

COVAL

vacuum managers

mini-modules
compact integrated vacuum pumps

LEM



LEM series: mini-module



twin tech™

Integration & Intelligence

All industrial vacuum functions integrated into the mini-module

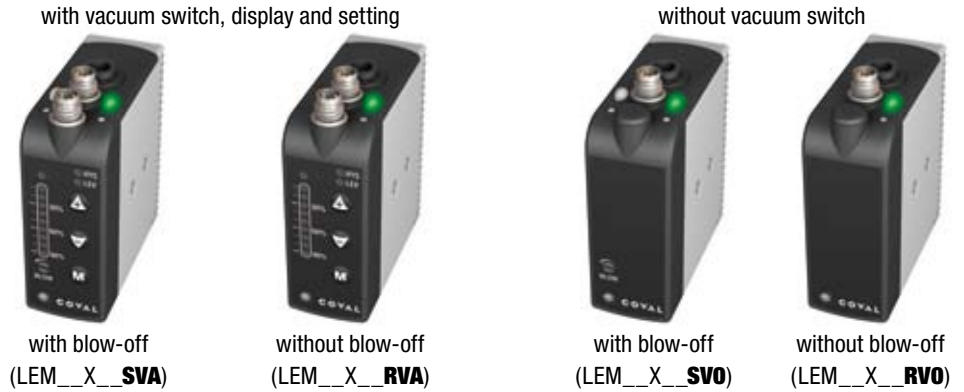
Efficient communication for easy setting, production and maintenance.

vacuum pumps

A mini-module for each application:

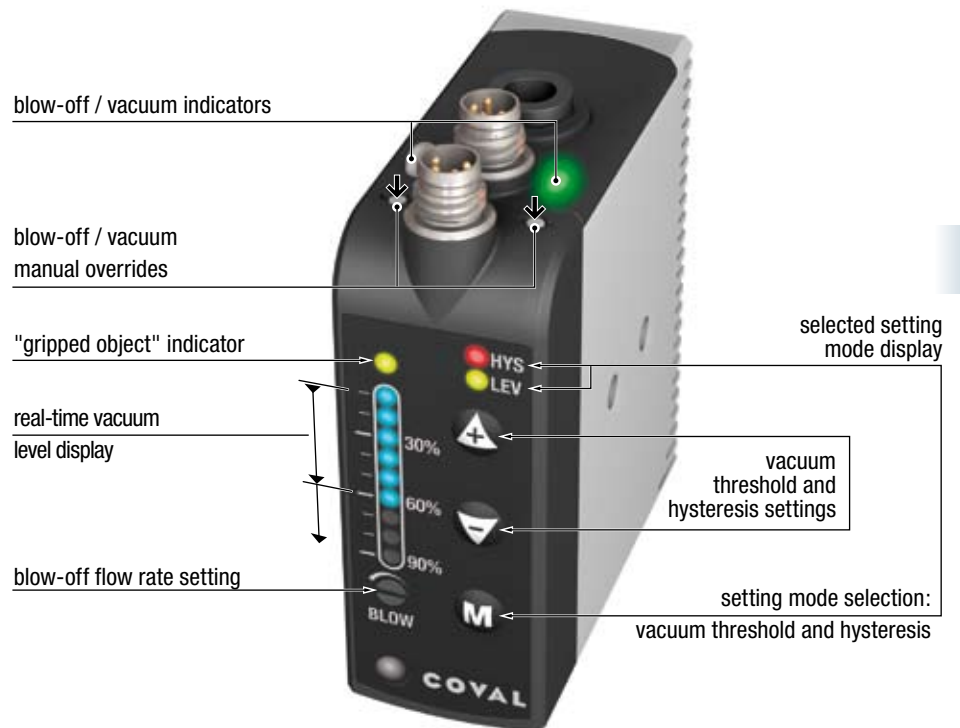
A COMPLETE LINE

- 4 basic configurations, see adjacent illustrations →
- 2 levels : 60% and 90% vacuum.
- 3 standard nozzle diameters : 1, 1.2 and 1.4 mm.
- Air suction flow : up to 92 NI/mn.
- Other options on request.



AN EFFICIENT COMMUNICATION

For settings and troubleshooting, a simple and complete communication through the means described by the adjacent illustration.

