



LITE  
VIS-NIT  
NIR  
NIRe

REFERENCE INSTRUMENTS FOR  
SPECTROPHOTOMETRIC ANALYSIS

polispec  
GETTING INSIGHT

POLISPEC.COM

SPECTROPHOTOMETRY AND  
APPLIED ELECTRONICS

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Those who contact us have the opportunity to meet a partner able to offer:

 KNOW-HOW

 EXTREME SPECIALISATION

 COMPLETE DESIGN AND PRODUCTION "turnkey"

### *Spectrophotometry and applied electronics*

We are a dynamic and creative company founded in 2012, **specialising in spectrophotometry and applied electronics**. We use our theoretical and practical knowledge and methodologies to design and **build electronic systems and measuring instruments**. Our core business is applied spectrophotometry, in its various forms and for each application sector. We work to design and build systems for rapid and non-destructive measurements, **suitable for all contexts where precise, immediate and multiparametric information is required**. This allows us to study and obtain technological solutions for various fields of application, to manage the variables necessary for the integration of systems in different environments and to solve the specific needs of each production process.

We are versatile and multisectoral, our ideas have no boundaries.

# Polispec

## Getting insight



P O L I S P E C . C O M

### TECHNOLOGICAL ADVANTAGES



. DESIGN



. QUALITY



. SOFTWARE  
INNOVATION

We have created **Polispec (Portable and On-Line SPECTrophotometer)**, a line of compact spectrophotometers with an industrial design, **conceived and built for both portable use and online installation** and available for different wavelength ranges. Their operation is based on the interaction of a light source with the molecules and with the chemical bonds that characterise the matrix to be analysed, thus performing both **quantitative and qualitative measurements**.

The instruments of the Polispec line are designed to guarantee their intensive use in all processes in which **immediate and precise measures** are required for the management of variables and for self-control systems.

All Polispec instruments **are distinguished by the technique of direct coupling between the measuring optics and the spectrograph**, a feature that gives them the compact shape and the necessary robustness such as to make them suitable for multiple uses and in various work environments.

The Polispec devices have also been designed **to work reliably and with measurement precision in challenging environmental conditions**. Furthermore, they can be supplied with different levels of protection against liquids and powders according to the needs of the areas of use.

We have created **a complete and innovative range of software solutions** that allow the instruments of the Polispec line to be used in **multiple contexts**, both as portable systems and as tools integrated in the process. In addition to the availability of a number of pre-calibrated versions, we also provide software packages for the multi-instrument management of the calibration curves.



**P O L I S P E C**

*Portable and On-Line SPECTrophotometer*

*Professional spectrophotometers for portable and line analysis. They have no limits in their applications because they are designed for the measurement of all organic matrices and are designed for immediate and multi-parametric analyses.*



**L I T E**



**V I S - N I T**



**N I R || N I R e**

## TYPES



## LITE

Polispec LITE is a reflection spectrophotometer (also configurable for transmission or contactless applications), with extremely compact dimensions, equipped with an interior lighting system and automatic references. Available in different spectral configurations between 400 and 1100 nm, i.e. between the end of the visible band and the first part of the near infra-red, Polispec LITE has been designed for both portable use and for in-process installation. Particularly suitable for the analysis of macro-elements, Polispec LITE easily adapts to different working conditions. The casing is made entirely of anodised aluminium, while a large heat sink is located at the front to remove the heat generated by the lighting system. Designed for reflectance analysis, this instrument integrates diffuse/0° acquisition optics and a system of automatic internal references which, when configured for portable mode, can be controlled by two buttons positioned on the body of the instrument itself.

The area framed by the collection optics is extremely large and particularly suitable for the analysis of whole and not very homogeneous products or even product flows in motion. For in-process installation, the tool/machine coupling can be created in different shapes and materials to be able to adapt to the most particular requirements (e.g. in the food and industrial sectors). The software interface is extremely simple, intuitive and compatible with different calibration suites for users who wish to develop their own chemometric models. We have created the entire software infrastructure to be easy to use both for direct use and for the system used in the back-end and integrated, for example, with plant PLC systems or CAN protocols. Both the hardware and software configurations of the Polispec instrument range can be adapted for compatibility with different protocols and communication interfaces, so that the integration work is minimal for the customer.



