

LasGAR Plus

Laser gas control valve with Piezo activation and upstream gas valves

LGRP type series analog and EtherCAT

Brief operating instructions

Version 01



For complete up-to-date operating instructions, visit <http://www.hoerbiger.com/>

ID no.:

PS09587A



Table of contents

1	Note for using the brief operating instructions.....	3
2	Product description	4
2.1	Description	4
2.2	Technical data	5
3	Assembly and installation	6
3.1	Assembly	6
3.2	Gas installation.....	8
3.2.1	Gas connections.....	8
3.2.2	Connecting gases	10
3.3	Electrical installation	12
3.3.1	Analog device variant	13
3.3.2	Digital device variant	15
4	Start-up	16
4.1	Start-up.....	16
5	Service.....	17
5.1	Inspection and maintenance plan	17
5.2	Filter change in the input filter unit.....	18
5.2.1	Taking device out of service	19
5.2.2	Changing the gas filter	20
5.2.3	Changing the control air filter.....	20
6	Repair and maintenance	20

1 Note for using the brief operating instructions

These brief operating instructions do not replace the associated operating instructions for this product (PS09586_).

The brief operating instructions describe the pneumatic and electrical connection of the device, as well as its start-up. They include notes about electrical and pneumatic characteristics.

The brief operating instructions do not include any basic safety instructions and warnings. Therefore, they may only be used by qualified personnel who have read and understood the **up-to-date** operating instructions belonging to the product. These operating instructions can be downloaded from the HOERBIGER company website <http://www.hoerbiger.com>.

For additional information, contact the manufacturer at the following address:

HOERBIGER Flow Control GmbH
Südliche Römerstraße 15
86972 Altenstadt
Germany

Information on the Internet: www.hoerbiger.com

2 Product description

2.1 Description

The LasGAR Plus is a control and regulation device for cutting gases for laser cutting.

The LasGAR Plus consists of the following components:

1. Control and communication electronics for precise, dynamic cutting gas regulation and analog or digital communication with the machine control.
2. Input filter unit to protect the device against coarse dirt particles from the supply line. Only present in the model LasGAR Plus Filter.
3. Upstream valve unit with 2 or 3 upstream valves for gas selection of the cutting gases.
4. Control valve electronically controlled to regulate cutting pressure during the cutting process.

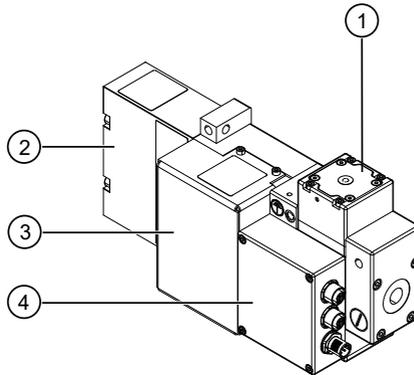


Fig. 1: Components of the LasGAR Plus

1	Control valve	3	Upstream valve unit
2	Input filter unit	4	Control and communication electronics

The compact, ready-to-use unit can be installed in laser cutting machines and connected using gas and electric connections.

2.2 Technical data

Designation	LasGAR Plus (types LGRP and LGRPF)
Installation position	Vertical
Protection type	IP 50 (DIN EN 60529 A1:2000) ¹⁾
Max. permissible accelerations	
Positioning	30 m/s ² (total)
Cutting (x/y axis)	20 m/s ² (total)
Shock	30 m/s ²
Behavior in case of power failure	Cutting gas inputs are closed, gutting gas output ventilated
Input filter unit (only for LGRPF version)	
Mesh size filter elements Gas inputs	10 µm
Mesh size filter elements Control pressure input	100 µm

¹⁾ Only with properly mounted plug connectors, gas, and compressed air connections

3 Assembly and installation

3.1 Assembly



CAUTION

Personal injury or property damage due to covered ventilation openings!

Covered ventilation openings can cause severe injuries and damage to the valve.

- Make sure that the distance between the ventilation openings (marked as “y” in Fig. *Ventilation openings, page 7*) and the surrounding parts is at least equal to the opening diameter.

