Sensyflow eco 2

Thermal Air-Mass Flow Meter compact, highly dynamic, for pneumatics and dosage

10/14-6.63 EN

DESIGN AWARD WINNER 1998
INDUSTRIE FORUM DESIGN HANNOVER

- **Mass flow meter for air, independent of media pressure and temperature**
- **Wide measuring range**
- **Highly dynamic**
- **No moving parts**
- **Compact design**
- **Low weight**
- **Easy installation**
- **Arbitrary mounting orientation**
- **Variable process adapter**
- **Ouput signals configurable**

Applications

- **Painting roboters**
- **Dosage**
- **Pneumatics**
- **Compressed air**

The Sensyflow eco 2 is a compact and very fast mass flow meter for air.

Sensyflow eco 2 operates according to the principle of a hot-film anemometer, which determines the mass flow rate of air directly. That means, a further measurement and correction of pressure and temperature is not necessary.

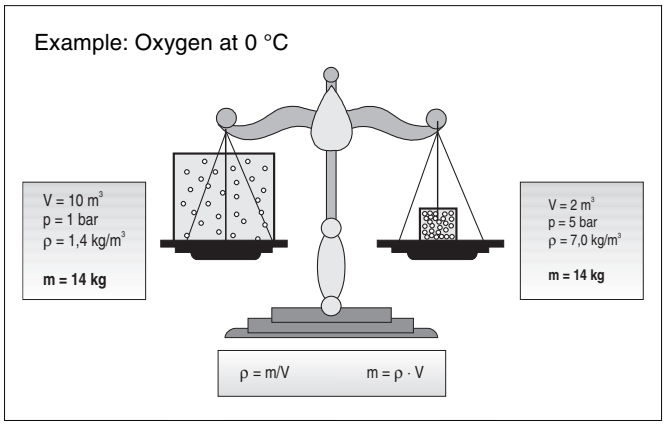
The transducer is designed in the form of an easily-installed measuring pipe. It contains the sensor unit, the electronic transmitter circuit and provides linearized analog and digital outputs. The Sensyflow eco 2 is calibrated and can be used at once without settings. A special supply and evaluation unit is not necessary.

The different output signals, that is, the current, voltage, frequency and binary signals, can be configurated via serial RS 232 interface.

The variable adapters allow the easy installation of the instrument into your process with tubes, threads, Transair or KF flanges.

A standard power supply unit can be used for the power supply.

Function and System Design



Most of the conventional flow meters determine volumetric flow rate. In this case, it is necessary to correct the density of the mass flow through additional measurement of pressure and temperature. These corrective measures make measurements more expensive and they reduce the ultimate accuracy of the measuring system. Sensyflow measuring systems provide the mass flow rate directly, i.e. without further measurement or correction.

Flow based on units of mass is a requirement of almost all technical applications. In view of the close relationship between mass and amount of substance, mass flow is used as an assessment factor in chemical reactions, e.g., to set the stoichiometric relationship between the reaction partners exactly.

Example:
If 10 m3 of oxygen is to be compressed from 1 to 5 bar at a constant temperature, the volume or volume flow will change to 2 m3, although the amount of substance and the mass are still the same (14 kg). In this case, a volume flow meter will only indicate 20 % of the original volume flow.

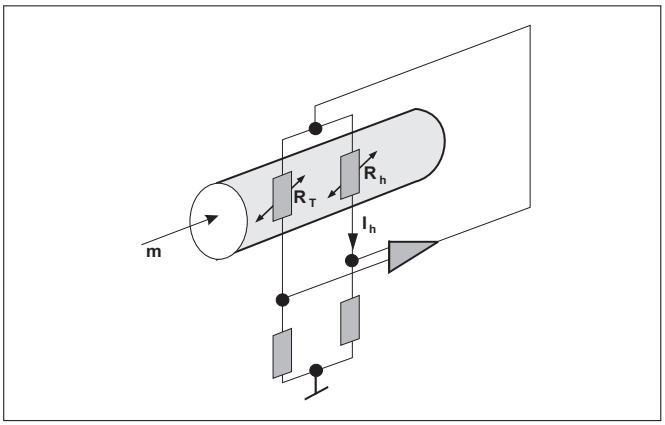
As a result, a volume flow measurement for gases without a correction of pressure and temperature is without any meaning.

