

## Product Datasheet

# Laser Gas Detection OEM Module LGD F200P2-H Series

## 1 General description

**Axetris** is offering Laser Gas Detection (LGD) modules with exceptional advantages and value for the customer. Tunable Diode Laser Spectrometry (TDLS), enhanced by proprietary technology, is used for the measurement of CO<sub>2</sub>, NH<sub>3</sub>, CH<sub>4</sub>, HCl, (H<sub>2</sub>O). The modules are designed for integration by Original Equipment Manufacturers (OEMs), active in the field of gas detection and monitoring in diverse industries.

The **LGD F200** series is based on a contactless, near-infrared absorption measurement of the target gas. The systems are self-contained, ready-to-use OEM modules, using a flow-through cell set-up for extractive measurements. The slightly bigger LGD F200 (H) version features optional cell heating up to 190°C for hot gas measurements in process control and environmental compliance related applications.

The system has micro-processor-driven read-out electronics and digital and/or analog data outputs for industry-standard connectivity. Proprietary electronic lock-in technology allows separating gas absorption information from electro-optical system information, eliminating the need for a physical reference channel and providing continuous sensor status monitoring. Low maintenance operation and long life time provide customers with exceptionally low cost-of-ownership and make the LGD F200 the ideal instrument for your OEM applications.

### Main applications

- Process control:  
SCR, incineration & combustion processes, ...
- Emission monitoring:  
Power generation, engine development, waste incineration furnaces, ...
- Environmental monitoring:  
Landfill & green-house gases, livestock, ...
- Chemical engineering:  
Production control & monitoring ...
- Safety:  
Leak detection, refrigeration, toxic gases, ...
- Climate control & monitoring:  
Livestock, climate chambers & rooms, ...



### Key features

- Made for easy integration by OEMs
- Optical, contact-less measurement
- Accurate laser-diode electro-optics
- High selectivity
- Fast response
- Self-contained
- Continuous sensor status monitoring
- Low maintenance
- Low cost-of-ownership
- 10-30V power supply
- Digital and analog data interfaces
- Hot-gas measurement up to 190/220°C

## 2 Execution specifications

### 2.1 Gas detection specifications for LGD F200P2 H NH3

Important:

Reference conditions: External: 20°C – 23°C, 920 -1020 hPa, 40 to 50% r.H.; Gas & cell: Incoming gas temperature at 190°C, measurement cell at 190°C, 10% absolute H<sub>2</sub>O in the measurement gas.

| Parameter                                      | Unit                    | Value / Range   |
|--|-------------------------|---|
| Gas  | -                       | NH <sub>3</sub>   |
| Principle of detection                         | -                       | Tunable Diode Laser Spectrometry (TDLS)   |
| Maximum Range                                  | ppm                     | 0 – 100   |
| Minimum Range                                  | ppm                     | 0 – 20  |
|  |                         | calibration to full scale (FS) range, standard is 100 ppm, for safety reasons max. calibration to 100 ppm (linearity up to 500 ppm, no warranty of precision) |
| Accuracy <sup>1</sup>                          | -                       | ± 2.0 % full scale reading depending on integration stability (temperature & pressure)  |
| Precision <sup>2</sup> 2σ                      | ppm                     | 1.8 with 1 s averaging time <sup>3</sup><br>0.8 with 10 s averaging time <sup>3</sup>   |
| Linearity & Repeatability                      | -                       | included in the accuracy  |
| Gas cross talk/interference                    | -                       | to H <sub>2</sub> O: < 0.05 ppm of reading NH <sub>3</sub> per % H <sub>2</sub> O   |
| Displayed resolution                           | ppm                     | 0.01 (negative values can also be displayed)  |
| Refresh rate                                   | s                       | 1 (integration time can be selected, max. 600 s)  |
| T <sub>90</sub> time                           | s                       | 2 (at gas flow rate of 3 L/min)   |
| Recommended stabilized Integration Temperature | °C                      | 20 ... 45 (as narrow as possible, application defined)  |
| Cell temperature range                         | °C                      | 190/220   |
| Incoming gas temperature                       | °C                      | same as set cell temperature  |
| Max. surface temp. housing                     | °C                      | 65 (@190°C) / 75 (@220°C)   |
| Meas. gas max. humidity                        | % abs. H <sub>2</sub> O | 30  |
| Input for external parameter compensation      | -                       | pressure, temperature or matrix gas concentration (optional)  |

<sup>1</sup> **Accuracy:** The accuracy is defined as the difference between the mean response during a 2 min time interval and the reference value at reference conditions. Variations of the operating temperature and pressure can affect the accuracy of the system.

