

# Design Installation Operation Manual



## NANO FIRE DETECTION AND EXTINGUISHING CONTROL SYSTEM



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## 1 DOCUMENT REVISION DETAILS

| Issue | Modification Detail                                         | Author | Date           |
|-------|-------------------------------------------------------------|--------|----------------|
| 01    | 1 <sup>st</sup> publishing document                         | CvT    | 01 / 08 / 2022 |
| 02    | Textual addition chapter 20 (environment & power)           | CvT    | 01 / 09 / 2022 |
| 03    | Textual addition chapter 22 (specifications extended)       | CvT    | 01 / 03 / 2023 |
| 04    | Improvement diagram 16                                      | CvT    | 14 / 04 / 2023 |
| 05    | Textual addition chapter 5                                  | CvT    | 01 / 07 / 2023 |
| 2.0   | Sounder & beacon type expanded, improve diagram 16/17/19/30 | CvT    | 01 / 07 / 2024 |
| 2.1   | Add Modbus register                                         | CvT    | 01 / 08 / 2024 |
| 2.2   | Add test mode                                               | CvT    | 01 / 10 / 2024 |
| 2.4   | Add confirmation Extinguishing                              | CvT    | 01 / 04 / 2026 |
| 2.5   | Add ETB5 Cabinet                                            | CvT    | 09 / 09 / 2026 |

## 2 SOFTWARE UPGRADE DETAILS

| Ver. | Modification Detail                        | Author | Date           |
|------|--------------------------------------------|--------|----------------|
| 02   | 1 <sup>st</sup> release Kiwa/Dare EMC test | CvT    | 01 / 08 / 2022 |
| 03   | Event log expanded                         | CvT    | 01 / 10 / 2022 |
| 2.0  | Event log expanded                         | CvT    | 01 / 07 / 2024 |
| 2.1  | Add Modbus register                        | CvT    | 01 / 08 / 2024 |
| 2.2  | Add test mode                              | CvT    | 01 / 10 / 2024 |
| 2.4  | Add confirmation Extinguishing             | CvT    | 01 / 04 / 2026 |



### 3 IMPORTANT NOTES

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This manual must be thoroughly read and understood before installation and/or commissioning of the system is carried out. The NANO system shall not be considered to be used correctly if it is operated without taking into account any relevant information or advice regarding its use provided by the supplier. The NANO system and its associated connections must be installed, commissioned, and maintained by a skilled, knowledgeable, and competent person or organization qualified to perform such work and familiar with the purpose of the equipment and the related technical terminology. This equipment is not covered by warranty unless the complete installation has been installed and commissioned in accordance with the applicable local, national, and/or international standards. The NANO/MAR has successfully passed CE and FCC EMC testing in accordance with EN 50130, EN 61000, EN 55016, 47 CFR Part 15, ICES-003, ANSI 63.4, and IEC 60945 Clause 11. In addition, it has obtained DNV marine type approval according to DNV Class Guideline 0339-2021, certificate no. TAA000037H. To achieve this approval, the NANO has undergone extensive environmental testing, including vibration, dry heat, damp heat, and cold tests, in accordance with the requirements of the DNV-CG 0339 standard. Where applicable, the NANO also complies with the requirements of the FSS Code (International Code for Fire Safety Systems).

### 4 WARRANTY

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N2KB B.V. warrants that the NANO system is free from defects in materials and workmanship. This warranty does not cover a NANO system that has been damaged, misused, and/or used contrary to the supplied operating manuals, or that has been repaired, modified, or altered by parties other than N2KB B.V. The liability of N2KB B.V. shall at all times be limited to the repair of or, at the sole discretion of N2KB B.V., the replacement of the NANO system. Under no circumstances shall N2KB B.V. be liable for any indirect, special, incidental, or consequential damages, including but not limited to damage to or loss of property or equipment, costs related to de-installation or reinstallation, transportation or storage costs, loss of profits or revenue, cost of capital, costs of purchased or replacement goods, or any claims made by customers of the original purchaser or by third parties, or any other similar loss or damage, whether incurred directly or indirectly. The remedies provided herein for the original purchaser and all other parties shall not exceed the purchase price of the NANO system supplied. This warranty is exclusive and expressly replaces all other warranties, whether express or implied, including, without limitation, any implied warranties of merchantability or fitness for a particular purpose. This warranty may be void if the equipment has been damaged by electrostatic discharge.

### 5 INTRODUCTION

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The NANO is a compact and robust stand-alone fire detection and extinguishant release panel designed to protect applications such as electrical cabinets, CNC machines, engine rooms in vessels and yachts, vehicles, and other small areas or equipment requiring rapid fire detection and suppression. The NANO continuously monitors its inputs and activates a product-specific extinguishing system in the event of a fire. Release can be initiated manually via the front panel buttons, an external release button, or automatically through fire sensor inputs. In marine applications, the default configuration is manual release only, as automatic release in engine rooms is not common practice. The system can be configured for automatic and manual release if required. With two detection zones, the NANO provides a versatile and high-performance fire protection solution. The NANO is a versatile fire detection and extinguishing release system designed for reliable high-performance operation.

## 6 ENCLOSURE & INSTALLATION

The NANO control panel must be mounted on a dry, flat surface in a horizontal position at eye level to prevent deformation of the enclosure. The NANO should be installed in an easily accessible location. Environmental conditions, such as high temperatures, must be taken into consideration during installation. The enclosure is provided with seven pre-drilled holes for cable glands: 2 × M16 and 5 × M12. To maintain the specified IP rating, all cables must be installed using suitable cable glands. Enclosure dimensions: 120 × 80 × 58.5 mm (W × H × D).



## 7 MAINTENANCE & CLEANING

The NANO contains no user-replaceable parts. Always take Electrostatic Discharge (ESD) precautions when opening the NANO. Wear a properly grounded anti-static wrist strap at all times. Avoid direct contact with components or connectors connected to the printed circuit board. Never allow the electronics to come into contact with clothing, as a grounding strap cannot dissipate static charges from fabrics. Failure to follow proper ESD handling procedures may result in damage to the NANO.

Before starting any cleaning procedure, take the system out of operation to prevent unintended activation of the fire extinguishing system.

The NANO fire detection and extinguishing release panel has an IP65 rating. The IP rating system uses a two-digit code to define the level of protection provided by the enclosure. The first digit indicates protection against solid particles, and the second digit indicates protection against liquids. The digit 6 means the enclosure is completely dust-tight, providing full protection against dust and other particles. The digit 5 indicates protection against low-pressure water jets (6.3 mm nozzle) from any direction, with limited water ingress permitted without harmful effects.

The IP rating applies only to the enclosure and is valid only when the correct mounting method is used and the appropriate cable glands are properly installed.

Improper cleaning of the NANO front panel may damage the control surface and affect its ability to detect fire and activate the extinguishing system. To remove dust and contaminants, use non-alcohol-based cleaning products specifically designed for this purpose.

**DO NOT USE HIGH-PRESSURE WASHERS OR STEAM CLEANERS.**

These may damage the front foil containing the control buttons and LED indicators.

## 8 THE NANO

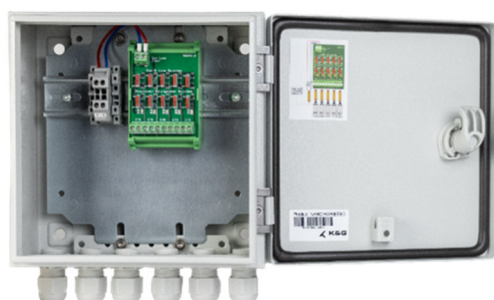
The NANO is designed for both land-based and marine applications. It has obtained DNV-CG Type Approval in accordance with the DNV-CG 0339 standard. The NANO system consists of two main components: the NANO control panel and the Extinguishant Terminal Board (ETB). The NANO control panel is typically installed on the bridge or in its vicinity. The ETB (Extinguishers Terminal Board) is specifically designed for the activation of aerosol extinguishers. The ETB (Extinguishers Terminal Board) is equipped with built-in safety electronics to ensure all extinguisher igniters are activated. Together with an end of line switch, this option makes the system a complete and reliable fire detection and extinguishing release system.





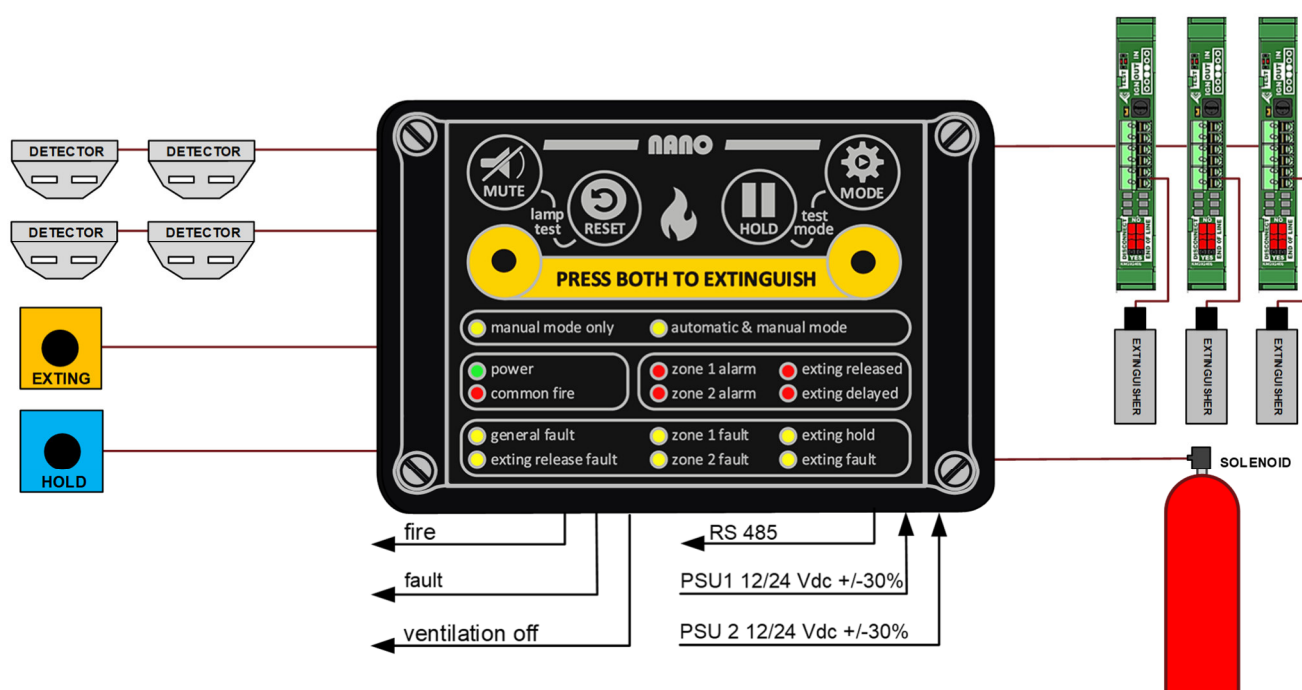
The ETB must be installed in a suitable enclosure outside, but close to, the protected engine room. The standard ETB is suitable for extinguishing actuators with a maximum resistance of  $<2 \Omega$ . The **ETB/H** is suitable for extinguishing actuators with a maximum resistance of  $>2 \Omega$ . A cable connects the ETB to the aerosol extinguisher installed in the protected area.

The cable connection between the NANO control panel and the ETB is continuously monitored for faults. The connection between the ETB and the extinguisher igniter is also monitored for open circuits or malfunctions. The cable from the extinguishers terminal board (ETB) to the extinguisher's igniter is also monitored for fault or malfunction. The ETB (Extinguishers Terminal Board) unit is available in a built-in 35 mm DIN rail version. **Dimensions** (without ETB modules): H x W x D: 120 x 95 x 67 mm.



Designed for harsh environments the N2KB/ETB5/IP66 enclosure is supplied with an ETB5 module for connecting up to **five** aerosol generators. It features six cable glands and an integrated terminal connection panel for fast and reliable installation. **Dimensions:** H x W x D: 200 x 200 x 120 mm

In marine applications, it is **NOT** common practice for an engine room fire suppression system to be automatically released by fire detectors. However, the NANO provides two fire alarm zones for connection of marine-approved fire detectors, such as the Apollo Orbis Marine series. The NANO can be configured so that fire alarms from connected detectors are displayed as information only and do not activate the extinguishing system. By default, the NANO is configured for manual release only. If required, it can be configured for automatic and manual release, allowing fire detector signals to activate the extinguishing system.



## 9 KEY PROPERTIES

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- Configurable for manual, single-stage, or double-stage detection, alarm, and extinguishing release.
- Outputs for fire alarm, fault, ventilation shutdown, and visual and audible alarm devices.
- Fully monitored output for aerosol fire extinguishing generators.
- Two fully monitored fire alarm input zones for linear heat and/or conventional fire detectors.
- Two fully monitored input zones for external extinguishing release and hold functions.
- Dual extinguisher release buttons to prevent unintended activation.
- Extinguishing hold button to postpone the release sequence.
- Extinguishing release delay to prevent unintended activation.
- Adjustable extinguishing delay from 0 to 35 seconds.
- Additional option to override the extinguishing delay after manual release.
- Additional functionality for separate external hold-off functions.
- Additional functionality for separate external extinguishing release functions.
- Historical event log memory accessible via a USB port.
- Modbus RS485 communication port.
- Operating voltage: 8 to 28 VDC.
- IP65-rated enclosure with cable glands.
- ESD and EMC protected, CE and FCC marked.
- DNV-CG Type Approval in accordance with the DNV-CG 0339 standard.

