

Intelligent Vacuum Pumps

Chapter 8

Ultra-Compact series

LEM



Integrated Mini-vacuum Pumps with ASR (Air Saving regulator)

- Nozzle Ø: 1; 1.2; 1.4 mm
- 2 vacuum levels: 60% and 85%
- Suction flow rate up to 3.25 SCFM
- Integrated pressure regulator (ASR)
- All required functions integrated internally
- M8 connections
- Stand-alone or island module
- For airtight and porous objects
- Ultra compact and lightweight
- Control panel for monitoring and adjustment
- Energy savings in all networks > 4 bars
- Reduced wiring
- Reduced installation time
- Adaptable to all industries

P 8/3

LEM+



Compact High-flow Vacuum Pumps with ASR (Air Saving Regulator)

- Nozzle Ø: 2; 2.5 mm
- 2 vacuum levels: 60% and 85%
- Suction flow rate up to 9.71 SCFM
- Integrated pressure regulator (ASR)
- All required functions integrated internally
- M12 connections
- For airtight and porous objects
- Compact and lightweight
- Control panel for monitoring and adjustment
- Energy savings in all networks > 4 bars
- Reduced wiring
- Reduced installation time
- Adaptable to all industries

P 8/9

LEMAX



Integrated Mini-vacuum Pumps with ASC (Air Saving Control)

- Nozzle Ø: 1; 1.2; 1.4 mm
- Vacuum levels: 85%
- Suction flow rate up to 2.47 SCFM
- Integrated pressure regulator (ASR)
- Integrated mini-vacuum pump (ASC)
- All required functions integrated internally
- M8 connections
- Stand-alone or island module
- For airtight and porous objects
- Ultra compact and lightweight
- Control panel for monitoring and adjustment
- ASC = 75 to 99% energy savings
- Reduced wiring
- Reduced installation time
- Adaptable to all industries

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LEMAX+



Compact High-flow Vacuum Pumps with ASC (Air Saving Control)

- Nozzle Ø: 2; 2.5 mm
- Vacuum levels: 85%
- Suction flow rate up to 7.06 SCFM
- Integrated pressure regulator (ASR)
- Integrated mini-vacuum pump (ASC)
- All required functions integrated internally
- M12 connections
- For airtight and porous objects
- Compact and lightweight
- Control panel for monitoring and adjustment
- ASC = 75 to 90% energy savings
- Reduced wiring
- Reduced installation time
- Adaptable to all industries

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LEMCOM



Mini-vacuum Pump Communicating via Industrial Field Bus

- Nozzle Ø: 1; 1.2; 1.4 mm
- 2 vacuum levels: 60 and 85%
- Suction flow rate up to 3.25 SCFM
- Integrated pressure regulator (ASR)
- Integrated mini-vacuum pump (ASC)
- Field bus: Ethernet IP™ ou CANopen®
- M8 connections
- Stand-alone or island module
- For airtight and porous objects
- Ultra compact and lightweight
- Settings and diagnosis by remote monitoring.
- ASC = 75 to 99% energy savings
- Reduced wiring
- Reduced installation time
- Adaptable to all industries

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EtherNet/IP™ CANopen®

Intelligent Vacuum Pumps

Chapter 8

GEM

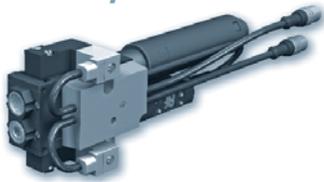


Vacuum Pump with ASR (Air Saving Regulator)

- Integrated energy-saving vacuum pumps
- Nozzle Ø 1.2 ; 1.5 ; 2 ; 2.5 ; 3 mm
- 2 levels of vacuum: 60% and 85%
- All required functions integrated internally
- Integrated pressure regulator
- Integrated M12 connection (Plug & Play)
- Energy savings exceeding 50 %
- Noise levels reduced by up to 30 dBA
- Modular design with interchangeable options
- Reduced wiring
- Reduced installation time
- No clogging
- Optimized performance for handling all types of objects
- Adaptable to all industries

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GVMAX V2-2 / V2-2R



Self-regulating Vacuum Pump

- Electric vacuum and blow-off controls
- Nozzle Ø: 2.5 mm
- Maximum vacuum level 90%
- Vacuum regulation function
- Integrated vacuum solenoid valves and blow-off
- Integrated vacuum check-valve
- Compact and lightweight
- Ideal for retaining airtight objects in the automotive, plastics and sheet metal industries
- Energy savings thanks to the vacuum regulation function
- Safety guaranteed in case of power failure
- Optimized performance for handling all types of objects
- Silent operation
- No clogging

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GVMAX



Self-regulating Vacuum Pump (electric or pneumatic control)

- Nozzle Ø: 2.5 mm
- Three vacuum levels: 50%, 75% and 90%
- Vacuum regulation function
- Integrated vacuum solenoid valves and blow-off
- 2 integrated non-return valves for pneumatic version and 1 for electric version
- Integrated vacuum switch to adjust the vacuum threshold and hysteresis
- Integrated silencer
- Compact and lightweight
- Ideal for retaining airtight objects in the automotive, plastics and sheet metal industries
- Energy saved by the vacuum regulation function
- Safety guaranteed in case of power failure
- Optimized performance for handling all types of objects
- Silent operation
- No clogging

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LEM

Integrated Mini-Vacuum Pumps with ASR (Air Saving Regulator)



Industry-specific applications



For all objects, porous or airtight

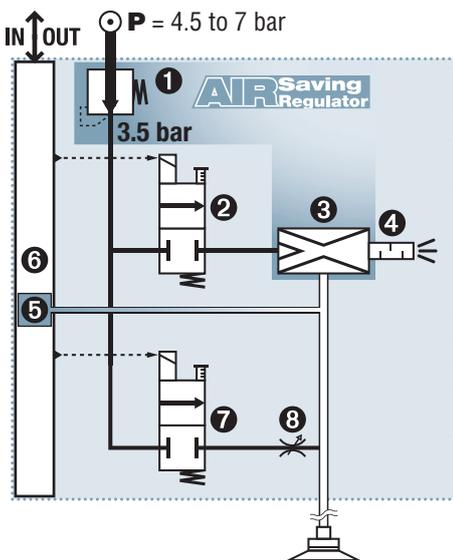
Advantages

- "All-in-one" solution, no more peripherals to be added.
- Simplified installation and use thanks to the Plug & Play system
- Unmatched compactness: Installation close to suction cups → short response times and energy savings.
- No clogging, thanks to the through-type silencer.
- A LEM for every need: a wide range, with many options.
- Smart dialogue → user friendly at all stages: initial settings, operation, maintenance.

Compact Integration

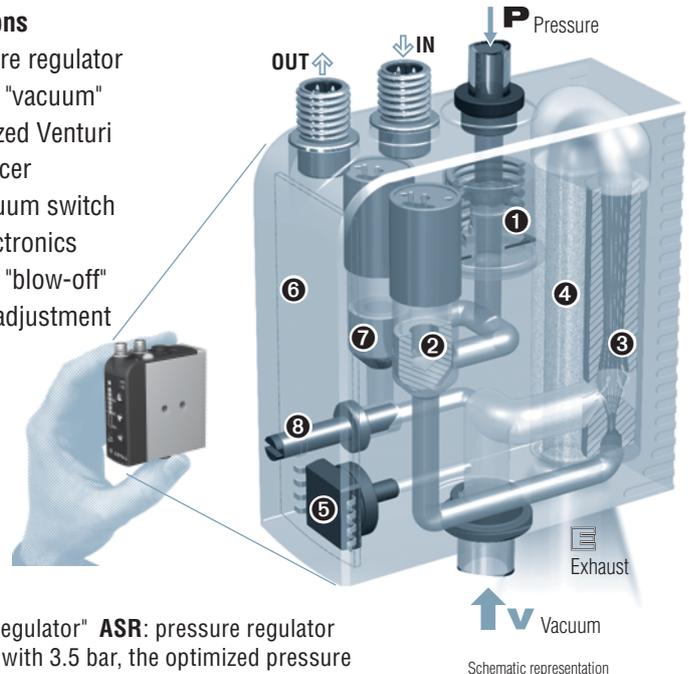
The illustrations below demonstrate the 8 functions integrated in the mini-module, and their respective roles in operation. The result of this COVAL innovation is:

- **A mini module** (≅ 120 g) that is easy to install close to the suction cups, reducing the volume to be evacuated → increased speed and energy savings.
- **A complete module** (including integrated pressure regulator and clog-free silencer), therefore not requiring any additional function or connection.



Integrated functions

- 1 3.5 bar Pressure regulator
- 2 Solenoid valve "vacuum"
- 3 3.5 bar optimized Venturi
- 4 Clog-free silencer
- 5 Electronic vacuum switch
- 6 Integrated electronics
- 7 Solenoid valve "blow-off"
- 8 Blow-off flow adjustment



Combined "venturi regulator" **ASR**: pressure regulator 1 feeds venturi 3 with 3.5 bar, the optimized pressure for its operation.

→ **No more unnecessary consumption of compressed air.**

8

LEM



40% Energy savings

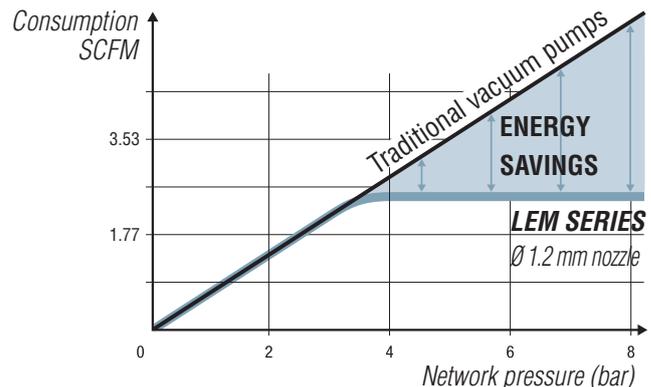
AIR Saving Regulator (ASR): Air Saving Regulator

The LEM vacuum pumps, which integrate an **ASR** "venturi regulator" combination, maintain ideals that COVAL values greatly: reducing both compressed air consumption and noise generation.

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

- No more unnecessary energy consumption.
- No external regulator required and thus the risk of inadvertent misadjustment is eliminated.

Compared to pressures found in most compressed air networks (5-7 bar), the graph opposite demonstrates an achieved economy of 40% on average.

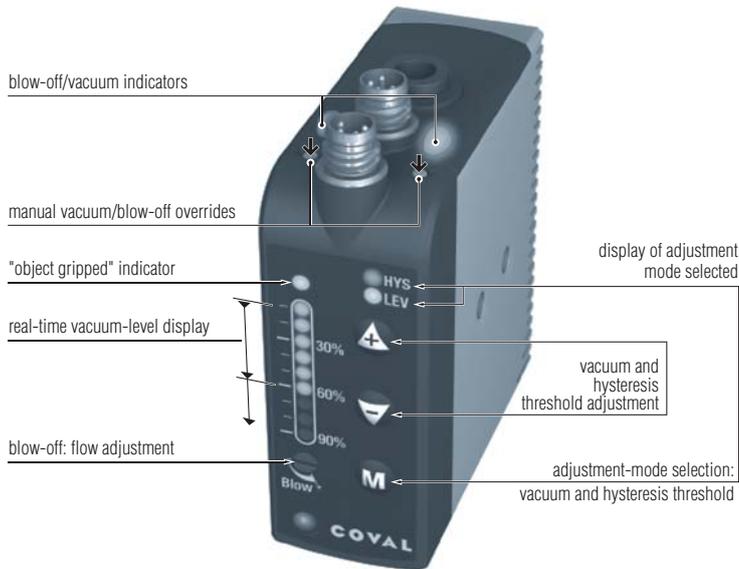




Smart Dialogue

The front dialogue panel shown below displays the real-time vacuum level and lets the operator set the threshold level which triggers the "object gripped" signal allowing operations to continue.

This communications panel is particularly visual and intuitive. It makes it easy to monitor production by viewing each of the phases of the cycle: vacuum, blow-off, and rest.



Stand-alone or Island Modules?

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

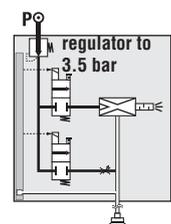
When several suction cups are operating according to different sequences, multiple modules are required, which can be:

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

The diagrams below help in the selection:

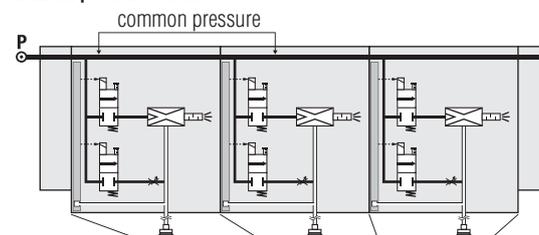
- Stand-alone modules are complete, with the integrated pressure regulator (ASR, see p 8/3)
- in an island, the integrated regulator is absent: to maintain the advantage of economical and silent operation, it is recommended to reduce the pressure of the island's common pressure unit to 4 bar.

4.5 to 7 bar network pressure



stand-alone module

network pressure 4 bar



P optimal = 4 bar
(operation at 4-7 bar)



island of 3 modules supplying suction cups according to different sequences



LEM: Versatile Series for all Applications

The opposite page demonstrates the versatility of this series. In addition to a very wide range of complete, stand-alone, or island vacuum pumps, there are the options of no blow-off and/or no vacuum switch, and for specific applications.

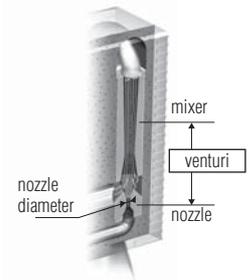
Select Vacuum Level and Nozzle Diameter

The introductory guide in this catalog shows that for porous objects, a 30-55 % vacuum is economical and effective. This is obtained with a 60 % maximum vacuum pump.

The table below helps to select the nozzle diameter which generates enough vacuumed air flow to respond in the time required by the application, based on a measurement of the material's leakage rate.

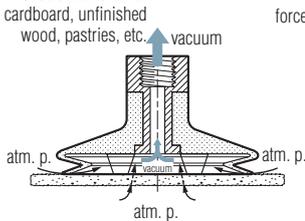
On the contrary, with an airtight material, the vacuum used is 55 % to 80 %, obtained by a 85 % max. vacuum pump.

- For standard cases, with its integrated blow-off, the LEMAX series is preferable, as it is more economical due to its ASC (Air Saving Control) function (see p. 8/15).
- For special cases, the LEM series contains versions without blow-off and versions without a vacuum switch. The table below helps to select the nozzle diameter required for the application.

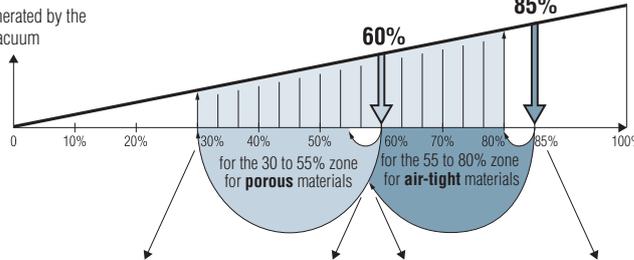


Porous materials:

cardboard, unfinished wood, pastries, etc.

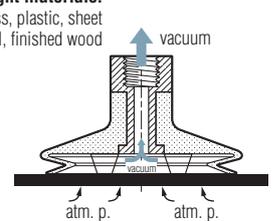


force generated by the vacuum



Airtight materials:

glass, plastic, sheet metal, finished wood



Porous Objects > Maximum Vacuum Level: 60%

Time to create vacuum (seconds) for a volume of 1 liter

vacuum achieved	vacuum achieved						Air consumed (SCFM)	Air drawn in (SCFM)
	30%	35%	40%	45%	50%	55%		
ø nozzle								
1.0 mm	0.66	0.83	1.04	1.31	1.70	2.35	1.55	1.34
1.2 mm	0.41	0.52	0.66	0.83	1.07	1.49	2.30	2.54
1.4 mm	0.27	0.34	0.43	0.54	0.70	0.97	3.18	3.25

Airtight Objects > Maximum Vacuum Level: 85%

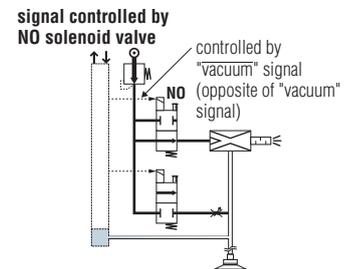
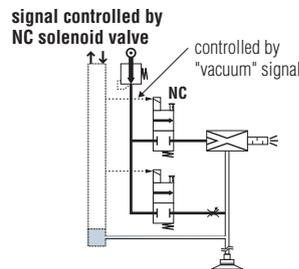
Time to create vacuum (seconds) for a volume of 1 liter

vacuum achieved	vacuum achieved						Air consumed (SCFM)	Air drawn in (SCFM)
	55%	60%	65%	70%	75%	80%		
ø nozzle								
1.0 mm	1.76	2.04	2.38	2.80	3.33	4.09	1.55	1.02
1.2 mm	1.13	1.31	1.53	1.80	2.15	2.64	2.30	1.59
1.4 mm	0.73	0.85	0.99	1.16	1.38	1.70	3.18	2.47

Select Vacuum Controlled by NC or NO Solenoid Valve

Vacuum controlled by a NC (Normally Closed) solenoid valve remains the simplest standard option to use. In the event of an electricity shutoff, the vacuum is interrupted and the object is released.

Select vacuum controlled by NO (Normally Open) solenoid valve if the application requires holding the object in the event of an electricity shut-off. In this case, make sure to control the NO solenoid valve with the inverse signal of the "vacuum" signal, which is noted as "vacuum".



Select with or without Integrated Blow-off

Many applications require integrated blow-off. However, for some applications not requiring blow-off, a simplified version without blow-off is offered.

Select with or without Vacuum Switch

For common applications, the vacuum switch is needed, with the dialogue face for digital display and adjustment → see page 8/4. However, some applications may just require a simple operation, without an "object gripped" return signal. The simplified version may then be chosen, with no vacuum switch, display, or adjustment.

Integrated Mini-Vacuum Pumps with ASR Configuring a Vacuum Pump



Part numbers for an island assembly or components in an island

Part numbers for stand-alone units

LEM	60	X	12	S	VA	B3
VACUUM LEVEL						
60% max. vacuum → porous objects	60					
85% max. vacuum → airtight objects	90					
		NOZZLE DIAMETER				
		∅ 1 mm nozzle	10			
		∅ 1.2 mm nozzle	12			
		∅ 1.4 mm nozzle	14			
				VACUUM SWITCH		
				VA	<ul style="list-style-type: none"> Electronic vacuum switch with digital display and adjustment 	
				VO	<ul style="list-style-type: none"> No vacuum switch and no adjustment 	

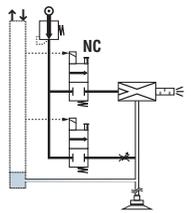
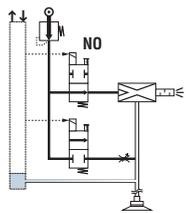
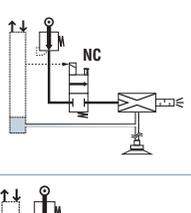
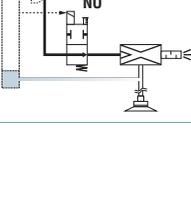
ISLAND ASSEMBLIES

B2		LEM--X----- B2 island assembly with 2 identical modules.
B3		LEM--X----- 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		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. Part No.: LEMSETA

COMPOSITION OF THE MODULE	
S	<ul style="list-style-type: none"> Vacuum controlled by NC solenoid valve → if the electricity is shut off, the vacuum is interrupted. Blow-off controlled by a specific signal 
V	<ul style="list-style-type: none"> Vacuum controlled by NO solenoid valve → vacuum is maintained if electricity is shut off Blow-off controlled by a specific signal 
R	<ul style="list-style-type: none"> Vacuum controlled by NC solenoid valve No blow-off 
U	<ul style="list-style-type: none"> Vacuum controlled by NO solenoid valve No blow-off 

Additional options: On specific request:

- Modules with enhanced blow-off by integrated isolation valve.
- Modules with non-return valve will maintain vacuum in the event of loss of pneumatic and/or electrical power, during the grip cycle.

EXAMPLE COMPOSITE PART NUMBER FOR AN ISLAND ASSEMBLY:

LEM60X14SVAB3

LEM island assembly, containing 3 x 60% max. vacuum modules, ∅ 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
 - LEMSETA
- 3 LEM modules for a group, of different types.
Set of ends for island.

REFERENCE EXAMPLE COMPOSED OF A STAND-ALONE MODULE:

LEM60X12SVA

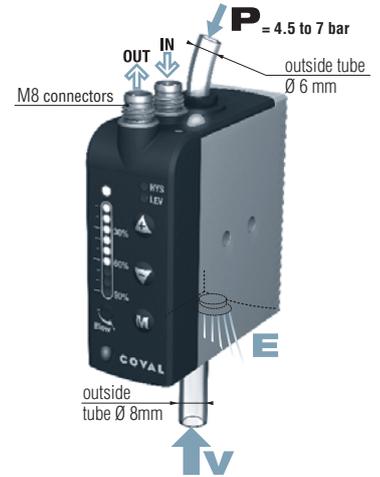
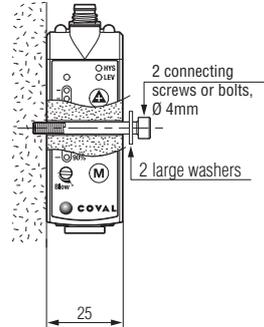
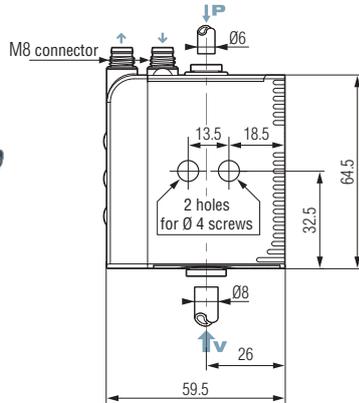
Stand-alone LEM Module, 60% max. vacuum, ∅ 1.2 mm nozzle, vacuum controlled by NC solenoid valve, blow-off and vacuum switch.



Stand-alone Modules



Side mounting



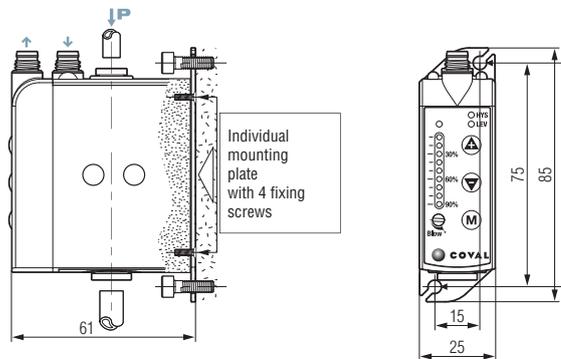
For front mounting, order the necessary kit, in addition to the module:

Front mounting kit:
1 plate + 4 screws

Part No.: LEMFIXA



Front mounting



2 Ø 4 fixing screws

A module can be clipped onto a DIN rail.

