



Installation Manual

Fuel Gas Analyser



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Fuel Gas Analyser

The purpose of this installation manual is to provide the information required to install FGA in a safe and efficient manner.

This manual is intended for personnel performing the installation. The information supplied shall be used as basis for the installation contractor's own drawings applicable to the ship/plant. On completion of the installation, this manual must be kept on the ship/plant for reference purposes during system maintenance.

Revision status

Revision	Date	Prepared	Checked	Approved
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Document history

Revision	Reason for issue
Rev. 01	First issue. Document renamed from NA-E-INS-121-01.
Rev. 02	Section 9 updated
Rev. 03	Drawings added in section 9.

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Important

Before using the equipment, read all instructions thoroughly and follow all precautions and warnings contained within this document. Improper use may cause personal injury and/or damage to the equipment and may void the warranty. Norsk Analyse disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

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Acronyms and abbreviations

CO ₂	Carbon dioxide
DWG	Drawing
FGA	Fuel Gas Analyser
GA	General Arrangement (Drawing)
N ₂	Nitrogen

Admonitions

<i>Note</i>	<i>Text set off in this manner presents clarifying information or specific instructions relevant to the immediate instruction.</i>
<i>Caution</i>	<i>Text set off in this manner provides a warning notice that failure to follow the directions in this caution can result in damage to equipment.</i>
Warning	<i>Text set off in this manner provides a warning notice that failure to follow the directions in this warning can result in bodily harm or loss of life and/or extensive damage to equipment.</i>
DANGER	TEXT SET OFF IN THIS MANNER PROVIDES A WARNING NOTICE THAT FAILURE TO FOLLOW THE DIRECTIONS IN THIS WARNING WILL RESULT IN BODILY HARM OR LOSS OF LIFE AND/OR EXTENSIVE DAMAGE TO EQUIPMENT.

1 Introduction

1.1 Purpose

The purpose of this installation manual is to provide the information required to install Fuel Gas Analyser, FGA, in a safe and efficient manner.

The FGA analyse hazardous sample gas and is therefore under ATEX regulation.

This manual is intended for personnel performing the installation. The personnel must knowledge of the ATEX directive as well as local ATEX regulation. The information supplied shall be used as basis for the installation contractor's own drawings applicable to the ship/plant.

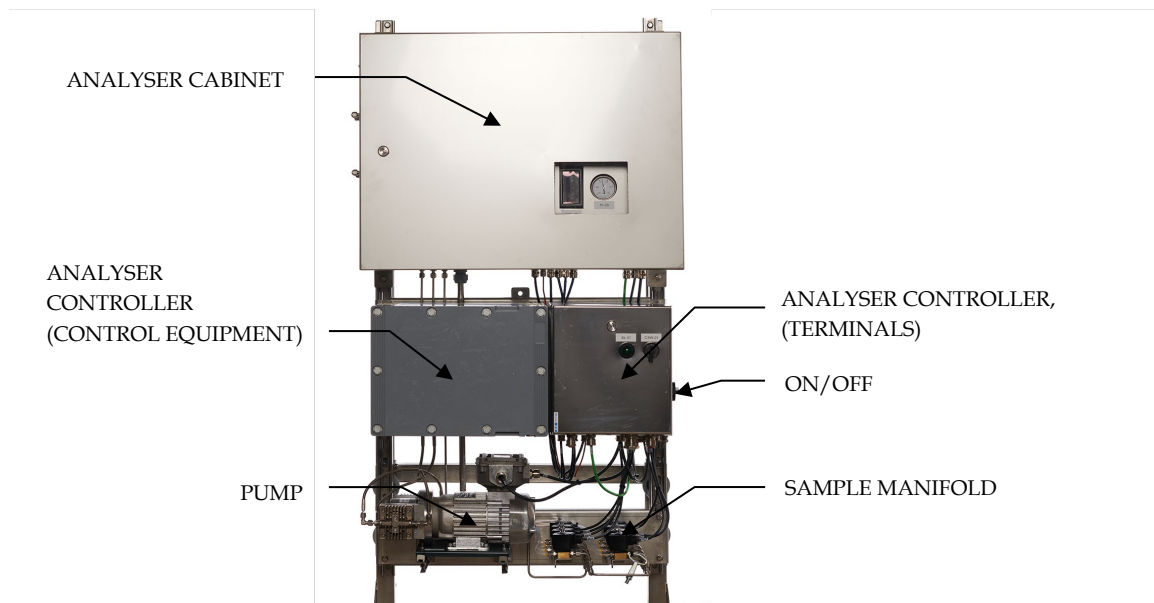


Figure 1 FGA main parts

1.2 Scope of supply

The FGA consists of the following main units:

- Analyser cabinet with analyser module
- Analyser controller
- Pump
- Manifolds with 8 solenoid valves

1.3 Scope conditions

The installer performing the installation becomes fully responsible for the FGA equipment upon receipt unless otherwise stated in the contract. The duration of responsibility includes:

- The time the equipment is stored locally before installation.
- During the entire installation process.
- While commissioning the equipment.
- The time between commissioning and the final acceptance of the equipment by the ship/plant owner.

Note *Prior to installation, check all units for damage as described in the chapter 4.*

Note *Installation check list needs to be signed and sent to Norsk Analyse in order to obtain guaranty of the FGA. Refer to section 8.*

1.4 Contact details

For enquiries related to sales, service, support, maintenance, and spare parts, please contact us at:

Norsk Analyse
P.O. Box 2313, 3103 Tønsberg, Norway

www.norskanalyse.com

Phone: +47 3337 5100

Fax: +47 3337 5149

Support: support@norskanalyse.com

Service: service@norskanalyse.com

Spare parts: marine@norskanalyse.com

2 General safety rules

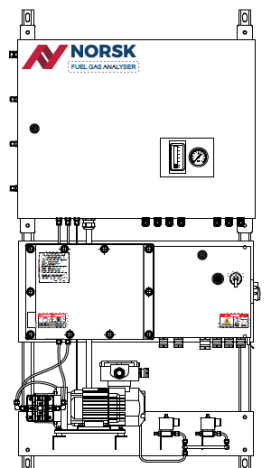
Safety precautions must always be followed during installation, operation and maintenance of the system. Personnel shall be sufficiently qualified, and proper caution shall be taken to avoid injuries or damage to life, health, environment, equipment and property.

Warning Only ATEX trained personnel are allowed to install the FGA!

