

INSTRUCTION FOR USE

Masterwatch Ultra NAV IO module

**Masterwatch Ultra
Medical Gas Alarm**

System OK

02

AIR

Monitoring
emergency
shut off box

Training

Alarm
list

Setting

Thank you for choosing Masterwatch Ultra NAV IO module from QMT-Tech AB

Your new Masterwatch Ultra is an advanced medical device with high-quality components and features for safe operation and high performance.

Read the information for use before installation, commissioning and use so that you are well informed about how it is installed, commissioned and used safely.

Information on use is supplemented with instructions on installation, operation and maintenance for a long and trouble-free use.

We wish you a long, safe and trouble-free use.

This manual describes the Masterwatch Ultra's functions for safe installation, commissioning and use.

The information for use should be read and understood by all intended users.

The following symbols are used in the user manual:



Warning



Note, important information



Read the information for use

Digital copy can be downloaded from qmt3.com

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Intended use:

The Masterwatch Ultra NAV IO module is used to monitor pressure or valve status in an emergency shut-off box on the ward. The device records the status and forwards the information to the Masterwatch Ultra pressure monitor.

The alarm can monitor up to 20 IO modules on the ward, providing centralized and efficient management of all emergency shut-off boxes.

This enables rapid action and helps ensure patient safety.

Intended users:

Installation – Installer, pipe fitter, electrician, etc.

Daily use – Healthcare staff and hospital maintenance/operations technicians

Maintenance – Technician from QMT-tech or another technician authorised for the task by QMT-tech AB.

Target group:

Not limited, since medical gases are used in all areas of the hospital.

Indications:

Non-specific since medical gases are used in all areas of the hospital for many different conditions.

Contra indications:

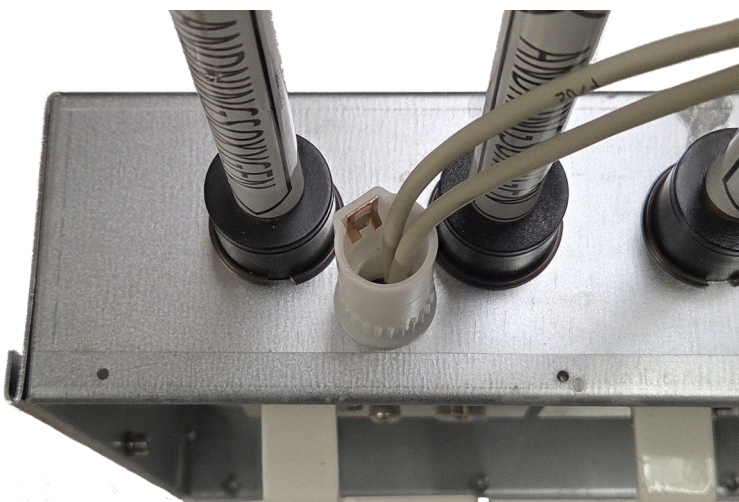
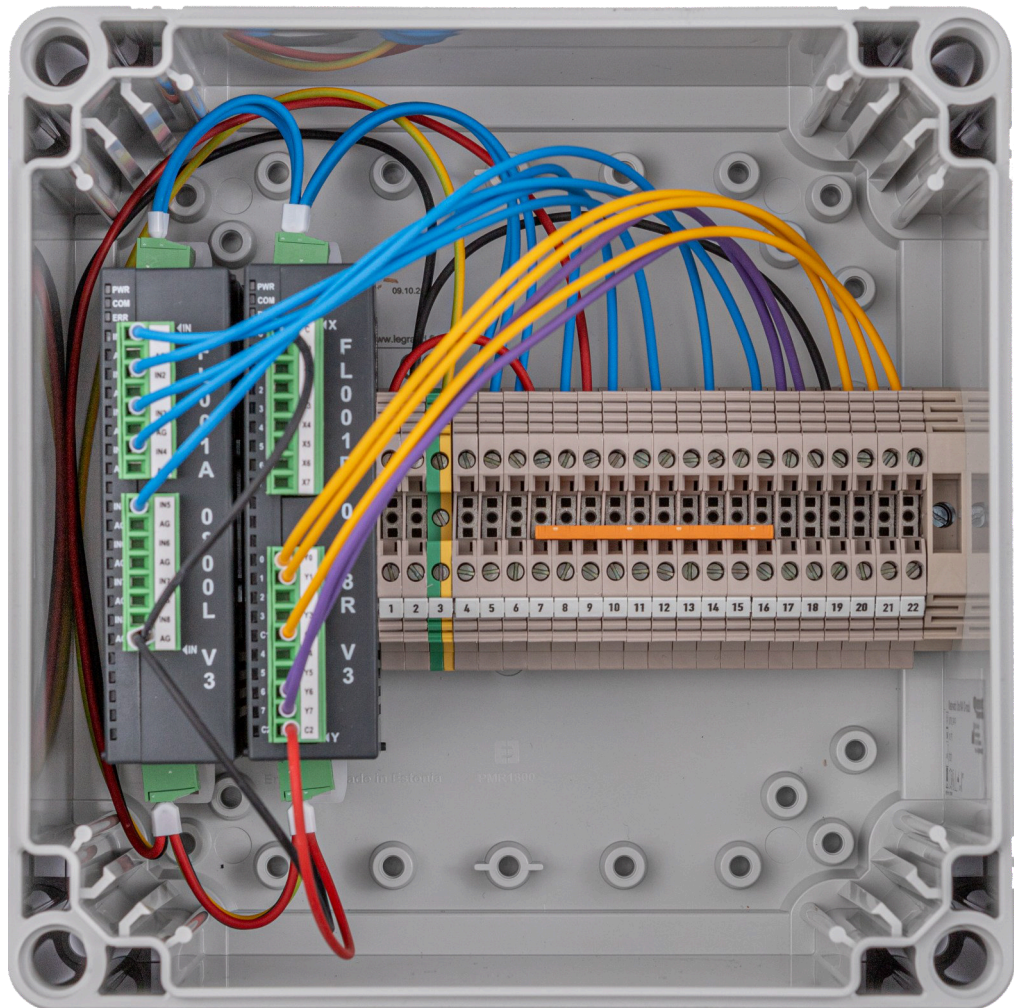
Non-specific since medical gases are used in all areas of the hospital for many different conditions.

