



Instruction Manual

DB04A

***Thermal Mass Flowmeter for Gases
without auxiliary Power***



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Operating instructions

DB04A



Version : DB04A EN A1-9

For the latest information on our products, see our website at www.pkp.de

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This symbol alerts the user to important operating, maintenance and service information.



Important instructions

- Do not remove the electronics housing. A damaged hologram seal will void the warranty.
- There are no serviceable parts inside the unit.
- Repairs must only be performed by qualified personnel



Attention

This unit has several power supply possibilities. If you use the external 24 Vdc power supply, it is strongly recommended to have this device grounded.

Subject to change

Due to our policy of ongoing product development, we reserve the right to change the information in this manual without notice.



Recycling

Note the existing regulations of your country.



Toxic, flammable gases and ATEX

In the case of toxic and flammable gases, the respective safety guidelines in each country must be followed. This *DB04A* device is **NOT** Ex certified. In the case of flammable and toxic gases, fittings, cable glands and pipes intended for that purpose must be used. The responsibility for safe operation lies with the user and designer of the facilities.



Oxygen service

PKP is not liable for any damage or personal injury, whatsoever, resulting from the use of our standard mass flow meters or controllers for oxygen gas. You are responsible for determining if this mass flow meter or controller is appropriate for your oxygen application. You are responsible for cleaning the mass flow meter or controller to the degree required for your oxygen flow application.

Trademark

DB04A is a Trademark of PKP. Other product and company names listed in this manual are trademarks or trade names of their respective manufacturers.

Receipt of your instrument

When receiving the instrument, carefully check the outside packing carton for damage that may have incurred during shipment. If the carton is damaged, notify the local carrier and submit a report to the factory or distributor. Remove the packing slip and check that all ordered components are present and match your specifications (as ordered). Make sure any spare parts or accessories are not discarded with the packing material. Do not return any equipment to the factory without first contacting PKP:

E-mail Customer Service:

info@pkp.de

Installation

Please note before the start-up:

- Do not use sealing tape or liquid sealant
- Piping must be cleaned before installation of instrument.

Products in this manual may contain metal or elastomer seals, gaskets, o-rings or valve seats. It is the "user's" responsibility to select materials that are compatible with their process and process conditions. Using materials that are not compatible with the process limitations of the device, may result in equipment damage and/or personnel injury or death.

It is recommended that the user check the devices on a regular schedule to ensure that it is leak free as both metal and elastomer seals, gaskets, o-rings and valve seats may change with age and exposure to process gas.



Power

If it becomes necessary to remove the instrument from the system or change a battery, the power to the device must be disconnected. Always switch off the power before you disconnect terminal connections in potentially dangerous surroundings to avoid sparks.

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1. Introduction

Thank you for choosing devices from the *DB04A series*. These operating instructions will help you to install and operate the measuring devices. Please read through these instructions carefully before installing the devices. Our aim has been to write a full and practical guide. We would be grateful if you would notify us of any shortcomings or mistakes.

Please contact PKP if you have questions about any aspect of the products.

The *DB04A* is a thermal based mass flow meter that can measure the mass flow of gases. The core element of the *DB04A* thermal mass flow meter is a CMOS sensor chip. The sensor and parts of the electronics are on one board and offer a number of advantages for the user.

1.10. Features of DB04A thermal mass flow meters

In developing and manufacturing the devices, we have focused primarily on customers and their applications. Our aim is to implement customers' requirements in the form of new developments or enhancements on an ongoing basis. The essential features are:

- ⇒ Compact design
- ⇒ Battery operated optional (Portable)
- ⇒ Dot-matrix LCD touch screen
- ⇒ Multiple gases possible (3 gases)
- ⇒ Flexible due to the many different settings accessible through the touch screen
- ⇒ Back-light screen in USB and 12-30 Vdc power mode
- ⇒ Power also possible with USB micro-B connector or external 12-30 Vdc (Separate module)
- ⇒ Optional alarm module with power, 3 contacts and 2 inputs
- ⇒ Display can be rotated 180 degrees
- ⇒ Fast and accurate measurement and control
- ⇒ Integrated temperature compensation and flow totalizer (standard)
- ⇒ Easy to maintain and service
- ⇒ Firmware upgradable through USB connection
- ⇒ 3-year warranty

1.11. Scope of warranty

Warranty for the *DB04A* product line extends to material and manufacturing defects only. Maximum warranty covers product replacement free of charge. The following causes of faults/damage are not covered under warranty:

- ⇒ Use outside the operating limits
- ⇒ Damage due to corrosion
- ⇒ Damage due to leaking batteries
- ⇒ Mechanical damage in general
- ⇒ Contamination due to improper sealing
- ⇒ Contamination due to impure gases or penetration of liquids
- ⇒ Damage to electronic components due by over-voltage or electrostatic discharges, and corrosion damage due to aggressive environments.
- ⇒ Functional failure due to incorrect operation or faulty parameterization
- ⇒ If the unit has been opened or otherwise tampered with.
- ⇒ Drift in the calibration

1.12. Instructions and warnings

Read all of the operating instructions thoroughly before installing and commissioning equipment. Misconceptions and incorrect use can lead to breakage of the measuring device or risk of personal injury.

The installation, commissioning and operation and maintenance must be done by appropriately qualified personnel.

1.13. Documentation and cables supplied

Every unit comes with a USB A to USB Micro-B cable. This cable can be used to power the unit and to upgrade the firmware.

1.14. The measurement principle

The thermal mass flow measurement principle is particularly suitable for the measurement and control of clean and dry gaseous media. The most significant advantage is that the measurement process measures the real mass flow and is largely independent of temperature and pressure.

Stated simply, the thermal measurement principle measures the heat transport by gas flowing past.

In the case of *DB04A* mass flow measuring instruments, a constant heat input gives a flow-dependent temperature difference (ΔT). Two temperature sensors are positioned in the measuring channel (T1, T2), one before the heating system (H) and one after it.

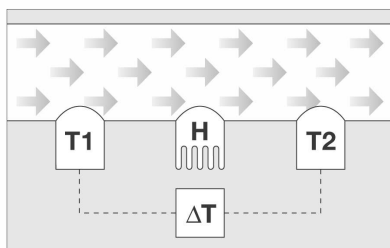


Figure 1: Measurement principle

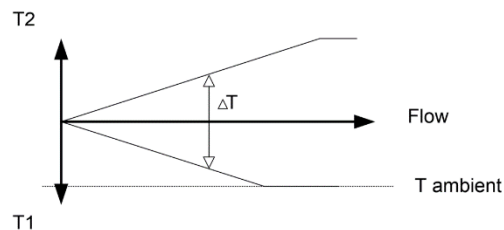


Figure 2: Sensor operation

If there is no flow, the heat spreads symmetrically in directions T1 and T2. The temperature difference T1-T2 is therefore zero.

Flow rates > 0 create a temperature difference.

The sensor T1 at the inlet is cooled by the gas flowing past it, and the temperature of the second sensor T2 rises due to the heat drawn from the heating system.

The temperature difference is related non-linearly to the mass flow, with very high repeatability. The electronics will, based on the calibration, convert this temperature difference in a linear and proportional indication of the mass flow of the gas.

1.15. Real, Standardized and Normalized flow

The user-selectable engineering units of the *DB04A* has been divided in two groups: “Real and Normal” units and “Other units”

This separation is not only there to find the unit you want to select quicker, it also separated the “Normalized flow” from the “Standardized flow”

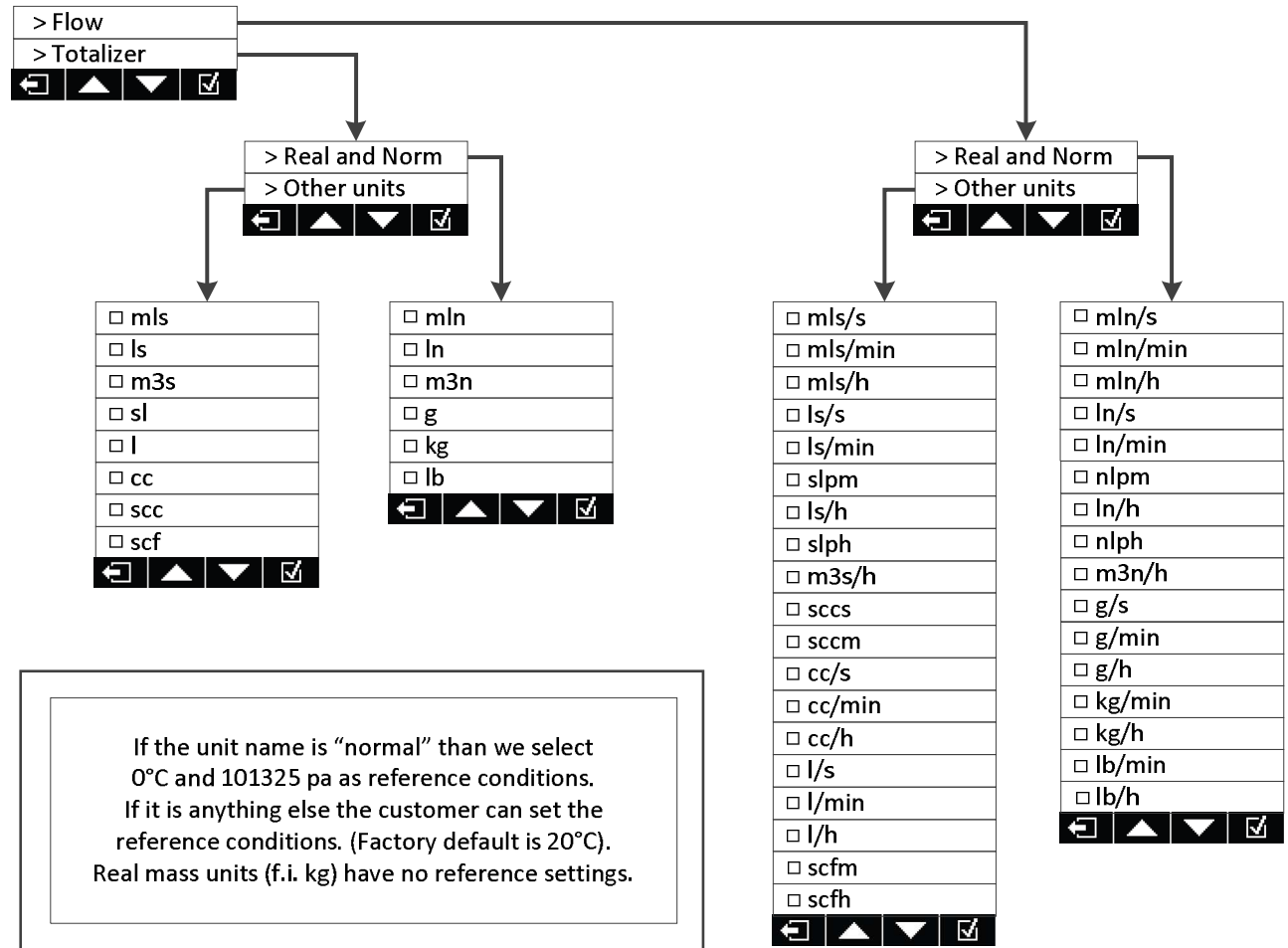


Figure 3: Units menu

The *DB04A* has basically 2 reference conditions: One for “Real and Normal” units and one for “Other units”

The factory setting is as follows:

- 1) For all units that are used in "normal" (like l/min), the reference conditions are always 0°C and 1013.25 mbara. This cannot be adapted.
- 2) For all the other units that are “standard” (like ls/min and sccm) and the l/min the reference conditions has to be defined when the unit is ordered.

The reference value for all units that are not “Normal” or “Real” it has to be defined with the purchase order. It cannot be changed after the units has been delivered.

On the sticker of the *DB04A* we will mention a reference condition. This reference condition is for the “Standard” units only. The “normal” units will always be 0°C and 1013.25 mbara.

In future version of the firmware the reference conditions will be adjustable in the menu.

Gas flow in general can be expressed in one of the following:

- Volumetric flow: (f.i. l/min). This theoretically cannot be measured by the *DB04A* because it is volume. The *DB04A* measures **mass flow**. However, due to regional requirements we still have it as a flow unit that is selectable. Units shown as volume (l/min) refer to the customer defined reference conditions (Same as “standard”)
- Real Mass flow: (f.i. Kg/hr). This refers to true mass units per time unit. The *DB04A* can measure this and you can select this type of unit from the menu.
- Normalized volumetric flow: Normalized means that the units are “translated” to predefined pressure and temperature conditions. Normalized or Normal Conditions refers to 0°C and 1013.25 mbar absolute. You can select this type of unit from the menu of the *DB04A*. These units are mostly used in Europe and China.
- Standardized volumetric flow: Standardized means that the units are “translated” to predefined pressure and temperature conditions. Standardized or Standard conditions refers to 20°C (68°F) and 1013.25 mbar (=760 mmHg) absolute. You can select these type of units from the menu of the *DB04A*. These units are mostly used in the USA. Standardized can also refer to other reference conditions (f.i. Natural Gas industry often uses 15°C and 1013.25 mbar absolute. In the semicon world they often use 25°C and 1013.25 mbara. Please define and mention these reference condition at the time of your order.

Please note that reference condition relating to Normalized or Standardized volumetric flow are NOT the operating conditions. According to the ideal gas law, the gas volume will change by 0.35% per K.

Please note that PKP standard uses the following densities for their main 3 gasses:

Air: 1.293 gr/m³, N₂: 1.2504 gr/m³, O₂: 1.429 gr/m³ (All at 0°C and 1013.25 mbar absolute). If you use other densities or need additional information for other gasses, please contact the factory. Densities need to be defined before manufacturing and cannot be adjusted once the unit has been delivered.

1.16. CMOS technology

The *DB04A* measuring and control devices are equipped with an innovative CMOS semiconductor sensor that sets new standards for accuracy, speed and measurement dynamics.

With our CMOS technology the sensor element, amplifier and A/D converter form a single silicon chip.

1.17. Block diagram

The following GCM block diagram shows the structure of the device. The block diagram does not show the optional manual control/needle valve (Model GCR) that would normally be placed on the outlet of the unit.

