ISO 9001

Oxygen Sensor QGO20...

The QGO20... is an oxygen sensor designed for measuring the residual oxygen content of flue gases in heat generation plant burning natural gas or light fuel oil.

Together with the RPO25... control unit, it monitors and controls the combustion process.

The QGO20... and this data sheet are intended for OEMs which integrate the oxygen sensor in their products!

Use

Using the products of the ECOGYR range, and especially in connection with oxygen trim control,
– emissions will be minimized, and
– the efficiency of the combustion process optimized - also with retrofits

The QGO20... is suited for use in all types of heat generation plant burning natural gas or light fuel oil with flue gas temperatures up to 300 °C at the point of measurement.

Mechanical design

The **QGO20...** consists of
– immersion tube with mounting flange made of heat-resistant stainless steel, and
– connecting head made of die-cast aluminium

The **immersion tube** contains and protects
– the measuring cell
– the cell heating element, and is
– resistant to aggressive substances found in the flue gases of combustion plant burning natural gas or light fuel oil

The sensor's **connecting head** accommodates a printed circuit board with the terminals for the electric connections.
The cable enters through replaceable Pg entry glands.
The cable glands can be left with the cable, thus facilitating installation and service work.

Accessory
The QGO20... is for use with the flue gas collector AGO20...
– which is to be welded into the stack where the measurement shall be made, also serving as a
– mounting flange and
– flue gas guidance

Warning notes

To avoid personal injury, damage to property or the environment, the following warning notes must be observed:

- It is not permitted to open, interfere with or modify the oxygen sensor!
- Electric shock hazard!
  – The control unit RPO25... must be completely isolated from the mains supply before performing any wiring changes on the QGO20...!
  – During operation, the sensor's connecting head must be closed
- Risk of explosion!
  – Check wiring and all safety functions!
  – Make certain the hot QGO20... does not get into contact with explosive or inflammable gases!
- Risk of injury on the hot immersion tube!
  – Remove QGO20... from AGO20... only after the equipment has cooled down!

Engineering notes

- Check the electromagnetic compatibility with adjacent components!
- **Do not** put the burner into operation before the sensor's heating up phase is terminated!
  ⇒ Collection of condensate inside the QGO20...
- When commissioning the plant, a heating up time of at least 2 hours should be observed, afterwards at least 1 hour!
  ⇒To avoid incorrect measurements
- If the burner is shut down for less than 1 or 2 weeks, keep QGO20... and RPO25... **under voltage**!
- To ensure a good response, always use the QGO20... together with the AGO20...

Mounting notes

- The relevant national safety regulations must be complied with!
- The QGO20... may only be used with natural gas and light fuel oil!
  ⇒ Other fuels can damage the sensor, due to aggressive substances contained in their flue gases.
- The flue gas temperature at the QGO20... may not exceed max. 300 °C!
  ⇒ Higher temperatures may damage the sensor!
- To facilitate mounting, both the QGO20... and AGO20... carry markings (refer to Mounting Instructions M7842).
- The sensor **must** be mounted at a location where the flue gas flow is homogeneous, with no or only very limited turbulence! When mounted near air dampers or pipe bends, faulty measurements can occur.
- Air must not be allowed to join the flue gases between the burner and the point of measurement!

Installation notes

- Installation and commissioning work may only be carried out by qualified personnel!
- Observe the maximum permissible sensor lengths and relevant specification!
  ⇒ Refer to «Technical data»!
- Always run ignition cables separately, with the greatest possible distance to other cables!
- Check wiring carefully before putting the sensor into operation!

Service notes

- Replace the flange gasket on each service visit!
- Allow the QGO20... to cool down before applying compressed air for cleaning!
- Check flue gas collector AGO20... at regular intervals and clean if necessary!

Ordering

Oxygen sensor, incl. flange gasket	**QGO20.000C27**
Flange gasket, for service	**5 769 2021 0**
Flue gas collector	
– For stack dia. **up to** 400 mm	**AGO20.001A**
– For stack dia **above** 400 mm	**AGO20.002A**
Control unit for measuring and controlling the residual oxygen content – Also refer to data sheet 7847	**RPO25.000A27**

Technical data

QGO20...

