EsiWelma®
a Navim Group Company

Sensigas®

HANDHELD TERMINAL FOR MONITORING AND SETTING UR.20.. SENSORS

Terminal Unit
TUS40-20

INSTRUCTION MANUAL

Type / N.	Rev.	Date	Page	Total pages
EW082.696_en	6	05/10/2020	1	28

CONTENTS

1 GENERAL

This chapter provides some information on the characteristics of the gases and on the installation criteria for gas detection devices before the description of the TUS40-20 terminal unit.

It is not essential to read this chapter to install and commission the terminal unit described in this manual. Readers who already know the subject can skip this part.

1.1 Meaning of symbols

The symbols used in this manual have the following meaning:

- ppm: Parts Per Million of concentration of gas in the air
- L.E.L%: Lower Explosive Limit
- %VOL: concentration of gas measured in percentage by volume
- D: Detector
- t: threshold limit value
- Pr: pre-alarm threshold
- 1t: alarm threshold one
- 2t: alarm threshold two
- FA: fail

1.2 Hazardous gas threshold

For gases and for combustible vapours, the hazardous conditions begin from a threshold called "Lower Explosive Limit" (LEL) that is the lowest concentration (percentage) of a gas in air capable of producing a flash of fire in presence of an ignition source. This threshold changes from gas to gas. The Lower Explosive Limits for some of the most common gases are shown in the table below.

	LEL (100%)	
GAS	**ppm**	**%VOL**
METHANE (CH4)	50,000	5%
ISOBUTANE (iso-C4H10)	18,000	1.8%
BUTANE (C4H10)	18,600	1.86%
LPG	19,000	1.9%
HYDROGEN (H2)	40,000	4%

Table 1.1

For toxic gases such as carbon monoxide (CO), the hazard level must be considered also in relation to the duration of the person's exposure in the polluted environment. The table below shows risks from exposure to carbon monoxide (CO). Carbon monoxide is generated wherever combustion occurs and the lungs rapidly absorb it and spread it through the pulmonary alveolus where it reversibly binds with the haemoglobin as “carboxyhemoglobin” (COHb). It is also colourless and odourless so it is not naturally detected. This is why CO-specific detection devices are necessary.

COHb in the bloodstream has the following effects on healthy adults.

% COHb	EFFECTS
0.3-0.7	Normal amount in non-smokers from the endogenous production of CO
0.7- 2.9	No detectable symptoms
2.9-4.5	Cardiovascular disorders in patients suffering from heart disease
4-6	Usual levels in smokers, some physical impairment in psychomotor tests
7-10	Ailments in patients without heart disease (increase in cardiac output and in blood flow in coronary arteries)
10-20	Slight headache, weakness, possible effect on foetus
20-30	Strong headache, nausea, loss of movement in hands
30-40	Strong headache, irritability, confusion, loss of vision, nausea, muscle weakness, dizziness
40-50	Convulsions and loss of consciousness
60-70	Coma, respiratory arrest, death

Table 1.2

This issue is covered in other similar tables and a wide range of literature. In its document, "Air quality for CO", the US department of Health, Education and Welfare refers to an observed weakening in vision observed with 3% of COHb and in other psychomotor tests with 5% of COHb.
More recently, subjects exposed to a dose of 100 ppm CO for one hour have shown a loss of motor skills.

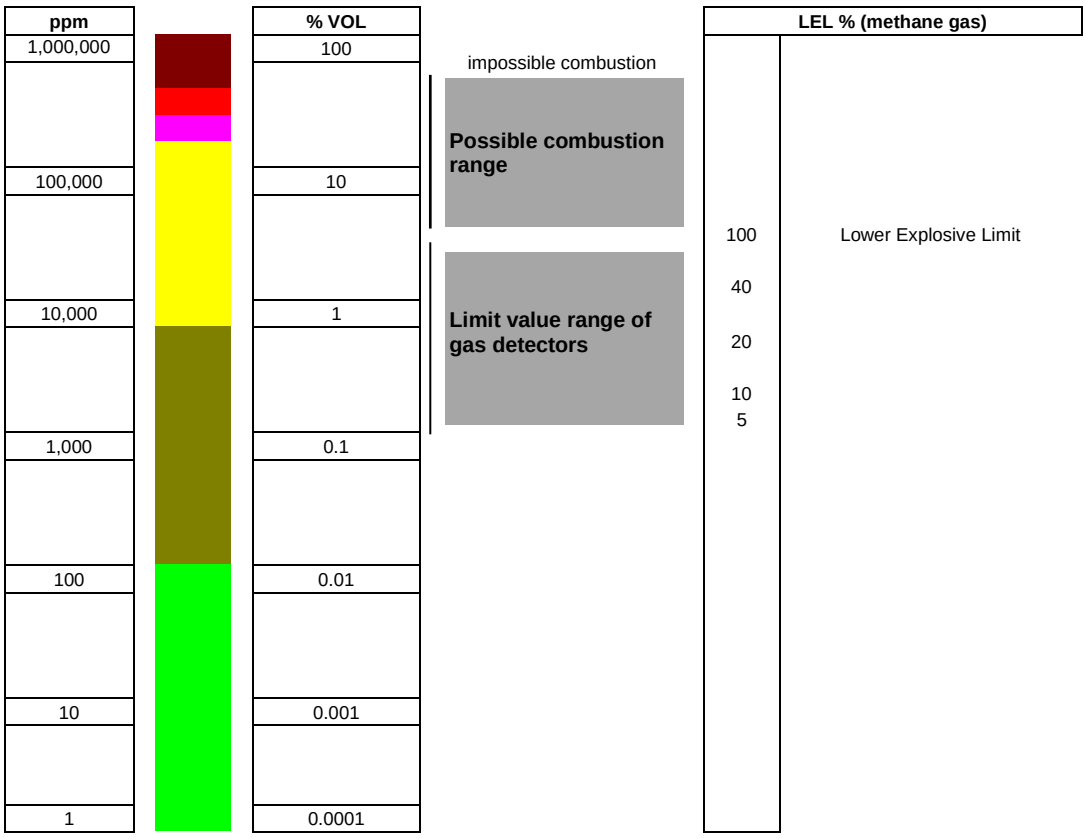


Fig. 1.1

2 DESCRIPTION OF TERMINAL UNIT

The **TUS40-20** is a terminal unit for monitoring and setting the UR.20. sensors and consists of:

- the**TUS40** handheld terminal
- the **UIC20** junction card
- the 3m long **CBL01** coiled cable

the two units communicate through a dedicated master protocol.
The TUS40-20 terminal unit is necessary when a mobile monitoring system is required and/or for different settings of the gas detection threshold limit values from the ones that can be set using the DIP switch; it is also necessary for recalibrating sensors if standard factory calibration gas cylinders are not used.

NOTE: the words "detector" and "sensor" are used without distinction throughout this document and have the same meaning, except where this may create ambiguity.

The system structure is shown in Fig. 2.1.

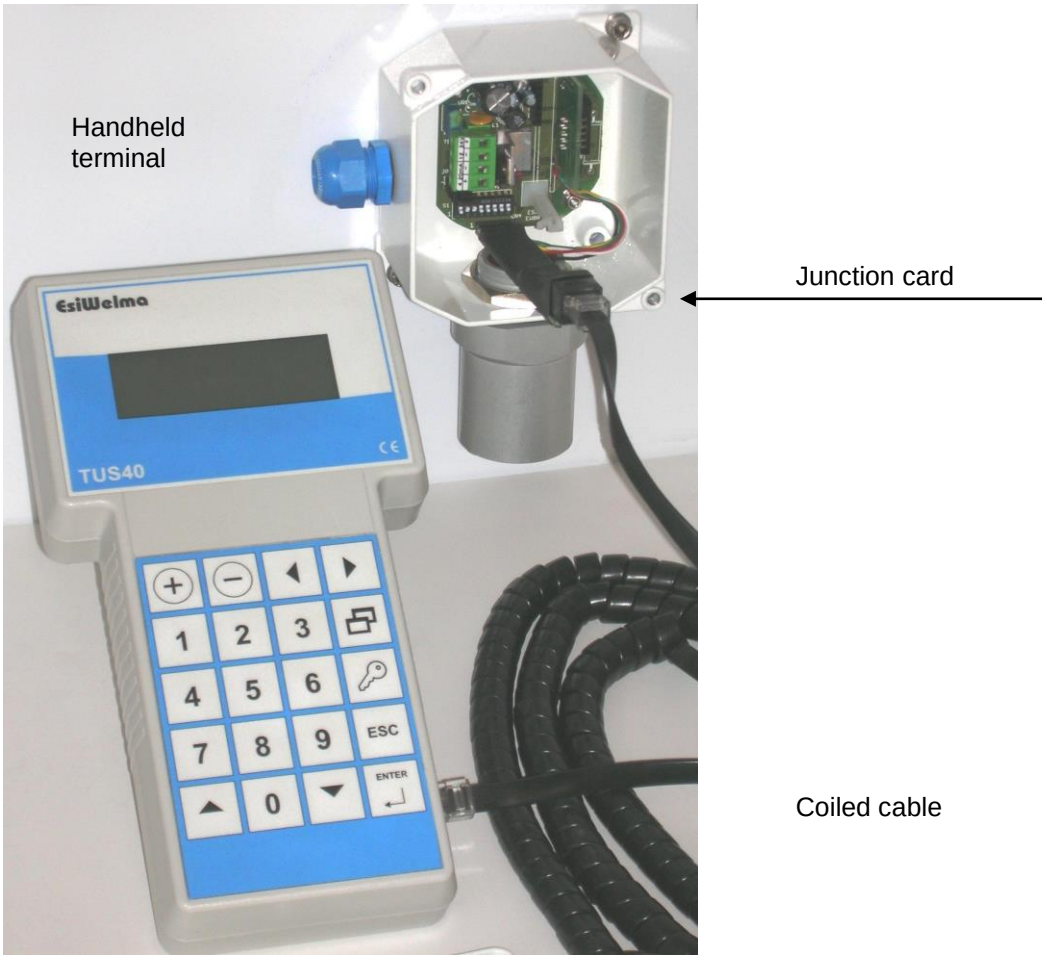


Fig. 2.1 – Terminal unit for monitoring and setting UR.20.. sensors

Under normal operating conditions (monitoring) the handheld terminal receives the information relating to measurements taken by the detector and the alarm status established by the threshold limit values. Three threshold limit values and one fail condition can be defined, and they are respectively called:

- pre-alarm: **Preall.**
- alarm threshold one: **Treshold1**
- alarm threshold two: **Treshold2**
- device failure: **Fail**

The UR.20.. detectors come in four models (E, S, I, L) and their use depends on the protection mode required:

Application	Protection mode	Part number	
Classified (hazardous) areas (ATEX certification required)	Group II Category 2G Ex d IIC T6 T_{AMB}: -20 °C ÷ +50 °C	UR.20.**E**	
	Group II Category 3G Ex nA d IIC T6 T_{AMB}: -20 °C ÷ +50 °C	UR.20.**S**	
Unclassified (non-hazardous) areas (ATEX certification is <u>not</u> required)	Heavy-duty applications Construction conforming to Ex d requirements IP65	UR.20.**I**	
	Standard applications Construction conforming to Ex nA requirements IP55	UR.20.**L**	
	Car Parks applications Construction conforming to Ex nA requirements IP55	UR.20.**P**	

Tab.2.1 – Gas sensors: available models

In turn, each model (E, S, I, L, P) has two possible executions:

- with Standard sensor (code S: UR.20**S**.)
- with Professional sensor (code P: UR.20**P**.)