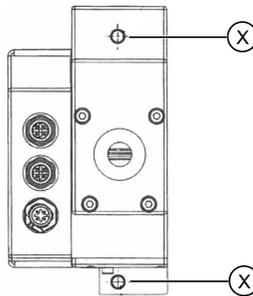


Fig. 2: LGRP fastening rear

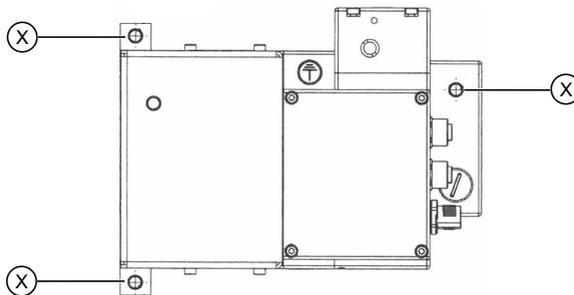


Fig. 3: LGRP fastening side

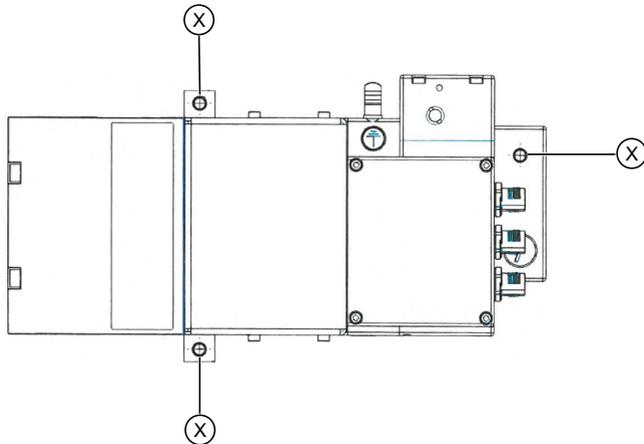


Fig. 4: LGRPF fastening side

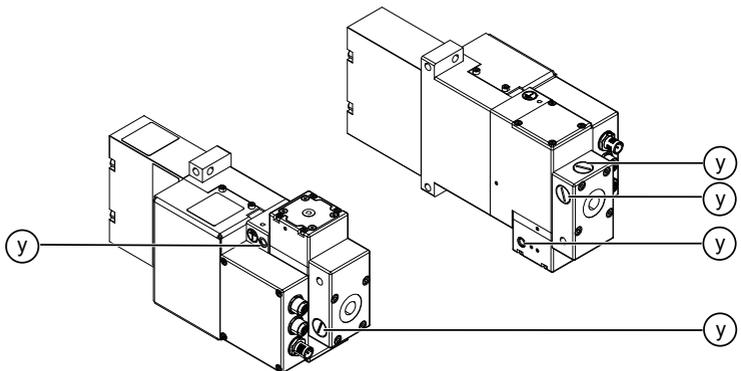


Fig. 5: Ventilation openings

1. Screw device to a carrier plate with M6 screws. Here, you can choose one of the following fastening types:
 - ↳ Fasten device at the rear using 2 fastening holes (X) (see Fig. *LGRP fastening rear, page 6*) or
 - ↳ Fasten device on the side using 3 fastening holes (X) (see Fig. *LGRP fastening side, page 6* and Fig. *LGRPF fastening side, page 7*).
2. Use screw locks.
3. Heed the tightening torque of 9.5 ± 0.5 Nm.

4. Make sure that the distance between the ventilation openings (y) and the surrounding parts is at least equal to the opening diameter (see Fig. *Ventilation openings*, page 7).



Mounting turned by 180° is possible.

