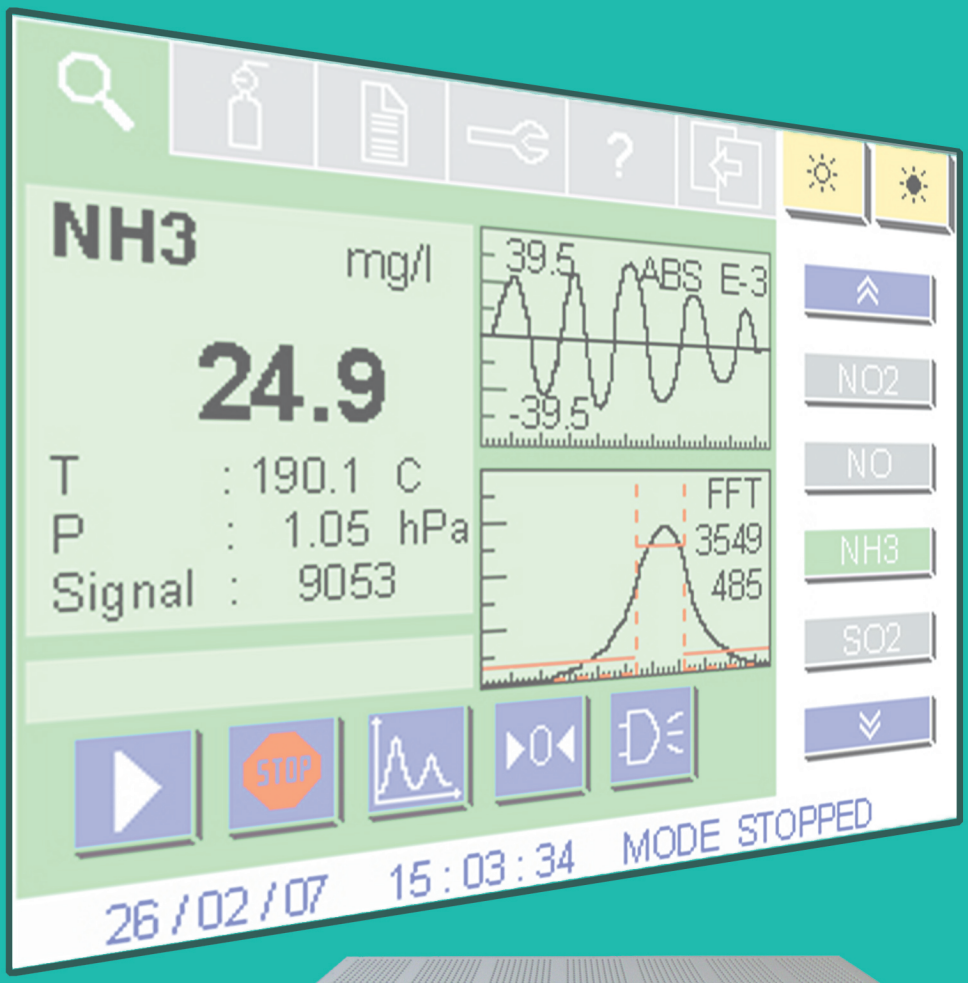
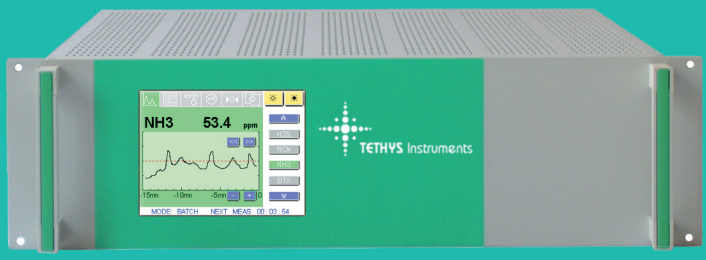
On-line ex-situ gas analyser EXM400





TETHYS Instruments

CONSIGNE DE SECURITE, GARANTIE ET RESPONSABILITE

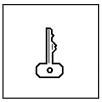
Mise à la terre

Cet instrument doit être connecté à la terre !
Afin d'éviter tout choque électrique, vérifier que la prise électrique utilisée pour cet instrument est bien une mise à la terre conformément à la réglementation en vigueur.

Garantie deux ans

Cet instrument a une garantie de deux ans à partir de la date de livraison (excepter pour la pompe et la lampe xénon). Il doit être retourné à notre usine en cas de panne ou de pièce défectueuse. Tout dommage ou défaut survenu à la suite d'une erreur d'utilisation ou d'une mauvaise manipulation tel que la chute, l'immersion, le gel ou l'exposition à une surtension ne sont pas couverts. Dés lors, toutes conséquences directs ou indirects qui en résultent en sont exclus.

Maintenir verrouillé



Durant l'utilisation normale, l'instrument doit être fermé à clé !
Seul les personnes habilitées peuvent ouvrir cet instrument.
Afin de prévenir les choques électriques, débrancher le câble d'alimentation avant n'importe quelle intervention ou manipulation à l'intérieur de l'appareil.

Rayonnement UV

L'exposition au rayonnement UV est dangereuse !
Lorsque l'analyseur est ouvert, veuillez porter des lunettes de protection durant le cycle de mesure afin de protéger vos yeux.

Toxicité

Les gaz de calibration et les gaz à analyser présentent un risque !
Ils peuvent être toxiques par inhalation, corrosif pour les yeux, le système respiratoire et la peau ou encore inflammable.
En cas de dispersion accidentel, veuillez respecter les actions préconiser par les fiches de données de sécurité.

Réglementation

Pour le respect de l'environnement, veuillez suivre la réglementation en vigueur pour l'élimination des déchets.

Responsabilité légal

Le fabricant ou son agent ne sont pas responsables des conséquences directes ou indirectes résultant d'une panne, d'une mauvaise maintenance, d'une erreur de mesure ou bien d'une utilisation inapproprié de cet instrument.

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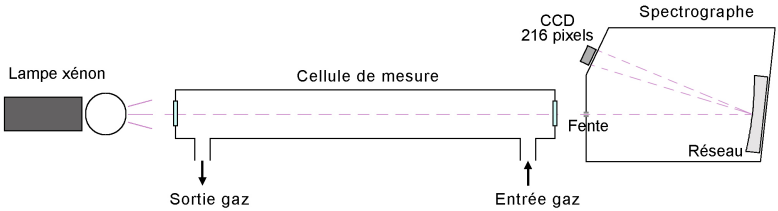
1 - PRINCIPE DE MESURE

1.1 - Description

La méthode utilisée pour déterminer la concentration des différent gaz que l'on propose est la spectroscopie UV.

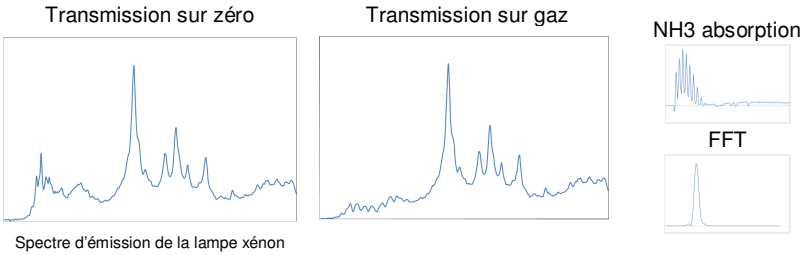


La première étape de la mesure consiste à définir le spectre de référence pour le zéro en enregistrant le spectre d'émission de la lampe xénon au travers d'un gaz neutre (comme l'air ou l'azote).

Puis, lorsque l'échantillon à analyser circule dans la cellule, l'analyseur mesure à nouveau le signal transmit afin de d'obtenir un spectre d'absorption grâce à la loi de Beer-Lambert suivante:

$$[Abs] = \log \frac{Iin}{Iout}$$

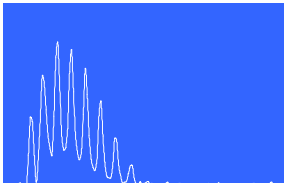
A partir de ce spectre d'absorption et en utilisant les algorithmes appropriés, l'analyseur est capable de déterminer la concentration de la plupart des gaz qui composent l'échantillon. Les valeurs de la pression et de la température sont utilisées pour compenser leurs influences sur la mesure



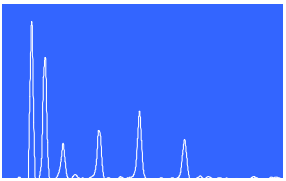
Spectre d'émission de la lampe xénon

Note: La gamme de mesure est définie en fonction du chemin optique correspondant à la longueur de la cellule de mesure.