Two types of sensors are commonly used for the gases that most frequently require detection (methane, LPG, gasoline vapours, carbon monoxide etc.): catalytic (Pellistor) and electrochemical cell. In both cases, the Professional execution is differentiated from the Standard execution by the use of sensors that are based on the same operating principle as the others but that over time have more measurement stability and higher poison resistance to the continuous presence of gas.

As you can see in the table below, the part number includes several fields for rapid identification in order to facilitate the choice of the detector according to the technical features described above:

	Detectable Gas	Sensing Element			
		Standard Catalytic	Pellistor Catalytic (Professional)	2-terminal Electr. Cell	Non Dispersive infrared
Available models	Methane	URG20S.	URG20P.	---	---
	LPG	URP20S.	URP20P.	---	---
	CO	---	---	URO20S.	---
	Gasoline Vapours	URB20S.	URB20P.	---	---
	O_2	---	---	URS20S.	---
	CO_2	---	---	---	URD20S.
Models on request	Acetylene	URL20S.	URL20P.	---	
	Hydrogen	URI20S.	URI20P.	---	
	Ammonia	URM20S.	URM20P.	---	
	Propane	URC20S.	URC20P.	---	
	Octane	URT20S.	URT20P.	---	
	Ethyl Alcohol	URE20S.	URE20P.	---	

For other Gases, on request, please contact Customer Service.

Tab. 2.2 – Gas detector part numbers

3 INSTALLATION

3.1 Installation of the TUS40-20 Terminal Unit

The TUS40 handheld terminal is constructed in plastic housing and it plugs into the junction box via the coiled cable to be powered by the UR.20.. sensor.
A fold-out bar on the back of the TUS40 handheld terminal can be used to place it at a convenient tilt on a minimum surface area of 220x130 mm. Knurling at the sides of the keypad ensures an easy and secure grip.

The TUS40-20 terminal unit must be connected with the sensor power off; follow product and/or installation instructions before opening the sensor cover. Proceed as follows to connect the TUS40-20 terminal unit:

1. Make sure the area is clear of gas and that the sensor is not powered up
2. Open the UR.20 sensor cover (Fig.3.1)
3. Identify the position of the CN4 connector on the diagram (Fig. 3.2)
4. Plug the junction card into the socket, making sure it is properly lined up with the contacts (Fig. 3.3), then plug the cable and handheld terminal into the junction card RJ45 connector.
5. Power up the sensor
6. Wait for the handheld terminal display to switch on; it will show a row of asterisks, followed by the sensor status page (Fig. 4.1 and 4.2)
7. Wait for the end of the warm-up phase (preheating, Fig. 4.3)
8. The handheld terminal will then show the basic display (Monitoring Mode).

It is now possible to operate with the handheld terminal (Fig. 4.4).

The direction of the detector must always have the sensor facing downwards

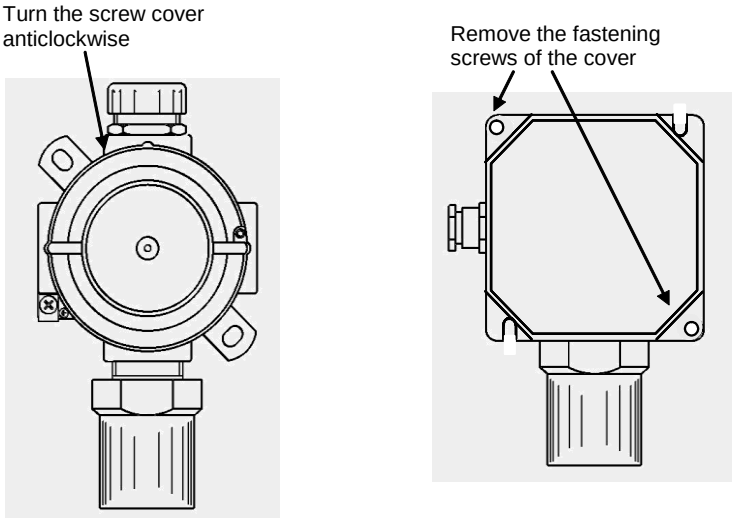


Fig. 3.1 – Removing the cover of the UR20 sensors

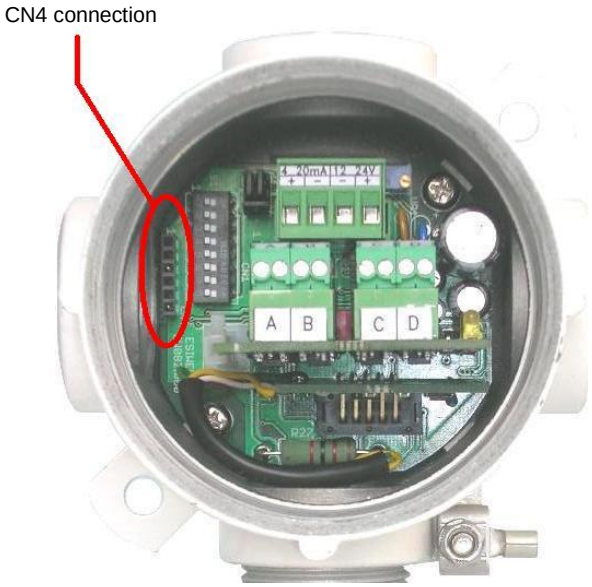
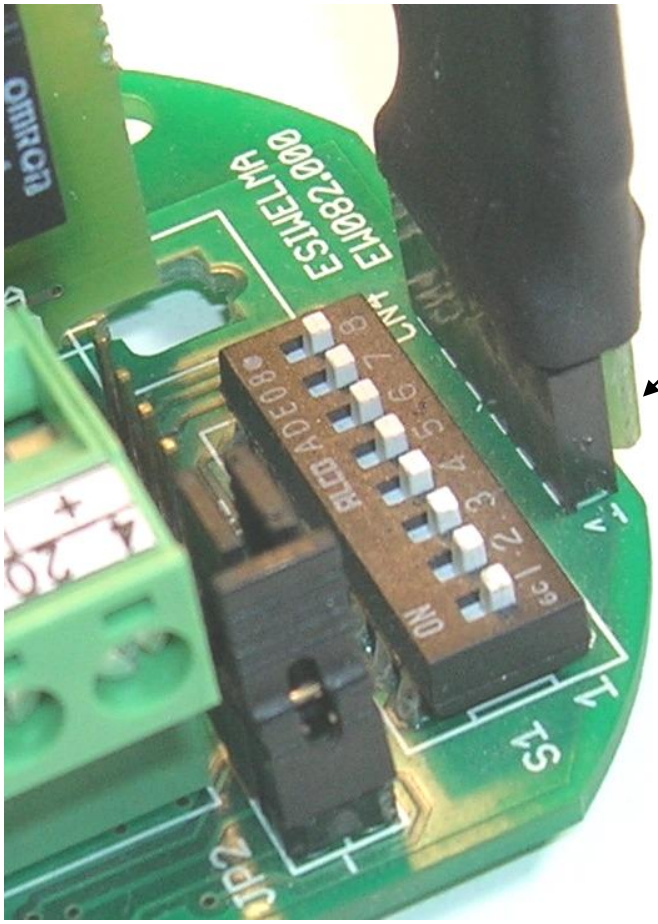


