CONTENTS

Section 2 page:

1. How to Install and Wire the System

This section contains basic installation information concerning the choice of controller, servos, sensor environment, wiring specification and connection details.

WARNING

EXPLOSION OR FIRE HAZARD CAN CAUSE PROPERTY DAMAGE, SEVERE INJURY OR DEATH

- **To prevent possible hazardous burner operation, you must verify the safety requirements each time a control is installed on a burner, or if the installation is modified in any way.**
- **This manual may cover more than one model in the NX6300 series. Check for additional information at the end of this chapter.**
- **This controller MUST NOT be directly connected to any part of a 'Safety Extra Low Voltage' (SELV) circuit.**

WHEN INSTALLING THIS PRODUCT:

- Read these instructions carefully. Make sure you fully understand the product requirements. Failure to follow them could damage the product or cause a hazardous condition.
- Check the ratings given in these instructions to make sure the product suits your application.
- After installation is complete, check that the product operates as described in these instructions.

CAUTION

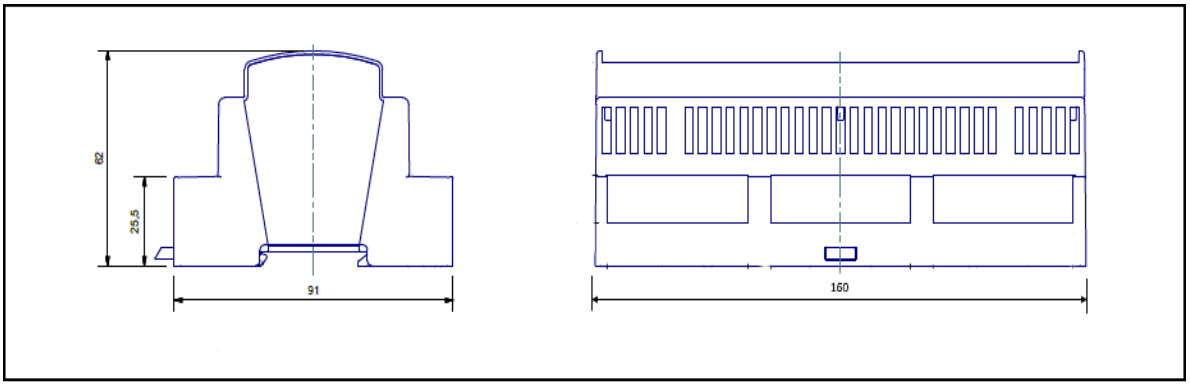
- Disconnect the power supply before beginning installation, to prevent electrical shock, equipment and/or control damage. More than one power supply disconnect may be involved.
- Wiring must comply with all applicable codes, ordinances, and regulations.
- Loads connected to the NX6300 series must not exceed those listed in the specifications as given in this manual.
- All external components connected to the control must be approved for the specific purpose for which they are used.
- Choose the servos carefully to make sure they operate within their specification.
- Make sure all sections of the control are earthed, to maintain electrical safety.

1.1 Mounting details for the NX6300 Control Module

The NX6300 control module has been designed for fitting inside a burner control cabinet. The cabinet should have a minimum protection level of IP40 for indoor use, or IP54 for outdoor use.

The controller may be clipped on to DIN rail or located on to mounting studs.

Enclosure dimensions:



The NX6300 ***must*** be installed in a clean environment that meets the conditions defined in UL 60730-1, and where the ambient temperature is within the range 0 to 60 ºC (32 to 140 ºF). Refer to section 6, “Specifications” for more details.

Allow 100 mm (4 in.) for the depth of the controller in the panel. Leave a clearance of a least 60 mm (2.5 in.) around the device to allow sufficient space for wiring and ventilation.

1.2 Mounting details for the 12 Key Display option

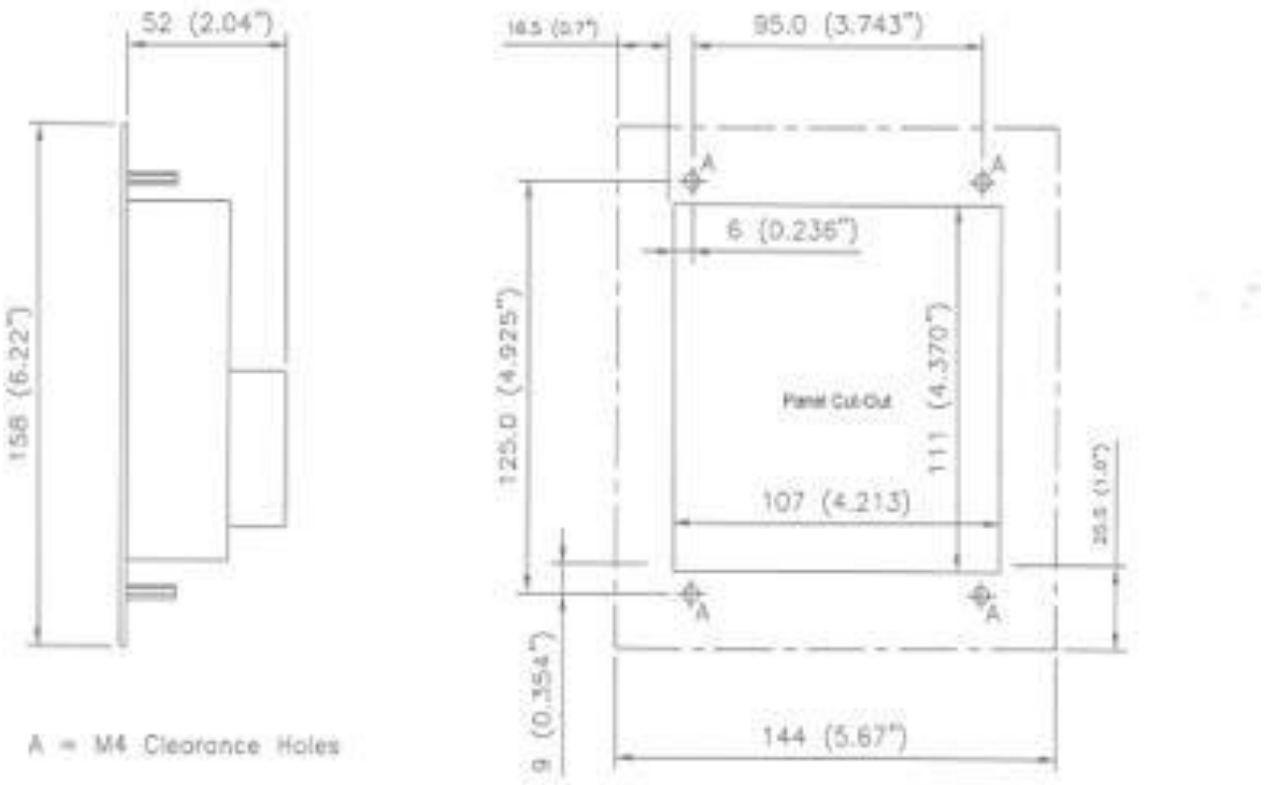
Mount the display on the front of the burner cabinet, or in a similar accessible location.

The maximum allowable panel thickness is 3 mm. (0.118”)

Install the display such that the section within the panel is in a clean environment, according to UL 60730-1. The ambient operating temperature range of the equipment is 0 to 60 ºC (32 to 140 ºF).

With the sealing gasket installed between the panel and the display, the display unit ‘outside’ of the panel will provide protection to IP65.

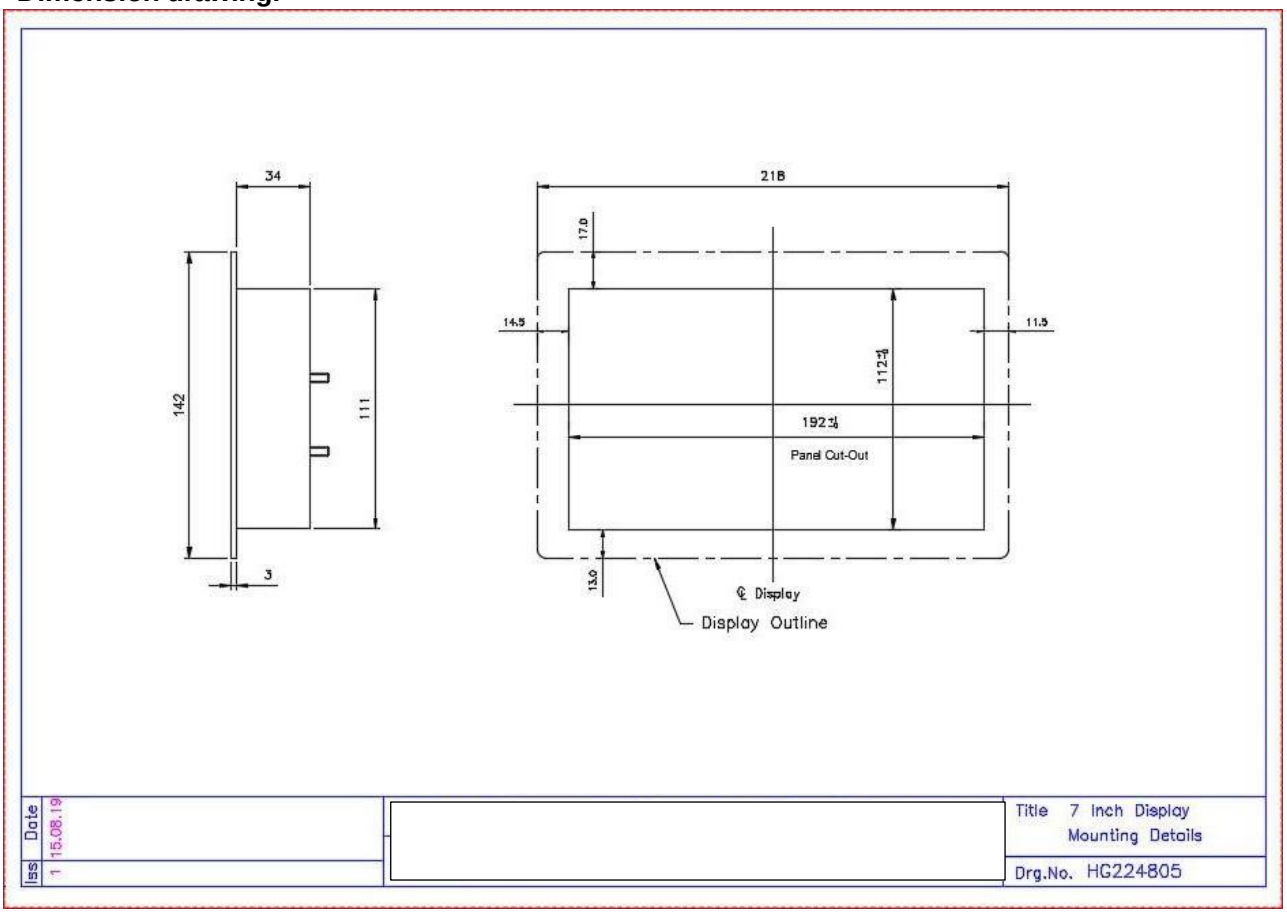
The display unit MUST be earthed to maintain electrical safety and ensure reliable operation. An earth terminal is provided on the back cover of the display unit. Connect the screen of the CANbus cable to this earth connection point.



1.3 Mounting details for the 7” Touchscreen display option

The NXTSD007 HMI is designed to be mounted in the front door of an electrical enclosure. This requires an opening to be cut in the enclosure door and then the HMI is mounted to the door through the enclosure door opening.

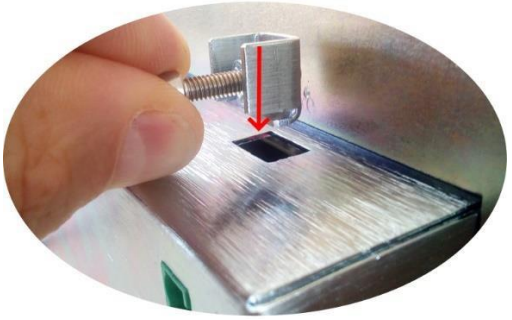
Dimension drawing.



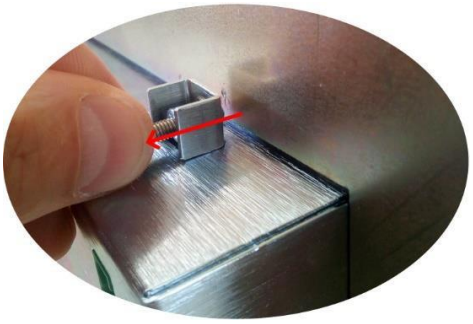
Screw-jack clamps supplied with the NXTSD007 HMI hold it in-place. The clamps provide tension to compress a molded gasket between the door front and the HMI fascia plate, which makes a waterproof seal. The colored material applied to the screw threads prevents any vibration in the enclosure from loosening the screws when the HMI is installed in place.

The clamps are put into place like this.

1.



2.



Then the hexagon cap head clamp screws (3mm AF) are tightened evenly.

3.

Tighten until the fascia plate of the HMI is tight to the enclosure door forming an IP65 seal to the door front surface.

There are two clamp mounting slots in the HMI cover, this is to account for different panel thicknesses. In most applications the apertures closest to the fascia plate should be used.

1.3.1 CANBus Boiler Temperature sensor.

The temperature sensor has a protection level of IP65 if suitable conduit glands are used, and it can be mounted in any attitude. It has been designed for mounting into a well, or pocket, that has been inserted into the boiler shell. When choosing the position of the well, make sure that the sensor will operate within its environmental specifications, and that the position will allow measurements and subsequent control actions to be correlated to other devices e.g., auxiliary safety stats.

The ambient operating temperature range is 0 to 60 ºC (32 to 140 ºF).

The sensor MUST be earthed to maintain electrical safety and ensure reliable operation.

The electrical connection is by way of a 12mm plug and socket arrangement.

1.3.2 CANBus Gas Pressure sensors

The preferred mounting for the gas pressure sensors is **vertically**, to make sure water vapor does not collect inside the sensor.

Maintenance procedures must include inspecting for evidence of condensates from the gas at the sensing point.

If evidence of condensate is found, then you must take preventative action to eliminate the cause.

The ambient operating temperature range is 0 to 70 °C (32 to 158 ºF).

The sensor MUST be earthed to maintain electrical safety, and to ensure reliable operation.

The electrical connection is by way of a 12mm plug and socket arrangement.

Example pressure sensor

1.3.3 CANBus Steam Pressure Sensors

When fitting the sensor, make sure that the sensor operates within its environmental specifications. An important issue is the heating effect of the steam. Also, connect the sensor to the process in such a way that readings, and subsequent control actions, can be correlated to other devices, such as the boiler pressure dial gauge and any auxiliary pressure safety devices.

