NIRS XDS Process Analyzer

Hardware & Installation Manual

8.928.8001EN

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Process Analytics

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1 General

1.1 Warranty

1.1.1 Warranty (guarantee)

Metrohm Applikon guarantees that the deliveries and services it provides are free from material, design or manufacturing errors. The warranty period is 12 months from the day of commissioning or 18 months from delivery, whichever comes first. The warranty remains valid on condition that the service is provided by an authorized Metrohm Applikon service organization. The warranty for the accuracy corresponds to the technical specifications given in this manual. For components from third parties that make up a considerable part of our instrument, the manufacturer's warranty provisions apply. Warranty claims cannot be pursued if the Customer has not complied with the obligations to make payment on time.

During the warranty period Metrohm Applikon undertakes, at its own choice, to either repair at its own premises, free of charge, any instruments that can be shown to be faulty or to replace them. Transport costs are to the Customer's account.

Faults arising from circumstances that are not the responsibility of Metrohm Applikon, such as improper storage or improper use, etc. are expressly excluded from the warranty.

1.2 About the documentation

The following symbols and styles are used in this documentation:

1	**Instruction step** Carry out these steps in the sequence shown.
	**Warning** This symbol indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
	**Warning** This symbol indicates hazards arising from dangerous voltages.

	**Warning** This symbol draws attention to a possible hazard due to heat or hot instrument parts.
	**Caution** This symbol indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	**Note** This symbol marks additional information and tips.

1.3 Safety instructions

1.3.1 General notes on safety

WARNING

This instrument may only be operated in accordance with the specifications in this documentation.

This instrument has left the factory in a flawless state in terms of technical safety. To maintain this state and ensure non-hazardous operation of the instrument, the following instructions must be observed carefully.

1.3.2 Electrical safety

All relevant safety measures are to be observed when working with equipment.

WARNING

Only personnel qualified by Metrohm Applikon are authorized to carry out service work on the analyzer.

WARNING

Only connect the analyzer to other equipment that is in compliance with the appropriate directives (i.e.: LVD, EMC etc.).

WARNING

If the analyzer is connected to ICT equipment, this equipment should be in compliance with the EN 60950-1 incl. all (recent) amendments.

Mains voltage

WARNING

Only operate the analyzer with a mains voltage specified for it (see the analyzer identification plate).

Protection against electrostatic discharge

CAUTION

Always take ESD precautions.

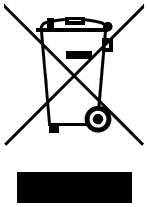
The electronic components are sensitive to electrostatic charges and can be destroyed by discharges.

1.3.3 Potentially hazardous solvents and chemicals

WARNING

Depending on the analysis procedure and/or local regulations, it can be possibe that the analyzer should be placed in a ventilated environment (e.g. (walk in) fume hood).

1.3.4 Recycling and disposal



This product is covered by European Directive 2002/96/EC, WEEE – Waste from Electrical and Electronic Equipment.

The correct disposal of your old equipment will help to prevent negative effects on the environment and public health.

More details about the disposal of your old equipment can be obtained from your local authorities, from waste disposal companies or from your local dealer.

1.4 List of abbreviations

Table 1 List of abbreviations

°C	Degrees celsius
°F	Degrees fahrenheit
ATEX	Atmosphères Explosibles
DCM	Data Collection Method
EMC	Electromagnetic compatibility
ESD	Electrostatic discharge
ID	Inner diameter
IP	Ingress Protection
Kg	Kilogram
L/min	Liter per minute
LBS	Pounds
LED	Light Emitting Diodes
LVD	Low Voltage Directive
mm	millimeter
NIR	Near InfraRed
NPT	National Pipe Thread Tapered Thread
OD	Outer diameter
PSI	Pounds per square inch
SMA	SubMiniature version A
USB	Universal Serial Bus
VAC	Voltage in Alternating Current

2 Introduction

Congratulations on your purchase of an NIRS XDS Process Analyzer from Metrohm Process Analytics! We welcome you to our family of satisfied customers who enjoy the benefits of the highest quality NIR.

The NIRS XDS Process Analyzer provides the next generation of process analyzers for real-time analysis in the pharmaceutical, chemical and petrochemical industries. Non-destructive, accurate measurements are performed directly in- or at- the process line, granulator, dryer or reactor.

The XDS Process Analyzer uses Near Infrared (NIR) energy to determine chemical and physical characteristics of a sample. The sample is illuminated with white light, and the returning signal is broken down into visible and NIR wavelengths for spectroscopic analysis. The spectroscopic data is then processed using a PC, and results are output in real time. This allows on-the-fly adjustments of the process to maintain optimum characteristics.

Vision Software® is used for the analysis. Vision® has a complete suite of analysis methods for both quantitative measurements, and for qualitative analysis. The quantitative tools permit the measurements of specific constituents (analytes) within a given product. The qualitative tools permit the identification (ID) of products, as well as their “qualification” to determine

the suitability of that particular product, as compared to previously scanned samples. The pharmaceutical version is fully validatable and is a 21 CFR Part 11 compliant software.

The XDS Process Analyzer is able to distinguish between very small absorbance differences at each data interval (0.5 nm). By scanning samples of known constituent values, or known qualitative characteristics, the user may develop a very precise calibration set, as well as a library of known products, to produce a model specific to his process.

The instrument has been designed to be adaptable for a wide variety of processes and withstand the harshest environments.

The analyzer is available in several versions according to your needs:

- XDS Microbundle Fiber– Single Point
- XDS Microbundle Fiber – Multiplexer 4 Ch
- XDS Microbundle Fiber – Multiplexer 9 Ch
- XDS Single Fiber – Single Point
- XDS Single Fiber – Multiplexer 4 Ch
- XDS Single Fiber – Multiplexer 9Ch

All versions can optionally be equipped with the following options:

- Probes.
- AC or vertex cooling.
- Purge and vent.
- Fiber optic communication module.

While the user should never perform service on the process instrument, it is helpful to understand the component functions and be familiar with the terminology.

A schematic representation as well as a picture of the instrument are presented. On the scheme, two types of probes (transmission and reflectance) are connected to the instrument allowing sequencial analysis.

Two optical fibres (single fiber or microbundle fiber) are necessary for the transmission probe whereas only one is necessary (microbundle) for the reflectance probe.

Note the main components of the instrument from the light source to the detector: the lamp box, the optical fibers, the probes, the Multiplexer, the monobox and the detector.

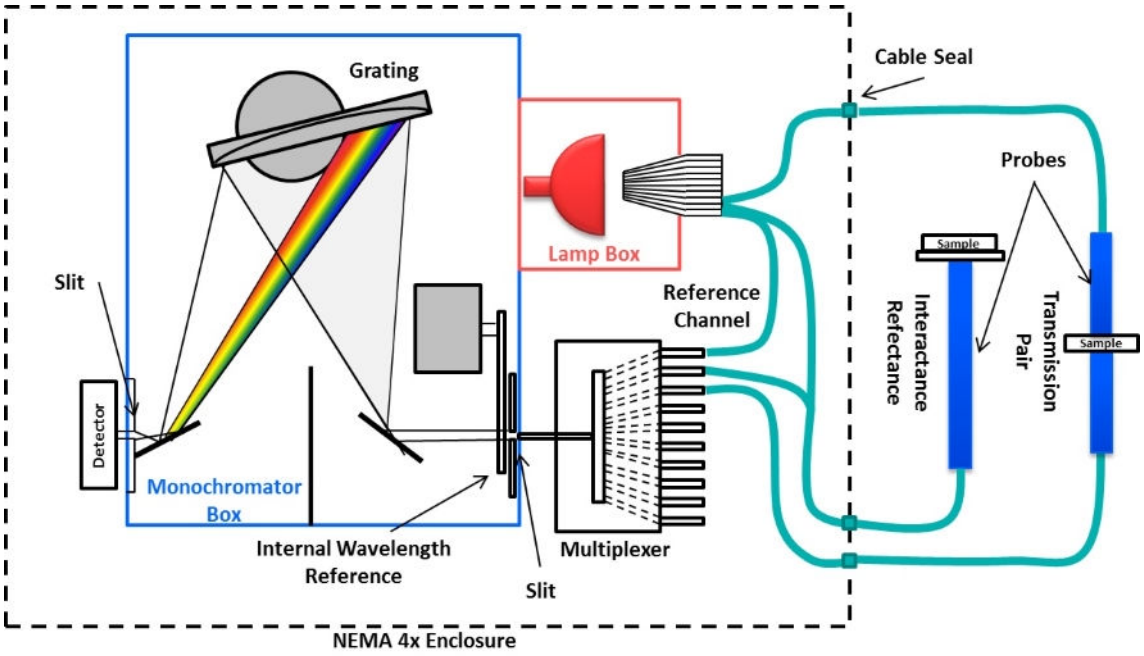


Figure 1 System overview

Figure 2 System corresponding to the schematic system overview

3 Overview of the instrument

3.1 Exterior view of the Analyzer

3.1.1 Front view of the analyzer

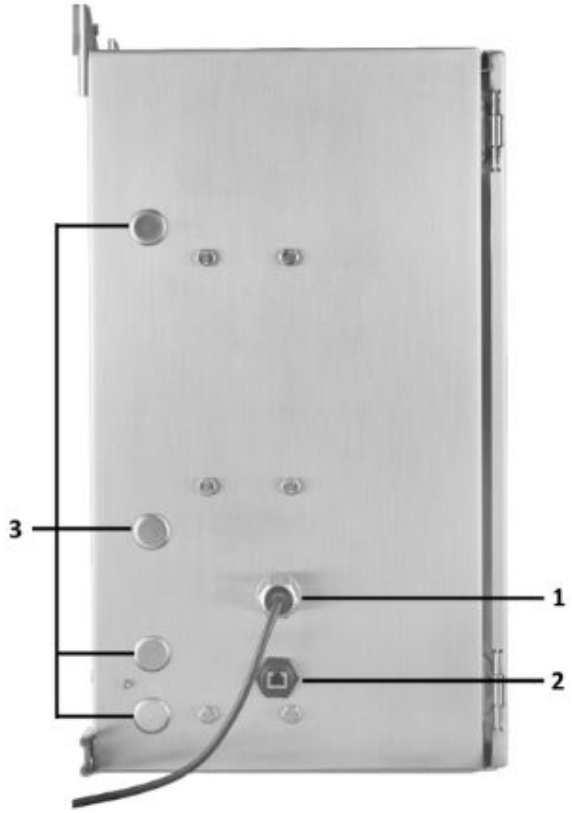
1	**Insulated door** This door protects and gives access to the core components of the analyzer.
2	**Locks** Two locks allow the door to be closed thanks to a key provided in the accessory kit.
3	**Led Panel** The LED panel indicates, from left to right, the lamp status (ON/OFF), the communication status (operating or not) and whether the instrument is scanning or not.
4	**Temperature Controller Panel** The analyzer contains a temperature controller to maintain internal temperature of the enclosure. This is normally set to 38.0 °C
5	**Mounting brackets** The mounting brackets are used to install and suspend the analyzer.

3.1.2 Left side view of the analyzer

3.1.2.1 Left side view basic configuration

CAUTION

Do not remove the optional purge unit plugs.



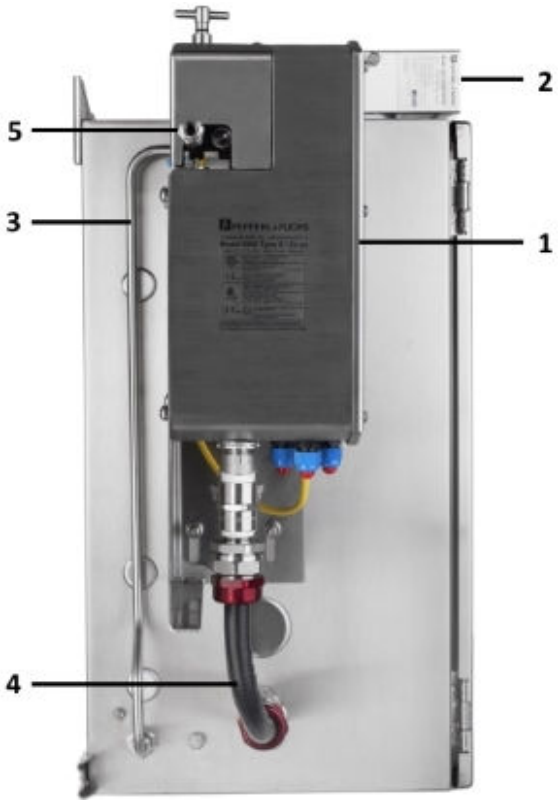
1 AC cable entrance
The XDS Process Analyzer is shipped with an AC cable for testing and lab use only, since many instruments are operated in a laboratory setting prior to their implementation on the process line.

This AC cable may be removed when the XDS Process Analyzer is installed into the process location. Wiring must follow all local codes and requirements.

2 RJ-45 connection
The RJ-45 Cable Connection applies to the non-purged instrument. For the purged units, fiber optic modems are provided, to meet hazardous location requirements.

3 Plugs
The four plugs shown are for the optional purge unit. On the Basic XDS Process Analyzer, these plugs remain in place as shown.

3.1.2.2 Left side view with purge system



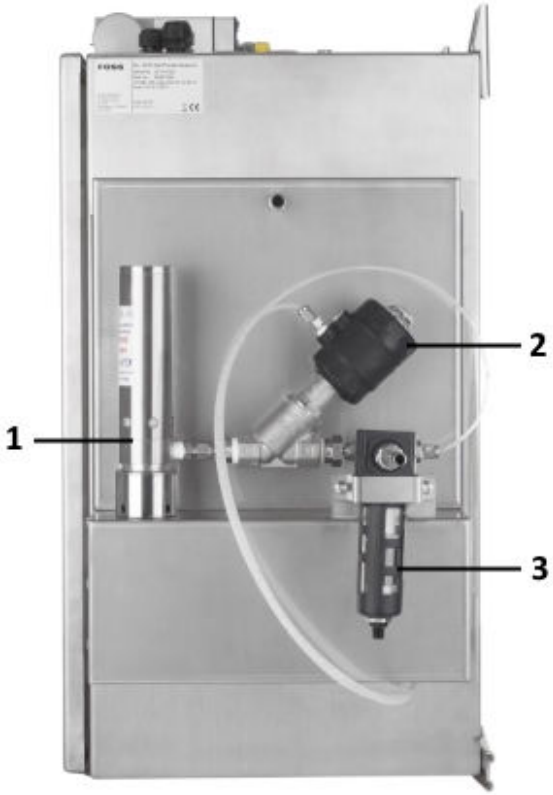
1	**Purge unit** The purge unit is used to operate the system in an ex proof environment.
2	**Vent** The vent is used to prevent overpressure inside the instrument.
3	**Stainless Steel Tube** Connection from the purge to the enclosure of the process Analyzer. Note that Type 4X (IP66) fittings for enclosure flow are used.
4	**Vent Cable** Cable to the vent is I.S. wiring and must be properly isolated from other wiring.
5	**Protective gas supply inlet** The protective gas supply to the enclosure system must be a clean, instrument quality compressed air or inert gas filtered to a minimum of 40 microns.

3.1.3 Right side view of the analyzer

3.1.3.1 Right side view with heat sink and fans

1	**Heat Sink** Heat sinks are used as a mean to air-cool the process analyzer (Operating temperature range: 0 - 30 °C)
2	**Fan housing** Two fans allow air circulation through the heat sink for controlling the temperature of the process analyzer enclosure.

3.1.3.2 Right side view with vortex cooling

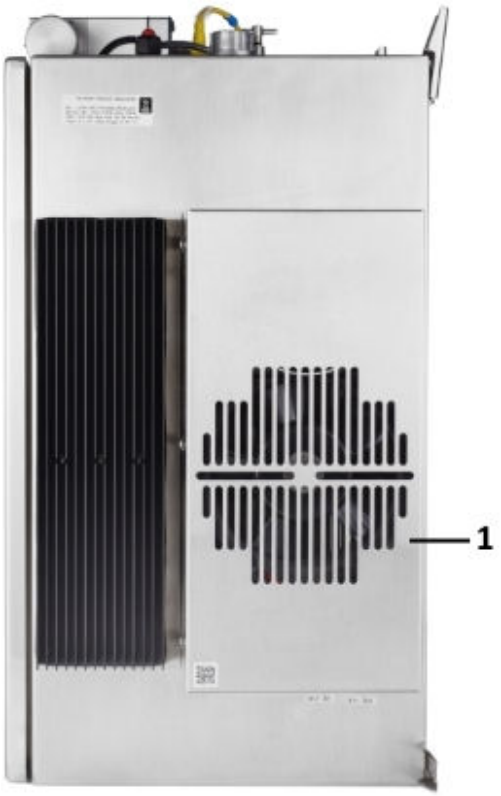


1 Vortex cooler
A Vortex Cooler is designed to use filtered compressed air to cool industrial enclosures without the use of any refrigerants (Operating temperature range: 0 - 40 °C). An internal Vortex tube lowers the temperature and pressure of the compressed air supplied to the enclosure.

2 Solenoid valve
A solenoid valve is an electromechanically operated valve. The valve used is rated NEMA 4x.

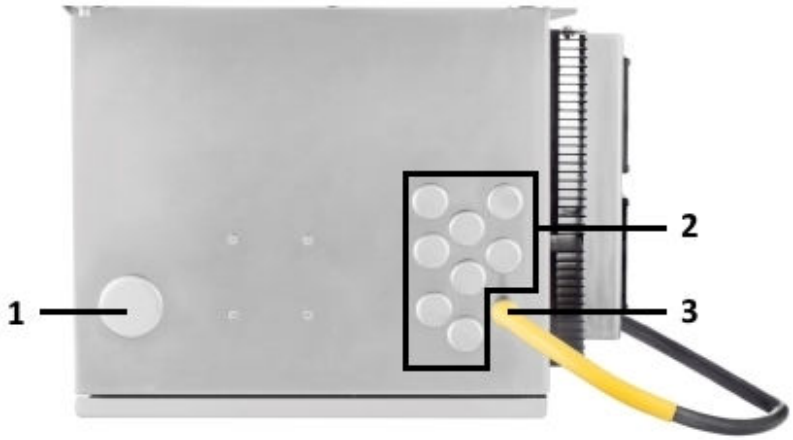
3 Filter
The compressed air supply must be filtered to remove water and dirt using a 5 micron or smaller filter. Failure to use a filter may cause clogging (and freezing) of the compressed air paths inside the system.

3.1.3.3 Right side view with AC cooling



1 AC cooling
AC cooling is used to operate the instrument in an environment between 0 and 50 °C

3.1.4 Top view of the analyzer



1 Purge vent plug
The plug shown is for the optional vent unit which comes with the purge unit. On the Basic XDS Process Analyzer, the plug remains in place as shown.

2 Plugs
The process Analyzer enclosure displays 9 plugs which are for connecting the optical fibers. For channels which are not used, the plugs remain in place.

3 Optical fiber Connection
A microbundle fiber is tightly connected to the XDS process Analyzer.

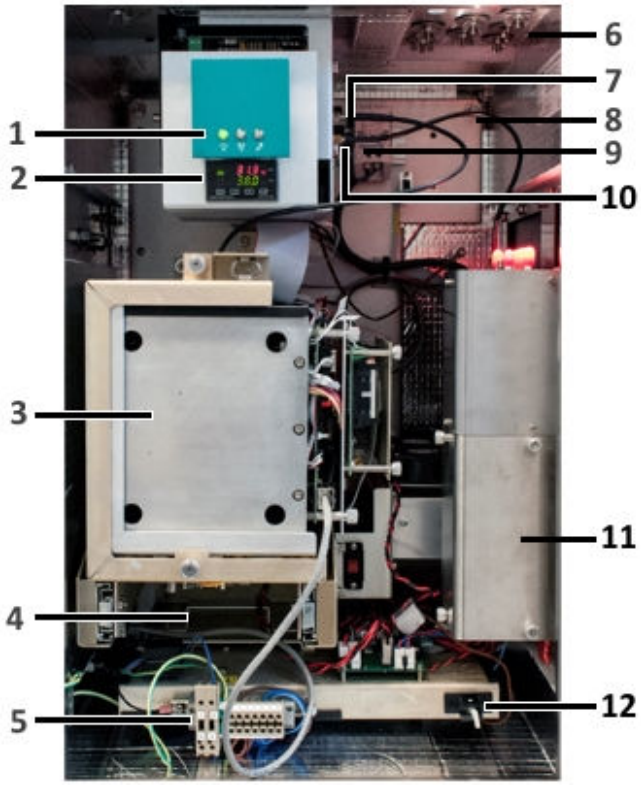
3.2 Interior view of the analyzer

CAUTION

Do not change the set internal enclosure temperature value.

CAUTION

Do not change the set catastrophic shut down temperature value



1 Led Panel
The LED panel indicates, from left to right, the lamp status (ON/OFF), the communication status (operating or not) and whether the instrument is scanning or not.

2 Temperature Controller Panel
The analyzer contains a temperature controller to maintain internal temperature of the enclosure. This is normally set to 38.0 °C.

3 The monochromator
The monochromator enclosure is mounted on wire rope shock absorbers to minimize the effect of vibration in the ambient environment.

4 Optical fiber modem
For process analyzer equipped with a purge unit, an optical fiber modem is provided. In the basic configuration the space remains empty.

5 AC Power terminal strip
AC Power (Mains) connection is done at the terminal strip inside the XDS Process Analyzer enclosure.

6 Optical fibre connection
The optical fibers connected to the lamp box are brought to the sampling point(s) through these holes. Non used channels are sealed with stainless steel plugs.

7 Optical fibers connectors
The version shown is for an instrument having a multiplexer.

8 Reference Channel
The process analyzer comes with an internal reference channel. The optical fiber runs from the lamp directly to the multiplexer.

