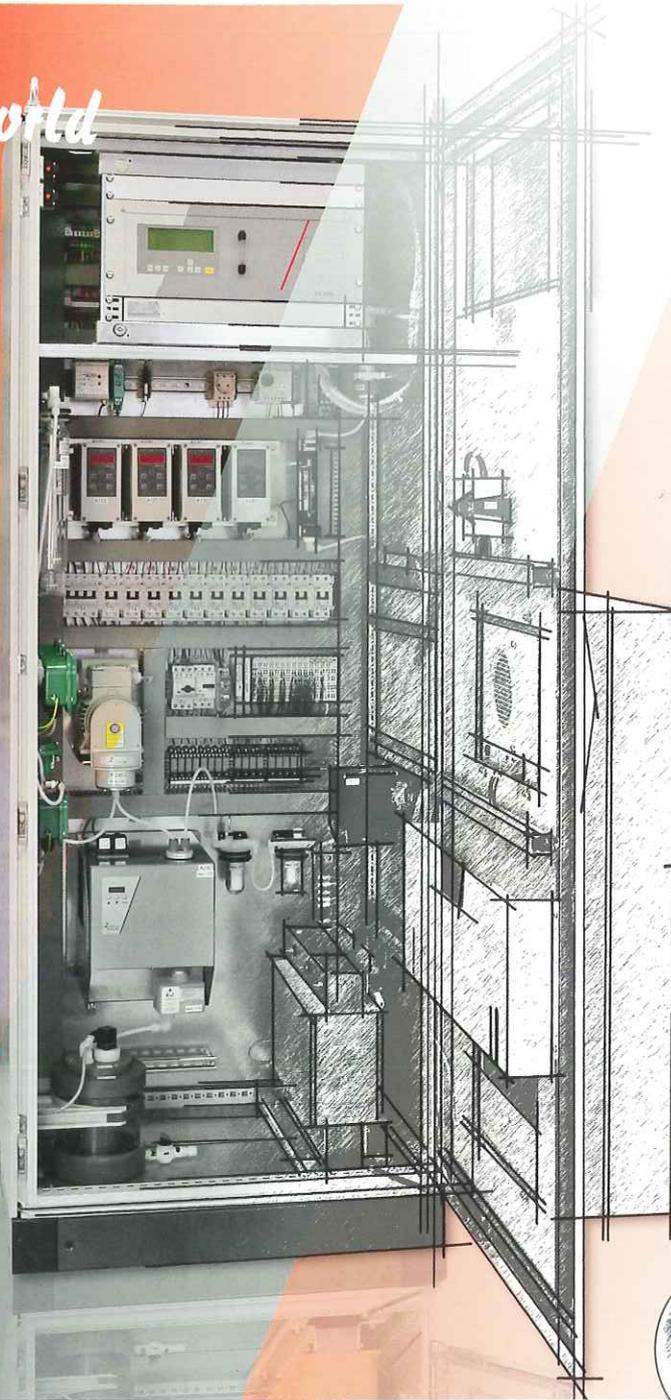
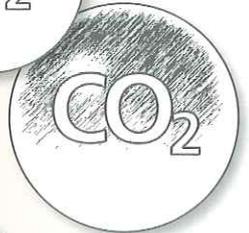
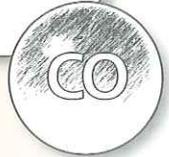
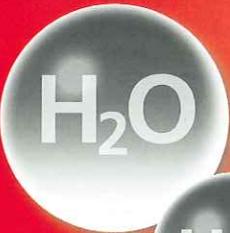




*Gas analysis
is our world*



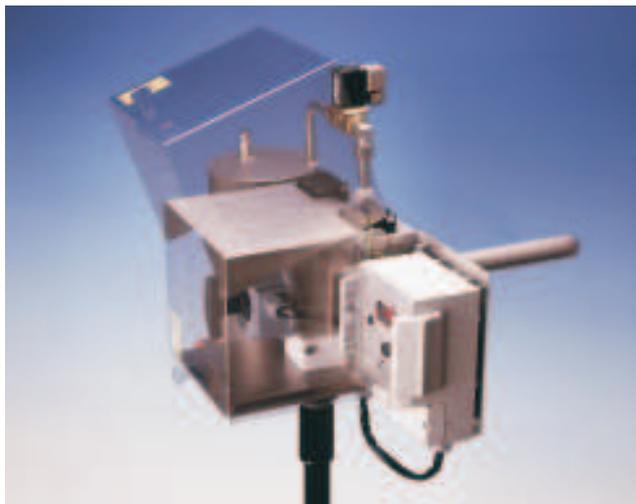
Gas Analysis

***Sample conditioning,
components and systems***

Sample Gas Probes Series GAS 222

A comprehensive range of basis units

- heated (selfregulating, regulated, steam)
- unheated
- probes for hazardous areas Zone 1 or 2
- in-situ or downstream filters
- high dust concentration



Features

- easy to operate
- filter replacement without tools
- easy to open, selflocking weather shield
- highly efficient filter cleaning system, blowback reduces cost of ownership
- effective insulation provides stable temperature and safe operation
- integrated controls provide good system compatibility.

Options and accessories

- various filter materials and retention rates
- heated/unheated extentions
- various blowback options and blowback control units



In gas analysis the sample point is a critical interface between the process and the analysis system. Probes for this harsh and demanding environment must be specially designed. Robust and flexible design provides low operational cost.

The GAS 222. range of probes features a modular design allowing the easy adaption to the application specific requirements. The probe is ex works assembled to order and easy to install on site.

Gas probe with downstream filter

These probes are typically used in low dust applications (approx. 2 g/m³). Since no tools are required, the filter element can be replaced in a few minutes.

In-situ filter

These versions feature an in-situ filter located directly in the process stream.

In combination with a very effective blowback system, the filter elements can remain in place for a long time, thus providing low cost of ownership due to low maintenance requirements. Depending on dust concentration and other application parameters, the filter elements can be chosen from various sizes and materials.

The blowback system is based on a capacitive vessel which is directly attached to the probe. By actuating a set of solenoid valves, the sample gas stream is cut off for a short time. A blow with large volume of pressurised air is blown reversely through the filter element. If the application requires, the pressurised air can be heated.

The sequence of the this blowback operation can be set either in the main PLC or is fully controlled by an optional blowback control unit.

The GAS222.35 version combines the advantages of the upstream location of the filter with an easily accessible filter element. Due to this advanced design the filter element can be replaced while the probe remaining in place. This contributes to lower cost.

In-situ/downstream combinations

Some end users prefer to combine the advantages of the in-situ filter with an additional attached downstream filter as a last chance filter. The above combination is available but the blowback only cleans the in-situ element.

The downstream filter can be replaced easily without any tools.

If there is no solution for your application, do not hesitate to sent us a detailed enquiry with all parameters of your process.

Heated and unheated sample gas probes

In many process moisture or vapor is present in the stream as an unavoidable component of the process. Moisture and dust particulates, present undesired impurit in an analysis system. Therefore measures must be taken to keep the moisture in vapor phase. This is typically done by heating the sample probe and the sample lines to keep the gas temperature above the dew point.

Depending on the application the probes can be electrically heated or steam heated. The electrical heaters can be selfregulated or regulated by means of an electronic controller directly attached to the probe.

Gas sampling probes for hazardous areas

We can provide probes for zone 2 / category 3 and zone 1/ category 2. All described combinations and blowback options are possible. The unheated and the steam heated probes are suitable for hazardous areas as well.

Sample tubes and extensions for sample tubes

There is a variety of heated or unheated sample tubes and extensions for sample tubes available.

Further options

Upon request, a comprehensive range of accessories such as special flanges, calibration gas ports and protection shields are available.

Combinations

To select the appropriate type of sample probe please read the individual data sheets carefully. Basic features of the basis units and all available combinations are detailed in the data sheet. Data sheet DE 461099 contains further important information.

Data sheets and probe finders

Data sheets describe the individual probe types respectively. This information is enhanced by schemes and drawings. In the following, please find a probe finder as well some examples about how to compose individual solutions.

Probe finder

The table shows the most important selection criteria for the determination of a probe and shall help to navigate through our comprehensive programme. If you have selected a particular type, please read the corresponding data sheet (number is indicated) carefully to confirm that all your requirements are met.

dust concentration filter Type	Non hazardous area			Hazardous area		process temperature max.
	heated selfregulated	heated regulated	unheated	zone 1	zone 2	
max. allowed operating pressure 6 bar / max. probe inlet temperature 200 °C						
up to 2g/m³ downstream filter	GAS 222.15 (DE461015)	GAS 222.20 (DE461020)	GAS 222.10 (DE461010) GAS 222.11 (DE461011)	GAS 222.20 ATEX (DE461120)	GAS 222.20 ATEX 2 (DE461220)	1700°C
	GAS 222.17 (DE461017)	GAS 222.21 (DE461021)	Steam heated GAS 222.20DH (DE461320)	GAS 222.21 ATEX (DE461121)	GAS 222.21 ATEX 2 (DE461221)	
> 2g/m³ in-situ filter		GAS 222.31 (DE461031)	GAS 222.30 (DE461030)	GAS 222.31 ATEX (DE461131)	GAS 222.31 ATEX 2 (DE461231)	1000°C
> 2g/m³ in-situ and downstream filter		GAS 222.21 (DE461021)		GAS 222.21 ATEX (DE461121)	GAS 222.21 ATEX 2 (DE461221)	
> 2g/m³ without tools repla- ceable in-situ filter		GAS 222.35 (DE461035)	GAS 222.35U (DE461335)	GAS 222.35 ATEX (DE461135)	GAS 222.35 ATEX 2 (DE461235)	600°C

How to order

- select part no for probe basis unit from respective data sheet
- select required accessories to make basis unit application specific and operational.

Example 1

Application has a dust concentration of approx. 89g/m³, moisture is present, the extraction temperature is between 500 and 600°C, it is a non hazardous area. The process is not particularly corrosive. Power supply is 230 V AC. Blow back control is from main PLC.

Solution:

According to the probe finder two basis units could be chosen: GAS 222.31 and GAS 222.35.

Since the extraction temperature is ranging between 500 and 600°C. If low cost of ownership is a concern, GAS 222.35 is the final choice: The p/n for the GAS 222.35 heated is 4622235

To complete the probe data sheet DE 461099 has to be consulted: the in-situ filter required is p/n 46222359

For an effective blowback, the capacitive vessel is recommended: p/n 46222PAV

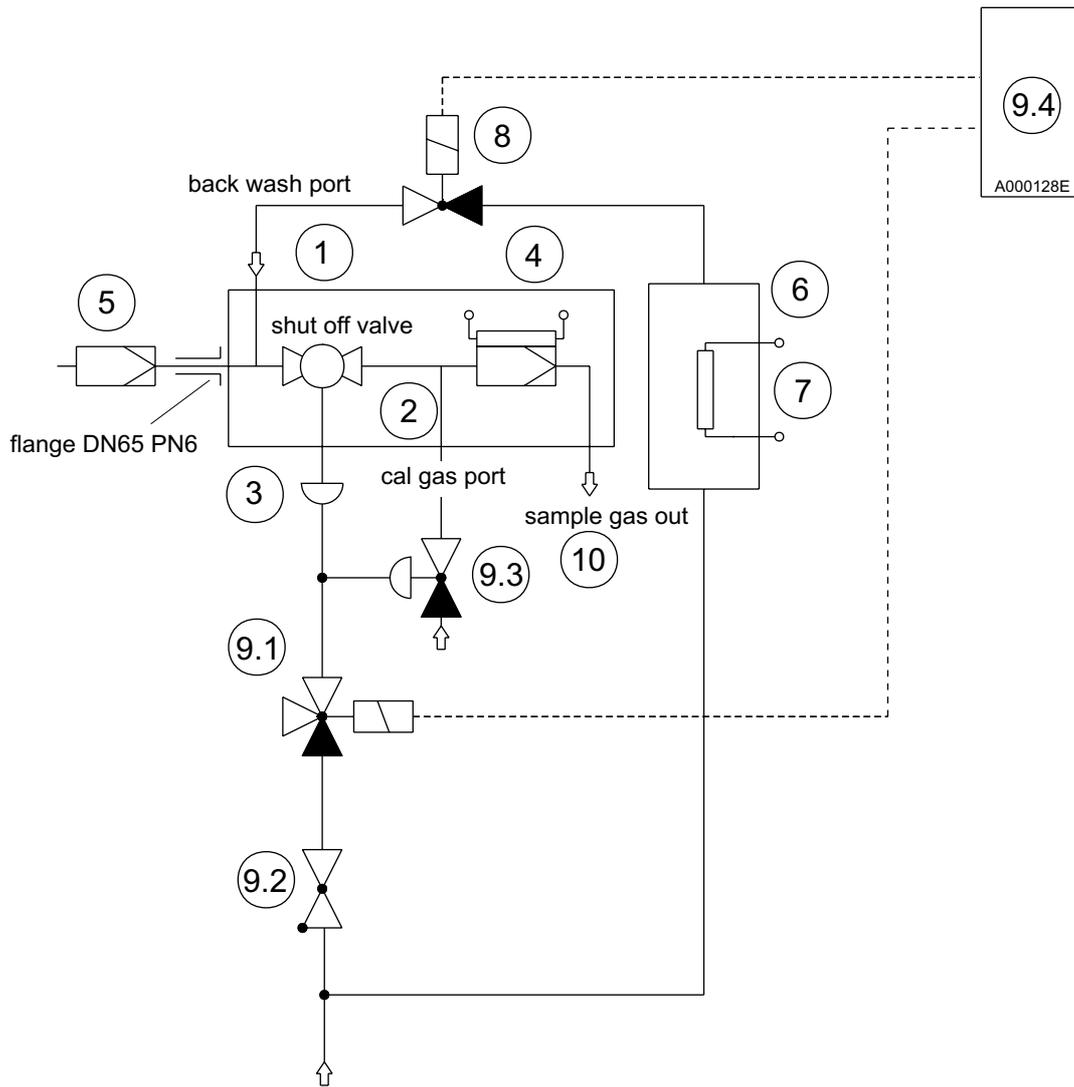
To control the blowback, one 2/2 way solenoid valve between capacitive vessel and probe is needed; p/n 46222PAVMV3.

The complete probe consists of:

p/n 4622235	1 piece
p/n 46222359	1 piece
p/n 46222PAV	1 piece
p/n 46222PAV MV3	1 piece*

*We assume that the sample line is shut off during blowback within the sample conditioning system.

**Example 2:
GAS 222.21 with automatic blowback and control**



Application similar to Example, 1 extraction temperature around 600°C. Dust concentration is certainly above 10g/m³ and unpredictable. Therefore a large filter element should be applied and a last chance filter is recommended. Blowback control is by main PLC.

	Data sheet	part.-no.:
1) sample gas probe GAS 222.21	DB461021	4622221
2) cal gas connection	DB461099 page 6	46222309
3) pneumatic actuator for the ball valve	DB461099 page 4	46222008
4) downstream filter	DB461099 page 6	46222010
5) in-situ filter	DB461099 page 2	46000303
6) capacitive vessel	DB461099 page 4	46222PAV
7) self regulated heating system	DB461099 page 4	46222PAVHZ1
8) 2/2 way solenoid valve for recommended pressurized air	DB461099 page 4	46222PAVMV3
9) control unit the back purged probe:		
9.1) 3/2 way solenoid valve for pneumatic actuator		
9.2) non-return valve		
9.3) calibration gas port		
9.4) junction box for solenoid valves		
10) fitting for sample gas port	DB461099 page 6	9026172

Sample Gas Filter AGF - PV - 30



Sample gas streams must be conditioned to provide particulate and moisture free gas to enter the analyser cells.

The sample gas filter with Bühler-Unique-QC bracket provides fine filtration and a very easy change of the exhausted filter elements. The Unique-QC bracket eliminates completely the need of tools to open the filter bowl hence making the change of the element a matter of seconds.