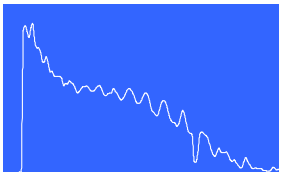
1.2 – Spectres d'absorption



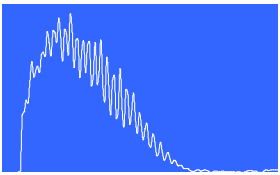
NH_3 - Ammoniac



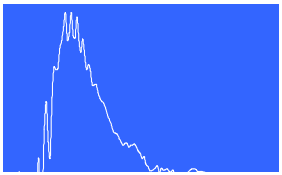
NO - Monoxyde d'azote



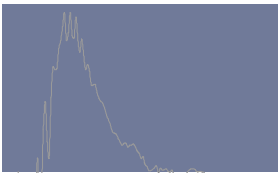
NO_2 - Dioxyde d'azote



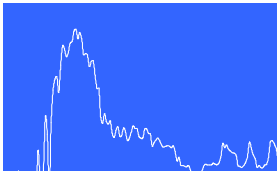
SO_2 - Dioxyde de soufre



H_2S - Sulfure d'hydrogène

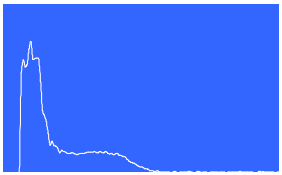


CS_2 - Disulfure de carbone

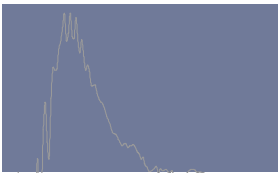


C_6H_6 - Benzène

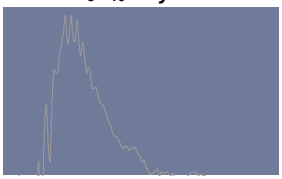
C_7H_8 - Toluène



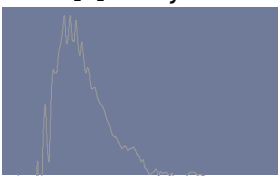
C_8H_{10} - Xylène



C_2H_2 - Acétylène



HCHO - Formaldéhyde



CH_3CHO - Acétaldéhyde

1.3 - Spécifications

Caractéristique générale

Température ambiant:	0°C to 40ºC
Débit:	Min: 0.1 L/min Max: 10 L/min
Température gaz:	inférieur à la température ambiant (40°C max.) Ou version chauffée à 190°C
Pression:	Min: -100 hPa Rel. Max: 100 hPa Rel.
Capacité de stockage:	2500 mesures par gaz définie
Interface:	RS232 (Windows application, MODBUS or AK) Port USB pour clef USB WIFI (IEEE 802.11 B) en option Ethernet10 Base-T (IEE 802.3) en option
Signaux:	Jusqu'à 8 sorties analogiques 4-20 mA Jusqu'à 4 relais programmables
Ecran:	couleur LCD (320x240 pixels) avec rétro éclairage
Alimentation:	90-264 VAC / 1000 VA / 50-60Hz
Normes CE:	EN 61010-1, EN 61326, IEC 61010-1, IEC 61326
Coffret:	Rack 19" 3U
Dimensions (HxLxP):	482.6 x 132 x 560 mm
Poids:	15-21 kg

Spécification par gaz

	*Range**	*Limite de détection **	*Répetabilité****
NH_3	**Ammoniac** 0 – 100 ppm NH_3 (0 – 70 mg/m^3 NH_3) Possible jusqu'à 1000 ppm NH_3	0.2 ppm	0.5 ppm (for 100 ppm)
NO	**Monoxyde d'azote** 0 – 2000 ppm NO (0 – 2462 mg/m^3 NO) Possible jusqu'à 5000 ppm NO	10 ppm	3 ppm (for 1000 ppm)
NO_2	**Dioxyde d'azote** 0 – 2000 ppm NO_2 (0 – 3780 mg/m^3 NO_2) Possible jusqu'à 15000 ppm NO_2	30 ppm	45 ppm (for 1000 ppm)
SO_2	**Dioxyde de soufre** 0 – 500 ppm SO_2 (0 – 1314 mg/m^3 SO_2) Possible jusqu'à 1000 ppm SO_2	3 ppm	30 ppm (for 1000 ppm)
H_2S	**Sulfure d'hydrogène** 0 – 100 ppm H_2S (0 – 140 mg/m^3 H_2S) Possible jusqu'à 1000 ppm H2S	1 ppm	2 ppm
CS_2	**Disulfure de carbon** 0 – 100 ppm C_2S (0 – 310 mg/m^3 C_2S)	1 ppm	
C_6H_6	**Benzène** 0 – 100 ppm C_6H_6 (0 – 320 mg/m^3 C_6H_6) Possible jusqu'à 200 ppm C_6H_6	0.5 ppm	
C_7H_8	**Toluène** 0 – 30 ppm C_7H_8 (0 – 113 mg/m^3 C_7H_8) Possible jusqu'à 60 ppm C_8H_{10}	0.1 ppm	
C_8H_{10}	**Xylène** 0 – 30 ppm C_8H_{10} (0 – 130 mg/m^3 C_8H_{10}) Possible jusqu'à 60 ppm C_8H_{10}	0.1 ppm	
HCHO	**Formaldéhyde** 0 – 100 ppm HCHO (0 – 120 mg/m^3 HCHO)	1 ppm	
CH_3CHO	**Acétaldéhyde** 0 – 100 ppm CH_3CHO (0 –180 mg/m^3 CH_3CHO)	2 ppm	
C_2H_2	**Acétylène** 0 – 5000 ppm C_2H_2 (0 – 5300 mg/m^3 C_2H_2)	50 ppm	20 ppm

****Gamme donnée en mg/m3 à 20°C***
*****Limite de détection (3x sigma sur un gaz zéro)***
******Répetabilité (1x sigma sur un gaz étalon)***
La gamme de mesure est donnée pour un chemin optique de 235 mm
Le nombre d'acquisition par mesure est égal à 10
Le temps de mesure est inférieur à 2 secondes

2 - MISE EN SERVICE

Vous venez juste de recevoir l'analyseur EXM400. Maintenant, vous devez l'installer dans une baie selon ces dimensions **(Voir chapitre 3.1)**.

Puis, vous devez connecter l'entrée gaz, le zéro, et la sortie gaz à l'arrière de l'appareil **(Voir chapitre 3.2)**.

Ensuite, vous connectez toutes les entrées et sorties électriques nécessaire **(Voir chapitre 3.3).**

Lorsque que vous mettrez sous tension l'analyseur, vous pourrez regler toutes les interfaces **(Voir chapitre 4)**.

Avant de commencer la mesure, vous devez régler premièrement la mesure de la pression **(Voir chapitre 5)**.

Deuxièmement, vous devez contrôler que la température de consigne a bien été définie conformément à de votre application **(Voir chapitre 6)**.

Troisièmement, vous devez régler l'horloge pour permettre un enregistrement cohérent des mesures **(Voir chapitre 11.1)**.

Quatrièmement, vous devez définir la période du cycle de zéro automatique **(Voir chapitre 11.2)**.

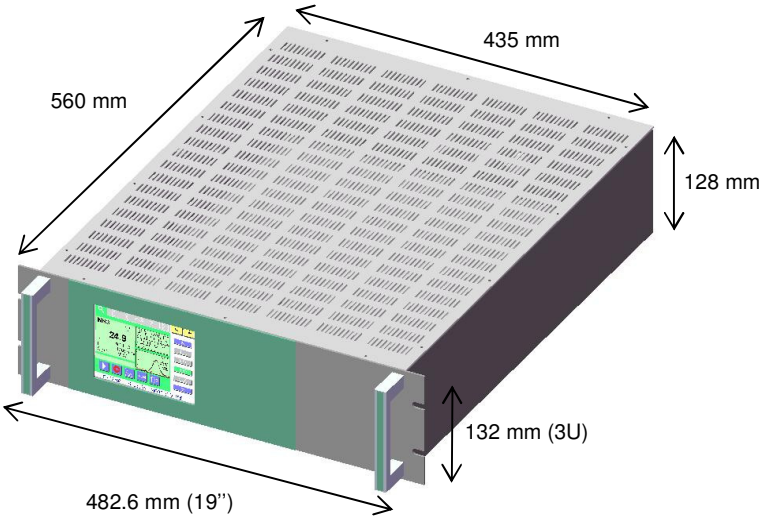
Cinquièmement, Vous devez régler le mode de mesure (périodique, continue…) suivant les besoins de votre application **(Voir chapitre 11.3)**.

