COVAL

vacuum managers

mini-modules LEMAX

"ASC" compact vacuum pumps

AIR Saving Control

twin tech™
Integration & Intelligence

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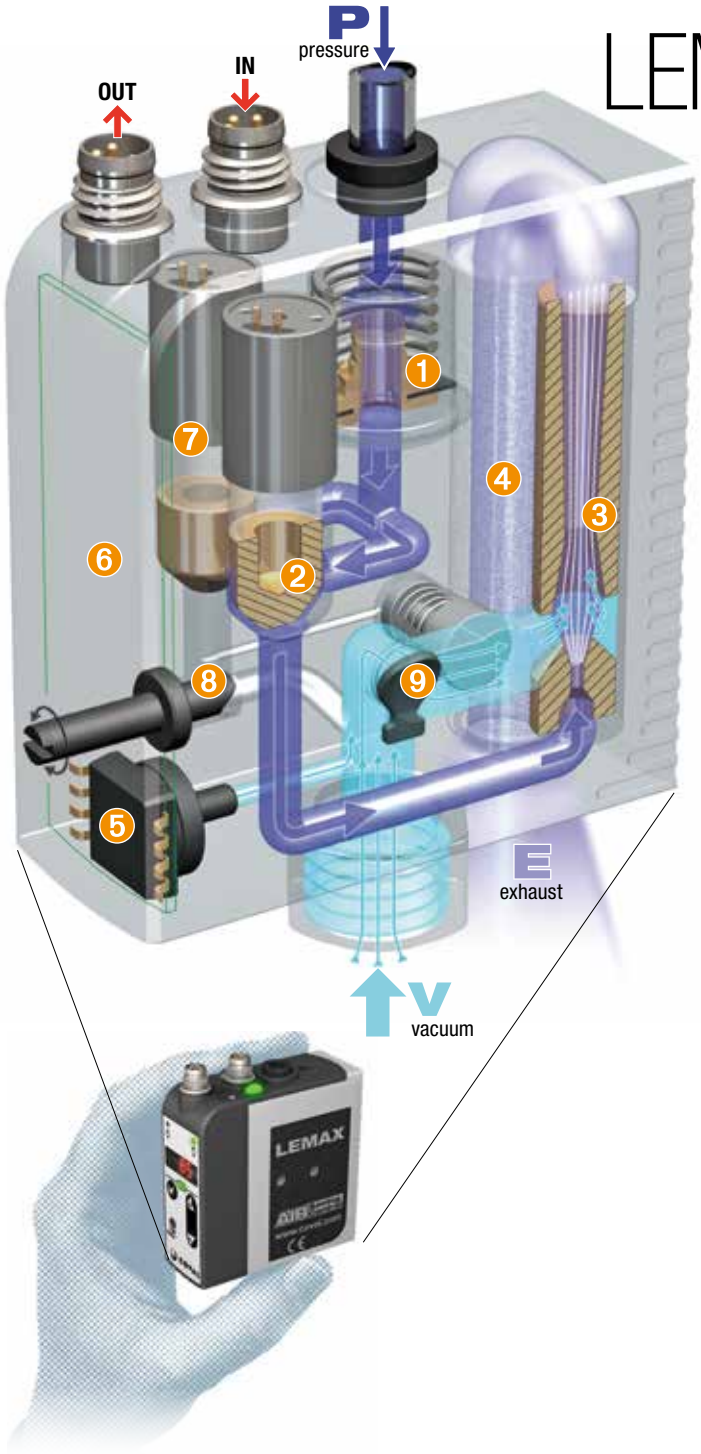
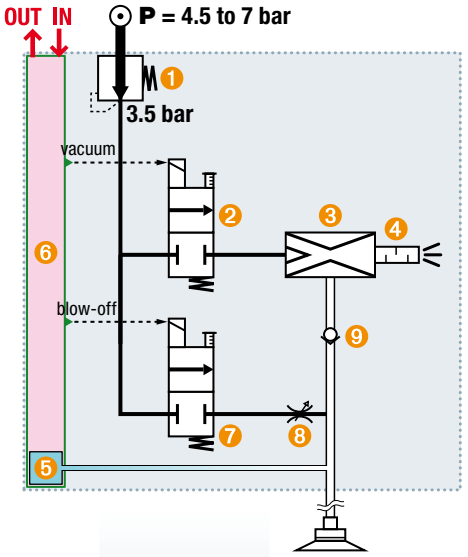
US4

LEMAX Series: Compact





INTEGRATED FUNCTIONS

1. 3.5 bar pressure regulator
2. "Vacuum" solenoid valve
3. 3.5 bar optimized venturi
4. Clog-free silencer
5. Vacuum switch
6. Integrated electronics
7. "Blow-off" solenoid valve
8. Blow-off flow regulator
9. Vacuum non-return valve

Compact Integration: The COVAL Technique

The illustrations demonstrate the COVAL technique: all necessary functions are integrated into a complete and self governing mini-module, together with the electronics implicitly controlling the "ASC" process.

