KEIT INDUSTRIAL ANALYTICS

IRmadillo™

DOC1048R IRmadilloNA User Manual - Safety

Model Number: ASM0627-09-N-Cx-O-Gx-D3x

www.keit.co.uk
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1. SAFETY

EN: "**WARNING**" refers to situations that could result in **personal injury**.
"**CAUTION**" refers to situations that could result in **equipment damage**.
Failure to follow the requirements below may lead to dangerous situations.

FR: «**AVERTISSEMENT**» fait référence à des situations pouvant entraîner des blessures corporelles.
«**ATTENTION**» fait référence à des situations pouvant entraîner des dommages matériels.
Le non-respect des exigences ci-dessous peut conduire à des situations dangereuses.

If the equipment is used in a manner not specified by Keit, the protection provided by the equipment may be impaired.

This manual is intended to be read in conjunction with DOC1049R which describes non-safety aspects of using the IRmadilloNA.

1.1. General safety

⚠ **WARNING** AVERTISSEMENT	**The spectrometer weighs ~18 kg; handle with care** Le spectrometer pèse environ 18 kg; manipulez-le avec soin
⚠ **CAUTION** MISE EN GARDE	**Do not operate outside the range of environmental or analyte conditions specified on the product label** N'utilisez pas l'équipement hors des conditions environnementales ou d'analyte spécifiées dans la plaque signalétique
⚠ **CAUTION** MISE EN GARDE	**The probe is NOT a carry handle** La sonde n'est pas une poignée de transport
⚠ **CAUTION** MISE EN GARDE	**Do not open the spectrometer; it contains no user-serviceable parts.** N'ouvrez pas le spectromètre, il ne contient aucune pièce dont l'entretien doit être effectué par l'utilisateur.

1.2. Lifting instructions

Lift the device using the lip around the lid or with hands underneath the base. Do not use the probe as a carry handle; this could cause damage. Users should risk assess manual handling and use lifting equipment if necessary.

1.3. Electrical safety

⚠ **WARNING** AVERTISSEMENT	**The electrical mains cable must be earthed and should include a 5A fuse with a means of isolating both live and neutral; obey local electrical safety codes** Le câble d'alimentation électrique doit être mis à la terre et doit comporter un fusible de 5 A avec un moyen d'isoler la phase et le neutre ; respectez les codes de sécurité électrique locaux.
⚠ **WARNING** AVERTISSEMENT	**An additional earth connection is provided on the enclosure chassis using an M6 screw; use if required by local codes** Une mise à la terre supplémentaire est fournie sur le châssis de l'enceinte au moyen d'une vis M6 ; utilisez-la si cela est requis par les codes locaux.
⚠ **WARNING** AVERTISSEMENT	**Never disconnect the mains power connector when energised** Ne débranchez jamais le connecteur d'alimentation réseau lorsqu'il est branché.
⚠ **CAUTION** MISE EN GARDE	**Residual current protection or ground fault interrupter devices are recommended** L'installation d'une protection contre le courant résiduel ou d'un interrupteur de défaut de terre est recommandée.

1.4. Pressure and temperature limits

The maximum pressure and temperature (ambient and analyte) limits for the device vary depending on the model and mechanical interface. Refer to the product label to confirm the limits.

Do not exceed the pressure limits on the product label as this could be dangerous and will invalidate the warranty. If in doubt, contact Keit for advice before installing the spectrometer.

When purging the instrument, the maximum total flow rate of the purge gas is 3 liters/minute.

1.5. Operating environment limits

The spectrometer is thermally stabilised and designed to operate indoors or outdoors under a variety of conditions and environments. Avoiding exposure to direct sunlight will help maintain this thermal stability.

Table 1 – Atmospheric requirements for electrical safety

Parameters	Value	Units
Pollution degree of intended environment	4	
Maximum installation altitude	3000	metres

Pollution degree of the environment refers to the level of contamination that the exterior of the device can cope with. Pollution degree 4 means that continuous conductivity from conductive dust, rain or other wet conditions will not cause *electrical safety* to be compromised.

1.6. Specific conditions of use

1.6.1. IRmadilloNA Spectrometer, certificate: IECEx CML 22.0082X

i. The media to be monitored must be in an area where dust particles are excluded.
ii. The probe must be mounted so it is protected from impact.
iii. Models with external parts manufactured from light metals can be an ignition source due to impact or friction sparks. On equipment fitted with a probe of material 'TI' (titanium), this shall be considered during installation, particularly in zone 0 locations.
iv. On equipment fitted with probe type 'K' (High Temperature dia25), the rate of change of temperature on the end of the probe shall be limited to 50°C per minute maximum.*
v. It is the responsibility of the manufacturer, installer and end user to ensure chemical compatibility between the process analyte and all wetted materials. Consult manufacturer before installation in a process.
vi. The main enclosure shall not be opened. The flamepaths of the main enclosure shall not be repaired.

*point iv. does not apply to the instrument referred to in this user manual.

1.6.2. Passed on from the CMP Cable Gland certificate: IECEx CML 18.0182X cCSAus 2288626

i. The glands when used for terminating braided cables are only suitable for fixed installations.
ii. Cables must be effectively clamped to prevent pulling or twisting.
iii. When assembled for fitting to flexible conduit, the conduit shall be effectively clamped to prevent twisting and pulling.
iv. Instrument design confirms conformity with this condition.

1.6.3. Passed on from Hawke Cable Gland certificate: IECEx CML 19.0045X cCSAus 1015065

i. Instrument design confirms conformity with this condition.
ii. It is the responsibility of the manufacturer to confirm conformity with this condition.
iii. Does not apply to model number ASM0627-09-N-Cx-O-Gx-D3x.

1.6.4. Passed on from FibreEx Fibre Optic Connector Certificate: IECEx BAS 16.0032X certificate: IECEx CML 19.0045X

i. The protective caps shall be fitted immediately following separation.
ii. Instrument design confirms conformity with this condition.
iii. It is the responsibility of the manufacturer to confirm conformity with this condition.
iv. It is the responsibility of the manufacturer to confirm conformity with this condition.
v. It is the responsibility of the manufacturer to confirm conformity with this condition.

1.6.5. Passed on from CMP 737 Thread Reducer certificate: IECEx CML 18.0177X cCSAus 1055233

i. It is the responsibility of the manufacturer to confirm conformity with this condition.
ii. Instrument design confirms conformity with this condition.
iii. It is the responsibility of the manufacturer to confirm conformity with this condition.
iv. Does not apply to model number ASM0627-09-N-Cx-O-Gx-D3x.

v. Does not apply to model number ASM0627-09-N-Cx-O-Gx-D3x.
vi. Does not apply to model number ASM0627-09-N-Cx-O-Gx-D3x.