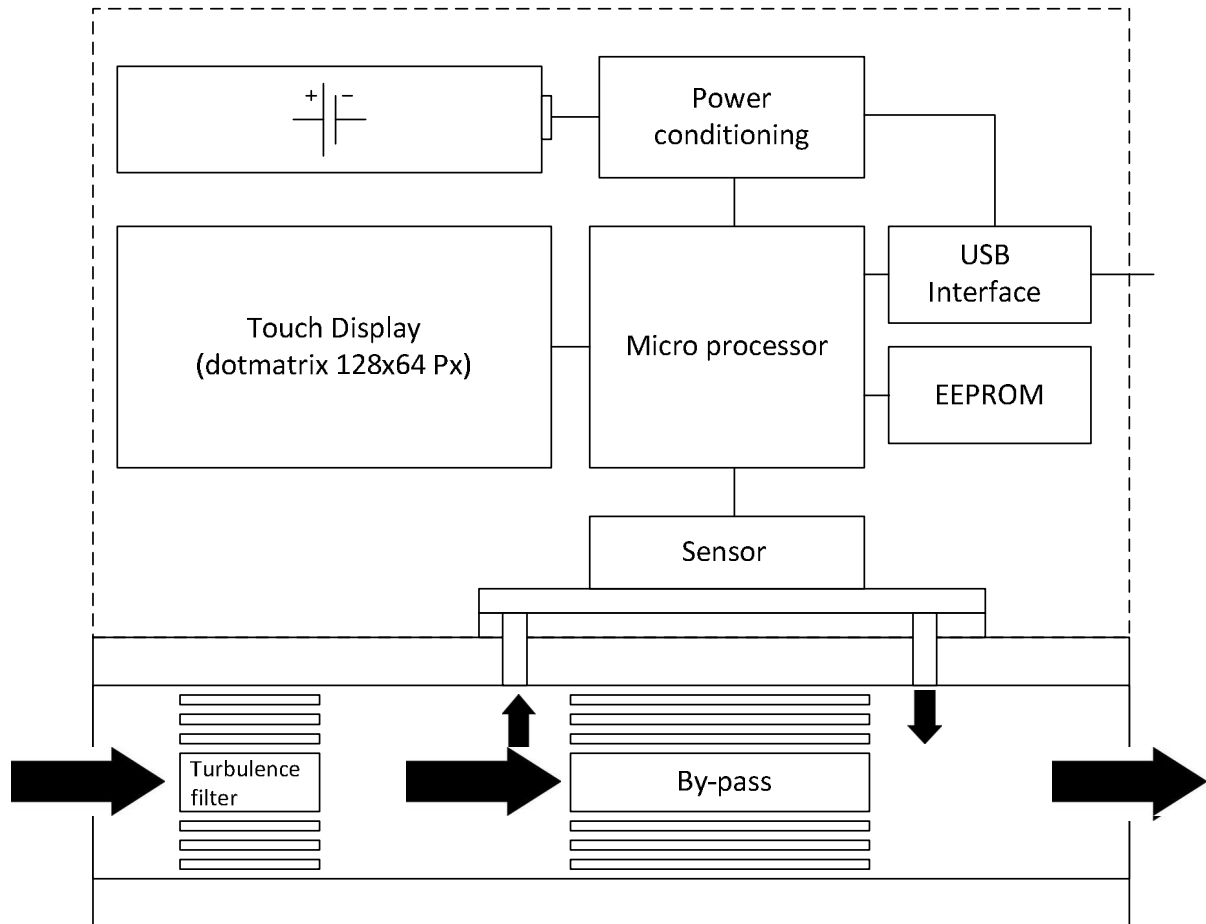


Figure 4: Block diagram

2. General device specifications

Media (real gas calibration):	Air, O ₂ *, N ₂ *, He, Ar, CO ₂ , H ₂ , CH ₄ , C ₃ H ₈ (other gases and gas mixtures on request)
*O ₂ & N ₂ are calibrated with air.	
Accuracy:	
Standard:	±2.0% of full scale; Ranges > 200 l/min ±3.0% of full scale
Option G:	±1.0% of full scale (only G ¹ / ₄ " instruments and real gas calibrations)
Dynamics:	
Standard:	1:50 (Meter reads zero if flow is less than 1.7% of full scale)
Option G:	1:100 (Meter reads zero if flow is less than 0.83% of full scale)
Response time:	Maximum 300 msec (filter setting dependend)
Flow update by sensor	40 ms (Battery mode 500 ms)
Display update	240 ms (Battery mode 500 ms)
Repeatability:	±0.5% of full scale
Long-term stability:	< 1% of reading / year
Temperature coefficient:	< 0.025% FS measuring range type per °C < 0.012% FS measuring range type per 1°F
Pressure coefficient:	< 0.2% / bar of reading (typical N ₂) < 0.014% / psi of reading (typical N ₂)
Working pressure range:	0.2 - 11 bara (3-160 psia)
Test pressure:	16 bara (232 psia)
Storage conditions:	-20 to 80°C (-4 to 176°F), 0-95% RH, non-condensing
Temperature range:	0 – 50°C (32 bis 122°F), 0-95%, RH, non-condensing
	<i>Do not expose device to direct sun light.</i>
Warm-up time:	< 5 sec. for full accuracy

Materials

Electronics housing:	ABS (Acrylnitril-Butadien-Styrol)
Body Material:	Anodized aluminium or stainless steel 1.4404 (316L)
Sensor area:	Silicon, glass, epoxy
Seal material:	FKM, optional EPDM (FDA compatable)
Wetted parts:	See appendix (see chapter Wetted Parts List)

Integration

Display:	Touch display 128x64 px Backlighting only with external power supply (Micro-USB or 24 Vdc)
Process connection:	G ¹ / ₄ " (BSPP* female) up to 60 l/min, G ¹ / ₂ " (BSPP* female) up to 450 l/min *British Standard Pipe Parallel
Inlet section:	None required
Mounting orientation:	Any position (consult manufacturer above 5 bara (72 Psia) if the DB04A will be mounted vertical)
Connection cable:	For external power supply: 2 m with loose ends (fly leads)

2.10. Safety

Test Pressure:	16 Bara (232 psia)
Leak rate:	1 x 10 ⁻⁶ mbar*l/s He
Protection class:	IP-50
EMC	EN 61326-1

2.11. Electrical data

Supply voltage:	Power supply <i>DB04A</i> meter & regulator Standard AA battery or USB micro-B power supply (DIN 62684) Option: External power 12...30 Vdc (required current power supply 120 mA. We recommend a power supply with a minimum current of 150 mA) (Power supply hereafter referred to as the 24 Vdc power supply)
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2.12. Measurement ranges (air)

The *DB04A* has 4 different flow elements. Each element has a defined maximum operating flow range that will be defined during calibration. The flow ranges selectable below are the maximum flow ranges for air/O₂ and N₂ only. For other gasses consult the factory.

These ranges are adjustable electronically during factory configuration to your desired full scale range.

	Measurement full scale (air)	scale freely selectable
DB04A:	from 50 mln/min	to 600 mln/min
	from 600 mln/min	to 6000 mln/min
	from 6 ln/min	to 60 ln/min
	from 60 ln/min	to 450 ln/min

2.13. USB interface

The unit has an female USB micro-B connection (DIN 62684) that can be used as an external power supply and to upgrade the firmware (USB micro-B is the same connector you find on most Android and Windows portable phones, you can use the charger of your telephone to power the DB04A). It is not possible to read data from the flow meter through the USB connection.

2.14. Battery

The battery operated DB04A can operate on any common AA battery. The lifetime is strongly dependent on the usage and the quality of the battery. In general we can state that the battery lasts for about 3-6 months under non-continuous use.

We recommend to use external power (USB micro-B or 24 Vdc) if your application needs continuous measurement like measuring totalized flow. To extend the lifetime of the battery, the back-light is disabled during battery operation, you cannot activate it. We strongly recommend to use the “*auto power off*” in the menu for battery driven devices.

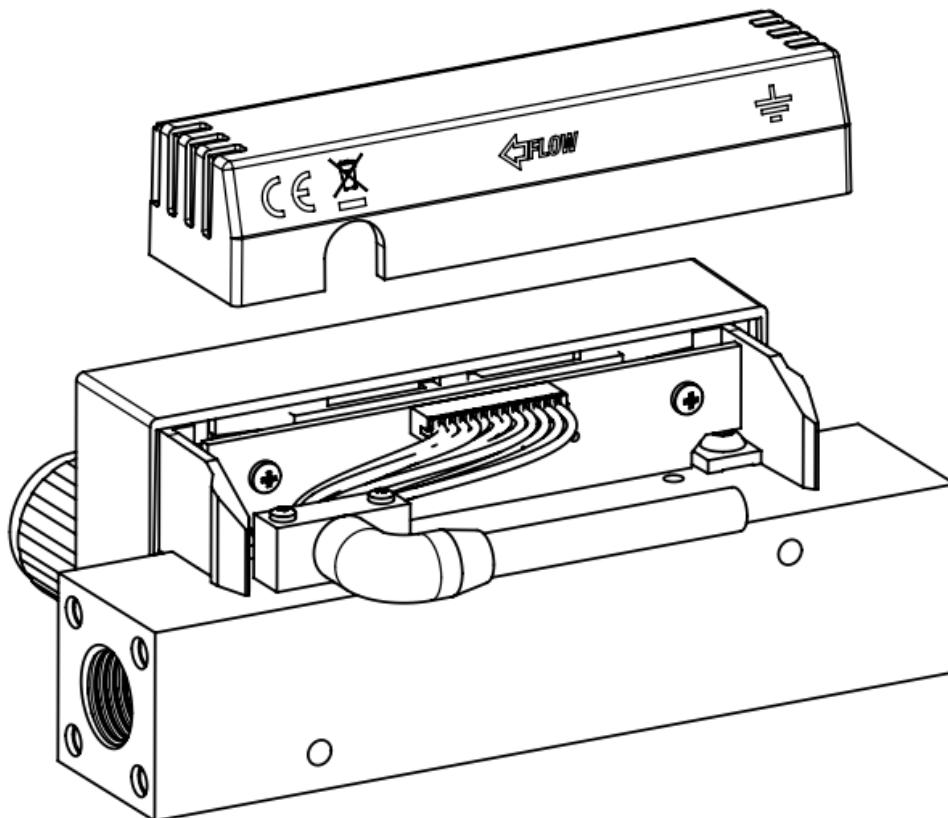
More information on the battery in chapter [3.15 Electrical power supply](#) and [3.16 How to replace the battery?](#)

Note: When we **supply the unit**, the “*auto power off*” will be set to 15 minutes

2.15. Optional Modules

As an additional option you can purchase a power supply or an alarm module. See our website or contact your local distributor for additional information.

The **power supply module**, is provided with a voltage from 12 to 30 Vdc, will power the unit. The unit comes with a 2 meter cable.



The **alarm module** can in addition to the above power module, provide 3 customer individually settable alarms and 2 inputs. The module is supplied with a 2 meter fly-lead cable.

Each of the 3 alarm contacts can be configured as high, low, window and totalizer alarm. Once the alarm becomes active, the 3 potential free alarm contacts can be reset in many different ways. Automatic, through the touch screen or with one of the 2 input signals. Other options like hysteresis settings and delays are also available.

For detailed information see [4.11.2 Alarm Menu](#) in this manual.

Both the power and the alarm module are mounted similar to the battery module (see [3.16 How to replace the battery](#)). They replace the battery module, so you cannot use these modules in combination with battery power.

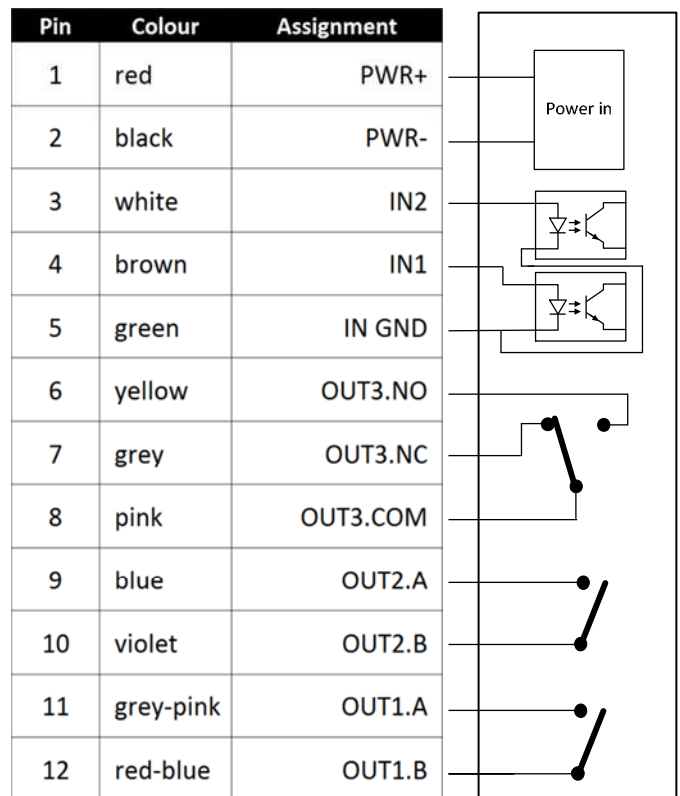


Figure 5: Power and Alarm module wiring

Generic specifications optional alarm module

Power input:	
Voltage supply range : 12 - 30 VDC (Power supply hereafter referred to as the 24 Vdc power supply)	
Max. current : 300 mA	
Protection input: Polyfuse (trip current > 500mA) and reverse polarity protected	
Switch ratings switch 1 + 2 (SPST hard contact):	
Maximum current	0.5 A
Maximum voltage	30 Vdc
Switch ratings switch 3 (DPST contact):	
Maximum current	1 A
Maximum voltage	30 Vdc
Inputs 1 + 2 (Opto-couplers):	
Voltage range (polarity sensitive): 5 – 30 Vdc (@ 5mA max)	
Min. recommended pulse width	100 msec (Sample interval: 20 msec)

2.16. Calibration

Each measuring device is supplied with a factory calibration report. The calibration is traceable to American and/or European standards. On request we can also provide DAkkS calibration (German Accreditation Body).

2.17. Operation with other gases

Each measuring device can store data for up to 3 types of gas or operational states that need to be defined at the time of purchase.

CMOS gas flow sensors are not linear (The output is linearized) and respond different to each gas. If the gas or gas composition is different than the gas that the unit was calibrated for, the unit will not measure accurately. It is possible to program up to 3 different gases and gas mixtures, but this needs to be done at the factory. Please contact PKP for additional information.

Note:



Please note that, among other effects, the zero-point error (offset display) will be higher if the device is not operated with the type of gas, for which it had been calibrated. A difference in zero indication is also possible if the used pressure is different than specified.

2.18. Pressure loss

Our thermal mass flow meters have a low pressure drop. The pressure drop depends mainly on the medium, the pressure conditions and the flow rate. In chapter [6.11 Pressure Loss](#) you find the pressure drop for the most common gases. PKP has a calculation program for the other gases.

Please note that the size of the pipes has a large effect on the pressure loss. For example from around 60 l/min, we recommend a pipe inside diameter of at least 10 mm.

Please also note that some fittings have a reduced diameter and can cause considerable pressure drop in your system. Be especially careful with vacuum applications, please select a relative big pipe diameter).

2.19. Temperature compensation

The DB04A thermal mass flow meters measure the mass flow of gases, the result being largely independent of pressure and temperature. In addition to the fundamental principle an internal sensor measures the gas temperature and, with the help of a 3-dimensional table of interpolation values, a correction factor is calculated automatically. The flow indication is thus temperature-compensated.

2.20. Pressure compensation

During calibration, the specified operating pressure is taken into account. Changes to the pressure conditions may introduce an additional error. This is around $\pm 0.2\%$ per bar.

Please note that the control behavior is influenced by substantially different pressure conditions. (relevant for units with an integrated needle valve only)

2.21. Response time

The response time is time required to display 98% of its final value after a sudden change in flow. This response time for the DB04A 2 is around 300 ms but is dependent on your filter settings.

2.22. Filter settings

The filter settings smoothens the reading of pulsating or noisy flows. It can be set through the set-up menu.

Higher filter settings will slow down the response time of the unit.

(Please always first try to find and remove the cause of your noisy or pulsating flow e.g. add volume to your system). More information on the filter settings in chapter [4.12.3 Filter](#)

3. Installation and commissioning

3.10. Scope of delivery

We ship the device with the following accompanying documentation:

- ⇒ With each device, USB cable + 1 x AA battery (if battery powered)

3.11. Mounting position and mounting location

Although the recommend mounting position is horizontal, the unit can be used upright, vertical or upside down. With a vertical mounting position, dependent on the type of gas and at pressures above 5 bara (72 psia, 500 kPa(abs)), a zero-point offset can be possible. This effect is caused by convection in stationary media.

With regard to mounting location, the following situations can cause problems:

- ⇒ Strong heat sources, or ambient temperatures outside the specification
- ⇒ Strong sources of electromagnetic radiation such as spark discharges
- ⇒ Humid environments and the associated condensation lead to damage of the electronic components
- ⇒ In general, aggressive environments reduce the service life.
- ⇒ Liquid running backwards can penetrate into the measuring instrument. An elevated mounting location generally helps, or using check valves.
- ⇒ If your ambient air contains high humidity and at night the temperature goes down, it is possible that you will get some condensation inside the unit. Please take precautions to avoid this.

3.12. Requirements for pipework

The most common causes of faults concern the way that devices are connected to the gas supply. Please note the following points:

- ⇒ The pipes must be absolutely clean. Please flush them **before** installing the measuring instruments!
- ⇒ Please ensure there are no pieces of thread sealant (f.i. Teflon tape) in the piping!
- ⇒ Use appropriate pipe materials (pressure rating, durability)
- ⇒ Even when connected to fixed pipework, we recommend that the devices are mounted using the appropriate mounting holes
- ⇒ From 50 l/min, we recommend the following flow-calming sections of straight and unobstructed straight tubing: Inlet: 10 x diameter; outlet: 5 x diameter
- ⇒ Use appropriate fittings (see chapter [3.13 Fittings and Filters](#)).
- ⇒ Malfunctions can be caused by unstable pressure controllers, pumps that oscillate, and volumes before and/or after the measuring device that are generally too small. Install an air reservoir with 2 liter volume in the feed pipe (2 liter is an example, the volume depends on the application).