Steam Pressure sensors **must be mounted vertically** to make sure that water vapor does not collect inside the sensor. Additional devices, e.g. a “pig tail” feed pipe, may be required to reduce the possibility of moisture reaching the sensor during normal operation.

Maintenance procedures must include inspecting the sensor for evidence of condensation collecting at the sensing point. If evidence of condensate is found, then preventative action must be taken to eliminate the cause.

Example pressure sensor

The ambient operating temperature range is 0 to 70 °C (32 to 158 ºF).

The sensor MUST be earthed to maintain electrical safety and ensure reliable operation.

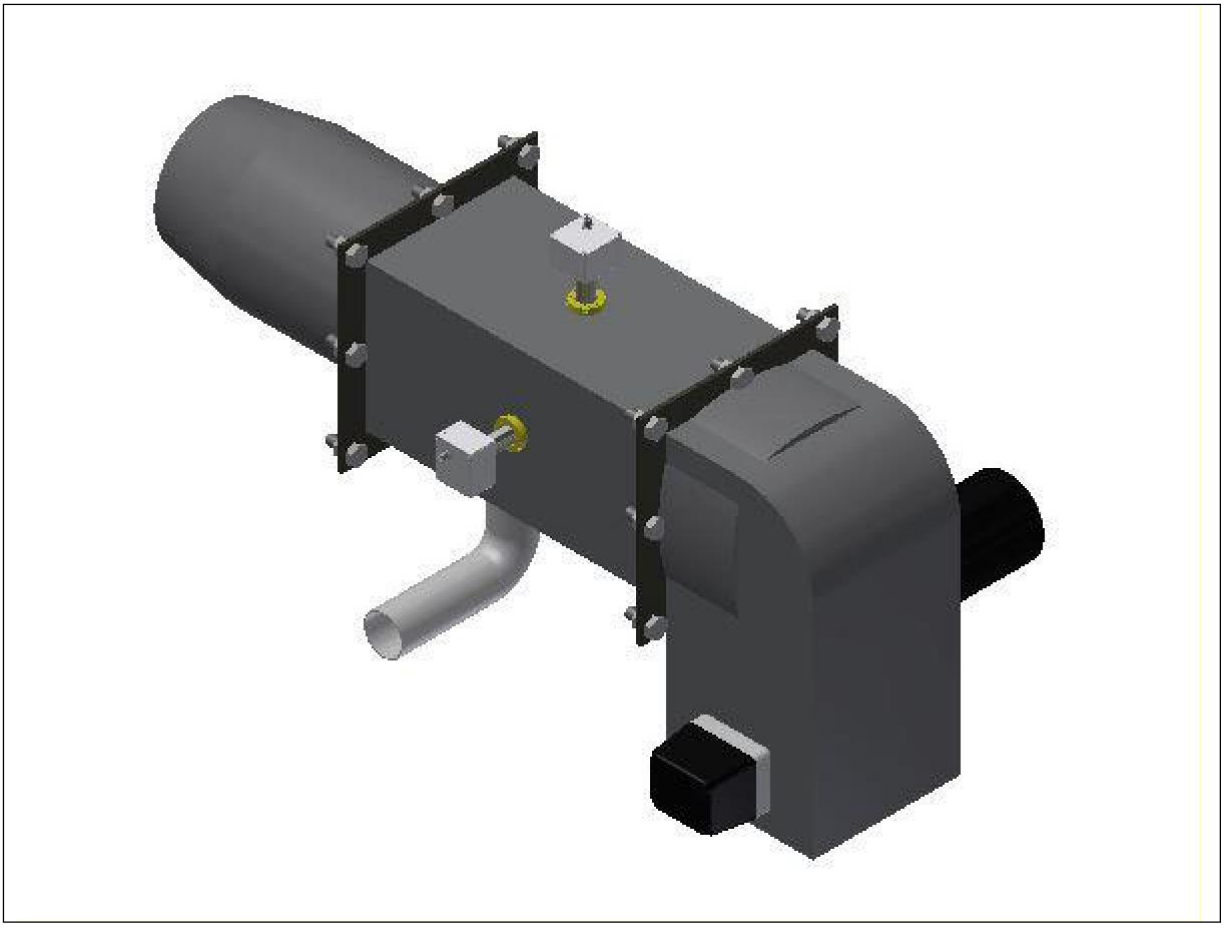
The electrical connection is by way of a 12mm plug and socket arrangement.

1.4 Mounting arrangements for NX6094 CANBus flame detector.

The NX6094 flame detector is a self-checking UV flame detector for continuous operation (>24hrs). The detector is for radial view of the flame. For full technical specifications of sensors, see “Specifications” in section 6.

Mounting the flame detector to the burner is by way of a clamp ring around the sight tube. If there is any doubt that the burner casing is not a good electrical Earth, then the clamp ring must be connected to electrical ‘Earth’ using suitable cable.

Mount the detector in one of the two attitudes shown in the following picture.



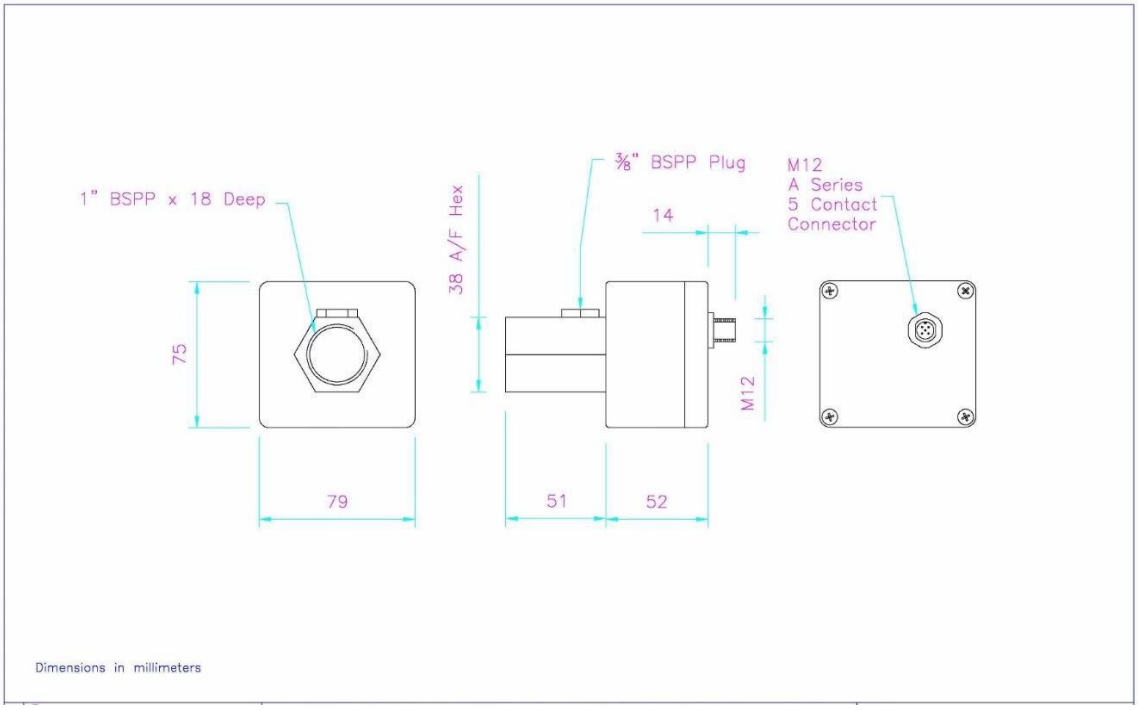
Electrical connection is by way of a 12mm plug and socket on the square section of the body.
The ambient operating temperature range for this device is -20 to 60 ºC (32 to 140 ºF).

1.5 Mounting arrangements for NX6095 CANBus flame detector.

The NX6095 flame detector is a self-checking UV flame detector for continuous operation (>24hrs). The detector is for axial view of the flame. For full technical specifications of sensors, see “Specifications” in section 6.

Mount the flame detector to the burner by way of a 1” NPT thread to a sighting tube on the burner front. There is provision for an air purge/cooling connection on the hexagonal section of the body.

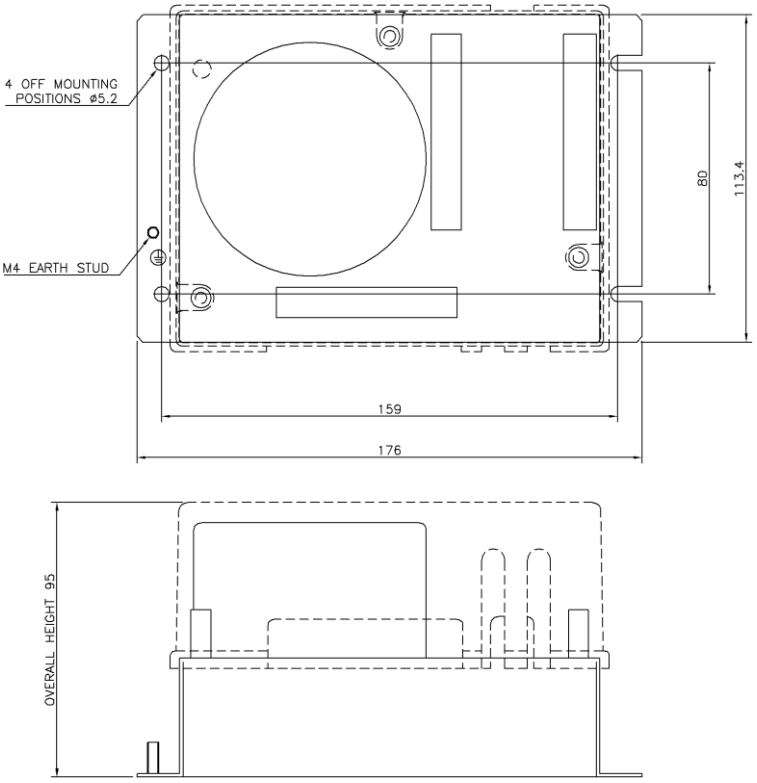
Although connection is 1” BSP there is sufficient thread to securely fasten to 1” NPT pipe.



Electrical connection is by way of a 12mm plug and socket on the square section of the body. The ambient operating temperature range for this device is -20 to 60 ºC (-4 to 140 ºF).

1.6 Mounting details for the NXCBH CANBus Hub and PSU.

The NXCBH CANBus Hub may be required when the peripheral loading to the CANBus exceeds 20VA (this excludes the HMI). The NXCBH provides an additional 60VA of power to the CANBus with continuity for the CAN data lines.



The NXCBH MUST be installed in a PD1 or PD2 environment, according to UL 60730-1, and the ambient operating temperature range of the equipment is 0 to 60 °C (32 to 140F).

Allow 100mm (4in.) for the depth of the unit including the lid, and LED window.

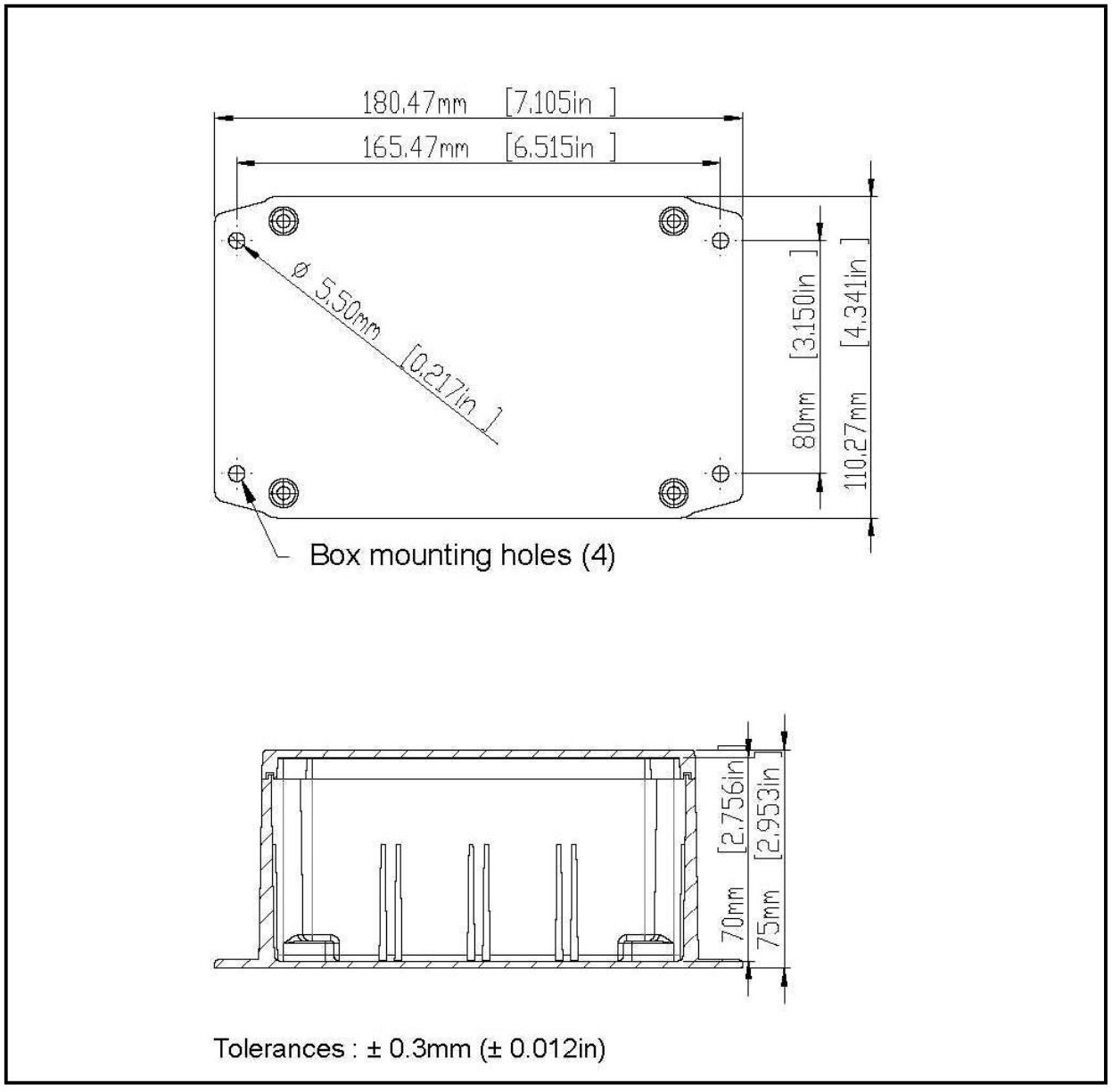
The device MUST be electrically earthed, using the largest cross-section area cable possible, to maintain electrical safety and ensure reliable operation.

The device MUST be installation inside a burner control cabinet. The cabinet should have a minimum protection level of IP54.

The NXCBH may be mounted in any attitude; clearances of a least 30mm (1.5 in.) should be left around the unit to allow sufficient space for wiring and to ensure reliable operation.