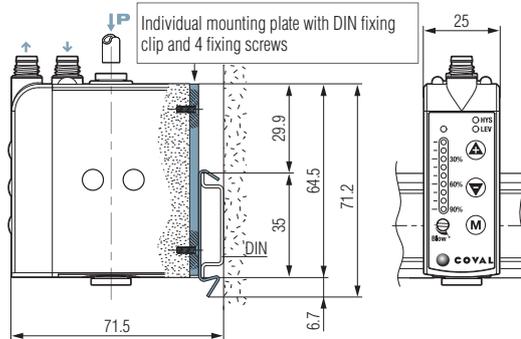
For this purpose, the module must first be equipped with an individual DIN installation plate, ordered separately:

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

Part No.: LEMFIXB

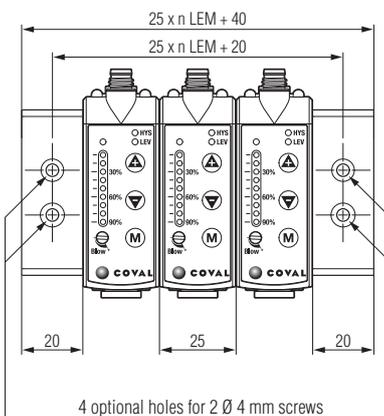


Mounting on DIN rail



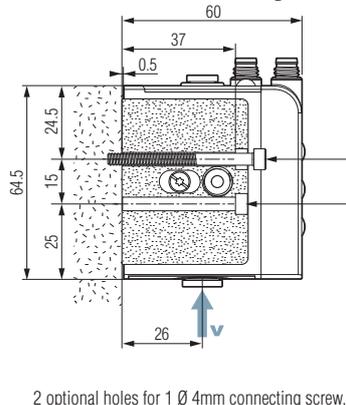
Individual mounting plate with DIN fixing clip and 4 fixing screws

Islands



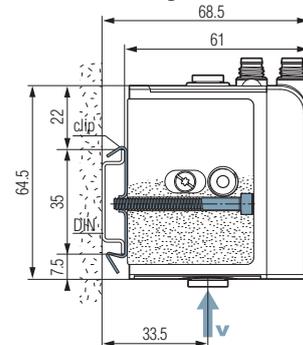
4 optional holes for 2 Ø 4 mm screws

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 + 2 screws

Part No.: LEMFIXC



Overall Characteristics

- Supply: non-lubricated air filtered to 5 microns according to standard ISO 8573-1 class 4.
- Operating pressure: 4.5 to 7 bar.
- Mini dynamic pressure:
 - stand-alone module: P = 4.5 bar.
 - island modules: 4 bar.
- Blow-off: adjustable flow:
 - stand-alone version: P = 3.5 bar.
 - island version: P network.
- Maximum vacuum: 60% or 85% depending on model (see page 8/4).
- Suction rate: 1.02 to 3.25 SCFM depending on model (see page 8/5).
- Air consumption: 1.55 to 3.18 SCFM depending on model (see page 8/5).
- Electrical protection level: IP 65.
- Control voltage: 24 V DC (regulated $\pm 10\%$).
- Current draw: 30 mA (0.7 W) vacuum or blow-off.
- Max. operating frequency: 4 Hz.
- Endurance: 10 million cycles.
- Weight: 80 to 120 g, depending on model.
- Operating temperature: 50 to 140 °F.
- Materials: PA 6-6 15 %FV, brass, aluminium, NBR.

Integrated Vacuum-switch Characteristics

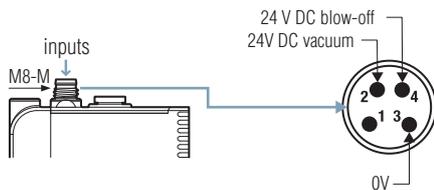
- Measuring range: -1 to 0 bar.
- Precision: $\pm 1.5\%$ of the range.
- Hysteresis: adjustable from 0% to 100%.
- Output threshold: 1 x T.O.R. in NO.
- Analog output: 1 V DC to 5 V DC on the measuring range.
- Switching power: 125 mA, PNP.
- Threshold status display: 1 green LED.
- Supply voltage 24V DC (regulated $\pm 10\%$).
- Current draw: < 20 mA.
- Protection: against polarity inversions.

Integrated-silencer Characteristics

- Noise level: approximately 68 dBA.
- Clog-free silencer.

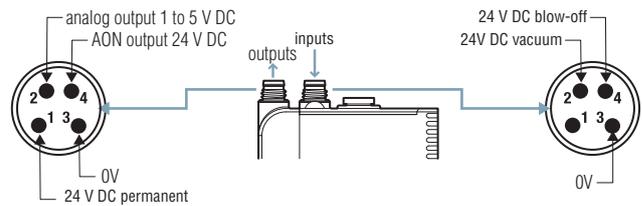
Electrical Connections

MODULES WITHOUT VACUUM-SWITCH FUNCTION



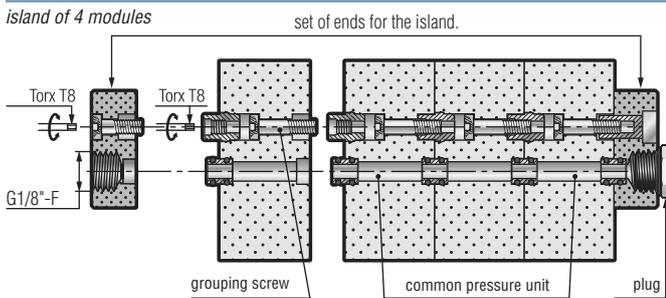
Note: straight and angled M8 connectors shown (p. 10/9).

MODULES WITH VACUUM-SWITCH FUNCTION



Characteristics and Connecting an Island

island of 4 modules



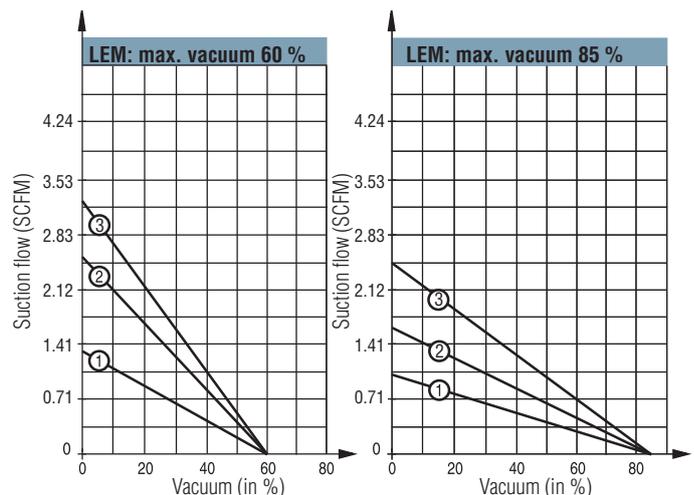
island of 3 modules



Maximum number of modules in an island:

- $\varnothing 1.4$ mm nozzle \rightarrow 5 modules
- $\varnothing 1.2$ mm nozzle \rightarrow 7 modules
- $\varnothing 1$ mm nozzle \rightarrow 9 modules

Suction Flow Rate / Vacuum Curves



- 1 - LEM60X10
- 2 - LEM60X12
- 3 - LEM60X14

- 1 - LEM90X10
- 2 - LEM90X12
- 3 - LEM90X14

Note:

In the same island, it is possible to combine LEM series modules and LEMAX series modules.

LEM+

Compact, High Flow Vacuum Pumps

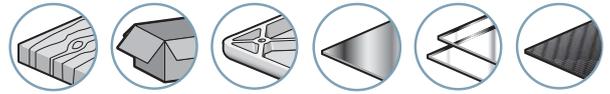
General Information

LEM+ Series, compact, high flow vacuum pumps, integrate **ASR** (Air Saving Regulator) technology that allows up to 40% of energy savings. They are designed for gripping porous products or those with a rough surface.

For gripping airtight or semi-airtight products, it is recommended to use the **LEM+ Series** (see page 8/21).



Industry-specific applications



Advantages

- Easy implementation: Plug & Play, multiple choices, every type of application.
- Maximum automatic energy savings:
 - ASR**: 40% savings for porous products.
- Compactness: LEM+ vacuum pumps are the most compact on the market.
- Short response times: Possible installation very close to vacuum pads.
- Automatic blow-off: Reduced PLC I/O requirement thanks to the automatic blow-off function (blow-off time configurable from 0 to 10s).
- Dust resistant: Non-clogging through-type silencer.
- Safety: Product gripping is maintained even during power failure.

Configurations

- 60 or 85% of maximum vacuum.
- NC or NO, depending on safety.
- Combined **ASR** "venturi regulator".
- With or without visual display.
- With or without vacuum sensor.
- With or without controlled blow-off or automatic blow-off function.
- Powerful blow-off as option.
- Versions with 1 or 2 M12 connectors.
- Suction flow rate (SCFM):

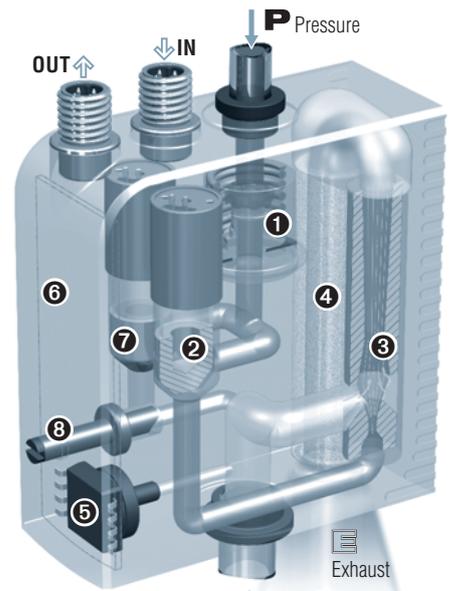
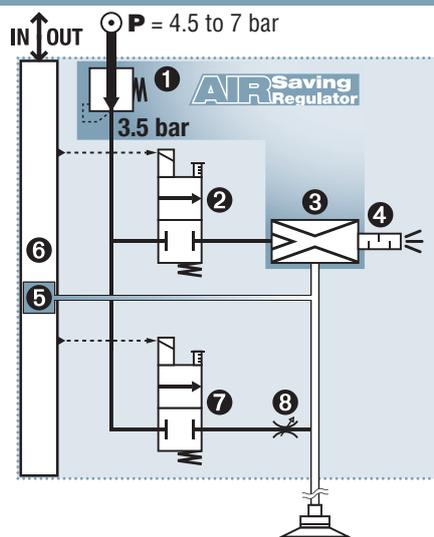
max. vacuum nozzle Ø	60%	85%
2.0 mm	6.67	4.41
2.5 mm	9.71	7.06



Integration

The **LEM+** compact modules integrate all the functions of "industrial vacuum" including simple, efficient, economical compressed air and are adapted for every application:

- 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



Combined "venturi regulator" **ASR**: pressure regulator 1 feeds venturi 3 with 3.5 bar, optimal for its operation.

→ **No more unnecessary consumption of compressed air.**



40% energy savings (on average, see p.8/10).

LEM+

Compact, High Flow Vacuum Pumps Energy Savings & Intelligence

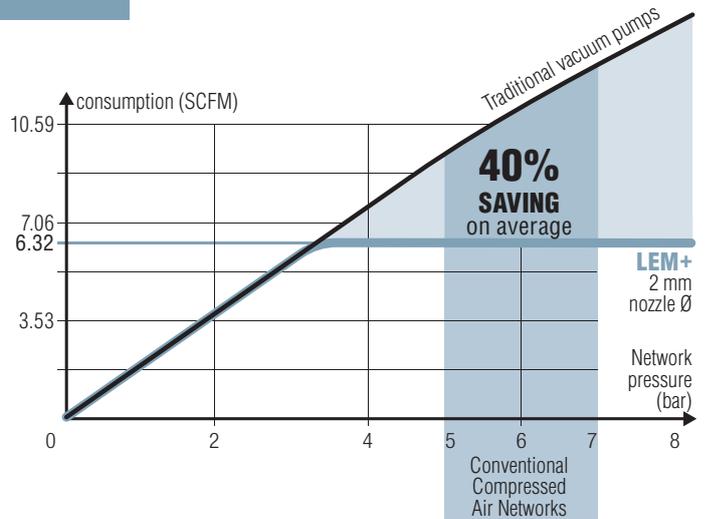


AIR Saving Regulator (ASR): Air Saving Regulator

The LEM+ vacuum pumps, which integrate an **ASR** "venturi regulator" combination, maintain ideals that COVAL values greatly: reducing both compressed air consumption and noise generation. Regardless of pressure supplied by the compressed air network, the integrated regulator feeds the venturi at **3.5 bar** pressure, optimal for its operation.

- No more unnecessary energy consumption.
- No external regulator required and thus the risk of inadvertent misadjustment is eliminated.

Compared to pressures found in most compressed air networks (5-7 bar), the graph opposite demonstrates an achieved economy of 40% on average.



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 standard factory settings, optimize the implementation, operation, monitoring and maintenance.

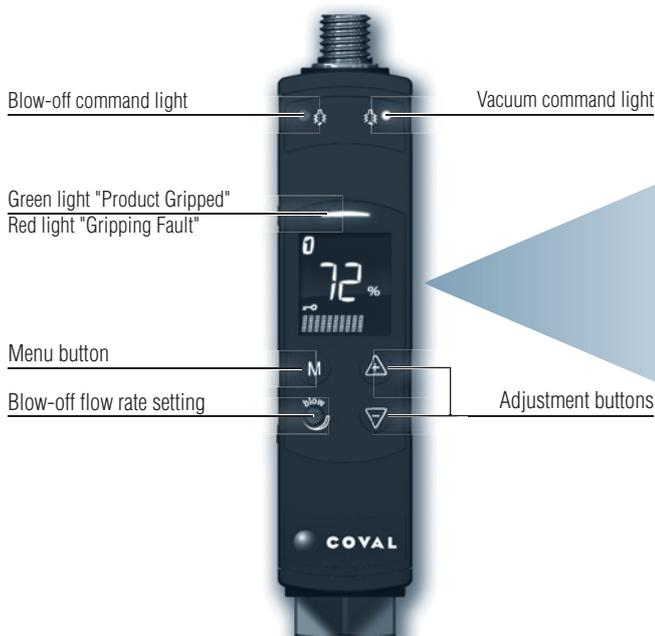
- **Simplified & Protected Installation and Operation.**

Due to the high visibility display of the **LEM+** modules, all useful information can be seen at a single glance: vacuum level, product gripped, thresholds reached, energy saving mode activated, etc.

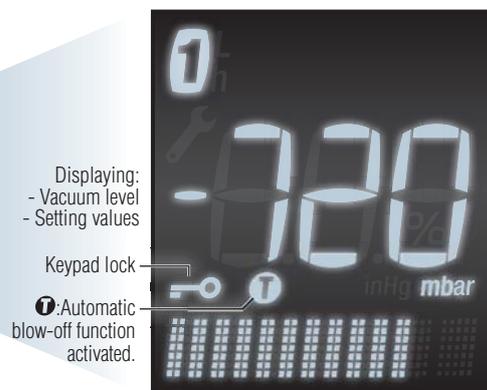
The actual vacuum level is shown with direct reading (selection of different display units), and with "bar graph".

Configuration help messages (multilingual: in French, English, Italian, Spanish, German) are also provided.

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



L1 "Product Gripped" visualisation and setting: (vacuum threshold, hysteresis)



Display units: %, mbar, inHg.

Display shows data in many languages / bar graphs

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LEM+



LEM+: Versatile Series for all Applications

The opposite page demonstrates the versatility of this series. In addition to a very wide range of complete vacuum pumps, there are the options of no blow-off and/or no vacuum switch, and for specific applications.

Select Vacuum Level and Nozzle Diameter

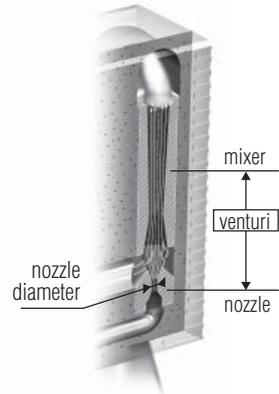
The introductory guide in this catalog shows that for porous objects, a 30-55% vacuum is economical and effective. This is obtained with a 60% maximum vacuum pump.

The table below helps to select the nozzle diameter which generates enough vacuumed air flow to respond in the time required by the application, based on a measurement of the material's leakage rate.

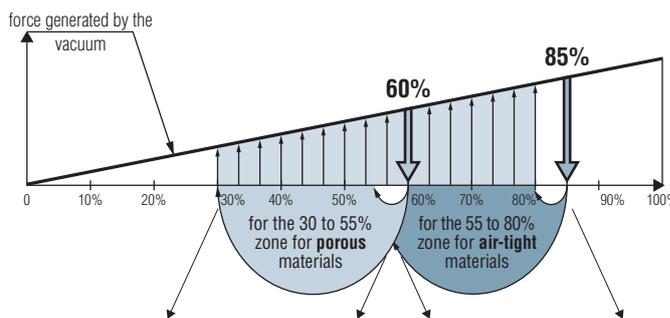
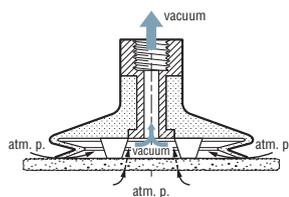
On the contrary, with an air-tight material, the vacuum used is 55% to 80%, obtained by a 85% max. vacuum pump.

For standard cases, with its integrated blow-off the LEMAX+ series is preferable, and more economical due to its ASC (Air Saving Control) function → see p. 8/21.

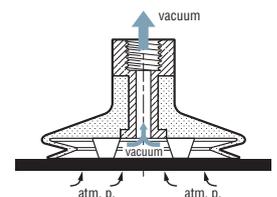
For special cases, the LEM+ series contains versions without blow-off and versions without a vacuum switch. The table below helps to select the nozzle diameter required for the application.



Porous materials:
cardboard, unfinished wood, pastries, etc.



Air-tight materials:
glass, plastic, sheet metal, finished wood



Porous Objects ▶ Maximum Vacuum Level: 60%

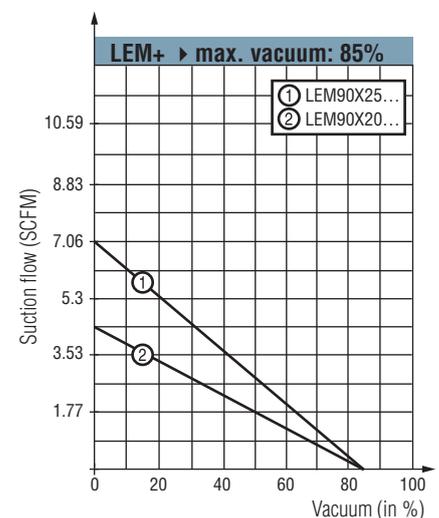
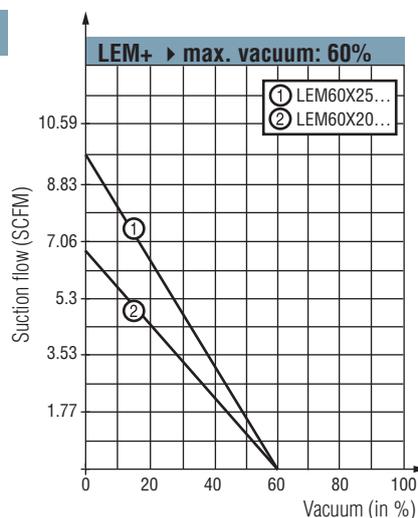
∅ nozzle	Time to create vacuum (seconds) for a volume of 1 liter			Air consumed (SCFM)	Air drawn in (SCFM)
	vacuum achieved 35 %	45 %	55 %		
2.0 mm	0.16	0.27	0.42	6.32	6.67
2.5 mm	0.11	0.18	0.31	9.18	9.71

Airtight Objects ▶ Maximum Vacuum Level: 85%

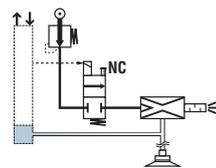
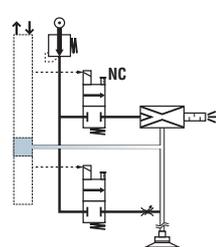
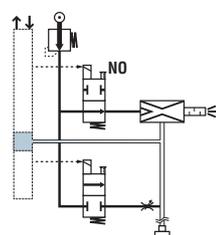
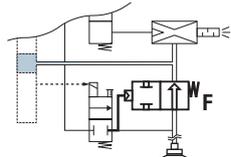
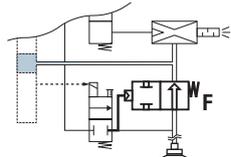
∅ nozzle	Time to create vacuum (seconds) for a volume of 1 liter			Air consumed (SCFM)	Air drawn in (SCFM)
	vacuum achieved 55 %	65 %	75 %		
2.0 mm	0.38	0.55	0.80	6.32 *	4.41
2.5 mm	0.26	0.35	0.50	9.18 *	7.06

* To save compressed air, choose LEMAX+ → ASC reduces the air consumption by 90%

Suction Flow Rate / Vacuum Curves





	LEM	60	X	25	S	VA	C15	P	G1	F
VACUUM LEVEL						VACUUM SENSOR DIALOGUE		CONNECTORS		
60 % max. vacuum is optimal for porous materials		60				Vacuum pump without vac. sensor		VO	C14	one M12 connector 4 pins (C14)
85 % max. vacuum is optimal for air-tight products		90				LEM_X__VOC14PG1				
		NOZZLE DIAMETER						<ul style="list-style-type: none"> Simplified LEM+ without settings and dialogue. Automatic operation until maximum vacuum level. 		
		2 mm nozzle Ø		20						
		2.5 mm nozzle Ø		25						
MODULE COMPOSITION										
NC Vacuum Pump Without Blow-Off						R				
 <p>LEM_X__RV_C__PG1</p> <ul style="list-style-type: none"> Single command signal. NC vacuum command valve. 										
NC Vacuum Pump With Blow-Off						S				
 <p>LEM_X__SV_C__PG1</p> <ul style="list-style-type: none"> 2 command signals. NC vacuum command valve. Blow-off configured on site, at choice: <ul style="list-style-type: none"> Blow-off controlled by specific signal; Automatic blow-off function (blow-off time configurable from 0 to 10s), only with VA option (advantage: reduced PLC I/O requirement). Adjustable blow-off flow rate. 										
NO Vacuum Pump With Blow-Off						V				
 <p>LEM_X__VV_C__PG1</p> <ul style="list-style-type: none"> 2 command signals. NO vacuum command valve. Blow-off controlled by external signal. Adjustable blow-off flow rate. 										
Safety in Case of Power Failure										
<p>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). This version does not include automatic blow-off function that enables control of the module with a single "vacuum and blow-off" signal.</p>										
						Vacuum pump with vacuum sensor & dialogue		VA	C15	one M12 connector 5 pins (C15)
						LEM_X__VAC15PG1				
								<ul style="list-style-type: none"> 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__VAC24PG1				
								<ul style="list-style-type: none"> Electronic vacuum sensor (VA). Stand alone I/O. "Gripped product" switching output 24V DC / NO. 1 auxiliary output: "Vacuum level" signal analogic 1 to 5V DC. Front face panel with full dialogue. 		
						POWERFUL BLOW-OFF				
								Without		
								With F		
						<p>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__SV... and LEM_X__VV...</p>				
						<p>NB: If option F is selected, no blow-off flow rate setting is available.</p>				

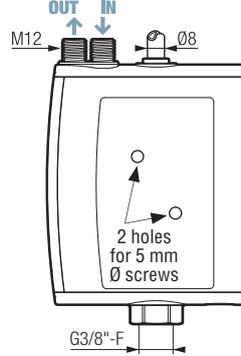
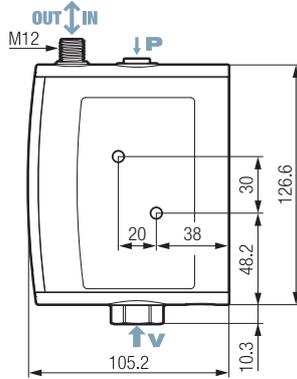
EXAMPLE OF COMPLETE PART NUMBER: LEM60X25SVAC15PG1 LEM+ vacuum pump, 60% maximum vacuum, 2.5 mm nozzle Ø, controlled by a NC (Normally Closed) solenoid valve with vacuum sensor and dialogue, connection by 1 M12 5-pin connector.



Side Mounting

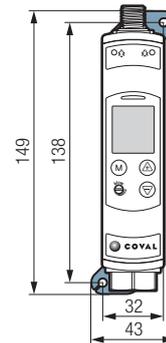
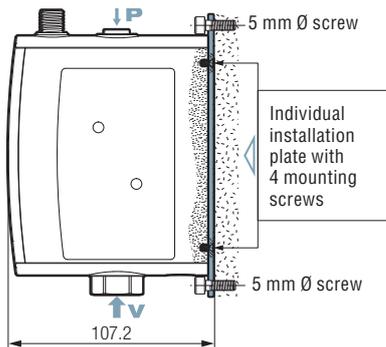
▪ Version: one M12 connector

▪ Version: two M12 connectors



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

Mounting from Front



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

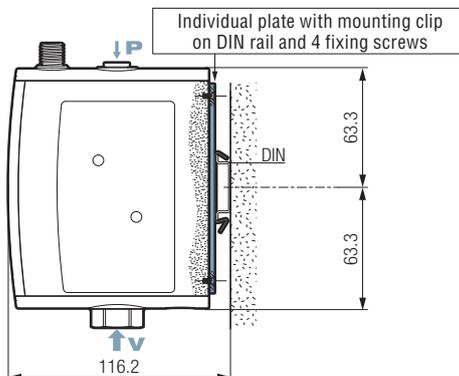
Mounting from front kit:
 1 plate + 4 screws

Part No.: LEMFIX2A

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LEM+

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

Part No.: LEMFIX2B



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 4.41 to 9.71 SCFM, depending on model.
- Air consumption: From 6.32 to 9.18 SCFM, depending on model.
- Integrated non-clogging silencer.
- Sound level: From 72 to 75 dBA.
- 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: IP 65.
- 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 50 to 122°F.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR, HNBR, PU.

Electrical Controls

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

VA MODEL 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 automatic (blow-off time configurable 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: L1 = 65%, h1 = 10%.

