



Thermal Mass Flow Meters and Manual Controllers for gases.

red-y compact series operating instructions (For serial number >300000)

Operating instructions

red-y compact series (Serial Number >300000)

red-y compact meter GCM

red-y compact manual controller GCR



Version: *red-y compact* series EN A1-7

For the latest information on our products, see our website at www.voegtlin.com or www.vogtlinusa.com

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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 *red-y* 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

Vögtlin Instruments AG 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

red-y is a Registered Trademark of Vögtlin Instruments AG. 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 one of Vögtlin Technical Support Centres:

E-mail Customer Service:

service@voegtlin.com

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, 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 *red-y compact 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 your sales partner if you have questions about any aspect of the products.

The *red-y compact* is a thermal based mass flow meter that can measure the mass flow of gases. The core element of the red-y 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 red-y compact 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 throughout 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)
- ⇒ 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 *red-y compact* 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

Each delivery includes a CD-ROM with the manual in PDF format.

However, we recommend to visit our website where you can see the latest version of the manual and, if available, the latest firmware version for the *red-y compact*.

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 *red-y* 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.

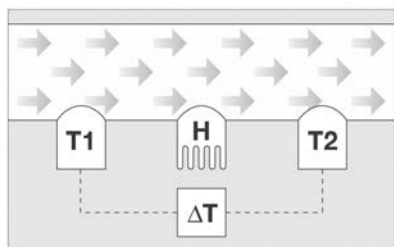


Figure 1: The measurement principle

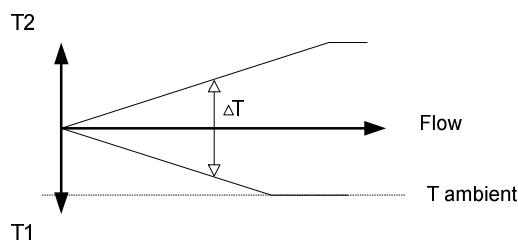


Figure 2: Sensor signals

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.

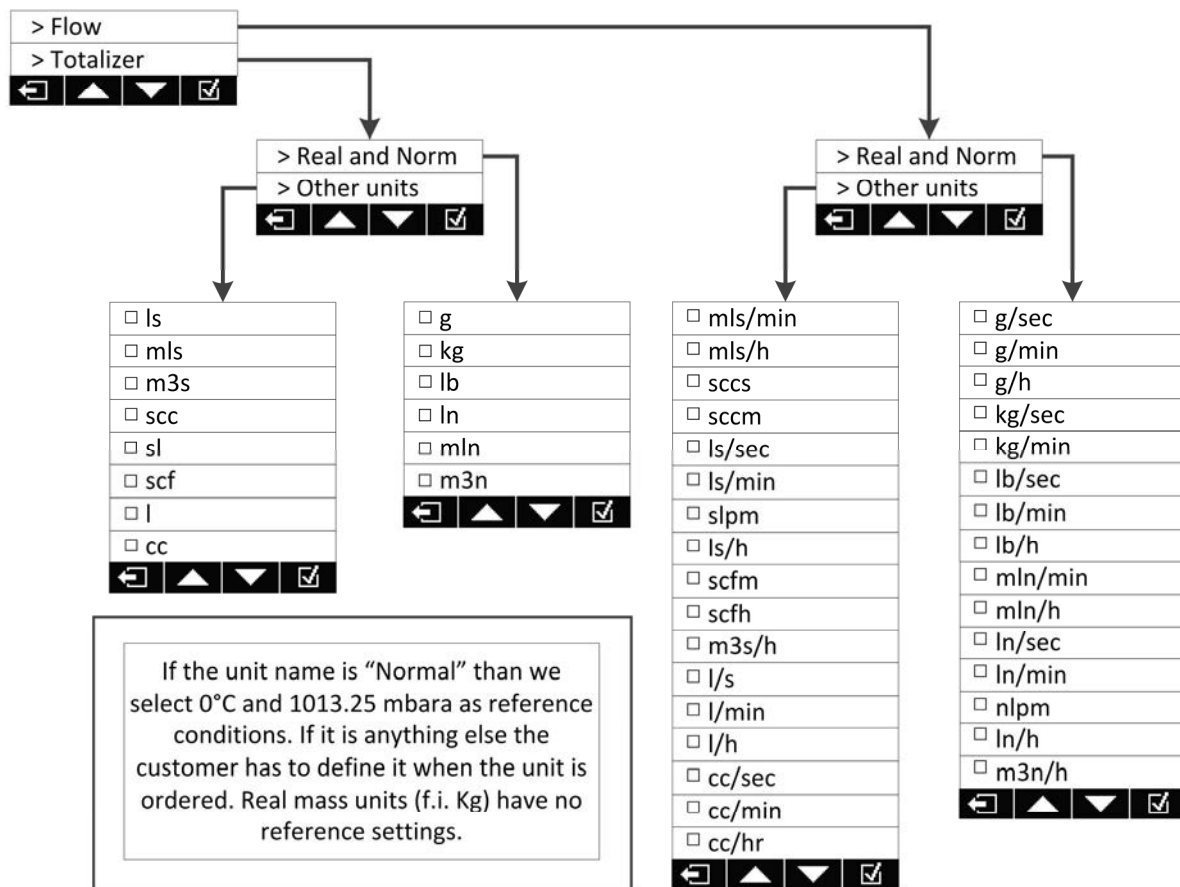
The sensor T1 at the inlet is cooled by the gas flowing past it, and the temperature of the second sensor T2 rises due to the heat drawn from the heating system.

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 *red-y compact* 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”



The *red-y compact* 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 ln/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 *red-y compact* 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 *red-y compact* because it is volume. The *compact* 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 *red-y compact* 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 *red-y compact*. 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 *red-y compact*. 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 mbar absolute. 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.

1.16 CMOS technology

The *red-y* 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.