The IO module for the emergency shut-off box is delivered in a plastic housing where the IO unit and a terminal strip are mounted. All wiring is connected to the terminal strip.

Feed-throughs to the housing are made during installation, adapted to the number of cables to be connected. Control that connected conductors fitted with ferrules are inserted to the correct depth in the terminal, so that the clamp grips the metallic part and not the insulated part of the ferrule.

Install the housing so that it is easily accessible for configuration and troubleshooting.

Width: 200 mm
Height: 200 mm
Depth: 132 mm



The emergency shut-off box contains a 16 mm pipe sleeve where the wiring from two gases is led out. When installing with more gases,

additional 16 mm pipe sleeves are installed. Run the cables further up into the false ceiling to the IO module.

Step 1 - Preparations

Before starting the installation, the document below must be completed. Names and which gases are to be monitored must be specified in order for the installation to be carried out.

Information about the location of the compartment is not necessary, but is recommended if multiple compartments are to be installed, so that the documents can be separated and linked to the correct compartment.

Hospital _____

House _____

Plan _____

Department _____

Check below which gases and emergency shut-off boxes have

Name of the emergency shut-off box that will be in the alarm, e.g. NAV1101 (max 10 characters)		O ₂	N ₂ O	AIR	AIR800	CO ₂	N ₂	Ar
Box 1	_____	☐	☐	☐	☐	☐	☐	☐
Box 2	_____	☐	☐	☐	☐	☐	☐	☐
Box 3	_____	☐	☐	☐	☐	☐	☐	☐
Box 4	_____	☐	☐	☐	☐	☐	☐	☐
Box 5	_____	☐	☐	☐	☐	☐	☐	☐
Box 6	_____	☐	☐	☐	☐	☐	☐	☐
Box 7	_____	☐	☐	☐	☐	☐	☐	☐
Box 8	_____	☐	☐	☐	☐	☐	☐	☐
Box 9	_____	☐	☐	☐	☐	☐	☐	☐
Box 10	_____	☐	☐	☐	☐	☐	☐	☐
Box 11	_____	☐	☐	☐	☐	☐	☐	☐
Box 12	_____	☐	☐	☐	☐	☐	☐	☐
Box 13	_____	☐	☐	☐	☐	☐	☐	☐
Box 14	_____	☐	☐	☐	☐	☐	☐	☐
Box 15	_____	☐	☐	☐	☐	☐	☐	☐
Box 16	_____	☐	☐	☐	☐	☐	☐	☐
Box 17	_____	☐	☐	☐	☐	☐	☐	☐
Box 18	_____	☐	☐	☐	☐	☐	☐	☐
Box 19	_____	☐	☐	☐	☐	☐	☐	☐
Box 20	_____	☐	☐	☐	☐	☐	☐	☐

Step 2 - Connection

1. Power supply

To ensure correct function, connect a stabilised 24 VDC power supply as follows:

Terminal	Function	Specification
1	+24 VDC	IMPORTANT! 24 VDC $\pm$10% (Max ripple $\leq$ 200 mV), (More information on page 8 under Power supply)
2	0 VDC	
3	Protective earth	

2. Modbus communication

The IO module communicates with the Masterwatch Ultra alarm via Modbus.