- ⇒ The size of the pipe must be matched to the measuring/control device. A diameter that is too small results in an increased pressure drop.
- ⇒ Check for any leaks before commissioning the devices.
- ⇒ For maintenance work, we recommend that a bypass system is used. This is particularly important where the gas supply must not be interrupted.

Sealants

The design of the devices enables sealing at the ends with O-rings or flat seals. It is **essential** that you **avoid**:

- ⇒ the use of sealing tape to seal threads. Small pieces can cause incorrect measurements and control-valve malfunctions. As well as that, if the device has to be checked or recalibrated, there will be an extra charge for the additional cleaning work.
- ⇒ sealing with liquid sealants will incur a higher cleaning charge for cleaning the device in an ultrasonic tank.

3.13. Fittings and filters

We recommend fittings which are sealed with O-Rings. Than sealing agents or Teflon tape are not necessary. Some compression fittings are available with an internal 50µ filter.

Please also consider that fittings and filters can create additional pressure drops over the flow meter.



Please note that the length of the tread on you fitting that is screwed inside the body is for the G $\frac{1}{4}$ " no longer than 10mm ($\frac{3}{8}$ "") and for the G $\frac{1}{2}$ " no longer than 13mm ($\frac{1}{2}$ "") to avoid internal damage.

Installation

The fittings are normally supplied in pairs: they preferably should be installed with filter at the inlet and without filter at the outlet. The fitting with a filter must be installed at the inlet (as determined by the flow direction). The sealing rings (O-rings) must not be damaged during assembly.

3.14. Filters / Gas cleanliness

We always recommend that a filter, or at least a fine-mesh sieve (50 microns), is installed before the measuring devices. It often happens that solid matter such as welding residues, metal or plastic chips, rust, sealing tape, etc. affect the function.

In pressurized-air applications using compressors, the air must be dry and free of oil. Please ensure that a suitable processing unit is located before the devices. In the case of gases from cylinders, in general no filter is needed. For more information, see chapter [5. Maintenance](#).

3.15. Electrical power supply

The *DB04A* can be provided with power from a standard AA battery or from a common USB micro-B charger that you typically use for the charging of your phone. There are optional modules by which you can apply a 12 to 30 Vdc external power.

The lifetime of the battery strongly depends on the type and quality of the AA battery you use. We recommend (and determine the specifications with) an Alkaline-Manganese Dioxide Battery with a capacity of 3000 mAh (ANSI: 15A IEC: LR6)

Other types of batteries (for instance Zinc Carbon, Zinc Chlorine, NiCd, NiMH or Li-ion) can be used, as long as the voltage is 1.2 to 1.8 Vdc. Using other batteries will influence the life of the battery when used in the *DB04A* flow meter.

It is also possible to use rechargeable batteries, but the unit will however not charge the battery if powered by the USB micro-B.

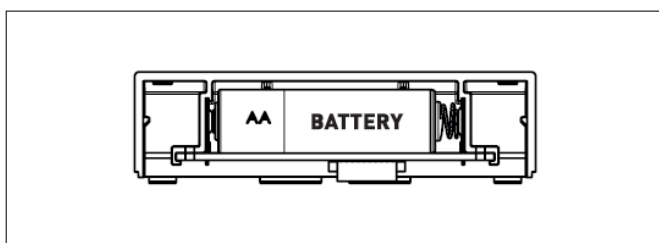
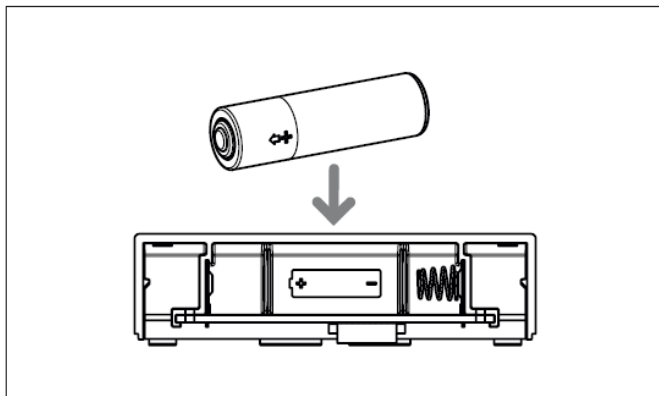
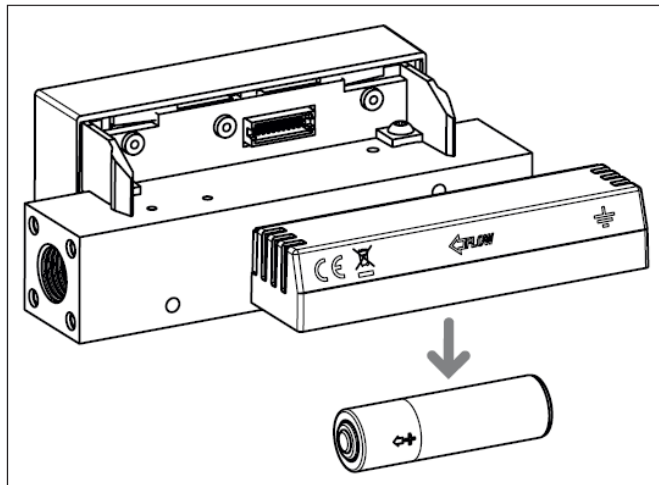
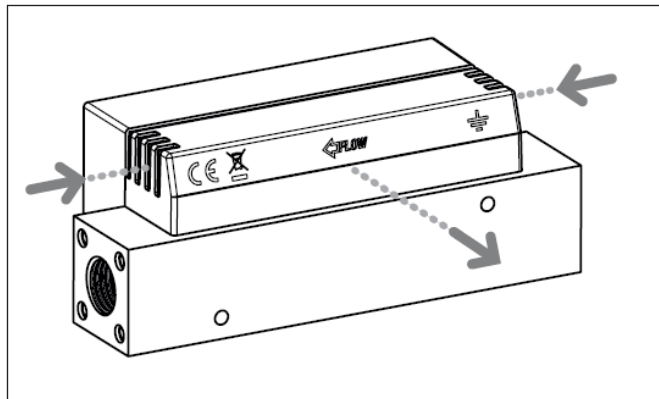
We strongly recommend to remove the battery from the case if you do not use the meter for longer periods of time to avoid damage to the flow meter in case the battery starts to leak. The unit will retain its settings so when you re-insert the battery the settings will be the same as when you took it out. (The totalizer will be stored to the non-volatile memory once every 10 minutes, so the stored value will never be older than 10 minutes)

There is no need to remove the battery if you connect the USB power supply. When you run the unit on power from the USB micro-B and have a battery inserted, you can remove the USB connector and the battery automatically takes over.

When the unit is powered by the battery you will not see the backlight to conserve energy. The backlight is only operational when there is a power supply other than a battery.

When you replace or install a battery, all power to the unit should be disconnected.

3.16. How to replace the battery?



When you replace or install a battery, all power to the unit should be disconnected.

The battery is in plastic compartment mounted above the body and connected to the main display/electronics housing. This plastic part has 3 notches on each side. With one hand hold the housing on the sides of the display and with your other hand grab the side where the plastic notches are located. Pull the battery compartment from the main housing. Replace the battery and push the battery compartment back on the main housing.

By pushing the battery compartment into place you automatically connect the battery to the electronics. It will take a few seconds for the meter to start up.

You have to press the screen for about 3 seconds in order to switch the unit on. Replacing the battery will not automatically turn on the unit.

Inserting the battery incorrectly will not damage the unit.



Please dispose of the battery on an environmental friendly way

3.17. Warm-up time

All instruments of DB04A line are ready for use within seconds of connecting the power. There is no significant warm-up time (<5 sec).

4. Operation

4.10. Introduction

The *DB04A* has a touch screen based on pressure. You can operate the screen with your finger or an object that does not create any scratches on the display.

The display has a backlight that only operates if the unit is powered by an external power source. To start the unit, insert a battery or connect an external power supply (USB or 24 Vdc). Press the screen for at least 3 seconds until the unit switches on. When connecting the unit to an external power source it will be turned on automatically.

Once you switch the unit on you are able to access a menu structure with which you can adjust the meter for your specific applications and preferences.



Before you put the unit into operation verify that the unit is suitable for your application (gas, range, pressure and temperature). You find these details on the supplied calibration sheet. If any of these details deviate from your application please contact the factory.

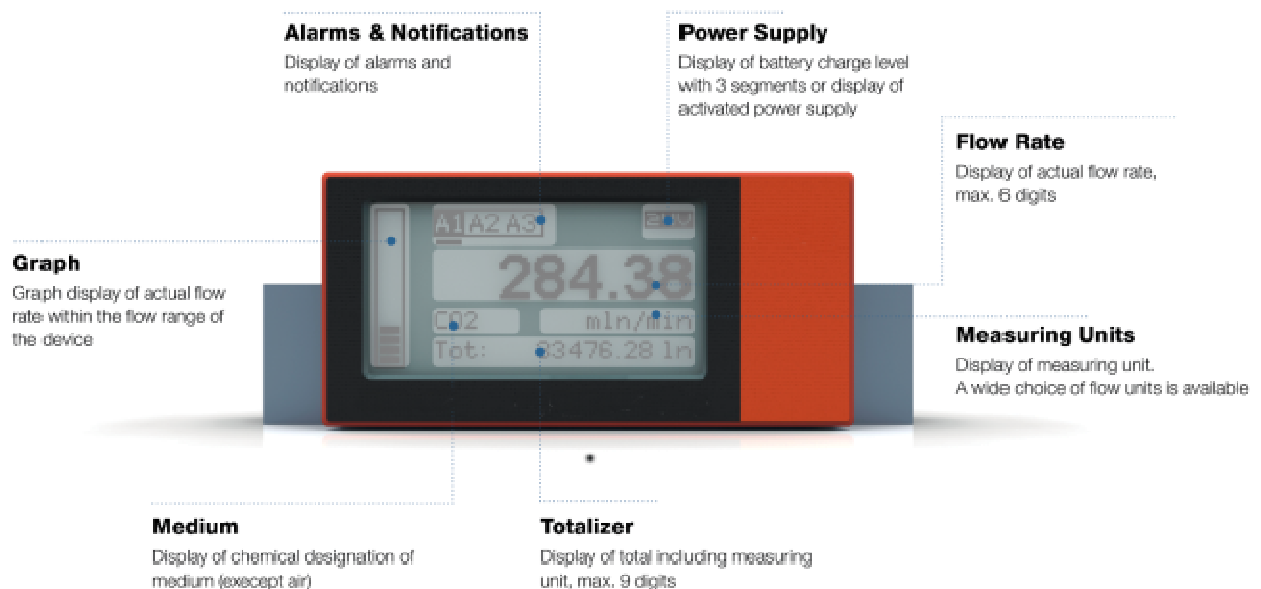


Figure 7: Display main home screen overview

4.10.1. Start-up screen

When the unit starts up, it will show a startup screen for 4 seconds (Screen name: Sensor mode). After this screen you will see the main **home screen** that indicates the flow and totalized value. On the right top you see the battery icon or the symbol for external power. The bar graph on the left of the display represents the current flow graphically. The display also shows the selected gas

and the selected measuring units. **Note: If you hold the screen too long during start up, you get into the “service mode”. Hold the display for 6 seconds to leave the service mode.**

4.10.2. Display flow reading resolution

The DB04A has the ability to show the actual flow in many different engineering units. This means that the number of digits in the readout can change a lot. In automatic resolution mode the DB04A calculates the required number of digits depending on the range and selected units. This resolution is however adjustable by the user (See chapter [4.12.4 Resolution](#))

4.10.3. Alarms and notifications on home screens

Flow Rate

If the flow is higher than 108% of the calibrated full scale, the message: “Overflow” will be shown in the “Alarms and notification” section in the top of the screen.

If you select an engineering unit for the flow indication that has too many digits to display for the range of the unit, the area where the flow is normally displayed, will show: “Out of range”. Select a different flow unit in section [4.12.2 Units](#)

Totalizer

If the totalized value exceeds the 8 available digits or you selected a totalized unit that exceeds the current totalized flow, the totalizer will show all 9's on its display. (9999999)

You will have to select an engineering unit for the totalizer indication that is big enough to show all totalized flow (for instance m³n or kg). Select a different flow unit in section [4.12.2 Units](#)

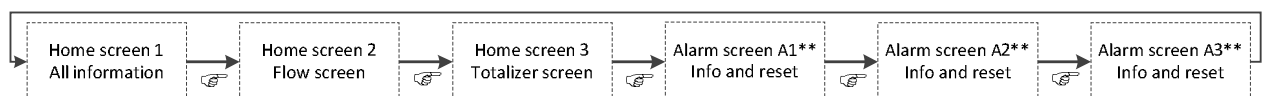
Alarm notifications

If you make use of the optional alarm module you will see the status on the main screen. More information on the Alarm module see chapter [4.11.2 Alarm Menu](#).

4.10.4. Home screens and Menu access

The DB04A has customer selectable “home screens”:

- Overview: Shows flow + flow totalizer + bar graph
- Flow: Shows flow in big digits
- Total: Shows the totalized flow in big digits
- Alarms: Alarm screens 1 to 3 (or notification if no alarm module is connected)

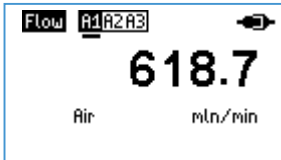


** only active with alarm module

You can switch between the home screens by touching the screen for less than one second. It is possible to hide screens with the display menu. (See compact manual [4.12.1.1 Home screen](#))



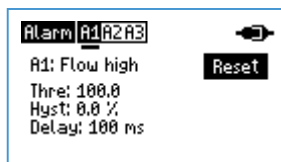
Home screen 1: Screen which shows both the actual flow and the totalizer in smaller digits. The bar graph represents 0-100% of the maximum flow range. The A1, A2 and A3 represent the alarms and only show when you have installed the optional alarm module.



Home screen 2: Screen which shows the actual flow.



Home screen 3: Screen which shows the totalized flow in big digits.

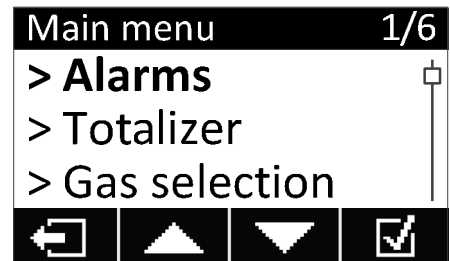


Home screen 4 to 6: Screens dedicated to the individual alarm (Each alarm has its own page. Here you can read the main settings of an alarm. If the alarm is activated you can reset it here if the manual reset is activated. These screens are only relevant if the alarm module is installed.

If you touch any of the home screens longer than one second you will access the *Main Menu*. You will see the screen shown on the right.

From this menu you can modify your preferences and access the alarm settings menu.

If you have the password activated, you have to enter your passcode before you have access to the Main menu (See [4.12.5 Security](#)).



4.10.5. Buttons and selection

Each menu has a name (See top inverted bar) and on the upper right you see 2 numbers (example 1/6). The first number shows which item you selected, the second number how many items there are in the menu you selected.