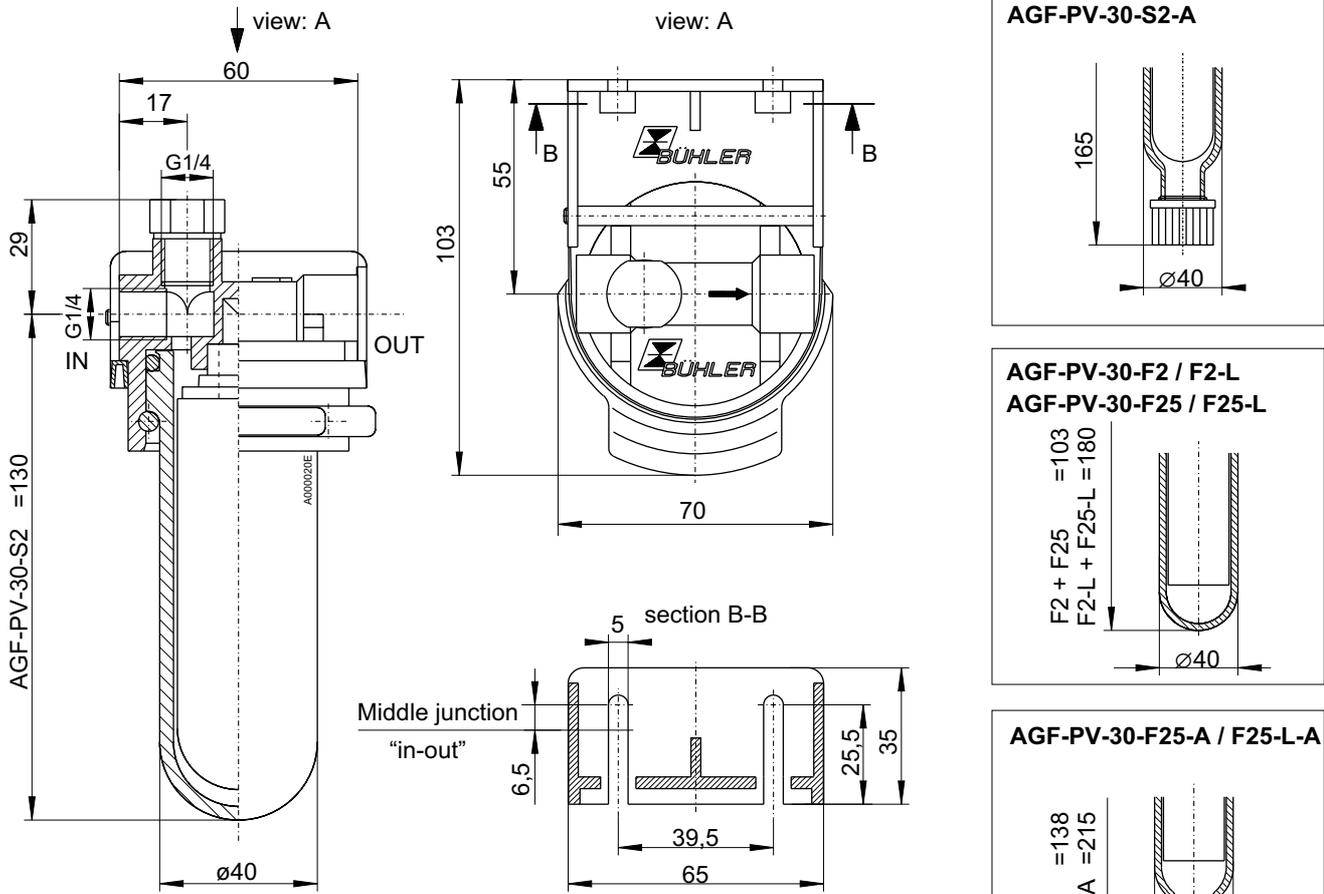
The QC bracket fits either from the front or the rear side making the panel installation of the filter independent from the flow direction chosen. The versatile mounting bracket makes the installation very easy.

The filter head has an auxiliary port. This can be used either for a bypass or can take a moisture detector to detect a water slip through the cooler or other items.

There is a choice of filter elements available to meet different application parameters.

- **Bühler Unique - QC bracket**
- **easy change of filter element without tools**
- **fast reaction in sample conditioning systems due to low death volume**
- **versatile mounting bracket**
- **condensate drain in bowl optional**
- **filter-head with additional port for bypass or moisture detector connection**

dimensions



technical data

filter head	PVDF
filter bowl	Glas
seal	Viton
temperature max.	100 °C
pressure max.	4 bar

please indicate with order*

AGF-PV-	30-S2	30-S2-A	30-F2	30-F2-L	30-F25	30-F25-A	30-F25-L	30-F25-L-A
retention rate	2 µm	2 µm	2 µm	2 µm	25 µm	25 µm	25 µm	25 µm
part no.	41 50 099	41 50 199	41 50 2999	41 50 799	41 50 299	41 50 399	41 50 499	41 50 599
element	S2	S2	F2	F2L	F25	F25	F25L	F25L
death volume	57 ml	69 ml	57 ml	108 ml	57 ml	63 ml	108 ml	117 ml
weight approx.	0,28 kg	0,29 kg	0,24 kg	0,29 kg	0,23 kg	0,24 kg	0,29 kg	0,30 kg

* delivery includes one filterelement

spare filter elements AGF-PV-30

type	filter elements	material	retention rate	filter surface	part no.	package
S2	husk	glass fibre	2 µm	80 cm ²	41 01 001	5 pcs.
S2	husk	glass fibre	2 µm	80 cm ²	41 01 002	25 pcs.
F2	PTFE sintered	PTFE	2 µm	60 cm ²	41 03 005	5 pcs.
F2L	PTFE sintered	PTFE	2 µm	125 cm ²	41 02 005	1 pc.
F25	PTFE sintered	PTFE	25 µm	60 cm ²	41 02 013	5 pcs.
F25L	PTFE sintered	PTFE	25 µm	125 cm ²	41 01 012	1 pc.

Sample Gas Filter

AGF - T - 30



Sample gas streams must be conditioned to provide particulate and moisture free gas to enter the analyser cells.

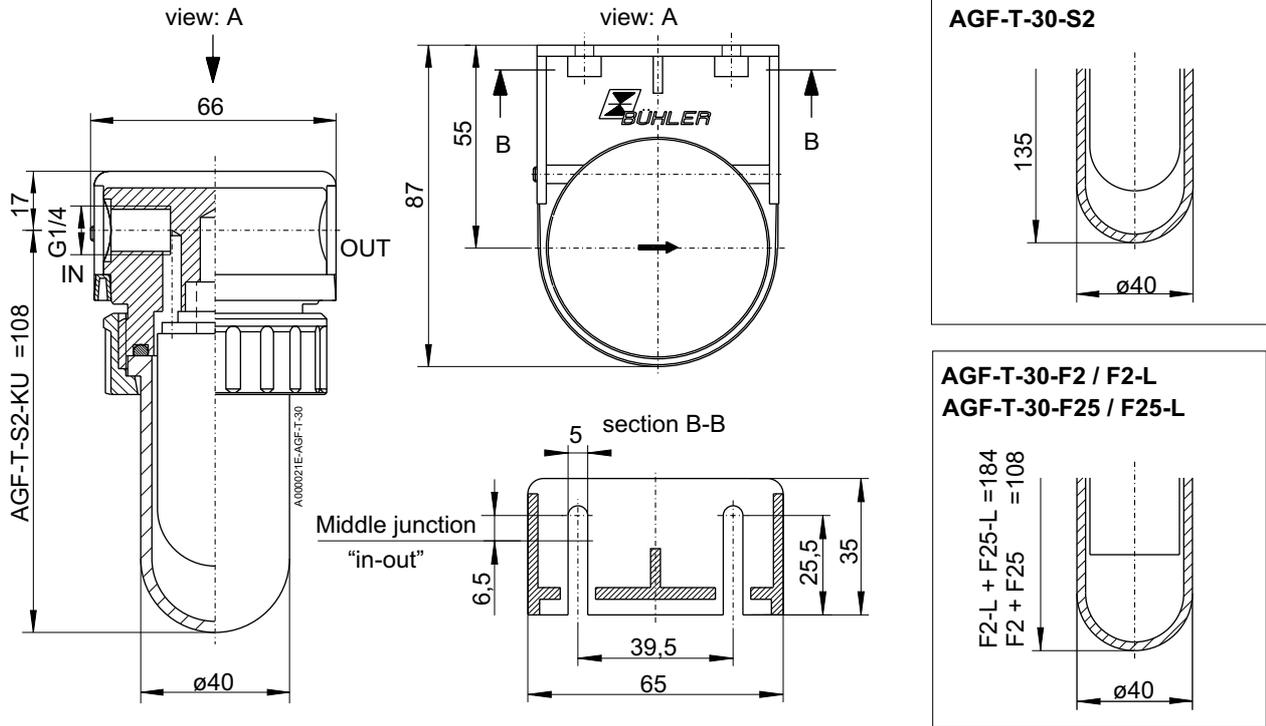
Some of these applications require components made of highly corrosion resistant materials.

The AGF - T - 30 is made of Duran glass and PTFE and is an excellent solution for this category of applications.

The filter elements are made of sintered PTFE and have almost no absorption properties. The versatile mounting bracket allows to install the filter in any flow direction. A variation of sizes and retention rates allows the best choice for individual applications. Element and casing provide low death volumina.

- **filter head made of solid PTFE**
- **seal PTFE**
- **highly corrosion resistant**
- **choice of elements**
- **no absorption of trace gases**
- **fast reaction in sample conditioning systems due to low death volume**
- **versatile mounting bracket**

dimensions



technical data

filter head	PTFE
filter bowl	glass
seal	viton with PTFE jacket
Temperature max.	100 °C
pressure max.	4 bar

please indicate with order*

AGF-T-	30-S2	30-S2-KU	30-F2	30-F25	30-F2-L	30-F25-L
filter retention	2 µm	2 µm	2 µm	25 µm	2 µm	25 µm
part no.	41 51 399	41 51 499	41 51 799	41 51 199	41 51 099	41 51 299
element	S2	S2KU	F2	F25	F2L	F25L
death volume	57 ml	50 ml	57 ml	57 ml	108 ml	108 ml
weight approx.	0,41 kg	0,35 kg	0,35 kg	0,35 kg	0,43 kg	0,43 kg

* delivery includes one filter element

spare filter elements AGF-T-30

type	filter elements	material	filter fineness	filter surface	part no.	package
S2	Husk	glas fibre	2 µm	80 cm ²	41 01 001	5 pcs.
S2	Husk	glas fibre	2 µm	80 cm ²	41 01 002	25 pcs.
S2KU	Husk	glas fibre	2 µm	61 cm ²	41 01 014	5 pcs.
S2KU	Husk	glas fibre	2 µm	61 cm ²	41 01 015	25 pcs.
F2	PTFE sintered	PTFE	2 µm	60 cm ²	41 03 005	5 pcs.
F25	PTFE sintered	PTFE	25 µm	60 cm ²	41 02 013	5 pcs.
F2L	PTFE sintered	PTFE	2 µm	125 cm ²	41 02 005	1 pc.
F25L	PTFE sintered	PTFE	25 µm	125 cm ²	41 01 012	1 pc.

Sample Gas Coalescing Filter K - AGF - PV - 30 -A



The removal of aerosols from sample gas streams is a request in numerous applications.

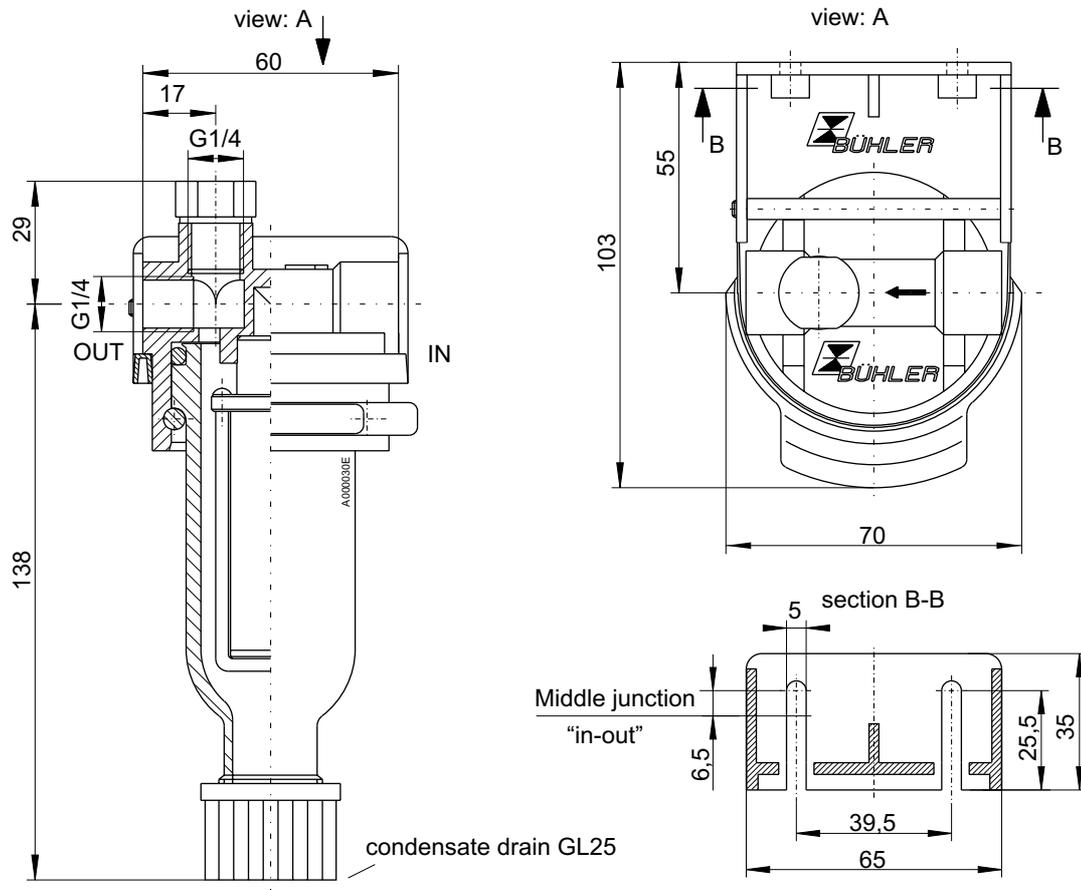
An appropriate answer is the use of a coalescing filter. This filter is equipped with an element made of borosilicate fibers. The gas stream is passing the element from inside to outside. The aerosols are caught in the matrix and form steadily growing droplets which finally drop down into the bowl as liquid phase.

The lifetime of the elements depends on the particulates also carried by the gas stream. If they are retained upstream the coalescer filter the life time of the filter element is almost unlimited.

The liquid collected in the bowl is drained off by either a condensate drain or a peristaltic pump.

- **Bühler - Unique-QC bracket**
- **easy change of filter element without tools**
- **versatile mounting bracket**
- **filter head with auxiliary port**

dimensions



technical data

filter head	PVDF
filter bowl	Duran glass
seal	Viton
pressure	max. 4 bar
temperature	max. +80 °C
death volume	73 ml
weight approx.	0,24 kg



Attention! The liquid can be harmful. Honor the safety regulations!

please indicate with order

coalescing filter including one filter element

part no.	type
41 50 699	K-AGF-PV-30-A

filter element

part no.	type	filter element	material	filter surface	package
49 32 001	12-57-C	husk	borosilicat	28 cm ²	1 pc.

Sample Gas Pump P 2.2-Atex



The transportation of sample gas in sample conditioning systems requires very reliable sample pumps. Of course, the sample gas should have an equal and steady flow but very often the corrosive nature of the gas and the presence of condensate form the real task for the pump.

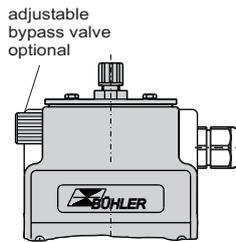
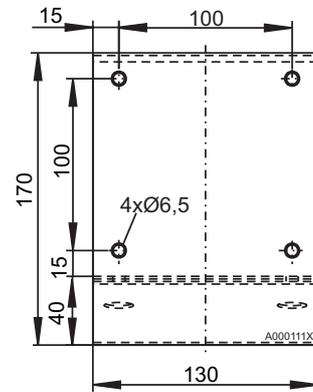
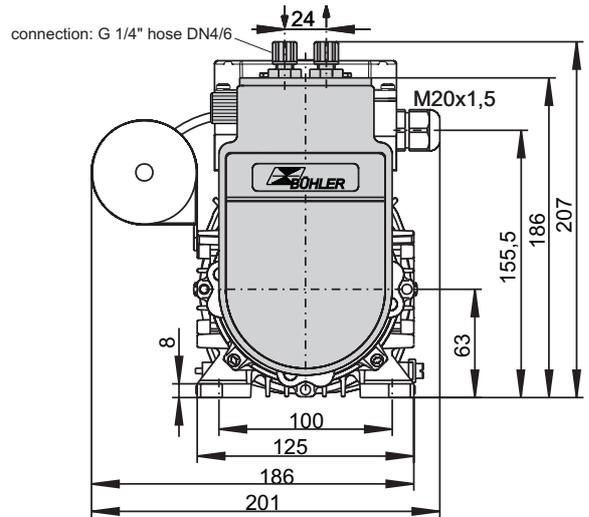
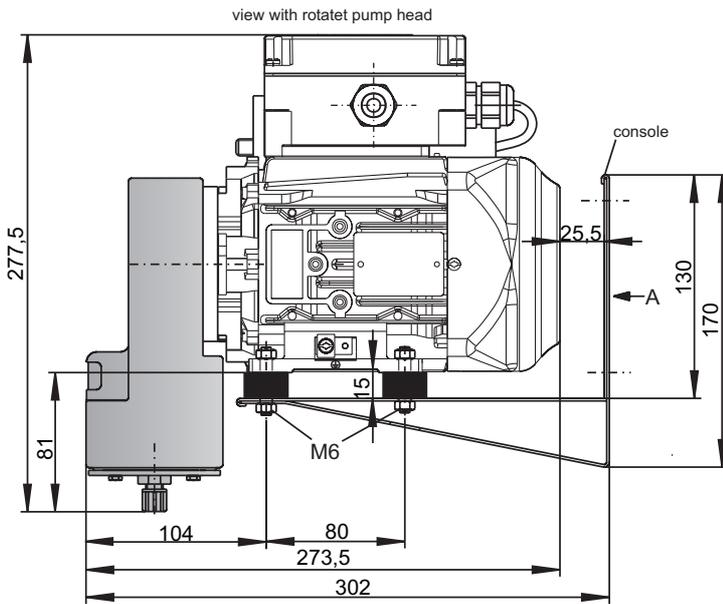
The standard version of the P 2.2 Atex sample pump is equipped with a bellows made of solid PTFE which has proven his reliability and long lifetime in numerous applications.

