BUCHI
SWITZERLAND

NIR-Online®

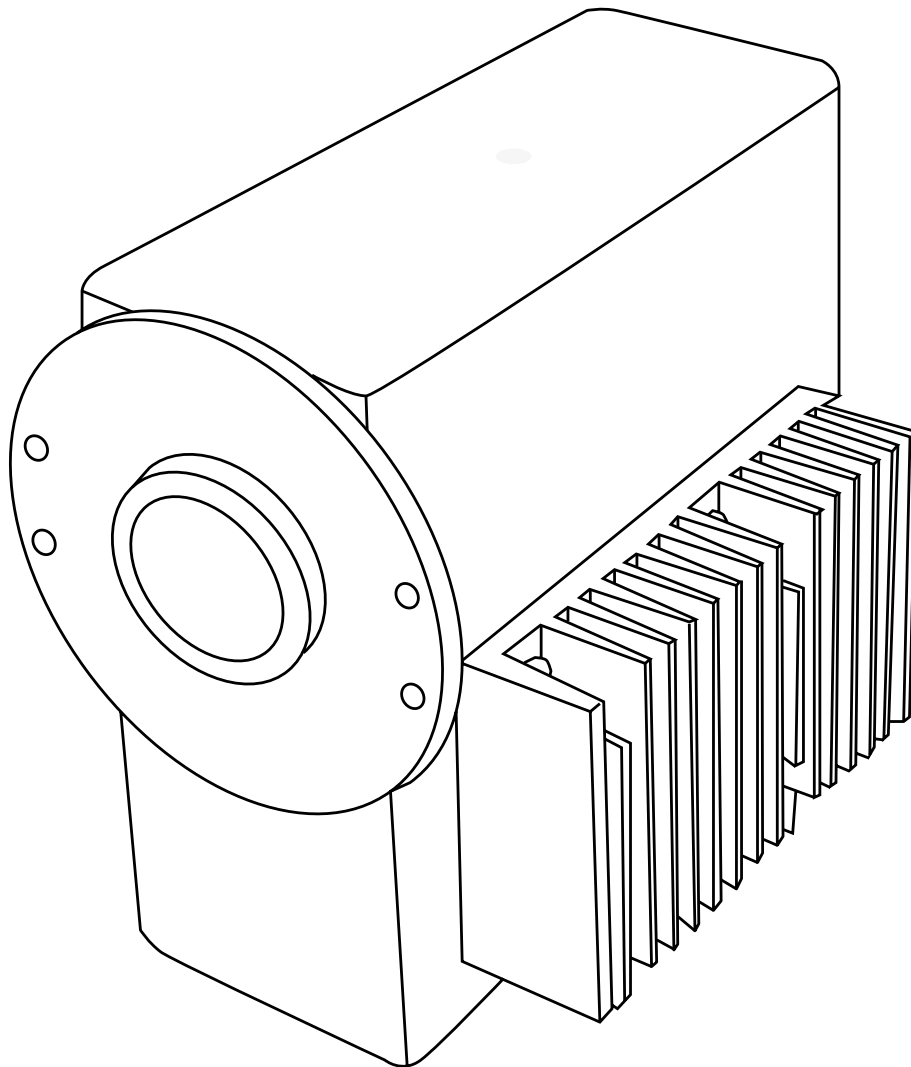# NIR-Online
Technical data sheet

All NIR-Online sensors are 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	extended wavelength range (PA2)	Gas-Ex	high speed version (V3S)
X-One 11X1-Series	●			●	0 - 20 mm	●	●	●
X-Two 11X2-Series	●		●	●	0 - 20 mm	●		
X-Three 11X3-Series	●	●		●	0 - 20 mm	●	●	
X-Four 11X4-Series	●	●	●	●	0 - 20 mm	●		
X-Beam 11XB2-Series	●	●			100 - 200 mm		●	
X-FFPA 11XF-Series	●	●			immersion			

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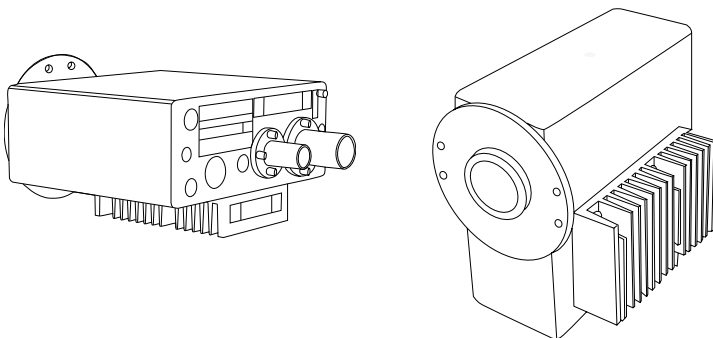
Instrument with fiber free port adapter
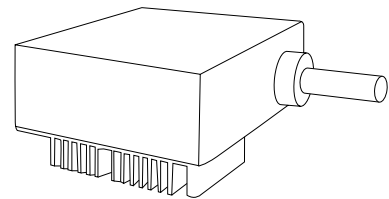
System requirements

