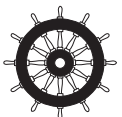
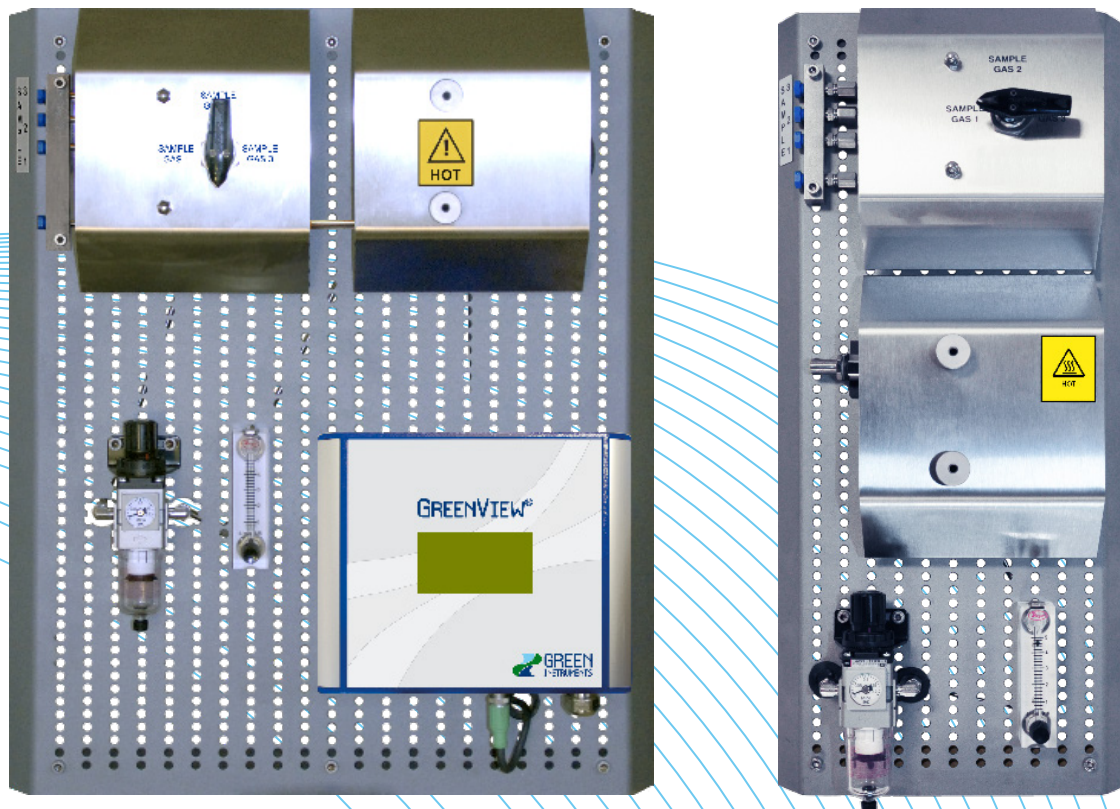


# GAS SAMPLING BOARDS FOR N2 GENERATORS FOR G3610/G3611

PART NUMBER.: 01599





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# ***1 Introduction***

## **1.1 About this Manual**



This manual contains data and instructions for the installation, operation, and maintenance of the Green Instruments gas sampling boards for nitrogen generators:

-  G<sub>3610a</sub> N2W board 100-230 VAC – wide
-  G<sub>3612a</sub> N2W board 100-230 VAC – wide with flow alarm
-  G<sub>3611p</sub> N2N board 24 VDC – narrow
-  G<sub>3613p</sub> N2N board 24 VDC – narrow with flow alarm

Other system may be added at a later stage.

The sampling boards can be combined with the G<sub>36a</sub> Oxygen Analyzer or the G<sub>36p</sub> Oxygen Analyzer panel mounted. One sampling board and one analyzer forms a complete oxygen analyzing system for nitrogen generators, hereafter named a NGOA System.

