

DynamiQ-X process GC

Gas chromatographs for on-line gas analysis



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The DynamiQ-X process GC provides fast and accurate on-line monitoring of various process gases, and delivers concentrations and calculated values related to the composition.

The instrument can be programmed for continuous unattended process monitoring as well as manual gas analysis.

The hazardous-area-certified micro process GC

is extremely compact while its capabilities are massive. The applied micro GC chips enable analysis times of less than a minute.



DynamiQ-X micro process GC

Very short analysis times

The DynamiQ-X micro process GC accommodates one to four gas chromatograph (GC) units working in parallel, each performing a different GC analysis under individually optimized conditions. Each GC unit contains a state-of-the-art microchip-based injector and a thermal conductivity detector (TCD) combined with a proven microbore GC column, and is set with optimal chromatography conditions. This enables a compact instrument as well as very short analysis times of typically less than a minute.

Continuous monitoring

The instrument is designed for continuous monitoring and therefore works in a stand-alone configuration using the integrated processor on a future-proof operating system based on Linux RT, without the need for a separate controller to give commands. In addition, dedicated DynamiQ PC software can be used to analyze the collected data in

further detail and to change operation settings. The PC can be connected to the process GC at any location via a network connection.

Versatile instrument

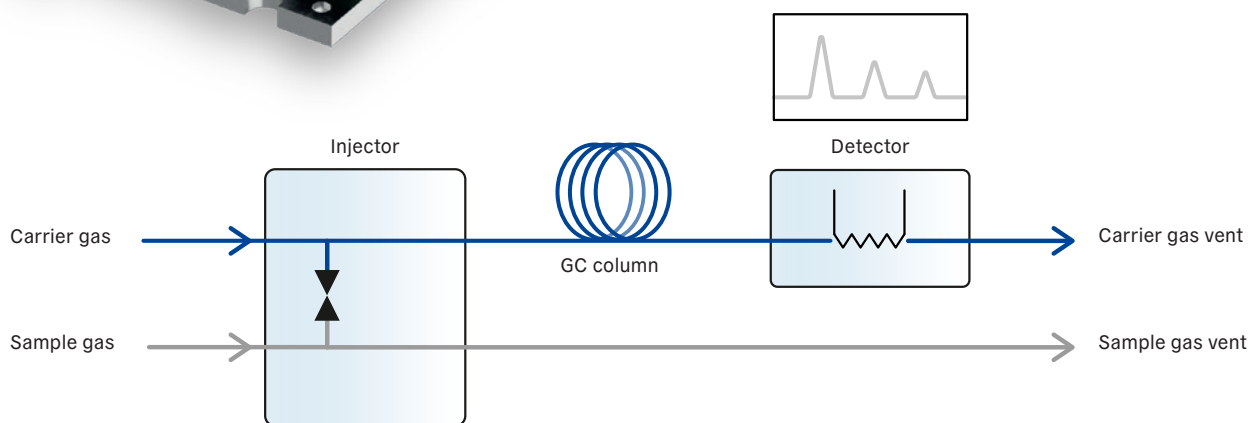
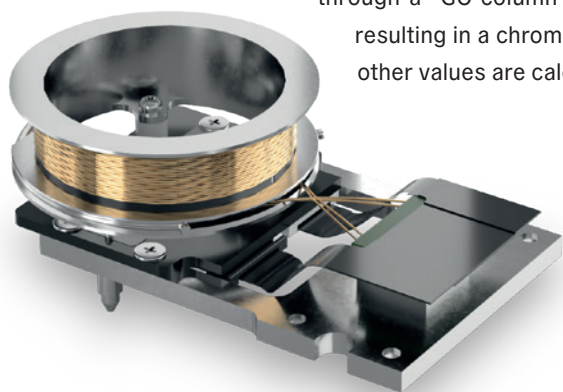
By selecting different columns in the GC units, a wide range of gas analysis applications can be served. The instruments are factory tested with standard gas components, but users can change gases and optimize methods and thus applications using the DynamiQ PC software. Methods can be optimized for client-specific applications using the automatic parameter variation tool in the software.

Compact device

The compact instrument has a volume of only 10l and weighs less than 15kg, so it is very easy to transport and can be deployed anywhere for gas analysis if local power and gas bottles are available.