The mass flow meter directly determines the mass per unit of time of a flowing medium; a measured value in kg/h is displayed. Parameters such as volumetric flow rate (referred to the standard state) can be calculated directly from the standard density of the medium:

$q_n = q_m / \rho_n$ e.g. in standard m^3/h*) where

q_n = Volumetric flow rate referred to the standard state (e.g. 0 °C and 1013 hPa)
q_m = Mass flow rate
ρ_n = Density referred to the standard state (e.g. 0 °C and 1013 hPa)

*) m^3/h -q_n



Measuring principle

Sensyflow operates according to the principle of the hot-film anemometer. This method of measurement is based on the abstraction of heat from a heated body by an enveloping gas flow. The "flow-dependent" cooling impact is used as the measuring impact.

The gas stream flows past two temperature-sensitive resistors Rh and RT which are part of an electrical bridge circuit. Due to the chosen resistance ratio Rh << RT, Rh is heated by the current Ih, and RT adopts the same temperature as the gas. The current Ih is preset by the electronic control circuit to produce a constant temperature difference between the heated resistor Rh and the temperature of the gas.

The electrical power generated with resistor Rh exactly compensates its loss of heat to the gas flow. As this loss of heat is dependent on the number of particles which collide with the surface of resistor Rh, Ih represents a measure of mass flow rate.

Technical data

Measuring principle

Thermal: hot-film anemometer

Input

Measured medium

Air

Measuring ranges[1)]

0 (1)...100 kg/h or

0 (12)...1250 Nl/min [2)]

Output

Analog output signal	0... 5 V 0...10 V 0/4...20 mA,
Load	< 500 Ω

Error message
< 3,5 mA oder > 22 mA

Digital output signal
24 V, 20 mA

Frequency output signal
1... 100 Hz
10...1000 Hz

Counter pulse
Pulse evaluation configurable
Pulse duration configurable

Alarm values
Minimum and maximum, adjustable

Polarity adjustable

Performance characteristic, measurement accuracy

Measured error
< ± 3,0 % of measured value

Repeatability
< ± 0,5 % of measured value

Influences

Temperature effect
< 0,1 %/K of measured value

Pressure effect
≤ 0,2 %/100 kPa (/bar) of measured value

Setting time
$T_{63} \approx 25$ ms
$T_{98} \approx 90$ ms

Pressure drop
< 10 kPa (100 mbar)
at full scale and using the KF flange adapter DN 25
decreasing quadrataically to smaller flow rates
approx. 15 mbar at type of operation without special sieve and at full scale flow rate

1) Approximate values are given for applications with air under atmoshperic conditions. The values in brackets indicate the lower limit of the measuring range for which the measured value accuracy indicated is specified.
2) It is possible to specify any unit which you can transform into a mass or standard volume flow. For Example 1 ballon/min = 7 l/min - q_n.

Operating conditions

Environment conditions

Ambient temperature transducer	0...50 °C
Degree of protection	IP 65
Storage temperature	-25...85 °C

Measured medium conditions

Operating temperature	0...50 °C
Maximum operating pressure	
Standard	8×10^2 kPa (= 8 bar)
High pressure version	16×10^2 kPa (= 16 bar)

Construction

Weight
0,51 kg
(Accessories: see ordering information)

Material

Transducer	aluminium, Hostadur, Cu tinned, glass
Process connections	aluminium
Fittings	aluminium

Process connection
see ordering information

Electrical connection
Sub-D connector, serie 712, 8 pin, IP 65

Power supply[3)]

Voltage
24 V DC ± 10%

Power consumption
< 15 W

Current

Peak	< 1 A
Operation	< 0,6 A

Interface

RS 232

Accessories (optional)