2.1 Explosive atmosphere

The workplace is potentially explosive due to the presence of sample gas that are likely to ignite or explode.

The ATEX directive is minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres. Personnel installing or working with the FGA must have knowledge of the ATEX directive and local ATEX regulations.



DANGER FAILURE TO FOLLOW THE DIRECTIONS IN THESE WARNINGS CAN RESULT IN BODILY HARM OR LOSS OF LIFE AND/OR EXTENSIVE DAMAGE TO EQUIPMENT.

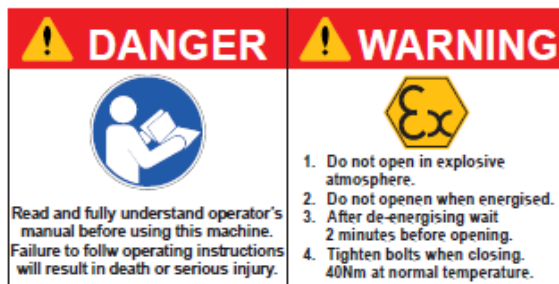


Figure 2 Analyser controller left side (control equipment)

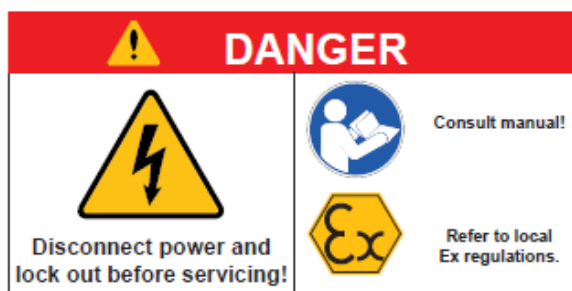


Figure 3 Analyser controller right side (terminals)

2.2 High voltage

Warning *FGA operates at a potentially lethal AC voltage.*

Always switch off all power before installation or maintenance. Adhere to safety precautions and instructions as directed by company policy. For safety reasons during troubleshooting on the equipment with power ON, two persons must always be present.

Whenever installation or maintenance is carried out, it is essential that a first aid kit is available, and that personnel are familiar with the first aid instructions for electrical shock.

2.3 Hazardous components

Warning *Many toxic gases are colourless, odourless, and non-irritating, and may overcome exposed persons without notice.*

The sample gas may contain trace amounts of hazardous components. Personnel should have a thorough knowledge and understanding of the physical properties and safety precautions for the relevant gas samples before operating the system.

Nitrogen is used for zero gas and for solenoid valve. If any leakage occurs, it can be potentially lethal to be in a small, confined space, since the nitrogen is odourless and colourless.

Make sure the ventilation is good especially if the analyser cabinet is in a small room. Ensure that gas has access to free air.

Norsk Analyse recommends using oxygen detector to warn if oxygen levels are too low.

2.4 Heavy equipment

The cabinets are heavy units. Do not open cabinet doors while in rough seas. Doors may suddenly swing open and cause damage or injury.

Use appropriate safety clothing and certified lifting equipment during installation or replacement of larger units!

3 System description

3.1 Name plate and markings

1. Fuel Gas Analyser logotype
2. Name plate with CE marking
3. ATEX sign for analyser controller
4. Warnings for analyser controller left side. Refer to Figure 2.
5. Warnings for analyser controller right side. Refer to Figure 3.

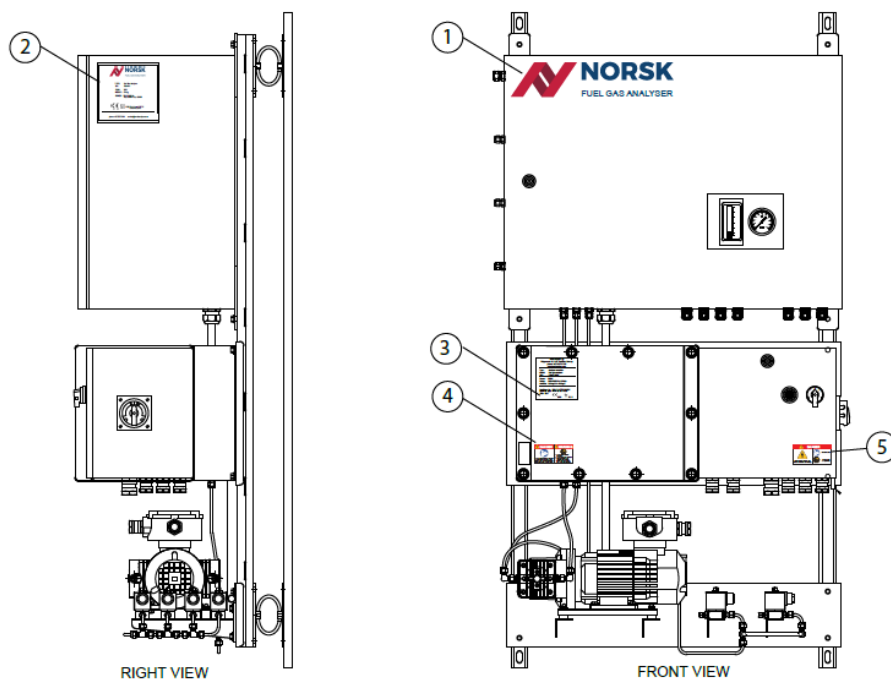


Figure 4 Name plate and markings

3.2 System overview

The main purpose of the FGA is to analyse the calorific value of the LNG sample gas.

The standard FGA consists of the following main units:

- Analyser cabinet with analyser module
- Analyser controller
- Pump
- Manifolds with 8 solenoid valves

Note *Equipment provided locally by the installation contractor or by local dealers is not described in this manual.*

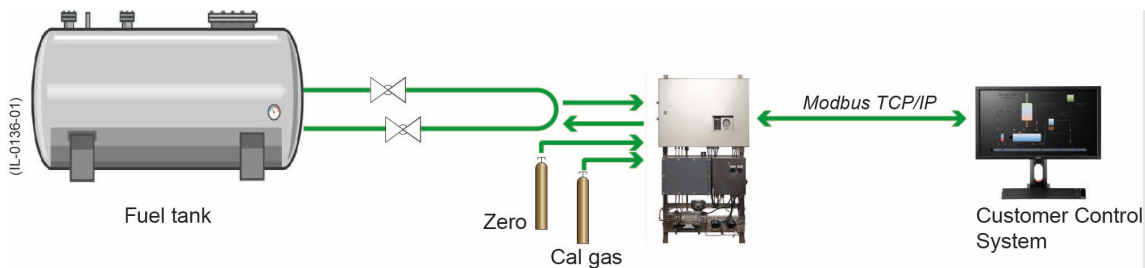


Figure 5 Block diagram for FGA

3.3 Sample and calibration gas flow

Refer to the following drawing:

→ [FGA-3001] SYSTEM DIAGRAM FUEL GAS ANALYSER

The system is type approved for ambient temperature: -25°C to + 45°C. The gases must be within this range.

