COVAL

vacuum managers

series LEM+
LEMAX+

Compact, high flow vacuum pumps

AIR Saving Regulator

AIR Saving Control

twin tech Integration & Intelligence

LEM+ / LEMAX+ Series: Compact,

2 Complementary Series for Your Applications

LEM+

For gripping any products: porous, airtight or those with a rough surface.

Configurations:
- 60 or 85% of maximum vacuum.
- NC or NO, depending on safety.
- Combined **ASR** "venturi regulator".
- With or without display.
- With or without vacuum sensor.
- With or without controlled blow-off or automatic time delay.
- Powerful blow-off as option.
- Versions with 1 or 2 M12 connectors.

- Suction flow rate (Nl/min):

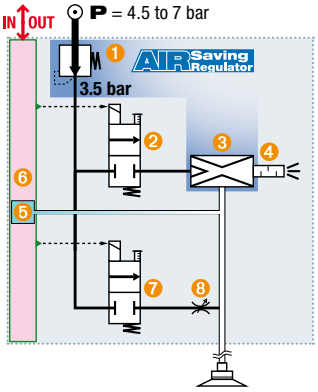
max.vacuum / nozzle Ø	60%	85%
2.0 mm	189	125
2.5 mm	275	200

AIR Saving Regulator

40% energy savings *(on average, see p.4).*

Combined "venturi regulator" **ASR**: pressure regulator ❶ feeds venturi ❸ with 3.5 bar, which is the optimum pressure for its operation.

➔ *No more unnecessary consumption of compressed air.*



LEMAX+

The series that has been specifically designed to grip airtight or semi-airtight products.

Configurations:
- 85% of maximum vacuum.
- NC or NO, depending on safety.
- **ASC** advanced electronics.
- High visibility display.
- Integrated vacuum sensor.
- Vacuum non-return valve.
- Combined **ASR** "venturi regulator".
- Blow-off control or automatic time delay.
- Powerful blow-off as option.
- Versions with 1 or 2 M12 connectors.
- Suction flow rate (Nl/min):

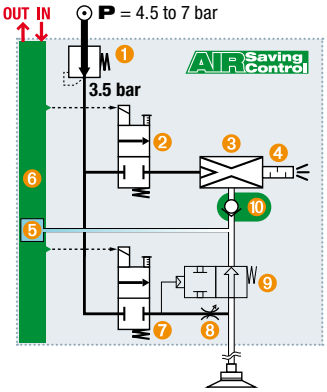
max.vacuum / nozzle Ø	85%
2.0 mm	125
2.5 mm	200

AIR Saving Control

90% energy savings *(on average, see p.4).*

Combination of non-return ❿ and advanced electronics ❻ ensures the **ASC**'s automatic management.

➔ *Once vacuum is established, the pump does not continue to consume air to hold the product..*



	Porous Materials, Rough Surfaces					Impervious & Semi-Airtight Materials			
	Cardboard	Food	Wood	Paper	Concrete/Stone	Plastic	Metal	Glass	Composites
LEM+	●	●	●	●	●	●	●	●	●
LEMAX+						■	■	■	■

● Air Saving Regulator ➔ **40%** of energy savings on average.

■ Air Saving Control ➔ **90%** of energy savings on average.

ADVANTAGES

- **Easy implementation:** Plug & Play, multiple choices, every type of application.
- **Maximum automatic energy savings**:
  - AIR Saving Regulator 40% savings for porous products.
  - AIR Saving Control 90% savings for airtight products.
- **Compactness:** LEM+ / LEMAX+ vacuum pumps are the most compact on the market.
- **Short response times:** Possible installation very close to vacuum pads.
- **Automatic blow-off:** Economy of an automaton outlet due to an automatically delayed blow-off time from 0 to 10s.
- **Dust resistant:** Non-clogging through-type silencer.
- **Safety:** Product gripping is maintained even during power failure.