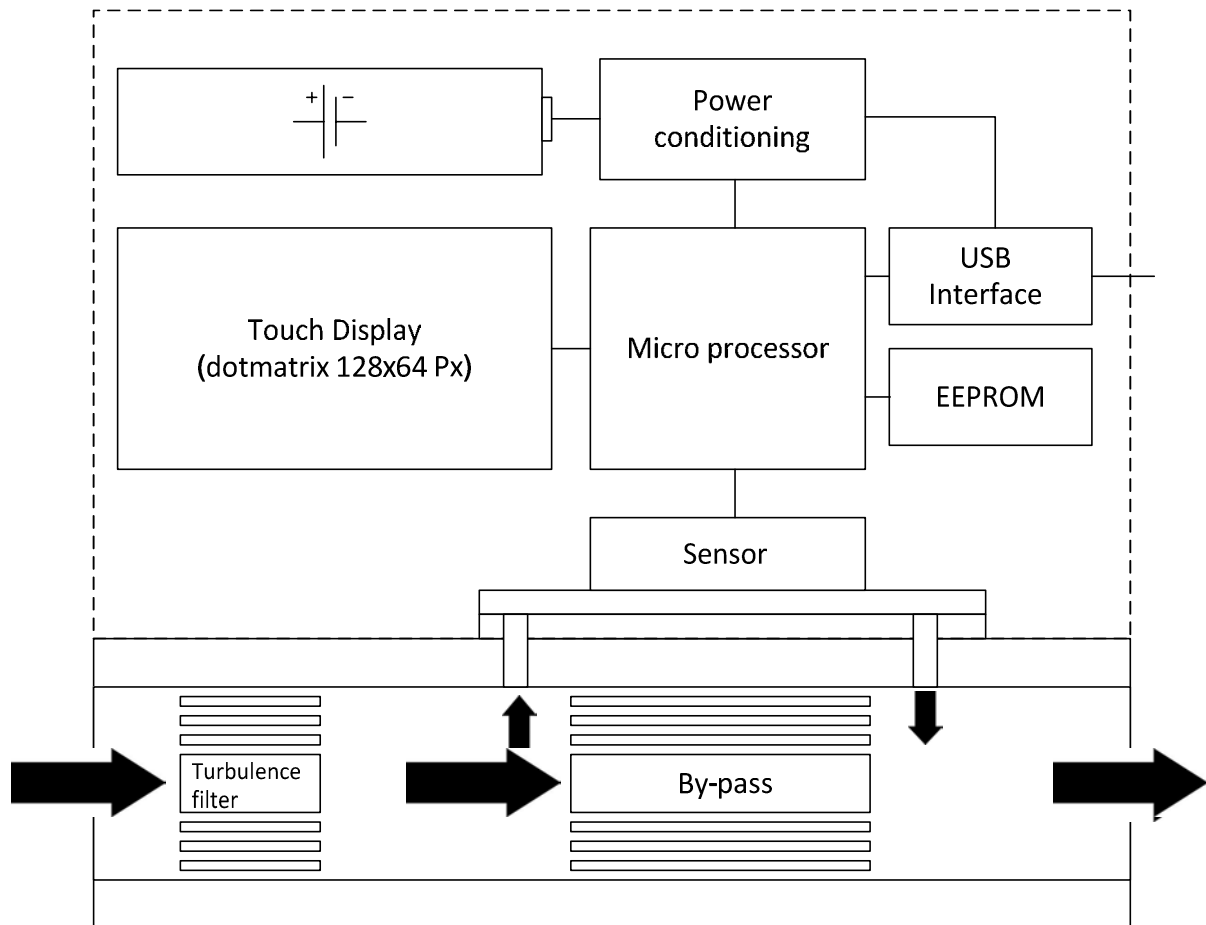


Figure 3: Block diagram

2. General device specifications

Media (real gas calibration):	Air, O2*, N2*, He, Ar, CO2, H2, CH4, C3H8 (other gases and gas mixtures on request)
*O2 & N2 are calibrated with air.	
Accuracy:	
Eco:	±2.0% of full scale; Ranges > 200 l/min ±3.0% of full scale
Special:	±1.0% of full scale (only G1/4" instruments and real gas calibrations)
Dynamics:	
Eco:	1:50 (signal suppression less than 1.7% of full scale)
Special:	1:100 (signal suppression less than 0.83% of full scale)
Response time:	500 ms (Application dependent)
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 N2) < 0.014% / psi of reading (typical N2)
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 compatible)
Wetted parts:	See appendix (See 6.15)

Integration

Display:	Touch display 128x64 px Backlight only with external power supply (Micro-USB or 24 Vdc)
Process connection:	G1/4" (BSPP* female) up to 60 l/min, G1/2" (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 compact will be mounted vertical)
Connection cable:	For external power supply: 2 m with loose ends (fly leads)

2.10 Safety

Safety	
Test Pressure:	16 Bara (232 psia)
Leak rate:	1×10^{-6} mbar·l/s He
Protection class:	IP-50
EMC	EN 61326-1

2.11 Electrical data

Supply voltage:	Power supply <i>red-y compact</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 *red-y compact* has 4 different flow elements. Each element has a defined operating range that can be defined during calibration. The flow ranges selectable below are for air/O₂ and N₂ only. For other gasses consult the factory.

	Type	Measurement full scale (air), scale freely selectable	
compact meter GCx:	GCx-A	from 50 mln/min	to 600 mln/min
	GCx-B	from 600 mln/min	to 6000 mln/min
	GCx-C	from 6 ln/min	to 60 ln/min
	GCx-D	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 *red-y compact*). It is not possible to read data from the flow meter through the USB connection.

2.14 Battery

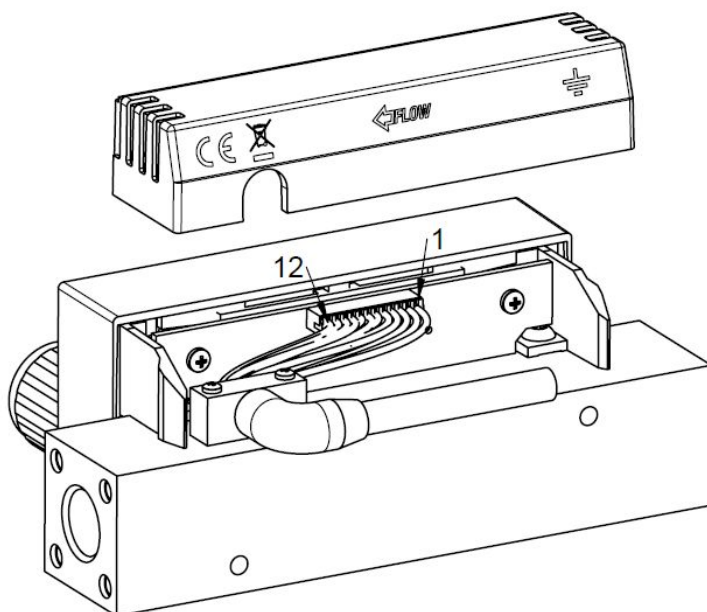
The battery operated compact can operate on any common AA battery. The lifetime is strongly dependent on the usage and the quality of the battery. In general we can state that the battery lasts for about 3-6 months under non-continuous use.

We recommend to use external power (USB micro-B or 24 Vdc) if you 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 (See Chapter [4.12.5 Bat auto off](#))

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

2.15 External Power Module

As an extra option you can purchase a power supply module that, if provided with a voltage from 12 to 30 Vdc, will power the unit. This unit comes with a 2 meter cable. The Module is mounted similar to the battery module (see [3.16 How to replace the battery?](#))



1 red PWR+
2 black PWR-

The numbers 1 and 12 on the drawing only refer to the connection location and identification. The power is connected to connections 1 (+ red wire) and 2 (- black wire)

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 or at a Vögtlin certified calibration center. Please note that the so-called K-factors as used in the traditional capillary MFM/MFC cannot be used for CMOS mass flow meters. Please contact the factory 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](#) you find the pressure drop for the most common gases. Your sales partner 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 *red-y compact* 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 CMOS sensor itself has a very fast response time of 50 ms. However to save energy the frequency of measurements is brought down. On average the response time is approximately 500 msec. The filter settings will also influence the response time.

2.22 Filter settings

The filter settings smooth the reading of the flow. It can be set through the set-up menu. The filter is basically a floating average filter (also referred to a boxcar filter). It takes a defined number of readings and calculates the average. At high filter settings, more readings will be taken into the average. Higher filter settings will also 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)

3. Installation and commissioning

3.10 Scope of delivery

We ship the device with the following accompanying documentation:

- ⇒ With each device, 1 factory calibration certificate per ordered calibration
- ⇒ With each device, final inspection report
- ⇒ With each device, USB cable + 1 x AA battery (if battery powered)
- ⇒ With each shipment, 1 CD-ROM with manual(s) + Quick Start Guide

3.11 Mounting position and mounting location

We always recommend a horizontal mounting position. This can be upright, sideways or upside down. With a vertical mounting position, dependent on the type of gas and at gauge pressures above 5 bara (72 psia, 500 kPa(abs)), a zero-point offset can develop. 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](#))
- ⇒ 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

You can order a wide range of process fittings and adapters for the compact. Some compression fittings are available with an internal 50µ filter (see more information below) Please contact your local distributor for more details.

 Please note that the length of the tread on your 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.

Types

Part No.	Type/Connections	Material
328-1001	G $\frac{1}{4}$ " to 6 mm	Stainless steel, FKM
328-1002	G $\frac{1}{4}$ " to $\frac{1}{4}$ "	Stainless steel, FKM
328-1003	G $\frac{1}{4}$ " to 12mm	Stainless steel, FKM
328-1004	G $\frac{1}{4}$ " to $\frac{1}{2}$ "	Stainless steel, FKM



Pressure loss (air)

Flow rate	Pressure loss G $\frac{1}{4}$ "	Flow rate	Pressure loss G $\frac{1}{2}$ "
5 l/min	2.2 mbar	50 l/min	5 mbar
20 l/min	25 mbar	100 l/min	10 mbar
40 l/min	85 mbar	200 l/min	30 mbar
60 l/min	180 mbar	300 l/min	70 mbar
		400 l/min	140 mbar

Installation

The fittings are 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.

