LEMCOM
USER MANUAL

1155UM0067 Rev. E
06/2023

COVAL
vacuum managers

COVAL SAS
ZA Les Petits Champs
26120 Montélier – France
Tel : +33 (0)4 75 59 91 91
www.coval.com

EtherNet/IP™ is a trademark of ControlNet International under license by ODVA (Open DeviceNet Vendor Association, Inc.).

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.

Reproduction and/or copy of this document is not allowed without COVAL's written permission.

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.

Others 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 have to 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 EtherNet/IP™ 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 firmwares versions:
- LEMCOM Master EtherNet/IP (LEMC..X…**Y2**G..) : v01.00
- LEMCOM Secondary Module (LEMC..X…**Z2**G..) : v01.00 or v02.03

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

1.3 User manual version history

Revision	Date	Related firmware version LEMCOM Master EtherNet/IP | LEMCOM Secondary Module
A	11/2015	v00.11 | v00.07
B	02/2016	v00.22 | v00.19
C	07/2016	v00.40 | v00.40
D	05/2017	v01.00 | v01.00 Added: Firmwares & software update info (page 5) Added: usage warning related to output assembly 112 (page 24)
E	06/2023	V1.07 | v01.00 or v02.03

Table 1 - User manual version history

1.4 Firmware and software updates

Always make sure that:

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

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

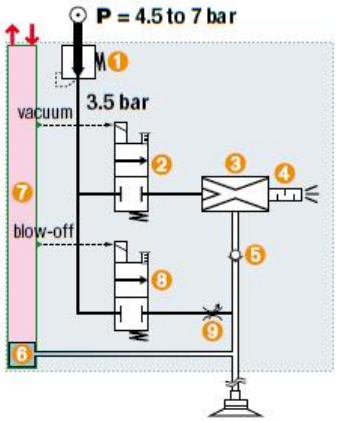
2 LEMCOM OVERVIEW

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

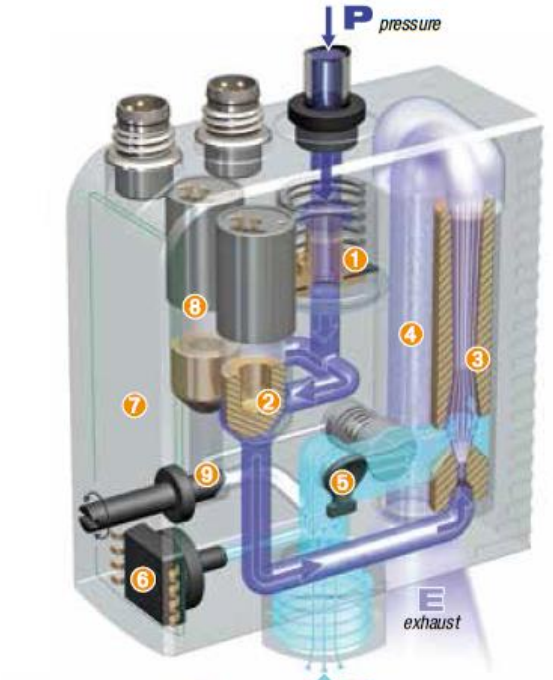
Compact integration: The COVAL technique

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

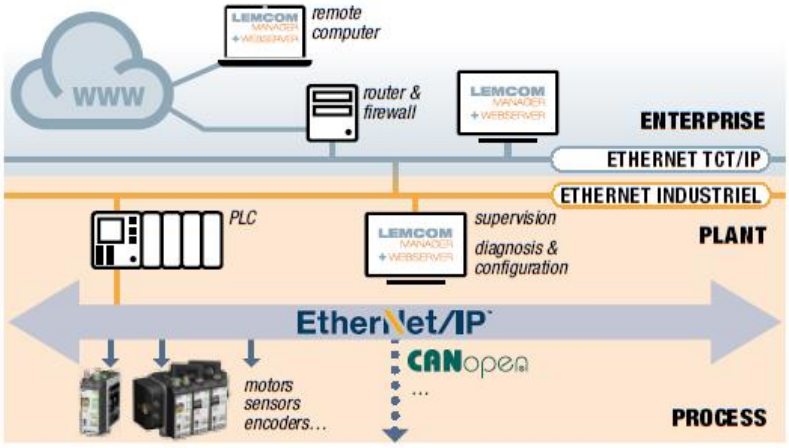
Easy integration with existing industrial network

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.

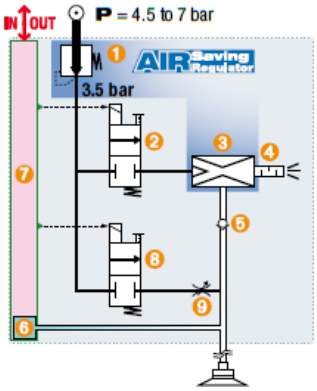
2 integrated energy-saving technologies

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.*

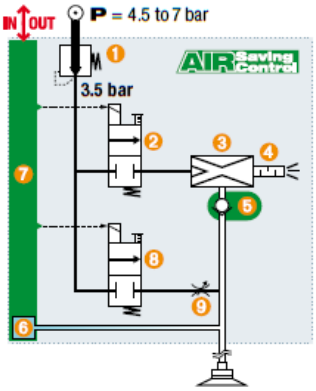


AIR Saving Control

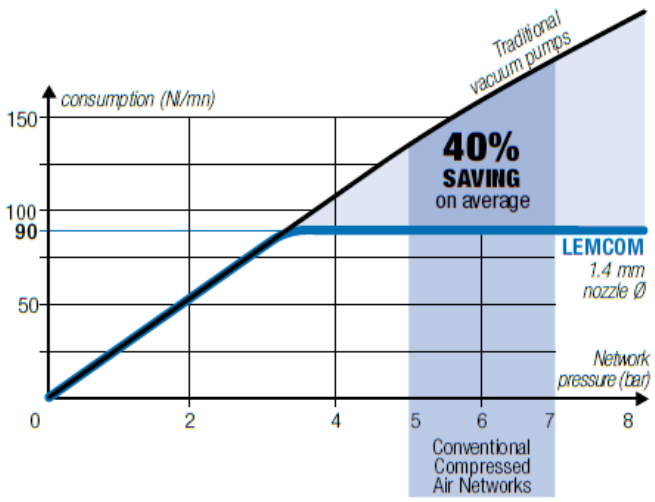
90% energy savings *(on average, see p.4).*

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.

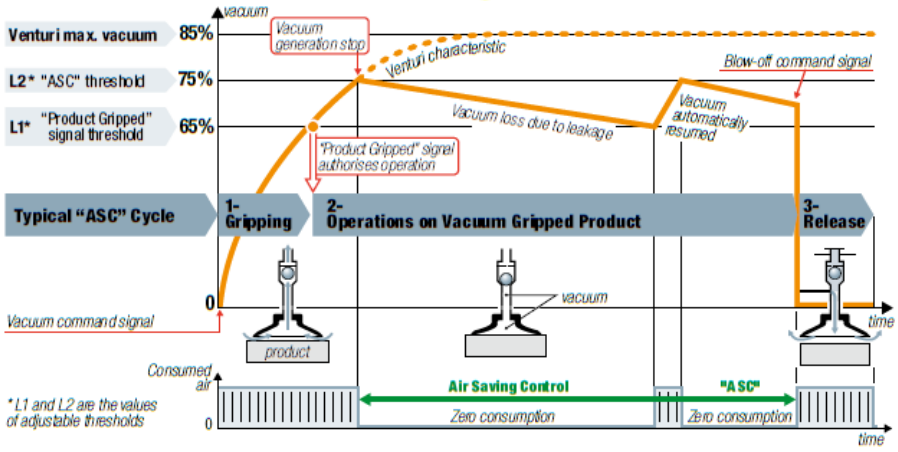
→ No more unnecessary compressed air consumption.

→ 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%

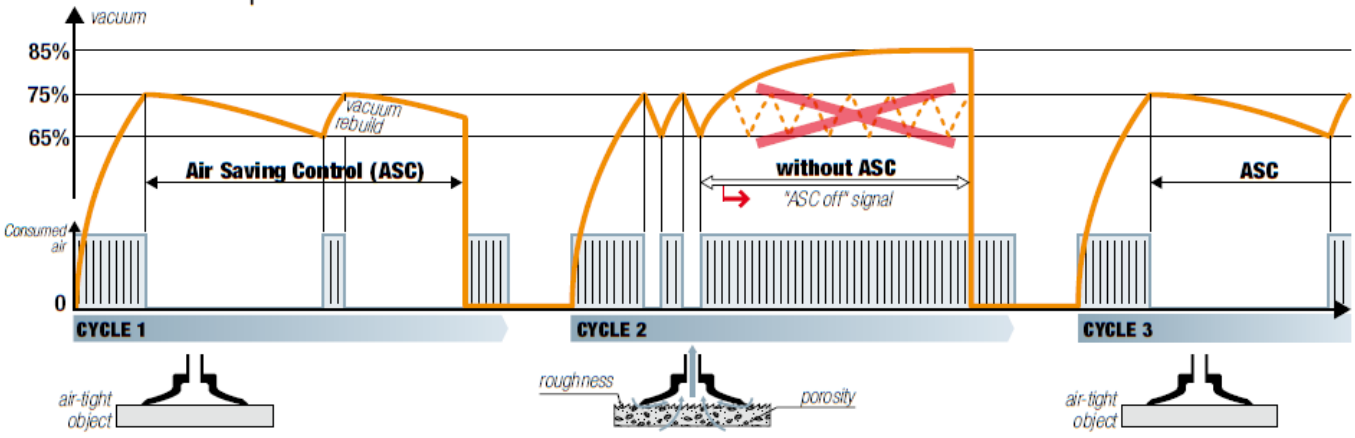
RESULTING SAVINGS

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 equipments 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 EtherNet/IP to communicate with a programmable logic controller. An embedded 2-port ethernet switch allows installer to connect additional EtherNet/IP capable products in series (or an additional LEMCOM island).