Fig. 3.2 – CN4 position



Warning:
Properly align the female and male CN4 connector with the PCB side of the **UIC20** junction card to the outside of the main board of the sensor.

Fig. 3.3 – TUS40 terminal plug-in operation

3.2 Types of detector installation for correct monitoring

The detectors must be wall-mounted at whatever height is appropriate for the type of gas to be detected (Fig. 3.4).

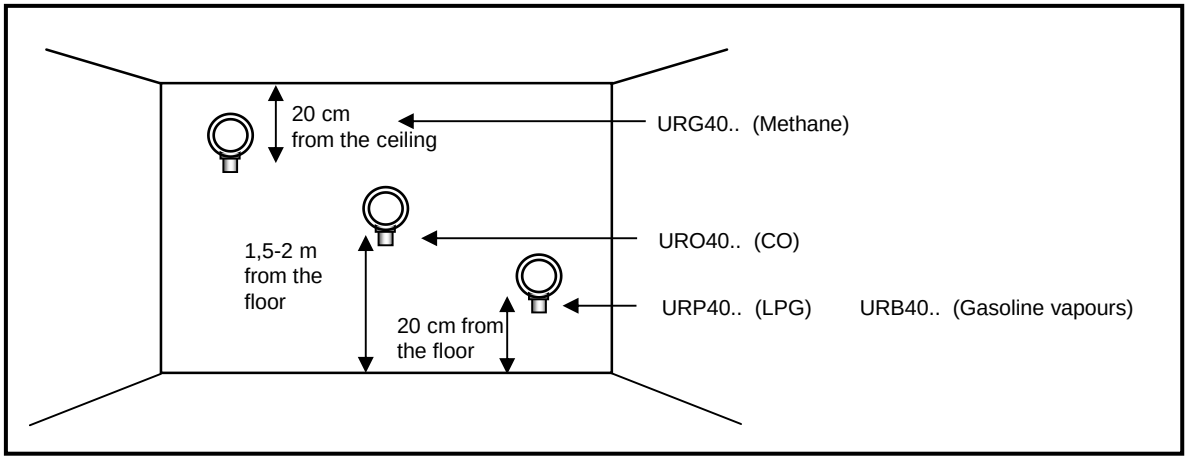


Fig. 3.4 – Possible detector positions

Use the information below to correctly position the detectors:

- 20 cm from the floor to detect gases heavier than air (LPG or Gasoline Vapours)
- 20 cm from the ceiling to detect gases lighter than air (Methane)
- midway between floor and ceiling (1.5 - 2 m) to detect gases as heavy as air (CO)

The TUS40-20 termination kit comes with a 3 m coiled cable so it can operate correctly even at a considerable height and distance from the sensor.
The connection cable must not be stretched to its full length when it is plugged in to make sure it does not disconnect from the junction card.
Do not use extension cords on the cables and do not extend the cables themselves by cutting and joining as this may adversely affect the proper operation and safety of the device.

To guarantee correct gas detection, in addition to the instructions above, the positions of the detectors must take into consideration the following **specific installation guidelines**:

The detector must be mounted:

- where accidental gas leakages are possible
- at least 1.5 metres from heat sources
- not in spaces where ventilation is poor and where gas pockets may form
- at least 1.5 metres from vent holes
- away from hindrances to natural gas flow
- in environments with a temperature range of -20°C to 50°C and relative humidity below 90% (non-condensing).

4 USING THE TERMINAL UNIT

After the wiring and connections between the sensor and the TUS40-20 terminal unit are complete, visually inspect them to make sure they are correct, ensure you are operating in a safe zone, then power up the sensor.

4.1 Operating modes

Only connect and disconnect the TUS40-20 junction box to and from the sensor if the sensor power is off, to avoid connection errors. This makes it possible to correctly activate communication between the two devices and their alignment.

The TUS40-20 terminal unit can be used for several calibrations and checks:

- Monitoring or normal operating mode
- Alarm thresholds setting mode
- Sensor calibration mode
- Output test mode
- 4…20mA signal calibration mode

When the unit is switched on, the following display sequences will appear:

1. The backlighting will switch on and the following words will appear on the handheld terminal display:

Fig. 4.1

2. The display then shows the following, where x.xxx stands for the firmware version:

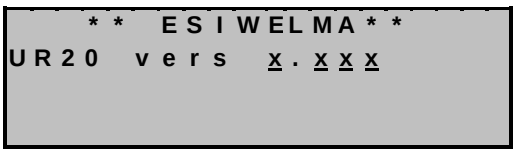


Fig. 4.2

In this phase, the sensors begin the warm-up phase and the operation can take a few minutes.

