



## EN

### OPERATING INSTRUCTIONS

This manual is intended for users of **CVGL** series vacuum grippers.

It contains all the information you need to integrate the grippers, as well as the instructions for use and maintenance.

The operating instructions were originally drafted in French (original version).

They must be kept for any future use.

Subject to technical changes, mistakes or printing errors.

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NFC ))))

IO-Link



**PRIOR TO COMMISSIONING THIS PRODUCT,  
PLEASE CAREFULLY READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS.**



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## SUMMARY

<b>1. IMPORTANT INFORMATION</b>	<b>3</b>	<b>17. DIAGNOSTICS</b>	<b>24</b>
<b>2. SAFETY INSTRUCTIONS</b>	<b>3</b>	17.1. Device Info	24
<b>3. INSTRUCTIONS FOR USE</b>	<b>4</b>	17.2. Cycle Counters	24
3.1. Basic Installation	4	17.3. Manual Mode	25
3.2. Commissioning and Decommissioning	4	17.4. Calibration	25
3.3. Operating the Vacuum Gripper	5	17.5. Reset Settings	26
3.4. Transportation and Storage	5	<b>18. EVENTS AND ALARMS</b>	<b>26</b>
3.5. Maintenance	5	<b>19. IO-LINK PARAMETER SETTINGS</b>	<b>27</b>
3.6. Disposal	5	19.1. IO-Link Communication	27
<b>4. NAMEPLATE</b>	<b>5</b>	19.2. Cyclical Data (PDI/PDO)	27
<b>5. IDENTIFYING YOUR MODEL</b>	<b>6</b>	19.3. Acyclical Data	28
<b>6. TECHNOLOGIES USED</b>	<b>8</b>	<b>20. NFC</b>	<b>29</b>
6.1. Gripping Interface	8	20.1. Technical Data	29
6.2. Flow Control Technologies	9	20.2. Using NFC	29
<b>7. OVERVIEW, DIMENSIONS, AND MOUNTING</b>	<b>9</b>	20.3. Functionality	30
7.1. Overview	9	20.4. Downloading the COVAL VACUUM MANAGER NFC App	30
7.2. Dimensions and Mounting Options	10	<b>21. OPERATING THE VACUUM GRIPPER</b>	<b>30</b>
7.3. Gripping Interface Dimensions	12	21.1. Version with Foam Gripping Interface	30
<b>8. CHARACTERISTICS</b>	<b>13</b>	21.1.1. Version with foam and flow control technology using valves	31
<b>9. INSTALLING THE VACUUM GRIPPER</b>	<b>14</b>	21.1.2. Version with foam and flow control technology using flow control nozzle	32
9.1. Pneumatic Supply for Vacuum Grippers Equipped with One or More CMS HDE Vacuum Generators	14	21.2. Version with Suction Cup Gripping Interface	33
9.2. Pneumatic Connection	14	21.3. Version with COVAL-flex Gripping Interface	34
9.2.1. CVGL Versions D1 and D2	15	<b>22. MAINTENANCE</b>	<b>35</b>
9.2.2. CVGL Version D3	15	22.1. Frequency	35
9.2.3. CVGL Version G0	15	22.2. Assembling/Disassembling Gripping Interfaces	36
9.3. Connecting a Vacuum Switch	16	22.3. Replacing the Gripping Foam	36
9.4. Electrical Connections: CVGL with Vacuum Generator Control (versions S and V)	16	22.4. Replacing Suction Cups	37
9.5. CVGL with Vacuum Level Display (Versions VA and VF)	17	22.5. Disassembling the CMS HDE Series Vacuum Generator	37
<b>10. INSTALLING AND OPERATING REMOTE HMI (CVGL VERSION VI)</b>	<b>17</b>	22.6. Maintenance Procedures for a Vacuum Generator, CMS HDE Series	38
10.1. Dimensions	17	22.6.1. Cleaning the filter screen on the compressed air supply	38
10.2. Installing the Remote HMI, part no. HMIHD1M84P	18	22.6.2. Cleaning the vacuum filter and the vacuum check valve	38
10.3. Configuring a Remote HMI	18	22.6.3. Cleaning the multi-stage venturi profiles	40
10.4. Front Panel Dialog	19	22.6.4. Replacing the solenoid valves	41
<b>11. HMI DETAILS AND FEATURES</b>	<b>19</b>	22.6.5. Replacing the pressure connection end plate for CMSHDE90X__NV0	41
11.1. Powering On	19	22.6.6. Replacing the valve block for CMSHDE90X__SV0C15P / VV0C15P and CMSHDE90X__SVX_ / VVX_	41
11.2. Details of the Main Screen	19	22.6.7. Replacing the exhaust silencer	42
11.3. Keypad Functions	20	22.7. Performing Airtightness Test on Vacuum Gripper	42
<b>12. SUMMARY OF FUNCTIONS</b>	<b>20</b>	<b>23. SPARE PARTS</b>	<b>43</b>
12.1. Accessing Live Diagnostic Data	20	23.1. Foam Gripping Interface	43
12.2. Menu Tree	21	23.1.1. Complete spare foam gripping interface	43
<b>13. LOCKING/UNLOCKING THE KEYPAD</b>	<b>22</b>	23.1.2. Spare foam bases	44
<b>14. PROCESS SETTINGS</b>	<b>22</b>	23.2. Suction Cup Gripping Interfaces	44
14.1. Setting Threshold 1	22	23.2.1. Complete replacement suction cup gripping interface	44
14.2. Auto Blow-off	23	23.2.2. Spare suction cups	45
<b>15. USER SETTINGS</b>	<b>23</b>	23.3. CMS HDE Series Multi-Stage Vacuum Generators for CVGL__D1, D2, or D3	46
15.1. Language	23	23.4. Spare Parts for CMS HDE Series Vacuum Generators	46
15.2. Screen	23	23.5. Vacuum Switch and Vacuum Gauge	50
15.3. Units	23	23.6. Accessories	50
<b>16. DEVICE SETTINGS</b>	<b>24</b>	<b>24. GLOSSARY</b>	<b>50</b>
16.1. Input/Output Switching Mode: PNP or NPN	24	<b>25. WARRANTY</b>	<b>50</b>
16.2. NO / NC	24	<b>26. RECYCLING</b>	<b>50</b>
		<b>27. EC DECLARATION</b>	<b>51</b>

**NOTE:**

This document provides detailed operating instructions for the *standard models* referenced in chapter 5. For *custom models*, the information herein must be adapted to the specific features of the product. Custom versions are products that have been tailored to meet the constraints of a specific application. The following are examples of such custom models:

- Different product lengths
- Multi-zone
- Different suction cups
- Different accessories

## 1. IMPORTANT INFORMATION

This document contains important instructions and information regarding various stages in the life cycle of the product:

- Transportation, storage, commissioning, and decommissioning.
- Operation and service.

The operating instructions correspond to the product actually delivered.

This document is part of the product and the instructions below must be followed:

- Read this document carefully and observe the instructions to ensure safe installation, optimal operation of the product, and to avoid any malfunction.
- Keep the document within reach of the product so operators can easily access it.



- Failure to observe the instructions specified in this document may lead to injury or even death!
- COVAL will not be held liable for any damage or breakdown resulting from failure to follow instructions.

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## 2. SAFETY INSTRUCTIONS

Only qualified personnel should be authorized to use the components. These individuals must be trained in the following areas:

- Installing pneumatic and electric equipment.
- Applicable safety rules and requirements for using components and installing them in devices, machines, and production lines.
- Appropriate handling of components and their respective products.
- Proper use of the operating materials and supplies.
- The latest applicable EC directives, legislations, decrees, and standards, as well as the current state of the technology for its intended use.
- Any special measures necessary to meet these requirements, as well as the current state of the technology.
- Installation in a secure environment.

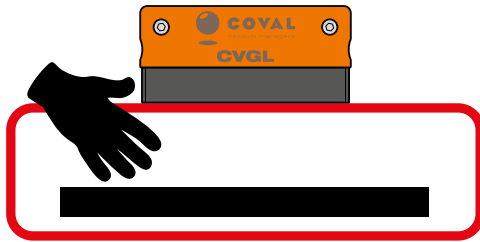
**The vacuum gripper is solely intended for use in automated applications and in secure areas.**

The improper use of components, use of operating materials and supplies other than those defined, improper voltages, and/or other environmental conditions may lead to failure, damage, and/or injury.

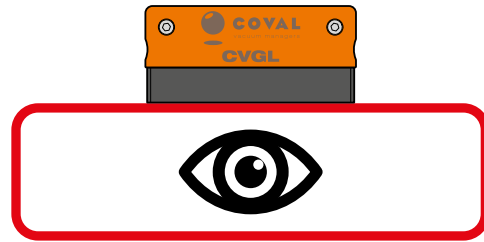
*This list must be considered as an overview and does not claim to be exhaustive. It can be further expanded by users according to their particular needs.*

## HAZARD AREAS

Area where there is a risk of crushing



Area where there is a risk of air ejection



### Notes for the manufacturer of the final machinery and for the end user

- Standing or walking in the operating area of the vacuum gripper is strictly prohibited. In the event of a power or pneumatic supply failure, the load handled by the gripper will be released.
- Never look inside and/or introduce hands into cavities, holes, or openings (e.g. air exhausts, openings/holes under the suction cups, etc.).
- The vacuum gripper described in this manual is designed for implementation in industrial systems. In other words, It must not be used under any conditions other than those specified.
- Once the vacuum gripper is installed, the manufacturer of the final machinery is responsible for the final assessment of safety systems applied prior to putting the facility into operation. It is the responsibility of the manufacturer of the final machinery to specify the PPE required for operators standing in the vicinity as well as for those who have access to the operating area. Furthermore, the said manufacturer must certify final commissioning in accordance with applicable local rules and regulations.

## 3. INSTRUCTIONS FOR USE

### 3.1. Basic Installation

In order to ensure flawless installation and operation, the following rules must also be observed:

- Vacuum grippers must be carefully removed from their packaging.
- Vacuum grippers must be protected against any and all damage.
- During installation and maintenance work, the vacuum generator must be de-energized (air and power) and secured against any unauthorized activation.
- Any attempt to alter the vacuum gripper is strictly prohibited.
- The area surrounding the vacuum gripper and the location where it is used must be kept clean (no outdoor use).
- Only the fittings/connectors provided may be used.
- During installation, only flexible tubes and tubes that are suitable for the specific operating material may be used (Improper tubing and/or electrical lines are a major safety hazard- **including risk of death!**).
- Conductive and live cable lines must be insulated, of an adequate size, and properly installed.
- Pneumatic and electric lines must be connected to the component in a stable and safe manner.
- Ensure that any physical contact with electric parts is prevented (protect electrical contacts).
- Only available fastening means described in this document may be used and tightening torques must be used accordingly.
- The possibility of power or pneumatic supply interruption must be taken into consideration to ensure people and systems are protected at all times.
- Emergency stops should be accounted for when designing the system.

### 3.2. Commissioning and Decommissioning

#### Commissioning:

- Ensure the flexible tubes for compressed air and power supply are connected correctly using the appropriate connectors.

#### Decommissioning (prior to any disassembly or maintenance work):

- Ensure the gripper is not holding any objects (load may drop).



### 3.3. Operating the Vacuum Gripper



#### Intended use

The vacuum gripper is solely intended for use in automated applications and in secure areas. Use cases depend on the gripping interfaces used → see chapter 6.



#### Unintended use

The vacuum gripper may not be used for the following:

- Manual applications.
- Uses other than those established by the manufacturer or specified in this manual.
- In direct contact with hazardous materials (molten masses, radioactive products), water, steam, or in environments where dripping or splashing water, oil, etc. may occur.
- In explosive, acidic, alkaline, or saline atmospheres.
- In environments subject to strong vibrations and/or shocks.

### 3.4. Transportation and Storage

When handling the vacuum gripper, only use equipment that is suitable for its dimensions and weight.

For proper storage of the system and its spare parts, we recommend the following:

- Do not store in outdoor areas or areas exposed to bad weather, excessive moisture, or direct sunlight
- In a reasonably clean environment, place the system in such a way that it rests on a stable support base, and ensure that the device cannot tip over.
- Store the gripper in a manner where the interface is uncompressed.

### 3.5. Maintenance

Maintenance must be performed in accordance with the instructions in this manual. Prior to performing any maintenance work, follow the instructions provided in section 3.2.

### 3.6. Disposal

When disposing of the system or any of its constituent parts that are no longer functional, follow the procedure below:



Waste electrical and electronic equipment (WEEE) must not be disposed of in urban waste collection bins but given to the appropriate recycling organization (see section 26 on RECYCLING).



- Failure to observe the above safety instructions may lead to failure, damage, and injury—even risk of death.
- The components of the device that are no longer in working order must be recycled in an environmentally-friendly manner!

## 4. NAMEPLATE

The nameplate is affixed to the vacuum gripper in such a way that it is legible at all times.

It includes the following information:




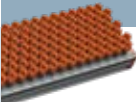
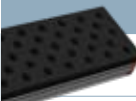
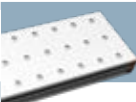
- Part number
- Serial number
- Weight
- CE marking
- UKCA marking.



*Sample nameplate*





Always provide the part and serial numbers of the product when you contact COVAL.

## 5. IDENTIFYING YOUR MODEL

	CVGL	424	D		VSA33JK	X		H	X	
<b>OVERALL LENGTH</b>										<b>ASSEMBLY TYPE</b>
	424 mm	<b>424</b>								<b>X</b> Screw mounting
	624 mm	<b>624</b>								<b>C</b> Quick-mounting spring clips
	824 mm	<b>824</b>								
<b>HOLE/CUP PATTERN LAYOUT</b>										
	Staggered		<b>Q</b>							
	Straight*		<b>D</b>							
* Only available for "maxi" type gripping interface with minimum suction cup Ø 26mm.										
<b>SUCTION CUPS GRIPPING INTERFACES</b>							<b>FILTER</b>		<b>TECHNOLOGY</b>	
 <b>"mini" type interface:</b> 2.5 bellows suction cups Ø 14 mm in silicone 35 Shore with flow control nozzles				<b>VSP14BF</b>		<b>X</b>	Without	<b>H</b>	Flow control nozzles	
<b>"medium" type interface:</b> 1.5 bellows suction cups Ø 25 mm in natural rubber with flow control nozzles.				<b>VSA25JI</b>						
<b>"maxi" type interface:</b> 1.5 bellows suction cups Ø 33 mm in natural rubber with flow control nozzles.				<b>VSA33JK</b>						
<b>"maxi" type interface:</b> 2.5 bellows suction cups Ø 30 mm in white silicone 35 Shore with flow control nozzles.				<b>MVS30EK</b>						
<b>FOAM GRIPPING INTERFACES</b>										
 <b>Foam "mini" type interface:</b> EPDM (thickness 20 mm)				<b>F2S</b>		<b>X</b>	Without	<b>H</b>	Flow control nozzles	
<b>Foam "maxi" type interface:</b> EPDM (thickness 20 mm)				<b>F2B</b>		<b>F</b>	With filter	<b>E</b>	Airtight valves	
<b>COVAL-flex GRIPPING INTERFACES</b>									<b>V</b>	Check valves
 <b>"COVAL-flex" gripping interfaces are designed to respond to specific applications. Our vacuum team will recommend and define any applications of yours which can benefit from its special features.</b>										

### SPECIAL VERSIONS

There can be instances where the standard CVGL versions will not match your application requirements. COVAL can provide you personalized solutions based on your specifications, by integrating specific function and suggesting custom lengths and suction cup types.

	D1	S		1		K		VA
VERSION WITHOUT VACUUM GENERATOR			GENERATOR CONTROL		GENERATOR CONFIGURATION		EXHAUST	
Without vacuum generator	<b>G0</b>	<b>N</b>	Without	<b>0</b>	Without	<b>X</b>	Without	
VERSIONS WITH VACUUM GENERATOR*			GENERATOR CONTROL		GENERATOR CONFIGURATION		EXHAUST	
1 x CSMHDE_50 multi-stage vacuum pump Flow rate: 700 NI/min	<b>D1</b>	<b>N</b>	Without	<b>0</b>	Without	<b>K</b>	Through-type silencer	
1 x CSMHDE_100 multi-stage vacuum pump Flow rate: 1100 NI/min	<b>D2</b>	<b>S*</b>	CSMHDE__S__ Vacuum pump with <b>NC</b> vacuum control and <b>NC</b> blow-off control. Choice of blow-off settings (only on CVGL__S2_models): ▪ Controlled by external signal ▪ Automatic timer from 50 to 9999 ms (advantage: saves one controller output).	<b>1</b>	CSMHDE____VOC15P_ Multi-stage vacuum pump without vacuum switch and HMI ▪ One M12 5-pin male PNP ▪ Digital inputs/ outputs mode (SIO)			
2 x CSMHDE_100 multi-stage vacuum pump Flow rate: 2200 NI/min	<b>D3</b>	<b>V*</b>	CSMHDE__V__ Vacuum pump with <b>NO</b> vacuum control and <b>NC</b> blow-off control. ▪ Blow-off controlled by external signal	<b>2</b>	CSMHDE____VXC15X_ Multi-stage vacuum pump with integrated vacuum switch and pressure sensor, without HMI ▪ One M12 5-pin male configurable as PNP or NPN ▪ One M8 4-pin male for remote HMI ▪ Electronic vacuum switch ▪ Digital Output D01 "object gripped" 24 V DC / NO ▪ Digital input/outputs mode (SIO) /  IO-Link ▪ Compatible with HMI (for VI option)			
* Only for D1 and D2.								
VACUUM LEVEL DISPLAY								
Without								<b>VO</b>
	Vacuum switch with electronic display							<b>VA</b>
	Vacuum gauge (for versions with control, option available for 624 mm in length and longer)							<b>VF</b>
	HMI on CMS HDE (compatible with S2 and V2 versions only)							<b>VI</b>

## 6. TECHNOLOGIES USED

### 6.1. Gripping Interface

With **CVGL**, COVAL gives you a choice of 3 complementary gripping interface technologies: vacuum grippers with foam, suction cup grippers, and grippers with a COVAL-flex interface.

In order to optimize the performance of the **CVGL** series for different applications, the vacuum grippers are available in different gripping patterns, hole diameters, and cup sizes.

→ A broad range which meets all application requirements.

#### "FOAM" Interface

- Handling of rigid products.
- Gripping textured or uneven surfaces.
- Flow control nozzles, airtight valves, or check valves.
- 2 standard hole diameters (Ø 12, 16mm).
- 2 standard hole patterns.
- 3 standard lengths (424, 624, and 824mm) or custom length.



#### "SUCTION CUP" Interface

- Handling of flexible products.
- Wide range of cup options.
- Flow control nozzles in multiple diameters.
- 4 types of standard suction cups (Ø 14, Ø 25, Ø 30 and Ø 33 mm).
- 3 standard cup patterns.
- 3 standard lengths (424, 624, and 824mm) or custom length.



#### "COVAL-flex" Interface

- Handling of aluminum cans, canned food, glass containers, etc.
- Flexible interface, extremely tear-resistant.
- Hole pattern dependent upon application requirements, completely customizable.



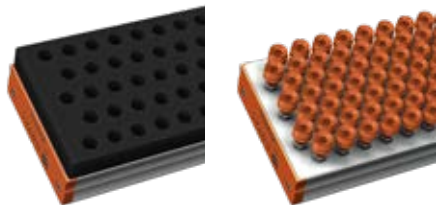
**COVAL-flex**

### Standard Hole/Cup Patterns

In order to optimize the performance of the **CVGL** series for different applications, the vacuum grippers are available in different gripping patterns, hole diameters, and cup sizes.

#### "MINI" type

- Reduced hole spacing, allowing small, flexible pieces to be gripped.
- The multitude of gripping points guarantees a strong grip, even with random positioning of products.



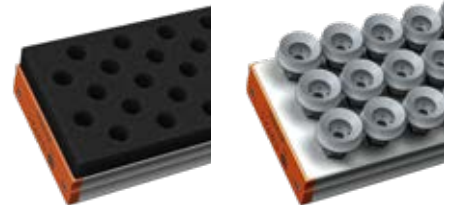
#### "MEDIUM" type

- An intermediate distribution of gripping points between the "mini" and "maxi" type.
- Ideal for handling dense loads with reduced gripping surface.



#### "MAXI" type

- Large gripping point surfaces, allowing heavy loads to be gripped.
- Ideal for gripping parts with rigid gripping surfaces.