The instructions for installation, operation, and maintenance of the analyzers are provided in separate manuals:

-  the G<sub>36a</sub> Oxygen Analyzer manual (p#01245)
-  the G<sub>36p</sub> Oxygen Analyzer manual (p#01381)

Therefore, for the installation, operation, and maintenance of an entire NGOA System, this manual and the concerned oxygen analyzer manual must be read carefully in their entirety.

The instructions have been made in general terms and do not take into consideration the existing equipment of the nitrogen generator and its installation. As such, this manual is designed for the standard Green Instruments NGOA System.

This manual does not describe all possible situations but only the most common and known situations. It cannot replace the necessary education and training of the personnel.

Should situations not described in this manual occur that cannot be solved in accordance with normal known practice and good workmanship, the operator should contact Green Instruments A/S for instructions.

Green Instruments A/S reserves the right to minor alterations and improvements owing to developments without being obliged to enter the corresponding changes in this manual.

Green Instruments A/S reserves the copyright of this manual. Without prior written permission of Green Instruments A/S, the manual may not be copied and given to unauthorized people.

## **1.2 Inquiries and Feedback**

All claims and inquiries for spares shall be addressed to Green Instruments A/S or our distributors.

In all correspondence or when ordering spare parts, please carefully state the equipment type and fabrication number which you can find on the back of the G<sub>36p</sub> Oxygen Analyzer or on the right side of the G<sub>36a</sub> Oxygen Analyzer.

Green Instruments A/S appreciates all feedback and suggestions for improvement. If you have any questions or find any errors in the manual, you are welcome to contact us at the following address:



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## ***2 Specifications***

<b>Sampling Board for Nitrogen Generator</b>	
Sample pressure	Minimum 4 bar – maximum 10 bar on all inlet ports – preferably constant and identical pressure on all inlet ports.
Sample flow	1–5 l/m.
Sample temperature	0 °C to 70 °C.
Sample manifold	3 sample/test gas ports – 1/8" BSP connection. 1 port for vent line connection - 1/8" BSP connection.
Selector valve	5-way and 3-position switching valve SS 316.
Narrow board dimension	Dimensions: 60 × 30 × 14 cm (H × W × D). Weight: Approx. 7.5 kg without analyzer and packaging.
Wide board dimension	Dimensions: 60 × 50 × 14 cm (H × W × D). Weight: Approx. 9.0 kg without analyzer and packaging.
<b>Analyzer</b>	
See details in the oxygen analyzer manual chapter 2.	
<b>Optional Equipment</b>	
Digital flow switch	0.2–10.0 l/min, 1 analog output 4–20 mA & 1 NPN output, display with LED type 3 digits, 1 alarm set point with the NPN output.
Other optional equipment	Pre-filter for sample gas, signal amplifier, signal amplifier for logarithmic output, remote digital display, visualization, recording, and data logging.
Specifications are subject to changes without notice.	

# ***3 Installation***

**Read this chapter in its entirety before installing the system.**

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## **3.1 Control at Delivery**

When you receive the shipment, please inspect and confirm that the received scope of supply is in accordance with the packing list and not damaged. Any discrepancy should be reported to the supplier immediately. If any of the received parts are damaged, the shipping company should be informed, and new parts should be made available before completing the installation.

## **3.2 Where to Install the System**

Satisfactory operation, faultless functions, and minimal maintenance of the sampling board, are achieved by paying attention to the following points:

- The sampling board should be installed in a clean area away from dust, oil mist, and moisture. The elements of the system shall be installed at viewing level so that they are easy to access in connection with operation and service.
- It is recommended that the sampling board is located very close to the sampling point of the nitrogen generator in order to obtain current and accurate readings. Large bore sample lines as well as longer sample lines will increase the response time due to dead volume.
- The best results are achieved with constant and identical pressure on all incoming ports between 4...10 bar.
- The panel mounted analyzer G36p can be installed up to 6 m from the sampling board.

For details about the installation of the analyzer, please see section 3.2 in the analyzer manual.