At the bottom of most screens you find the inverted buttons. Meaning of buttons:



Return: Return to the previous menu. If you hold it for longer than 0.5 sec you return to the home screen



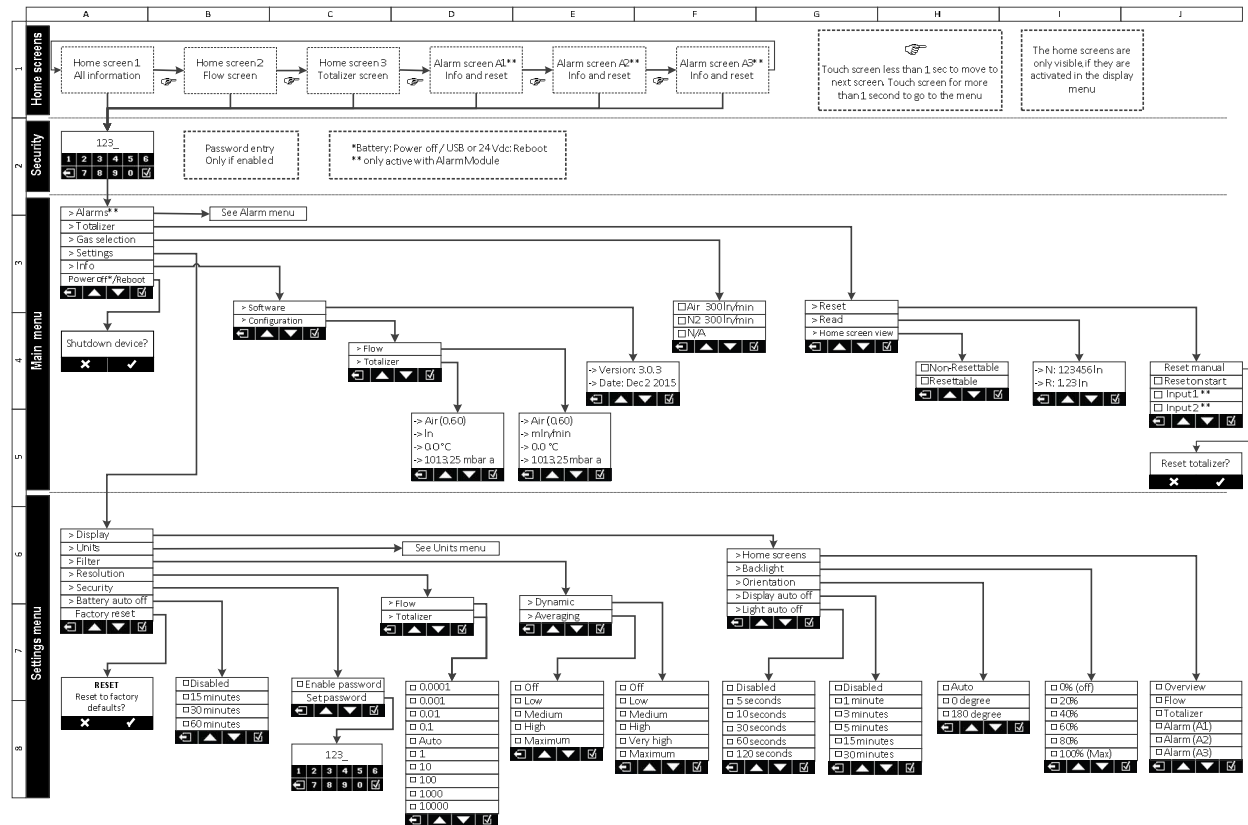
Up/down: increase/decrease (you can also select a menu item by touching the relevant line)



Select/confirm: Store selected value

4.11. Main Menu

Below is an overview of the main menu structure.



4.11.1. Main Menu

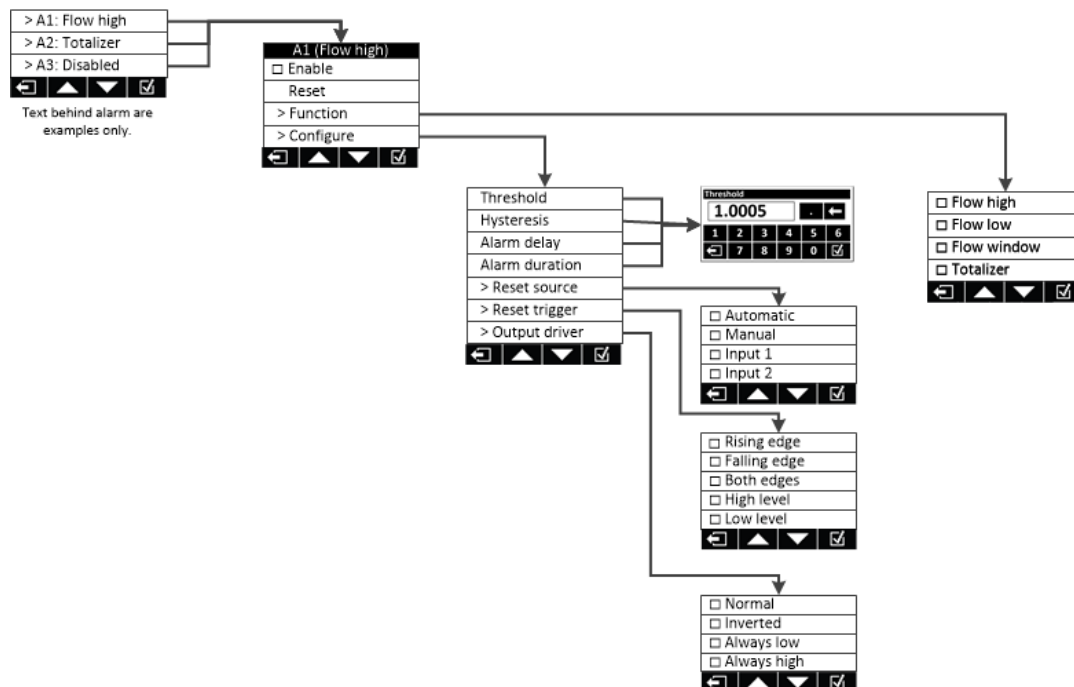
> Alarms**
> Totalizer
> Gas selection
> Settings
> Info
Power off/Reboot*

In the main menu you have access to the Alarms, totalizer settings, gas selection, settings, information about the status and settings of your unit. If your unit is battery powered, it will give the option “Power off” on the bottom line. If the unit is externally powered it will give you the option to “Reboot” the unit.

**Alarms will be visible but if the Alarm module is not installed this menu option cannot be used.

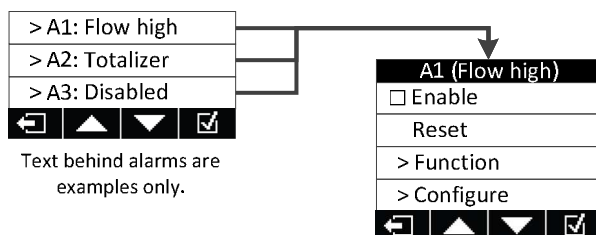
4.11.2 Alarm Menu

If you have installed the optional alarm module and once the alarm function is selected from the main menu, you can select which of the 3 alarms (A1, A2 or A3) you want to configure. Please note that alarm 3 has a different contact type and capacity than alarms 1 and 2 (see diagram in [2.15 Optional Modules](#)). If an alarm has already been configured the primary function is mention behind the Alarm (f.i. A1: flow high).

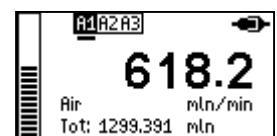


4.11.2.1 Select Alarm Menu

Once you selected A1, A2 or A3, you go into the specific alarm menu. You have the following options:



Enable: If you active this, the alarm becomes operational. You can see that an alarm is enabled on any home screen. If an alarm has been enabled the corresponding alarm name is shown underlined (see picture on the right).



Reset: If applicable you can manually reset an alarm here (The other reset location is on the alarm home screen). If the alarm is enabled you see a star (★) behind the word "Reset".

Function: With this submenu you can set the function of the alarm (Options: Flow high, low or window and totalizer). For more details see chapter [4.11.2](#)

Configure: In this menu item you can set the details of the alarm like it alarm value(s), how the alarm is reset, Alarms delays, hysteresis and more. For more details see chapter [4.11.2.3](#)

4.11.2.2 Function Alarm Menu:

Under the function alarm item you define the functionality of the alarm

<input type="checkbox"/> Flow high
<input type="checkbox"/> Flow low
<input type="checkbox"/> Flow window
<input type="checkbox"/> Totalizer

Flow high: with this function the alarm gets activated if the flow goes over a predefined value set in the threshold by the customer.

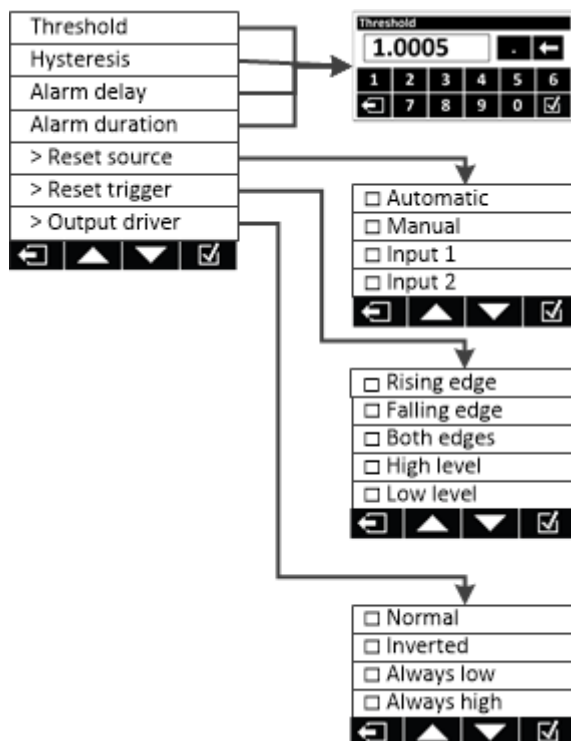
Flow low: with this function the alarm gets activated if the flow is under a predefined value set in the threshold by the customer

Flow window: with this function the alarm gets activated if the flow is outside a “Window” that is predefined by the customer. For example if upper threshold is set to 5 and lower threshold to 4 the alarm will get active if flow is lower than 4 or higher than 5.

Totalizer: The DB04A has 2 build in totalizer. One is permanent and non-resettable. The second one is a resettable totalizer. You can bring it back to zero. The totalizer alarm works with the resettable totalizer. You enter a value in the threshold and once that value is reached the alarm goes on.

4.11.2.3 Configure Alarm Menu:

Once you defined the function of an alarm you can define the details of the operation in this menu



Numerical entry screen: If you have to enter numeric values (Like an alarm value (Threshold)) you will see a little keyboard on the screen where you can enter a numerical value.

The decimal point is located behind the number display field. Once you entered a decimal point followed by another number, the dot changes into an “E”. If you press this you can enter the scientific notation, for instance $1.0E-3 = 0.001$ or $2.2E2=220$.

Threshold: Threshold is the activation value. If f.i. you selected a high alarm, the alarm will be active when the flow value comes over the Threshold value. The value is entered in flow engineering values that the unit is set for at that moment (f.i. in m^3/min). If you change the engineering units of the unit in a later stage, the Threshold value will automatically adjust itself to the new flow unit.



Please note that there is no limit to the value you can enter as a threshold. Please double check your entered value.

Hysteresis: The hysteresis is the difference between the value where the alarm turns ON from turning OFF and the value where it turns OFF from turning ON. This difference is defined in % of full scale. In figure 9 an example of a 50% threshold value high alarm with a 10% hysteresis. The blue line in the top graph reflects the gas flow, the vertical dotted lines the switching points. The blue area's in the graph below is where the alarm is activated. The reset is set to automatic.

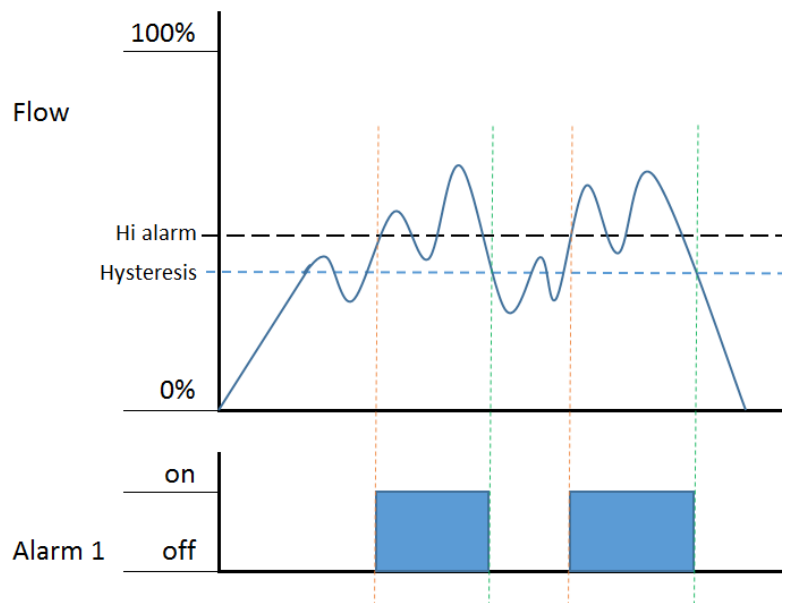


Figure 8: Explanation hysteresis



Please note that you can enter a value of 100% as hysteresis value. If you do that the alarm will no longer switch off.

Alarm delay: The alarm delay is a delay in milliseconds between the moment the alarm situation occurs to the moment that the alarm is activated. It can be set from 20 to 9999999 msec (=2.777 hr).

Alarm duration: (Note: This function is only active if the reset is set to automatic)
The alarm duration is minimum time that the alarm is active after it is activated. It can be set from 100 to 9999999 msec (=2.777 hr)

Reset source: The alarm can be reset in different ways. Below a list of the 4 possible settings:

Automatic: The alarm is reset the moment the alarm situation is no longer valid. This unless you programmed an alarm duration. For a totalizer alarm this setting will reset the totalizer as soon as the threshold has been exceeded.

Manual: The alarm stays active until you manually reset the alarm through the touch screen of the flow meter.

Input 1: The alarm stays active until you activate input 1

Input 2: The alarm stays active until you activate input 2



Reset trigger: (Note: this function only relates to alarm reset by input 1 or 2).

When you use input 1 or 2 as an alarm reset, you can set exactly on which action the alarm is reset. If for example the input is a manual push button, the rising edge is the moment that you push the button and the falling edge the moment when you let go of the push button.

<input type="checkbox"/> Rising edge
<input type="checkbox"/> Falling edge
<input type="checkbox"/> Both edges
<input type="checkbox"/> High level
<input type="checkbox"/> Low level
<input type="button" value="←"/> <input type="button" value="▲"/> <input type="button" value="▼"/> <input type="button" value="✓"/>

Please note that the reset overrides the alarm. Even if the alarm is still valid, if you set this reset trigger to high level, the alarm is ignored until the level becomes low again.

If the blue represents the input being active you can see the different trigger points below.

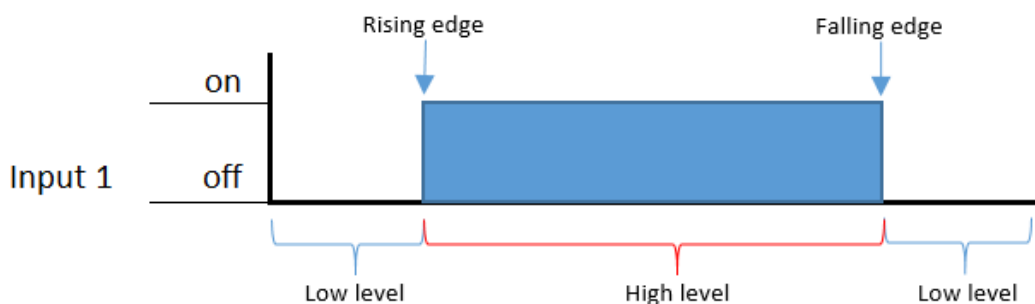


Figure 9: Explanation trigger points

Output driver: the output driver setting offers the possibility to invert the action from the alarm switch and set the alarm to a predefined state which is convenient for testing systems.

The “Always low” and “Always high” override all alarm settings and flow signals. Please make sure that you take precautions before you use these options in a “life” system.

