



Measurement & Analytics | Measurement made easy

## MB-Rx

In situ reaction monitor

Designed for research and development laboratories  
and pilot plants

# Reaction monitoring made

easy

## Focus on ease of use

With its reduced footprint, the MB-Rx can be used inside crowded fumehoods, providing convenient access to reactors. Its optics are non-hygroscopic, and do not require desiccant cartridges. For additional ease of use, the MB-Rx operates with a room-temperature detector, so that users do not have to worry about nitrogen supply for cryogenically cooled detectors or regular refurbishment constraints associated with Stirling cooled detectors. All key spectral and chemical properties are trended in real time, and the ergonomic software interface allows for rapid



**Plug-and-play solution for reaction monitoring** In situ

set-up of new experiment templates.

## Analytical performance, reliability and simplicity

reaction monitoring is an essential step in the chemical synthesis process. Intended for laboratories and pilot plants, the MB-Rx Reaction Monitor provides chemists with direct access to real-time experiment data via a rugged insertion probe and an intuitive software interface. The MB-Rx was designed around the key concepts of analytical performance, reliability and simplicity. It is a plug-and-play solution that can be used at any time, and it does not require any consumables or maintenance.

### Uncompromised analytical performance

The MB-Rx pre-aligned fibre-optic interface was designed to optimize the efficiency of fibre coupling and provide maximum throughput for ATR applications. The extremely stable interferometer design generates reproducible data, and the novel patented signal-processing algorithms contribute to enhanced sensitivity. As a result of these multiple innovations, the MB-Rx boasts excellent signal-to-noise performance using a maintenance-free room-temperature detector. It perpetuates the reputation of ABB analysers in terms of their analytical excellence.

### The MB-Rx benefits at a glance

- No manual sample handling
- Minimal reaction volume required (2-3 ml)
- Direct access to real-time experiment/process data
- Powerful optics with room-temperature detector
- No consumables required
- Maintenance-free

**Peace of mind through technical innovation** Our engineers have designed the MB-Rx with dependable components in order to provide uninterrupted reaction monitoring capability without

requiring adjustments. The insertion probes are made from Hastelloy and the fibreoptics are protected by a rugged and liquid-tight conduit, with the connectors secured in acetal sleeves. The aluminium casting of the MB-Rx provides the level of protection required for intensive use in an industrial environment. It also features permanently aligned optics and a light source that has an average lifespan of 10 years, which

means that the instrument is virtually maintenance-free. For additional serenity, users can rely on the built-in health monitoring checks that run continuously while the MB-Rx is in operation, because we believe that chemists should focus their attention on the reaction itself, rather than the measurement interface.

Hardware features	Benefits
Plug-and-play solution	No liquid nitrogen required for detector cooling
Maintenance free	No consumables
Continuous health monitoring	Live and extensive analyzer statuses
Reduced footprint	More bench space available
Upwards fiber launcher	Easy access to reaction vessel
Non-hygroscopic optics	No desiccant required
Extremely stable double-pivot interferometer design	Reproducible data
Novel patented signal-processing algorithms	Enhanced sensitivity
Hastelloy insertion probe	Chemical and physical resistance
Rugged and liquid-tight fiber optic conduit	Secure manipulations
Aluminum casting	Industrial protection
Choice of 3 types of ATR crystals	Flexible (different spectral ranges, pH, temp. and pressure conditions)
Pre-aligned optics	No optical adjustment needed



# Complete software package

## A comprehensive and intuitive package

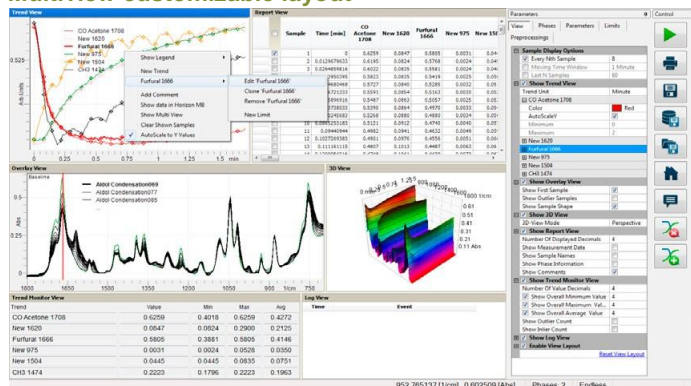
The MB-Rx features a number of integrated software modules that include all of the functions required for collecting and analyzing real-time data generated during chemical experiments. The Reaction Configuration Wizard takes the user through the critical steps of the experiment set-up process. The system can generate multiple real-time trends related to spectral features or chemical properties. Experiments can be modified “on the fly” using the full featured main reaction interface. At the end of a reaction, the experiment data can be saved and reprocessed off-line using a variety of pre-treatments in order to optimize a reaction. Use the MB-Rx to identify intermediate reactions, get insights on reaction kinetics, detect reactions end point or evaluate long term stability.