1.6.6. Passed on from Redapt BD-U Breather certification: IECEx ITS 16.0014X

i. Instrument design confirms conformity with this condition.
ii. It is the responsibility of the manufacturer to confirm conformity with this condition.
iii. It is the responsibility of the manufacturer to confirm conformity with this condition.
iv. Instrument design confirms conformity with this condition.
v. It is the responsibility of the manufacturer to confirm conformity with this condition.
vi. It is the responsibility of the manufacturer to confirm conformity with this condition.

The Ex-certified version of this product (ASM0627-09-N-Cx-O-Gx-D3x) was assessed against the following standards for hazardous environments:

IEC60079-0 Explosive Atmospheres – Equipment General Requirements

IEC60079-1 Explosive Atmospheres – Equipment protection by flameproof enclosures

IEC60079-26 Explosive Atmospheres – Equipment with EPL Ga

In addition, IEC60079-28 Explosive Atmospheres – Protection of equipment using optical radiation was considered but the equipment is not in the scope of this standard because (ref section 1, part 5) it has an enclosure that fully contains the optical radiation and provides IP6X protection in accordance with IEC60529 Degrees of protection provided by enclosures (IP code).

Furthermore, elements of IEC60079-31 Explosive Atmospheres – Equipment dust ignition protection by enclosure have been applied to preclude optical absorbers from entering the probe.

In accordance with IEC60079-26, the rigid dip probe achieves EPL Ga and can be inserted into zone 0 environments while the main instrument achieves EPL Gb for use in zone 1. The user should be aware that creating an opening in a zone 0 environment may lead to the release of flammable gas and flame entrance. EPL Ga is achieved for the dip probe since it is an enclosure providing protection against dust ignition.

The North American Class 1, Zone 0/1 (Class 1, Division 2) product (ASM0627-09-N-Cx-O-Gx-D3x) was also assessed against the following standards for hazardous environments:

UL 61010-1 / CSA C22.2 No.61010-1-12 Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use Part 1: General requirements

UL 60079-0 / CSA C22.2 No. 60079-0 Standard for Safety Explosive Atmospheres – Part 0: General requirements

UL 60079-1 / CSA C22.2 No. 60079-1 Standard for Safety Explosive Atmospheres – Part 1: Equipment Protection by Flameproof Enclosures “d”

UL 60079-26 / CSA C22.2 N0. 60079-26 Standard for Safety Explosive Atmospheres – Part 26: Equipment with Equipment Protection Level (EPL) Ga

1.7. Product marking

The device is certified for installation in explosive gas atmospheres and uses a flameproof enclosure for protection. It is marked with its certification coding.

1.7.1. Pressure and temperature limits

The maximum pressure and temperature (ambient and analyte) limits for the device vary depending on the model. Refer to the product label to confirm the limits. Do not exceed the pressure limits on the product label as this could be dangerous and will invalidate the warranty. If in doubt, contact Keit for advice before installing the spectrometer.

1.7.2. Partition walls

The minimum partition wall thickness is 1 mm.

The material of the partition wall is given by the final part of the model number as follows:

Code	Probe Material
[blank]	Hastelloy
TI	Titanium
IN	Inconel
SS	Stainless Steel
TA	Tantalum

2. HOW TO POWER AND CONNECT THE IRmadilloNA

2.1. Powering the IRmadilloNA

⚠ **NOTE** REMARQUE	**See Section 1 Safety prior to attempting installation.** Reportez-vous à la section 1 Safety avant de procéder à l'installation.

The spectrometer is normally supplied with a blunt-cut mains cable to be wired into your electrical supply. The instrument requires single-phase mains input and must be connected to a permanent earth (grounding) connection. A 5A fuse should be fitted in the live/hot supply connection.

The power supply needs to be fitted with a means of isolating both live and neutral by fitting a disconnecting switch or using a suitable circuit breaker that meets the requirements of IEC 60947-1 and IEC 60947-3. The switch must be located within easy reach of the instrument and must be marked as the disconnection device for the equipment. The disconnection device must not interrupt the earth connection.

The spectrometer is designed to operate over a wide range of voltages shown below in Table 2 - IRmadilloNA power specifications. If you plan to operate the spectrometer outside of these ranges, contact Keit for advice before powering up the instrument.

Table 2 - IRmadilloNA power specifications

Parameters	Value	Units
AC input voltage	100-240	V
AC input frequency	50/60	Hz
Mains supply fluctuations (% of Nominal Value)	±10	%
Power consumption	110 (max)	W
Overvoltage Category	CAT II	

2.1.1. Uninterruptible power supply (UPS)

To ensure a reliable supply of power to the IRmadilloNA, we strongly recommend use of an uninterruptible power supply (UPS). Contact support@keit.co.uk for further information.

If you are unable to use a UPS, you may find that the system fails to start correctly following a power cut. In this situation, Keit recommends power cycling **first** the IRmadilloNA and **then** the controller.

2.1.2. Power cable

The power cable for the IRmadilloNA is a permanently connected flying lead passed through a cable gland; this is located at the rear of the spectrometer. The gland and cable must be sufficiently protected from loading and twisting. The cable should ideally be routed above ground to avoid accidental damage.

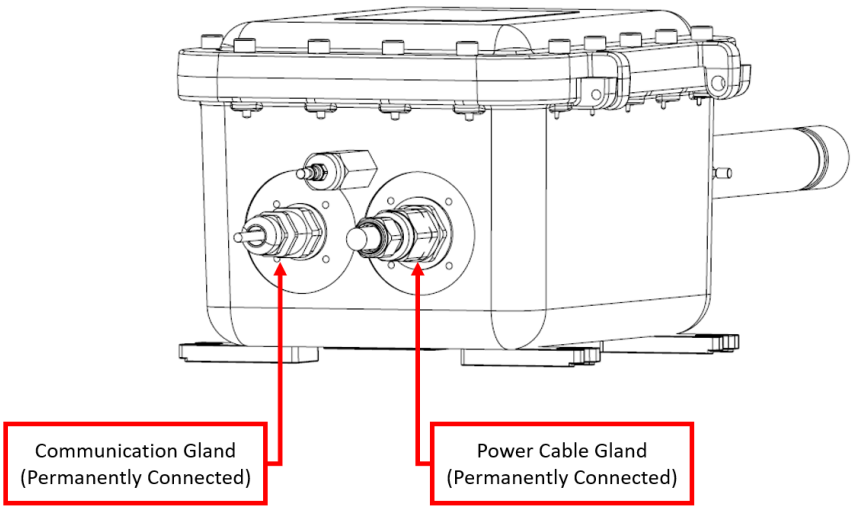


Figure 1: Power and communication gland locations

The spectrometer body has an optional external M6 earth attachment point below the probe. This can be used where local codes require it. The internal earth bonding through the power supply cable is the primary earth and the external is optional. Please identify and adhere to any applicable local standards.