<input type="checkbox"/> Normal
<input type="checkbox"/> Inverted
<input type="checkbox"/> Always low
<input type="checkbox"/> Always high
<input type="button" value="←"/> <input type="button" value="▲"/> <input type="button" value="▼"/> <input type="button" value="✓"/>

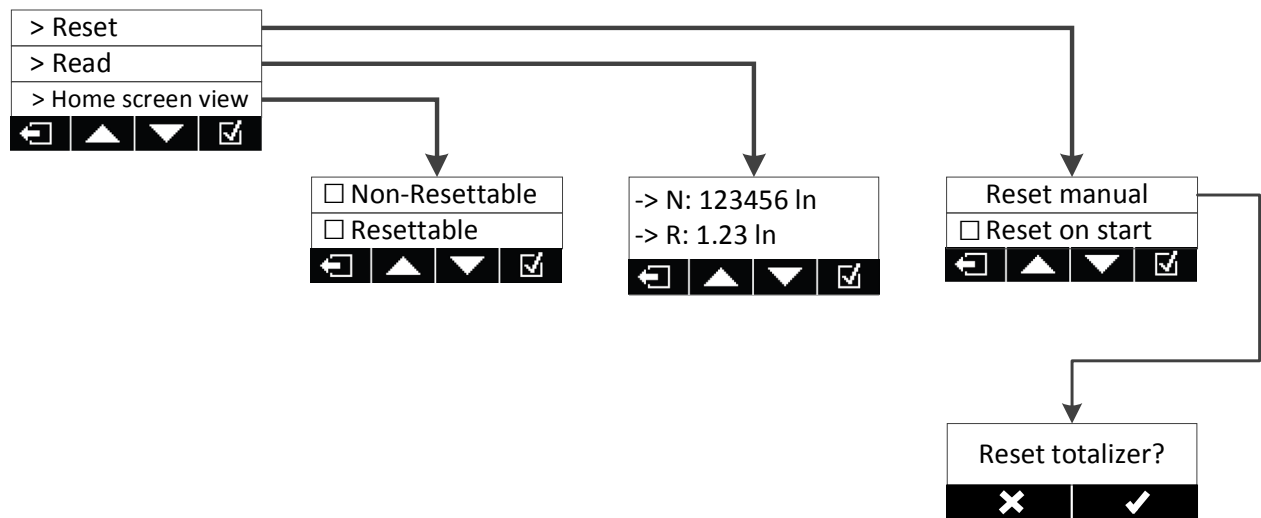
4.11.3. Totalizer

The totalizer calculates how much gas has totally passed through the flow meter based on the measured flow and the factor time. The instrument has 2 totalizers. Each can display a maximum

of 8 digits. The totalizer value will be stored internally as a IEEE 754 floating point number. The internal totalizer will never roll-over, the maximum value far exceeds the lifetime of the instrument. One of the two totalizers is resettable, the other can never be reset and always continues to count for the lifetime of the instrument. Both the totalizer values are stored every 10 minutes in a permanent memory so even if there is no power supply the last stored value will still be kept. If you apply power again the saved value will be restored (Unless you activated the “reset on start” feature).

Please note that if the flow rate exceeds the full scale of the unit (overflow), the totalized value will not be correct. Even if there is an overflow the totalizer operation will continue normally. However since the flow value is limited the totalizer is totalizing the limited flow value only.

If the totalizer value exceeds the possible 8 digit display, you can set the totalizer engineering units to a suitable unit that can display the value within the 8 digits, for instance m³/h or kg. See section [4.12.2 Units](#).



Reset: Reset the resettable totalizer to zero

Reset manual: Select this option to manually reset the resettable totalizer

Reset on start: Activate this option if you want that the resettable totalizer is set to zero every time you switch the unit on. *Please note: Upon startup the totalizer will be silently reset without asking for confirmation. It simply resets the resettable totalizer to zero every time you switch the unit on.*

Remark: With the alarm module it is possible to reset the totalizer with an external remote switch or signal.

Read: Read the totalizers (for instance in-case you only activated the flow screen).

N: is the non-resettable totalizer, R: is the current value of the resettable totalizer.

Home screen view: Here you can select if you want to read the Non-resettable or Resettable totalizer on the main screen.

4.11.4. Gas selection

<input type="checkbox"/> Air 300 l/min
<input type="checkbox"/> N2 300 l/min
<input type="checkbox"/> N/A

The *DB04A* can store up to 3 different curves for different gases or gas mixtures in its memory. If you have ordered more than one gas when you purchased this unit, you can select the required gas here. The locations that do not have a gas programmed are marked with “N/A”.

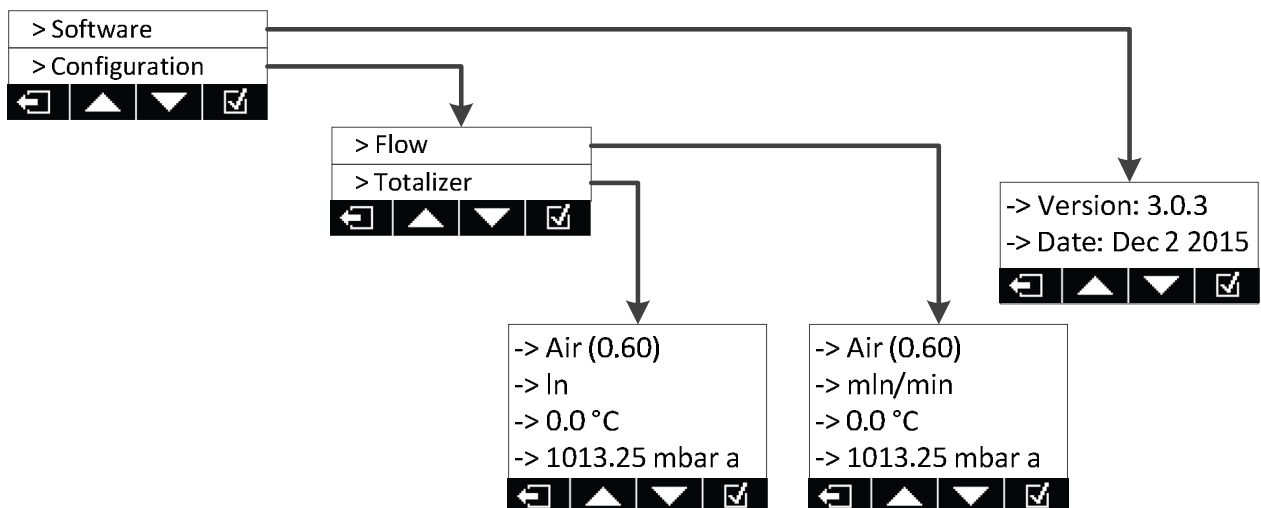
Behind the gas name you see the maximum flow you can measure in your selected units.

4.11.5. Settings

> Display
> Units
> Filter
> Resolution
> Security
> Battery auto off
Factory reset

In this menu you can adjust your preferences. See section [4.12 Settings](#) for details.

4.11.6. Info



Info brings you to menu that informs you about the current configuration of the unit. When you select “Software” under the Info menu you can see the current firmware version and the date that this version was released.

Under “Configuration” you see the active settings for the flow and the totalizer. The temperature and pressure refer to the reference conditions for the selected flow units. (See [1.15 Real, Standardized and Normalized flow](#))

4.11.7. Reboot or Power off

Shutdown device?

If your unit is battery powered, it will give the option “Power off” in the main menu. You can switch the unit on again by touching the display for 3 seconds.

If the unit is externally powered it will give you the option to “Reboot” the unit. “Reboot” restarts the unit. If you select one of these options the unit will ask you to confirm your selection.

4.12. Settings

> Display
> Units
> Filter
> Resolution
> Security
> Battery auto off
Factory reset

In the settings menu you can adjust the user variables. See the chapters below for more details.

4.12.1. Display

> Home screens
> Backlight
> Orientation
> Display auto off
> Light auto off

In the display menu you can configure the settings for the display

4.12.1.1. Home screen

<input type="checkbox"/> Overview
<input type="checkbox"/> Flow
<input type="checkbox"/> Totalizer
<input type="checkbox"/> Alarm (A1)
<input type="checkbox"/> Alarm (A2)
<input type="checkbox"/> Alarm (A3)

There are 6 different home screens (See chapter [4.10.4 Home screens](#)) and in this menu you can deactivate up to 5 of the home screens. Deactivated screens do not show up as a home screen

4.12.1.2. Backlight

<input type="checkbox"/> 0% (off)
<input type="checkbox"/> 20%
<input type="checkbox"/> 40%
<input type="checkbox"/> 60%
<input type="checkbox"/> 80%
<input type="checkbox"/> 100% (Max)

In this menu you can select the brightness of the backlight. The backlight is only available if you use an external power (USB or 24 Vdc).

4.12.1.3. Orientation

<input type="checkbox"/> Auto
<input type="checkbox"/> 0 degree
<input type="checkbox"/> 180 degree

The screen can be orientated upside down (180 degree turned). If this menu is set to Auto, the unit will do this automatically. A sensor determines it's orientation. The sensor can be overridden with the 0 or 180 degrees settings. This is very convenient if you want the gas inlet to be on the right side of the flow meter.

4.12.1.4. Display auto off

<input type="checkbox"/> Disabled
<input type="checkbox"/> 1 minute
<input type="checkbox"/> 3 minutes
<input type="checkbox"/> 5 minutes
<input type="checkbox"/> 15 minutes
<input type="checkbox"/> 30 minutes

The display can be set to switch off after a defined time following your last touch event. If you set the “Display auto off” to “Disabled”, the display stays on till the power is switched off. When the display is switched off, the backlight will also switch off. The totalizer is still working. You can activate the display again by touching it.

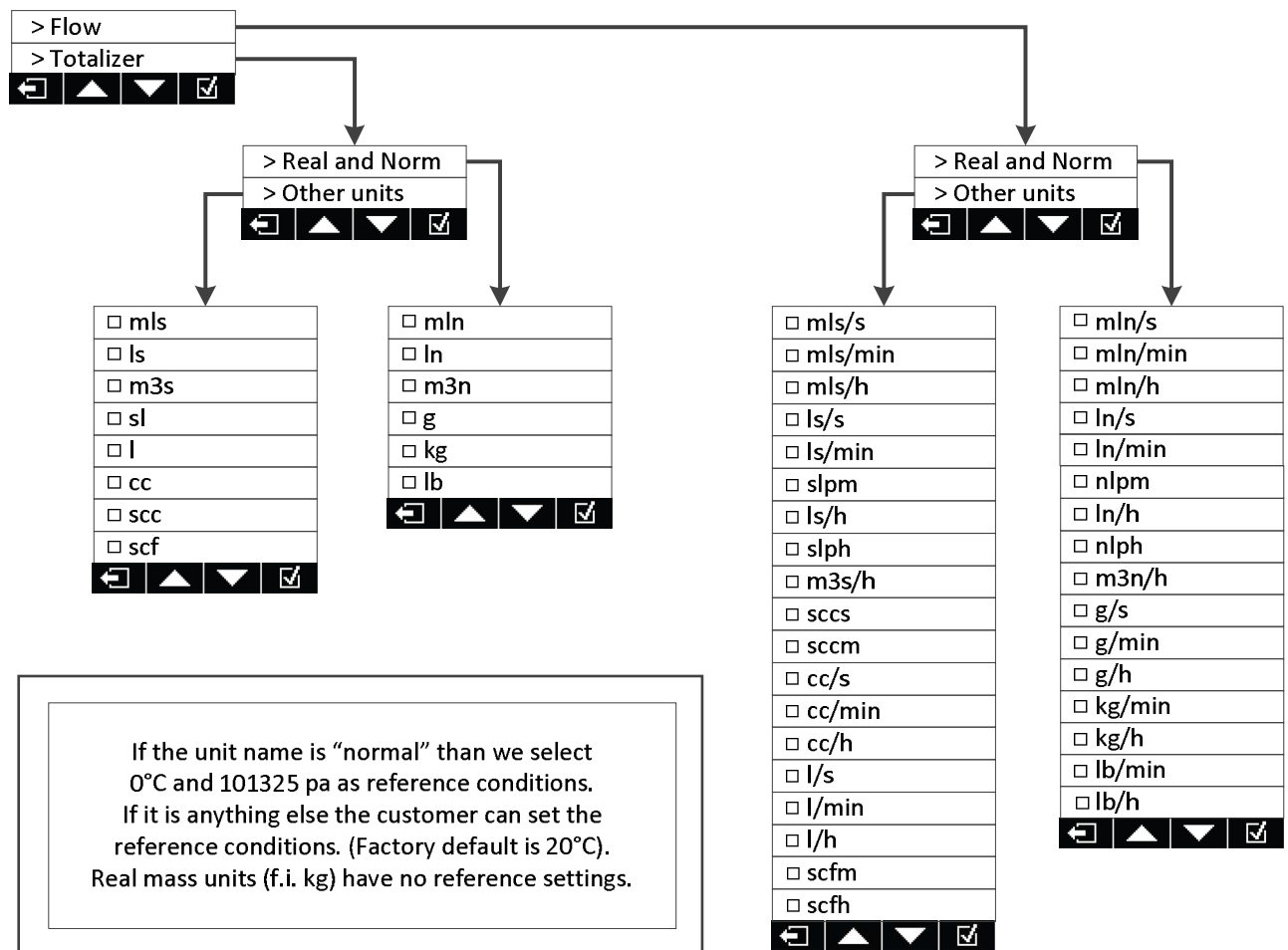
4.12.1.5. Light auto off

<input type="checkbox"/> Disabled
<input type="checkbox"/> 5 seconds
<input type="checkbox"/> 10 seconds
<input type="checkbox"/> 30 seconds
<input type="checkbox"/> 60 seconds
<input type="checkbox"/> 120 seconds

In this menu you can define a time before the backlight automatically switches off (after the last touch event). The backlight goes on again when you touch the display. When the setting is “Disabled” the light is continuously on.

When the backlight is switched off you can still read the display. The backlight only works if there is an external power connected. On battery power supply the backlight is not operational.

4.12.2. Units

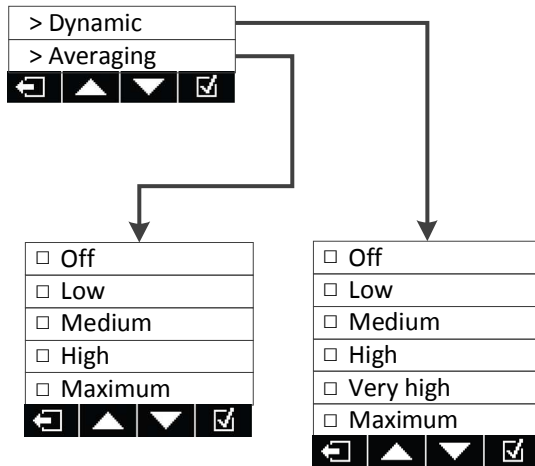


In the *Units* menu you can set the required engineering units for the totalizer and the flow indication. If there is a unit selected with too many digits, the device will show: “Out of range” on the display. If you select a totalizer unit that would create too many digits the totalizer will show 9999999.

More information in section [4.10.3 Alarms and notifications on home screens](#)

For more information on “normal” and “standard” flow units see chapter [1.15 Real, Standardized and Normalized flow](#) of this manual.

4.12.3. Filter



With the filter settings you adjust the reading of quickly changing flows. The filter basically averages the readings from the sensor. More information can be found in chapter [2.22 Filter Settings](#).

There are two separate filters that are adjustable and independent of each other.

Dynamic and Averaging filter:

Dynamic Filter:

The dynamic filter will increase the number of readings that are averaged when the flow is less dynamic and decrease the number of readings that

are averaged when the flow shows quick changes. So when the flow is quickly rising or falling it will take less averages in its calculations. On this way the unit will react faster to changes in the flow.

Averaging filter:

The averaging filter is a “moving average filter”. It calculates the average value of a number of measurements and shows the average on the display. As you increase the filter setting from off to maximum, you increase the number of measurements the average is calculated from.



Before you apply higher filter values, please try to identify the cause of the flow pulsations. This could be a compressor, pressure amplifiers, incorrectly sized fittings, non-return valves or pressure regulators. Sometimes creating more “dead volume” before or behind your flow meter could solve the problem.