The display shows the following during the warm-up phase:

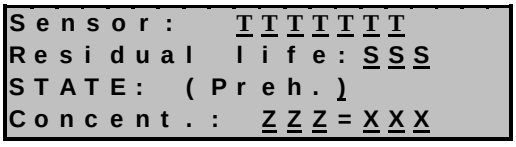


Fig. 4.3

4.2 Monitoring mode

At the end of the warm-phase, the sensor shows the following display:

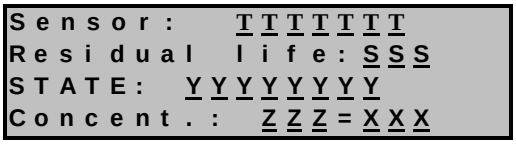


Fig. 4.4

Where:

- TTTTTT = Abbreviation of sensor type
- SSS= residual operational lifetime in weeks
- YYYYYYYY = Abbreviation of sensor status
- ZZZ= Unit of measure of the concentration (ppm for CO or LEL for explosive gases)
- XXX= Concentration detected by the sensor

Abbreviations used for the sensor status:

- **(Preh.)**: only during Preheating
- **OK**: during normal operation
- **Preall**: if the sensor has exceeded the pre-alarm threshold
- **Threshold 1**: if it has exceeded the 1st threshold
- **Threshold 2**: if it has exceeded the 2nd threshold
- **Fail**: if a fault of any kind is detected.

The abbreviation identifying the sensor is one of the following:

- **CAT_1** for type A catalytic sensors
- **CAT_2** for type B catalytic sensors
- **CAT_3** for type C catalytic sensors
- **CEL_4** for type A electrochemical cell sensors
- **CAT_5** for type D catalytic sensors
- **SEMIC_6** for type A semi-conductor sensors
- **SEMIC_7** for type B semi-conductor sensors
- **SEMIC_8** for type C semi-conductor sensors
- **CEL_9** for type B electrochemical cell sensors
- **CEL_10** for type C electrochemical cell sensors
- **CEL_11** for type D electrochemical cell sensors
- **NDIR_1** for type A non dispersive infrared sensors
- **NDIR_2** for type B non dispersive infrared sensors

In this phase, the handheld terminal constantly displays the concentration measured and continues to update the value every few seconds.

4.3 Setting mode

With the UR20, setting is possible after the warm-up phase is complete.

Press the SETTING key to enter Setting Mode 
The following operations are possible in setting mode:
1) Setting the alarm threshold limit values (useable in custom mode)
2) Setting the full scale set point of the device
3) Calibrating the sensor

Enter setting and the display will show the set point thresholds:

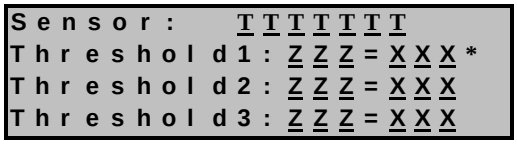


Fig. 4.5

Where:
TTTTTTT = Abbreviation of sensor type
ZZZ = Unit of measure of the concentration (PPM, LEL or %)
XXX = Threshold limit values set in the configurable set point for each threshold
Threshold 1 is the pre-alarm threshold, Threshold 2 is the 1st alarm level and Threshold 3 is the 2nd alarm level.

The cursor (an asterisk) starts out on the first line:
Use the UP and DOWN keys to scroll up to the previous line or down to the next line 
Note: it is not possible to scroll beyond the first or the last line

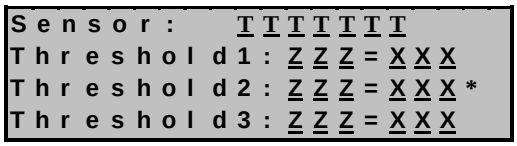


Fig. 4.6

Press ENTER to show the change threshold value display 

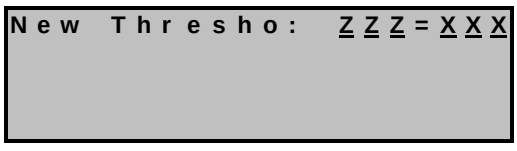
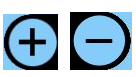


Fig. 4.7

Use the PLUS or MINUS keys to set the new threshold value. 

After setting the new threshold value you can press these keys:

- ENTER to permanently memorise the threshold setpoints 
- ESCAPE to go back to normal operating without memorising anything (if the ENTER key was not pressed) 

4.4 Calibration mode

The UR20 is calibrated by two measurement values. The first of the two values is always zero - no gas measured, make exception O_2 that in free air has a concentration of 20,9%; the second is the factory-calibrated set point of:

- 50% of LEL (mid scale) for explosive gases
- 500 PPM (full scale) for toxic gases
- 0,5% Vol. only for CO_2 sensor
- 4,0% Vol. Only for O_2

Except for the infrared sensors, (see NDIR_1,2) that do not handle some of the parameters, is possible view the sensor calibration values, pressing **1** in the Setting Mode. The display will show the following:

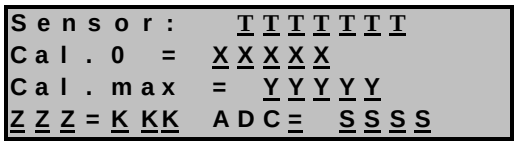


Fig. 4.8

Where:
TTTTTTT = Abbreviation of sensor type
XXXXX = Value in steps of the A/D converter of the 1st calibration set point
XXXXX = Value in steps of the A/D converter of the 2nd calibration set point
ZZZ = Units of the concentration (PPM or LEL)
KKK = Value of concentration
SSSS = Steps of the A/D converter equivalent to the measured value

Press ESC to return to Setting mode from this display 

If the gas used comes in different concentrations from 50% LEL or 500 PPM, it is possible to change the correspondence of the LEL percentage in the 2nd calibration set point.

