



CYBER OTH/ XIN IP65

Head

Plastic heads

Instruction manual





THIS MANUAL MUST BE CAREFULLY READ BY ALL PERSONS WHO HAVE OR WILL HAVE THE RESPONSIBILITY FOR INSTALLING, USING OR SERVICING THIS PRODUCT.

Like any equipment, this product will perform as designed only if installed, used, and serviced in accordance with the manufacturer's instructions.

OTHERWISE, IT COULD FAIL TO PERFORM AS DESIGNED AND PEOPLE WHO RELY ON THIS PRODUCT FOR THEIR SAFETY COULD SUFFER SEVERE PERSONAL INJURY OR DEATH.

The warranties made by N.E.T s.r.l. with respect to this product are voided if the product is not installed, used, and serviced in accordance with the instructions in this user guide. Please protect yourself and others by following them.

We recommend our customers to write or call us regarding this equipment prior to use or for any additional information relative to use or repair.

Summary

1.0	Introduction	4
1.1	General description	4
2.0	Technical specifications	5
3.0	Mechanical Specifications	6
4.0	Installation site pre arrangement	6
4.1	General precautions.....	6
4.2	Precautions based on the gas to detect and environmental inhibitors	7
4.3	Special conditions for safe use	7
5.0	Installation	7
5.1	I/O Connections	8
5.2	Safety data	9
5.3	4-20 mA output connection.....	9
5.4	RS485 digital connection	9
6.0	Testing and use.....	10
6.1	Power on.....	10
6.2	Testing	10
6.3	Use	10
7.0	Maintenance	11
7.1	Preventive maintenance routines	11
7.2	Corrective maintenance routines	11
7.3	Note on IP grade	11
7.4	Cleaning.....	11
7.5	Disassembly instructions.....	11
7.6	Trouble shooting guide.....	12
8.0	Restorations.....	13
9.0	Packing instructions.....	13
10.0	Warranty for repairing	14
11.0	Instructions for disposal.....	14

1.0 Introduction

These instructions refer to the installation, use and maintenance of CYBER OTH and XIN plastic head gas sensors.

1.1 General description

CYBER OTH and XIN/DIN head gas sensors are used to detect the presence of different gases in environments where the principal constituent is air.

The sensing element inside the CYBER OTH detector can be either a catalytic sensor, an infrared sensor, or an electrochemical cell. XIN/DIN heads are supplied with only infrared sensor.

The industrial grade catalytic sensor (pellistor) employed for the detection of flammable compounds offers a great precision and selectivity with most of the explosive gases, thus avoiding false alarms. Infrared sensors are immune to poisoning produced by certain substances that inhibit and damage catalytic sensors. This allows you to add reliability and durability, allowing the use of detectors even in places where the pellistors cannot guarantee optimal functionality. Electrochemical cells are used to detect gases at low concentration, for this reason they are used to detect toxic gases.

CYBER OTH and XIN/DIN head are devices characterised by the presence of the sensing element and the electronics required to process the signal in the detector head. A multi-core cable with 6 conductors allows the connection to power supply and different outputs depending on the configuration of the detector.

To protect and increase the stability and accuracy of the gas detector, the microprocessor present on the internal electronic circuit board, is programmed with the following software algorithms:

- Self-diagnostic procedure to control the detector main operational parts, both hardware and sensing element.
- Zero-point tracking to maintain the zero parameter of the sensor apart from possible drifts due to thermal or physical variations of the sensor.
- Digital filter employed in the digital analysis of the analogue values sampled. It is designed to prevent the effects of transients, which may cause instability or incorrect readings with possible false alarms.
- Hysteresis cycle applied to the digital outputs to eliminate continuous switching close to the preset alarm thresholds.
- Watch-dog for the microprocessor control. In case of intervention, the output current drops down to 0mA. If the RS485 interface is connected, the communication will be interrupted, while the Fault signal (if present) will be activated.