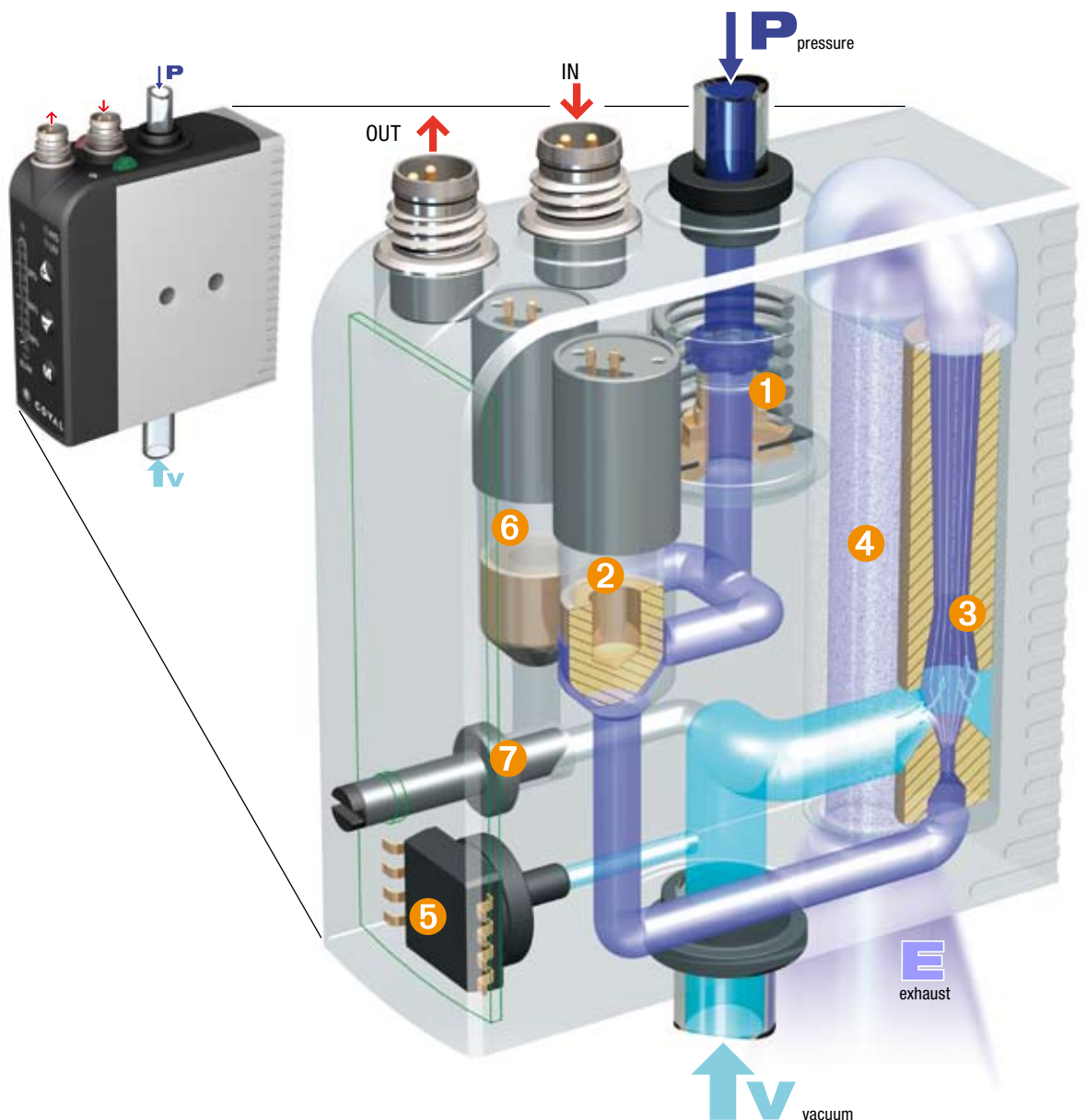


MOUNTINGS CHOICE

Individual mountings, close to vacuum pads or compact island association.



LEM series: compact functions



The COVAL compact integration technique

The traditional venturi vacuum pumps must be completed with the optional components necessary to their functioning: solenoid valves, pressure regulator, vacuum switch, blow-off circuit, electronic control ...

One can see the advantages of a compact integration of these functions into a sole mini-module vacuum pump that becomes all inclusive. The above illustration shows the excellence of Coval in this perspective: each function type to be integrated has been redesigned, optimized and miniaturized to fit its place in the mini-module body.

ADVANTAGES

- **direct control 24 V DC - 0.7W**

- M8 connectors, IP65 protection.

- **simplified use**

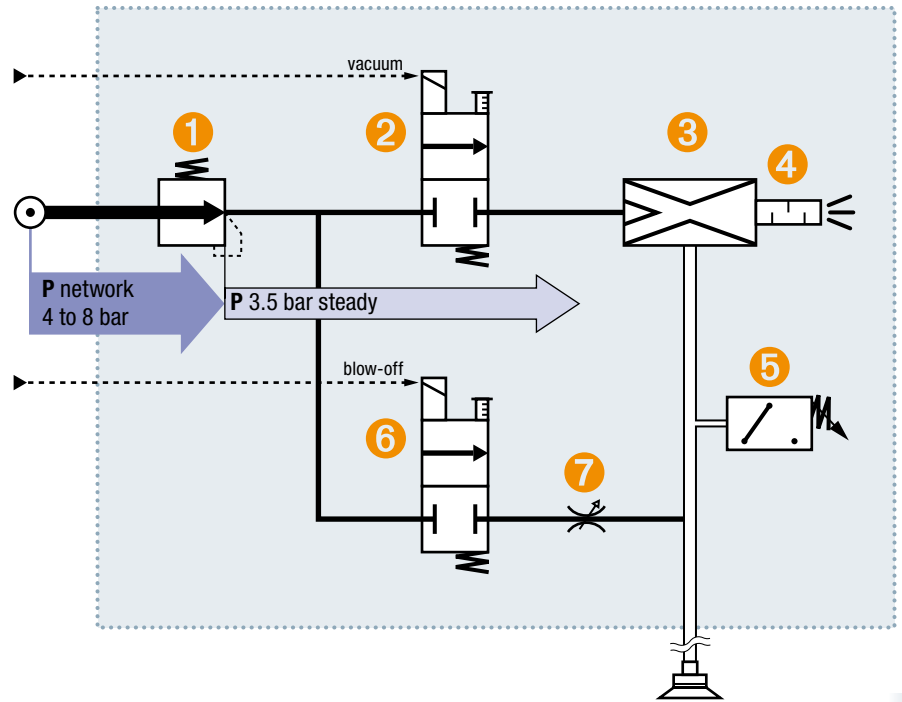
- only one easy to install module;
- instant pneumatic and vacuum connections;
- plug and pay.