Press key **2** from the Setting mode and the following display will appear:

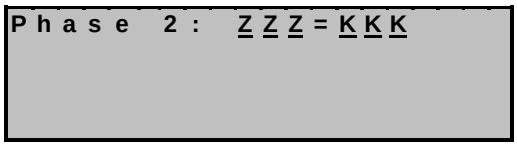


Fig. 4.9

Where:
ZZZ = Unit of measure of the concentration (PPM, LEL or %)
KKK = Value of concentration of the 2nd calibration set point

Press keys **0** to **9** to set the correspondence of the LEL (or PPM) percentage in the 2nd calibration set point.

Lastly, press ENTER to memorise the set point value 

Press ESC to return to Setting mode from this display 

4.5 Calibrating the sensor

Hold down the KEY  button for at least 5 seconds to enter this phase from the setting mode. The display will show the following:

Fig. 4.10

Press the **1** button to enter in the real calibration menu in Figure 4.13 and below.

Press the **3** button to displays a screen in Figure 3. 4.11 which shows the full scale of the detector and the gas concentrations to which the calibrations were performed.

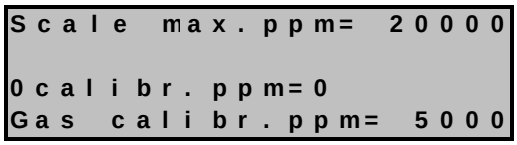


Fig. 4.11

Press the **2** button for to see the following screen in Figure 4.12:

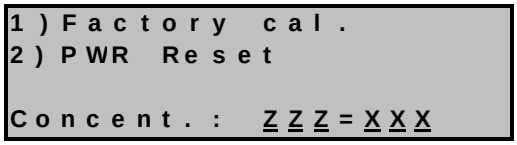


Fig. 4.12

From this menu by press the **1** button it can be execute the reset, upon confirmation of the calibration values to those inserted by the manufacturer of the sensor.

Press the **2** button for execute a supply interruption of the only sensor without resetting the entire detector. After wait the preheating time.
From all the screens you can return to the Calibration mode by pressing ESC.

Fig. 4.13

Two successive steps are required for calibration:

- Calibrating the zero point (clean air for toxic and flammable gas, nitrogen for poison gas such as CO_2)
- Calibrating the factory-set concentration (default: 50% LEL for explosive gases, 500 PPM for CO, 5000 PPM for CO_2, 4%vol for O_2) as per the section above

At this point it is possible to press:

- ESCAPE to take the sensor back to normal operation 

- ENTER to start up calibration of 0 (zero) set point in clean air (zero gas concentration) 

Fig. 4.14

When the words **In progress…** show on the display, wait until the end of the procedure
At the end, if the calibrating procedure has been successful the display will show:

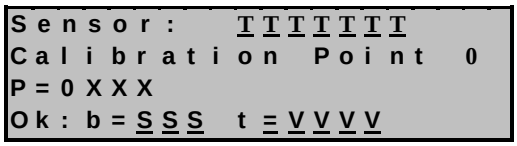


Fig. 4.15

The top two lines stay the same, the third line shows:
0XXX= Steps of the A/D converter to read the sensing element.
The next line:
SSS = Steps applied to the electronic potentiometer (only for sensors that include this)
VVVV = Value read by the converter and expressed in steps, not in concentration measuring unit.

The two values could be periodically updated throughout the procedure that can last for many seconds (duration depends on the type of sensor).
At this point it is possible to press:

- ESCAPE to take the sensor back to normal operation 

- ENTER to start up calibration at the default gas concentration (2nd set point) 

If Zero calibration was not successful, the display will show **Fail**. Press ENTER to repeat the zero calibration procedure.

If Zero calibration was successful, when ENTER is pressed, calibration at the default set point will start up. The display will show:

Fig. 4.16

Apply the gas to the sensor at the default concentration and wait for about 3 minutes for reading to stabilise the value on the third line of the display will stabilise. (WARNING: this is always an absolute value).
At this point it is possible to press:

- ESCAPE to take the sensor back to normal operation
- ENTER to start up calibration at the gas concentration of the 2nd point

Calibration only takes a few seconds and the display will show **In progress…**
At the end, it will show:

```
Sensor:    T T T T T T
Calibration II Point
P=0 X X X
Ok: t 0 = V V V V  t = V V V V
```

Fig. 4.17

If the point calibration has been successful, where:
VVVV = Values read by the converter and expressed in steps at point 0 and at the 2nd point.
Or:

```
Sensor:    T T T T T T
Calibration II Point
P=0 X X X
Fail: t 0 = V V V V  t = V V V V
```

Fig. 4.18

At this point it is possible to press:

- ESCAPE to take the sensor back to normal operation
- ENTER to unconditionally repeat calibration of the 2nd point.

If a calibration error occurs, press ENTER and the display will show the calibration fail. To return to the display as per Fig. 4.2, switch off the system, wait for at least ten seconds, then power up again.

if the fault persists, the error shows again on the display as follows

```
Fail:
Wrong Calibration
```

Fig. 4.19

4.6 Output test mode

During the warm-up phase only, enter the monitoring mode and press **9** to access a menu where it is possible to directly test the outputs, or press **0** to access the 4…20mA calibration procedure described in the relative paragraph.
The display will show the following:

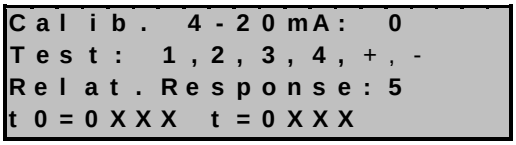


Fig. 4.20

WARNING: the 0XXX values shown on the fourth line are the values of the A/D converter corresponding to the two calibration points of the sensor.