(More information can be found on pages 8 - 9 under Modbus communication)

Terminal	Function	Connects to terminal block in Masterwatch Ultra
4	Modbus A	28
5	Modbus B	29
6	GND Modbus	30

3. Connecting the emergency shut-off box

Connect the signals from the emergency shut-off box to the IO module. (For more information, see page 9 under Connecting the emergency box)

Terminal	Function	Marking conductors
7	O2 24 VDC	White
8	O2 signal	Brown
9	N2O 24 VDC	White
10	N2O signal	Brown
11	AIR 24 VDC	White
12	AIR signal	Brown
13	AIR800 24 VDC	White
14	AIR800 signal	Brown
15	CO2 24 VDC	White
16	CO2 signal	Brown

4. External alarm outputs

Connections for external alarm outputs. (For more information, see page 9 under External alarm outputs)

Terminal		Function	Max load
17 (24VDC+)	19 (0V)	Remote alarm basic/Remote lamp	2 A
18 (24VDC+)	19 (0V)	Remote buzzer	2 A

5. Relay outputs

Connections for relay outputs. (More information can be found on page 9 under Relay outputs)

Terminal			Function	Max load
20 (NC)	21 (NO)	22 (COM)	Relay	2A, 250VAC

Power supply



Masterwatch Ultra IO module must be supplied with **24 VDC $\pm 10\%$ (max ripple $\leq 200\text{mV}$)**.

Only stabilized power supplies may be used.

Maximum current consumption 180 mA.

The use of unstabilized transformers can cause voltage fluctuations and ripples that risk damaging or negatively affecting the device.

The IO devices have a PWR light.
If it is green, the device has power.

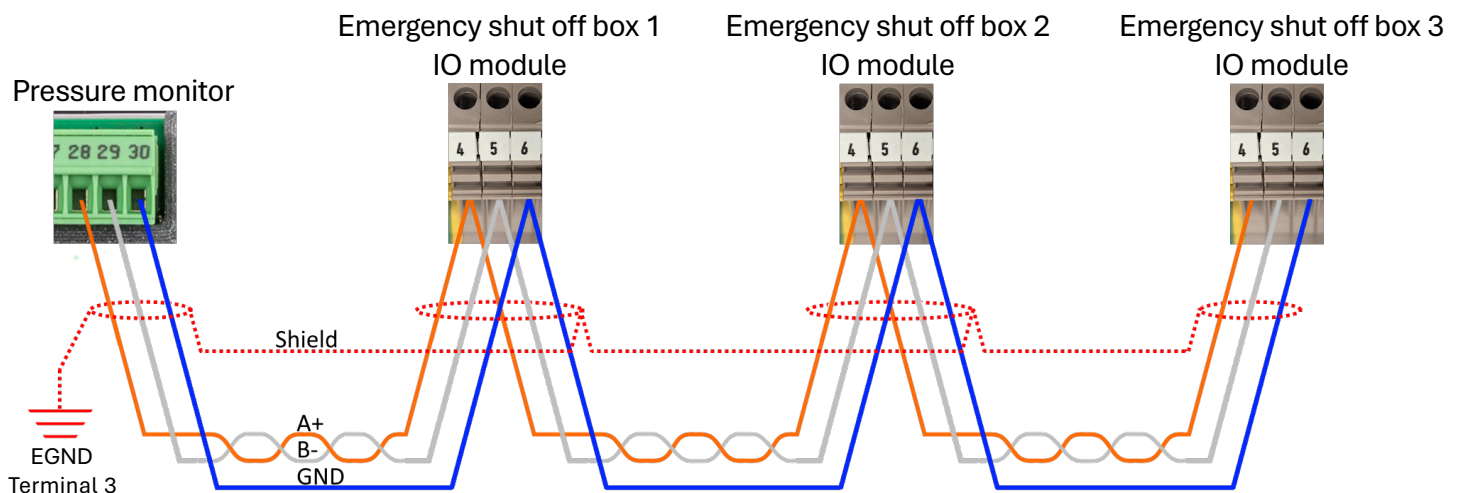


Note: If external alarm outputs are used, their power consumption must be included when sizing the transformer and fuse.

Modbus communication

The IO module acts as a signal transmitter: It receives the status from the emergency shut-off box and forwards the information to the Masterwatch Ultra pressure monitor alarm panel. In order for the emergency shut off box to be monitored, the Modbus communication must be working properly.

- A Modbus RTU loop should always be **daisy-chained** and should never be connected in parallel or as a star connection.
- Recommended cables: Belden 9842LW, Belden 3106A or equivalent cable of similar quality.
(Please note that QMT does not supply or sell cables. Cables are ordered separately from your electrical wholesaler or other supplier of installation materials.)
- The Modbus RTU loop should be terminated with $120\ \Omega$ at both ends. (see page 9)
- The shield should be connected to terminal 3 (Protective Earth) in the pressure monitor.