For more information, see the data sheet for the fittings.

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 *red-y compact* 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 is an optional module 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 *red-y compact* flow meter.

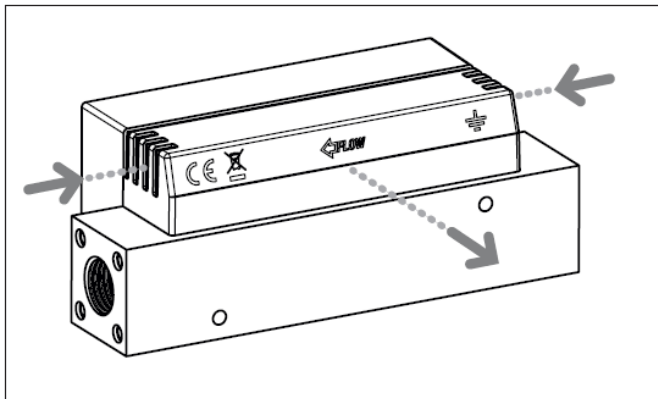
It is also possible to use rechargeable batteries, but the unit will however not charge the battery if powered by the USB micro-B.

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)

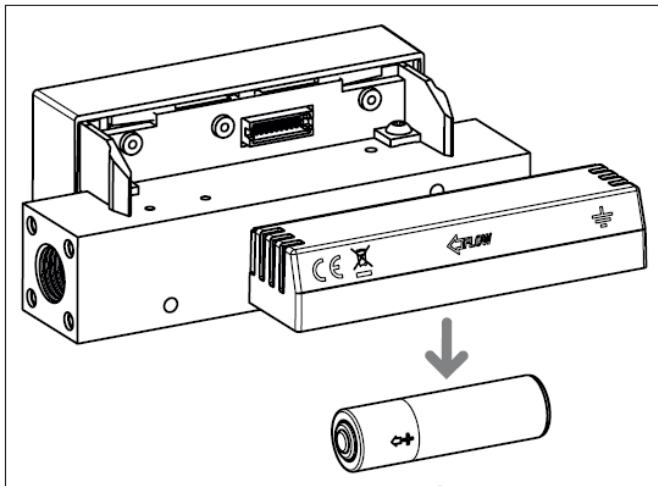
There is no need to remove the battery if you connect the USB power supply. When you run the unit on power from the USB micro-B and have a battery inserted, you can remove the USB connector and the battery automatically takes over.

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.

3.16 How to replace the battery?



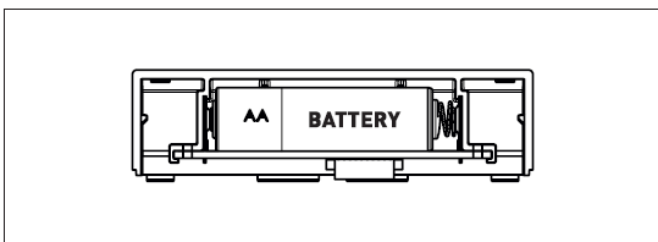
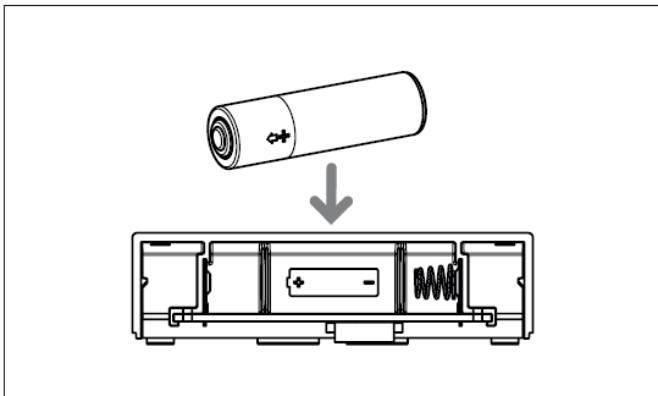
The battery is in plastic compartment mounted above the body and connected to the main display/electronics housing. This plastic part has 3 notches on each side. With one hand hold the housing on the sides of the display and with your other hand grab the side where the plastic notches are located. Pull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

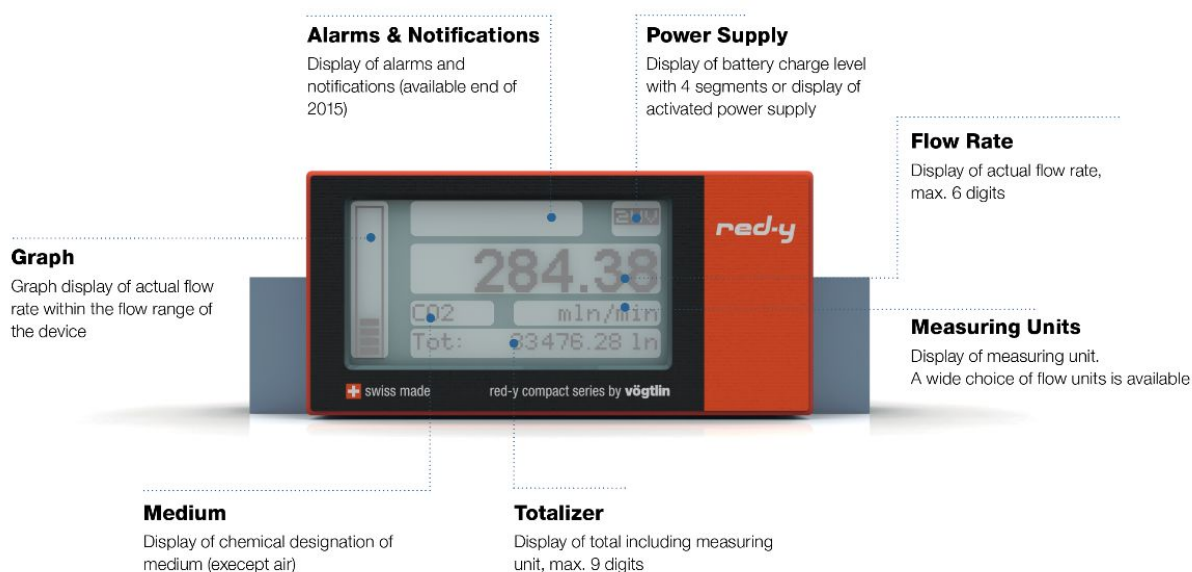
The display has a backlight that only operates if the unit is powered by an external power source.

To start the unit, insert a battery or connect an external power supply. 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

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 if the unit is running on battery or 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.

The resolution of the numbers is automatically adjusted and cannot be set by the user.

4.10.2 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. (99999999)

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](#)

4.10.3 Home screens and Menu access

The *red-y compact* has 3 different “home screens”:

- Overview: Shows flow + flow totalizer + bar graph
- Flow: Shows flow in big digits
- Totalizer: Shows the totalized flow in big digits

You can switch between the three home screens by touching the screen for less than one second. It is possible to switch off two of the three screens with the display menu.

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.

If you have the password activated, you have to enter your passcode before you have access to the Main menu ([See 4.12.4 Security](#)).