⚠ **WARNING** AVERTISSEMENT	**Failure to properly earth the spectrometer may cause serious injury or death.** Une mise à la terre incorrecte du spectromètre peut causer des blessures graves, voire la mort.

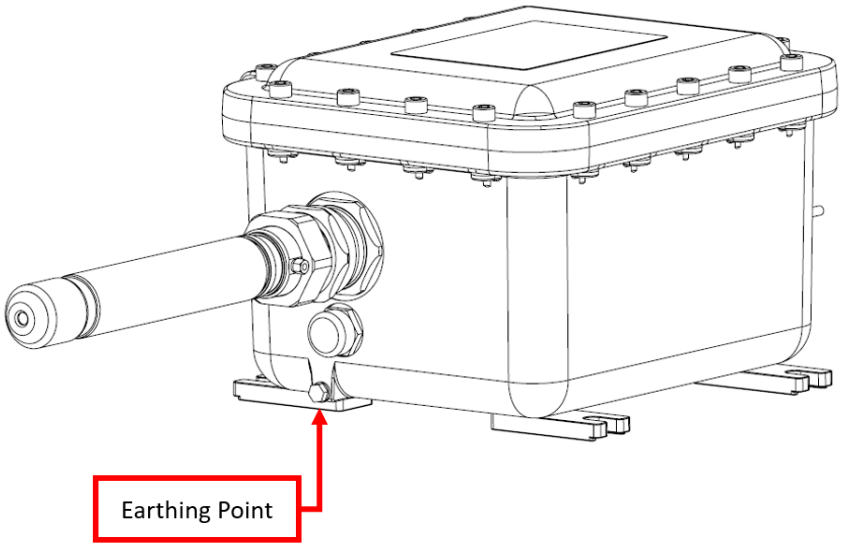


Figure 2: Optional External Earthing point

2.2. How to connect data communications

Like the power cable, the IRmadilloNA is supplied with a permanently connected flying lead for communication that is passed through a cable gland. You must ensure that the cables are sufficiently protected from loading and twisting. The cable should ideally be routed above ground to avoid accidental damage.

⚠ **NOTE** REMARQUE	**Ensure the mains and data communication cable connectors are dry prior to mating.** Assurez-vous que les connecteurs du câble d'alimentation et de celui de communication des données sont secs avant de les brancher.
⚠ **NOTE** REMARQUE	**Keep the dust caps fitted on connectors when not in use. Never leave an exposed connector.** Maintenez les bouchons antipoussière installés sur les connecteurs lorsqu'ils ne sont pas utilisés. Ne laissez jamais un connecteur exposé.

Model numbers of the form ASM0627-09-N-Cx-O-G-xx have the Hawke FibreEx in-line connector for use in explosive atmospheres. The flying lead from the IRmadilloNA mates with the supplied extension cable.

2.2.1. Connecting the Hawke FibreEx in-line connector

- Unscrew the cap on the end of the connector.
- Align the key on the connector with the keyways in the corresponding connector
- Mate the two connectors together
- Rotate the shell secure and complete the connection
- Check that the green and orange lights on the controller are present (Figure 5)

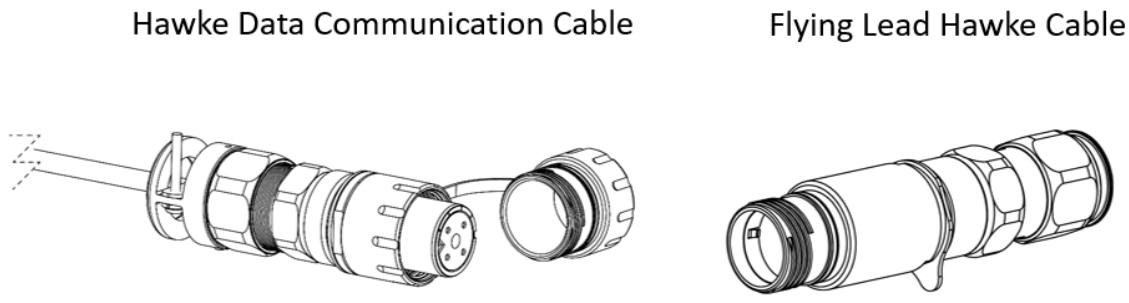


Figure 3 Hawke in-line plug and socket

The extension cable is terminated with a Souriau UTS-LC in-line plug.

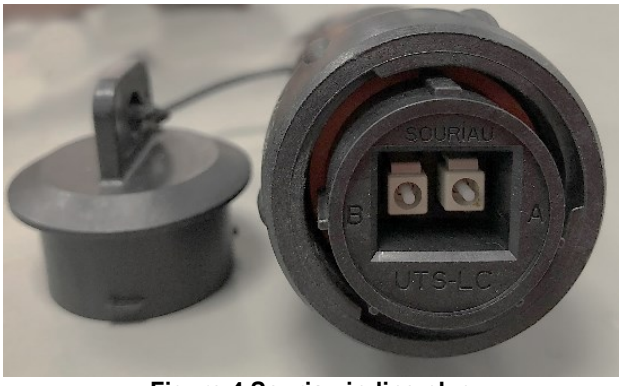


Figure 4 Souriau in-line plug

2.2.2. Connecting the fibre data communication cable to the controller

- Remove the dust cap from the data communication cable.
- Carefully match up the data communication cable with the corresponding port on the back of the controller.
- Tighten the locking nut. This will make a secure connection.
- Check that the green and orange lights on the controller are present (see image).