"ASC" = AIR Saving Control

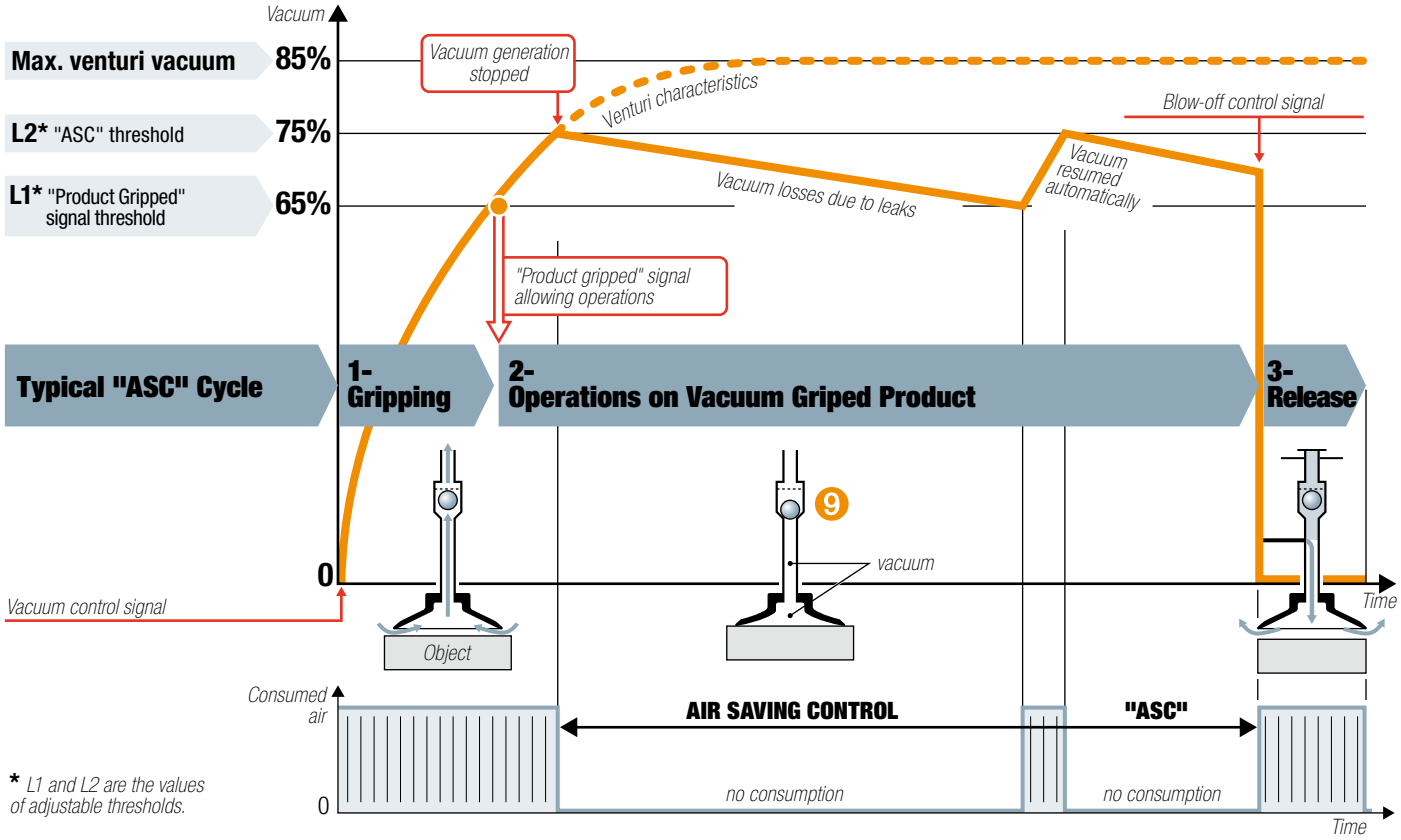
➔Once vacuum is established, no more air consumption to hold the product.

CONCLUSION: ***a major innovation, essential for a smart, modern approach to vacuum handling.***

ADVANTAGES:

- **"ASC" process regulation:**
  - energy savings pay for investment in just a few months.
- **Integrated intelligence:**
  - continuous vacuum feedback loop.
- **Simplified use:**
  - plug & play, programmable automatic blow-off…
- **Short response times:**
  - due to easy installation very close to vacuum cups.
- **Dust resistant:**
  - non-clogging open silencer.
- **Silent technology:**
  - pump at rest most of the cycle.
- **Safety:**
  - product gripping is maintained even with power failure.

Integration + Air Saving Control (ASC)



The "Air Saving Control" Cycle

As illustrated above, the LEMAX module automatically executes the "ASC", cycle, thus saving the maximum amount of energy, based on the following 3 phases.

1- Gripping the object

The "vacuum" solenoid valve ❷ starts the cycle by supplying the venturi ❸ which generates the vacuum to quickly pick up the object with the suction cup ➔ short-term consumption.

2- Operations on the object held by vacuum

The vacuum level is constantly monitored by the vacuum switch ❺. When it reaches the L1 threshold (65%), the "Product gripped" signal is generated, which allows the planned operations (transfer, machining, etc.). When the vacuum reaches threshold L2 (75%), the supply to the venturi via the solenoid valve ❷ is cut off ➔ consumption is halted. The object remains held by the retained vacuum thanks to the closed valve ❾.

Micro-leaks will generally cause the vacuum level to fall slowly. Each time it falls below 65%, vacuum generation is briefly resumed until it reaches threshold L2 (75%).

3- Releasing the object

At the end of operations, release is ordered. The "Blow-off" solenoid valve ❼ sends an air jet and blows-off the product for a fast release. Blow-off flow is adjustable through regulator ❽.

ASC automatically provides 60 to 90% energy savings, depending on application:investment pays for itself in just a few months.

