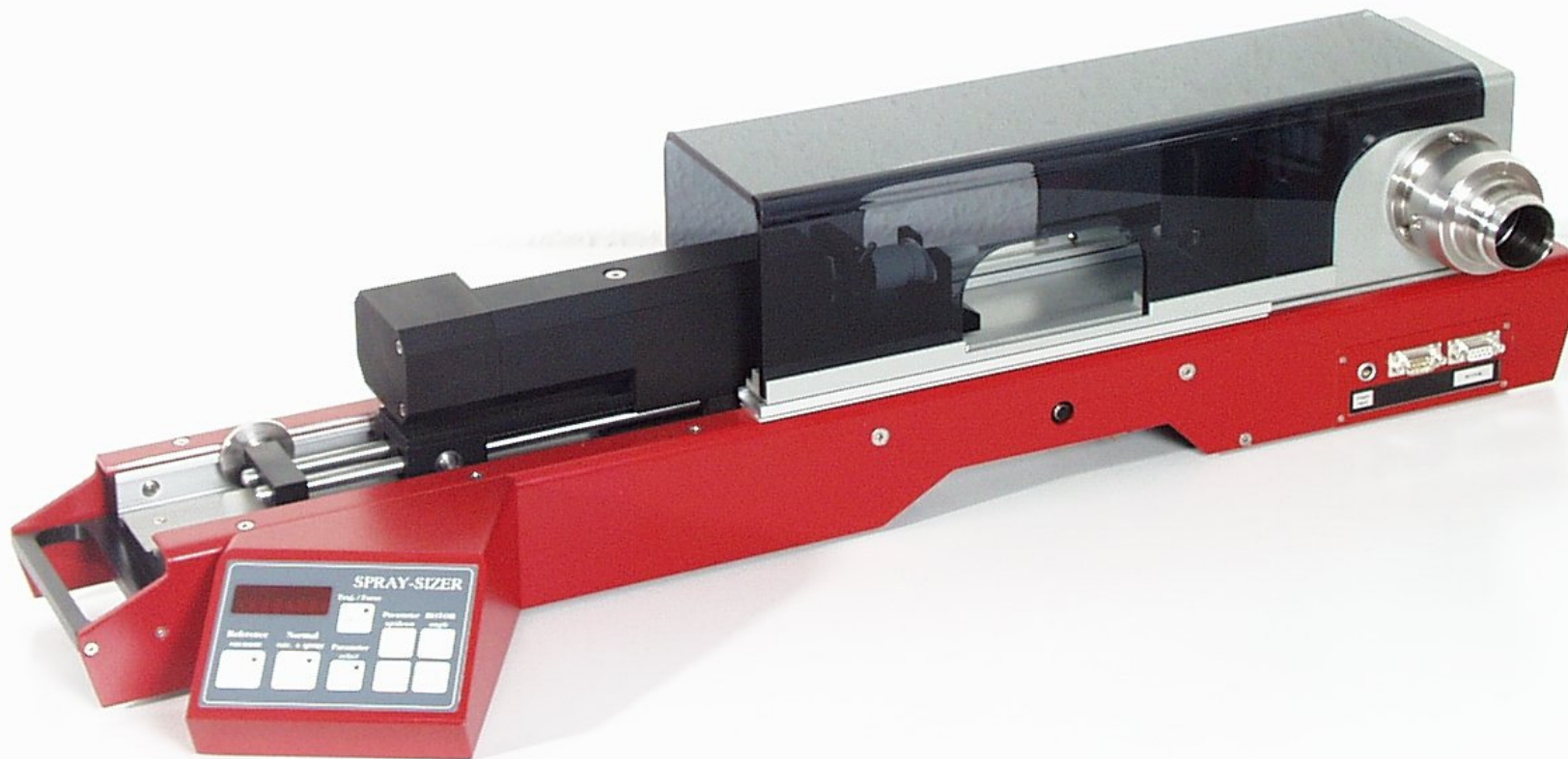
★ Coarse Particle Trap

Conclusions

SYMPATEC

INHALER offers outstanding benefits:

✓ Based on the *experience* of experts in both,
  laser diffraction and *inhaler development*

✓ Simple adaptation to all kinds of *MDI's*, *DPI's* and *Nebulisers*

✓ Support of DPI' with *adhesive mixtures* or *spherical pellets*

✓ *Modular structure*

✓ Monitoring and control of all relevant parameters (e.g. T, RH, P) enables and
  simplifies the necessary *system validation* in pharmaceutical applications

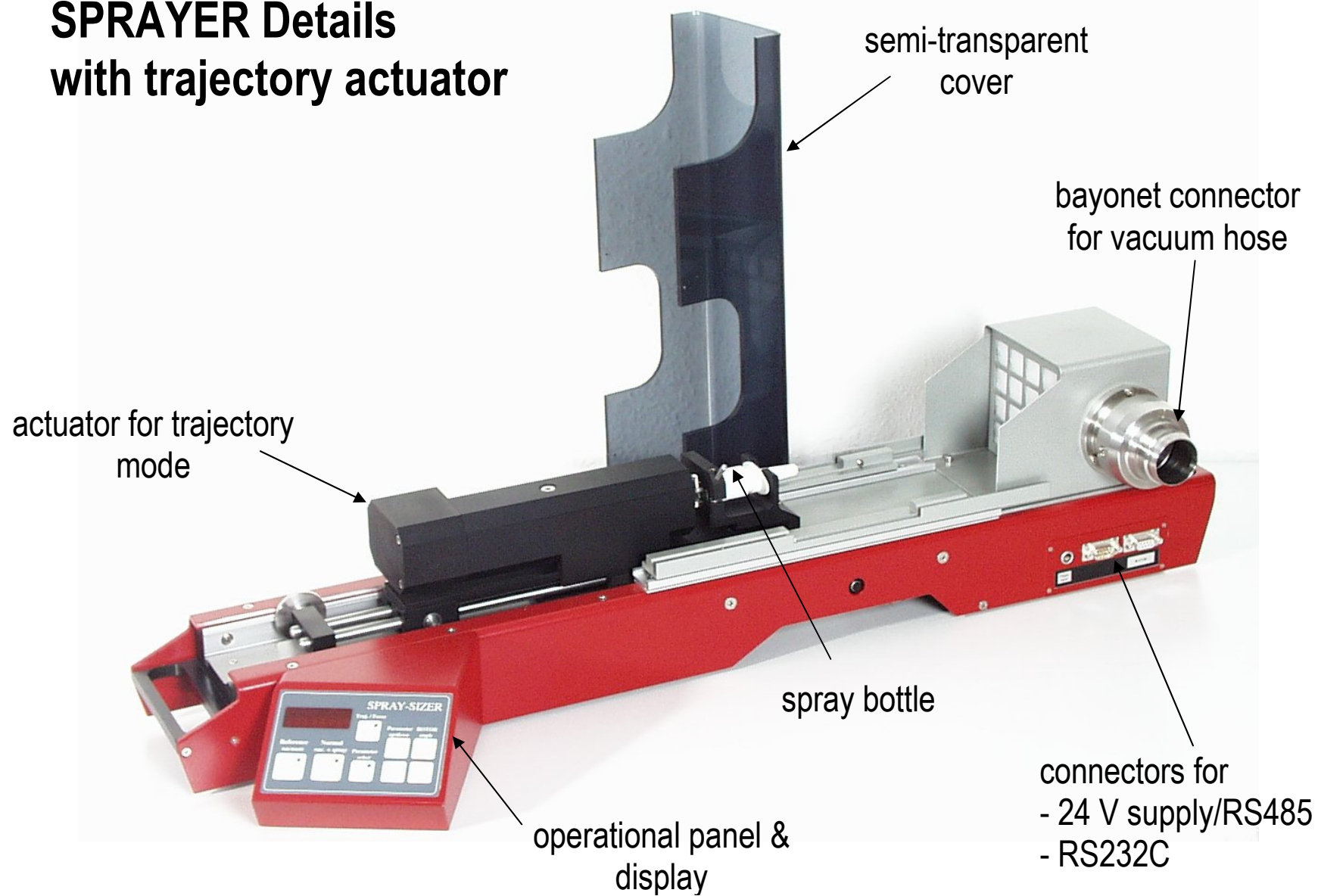✓ Easy handling (security functions included)