**Dim.** 23.4 x 18.1 x 8.5 cm (l x h x w)

**Weight** 2.4 kg

**Material** Anodised aluminium (standard)

**IP degree** 54



**Sensor** CMOS, 256 pixel

**Spectral range** Available in various ranges between 400-1100 nm

**Average numerical resolution** < 2 nm

**Average optical resolution HWHM** < 8 nm (in range 640-1050 nm)

**Optical signal collection** Direct optical coupling

**Supply** 12 Vdc power supply with supplied power supply, interchangeable rechargeable battery

**Maximum absorbed power** 15 W



**Type of measurements** Reflectance / transmittance \*  
\* may require external accessories

**Measurement geometry** Diffuse / 0°

**Measurement references** Internal and automatic

**Communication channels\*\*** Standard WiFi + RS422 / RS485  
\*\* also available in WiFi + Ethernet configuration

**Source type** Replaceable halogen lamp



### Commands and signals

Hardware button dedicated to the acquisition of references.  
Hardware button dedicated to the measurement acquisition.  
Light and acoustic signalling of the acquisition status.



### Software

**poliDATA** Data acquisition and chemometric prediction software compatible with the SensoLogic and UCal Chemometric suites.

**poliPROCESS** Process analysis software compatible with the SensoLogic and UCal Chemometric suites, interface available for ISObus and PLC systems (modbus over TCP).

**polispec**LITE

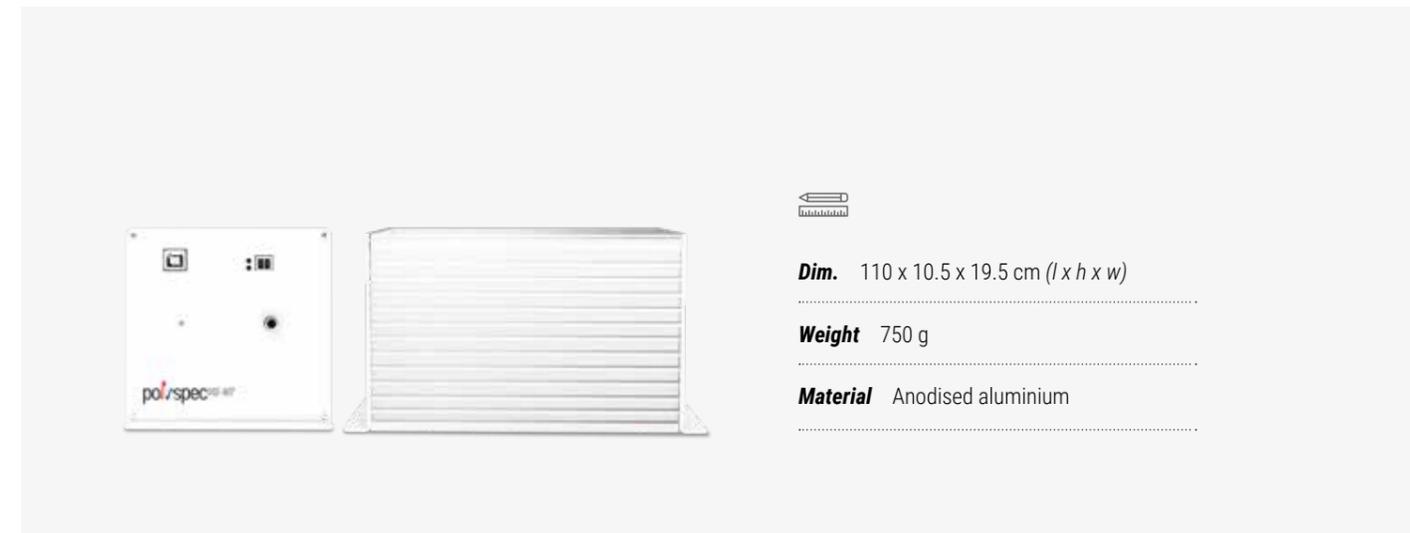


## V I S - N I T

Polisppec VIS-NIT is an extremely robust spectrophotometric sensor, designed to be connected via fibre optics to a variety of measurement probes and lighting sources. It is available in the spectral ranges between 340 and 1100 nm. Thanks to its particular compactness, Polisppec VIS-NIT can be easily integrated into any point of a production line. This instrument is equipped with two programmable internal signal modulators to make it efficient even in processes in which the work dynamics are very different from each other in order to avoid having to adapt the system with

