LEMCOM
USER MANUAL

1155UM0115 Rev. C
10/2023

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Important information

Please read this manual carefully before operating the LEMCOM. Make sure you understand its capabilities and limitations.

The information given in this document is subject to change without notice. COVAL S.A.S. assumes no responsibility for any errors that may appear in this manual.

COVAL shall not be liable for any direct, indirect, consequential or incidental damages arising out of the use or inability to use this document or the software and hardware described in this manual.

Safety

These safety instructions are intended to prevent hazardous situations and/or equipment damage:

DANGER

Hazard with a high level of risk which, if not avoided, could result in death or serious injury.

CAUTION

Hazard with a low level of risk which, if not avoided, could result in minor injury or could cause damage to the equipment.

Other symbols:

INFORMATION

Recommendation, advice, reference to other documents.

ACCESSORY

Required or useful accessories.

Enumeration:

- Actions that can be performed in any order.

1. Actions that must be performed in the indicated order.

- General enumeration.

Table of contents

1 INTRODUCTION

This document gives all relevant information related to configuration, control and troubleshooting of your PROFINET™ LEMCOM vacuum pump.

1.1 Users

This manual is intended to be used by skilled technicians and engineers who have experience working with automated systems.

1.2 Firmware version

This document is related to the following firmware versions:
- LEMCOM Master PROFINET (LEMC..X…**Q2**G..) : v01.14
- LEMCOM Secondary Module (LEMC..X…**Z2**G..) : v01.00 or v02.03

The LEMCOM Manager program does not support PROFINET firmware versions under 1.12.

LEMCOM Secondary Module since 2023 requires LEMCOM Manager version 3.0.3 or greater.

1.3 PROFINET compliance

PNIO_Version	V2.34
Conformance Class	A
Optional Features	Legacy
Netload Class	I


Certificate

PROFIBUS Nutzerorganisation e.V. grants to

COVAL SAS
ZA Les Petits Champs, 26120 Montelier, France

the Certificate No: Z12612 for the PROFINET Device:

Model Name:	LEMCOM PROFINET
Revision:	SW/FW: V1.1.2; HW: 1
Identnumber:	0x0421: 0x0001
GSD:	GSDML-V2.34-lemcom-profinet-20190524.xml
DAP:	DAP2, 0x00000001

This certificate confirms that the product has successfully passed the certification tests with the following scope:

PNIO_Version	V2.34
Conformance Class	A
Optional Features	Legacy
Netload Class	I
PNIO_Tester_Version	Version 2.35.2 (2018-09-21)
Tester	IMA, Magdeburg, Germany; PN 251-01

This certificate is granted according to the document "Framework for testing and certification of PROFIBUS and PROFINET products". For all products that are placed in circulation by October 14, 2022 the certificate is valid for life.

Karlsruhe, October 21, 2019

Board of PROFIBUS Nutzerorganisation e. V.

(Official in Charge)

(Master Schneider)

(Dr. Jörg Hähniche)

1.4 User manual version history

Revision	Date	Related firmware version LEMCOM Master PROFINET | LEMCOM Secondary Module
A	12/2022	v01.14 | v01.00
B	6/2023	V01.14 | v01.00 or v02.03
C	18/10/2023	Update of the configuration through PLC

Table 1 - User manual version history

1.5 Firmware and software updates

Always make sure that:

- LEMCOM master and secondary firmware versions are up to date.
- LEMCOM Manager Software is up to date.

UPDATE PACKAGE

Latest releases of the firmware and software are available on LEMCOM webpage. Download the zip package “LEMCOM_Update_Vx.us.zip”.

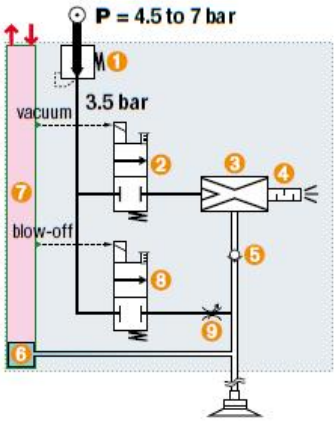
2 LEMCOM OVERVIEW

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

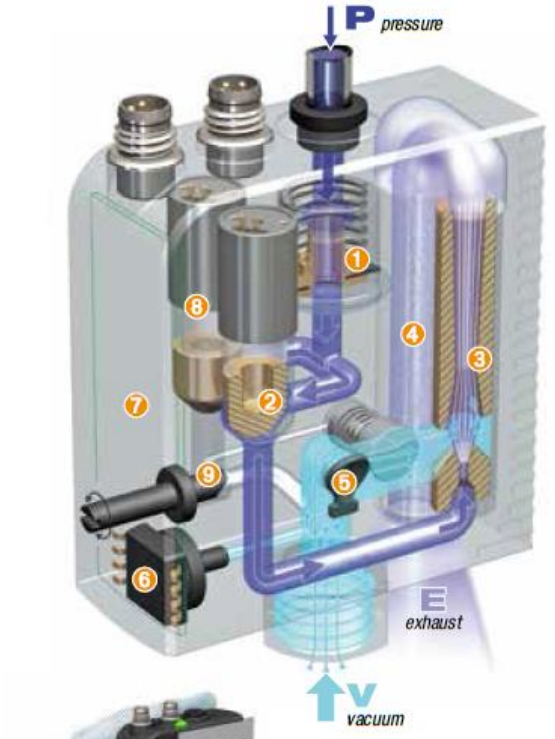
Compact integration: The COVAL technique

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

INTEGRATED FUNCTIONS



1. 3.5 bar pressure regulator
2. "Vacuum" solenoid valve
3. 3.5 bar optimized venturi
4. Optimized muffler
5. Vacuum non-return valve
6. Vacuum sensor
7. Integrated electronics: management of "vacuum" functions and comu-nication
8. "Blow-off" solenoid valve
9. Blow-off flow regulator



EtherNet/IP

CANopen

PROFINET

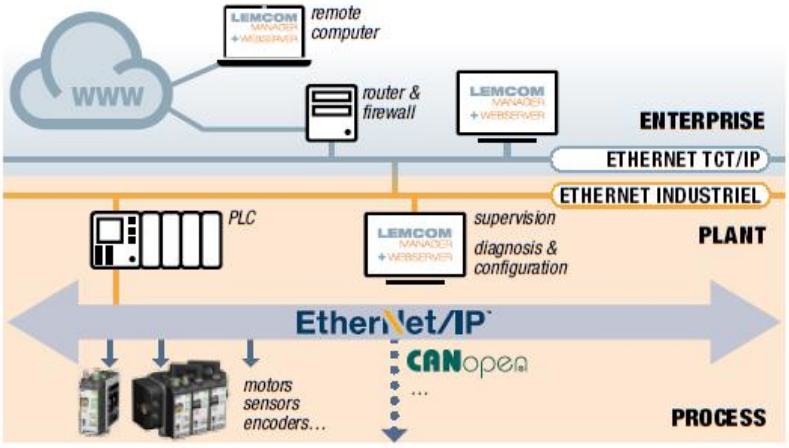
Easy integration with existing industrial network

ODVA CONFORMANT

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 field bus through their two integrated communication ports.
Certified conformity 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, thanks to only 2 cables, the supply and control of 1 to 16 vacuum pumps.



ADVANTAGES

- **Easy implementation:** Plug & Play, multiple choices, every type of application.
- **Maximum automatic energy savings:**
  - AIR Saving Regulator 40% savings for porous products.
  - AIR Saving Control 90% savings for airtight products.
- **Compactness:** LEMCOM vacuum pumps are the most compact on the market.
- **Short response times:** Possible installation very close to vacuum pads.
- **Dust resistant:** Non-clogging through-type silencer.
- **Safety:** Product gripping is maintained even during power failure.
- **Supported buses:** EtherNet/IP and CANopen.
- **Wiring economy:** 2 cables are enough to manage 1 to 16 modules.
- Settings and diagnosis by **remote monitoring.**
- Possibilities of limitless installation (stand-alone module, island or remote module) → see page 7.