- **a LEM for each application**

- choice of the vacuum level and of the air suction flow;
- only necessary functions are retained.

INTEGRATED FUNCTIONS

- 1 3.5 bar pressure regulator
- 2 Vacuum solenoid valve
- 3 3.5 bar optimized venturi
- 4 Optimized muffler
- 5 Electronic vacuum switch
- 6 Blow-off solenoid valve
- 7 Blow-off flow rate setting



The "regulator+venturi" 3.5 bar optimized combination

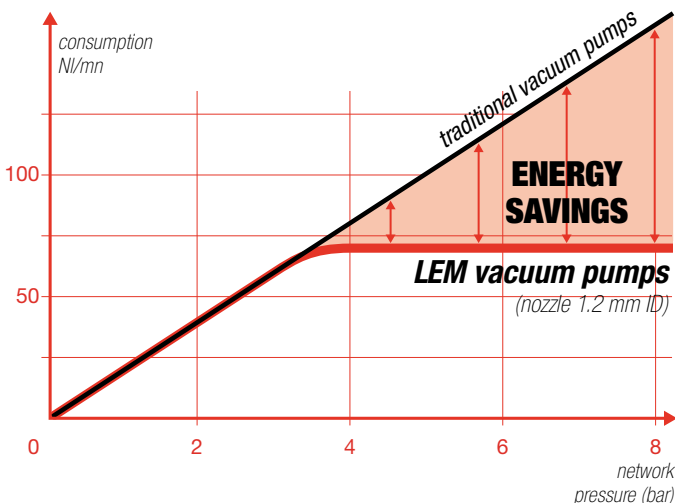
The traditional venturi vacuum pumps must work within the defined compressed air network settings: between 4 to 8 bar, depending of the application. In the process, their efficiency and noise performances have been forsaken to meet these requirements.

With the integration of the 3.5 bar pressure regulator, function as a standard, COVAL succeeded in optimizing the associated venturi for this sole pressure, thus providing two key advantages:

- an exceptional output → energy savings.
- a remarkably silent functioning. → controlled consumption.

ENERGY SAVINGS

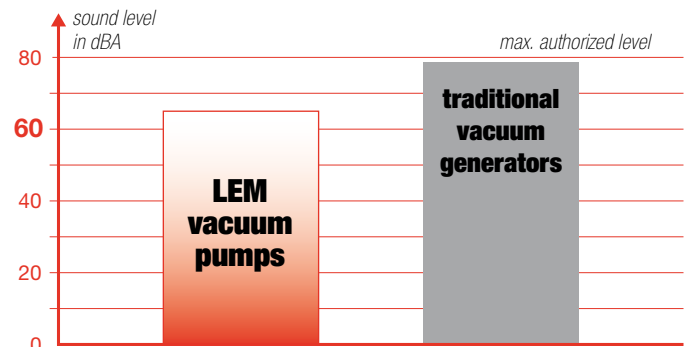
- The internal intelligence of the LEM modules controls the network supply pressure and helps to optimize the air consumption to 3.5 bar. This results in exceptional energy savings as shown in the figure below:



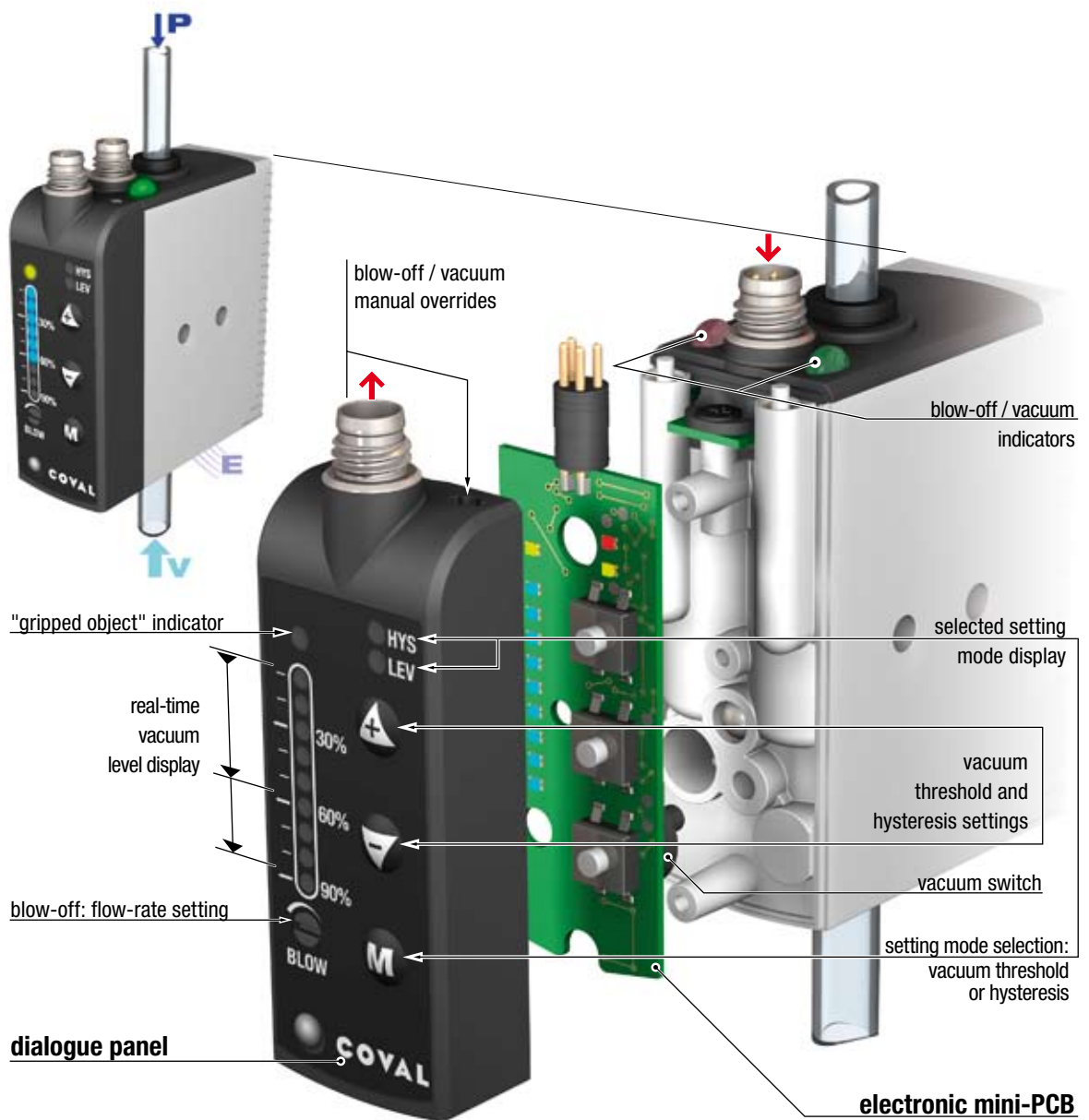
SILENT TECHNOLOGY

- The pressures to be exhausted to atmosphere are much lower.
- The efficiency of the optimized muffler is better.

From this, results the sound level reduction shown by the bar graph below:



LEM series: dialogue intelligence



The dialogue intelligence completes the compact functions integration

The previous pages have shown the interest to integrate into a sole compact module all the functions necessary for an optional control of vacuum handling.

This integration also makes possible, the compact realization of the electronic intelligence shown above:

- an electronic mini-PCB combines the vacuum switch and other electronic components required for controls and settings.
- a dialogue panel completes this by directly controlling the PCB.

ADVANTAGES

• simple and complete communication

For settings and troubleshooting, the dialogue panel gathers all the informations and access required for a complete man/machine dialogue. The machine commissioning, production and maintenance are facilitated.

• easy installation, protected equipment

- only one module to mount and to connect.
- sealed M8 connections; IP65 electrical protection;
- lockable dialogue panel: protection against unexpected actions.

An efficient communication at each step

1-SETTINGS

At the first machine commissioning or for all evolutions the different settings are easily made.

- **Setting of the Vacuum threshold:** the vacuum level at which the vacuum switch emits the "object gripped" signal. Visual display of this setting can be observed on the LED Scale.
- **Hysteresis setting:** the reduction in the vacuum level at which the "object gripped" signal is turned off.
- **Blow-off flow rate setting:** adjustable blow-off control through screw setting or manual valve override while testing.

2-PRODUCTION

Visual surveillance of functioning during each phase: rest, vacuum, blow-off.

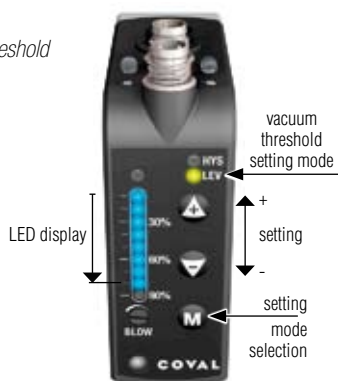
- **vacuum:** - "vacuum" activated.
- "vacuum" indicator (green) ON.
- linear LED scale displays the vacuum level.
- at set threshold, "gripped object" indicator and "gripped object" output signal.
- **blow-off:** - "blow-off" is emitted.
- "blow-off" indicator (red) ON.
- the object is released.
- **rest:** no activation signal and no display.

3-TROUBLESHOOTING

After any malfunctioning, troubleshooting is quickly made.

- **Automatic check**
At each return to tension, automatic check of the electronic functions: vacuum switch, displays, settings ...

SETTING
vacuum threshold



TROUBLESHOOTING
automatic check



Stand-alone or island modules?

Stand-alone modules are suitable for the most common applications; one module controls one or more suction pads which all operate according to the same sequence.