hardware devices. The casing is made of anodised aluminium and is available with different levels of protection from liquids and dusts.

The software interface was developed in the logic of process systems to be easily integrated into the system and with PLC modules. The entire system, consisting of Polisppec VIS-NIT and the management software, can therefore be supplied with different protocols and communication interfaces, so that the integration work is minimal for the customer.



-  **Sensor** CMOS, 256 pixel
- Spectral range**
  - A:** 340-750 nm
  - B:** 580-1080 nm
- Average numerical resolution** < 2 nm
- Average optical resolution HWHM**
  - A:** < 7 nm
  - B:** < 10 nm
- Optical signal collection** Collimated SMA input
- Supply** 12 Vdc power supply with supplied power supply
- Maximum absorbed power** 10 W
-  **Measurement geometry** Multi-level ND attenuation  
Continuous optical attenuation by reducing the input beam along the X axis or in predefined steps (contextual attenuation along X and Y)
- Acquisition of references** Automatic internal references
- USB communication channel** USB - RS422 / RS485 / RS232  
(to be defined when ordering)
-  **Software**
  - poliPROCESS** for in-line measurements for interfacing with PLC automation. Available for continuous acquisitions for filtering and for real-time chemometric predictions.
  - poliDATA** fully automated software for stand-alone and laboratory acquisitions and chemometric predictions.
  - poliADK** Windows ADK for software developers. ADK is able to independently manage the optimal settings of the instrument, including calculation of the optimal integration time. The reference acquisition procedure is also automated and is used to apply pre-treatments such as smoothing or interpolation of the spectra. It also extracts raw and post processed spectral information.

*ITPhotonics software is compatible with the SensoLogic and UCal Chemometric calibration suites.*

**polisppec** VIS-NIT



## N I R

Polisppec NIR is the instrument of excellence of the range, it is a robust and compact spectrophotometer, made both for portable use and for in-process installation. It is available in the near infra-red spectral ranges, between 900 and 1700 nm. It has been designed considering various technological approaches that make it highly performing in terms of sensitivity, operational dynamics and signal cleanliness.

These qualities make Polisppec NIR suitable for analysing very different matrices, from the most reflective to the most absorbent, without the need for different versions of the instrument for each application area. The casing is made entirely of anodised aluminium, while a large heat sink is located at the front to remove the heat generated by the lighting system and the active cooling system of the sensor. Adaptable to different types of applications (reflection, transmission, contactless...), in its standard configuration in reflectance Polisppec NIR integrates a diffuse/0° optics and a system of

automatic internal references which, as well as for the acquisition of the measurement, can be controlled by two buttons. The area framed by the collection optics is extremely large and particularly suitable for the analysis of whole products and for product flows in motion.

For in-process installation, the tool/machine coupling can be created in different shapes and materials in order to be adapted to the most particular needs (for example in the food and industrial sectors).

The software interface is extremely simple, intuitive and compatible with different calibration suites for users who wish to develop their own chemometric models. We have created the entire software infrastructure to be easy to use both independently and for easy integration, for example, with plant PLC systems or machine CAN protocols. The instrument itself can be configured for different communication protocols in order to make its use even easier.



