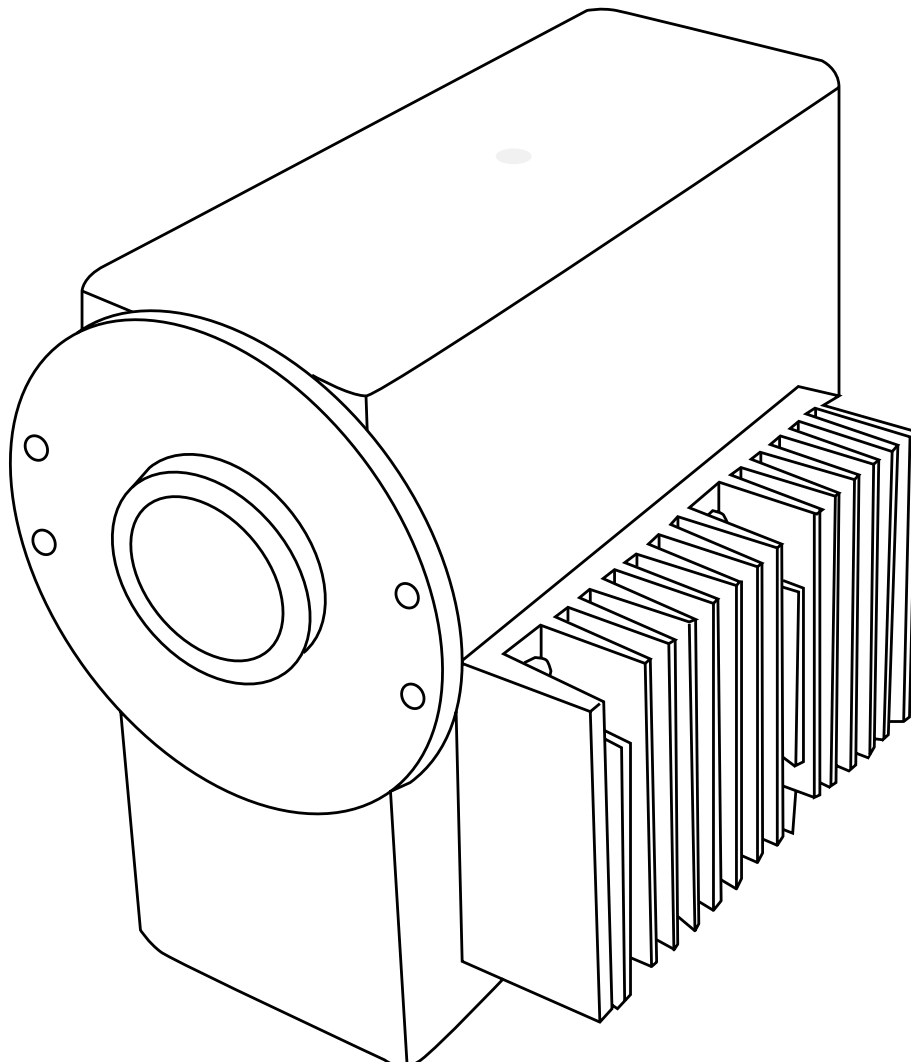**BÜCHI**
SWITZERLAND

NIR-Online®
Technical data sheet

The NIR-Online spectrometer is based on diode-array technology. The compact, robust instrument is equipped with a flange and sapphire lens. It can be directly mounted to a process vessel or tube. Additional accessories for solid and liquid products are available.

Scope of delivery

Different detectors can be combined in one instrument to meet a wide variety of requirements.

| Available instrument configuration	NIR	VIS	Imaging	Dual lamp	Measuring distance	Available in: advanced*	Gas-Ex
X-One XO-0200	●			●	0 - 20 mm	●	●
X-Two XT-0100	●		●	●	0 - 20 mm	●	
X-Three XO-0100	●	●		●	0 - 20 mm	●	●
X-Four XF-0100	●	●	●	●	0 - 20 mm	●	
X-Five XO-0300		●		●	0 - 20 mm		
X-Six XO-0600		●	●	●	0 - 20 mm		
X-Beam XB-0100	●				100 - 400 mm		●
X-Beam XB-0200	●	●			100 - 400 mm		
X-Beam XB-002	●				100 - 200 mm		
X-View XV-0100			●		0 - 20 mm		
Fiber Free Port Adapter	●				immersion		
X-Zero **	(●)	(●)	(●)	●	0 - 20 mm	●	

* The advanced version V.3 consists of a detector with higher resolution (s. technical data).
** Measurement of 1 parameter using 1 calibration in 1 product. The instrument configuration depends on the application.