COM (green): Lights up as soon as the RS-485 loop is electrically connected and the voltage on the A/B conductors is within the correct level.

Note: The fact that COM is lit only means that the RS-485 loop is connected, not that communication is working.

The COM diode can therefore also light up if:

- * A and B are reversed
- * The master is not sending Modbus data to the current address
- * There is no actual Modbus traffic on the bus

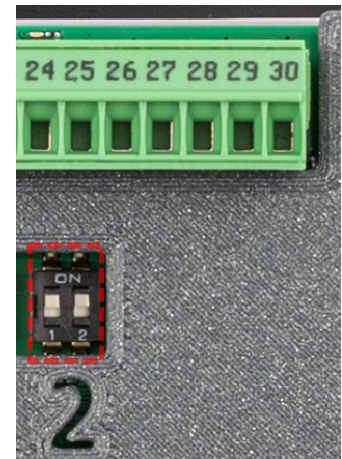
ERR (red): Lights up if no RS-485 loop is connected. In this state, the COM diode turns off.



The RS-485 loop is terminated with 120 Ω resistors at both ends. This provides stable signal levels, prevents reflections, and ensures reliable communication between the Ultra alarm pressure monitor and the IO modules.

The Masterwatch Ultra alarm in the pressure monitor is equipped with a DIP switch for terminating the RS-485 communication.

Set both switches on switch 2 (marked in red) to the ON position to activate the built-in 120 Ω resistor. (see image to the right)



On the IO module that is located furthest in the loop, a loose 120 Ω resistor should be connected in parallel across terminals 4 and 5. (picture on the right)



Emergency shut-off box connection

Connect the pressure transmitter or limit switch from the emergency shut-off box to the IO module terminal strip. Only the gases used in the emergency shut-off box need to be connected to the terminal strip. Unused terminals are left empty and are not monitored by the system.

If the emergency box is equipped with nitrogen or argon, connect them to a free terminal. During configuration, you specify which terminal is used, so that the alarm panel can receive status from these gases.

External alarm outputs

The IO module has alarm outputs that are activated only when there is an alarm in the emergency shut-off box connected to the module. If new alarms occur in the emergency box, or if an alarm has been active for more than 15 minutes, the outputs are reset for two seconds and then activated again.

This is done to reactivate remote alarm basic or similar devices that have previously been silenced, but where no action has yet been taken to resolve the cause of the alarm.

(The outputs and relay only works when Modbus communication with the Masterwatch Ultra pressure monitor alarm is works.)

- Remote alarm basic/remote lamp: outputs 24 VDC for the entire time an alarm is active in the emergency box.
- Buzzer: outputs 24 VDC as long as an alarm is active and the alarm's internal buzzer sounds.

Relay outputs

The IO module has a potential-free relay output (NO and NC). The relay is activated as long as an alarm is active in the emergency shut off box.

Step 3 - Addressing IO modules

In order for the IO module to communicate with the Masterwatch Ultra alarm, the IO module needs to be given a specific Modbus addressing.

The DIP switches for addressing are located on the left side of the IO unit. Remove the unit from the DIN rail and angle it to the right to access the switches. The location is marked in green in the image opposite.

The type of IO module used depends on how the emergency shut-off box is equipped.

- If the emergency shut-off box is equipped with pressure transmitter, the IO module **QMT8ULTRA74T** is used. It contains two IO units to be addressed: **FL001D 0808R V3** (relay unit) and **FL001A 0800L V3** (analog unit).
- If the emergency shut-off box is instead equipped with limit switches, the IO module **QMT8ULTRA74G** is used. It contains only one IO unit to be addressed: **FL001D 0808R V3**.



Set the DIP switches according to the table. The numbers given in the table should be in the **ON** position for the respective IO device. If you change an address afterwards, the power supply to the device must be cut off for a few seconds for the new setting to take effect.

	FL001A 0800L V3	FL001D 0808R V3
Box 1	1, 6	1
Box 2	2, 6	2
Box 3	3, 6	3
Box 4	4, 6	4
Box 5	5, 6	5
Box 6	1, 5, 6	1, 5
Box 7	2, 5, 6	2, 5
Box 8	3, 5, 6	3, 5
Box 9	4, 5, 6	4, 5
Box 10	1, 2, 5, 6	1, 2, 5
Box 11	2, 3, 5, 6	2, 3, 5
Box 12	3, 4, 5, 6	3, 4, 5
Box 13	1, 2, 3, 5, 6	1, 2, 3, 5
Box 14	1, 2, 3, 4, 5, 6	1, 2, 3, 4, 5
Box 15	2, 3, 4, 5, 6	2, 3, 4, 5
Box 16	1, 3, 4, 5, 6	1, 3, 4, 5
Box 17	1, 2, 4, 5, 6	1, 2, 4, 5
Box 18	2, 4, 5, 6	2, 4, 5
Box 19	1, 3, 5, 6	1, 3, 5
Box 20	1, 4, 5, 6	1, 4, 5