## 10 FEATURES NANO

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### 10.1 ACOUSTIC ALARM

The NANO has an internal audible attention signal and a monitored output for connection of an external sounder/beacon. Fault conditions are indicated by a continuous tone, while alarm conditions are indicated by a pulsating tone. A different tone pattern is used during extinguishing activation and when the hold (extinguishing delay) function is active. The voltage of the monitored output for driving an additional sounder/beacon is controlled by the NANO and is independent of the main power supply voltage.

### 10.2 EXTINGUISHANT RELEASE OUTPUT

The NANO is equipped with two activation methods for fire extinguishing systems. The required method can be selected using DIP switch 3. By default, the NANO is configured to activate electrical igniters used in aerosol fire extinguisher generators, with DIP switch 3 in the OFF position. Activation of aerosol fire extinguishing units is achieved by applying a current pulse of 1.3 A for 50 ms.

When DIP switch 3 is set to the ON position, the NANO is configured to activate fire extinguishing systems using a solenoid actuator. In this configuration, the activation output provides 24 VDC with a maximum current of 1 A.

#### **IMPORTANT**

For the default current pulse activation method (DIP switch 3 OFF), the NANO activation output voltage for electrically activated aerosol fire extinguisher units is 12 to 24 VDC  $\pm 30\%$ . For the voltage-controlled activation method (DIP switch 3 ON), the NANO activation output voltage for extinguishing systems using a solenoid actuator is 24 VDC.



### 10.3 HISTORIC EVENT LOG

The NANO has a historical event log memory capable of storing up to 10,000 events, accessible via a USB port. Connect a USB cable between the USB port and a computer. The NANO will be recognized as a USB storage device, and the operating system will create a new disk drive. The files on the drive are text files containing the logged events. The event log is intended for viewing, monitoring, and analysis only. Events are recorded without date and time information, but in chronological order. Each time the NANO is restarted, a new log file is created with a unique batch number in the file name. Pressed control buttons, detailed alarm and fault indications, and relay activation events are recorded in the log files.



### 10.4 COMMUNICATION PORT

The NANO is equipped with a Modbus network connection. Modbus enables communication between devices connected to the same network. A Modbus network consists of one master device and multiple slave devices, each with a unique address. For more information, refer to the MODBUS user manual.

### 10.5 DIRECT RELEASE

When the extinguishing delay timer is set between 10 and 35 seconds, DIP switch 1 (direct extinguishing release) provides the option to override the delay in the event of a fire alarm. When a fire alarm is detected by the NANO automatic fire detectors and the countdown timer has started, the delay can be overridden. By pressing the dual extinguishing release buttons on the front panel or the external extinguishing release button, the extinguishing release sequence starts immediately without delay. This function can be enabled via DIP switch 1.

### 10.6 VEHICLE MODE (NORMALLY NOT IN USE IN MARINE APPLICATIONS)

If the extinguishing system is installed to protect a vehicle engine bay, any programmed extinguishing delay must be disabled when the vehicle is parked and the driver leaves the vehicle. In this situation, an extinguishing delay provides no benefit and should be overridden. As soon as the ignition switch is activated again, even briefly, the system automatically returns to the programmed delay setting. In vehicle mode, a single or dual fire alarm (depending on the DIP switch setting) will activate the extinguishers immediately without delay. During normal operation, the NANO is powered via terminals 15 (+) and 14 (-), indicating that the vehicle engine is running. To enable vehicle mode, terminal 13 (+) must be connected in addition to terminal 15 (+). When the vehicle is parked and the ignition key is removed, power to terminals 13 and 15 is interrupted, and the backup power supply maintains operation of the NANO. When DIP switch 2 is enabled and no voltage is present on terminals 13 and 15, any programmed extinguishing delay is disabled. When vehicle mode (DIP switch 2) is enabled, the green power LED flashes at a different frequency compared to operation on the secondary power supply. If vehicle mode is not used and no external backup battery or power supply is connected, battery inputs 17 and 18 must be connected in parallel to power terminals 14 and 15 to prevent a battery fault indication.

**Please note that the vehicle mode does not work in the only manual mode (12.5)**

### 10.7 GENERAL FAULT RELAY

The fault relay is normally energized and de-energizes upon any fault condition, including complete loss of power. This ensures a fail-safe condition of the NANO panel in the event of a fault.

## 10.8 VFC FIRE RELAY IN SINGLE OR DUAL MODE

A single or dual FIRE indication can activate the VFC (*Volt-Free Contact*) relay. In single mode, the VFC relay is activated when one of the fire detection zones enters a fire alarm condition. In dual mode, the relay is activated only when both fire detection zones are in a fire alarm condition. This function can be selected using DIP switch 5.

## 10.9 SINGLE OR DUAL ZONE

Normally, the extinguishing system operates in two-group dependent mode (coincidence detection), requiring fire alarms from both detection zones before extinguishing activation is initiated. In dual mode (standard setting), the extinguishers are released only when both detection zones are in a fire alarm condition. This condition activates the internal pulsating alarm sound, the fire relay, and the extinguishing output according to the DIP switch settings. In single mode, the extinguishers are released when one detection zone enters a fire alarm condition. This condition activates the internal pulsating alarm sound, the fire relay, and the extinguishing output according to the DIP switch settings. This function can be selected using DIP switch 4.

## 10.10 EXTINGUISHANT RELEASE DELAY

The extinguishing delay is intended for use in normally occupied areas. The delay timer is configured using DIP switches 6, 7, and 8. These switches allow the delay time to be set in 5-second increments from 0 to 35 seconds. The countdown timer provides a defined delay period before the extinguishers are activated.

# 11 INPUTS

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The NANO is equipped with two fire detection zones and two external button inputs (Extinguishing Release and Hold). These inputs are continuously monitored for alarm and fault conditions. All inputs are supervised and require a 10 k $\Omega$  end-of-line resistor, including unused inputs. The button inputs require a trigger resistor between 470  $\Omega$  and 1 k $\Omega$ .

## 11.1 DETECTION ZONES

The NANO is equipped with two fire detection zone inputs. The inputs are continuously monitored for fire alarm and fault conditions. The inputs are configured with the following values:

- RESISTANCE of less than 100  $\Omega$ : FAULT
- RESISTANCE of more than 100  $\Omega$  and less than 1,5 k $\Omega$ : FIRE
- RESISTANCE of more than 1,5 k $\Omega$  and less than 8 k $\Omega$ : FAULT
- RESISTANCE of more than 8 k $\Omega$  and less than 12 k $\Omega$ : NORMAL
- RESISTANCE of more than 12 k $\Omega$ : FAULT

When a low-resistance linear heat cable (less than 450  $\Omega$ ) is used, a 470  $\Omega$  resistor must be installed in series at the beginning of the loop on one of the wires. Without this resistor, the linear heat cable will generate a fault condition instead of a fire alarm. When using a Fenwal or equivalent thermal heat detector, a 470  $\Omega$  resistor must be installed in series with the alarm contact. In addition, a 10 k $\Omega$  end-of-line resistor must be connected in parallel across the alarm contact and the 470  $\Omega$  resistor. A maximum of four detectors may be connected to each zone. The voltage of all monitored detection inputs is controlled by the NANO and is independent of the main power supply voltage. The NANO fire alarm zones 1 and 2 operate in the normal (quiescent) state at 15 VDC. Each input zone requires a 10 k $\Omega$  end-of-line resistor, even when the fire zone is not used.



## 11.2 EXTERNAL RELEASE INPUT

The NANO is equipped with a dedicated input for an external extinguishing release button. This button has the same function as the dual extinguishing release buttons on the front panel. When the external extinguishing release button is pressed, the extinguishing system is activated. Depending on the DIP switch timer settings, the release can be delayed. The delay time can be configured from 0 to 35 seconds in 5-second increments. The input loop is continuously monitored for alarm and fault conditions.

## 11.3 EXTERNAL HOLD INPUT

The NANO is equipped with a dedicated input for an external hold button. The external hold button has the same function as the internal hold button on the front panel. When an alarm condition is active and the hold button is pressed, the extinguishing release sequence is delayed. When the hold button is released, the system waits for the configured delay time before continuing the release sequence. Releasing the hold input restarts the countdown release timer with the full configured delay time.

# 12 OUTPUTS

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The NANO is equipped with five outputs: two monitored outputs and three potential-free relay outputs. The monitored outputs are continuously supervised for open-circuit and short-circuit fault conditions. The potential-free outputs have a maximum contact rating of 30 VDC / 1 A. The monitored outputs are used for the extinguishing release output and the electronic sounder/beacon output.

## 12.1 VOLT FREE CONTACT RELAY OUTPUTS

- **General fire alarm relay output.** The general fire relay is energized when a fire condition is detected in any fire detection zone or when the internal or external extinguishing release button is activated.
- **General fault relay output.** The general fault relay indicates the presence of a fault condition in the NANO. In the event of a complete loss of power, the general fault relay de-energizes to provide a fail-safe fault indication.
- **VFC relay output (1st or 2nd fire alarm)** The VFC relay output can be programmed for activation on the first or second fire alarm. It is intended, among other applications, for switching off ventilation and/or air-conditioning systems in the protected area..

## 12.2 MONITORED EXTINGUISHING OUTPUT

The NANO is equipped with a monitored extinguishing output that detects short circuits and open-circuit faults. When used in combination with the ETB (Extinguishant Terminal Board), the NANO extinguishing output is protected against reverse polarity and voltage surges. Without the ETB, the extinguishing activation output is not protected against reverse polarity or voltage surges. In this configuration, an end-of-line diode must be installed (1N5400, 1N4007, RL201, or SF21). Refer to Chapter 18/33 for further information.

## 12.3 MONITORED SOUNDER OUTPUT

This output, intended for connection to an optical and/or audible alarm device, is monitored for short circuits and open-circuit faults by installing a 10 kΩ end-of-line monitoring resistor at the alarm device, such as the VTB-32EM or YL 40 sounder/beacon. Refer to the connection diagrams on pages 26 and 27. For some sounder/beacon types, the end-of-line resistor is not required, as the input resistance of the device is sufficient to monitor for short circuits and/or open-circuit faults.

## 13 CONTROL BUTTONS



The NANO is equipped with a clear and well-structured front panel, allowing the system status to be determined quickly and easily. The figure shows the controls and indicators with their corresponding labels. The front panel features a specially designed overlay with integrated control buttons and LED indicators.

### 13.1 MUTE

The internal buzzer can be silenced at any time by pressing the Mute button. To silence the external sounder, press the Mute button twice. The external sounder cannot be silenced during an extinguishing release condition. In the event of a second alarm condition, the external sounder and internal buzzer are activated again.

### 13.2 RESET

After the cause of the alarm has been identified and resolved, the NANO can be reset by pressing the Reset button. Manual Call Points, if activated, must first be reset locally. Fault indications are self-resetting and automatically disappear once the fault condition has been cleared.

### 13.3 LAMP TEST

All indicators and the buzzer can be tested at any time by pressing the Mute and Reset buttons simultaneously.

### 13.4 HOLD EXTINGUISHING RELEASE

Pressing the **Hold** button on the control panel or an external **Hold** button pauses the extinguishing release sequence for as long as the button is held. During this time, the yellow **Hold** indicator flashes and the buzzer emits a pulsating tone. In a second-stage alarm condition, the alarm tone changes to the first-stage alarm tone. Releasing the **Hold** button restarts the release delay timer with the full configured delay time.

### 13.5 AUTOMATIC & MANUAL RELEASE OR MANUAL ONLY MODE

The system mode can be switched between Manual Only and Automatic & Manual using the MODE push button on the NANO. In Manual Only mode, automatic fire detectors provide indication only and cannot activate the extinguishing release. To switch modes, press and hold the MODE button for 3 seconds. To return the system to Manual Only mode, press and hold the MODE push button again for 3 seconds..