Maintenant, vous pouvez commencer vos mesures **(Voir chapitre 13)**.

3 - INSTALLATION

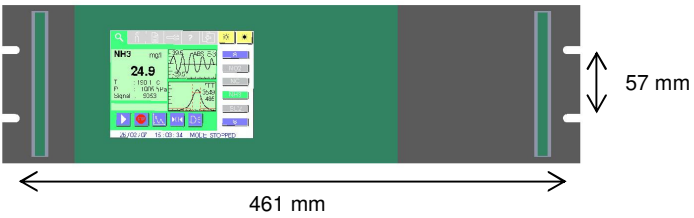
3.1 - Dimension

L'analyseur se présente dans un boîtier rack 19" avec une hauteur 3U.



L'analyseur doit être installé dans une baie avec un espace de 40 mm en dessus et en dessous pour permettre une bonne ventilation.

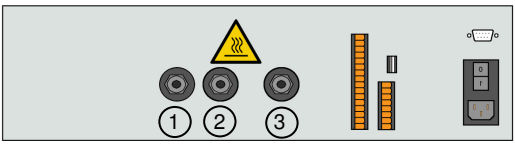
L'analyseur a quatre trous de fixation.



Chaque vis de fixation doit être capable de supporter le poids total de l'appareil.

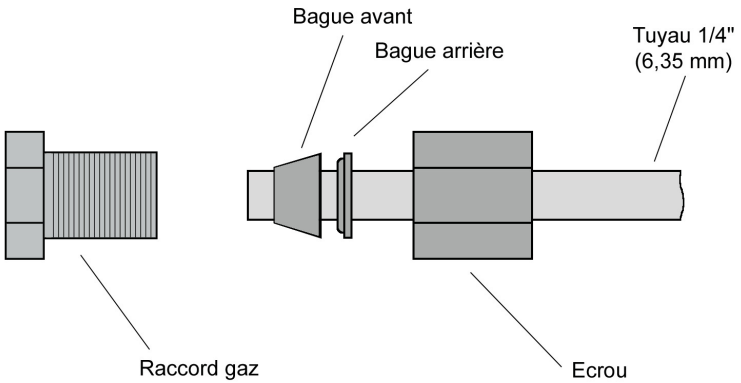
3.2 - Raccordement gaz

L'entrée et la sortie échantillon ainsi que l'entrée zéro doivent être raccordés à l'arrière de l'appareil à des tuyaux ¼" (6,35 mm).



1- Sortie échantillon
2- Entrée zéro (azote ou air)
3- Entrée échantillon

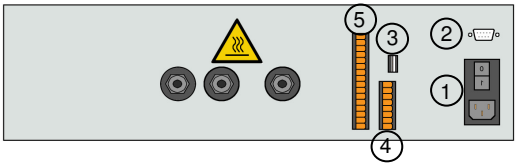
L'écrou ainsi que la bague avant et arrière doivent être placés sur le tuyau de la manière suivante :



Puis enfiler le tube dans le raccord et serrer l'écrou (1 tour ¼).

3.3 - Raccordements électriques

L'analyseur admet une tension d'alimentation comprise entre 90 à 264 VAC.
Deux fusibles F 6.3 A dont un de remplacement sont placés dans le compartiment arrière de l'embase secteur.



1- Embase secteur avec interrupteur et fusibles
2- Port RS232 sub-D 9
3- Port USB
4- Relais programmables
5- Sorties analogiques 4-20 mA

4 - INTERFACES

4.1 - Sortie analogique 4-20 mA

4.1.1 - Description électrique

Pour chaque paramètre, la mesure peut être récupérer en temps réel en utilisant une sortie analogique 4-20 mA.

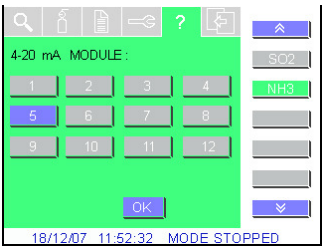
Caractéristiques
Résolution: 12 bits
Impédance maximum:500 Ohms
Ce module est opto-isolé

Ce module est spécifié pour une tension en mode commun de 33 VAC ou 70 VDC.

4.1.2 - Définition de l'emplacement

Pour contrôler la position de la sortie analogique spécifique à un paramètre, presser :

? > POSITIONS > 3333

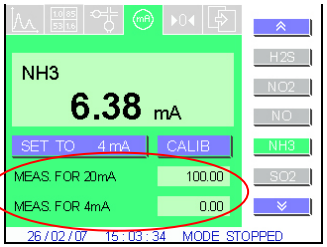


Cette écran permet de définir ou de vérifier la position physique du module sortie 4-20 mA sur la carte écran DSP400.

Dans cette exemple, la sortie 4-20 mA du NH3 se trouve sur l'emplacement numéro 5.

4.1.3 - Echelle

Pour définir l'échelle de la sortie 4-20 mA, vous devez aller dans le menu suivant :



Cette écran permet d'afficher la valeur de la sortie 4-20 mA correspondant à la dernière mesure du paramètre sélectionné sur le coté droit.

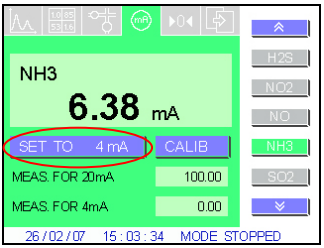
MEAS. FOR 20mA: Entrer la valeur correspondant à l'échelle haute de la sortie 4-20 mA.

MEAS. FOR 4mA: Entrer la valeur correspondant à l'échelle basse de la sortie 4-20 mA.

4.1.4 - Test

Afin de forcer la sortie 4-20 mA, activer la fonction suivante :

> SET TO 4 mA



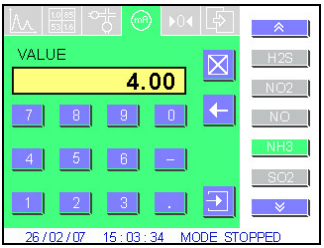
Il est possible de tester la sortie 4-20 mA en forçant sa valeur par pas de 1 mA afin de vérifier le bon fonctionnement
. A chaque
20mA in steps of 1 mA in order to verify the electrical behaviour of the 4 to 20mA circuitry if the user has a doubt about the correctness of the signal produced.

When you press It produce a milliamp signal from 4mA to

4.1.5 - Calibration

You have to test the current at 4mA and 20mA, and to calibrate the analog output, press CALIB

It displays the current loop calibration menu.



The first signal which appears is 4.00mA. If the millimetre reading is different, you have to enter the value measured instead of 4.00mA and valid. The procedure is similar for the second signal at 20.00mA.

4.2 - Relay

4.2.1 - Electrical description

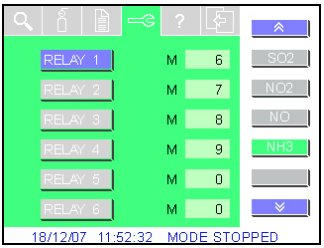
Relays are available in option as threshold or fault alarm. But they can be used to make a multiplexing if there are several streams.

Characteristics:

This module is specified for maximum common mode voltage 33 VAC or 70 VDC.
Relay are specified for maxi 24 VAC / 2 A.

4.2.2 - Position

To check the position of relay modules, press +



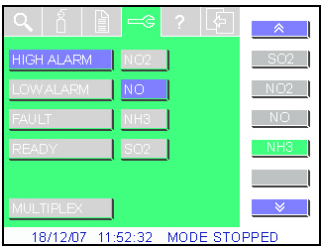
This is the screen of position selection of relays modules.
Normally it is already done.

Up to six relays could be available on socket modules (in option).
To declare a relay module you have to enter the position of it.

Example:
M0 means there is no relays.
M6 means there is a relay module on position M6.

4.2.3 - Define function

To define the function of relay module, press RELAY 1



HIGH ALARM | LOW ALARM

Allow indicating when the measurement overpasses the alarm threshold high or low. The set points values are defined using the CONFIG screen. The relay contacts are open when no alarm and closed in the case of an alarm.

FAULT

Allow the user to be informed when the analyzer encounters a problem during the measurement cycle. The relay contact is open under no fault and closed in the case of an operation fault.

READY

One of the options offered with all analyzers is a “Logical Input Module”. This module can be used when the user wishes to trigger the analyzer to start a measurement from an external pulse command. This scenario can be implemented if the user wishes to slave the analyzer to a Programmable Logical Controller (PLC) or to the plant DCS. The relay condition (open or closed) is used to inform the PLC (or the DCS) on the operating status of the analyzer, meaning whether or not the analyzer is currently performing a measurement or a cleaning cycle. The relay contact is open when the analyzer is performing any action and closed in the case of no action. This last condition corresponds to the READY status for external remote command.