Vacuum Sensor

- Power supply voltage: 24V DC ($\pm 10\%$ regulated).
- Current consumption: Standby: <25mA / max. 60 mA.
- Measurement range: 0 to 99% of vacuum, 0 to -999 mbar, 0 to -29.9 inHg.
- Measurement accuracy: $\pm 1.5\%$ of range, temperature compensated.

"Gripped Product" Output Signal

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

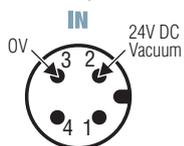
Auxiliary output (C24 model only, 2 x M12 4 pins)

- "Vacuum level" signal, analogic 1 to 5V DC of measuring range.

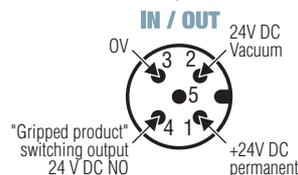
Electrical Connections

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

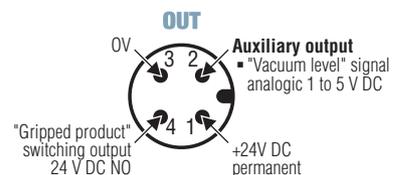
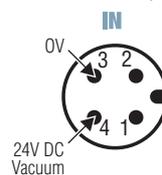
- C14: 1 M12 4-pin connector



- C15: 1 M12 5-pin connector

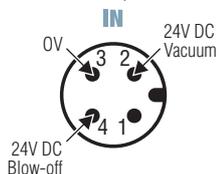


- C24: 2 M12-4 pin connector

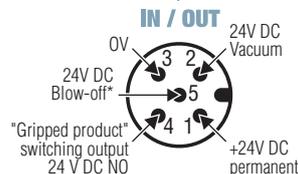


2- For Vacuum Pumps of Model S (vacuum control NC valve, blow-off control NC valve)

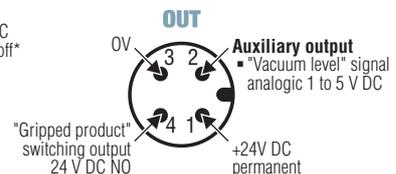
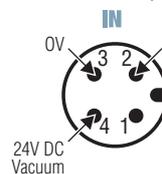
- C14: 1 M12 4-pin connector



- C15: 1 M12 5-pin connector



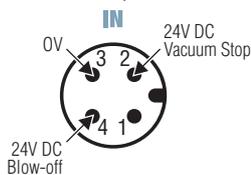
- C24: 2 M12-4 pin connector



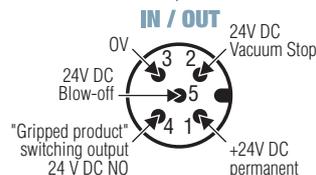
* externally controlled blow-off or automatic blow-off function > economy of an automaton outlet.

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

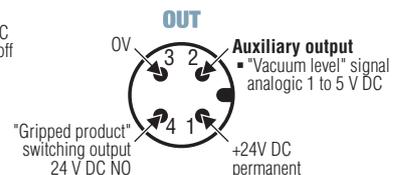
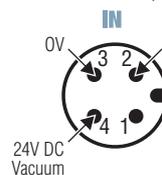
- C14: 1 M12 4-pin connector



- C15: 1 M12 5-pin connector



- C24: 2 M12-4 pin connector



M12 Electrical Connectors: see page 10/9.

LEMAX

Integrated Mini Vacuum Pump with "ASC" (Air Saving Control)



Industry-specific applications



For all objects, airtight or not very porous

Advantages

- Energy savings of 75 to 99% (depending on application) thanks to automatic **ASC** (Air Saving Control) operation.
- "All-in-one" solution, no more peripherals to be added.
- Simplified installation and use thanks to the Plug & Play system.
- Unmatched compactness: Installation close to suction cups → short response times and energy savings.
- No clogging, thanks to the through-type silencer.
- Controlled or timed blow-off.
- Gripping safety in the event of electricity shut-off.
- Smart communication → Easier experience at all stages: initial settings, production, maintenance.

Compact Integration

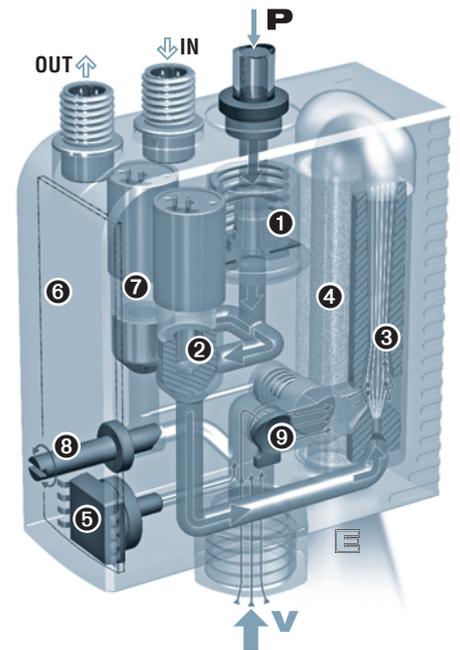
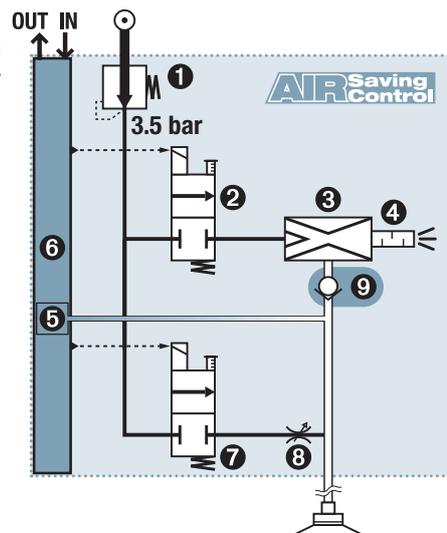
The illustrations below demonstrate the 9 functions integrated in the mini-module, and their respective roles in operation.

The result of this COVAL performance is:

- **A mini module** (\cong 130 g) that is easy to install close to the suction cups, reducing the volume to be evacuated → increased speed and energy savings.
- **A complete module**, therefore not requiring any additional function or connections.

The **LEMAX** compact modules integrate all the functions of "industrial vacuum" including simple, efficient, economical compressed air usage and are adapted for every application:

- 1 3.5 bar pressure regulator
- 2 Solenoid valve "vacuum"
- 3 3.5 bar optimized Venturi
- 4 Through-type silencer
- 5 Electronic vacuum switch
- 6 Integrated electronics
- 7 Solenoid valve "blow-off"
- 8 Blow-off flow adjustment
- 9 Check valve on vacuum



Combination of non-return 9 and advanced electronics 6 ensures the **ASC's** automatic performance.

→ **Once desired vacuum level is reached, the LEMAX no longer consumes air when gripping the product.**



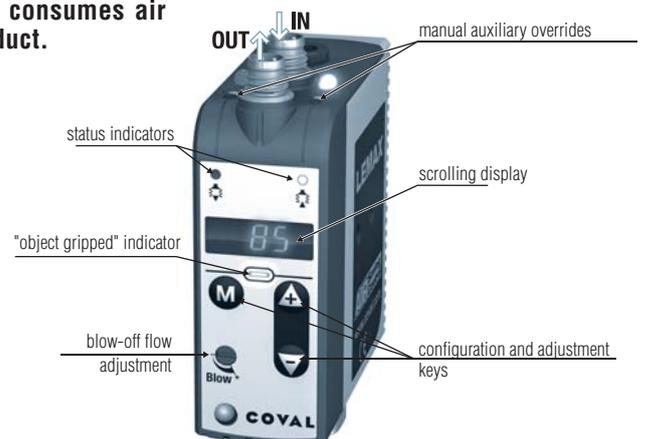
90% energy savings
(on average, see p.8/16).

Smart Communication

The adjacent illustration presents the display panel which enables:

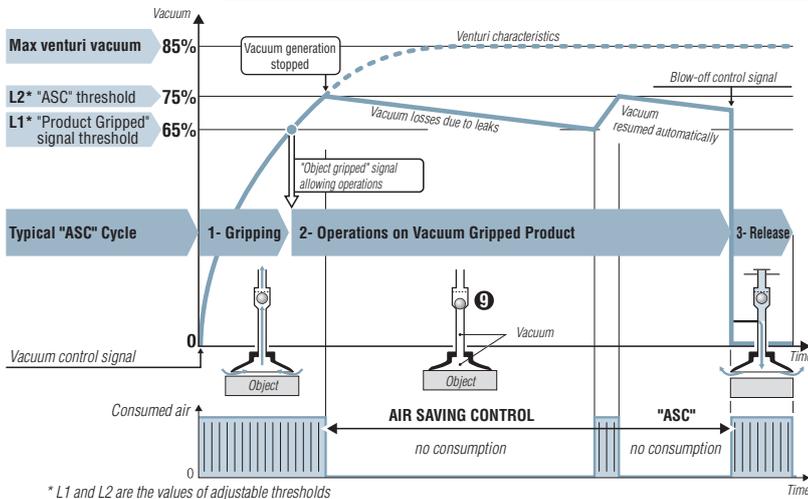
- Initial settings
- Any adjustments
- Production monitoring
- Maintenance

In particular, the no "**ASC**" alert, (see next page), helps to start maintenance operations in order to return to "**ASC**" operation, which is especially energy-saving.





"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 starts the cycle by supplying the venturi 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

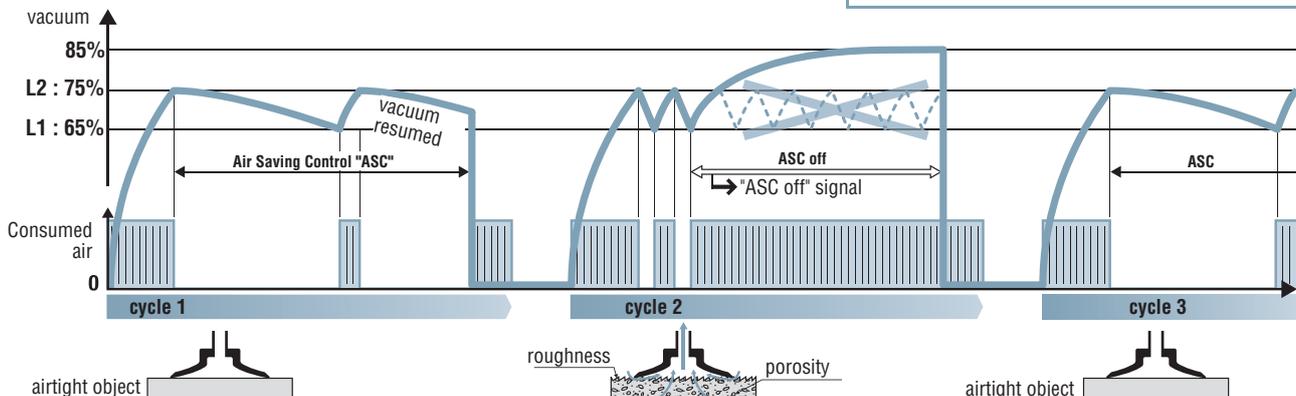
The vacuum level is constantly monitored by the vacuum switch. When it reaches the L1 threshold (65%), the "gripped object" signal is generated, which allows the planned operations (transfer, machining, etc.). When the vacuum reaches threshold L2 (75%), the supply to the venturi via the solenoid valve is cut off → consumption is halted. The object remains held by the retained vacuum thanks to the closed valve. 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, blow-off is ordered. The "blow-off" solenoid valve generates a stream of air which closes the isolation valve, blows on the object to release it quickly.

Smart Adaptation

The illustration below shows the adaptation capacities of the LEMAX module. "ASC" operation is automatic for any object that is airtight enough (cycle 1). If a leak occurs (cycle 2), due to a rough object or to suction-cup wear, the module automatically detects the anomaly, ends the cycle without "ASC" in order to continue production and reports the event for possible maintenance. Production continues. Once everything is returned to normal (cycle 3), "ASC" operation is automatically resumed.



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	75 %
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	

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	99 %
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	

Resulting savings

Energy savings from "ASC" are major, as the two examples opposite above:

- 75% savings for transferring an object after gripping.
- 99% savings for holding an object during a 1 minute operation.

The investment generally pays for itself in just a few months.

"ASC": AN ADVANTAGE WITHOUT LIMITATIONS

Saving energy has become essential. With LEMAX, thanks to "ASC", energy is automatically saved without interfering with established operations:

- 1- No specific adjustment:** The initial setting (L1 = 65%, L2 = 75%) is suitable for most applications.
- 2- Production regardless of what happens:** Operation is always ensured, if necessary without "ASC", if the leakage level is too high.
- 3- Guided maintenance:** Clear display of the need for maintenance to return to auto-regulated "ASC" operation.



The 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. See p. 8/3.

Integrated Mini Vacuum Pump with "ASC" Selection Guide



Stand-alone or Island Modules?

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

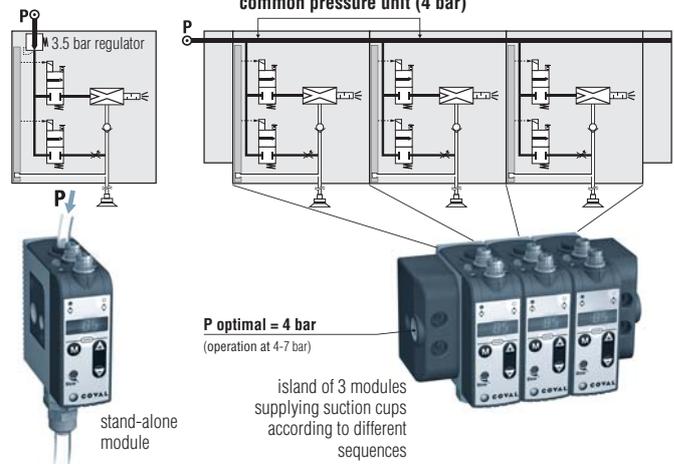
When several suction cups are operating according to different sequences, multiple modules are required, which can be:

- several autonomous modules;
- a group of these modules with an internal common pressure unit.

The illustrations opposite guide the selection:

- stand-alone modules are coupled with integrated pressure regulators (see "ASR" p. 8/3)
- in an island, the integrated regulator is removed: to maintain the advantage of economical and silent operation, it is recommended to reduce the island's common pressure supply pressure to 4 bar.

Network pressure:
4.5 to 7 bar



Power Determined by the Venturi Nozzle Diameter

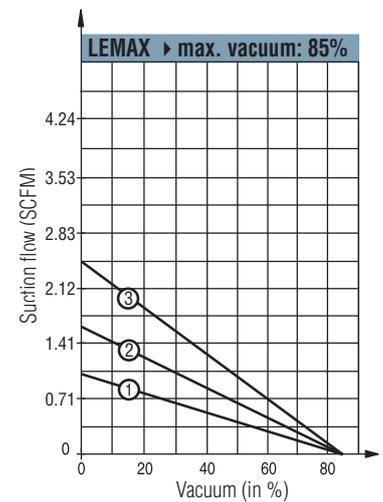
The table shows the power levels generated by each of the nozzle diameters available: when the module is operating with "ASC" off, a larger nozzle draws and consumes more compressed air.

On the other hand, during "ASC" operation, a large nozzle quickly reaches the vacuum threshold generating power shut-off.

In conclusion:

- 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

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



Select Vacuum Controlled by NC or NO Solenoid Valve

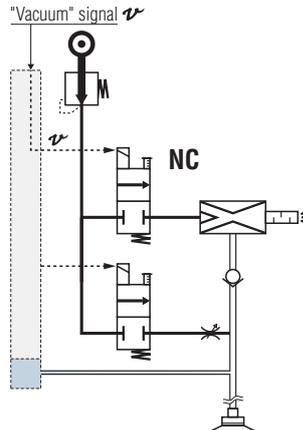
Vacuum controlled by a NC (Normally Closed) solenoid valve remains the simplest standard option to use. In the event of an electricity shutoff, the vacuum is interrupted and the object is released. On the contrary, with vacuum control by NO (Normally Open) solenoid valve, the vacuum continues to be generated in the event of an electrical shut-off: positive object-holding security.

The diagrams opposite show that both versions are controlled by the same "vacuum" signal \bar{v} :

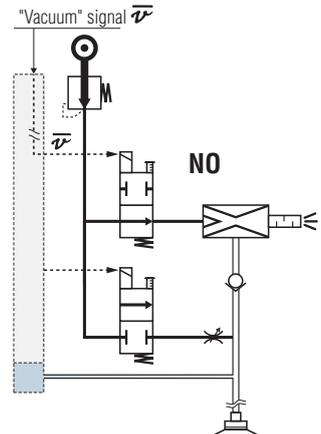
The opposite \bar{v} required for control of the NO solenoid valve is automatically obtained internally by the control electronics.

Note, however, that the NO version requires blow-off controlled by a specific signal: automatic, timed blow-off can only be configured in the NC version.

NC solenoid valve



NO solenoid valve



Integrated Mini Vacuum Pump with "ASC" Configuring a Vacuum Pump



Part numbers for an island assembly or components in an island

Part numbers for stand-alone units

LEMAX	90	X	14	S	B3
--------------	-----------	----------	-----------	----------	-----------

VACUUM LEVEL
maximum 85% vacuum optimum for airtight objects
90

NOZZLE DIAMETER

∅ 1.4 mm nozzle	14
∅ 1.2 mm nozzle	12
∅ 1 mm nozzle	10



ISLAND ASSEMBLIES

B2		LEMAX90X--- B2 island assembly with 2 identical modules.
B3		LEMAX90X--- B3 island assembly with 3 identical modules.
B4	...	

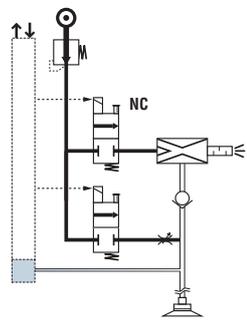
If the planned island contains different module types, it must be ordered as separate components in order to then be assembled on site according to the arrangement suitable to the application. (see p. 8/20)

COMPONENTS FOR THE ISLAND TO BE ASSEMBLED

B		LEMAX... 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

COMPOSITION OF THE MODULE

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

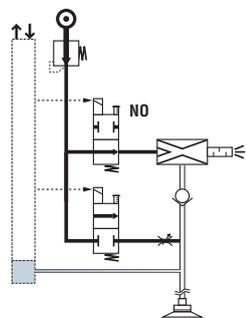


LEMAX90X--S--

- In the event of an electrical shut-off, vacuum is no longer generated.
- Optional configured blow-off:
 - by specific signal,
 - automatic, timed 0 to 3 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

REFERENCE EXAMPLE COMPOSED OF A STAND-ALONE MODULE:

■ LEMAX90X14S

LEMAX, mini vacuum pump, 85% max. vacuum, 1.4 mm nozzle, controlled by a NC (Normally Closed) solenoid valve.

EXAMPLE COMPOSITE PART NUMBER FOR AN ISLAND ASSEMBLY:

■ LEMAX90X14SB3

LEMAX group assembly, containing 3 x 85% max. vacuum modules, ∅ 1.4 mm nozzle, controlled by NC (Normally Closed) solenoid valve.

ORDER EXAMPLE FOR AN ISLAND TO BE ASSEMBLED:

- LEMAX90X14VB
- LEMAX90X12SB
- LEMAX90X10VB
- LEMSETA

3 LEMAX modules for an island, of different types.

Set of ends for island.

LEMAX

Integrated Mini Vacuum Pump with "ASC"

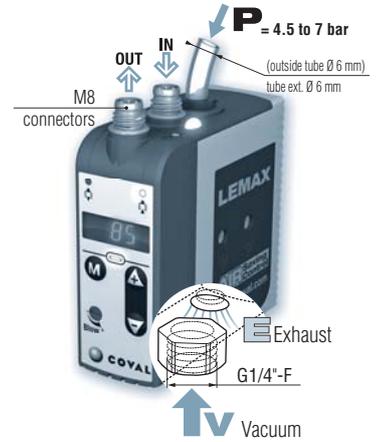
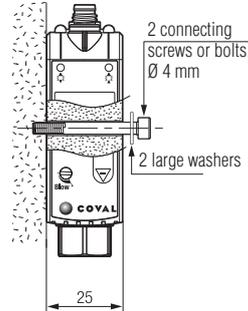
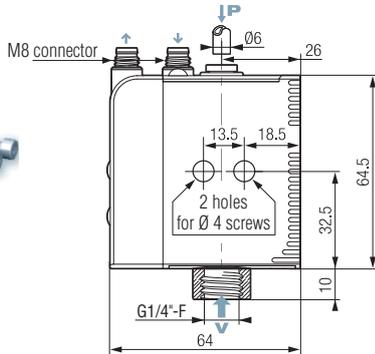
Dimensions, Mounting Options



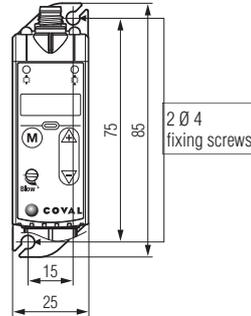
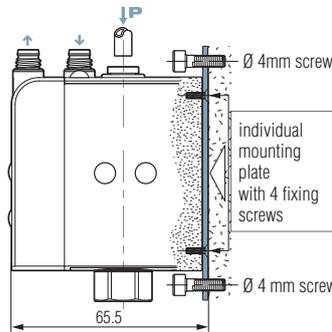
Stand-alone Modules



Side mounting



Front mounting



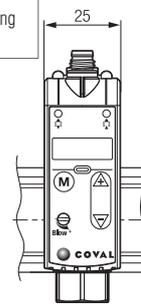
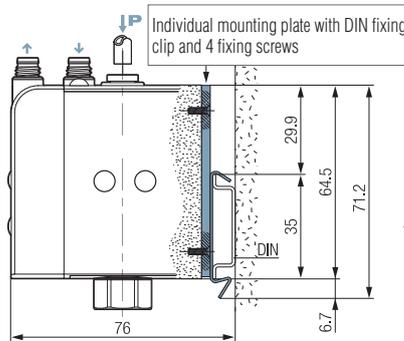
For front mounting, order the necessary kit, in addition to the module:

Front mounting kit:
1 plate + 4 screws

Part No.: LEMFIXA



Mounting on DIN rail



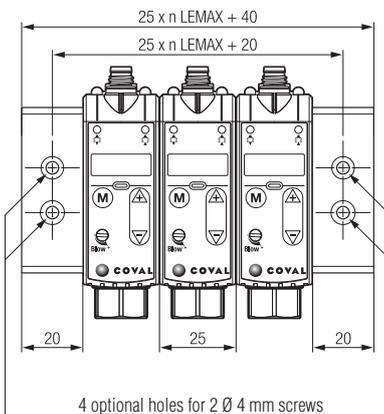
A module can be clipped onto a DIN rail.

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

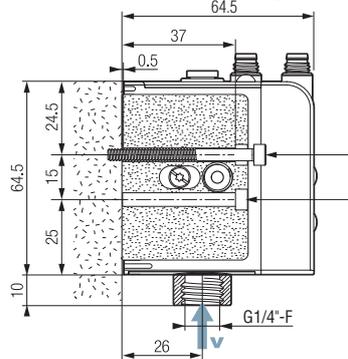
DIN rail mounting kit:
1 plate/clip + 4 screws

Part No.: LEMFIXB

Islands

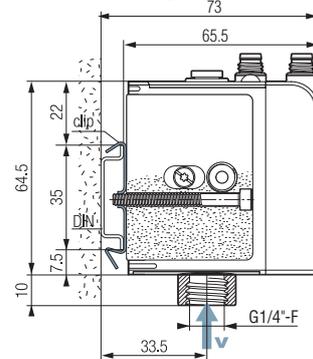


Front mounting



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

Mounting on DIN rail



DIN rail mounting kit: 2 clips + 2 screws

Part No.: LEMFIXC



Overall Characteristics

- Supply: non-lubricated air filtered to 5 microns according to standard ISO 8573-1 class 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 3.25 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 $\pm 10\%$).
- 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.

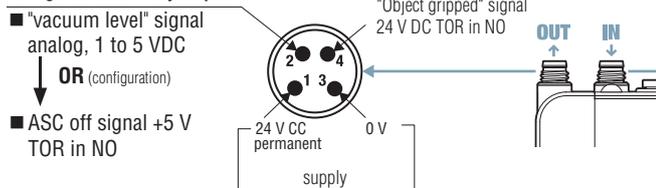
Service Characteristics

- "Object gripped" output signal
 - 24 VDC, switching output / NO, switching power: 125 mA PNP.
- Configurable auxiliary output, you can choose from:
 - "vacuum level" signal, analog 1 to 5 VDC of the measuring range.
 - "ASC" off signal, +5 V switching output / NO.
- 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.