2.0 Technical specifications

Table 1) Technical specifications of gas sensors

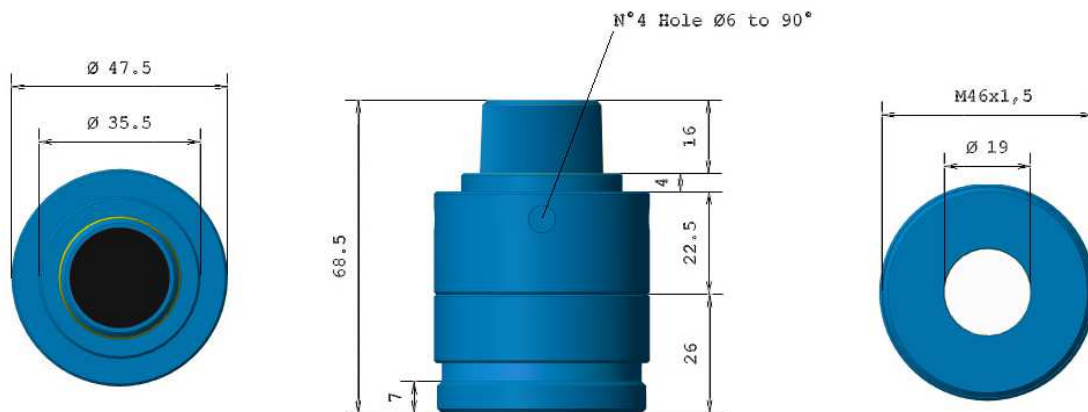
General	Product type:	CYBER OTH	XIN/DIN 4-20mA
	Sensing Element:	IR sensor, EC cell, catalytic bead	NDIRsensor
	Operating temperature range	Electronics between -40°C / +60°C Sensing elements depend by the sensor technology (See Sensor specification)	
	Storage temperature range	Depend by the sensor technology (See Sensor specification)	
	Maximum temperature cycle variations	± 1°C/min	
	Operating humidity range	0-95% NDIR & catalytic 20-90% EC cell	0-95% non condensing
	Operating pressure range	800-1200 mBar NDIR sensor 900-1100 mBar EC cell & catalytic	800-1200 mBar
	Enclosure	Acetal Copolymer IP rating: IP65	
	Calibration	Individually calibrated with temperature compensation. Test report supplied.	
	Accessories	NECAP3: Aluminium calibration adapter. It allows the right quantity of gas inlet to flow to the detector.	
Measurement	Range	ppm; %vol;%lel	ppm; %vol
	Response time	Depending on sensor type	<60 seconds
	Digital to analog error	±3%F.S	±2%F.S
	Digital error	±5%F.S	Depend by the sensor
	Stabilization Time	At least 60 minutes	
	Warmup time	<120 seconds	
Electrical	Power Voltage	Nominal 12-24Vdc (-20% +15%)	
	Current Consumption @12V	20-25mA with EC cell 75-85mA with NDIR 40-60mA with catalytic bead	<80 mA I _{dc}
	Current Consumption @24V	25-35mA with EC cell 40-50mA with NDIR 20-30mA with catalytic bead	<40 mA I _{dc}
	Warm up time	90 s for full operation @ 25 °C 1 hour for full specification @25°C	60 s for full operation @ 25 °C 1 hour for full specification @ 25 °C
	Max output current	24 mA	
	Output load resistor range	330Ω with V _{in} between 12-15V 500Ω with V _{in} between 15-24V	100-350 Ω
	DC output impedance	100 Ω	30 Ω
Signal Output	Analog output	4-20mA	4-20mA
	Digital communication	Modbus protocol RS485	Modbus protocol UART TTL or RS485
	Baud Rate	9600 bps	4800;9600;19200;38400 bps

2.1 Label explanation

Table 2 The data present on the product label are explained below

N.E.T S.r.l.	Name of the manufacturer of the device
NETC32/PB-AIN-IFP32-1ZEL	Example of identification code
CYBER HEAD	Product model
Thread: ¾" NPT	Thread type
Gas: R1234ZE	Example of gas to be detected
F.S: 100%LEL (6.5%Vol)	Example of measuring range
Vin: 12-24 V	Power supply
Output: 4-20 mA	Signal output
Cyber S/N: XXXXX	Serial Number
Sensor batch: XXXXXX	Sensor Batch
IP65	IP degree of protection (1st number: protection against solids, 2nd number: protection against liquids) guaranteed when the optional dust cover is applied

3.0 Mechanical Specifications



All dimensions are expressed in mm.

Standard length of the cable is 25cm, other lengths are available on customer's request.