Software features	Benefits
<b>Horizon MB Rx module</b>	
Intuitive reaction wizard for reaction essentials	Easy set-up
Reaction templates and access list	Quick execution including previous experiments
Fully functional single screen configurable workspace: – Synchronized data views, Multi-view customizable layout, Mouse driven layout optimization, 2D and 3D spectral views, Multiple editable real time trends, Report grid for data info and comments	Reaction information at-a-glance
Full flexibility in parameters modification:	Every single aspect of the reaction run can be optimized
– Simple real-time and off-line editing of reaction profiles	Several reaction schemes can be achieved through “What-if” scenarios
– Easy setup of acquisition parameters	Optimization of analyzer performance
– Configurable multi-view reaction dashboard	Possibility to select information displayed
– Different phases can be defined within a reaction	Analytical parameters optimized for each phase
– Complete list of functions for data preprocessing	Corrections for baseline, solvent signature or any other variation
– Several ways to set limits and trigger actions	Easy visualization of out-of-range data and execution of external actions
– Possibility to define an experiment run as “golden batch”	Real-time comparison of current trend with reference experiment
Reprocessing options for any set of spectral data	Horizon MB Rx module can be used for other applications
Save to files or Horizon MB FTIR projects	Straightforward management of trends, spectra and reaction runs
<b>Horizon MB Quantify module</b>	
Modern chemometrics toolbox with full multivariate and univariate data processing capability	Development of quantitative models and trending of property values
<b>Horizon MB FTIR module</b>	
File saving options to various formats including *.TXT and *.CFL	Seamless import/export
Enhanced mathematical functions	Several options for spectral adjustments and corrections
Copy/paste capabilities with office programs	Ease of data transfer
Possibility to generate customized reports	Facilitates chemical reaction reviewing, reporting and archiving
Intuitive health monitoring interface	Automated spectroscopic performance validation of the instrument
Project menu for data organization	Easy spectra, calibrations, reaction runs and external files handling

# Reaction monitoring software

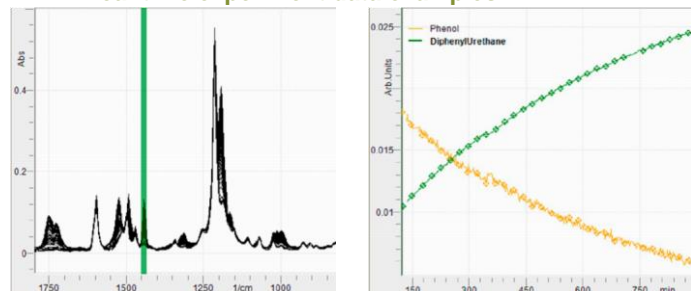
## Multiview customizable layout



## Full featured interface

Dashboard including trends, report grid, overlaid 2D spectra, 3D spectral view, trend monitor, measurement log, parameters panel, control panel and status bar.

## MB-Rx real-time experiment data examples



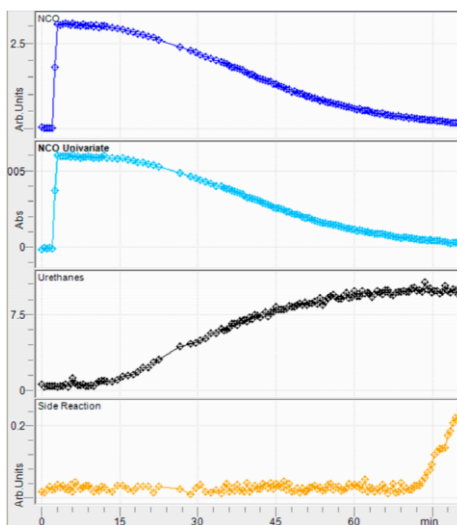
## Pesticide active ingredient synthesis

- Reaction of phenol and phenyl-isocyanate to create diphenylurethane
- 2D accumulated spectra and selected region for urethane trending (top)
  - Overlaid trends of urethane and phenol characteristic bands (bottom)



## Simplified interface

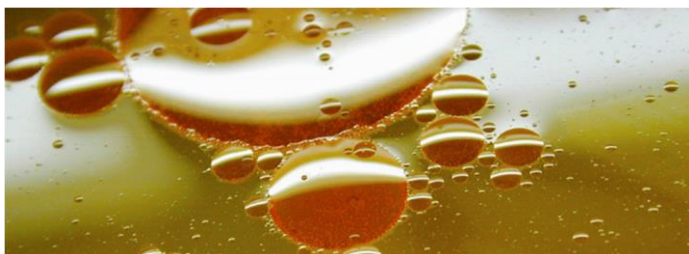
Dashboard only displaying trends, control panel and status bar. Report grid, overlaid 2D spectra, 3D spectral view, trend monitor, measurement log and parameters panel are tabbed.