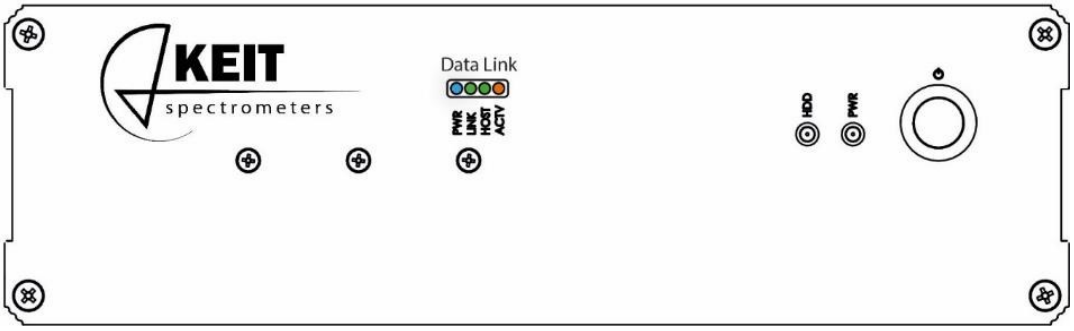


Figure 5: Front panel of Keit controller

⚠ **NOTE** REMARQUE	**Protect the data communication fibre from stress and tight bends (< 80mm bend radius not allowed!). Tight bends cause a stress at the glass surface and increase the probability of fracture.** Protégez la fibre de communication de données des contraintes et des courbures serrées (rayon de courbure < 80 mm interdit!). Les courbures serrées provoquent des contraintes à la surface du verre et augmentent la probabilité de fracture.

2.3. Installation best practice

Having cleaned the probe and taken a background spectrum, the IRmadilloNA is ready to be inserted into the reaction/process of interest.

Probe installation is unique for each application. Safe installation of the probe into the process is the responsibility of the user and should be assessed by a suitably trained person.

Please refer to the interface drawings of your probe and mounting system for further guidance. If you have not been provided with interface drawings, please contact support@keit.co.uk.

To ensure success with installs, it is important to consider the following requirements:

- The IRmadilloNA needs to be suitably supported. The weight of the instrument is ~18 kg, and it must be supported using the mounting points at the base, either through a custom stand or using a Keit Cradle. The probe should not be used to support the instrument.

- The body of the IRmadilloNA should not be placed in direct sunlight or near a heat source. The instrument has internal temperature control, but this rating is limited and model dependant. Direct heat sources can force the instrument beyond its operating range and cause damage.

- The IRmadilloNA must be axially restrained when in the flow. Pressure on the probe will cause the system to move if not properly restrained along the probe's axis.

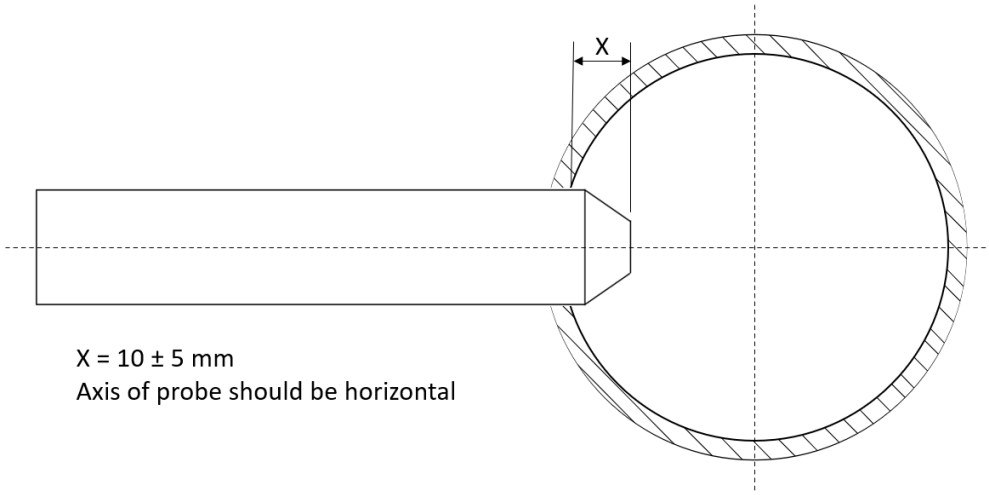


Figure 6: Probe immersion depth in pipework

- The central axis of the probe must be in line with the centre of the pipework.

- The probe must be aligned correctly with the port in which it is placed. It should not be forced or bent into place as this will cause damage to the instrument.

- The nominal position of the probe end from the internal pipe wall is 10 ± 5 mm.

- The IRmadilloNA must be exposed to the flow when in operation. The probe tip must be positioned in the flow within the pipeline or vessel to perform correctly; turbulent flow is desired. If the tip is held in stagnant chemistry, building representative chemometric models will not be possible.

- It is preferable to mount the IRmadilloNA with the probe positioned horizontally. Mounting the IRmadilloNA with the probe pointing downwards risks the formation of bubbles on the ATR element, and prevents the ATR from coming into full contact with the analyte to correctly analyse the process liquid.

- Similarly, avoid mounting the IRmadilloNA with the probe pointing upwards. If there are any suspended solids in the mixture, there is a risk of these solids settling on the probe tip, which may result in the spectra not being representative of the process liquid.

- The IRmadilloNA body should not be placed directly in caustic or acidic environments. The body is made from aluminium and will break down.

3. MAINTENANCE

There are no user-serviceable parts inside the IRmadilloNA. Please contact Keit or our local agent to arrange service or repair. Service should only be performed by suitably trained engineers.

3.1. Service and support contacts

Website: www.keit.co.uk

Postal address: Keit Ltd.
Unit 4, Zephyr Building
Eighth Street, Harwell Campus
Didcot
Oxfordshire
OX11 0RL
United Kingdom

Telephone number: +44 (0) 1235 431260

Support email: support@keit.co.uk

3.2. Maintenance & support programme (MSP)

The MSP is for those customers who purchase an IRmadilloNA and want the assurance that their instrument will receive regular system maintenance to operate smoothly and uninterrupted. The service package provides a comprehensive set of health checks, upgrades and remote support to keep the IRmadilloNA functioning at the highest level.

Keit requires access to the Spectrometer User account on the controller in order to provide remote support. If this is not possible, any issues will require the system to be returned to Keit for diagnosis.

For more information about our maintenance & support programme contact Keit using enquiries@keit.co.uk.

4. COMPONENTS

This section contains general information about the IRmadilloNA spectrometer, such as the constituent components and internal controller specifications.

