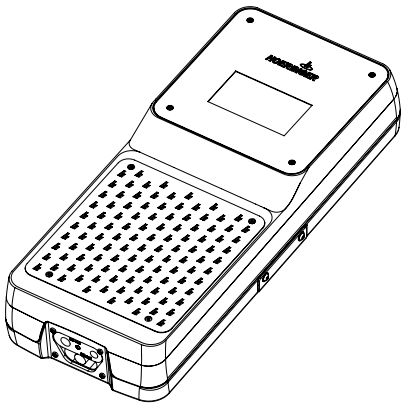
LASGAM

Piezo-controlled Gas Mixing System for laser cutting machines

Technical data

EN MET

HOERBIGER
because performance counts



REVOLUTIONIZE PRECISION: UNLEASH THE POWER OF PIEZO TECHNOLOGY FOR LASER CUTTING IN YOUR APPLICATION! EXPERIENCE UNPARALLELED PRECISION AND EFFICIENCY – ELEVATE YOUR CUTTING EXPERIENCE WITH INNOVATION AT YOUR FINGERTIPS. WE AT HOERBIGER CAN HELP YOU OPTIMIZE YOUR ENTIRE CUTTING PERFORMANCE WITH YOUR MACHINE.

LASGAM

Piezo-controlled Gas Mixing System for laser cutting machines

The HOERBIGER Piezo-controlled Gas Mixing System LasGAM is an inline gas mixing system for oxygen and nitrogen. The system is continuously monitoring and controlling nitrogen and oxygen gas flows. Actual mixing is done in the pressure regulator just before the cutting head. The whole system is shown schematically in the figure below. The input ports are connected to the oxygen and nitrogen pressure supply of your laser cutting machine.

100% nitrogen, 100% oxygen and nitrogen/oxygen mix gas cutting is done by using the LasGAM.

Cutting with pure oxygen is done by selecting the oxygen mode of the gas mixer and the OXYGEN input port of the pressure regulator. Cutting with pure nitrogen is done by selecting the nitrogen mode of the gas mixer and the NITROGEN input port of the pressure regulator.

For cutting with controlled mixture of oxygen and nitrogen, set the gas mixer into cutting mode. This will open both lines, oxygen and nitrogen inlet and outlet valves. The gas mixer regulates the gas flow in both lines. A more detailed description of the operation modes is given on the next pages.

YOUR BENEFITS AT A GLANCE	ADVANTAGES	FEATURES
You increase your productivity by up to 50 %	Ultrafast change of the mixing ratio	Tankless design
You reduce your cutting gas consumption by up to 55 %		
You can achieve a mixing ratio between 0 – 20 % O_2 in less than 1 sec.		
You get reliable cut quality through uninterrupted status monitoring	Mobile function monitoring	Bluetooth connection with app
You get reliable cutting quality through highest repeatability	Stable system (mechanical, pneumatic)	Hose-free design

+50 %

Productivity compared to cutting without gas mixing system

-55 %

Cutting gas consumption compared to cutting without gas mixing system

<1 sec

Mixing gas ratio of 0–20 % O_2 achieved

GENERAL PROPERTIES
LasGAM

GENERAL PROPERTIES

MECHANICAL PROPERTIES

Length	785 mm
Width	320 mm
Height	150 mm
Weight	20 kg
IP-Protection	IP5X

PNEUMATIC CONNECTIONS

Nitrogen input	G 1/2“ 40 bar MAX
Nitrogen output	G 1/2“
Oxygen input	G 3/8“ 25 bar MAX
Oxygen output	G 3/8“
Pilot air input	G 1/8“ 4,5 ... 7 bar

ELECTRICAL PROPERTIES

Electric connections	M12 A-coded 4-pin male
Bus connection	Ethercat (IN & OUT) or Profinet M12 D-coded 4-pin female
Supply	
Nominal voltage (U_N)	24 V DC ± 10 %
Max. residual ripple (U_N)	10 %
Current consumption (I_{max})	1,05 A
Nominal power (P_N)	20 W (max 25 W)

MIXING PERFORMANCE

Adjustable oxygen ratio	0 ... 20 % in mixing mode
Repeatability	Typ. ± 0.007 % abs[1]
Control accuracy	Typ. ± 0.25 % abs[1]
Maximum flow rate mixgas	2.500 l/min (6 bar to 0 bar)
Pressure mixed gas	Default setting: O2 input minus 1 bar