## 13.6 EXTINGUISHING RELEASE

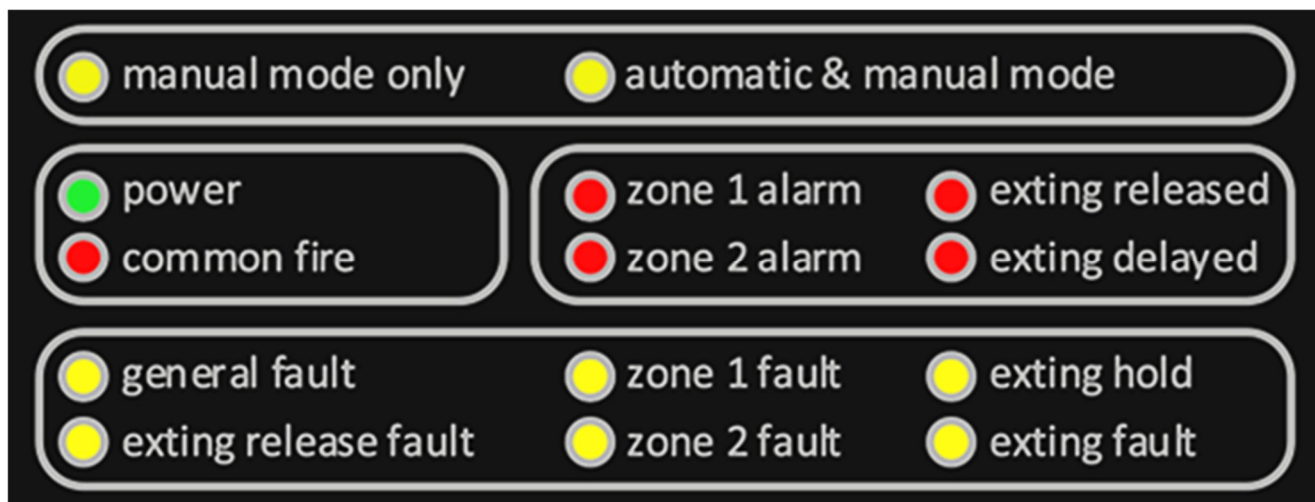
In the event of a fire, press both front extinguishing release push buttons simultaneously. This will initiate the alarm condition and activate the extinguishing system according to the DIP switch timer settings.

## 13.7 TEST MODE

Fire alarm systems must be tested regularly to ensure correct operation. The NANO can be tested using the TEST MODE function. For extinguishing systems based on aerosol technology, the ETB provides a means to disable the extinguishers during testing and maintenance activities. For solenoid-controlled extinguishing systems, an ETB is not applicable. However, the ability to disable the extinguishing output during testing is still required. For this purpose, the NANO is equipped with a TEST MODE function. In TEST MODE, the alarm and fault circuits can be tested without activating the extinguishing output. Activation of TEST MODE is indicated by activation of the general fault relay and flashing of the yellow EXTING FAULT indicator. To enable TEST MODE, press the MODE and HOLD buttons simultaneously for 1 second. The general fault relay is activated and the yellow EXTING FAULT indicator starts flashing. To return the system to normal operation, press the MODE and HOLD buttons simultaneously again for 1 second. The TEST MODE indication is cleared and the yellow indicator stops flashing.

## 14 LED INDICATORS

The front panel of the NANO contains one common fire indicator, three internal fault indicators, and thirteen individual LED indicators. These indicators are divided into three sections to show general functions, fire alarm status, and extinguishing status. Under normal operating conditions, only the green Power LED and either the Manual Only or Automatic & Manual mode LED are illuminated. The yellow fault LEDs automatically turn off when the corresponding fault condition has been cleared.



### 14.1 MANUAL RELEASE ONLY

When the yellow "Manual Only" LED is illuminated, the aerosol extinguishers cannot be released by automatic fire detectors and can only be activated through manual operation.

### 14.2 AUTOMATIC & MANUAL RELEASE

When the yellow "Automatic & Manual" LED is illuminated, the aerosol extinguishers can be released by automatic fire detectors and/or by manual operation.

### 14.3 POWER PSU 1 & 2

PSU 1 = mains power supply and PSU 2 = backup power supply. Under normal operating conditions, the NANO control panel has only the green Power LED illuminated and either the Manual Only or Automatic & Manual mode LED illuminated. Failure of the mains power supply or disconnection of the backup power supply will generate a fault condition. The Power LED changes its indication pattern to show an abnormal power supply condition of the NANO. After restarting the NANO following a power failure or an extinguishing release, the green Power LED flashes for a maximum of 1 minute. When the system is ready for operation, the Power LED remains continuously illuminated.

If the **mains power supply** is not present, the backup power supply takes over. The Power LED flashes once per second, the yellow General Fault LED is illuminated, and the common fault relay is de-energized.

If the **backup power supply** is not present, the Power LED flashes twice per second followed by a 1-second pause, after which the sequence repeats. The General Fault LED and Internal Battery Fault LED are illuminated, and the common fault relay is de-energized.

If **no backup power source** is available, terminals 17 and 18 must be connected respectively to terminals 14 and 15 to prevent a fault message.

When the **vehicle function** (DP2) is enabled, the green Power LED flashes once per second when the vehicle is parked and the system switches to the secondary vehicle voltage supply.

### 14.4 COMMON FIRE

In the event of a fire alarm from either the fire detectors or activation of the extinguishing release push buttons, the red General Fire LED is illuminated.

### 14.5 FIRE ZONE ALARM

Upon receiving a fire alarm condition caused by the activation of a fire detector, the red alarm indicator of the corresponding fire alarm zone flashes. The common Fire indicator is activated simultaneously, and the internal buzzer generates a pulsating tone.

### 14.6 EXTINGUISHING RELEASED

The red Extinguishing Release indicator is continuously illuminated when the extinguishing system has been activated. The indicator is illuminated after the configured extinguishing delay time has elapsed, when both extinguishing release buttons on the front panel are pressed, or when the external extinguishing release button is activated.

### 14.7 EXTINGUISHING RELEASE CONFIRMED

The NANO system is equipped with a "**discharge confirmed**" indication. Upon activation of the extinguishing system, the red **Extinguishing Release LED** starts flashing. The LED changes to steady illumination only after successful activation of the electrical igniters has been confirmed.

### 14.8 EXTINGUISHING DELAY

The red Extinguishing Delay indicator flashes while the release delay is active. Pressing the Hold button causes the indicator to illuminate continuously. Releasing the Hold button resets the delay timer to its maximum value, after which the indicator resumes flashing until the delay period expires.

### 14.9 GENERAL FAULT

The general fault indicator and the applicable specific fault indicator(s) flash. The yellow fault indicator remains continuously illuminated whenever a fault condition is present.



## 14.10 FIRE ZONE FAULT

When the NANO detects a fault in one of the system's critical fire detection circuits, the corresponding yellow zone fault indicator flashes and the general fault indicator illuminates continuously. The internal buzzer emits a pulsating tone.

## 14.11 EXTINGUISHING RELEASE HOLD

The yellow Hold indicator flashes, and a distinct audible tone sounds while the Hold button on the front panel or an external Hold button is pressed. The Hold indicator turns off when the Hold button is released.

## 14.12 EXTINGUISHING RELEASE FAULT

The yellow Test indicator illuminates continuously when the system is in Test mode. If a critical fault occurs in the extinguishing release output, the yellow Extinguishing Release indicator flashes. The indicator turns off automatically when the fault has been cleared.

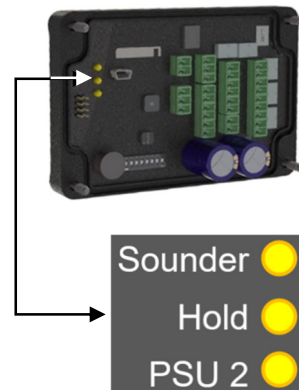
## 14.13 INTERNAL FAULT INDICATORS

Three additional yellow fault indicators are located on the internal electronic PCB and are used to indicate secondary-priority fault conditions. These indicators flash when the corresponding fault is present.

LED 1 indicates a fault on the monitored sounder/beacon circuit.

LED 2 indicates a fault in the external extinguishing release hold input circuit.

LED 3 indicates a fault in the secondary emergency power supply (PSU 2).

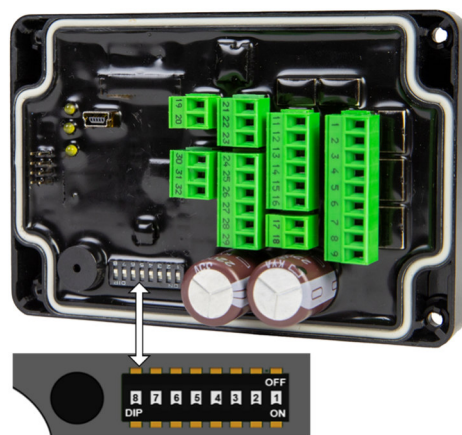


# 15 DIP SWITCHES

## 15.1 SETTINGS

**Standard setting ex factory, all dipswitches in OFF position.**

- Automatic fire detectors are configured as the initiating devices for extinguishing release; the release delay timer is not overridden.
- Vehicle mode is disabled.
- The extinguishing release output is configured for electrical igniters used with aerosol fire extinguishers.
- Automatic extinguishing release requires a dual-zone fire alarm.
- The VFC relay activates on the second fire alarm.
- The extinguishant release delay is set to 0 seconds.



## Recommended DIP Switch Settings for Marine Applications (Manual Release Only)

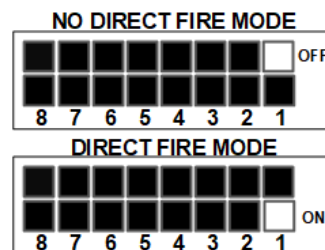
- Manual release from the NANO front panel only; automatic fire detectors are disabled (**DP1 OFF**).
- Vehicle mode is disabled (**DP2 OFF**).
- Extinguishing release output for electrical igniters used with aerosol fire extinguishers (**DP3 OFF**).
- Dual-zone alarm function is disabled (**DP4 OFF**).
- VFC relay activates on the first alarm (**DP5 ON**).
- Extinguishant release delay set to **20 seconds** (**DP6 ON, DP7 OFF, DP8 OFF**).

## 15.2 DIRECT RELEASE (DP1)

If a fire alarm is detected by the automatic fire detectors, the extinguishant release delay timer starts. Pressing the Manual Release button overrides the delay timer and initiates immediate extinguishant release.

DS1 OFF – The programmed extinguishant release delay also applies to manual release.

DS1 ON – Manual release overrides the programmed delay and initiates immediate extinguishant release.

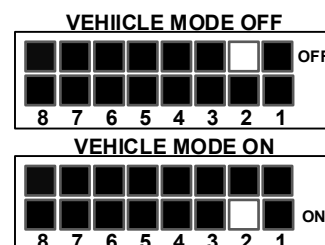


## 15.3 VEHICLE MODE (DP2)

When the extinguishing system is used to protect a vehicle engine compartment, the programmed extinguishant release delay can be automatically disabled when the vehicle is parked and the driver has left the vehicle.

DS2 OFF – The system operates with extinguishant release delay.

DS2 ON – Extinguishant release delay is disabled when the vehicle is parked.

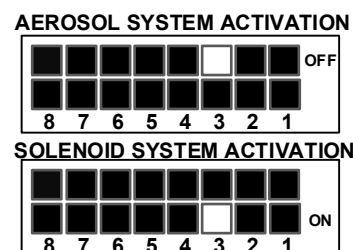


## 15.4 EXTINGUISHING RELEASE OUTPUT (DP3)

The N2KB NANO supports two extinguishing release output configurations. By default (DS3 OFF), the system is configured to activate electrical igniters for aerosol fire extinguishers. Setting DS3 to ON configures the release output for solenoid activation.

DS3 OFF – Electrical igniters for aerosol fire extinguishers (1.3 A / 50 ms).

DS3 ON – Solenoid activation (24 VDC, 1 A).



### WARNING

**Do not use an ETB when DS3 is set to the ON position (Solenoid mode).**

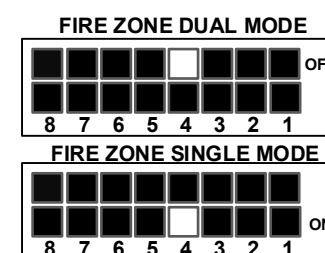
**Doing so may cause permanent damage to both the ETB and the NANO control panel.**

## 15.5 SINGLE OR DUAL FIRE ALARM (DP4)

The NANO is configured for dual-zone operation by default. In this mode, extinguishant release occurs only when both fire detection zones are in alarm. For applications requiring a faster response, single-zone operation can be selected, allowing extinguishant release when either fire detection zone is in alarm.

DS4 OFF – Automatic extinguishant release requires both fire detection zones to be in alarm.

DS4 ON – Automatic extinguishant release occurs when either fire detection zone is in alarm.

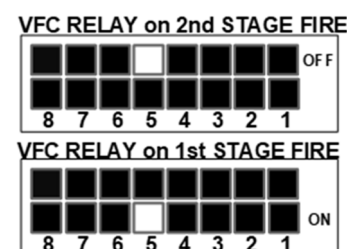


## 15.6 VFC RELAY (DP5)

The VFC relay can be configured to activate either on the first fire alarm or on the second fire alarm.

DS5 OFF – The VFC relay activates on the second fire alarm.

DS5 ON – The VFC relay activates on the first fire alarm.



## 15.7 EXTINGUISHING DELAY TIMER (DP6-7-8)

The extinguishant release delay is intended for normally occupied areas only. The delay can be set from 0 to 35 seconds in 5-second increments using DIP switches 6, 7, and 8. When a fire alarm initiates an extinguishing sequence, the countdown timer delays extinguishant release by the programmed time.

