



COVAL

vacuum managers

mini-modules

"ASC" compact vacuum pumps

LEMAX



BARTROM

Pneumatică & Control Fluide

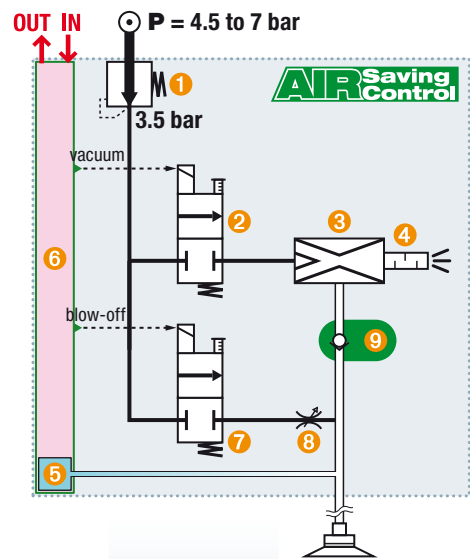
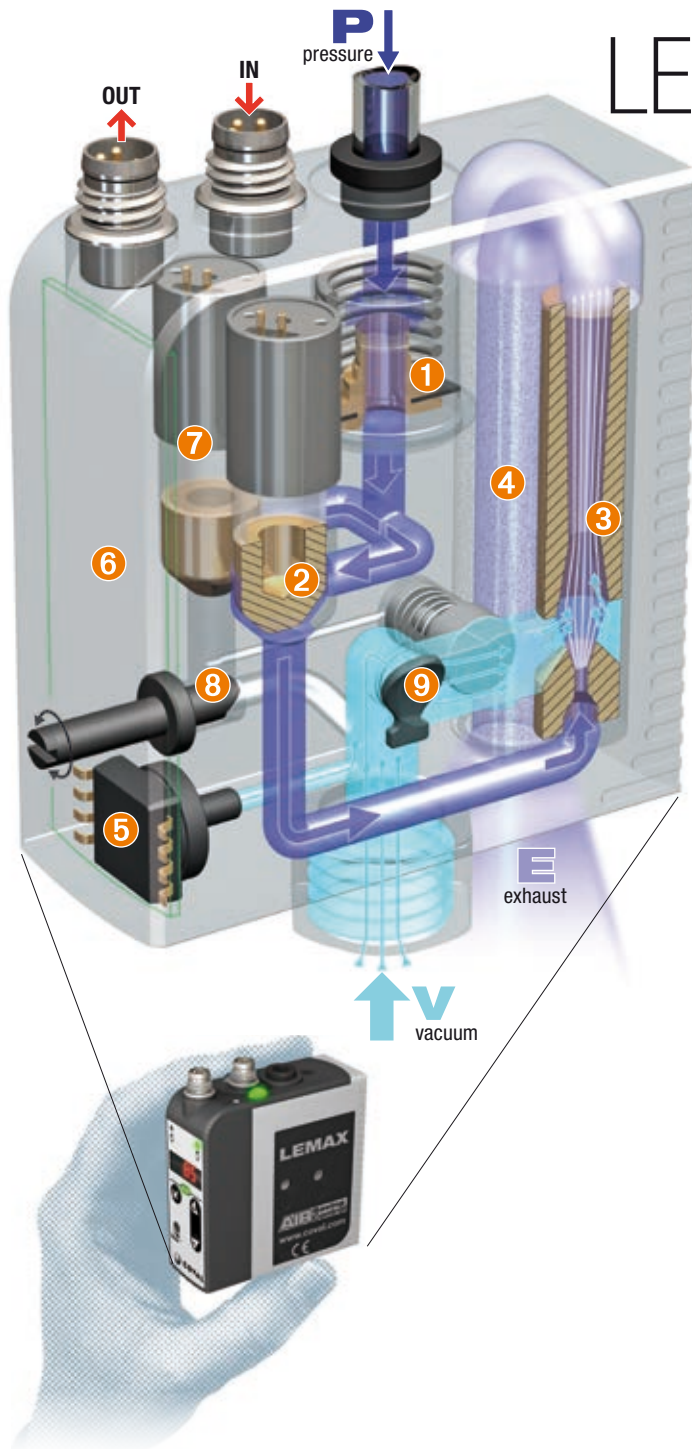
www.coval.com

AIR Saving
Control

twin tech™
Integration & Intelligence

US5

LEMAX Series: Compact



INTEGRATED FUNCTIONS

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

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.