DynamiQ's micro gas chromatography

The gas analysis is conducted by means of gas chromatography, a proven analysis method for determining the chemical composition of a gas mixture. A small volume of the sample gas is injected into the carrier gas and this mixture flows through a "GC column", where the gas components are separated and individually detected, resulting in a chromatogram. From this chromatogram, the components' concentrations and other values are calculated.



Gas chromatography – schematically

Easy-connect and universal options

ATEX/IECEX certified DynamiQ-X easy-connect analyzers feature an Ex connector, while the ATEX/IECEX/cQPSus certified DynamiQ-X universal analyzers come with a fixed Ex cable. Both models are securely encased in a marine-grade aluminum IP65 enclosure, ensuring explosion safety and making them ideal for harsh environments.

Tubeless process GC

A one-piece manifold replaces tubing found in traditional process GCs. This adds to the robustness and performance of the process GC, as fewer connections reduce possible sources of leakage. In fact, the GC column is the only “tube” inside the instrument.

Fast exchange of cartridges

The cartridge, which contains the GC units, can be replaced by the end user. The replacement is simple and can be done within 10 minutes. Approximately two hours after cartridge replacement, the DynamiQ-X is fully operable again.

Stream selector

The process GC has a built-in stream selector to connect up to four streams and/or calibration gas bottles. This integrated stream selector switches between the different gas inlets, so only one stream is introduced into the process GC at a time. The stream selector has a double block

and bleed design, so there are virtually no history or cross contamination effects between the different gas streams. After the stream selector, the selected sample gas together with the carrier gas is led in parallel through all GC units.

In addition, an external (VICI) 16-port multi-stream selector can be connected and controlled from the instrument software.

Injector

Time-controlled injection is used, with an integrated array of pneumatically controlled micro membrane valves. This makes injection extremely accurate and reproducible, and provides short analysis times.

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. The advantage of this principle is that sample gas is injected at controlled carrier gas pressure, and consequently there is no measurement error caused by a pressure variation.

Detector

The in-house-fabricated detector chip is a thermal conductivity detector (TCD), a robust device featuring simplicity, a large dynamic range, a general response to both organic and inorganic species and a non-destructive character. The temperature-controlled micro TCD – with 2×24-bit digital detector electronics – automatically adapts to different gases and is protected against overheating. It may



be better to avoid splitting this name over two lines. micro-chip TCD technology results in a detection limit better than 0.5 ppm (for pentane).

Back-flush to detector

The DynamiQ-X process GC is equipped with back-flush-to-detector technology. This increases the analytical column lifetime because polluting or reactive components are prevented from entering the column.

Moreover, by using a second detector, both fore-flush and back-flush chromatograms run in parallel, which reduces the analysis time even more. For example, a standard natural gas C₆+ analysis is conducted every 45 seconds.

Fastloop

So that changes in the gas composition can be followed in near real-time, the DynamiQ-X process GC features a fast-loop. For sample flow refreshment, the fastloop increases the incoming sample flow by connecting a parallel gas channel which reduces the overall sample flow resistance.

Low carrier gas consumption

The gas port connections are 1/16" VICI Valco fittings. Typical carrier gas consumption is less than 15ml/minute during an analysis. By applying optimal measurement settings, the use of carrier gas can be limited to one gas bottle every three years.

Helium, argon, nitrogen or hydrogen can be applied as carrier gas.