→ ***An indispensable innovation for rational use of vacuum gripping***

2 vacuum levels to provide exact application needs

VERSION 60 (Max. 60% vacuum) to enable a high rate of drawn-in air and to compensate the leakage flow on porous material.

Suction flow rate (Nl/mn) :

max. vacuum / Nozzle Ø	60%
1.0 mm	38
1.2 mm	72
1.4 mm	92

VERSION 90 (Max. 85% vacuum) to enable a high vacuum level and thus privilege the strength of the suction cups for gripping airtight material.

Suction flow rate (Nl/mn) :

max. vacuum / Nozzle Ø	85%
1.0 mm	29
1.2 mm	45
1.4 mm	70

	Porous Materials, Rough Surfaces				Impervious & Semi-Airtight 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.

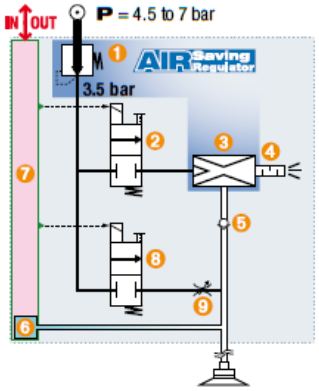
2 integrated energy-saving technologies

AIR Saving Regulator

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

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

→ *No more unnecessary consumption of compressed air.*

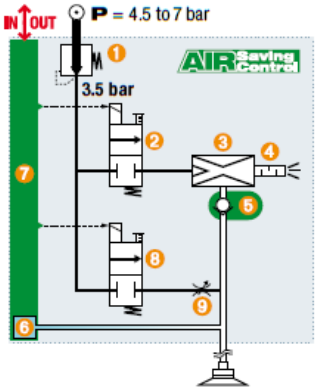


AIR Saving Control

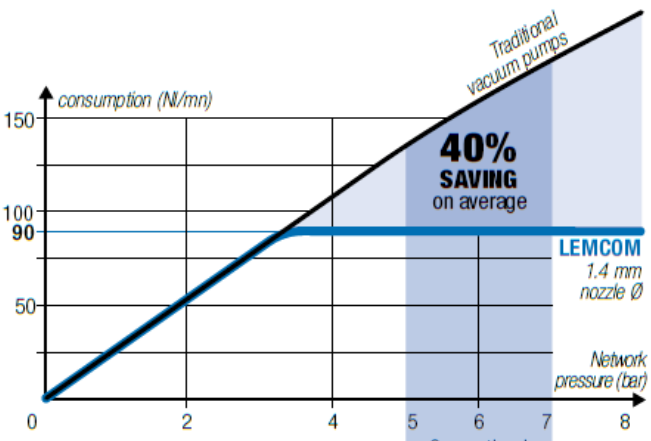
90% energy savings *(on average, see p.4).*

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

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



AIR Saving Regulator (ASR): porous applications



COVAL's own specificity, LEMCOM series vacuum pumps, which integrate an **ASR** "venturi regulator" combination, share values that COVAL values greatly: they greatly reduce the volume of compressed air consumption and noise level.

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

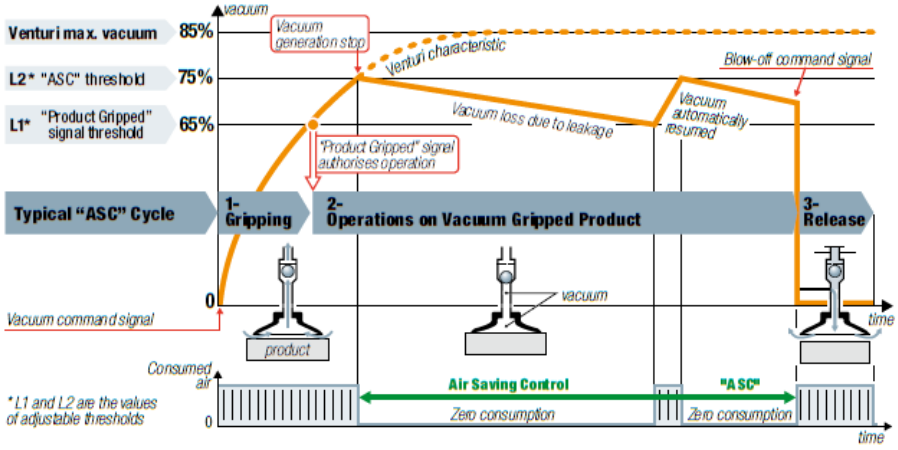
→ No more unnecessary compressed air consumption.

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

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

Energy saving & intelligence

AIR Saving Control (ASC): airtight products



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

1- Product gripping : Vacuum generated by the venturi.

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

3- Product release : By externally controlled blow-off or automatic blow-off function.

1- Gripping + transfer

(1.4 mm nozzle Ø, emptying 0.2 l).

Phase	Duration	Air consumption without "ASC"	Air consumption with "ASC"	
Gripping	0,28 s	0,4 Nl	0,4 Nl	achieved economy
Transfer	1,20 s	1,8 Nl	0	
Release	0,14 s	0,2 Nl	0,2 Nl	
		2,4 Nl	0,6 Nl	→ 75%

2- Clamping + operations

(1.4 mm nozzle Ø, emptying 0.4 l).

Phase	Duration	Air consumption without "ASC"	Air consumption with "ASC"	
Clamping	0,55 s	0,8 Nl	0,8 Nl	achieved economy
Operations	60 s	90 Nl	0	
Release	0,14 s	0,2 Nl	0,2 Nl	
		91 Nl	1,0 Nl	→ 99%

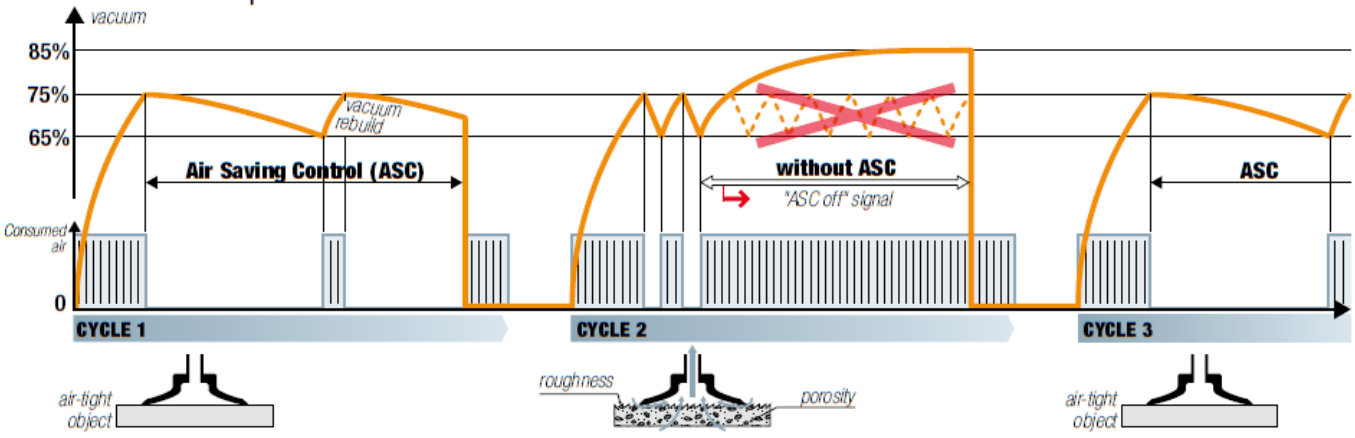
RESULTING SAVINGS

Energy savings from "ASC" are major, 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 investment generally pays for itself in just a few months.

Smart adaptation



The illustration above 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.

ENERGY SAVING APP

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

"ASC": AN ADVANTAGE WITHOUT LIMITATIONS

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

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.

Thanks to LEMCOM, all settings are configurable at distance, and the diagnosis is made easier.

To reply to increasing needs of manufacturers for pieces of equipment that can be integrated in their industrial field buses, COVAL releases the LEMCOM, a « connected » evolution of the compact vacuum pump LEMAX.

LEMCOM can easily be integrated to the existing field bus without requiring gateway or any other specific interfaces.

The master LEMCOM uses PROFINET to communicate with a programmable logic controller. An embedded 2-port ethernet switch allows installer to connect additional PROFINET capable products in series (or an additional LEMCOM island).