4.0 Installation site pre arrangement

4.1 General precautions

At the mounting and installation phase, be sure all safety precautions have been considered. Always remember how important the correct positioning of gas sensors is to get the optimum response. Be careful:

- never to install gas sensors close to air intakes or fans causing strong air currents.
- the detectors are attached to a firm base to prevent vibration that can damage them, producing unreliable results. Although the electronics comply with the electromagnetic compatibility rules, it is advised to keep the detectors at a distance from any radio frequency senders (such as radio links or similar).
- those detectors are placed in a convenient location for future maintenance and calibration requirements.

4.2 Precautions based on the gas to detect and environmental inhibitors

When preparing the installation site, it is necessary to consider the nature of the gas to be detected and the presence of chemical agents in the environment.

- All the gases lighter than air (Methane, Hydrogen, Ammonia) tend to spread upwards; the sensor should be placed at 30 cm from the ceiling to maximise the effectiveness of the detection. All the gases heavier than air (LPG, Butane, Petrol Vapours) tend to spread downwards; the detector should be placed at 30 cm from the floor.
- Catalytic sensors (Pellistors) offer excellent output linearity up to 100% LFL and have an estimated lifetime of 4 years. Catalytic sensor performance may be altered by the presence of some substances that, when present in the atmosphere being analysed, can considerably change the response of the sensor, and even damage it irretrievably. The presence of inhibitors or poisons is the most common cause of problems in the gas detection, and, for this reason, it is necessary to pay attention to avoid any contamination. Among the most common poisons or inhibitors we can list silicones, tetraethyl lead, sulphurous compounds (hydrogen sulphide), chlorinated compounds (carbon tetrachloride), trichloroethylene and halogenated hydrocarbons. These compounds do not affect the Infrared sensor, which find a suitable application whenever a flammable gas is to be detected in environments where Pellistor cannot work. This new technology has undoubted advantages such as lower dependence from environmental factors.

WARNING!

Do not use gas sensors in atmospheres with an oxygen concentration greater than 21%.

4.3 Special conditions for safe use

- The supply cable of the gas detector must be protected against mechanical damages caused by impact or friction.
- Power supply must be guaranteed to a stable level without presence of spikes or interruption of the power level.

5.0 Installation

The installation should be performed by qualified personnel, consider as example the EN 60079-14 standard. It is strictly recommended the use of personal protective equipment during operations inside the enclosure.

The enclosure of the sensor and the GoreTex filter must not be damaged, drilled or removed. The GoreTex filter must never be touched with bare hands as this alters the properties of the filter.

It is recommended to mount the head with the filter directed to the floor; horizontal mount is permitted but it should be considered that in this orientation, in case of external use, the head is more subjected to be in contact with water and/or deposit of dust.

It is forbidden to mount the head with filter directed to the ceiling because with this orientation any dust or dirt can block the filter and then possibility to detect gas.

5.1 I/O Connections

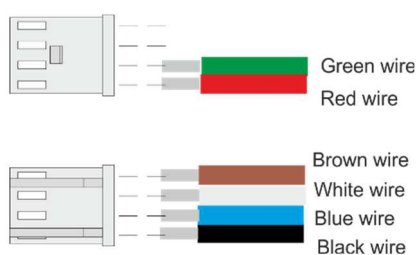
CYBER OTH, XIN, DIN products could be configured with possibility to manage different output connections based on the type of specific request of the customers. It is possible to select up to 4 different signals to be connected to the output connector, indeed VCC and GND wires are fixed. Here are following lists of the possible optional signals that could be managed with CYBER OTH and XIN/DIN products:

CYBER OTH head
TX (UART)
RX (UART)
RS485—A
RS485—B
4-20 mA output signal
Vout (+5V)
FAULT
Threshold 1
Threshold 2
Threshold 3

XIN head	DIN head
VCC	VCC
GND	GND
TX (UART)	RS485—A
RX (UART)	RS485—B
4-20 mA output signal	4-20 mA output signal

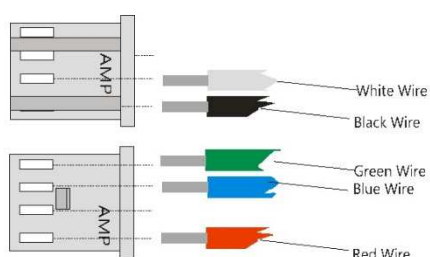
Connector type: AMPMODU II 280365-0
 Mating connector: AMPMODU II 280384-1

