

## IML Air Volume Transmitter/ Controller

IML is made for detecting and controlling air volumes in air handling units and room spaces. Air volumes will be calculated by using the differential pressure resulting from the flow of the air in the duct or in the fan.

The display is showing air volume or differential pressure, the desired variable that can be locked on the display. The variable will be selected in the menu during commissioning. The housing of the IML is made so that it can be used also in dusty and wet surroundings. The efficiency of the fast changing pressures resulting from process problems can be eliminated by changing the time constant. Excellent accuracy of the measurement is guaranteed by the automatic zero point calibration.

IML-M offers Modbus RTU communication for connection to monitoring systems and to BMS solutions. The measurements can be read and the settings can be made via Modbus.

IML can be used as stand-alone volume controller, volume controller part of a BMS, as a Modbus pressure transmitter or a Modbus volume transmitter/controller.

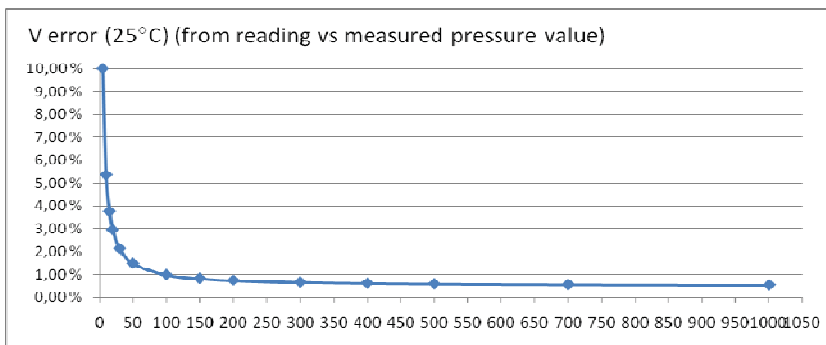


Model Types	Model	Description
	<b>IML</b>	Air Volume Trasmmitter / Controller
	<b>IML-M</b>	Air Volume Trasmmitter / Controller with Modbus RTU Communication
<b>Technical Data</b>	Power supply	22..28Vac/dc, max. 1.5VA @ 24Vac, max 1.0VA @ 24Vdc
	Measuring ranges	0...1000Pa, 0...2000Pa, 0...5000Pa, 0...7000Pa Selectable during the commissioning
	Air Volume Range	Selectable in menu
	Output 1	Air Volume (l/s, m3/h, m3/s): 0...10Vdc, 2mA max
	Output 2	Diff Pressure or Control Output: 0...10Vdc, 2mA max
	Input	External Setpoint (% Vnom/dPmax): 0..10Vdc
	Accuracy of diff. pressure	±1Pa + ±1% of reading Pa (25°C)
	Temperature drift (typ.)	<0.1%/K of range, typical
	Time constant	1..20s (8s = factory default)
	Communication (IML-M)	Modbus RTU RS 485 Communication, 9.6/19.2/38.4/56 bps, 8 data bits, Parity None, 1 Stop Bit
	Operating Modes	Air Volume Measurement (m3/h,l/s) Air Pressure Measurement (Pa) Air Volume Control (m3/h, l/s, m3/s)
	Operating temperature	0°C...+45°C
	Max. static/over pressure	25kPa
	Pressure connections	D6/4mm flex tubes
	Enclosure	IP 54, polycarbonate
	Dimensions	115W x 115H x 45D mm
	EC Approvals	Directive: 2004/108/EY Emissions: EN61000-6-3: 2001 Immunity: EN61000-6-2: 2001

<b>Wiring Terminals</b>	1	24Vac/dc power supply
	2	0Vac
	3	0...10Vdc output, air volume
	4	0...10Vdc output, diff. pressure / controller
	5	0...10Vdc input, external setpoint
	6	RS485 A+ Modbus (IML-M)
	7	RS485 B- Modbus (IML-M)
	8	RS485 0V (IML-M)

**Volume Measurement Accuracy**

Accuracy of Air Volume: V error (at 25°C) + error of the probe



**Air Volume Measurement**

Air volume measuring can be implemented by:

- Using fans with flow measuring connections. By selecting in the menu the unit of measurement and the manufacturer of the fan, and by setting the individual k-value of the fan.
- Using traditional air flow sensors like pitot-tube or iris dampers in the ventilation duct and by selecting in the menu the common form,  $Q = k \cdot \sqrt{Qr}$  (dP Pa). The size of the k-value depends on the cross-section of the duct or on the diameter of the hole in the iris-damper.