Figure 1 – Master/Secondary concept

- 1 Master can control up to 15 Secondary modules.
- Island assembly or standalone modules for flexible integration (close to the application).
- Communication between the master LEMCOM and the controller is based on the PROFINET.
- Master ⇔ Secondary Module communication through « COVAL Bus » (CAN support, proprietary communication protocol)
  - 24V DC is supplied to all LEMCOM via the back M8 connector of the last module of the island.
- Master module is also a vacuum pump and not only an « PROFINET head »; it can be used as a standalone module without any Secondary module connected to it.

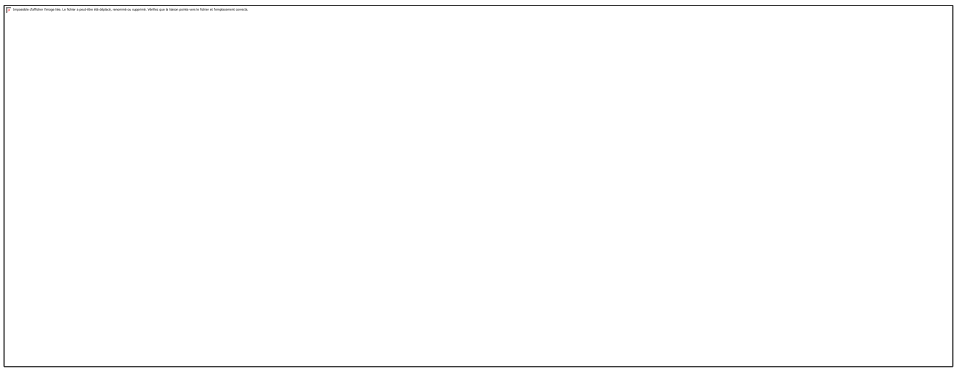
NOTE

Secondary modules are identical whatever the fieldbus protocol (PROFINET™, Ethernet IP, etc.) used between the master module and the controller.

The Profinet master does not exist without the venturi function, however it is possible not to connect it to the pressure and vacuum networks, and to deport it from the island using a connection cable.

We have customers who order islands made up of LEMCOM Slaves with a separate Profinet master.

Perhaps this could suit this customer better, the architecture of the Profinet network would then remain unchanged during maintenance of the islands.



This hardware configuration is presented on our Profinet GuickstartGuide

https://doc.coval.com/g/LEMCOM/not/lemcom_quick-start-guide_profinet_coval_v03_en.pdf

3 WIRING INSTRUCTIONS

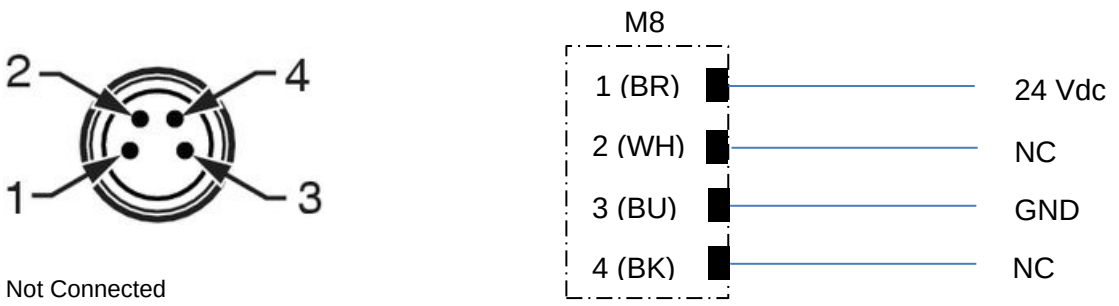
- Connectors type: M8, 4-pin, male

Figure 2 – Island overview

3.1 Power supply connector

To end the COVAL Local Bus, **it is mandatory to use the M8 termination provided with any LEMCOM island** (to be ordered separately for customized configuration). This specific interface must be inserted in between the last Secondary module back connector and the power supply cable. It ensures a good reliability of the COVAL Bus communication (integrated 120 ohms termination resistor) and separates the communication lines from the power supply.

The termination is not required for a standalone master module used without any secondary modules.



NC = Not Connected
BR: brown / WH: white / BU: blue / BK: black

Figure 3 – Wiring instructions (M8 – Power supply connector)

3.2 COVAL Bus connector

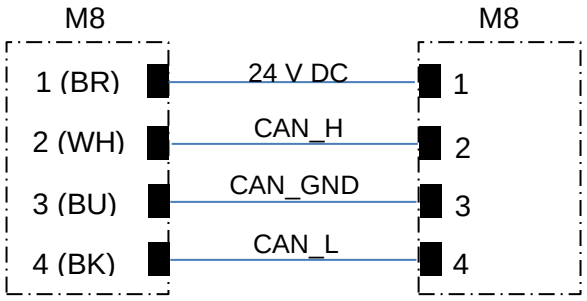


Figure 4 – Wiring instructions (M8 – COVAL bus connector)

Connection between LEMCOM modules is done with a M8 / M8 cable (female-female) or, if assembled as an island, with a specific M8 / M8 bridge.

Figure 5 - Coval Bus bridge connector

The maximum overall length for COVAL Bus is 20 meters.

3.3 Ethernet ports

The master PROFINET LEMCOM embeds a fast Ethernet 2-port switch. Field bus can be connected to one of the two ports and the other is available to connect another PROFINET capable device in series (either another LEMCOM or a motor, encoder, etc.).

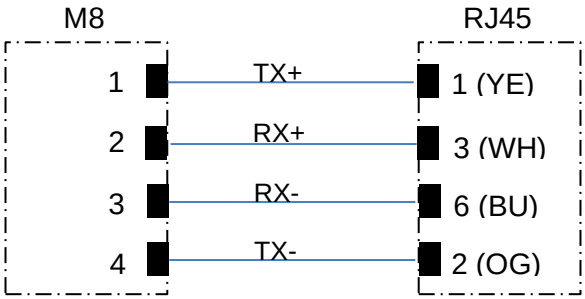


Figure 6 - Wiring instructions (M8 – Ethernet connector)

The same wiring standard as EtherCAT has been chosen to allow installers to get M8 / RJ45 cables from connectors and cables suppliers such as Phoenix Contact, Beckhoff, Weidmüller, Igus, etc.

M8/RJ45 ETHERNET CABLE – Shielded – CAT 5
The following Coval references (M8 4-pin straight IP67 / RJ45 4-pin straight IP20) can be used:
CDM8RJ45L2 2 meters
CDM8RJ45L5 5 meters
(0.2 to 40.0m length available upon request)

SHIELDED CABLES
It is highly recommended to use shielded CAT-5 cable (with STP, Shielded Twisted Pair) to connect the master pump to the network.

4 FRONT PANEL INDICATORS AND BUTTON

FIRST IMAGE MUST BE OF A PROFINET LEMCOM

Multiple led indicators on the front panel give information on the LEMCOM status.