If the pump head is pointed downwards the pump is able to pump sample gas with condensate contents. The pump employs explosion proof motors and is suitable for category 2.

For easy installation a support console with dampers is included .

- **robust and reliable design**
- **easy to change valves**
- **bellows made of a solid piece**
- **pumps condensate containing gas**
- **low noise emission**
- **with support console**
- **optional adjustable bypass valve**
- **high life expectancy**

dimensions



technical data

nominal voltage see order number
 nominal current see order number
 protection class electrical IP 54
 mechanical IP 20
 weight approx 8,5 kg
 death volume 8,5 ml
 Ex-prot. class 2 GEx e II T1-T4

media temperature	ambient temp.	
80°C	-20°C up to 40°C	T4
120°C	-20°C up to 40°C	T4
140°C	-20°C up to 40°C	T3

media temperature valves PTFE/PVDF 80 °C
 Valves PTFE/PCTFE 140 °C
 ambient temp. Temp. class F max. 40 °C

materials in gas path
 according to pumptype:
 PTFE / PVDF / PCTFE / Viton
 FFKM / 1.4401 / 1.4571

Please keep in mind the required protection devices for the pump's motor

please indicate with order

x stands for the number below

part no..
 4261 x x x x 99

1				
2				
3				
4				
	1			
	2			
		1		
		2		

motors

230 V, 50 Hz, 0,88 A
 220 V, 60 Hz, 0,89 A
 115 V, 50 Hz, 1,76 A
 115 V, 60 Hz, 1,78 A

position pump head

normal pos. vertical
 pointed downwards

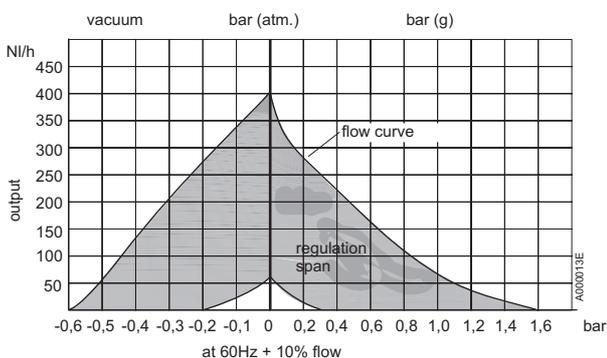
material pump head

PTFE
 SS 1.4571/ viton/ 1.4401
 PTFE with bypass valve

material valves

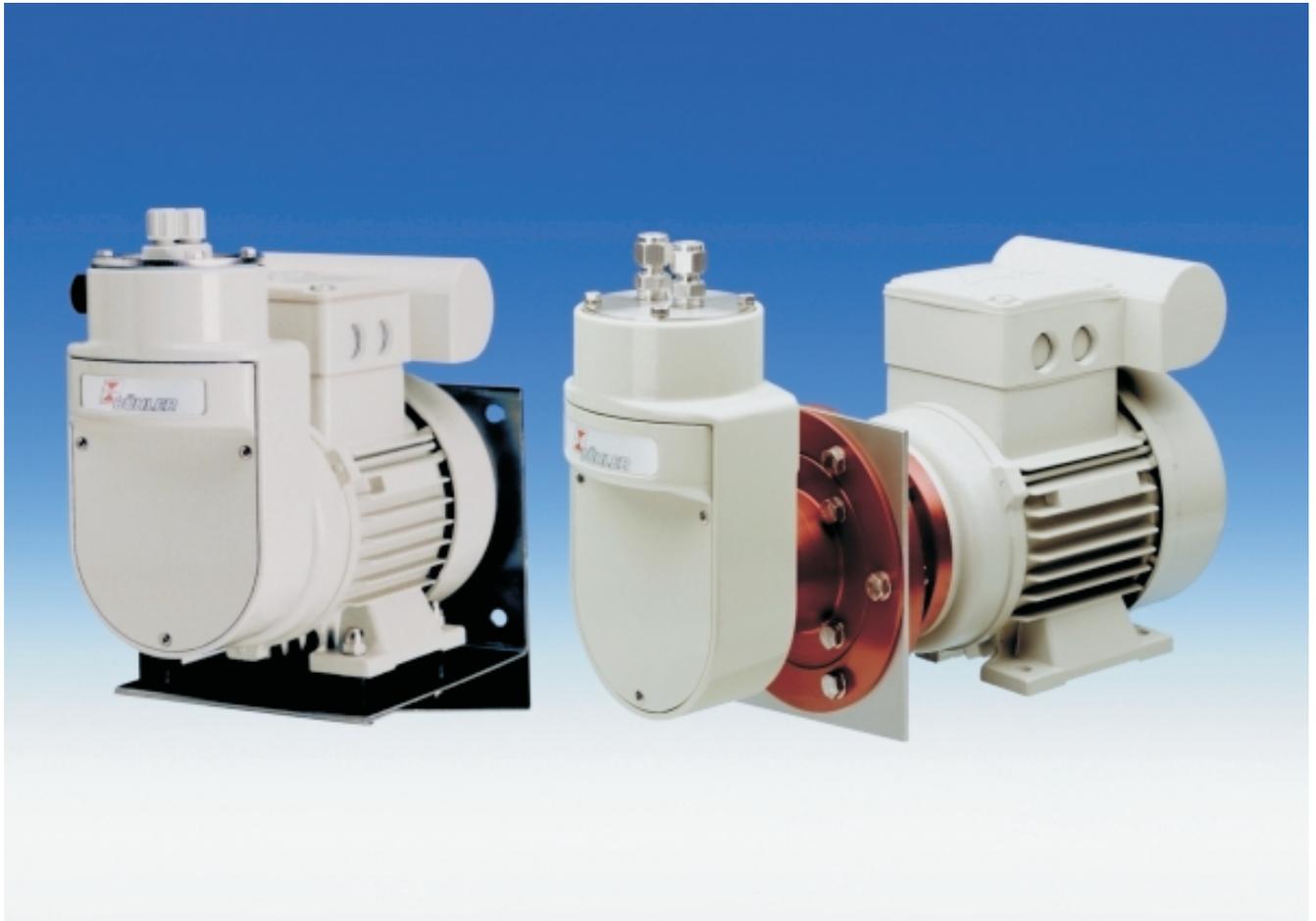
up to 80°C PTFE / PVDF
 up to 140°C PTFE / PCTFE

flow curve



Sample Gas Pump

P 2.3; P 2.83; P 2.4; P 2.84



The transportation of sample gas in sample conditioning systems requires very reliable sample pumps. Of course, the sample gas should have an equal and steady flow but very often the corrosive nature of the gas and the presence of condensate form the real task for the pump.

The sample pumps are equipped with a bellows made from solid PTFE which has proven its reliability and long lifetime in numerous applications. If the pump head is pointed downwards the pump is able to pump sample gas with condensate contents.

A special flange design makes the P2.4 and P2.84 pumps suitable for hot applications i.e. the flange is designed of two parts, one -carrying the pump head - can be installed into a heated cabinet and the other part - carrying the electrical motor - is flanged to the outside of the cabinet keeping the motor in ambient conditions.

- **robust and reliable design**
- **easy to replace valves**
- **bellows made of one solid piece**
- **pumps gas containing condensate**
- **high life expectancy**
- **explosion proof version available**
- **low noise emission**

pump types P2.3 and P2.83

For easy installation of the P2.3 and P2.83 pumps a support console with dampers is included.

The pump head can be ordered with an internal bypass valve.

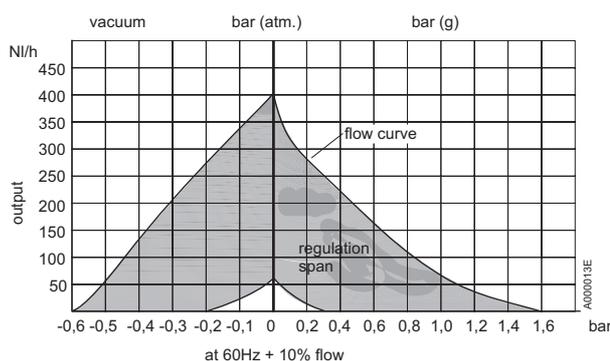
The difference between the P2.3 and P2.83 pump is in the flow provided. The P2.3 pump has got 400l/h free flow and the P2.83 has got 800l/h free flow.

The P2.3 and P2.83 Pumps must not be applied to explosive areas. The corresponding type for ex areas would be the P2.2 ATEX; data sheet 420006, or the US-P2.6Ex, data sheet 420005.

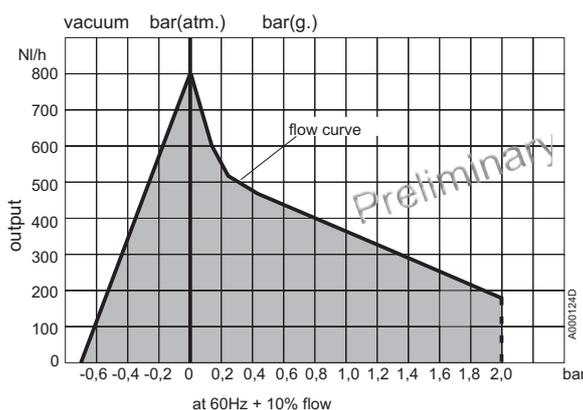
technical data

nominal voltage	see order number
nominal current	see order number
protection class	IP 55
weight	6,5 kg
clearance volume	8,5 ml
media temperature	80 °C Ventile PTFE / PVDF 140 °C Ventile PTFE / PCTFE
ambient temp.	max. 60 °C

flow curve P2.3



flow curve P2.83



please indicate with order

x stands for number below

The P2.83 pump are only with 140°C valves.

ordering example:

part no.. 42 631112 99
 63 for 800 Liter pump P2.83
 1 for 230V 50/60Hz Motor
 1 for pump head pointing up
 1 pump head PTFE
 2 for 140°C valves

part no.

42 xx x x x x 99

56
63

P2.3 400l pump

P2.83 800l pump

motor

230 V, 50/60Hz, 0,85/0,8 A

115 V, 50/60Hz, 1,7/1,6 A

position of pump head

normal pos. vertical
pointing downwards

material of pump head

PTFE

SS 1.4571, viton, 1.4401

PTFE with bypass valve

material of valves

1 up to 80°C PTFE / PVDF (P2.3 only, not aviable for P2.83)

2 up to 140°C PTFE / PCTFE

pump types P2.4 and P2.84

A cabinet wall thickness of up to 30mm can be compensated without other modifications.

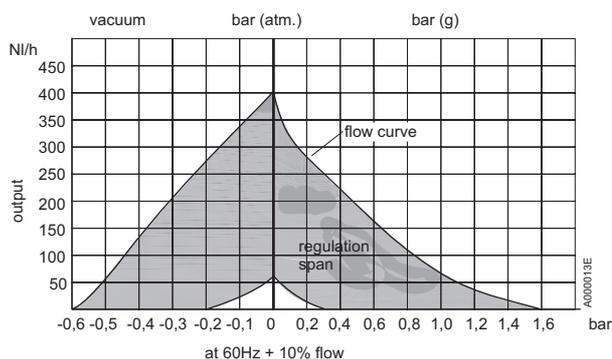
The difference between the P2.4 and P2.84 pump is in the flow provided. The P2.4 pump has got 400l/h free flow and the P2.84 has got 800l/h free flow.

The P2.4 and P2.84 Pumps must not be applied to explosive areas. The corresponding type for ex areas would be the P2.4 ATEX; data sheet 420007.

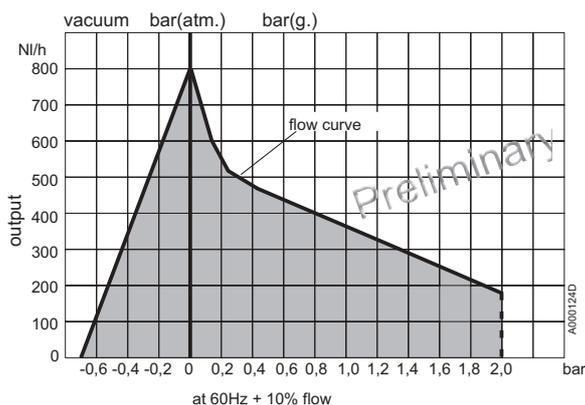
technical data

nominal voltage	see order number
nominal current	see order number
protection class	IP 55
weight	7,5 kg
clearance volume	8,5 ml
media temperature	140 °C Ventile PTFE / PCTFE
ambient temp.	
motor	max. 60 °C
pump head	max. 100°C

flow curve P2.4



flow curve P2.84



please indicate with order

x stand for number below

part no.