**Control Options**

By using the internal controller functions, the IML can carry out:-

- Variable Air Volume Control
- Differential Pressure Control

Variable Air Volume Control

Variable air volume control (VAV). The set point needed by the IML can be set by 3 different ways:

- using an external 0...10V setpoint signal
- during commissioning in the menu
- for IML-M transmitter via Modbus

The internal controller logic monitors the air volume and compares it to the controller setpoint. The Output 2 (controller output) is normally wired dampers, and based on the requirements the IML modulates the dampers to desired position.

By using two IML controllers it is possible to maintain the balance between supply and extract air flows (pressure independent VAV control). The signal of measured extract air volume (output 1) is used in this configuration as a setpoint for the incoming VAV control.

For balancing the air volumes, there is a coefficient (50...150%) selectable in the menu.

**VAV Application**

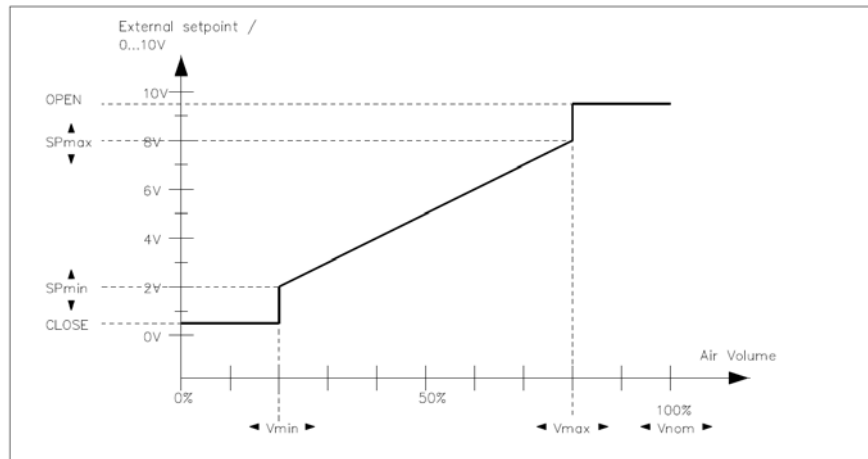
Air volumes will be regulated by 0..10V controlled dampers.

External set point < 0.3V is always CLOSING the damper

External set point > 9.7V is always OPENING the damper (air volume = Vnom )

Parameters to be set:

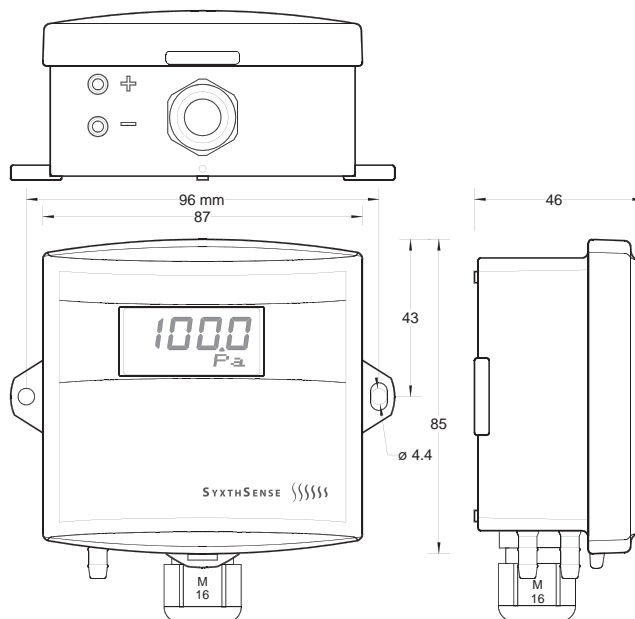
- Defined maximum volume Vnom (V nom = Out1 max)
- Vmin and corresponding SPmin control signal (percents from Vnom value)
- Vmax and corresponding SPmax control signal (percents from Vnom value)



**Installation Instructions**

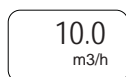
- Ambient conditions:** Enclosure type rating for IML sensors is IP 54. It can be used also in dusty and wet surroundings. To minimize the temperature drift it is important, that ambient temperature is stable.
- Installation position:** All installation positions (horizontal, vertical, etc.) are allowed. It is recommended to mount inlets downwards. No water allowed into the inlets.
- Mounting:** The IML sensors should be fitted so that it is not subject to vibrations. The lower part of the casing is provided with Ø4.5mm holes for fitting screws. The hole distance is 96mm.
- Pressure connections:** Tubes (Ø6/4mm = Ø outside/inside) are connected to the inlets (+) and (-). Pressure at (+) is higher than at (-).