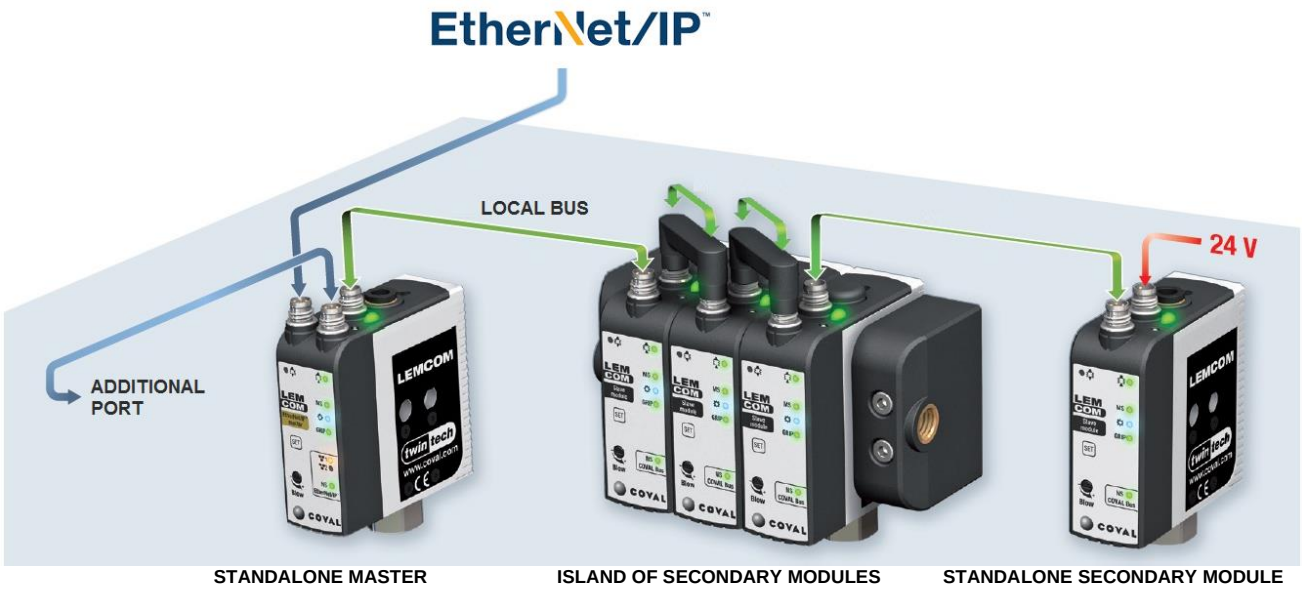


Figure 1 – Master/Secondary concept

- 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 CIP “producer/consumer” model.
- 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 « EtherNet/IP 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 (EtherNet/IP™, CANopen®, etc.) used between the master module and the controller.

3 WIRING INSTRUCTIONS

- Connectors type: M8, 4-pin, male

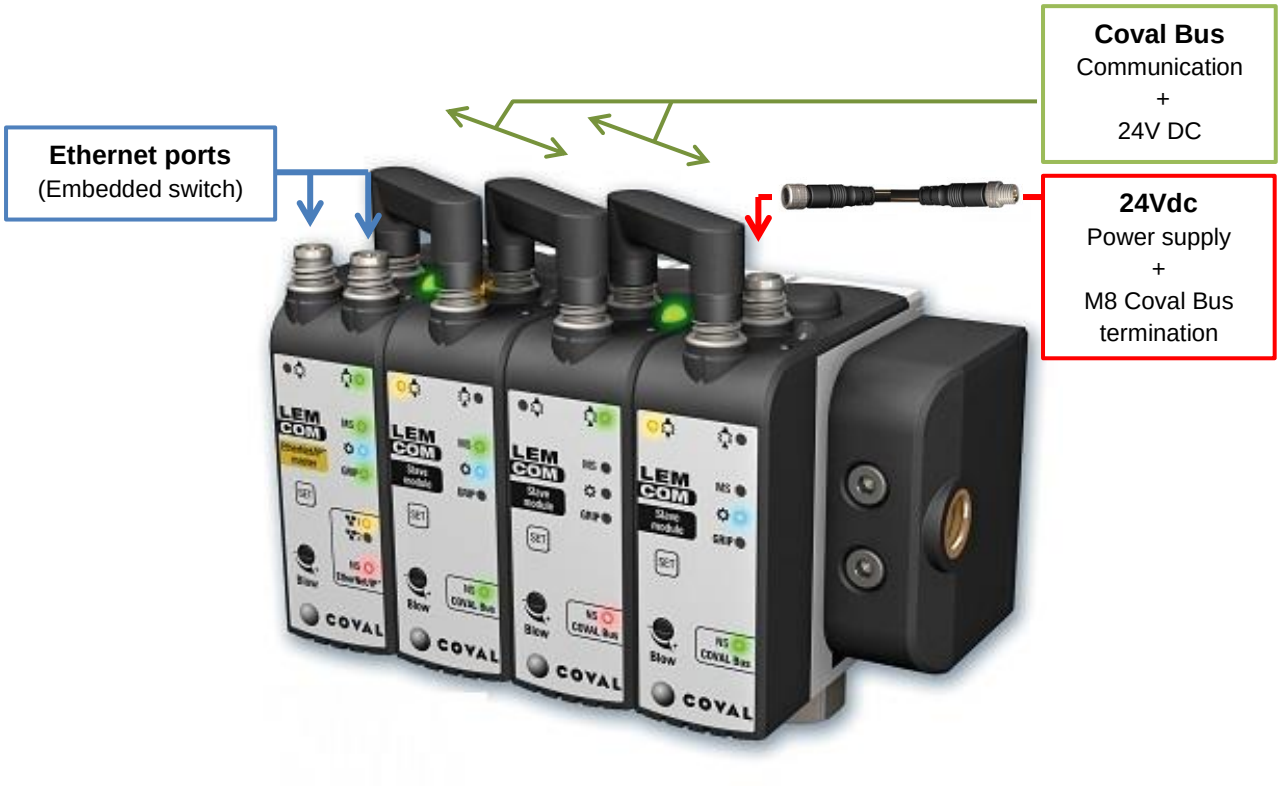


Figure 2 – Island overview

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

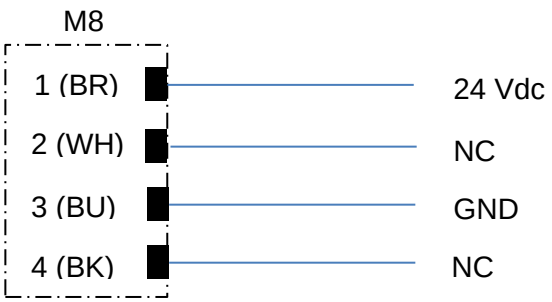


Figure 3 – Wiring instructions (M8 – Power supply connector)

3.2 Coval Bus connector

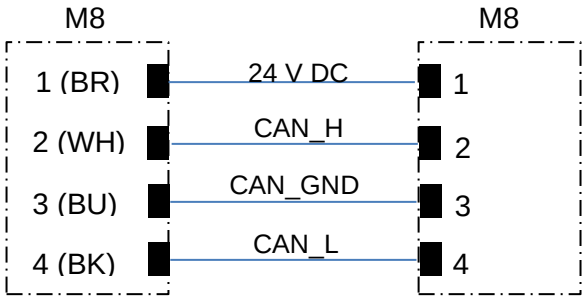


Figure 4 – Wiring instructions (M8 – Coval bus connector)

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 EtherNet/IP 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 EtherNet/IP capable device in series (either another LEMCOM or a motor, encoder, etc.).

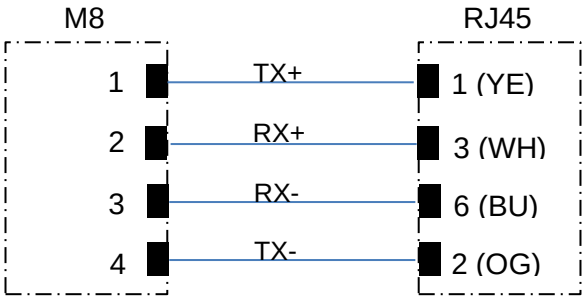


Figure 6 - Wiring instructions (M8 – Ethernet connector)

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

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

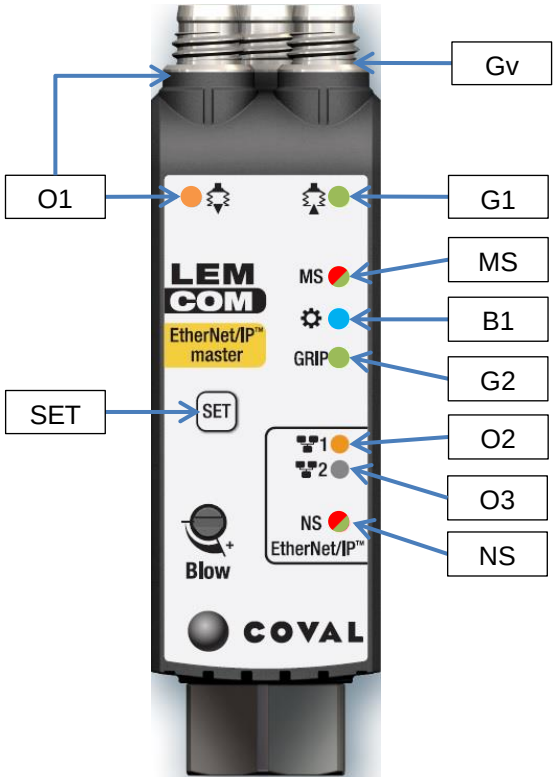


Figure 7 – Master LEMCOM front panel

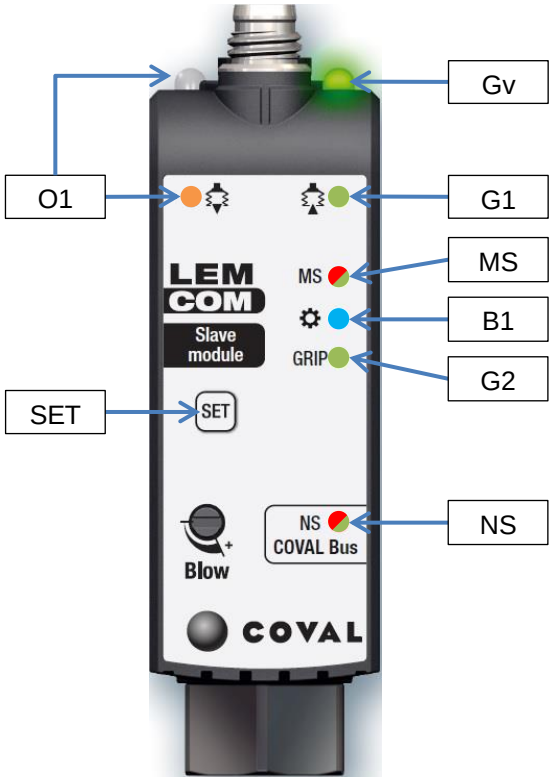


Figure 8 - Secondary LEMCOM front panel

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 EtherNet/IP 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 & WEB SERVER
Please refer to the specific user manuals LEMCOM-Manager-xx-x-1155UM0069 and LEMCOM-Web-Server-xx-x-1155UM0070 for detailed information on the PC software usage and the embedded web server.