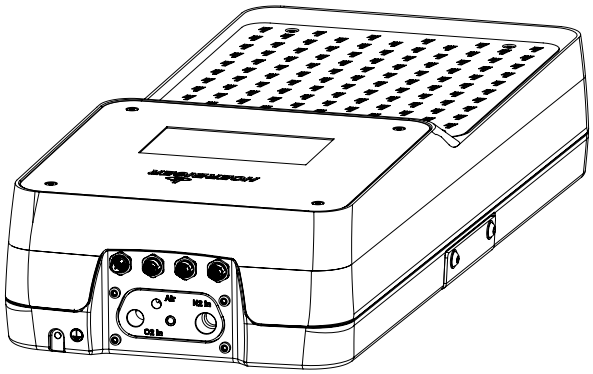
MODES (100% NITROGEN, 100% OXYGEN)

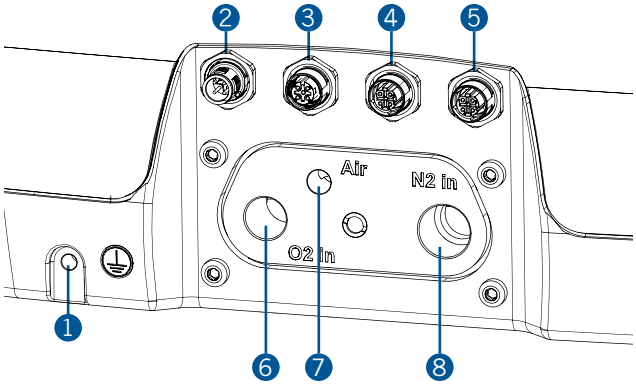
Flow rate (Nitrogen)	0 ... 2500 l/min
Output pressure (Nitrogen)	Input pressure of nitrogen
Flow rate (Oxygen)	0 ... 250 l/min
Output pressure (Oxygen)	Input pressure of oxygen

[1] With successful flow calibration (see operating instructions)

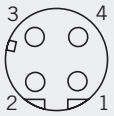
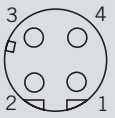
DRAWINGS
LasGAM

FRONT PLATE





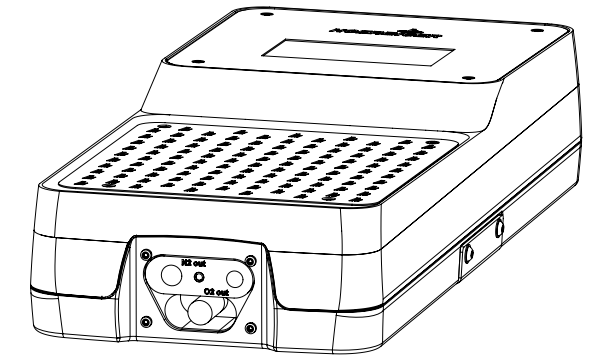
ELECTRICAL CONNECTIONS

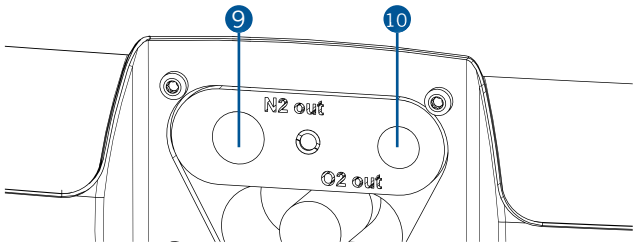
1	PE Conductor		
2	Supply 24 V		1 +24VDC power 2 3 GND 4
3	Service Interface		
4	Ethercat In or Profinet		BUS_IN 1 TX + 2 RX + 3 TX – 4 RX –
5	Ethercat Out or Profinet		BUS_OUT 1 TX + 2 RX + 3 TX – 4 RX –

PNEUMATIC CONNECTIONS

6	O_2 input
7	pilot air
8	N_2 input

BACK PLATE





PNEUMATIC CONNECTIONS

9	N_2 output
10	O_2 output

OPERATION MODES
LasGAM

The LasGAM has **3 operation modes** and additionally **HOLD**, **OFF** and **Flow Calibration** mode. The modes are changed using the Ethercat or Profinet interface. The flow chart on the next page shows the single states and some basic properties.

Please note that this is just a rough explanation of the modes. A detailed description of the bus commands will be supplied and you will be given a detailed introduction separately.

YOUR BENEFITS AT A GLANCE

When the system is switched on, it starts in the **OFF** state. In- and outputs valves of the regulator unit are closed and the control valves are closed as well. After powering the system, the oxygen and nitrogen pipes to the cutting head are unpressurized. To ensure a proper start up, the laser cutting machine must start up the system.