ASC: Essential to Compete

Since ASC provides major energy efficiency, it is a key factor in remaining competitive with production. Two typical examples:

1- Gripping + transfer *(Ø 1.4 mm nozzle, 0.2 l of vacuum).*

Phase	Duration	Air consumption		
		"ASC" off	"ASC" on	
Gripping	0.28 s	0.014 ft³	0.014 ft³	Energy savings achieved
Transfer	1.20 s	0.063 ft³	0	
Release	0.14 s	0.007 ft³	0.007 ft³	
		0.084 ft³ →	0.021 ft³ →	75%

2- Clamping + operations *(Ø 1.4 mm nozzle, 0.4 l of vacuum).*

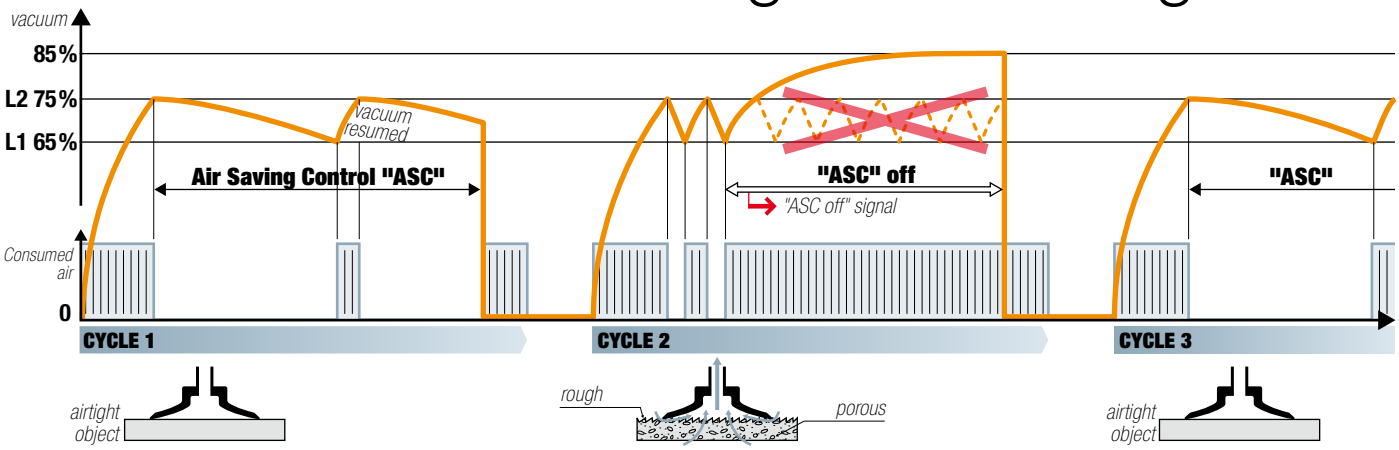
Phase	Duration	Air consumption		
		"ASC" off	"ASC" on	
Clamping	0.55 s	0.028 ft³	0.028 ft³	Energy savings achieved
Operations	60 s	3.178 ft³	0	
Release	0.14 s	0.007 ft³	0.007 ft³	
		3.213 ft³ →	0.035 ft³ →	99%

AIR Saving Control

twin tech™ Integration & Intelligence

COVAL vacuum managers

LEMAX Series: Integrated Intelligence



Adaptation Intelligence

The above example shows the LEMAX module's capacity to adapt from one cycle to another:

■ CYCLE 1

The ASC regulation process starts automatically. Due to micro-leaks, vacuum is automatically restored according to need.

■ CYCLE 2

If uncontrollable leaks arise (here due to a rough or porous product), vacuum is automatically restored at the cost of faster valve cycling and shorter life expectancy in the module. The integrated intelligence detects the anomaly, ends the cycle without ASC, and sends out the "ASC missing" signal thus preventing unnecessary wear and tear.

■ CYCLE 3

If the next product is airtight, the ASC cycle is automatically restored and the "ASC missing" signal disappears.
The module integrated intelligence adapts the cycle to the type of product (airtight or not) and, on longer terms, will call for maintenance when leaks are the result of worn out vacuum cups or aging circuits.

ASC: a simple practice with no limits

Saving energy has become a major target for many companies. With LEMAX and ASC, savings are achieved automatically without changing any established operations.

1- Wide range of choices (see p.7 and 9)
Stand-alone or island modules, specific signal or automatic blow-off, NO vacuum solenoid valve for product holding security.

2- Optimized factory settings
The factory setting (L1=65% vac., L2=75% vac.) is convenient for most applications, but may be customized as necessary.

3- Production continuity
The production process carries on, possibly without ASC, if leak level is too high.

4- Guided maintenance
Clear display of the maintenance requirements in order to return to the ASC regulation.

Communication Intelligence

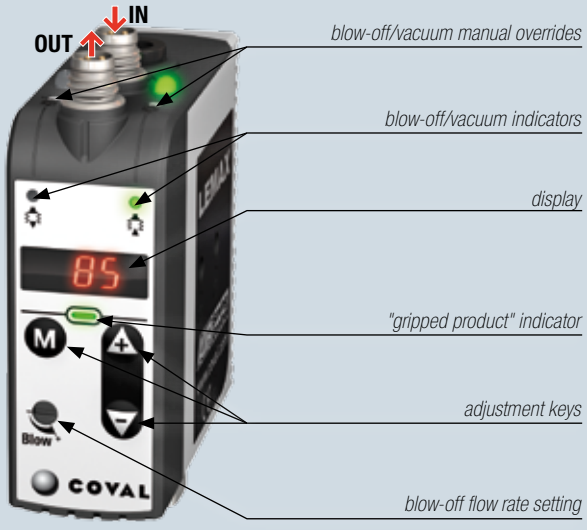
The LEMAX module's integrated intelligence also controls the following communications:

■ **Signals sent**
- "Gripped product" signal.
- "ASC missing" signal and, in complement, a blinking alert message on the display panel.

■ **Display and dialog**
- Display for follow-up and diagnostic.
- Visual indicators: "vacuum", "blow-off", "gripped product" signal.
- Manual overrides: "vacuum", "blow-off".

■ **Configurations**
The keys and indicators shown below give access to:
- the choice of blow-off type: controlled or auto 0 to 9.9 s.
- The auxiliary output configuration ➔ see page 10.

■ **Settings**
The LEMAX module is supplied pre-programmed according to the "factory" setting: L1=65% vac., L2=75% vac. However, for very specific applications, this setting may easily be changed as needed.