MULTIPLEX

This option cannot be activated on this screen. It is just to inform the user if the relay is associated to the multiplexing system.

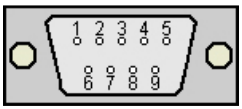
4-3 - RS232

4.3.1 - Electrical description

RS232 connection enables to download measurements with Windows communication by Hyperterminal, or to connect Modbus communication or AK protocol.

Characteristics:
The RS232 is provided with a cable terminated by 9-ways SUB-D female connectors for direct connection to serial port COM1 of IBM® compatible laptop (or desktop).

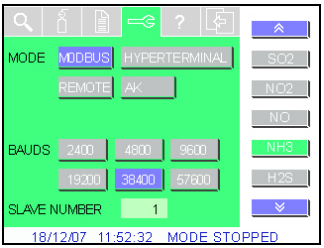
Sub-D connector of the module RS232:



Pin no 2: RxD
Pin no 3: TxD
Pin no 5: GND

4.3.2 - Position

To check the RS232 configuration, press +



4.3.3 - Hyperterminal

RS232 connection can be done between the analyzer and a Windows-based PC using HYPERTERMINAL to download data stored in the analyzer memory. Since all Tethys analyzers support the MODBUS communication protocol (used extensively in industrial automation), a short distance RS232 link can also be implemented between the analyzer and an intelligent device such as a PLC.

The screen above shows configuration menus for the RS232 data download scenario using Hyperterminal and for the RS232 connection to a Modbus compatible device.

HYPERTERMINAL is a standard communication accessory of WINDOWS. After selecting HYPERTERMINAL on the TSDI, the user must also set the baud rate at which communication will occur between the analyzer and the PC. The PC baud rate is set through HYPERTERMINAL.

The measurements are automatically recorded every 10 minutes for all the active channels with the date and time.

To download on Windows98®, connect the RS232 cable (refer to Installation) and proceed as follow on the laptop:

- Click on START, then PROGRAMS, then ACCESSORIES, then COMMUNICATIONS, then HYPER TERMINAL.
- Double click on Hypertrm.exe to start it.
- Enter a name for the connection, for example EXM400.
- Select COM1 for “connect using” and valid with OK.
- Select 9600 for “bit per second” and valid with OK.

Now Hyper Terminal® is ready to use.

- Press one time on the key ENTER to communicate with the instrument and follow the instructions.

To transfer the measurement in file:

- Click on TRANSFER, then CAPTURE TEXT, then BROWSE to select your working folder.
- Enter a file name with keeping the extension “.TXT” and valid with OK.
- Press on the key ENTER to start the transfer.
- When the transfer is finished, click again on TRANFER, then CAPTURE TEXT, then STOP.
- Close Hyper Terminal and disconnect the RS232 cable.

Then you can start your worksheet and open the newly created file for printing or doing graphs with the measurements.
Refer to your worksheet manual for importing text files if necessary.

Be careful at Windows Vista user, there is no HYPERTERMINAL on Vista.

4.3.4 - Modbus

MODBUS

Selecting MODBUS tells the analyzer that it will communicate with a PLC (or any other device supporting MODBUS).Since MODBUS needs to have an address for each device communicating with one another, the slave number (or address) of the analyser must be specified in the corresponding field.

MODBUS is the standard communication protocol available with RS232 port. For other protocol, refer to specific documentation. MODBUS is a PLC communication protocol created by MODICON. It is based on frame exchanges between one master unit and up to 255 slaves units. Refer to RS232 setting to select the slave number of the instrument and the baud rate in accordance to the master unit. The values of each channel can be read using the function 3 of MODBUS as shown below:

Request from the master unit:

Slave number	3	Address of first byte	NB of byte	CRC16

Answer from the instrument:

Slave number	3	NB of read byte	Value 1st byte	.....	CRC16

The CRC16 is used to check the integrity of the received frame. The frames are transmitted (and expected to be received) in binary mode (not in ASCII). Addresses of measured values, error code, start of measurement cycle and start of cleaning cycle are indicated on the test screen of modbus.

Address of the measured values:

Decimal address	Hexadecimal address	Reading for
60 61	3CH 3DH	Channel 1
62 63	3EH 3FH	Channel 2
.....	.....	.....
82 83	52H 53H	Channel 12

Error code:

Decimal address	Hexadecimal address	Reading for
4	4H	Channel 1
5	5H	Channel 2
.....	.....	.....
15	FH	Channel 12

The values are readable in float IEEE format 4 bytes long, higher first, lower last. Invalid codes are 1 byte long. Addresses are given in hexadecimal.

Start of measurement cycle:

Decimal address	Hexadecimal address	Write
3	3H	1

When the measurement is finished, the value reading in address 3H returns to 0.

Start of cleaning cycle:

Decimal address	Hexadecimal address	Write
2	2H	1

When the measurement is finished, the value reading in address 2H returns to 0.

4.3.5 - AK Protocol

AK

Activate AK protocol communication. It uses particularly on test monitor bench application.

The serial interface is made for slow point to point connections (f ≤ 10 Hz). The communication between the Test Bench Control Computer (TBCC) and the peripheral analysers works according to the master slave principle. That means that the peripheral analysers will only answer with a response telegram to the command telegram of the TBCC. They will not send an own message.

List of commands:

Control commands:

CODE:	Function:
SARA	Autoranging "OFF" (located range will remain)
SARE	Autoranging "ON"
SATK	Autom. Calibration (zero and span calibration + zerogas + stand-by)
SEGA	Spangas (spangas will flow with time limit)
SEMB	Set range (1, 2, 3, 4)
SMAN	Operation mode "Manual"
SMGA	Samplegas (will be sucked or will be on)
SNGA	Zerogas (zerogas will flow with time limit)
SPAU	Pause (resting status, e.g. pumps, ozonator, deozonator, high voltage off, gas input closed within the device)
SREM	Operation mode "Remote"
SRES	Reset (analyser will change via initializing mode to stand-by)
SSPL	Purging (purge air will be sucked or will be on)
STBY	Stand-by (get ready for measurement no matter of the previous history)
SENO	NO measurement (operation mode CLD)
SNOX	NOx measurement (operation mode CLD)

Read commands:

CODE:	Function:
AEMB	Select range (R1, R2, R3, R4)
AKAK	Calibration gas concentration (in ppm)
AKON	Concentration (current value in ppm)
AMBE	End of range (in ppm)
ASTF	Internal error status
ASTZ	Device status
ATEM	Temperature
ADRU	Pressure (for device)
ADUF	Flow (for device)
AKEN	Device tag

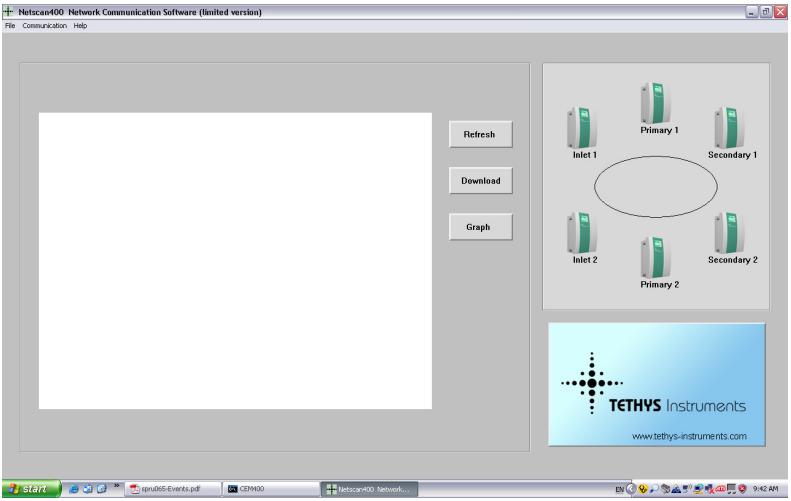
Write commands:

CODE:	Function:
EKEN	Device tag

4.3.6 - Remote

REMOTE

Mode REMOTE can control the analyser by a laptop with special software provide by Tethys.
Refer to the operating manual of this software (NetScan400)



Interface

4.4 - USB

USB port is for an intermittent connection of a mass storage key (extension wire must be inferior at 3m)

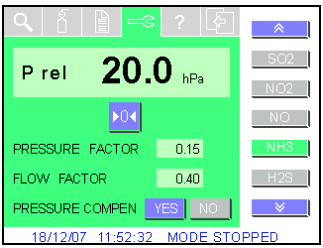
Characteristics:
When the key is connected, diagnostic data and measurement data are stored in .txt files.
For diagnostic data, the name of file begins by “D”, followed by the board number and by the incremental number. For measurement data, the name of file begins by “M”, followed by the board number and by the incremental number.