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

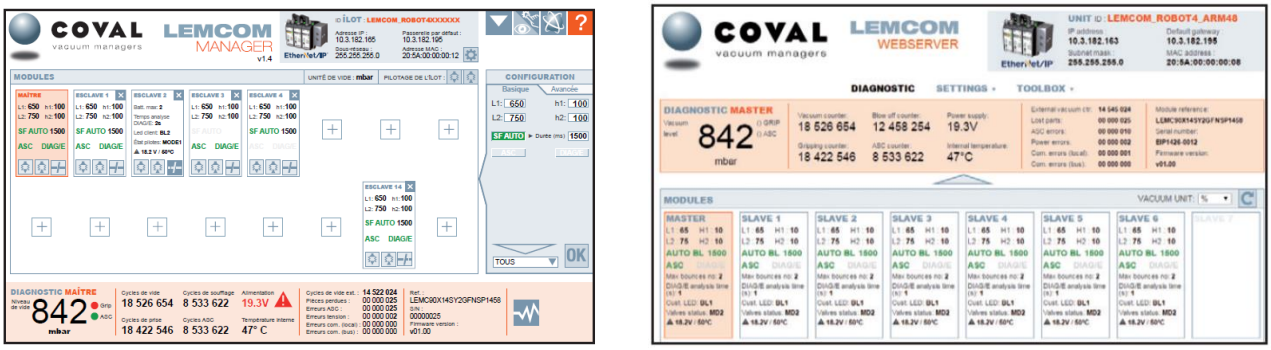


Figure 9 - LEMCOM Manager and LEMCOM Web Server preview

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.

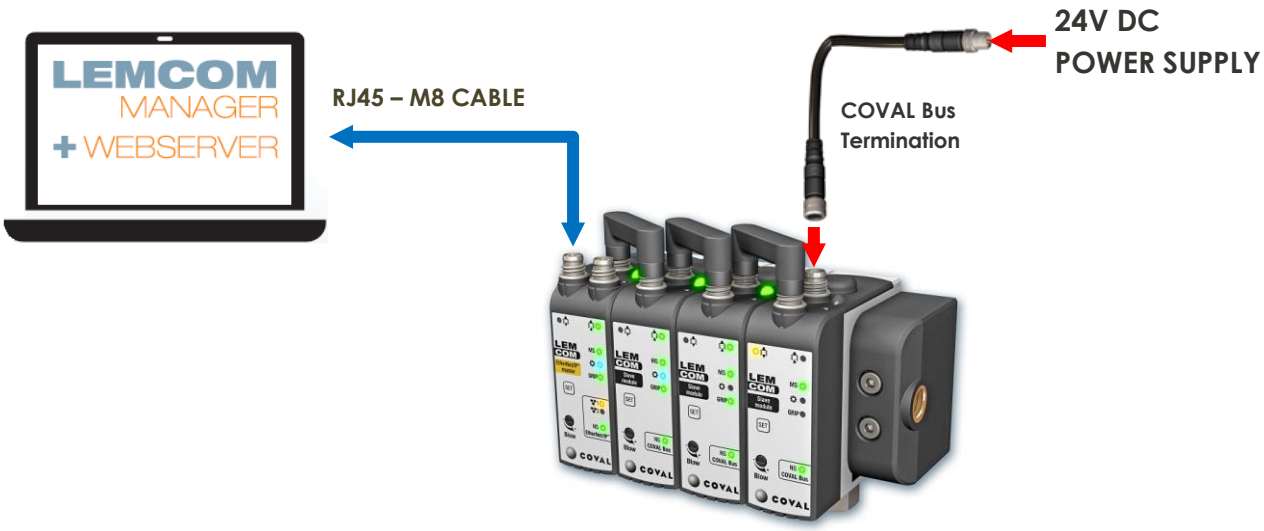


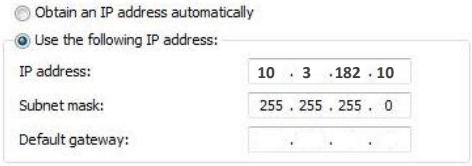
Figure 10 - Direct connection between a LEMCOM island and a computer

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 have to be set according to those of the LEMCOM:

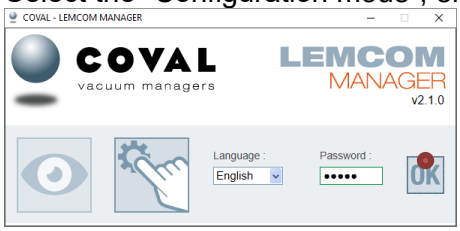
1) Click the Start button.
2) Select Control Panel.
3) Click the Network and Internet link.
4) Click the Network and Sharing Center link.
5) View your network connections; click the Change adapter settings link.
6) Right-click your local area connection.
7) From the drop-down list, select Properties.
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

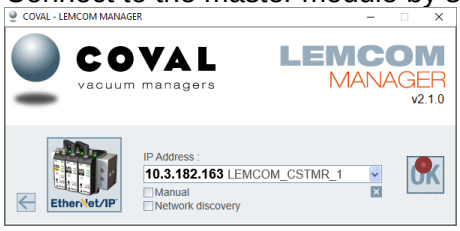
6.2.1 Using LEMCOM Manager

1. Launch LEMCOM Manager
2. Select the “Configuration mode”, enter the password “coval” and click OK

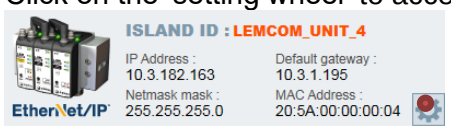


3. Select “EtherNet/IP”

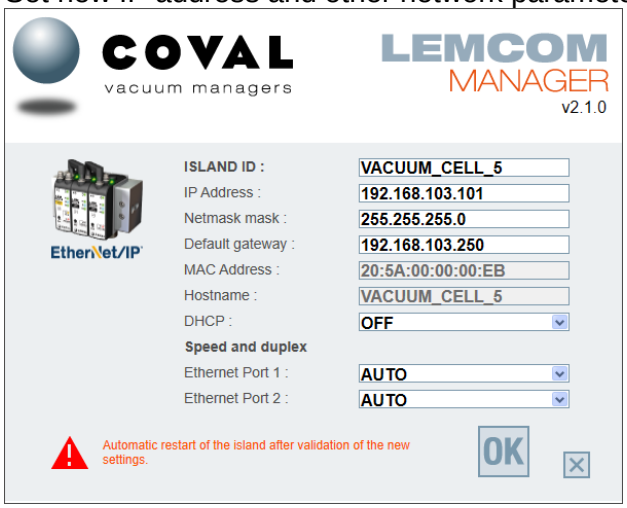
4. Connect to the master module by selecting default IP 10.3.182.163 and click OK



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



6. Set new IP address and other network parameters



7. 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.

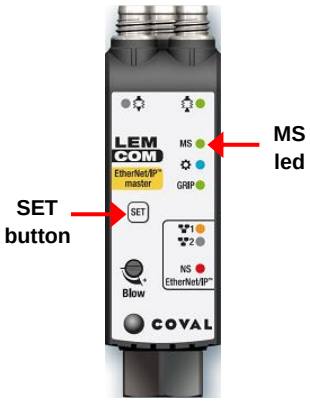
6.2.2 *Using LEMCOM webserver*

Not implemented 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 EtherNet/IP.

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

8 ETHERNET/IP™

8.1 General

EtherNet/IP stands for Ethernet Industrial Protocol and defines an open industry standard that extends the classic Ethernet with an industrial protocol.

8.2 RSLogix 5000 configuration

Make sure you followed the "Network configuration" steps before trying to connect to LEMCOM using a PLC and RSLogix 5000 software.

Installing the Electronic Data Sheet Files (EDS)

Installing an EDS file allows the Ethernet/IP Module to be identified by Rockwell's RSLinx software.

➔ DOWNLOAD LEMCOM EDS FILE FROM COVAL WEBSITE ←

The installation procedure is straightforward.

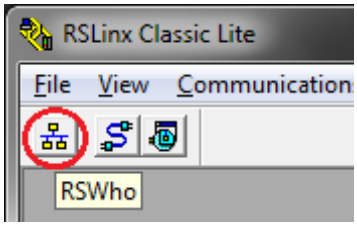
1. From the computer's desktop, click Start > Programs > Rockwell Software > RSLinx Tools > EDS Hardware Installation Tool. This will execute the EDS Hardware Installation Tool software.
2. From the Rockwell Software - Hardware Installation Tool dialog box, click Add.
3. From the Rockwell Software's EDS Wizard, click Register a single EDS file.
4. Select LEMCOM's EDS file (available in the download area of LEMCOM webpage).
5. Click Next.
6. The software will run the files through a test that evaluates the EDS files for errors.
7. The test results should display a "green check mark" to the left of the EDS file.
8. Click Next.
9. The installation tool may ask if you want to Change Graphic Image. The icon provided in the zip file will be automatically used.
10. Click Next.
11. This will bring up the Final Task Summary.
12. Click Next.
13. Once the "Please wait as the EDS wizard installs the new files..." message goes away, you have successfully completed the registration of the EDS files.
14. Click Finish.

Close the Rockwell Software - Hardware Installation Tool dialog box by clicking Exit.

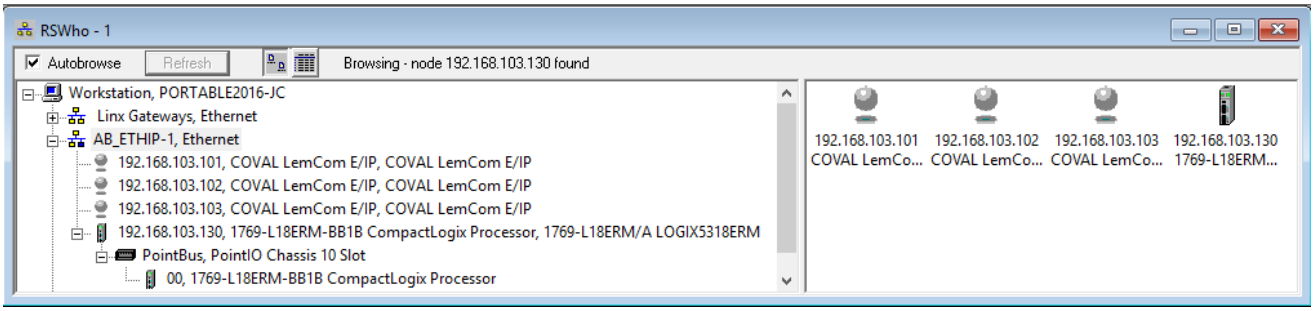
RSLinx – Check LEMCOM visibility

Use RSLinx Classic to check whether the LEMCOM's IP address set is detected by the controller.