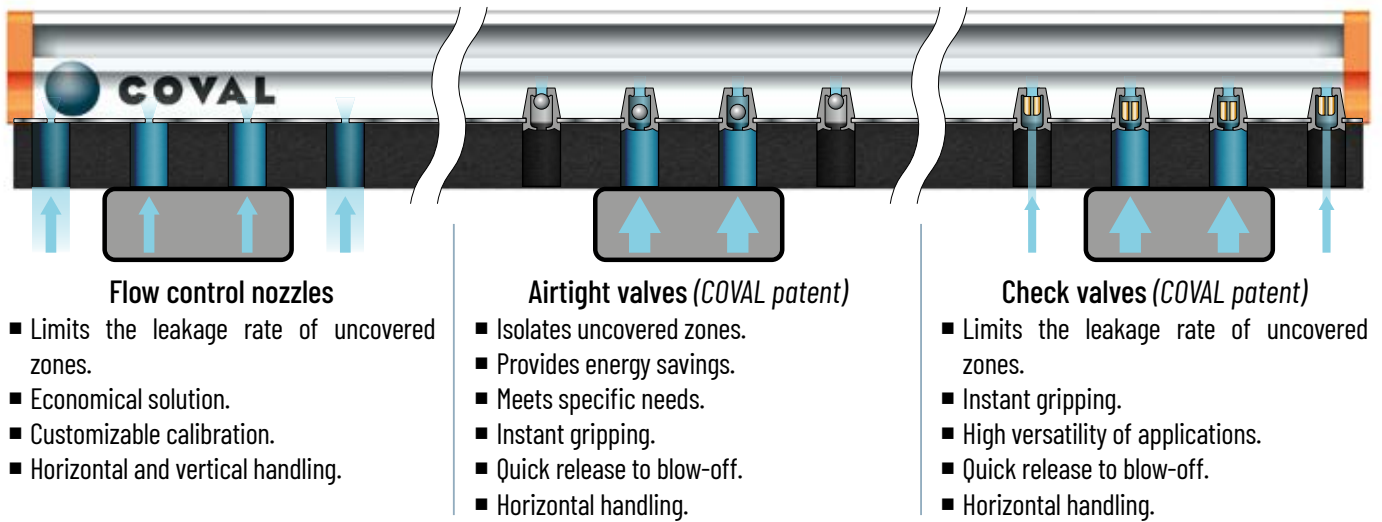
### Vacuum Gripping Force

Part number	Total length of the vacuum gripper (mm)	Force at 80% vacuum* (N) / (lbf)	Force at 45% vacuum* (N) / (lbf)
CVGL 424_ _ _ _	424	1035 / 232.6	600 / 134.9
CVGL 624_ _ _ _	624	1550 / 348.4	900 / 202.3
CVGL 824_ _ _ _	824	2070 / 465.3	1200 / 269.8

\* Indicative force for a vacuum gripper 100% covered by the load, without safety factor, on a rigid and airtight surface.

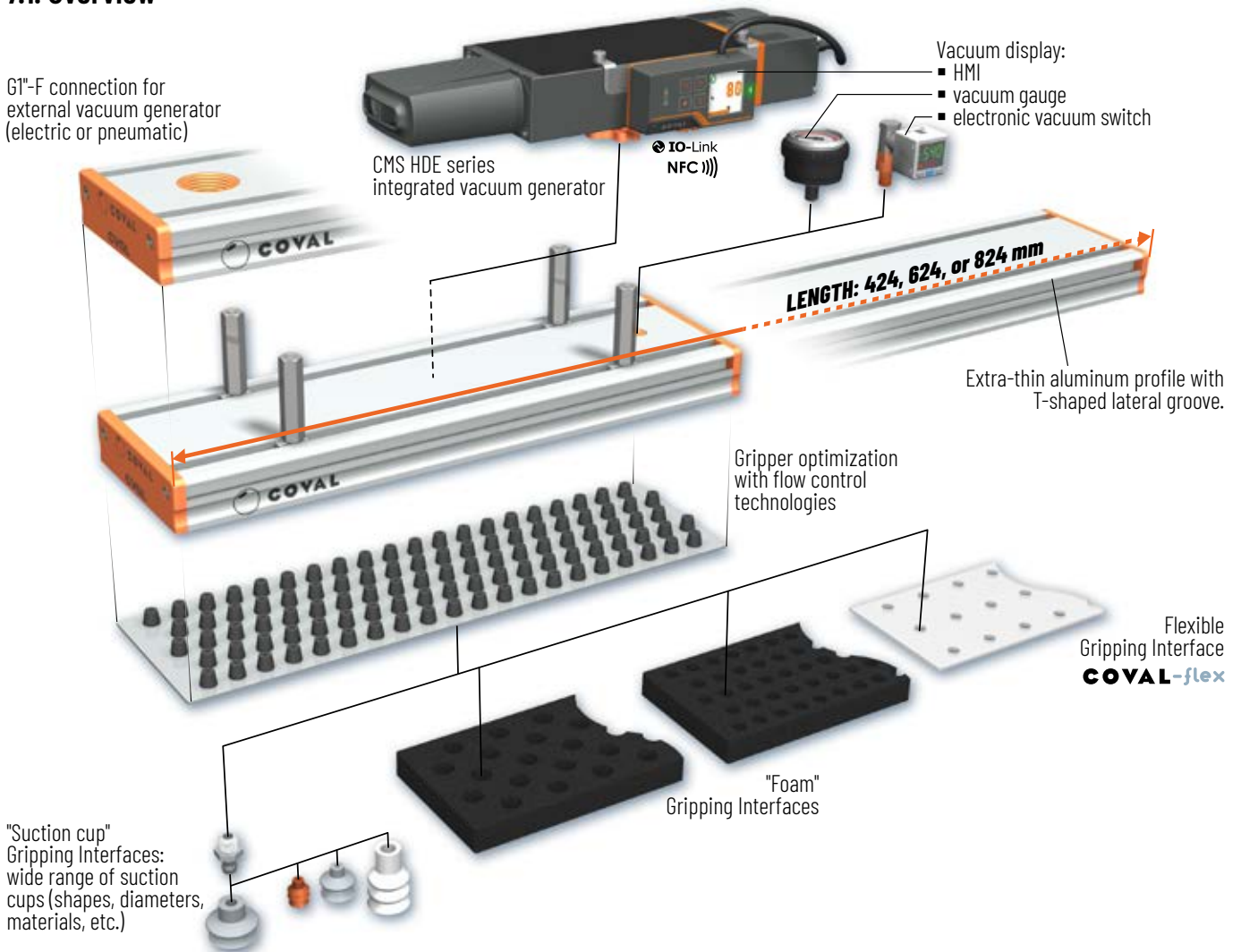
## 6.2. Flow Control Technologies

COVAL offers 3 flow control technologies to optimize your vacuum gripper and perfectly respond to the constraints of your application.



## 7. OVERVIEW, DIMENSIONS, AND MOUNTING

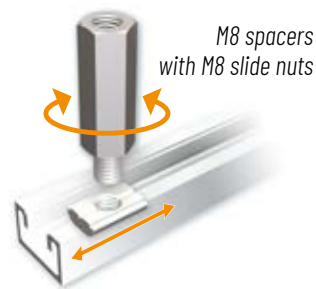
### 7.1. Overview



## 7.2. Dimensions and Mounting Options

COVAL CVGL series vacuum grippers can be mounted on all types of automated or robotic systems, using M8 spacers that slide in the grooves of the aluminum profile.

Permissible tightening torque on spacers: 20 N m max.



### VERSION G0 (with external vacuum generator)

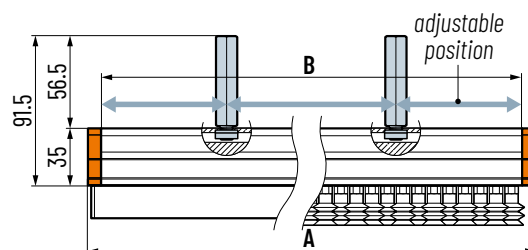
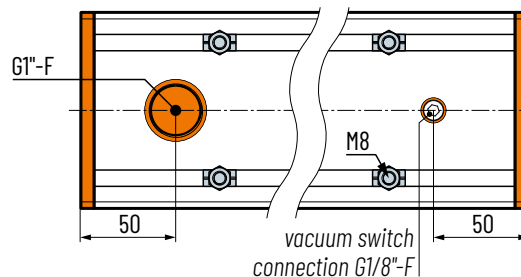
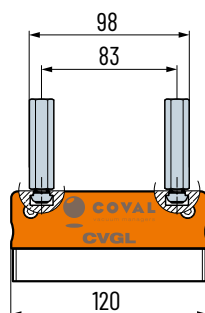
- CVGL 424 and 624: 4 x M8 spacers.
- CVGL 824: 8 x M8 spacers.

Permissible tightening torques:

- Spacers: 20 N m
- G1" vacuum connection: 25 N m

Dimensions

	CVGL424	CVGL624	CVGL824
<b>A</b>	424	624	824
<b>B</b>	408	608	808



### VERSIONS D1 or D2 without control (1 integrated CMS HDE series vacuum generator)

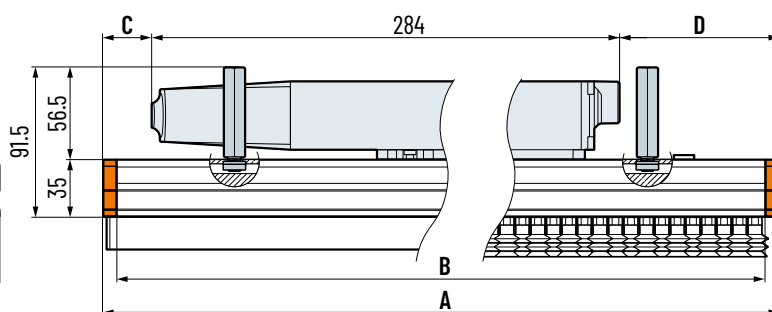
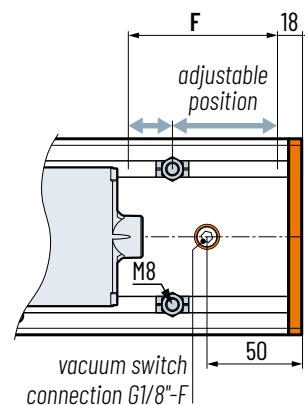
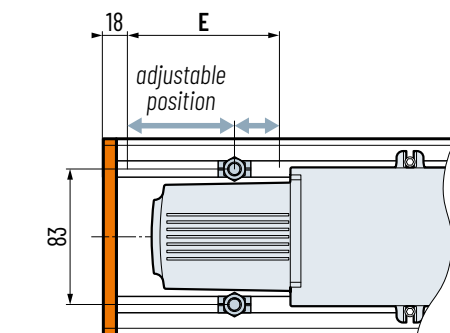
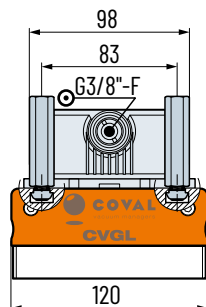
- CVGL 424 and 624: 4 x M8 spacers
- CVGL 824: 8 x M8 spacers

Permissible tightening torques:

- Spacers: 20 N m
- G3/8" pressure connection: 10 N m

Dimensions

	CVGL424	CVGL624	CVGL824
<b>A</b>	424	624	824
<b>B</b>	408	608	808
<b>C</b>	15	134	233
<b>D</b>	125	207	307
<b>E</b>	76	194	294
<b>F</b>	116	198	298



Note: all dimensions are in mm.



**VERSIONS D1 or D2 with control (1 integrated CMS HDE series vacuum generator)**

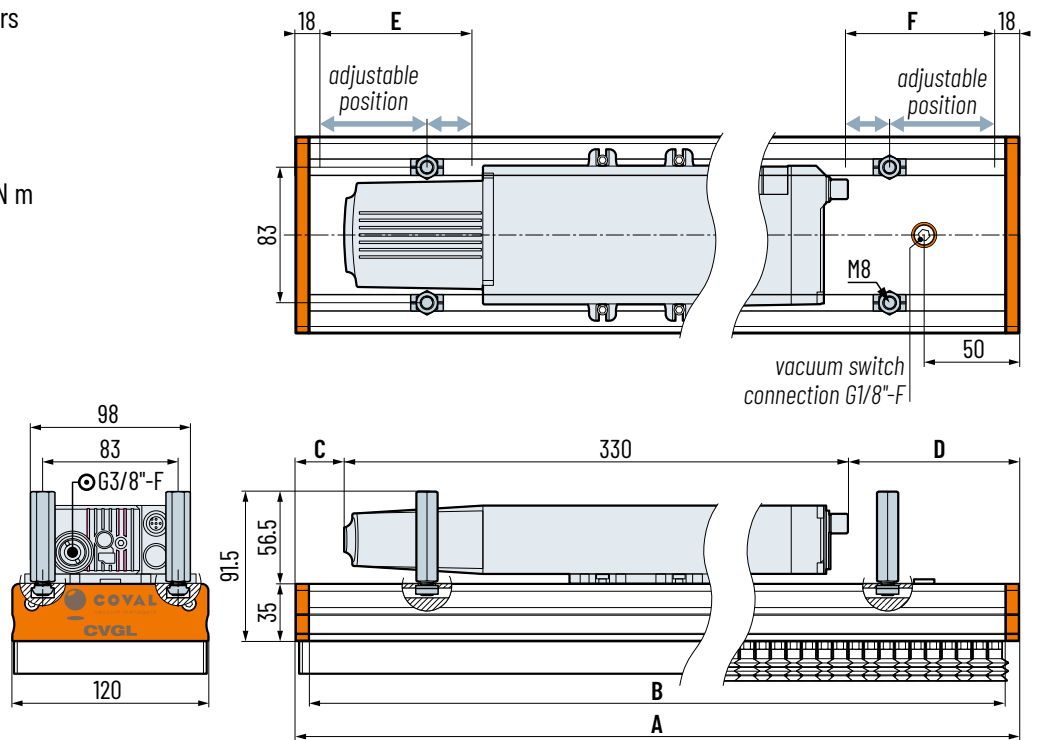
- CVGL 424 and 624: 4 x M8 spacers
- CVGL 824: 8 x M8 spacers

Permissible tightening torques:

- Spacers: 20 N m
- G3/8" pressure connection: 10 N m

Dimensions

	CVGL424	CVGL624	CVGL824
A	424	624	824
B	408	608	808
C	15	134	234
D	78	160	260
E	76	194	294
F	47	129	229

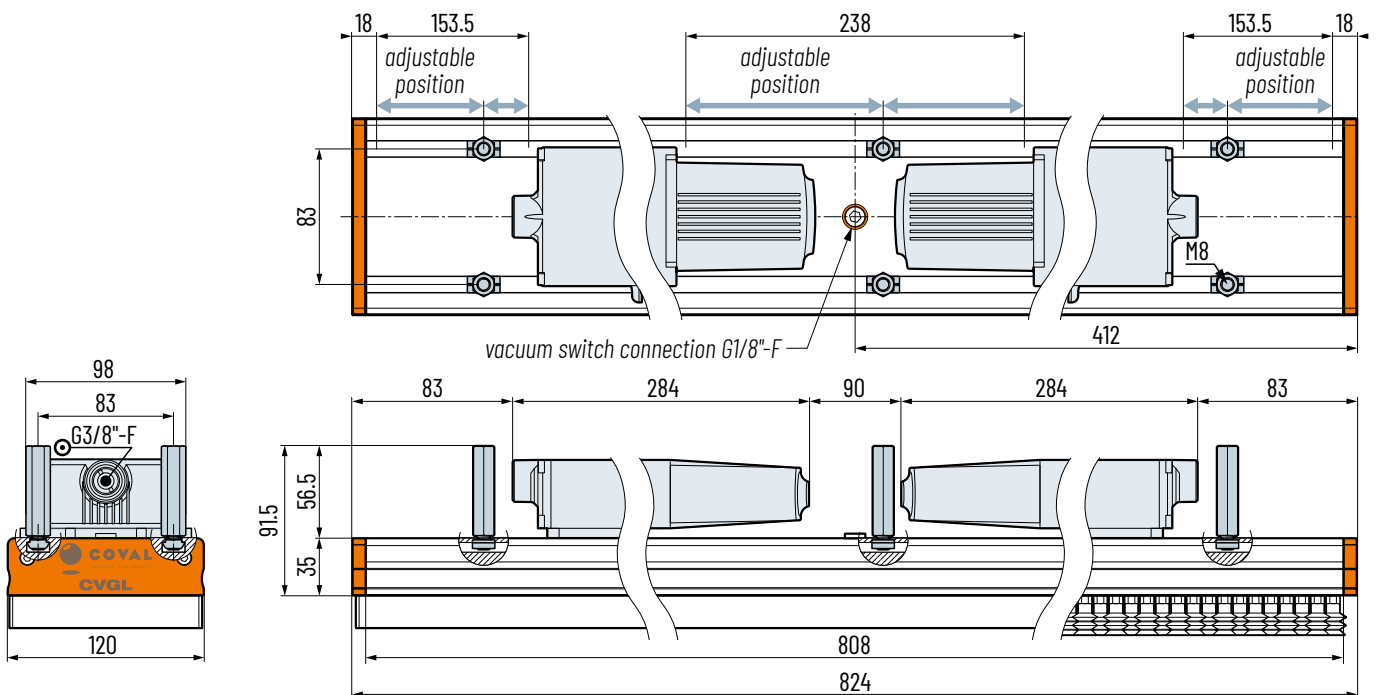


**VERSION D3 (2 integrated CMS HDE series vacuum generators)**

- CVGL 824: 6 x M8 spacers

Permissible tightening torques:

- Spacers: 20 N m
- 2 x G3/8" pressure connection: 10 N m

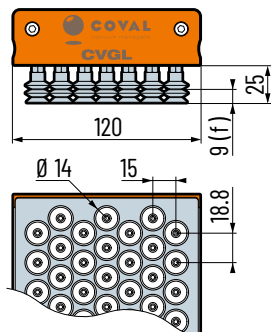


Note: all dimensions are in mm.

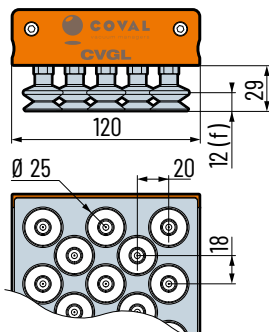
### 7.3. Gripping Interface Dimensions

#### SUCTION CUP GRIPPING INTERFACE

"MINI" type suction cup gripping interface

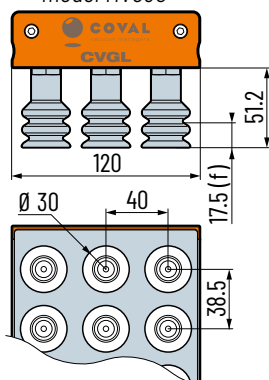
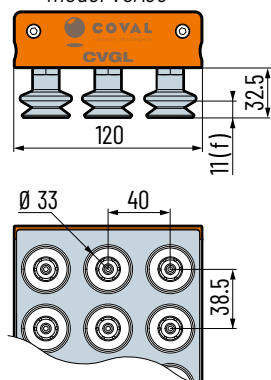


"MEDIUM" type suction cup gripping interface

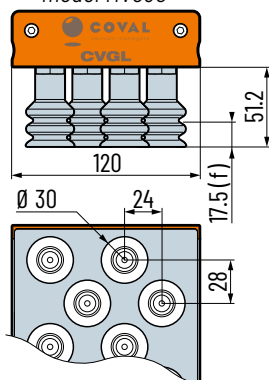
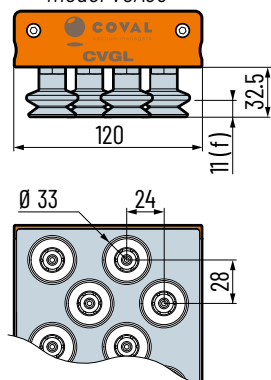


*f: suction cup deflection*

"MAXI" type suction cup gripping interface, STRAIGHT PATTERN  
model VSA33



"MAXI" type suction cup gripping interface, STAGGERED PATTERN  
model VSA33

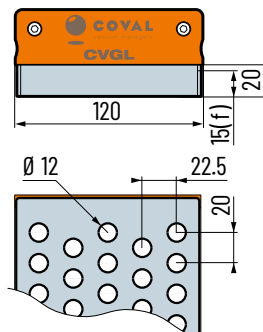


NUMBER OF SUCTION CUPS  
PER GRIPPING INTERFACE

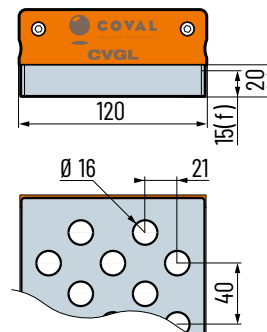
	CVGL424	CVGL624	CVGL824
"Mini" type suction cup Ø14 mm (Ø16 mm max.)	150	220	297
"Medium" type suction cup Ø25 mm (Ø18 to 25 mm)	55	83	113
"Maxi" type, STRAIGHT pattern Ø30 or Ø33 mm suction cups (Ø36 mm max.)	33	48	63
"Maxi" type, STAGGERED pattern Ø30 or Ø33 mm suction cups (Ø36 mm max.)	28	42	58

#### FOAM GRIPPING INTERFACE

"MINI" type foam gripping interface



"MAXI" type foam gripping interface



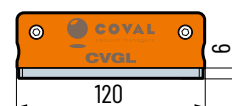
*f: foam compression*

NUMBER OF GRIPPING  
POINTS PER INTERFACE

	CVGL424	CVGL624	CVGL824
"mini" type gripping interface Ø12 mm	98	148	198
"maxi" type gripping interface Ø16 mm	50	75	100

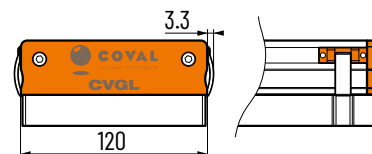
#### COVAL-flex GRIPPING INTERFACE

**COVAL-flex**



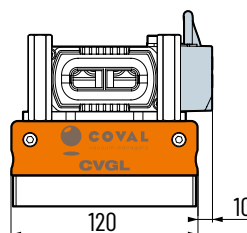
#### Option: quick installation of the interface

Option: CVGL...C...  
quick installation of the  
interface via spring clips



#### Option: HMI integrated on generator

Option: CVGL...VI



*Note: all dimensions are in mm.*

## 8. CHARACTERISTICS

### General Characteristics

- Temperature: from 0 to 50°C (32 to 122° F).
- Material of the gripper: aluminum, PA 6.6 15% GF, brass, stainless steel, neoprene.
- Foam gripping interface material: EPDM.
- Suction cup gripping interface materials:
  - "mini" type interface: silicone 35 Shore.
  - "medium" type interfaces: natural rubber 50 Shore.
  - "maxi" type interfaces: natural rubber 50 Shore or white silicone 35 Shore.