### 3.3 Safety Aspects

#### Hot sensor

The sensor is hot and can cause severe burning of personnel if not handled with care.

#### Analyzer

Before working with the analyzer, please read the oxygen analyzer manual in its entirety.

#### Installation and operation

It should be pointed out that installation and operation of the sampling board for nitrogen generators and associated equipment must be carried out by skilled, trained, and certified personnel, and that Green Instruments A/S does not take any responsibility of the operation of the system and associated equipment whatsoever.

The successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

#### Recycling

Do not dispose any part of the sampling board with regular refuse. Disposal should be in accordance with the requirements of the current statutory regulations.

### 3.4 Sampling Board

The sampling boards are designed for mounting with the G<sub>36p</sub> Oxygen Analyzer panel mounted version or the G<sub>36a</sub> Oxygen Analyzer.

#### 3.4.1 Mounting Panel

The mounting panel has two angle iron mounting brackets. The brackets are made of ordinary mild steel and can be welded or bolted directly to a chosen structure as required. The two mounting brackets are mounted horizontal and parallel with a distance of 550 mm. See Figure 3-3 for the dimensions and layout of the narrow board and Figure 3-4 for the wide sampling board.

The sampling board needs to be installed as close as possible to the nitrogen gas supply line in order to reduce dead time of test gas flowing through the piping (see section 3.2). When the sampling board is installed in an appropriate location, the sample gas, calibration gas, and power are connected as described below.

### 3.4.2 Gas Connection

The connections for the gas lines are located in the upper left corner of the system board at the manifold. It is possible to connect up to three samples. The three connections are all arranged as 1/8" BSP female connections, and are marked from the bottom: 1, 2, and 3. The system is supplied with the sample ports plugged.

Green Instruments A/S advises the following arrangements of gas connection:

- Port 1 (bottom) sample line from the nitrogen generator
- Port 2 (middle): span calibration gas (typically clean dry instrument air)
- Port 3 (top): zero calibration gas with a known oxygen concentration

