

Operating instructions

DynamiQ-S micro-GC analyzer



Disclaimer

Publisher

Qmicro B.V.
Neptunusstraat 21
7521WC Enschede
The Netherlands
© Qmicro B.V. All rights reserved.

Tel. +31(0)88 6760 700
Fax. +31(0)88 6760 701
www.qmicro.com
info@qmicro.com

QMICRO-346718359-41
Version: 3.10

Technical Information contained in this publication is for reference purposes only and is subject to change without notice. The contents of this publication have been reviewed to ensure consistency with the described hardware. Since deviations cannot be precluded entirely, full consistency cannot be guaranteed. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions. The installation of the belonging equipment must conform with local, national and/or international codes applicable to the installation location. Qmicro assumes no responsibility for compliance with these requirements. The safety of any system incorporating the DynamiQ instrument is the responsibility of the user of the system. The contents of instructions given in this manual are neither part of an earlier existing agreement, statement or legal commitment nor do they change this. All obligations on the part of Qmicro are contained in the respective sales contract which also contains the complete and solely applicable warranty conditions. Any statements contained herein do not create new warranties or modify the existing warranty.

CONTENTS

1	Introduction	8
2	Safety information	9
3	Unpacking and inspection.....	12
3.1	Labelling	12
4	DynamiQ-S micro-GC analyzer.....	13
4.1	Gas chromatography.....	13
4.2	DynamiQ instruments	13
4.2.1	Stream selector.....	15
4.2.2	Injection	15
4.2.3	Detector	16
4.2.4	Back-flush-to-detector.....	16
4.2.5	Fastloop	17
4.2.6	Sample pump.....	18
4.2.7	Data acquisition.....	18
5	Hardware and installation	19
5.1	Host	20
5.2	Cover plate	20
5.3	Cartridge	21
5.4	Back plate	22
5.4.1	Mounting	23
5.5	Data connections	24
5.5.1	LAN	25
5.5.2	I/O	25
5.6	Electrical connections.....	26
5.6.1	Grounding	26
5.6.2	Instructions to commission the electrical connections	26
5.7	Gas connections and flow	28
5.7.1	Gas ports.....	29
5.7.2	Connecting gas lines	30
5.7.3	The DynamiQ-S gas supplies in any configuration	31
5.7.4	Stainless-steel gas tubing fitting assembly	32
6	DynamiQ-S start up and commissioning	34
6.1	Instructions to start up the DynamiQ-S micro-GC.....	35
7	Troubleshooting, service and maintenance	37
7.1	Unmounting	38
7.2	Cartridge re-attachment/replacement	38
7.2.1	Commissioning the GC after the cartridge replacement	42
7.3	Transportation.....	44
7.4	Cleaning	44
7.5	Disposal	44
7.6	Overheating	44
8	Technical specifications	45
9	Resources and references	48

10 Appendices.....	49
10.1 Declaration of conformity	49
10.2 QPS Certificate	50
10.3 Applicable standards.....	51

DRAFT

LIST OF FIGURES

Figure 1. Schematic representation of gas components separation in a GC.....	13
Figure 2. Schematic representation of a GC unit consisting of injector, column and detector.	14
Figure 3. Block diagram of a typical layout of the DynamiQ analyzer.	14
Figure 4. Schematic representation of a 3-stream selector.....	15
Figure 5. Schematic representation of the micro injector. Left: no injection, right: during injection.	15
Figure 6. Foreflush to detector.....	16
Figure 7. Backflush to detector.	17
Figure 8. Schematic representation of the fastloop.....	17
Figure 9. Schematic representation of the optional sample pump.	18
Figure 10. Naming conventions of the DynamiQ-S.....	19
Figure 11. Exploded view of the DynamiQ-S.....	19
Figure 12. Schematic representation of the host.....	20
Figure 13. DynamiQ-S cover plate.....	20
Figure 14. Top and bottom view of a cartridge that contains four analytical units.....	21
Figure 15. Backplate plate.	22
Figure 16. Backplate technical drawing.	23
Figure 17. DynamiQ-S front view zoom.	24
Figure 18. I/O port of the DynamiQ-S.....	25
Figure 19. Power connection on the DynamiQ-S.	26
Figure 20. Backside view of the DynamiQ-S.	28
Figure 21. Schematic representation of gas connections and flow in DynamiQ analyzers.	28
Figure 22. LED indicators on the DynamiQ-S.....	34

LIST OF TABLES

Table 1. Meaning of symbols used in figures.....	8
Table 2. Supported protocols.....	24
Table 3. I/O port of the DynamiQ-S pin description.....	25
Table 4. Equipment for stainless steel gas tubing assembly.....	32
Table 5. LED status light scheme indicators for DynamiQ-S.....	36
Table 6. Equipment for cartridge re-attachment and replacement.....	38

DRAFT

ABBREVIATIONS

Abbreviation	Description
A	Actuation gas inlet
AC	Alternating current
Ar	Argon
Av	Actuation vent
C1	Carrier gas inlet one
C2	Carrier inlet two
CAS	Chemical Abstract Service
CH ₄	Methane
Cv1	Carrier vent one
Cv2	Carrier vent two
DC	Direct current
e.g.,	For example,
EMC	Electromagnetic compatibility
ESD	Electrostatic discharge
FAQ	Frequently asked questions
FCC	Federal Communications Commission
FSI	Fast Serial Interface
GC	Gas chromatography
H ₂	Hydrogen
He	Helium
i.e.,	that is
IP	Ingress protection rating
LAN	Local area network
LED	Light-emitting diode
MEMS	Micro-electromechanical systems
N/A	Not Applicable/ Not Available
N ₂	Nitrogen
OEM	Original equipment manufacturer
PC	Personal computer

Abbreviation	Description
PE	Protective earth
SDSs	Safety Data Sheets
SELV	Separated extra-low voltage
Sv	Sample vent
TCP	Transmission control protocol
VDC	Volts of direct current
WEEE	Waste Electrical and Electronic Equipment

1 Introduction

Welcome to the DynamiQ-S operating instructions manual. A comprehensive guide for utilizing the DynamiQ-S micro-gas chromatograph (GC) analyzer effectively and efficiently. This manual is carefully designed to provide the necessary tools on how to operate the DynamiQ-S together with clear installation and commissioning instructions. This document contains all information needed by a trained technician to install, commission, and operate the DynamiQ-S micro-GC.

The "DynamiQ" analyzer refers to the entire DynamiQ family of micro-GC analyzers, including rebranded and original equipment manufacturer (OEM) versions. DynamiQ-S analyzers refer to both the DynamiQ-S analyzer and OEM-S versions. This document is specific for operating instructions regarding the DynamiQ-S analyzers. The DynamiQ micro-GC analyzers are controlled by the dedicated DynamiQ software, specifically DynamiQ Explorer and DynamiQ Process¹.

Organized into the following sections: Introduction, Safety information, Unpacking and inspection, DynamiQ-S micro-GC analyzer, Hardware and installation, DynamiQ-S startup and commissioning, Troubleshooting, service and maintenance, Technical specifications, Resources and references, Appendices and, Index; this manual is a roadmap to seamless DynamiQ-S micro-GC analyzer functionality.

This document contains numerous figures that illustrate, e.g., procedures within the GC. These figures can contain different symbols which are explained below in Table 1.

Table 1. Meaning of symbols used in figures.

Symbol	Meaning
▷	Open valve
◁	Closed valve
○○○	Column

Adhering to the guidance within this manual allows procedures within your operations to flow smoothly, by aiding with solving and overcoming challenges that may arise and enhancing technicians'/ users overall grasp of the DynamiQ-S micro-GC analyzers functionalities.

Should any challenges arise or if further assistance is required after reading this manual, rest assured that the dedicated Qmicro support team is readily available to offer guidance and address any questions. For prompt communication, we kindly request you to utilize this email address: support@qmicro.com.

Let this manual be your trusted companion when you operate and or encounter challenges with the DynamiQ-S micro-GC analyzer, ensuring success every step of the way.

¹ To find out more about the DynamiQ Explorer software functionality, please refer to the *DynamiQ software manual*.

To find out more about the DynamiQ Process software functionality, please refer to the *DynamiQ Process software manual*.

2 Safety information

This manual contains information and warnings which must be followed to ensure safe operation and to keep the device in a safe condition. Installation, maintenance, and repairs should only be performed by qualified personnel. The installation instructions mentioned in this manual are intended for information only. The installation instructions must conform to any national, local, or company codes applicable to the location. Qmicro does not assume responsibility if the precautions outlined in this manual are not adhered to.

Symbols in this manual are used to indicate essential information. The absence of graphical symbols does not exempt the user from following all the necessary instructions, guidelines, or regulations associated with the product.

The following symbols and typographical conventions can be used throughout this manual:

DynamiQ symbols and typographical



This alerts you to an action or sequence that, if improperly performed, could result in damage to the instrument or possible physical harm to the user.



This indicates an electric shock hazard.



This indicates danger from high temperature surfaces or substances.



This indicates an explosion hazard.



This indicates advice from Qmicro.



This indicates the need for proper disposal in accordance with the Waste Electrical and Electronic Equipment (WEEE) directive.

Italic

Italics are used to emphasize a point and identify titles of documents that are referred to in the text.

Cross references

In online documents, the blue text indicates hyperlinks that once clicked-on redirects to the referred material.

Bold text

This indicates the beginning of a chapter or procedure. Bold text is also used to emphasize a point.

General precautions for DynamiQ-S



The DynamiQ-S instrument must be used in accordance with the instructions given in this guide. Improper use can adversely affect instrument protection. Analytical operation requires the use of gases having different hazard specifications. Before using gases, please read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the relevant Chemical Abstract Service (CAS) number and/or Safety Data Sheets (SDSs)



When using the DynamiQ-S instrument, the user should always adhere to the safety, environmental and law regulations/ codes that apply in the country of use.



Power off and disconnect the DynamiQ-S, also shut off all gases before exchanging the cartridge. Take proper ESD precautions to prevent electrostatic discharge and prevent touching electronic components. Make sure there are no harmful gases present in the instrument before removing the cartridge as it may be released to the environment.



In case of damage or presumable defects, do not commission the DynamiQ-S and contact Qmicro.



Do not diagnose or repair the GC in humid, dusty, dirty or unsafe conditions to prevent damage to the GC.



It is prohibited to remove any of the host unit enclosure parts. Access to the host unit is not allowed. The warranty is no longer valid after unauthorized access.



Do not reuse cartridge screws that exhibit any signs of damage, contamination, or rust; to maintain the integrity of the assembly and prioritize safety



It is crucial to adhere strictly to the guidelines provided in the manual and utilize exclusively the designated equipment. Failure to do so can have severe consequences, potentially resulting in personal injury, irreparable damage to the instrument or additional hazard.



Do not use soap solutions or liquid leak testing devices, as it will damage the GC.



Carrier gases used in the instrument should be dry and particle free.



Make sure that the gas port vents are not blocked at any time or experience any flow resistance to avoid internal valve damage. In addition, do not connect/combine gas port vents to avoid pneumatic crosstalk effects.



Do not use excessive force/torque when making a gas connection to a gas inlet.



The applied gas pressures should not exceed 200kPa, as the sample valves can handle a maximum of 200kPa.



The carrier gas supply pressures should be $450 \pm 5\% \text{ kPa}$.

General precautions for DynamiQ-S



Avoid liquids entering inside the instrument.



Only use the screws and washers supplied by Qmicro for DynamiQ-S. The screws and washers contain a special coating for (galvanic) corrosion protection.



In the event that materials are spilled in the instrument, immediately shut down the instrument and call a Qmicro support for proper instructions.



Full instrument servicing and repair should only be carried out by an authorized Qmicro engineer.



Do not access/replace the lithium battery within the DynamiQ-S instruments.

The DynamiQ-S can be used with carrier gases He, Ar, N₂, H₂ and air, but do not use other gases as it might harm the instrument.

Note that the DynamiQ-S does not include any safety measures when using Hydrogen as the carrier gas. Therefore, safety precautions must be taken. For more information please, contact Qmicro.



This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.



Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

3 Unpacking and inspection

The DynamiQ-S is shipped in a carton box or an optional robust case together with gas port vent plugs and an accessories kit consisting of Valco fitting ferrules and nuts, and a 1/4" combination spanner, see the *Shipment packing list* in the package.

Carefully remove all items from the case or box. The DynamiQ-S should be checked after every shipping for damage. Inspection points are dents, scratches, loose parts, bent parts, etc. If there is any damage or defects, contact Qmicro.

Inspection precautions²



In case of damage or presumable defects, do not commission the DynamiQ-S and contact Qmicro.