Sample gas enters in nozzle X5 and pressure is reduced to 0.12 bar before entering the analyser.

Span gas for calibration enters in nozzle X9 and pressure is reduced to 0.1 bar before entering the analyser.

Nitrogen supply is provided by the ship/plant. It is connected to the analyser cabinet in nozzle X6. It supplies both the analyser module with zero gas and the solenoid valves with gas for operating the valves. For zero gas pressure is reduced to 0.1 bar before entering the analyser. For the solenoid valves pressure is reduced to 4 barg.

Instrument air can be used for the solenoid valves, but re-construction of system is then necessary. Quality must be ISO 8573-1:2010 [4: 3: 4] or better.



3.4 Power distribution

Refer to the following drawing in FGA Drawing Package: :

- [FGA-5001] TERMINATION DIAGRAM - OVERVIEW POWER & SIGNALS
- [FGA-5002] TERMINATION DIAGRAM 230VAC & 24DC POWER DISTRIBUTION
- [FGA-5004] TERMINATION DIAGRAM - OVERVIEW CUSTOMER CONNECTIONS

FGA requires continuous power supply 230/220VAC, 50/60 Hz to operate.
The minimum requirement for the power feed cables is:

- 230V: 2 x 2.5 mm² + PE (protective earth)

Note *System protective earth cable is min. 4 mm².*

Note *Protective earth bolt M10x30 is torqued to 28 Nm.*

All system units must be connected to a local On/Off two-pole power switch located within a radius of 1.5 metres. All switches must be provided by the installation contractor. External power must be locked out before installation.

Warning ***Use the appropriate circuit breaker in the ship/plant's switchboard and label the breaker with a warning sign informing that installation work is being carried out. Inform installer before connecting the external power.***

The circuit breaker label can only be removed after all power and signal interfaces have been connected.

3.5 Signal distribution

Refer to the following block diagrams in FGA Drawing Package for overview:

- [FGA-5003] TERMINATION DIAGRAM SIGNAL DISTRIBUTION
- [FGA-6002] SYSTEM BLOCK DIAGRAM - SIGNAL AND POWER - FUEL GAS ANALYSER

Cable glands for signal are EMC type to reduce disturbance on signal.

4 Equipment handling

This chapter describes the equipment handling procedures needed for the installation contractor to evaluate the equipment dispatch and to make plans for receipt, storage, and installation of the equipment.

Note *Failure to adhere to instructions given may render the warranty void.*

Caution *During all stages of equipment handling, including installation, use adequate protective covers to shelter the equipment from falling objects from overhead work or similar.*

4.1 Transportation

Unless otherwise stated in the accompanying documentation, equipment supplied by Norsk Analyse can be transported using all methods approved for fragile equipment. The units must be transported in accordance with general or specific instructions for the appropriate units, using pallets, transport cases or carton boxes as appropriate.

- 1) Always keep the equipment dry and ensure it is sheltered from weather.
All equipment shall therefore be transported below deck for sea transport, and preferably under a canopy for road transport.
- 2) When equipment is marked with text and symbols indicating which way it is to be placed, follow the instructions given.
- 3) Ensure that ambient conditions, such as temperature and humidity, are always within the equipment's specifications.
- 4) Securely restrain the equipment to avoid mechanical damage and injury to the equipment and to personnel.
- 5) Ensure that the equipment will not be subject to shock, excessive vibrations, or other rough handling.
- 6) Handle equipment containing fragile electronic components, such as analyser module, with special care.

4.2 Inspection at receipt

A visual inspection must be carried out immediately after the equipment has arrived at its destination to check for any transport or unloading damages.

- 1) Check all pallets, wooden boxes, plastic bags, and other packing media for physical damage. Look for signs of dropping, immersion in water or other mishandling.
- 2) If damage is detected externally, open the packaging to check the contents. Request a representative of the carrier to be present while opening, so any transportation damage to single units can be identified.
- 3) If any unit is damaged, prepare an inspection report stating the condition of the unit and actions taken. The report shall be sent promptly to Norsk Analyse.
- 4) Check the humidity absorbing material. If required, dry or replace the bags, then repack the units.

4.3 Lifting

The FGA weighs approx. 170 kg. To ensure selecting the correct lifting apparatus, always check the weight of the equipment before attempting to lift it.

Caution *Please handle all equipment with care to avoid damage due to sudden shock or impact.*

- 1) Cabinets and similar equipment packed onto pallets and can be lifted by a forklift or a pallet truck.
- 2) Loose items (if any) can be removed from pallets by hand.
- 3) Analyser cabinet can be lifted in lifting lugs.



4.4 Pre-installation storage

The equipment should be stored in its original transport case until ready for installation. Transport cases must not be used for any purpose for which they were not intended.

It is recommended that the equipment is stored indoors until placed in its intended operating position.

If stored outdoors and exposed to ambient conditions, additional heaters provided by the installation contractor must be used inside cabinets to avoid any vapour to condense in electronic and electrical equipment prior to commissioning and start-up.

- 1) Keep the equipment in a dry, non-condensing atmosphere, free from corrosive agents and isolated from sources of vibration.
- 2) Ensure that the temperature at the storage location is at least +15°C (+59°F) with a relative humidity of 0 to 95 % (non-condensing).
- 3) Carefully unload cabinets onto their foundation or at levelled foundations at the site's storage facilities.
- 4) If stored in a humid environment, ensure that cabinets are heated to avoid failure of built-in sensitive instrumentation, such as analysers. Note that sample probes and similar equipment may be stored in an unheated environment.
- 5) Close all doors and other openings to prevent ingress of dust, dirt and moisture.
- 6) Always lock the cabinets to prevent unauthorised personnel accessing the equipment.

4.5 Unpacking

Normal precautions must be undertaken during unpacking to prevent damage to equipment or to personnel.

It is recommended to store equipment (unless equipment is prepared for immediate use) in its original packing.

Equipment must be installed in its intended operating position as soon as possible after unpacking.