-  **Sensor** InGaAs sensor, 256 pixels, cooled with single Peltier stage
- Feedback cooling control system** Feedback, stability T < 0,01 K
- Spectrum range** 900-1700 nm
- Average numerical resolution** 3.2 nm
- Average optical resolution HWHM** 3.25 nm
- Optical signal collection** Direct optical coupling
- Supply** 12 Vdc power supply with power supply provided, interchangeable rechargeable battery
- Maximum absorbed power** 20 W
-  **Type of measurements** Reflectance / transmittance \*  
*\* may require external accessories*
- Measurement geometry** Diffuse / 0°
- Measurement references** Internal and automatic
- Communication channels\*\*** Standard WiFi + RS422 / RS485  
*\*\* also available in WiFi + Ethernet configuration*
- Source type\*\*\*** Replaceable halogen lamp  
*\*\*\* internal back-up lamp option available*
-  **Commands and signals**  
Hardware button dedicated to the acquisition of references.  
Hardware button dedicated to the measurement acquisition.  
Light and acoustic signalling of the acquisition status.
-  **Software**  
**poliDATA** Data acquisition and chemometric prediction software compatible with the SensoLogic and UCal Chemometric suites.  
**poliPROCESS** Process analysis software compatible with the SensoLogic and UCal Chemometric suites, interface available for ISObus and PLC systems (modbus over TCP/IP or S7).





## N I R e

Polisppec NIRE is a latest generation spectrophotometer with the widest spectral range of the entire Polisppec range. Made with the use of the experience gained from the other instruments of the family, Polisppec NIRE was also created with the same characteristics of robustness and compactness that make it easy to use both as a portable instrument or for the laboratory, and as a system for installation on plants.

Thanks to its particular diffraction grating and the double chip InGaAs 512 pixels sensor with controlled cooling system, Polisppec NIRE covers the extraordinary spectral range 930-2180 nm while maintaining all the characteristics of versatility, sensitivity, operating dynamics and cleaning of the signal of the other Polisppec systems. These qualities make Polisppec NIRE suitable for analysing very varied matrices, from the most reflective to the most absorbent, without the need to have different versions of the instrument for each application area. The casing is made entirely of

anodised aluminium, while a large heat sink is located at the front to remove the heat generated by the lighting system and the active cooling system of the sensor. The area framed by the collection optics is extremely large and particularly suitable for the analysis of whole products and for product flows in motion.

For in-process installation, the tool/machine coupling can be created in different shapes and materials in order to be adapted to the most particular needs (for example in the food and industrial sectors).

The software interface is extremely simple, intuitive and compatible with different calibration suites for users who wish to develop their own calibration models. We have created the entire software infrastructure to be easy to use, both independently and for easy integration, for example, with plant PLC systems or machine CAN protocols. The instrument itself can be configured for different communication protocols in order to make its use even easier.



- Sensor** dual-chip sensor, 512 pixels, cooled with double Peltier stage
- Feedback cooling control system** Feedback, stability  $T < 0,03$  K
- Spectrum range** 930-2180 nm
- Average numerical resolution** 2.4 nm
- Average optical resolution HWHM** 4 nm
- Optical signal collection** Direct optical coupling
- Supply** 12 Vdc power supply with power supply provided, interchangeable rechargeable battery
- Maximum absorbed power** 24 W
- Type of measurements** Reflectance / transmittance \*  
\* may require external accessories
- Measurement geometry** Diffuse / 0°
- Measurement references** Internal and automatic
- Communication channels\*\*** Standard WiFi + RS422 / RS485  
\*\* also available in WiFi + Ethernet configuration
- Source type\*\*\*** Replaceable halogen lamp  
\*\*\* internal back-up lamp option available
- Commands and signals**
  - Hardware button dedicated to the acquisition of references.
  - Hardware button dedicated to the measurement acquisition.
  - Light and acoustic signalling of the acquisition status.
- Software**
  - poliDATA** Data acquisition and chemometric prediction software compatible with the SensoLogic and UCal Chemometric suites.
  - poliPROCESS** Process analysis software compatible with the SensoLogic and UCal Chemometric suites, interface available for ISObus and PLC systems (modbus over TCP/IP or S7).