42 xx x 1 x 2 99

57
64

P2.4 400l pump

P2.84 800l pump

motor

230 V, 50/60Hz, 0,85/0,8 A

115 V, 50/60Hz, 1,7/1,6 A

1
2

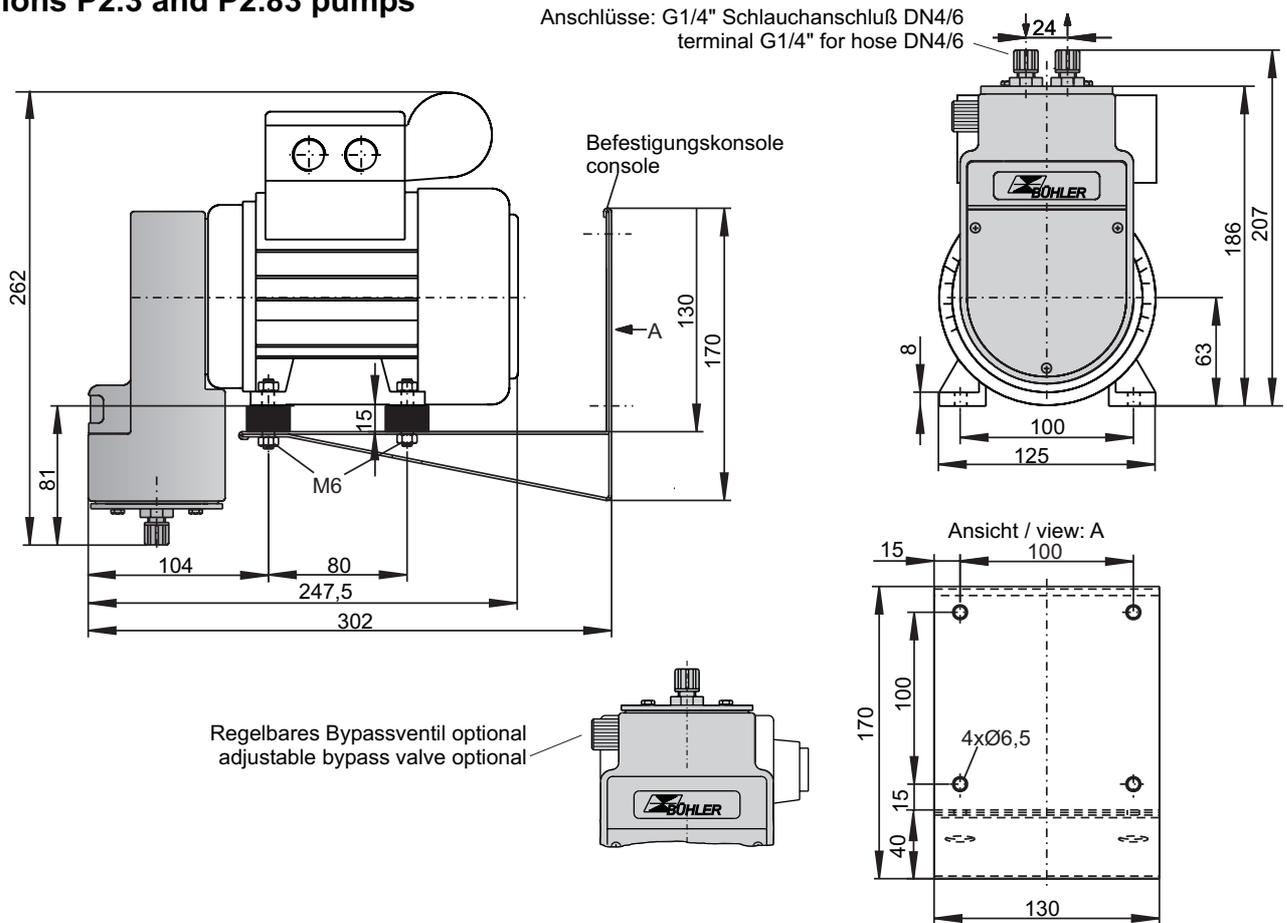
material pump head

PTFE

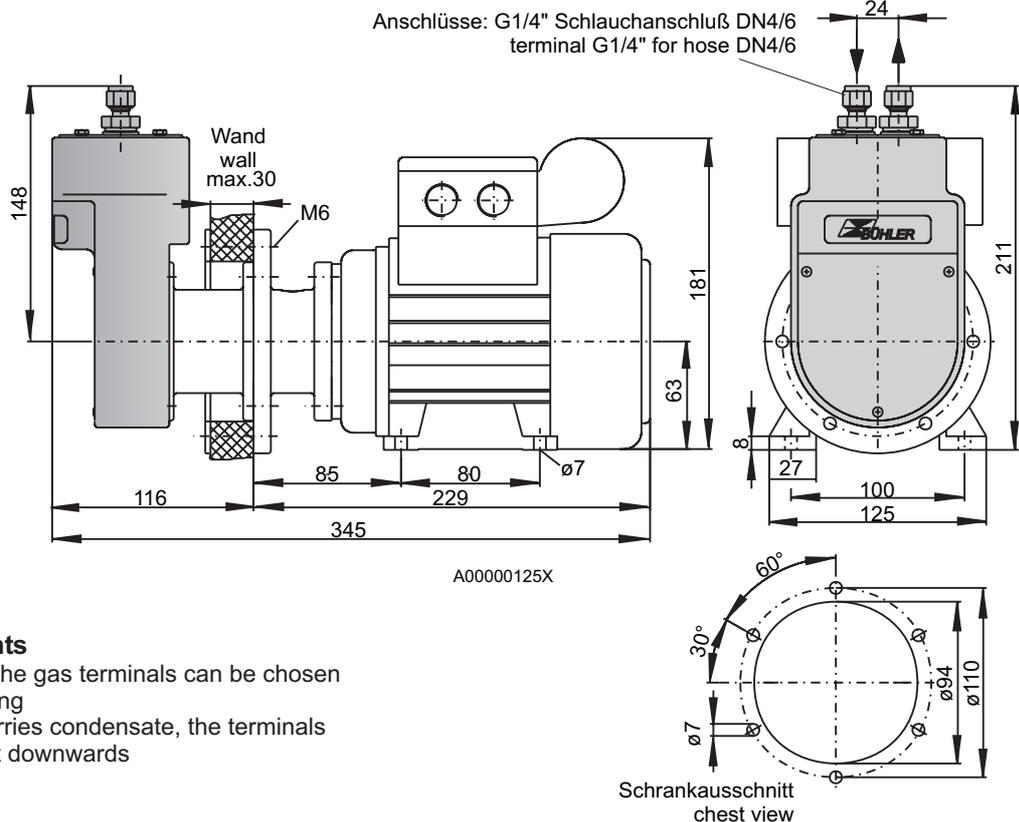
SS 1.4571, viton, 1.4401

1
2

dimensions P2.3 and P2.83 pumps



dimensions P2.4 and P2.84 pumps



Mounting hints

- 1) Direction of the gas terminals can be chosen while mounting
- 2) If the gas carries condensate, the terminals have to point downwards

Sample Gas Pump P1.1, P1.1E, P1.2, P1.2E



The transportation of sample gas in sample conditioning systems requires reliable sample pumps. The corrosive nature of the gas and the potential of condensate formation are the real challenges for any pump.

These sample pumps are equipped with a bellows made from solid PTFE. This design has demonstrated the highest reliability and long lifetime in numerous applications. Designed specifically for harsh gas applications that have entrained liquids present or where condensate is expected to form, it is recommended that the pump head be pointed downwards to accommodate draining of these liquids.

Model P1.2 and P1.2E sample gas pumps are approved to transport flammable gases of explosion group IIA and IIB.

Housing versions P1.1E and P1.2E include a standard 3 m connection line and are available with optional On/Off switch.

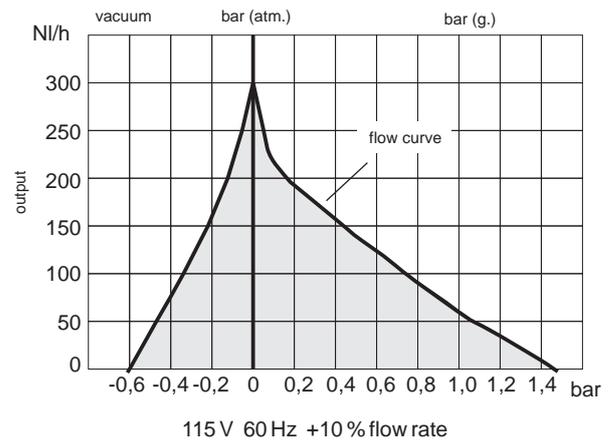
- **Easy to replace valves**
- **Bellow made of one solid piece**
- **Pumps gases with entrained liquid**
- **Well-proven pump technology**
- **Attractive price**
- **Small mounting space required**
- **Mounting accessories and fittings available as options**
- **Housing: protection class IP20**

Technical Data

Voltage	see order number
Current consumption	see order number
Protection class OEM/housing	IP 00 / IP 20
Weight (without accessories)	approx. 1,3 kg
Media temperature *	max. 70 °C
Ambient temperature	0 °C to 50 °C
Nominal output	280 l/h
Media wetted materials	PTFE, PVDF, 1.4571, 1.4401
varies by configuration	
*P1.2/P1.2E see table below	

The gas tubes are connected via screwed fittings (G 1/4" thread). Respective fittings, mounting brackets and dampers can be ordered optionally.

Flow Curve



Restrictions for sample and ambient temperature

Pump types P1.2/P1.2E	Media temperature
Sample without flammable gases	70 °C
Sample with flammable gases above the lower explosion	T3 T4

Marking P1.2/P1.2E:

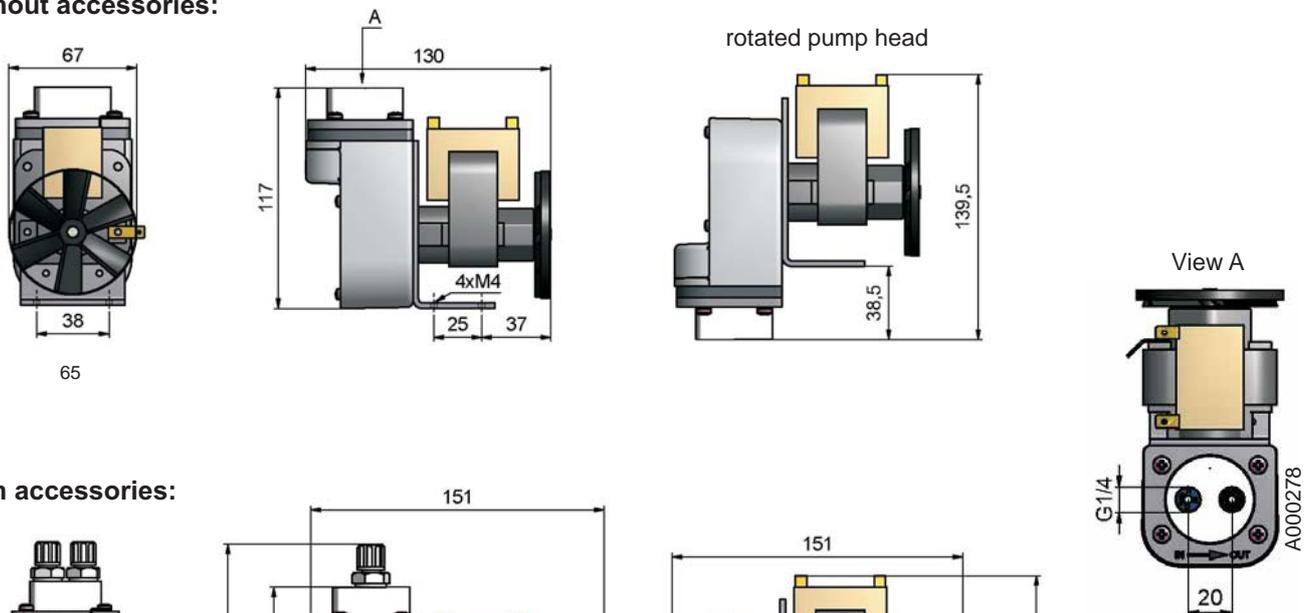
II 3G/- c IIB T4

Note: This unit is not suitable for installation in explosive areas!

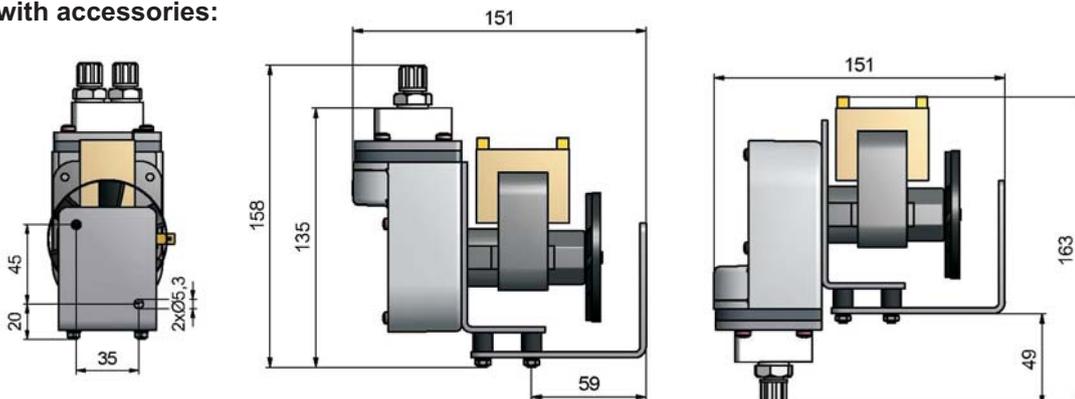
Dimensions Pump P1.1 / P1.2

The sample gas pump P1.1/P1.2 is electrically connected by push-on receptacles.

without accessories:



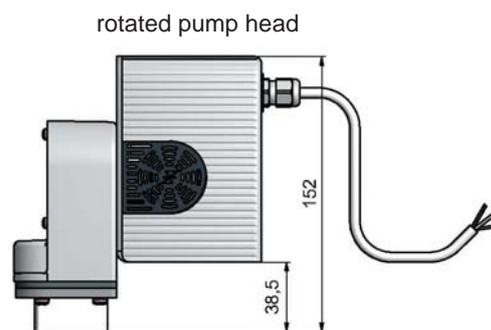
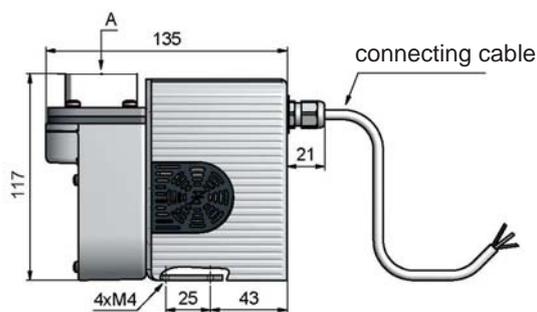
with accessories:



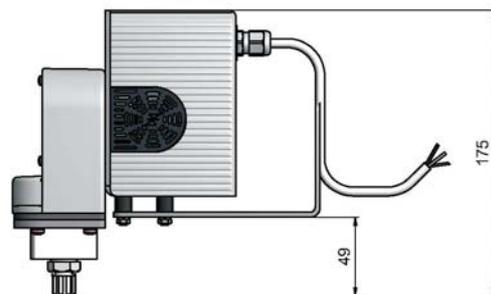
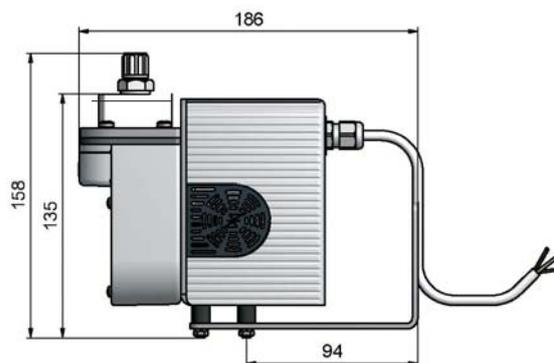
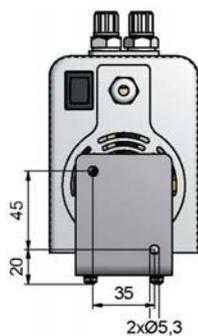
Dimensions Pump P1.1E / P1.2E

The sample gas pump P1.1E/P1.2E is by default equipped with a connecting cable, length 3 m.

without accessories:



with accessories:



Ordering hints:

Part no.	42	XX	X	X	X	1	X	X	X	0	0	Feature
												Basic type
28												P1.1 280 l/h
29												P1.2 280 l/h (II 3G/- c IIB T4)
												Motor supply
1												230 V / 50 Hz, 0,44 A
2												115 V / 60 Hz, 0,76 A
												Pump head position
1												normal pos. vertical
2												pointing downwards
												Material pump head
1												PTFE
2												VA (1.4571)
4												PVDF
												Material valves
1												up to 70 °C PTFE/PVDF
												Male stud couplings / pipe fittings
0												without fittings
1												PVDF DN 4/6 *
2												PVDF 1/4"-1/6" *
3												PVDF 1/4"-1/8" *
5												VA (1.4401) 6 mm **
6												VA (1.4401) 1/4" **
												Mounting accessories
0												without mounting accessories
1												mounting brackets and set of vibration dampers
2												set of vibration dampers only
												Housing
0												no housing
1												housing incl. connection cable, length 3 m
2												housing incl. ON/OFF switch and connection cable, length 3 m

*only for PTFE or PVDF pump bodies

**only for VA pump body

Accessories

Part no.	Description
on request	Adapter plate for mounting the pump on different drilling patterns

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Sample Gas Cooler PKE 5



Accurate measurement of gases requires gas samples with stable dew points even under harsh ambient conditions. The PKE Models feature a semiconductor Peltier cooling system with an aluminum cooling block. Fitted into the block is a removable high efficient heat exchanger made of stainless steel, DURAN-glass or PVDF.

The PKE 5 is designed for moderate ambient and gas temperatures (150 l/h @ 70°C) and an inlet dew point of about 40 °C (approx. 5 Vol%). For higher ambient temperatures up to a maximum of 50 °C order the PKE 52x.

The dew point of 5 °C is regulated by an electronic controller. The temperature (in °C or °F) of the cooling block is shown on a LED-display. The status is indicated by a flashing display which shows too high or low temperature and operates together with a relay in fail-safe mode.

Condensate is removed by peristaltic pumps, automatic condensate drains or condensate vessels.

- **Compact design**
- **Easy installation**
- **No maintenance required**
- **Low noise**
- **Efficient heat exchangers made of stainless steel, DURAN-glass or PVDF**
- **Nominal cooling capacity 90/100 kJ/h**
- **Dew point stability 0.1 °C**
- **Status display and -output**
- **Cooling temperature display**
- **Model available for high ambient temperatures**

Model Overview

The PKE 5 Peltier cooler family includes several types which may be categorised by two criteria:

- 1) Cooling capacity and maximum ambient temperature
- 2) Number of heat exchangers

These criteria can be specified in the model number as shown in the table below.

Application:	Standard		
Max. ambient temperature:	40 °C	50 °C	
1 heat exchange	PKE 511	PKE 521	3rd no. = 1
2 heat exchanger	PKE 512	PKE 522	3rd no. = 2
	2nd no. = 1	2nd no. = 2	

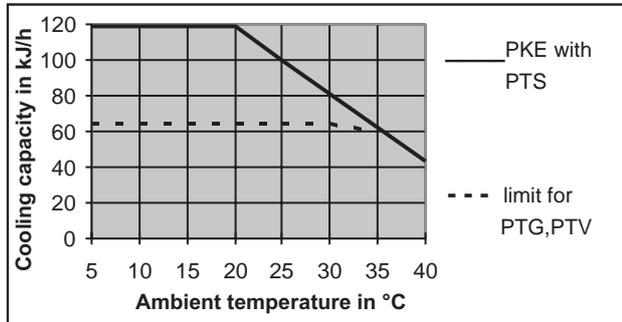
The general specifications can be found in the table below. On the next page are the performance curves and the specifications for each cooler. In the table below that there is an overview of the heat exchanger's data.