3.1 Labelling

The DynamiQ-S has four labels namely: the logo label, the type label which indicates the conditions under which the DynamiQ-S is approved for use, the user label which gives information on the electrical, ground and gas connections, and the LED indicators label see Figure 22.

Labeling precautions²



It is prohibited to remove the labels from the DynamiQ-S.

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer. Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

4 DynamiQ-S micro-GC analyzer

4.1 Gas chromatography

The DynamiQ instruments are based on gas chromatography which is a chemical analysis method for determining gas composition of gas mixtures. The GC uses a flow-through narrow tube known as the column, through which different chemical constituents of a sample pass in a gas stream (carrier gas, mobile phase) at different rates. The rate depends on the various chemical and physical column properties and their interaction with a specific column filling, called the stationary phase. The function of the stationary phase in the column is to separate different components, causing each one to exit the column at a different time (retention time). Other parameters that can be used to alter the order or time of retention are the carrier gas pressure, column length, column diameter and column temperature. As the chemicals exit at the end of the column, they are detected electronically and identified with a data system.

GC hardware in general consists of 3 building blocks: injector, column oven and detector which are schematically represented in Figure 1.

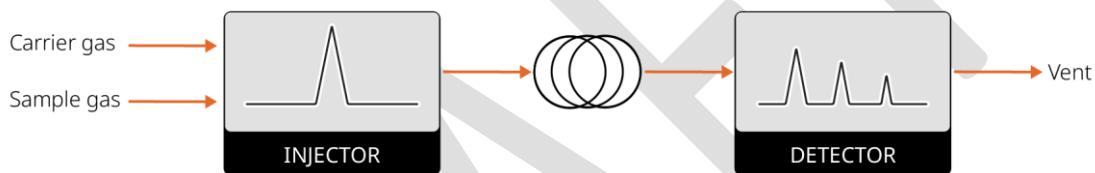


Figure 1. Schematic representation of gas components separation in a GC.

4.2 DynamiQ instruments

The DynamiQ micro-GC analyzer is an instrument that analyses the concentrations of constituents in a gas mixture. It can accommodate multiple GC units, each performing in parallel a different GC analysis under individually optimized conditions.

The DynamiQ micro-GC analyzer is equipped with several MEMS micromachined chip components, which are connected by a patented chip to chip connection technology. This enables not only a compact instrument but also very short analysis times of typically less than a minute.

The instrument is designed for continuous monitoring and works therefore stand-alone using the integrated processor with firmware, without the need of a separate controller giving commands. In addition, dedicated DynamiQ PC software can be used to analyze the collected data in further detail and to change operation settings.

The DynamiQ micro-GC analyzer can contain up to 4 GC units, each simultaneously performing their own analysis. Every GC unit contains an injector chip with micro channels, micro valves, columns and micro detectors, and is specifically designed to analyze a range of components. The GC units are defined by their column type and parameters such as temperature, pressure and injection time. A schematic representation of a GC unit is given in Figure 2.

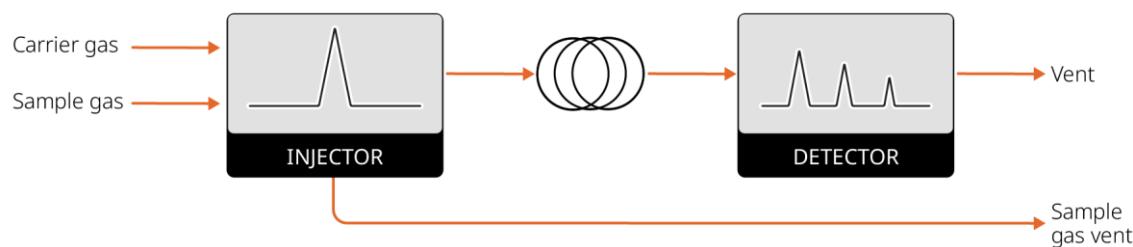


Figure 2. Schematic representation of a GC unit consisting of injector, column and detector.

In Figure 3 a block diagram is shown of the typical layout of the DynamIQ analyzer. Carrier gas, calibration gas and multiple sample lines (streams) can be connected to the inlet of the stream selector, see § 4.2.1). After the stream selector, the selected sample gas together with the carrier gas is led in parallel through all GC channels. In the injector, a small amount of sample gas is injected in the carrier gas flow and guided via the column to the detector and vent, see § 4.2.2.

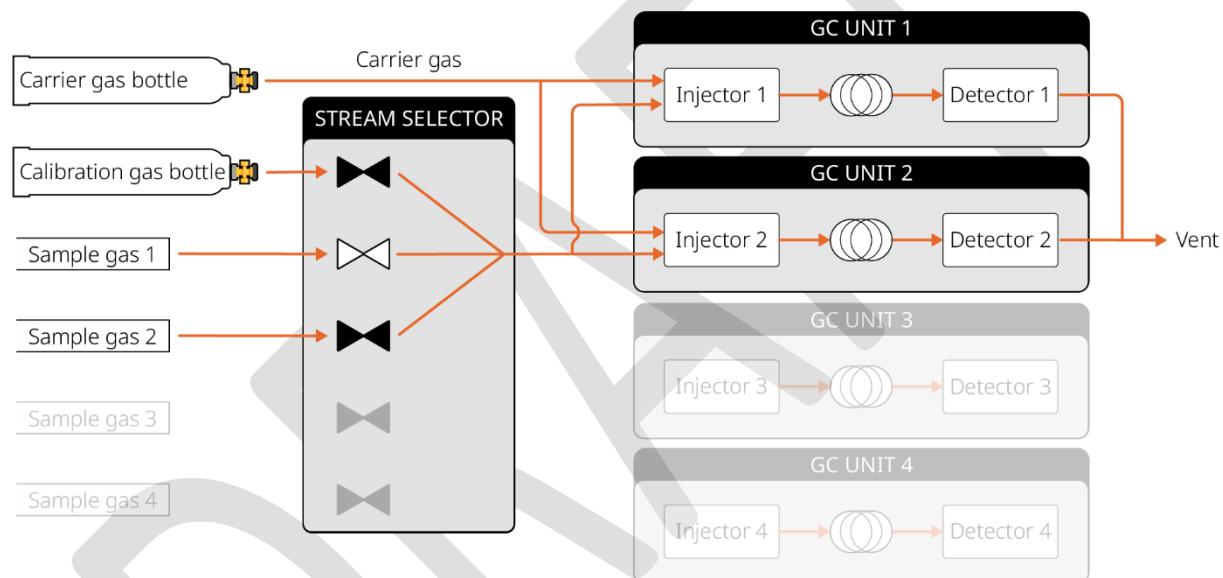


Figure 3. Block diagram of a typical layout of the DynamIQ analyzer.

All DynamIQ instruments are equipped with an exchangeable cartridge that contains the analytical parts of all the GC units.

4.2.1 Stream selector

The DynamiQ micro-GC analyzer is equipped with an internal multi stream selector which allows to connect multiple sample gases and/or calibration gases. The number of streams within the DynamiQ micro-GC analyzer is specific to GC type. In Figure 4 a schematic representation of a 3-stream selector with 2 sample gases and 1 permanent calibration gas is given. This integrated stream selector switches between the different inlets, so only 1 stream is let into the analyzer at a time. Stream switch occurs during the analysis (inrun), e.g., when switching from stream 1 to stream 2, the first analysis of stream 2 will be made with the stream 1. Note that in the case of applying a permanent calibration bottle to one of the inlets, for a 3-stream selector only 2 sample gas stream inlets are possible. The stream selector is a double block and bleed design so there are virtually no history or cross contamination effects between the different gas streams.

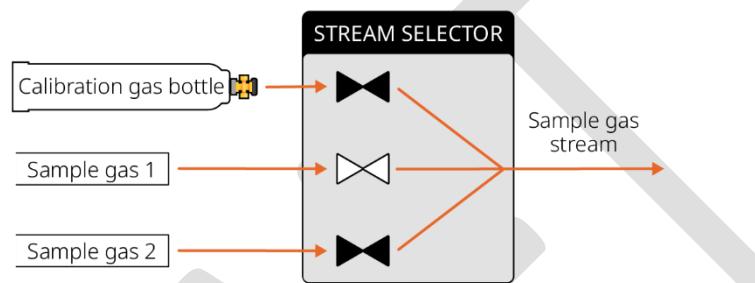


Figure 4. Schematic representation of a 3-stream selector.

4.2.2 Injection

In principle both the sample gas and the carrier gas flow continuously into the GC and through the chips of all GC units. Inside these chips is a small chamber called the sample loop, through which the sample gas is continuously flowing. At injection, this sample loop is closed off, pressurized by carrier gas pressure, followed by a release towards the columns, see Figure 5.

The advantage of this principle is that sample gas is injected at controlled carrier gas pressure and consequently there is no measurement error by pressure variation. The amount of sample that is injected depends on the injection time, a parameter that can be set in the DynamiQ software. Please refer to the *DynamiQ Software Manual / DynamiQ Process Software Manual* for more information on how to set parameters in the software.

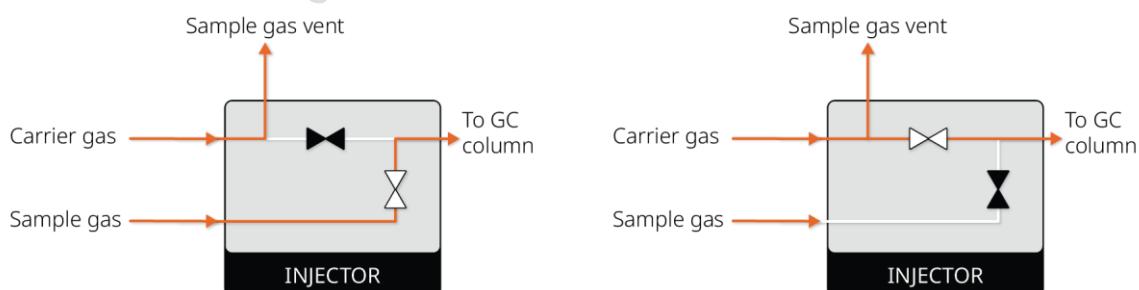


Figure 5. Schematic representation of the micro injector. Left: no injection, right: during injection.

4.2.3 Detector

The used in-house fabricated detector chip is a thermal conductivity detector (TCD) which is a universal detector for gas chromatography. This detector senses changes in the thermal conductivity of the column effluent and compares it to a reference flow of carrier gas. The major advantages of the TCD are its simplicity, its large dynamic range, its general response to both organic and inorganic species and its non-destructive character.

4.2.4 Back-flush-to-detector

DynamiQ micro-GC analyzer is equipped with a back-flush-to-detector configuration, a pre-column is added before the analytical column. After a defined time after injection, the flow in the pre-column is reversed and backflushed to a second detector (TCD BF). Simultaneously, the peaks that already left the pre-column are led via the analytical column to the first detector (TCD FF). The purpose of this configuration is two-fold:

1. The analytical column lifetime is increased because polluting/reactive components are prevented to enter the column.
2. By using a second detector, both foreflush and backflush chromatograms run in parallel, which thus reduces the total analysis time which is explained in detail below.

At the start of an analysis, the carrier gas directs the sample in the so called foreflush (FF) state to the pre-column and analytical column, as depicted in the Figure 6. The injected sample is separated in the pre-column and the separated components can enter the analytical column.

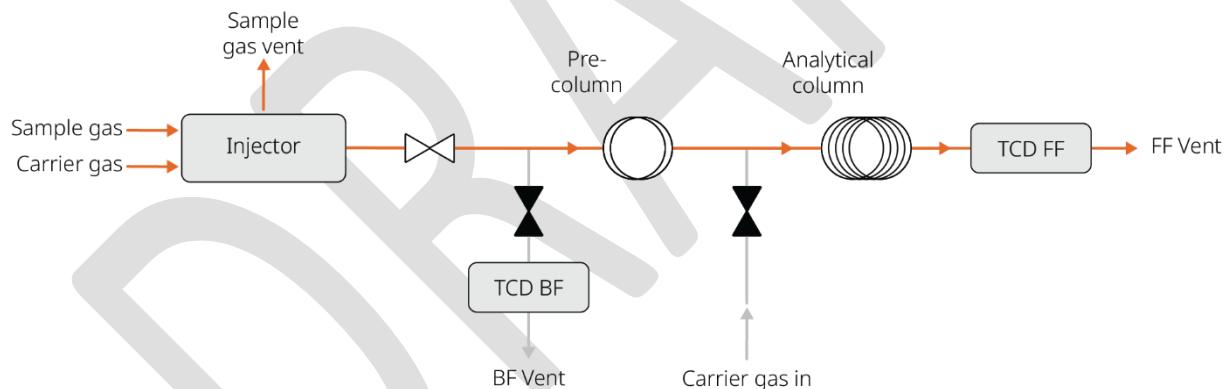


Figure 6. Foreflush to detector.