4.10.4 Buttons and selection

Each menu has a name (See top inverted bar) and on the upper right you see 2 numbers (example 1/4). 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



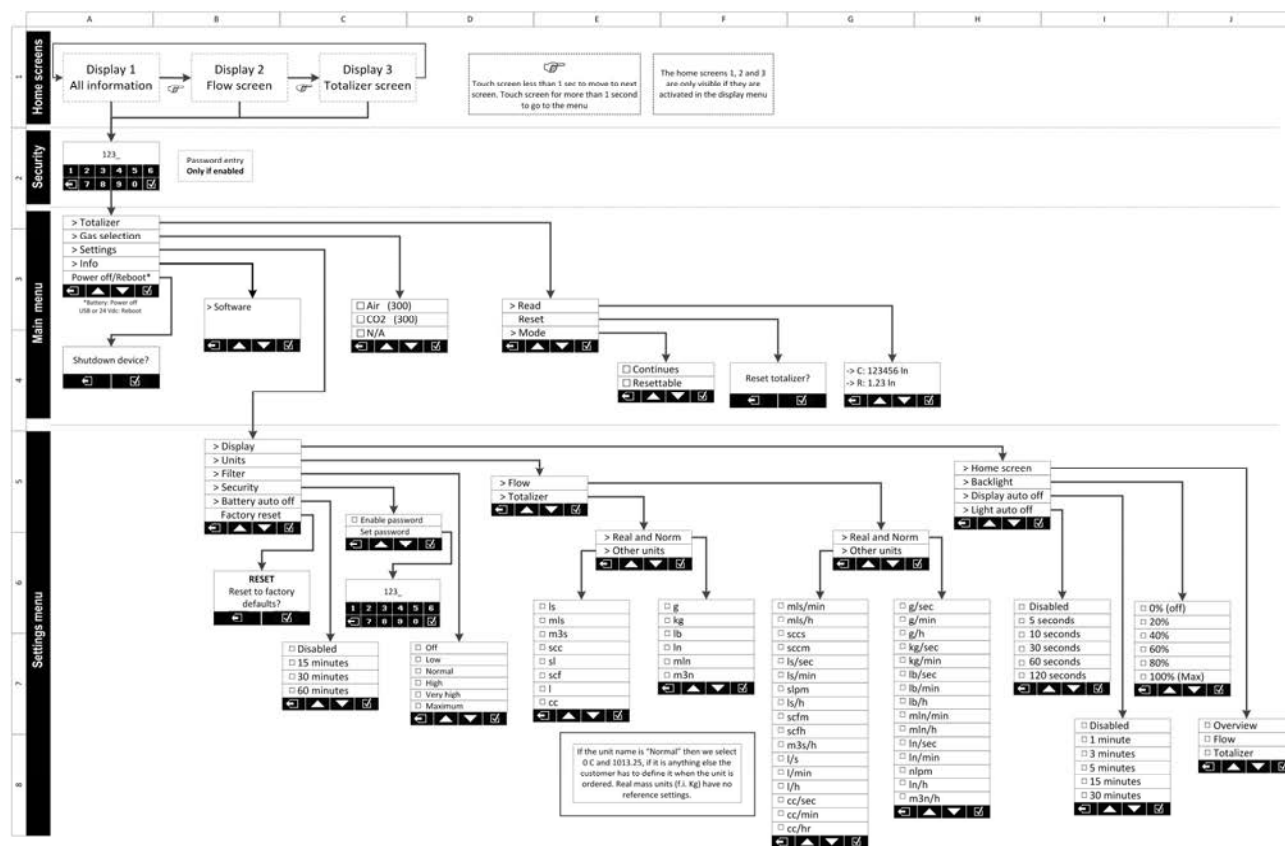
Up/down: increase/decrease (you can also select a menu item by touching the relevant line)



Select/confirm: Store selected value

4.11 Main Menu

Below is an overview of the menu structure and a full page version can be found on the last page of this manual.



4.11.1 Main Menu

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

In the main menu you have access to the totalizer settings, gas selection, settings and you can switch the unit off if battery powered. (Only the battery powered device can be switched off)

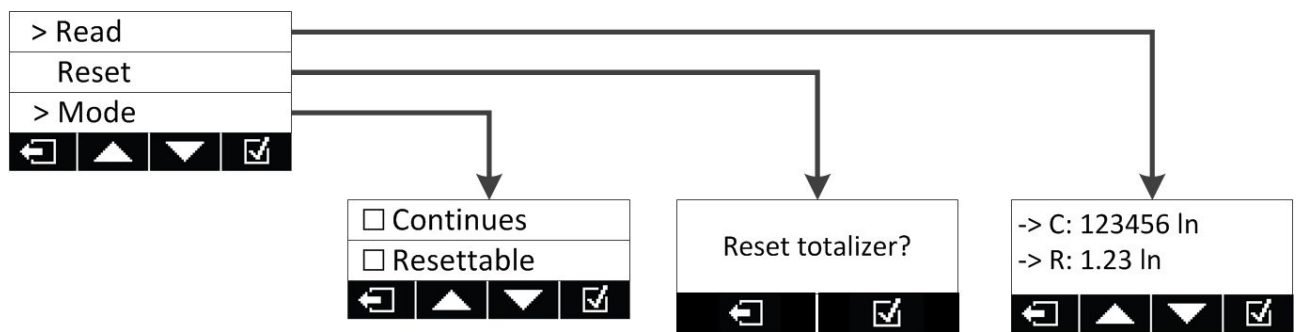
4.11.2 Totalizer

The totalizer calculates how much gas has totally passed through the flow meter based on the measured flow and the factor time. The *red-y compact* has 2 totalizers. Each can display a maximum of 8 digits. The totalizer value will be stored internally as a 64-bit floating point variable. 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, infinitely. The totalizer value is 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.

Please note that if the flow rate exceeds the full scale of the unit (overflow), the totalized value will not be correct. It will not totalize excess flow.

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 m3n or kg) ([See 4.12.2](#))



Read: Read the totalizer (in-case you only activated the flow screen)> Please note that the arrows in this screen are not active. Only the return key works. This will be corrected in an upcoming firmware version.

Reset: Reset the resettable totalizer to zero

Mode: Under the Mode you can select if you want to read the continuous or resettable totalizer.

4.11.3 Gas selection

<input type="checkbox"/> Air (300)
<input type="checkbox"/> CO2 (300)
<input type="checkbox"/> N/A
← ▲ ▼ ✓

The *red-y compact* 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. These values are expressed in l/min.

4.11.4 Settings

> Display
> Units
> Filter
> Security
> Battery auto off
Factory reset
← ▲ ▼ ✓

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

4.11.5 Info

When you select "software" under the Info menu you can see the current firmware version and the date that this version was released.

4.11.6 Power off

Shutdown device?
← ✓

Only available if the unit is powered by a battery: In this menu you can confirm if you really want to switch the unit off. You can switch the unit on again by touching the display for 3 seconds.

4.12 Settings

> Display
> Units
> Filter
> 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 screen
> Backlight
> 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

There are 3 different home screens (See [4.10.3 Home screens](#)) and in this menu you can de-activate one or two of the home screens.

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 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.