high flow vacuum pumps

COVAL Dual Expertise

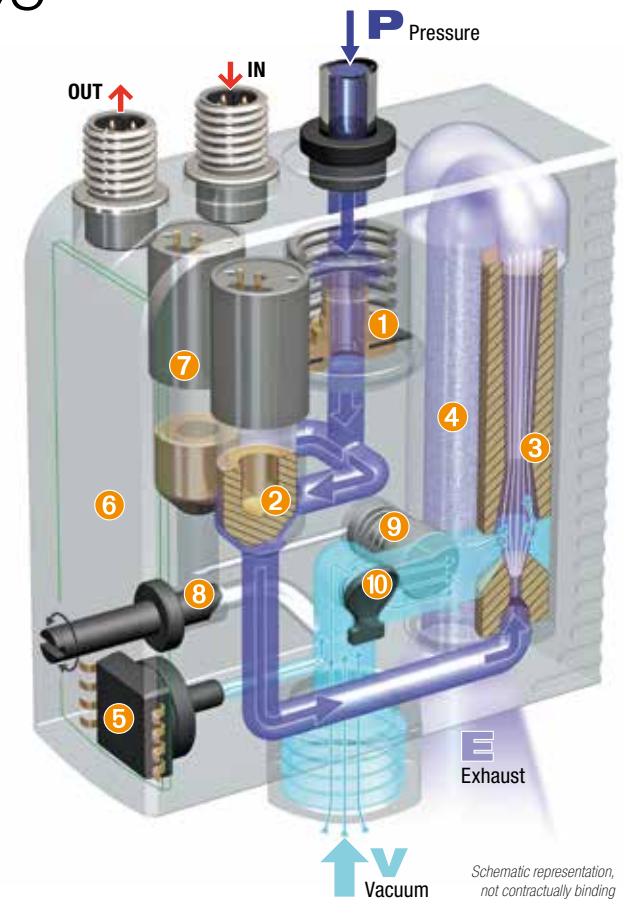
twin tech™
Integration & Intelligence

1- Integration

The LEM+ / LEMAX+ compact modules integrate all the functions of “industrial vacuum” including simple, efficient, economical compressed air and are adapted for every application.

INTEGRATED FUNCTIONS

1. **3.5 bar** pressure regulator
2. “Vacuum” solenoid valve
3. **3.5 bar** optimised venturi
4. Optimized silencer
5. Electronic vacuum sensor
6. Integrated electronics
7. “Blow-off” solenoid valve
8. Blow-off flow rate regulator
9. Powerful blow-off valve
10. Vacuum non-return valve



Schematic representation, not contractually binding

2- Intelligence

The front communication face panel allows access and programming of all operations: Various types of monitoring, threshold settings, pump configuration, diagnostics, etc. This front face panel can be locked to prevent an inadvertent misadjustment.
Built-in intelligence, as well as the factory settings configured for standard cases of use, optimise the implementation, operation, monitoring and maintenance.

➔ **Simplified & Protected Installation and Operation.**

Due to the high visibility display of the LEM+ / LEMAX+ modules, all useful information can be seen at a single glance: vacuum level, product gripped, thresholds reached, energy saving mode activated, etc. The actual vacuum level is shown with direct reading (selection of different display units), and with “bar graph”.
Configuration help messages (multilingual: in French, English, Italian, Spanish, German) are also provided.

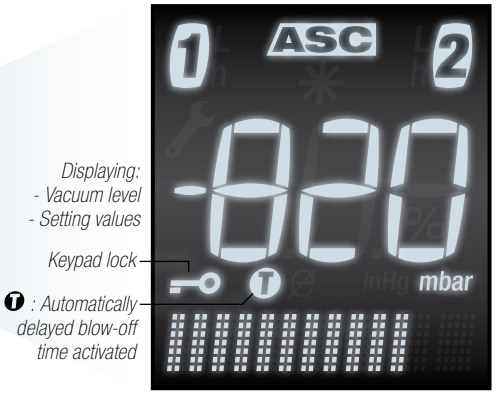
➔ **Clear & Complete Communication at Each Stage.**

These illustrations show LEMAX+ models. The display of LEM+ (VA) models includes only the elements that are relevant to their functions.

L1 “Product Gripped” *visualisation and setting: (vacuum threshold, hysteresis)*

"ASC" monitoring

L2 “ASC Threshold” *visualisation and setting: (vacuum threshold, hysteresis)*



Displaying: - Vacuum level - Setting values

Keypad lock

: Automatically delayed blow-off time activated

Display units: %, mbar, inHg.

Display shows data in many languages / bar graphs

COVAL
vacuum managers

COVAL Energy Saving Solutions

AIR Saving Regulator (ASR): Porous Applications

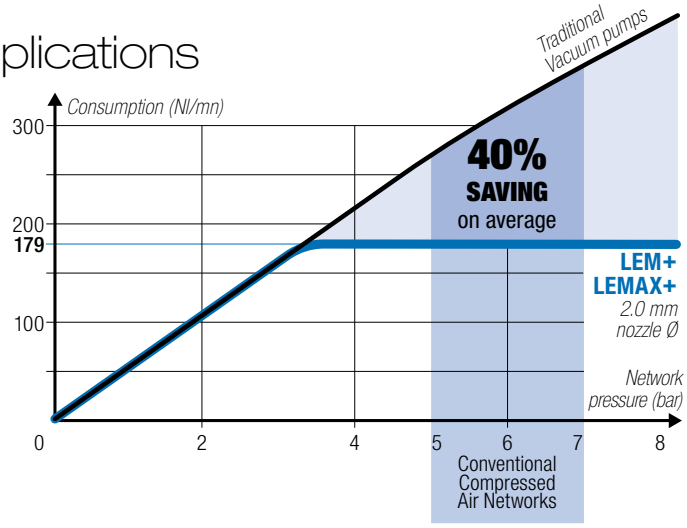
The LEM+ and LEMAX+ vacuum pumps, which integrate an **ASR** "venturi regulator" combination, share values that COVAL values greatly: they greatly reduce the volume of compressed air consumption and noise level.