After a certain time, the flow is switched to the backflush (BF) state. The 'carrier gas'-valve in between the columns is opened and the gas flows backwards in the pre-column and simultaneously keeps on flowing forward in the analytical column. The backward flow of the pre-column is led to the backflush TCD and to the backflush vent, see Figure 7. In this way, unwanted components that move slowly through the pre-column are prevented from entering the analytical column; so, in principle the pre-column backflush works as a filter. Note that separated sample components in the pre-column will group again during back-flush and consequently result in a single so-called back-flush peak at the backflush detector.

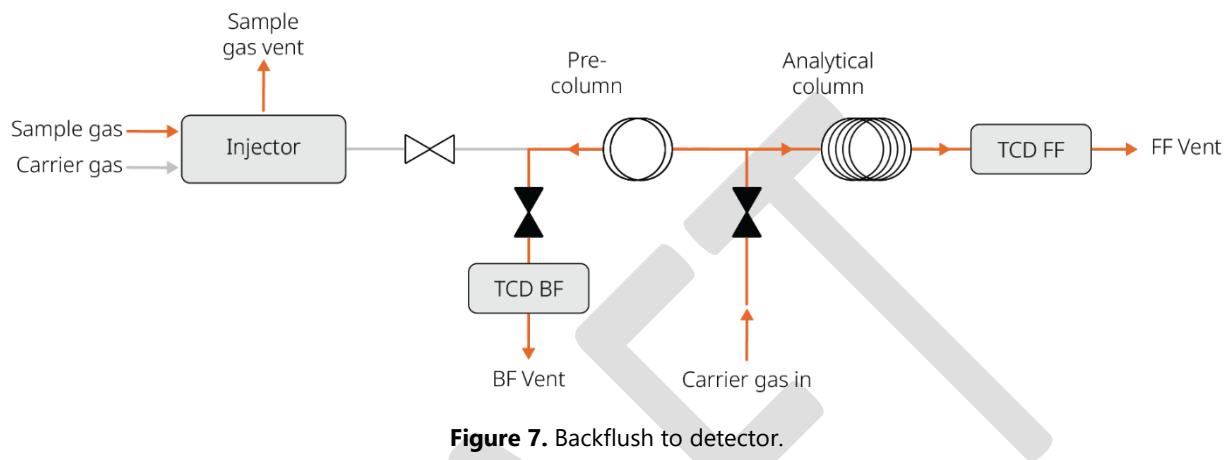


Figure 7. Backflush to detector.

4.2.5 Fastloop

To enhance the transport of fresh sample gas toward the analyzer, the fastloop option can be enabled. The fastloop increases the incoming sample flow by connecting a parallel gas channel which reduces the overall sample flow resistance, see figure below. Note that the sample flow through the injector chip remains the same in both 'fastloop on' and 'fastloop off' situation. The fastloop can be switched on or off via the software. In Figure 8, a schematic representation of a fastloop line is given. Please refer to the *DynamIQ Software Manual / DynamIQ Process Software Manual* for more information on how to enable/disable the fastloop option.

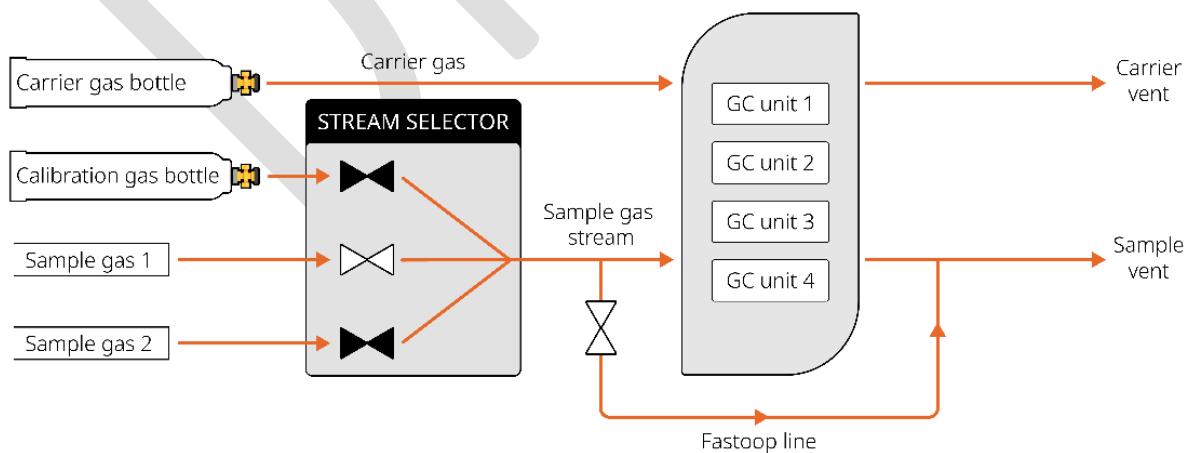


Figure 8. Schematic representation of the fastloop.

4.2.6 Sample pump

Optionally, the DynamiQ micro-GC analyzer can be equipped with an integrated sample pump. The sample pump is located between the GC units and sample vent, see Figure 9. It creates a continuous sample flow by sucking sample gas into the instrument. This is used when no pressurized sample is available. The sample pump can be combined with a stream selector and fastloop line. Please refer to the *Quick Guide-DynamiQ integrated sample pump* for more information about the optional integrated sample pump provided by Qmicro.

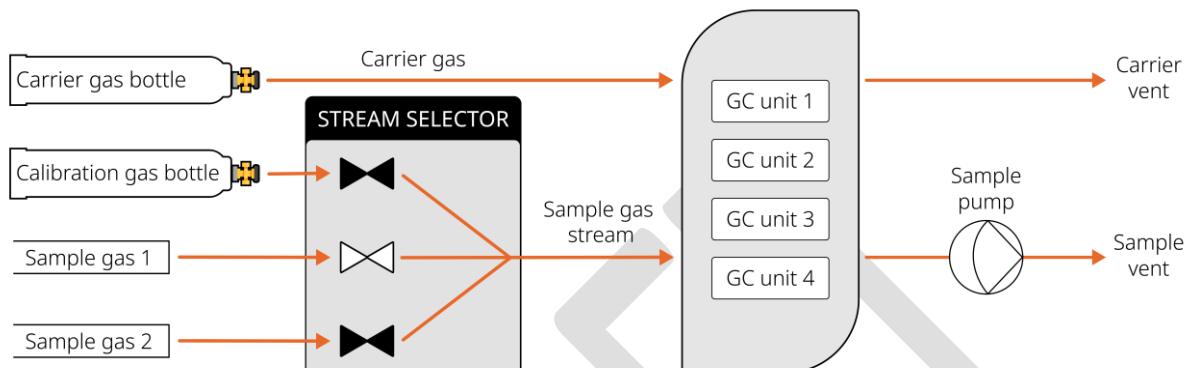


Figure 9. Schematic representation of the optional sample pump.

4.2.7 Data acquisition

The detector data is processed by an integrated processor. The autonomous running instrument generates data according to a user defined format. This can be MODBUS, ASCII or customer specific over LAN, RS232 or RS485. Besides, result reports can be generated. Please refer to the *Quick Guide - DynamiQ Modbus connection* for more information about Modbus connection with DynamiQ instruments.

5 Hardware and installation

The DynamiQ-S micro-GC analyzer is a small microchip-based gas analyzer for fast analysis of gaseous samples based on gas chromatography (GC). The naming conventions of the DynamiQ-S are given in Figure 10. The DynamiQ-S consists of two main parts: the host and the cartridge, see Figure 11 for an exploded view of the DynamiQ-S. The cartridge contains all core GC hardware (injector, column, detector, and heaters). The host facilitates fluidic and electronic connections and contains the pneumatic and electronic control functionality. The parts are discussed in more detail in the subsequent sections. Normally, the DynamiQ-S instrument is wall mounted with all gas and electrical connections directed downwards, however it can also be mounted on a flat surface.

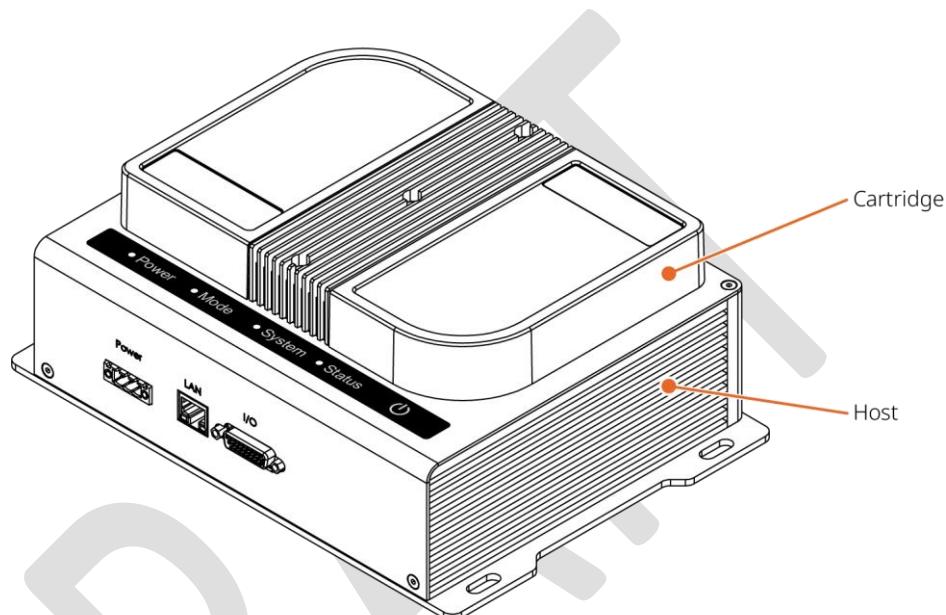


Figure 10. Naming conventions of the DynamiQ-S.

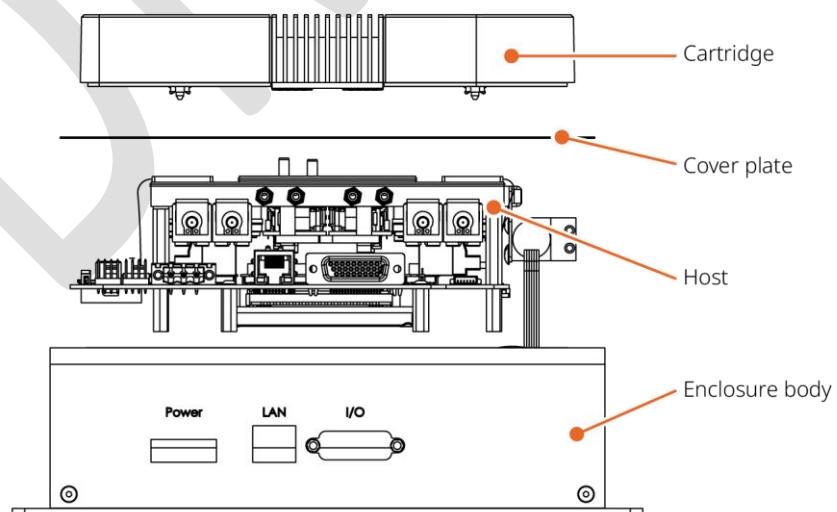


Figure 11. Exploded view of the DynamiQ-S.

5.1 Host

The host consists of electronics with processing power, pneumatic components and a gas distribution manifold. Via dedicated firmware it takes care of controlling the microchips, column heaters, sample injectors and read-out of the thermal conductivity detector (TCD) signals. Furthermore, it controls valves for directing the incoming gases to the cartridge and provides the electrical connections to the cartridge and the receptacle (i.e. power supply and communication). A schematic representation of the host interface is given in the Figure 12. Note that the electrical and gas connections and the gas ports should always be kept clean.