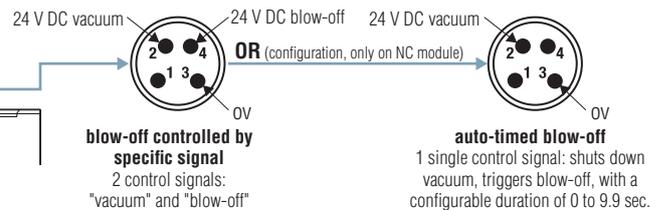
- Settings
 - By mechanical keys and drop-down menu (see page 8/15).
 - Measurement unit selection (% , mbar, inHg)..
 - Blow-off type selection: controlled or automatic adjustable from 0 to 9.9 sec.
- Settings
 - Display of the number of cycles (vacuum cycle counter).
 - If the application so requires, 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

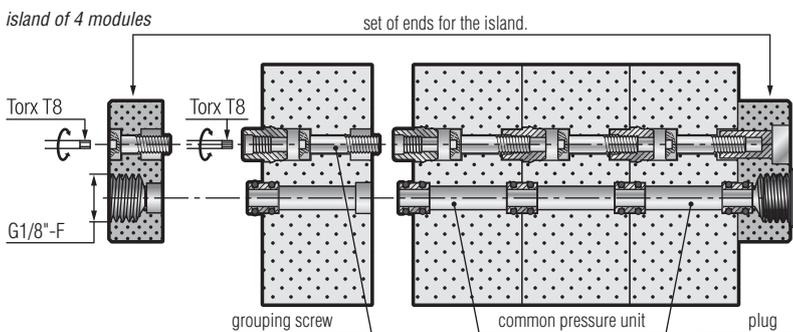
configurable auxiliary output



Note: straight and angled M8 connectors shown p. 10/9



Assembling and Connecting an Island



island of 3 modules



Maximum number of modules in an island:

- \varnothing 1.4 mm nozzle \rightarrow 5 modules
- \varnothing 1.2 mm nozzle \rightarrow 7 modules
- \varnothing 1 mm nozzle \rightarrow 9 modules

Note:

In a single island, it is possible to combine LEMAX series modules and LEM series modules (see p. 8/3).

LEM MAX+

Compact, High Flow Vacuum Pumps

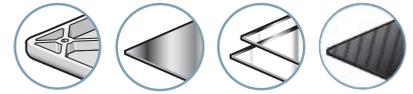
General Information



LEM MAX+ Series, compact, high flow vacuum pumps, integrate ASC (Air Saving Control) technology that allows up to 90% of energy savings. They are specifically designed for gripping airtight or semi-airtight products.

For gripping porous products or those with a rough surface, it is recommended to use the **LEM+ Series** (see page 8/9).

Industry-specific applications



Advantages

- Easy implementation: Plug & Play, multiple choices, every type of application.
- Maximum automatic energy savings:
 - **AIR Saving Control ASC**: 90% savings for airtight products.
- Compactness: **LEM MAX+** vacuum pumps are the most compact on the market.
- Short response times: Possible installation very close to vacuum pads.
- Automatic blow-off: Reduced PLC I/O requirement thanks to the automatic blow-off function (blow-off time configurable from 0 to 10s).
- Dust resistant: Non-clogging through-type silencer.
- Safety: Product gripping is maintained even during power failure.

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".
- External blow-off signal or automatic blow-off function.
- Powerful blow-off as option.
- Versions with 1 or 2 M12 connectors.
- Suction flow rate (SCFM):

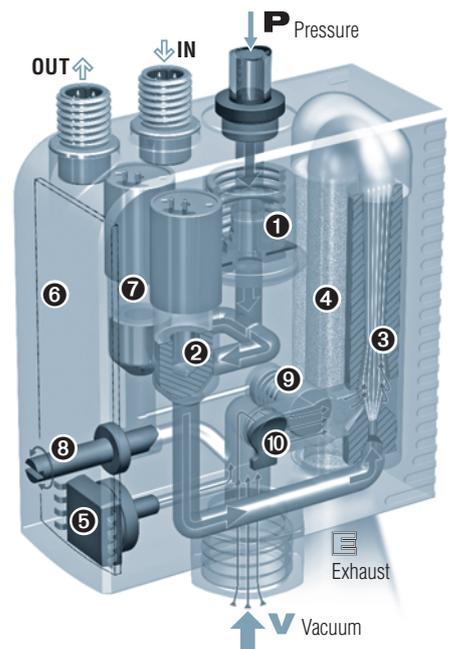
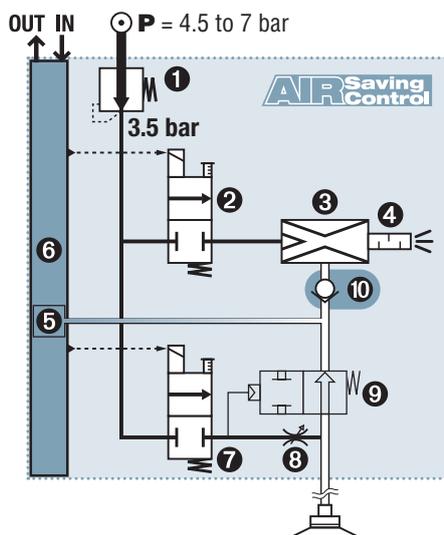
nozzle Ø	max. vacuum	85%
2.0 mm	4.41	
2.5 mm	7.06	



Integration

The **LEM MAX+** compact modules integrate all the functions of "industrial vacuum" including simple, efficient, economical compressed air usage and are adapted for every application:

- 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



Combination of non-return 10 and advanced electronics 6 ensures the ASC's automatic management.

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

Schematic representation

8 LEM MAX+



90% energy savings
(on average, see p.8/22).

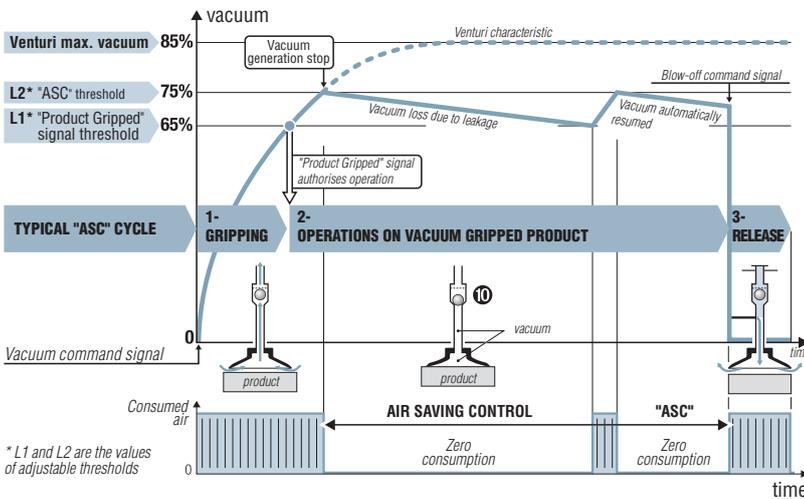
LEMAX+

Compact, High Flow Vacuum Pumps

Energy Saving & Auto-adjustment



AIR Saving Control "Air Saving Control" Cycle



As illustrated in the above figure, 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 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 "gripped object" 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 vacuum maintained thanks to the closed valve ①. 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%).

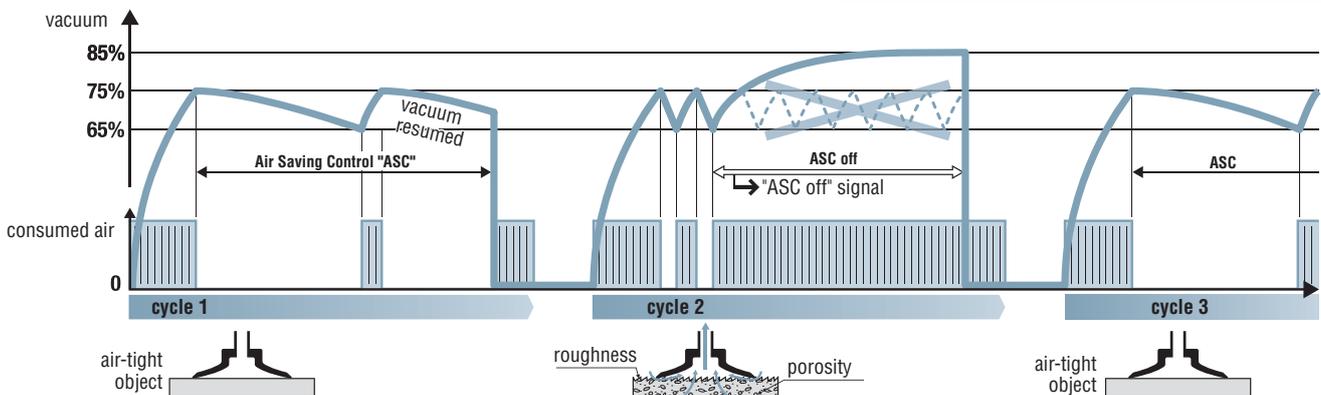
3- Releasing the object

At the end of operations, blow-off is ordered. The "blow-off" solenoid valve ⑦ generates a stream of air which closes the isolation valve ④, and, via flow regulation ⑥, blows on the object to release it quickly.

Smart Adaptation

The illustration below shows the adaptation capacities of the LEMAX module. "ASC" operation is automatic for any object that is air-tight enough (cycle 1).

If a leak occurs (cycle 2), due to a rough object or to suction-pad wear, the module automatically detects the anomaly, ends the cycle without "ASC" in order to continue production and reports the event for possible maintenance. Production continues. Once everything is returned to normal (cycle 3), "ASC" operation is automatically resumed.



1- Gripping + transfer (2 mm nozzle Ø, emptying 0.2 l)

Phase	Duration	Air consumption		achieved economy
		without "ASC"	with "ASC"	
Gripping	0.16 s	0.016 ft ³	0.016 ft ³	80 %
Transfer	1.20 s	0.106 ft ³	0	
Release	0.14 s	0.010 ft ³	0.010 ft ³	
		0.132 ft ³	0.027 ft ³	

2- Clamping + operations (2 mm nozzle Ø, emptying 0.4 l)

Phase	Duration	Air consumption		achieved economy
		without "ASC"	with "ASC"	
Clamping	0.32 s	0.032 ft ³	0.032 ft ³	99 %
Operations	60 s	6.32 ft ³	0	
Release	0.14 s	0.010 ft ³	0.010 ft ³	
		6.36 ft ³	0.042 ft ³	

Resulting Savings

Energy savings from "ASC" are major, as the two examples above show:

- 80 % savings for transferring an object after gripping.
- 99 % savings for holding an object during a 1 minute operation.

The investment generally pays for itself in just a few months.

"ASC": AN ADVANTAGE WITHOUT LIMITATIONS

Saving energy has become essential. With LEMCOM, thanks to ASC, energy is automatically saved without interfering with established operations:

1- No specific adjustment

The initial setting (L1 = 65%, L2 = 75%) is suitable for most applications.

2- Production regardless of what happens

Operation is always ensured, if necessary without "ASC", if the leakage level is too high.

3- Guided maintenance

Clear display of the need for maintenance to return to auto-regulated "ASC" operation.



Specially designed by COVAL, the LEMAX+ vacuum pumps integrate the ASR (regulator-venturi) combination which greatly reduces the compressed air consumption and noise level. See page 8/3.

LEM MAX+

Compact, High Flow Vacuum Pumps

Intelligence & Selection Guide



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 standard factory settings, optimize the implementation, operation, monitoring and maintenance.

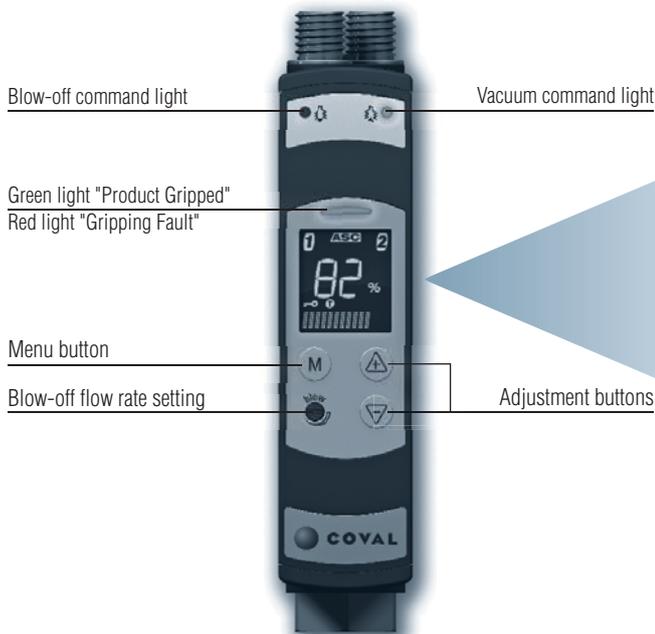
→ Simplified & Protected Installation and Operation.

Due to the high visibility display of the **LEM MAX+** modules, all useful information can be seen at a single glance: vacuum level, product gripped, thresholds reached, energy saving mode activated, etc.

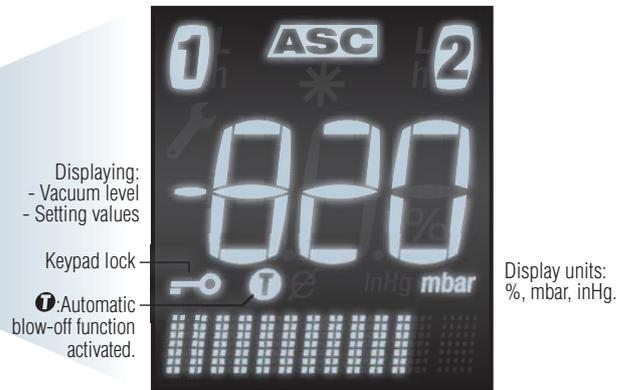
The actual vacuum level is shown with direct reading (selection of different display units), and with "bar graph".

Configuration help messages (multilingual: in French, English, Italian, Spanish, German) are also provided.

→ Clear & Complete Communication at Each Stage.



L1 "Product Gripped" visualisation and setting: (vacuum threshold, hysteresis)
 "ASC" monitoring
 L2 "ASC Threshold" visualisation and setting: (vacuum threshold, hysteresis)



Display shows data in many languages / bar graphs

8

LEM MAX+

Power Determined by the Venturi Nozzle Diameter

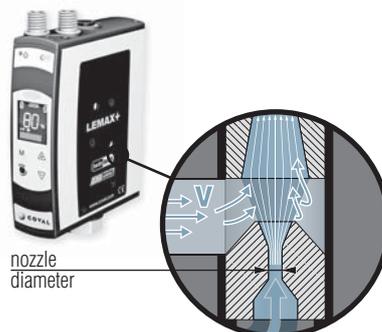
The table shows the power levels generated by each of the nozzle diameters available: when the module is operating "ASC" off, a larger nozzle draws and consumes more compressed air.

On the other hand, during "ASC" operation, a large nozzle quickly reaches the vacuum threshold generating power shut-off.

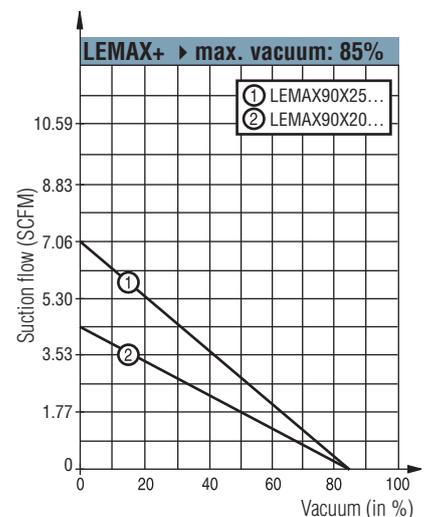
In conclusion:

- A large nozzle enables quicker gripping without consuming more during "ASC" operation.
- A small nozzle does not consume less when operating with "ASC" off.

nozzle Ø	Nozzle Diameter Selection				
	Venturi Specifications While Working Without "ASC"		Evacuation of 1L Volume. "ASC" Operation:		
	Vacuum flow (SCFM)	Consumed Air (SCFM)	Gripping Time (65% Vacuum) (s)	Time Until 75% Vacuum (s)	Consumed Air (ft ³)
2.0 mm	4.41	6.32	0.55	0.80	0.077
2.5 mm	7.06	9.18	0.35	0.50	0.077



Suction Flow Rate / Vacuum Curves



LEMAX+

Compact, High Flow Vacuum Pumps

Configuring a Vacuum Pump



	LEMAX	90	X	25	S	C24	P*	G1	F	S					
VACUUM LEVEL		85% max. vacuum is optimal for airtight products		90											
NOZZLE DIAMETER		2 mm nozzle Ø		20											
		2.5 mm nozzle Ø		25											
MODULE COMPOSITION															
NC Vacuum Pump With Blow-Off					S										
<p>LEM MAX _ X _ SV _ C _ PG1</p> <ul style="list-style-type: none"> 2 command signals. NC vacuum command valve. Blow-off configured on site, at choice: <ul style="list-style-type: none"> Blow-off controlled by specific signal; Automatic blow-off function (blow-off time configurable from 0 to 10s.). Advantage: reduced PLC I/O requirement. Adjustable blow-off flow rate. 					C15 Vacuum Pump with 1 M12 5-pin Connector LEMAX90X__C15PG1 <ul style="list-style-type: none"> "Gripped product" switching output 24V DC / NO. 						POWERFUL BLOW-OFF <p>Without</p> <p>F With</p> <p>The powerful blow-off option allows you to release the product quickly.</p> <p>Isolation valve F directs the entire blow-off flow to the vacuum pad.</p> <p>NB: If option F is selected, no blow-off flow rate setting is available.</p>				
NO Vacuum Pump With Blow-Off					V										
<p>LEM MAX _ X _ VV _ C _ PG1</p> <ul style="list-style-type: none"> 2 command signals. NO vacuum command valve. Blow-off controlled by external signal. Adjustable blow-off flow rate. 					C24 Vacuum Pump with 2 M12 4-pin Connectors LEMAX90X__C24PG1 <ul style="list-style-type: none"> Stand alone I/O. "Gripped product" switching output 24V DC / NO. 1 configurable auxiliary output: <ul style="list-style-type: none"> either "Vacuum level" signal analogic 1 to 5V DC. - or "Without ASC" signal +5V DC switching output NO. 						AIR SAFETY VALVE <p>Without</p> <p>With S</p> <p>Safety in Case of Air Cut</p> <p>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.</p>				
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). This version does not include automatic blow-off function that enables control of the module with a single "vacuum and blow-off" signal.					<p>*P = PNP electronic → NPN version available upon request.</p>										

8 LEMAX+

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.

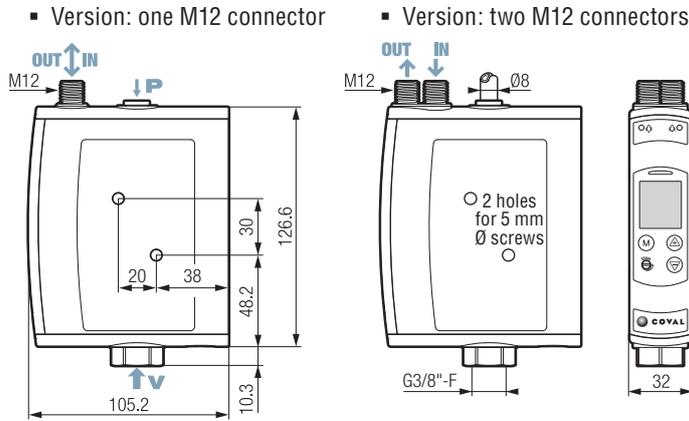
LEMAX+

Compact, High Flow Vacuum Pumps

Dimensions, Mounting Options

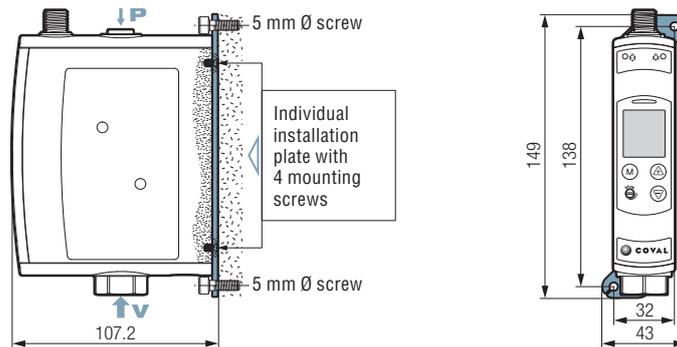


Side Mounting



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

Mounting from Front



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

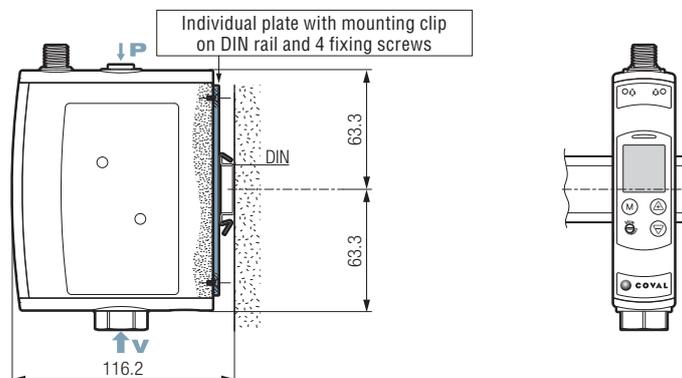
Mounting from front kit:
1 plate + 4 screws

Part No.: LEMFIX2A

8

LEMAX+

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

Part No.: LEMFIX2B



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: 85%.
- Suction flow rate: From 4.41 to 7.06 SCFM, depending on model.
- Air consumption: From 6.32 to 9.18 SCFM, depending on model (when operating "without ASC").
- Integrated non-clogging silencer.
- Sound level: From 72 to 75 dBA "without ASC". 0 dBA with ASC available.
- 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: IP 65.
- 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 50 to 122°F.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR, HNBR, PU.

Electrical Controls

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

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 automatic (blow-off time configurable 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: L1 = 65%, h1 = 10%).

Vacuum Sensor

- Power supply voltage: 24V DC ($\pm 10\%$ regulated).
- Current consumption: Standby: <25mA / max. 60 mA.
- Measurement range: 0 to 99% of vacuum, 0 to -999 mbar, 0 to -29.9 inHg.
- Measurement accuracy: $\pm 1.5\%$ 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.

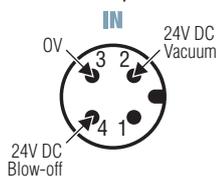
ASC: Regulation & Self-Adaptation

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

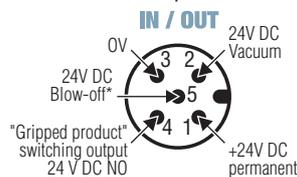
Electrical Connections

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

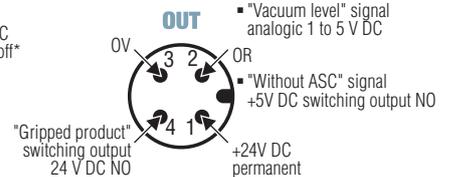
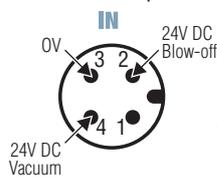
- C14: 1 M12 4-pin connector



- C15: 1 M12 5-pin connector



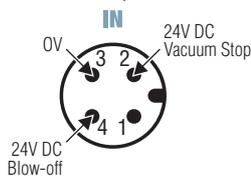
- C24: 2 M12-4 pin connector



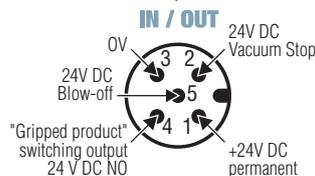
* externally controlled blow-off or automatic blow-off function > economy of an automaton outlet.

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

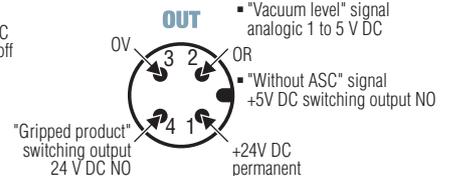
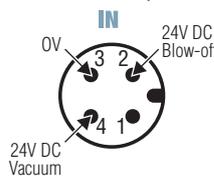
- C14: 1 M12 4-pin connector



- C15: 1 M12 5-pin connector



- C24: 2 M12-4 pin connector



M12 Electrical Connectors: see page 10/9.