Stand-alone and Island Modules

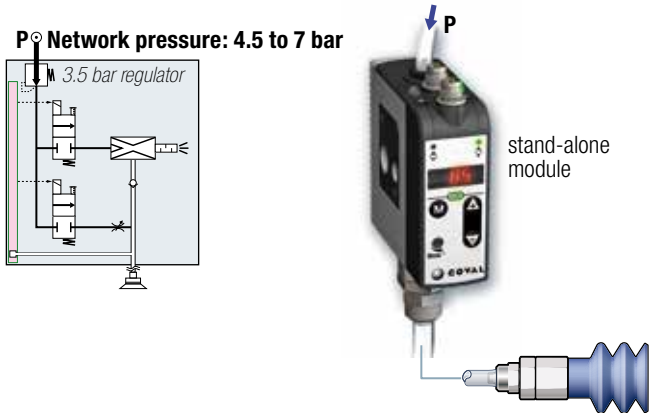
The LEMAX series offers 2 module configurations:

1- Stand-alone modules

The complete solution to the most common applications, where all vacuum pads are working according to the same sequence.

They are individually fixed, supplied and controlled. Their integrated 3.5 bar pressure regulator allows a direct supply from the air pressure network, from 4.5 to 7 bar.

See p. 6 and 7 for the part numbers, connections and mounting options for stand-alone modules.



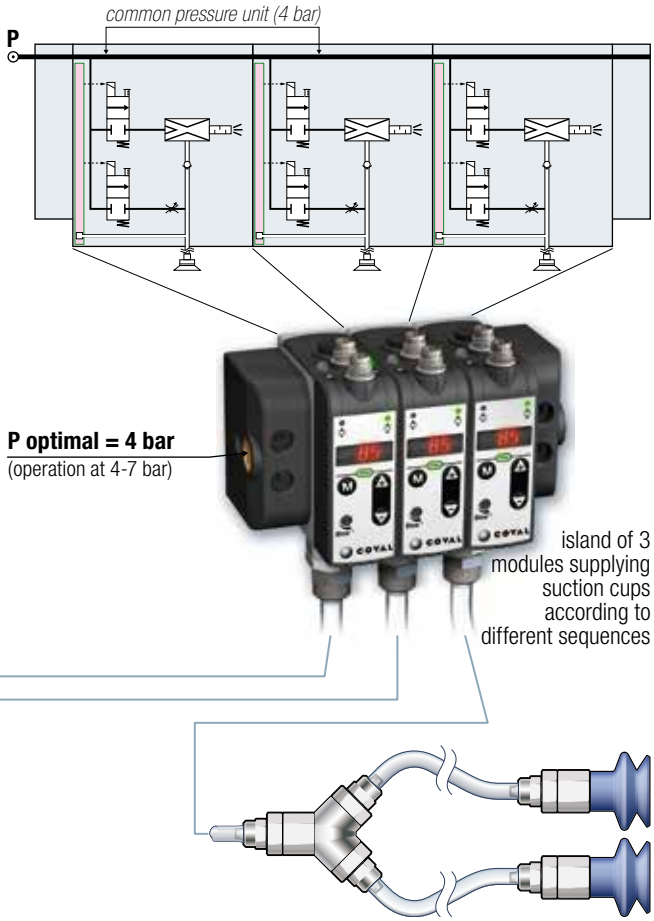
2- Island modules

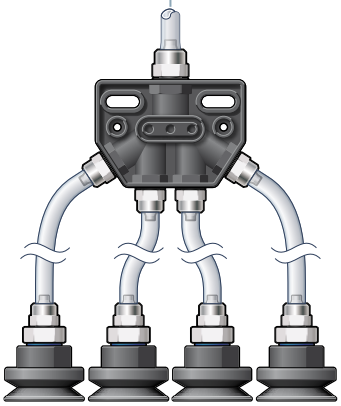
An island may be convenient for feeding vacuum pads following different sequences.

These modules are to be banked together to form a compact island block. The common pressure unit thru the island supplies each module which receives its own controls and feeds its own set of vacuum pads.

In contrast to stand-alone modules, island modules have no integrated pressure regulator; hence, the optimum pressure to feed the island is 4 bar.

See p. 8 and 9 for the part numbers, connections and mounting options for island modules.





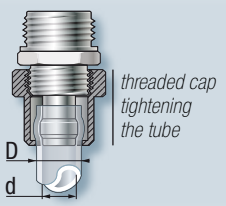
Long-lasting airtight vacuum circuits

With stand-alone or island LEMAX modules, the ASC cycle will keep operating only if the vacuum circuit remains airtight over time.

If this circuit includes tubing that moves respective to the the fittings, threaded cap fittings should preferably be used (see below).

Threaded cap fittings

Screwing the cap (see illustration) tightens the tube onto the fitting sealing barb.
The connection remains airtight, even if the tube is moving respective to the fitting.



These threaded cap fittings are available from the COVAL catalog: elbows, Ys, manifolds and straight threaded connectors (illustration), for d x D tubes (4 x 6 mm, 6 x 8 mm and 8 x 10 mm).

Tube 4 x 6 mm is flexible and convenient for moving circuits.

