

COVAL

vacuum managers

LEMAX IO

Mini Vacuum Pumps with Communication

 **IO-Link**



AR Saving Control

ADVANCED VACUUM SOLUTIONS

LEMAX IO

Mini Vacuum Pumps with Communication IO-Link

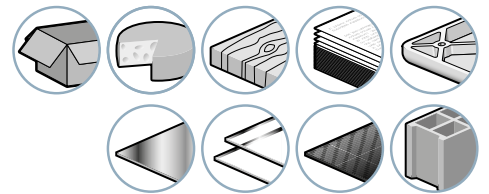
General Information



AIR Saving Control

IO-Link

Industry-specific applications



Advantages

- Easy installation and operation thanks to the IO-Link communication interface.
- 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.
- 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.

Compact Integration

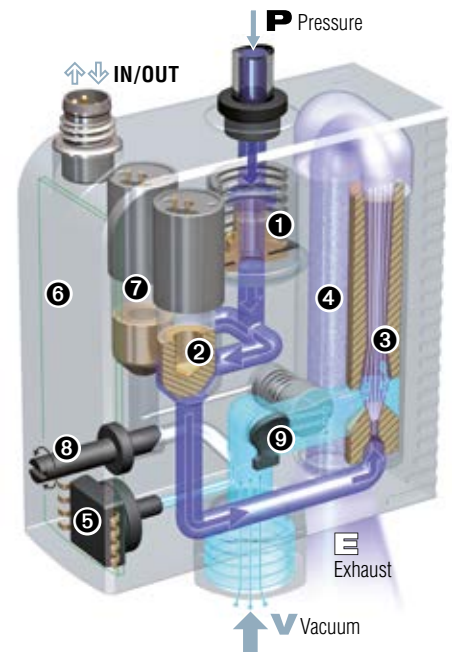
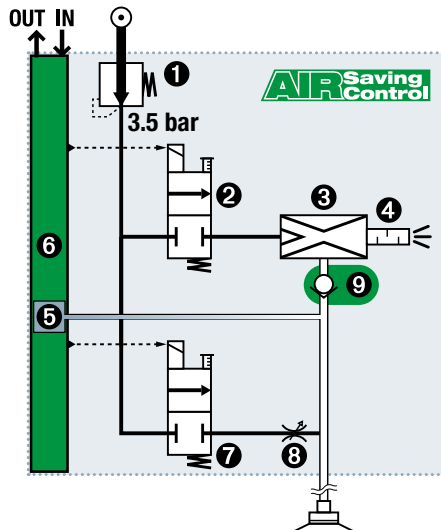
The illustrations below show the 9 functions integrated into the mini-module, and their respective roles in operation.

The result of this COVAL performance is:

- **A mini module** (≅ 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 IO** 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



Schematic representation



90% energy savings (on average).

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

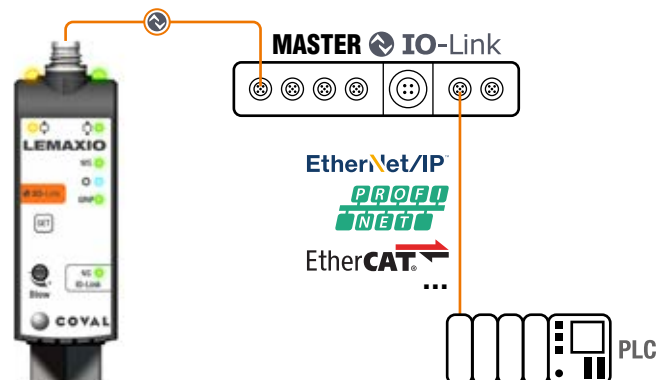
→ **Once desired vacuum level is reached, the LEMAX IO no longer consumes air when gripping the product.**



The IO-Link system provides efficient real-time communication between LEMAX IO vacuum pumps and any higher-level protocol (EtherNet/IP, PROFINET, EtherCAT, etc.) required to monitor the production line. It can be used to control pumps, configure settings, and get feedback to ensure maximum productivity.