### Multi-stage Vacuum Pumps General Characteristics

- Supply: non-lubricated air, filtered to 5 microns, according to standard ISO 8573-1:2010 [3:4:4]
- Operating pressure: from 2 to 8 bar
- Optimal dynamic pressure:
  - CMSHDE\_**NVO** (for CVGL\_**D\_NO** grippers) without control: 5.5 bar.
  - CMSHDE\_**S** / CMSHDE\_**V** with control (for CVGL\_**S**/CVGL\_**V** grippers): 6 bar.
- Pressure connection: G3/8"-F with removable 350 µm filter screen
- Max. vacuum: 80%
- Air suction flow rate: 700 to 2200 NI/min
- Air consumption: 220 to 840 NI/min
- Noise level:
  - CMSHDE90X**50**\_**K**: 59 dBA
  - CMSHDE90X**100**\_**K**: 62 dBA
- Degree of protection: IP65
- Max. operating frequency: 4 Hz
- Endurance: 50 million cycles
- Materials: PA GF, brass, aluminum, steel, NBR, PU, FKM
- M12 and M8 male connectors (depending on version)

### Integrated electronics

- 24 V DC power supply (regulated ±10%)
- Inputs/outputs protected against reversed wiring and polarity
- Consumption: 170 mA max. (without load)

Only on models CMSHDE\_**VX** installed on CVGL **S2** / **V2**:

- Vacuum measuring range: 0 to 99%
- Pressure measuring range: 0 to 10 bar
- Vacuum and pressure measurement accuracy: ±1.5% of the range, compensated for temperature
- Input/Output switching mode: PNP or PNP/NPN configurable
- Digital inputs/outputs mode (SIO) / IO-Link

### D01 output signal

Only on models CMSHDE\_**VX** installed on CVGL **S2** / **V2**:

- Configurable as PNP or NPN
- NO or NC
- Breaking capacity: 330 mA
- D01: object gripped output (factory setting 40%)

### Diagnostic

Only on models CMSHDE\_**VX** installed on CVGL **S2** / **V2**:

- Instantaneous vacuum level (unit transmitted over IO-Link: mbar)
- Available information: Object gripped, object lost
- Cycle counters (vacuum, blow-off, object gripped, object lost, etc.)
- Supply pressure monitoring
- Supply voltage monitoring
- Product part number and serial number
- Software version

**Indicator** on models CMSHDE\_**VOC15P** installed on CVGL **S1** / **V1**:

- Status LED for control functions:
  - Green LED: vacuum control
  - Orange LED: blow-off control

### Information displayed on HMI (VI option)

- LED gripping status indicator on front panel (Green: object gripped, Red: object lost)
- 1.54" high-visibility color LCD display:
  - Displays vacuum level with bar graph and thresholds
  - Warns when service life has been exceeded (> 50 million cycles)
  - Explicit fault messages
  - "Suction cup" icon indicating the status of control functions:
    - Green suction cup: vacuum control
    - Orange suction cup: blow-off control
    - Red suction cup: simultaneous vacuum and blow-off control
  - Configurable display orientation: 0 - 90 - 180 - 270°

### Parameter settings available with the HMI or IO-Link

Only on models CMSHDE\_**VX** installed on CVGL **S2** / **V2**:

- Choice of blow-off type (CVGL\_**S2** only):
  - Controlled
  - Automatic timed, adjustable from 50 to 9999 ms
- Object gripped (L1) control thresholds
- Whenever required by the application, specific threshold and hysteresis settings that are different from the initial factory settings can be defined: L1 = 40%, h1 = 10%

### Additional settings available only with the HMI

(performed with 4-key membrane keyboard):

- Choice of language: EN, FR, DE, IT, or ES
- Choice of vacuum measurement unit (kPa, %, mbar, inHg)
- Choice of pressure measurement unit (MPa, bar, psi)
- Monostable electrical manual controls

### Communication

#### IO-Link

- Revision: 1.1
- Transmission rate: COM3 - 230.4 kbit/s
- Min. cycle time: 1 ms
- SIO mode: Yes
- Process Data Input (PDI): 6 bytes
- Process Data Output (PDO): 1 byte
- IO device description file (I0DD) available for download

#### NFC

- COVAL VACUUM MANAGER mobile app available:
  - Android, version 8.1 and higher
  - iOS, version 13 and higher

## 9. INSTALLING THE VACUUM GRIPPER



### COMPRESSED AIR OR VACUUM NETWORKS:

- Wear safety goggles
- Make sure all fittings and tubes are tightened securely
- Air line ends must be fastened to avoid any risk of being pulled off in the event of accidental breakage

### 9.1. Pneumatic Supply for Vacuum Grippers Equipped with One or More CMS HDE Vacuum Generators (CVGL Version D1, D2, and D3)

Note: For CVGL vacuum gripper without vacuum generator (version G0), see section 9.2.3 "Connecting an external vacuum source".

#### Pneumatic supply characteristics

- Non-lubricated air, filtered to 5 microns, according to standard ISO 8573-1:2010 [3:4:4].
- Operating pressure: from 2 to 8 bar.
- Optimal dynamic pressure:
  - CMSHDE\_**NVO** (without control) for CVGL\_**GON**\_ grippers: 5.5 bar.
  - CMSHDE\_**S**\_ / CMSHDE\_**V**\_ (with control) for CVGL\_**S**/CVGL\_**V**\_ grippers: 6 bar.
- 1 power supply for D1 and D2 generators (pressure connection: G3/8"-F with removable 350 µm filter screen).
- 2 power supplies for D3 generators (pressure connection: G3/8"-F with removable 350 µm filter screen).

#### Technical data of the integrated CMS HDE series vacuum generators

Vacuum generators	Version	Consumption (NI/min) / (SCFM)	Flow rate (NI/min) / (SCFM)	Max. vacuum (%)	Sound level (dBA)
CMSHDE_ <b>50</b> _	CVGL _ _ <b>D1</b>	220 / 7.77	700 / 24.72	80	59
CMSHDE_ <b>100</b> _	CVGL _ _ <b>D2</b>	420 / 14.83	1100 / 38.85	80	62
2 x CMSHDE_ <b>100</b> _	CVGL _ _ <b>D3</b>	840 / 29.66	2200 / 77.69	80	65

### 9.2. Pneumatic Connection

#### NOTE: MODULE PROTECTION

- Removable 100 µm filter screen integrated in the vacuum connection to protect the pump against particles.
- Possible additional filter on vacuum circuit: In the rare cases of fine dust in a wet environment, the use of an appropriate filter will prevent any internal clogging: → See COVAL catalog: "Filters for vacuum circuits"

#### Lengths and diameters of compressed air supply lines

Vacuum generators	Version	Min. internal line dia.
CMSHDE_ <b>50</b> _	CVGL _ _ <b>D1</b>	Ø6 mm – max. length 2 m Ø8 mm – max. length 6 m
CMSHDE_ <b>100</b> _	CVGL _ _ <b>D2</b>	Ø6 mm – max. length 2 m Ø8 mm – max. length 6 m
2 x CMSHDE_ <b>100</b> _	CVGL _ _ <b>D3</b>	Ø8 mm – max. length 6 m

- Flexible lines must be as short as possible in order to minimize response times.
- Make sure there is no pollution in the device connections and lines.
- Flexible lines must be connected without bends and without crushing them.



#### IF THESE CONDITIONS ARE NOT OBSERVED, YOU RISK THE FOLLOWING ISSUES:

- If the chosen internal diameter on the compressed air inlet is too small, the compressed air supply will be insufficient to achieve optimal performance. The generator will be unable to achieve the specified maximum vacuum rate.
- If the chosen internal diameter on the vacuum inlet is too small, the airflow is slowed down due to this restriction, which has a negative effect on suction power and on suction or exhaust time.

### 9.2.1. CVGL Versions **D1** and **D2**

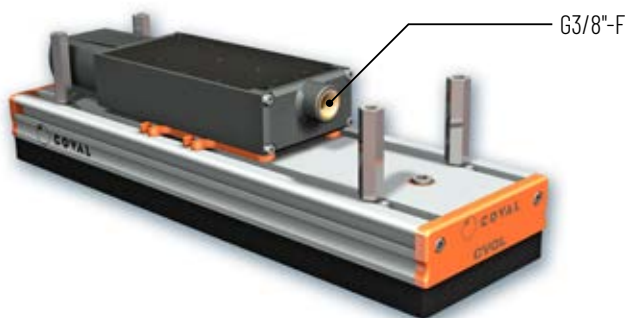
Connect the compressed air to the G3/8" connection on the CMS HDE series multi-stage vacuum generator.

Permissible tightening torque:

- G3/8" pressure connection: 10 N m

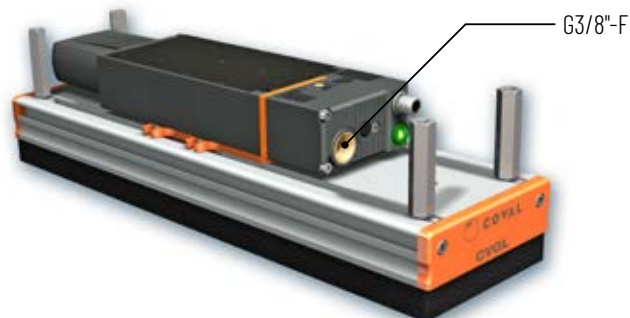
**Version CVGL\_N:**

Without vacuum generator control



**Version CVGL\_S or V :**

With vacuum generator control

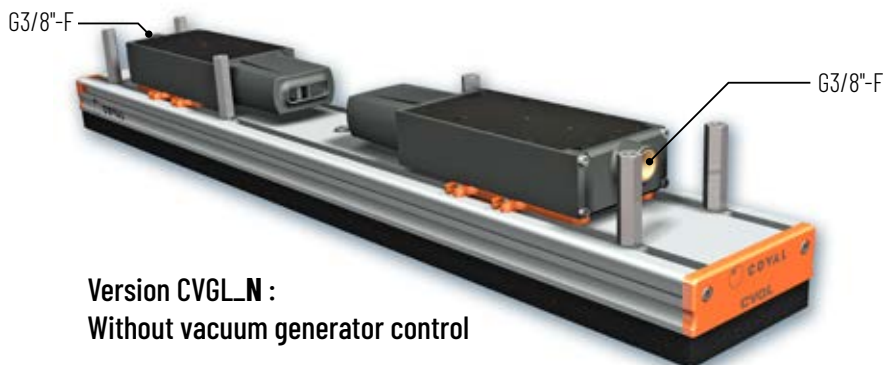


### 9.2.2. CVGL Version **D3**

Connect the compressed air to the two G3/8" fittings located on the CMS HDE series multi-stage vacuum generators.

Permissible tightening torques:

- 2 x G3/8" pressure connection: 10 N m



**Version CVGL\_N :**

Without vacuum generator control

### 9.2.3. CVGL Version **G0**

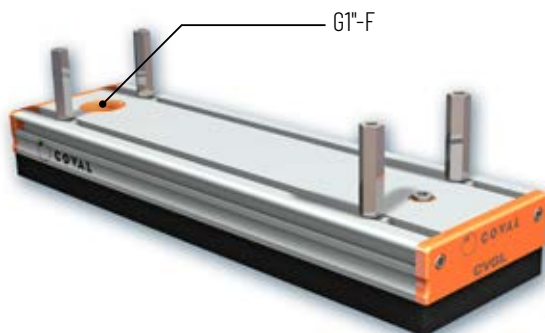
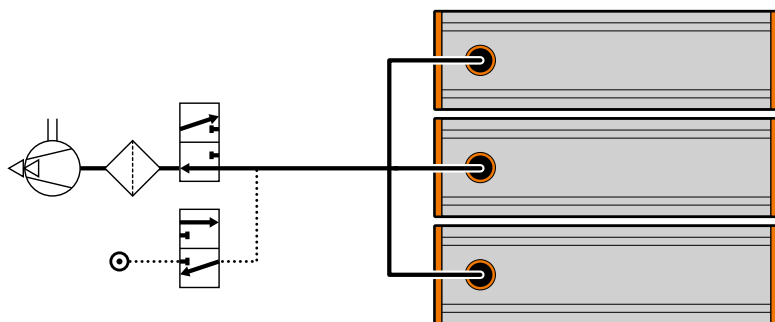
**Connecting an external vacuum source**

To allow for an external vacuum source to be connected, version G0 of the CVGL vacuum gripper is equipped with a G1"-F threaded flange.

Permissible tightening torque:

- G1" vacuum connection: 25 N m

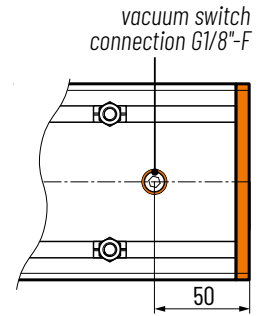
Note: Diameter of supply lines must be suitable for the flow rate of the external vacuum generator.



### 9.3. Connecting a Vacuum Switch

In order for an external vacuum switch to be connected, the CVGL vacuum gripper is equipped with a G1/8"-F connection.

Permissible tightening torque: vacuum switch connection G1/8"-F: 12 N m



### 9.4. Electrical Connections: CVGL with Vacuum Generator Control (versions S and V)

When required, CVGL series vacuum grippers with integrated vacuum generator (versions D1 and D2) can be equipped with a vacuum and/or blow-off control valve to optimize the release of gripped objects. This also enables cleaning of the vacuum network, flow control nozzles, check valves, and airtight valves. A vacuum switch or analog gauge is available as an option should a visual display of the vacuum level in the system be needed (see below).

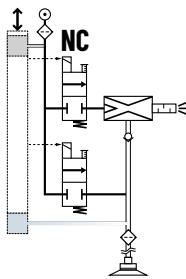


#### VACUUM CONTROL: 2 SOLUTIONS

**Model CVGL\_\_S\_:** vacuum pump with **NC** vacuum control and **NC** blow-off control.

In the event of power failure, vacuum is no longer generated. In the event of compressed air failure, the vacuum is no longer maintained.

- NC blow-off and vacuum control: solenoid valves
- Choice of blow-off settings (only on CVGL\_\_S2\_ models):
  - controlled by external signal
  - automatic timer from 50 to 9999 ms (advantage: saves one controller output)

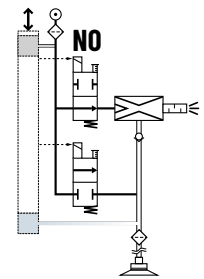


**Model CVGL\_\_V\_:** vacuum pump with **NO** vacuum control and **NC** blow-off control.

In the event of power failure, vacuum is still generated: object is held in place  
→ fail-safe.

In the event of compressed air failure, the vacuum is no longer maintained.

- NO vacuum control solenoid valve
- NC blow-off control solenoid valve
- Blow-off controlled by external signal

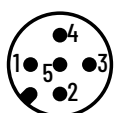


#### ELECTRICAL CONNECTIONS

CMS HDE vacuum pumps must be used with power supply units that provide Protective Extra Low Voltage (PELV) and supply voltage isolation according to EN 60204.

##### CVGL \_ S1 / V1:

- One M12 5-pin male connector

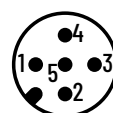


- 1 /
- 2 24V DC suction command <sup>(1)</sup>
- 3 0V - GND
- 4 24V DC blow-off command
- 5 /



##### CVGL \_ S2 / V2:

- One M12 5-pin male connector



- 1 24V DC
- 2 24V DC suction command <sup>(1)</sup>
- 3 0V - GND
- 4 24V DC object gripped D01 - C/Q
- 5 24V DC blow-off command



- One M8 4-pin male connector → HMI



- 1 24V DC
- 2 RS485 (DATA+)
- 3 0V - GND
- 4 RS485 (DATA-)

<sup>(1)</sup> 24V DC suction command, depending on version:

- **S**: 24V DC vacuum control
- **V**: 24V DC vacuum off command

⚡: connections for ⚡ IO-Link

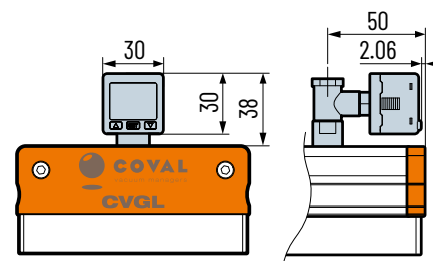


## 9.5. CVGL with Vacuum Level Display (Versions VA and VF)

When required, CVGL series grippers can include a vacuum level display with an electronic vacuum switch or vacuum gauge:

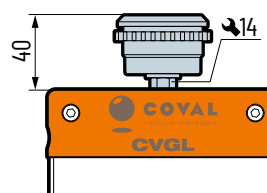
### ■ Option VA - electronic vacuum switch with 3-color display (PSD100CPNP): CVGL \_\_\_\_\_ X \_\_ VA

- Pressure rating range: 0 ~ -101.3 kPa.
- Pressure setting range: 10 ~ -101.3 kPa.
- Max. pressure: 300 kPa.
- Fluid: Air, non-corrosive/non-flammable gas.
- Hysteresis: adjustable.
- Response time: ≤ 2.5ms, with anti-vibration function.
- 7 segment LCD display: 2 color (red/green) main display, orange sub-display (refresh rate: 5 times/sec).
- Choice of pressure unit display: kPa, MPa, kgf/cm<sup>2</sup>, bar, psi, inHg, mmHg.
- Power supply voltage: 12 to 24V DC ±10%.
- Current consumption: ≤ 40 mA (without load).
- Repeatability (switch output): ≤ ±0.2% F.S. ±1 digit.
- Electrical connection: M8 (4-pin).
- Protection: IP40.
- Ambient temperature range (operation): 0-50° C (32-106° F).
- Material (enclosure): PA 6.6 20%GF.



### ■ Option VF - vacuum gauge (VAF11140): CVGL \_\_\_\_\_ X \_\_ VF

- Vacuum gauge with needle.
- Damping: by silicone movement (patented).
- Measuring: Bourdon tube in CuSn.
- Precision: +/- 2.5% of max. scale value.
- Frame: black ABS



## 10. INSTALLING AND OPERATING REMOTE HMI (CVGL VERSION VI)

Part number: ■ Option **VI**: integrated on the vacuum gripper:

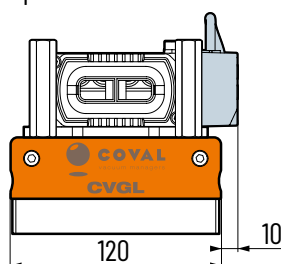
■ Option **HMIHD1M84P**: remote

Accessory only compatible with vacuum grippers CVGL\_\_\_\_**S2/V2**\_\_.

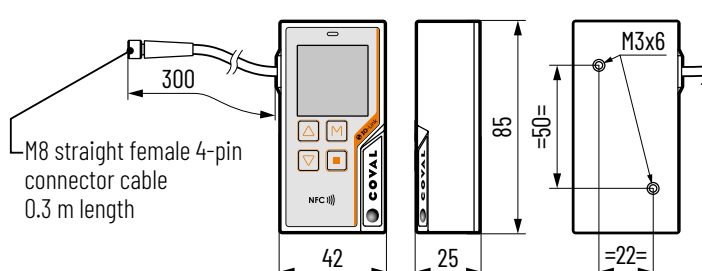
The CVGL\_\_\_\_**S2/V2**\_\_ vacuum grippers are supplied with the standard factory settings described in this manual.  
To be able to modify them, you must use a remote HMI or configure the module using IO-Link.

### 10.1. Dimensions

Option: CVGL\_\_\_\_**VI**

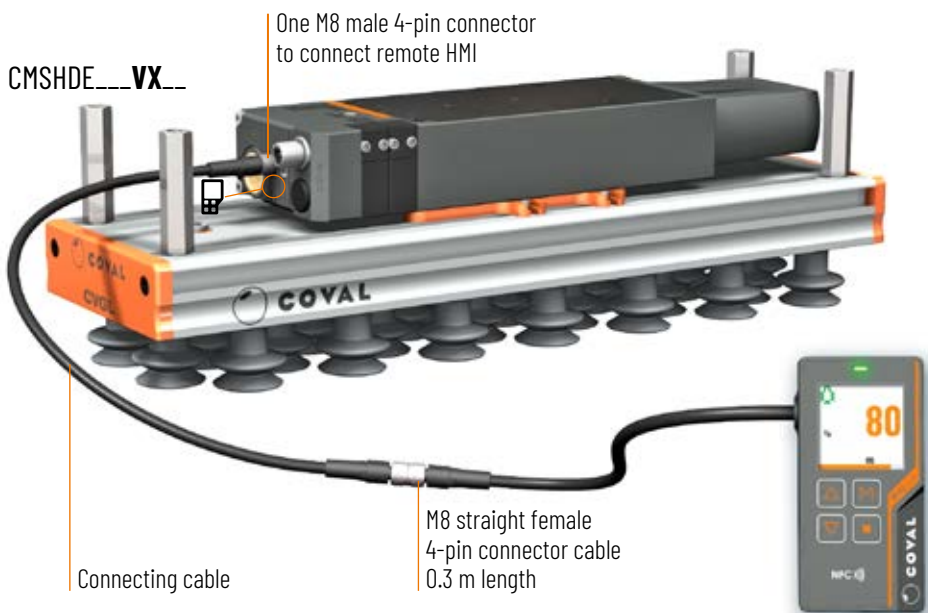



Remote HMI version: **HMIHD1M84P**



Note: all dimensions are in mm.