LEMCOM

1st Mini Vacuum Pump on Industrial Fieldbus General Points



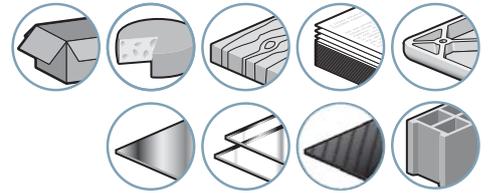
CANopen
EtherNet/IP™



In a world where everything is connected, COVAL is innovating once more by unveiling the LEMCOM series: the first vacuum pump on fieldbus.

The LEMCOM establishes a verified remote communication between the operator and the vacuum pump, with two possible fieldbus choices, CANopen and Ethernet / IP. This allows the operator to receive real-time information and more importantly respond at all times to configure, diagnose and maintain the operation.

Industry-specific applications

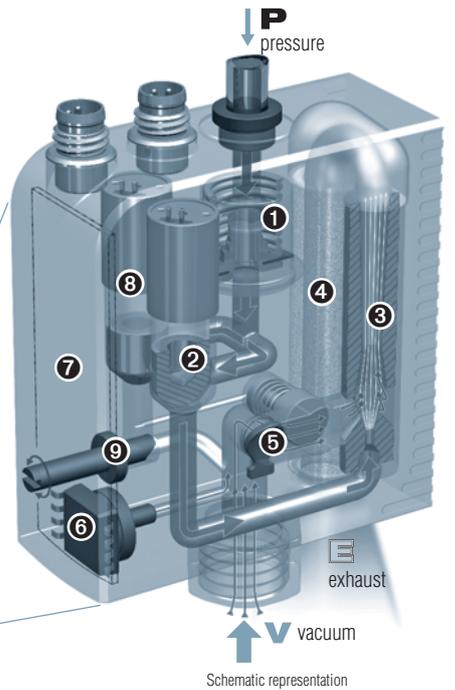
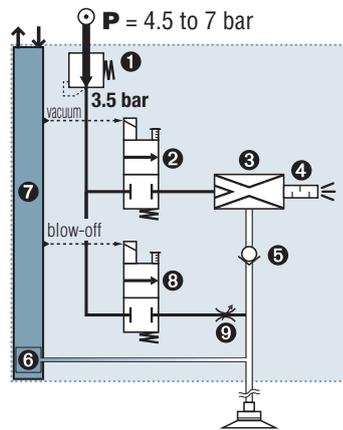


Compact Integration: The COVAL Technique

The illustrations demonstrate the COVAL advantage: all necessary functions are integrated into a complete and self-governing mini-module.

INTEGRATED FUNCTIONS:

- ❶ Pressure regulator 3.5 bar
- ❷ "Vacuum" solenoid valve
- ❸ 3.5 bar optimized venturi
- ❹ Optimized silencer
- ❺ Vacuum non-return valve
- ❻ Vacuum sensor
- ❼ Integrated electronics: management of "vacuum" functions and communication
- ❽ "Blow-off" solenoid valve
- ❾ Blow-off flow regulator



CANopen
EtherNet/IP™

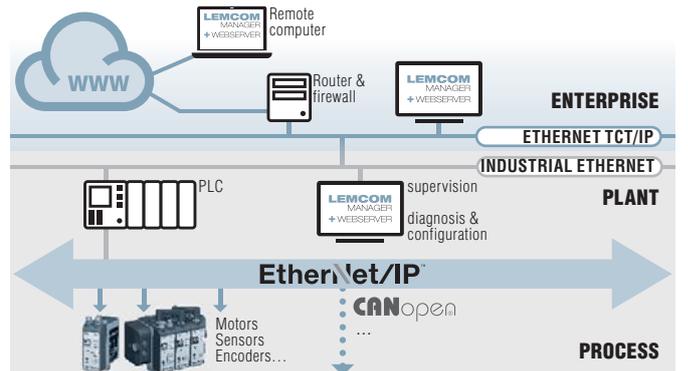
ODVA
CONFORMANT

Easy Integration with Existing Industrial Network

LEMCOM is the first vacuum pump which seamlessly integrates with the field network without the use of gateways or other specific interfaces.

The LEMCOM "master" modules enable the continuity of a fieldbus through their two integrated communication ports. Tested and certified by ODVA (EtherNet/IP) and by CiA (CANopen), LEMCOM is connected very easily to the PLC (EDS file, RSLogix 5000 Add-On Instructions).

Based on a "master/secondary" structure where the "master" is a fully-integrated pump, the LEMCOM design enables the supply and control of 1 to 16 vacuum pumps while requiring only 2 connecting cables.



Advantages

- **Easy implementation:** Plug & Play, custom configuration for every type of application.
- **Maximum automatic energy savings:**
 - ASR:** 40% savings for porous products.
 - ASC:** 90% savings for airtight products.
- **Compactness:** LEMCOM vacuum pumps are the most compact on the market.
- **Short response times:** Installed in close proximity to vacuum cups.

- **Dust resistant:** Non-clogging through-type silencer.
- **Safety:** Product gripping is maintained even during power failure.
- **Supported buses:** EtherNet/IP and CANopen.
- **Wiring simplified:** 2 cables are capable of managing 1 to 16 modules.
- Settings and diagnosis via **remote monitoring**.
- Nearly unlimited arrangements (stand-alone modules, island assemblies or remote modules), see page 8/32.

→ An essential innovation for intelligent vacuum gripping.

LEMCOM

1st Mini Vacuum Pump on Industrial Fieldbus Vacuum Levels and Energy-saving



CANopen
EtherNet/IP™



2 Vacuum Levels to Match Precise Application Needs

VERSION 60 (Max. 60% vacuum)

To enable a high rate of vacuum flow and compensate for leakage when gripping porous materials.

Suction flow rate (SCFM):

max. vacuum Nozzle Ø	60%
1.0 mm	1.34
1.2 mm	2.54
1.4 mm	3.25



VERSION 90 (Max. 85% vacuum)

To enable a high vacuum level and thus increase the holding force for gripping airtight materials.

Suction flow rate (SCFM):

max. vacuum Nozzle Ø	85%
1.0 mm	1.02
1.2 mm	1.59
1.4 mm	2.47



	Porous Materials, Rough Surfaces				Airtight & Semi-Porous Materials				
	Cardboard	Food	Wood	Paper	Plastic	Metal	Glass	Composites	Concrete/Stone
LEMCOM 60	●	●	●	●	●	●	●	●	●
LEMCOM 90					■	■	■	■	■

● Air Saving Regulator

→ 40% of energy savings on average.

■ Air Saving Control

→ 90% of energy savings on average.

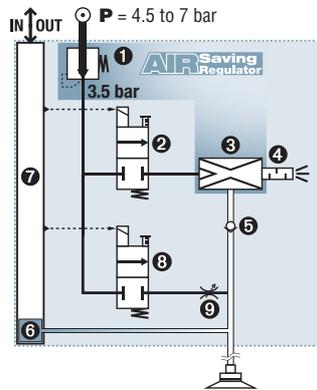
Integrated Energy-saving Technologies

AIRSaving Regulator

40% energy savings
(on average, see below).

Combined "venturi regulator"
ASR: pressure regulator ①
feeds venturi ③ with 3.5 bar,
the optimized pressure for
operation.

→ No more unnecessary
consumption of compressed
air.

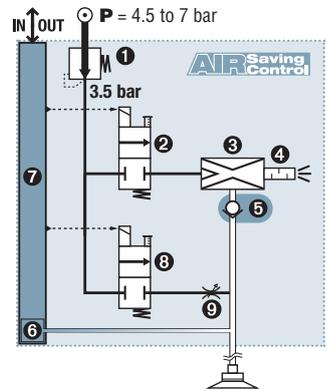


AIRSaving Control

90% energy savings
(on average, see p.8/29)

Combination of non-return
valve ⑤ and advanced
electronics ⑦ ensures ASC's
automatic performance.

→ Once vacuum is
established, the pump no
longer consumes air to hold
the product.



AIRSaving Regulator (ASR): Air Saving Regulator

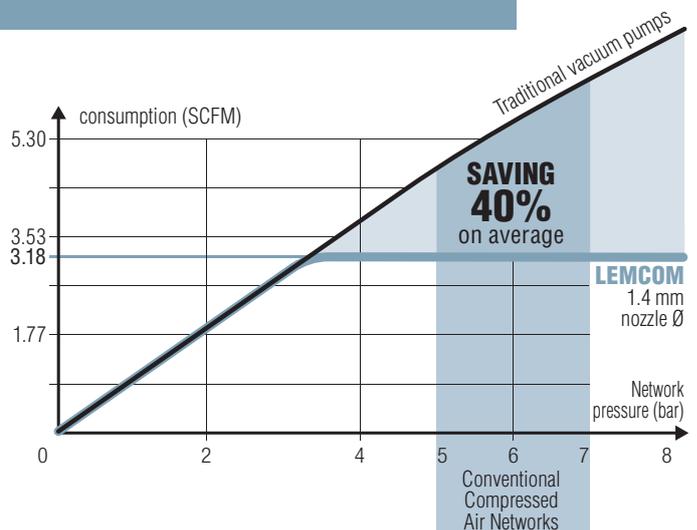
LEMCOM series vacuum pumps, which integrate an ASR "venturi regulator" combination, maintain ideals that COVAL values greatly: reducing both compressed air consumption and noise generation.

Regardless of pressure supplied by the compressed air network, the integrated regulator feeds the venturi at 3.5 bar pressure, optimal for its operation.

→ No more unnecessary energy consumption.

→ No external regulator required, thus eliminating the risk of improper adjustment.

Compared to pressures found in most compressed air networks (5-7 bar), the graph opposite demonstrates an achieved economy of 40% on average.

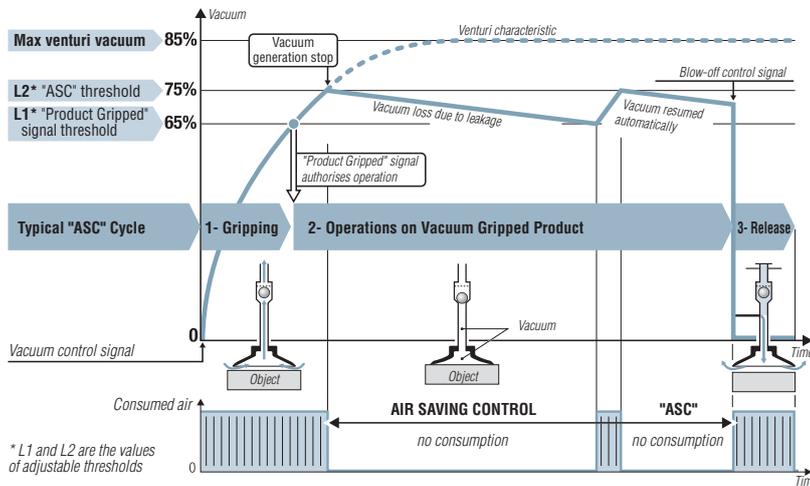




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AR Saving Control "Air Saving Control" Cycle



As illustrated above, the **LEMCOM** 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 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 ④. When it reaches the L1 threshold (65%), the "gripped object" 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 ⑤. 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

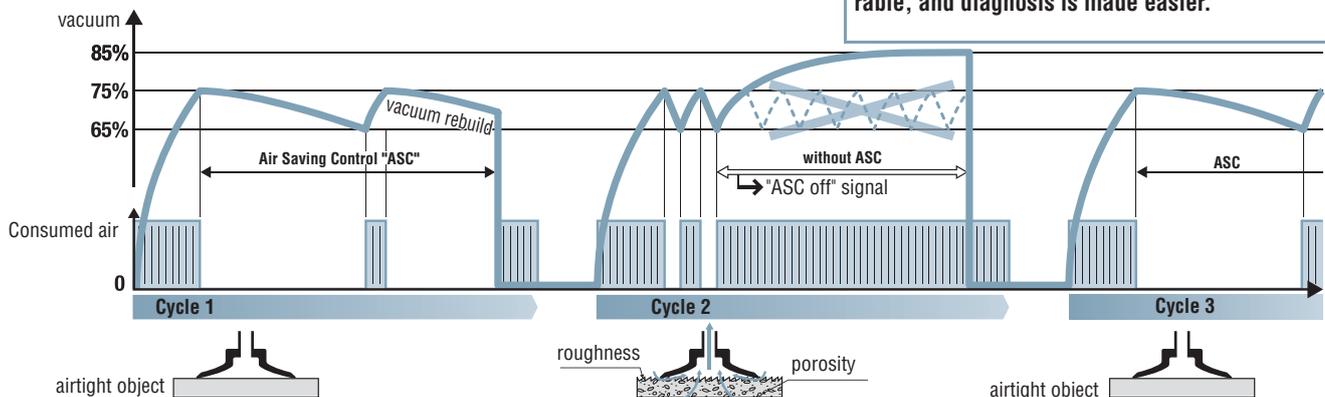
At the end of operations, blow-off is ordered. The "blow-off" solenoid valve ⑥ generates a stream of air which closes the isolation valve ⑦, blows on the object to release it quickly.

Smart Adaptation

The illustration above shows the adaptation capability of the **LEMCOM** module. "ASC" operation is automatic for any object that is airtight or generally nonporous (cycle1).

If a leak occurs (cycle 2), due to a rough object or suction cup wear:

1/ the module automatically detects the anomaly, 2/ ends the cycle without "ASC" in order to continue production and 3/ reports the event for possible maintenance. Production continues and once everything is returned to normal (cycle 3), "ASC" operation is automatically resumed.



1- Gripping + Transfer (1.4 mm nozzle Ø, emptying 0.2 l)

Phase	Duration	Air consumption		Energy savings achieved
		without "ASC"	with "ASC"	
Gripping	0.28 s	0.014 ft ³	0.014 ft ³	75 %
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	

2- Clamping + Operations (1.4 mm nozzle Ø, emptying 0.4 l)

Phase	Duration	Air consumption		Energy savings achieved
		without "ASC"	with "ASC"	
Clamping	0.55 s	0.028 ft ³	0.028 ft ³	99 %
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	

Resulting Savings

Energy savings from "ASC" are significant, as the two examples opposite show:

- 75% savings for transferring an object after gripping.
- 99% savings for holding an object during a 1 minute operation.

The product often pays for itself in just a few months.

"ASC": AN ADVANTAGE WITHOUT LIMITATIONS

Saving energy has become essential. With **LEMCOM**, thanks to ASC, energy is saved automatically without interfering with established practices:

1- No specific adjustment

The default setting (L1 = 65%, L2 = 75%) is suitable for most applications.

2- Production regardless of conditions

Performance is guaranteed. When necessary, without "ASC", if the leakage level is too high.

3- Guided maintenance

Clear display of the need for maintenance in order to return to autoregulated "ASC" operation.

With LEMCOM, all settings are remotely configurable, and diagnosis is made easier.



CANopen
EtherNet/IP™



Individual or Island Modules?

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

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

- several autonomous modules, OR
- a group of these modules with an internally shared pressure supply

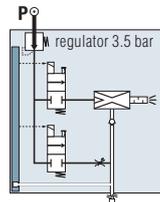
The illustrations shown here guide the selection:

- autonomous modules are coupled with integrated pressure regulators (ASR)
- in a group, the integrated regulator is eliminated: to maintain the advantage of economical and silent operation, it is recommended to reduce the group's common pressure supply to 4 bar.

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

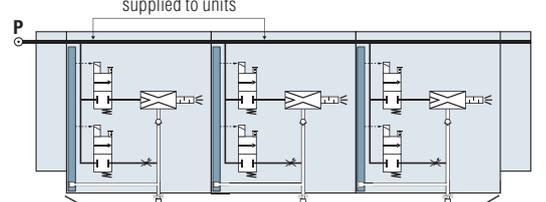
- 5 modules maximum for nozzle 1.4 mm ID.
- 7 modules maximum for nozzle 1.2 mm ID.
- 9 modules maximum for nozzle 1 mm ID.

Network: 4.5 to 7 bar



stand-alone module

Optimal pressure: 4 bar



P optimal = 4 bar
(operation at 4-7 bar)



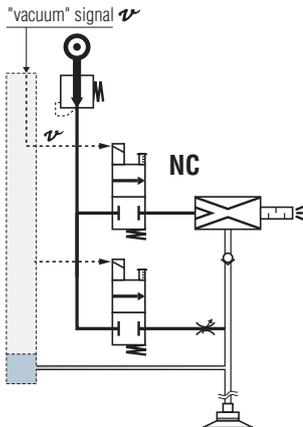
island of 3 modules supplying suction cups according to different sequences or operations

Vacuum Control by NC or NO Solenoid Valve

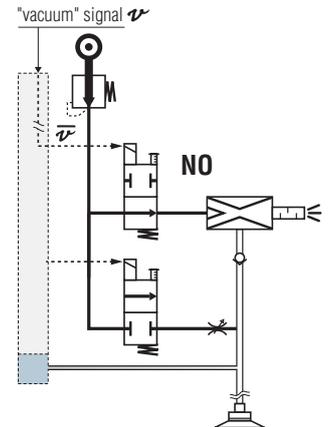
Vacuum control by NC (Normally Closed) solenoid valve is the most common: in the event of an electrical shut-off, vacuum is no longer generated. On the other hand, with a NO (Normally Open) solenoid valve, vacuum continues to be generated in the event of an electrical shut-off, providing positive object-gripped security.

The diagrams opposite show that both versions are controlled by the same "vacuum" signal v : The opposite \bar{v} required for control of the NO solenoid valve is automatically obtained internally by the control electronics.

■ NC solenoid valve

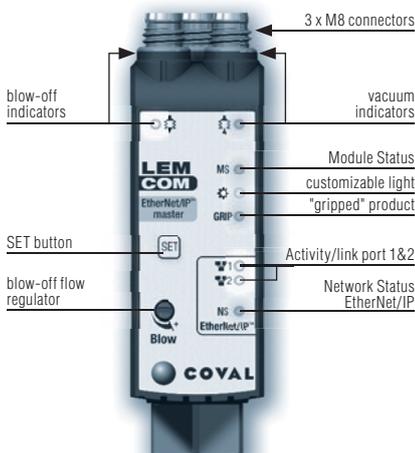


■ NO solenoid valve

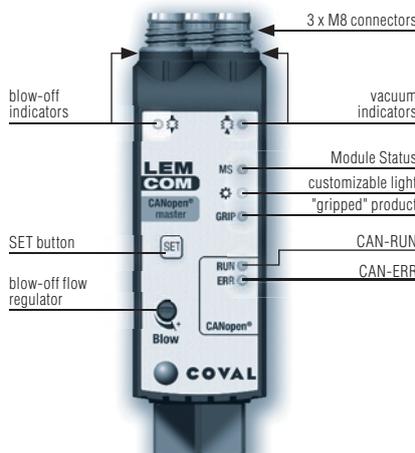


Communications Panel

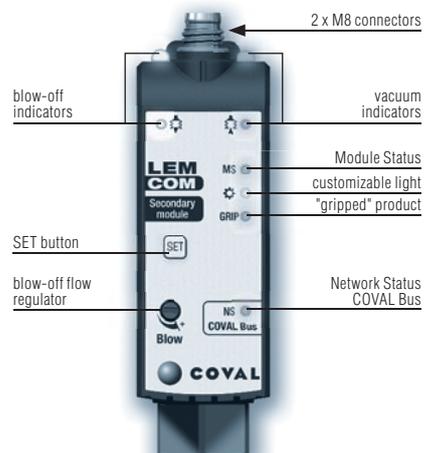
LEMCOM master
EtherNet/IP™



LEMCOM master
CANopen



LEMCOM secondary module



LEMCOM

1st Mini Vacuum Pump on Industrial Fieldbus Simplified Communication along the Entire Line



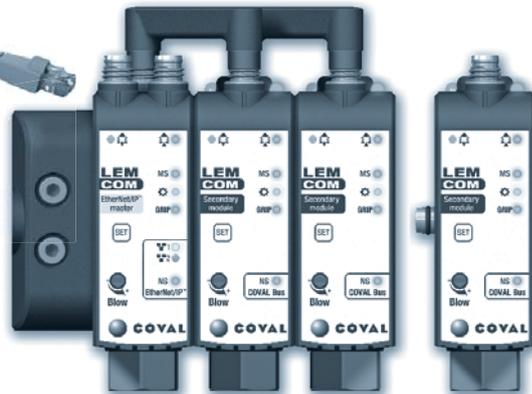
CANopen®
EtherNet/IP™



Multitude of Innovations

- Maximum intelligence / minimal bulk.
- One "master" module controls up to 15 secondary modules.
- Master module is a fully-integrated pump.
- Remote configuration, monitoring and diagnostics.
- Dedicated Coval bus between master and secondary modules.
- Simplified wiring and installation.
- Standard secondary modules (regardless of the type of bus).
- Additional communications port.
- Supported buses: EtherNet/IP™ / CANopen®...
- IP 65 / M8 standard connectors.

EtherNet/IP™
CANopen®



up to
16
modules



A Simple Product to Utilize

LEMCOM master EtherNet/IP™



- On-board 2-Port Ethernet Switch.
- On-board web server.
- Dedicated configuration software.
- M8/RJ45 standard connectors.
- RSLogix 5000 Add-On Instructions.

LEMCOM master CANopen®



- Two CAN ports.
- From 20 to 1000 Kbps.
- Dedicated configuration software.
- Configuration by SDO.
- Adjustable PDO-TX transmission threshold.

LEMCOM secondary module



- Universal secondary module, whatever the type of bus used.

Settings, Diagnosis and Process Data



CONFIGURABLE SETTINGS

- "Product Gripped" and vacuum regulation (ASC) thresholds.
- Automatic blow-off.
- State of valves in the event of loss of communication.
- Client LED status.
- Network parameters.
- Firmware updates...



DIAGNOSTIC

- Cycle counters, vacuum and blow-off control, gripped pieces, lost pieces, ASC...
- Power-supply voltage.
- Firmware version.
- Product reference.
- Vacuum cycle acquisition...



INPUT DATA

- Vacuum and blow-off control.



OUTPUT DATA

- Instant vacuum level (0 to 100%).
- "Gripped Product" signal (ON/OFF).
- Regulation system status.
- Alarms (power-supply voltage, temperature, preventive maintenance).

LEMCOM

1st Mini Vacuum Pump on Industrial Fieldbus Simplified Communication along the Entire Line



CANopen
EtherNet/IP™



A Setting for Every Application

The LEMCOM is based on an innovative, efficient product structure:

- The "master" module manages communication on the fieldbus, assures management of the "secondary" modules and is a fully-integrated vacuum pump. Its 2 communication ports enable a continuous fieldbus.
- The "secondary" modules are interconnected with the "master" module via the COVAL bus.

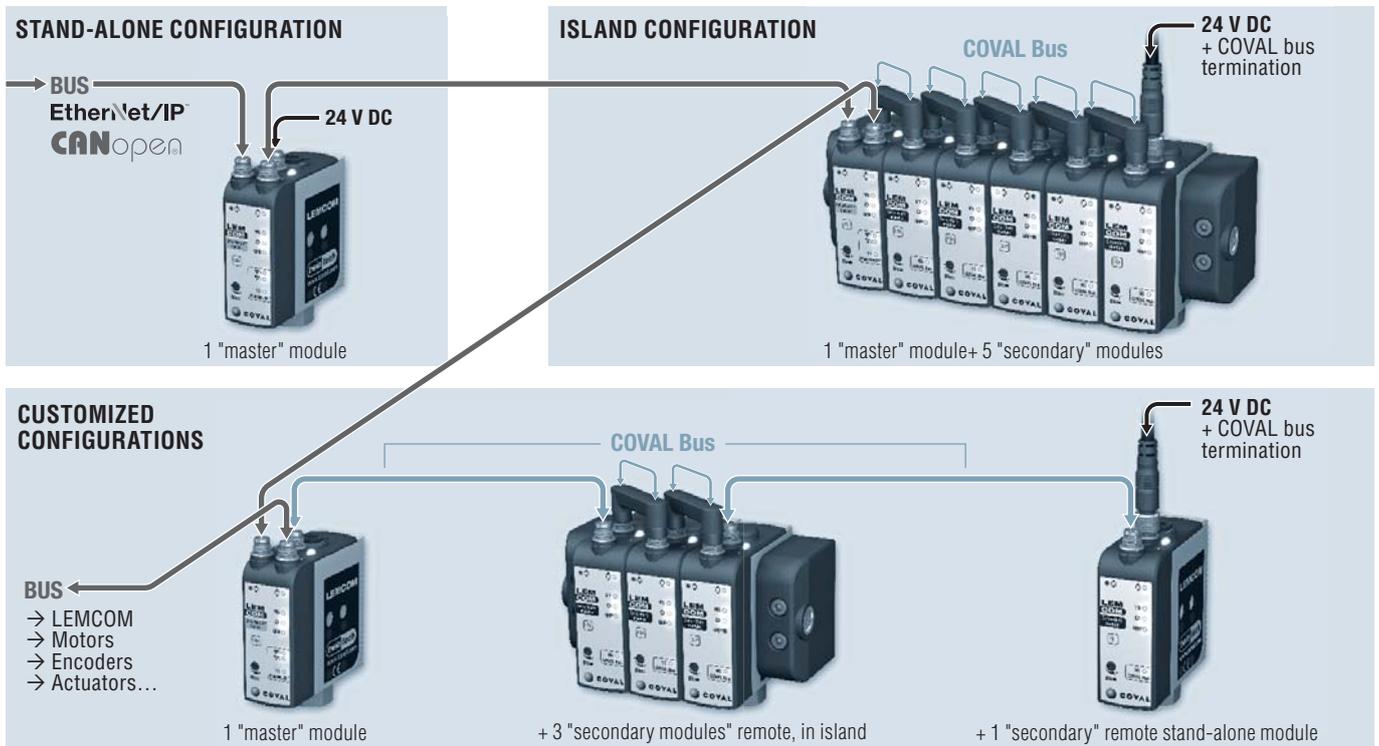
Contact between the "master" module and the "secondary" modules is confirmed by an M8 connecting bridge for island configurations or by a M8/M8 standard cable for configurations based on remote modules.