It is crucial for the performance and warranty of the analyser module that it is stored in a tempered and clean environment until commissioning.

- 1) Place the transport case to be unpacked on the floor or on a stable work bench.
- 2) When equipment is marked with text and symbols indicating which way it is to be placed, follow the instructions given.

Caution Use certified lifting apparatus when handling heavy units.

Caution Be careful when working with pallets and wooden boxes. The metal edges of such units may be sharp.

- 3) Check the transport case for signs of dropping, immersion in water or other mishandling.
- 4) Open the transport case using appropriate tools. Open the case carefully to ensure the contents are not damaged.

Caution If a wooden box has been closed using screws, always remove them using a screwdriver. Do not attempt to force the lid off with a crowbar or similar.

Caution Do not use a knife to open cardboard cartons, as the contents may lie close to the surface, and may therefore be damaged by the blade.

- 5) Once the transport case is open, carefully remove all loose packing and insulation material before lifting out and installing the equipment contained. Use lifting lugs when lifting.

Caution Tubing and cable must never be used as carrying handles or lifting points.

Caution Protect pump and manifolds for impact when lifting.

- 6) Also check the transport case for additional equipment that may have been added to the cradle during packing such as manuals, special tools, door keys etc.

5 Technical specifications

5.1 Environmental requirements

FGA is designed to comply with:

- IACS E10 - Test Specification for Type Approval
- IEC 60945
 - Maritime navigation and radio communication equipment and systems
 - General requirements
 - Methods of testing and required test results
- IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code)

5.2 Type approvals

FGA is designed in accordance with the requirements of:

- DNV DNV 21 ATEX 94263X
- Lloyds Register LR2201492TA

5.3 Physical dimensions

Item	Specification
Analyser cabinet	
Dimensions (W x D x H)	800 x 510 x 1550 mm
Weight	170 kg

5.4 Materials

Item	Specification
Cabinets	SS316L
Wetted parts	SS316L

5.5 Ingress protection

- IP65

5.6 Power supply

Item	Specification
Power from switchboard	230/220VAC, 2-phase, 50/60 Hz
Power cable specifications	230V: 2 x 2.5 mm ² + PE

5.7 Power consumption

Item	Specification
Analyser cabinet	1000 W (while running)

5.8 Measuring range

Item	Specification	Accuracy
Methane	0-100%	0.5% Vol
Ethane	0-20%	0.5% Vol
Propane	0-20%	0.5% Vol
Iso-Butane	0-5%	0.2% Vol
N-Butane	0-5%	0.2% Vol
C5 total	0-2%	0.2% Vol
CO2	0-10%	1.0 % Vol
Nitrogen	0-100%	Balance
Calorific Value (GCV) (ISO 6976:2016)		
Methane Number (MN) (ISO 22302:2014)		

5.9 Calibration gas

Item	Specification
Span gas	Hydrocarbon mix. (Design pressure 10 barg.)
Zero gas	97.5% Nitrogen or better. (Design pressure 10 barg.)

5.10 Instrument air (optional)

Instrument air is normally not used.

If nitrogen quality is insufficient, the gas must be supplied on gas cylinder. It is then recommended to connect instrument air for valve gas to save nitrogen for calibration. Request instructions for conversion to air supply.

Item	Specification
Quality	Dry, oil-free according to ISO 8573-1:2010 class [4: 3: 4]: Solid particles (1-5 micron) ≤ 10000 Vapour pressure dew point (atm.) $\leq -20^{\circ}\text{C}$ Total oil (aerosol liquid and vapour): $\leq 5 \text{ mg/m}^3$
Pressure range	8.5 to 10 barg

6 Installation guidelines

The workplace is potentially explosive due to the presence of sample gas that can ignite or explode.

The ATEX directive is minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres. Personnel installing or working with the FGA must have knowledge of the ATEX directive and local ATEX regulations.



DANGER **FAILURE TO FOLLOW THE DIRECTIONS IN THESE WARNINGS CAN RESULT IN BODILY HARM OR LOSS OF LIFE AND/OR EXTENSIVE DAMAGE TO EQUIPMENT.**

FGA is subject for approvals by classification societies. The approval design and verification are obtained according to the latest IACS E10 revision.

As the installation contractor has the final EMC responsibility, the installation contractor must ensure that the installation complies with classification rules. The classification society may also enforce additional requirements influencing the installation. The installation contractor must ensure that the FGA installation complies with any additional requirement defined by the classification society.

FGA must be installed by skilled personnel and be supervised by a technician with relevant experience. Recommendations and requirements for installation of main system items are listed in the following.

Note *Failure to adhere to instructions given may render the warranty void.*

All work shall be carried out in accordance with approved drawings. Therefore, prior to installation, the drawing file prepared by Norsk Analyse shall be consulted.

Note *Detailed plant specific mechanical drawings for the installation must be provided by the installation contractor, or any contractor performing the installation. Norsk Analyse may, on special order, provide assistance to these drawings.*

Note *All physical dimensions in this manual are given in millimetres (metric).*

Caution **Instruments, cables and other electrical equipment must be protected against mechanical damage during installation.**

Observe that the FGA framework structure is of stainless-steel material SS316L. Plan your installation procedures accordingly. Install cabinets (especially analyser cabinet) on reinforced floor/wall or structural beams.

Caution *As instruments are sensitive devices, do not weld onto the FGA framework.*

If planning to install any FGA units outdoors, weatherproof protection must be provided. Also avoid installing in open areas with heavy winds, sea splash zones and other areas not suitable for service and maintenance activities.

6.1 HSSE

Installation personnel must have a solid knowledge of Ex equipment and its dangers.

DANGER ***FAILURE TO FOLLOW THE DIRECTIONS IN WARNINGS CAN RESULT IN BODILY HARM OR LOSS OF LIFE AND/OR EXTENSIVE DAMAGE TO EQUIPMENT.***

Nitrogen is used for zero gas and for solenoid valve. If any leakage occurs, it can be potentially lethal to be in a small, confined space, since the nitrogen is odourless and colourless.

Make sure the ventilation is good especially if the analyser cabinet is in a small room. Ensure that gas has access to free air.

Norsk Analyse recommends using oxygen detector to warn if oxygen levels are too low.