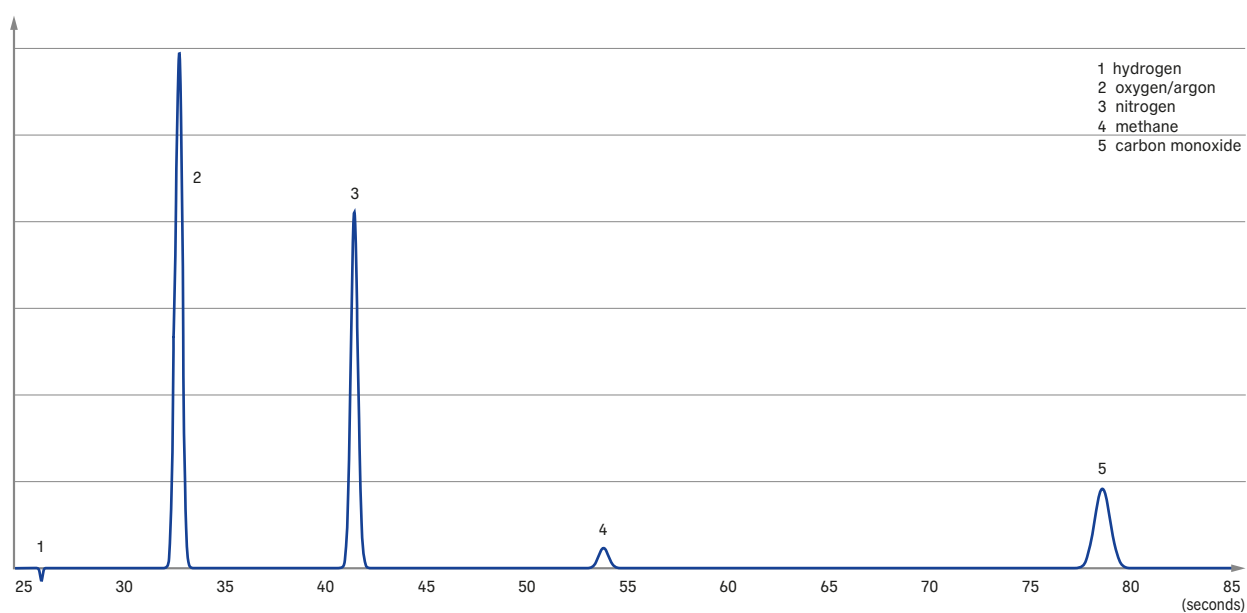
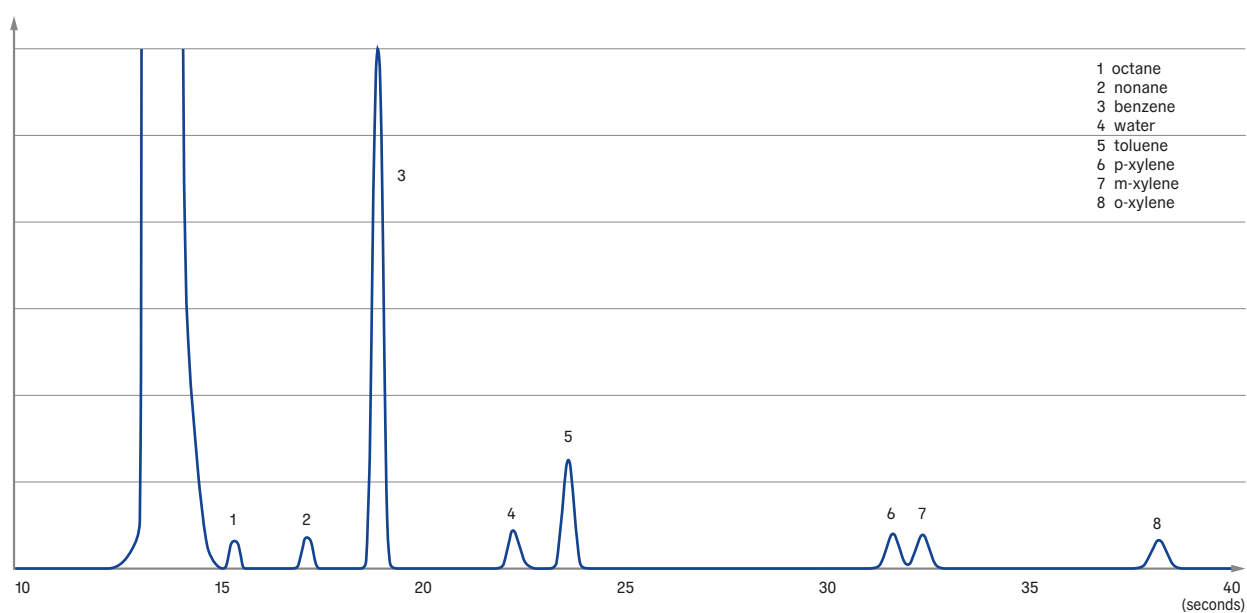
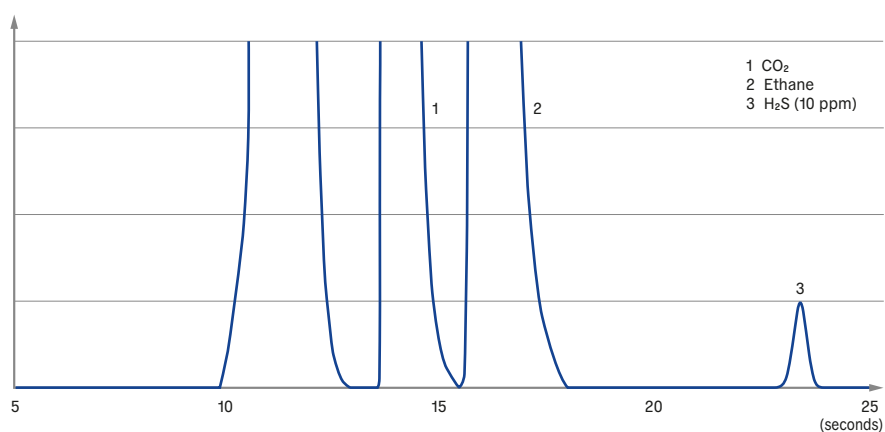
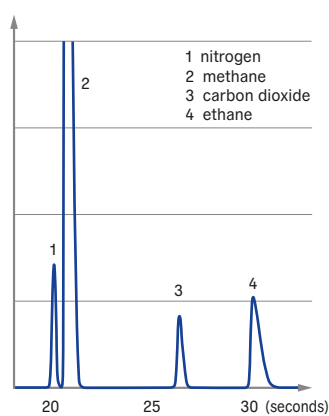
Instruments with multiple GC units have two separate carrier gas inlets, to which two different carrier gases can be connected. The second carrier gas port leads to one specific GC unit. The instrument control adapts automatically, without the need for any hardware adaptation.