Description	Technical Specifications for All Models	
<p>The PKE coolers are controlled by a microprocessor. The different operating characteristics of the heat exchangers are established at the factory.</p> <p>Menu-guided with three keys it is easily possible to adapt settings to the specific requirements of any application.</p> <p>The outlet dew point can be set in a range of 2 to 20 °C (36..68°F). It is factory preset to 5°C (41°F).</p> <p>Warning limits for high or low temperature can be set relative to the chosen outlet dew point τ_a. For low temperature the range is $\tau_a - 1..3^\circ\text{C}$ (minimum 1°C / 34°F). For high temperature it is $\tau_a + 1..7^\circ\text{C}$. Factory preset for both is 3°C.</p> <p>When the warning limits are exceeded (e.g. at start-up) this is signalled by a flashing display and the status contact.</p> <p>The status contact could be used to control the sample gas pump so that the gas flow is turned on when the cooler reaches the desired temperature.</p>	<p>Ready for application</p> <p>Ambient temperature</p> <p>Factory set dew point</p>	<p>after max. 10 Minutes</p> <p>+5...40°C/ 50°C</p> <p>5°C</p>
	<p>Protection class</p> <p>Material of housing</p> <p>Packing dimensions appr.</p> <p>Weight including heat exchanger(s)</p>	<p>IP 20</p> <p>Stainless steel</p> <p>350 x 220 x 220 mm</p> <p>appr. 6,5 kg</p>
	<p>Power supply</p> <p>Power consumption</p> <p>Status output</p>	<p>115 or 230V</p> <p>50/60 Hz</p> <p>max. 120 VA</p> <p>max. 230V AC, 150 V DC</p> <p>2A, 50 VA, dry</p>
	<p>Electrical connectors</p> <p style="padding-left: 20px;">Standard applications</p> <p style="padding-left: 20px;">(PKE 511, 512, 521, 522) Plugs according to DIN 43650</p>	

One heat exchanger

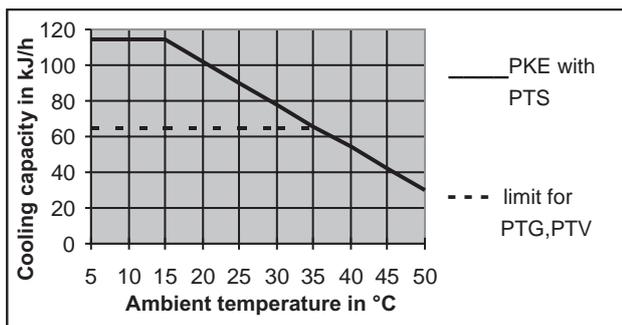
Type PKE 511

Nominal cooling capacity (at 25 °C)	100 kJ/h
Max. ambient temperature	40 °C
Dew point noise static	± 0.1 K
Drift over full range	± 1.5 K



Type PKE 521

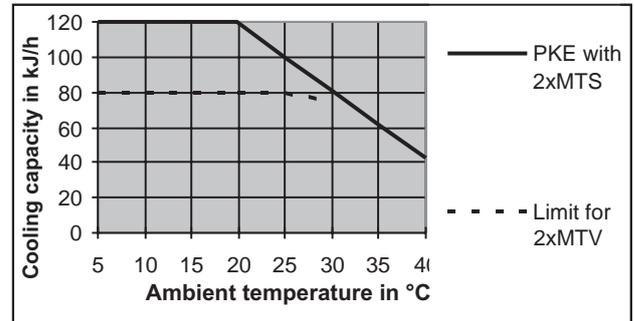
Nominal cooling capacity (at 25 °C)	90 kJ/h
Max. Ambient temperature	50 °C
Dew point noise static	± 0.1 K
Drift over full range	± 1.5 K



Two heat exchangers

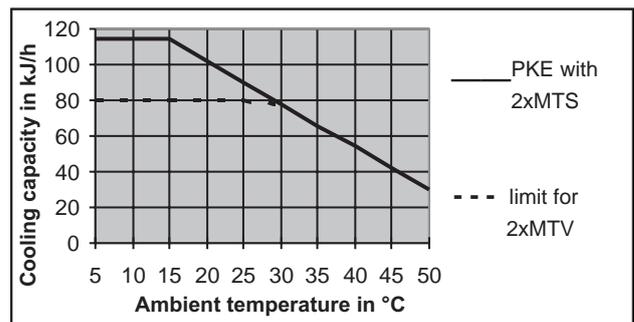
Type PKE 512

Nominal cooling capacity (at 25 °C)	100 kJ/h
Max. ambient temperature	40 °C
Dew point noise static	± 0.1 K
Drift over full range	± 1.5 K
Temperature differential between heat exchangers	< 0.5 K



Type PKE 522

Nominal cooling capacity (at 25 °C)	90 kJ/h
Max. Ambient temperature	50 °C
Dew point noise static	± 0.1 K
Drift over full range	± 1.5 K
Temperature differential between heat exchangers	< 0.5 K



Note: The limits in the diagrams for the PTG, PTV respectively MTV are for a dew point of 40°C.

Heat exchanger

The energy content of the sample gas and, as a result, the required cooling capacity of the cooling system is determined by 3 parameters: gas temperature ϑ_G , dew point τ_e (moisture content) and flow v .

The outlet dew point raises with increasing energy content (heat) of the gas. The required cooling capacity is determined by the maximum acceptable level of the outlet dew point.

The following table shows cooler performance assuming the following conditions: $\tau_e=40^\circ\text{C}$ and $\vartheta_G=70^\circ\text{C}$. Indicated is the v_{\max} in l/h cooled air (i.e. after the moisture has condensed). With other dew points and gas inlet temperatures the values may differ.

Please contact one of Buhler's application specialists for assistance and further information.

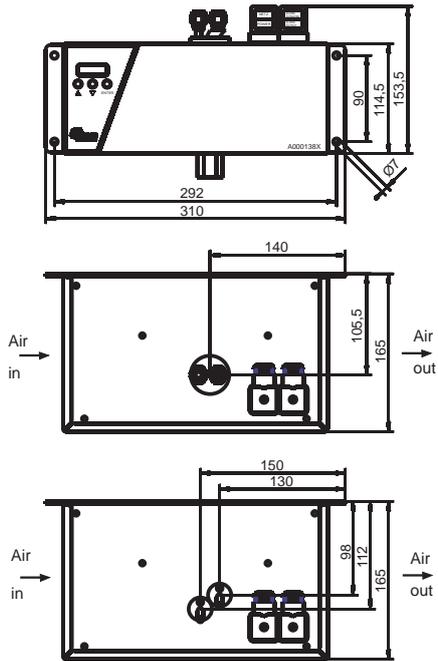
Heat exchanger	PTS	PTG	PTV	MTS	MTV
Flow rate v_{\max}^1	450 l/h	250 l/h	250 l/h	300 l/h	190 l/h
Inlet dew point $\tau_{e,\max}^1$	65 °C	65 °C	65 °C	65 °C	65 °C
Gas inlet temp. $\vartheta_{G,\max}^1$	180 °C	140 °C	140 °C	140 °C	140 °C
Max. Kühlleistung Q_{\max}	150 kJ/h	90 kJ/h	90 kJ/h	95 kJ/h	60 kJ/h
Gas pressure p_{\max}	160 bar	3 bar	2 bar	25 bar	2 bar
Pressure drop Δp ($v=150$ l/h)	10 mbar	10 mbar	10 mbar	20 mbar	18 mbar
Dead volume	29 ml	29 ml	57 ml	19 ml	17 ml
Sample gas connections	Swagelok 6 mm	GL 14	DN 4/6	Rohr 6 mm	DN 4/6
Condensate out connection	G 3/8" i	GL 25	G3/8" i	G1/4" i	G 1/4" i

¹⁾ consider the maximum cooling capacity of cooler

Remark: Heat exchangers MTS and MTV cannot be drained by automatic drainers.

Dimensions

Models for standard applications (PKE 51x und 52x)



Ordering hints

In the following table, replace the x by the codes above the part number. The ttt is replaced by the basic type number and the y is replaced by the number of peristaltic pumps to be mounted.

		1			Power supply	115V
		2				230V
		1			Material of heat exchanger	SS
		2				Glas (not for types with 2 heat exchangers)
		3				PVDF
44 6	ttt	x	x	y	00	
511					Types with 1 heat exchanger	
521					PKE 511: Standard	Ambient temperature 40°C
					PKE 521: Standard	Ambient temperature 50°C
				0	Peristaltic pumps	none
				1		one
512					Types with 2 heat exchangers	
522					PKE 512: Standard	Ambient temperature 40°C
					PKE 522: Standard	Ambient temperature 50°C
				0	Peristaltic pumps	none
				1		one
				2		two

Accessories

Part No.	Description
45 10 008	Automatic condensate drain type AK 5.2
44 10 005	Glass vessel GL 1
9124030027	Spare tube for peristaltic pump, right angle terminals

Sample Gas Cooler EGK 1/2



Accurate measurements of gas components require gas samples with stable dew points even under harsh ambient conditions.

The EGK types provide a cooling system basically designed like a refrigerator type cooling system connected to a cooling block. This cooling block has an even heat dissipation and thus supports the performance of highly efficient heat exchangers. While the compressor is running constantly the temperature regulation is done by the Bühler-constant-regulating-system. This system allows very smooth regulation and eliminates all disadvantages of the traditional on-off operating mode.

The cooling block takes either a single stream or a dual stream heat exchanger hence the cooler is suitable to serve two separate gas sample streams.

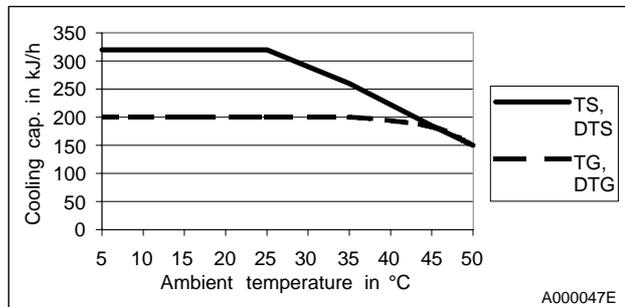
Depending on the system's basic principle the condensate is removed either by peristaltic pumps (up to two can be integrated into the cooler's cover), by automatic condensate drains or condensate vessels.

- **compact design**
- **single or dual gas streams**
- **heat exchangers made of stainless steel or duran glass**
- **Bühler-constant-regulating-system**
- **selfchecking**
- **status alarm**
- **display of cooling temperature**
- **cooling capacity 320kJ/h**
- **dewpoint stability 0,1 °C**

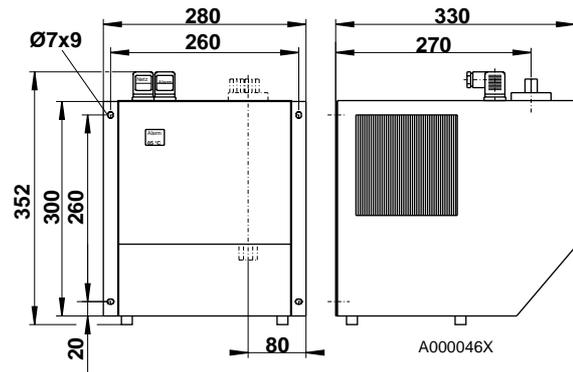
technical data

ready for operation	max. 15 minutes
cooling capacity (at 25°C)	320 kJ
ambient temperature	+5..+50 °C
dewpoint (set at factory)	approx. 5 °C
dewpoint variations static	0,1 K
over full operation range	± 1,5 K
power supply	115 or 230 V, 50/60 Hz, plug according to DIN 43650
power consumption	180 VA, fuse (external) 10 A
alarm output:	max. 250V, 2 A, 50 VA plug acc. to DIN 43650
protection class	IP 20
housing	stainless steel
installation	table or wall mounting
packing dimensions	approx. 390 x 300 x 400 mm
weight incl. heat exchangers	approx. 15 kg

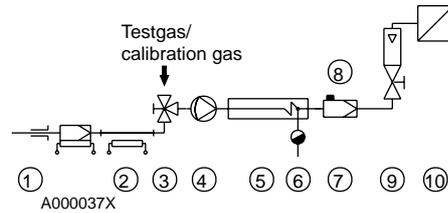
performance data's



dimensions



typical installation scheme:



- | | |
|------------------------|---------------------------|
| 1 sample probe | 7 moisture detector |
| 2 sample tube | 8 fine filter |
| 3 3 way valve | 9 flowmeter |
| 4 sample gas pump | 10 analyser |
| 5 sample gas cooler | |
| EGK-1/2 | |
| 6 automatic condensate | Types and datas of |
| drain or perist. pump | components see individual |
| | data sheets. |

heat exchanger

The energy content of the sample gas and as a result the required cooling capacity is determined by 3 parameters: gas temperature ϑ_G , dewpoint τ_e (moisture content) and flow Q. The outlet dew point raises with increasing energy content of the gas due to physical rules. The acceptable cooling capacity is determined by a tolerated raise of the outlet dew point.

The following limits are set for $\tau_e=65^\circ\text{C}$ and $\vartheta_G=90^\circ\text{C}$. Indicated is the Q_{max} in NI/h cooled air i.e. after the moisture has condensed.

If the real values stay below the parameters τ_e and ϑ_G , Q_{max} can be increased. As an example instead of $\tau_e=65^\circ\text{C}$, $\vartheta_G=90^\circ\text{C}$ and $v=250$ l/h the values $\tau_e=50^\circ\text{C}$, $\vartheta_G=80^\circ\text{C}$ and $v=350$ l/h could be accepted.

Please let us know if you want assistance or use our cooler adaption programme.

heat exchanger	TS	TG	DTS	DTG
flow rate $v_{\text{max}}^{1)}$	400 l/h	250 l/h	2 x 200 l/h	2 x 125 l/h
inlet dewpoint $\tau_{e,\text{max}}^{1)}$	80 °C	80 °C	80 °C	65 °C
gas inlet temperature. $\vartheta_{G,\text{max}}^{1)}$	180 °C	140 °C	180 °C	140 °C
max. cooling capacity Q_{max}	340 kJ/h	200 kJ/h	340 kJ/h	200 kJ/h
gas pressure p_{max}	160 bar	3 bar	25 bar	3 bar
pressure drop Δp ($v=150$ l/h)	8 mbar	8 mbar	each 5 mbar	each 5 mbar
death volume V_{tot}	69 ml	48 ml	28 / 25 ml	28 / 25 ml
sample gas connections	G 1/4" i ²⁾	GL 14	tube 6 mm	GL 14
condensate out connections	G 3/8" i ²⁾	GL 25	tube 10 mm	GL 18

¹⁾ with maximum heat transfer of the heatexchanger and max. cooling capacity of the cooler

²⁾ NPT-threads upon request

Please indicate with order

cooler

45 65 999 EGK-1/2 230 V 50/60Hz

45 66 999 EGK-1/2 115 V 50/60Hz

heat exchanger

45 10 023 TS, stainless steel 1.4571

45 10 013 TG, Duran glass

45 01 026 DTS, stainless steel 1.4571, dual

45 01 027 DTG, Duran glass, dual

accessories

44 10 001 automatic condensate drain 11 LD V 38

44 10 004 automatic condensate drain AK 20, PVDF

44 10 005 condensate vessel GL 1; glass, 0,4 l

44 10 019 condensate vessel GL 2; glass, 1 l

45 10 130 1 peristaltic pump 230 V, 0,3 l/h, built-in

45 10 230 second peristaltic pump 230 V, 0,3 l/h, built-in

45 10 131 1 peristaltic pump 115 V, 0,3 l/h, built-in

45 10 231 second peristaltic pump 115 V, 0,3 l/h, built-in

45 10 122 per. pump 230 V, 0,3 l/h, separat mounting

45 10 222 per. pump 115 V, 0,3 l/h, separat mounting

Sample Gas Cooler EGK 2 Ex



Accurate measurements of gas components require gas samples with stable dew point. The gas cooler is an important part in the gas conditioning system. The dew point is lowered to a definite point to prevent moisture from condensing in expensive analyser parts.

Compressor coolers type EGK assure a stable outlet dew point due to their reliable design. The cooling system is filled with a fluorchlorocarbonfree coolant and free of maintenance. The main part of the cooling system is a cooling block assuring an even heat dissipation. One or two highly efficient heat exchangers are inserted into the cooling block.

The controller is self-checking. Deviation of more than 3K off the preset will be signalled by a status output. A bicolour LED on the front shows 4 different operation conditions.

Depending on the system's basic principle the condensate is removed either into condensate vessels or by automatic condensate drainers which can be directly attached to the heat exchangers within the coolers outer contour.