Note *For systems that use instrument air to operate solenoid valve, the zero gas valve can be closed when not used.*

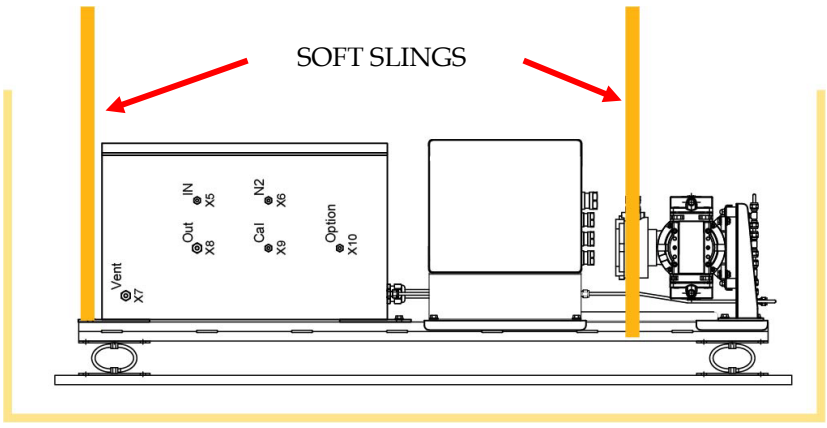
7 Installation procedures


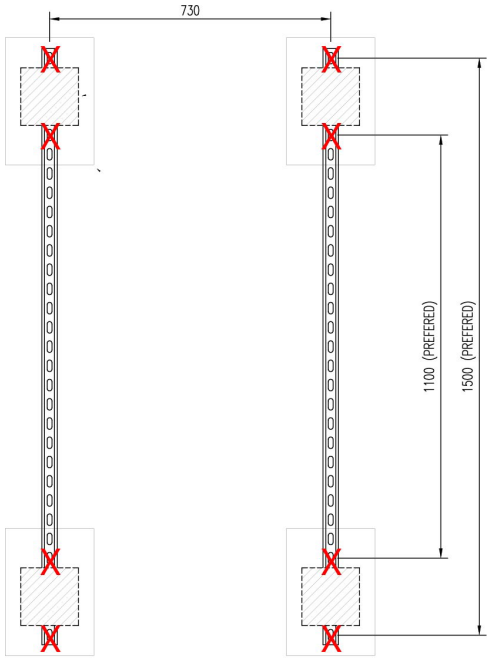

The installation procedures are listed in the preferred installation order. The three sections represents a sequence. Follow the reference in the manual listed to the right.

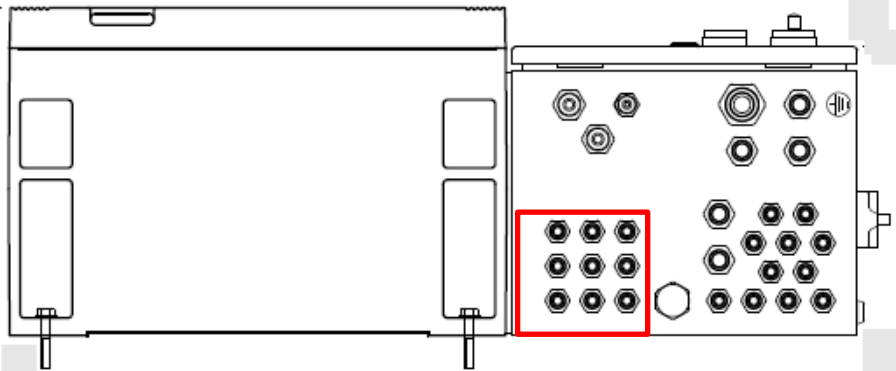
Warning *Outlet gas and calibration gas from cabinet needs to be vented to free air. Nitrogen can cause suffocation and death.*

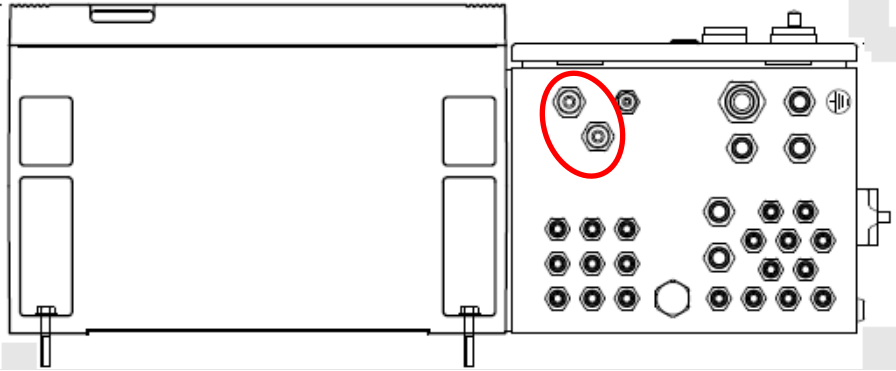
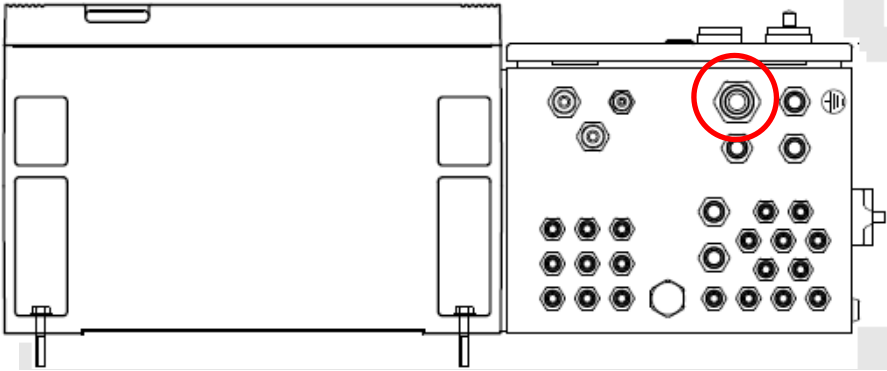
If FGA is installed in a small room, the outlet gas level will increase unless it is vented. For personal safety, ensure the outlet gas has access to free air.

Use portable oxygen meter when in doubt.