Compact Integration: The COVAL Technique

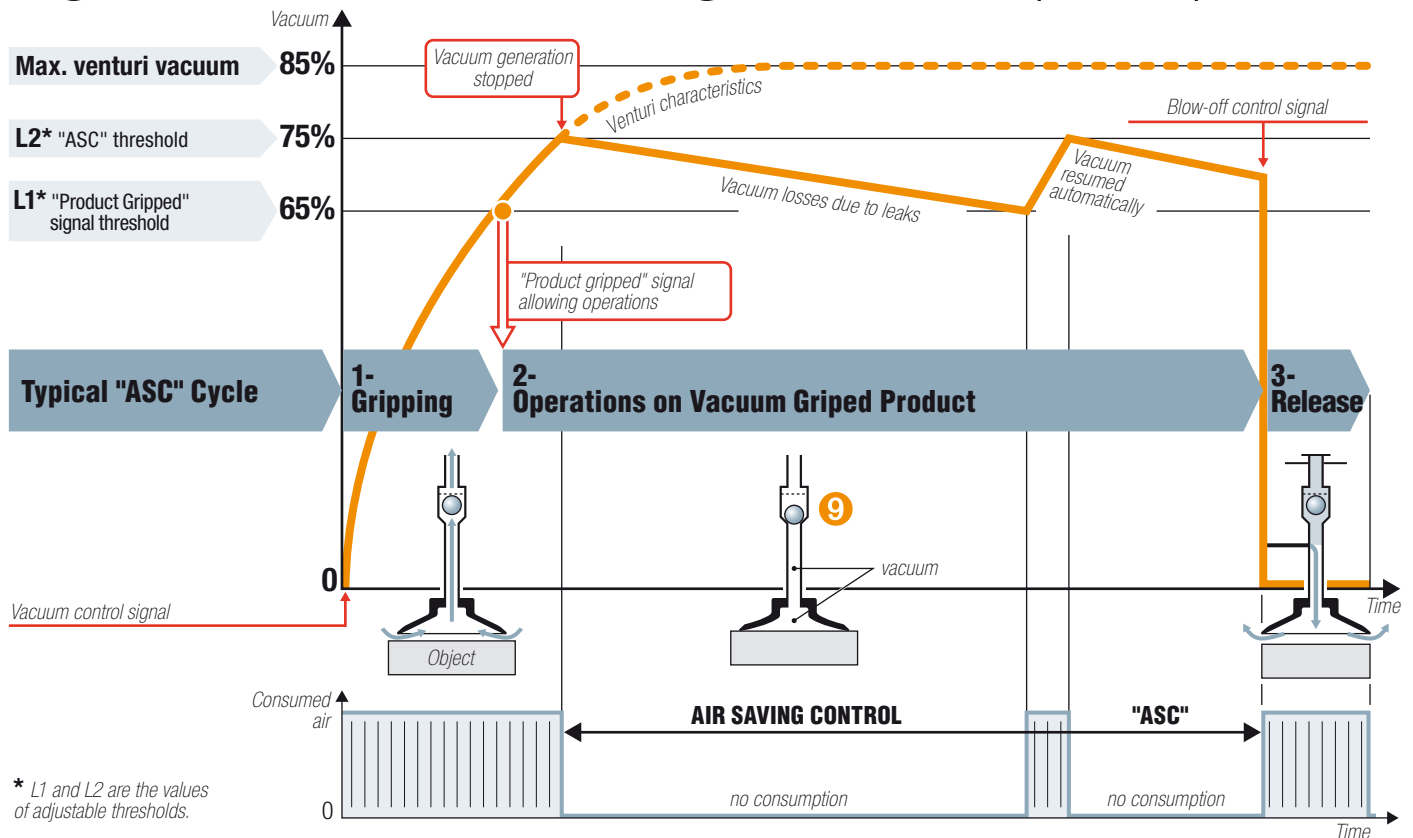
The illustrations demonstrate the COVAL technique: all necessary functions are integrated into a complete and self governing mini-module, together with the electronics implicitly controlling the "ASC" process.

"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.*

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 ② starts the cycle by supplying the venturi ③ 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 ⑤. 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 ② is cut off → consumption is halted. The object remains held by the retained vacuum thanks to the closed valve ⑨.

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 ⑦ sends an air jet and blows-off the product for a fast release. Blow-off flow is adjustable through regulator ⑧.

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).

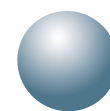
Phase	Duration	Air consumption		Energy savings achieved
		"ASC" off	"ASC" on	
Gripping	0.28 s	0.014 ft ³	0.014 ft ³	
Transfer	1.20 s	0.063 ft ³	0	
Release	0.14 s	0.007 ft ³	0.007 ft ³	
		0.084 ft ³	0.021 ft ³	75%

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

Phase	Duration	Air consumption		Energy savings achieved
		"ASC" off	"ASC" on	
Clamping	0.55 s	0.028 ft ³	0.028 ft ³	
Operations	60 s	3.178 ft ³	0	
Release	0.14 s	0.007 ft ³	0.007 ft ³	
		3.213 ft ³	0.035 ft ³	99%