- **ATEX certificate Zone 1 (Cat. 2G)**
- **FCKW free**
- **nominal cooling capacity 575 kJ/h**
- **1 or 2 heat exchangers can be inserted: up to 4 gas paths**
- **selfchecking with status output**
- **4 operational conditions displayed**
- **simple operation and test**
- **very easy to install**
- **condensate draining can be mounted inside of outer shape**

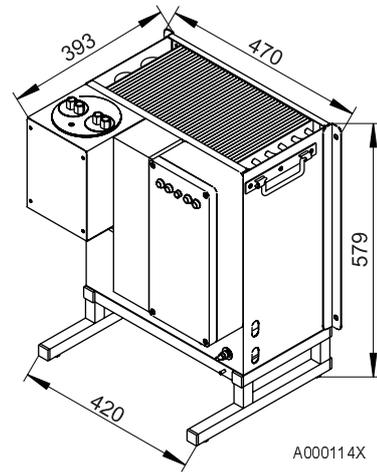
Technical data

ATEX-class	Ex II 2 G Eex pmeq [ia] T4
ready for operation	after max. 20 minutes
cooling capacity (at 25°C)	> 575 kJ/h (160W)
ambient temperature	+0..40°C
gas outlet dewpoint (preset)	approx. 5 °C
dewpoint stability static	± 0,2 K (with st. steel) ± 0,5 K (with PVDF)
Over whole spec. Range:	± 2 K
power supply	230V, 50 Hz or 115V, 60 Hz
power consumption	250 VA (230V) 300VA (115V)
fuse	motor protection switch
potential-free status outputs (fail-safe)	250 V / 8 A AC 24 V / 1 A DC
protection classelectrically	IP 54
Housing material	stainl. steel / polyester
installation	upright or against wall
shipping dimensions approx.	700 x 500 x 500 mm
shipping weight incl. 2 heat exchangers	approx. 37 kg

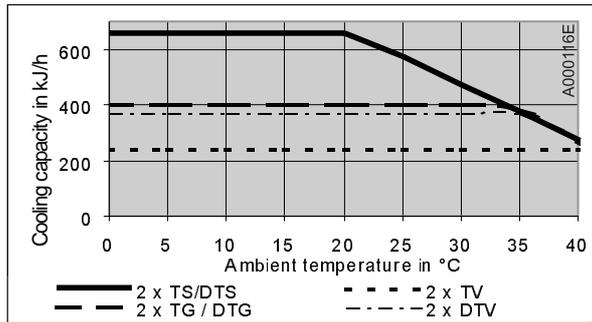
Display

Status LED with 4 conditions:	
Green:	temperature in range
Green flashing:	temperature in range, compressor is running
Red:	temperature off range, cooling operation
Red flashing:	Cooler stooped or service required

Dimensions



Performance data



Heat exchanger

The energy content of the sample gas and as a result the required cooling capacity is determined by 3 parameters: gas temperature ϑ_{G1} , dewpoint τ_e (moisture content) and flow Q. The outlet dew point raises with increasing the energy content of the gas due to physical rules. The acceptable cooling capacity is determined by a tolerated raise of the outlet dew point.

The following limits are set for $\tau_e=65^\circ\text{C}$ and $\vartheta_{G1}=90^\circ\text{C}$. Indicated is the Q_{max} in l/h cool air i.e. after the moisture has condensed.

If the real values stay below the parameters τ_e and ϑ_{G1} , Q_{max} can be increased. As an example instead of $\tau_e=65^\circ\text{C}$, $\vartheta_{G1}=90^\circ\text{C}$ and $v=250$ l/h the values $\tau_e=50^\circ\text{C}$, $\vartheta_{G1}=80^\circ\text{C}$ and $v=350$ l/h could be accepted.

Please let us know if you want assistance or use our cooler adaption programme.

Heat exchanger	TS	TG	TV	DTS	DTG	DTV ⁴⁾
flow rate v_{max} ¹⁾	400 l/h	250 l/h	125 l/h	2*200 l/h	2*125 l/h	2*115l/h
inlet dewpoint $\tau_{e,\text{max}}$ ¹⁾	80 °C	80 °C	65 °C	80 °C	65 °C	65 °C
gas inlet temperature $\vartheta_{G1,\text{max}}$ ^{1) und 3)}	180(135) °C	135°C	135 °C	180(135) °C	135 °C	135 °C
max. cooling capacity Q_{max}	340 kJ/h	200 kJ/h	120 kJ/h	340 kJ/h	200 kJ/h	185 kJ/h
gas pressure p_{max}	160 bar	3 bar	3 bar	25 bar	3 bar	2 bar
pressure drop Δp ($v=150$ l/h)	8 mbar	8 mbar	8 mbar	each 5 mbar	each 5 mbar	each 15 mbar
death volume V_{tot}	69 ml	48 ml	129 ml	28/25 ml	25/25 ml	eah 21 ml
sample gas connections	G 1/4" i ²⁾	GL 14	DN 4/6	tube 6mm	GL 14	DN 4/6
condensate out connections	G 3/8" i ²⁾	GL 25	G 3/8" i	tube 10mm	GI184	DN 4/6

¹⁾ with maximum heat transfer of the heatexchanger and max. cooling capacity of the cooler

²⁾ NPT-threads upon request

³⁾ Values in parentheses due to temperature class

⁴⁾ Use of automatic condensate drainers and glass vessels not possible

Please indicate with order

Coolers

45 90 999	EGK 2 Ex, 230V / 50 Hz
45 91 999	EGK 2 Ex, 115V / 60 Hz

Heat exchanger

45 10 023	TS, stainless steel 1.4571
45 10 013	TG, Duran glass
45 01 004	TV-SS, PVDF
45 01 026	DTSstainless steel 1,4571, two streams
45 01 027	DTG Duran glass, two streams
45 01 028	DTV, PVDF, two streams

Motor protection switches

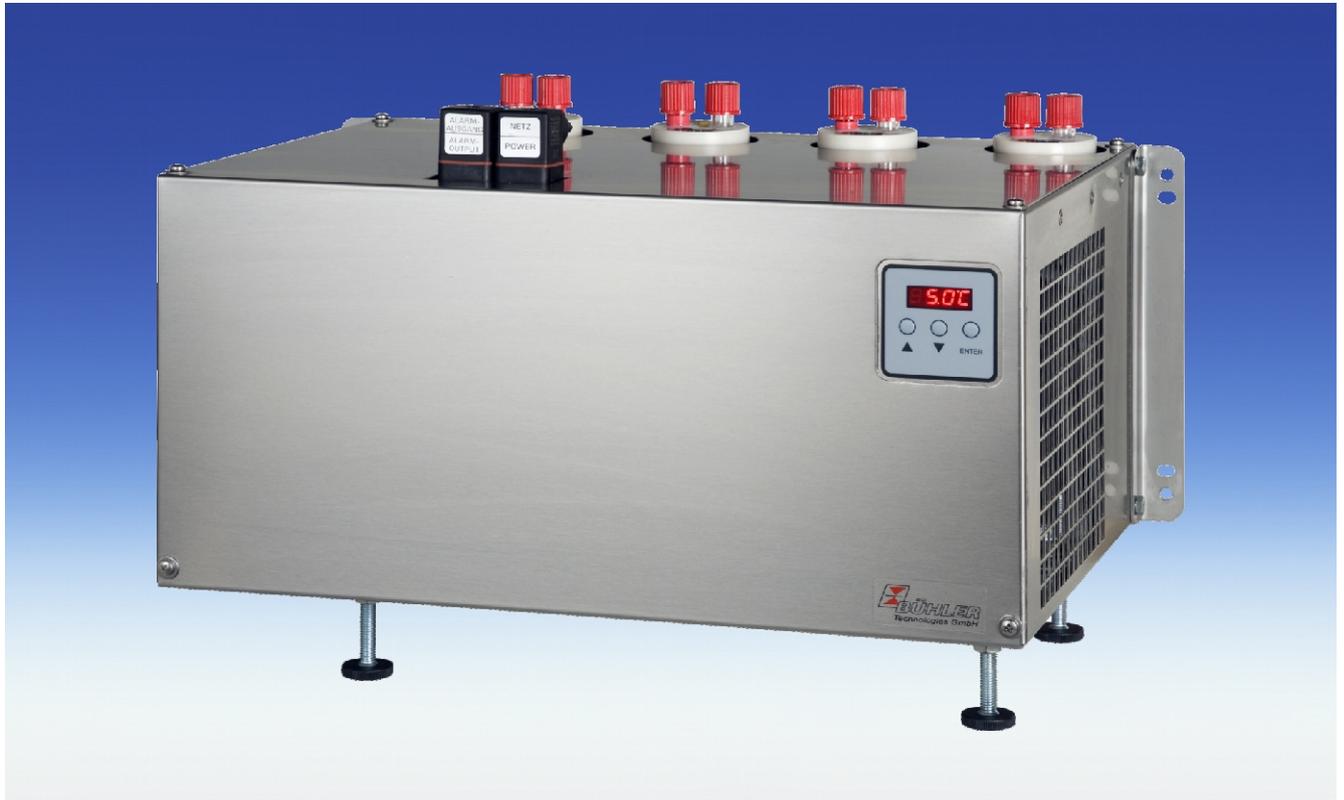
The cooler has to be connected via a motor protection switch

9132020021	Motor protection switch mounted outside of hazardous area for cooler 230V/50Hz
9132020030	Motor protection switch mounted outside of hazardous area for cooler 115V/60Hz
9132020032	Motor protection switch mounted inside of hazardous area for cooler 230V/50Hz
9132020033	Motor protection switch mounted inside of hazardous area for cooler 115V/60Hz

Accessories

44 10 001	Automatic condensate drainer 11 LD V 38 (SS)
44 10 004	Automatic condensate drainer AK 20 (PVDF)
44 10 005	Condensate vessel GL 1; glass, 0,4 l
44 10 019	Condensate vessel GL 2; glass, 1 l

Sample gas cooler EGK 4 S



Accurate measurements of gases require gas samples with stable dew points even under harsh ambient conditions.

The heart of any cooling system is the cooling block. Bühler gas coolers feature cooling blocks made of aluminum which accommodate highly efficient heat exchangers available in a variety of materials such as stainless steel, glass or PVDF. The temperature of the cooling block is regulated by the **Bühler Constant Regulating System** featuring a straight and constant temperature value. Maintenance-free models accommodating up to four gas streams are available.

The coolers status can be monitored by a display of the cooling block temperature and a LED which blinks until the cooler reaches the valid temperature range.

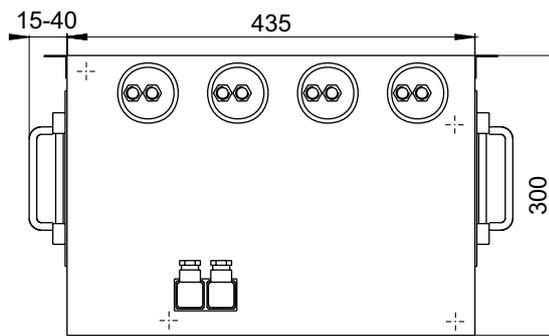
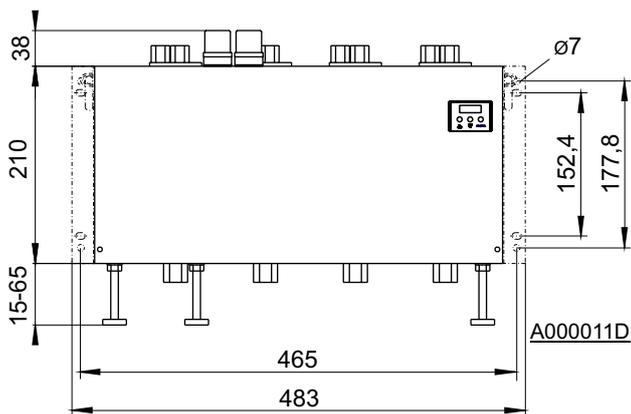
The cooler can be supplied with feet adjustable from about 1,5 to 6,6 cm and either mounting brackets or handles.

- **Compact design**
- **Easy installation**
- **Wall, rack or table mountable**
- **Reliable cooling system**
- **CFC-free**
- **Up to 4 gas streams**
- **Heat exchangers in SS, glass or PVDF**
- **Nominal capacity 800 kJ/h**
- **Dew point stability 0.2 °C**
- **Temperature display**
- **Feet, handles or mounting brackets available**

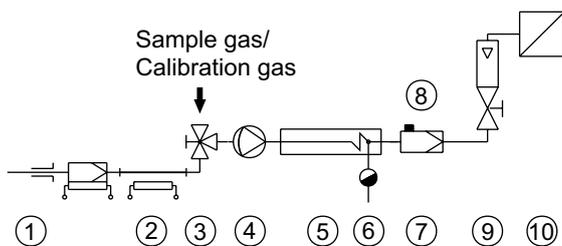
Technical Data

Ready for operation	max. 15 minutes
Cooling capacity (at 25°C)	800 kJ/h
Ambient temperature	+5 °C to 50 °C
Dew point (set at factory)	approx. 5 °C
Dew point variations static	0,2 K
Over full operation range	± 2 °C
Power supply	115 V or 230 V, 50/60 Hz
Power consumption	170 VA / 500 VA
Fuse	10 A
Alarm output	230 V AC/150 V DC, 2 A, 30 VA change over contact
Protection class	IP 20
Housing material	stainless steel
Installation	wall, rack or table mounting
Dimensions (H x W x D)	approx. 510 mm x 355 mm x 450 mm
Weight (incl. 4 heat exchangers)	max. 32 kg

Dimensions (mm)



Typical Installation Diagram



A000037X

- 1 Sample probe
- 2 Sample tube
- 3 3 way valve
- 4 Sample gas pump
- 5 Sample gas cooler EGK 4S
- 6 Automatic condensate drain or perist. pump
- 7 Moisture detector
- 8 Fine filter
- 9 Flowmeter
- 10 Analyser

For models and specs of components see individual data sheets.

Heat Exchanger

The energy content of the sample gas and, as a result, the required cooling capacity of the gas cooler is determined by 3 parameters: gas temperature ϑ_G , dewpoint τ_e (moisture content) and flow v . The outlet dew point rises with increasing energy content (heat) of the gas. The required cooling capacity is determined by the maximum acceptable level of the outlet dew point.

The following table shows cooler performance assuming the following conditions: $\tau_e=65^\circ\text{C}$ and $\vartheta_G=90^\circ\text{C}$. Indicated is the v_{max} in NI/h cooled air (i.e. after the moisture has condensed). If the actual values stay below the parameters τ_e and ϑ_G , v_{max} can be increased. For example (TG), instead of $\tau_e=65^\circ\text{C}$, $\vartheta_G=90^\circ\text{C}$ and $v=250$ l/h the values $\tau_e=50^\circ\text{C}$, $\vartheta_G=80^\circ\text{C}$ and $v=350$ l/h could be achieved.

Please contact one of Buhler's application specialists for assistance and further information.

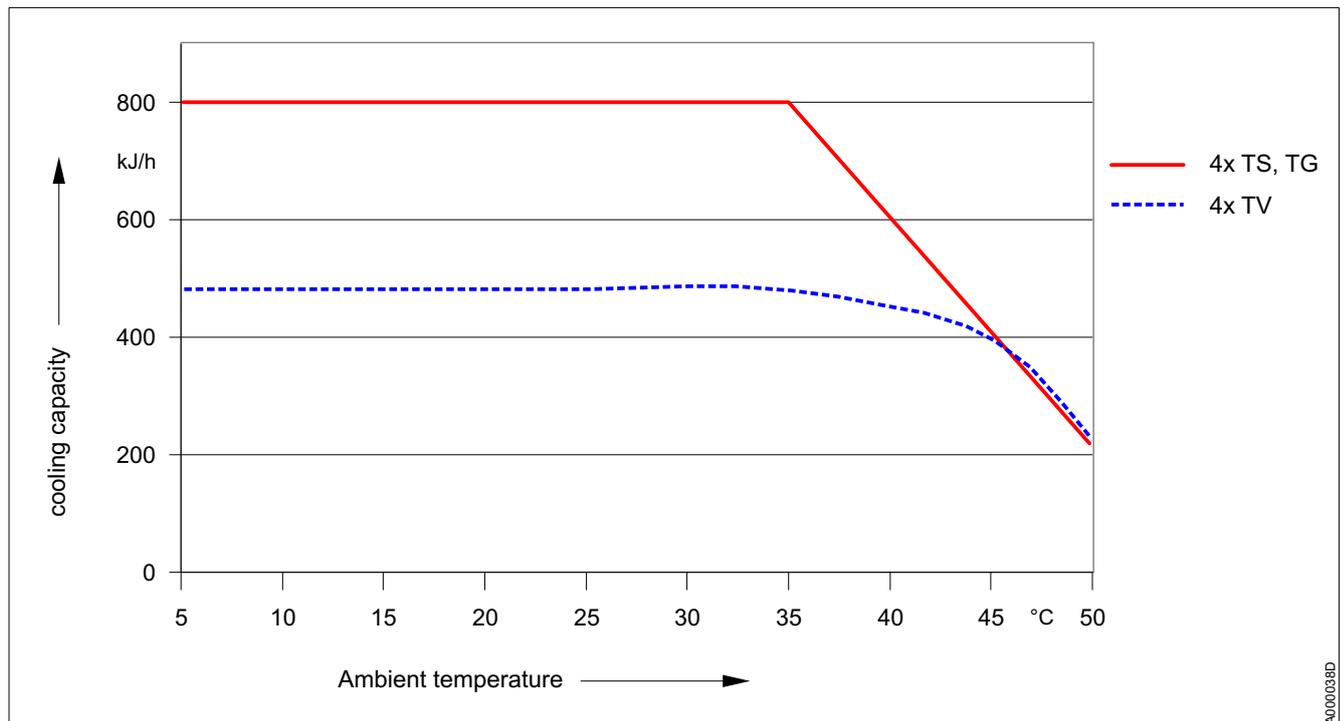
Heat Exchanger

	TS	TG	TV
Flow rate $v_{\text{max}}^{1)}$	530 l/h	280 l/h	150 l/h
Inlet dewpoint $\tau_{e,\text{max}}^{1)}$	80 °C	80 °C	65 °C
Gas inlet temperature $\vartheta_{G,\text{max}}^{1)}$	180 °C	140 °C	140 °C
Max. cooling capacity Q_{max}	450 kJ/h	230 kJ/h	120 kJ/h
Gas pressure p_{max}	160 bar	3 bar	3 bar
Pressure drop Δp ($v=150$ l/h)	8 mbar	8 mbar	8 mbar
Dead volume V_{tot}	69 ml	48 ml	129 ml
Sample gas connections	G 1/4" i ²⁾	GL 14	DN 4/6
Condensate out connections	G 3/8" i ²⁾	GL 25	G 3/8" i

¹⁾ with maximum heat transfer of the heat exchanger and max. cooling capacity of the cooler

²⁾ NPT-threads upon request

Performance Data



Please indicate with order

Please extract the part number for the cooler fulfilling your requirements from the type code below.