9 Catastrophic shut down
The instrument contains a catastrophic shutdown temperature control, shown at right. This instrument is set at 50 °C (120 °F). If the temperature of the instrument (inside) exceeds the preset temperature, the instrument will be shut down for safety.

10 Multiplexer
The multiplexer allows to connect up to 9 optical fibres which can be sequentially selected to be sent to the detector. Note that for single point process analyzers the multiplexer is not present.

11 Lamp Box
The lower compartment contains the tungsten halogen illumination lamp, pointing upward.

The upper compartment is for fiber routing to each channel. Note that for single point process analyzers the upper part is not present.

12 Interlock switch
The door has a safety interlock switch to automatically power down upon opening of the enclosure.

A manual key is provided for the interlock switch, for use during initial set-up. This key is red, and is shaped like the letter "I".

4 Overview of the accessories

4.1 Optical fibers

Considerations for each type of fibre are summarized below:

	Single fibres	Microbundle
Sample Type	Clear Liquids	Cloudy to turbid liquids
Fibre distance from Analyzer	100 m maximum	Up to 50 m
Probes	Transmission (pair)	All probes

4.1.1 Single fibres

Single fibres are used in combination with transmission probes or flow cells and are always used as a pair. One conducts light from the analyzer to the sample and the other way around for the other second fibre. They have a core diameter of 0.6 mm.

4.1.2 Microbundle fibres

4.1.2.1 For Transmission

Microbundle fibers for transmission are used to measure samples which are slightly opaque or turbit. They are used when single fibers fail to bring enough light to the sample. They are composed of 40 individual fiber bundled together (see picture). They are always used as a pair.

4.1.2.2 For Reflectance and Immersion probes

For Reflectance and Immersion probes, the light is brought to the sample and collected from the sample with the same fibers. These microbundles are composed of 2 bundles of 40 individual fibers each, forming an inner circle and an outer ring (see pictures). The light reach the sample through the inner circle (left picture) and is collected through the outer ring bundle (middle picture). They present the advantage that only one opening is necessary to insert the probe to the process.

4.1.3 Fibres connectors

The difference between microbundle and single fibres is illustrated below.

The dark spot at the center of the SMA connector is the fibre of each type. Because the micro-bundle has more fibres, it has a greater light-carrying capacity. It is therefore possible to measure denser samples.

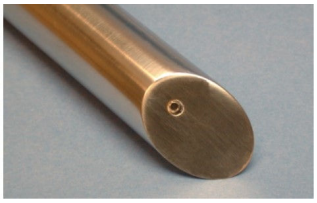
4.2 Probes

4.2.1 Probe types

4.2.1.1 Reflectance Probes

Reflectance Probes are used for processes where the medium is somewhat turbid and will provide a good reflectance signal back to the instrument. This includes fermentation products and other materials with high solids content.

A “flush” version (spoon probe, mostly used in fluid bed drying or applications involving flakes) and a 45 ° probe coupled to an angled fiber are also available. Please consult our product specialist for more insights.



4.2.1.2 Transmission probes

Transmission probes are used for liquids that may be clear to somewhat turbid. Tests may be required to determine the optimum path length, based upon the sample medium, and the analyte level.

This photo shows threaded transmission probes, which come with several spacers (2 mm shown) which maintain the probes at a pre-determined distance for consistent analysis.

Customers may have designed their own interface to the process, and prefer transmission probes as shown below. These probes may be placed into the process using 1" Swagelok® fittings. A method for aligning the ends must be found to ensure consistent positioning and therefore reproducibility.

Frequently the process interface is designed so that these probe "barrels" are left in the process permanently, and the fibre bundles are slidden out for periodic instrument maintenance and/or qualification testing.

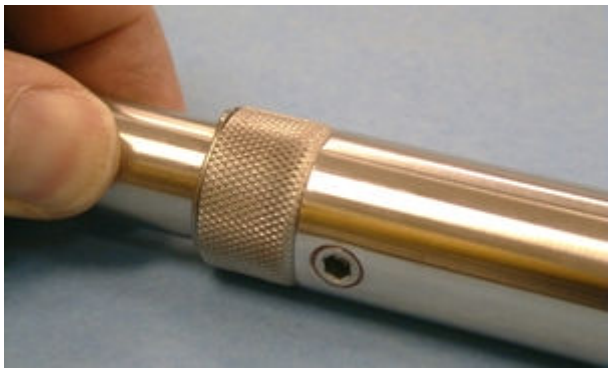
4.2.1.3 Immersion probes

Immersion probes are suitable for transmission-style measurements on clear to partly clear liquids. In this probe style, the beam is directed through the sample to a protected mirror, then reflected (back through the sample again) to the receiving channel. The advantage is that a transmission measurement is made with only one probe entrance into a vessel.

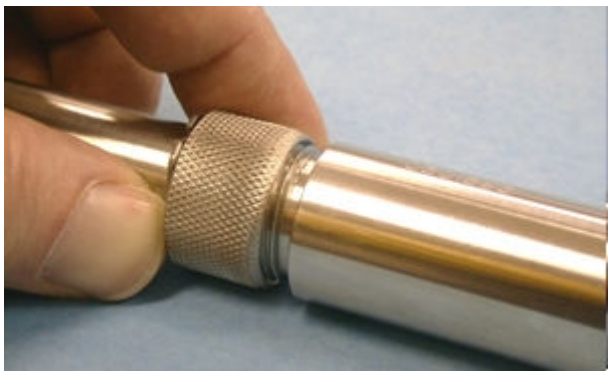
4.2.2 Probe disassembly

It may be necessary to remove the outer lens barrel from the fiber optic bundle for mounting. Follow these instructions. (Instructions apply only to the probe type shown.)

1 Note the knurled collar. To remove the lens barrel, unscrew the knurled collar.



2 As the knurled collar is loosened, be sure to support the lens barrel. Do not let it drop.



3 When the knurled collar is disengaged from the lens barrel, slide the lens barrel off over the fiber optic bundle end.

The knurled collar is captured, and will not fall off. Do not use the set screws – the knurled collar sets the gap, and the set screws will interfere with that setting.

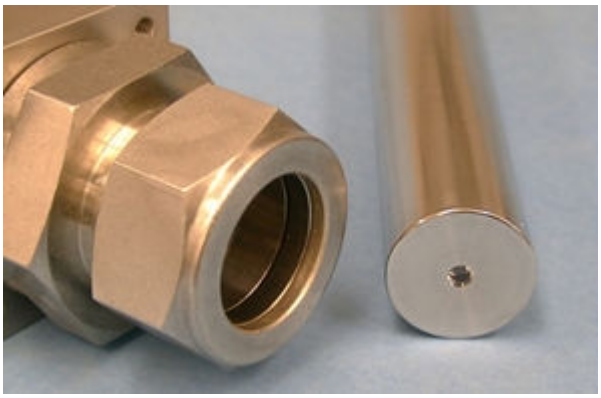
4 To re-assemble, gently insert the fiber optic bundle end into the lens barrel.

Fully tighten the knurled collar onto the lens barrel. Hand tighten; do not use tools. Internal spacing between the lens and the fiber optic bundle end is automatically set using this method.

This photo shows the assembled probe from the “snap-ring” side.

5 Probes are generally mounted in pressure vessels (and other locations) using Swagelok™ fittings such as that shown. Nominal inside diameter is 1.00”.

Always follow Swagelok recommendations for proper pressure sealing. Any deviation from instructions may result in leaking.



6 A “probe purge port” is provided on each lens barrel. This may be used to introduce a vacuum on the inside of the lens barrel of the probe. On high temperature vacuum vessels, this technique minimizes pressure stress on the probe window.

If used, remove the 1/16”set screw using a 3/32” Allen wrench. Use a suitable 1/16” NPT fitting to connect.

Use of non-threaded lens barrel (old systems)

1 Users with permanently installed, non-threaded lens barrels may upgrade to the new XDS Process Analytics instrument. The the older barrel styles are not threaded.

The snap ring must be loosened enough to slide the knurled collar back, for access to the set screws.

Window gapping may be an issue with retrofits. Consult factory for proper procedure.

2 After tightening the set screws, move the snap ring into the groove to retain the knurled knob. This protects the set screws from dirt and tampering.

4.2.3 Probe drawings

Probe drawings are provided as a guide. Because probes vary, and are subject to updates, DO NOT USE THESE DRAWINGS without verifying current dimensions, fittings and materials with Metrohm Applikon B.V..

Metrohm Applikon B.V. is not responsible for use of these drawings for probe installation. Always request current probe drawings before finalizing installation.

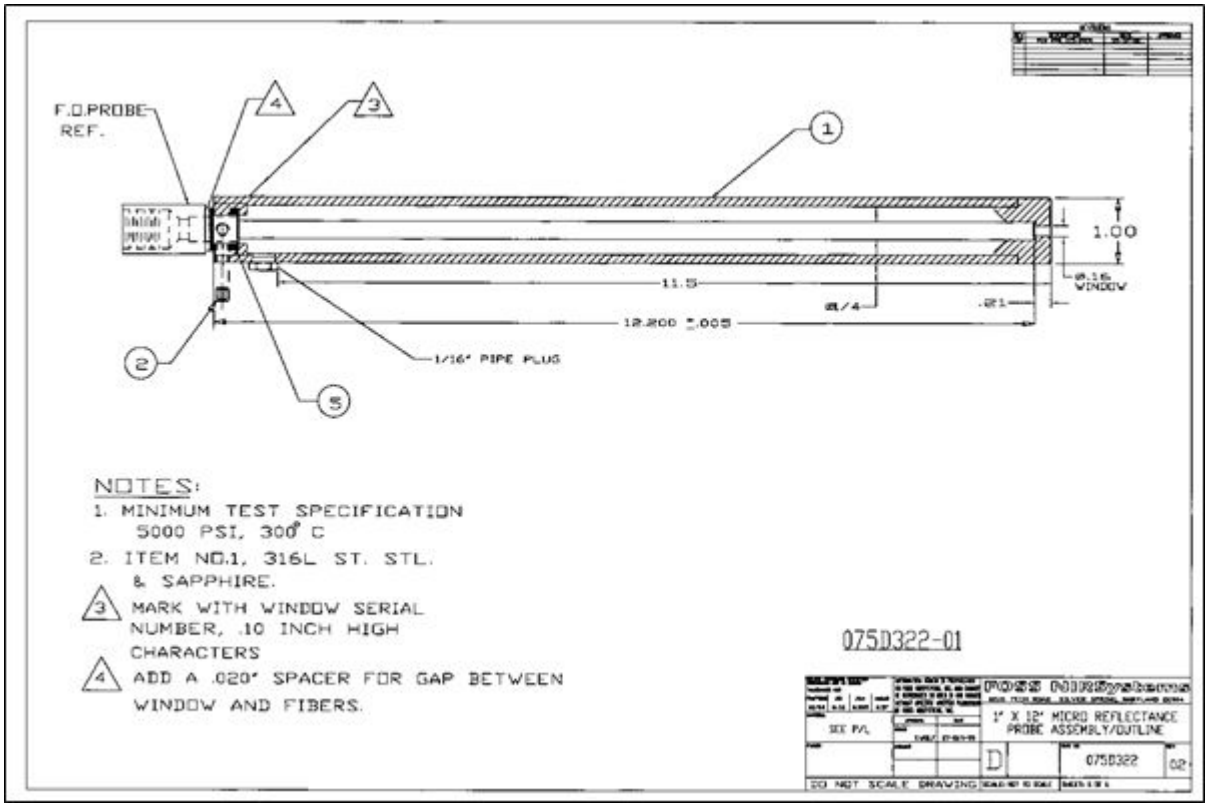


Figure 3 Typical Interactance Reflectance Probe Style

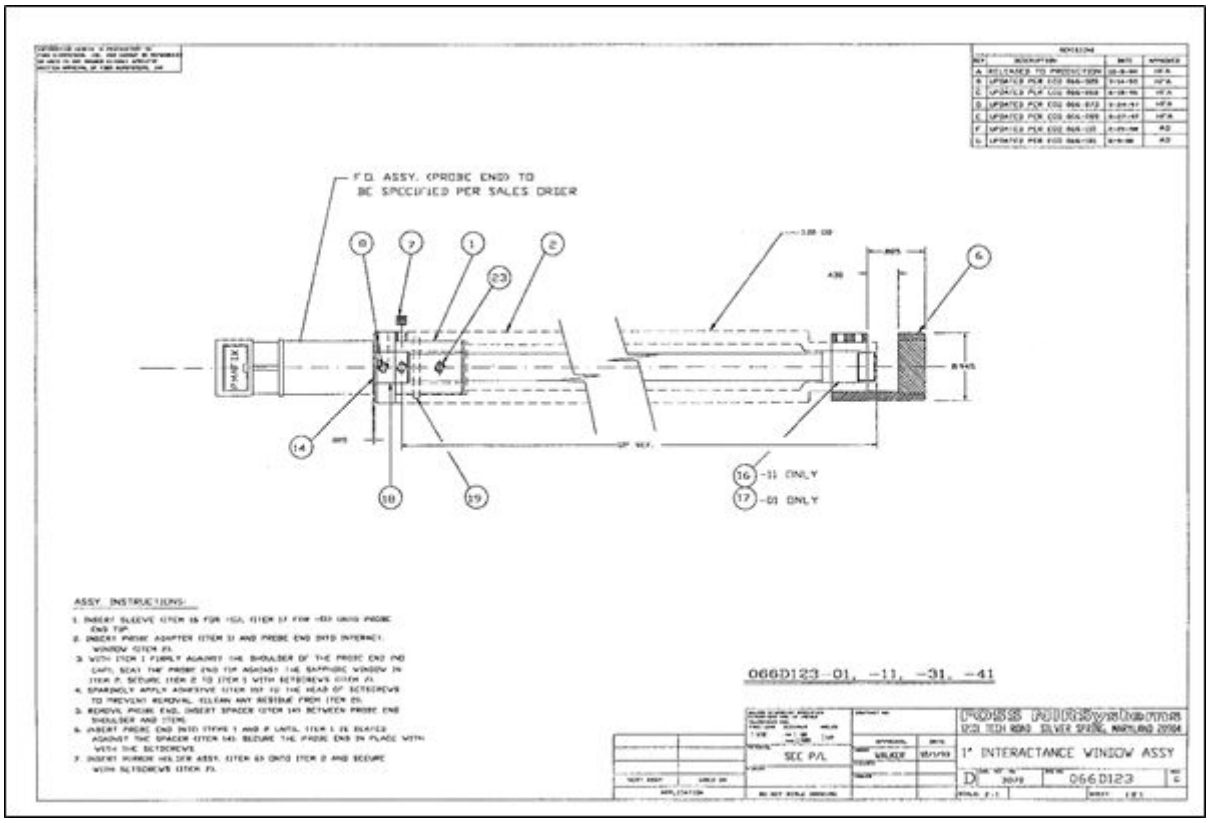


Figure 4 Typical Interactance Immersion Probe Style

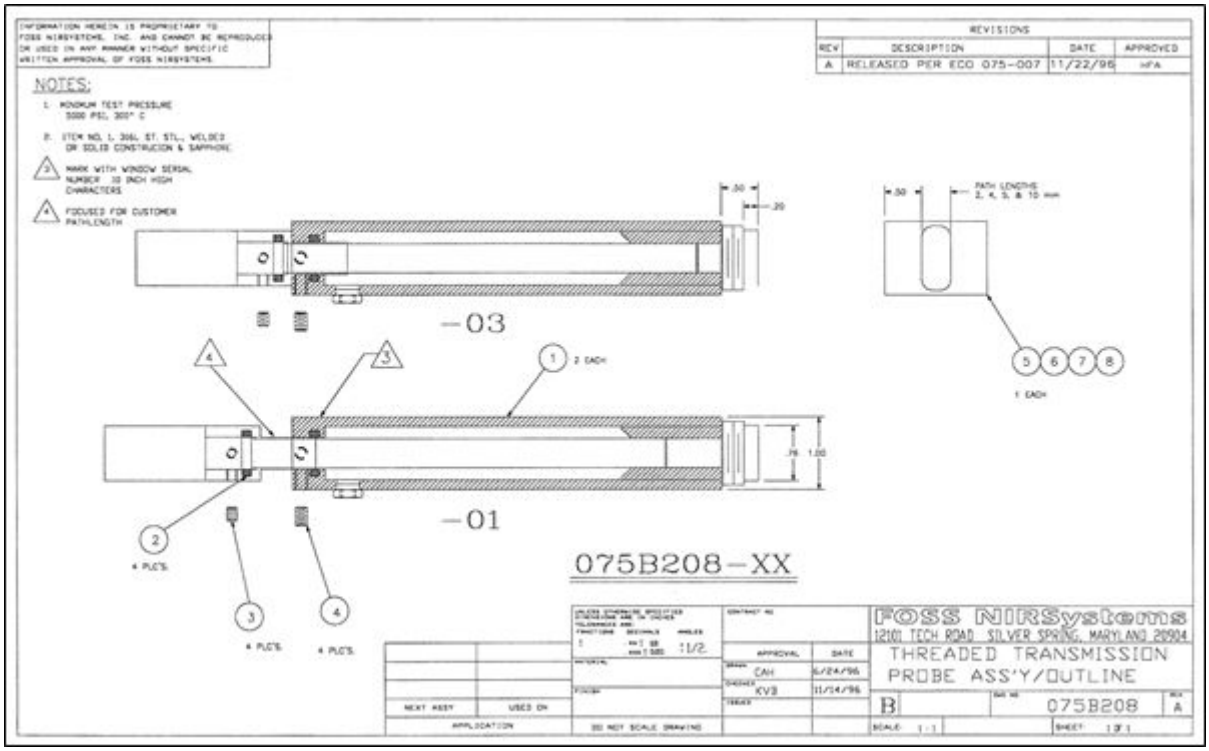


Figure 5 Typical Transmission Probe Style with threaded spacer

4.3 XDS Process Options

4.3.1 Multiplexer

Multiplexed systems are used where several channels are required. An optical switching device is used to monitor the sample channels one at a time, in sequence. (This is called time-division multiplexing.)

This configuration is suitable for both micro-bundle and single fiber systems. Any system with more than one sample channel uses a multiplexer assembly as shown.

4.3.2 Fiber optic communication modem

A fiber optic communication modem is included with all purged systems in place of the traditional Ethernet cable. This fiber optic communication permits communication, for safe operation in classified environments.

Whether the length of the Ethernet cable should exceed 75 m, it is recommended to use fiber optic.

Communication cable should be handled carefully to avoid breakage. Avoid sharp bends, chafing, or other damage.

4.3.3 Purged System for Hazardous Environments

Metrohm Process Analytics offers the option of a purging system for hazardous environment use. The compact purging system is designed to meet European approvals as well as North American standards.

The purging system is a complete automatic system that will purge and pressurize the XDS process analyzer protected enclosure and maintain pressure within the enclosure.

The purging system is suitable for Class I and II, Division 1(as defined under NEC 500 standards) and in Zone 1 (as defined by IEC/CENELEC and NEC 505 requirements) and Zone 21 to non-hazardous area.

The system supplies clean air or inert gas, to remove flammable gases and prevent accumulation of ignitable dusts within the protected XDS Process Analyzer enclosure. The XDS Process Analyzer is therefore protected against combustion, heat, moisture, dust build-up and corrosion.

The specific system supplied is rated for enclosure volumes of up to 7.08 m3 (250 ft3). Actual volume of the XDS Process Analyzer enclosure is approximately 0.09 m3 (3.1 ft3).

Enclosure purging systems offer a safe and practical means of installing electrical equipment in hazardous locations, eliminating the need for explosion-proof boxes and intrinsic safety barriers.

The purge system conforms to ATEX, NFPA 496 and ISA 12.4

4.4 Instrument with Accessories

4.4.1 Single Point

Single point instruments are connected to one sampling point either through single fibers or microbundles. Any type of probes can be used. The pictures below represent a single point single fiber instrument and 2 single point microbundle instruments with respectively a transmission pair, a reflectance probe and a transmission pair.

Figure 6 XDS Process Analyzer, single point, single fibers

Figure 7 XDS Process Analyzer, single point microbundle, reflectance probe

Figure 8 XDS Process Analyzer, single point microbundle, transmission pair

4.4.2 Multiplexer

Instruments having a multiplexer offer the possibility to sequentially measure up to nine different sampling point. Single fibers or microbundles can be used and any combination of probes can envisioned. On the examples below, an XDS process analyzer with a reflectance probe and a transmission pair is depicted together with a system displaying single fibers and microbundle fibers. Note that for this latest configuration a microbundle multiplexed instrument has to be considered.