The example below shows how FL001D 0808R V3 is addressed for emergency shut off box 5



Step 4 - Modbus list

Alarm data from the emergency shut-off boxes is retrieved via the Masterwatch Ultra alarm in the pressure monitor that monitors the IO modules. The Modbus list in the alarm is the same as before, but is expanded with the list below when emergency boxes are monitored. In order to read the Modbus list below, the table on page 6 must be filled in and available. Either the pressure transmitter or limit switch tags are retrieved, depending on what the emergency shut-off box is equipped with.

The first digit is the function code. XX is replaced with the number of the emergency box according to the completed table on page 6.

To read **O2 low pressure i emergency shut-off box 2** use function **Discrete Inputs** tag **02010**

To read **N2O pressure i emergency shut-off box 9** use function **Input Registers** tag **09020**

To read **AIR valve not open i emergency shut-off box 12** use function **Discrete Inputs** tag **12032**

Emergency shut-off box with pressure transmitter

	Information	Alarm class	R/W	Input coil
Alarm bits	O2 low pressure	A	R	1XX010
	O2 high pressure	A	R	1XX011
	N2O low pressure	A	R	1XX020
	N2O high pressure	A	R	1XX021
	AIR low pressure	A	R	1XX030
	AIR high pressure	A	R	1XX031
	AIR800 low pressure	A	R	1XX040
	AIR800 high pressure	A	R	1XX041
	CO2 low pressure	A	R	1XX050
	CO2 high pressure	A	R	1XX051
	N2 low pressure	A	R	1XX060
	N2 high pressure	A	R	1XX061
	Ar low pressure	A	R	1XX070
	Ar high pressure	A	R	1XX071
	Communication error with analog IO module	B	R	1XX090
	Communication error with relay IO module	B	R	1XX091

Alarm bit is high when alarm is active

	Information	Scaling	R/W	Typ	Input Registers
Value	O2 pressure	xx.x bar	R	uint16	3XX010
	N2O pressure	xx.x bar	R	uint16	3XX020
	AIR pressure	xx.x bar	R	uint16	3XX030
	AIR800 pressure	xx.x bar	R	uint16	3XX040
	CO2 pressure	xx.x bar	R	uint16	3XX050
	N2 pressure	xx.x bar	R	uint16	3XX060
	Ar pressure	xx.x bar	R	uint16	3XX070

Emergency shut off box with limit switch

	Information	Alarm class	R/W	Input coil
Alarm bits	O2 valve not open	A	R	1XX012
	N2O valve not open	A	R	1XX022
	AIR valve not open	A	R	1XX032
	AIR800 valve not open	A	R	1XX042
	CO2 valve not open	A	R	1XX052
	N2 valve not open	A	R	1XX062
	Ar valve not open	A	R	1XX072
	Communication error with IO module	B	R	1XX092

Alarm bit is high when alarm is active

Step 5 - Configuration in the Masterwatch Ultra alarm

When the installation of the IO modules is complete, the monitoring should be configured and tested in the alarm for the emergency shut-off boxes that are to be monitored. This is done when the entire alarm system is installed and powered up.

1. Go to the pressure monitor Ultra alarm
2. Open the **Settings → Other → System configuration → Monitoring emergency shut-off box** (the button is on the far right, swipe to reach it).
3. A configuration wizard starts and guides you step by step through the settings for monitoring all emergency boxes.
4. To be able to complete the configuration, you need to have the table on page 6 filled in and available.

When the installation of the IO modules is complete, adjustments can be made in the menu
Settings → Other → System configuration → Monitoring emergency shut-off box

Here you can activate/deactivate emergency boxes and gases, and change the names of emergency shut-off boxes.

This is used when changes are needed in the facility, for example during renovation or reconstruction.

The emergency shut-off box user interface is integrated into the pressure monitor Ultra alarm panel. This section only describes the additional functions and menus that become available when the Masterwatch Ultra alarm monitors emergency shut-off boxes.

Start screen



The start screen is the view normally shown during normal operation of Masterwatch Ultra. It provides a quick overview of system status and is always available. If there is no activity within 5 minutes and no alarms are active, the system automatically returns to this view.

System status

The current system status is clearly displayed in the center in a colored box.

During normal operation, the text "System OK" is shown in green.

If an alarm occurs, both text and color change automatically to indicate the deviation.