Please note: Each gas path should be equipped with a peristaltic pump or an automatic condensate drain.

Part No.	4	5	7					0	0	EGK 4S
Type										
	0									Wall mount
	1									19"-rack mount
Power Supply										
	1									115V
	2									230V
Gas Paths										
	0									Without heat exchanger
	1									1 Gas path
	2									2 Gas paths
	3									3 Gas paths
	4									4 Gas paths
Material Heat Exchanger / Version										
	0	0								Without heat exchanger
	1	0								Single heat exchanger stainless steel / TS
	2	0								Single heat exchanger glass / TG
	3	0								Single heat exchanger PVDF/ TV
Condensate Discharge¹⁾										
	0									Without condensate discharge
Accessories										
									0	Without accessories
									1	With mounting brackets
									2	With feet
									3	With mounting brackets and feet
									4	With handles
									5	With mounting brackets and handles
									6	With feet and handles
									7	With mounting brackets, feet and handles

¹⁾ Peristaltic pumps may be installed to the cooler using a mounting bracket or must be installed separately.
The power supply of the pump must be the same as for the cooler itself.
Automatic condensate drains must be installed separately.

Accessories

44 10 001	Automatic condensate drain 11 LD V 38
44 10 004	Automatic condensate drain AK 20, PVDF
44 10 005	Condensate vessel GL 1; glass, 0,4 l
44 10 019	Condensate vessel GL 2; glass, 1 l
912 40 30 104	Peristaltic pump 230 V, 0,3 l/h, for separate mounting
912 40 30 105	Peristaltic pump 115 V, 0,3 l/h, for separate mounting
45 70 008	Mounting bracket for up to 4 peristaltic pumps

Automatic Condensate Drains AK5, AK 20 and 11 LD V 38



The discharge of condensate from sample conditioning systems requires special discharge systems. Particularly for the use in pressurised sample conditioning systems the following condensate discharge have been developed

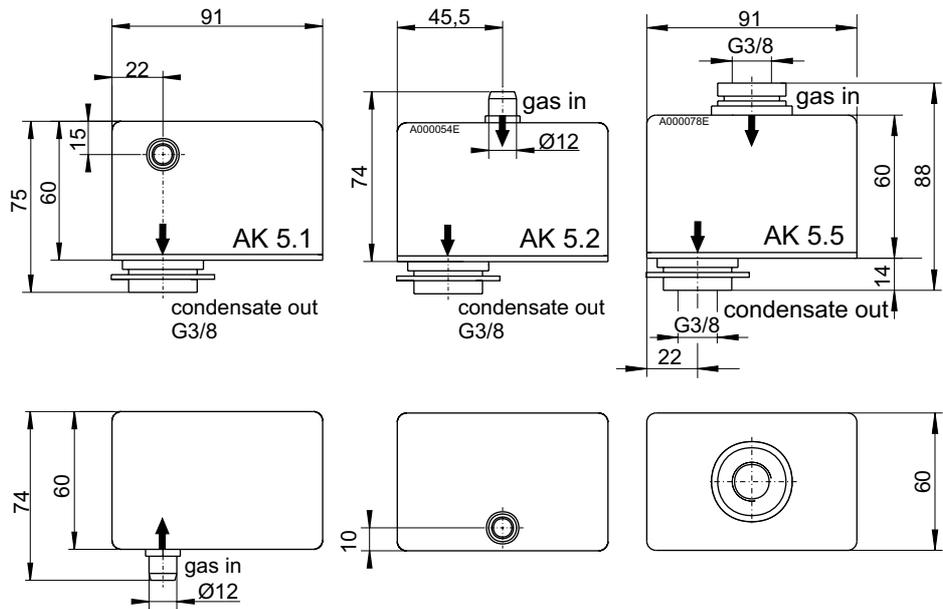
AK 5
AK 20
11 LD V 38

All these units have special designed low friction drain valves which increase the operation reliability and the life time.

- **easy to assemble due to various geometrical forms**
- **long life time**
- **various materials to meet with application parameters**
- **high reliability of operation**

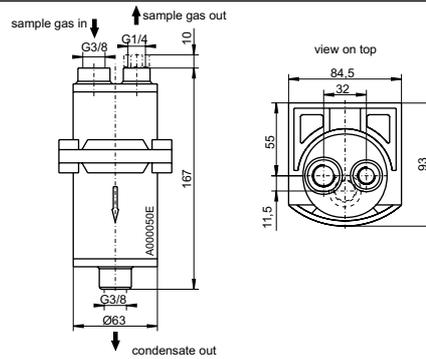
technical data AK 5

	AK 5
flow	100 l/h H ₂ O / 1 bar
material	PVDF
operating pressure max.	2 bar
operating temperature max.	+ 100 °C
weight	0,25 kg



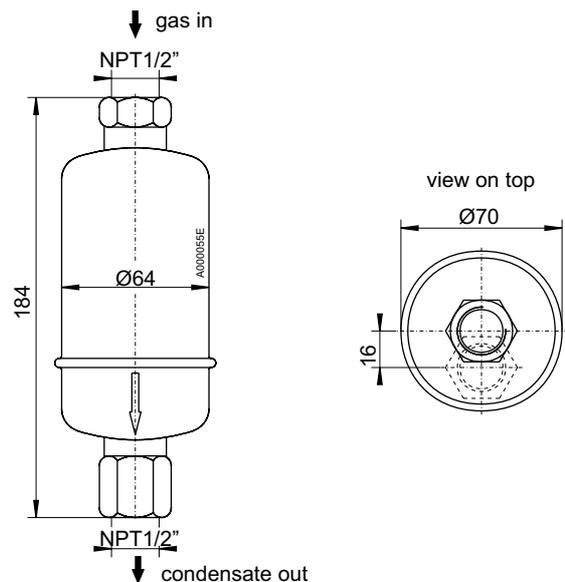
technical data AK 20

	AK 20
material	PVDF
operating pressure max.	2 bar
operating temperature max.	+ 100 °C
weight with mounting frame (gas out is closed)	0,3 kg



technical data 11 LD V 38

	11 LD V 38
material	
- housing	SS 1.4306
- valve and seat	SS 1.4401
- float and lever	SS 1.4301
operating pressure max.	20 bar
test pressure	200 bar
operating temperature max.	+ 200 °C
weight	0,8 kg



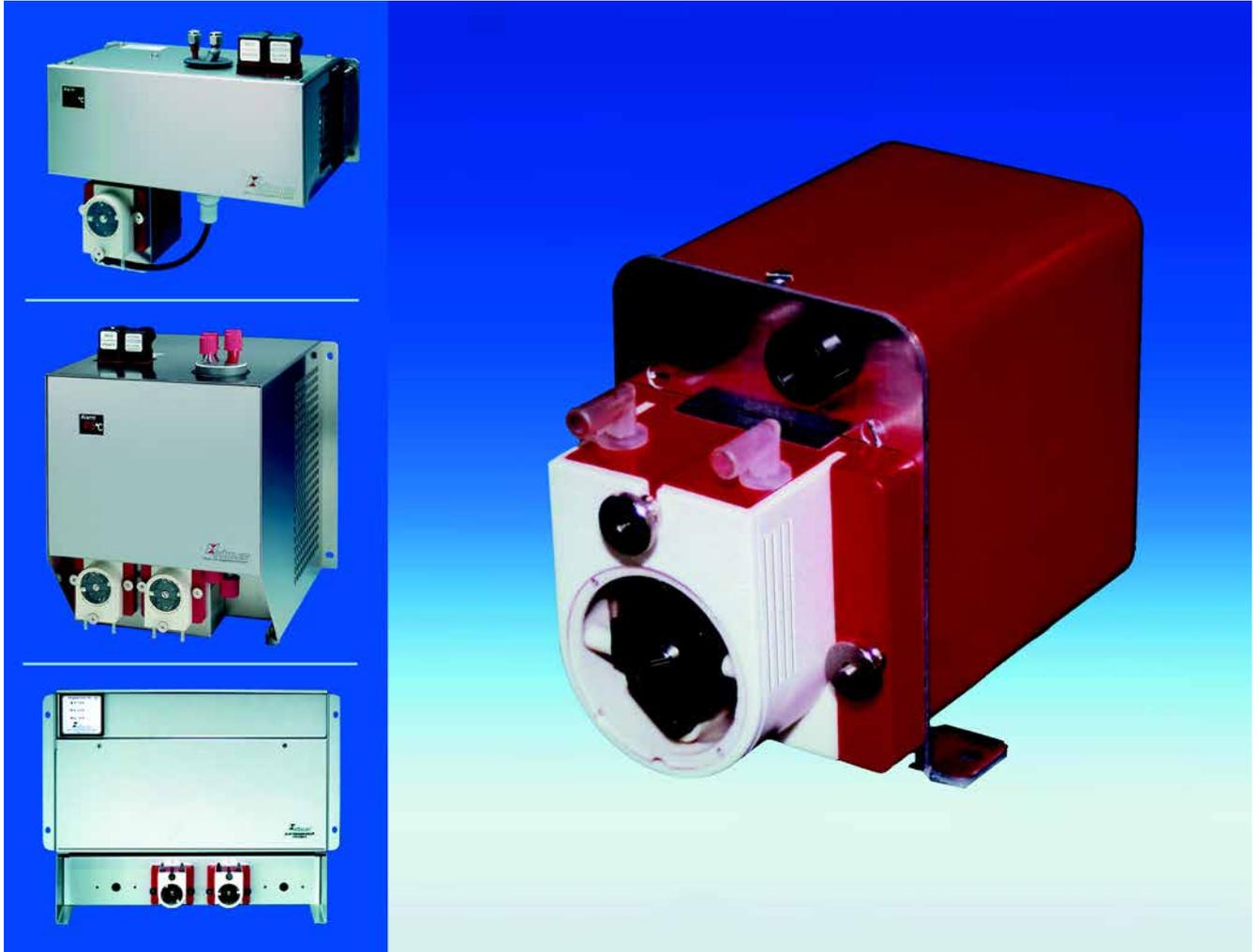
please indicate with order

part no.	type
45 10 006	AK 5.1 horizontal inlet
45 10 008	AK 5.2 vertical inlet
45 10 028	AK 5.5
44 10 004	AK 20
44 10 001	11 LD V 38



Attention!
Be careful:
condensate may be harmful

Condensate discharge by peristaltic pumps



The discharge of condensate from sample conditioning systems requires special discharge systems.

Peristaltic pumps are the appropriate equipment for systems operating at pressure below ambient.

To make integration as simple as possible, we provide add-on frames which are mounted directly to the EGK 1/2 or EGK 4 compressor coolers. Up to 2 pumps can be integrated inside the EGK 1/2 and up to 4 inside the EGK 4 frame.

For other applications standalone pumps with protection housing are available.

Peltier coolers PKE 4 can be delivered with a pump already mounted.

technical data peristaltic pump

power supply	230 V AC, 50/60 Hz	115 V AC, 50/60 Hz
power consumption	60 mA	110 mA
protection class	IP 51	IP 51
connection	flat plug	flat plug

suction volume	0,3 l/h
vaccum	> 320 mbar
pressure	> 0,5 bar
hose	3x1, Silicon

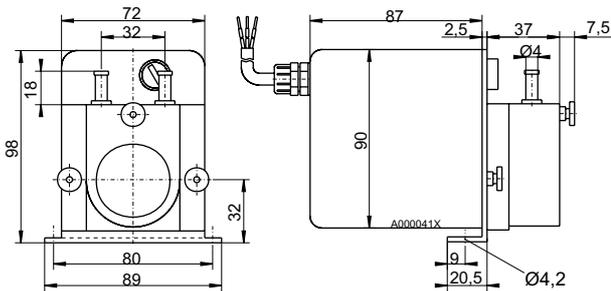
higher suction volume on request

please indicate with order

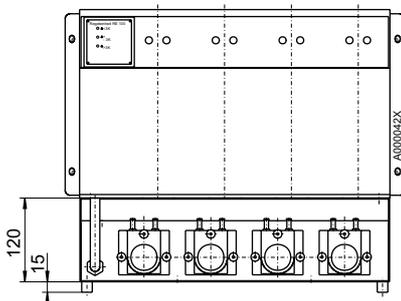
part no. type

pump

- 45 10 122 peristaltic pump with shield for stand alone installation 230 V AC, 50/60 Hz, protection class IP 51
- 45 10 222 peristaltic pump with shield for stand alone installation 115 V AC, 50/60 Hz, protection class IP 51



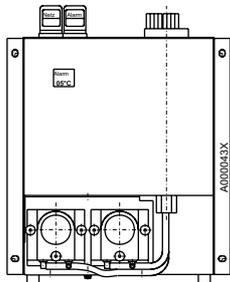
EGK 4



EGK 4

- 45 10 120 auxiliary frame for EGK 4 assembled with peristaltic pump 230 V AC, 50/60 Hz
- 45 10 220 auxiliary frame for EGK 4 assembled with peristaltic pump 115 V AC, 50/60 Hz
- 45 10 121 additional peristaltic pump 230 V AC, 50/60 Hz
- 45 10 221 additional peristaltic pump 115 V AC, 50/60 Hz

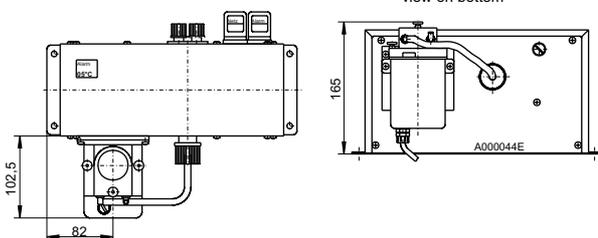
EGK 1/2



EGK 1/2

- 45 10 130 auxiliary frame for EGK 1/2 assembled with peristaltic pump 230 V AC, 50/60 Hz
- 45 10 131 auxiliary frame for EGK 1/2 assembled with peristaltic pump 115 V AC, 50/60 Hz
- 45 10 230 additional peristaltic pump 230 V AC, 50/60 Hz
- 45 10 231 additional peristaltic pump 115 V AC, 50/60 Hz

PKE 4



PKE 4

- 44 60 799 peristaltic pump assembled with PKE 4 230 V AC, 50/60 Hz
- 44 60 899 peristaltic pump assembled with PKE 4 115 V AC, 50/60 Hz

Pre-coolers

AK 20 V, 11 LD spec., 165 SS and 165 T



In a number of applications with high moisture content in sample gas streams the installation of additional condensate separators upstream the final cooler is in many aspects a favourable solution. Further more these separators either as stand alone units or in combination with coalescence filters are in some applications the appropriate alternative to a gas cooler.

Separator AK 20 V - with automatic drain valve

Vertically mounted the AK 20 V serves as a separator upstream of a SCS system or as a condensate trap. The unit has an integrated drain valve with low friction pivot points giving exceptional long service free life. The unit comes with a plug in the gas outlet which is to be removed if used as a separator.

Separator 11 LD spec. - with automatic drain valve

Mounted vertically the 11 LD spec. serves as an upstream separator with an integrated drain valve. The drain valve has no mechanical pivot points giving an exceptional long service life.

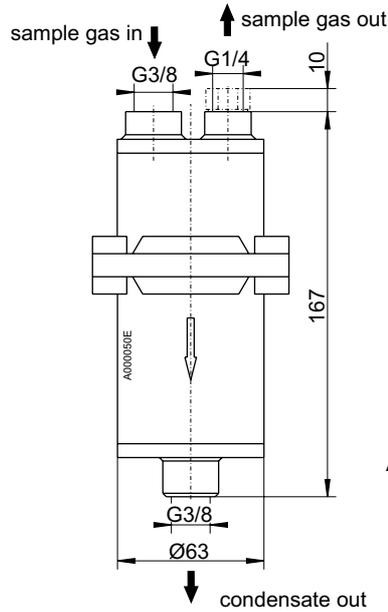
Centrifugal separator 165 SS and 165 T

The type 165 is a combination of a centrifugal separator and a coarse filter. The upper end of the shell is containing a coarse demister which is removing both the last rest of the moisture forming it into condensate and particulate that may also be carried by the sample gas. Quite a part of the particulate is directly washed out by the condensate and thus drained off.