## 10.2. Installing the Remote HMI, part no. HMIHD1M84P



Connect the HMI's M8 female 4-pin connector to the M8 male connector on the pump's valve block (marked ). If necessary, use a M8 female 4-pin / M8 male 4-pin connecting cable, compatible with drag chain:


- Length 2 m:  
- Part no. **CDM8MF4PL2**
- Length 5 m:  
- Part no. **CDM8MF4PL5**

## 10.3. Configuring a Remote HMI

Reminder: The remote HMI (part no. **HMIHD1M84P**) can only be used with vacuum grippers CVGL **S2/V2** (equipped with CMSHDE...VX... multi-stage vacuum pumps).

The CMSHDE...VX... multi-stage vacuum pumps are supplied with the standard factory settings described in this manual. To be able to modify them, you must use a remote HMI or configure the module using IO-Link.

### Configuration procedure

Step 1: Connect the remote HMI to M8 connector (marked ) on the CMS HDE. The CMS HDE must be powered on.

Step 2: When the HMI is powered on, a message is displayed asking which settings should be used (HMI or IO).

➔ **Transfer and apply settings from the HMI module? YES/NO?**

Step 3: Choose either YES or NO.

- **NO** (selected by default): If the user presses **M** or does nothing within 5 seconds, the settings present in the vacuum switch of the CMS HDE are transferred to the remote HMI.
- **YES**: The process settings and device settings contained in the remote HMI are transferred to the vacuum switch of the CMS HDE and applied immediately.

This operation can be used to copy settings from one product to the next. The device's own product ID, serial number and device name remain unchanged. Likewise, the display settings (language, vacuum and pressure units, display rotation), also called "user settings", are not transferred since they are only related to the remote HMI.

**Reminder:**



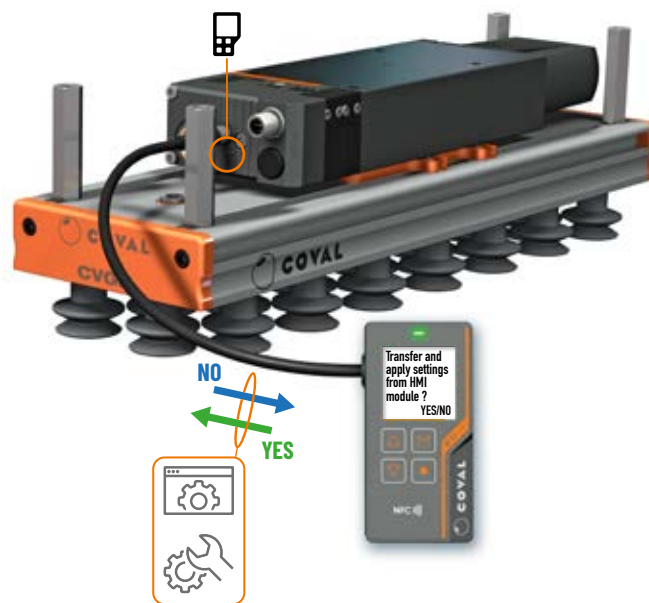
Process settings (for details see sect. 14)

- L1/h1
- Automatic blow-off



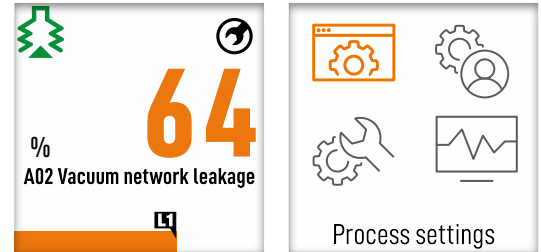
Device settings (for details see sect. 16)

- PNP/NPN
- NO/NC

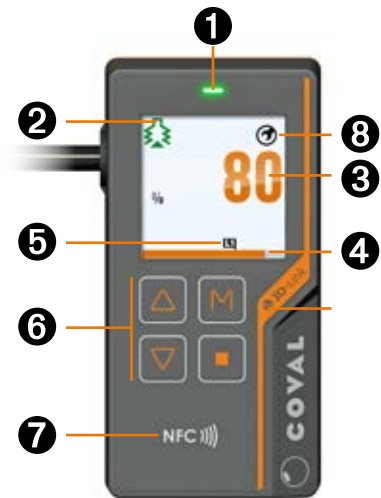


## 10.4. Front Panel Dialog

The HMI allows for easy and efficient reading of the pump's operation. The 1.54" high-visibility color LCD screen gives real-time access to the process data, settings, and diagnostic data.



- ❶ Gripping status indicator light:
  - Green: object gripped
  - Red: object lost
- ❷ Status indicator for vacuum and blow-off control:
  - 🌿 Vacuum generation
  - 💨 Blow-off
  - 🌿💨 Simultaneous vacuum and blow-off control
- ❸ Instantaneous vacuum level (in kPa, % vacuum, mbar, or inHg)
- ❹ Bar chart indicating the instantaneous vacuum level
- ❺ L1 vacuum threshold: threshold for "object gripped" signal
- ❻ Keypad: M button (menu), △ and ▽ buttons ■ button (return)
- ❼ NFC antenna
- ❽ Maintenance indicator



## 11. HMI DETAILS AND FEATURES

### 11.1. Powering On

- The following occurs when the device is powered on:
- 1: COVAL logo is displayed (for about 15 seconds).
  - 2: Main screen is displayed showing the vacuum level.
  - 3: The keypad is locked by default.

**Note:** During the startup phase (1), the product is immediately operational in terms of inputs/outputs (suction/blow-off commands, contact outputs). Only the "HMI" part is being initialized during this phase.

### 11.2. Details of the Main Screen

Status indicator for vacuum and blow-off commands:

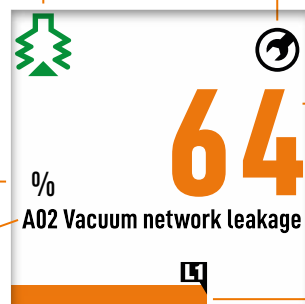
- 🌿 : Vacuum generation
- 💨 : Blow-off command
- 🌿💨 : Simultaneous vacuum and blow-off commands

Vacuum unit

kPa / % of vacuum / mbar / inHg

Variable message

Displays code + error messages, alarms (see sect. 18)



Bar chart indicating the instantaneous vacuum level

Maintenance indicator

Icon shown if the vacuum solenoid valve has reached 50 million cycles.

Instantaneous vacuum level

Displayed in:  
 - kPa: 0 to -99  
 - Vacuum %: 0 to 99  
 - mbar: 0 to -999  
 - inHg: 0 to -29.9

L1 vacuum threshold

L1: Threshold for "object gripped" signal

### 11.3. Keypad Functions

The keypad consists of 4 keys used to navigate to the various menus/screens and to change the parameters, etc.



Navigate to screens and menus

Increase/decrease values



Hold down to quickly scroll through values



From main screen: access main menu

Validate menus and settings

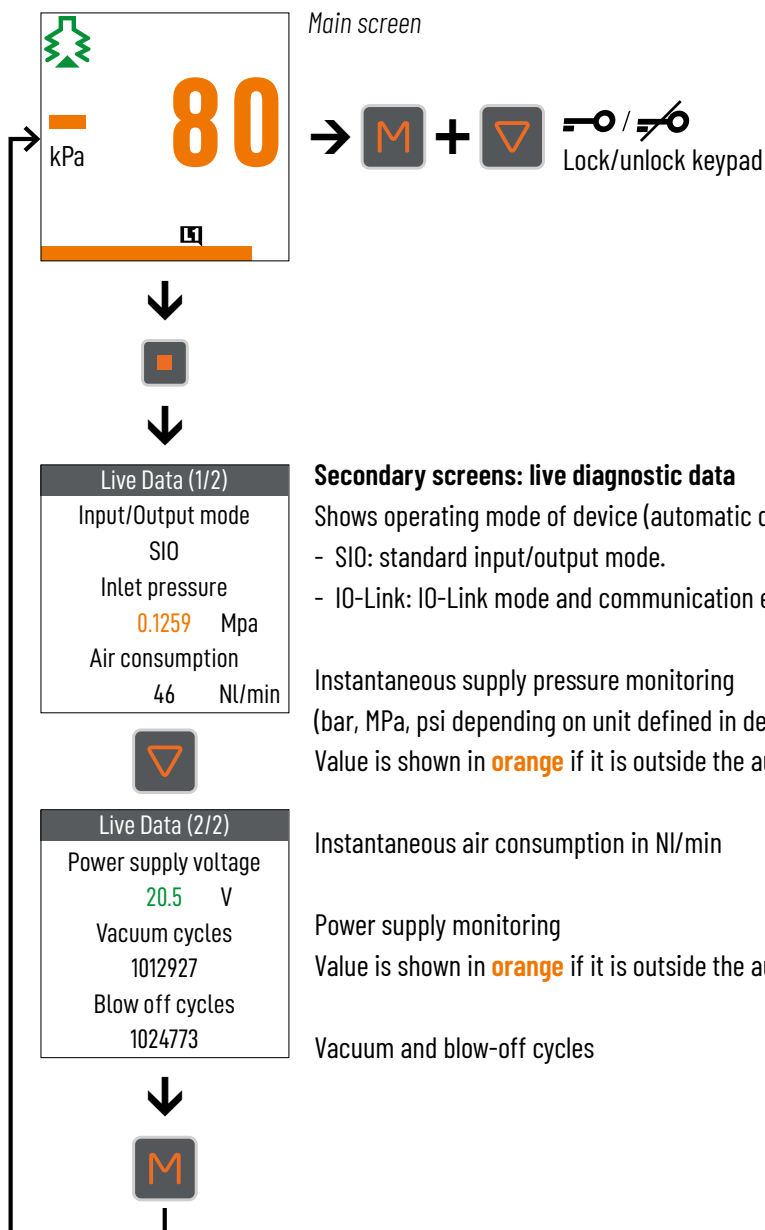


From main screen: access secondary screen

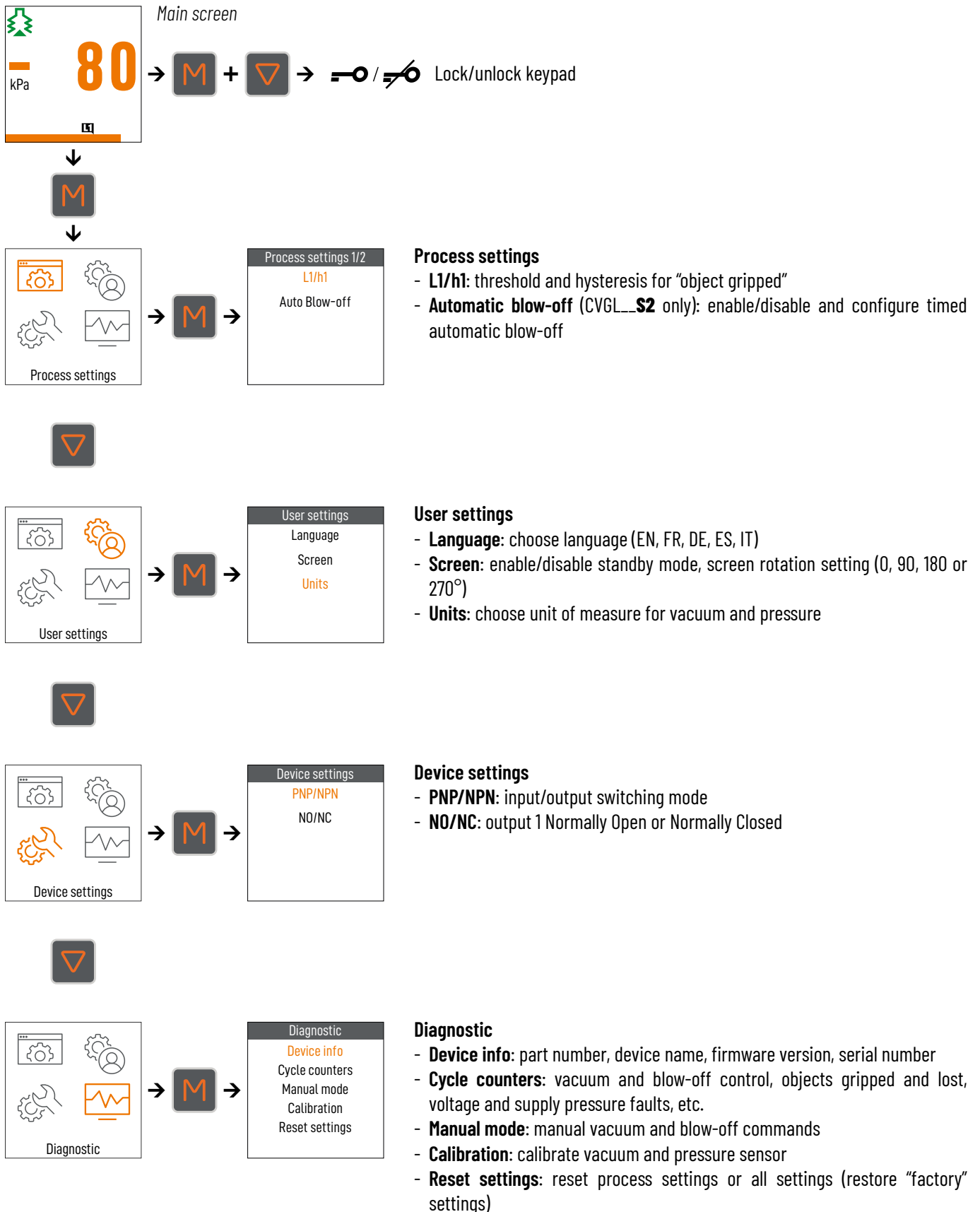
From menus: return to previous menu

## 12. SUMMARY OF FUNCTIONS

### 12.1. Accessing Live Diagnostic Data



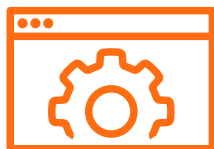
## 12.2. Menu Tree




### 13. LOCKING/UNLOCKING THE KEYPAD



- 1- Simultaneously pressing the **M** and  $\nabla$  keys unlocks the keypad (pressing them again locks it).
- 2- Pressing the keys to scroll through the following displayed messages **K01 Keyboard locked, M + Down to unlock** and **K02 Keyboard unlocked**.
- 3- The display automatically returns to the vacuum level 0 kPa.



### 14. PROCESS SETTINGS

Main menu	Secondary menu	Display conditions	Factory settings
	<b>L1/h1</b>	Permanent	L1= -40 kPa h1= -10 kPa

#### 14.1. Setting Threshold 1

##### Reminder of the "factory" setting

This initial factory setting is suitable for most applications.

##### Threshold L1 :

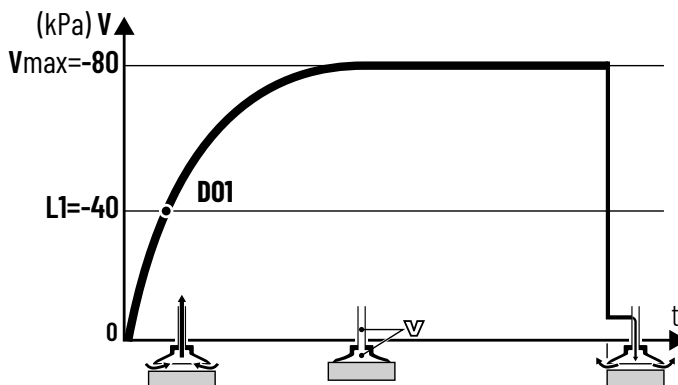
L1= -40 kPa, vacuum threshold that generates the D01 "object gripped" signal.

h1= -10 kPa, L1 hysteresis, drop in vacuum that will make the D01 signal "object gripped" disappear.


The figure below explains how this "factory" setting works.

##### Recommendations

Recommended value: Hysteresis from -1 to -20 kPa.





Main menu	Secondary menu	Display conditions	Factory settings
	<b>Auto Blow-off</b>	CVGL__S2	OFF

## 14.2. Auto Blow-off

Timed automatic blow-off eliminates the need for a controller output and controls the blow-off as soon as vacuum control is stopped and for a configurable amount of time.

The initial "factory" setting for blow-off is the "blow-off controlled by external signal" option.

This setup is only available for CVGL\_\_S2

(refer to section 9.4, electrical connections)


**OFF:** Auto blow-off disabled = blow-off controlled by external signal

**ON:** Auto blow-off enabled

If enabled, the duration of the automatic blow-off can be adjusted from 50 to 9999 ms (factory setting 500 ms).




## 15. USER SETTINGS

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Language</b>	Permanent	English

### 15.1. Language

To make the CMS HDE easier to use and configure, all information, messages and menus are available in the following 5 languages:

- EN: English
- FR: French
- DE: German
- IT: Italian
- ES: Spanish

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Screen</b>	Permanent	Sleep mode: ON Rotation: 0°

### 15.2. Screen


The display goes into sleep mode after 10 min. if no external commands are received (vacuum or blow-off) and no key is pressed on the keypad.

- ON: Sleep mode enabled
- OFF: Sleep mode disabled

#### Rotation:

To make it easier to read the information displayed on the screen of the remote HMI, the display on the screen can be rotated according to how the vacuum pump is placed in the facility.

The display rotation can be configured as follows: 0 / 90 / 180 / 270°

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Units</b>	Permanent	Vacuum: kPa Pressure: MPa

### 15.3. Units

The unit of measure to display the vacuum level can be selected from among the following:

- kPa    ▪ %    ▪ mbar    ▪ inHg

The unit of measure to display the pressure can be selected from among the following:

- MPa    ▪ Bar    ▪ psi



## 16. DEVICE SETTINGS

Main menu	Secondary menu	Display conditions	Factory settings
	<b>PNP/NPN</b>	Permanent	PNP

### 16.1. Input/Output Switching Mode: PNP or NPN

Select PNP or NPN to choose the switching mode for inputs (vacuum and blow-off commands) and for output (DO1).

Main menu	Secondary menu	Display conditions	Factory settings
	<b>NO/NF</b>	Output 1: Permanent	Output 1: NO

### 16.2. NO / NC

The contact output (DO1) can be set to either NO (Normally Open) mode or NC (Normally Closed) mode.

Factory setting:  
DO1 "Object gripped": NO



## 17. DIAGNOSTICS

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Device info</b>	Permanent	

### 17.1. Device Info

The information concerning the CMS HDE are available on the following 3 screens:

#### "Device info" screen 1/3:

The complete part number of the CMS HDE consists of the following 2 parts:

- Part 1/2: e.g. CMSHD90X50
- Part 2/2: e.g. SVXC15XG4KD

Example of complete part number: CMSHDE90X50SVXC15XG4KD

#### "Device info" screen 2/3:

IO firmware version and IO serial number

#### "Device info" screen 3/3:

HMI firmware version and HMI serial number


Main menu	Secondary menu	Display conditions	Factory settings
	<b>Cycle counters</b>	Permanent	

### 17.2. Cycle Counters

The menu used to access counters consists of 4 screens.

#### Screen 1/4:

- **Vacuum commands:** Total number of times vacuum solenoid valve activated (external/customer command).
- **Blow-off commands:** Number of times blow-off solenoid valve activated (external command and automatic blow-off).
- **Gripped parts:** Number of parts handled by the vacuum pump.

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Cycle counters</b>	Permanent	

#### Screen 2/4:


- **Lost parts:** Number of parts lost during handling stage.
- **Power too high faults:** Number of vacuum or blow-off commands that have occurred while the supply voltage was greater than 26.4 V.
- **Power too low faults:** Number of vacuum or blow-off commands that have occurred while the supply voltage was lower than 21.6 V.

#### Screen 3/4:

- **Pressure too high faults:** Number of vacuum or blow-off commands that have occurred while the pressure was greater than 8 bar.
- **Pressure too low faults:** Number of vacuum or blow-off commands that have occurred while the pressure was lower than 5 bar.
- **Vac. and blow-off cmds:** Number of times the vacuum and blow-off commands have been activated simultaneously. To ensure efficient blow-off, vacuum generation must be stopped to set down the part.

#### Screen 4/4:

- **Blow-off faults:** Number of unloading cycles during which blow-off did not work properly (residual vacuum rate after blow-off).


Main menu	Secondary menu	Display conditions	Factory settings
	<b>Manual mode</b>	Permanent	

### 17.3. Manual Mode

The CMS HDE vacuum pump is equipped with an electronic manual control for the vacuum and blow-off solenoid valves.

Pressing and holding  $\triangle$  once activates the vacuum solenoid valve (green suction cup icon lights up on the main screen), while pressing and holding  $\nabla$  once activates the blow-off solenoid valve (orange suction cup icon lights up on the main screen).

Wait 10 seconds or press **M** to exit the mode.

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Calibration</b>	Permanent	

### 17.4. Calibration

#### Vacuum sensor calibration

The calibration procedure may only be performed when the vacuum network is at atmospheric pressure.

**Note:** Zero point correction is only possible within a  $\pm 5\%$  range around atmospheric pressure.


Follow the instructions in the "Vacuum sensor" menu.

#### Pressure sensor calibration

The calibration procedure may only be performed when the compressed air supply pressure is null.

**Note:** Zero point correction is only possible within a  $\pm 5\%$  range around atmospheric pressure.

Follow the instructions in the "Pressure sensor" menu.