<sup>2</sup> **Precision:** The precision is defined as 2 times the standard deviation  $\sigma$  of a 2 min measurement at stable reference conditions over the full measuring range. The precision of the system can be improved by mean of averaging.

<sup>3</sup> **Averaging time:** An exponential moving average (EMA) is applied on measured concentration values. The averaging time expresses the period of time of past measurements considered to compute the next averaged value. The averaging time can be set up to 600 s.

## 2.2 Gas detection specifications for LGD F200P2 H NH3 SCR QAL1 compliant

Important:

Reference conditions: External: 20°C – 23°C, 920 -1020 hPa, 40 to 50% r.H.; Gas & cell: Incoming gas temperature at 190°C, measurement cell at 190°C, 10% absolute H<sub>2</sub>O in the measurement gas.

| Parameter                                      | Unit   | Value / Range  |
|--|--------|--|
| Gas  | -      | NH <sub>3</sub> / H <sub>2</sub> O   |
| Principle of detection                         | -      | Tunable Diode Laser Spectrometry (TDLS)  |
| Ammonia NH <sub>3</sub>                        | ppm    |  |
| Minimum Range                                  |        | 0 – 15   |
| Extended Range                                 |        | 0 – 50   |
| Humidity H <sub>2</sub> O                      | % vol. |  |
| Minimum Range                                  |        | 0 – 30   |
| Maximum Range                                  |        | 0 – 40   |
| Accuracy <sup>1</sup>                          | -      | ± 2.0 % full scale reading depending on integration stability (temperature & pressure) |
| NH <sub>3</sub> Precision <sup>2</sup> 2σ      | ppm    | 0.2 with 60 s averaging time <sup>3</sup>  |
| H <sub>2</sub> O Precision <sup>2</sup> 2σ     | ppm    | 1000 with 60 s averaging time <sup>3</sup>   |
| Linearity & Repeatability                      | -      | included in the accuracy   |
| Cross-sensitivity NH <sub>3</sub>              | -      | < 4.0 % (15% vol. H <sub>2</sub> O)  |
| Cross-sensitivity H <sub>2</sub> O             |        | < 4.0 % (15% vol. CO <sub>2</sub> , 21% vol.O <sub>2</sub> )                           |
| Displayed resolution                           | ppm    | 0.01 (negative values can also be displayed)   |
| Refresh rate                                   | s      | 2 (integration time can be selected, max. 600 s)                                       |
| T <sub>90</sub> time                           | s      | 10 (at gas flow rate of 3 L/min)   |
| Recommended stabilized Integration Temperature | °C     | 20 ... 45 (as narrow as possible, application defined)                                 |
| Cell temperature range                         | °C     | 190  |
| Incoming gas temperature                       | °C     | same as set cell temperature, max. 190   |
| Max. surface temp. housing                     | °C     | 65   |
| Input for external parameter compensation      | -      | pressure, temperature or matrix gas concentration (optional)                           |

<sup>1</sup> **Accuracy:** The accuracy is defined as the difference between the mean response during a 2 min time interval and the reference value at reference conditions. Variations of the operating temperature and pressure can affect the accuracy of the system.

<sup>2</sup> **Precision:** The precision is defined as 2 times the standard deviation  $\sigma$  of a 2 min measurement at stable reference conditions over the full measuring range. The precision of the system can be improved by mean of averaging.

<sup>3</sup> **Averaging time:** An exponential moving average (EMA) is applied on measured concentration values. The averaging time expresses the period of time of past measurements considered to compute the next averaged value. The averaging time can be set up to 600 s.