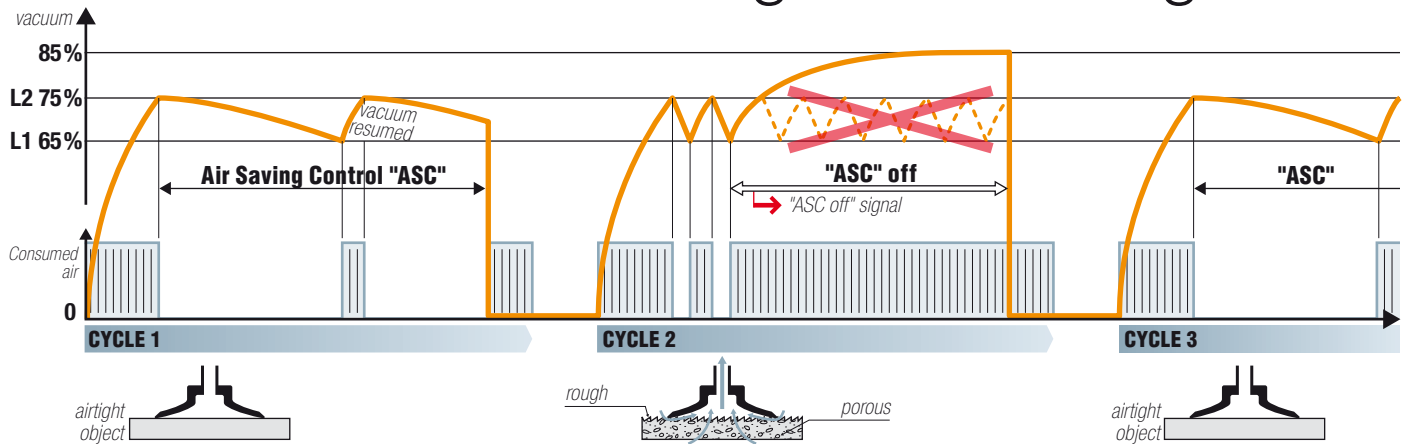
AIR Saving Control

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.

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.

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

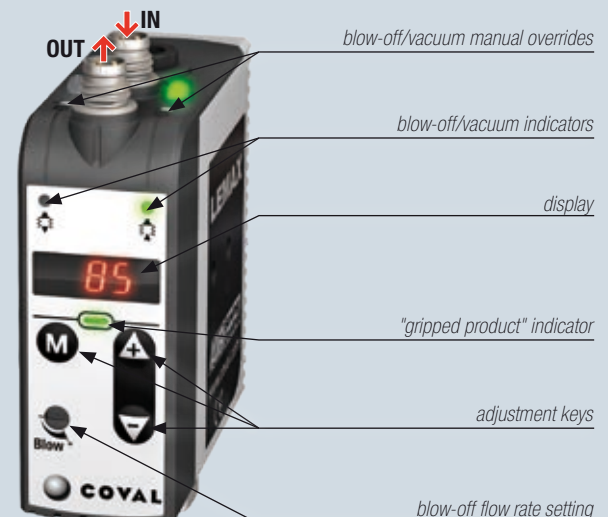
The factory setting (L1=65% vac., L2=75% vac.) is convenient for most applications, but may be customized as necessary.

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.



Stand-alone and Island Modules

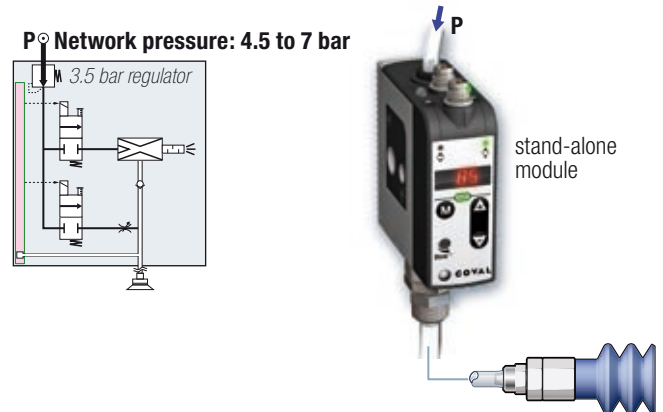
The LEMAX series offers 2 module configurations:

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.