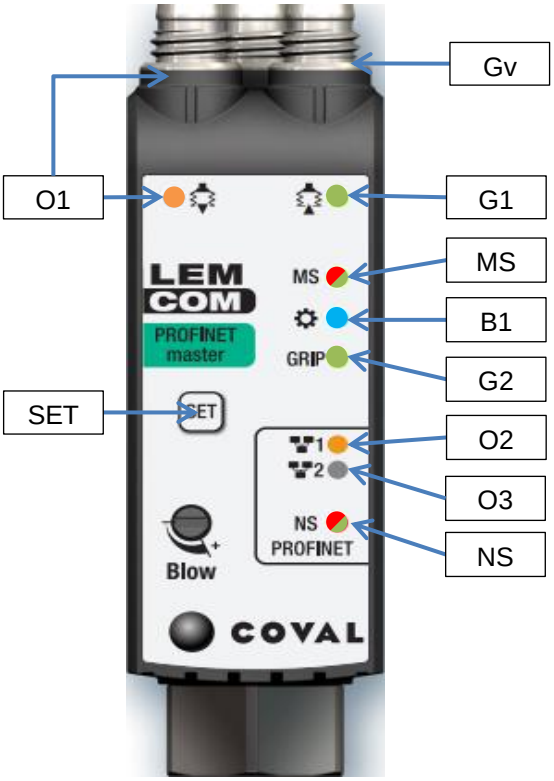


Figure 7 – Master LEMCOM front panel

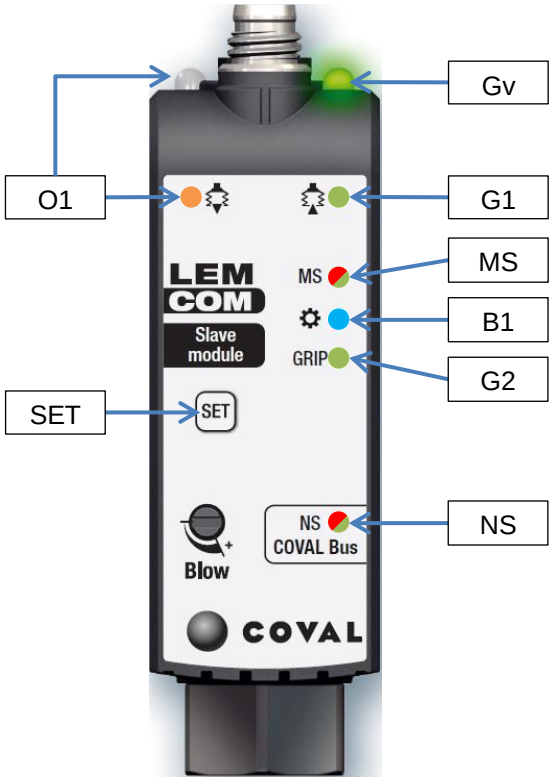


Figure 8 - Secondary LEMCOM front panel

Colors: Ox (Orange) – Gx (Green) – Bx (Blue) – MS, NS (Red/Green)

Ref.	Related to	Meaning
O1	Parts handling	ON : Blow-off command enabled / otherwise OFF
G1	Parts handling	ON : Vacuum is generated / otherwise OFF
Gv	Parts handling	Gv gives an indication of vacuum valve status: If Normally Closed (NC) valve ➔ Gv behaves as G1 If Normally Open (NO) valve ➔ Gv OFF: Vacuum is generated / otherwise ON
G2	Parts handling	ON : Object gripped signal (vacuum level > L1 threshold) / otherwise OFF
B1	Customer led	Configurable led according to customer needs (refer to section 4.1 for detailed meaning)
MS	Module Status	Indicates the current status of the device (refer to section 4.2 for detailed meaning)
NS	Network Status	Indicates the current status of the PROFINET or COVAL Bus network interface (refer to section 4.3 for detailed meaning)
O2/O3	Ethernet network	Ethernet link / activity – Left Port (O2), Right Port (O3) OFF : No network connection Steady-ON : Network connection OK but no activity Blinking: Network connection OK and activity

SET	Setting button	**Master module**: IP address reset **Secondary module**: COVAL Bus address assignment and reset

Table 2 – Led indicators and button meaning

4.1 Customer led (B1)

Functioning mode of the blue led can be configured according to customer needs using LEMCOM Manager or LEMCOM Web Server.

The following modes are available:

MODE	Detailed functioning
BL 1	ASC ENABLED + REGULATION ERROR: Led ON if ASC option is enabled / Blinking in case of regulation issue (permanent vacuum) / OFF otherwise
BL 2	ASC ENABLED: Led ON if ASC option is enabled / OFF otherwise
BL 3	REGULATION IN PROGRESS: Led ON during regulation phase / OFF otherwise
BL 4	REGULATION ERROR: Led blinking in case of regulation issue (permanent vacuum) / OFF otherwise
BL 5	30M CYCLES PREVENTIVE MAINTENANCE: Led ON if ***Vacuum counter*** > 30 million cycles / OFF otherwise

Table 3 - Customer LED modes

4.2 Module Status indicator (MS)

Red LED 🔴	Green LED 🟢	Meaning
OFF	OFF	**Not Powered**: check power supply connection.
OFF	Flashing	**Standby**: Device is not configured.
OFF	ON	**Operational**: Device is configured and operating correctly.
Flashing	OFF	**Major Recoverable Fault**: incorrect vacuum settings, low voltage error, high temperature error.
ON	OFF	**Major Unrecoverable Fault**: part lost error, firmware error.
Flashing	Flashing	**Self-Test**: Start-up phase in progress.

Table 4 - Module Status indicator meanings

4.3 Network Status indicator (NS)

Red LED 🔴	Green LED 🟢	Meaning
OFF	OFF	**Not powered, no IP address**: the device is powered off, or is powered on but with no IP address (master) / local bus address (secondary) configured
OFF	Flashing	**No connections** Master module: an IP address is configured, but no CIP connections are established
OFF	ON	**Connected** Master module: an IP address is configured, at least one CIP connection (any transport class) is established. Secondary module: a local bus address is configured and the connection with the master module is established.
Flashing	OFF	**Connection timeout** Master module: an IP address is configured, and an Exclusive Owner connection for which this device is the target has timed out. Secondary module: a local bus address is configured, and the connection with the master module has timed out.
ON	OFF	**Duplicate IP address**: an IP address or local bus address conflict has been detected (not implemented yet).
Flashing	Flashing	**Self-Test**: Start-up phase in progress.

Table 5 - Network Status indicator meanings

5 CONFIGURATION TOOLS

LEMCOM modules can easily be configured, updated, controlled and diagnosed remotely using one of the following tools:

LEMCOM MANAGER

Universal PC software dedicated to configuration, update, control and diagnostic of all LEMCOM vacuum pumps of the factory.

Compatible with all LEMCOM protocols.

LEMCOM WEBSERVER

Embedded web server that allows configuration, update, control and diagnostic of one given LEMCOM island.

No software installation required.

LEMCOM MANAGER
Please refer to the specific user manual LEMCOM-Manager-xx-x-1155UM0069 for detailed information on the PC software usage.

CAUTION

These configuration tools **must not be used during production** as unexpected hazardous motion of machinery may occur.

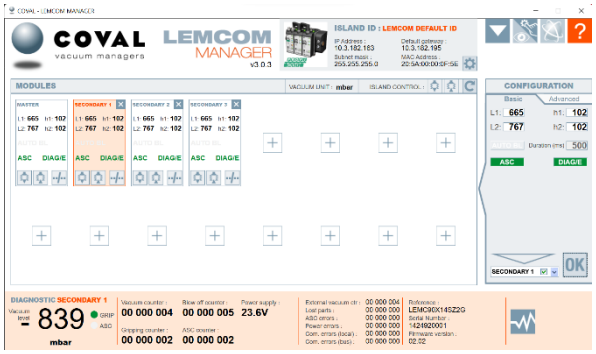


Figure 9 - LEMCOM Manager preview

6 NETWORK CONFIGURATION

Either you use a standalone master module or an island, the first step before using LEMCOM is to set the network settings of the master module to make it “visible” on the factory network.

6.1 Computer network settings

To make first configuration easier, it is recommended to use a direct cable connection (M8 / RJ45) between the computer that will be used for configuration and the master LEMCOM.