Whatever the pressure supplied by the compressed air network is, the integrated regulator feeds the venturi at **3.5 bar** pressure, which is optimal for its operation.

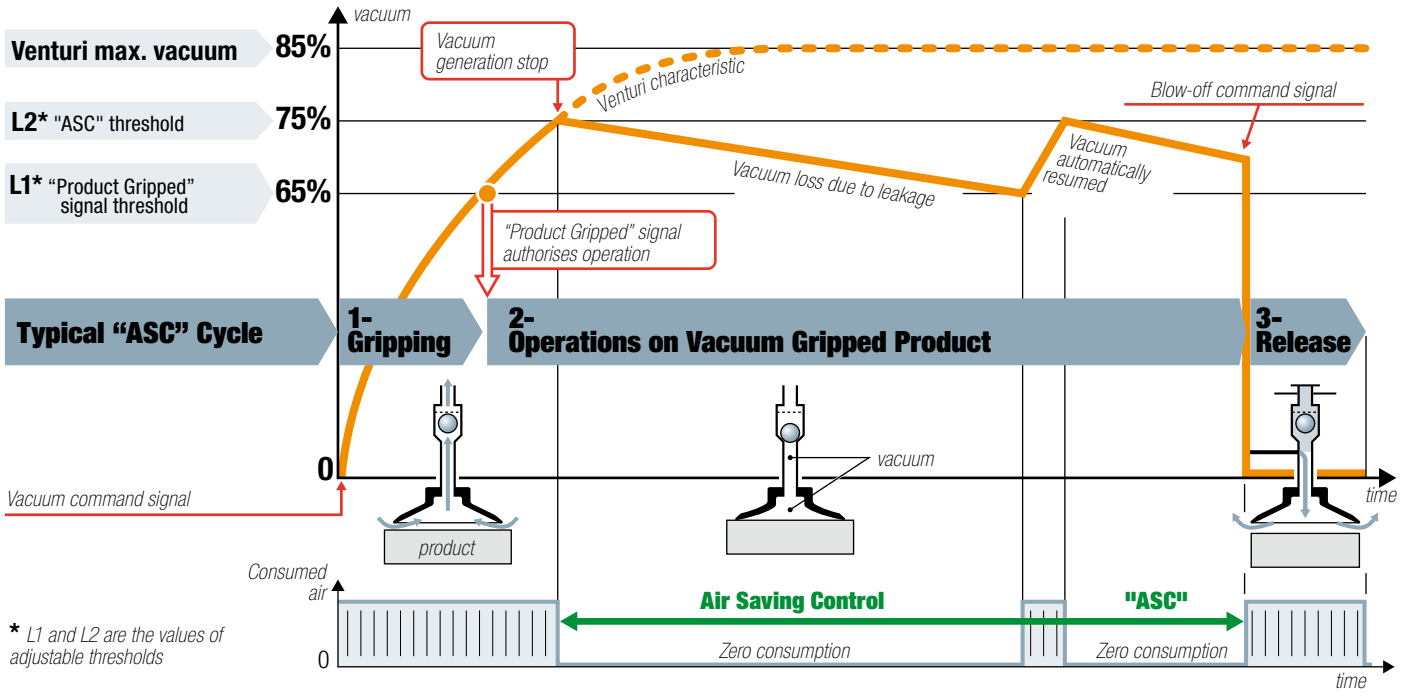
→ No more unnecessary compressed air consumption.

→ No external regulator required and thus the risk of inadvertent misadjustment is eliminated.

As for the usual compressed air network pressures (5-7 bar), the calculation opposite shows that the achieved economy is 40% on average.



AIR Saving Control (ASC): airtight products



For airtight or semi-airtight products, the LEMAX+ pumps automatically run the above "ASC" cycle, thus resulting in maximum energy savings, according to the following three phases:

1- Product gripping : Vacuum generated by the venturi.

2- Operations on vacuum gripped product : At the L2 vacuum threshold (75%), incoming air pressure is blocked → consumption becomes zero; the product remains gripped due to the non-return valve. If micro-leaks make the vacuum drop to the L2 threshold – (the value of regulated hysteresis), vacuum generation is briefly resumed.

AUTO-ADJUSTMENT: At each cycle, the **ASC** analyzes the level of leakage and adapts itself. Example: In the case of flexible production requiring the handling of porous products, the **ASC** detects the leaks, and immediately adapts the vacuum pump operation terminating the cycle without vacuum regulation.

3- Product release : By blow-off signal or automatic time delay (according to configuration).

Maximum energy savings for all applications:

AIR Saving Regulator on porous products, rough surfaces
→ **40%** of compressed air saved on average.

AIR Saving Control on airtight or semi-airtight products
→ **90%** of compressed air saved on average.