✓ Easy cleaning

SPRAYER

For Spray Bottles and Propellant Gas MDI's

SPRAYER Details
with trajectory actuator

semi-transparent
cover

bayonet connector
for vacuum hose

actuator for trajectory
mode

spray bottle

operational panel &
display

connectors for
- 24 V supply/RS485
- RS232C

SPRAY-SIZER

SPRAYER Details
with constant force actuator

actuator for force
mode

Specifications: Standard Extent of Delivery

SYMPATEC

★ Bench

☆ Fits into standard measuring zone of HELOS/F- and A-series (quick clamp mechanism)

☆ Integrated operational panel for manual operation and status display

☆ Single plug connection to HELOS via 24V/RS485 connection

★ Device holder

☆ Quick clamp mechanism (magnetic), suitable for standard pump spray bottles

☆ Position control, allows for FDA compliant variation of the measurement position, i.e. measurement can be automatically taken in a cycle at 3 different distances

☆ Positioning range: 0 to 200 mm

★ Actuator

☆ Precise control of the pump dynamics for optimum reproducibility

☆ DC servo-actuator with trajectory control, i.e.:

✱ Stroke: 0 to 15 mm

✱ Velocity: 0 to 250 m/s

✱ Acceleration: 0 to 2.50 m/s²

☆ Automatic recording of position vs. time during the spray process (res.: 1 ms, < 5 µm) for precise monitoring of the dynamics → EXCEL® -interface

☆ Simple adaptation to spray bottles of different lengths

★ **User Protection**

☆ Semi-transparent (acryl glass) cover allows for secure operation, easily removable for cleaning and inspection, moves on rails for optimum shielding

☆ Vacuum inlet with optimised flow, filter and bayonet connection to external vacuum unit

★ **Control**

☆ RS485/RS232 interface

☆ Trajectory & device position

☆ Vacuum on/off (via HELOS)

★ **Software**

☆ Supported by WINDOX 4.0

Options

★ **Force Actuator**

☆ Constant force setting by software: 10 to 60 N, res. 1 N

☆ Stroke 0 to 15 mm

☆ Dynamic position measurement, res. 5 µm (1 measurement / ms)