Sample pump as an option

Optionally, a vacuum sample pump can be integrated into the DynamiQ-X, located inside the GC before the sample vent. It creates a continuous sample flow by drawing sample gas into the instrument, which is required for samples at atmospheric pressure.

The sample pump can be combined with the stream selector and the fastloop line.





Example chromatograms: C₁-C₂ NGA on P column (top left), C₃-C₅, H₂S on U column (top right), BTX on Wax column (mid) and H₂, O₂, N₂, C₁ and CO on M column (bottom)

Operation and data processing

Stand-alone or manual operation

DynamiQ-X analyzers are designed for on-line continuous monitoring, therefore operate stand-alone and unattended. For maximum flexibility, manual operation is also possible whenever required.

Data processing and communication

The detector data is processed by an integrated processor. The autonomous instrument generates data that can be communicated to external systems via MODBUS or other supported protocols over RS485, RS232 or Ethernet interfaces. Digital I/O interfaces are also available. The DynamiQ-X analyzers integrates easily with supervisory systems, including SCADA platforms.

DynamiQ PC software for data analysis and changing settings

Upon delivery, the DynamiQ-X analyzers are supplied with DynamiQ PC software, which can be used for setting, tuning and programming the process GC, after which it runs as a stand-alone instrument. Multiple methods can be programmed in an automatic sequence. Furthermore, this software provides facilities to analyze the collected data in detail. The communication between the DynamiQ-X and the Windows PC is over a (wired) LAN connection.

The DynamiQ PC software is able to:

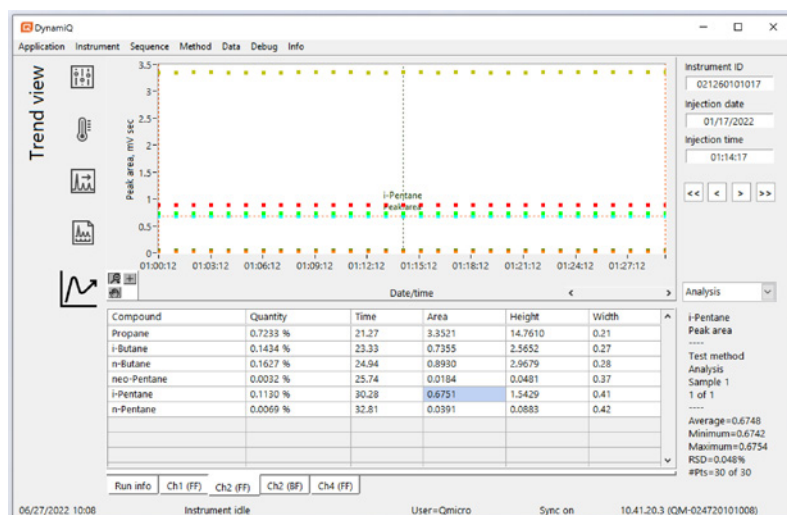
- View and change instrument and method settings
- Perform calibration or validation runs
- Perform multi-level calibration with polynomial fitting
- Perform single or multiple analysis runs
- Analyze collected data in detail
- Show trend plots of measurement data and calculated results
- Recalculate results
- Export results data (to a delimited ASCII spreadsheet) for further processing.