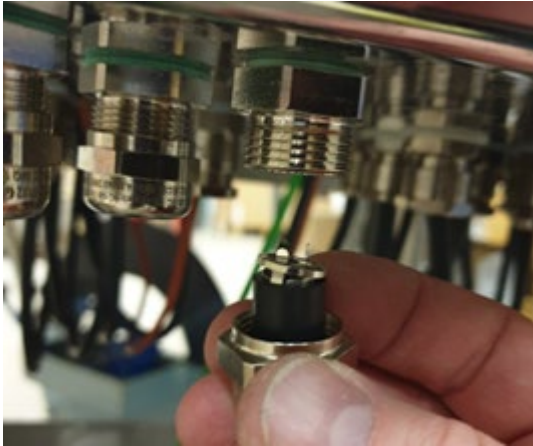


Step	Description	Ref in manual
1.	<p>Lift the assembly gently from the transportation cradle. Use lifting lugs and additional slings around anchor rails. Beware of movements when lifting due to low centre of gravity.</p>  <p style="text-align: center;">SOFT SLINGS</p>	4.3
<p>Caution <i>Do not damage any tubing or other items while lifting.</i></p>		


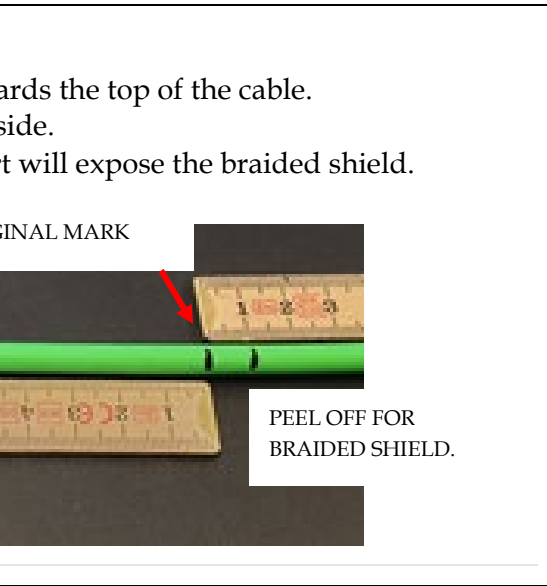

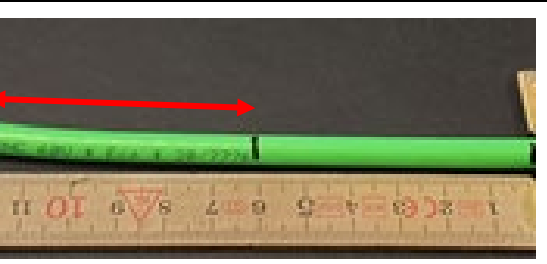
Step	Description	Ref in manual
2.	<p>When the assembly is lifted out of the transportation cradle, raise it vertically (only top sling).</p>	
3.	<p>Mount the assembly in the anchor rails. Use 8x M8 (max M12).</p> <ul style="list-style-type: none"> • M8 inside rail • M10-M12 on top of rail with large washer. <p>Mount above and below the wire dampers. Refer to FGA-2001 in in FGA Drawing Package.</p> <p>Torque to approx. 30 Nm (M12 - 35 Nm).</p>	
4.	<p>Remove plugs at nozzles X5, X6, X7, X8 and X9.</p>	


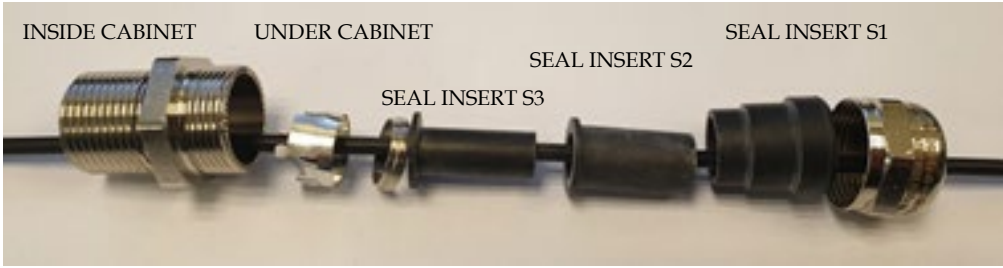


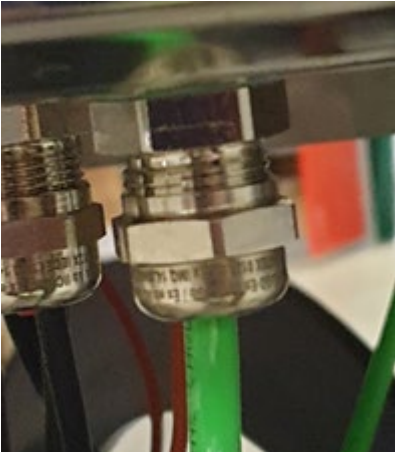
Step	Description	Ref in manual
5.	<p>Connect utilities. Refer to in FGA Drawing Package; FGA-1001, FGA-6002 and FGA-6002.</p> <ul style="list-style-type: none"> • Inlet sample at X5. • Zero calibration and PRV-1 at X7 • Sample outlet at X8 • Span gas at X9. • Nitrogen (N2) at X6 • Optional valve gas (instrument air) at X10 <hr/> <p><i>Caution</i> <i>Adjust span gas pressure to MAX 10 Bar.</i></p>	
6.	<p>Attach earth bolt with 28 Nm. Minimum earth wire is 4 mm². Refer to in FGA Drawing Package; FGA-5004.</p>	
7.	<p>Information: The cables/glands marked below are intrinsically safe. The distance to other cables must be at least 50 mm.</p>  <p>The diagram shows a control panel with various terminals. A 3x3 grid of terminals in the lower-left quadrant is highlighted with a red box, indicating they are intrinsically safe. The panel also features several larger circular ports and other smaller terminals.</p>	