Advantages:

- Straightforward wiring, installation, and setup
- Availability of diagnostic status data
- Simpler preventive maintenance and vacuum pump replacement without manual setup, and more



LEMAX IO

Mini Vacuum Pumps with Communication IO-Link Energy Savings

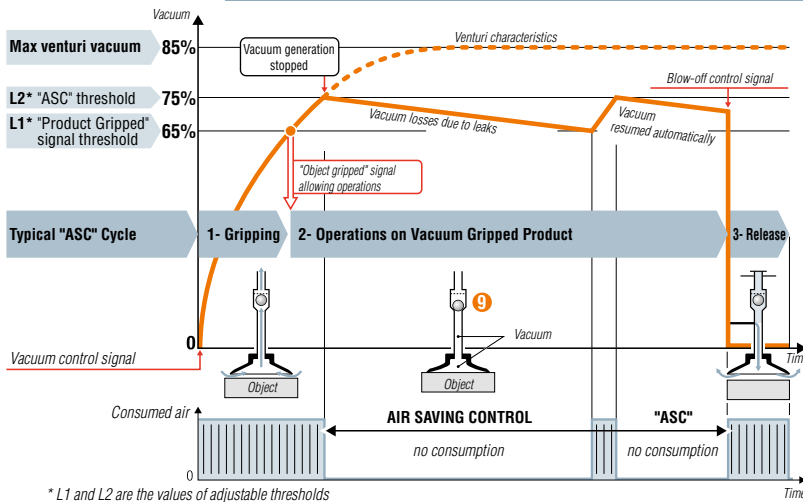


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"Air Saving Control" Cycle



As illustrated above, the LEMAX IO 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

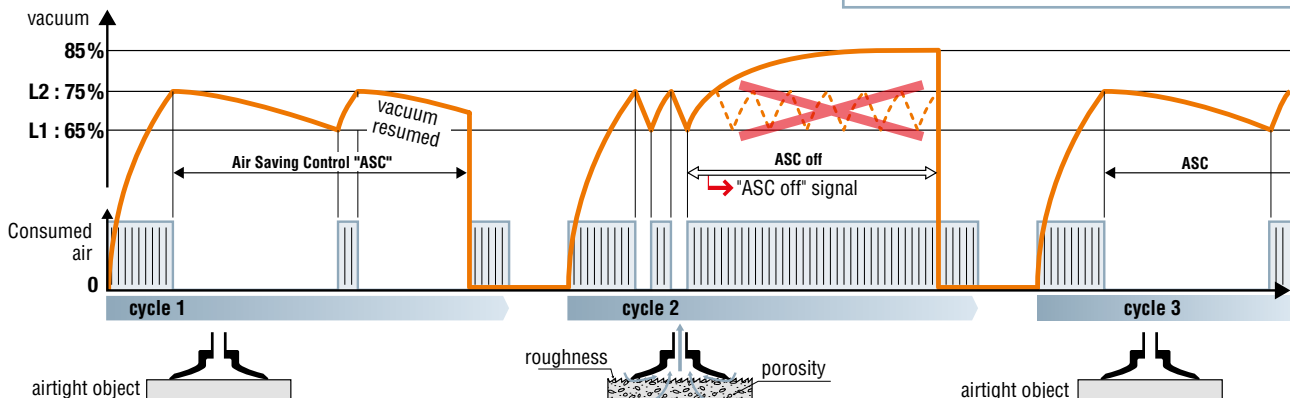
The vacuum level is constantly monitored by the vacuum switch. When it reaches the L1 threshold (65%), the "gripped object" signal is generated, which allows the planned operations (transfer, machining, etc.). When the vacuum reaches threshold L2 (75%), the supply to the venturi via the solenoid valve 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 IO 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 IO, 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 IO 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.