The PC must meet the following requirements:

Operating System	Windows 7 (32-bit or 64-bit) SP1 or Windows 10 (Windows 8 not supported)
Central Processing Unit	Intel Core i5 generation 6600 or later, Intel Core i7 generation 6700T or later when using camera or multiple instruments
RAM	4 GB or more
Hard disk	80 GB free hard disk space. The hard drive needs to be extra durable, e.g. type: Seagate ST500VT000 or ST1000NX0323 Network or external hard disk for backup (approx. 0.5 GB + 20 MB/day/instrument)
Display resolution	1280x1024 or higher
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 or higher

Minimum configuration

A minimum functional setup consists of at least one 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 further details.

Technical data

Dimensions (W x D x H)	220 x 220 (+100 for FFPA) x 135 mm (V2, V3, V3S) 235 x 230 x 180 mm (PA2)
Weight	6 - 10 kg, depending on configuration (V2, V3, V3S) 14 - 15 kg (PA2)
Max. operating pressure	30 bar at flange
Relative humidity	<90% non condensing
Ambient temperature	-10°C – 40°C
Product / flange temperature	-10°C – 70°C (130°C with X-Cell water cooling)
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 (V2)	950 – 1750 nm; 5700 - 10500 cm^{-1}
	NIR range (V3, V3S)	900 – 1700 nm; 5900 - 11100 cm^{-1}
	NIR range (PA2)	1100 – 2200 nm; 4545 - 9090 cm^{-1}
Measuring time	V2 10 spectra/s	
	V3 20 spectra/s	
	V3S 200 spectra/s	
	PA2 5 spectra/s	
	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). (except X-Beam)	
Electric power supply	110 or 220 VAC ± 20%, 50/60 Hz, 30 W	
Housing materials	Stainless steel (nickel coated), aluminum cooler, FFKM (standard sealing material; custom sealing upon request)	
System protection*	IP65, IP66, IP66k, IP68	
Temperature Stabilization	ASDC (Advanced Spectral Drift Control): active temperature control to ±1°C from set system operating temperature. Deviations will lead to automatic white reference measurement to account for spectral drifts.	
ATEX	Dust: II 2 D Ex tb [op is Da] IIIC T80°C Db	
	Gas*: II 2 G Ex pxb [op ist Ga] IIC T4 Gb	

* 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	Occurence
SX-Server	Instrument driver / Usage of special functions	Read out instrument status	Operator	As needed
		Setup of instrument hardware	NIR-admin	On installation and maintenance
		Setup of camera for image analysis or accessory	NIR-admin	When adjusting to new product

	Special function	Description	User	Occurence
SX-Server	Conveyor belt	Optimized for measurement of moving objects on a conveyor belt	NIR-admin	As needed
	Mix	Control end-point of mixing processes	NIR-admin	As needed
	Sample move-ment detection	Verify sample flow	NIR-admin	As needed
	Imaging	Count particles and calculate area		

	Description	Typical usage	User	Occurence
SX-Center	User interface (online / lab mode)	Recipe / product & calibration management	Operator	Daily use (if not fully automated)
		View results (table, trend charts, reports)		
		Reference data management		
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)		

Optional software

Software	Description	Typical usage	User	Occurrence
AutoCal®	Automated calibration	If new reference data is avail-able 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 optimiza-tion of calibrations.	NIR-admin	When calibration update is needed.
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 process analyzer 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	LAN 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 IO, 4-20mA Interface	· Analog output of results · Alarm output · Heart-beat toggle for verification of interface · max. 4 parameters for 4-20mA, max. 8 parameters 1-9V
Profibus	Softing PB-IF-1MS or PB-IF-1S	· Transmission counters to monitor function · Profibus and TCP/IP cannot be used at the same time · Needs SX-Profi software
TCP/IP, RS422	Standard interface card	· Transmission counters to monitor function · Profibus and TCP/IP cannot be used at the same time.
OPC	Standard ethernet card	· Additional tool which allows communication between SX-Center and a process control system
Modbus	Standard ethernet card	· Additional tool which allows communication between SX-Center and a process control system
SQL	Standard ethernet card	· Additional tool which allows data export to a SQL-database

Accessories

Installation boxes
Power supply for process analyzers

Articles	Details
Installation box standard	Supplies the instrument with power. Data cable to PC needs to ordered separately. · Material 1.4301 / SST 304 · Dimensions: 300 x 300 x 167 mm (WHD) · ATEX Ex tb IIIC T100°C Db IP66 · Power supply · Instrument cable 10 m (32.8 ft) · Optional interface for external push button
Installation Box Gas-Ex with Purge Control Unit	Supplies the NIR-Online gas-ex sensor with power. The purge control unit controls the pressure inside the sensor. · Dimensions installation box: 220 x 210 x 90mm (WHD) · Dimensions purge control: 380 x 300 x 210mm (WHD) · ATEX: Ex II 2G Ex px IIC T4 Gb · Power supply · Instrument cable 10 m (32.8 ft) · Optional interface for external push button
Installation box bypass	Supplies the instrument and a feeder with power. Controls the pneumatic sampler. · Material 1.4301 / SST 304 · Dimensions: 380 x 380 x 217 mm (WHD) · ATEX II Ex 3D A 22 IP65 T100°C · 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 · Optional interface for external push button

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

Video card	PCI or PCI express Video Interface (frame grabber card). 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 when video cable exceeds 100m.