3.2 Gas installation

3.2.1 Gas connections

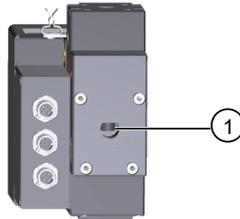


Fig. 6: Gas connections front side

1	Cutting gas output G $\frac{1}{4}$		
---	------------------------------------	--	--

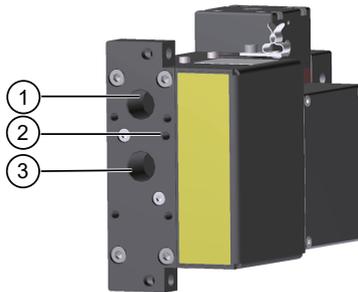


Fig. 7: LGRP2V gas connections rear

1	Input cutting gas 2 G $\frac{3}{8}$	3	Input cutting gas 1 G $\frac{3}{8}$
2	Input control air M5		

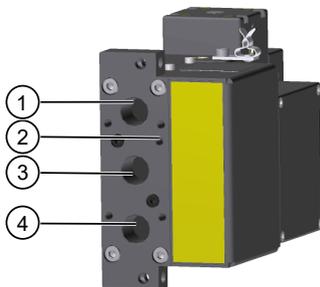


Fig. 8: LGRP3V gas connections rear

1	Input cutting gas 3 G%	3	Input cutting gas 2 G%
2	Input control air M5	4	Input cutting gas 1 G%

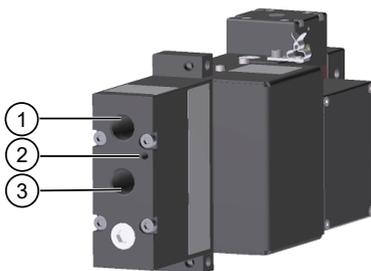


Fig. 9: LGRPF2V gas connections rear

1	Input cutting gas 2 G%	3	Input cutting gas 1 G%
2	Input control air M5		

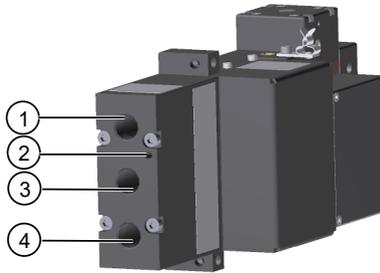


Fig. 10: LGRPF3V gas connections rear

1	Input cutting gas 3 G $\frac{3}{8}$	3	Input cutting gas 2 G $\frac{3}{8}$
2	Input control air M5	4	Input cutting gas 1 G $\frac{3}{8}$

3.2.2 Connecting gases



! DANGER

Mortal danger due to improperly connected pressure lines!

The pressure lines are under high pressure. Improperly connected lines can loosen under pressure, whip around, and cause life-threatening injuries.

- Only have the device started up by trained personnel.
- Only have faults on the device eliminated by trained personnel.
- Before start-up and troubleshooting, check the connections.
- Only have compressed air supply and cutting gases connected by trained personnel.
- Before installation, depressurize all lines and lock against switching on again.
- Only operate the device within the prescribed power limits, see Technical data.
- Do not use any grease when mounting the lines (e.g. threaded connections).



! DANGER

Mortal danger with use of oxygen as cutting gas!

Using oxygen as a cutting gas can cause life-threatening injuries and damage to the device.

- Heed maximum pressure, see Technical data.
- During filter cartridge change in the input filter unit, only use greases that are suitable for oxygen.



⚠ WARNING

Personal injury and property damage due to undefined machine states!

Undefined machine states can cause severe injuries and damage to the valve.

- Wear prescribed protective equipment.



⚠ CAUTION

Personal injuries and property damage due to soiled compressed air or gas lines!

Soiled compressed air or gas lines can cause injuries and damage to the valve.

- Only use dry, clean compressed air and gases. Adhere to the media quality, see chapter Pneumatic Characteristics.
- Before each gas connection, place a filter with max. 5 µm mesh size upstream. Do not use filters based on sintering material.
- Only supply compressed air and gases through clean, particle- and dust-free lines.
- Flush compressed air and gas lines before connection to the valve or clean them with a brush (cleaning scraper) in order to remove particles and deposits (see Fig. *Cleaning the gas line with cleaning scraper*, page 11 below).
- Only use O-ring seals for compressed air and gas connections (see Fig. *Screwing with O-ring seal*, page 12 below); do not use PTFE sealing tape, pastes, adhesive threaded seals, or hemp.