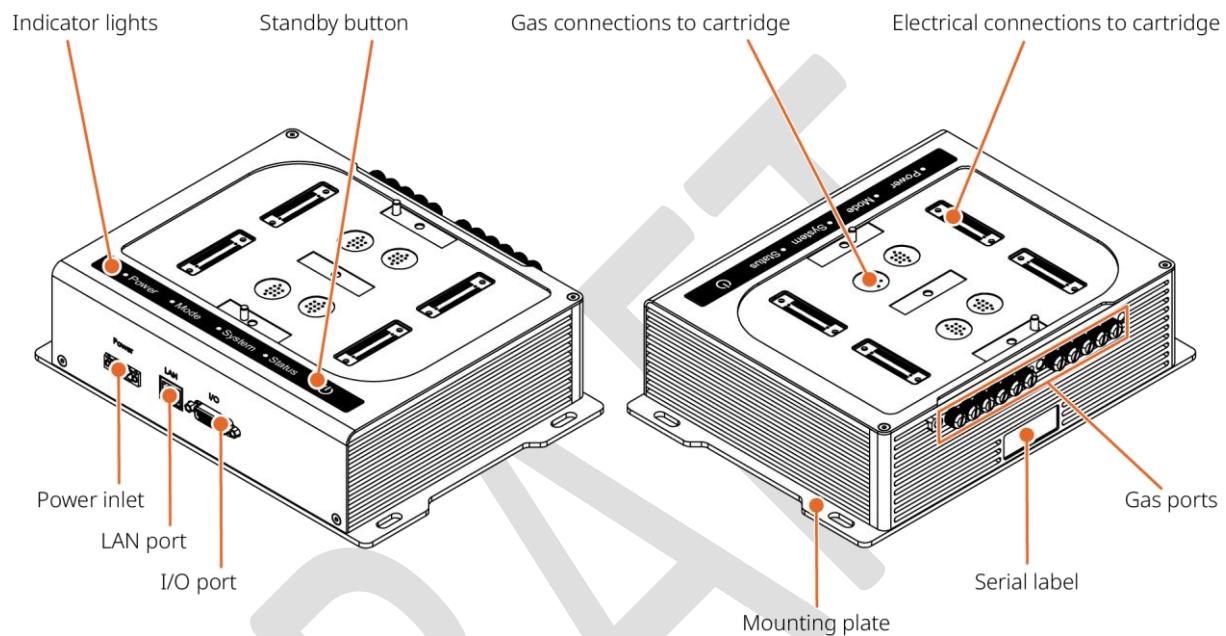


Figure 12. Schematic representation of the host.

5.2 Cover plate

The cover plate is mounted on top of the host unit, see Figure 13. It prevents accidental access to the host when the cartridge is removed. It protects the host from getting damaged by e.g. ESD, bumping, etc.

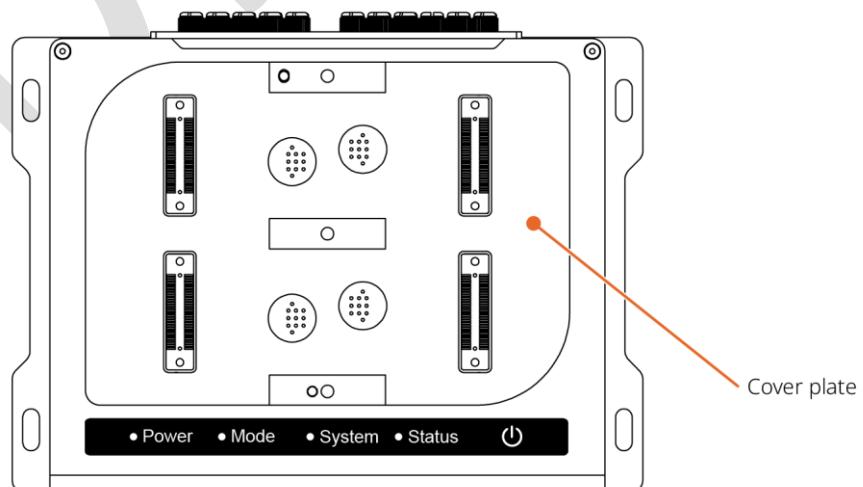


Figure 13. DynamIQ-S cover plate.

5.3 Cartridge

The cartridge is an exchangeable part which can be replaced by the end user. Please refer to § 7.2 for cartridge re-attachment / replacement instructions. The cartridge contains four separate areas for four GC units. The cartridge contains an electrical and a gas connection per unit. A schematic representation of the cartridge is displayed below in Figure 14. The number of installed analytical units in the cartridge depends on the application. The cartridge can only be placed in one way.

Note that the electrical and gas connections should always be kept clean.

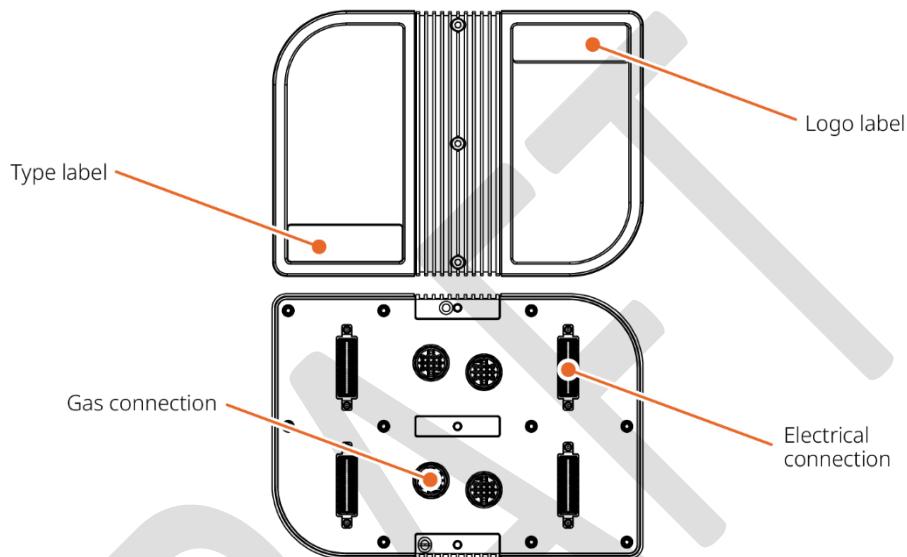


Figure 14. Top and bottom view of a cartridge that contains four analytical units.

5.4 Back plate

The DynamIQ-S is supplied with a backplate, see Figure 15. The standard supplied back plate makes it possible to mount the DynamIQ-S to a wall or setup, see Figure 16 for the technical drawings of the back plate.

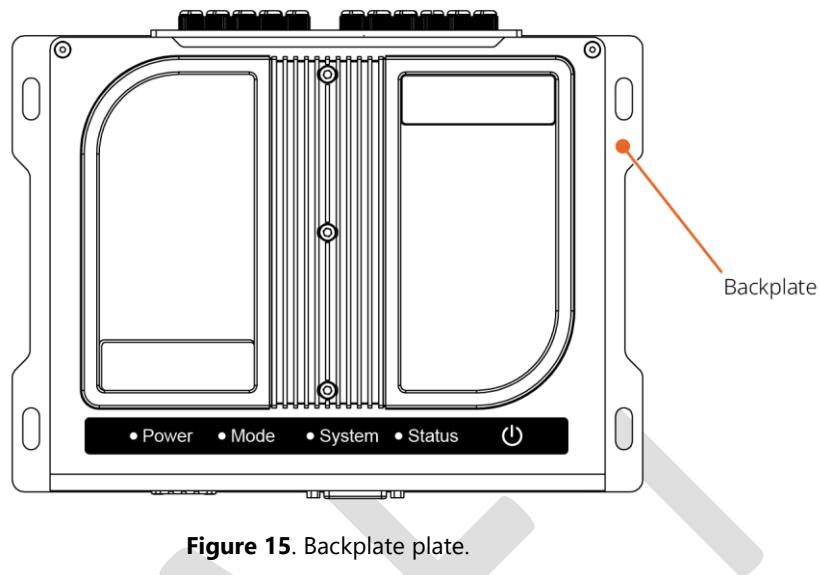


Figure 15. Backplate plate.

Backplate advice



For optimal operation of the DynamIQ-S, it is advised to always use the mounting wall plate.

5.4.1 Mounting

The DyamiQ-S is preferably mounted vertically via the supplied backplate to a wall/setup. The mounting hole pattern (technical drawing) on the wall for the backplate can be derived from Figure 16.

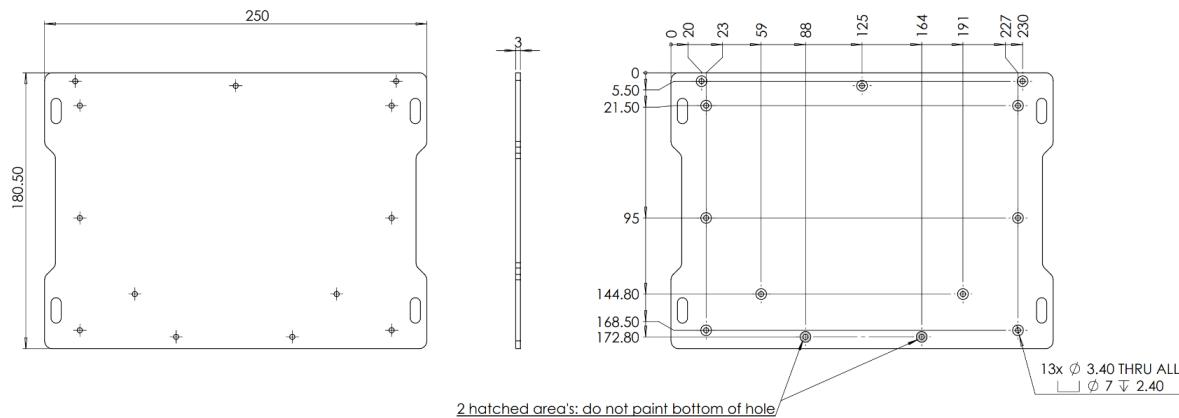
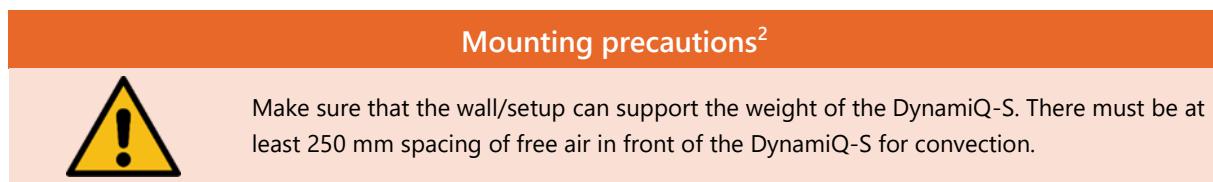


Figure 16. Backplate technical drawing.

² These precautions are in addition to the general precautions for the DyamiQ-S micro-GC analyzer. Therefore, the general precautions for the DyamiQ-S micro-GC analyzer should also be considered.

5.5 Data connections

The DynamiQ-S has a LAN connector and I/O connector for data communication, see Figure 17. The exact configured communication interface and protocol is described in the *Instrument configuration appendix*.

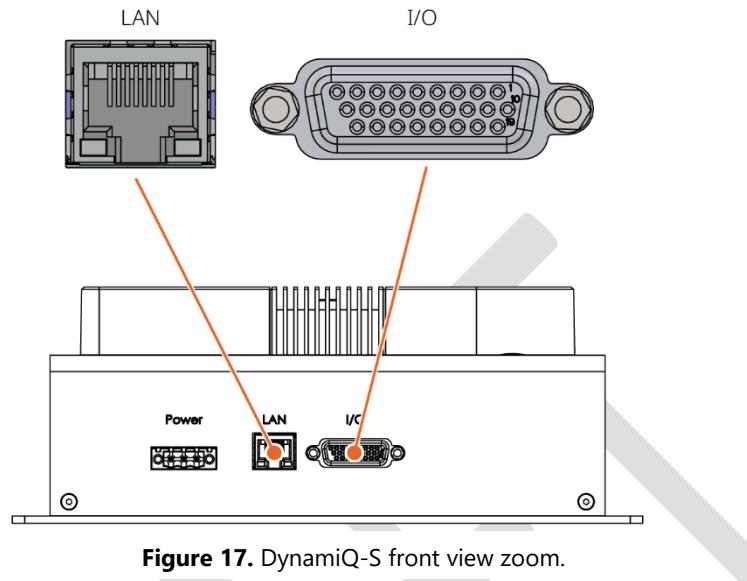


Figure 17. DynamiQ-S front view zoom.

The following protocols listed in Table 2 are available. For further information about implementing Modbus protocol, please refer to the *Quick Guide- DynamiQ Modbus connection*.

Table 2. Supported protocols.

Name	Description	Compatible bus	Default
Modbus serial (RTU)	Modbus over serial line (binary)	RS-232, RS-485	Yes
Modbus serial (ASCII)	Modbus over serial line (ASCII)	RS-232, RS-485	Upon request
Modbus TCP	Modbus over LAN	LAN	Yes
VICI stream selector	Control external rotary valve VICI stream selector	RS-232	Upon request
Smalltalk	Qmicro protocol for DynamiQ application	LAN	Yes
Custom project	Custom protocol	LAN, RS-232, RS-485	Upon request
Custom sensor	Custom external sensor protocol	LAN, RS-232, RS-485	Upon request
Simple	Qmicro protocol for simple functionality	LAN, RS-232, RS-485	Upon request

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer.

Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

5.5.1 LAN

A standard UTP cable can be connected to the RJ45 Ethernet port of the DynamiQ-S. The DynamiQ-S can be accessed via the DynamiQ software by any computer that is on the same network.

5.5.2 I/O

The I/O port can be used for several communication interfaces and protocols. The connector type is male High Density D-SUB, 26-pins, see Figure 18. The pin definition of this port is described in Table 3.

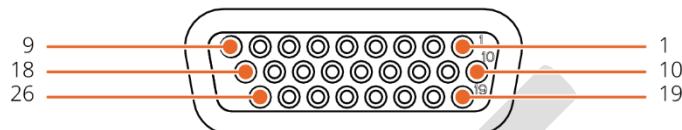


Figure 18. I/O port of the DynamiQ-S

Table 3. I/O port of the DynamiQ-S pin description.

Pin	Function	Type
Pin 1	RX – receiving wire (connects to TX of sender RS232-port 2) *	RS-232
Pin 2	Positive wire (connects to positive wire of RS-485-port 2) **	RS-485
Pin 3	TX – transmitting wire (connects to RX of sender RS232-port 2) or Negative wire (connects to negative wire of RS485-port 2) ***	RS-232 RS-485
Pin 4	Positive wire, connects to positive wire of RS-485 bus (port1)	RS-485
Pin 5	Negative wire, connects to negative wire of RS-485 bus (port1)	RS-485
Pin 6	Common contact	Digital input
Pin 7	Reset (resets the instrument)	Digital input
Pin 8	Conf1 (factory configurable)	Digital input
Pin 9	Ground connection	Ground
Pin 10	RX – receiving wire (connects to TX of sender RS232-port 1)	RS-232
Pin 11	TX – transmitting wire (connects to RX of sender RS232-port 1)	RS-232
Pin 12	Ready (signals instrument ready)	Digital output
Pin 13	Error (signals instrument error)	Digital output
Pin 14	Conf0 (factory configurable)	Digital output
Pin 15	Conf1 (factory configurable)	Digital output
Pin 16	On-standby (turn on the instrument or put in stand-by)	Digital input
Pin 17	Conf0 (factory configurable)	Digital input
Pin 18	Power supply (24 V, max 1.5A) ****	Power
Pin 19	Reserved	

Pin	Function	Type
Pin 20	Ground connection	Ground
Pin 21	Ready (signals instrument ready)	Digital output
Pin 22	Error (signals instrument error)	Digital output
Pin 23	Conf0 (factory configurable)	Digital output
Pin 24	Conf1 (factory configurable)	Digital output
Pin 25	Ground connection	Ground
Pin 26	Power supply (24 V, max 1.5A) ****	Power

5.6 Electrical connections

The DynamiQ-S must be powered by nominal 24 VDC (max 75 Watt). The power connector type is a 3 pin Eurostyle terminal plug with 5.08 mm pitch. Pinout is given in Figure 19.

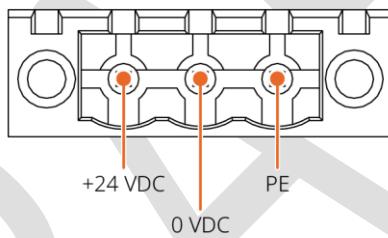


Figure 19. Power connection on the DynamiQ-S.

5.6.1 Grounding

The instrument must be grounded. This can be done by using the optionally delivered power supply with internal earth or else by connecting the ground pin of the connector to earth.

Do not apply electrical power to the device until all interconnections and external signal connections have been verified and proper grounds have been made.

5.6.2 Instructions to commission the electrical connections

1. Ensure proper grounding by using the provided power supply cable with internal grounding or by connecting the ground pin of the connector directly to the Protective earth (PE).
2. Inspect cables for any signs of damage or defects.
3. Verify that cables are placed correctly in the right ports.

* Only if the second RS-232 port is configured, else the pin is reserved / not in use.

** Only if the second RS-485 port is configured, else the pin is reserved / not in use.

*** Depending on the configuration (either second RS-232 port or second RS-485 port).

**** These 2 supply lines are separately secured and connected internally to the power supply. This voltage stays high as long as the power supply is connected, also in the standby mode.

Electrical connections precautions²



The DynamiQ-S should first be grounded before any other connections are made.



The DynamiQ-S should be power by a 24 VDC power supply with a maximal 75W power rating, and it should be compliant with the separated extra-low voltage (SELV) standard.



Failure to check the power supply label may result in injury or death to personnel or cause damage to the equipment. Applying 110 to 220 VAC to the DC power terminals will severely damage the device. See power supply label prior to connection.

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

The DynamiQ-S has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This DynamiQ-S generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.



If the DynamiQ-S does cause harmful interference to radio or television reception, which can be determined by turning the instrument off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note that the DynamiQ-S is configured in either industrial or laboratory mode. Only in laboratory mode, the standby button is enabled. The configured mode can be found in the configuration description in the *Instrument configuration appendix* which is available on the Qmicro Partner SharePoint site.

In case of a functional standby button (laboratory mode), the standby off/on works as follows:

Power on:

A short button press will be sufficient to turn on the DynamiQ-S.

Power off:

Press the standby button for about 5 seconds. Immediately after pressing the button, the status LED (see § 6.1) will turn pink and the other 3 LEDs turn off, to indicate the power-off action started. If the button is held for longer than 5 seconds, the analyzer will go on standby and the power LED will turn red. A shorter press of the button will not result in an action to prevent an accidental shut down, and the LEDs go back to their former state.

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer.

Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

5.7 Gas connections and flow

The DynamiQ-S micro-GC contains a stainless-steel manifold in which, dependent on the application, the type, amount and mapping of gas connections are implemented. The gas ports are located at the backside of the DynamiQ-S, see Figure 20. Please refer to the *Instrument configuration appendix* of the GC which is available on the Qmicro Partner SharePoint site, where the exact number of gas inlet and vent ports are indicated together with their specifications.

The function of each gas port is application specific and indicated on the user label above the ports. Please refer to the *Instrument configuration appendix* of the GC which is available on the Qmicro Partner SharePoint site, where the exact number of gas inlet and vent ports are indicated together with their specifications.

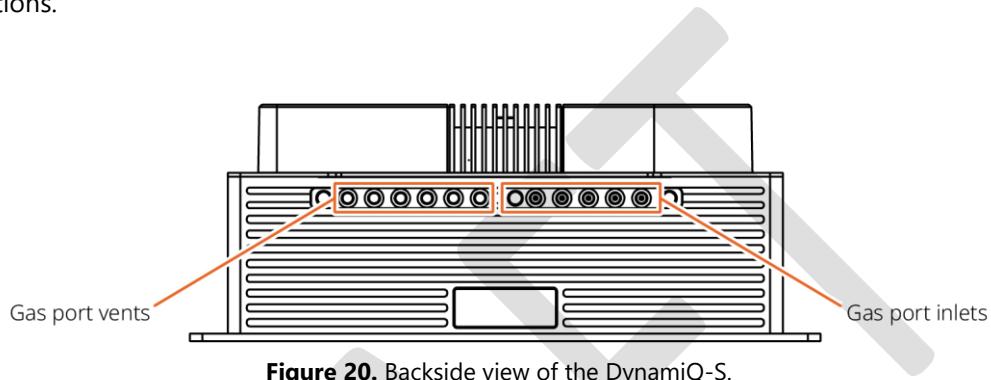


Figure 20. Backside view of the DynamiQ-S.

Carrier gas 1 (C1 gas inlet) is always connected to GC units 1, 2 and 3, while carrier gas 2 (C2 gas inlet) is always connected to GC unit 4. Both inlet (C1 and C2) must be connected to the carrier gas all the time. In case of a single carrier gas application the same carrier gas source can be connected to C1 and C2 gas inlets by using a carrier gas inlet splitter $\frac{1}{16}$ ".

Figure 21 gives an example of a DynamiQ-S instrument that consists of 4 GC units to visualize the gas connection and flow within the DynamiQ analyzers. The stream selector allows the user to select the desired stream for executing measurements. After the stream selector, the selected sample gas together with the carrier gas is led simultaneously through all GC units. In the injector, a small amount of sample gas is injected in the carrier gas flow and guided via the column to the detector and vent. The Fastloop is an extra line in the sample path that reduces resistance.

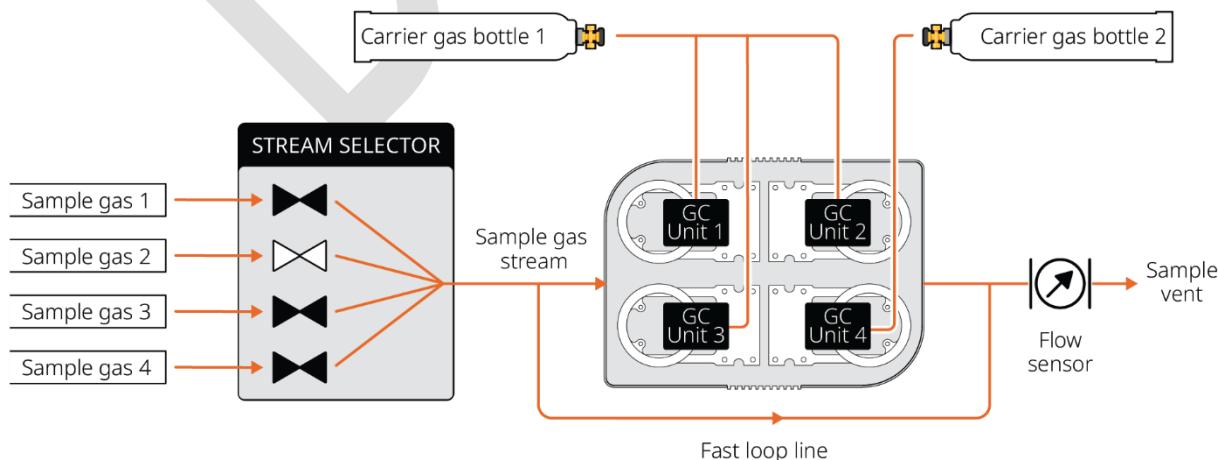


Figure 21. Schematic representation of gas connections and flow in DynamiQ analyzers.

5.7.1 Gas ports

DynamiQ micro-GC gas analyzers have 2 types of gas ports namely gas port inlets and gas port vents. Gas port inlets are for connecting the sample, carrier and actuation gases, whereas gas port vents are for venting the outgoing gases.

Gas port vents can be made suitable for connection to a tube for further processing and/or transportation of the vented gas. The default gas vent ports for the DynamiQ-S micro-GC analyzers have a female 10-32 UNF thread and barbed 10/32" Beswick connectors, which are delivered with the instrument.

Gas connections precaution²



It is important to vent outgoing gases as hazardous substances can endanger the health and safety of the user. Venting outgoing gases must be conform with local, national and/or international regulations that are applicable to the GC installation location.

The type of connection to the gas port inlets is customizable but is standard Valco fitting (VICI AG international) for $\frac{1}{16}$ inch tubing [1]. Note that the tubing, nuts, and ferules should all be stainless steel.

Please refer to the *Instrument configuration appendix* of the GC which is available on the Qmicro Partner SharePoint site, where the exact number of inlet and vent ports are indicated together with their specifications.

Gas connections advice



During shipping, dust plugs are mounted into the gas port inlets/outlets which must be removed before use. It is recommended to store the dust plugs for future transport.

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer. Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

5.7.2 Connecting gas lines

1. Remove the dust plugs from the GC and store them safely for future use when storing or transporting the GC.
2. Flush all stainless-steel tubing with the applicable gas(es) before connecting gas lines to the GC.
3. Assemble the stainless-steel gas tubing fittings by following steps given in § 5.7.4.
4. Connect a carrier gas supply to the carrier/actuation inlet and connect the sample gas to the sample inlet, see *Instrument configuration appendix*. To connect the inlet gas lines, use the $1/16$ " Valco fittings that are delivered with the DynamiQ-S: nuts ZN1 and ferrules ZF1 from VICI AG International.
5. Set the carrier/actuation pressure to $450 \pm 5\%$ kPa with the pressure controller on the carrier gas supply.
6. To connect tubing to the vent outlets, the dedicated connectors that are available for the DynamiQ-S can be used.
7. Check the connections made for leakage with an electronic leak testing device.