4.12.4. Resolution



<input type="checkbox"/> 0.0001
<input type="checkbox"/> 0.001
<input type="checkbox"/> 0.01
<input type="checkbox"/> 0.1
<input type="checkbox"/> Auto
<input type="checkbox"/> 1
<input type="checkbox"/> 10
<input type="checkbox"/> 100
<input type="checkbox"/> 1000
<input type="checkbox"/> 10000

In this menu you can adjust the resolution of your flow and totalizer values shown on the display.

The DB04A has the ability to show the actual flow and the totalizer in many different engineering units. This means that the number of digits in the readout can change a lot. In automatic resolution mode (menu option "Auto") the number of digits are computed depending on range and current selected unit.

The minimum number of digits is 4, the maximum 6 (Excluding the decimal point). Below you find the table on how many digits will be visible in this auto mode.

Range		Examples display values		Display resolution
from	until	from	until	
0.01	0.09	0.01	0.09999	0.00001
0.1	0.9	0.1	0.9999	0.0001
1	9	1	9.999	0.001
10	99	10	99.99	0.01
100	999	100	999.9	0.1
1000	9999	1000	9999	1
10'000	99'999	10'000	99'990	10
100'000	999'999	100'000	999'900	100

Notes:

1. Because the value is right-aligned, it is possible that depending on the actual flow you can see a change in the number of digits behind the decimal point. For example if the flow is changing from 2 to 2.01 and then 2.1 you can see: 2.0, 2.01 and 2.1 on the display.
2. If the maximum number of digits is exceeded you see out of range on the display. In that case select another unit (see chapter [4.12.2 Units](#)).
3. The step size in auto mode between each reading is depending on the range but it is always well within the accuracy of the flow meter. For other setting mentioned below, this does not have to be the case.

The other settings are the minimum step that the value will take between values.

Example: If you have a flow of 189.673 ml/min then the unit will show 189.6 in auto mode.

When selecting the other settings you would see:

Resolution setting	Flow	Displayed	Remarks
0.0001	189.673	189.673	The display cannot show more than 6 digits
0.001		189.673	
0.01		189.67	
0.1		189.6	
auto		189.6	
1		189	
10		180	
100		100	
1000		0.0	
10000		0.0	

Note: The numbers are not rounded off, but they are made invisible (also called a floor function) The totalizer and the bar graph will not be effected by this setting and will also work based on the real high resolution flow.

4.12.5. Security

<input type="checkbox"/> Enable password
Set password
<div> <div>←</div> <div>▲</div> <div>▼</div> <div>✓</div> </div>

123_					
1	2	3	4	5	6
←	7	8	9	0	✓
<input type="checkbox"/> Disabled					
<input type="checkbox"/> 15 minutes					
<input type="checkbox"/> 30 minutes					
<input type="checkbox"/> 60 minutes					
<div> <div>←</div> <div>▲</div> <div>▼</div> <div>✓</div> </div>					

To avoid the unauthorized changing of settings in the menu, it is possible to protect the menu with a self-defined password. If you enable this option you first have to enter a 4-digit numeric password to gain access to the menus. In this setting you can also define that password. You can only activate the password after you have defined your own personal password under "Set password"

If you forget or lose your password, please contact the factory at: info@pkp.de

4.12.6. Battery auto off

To extend the battery life to the maximum we recommend that you set this menu so that, when powered with a battery, the *DB04A* will switch off automatically after the indicated number of minutes. Please note that this menu has no effect if the unit is powered by USB or the external 24 Vdc.

Once the unit is switched off it no longer totalizes the flow.

Note: When we supply the unit, the "auto power off" will be set to 15 minutes

4.12.7. Factory reset

RESET	
Reset to factory defaults?	
←	✓

If you activate the factory reset, all variables will be reset to the factory default (for instance the password protection will be disabled). The continuous totalizer, however, keeps its value. Only the resettable totalizer gets reset to zero. The reset takes about 30 seconds.

5. Maintenance

When operated properly and with the use of clean and dry gas, *DB04A* devices do not require any routine maintenance. There are no internal moving parts in the measurement part of the device. However, we recommend that the calibration is checked after 12 months. If your *DB04A* is still within tolerance, this time interval can be extended. The timing of the periodic check is the customer's responsibility.

5.10. Cleaning to remove contamination

Depending on the type of contamination, on-site cleaning of the measuring or control device may be possible. As a first step, we recommend flushing with N₂ or dry air. If it is contaminated with liquids (ex. oil), pure methanol alcohol (100%) can be used. After cleaning, rinse the *DB04A* with the optional needle valve position fully open with dry air or nitrogen for approximately 15 minutes to dry out all liquids.



Notes:

- ⇒ **The warranty is null and void if the housing was removed.**
- ⇒ Only use the proper tools.
- ⇒ Be careful when handling the device and the individual components.
- ⇒ Make sure that the disassembly environment is clean.
- ⇒ Do not touch the circuit board or electronic components without first grounding yourself and the surroundings. Electrostatic discharges can destroy components.
- ⇒ After cleaning, you should have the device checked or, if necessary, recalibrated by PKP at the next opportunity.

5.11. Returns

When returning a *DB04A* please insure suitable packaging. Please contact us before you return the unit to us. To repair the unit we require a detailed and accurate description of the problem, the required service and the possible causes of the faults. You can contact us at: info@pkp.de

**Note:**

If the device has come into contact with aggressive or toxic gases, please ensure that it is properly cleaned/flushed before returning the device to us. Please always complete the contamination declaration form. You will find these in the appendix or in the enclosed CD and in this manual, see section [6.17 Contamination Statement](#).

6. Appendix

6.10. Troubleshooting

In the following table we have compiled fault symptoms, their possible causes and suitable measures you can take. If you do not recognize your fault symptom, or the proposed measures were not successful, please consult PKP.

If you are planning to return a product, please refer to the chapter [5.11 Returns](#).

If you have to remove the measuring or control device from the pipeline, please observe any flushing procedures and the relevant safety guidelines. You will find a guide on how to remove and clean the devices in the chapter 'Operation and Maintenance'.

Error	Possible causes	Measures
Output indicates high flow continuously	Flow is too high (Overflow)	Reduce the flow rate. If necessary, the full scale can be extended. Please consult PKP
	Device is heavily contaminated	Please consult PKP
	Sensor faulty	Please consult PKP
Flow is shown despite zero flow.	Sensor contaminated	Please consult PKP
	The device is being operated with a different gas from its calibration.	For multi-gas instruments, you can set the appropriate gas type
	Offset due to mounting position	Particularly with small measurement ranges, heavy gases and gauge pressures > 5 bar, a zero-point offset can occur where the mounting position is vertical >> chimney effect. Where possible, mount the device horizontally
The manual valve is leaking	Contaminated valve	Flush the valve repeatedly with clean dry nitrogen
Meter does not indicate the expected value.	Leakage	Flow rate > than reference: Leakage between measuring device and your reference Flow rate < than reference: Leakage upstream of the measuring instrument
	Contamination	With contamination by sealing tape, for example, it is possible that the flow divider is partially blocked. In this case the device displays more than the reference. Please consult PKP.
	The device is being operated with a different gas than calibrated.	Connect the intended gas, or change the type of gas in the 'Calibration' menu
	Different reference conditions	Verify "Normal" or "Standard" conditions
	Inlet pressure is too low	Check your inlet and outlet pressures
	Pressure drop too high	Check for blockage or pollution. Check fittings ID

Error	Possible causes	Measures
Unit, backlight or display unexpectedly switched off	Battery empty	Replace battery
	Menu settings incorrect	Adjust the auto off menu's
Unit always enters service mode when switched on	Firmware damaged	Perform a firmware upgrade as described in this manual. If the problem remains please consult PKP.
Out of Range	Wrong unit selection	Select a unit that fits better to the current flow.
Forgot Password	Contact the factory or distributor	Please consult PKP
Totalizer shows 9999999	Overflow totalizer units	Select a different unit (try m3n or kg)

If you need any support please contact us by e-mail through Customer Service:

info@pkp.de

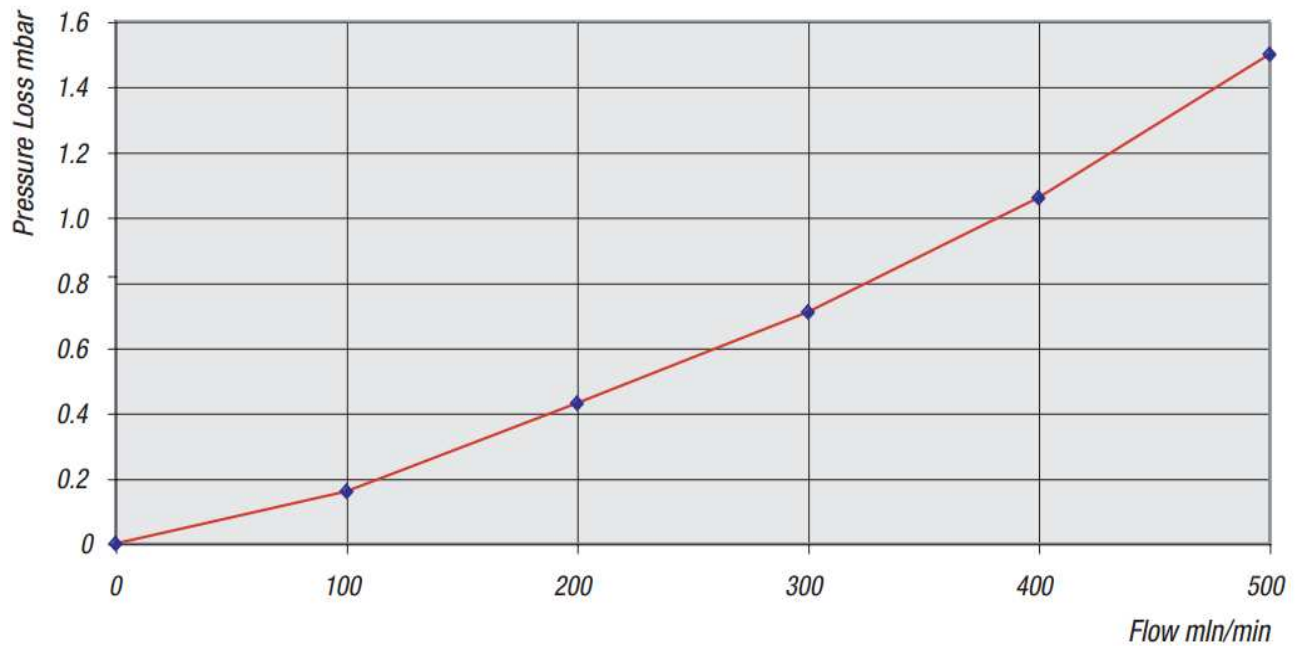
6.11. Pressure loss

The following figures show examples of the pressure drop of a *DB04A* (measuring instrument only, not the valve)

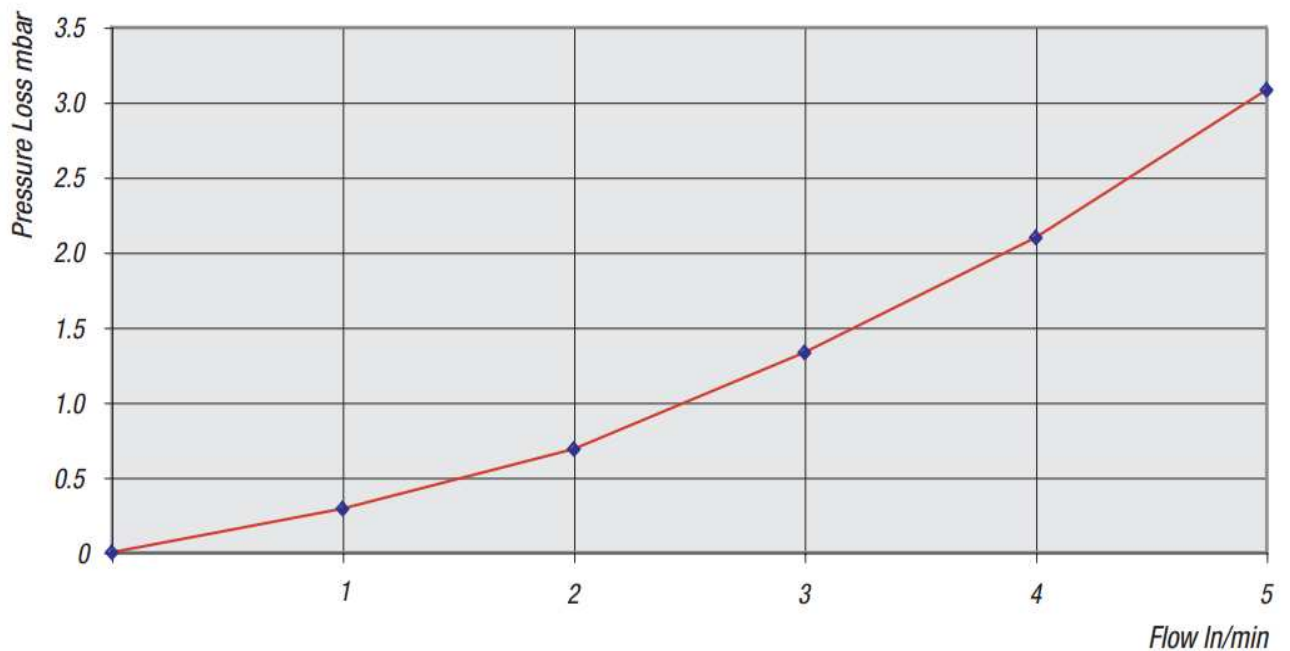
Please note that the curves below are as an indicator only and based on atmospheric outlet pressure. Especially when the outlet is under vacuum, the pressure drop can be higher.

Heavier gasses like Argon will create more pressure drop, lighter gasses like helium will create less pressure drop.

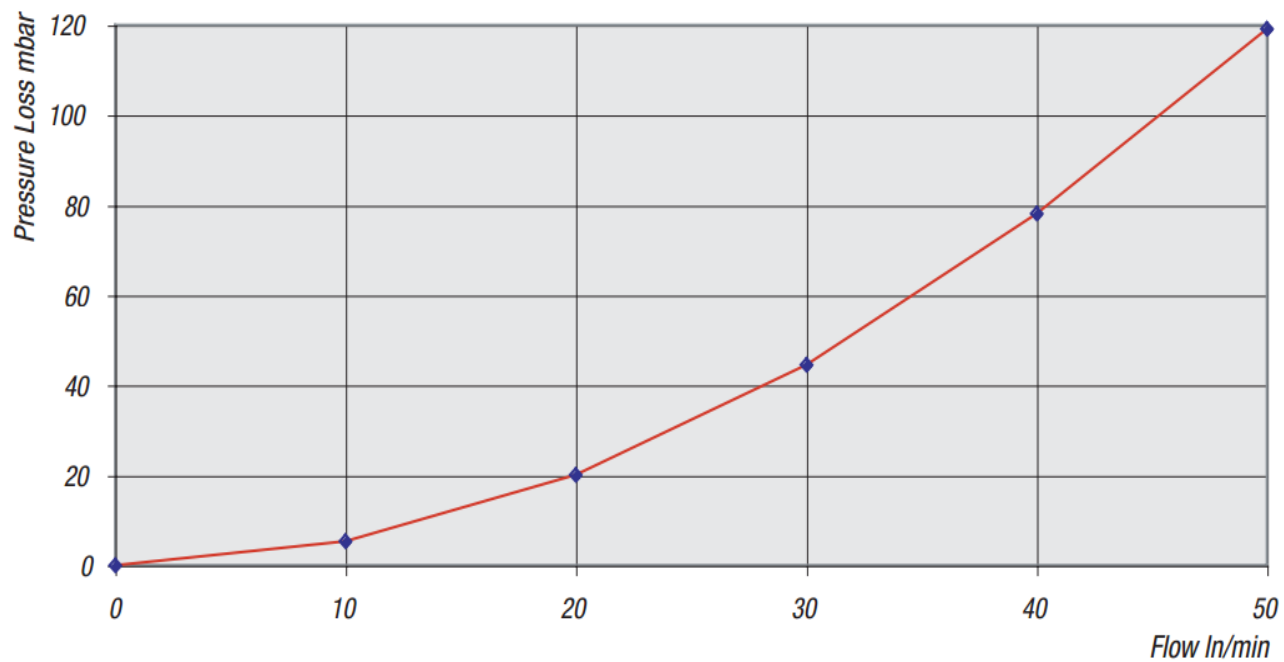
Pressure Loss 500 mln/min (Air)