## 2.3 Gas detection specifications for LGD F200P2 H H2O

Important:

Reference conditions: External: 20°C – 23°C, 920 -1020 hPa, 40 to 50% r.H.; Gas & cell: Incoming gas temperature at 190°C, measurement cell at 190°C, 10% absolute H<sub>2</sub>O in the measurement gas.

| Parameter                                      | Unit                    | Value / Range   |
|--|-------------------------|---|
| Gas  | -                       | H <sub>2</sub> O  |
| Principle of detection                         | -                       | Tunable Diode Laser Spectrometry (TDLS)   |
| Range  | % vol.                  | 0 – 30<br>calibration to full scale (FS) range  |
| Accuracy <sup>1</sup>                          | % vol.                  | ± 0.5 absolute, depending on integration stability (temperature & pressure)           |
| Precision <sup>2</sup> 2σ                      | % vol.                  | 0.2 with 1 s averaging time <sup>3</sup><br>0.1 with 10 s averaging time <sup>3</sup> |
| Linearity & Repeatability                      | -                       | included in the accuracy  |
| Displayed resolution                           | ppm                     | 0.01 (negative values can also be displayed)  |
| Refresh rate                                   | s                       | 1 (integration time can be selected, max. 600 s)                                      |
| T <sub>90</sub> time                           | s                       | 2 (at gas flow rate of 3 L/min)   |
| Recommended stabilized Integration Temperature | °C                      | 20 ... 45 (as narrow as possible, application defined)                                |
| Cell temperature range                         | °C                      | 190   |
| Incoming gas temperature                       | °C                      | same as set cell temperature, max. 190  |
| Max. surface temp. housing                     | °C                      | 65  |
| Meas. gas max. humidity                        | % abs. H <sub>2</sub> O | 30  |
| Input for external parameter compensation      | -                       | pressure, temperature or matrix gas concentration (optional)                          |

<sup>1</sup> **Accuracy:** The accuracy is defined as the difference between the mean response during a 2 min time interval and the reference value at reference conditions. Variations of the operating temperature and pressure can affect the accuracy of the system.

<sup>2</sup> **Precision:** The precision is defined as 2 times the standard deviation  $\sigma$  of a 2 min measurement at stable reference conditions over the full measuring range. The precision of the system can be improved by mean of averaging.

<sup>3</sup> **Averaging time:** An exponential moving average (EMA) is applied on measured concentration values. The averaging time expresses the period of time of past measurements considered to compute the next averaged value. The averaging time can be set up to 600 s.

## 2.4 Gas detection specifications for LGD F200P2 H HCl

Important:

Reference conditions: External: 20°C – 23°C, 920 -1020 hPa, 40 to 50% r.H.; Gas & cell: Incoming gas temperature at 190°C, measurement cell at 190°C, 10% absolute H<sub>2</sub>O in the measurement gas.

| Parameter                                      | Unit                    | Value / Range  |
|--|-------------------------|--|
| Gas  | -                       | HCl  |
| Principle of detection                         | -                       | Tunable Diode Laser Spectrometry (TDLS)  |
| Maximum Range                                  | ppm                     | 0 – 100  |
| Minimum Range                                  | ppm                     | 0 – 50<br>calibration to full scale (FS) range, standard is 50 ppm, for safety reasons max. calibration to 100 ppm (linearity up to 500 ppm, no warranty of precision) |
| Accuracy <sup>1</sup>                          | -                       | ± 2.0 % full scale reading depending on integration stability (temperature & pressure)   |
| Precision <sup>2</sup> 2σ                      | ppm                     | 0.5 with 10 s averaging time <sup>3</sup><br>0.2 with 10 s averaging time <sup>3</sup>   |
| Linearity & Repeatability                      | -                       | included in the accuracy   |
| Gas cross talk/interference                    | -                       | to H <sub>2</sub> O: < 0.05 ppm of reading HCl per % H <sub>2</sub> O  |
| Displayed resolution                           | ppm                     | 0.01 (negative values can also be displayed)   |
| Refresh rate                                   | s                       | 2 (integration time can be selected, max. 600 s)   |
| T <sub>90</sub> time                           | s                       | 20 (at gas flow rate of 3 L/min)   |
| Recommended stabilized Integration Temperature | °C                      | 20 ... 45 (as narrow as possible, application defined)   |
| Cell temperature range                         | °C                      | 190  |
| Incoming gas temperature                       | °C                      | same as set cell temperature, max. 190   |
| Max. surface temp. housing                     | °C                      | 65   |
| Meas. gas max. humidity                        | % abs. H <sub>2</sub> O | 30   |
| Input for external parameter compensation      | -                       | pressure, temperature or matrix gas concentration (optional)   |