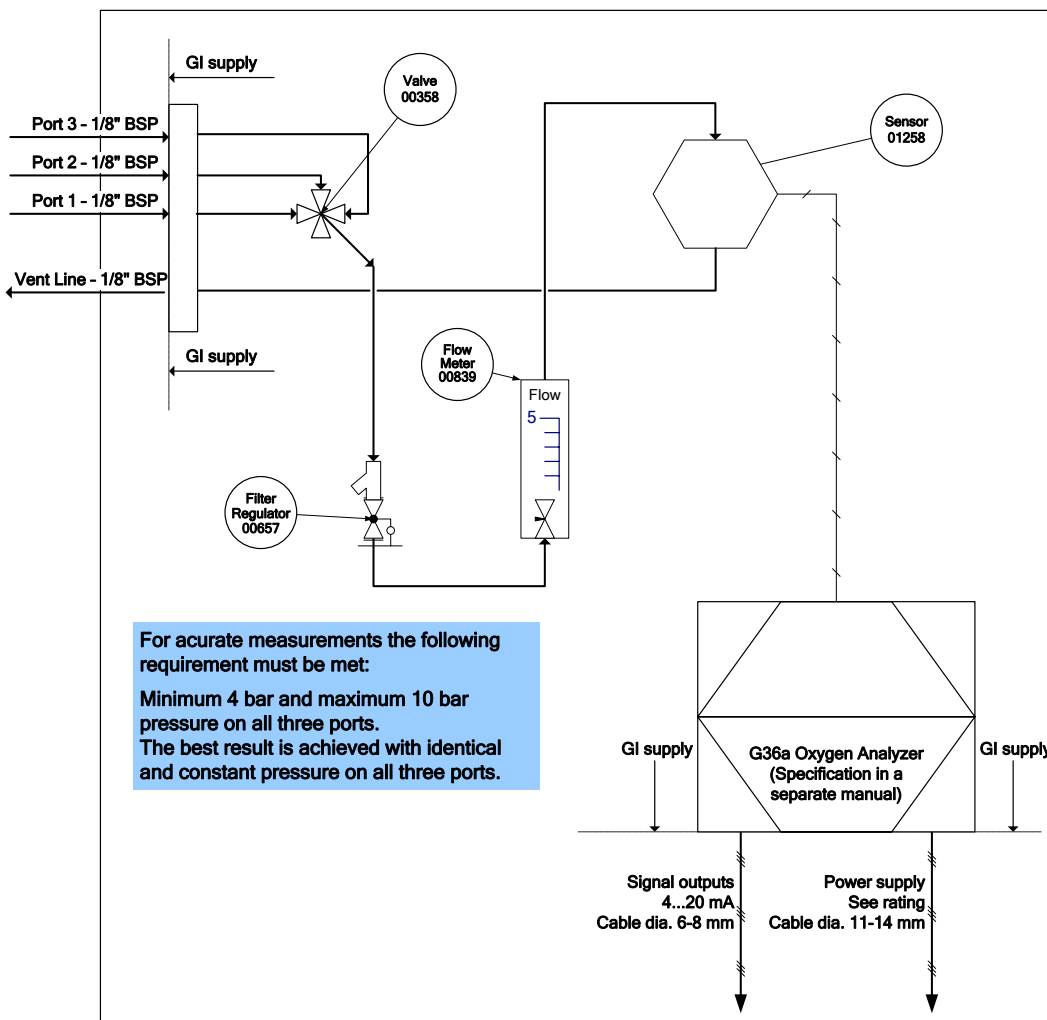


Figure 3-1: P&ID of the G3610a with oxygen analyzer mounted on board

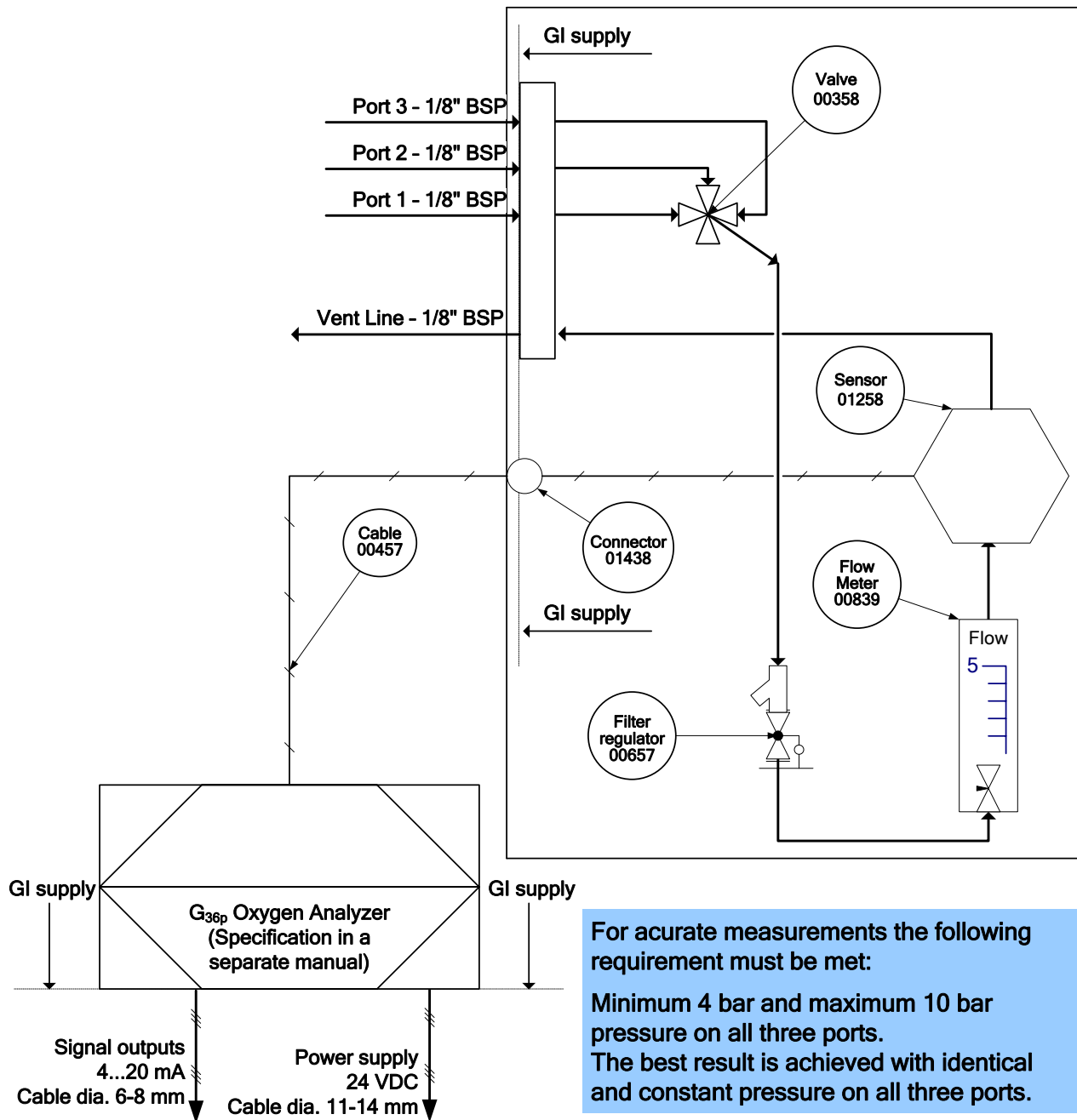


Figure 3-2: P&ID of the G<sub>3611p</sub> with separate G<sub>36p</sub> Oxygen Analyzer

The sample gas has to be extracted from a suitable location that represents the gas to be tested.

Calibration gases are typically clean and dry instrument air as span gas (i.e. with 20.9% oxygen) and a test gas bottle as zero gas (typically in the range of 0% to 5% oxygen). The zero gas should be chosen so that the concentration is just under the targeted O<sub>2</sub> concentration of the nitrogen generator.

The pressure and flow rate of the calibration gasses should be the same as the pressure and flow rate from the sample line under normal operating conditions of the nitrogen generator. Please keep the inlet pressure as even and identical on all inlet ports as possible.

### **3.4.3 Vent Line Connection**

The vent line connection for the sensor house is placed right below the sample ports. It is used to connect an external vent line which allows venting the sample/test gases going through the sensor to the outside air. The vent line must be dimensioned to allow a gas flow of at least 10 l/min and arranged in such a way that it avoids backpressure and secures a sufficient gas flow. The vent line must be uninterrupted and easily remove the sample/test gases.

### **3.4.4 Analyzer and Electrical Connection**

The instructions for the electrical connections of the analyzer are described in section 3.4 in the analyzer manual.

### **3.4.5 Digital Flow Switch (Optional)**

If the sampling board is configured with a digital flow switch, please see the enclosed leaflet for installation and operating instructions.

### **3.4.6 Sensor Connection for the G<sub>36p</sub> Panel Mounted Analyzer**

The panel mounted analyzer is connected to the sampling board by a sensor cable. The sensor connection is arranged below the vent line connection. For details, please see item number 2 in Figure 3-3.