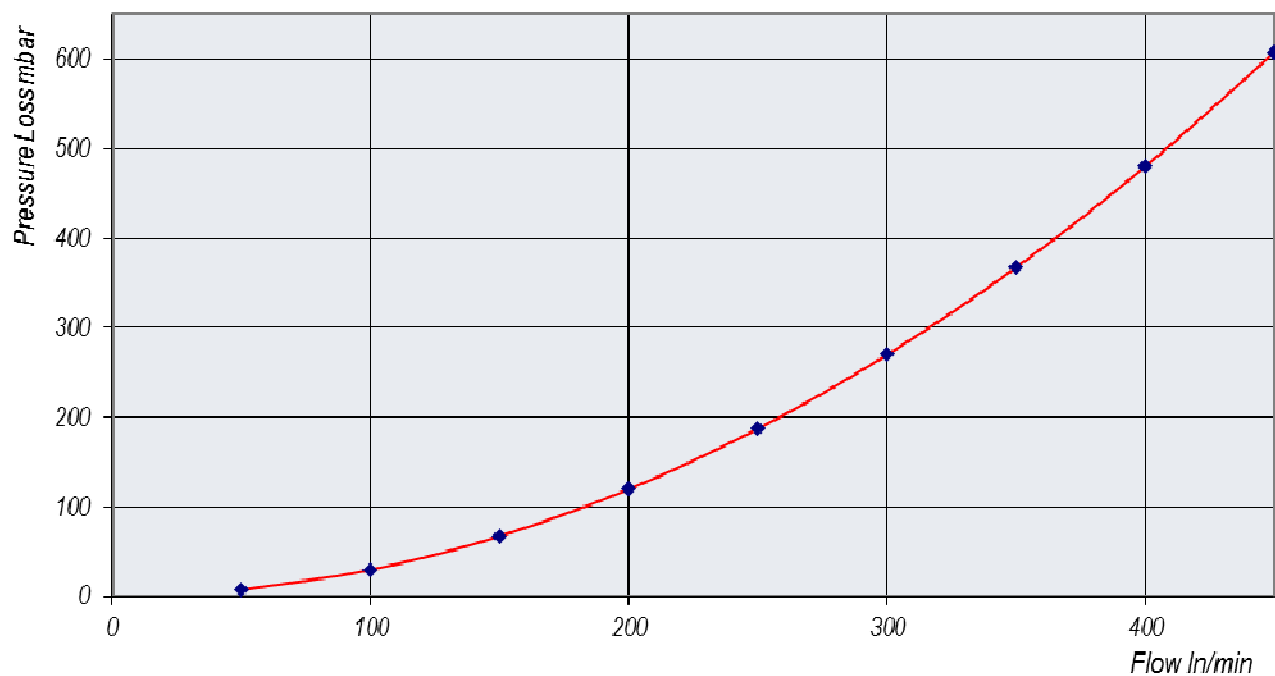
Pressure Loss 5 lln/min (Air)



Pressure Loss 50 l/min (Air)

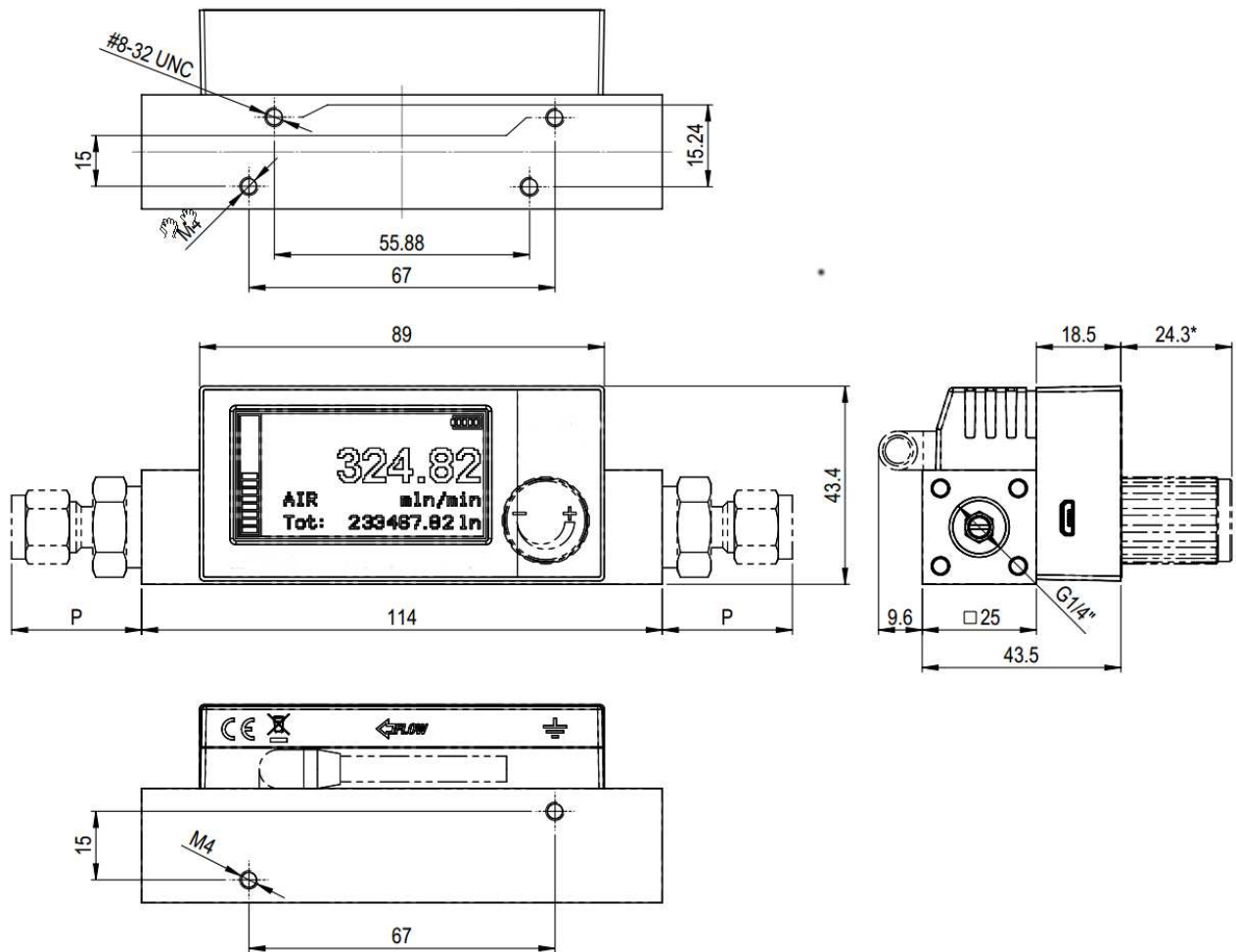


Pressure loss 450 l/min (Air)



6.12. Dimensional drawings 1/4" in mm

Units with 1/4" BSP process connections

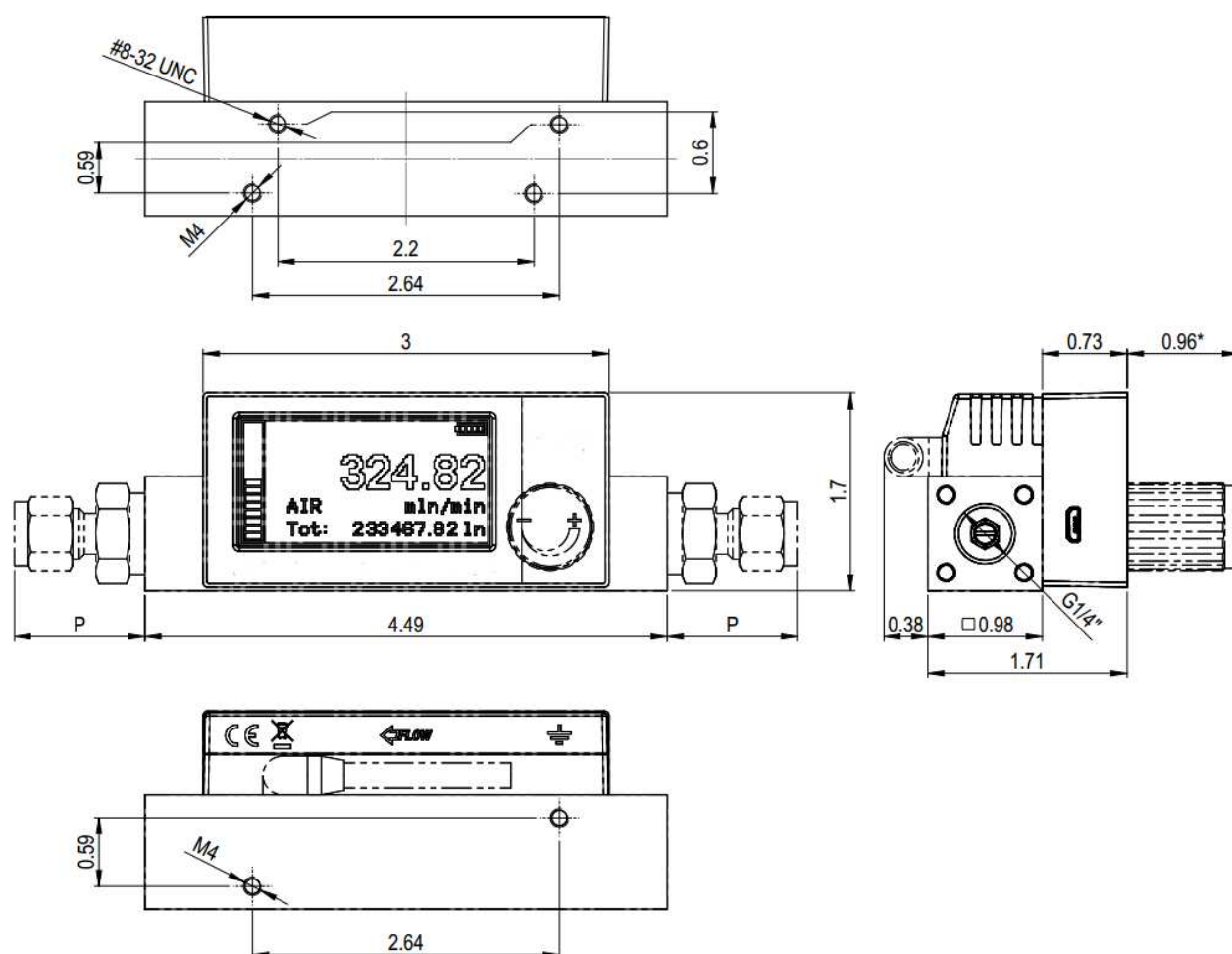


"P" refers to the optional fittings length. Fittings are options only. Standard process connection is female 1/4" BSPP tread.

If additional information is needed, please consult PKP.

6.13. Dimensional drawings 1/4" in inches

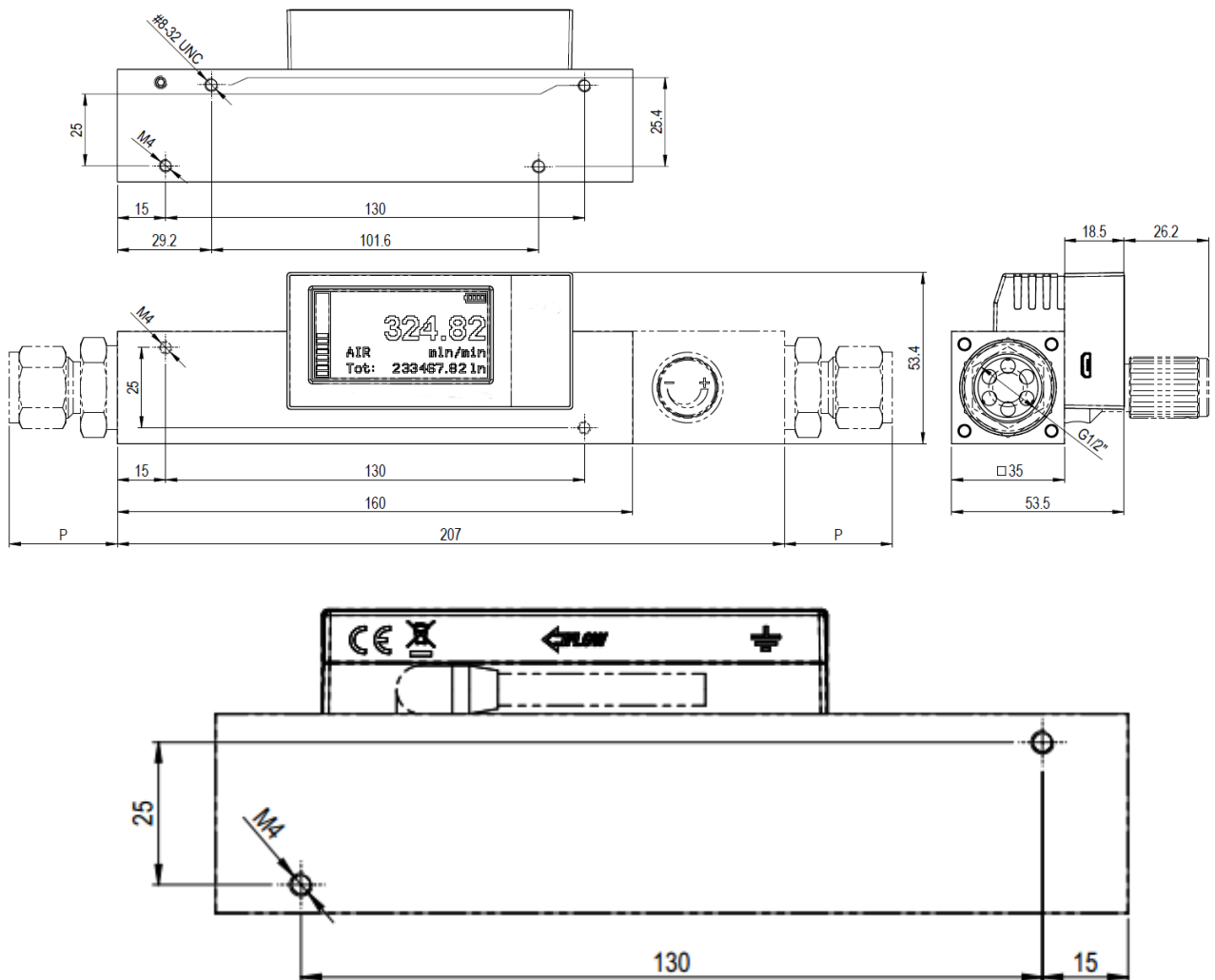
Units with 1/4" BSP process connections



“P” refers to the optional fittings length. Fittings are options only. Standard process connection is female 1/4" BSPP tread.

If additional information is needed, please consult PKP.