- Entry and exit length
- Pipe fittings
- Adapters
- Quick-clamping connectors
- Reducers
- Power supply unit
- Display
- Display and supply unit completely mounted in an IP 65 housing

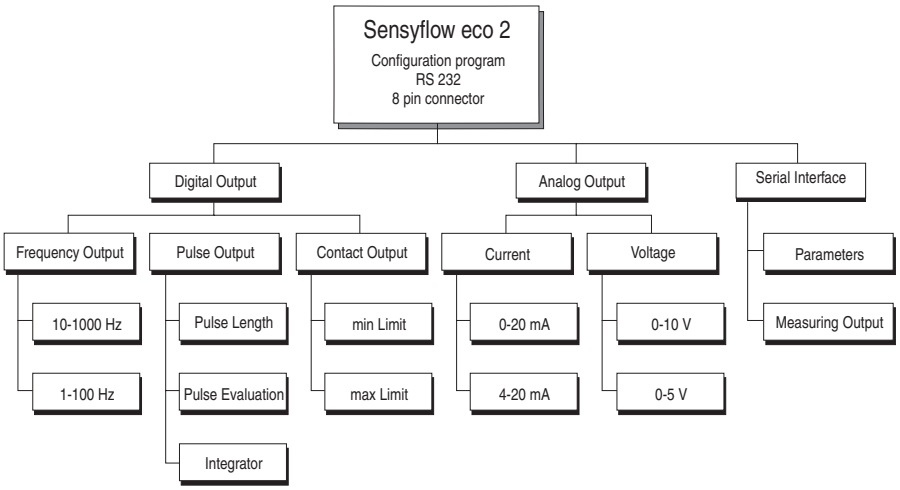
3) Power supply with safe electrical separation correspond to EN 61010 and IEC 950, with max. output power of 150 W.

Configuration

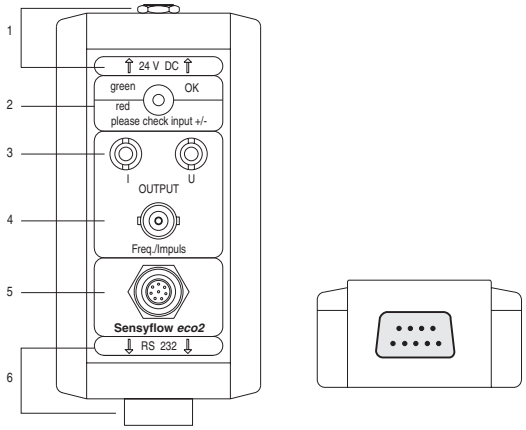
The Sensyflow eco 2 can simultaneously serve one analog output (current 0/4...20 mA or voltage 0...5/10 V), one digital output (frequency, pulse, alarm) and a serial RS 232 interface.

The configuration of the Sensyflow eco 2 is operating via the serial interface. With this, it is possible to change the output signals or the settings of the measuring ranges and signals by using a standard PC or Laptop.

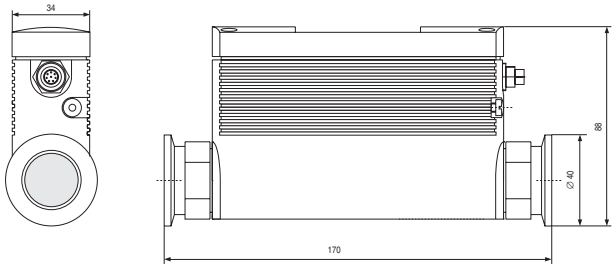
The configuration program belongs to the standard delivery program. A service and configuration box is available as an accessory. It will help to connect the different signals of Sensyflow eco 2 quick and easily.