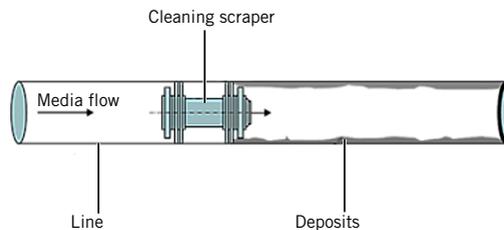


Fig. 11: *Cleaning the gas line with cleaning scraper*



Fig. 12: Screwing with O-ring seal

1. Remove protective films from the connections.
2. Connect gas lines according to drawings in chapter *Gas connections*, page 8.
3. Connect control air supply to the control air connection.
4. Connect argon, compressed air, oxygen, or nitrogen supply to the connections Gas 1, Gas 2, or Gas 3.
5. Check connections for tight fit and leaks.

3.3 Electrical installation

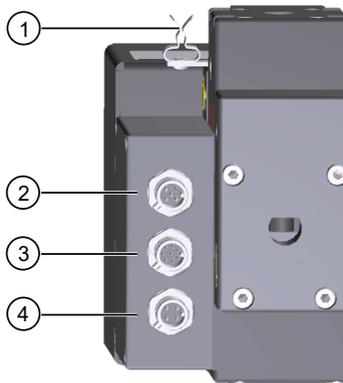


Fig. 13: Electrical connections

1	Screening clamps (only for analog device variant) and PE connection	3	Plug connection X2
2	Plug connection X3	4	Plug connection X1



If necessary, the screening clamps can be moved to the opposite housing side.

3.3.1 Analog device variant

1. Connect the 24 V power supply to X1. **NOTICE! Do not connect pins 2 and 4!**
2. Connect the cable for the control signals to X2.
3. Connect the cable for gas selection to X3.
4. Check plug connection for correct fit.
5. Connect screen of the connection lines (X1 – X3) to the machine ground.
6. To improve the EMC interference resistance, strip cable to plug connection X2 approx. 150 mm away from the plug to approx. 20 mm and fasten in the screen clamps (1).
7. To improve the EMC interference resistance, connect the valve via one of the two grounding connections on the housing to the machine body (2) using a line with as large a cross section as possible.

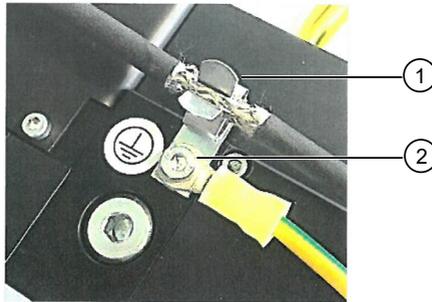
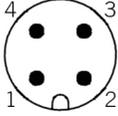
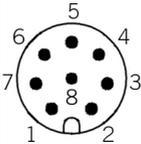
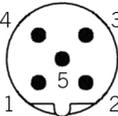


Fig. 14: Connection of cable screen

1	Screen line to connection X2 (only for analog model)	2	Connection to machine body
---	--	---	----------------------------

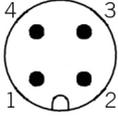
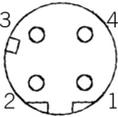
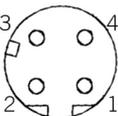
Plug connection	Connection	Pin assignment
X1	Power supply M12x1 A-coded 4-pin plug 	1: 24 V 2: Do not connect! 3: GND (connected to housing) 4: Do not connect!
X2	Control signals M12x1 A-coded 8-pin plug 	1: +Target value (0 to 10 V / input) 2: -Target value (GND/input) 3: GND 4: Input pressure P1 (0 to 10 V = 0 to 30 bar / output) 5: Output pressure P2 (0 to 10 V = 0 to 30 bar output) 6: Digital_I01 (Ready [0/24 V output]) 7: Digital_I02 (pressure reached [0/24 V output]) 8: Digital_I03 (Calibration [0/24 V input])
X3	Gas selection M12x1 B-coded 5-pin plug 	1: Gas 1 (0/24 V input) ¹⁾ 2: Gas 2 (0/24 V input) ¹⁾ 3: GND 4: Gas 3 (0/24 V input) ¹⁾ ; only for variant 3 upstream valves 5: n.c.