★ **Force Sensor**

☆ 0 to 200 N, res. 1 N with certificate for calibration of force actuator

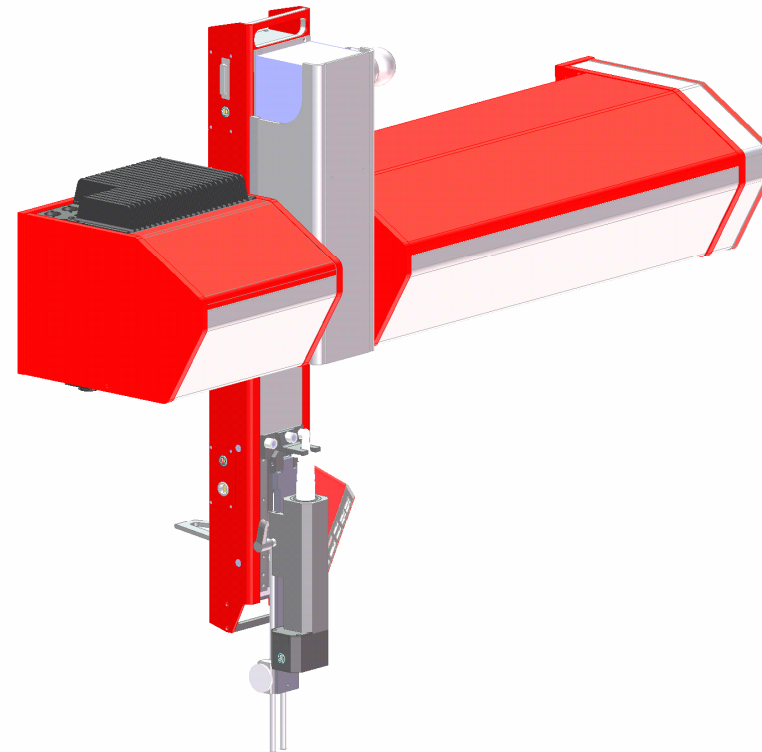★ Adapter for propellant sprays

★ Customer specific device holders

ROTOR/M

★ Nasal sprays are usually operated in vertical direction

☆ The measurement should image this situation

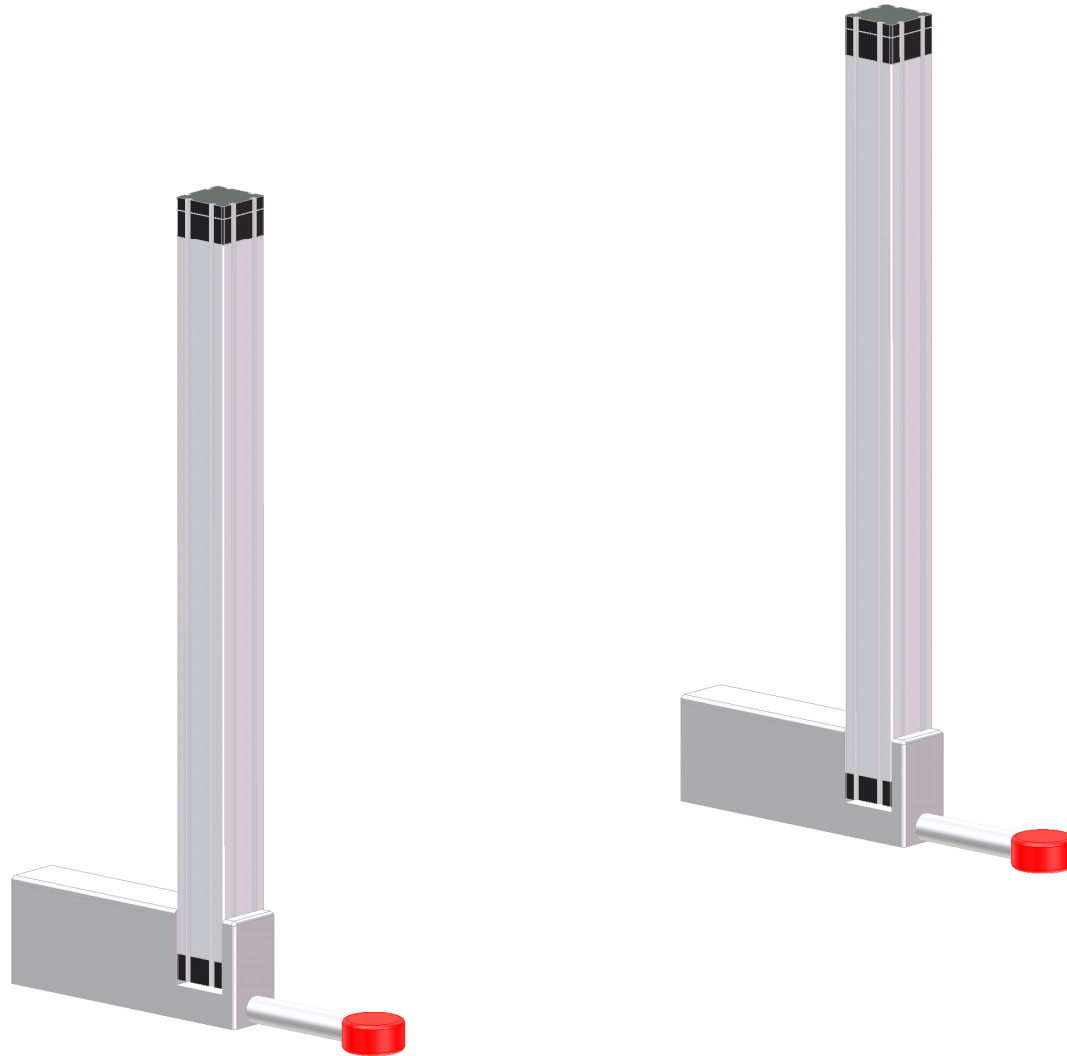☆ This is a standard request of pharmaceutical users