1 Power supply
2 Current direction protection
3 Analog output
4 Digital output (frequency/pulse)
5 Connection of Sensyflow eco 2
6 To PC or Laptop



Dimensional drawing (dimensions in mm)



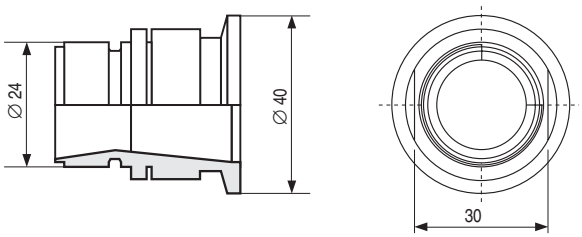
Transducer, example with KF DN 25 process adapter

Accessories

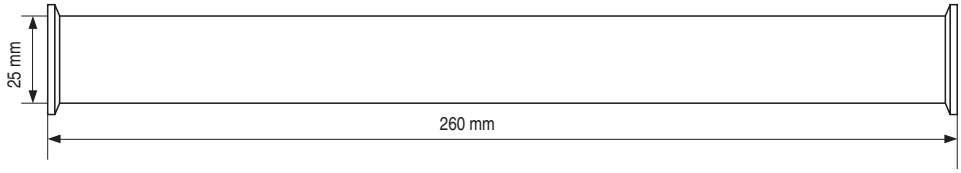
Process connections

Flange connections

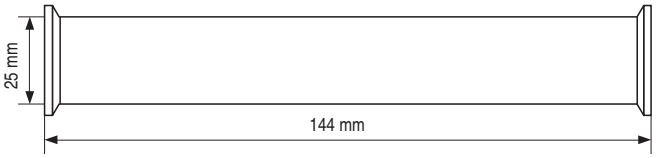
Process adapter flange KF DN 25, inlet run and outlet run, 2 clamp rings und 2 sealing rings



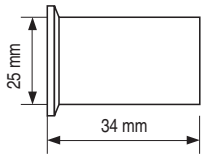
Inlet run lenght 10 x D, both sides with KF-DN 25 connections



Outlet run lenght 5 x D, both slides with KF DN 25 connections

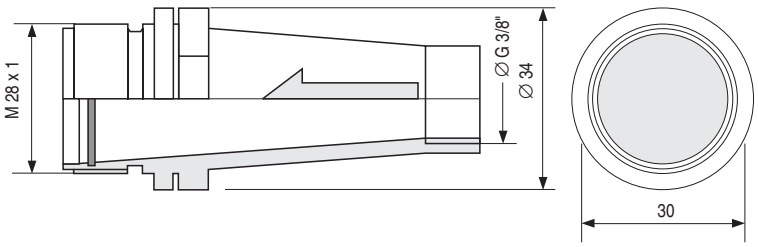


Hose adapter for KF DN 25, incl. 1 flange, 1 clamping ring and 1 sealing ring

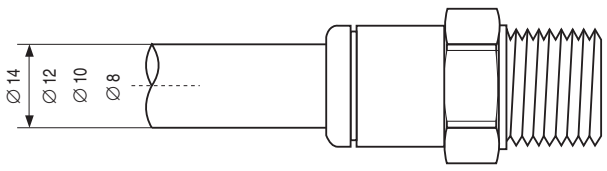


Threads

Threads G $^{3}/_{8}$“, also connection for Legris-tube adapters
One pair for inlet run and outlet run. Outlet run adapter includes a high-tech flow conditioner



Legris-tube adapter (pair)