Trends

The software is able to show a trend plot for the results of a series of analyses for a selected parameter, such as quantity, time, area, height, width or a status parameter of the instrument at run start.

Historical data

All method parameters, analysis results, calibration results, calculated values and alarms can be stored with date and time stamp for at least two years, with a memory storage of up to 256 GB inside the DynamiQ-X. This facilitates problem-solving, may help to comply with legislation and enables observation of long-term trends.



DynamiQ software trend view screen sample

Areas of application

Applications

By selecting column and GC method combinations, the fast and accurate process GC can be used for a wide range of applications, including:

- Natural gas C₆+, C₉+, C₁₂+
- Natural gas extended with sulfur compounds, BTEX
- Natural gas odorants
- Mud logging
- Liquefied petroleum gas (LPG)
- Syngas
- Flare gas/flue gas
- Landfill gas
- Biogas, biomethane
- Refinery gas
- Dissolved gas analysis (DGA)/TOGA
- Fuel cell, hydrogen
- Coal mine gas
- Impurities in gases
- Industrial process gas
- Carbon capture, utilization and storage

Columns

Column	Components
M	Permanent gases, CH ₄ , CO
U	Hydrocarbons C ₁ –C ₃ saturated and unsaturated, CO ₂ , sulfur compounds
P	Hydrocarbons C ₃ –C ₁₂ , sulfur compounds
W	Polar volatile solvents, light aromatics (BTX)
A	Light hydrocarbons C ₁ –C ₅ saturated and unsaturated
T	Odorants (THT) in natural gas

Natural gas and hydrogen blends

Accurate measurement of natural gas composition along with hydrogen, calorific value, and Wobbe index in seconds with high analytical accuracy. ISO 6974 compliant and OIML-R140 evaluated solutions are available for custody transfer and energy metering applications.

Comprehensive natural gas applications, such as C₉+, C₁₂+, sulfur compounds and BTEX, can be analyzed using a single instrument.

Calculated values for natural gas applications*

- Normalized components
- Unnormalized sum
- Superior and inferior heating value
- Wobbe index
- Relative density and density
- Molar mass
- Compressibility

* According to ISO 6976, GPA 2172, ASTM D3588, AGA8

Biogas and biomethane (RNG)

Continuous monitoring of renewable gases for process optimization, quality assurance and grid injection compliance. Inert coated options are available for precise and reliable measurements of sulphur components.

Hydrogen

Reliable hydrogen quality analysis for production, transport, storage, and fueling applications. DynamiQ-X analyzers provide highly repeatable measurements for trace impurities and oxygen concentrations down to sub-ppm levels, supporting compliance with hydrogen fuel quality requirements.

Mudlogging

High-speed gas analysis for oil and gas exploration. C₁-C₅ hydrocarbons are measured within seconds and comprehensive hydrocarbon analysis up to C₈ in approximately one minute, enabling near real-time reservoir evaluation from laboratory environments to offshore drilling rigs.

Carbon Capture, Utilization and Storage (CCUS)

Reliable analysis of impurities in captured carbon dioxide streams. DynamiQ-X analyzers support emerging CCUS applications by providing flexible monitoring solutions for evolving industry specifications and operator requirements.

Flare Gas and Flue Gas Monitoring

Continuous monitoring of process and emission gases, supporting environmental compliance, operational efficiency, and process optimization in industrial facilities.