5 - PRESSURE

Position

To check the pressure of the gas circuit, press + PRESSURE

Define function



Set the zero pressure according to your specific environment.

PRESSURE FACTOR: Coefficient of calibration of pressure measurement set in factory.

FLOW FACTOR: Coefficient of calibration of flow measurement that should be set after the complete installation of the analyzer.

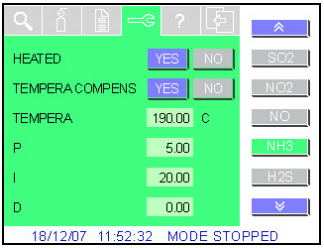
PRESSURE COMPEN: Activate the pressure compensation.

6 - TEMPERATURE

Position

To check the temperature setting of the gas circuit, press + TEMPERA

Define function



HEATED: Select if the gas circuit is heated or not. If not, there is no need to configure the following.

TEMPERATURE COMPENS: Activate the pressure compensation.

TEMPERA: Set the temperature of the gas circuit.

P I D: Proportional, Integral and Derivative coefficients in order to avoid any deviation of temperature from the setpoint.

To check the temperature value, you have to go on + TEMPERA

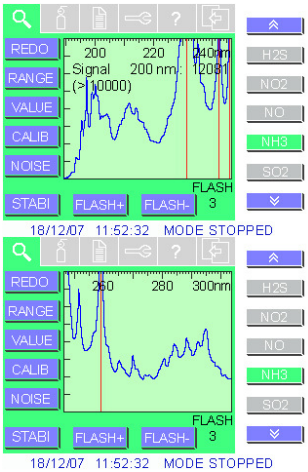
7 - SIGNAL ADJUSTMENT

7.1 - Signal transmission

Position

To check the signal of xenon lamp, press +

Define function



This is the screen to control the signal of xenon lamp.

It displays the specific spectrum of xenon lamp between 190 to 245nm.

RANGE Give the rest of spectrum between 246 to 315nm.

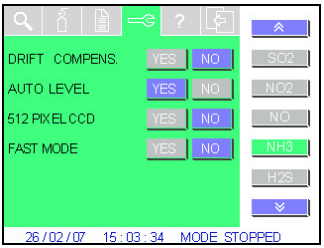
CALIB Allow to calibrate the spectrum on the 230nm peak.

7.2 - Spectrograph setting

Position

To configure the electronic of spectrograph, press + SPECTRO

Define function



DRIFT COMPENS.: Activate the drift compensation on the spectrograph. By default, it is not necessary.

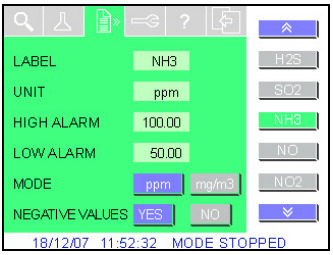
AUTO LEVEL: If activated, the number of flashes is automatically adjusted at each zero to maintain a constant level of light. If not activated, the number of flashes is fixed manually in the “Signal” screen

512 PIXEL CCD: The 512 pixel CCD is available as an option. If this option is install, it must be selected as “YES”.

FAST MODE: Activate a fast mode to increase flashes frequency of xenon lamp to reduce the measuring time.

8 - CONFIGURATION

8.1 - NH_3 Ammonia



LABEL: Display the appropriate label.

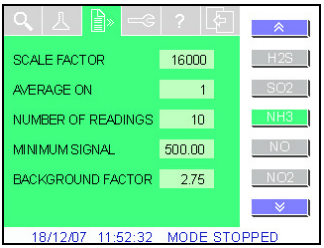
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



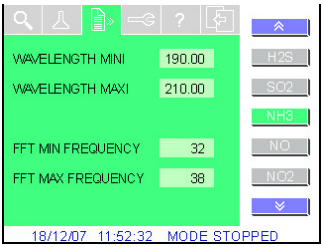
SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

BACKGROUND FACTOR: Factor for zero correction



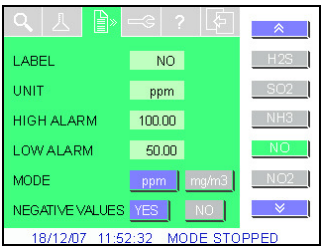
WAVELENGTH MINI: Enter the value corresponding to the minimum wavelength of the spectrum range used for the FFT measurement.

WAVELENGTH MAXI: Enter the value corresponding to the maximum wavelength of the spectrum range used for the FFT measurement.

FFT MIN FREQUENCY: Display the FFT minimum of frequency.

FFT MAX FREQUENCY: Display the FFT maximum of frequency.

8.2 - NO Nitrogen Monoxide



LABEL: Display the appropriate label.

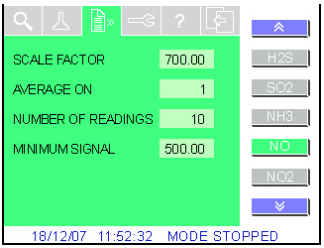
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.

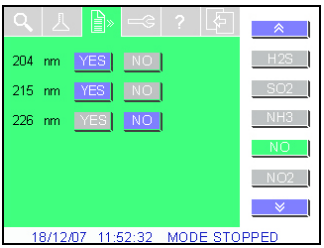


SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

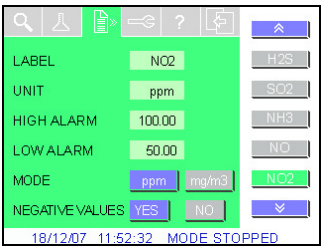


204 nm: Take into account the absorption peak at 204 nm for NO measurement

215 nm: Take into account the absorption peak at 215 nm for NO measurement

226 nm: Take into account the absorption peak at 226 nm for NO measurement

8.3 - NO_2 Nitrogen Dioxide



LABEL: Display the appropriate label.

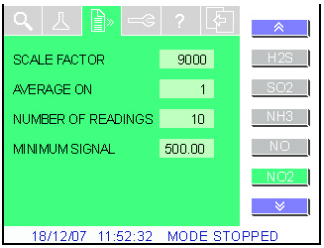
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.

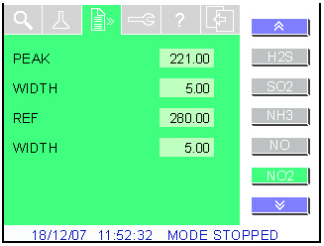


SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.



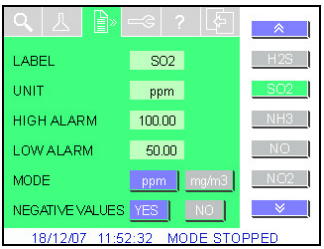
PEAK: The wavelength of central absorption peak.

WIDTH: Width taken in account for the calculation of absorption peak.

REF: The wavelength of central absorption reference.

WIDTH: Width taken in account for the calculation of absorption reference.

8.4 - SO_2 Sulphur Dioxide



LABEL: Display the appropriate label.

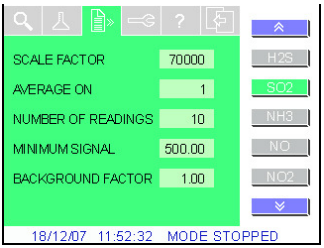
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



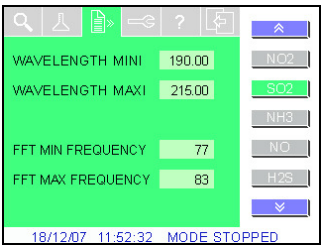
SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

BACKGROUND FACTOR: Factor for zero correction

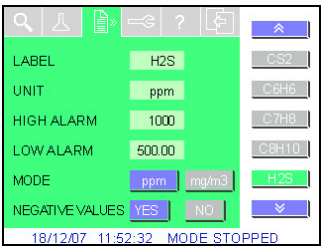


WAVELENGTH MINI: Enter the value corresponding to the minimum wavelength of the spectrum range used for the FFT measurement.
WAVELENGTH MAXI: Enter the value corresponding to the maximum wavelength of the spectrum range used for the FFT measurement.

FFT MIN FREQUENCY: Display the FFT minimum of frequency.

FFT MAX FREQUENCY: Display the FFT maximum of frequency.

8.5 - H_2S Hydrogen Sulfide



LABEL: Display the appropriate label.