Main menu	Secondary menu	Display conditions	Factory settings
	<b>Reset Settings</b>	Permanent	

### 17.5. Reset Settings

Various settings on CMS HDE vacuum pumps can be reset to revert to the "factory settings":

- Process settings
- All settings
- Maintenance status

## 18. EVENTS AND ALARMS

Whenever necessary, messages are displayed on the main screen during operation to warn about an event, error, or alarm:

### EVENTS

Message	Condition for raising	Condition for clearing	Action
K01 Keypad locked, <b>M</b> + ▽ to unlock	When you press a button without having unlocked the keypad	This message is cleared automatically after 1 s.	If necessary, unlock the keypad (see sect. 13)
K02 Keypad unlocked	When you press <b>M</b> and ▽ simultaneously, when the keypad is locked	This message is cleared automatically after 1 s.	See sect. 13
I01 Manual mode, △ - Vacuum ▽ - Blow-off	Upon confirming the menu Diagnostic/Manual mode	This message is cleared automatically after 10 s or when you change screens.	Pressing and holding △ activates the vacuum solenoid valve Pressing and holding ▽ activates the blow-off solenoid valve

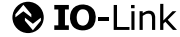
### ALARMS

Message	Condition for raising	Condition for clearing	Action
A01 Lost part	Suction command active and vacuum level lower than L1-h1. The LED on the HMI's front panel is red.	Vacuum control is stopped and/or blow-off is activated	Check the various parameter settings, the vacuum pump's supply pressure, as well as the quality of the vacuum network and the suction cup size in relation to the load being handled.
A03 Power supply too high (> 26.4V)	Supply voltage higher than 26.4 V	Supply voltage is set within the recommended voltage range (24V DC +/-10%)	Use a regulated 24V DC power supply +/-10%
A04 Power supply too low (< 21.6V)	Supply voltage is lower than 21.6V	Supply voltage is set within the recommended voltage range (24V DC +/-10%)	Use a regulated 24V DC power supply +/-10%
A05 Input pressure too high (> 8 bar)	Supply pressure is greater than 8 bar	Supply pressure is set within the recommended pressure range	Check the supply pressure on the compressed air network (see sect. 9.1)
A06 Input pressure too low (< 5 bar)	Supply pressure is lower than 5 bar	Supply pressure is set within the recommended pressure range	Check the supply pressure on the compressed air network (see sect. 9.1)

## 19. IO-LINK PARAMETER SETTINGS

CVGL...S2/V2 vacuum grippers, equipped with CMSHDE (VX version) vacuum pumps, feature an IO-Link communications interface based on the IEC 61131-9 standard. This protocol is used to establish a point-to-point link between a sensor/actuator and an IO-Link input/output module called "IO-Link master", which is connected to the programmable logic controller.

### 19.1. IO-Link Communication

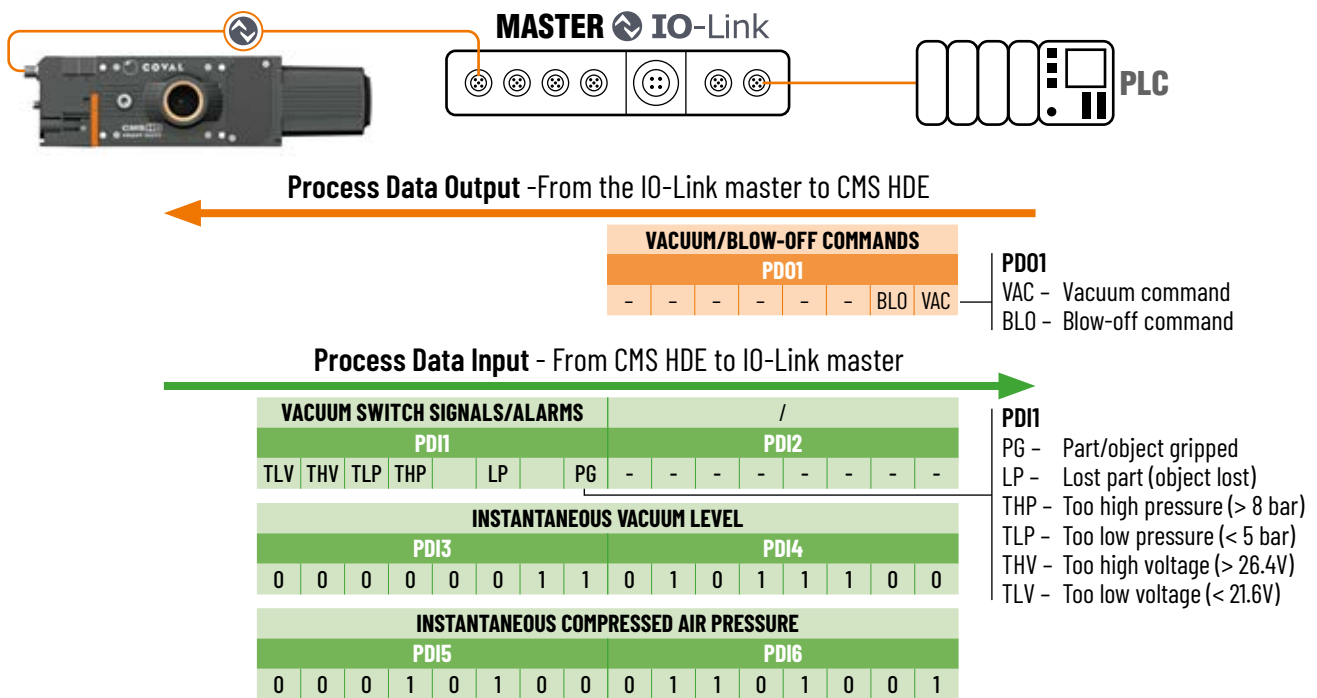


IO-Link revision	1.1
Transmission rate	COM3 - 230.4 kbit/s
Min. cycle time	1 ms

Update of IO Device Description (IODD) file: available for download.

SIO mode	Yes
Process data input (PDI)	6 bytes
Process data output (PDO)	1 byte

### 19.2. Cyclical Data (PDI/PDO)



Process Data	Parameter	Bit	Length (byte)	R/W	Unit	Comment
PDI1	PG - Part gripped (L1)	0	BOOL	RO		Vacuum level greater than L1 then between L1 and L1-h1
	LP - Lost Part	2	BOOL	RO		Vacuum level lower than L1-h1 during part handling
	THP - Too High Pressure	4	BOOL	RO		Compressed air level greater than 8 bar
	TLP - Too Low Pressure	5	BOOL	RO		Compressed air level lower than 5 bar (dynamic)
	THV - Too High Voltage	6	BOOL	RO		Power supply voltage greater than 26.4V
	TLV - Too Low Voltage	7	BOOL	RO		Power supply voltage lower than 21.6V (dynamic)
PDI2	-	0-7	8xBOOL	RO		Not used
PDI3 / PDI4	Instant vacuum level	0-15	2	RO	mbar	Instantaneous vacuum level (0 to -1013 mbar)
PDI5 / PDI6	Instant pressure level	0-15	2	RO	mbar	Instantaneous compressed air pressure level (0 to 10,000 mbar)
PDO1	VAC - Vacuum command	0	BOOL	RW		0: vacuum OFF 1: vacuum ON
	BLO - Blow-off command	1	BOOL	RW		0: Blow-off OFF 1: Blow-off ON
	-	2-7	6xBOOL	RW		Not used

### 19.3. Acyclical Data

#### IDENTIFICATION

Index (dec)	Parameter	Length (byte)	R/W	Unit	Value			Comment
					min	Typ.	max	
7	Vendor ID	2	RO	-		0x04		0x0421 = COVAL SAS
8						0x21		
9	Device ID	3	RO	-		0x00		0x3001 = CSMHDE Series
10						0x30		
11						0x01		
16	Vendor name	9	RO		COVAL SAS			
17	Vendor text	15	RO		Vacuum managers			
18	Product name	32	RO		CSMHDE-X-----			Complete part number
19	Product ID	10	RO		CSMHDCxx			Simplified part number
20	Product text	38	RO		Heavy Duty Vacuum Pump			
21	Serial number	8	RO		20420852461000000			
22	Hardware revision	3	RO		1.0			
23	Firmware revision	22	RO		io 03.05_hmi 03.05			



#### PROCESS SETTINGS

Index (dec)	Parameter	Length (byte)	R/W	Unit	Value			Comment
					min	Typ.	max	
64	Gripped product threshold L1	2	RW	mbar	10	400	999	Recommendations: h1 ≥ 10 L1 > h1
65	Gripping threshold hysteresis h1	2	RW	mbar	0	100	999	
72	Automatic blow-off	1	RW	-	0	0	1	0: OFF / 1: ON
73	Automatic blow-off duration	2	RW	msec	100	500	9999	Automatic blowing triggered as soon as vacuum control is disabled.
▼ Preset configurations ▼								
74	CONF1-L1	2	RW	mbar	10	400	999	
75	CONF1-h1	2	RW	mbar	0	100	999	
78	CONF2-L1	2	RW	mbar	10	500	999	
79	CONF2-h1	2	RW	mbar	0	0	999	
2	Configuration 1 selection	1	WO	-	162 / 0xA2			Enables the following settings: CONF1-L1/h1
2	Configuration 2 selection	1	WO	-	163 / 0xA3			Enables the following settings: CONF2-L1/h1



#### DEVICE SETTINGS

Index (dec)	Parameter	Length (byte)	R/W	Unit	Value			Comment
					min	Typ.	max	
90	I/O switching type	1	RW	-	0	0	1	0: PNP / 1: NPN
91	Switching output 1 (DO1)	1	RW	-	0	0	1	0: NO / 1: NC





## DIAGNOSTIC

Index (dec)	Parameter	Length (byte)	R/W	Unit	min	Value Typ.	max	Comment
100	Custom device name	20	RW	-		CMSHDE		Free field, 20 characters max.
101	HMI serial number	20	RO	-		20420852461000000		
▼ Cycle counters ▼								
110	Vacuum commands counter	4	RO	-	0	0	1E+08	
112	Blow-off commands counter	4	RO	-	0	0	1E+08	
113	Grip counter	4	RO	-	0	0	1E+08	
114	Grip faults counter	4	RO	-	0	0	1E+08	
117	Power supply too high faults counter	4	RO	-	0	0	1E+08	
118	Power supply too low faults counter	4	RO	-	0	0	1E+08	
119	Vacuum and blow-off at the same time counter	4	RO	-	0	0	1E+08	
120	Pressure too high faults counter	4	RO	-	0	0	1E+08	
121	Pressure too low faults counter	4	RO	-	0	0	1E+08	
122	Blow-off faults counter	4	RO	-	0	0	1E+08	
▼ Sensors calibration ▼								
2	Vacuum sensor calibration	1	WO	-		160 / 0xA0		
2	Pressure sensor calibration	1	WO	-		161 / 0xA1		
▼ Factory settings ▼								
2	Reset process settings	1	WO	-		166 / 0xA6		
2	Reset all settings	1	WO	-		130 / 0x82		

## 20. NFC

### 20.1. Technical Data

The remote HMI (item no.: HMIHD1M38P) includes Near Field Communication (NFC) technology that enables short-range wireless data transfers between two devices.

The remote HMI includes an NFC tag that gives mobile devices read and/or write access to the diagnostic data and pump settings, provided they feature this technology and have the COVAL Vacuum Manager mobile app installed (available on App Store and Google Play).



### 20.2. Using NFC

Proceed as follows for efficient use and optimal connection between devices:

- Locate the NFC antenna on your mobile device
- **When prompted by the app** (initial connection or settings update), place your mobile device as parallel as possible to the front panel of the remote HMI making sure to align the NFC antennas.

CMS HDE data can be read or written regardless of whether the vacuum pump is switched on or off. However, firmware updates require the pump to be switched on.



## 20.3. Functionality

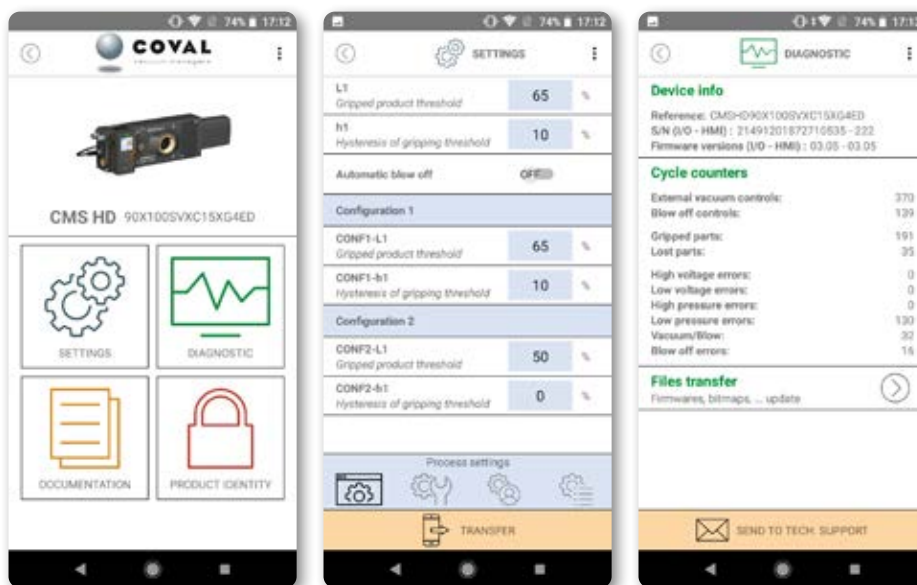
The NFC wireless technology integrated in the remote HMI together with the COVAL Vacuum Manager app allow you to access and make changes to all the configuration and diagnostic functions using your mobile devices.

### Additional functions:

- Read/write settings with the device powered off or on
- Copy settings from one CMS HD to another
- Save up to 5 setting configurations
- COVAL support: Send a report specifying the settings and diagnostic data to COVAL for technical support.

## 20.4. Downloading the COVAL VACUUM MANAGER NFC App

- Mobile apps available:
- Android, version 8.1 and higher.
- iOS, version 13 and higher.



**NFC APP:**  
**COVAL VACUUM MANAGER**

iOS Version 

Android Version 

or → <https://doc.coval.com/>

## 21. OPERATING THE VACUUM GRIPPER

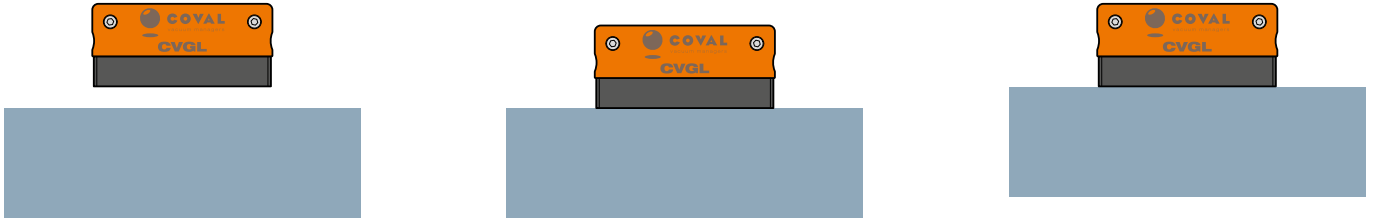
### 21.1. Version with Foam Gripping Interface

#### Recommendation:

- Operating temperature: from -40 to 120 °C (from -40 to 248 °F)
- Avoid protruding shapes
- Pay attention to the angle of approach and stroke of robot
- Cover 50% of the surface of the foam gripping interface
- Gripper position:
  - Always place the gripper in the center of the load to be handled
  - CVGL vacuum grippers are designed to handle loads using a horizontal motion
- We advise against using the CVGL for vertical gripping as the foam could deteriorate quickly:
  - In rare cases of vertical use, tests should be performed prior to commercial use
  - COVAL will not be held liable for any premature foam degradation

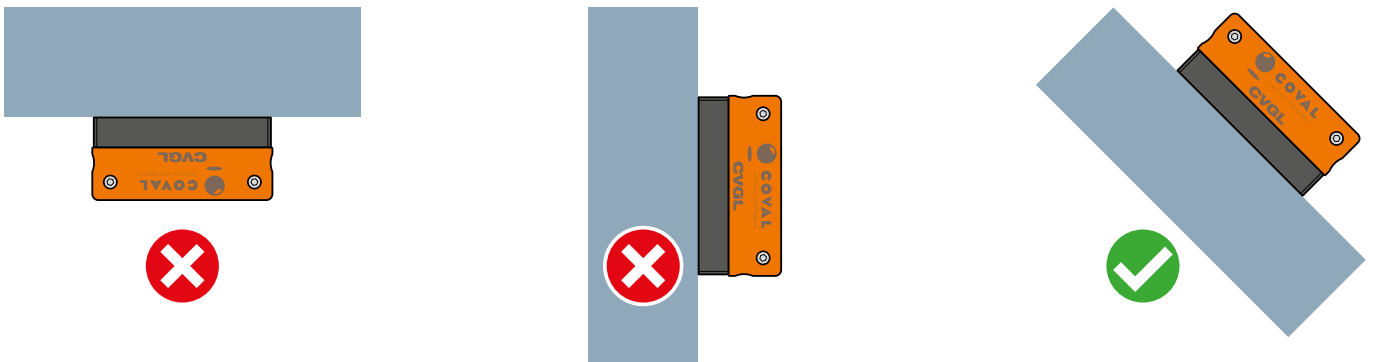
### 21.1.1. Version with foam and flow control technology using valves Models CVGL\_E (airtight valves) and CVGL\_V (check valves)

A working cycle of a CVGL vacuum gripper includes the following steps:



1. Position the vacuum gripper above the object to be handled with the foam gripping interface parallel to the object's surface.
2. Bring the vacuum gripper into contact with the object and slightly compress the foam.
3. Activate the vacuum.
4. Handle the object.
5. Deposit the object by stopping the vacuum and blowing it off, if necessary.

**Note:** If you activate the vacuum before the vacuum gripper is in contact with the object, the object will not be suctioned because the check valves will be closed and will not allow gripping.



- The CVGL vacuum gripper with valves is designed for horizontal use:
  - Admissible inclination: 45° max.
  - The use of the vacuum gripper at 180° or 90° is not allowed.
- Standing or walking in the working area of the empty gripper is strictly prohibited. In the event of a power or pneumatic supply failure, the load handled by the gripper will be released.
- The maximum vertical acceleration allowed is 5 m/s<sup>2</sup> (16 ft/s<sup>2</sup>).
- Caution: When check valves or airtight valves are used in the vacuum gripper, the vacuum value measured by the vacuum switch cannot be used as a reliable indication of the grip on the object. The vacuum switch indicates the vacuum level inside the gripper, and due to the action of the valves (closing of valves), the vacuum level will be high even when the object is not present.

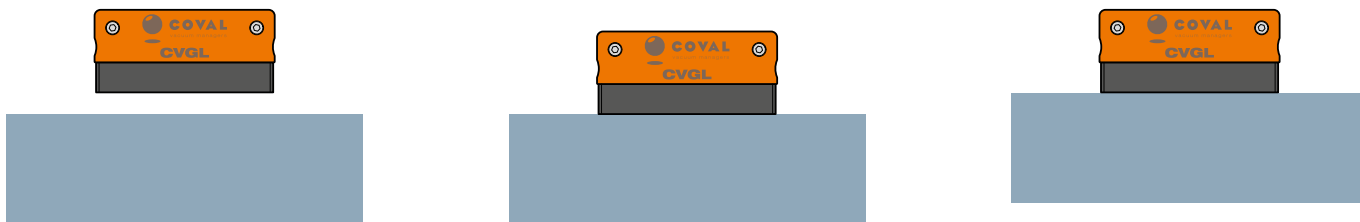
**Note:** We recommend always performing preliminary tests with samples of the objects to be handled.

**Contact the COVAL team to perform validation tests, if necessary.**

### 21.1.2. Version with foam and flow control technology using flow control nozzle

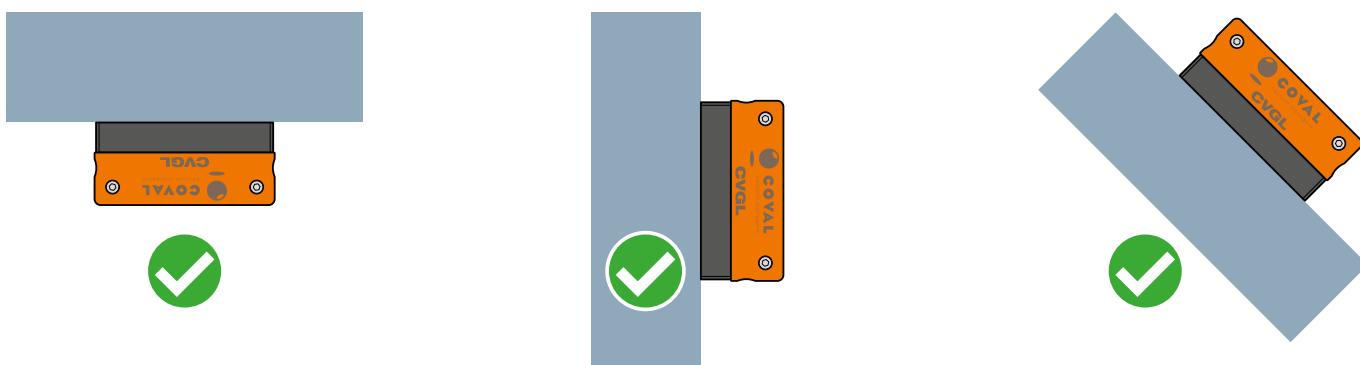
#### Model CVGL\_H (flow control nozzle)

A working cycle of a CVGL vacuum gripper includes the following steps:



1. Place the vacuum gripper above the object to be handled with the foam grip interface parallel to the object's surface.
2. Bring the vacuum gripper into contact with the object and slightly compress the foam.
3. Activate the vacuum.
4. Handle the object.
5. Deposit the object by stopping the vacuum and blowing it off, if necessary.

**Note:** In this case, the vacuum can be activated either before or after contact with the object.



- Standing or walking in the working area of the empty gripper is strictly prohibited. In the event of a power or pneumatic supply failure, the load handled by the gripper will be released.
- With the flow control nozzle, the vacuum level measured by the vacuum switch in the gripper is the actual vacuum present at the object's surface. In this case, the vacuum switch can be used to check the grip on the object.
- Caution: Please note that the vacuum level is influenced by the degree of coverage of the vacuum gripper on the object, as well as the porosity of the object handled.