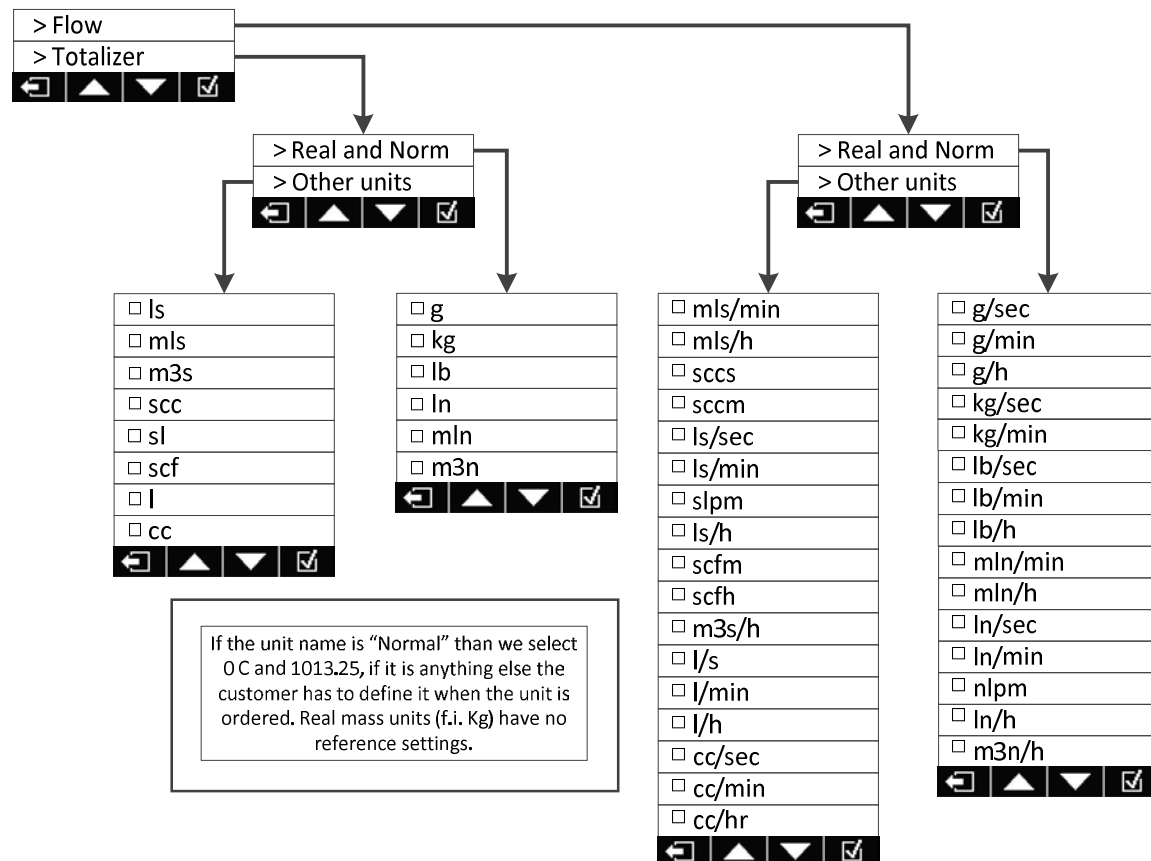
4.12.1.4 Light auto off

<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. (No backlight on battery power)

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 99999999.

More information in [4.10.2 Alarms and notifications](#)

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

4.12.3 Filter

<input type="checkbox"/> Off
<input type="checkbox"/> Low
<input type="checkbox"/> Normal
<input type="checkbox"/> High
<input type="checkbox"/> Very high
<input type="checkbox"/> Maximum

With the filter 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](#)

4.12.4 Security

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

123_					
1	2	3	4	5	6
←	7	8	9	0	✓

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 "Modify password"

If you forget or lose your password, please contact the factory at:

service@voegtlin.com

4.12.5 Bat auto off

<input type="checkbox"/> Disabled	
<input type="checkbox"/> 15 minutes	
<input type="checkbox"/> 30 minutes	
<input type="checkbox"/> 60 minutes	
← ▲ ▼ ✓	

To extend the battery life to the maximum we recommend that you set this menu so that, when powered with a battery, the *red-y compact* 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

4.12.6 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, *red-y compact* 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 *red-y compact* 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 *red-y compact* 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 your sales partner at the next opportunity.

Flow splitter disassembly

If the basic body has become contaminated, the flow splitter can be removed. The removal should only be done by trained service personnel. Removal and Assembly can potentially shift the calibration of a unit. Disassembly is different for the different device types:

Note: The fourth letter of the article code defines the type of the flow splitter. For example: GCM-B9EA-BB20 contains a flow splitter of the type B.

Type A

- ⇒ First release the slotted screw in the center of the flow splitter (Left tread, approx. 5 turns)
- ⇒ Unscrew the whole flow splitter with a hex key

Type B, C

- ⇒ Unscrew the whole flow splitter with a hex key

Type D (G 1/2")

- ⇒ First unscrew the locking pin (underside of the body) with a hex key
- ⇒ Unscrew the flow straightener with a suitable tool
- ⇒ Pull the flow splitter out of the body

Flow splitter assembly

- ⇒ Carry out the steps described above in reverse order
- ⇒ After correct assembly flush *red-y* with dry inert gas.
- ⇒ Check that the cleaned measuring device is functioning correctly by checking the zero point and some defined measurement values.

Recalibration

It is mandatory to recalibrate the instrument after replacing the flow splitter.

5.12 Returns

When returning a *red-y compact* 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: USA: service@vogtlinusa.com, Asia: service@vogtlin.cn, Rest of the world: service@voegtlin.com



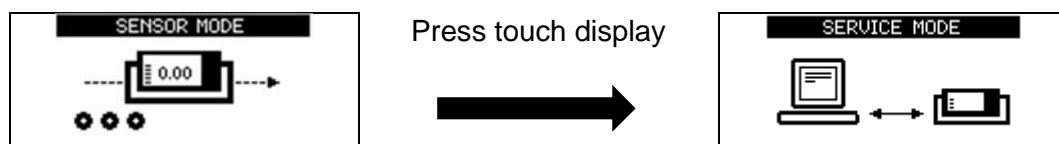
Note:

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. ([Appendix 6.16](#))

5.13 Firmware upgrade

Vogtlin continues to improve and add features to the firmware of this instrument. Firmware updates are available free of charge on our website www.voegtlin.com or www.vogtlinusa.com. Register as user on our website to get notified on any future firmware updates.

To perform a firmware update the instrument must be started in service mode. To enter service mode, restart the instrument and keep the touch display pressed for about 4 seconds while the startup screen is showing (see picture below). When done, connect the instrument via USB to a PC.



Download the firmware update file and firmware update software which is available on our website. Install and start the firmware update software on your PC and follow the instructions to perform the firmware update. Do not disconnect USB cable during the firmware update. Once the firmware update is finished, the instrument automatically restarts using the updated firmware.

To leave service mode without performing a firmware update, keep the touch display pressed for about 6 seconds. This will power-off (on battery supply) or restart (on cable power supply) the instrument without replacing its current firmware.

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 your sales partner.

If you are planning to return a product, please refer to the chapter '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'.