1.7 Mounting details for the NXO2TRIM Oxygen Probe Interface.

The NXO2TRIM oxygen trim interface enclosure has IP65 protection and is suitable for mounting on to most surfaces. The following drawing gives the dimensional information and the details required to fix the interface.



If you use suitable conduit glands, the optional NXO2TRIM Oxygen Probe Interface unit has a protection level of IP65. You can mount it in any orientation, either inside or outside a control cabinet.

Maintain a clearance around the conduit entries to the unit to allow sufficient space for wiring etc. The ambient operating temperature range is specified as -20 to 60 ºC (-4 to 140 ºF).

The Oxygen probe interface MUST be connected to earth to maintain electrical safety and ensure reliable operation. The Earth connection point is symbolized on the mounting ‘ears’ of the enclosure.

1.8 NX6300 Line Supply Fuse

CAUTION

- The NX6300 is configured for either 115VAC. or 230VAC operation at the time of manufacture. Ensure that you have the correctly rated device for your application BEFORE you apply power to the burner.
- Fitting an incorrect fuse type **MAY** damage or destroy the controller.

You must fit the correct fuse type and rating appropriate to the Line supply to the burner control circuits. Failure to do so may damage the device.

Supply voltage(V)	Fuse rating (mA)
115 VAC	T250 mA anti-surge (IEC 127)
230 VAC	T120 mA anti-surge (IEC 127)

The manufacturer of this equipment recommends the fuse type Bussmann S506 series.

1.9 NXCBH Line Supply Voltage links (LK1 - 4)

CAUTION

- Incorrect setting of the Links **WILL** damage or destroy the unit.

The supply voltage configurations are shown below, together with the necessary fuse rating.

Important: Incorrect setting of the ‘supply selection links’ will damage the unit.

You must fit the correct fuse type and rating. Failure to do so may damage the device.

Supply voltage(V)	Links required	Fuse rating (mA)
120 VAC	LK1 and LK3	630 mA anti-surge (IEC 127)
230 VAC	LK2 and LK4	315 mA anti-surge (IEC 127)

The manufacturers of this equipment recommend the fuse type Bussmann S506 series.

2. Wiring Requirements

Please pay particular attention to the wiring requirements for each unit. These will protect the equipment from electrical interference, earth loop problems, and damage to the controller and peripheral devices.

2.1 General

CAUTION

- Disconnect the power supply before beginning installation, to prevent electrical shock, equipment and/or control damage. More than one power supply disconnect may be involved.
- Wiring must comply with all applicable codes, ordinances, and regulations.
- Loads connected to the NX6300 series control and optional daughter board must not exceed those listed in the specifications given in this manual.
- Make sure the maximum total load on the CANbus cabling (servos, sensors, HMI etc.) is within the specifications for the cable being used.
- This control MUST NOT be directly connected to any part of a 'Safety Extra Low Voltage' (SELV) circuit.

WIRING INSTALLATION MUST BE CARRIED OUT BY A COMPETENT ELECTRICIAN AND IS SUBJECT TO I.E.E. WIRING REGULATIONS (BS 7671:2018) AND/OR LOCAL STANDARDS THAT MAY PREVAIL.

HAZARDOUS VOLTAGES MUST BE ISOLATED BEFORE SERVICE WORK IS CARRIED OUT.

The NX6300 controller MUST be mounted within a ‘burner cabinet’ or similar panel. The metal body of all other component parts MUST be connected to earth ensure safe and reliable operation; use 1.5mm^2 (AWG 16) green or green and yellow earth wire. **Do not use a green/yellow conductor for any purpose other than earth**.

To comply with EMC requirements, the controller and any optional units must be connected using the specified cable sizes, and screen connections, observing any maximum cable length limitations.

Cabinet designers MUST separate the Line voltage and Extra Low Voltage (ELV) cables within the burner cabinet, distribution panels and conduits.

The manufacturer of this equipment recommends the use of bootlace ferrules on all wire ends, as a “best practice”.

Bootlace ferrules

All cabling that operates at more than 50 V must be multi-strand, single core, PVC insulated, 0.5mm^2 cross-sectional area (AWG 20) and must meet the requirements of IEC 227 or IEC 225.

For cables carried in conduit, secure all cables at both ends, using a suitable anchorage method in the cabinet.

Connect all signal cable 'braid' screens to earth using Earthed DIN terminals, Terminal 5 on the Fireye CAN Bus distribution board or the screen termination clamps provided on the NXCBH CAN Bus PSU and Hub. Where CAN Bus wiring connects through one device to connect to another, terminals 5 and 6 are provided for the screen to maintain continuity, but do not connect to Earth.

If the power supply is known to be electrically noisy, or suffer from occasional brownouts or blackouts, then use a correctly rated "direct on-line" un-interruptible power supply (UPS) to make sure a clean continuous mains power supply to the NX6300. No rating for the UPS is given here, as this will need to be assessed and calculated to include the power requirement of the safety valves connected to and routed through the controller. Locate the UPS as close as possible to control circuit fuse.

The equipment described in this manual has been tested for compliance to UL and CE directives listed in the section headed "approvals". However, after it has been connected to a burner and other associated equipment, it is the responsibility of the installer to make sure the complete installation meets the requirements of the local agency's relevant to the particular installation.

2.1.1 Earth Connection

All sections of the control system with metal enclosures **MUST** be connected to earth. Connect at the tag showing the **Earth** symbol, or to the body of the device. Use a 1.5mm^2 (AWG 16) conductor for this connection.

These connections are required to maintain the overall electrical safety of the installation and ensure the EMC performance of the equipment. Failure to comply with the wiring requirements will affect the performance of the system and may cause a hazardous condition to occur.

Where necessary, remove any paint from connection points and use shake-proof washers to ensure a reliable electrical connection. **DO NOT** use the screen of the signal cable to provide the electrical safety earth.

2.1.2 Earth Connection – Display Units

The display unit **MUST** be connected to earth. Make the connection at the stud or tag showing the Earth symbol. Use a 1.5mm^2 (AWG 16) conductor for this connection.

If the display unit is mounted into a burner cabinet door, make sure there is a good electrical connection between the door and the main cabinet, in addition to a good electrical contact between the display unit and the door.

2.1.3 Earth Connection - Oxygen Probe Interface

The oxygen probe interface **MUST** be connected to earth. Make the connection at the mounting screw position showing the Earth symbol. Use a 1.5mm^2 (AWG 16) conductor for this connection.

International Wire Size Conversion Table:

All dimensions shown are as accurate as possible, however when converting AWG, SWG, inches and metric dimensions, round-off errors do occur. Wire and cable also vary depending upon manufacturer.

American or Brown & Sharpies AWG	British Standard SWG	Nominal Conductor Diameter (0) (inches)	Fractional Equivalent (inches)	Nominal Conductor Diameter (0) (mm)	Cross Sectional Conductor Area Sq mm (mm^2)	** Stranded Wire Number of x Diameter (inches)	Construction Strands of Strands (mm)
16	-	0.051	-	1.30	1.33	26 x .010	19 x .30
18	19	0.040	-	1.02	0.82	16 x .010	7 x .4
20	21	0.032	-	0.81	0.52	10 x .010	16 x .2
24	25	0.020	-	0.51	0.20	7 x .008	7 x .2

2.1.4 ELV signal cable Screen Connection

CAUTION

THE RULES FOR ELV SIGNAL CABLES CONNECTED TO NX6300 ARE DIFFERENT TO THOSE APPLIED TO THE PPC6000 and NX6100 CONTROLLERS.

Read and use the information in this section carefully because the rules apply in a variety of configurations.

ELV (low voltage) signal cables MUST have a screen of the 'tinned copper braid shield' type.
The manufacturers of this equipment recommend:
Belden type 9927 or 3084A,
Alpha type 3233 or 6352,
Harting type 09456000102. (Preferred)

Rule 1. These types of cable may also employ a 'foil with drain wire'. This is **not** suitable as a screen because the cross section of the drain wire is insufficient to provide correct screening of the signals. Also, there is no provision to connect the foil or drain at the controller.

Rule 2. You must connect the ELV signal cable screens to an earth point in the panel, which must be one of the following:

- Earthed DIN rail terminal.
- Terminal 5 on the CAN Bus distribution board, which has a common Earth connection point.
- Screen clamp on the NXCBH.

Rule 3. Screened cables that are more than 10m (33ft) in length must have the screen connected to earth at both ends of the cable.

Rule 4. Where screened cables are required to run through one device to connect to another, terminal 5 is provided to allow the screens to be connected, by forming a 'tail' with the braided screen of each cable, the length of unscreened conductors ***must*** be kept as short as possible, but in any case, **MUST NOT exceed 30 mm (1.25 in)** per cable 'tail'.

Rule 5. Where screened cables are required to connect to a **terminal rail**, ensure that there is provision for a screen terminal, which must be connected to Earth. Screen 'tails" and each cable core tail **MUST not exceed 40 mm (1.25in)** in length.

2.2 Labelling of Terminal Connections

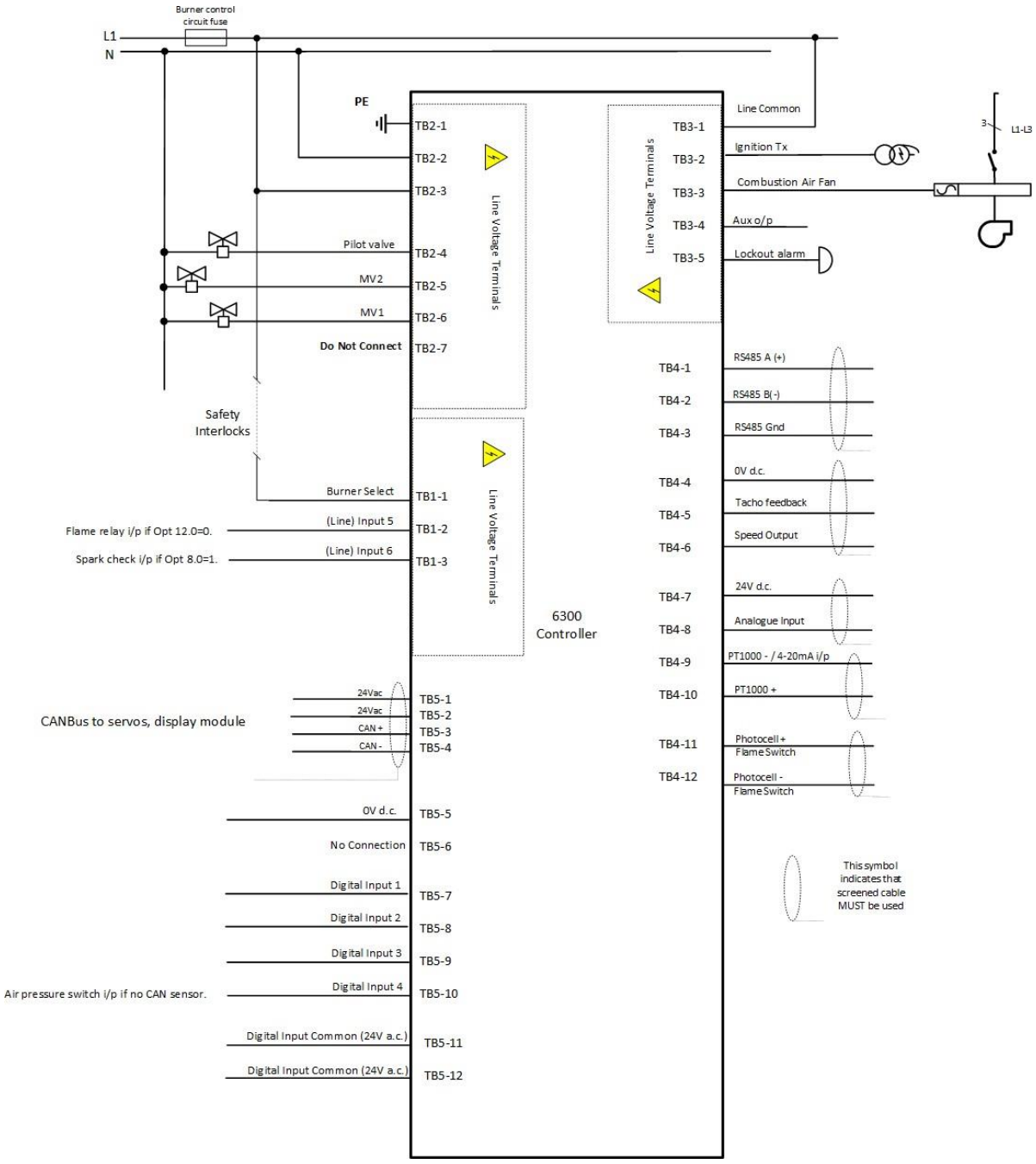
All terminals within the system have unique terminal labelling, to reduce the possibility of wiring errors. The terminal number, function and expected voltage range is given in the table below:

Terminal No.	Module	Function	Voltage Range
TB1-1	**6300 Controller**	Burner On/Off - Recycle Limits - Input	115 – 230 Vac
TB1-2	6300 Controller	Digital Input 5 Live	115 – 230 Vac
TB1-3	6300 Controller	Digital Input 6 Live	115 – 230 Vac
TB2-1	6300 Controller	Panel Earth Ground	-
TB2-2	6300 Controller	Neutral	115 – 230 Vac
TB2-3	6300 Controller	Line Input Supply	115 – 230 Vac
TB2-4	6300 Controller	Pilot Valve output	115 – 230 Vac
TB2-5	6300 Controller	MV2 Output	115 – 230 Vac
TB2-6	6300 Controller	MV1 Output	115 – 230 Vac
TB2-7	6300 Controller	Reserved	115 – 230 Vac
TB3-1	6300 Controller	Line Input Supply	115 – 230 Vac
TB3-2	6300 Controller	Ignition Output	115 – 230 Vac
TB3-3	6300 Controller	Combustion Fan Output	115 – 230 Vac
TB3-4	6300 Controller	Auxiliary Output	115 – 230 Vac
TB3-5	6300 Controller	Lockout Alarm Output	115 – 230 Vac
TB4-1	6300 Controller	RS485 A (+)	0 – 5 Vdc
TB4-2	6300 Controller	RS485 B (-)	0 – 5 Vdc
TB4-3	6300 Controller	RS485 Gnd	0Vdc
TB4-4	6300 Controller	0Vdc reference for speed control.	0Vdc
TB4-5	6300 Controller	Tachometer feedback signal.	0 – 10 Vdc
TB4-6	6300 Controller	Speed output.	0 – 10 Vdc
TB4-7	6300 Controller	24Vdc Supply	24 Vdc
TB4-8	6300 Controller	4-20 mA Analog Input (speed)	0 – 5 Vdc
TB4-9	6300 Controller	PT1000(-) / 4-20 mA Pres/temp Input	0 – 5 Vdc
TB4-10	6300 Controller	PT1000 (+)	0 – 5 Vdc
TB4-11	6300 Controller	IR Photocell (+) or Flame switch	0 – 5 Vdc
TB4-12	6300 Controller	IR Photocell (-) or Flame switch	0 – 5 Vdc
TB5-1	6300 Controller	CANBus 24Vac	24 Vac
TB5-2	6300 Controller	CANBus 24Vac	24 Vac
TB5-3	6300 Controller	CAN +	0 – 5 V