DS 6 OFF |

DS 7 OFF | - is no delay

DS 8 OFF |

DS 6 OFF |

DS 7 OFF | - is 5 seconds delay

DS 8 ON |

DS 6 OFF |

DS 7 ON | - is 10 seconds delay

DS 8 OFF |

DS 6 OFF |

DS 7 ON | - is 15 seconds delay

DS 8 ON |

DS 6 ON |

DS 7 OFF | - is 20 seconds delay

DS 8 OFF |

DS 6 ON |

DS 7 OFF | - is 25 seconds delay

DS 8 ON |

DS 6 ON |

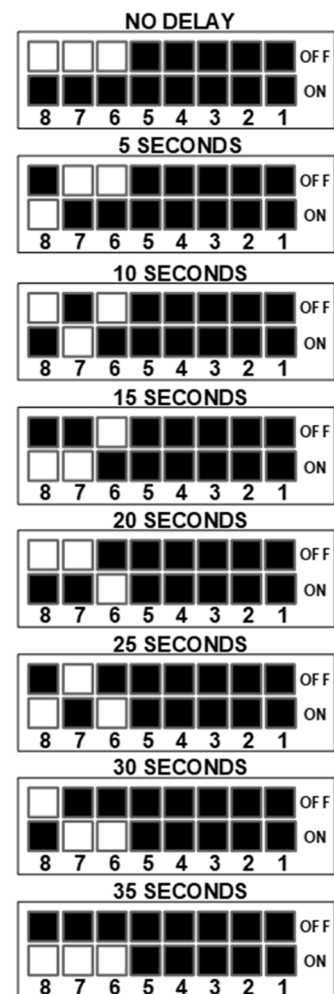
DS 7 ON | - is 30 seconds' delay

DS 8 OFF |

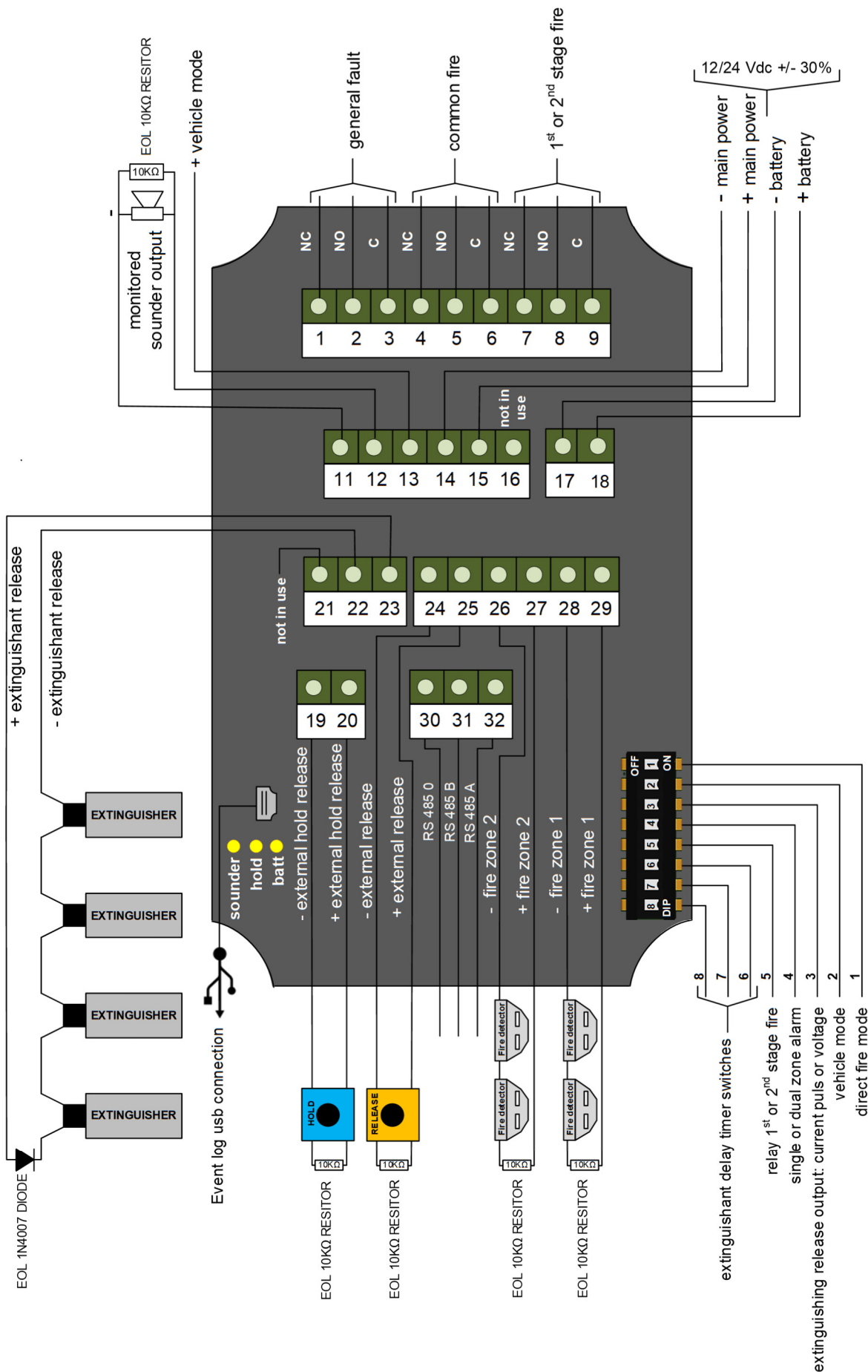
DS 6 ON |

DS 7 ON | - is 35 seconds delay

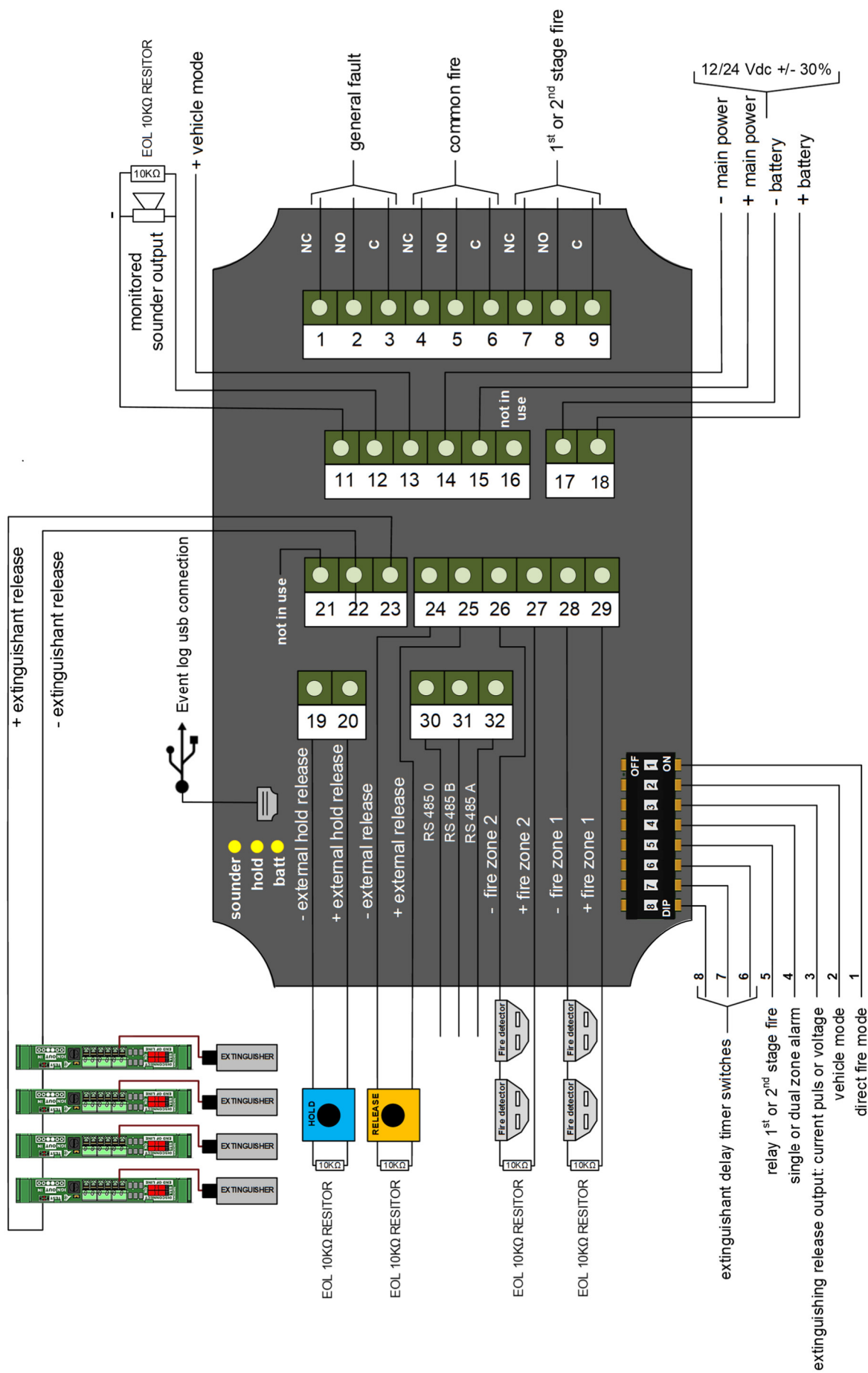
DS 8 ON |



# 16 WIRING DIAGRAM NANO CONNECTED TO IGNITER ACTUATORS



## 17 WIRING DIAGRAM NANO CONNECTED TO AN ETB

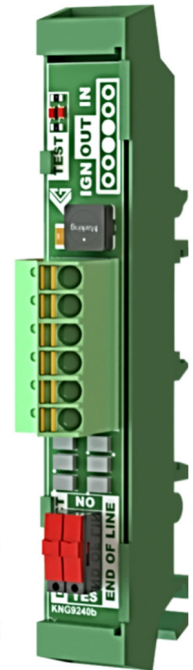


## 18 THE ETB

The ETB is specially developed for connecting aerosol extinguishers. This terminal connection board includes integrated safety electronics to ensure reliable activation of all connected extinguishing unit igniters. Combined with an end-of-line switch, the ETB enables the NANO system to function as a complete and reliable fire detection and extinguishing system.

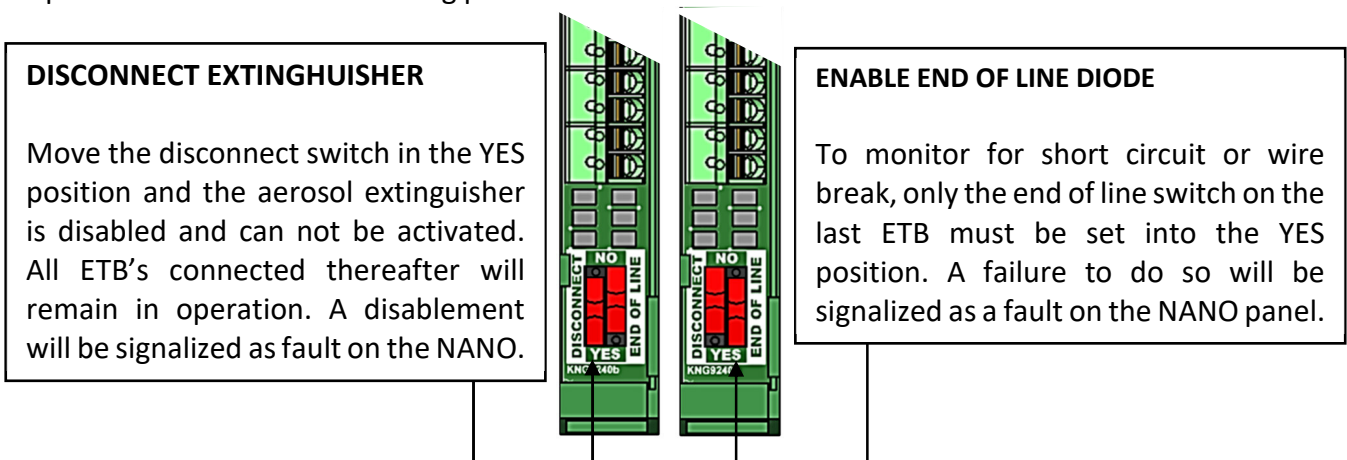
### The most important characteristics of the ETB are:

- simple push-in connection technology
- minimum core diameter 0.5 mm<sup>2</sup> (AWG 20)
- maximum core diameter 1.5 mm<sup>2</sup> (AWG 16)
- bridging protection ensures that the ignition current is maintained through all electrical activators for at least 50 ms, even if one igniter malfunctions or behaves differently from the others (e.g., ignites earlier and reaches high impedance before the remaining igniters are activated).
- the ETB is equipped with a switch that enables the end-of-line monitoring diode on the last and final extinguishing generator in the extinguishing circuit.
- a second switch is provided to disconnect the electrical activator from the extinguishing circuit, allowing the extinguishing circuit to be tested without activating the extinguishing generators.
- a red test LED provides visual confirmation that the activation current is being initiated during the installation test procedure
- the ETB is equipped with reverse polarity protection, preventing damage or malfunction caused by incorrect wiring connections.
- the ETB is equipped with surge protection, reducing the risk of unintended activation of the fire generator due to nearby lightning strikes or electrical surges.
- mounting method: 35 mm DIN rail mounting.