Buttons

- **The gas buttons** on the left show each gas monitored by the system. Press a gas to open detailed information.
(In this window you can also swipe up to see detailed information on the emergency shut-off boxes that are being monitored)
- **Monitoring emergency shut-off box** In this window you can see detailed information on the emergency shut-off boxes that are being monitored.
- **Alarm list** shows all current and previous alarms.
(In this window you can also swipe up to see detailed information on the emergency shut-off boxes that are being monitored)
- **Settings** provides access to system settings such as relay functions, communication and alarm limits. Access requires a code.

If you are in Gas overview or the Alarm list, you can quickly return to the start screen by swiping down on the display.

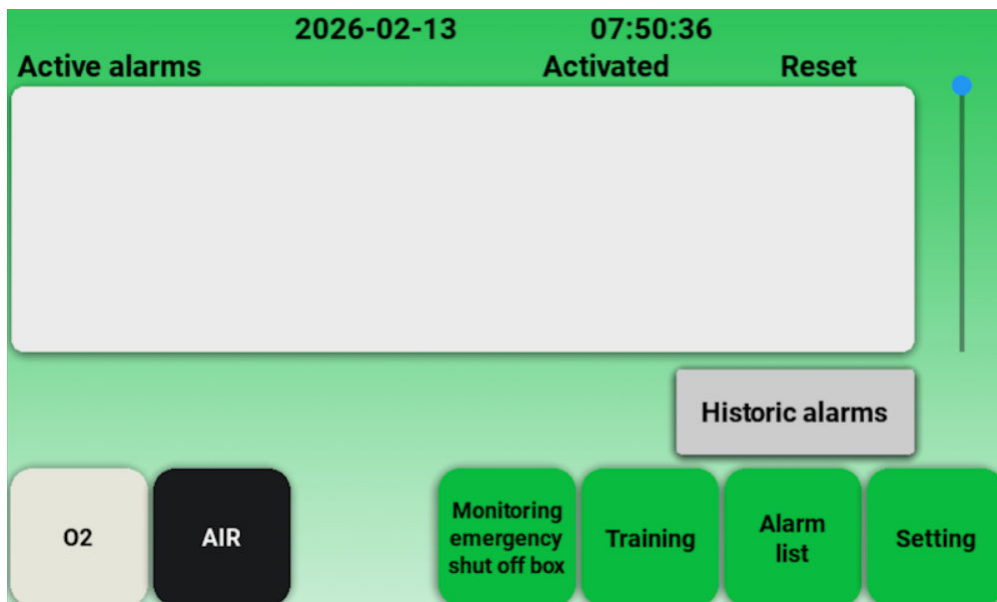
Overview emergency shut-off box



This view shows the current status of the selected emergency shut-off box. The name of the emergency shut-off box is displayed at the top. If the emergency shut off box is equipped with a pressure transmitter, the current gas pressures are displayed, otherwise only "OK" is displayed for the respective gas if the emergency shut-off box is equipped with limit switches. When alarms are active in the emergency shut off box, alarm texts pulsate on the screen.

Arrows on the sides make it possible to scroll between all emergency shut-off boxes that are monitored.

Alarm list



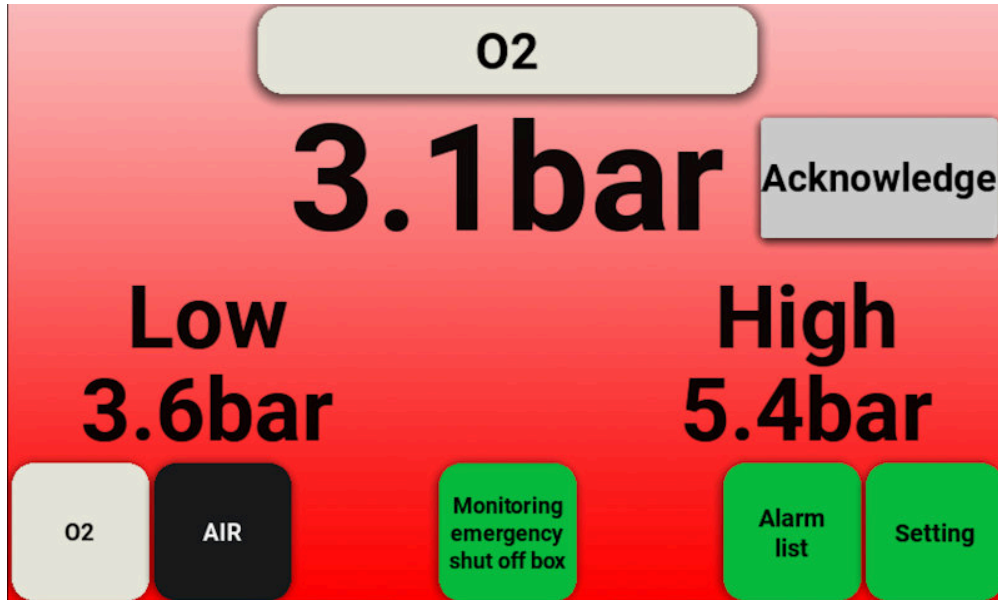
The alarm list provides an overview of all active alarms.