LEMAX IO

Mini Vacuum Pumps with Communication IO-Link

Communication / Selection Guide

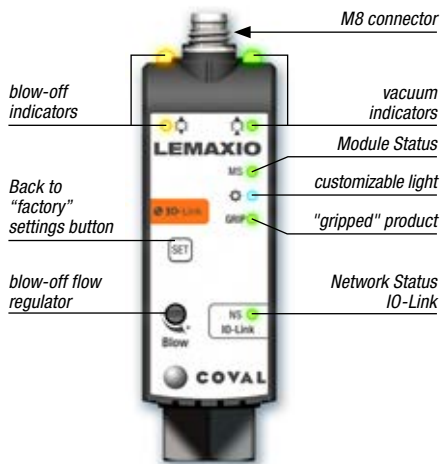


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Communication HMI / IO-Link



Settings, Diagnostics, and Process Data



CONFIGURABLE SETTINGS

- "Object gripped" and ASC control thresholds.
- ASC vacuum control system management.
- Automatic blow-off.
- Configurable LED.



DIAGNOSTICS

- Cycle counters (vacuum and blow-off control, objects gripped, objects lost, etc.)
- Monitoring of the supply voltage.
- Software version.
- Product number and serial number.



PROCESS INPUT DATA

- Vacuum and blow-off control.



PROCESS OUTPUT DATA

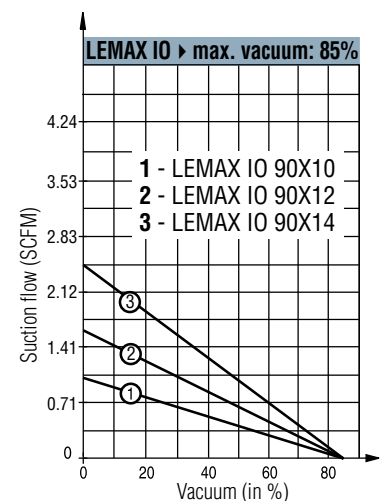
- Instantaneous vacuum level.
- Object gripped and object lost information.
- Status of ASC vacuum regulation system.
- Alarms (high / low voltage).

Power Determined by the Venturi Nozzle Diameter

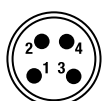
Selecting the Nozzle Diameter					
Ø nozzle	Venturi characteristics during "ASC off" operation.		"ASC" operation - gripping at 65% vacuum - vacuum shutoff at 75% Time for a volume of 1l		
	air drawn in (SCFM)	air consumed (SCFM)	grip time (s) (65% vacuum)	time (s) up to 75% vacuum	air consumed (ft ³)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



Suction Flow Rate / Vacuum Curves



Electrical Connections



Pin	Designation	Function	Wire
1	24 V DC	L+	Brown
2	/	/	White
3	0 V - GND	L-	Blue
4	IO-Link communication line	C/Q	Black

Note

Max. total cable length: 20 meters

Accessory

Power supply cable M8, straight, female, 4-pin – M12, straight, male, 4-pin:

- **CDM8M12**: length. 1 m.



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Mini Vacuum Pumps with Communication IO-Link

Option, Choice of Layout



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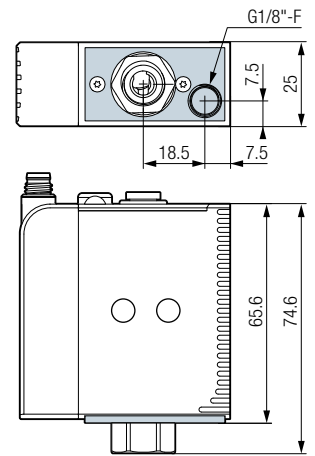
IO-Link

Exhaust manifold: option E

The LEMAX IO mini vacuum pumps can be equipped with the "exhaust manifold" option, which provides a G1/8"-F connection to the exhaust in order to add a silencer, transfer the exhaust outside the work area or to avoid air discharge near the workpiece (LEMAXIO___E version).

This option must be specified at time of ordering as it cannot be added later.

Note: The design of the exhaust manifold and vacuum pumps do not guarantee the complete sealing of the exhaust and therefore cannot be used in a "clean room" environment.



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.