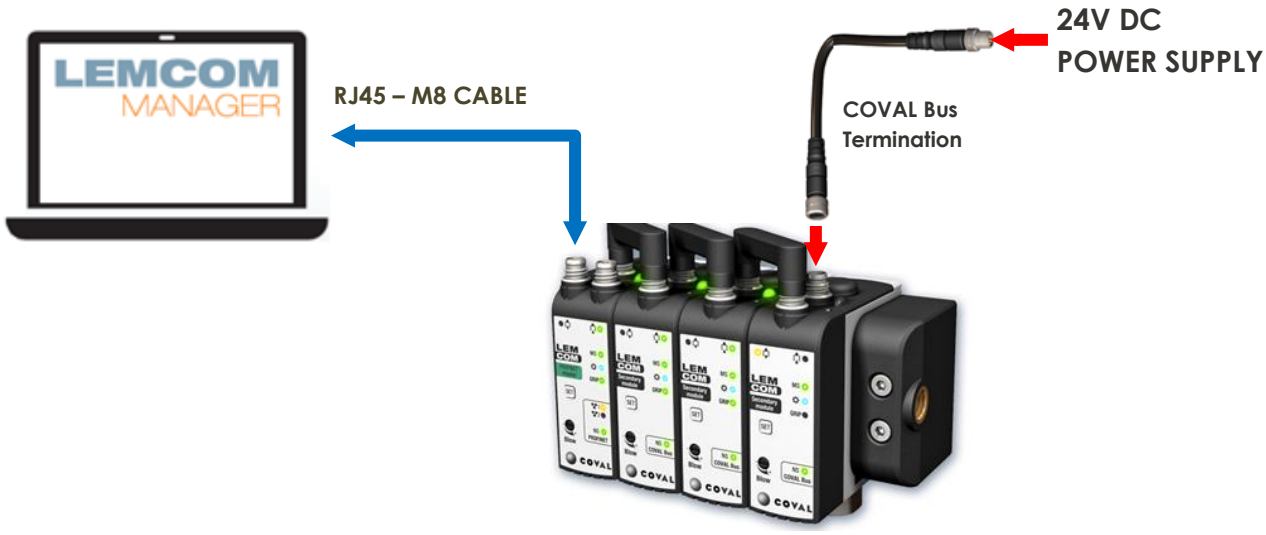


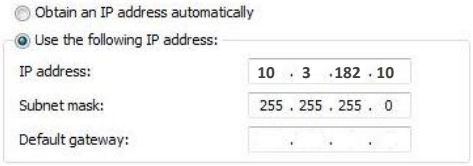
Figure 10 - Direct connection between a LEMCOM island and a computer

Considering it is the first time the LEMCOM is used, its default network settings are:

Parameter	Factory setting
IP address	10.3.182.163
Default gateway	10.3.1.1
Subnet mask	255.255.255.0
DHCP	OFF

The computer network settings must be set according to those of the LEMCOM:

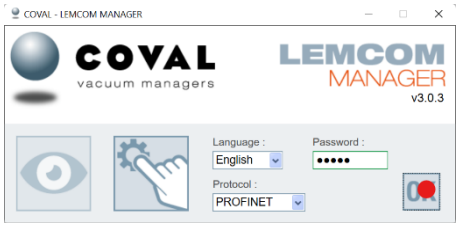
1) Click the Start button.
2) Select Control Panel.
3) Click the Network and Internet link.
4) Click the Network and Sharing Center link.
5) View your network connections; click the Change adapter settings link.
6) Right-click your local area connection.
7) From the drop-down list, select Properties.
8) Under "This connection uses the following items," select Internet Protocol Version 4
9) Click the Properties button
10) Fill in the window as shown here ➔
11) Press OK button.
12) If not done yet, connect the LEMCOM to the computer Ethernet port and to the power supply.



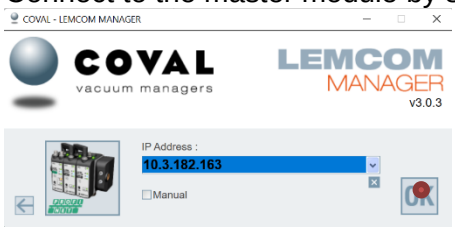
6.2 LEMCOM network settings

6.2.1 Using LEMCOM Manager

1. Launch LEMCOM Manager
2. Select “Configuration mode”, select “PROFINET” in the Protocol list, enter the password “coval” and click OK

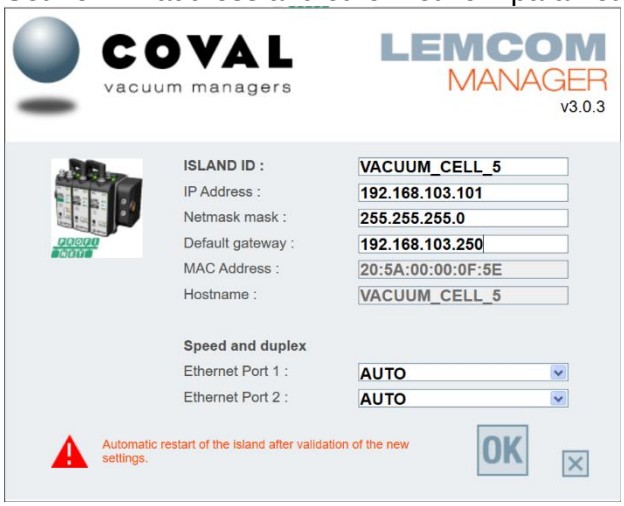


3. Connect to the master module by selecting default IP 10.3.182.163 and click OK



4. Click on the ‘setting wheel’ to access network settings screen

5. Set new IP address and other network parameters



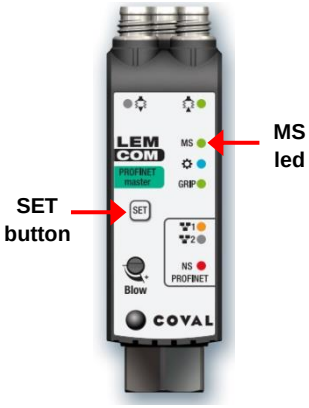
6. Master module restarts when “OK” button is pressed then LEMCOM Manager automatically tries to reconnect to the LEMCOM (however, reconnection would fail if computer and LEMCOM are not on the same network anymore).

The LEMCOM can now be connected to the factory or machine network.

6.2.2 *Using LEMCOM webserver*

The LEMCOM webserver is not implemented for PROFINET modules yet.

6.3 Reset LEMCOM’s IP address



LEMCOM’s IP address can be set back to its default value (10.3.182.163):

1. Unplug LEMCOM from the 24V DC power supply.
2. Press and hold the **‘SET’ button** on the front panel of master LEMCOM.
3. Plug back in the power supply.
4. Release the button when **MS** led starts to blink.

IP address is now 10.3.182.163.

6.4 LEMCOM MAC address

Any LEMCOM master module can be identified on the ethernet network by its unique hardware address, the MAC address.

The Coval OUI (Organizationally Unique Identifier) is **20:5A:00** so all LEMCOM MAC addresses follow the format 20:5A:00:xx:xx:xx (where xx:xx:xx is an incremental and unique value).

The MAC address is written on the left side of the LEMCOM master module and can also be read using LEMCOM Manager.

7 LEMCOM VACUUM PUMP SETTINGS

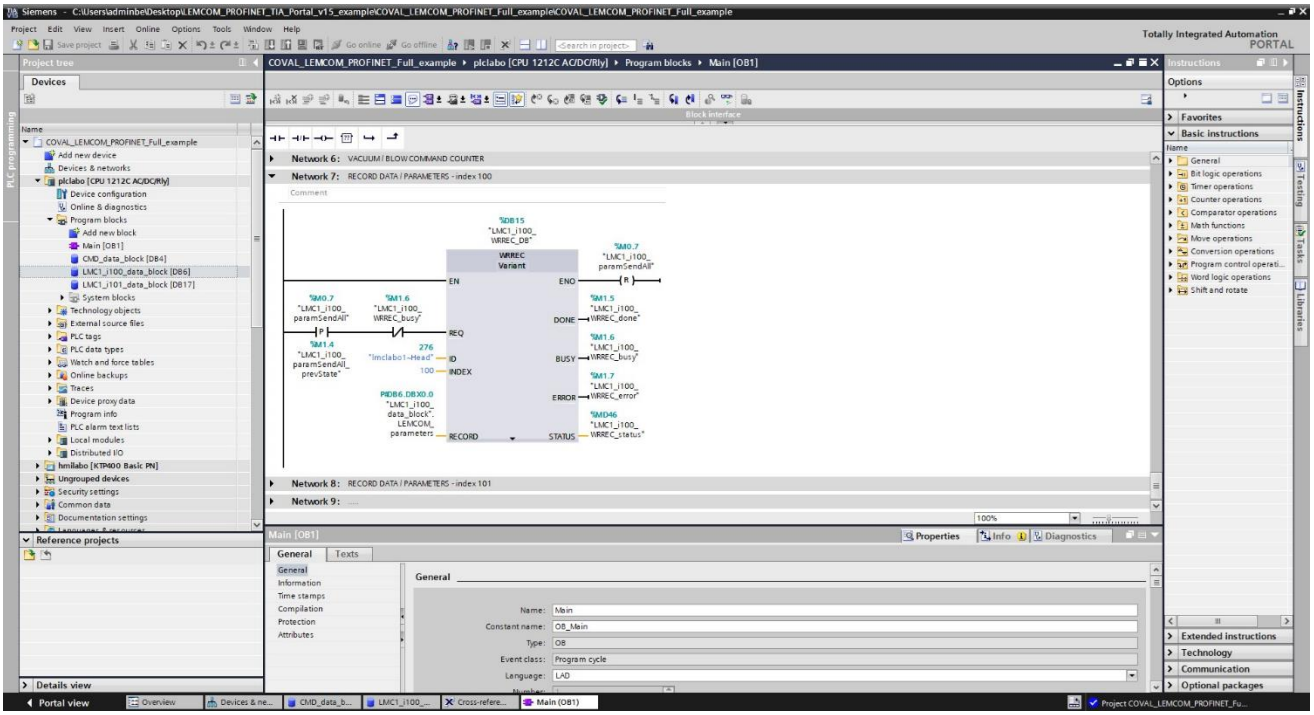
This chapter describes all the settings that can be configured individually on each LEMCOM module (master or secondary). Configuration can be done using LEMCOM Manager (PC software), LEMCOM Web Server and by sending configuration data via PROFINET.