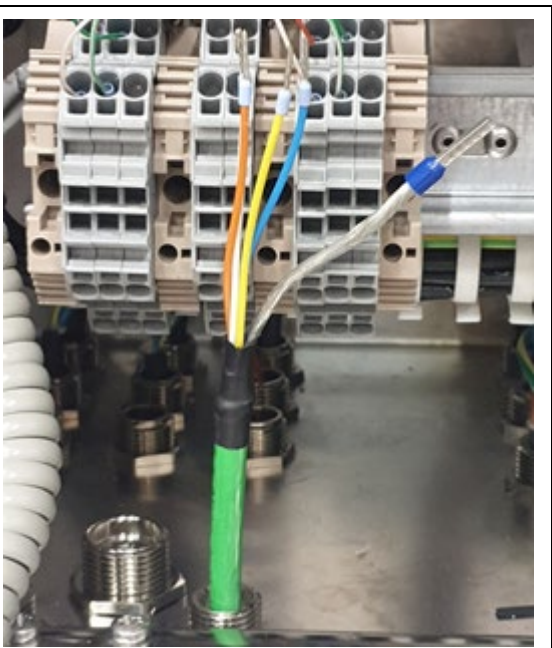
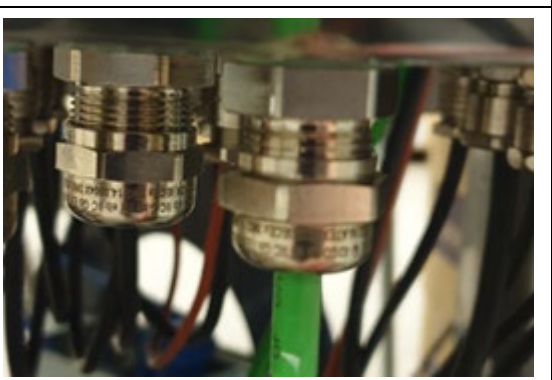
Step	Description	Ref in manual
8.	<p>Connect signal cables. Refer to in FGA Drawing Package; FGA-5001 and FGA-5004.</p> <ul style="list-style-type: none"> • Modbus TCP/IP in one of the M16 EMC • Option Modbus RTU in the other M16 EMC if applicable. <hr/> <p>Caution <i>It is important to use the premounted M20 EMC cable glands. Refer to instruction in section 7.1.</i></p> <hr/>  <p>Analyser controller bottom view.</p>	7.1
9.	<p>Connect power cables. Refer to in FGA Drawing Package; FGA-5001 and FGA-5004.</p> <ul style="list-style-type: none"> • 220-230VAC 60/50Hz • Option vaporiser if applicable. <hr/> <ul style="list-style-type: none"> • <i>If a power cable with smaller diameter is used, there is a spare cable gland (for 9.5 – 15.4 mm) in the installation kit that can be used.</i> <hr/> 	

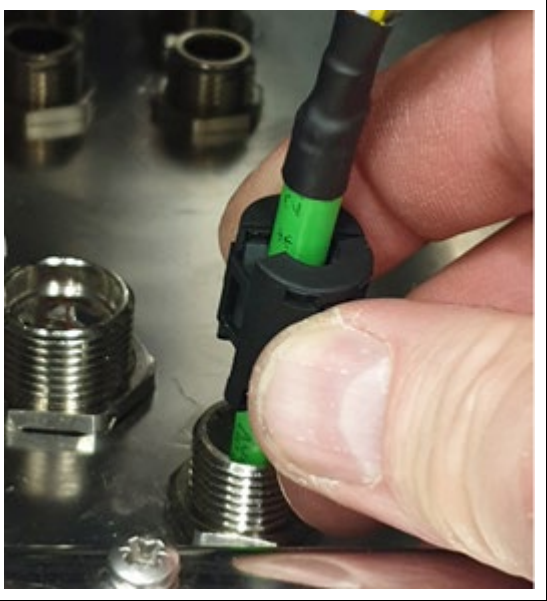
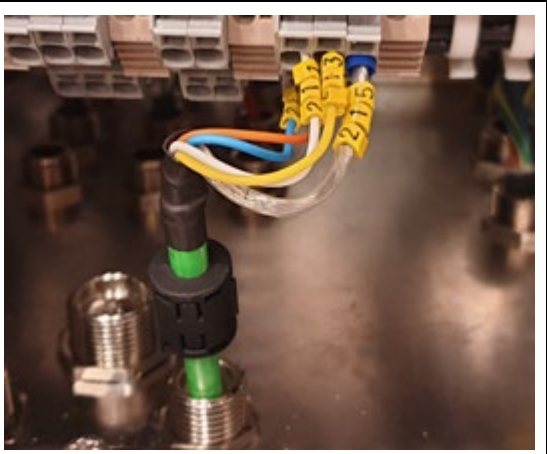
7.1 Assembly instruction for EMC cable gland, signal

Step	Description
1.	<p>Remove the inner pieces the cable gland and put aside.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>ARMOUR GRIP</p>  </div> </div>
2.	<p>Enter the cable in the cable gland hole. Adjust the cable length below the cabinet.</p>
3.	<p>Use a permanent maker and mark at the top of the cable gland. (145330)</p> 

<p>4.</p>	<p>Cut the cable approx. 120 mm from the mark.</p>	
<p>5.</p>	<p>Mark two more lines;</p> <ul style="list-style-type: none"> • 50-60 mm from the first mark towards the top of the cable. This part will expose the cables inside. • 6-10 mm below the mark. This part will expose the braided shield. 	
<p>6.</p>	<p>Peel off for braided shield:</p> <p>Use a knife to cut carefully and peel off outer sheath until the braided shield is visible (between the markings).</p>	
<p>7.</p>	<p>Remove outer shield on top of the cable.</p>	

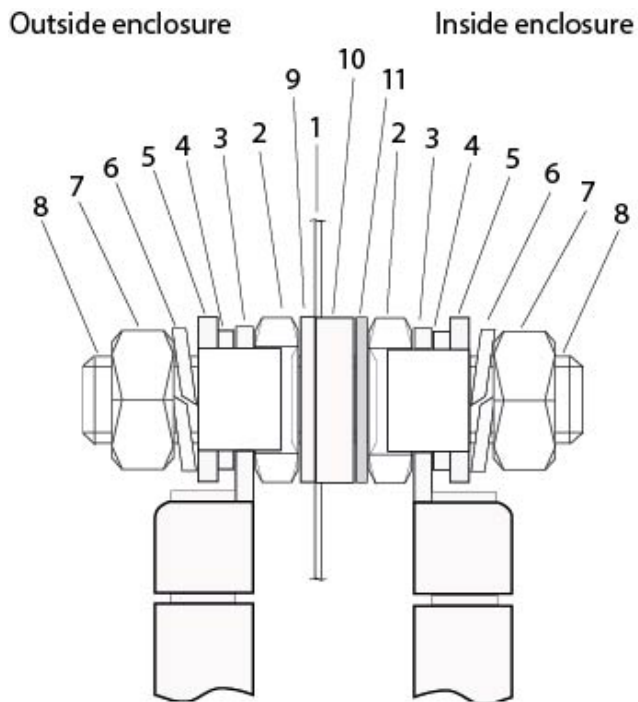
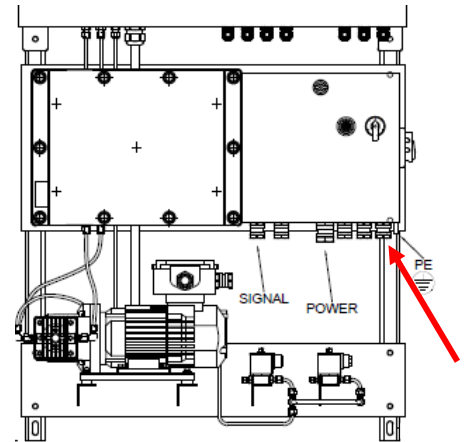
<p>8.</p>	<p>On top of the cable,</p> <p>a) Mount terminal sleeves.</p> <p>b) Isolate the shield and mount terminal sleeve.</p>	
<p>9.</p>	<p>Select seal insert(s) for the specific EMC cable to be used.</p>  <p>The seal inserts seals around the cable.</p> <ul style="list-style-type: none"> • For cable 4-6 mm: use all three seals. • For cable 6-9 mm: use seals S1 and S2 (discard S3). • For cable 9-12 mm: use seals S1 (discard S3 and S2). <p>When seals are selected, pack them together. See picture below:</p>  <p>Remount the inner pieces of the cable gland and mount it in the cabinet.</p>  	