ENERGY SAVING APP

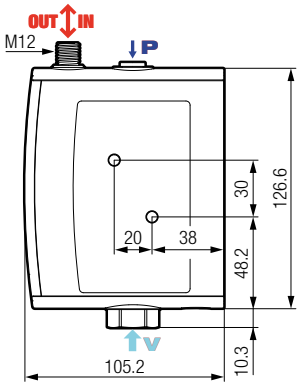
Calculate the savings you can make with the ASC technology with our free software.

LEM+ / LEMAX+: Implementation

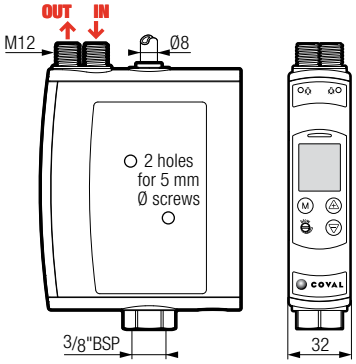
Mountings and Connections

1- Mounting from side

- Version: one M12 connector

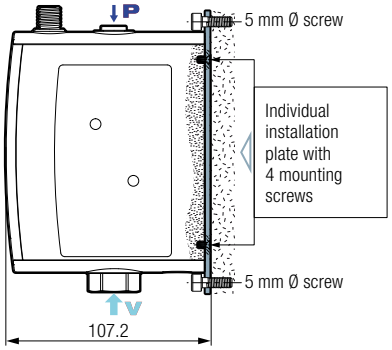


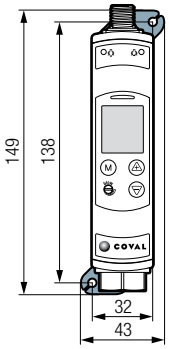
- Version: two M12 connectors



Mounting from side is the simplest to implement: Two Ø 5 mm through screws or bolts with large washers.

2- Mounting from front

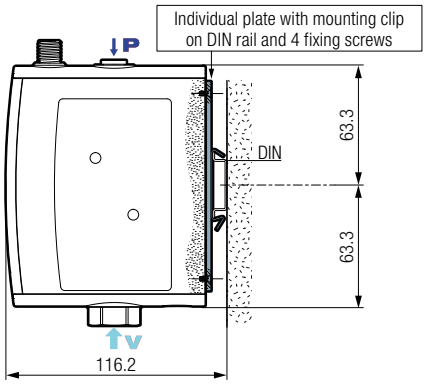


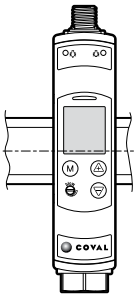


For mounting from front, in addition to the module, you need to order an additional kit:

Mounting from front kit: 1 plate + 4 screws
REF : LEMFIX2A

3- Mounting on DIN rail





For a static mounting (for example, in a cabinet), a module can be clipped onto a DIN rail. For this purpose, the module must first be equipped with an individual plate for fixing onto a DIN rail, to be ordered separately:

Kit for mounting on DIN rail: 1 plate / clip + 4 screws
REF : LEMFIX2B

LEM+ Series: Selection

Reminder: LEM+ modules are adapted for gripping all porous or air-tight products. If you handle mostly airtight products, the LEMAX+ (ASC) modules will enable you to achieve remarkable air economy.

AIR Saving Regulator

LEM	60	X	25

VACUUM LEVEL		NOZZLE DIAMETER	
60% max. vacuum is optimal for porous materials	**60**	**20**	2.0 mm nozzle Ø
85% max. vacuum is optimal for airtight products	**90**	**25**	2.5 mm nozzle Ø

VENTURI SPECIFICATIONS:

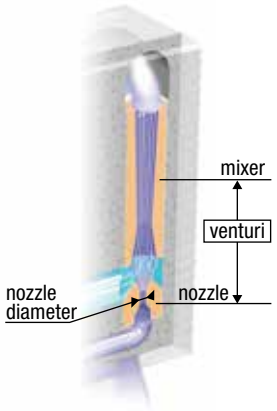
1- Maximum Vacuum Level

It depends on the mixer profile:

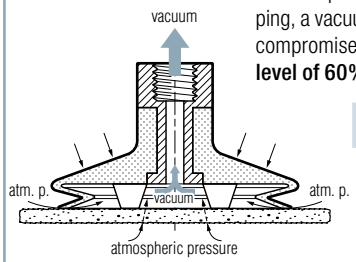
- 85% of maximum vacuum is optimal for gripping airtight products.
- 60% of maximum vacuum is optimal for gripping porous products.

2- Nozzle Diameter

It reflects the generated vacuum flow rate, as well as the power consumed. Therefore, it must be selected to meet the right requirements, without excess.



Handling porous products: cardboard, raw wood, pastries, etc.



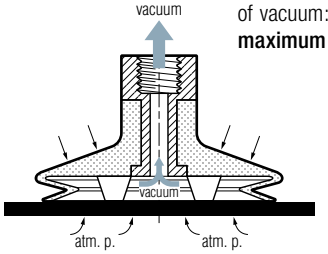
Leaks of porosity and / or surface have to be anticipated. For gripping, a vacuum level between 35 and 55% is the best economical compromise generated by **a venturi with maximum vacuum level of 60%.**

To determine nozzle diameter, use the table below and measure the leakage flow rate of the material.