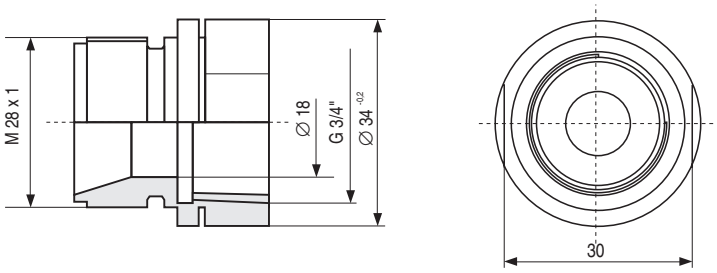


Accessories

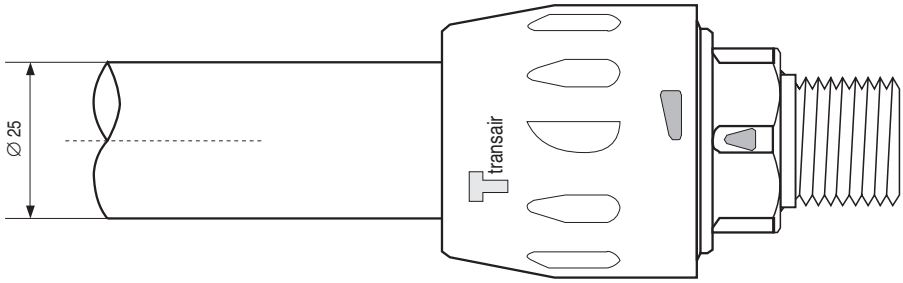
Process connections

Threads

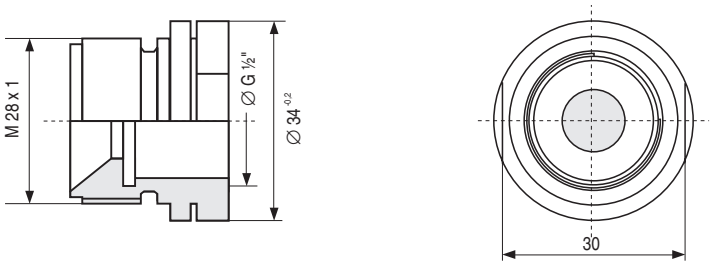
Thread G ¾“ also connection for Transair System 25 mm (pair)



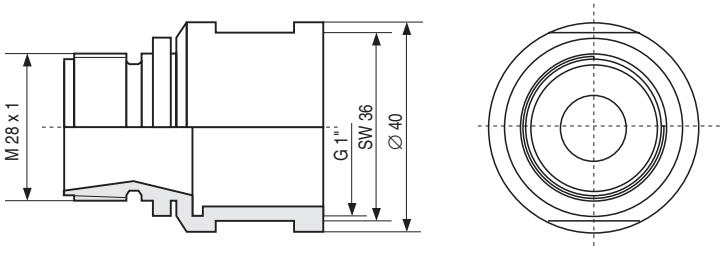
Transair adapter 25 mm (pair)



Threads G ½“
Pair for inlet run and outlet run. Inlet run adapter includes a high-tech flow conditioner



Thread G 1“



Ordering information

	Catalog No					Code		
Sensyflow eco 2	**V14252 -**							
Standard calibration 0 -100 kg/h weight: 0.51 kg Operating pressure 1 to 10 bar abs. customer specified configuration: measuring range, unit, standard state, upper range value acc. to Code Nos 110 and 114 incl. 5 m connecting cable, configur. software		1						
High pressure version, operating pressure 10 to 16 bar abs. customer specified configuration: measuring range, unit, standard state, upper range value acc. to Code Nos 110 and 114 incl. 5 m connecting cable and configuration software		2						
Customer specified calibration Operating pressure 1 to 10 bar abs. customer specified configuration: measuring range, unit, standard state, Nos 110 and 114 incl. 5 m connecting cable and configuration software		3						
High pressure version, operating pressure 10 to 16 bar abs. customer specified configuration: measuring range, unit, standard state, upper range value acc. to Code Nos 110 and 114 incl. 5 m connecting cable and configuration software		4						
Activated analog output								
0... 5 V			1					
0...10 V			2					
0...20 mA (error message > 22 mA)			3					
4...20 mA (error message < 3,5 mA)			4					
4...20 mA (error message > 22 mA)			5					
Activated digital output								
Counter pulse output (high level)[1], pulse evaluation Code -No 310				1				
Counter pulse output (low level)[1], pulse evaluation Code -No 310				2				
Frequency output adjustable up to 2500 Hz, standard 1..1000 Hz				4				
Alarm output (alarm = high), alarm values Code -Nos 312...313				5				
Alarm output (alarm = low), alarm values Code -Nos 312...313				6				
Process connection								
1 pair process adapter KF DN 25, incl. 2 clamping rings and 2 sealing rings					1			
1 pair of threads G 3/8", also connection for Legris -tube adapters					2			
1 pair of threads G 1/2"					3			
1 pair of threads G 3/4", also connection for Transair System 25 mm					4			
1 pair of threads G 1"					5			