SETTING	DESCRIPTION	COMMENT
L1	**Gripped product threshold** Vacuum threshold that enables the "Gripped product" signal.	Default unit: percent vacuum (0 to 99%) Other units (inHg / mbar) available from LEMCOM Manager and LEMCOM Web Server.
h1	**Hysteresis of gripping threshold** Vacuum drop that disables the "Gripped product" signal.	
L2	**ASC Regulation threshold** Vacuum threshold that automatically disables the vacuum generation (ASC regulation system).	
h2	**Hysteresis of ASC regulation threshold** Vacuum drop that restarts vacuum generation.	
AUTO BLOW	Automatic blow off function	
AUTO BLOW duration (ms)	Automatic blowing for a period of 1 to 9999ms.	Automatic blow off starts as soon as vacuum control is disabled.
ASC	Vacuum regulation system (Air Saving Control)	Compressed air savings of 60 to 99%. Regulation threshold is defined with L2 parameter.
DIAG/E	Regulation system monitoring (DIAG ECO)	DIAG ECO avoids repetitive bounces of the regulation system in case of vacuum leakage (porous handled product). LEMCOM automatically switches to permanent vacuum once the vacuum valve bounces more than "**Maximum bounces No**." during a period of "**DIAG/E analysis time**".
Maximum bounces Number	Maximum bounces of the regulation system before enabling permanent vacuum.	
DIAG/E analysis time (s)	Analysis period for counting bounces of the regulation system.	
Customer LED	**Configurable blue LED** Define the operating mode of the blue LED located on the front side of the LEMCOM.	Refer to §4.1 to get the description of blue led modes.
Valves status	**Status of the vacuum pump valves in case of communication loss** Security setting that defines the status of the vacuum and blow-off valves when fieldbus (master module) or local bus (secondary modules) communication is lost.	**MD1 (0x00)** ➔ Hold the valves in the states they were before communication loss **MD2 (0x01)** ➔ Vacuum command enabled / blow-off command disabled **MD3 (0x02)** ➔ Vacuum command disabled / blow-off command enabled **MD4 (0x03)** ➔ Vacuum and blow-off commands disabled **MD5 (0x04)** ➔ Vacuum disabled then blow-off for 2s then vacuum and blow-off disabled

Table 6 - Vacuum pump settings

7.1 Sending configuration through PROFINET

Sending configuration data through PROFINET" is possible using an Acyclic Record Data Write function block on the PLC.



Acyclic Record Data (WRREC function block, index 100):

- L1, H1 [%]
- L2, H2 [%]
- ASC (on/off)
- DIAGECO (on/off)

Acyclic Record Data (WRREC function block, index 101):

- L1, H1 [%]
- L2, H2 [%]
- ASC (on/off)
- DIAGECO (on/off)
- Auto blow (on/off)
- Auto blow duration [ms]

This is the link to the example for SIEMENS PLC available on our documentation web site.

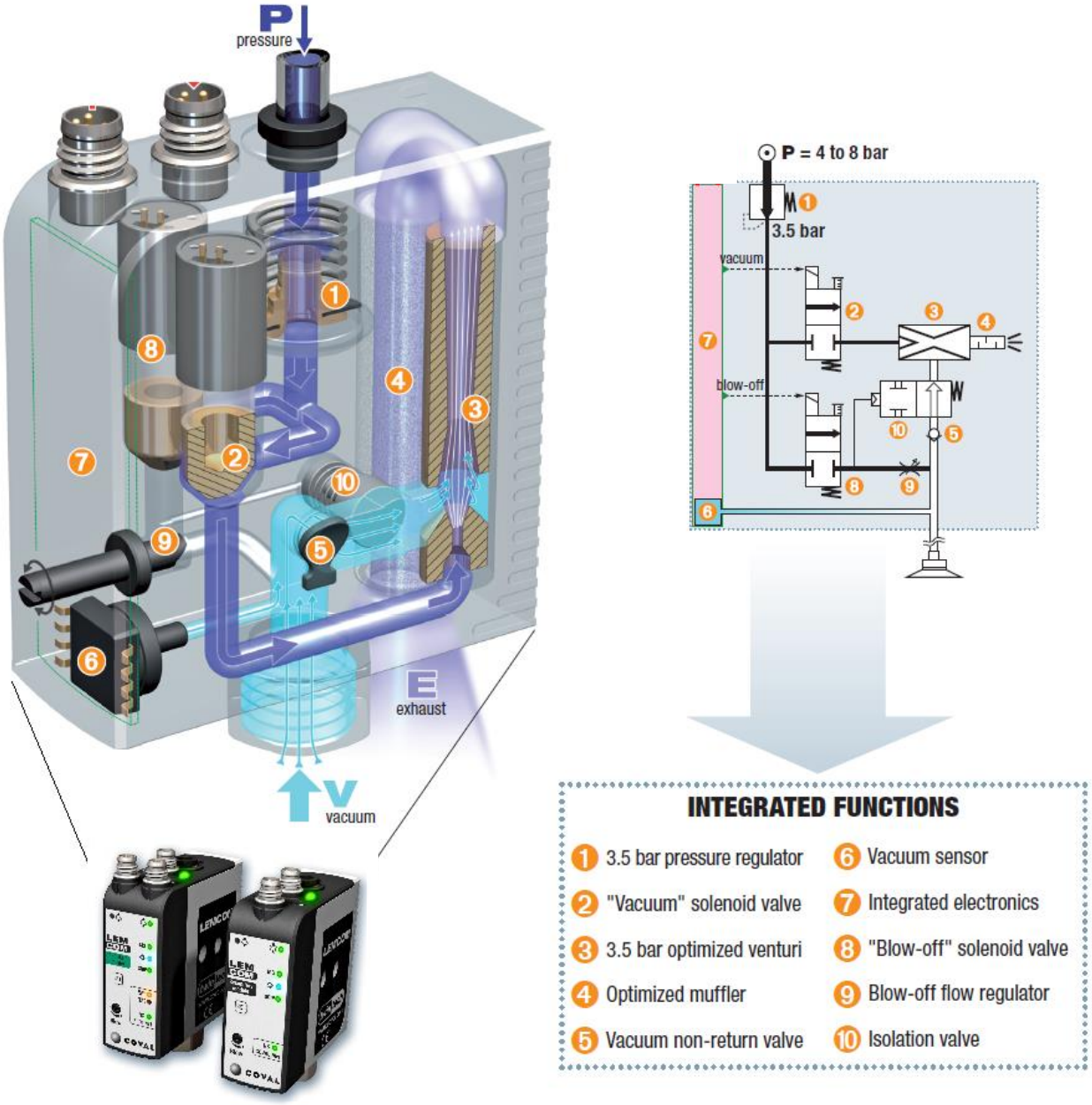
https://doc.coval.com/g/LEMCOM/profinet_lemcom_coval_en.zip

8 VACUUM CHARACTERISTICS

8.1 Global overview

LEMCOM is a compact, energy efficient and connected vacuum pump thought to be easily integrated closed to the customer application.