LEM+ 60% max. vacuum

Evacuation time *(seconds)* of 1 liter volume				Consumed Air *(Nl/mn)*	Vacuum flow *(Nl/mn)*
Reached vacuum / Nozzle Ø	35%	45%	55%		
2.0 mm	0.16	0.27	0.42	**179**	**189**
2.5 mm	0.11	0.18	0.31	**260**	**275**

Handling airtight products: glass, plastic, coated wood, sheet metal, etc.



Gripping done without major leakage can benefit from a high level of vacuum: Between 55 and 75% generated by **a venturi with maximum vacuum level of 85%.**

Depending on the volume to be evacuated and the time available for evacuation, the table below enables you to select the most economical nozzle diameter and to know the air flow intake rate.

LEM+ 85% max. vacuum

✱ To save compressed air, choose LEMAX+.
➔ ASC reduces the specified consuming by **90%** .

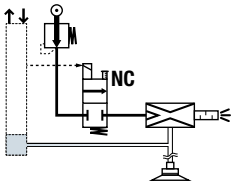
Evacuation time *(seconds)* of 1 liter volume				Consumed Air *(Nl/mn)*	Vacuum flow *(Nl/mn)*
Reached vacuum / Nozzle Ø	55%	65%	75%		
2.0 mm	0.38	0.55	0.80	**179** ✱	**125**
2.5 mm	0.26	0.35	0.50	**260** ✱	**200**

and order of a module

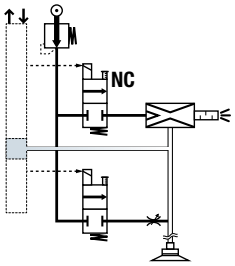
S		**VA**	**C15**		**P**	**G1**		**F**

MODULE COMPOSITION

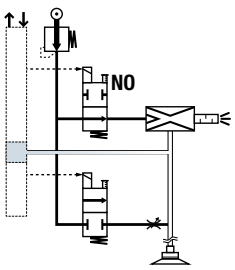
R — **NC Vacuum Pump Without Blow-Off**
LEM__X__**R**V_C__PG1
- Single command signal.
- **NC** vacuum command valve.



S — **NC Vacuum Pump With Blow-Off**
LEM__X__**S**V_C__PG1
- 2 command signals.
- **NC** vacuum command valve.
- Blow-off configured on site, at choice:
  - Blow-off controlled by specific signal;
  - Automatically delayed blow-off time from 0 to 10 s, only with next VA option *(advantage: economy of an automaton outlet)*.
- Adjustable blow-off flow rate.



V — **NO Vacuum Pump With Blow-Off**
LEM__X__**V**V_C__PG1
- 2 command signals.
- **NO** vacuum command valve.
- Blow-off controlled by external signal.
- Adjustable blow-off flow rate.



Safety in Case of Power Failure
This version is suitable for applications where product gripping safety must be ensured in the event of an untimely power failure, and this even in the case of leakage (failsafe).

However, this version does not include the possibility of setting an automatically delayed blow-off time that enables control of the module with a single"vacuum and blow-off" signal.

VAC. SENSOR DIALOGUE / CONNECTORS

Vacuum Pump Without Vacuum Sensor — **VO** **C14** — **one M12 connector 4 pins (C14)**

LEM__X___**VOC14**PG1

- Simplified LEM+ without settings and dialogue.
- Automatic operation until maximum vacuum level.

Vacuum Pump With Vacuum Sensor & Dialogue — **VA** **C15** — **one M12 connector 5 pins (C15)**

LEM__X___**VAC15**PG1

- Electronic vacuum sensor (VA).
- "Gripped product" switching output 24V DC / NO.
- Front face panel and full dialogue.

Vacuum Pump With Vacuum Sensor & Dialogue — **VA** **C24** — **two M12 connectors 4 pins (C24)**

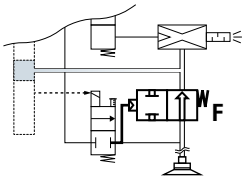
LEM__X___**VAC24**PG1

- Electronic vacuum sensor (VA).
- Stand alone 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.
- Front face panel with full dialogue.

POWERFUL BLOW-OFF

Without	
With	**F**

The powerful blow-off option allows you to release the product quickly.



Isolation valve **F** directs the entire blow-off flow to the vacuum pad.

The option is only available with LEM+ modules equipped with a blow-off regulation:
- Version LEM__X__**S**V…
- Version LEM__X__**V**V…

NB: If option **F** is selected, no blow-off flow rate setting is available.

EXAMPLE OF COMPLETE PART NUMBER:

LEM60X25SVAC15PG1_

LEM+ vacuum pump, 60% maximum vacuum, 2.5 mm nozzle Ø, controlled by a NC (Normally Closed) solenoid valve with vacuum sensor and dialogue, connection by 1 M12 5-pin connector.