1. Start RSLinx Classic (Start menu > Rockwell Software > RSLinx > RSLinx Classic)
2. Click on the RSWho button:



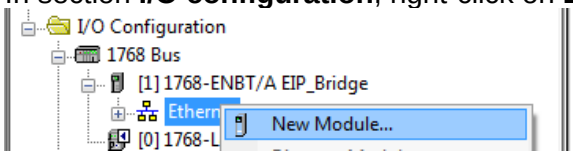
3. Then open the path **AB_ETHIP1, Ethernet** (EtherNet/IP driver must be configured in Communications > Configure drivers… menu). The LEMCOM can be seen with their IP addresses:



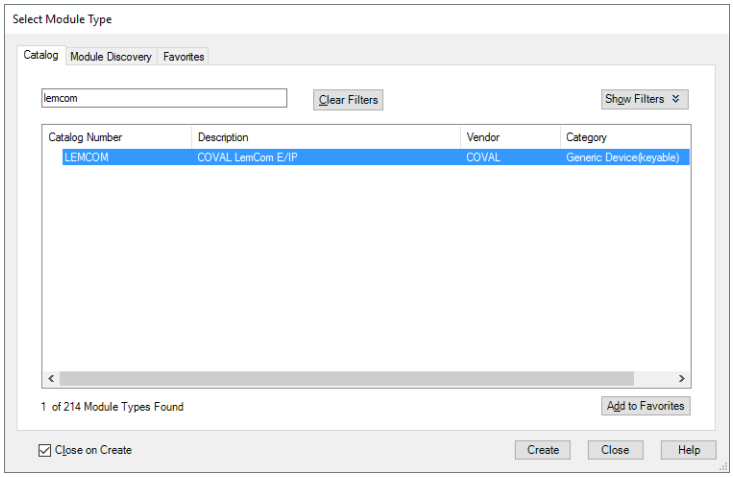
Add LEMCOM module to an RSLogix 5000 project

Follow the steps below to add a LEMCOM module (or a LEMCOM island) to a project in RSLogix 5000.

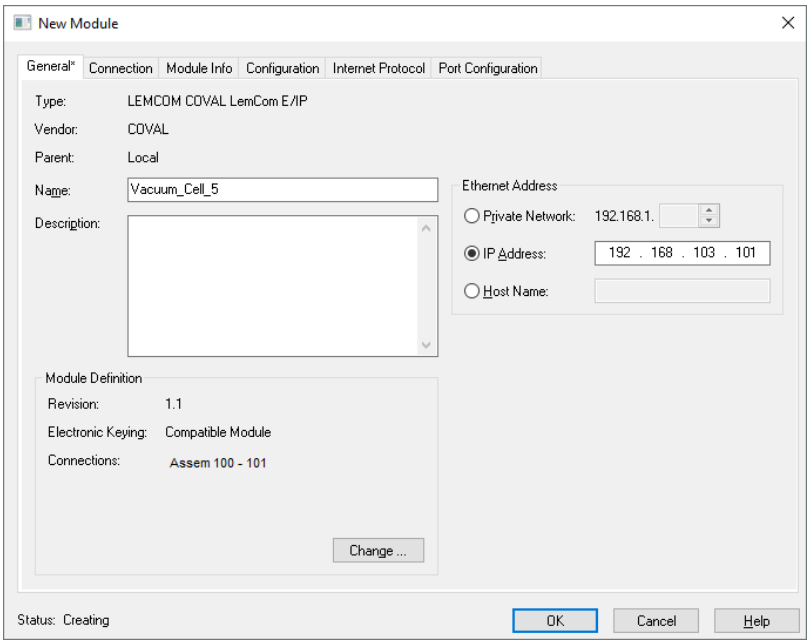
1. In section **I/O configuration**, right-click on **Ethernet** then "New module…"



2. Type in "Lemcom" or "Coval" in the search box. Select the item that appears in the list then click on "Create" (note that LEMCOM EDS file must be installed prior to this).

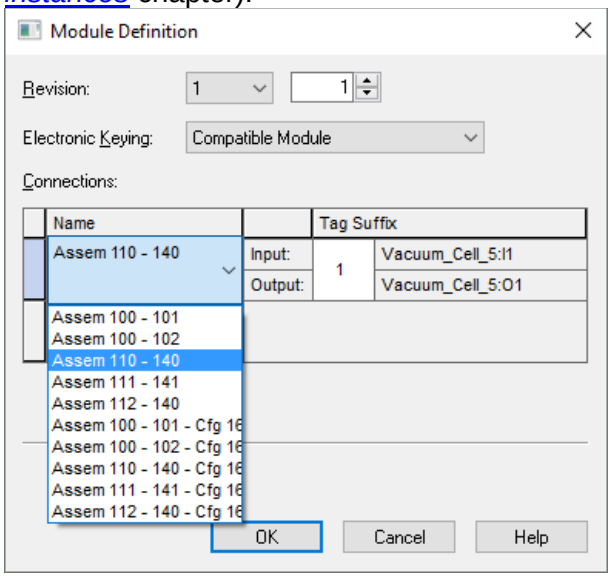


3. The following module configuration window appears:

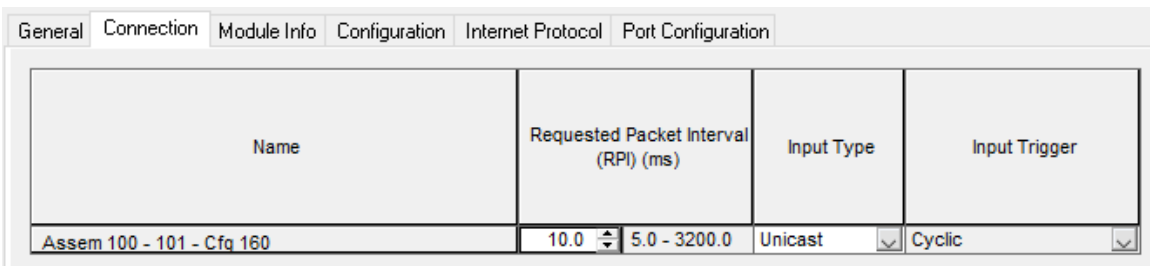


4. Give a name to the LEMCOM island and type in its IP address.

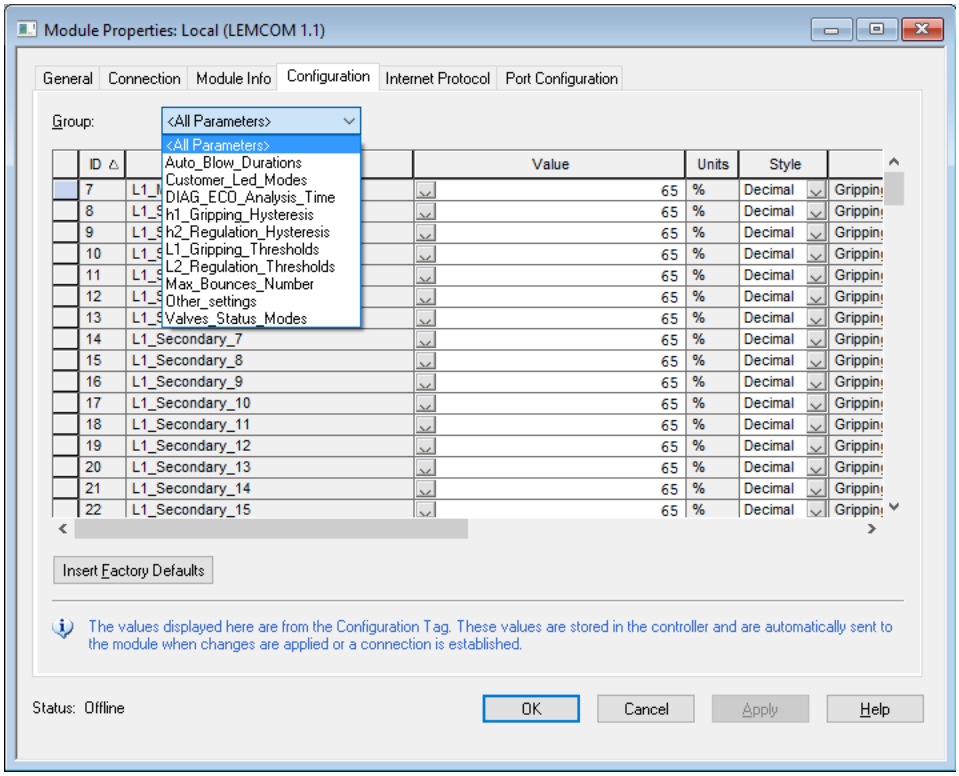
5. Default input/output assemblies are 100/101. Other connections can be selected by clicking on “Change…” button (the structures of each assembly are given in the *Static assembly instances* chapter):



6. In the Connection tab, define the Request Packet Interval (RPI). Default value is 10ms.



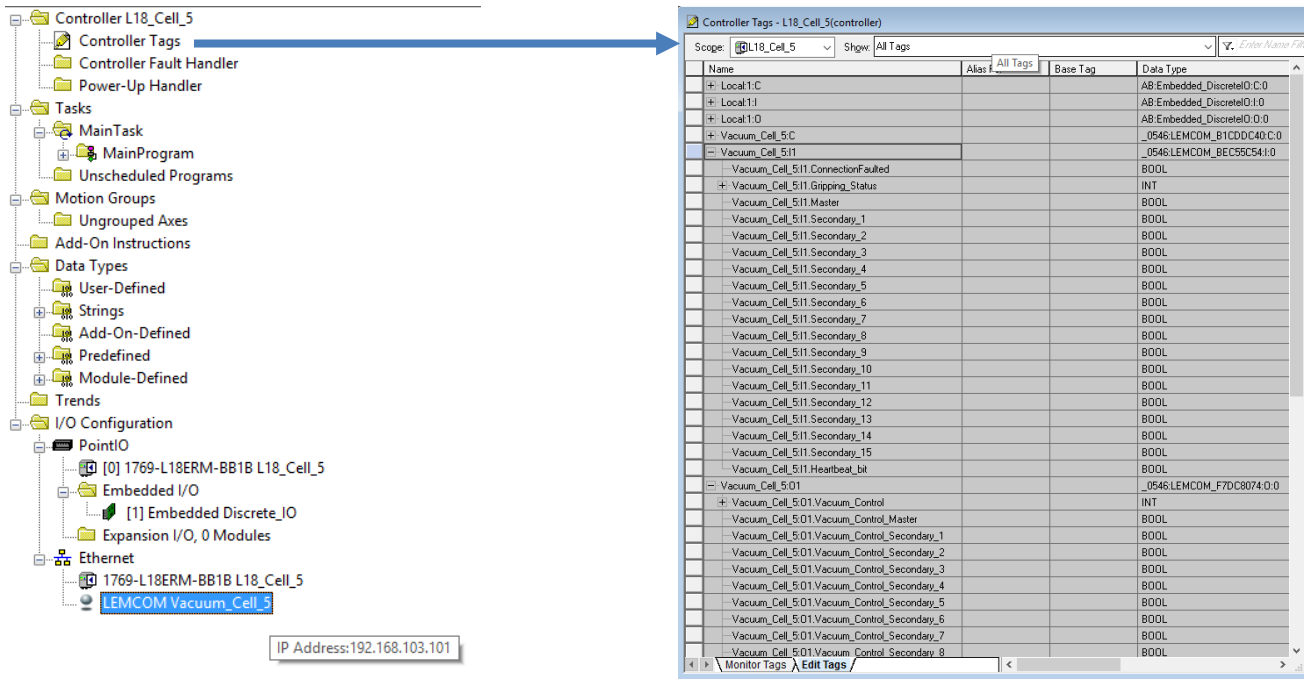
7. The Configuration tab is available when a connection that includes “Cfg 160” assembly is selected. This configuration assembly is used to store default parameters for all LEMCOM modules of the island. These data are automatically sent to the LEMCOM unit when changes are applied or a connection is established.