Terminal No.	Module	Function	Voltage Range
TB5-4	6300 Controller	CAN -	0 – 5 V
TB5-5	6300 Controller	0V dc	0 5 V
TB5-6	6300 Controller	No Connection	-
TB5-7	6300 Controller	Digital Input 1	0 – 24 Vac
TB5-8	6300 Controller	Digital Input 2	0 – 24 Vac
TB5-9	6300 Controller	Digital Input 3	0 – 24 Vac
TB5-10	6300 Controller	Digital Input 4	0 – 24 Vac
TB5-11	6300 Controller	Digital Common Supply	0 – 24 Vac
TB5-12	6300 Controller	Digital Common Supply	0 – 24 Vac
PG1	**NXO2TRIM**	CAN 24Vac Supply	24 Vac
PG2	NXO2TRIM	CAN 24Vac Supply	24 Vac
PG3	NXO2TRIM	CAN +	0 – 5 V
PG4	NXO2TRIM	CAN –	0 – 5 V
PG5	NXO2TRIM	0V (4-20mA 0V)	0 Vdc
PG6	NXO2TRIM	4-20mA Input 1 (CO)	0 – 5 Vdc
PG7	NXO2TRIM	4-20mA Input 2 (O_2)	0 – 5 Vdc
PG8	NXO2TRIM	4-20mA Input 3	0 – 5 Vdc
PG9	NXO2TRIM	0V (4-20mA 0V)	0 Vdc
	NXO2TRIM		
PH1	NXO2TRIM	Probe 1 (Black)	0 – 14 Vdc
PH2	NXO2TRIM	Probe 2 (Red)	0 – 14 Vdc
PH3	NXO2TRIM	Probe 3 (Yellow)	0 – 14 Vdc
PH4	NXO2TRIM	Probe 4 (Green)	0 – 14 Vdc
PH5	NXO2TRIM	Probe 5 (Blue)	0 – 14 Vdc
PH6	NXO2TRIM	Probe 6 (White)	0 – 14 Vdc
PH7	NXO2TRIM	Flue gas thermocouple White	0 – 5 V
PH8	NXO2TRIM	Flue gas thermocouple Green	0 – 5 V
PK1	**Servos**	24 Vac Supply	24 – 40 Vac
PK2	Servo	24 Vac Supply	24 – 40 Vac
PK3	Servo	CAN +	0 – 5 V
PK4	Servo	CAN –	0 – 5 V
PK5	Servo	Screen connection	Not applicable
PK6	Servo	Screen connection	Not applicable

Terminal No.	Module	Function	Voltage Range
PR1	**NX6220/NX6330**	Relay output 1 normally open	0 – 250 V
PR2	NX6220/NX6330	Relay output 1 normally closed	0 – 250 V
PR3	NX6220/NX6330	Relay outputs 1 common	0 – 250 V
PR4	NX6220/NX6330	NO CONNECTION	
PR5	NX6220/NX6330	Relay output 2 normally open	0 – 250 V
PR6	NX6220/NX6330	Relay output 2 normally closed	0 – 250 V
PR7	NX6220/NX6330	Relays 2 & 3 common	0 – 250 V
PR8	NX6220/NX6330	Relay output 3 normally closed	0 – 250 V
PR9	NX6220/NX6330	Relay output 3 normally open	0 – 250 V
PT1	**NX6220/NX6330**	24 Vac Supply	24 – 40 Vac
PT2	NX6220/NX6330	24 Vac Supply	24 – 40 Vac
PT3	NX6220/NX6330	CAN +	0 – 5 V
PT4	NX6220/NX6330	CAN –	0 – 5 V
Earth point	NX6220/NX6330	Screen connection	Not applicable
L (PE1)	**NXCBH**	Line supply	115/230V ac
N (PE2)	NXCBH	Neutral supply	115/230V ac
PA1 1	NXCBH	24Vac Supply CAN devices.	24 – 40Vac
PA2 2	NXCBH	24Vac Supply CAN devices.	24 – 40Vac
PA3 3	NXCBH	CAN +	0 – 5V
PA4 4	NXCBH	CAN -	0 – 5V
PB 1	NXCBH	24Vac Supply CAN devices.	24 – 40Vac
PB 2	NXCBH	24Vac Supply CAN devices.	24 – 40Vac
PB 3	NXCBH	CAN +	0 – 5V
PB 4	NXCBH	CAN -	0 – 5V

2.2.1 System Connection Diagram



2.3 LINE voltage connections and fuse requirements

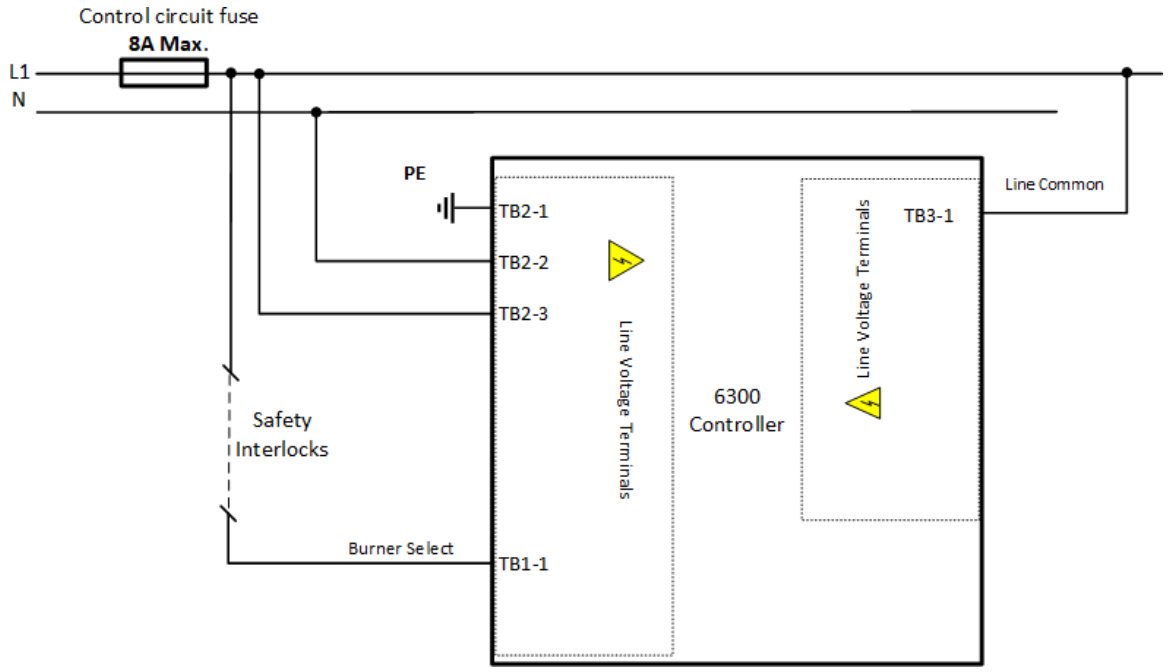
CAUTION

- Incorrect fuse rating of the line voltage supply **WILL** damage or destroy the unit.

Connect the LIVE and NEUTRAL using PVC insulated, multi-strand, 0.5 mm^2 (AWG 20) wire.

The live connections to TB1-1, TB2-3 and TB3-1 must be fused, with a **maximum rating** of 8A. The controller has internal fuse protection.

The configuration for the Line supply is shown below:



NOTE: If a control circuit fuse greater than 4 A is required, then the feeds to TB1-1 and TB3-1 must be individually fused, to protect the output relay contacts from 'welding'. More details are given in the next two pages.

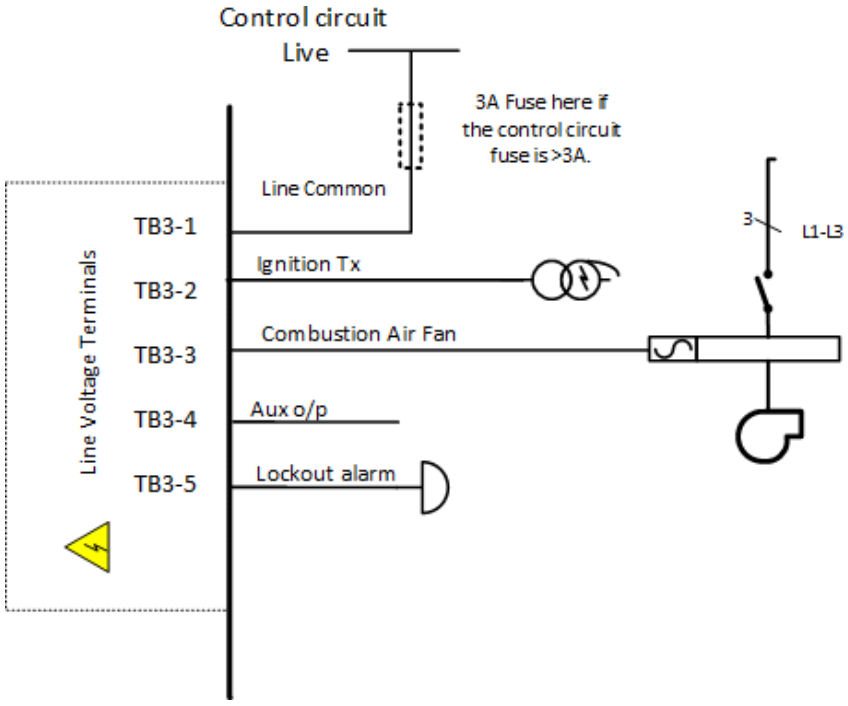
2.3.1 Ignition, Burner Fan, Auxiliary and Alarm Outputs.

To minimize electrical interference, the manufacturer of this equipment recommends that the ignition transformer is mounted as far away from the controller as possible. In addition, the EARTH terminal/wire for the ignition transformer must be as short as possible, connecting to the earthed burner chassis or panel using the transformer mounting screws.

The Ignition Tx output is designed to supply an ignition transformer directly.

The Combustion Air Fan output must be connected to the fan motor contactor or to a device which controls the “RUN” circuit for an inverter.

The Auxiliary output may be connected to contactor loads also, for example a gas booster or oil pump contactor.



Connections to these terminals must be made using multi-strand, single core, PVC insulated 0.5 mm^2 wire.
(AWG 20)

Fuses not exceeding 3 A must protect all relay outputs from the TB3 terminal block.

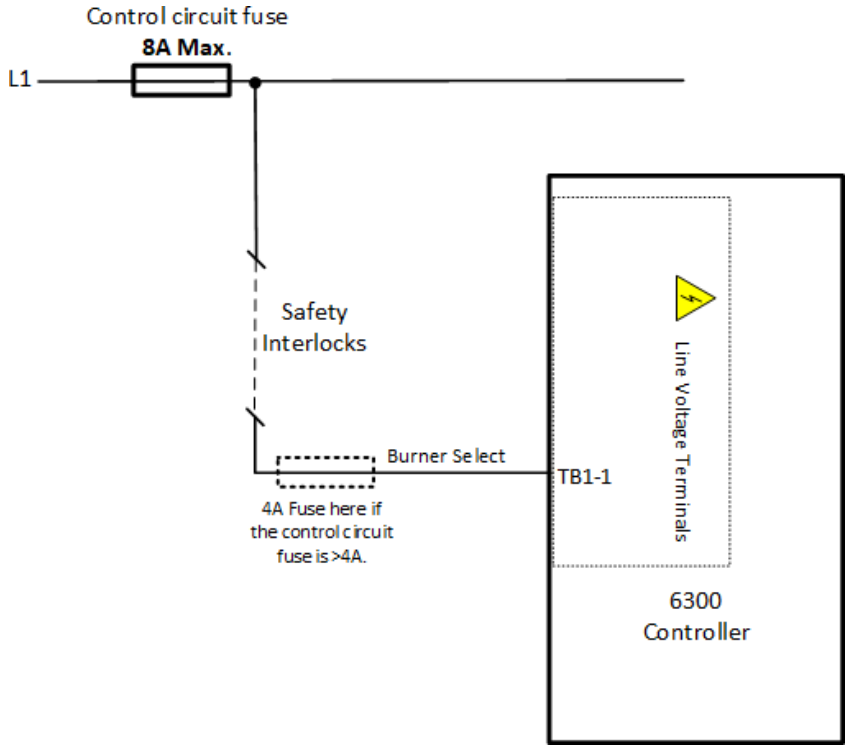
If the burner control circuit panel fuse is greater than 3 A, then the relay common terminal ***must*** be separately fused at 3 A.

Alternatively, if the total current output from all TB3 terminals exceeds 3 A, then you ***must*** include a separate 3 A fuse on each TB3 relay output, to protect the relay contacts from ‘welding’.

2.3.2 Burner select input

CAUTION

- If an external limit device is fitted, then it must be connected into the Burner Select line, unless connected into the auxiliary inputs and the correct function selected.
- If a limit device is fitted into the Burner Select line, it must be capable of supplying the total current required by the main and pilot valves.
- Any limit device connected to the NX6300 controller must be approved for the specific purpose for which it is being used.
- If a limit device connected to this input removes power to the input, then the NX6300 will shut down, **NOT** Lock out.
- Wiring must comply with all applicable codes, ordinances, and regulations.



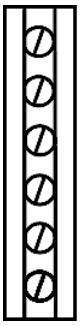
Connect the Burner select input to the devices up-stream in the safety interlock chain, using multi-strand, single core, PVC insulated 0.5 mm^2 (AWG 20) wire.

This cable may run adjacent to, and/or in the same conduit as high voltage wiring. Therefore, the cable voltage rating must exceed the maximum voltage carried by any other cable connected to the controller or run in the same conduit.

If the burner control circuit panel fuse is greater than 4 A, then the feed to the Burner Select terminal ***must*** be separately fused at 4 A.

Alternatively, if the total current output from all TB2 terminals exceeds 4 A, then you ***must*** include a separate 4 A fuse on each TB2 relay output, to protect the relay contacts from 'welding'.

2.3.3 Main valves and pilot valve outputs



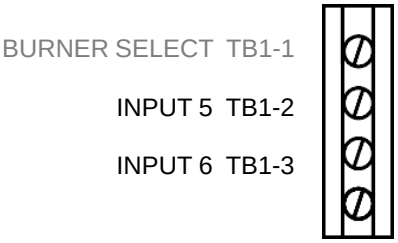
The Burner Select input supplies the power to the fuel valve energizing circuits.