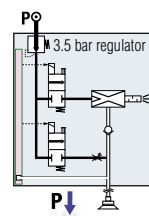
When several suction cups are operating according to different sequences, multiple modules are required, which can be:

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

The illustrations opposite guide the selection:

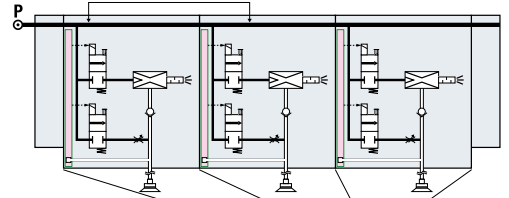
- stand-alone modules are coupled with integrated pressure regulators
- in an island, the integrated regulator is removed: to maintain the advantage of economical and silent operation, it is recommended to reduce the island's common pressure supply pressure to 4 bar.

Network pressure:
4.5 to 7 bar



stand-alone module

common pressure unit (4 bar)



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

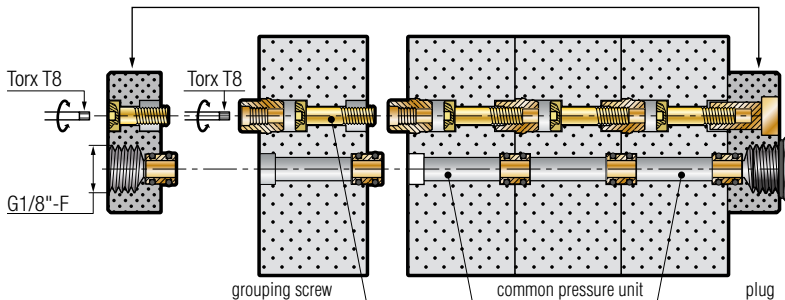


island of 3 modules
supplying suction cups
according to different
sequences

Assembling and Connecting an Island

island of 4 modules

set of ends for the island.



island of 3 modules



Maximum number of modules in an island:

- Ø 1.4 mm nozzle → 5 modules
- Ø 1.2 mm nozzle → 7 modules
- Ø 1 mm nozzle → 9 modules

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Mini Vacuum Pumps with Communication IO-Link Configuring a Vacuum Pump



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Part numbers for an island assembly or components in an island

Part numbers for stand-alone units

LEMAXIO 90 X 14 S C14 - B2

VACUUM LEVEL

maximum 85% vacuum optimum for airtight objects

90

NOZZLE DIAMETER

Ø 1.4 mm nozzle

14

Ø 1.2 mm nozzle

12

Ø 1 mm nozzle

10

EXHAUST

Open (integrated silencer)

-

Exhaust manifold (G1/8"-F)

E

ISLAND ASSEMBLIES

B2

LEMAXIO90X...**B2**
Island assembly with 2 identical modules.



B3

LEMAXIO90X...**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

LEMAXIO...**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

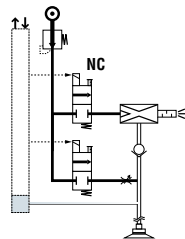
COMPOSITION OF THE MODULE

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

S

LEMAXIO90X...**S**...

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

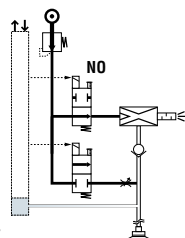


Vacuum pump controlled by a Normally Open (NO) solenoid valve

V

LEMAXIO90X...**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.



REFERENCE EXAMPLE COMPOSED OF A STAND-ALONE MODULE:

LEMAXIO90X14SC14

LEMAX IO, 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:

LEMAXIO90X14SC14B3

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

ORDER EXAMPLE FOR AN ISLAND TO BE ASSEMBLED:

LEMAXIO90X14VC14B

LEMAXIO90X12SC14B

LEMAXIO90X10VC14B

LEMSETA

3 LEMAX IO modules for an island, of different types.

Set of ends for island.