<sup>1</sup> **Accuracy:** The accuracy is defined as the difference between the mean response during a 2 min time interval and the reference value at reference conditions. Variations of the operating temperature and pressure can affect the accuracy of the system.

<sup>2</sup> **Precision:** The precision is defined as 2 times the standard deviation  $\sigma$  of a 2 min measurement at stable reference conditions over the full measuring range. The precision of the system can be improved by mean of averaging.

<sup>3</sup> **Averaging time:** An exponential moving average (EMA) is applied on measured concentration values. The averaging time expresses the period of time of past measurements considered to compute the next averaged value. The averaging time can be set up to 600 s.

## 2.5 Gas detection specifications for LGD F200P2 H HCl CEM QAL1 compliant

Important:

Reference conditions: External: 20°C – 23°C, 920 -1020 hPa, 40 to 50% r.H.; Gas & cell: Incoming gas temperature at 190°C, measurement cell at 190°C, 10% absolute H<sub>2</sub>O in the measurement gas.

| Parameter                                      | Unit   | Value / Range  |
|--|--------|--|
| Gas  | -      | HCl / H <sub>2</sub> O   |
| Principle of detection                         | -      | Tunable Diode Laser Spectrometry (TDLS)  |
| HCl  | ppm    |  |
| Minimum Range                                  |        | 0 – 10   |
| Extended Range                                 |        | 0 – 50   |
| Humidity H <sub>2</sub> O                      | % vol. |  |
| Minimum Range                                  |        | 0 – 30   |
| Maximum Range                                  |        | 0 – 40   |
| Accuracy <sup>1</sup>                          | -      | ± 2.0 % full scale reading depending on integration stability (temperature & pressure) |
| HCl Precision <sup>2</sup> 2σ                  | ppm    | 0.2 with 60 s averaging time <sup>3</sup>  |
| H <sub>2</sub> O Precision <sup>2</sup> 2σ     | ppm    | 1000 with 60 s averaging time <sup>3</sup>   |
| Linearity & Repeatability                      | -      | included in the accuracy   |
| Cross-sensitivity HCl                          | -      | < 4.0 % (15% vol. H <sub>2</sub> O)  |
| Cross-sensitivity H <sub>2</sub> O             |        | < 4.0 % (15% vol. CO <sub>2</sub> , 21% vol.O <sub>2</sub> )                           |
| Displayed resolution                           | ppm    | 0.01 (negative values can also be displayed)   |
| Refresh rate                                   | s      | 2 (integration time can be selected, max. 600 s)                                       |
| T <sub>90</sub> time                           | s      | 20 (at gas flow rate of 3 L/min)   |
| Recommended stabilized Integration Temperature | °C     | 20 ... 45 (as narrow as possible, application defined)                                 |
| Cell temperature range                         | °C     | 190  |
| Incoming gas temperature                       | °C     | same as set cell temperature, max. 190   |
| Max. surface temp. housing                     | °C     | 65   |
| Input for external parameter compensation      | -      | pressure, temperature or matrix gas concentration (optional)                           |

<sup>1</sup> **Accuracy:** The accuracy is defined as the difference between the mean response during a 2 min time interval and the reference value at reference conditions. Variations of the operating temperature and pressure can affect the accuracy of the system.

<sup>2</sup> **Precision:** The precision is defined as 2 times the standard deviation  $\sigma$  of a 2 min measurement at stable reference conditions over the full measuring range. The precision of the system can be improved by mean of averaging.