Mounting accessories

The mounting accessory is the harware interface between instrument and process. Depending on the setup specific mounting accessories 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. · Dimensions: 160 x 241 x 3 mm · Material: DIN 1.4301 (SST304) · Thread bolts M6
X-Square For all free flowing powders and granulates	The X-Square can be inserted in the product stream or bypass · Inspection panel (Plexiglas) · Adapted for Jacob pipes Ø150 mm · Stainless steel DIN 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) · 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 · Adapter plate, ø140/106 mm, for wall thickness up to 8,5 mm · Material: Stainless steel DIN 1.4404 (SST316L) / DIN 1.4571 (SST316Ti) · Sealing material FFKM White G74S, FDA compliant 15°C (+59°F) to 260°C (+500°F) · Operating pressure -0.5 to 30 bar. Max. pressure 100 bar short term · Purge port M5 (ø4mm tube adapter provided) to prevent condensation or detect leakage · High grade sapphire crystal optical lens, polished for reduced adhesion · Dead volume max. 60 mm^3
Weld-in flange pipe	Flange with sapphire window and purge port for installation in pipes or bended surfaces · Outer diameter: 140 mm. · Material: Stainless steel DIN 1.4404 (SST316L) · Sealing material: FFKM White G74S · Operating pressure: -0.5 to 30bar. Max. pressure 100 bar short term · Purge port M5 (ø4mm tube adapter provided) to prevent condensation or detect leakage · The pipe diameter has to be specified upon order
Weld-in flange hopper	Flange with sapphire window and purge port for installation in hopper or bended surfaces with different diameters · Outer diameter: 140 mm · Material: Stainless steel DIN 1.4404 (SST316L) · Sealing material: FFKM White G74S · Operating pressure: -0.5 to 30bar. Max. pressure 100 bar short term · Purge port M5 (ø4mm tube adapter provided) to prevent condensation or detect leakage · The upper and lower hopper diameter has to be specified upon order

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 DIN 1.4404 (SST316L) · Sealing material FFKM White G74S (FDA compliant), or custom · Operating pressure up to 10 bar (145 psi). TÜV certificate upon request · Build for DN50 DIN 32676, process connection type N · Product temp. -14 °C(+5 °F) to 230 °C (+446 °F) · Path length adapter configurable between 0,5 to 42 mm
X-Cell For gas, liquid and paste-like products	The cell can be inserted in the product stream or bypass · Material DIN 1.4404 (SST316L) · Sealing material: FFKM White G74S · Operating pressure up to 10 bar (145 psi). TÜV certificate upon request · Measurement slit 26 mm, configurable between 1 and 15 mm with additional adapter · DN 50 flange (other sizes upon request) · Clearance volume max. 120 mm^3 Cells can be customized with different diameter and flanges.
X-Cell 4-Edge	The X-Cell is an accesory to install the sensor into pipes. For liquid and paste like products. · Material: DIN 1.4404 (SST316L) · Sealing material: FFKM White G74S · Operating pressure: max 3bar · Flange: DN50 · Path length: 34mm · Typical use: Wine Applications
Path length adapter To measure transparent liquids with the X-Cell	The reflector reduces the length of the optical path. · Material DIN 1.4404 (SST316L) · Gap 1 / 2 / 5 / 10 / 15 mm available · Diffuse or polished surface
Air nozzle To improve instrument cooling	Reduces dust deposit on cooling fins and increases heat exchange of the instrument cooler · Fits for all instruments with passive cooler · N$_2$ 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 (SST316L) · Tube length 60 mm, Ø 53 mm (outside) · Pneumatic connection M5 (N$_2$ or pressurized air DIN ISO 8573 Class 1)
Water cooler flange	· Can be used with all instruments, only in combination with X-Cell and weld-in flange · Product temperature above 70 °C to 130 °C. At a product temperature of 130 °C a flow rate of at least 5 l water per hour at 20 °C is required · 40 °C over temp switch for external alarm purpose, NO (Normally Open) circuit · Water connectors for 8/6 mm hose (without hose)

Water cooler housing	· Can be used with all instruments
	· For ambient temperature above 40 °C up to 100 °C. A flow rate of at least 5 l water per hour at 20 °C is required
	· 40 °C over temp switch for external alarm purpose, NO (Normally Open) 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-Suite

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

Data cable
(RS 422)

Installation box with
Power Supply

1 Sensor per measurment point

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

Quality in your hands