Process Control

Fast and accurate online gas analysis for chemical, petrochemical, energy, and industrial processes. Rapid measurement cycles enable operators to optimize production, improve product quality, and enhance operational safety.

Accessories

Easy-connect cable (2 m)

ATEX / IECEx certified DynamiQ-X easy-connect analyzers feature an Ex receptacle for powering and communication. Optionally, a two-meter cable with connector and wiring scheme is provided to enable practical outward connections.

Junction box with easy-connect cable

An optional junction box enables users to use their own cables (e.g. separate power cable and communication cable) for connection to the DynamiQ-X easy-connect analyzers. It is an Ex e electrical junction box to be placed near the DynamiQ-X in the same zone. The box has a pre-assembled cable with a connector for the DynamiQ-X easy-connect receptacle. Inside the box are terminals for wiring and the box has several (customizable) cable glands.



Junction box for DynamiQ-X universal

ATEX / IECEx / cQPSus certified DynamiQ-X universal analyzers come with a fixed Ex cable. They connect seamlessly to the universal Ex junction box, which includes a cable gland designed for the fixed Ex cable of the DynamiQ-X analyzer. The junction box has multiple threaded holes that allow for customizable cable gland configurations.

The plastic square-shaped Ex electrical junction box is classified as Class I, Div 2, Groups A, B, C, D T6.



The metal round-shaped Ex electrical junction box is classified as Class I, Div 1, Groups B, C, D T6.



Protective case

To ensure safe transportation of DynamiQ-X easy-connect, a robust customized protective case is offered.



Mounting wall plate

Normally, the DynamiQ-X analyzers are wall-mounted with all gas and electrical connections directed downwards. The DynamiQ-X analyzers are supplied with a backplate, enables them to be mounted the instrument to the wall or setup.

In addition, an optional mounting wall plate is available which enables quick mounting and removal of the DynamiQ-X.



Carrier gas combiner

In cases where a single carrier gas is used, a T-connector enables one connection from the carrier gas bottle to the two carrier gas instrument inlets.

Vent adapters

An optional vent adapter with the correct screw thread eases connections between a vent line and the instrument.

Fastener set

A complete spare set of screws for the instrument housing is provided, along with fastener-set instructions.

DynamiQ display

The DynamiQ display is designed for placement in the same explosive hazardous zones as the DynamiQ-X easy-connect analyzers, providing users with immediate access to the GC.



Technical specifications

DynamiQ-X

Specifications	Values
Cycle time	15 to 60 s (typical)
Repeatability of concentration	< 0.05 % RSD (typical, concentration dependent)
Calorific value calculation for natural gas	ISO 6976:2016, GPA 2172, ASTM D3588: $\pm 0.025\%$ repeatability
Operating temperature	-20 to 55 °C / -4 to 131 °F
Storage temperature	-25 to 70 °C / -13 °F to 158 °F
Moisture (non-condensing)	5 to 95 %
Dust/water protection	IP65 (only valid with receptacle cap / mating connections) Type 4X*
Power supply	20 to 28 VDC
Power consumption	20 W nominal, 75 W max
Dimensions	289 × 258 × 122 mm / 11.4 × 10.2 × 4.8"
Weight	< 15 kg / 33 lb. (without mounting brackets)
Gas ports	1/16" VICI Valco
Carrier gas	He, Ar, N ₂ , or H ₂
Carrier gas input pressure	450 $\pm$ 5 % kPa
Carrier gas consumption	2-5 ml/min per GC unit (typical)
Sampling	Pressurized or atmospheric (integrated pump)
Sample pressure	10 to 200 kPa (application dependent)
Sample streams	4 (option for more)
Detectors	Fore-flush and back-flush micro TCD
Detection limit	500 ppb to 100 % (application dependent)
Communication protocols and ports	MODBUS over serial or ethernet
	1 × RS-232
	2 × RS-485
	2 × Ethernet
	1 × Digital input
Memory storage	1 × Digital output
	Up to 256 GB
	CE 0344 Ex II 2G Ex db IIB+H2 T4 Gb
	PSI Certified CLASS: 1, DIVISION: 1, GROUPS: B, C, D, T4*
	EMC 2014/30/EU
Certifications	FCC Part 15 Class B
	OIML R 140 class A compliant, PTB certified by German partner

* Universal options only

Contact

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