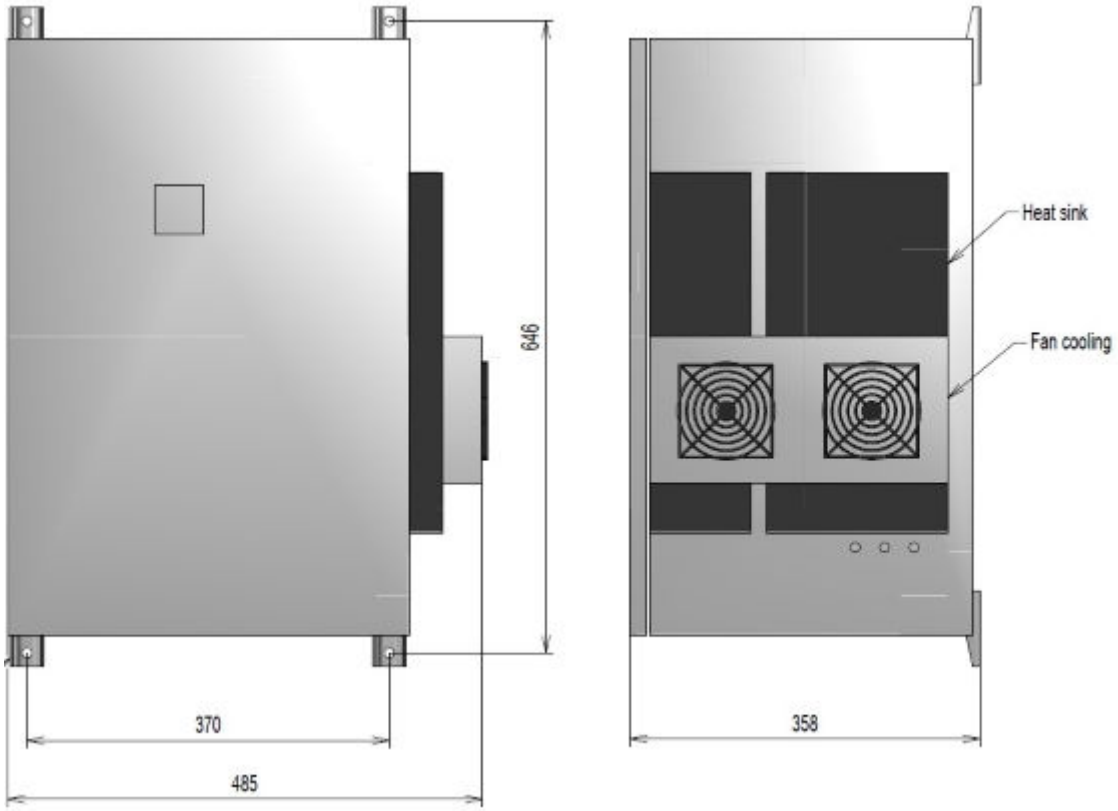
Consult with Metrohm Applikon specialists for more information.

Figure 9 XDS Process Analyzer, multiplexer microbundle, reflectance probe + transmission pair

Figure 10 XDS Process Analyzer, multiplexer microbundle, reflectance probe + transmission pair & single fiber transmission pair

5 Technical specifications

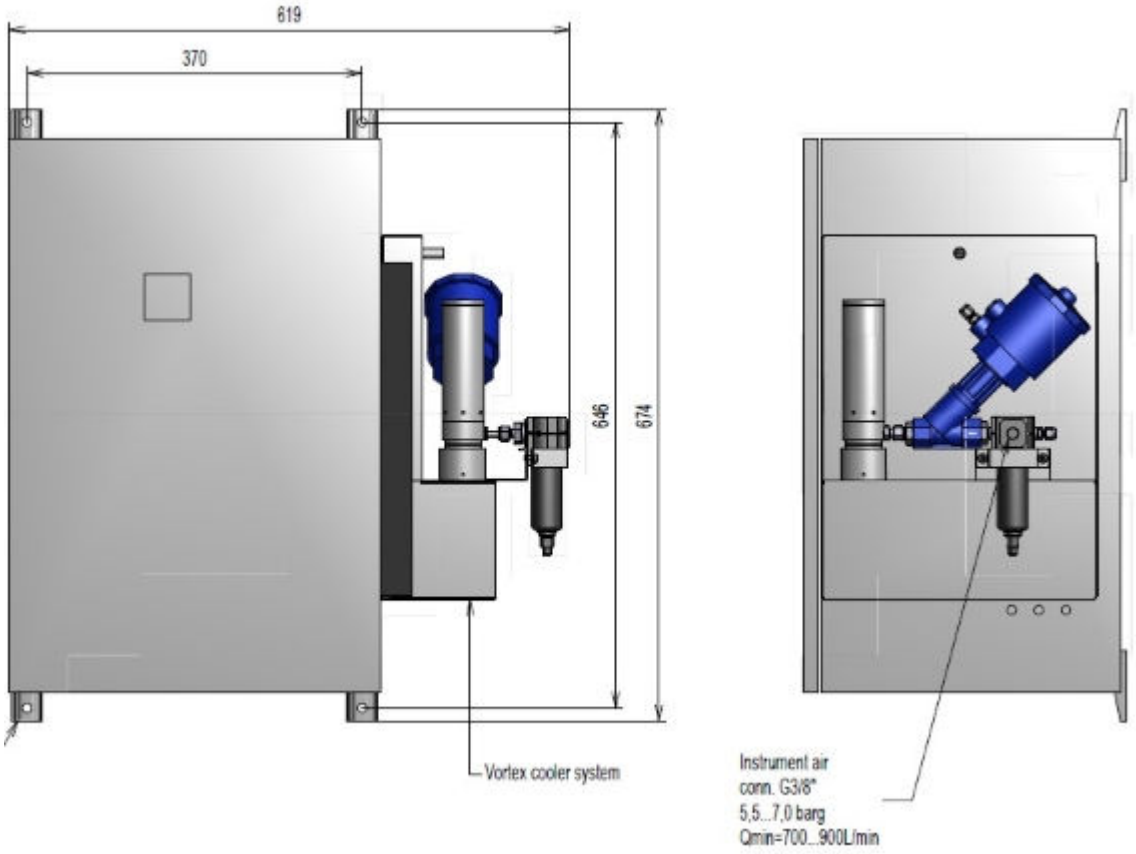
5.1 Basic Unit with Heat sink and Fans dimensions



Dimensions

Width	485 mm (19.09”)
Height	646 mm (25.43”)
Depth	358 mm (14.09”)

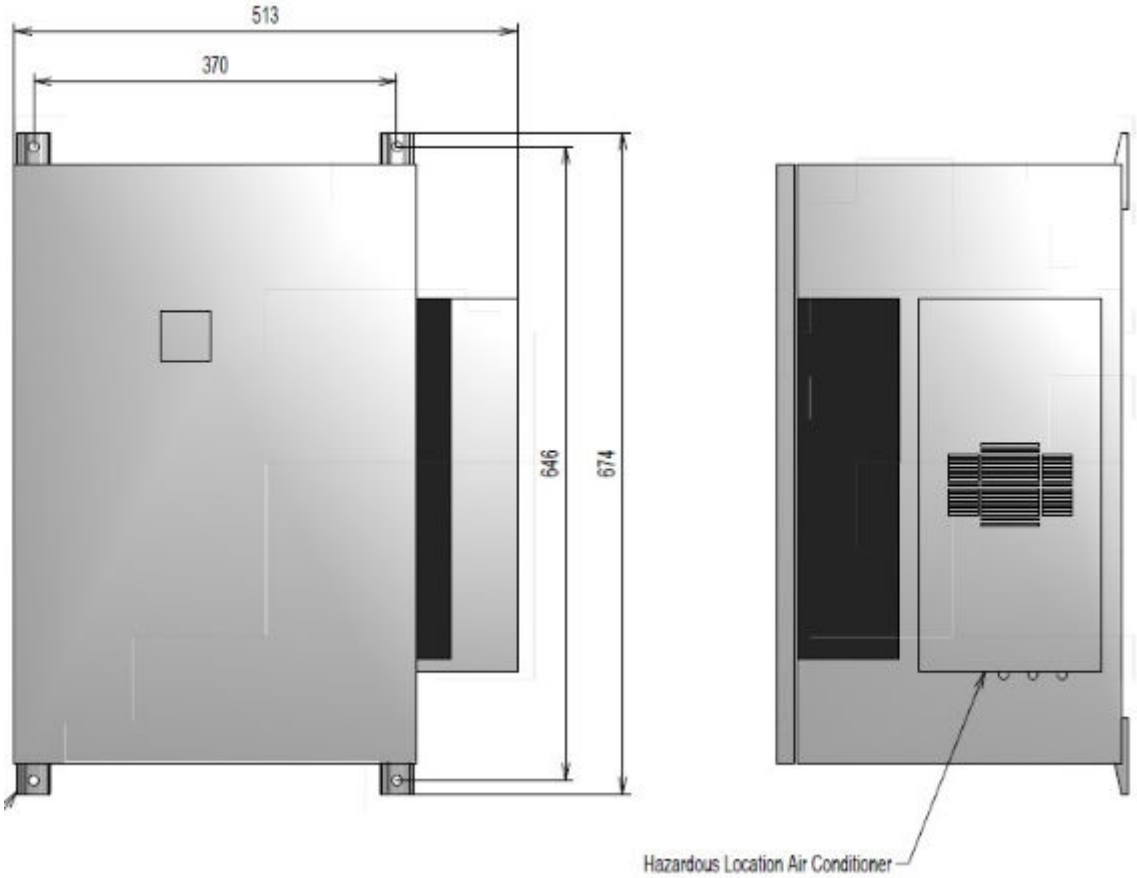
5.2 Basic Unit with Vortex Cooling dimensions



Dimensions

Width	619 mm (24.37”)
Height	646 mm (25.43”)
Depth	358 mm (14.09”)

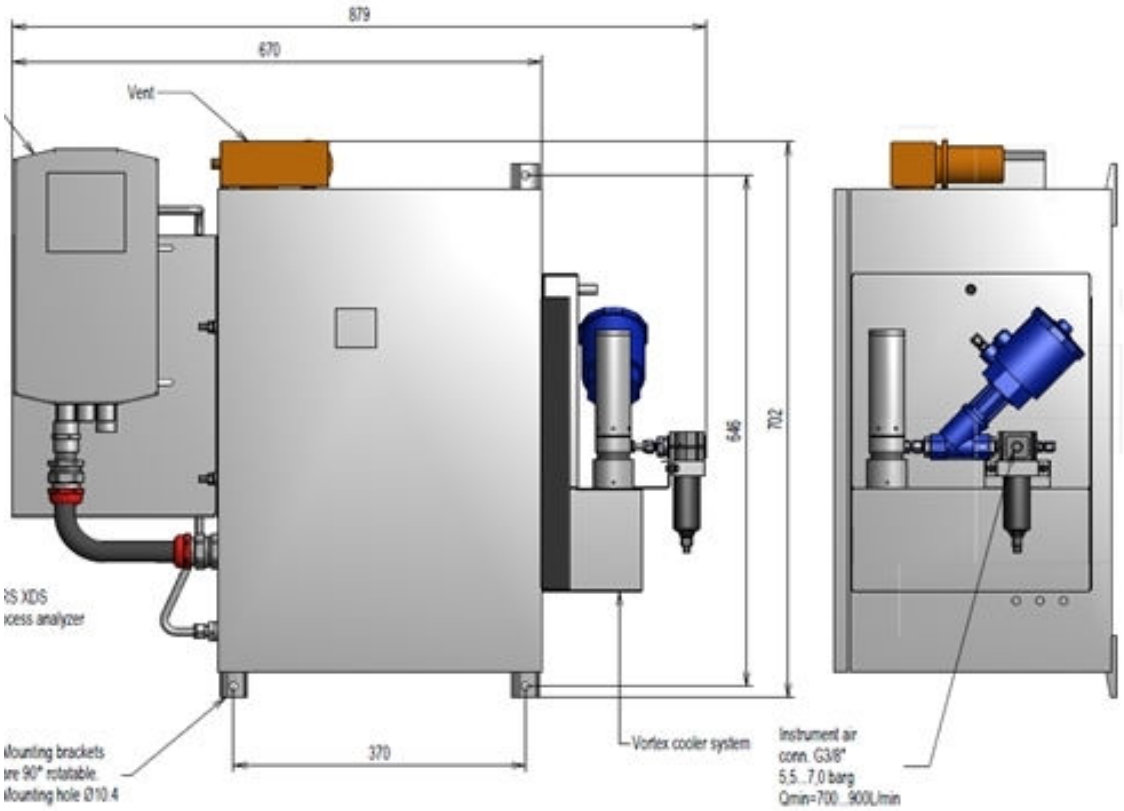
5.3 Basic Unit with Air Conditioning dimensions



Dimensions

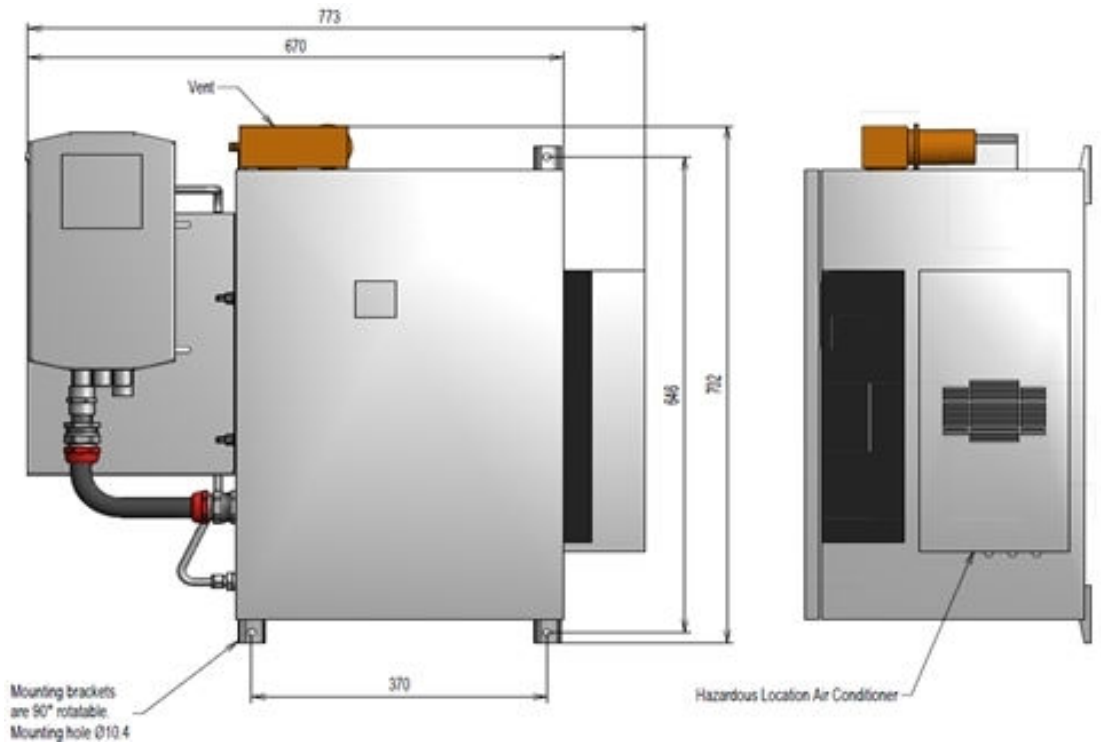
Width	513 mm (20.19”)
Height	646 mm (25.43”)
Depth	358 mm (14.09”)

5.4 Purged Unit with Vortex cooling



Width	879 mm (34.60″)
Height	702 mm (27.64″)
Depth	358 mm (14.09″)

5.5 Purged Unit with AC cooling



Width	773 mm (30.43”)
Height	702 mm (27.64”)
Depth	358 mm (14.09”)

5.6 Weight

System Type	Weight (kg)	Weight (lbs)
Basic System	41.9	92.3
With Vortex Cooler	48.0	105.8
With Purge Control and Vortex Cooler	59.4	130.9
With Air Conditioning	50.5	111.3
With Purge Control and Air Conditioning	61.9	136.4

5.7 Operating Temperature Range

System Type	Temperature (°C)	Temperature (°F)
Basic System	0 - 30	32 - 86
With Vortex Cooler	0 - 40	32 - 104
With Purge Control and Vortex Cooler	0 - 40	32 - 104
With Air Conditioning	0 - 51	32 - 124
With Purge Control and Air Conditioning	0 - 51	32 - 124

5.8 Operating Humidity Range

System Type	Relative Humidity (%)
All systems	10-90 % non-condensing

5.9 Mains connection

Voltage	100/240 VAC Selectable
Frequency	50/60 Hz
Amperage	2 A / 1.5 A
Amperage with Air Conditioning (optional)	5 A / 2.7 A
Power consumption (non Air Conditioning)	100 W

5.10 Air Consumption

System Type	Air requirements	Flow rate
Vortex cooler	5.5-7.0 bar (80-100 psi)	700-900 L/min (25-32 SCFM)
Purge	1.4-8.3 bar (20-120 psi)	Set @ 340 L/ min (12 SCFM)

5.11 Scan Range

The Data Collection Method (DCM) selection range is as follow:

Extended InGaAs detector: 800-2200 nm.

5.12 Data Interval

0.5 nm Data Interval

5.13 Clock/ Oscillator Frequencies

10 MHz – Amplifier

18.423 MHz, 25 MHz and 30 MHz – Mother Board

20 MHz – Module Control Board

5.14 Lamp Source

50 Watt Tungsten Halogen Reflector Lamp. This lamp is specially processed to enhance NIR energy output and assure stable illumination. A spare lamp is provided in the Accessory Kit. Do not substitute any lamp other than that available from Metrohm Process Analytics or its authorized distributor. Metrohm Process Analytics is not responsible for damage, lost production time, or warranty claims arising from unauthorized use of a non- Metrohm Process Analytics lamp.

5.15 Communication

UTP Crossover Cable, Category 5, RJ-45 connection

5.16 Process communication

Process communication can be done using the following protocols:

1. Digital protocols : MODBUS, PROFIBUS, OPC
2. I/O module: 4-20 mA

6 Installation

6.1 Mounting of the XDS Process Analyzer Enclosure

CAUTION

Verify that the mounting area is able to support the full weight of the instrument, including options. Consider dynamic loading if the area is subject to unusual conditions.

CAUTION

Don't use the fiber optic cable connection as a lifting point or “grab handle.”

NOTE

Select a mounting area with a minimum of transmitted vibration which could affect the instrument.

These steps explain physical mounting of the XDS Process Analyzer enclosure. Note that the enclosure may weigh as much as 61.9 kg. It is imperative that the installers take precautions to avoid injury during installation.

Always use a sturdy wheeled cart when transporting the instrument. It may be laid on its back for stability, then lifted upright prior to actual mounting.

The unit may be lifted by two workers and guided into place by a third. One worker should be positioned on each side of the unit, and should hold the cabinet, not any accessories. Alternatively, a wide platform may be placed under the instrument, and the platform may be lifted.

If using a lift truck or other mechanized equipment, avoid damage to the cabinet or installed parts. Always stabilize the enclosure, so it cannot fall and sustain damage, or injure a worker.

Always wear safety glasses, safety shoes and other protective equipment as required.

Leave adequate mounting space for all installed options, as well as room for air circulation and wiring access. Recommended minimum access and mounting space is as describes

Mounting dimensions for the enclosure feet are as shown on the following page. The mounting bolts must be 10 mm (3/8") in size. The environment may require stainless steel due to industry or wash-down requirements.

1 Lift the instrument onto the mounting bolts, seating both upper mounting brackets first.

These photos show a mounting with 10 mm (3/8") mounting studs, welded to a heavy backing plate.

The mounting may also be a sturdy frame, or other method suitable to support the full weight of the instrument.

Use extreme caution with the fiber optic cables when mounting the instrument. If possible, the cables should be coiled up and secured to the unit to avoid damage. Radius of coiled fibers should never be less than 153 mm (6"). Diameter should be at least 305 mm (12").

2 Install a large washer, locking washer and nut onto each of the two upper mounting studs.

Tighten nuts to the torque recommended by the fastener supplier.

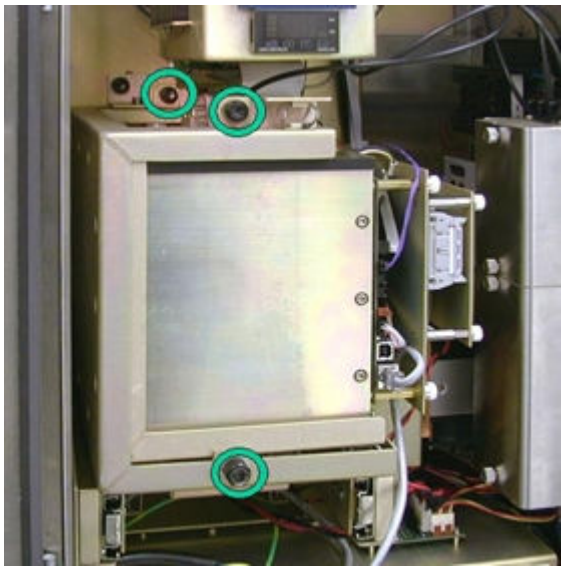
3 The bottom right mounting foot is shown. Be sure both lower mountings are securely tightened.

4 Verify that all four mounting brackets are securely fastened to the mounting studs, and that the hardware is tight.

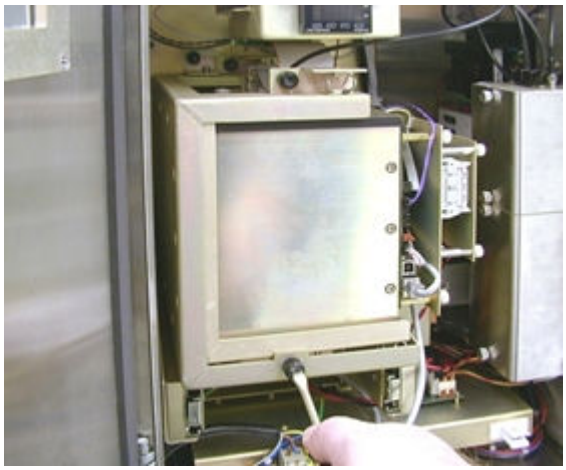
6.2 Removal of Shipping Restraints

The monochromator enclosure is mounted on wire rope shock absorbers to minimize the effect of vibration in the ambient environment. The monochromator is locked down for shipment, to prevent shipping movement from jostling the shock mounts beyond their normal range of motion. Release the shipping restraints as shown.

The shipping restraints are three (3) captive screws, circled in green on the photo. Two are on the top of the monochromator box, and one is at the bottom.



Use a regular screwdriver to loosen the captive screws. The screw at the rear requires a long screwdriver shaft, at least 280 mm (11”) long, to comfortably reach the screw.



When the restraints are all loosened, the monochromator will “float” somewhat on the wire rope mountings.

The shipping restraints should be locked down any time the instrument is moved, to prevent damage. Follow the reverse of the above procedure to lock the monochromator down for shipment.

6.3 Fiber optics

Fiber optic cables are quite rugged, and are jacketed to protect the delicate optical fibers within. While protected, the fiber bundles are still somewhat fragile when not handled correctly. Always use care when routing and installing fibers.