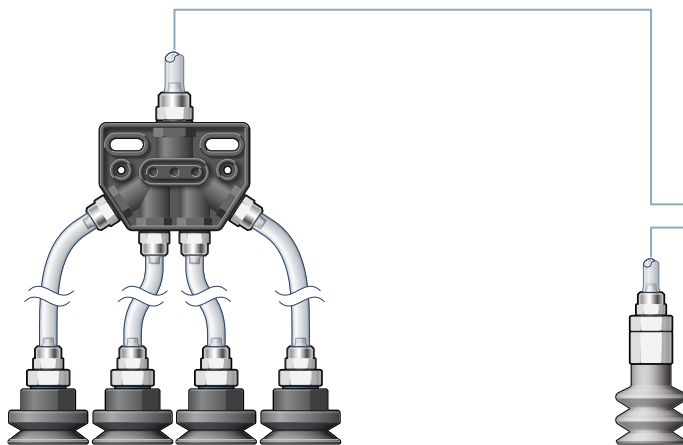
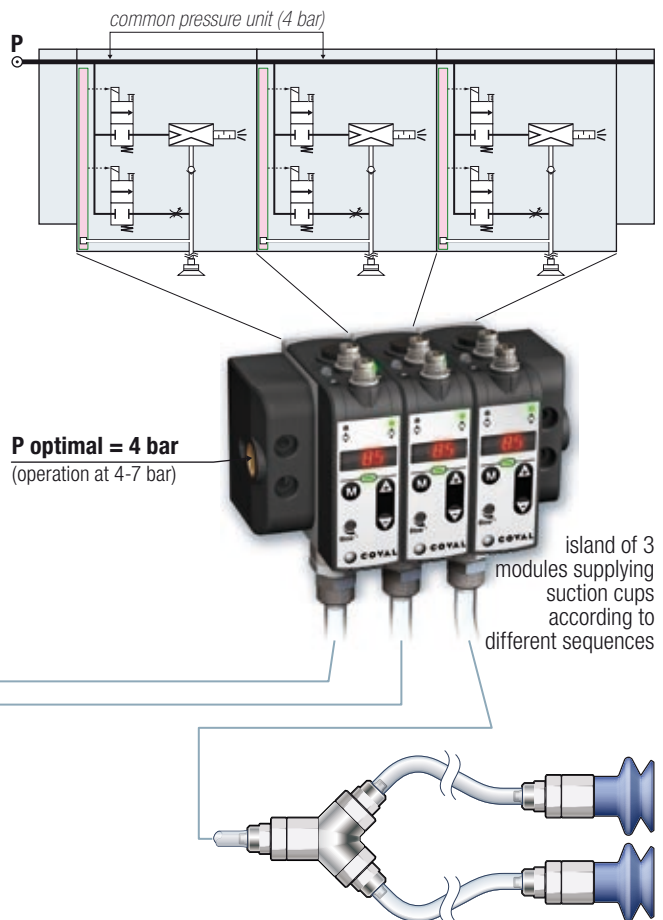
2- Island modules

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.



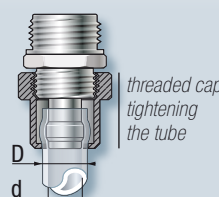
Long-lasting airtight vacuum circuits

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

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 $d \times D$ 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.

LEMAX Series: Stand-alone

Module Connections

■ Pressure supply

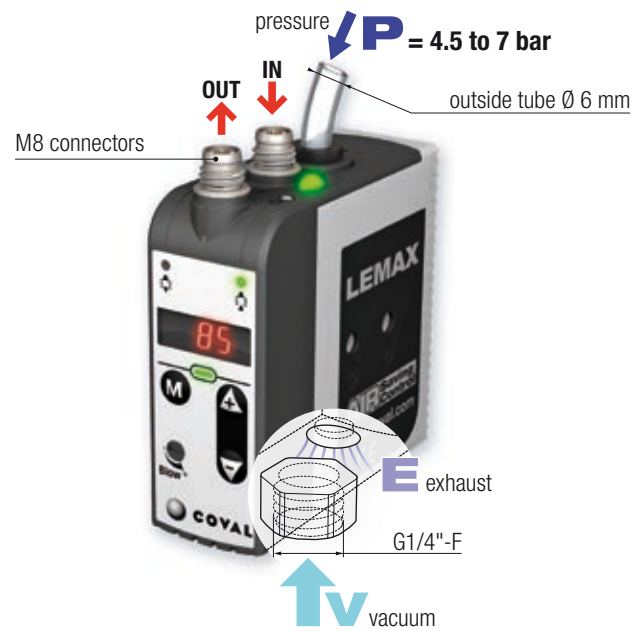
- P = 4.5 to 7 bar.
- 6mm OD tubing onto push-in connection.

■ Electrical connections

- 2 M8 4-pin Connectors
- or
- 1 M8 4-pin Connector.

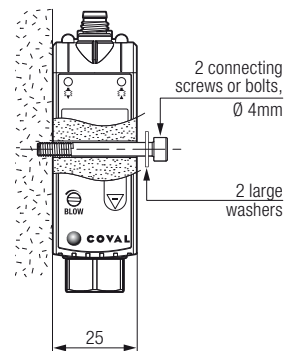
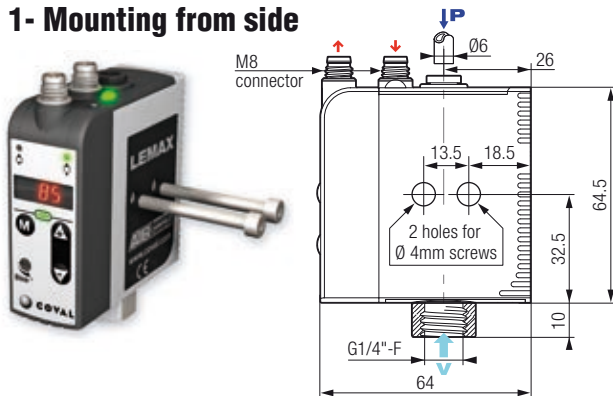
■ Vacuum circuit connection