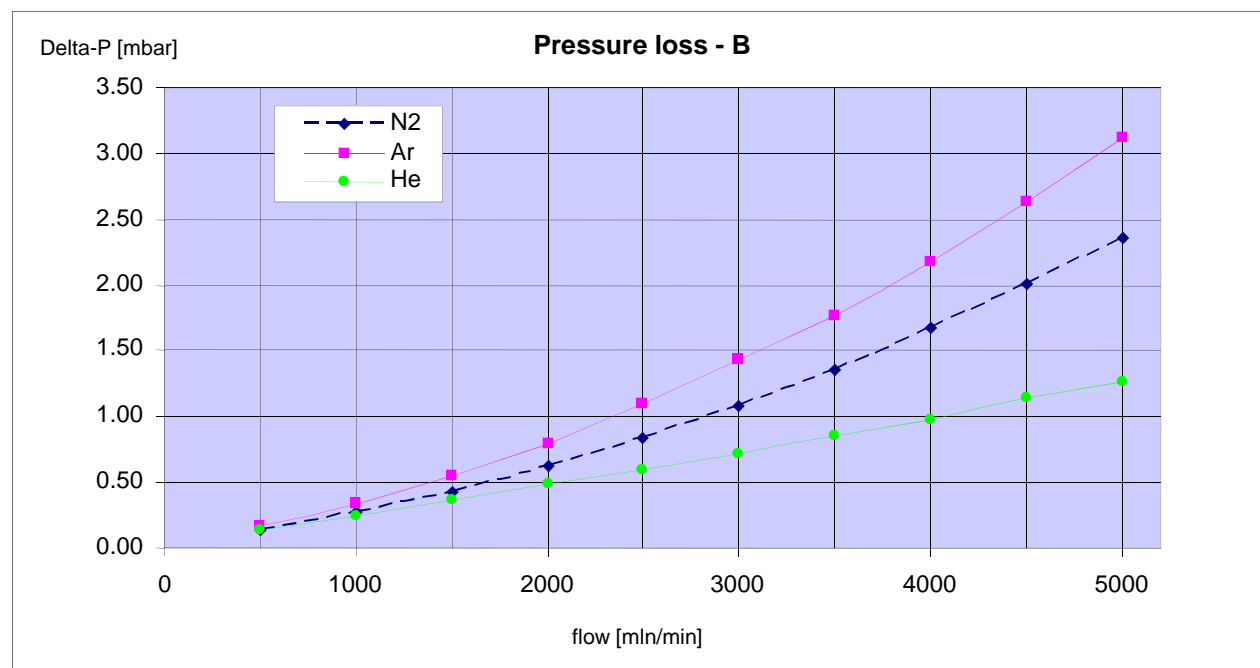
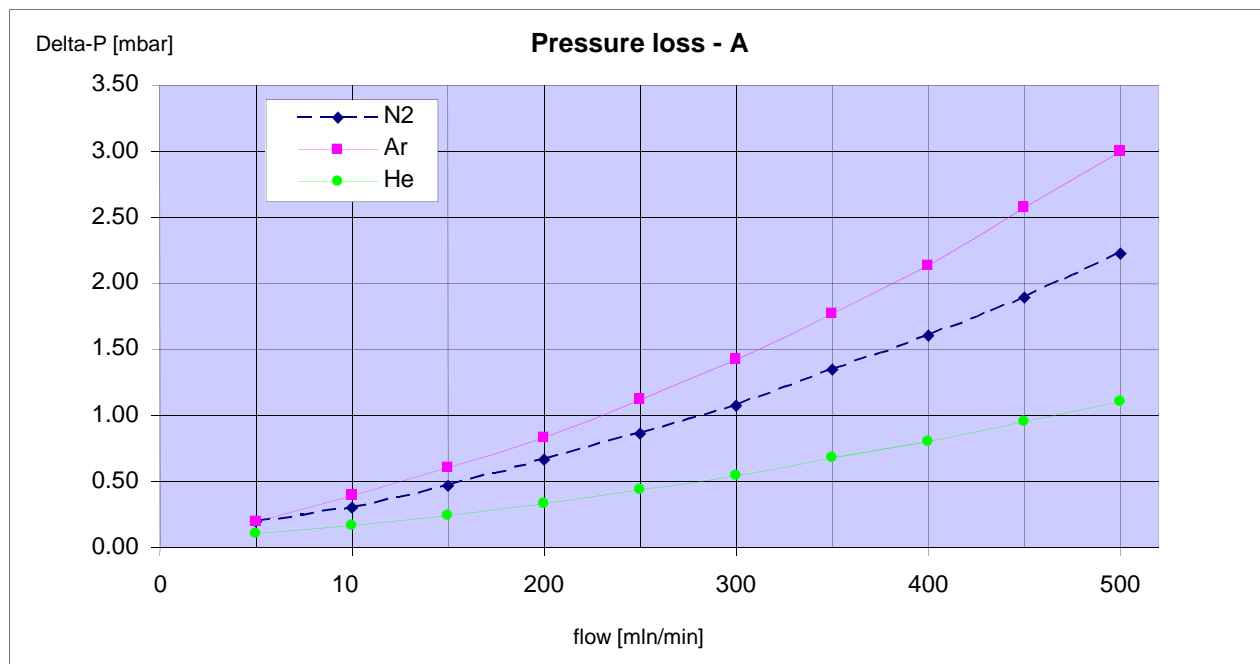
Error	Possible causes	Measures
Output indicates high flow continuously	Flow is too high (Overflow)	Reduce the flow rate. If necessary, the full scale can be extended. Please consult your sales partner
	Device is heavily contaminated	Please consult your sales partner
	Sensor faulty	Please consult your sales partner
Flow is shown despite zero flow.	Sensor contaminated	Please consult your sales partner
	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 your sales partner
	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
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 your sales partner.
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 your sales partner
Totalizer shows 99999999	Overflow totalizer units	Select a different unit (try m3n or kg)

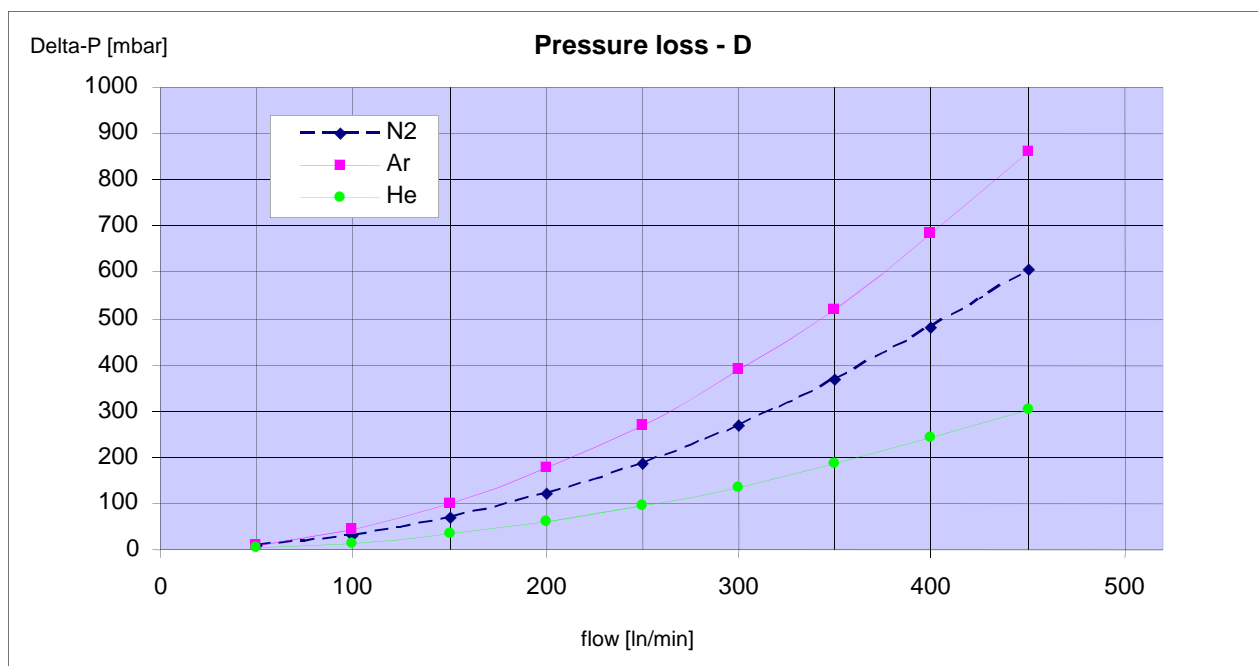
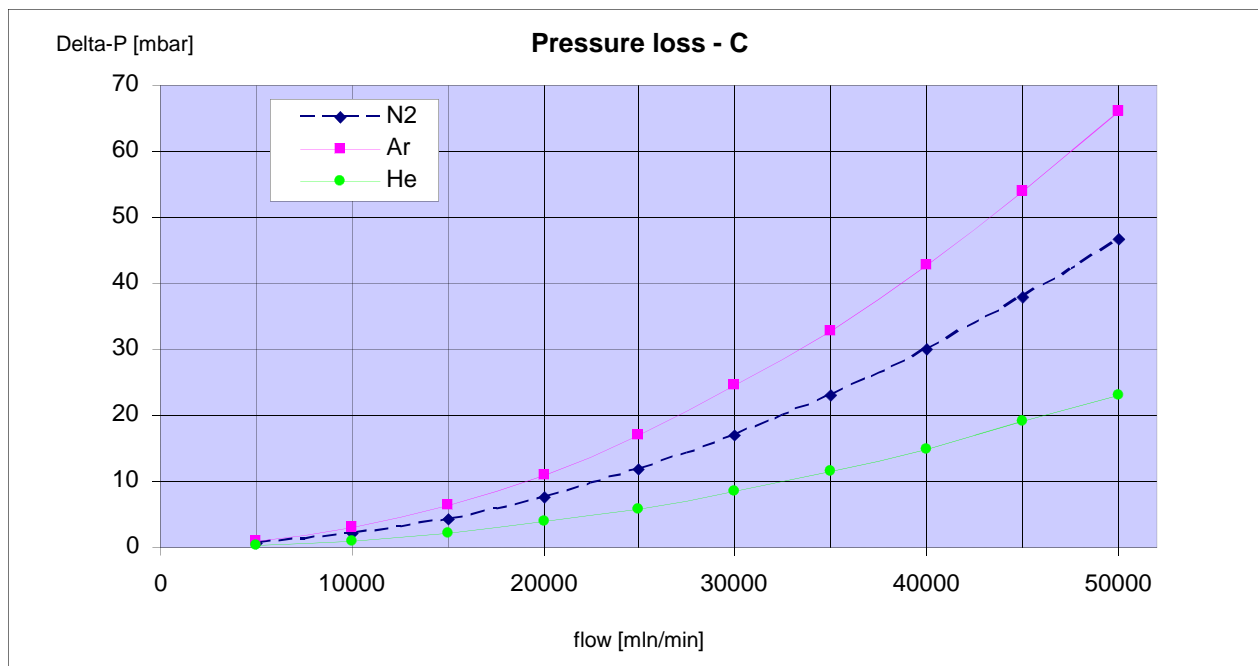
If you need any support please contact us by e-mail through Customer Service:

service@voegtlin.com

6.11 Pressure loss

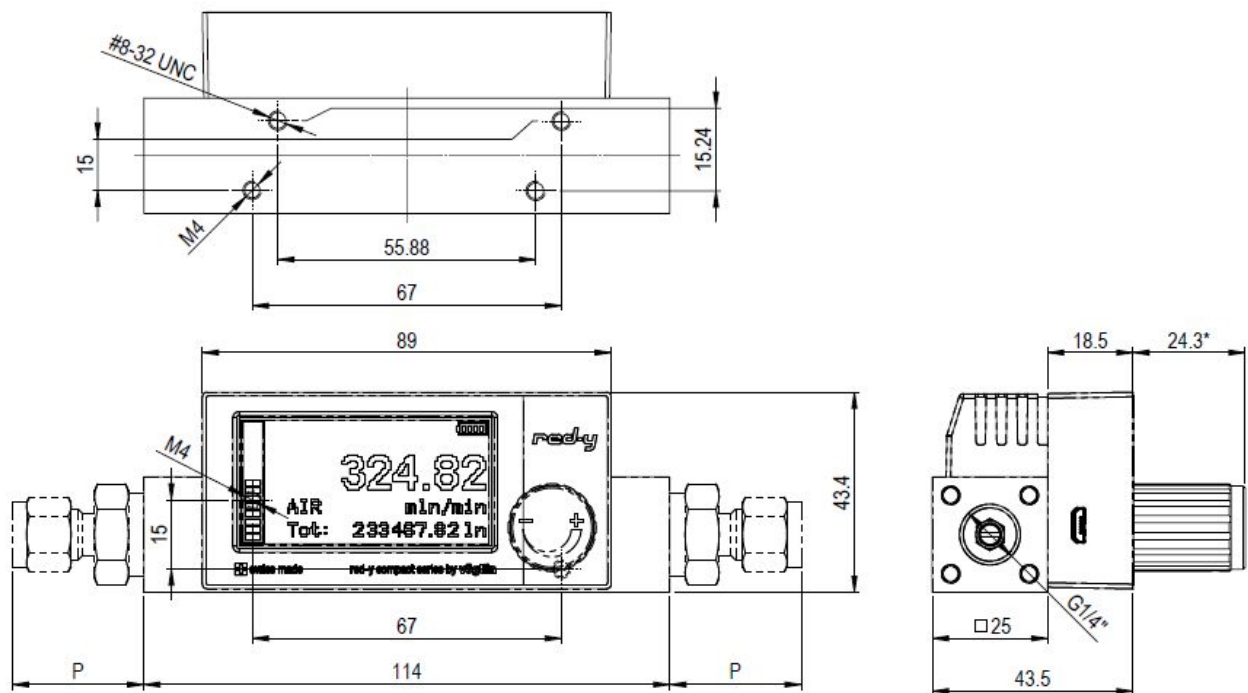
The following figures show the pressure drop of a *red-y compact* (measuring instrument) Type A, B, C, D relates to the built-in *red-y compact* flow divider.



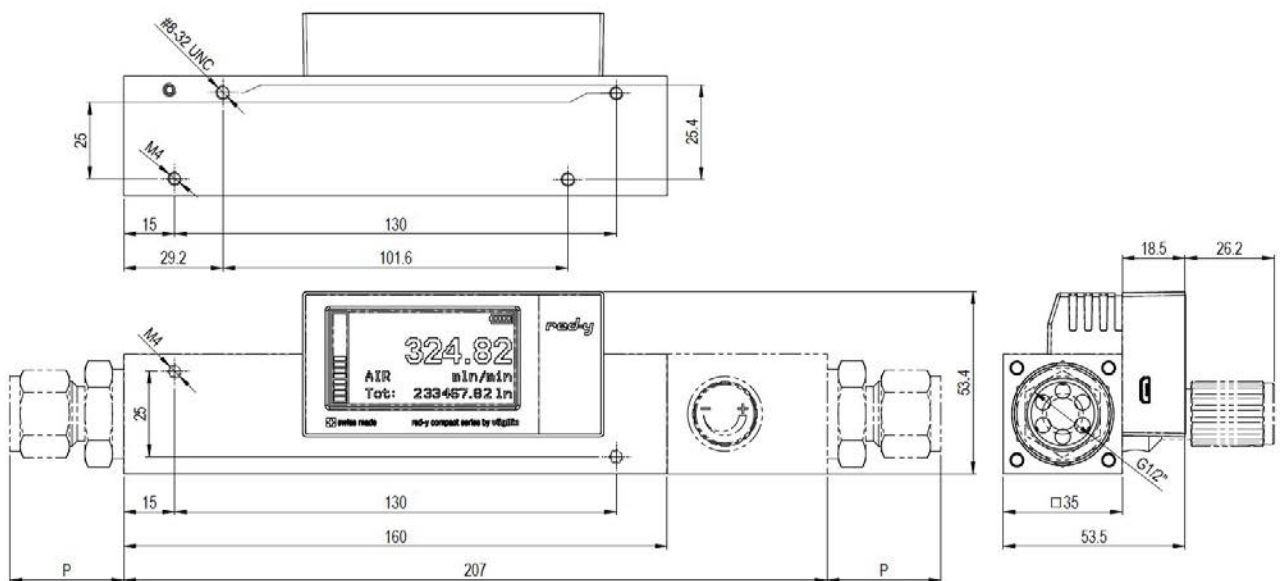


6.12 Dimensional drawings in mm

GCx-A/B/C:

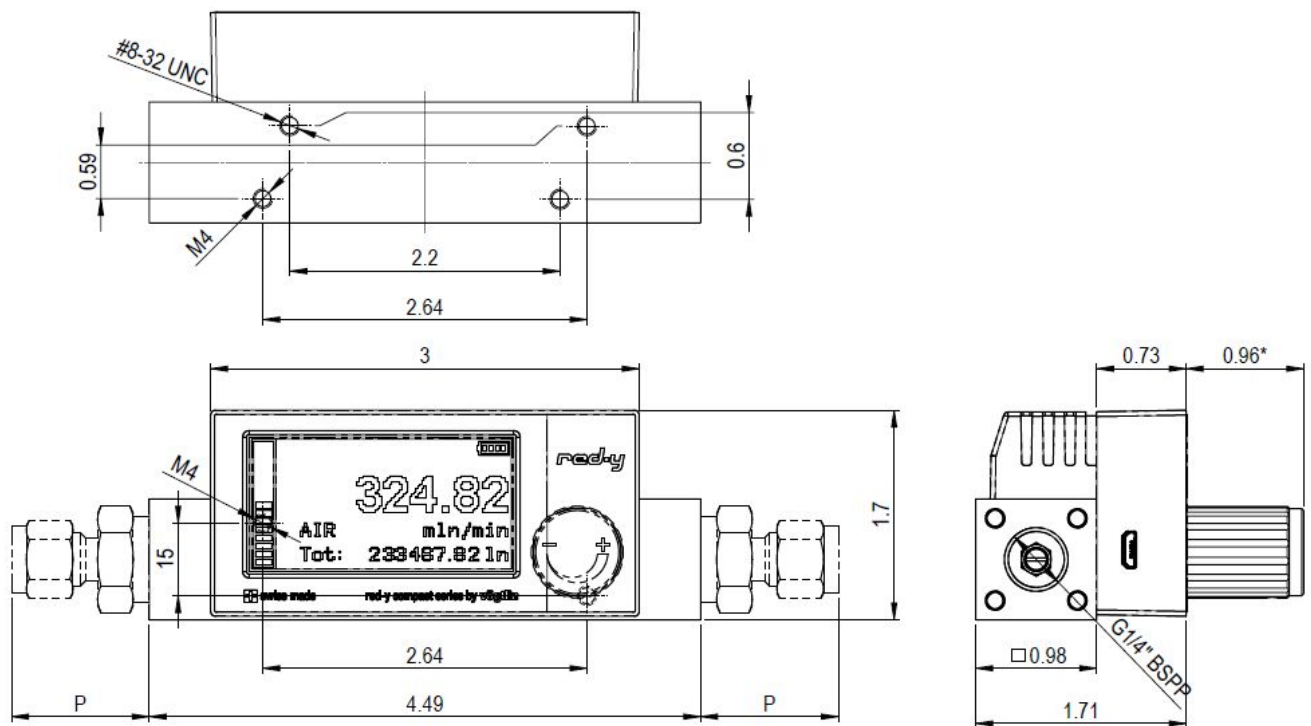


GCx-D:

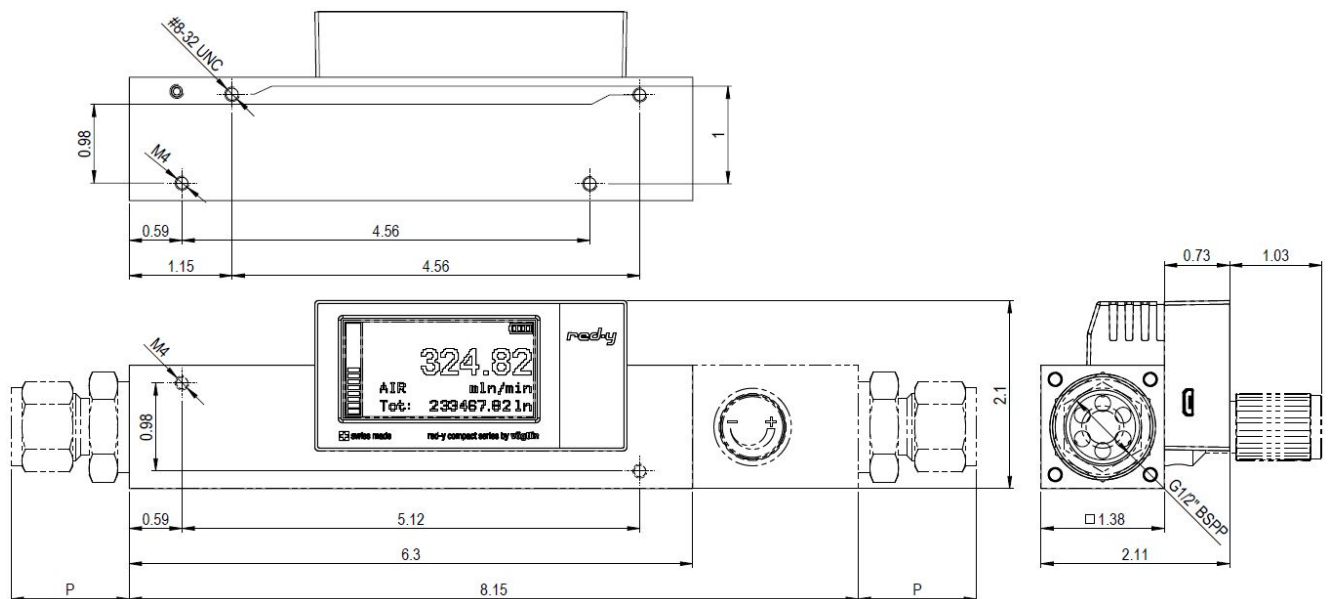


6.13 Dimensional drawings in inches

GCx-A/B/C:



GCx-D:



You can find detailed information for the individual products on our homepage www.voegtlin.com or www.voegtlinusa.com.

If additional information is needed, please consult your sales partner. The contact list for our distributors can be found on our website.

6.14 Type code overview

[illegible]

6.15 Wetted parts *red-y compact series*

Instrument Gerät	red-y compact 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.

6.16 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:	

6.17 Overview Default settings

No.	Group	Subgroup	Name	Options	Default	Remarks
1	Main menu		Totalizer Mode	Continues Resettable	<input type="checkbox"/> <input checked="" type="checkbox"/>	
2	Main menu		Gas selection	Lut 1 Lut 2 Lut 3	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1)
3	Settings	Display	Home screens (multiple choice)	Overview Flow Totalizer	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" 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	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"/>	
6	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"/>	
7	Settings	Units	Flow	Custom		2)
8	Settings	Units	Totalizer	Custom		2), 3)
9	Settings		Filter	Off Low Normal High Very high Maximum	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
10	Settings		Security	Enable password	<input type="checkbox"/>	
11	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. (Lut = gas storage lookup table)
- 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: In/min becomes In, kg/hr becomes kg, etc. The totalizer unit can be changed by the user anytime. See 4.11.2 and 4.12.2.

6.18 CE Declaration of Conformity

flow technology by **vögtlin**



Konformitätserklärung *Declaration of Conformity*



Vögtlin Instruments AG
Langenhagstrasse 1
CH-4147 Aesch

Wir erklären in alleiniger Verantwortung, dass die Produkte auf welche sich diese Bescheinigung bezieht, mit den folgenden Normen übereinstimmen:

Gemäss den Bestimmungen der Richtlinie:

2014/30/EU

Richtlinie über die elektromagnetische Verträglichkeit (EMV)

Test Spezifikation:

IEC 61000-4-2
IEC 61000-4-3
IEC 61000-4-4
IEC 61000-4-5
IEC 61000-4-6
CISPR11

Test Vorgabe:

IEC 61326-1

Resultat:

Bestanden

Testcenter:

Mesco

Berner Weg 7 / D-79539 Lörrach

LCIE Bureau Veritas

Nord-Est / Aire de la Thur / F-68840 Pulversheim

Produkte:

GCM-*

GCR-*

red-y compact meter / Massedurchflussmesser
red-y compact regulator / Massedurchmesser mit Ventil

**) und etwaige Ausführungen*

Aesch, 1.06.2015

Fabian V. Waltz
Managing Director

We declare under our sole responsibility that the products to which this declaration relates are in conformity with the following standards:

Following the provisions of directive:

2014/30/EU

Electromagnetic compatibility (EMC) legislation

Test specification:

IEC 61000-4-2
IEC 61000-4-3
IEC 61000-4-4
IEC 61000-4-5
IEC 61000-4-6
CISPR11

Test requirement:

IEC 61326-1

Results:

Passed

Testcenter:

Mesco

Berner Weg 7 / D-79539 Lörrach

LCIE Bureau Veritas

Nord-Est / Aire de la Thur / F-68840 Pulversheim

Products:

GCM-*

GCR-*

red-y compact meter / Mass Flow Meter
red-y compact regulator / Mass Flow Meter with Valve

**) and various versions*



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© 2015 Vögtlin Instruments AG Switzerland – subject to technical change – 399-3006_ml_ce_compact

6.19 Change history

Date	Version	Replaces	FW	Author	Note
01/06/2015	EN A1-1			PdW	Initiated new Manual
29/06/2015	EN A1-2	EN A1-1		PdW	After review Engineering
03/07/2015	EN A1-3	EN A1-2	3.0.0	PdW	After review Sales
08/07/2015	EN A1-4	EN A1-3	3.0.0	PdW	After review Management
13/07/2015	EN A1-5	EN A1-4	3.0.0	PdW	Clarified current power supply
15/07/2015	EN A1-6	EN A1-5	3.0.1	PdW	Adapted for new firmware
24/07/2015	EN A1-7	EN A1-6	3.0.1	PdW	Adapted 4.11.3 (Units), overview default setting, minor corrections

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8. Overview menu *red-y compact*