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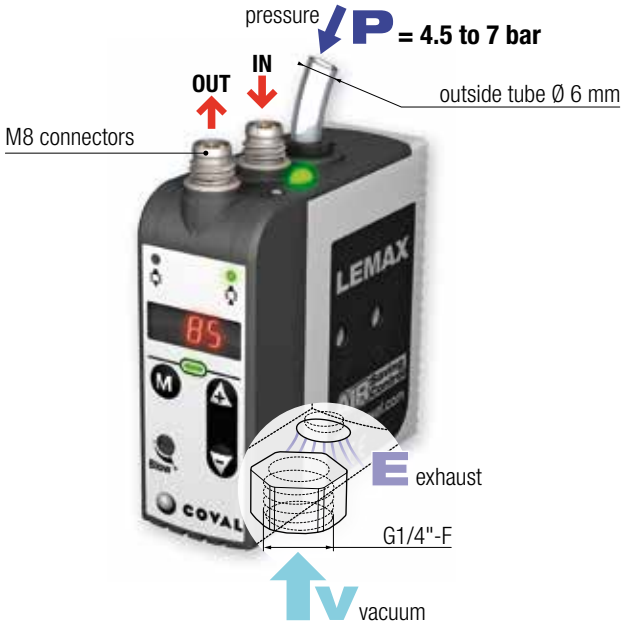
LEMAX Series: Stand-alone

Module Connections

■ **Pressure supply**
- P = 4.5 to 7 bar.
- 6mm OD tubing onto push-in connection.

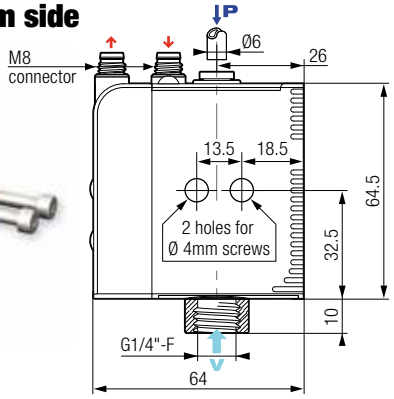
■ **Electrical connections**
- 2 standard M8 connectors.
- Standard connectors: see page 10.

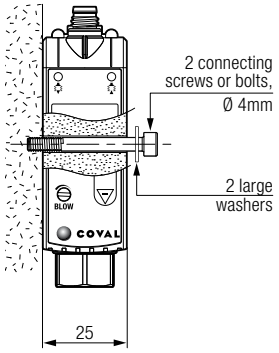
■ **Vacuum circuit connection**
- G 1/4"-F threaded port.
- See page 5 recommendations for a long lasting air tight circuit.



Choice of Mounting

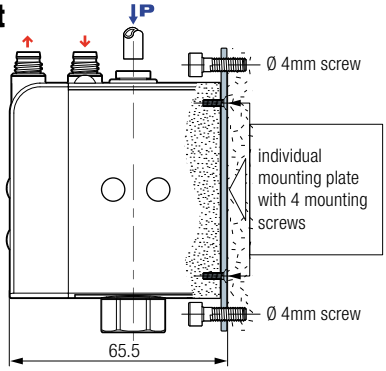
1- Mounting from side

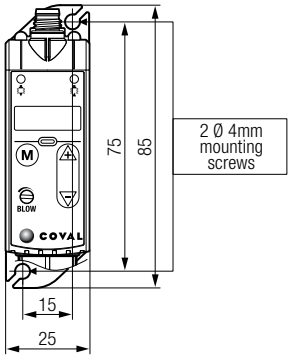




The side mounting is the simplest of all:
2 protruding screws or bolts with large washers.

2- Mounting from front



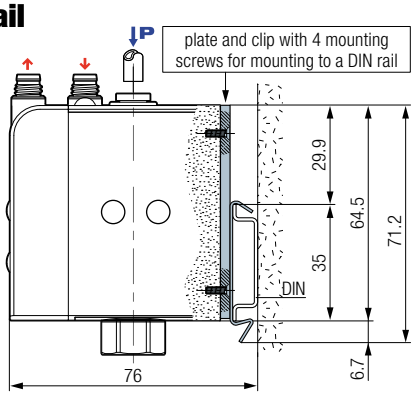


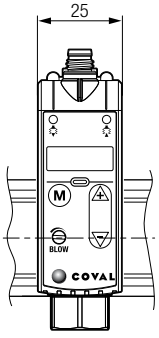
For mounting from front, please order the necessary kit in addition to the ejector module:

Kit for mounting from front: 1 plate + 4 screws

Part No.: LEMFIXA

3- Mounting to a DIN rail





The module may be clipped over a DIN rail.

To do so, the module should be equipped with an individual mounting plate over the DIN rail which is to be ordered separately:

Mounting kit for the DIN rail: 1 plate/clip + 4 screws

Part No.: LEMFIXB

Modules Configuration

LEMAX	90	X	14		S

Composed module part number

VACUUM LEVEL

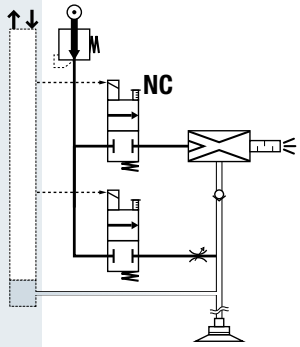
85% max. vacuum optimum for airtight objects	**90**

NOZZLE DIAMETER

Ø 1.4 mm nozzle	**14**
Ø 1.2 mm nozzle	**12**
Ø 1 mm nozzle	**10**

MODULE COMPOSITION

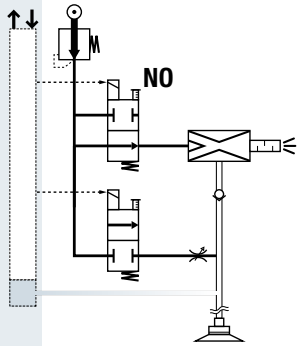
S — Vacuum pump controlled by a Normally Closed solenoid valve (NC)



LEMAX90X__**S**

- In case of electrical cut-off, the vacuum generation stops.
- Blow-off programmed on-site. Choice between:
  - blow-off controlled by specific signal.
  - automatic blow-off with 0 to 9.9 s adjustable time → only one signal for vacuum and blow-off.

V — Vacuum pump controlled by a Normally Open solenoid valve (NO)



LEMAX90X__**V**

- In case of electrical cut-off, vacuum generation continues.
  → Product holding is maintained for safety
- Blow-off is controlled by specific signal.