Tab. 1: Analog connections

¹⁾ Place inputs not used on GND.

3.3.2 Digital device variant

1. Connect to X1 24 V power supply. **NOTICE! Do not connect pins 2 and 4!**
2. Connect input cable to X2 EtherCAT.
3. Connect output cable to X3 EtherCAT.
4. Check plug connection for correct fit.
5. Connect screen of the connection lines (X1 – X3) to the machine ground.
6. In order to improve the EMC interference resistance, strip the insulation from the cable on the plug side and fasten cable screen to the machine ground with a grounding clip.

Plug connection	Connection	Pin assignment
X1	Power supply M12x1 A-coded 4-pin plug 	1: 24 V 2: Do not connect! 3: GND (connected to housing) 4: Do not connect!
X2	EtherCAT input M12x1 D-coded 4-pin socket 	1: Tx + 2: Rx + 3: Tx - 4: Rx -
X3	EtherCAT output M12x1 D-coded 4-pin socket 	1: Tx + 2: Rx + 3: Tx - 4: Rx -

Tab. 2: EtherCAT connections

4 Start-up

4.1 Start-up



! DANGER

Mortal danger due to improperly connected pressure lines!

The pressure lines are under a pressure of up to 30 bar. Improperly connected lines can loosen under pressure, whip around, and cause life-threatening injuries.

- Only have the device started up by trained personnel.
- Only have faults on the device eliminated by trained personnel.
- Before start-up and troubleshooting, check the connections.
- Only have compressed air supply and cutting gases connected by trained personnel.
- Before installation, depressurize all lines and lock against switching on again.
- Only operate the device within the prescribed power limits, see Technical data.
- Do not use any grease when mounting the lines (e.g. threaded connections).



! WARNING

Personal injury and property damage due to undefined machine states!

Undefined machine states can cause severe injuries and damage to the valve.

- Wear prescribed protective equipment.
1. Check whether electrical cables and gas lines are connected correctly, see chapter *Gas installation, page 8* and *Electrical installation, page 12*.
 2. Connect compressed air supply, control air, and cutting gases to superior air and gas supply.
 3. Switch on 24 V voltage supply.

5 Service



⚠ WARNING

Personal injury and property damage due to improper servicing

Malfunctions can result.

- In case of fault, do NOT service the device.
- In case of fault, shut the device down immediately.
- Remove the complete valve and send it to the manufacturer's local agent for servicing.

5.1 Inspection and maintenance plan

Work to be performed	ir	d	w	¼ y	y	oh
<ul style="list-style-type: none"> ■ Check compressed air and gas connections for leaks. 				X		
<ul style="list-style-type: none"> ■ Check electrical cable for cracks, kinks, and damage to the cable insulation. ■ Replace damaged cables. 				X		
<ul style="list-style-type: none"> ■ Check electrical plug connection and union nuts to ensure they are tight. ■ If necessary, tighten union nuts. 				X		
<ul style="list-style-type: none"> ■ Check fixed clamping of the screen on the screening clamp. ■ If necessary, fix or replace clamp. 				X		
<ul style="list-style-type: none"> ■ Check body connection between LGR and machine body. ■ If necessary, tighten screws. 				X		
<ul style="list-style-type: none"> ■ Check screws to ensure they are tight, tighten if necessary. 				X		
<ul style="list-style-type: none"> ■ Check type plates to ensure they are present, visible, legible, and complete; replace if necessary. 					1	
<ul style="list-style-type: none"> ■ Check filter cartridges in input filter unit for soiling and replace if necessary. (Only for LGRPF model) 	ir				1	
Legend: ir= if required, d = daily, w = weekly, ¼ = quarterly, y = annually, oh = operating hours						

5.2 Filter change in the input filter unit



⚠ DANGER

Mortal danger due to unsuitable components!

The use of unsuitable components can cause life-threatening injuries.

- Use only the manufacturer's filter sets since these are suitable for oxygen use.