Important note: when configuration assembly is used, the settings defined above will override any changes made from LEMCOM Manager software.

8. Click on “OK” to validate the module configuration

9. The LEMCOM island is now shown below the Ethernet node and its I/O tags are now listed in the Controller Tags menu:



8.3 EtherNet/IP Device Profile

The device uses the Ethernet profile “Generic Device, Device Type: 2Bh”.

8.4 Supported CIP objects

Class	Name	Instances	Instance Attribute	Remark
01h	Identity object	1	1…7	
02h	Message router object	1		
04h	Assembly object	100, 110, 111, 112 101, 102, 140, 141 160	3,4 3,4 -	O ➔ T T ➔ O O ➔ T (configuration assembly)
06h	Connection manager object	1		

Table 7 - CIP objects

8.5 Supported EtherNet/IP objects

Class	Name	Instances	Instance Attribute	Remark
F5h	TCP/IP Interface Object	1	1…6	
F6h	Ethernet Link Object	2(1)	1…3, 7…10	2 ports

Table 8 - EtherNet/IP objects

(1) 2 instances for the Ethernet Link Object, one for each port.

8.6 Supported CIP services

The following services are supported depending on objects: “Get_Attribute_Single“, “Set_Attribute_Single“ and “Get_Attribute_All“.

8.7 Number of CIP connections

Connection type	Number	Access
I/O Messaging	3	1 * Exclusive Owner (Multicast) 2 * Listen Only

Table 9 – Number of CIP connections

8.8 Static assembly instances

8.8.1 Output assembly instances (O => T)

Assembly instance	Type	Data size (bytes)	Description	Comments
100	OUTPUT	4	Vacuum control (2 bytes) Blow-off control (2 bytes)	Used to send vacuum and blow-off commands to all the modules of a LEMCOM island, i.e. to the master module and to the 1 to 15 Secondary modules that may be connected to the master. Vacuum and blow-off are independent which means that vacuum can be activated at the same time as blow-off (might be useful for high speed application).
110	OUTPUT	6	Vacuum control (2 bytes) Blow-off control (2 bytes) Island restart (1 byte) Unused (1 byte)	Same as above + global restart of the island (first bit of the 5th byte).
111	OUTPUT	6	Vacuum control (2 bytes) Blow-off control (2 bytes) Island restart (1 byte) Module selection for diagnostic (1 byte)	**To be used concurrently with Input instance n° 141.** Same as above + one byte used to define the module for which the diagnostic data have to be sent back in input instance 141. By default, master module (0) is selected.
112	OUTPUT	74	Vacuum control (2 bytes) Blow-off control (2 bytes) Island restart (1 byte) Settings modification allowed (1 byte) L1 threshold (16 bytes) h1 threshold (16 bytes) L2 threshold (16 bytes) h2 threshold (16 bytes) ASC option (2 bytes) DIAG_ECO option (2 bytes)	Same as instance 110 + the ability to adjust vacuum settings (gripping and regulation thresholds, regulation system) during the process. This can be useful for applications that require different settings from one cycle to another. Settings are applied to the LEMCOM modules only when the first bit of the “Settings modification allowed” byte is set to ‘1’. **WARNING: never maintain “Settings modification allowed” bit to ‘1’ all the time, this would constantly update all LEMCOM units parameters and overwhelm master module (risk of communication loss or vacuum/blow-off commands hazards).** LEMCOM settings modification must be done carefully while machine is not running.

Table 10 - EtherNet/IP Output assembly instances

8.8.2 Input assembly instances (T => O)

Assembly instance	Type	Data size (bytes)	Description	Comments
101	INPUT	3	Gripping status (2 bytes) Heartbeat (1 byte)	Used to get “Object gripped” information of all the modules of a LEMCOM island. Each bit of the 2 bytes word corresponds to a module. Bit = ‘1’ means that the product handled by the corresponding LEMCOM module is gripped (vacuum level is above L1 threshold). This input instance also includes a Heartbeat byte. This helps users to monitor Ethernet communication status between PLC and LEMCOM.
102	INPUT	19	Gripping status (2 bytes) Heartbeat (1 byte) Vacuum level (16 bytes)	Contains same data as instance 101 and the Vacuum level values of all the modules of the island (Master module and secondary modules at address 1 to 15). Vacuum level is given in percent vacuum (0 to 99%).
140	INPUT	34	Heartbeat (1 byte) Unused (1 byte) Island composition (2 bytes) Gripped information (2 bytes) Regulation information (2 bytes) Vacuum level – % vacuum (16 bytes) Lost part alarm (2 bytes) Regulation error alarm (2 bytes) 30MCycles alarm (2 bytes) Temperature alarm (2 bytes) Power supply alarm (2 bytes)	Input assembly 140 gives some more diagnostic data of the LEMCOM island such as: - A list of the connected modules (island composition) - Alarm signals for regulation, lost part, power supply, etc. All diagnostic data are coded in a 2 bytes word where each bit corresponds to the 1 to 16 LEMCOM modules that may be on the island (1 master and up to 15 secondaries).
141	INPUT	78	Heartbeat (1 byte) Selected module in instance 111 (1 byte) Island composition (2 bytes) Gripped information (2 bytes) Regulation information (2 bytes) Vacuum level – % vacuum (16 bytes) Lost part alarm (2 bytes) Regulation error alarm (2 bytes) 30MCycles alarm (2 bytes) Temperature alarm (2 bytes) Power supply alarm (2 bytes) --- Counter - external vacuum cmd (4 bytes) Counter - internal vacuum cmd (4 bytes) Counter - blow off cmd (4 bytes) Counter - Handled parts (4 bytes) Counter - Lost parts (4 bytes) Counter - ASC regulation(4 bytes) Counter - Regulation errors (4 bytes) Counter - Local bus com error (4 bytes) Counter - Field bus com error (4 bytes) Counter – Power supply error (4 bytes) Power supply (2 bytes) Temperature (2 bytes)	Contains same data as instance 140 + the complete diagnostic data related to the module selected in the last byte of instance 111.

Table 11 - EtherNet/IP Input assembly instances

8.8.3 Configuration assembly instance

Assembly instance	Type	Data size (bytes)	Description	Comments
160	CONFIG	166	L1 threshold (16 bytes) h1 threshold (16 bytes) L2 threshold (16 bytes) h2 threshold (16 bytes) ASC option (2 bytes) DIAG_ECO option (2 bytes) Max. bounces Nb (16 bytes) DIAG ECO analysis time (16 bytes) Auto blow (2 bytes) Auto blow duration (32 bytes) Valves status (16 bytes) Customer led mode (16 bytes)	The assembly 160 is used to transfer the vacuum settings to all LEMCOM of an island (1 to 16 modules). The parameters are sent to the master LEMCOM at PLC startup, when the communication with the unit is established. Please note that, unlike LEMCOM Manager that warns user in case of incorrect parameters, the configuration assembly lets the user sends any settings. That may lead to the apparition of warnings on the modules front panels (for example: threshold or hysteresis set to 0).

Table 12 - EtherNet/IP Configuration assembly instance

8.9 Detailed instance data mapping

Abbreviations:

- SMx : Secondary Module x (with x = module address, from 1 to 15)

8.9.1 Output instance 100

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ VACUUM COMMANDS (MODULE 0 TO 15) ↓								
Byte 0	Vacuum SM7	Vacuum SM6	Vacuum SM5	Vacuum SM4	Vacuum SM3	Vacuum SM2	Vacuum SM1	Vacuum Master Module
Byte 1	Vacuum SM15	Vacuum SM14	Vacuum SM13	Vacuum SM12	Vacuum SM11	Vacuum SM10	Vacuum SM9	Vacuum SM8
↓ BLOW OFF COMMANDS (MODULE 0 TO 15) ↓								
Byte 2	Blow off SM7	Blow off SM6	Blow off SM5	Blow off SM4	Blow off SM3	Blow off SM2	Blow off SM1	Blow off Master Module
Byte 3	Blow off SM15	Blow off SM14	Blow off SM13	Blow off SM12	Blow off SM11	Blow off SM10	Blow off SM9	Blow off SM8

Table 13 - Data mapping - Output instance 100

Controller tags in RSLogix 5000:

Name	Data Type
Vacuum_Cell_5:O1	_0546:LEMCOM_F7DC8074:O:0
Vacuum_Cell_5:O1.Vacuum_Control	INT
Vacuum_Cell_5:O1.Vacuum_Control_Master	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_1	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_2	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_3	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_4	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_5	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_6	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_7	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_8	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_9	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_10	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_11	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_12	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_13	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_14	BOOL
Vacuum_Cell_5:O1.Vacuum_Control_Secondary_15	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control	INT
Vacuum_Cell_5:O1.Blow_Off_Control_Master	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_1	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_2	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_3	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_4	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_5	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_6	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_7	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_8	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_9	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_10	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_11	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_12	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_13	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_14	BOOL
Vacuum_Cell_5:O1.Blow_Off_Control_Secondary_15	BOOL

8.9.2 Output instance 110

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ VACUUM COMMANDS (MODULE 0 TO 15) ↓								
Byte 0	Vacuum SM7	Vacuum SM6	Vacuum SM5	Vacuum SM4	Vacuum SM3	Vacuum SM2	Vacuum SM1	Vacuum Master Module
Byte 1	Vacuum SM15	Vacuum SM14	Vacuum SM13	Vacuum SM12	Vacuum SM11	Vacuum SM10	Vacuum SM9	Vacuum SM8
↓ BLOW OFF COMMANDS (MODULE 0 TO 15) ↓								
Byte 2	Blow off SM7	Blow off SM6	Blow off SM5	Blow off SM4	Blow off SM3	Blow off SM2	Blow off SM1	Blow off Master Module
Byte 3	Blow off SM15	Blow off SM14	Blow off SM13	Blow off SM12	Blow off SM11	Blow off SM10	Blow off SM9	Blow off SM8
↓ RESTART COMMAND ↓								
Byte 4	-	-	-	-	-	-	-	Restart island command
↓ UNUSED ↓								
Byte 5	-	-	-	-	-	-	-	-

Table 14 - Data mapping - Output instance 110

8.9.3 Output instance 111

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ VACUUM COMMANDS (MODULE 0 TO 15) ↓								
Byte 0	Vacuum SM7	Vacuum SM6	Vacuum SM5	Vacuum SM4	Vacuum SM3	Vacuum SM2	Vacuum SM1	Vacuum Master Module
Byte 1	Vacuum SM15	Vacuum SM14	Vacuum SM13	Vacuum SM12	Vacuum SM11	Vacuum SM10	Vacuum SM9	Vacuum SM8
↓ BLOW OFF COMMANDS (MODULE 0 TO 15) ↓								
Byte 2	Blow off SM7	Blow off SM6	Blow off SM5	Blow off SM4	Blow off SM3	Blow off SM2	Blow off SM1	Blow off Master Module
Byte 3	Blow off SM15	Blow off SM14	Blow off SM13	Blow off SM12	Blow off SM11	Blow off SM10	Blow off SM9	Blow off SM8
↓ RESTART COMMAND ↓								
Byte 4	-	-	-	-	-	-	-	Restart island command
↓ MODULE SELECTION FOR DIAGNOSTIC DATA (Instance 141) ↓								
Byte 5	Module number for which user needs to collect diagnostic data in input instance 141. Encode module number (0 to 15) in byte 5.							