Standard instrument front and rear view
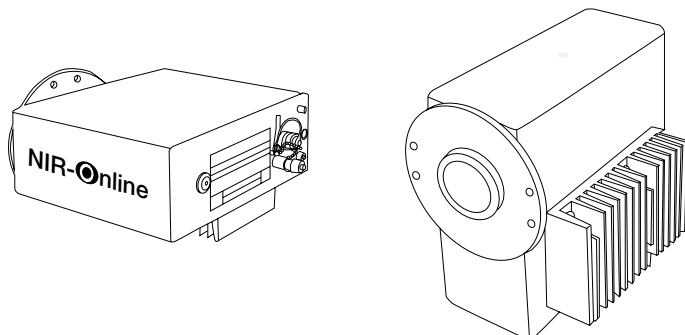
instrument with fiber free port adapter
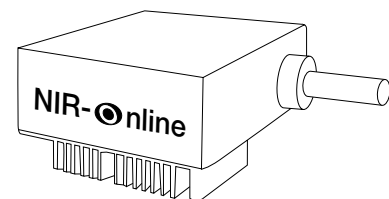
System requirements

The PC must meet the following requirements:

Operating System	Windows 7 (32-bit or 64-bit) SP1
Central Processing Unit	Intel Core i5 or higher, Intel Core i7 or higher when using camera or multiple instruments
RAM	4 GB or more
Harddisk	80 GB free hard disk space. The hard drive needs to be extra durable, e.g. type: Seagate EE25.2 Intranet or secondary hard disk for backup storage 0.5GB + 20MB/day/instrument
Display resolution	1280x1024
LAN	1 x 100 Mbit/s LAN or faster (2x LAN recommend)
USB 2.0 / 3.0	1 x USB per instrument 1 x USB per DataLab I/O box
PCI / PCIe	1 slot for frame grabber card (if camera for imaging is selected) 1 slot for profibus card (if profibus interface is selected)
Required software	Microsoft Word and Excel 2003, 2007 or 2010

Minimum configuration

A minimum functional setup consists of at least an instrument, installation box, cable and PC with SX-Suite software. Additional hardware may be needed for accessories, such as a camera or process control interfaces. Please contact your local BUCHI representative for details.

Technical data

Dimensions (W x D x H)	220 x 220 x 135 mm		
Weight	6 - 7 kg, depending on configuration		
Operating pressure	30 bar at flange		
Relative humidity	<90% non condensing		
Ambient temperature	-10°C – 40°C		
Product temperature	-10°C – 70°C		
Vibrations	0.2 G at 0.1 – 150 Hz		
Detector	Diode array		
Spectral range*	Visible range	350 – 920 nm	10800 - 28500 cm^{-1}
	NIR range (version 2)	950 – 1750 nm	5700 - 10500 cm^{-1}
	NIR range (adv. vers. 3)	900 – 1700 nm	5900 - 11100 cm^{-1}

Measuring time	30 ms (vers. 2)
	10 ms (vers. 3)
	Maximum product flow speed for imaging is 1 m/s
Illumination spot diameter	30 - 40 mm, depending on accessory and optical setup
Imaging*	High res. CCD, visible range, 80 µm spatial resolution
Type of lamp/lifetime lamp (MTBF)	Tungsten halogen dual lamp / 18000 h (2 x 9000 h)
Electric power supply	110 or 220 VAC ± 20%, 50/60 Hz, 30 W
Housing materials	Stainless steel nickel coated, aluminum cooler, NBR
System protection	IP 65 or IP 67
ATEX	Ex II 1/2D ta tb IIIC T80C Da Db IP65
	EX II 2G Ex px T4 TüV XXX, IP67 (on request)

* Availability depends on the selected instrument configuration

Software

All configurations of the instruments are operated by the SX-Suite, consisting of the following modules:

	Description	Typical usage	User	Occurrence
SX-Server	Instrument driver	Read out instrument status	Operator	As needed
		Setup of hardware	NIR-admin	On installation and maintenance
		Setup of camera for image analysis or accessory	NIR-admin	When adjusting to new product
SX-Center	User interface	Choose product	Operator	Daily use (if not fully automated)
		View results (table, trend charts, reports)		
		Enter reference data		
SX-Backup	Data backup scheduler	Automated backup of measurement data, results and calibrations	NIR-admin	On setup
		Store or delete images from camera (if applicable)	NIR-admin	On setup

The following licenses activate different functionality of the SX-Suite. All versions of the SX-Suite are capable of measuring and analyzing NIR and vis spectra, if the respective detector is installed.

License	Imaging	Use case
Standard	●	Count particles and calculate area
Conveyor belt		Optimized for measurement of moving objects on a conveyor belt
Mix		Control end-point of mixing processes
Sample movement detection	●	Verify sample flow
Zero		Measurement of one parameter using one calibration in a single product

Optional software

Software	Description	Typical usage	User	Occurrence
Autocal	Automated calibration	If new reference data is available the calibration is updated and optimized automatically.	Operator (to enter reference data)	When calibration update is needed.
SX-Plus	Chemometric software	Manual build up or optimization of calibrations.	NIR-admin	When calibration update is needed.
SX-Profi	Profibus interface software	Configuration of profibus protocol (requires profibus card)	Process-control-system expert	On setup
SX-Client	Remote data visualizing	Display results or journal data for calibration purpose from a remote PC	Operator, NIR-admin	Daily use (if not fully automated)

Interfaces to computer

Interface	Hardware	Imaging	Details
RS422	USB adapter	●	· Converts the instruments RS422 signal to USB COM port · Electrically isolated · Imaging requires an additional coaxial cable
Ethernet	USB adapter	(●)	· Converts the instruments RS422 signal to a virtual COM port via ethernet · Imaging requires an additional coaxial cable
Bluetooth	Bluetooth interface		· Wireless operation together with a battery pack (needs to be ordered separately). · Does not submit imaging data

Interfaces to Process Control System

Interface	Hardware	Details
Analog	Datalab, 4-20mA Interface	· Analog output of results · Alarm output · Heart-beat toggle for verification of interface · max. 4 parameter · 1 box per instrument
Profibus	Softing PB-IF-1MS or PB-IF-1S (+ SX-Profi software)	· Transmission counters to monitor function · Profibus and TCP/IP can't be used at the same time · Needs SX-Profi software
RS422	Standard interface card	
TCP/IP	Standard ethernet card	· Transmission counters to monitor function · Profibus and TCP/IP cannot be used at the same time.

Accessories

Articles	Details
Installation box	Supplies the instrument with power. Data cable to PC needs to ordered separately. · Steel housing 1.4301 / SST 304 (250x200x157 mm) · ATEX II Ex 3D A 22 IP66 T100°C · Power supply · instrument cable 10 m (32.8 ft)
Installation box bypass	Supplies the instrument and a feeder with power. Controls the pneumatic sampler. · ATEX II Ex 3D A 22 IP65 T100°C · Material 1.4301 / SST 304 · Size of box: 380 x 380 x 217 mm · Power supply, relays and DIN rail included · instrument, motor and valve-control cable 10 m (32.8 ft) · Requires data cable, DataLab device and cable

Imaging

When using an instrument with camera, the camera will be connected via a video card.

Video card	Frame grabber card (PCI or PCI express). This is the camera interface to the PC.
Video filter	Filters ground potentials and reduces LF and HF interferences. Mandatory for online installations with camera.
Video amplifier	Amplification of 4 channels video signals for installations where video cable exceeds 100m.

Mounting accessories

The instrument flange can be directly mounted to a tube or reactor. Depending on the specific setup additional mounting accessory might be needed for implementation into the production facility.