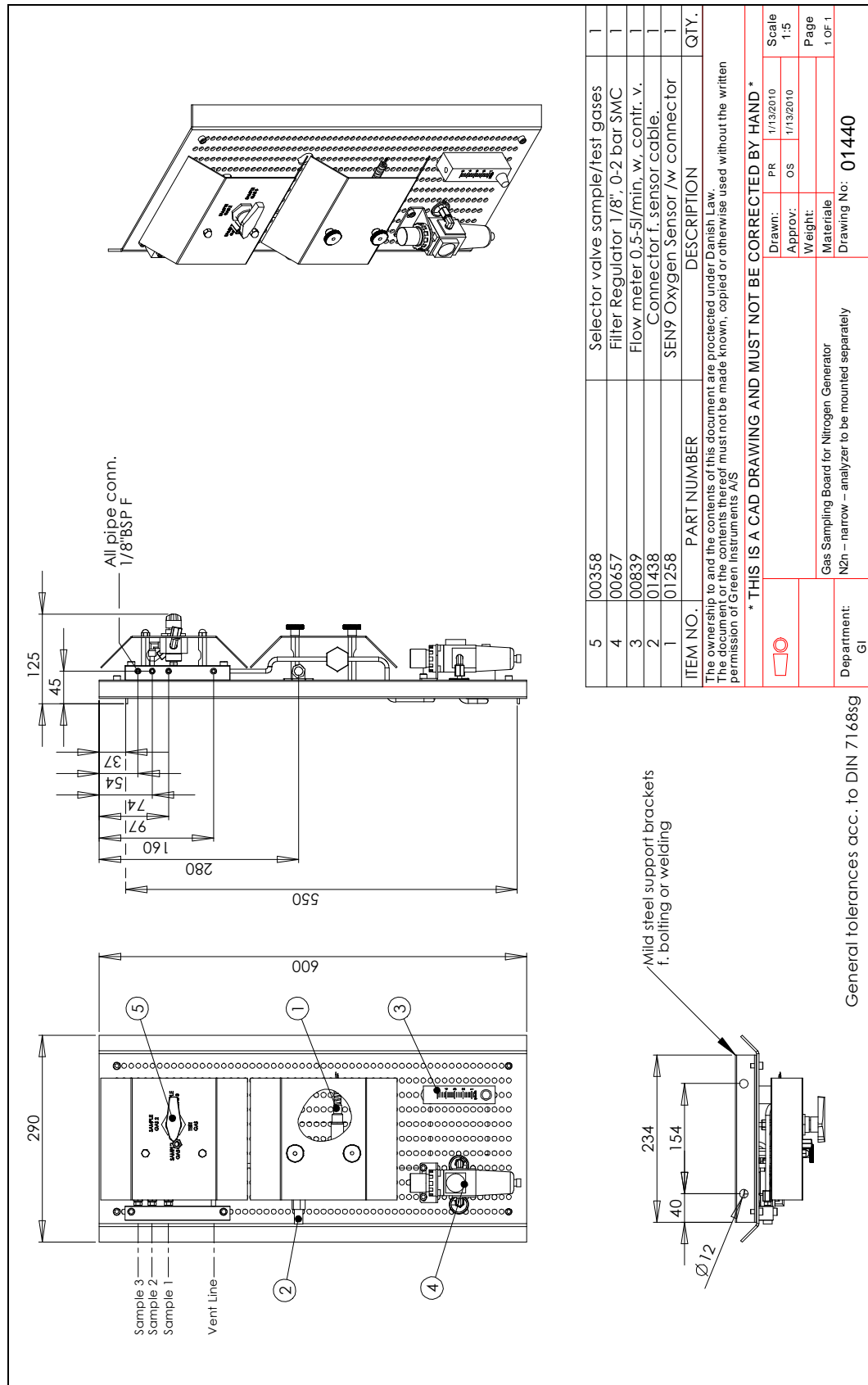


Figure 3-3: N2n - narrow sampling board without analyzer

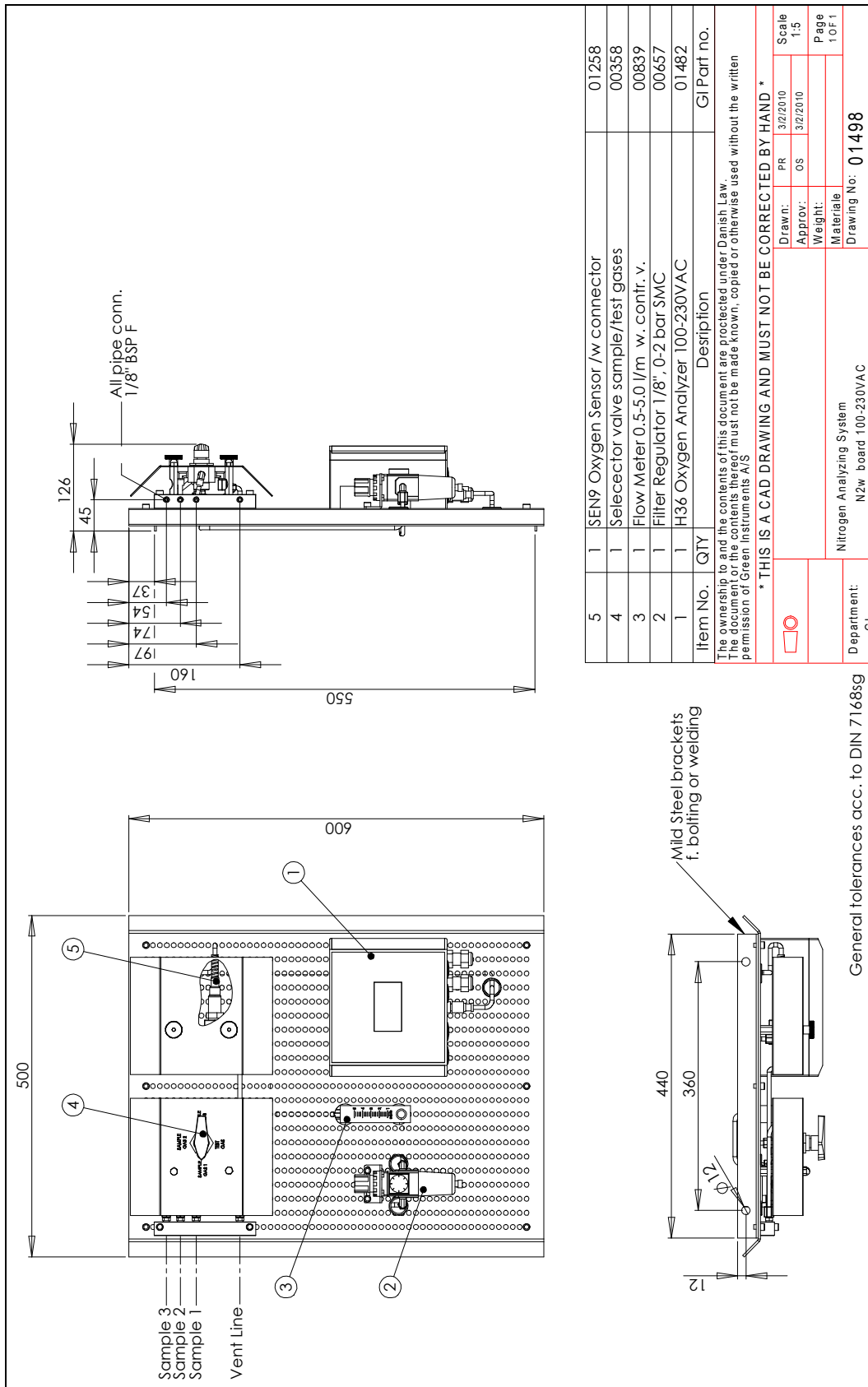


Figure 3-4: N2w – wide sampling board with G<sub>36a</sub> Oxygen Analyzer

# 4 Commissioning

**Before starting the system for the first time after completing the installation, please check the installation of the system.**

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## 4.1 Installation Checks of the Sampling Board

- Check that the span and zero calibration gases are connected and that all connections are secured and not leaking. *A leaking connection will result in loss of calibration gas and may result in poor calibration.*
- Check that the sample gas line is connected and that the connections are secured and not leaking. The sample gas connection should be as close to the process as possible, preferably made from 6 mm stainless piping in order to reduce the dead volume in the sampling system. If the sample gas is heavily contaminated with particles, a pre-filter should be installed. The sample gas has to be extracted from a suitable location that represents the gas to be tested.
- Check the pressure and flow rate of the calibration gasses which should be the same as the pressure and flow rate from the sample line under normal operating conditions of the nitrogen generator. Please keep the inlet pressure as even and identical on all inlet ports as possible.