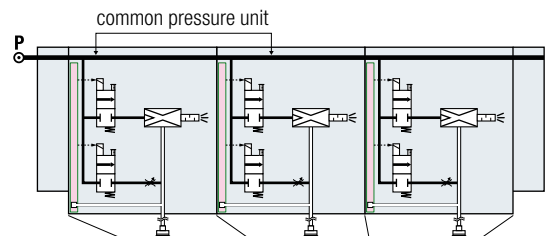
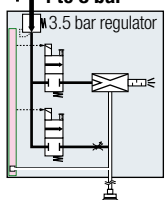
When several suction pads are operating according to different sequences, multiple modules are required, which can be:

- several stand-alone modules, OR
- an island of these modules with an internal common pressure unit.

The adjacent illustrations help in the selection:

- Stand-alone modules are complete, with the integrated pressure regulator.
- In an island, the integrated regulator is absent: to maintain the advantage of economical and silent operation, it is recommended to reduce the pressure to the island's common pressure unit to 4 bar.

Network pressure
P₀ 4 to 8 bar

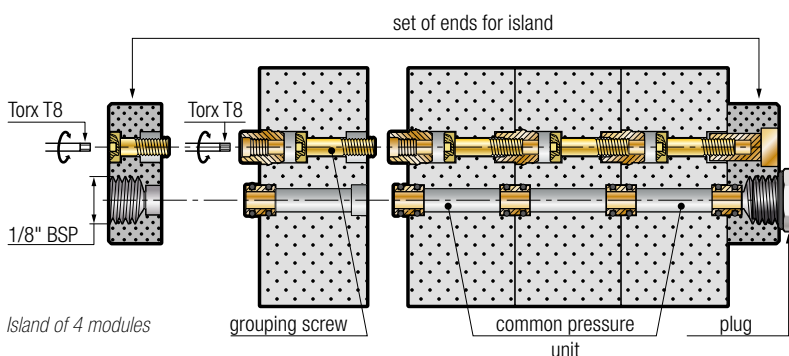


P optimal = 4 bar
(operation at 4-8 bar)



island of 3 modules supplying suction pads according to different sequences

CHARACTERISTICS AND CONNECTING AN ISLAND



Maximum number of modules in an island:

- Ø 1.4 mm nozzle → 5 modules.
- Ø 1.2 mm nozzle → 7 modules.
- Ø 1.0 mm nozzle → 9 modules..

Note: in the same island, it is possible to combine LEM series modules and LEMAX series modules.

REF. COMPOSED OF AN ASSEMBLED ISLAND OR COMPONENTS FOR

REF. COMPOSED OF A STAND-ALONE MODULE

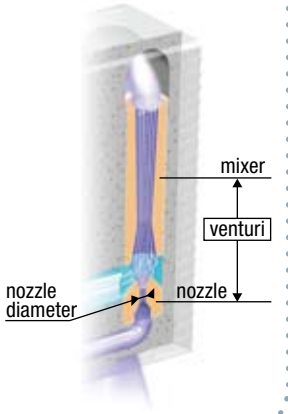
LEM	90	X	12
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VACUUM LEVEL		NOZZLE DIAMETER	
90% max. vacuum optimum for air tight products	90	10	nozzle 1.0mm ID
60% max. vacuum optimum for porous products	60	12	nozzle 1.2mm ID
		14	nozzle 1.4mm ID

VENTURI CHARACTERISTICS

1- Maximum vacuum level
 This level results from the venturi mixer's profile:
 - 90% max. vacuum is optimum for air tight products.
 - 60% max. vacuum is optimum for porous products.

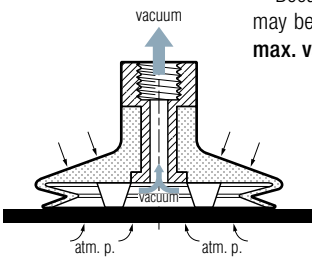
2- Nozzle diameter
 It reflects the air suction flow, but also the power consumption. Thus it must be chosen for the specific need, without excess.




Air tight products handling: glass, plastic, coated wood, metal sheet ...

Because vacuum leaks are limited, the vacuum level to be used may be high: between 50 to 80%, to be generated by a **90% max. vacuum level venturi.**

Taking into account the volume to be emptied and the response time to do so, the chart below is a guide towards the most economical nozzle and gives the air suction flow.



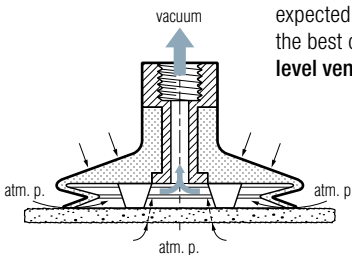
90% max. vacuum LEM

nozzle ID	Emptying time (seconds) for 1 liter volume						Air consumption (NI/mn)	Air suction (NI/mn)
	reached vacuum	55%	60%	65%	70%	75%		
1.0 mm	1.76	2.04	2.38	2.80	3.33	4.09	44	29
1.2 mm	1.13	1.31	1.53	1.80	2.15	2.64	65	45
1.4 mm	0.73	0.85	0.99	1.16	1.38	1.70	90	70

Porous products handling: cardboard, raw wood, pastries ...