Example of the possible wire assembly that could be available with CYBER OTH head:



Wire colour	Meaning
Red	Vcc (12/24 Vdc)
Black	GND
Brown	RS485—A
White	RS485—B
Blue	4-20 mA output signal
Green	Vout (+5V)

Example of the possible wire assembly that could be available with XIN/DIN head:



Wire colour	Meaning
Red	Vcc (12/24 Vdc)
Black	GND
Green	RX or RS485—A
Blue	TX or RS485—B
White	4-20 mA output signal
Brown	It is not connected

5.2 Safety data

CYBER OTH and XIN/DIN products have been designed to be used in applications requiring SIL Capability. Based on the different type of configuration chose, specific values of SIL Capability have been obtained. Please refer to the specific document to check each value or ask to technical support to receive the related information.

5.3 4-20 mA output connection

- Use shielded cables in case it is needed to reduce EMC interference
- Wires' cross section depends on the distance between the control panel and the detector: for a distance up to m 100 we advise a 3-core wire with cross section area of 0.75 mm²; for a distance between m 100 and 200 we recommend a 3-core wire with cross section of 1.0 mm²; for a distance between m 200 and 300 we recommend a 3-core wire with cross section 1.5 mm².
- Should any junctions be necessary on wires, please make sure there is no interruption on the shield (in case of cable version head).
- Please remember that the shield is to be grounded from the control panel side only. Also remember never to connect the shield to the detectors.
- Ensure the wire connections, either clutching or crimping type, are properly carried out with terminals that do not oxidise or loosen. We recommend having them soldered.
- The CYBER OTH/XIN/DIN gas sensors can be connected to control panels available on the market having 4-20mA input signals.

5.4 RS485 digital connection

The connection of detector head to RS485 bus lines should be performed by using a 4-wire cable, 1 pair for the RS485 bus and 1 for the power supply.

It is also necessary that:

- Wiring between the detector and the control panel should be made by using connection cable EIA RS485: 2 core wires with section 0.22 / 0.35 mm² and shield (twisted pair). Nominal capacity between the wires <50pF/m, nominal impedance 120 Ω. These features can be found in BELDEN cable 9842 or similar (data transmission cable in EIA RS485).
- Using this wiring, the total length of the line should not exceed 1000 m.
- Make sure that each multi-polar wire includes just one RS485.
- Make sure that a 120 Ω end line resistor is placed at the beginning and at the end (on the last sensor) of the bus line.
- For the power supply connection, we recommend using a 2-wire cable with suitable section according to the distance and number of detectors. Once the installation has been completed, verify that each detector reaches at least 12 Vdc.

When sensors are RS485 connected, the proportional 4-20mA output remains active.

Please refer to the specific Modbus communication protocol for any additional information.

6.0 Testing and use

6.1 Power on

When the detector is powered on, output current is nearly 1.5 mA.

After nearly two minutes, the output current is 4.0mA.

Once the warm-up phase is over, the detector can work correctly, although the optimal performances will be achieved after one hour.

6.2 Testing

Detectors are factory calibrated for the specific gas required by the customers. Future adjustment of the pre-set calibration can be carried out through digital communication.

IMPORTANT!

Check the functionality at least one time per year, by testing detector response with gas application.

Testing / initial checking and calibration should be carried out by using a gas mixture in the appropriate range, along with our calibration kit.

To execute this operation, the user must use the proper test gas bottle and connect to this the valve with flowmeter. Connect a pipe with adequate diameter, which connects to the calibration adapter for the gas detector. The calibration of the detector is made by handheld calibration keypad or the related calibration SW. Ask to N.E.T for more details about the accessories for calibration.

Please consult the specific instruction manuals (keypad) for further information on use. We recommend recalibrating hydrocarbon detector with Infrared technology in both zero and span condition, zero calibration should be made applying Nitrogen, in case zero calibration will be performed in ambient air then span calibration should be performed applying target gas using a nafion tube interposed between calibration gas cylinder and detector head.

6.3 Use

The detector works autonomously and automatically. Once adequately connected, no further operations are required.