It makes it easy to see which alarms are active, when they occurred, and when they were restored provided the alarm has not been acknowledged.

Each entry shows alarm text, date/time of activation, and date/time of restoration (if restored). Restored and acknowledged alarms are automatically removed from the current alarm list.

Press Historical alarms to view earlier alarms, including restored ones. Deleting the historical alarm list requires the settings login code.

In alarm



When an alarm is activated in Masterwatch Ultra, the appearance of the screens and gas buttons changes to immediately attract the user's attention.

In the case of a B alarm (less critical), the background color changes to yellow.

In the case of an A alarm (critical), the background always changes to red, even if a B alarm is active at the same time.

If a gas in the pressure monitor alarms, the status window for that gas is displayed.

If only one emergency shut-off box is alarming, the alarm list opens instead, where the alarm text is displayed.

If an alarm is reset before it is acknowledged, the background returns to green, but the alarm sound continues. In this case, the Alarm List is automatically displayed, so the user can immediately see which alarms have been active but not acknowledged.

Relay functions

Press the buttons to set what activates the relay outputs. New settings are activated when you return to the home screen.

Time that active relays are reset at new alarms.
2 sec

Relay 1
NC terminal 6 and 8
NO terminal 7 and 8

Relay 2
NC terminal 9 and 11
NO terminal 10 and 11

Relay 3
NC terminal 12 and 14
NO terminal 13 and 14

Relay 4
NC terminal 15 and 17
NO terminal 16 and 17

Relay 5
NC terminal 18 and 20
NO terminal 19 and 20

A-alarm

A-alarm

A-alarm

A-alarm

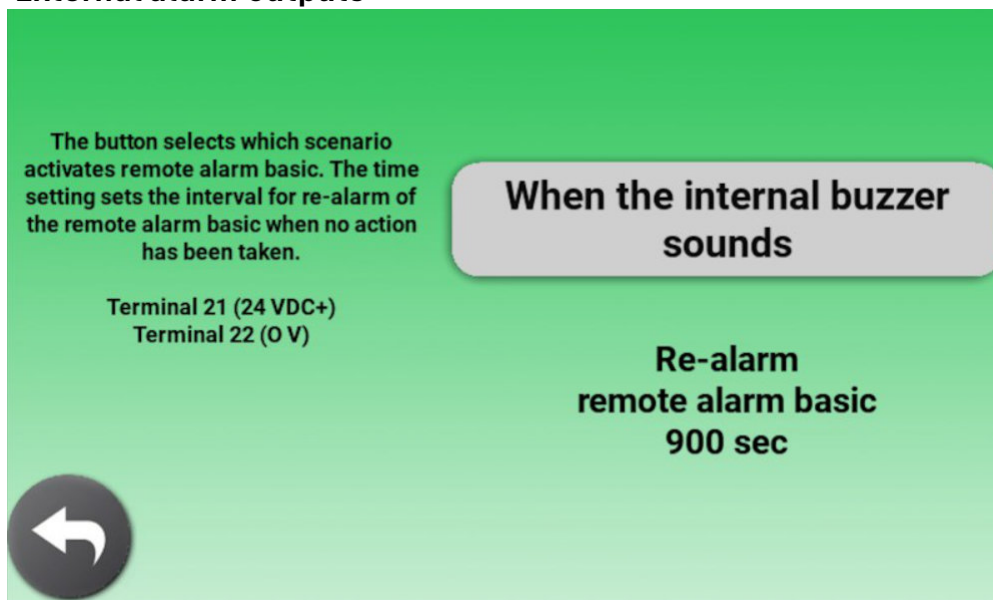
A-alarm



In this menu you set what should activate each relay output in the alarm system. There are five relays, and each relay can be programmed individually to suit the needs of the system. When the pressure monitor monitors emergency shut-off boxes, the functions below are also added.

Function	Description
Wrong gas pressure in the pressure monitor	The relay is activated if incorrect pressure is detected in the pressure monitor. The relay is not activated by alarms from emergency shut off boxes. This makes it possible to distinguish whether the alarm comes from the pressure monitor and not from one of the emergency shut-off boxes.
Wrong gas pressure in a emergency shut-off box	The relay is activated if incorrect pressure is detected in any emergency shut-off box. This makes it possible to distinguish that there is incorrect gas pressure in any of the emergency shut-off boxes not from the pressure monitor.
Valve alarm in a emergency shut-off box	The relay is activated if a valve alarm is detected in any emergency shut-off box. This makes it possible to distinguish that any valve is not open in any of the emergency boxes.

External alarm outputs



In this menu you set which scenario should activate the alarm outputs in the alarm system, such as remote alarm basic, external lamp or external buzzer. The settings can be adapted to how the equipment is installed and what the needs of the system are.