Significant porosity and/or surface vacuum leaks are to be expected. For handling, a vacuum level between 30 to 55% is the best compromise, to be generated by a **60% max. vacuum level venturi.**

The chart below is a first indication towards the most economical nozzle ID, to be completed by a leak flow product measurement.



60% max. vacuum LEM

nozzle ID	Emptying time (seconds) for 1 liter volume						Air consumption (NI/mn)	Air suction (NI/mn)
	reached vacuum	30%	35%	40%	45%	50%		
1.0 mm	0.66	0.83	1.04	1.31	1.70	2.35	44	38
1.2 mm	0.41	0.52	0.66	0.83	1.07	1.49	65	72
1.4 mm	0.27	0.34	0.43	0.54	0.70	0.97	90	92

AN ISLAND TO BE ASSEMBLED

S

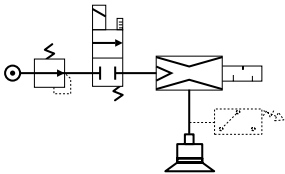
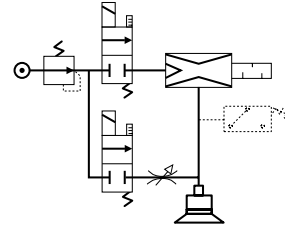
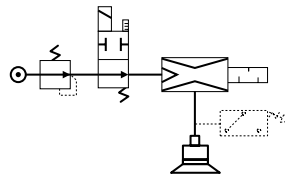
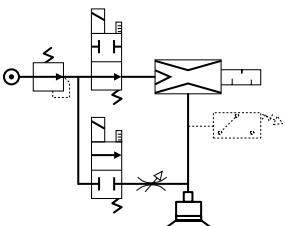
V A

B3

MODULE COMPOSITION

VACUUM SWITCH / DIALOGUE PANEL

ISLAND ASSEMBLIES

R	<p>Simple vacuum pump without blow-off: LEM__X__RV__</p> <ul style="list-style-type: none"> • Only one control signal. • NC vacuum control valve. 
S	<p>Vacuum pump with controlled blow-off: LEM__X__SV__</p> <ul style="list-style-type: none"> • 2 control signals. • NC vacuum control valve. • Blow-off controlled by external signal (NC control valve) with adjustable flow rate. 
U	<p>Simple vacuum pump without blow-off: LEM__X__UV__</p> <ul style="list-style-type: none"> • Only one control signal. • NO vacuum control valve. 
V	<p>Vacuum pump with controlled blow-off: LEM__X__VV__</p> <ul style="list-style-type: none"> • 2 control signals. • NO vacuum control valve. • Blow-off controlled by external signal (NC control valve) with adjustable flow rate. 

VA

Electronic vacuum switch with display and setting

- Separate settings for vacuum threshold and hysteresis.
- Real-time vacuum level display.
- "Gripped product" indicator.
- M8 connectors for inputs and outputs. Switching output and analogic output. Electrical protection: IP65.



VO

No vacuum switch

- Automatic functioning up to maximum vacuum level (no setting and no display).
- M8 connector for inputs only.
- Electrical protection: IP65.



B2



LEM__X__B2
island assembly with 2 identical modules

B3



LEM__X__B3
island assembly with identical modules

B4 ...

If the planned island contains different module types, it must be delivered as separate components in order to then be assembled on site according to the arrangement suitable to the application.

COMPONENTS FOR THE ISLAND TO BE ASSEMBLED

B



LEM__X__B
Module that can be grouped (complete with integrated grouping screw).



Set of ends for a complete group, with grouping screw and common pressure unit plug.

REF: LEMSETA

EXAMPLE COMPOSITE PART NUMBER FOR AN ISLAND ASSEMBLY:

■ LEM60X14SVAB3

LEM island assembly, containing 3 x 60% max. vacuum modules, ø 1.4 mm nozzle, controlled by NC solenoid valve, blow-off and vacuum switch.

ORDER EXAMPLE FOR AN ISLAND TO BE ASSEMBLED:

■ LEM60X10VVAB

■ LEM90X12SVAB

■ LEM60X14SVAB

3 LEM modules for a group, of different types.

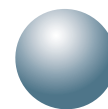
■ LEMSETA

Set of ends for island.

REFERENCE EXAMPLE COMPOSED OF A STAND-ALONE MODULE:

■ LEM60X12SVA

Stand-alone LEM Module, 60% max. vacuum, ø 1.2 mm nozzle, vacuum controlled by NC solenoid valve, blow-off along with vacuum switch.