COVAL vacuum managers

LEMAX+ Series: Selection

Reminder: LEMAX+ modules are suitable for gripping airtight or semi-airtight products. For handling porous products or rough surfaces, select LEM+ modules.

AIR Saving Control

LEMAX	90	X	25

VACUUM LEVEL

85% max. vacuum is optimal for airtight products	**90**

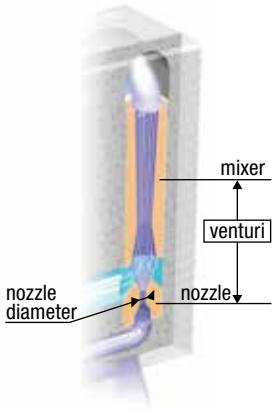
NOZZLE DIAMETER

20	2.0 mm nozzle Ø
25	2.5 mm nozzle Ø

VENTURI SPECIFICATIONS:

1- Maximum Vacuum Level
It depends on the mixer profile:
- 85% of maximum vacuum is optimal for gripping airtight or semi-airtight products.

2- Nozzle Diameter
It reflects the generated vacuum flow rate, as well as power consumption.
The table below helps to optimise the choice depending on the application operating with “ASC” and without “ASC”.



Handling airtight products:
glass, plastic, coated wood, sheet metal, etc.

Gripping done without major leaks can benefit from a high level of vacuum: Between 55 and 75% generated by **a venturi at the maximum vacuum level of 85%.**

From the table opposite, we can deduce that:
- A big nozzle provides a quicker grip without consuming more, as long as “ASC” is used.

- A small nozzle consumes less only when the operation is performed without “ASC”.

85% max. vacuum

Nozzle Diameter Selection

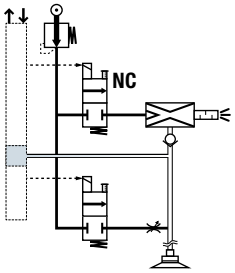
Nozzle Ø	Venturi Specifications While Working Without “ASC”		Evacuation of 1L Volume. “ASC” Operation: - Gripping at 65% Vacuum - Stop Vacuum at 75%		
	Vacuum flow *(Nl/mn)*	Consumed Air *(Nl/mn)*	Gripping Time (65% Vacuum) *(s)*	Time Until 75% Vacuum *(s)*	Consumed Air *(Nl)*
2.0 mm	**125**	**179**	**0.55**	**0.80**	**2.2**
2.5 mm	**200**	**260**	**0.35**	**0.50**	**2.2**

and order of a module

	S		C24		P	G1		F	S

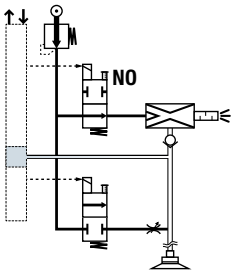
MODULE COMPOSITION

S — **NC Vacuum Pump With Blow-Off**
LEMAX90X__**S**C__PG1



- 2 command signals.
- **NC** vacuum command valve.
- Blow-off configured on site, at choice:
  - Blow-off controlled by specific signal;
  - Automatically delayed blow-off time from 0 to 10 s *(advantage: economy of an automaton outlet).*
- Adjustable blow-off flow rate.

V — **NO Vacuum Pump With Blow-Off**
LEMAX90X__**V**C__PG1



- 2 command signals.
- **NO** vacuum command valve.
- Blow-off controlled by external signal.
- Adjustable blow-off flow rate.

Safety in Case of Power Failure
This version is suitable for applications where product gripping safety must be ensured in the event of an untimely power failure, and this even in the case of leakage (failsafe).

However, this version does not include the possibility of setting an automatically delayed blow-off time that enables control of the module with a single“vacuum and blow-off” signal.

CONNECTORS

C15 — **Vacuum Pump with 1 M12 5-pin Connector**
LEMAX90X___**C15**PG1

- "Gripped product" switching output 24V DC / NO.

C24 — **Vacuum Pump with 2 M12 4-pin Connectors**
LEMAX90X___**C24**PG1

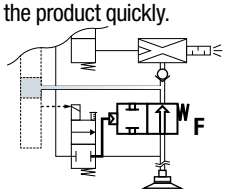
- Stand alone I/O.
- "Gripped product" switching output 24V DC / NO.
- 1 configurable auxiliary output:
  - either "Vacuum level" signal analogic 1 to 5V DC.
  - or "Without ASC" signal +5V DC switching output NO.

POWERFUL BLOW-OFF

Without

With **F**

The powerful blow-off option allows you to release the product quickly.



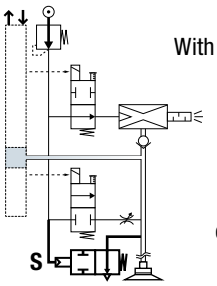
Isolation valve **F** directs the entire blow-off flow to the vacuum pad.