Press key:

1 To activate and deactivate the fail alarm relay output
2 To activate and deactivate the alarm relay output for exceeding the 2nd threshold
3 To activate and deactivate the alarm relay output for exceeding the 1st threshold
4 To activate and deactivate the pre-alarm relay output
5 To select Methane Relative Response page (see chapter 4.8)

+ to increase the output current on measurement terminals 3 and 4 up to 22mA
− to decrease the output current on measurement terminals 3 and 4 down to 0mA
ESC to exit output test mode and return to monitoring mode.

Note: for the functions relating to keys 1, 2, 3 and 4 it is necessary to have the UZR20.4 relay card in the equipment.

The warm-up phase is suspended during output test mode and starts again after returning to monitoring mode.

If no key is pressed for 5 minutes during output test mode, it automatically exits and returns to monitoring mode.

4.7 4…20mA signal calibration mode

To execute this type of calibration, it is necessary to insert in series to the 4...20mA output an instrument suitable for this magnitude and with a precision of at least 2% on the full scale.

Calibration consists of calibrating two points (one at 4mA, the other at 15 mA)

During the warm-up phase only, enter the monitoring mode and press **9** to enter a menu where it is possible to directly test the relay outputs, or press **0** to enter the 4…...20mA output calibration procedure.

The display will show the following:

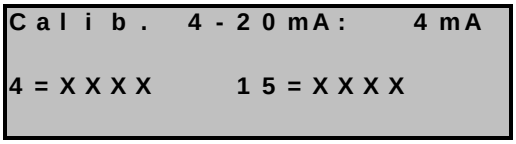


Fig. 4.21

The two fields XXXX are the A/D Converter values required to generate the output currents.

Press:  or  to vary the output that generates the 4mA with a delay of about 2 seconds.

Press the  key to memorise calibration; the display will show that the new value has been saved by changing as follows:

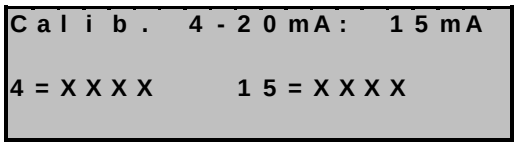


Fig. 4.22

Press:  or  to vary the output that generates the 15mA with a delay of about 2 seconds.

Otherwise, press  to terminate the procedure without memorising the new value.

Press the  key to memorise calibration; the display will show the previous display as confirmation that the new value has been saved:

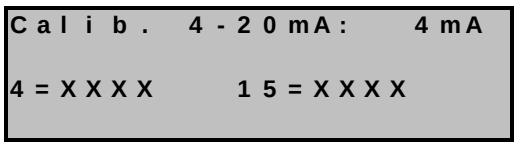


Fig. 4.23

To terminate the procedure press key 

.

The warm-up phase is suspended during 4...20mA calibration test mode and starts again after returning to monitoring mode.

If no key is pressed for 5 minutes during 4...20mA output calibration mode, it automatically exits from the calibration mode and returns to monitoring mode.

The device is automatically reset in all output modes, as shown in the following display:

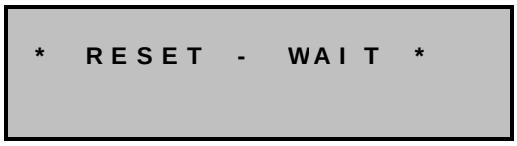


Fig. 4.24

4.8 Methane Relative Response set mode

To select this type of set procedure, it is necessary that the sensor is an LEL flammable gases detector.

During the warm-up phase only, enter the monitoring mode and press **9** to enter a menu where the display will show the following:

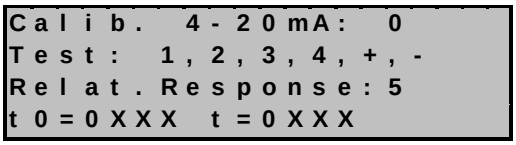


Fig. 4.25

Press **5** to enter in the Methane Relative Response (RR) set procedure.

The display will show the relevant page where the Methane Relative Response could be changed

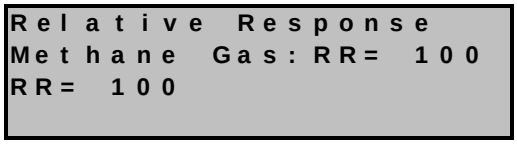


Fig. 4.26

Press: ⊕ or ⊖ to adjust the value of Methane Relative Response set in according to Relative response table of the type of sensor used (CAT_2 for professional sensing element **UR.20P.** or CAT_5 for standard sensing element **UR.20S.**).

Press the ↵ key to memorise the new value of RR or ESC to avoid it.

In any case press ESC to terminate the procedure.

4.9 Troubleshooting

Cabling errors may show up as follows.

PROBLEM	POSSIBLE CAUSE	REMEDY
All the LEDs on units concerned are off	Inversion of power supply on peripheral units	Restore correct connection after switching off the detector
Components broken, peripheral units off	Power supply connections inverted with 4...20mA output connections	Replace damaged unit
Lack of communication between sensor and TUS40-20 terminal unit	Positioning of the TUS40-20 junction card inverted or misaligned	Restore correct BUS connection after powering off the sensor

Table 4.1 – Diagnosis of possible causes of fail

Some error sequences are reported by particular flashing in the visual alarms present on the UR.20. detector. For a complete table of sensor fail reporting signals, see the relative instruction manual.

The luminous alarms (LEDs) on the UR.20 detectors can be found in the figures below.