It is made of different subassemblies that are specifically chosen to fulfill each application requirements.



LEMCOM has an integrated regulation function (ASC = Air Saving Control) that automatically stops air consumption once vacuum is established. Regulation threshold (L2) is configurable via the PC software and the embedded web server.

8.2 Typical handling cycle

The following vacuum parameters can be remotely configured using LEMCOM Manager:

- **L1 threshold / h1 hysteresis**
  - Define the vacuum threshold that triggers the “object gripped” signal.
  - Master LEMCOM periodically collects gripping status of every module it controls and produces a gripping status message on the PROFINET™ field bus.
  - Vacuum level value can also be added to the message sent on the bus.

- **L2 threshold / h2 hysteresis**
  - Define the vacuum threshold that turns OFF internal vacuum command for air saving purpose.
  - Only used if ASC is enabled

- **Air Saving Control - ASC (ON/OFF)**
  - Enable/disable the regulation system

- **DIAG/ECO - DIAG/E (ON/OFF)**
  - Enable/disable the system that prevents vacuum valve to turn ON and OFF frequently due to rough or porous product.
  - Diag Eco can be enabled only if ASC is ON.
  - Diag Eco ON: if regulation system turns ON and OFF the vacuum pilot more than 2 times in a second, it maintains the vacuum command ON until the end of the cycle to avoid useless wear of the pilot.

- **Auto-blow (ON/OFF) + auto-blow duration (millisecond)**
  - If turned ON, blow-off is automatically enabled as soon as vacuum command is disabled.
  - The blow-off duration can be set between 1 and 9999 ms.

The figure below details a typical vacuum cycle with ASC function enabled:

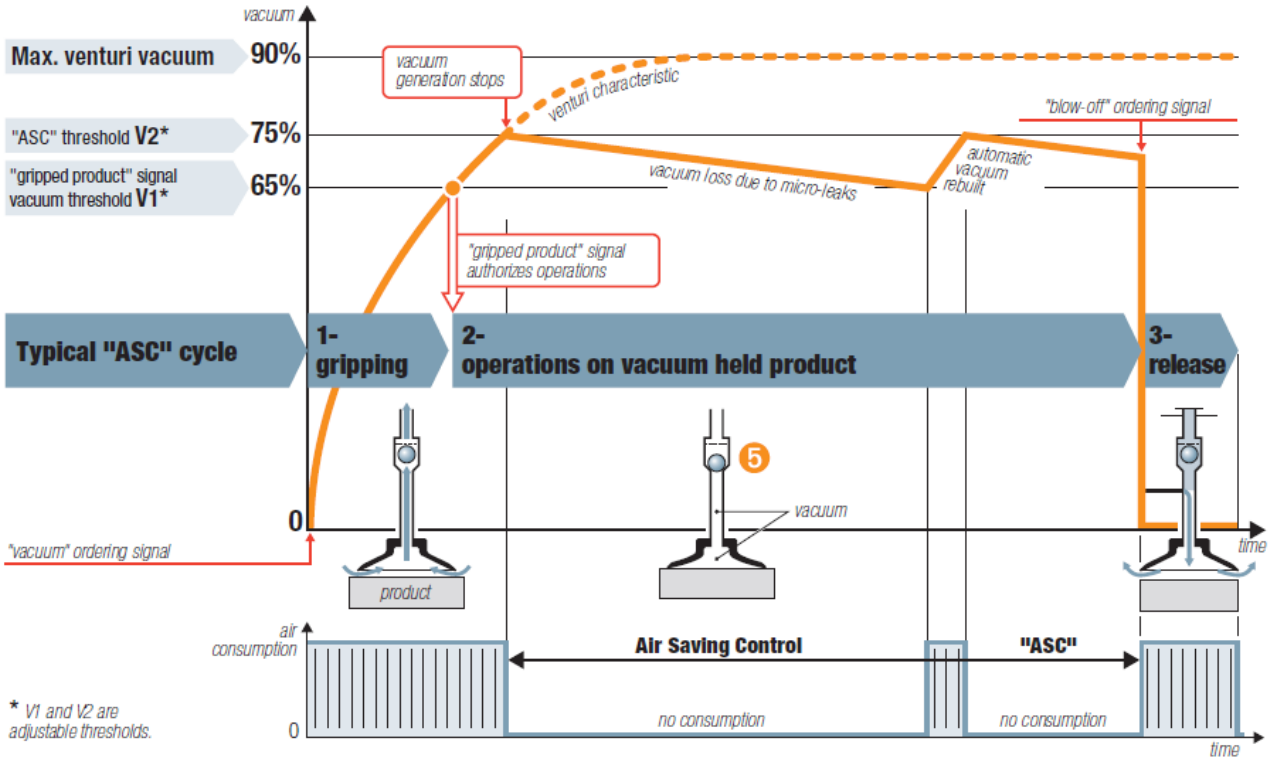


Figure 11 - Typical vacuum cycle

Factory settings

The LEMCOM provided to you has been configured with default settings that suit most applications. Depending on the chosen model (LEMC60X or LEMC90X), LEMCOM is configured as follows:

	LEMC60X... 60% max. vacuum	**LEMC90X…** 90% max. vacuum
L1/h1	**35%** / 10%	**65%** / 10%
L2/h2	**45%** / 10%	**75%** / 10%
Auto-blow	OFF	
Auto-blow duration	500 ms	
ASC	ON	
DIAG ECO	ON	
Maximum bounces number	2	
DIAG ECO analysis time (s)	1	
Customer LED mode	BL1	
Valves status mode	MD1	

Table 7 - Factory settings

Recommendations

Default vacuum parameters may have to be adjusted to perfectly suit application requirements. If so, it is recommended to respect the following conditions:

- L2-h2 > L1 i.e. regulation zone should be above the “object gripped” threshold
- h1<L1 i.e. hysteresis should be lower than “object gripped” threshold
- h2<L2 i.e. hysteresis should be lower than “regulation” threshold
- In case of rough or porous product handling, disable ASC to avoid vacuum pilot to turn ON and OFF frequently.

INCORRECT SETTINGS INDICATION
If the recommendations given above are not respected when configuring a LEMCOM, the MS led of the corresponding module will blink red.

9 TECHNICAL SPECIFICATIONS

9.1 General characteristics

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 29 to 70 Nl/mn.
- Air consumption: From 44 to 90 Nl/mn, 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 0 to 50°C.
- Materials: PA 6-6 15% FG, brass, aluminum, NBR.
- 4-pins M8 male connectors.

Self-Adaptation

- Continuous monitoring of the leakage level: Back-off 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 surveillance 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 (ies)" / 1 Mbps
- Connection by specific bridge for island assembly or unshielded female M8/female M8 cable
- Max total length of the COVAL Bus: 20 metres.

The LEMCOM vacuum pump must be used with power supply units that provide a Protective Extra Low Voltage (PELV) and with an isolation of the supply voltage according to EN60204.

9.2 Power supply voltage

If a led MS is flashing red, please check the voltage at least through LEMCOM Manager or better through a digital multimeter on both sides of the islands. If impossible to check, please consider increasing slightly the power supply at least by 1V.

NB: LEMCOM Manager indicates the voltage seen by the LEMCOM modules, this voltage is representative of the voltage applied to the solenoid valves, not from the local bus power supply itself.

Operating under low voltage may reduce the lifetime of products and lead to erratic operation.

LEMCOM modules require a power supply of 21.6V (24V-10%) minimum on their solenoid valves otherwise a low voltage error occurs (Led MS flashing red).

The solenoid valves power supply is of a diode voltage drop (around -0,5V) lower than applied local bus power supply.

Depending on the LEMCOM island configuration, it may appear a large voltage drop across the local bus power supply. i.e. -1.0 V is the typical voltage drop across a 16 LEMCOM island configuration connected through bridges. If long connection cables are used instead of bridges, the voltage drop is even likely to be higher (i.e. For splitting a 16 LEMCOM configuration into 2 islands of 8 LEMCOM).