NB: If option **F** is selected, no blow-off flow rate setting is available.

AIR SAFETY VALVE

Without

With **S**



Safety in Case of Air Cut

If compressed air is blocked, valve **S** ensures venting of the vacuum pad.
The product is then automatically released, allowing maintenance work to be carried out safely.

EXAMPLE OF COMPLETE PART NUMBER:

LEMAX90X25SC24PG1

LEMAX+ vacuum pump, 85% maximum vacuum, 2.5 mm nozzle Ø, controlled by a NC (Normally Closed) solenoid valve, connection by 2 M12 4-pin connectors.

COVAL vacuum managers

LEM+ / LEMAX+: Specifications

COMMON SPECIFICATIONS

- Supply: Non-lubricated air 5 microns filtered, according to ISO 8573-1 Class 4 standard.
- Operating pressure: 4.5 to 7 bar.
- Blow-off: Adjustable flow rate.
- Powerful blow-off (option **F**) P = 3.5 bar without flow rate control.
- Maximum vacuum: 60% or 85% depending on model.
- Suction flow rate: From 125 to 275 Nl/min, depending on model.
- Air consumption: From 179 to 260 Nl/min, depending on model (for LEMAX+, when operating "without ASC").
- Integrated non-clogging silencer.
- Sound level: From 72 to 75 dBA "without ASC". 0 dBA with ASC available (LEMAX+).
- Display status :
  - of the vacuum control on the front panel: Green LED.
  - of the blow-off control on the front panel: Orange LED.
- Electric protection grade: IP65.
- Maximum operating frequency: 4 Hz.
- Response time for opening / closing: 20/30 ms.
- Service life: 30 million cycles.
- Weight: From 410 to 460 g, depending on model.
- Operating temperature: From 10 to 50°C.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR, HNBR, PU.

Electrical Controls

- Control voltage: 24V DC (±10% regulated).
- Current consumption: 30 mA (0.7W) by vacuum or blow-off solenoid valve.

LEM+ (VA MODEL) AND LEMAX+ SPECIAL SPECIFICATIONS

Displays

- Display status of the threshold on the front panel: Green or red LED.
- Black and white LCD display, 7 matrix, symbols, vacuum reading area.
- Displaying the vacuum level and bar graph.
- Displaying number of cycles (vacuum cycles counter).
- Indication of exceeding service life (> 30 million cycles).

Settings

- Using membrane keypad and pull down menu.
- Language selection: FR, ENG, DE, IT or ES.
- Blow-off type selection: Controlled or automatically timed from 0 to 10s.
- Measurement unit selection (%, mbar, inHg).
- Manual, electrical, monostable commands.
- If the application requires, specific setting of thresholds and hysteresis that are different from the initial factory settings:
  - LEM+ (VA model): V1 = 65%, h1 = 10%).
  - LEMAX+: V1 = 65%, h1 = 10%, V2 = 75%, h2 = 10%).

Vacuum Sensor

- Power supply voltage: 24V DC (±10% regulated).
- Current consumption: Standby: <25mA / max. <100 mA.
- Measurement range: 0 to 99% of vacuum, 0 to -999 mbar, 0 to -29.9 inHg.
- Measurement accuracy: ±1.5% of range, temperature compensated.

"Gripped Product" Output Signal

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

Configurable auxiliary output (C24 model only, 2 x M12 4 pins)

- either "Vacuum level" signal, analogic 1 to 5V DC of measuring range.
- or "without ASC" signal +5V DC NO switching output.

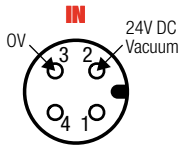
ASC: Regulation & Self-Adaptation (LEMAX+ only)

- Continuous monitoring of the leakage level: Back-off or automatic return to operation with ASC.

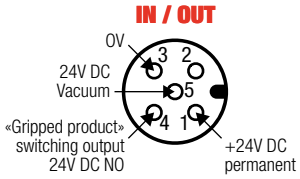
Electrical Connections

1- For Vacuum Pumps of Model R (vacuum control **NC** valve)

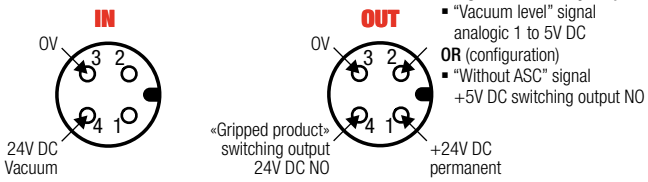
- **C14**: 1 M12 4-pin connector



- **C15**: 1 M12 5-pin connector

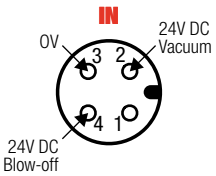


- **C24**: 2 M12 4-pin connectors

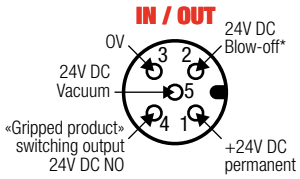


2- For Vacuum Pumps of Model S (vacuum control **NC** valve, blow-off control **NC** valve)