How to position the HELOS front
side down with vertically operational
SPRAYER ?
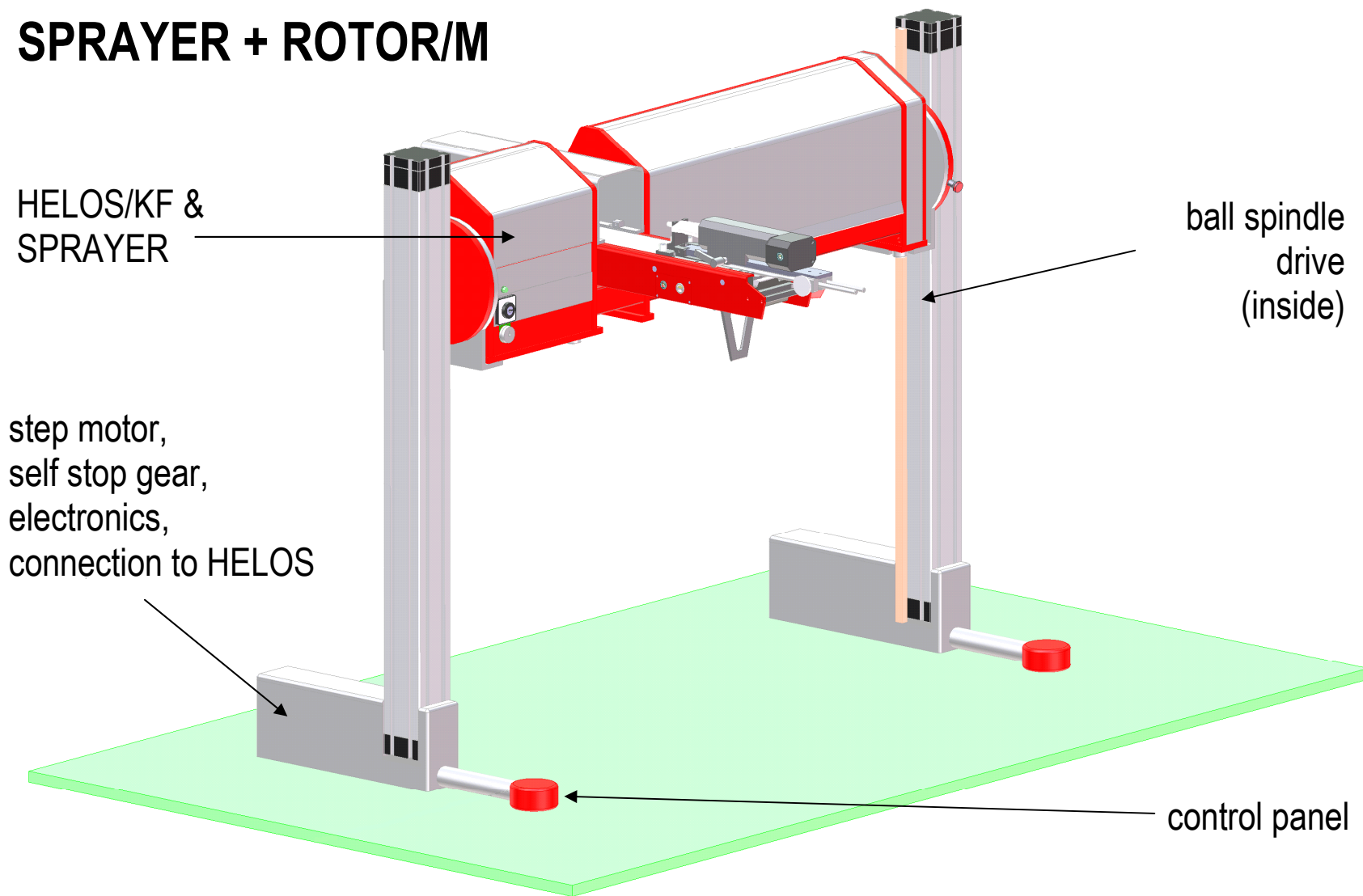
HELOS has to be lifted up and
turned by 90 degrees !