<p>10.</p>	<p>Enter the cable with mounted terminal sleeves through the cable gland from the bottom (do not mount terminal numbers before inserting cable because it will not fit through the gland).</p>	
	<p>Continue slowly until the braid is visible.</p>	<p>Then pull the cable gently back approx. 10 mm until stop. The braided shield is hidden inside the cable gland.</p>
<p>11.</p>	<p>Tighten the cable gland under the cabinet.</p>	

<p>12.</p>	<p>Mount a ferrite core (not provided) on the cable inside the cabinet above the cable gland.</p> <p>Size of core: approx. 150 Ohm at 100MHz</p> <p>The ferrite core reduces the interference in the signal cable. Other values on the ferrite core might be needed depending on environmental conditions.</p>	
<p>13.</p>	<p>Mark cables and terminate according drawing FGA-5003 in in FGA Drawing Package.</p>	

7.2 Earth bolt connection

1. Remove items 5, 6 and 7 below.
2. Connect earth cable.
Connect and tighten earth bolt on Ex e box with 28 Nm.



1.	Enclosure
2.	Half nut
3.	Ring cable lug
4.	Flat washer
5.	Saddle washer
6.	Washer
7.	Full nut
8.	Earth bolt
9.	Seal washer
10.	Earth bush
11.	Shakeproof washer

7.3 Rebuild kit - to use instrument air

If the quality of nitrogen is not 97.5% N₂, the gas is not clean enough. To solve this problem, there are two options:

- Use cylinder gas (bottled) of 97.5% N₂ for Zero of analyser and for Valve gas
- Use cylinder gas (bottled) of 97.5% N₂ for Zero of analyser and rebuild system to use instrument air for Valve gas

Note *Instrument air must be Dry, oil-free according to ISO 8573-1:2010 class 4.3.4*

Dew point: $\leq -17^{\circ}\text{C}$

Particles per m³ (1-5 μm): ≤ 10

Total oil: 0.01 mg/m³

8 Installation checklist

After the installation has been performed and before FGA is brought into operation for the first time, the checklist described in this chapter must be completed to confirm a correct installation.

It is recommended to set aside time at the end of the installation phase specifically for these tests.

All results from the tests and any remarks to the product or the test results shall be recorded by hand in the accompanying tables.

The installation checklist shall be signed by the installation contractor when completed. This chapter shall then be printed or scanned and be returned to Norsk Analyse prior to commissioning.

Note *Return a scanned copy of the Installation checklist with results and if applicable remarks to Norsk Analyse after installation. Send to service@norskanalyse.com and write the following in the subject field:*

FGA installation checklist, Project number: 50XXX

Warranty does not apply unless the scanned copy of the Installation checklist is returned to Norsk Analyse.

Caution *Make sure the room is vented.*

	Action	Acceptance criteria	Result	Remark
1.	Check that all units have been delivered and installed.	Units shall be handled in accordance with GA and detail drawings.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
2.	Check that the units are not damaged.	No mechanical damages, scratches or dents shall be observed.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	

	Action	Acceptance criteria	Result	Remark
3.	Check that each unit is accessible for operation and maintenance work.	Verify service access (cabinet doors can open completely, necessary access to internal modules, proper lightning etc.).	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
4.	Check that all units are labelled.	Verify that labels are manufactured and mounted according to requirements.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
5.	Check the cabinet's vibration mounting.	Verify that the cabinets are fastened using proper mounting bolts and torque.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
6.	Check the external tubing.	Verify that sample lines, calibration gas and instrument air is connected as specified. Make sure that the tubing is supported and protected from breakage.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
7.	Optional. Check instrument air.	Verify that instrument air is dry and oil free acc. to ISO 8573-1:2010 class 4.3.4.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
8.	Check vents. <hr/> Warning Make sure room is vented! <hr/>	Verify that the atmospheric vent is not restricted.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	

	Action	Acceptance criteria	Result	Remark
9.	<p>Check sample out and safety valve outlet under analyser cabinet are vented.</p> <hr/> <p>Warning Make sure room is vented!</p> <hr/>	Verify that plugs are removed.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
10.	Check for loose fittings.	Check tightness by hand.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
11.	Check the electrical cabling.	Verify that all power and signal cables are routed and terminated according to termination and wiring diagrams.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
12.	Check for loose wires.	Verify that all connections in junction boxes and internal terminal blocks are tight and secure.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
13.	Check electrical fuses.	Verify that all equipment is connected to its correct fuse. Verify correct current rating for all fuses.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
14.	Check the gas filters, F-1, F-2 and AF-1.	Verify adequate filter quality by inspecting the filter housing and filter element.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	
15.	Check the gas pump P-01.	Inspect the gas pump for any damage or for obstacles.	<input type="checkbox"/> Accepted <input type="checkbox"/> Not accepted	

To be filled in by installation contractor:

Installation contractor	
Ship hull no./plant name	
Ship/plant owner	
Checks performed by (date/sign)	
Checks verified by (date/sign)	

9 References

The FGA drawings given below are enclosed as separate files.

Note that [nnnn] is used as number identification for standard product drawings, but this is subject to change when specified by contract.

DWG/DOC	Description
Mechanical drawings:	
FGA Drawing Package	
Documents	
FGA-D21	USER MANUAL
FGA-D40	UTILITIES SPECIFICATION

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