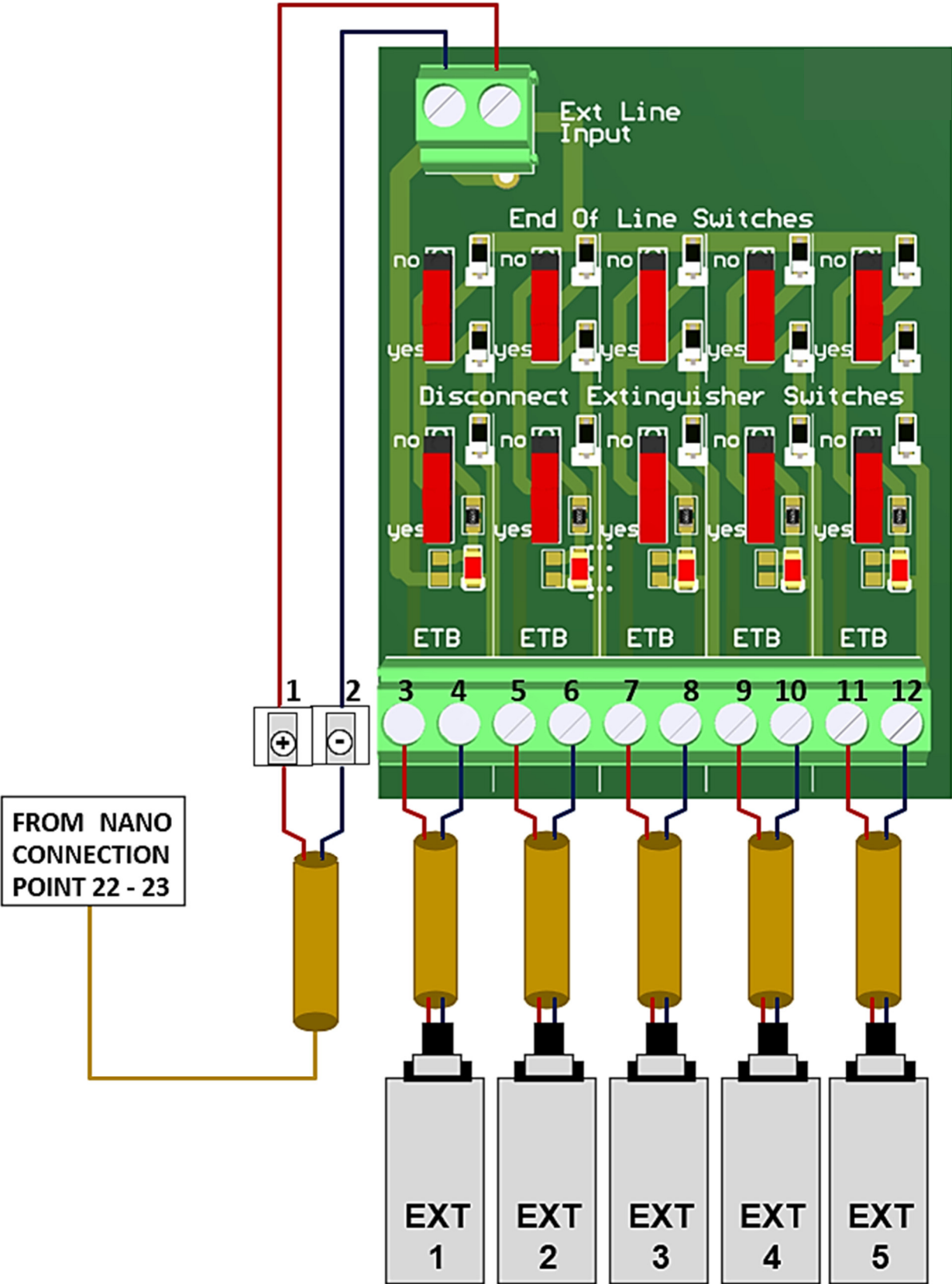


### 18.1 USING THE TWO SWITCHES ON THE ETB

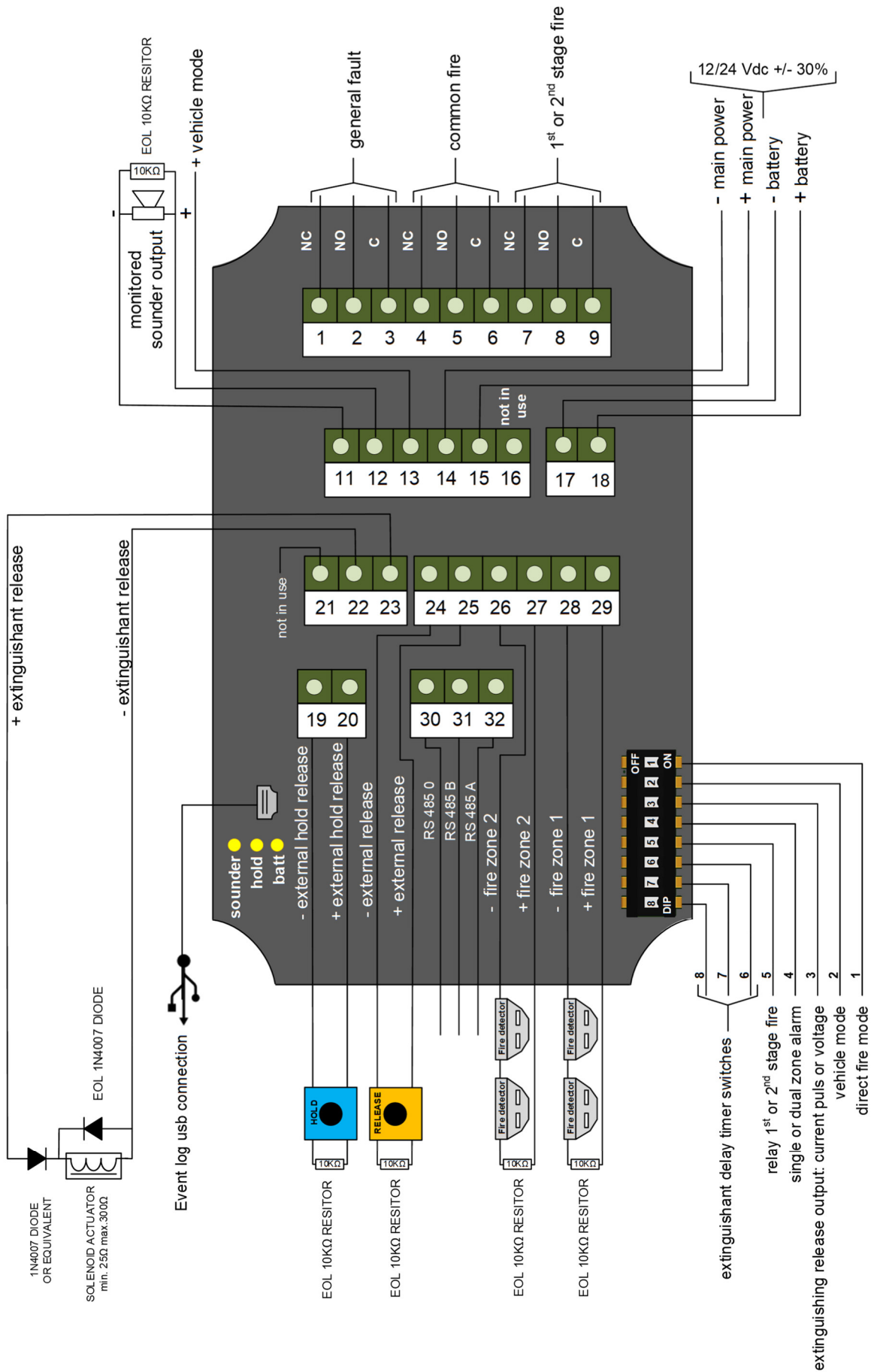
Incorrect placement of the end-line switch may result in part of the extinguisher's activation circuit being disabled. Therefore, a visual inspection is an essential part of the work performed by commissioning and maintenance engineers. This inspection shall be included as a standard requirement in the commissioning procedure.



19 WIRING DIAGRAM NANO CONNECTED TO AN ETB/5



## 20 WIRING DIAGRAM OF THE NANO USING A SOLENOID ACTIVATOR



## 21 NANO WIRING DIAGRAM SOLENOID ACTIVATION SYSTEM

In addition to a fire extinguishing output for electric igniters used with aerosol fire extinguishing generators, the NANO is also equipped with an extinguishing output suitable for solenoid-controlled fire extinguishing systems. The extinguishing output is capable of supplying up to 1 A to a solenoid for the maximum activation duration.

The solenoid must have a resistance between 25 and 200  $\Omega$  at 18/28 V DC to ensure that the maximum current rating of the extinguishing output is not exceeded. The maximum permissible cable impedance is between 1.5  $\Omega$  and 5.0  $\Omega$ , depending on the coil impedance. Calculate the voltage drop across the cable to ensure that sufficient voltage remains at the end of the control cable for reliable activation of the solenoid actuator.

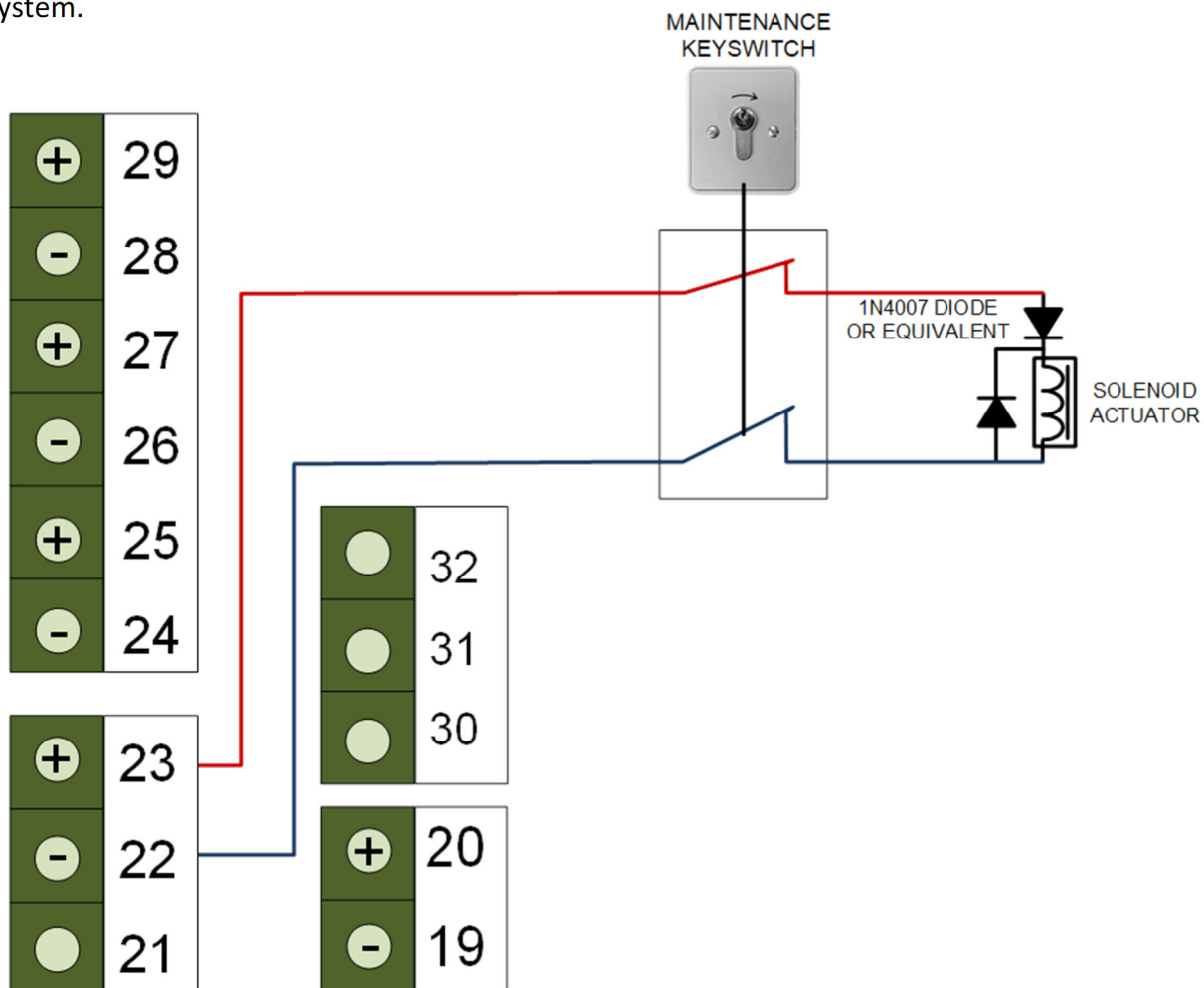
The solenoid should be fitted with two diodes:

- One diode for end-of-line monitoring.
- One flyback diode.