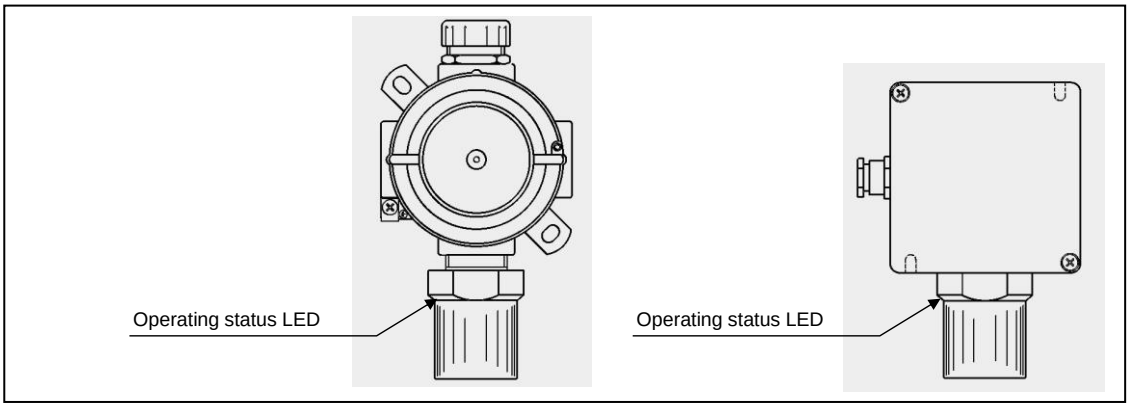


Fig. 4.25 – Function of the LEDs on the UR.20.. detectors

Sensor status	*4...20mA Output*	*Status LED on sensor body*
WARM-UP	2mA	Flashing at 2 Hz
OPERATING	4...20mA *0,10,20mA for threshold applications*	1 flash about every 10 sec.
PRE-ALARM		2 flashes about every 5 sec.
1st ALARM THRESHOLD		3 flashes about every 5 sec.
2nd ALARM THRESHOLD		4 flashes about every 5 sec.
SENSOR FAIL	22mA	Steady

Table 4.2 – Operating significance of the LED on the sensor body and of the 4...20mA output

4.10 Sensor operation check

After the sensor is calibrated, it is necessary to make sure it is operating correctly. For this purpose, it is necessary to scrupulously perform the following in order to prevent incorrect test actions that could cause permanent damage to the sensing element.
We recommend using the TUL40 calibration and test case for this purpose. It consists of:

- One cylinder (12 l) of gas calibrated at 50% of the L.E.L. of the detected gas (e.g.: Methane)
- One pressure valve and flow regulator (the latter is optional)
- One flow chamber that will fit properly around the sensing element
- One hose between cylinder and adapter (~ 2 m long)

In any case, follow the checklist below to carry out the test:

1. for the test, use the same type of gas that the sensors will be detecting
2. the test cylinder must be calibrated with the concentration kept below the maximum levels of the detector measuring range
3. the test gas flow must spread to the sensing element or reach it at a low flow rate (max 0.5 litres / minute).
   For this purpose, use a specific flow measurement chamber that fits properly around the sensing element (Fig. 4.26), and if necessary a field flow meter
4. a few dozen seconds may pass from the time the test gas is released to the moment the detector senses its presence and precisely measures its concentration. This “delay” is caused by the action of the sintered filter located at the bottom end of the detector to protect the sensing element. The same delay may occur from the moment test gas release is terminated until the moment the detector no longer senses its presence.

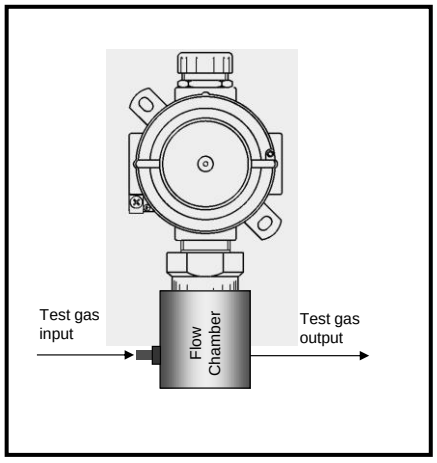


Fig. 4.26 – Flow chamber

5. the sensor must activate the alarm during the test: make sure the alarm is activated by controlling the LED status on the sensing element; this must be flashing as shown in table 4.2, according to the concentration level detected by the TUS40-20 terminal unit in the monitoring mode described above.

WARNING

Repeated use of inappropriate or high concentrations of test gases causes permanent poisoning of the sensing element with a subsequent deterioration in performance, or permanent abnormality, of the detector.

4.11 Residual life

The TUS40-20 terminal unit can display the residual operational lifetime of the sensor in weeks: in figure 4.3 is shown in the sensor monitoring section as **Residual life**. When the operational lifetime descends to zero, the sign becomes negative and the system continues to operate and count down the weeks of operational lifetime but of course there is no guarantee that the sensor is operating correctly.

4.12 Changing the contrast on the display

Keep the ENTER key pressed down to switch on the sensor 
The display will show the following:

Fig. 4.27

Press keys  to adjust the contrast to how you want it.

Press ESC  to exit and continue with the normal operations of the TUS40-20 terminal unit.

5 INSTALLATION DATA

To be filled in by Installer		*Installer's stamp and signature*
Installation site and/or room:		
Product order number:		
Part Number:	Manufacturing date:	

DETECTORS					
No.	Gas detected	Position of detector	No.	Gas detected	Position of detector
1			26		
2			27		
3			28		
4			29		
5			30		
6			31		
7			32		
8			33		
9			34		
10			35		
11			36		
12			37		
13			38		
14			39		
15			40		
16			41		
17			42		
18			43		
19			44		
20			45		
21			46		
22			47		
23			48		
24			49		
25			50		

6 ROUTINE CHECKS

To be filled in by Installer/Service Personnel		*Signature*
Date	*Description*	

NOTES

Via F.lli Canepa 134D-E
16010 Serra Riccó (Genova)
Italy

Tel: +39 010 75421 1
Fax: +39 010 75421 78
e-mail: info@esiwelma.it
Web: www.esiwelma.it