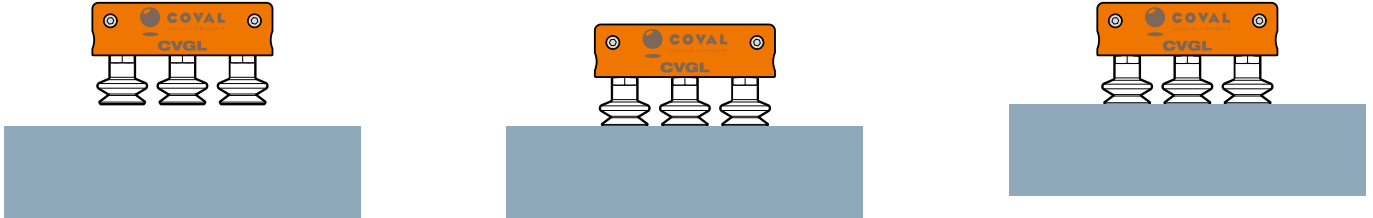
**Note:** Handling with the vacuum gripper in an upright position may subject the gripping foam to shearing stress. Depending on the load's weight and/or center of gravity, the foam may deteriorate quickly. We recommend always performing preliminary tests on actual samples of the objects to be handled.

**Contact the COVAL team to perform validation tests if necessary.**

## 21.2. Version with Suction Cup Gripping Interface

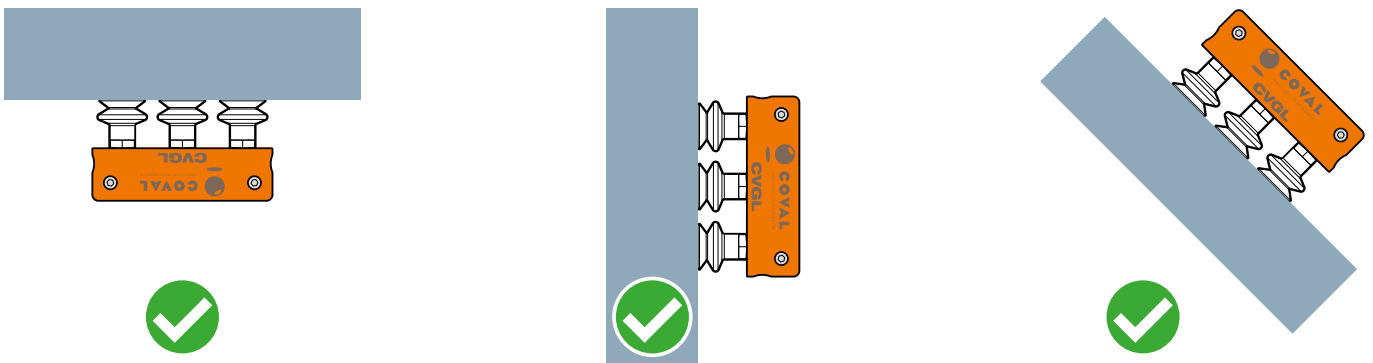
- Operating temperature: dependant on the material of the suction cups used.
- Food compatibility: Dependant on the material of the suction cups used.
- Avoid protruding shapes.
- Pay attention to the approach angle and stroke of the robot.

A working cycle of a CVGL vacuum gripper includes the following steps:



1. Place the vacuum gripper above the object to be handled with the suction cups gripping interface parallel to the object's surface.
2. Bring the vacuum gripper into contact with the object.
3. Activate the vacuum.
4. Handle the object.
5. Deposit the object by stopping the vacuum and blowing it off, if necessary.

**Note:** In this case, the vacuum can be activated either before or after contact with the object.



- Standing or walking in the working area of the empty gripper is strictly prohibited. In the event of a power or pneumatic supply failure, the load handled by the gripper will be released.
- With the flow control nozzle, the vacuum level measured by the vacuum switch in the vacuum gripper is the actual vacuum present at the object's surface. In this case, the vacuum switch can be used to check the grip on the object.
- Caution: Please note that the vacuum level is influenced by the degree of coverage of the vacuum gripper on the object, as well as the porosity of the object to be handled

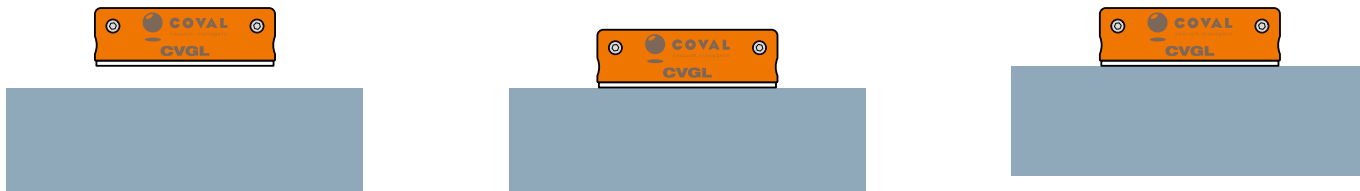
**Note:** We recommend always performing preliminary tests on actual samples of the objects to be handled.

**Contact the COVAL team to perform validation tests if necessary.**

### 21.3. Version with COVAL-flex Gripping Interface

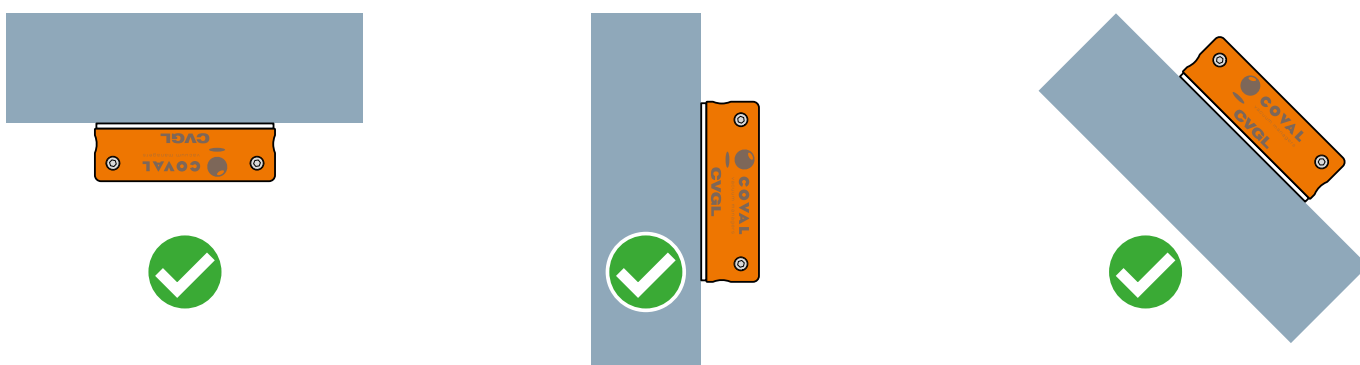
- Operating temperature: from -0 to 120 °C (from -32 to 248 °F)
- Avoid protruding shapes
- Usage: gripping hollow products, such as cans, glass, or jars, that must comply with food safety regulations (CE 1935/2004).
- Caution: low deflection (< 1 mm)
- Pay attention to the angle of attack and stroke of robot.

A working cycle of a CVGL vacuum gripper includes the following steps:



1. Place the vacuum gripper above the object to be handled with the gripping interface parallel to the object's surface.
2. Bring the vacuum gripper into contact with the object.
3. Activate the vacuum.
4. Handle the object.
5. Deposit the object by stopping the vacuum and blowing it off, if necessary.

**Note:** In this case, the vacuum can be activated either before or after contact with the object.



- Standing or walking in the working area of the empty gripper is strictly prohibited. In the event of a power or pneumatic supply failure, the load handled by the gripper will be released.
- With the flow control nozzle, the vacuum level measured by the vacuum switch in the vacuum gripper is the actual vacuum present at the object's surface. In this case, the vacuum switch can be used to check the grip on the object.
- Caution: Please note that the vacuum level is influenced by the degree of coverage of the vacuum gripper on the object, as well as the porosity of the object to be handled.

**Note:** Handling with the gripper in a vertical position may subject the COVAL-flex interface to shearing stress. Depending on the load's weight and/or center of gravity, the COVAL-flex interface may deteriorate quickly. We recommend always performing preliminary tests on actual samples of the objects to be handled.

**Contact the COVAL team to perform validation tests if necessary.**

## 22. MAINTENANCE

### 22.1. Frequency

Determination of the maintenance frequency according to the rates, environment, and type of load:

→ **To be defined by the user according to gripping efficiency and visible wear of gripping interface.**

#### Maintenance plan

	Daily	Weekly	Monthly	Every 6 months	Every year
Check the maximum vacuum level		×			
Check the tightness of parts				×	
Check the suction cups/foams/COVAL-flex	×				
Check the electrical connections			×		
Check the vacuum supply		×			
Check the general condition					×
Clean the outside of the gripper				×	

#### Troubleshooting

Failure	Possible cause	Remedy
Vacuum level too low or vacuum not reached fast enough	The internal diameter of the air line is too small	Use tubes with a larger internal diameter
	Gasket damaged	Check and replace as required
	Leakage in lines	Check tubes
	The foam or suction cups may be damaged	Replace any damaged suction cup or foam
Object not gripped	Low vacuum level	See above
	Insufficient suction flow rate	Increase the vacuum generator's suction flow rate
	Lifting speed is too fast	Reduce lifting speed, avoid acceleration peaks
	Suction cup inserts are clogged	Clean inserts
	Objects are not suitable for lifting with this system	Replace the gripping solution
Suction cups wear out very quickly	The vacuum gripper is not correctly placed on the object to be handled	The vacuum gripper must be parallel with the surface of the object
The vacuum pump does not work.	No supply voltage or power supply defective.	Check the electrical connection and the pin assignment on the M12 connector(s)
	No compressed air supply	Check the compressed air supply
The vacuum level is not correct.	A filter is clogged in the facility or network.	Clean or replace the filter screen of the vacuum connection. If the facility includes an additional vacuum filter, clean or replace the filter cartridge.
	Vacuum check valve clogged.	Clean or replace the vacuum check valve.
	Leakage in the vacuum network	Check the fittings and tubes.
	Suction cup leakage	Check the suction cup.
The vacuum build-up is too slow.	Pressure too low	Increase the pressure (refer to technical data).
	Inner diameter of tubes too small	See recommendations for air line diameters.
	Vacuum level too low	Check the L1 threshold
Cannot hold the payload in place.	Suction cup too small or insufficient number of suction cups	Choose a larger suction cup and/or increase the number of suction cups.



## 22.2. Assembling/Disassembling Gripping Interfaces

There are two options for maintenance:

Replace either only the foam or suction cups, or replace the entire gripping interface.

**Removing the interface: 2 mounting versions available:**

**Screw-on gripping interface:**

The interfaces are screwed to the vacuum gripper's aluminum profile.

Note: For vacuum grippers with foam, remove the foam to access the screws.

**Clip-on gripping interface:**

Version CVGL \_ \_ \_ **C**

Solution for quick assembly/disassembly of the gripping interface, with spring blade clips.

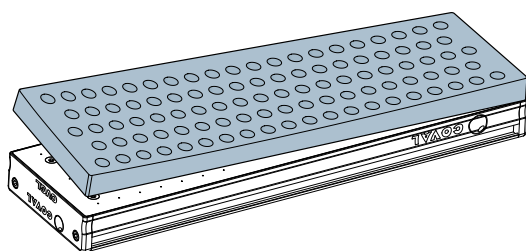
Number of clips according to the length of the vacuum gripper:

- CVGL424: 6 clips
- CVGL624: 8 clips
- CVGL824: 10 clips

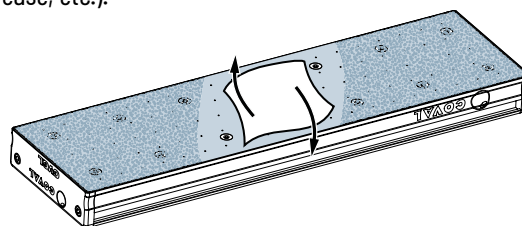


## 22.3. Replacing the Gripping Foam

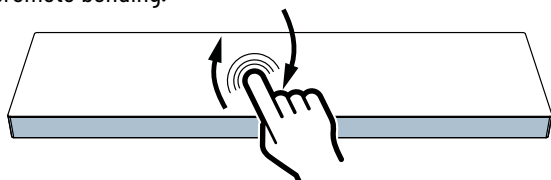
1. Manually remove the used foam interface.



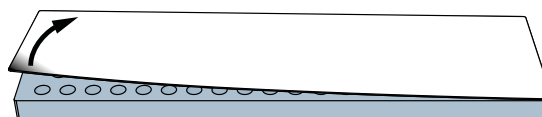
2. Clean the plate with a chemical degreaser (e.g. acetone) to remove unwanted compounds (adhesive residue, grease, etc.).



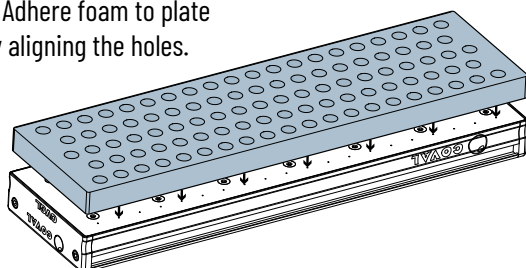
3. On the replacement foam, rub the protective film on the adhesive side for a few seconds to activate the cells and promote bonding.



4. Remove the protective film.



5. Adhere foam to plate by aligning the holes.



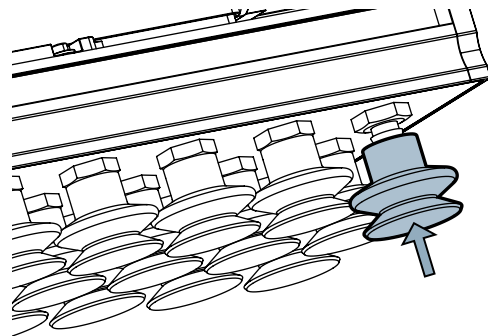
6. Turn the gripper over and place it on a flat, smooth and clean surface. Press lightly on the gripper for 30 seconds so that the foam is uniformly adhered to the plate.

## 22.4. Replacing Suction Cups

The suction cups are mounted on barbed fittings. Simply pull the suction cup to remove it.

### *Tip for mounting the suction cups:*

*Soak the suction cup neck in lukewarm water to facilitate the mounting on the fitting.*



## 22.5. Disassembling the CMS HDE Series Vacuum Generator



**Prior to working on the pump, make sure the compressed air network is depressurized and that the connector(s) has (have) been removed.**

1. Unscrew the 4 CHC M4X8 screws, using a 3 mm hexagon bit socket, to remove the CMS HDE from the aluminum profile.

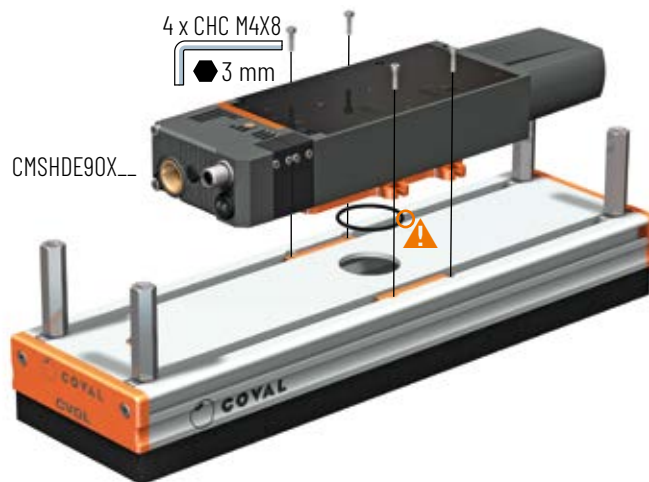
⚠ Pay attention to the seal.

2. Replace the CMS HDE (see part number in section 23.3).

3. Make sure to place the seal in the corresponding groove on the CMS HDE mounting plate.

4. Position the CMS HDE by centering the vacuum port of the CMS HDE opposite the vacuum supply port of the aluminum profile.

5. Tighten the 4 CHC M4X8 screws using a 3 mm hexagon bit socket. Tightening torque: 2.5 N m.

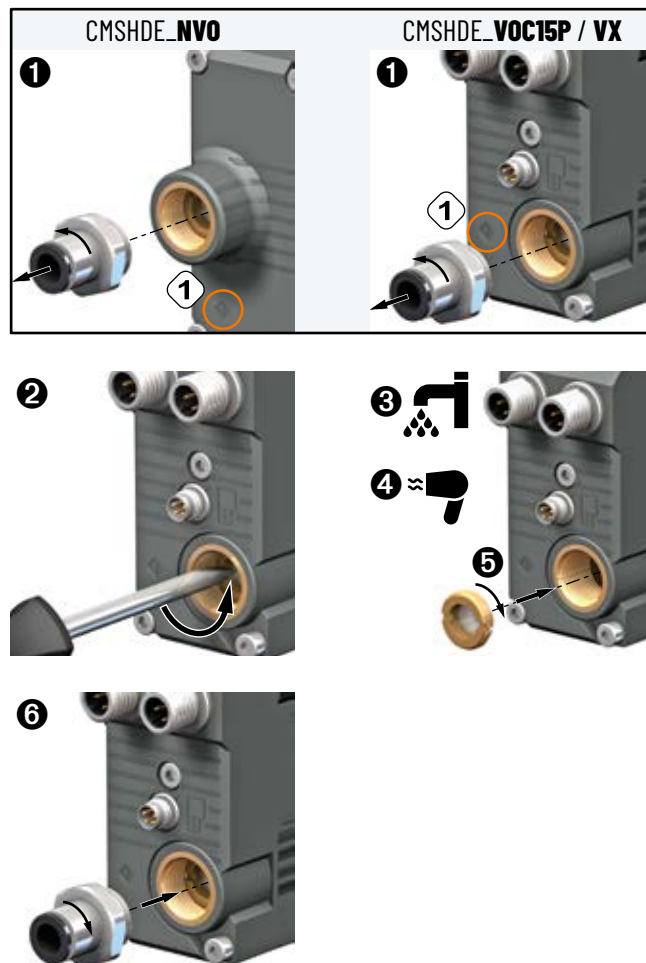


## 22.6. Maintenance Procedures for a Vacuum Generator, CMS HDE Series

### 22.6.1. Cleaning the filter screen on the compressed air supply

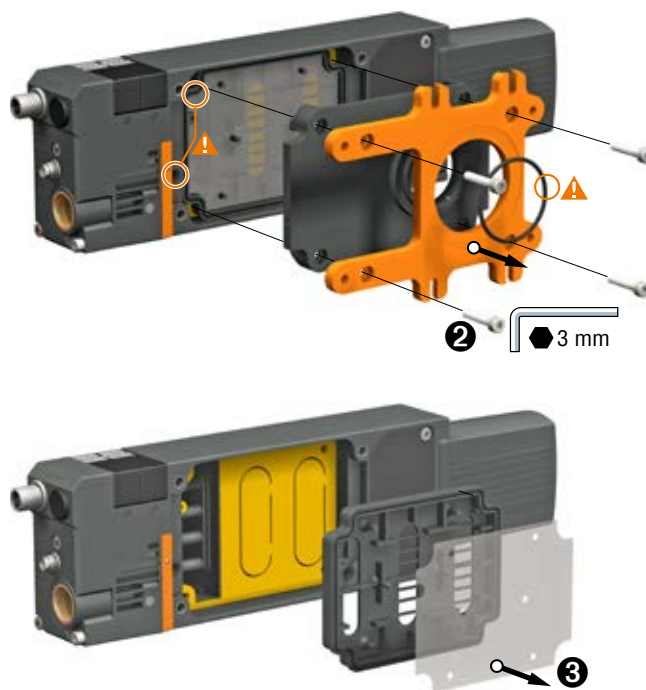
(Marked ① on the pressure connection end plate for pumps without control (CMSHDE\_**NVO**), or on the control valve block on pumps with control (CMSHDE\_**VOC15P** and **VX**).

- ① Loosen the G3/8" fitting to access the filter screen.
- ② Use a slotted screwdriver. Turn counterclockwise.
- ③ Clean the protective grid.
- ④ Dry the grid.
- ⑤ Reassemble the grid by screwing clockwise.
- ⑥ Mount the G3/8" fitting back in place.