6.14. Dimensional drawings ½" in mm

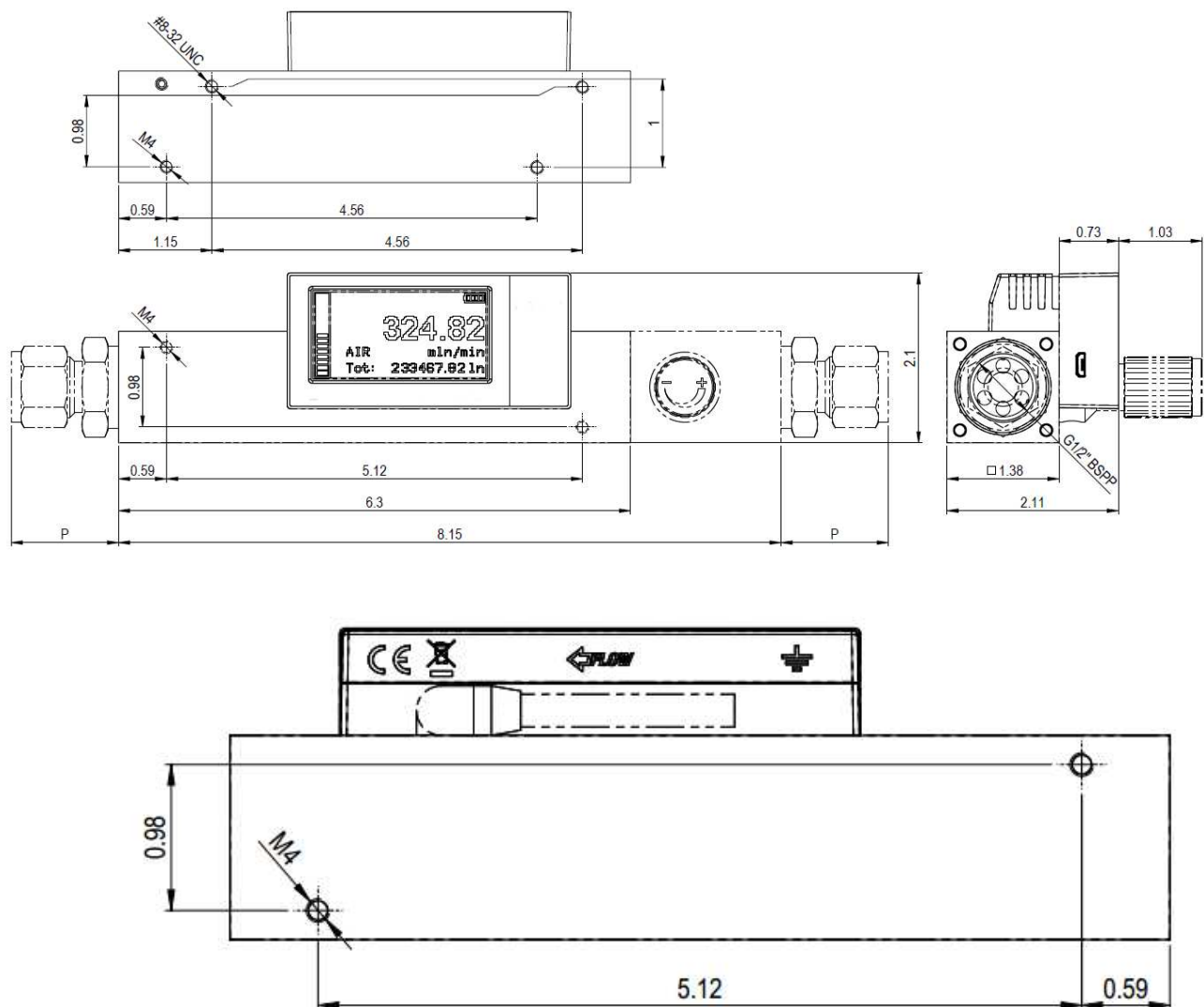


“P” refers to the optional fittings length. Fittings are options only. Standard process connection is female ½" BSPP tread.

If additional information is needed, please consult PKP.

6.15. Dimensional drawings 1/2" in inches

Units with 1/2" BSP process connections



"P" refers to the optional fittings length. Fittings are options only. Standard process connection is female 1/2" BSPP tread.

If additional information is needed, please consult PKP.

6.16. Wetted parts DB04A series

Instrument <i>Gerät</i>	DB04A series
Body <i>Grundkörper</i>	1.4404 (316L) or aluminium
Body: O-Rings <i>Grundkörper: O-Ringe</i>	FKM (Standard), EPDM (option)
Flow divider <i>Strömungsteiler</i>	1.4305
Control valve <i>Regelventil</i>	1.4305/1.4105/1.6908
Control valve: O-Rings <i>Regelventil: O-Ringe</i>	FKM (Standard), EPDM (option)
Sensor material <i>Sensormaterialien</i>	Silicon, silicon oxide, silicon nitride <i>Silizium, Siliziumoxid, Siliziumnitrit</i> Epoxy
Sensor packaging	1.4305

Abbreviation <i>Kurzbezeichnung</i>	Designation <i>Bezeichnung</i>	Remarks <i>Bemerkungen</i>
EPDM	–	Ethylene-propylene-diene-monomer rubber Ethylen-Propylen-Dien-Kautschuk
Epoxy	–	Adhesive for sensor fixation, protection for wire bonding Klebstoff für Sensorfixierung, Schutz für Bonddrähte
FKM	–	Fluor rubber Fluor-Kautschuk

For units with EPDM O-rings it is possible to get a FDA compatible materials statement. Please contact the factory or your local distributor for additional information.

6.17. Contamination statement

When returning equipment to us, please complete all sections of the following declaration. In particular, the reason for return, in the case of contamination the nature of the residues and the cleaning, as well as information on any possible hazards. Include this with shipment.	
Device(s)	
Model code:	
Serial number(s):	
Reason for return:	
Type of contamination	
Device was in contact with:	
It was cleaned by us with:	
To protect our employees and for general safety during transport, it is vital to clean devices properly and to use appropriate packaging.	
Can you provide further information on the contamination?	Inert (no hazard) Corrosive Caustic/acid Must not come into contact with moisture Oxidizing Toxic Other hazards: _____
Legally binding declaration	
We hereby confirm the correctness and completeness of the above information.	
Company:	
Address:	
Phone:	
Contact person:	
e-mail address:	
Date:	
Signature:	

6.18. Overview Default settings

No.	Group	Subgroup	Name	Options	Default	Remarks
1	Totalizer		Home screen view	Non- Resettable Resettable	<input type="checkbox"/> <input checked="" type="checkbox"/>	
2	Gas selection			Gas 1 Gas 2 Gas 3	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1)
3	Settings	Display	Home screens (multiple choice)	Overview Flow Totalizer Alarm (A1) Alarm (A2) Alarm (A3)	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
4	Settings	Display	Backlight	0% (Off) 20% 40% 60% 80% 100% (Max)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	
5	Settings	Display	Orientation	Auto 0 degree 180 degree	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
6	Settings	Display	Display auto off	Disabled 1 minute 3 minutes 5 minutes 15 minutes 30 minutes	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
7	Settings	Display	Light auto off	Disabled 5 seconds 10 seconds 30 seconds 60 seconds 120 seconds	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
8	Settings	Units	Flow	Custom		2)
9	Settings	Units	Totalizer	Custom		2), 3)
10	Settings	Filter	Dynamic filter	Off Low Medium High Very high Maximum	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
11	Settings	Filter	Averaging filter	Off Low Medium High Maximum	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
12	Settings	Resolution	Flow	0.0001 0.001 0.01 0.1 Auto 1 10 100 1000 10000	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

13	Settings	Resolution	Totalizer	0.0001 0.001 0.01 0.1 Auto 1 10 100 1000 10000	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
14	Settings		Security	Enable password	<input type="checkbox"/>	
15	Settings		Battery auto off	Disabled 15 minutes 30 minutes 60 minutes	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

- 1) If ordered for air **or** N₂ **or** O₂ and the unit is calibrated with air and all have the same operating conditions, range and dynamics, all these 3 gasses will be programmed. The gas is set default on the customer ordered gas.
- 2) The reference condition of all units under "Real and Norm" are always 0°C and 1013.25 mbara. (Both for the totalizer and flow units). The reference conditions of all "Other Units" are always defined at the time of ordering.
- 3) If no units are specified for the totalizer, it is set it the same as the main unit without the time factor. For example: l/min becomes l, kg/hr becomes kg, etc. The totalizer unit can be changed by the user anytime. See [4.11.3 Totalizer](#) and [4.12.2 Units](#).

DB04A

Thermal Mass Flowmeter for Gases without Auxiliary Power

- **pressure and temperature independent measurement**
- **range: 0,001...450 NI/min**
- **indication of flow and total consumption (totalisator integrated)**
- **compact design, no need for straight pipe runs**
- **touch display for intuitive navigation**
- **optional with valve, limit switch**
- **high accuracy +/- 1 %**
- **battery operated (AA) – no external power supply needed**



Description:

The DB04 thermal mass flowmeter is a modular system for the measurement of the flow of gases. Due to its being independent of any power supply because of its integrated battery, and its excellent cost-effectiveness, the device can replace conventional variable area flowmeters in many cases. The DB04 can be supplied in a number of versions:

As a flowmeter with an integrated regulating valve, a totaliser or with an adjustable limit switch. Depending on the medium, the device can be made of either stainless steel or aluminium.

The convenient LCD-touch display combines a clear indication with an easy and self-explanatory programming. The device operates in any position and can be easily cleaned without the need for recalibration.

Typical applications:

The DB04A measures flow rates from 0,001...0,05 NI/min to 9...450 NI/min.

The standard calibration medium is air, but a large number of other gases can be measured as well: O₂, N₂, He, Ar etc. Because of the totalisator the device can be perfectly use for consumption measurement of the gases.

Models:

DB04A.1:	Mass flowmeter, battery operated
DB04A.2:	Mass flowmeter, battery operated with integrated manual regulating valve
DB04A.3:	Mass flowmeter 24 VDC voltage supply with 3 integrated limit contacts
DB04A.4:	Mass flowmeter 24 VDC voltage supply with manual regulating valve and 3 integrated limit contacts

Technical Data:

Pressure:	0,2...11 bar abs.
Medium temperature:	0...50 °C
Media:	air, O ₂ , N ₂ , He, Ar Co ₂ H ₂ CH ₄ , C ₃ H ₈ (others on request) all devices are delivered free from oil and grease (wetted parts)
Norm conditions	0 °C, 1013 mbar, other on request
Gas/Calibration:	up to 3 Gas/calibrations (optional)
Gas connection:	G ¼ female up to 60 NI/min G ½ female up to 450 NI/min
Accuracy: (air)	+/- 2 % of full scale, > 200 NI/min: +/- 3 % of full scale optional: +/- 1 % of full scale (up to 50 NI/min)
Dynamic: (measuring range)	1:50, optional 1:100 (up to 50 NI/min)
Response time:	500 ms
Repeatability:	+/- 0,5 % of measured value
Power supply:	standard battery AA micro-USB supply optional: external supply 12...30 VDC (max. 200 mA) (standard at devices with limit switch) 2 m cable
Display:	touch display 128x64 px background light (not at battery operated use)
Units/scale:	free selectable
Password protection:	for menu available
Installation position:	up to 5 bar: any from 5 bar: horizontal
Limit output:	potential-free changer (24 V, 1 A)
Function:	MIN or MAX-alarm, switching point, delay, hysteresis programmable
Protection class:	IP50

Alarm contacts:

3 alarm contacts: 2 N/O:	max. current: 0,5 A max. voltage: 30 VDC
1 SPDT:	max. current: 1 A max. voltage: 30 VDC
power supply:	12...30 VDC, with reverse-pole protection
2 optical separated input channels:	voltage range: 5...30 VDC, at 5 mA max.
Including 2 m cable connection	

Measuring ranges for air and dimensions:

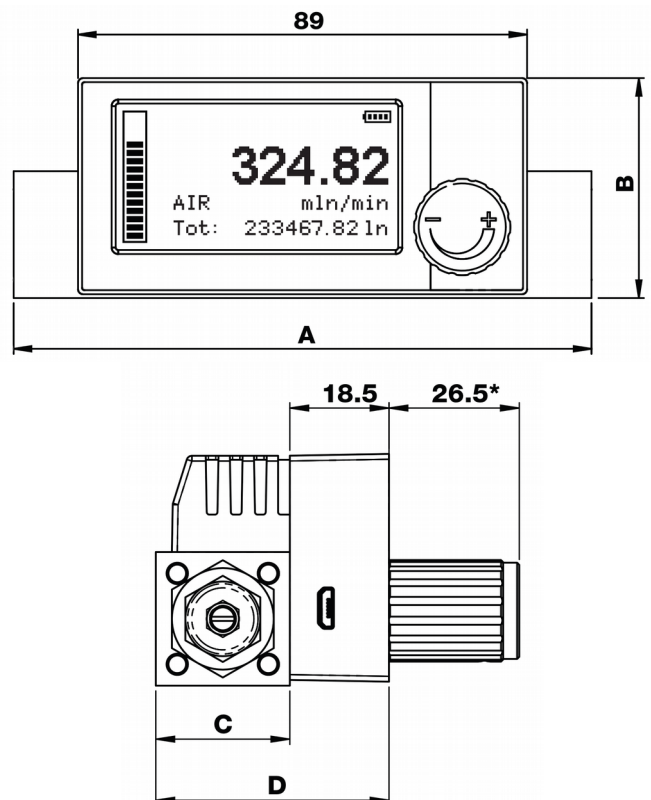
(Standard accuracy and dynamic)

Range [NI/min]	Connec- tion [G female]	A [mm]	B [mm]	C [mm]	D [mm]
0,001...0,05	1/4	114	44	25	44
0,004...0,2	1/4	114	44	25	44
0,01...0,5	1/4	114	44	25	44
0,04...2	1/4	114	44	25	44
0,1...5	1/4	114	44	25	44
0,4...20	1/4	114	44	25	44
0,8...40	1/4	114	44	25	44
1...60	1/4	114	44	25	44
2...100	1/2	160*	54	35	54
4...200	1/2	160*	54	35	54
6...300	1/2	160*	54	35	54
9...450	1/2	160*	54	35	54

relating to 0 °C and 1013 mbar

* 270 with flanged hand valve

Dimensions:



Materials:

- DB04A.x.x.A:** housing made of aluminium, anodised,
sensor made of PBT, sealing made of FKM
- DB04A.x.x.E:** housing made of st.st 1.4404,
electropolished,
sensor made of PBT, sealing made of FKM

Options:

- special measuring ranges
- other media as air, Nitrogen, Oxygen
- sealings EPDM
- power supply 24 VDC for DB04A.1./2.
- high accuracy +/- 1 % of f.s., dynamic: 1:100
- up to 3 types of gases calibrated
- calibration certificate

G 1/4 female connection with regulating valve



G 1/2 female connection, with flanged regulating valve



G 1/4 female connection, without regulating valve



Order Code:

Order number: **DB04A. 1. 01. A. B. L.**

Thermal mass flowmeter for gases

Models:

- 1 = flowmeter
- 2 = flowmeter with manual regulating valve
- 3 = flowmeter and controller
(3 alarm contacts, only with 24 VDC)
- 4 = flowmeter and controller with manual
regulating valve
(3 alarm contacts, only with 24 VDC)

Measuring range (air, 0 °C, 1013 mbar):

- 1A = 0,001...0,05 Nl/min, G 1/4 female thread
- 01 = 0,004...0,2 Nl/min, G 1/4 female thread
- 02 = 0,01...0,5 Nl/min, G 1/4 female thread
- 03 = 0,04...2 Nl/min, G 1/4 female thread
- 04 = 0,1...5 Nl/min, G 1/4 female thread
- 05 = 0,4...20 Nl/min, G 1/4 female thread
- 5A = 0,8...40 Nl/min, G 1/4 female thread
- 06 = 1...60 Nl/min, G 1/4 female thread
- 07 = 2...100 Nl/min*, G 1/2 female thread
- 08 = 4...200 Nl/min*, G 1/2 female thread
- 09 = 6...300 Nl/min*, G 1/2 female thread
- 10 = 9...450 Nl/min*, G 1/2 female thread
- S = special measuring range

Material

- A = aluminium housing, valve made of brass
- E = st. st. 1.4404 housing, valve made of st. st.

Options:

- B = battery powered
- V = voltage supply 24 VDC
- E = gasket EPDM
- G = higher accuracy +/- 1 % of FS,
dynamic: 1:100 (up to 50 Nl/min)
- 3 = calibration for up to 3 different gases
- M = Multigas option (duplicate of a programmed curve for air,
Nitrogen or Oxygen)
- 9 = please indicate in writing

Medium:

- L = standard-medium: air
- N = standard-medium: N₂
- O = standard-medium: O₂
- H = Helium He
- W = Hydrogen H₂
- A = Argon Ar
- M = Methane CH₄
- P = Propane C₃H₈
- S = other media (please indicate in writing)

* manual control valve flange mounted

For technical configuration of the control valve please indicate the inlet and outlet pressure

If required a calibration certificate is available.