4.1. IRmadilloNA spectrometer

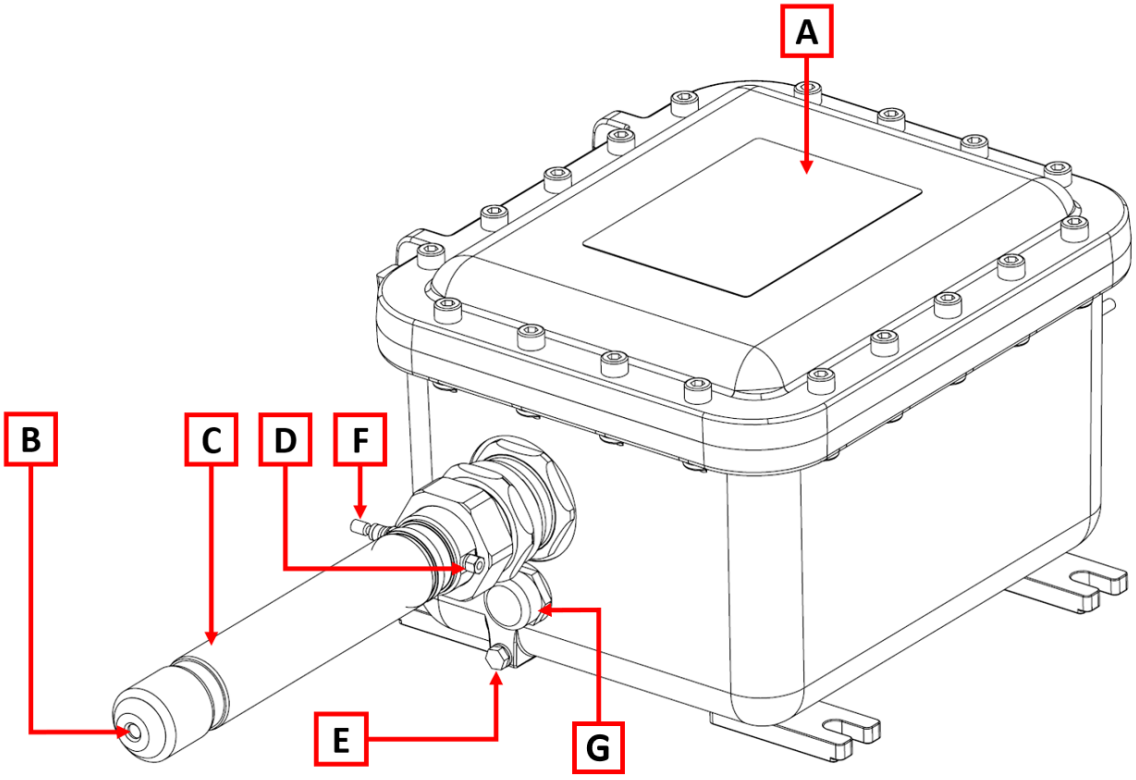


Figure 7: ASM0627-09-N front and top of the instrument

(A) Product label

The product label specifies the model of instrument with permissible environmental and analyte operating conditions, along with applicable certification. Particular attention should be given to the rated pressure and temperature limits.

(B) ATR element

The diamond ATR element is located at the end of the probe.

(C) Probe

The probe is designed to be installed directly into a reaction vessel or pipe and is made of a corrosion-resistant metal.

(D) Probe (gas) purge outlet

Allows purge gas to escape the probe. There is a single outlet located on the probe for all purge gas to escape.

(E) Earthing point

The spectrometer body has an M6 earth attachment point below the probe. This can be used where local codes require it in addition to earthing through the power supply cable.

(F) Probe Purge inlet

The probe purge inlet is used to purge the probe only. The connection is a 4mm or 5/32” Legris push-fit fitting typically fitted with a blanking plug that will need to be removed to allow connections. Rigid or fixed piping may be used if the fitting is compatible and mechanical stress is avoided.

(G) Body (gas) purge outlet

Allows purge gas to escape the spectrometer body. There is a single outlet located beneath the probe for purge gas to escape.

More detail on how to purge the instrument is given in DOC1049R.

⚠ **WARNING** AVERTISSEMENT	**Failure to properly earth the spectrometer may cause serious injury or death.** Une mise à la terre incorrecte du spectromètre peut causer des blessures graves, voire la mort.

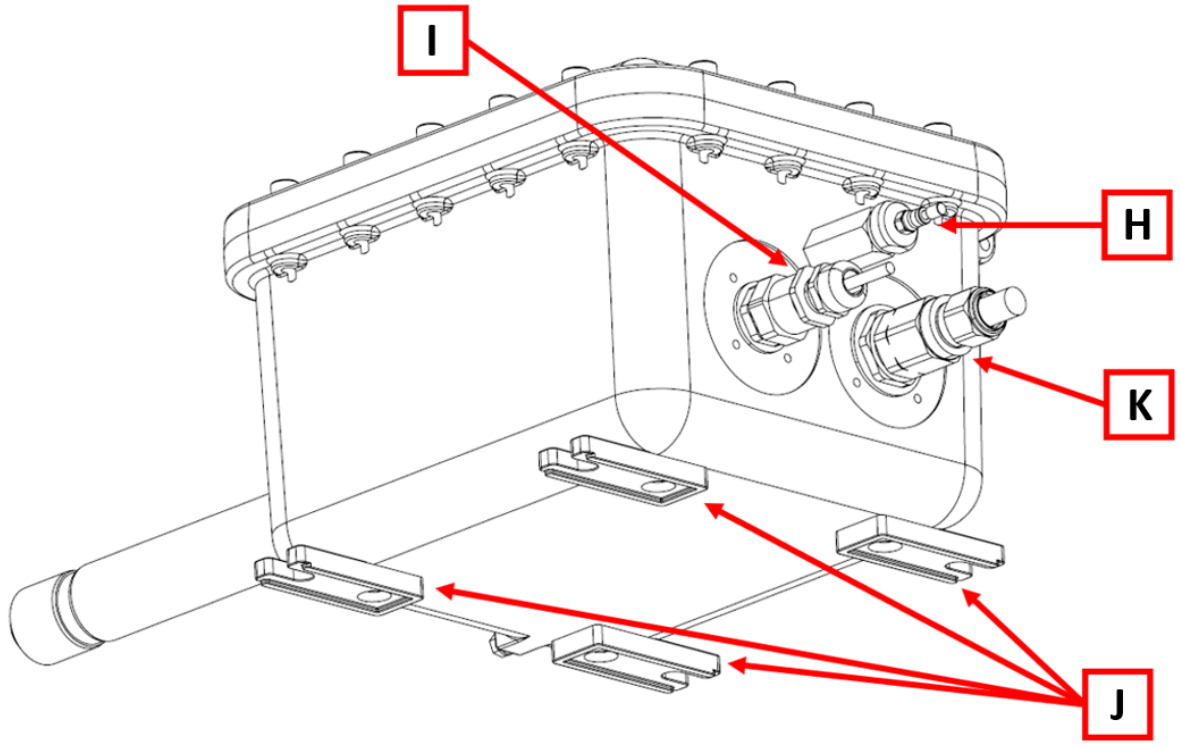


Figure 8: ASM0627-09-N back and base of the instrument

(H) Body Purge inlet

The spectrometer purge inlet is used to purge the spectrometer body. The connection is a Legris push-fit fitting typically fitted with a blanking plug that will need to be removed to allow connections. Rigid or fixed piping may be used if the fitting is compatible and mechanical stress is avoided.