Gas connections precaution² and advice



Do not use soap solutions or liquid leak testing devices, as it will damage the GC.



Use only dual stage regulators for carrier gas bottles.



Use stainless-steel gas tubing and stainless-steel fittings only.



Do not block the sample and carrier vents.



Ensure that stainless steel gas tubes are connected to the correct DynamiQ micro-GC gas inlets and gas bottles by referring to the same *Instrument configuration appendix*.

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer. Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

5.7.3 The DynamiQ-S gas supplies in any configuration

1. An externally regulated and conditioned carrier/actuation gas supply: helium, argon, nitrogen, hydrogen or air. The supplied gas should be pure (e.g. 99.999%), dry and free of particles. Carrier pressure should be $450 \pm 5\%$ kPa for optimal functionality of the GC. Supply pressure for carrier gas is also used for actuation pressure.
2. One or more sample gas supplies. The supplied gases should be dry (non-condensing between 0-50°C) and free of particles. When the optional internal sample pump of the DynamiQ-S is not used, the sample gas should be supplied with a pressure between 10 and 200 kPa (hardware limit). Please note that the pressure upper limit is application specific.

Gas connections advice



Sample pressure that is too high can result in split chromatogram peaks. Therefore, it is advised to maintain a sample pressure that is 10-15% lower than the lowest carrier pressure in the analysis method.

3. Typically, the gas for actuation and carrier is the same gas. But optionally, a separate actuation gas supply is available (different than the carrier gas).

The supplied actuation gas should be dry and free of particles. In the *Instrument configuration appendix*, it is described if this option is installed, together with the required actuation supply pressure. In some configurations/applications more than one carrier gas is applied.

Gas connections precautions²



Before using gases, carefully read the hazard indications and information reported in the Safety Sheet supplied by the manufacturer referring to the Chemical Abstract Service (CAS) number and/or Safety Data Sheets (SDSs). It is the user's responsibility to see that all local safety regulations for the use of gases are obeyed.



Carrier gases used in the instrument should be dry and particle free.



Make sure that the gas port vents are not blocked at any time or experience any flow resistance to avoid internal valve damage. In addition, do not connect/combine gas port vents to avoid pneumatic crosstalk effects.



Do not use excessive force/torque for making a gas connection to a gas port. In case a gas port can be freely rotated, do not commission the DynamiQ-S and contact Qmicro.



The applied gas pressures should not exceed 200kPa, as the sample valves can handle a maximum of 200kPa.



The carrier gas pressure should be $450 \pm 5\%$ kPa.



Vent ports should be free (not blocked) at all times to avoid internal valve damage. Do not connect/combine vents to avoid pneumatic crosstalk effects

Gas connections precautions²



The DynamiQ-S can be used with carrier gases He, Ar, N₂, H₂ and air, but do not use other gases as it might harm the instrument.

Note that the DynamiQ-S does not include any safety measures when using Hydrogen as the carrier gas. Therefore, safety precautions must be taken. For more information please, contact Qmicro.



It is important to vent outgoing gases as hazardous substances can endanger the health and safety of the user. Venting outgoing gases must be conform with local, national and/or international regulations that are applicable to the GC installation location.



For connecting the gases, use 1/16" metal tubing and only use dual stage pressure regulators with metal seals.



Flush all the tubing and regulators before use and flush gas lines to remove air or other unwanted gases.

5.7.4 Stainless-steel gas tubing fitting assembly

Vici Valco fittings are used for all 1/16" tubing and couplings at Qmicro. The connection between the tubing and body of fitting is made with ferrules that have a cone shape. The VICI Valco fittings for chromatography typically employ a compression fitting, in which a ferrule is compressed onto the tube as a nut is tightened. These fittings provide excellent stability and reliability in high pressure applications for GC [1]. Please gather the necessary equipment listed in Table 4 and proceed with the following instructions.

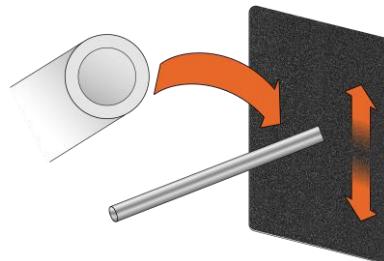
Table 4. Equipment for stainless steel gas tubing assembly.

Equipment for stainless steel gas tubing assembly	
Equipment	Brand/ type
1/16 inch stainless steel tubing	Generic Vici (recommended)
File	Generic
Stainless steel tubing cutter	Generic
GC accessories kit	
• Vici stainless steel male nut 1/16 inch SS303	Vici
• Vici stainless steel ferrule 1/16 inch SS303	Vici
• Combination spanner 1/4 inch	Generic

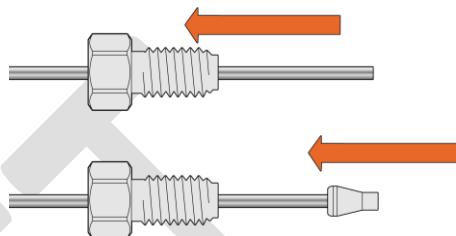
² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer.

Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

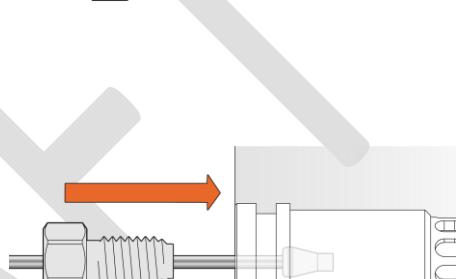
1. Measure the desired length of stainless-steel tubing to fit between the gas inlets and gas bottles and cut with a $\frac{1}{16}$ inch (1.6mm) tubing cutter.



2. Ensure that the edges of the stainless-steel tube are flat with a visible hole. Use sandpaper if needed to flatten the edges of the cut stainless steel tube



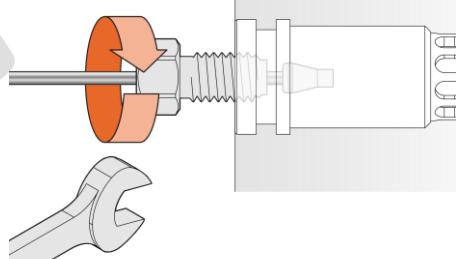
3. Place the male nut over the stainless-steel tube



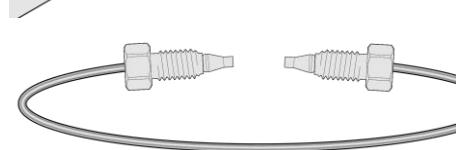
4. Place the ferrule over the stainless-steel tube



5. Insert the stainless-steel tube with male nut and ferrule the body of fitting e.g., a gas inlet on the GC. Apply pressure with the $\frac{1}{4}$ inch combination spanner.



6. Apply pressure with the $\frac{1}{4}$ inch combination spanner.



7. Repeat steps 1 to 5 on the other side of the stainless-steel tube. New stainless-steel gas tube is complete.

6 DynamiQ-S start up and commissioning

This paragraph gives step-by-step instructions on how to start-up and commission the GC. The DynamiQ-S micro-GC gas analyzers have 2 power modes namely: industrial and laboratory mode. With industrial mode the GC is directly turned on when connected to a power source. When the GC is configured with laboratory mode it will turn on when the power-on button on the GC is manually pushed. The modes are interchangeable and can be configured at Qmicro. When powering up, the status LED light indicator should light up. The status LED light indicator is located at the front of the DynamiQ-S see Figure 22.

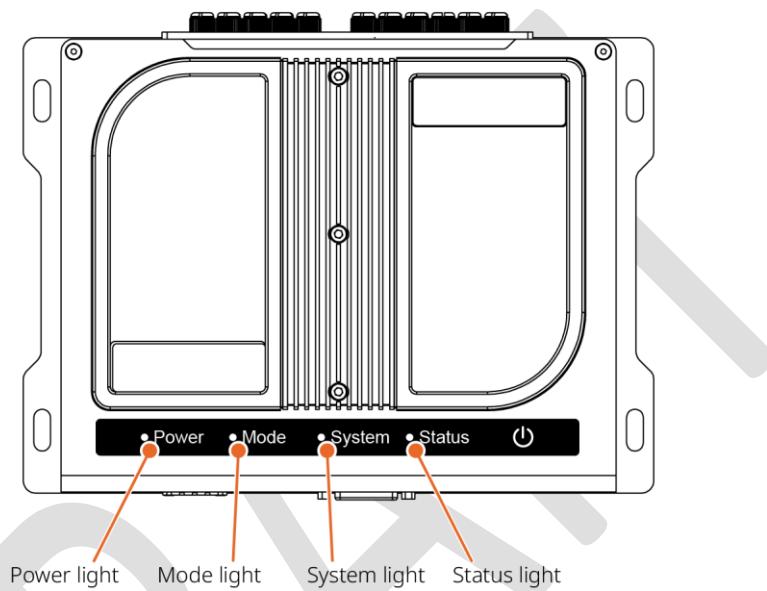


Figure 22. LED indicators on the DynamiQ-S.

6.1 Instructions to start up the DynamiQ-S micro-GC

1. Before powering up the GC ensure proper grounding and gas line connections as described in Chapter 5.
2. Power the DynamiQ-S with the specified voltage as described in Chapter 8 (Technical specifications).
 - a. A GC in industrial mode will be turned on when powered on.
 - b. A GC in laboratory mode will be turned on when the power button is pressed.
 - c. In case the LED light indicators illustrated in Figure 22 do not light up, the GC is unable to receive power. Contact Qmicro support team.
3. The instrument will start up automatically when powered.
 - a. Check the LED light pattern. The power LED continuously lights red when the instrument is switched on. Under normal conditions, the power LED should turn pink and all lights on the DynamiQ-S LED indicator should turn solid white within 2 minutes and remain unchanged.
 - b. If any other LED light pattern shows, please identify the GC status with Table 5.
 - c. Further operation is done via the software. Login is possible when the instrument starts stabilizing. Please refer to the *DynamiQ Software Manual*/ DynamiQ Process Software Manual for detailed information on how to start analyzing with the DynamiQ instrument.
4. Check the actuation pressure, this should be $450 \pm 5\%$ kPa.
5. Read the *Instrument configuration appendix* to check if the analytical units should be conditioned before use.
6. The DynamiQ-S should be in idle mode for at least 2 hours, connected with carrier gas, to reach thermal equilibrium for optimal accuracy (stabilize).
7. Adjust the sample inlet pressure to get a (stable) value < 200 kPa such that enough refreshing sample is realized for the application. For an optimal accuracy, the sample pressure should be set within $\pm 10\%$ of the sample pressure at calibration
8. The DynamiQ-S is now ready for (continuous) analysis. For detailed information how to start analyzing, please refer to the *DynamiQ Software Manual* for instructions regarding the DynamiQ Explorer software or the *DynamiQ Process Software Manual* for instructions regarding the DynamiQ Process software.

Table 5. LED status light scheme indicators for DynamiQ-S.

Power LED	Mode LED	System LED	Status LED	Status
Off	Off	Off	Off	Off
Solid red	Off	Off	Off	Standby and powered
Solid pink	Off	Off	Off	Processor booting
Blinking pink/red	Off	Off	Off	Processor error
Solid white	Off	Solid white	Solid white	Normal, processor in run mode
Solid white	Solid white	Solid white	Solid white	Mode: analysis running
Solid white	Slow blinking white/off (0.5 Hz)	Solid white	Solid white	Mode: idle
Solid white	Moderate blinking white/off (1 Hz)	Solid white	Solid white	Mode: stabilizing
Solid white	Fast blinking white/off (2.5 Hz)	Solid white	Solid white	Mode: sequence error
				System error:
Solid white	Off	Fast blinking red/white (2.5 Hz)	Solid white	<ul style="list-style-type: none"> Supply error Sample flow out of range Actuation pressure out of range
				Status error:
Solid white followed by the GC turning off within seconds	Off	Solid white	Fast blinking red/white (2.5 Hz)	<ul style="list-style-type: none"> Hardware error (configuration corruption) Low memory High equipment temperature

Note that: When the GC is turned off via the DynamiQ software, the Power LED light will turn pink for approximately 3 seconds before turning red. The red LED light indicates that the GC is powered and in standby mode.

7 Troubleshooting, service and maintenance

For troubleshooting and support see the corresponding manuals and quick guides which are available on the Qmicro Partner SharePoint site.

For support contact Qmicro at support@qmicro.com.

For field support contact your supplier.

Troubleshooting, service and maintenance²



Repair of the DynamiQ-S is prohibited. In case of a defect or damage, always contact Qmicro.