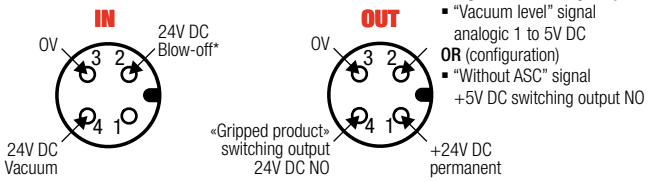
- **C14**: 1 M12 4-pin connector



- **C15**: 1 M12 5-pin connector



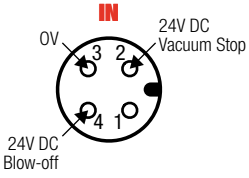
- **C24**: 2 M12 4-pin connectors



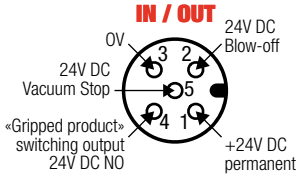
** Blow-off can be controlled by specific signal or automatic time delay > control signal suppression.*

3- For Vacuum Pumps of Model V (vacuum control **NO** valve, blow-off control **NC** valve)

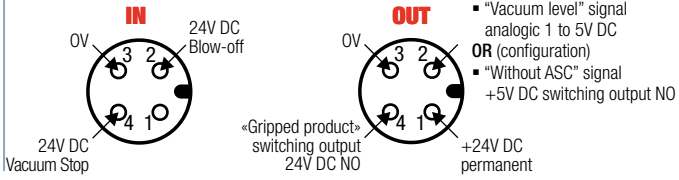
- **C14**: 1 M12 4-pin connector



- **C15**: 1 M12 5-pin connector

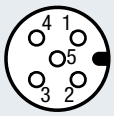


- **C24**: 2 M12 4-pin connectors



M12 Electrical Connectors

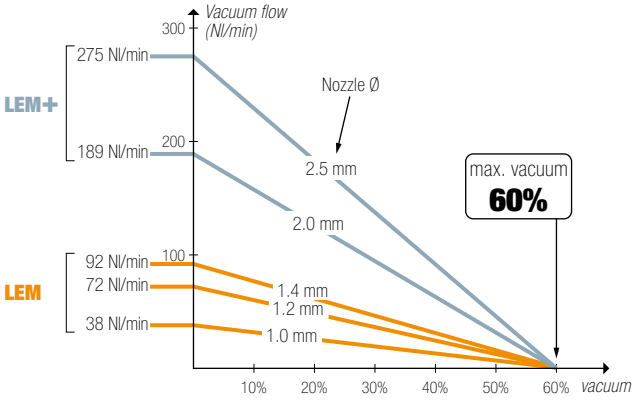
SPECIFICATIONS
- Threaded female connectors.
- PVC covered cable.
- IP65 protection.

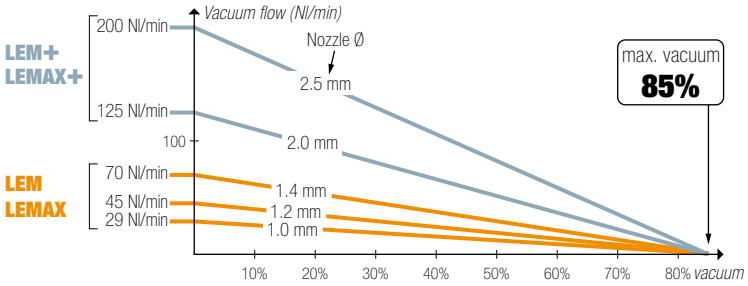
Part Number	Number of Pins	Orientation	Cable Length	Layout	Colour code
CDM12N	4	Straight	2 m		1: Brown 2: White 3: Blue 4: Black
CDM12L5	4	Straight	5 m		
CCM12	4	Bent	2 m		
CDM125PL2	5	Straight	2 m		1: Brown 2: White 3: Blue 4: Black 5: Gray
CDM125PL5	5	Straight	5 m		
CCM125PL2	5	Bent	2 m		

LEM / LEMAX: 2 Complementary Series

LEM+ and LEMAX+ meet the “high capacity flow rates” needs of installations.
They complement the LEM and LEMAX series provided for average flow rates.

twin & tech™ Integration & Intelligence





LEM Series

Designed for any gripping:
- Porous products: cardboard, coated wood, pastries, etc.
- Airtight products, when LEMAX is not feasible.

AIR Saving Regulator

LEMAX Series

Designed for gripping airtight products:
- “ASC” self-regulation saves from 60 to 99% of energy without any operating constraints.

AIR Saving Control

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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 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.

COVAL References can be found in several industrial sectors (Packaging, Automotive Industry, Plastics, Graphic, Aeronautic…) where vacuum handling is important for high efficiency and productivity.

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