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Mini Vacuum Pumps with Communication IO-Link Dimensions, Mounting Options



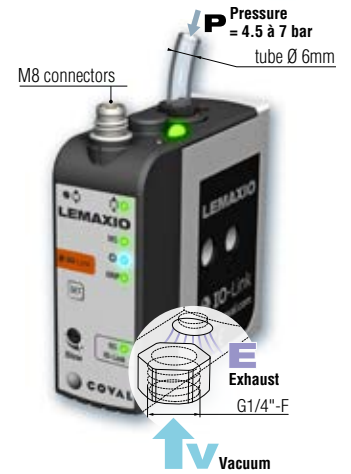
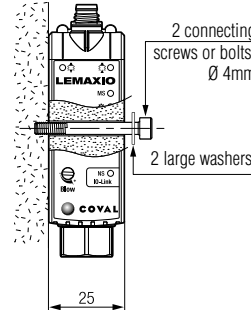
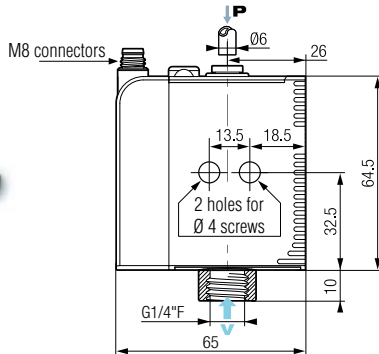
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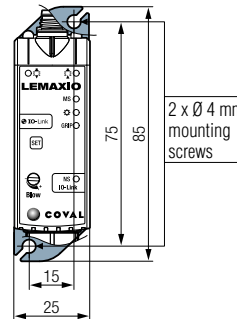
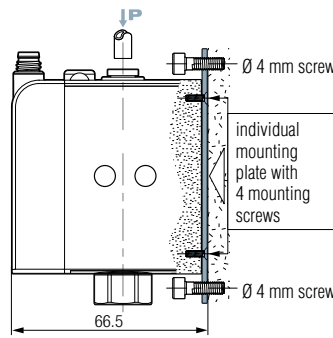


1- Stand-alone Modules

Mounting from side



Mounting from front

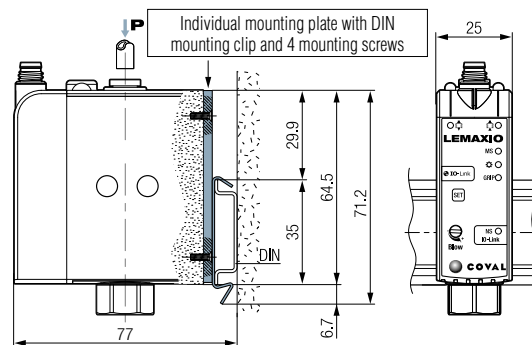


To mount from front, in addition to the module, a mounting kit must be ordered:

Kit for mounting from front:
1 plate + 4 screws

Part No.: LEMFIXA

Mounting on DIN rail



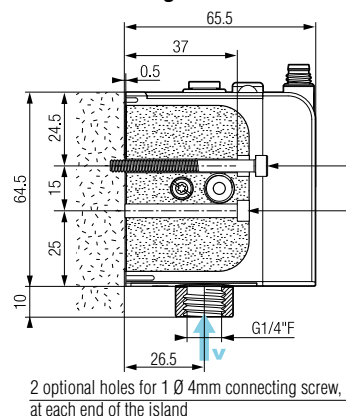
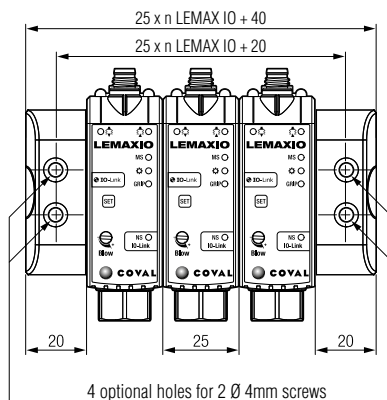
For static mounting (for example, in a cabinet), a module can be clipped onto a DIN rail. For this purpose, the module must first be equipped with an individual plate for mounting onto a DIN rail