Solution

✓ Suitable for HELOS/BF
or -/KF

✓ When HELOS is on the
floor or table top

⇨ Standard operation
(*for all dispersing
units*)

✓ When HELOS is lifted,
it can be tilted from
0° to 90° manually in
steps of 5°

⇨ Operating mode for
SPRAYER

HELOS/KF &
SPRAYER + ROTOR/M

HELOS/KF &
SPRAYER

ball spindle
drive
(inside)

step motor,
self stop gear,
electronics,
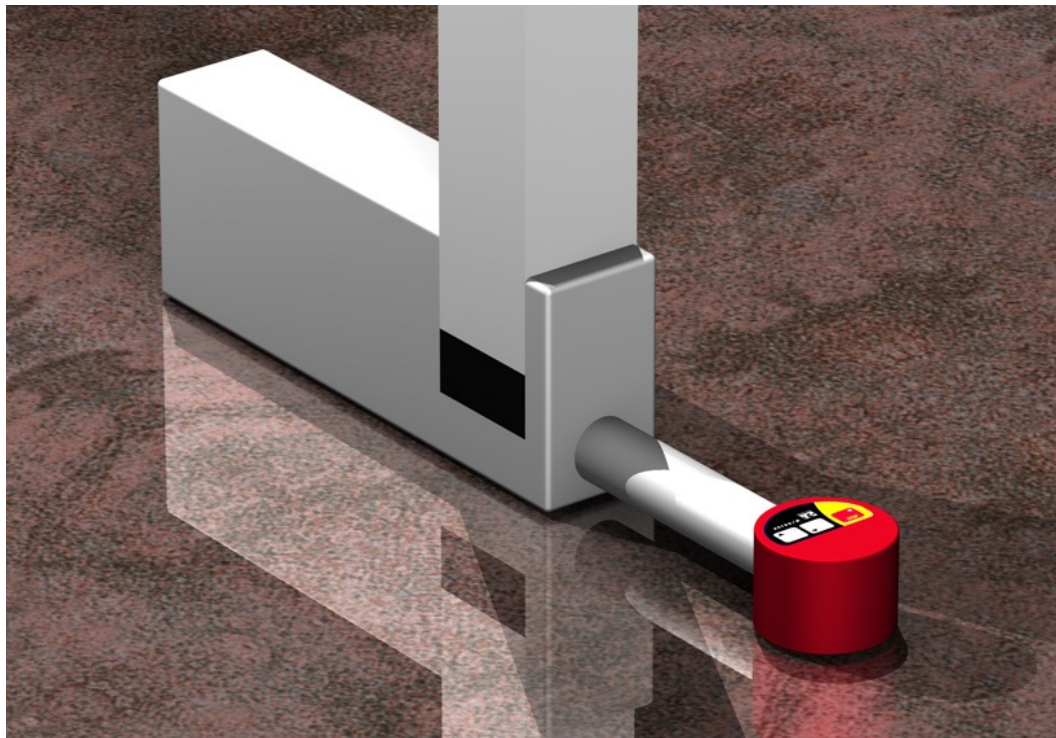connection to HELOS