CYBER OTH detector is equipped with an overrange indication which is activated when the gas concentration exceeds 100% of the full scale or when the sensor signal is lower than the zero-calibration value.

7.0 Maintenance

It is recommended that maintenance activities will be performed by trained staff following EN 60079-17 criterion.

7.1 Preventive maintenance routines

The preventive maintenance routines can be carried out according to EN/IEC 60079-17 Standard. Moreover, all industrial gas detectors for flammable gases or for toxic gases must be verified with a test mixture every one or three months according to the installation and plant type and according to the work duty.

7.2 Corrective maintenance routines

If any anomalous conditions occur during test operations, please repeat the test phase. Should the detector not react to the gas it has been calibrated for, please send it back to your supplier, for him to return it to the manufacturer or to a N.E.T. authorized technical centre for the repair.

7.3 Note on IP grade

Please note that the IP rating indicated on the instrument label does not imply that the equipment will detect gas during and after exposure to those conditions of dust and water intrusion. If exposed to the condition's representative of the IP rating, the equipment should be checked and recalibrated with a higher frequency and in case of damage of the IP protection cap, it must be replaced. The PTFE filter of the IP protection cap should by no means be touched by bare hands as this may alter the protection and the response in gas.

7.4 Cleaning

The detectors must be kept clean of dust deposits. Cleaning must be performed with damp cloths or with cloths that do not accumulate electrostatic charges. It is strictly forbidden the dust cleaning using compressed air.

7.5 Disassembly instructions

Power the unit off, disconnect the wires on the terminals and dismount the housing from any blocking systems.

The opening of sensor head can be conducted in safe zone and without power source. After 10 minutes from power source interruption, the equipment can be opened. It is strictly recommended the use of personal protective equipment during operations inside the enclosure.

7.6 Trouble shooting guide

The following table lists all error messages, which can be encountered, with corrective actions to resolve them. When the detector is in error status the 4-20 mA output is 2mA.

Table 3) Error messages with their corrective actions for CYBER OTH

CYBER OTH Error Code	CYBER OTH Error Name	Error Description	Corrective action
0x00	NO_ERRORS	No error present	None
0x01	HEATING	Warmup state condition	Wait 2 minutes
0x02	E2PROM_ERROR	Internal E2PROM error	<ul style="list-style-type: none"> ➤ Turn power off, then on again. ➤ If the previous action does not resolve the error, please contact N.E.T.
0x03	FLASH_ERROR	Internal FLASH error	
0x04	RAM_ERROR	Internal RAM error	
0x05	VCC_ERROR	Power voltage below 10V or above 30V	Adjust detector power (10-30 V interval)
0x08	VGND_ERROR	Internal voltage out of limits	<ul style="list-style-type: none"> ➤ Turn power off, then on again. ➤ If the previous action does not resolve the error, please contact N.E.T.
0x0A	E2PROM_CKSM_ERROR	E2PROM Checksum error	
0x0B	CHANGE_SENSOR	Sensing element out of date	Sensing element life time is expired, please contact N.E.T
0x0C	ANALOG_OUT_ERROR_4_20ma	4-20 mA error. Open loop or fault on analog output	Restore 4-20 mA loop
0x0E	ADC_ERROR	ADC reading out of limits	<ul style="list-style-type: none"> ➤ Turn power off, then on again. ➤ If the previous action does not resolve the error, please contact N.E.T.

Table 4) Error messages with their corrective actions for XIN/DIN Head

XIN/DIN Error Code	XIN/DIN Error Name	Error Description	Corrective action	
0x00	NO_ERROR	None	None	
0x02	E2PROM_CKSM_ERROR	Internal E2PROM error	<ul style="list-style-type: none"> ➤ Turn power off, then on again. ➤ If the previous action does not resolve the error, please contact N.E.T. 	
0x03	FLASH_CKSM_ERROR	Internal FLASH error		
0x04	RAM_ERROR	Internal RAM error		
0x05	VDD_ERROR	Internal Power supply fail		
0x06	I2C_ERROR	Internal communication error		
0x08	SPI_ERROR	Internal communication error		
0x09	VREF_ERROR	Internal Vref error		
0x0A	DAC_ERROR	Internal DAC error		
0x0C	ANALOGUE_4-20MA_ERROR	Output voltage does not correct		
0x0E	ADC_ERROR	Internal ADC error		
0x0F	SW_ERROR	Internal calculation error		
0x10	VIN_ERROR	Power supply level not correct		Verify input power that meets Sensor's power supply range
0x11	FLASH_READ_ERROR			
0x12	FLASH_WRITE_ERROR	Internal FLASH error		
0x13	FLASH_ERASE_ERROR			
0x14	E2PROM_WRITE_ERROR	Internal E2PROM error		
0x16	RFI_ERROR	Internal signals not stable	Verify if Electromagnetic disturbances are present in the working environment.	
0x17	VBG_ERROR	Internal Band gap error	<ul style="list-style-type: none"> ➤ Turn power off, then on again. ➤ If the previous action does not resolve the error, please contact N.E.T. 	
0x18	LAMP_ERROR	IR LAMP not work		
0x19	AMP_ERROR	OP AMP not work		