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

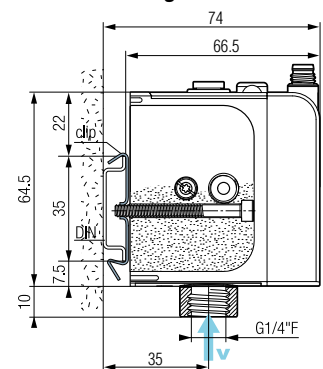
Part No.: LEMFIXB

2- Islands

Mounting from front



Mounting on DIN rail



DIN rail mounting kit:
2 clips + 2 screws

Part No.: LEMFIXC

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Mini Vacuum Pumps with Communication IO-Link

Characteristics



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Overall Characteristics

- Supply: non-lubricated air filtered to 5 microns according to standard ISO 8573-1:2010 [4:5:4].
- Operating pressure: 4.5 to 7 bar.
- Mini dynamic pressure:
 - stand-alone version: P = 4.5 bar.
 - island version: P = 4 bar.
- Blow-off: adjustable flow:
 - stand-alone version: P = 3.5 bar.
 - island version: P network
- Maximum vacuum: 85%
- Suction rate: 1.02 to 2.47 SCFM.
- Air consumption: 1.55 to 3.18 SCFM during "ASC" off operation.
- Integrated clog-free silencer.
- Noise level: approximately 68 dBA "ASC" off. 0 dBA with "ASC".
- Electrical protection level: IP 65.
- Max. operating frequency: 4 Hz.
- Endurance: 30 million cycles.
- Weight: 130 g.
- Operating temperature: from 32 to 122°F.
- Materials: PA 6-6 15%FV, brass, aluminum, NBR.
- 4-pins M8 male connector.

Analysis of the vacuum regulation system (ASC)

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

Integrated electronics

- 24 V DC supply (regulated $\pm 10\%$).
- Electric consumption < 100 mA, of which 30 mA (0.7W) per vacuum and blow-off pilot.
- Measurement range: 0 to 99% vacuum.
- Measurement accuracy: $\pm 1.5\%$ of range, temperature compensated.
- Inputs/outputs protected against wiring errors or reversed polarity.
- IO-Link Operation.

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.
- Product reference and serial number.
- Firmware version.

Displays

- Control status indicators:
 - "vacuum": green LED
 - "blowoff": orange LED
- "Part gripped" indicator: green LED
- Configurable indicator: blue LED
- "Module Status" indicator: green/red LED
- "IO-Link Network Status" indicator: green/red LED

Settings

- Piece gripping (L1) and regulation (L2) thresholds. If the application so requires, specific adjustment of thresholds and hysteresis different to original factory settings (L1=65% h1=10%, L2=75%, h2=10%).
- Automatic timed blow-off (0 to 10 seconds) only on LEMAXIO90X__S__
- 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.
- Back to "factory" settings.

IO-Link

- Revision: 1.1
- Transmission rate: COM2 / 38.4 kbit/s
- Min. cycle time: 3.6 ms
- SIO mode: No.
- Process Data Input (PDI): 4 bytes.
- Process Data Output (PDO): 1 byte.
- IO device description file (IODD) available for download.
- Max. total cable length: 20 meters.

Accessory

Protection for standalone mini-vacuum pumps LEMAXIO__SC14 (with one M8 connector), Part No.: **80004409**

The COVER is made of silicone and serves as a protective sleeve for vacuum pumps, protecting them against splashing water, in particular during cleaning cycles.

- High level of protection against splashing water
- Easy to mount and clean





COVAL
vacuum managers

vacuum
components



A TECHNOLOGICAL PARTNER ON A GLOBAL SCALE

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

COVAL is an ISO 9001: V2015 certified company which offers innovative solutions integrating reliable and optimized components with intelligent functionalities. The focus is to provide the most personalized and economic solution to a given application while assuring a significant improvement in the productivity and the safety for the vacuum users around the world.

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

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

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

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



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