These outputs must be connected using multi-strand single core PVC insulated 0.5 mm^2 (AWG 20) wire. In most cases, you can connect the outputs directly to the designated devices without the use of additional fusing, see 2.3.2 for rules on fuses.

If the total current output from all TB2 terminals exceeds 4 A, then you ***must*** include a separate 4 A fuse on each TB2 relay output, to protect the relay contacts from 'welding'.

2.3.4 Line voltage inputs

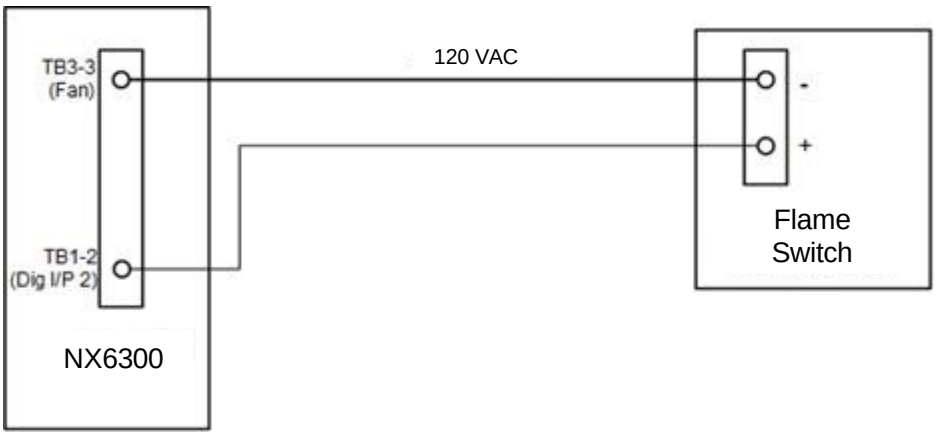
These inputs are suitable for connection to Line voltage interlocks. However, some option settings may pre-determine the input function. For example, if Option 8.0=1 then Input 6 is set as the spark check input.



Connect these inputs using multi-strand single core PVC insulated 0.5 mm^2 (AWG 20) wire.

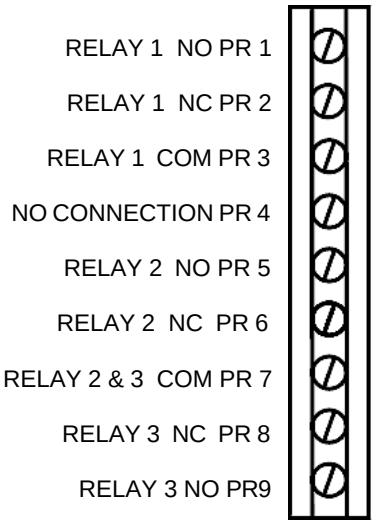
2.3.5 Flame Switch detection device

For controllers with a line supply voltage of 120/220VAC, a flame switch device may be used for intermittent operation. The device is powered from the Fan output terminal and the return wire is to the TB1-2 terminal as shown below.



Set option parameter 13.0 to a value of 1 for this mode of flame detection.

2.3.6 Auxiliary Relay Outputs *(NX6220/NX6330 OLED display)*



Fuses not exceeding 4 A must protect all relay outputs. Fit a 4 A fuse to the Burner Panel Supply, relay common or, where the total current exceeds 4 A, fit a separate fuse on each relay COM terminal to achieve this.

Connect these outputs using multi-strand single core PVC insulated 0.5 mm^2 (AWG 20) wire. See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

The 3 auxiliary relays provide volt free change-over contacts. However, 2 of the relays share a common terminal connection. The relays are separated on the circuit board to allow either the pair sharing the common or the single relay to operate at Line voltage while the other(s) operate at ELV (low voltage).

The relay functions are set by option parameters.

2.4 Cable Voltage Rating Rule

Important

Some cables may lay adjacent to, and/or in the same conduit as Line voltage wiring.

In this instance the cable voltage rating must exceed the maximum voltage carried by any other cable connected to the controller or run in the same conduit.

- **This rule applies where referred to in the text.**

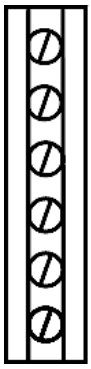
2.5 ELV connections.

2.5.1 Low voltage digital inputs

CAUTION

These input terminals are designed for low-voltage (24 Vac) signals only and must be powered from the terminals TB5-11 and TB5-12. Under no circumstances must these inputs be connected to Line potential. Connection of any voltage above 24 Vac to these terminals will damage or destroy the controller and peripherals.

DIGITAL INPUT 1 **TB5-7**
DIGITAL INPUT 2 **TB5-8**
DIGITAL INPUT 3 **TB5-9**
DIGITAL INPUT4 **TB5-10**
DIG. COMMON **TB5-11**
DIG. COMMON **TB5-12**



The COMMON terminal for the Low voltage digital system is a 24Vac signal. Feed this signal through interlock devices and back to the digital input terminals to signal events to the controller.

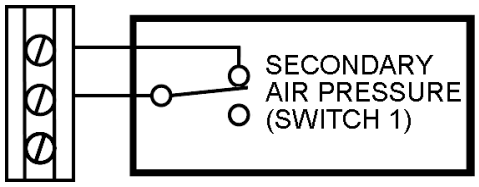
These circuits must be connected using multi-strand single core PVC insulated 0.5 mm^2 (AWG 20) wire. See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

In cases where the cable length exceeds 10m (33ft), these inputs MUST be connected using multi-strand overall 'braid' screened, PVC insulated, 2,3 or 4 core wire and the rules defined in 2.1.4 apply.

These digital inputs may have pre-assigned functions depending upon the option settings for the burner application. For example, input 4 is the air pressure switch circuit when the NX6087-x combustion air pressure sensor is not configured as part of the burner system.

2.5.2 Combustion Air pressure switch

DIGITAL COMMON TB5-11
DIGITAL INPUT 4 TB5-10



Connect these terminals to the appropriate terminals on the burner's air pressure switch.

In cases where the cable length exceeds 10m (33 ft), these terminals MUST be connected using multi-strand overall 'braid' screened, PVC insulated, 2-core wire and the rules defined in 2.1.4 apply.

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Never connect the Air Pressure switch input or output to Line potential. Connection of any voltage above 24 Vac to these terminals will damage the controller.

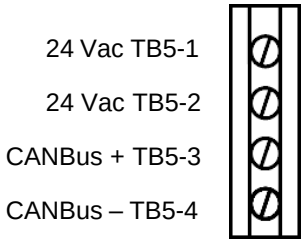
2.5.3 CAN Bus wiring to peripheral devices

CAUTION

- The total electrical load for all CAN Bus peripherals connected to the controller MUST NOT exceed 20 VA.
- Incorrect connection may damage or destroy the devices connected on the CAN Bus.

Terminals

The TB5-1 to 4 terminals is CANbus connections.



CANBus allows several options for connecting the devices together, based on the physical position of each device relative to the main controller, and the current required by each device.

Routing the cable

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

After the location of each device is defined (usually by the mechanical construction of the burner and boiler), you can select the ‘best’ cable route to each device. If required, you can run several cables from a distribution panel or hub, or a single cable can be ‘looped through’ all the connected devices, provided the load does not exceed the maximum current rating of the cable.

Where wiring is “looped through” devices, ensure that the screen of each cable is connected to terminal 5 provided, to ensure the continuity of the screen in the chain. For CANBus connections to display modules, terminate the screen at the earth stud provided on the rear cover.

If the NXCBH CANbus PSU and Hub is required, the screens ***must*** be terminated using the screen clamps.

Recommended cable and electrical load

The minimum cable size recommended for CAN Bus is overall ‘braid’ screened, PVC insulated, 4-core, 0.25 mm^2 (AWG 24) wire, which has a maximum current rating of 600 mA at 60 °C (140°F). This will limit the number of devices that can powered from the controller. If the maximum load exceeds 600 mA then use a 4-core, 0.5 mm^2 (AWG 20) screened cable instead. **Do Not** use separate cables for CAN Bus power and data.

The rules for ELV circuits, defined in 2.1.4, apply.

If the loading on the CAN Bus is calculated to be greater than 20VA, then the NXCBH must be added to the wiring configuration to add extra power capacity. The following table is a “quick reference” to the VA ratings for peripheral devices.

Device type	VA Rating	Supply Current
NXC04 servo.	3	125mA
NXC20 servo	5	210mA
NXC40 servo	10	416mA
NXO2TRIM O2 probe interface	8	300mA
NXIATS Ambient temp. sensor	0.1	-
NXESI120 Line Servo interface	1	42mA
NX609-x Flame detector	2	84mA
NX604-x Pressure/Temp sensor	0.3	13mA
NX6087-x Comb. Air Pres. Sensor	0.3	13mA

Using the preceding data, the total load for the CAN Bus can be calculated for different combinations of peripheral devices. Where the total load on the CAN Bus exceeds 20 VA the NXCBH will be required to provide extra power capacity.

2.5.4 Pressure/Temperature Sensor or Modulation Rate input

CAUTION

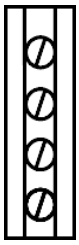
- Incorrect connection or application of excess voltage to the sensor input may damage or destroy the sensor and controller inputs.

The process sensor or remote modulation rate signal can be a 4-20mA loop powered, or passive input type. The connections are as follows:

Pressure Temperature Sensor Input.

TB4-7 **24Vdc** Output to sensor

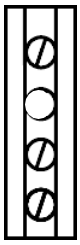
TB4-9 **4-20mA** Signal from the Sensor.



Remote Setpoint. Track Modulation

TB4-4 **4-20mA (-)** Signal from 3rd party device.

TB4-9 **4-20mA (+)**



The sensor cabling MUST be overall ***‘braid’ screened*** PVC insulated 0.25 mm^2 (AWG 24) (number of cores as required by the relevant sensor).

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Connect the cable ‘braid’ screen to earth at an Earthed DIN terminal in the panel. Ensure that the screen covers the signal wires until 30mm from the TB4 terminals.

In cases where the cable length exceeds 10m (33’), these terminals MUST be connected using multi-strand overall ‘braid’ screened, PVC insulated, 2-core wire and the rules defined in 2.1.4 apply.

2.5.5 CANBus fail-safe sensors.

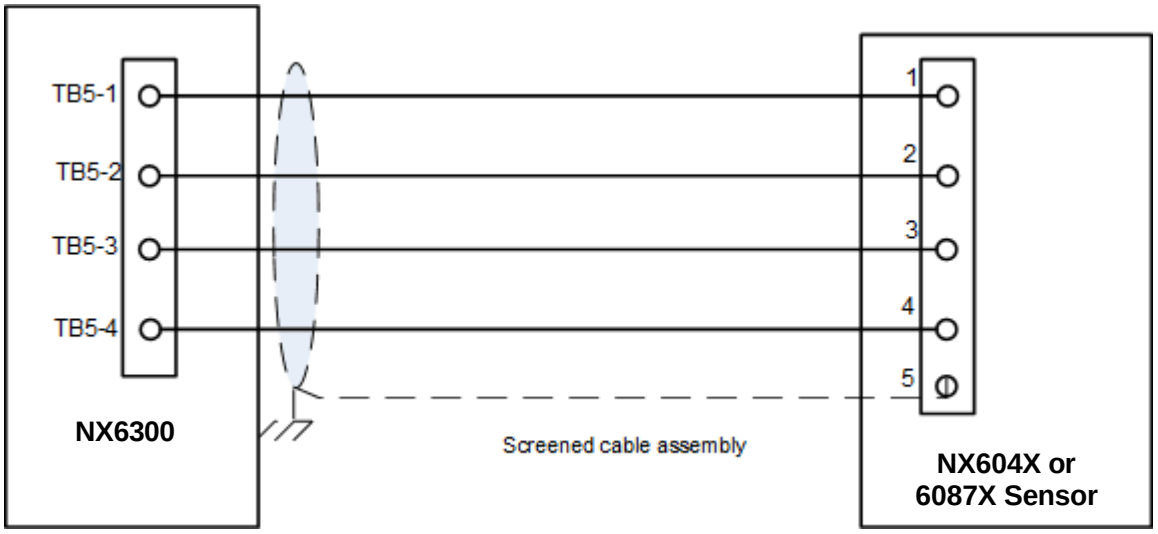
Connection is to the CANBus only using the M12 interconnection system shown below.

The sensor cabling MUST be overall ***'braid' screened*** PVC insulated 0.25 mm^2 (AWG 24).

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Connect the cable 'braid' screen to earth at an Earthed DIN terminal in the panel or terminal 5 on a distribution board. Ensure that the screen covers the signal wires until 30mm from the terminal rail or distribution board terminals.

The connection details are as follows:



Pre-assembled wiring cable.

Screened connection wires are available from Fireye.

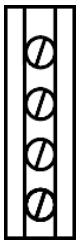
NX224760-15, 5m (15") Connection Cable.

2.5.6 PT1000 Temperature Sensor input

CAUTION

- Incorrect connection or application of excess voltage to the sensor input may damage or destroy the sensor or controller inputs.

You can connect a PT1000 process temperature sensor directly to the controller to determine fire-rate requirements via a PID control loop. The connections are as follows:



TB4-9 **PT1000 (-)**

TB4-10 **PT1000 (+)**

The sensor cabling MUST be overall ***'braid' screened*** PVC insulated 0.25 mm^2 (AWG 24).

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Connect the cable 'braid' screen to earth at an Earthed DIN terminal in the panel. Ensure that the screen covers the signal wires until 30mm from the TB4 terminals.

The rules for ELV circuits, defined in 2.1.4, apply.

CAUTION

FLAME DETECTION SYSTEMS.

- For all flame detection devices, mount the sensor onto the burner in such a way that an ignition spark will not trigger the presence of a flame during pre-ignition. The controller will 'Lockout' if this occurs.
- Where there is risk of the detector interpreting the spark as a flame, set option 8.0 to check the ignition output, and connect terminal **TB1-3** to **TB3-2**.

2.5.7 NX6094 / 6095 self-checking UV flame detector connections

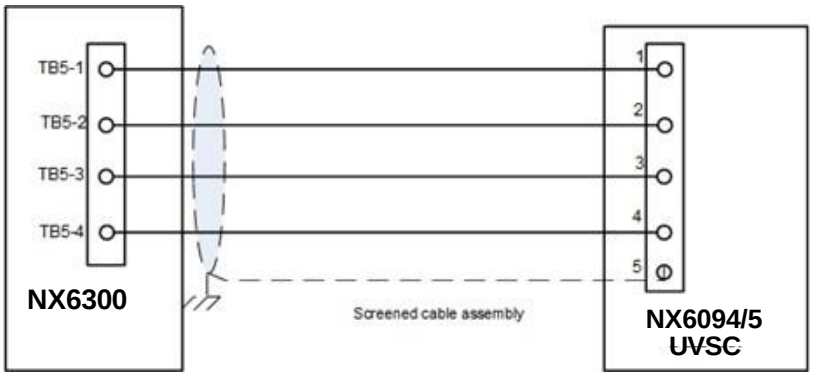
Connection is to the CANBus only using the M12 interconnection system shown below.