More detail on how to purge the instrument is given in DOC1049R.

(I) Communication gland

This is the connection from the spectrometer to the controller. More detail on how to connect using the cables is given in section 2.2, *How to connect data communications*. The spectrometer is configured to accept a fibre-optic data cable and is fitted with a cable gland.

(J) Mounting holes

The spectrometer must be supported using the four M8 mounting holes in its base. Optional feet are provided (shown attached in Figure 8).

(K) Power cable gland

This is the mains power connection to the spectrometer. More detail on how to connect power to the spectrometer can be found in Section 2.1,Powering the IRmadilloNA.

4.2. Controller specifications

Table 3 - Specifications of the IRmadilloNA controller

Category	Specification
Controller	The controller has been optimised for the rugged operation of the IRmadilloNA spectrometer; it is not a general-purpose personal computer. Keit does not recommend the installation of additional software; changes to the configuration may affect performance and reliability.
User accounts	There are two user accounts, one with system administrator privileges and a second ‘standard’ user. The standard user account starts automatically and is the default account for the KeitSpec software application. The system administrator account is provided to make changes to the operating system configuration and install additional software, if required. If providing Keit remote access to the controller, the connection should be to the ‘standard’ Spectrometer user account.
Windows updates	The controller is running Windows 10 LTSC with automatic updates disabled by default. The local administrator should choose when/if to update the operating system. A strategy will be required to manage updates, particularly if the controller is connected to a network.
Anti-virus	There is no anti-virus installed. The controller should only be connected to internal, protected networks. Install your preferred anti-virus if required

For detailed information on the controller, see Appendix 1: *Controller Specifications*.

5. WELDED HUB FOR LAP JOINT FLANGE OPTION

A version of the IRmadilloNA is available to allow connection to process pipework with an ANSI/ASME B16.5 (other options available on request) compliant flange. A hub is welded to the wall of the probe and a compatible lap-joint flange is mounted between the hub and spectrometer body to permit clamping to process pipework. For technical drawings, contact Keit at support@keit.co.uk.

It is important to follow these instructions completely to ensure safe use of the flanged probe.

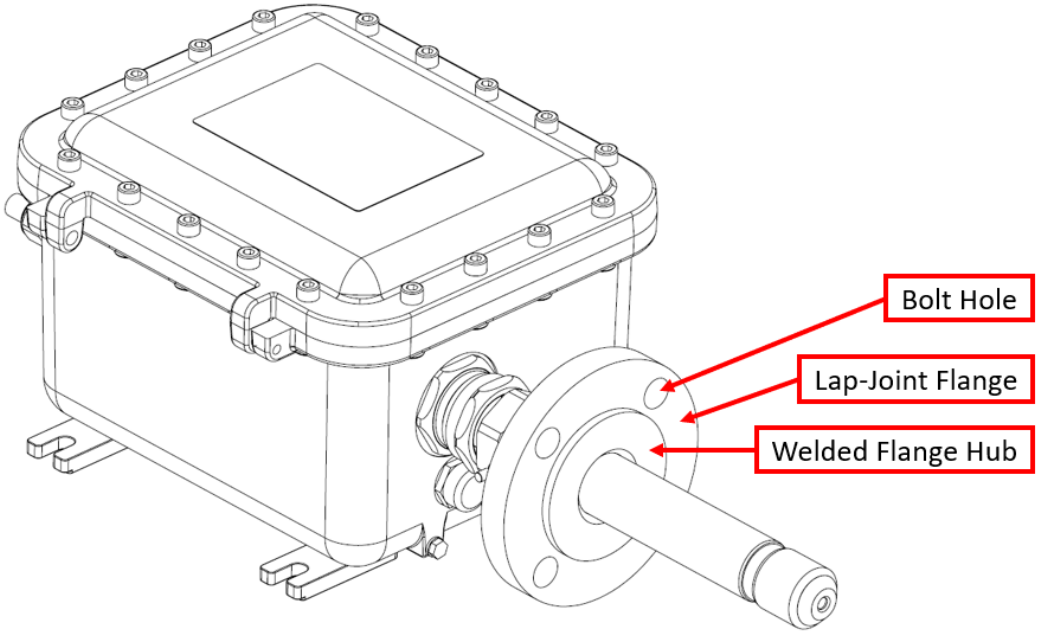


Figure 9: Welded hub for lap joint flange

5.1.1. Safety

⚠ **WARNING** AVERTISSEMENT	**The flange and hub form a seal with the process pipework and as such are safety critical to prevent an accidental discharge of the process media. Keit recommends regular inspection of the integrity of the welds on the front and rear in line with local safety procedures.** La bride et l'écrou constituent un dispositif d'étanchéité avec le raccord de tuyauterie de processus pour prévenir tout déversement accidentel du fluide de processus. Keit recommande une inspection régulière de l'ensemble des soudures de l'avant et de l'arrière en conformité aux procédures de sécurité locales.
⚠ **CAUTION** MISE EN GARDE	**The spectrometer weighs ~18kg. The flange must not be used to support the instrument on process pipework. Doing so risks damage to the spectrometer and excess stress on the piping system.** Le spectromètre pèse environ 18 kg. La bride ne doit pas être utilisée pour supporter l'instrument sur le raccord de tuyauterie de processus. Cela risque d'endommager le spectromètre et d'imposer une charge excessive à la tuyauterie.

⚠ **WARNING** AVERTISSEMENT	**Pipe flanges' permitted working pressures are temperature dependent in accordance with the relevant standard (ANSI/ASME B16.5 or EN 1092-1).** Les pressions fonctionnelles admises des brides de tuyauterie varient selon les températures, conformément à la norme pertinente (ANSI/ASME B16.5 ou EN 1092-1).

Table 4 - Specifications and safety limits (welded flange probe)

Parameter	Welded Flange Probe
Pressure	This is limited by the ASME B16.5-2020 Pipe Flanges and Flanged Fittings Standard. Pressure derated with temperature.
Analyte Temperature	Refer to IRmadilloNA product label
Probe Body Material	Hastelloy C276
Welded-Hub Material	Hastelloy C276
Lap-Joint Flange Material	Hastelloy C276 or stainless steel
Gasket Material	Customer supplied. Material must be to specification of standard ANSI B16.21 or EN equivalent
Port Size	Nominal pipe size: 2 inches

5.1.2. Installation

The sealing face on the probe requires a gasket to mate against the flange on the process pipework. The gasket material must be chosen to be compatible with the pressure and temperature range of the process media and must be chemically compatible.