**Dimensions**



**User Mode**

In the user mode the display shows volume and pressure. In addition the setpoint can be altered.



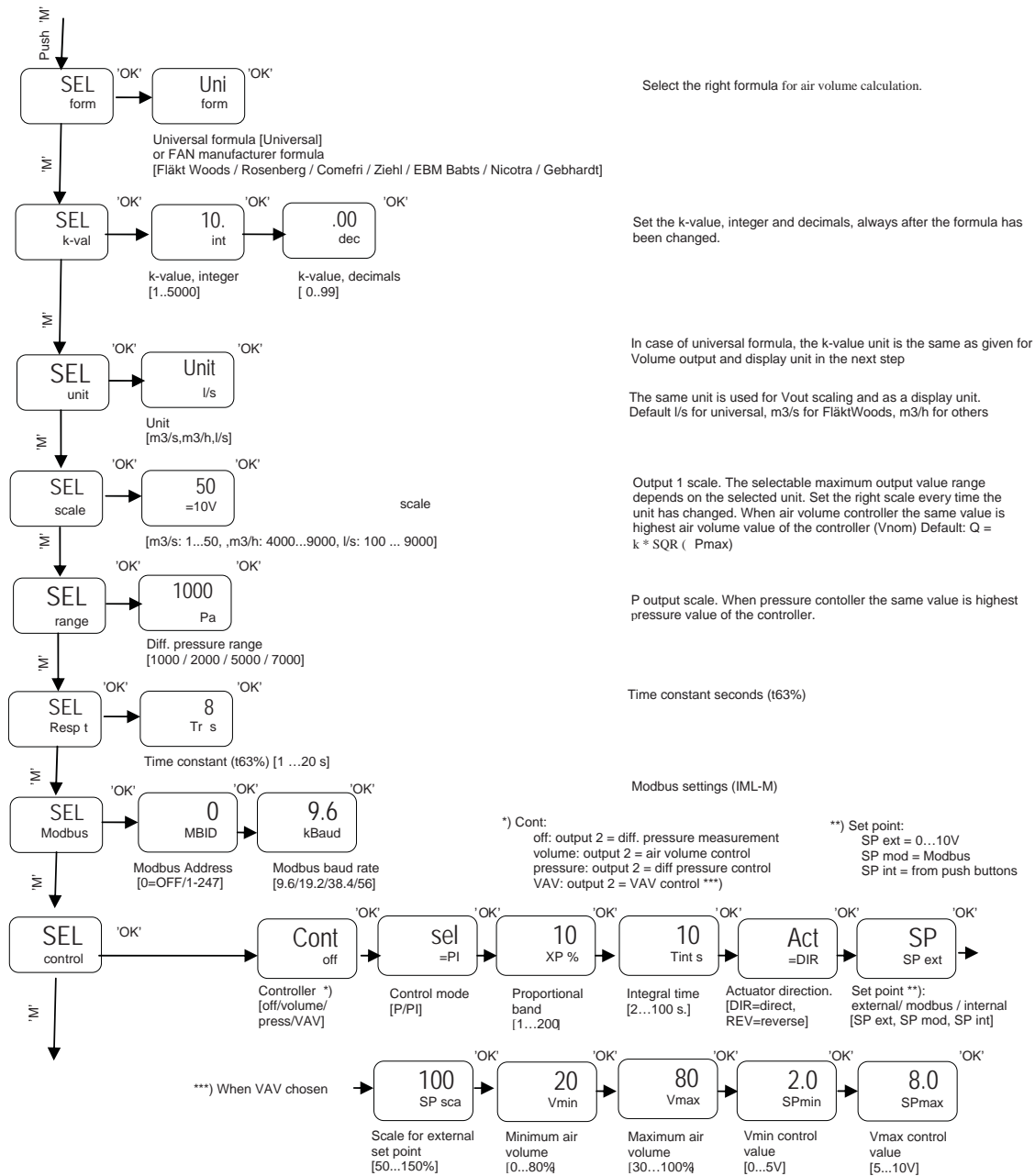
The display changes every 3 seconds between volume and pressure. Push 'OK' button to freeze the display unit.