The fibers are installed on the instrument, and are shipped in a coiled position in the shipping container.

Handle very gently when moving and lifting, to avoid damage. Follow these guidelines:

1. Never bend in a radius of less than 153 mm (6”).
2. Never pull on the fiber bundle, as this can stress the fiber and cause breakage of individual strands.
3. Avoid any impact or abuse of the fiber bundles.
4. Do not leave the fiber optic cable unsupported. Any motion in the cable during scanning may cause minor variations in spectral response, due to slight differences in the internal reflection at different bend angles. While this effect is quite small, it can cause the error of prediction to increase slightly.
5. Never scratch or mar the polished ends of the fibers.

6.4 Cable Tray

Due to the safety and resistance to inductance of the fiber bundles, these fibers can be installed in commercially available cable trays. This method of fiber installation is preferable due to the fact that the fiber is not exposed to a constrictive environment, as is the case with conduit. Therefore, it is less likely that an individual fiber will break when being installed in a cable tray.

The fiber may be installed in a “ladder tray” with supports every 100-150 mm (4-6 inches). Note the minimum fiber bend radius mentioned above.

A solid-bottom tray may also be used. Tray material may be metal, fiberglass, or any other material that does not react with the jacketing material.

6.5 Multiplexer

The “Channel” number for a given fiber (or pair, if transmission) may be determined by checking where the “return” fiber is screwed in to the multiplexer.

The channel numbers are stamped into the sheet metal.

Position #10 is reserved for the internal reference fiber, do not change!The fiber at the center takes the light to the monochromator box

Tightening torque is 0.9 Nm (8 in-lb). Do not exceed the recommended torque to prevent damage. Tightening with fingers is sufficient.

6.6 Electrical connection

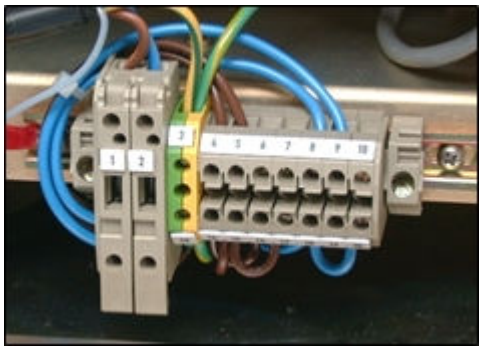
6.6.1 Permanent mains cable

WARNING

Wiring must follow all applicable electrical codes for the area of installation.

The XDS Process Analyzer is shipped with an AC line cord, which is used for initial checkout testing only. When installed in a permanent location, the instrument is to be connected with a dedicated conduit drop, following all applicable electrical codes.

AC Power (Mains) connection is done at the terminal strip inside the XDS Process Analyzer enclosure, as shown in the photo below:



CAUTION

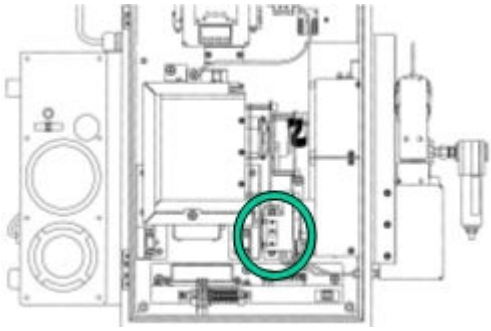
Do not use terminals 4 to 10. These are pre-wired at the factory.

Terminal 1	Terminal 2	Terminal 3
Phase	Neutral	Ground
Intl: Brown US: Black	Intl: Blue US: White	Intl: Green/Yellow US: Green

6.6.2 AC Power Switch Settings

There are two switches that must be set for the supplied operating voltage. These are:

Heater switch

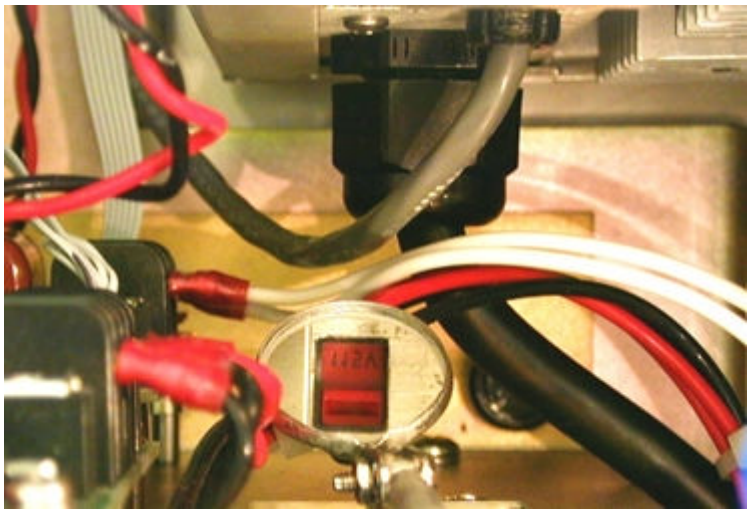


The first switch (Heater) is at the center of the circle in the above diagram. Switch position is as follows:

- Up position: 115 VAC
- Down position: 230 VAC

Air conditioner switch (optional)

The second switch is located on the bottom of the optional air conditioner, in a difficult location.



This photo shows the switch in the 115 V position, using a round 45-degree mirror to verify the setting.

Because this switch is rather inaccessible, it is factory-set for the voltage in the destination location. If this switch needs to be reset due to instrument relocation, please advise Metrohm Applikon of this fact. Instructions will be supplied for changing the voltage.

6.7 RJ-45 Network Connection

RJ-45 Cable Connection applies to the non-purged instrument, and is detailed below. For the purged unit, fiber optic modems are provided, to meet hazardous location requirements.

6.7.1 Basic Process Instrument RJ-45 Connection

The Basic XDS Process Analyzer (non-Purged) has an RJ-45 cable entrance on the left side of the box, toward the bottom. It is shown, with the cable connected.

The plug shown is a water-tight, dust-tight connector with O-ring seals. It is suitable for NEMA 4X environments.

6.7.2 Purged Unit Instrument RJ-45 Connection

A fiber optic pair is supplied. Longer lengths are available by special order. Maximum cable distance is 100 kilometers.

The fibers must be fed into the enclosure using a proper fitting, as shown.

The RJ-45 ports are auto-sensing for 10Base-T, 100Base-TX or 1000Base-T devices connections. Auto MDI/MDIX means that you can connect to another switch or workstation without changing the crossover cabling.

6.8 Temperature Controller Set-up

The XDS Process Analyzer contains a temperature controller to maintain internal temperature of the enclosure. This is normally set to 38.0 °C (100.4 F), temperature is read in °C.

A temperature-sensing device is embedded in the instrument cabinet, and used as a method to control the internal temperature.

This control maintains internal temperature by cycling the heaters, air conditioner (if so equipped), Vortex cooler (if so equipped) and the external fan to drive cooling air over the heat sink.

An internal fan is used to circulate air inside the enclosure. This assures that all components are at a consistent operating temperature.

This photo shows the set point as 38.0 °C, and the actual enclosure temperature as 38.0 °C, equal to the set point. This indicates a stable temperature situation.

The upper number (red LED) indicates actual enclosure temperature. The lower number (green LED) indicates the set-point value. Normal temperature operation is comprised between 37 and 39 °C.

7 Vision Software Operation

This section describes the steps required to establish communication with the XDS Process Analytics Instrument. It explains how to run set-up diagnostics, and run routine instrument assessment diagnostics. The Vision Software Manual provides information on quantitative and qualitative operation. Communication between the computer (with Vision Software loaded) and the XDS instrument may be handled in one of several ways. The most common method is Direct Connection using DHCP Addressing. Alternatively, the instrument may be run on a network using a patch cable. A separate document describes the specific steps in establishing communication.

Once the direct connection or network issues are finalized, the user may work through this section for software setup.

7.1 Installation

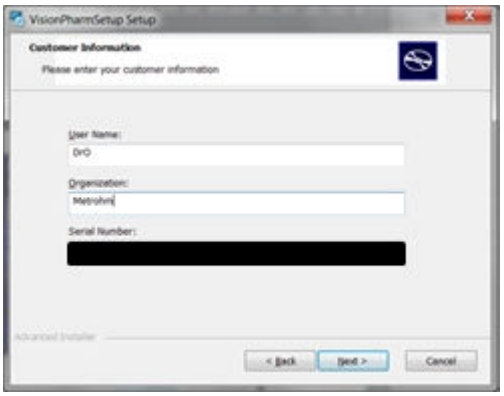
1 Install Vision on the computer to be used for instrument operations.

Launch the .exe file from vision CD-ROM or USB stick.

A first window appears, click on Next.

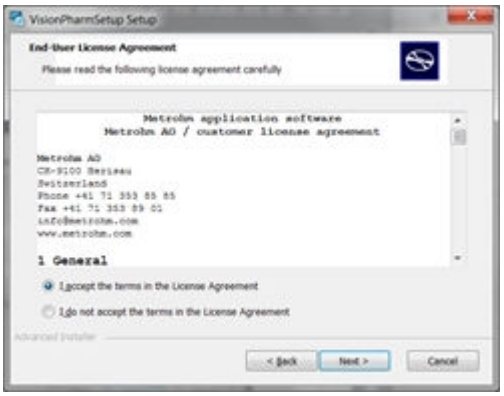
2 Enter your user name, your organization and type in the provided serial number.

Click on Next.



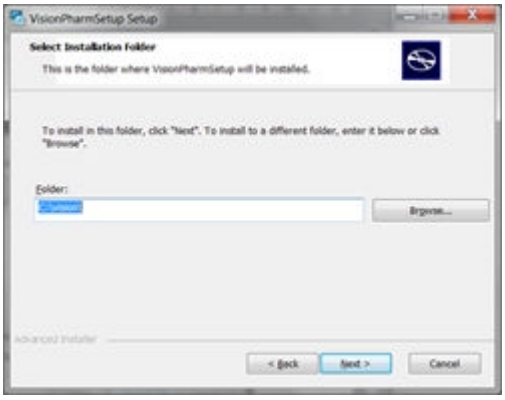
3 Read and then accept the terms in the License Agreement.

Click on Next.

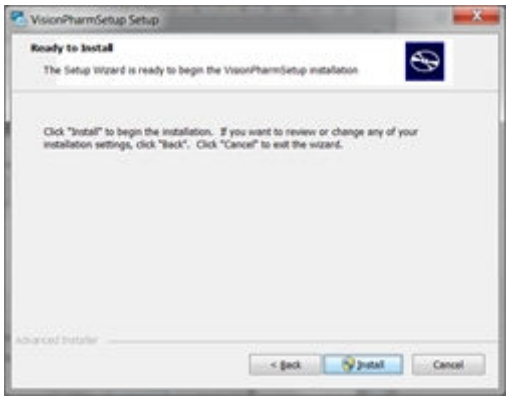


4 Choose a destination folder for Vision software. It is recommended to use the default location. (C:\Vision).

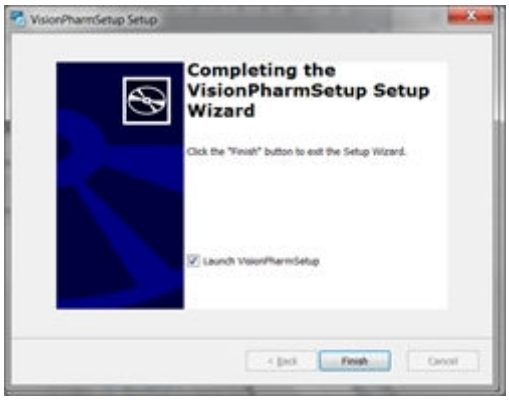
Click on Next.



5 In the new window, click on Install. You must have admin rights.



6 After less than 2 minutes, the software is installed on the computer and a new window appears, you are then offered the possibility to Launch the program while clicking on Finish. Proceed as such.



7.2 Configuring

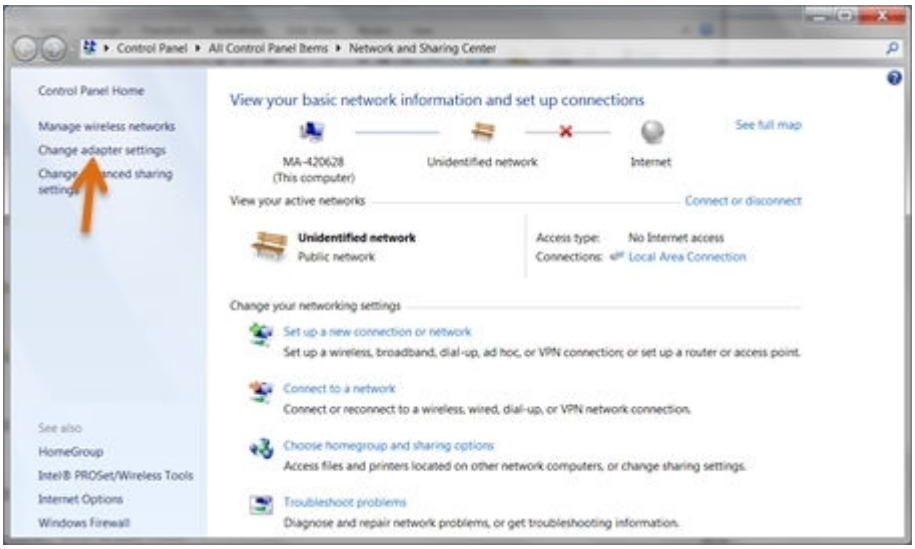
7.2.1 Setting up the network properties in Windows

This section is to make your instrument detectable by Vision. Please make sure all firewalls, VPNs as well as your wireless adapter are disabled.

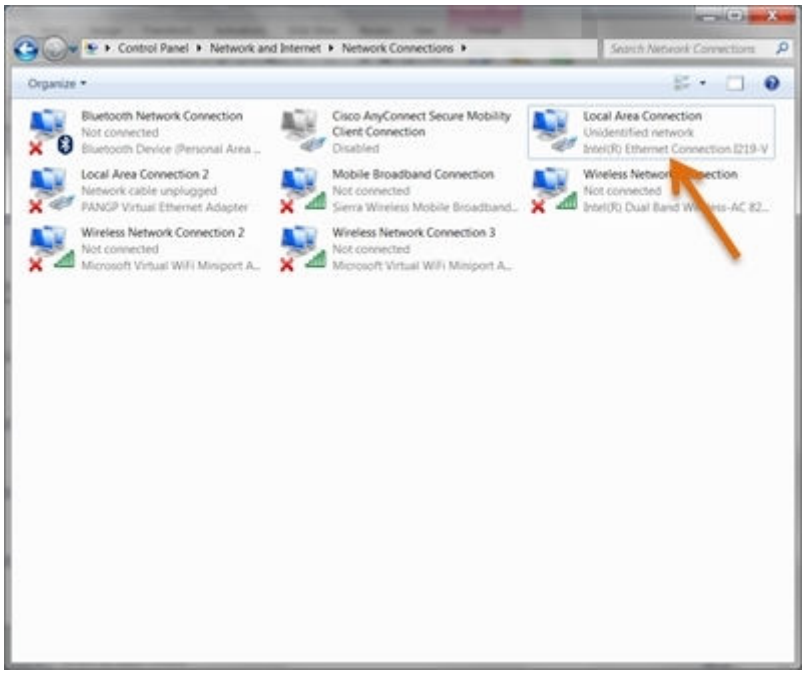
1 Right click on the icon of your connection in the task bar of Windows.

Click on Open network and Sharing Center

2 In the left column, click on Change adapter settings



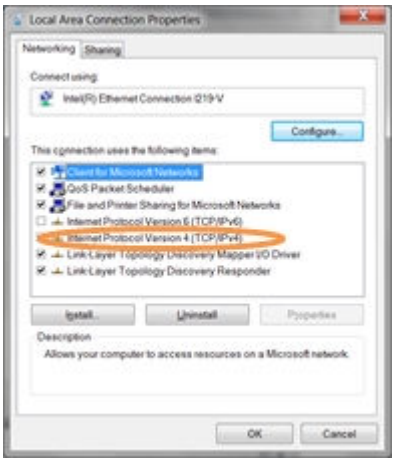
3 Double click on Local Area Connection



4 A new window pops up.

Click on Properties.

5 Double click on Internet Protocol Version 4 (TCP/IPv4)



6 In the new window, select Obtain IP address automatically and Obtain DNS server address automatically.

Click on OK.

Your instrument should be now detectable by the software.

7.2.2 Establishing the communication between Vision and your XDS Process Analyzer

1 The log-in box appears on the opening screen.

2 Enter the default User ID, “NIRS”. It is not case-sensitive.

Tab (or mouse) to the Password box, and enter the default password, “NIRS”.

Note that you should set up specific User ID and passwords for each authorized user.

Do not operate on the default User ID, or you will be in violation of CFR 21, Part 11, where applicable.

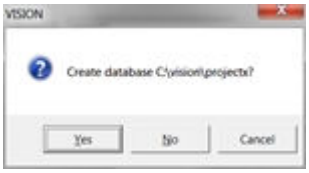
3 To begin, a new project must be created. The project is used to store data and calibrations for a given type of analysis.

Multiple projects may be used, to keep spectra, calibrations and other data separate and well-organized.

Assign to the project some meaningful name, to make it easy to remember. For our purposes, we simply called this “projectx”. Please use a more descriptive name. (no space allowed)

Vision will assign a Location; leave this blank.

4 Vision asks if the default directory location is acceptable. Click on "Yes". Vision creates a directory for the project as shown.



5 This screen sets up communication parameters for the instrument. The XDS instrument has a unique driver. Highlight this box and click on "Configure".

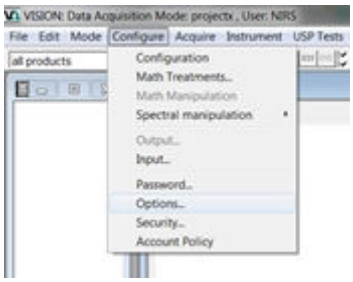
6 This box allows the user to select the instrument identified by the instrument serial number. The number in front of the instrument S/N is the IP (Internet Protocol) address assigned to the XDS instrument.

Use the drop-down arrow of the IP Address box, and select the correct instrument. The instrument must show "Available" to be selected. If no IP address is displayed, please refer to the end of this section.

7 Vision prompts the user to connect to the instrument. Be sure the instrument is turned on and is ready. Click on "Use existing data".

8 If the data to be acquired will be used on other similar instruments, it is advisable to enter Configure, Options from the menu bar.

This should be done before setting up a Data Collection Method (DCM).

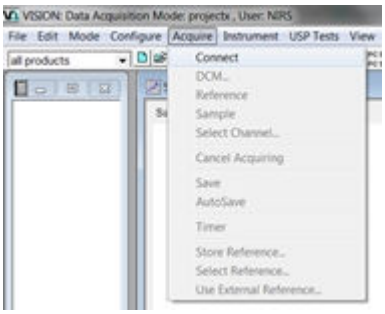


9 Select Options as shown below.

Reference Standardization and *Use Instrument Calibration* are essential for method transfer between similar instruments. Check both boxes, then click on "OK".

This screen is discussed in more detail in the next section of this manual.

10 Click on Acquire, Connect



11 A Data Collection Method (DCM) selection box will appear. It is empty, so no selection is available.

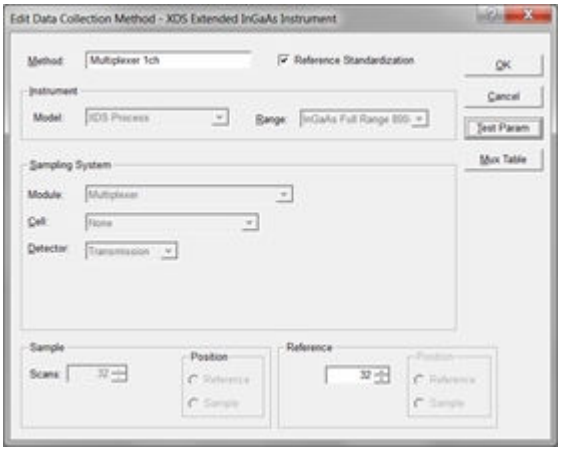
Click on the "New" button. A blank DCM screen will be displayed.

An example of a DCM for this instrument is shown next.

12 When this DCM screen is shown, the Method is blank. Fill in the name with a meaningful description. In this case we will name the method "Multiplexer 1ch," for the type of instrument, and the number of sample channel used.

The Multiplexer has a Range of 800-2200nm. This is shown as selected. (Performance Test range is 850-2100 nm.)

Click on the "Mux Table" button.



13 This screen is used to set up the multiplexer channels. Selections include Tip Type, Fiber Count, and Fiber Length. Click on Channel 1. Click on "Used" to indicate that it will be used for sampling.

14 Click on the drop-down arrow beside the Tip Type box. This shows supported types of probe configurations. In this case, Interactance Immersion Probe is selected.

15 Click on the drop-down arrow next to Fiber Count. Supported types are Regular Bundle, Micro Bundle, and Single Fiber. In this case, Micro Bundle is selected.

Fiber Length depends on the fibers used in the system. The default is 0-3 Meters.

Scans defaults to 32 scans for a spectrum. This is normally not changed unless there is a sampling reason that requires fewer or more scans.

16 Now click on Channel 2. By default, Channels 2-9 are marked “Not Used”. If a channel is used, be sure to click “Used” for that channel. Continue through all channels and verify the correct setting.

Click on OK when finished. This returns the user to the DCM screen.

17 After few seconds, the new DCM appears in the list.

Click on the DCM method to highlight it, then click on OK.

The instrument will connect

18 The instrument configuration pops up automatically.

Click OK .