Table 15 - Data mapping - Ouput instance 111

Output instance 111 is meant to be used with input instance 141, byte 5 allowing to specify the module to be monitored:

- If 0x0 is written in byte 5, the bytes 34 to 77 of the input assembly 141 are populated with the diagnostic data of the master module.
- If 0x6 is written in byte 5, the bytes 34 to 77 of the input assembly 141 are populated with the diagnostic data of the secondary module located at address 6.

8.9.4 Output instance 112

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ VACUUM COMMANDS (MODULE 0 TO 15) ↓								
Byte 0	Vacuum SM7	Vacuum SM6	Vacuum SM5	Vacuum SM4	Vacuum SM3	Vacuum SM2	Vacuum SM1	Vacuum Master Module
Byte 1	Vacuum SM15	Vacuum SM14	Vacuum SM13	Vacuum SM12	Vacuum SM11	Vacuum SM10	Vacuum SM9	Vacuum SM8
↓ BLOW OFF COMMANDS (MODULE 0 TO 15) ↓								
Byte 2	Blow off SM7	Blow off SM6	Blow off SM5	Blow off SM4	Blow off SM3	Blow off SM2	Blow off SM1	Blow off Master Module
Byte 3	Blow off SM15	Blow off SM14	Blow off SM13	Blow off SM12	Blow off SM11	Blow off SM10	Blow off SM9	Blow off SM8
↓ RESTART COMMAND ↓								
Byte 4	-	-	-	-	-	-	-	Restart island command
↓ ALLOW SETTINGS MODIFICATION ↓								
Byte 5	-	-	-	-	-	-	-	Settings modification allowed (1)
SETTINGS								
Bytes 6-21	Byte 6 : L1 gripping threshold for master module Byte 7 : L1 gripping threshold for SM1 … Byte 21 : L1 gripping threshold for SM15							
Bytes 22-37	Byte 22 : h1 gripping hysteresis for master module Byte 23 : h1 gripping hysteresis for SM1 … Byte 37 : h1 gripping hysteresis for SM15							
Bytes 38-53	Byte 38 : L2 regulation threshold for master module Byte 39 : L2 regulation threshold for SM1 … Byte 53 : L2 regulation threshold for SM15							
Bytes 54-69	Byte 54 : h2 regulation hysteresis for master module Byte 55 : h2 regulation hysteresis for SM1 … Byte 69 : h2 regulation hysteresis for SM15							
Byte 70	ASC SM7	ASC SM6	ASC SM5	ASC SM4	ASC SM3	ASC SM2	ASC SM1	ASC Master Module
Byte 71	ASC SM15	ASC SM14	ASC SM13	ASC SM12	ASC SM11	ASC SM10	ASC SM9	ASC SM8
Byte 72	DIAG ECO SM7	DIAG ECO SM6	DIAG ECO SM5	DIAG ECO SM4	DIAG ECO SM3	DIAG ECO SM2	DIAG ECO SM1	DIAG ECO Master Module
Byte 73	DIAG ECO SM15	DIAG ECO SM14	DIAG ECO SM13	DIAG ECO SM12	DIAG ECO SM11	DIAG ECO SM10	DIAG ECO SM9	DIAG ECO SM8

Table 16 - Data mapping - Output instance 112

(1) All the data written in bytes 6 to 73 are applied to the LEMCOM island when the “Setting modification allowed” bit is set to 1. Only enable this bit for one PLC cycle.

WARNING: never maintain “Settings modification allowed” bit to ‘1’ all the time, this would constantly update all LEMCOM units parameters and overwhelm master module (communication loss or vacuum/blow-off commands hazards).

LEMCOM settings modification must be done carefully while machine is not running.

8.9.5 Input instance 101

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ GRIPPING STATUS ↓								
Byte 0	Gripping SM7	Gripping SM6	Gripping SM5	Gripping SM4	Gripping SM3	Gripping SM2	Gripping SM1	Gripping master
Byte 1	Gripping SM15	Gripping SM14	Gripping SM13	Gripping SM12	Gripping SM11	Gripping SM10	Gripping SM9	Gripping SM8
↓ HEARTBEAT ↓								
Byte 2	-	-	-	-	-	-	-	Heartbeat

Table 17 - Data mapping - Input instance 101

Controller tags in RSLogix 5000:

Vacuum_Cell_5:I1	_0546:LEMCOM_BEC55C54:I:0
Vacuum_Cell_5:I1.ConnectionFaulted	BOOL
Vacuum_Cell_5:I1.Gripping_Status	INT
Vacuum_Cell_5:I1.Master	BOOL
Vacuum_Cell_5:I1.Secondary_1	BOOL
Vacuum_Cell_5:I1.Secondary_2	BOOL
Vacuum_Cell_5:I1.Secondary_3	BOOL
Vacuum_Cell_5:I1.Secondary_4	BOOL
Vacuum_Cell_5:I1.Secondary_5	BOOL
Vacuum_Cell_5:I1.Secondary_6	BOOL
Vacuum_Cell_5:I1.Secondary_7	BOOL
Vacuum_Cell_5:I1.Secondary_8	BOOL
Vacuum_Cell_5:I1.Secondary_9	BOOL
Vacuum_Cell_5:I1.Secondary_10	BOOL
Vacuum_Cell_5:I1.Secondary_11	BOOL
Vacuum_Cell_5:I1.Secondary_12	BOOL
Vacuum_Cell_5:I1.Secondary_13	BOOL
Vacuum_Cell_5:I1.Secondary_14	BOOL
Vacuum_Cell_5:I1.Secondary_15	BOOL
Vacuum_Cell_5:I1.Heartbeat_bit	BOOL

Vacuum_Cell_5:I1.Gripping_Status (Gripping status of module 0 to 15)

Value = 0 ➔ object not gripped (i.e. vacuum level is below L1 threshold).
Value = 1 ➔ object gripped (i.e. vacuum level is above L1 threshold).

Vacuum_Cell_5:I1.Heartbeat_Bit equals to ‘1’ when communication with PLC is established.

8.9.6 Input instance 102

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ GRIPPING STATUS ↓								
Byte 0	Gripping SM7	Gripping SM6	Gripping SM5	Gripping SM4	Gripping SM3	Gripping SM2	Gripping SM1	Gripping Master Module
Byte 1	Gripping SM15	Gripping SM14	Gripping SM13	Gripping SM12	Gripping SM11	Gripping SM10	Gripping SM9	Gripping SM8
↓ HEARTBEAT ↓								
Byte 2	-	-	-	-	-	-	-	Heartbeat
↓ VACUUM LEVEL ↓								
Byte 3	Vacuum level – Master module – 0 to 99 % vacuum							
Byte 4	Vacuum level – SM1 – 0 to 99 % vacuum							
…	…							
Byte 18	Vacuum level – SM15 – 0 to 99 % vacuum							

Table 18 - Data mapping - Input instance 102

Controller tags in RSLogix 5000:

LemCom_B4_Bat3:I	{...}	AB:ETHERNET_...	
LemCom_B4_Bat3:I.Data	{...}	SINT[19]	
LemCom_B4_Bat3:I.Data[0]	0	SINT	Gripping Status - Modules #0 to #7
LemCom_B4_Bat3:I.Data[1]	0	SINT	Gripping Status - Modules #8 to #15
LemCom_B4_Bat3:I.Data[2]	0	SINT	Heartbeat
LemCom_B4_Bat3:I.Data[3]	0	SINT	Vacuum level - Module #0 (master)
LemCom_B4_Bat3:I.Data[4]	0	SINT	Vacuum level - Module #1
LemCom_B4_Bat3:I.Data[5]	0	SINT	Vacuum level - Module #2
LemCom_B4_Bat3:I.Data[6]	0	SINT	Vacuum level - Module #3
LemCom_B4_Bat3:I.Data[7]	0	SINT	Vacuum level - Module #4
LemCom_B4_Bat3:I.Data[8]	0	SINT	Vacuum level - Module #5
LemCom_B4_Bat3:I.Data[9]	0	SINT	Vacuum level - Module #6
LemCom_B4_Bat3:I.Data[10]	0	SINT	Vacuum level - Module #7
LemCom_B4_Bat3:I.Data[11]	0	SINT	Vacuum level - Module #8
LemCom_B4_Bat3:I.Data[12]	0	SINT	Vacuum level - Module #9
LemCom_B4_Bat3:I.Data[13]	0	SINT	Vacuum level - Module #10
LemCom_B4_Bat3:I.Data[14]	0	SINT	Vacuum level - Module #11
LemCom_B4_Bat3:I.Data[15]	0	SINT	Vacuum level - Module #12
LemCom_B4_Bat3:I.Data[16]	0	SINT	Vacuum level - Module #13
LemCom_B4_Bat3:I.Data[17]	0	SINT	Vacuum level - Module #14
LemCom_B4_Bat3:I.Data[18]	0	SINT	Vacuum level - Module #15

LEMCOM_B4_Bat3:I.Data[0] contains the 8 bits that give the gripping status of module #0 to #7.
LEMCOM_B4_Bat3:I.Data[1] contains the 8 bits that give the gripping status of module #8 to #15.

LEMCOM_B4_Bat3:I.Data[2] contains the Heartbeat bit (LEMCOM_B4_Bat3:I.Data[2].0), equal to '1' when communication with PLC is established.

LEMCOM_B4_Bat3:I.Data[3] contains the 8 bits that give the vacuum level of module #0 (master). Value is given in percent vacuum (0 to 99%) and is coded on the 8 bits.
LEMCOM_B4_Bat3:I.Data[4] contains the 8 bits that give the vacuum level of module #1 (SM1).
…
LEMCOM_B4_Bat3:I.Data[18] contains the 8 bits that give the vacuum level of module #15 (SM15).