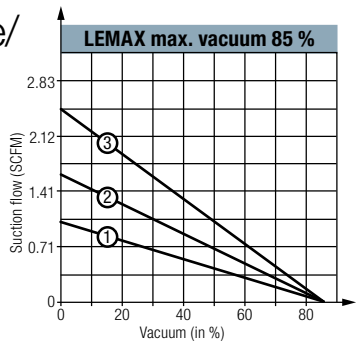
Selecting the Nozzle Diameter

Ø Nozzle	Venturi characteristics during "ASC off" operations		"ASC" operation: - gripping at 65% vacuum - vacuum shutoff at 75% Time for a volume of 1l		
	air drawn in (SCFM)	air consumed (SCFM)	gripping time (s) (65% vac.)	time (s) up to 75% vac.	air consumed (ft^3)
1.4 mm	**2.47**	**3.18**	**0.99**	**1.38**	**0.077**
1.2 mm	**1.59**	**2.30**	**1.53**	**2.15**	**0.077**
1.0 mm	**1.02**	**1.55**	**2.38**	**3.33**	**0.077**

→ A large nozzle enables quicker gripping without consuming more during "**ASC**" operation.
→ A small nozzle consumes less only when operating continues without "**ASC**".

Suction Flow Rate/ Vacuum Curves

1- LEMAX90X10
2- LEMAX90X12
3- LEMAX90X14



EXAMPLE OF COMPOSED PART NUMBERS:

LEMAX90X14S

LEMAX "ASC" compact vacuum pump, 85% maximum vacuum, Ø 1.4mm nozzle, controlled by a Normally Closed solenoid valve.

SPECIFIC COMPLEMENTARY OPTIONS:

Island of banked modules: see pages 8 and 9.

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LEMAX Series: Island

Island Composition

The island modules are modularly banked to form a compact island.

Each module is separately controlled in order to feed its vacuum pad(s) according to the required sequence.

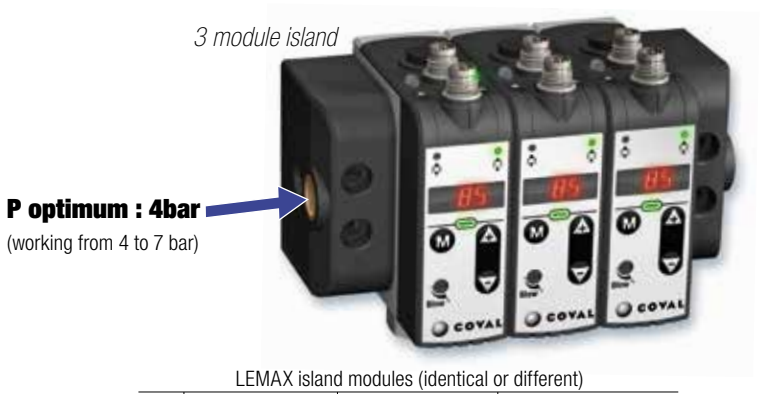
The island operates with a common pressure core that feeds each module. This common core receives pressure at either end, or both ends if needed.

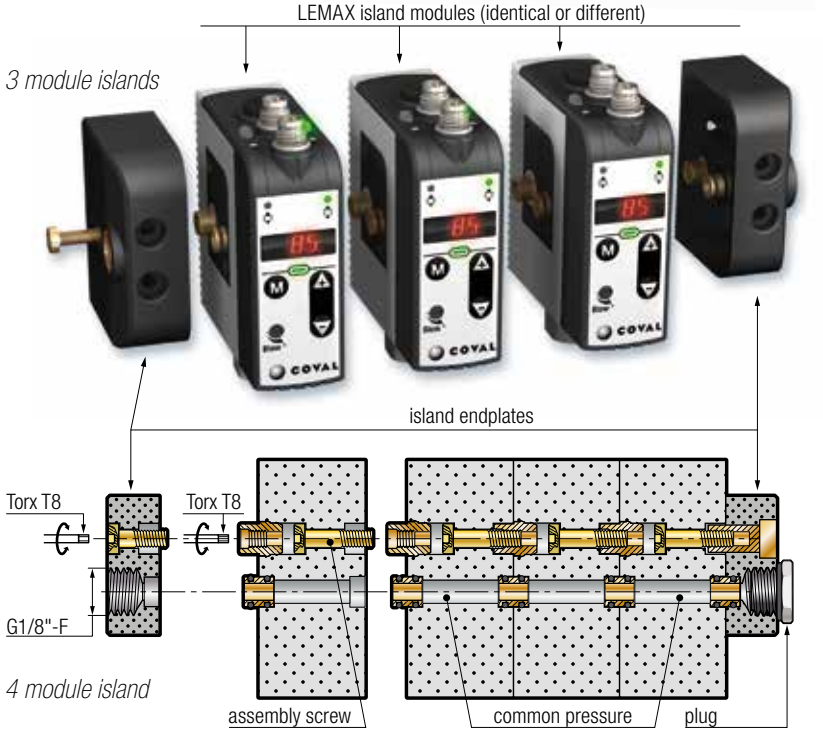
The maximum number of modules in an island depends of the power of the modules that must be active simultaneously:

- 5 modules maximum for Ø1.4 mm nozzle.
- 7 modules maximum for Ø1.2 mm nozzle.
- 9 modules maximum for Ø1 mm nozzle.

A part number may be defined and ordered (see next page) for islands with identical modules. Such islands will be delivered assembled.