As a controller the internal setpoint can be set by '+' or '-' buttons. Effective setpoint is shown, if external or Modbus setpoint is chosen.

**Configuration Menu**

Enter to the Menu by pushing 'M' button. Change the value or selection by pushing '+' or '-' button, and accept by pushing 'OK' button. Go forward on the menu by 'M' button. The device exits the menu if the buttons are not pressed within 30 seconds.

**NOTE:** In the user mode the device can be reset to the factory settings by pushing simultaneously 'M', '+' and 'OK' buttons for 5 seconds.



**MODBUS REGISTERS (IML Ver1.0)**

The IML supports the following Modbus registers and function codes. The default communication speed is 9600 bps, 8 data bits, Parity None, and 1 Stop Bit. The memory durability allows at least 100,000 write cycles

Function Codes:

- 0x01 Read Coils
- 0x02 Read Discrete Inputs
- 0x03 Read Holding Registers
- 0x04 Read Input Registers
- 0x05 Write Single Coil
- 0x06 Write Single Register

0x0F Write Multiple Coils  
 0x10 Write Multiple Registers  
 0x17 Read/Write Multiple Registers

Register	Parameter Description	Data Type	Value	Range	Default
FUNCTION CODES 01/05 - READ/WRITE COILS					
1	Control Mode P/PI	Bit	On - Off	On - Off	0
2	Actuator Direction (DIR/REV)	Bit	On - Off	On - Off	0
3	Output 1 Modbus Overdrive Enable	Bit	On - Off	On - Off	0
4	Output 2 Modbus Overdrive Enable	Bit	On - Off	On - Off	0
FUNCTION CODE 04 - READ INPUT REGISTERS					
30001	Pressure	Signed 16	0..7000	0..7000Pa	
30002	Flow	Signed 16	0..500	0.0..50.0	
	When selected unit m3/s	Signed 16	0..9000	0..9000	
	When selected unit m3/h	Signed 16	0..9000	0..9000	
30003	External Setpoint (0..10V)	Signed 16	0..100	0..10.0V	
30004	Internal Setpoint	Signed 16	0..100	0..100%	
FUNCTION CODES 03/06 - READ/WRITE HOLDING REGISTERS					
40001	Formula	Signed 16	0..7	0..7	0
40002	K-value integer	Signed 16	0..5000	0..5000	10
40003	K-value decimal	Signed 16	0..99	0.0..0.99	0
40004	Unit: 0=m3/s, 1-m3/h, 2=l/s	Signed 16	0..2	0..2	2
40005	Out 1 Scale, Vnom (unit above)	Signed 16	1..9000	1..9000	50
40006	Pressure Range: 1000 / 2000 / 5000 / 7000	Signed 16	0..3	0..3	0
40007	Response Time	Signed 16	1..20	1..20 secs	8
40008	Controller: 0 = Off, 1= volume, 2=pressure, 3=VAV	Signed 16	0..3	0..3	0
40009	Proportional Band	Signed 16	1..200	1..200	10
40010	Integral Time	Signed 16	2..100	2..100s	10
40011	Setpoint: 0=ext 0..10V, 1=Modbus, 2=internal (menu)	Signed 16	0..2	0..2	0
40012	Modbus Setpoint *)	Signed 16	0..1000	0..100%	0
40013	External Setpoint Scale (effective if 40008 = 3 VAV)	Signed 16	50..150	50..150%	100
40014	Vmin (effective if 40008 = 3 VAV)	Signed 16	0..80	0..80%	20
40015	Vmax (effective if 40008 = 3 VAV)	Signed 16	30..100	30..100%	80
40016	SPmin (effective if 40008 = 3 VAV)	Signed 16	0..50	0.0..5.0V	20
40017	SPmax (effective if 40008 = 3 VAV)	Signed 16	50..100	5.0..10.0V	80
40018	Output 1 Modbus Overdrive *)	Signed 16	0..100	0..10.0V	0
40019	Output 2 Modbus Overdrive *)	Signed 16	0..100	0..10.0V	0

**\*)NOTE:** These values marked as \*), set via Modbus, will be lost during a power failure and they must be updated after power is back.