Cyber OTH product also manages another type of information that is related to the status of the head. Inside the following table are indicated status of the detector and the related codes:

Table 5) Status indications for CYBER OTH

CYBER OTH Status Code	CYBER OTH	Status condition	Error Description
0x00	NO_ALARM	None	
0x01	FAULT		Head is in error condition, please refer to Table 3 to identify the specific error condition and the related action.
0x02	THRESHOLD 1		Gas concentration is above threshold 1 limit
0x04	THRESHOLD 2		Gas concentration is above threshold 2 limit
0x08	THRESHOLD 3		Gas concentration is above threshold 3 limit
0x10	OVERRANGE		Gas concentration is above 100%Full scale

XIN/DIN products, differently from CYBER OTH indicate presence of warning condition but is not indicating any status of the head.

Inside the following table are indicated warning of the detector and the related codes:

Table 6) Warning messages with their descriptions for XIN/DIN Head

XIN/DIN Warning Code	XIN/DIN Warning Name	Warning Description
0x00	NO_WARNING	(no warning, functioning ok)
0x01	WARMUP_WARNING	(warm-up)
0x02	INVALID_ACTIVE_WARNING	active not included within the functional limits expected)
0x04	INVALID_REFERENCE_WARNING	(REF not included within the functional limits expected)
0x08	INVALID_TEMPERATURE_WARNING	(TEMP not included within the functional limits expected)
0x10	INVALID_READINGS_WARNING	active and reference signals changed too fast. This condition can happen in case of fast gas flow rate transient, fast temperature changes and presence of radio frequency,interferences. In case this flag is active then gas concentration is freezed)
0x20	INVALID_ACTIVERMS_WARNING	(WRONG VALUES on the active channel. Active signal is too low)
0x40	INVALID_REFERENCERMS_WARNING	(WRONG VALUES on the reference channel;.Reference signal is too low)
0x80	HW_TEST_WARNING	(HW test in progress. It is performed once per day)

8.0 Restorations

Restorations are not allowed; the user must give the entire equipment to the manufacturer with the RMA number required in advance to return the goods.

9.0 Packing instructions

To grant a stout protection against impacts we recommend using the original package or protect the device with bubble wrap sheets.

10.0 Warranty for repairing

Warranty on N.E.T products is valid one year from the delivery date placed on transportation documents. Defective products can be returned to N.E.T. Srl only after a previous agreement and with a description of the fault. N.E.T. Srl has the right to replace or repair all the products that, according to his unquestionable judgement, are found to be defective, without being held responsible for any possible direct or indirect damages suffered by the Customer. According to the above-mentioned warranty, shipping and packaging charges and any other incidental expenses for the products returned to N.E.T. Srl will be at the Customer's own risk and charged to him. This warranty however is not valid for articles that have been broken, repaired by a third person or not used according to the instructions contained in this document or supplied with the products, related to the storage, installation, operation, maintenance, or servicing of the products.

IMPORTANT!

Please be aware that all perishables installed in our products (sensors) benefit only of the warranty conditions stated by the original manufacturer.

11.0 Instructions for disposal

When the device reaches the end of its life, it should be disposed of in accordance with local waste management requirements and environmental legislation. Employed materials are subdivided into the following categories:

- Sensor head enclosure: plastic
- Electronic boards: Waste Electrical & Electronic Equipment (WEEE)
- Sensing element: Waste Electrical & Electronic Equipment (WEEE)

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