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



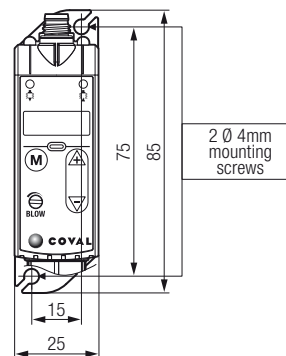
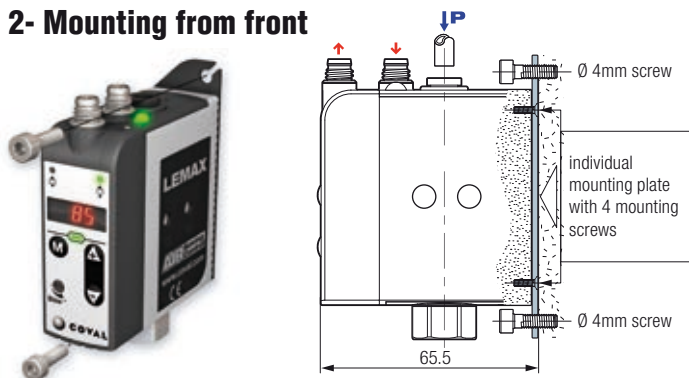
Choice of Mounting

1- Mounting from side



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

2- Mounting from front

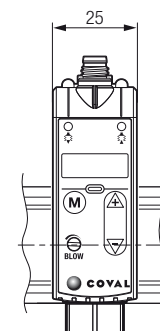
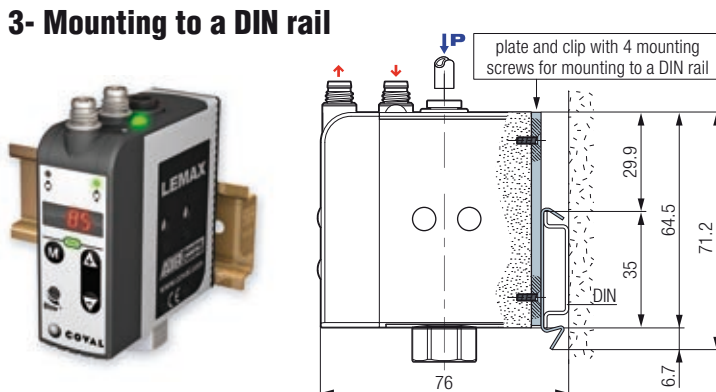


For mounting from front, please order the necessary kit in addition to the ejector module:

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

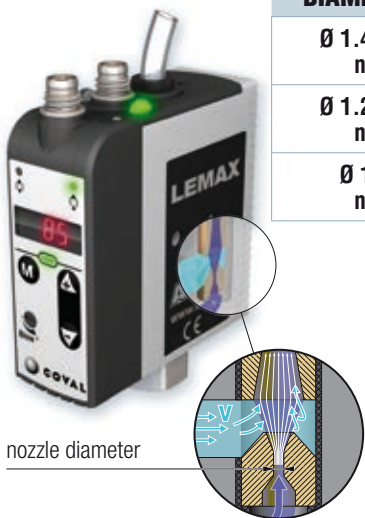
Modules Configuration

COMPOSED MODULE PART NUMBER

LEMAX	90	X	14		S	-
--------------	-----------	----------	-----------	--	----------	----------

VACUUM LEVEL	
max. 85% 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

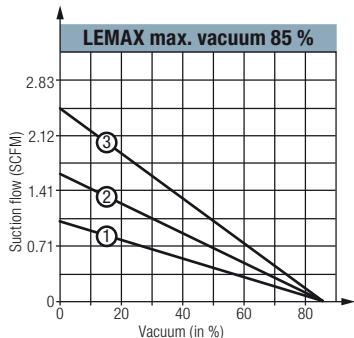


Selecting the Nozzle Diameter					
Ø nozzle	Venturi characteristics during "ASC off" operation.		"ASC" operation - gripping at 65% vacuum - vacuum shutoff at 75% Time for a volume of 1l		
	air drawn in (SCFM)	air consumed (SCFM)	grip time (s) (65% vacuum)	time (s) up to 75% vacuum	air consumed (ft³)
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

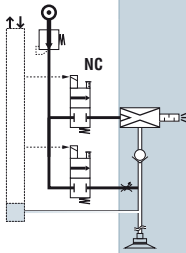


COMPOSITION OF THE MODULE

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

LEMAX90X__S__

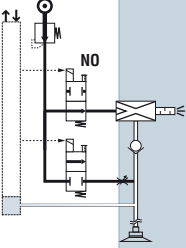
- In the event of an electrical shut-off, vacuum is no longer generated.
- Optional configured blow-off:
 - by specific signal,
 - automatic, timed 0 to 9.9 sec. (→ a single control signal vacuum and blow-off).