DynamiQ-S cartridge exchange precautions² and advice



Power off and disconnect the DynamiQ-S, also shut off all gases before exchanging the cartridge. Take proper ESD precautions to prevent electrostatic discharge and prevent touching electronic components. Make sure there are no harmful gases present in the instrument before removing the cartridge as it may be released to the environment.



Use only replacement parts supplied by Qmicro and follow the specified installation instructions.



Do not reuse cartridge and lid screws that exhibit any signs of damage, contamination, or rust; to maintain the integrity of the assembly and prioritize safety.



The DynamiQ-S can be used with carrier gases He, Ar, N₂, H₂ and air, but do not use other gases as it might harm the instrument.

Note that the DynamiQ-S does not include any safety measures when using Hydrogen as the carrier gas. Therefore, safety precautions must be taken. For more information please, contact Qmicro.



For fixing the cartridge, it is advised to use screws provided by Qmicro. Never use stainless steel screws to prevent cold welding.

² These precautions are in addition to the general precautions for the DynamiQ-S micro-GC analyzer. Therefore, the general precautions for the DynamiQ-S micro-GC analyzer should also be considered.

7.1 Unmounting

Follow instructions below to unmount the DynamiQ-S.

1. Shutdown the DynamiQ-S via the DynamiQ software. Please refer to the *DynamiQ Software manual* for more information regarding shutting off the GC.
2. Shut off the gas supplies.
3. Disconnect the DynamiQ-S from the power supply and disconnect all I/O and LAN communication lines.
4. Disconnect the gas connections.
5. If the DynamiQ-S is mounted to a wall or plate, it can now be unmounted.
6. Insert the dust plugs into the gas ports to protect the DynamiQ-S.

7.2 Cartridge re-attachment/replacement

The DynamiQ-S micro-GC analyzers consists of an exchangeable cartridge on a host, see Chapter 5. To exchange the cartridge, please gather the necessary equipment listed in Table 6 and follow the instructions.

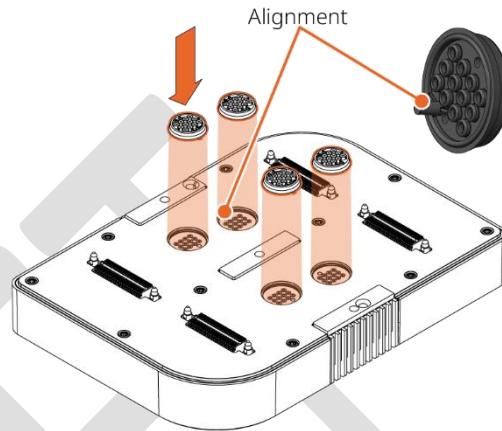
Table 6. Equipment for cartridge re-attachment and replacement.

Equipment	Brand/type
Inbus key	Generic – 3 mm inbus
Torque screwdriver	Generic – 3 mm inbus

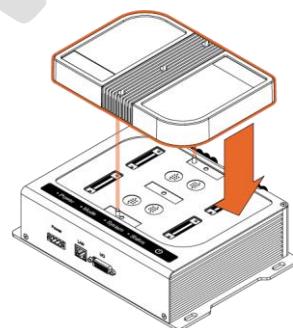
1. Shut down the GC using the DynamiQ software and make sure that **no power** is supplied to the GC and shut off all gas supplies.
2. Unscrew the three middle screws on the cartridge with an 3mm inbus key that attach the cartridge with the GC and take the cartridge out.
3. Before placing the cartage back on inspect and or change the gaskets if needed.

Bad cartridge connection may be solved by exchanging the gaskets on a cartridge.

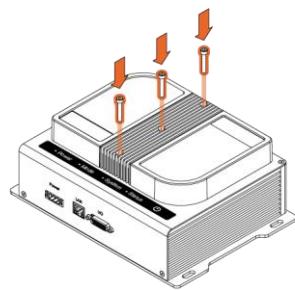
- To inspect the gasket, make sure that the gasket is securely in place on the analytical unit and does not move.
- To exchange the gasket, use tweezers to carefully detach the gasket from the analytical unit. Once the gasket is removed place another gasket aligning the gasket pin with the hole in the analytical unit. Apply slight pressure on the gasket and pinch the sides of the gasket into the analytical unit with tweezers. The gasket should be stuck to the analytical unit.



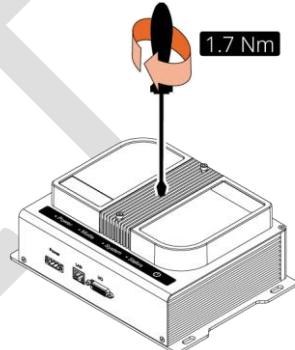
4. Place the cartridge back on the host with the two pins. Visually check that the cartridge correctly slid over the pins and is still parallel to the GC. Note that the cartridge can only be installed in one way, dowel pins prevent incorrect installation.



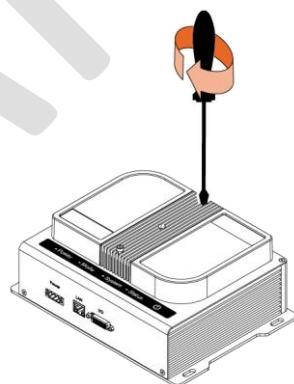
5. Place the three screws in the cartridge holes. Visually check that the cartridge correctly slides over the pins and is still parallel to the manifold.



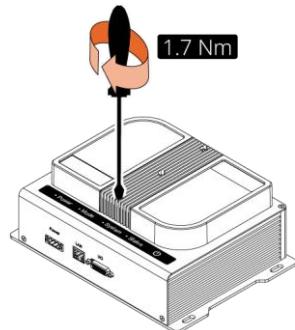
6. First tighten the center screw with mounting torque 1.7 Nm.
Use torque screwdriver.



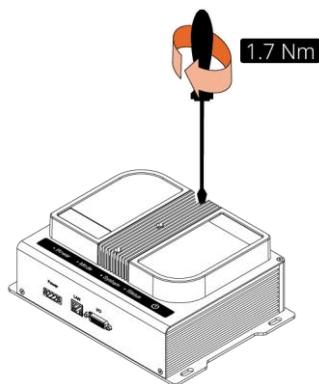
7. Tighten the top screw until a slight resistance is felt. Do **not** apply mounting torque.



8. Tighten the bottom screw with mounting torque 1.7 Nm.
Use torque screwdriver.



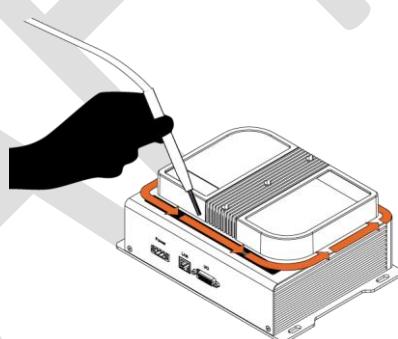
9. Tighten the top screw with mounting torque 1.7 Nm again.
 - *Use torque screwdriver.*



10. Tighten the middle screw again with mounting torque 1.7 Nm.
 - *Use torque screwdriver.*



11. It is strongly recommended to perform a leak test using an electronic leak testing device around the cartridge. Note that this step can only be executed in a non-hazardous zone.
 - a. Supply the instrument with carrier gas.
 - b. Perform leak test with electronic leak testing device.



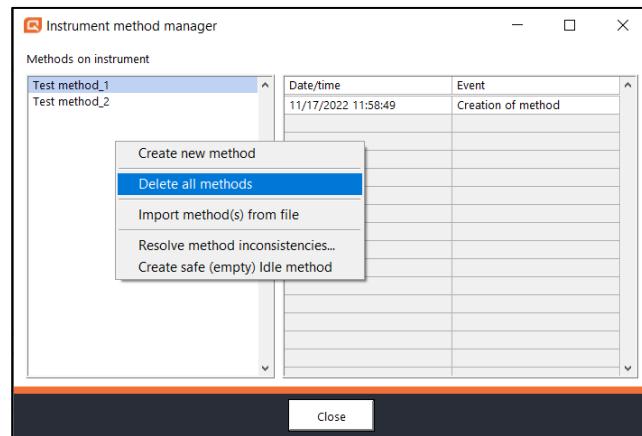
12. Supply the instrument with the carrier gas after mounting the cartridge back on.

7.2.1 Commissioning the GC after the cartridge replacement

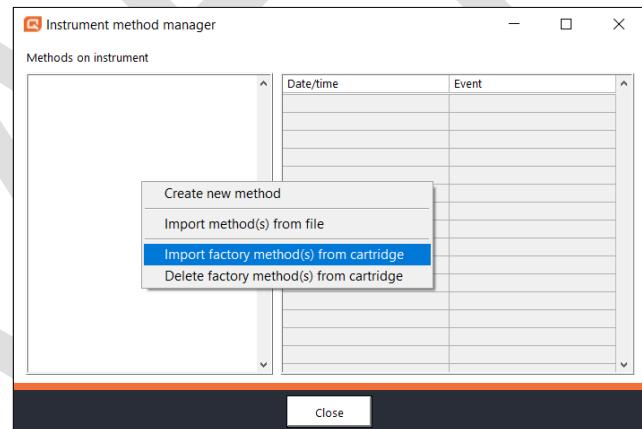
7.2.1.1 The cartridge with an application method

1. Turn on the DynamiQ micro-GC gas analyzer.
2. Log in to the DynamiQ software. Please refer to the *DynamiQ Software Manual* for more information.

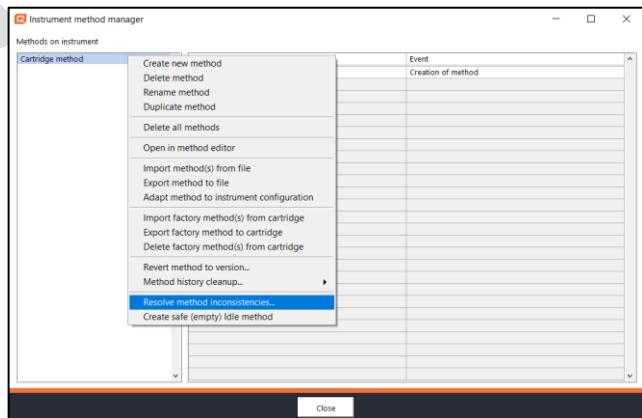
3. Go to *Instrument method manager* (Ctrl+F9). Delete all existing methods by right-clicking on a method and then click *Delete all methods*.



4. Go to *Instrument method manager* (Ctrl+F9) and import factory methods from cartridge by right-clicking on *Methods on instrument* table.



5. Go to *Instrument method manager* (Ctrl+F9) and resolve method inconsistencies by right-clicking *Methods on instrument* table.



6. Note that timing of integration events and/or identification windows may need to be adjusted. Please refer to the *DynamiQ Software Manual* for information about the integration and/or identification windows.

7.2.1.2 The cartridge without an application method

1. Switch on the DynamiQ micro-GC gas analyzer.
2. Log in to the DynamiQ software. Please refer to the *DynamiQ Software Manual* for more information.
3. Let the GC stabilize in Idle state for at least 2 hours.
4. Connect the calibration or validation sample to the selected stream and open the bottle.
5. Run the analysis method with selected stream until stabilization.
6. Check the results of all GC units, when the chromatograms are stabilized.
7. When the peaks are not identified as their correct gas components, the carrier pressure and/or the column temperature should be adjusted.
 - a. Adjust the carrier pressure accordingly to set the first peak of the chromatogram at its correct place. When the peak is on the right side of its identification window, increase the carrier pressure and when the peak is on the left side of its window, decrease the carrier pressure. Do this until the first peak is identified as its correct gas component.
 - b. Then, adjust the column temperature to get the last peak in the chromatogram to its correct place. When the peak is on the right side of its identification window, increase the column temperature and when the peak is at the left side of its window decrease the column temperature.
 - c. Lastly, adjust the carrier pressure a last time to get the first peak in its correct place as described under step a).
8. Adjust the backflush timing when it is necessary. Please refer to Quick guide- Backflush for more information.
9. Run the analysis method with the new settings and check the results of all GC units. When the concentrations in the analysis results are not the same as expected from the bottle, adjust the injection time to get the correct concentrations. When the concentrations in the results are lower than expected from the bottle the injection time should be increased and when the concentrations are higher the injection time should be decreased.
10. Note that timing of integration events and/or identification windows may need to be adjusted.

Please refer to the *DynamiQ Software Manual* or the *DynamiQ Process Software Manual* for more information.

7.3 Transportation

It is strongly recommended to transport the DynamiQ-S in the carton box/robust case with protective foam as how the DynamiQ-S was delivered. To transport the DynamiQ-S instrument first follow the instructions for unmounting the instrument given in § 7.1. Thereafter, place the DynamiQ-S in the dedicated protective case/box for transportation.