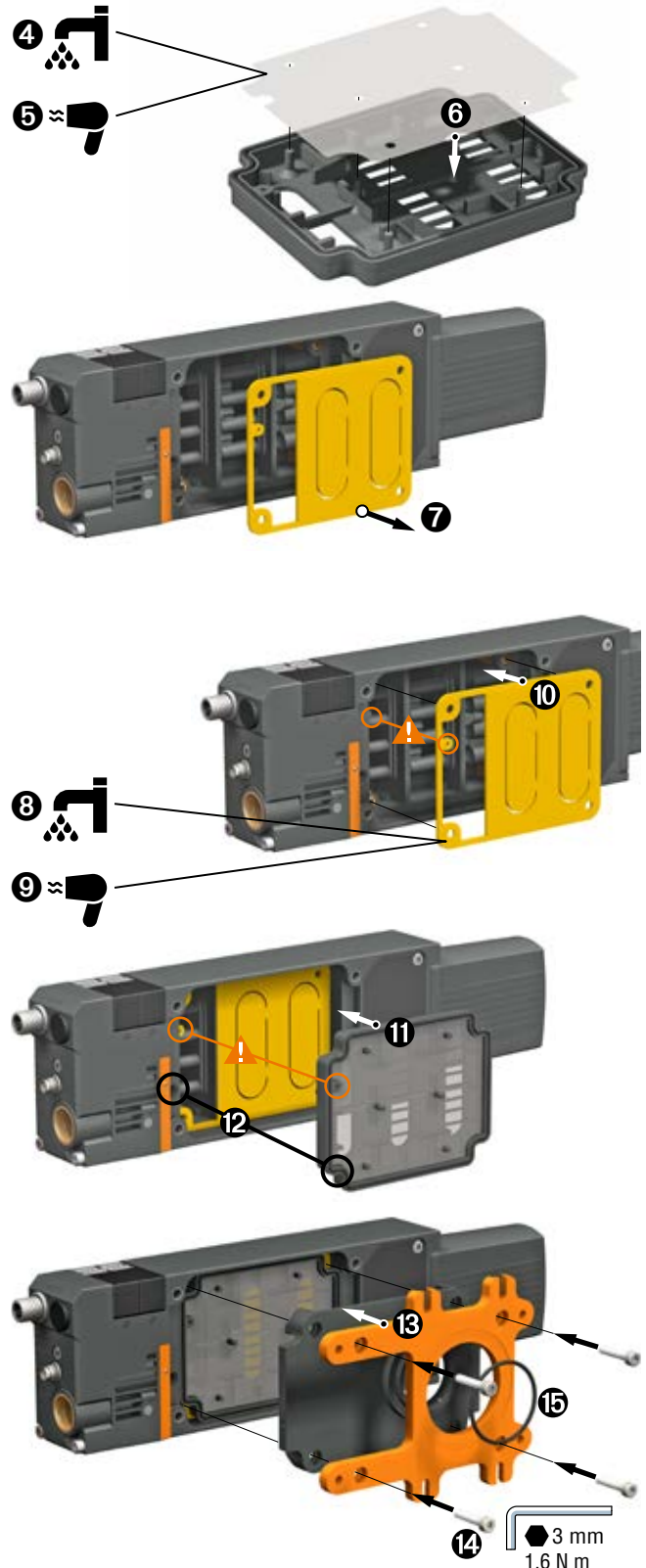


### 22.6.2. Cleaning the vacuum filter and the vacuum check valve

- ① Remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).
- ② Unscrew the 4 M4x20 CHC screws from the end plate, using a 3 mm hexagon bit socket, and then remove the mounting interface and the front end plate.
  - ⚠ Caution, the gaskets may be stuck to the end plate. Make sure they are properly placed in their groove.
- ③ Remove the filter basket and take out the vacuum filter.



- **4** Clean the vacuum filter.
- **5** Dry the vacuum filter.
- **6** Mount the vacuum filter back onto the filter basket.  
⚠ Make sure the vacuum filter is not deformed.
- **7** Remove the vacuum check valve.
- **8** Clean the vacuum check valve with water and soap (no solvents).
- **9** Dry the vacuum check valve.
- **10** Place the vacuum check valve in its groove.  
⚠ Observe the mounting direction of the vacuum check valve by placing the check valve's notch opposite the notch on the CMS HDE's body.
- **11** Set the filter basket in place.  
⚠ Observe the mounting direction of the filter basket by placing the basket's notch opposite the notch on the CMS HDE's body.
- **12** Make sure that the 2 gaskets are properly placed in their groove.
- **13** Place the end plate in its groove and the mounting interface.
- **14** Tighten the 4 M4x20 CHC screws using a 3 mm hexagon bit socket (tightening torque 1.6 N m).
- **15** Position the gasket in its groove.
- **16** Mount the CMS HDE vacuum generator on the CVGL (see section 22.5).




**NOTE:** Replacing the vacuum check valve and the vacuum filter for CMSHDE90X\_50/100 : Use the maintenance kit (part no.: 80008140) that contains 1 vacuum check valve, 1 vacuum filter, 2 flat gaskets for exhaust, 1 acoustic foam, and 1 set of o-rings and molded gaskets.

### 22.6.3. Cleaning the multi-stage venturi profiles

(Marked  on the "multi-stage Venturi profile" assembly).

**⚠** If necessary, remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).

- **1** Remove the 2 M4x8 CHC screws using a 3 mm hexagon bit socket to remove the exhaust silencer.  
**⚠** Caution: The gasket may be stuck to the end plate or exhaust option.

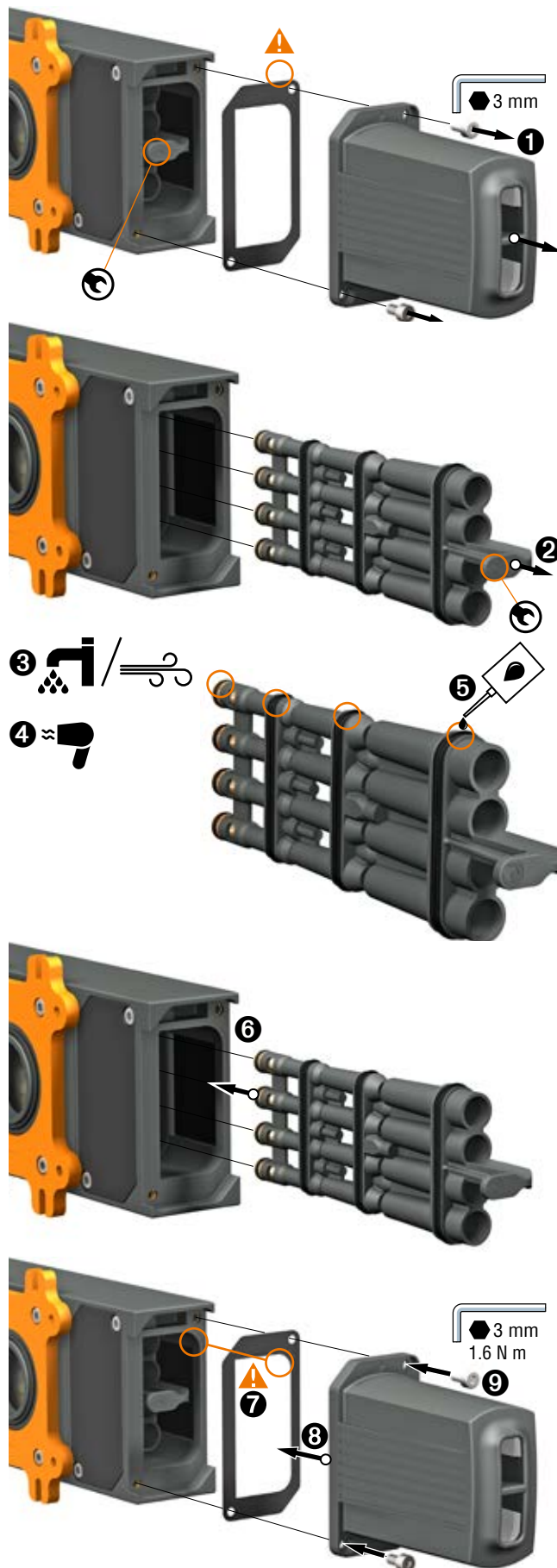
- **2** Extract the "multi-stage Venturi profile" assembly from the body by pulling on the hook (marked .

Note: The "multi-stage Venturi profile" assembly may sometimes be difficult to extract manually. Use a screwdriver as a lever on the hook.

- **3** Clean the "multi-stage Venturi profile" assembly with water and soap (no solvents) or using a blast of compressed air.
- **4** Dry the "multi-stage venturi profile" assembly.
- **5** Grease the gaskets on both sides using mineral oil.  
**⚠** Make sure the lip seals are properly placed in their groove.

- **6** Insert the "multi-stage Venturi profile" assembly and push it until it clips in. The clip should not protrude from the body.

- **7** Set the gasket in place.  
**⚠** Pay attention to the direction of the gasket: the internal cutout of the gasket must match the shape of the body.
- **8** Set the exhaust silencer in place.
- **9** Tighten the 2 M4x8 CHC screws using a 3 mm hexagon bit socket (tightening torque 1.6 N m).

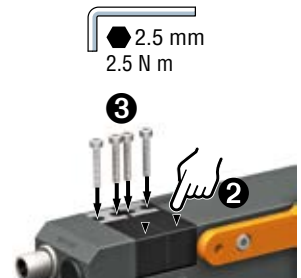
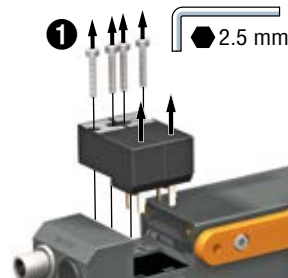




#### 22.6.4. Replacing the solenoid valves

⚠ If necessary, remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).

- ❶ Remove the M3x18 CHC screws that hold in place the solenoid valve(s) to be replaced (use a 2.5 mm allen wrench).
- ❷ Replace the solenoid valve(s) as required (for item numbers, refer to sect. 23.4).
- ⚠ Caution: Make sure to properly place the pins of the solenoid valves in the respective holes by pressing slightly.
- ❸ Tighten the M3x18 CHC screws (tightening torque 1.6 N m).



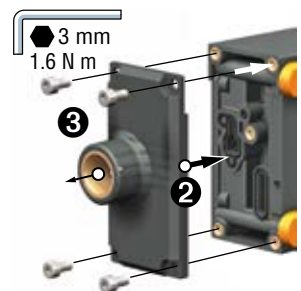
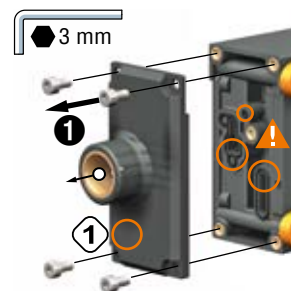
#### 22.6.5. Replacing the pressure connection end plate for CMSHDE90X\_\_NVO

(Mark ❶ on the end plate).

Spare part numbers: refer to sect. 23.4 (to replace the gaskets, use the maintenance kit matching the CMS HDE model).

⚠ If necessary, remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).

- ❶ Remove the 4 M4x8 CHC screws using a 3 mm hexagon bit socket to remove the pressure connection end plate.
- ⚠ Caution: Make sure that the 3 gaskets are properly placed in their groove.
- If necessary, replace the 3 gaskets (see Maintenance Kit).
- ❷ Replace the pressure connection end plate and set it in place.
- ❸ Tighten the 4 M4x8 CHC screws using 3 mm hexagon bit socket (tightening torque 1.6 N m).



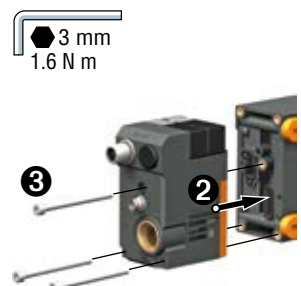
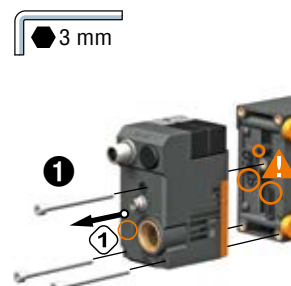
#### 22.6.6. Replacing the valve block for CMSHDE90X\_\_SVOC15P / VVOC15P and CMSHDE90X\_\_SVX\_ / VVX\_

(Marked ❶ on the end plate).

Spare part numbers: refer to sect. 23.4 (to replace the gaskets, use the maintenance kit matching the CMS HDE model).

⚠ If necessary, remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).

- ❶ Remove the 3 M4x55 CHC screws using a 3 mm allen wrench to remove the valve block.
- ⚠ Caution: Make sure that the 3 gaskets are properly placed in their groove.
- If necessary, replace the 3 gaskets (see Maintenance Kit).
- ❷ Replace the valve block and set the new one in place.
- ❸ Tighten the 3 M4x55 CHC screws using 3 mm allen wrench (tightening torque 1.6 N m).



### 22.6.7. Replacing the exhaust silencer

Spare part numbers: refer to sect. 23.4 (to replace the gaskets, use the maintenance kit matching the CMS HDE model)

⚠ If necessary, remove the CMS HDE vacuum generator from the CVGL gripper (see section 22.5).

- **1** Remove the 2 M4x8 CHC screws using a 3 mm allen wrench to remove the exhaust silencer.  
⚠ Caution: The gasket may be stuck to the end plate or exhaust silencer.
- **2** Set the gasket in place.  
⚠ Pay attention to the direction of the gasket: the internal cutout of the gasket must match the shape of the body.
- **3** Replace the exhaust silencer and set it in place.
- **4** Tighten the 2 M4x8 CHC screws using a 3 mm allen wrench (tightening torque 1.6 N m).



### 22.7. Performing Airtightness Test on Vacuum Gripper

To ensure the proper operation of CVGL vacuum grippers following maintenance work, it is important to perform an airtightness test:

1. Place the gripper on a clean, smooth, flat, and waterproof surface.
  2. Activate the vacuum.
  3. Check the vacuum level on the electronic vacuum switch. It must be at least 80% (-800 mbar) at the vacuum generator's optimal operating pressure.
- If the vacuum level is not reached, check the following:
- Quality of tested surface
  - Wear of gripping foam and its adhesive
  - Size of compressed air line (depending on configuration, see sect. 9.2)
  - Quality of compressed air network (connections, tubes, leaks, or damage) and replace any defective components
  - Pressure in compressed air network: optimal operating pressure is 6 bar



## 23. SPARE PARTS

### 23.1. Foam Gripping Interface

#### 23.1.1. Complete spare foam gripping interface

##### COMPLETE GRIPPING INTERFACE FOR CVGL "MINI" TYPE FOAM

Complete interface for CVGL "mini" type foam with **flow control nozzles** (CVGL \_\_QF2S H\_)

Part number	Description
CPL424QF2SXH	Complete interface for CVGL424QF2SXH (Foam dimensions 420 x 118 mm, with Ø12 mm holes without filter)
CPL624QF2SXH	Complete interface for CVGL624QF2SXH (Foam dimensions 620 x 118 mm, with Ø12 mm holes without filter)
CPL824QF2SXH	Complete interface for CVGL824QF2SXH (Foam dimensions 820 x 118 mm, with Ø12 mm holes without filter)
CPL424QF2SFH	Complete interface for CVGL424QF2SFH (Foam dimensions 420 x 118 mm, with Ø12 mm holes with filter)
CPL624QF2SFH	Complete interface for CVGL624QF2SFH (Foam dimensions 620 x 118 mm, with Ø12 mm holes with filter)
CPL824QF2SFH	Complete interface for CVGL824QF2SFH (Foam dimensions 820 x 118 mm, with Ø12 mm holes with filter)

Complete interface for CVGL "mini" type foam with **airtight valves** (CVGL \_\_QF2S E\_)

Part number	Description
CPL424QF2SXE	Complete interface for CVGL424QF2SXE (Foam dimensions 420 x 118 mm, with Ø12 mm holes without filter)
CPL624QF2SXE	Complete interface for CVGL624QF2SXE (Foam dimensions 620 x 118 mm, with Ø12 mm holes without filter)
CPL824QF2SXE	Complete interface for CVGL824QF2SXE (Foam dimensions 820 x 118 mm, with Ø12 mm holes without filter)
CPL424QF2SFE	Complete interface for CVGL424QF2SFE (Foam dimensions 420 x 118 mm, with Ø12 mm holes with filter)
CPL624QF2SFE	Complete interface for CVGL624QF2SFE (Foam dimensions 620 x 118 mm, with Ø12 mm holes with filter)
CPL824QF2SFE	Complete interface for CVGL824QF2SFE (Foam dimensions 820 x 118 mm, with Ø12 mm holes with filter)

Complete interface for CVGL "mini" type foam with **check valves** (CVGL \_\_QF2S V\_)

Part number	Description
CPL424QF2SXV	Complete interface for CVGL424QF2SXV (Foam dimensions 420 x 118 mm, with Ø12 mm holes without filter)
CPL624QF2SXV	Complete interface for CVGL624QF2SXV (Foam dimensions 620 x 118 mm, with Ø12 mm holes without filter)
CPL824QF2SXV	Complete interface for CVGL824QF2SXV (Foam dimensions 820 x 118 mm, with Ø12 mm holes without filter)
CPL424QF2SFV	Complete interface for CVGL424QF2SFV (Foam dimensions 420 x 118 mm, with Ø12 mm holes with filter)
CPL624QF2SFV	Complete interface for CVGL624QF2SFV (Foam dimensions 620 x 118 mm, with Ø12 mm holes with filter)
CPL824QF2SFV	Complete interface for CVGL824QF2SFV (Foam dimensions 820 x 118 mm, with Ø12 mm holes with filter)

##### COMPLETE GRIPPING INTERFACE FOR CVGL "MAXI" TYPE FOAM

Complete interface for CVGL "maxi" type foam with **flow control nozzles** (CVGL \_\_QF2B H\_)

Part number	Description
CPL424QF2BXH	Complete interface for CVGL424QF2BXH (Foam dimensions 420 x 118 mm, with Ø16 mm holes without filter)
CPL624QF2BXH	Complete interface for CVGL624QF2BXH (Foam dimensions 620 x 118 mm, with Ø16 mm holes without filter)
CPL824QF2BXH	Complete interface for CVGL824QF2BXH (Foam dimensions 820 x 118 mm, with Ø16 mm holes without filter)
CPL424QF2BFH	Complete interface for CVGL424QF2BFH (Foam dimensions 420 x 118 mm, with Ø16 mm holes with filter)
CPL624QF2BFH	Complete interface for CVGL624QF2BFH (Foam dimensions 620 x 118 mm, with Ø16 mm holes with filter)
CPL824QF2BFH	Complete interface for CVGL824QF2BFH (Foam dimensions 820 x 118 mm, with Ø16 mm holes with filter)

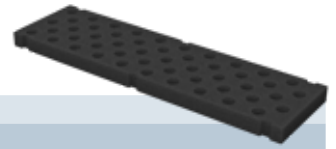
Complete interface for CVGL "maxi" type foam with **airtight valves** (CVGL \_\_QF2B E\_)

Part number	Description
CPL424QF2BXE	Complete interface for CVGL424QF2BXE (Foam dimensions 420 x 118 mm, with Ø16 mm holes without filter)
CPL624QF2BXE	Complete interface for CVGL624QF2BXE (Foam dimensions 620 x 118 mm, with Ø16 mm holes without filter)
CPL824QF2BXE	Complete interface for CVGL824QF2BXE (Foam dimensions 820 x 118 mm, with Ø16 mm holes without filter)
CPL424QF2BFE	Complete interface for CVGL424QF2BFE (Foam dimensions 420 x 118 mm, with Ø16 mm holes with filter)
CPL624QF2BFE	Complete interface for CVGL624QF2BFE (Foam dimensions 620 x 118 mm, with Ø16 mm holes with filter)
CPL824QF2BFE	Complete interface for CVGL824QF2BFE (Foam dimensions 820 x 118 mm, with Ø16 mm holes with filter)

Complete interface for CVGL "maxi" type foam with **check valves** (CVGL \_\_QF2B V\_)

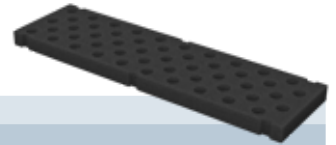
Part number	Description
CPL424QF2BXV	Complete interface for CVGL424QF2BXV (Foam dimensions 420 x 118 mm, with Ø16 mm holes without filter)
CPL624QF2BXV	Complete interface for CVGL624QF2BXV (Foam dimensions 620 x 118 mm, with Ø16 mm holes without filter)
CPL824QF2BXV	Complete interface for CVGL824QF2BXV (Foam dimensions 820 x 118 mm, with Ø16 mm holes without filter)
CPL424QF2BFV	Complete interface for CVGL424QF2BFV (Foam dimensions 420 x 118 mm, with Ø16 mm holes with filter)
CPL624QF2BFV	Complete interface for CVGL624QF2BFV (Foam dimensions 620 x 118 mm, with Ø16 mm holes with filter)
CPL824QF2BFV	Complete interface for CVGL824QF2BFV (Foam dimensions 820 x 118 mm, with Ø16 mm holes with filter)

### 23.1.2. Spare foam bases



#### Foam bases for CVGL "mini" type foam (CVGL \_\_QF2S \_)

Part number	For model	Description
80004220	CVGL424QF2SX_	Foam base for CVGL424QF2SX (Foam dimensions 420 x 118 mm, with Ø12 mm holes without filter)
80004221	CVGL624QF2SX_	Foam base for CVGL624QF2SX (Foam dimensions 620 x 118 mm, with Ø12 mm holes without filter)
80004222	CVGL824QF2SX_	Foam base for CVGL824QF2SX (Foam dimensions 820 x 118 mm, with Ø12 mm holes without filter)
80004223	CVGL424QF2SF_	Foam base for CVGL424QF2SF (Foam dimensions 420 x 118 mm, with Ø12 mm holes with filter)
80004224	CVGL624QF2SF_	Foam base for CVGL624QF2SF (Foam dimensions 620 x 118 mm, with Ø12 mm holes with filter)
80004225	CVGL824QF2SF_	Foam base for CVGL824QF2SF (Foam dimensions 820 x 118 mm, with Ø12 mm holes with filter)



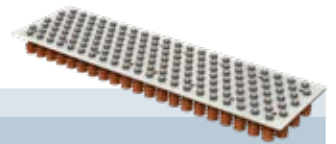
#### Foam bases for CVGL "maxi" type foam (CVGL \_\_QF2B \_)