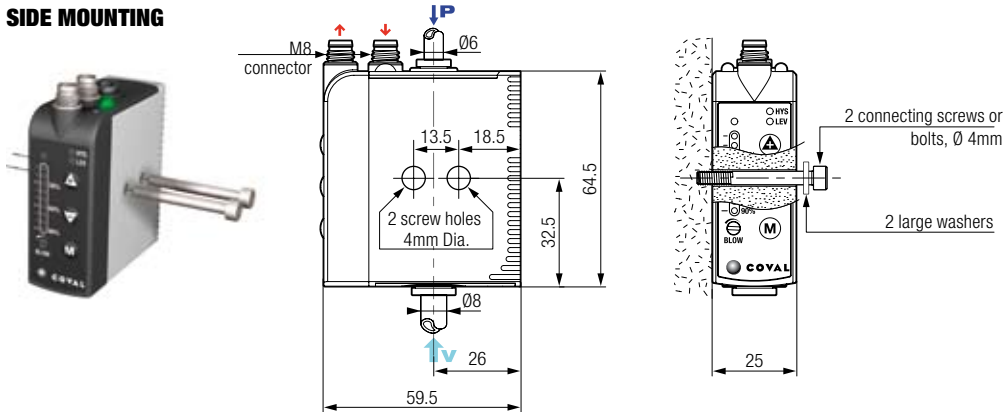


COVAL
vacuum managers

LEM series: mounting options

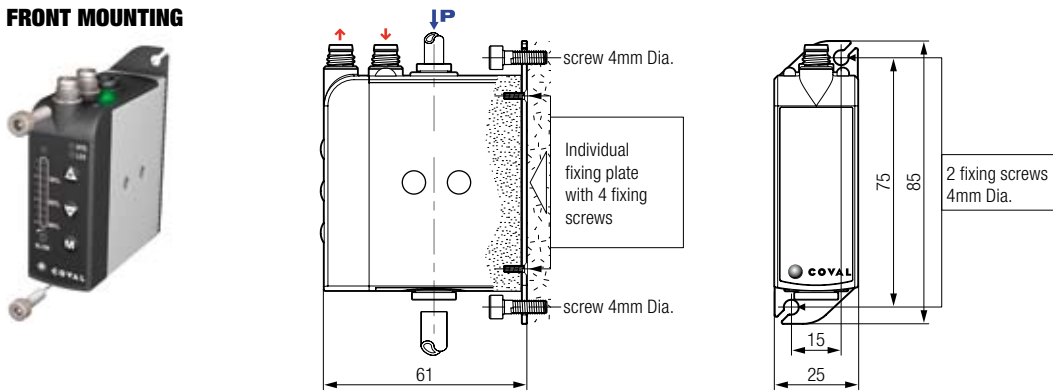
1- Stand-alone modules

SIDE MOUNTING



The side mounting is the simplest of all: 2 protruding screws.

FRONT MOUNTING

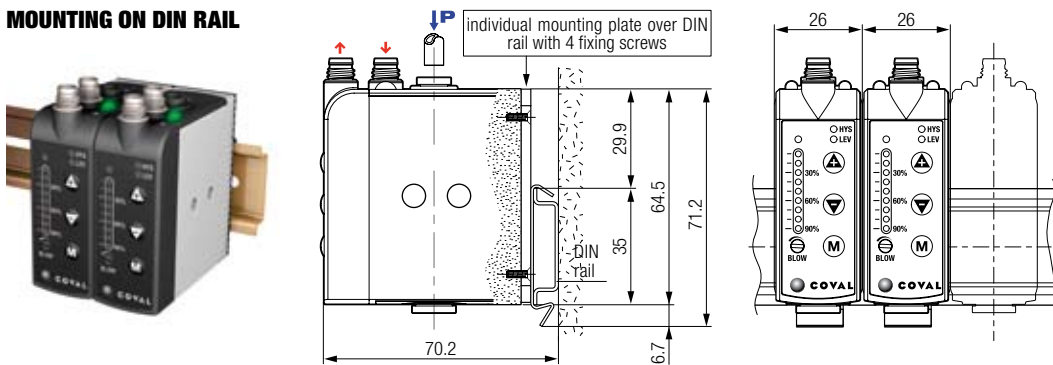


For fixing from front, please order the necessary kit in addition to the ejector module:

Kit for fixing from front :
1 plate + 4 screws

REF: LEMFIXA

MOUNTING ON DIN RAIL



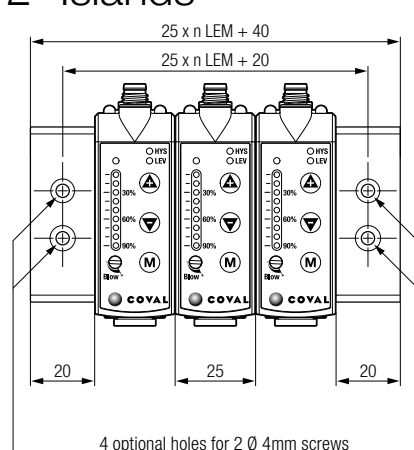
A module can be clipped onto a DIN rail.

For this purpose, the module must first be equipped with an individual DIN installation plate, ordered separately:

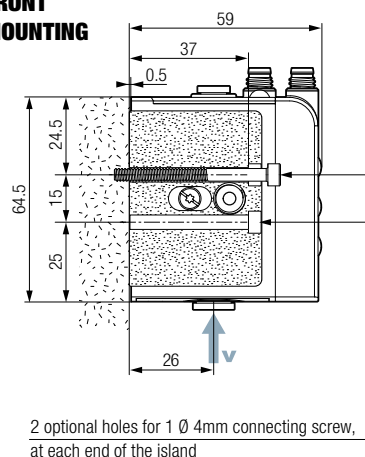
DIN rail mounting kit:
1 plate/clip + 4 screws