## 4.2 Commissioning of the Analyzer

- Check the connection and settings of the analyzer by following the instructions in chapter 3 to 5 in the analyzer manual.

## 4.3 Starting the System

Start the analyzer by following the instructions in chapter 5 in the oxygen analyzer manual. Then, follow the instructions below.

- Introduce the sample gas to the sensor by turning the selector valve to the correct position.

- ✚ Check the gas pressure at the pressure regulator. It is preset and locked to 0.03 MPa ( $\approx 0.3$  bar). It might swing  $\pm 0.01$  MPa ( $\approx 0.1$  bar).
- ✚ Adjust the flow to approximately 1–2 l/m. If the flow is too high (i.e.  $>5$  l/m) the sensor temperature will change and consequently the readings.

Calibration can be performed when the sensor temperature reaches normal operating temperature, and the indication has stabilized. This normally happens about 5–10 minutes after starting the system.

Now, the system is ready for calibration following the instructions in chapter 6 in the oxygen analyzer manual.



# ***5 Routine Maintenance***

## **5.1 Sampling System**

Routine inspection and maintenance of the sampling system is required to make sure no gas is leaking from the test or calibration gas supply. Failure to periodically inspect and maintain the above requirements may lead to imprecise analyzer readings and thus a malfunction of the nitrogen generator.

The system, including flow control valves and the sample and test gas selector valves, is tested from the factory.

For the selector valve packing, adjustment may be required for a leak-tight performance. Adjust the packing by turning the packing bolt clockwise in 1/16-turn increments until leak-tight performance is achieved. Always verify proper operation upon installation.

Protect the reduction units from the ultraviolet rays and adhesion of organic solvents. Depressurize the reduction stations before cleaning and service.

Clean with neutral detergent.





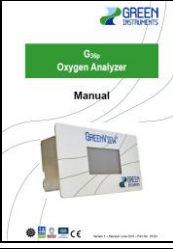



## **5.2 Analyzer**

See chapter 7 in the analyzer manual for routine maintenance of the analyzer.


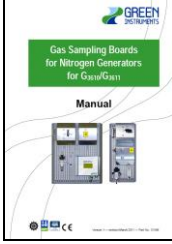

# 6 Spare Parts

When ordering spare parts, please quote the serial number of the analyzer which you can find on the label on the back of the G<sub>36p</sub> analyzer and on the right side of the blue G<sub>36a</sub> analyzer box.

Part No.	Part Description	the specific appearance of the spare parts is subject change without notice; the function however will not change
00358	Selector valve sample/test gases	
00457	Sensor cable – 3.0 m w. female & male connectors	
00657	Filter regulator – 1/8", 0–2 bar	
00839	Flow meter 0.5-5.0 l/m w. control valve	
01047	Cable gland – M20 (11-14 mm)	

Part No.	Part Description	the specific appearance of the spare parts is subject change without notice; the function however will not change
01241	G <sub>36a</sub> Oxygen Analyzer 100-230 VAC	
01245	G <sub>36a</sub> Oxygen Analyzer manual	
01251	Fuse 2 AT (pkg of 10)	
01258	SEN9 oxygen sensor/w connector – screw type	
01381	G <sub>36p</sub> Oxygen Analyzer manual	
01382	G <sub>36p</sub> Oxygen Analyzer Panel 24 VDC (includes 01388)	
01388	Gasket for panel mounted analyzer	
01434	Panel feed through, M12, 5 poles	

Spare Parts

01471	SD card with software & standard settings files – please quote the serial number of the analyzer when you order an SD card.	
01599	This manual	
<b>Optional</b>		
01453	Digital flow switch 0.2-10 l/min (optional)	
Other optional equipment e.g. visualization, recording and data logging, monitoring of gas temperature, pressure, and load.		



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