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

LEMAX90X__V__

- In the event of an electrical shut-off, the vacuum continues to be generated: gripped object held → positive security.
- Blow-off controlled by a specific signal.



CONNECTORS

Vacuum Pump with 2 M8 4-pin Connectors LEMAX90X__

- Discrete I/O.
- "Gripped product" switching output 24V DC / NO.
- 1 configurable auxiliary output:
 - either "Vacuum level" signal analogic 1 to 5V DC.
 - or "Without ASC" signal +5V DC switching output NO.



C14

Vacuum Pump with 1 M8 4-pin Connector

LEMAX90X__SC14 (\$ version only)

- "Gripped product" switching output 24V DC / NO.
- Automatic blow-off, timed 0 to 9.9 sec.



Input/Output switching type can be set to PNP/NPN

REFERENCE EXAMPLE COMPOSED OF A STAND-ALONE MODULE:

■ LEMAX90X14S

LEMAX mini vacuum pump, 85% max. vacuum, 1.4mm nozzle, controlled by a NC (Normally Closed) solenoid valve, with 2 M8 4-pin Connectors.

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.

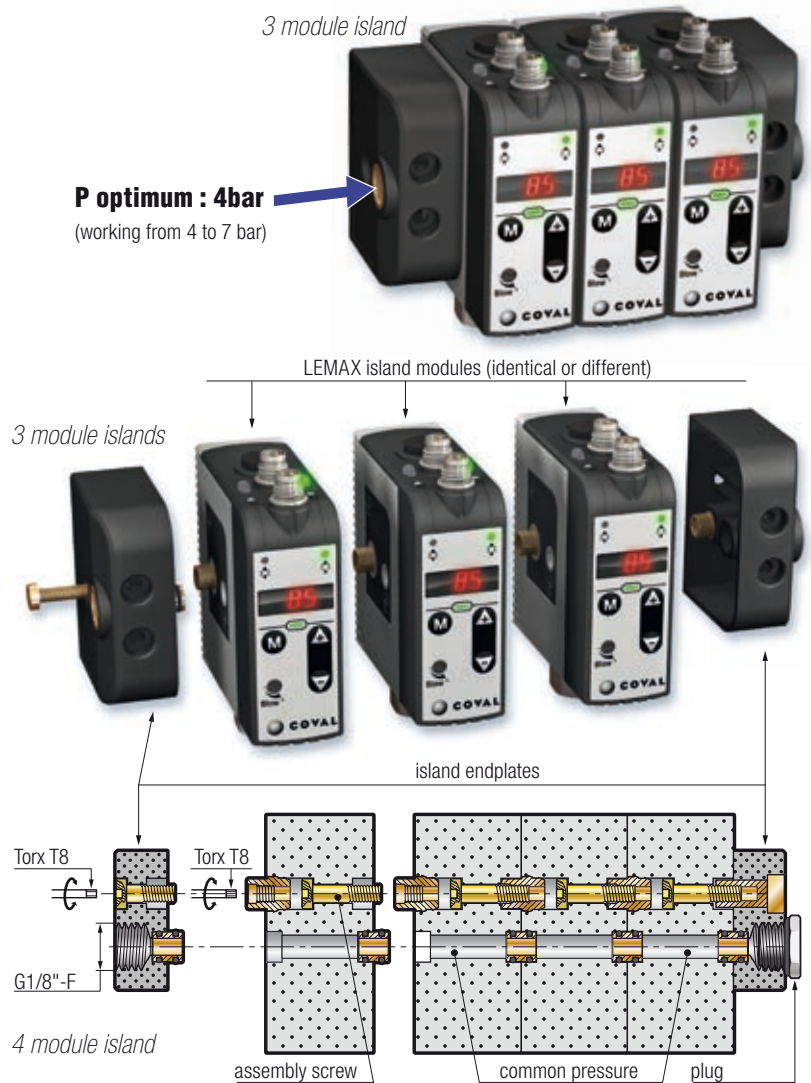
The island operates with a common pressure core that feeds each module. This common core receives pressure at either end, or both ends if needed.

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.