# polispec<sup>NIR</sup>



## OPTICAL GEOMETRY DIFFUSE / 0°

*It is the best configuration to exclude the specular reflections that mask the signal. In this way it increases the efficiency in the measurement of complex, wet and / or specular matrices and improves in-process applications; wide signal dynamics thanks to the low contribution of the stray light*



## COMPACT DESIGN WITH DIRECT SPECTROGRAPH / OPTICS COUPLING

*Immunization from typical optical fiber side effects; no parts in relative movement*



## DESIGNED TO FACILITATE THE REPLACEMENT OF WORN PARTS OR ANTI-WEAR PARTS

*Scanning window, light source, front fan and batteries*



## LARGE AND HOMOGENEOUS SAMPLING AREA



*Each single measurement represents the optical average of the entire framed surface*

## DEDICATED ANALOG AMPLIFIER FOR AN HIGH SIGNAL TO NOISE RATIO



*A dedicated differential signal amplifier allows to maximize the gain while keeping electronic noise low*

## DIODE ARRAY SENSOR InGaAs 256 / 512 PIXELS WITH ACTIVE COOLING TEMPERATURE CLOSED (LOOP CONTROL, STABILITY $\Delta T < 0.01 \text{ K}$ )



*It allows a high numerical resolution (approximately 3.1 nm / 2.5 nm), allowing numerical processing without loss of resolution. Active cooling reduces the PDA PNRU, that is the difference in dynamics of the various pixels, and avoids the deformation of the signal due to the temperature variation*

## APPLICATION ADVANTAGES



### EASE OF INTEGRATION

The connection modules for the entire Polispac range are particularly flexible and allow this tool to be easily integrated into a wide variety of production processes



### SIMPLICITY OF USE

All the Polispac instruments are designed for simple management. They are intuitive both in their practical use and in that of software and therefore do not require the support of specialist personnel to use them



### IMMEDIATE DATA

The analysis with Polispac systems is used to obtain immediate data, thus obtaining a real-time survey of the measured product available



### PRECISION OF RESULTS

Thanks to their advanced technology, Polispac instruments are able to ensure maximum reliability of the measurements obtained, constantly offering the user precise and reliable data for each use



### VERSATILITY OF MEASUREMENTS

The measurements obtained by Polispac spectrophotometers represent immediate, non-destructive and multi-parametric analyses, applicable on a variety of products and always originating from the comparison with the calibration database

## APPLICATIONS

Thanks to the great application versatility and easy integration, the range of Polispac instruments finds application in various sectors, including:



### INDUSTRIAL



### AGRICULTURAL AND AGRI-FOOD



### CHEMICAL AND SCIENCE

## OUR SOFTWARES

The Polispac line of instruments is extremely versatile because it is equipped with software systems designed by us that make it possible to make these devices technologically performing and customised to the specific characteristics of each customer's business, both for portable and offline use. The versatility of the range is also noticeable in the industrial sector thanks to the integration of our software modules within plant management systems.

. p o l i D A T A

. S P 3 M A N A G E R

. p o l i P R O C E S S

. C M M (Chemometric Model Manager)

## p o l i D A T A



*Different sampling modes*



*Immediate results*



*Archiving system*



*Custom setting*



*Guided diagnostics and calibration*



**It is our main software for portable use of Polispac instruments** and offers an interface designed for use on both tablets and desktops. It is available in several languages and can optionally be configured for compatibility with two prediction engines, Sensologic and UCal. Its basic features are:

- **Quantitative chemometric analysis:** by choosing a rented or self-made chemometric model, it is possible to analyse a product with different sampling methods (single swipe, multiple swipe, multipoint). The results of the analysis are instantly visible, can be exported in various formats (PDF reports, DAT files, CSV/XML compatible with different formulation software) and can be saved in an archive

- **Analysis archive:** it is used to keep and consult the data generated and saved, to print reports, to send them via a simple QRcode and to compare different analyses

with each other

- **Acquisition of spectra:** it is used to save the acquired spectra to create a dataset, with export formats such as SP3 (proprietary binary software) or CSV

- **Instrument diagnostics:** it contains two functionalities for instrument diagnostics:

→ **Check cell,** a guided procedure, that allows the user to verify the correct spectral calibration of the instrument

→ **Diagnostic Tool,** a guided procedure that is used to check the operation of the main components of the instrument (buttons, fans, internal electronics...)