Mains voltage for heating the measuring cell (only with RPO2...)	AC 230 V ±15 %	Measuring principle	Zirconium dioxide cell as an oxygen ion conductor
Mains frequency	50...60 Hz ±6 %	Perm. flue gas velocity (only with AGO20...)	1...10 m/s
Power consumption	max. 90 W typically 35 W		
Perm. mounting orientation	refer to Mounting Instructions M7842	Perm. fuels	light fuel oil or natural gas
		Measuring range	0.2...20.9 % O2
Degree of protection	IP 40	Perm. cable length	max. 100 m
Weight	approx. 0.9 kg		
Signal lines - Shielded 6-core cable, twisted pairs - Shielding connected to terminal GND of RPO25... - Dia. of wire e.g.	 min. 0.25 mm² LiYCY 6 x 2 x 0.2 / 22 or LiYCY 6 x 2 x 0.2	Power supply lines - Mains cable - Wire dia. e.g.	 min. 1 mm² NYM 3x1.5

Environmental conditions

Operation	IEC 721-3-3	**Transport**	IEC 721-3-2
Climatic conditions	class 3K5	Climatic conditions	class 2K2
Temperature range		Temperature range	-25...+70 °C
– Flange	max. 250 °C	Humidity	< 95 % r.h.
– Connecting head	max. 70 °C	Mechanical conditions	class 2M2
– Flue gas	≤ 300 °C		
Humidity	< 95 % r.h.		

⚠ Condensation, formation of ice and ingress of water are **not** permitted!

AGO20...

Tube	DN50, steel X5 CrNi 18 9	Flange	DN50, steel X5 CrNi 18 9
Tube length	180 mm for AGO20.001A or 260 mm for AGO20.002A		

Functions

The difference of oxygen concentrations in the measured gas and the reference gas at the measuring cell generates a voltage which is used as a signal for the RPO25... control unit.

The measuring cell is made of zirconium dioxide (ZrO2).

As ZrO2 becomes oxygen ion-conductive at high temperatures, the difference between the O2 concentrations inside and outside the measuring cell generates an electrical voltage.

This voltage, the so-called Nernst voltage VN, is acquired by porous platinum electrodes located on the inner and outer sides of the measuring cell.

A heating element keeps the measuring cell at a constant working temperature of 700 °C.

The flue gas enters the gas guidance chamber from the bottom of the sensor tube and passes the space between the outside of the measuring cell and the gas guidance in 1 to 2 seconds, then leaving laterally through the sensor tube.

The inside of the measuring cell, which is hermetically sealed against the ingress of flue gases, communicates with the outside air which is used as the reference gas when making measurements (20.9 % O2).

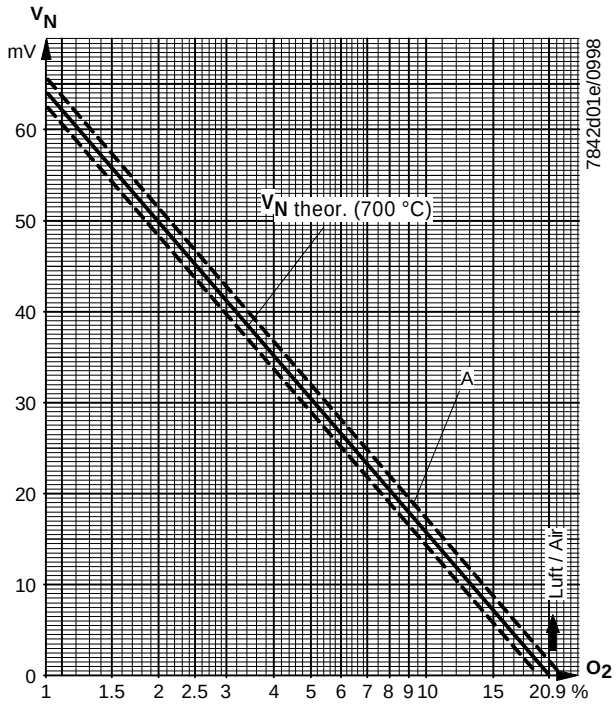
The Nernst voltage VN is a function of the oxygen content differential and the temperature of the measuring cell as expressed by the following formula:

$$VN = \frac{R \times T}{4F} In \frac{(O2)Ref}{(O2)} = (mV)$$

where:

$$\frac{R \times T}{4F} = 20.9\,mV\,at\,700\,^{\circ}C$$

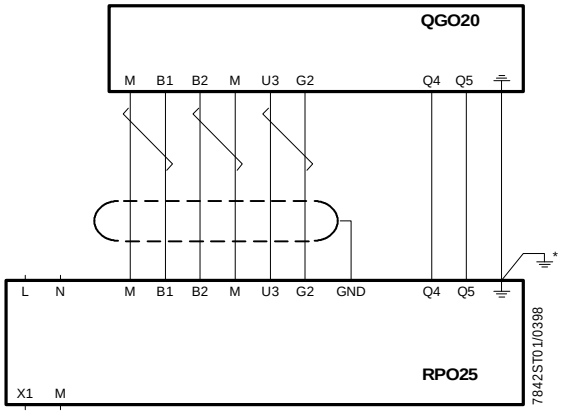
According to the above formula, the Nernst voltage at an oxygen concentration of 1 % in the flue gas is 64 mV.



Legend

A	Tolerance range	(O2)	Oxygen content (vol. %) of flue gas
F	Faraday constant (96486 Clb)	R	Gas constant (8.3 J/K)
In	Natural logarithm	T	Absolute temperature of measuring cell (973 K)
(O2)Ref	Oxygen content (vol. %) inside the measuring cell (reference gas)	VN	Nernst voltage

Connection diagram



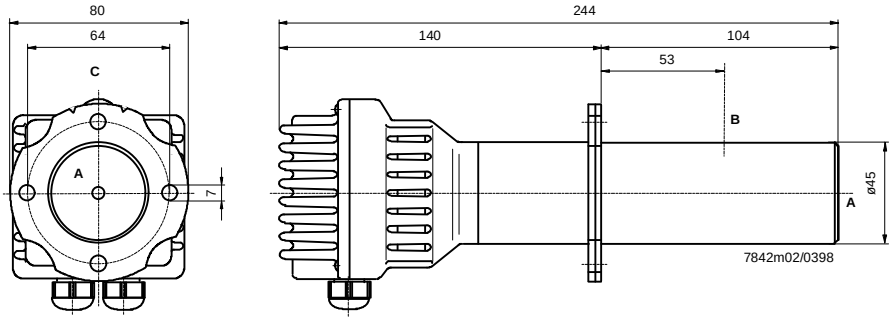
Legend

QGO20...	B1	(+)	Signal of oxygen measuring cell
	M	(-)	Ground for B1 and B2
	B2	(+)	Thermocouple voltage
	M	(-)	
	U3	(+)	Signal of temperature compensation element
	G2	(-)	Power supply for temperature compensation element
	GND		Ground for shielding
	Q4		Sensor heating (AC 230 V)
	Q5		Sensor heating (AC 230 V)
	⏚		Protective earth (PE)
RPO25...	L		Live
	N		Neutral
	⏚		Protective earth (PE)
	X1		Actual value output of O2 (DC 0...10 V)
	M	(-)	

Dimensions

Dimensions in mm

QGO20...



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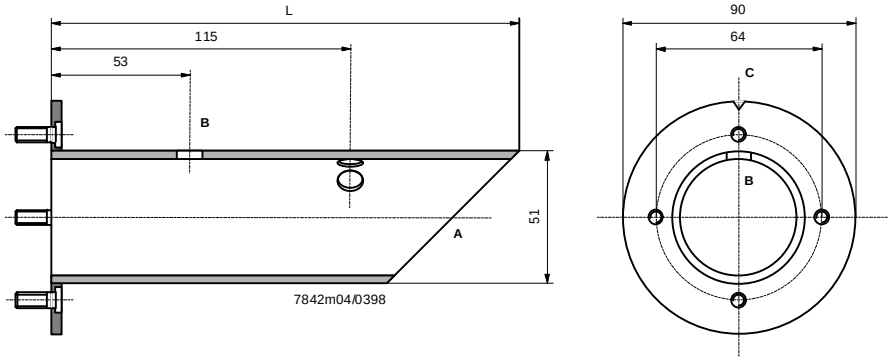

Legend

A	Flue gas inlet	C	Notch on the flange marking the flue gas outlet side
B	Flue gas outlet		

L 180 mm for AGO20.001A
260 mm for AGO20.002A