A flyback diode is connected across the coil to suppress the voltage spike generated when the current through an inductive load is suddenly reduced or interrupted. It is used in circuits containing inductive loads to protect the control electronics.

### IMPORTANT

Although the NANO has a button on the front panel for manual extinguishing activation, we recommend installing a service/maintenance key switch in the extinguishing output circuit. This allows testing and maintenance activities to be performed without activating the extinguishing system.



## 22 WIRING & CABLE SPECIFICATIONS:

- Shielded cable is not required.
- Use twisted-pair cable. This improves protection against electrical and magnetic interference.
- Minimum solid copper conductor cross-section for extinguisher line cables:
- Cable length < 50 m: 1.0 mm<sup>2</sup> (AWG 18).
- Cable length > 50 m: 1.5 mm<sup>2</sup> (AWG 16).
- Minimum solid copper conductor cross-section for fire detection cables: 0.5 mm<sup>2</sup> (AWG 20).
- Maximum solid copper conductor cross-section for other cables: 1.0 mm<sup>2</sup> (AWG 18).
- Maximum conductor loop resistance for 1.5 mm<sup>2</sup> cable: 24 Ω/km.
- Maximum cable length of fire zone cables: 50 m.
- Maximum cable length between the NANO and the ETB: 30 m.
- The total cable length for all extinguishers combined must not exceed 125 m.

## 23 TECHNICAL SPECIFICATION

### Environment

|                           |                            |
|---------------------------|----------------------------|
| Ambient Temperature Range | -25 to +55 degrees Celsius |
| Dust and water rating     | IP65                       |
| Compass safe distance     | minimum 50 mm              |

### Power related specification

|                                            |                                  |
|--------------------------------------------|----------------------------------|
| Input voltage main and emergency battery   | 12/24 VDC +/-30%                 |
| Maximum power usage                        | 1 Watt quiescent 5 Watt in alarm |
| Maximum contact rate relays                | 30 VDC/1A                        |
| Voltage fire zone                          | 15 Vdc                           |
| Limited alarm current fire detectors       | 60 mA                            |
| Sounder / beacon voltage main powered mode | 12 – 22 VDC                      |
| Sounder / beacon alarm maximum current     | 150 mA                           |

### Connector and cable specification

|                                                                          |                                             |
|--------------------------------------------------------------------------|---------------------------------------------|
| Conductor cross section solid (Cross Sectional Area mm <sup>2</sup> )    | 0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> |
| Conductor cross section flexible (Cross Sectional Area mm <sup>2</sup> ) | 0.5 mm <sup>2</sup> ... 1.5 mm <sup>2</sup> |
| Conductor cross section AWG                                              | 20 ... 16                                   |
| Stripping length                                                         | 8 mm                                        |

### Aerosol extinguisher output specification

|                                               |                                             |
|-----------------------------------------------|---------------------------------------------|
| Max extinguisher count ETB (Igniter ≤ 2ohm)   | 8 connected on ETB max 125 meter cable      |
| Max extinguisher count ETB/H (Igniter ≥ 2ohm) | 6 connected on ETB/H max 125 meter cable    |
| Max extinguishers count without ETB           | 6 connected without ETB max 125 meter cable |
| Extinguisher release current                  | 1,3A                                        |
| Extinguisher release pulse length             | 35 ms                                       |

### Solenoid extinguisher output specification

|                                   |                                       |
|-----------------------------------|---------------------------------------|
| End of line component             | 2 x back - EMF diodes 1N4004 or equal |
| Maximum number solenoids          | 1                                     |
| Maximum coil resistance           | 25 to 200 ohms                        |
| Maximum current                   | 1 A                                   |
| Voltage                           | 24Vdc                                 |
| Extinguisher release pulse length | 20 seconds                            |



## Detection zone, hold and extinguishing release inputs

|                        |                                             |
|------------------------|---------------------------------------------|
| Normal state           | $> 8 \text{ k}\Omega < 12 \text{ k}\Omega$  |
| Alarm load             | $< 100 \Omega > 1.2 \text{ k}\Omega$        |
| Zone fault threshold 1 | $< 100 \Omega$                              |
| Zone fault threshold 2 | $> 1.2 \text{ k}\Omega < 8 \text{ k}\Omega$ |
| Zone fault threshold 3 | $> 12 \text{ k}\Omega$                      |
| Alarm resistant        | $470 \Omega$                                |
| End of line resistant  | $10 \text{ k}\Omega$                        |

## 24 DEVICES SUPPORTED AND INVOLVED BY THE NANO APPROVAL

### 24.1 DETECTION DEVICE SUPPORT

| The detector types below have been evaluated on the NANO and are approved for such |                        |        |
|------------------------------------------------------------------------------------|------------------------|--------|
| Part no                                                                            | Type                   | Brand  |
| ORB-OP-42001-MAR <sup>1</sup>                                                      | smoke detector         | Apollo |
| ORB-OH-43001-MAR <sup>1</sup>                                                      | smoke/heat detector    | Apollo |
| ORB-HT-41002-MAR <sup>1</sup>                                                      | heat 61°C detector     | Apollo |
| ORB-HT-41004-MAR <sup>1</sup>                                                      | heat 73°C detector     | Apollo |
| ORB-HT-41006-MAR <sup>1</sup>                                                      | heat 90°C detector     | Apollo |
| ORB-MB-00001-MAR                                                                   | standard detector base | Apollo |

### 24.2 SOUNDER/BEACON DEVICE SUPPORT

| Part no                               | Type           | Brand          |
|---------------------------------------|----------------|----------------|
| YL40/DL/C/25/WN/WR                    | sounder beacon | Clifford Snell |
| VTB-32EM-DB-RB/RL (VTB <sup>2</sup> ) | Sounder beacon | Cranford       |

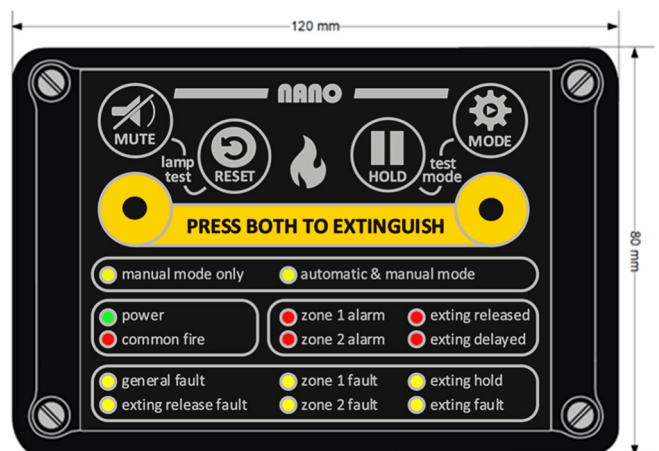
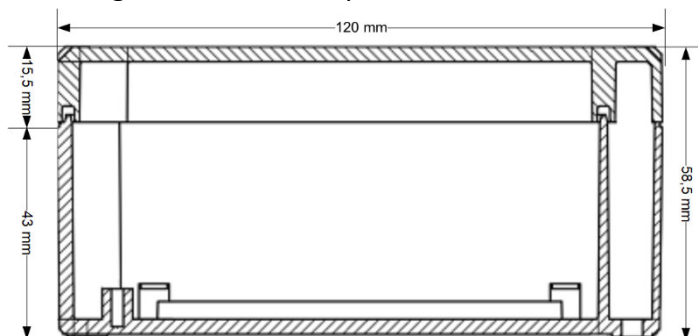
Note: 1 Device input voltage 8 – 22 VDC

Note: 2 Device input voltage 18 – 22 VDC

Always check the specification of the devices of your preference before installing them on the NANO control panel.

## 25 ENCLOSURE SPECIFICATIONS

- outside enclosure : 120 x 80 x 58,5 mm w x h x d
- protection class : IP 65
- color of enclosure : black RAL 9005
- enclosure material : ABS suitable for outdoor use
- cable gland holes : 7 predrilled holes

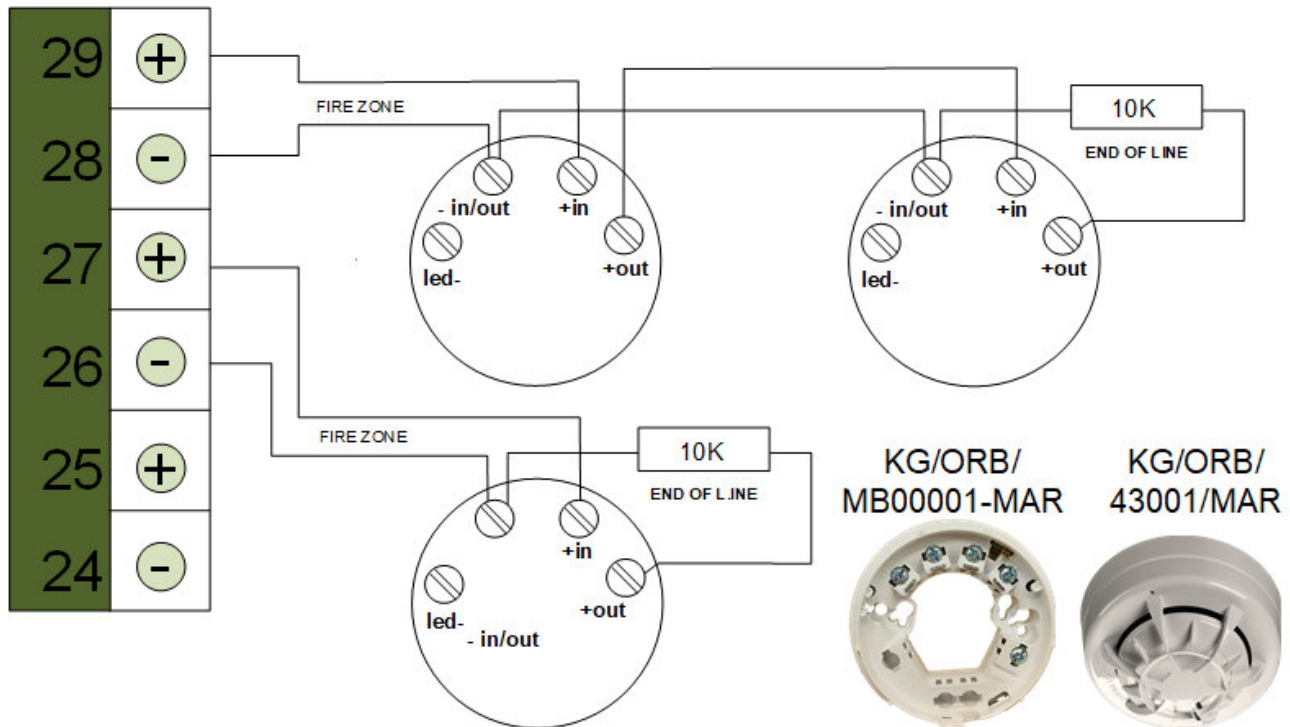


## 26 NANO FIRE DETECTOR AND WIRING OPTIONS

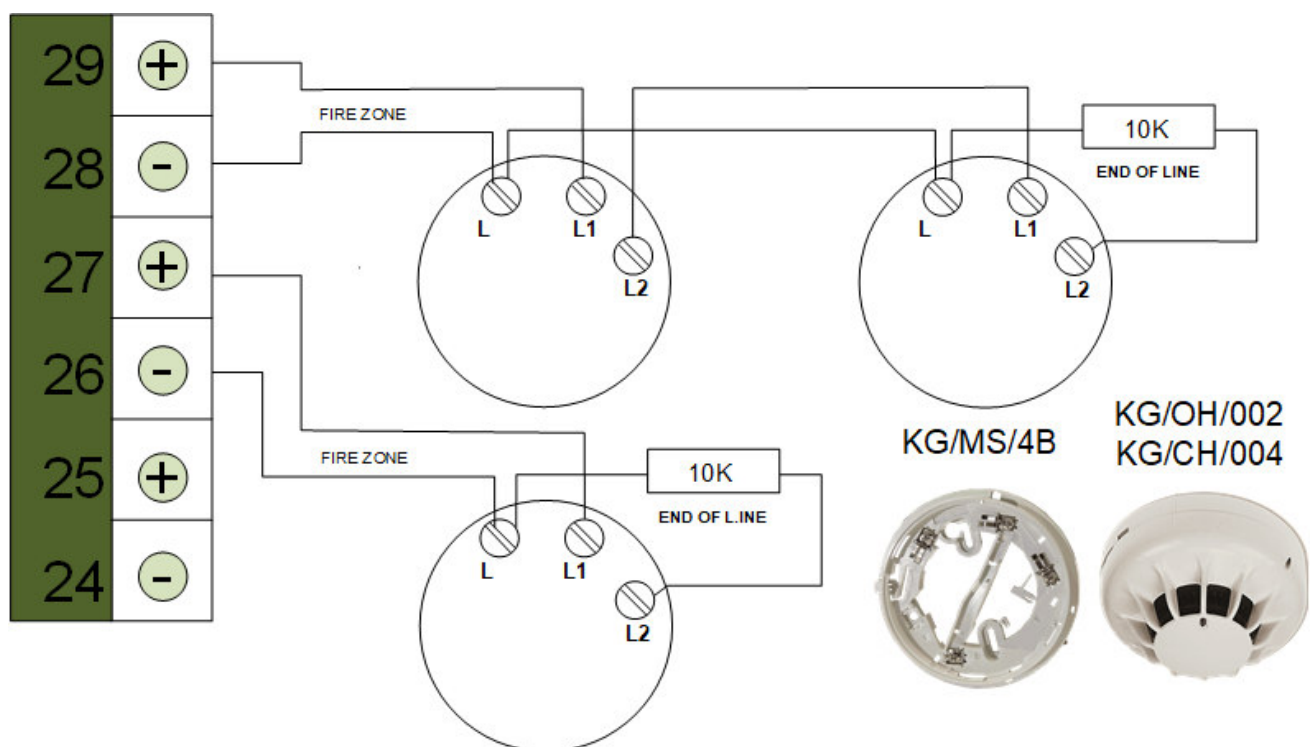
There are three options for connecting fire detectors to the NANO.