<sup>3</sup> **Averaging time:** An exponential moving average (EMA) is applied on measured concentration values. The averaging time expresses the period of time of past measurements considered to compute the next averaged value. The averaging time can be set up to 600 s.

## 2.6 Environmental conditions

| Parameter                           | Unit   | Value / Range            |
|-------------------------------------|--------|--------------------------|
| Usage                               | -      | Interior use             |
| Maximum operating temperature range | °C     | 15 ... 50                |
| Operating humidity                  | % r.H. | 0 ... 99, non-condensing |
| Operating pressure                  | mbar   | 800 ... 1100             |
| Storage temperature                 | °C     | -40 ... 80               |
| Storage humidity                    | % r.H. | 0 ... 99, non-condensing |
| Emission level L <sub>pa</sub> *    | dB     | <70                      |

\*specification for CE conformity

## 2.7 Mechanical characteristics

| Parameter                                       | Unit            | Value / Range           |
|---|-----------------|-------------------------|
| Measurement cell                                | -               | Flow-through set-up     |
| Standard cell length                            | mm              | 200                     |
| Standard cell volume                            | mL              | 15                      |
| Maximum measurement gas flow rate (Minimum)     | mL / min        | 5'000 (1'500)           |
| Dimensions housing, heated (H) version:         | mm <sup>3</sup> | 380 x 122 x 78          |
| Approx. weight, heated (H) version              | kg              | 3.3                     |
| Inlet / outlet connectors, measurement gas      | mm              | 6 O.D., Swagelok        |
| Inlet / outlet connectors, purge gas (optional) | mm              | 6 O.D., push-in fitting |

## 2.8 Electrical characteristics

| Parameter  | Unit | Value / Range   |
|--|------|---|
| Voltage supply DC<br>Min. / Max. rating          | V    | 10 ... 30 (max. ripple ± 100mV, max. current 0.5A, DC inrush current limitation 1A, reverse battery protection) |
| System power consumpt.                           | W    | < 2   |
| Max. cell heating power consumption, (H) version | W    | 100   |
| Start-up time                                    | s    | 30  |
| Warm-up time                                     |      |   |
| Cell heating to 190°C                            | min. | 30 (starting at 25°C)   |
| Cell heating to 220°C                            | min. | 40 (starting at 25°C)   |
| Stable operation after                           | min  | 60 (at 190°C cell temperature)  |

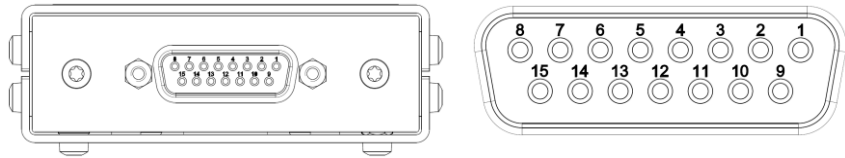
## 2.9 Communication interface

| Parameter         | Unit | Value / Range  |
|-------------------|------|--|
| Digital interface |      |  |
| RS232             | -    | Protocol available; standard.                        |
| Analog interface  |      |  |
| Current output    | mA   | 4...20, 12-bit resolution (on 0 ... 25 mA); standard |
| Voltage output    | V    | 0...5, 12-bit resolution; on request                 |
| Alarm             | -    | Customer configurable and definable                  |

## 3 Connector assignments

### 3.1 System Power / User interface connector assignments

**Figure 1:** Head view electronics housing. System Power / User interface terminal connector assignment.



Connector assignment:

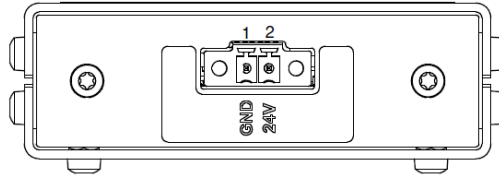
|                    | Pin | Name        | Description  |
|--------------------|-----|-------------|--|
| Power Supply       | 1   | POWER IN    | Power supply 10 ... 30V  |
|                    | 2   | GND IN*     | Power supply ground  |
|                    | 3   | SHIELD      | DB 15 Connector - Housing  |
| Digital Interfaces | 6   | GND*        | Ground serial communication  |
|                    | 7   | RS232 TX    | UART serial communication  |
|                    | 8   | RS232 RX    | UART serial communication  |
|                    | 14  | N/A         | Not used   |
|                    | 15  | N/A         | Not used   |
| Relay Alarms       | 4   | ALARM 1     | On/Off signal at defined conditions for relay control, hardware watchdog, etc                    |
|                    | 5   | ALARM 2     | On/Off signal at defined conditions for relay control, hardware watchdog, etc                    |
|                    | 11  | ALARM 3     | HW watchdog, firmware error and warnings   |
|                    | 12  | VCC RELAY   | Relay power supply: 10 V < Vcc Relay < 30 V; max. 0.75 A   |
|                    | 13  | GND*        | Ground, relay alarms   |
| Analog Interface   | 9   | ANALOG GND* | Analog ground  |
|                    | 10  | ANALOG OUT  | Analog output<br>Factory setting: output current (4-20mA); output voltage (0-5V) on request only |

\* same potential



### 3.2 Measurement cell heater connector assignment

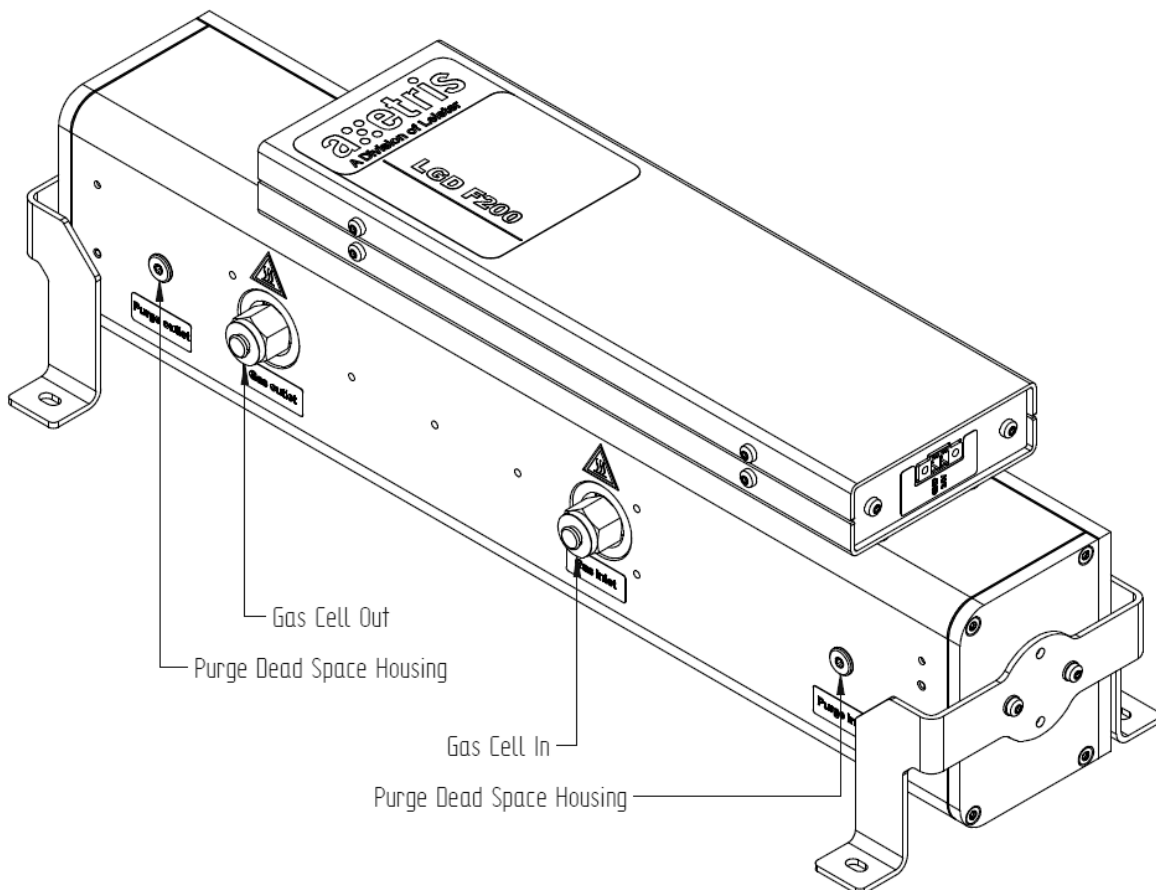
**Figure 2:** Cell heater screw terminal connector assignment. Head view electronics housing.