This may result in the need for applying a minimum of 22V, 23V or even 26.4V local bus power supply.

There is a hysteresis implemented in case of Low voltage error (Led MS flashing red). The default may be cleared by increasing power supply by at least 1V.

9.3 Current consumption table

The LEMCOM structure implies that all vacuum generators connected together on the COVAL bus are electrically supplied by the same power source. The following consumption table has to be taken into account when the required power supply wattage and amperage is calculated.

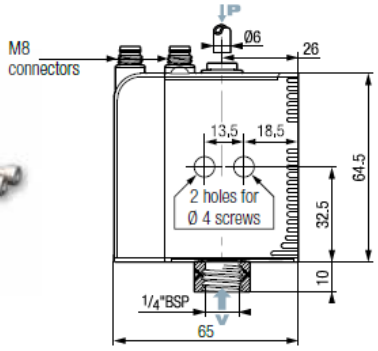
Number of modules	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Maximum current draw (mA) 24V supply	150	250	350	450	550	650	750	850	950	1050	1150	1250	1350	1450	1550	1650

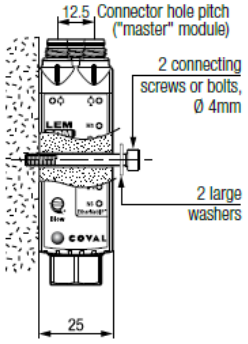
Table 8 - Current consumption of a LEMCOM island

9.4 Dimensions and mounting options

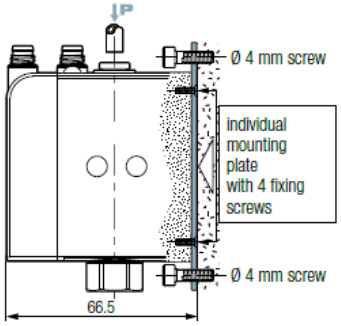
1- Stand-alone modules

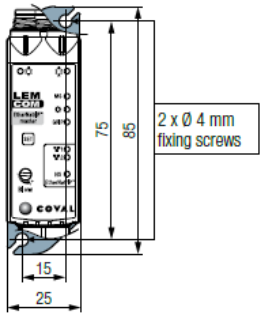
Mounting from side





Mounting from front

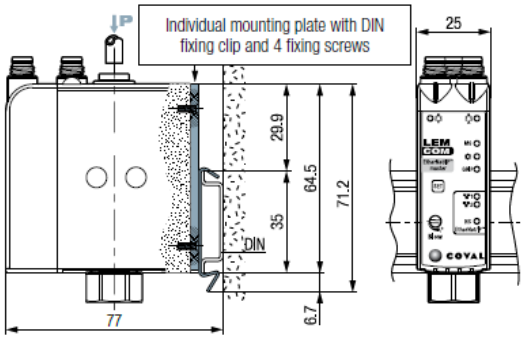




For mounting from front, in addition to the module, you need to order an additional kit:

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

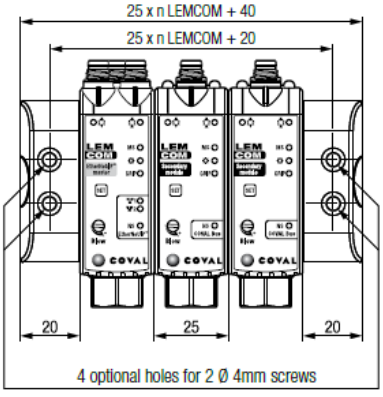
Mounting on DIN rail



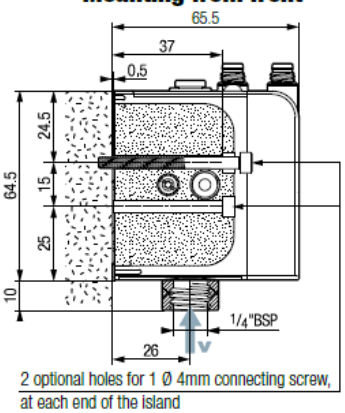
For a static mounting (for example, in a cabinet), a module can be clipped onto a DIN rail. For this purpose, the module must first be equipped with an individual plate for fixing onto a DIN rail, to be ordered separately:

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

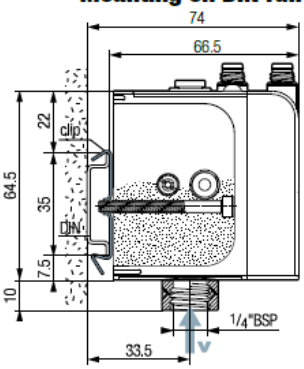
2- Islands



Mounting from front



Mounting on DIN rail



DIN rail mounting kit: 2 clips + 2 screws
REF : LEMFIXC

3D COVAL Data *On our site www.coval.com you will find 3D models of all our products, in formats suitable for the principal CAD software.*

9.5 Standards and Regulations

LEMCOM has been developed in accordance with the following standards:

- EN61000-6-4/A1: 2007/2010
- EN61000-6-2: 2005

Test standard	Description	Test result
CISPR 16-2-3	Radiated disturbance measurements	Class A
CISPR 16-2-1 CISPR 14-1	Conducted disturbance measurements (power supply access)	Class A
CISPR 22	Conducted disturbance measurements (communication and network access)	Class A
IEC / EN 61000-4-2	Electrostatic discharges (ESD)	Criterion B
IEC/EN 61000-4-3	Immunity to radiated interference	Criterion A
ENV 50204		Criterion A
IEC/EN 61000-4-4	Electrical Fast Transient / Burst Immunity Test	Criterion B
IEC/EN 61000-4-5	Lightning and industrial surges	Criterion B
IEC/EN 61000-4-6	Immunity to conducted interference	Criterion A
IEC/EN 61000-4-8	Immunity to magnetic fields	Criterion A
IEC/EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests’	Criterion A/B
NF EN 60068-2-6 (2008)	Vibration resistance	5g, 10 to 150 Hz, 1 hr / axes (x, y, z)
NF EN 62262	IK07 test - Protection against mechanical impacts	Impact energy: 2 joules, 500g weight, height: 40cm
NF EN 60068-2-27 (2009)	Shock resistance	10g, 11 ms, Half-Sine Shock Pulse, 6 shocks per axis (x, y, z)
/	Humidity test	+40°C, 95% RH, 24 hrs
/	Temperature test	72 hrs, 1°C / minute, 24 hrs at 0°C, +25°C and +50°C

10 FIGURES LIST

11 TABLES LIST

12 APPENDICES

12.1 Vacuum conversion chart

% Vacuum	-inHg	-mbar	Pg-psig	Pa-psia
0.0	0	0.00	0.00	14.70
3.3	1	33.86	0.49	14.24
6.6	2	67.72	0.98	13.75
9.9	3	101.58	1.47	13.26
13.2	4	135.44	1.96	12.76
16.5	5	169.30	2.45	12.27
19.8	6	203.16	2.95	11.78
23.1	7	237.02	3.44	11.29
26.4	8	270.88	3.93	10.80
29.7	9	304.74	4.42	10.31
33.0	10	338.60	4.91	9.82
36.3	11	372.46	5.40	9.33
39.6	12	406.32	5.89	8.84
42.9	13	440.18	6.38	8.35
46.2	14	474.04	6.87	7.86
49.5	15	507.90	7.36	7.36
52.8	16	541.76	7.86	6.87
56.1	17	575.62	8.35	6.38
59.4	18	609.48	8.84	5.89
62.7	19	643.34	9.33	5.40
66.0	20	677.20	9.82	4.91
69.3	21	711.06	10.31	4.42
72.6	22	744.92	10.80	3.93
75.9	23	778.78	11.29	3.44
79.2	24	812.64	11.78	2.95
82.5	25	846.50	12.27	2.45
85.8	26	880.36	12.76	1.96
89.1	27	914.22	13.26	1.47
92.4	28	948.08	13.75	0.98
95.7	29	981.94	14.24	0.49
100.0	29.92	1013.00	14.70	0.00