Weld-in mounting plate For instrument in direct contact with the product	Plate with opening, fitting to instrument flange. · Size: 160 x 241 x 3 mm · Material: 1.4301 / SST304 · Thread bolts M6
X-Square For all free flowing powders and granulates	The cell can be inserted in the product stream or bypass · Inspection panel (Plexiglas) · Adapted for Jacob pipes Ø150 mm · Stainless steel 1.4301 electro polished
Bypass sampler For free flowing goods (mealy / grainy)	Bypass with feeder and sampling point · Pneumatic sampler (min. 5 bar / 72.5 psi water or oil free compressed air DIN ISO 8573 Class 1) · Screw-conveyor (feeding capacity 1.5 t/h) · Motor (380V/50Hz ATEX A22 0.25 KW) · ATEX magnetic coil 12 V · Requires bypass-installation box and a DataLab IO device

Weld-in flange Provides the ability to remove instrument while keeping the process sealed	Flange with sapphire window and purge port for welding. · Adapter plate, ø140/106 mm, for wall thickness up to 8,5 mm · Stainless steel DIN 1.4404 (SST316Ti) · Purge port M5 (ø4mm tube adapter provided) to prevent condensation or detect leakage · High grade sapphire crystal optical lens, polished for reduced adhesion · Sealing material FFKM White G74S, FDA compliant 15°C (+5°F) to 260°C (+500°F) · Operating pressure -0.5 to 30 bar, peak pressure 100 bar max. · Dead volume max. 60 mm³
Varinline DN50 adapter For opaque products like powder or granules	In combination with a path length adapter also for transparent liquid, gel or pasty products. · Material 1.4404 (SST316L), C max.0,03% · Operating pressure up to 10 bar · Build for DN50 DIN 32676 · Sealing material FEPM Viton extreme, FDA compliant · Product temp. -14 °C(+5 °F) to 230 °C (+446 °F) · Path length adapter, pressure test with TÜV certificate upon request
X-Cell For gas, liquid and paste-like products	The cell can be inserted in the product stream or bypass · Material 1.4404 (SST316L), C max.0,03 % · Operating pressure up to 10 bar (145 psi) · Measurement slit 26 mm, configurable between 1 and 15 mm with additional adapter · DN 50 flange · Clearance volume max. 120 mm³ Cells can be customized with different diameter and flanges.
Path length adapter To measure transparent liquids with the X-Cell	The reflector reduces the length of the optical path · Material 1.4404 (SST316L) C max 0.03 % · Gap 1 / 2 / 5 / 10 / 15 mm available
Air nozzle To improve instrument cooling	Reduces dust deposit on cooling fins and increases heat exchange of the instrument cooler · Fits for all instruments · N₂ or air DIN ISO 8573 Class1, min. 1 bar continuously · Connections for 8/6 mm hose Without hose · Cooling power performance unspecified
Purge adapter Reduces dust deposit on the measurement window	Extension for contactless measurement with X-Beam only · Stainless steel DIN 1.4404 · Tube length 60 mm, Ø 53 mm (outside) · Pneumatic connection M5 (N₂ or pressurized air DIN ISO 8573 Class 1)
Water chiller For maximum cooling	If product is warmer than 40 °C, additional cooling with the chiller may be needed. · Can be used with all instruments, only in combination with X-cell and Weld in flange. · Product temperature over 40 °C to 130 °C, for a product temperature of 130 °C at least a flow of 5 l/h @20 °C is needed. · 40 °C Over temp switch for external alarm purpose, NC (Normally closed) circuit · Water connectors for 8/6 mm hose (without hose)

Functional principle

One instrument is mounted to one measurement point. The installation box provides electrical power and connects the instrument with a PC. The PC is running the SX-Suite and calculates the results. These are shown as numbers and trend charts. Optionally the results can be transferred to a process control system or remote PC.

Production Site

Server / Control room
Desktop PC
SX-Center

Control Center

Process
Control System

Video / Frame-
grabber card   USB

optional
interfaces:
· Profibus
· 4-20 mA
· TCP/IP
· OPC

Video
filter

Video cable

remote access via Ethernet

Sensor cable
(power, RS422)

USB converter

Remote PC

SX-Client
to display results, trend charts

SX-Plus
chemometric SW
manual calibration

Installation box with
Power Supply

Data cable
(RS 422)

1 Sensor per measurment point

Up to 4 Sensors per PC
(up to 2 Sensors with video per PC)

NIR-Online

www.buchi.com/nir

Quality in your hands