⚠ DANGER

Mortal danger due to incorrect greases!

The O-rings of the filter elements are pre-greased with oxygen-suitable grease. The use of other greases can cause life-threatening injuries.

- Never re-grease O-rings.



A filter change can only be done for the LasGAR Plus in the LGRPF model and for the LASFIL Compact.

The input filter unit is equipped with one filter per gas input and one filter for the control air connection. Soiled filter elements can be changed out.

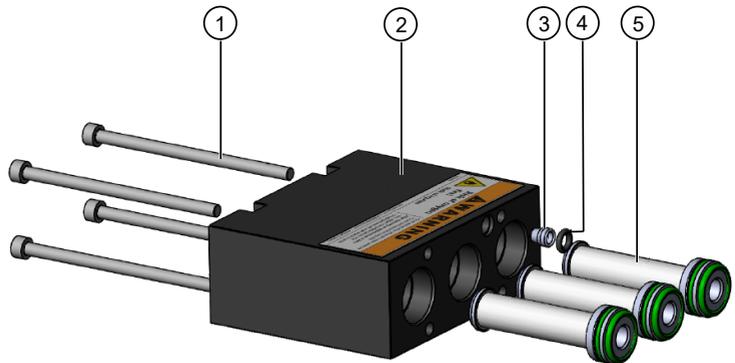


Fig. 15: Filter unit with replacement filters

1	Fastening screws	4	O-ring
2	Filter housing	5	Filter cartridge cutting gases
3	Filter use control air		

Replacement filters can be ordered using the following item numbers:

Filter	Item number	Scope of delivery
Filter set for cutting gas inputs	PS12739A	1 filter cartridge with O-rings mounted and pre-greased with oxygen grease
Filter set for control lift input	PS12740A	1 filter element 1 O-ring

Tab. 3: Replacement filter

5.2.1 Taking device out of service



DANGER

Mortal danger due to residual energies!

After switching off, there are residual electrical and pneumatic energies on the device that have to be reduced slowly and can cause life-threatening injuries if the device is touched.

- Disconnect the device from electrical and pneumatic power supplies before dismantling.
- Wait 10 seconds until residual energies in the system have been reduced completely.



WARNING

Risk of injury due to pressure

- Do not perform any work on the valve when it is pressurized.
1. De-energize and depressurize the device.
 2. Lock and ventilate the gas and compressed air supply.
 3. Wait 10 seconds until residual energies in the device have been reduced completely.
 4. Check whether the gas and pressure supplies are depressurized.

5.2.2 Changing the gas filter

1. Loosen the 4 fastening screws (1) in order to loosen the filter unit from the LasGAR Plus or the connection plate.
2. Pull the filter cartridge (5) out of the filter housing (2) using an M8 screw.
3. In the filter housing (2), check the installation space of the filter cartridge (5) for soiling and clean if necessary.
4. Push the new filter cartridge into the filter housing (2) and press it in by hand up to the stop. In the process, heed the correct position of the two pre-mounted O-rings.
5. Screw the filter unit with 4 fastening screws (1) to the LasGAR Plus or the connection plate, tightening torque $6 \text{ Nm} \pm 0.5 \text{ Nm}$.

5.2.3 Changing the control air filter

1. Loosen the 4 fastening screws (1) in order to loosen the filter unit from the LasGAR Plus or the connection plate.
2. Remove O-ring (4) from the control air connection.
3. Remove the filter insert (3) from the filter housing (2).
4. In the filter housing (2), check the installation space of the filter insert (3) for soiling and clean if necessary.
5. Insert the new filter insert (3) into the filter housing (2).
6. Insert the O-ring (4).
7. Screw the filter unit with 4 fastening screws (1) to the LasGAR Plus or the connection plate, tightening torque $6 \text{ Nm} \pm 0.5 \text{ Nm}$.

6 Repair and maintenance

1. Only have repair work on the device performed by the manufacturer since only the manufacturer has the equipment for optimal adjustment after repair and can therefore guarantee perfect functionality.
2. Do NOT perform maintenance on the inner parts of the device.
3. Send the complete valve to the manufacturer for maintenance and service.