## Polyurethane synthesis

- Isocyanate monitoring
- Spectral absorbance trends illustrating consumption of isocyanate, production of urethane and a secondary reaction

# Reaction monitoring made easy



**Oils and lubricants**  
Composition monitoring



**Liquid chemicals**  
Monitoring of mixtures, detection of impurities,  
analysis of inorganic materials



**Fuels**  
Determination of additives



**Pharmaceutical drug substance**  
Synthesis of active pharmaceutical ingredients  
or intermediates



**Polymerisation**  
Detection of multiple bonds in molecules



**Biotechnology**  
Monitoring of fermentation and cell culture



**Consumer products**  
Detection of minor components, additives, impurities



**Chemical reactions**  
Monitoring and identification of functional groups

# Technical specifications

## Optical bench

- Beamsplitter material: ZnSe (non-hygroscopic)
- Patented double-pivot high-throughput Michelson interferometer, fully jacketed
- Source: Ceramic glowbar with electronic stabilization
- Metrology: Solid-state laser
- Detector module: DTGS
- Pre-aligned ergonomic fibre-optic launcher with protective connector sleeve – Probe + fibre-optic assembly:
  - Probe shaft dimensions: 250 mm length, 12 mm diameter
  - Probe body: Hastelloy C-22
  - ATR crystal material: ZnSe (default) / Diamond or ZrO<sub>2</sub> (options)
  - Fibre material: Polycrystalline silver halide AgHal (Option: chalcogenide As-S glass)
  - Fibre protection: Liquid-tight stainless steel conduit with silicone coating
  - Numerical aperture: 0.25 +/- 0.03
  - Fibre connectors: SMA-905 titanium
  - Total length: 150 cm, including 20 cm split legs
  - Minimal bending radius: 130 mm
  - Maximal pressures: 10 bar (ZnSe) / 200 bar (Diamond) / 50 bar (ZrO<sub>2</sub>)
  - Operating temperature: -150°C to +140°C (ZnSe, Diamond) / -150°C to +90°C (ZrO<sub>2</sub>)

## Spectroscopic performance (typical at 25°C) –

Spectral ranges:

- ZnSe ATR probe + silver halide fibres: 600-3300 cm<sup>-1</sup> –  
Diamond ATR probe + silver halide fibres:  
600-1900 cm<sup>-1</sup> + 2300-3300 cm<sup>-1</sup>
- ZrO<sub>2</sub> ATR probe + chalcogenide fibres: 1550-8000 cm<sup>-1</sup>
- Apodized resolution adjustable from  
1 cm<sup>-1</sup> to 64 cm<sup>-1</sup> (2<sup>r</sup> increments) – Signal sampling: 24-bit ADC
- Limit of Detection for acetone in toluene:  
0.1% w/w (60s acquisition, 4 cm<sup>-1</sup> resolution)

## Instrument enclosure

- Casting: Rugged all-metal (27 kg)
- Size: 43.5 cm (W) x 28.0 cm (D) x 37.2 cm (H)

## Environmental

- Universal power supply: 120-240 VAC, 50/60 Hz
- Power consumption: 65 W
- Operating temperature: 10°C to 35°C
- Operating relative humidity: 5% to 80%, non-condensing
- Regulatory certification and compliance: TÜV and CE

## Documentation

- MB-Rx Quick Start Guide
- MB-Rx Test Report
- Horizon MB Rx Tutorial
- Pre-loaded demo reaction template and project data

## Software

- Standard software modules:
  - Horizon MB Rx: Real-time reaction monitoring
  - Horizon MB FTIR: Basic instrument operations and validation
  - Horizon MB Quantify: Chemometrics and calibration development – Optional software modules:
    - Horizon MB Library: Library search engine
    - Horizon MB IR Interpretation: Identification of functional groups in molecules and interpretation of complex spectra based on automated peak table search against a reference library
    - Horizon MB Security: Configurable settings for securized access control, electronic records protection and traceability
    - FTSW100: Automated process monitoring