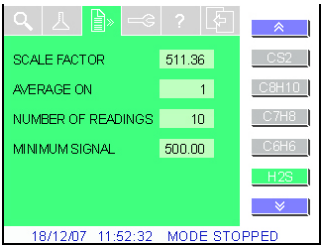
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

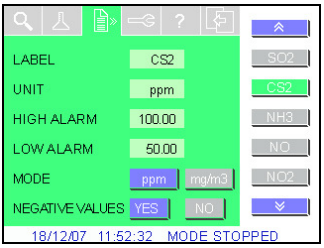
PEAK: The wavelength of central absorption peak.

WIDTH: Width taken in account for the calculation of absorption peak.

REF: The wavelength of central absorption reference.

WIDTH: Width taken in account for the calculation of absorption reference.

8.6 - CS_2 Carbon Disulfide



LABEL: Display the appropriate label.

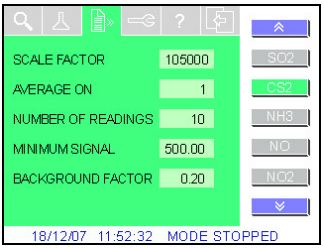
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



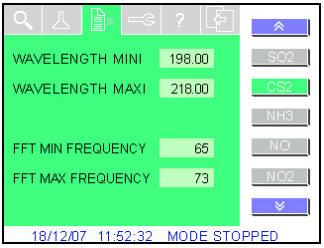
SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

BACKGROUND FACTOR: Factor for zero correction



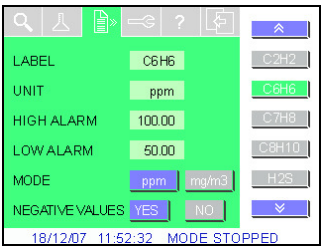
WAVELENGTH MINI: Enter the value corresponding to the minimum wavelength of the spectrum range used for the FFT measurement.

WAVELENGTH MAXI: Enter the value corresponding to the maximum wavelength of the spectrum range used for the FFT measurement.

FFT MIN FREQUENCY: Display the FFT minimum of frequency.

FFT MAX FREQUENCY: Display the FFT maximum of frequency.

8.7 - C_6H_6 Benzene



LABEL: Display the appropriate label.

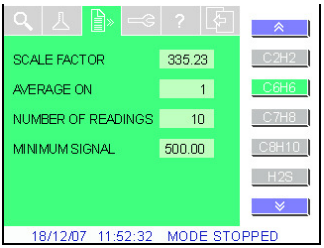
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

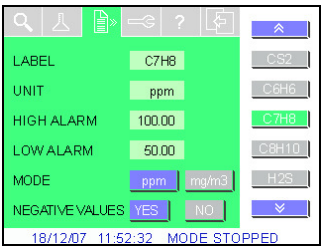
PEAK: The wavelength of central absorption peak.

WIDTH: Width taken in account for the calculation of absorption peak.

REF: The wavelength of central absorption reference.

WIDTH: Width taken in account for the calculation of absorption reference.

8.8 - C_7H_8 Toluene



LABEL: Display the appropriate label.

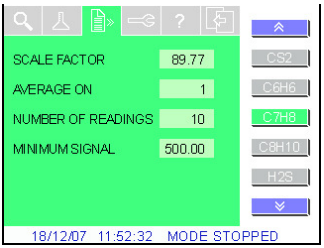
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.



SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.

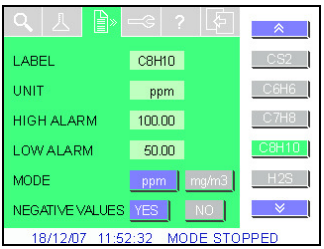
PEAK: The wavelength of central absorption peak.

WIDTH: Width taken in account for the calculation of absorption peak.

REF: The wavelength of central absorption reference.

WIDTH: Width taken in account for the calculation of absorption reference.

8.9 - C_8H_{10} Xylene



LABEL: Display the appropriate label.

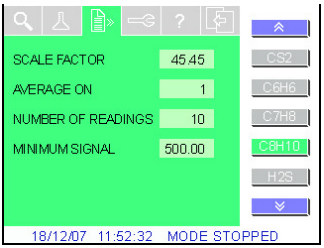
UNIT: Display the appropriate unit.

HIGH ALARM: Display the threshold of high alarm.

LOW ALARM: Display the threshold of low alarm.

MODE: Read directly the measurement in ppm or in mg/m^3.

NEGATIVE VALUES: If you don't want to display the negative values on the main screen, you must press "NO". Otherwise, press "YES" to display the negative values.

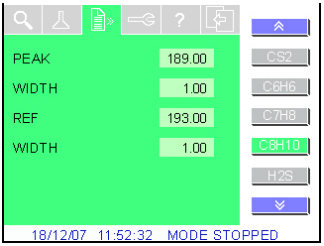


SCALE FACTOR: Coefficient of calibration set in factory.

AVERAGE ON: The number of acquisition that the analyzer needs to perform an average measurement.

NUMBER OF READING: Display the number of reading.

MINIMUM SIGNAL: Display the minimum of signal; limit of error.



PEAK: The wavelength of central absorption peak.

WIDTH: Width taken in account for the calculation of absorption peak.

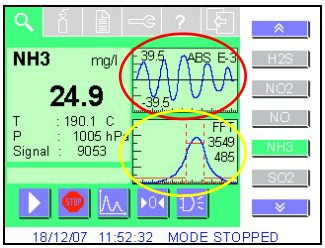
REF: The wavelength of central absorption reference.

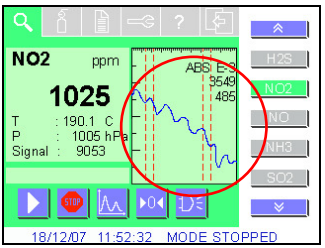
WIDTH: Width taken in account for the calculation of absorption reference.

8.10 - C_2H_2 Acetylene

9 - CHECK

9.1 - Description of screen





The spectrum encircles in red, show the absorbance spectrum. The first screen shows the specific absorbance spectrum of ammonia gas, with its periodic structure. The second one, shows the specific absorbance spectrum of NO_2 gas

For gas treated by FFT algorithm, there is an other spectrum in yellow. Its shows the FFT.

9.2 - Manual measurement

This screen allows making a manual measurement. We have some buttons in the bottom of screen.

Pressing this button, a measurement cycle starts

Pressing this button, pump stops

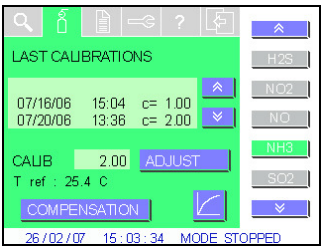
Pressing this button, we can check the absorbance

Pressing this button, we can do a zero

Pressing this button, we can check the signal

10 - CALIBRATION

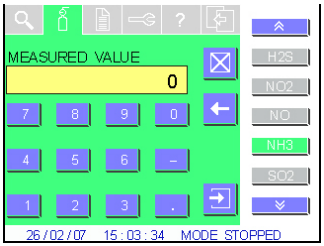
10.1 - Description

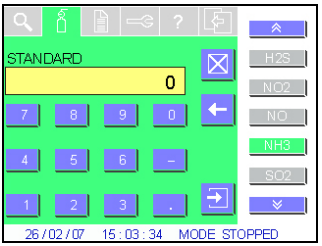


This screen allows adjusting the calibration factor. This factor corresponds to the ratio between the measured value and the standard value. This factor is required that the analyser displays the real value. This screen displays the historic of calibration factor adjustment (date, hour and value).

10.2 - Adjust calibration factor

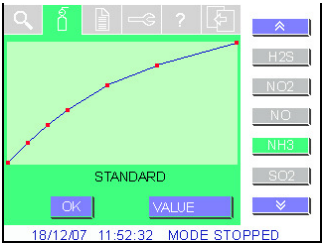
ADJUST :Adjust the calibration factor entering the measured value in first step and entering the standard value. The analyser calculates the new calibration factor.

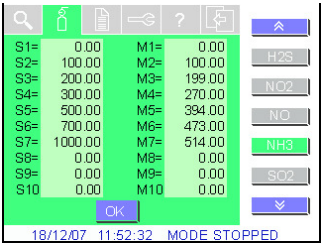




10.3 - Linearization curve

Display the linearization curve





If you press the “VALUE” key, you can access to values of linear curve, and you can change them.
If you want to make the linearization, don’t forget to clear the linearization curve before measurement. To clear it, you have to put (0, 0); (1, 1); (0, 0); (0, 0); (0, 0); (0, 0); (0, 0); (0, 0); (0, 0); (0, 0); (0, 0).