The sensor cabling MUST be overall ***'braid' screened*** PVC insulated 0.25 mm^2 (AWG 24).

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Connect the cable 'braid' screen to earth at an Earthed DIN terminal in the panel or terminal 5 on a distribution board. Ensure that the screen covers the signal wires until 30mm from the terminal rail or distribution board terminals.

The connection details are as follows:



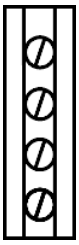
Pre-assembled wiring cable.

Screened connection wires are available from Fireye.

NX224760-15, 5m (15') Connection Cable

Refer to paragraph 2.5.3 for details on CANbus wiring. The rules for ELV circuits, defined in 2.1.4, apply.

2.5.8 IR Resistive Photocell or Volt-Free flame switch connection.



TB4-11 Photocell (+) /Flame switch

TB4-12 Photocell (-) /Flame switch

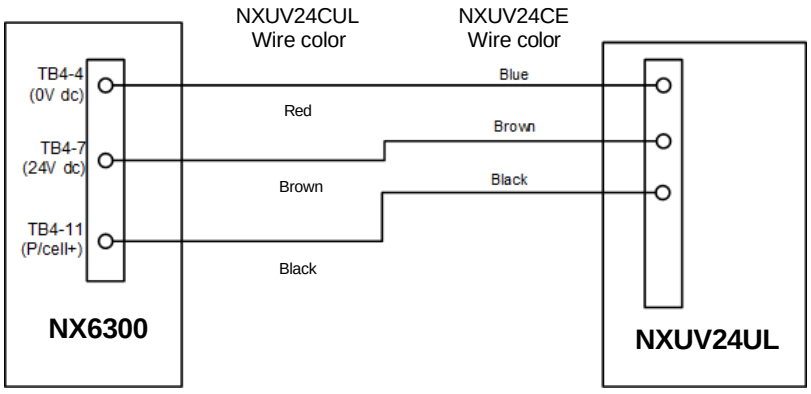
Install and wire the photocell or VFC according to the instructions supplied with the sensor device. The flame sensor MUST be connected using multi-strand overall 'braid' screened, PVC insulated, 2-core of 0.25 mm^2 (AWG 24) wire.

The rules for ELV circuits, defined in 2.1.4, apply.

Connect the cable 'braid' screen to earth at an Earthed DIN terminal in the panel. Ensure that the screen covers the signal wires until 30mm from the terminal rail and TB4 terminals.
See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

2.5.9 NXUV24UL flame detector for intermittent operation.

The NX6300 can be configured for use with the NXUV24UL flame detector from BST Solutions (KLC20/24) - https://flamonitec-bst.com . The NXUV24UL device is suitable for intermittent operation of the burner regardless of the line supply voltage. Connection of the device to the NX6300 is shown below.



The standard cable for the KLC device is not screened. Where the distance between the KLC device and the NX6300 is greater than 600mm, (2 ft.) then screened cable must be used to extend the cable length using multi-strand overall 'braid' screened, PVC insulated, 3-core of 0.25 mm^2 (AWG 24) wire.

The rules for ELV circuits, defined in 2.1.4, apply.

Connect the cable 'braid' screen to earth at an Earthed DIN terminal in the panel. Ensure that the screen covers the signal wires until 30mm from the terminal rail and TB4 terminals.
See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Set option parameter 12.0 to a value of 1 for this mode of flame detection.

2.5.10 Fan or Pump speed control loop

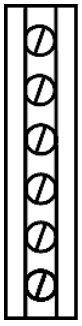
The NX6300 controller includes a speed control algorithm for combustion air fan, or fuel pump, speed control. In either case the speed control is a closed loop type.
There are two mutually exclusive speed control systems, and the system type is determined by the controller order code.

The output and feedback combinations are described in the following table:

Output type	Speed feedback type
PWM	Pulse feedback
0-10Vdc output	Pulse feedback. OR 4-20mA feedback signal.

2.5.10.1 PWM system connections

This scheme is suitable for smaller fan systems with integrated speed control.



TB4-4 OV dc
TB4-5 Tacho/pulse feedback
TB4-6 PWM Output
TB4-7 24vDC Supply to Detector

All speed and feedback cabling MUST be overall 'braid' screened, PVC insulated, multi-core of 0.25 mm^2 (AWG 24) wire.
The rules for ELV circuits, defined in 2.1.4, apply.

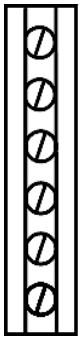
See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Terminate the screen an **appropriate ground point** in the panel or terminal rail**.**

2.5.10.2 0 – 10Vdc system connections

This scheme is suitable for motor speed control using an inverter. The choice of pulse or current feedback system will be determined by local code requirements.

Current feedback connections:



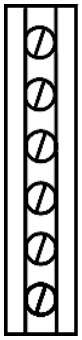
TB4-4 0Vdc.
TB4-6 0-10V Speed output.
TB4-7
TB4-8 4-2mA Speed feedback signal.

All speed and feedback cabling MUST be overall 'braid' screened, PVC insulated, multi-core of 0.25 (AWG 24) mm^2 wire.
The rules for ELV circuits, defined in 2.1.4, apply.

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Terminate the cable screen at an **appropriate ground point** in the panel or terminal rail**.**

Encoder pulse feedback connections:



TB4-4 ***0Vdc*** (Black)

TB4-5 Tacho/pulse feedback (Blue)

TB4-6 ***0-10V*** *Speed output*

TB4-7 ***24Vdc*** Supply to Detector (Brown)

All speed and feedback cabling MUST be overall 'braid' screened, PVC insulated, multi-core of 0.25 mm^2 (AWG 24) wire.
The rules for ELV circuits, defined in 2.1.4, apply.

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Terminate the cable screen at an **appropriate ground point** in the panel or terminal rail**.**

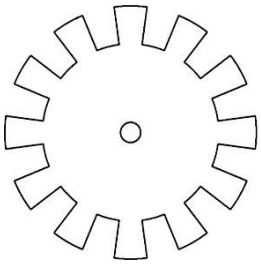
Note: Incorrect connection or application of excess voltage may damage or destroy the devices being connected.

Encoder feedback is in the form of a series of electronic pulses, which represent the speed of the motor shaft. A toothed encoder wheel is fixed to the motor shaft. The electronic pulses are generated when the teeth of the wheel pass close to a proximity detector. The number of teeth on the encoder wheel determines the resolution of speed measurement.

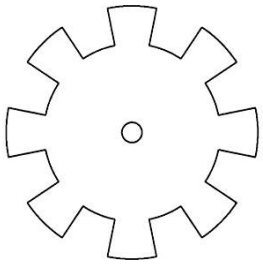
The manufacturer of this equipment recommends the following relationship between the maximum motor speed and the number of teeth on the encoder wheel:

Motor speed rating for 50/60 Hz	Number of teeth
1000 – 2499 rpm	12
1000 – 3750 rpm	8
3000 – 5000 rpm	6

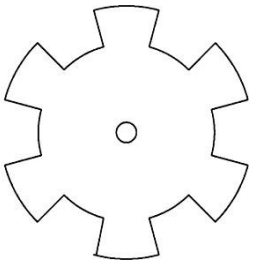
The encoder wheel must be manufactured to close tolerances to ensure an even ON and OFF pulse width when rotating. Here are drawings of example encoder wheels:



12 teeth



8 teeth



6 teeth

Proximity Detection Devices:

The NX6300 is designed to operate with a detector that meets a minimum requirement specification is as follows:

- 24 V d.c. supply
- 3- wire
- PNP, open collector output.

The following proximity detection devices have been tested and are recommended for use with the NX6300 when using encoder discs of the types shown above:

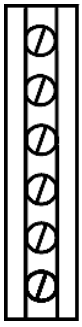
Omron - E2E-X5MB1 L12.

Carlo Gavazzi – ICB12L50F04

Pepperl+Fuchs – NBB4-12GM30 E2

2.5.11 RS485 Communications interface

The RS485 interface included in the controller is for transferring data between the controller and a third-party device using ModBus RTU.



TB4-1	RS485 A (+)
TB4-2	RS485 B (-)
TB4-3	RS 485 Gnd

The RS485 cabling MUST be overall ‘braid’ screened, PVC insulated, 3-core of 0.25 mm^2 (AWG 24) wire. The rules for ELV circuits, defined in 2.1.4, apply.

See **Cable Voltage Rating rule** in paragraph 2.4 on page 26.

Terminate the screen an **appropriate ground point** in the panel or terminal rail**.**

Note: Incorrect connection or application of excess voltage may damage or destroy the devices being connected.

2.5.12 NXO2TRIM Oxygen Probe Interface Connection *(optional)*

CAUTION

- Incorrect connection may damage or destroy the devices connected to the CANBus.

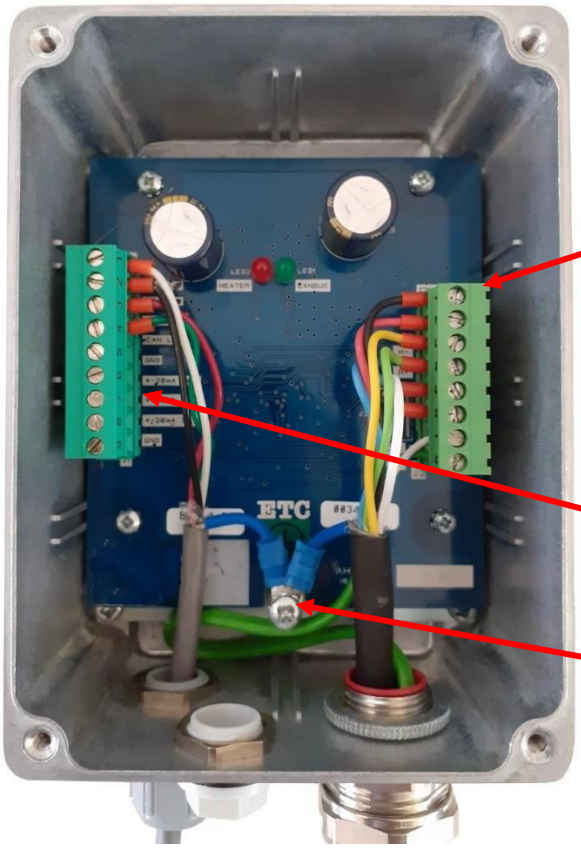
The electrical connection between the NX6300 series controller and NXO2TRIM must meet the CANBus 4-core screen cable specification. The rules for ELV circuits, defined in 2.1.4, apply.

Connect the CAN cable ‘braid’ screen to Earth at an earthed DIN rail terminal or using the screen termination clamps provided on the NX8WC-HUB.

Terminate the ‘braid’ screen for all connections in the NXO2TRIM enclosure, at ring terminal point inside the enclosure.

Incorrect connection or application of excess voltage will damage or destroy the device(s).

Internal view of NXO2TRIM.



Probe connection terminals. PH1 to PH8

CAN and 4-20mA connection terminals PG1 to PG8

Ring terminal point for CAN and Probe cable screen termination.
NOTE: Cable screen terminations are as short as possible.

Cable entries points are provided on this face.

2.5.12.1 Terminal connections.

Terminal No.	Module	Function	Voltage Rating
PG1	O2 Trim Interface	CAN 24Vac Supply	24 – 32Vac
PG2	O2 Trim Interface	CAN 24Vac Supply	24 – 32Vac
PG3	O2 Trim Interface	CAN + (High)	0-5V
PG4	O2 Trim Interface	CAN – (Low)	0-5V
PG5	O2 Trim Interface	GND (4-20mA 0V)	0V
PG6	O2 Trim Interface	4-20mA Input 1 (CO)	0-5V
PG7	O2 Trim Interface	4-20mA Input 2 (O_2)	0-5V
PG8	O2 Trim Interface	4-20mA Input 3	0-5V
PG9	O2 Trim Interface	GND (4-20mA 0V)	0V
PH1	O2 Trim Interface	Probe 1 (Black)	0-14V
PH2	O2 Trim Interface	Probe 2 (Red)	0-14V
PH3	O2 Trim Interface	Probe 3 (Yellow)	0-14V
PH4	O2 Trim Interface	Probe 4 (Green)	0-14V
PH5	O2 Trim Interface	Probe 5 (Blue)	0-14V
PH6	O2 Trim Interface	Probe 6 (White)	0-14V
PH7	O2 Trim Interface	Flue gas thermocouple White	0-5V
PH8	O2 Trim Interface	Flue gas thermocouple Green	0-5V

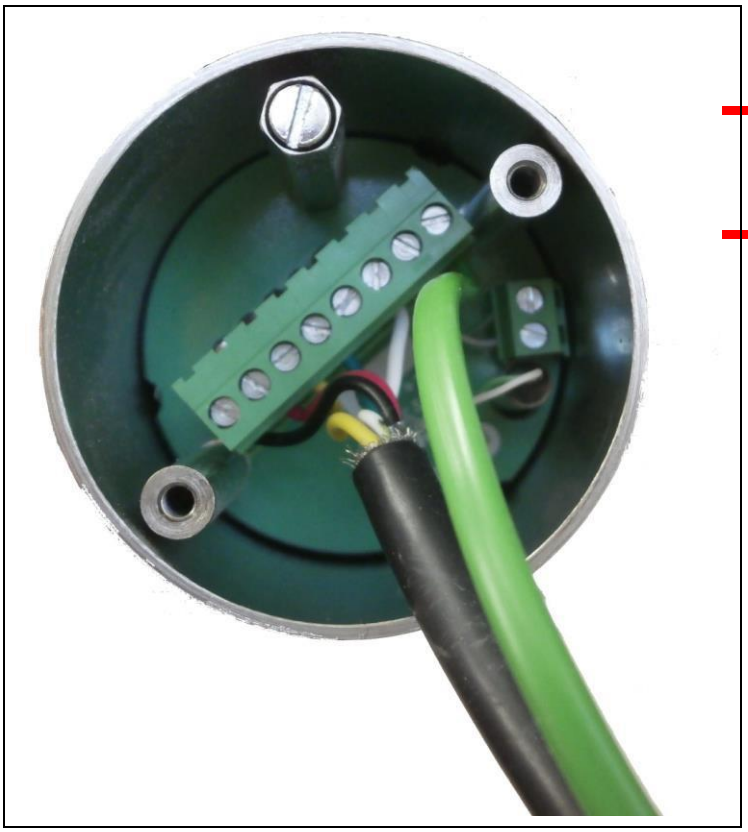
The connection scheme between the NXO2TRIM and NX6083 is by direct connection of PH terminal1 to Probe terminal1, PH terminal 2 to Probe terminal 2 and so on up to terminal 8. See the reference to PH above.