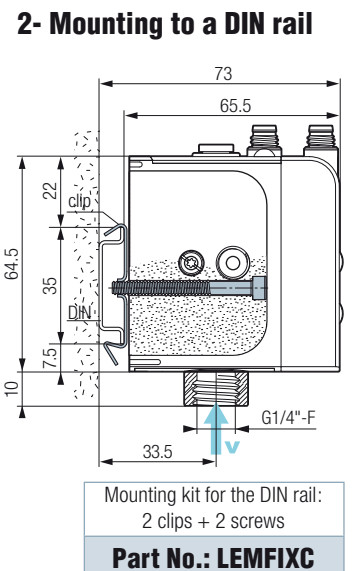
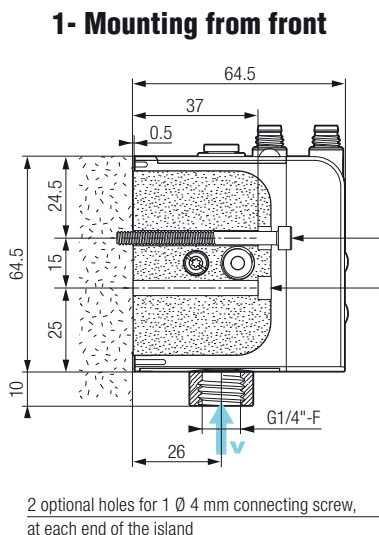
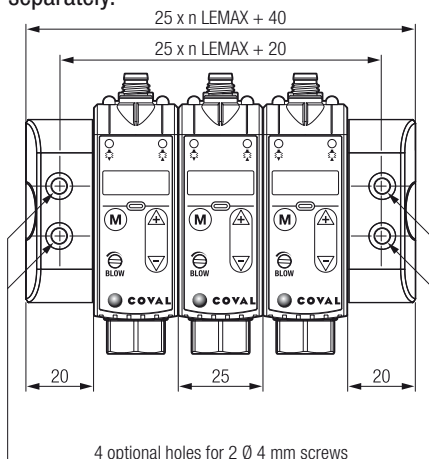
A part number may be defined and ordered (see next page) for islands with identical modules. Such islands will be delivered assembled.

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.



Modules Configuration

COMPOSED PART NUMBER FOR AN ISLAND OR AN ISLAND MODULE

LEMAX 90 X 14 S - B3

VACUUM LEVEL
max. 85% vacuum
optimum for
airtight objects

90

**NOZZLE
DIAMETER**

Ø 1.4 mm
nozzle

14

Ø 1.2 mm
nozzle

12

Ø 1 mm
nozzle

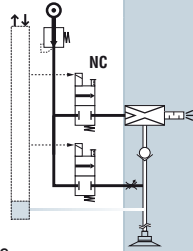
10

COMPOSITION OF THE MODULE

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

LEMAX90X__S__

- In the event of an electrical shut-off, vacuum is no longer generated.
- Optional configured blow-off:
 - by specific signal,
 - automatic, timed 0 to 9.9 sec.
 (→ a single control signal vacuum and blow-off).

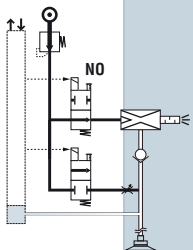


S

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

LEMAX90X__V__

- In the event of an electrical shut-off, the vacuum continues to be generated: gripped object held → positive security.
- Blow-off controlled by a specific signal.



V

CONNECTORS

-
Vacuum Pump
with 2 M8 4-pin
Connectors
LEMAX90X__



- Discrete I/O.
- "Gripped product" switching output 24V DC / NO.
- 1 configurable auxiliary output:
 - either "Vacuum level" signal analogic 1 to 5V DC.
 - or "Without ASC" signal +5V DC switching output NO.

C14

Vacuum Pump
with 1 M8 4-pin
Connector

LEMAX90X__SC14
(S version only)



- "Gripped product" switching output 24V DC / NO.
- Automatic blow-off, timed 0 to 9.9 sec.

ISLAND ASSEMBLIES

B2

LEMAX90X__B2

Island
assembly
with 2 identical
modules.



B3

LEMAX90X__B3

Island
assembly
with 3 identical
modules.



B4

...

If the planned island contains different module types, it must be ordered 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

LEMAX90X__B

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



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



PART No.: LEMSETA

EXAMPLE COMPOSITE PART NUMBER FOR AN ISLAND ASSEMBLY:

■ **LEMAX90X14SB3**

LEMAX assembled island with 3 modules 85% max. vacuum, Ø 1.4 mm nozzle, controlled by a Normally Closed solenoid valve, with 2 M8 4-pin Connectors.

ORDER EXAMPLE FOR AN ISLAND TO BE ASSEMBLED:

■ **LEMAX90X14VB**

■ **LEMAX90X12SB**

■ **LEMAX90X10VB**

3 LEMAX modules
for an island, of
different types.

■ **LEMSETA**

Set of ends for
island.

Input/Output switching type can be set to
PNP/NPN



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LEMAX Series: Characteristics

Overall Characteristics

- Supply: non-lubricated air filtered to 5 microns according to standard ISO 8573-1:2010 [4:5:4].
- Operating pressure: 4.5 to 7 bar.
- Mini dynamic pressure:
 - stand-alone version: P = 4.5 bar.
 - island version: P = 4 bar.
- Blow-off: adjustable flow:
 - stand-alone version: P = 3.5 bar.
 - island version: P network
- Maximum vacuum: 85 %
- Suction rate: 1.02 to 2.47 SCFM.
- Air consumption: 1.55 to 3.18 SCFM during "ASC" off operation
- Integrated clog-free silencer.
- Noise level: approximately 68 dBA "ASC" off. 0 dBA with "ASC".
- Electrical protection level: IP 65.
- Max. operating frequency: 4 Hz.