8.9.7 Input instance 140

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ HEARTBEAT ↓								
Byte 0	-	-	-	-	-	-	-	Heartbeat
↓ UNUSED ↓								
Byte 1	-	-	-	-	-	-	-	-
↓ ISLAND COMPOSITION ↓								
Byte 2	SM7 present	SM6 present	SM5 present	SM4 present	SM3 present	SM2 present	SM1 present	Master module present
Byte 3	SM15 present	SM14 present	SM13 present	SM12 present	SM11 present	SM10 present	SM9 present	SM8 present
↓ GRIPPING STATUS ↓								
Byte 4	Gripping SM7	Gripping SM6	Gripping SM5	Gripping SM4	Gripping SM3	Gripping SM2	Gripping SM1	Gripping Master Module
Byte 5	Gripping SM15	Gripping SM14	Gripping SM13	Gripping SM12	Gripping SM11	Gripping SM10	Gripping SM9	Gripping SM8
↓ REGULATION SYSTEM (ASC) STATUS ↓								
Byte 6	ASC Status SM7	ASC Status SM6	ASC Status SM5	ASC Status SM4	ASC Status SM3	ASC Status SM2	ASC Status SM1	ASC Status Master Module
Byte 7	ASC Status SM15	ASC Status SM14	ASC Status SM13	ASC Status SM12	ASC Status SM11	ASC Status SM10	ASC Status SM9	ASC Status SM8
↓ VACUUM LEVEL ↓								
Byte 8	Vacuum level – Master module – 0 to 99 % vacuum							
Byte 9	Vacuum level – SM1 – 0 to 99 % vacuum							
…	…							
Byte 23	Vacuum level – SM15 – 0 to 99 % vacuum							
↓ LOST PART ALARM ↓								
Byte 24	Lost part on SM7	Lost part on SM6	Lost part on SM5	Lost part on SM4	Lost part on SM3	Lost part on SM2	Lost part on SM1	Lost part on Master Module
Byte 25	Lost part on SM15	Lost part on SM14	Lost part on SM13	Lost part on SM12	Lost part on SM11	Lost part on SM10	Lost part on SM9	Lost part on SM8
↓ REGULATION SYSTEM (ASC) ALARM ↓								
Byte 26	ASC alarm SM7	ASC alarm SM6	ASC alarm SM5	ASC alarm SM4	ASC alarm SM3	ASC alarm SM2	ASC alarm SM1	ASC alarm Master Module
Byte 27	ASC alarm SM15	ASC alarm SM14	ASC alarm SM13	ASC alarm SM12	ASC alarm SM11	ASC alarm SM10	ASC alarm SM9	ASC alarm SM8
↓ 30 MILLION CYCLES ALARM ↓								
Byte 28	30Mcycles alarm SM7	30Mcycles alarm SM6	30Mcycles alarm SM5	30Mcycles alarm SM4	30Mcycles alarm SM3	30Mcycles alarm SM2	30Mcycles alarm SM1	30Mcycles Master Module
Byte 29	30Mcycles alarm SM15	30Mcycles alarm SM14	30Mcycles alarm SM13	30Mcycles alarm SM12	30Mcycles alarm SM11	30Mcycles alarm SM10	30Mcycles alarm SM9	30Mcycles alarm SM8
↓ TEMPERATURE ALARM ↓								
Byte 30	Temp alarm SM7	Temp alarm SM6	Temp alarm SM5	Temp alarm SM4	Temp alarm SM3	Temp alarm SM2	Temp alarm SM1	Temp alarm Master Module
Byte 31	Temp alarm SM15	Temp alarm SM14	Temp alarm SM13	Temp alarm SM12	Temp alarm SM11	Temp alarm SM10	Temp alarm SM9	Temp alarm SM8
↓ POWER SUPPLY ALARM ↓								
Byte 32	Power alarm SM7	Power alarm SM6	Power alarm SM5	Power alarm SM4	Power alarm SM3	Power alarm SM2	Power alarm SM1	Power alarm Master Module
Byte 33	Power alarm SM15	Power alarm SM14	Power alarm SM13	Power alarm SM12	Power alarm SM11	Power alarm SM10	Power alarm SM9	Power alarm SM8

Table 19 - Data mapping - Input instance 140

8.9.8 Input instance 141

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ HEARTBEAT ↓								
Byte 0	-	-	-	-	-	-	-	Heartbeat
↓ SELECTED MODULE IN INSTANCE 111 (DIAGNOSTIC REQUEST ACKNOWLEDGEMENT) ↓								
Byte 1	Diagnostic data given in bytes 34 to 77 are related to module number given here							
Byte 2 To Byte 33	Refer to bytes 2 to 33 described for Instance 140							
↓ DIAGNOSTIC DATA OF THE SELECTED MODULE IN INSTANCE 111 ↓								
Bytes 34-37	**External vacuum counter**: Number of external activation of the vacuum valve (customer controls only / sent by PLC, LEMCOM MANAGER, Web server) Most significant byte on byte 37.							
Bytes 38-41	**Internal vacuum counter**: Total number of activation of the vacuum valve (external/customer controls + automatic controls due to ASC). Most significant byte on byte 41.							
Bytes 42-45	**Blow-off counter**: Number of activation of the blow-off valve (external/customer controls + automatic blow-off). Most significant byte on byte 45.							
Bytes 46-49	**Gripping counter**: Number of parts handled by the vacuum pump. Most significant byte on byte 49.							
Bytes 50-53	**Lost parts counter**: Number of lost parts during handling. Most significant byte on byte 53.							
Bytes 54-57	**ASC counter**: Number of activation of the Air Saving Control (ASC) system. Most significant byte on byte 57.							
Bytes 58-61	**ASC errors counter**: Number of interruption of the regulation system due to vacuum leakage (switch to permanent suction). Most significant byte on byte 61.							
Bytes 62-65	**Com. errors (local)**: Number of communication errors detected on the CAN local bus. Most significant byte on byte 65.							
Bytes 66-69	**Com. errors (bus)**: Number of communication errors detected on the customer fieldbus (Master module only). Most significant byte on byte 69.							
Bytes 70-73	**Power supply errors**: Power supply monitoring and warning when voltage is below the Power supply threshold (21,6V by default). Most significant byte on byte 73.							
Bytes 74-75	**Power supply measurement**: given in tenth of volts Most significant byte on byte 75.							
Bytes 76-77	**Internal temperature measurement** Most significant byte on byte 77.							

Table 20 - Data mapping - Input instance 141

8.9.9 Configuration instance 160

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
↓ ISLAND SETTINGS ↓								
Bytes 0-15	Byte 0 : L1 gripping threshold for master module Byte 1 : L1 gripping threshold for SM1 … Byte 15 : L1 gripping threshold for SM15							
Bytes 16-31	Byte 16 : h1 gripping hysteresis for master module Byte 17 : h1 gripping hysteresis for SM1 … Byte 31 : h1 gripping hysteresis for SM15							
Bytes 32-47	Byte 32 : L2 regulation threshold for master module Byte 33 : L2 regulation threshold for SM1 … Byte 47 : L2 regulation threshold for SM15							
Bytes 48-63	Byte 48 : h2 regulation hysteresis for master module Byte 49 : h2 regulation hysteresis for SM1 … Byte 63 : h2 regulation hysteresis for SM15							
Byte 64	ASC SM7	ASC SM6	ASC SM5	ASC SM4	ASC SM3	ASC SM2	ASC SM1	ASC Master Module
Byte 65	ASC SM15	ASC SM14	ASC SM13	ASC SM12	ASC SM11	ASC SM10	ASC SM9	ASC SM8
Byte 66	DIAG ECO SM7	DIAG ECO SM6	DIAG ECO SM5	DIAG ECO SM4	DIAG ECO SM3	DIAG ECO SM2	DIAG ECO SM1	DIAG ECO Master Module
Byte 67	DIAG ECO SM15	DIAG ECO SM14	DIAG ECO SM13	DIAG ECO SM12	DIAG ECO SM11	DIAG ECO SM10	DIAG ECO SM9	DIAG ECO SM8
Bytes 68-83	Byte 68 : Maximum bounces number for master module Byte 69 : Maximum bounces number for SM1 … Byte 83 : Maximum bounces number for SM15							
Bytes 84-99	Byte 84 : DIAG ECO analysis time (second) for master module Byte 85 : DIAG ECO analysis time for SM1 … Byte 99 : DIAG ECO analysis time for SM15							
Byte 100	AUTO BLOW SM7	AUTO BLOW SM6	AUTO BLOW SM5	AUTO BLOW SM4	AUTO BLOW SM3	AUTO BLOW SM2	AUTO BLOW SM1	AUTO BLOW Master Module
Byte 101	AUTO BLOW SM15	AUTO BLOW SM14	AUTO BLOW SM13	AUTO BLOW SM12	AUTO BLOW SM11	AUTO BLOW SM10	AUTO BLOW SM9	AUTO BLOW SM8
Bytes 102-133	Byte 102 : Auto blow off duration (ms) for master module (1 to 9999 ms) – Least Significant Byte (LSB) Byte 103 : Auto blow off duration (ms) for master module – Most Significant Byte (MSB) Byte 104 : Auto blow off duration (ms) for SM1 – Least Significant Byte (LSB) Byte 105 : Auto blow off duration (ms) for SM1 – Most Significant Byte (MSB) … Byte 132 : Auto blow off duration (ms) for SM15 – Least Significant Byte (LSB) Byte 133 : Auto blow off duration (ms) for SM15 – Most Significant Byte (MSB)							
Bytes 134-149	Byte 134 : Valves status (in case of communication loss) for master module Byte 135 : Valves status for SM1 … Byte 149 : Valves status for SM15							
Bytes 150-165	Byte 150 : Customer LED mode (blue LED) for master module Byte 151 : Customer LED mode for SM1 … Byte 165 : Customer LED mode for SM15							