The screen of the probe heater and signal cable MUST be terminated, using a ‘ring terminal’, to the termination point inside the NXO2TRIM enclosure.

The electrical cable specification for connections between the NXO2TRIM and NX6083-x probe must follow the description below:

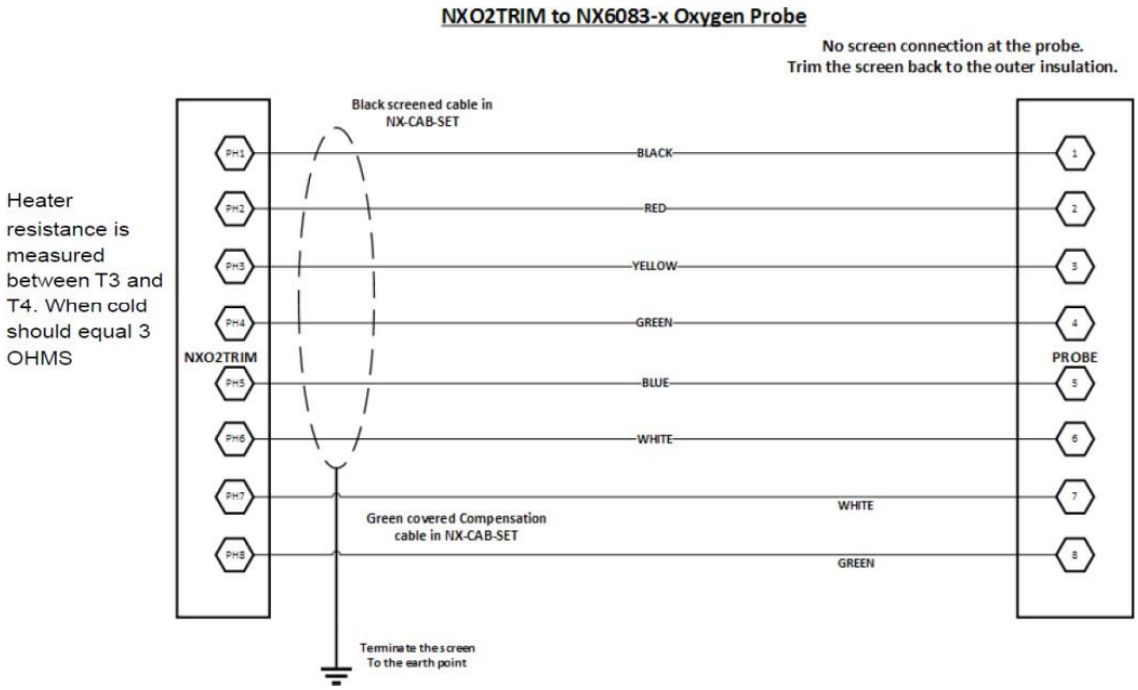
Cell heater and Oxygen measurement.	**Max Voltage in use 14V d.c.** • 6-core cable with each core 16/0.2mm (AWG 20) and with overall braided screen. Cable covered in PVC sheath. • Resistance per core 40 milliohms/meter. • Maximum length between the probe and controller is 10m (33ft).
Flue Gas temperature measurement.	**Max Voltage in use 5V d.c.** • Type ‘K’ compensating cable. • 2-core PVC insulated cable with 0.25mm2 (AWG 24) conductors, covered in overall PVC sheath.

View of NX6083 oxygen probe terminals.



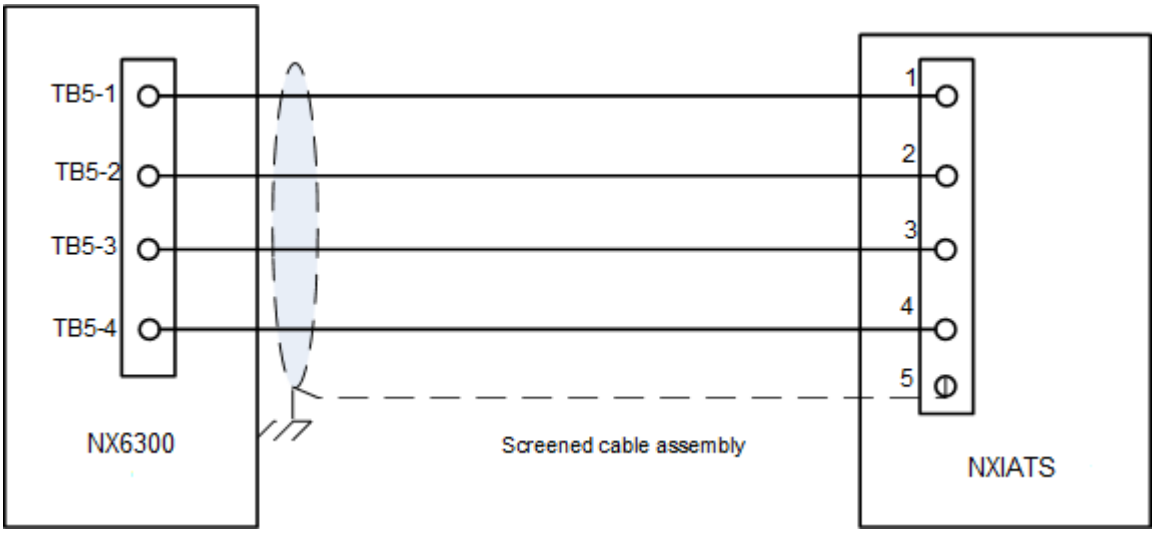
NOTE: There is no screen termination point. The screen in the 6-way cable must be cut short to the PVC outer cover.

Make sure all connectors are correctly fitted, and then secure the probe cap on the probe.



2.5.13 Inlet Temperature sensor *(optional)*

The system allows direct connection of an NXIATS inlet temperature sensor. The unit is connected via CANbus in the same way as for the servo and display and MUST be connected using overall 'braid' screened, PVC insulated, 4-core, 0.25mm^2 wire (AWG 24). The rules for ELV circuits, defined in 2.1.4, apply.



See Cable Voltage Rating rule in paragraph 2.4 on page 26.

Incorrect connection or application of excess voltage may damage or destroy the devices being connected.

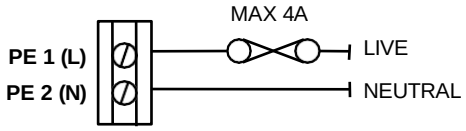
2.6 Wiring to the NXCBH CAN Bus PSU and Hub

2.6.1 LIVE and NEUTRAL supply.

WARNING

Incorrect setting of the Supply Voltage Links **WILL** damage or destroy the unit.

The LIVE and NEUTRAL supplies must be connected using multi-strand single core PVC insulated 0.5mm (AWG 20) wire. The live connection MUST be fused with a **maximum rating** as shown.

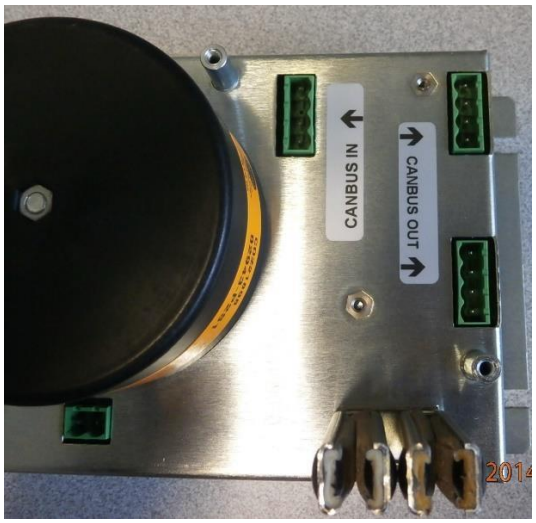


2.6.2 CAN Bus connection

CAUTION

- **The total electrical load for the devices connected to a single PSU hub MUST NOT exceed 60VA.**
- **Incorrect connection may damage or destroy the devices connected.**

The connection terminal positions are shown in the picture below.

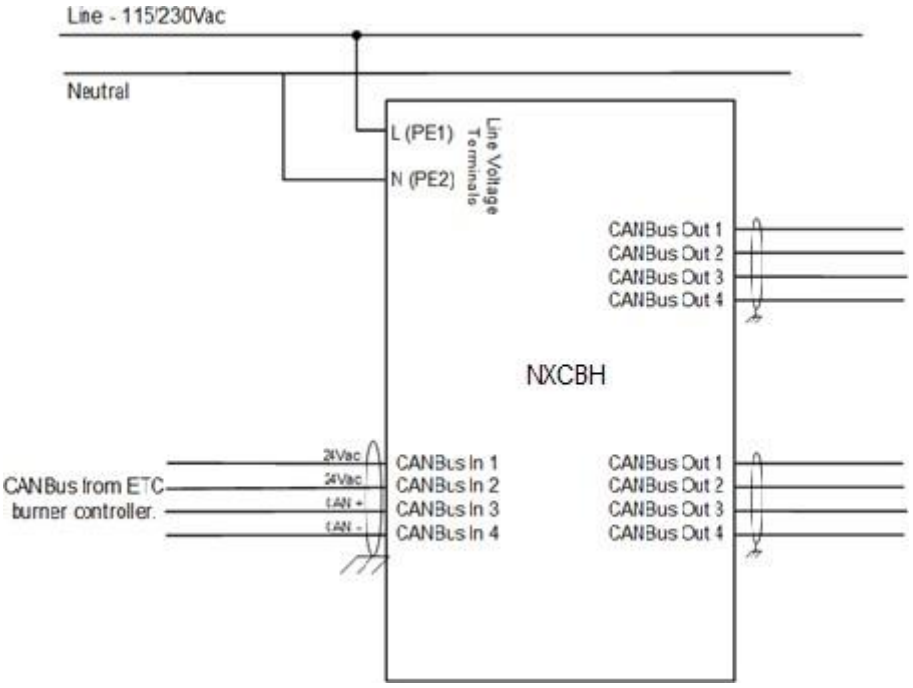


There is a 2-way terminal block for the live voltage connection (bottom-left).

There are 3 sets of terminal blocks for the CAN Bus connections on the NXCBH. These terminal blocks are labeled as ‘CANBus In’ or ‘CANBus Out’. Each terminal block set has terminals 1 to 4 labeled and the ‘CANBus Out’ terminals have internal connections between the terminal numbers.

Connect the braided screen of each cable with the use of the screen termination clamp, at the NXCBH.

The electrical scheme for the connections are shown below.



2.7 Final Checks

CAUTION

- Incorrect setting of the Supply Voltage Links **WILL** damage or destroy the controller module. This is not covered by warranty.

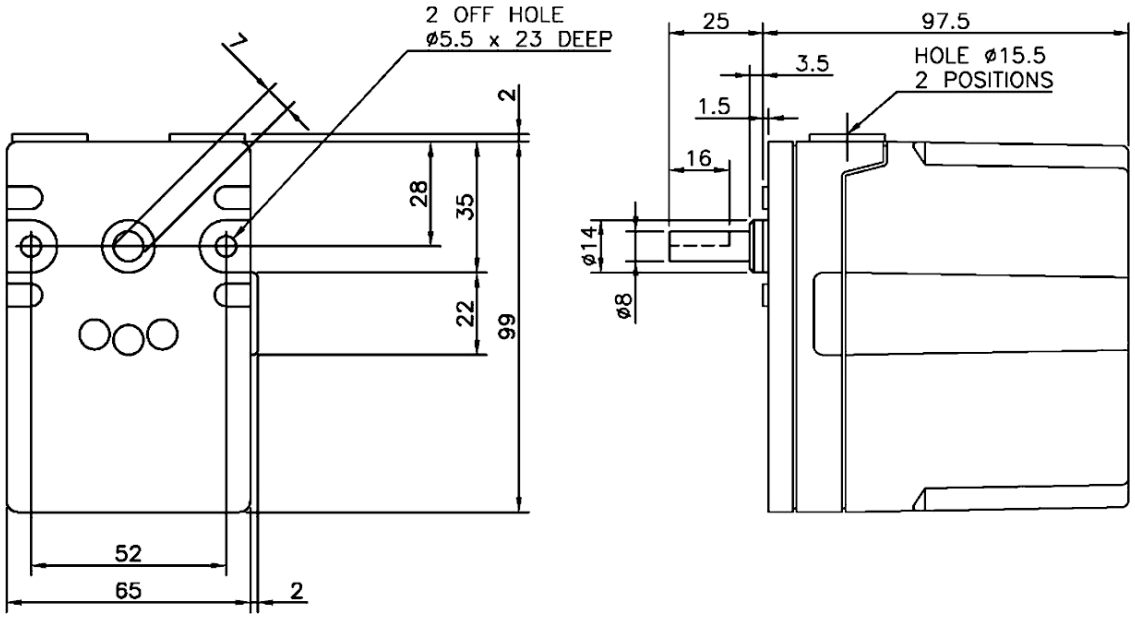
Before applying power:

- Check all supply link positions are correct (NXCBH).
- Check the supply fuse(s) are of the correct type and value.
- Check that all wiring and connections have been made according to the specifications detailed in this manual.
- Check you have fitted the enclosure lid(s) before applying power to the system.
- Check all metal ‘bodied’ parts of the system are correctly connected to earth.
- Check that all cables where required are of the correct ‘braided screen’ specification and terminated as defined in this manual.