When the pressure monitor monitors emergency shut-off boxes, the functions below are also added.

Function	Description
In case of alarm in any emergency shut-off box	The output outputs 24V DC as long as any of the emergency shut-off boxes has incorrect pressure or valve alarm.

Below is a guide to troubleshooting common questions and problems related to operating the Masterwatch Ultra.

The alarm does not contact the IO module during configuration

- Check that the power supply is correctly connected to the IO module.
- Check that the Modbus cabling is correctly routed.
See pages 8 and 9
- Check that the IO module addressing is set correctly. See page 10

Alarms are active at startup

- Check that the gas pressure is correct.
- Check that the wiring from the emergency shut off box is correctly connected to the IO module

The alarm generates communication errors with the IO module, continuously or sporadically

- Check that the power supply is correctly connected to the IO module.
- Check that the Modbus wiring is correctly routed.
See pages 8 and 9
- Check that the IO module addressing is set correctly. See page 10

The Masterwatch Ultra NAV IO module is designed to be maintenance-free in normal operation.

This product is a medical gas monitoring alarm system. To ensure safe and correct operation, the following points must be observed:



General warnings

- Masterwatch Ultra should be supplied with **24 VDC $\pm 10\%$ (max ripple $\leq 200\text{mV}$)**.
Only stabilized power supplies may be used.
- Installation must be performed by personnel with knowledge of Masterwatch Ultra and medical gas systems.
- Reconfiguration/service may only be performed by authorized personnel.
- Incorrect installation may result in the alarm not functioning.

During configuration

- All system settings (e.g. relay logic, alarm limits) only take effect after exiting the settings menu.

Logging/traceability

- Changes are logged with date/time and user type.
- Logs cannot be deleted and provide full traceability over the system life cycle.

Manufacturer:	QMT-tech AB Amerikavägen 6 39354 Kalmar
Product name:	Masterwatch Ultra NAV IO module
Article number:	QMT8ULTRA74X
Power consumption:	4,4 Watt
Supply voltage:	24 VDC $\pm 10\%$ (max ripple $\leq 200\text{mV}$)
Relay outputs::	2 st potential-free contacts , (1st NO 1st NC), Max 2A, 250VAC
External alarm outputs:	2 st 24 VDC-outputs, max load 2 A per output
Kommunikation:	1 st Modbus RTU (RS-485) to Masterwatch Ultra alarm
Communication:	-20 till 70 °C dry indoor
Operating:	-20 till 70 °C dry indoor
Technical lifetime:	10 years (provided maintenance is performed according to this manual)

Article number

- QMT8ULTRA74T – Masterwatch Ultra NAV IO module for emergency shut-off box equipped with pressure transmitter
- QMT8ULTRA74G – Masterwatch Ultra NAV IO module for emergency shut-off box equipped with limit switch on valve

Accessories

Masterwatch Ultra IO module s supplied as a complete product for monitoring the gas system. However, there are a number of accessories that can be used to power the unit, monitor or to forward alarms to other locations in the facility. Below is a list of available accessories with name, part number, power consumption (if applicable) and a short description:

- Power supply UNO-PS (QMT7TU6PS)
60W, 24vdc transformer. Used to power Masterwatch Ultra IO module if no 24vdc is available at the facility. QMT7TU6PSK transformer in plastic housing 130x180x125mm.
- Power supply UNO-UPS (QMT7TU6800)
If the facility lacks priority power, this unit can power the alarm in the event of a power outage. Battery capacity: 0.8 Ah.
- Remote alarm basic (QMT704206U) - about 50 mA
Remote alarm basic that is supplied with 24 VDC from Masterwatch Ultra IO module in case of alarm. When activated, an LED lights up and a buzzer sounds.
The buzzer can be silenced locally with the acknowledgement button on the box.
The remote alarm basic is intended to be placed at an emergency shut-off box – it is therefore only activated by an alarm in this particular emergency shut-off box, not by alarms from other emergency shut-off boxes.
- Indicator panel(QMT704209) - up to 150 mA
An external box with a lamp and buzzer that is powered by 24 VDC from the IO module in the event of an alarm. It is connected directly to the emergency shut off box's IO module and is therefore only activated in the event of an alarm in that emergency shut-off box – not by alarms from other emergency shut-off boxes.

Manufacturer: QMT-tech AB
Amerikavägen 6
39354 Kalmar

Product name: Masterwatch Ultra NAV IO module

Article number: QMT8ULTRA74X

Complies with:

Directive 2014/30/EU

LVD 2014/35/EU

Masterwatch Ultra IO module is an electronic product and must not be disposed of with household waste.

At end of life, handle as electrical and electronic waste according to local regulations.
Deliver the unit to an approved recycling facility or equivalent receiver.

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