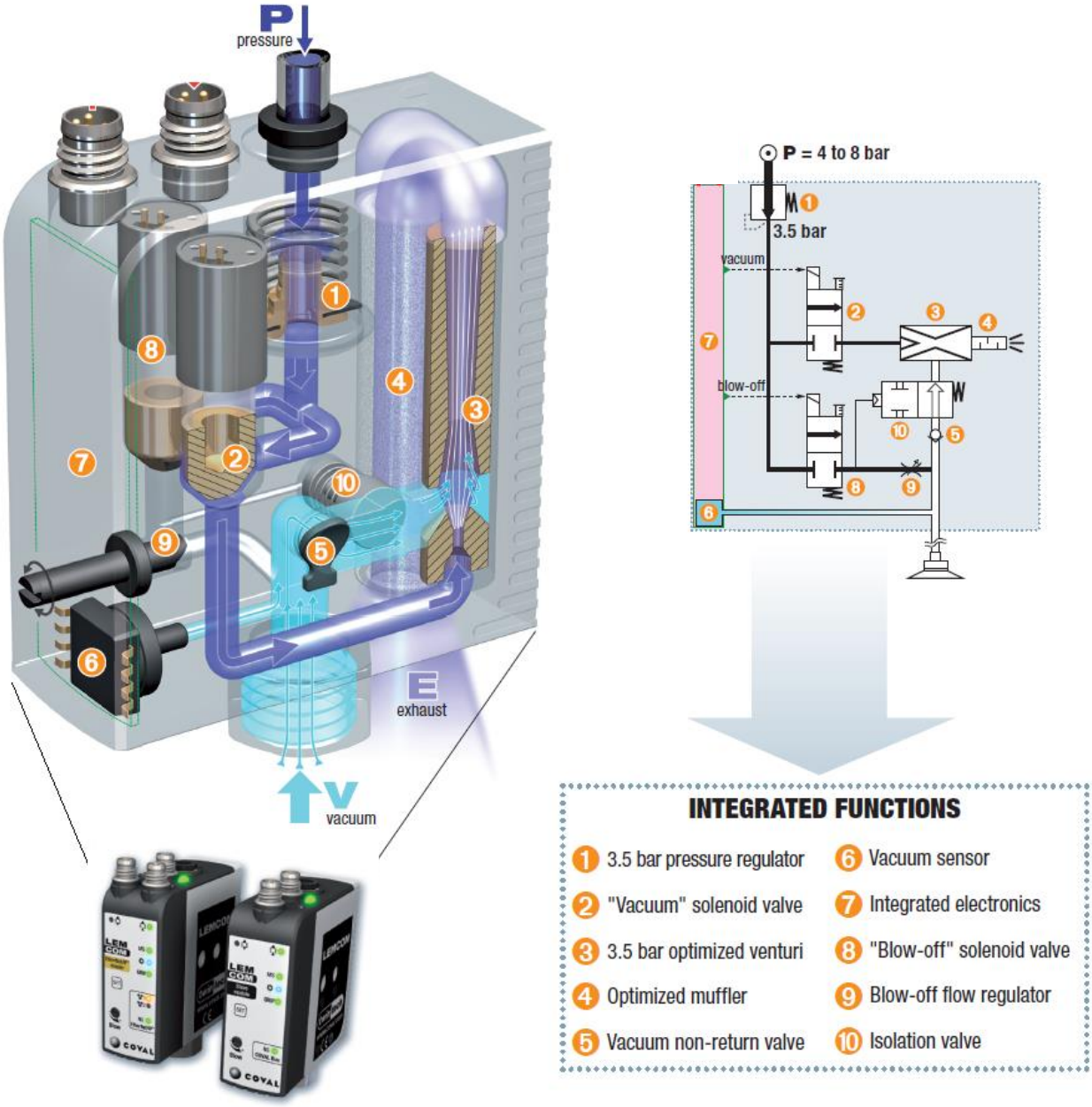
Table 21 - Data mapping - Configuration instance 160

9 VACUUM CHARACTERISTICS

9.1 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.

9.2 Typical handling cycle

The following vacuum parameters can be remotely configured using LEMCOM Manager or the LEMCOM Web Server:

- **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 EtherNet/IP™ 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:

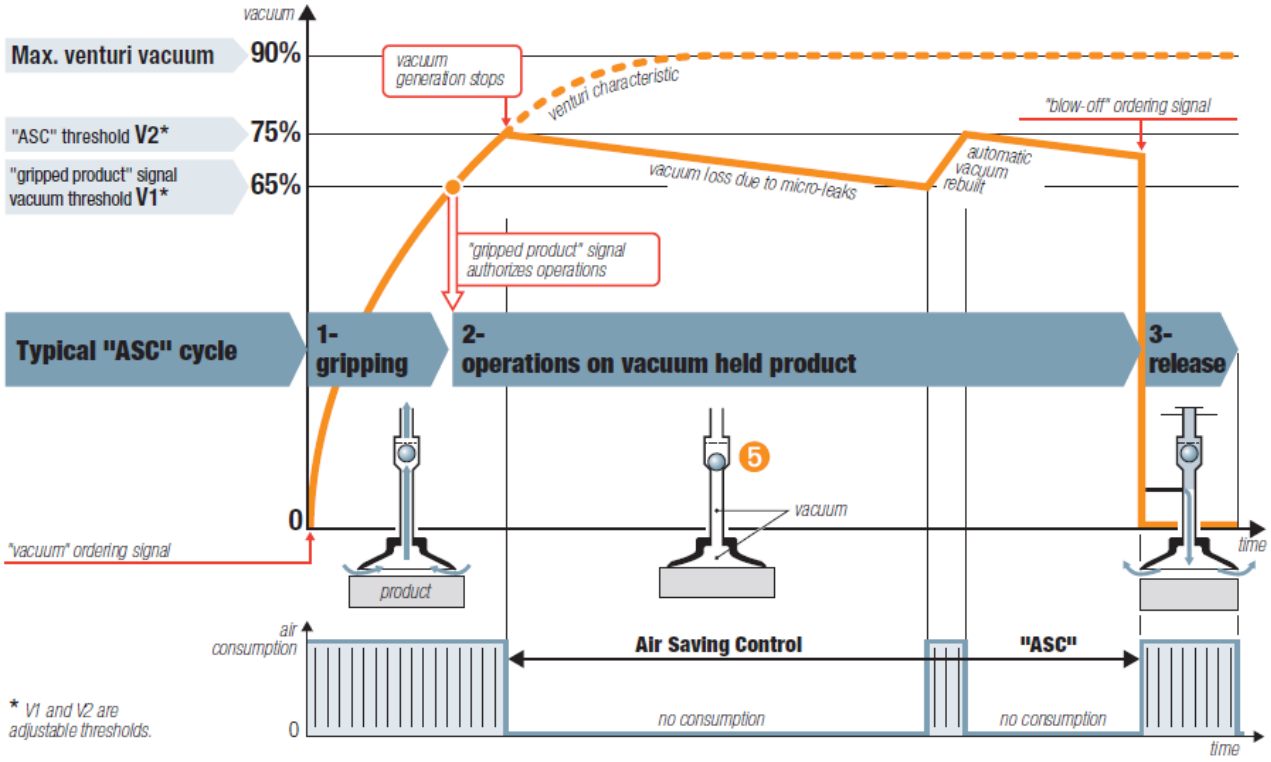


Figure 11 - Typical vacuum cycle

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 22 - 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.

10 TECHNICAL SPECIFICATIONS

10.1 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 :

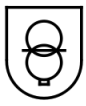
- 2-port ethernet switch
- Static IP address or DHCP
- EDS file & RSLogix 5000 Add-On Instructions

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.

10.2 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 22,23 or even 24V 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.

10.3 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.

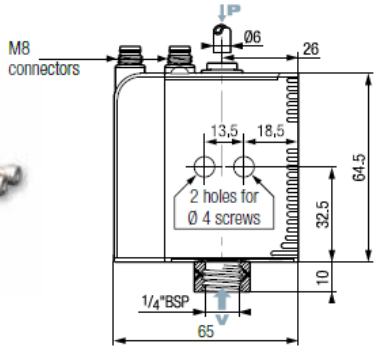
Number of modules	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Maximum current draw (mA) 24V supply	150	250	350	450	550	650	750	850	950	1050	1150	1250	1350	1450	1550	1650

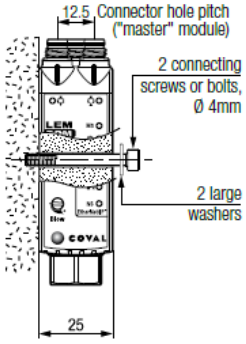
Table 23 - Current consumption of a LEMCOM island

10.4 Dimensions and mounting options

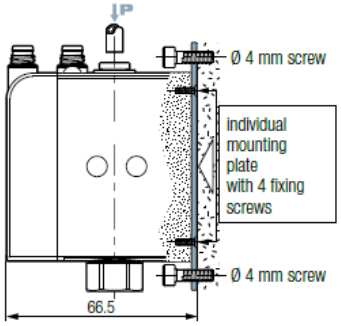
1- Stand-alone modules

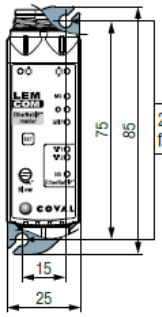
Mounting from side





Mounting from front

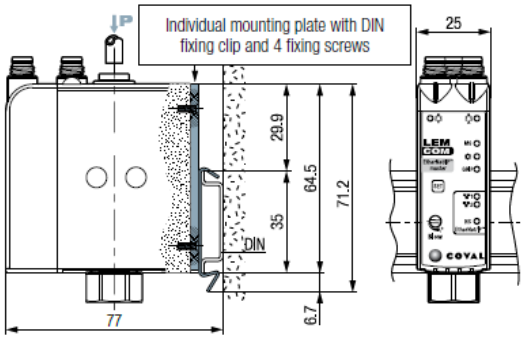




For mounting from front, in addition to the module, you need to order an additional kit:

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

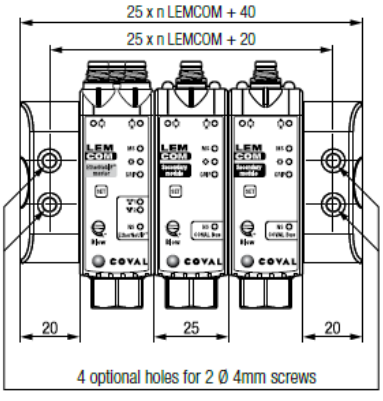
Mounting on DIN rail



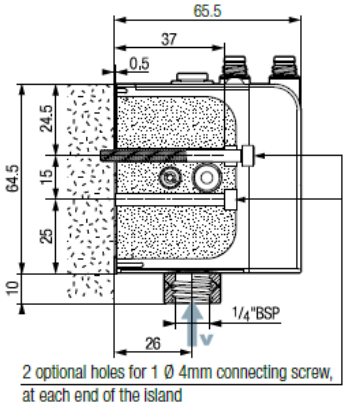
For a static mounting (for example, in a cabinet), a module can be clipped onto a DIN rail. For this purpose, the module must first be equipped with an individual plate for fixing onto a DIN rail, to be ordered separately:

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

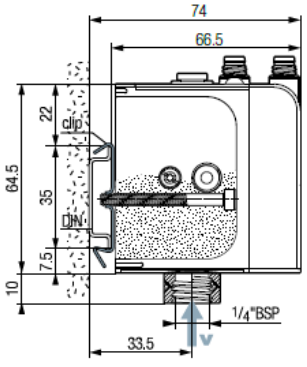
2- Islands



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.*

10.5 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

11 FIGURES LIST

12 TABLES LIST

13 APPENDICES

13.1 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