control panel

Design Details

★ Stand & feet

★ Operational panel

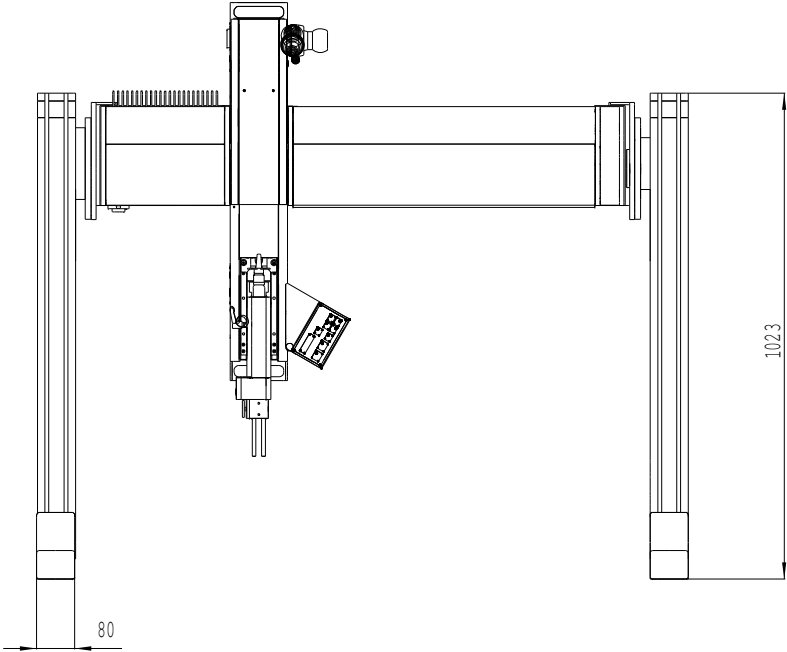   ☆ Up (in any height)

    ☆ Down (in any height)

    ☆ Emergency stop

Technical details

1023

80

max 1153

140

620

KF= 1368 / BF=970
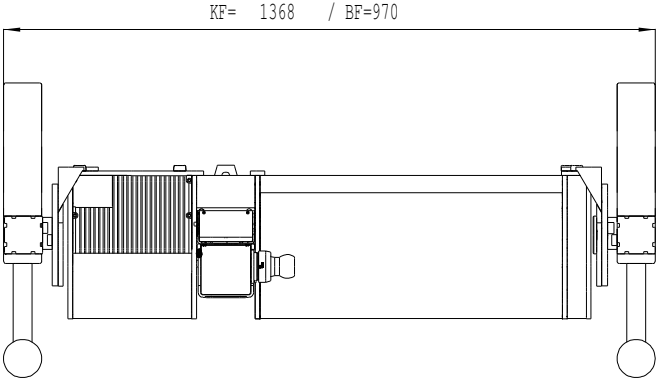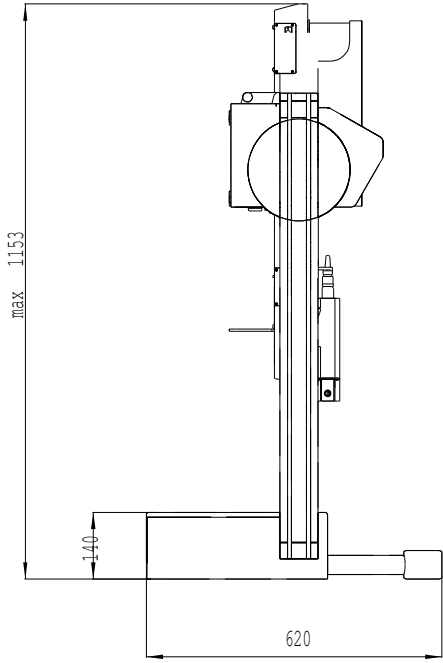
Conclusions

✓ ROTOR/M satisfies the requirements for vertical spray measurements with SPRAYER

✓ Applicable for HELOS/BF & KF (no VARIO support)

✓ Lifts the measuring system to any height from 0 mm to 650 mm above the table:

    ✰ Synchronised stepper motors
    ✰ *Self stop gear*
    ✰ Integrated control unit with RS485 interface
        ↳ Read-out of height is possible for future software versions

✰ Safety functions:
    ✳ 0° detection
    ✳ Floor detection

✓ Rotates from 0° to 90° in 5° steps

✓ While in low position, standard operation of all dispersing units possible, without dismounting of the unit

✓ Easy assembly

    ✰ Can be bolted to the floor
    ✰ Mounting plate (as option, instead of bolting to floor)