Additional ordering information

Measuring range	.....			110	
Unit	.....	unit[2]		111	
Standard state	.....	°C, mbar abs. [3]		112	
Conversion factor for unit	.....			113	
Upper range -value (MUV), adjusted to	.....	value[4]		114	
Frequency output, min and max value		Hz, Hz [7]		115	
Pulse evaluation	.....	value[5]		310	
Alarm, minimum value	.....	in % of MUV		312	
Alarm, maximum value	.....	in % of MUV		313	

1) The digital output can have states High = 24 V or Low = 0 V. Please specify the required polarity

2) Customer specified unit: please specify a unit, which can be transformed to kg/h or l/min - qn.
Please give us this calculation on a separate page. Example: 1 balloon = 7 l/min - qn. => 1 balloon per min = 7 l/min - qn

3) Standard state for volume flow units. Please specify your reference conditions, e.g. standard state 0 °C, 1013 mbar.

4) The measuring upper range value (MUV) must be smaller than the calibrated measuring range (100 kg/h or 1250 l/min - q_n)

5) Please specify how many units of the totalized flow should produce one pulse at the integrator output.

6) Code-Nos should be appended to the Catalog No.

7) Please specify the frequencies for flow=0 and flow=max. The min is 1Hz the max 2500 Hz.

*) N = Norm...; Can also written as: l/min - q_n

Accessories				
	Weight	Catalog No		
Process connections				
Process adapter KF DN 25 for entry and exit incl. 2 clamping rings and 2 sealing rings	0.1 kg	14252-7962850		
Entry length 10 x D both sides with KF DN 25 connections	0.2 kg	14247-7962801		
Exit length 5 x D both sides with KF DN 25 connections	0.11 kg	14247-7962802		
Clamping ring and seal for KF DN 25 connection	0.08 kg	14247-7962809		
Hose adapter KF DN 25, flange 1 clamping ring and 1 sealing ring	0.01 kg	14247-7962803		
Threads				
Thread G 3/8", also connection for Legris -tube adapter, pair of entry and exit; Entry adapter includes a high -tech flow conditioner	0.08 kg	14252-7962851		
Legris -tube adapter (pair)	0.08 kg			
8 mm		14252-7962855		
10 mm		14252-7962856		
12 mm		14252-7962857		
14 mm		14252-7962858		
Thread 3/4" also connection for Transair System 25 mm (pair)	0.08 kg	14252-7962853		
Transair -adapter 25 mm (pair)	0.4 kg	14252-7962812		
Thread G 1/2", pair for entry and exit Entry adapter includes a high -tech flow conditioner	0.08 kg	14252-7962852		
Thread G1" (pair)	0.08 kg	14252-7962854		
Installation accessories				
Additional connecting cable, 5 m with 1 plug	0.3 kg	14252-7962817		
Service and configuration box Sensyflow eco 2 to RS 232, Power supply Digital and analog output (shunt switch) Connecting cable 2 m (6 ft) with 2 plugs	0.11 kg	14252-7962818		
Electrical adapter for connecting cable type eco 1 to eco 2 Length aprox. 20 m (2/3 ft)	0.2 kg	14252-7962819		
Installation adapter for busbar mounting	0.04 kg	14252-7962816		
Electrical accessories				
Power supply unit for rail mounting, 24 V DC; 2,5 A		14252-7962800		
Digital display, 3 1/2 digit LED, 24 V DC, data sheet 10 -5.11		10319-7957527		
Digital display, 3 1/2 digit LED, 230 V AC, data sheet 10 -5.11		10319-7957526		
Power supply unit and display mounted in IP 65 housing		on request		
Complete set Sensyflow eco 2				
Suitcase with Sensyflow eco 2 with standard calibration together with all process adapters incl. power supply, configuration box and software incl. connecting cable 2 m with 2 plugs		14252-7962814		

Technical support and application:
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