Transportation advice



During shipping, dust plugs are mounted into the gas port inlets/outlets which must be removed before use. It is recommended to store the dust plugs for future transport.



It is strongly recommended to transport the DynamiQ-S in the carton box/robust case with protective foam as how the DynamiQ-S was delivered.

7.4 Cleaning

The DynamiQ-S can be cleaned with a damp cloth wetted by water, while unpowered.

Cleaning advice



Use of cleaning agents is not recommended nor is the use of a water projection nozzle.

7.5 Disposal

Follow local, national and/or international regulations to dispose of the DynamiQ.

Disposal precaution



The DynamiQ- should be disposed of in accordance with the Waste Electrical and Electronic Equipment (WEEE) directive.

7.6 Overheating

Prevent overheating of the DynamiQ-S by placing the instrument in an environment specified in Chapter 7. Additionally, overheating of the instrument can be prevented by placing it against a surface that diverts thermal energy.

Overheating advice



If overheating occurs repeatedly while the environmental temperature is below 55°C and the backplate of the instrument is against a surface that diverts thermal energy, there may be a defect, and it is recommended to contact Qmicro.

8 Technical specifications

Environmental

Ambient operating temperature	5 °C to 55°C / 41 °F to 131 °F
Ambient storage temperature	-20 °C to 60 °C / -4 °F to 140 °F
Ambient transportation temperature	-20 °C to 60 °C / -4 °F to 140 °F
Ambient relative humidity	5% to 95% non-condensing

Electrical

Power supply	20 VDC to 28 VDC
Maximum power consumption	75W

Communication

Protocol	MODBUS over serial or ethernet
Ports	1x RS232 (serial) 2x RS485 (serial) 1x TCP/LAN (ethernet) 4x Digital Inputs 4x Digital Outputs
Data storage	32 GB SD card integrated in the host

Dimensions and weight

Dimensions	250 x 180 x 100 mm / 9.8 x 7.2 x 3.8 "
Weight	< 8 kg / 17.6 lb.

Columns

Type	Variety of silica (WCOT/PLOT) columns
Number/type of GC units	1 to 4 columns/Isothermal (temperature-ramping on request)
Column temperature range	70 °C to 150 °C continuously, 180 °C intermittent
Column temperature stability	± 0.1 °C

Carrier gas

Carrier gas	He, Ar, N ₂ , H ₂ (see Chapter 2 for safety precautions regarding H ₂)
Gas purity	≥ 99.999%

Carrier gas

Required filtration	5 µm filter size
Carrier gas consumption	2-5 ml/min per GC channel (application dependent)
Carrier gas input pressure	450 ± 5% kPa
Gas ports	1/16" VICI, see instrument configuration appendix

Injector and sample gas

Sample streams	3 or more. Please refer to the <i>Instrument configuration appendix</i>
Sampling	Pressurized sample or sample pumping
Gas ports	1/16" VICI. Please refer to the <i>Instrument configuration appendix</i>
Sample conditions	Non-condensing gas of 0 °C to 50 °C
Sample pressure	10 kPa to 200 kPa
Injector type	Foreflush and backflush-to-detector
Heated injector	Up to 120 °C
Injection volume	0.1-17 µL uncompressed, time based

Detectors

Detector type	On chip dual channel foreflush and backflush TCD
Internal flow path TCD	15 nl
Chemical protection	Inert coated sensors
Thermal/electrical protection	Intrinsically safe against heater burnout

Performance

Detection range	500 ppb to 100% (application dependent)
Detection limit (for pentane in natural gas)	< 500 ppb
Repeatability (for concentrations > 0.1%)	0.05% RSD
Cycle time	Typical 15 s to 60 s (application dependent)

Safety

Certifications

CE 0344

QPS Applicable Standards:
CAN/CSA C22.2 No.61010-1
UL 61010-1 – UL

FCC ID: 2BL2G-GC446171

DRAFT

9 Resources and references

[1] "VALCO FITTINGS," 21 8 2023. [Online]. Available: <https://www.vici.com/vfit/vfit.php>.

DRAFT

10 Appendices

10.1 Declaration of conformity

EU Declaration of Conformity

We,

Qmicro B.V.
Neptunusstraat 21
7521WC, Enschede
The Netherlands

hereby declare in our sole responsibility, that the following Gas Chromatograph product:

Type DynamIQ-S micro GC
and its private labeled or OEM equivalents

is in accordance with the Directives:

2014/30/EU, EMC Directive.

The equipment has been designed and manufactured to the relevant parts of the following harmonized standards:

EN 55011 (2009) + A1 (2010), EN-IEC 61000-4-2 (2009), EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010),
EN-IEC 61000-4-4 (2012), EN-IEC 61000-4-5 (2014), EN-IEC 61000-4-6 (2014), EN-IEC 61000-4-8 (2010).

We hereby certify that, to the best of our knowledge, compliance with RoHS (Reg. 2011/65/EU and the delegated directive 2015/863/EU) has been verified through internal controls, receipt of supplier declarations of compliance and/or analytical tests.



Mark Kok
Managing Director
Enschede, August 22, 2023



10.2 QPS Certificate



QPS Evaluation Services Inc
Testing, Certification and Field Evaluation Body
Accredited in Canada, the USA, and Internationally

File
LR3380

CERTIFICATE OF COMPLIANCE (ISO TYPE 3 CERTIFICATION SYSTEM)	
Issued to:	Qmicro B.V.
Address:	Neptunusstraat 21, Enschede, 7521 WC, The Netherlands
Project Number:	LR3380-1
Product:	Gas Chromatograph
Model Number:	DynamIQ-S, OEM-S
Ratings:	Input: 20-28Vdc, 75W max
Applicable Standards:	<ul style="list-style-type: none">• CAN/CSA C22.2 No. 61010-1 - Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements - Third Edition; June 2023• UL 61010-1 - UL - Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements - Third Edition; June 6, 2023
Factory/Manufacturing Location:	Same as applicant
Statement of Compliance: The product(s)/equipment identified in this Certificate and described in the Report covered under the above referenced project number have been investigated and found to be in compliance with the relevant requirements of the above referenced standard(s) and versions. As such, they are eligible to bear the QPS Certification Mark shown below, in accordance with the provisions of QPS's Service Agreement.	
IMPORTANT NOTE	
In order to maintain integrity of the QPS Mark(s), this certification will be revoked if:	
(1) Compliance with the above-mentioned Standard(s) – including any, informed through QPS Standard Update Notice (QSD 55) issued in future – is not maintained, or	
(2) The product/equipment is modified after certification is granted, without prior <u>written consent</u> from QPS.	
	
Issued By:	Scott Airdrie
Signature:	
Date: August 9, 2024	



The SCC and IAS Accreditation Symbols are official symbols of the respective accreditation bodies, used under license
81 Kelfield St., Units 7-9, Toronto, ON M9W 5A3 Tel: 416-241-8857; Fax: 416-241-0682
www.qps.ca



QSD 34

Rev 05

10.3 Applicable standards

The DynamiQ-S complies to the following standards:

Test description	Standard
Conducted emission, test with a LISN	EN 55011 (2009) + A1 (2010)
Radiated emission up to 1 GHz (SAC)	EN 55011 (2009) + A1 (2010)
ESD	EN-IEC 61000-4-2 (2009)
Radiated Immunity	EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010)
EFT	EN-IEC 61000-4-4 (2012)
Surge	EN-IEC 61000-4-5 (2014)
Conducted Immunity	EN-IEC 61000-4-6 (2014)
Power frequency magnetic field	EN-IEC 61000-4-8 (2010)
Conducted emission, test with a LISN	EN 55011 (2009) + A1 (2010)
Radiated emission up to 1 GHz (SAC)	EN 55011 (2009) + A1 (2010)
ESD	EN-IEC 61000-4-2 (2009)
Radiated Immunity	EN-IEC 61000-4-3 (2006) + A1 (2008) + A2 (2010)

INDEX

A

- actuation pressure.....35
- analytical unit.....39
- analyzer.....8, 12, 13, 14, 15, 16, 17, 18, 19, 22, 24, 27, 28, 29, 30, 32, 34, 37, 38, 42, 43
- application.....21, 28, 31, 42, 43, 46
- ASCII.....18

B

- backflush.....16, 17
- back-flush-to-detector.....16
- backplate.....22, 23

C

- calibration gas.....14, 15
- carrier gas.....6, 13, 14, 15, 16, 17, 28, 31, 41, 45, 46
- carrier pressure.....31, 43
- cartridge.....14, 19, 20, 21, 37, 38, 39, 40, 41, 42, 43
- chip.....13, 14, 16, 17, 46
- chromatogram.....16, 31, 43
- cleaning.....44
- cold welding.....37
- column oven.....13, 45
- combination spanner.....12, 33
- commissioning.....8, 34, 42
- communication.....8, 20, 24, 25, 38, 45
- computer.....6, 25
- configuration.....16, 24, 26, 27, 28, 29, 30, 31, 35, 36, 45, 46
- connection.....13, 21, 25, 26, 27, 29, 32, 39
- corrosion.....11
- cycle time.....46

D

- damage.....9, 26, 30
- detection limit.....46
- detection range.....46
- detectors.....14
- dimensions.....45
- dowel pins.....39
- dust plugs.....29, 38, 44
- DynamiQ Process Software Manual15, 17, 35, 43
- DynamiQ software8, 25, 36, 38, 42, 43
- DynamiQ Software Manual15, 17, 35, 42, 43
- DynamiQ-S.....8, 10, 11, 12, 13, 19, 24, 25, 26, 27, 28, 29, 31, 32, 35, 36, 37, 38, 44, 50

E

- earth26
- electric shock hazard9
- electrical connections20, 26
- emission50
- equipment1, 6, 8, 27, 32, 36, 38
- ESD20, 50
- ethernet25
- explosion47
- explosion hazard9

F

- Fast Serial Interface6
- fastloop17, 18
- ferrule12, 30, 32, 33
- firmware13, 20
- fitting12, 29, 30, 32, 33
- flow8, 13, 14, 15, 16, 17, 18, 36, 46
- foreflush16, 46
- Frequently asked questions6

G

- gas chromatography6, 13, 16, 19
- gas composition13
- gas connection10, 20, 21, 28, 31, 38
- gas port10, 12, 20, 28, 29, 31, 38, 44, 46
- gas purity45
- gas stream13, 15
- gas vent29
- gasket39
- GC6, 8, 16, 18, 28, 32, 39
- GC accessories kit32
- ground pin26
- guidelines9

H

- hardware1, 8, 13, 19
- host19, 20, 39

I

I/O	24, 25, 38
identification	42, 43
idle	36
industrial	27, 34
Information	1
injection	14, 15, 16
injector	13, 14, 15, 17, 19, 46
Installation	9, 34
instrument	11, 41
instrument configuration appendix	24, 27, 28, 29, 30, 35, 37, 45, 46
Instrument configuration appendix	31
integration	42, 43
international	1, 29, 32

L

laboratory	27, 34
LAN	6, 18, 24, 25, 38
LED	6, 35
legal	1
local	1, 9, 29

M

manifold	20, 28, 40
maximum power consumption	45
method	13, 31, 42, 43
microchips	20
mounting torque	40, 41
mounting wall plate	22

N

national	1, 9, 29
----------	----------

P

parameters	13, 14
peak	17, 43
pin-out	45
pneumatic crosstalk effects	31
power supply	25, 26, 27, 38, 45
processor booting	36
processor error	36
protection	10, 27, 46
protective earth	7
Protective earth	26
protocol	24
publication	1

R

reference	1, 8, 9, 16, 48
regulators	32
repair	11
RS-232	25
RS-485	25

S

Safety Data Sheets	10, 31
sample conditions	46
sample gas	14, 15, 17, 18, 46
sample loop	15
sample pressure	31, 46
sample pump	18
sample streams	46
screwdriver	32, 38, 40, 41
screws	39, 40
SharePoint site	10, 28, 29
shipping	12, 29, 44
software	8, 15, 17, 35, 39
stabilizing	36
stainless steel	30, 37
stainless steel tubing cutter	32
status LED light indicator	34
storage	45
stream selector	14, 15, 18
support	8
symbols	8, 9
system	1, 6, 13, 36

T

TCD	16, 17, 20, 46
TCP	7
technical drawing	22, 23
temperature	9, 13, 14, 36, 43, 45
transport	17, 44
transportation	29, 44, 45
tubing	32, 33

V

VICI	24, 29, 30, 32, 46
------	--------------------

W

wall mounted	19
weight	45