19 Once the instrument is successfully connected, the amber "Communications" LED will light (in the middle).

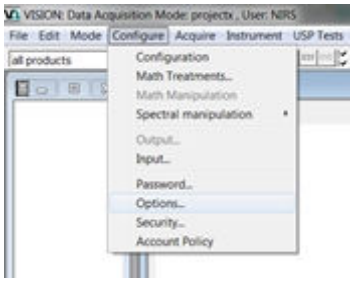
7.2.3 Parameters in Configure, Options

NOTE

When calibration or library transfer (between instruments) is anticipated, be sure that Reference Standardization and Instrument Calibration are selected, BEFORE creation of a DCM. These features assure best method transfer between similar instruments.

1 Before tests are run, the Options must be set. This determines the methods of instrument set-up, and affects how the data will be acquired.

Select Configure, Options from the menu bar.



2

The menu shown at right is the set of selections. A brief explanation follows:

- Performance Test must pass before data acquisition: This prevents the user from taking data on a non-functional instrument.
- Run performance test after wavelength linearization: Forces user to run test sequentially. This is not necessary with XDS.
- Use Auto-Linearization: Maintains correct wavelength registration automatically, using internal wavelength materials to keep instrument in precise adjustment over time.
- Reference Standardization: Used to create a virtual 100% reflectance reference, using a traceable photometric standard. This is explained in the next section. Required for Calibration Transfer in Reflectance.
- Master Standardization: This method is not used with XDS. Do not select.
- Use Instrument Calibration (XDS only) This is a method to adjust the instrument wavelength profile to an external, traceable wavelength standard. It is checked as a default for XDS. Required for Calibration Transfer.
- Use Window Correction: Select this when using XDS Process instrument with either Transmission Pair, or Interactance Immersion probes. This option should not be used with Interactance Reflectance.

7.3 Interactance Reflectance Probe Tests

CAUTION

The tests in this section apply specifically to Interactance Reflectance Probes. Do not use the same procedures on other styles of probe. See the proper section for each style of probe used.

7.3.1 Wavelength Linearization, Interactance Reflectance

The first test to be run is Wavelength Linearization. This provides initial wavelength locations for the sample spectrum, prior to final wavelength calibration.

Wavelength Linearization uses an internal wavelength standard set to determine a set of internal, arbitrary peak positions that the instrument will use to maintain repeatability of the wavelength response. Wavelength

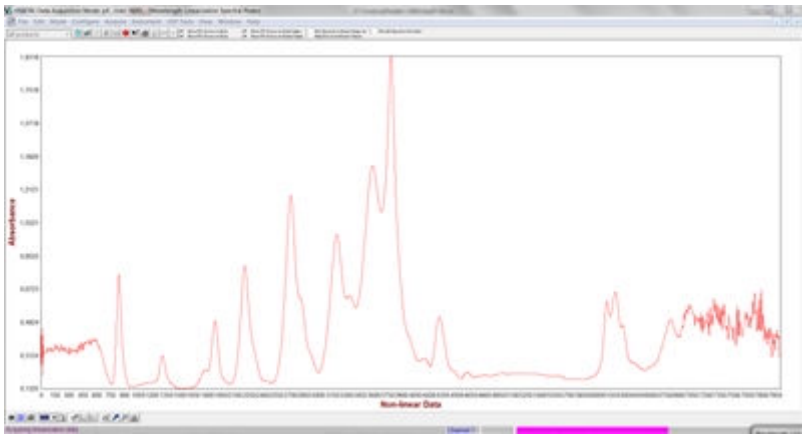
Linearization is performed on the internal reference fiber located in the XDS Process enclosure.

1 The NIR wavelength positions of these peaks appear as shown.

The scale of this display is marked in encoder pulses, which do not relate to nanometers directly.

From the peaks, a linearization is performed, which allows assignment of nanometer values. (Actual spectral shape depends on fiber configuration.)

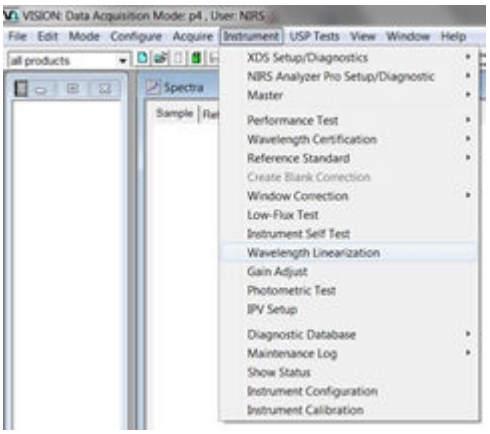
Note that the noise at the lower and upper ends of the spectrum, based upon the fiber's length used. This is normal.



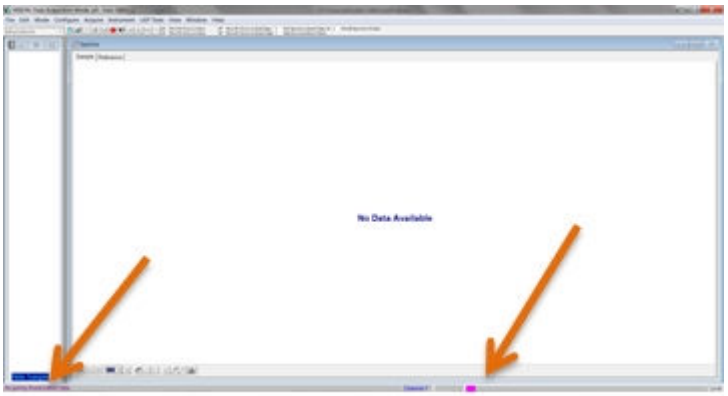
2 These peak positions are not meant to be traceable, as the wavelength calibration of the instrument is done on an external standard, at the sample plane, as given by ASTM and USP.

The internal wavelength standards are used to maintain the external wavelength registration by use of software adjustment for any external effects on the instrument.

Select Wavelength Linearization from the Instrument menu. The instrument will scan the reference, which is the fiber optic that runs from the monochromator to the detector area inside the instrument.

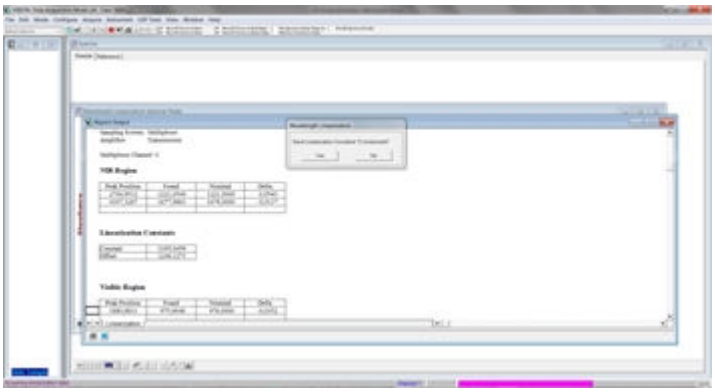


3 A message at the bottom left of the window and a progression bar indicate that the acquisition is in progress.



4 The results screen shown is typical. Peak positions for the reference materials are located using a peak-finding algorithm. These “found” peaks are compared to the nominals. Differences should be no more than 0.4 nm for any peak. Click Yes to send the linearization to the instrument.

This is done twice, one for each direction of the grating motion.



7.3.2 Reference Standardization, Interactance Reflectance

NOTE

The cleanliness of the probe window is very important when this program is run. If the window is not extremely clean, the character of the window contamination will be imparted to the reference correction. Therefore, maintain a clean window at all times.

Reference Standardization is a method to provide a virtual 100% reflectance reference at each data point, to serve as a true spectroscopic reference with no character attributable to the physical reference that is used. This will minimize spectroscopic differences between the sample fiber lengths. Reference Standardization is important to achieve a high-quality spectrum on each instrument channel, and to enhance transferability between instruments.

A photometric standard of known reflectivity (as measured on an absolute reflectance scale) is scanned on the instrument. The instrument standard is scanned. The differences of the instrument standard from 100% reflectivity are mapped, and a photometric correction is generated. This correction is then applied to every spectrum taken on the sample channel, to make each spectrum appear as if taken with a reference of 100% reflectance. This assures that bright samples do not saturate the instrument, or produce negative absorbance values.

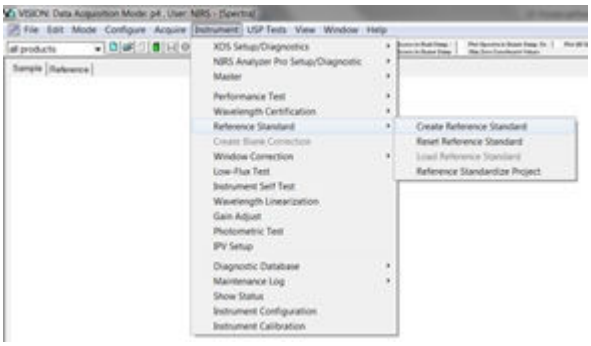
Vision software stores the Reference Standardization file, which is downloaded to the instrument, and is applied as a correction to each spectrum.

Note that Reference Standardization must have been selected under Configure, Options, for this to take effect. Once selected, a new Data Collection Method (DCM) must be created for Reference Standardization to be checked in the DCM box. It is not applied to a DCM retroactively.

When Reference Standardization is selected under Configure, Options, a Reference Standard must be created for every sample channel that is “Used” even if the probe style is not Interactance Reflectance.

Follow these steps to create a Reference Standardization on channels using Interactance Reflectance.

1 Select Instrument, Reference Standard, Create Reference Standard.



2 The instrument Configuration window pops up to make sure all settings are correct before the measurement. Click OK.

3 The Select Channel allows you to select the correct channel.

4 Vision takes an instrument reference scan.

The XDS instrument has an internal reference fiber, which is selected for this operation.

5 Vision requests that the Certified Reflectance Reference is positioned on the probe.

6 The Certified 99% Reflectance Reference is shown. It comes with a USB stick, which must be used during Reference Standardization with Interactance Reflectance probes.

The set is named RSSPxxxx, which includes the R99Pxxxx Certified Reflectance Standard, and the “Standards” files on a USB stick. The Standards USB stick contains a certified NIR spectrum, taken on a master instrument.

7 Place the Certified 99% Reflectance Reference onto the Reflectance Probe, hold in place, and click on “OK”.

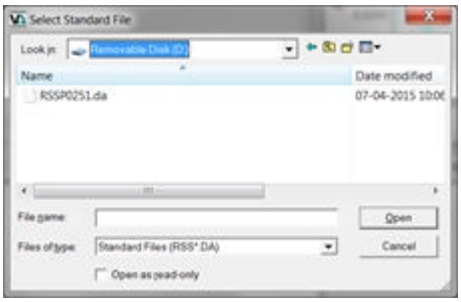
Note the orientation of the standard.

8 Vision may prompt the user to rotate the Certified 99% Reflectance Reference. It will be rotated in 90-degree increments, for a total of four scans. The four spectra are averaged, and the averaged spectrum is used for Reference Standardization. This is done to minimize the directional effects of the standard, and provide best consistency.

Note the label on the standard, and rotate 90 degrees at each prompt.

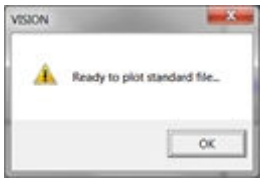
9 Vision requests the Standard File for the Certified 99% Reflectance Reference. This file is on the USB stick packed with the standard, and may be copied to the Vision directory for ease of use, as shown here.

The file is named “RSSPxxxx.da”. Click on the file, then click “Open”.



10 When finished, Vision plots a spectrum of the instrument reference.

Click OK to plot a spectrum of the Certified Reflectance Reference.



11 A correction is then plotted.

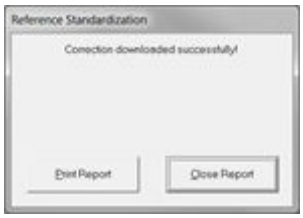
The correction spectrum represents the amount of spectral correction required to provide a virtual 100% reflectance reference at each data point.

Click OK.

12 A final spectrum is plotted to verify that the corrected spectrum produces the same results as the Certified Reflectance Reference.

13 Click “Close Report” to continue. The correction is automatically downloaded, and is saved in the Diagnostic Data Base.

The correction will be applied in real time to all spectra taken with a DCM where “Reference Standardization” is checked. This applies to all projects, using any DCM with Reference Standardization selected.



14 This must be performed for each channel which is in use in your setup.

Repeat the procedure accordingly to your setup.

7.3.3 Instrument Calibration, Interactance Reflectance

NOTE

This must be performed for each channel which is in use in your setup. Repeat the procedure accordingly to your setup.

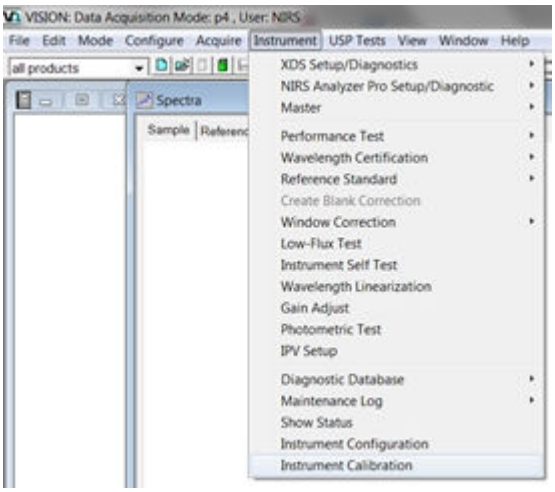
Instrument Calibration uses a traceable, stable, standard, of known wavelength response, as a method to establish the wavelength scale response of the instrument.

The instrument is set to scan the standard, and the nominal peak positions, for each major absorption peak, are determined. Vision performs an algorithm to set the peak positions of the instrument to those of the standard. These adjustments are saved, and are applied on each subsequent scan of the instrument, yielding to a correct spectrum.

This adjustment is performed in Interactance Reflectance, and applies to both Interactance Reflectance and Interactance Immersion.

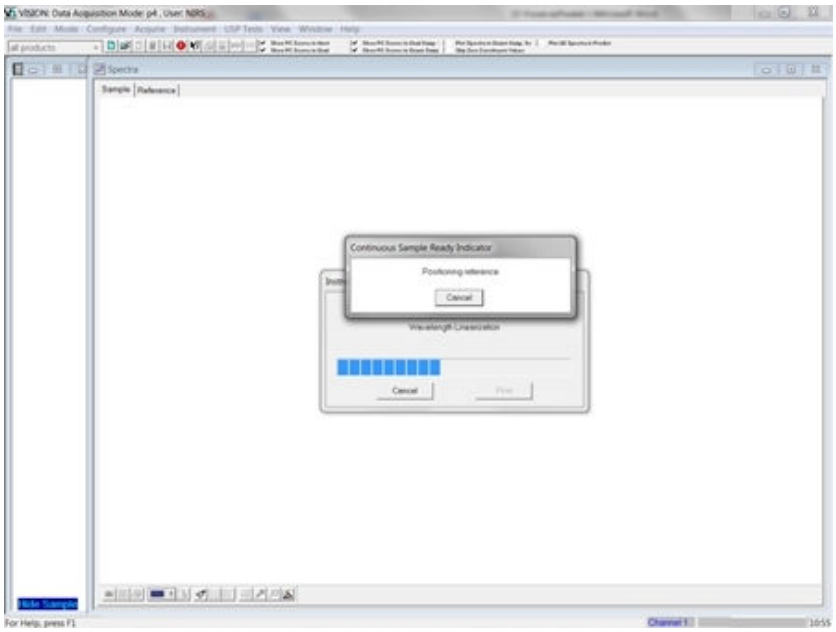
Vision takes an instrument reference, using the internal reference fiber. This takes about 20 seconds.

1 Select Instrument, Instrument Calibration



2 You are prompt to select the channel for calibration.

3 This dialog box is displayed, indicating that the instrument is positioning the reference.



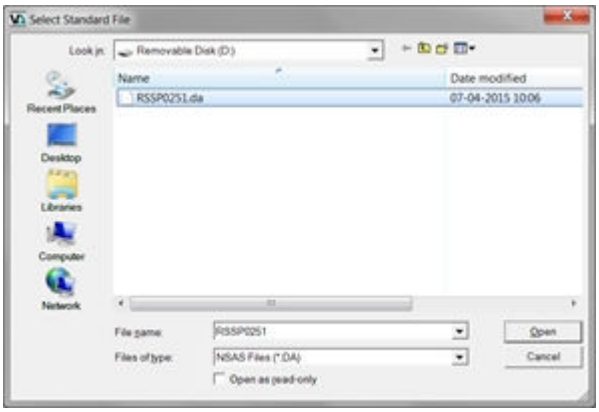
4 Next a scan is taken (on the reference) and this dialog box is displayed. This takes about 20-30 s.

Wavelength Linearization is performed in two sections, each of which takes about 15 seconds.

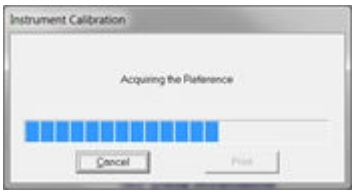
5 Following Wavelength Linearization, the user is asked to select a standard file. This is provided on the USB stick in the Certified Stand-

ard box. It may be manually copied on the computer in the Vision directory.

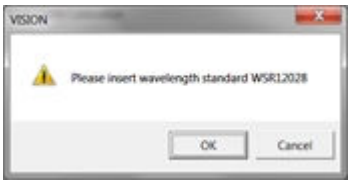
Select this file and click on “Open”.



6 This dialog box is displayed, indicating that the reference is being acquired.



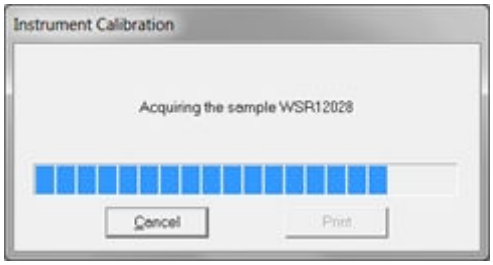
7 Vision prompts the user to position the WSRxxxxxx standard on the probe.



8 When prompted, position the WSRxxxxx Wavelength Standard Cell on the probe as shown. The label should always be in a consistent position. In this case, the bottom of the label is parallel with the holder.

Click OK to continue.

9 This test takes about 45 seconds.



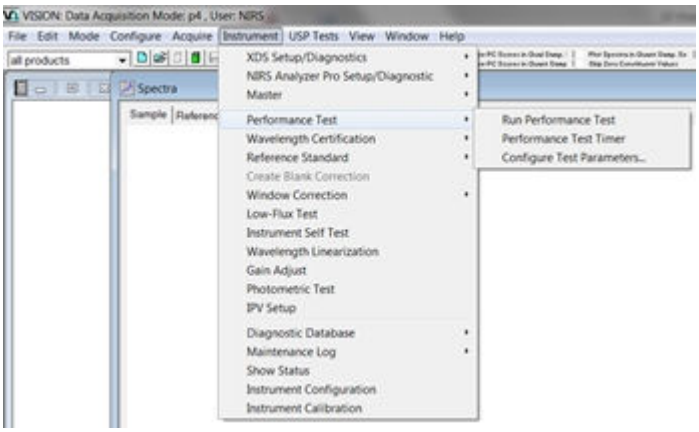
The wavelength response for each defined peak is adjusted, to assure precise wavelength registration between instruments. At the same time, bandwidth (bandpass) is measured, and is iteratively adjusted to an optimum value for the peaks measured. This is performed to assure good agreement from instrument to instrument, should multiple instruments be used for analysis of similar products. This calibration is needed to insure calibration transfer, as peak shapes may be slightly affected by fiber length.

At the end of the test a dialog box is displayed indicating the status of the calibration (passed or failed). If a hard copy of the calibration is desired, click on Print.

Click OK to exit Instrument Calibration.

7.3.4 Performance Test, Interactance Reflectance

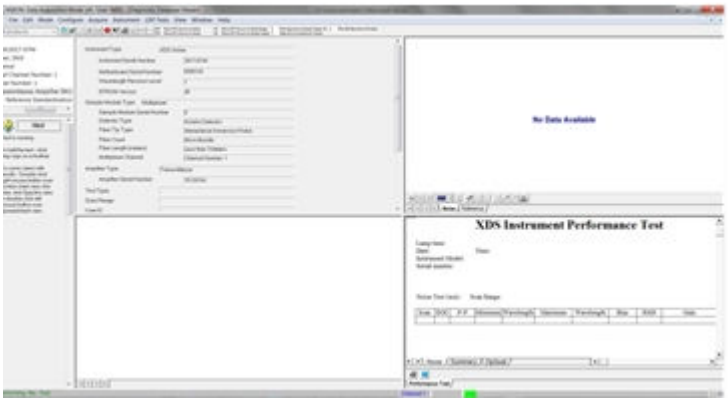
1 Select Performance Test from the Instrument menu bar.



2 Select the channel to be used for the test.

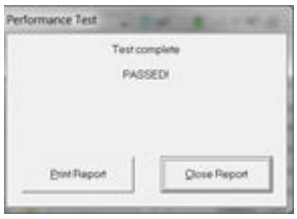
In this case, we select “SAMPLE”. The 99% Certified Reflectance Standard must be on the probe for this test.

3 Vision provides a split-screen display that details instrument performance. The lower right quadrant shows tabulated data. Double-click to enlarge this screen to full size. When the test is complete, tabs show results.



4 At the end of the test a dialog box is displayed indicating the status of the performance test (passed or failed). If a hard copy of the test is desired, click on Print Report.

Click Close Report to exit the Performance Test.



7.4 Interactance Immersion Probe Tests

NOTE

The tests in this section apply specifically to Interactance Immersion Probes. Do not use the same procedures on other styles of probe. See the proper section for each style of probe used.

The Interactance Immersion Probe is quite similar to the Interactance Reflectance Probe. It uses the same type of fiber bundle with concentric light paths. The only difference is the "lens barrel" which directs the light in a different geometry. Because this is the only difference, many of the adjustments and tests are the same as those done for the Interactance Reflectance Probe.