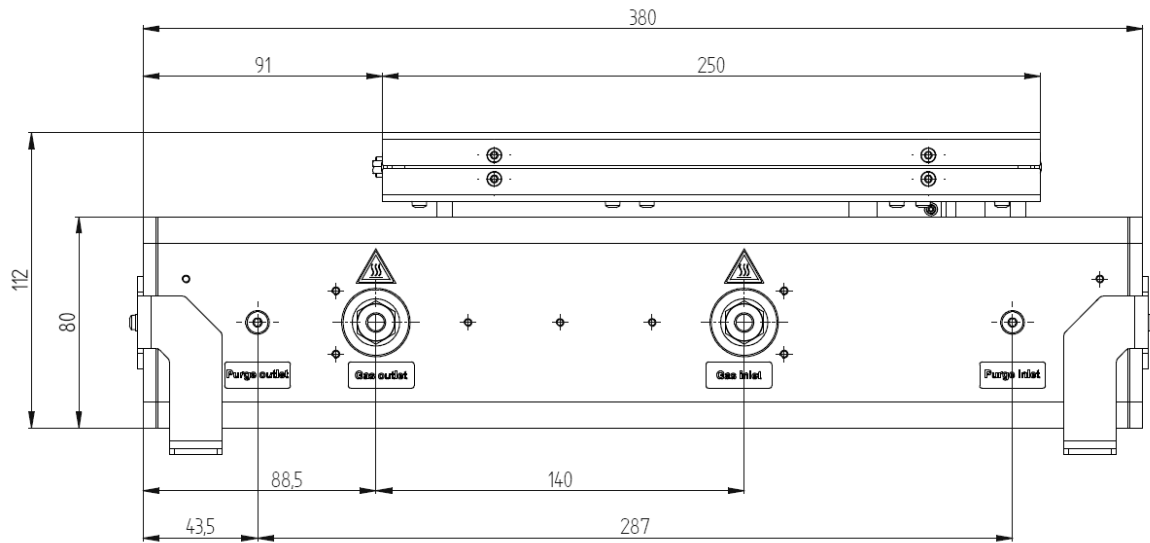
Connector assignment:

| Pin | Name | Description                          |
|-----|------|--------------------------------------|
| 1   | GND  | Power ground                         |
| 2   | 24V  | Power supply 24V, Consumption: < 96W |