- Conventional Apollo Orbis Marine and Fireclass fire detectors
- Heat detectors
- Linear cable heat detection

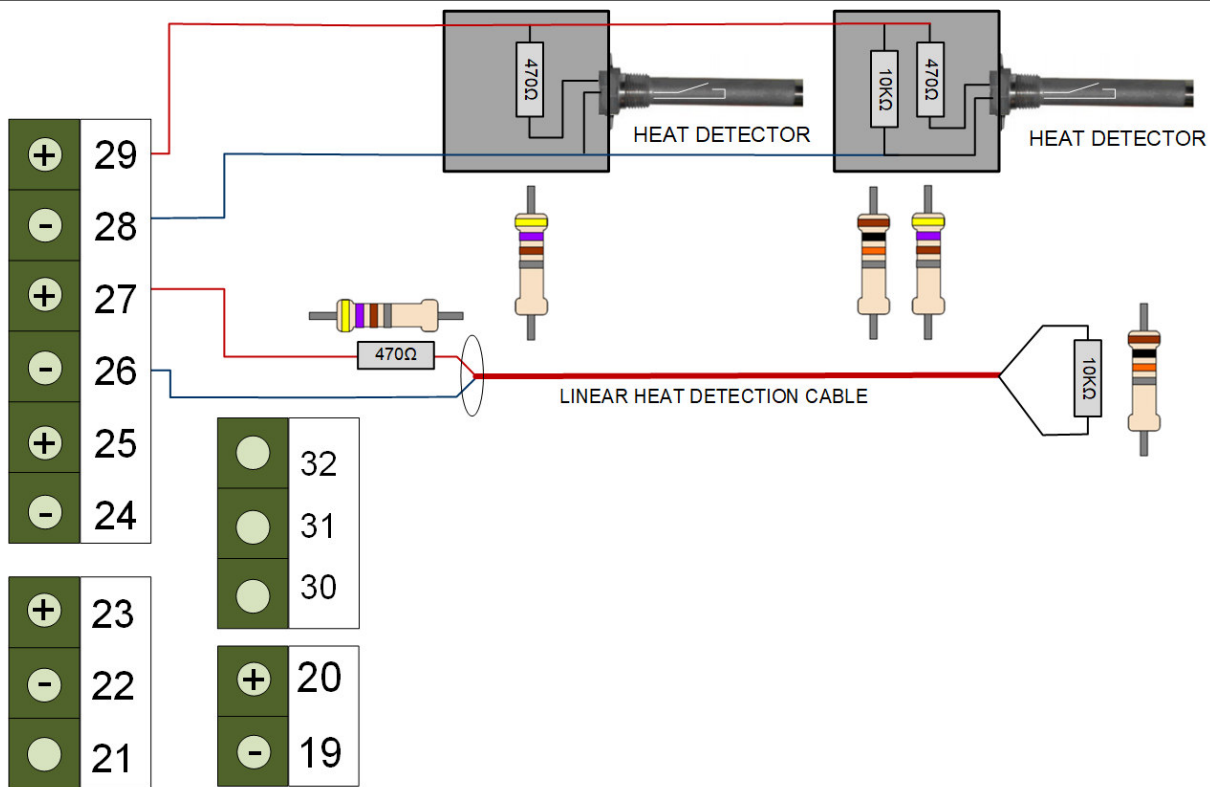
### 26.1 APOLLO DETECTOR



### 26.2 FIRECLASS DETECTOR

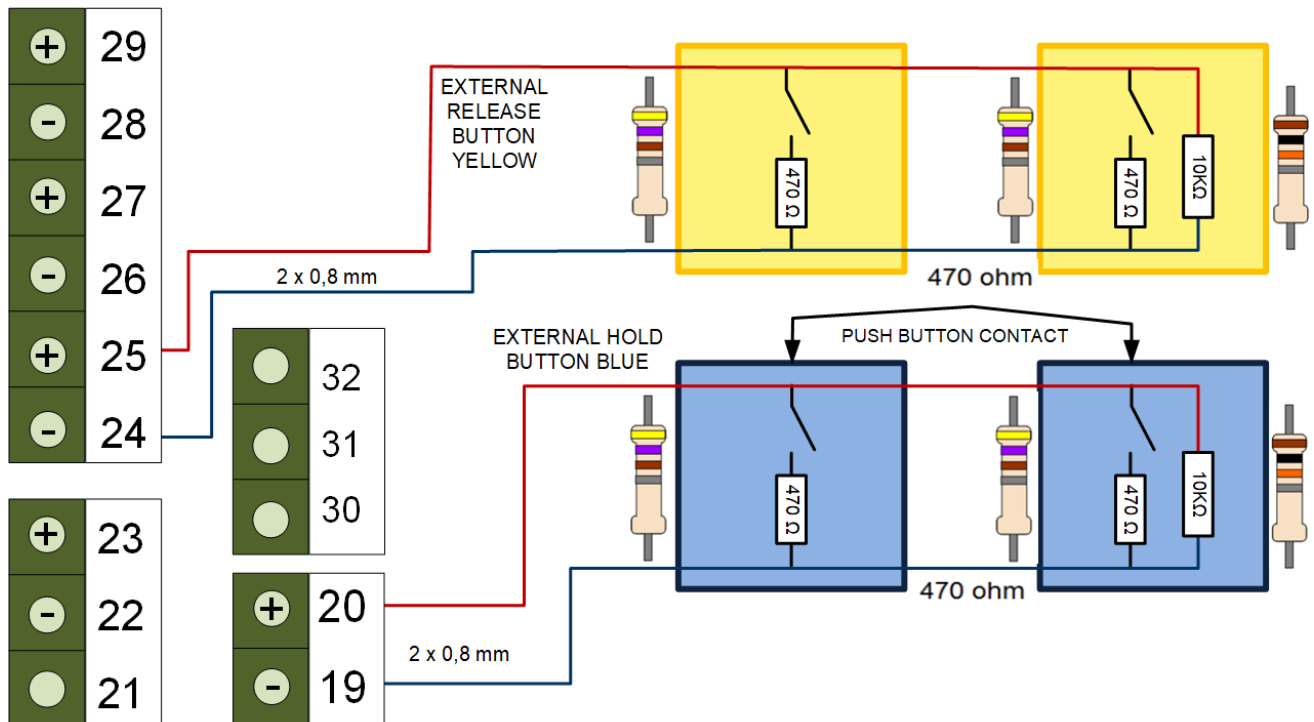


## 27 NANO LINEAR CABLE HEAT DETECTION



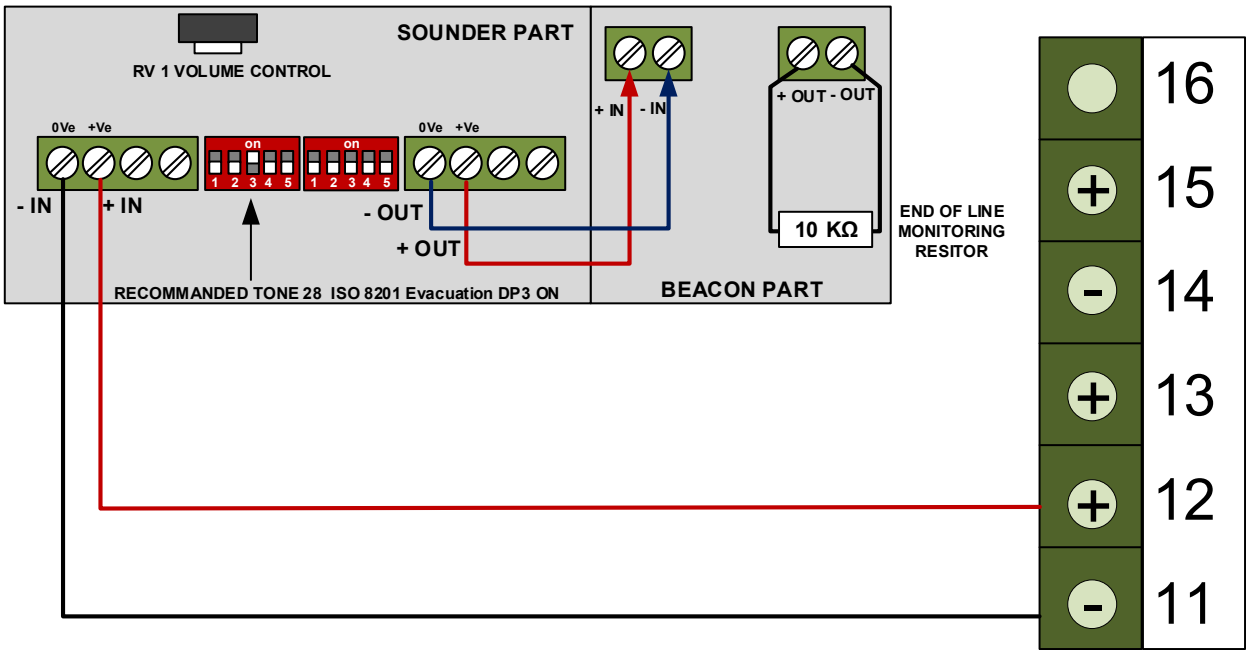
## 28 NANO EXTERNAL EXTINGUISHERS RELEASE & HOLD WIRING OPTIONS

The NANO has separate inputs for an external extinguishing release and an external hold-off button.



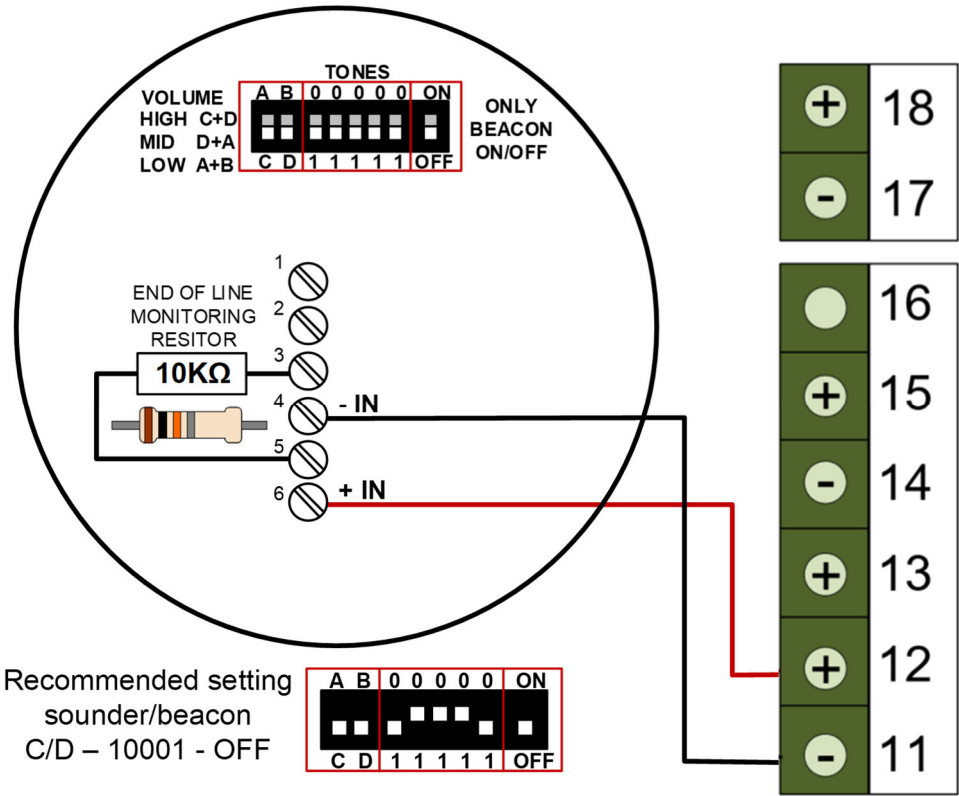
## 29 YL 40 WIRING OPTION SOUNDER & BEACON

For a single sounder beacon, follow the connection diagram below. The recommended settings provide the most distinctive and effective alarm signal compared with the standard evacuation alarm signals used on vessels.