⚠ **WARNING** AVERTISSEMENT	**Choice of gasket material must be appropriate for the chemistry and process being used.** Le matériau du joint choisi doit être approprié pour le produit chimique et le processus utilisés.

The probe body and hub are manufactured from Hastelloy as standard, which is resistant to many aggressive chemicals. **However, you are advised to check with Keit before installing on a new process.**

Before beginning installation, ensure that the gasket is in good condition and that the sealing faces are not scratched or dented.

Support the spectrometer on a suitable mounting frame that aligns the probe with the flange port that it will be fitted to. Avoid applying stress to the probe, weld, or flange by ensuring that the sealing face of the hub sits flush against the gasket and sealing face of the mating flange before fitting any mounting bolts to the flange.

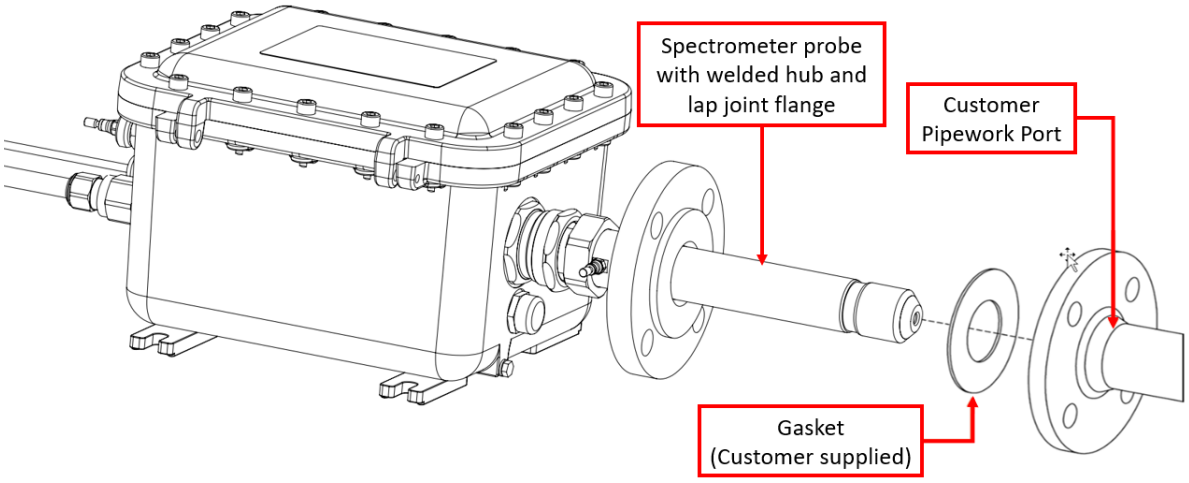


Figure 10: Fitting a flanged probe to process pipework

Once the spectrometer is aligned with the port, fit appropriate bolts as specified in the relevant standard, and tighten in stages in the order shown below.

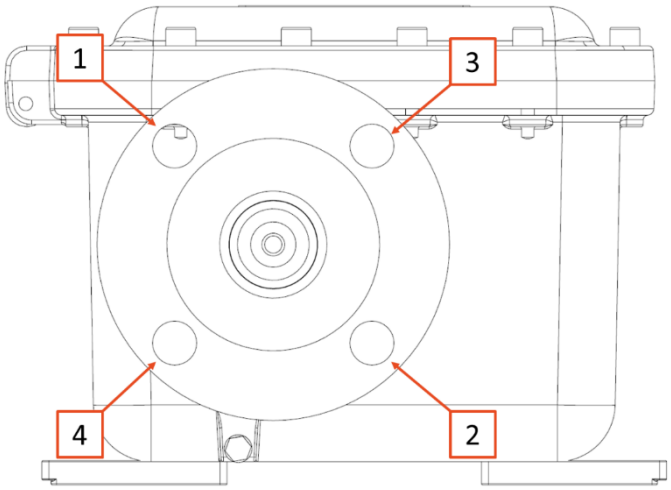


Figure 11: Front view of lap-joint flange, hub and bolt holes. Tighten bolts in steps in order 1-2-3-4 to ensure even compression of the gasket

Ensure that the bolts are sufficiently tight to prevent a leak from your pipework.

5.1.3. Maintenance

Keit recommends regular inspection of the integrity of the welds on the front and rear in line with local safety procedures.

Inspection of the sealing weld will require removal of the flange and spectrometer from the pressure vessel and can be completed as part of regular inspection/maintenance of the spectrometer and pipework.

Do not use impact (e.g. a hammer) to separate components if the gasket becomes stuck to the flange and hub.

The lap-joint flange may be manufactured from Hastelloy or stainless steel. Care should be exercised to ensure that it is not corroded by aggressive chemicals during maintenance or installation.

6. TROUBLESHOOTING

If you encounter any issues either during installation or during use of the IRmadilloNA please contact Keit (support@keit.co.uk).

Below are some examples of issues that may be experienced with potential solutions to the problem.

Table 5 – Troubleshooting guide

Issue	Cause	Potential Solution
Software cannot connect to spectrometer	No power to spectrometer	Check mains power connection
	Fibre-optic link issue	Check integrity of the fibre-optic link, remake the fibre-optic connections or clean the fibre-optic connectors
Insensitive to analyte changes	ATR element not in sample	Ensure ATR element is properly immersed in sample to be analysed
Noise in spectra that doesn't disappear with longer sampling times	Background scan taken with insufficient averaging	Experiment with increased background scan acquisition time
Negative peaks in spectrum	Background scan taken with a dirty probe	Clean ATR element and take a new background scan.
Signal too noisy	Insufficient averaging	Experiment with increased averaging
Low / No signal	Instrument warming up	Allow the instrument to warm up for several minutes before checking raw spectrum. Recommended to allow 12 hr to fully warm up before use.
	Switch on from a very low or a high temperature	Allow to warm up for 12 hr before checking raw spectrum. It will take time to stabilise the internal temperature and you must wait for this to occur.
	Thermal shutdown activated operation outside of specification.	Contact Keit for advice on resetting the instrument
Appearance of unexplained features (characteristically seen at 1600 – 1700 cm^{-1})	Water vapour present in instrument	Check that your purge gas specification is suitable and that your gas supply is free flowing with no blockages
		Check that any purge tubing is stainless steel or PTFE