10.4 - Standard gas

Before each manual measurement, be sure the zeroing was preformed correctly. Then measure the concentration of the calibration gas cylinder.
Chen you have the measurement, you can calibrate the analyser by adjusting the “calib factor” on the calibration menu.

Ammonia: 50ppm of NH_3.

Nitrogen monoxide: 1000ppm of NO.

Nitrogen dioxide: 1000ppm of NO_2.

Sulphur dioxide: 250ppm of SO_2.

Carbon disulfide: 50ppm of CS_2

Hydrogen sulphide: 50ppm of H_2S

Benzene: 50ppm of C_6H_6.

Toluene: 15ppm of C_7H_8.

Xylene: 15ppm of C_6H_6.

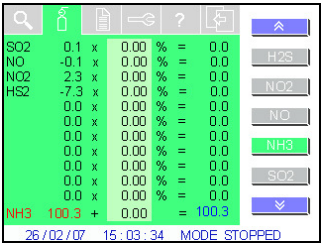
Formaldehyde: 50ppm of HCHO

Acetaldehyde: 50ppm of CH_3CHO

Acetylene: 2500ppm of C_2H_2

10.5 - Gas compensation

COMPENSATION: Set the interfering gas compensation on the measured gas.



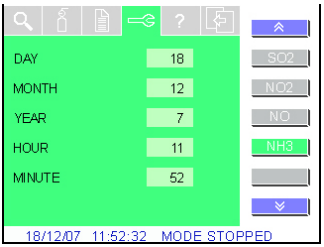
11 - SETTING

11.1 - Clock

Position

To set the clock, press +

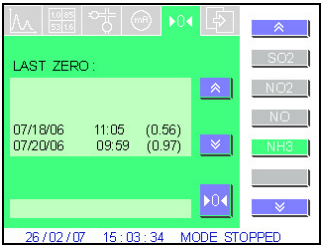
Define function



All the measurement data stored in the analyzer on-board memory is date time stamped. The date and time can easily be set with the "Real Time Clock Setting" screen shown above.
Pressing any of displayed fields (DAY, MONTH, YEAR, HOUR and MINUTE) brings up a numeric keypad where you can modify the value.

11.2 - Zeroing configuration

11.2.1 - Manual zeroing



This screen allows to do a zeroing on all parameters.

Activate a manual zeroing

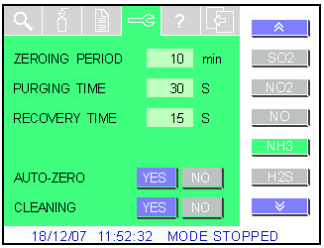
Shows the historic of zeroing (date, hour and drift of zero).

11.2.2 - Automatic zeroing

Position

To set the automatic zeroing, press +

Define function



This screen allows adjusting the daily cleaning.

ZEROING PERIOD: Set the period time for regular zeroing.

PURGING TIME: Set the circulation time of zero gas before zeroing.

RECOVERY TIME: Set the circulation time of sample gas before measurement.

AUTO-ZERO: Activate or deactivate the regular zeroing.

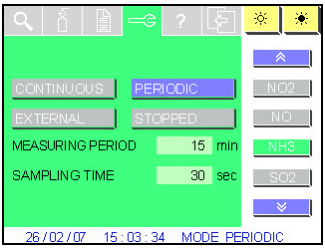
CLEANING:

11.3 - Measurement mode

Position

To define the measurement mode, press + MODE

Define function



The analyzers can be operated under several measuring modes.
The “Measuring Mode” takes into account whether sample flow into the analyzer is continuous (sample under pressure) or intermittent.

CONTINUOUS

“Continuous” here is used in the sense of measurements being made consecutively.
Measured values are stored in the memory at each measurement.

PERIODIC

The word PERIODIC is used here to mean that the parameter measurement is done on an interval basis, whether sample delivery is done with the optional membrane pump or continuous flow in and out of the analyzer. If the analyzer is equipped with a membrane pump, selecting the PERIODIC mode tells the analyzer to trigger the pump at the time interval set under the MEASURING PERIOD field and for a period of time defined under the SAMPLING TIME field.
The measurement interval (MEASURING PERIOD) is selectable from 1 minute to 720 minutes (12 hours).

STOPPED

This measuring mode prevents any measurement to take place and disables the automatic zeroing routine. It is selected for example when the user is doing some maintenance work around the analyzer on the sample delivery system. It prevents making and storing in memory measurements that would be meaningless as well as consuming cleaning solution for no reason.

EXTERNAL

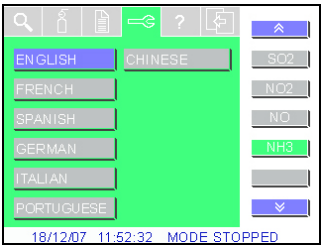
This measuring mode corresponds to the situation where an actual measurement of the analyzer is triggered by an external intelligent system such as a Programmable Logic Controller (PLC) or a DCS. In order to be able to implement this capability, the analyzer must be equipped with the optional MIL input module (remote command option).

11.4 - Language

Position

To set the language, press + LANGUAGE

Define function



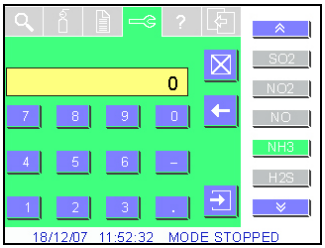
The analyzers are multilingual. The user can select among 7 languages to control the operation of the analyzer.
Press any button to highlight the chosen language and exit to validate.

11.5 - Password

Position

To define the password, press +

Define function



If the person responsible for operating the analyzer wants to avoid access to the programming screens of the analyzer, he has the possibility to set a numeric password set by entering up to 4 numbers on the password screen. Then, no one other than those knowing the password will be able to pass beyond the Process Screen

When the analyzer is first delivered to the client, the analyser has no pre-defined password. By default, the password is ZERO.

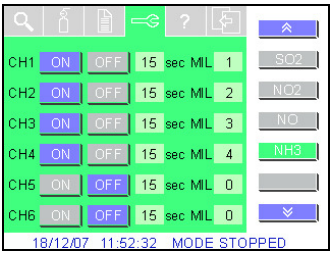
Pressing ENTER button on this screen will allow the user to move on.

The other reason when the analyser will ask you the password again is more to indicate to the user that he is entering a zone where he must be very cautious with the new modification in the configuration of the analyser.

12 - MULTIPLEXING

Position

To check the multiplexing configuration, press + MULTIPLEX



This is the screen of multiplexing. There are the numbers of streams, the time of sampling pump and the position of MIL modules. Normally it is already done.

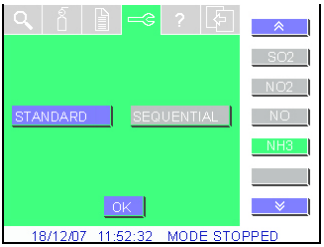
Define function

Multiplexing is available if you have several streams (up to 6) to control. For each stream, you must have a relay module.

ON or OFF : Activate the relay in function of the number of streams.
By default, if you have two streams on M1 and M2, the first channel is associated to M1 and the second channel is associated to M2.

“15 sec”: Modify the time necessary to renew the sample on the flow cell for each stream.

If you want to inhibit measurement by a robot, you can add MIL module (Logical Input Module).



Setting standard or sequential

STANDARD
Display all the parameters of each channel.

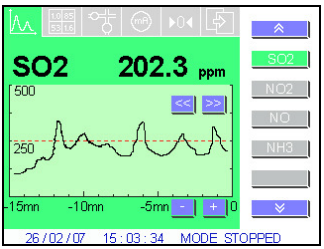
SEQUENTIAL
Display all the parameters with indication of the current channel measured.

Then select batch mode and adjust the measuring period to take into account the time of the complete multiplexing cycle.

Exit to save the new configuration.

13 - PROCESS SCREENS

13.1 - Graph display

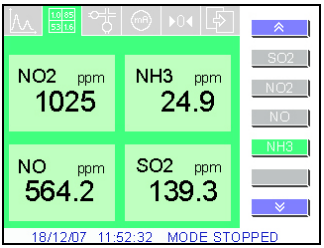


This screen displays last concentration reading and a graph of the measured data over the different time scale for each parameter selected on the right side (in green) among the list of measured parameters (in gray).

Modify graph's time scale from the last hour to the last month.

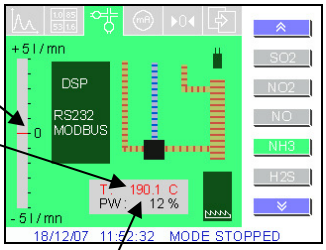
Move a curser on the graph to display a specific measurement.