3. How to select and install the Servos

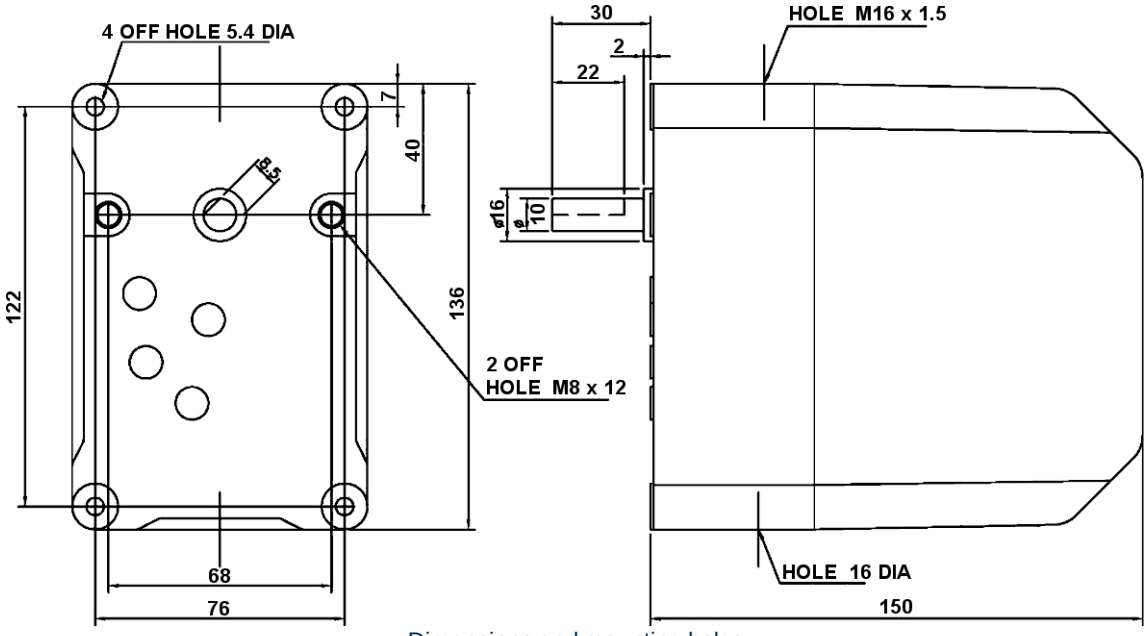
3.1 Servo (Servo) Models

3.1.1 NXC04 4 Nm Servo (3ft pd)



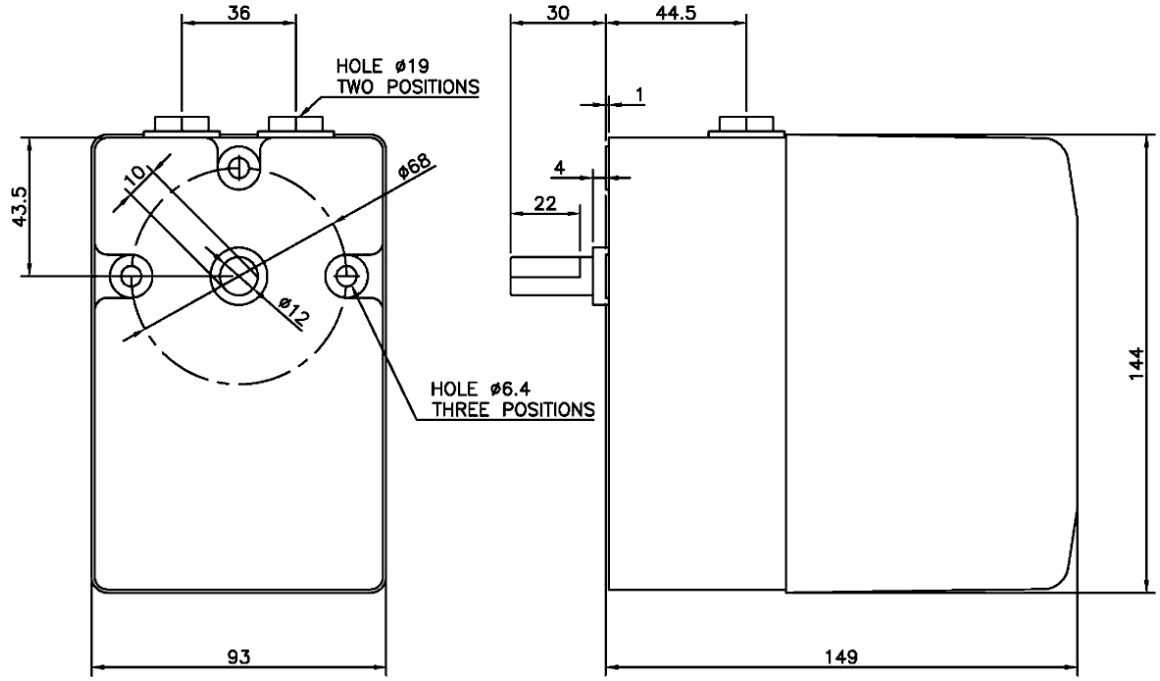
Dimensions and mounting holes

3.1.2 NXC12 10 Nm Servo (12ft pd)



Dimensions and mounting holes

3.1.3 NXC20 20 Nm Servo (20ft pd)



Dimensions and mounting holes

Dimensions and mounting holes

3.3 Locking the Servo to the Valve Shaft

CAUTION

- After the position of the servo shaft relative to the valve or damper shaft is correctly set, each servo **must** be locked to its valve shaft for all air damper(s) and fuel valve(s).
- In order to prevent the joint between servo and shaft moving, it is recommended that the device used to link the two items is pinned together. See the picture below.
- The servo zero point cannot be adjusted. Before connecting to the valve shaft, first make sure the servo direction is set, and the unit is driven to its minimum point.
- It is essential that the servo and valve remain securely connected, to ensure safe operation of the equipment, because the valve position feedback is only taken from the servo.

3.4 Valve Control Direction

Make sure that each servo travels in the correct direction to match the mechanical configuration of the burner. The default setting is for a servo to move anti-clockwise from the zero to 90-degree position (viewed facing the output shaft).

You can reverse this by setting Option parameters 5.0 to 5.3 to a value of 1.
DO THIS BEFORE ALIGNING AND SETTING THE ZERO POSTION FOR THE VALVE OR DAMPER SERVO.

3.5 Selecting and Calibrating Servos

CAUTION

- All servos connected to the NX6000 control system **must** be approved as part of system.
- The total electrical load for any controller is 18 VA. When the total servo power exceeds this limit a NXCBH CANbus Hub must be included into the panel design to provide the additional power requirement.
- Valve and servo alignment and calibration must be set in **Commission Ratio mode** before commissioning any profile set points.

3.5.1 Servo requirements

Only servos supplied by Fireye (NXCxx) may be used with this equipment; various servos are available to suit different applications.

The information below is intended as a general guide only. When installing or adjusting the servos fitted to the appliance, make sure you refer to the correct instruction manual.

- All servos must be connected via CAN Bus directly, or via a CAN Bus interface unit.
- CAN Bus servos operate at 24 Vac supplied from the main controller unit or the NXCBH.
- All have a 90° maximum movement, with an operating time of approximately 30 seconds for 90° of travel.
- Two types of servo are available:
  – The first type uses a potentiometer to provide feedback of the output shaft position,
  – The second type uses magnetic encoder to detect the position of the output shaft.
  These can be identified by the description “Actuator M” on the serial number plate.

The NXC servo/motors which use potentiometers for position feedback all have internal limit switches, which must be adjusted during commissioning. This will allow the Close Position check to be performed and will protect the burner/boiler against damage if there is an electronic fault.

3.6 Aligning the potentiometer type servo

CAUTION

- The servo internal feedback potentiometer must be secured within the servo, to make sure that there is no possibility that the potentiometer can become disconnected from the motor output shaft.
- For direct-drive servo potentiometers (all servos except 4 Nm), make sure the potentiometer body is secured to the flexible mounting, to prevent any movement between output shaft and potentiometer. Do not adjust the 'nuts' retaining the flexible mounting to the metalwork.
- For gear-driven servo potentiometers (4 Nm servo), make sure the potentiometer is secured to its mounting bracket and that the bracket is correctly attached to the servo body, to prevent any backlash between the potentiometer and the output shaft.

For each motor, it is necessary to adjust the servo position relative to the valve or damper shaft that it is driving (e.g. gas valve) in order to obtain the correct open and closed positions on the display. To do this, follow the procedure below:

1. Make sure that the correct servo direction is set before connecting the servo to the relevant valve. If the servo direction is incorrect, use the relevant option parameter to reverse.
2. Move the valve to its fully closed position and adjust the servo position by driving the motor so that approximately 1° is shown on the display.
3. Move the valve to its fully open position by driving the servo and check that the display reads approximately 90° or the maximum angular opening required from the servo if this is less than 90°.

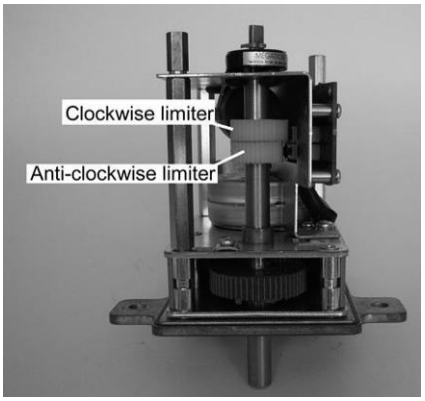
3.6.1 Adjusting the micro-switch positions

Each time a burner start-up sequence is initiated, the controller will move the fuel and air damper servos to their respective closed positions, to prove correct servo and potentiometer operation. Each servo has micro-switches fitted to set the close position during this proving operation and limit the maximum 'open' position to prevent burner/boiler damage in the event of a system failure. To set the micro-switch positions, follow the procedure below.

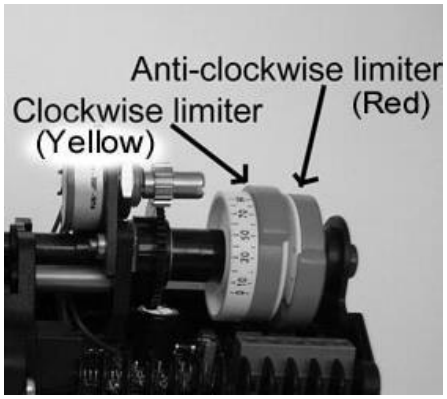
1. Enter Commission Ratio mode – see "Commissioning" in Section 3.
2. Move each servo to approximately 45°, using the **UP/DOWN** keys; this is to make sure the **DOWN** key will drive the servo.
3. Holding the **DOWN** key, tighten up the low limit micro-switch until the servo will no longer move down.
4. Holding the **DOWN** key, gradually slacken off the low limit micro-switch until the servo starts moving down. Continue to slacken off the micro-switch until the servo stops with a reading on the display of approximately 1°. Verify that the valve is in the 'closed' position.
5. Move the motor up and down a few times to check that the motor stops each time at approximately 1° and re-adjust the micro-switch if necessary. This position will allow for some tolerance in micro-switch operation.
6. Hold the **UP** key and tighten up the high limit micro-switch until the motor will no longer move up.

7. Holding the **UP** key, gradually slacken off the high limit microswitch until the motor starts moving up. Continue to slacken off the microswitch until the motor stops in the desired purge position. This position does not have to be 90°, but we recommend that it is in the range 45° to 90°. Verify that the servo is being stopped by the micro-switch, and not by being stalled by some mechanical limit on the valve that it is operating.
8. Move the motor, up and down a few times to check that the motor stops each time at the desired limit position. Repeat steps 3 to 7 for all servos.

3.6.2 Servo micro-switch movement limiters



NXC20/40 M



NXC04
NXC12
NXC20

Note: Available Fourth quarter 2024

3.7 Aligning the magnetic feedback servos

For each servo, it may be a requirement to adjust the servo output shaft position relative to the valve or damper shaft that it is driving (e.g., gas valve) in order to obtain the correct Closed (P0) position on the display.
Make sure that the correct rotation direction for each servo is set in option 5.x then follow the steps below:

.

1. With the controller in the P0 state, move the jumper link on the servo circuit board to connect across pins 1 and 2, like this...

2. In this setting mode the position feedback value will indicate zero degrees on the HMI.

3. Wait for 5 seconds, then adjust the servo shaft position to align with the Closed position on the valve or damper using the ▲ and ▼ keys on the HMI, making sure that the servo is not driving against a mechanical stop at the Closed position.
   Notes:
   1. *During this step the HMI will show a zero value for the position feedback.*
   2. *If you adjust the position in a negative direction, compared to the previous Closed position, then the servo will move very slowly for the first few degrees of movement (10 to 15 seconds), then pick up to normal speed.*

4. When the servo is correctly aligned to the Closed position of the valve or damper remove the jumper link from pins 1 and 2 and “park” it on pin 1, like this….

5. Wait for 5 seconds, then check that the position feedback value for the servo is within the limits of -0.5 to +0.5 degrees.

6. Check the full movement range for the servo and ensure that it can return to the zero position consistently.
   Note: *The servo speed will change and move very slowly as it approaches the fully Open or fully Closed positions.*

7. If the Closed position is outside of the limits in 8, then repeat steps 4 to 8.

8. Continue to set other servo zero positions, then commission profiles/curve sets as normal.

CAUTION

If the jumper is left in the programming position (Pins 1-2) when the controller exits to run mode, an ERR3 will be shown for the drive position and the controller will move to Lockout. In this case you may need to repeat the Closed point setting process.

4. How to change the Lithium battery.

The lithium battery provides a power backup for the clock/calendar, which is used to time-stamp the event and fault history log. The battery power will be used when the controller has no line voltage power.

The battery is mounted on the display circuit board. The expected life of the battery is in excess of 10 years. There is no indication of the battery condition from the controller, but a low battery condition will manifest itself as the wrong time in the display or event log. When this is noticed, suitable personnel may change the battery.

4.1 Battery change procedure.

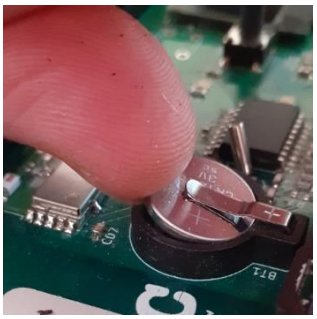
CAUTION

The battery changing procedure *must* be executed with power disconnected from the controller.

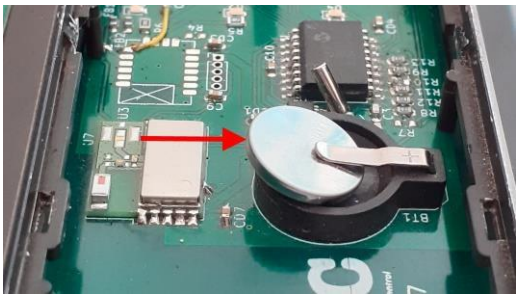
The battery type is ***CR1225*** and the location of the battery is shown in this picture.

Access to the battery is by removal of the top cover by prying it off like this...

With the cover removed the battery can be removed out of the holder with a non-conducting tool or a fingernail like this….



When the battery has been removed, the replacement battery can be inserted into the holder.
Insert the battery into the holder at an angle with the flat side facing upward, as shown in the following picture, and then push into place in the direction of the arrow.



Replace the cover to the controller by aligning it to the aperture at the top of the enclosure and pushing until several clicks are heard and the cover is flush with the long sides of the enclosure.

CAUTION

Battery disposal.

- Do not attempt to use any different battery type other than 3V, 1225 case style.
- If there is evidence of the battery leaking, the battery must be replaced immediately. Minor contamination of the battery holder can be removed using isopropyl alcohol but if significant damage has occurred, the controller should be replaced.
- **Do not** dispose of the battery in the garbage.
- Adhere to local and/or national regulations related to battery disposal.
- If in doubt, ask the application site personnel about the site battery disposal policy and follow it.
- The battery must be removed from the control before it is scrapped.

——— End of Section 2 ———

5. Section 2 Update History

New version	Date		Changes in brief
V1pt4	10.29.23	RAL	North America Version
V1pt4	03.14.24	RAL	Changed wire gauge values