- Endurance: 30 million cycles.
- Weight: 130 g.
- Operating temperature: 50 to 140 °F.
- Materials: PA 6-6 15%FV, brass, aluminium, NBR.

Electrical controls

- Control voltage: 24 V DC (regulated $\pm 10\%$), PNP or NPN.
- Current draw: 30 mA (0.7 W) vacuum or blow-off.

Integrated electronics

- Power supply 24 V; current draw: <57mA.
- Measuring range: 0 to 99% vacuum.
- Measuring precision: $\pm 1.5\%$ of the range, compensated in temperature.
- Display: 3 digits, 7 segments.

Service Characteristics

"Object gripped" output signal

- 24 VDC, switching output / NO, switching power: 125 mA PNP or NPN.

Configurable auxiliary output, choose either of the following (not available for version LEMAX90X..**SC14**):

- "vacuum level" signal, analog 1 to 5 VDC of the measuring range.
- "ASC" off signal, +5 V switching output / NO.

Input/Output switching type

- can be set to PNP (by default) or NPN.

Displays

- Scrolling display: 3 digits, 7 segments.
- Flashing if "ASC" off for maintenance.
- Status indicators: "Vacuum", green LED, "blow-off," red LED.
- "Object gripped" indicator: Green LED on front panel.

Configurations

- By mechanical keys and drop-down menu (see page 8/15).
- Measurement unit selection (% , mbar, inHg)..
- Choice of blow-off type:
 - LEMAX90X..**S**.. version: controlled by a specific signal or automatic and adjustable from 0 to 9.9 s.
 - LEMAX90X..**V**.. version: controlled by a specific signal.
 - LEMAX90X..**SC14** version: automatic and adjustable from 0 to 9.9 s.

Settings

- Display of the number of cycles (vacuum cycle counter).
- If the application so requires, specific adjustment of thresholds and hysteresis different to original factory settings (L1=65% h1=10%, L2=75%, h2=10%).

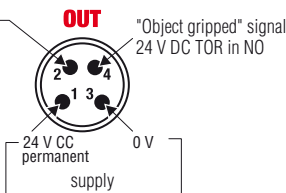
Autoreactivity

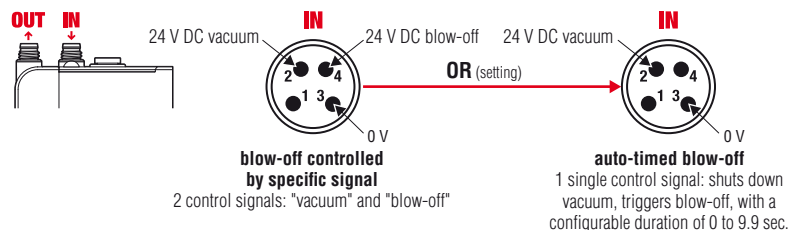
- Constant monitoring of leakage rate: abandon or automatic return to "ASC" operation.

Electrical connections and corresponding configurations

For NC Vacuum Pumps with 2 M8 4-pin connectors, model LEMAX90X..**S**..

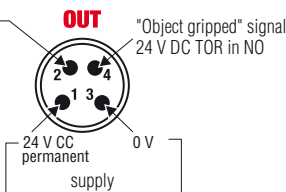
configurable auxiliary output

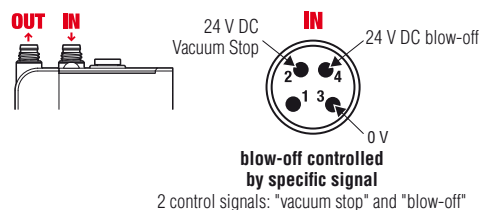
- "vacuum level" signal analog, 1 to 5 VDC
 - OR (configuration)
 - ASC off signal +5 V TOR in NO
- 



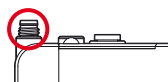
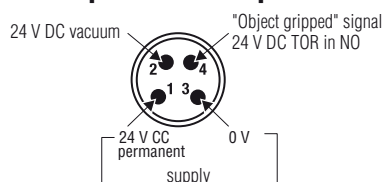
For NO Vacuum Pumps with 2 M8 4-pin connectors, model LEMAX90X..**V**..

configurable auxiliary output

- "vacuum level" signal analog, 1 to 5 VDC
 - OR (configuration)
 - ASC off signal +5 V TOR in NO
- 



For NC Vacuum Pumps with 1 M8 4-pin connector, model LEMAX90X..**SC14**



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 ...

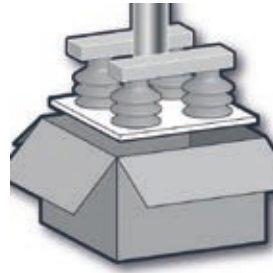
Optimized to serve small and medium sized suction cups, LEMAX helps to simplify the installation while integrating all control functions into a single lightweight mini-module, placed close to the suction cups.

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



CLAMPING

ROBOTIC HANDLING TOOLS



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



COVAL
vacuum managers