13.2 - Value display



This screen displays simultaneous the last concentration reading of all measured parameters.

13.3 - Synoptic display



Flow meter

Temperature of the gas circuit

Power apply on the Cartridge Heater

This screen shows the synoptic of measurement with animation according to the cycle of measurement.

14 - MAINTENANCE

	The 3V lithium battery used to backup the measurements has a 10 years lifetime. Observe local regulation for throw away the battery

General troubleshooting

Symptoms	**Checking / Probable cause**
The screen remains black and there is no “bip”.	Check the power socket. Check the position of the button on main filter is on “1”. Check if there is the fusible and if it is not burn out.

Cleaning

No special maintenance is required. In case of lose of signal due to the abnormal condition of use (condensation, dust…), please refer to the technical manual to know how to clean the optical parts.

Measuring troubleshooting

Symptoms	**Probable cause**
Err 1 Temperature	
Err 2 Light is too low	- Dirty or deposit on the optical parts - Disconnection of the emitter
Err 3 Light is too high	- Increase of the lamp signal after cleaning the optics - Reduce the number of flashes in the signal screen
Err 4 Spectrograph unpluged	
Err 5 Pressure	

15 - ANNEXES

Ammonia

AL002

Label 2.3 : Toxic gas.

Label 8 : Corrosive substance.

N : Dangerous for the environment

T : Toxic

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade name : Ammonia
MSDS No : AL002
Chemical formula : NH3
Company identification : AIR LIQUIDE SA
France
See paragraph 16 "OTHER INFORMATION"
Emergency phone nr : See paragraph 16 "OTHER INFORMATION"

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation : Substance.

Substance name		Contents	CAS No	EC No	Index No	Classification
Ammonia	:	100 %	7664-41-7	231-635-3	007-001-00-5	R10 T; R23 C; R34 N; R50

Contains no other components or impurities which will influence the classification of the product.

3 HAZARDS IDENTIFICATION

Hazards identification : Liquefied gas.
Toxic by inhalation.
Corrosive to eyes, respiratory system and skin.

4 FIRST AID MEASURES

First aid measures

- Inhalation : Toxic by inhalation.
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Skin/eye contact : May cause chemical burns to skin and cornea (with temporary disturbance to vision).
Immediately flush eyes thoroughly with water for at least 15 minutes.
Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
Obtain medical assistance.

- Ingestion : Ingestion is not considered a potential route of exposure.

5 FIRE-FIGHTING MEASURES

Flammable class : Non flammable.
Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : If involved in a fire the following toxic and/or corrosive fumes may be produced by

Hydrogen sulphide

AL073

Label 2.3 : Toxic gas.

Label 2.1 : flammable gas.

N : Dangerous for the environment

T+ : Very toxic

F+ : Extremely flammable

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade name : Hydrogen sulphide
MSDS No : AL073
Chemical formula : H2S
Company identification : AIR LIQUIDE SA
France
See paragraph 16 "OTHER INFORMATION"
Emergency phone nr : See paragraph 16 "OTHER INFORMATION"

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation : Substance.

Substance name		Contents	CAS No	EC No	Index No	Classification
Hydrogen sulphide	:	100 %	7783-06-4	231-977-3	016-001-00-4	F+; R12 T+; R26 N; R50

Contains no other components or impurities which will influence the classification of the product.

3 HAZARDS IDENTIFICATION

Hazards identification : Liquefied gas.
Extremely flammable.
Very toxic by inhalation.

4 FIRST AID MEASURES

First aid measures

- Inhalation : Very toxic by inhalation.
May cause damaging effects to central nervous system, metabolism and gastrointestinal tract.
Prolonged exposure to small concentrations may result in pulmonary oedema.
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Ingestion : Ingestion is not considered a potential route of exposure.

5 FIRE-FIGHTING MEASURES

Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition : Sulphur dioxide.

Extinguishing media

- Suitable extinguishing media : All known extinguishants can be used.
Specific methods : If possible, stop flow of product.
Move away from the container and cool with water from a protected position.

Nitric oxide

AL088

Label 2.3 : Toxic gas.

Label 5.1 : Oxidizing substances.

Label 8 : Corrosive substance.

O : Oxidizing

C : Corrosive

T+ : Very toxic

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade name : Nitric oxide
MSDS No : AL088
Chemical formula : NO
Company identification : AIR LIQUIDE SA
France
See paragraph 16 "OTHER INFORMATION"
Emergency phone nr : See paragraph 16 "OTHER INFORMATION"

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation : Substance.

Substance name		Contents	CAS No	EC No	Index No	Classification
Nitric oxide	:	100 %	10102-43-9	233-271-0	-----	O; R8 T+; R26 C; R34

Contains no other components or impurities which will influence the classification of the product.

3 HAZARDS IDENTIFICATION

Hazards identification : Compressed gas.
Very toxic by inhalation.
Corrosive to eyes, respiratory system and skin.
Oxidant. Strongly supports combustion. May react violently with combustible materials.

4 FIRST AID MEASURES

First aid measures

- Inhalation : Very toxic by inhalation.
Delayed adverse effects possible.
Prolonged exposure to small concentrations may result in pulmonary oedema.
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Skin/eye contact : May cause chemical burns to skin and cornea (with temporary disturbance to vision).
Immediately flush eyes thoroughly with water for at least 15 minutes.
Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
Obtain medical assistance.

AIR LIQUIDE

SAFETY DATA SHEET

Revised edition no : 1

Date : 15/7/2005

Supersedes : 0/0/0

Nitrogen dioxide - Dinitrogen tetroxide

AL090

Label 2.3 : Toxic gas.

Label 5.1 : Oxidizing substances.

Label 8 : Corrosive substance.

T+ : Very toxic

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade name : Nitrogen dioxide - Dinitrogen tetroxide

MSDS No : AL090

Company identification : AIR LIQUIDE SA
France
See paragraph 16 "OTHER INFORMATION"

Emergency phone nr : See paragraph 16 "OTHER INFORMATION"

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation : Preparation.

Substance name		Contents	CAS No	EC No	Index No	Classification
Nitrogen dioxide	:		10102-44-0	233-272-6	007-002-00-0	T+; R26 C; R34
Dinitrogen tetroxide	:		10544-72-6	234-126-4	007-002-00-0	T+; R26 C; R34

Contains no other components or impurities which will influence the classification of the product.

3 HAZARDS IDENTIFICATION

Hazards identification : Liquefied gas.
Very toxic by inhalation.
Corrosive to eyes, respiratory system and skin.
Oxidant. Strongly supports combustion. May react violently with combustible materials.

4 FIRST AID MEASURES

First aid measures

- Inhalation : Very toxic by inhalation.
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Skin/eye contact : May cause chemical burns to skin and cornea (with temporary disturbance to vision).
Immediately flush eyes thoroughly with water for at least 15 minutes.
Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
Obtain medical assistance.

- Ingestion : Ingestion is not considered a potential route of exposure.

5 FIRE-FIGHTING MEASURES

Flammable class : Non flammable.

Specific hazards : Supports combustion.
Exposure to fire may cause containers to rupture/explode.

Sulphur dioxide

AL113

Label 2.3 : Toxic gas.

Label 8 : Corrosive substance.

C : Corrosive

T : Toxic

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade name : Sulphur dioxide
MSDS No : AL113
Chemical formula : SO2
Company identification : AIR LIQUIDE SA
France
See paragraph 16 "OTHER INFORMATION"
Emergency phone nr : See paragraph 16 "OTHER INFORMATION"

2 COMPOSITION / INFORMATION ON INGREDIENTS

Substance / Preparation : Substance.

Substance name		Contents	CAS No	EC No	Index No	Classification
Sulphur dioxide	:	100 %	7446-09-5	231-195-2	016-011-00-9	T; R23 C; R34

Contains no other components or impurities which will influence the classification of the product.

3 HAZARDS IDENTIFICATION

Hazards identification : Liquefied gas.
Toxic by inhalation.
Corrosive to eyes, respiratory system and skin.

4 FIRST AID MEASURES

First aid measures

- Inhalation : Toxic by inhalation.
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

- Skin/eye contact : May cause chemical burns to skin and cornea (with temporary disturbance to vision).
Immediately flush eyes thoroughly with water for at least 15 minutes.
Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
Obtain medical assistance.

- Ingestion : Ingestion is not considered a potential route of exposure.

5 FIRE-FIGHTING MEASURES

Flammable class : Non flammable.
Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : None.
Extinguishing media
- Suitable extinguishing media : All known extinguishants can be used.

Distributor:

Comments:

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TETHYS Instruments

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