## SP3 MANAGER

-  Import settings
-  Data processing
-  Analysis of the collected data



It is a software that is used to import spectra saved in SP3 (or CSV) format and to process them. In its free version, it is used to query SP3 files and to convert them into CSV format to be used with common spreadsheets.

In the licensed version additional features are available:

- the renaming of samples
- the creation of an average of the samples with the same name
- exporting in different formats (CSV, CSV for Matlab or Octave, DAT, CPF)

The analysis functionality is also available for this software (it requires a specific licence): the selected spectra can be predicted using a chemometric model; the analyses can be exported in CSV format or copied directly into a spreadsheet and it is possible to choose

whether or not to display the statistical parameters relating to the analyses of each constituent. Finally, the **dataset functionality is also available** (it requires a specific licence): by adding to a file containing spectra, SP3 or CSV, the relative analyses (copy from the spreadsheet or imported directly from the CSV file itself), it is possible to create a dataset file and export it in DAT or CPF (\* Sensologic) format.

## poliPROCESS

-  Suitable for industrial systems or machines
-  Continuous analysis
-  Modularity



It is the main software for the use of tools on processes (industrial systems or machines) in which continuous analysis of the product is required. It is modular software that can be configured or expanded (with the custom development of new modules) to suit specific needs.

The main reference modules are:

### GPS module

which is used to acquire NMEA data from GPS antennas with serial connection and to use the received position to geo-reference the analyses

### Datalogger module

used to save the analyses in a file in CSV or KML (Keyhole Markup Language) formats

### ISObus module

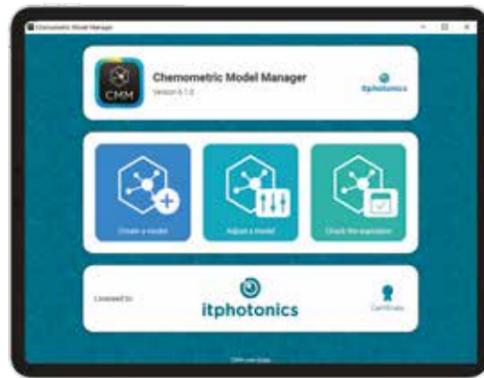
used to manage the analyses through an application on the Virtual Terminal; the acquired data are saved by the task controller of the device, they can be exported in ISOXML format to be used by the main analysis and mapping platforms. From the VT (Virtual Terminal) interface it is possible to completely control the process: selection of the product under analysis (chemometric model to be used), displaying of the instant and average analysis (of the process), receipt of notifications and alarms on any problems

### PLC module

used to control the measurement process via PLC using two different protocols: "Modbus over CP" and "ISO over TCP" (Siemens S7). The measurement process reports the analysis values and the system status on registers that can be configured during the installation phase

## C M M

(Chemometric Model Manager)



**This software allows the preparation of chemometric models that can be used by the software described above (poliDATA and poliPROCESS).**

Its operation depends on a certificate that determines the user and the accessory functions (expiry date, global standardisation...).

An exclusive of this software is the possibility of using a method for **"global standardisation"**, that is in particular an algorithm, developed by us ITPhotonics, to replicate use of the same calibration model on multiple instruments without the need to adapt the calibration curve itself or the instrument.

## D E V E L O P M E N T O F C A L I B R A T I O N C U R V E S

Within the structure, we have consolidated a team of highly specialist professionals who collaborate together in the design and implementation of **all the solutions tailored to customers**. In particular, the **"Application and Chemometry"** section is used for the **development of calibration curves** for our products and is available to anyone who requires support for the development of their calibration models, also on the NIR, VIS-NIR and NIR extended systems -already in place and not necessarily provided by us.

We have our experience at your disposal to design, execute and maintain calibration models for a wide range of applications, guaranteeing our support both on site and remotely.



. D E V E L O P M E N T  
A N D I N N O V A T I O N



. C U S T O M I Z A T I O N



. S P E C I A L I S T T E A M



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P O L I S P E C . C O M