7.4.1 Wavelength Linearization, Interactance Immersion

The first test to be run is Wavelength Linearization. This provides initial wavelength locations for the sample spectrum, prior to final wavelength calibration. Wavelength Linearization is performed on the internal reference fiber located in the XDS Process enclosure.

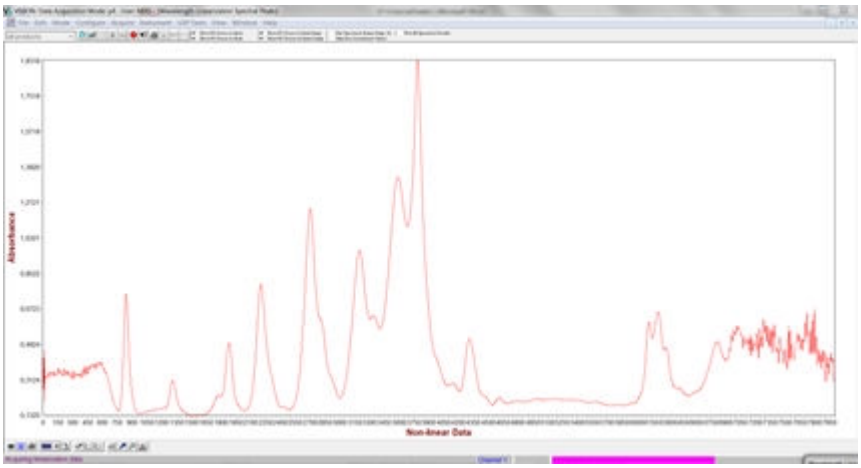
Wavelength Linearization uses an internal wavelength standard set to determine a set of internal, arbitrary peak positions that the instrument will use to maintain repeatability of wavelength response.

1 The NIR wavelength positions of these peaks appear as shown.

The scale of this display is marked in encoder pulses, which do not relate to nanometers directly.

From the peaks, a linearization is performed, which allows assignment of nanometer values. (Actual spectral shape depends on fiber configuration.)

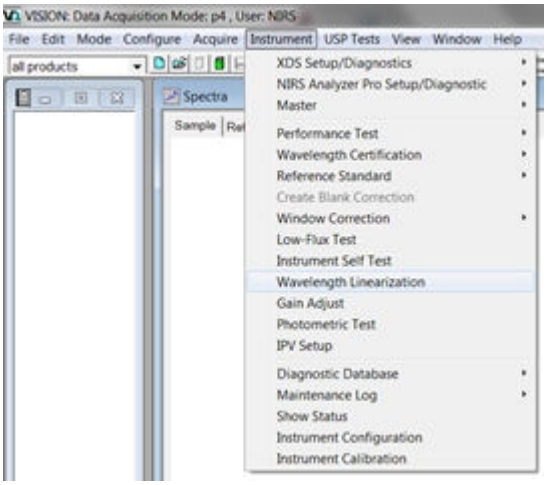
Note that the noise at the lower and upper ends of the spectrum, based upon the fiber's length used. This is normal.



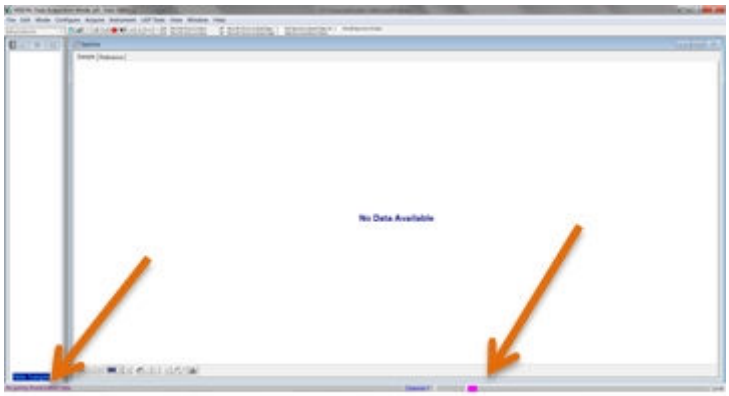
2 These peak positions are not meant to be traceable, as the wavelength calibration of the instrument is done on an external standard, traceable to NIST.

The internal wavelength standards are used to maintain the external wavelength registration by use of software adjustment for any external effects on the instrument.

Select Wavelength Linearization from the Instrument menu. The instrument will scan the reference, which is the fiber optic that runs from the monochromator to the detector area inside the instrument.

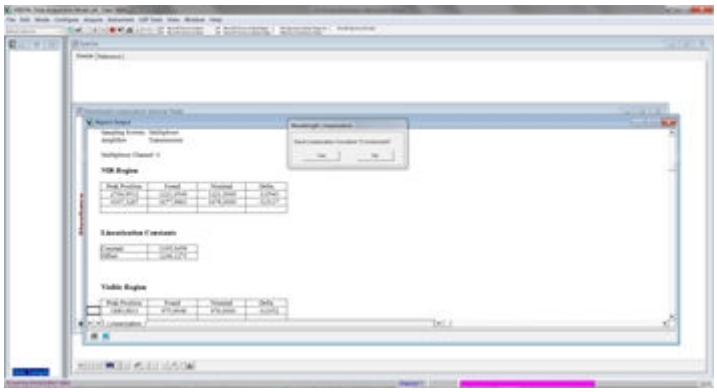


3 A message at the bottom left of the window and a progression bar indicate that the acquisition is in progress.



4 The results screen shown is typical. Peak positions for the reference materials are located using a peak-finding algorithm. These “found” peaks are compared to the nominals. Differences should be no more than 0.4nm for any peak. Click “Yes” to send the linearization to the instrument.

This is done twice, one for each direction of the grating motion.



7.4.2 Reference Standardization, Interactance Immersion

Reference Standardization is a method to provide a virtual 100% reflectance reference at each data point, to serve as a true spectroscopic reference with no character attributable to the physical reference that is used. In a process environment, this will minimize differences between the sample fiber lengths, and to the internal reference fiber. Reference Standardization is important to achieve a high-quality spectrum on each instrument, and to enhance transferability between instruments.

When using the Interactance Immersion Probe, Reference Standardization is performed using an Interactance Reflectance barrel. Following all calibration steps, the Interactance Reflectance barrel is removed, and the Interactance Immersion barrel is installed. A final "Window Correction" is performed, which adjusts the optical response to the Interactance Immersion configuration. This provides a reliable method of calibration, without requiring that the probe barrel be removed from pressure vessels or reactors. Window Correction is performed only at initial set-up, and is considered a constant correction factor thereafter.

A photometric standard of known reflectivity (as measured on an absolute reflectance scale) is scanned on the instrument. The instrument standard is scanned. The differences of the instrument standard from 100% reflectivity are mapped, and a photometric correction is generated. This correction is then applied to every spectrum taken on the sample channel, to make each spectrum appear as if taken with a reference of 100% reflectance. This assures that bright samples do not saturate the instrument, or produce negative absorbance values.

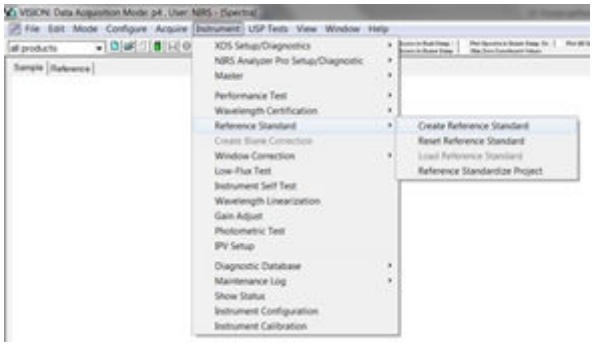
Vision software stores the Reference Standardization file, which is downloaded to the instrument, and is applied as a correction to each spectrum.

Note that Reference Standardization must have been selected under Configure, Options, for this to take effect. Once selected, a new Data Collection Method (DCM) must be created for Reference Standardization to be checked in the DCM box. It is not applied to a DCM retroactively.

When Reference Standardization is selected under Configure, Options, a Reference Standard must be created for every sample channel that is "Used" even if the probe style is not Interactance Immersion. See the sections on these probes for full information.

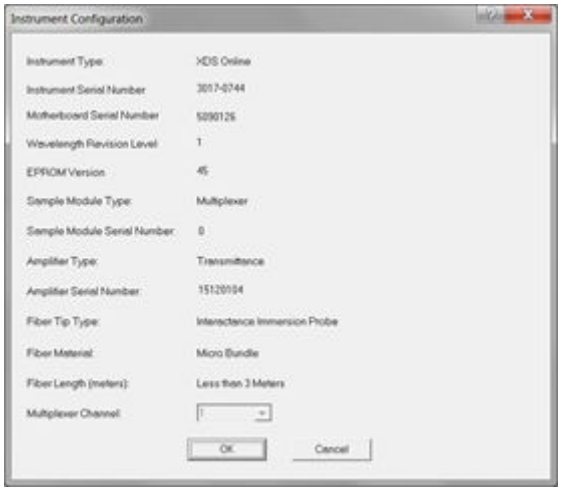
Follow these steps to create a Reference Standardization on channels using Interactance Reflectance.

1 Select Instrument, Reference Standard, Create Reference Standard.



2 The instrument Configuration window pops up to make sure all settings are correct before the measurement.

Click OK.



3 The Select Channel allows you to select the correct channel.

4 Vision takes an instrument reference scan.

The XDS instrument has an internal reference fiber, which is selected for this operation.

5 Vision requests that the Certified Reflectance Reference is positioned on the probe.

6 The Certified 99% Reflectance Reference is shown. It comes with a USB stick, which must be used during Reference Standardization with Interactance Reflectance probes.

The set is named RSSPxxxx, which includes the R99Pxxxx Certified Reflectance Standard, and the “Standards” files on a USB stick. The Standards USB stick contains a certified NIR spectrum, taken on a master instrument.

7 Place the Certified 99% Reflectance Reference onto the Reflectance Probe, hold in place, and click on “OK”.

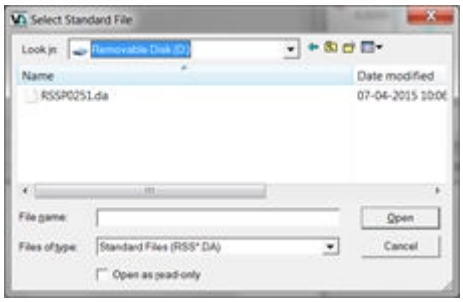
Note the orientation of the standard.

8 Vision may prompt the user to rotate the Certified 99% Reflectance Reference. It will be rotated in 90-degree increments, for a total of four scans. The four spectra are averaged, and the averaged spectrum is used for Reference Standardization. This is done to minimize the directional effects of the standard, and provide best consistency.

Note the label on the standard, and rotate 90 degrees at each prompt.

9 Vision requests the Standard File for the Certified 99% Reflectance Reference. This file is on the USB stick packed with the standard, and may be copied to the Vision directory for ease of use, as shown here.

The file is named “RSSPxxxx.da”. Click on the file, then click “Open”.



10 When finished, Vision plots a spectrum of the instrument reference.

Click OK to plot a spectrum of the Certified Reflectance Reference.

11 A correction is then plotted. T

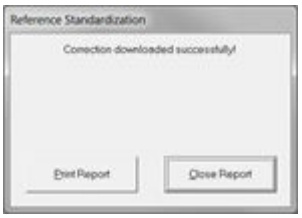
he correction spectrum represents the amount of spectral correction required to provide a virtual 100% reflectance reference at each data point.

Click OK.

12 A final spectrum is plotted to verify that the corrected spectrum produces the same results as the Certified Reflectance Reference.

13 Click “Close Report” to continue. The correction is automatically downloaded, and is saved in the Diagnostic Data Base.

The correction will be applied in real time to all spectra taken with a DCM where “Reference Standardization” is checked. This applies to all projects, using any DCM with Reference Standardization selected.



14 This must be performed for each channel which is in use in your setup.

Repeat the procedure accordingly to your setup.

Note that cleanliness of the probe window is very important when this program is run. If the window is not extremely clean, the character of the window contamination will be imparted to the reference correction. Therefore, maintain a clean window at all times.

The Interactance Reflectance Probe Barrel should be left in place for Instrument Calibration, which follows.

7.4.3 Instrument Calibration, Interactance Immersion

NOTE

This must be performed for each channel which is in use in your setup.

Repeat the procedure accordingly to your setup.

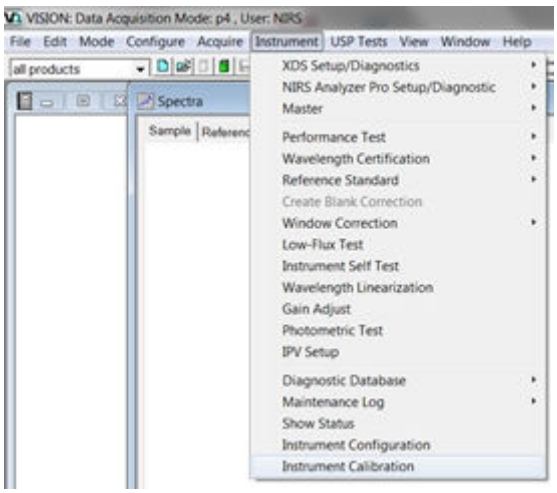
Instrument Calibration uses a traceable, stable, standard, of known wavelength response, as a method to establish wavelength scale response of the instrument.

The instrument is set to scan the standard, and the nominal peak positions for each major absorption are determined. Vision performs an algorithm to set the peak positions of the instrument to those of the standard. These adjustments are saved, and are applied on each subsequent scan of the instrument, yielding a correct spectrum.

This adjustment is performed using the Interactance Reflectance probe barrel supplied, and applies to both Interactance Reflectance and Interactance Immersion. (The DCM for Interactance Immersion may be used for this operation.)

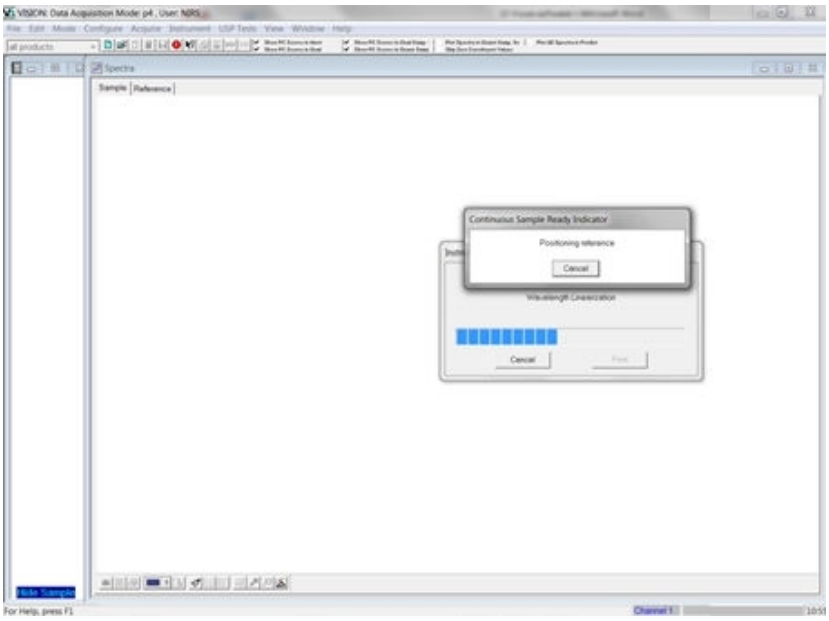
Vision takes an instrument reference, using the internal reference fiber. This takes about 20 seconds.

1 Select Instrument, Instrument Calibration



2 You are prompt to select the channel for calibration.

3 This dialog box is displayed, indicating that the instrument is positioning the reference.

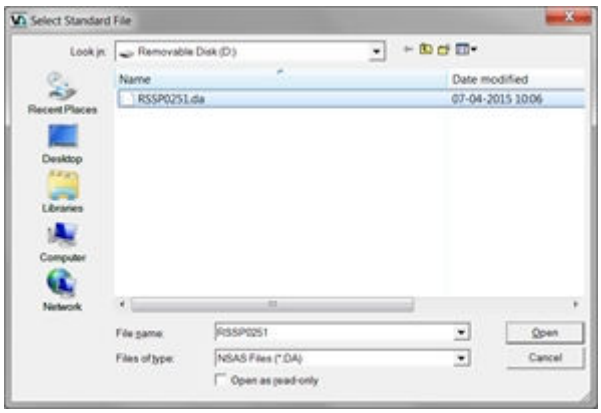


4 Next a scan is taken (on the reference) and this dialog box is displayed. This takes about 20-30 s.

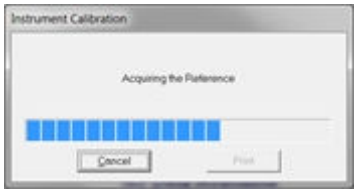
Wavelength Linearization is performed in two sections, each of which takes about 15 seconds.

5 Following Wavelength Linearization, the user is asked to select a standard file. This is provided on the USB stick in the Certified Standard box. It may be manually copied on the computer in the Vision directory.

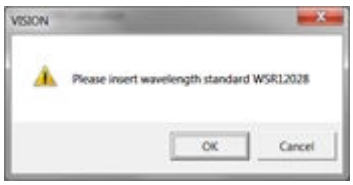
Select this file and click on “Open”.



6 This dialog box is displayed, indicating that the reference is being acquired.



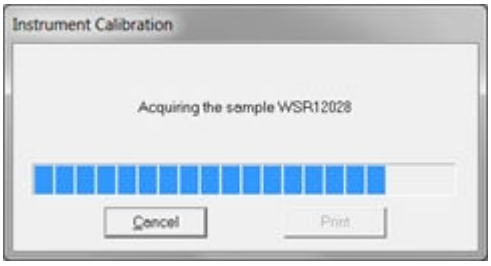
7 Vision prompts the user to position the WSRxxxxxx standard on the probe.



8 When prompted, position the WSRxxxxx Wavelength Standard Cell on the probe as shown. The label should always be in a consistent position. In this case, the bottom of the label is parallel with the holder.

Click OK to continue.

9 This test takes about 45 seconds.



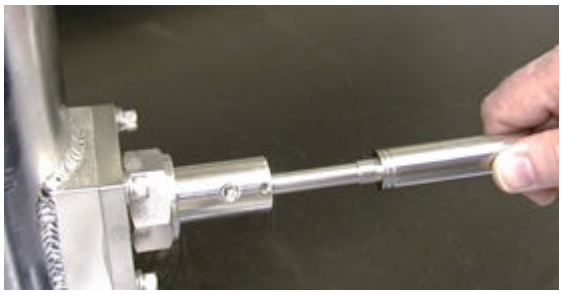
The wavelength response for each defined peak is adjusted, to assure precise wavelength registration between instruments. At the same time, bandwidth (bandpass) is measured, and is iteratively adjusted to an optimum value for the peaks measured. This is performed to assure good agreement from instrument to instrument, should multiple instruments be used for analysis of similar products. This calibration is needed to insure calibration transfer, as peak shapes may be slightly affected by fiber length.

At the end of the test a dialog box is displayed indicating the status of the calibration (passedor failed). If hard copy of the calibration is desired, click on Print.

Click OK to exit Instrument Calibration.

7.4.4 Window Correction, Interactance Immersion

Window Correction is a method to permit the user to calibrate the fiber optics using an Interactance Reflectance Probe. Insert the fiber into the Interactance Immersion Probe, and map the optical difference in response between the two geometries.



This window correction method offers a large advantage to users running with a probe barrel permanently installed in a reactor or other vessel. At initial set-up, the window difference is measured and stored in the instrument by channel.

At periodic maintenance intervals, the fiber optic bundle can be removed from the barrel, which is now permanently installed.

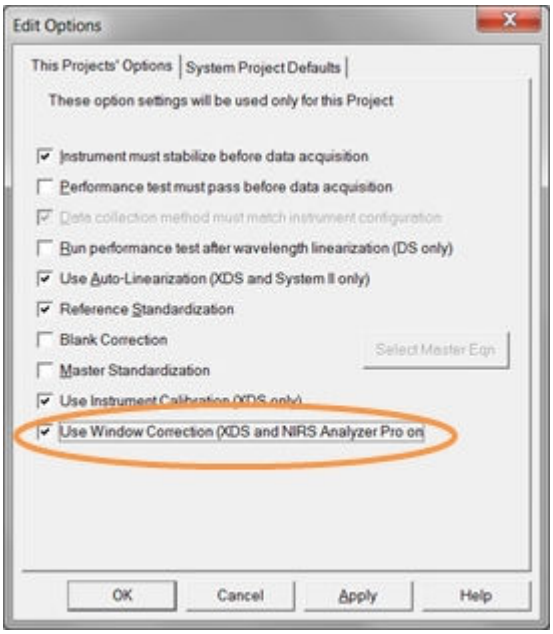
The instrument and fiber optic bundle can be calibrated for wavelength and Reference Standardized response, without using the Interactance Immersion barrel. After this is done, the fiber optic bundle is put back into the permanently installed barrel, and the Window Correction is re-applied. This assures consistent response, without removing the barrel.

The instrument and fiber optics can be calibrated for wavelength and Reference Standardized response, without using the Interactance Immersion Probe barrel. The Interactance Reflectance probe barrel is used instead. After this is done, the fiber optic bundle is put back into the permanently installed Interactance Immersion barrel, and the Window Correction is re-applied. This assures consistent response, without removing the barrel from the process.

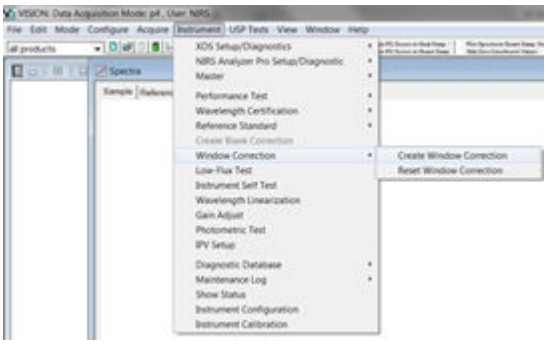
Because the spectroscopic response of various fibers is dependent upon length and other factors, screens will not be shown. Instead, the message boxes are given, in the order in which they appear. Be sure the fiber probe end is securely installed into the barrel (outer probe part) and proceed using this set of instructions.