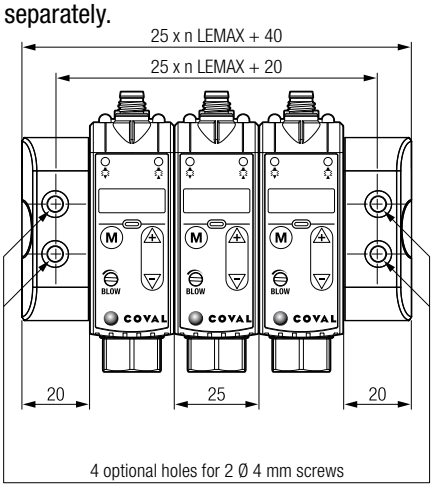
For islands with different modules, the order will list the part number for each module and the island endplates set part number (see next page). The island can be easily assembled on site (see illustration) with the modules positioned to fit the application needs.



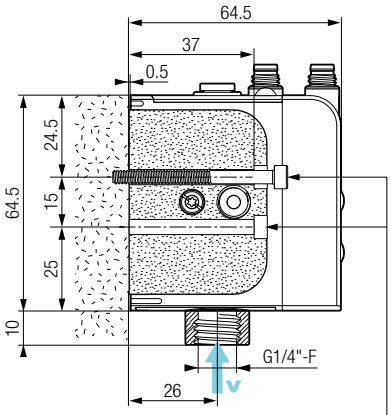


Island Mounting

An island is mounted by its 2 endplates, either from front with protruding screws or bolts or clipped over a DIN rail, with an additional mounting set to be ordered separately.

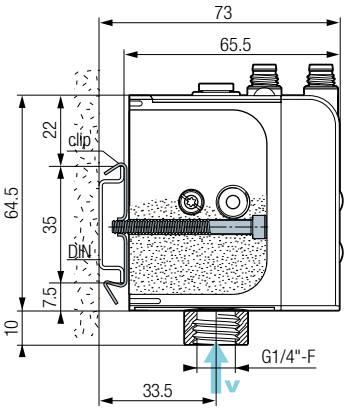


1- Mounting from front



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

2- Mounting to a DIN rail



Mounting kit for the DIN rail: 2 clips + 2 screws

Part No.: LEMFIXC

Modules Configuration

LEMAX	90	X	14	S		B3

Composed part number for an island or an island module

VACUUM LEVEL

85% max. vacuum optimum for airtight objects	**90**

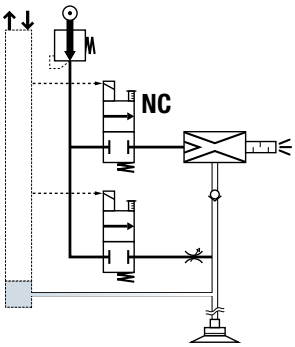
NOZZLE DIAMETER

Ø 1.4 mm nozzle	**14**
Ø 1.2 mm nozzle	**12**
Ø 1 mm nozzle	**10**

MODULE COMPOSITION

S

Vacuum pump controlled by a Normally Closed solenoid valve (NC)

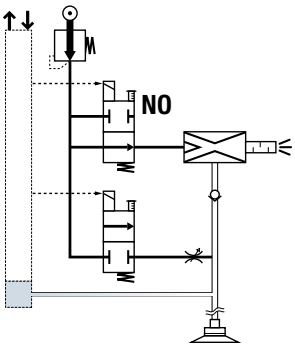


LEMAX90X__**S**__

- In case of electrical cut-off, the vacuum generation stops.
- Blow-off to be configured at choice:
  - with specific control signal.
  - automatic, with 0 to 9.9 s timing

V

Vacuum pump controlled by a Normally Open solenoid valve (NO)



LEMAX90X__**V**__

- In case of electrical cut-off, the vacuum generation continues.
- Product holding is maintained:
  → positive security.
- Blow-off controlled with specific signal.

ASSEMBLED ISLANDS

B2

LEMAX90X___**B2**

Assembled island with 2 identical modules.

B3

LEMAX90X___**B3**

Assembled island with 3 identical modules.

B4

…

If the required island includes modules of different types, the order must list all components part numbers, to be later assembled on site, per the application needs.

NON-ASSEMBLED ISLAND COMPONENTS

B

LEMAX90X___**B**

Island module, complete with integrated assembly screw.

Island endplates set complete with assembly screw and plug for pressure common.

REF : LEMSETA

EXAMPLE OF NON-ASSEMBLED ISLAND ORDER:

- **LEMAX90X14VB**
- **LEMAX90X12SB**
- **LEMAX90X10VB**

→ 3 LEMAX island modules of different types.

- **LEMSETA** → Island endplates set.

EXAMPLE OF ASSEMBLED ISLAND PART NUMBER:

- **LEMAX90X14SB3**

LEMAX assembled island with 3 modules 85% max. vacuum, Ø 1.4 mm nozzle, controlled by a Normally Closed solenoid valve.

COVAL vacuum managers

LEMAX Series: Characteristics

General Characteristics

- C.A. supply 5µ filtered, non-lubricated air relevant to ISO 8573-1 class 4 standard.
- Optimal working pressure: 4.5 to 7 bar.
- Mini dynamic pressure: - stand-alone module: 4.5 bar.
  - island modules: 4 bar.
- Blow-off: adjustable flow - stand-alone modules: P = 3.5 bar.
  - island modules: P supply.
- Maximum vacuum: 85%.
- Suction flow rate: 1.02 to 3.25 SCFM.
- Air consumption: 1.55 to 3.18 SCFM during "ASC" off operation.
- Integrated clog-free silencer.
- Sound level: about 68 dBA "ASC" off, 0 dBA with "ASC".
- Electrical degree of protection: IP65.
- Maximum frequency of utilization: 4 Hz.
- Number of operations: 30 million cycles.
- Weight: 130 g.
- Working temperature: 50 to 140°F.
- Materials: PA 6-6 15%FG, brass, aluminium, NBR.

Electrical controls

- Voltage tension: 24 V DC (adjustable ± 10 %).
- Current draw: 30 mA (0,7W) vacuum or blow-off.