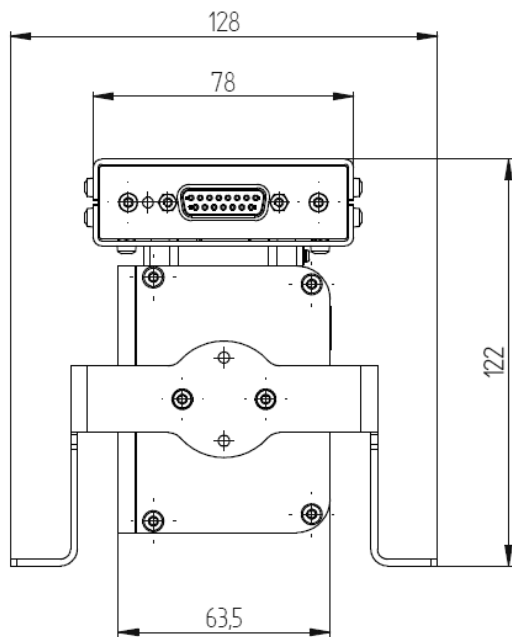
## 4 Mechanical dimensions



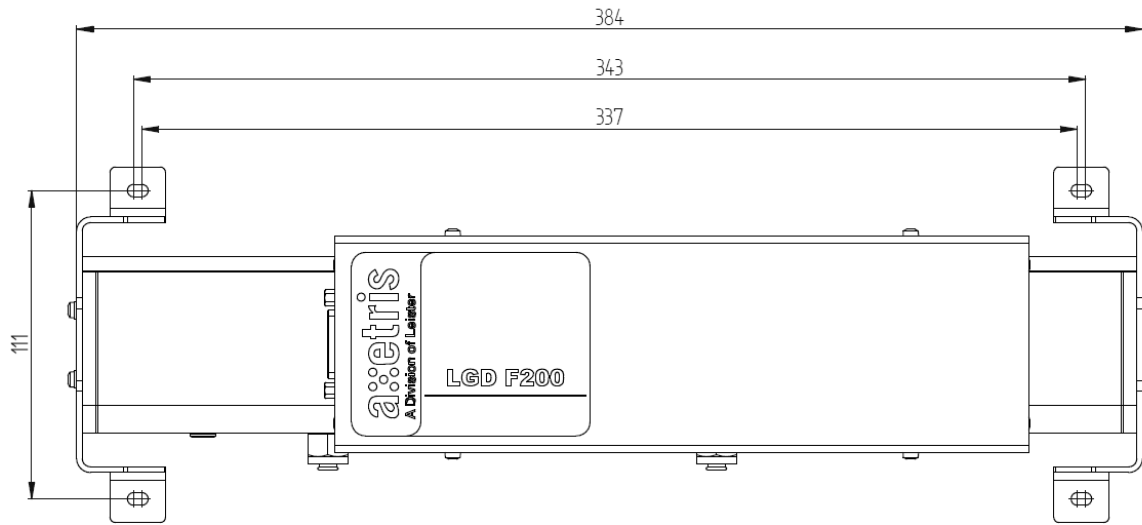
**Figure 3:** General view of the LGD F200P2 H sensor



**Figure 4:** Side view, with gas connectors. Dimensions in mm



**Figure 5:** Front view. Dimensions in mm



**Figure 6:** Top view. Dimensions in mm

## 5 Certifications

| Type                          | Standard / Regulation | Limits   |
|-------------------------------|-----------------------|--|
| European Conformity:          | CE                    |  |
| Low voltage                   | 2006/95/EG            |  |
| EMC compatibility             | 2004/108/EG           |  |
| Safety of laboratory products | EN/IEC 61010          |  |
| Safety of laser products      | EN/IEC 60825-1:2014   |  |
| EMC                           | EN/IEC 61326-1        | Immunity test requirements for equipment intended for use in industrial locations          |
| Shock                         | EN60068-2-27          | 150m/s <sup>2</sup> , half sinus, 11ms, max acceleration 15g, 18 cycles                    |
| Vibration                     | EN60068-2-6           | 5 ... 50Hz, amplitude 0.35mm, 1 octave /min, 2h per orientation (total 18 Frequency cycle) |
| Electronics conformity        | RoHS / WEEE           |  |

## 6 Caution

### 6.1 Product damage

- Read all instructions carefully before using the device.
- The LGD F200P2 H laser gas detection modules are calibrated for a particular gas and concentration range. Do not use the sensor outside of its specifications.
- The sensor is not suited for measuring gases with a dust load. The incoming measurement gas must be conditioned in order to avoid dust and condensation of liquid in the sensor. Gas loaded with particles or other substances can eventually contaminate the cell and make it necessary to service the instrument.
- The appliance must not be used in damp or wet surroundings.
- Use only accessories that are indicated in the instructions for use or are recommended by the manufacturer.
- Failure to comply with these instructions could result in product damage.

### 6.2 Danger of life

- The sensor must not be used with flammable or explosive gases or mixtures.
- Unprofessional gas handling can cause injury or death. The use of gas detection modules should only be performed by qualified personnel
- Do not use this product as safety or emergency stop device or in any other application where failure of the product could result in personal injury or death.

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## 7 Important Notice / Disclaimer

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## 8 Axetris Certifications

Axetris is an ISO 9001:2015 certified company. The LGD F200P2 H module is CE and RoHS 2 compliant.



**CLASS 1 LASER PRODUCT**  
(classified according to SN EN 60825:1:2014)