1 Window correction must be enabled under Configure, Options.

When enabled, a new DCM must be created for Window Correction to take effect.



2 From the Instrument menu, select Window Correction, Create Window Correction.

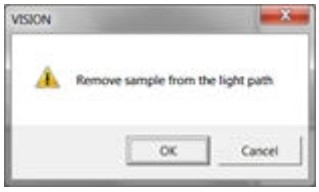


3 You are prompt to select the channel for calibration.

4 Vision provides a split-screen display that details instrument performance. The lower right quadrant shows tabulated data. Double-click to enlarge this screen to full size. When the test is complete, tabs shows results.

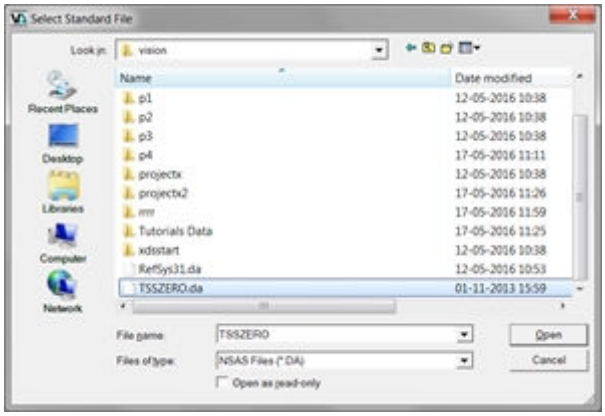
5 If not, remove any samples which might be present in the light path.

Click OK.



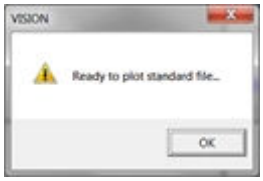
6 Vision requests a standard file (TSSZERO.da). Select the file shown, from the C:\Vision directory.

This file corrects the fiber optic path for the effects of the barrel (window) being installed.



7 The TSSZERO file is ready to be plotted. The spectrum is a flat line at 0 AU.

Click “OK”.



8 A correction is then plotted.

The correction spectrum represents the amount of spectral correction required to provide a virtual 100% reflectance reference at each data point.

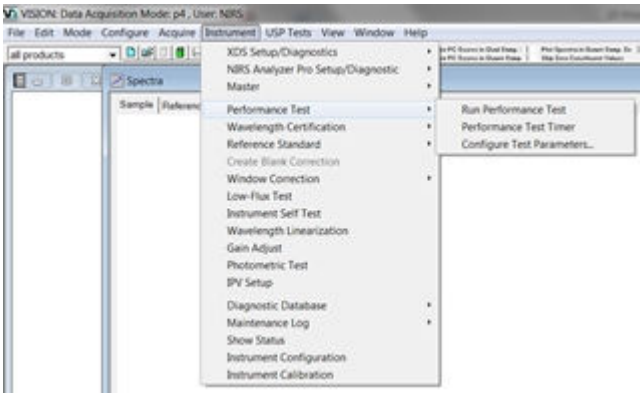
Click OK.

9 A final spectrum is plotted to verify that the corrected spectrum produces the same results as the Certified Reflectance Reference.

10 When finished, the user may print the report. Next, click on “Close Report” to finish.

7.4.5 Performance Test, Interactance Immersion

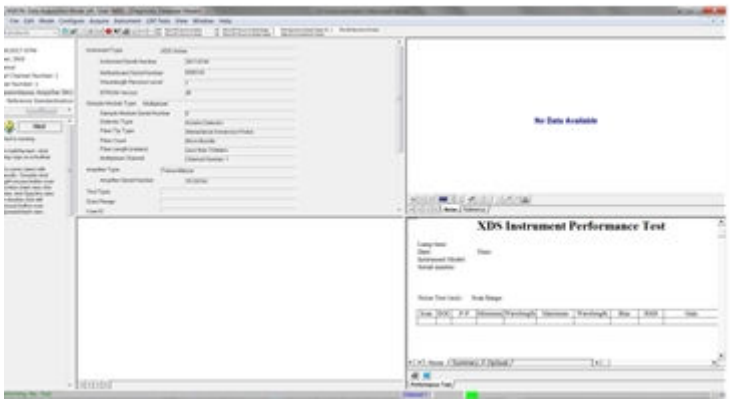
1 Select Performance Test from the Instrument menu bar.



2 Select the channel to be used for the test.

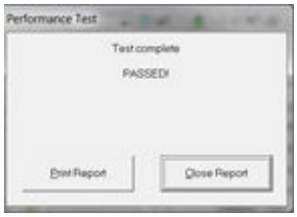
In this case, we select “SAMPLE”. The 99% Certified Reflectance Standard must be on the probe for this test.

3 Vision provides a split-screen display that details instrument performance. The lower right quadrant shows tabulated data. Double-click to enlarge this screen to full size. When the test is complete, tabs shows results.



4 At the end of the test a dialog box is displayed indicating the status of the performance test (passed or failed). If a hard copy of the test is desired, click on Print Report.

Click Close Report to exit the Performance Test.



7.5 Transmission Probe Tests

The tests in this section apply specifically to Transmission Probes. Do not use the same procedures on other styles of probe. See the proper section for each style of probe used.

The Transmission Probes require special methods of calibration. One fiber bundle carries “white light” from the instrument to the sample. The other fiber bundle is used to return light to the instrument, to be broken down in the monochromator to individual wavelengths, and then measured for spectral response. Absorbance of the sample is then determined.

7.5.1 Wavelength Linearization, Transmission Probes

The first test to be run is Wavelength Linearization. This provides initial wavelength locations for the sample spectrum, prior to final wavelength calibration.

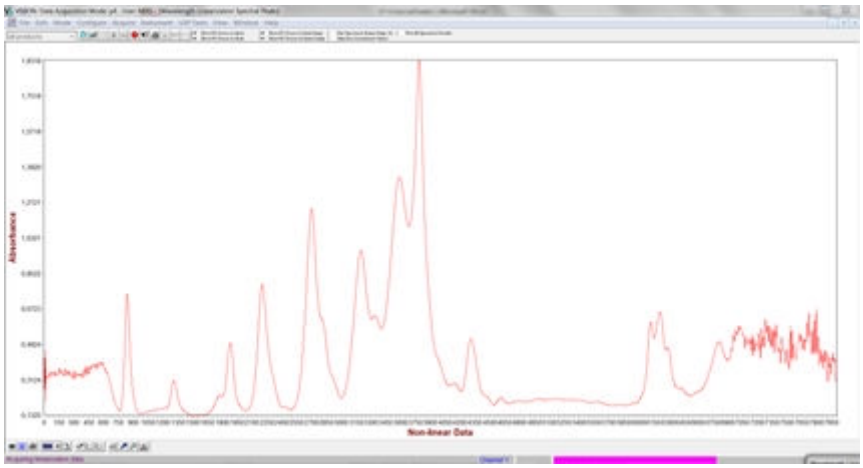
Wavelength Linearization uses an internal wavelength standard set to determine a set of internal, arbitrary peak positions that the instrument will use to maintain repeatability of wavelength response. Wavelength Linearization is performed on the internal reference fiber located in the XDS Process enclosure.

1 The NIR wavelength positions of these peaks appear as shown.

The scale of this display is marked in encoder pulses, which do not relate to nanometers directly.

From the peaks, a linearization is performed, which allows assignment of nanometer values. (Actual spectral shape depends on fiber configuration.)

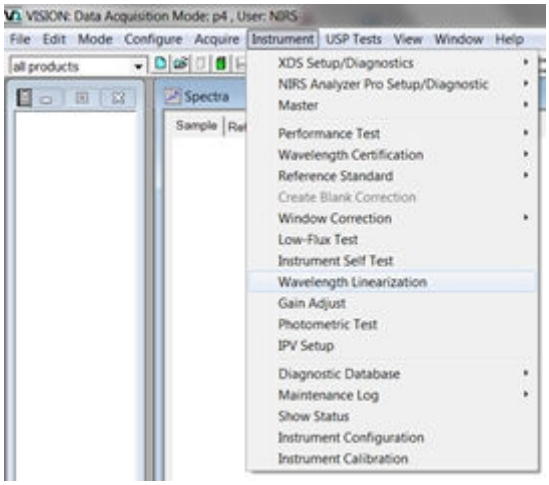
Note that the noise at the lower and upper ends of the spectrum, based upon the fiber’s length used. This is normal.



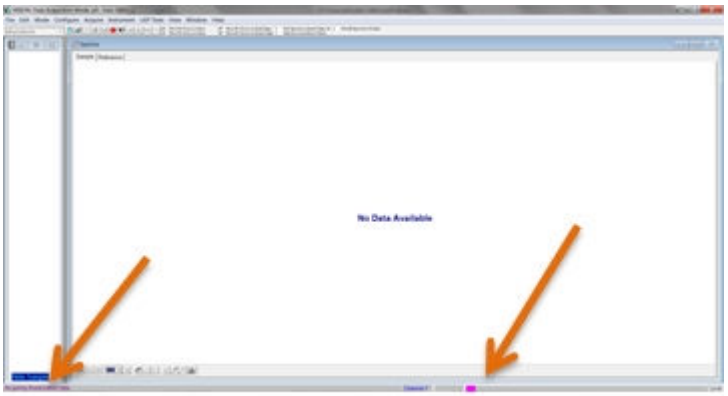
2 These peak positions are not meant to be traceable, as the wavelength calibration of the instrument is done on an external standard, traceable to NIST.

The internal wavelength standards are used to maintain the external wavelength registration by use of software adjustment for any external effects on the instrument.

Select Wavelength Linearization from the Instrument menu. The instrument will scan the reference, which is the fiber optic that runs from the monochromator to the detector area inside the instrument.

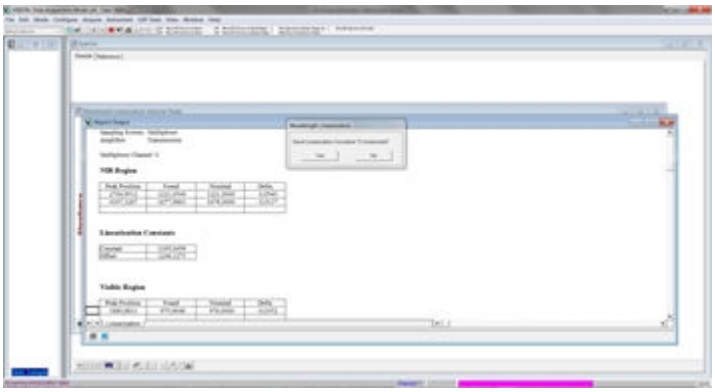


3 A message at the bottom left of the window and a progression bar indicate that the acquisition is in progress.



4 The results screen shown is typical. Peak positions for the reference materials are located using a peak-finding algorithm. These “found” peaks are compared to the nominals. Differences should be no more than 0.4nm for any peak. Click “Yes” to send the linearization to the instrument.

This is done twice, one for each direction of the grating motion.



7.5.2 Reference Standardization, Transmission Probes

Reference Standardization with Transmission Probes uses an innovative means to adjust each channel to a repeatable and transferable level of spectroscopic response. The fiber ends are placed into a fixture, the response is measured, and the signal is “normalized” using a spectral correction.

When Reference Standardizing, the fixture holds the two probes in alignment, at a pre-determined distance.

The optical response of the air gap is measured and stored. A correction is applied, to bring the channel to “0 Absorbance” in transmission, corresponding to the response of an air reference.

The fixture is also used in Instrument Calibration.

Follow these instructions to perform Reference Standardization:

NOTE

This must be performed for each channel which is in use in your setup.

Repeat the procedure accordingly to your setup.

1 For Single fibers, connect the SMA connectors to the fixture as shown on the picture:

For microbundle, slide the fiber barrels into the holes of the fixture until it stops, as shown on the picture. Tighten the orange thumb-screws gently.

2

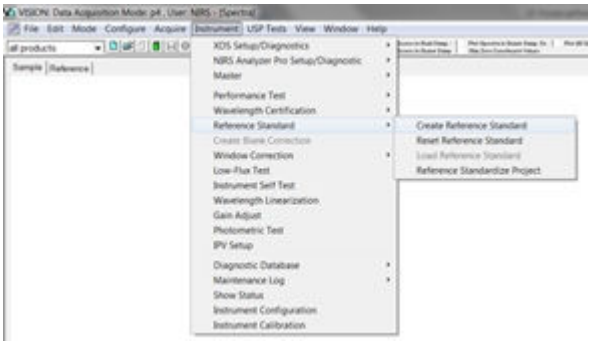
CAUTION

Do not insert the WST3WCAL standard. Nothing is to be placed in between the fibers during reference standardization.

With the fibers on both side well positioned, cover the center area as shown on the picture to prevent stray light from affecting the Refer-

ence Standardization. No cover is provided for the single fibers fixture.

3 Select Instrument, Reference Standard, Create Reference Standard.



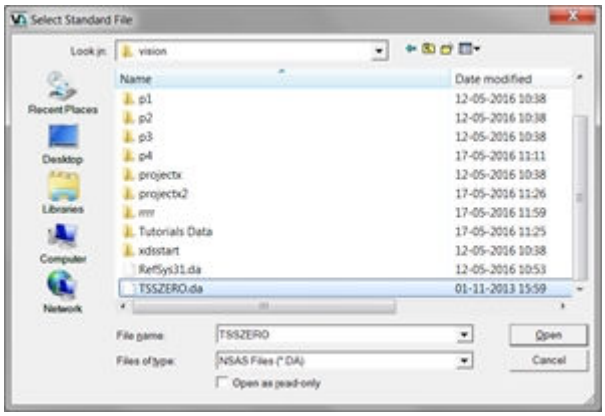
4 The instrument Configuration window pops up to make sure all settings are correct before the measurement.

Click OK.

5 You are prompt to select the channel for calibration.

6 Vision requests that the correction file be located. It is in the C:\Vision directory.

Select the file “TSSZERO.da” and click “Open.”



7 Once the file is selected, Vision applies the correction to sample spectra taken with this channel. This method enhances transferability of samples from one channel (of a given probe geometry) to another.

Click “Close Report” to proceed.

Note that cleanliness of the probe window is very important when this program is run. If the window is not extremely clean, the character of the window contamination will be imparted to the reference correction. Therefore, maintain a clean window at all times.

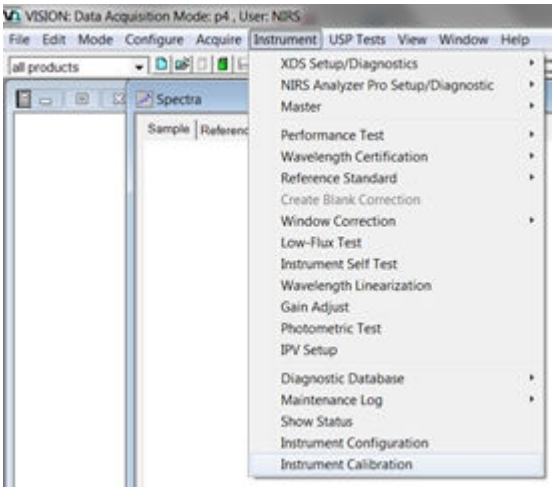
7.5.3 Instrument Calibration, Transmission Probes

Instrument Calibration uses a traceable, stable, standard, of known wavelength response, as a method to establish wavelength scale response of the instrument. The instrument is set to scan the standard, and the nominal peak positions for each major absorption are determined. Vision performs an algorithm to set the peak positions of the instrument to those of the standard. These adjustments are saved, and are applied on each subsequent scan of the instrument, yielding a correct spectrum.

NOTE

This must be performed for each channel which is in use in your setup. Repeat the procedure accordingly to your setup.

1 Select Instrument, Instrument Calibration



2 You are prompt to select the channel for calibration.

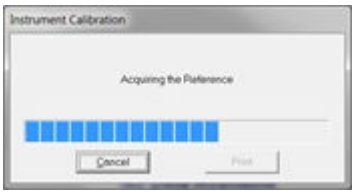
3 The calibration set for Transmission is composed of standard filter and a USB stick containing the files for calibration.

4 This dialog box is displayed, indicating that the instrument is positioning the reference.

5 Next a scan is taken (on the reference) and this box is displayed. This takes about 20-30 seconds.

Wavelength Linearization is performed in two sections, each of which takes about 15 seconds.

6 This dialog box is displayed, indicating that the reference is being acquired.



7 For single fibers:

Vision prompts the user to position the single fibers in the fixture as shown.

To avoid stray light reaching the probes, the center area may be covered to avoid light infiltration. When prompted, position the WST3xxxx.

Click “OK” to continue. This test takes about 45 seconds.

8 For microbundle:

Vision prompts the user to position the probes in the fixture as shown.

Click “OK” to continue. This test takes about 45 seconds.

The wavelength response for each defined peak is adjusted, to assure precise wavelength registration between instruments. At the same time, bandwidth (bandpass) is measured, and is iteratively adjusted to an optimum value for the peaks measured. This is performed to assure good agreement from instrument to instrument, should multiple instruments be used for analysis of similar products. At the end of the test this dialog box is displayed. Click “OK” to exit Instrument Calibration

7.5.4 Window Correction, Transmission Probes

Window Correction is a method to permit the user to calibrate the fiber optics using a calibration fixture. Next, the fibers are inserted into the barrels, and the optical differences are mapped. This gives a clear, repeatable measure of the optical difference between the two geometries.

This window correction method offers a large advantage to users running with probe barrels permanently installed in a reactor or other vessel. At initial set-up, the window difference is measured and stored in Vision.

At periodic maintenance intervals, the fiber optic bundles can be removed from the barrels, which are now permanently installed.

The instrument and fiber optics can be calibrated for wavelength and Reference Standardized response, without using the Transmission Probe barrels. After this is done, the fiber optic bundles are put back into the permanently installed barrels, and the Window Correction is re-applied. This assures consistent response, without removing the barrels.

Because the spectroscopic response of various fibers is dependent upon length and other factors, screens will not be shown. Instead, the message boxes are given, in the order in which they appear. Be sure the fiber probe ends are securely installed into the barrels (outer probe part) and proceed using this set of instructions.

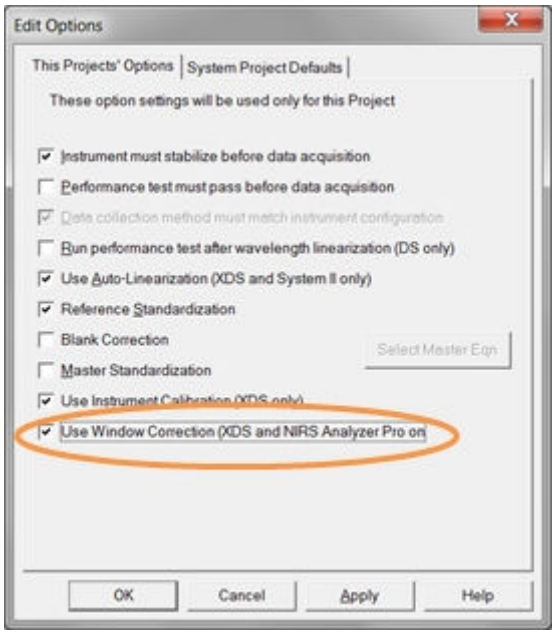
NOTE

This must be performed for each channel which is in use in your setup.

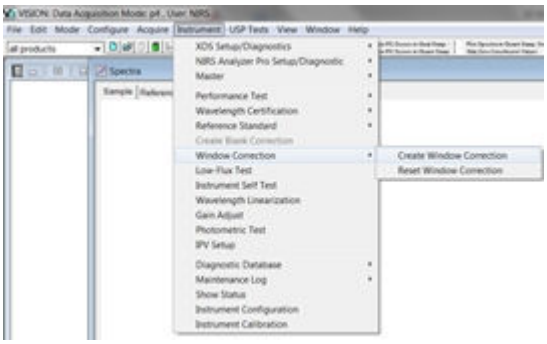
Repeat the procedure accordingly to your setup.

1 Window correction must be enabled under Configure, Options.

When enabled, a new DCM must be created for Window Correction to take effect.



2 From the Instrument menu, select Create Window Correction.



3 The instrument Configuration window pops up to make sure all settings are correct before the measurement.

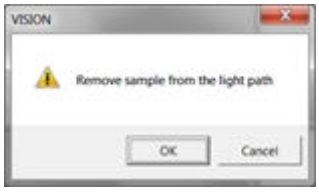
Click OK.

4 You are prompt to select the channel for calibration.

5 Vision provides a split-screen display that details instrument performance. The lower right quadrant shows tabulated data. Double-click to enlarge this screen to full size. When the test is complete, tabs shows results.

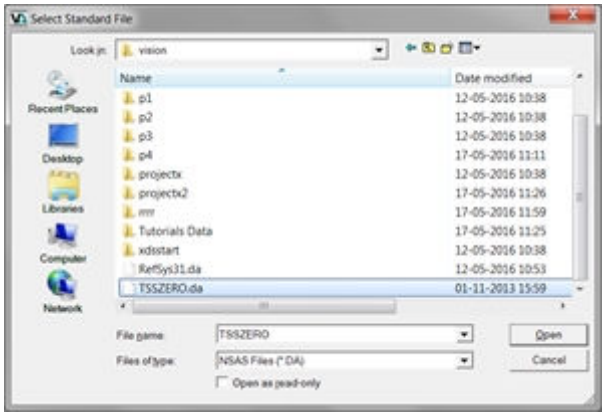
6 If not, remove any samples which might be present in the light path.

Click OK.



7 Vision requests a standard file (TSSZERO.da). Select the file shown, from the C:\Vision directory.

This file corrects the fiber optic path for the effects of the barrel (window) being installed.