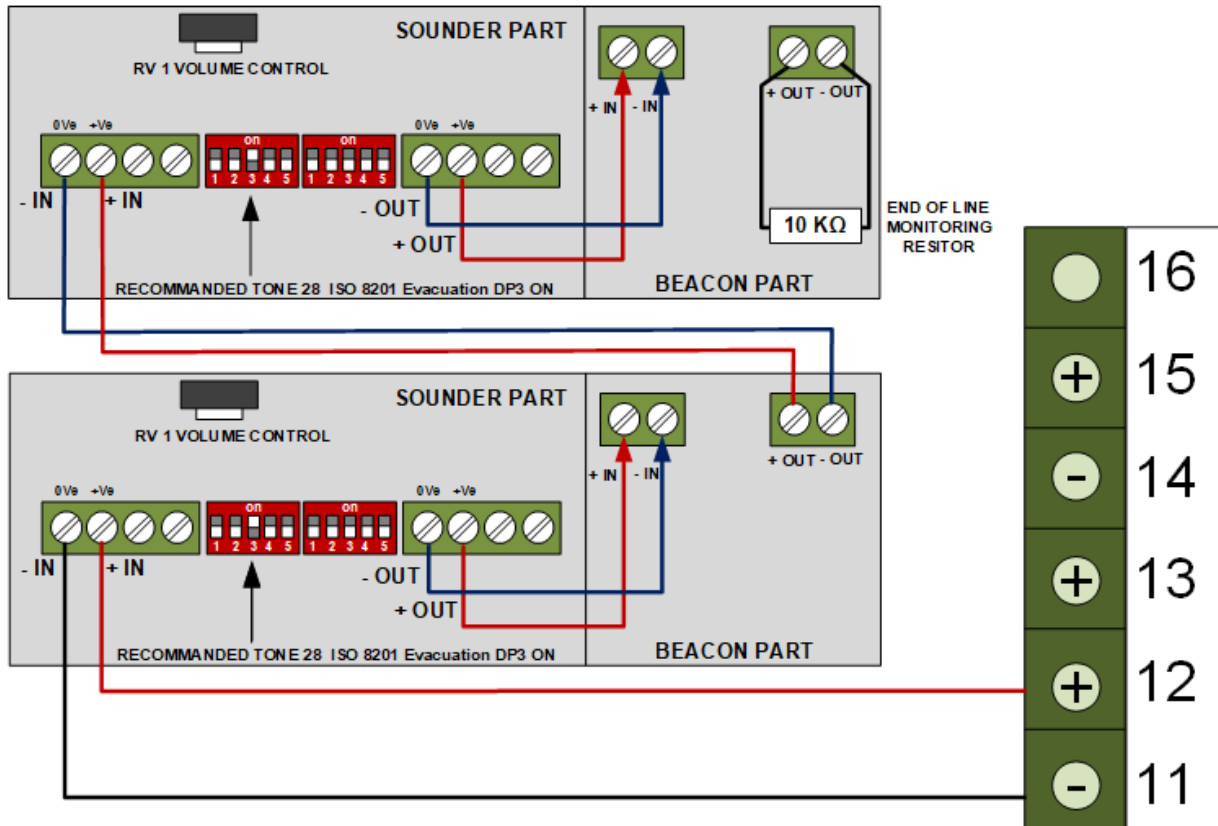
## 30 VTB-EM WIRING OPTION SOUNDER & BEACON

When using a single sounder beacon, follow the connection diagram below. The recommended setting provides the most effective and clearly distinguishable alarm signal compared with the standard evacuation alarm signal used on vessels.

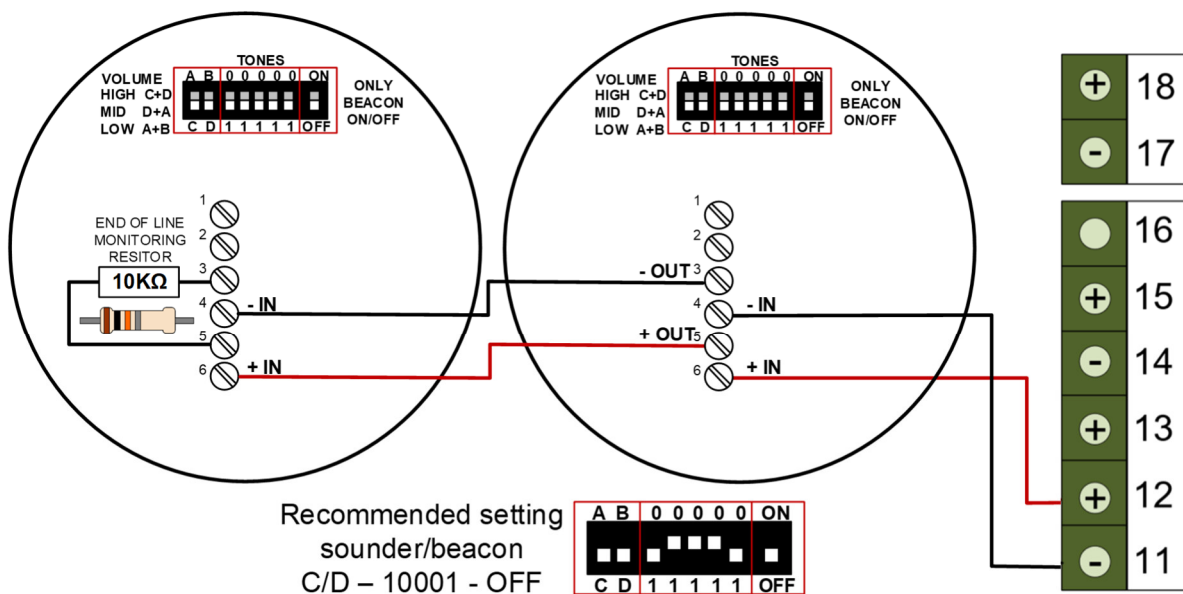


## 31 YL 40 WIRING OPTION EXTENDED SOUNDER & BEACONS

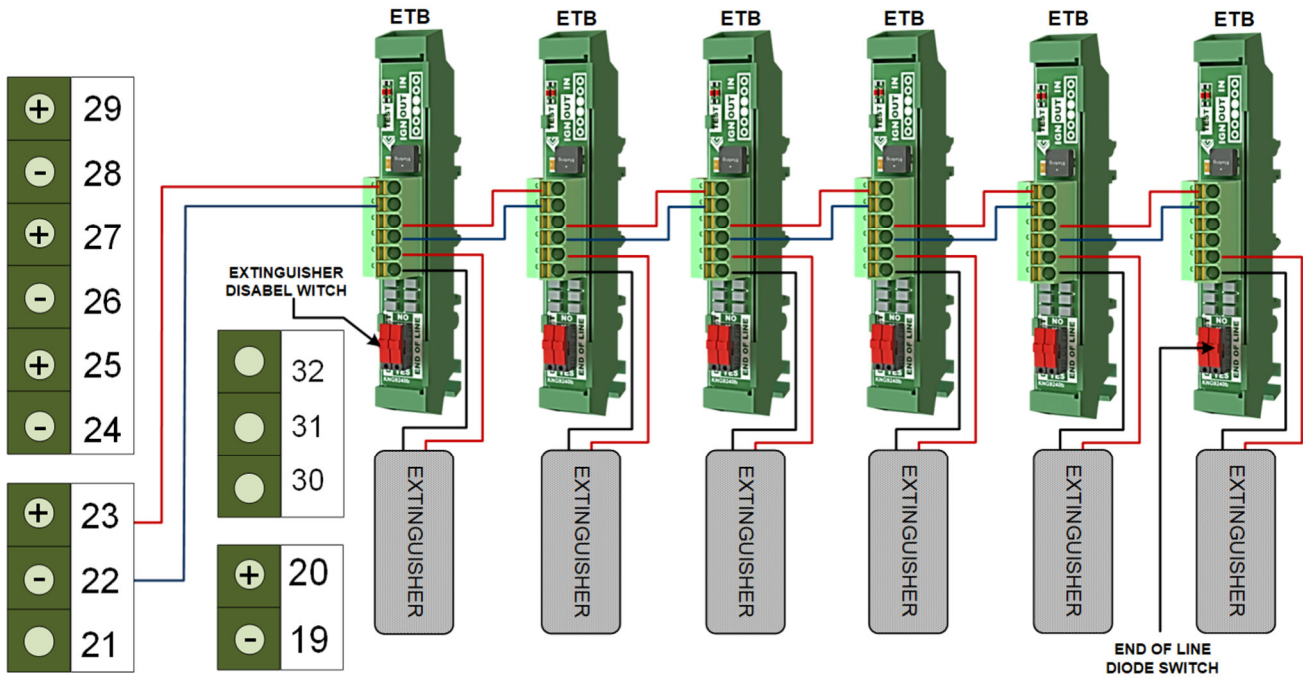
In some cases, the installation of a second signaling device may be necessary. This is usually caused by limited visibility of the optical alarm beacon within the protected area. In a noisy environment, the optical alarm signal is the primary warning indicator. When using more than one sounder beacon, follow the connection diagram below. The recommended settings provide the most effective and clearly distinguishable alarm signal compared with the standard evacuation alarm signal used on vessels. For some sounders, the end-of-line resistor is not required, as the input resistance of the sounder is sufficient to monitor for short circuits and/or wire breaks.



## 32 VTB-EM WIRING OPTION EXTENDED SOUNDER & BEACONS

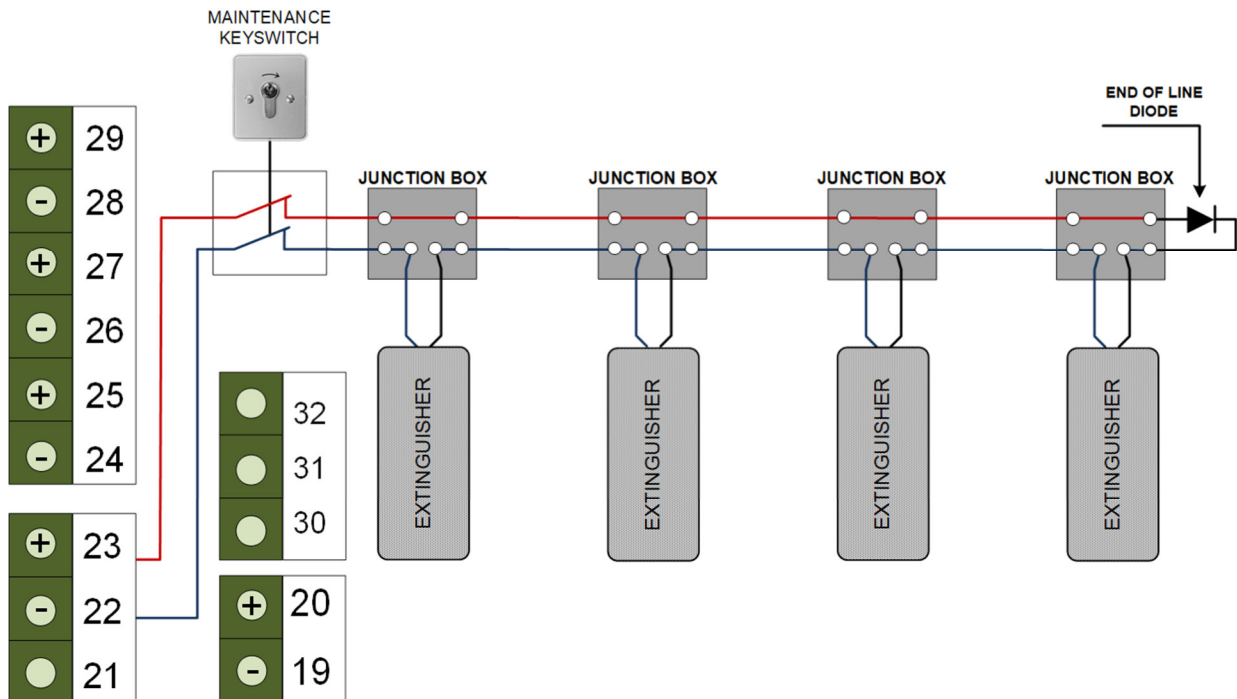


## 33 NANO WITH ETB CONNECTION



## 34 NANO WITHOUT ETB CONNECTION

A connection as shown below using a junction box is technically possible. However, this configuration is not covered by the manufacturer's warranty. The manufacturer only guarantees the proper operation of the NANO when used in combination with an ETB. Only an ETB provides bridge protection against a possible premature interruption, ensuring that the activation current always flows through all igniters.



The operating principle diagrams of the NANO fire extinguishing system included in this manual are provided solely to support the understanding of the system operation. They are not intended or suitable for technical design, implementation, or realization. No part of this manual may be reproduced, stored in an automated data system, or disclosed in any form or by any means, whether electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of N2KB B.V. N2KB B.V. follows a policy of continuous product improvement and therefore reserves the right to modify product specifications at any time without prior notice. Errors and omissions excepted.

Obsolete or replaced electronic equipment contains valuable recyclable materials. Dealers of the NANO system must comply with the local waste separation and recycling regulations applicable in the country of operation. Questions regarding the information provided in this manual may be directed to your dealer. For technical questions or support, please contact your dealer for further assistance.