Advantages:

This product structure guarantees flexibility in selection, enabling use of LEMCOMs in stand-alone, island or mixed configurations. As a result, vacuum generators may be placed in close proximity to the application, guaranteeing a reduction:

- in gripping time
- in cycle time
- in energy consumption.

Because setup and diagnosis of the LEMCOM is carried out remotely, it is not necessary to install them in easily accessible zones.



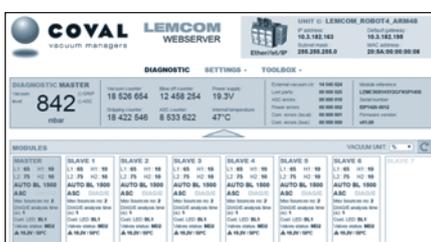
Full Remote Access

LEMCOM parameters can easily be updated remotely and in several ways. Configuration is possible using LEMCOM Manager PC software, the embedded web server (EtherNet/IP only) or by sending vacuum parameters directly from the PLC during use or on

initialization. This flexibility enables the LEMCOM user to adapt to all types of applications without direct intervention on the vacuum generator.

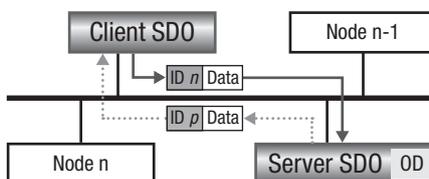
EtherNet/IP™

- Implicit (I/O) and explicit messaging (setting).
- Embedded web server.



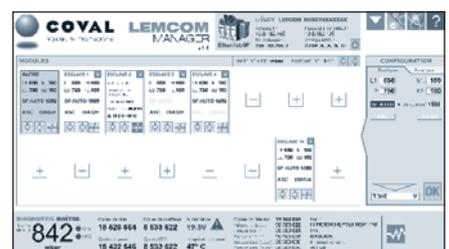
CANopen®

- PDO/SDO.
PDO: Process Data Object (I/O process data).
SDO: Service Data Object (configuration data).



LEMCOM MANAGER

- Dedicated universal application: LEMCOM Manager.





CANopen
EtherNet/IP™



LEMCOM: Versatile Series for all Applications

The opposite page demonstrates the versatility of this series. In addition to a wide range of complete, stand-alone, or island vacuum pumps, LEMCOM has options for protocol, vacuum level, and valve components.

Venturi Specifications

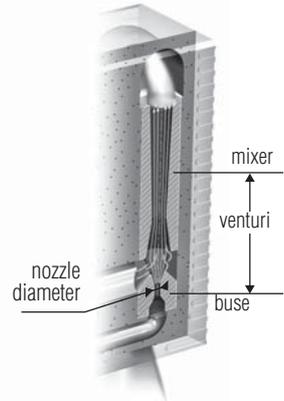
1- Maximum Vacuum Level

Dependent upon 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

Reflects the generated vacuum flow rate, as well as energy consumption. Hence, it must be selected to meet precise requirements without wasting energy.



Handling of Porous Products: (cardboard, untreated wood, pastries, etc.) → LEMCOM 60% max. vacuum

When porosity and/or surface leaks are expected during gripping, a vacuum level between 35 and 55% is the best economical compromise generated by a maximum **venturi vacuum level of 60%**.

To determine the most effective nozzle diameter, use the table at right and measure the leakage flow rate of the material.

Evacuation time (in seconds) of 1 liter volume	vacuum reached			Consumed Air (SCFM)	Vacuum flow (SCFM)
	35%	45%	55%		
Nozzle Ø					
1.0 mm	0.83	1.31	2.35	1.55	1.34
1.2 mm	0.52	0.83	1.49	2.3	2.54
1.4 mm	0.34	0.54	0.97	3.18	3.25

Handling of Airtight Products: (glass, plastic, coated wood, sheet metal, etc.) → LEMCOM 85% max. vacuum

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

Depending on the volume to be evacuated and the time available for product gripping, use the table below to select the most effective nozzle diameter and vacuum flow rate.



On airtight products, "ASC" enables you to considerably reduce compressed air consumption. The table below shows:

- A larger nozzle provides a faster grip without consuming more, when using "ASC".
- A smaller nozzle only consumes less when the operation is continued without "ASC".

Working without "ASC":

Evacuation time (in seconds) of 1 liter volume	vacuum reached			Consumed Air (SCFM)	Vacuum flow (SCFM)
	55%	65%	75%		
Nozzle Ø					
1.0 mm	1.76	2.38	3.33	1.55	1.02
1.2 mm	1.13	1.53	2.15	2.3	1.59
1.4 mm	0.73	0.99	1.38	3.18	2.47

When using "ASC" (evacuation of 1 liter volume):

Ø buse	gripping time (65% vacuum) (s)	Time up to 75% vacuum (s)	Consumed Air (ft³)
1.0 mm	2.38	3.33	0.077
1.2 mm	1.53	2.15	0.077
1.4 mm	0.99	1.38	0.077

ACCESSORIES

Shielded Ethernet cable - Cat-5 - M8 female / Plug straight RJ45.

- CDM8RJ45L2: length 2 m.
- CDM8RJ45L4: length 4 m.
- CDM8RJ45L10: length 10 m.

Other lengths on request.



Female M8/Female M8 cable to screw, straight, 4 pins, PVC cable, IP65, for "COVAL Bus" link.

- CDM8FFL05 : length 0.5 m.
- CDM8FFL1 : length 1 m.
- CDM8FFL2 : length 2 m.

Other lengths on request.



Female M8 cable (open ended), straight, 4 pins, PVC cable, IP 65.

- CDM8 : length 2 m.
- CDM8N : length 0.5 m.



M8/M8 "COVAL Bus" 120 Ω termination.

- 80002303: length 0.2 m.



The COVAL Bus is based on a CAN structure and needs the addition of an end of bus termination to guarantee perfect communication between the "secondary" and "master" modules. This is done by using an M8 male/M8 female cable integrating a 120 ohm termination resistor.

It must be integrated on the last "secondary" of the COVAL Bus, between the final M8 connector of the product and the 24 V DC electric supply.

The termination is not needed when a "master" module is used without any "secondary" module connected to it.



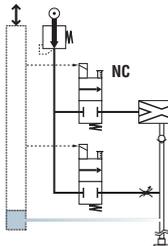
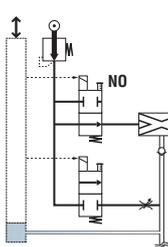
CANopen
EtherNet/IP™



LEMC 90 X 14 S Y2 G B2

VACUUM LEVEL	
60 % max. vacuum is optimal for porous materials	60
85 % max. vacuum is optimal for airtight products	90

NOZZLE DIAMETER	
1 mm Ø nozzle	10
1.2 mm Ø nozzle	12
1.4 mm Ø nozzle	14

MODULE COMPOSITION	
<p>NC Vacuum pump with blow-off</p>  <p>LEMC_X_S_G</p> <ul style="list-style-type: none"> NC vacuum control valve: <ul style="list-style-type: none"> → in case of electrical cut-off, vacuum generation stops (see p. 8/30). Blow-off configured on site at choice: <ul style="list-style-type: none"> - Blow-off controlled by specific signal; - Automatically delayed blow-off time from 0 to 10 s. Adjustable blow-off flow rate. 	S
<p>NO Vacuum pump without blow-off</p>  <p>LEMC_X_V_G</p> <ul style="list-style-type: none"> NO vacuum control valve: <ul style="list-style-type: none"> → In case of electrical cut-off, vacuum continues to be generated (see p. 8/30). Blow-off configured on site, at choice: <ul style="list-style-type: none"> - Blow-off controlled by specific signal; - Automatically delayed blow-off time from 0 to 10 s. Adjustable blow-off flow rate. 	V

PROTOCOL

W2 CANopen master
LEMC_X_W2G



- Two CAN ports.
- From 20 to 1000 Kbps.
- Dedicated configuration software.
- Configuration by SDO.
- Regulated PDO-TX transmission threshold.

Y2 EtherNet/IP™ master
LEMC_X_Y2G



- On-board 2-Port Ethernet Switch.
- On-board web server.
- Dedicated configuration software.
- M8/RJ45 standard connectors.
- RSLogix 5000 Add-On Instructions.

Z2 secondary module
LEMC_X_Z2G



- Universal secondary module, can be used with any fieldbus.
- If necessary, M8/M8 "COVAL Bus" 120 Ω termination, available in accessories.

OPTION:
Version without non-return valve available on request.

CONFIGURATION

1 stand-alone module

Island assemblies

B2 LEMC_X_GB2



Island assembly with 2 modules, with connecting bridges for internal "COVAL Bus" and M8/M8 120 Ω termination:

- The first module is of the type selected in "PROTOCOL".
- The following one is a secondary module.

B3 LEMC_X_GB3



Island assembly with 3 modules, with connecting bridges for internal "COVAL Bus" and M8/M8 120 Ω termination:

- The first module is of the type selected in "PROTOCOL".
- The following two are secondary modules.

B4 ...

NB: LEMC_X_Z2GB_ "Secondary" island modules are delivered without the M8/M8 "COVAL Bus" 120 Ω termination - order separately.

Components for island assembly

B LEMC_X_GB



Island module, complete with integrated assembly screw.



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

Part No.: LEMSETA



Connecting bridge for internal "COVAL Bus".

Part No.: 80001231

NB: If necessary, M8/M8 "COVAL Bus" 120 Ω termination is available in accessories

EXAMPLES OF COMPLETE PART NUMBER:

LEMC90X14SY2G LEMCOM vacuum pump, 85% maximum vacuum, 1.4 mm Ø nozzle, controlled by a NC (Normally Closed) solenoid valve, stand-alone EtherNet/IP™ "master" module.

LEMC90X10SY2GB3 Island assembly of 3 LEMCOM vacuum pumps, 85% maximum vacuum, 1 mm nozzle Ø, controlled by a NC (Normally Closed) solenoid valve, EtherNet/IP™ "master" module, 2 secondary modules, with connecting bridges and the M8/M8 "COVAL Bus" 120 Ω termination.

LEMCOM

1st Mini Vacuum Pump on Industrial Fieldbus

Dimensions, Mounting Options

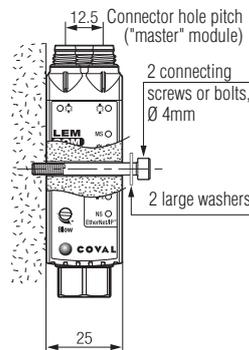
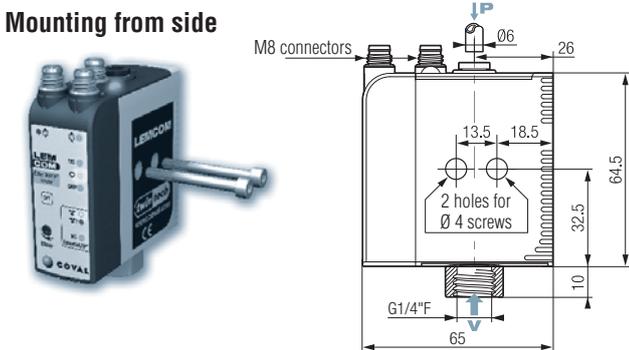


CANopen
EtherNet/IP™

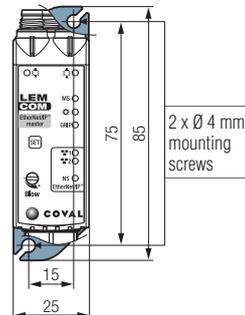
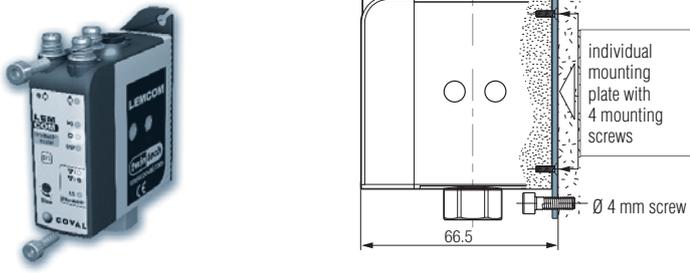


1- Stand-alone Modules

Mounting from side



Mounting from front

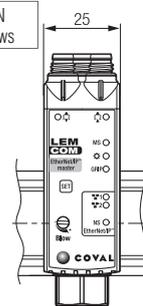
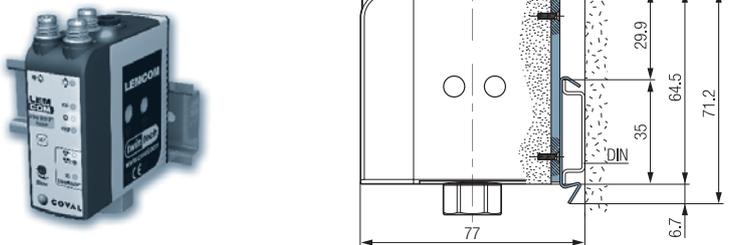


To mount from front, in addition to the module, a mounting kit must be ordered:

Kit for mounting from front:
1 plate + 4 screws

Part No.: LEMFIXA

Mounting on DIN rail

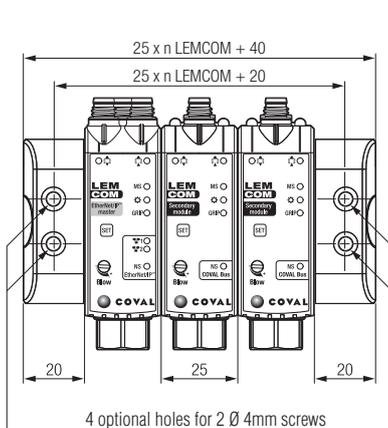


For static mounting (for example, in a cabinet), a module can be clipped onto a DIN rail. For this purpose, the module must first be equipped with an individual plate for mounting onto a DIN rail

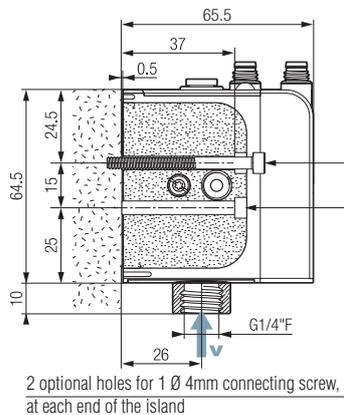
DIN rail mounting kit:
1 plate/clip + 4 screws

Part No.: LEMFIXB

2- Islands

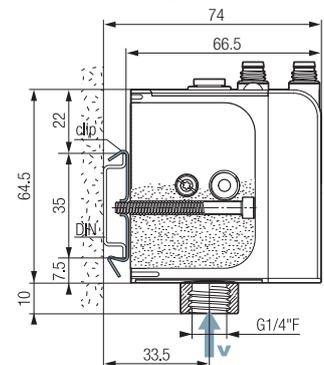


Mounting from front



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 + 2 screws

Part No.: LEMFIXC

8 LEMCOM

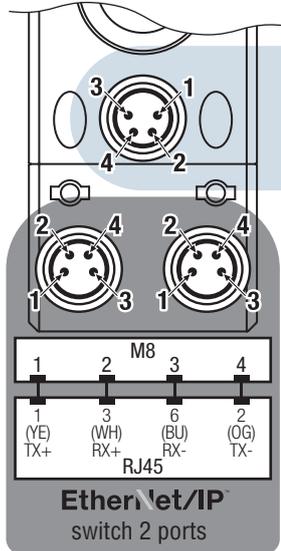


CANopen
EtherNet/IP™

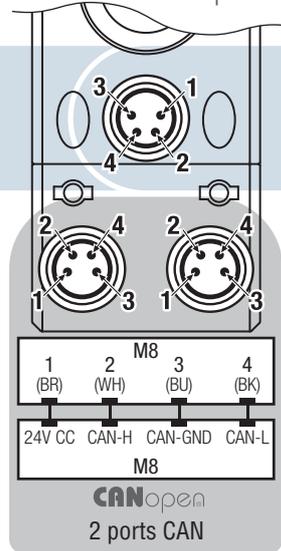


Electrical Connections

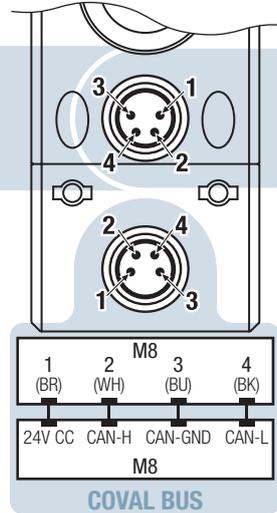
LEMCOM master EtherNet/IP™



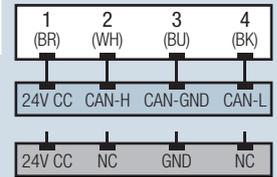
LEMCOM master CANopen



LEMCOM secondary module



→ bus "COVAL"



→ alimantation

M8/M8 "COVAL BUS" 120 Ω TERMINATION

Male M8/Female M8 cable integrating a 120 Ω termination resistor.

The termination must be integrated on the last "secondary" module of the COVAL Bus, between the final M8 connector of the product and the 24V DC electric supply.

See "Accessories", page 8/33.



YE: yellow, WH: white, BU: blue, OG: orange, BR: brown, BK: black

Common Specifications

- Supply: Non-lubricated air 5 microns filtered, according to ISO 8573-1 Class 4 standard.
- Operating pressure: 4.5 to 7 bar.
- Mini dynamic pressure:
 - stand-alone module: P = 4.5 bar.
 - island modules: 4 bar.
- Blow-off: adjustable flow:
 - stand-alone version: P = 3.5 bar.
 - island version: P network.
- Maximum vacuum: 85%.
- Suction flow rate: From 1.02 to 3.25 SCFM.
- Air consumption: From 1.55 to 3.18 SCFM, when operating "without ASC".
- Integrated non-clogging silencer.
- Noise level: approximately 68 dBA "ASC off". 0 dBA with ASC.
- Electric protection grade: IP65.
- Maximum operating frequency: 4 Hz.
- Service life: 30 million cycles.
- Weight: 150 g.
- Operating temperature: From 32 to 122°F.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR.
- 4-pins M8 male connectors.

Self-Adaptation

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

Integrated electronics

- 24V DC supply (regulated ± 10 %).
- Electric consumption: "master" < 150 mA, "secondary" < 100 mA, of which 30 mA (0.7W) per vacuum and blow-off pilot.
- Measurement range: 0 to 99% vacuum.
- Measurement accuracy: ±1.5 % of range, temperature compensated.
- Communication ports protected against wiring errors or reversed polarity.

Service Specifications

Settings

- Piece gripping (L1) and regulation (L2) thresholds.
- Automatic blow-off time configurable (0 to 10 seconds).
- Activation/deactivation of ASC regulation system.
- Activation/deactivation of the (DIAG ECO) leakage level monitoring system.
- Adjustable blue LED functioning mode
- Valve functioning mode in the event of loss of communication

Diagnosis

- Instantaneous vacuum level (0 to 99%).
- Gripped product, loss of product, regulation in process, regulation default information.
- Cycle counters (vacuum, blow-off, gripped piece, ASC, etc.).
- Supply voltage and internal temperature.
- Product reference and serial number.
- Firmware version.

Configuration and diagnosis tools

- LEMCOM Manager PC software (EtherNet/IP and CANopen universal application).
- Embedded web server (EtherNet/IP module only).

Communication

EtherNet/IP:

- 2-port ethernet switch.
- Static IP address or DHCP.
- EDS file & RSLogix 5000 Add-On Instructions.

CANopen:

- 2 CAN port.
- 10 to 1000 Kbps.
- EDS file.

COVAL Bus:

- CAN link between "master" and "secondary" units / 1 Mbps.
- Connection by specific bridge for island assembly or unshielded female M8/female M8 cable.
- Max total length of the COVAL Bus: 20 meters.

GEM

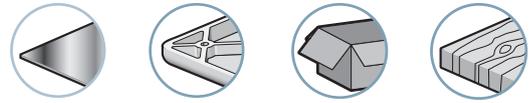
Vacuum Pump with ASR (Air Saving Regulator)

AIR Saving Regulator

twin tech
Integration & Intelligence



Industry-specific applications



For all objects, porous or airtight

Advantages

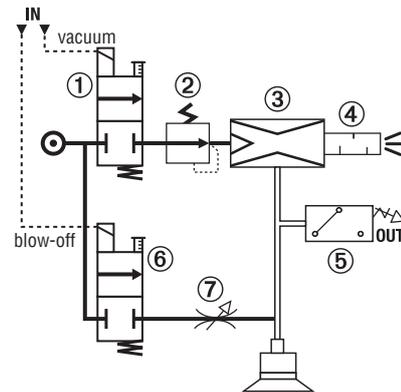
- "All-in-one" solution, no more peripherals to be added.
- Simplified installation and use thanks to the Plug & Play system
- Strong suction rate: up to 13.60 SCFM.
- A GEM for every need: a wide range, many options, and only the necessary functions are chosen.
- No clogging, thanks to the through-type silencer.
- Controlled or timed blow-off.
- Smart dialogue → User-friendly at all stages: initial settings, production, maintenance.

Compact Integration

The illustrations below present the 7 functions integrated in the vacuum pump and their respective roles in operation.

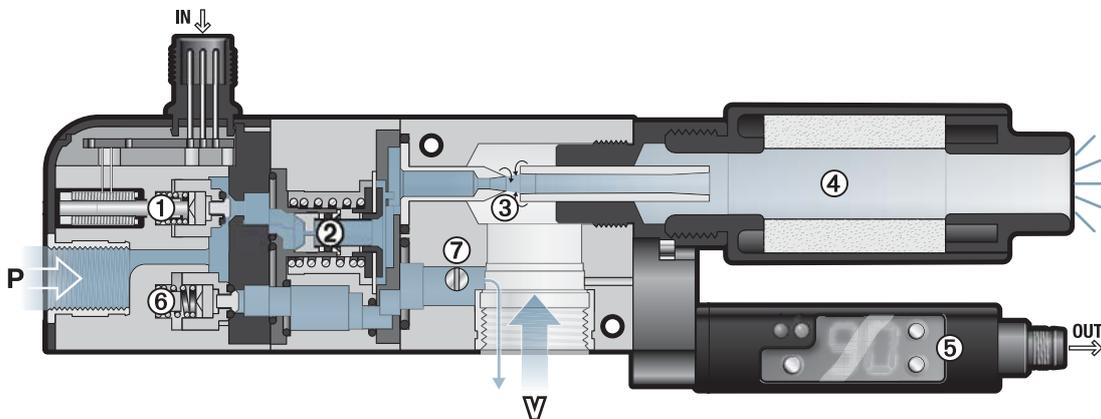
The result of COVAL's innovation is:

- A **compact vacuum pump**, that is easy to install as close as possible to the vacuum cups in order to reduce the volume to purge → speed and energy savings.
- A **complete vacuum pump** (including integrated pressure regulator (ASR) and clog-free silencer), therefore not requiring any additional function or connection.