8 The TSSZERO file is ready to be plotted. The spectrum is a flat line at 0 AU.

Click “OK”.

9 A correction is then plotted.

The correction spectrum represents the amount of spectral correction required to provide a virtual 100% reflectance reference at each data point.

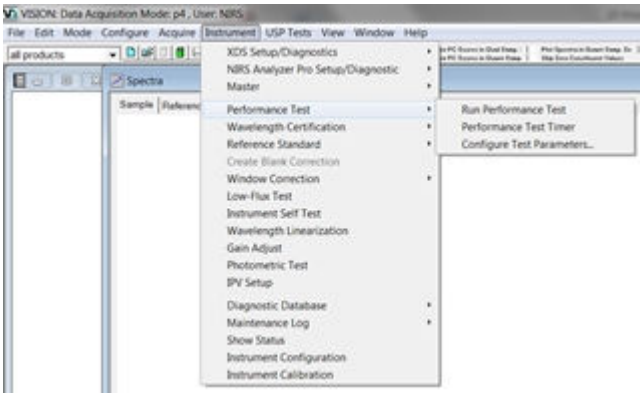
Click OK.

10 A final spectrum is plotted to verify that the corrected spectrum produces the same results as the Certified Reflectance Reference.

11 When finished, the user may print the report. Next, click on “Close Report” to finish.

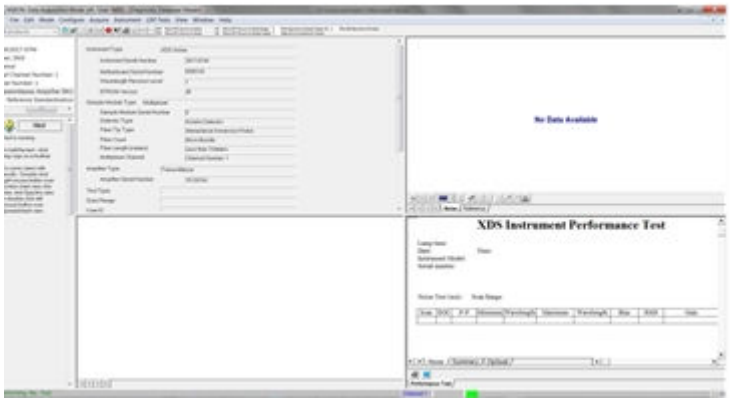
7.5.5 Performance Test, Transmission Probes

1 Select Performance Test from the Instrument menu bar.



2 You are prompt to select the channel for calibration.

3 Vision provides a split-screen display that details instrument performance. The lower right quadrant shows tabulated data. Double-click to enlarge this screen to full size. When the test is complete, tabs shows results.



8 Maintenance of the Instrument

The XDS Process Analytics Instrument is designed to be trouble-free, with a minimum of maintenance. These guidelines should always be followed:

1. Keep the outer enclosure as clean as possible, to maintain heat transfer characteristics.

2. Do not allow dirt buildup in the heat sink fins. These should be blown clear of any dirt or obstructions on a regular basis.

3. Be extremely careful of the fiber optic bundles. They are easily damaged by impact, bending too tightly, and by physical abuse. This will affect measurement sensitivity and may be catastrophic. Fiber optic replacement is expensive.

4. Consider lamp replacement on a regular schedule that coincides with normal factory downtime. Lamp life is expected to be in excess of 4000 hours. However, when running 24 hours per day, it is advisable to change lamps pro-actively to avoid unscheduled shutdowns.

5. Always keep one or two spare lamps on hand for unexpected emergencies.

8.1 Lamp Replacement

Lamp replacement is quite simple with the XDS Process Analyzer. Lamp replacement should normally be scheduled at factory shutdown intervals, to avoid unexpected downtime during peak production. Lamp instructions are as follows

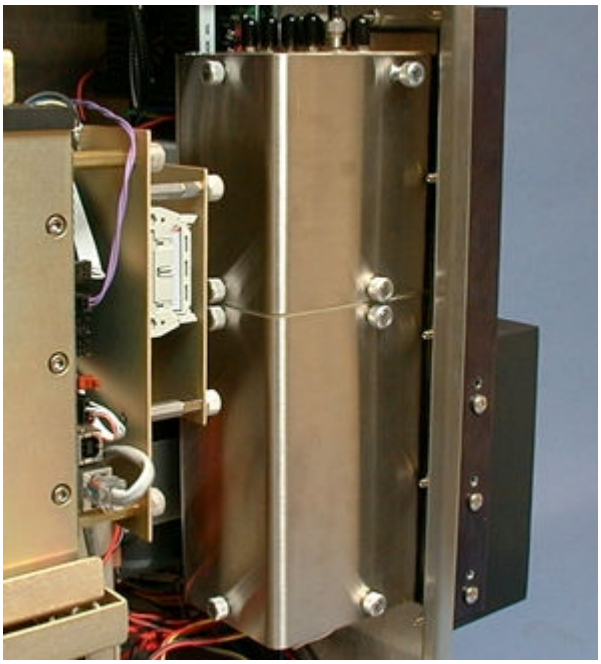
1. Shut off AC Power to the instrument. If the location has a “Lockout Policy” it must be followed.

2 Using the triangle shaped key provided in the accessory kit, open the door latches. Turn counter-clockwise to open.

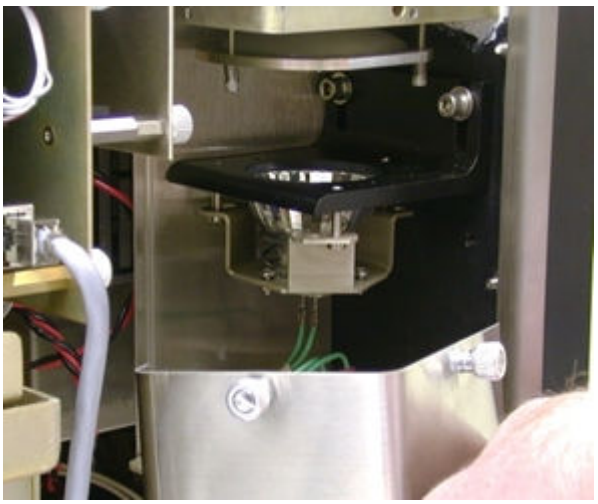
3 The lamp may be very warm. Give it at least 15-20 minutes to cool down before attempting replacement.

The lamp housing is the stainless steel cover at in the lower part of this photo. Note the four (4) captive thumbscrews.

When the housing is cool to the touch, loosen the four thumb-screws.

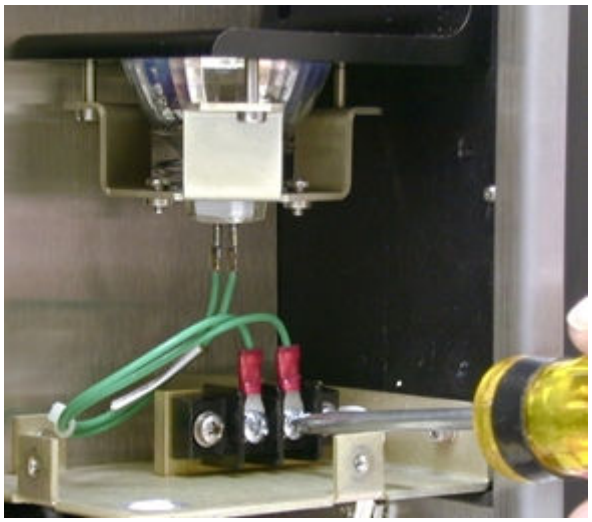


4 Carefully lift the cover off as shown. The lamp is now visible.



5 Loosen the two lamp screw terminals. Slide the lugs out from under the screws.

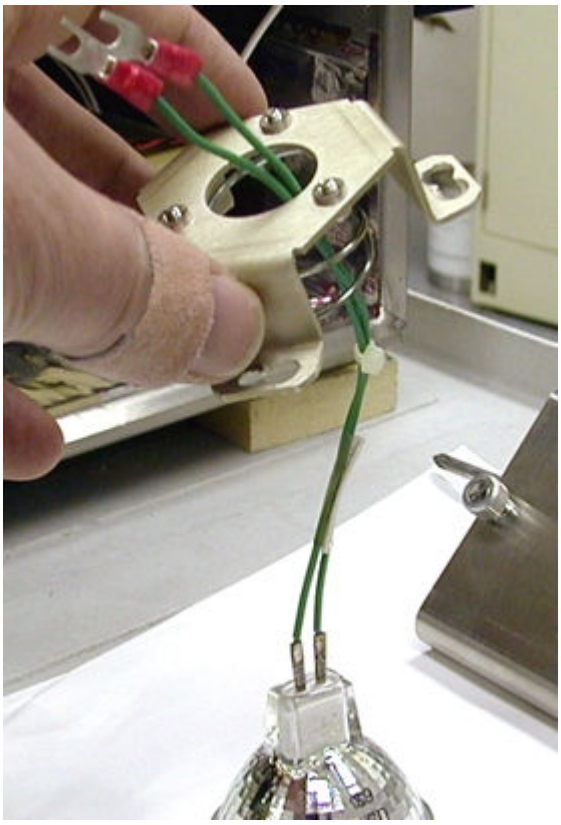
Do not remove the screws from the terminal strip.



6 Twist the lamp retaining ring to the right, and lower it from the heads of the shoulder screws.

Remove the lamp assembly from the instrument.

7 Carefully remove the ring from the lamp wires. This ring will be re-used with the new lamp.

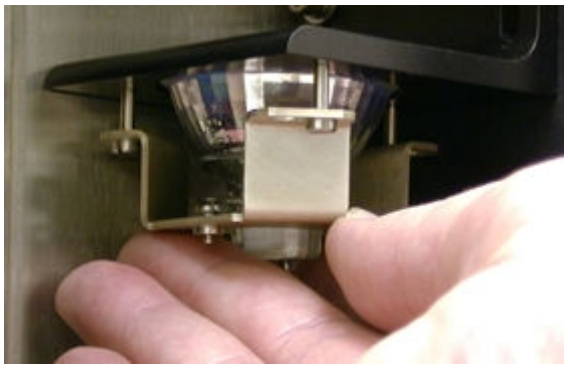


8 Place the new lamp retaining ring over the new lamp assembly. The wires must run through the center hole of the bracket as shown.

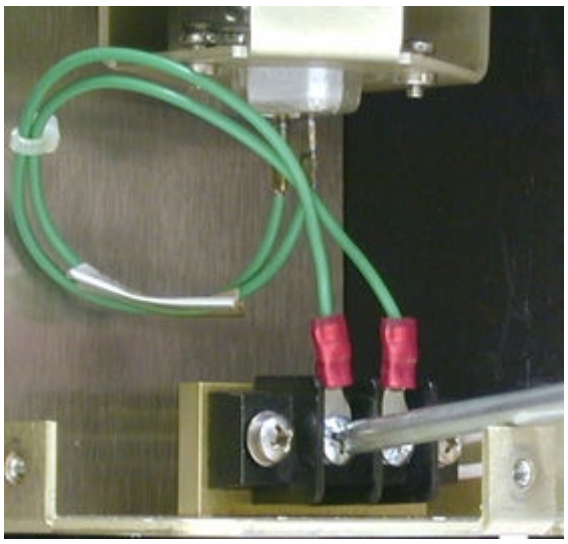
9 Carefully lift the lamp upward into the lamp bracket. Place the lamp retaining ring over the heads of the shoulder screws, then rotate to the left to lock in place.

Be sure all three shoulder screws are securely seated on the lamp retaining plate.

There is no rotary orientation of the lamp. It may be installed in any orientation. Be sure it is seated in the bracket properly, and is not tilted in any way.



10 Install the lamp wires (as shown) to the terminal strip. There is no polarity. One wire goes to each terminal. Tighten securely.



11 Install the lamp cover back onto the lamp housing. The widest part faces the user. Do not try to install in the wrong orientation.

12 Tighten the four (4) captive thumbscrews on the lamp cover. Do not use tools to tighten these screws, as the heat cycling of the instrument may make them hard to remove. Hand-tight is sufficient.

13 Close the instrument. Apply power to warm up the instrument.

14 Enter Vision Software and connect to the instrument.

15 Run Wavelength Linearization.

16 Run a new Reference Standardization.

17 Run Instrument Calibration.

18 Run Performance Test.

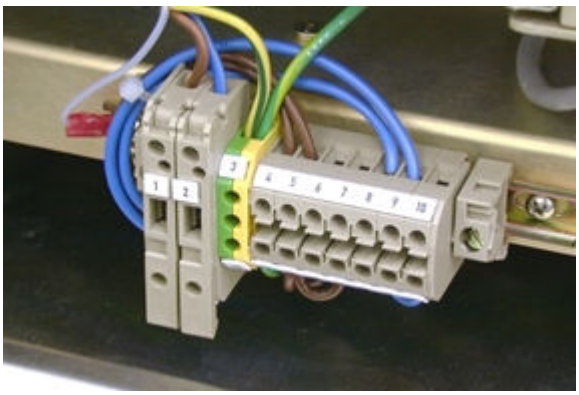
8.2 Fuse Replacement

Fuse Replacement is an unusual event, and usually is caused by some electrical fault. The electrical fault should always be investigated and repaired before fuse replacement. Once the fault is found and corrected, this procedure should be followed:

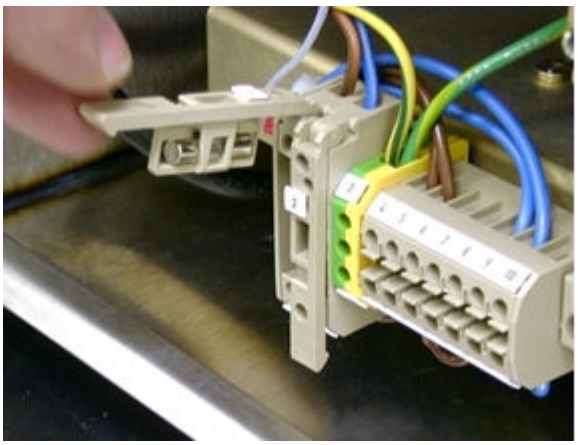
1 Turn off electrical power and follow any required lockout policy.

2 Use the special key provided with the instrument, turn counter-clockwise to open.

3 The AC (Mains) Fuses are located in the AC Power Block. Poles 1 and 2 contain the fuses for each side of the line.



4 Gently lift the tab to open each fuse position. Spare fuses are included in the instrument Accessory Kit.



Fuse Ratings: 250 VAC, 5 x 20mm, Slo-Blo (2) Required:

- Non-Air Conditioned: 3.15A
- Air-Conditioned: 6.3A

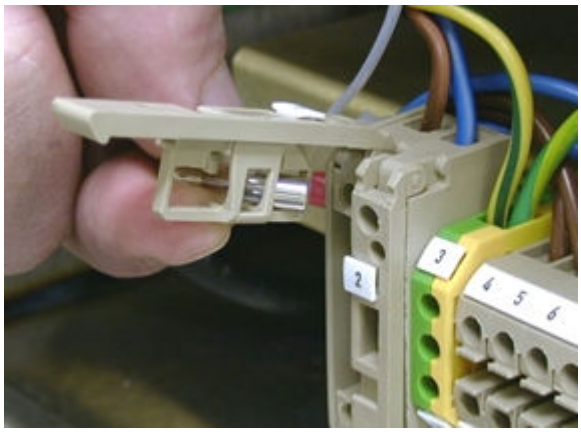
Order spare fuses immediately, to have on hand.

5 Remove each fuse from the clip.

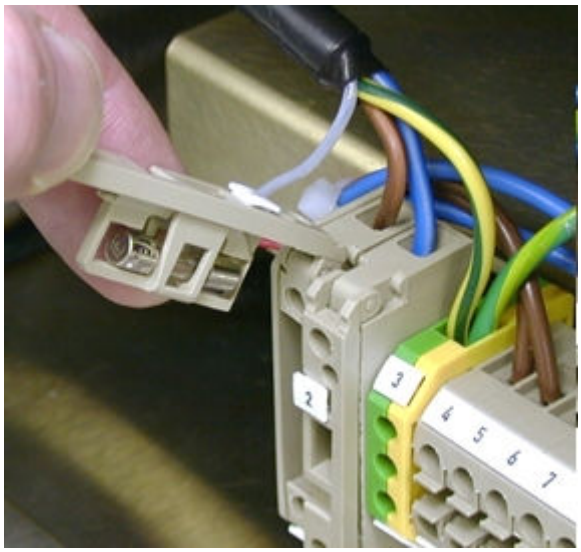
It may help to push the fuse, using a pencil eraser, from the side shown, and then grasp the fuse to fully remove.

Inspection of the blown fuses may provide some information about the type of fault. Use this information to help eliminate the cause of the problem.

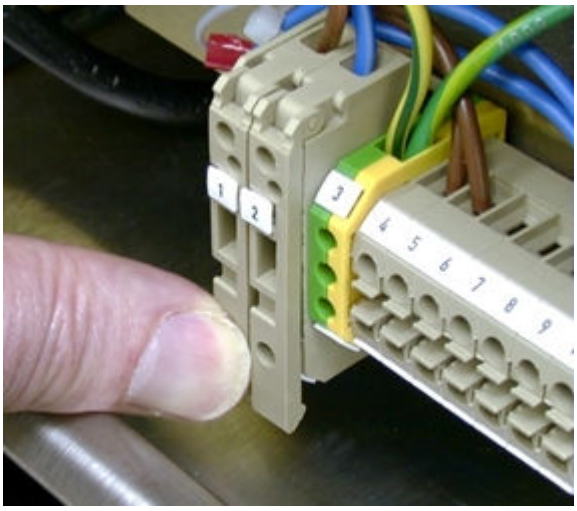
Discard old fuses immediately.



6 Install new fuses as shown. The fuses clip into the holder, and will be retained in position.



7 Push down the fuse door firmly until it snaps into place. Be sure this has been performed for both fuses.



8 Close and latch the door of the XDS Process Analytics Instrument.

9 Restore power to the instrument.

10 Connect to the instrument from Vision. Allow time for Purge System activation (if so equipped) plus about 20 minutes for temperature stabilization.

11 Run Performance Test to verify instrument operation. Because no optical components were changed, there is no requirement to run other tests.

9 Troubleshooting

The XDS Process Analyzer is a dependable, trouble-free instrument, designed for many years of service in your facility. In spite of the rugged design, problems may arise that require attention. This guide is intended as a means of diagnosing minor problems.

There are no user-serviceable parts inside the instrument enclosure, except for the lamp. Because of this design, we emphasize that under no circumstances should the user attempt to service any part other than the lamp. The components may be damaged or misaligned by handling. Hazardous voltages may be present even with power removed from the system. Any diagnosis of internal function should be performed using software diagnostics, not by internal inspection.

For minor problems, this guide should be consulted. While some recommendations are quite basic, some of the suggestions may be helpful in avoiding oversights or problems. Follow the recommendations and eliminate any possible causes listed. Recommendations are listed in logical order of occurrence wherever possible. When all recommendations have been checked, and if the instrument is not operating, please contact Metrohm Applikon (or your local authorized distributor) if the problem is not solved.

	Observed Problem	Recommendations
1	Instrument does not “power up”.	1. Verify that AC power line has power. 2. Verify that the Interlock switch is not damaged in any way. 3. Verify that the AC power feed switch is turned on. 4. Check for blown fuses. If fuses are blown, investigate and repair the cause, then replace fuses.
2	No communication between Vision and the instrument.	1. Verify that the RJ-45 cable is plugged in at both the instrument interface, and at the network jack. 2. Verify that the RJ-45 cable is plugged in at both the computer and at the network jack. (Note: Direct connection is explained in a separate document for non-network users. This requires a special “UTP Crossover” cable. 3. Verify that the instrument is powered on. (See previous Observed Problem.) 4. Verify that the network jack is active, and has a connection point within the internal network. 5. Verify that the instrument is Available in Configure, Input. The instrument serial number is found on the serial plate on the side of the instrument. This serial number should be visible in Vision in Configure, Input. 6. Verify that the connector ends of the RJ-45 cable are not damaged, crushed, or distorted in any way. Wires should be firmly clinched by the connectors.

3	Lamp does not come on when instrument is connected.	1. Verify communication with instrument. Click on Acquire, Disconnect, then Acquire, Connect, Select DCM to verify proper connection. If lamp does not come on, replace lamp according to instructions provided in part 11.2 of this manual. Do not attempt to replace lamp with AC power applied. 2. Lamp may be burned out. This should not occur for thousands of hours of normal use, but could be caused by jarring or other physical motion. Replace lamp. 3. Instrument thermal shutdown may have occurred due to high internal operating temperatures. Determine cause of high temperature and correct before subsequent operation.
4	Instrument fails Wavelength Linearization	Instrumental problems – contact Metrohm Applikon service or your authorized distributor.
5	Instrument Fails Performance Test.	1. Temperature and/or humidity may be changing rapidly during the test. This can usually be observed as large spectral activity between 1300-1400nm and 1800-1900nm. Be sure the instrument enclosure is closed and locked. Allow to stabilize. 2. Instrument may be located near grinders, stirrers, or other equipment which produces vibration or mechanical disturbance. This shows up as spectral activity in various areas, depending upon the transmitted frequency of the motion. Turn off all equipment that might cause such disturbance. Locate offending equipment to another area, or place it on isolated supports away from the XDS Process Analytics Instrument.
6	Instrument fails Instrument Calibration.	1. Verify that the Wavelength Standard is properly positioned when prompted by software. 2. In Interactance Reflectance, use the WSR103xx standard. 3. In transmission, use the WST3WCAL standard.
7	Instrument Gain is excessively high in Gain Test.	1. NIR Gain should always be less than 100 on the reference. If gain is high, check for fiber breakage. 2. Verify that lamp is lit. (see above)

If these measures do not correct the problem, please contact your sales and distribution office.