Issue	Cause	Potential Solution
Unrepeatable measurements	Damage to ATR element	Contact Keit
	Contamination of ATR element	Clean the probe. Refer to DOC1049R.
	Dip probe misaligned by inappropriate use	Contact Keit
	Analyte temperature changes	Some cross sensitivity is expected

APPENDIX 1: Controller Specifications

Physical details

Parameter / Feature	Description
Dimensions	See drawings below Optional mounting adaptors are available to fit a 2u 19” rack.
Operating Environment	The controller must be operated in a safe, non-hazardous environment. • $T_{ambient}$: 0°C to 50°C • Relative humidity: 5% to 90% at 25°C
Monitor Resolution	The recommended monitor resolution is 1280 x 1045 pixels or higher.
Mains Power	90 to 264 Volts AC, 47 to 63Hz Power consumption 20W (internal power supply rated to 60W)
Communications Link	Data communications between controller and spectrometer are through a multimode duplex fibre-optic lead with dual LC connectors available from Keit. The maximum possible length is determined by the fibre optic cable type used: Type OM1 (62.5/125µm): max length 275m Type OM3 (50/125µm): max length 500m Keit offers an optional OM3 extension with ASM0627-09-x-Cx-O-G-Dxx.

Depth

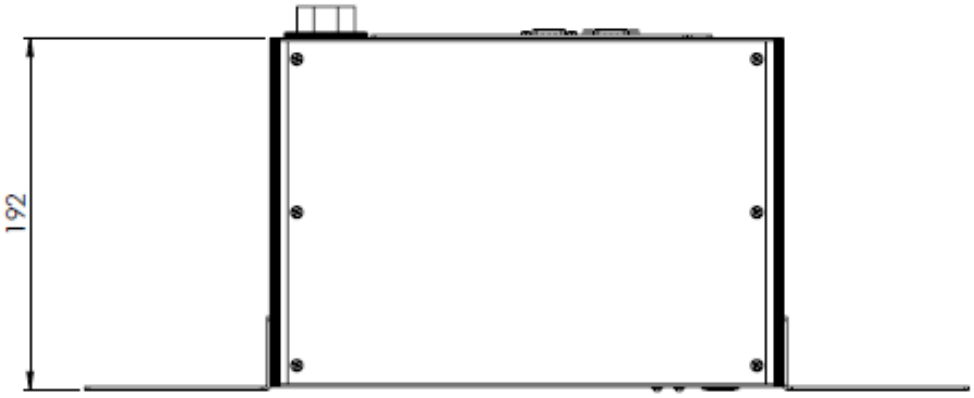


Figure 12 Plan view

Front panel

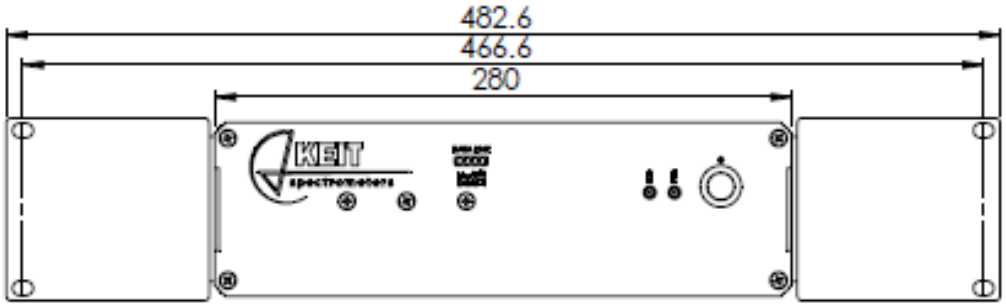


Figure 13 Front panel view

Indicator Label	Function
HDD	Hard Disk Drive active
PWR	Power ON
DATA LINK: PWR	LED blue when power is ON LED off when no power supplied
DATA LINK: LINK	LED green when fibre-optic link is established between controller and fibre-optic converter
DATA LINK: HOST	LED green (continuous) when fibre-optic converter is recognised by the controller LED green (blinking) when in suspend state
DATA LINK: ACTV	LED amber (flashing) when data transmission is active between fibre-optic converter and spectrometer LED off when in suspend mode

Rear panel

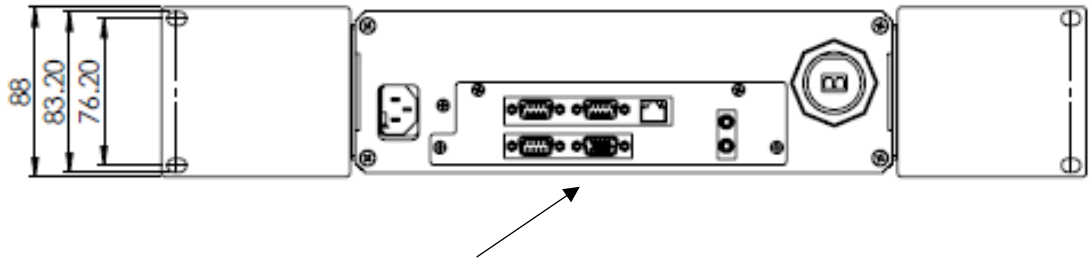


Figure 14 Rear panel view with blanking plate in position

Connections available:

- HMI: 1x VGA, 1x HDMI, PS2 keyboard, PS2 Mouse, Mic-in & Line-out
- USB:4 (2 x USB3.0, 2 x USB2.0)
- Networking: 2 x Gigabit LAN / Ethernet
- Serial Data: 3 x RS232/422/485 COM ports
- Mains Power

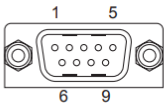
Information for Fibre Optic Patch Panel

The fibre-optic connectors are LC connectors manufactured by Souriau. If you wish to make a patch panel then a duplicate set of these will be required:

Existing Jam Nut Receptacle on rear of controller	UTS718LCN
New Required Plug	UTS6-JC18LCN

Wiring Pin Out for COM Ports

The COM ports are terminated with standard 9-way male D-sub Connector Plugs. The COM ports are configured in the BIOS by default to RS485 (RS232 and RS422 is available if required).



Pin	RS232	RS422	RS485
1	DCD	TX-	RTX-
2	RXD	RX+	N/A
3	TXD	TX+	RTX+
4	DTR	RX-	N/A
5	GND	GND	GND
6	DSR	N/A	N/A
7	RTS	N/A	N/A
8	CTS	N/A	N/A
9	COM1: +5V/+12V/+5VSB COM2, 3: +5V/+12V	COM1: +5V/+12V/+5VSB COM2, 3: +5V/+12V	COM1: +5V/+12V/+5VSB COM2, 3: +5V/+12V