Integrated functions

- ① Solenoid valve "vacuum"
- ② 3.5 bar Pressure regulator
- ③ 3.5 bar optimized Venturi
- ④ Clog-free silencer
- ⑤ Electronic vacuum switch
- ⑥ Solenoid valve "blow-off"
- ⑦ Blow-off flow adjustment



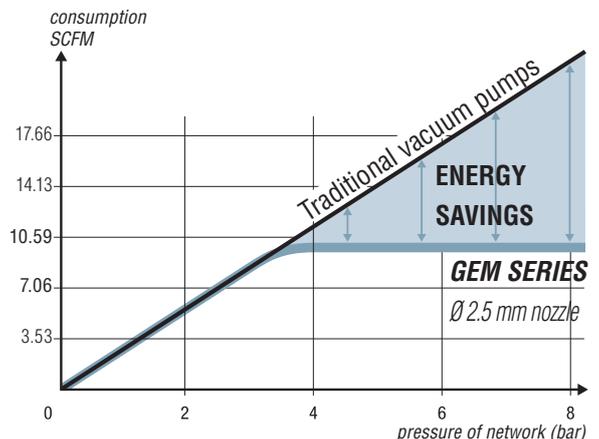
AIR Saving Regulator (ASR): Porous Applications

The GEM vacuum pumps, which integrate an ASR "venturi regulator" combination, maintain ideals that COVAL values greatly: reducing both compressed air consumption and noise generation.

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

- No more unnecessary energy consumption.
- No external regulator required and thus the risk of inadvertent misadjustment is eliminated.

Compared to pressures found in most compressed air networks (5-7 bar), the graph opposite demonstrates an achieved economy of 40% on average.



8 GEM

GEM

Vacuum Pump with ASR

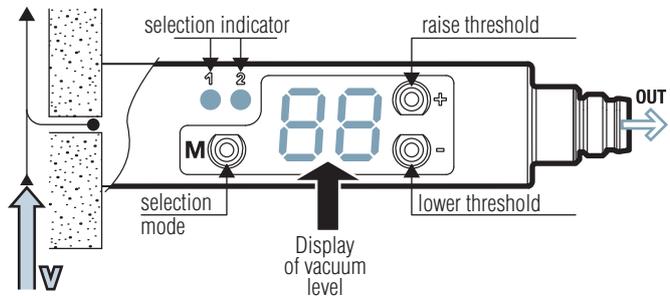
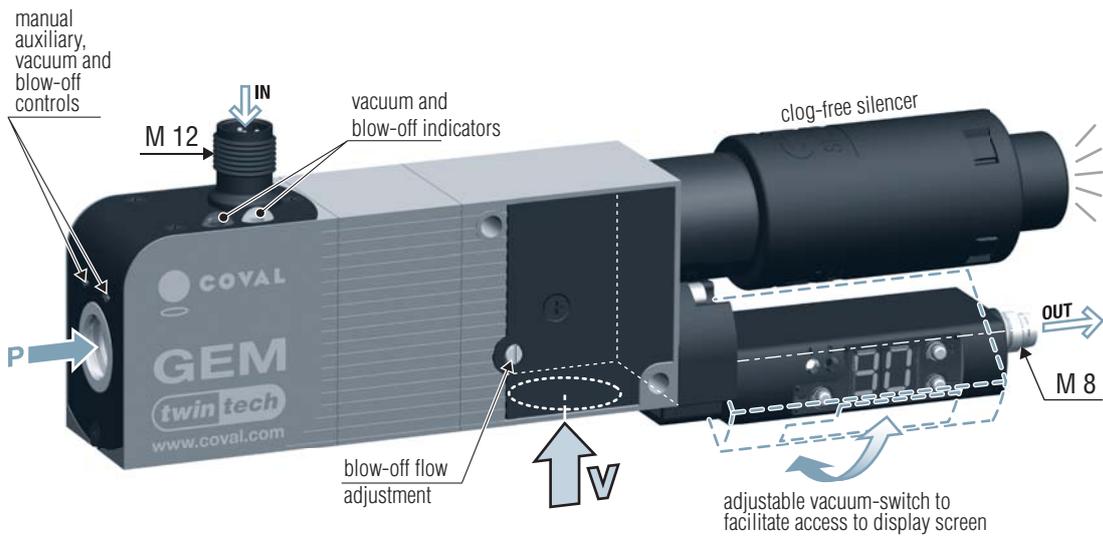
Smart Dialogue



Programmable Vacuum Switch with Display

In its version with electronic vacuum switch with display, GEM presents a particularly high-performance smart dialogue. The vacuum switch (figure opposite) measures the vacuum level measured at the input **V** connected to the vacuum cups and operates it as follows:

- Real-time display for monitoring production.
- Adjustment of the vacuum level generating the "object gripped" signal allowing operations to continue.



Adjustable Façade for Easy Access

Mounted as close as possible to the vacuum cups, the GEM vacuum pump can take on various positions. Depending on the position selected for the pump, the vacuum switch can be oriented so as to optimize access to its display screen. The different orientations possible are described (see p. 8/42).

GEM

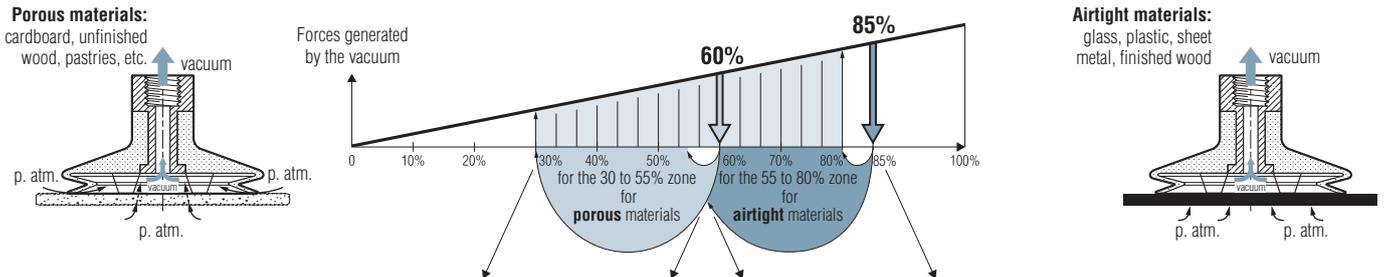
Vacuum Pump with ASR

Selection Guide



Select Maximum Vacuum Level and Nozzle Diameter

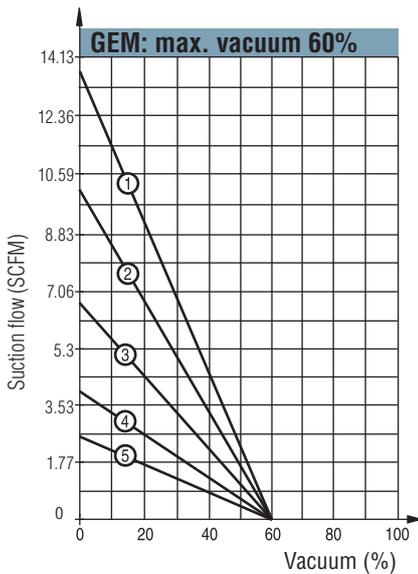
The introductory guide in this catalogue shows that for porous objects, a 30-55% vacuum is economical and effective. This is obtained with a 60% maximum vacuum pump.
 The table below helps to select the basic nozzle diameter which generates enough vacuum flow to respond in the time required by the application, based on a measurement of the material's leakage rate.
 On the contrary, with airtight objects, the economical and effective vacuum used is 55% to 80%, obtained with a 85% max. vacuum pump.
 The table below then helps to select the nozzle diameter which generates enough vacuum flow to respond in the time required by the application.



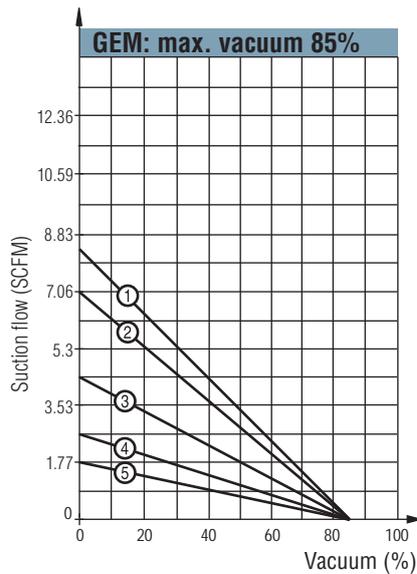
Porous Objects ▶ Maximum Vacuum Level: 60%									
∅ nozzle	Time to create vacuum (seconds) for a volume of 1 liter						Air consumed (SCFM)	Air drawn in (SCFM)	
	vacuum achieved	30 %	35 %	40 %	45 %	50 %			55 %
also see LEM	1.2 mm	0.35	0.43	0.55	0.72	0.9	1.09	2.30	2.54
	1.5 mm	0.23	0.25	0.36	0.46	0.59	0.73	3.43	3.88
	2 mm	0.13	0.16	0.21	0.27	0.34	0.42	6.32	6.67
also see LEM+	2.5 mm	0.09	0.11	0.14	0.18	0.24	0.31	9.18	9.71
	3 mm	0.07	0.08	0.10	0.13	0.17	0.22	13.60	13.60

Airtight Objects ▶ Maximum Vacuum Level: 85%									
∅ nozzle	Time to create vacuum (seconds) for a volume of 1 liter						Air consumed (SCFM)	Air drawn in (SCFM)	
	vacuum achieved	55 %	60 %	65 %	70 %	75 %			80 %
also see LEMAX	1.2 mm	1.01	1.19	1.40	1.62	1.98	2.37	2.30	1.77
	1.5 mm	0.66	0.73	0.93	1.08	1.33	1.59	3.43	2.65
	2 mm	0.38	0.46	0.55	0.65	0.80	0.95	6.32	4.41
also see LEMAX+	2.5 mm	0.26	0.30	0.35	0.41	0.50	0.59	9.18	7.06
	3 mm	0.21	0.24	0.28	0.33	0.40	0.48	13.60	8.65

Suction Flow Rate / Vacuum Curves



- 1 - GEM60X30
- 2 - GEM60X25
- 3 - GEM60X20
- 4 - GEM60X15
- 5 - GEM60X12



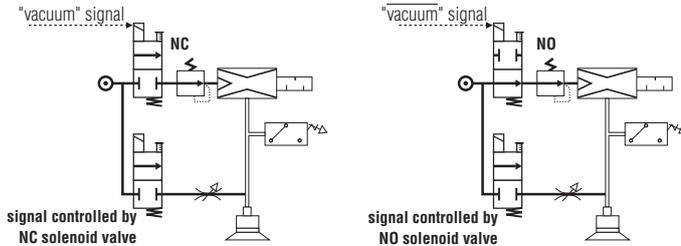
- 1 - GEM90X30
- 2 - GEM90X25
- 3 - GEM90X20
- 4 - GEM90X15
- 5 - GEM90X12



Select Vacuum Controlled by NC or NO Solenoid Valve

Vacuum controlled by a NC (Normally Closed) solenoid valve remains the simplest standard option to use. In the event of an electricity shut-off, the vacuum is interrupted and the object is released.

Select vacuum controlled by NO (Normally Open) solenoid valve if the application requires holding the object in the event of an electricity shut-off. In this case, make sure to control the NO solenoid valve with the inverse signal the "vacuum" signal, which is noted as "vacuum"



Select a Vacuum Switch Type

In addition to the electronic vacuum switch with display that supplies the full smart dialogue described on the previous page, the GEM range offers a selection of simplified vacuum switches for certain applications → see their descriptions p. 8/42.

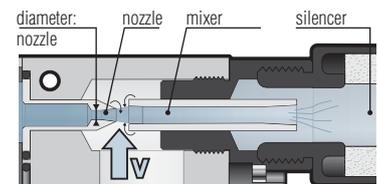


GEM 90 X 12 S				VA
VACUUM LEVEL			COMPOSITION OF THE MODULE	VACUUM SWITCH
maximum 60% vacuum optimum for porous objects	60		S <ul style="list-style-type: none"> Vacuum controlled by an NC solenoid valve Controlled blow-off → 2 control signals 	VA Electronic vacuum switch with display 2 outputs on M8 connector
maximum 85% vacuum optimum for airtight objects	90			V <ul style="list-style-type: none"> Vacuum controlled by an NO solenoid valve Controlled blow-off → 2 control signals
NOZZLE DIAMETER				VC Vacuum switch with electrical contact 1 output on M12 connector
ø 1.2 mm nozzle	12			VO No vacuum switch
ø 1.5 mm nozzle	15			
ø 2 mm nozzle	20			
ø 2.5 mm nozzle	25			
ø 3 mm nozzle	30			

Venturi: max. vacuum level and nozzle diameter.

The stream of compressed air draws on ambient air, which generates the vacuum.

- The mixer determines the maximum vacuum level: 60% or 85 %.
- The nozzle diameter determines the power expressed in vacuum flow rate and in air flow consumed, on the tables on the previous page.



Complete reference examples:

GEM60X30SVA

GEM vacuum pump, 60% max. vacuum, 3 mm nozzle diameter, vacuum controlled by NC solenoid valve and blow-off controlled by external signal, electronic vacuum-switch with display.

GEM90X20VVA

GEM vacuum pump, 85% max. vacuum, 2 mm nozzle diameter, vacuum controlled by NO solenoid valve and blow-off controlled by external signal, electronic vacuum-switch with display.

Vacuum Pump with ASR Characteristics and Dimensions

ASR Saving Regulator

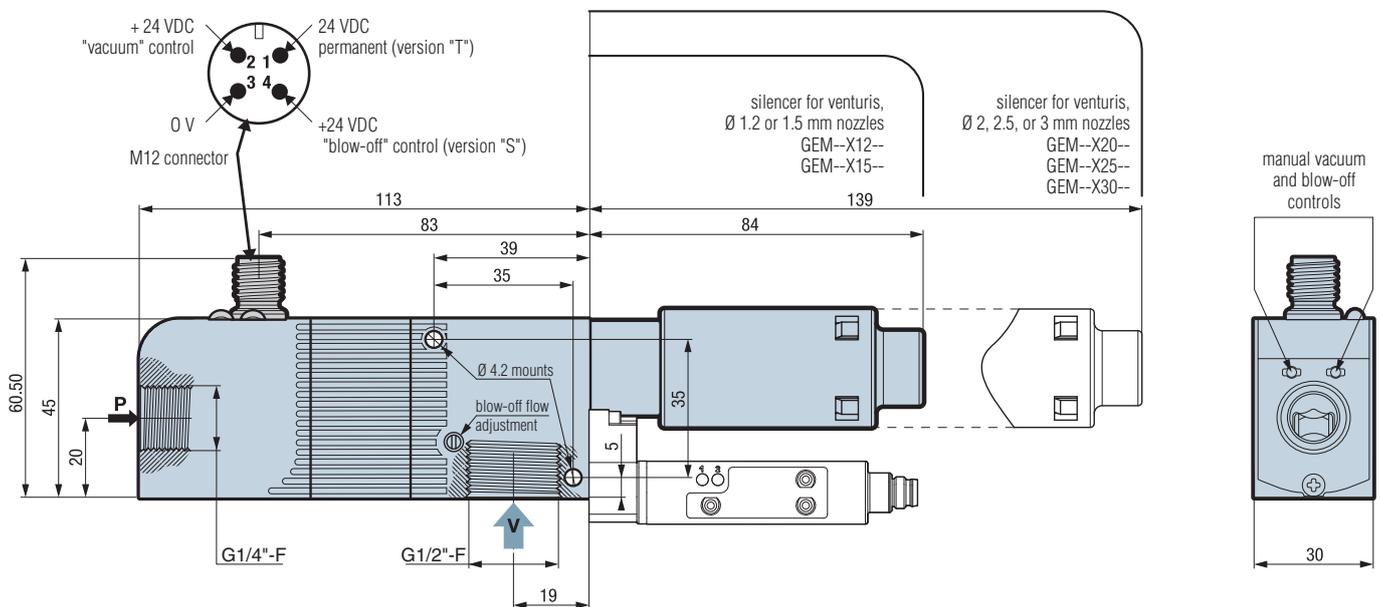
twin tech
Integration & Intelligence



Overall Characteristics

- Supply: non-lubricated air filtered to 5 microns according to standard ISO 8573-1 class 4.
- Electrical protection level: IP 65.
- Optimum operating pressure: 5 to 7 bar for GEM30.
- Blow-off: - network supply pressure, - adjustable flow
- Maximum vacuum: 60% or 85% depending on model (see p. 8/39).
- Suction rate: 1.77 to 13.60 SCFM depending on model (see p 8/39).
- Air consumption: 2.30 to 13.60 SCFM depending on model (see p. 8/39).
- Noise level: depending on the nozzle diameter selected:
 - \varnothing 1.2, 1.5, and 2mm nozzle \longrightarrow 57 dBA
 - \varnothing 2.5 mm nozzle \longrightarrow 65 dBA
 - \varnothing 3 mm nozzle \longrightarrow 67 dBA
- Control voltage: 24 V DC (regulated \pm 10%).
- Current draw: 30 mA (0.7 W) vacuum or blow-off.
- Max. operating frequency: 2 Hz.
- Number of operations: 10 million cycles.
- Weight: 250 g (depending on version).
- Materials: PA 6-6 15% FV, POM, PC 15% FV, brass, aluminum, NBR.
- Operating temperature: 50 to 140 °F

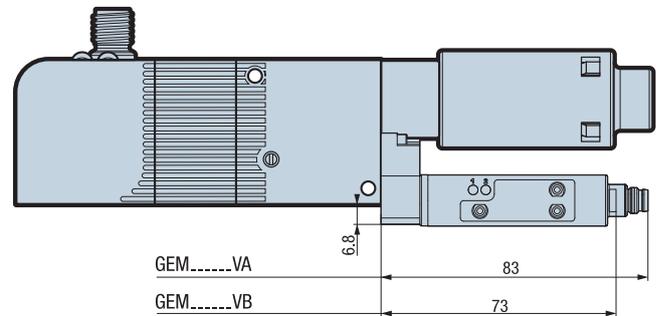
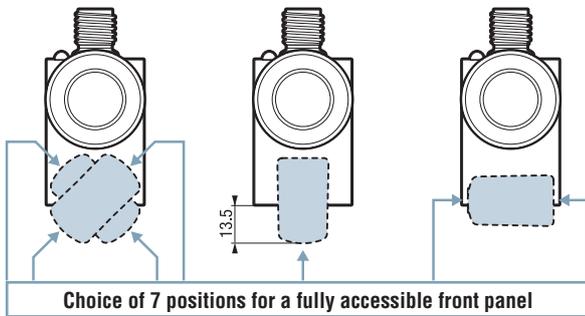
Dimensions and Connections



Note: Straight and angled M8 and M12 connectors shown p. 10/9.



1 - Modules with Electronic Indexable Vacuum Switch GEM-----VA or GEM-----VB

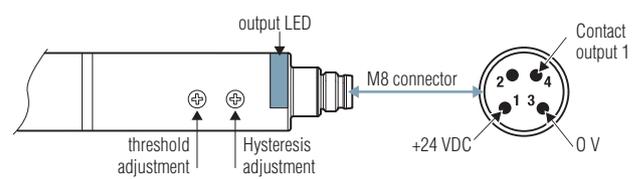
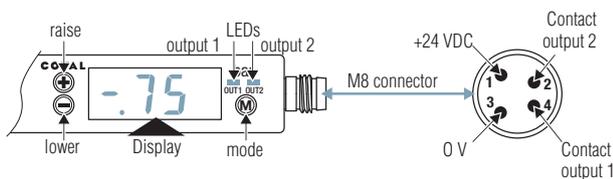


Vacuum switch with display, 2 outputs, GEM-----VA

- compatible fluids: non-corrosive gas, dry, non-lubricated air.
- measuring range: -1 ... 0 bar
- hysteresis: configurable.
- maximum excess pressure: 3 bar.
- repetitivity: +/- 1% of the range.
- output thresholds: 2 x NO / NC.
- switching power: 125 mA transistor PNP
- threshold status display: 2 x LEDs.
- display unit: bar.
- Electrical connection: M8 (4 pins).
- supply voltage: 12 - 24 VDC ± 10%.
- current draw: < 60 mA.
- protection level: IP40.
- working temperature: 32 to 122 °F

Electronic vacuum switch, 1 output, GEM-----VB

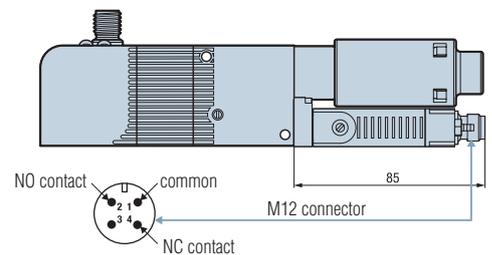
- compatible fluids: non-corrosive gas, dry, non-lubricated air.
- measuring range: -1 ... 0 bar
- hysteresis: configurable from 0 to 30%.
- maximum excess pressure: 3 bar.
- repetitivity: +/- 1% of the range.
- output thresholds: 1 x NO.
- switching power: 125 mA transistor PNP
- threshold status display: 1 x LED.
- electrical connection: M8 (4 poles).
- supply voltage: 18 - 30 VDC (regulated).
- current draw: < 20 mA.
- protection level: IP50.
- working temperature: 32 to 122 °F



2 - Modules with Electrical Contact Vacuum Switch GEM-----VC

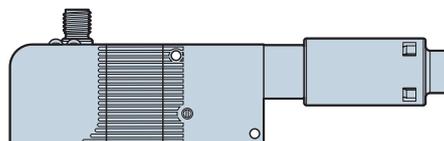
Contact vacuum switch, GEM-----VC

- compatible fluids: non-corrosive gas, dry, non-lubricated air.
- measuring range: -350 to -850 mb.
- hysteresis: 125 mb.
- maximum overpressure: 2 bar.
- repetitivity: 3% of the range.
- breaking capacity: 1 x NO, 1 x NC.
- switching power: 3 A (breaker)
- electrical connection: M12 (4 poles).
- supply voltage: up to 125 V.
- protection level: IP40.
- working temperature: 14 to 122° F.
- number of operations: 5 million cycles.
- maximum throughput: 30 cycles per minute.



3 - Modules without Vacuum Switch GEM-----VO

This model without vacuum switch must be accompanied by an independent vacuum switch on the vacuum circuit or a vacuum gauge for manually-controlled vacuum capacity.



Note:

Screw-on electrical connectors, straight and angled M8 and M12 shown p. 10/9.

General points

Self-Regulating Vacuum Pumps

Applications



Description

GVMAX series of pumps are designed for gripping, handling and retaining airtight objects.

The principle is simple: as soon as the required level of vacuum is reached, the compressed air supply is stopped and the vacuum is maintained in the installation thanks to the non-return valve. Thus, the self-regulating system guarantees an optimum level of vacuum.

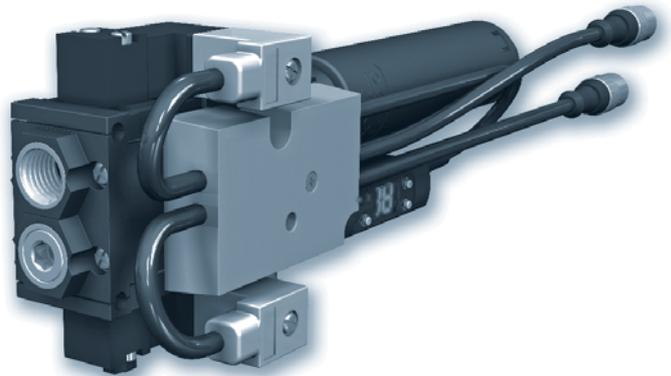
This approach considerably reduces both compressed air consumption and the noise level.

Moreover, thanks to their intelligent functions, they guarantee safety and optimum vacuum management for the application. COVAL recommends these pumps for applications involving airtight objects.

The Specific Functions of Vacuum-regulating Vacuum Pumps

They have the following characteristics:

- Vacuum generation by venturi effect (maximum pressure drop - 850 mbar or 85% vacuum).
- Air-saving, vacuum-regulating function.
- Adjustable blow-off.
- Visual and switching output control of vacuum level by digital electronic vacuum switch.
- Positive safety holds objects in case of electrical emergency stop (electrical outlets switched off) via its NO vacuum supply valve, maintenance can be carried out in complete safety.



8

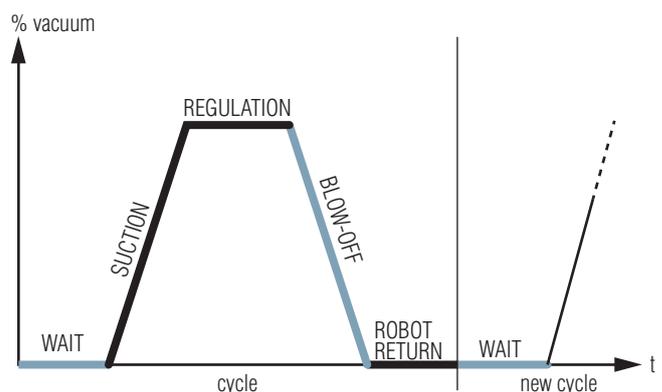
Operating Principle of a GVMAX Series Vacuum Pump

The cycle shows the three stages of a GVMAX:

Wait - Suction - Blow-off.