Integrated electronics

- Power supply: 24 V DC ; current draw: <57mA.
- Measuring range: 0 to 99 % vacuum.
- Measuring precision: ±1.5 % of the range, compensated in temperature.
- Display: 3 Digits, 7 Segments.

Service Characteristics

"Product Gripped" output signal

- 24V DC switching output/NO, switching power: 125 mA PNP.

Configurable auxiliary output

- either "vacuum level" signal, analogic 0 to 5V DC, along the 0 to 99 % vacuum measurement range.
- or "ASC off" signal +5V DC switching output/NO.

Displays

- Display: 3 Digits, 7 Segments.
- Blinking "ASC missing" signal for maintenance.
- Visual indicators: "vacuum" = green LED, "blow-off" = red LED.
- "Gripped product" visual indicator: green LED in front.

Configurations

- Through adjustment keys and display (see p.4).
- Measurement unit selection (%, mbar, inHg).
- Blow-off choice: controlled, or automatic timed 0 to 9.9 s.

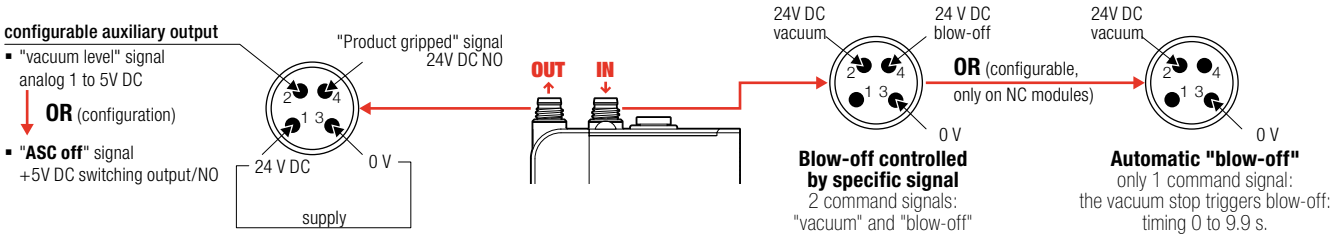
Settings

- Display of cycles number (vacuum cycles counter).
- If required by the application, threshold and hysteresis settings when different from initial factory setting (L1=65%, h1=10%, L2=75%, h2=10%).

Autoreactivity

- Continuous control of vacuum leaks level: automatic override or return to "ASC" regulation.

Electrical connections and corresponding configurations



M8 electrical connectors

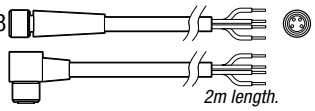
CHARACTERISTICS:

- screw type female connectors.
- 2m PVC cable, pre-assembled four-wire.
- protection IP65.

CONNECTOR WIRING:

REFERENCES:

- straight CDM8
- elbow CCM8



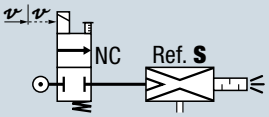
SPECIAL CONNECTORS ON REQUEST:

- PUR cable.
- 5 or 10 m length.

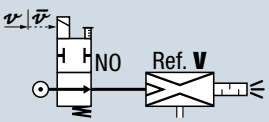
Gripping safety: vacuum command with a NC solenoid valve or a NO solenoid valve?

Both presented on p. 7 and 9, these 2 variants have a different behavior in case of electrical cut-off:

■ with a NC solenoid valve, vacuum stops being generated: the product is only maintained by the non-return valve on vacuum.



■ with a NO solenoid valve, vacuum goes on being generated to explicitly maintain the product gripping.



Both variants **S** and **V** are controlled by the same $\mathcal{V}$ signal (vacuum). In fact, on the NO variant that must be piloted when there is no need for vacuum, this $\mathcal{V}$ signal is internally inverted to $\bar{\mathcal{V}}$.

The NO variant (ref. **V**) is recommended for applications where the product gripping must explicitly be maintained in case of electrical cut-off, even if there are leaks on the vacuum circuit (positive safety).

However, this NO variant does not offer the automatic timed blow-off option which enables control of the modules through a single "vacuum + blow-off" signal.

LEMAX Series: Applications

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

Optimized to serve small and medium sized suction cups, LEMAX helps to simplify the installation while integrating all control functions into a single lightweight mini-module, placed close to the suction cups.

Integrated in all LEMAX modules, the ASC mechanism automatically provides 60-99% energy savings when handled products are airtight. If porous products are also handled, production continues normally, but without ASC.

The LEMAX series is thus applied on installations handling airtight products: glass, plastics, coated wood, metal sheets, etc… The energy savings pay for the investment in only a few months.

However, the LEMAX series may also be applied to mixed machines, that may receive airtight and porous products: the adaptation to the type of product is totally automatic.

PACKAGING MACHINES

ROBOTIC HANDLING TOOLS

CLAMPING

PLASTIC INDUSTRY

LEM+LEMAX: Complementary Series

LEM Series

■ **Series convenient for all gripping:**
- Porous products: cardboard, raw wood, pastries, etc …
- Airtight products, when LEMAX is not applied.

■ **Many configurations :**
- 60 and 85 % maximum vacuum.
- With or without vacuum switch.
- With or without blow-off.

The common advantages

- Integration: all necessary functions are integrated into a complete mini-module.
- Intelligence: integrated electronics for configuring the application and automatic follow-up.
- Complete ranges to suit all applications:
  - Power choice: Ø 1mm, 1.2mm and 1.4 mm nozzle.
  - Installations with choice of:
    - stand-alone modules (illustrations on left).
    - island modules (illustration below).

LEMAX Series

■ **Series convenient for all airtight product gripping:**
- The ASC mechanism saves 60 to 99% energy automatically.

Island gathering LEM modules and LEMAX modules

twin tech™ Integration & Intelligence

AIR Saving Control

COVAL vacuum managers

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: V2015 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.

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