REF: LEMFIXB

2- Islands

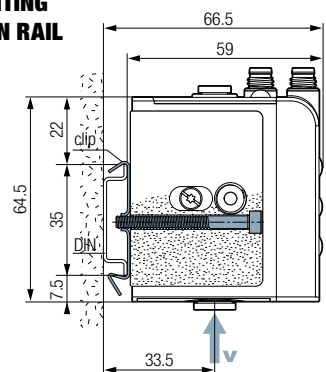


FRONT MOUNTING



2 optional holes for 1 Ø 4mm connecting screw, at each end of the island

MOUNTING ON DIN RAIL



DIN rail mounting kit:
2 clips + 4 screws

REF: LEMFIXC

LEM series: characteristics

General characteristics

- C.A supply 5 μ filtered, non-lubricated air relevant to ISO 8573-1 class 4 standard.
- Optimal working pressure: 4 to 8 bar.
- Blow-off: network supply pressure, adjustable flow rate.
- Maximum vacuum: 60% or 90% according to model (see page 8).
- Suction flow rate: 29 to 92 NL/min according to model (see page 8).
- Air consumption: from 44 to 90 NL/min according to model.
- Electric degree of protection: IP65.
- Voltage tension: 24 V DC (adjustable \pm 10%).
- Current draw: 30 mA (0,7W) vacuum or blow-off.
- Maximum frequency of utilization: 4 Hz.
- Number of operations: 10 million cycles.
- Weight: from 80 to 120 g according to model.
- Working temperature: from 10° C to 60 °C or 50 F to 140 F.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR.

Integrated vacuum switch

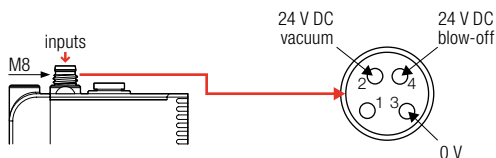
- Adjusting range: -1 to 0 bar.
- Precision: \pm 1, 5 % of the range.
- Hysteresis: from 0% to 100% (adjusted by potentiometer).
- Output threshold: 1 x switching output, NO.
- Analogic output: from 1 V DC over the measuring range.
- Switching power: 125 mA PNP.
- Threshold state display : 1x LED green
- Power supply: 24 V DC (regulated \pm 10%)
- Current draw: < 20 mA.
- Protection: against the inversions of polarity.

Integrated silencer

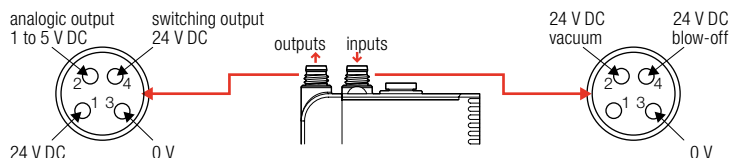
- Sound level: 68 dBA.
- Clog free silencer.

Electrical connections

MODULES WITHOUT VACUUM SWITCH



MODULES WITH VACUUM SWITCH



LEM series: applications

The LEM series mini-module vacuum pumps offer a new approach to vacuum handling in numerous domains: packaging, robotic, clamping, transfers, plastic molding, etc,...

Optimized to serve small and medium sized suction pads, LEM helps to simplify the installation while integrating all control functions into a single light weight mini-module, placed close to the suction pads.

In technical traditions, only the venturi and the vacuum switch are compact enough to be installed close to the suction pads. Further, they should be supplemented by solenoid valves, a pressure regulator, an electronic control ... which also need to be installed and fitted resulting in a laborious, expensive and complex installations.

A single block of LEM series mini module is enough to solve these well known problems. Thanks to its light weight, compact design and complete functions, the LEM mini-modules can be installed at the suction pads.

Additionally, as explained in the previous pages, the LEM also offers new energy savings, an exceptional silent functioning, and at last the dialogue intelligence needed for easy settings, follow up and maintenance.

**LEM, the unparalleled progress
in vacuum handling technology**

PACKAGING MACHINES



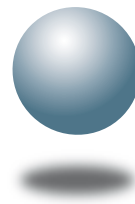
CLAMPING

ROBOTIC HANDLING TOOLS



PLASTIC INDUSTRY





COVAL
vacuum managers

vacuum components



A TECHNOLOGICAL PARTNER ON A GLOBAL SCALE

Located in the southeast region of France, COVAL conceives, manufactures and globally distributes high performance, advanced vacuum automation components and systems for industrial applications in all branches.

COVAL is an ISO 9001: V2008 certified company which offers innovative solutions integrating reliable and optimized components with intelligent functionalities. The focus is to provide the most personalized and economic solution to a given application while assuring a significant improvement in the productivity and the safety for the vacuum users around the world.

COVAL has an ambition for technical excellence and innovation. As a specialist in vacuum automation, COVAL is reputed for offering reliable, personalized, cost effective and productive solutions.

The references of COVAL can be found in several industrial sectors (Packaging, Automotive Industry, Plastic, Graphic, Aeronautic...) where vacuum handling is important for high efficiency and productivity.

COVAL markets its products and services all over Europe, in the United States and South America through its subsidiaries and authorized distribution network. COVAL strives to provide customer driven solutions and gives the best possible treatment to satisfy all its clients.

For all enquiries from Australia, Africa and Asia kindly contact COVAL head office in France.

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