Regulation is automatically carried out by the equipment's internal loop. The interest of the GVMAX vacuum pump is based on these three stages:

- Wait: no consumption, no clogging, no noise.
- Suction-regulation: the object is gripped and the vacuum pump automatically stops.
- Blow-off: automatically timed for release and return to neutral position in preparation for the next cycle.



General points

Self-Regulating Vacuum Pumps

General



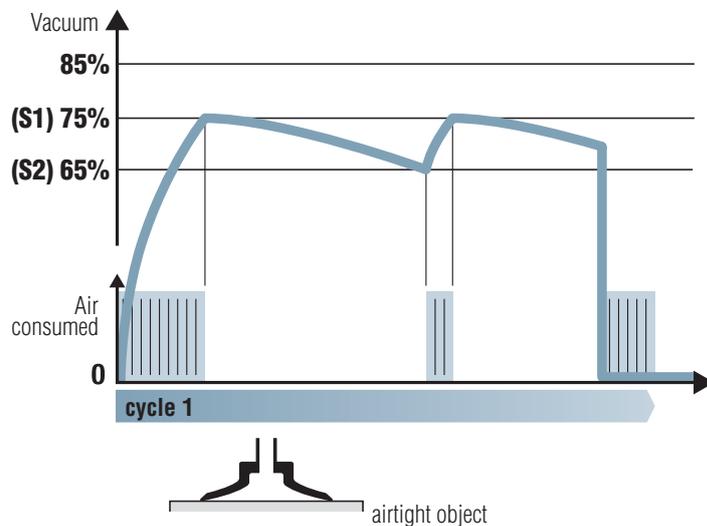
Regulating System in an Air-saving Vacuum Pump

The GVMAX vacuum pump is designed to save compressed air during a gripping cycle. The device stops consuming compressed air when the vacuum threshold pre-set in the vacuum switch is reached in the network. This is known as "regulation".

The diagram below shows the regulating system of a vacuum pump. As soon as optimum vacuum (vacuum threshold 1) is reached, the pumps maintain the vacuum until the level of vacuum descends to the hysteresis value after a period of time "t" due to leakage.

The self-regulating system guarantees that an optimum level of vacuum is maintained and reduces both air consumption and noise level throughout the cycle.

Vacuum Level in Relation to Time for a Regulation Cycle



GVMAX Vacuum Pump Yield

Volume of air consumed and time to create a vacuum in a 5 liter tank with a 4 bar GVMAX vacuum pump:

vacuum (%)	time to create a vacuum (s)	air consumed (SCFM)
10	0.2	0.03
20	0.3	0.06
30	0.6	0.10
40	0.8	0.15
50	1.1	0.21
60	1.5	0.28
70	2.1	0.38
80	3.0	0.55
85	4.0	0.74

General points

Self-Regulating Vacuum Pumps

Applications



HOLDING

During the final phase of manufacture a snowboard must be held in position for several minutes.

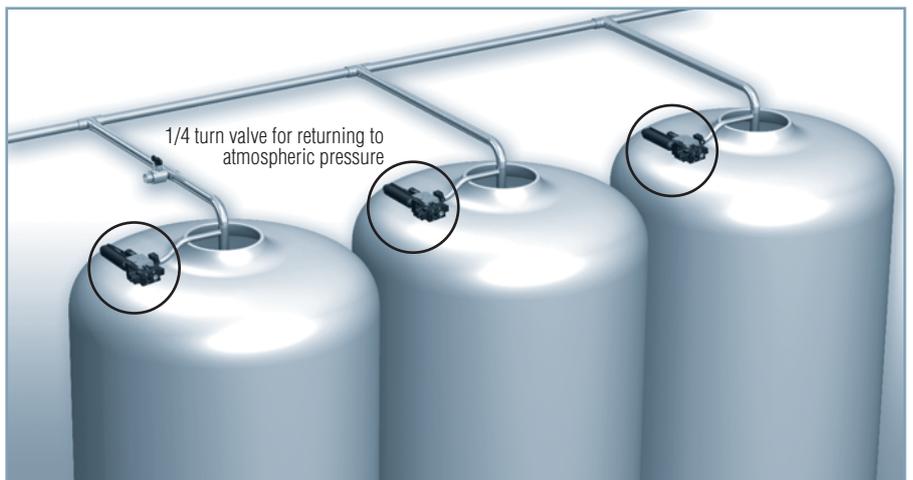
Using vacuum pumps with the air-saving function generates significant energy savings.

Also see the LEMAX series (p. 8/15) and LEMAX+ series (p. 8/21).



EMPTYING A TANK

The regulation function of the vacuum pumps are used in this type of application. Hysteresis of the switching output regulation is adjustable between 1 and 25% vacuum on electric models.



Attention: For regulation of the vacuum level in tanks of more than 10 liters, consult us for the pneumatic versions.

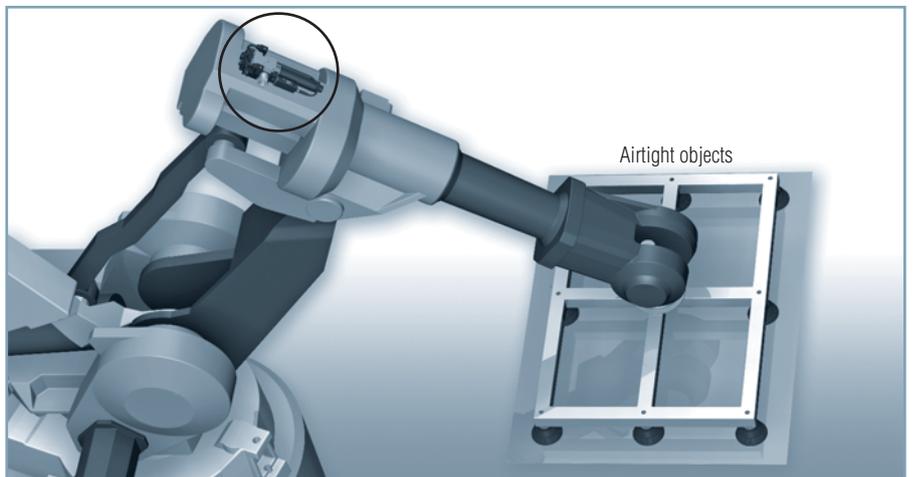
SAFE GRIPPING

■ Electric GVMAX

Grip is maintained on the object (airtight object) if there is a power failure.

■ Pneumatic GVMAX

Grip is maintained on the object (airtight object) if the pneumatic power is interrupted.



Grip is maintained if the electrical power or compressed air supply is interrupted.

GVMAX V2-2/V2-2R

Self-Regulating Vacuum Pumps

(Electric Vacuum and Blow-off Control)



Industry-specific applications



With GVMAXV2-2 and GVMAXV2-2R, COVAL offers two types of solutions based on a standard GVMAX electric vacuum pump.

These vacuum pumps provide an "all in one" solution by integrating all necessary functions, controls, valves, vacuum regulation, blow-off, product gripping control from an integrated vacuum switch, and silencer into a single, light and compact module.

The M12 connections dramatically simplify installation and use. They are available in two versions and are compatible with PLC safety:

- GVMAXV2-2: non-adjustable vacuum switch (factory configured)
- GVMAXV2-2R: adjustable vacuum switch

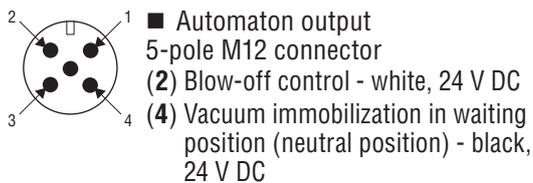
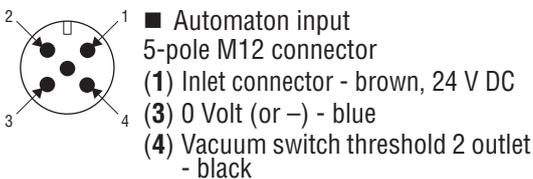
Characteristics

model	Ø nozzle (mm)	max. vacuum (%)	flow consumed at 4 bar (SCFM)	max. suction power (SCFM)	dynamic supply pressure	operating pressure	weight (g)
GVMAX V2-2	2.5	90	10.59	7.06	4.5 bar relative pressure	4.5 to 6 bar	550
GVMAX V2-2R	2.5	90	10.59	7.06	4.5 bar relative pressure	4.5 to 6 bar	550

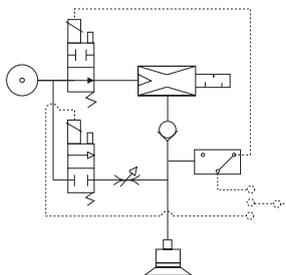
Applications

The two solutions, GVMAX V2-2 and GVMAX V2-2R are used for gripping airtight objects in the stamping, sheet-metal/bodywork and mounting industries for handling, transfer and holding operations. The GVMAX V2-2/V2-2R is designed for the Automotive sector.

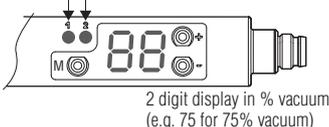
Electrical connections



- Pneumatic supply maintained on the "compressed air" input of the vacuum pump.
- Electric power supply
Suction: 24 V DC NO solenoid valve. From rest to suction (must be powered to stop suction).
Blow-off: 24V DC NC solenoid valve



Red LED Green LED



Evacuation Time in Seconds per Liter

% vacuum	10	20	30	40	50	60	70	80	85
GVMAX V2-2/V2-2R	0.03	0.07	0.11	0.16	0.22	0.30	0.41	0.60	0.77

Advantages

In relation to the standard GVMAX the GVMAX V2-2 and GVMAX V2-2R solutions offer the following advantages:

- Safety: vacuum generation in case of power failure by air inlet solenoid valve in normally open operation (24 V DC).
- Powerful, controllable blow-off.
- Data processing circuit (connection cable).
- Connection by 2 male 5 pin M12 connectors, (Input/ Output).
- Non-adjustable vacuum switch (factory-set) with the GVMAX V2-2 and adjustable vacuum switch with the GVMAX V2-2R.
- Compatible with safety PLCs and other safety systems.

Specifications

Base body	Aluminium (AU 4 PB)
Valve body	POM (black polyacetal)
Silencer	Black PC with felt internal element
Vacuum switch	PA66, PC, brass, NBR seal
Electric wiring	PA66
Screw	Zinc-plated steel
Inside parts	Brass; Aluminum; Desmopan
Seals	NBR
Membrane	NBR with nylon substrate

Vacuum switch display legibility

The GVMAX is fitted with an indexable vacuum switch (45°, 90°, 180°). This vacuum switch is set to the following values (values used in the automotive industry):

GVMAX V2-2 or V2-2R	Function	Threshold	Hysteresis
Threshold 1: vacuum regulation	NO	H1: 75 %	h1: 10 %
Threshold 2: object detected	NO	H2: 65 %	h2: 10 %

For all orders, please specify: **GVMAX V2-2** (Non-adjustable vacuum switch)
GVMAX V2-2R (Adjustable vacuum switch)

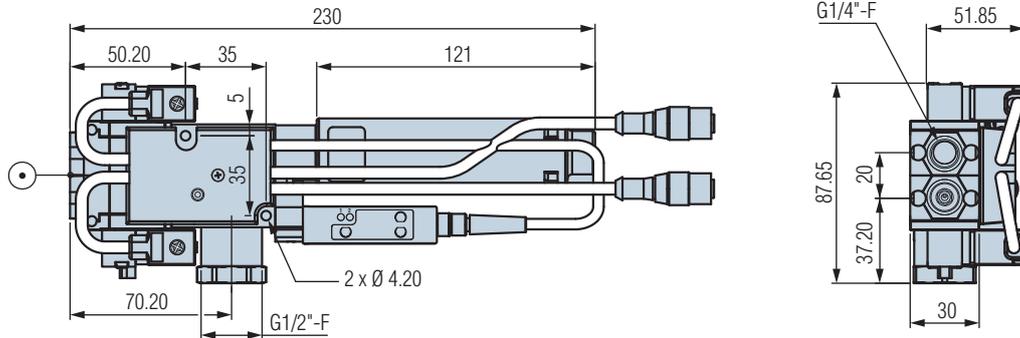
GVMAX V2-2/V2-2R

Self-Regulating Vacuum Pumps

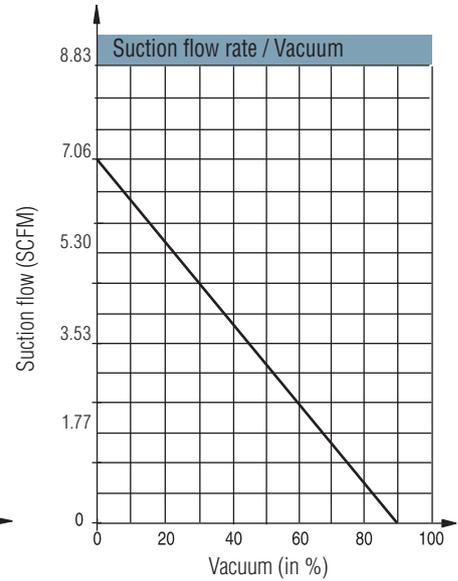
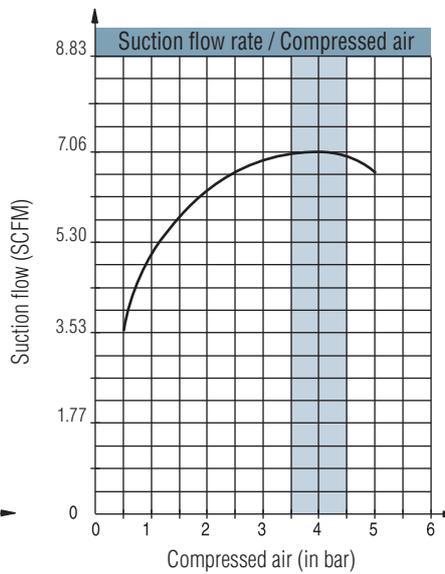
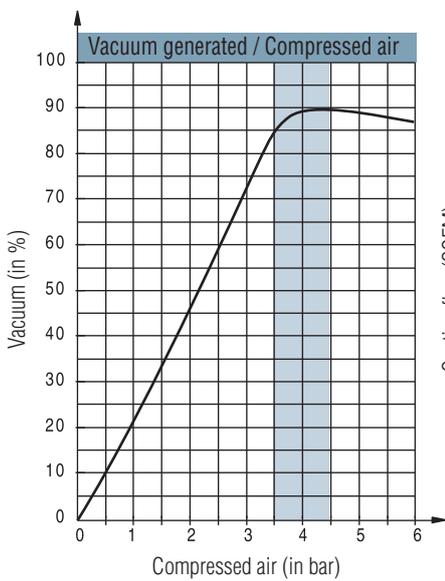
Dimensions, Curves, Options



Dimensions



Curves



Options

Manifold mounting

The GVMAX V2-2 and V2-2R can also be manifold-mounted.

Up to 4 vacuum pumps can be installed on one base.

Manifold references (example with GVMAX V2-2)

GVMAX V2-2 B1 (Base + 1 x GVMAX V2-2)

GVMAX V2-2 B2 (Base + 2 x GVMAX V2-2)

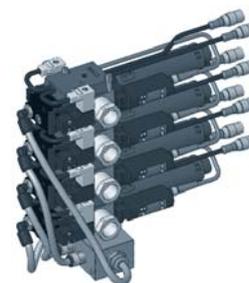
GVMAX V2-2 B3 (Base + 3 x GVMAX V2-2)

GVMAX V2-2 B4 (Base + 4 x GVMAX V2-2)

Protective housing for GVMAX, Part No. GVOMAXV2

The protective housing for the GVMAX is transparent and removable.

Coval recommends using a protective housing to protect the vacuum pump.



GVMAX V2-2 B4



GVOMAXV2

8 GVMAX V2

GVMAX

Self-Regulating Vacuum Pumps (Electric Vacuum and Blow-off Control)



The communication between both elements, electronic vacuum switch and gripping valve control, enables the consumption of compressed air to be regulated and in particular significantly reduced. This range of vacuum pumps is strongly recommended for gripping airtight objects, clamping, and for medium or long cycles. Electrically controllable blow-off is integrated for release.

Industry-specific applications



Materials

Similar to GEM (see page 8/37).

Safety

The GVMAX E1 has a non-return valve installed as standard which enables it to maintain the vacuum within the circuit if there is a power failure. This function guarantees maximum safety conditions for operators during handling.

Characteristics

model	Ø nozzle (mm)	max. vacuum (%)			air drawn in (SCFM)			L2 (mm)		⊞ (g)
		X	T	N	X	T	N	S	K ⁽¹⁾	
GVMAX E1	2.5	50	75	90	12.71	8.48	7.06	60	121	510

(1) delivered as standard on version X.

Evacuation Time in Seconds per Liter

% vacuum versions	Ø nozzle (mm)	10			20			30			35			40			45			50			60			70			80			85		
		X	T	N	X	T	N	X	T	N	X	T	N	X	T	N	X	T	N	X	T	N	X	T	N	X	T	N						
GVMAX E1	2.5	0.02	0.03	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.01	0.14	0.14	0.16	0.19	0.21	0.22	0.30	0.30	0.50	0.41	0.60	0.77											

Operating Principle

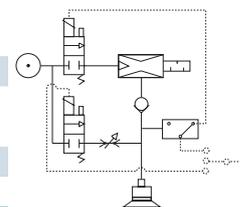
When the selected vacuum level is reached, the compressed air supply stops. This interruption does not have any effect as the non-return valve maintains the vacuum and thus the grip. The vacuum switch continually analyzes the vacuum requirements. As soon as the minimum threshold is reached, it activates the vacuum generation valve to return to the pre-set value.

See page 8/43.

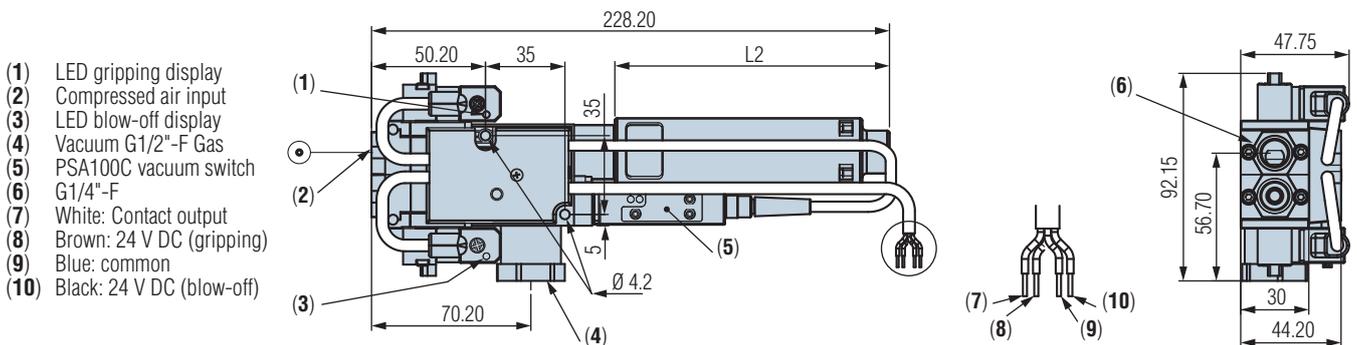
Specifications

Supply	Non-lubricated filtered air, 2 to 6 bar, optimum at 4 bar
Temperature	32 to 140 °F
Contact output	PNP switching output NO or NC, adjustable hysteresis
Anti-parasite function	Integrated with display LED
Suction rate	Adjusted by flow restrictor

Curves: see page 8/47



Dimensions



- (1) LED gripping display
- (2) Compressed air input
- (3) LED blow-off display
- (4) Vacuum G1/2"-F Gas
- (5) PSA100C vacuum switch
- (6) G1/4"-F
- (7) White: Contact output
- (8) Brown: 24 V DC (gripping)
- (9) Blue: common
- (10) Black: 24 V DC (blow-off)



For all orders, please specify:
Model + Characteristic + Silencer + C.A. fitting + Pilot
 Example: GVMAXNK14E1

1: Model	2: Characteristic	3: Silencer		4: C.A. fitting		5: Pilot			
GVMAX	X	50 % vacuum	-	Without silencer		14	G1/4"-F	E1	24 V DC NC
	T	75 % vacuum	S	Diffuser					
	N	90 % vacuum	K	Through-type					

GVMAX

Self-Regulating Vacuum Pumps (Pneumatic Vacuum and Blow-off Control)



Industry-specific applications



The communication between both elements, pneumatic vacuum switch and gripping valve control, enables the consumption of compressed air to be regulated and in particular significantly reduced. This range of vacuum pumps is strongly recommended for gripping airtight objects, clamping, and for medium or long cycles in explosive environments. Pneumatically controllable blow-off is integrated for release.

Note: The volume of the piping must not exceed 10 liters. For higher volumes, please consult us.

Materials

Similar to GEM (see page 8/41).

Safety

The GVMAX P1 has two non-return valve functions installed as standard which enables it to maintain the vacuum within the circuit if the pneumatic power is interrupted. This function guarantees maximum safety conditions for operators during handling.

Characteristics

model	Ø nozzle (mm)	max. vacuum (%)			air drawn in (SCFM)			L2 (mm)		⊞ (g)
		X	T	N	X	T	N	S	K ⁽¹⁾	
GVMAX P1	2.5	50	75	90	12.71	8.48	7.06	60	121	440

(1) delivered as standard on version X.

Evacuation Time in Seconds per Liter

% vacuum versions	Ø nozzle (mm)	10			20			30			35			40			45			50			60		70		80		85	
		X	T	N	X	T	N	X	T	N	X	X	T	N	X	T	N	T	N	T	N	T	N	N	N	N	N			
GVMAX P1	2.5	0.02	0.03	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.01	0.14	0.14	0.16	0.19	0.21	0.22	0.30	0.30	0.50	0.41	0.60	0.60	0.77						

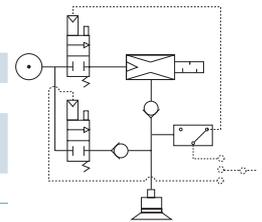
Operating Principle

When the selected vacuum level is reached, the compressed air supply stops. This interruption does not have any effect on the operation in progress as the no-return valve maintains the vacuum and thus the grip. The vacuum switch continually analyzes the vacuum requirements. As soon as the minimum threshold is reached, it activates the vacuum generation valve. The chosen level of vacuum is immediately re-established. See page 8/43.

Specifications

Supply	Non-lubricated filtered air, 2 to 6 bar, optimum at 4 bar
Temperature	32 to 140 °F
Vacuum switch	PSE100PKNO
Pressure at the vacuum switch	Equal to or greater than vacuum pumps supply pressure
Hysteresis	100 mbar max.

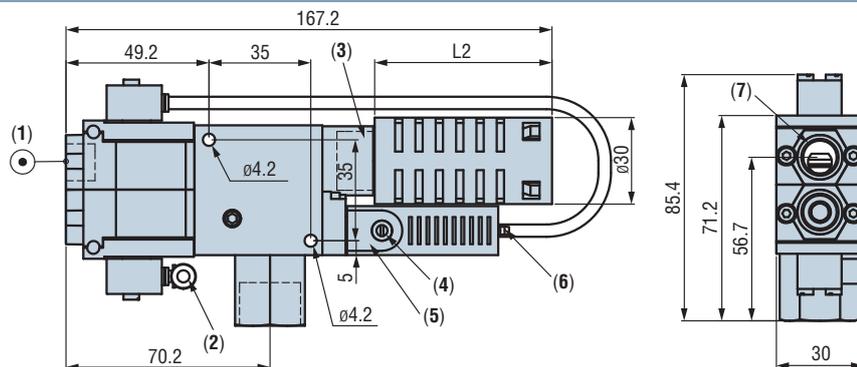
Curves: see page 8/47



Note: to ensure optimum operation, we advise you to ensure the vacuum network is airtight. For this purpose we recommend using NVS vacuum feeders and screwed vacuum fittings with O-rings (RDV, RCOV).

Dimensions

- (1) 5.5 bar compressed air input
- (2) Fast 2.7x4 blow-off control
- (3) G1/2"-F Gas Exhaust
- (4) Regulation threshold adjustment
- (5) PSE100PKNO vacuum switch
- (6) Hollow shaft for vacuum control vacuum switch pressurization
- (7) G1/4"-F



8 GVMAX



For all orders, please specify:
Model + Characteristic + Silencer + C.A. fitting + Pilot
Example: GVMAXNK14P1

1: Model	2: Characteristic	3: Silencer		4: C.A. fitting	5: Pilot
GVMAX	X	50 % vacuum	-	Without silencer	P1
	T	75 % vacuum	S	Diffuser	
	N	90 % vacuum	K	Through-type	