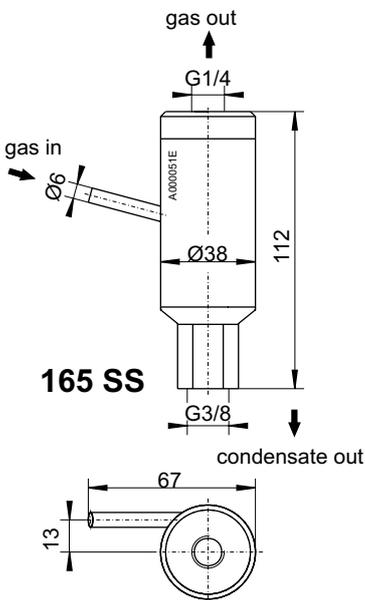
technical data AK 20 V

material	AK 20 V PVDF
operating pressure max.	2 bar/ 29 psi abs.
operating temperature max.	+ 100 °C/ 210 °F
weight	0,3 kg

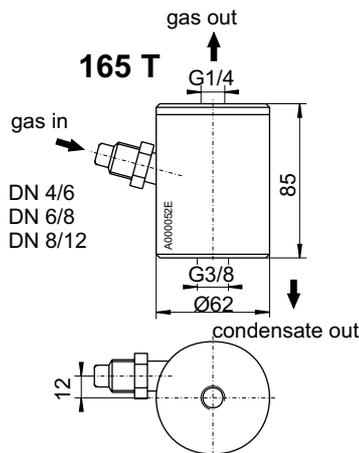
TÜV - approved



AK 20 V



165 SS



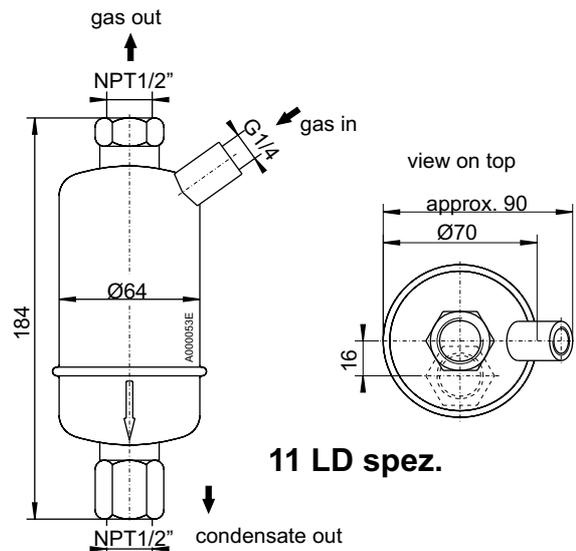
165 T

technical data 165 SS and 165 T

	165 SS	165 T
material	stainless steel 1.4571	PTFE
max. gasflow rate	200 l/h	200 l/h
max. op. pressure	64 bar/ 930 psi	4 bar/ 60 psi
max. op. temperature	+ 180 °C/ 360 °F	+ 80 °C/ 180 °F

technical data 11 LD spec.

material	11 LD spec.
- housing	stainless steel 1.4306
- valve with seat	stainless steel 1.4401
- float and lever	stainless steel 1.4301
max. operating pressure	20 bar/ 290 psi
max. operating temperature	+ 200 °C/ 390 °F
weight	0,8 kg



11 LD spec.

please indicate with order

part no.	type
44 11 004	AK 20 V
46 13 099	centrifugal separator 165 SS
46 13 299	centrifugal separator 165 T, connection DN 4/6
46 13 399	centrifugal separator 165 T, connection DN 6/8
46 13 499	centrifugal separator 165 T, connection DN 8/12
44 10 002	11 LD spec.



Attention! The liquid can be harmful.
Honor the safety regulations!

Gas-Converter ($\text{NO}_2 \Rightarrow \text{NO}$) BÜNOx



Because of the rising global industrialisation, the monitoring of exhaust gas pollution receives an increasing importance. Due to this context the monitoring of nitrogen oxide is of great importance because $\text{NO}_x = \text{NO} + \text{NO}_2$ is responsible for the formation of ozone at ground level and acid rain.

The gas converter BÜNOx allows an easy and cost efficient detection of the NO_x components.

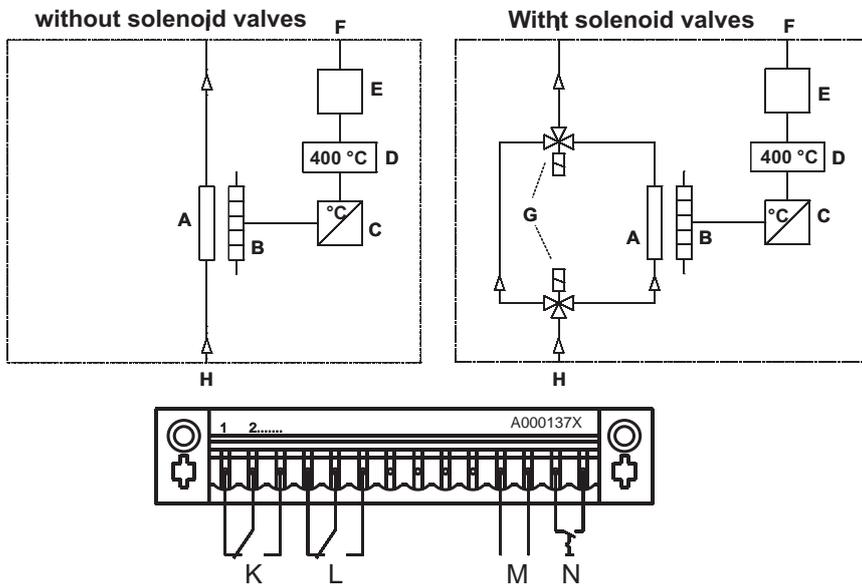
The device converts almost 100% of the NO_2 content of a sample gas by means of the replaceable reactor cartridge. The gas component $\text{NO}_x = \text{NO} + \text{NO}_2$ is directly (NO_2 indirectly) measurable by any commercially available IR-analyser.

The infill of the reactor cartridge which is designed in cooperation with a research institute enables the conversion of high NO_2 concentrations at comparatively low temperature. Perturbations on other gas components, such as CO , CO_2 , NO , are generally not observed. Moreover, a lifetime of over 12 months is possible under normal conditions. This leads to an obvious reduction of maintenance costs. The maintenance effort is minimized through the special reactor fastener at the front panel of the device. So the replacement of the cartridge is possible to be done in short time without any tool.

The temperature of the converter is free adjustable at the front panel through an easy-to-handle micro-controller.

Of course signals required in modern process control are accessible to the user.

- **high conversion rate at 400°C**
- **high NO_2 conversion-capability**
- **long lifetime**
- **easy replacement of converter cartridge without any tool**
- **temperature control by microcontroller**
- **free adjustable temperature**
- **temperature alarm contact**
- **4-20 mA temperature output**
- **status-LEDs**
- **bypass solenoid valve (optional)**
- **19" housing**



internal assembly

- A) converter cartridge
- B) tubular furnace
- C) temperature controller
- D) temperature display
- E) signal output,-input (temp. alarm, status signal, actuation solenoid valves)
- F) PHÖNIX connector (14 pole)
- G) 3/2 directional solenoid valves
- H) gas inlet
- I) gas outlet

plug arrangement (PHÖNIX, 14pol) :

- K) status (excess-, insufficient temp.)
- L) status (bypass, conversion)
- M) analog output temp. (4-20mA)
- N) activation solenoid valve (by an external switch)

technical data

General parameters

working temperature 400°C
warming-up time 30 min

Gas input conditions

sample gas pressure up to 1,5 bar
absolute
sample gas flow up to 120 l/h
sample gas temperature 5 to 80 °C
dewpoint < 20°C

Ambient conditions

permissible ambient temperature:
- operation +5 to +50°C
- storage and transport -20 to +70 °C

permissible ambient humidity < 80% relative humidity
for storage and transport

Electrical specifications

power supply 115VAC or 230VAC 50/60 Hz,
plug according to DIN 43650

power input approx. 650 W

Electrical input/output

(plug: 14 pol, PHÖNIX)

status: *excess- insufficient temp.* changeover contact,
max. 230VAC/DC, 1A

analog output (temperature) 4-20mA

status: *bypass , conversion* changeover contact,
max. 230VAC/DC, 1A

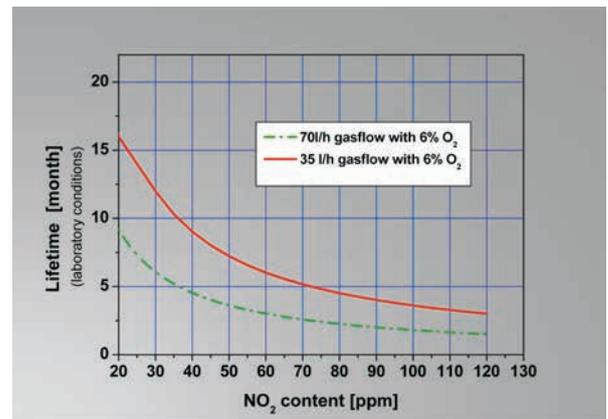
activation solenoid valves 24V, ~1mA ,
switchable by an external switch

Dimensions

frame 19", 3HU 133 x 483 x 285 (H x B x D)
weight approx. 6.5 kg
protection class IP 20 (EN60529)

Conversion properties (NO₂=> NO)

conversion factor NO₂=> NO ≥ 97% (new cartridge)
lifetime cartridge >12 months possible, depending
on NO₂ content (see diagram,
under laboratory conditions)
maximum load approx. 400ppm NO₂ at 70l/h
conversion temperature 400°C

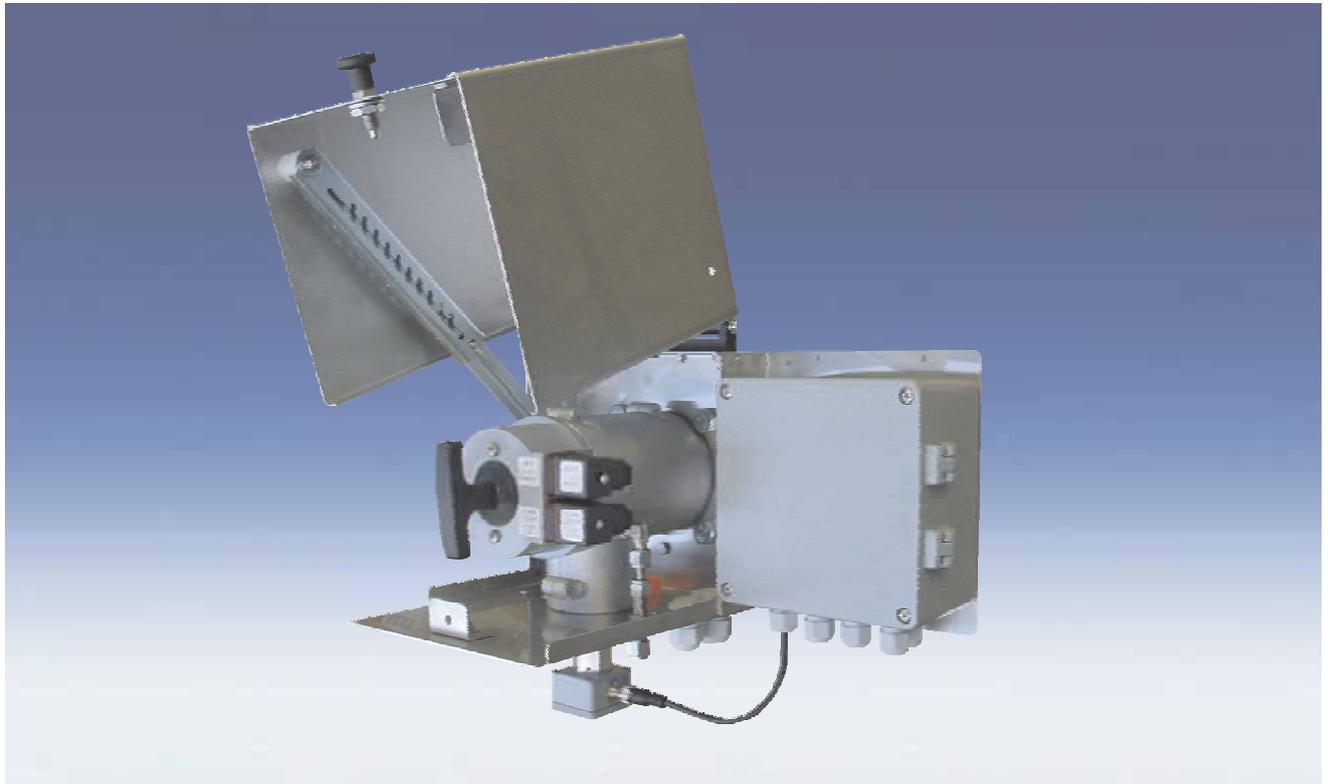


Ordering information

	order number
BÜNOx converter (230VAC)	55300099
BÜNOx converter(115VAC)	55300098
BÜNOx converter MV* (230VAC)	55301099
BÜNOx converter MV* (115VAC)	55301098
Bühler reactor cartridge	55399999

*With solenoid valves

Oxygen Flue Gas Analyzer BA 2000



The combustion parameters of gas or oil fired process heaters and steam generation boilers can vary rapidly. In order to reduce the NO_x emissions in such applications to a minimum a flue gas oxygen analyser is recommended. Equipped with a fast responding sensor and attached directly to the fire box, this analyser provides immediate information to allow the adjustment of the combustion process upon changes in composition or conditions.

The BA 2000 is particularly designed to ensure accurate and fast measurement in a representative sample of gas and oil-fired combustion processes. The unique fast loop design continuously provides a fresh sample gas stream to the zirconium oxide sensor. The sensor enclosure is heated up to 180 °C to avoid condensation forming. The accurate and fast responding zirconium oxide sensor does not need any reference gas or certified calibration gas. Calibration of the sensor takes place with instrument air which is also used for the aspirator driving the sample gas.

The measuring cell is protected by a filter in the hot area against dust and particulates. The filter element can be easily replaced without tools in few seconds by a 90°-turn of the handle.

Filter elements are available in ceramic, sintered stainless steel or pleated stainless steel.

The BA 2000 can be used in conjunction with these filters for dust loads up approx. 2g/m³.

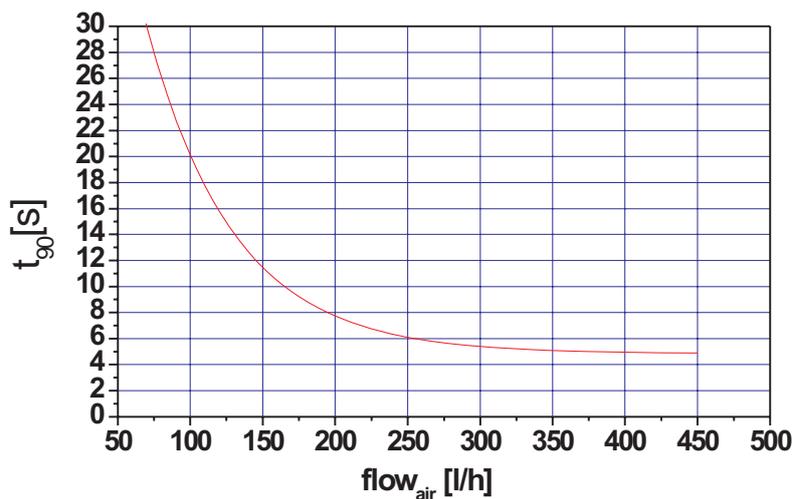
The BA 2000 in the basic version has a smart sensor design which provides all necessary information to the operators. The controller has an integrated display with push-buttons for input, alarm outputs, calibration function and 4-20mA signal output.

- **fast response**
- **quick probe and filter replacement**
- **easy to handle**
- **flue gas temperature up to 1600 °C**
- **SMART sensor design**
- **low maintenance request**
- **durable ZrO₂ - cell**
- **easy calibration by instrument air**

Technical Specification

Process connection:	DN65 PN6 (other flange sizes available upon request)
Sample tube length:	0,5 ... 1,5 m
Power:	115/230V 50/60Hz
Signal output:	4 -20 mA
Alarms:	two binary contacts, potential free
Ambient temperature:	-20 ... + 65 °C
Process temperature:	up to 1600 °C
Measuring Range:	0,1 to 21 % O ₂
Accuracy:	relative error < 5%
Response sensor:	$t_{90} < 5$ s
Electrical connections:	cable glands
Aspirator connection:	6 mm tube fitting
Calibration gas:	instrument air
Calibration gas connection:	6 mm tube fitting

t_{90} -time in dependence of air-flow



Order informations

55200099 BA 2000, 230V 50/60Hz

55200199 BA 2000, 115V 50/60Hz

Accessoires sample tubes, extensions and downstream filter
see data sheet DE461099 accessoires for sample gas probe GAS 222