Part number	For model	Description
80004229	CVGL424QF2BX_	Foam base for CVGL424QF2BX (Foam dimensions 420 x 118 mm, with Ø16 mm holes without filter)
80004230	CVGL624QF2BX_	Foam base for CVGL624QF2BX (Foam dimensions 620 x 118 mm, with Ø16 mm holes without filter)
80004231	CVGL824QF2BX_	Foam base for CVGL824QF2BX (Foam dimensions 820 x 118 mm, with Ø16 mm holes without filter)
80004232	CVGL424QF2BF_	Foam base for CVGL424QF2BF (Foam dimensions 420 x 118 mm, with Ø16 mm holes with filter)
80004233	CVGL624QF2BF_	Foam base for CVGL624QF2BF (Foam dimensions 620 x 118 mm, with Ø16 mm holes with filter)
80004234	CVGL824QF2BF_	Foam base for CVGL824QF2BF (Foam dimensions 820 x 118 mm, with Ø12 mm holes with filter)

## 23.2. Suction Cup Gripping Interfaces

### 23.2.1. Complete replacement suction cup gripping interface

COMPLETE INTERFACE LENGTH 424 MM FOR CVGL424\_



#### Screw mounting

Part number	Description
CPL424QVSP14BFXHX	Complete interface for CVGL424QVSP14BFXHX ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 Shore with flow control nozzles, screw mounting)
CPL424QVSA25JIXHX	Complete interface for CVGL424QVSA25JIXHX ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm natural rubber with flow control nozzles, screw mounting)
CPL424QVSA33JKXHX	Complete interface for CVGL424QVSA33JKXHX ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, screw mounting)
CPL424QMV30EKXHX	Complete interface for CVGL424QMV30EKXHX ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, screw mounting)
CPL424DVSA33JKXH	Complete interface for CVGL424DVSA33JKXH ("maxi" type gripping interface, straight layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, screw mounting)

#### Clip mounting

Part number	Description
CPL424QVSP14BFXHC	Complete interface for CVGL424QVSP14BFXHC ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 Shore with flow control nozzles, clip mounting)
CPL424QVSA25JIXHC	Complete interface for CVGL424QVSA25JIXHC ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm natural rubber with flow control nozzles, clip mounting)
CPL424QVSA33JKXHC	Complete interface for CVGL424QVSA33JKXHC ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, clip mounting)
CPL424QMV30EKXHC	Complete interface for CVGL424QMV30EKXHC ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, clip mounting)
CPL424DVSA33JKXC	Complete interface for CVGL424DVSA33JKXC ("maxi" type gripping interface, straight layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, clip mounting)

**COMPLETE INTERFACE LENGTH 624 MM FOR CVGL624\_\_\_\_\_**

**Screw mounting**

Part number	Description
<b>CPL624QVSP14BFHXH</b>	Complete interface for CVGL624QVSP14BFHXH ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 shore with flow control nozzles, screw mounting)
<b>CPL624QVSA25JIXHX</b>	Complete interface for CVGL624QVSA25JIXHX ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm natural rubber with flow control nozzles, screw mounting)
<b>CPL624QVSA33JKXHX</b>	Complete interface for CVGL624QVSA33JKXHX ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, screw mounting)
<b>CPL624QMV30EKXHX</b>	Complete interface for CVGL624QMV30EKXHX ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, screw mounting)
<b>CPL624DVSA33JKXH</b>	Complete interface for CVGL624DVSA33JKXH ("maxi" type gripping interface, straight layout, 1.5 bellows suction cups Ø33 mm natural rubber with flow control nozzles, screw mounting)

**Clip mounting**

Part number	Description
<b>CPL624QVSP14BFXHC</b>	Complete interface for CVGL624QVSP14BFXHC ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 shore with flow control nozzles, clip mounting)
<b>CPL624QVSA25JIXHC</b>	Complete interface for CVGL624QVSA25JIXHC ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm Natural rubber with flow control nozzles, clip mounting)
<b>CPL624QVSA33JKXHC</b>	Complete interface for CVGL624QVSA33JKXHC ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, clip mounting)
<b>CPL624QMV30EKXHC</b>	Complete interface for CVGL624QMV30EKXHC ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, clip mounting)
<b>CPL624DVSA33JKXC</b>	Complete interface for CVGL624DVSA33JKXC ("maxi" type gripping interface, straight layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, clip mounting)

**COMPLETE INTERFACE LENGTH 824 MM FOR CVGL824\_\_\_\_\_**

**Screw mounting**

Part number	Description
<b>CPL824QVSP14BFHXH</b>	Complete interface for CVGL824QVSP14BFHXH ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 shore with flow control nozzles, screw mounting)
<b>CPL824QVSA25JIXHX</b>	Complete interface for CVGL824QVSA25JIXHX ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm Natural rubber with flow control nozzles, screw mounting)
<b>CPL824QVSA33JKXHX</b>	Complete interface for CVGL824QVSA33JKXHX ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, screw mounting)
<b>CPL824QMV30EKXHX</b>	Complete interface for CVGL824QMV30EKXHX ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, screw mounting)
<b>CPL824DVSA33JKXH</b>	Complete interface for CVGL824DVSA33JKXH ("maxi" type gripping interface straight layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, screw mounting)

**Clip mounting**

Part number	Description
<b>CPL824QVSP14BFXHC</b>	Complete interface for CVGL824QVSP14BFXHC ("mini" type gripping interface, staggered layout, 2.5 bellows suction cups Ø14 mm silicone 35 shore with flow control nozzles, clip mounting)
<b>CPL824QVSA25JIXHC</b>	Complete interface for CVGL824QVSA25JIXHC ("medium" type gripping interface, staggered layout, 1.5 bellows suction cups Ø25 mm Natural rubber with flow control nozzles, clip mounting)
<b>CPL824QVSA33JKXHC</b>	Complete interface for CVGL824QVSA33JKXHC ("maxi" type gripping interface, staggered layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, clip mounting)
<b>CPL824QMV30EKXHC</b>	Complete interface for CVGL824QMV30EKXHC ("maxi" type gripping interface, staggered layout, 2.5 bellows suction cups Ø30 mm white silicone 35 Shore with flow control nozzles, clip mounting)
<b>CPL824DVSA33JKXC</b>	Complete interface for CVGL824DVSA33JKXC ("maxi" type gripping interface, straight layout, 1.5 bellows suction cups Ø33 mm Natural rubber with flow control nozzles, clip mounting)

**23.2.2. Spare suction cups**

Part number	Ø (mm)	Material	Description
<b>VSP14SI3</b>	Ø 14	Silicone 35 Shore	Red silicone, 2.5 bellows suction cup Ø14 mm
<b>VSA25NR</b>	Ø 25	Natural rubber	Natural rubber, 1.5 bellows suction cup Ø25 mm
<b>VSA33NR</b>	Ø 33	Natural rubber	Natural rubber, 1.5 bellows suction cup Ø33 mm
<b>MVS302.5SIB</b>	Ø 30	Silicone 35 Shore	White silicone, 2.5 bellows suction cup Ø14 mm



### 23.3. CMS HDE Series Multi-Stage Vacuum Generators for CVGL\_\_\_D1, D2, or D3

Generator without control valve: CVGL\_\_\_ **N**

Part number	Description
<b>CMSHDE90X50NVOG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D1N0K</b>
<b>CMSHDE90X100NVOG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D2N0K</b>
<b>2 x CMSHDE90X100NVOG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D3N0K</b>

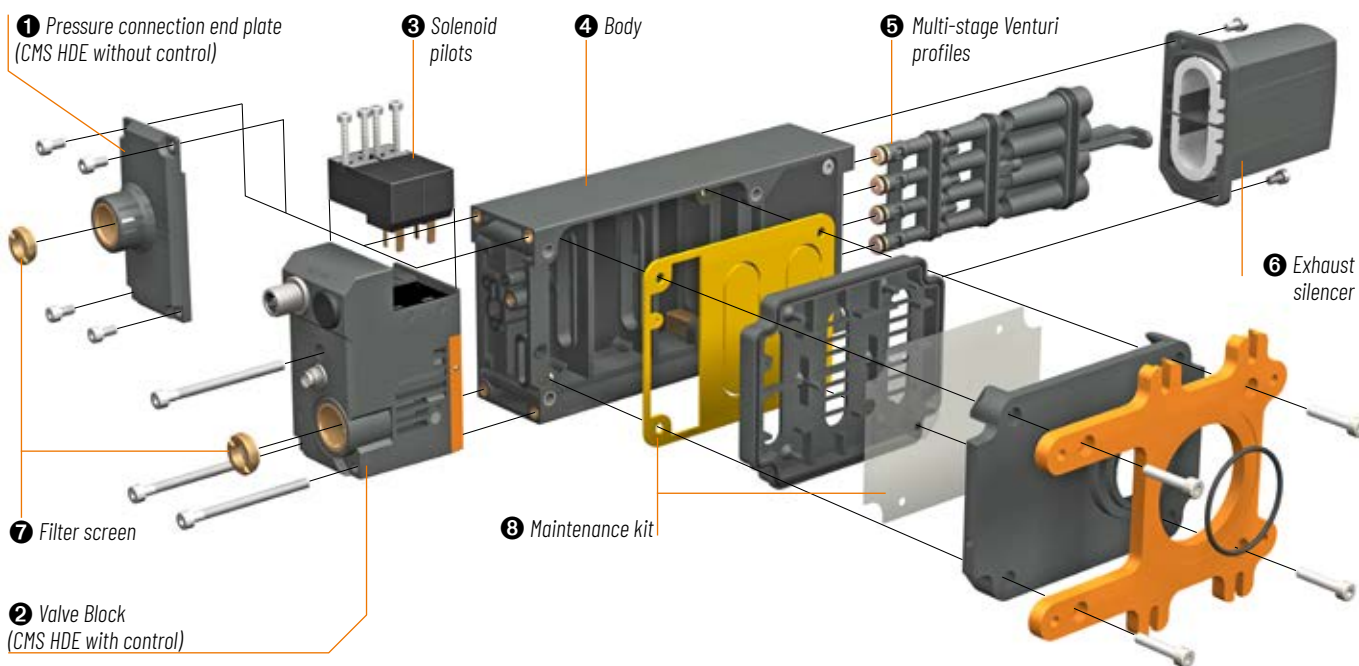
Generator with control valve: CVGL\_\_\_ **S1** ou **V1**

Part number	Description
<b>CMSHDE90X50SVOC15PG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D1S1K</b>
<b>CMSHDE90X50VVOG15PG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D1V1K</b>
<b>CMSHDE90X100SVOC15PG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D2S1K</b>
<b>CMSHDE90X100VVOG15PG4K</b>	Multi-stage vacuum generator for CVGL___ <b>D2V1K</b>

Generator with control valve: CVGL\_\_\_ **S2** ou **V2**

Part number	Description
<b>CMSHDE90X50SVXC15XG4KD</b>	Multi-stage vacuum generator for CVGL___ <b>D1S2K</b>
<b>CMSHDE90X50VVC15XG4KD</b>	Multi-stage vacuum generator for CVGL___ <b>D1V2K</b>
<b>CMSHDE90X100SVXC15XG4KD</b>	Multi-stage vacuum generator for CVGL___ <b>D2S2K</b>
<b>CMSHDE90X100VVC15XG4KD</b>	Multi-stage vacuum generator for CVGL___ <b>D2V2K</b>

### 23.4. Spare Parts for CMS HDE Series Vacuum Generators



#### 1 Pressure connection end plate for CMS HDE without control (CMSHDE\_\_\_NVO)

Description	Item code
Compressed air connection end plate	<b>80007381</b>





**② Valve block without solenoid valve for CMS HDE with control (CMSHDE...SV0/NV0 and SVX/VVX)**  
(item code depends on CMS HDE model)

For **SV0/NV0** model

For model	Description	Item code
CMSHDE90X...VOC15PG4_	One M12 5-pin male	CMSHDEVBVOC15P



For **SVX/VVX** models

For models	Description	Item code
CMSHDE90X50SVXC15XG4KD	One M12 5-pin male / one M8 4-pin for remote HMI	CMSHDEVB50SVXC15XG4KD
CMSHDE90X50VVXC15XG4KD	One M12 5-pin male / one M8 4-pin for remote HMI	CMSHDEVB50VVXC15XG4KD
CMSHDE90X100SVXC15XG4KD	One M12 5-pin male / one M8 4-pin for remote HMI	CMSHDEVB100SVXC15XG4KD
CMSHDE90X100VVXC15XG4KD	One M12 5-pin male / one M8 4-pin for remote HMI	CMSHDEVB100VVXC15XG4KD

**③ Solenoid valves for CMS HDE**

**DETAILS ON SOLENOID VALVE POSITIONS AND FUNCTIONS ACCORDING TO CMS HDE VERSION**

Version CMSHDE90X\_**S**...

Position	Function
<b>1</b>	NC solenoid valve: vacuum control
<b>2</b>	NC solenoid valve: blow-off control

Version CMSHDE90X\_**V**...

Position	Function
<b>1</b>	NO solenoid valve: vacuum control
<b>2</b>	NC solenoid valve: blow-off control



Solenoid valve position

Item code	Description	Position			
		CMSHDE90X_ <b>S</b> ...		CMSHDE90X_ <b>V</b> ...	
		1	2	1	2
80004627	NC - 3/2 - 24 V - 15 mm solenoid valve - 8 mm center distances	✗	✗		✗
80004628	NO - 3/2 - 24 V - 15 mm solenoid valve - 8 mm center distances			✗	



**④ Body for CMS HDE**

For model	Description	Item code
CMSHDE90X <b>50/100</b> _	Simple body	CMSHDEMBS



**5 Multi-stage profile assembly for CMS HDE**  
(item code depends on CMS HDE model)

For model	Description	Item code
CMSHD90X <b>50</b> _	Multi-stage profile assembly: 2 profiles 3 stages	<b>80006475</b>
CMSHD90X <b>100</b> _	Multi-stage profile assembly: 4 profiles 3 stages	<b>80006476</b>



**6 Exhaust option for CMS HDE**

Description	Item code
Through-type silencer	<b>80004915</b>



**7 Accessories**

Description	Item code
350 µm filter screen - G3/8"	<b>80005035</b>

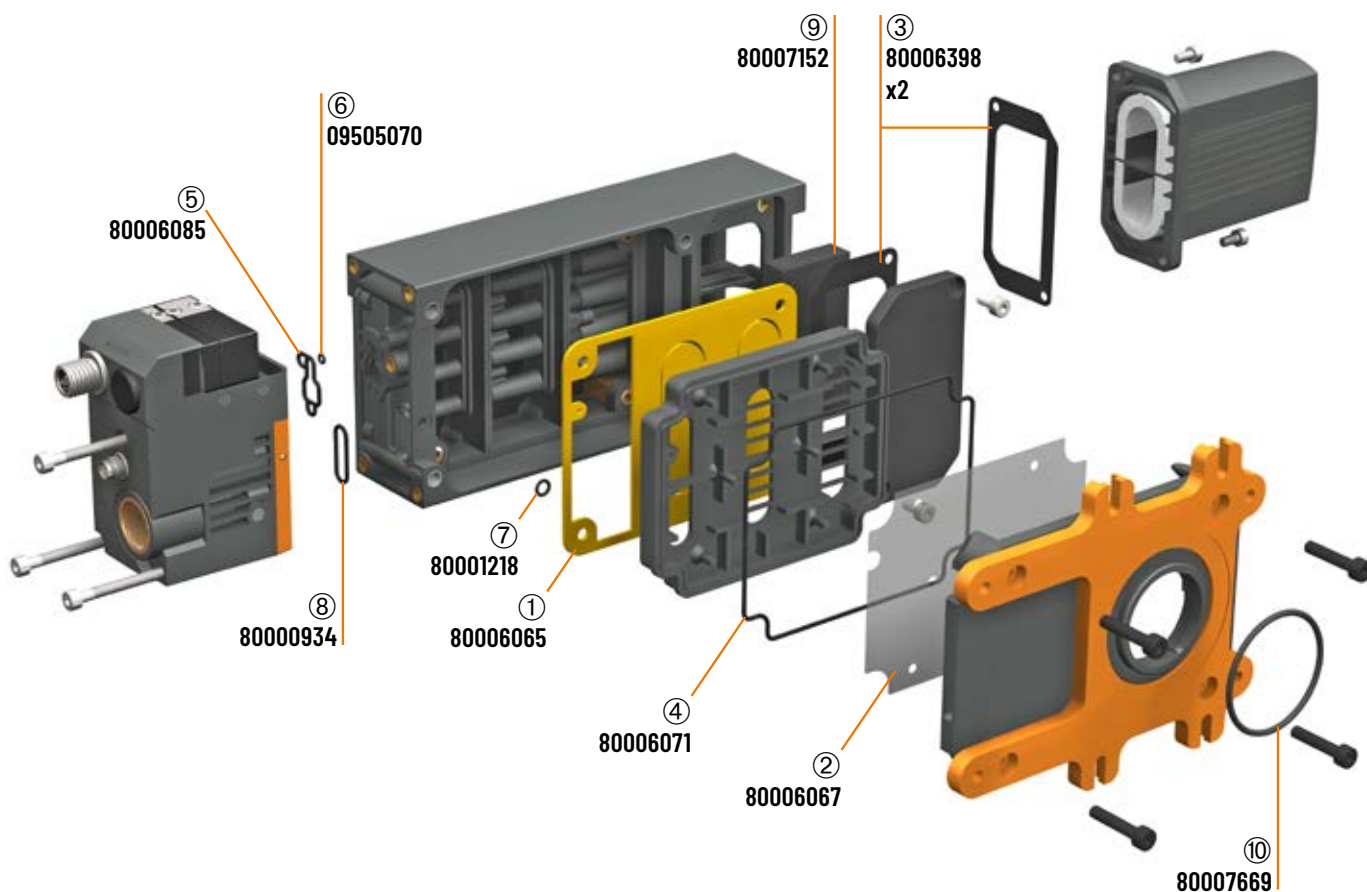
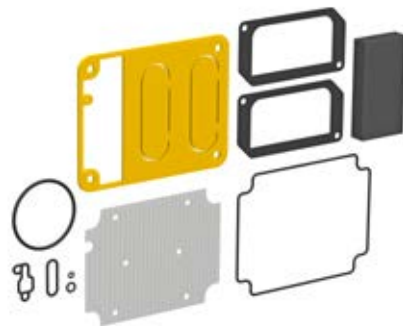


Description	Item code
Remote HMI	<b>HMIHD1M84P</b>



## 8 Maintenance kit

For model	Description	Item code
CMSHDE90X50/100_	Maintenance kit containing: ① vacuum check valve (80006065) x1 ② vacuum filter (80006067) x1 ③ flat gaskets for exhaust (80006398) x2 ④ molded gasket for end plate (80006071) x1 ⑤ molded gasket for vacuum (80006085) x1 ⑥ O-ring 2x1 (09505070) x1 ⑦ O-ring 4x1,5 (80001218) x1 ⑧ O-ring 14x1,5 (80000934) x1 ⑨ acoustic foam (80007152) x1 ⑩ O-ring 37x2 (80007669) x1	80008817





## 23.5. Vacuum Switch and Vacuum Gauge

Part number	Description
<b>PSD100CPNP</b>	Vacuum switch for CVGL____ <b>VA</b>



Part number	Description
<b>VAF11140</b>	Vacuum gauge for CVGL____ <b>VF</b>



## 23.6. Accessories

Part number	Description
<b>80004297</b>	M8 spacers

## 24. GLOSSARY

- **HMI**: Human-machine interface
- **I/O**: Input / Output
- **SIO**: Standard input/output
- **DO**: Digital Output
- **SDCI**: Single-drop digital communication interface, commonly known as IO-Link
- **C/Q**: Connection for communication or switching signal
- **IODD**: IO device description, a file that provides all the properties required to establish the communication and the parameters to establish the desired function of a sensor or actuator
- **Acyclical data**: Data transmitted from the controller only following a request (e.g. settings data, diagnostic data)
- **Cyclical data**: Data automatically transmitted by the controller at regular intervals (processing data, changes to values)
- **COMx**: IO-Link communication transmission rate (COM1: 4.8 kbit/s, COM2: 38.4 kbit/s, COM3: 230.4 kbit/s)

## 25. WARRANTY

We provide a warranty for this product and for any COVAL spare parts in accordance with our general terms of sale (GTS). The exclusive use of COVAL spare parts is a condition required to ensure the product's flawless operation and we will not be held liable for any damage resulting from the use of spare parts or accessories that are not made by COVAL. Wearing parts are excluded from the warranty.

## 26. RECYCLING



Waste from electrical and electronic equipment (WEEE) is a category of waste consisting of equipment at the end of its life cycle that uses electricity or electromagnetic fields to operate and designed to be used at a voltage that does not exceed 1000 volts for alternating current and 1500 volts for direct current.

CVGL vacuum grippers with solenoid pilots and vacuum switch are products that fall under this category of waste.

Waste from electrical and electronic equipment (WEEE) requires separately collection and recycling according to the European directive 2012/19/EU and to French legislation: decree no. 2014-928 from 19 August 2014.

COVAL is a member of ECOSYSTEM for the collection, decontamination and recycling of professional WEEE.

If you own any COVAL WEEE products, contact ECOSYSTEM who will collect and treat the products (Collection only applies to France):

<https://www.ecosystem.eco/>

## 27. EC DECLARATION

COVAL, the manufacturer, confirms that the product "CVGL Series vacuum grippers" described in this manual meets the following applicable EC directives:

- **2006/42/EC**, Machinery Directive, 17/05/2006.
- **2011/65/EU**, Restriction of the use of hazardous substances in electrical and electronic equipment (ROHS 2), 08/06/2011.

The following harmonized standards have been applied:

- **NF EN 12100:2010**, Safety of machinery - General principles for design - Risk assessment and risk reduction, 12/2010.

## A TECHNOLOGICAL PARTNER ON A GLOBAL SCALE

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

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

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

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

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

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



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