CUTTING WITH MIXED GAS

To start a cutting process with mixed gas, a $\%O_2$ **setpoint** must be sent to the gas mixer. Next, the pressure regulator at the cutting head must be given an **output pressure** and the gas inputs must be selected. Finally, the **CUTTING** mode must be selected.

Cutting can be started when the system's $\%O_2$ _reached flag gives a ready signal. Please ensure a **P_MIX_DELTA** and **PC_O2_IN_RANGE_DELTA** that is big enough. If you set **P_MIX_DELTA** to zero, it will be automatically set to the recommended value of 1.000 mbar.

CUTTING WITH PURE OXYGEN

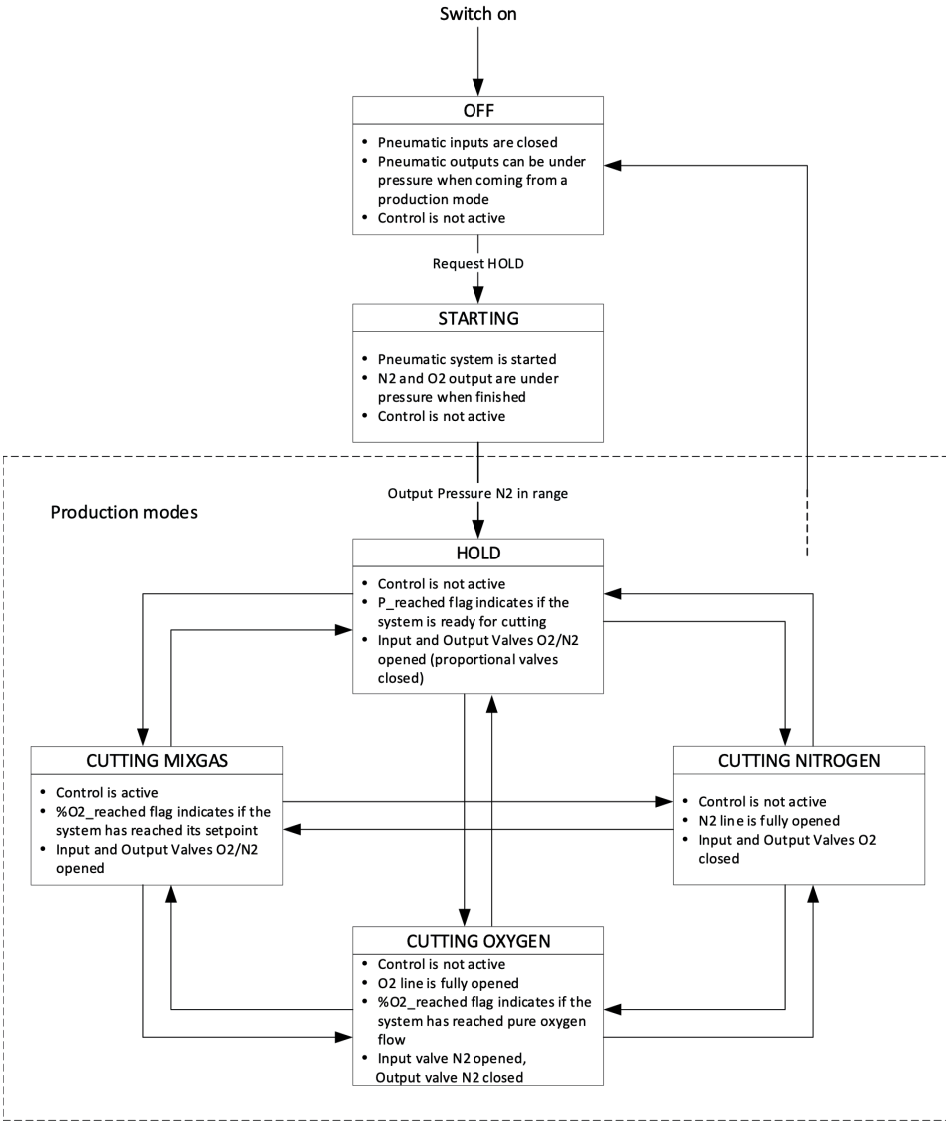
For Cutting with pure oxygen just select **OXYGEN** mode by setting the PDO "**STATE_REQUEST**" to Cutting_Oxygen value. The gas and control valves in the oxygen line are fully opened and the $\%O_2$ _reached flag will indicate that a pure oxygen flow is set up. Moving the cutting head does not require to change into HOLD mode in this case.

CUTTING WITH PURE NITROGEN

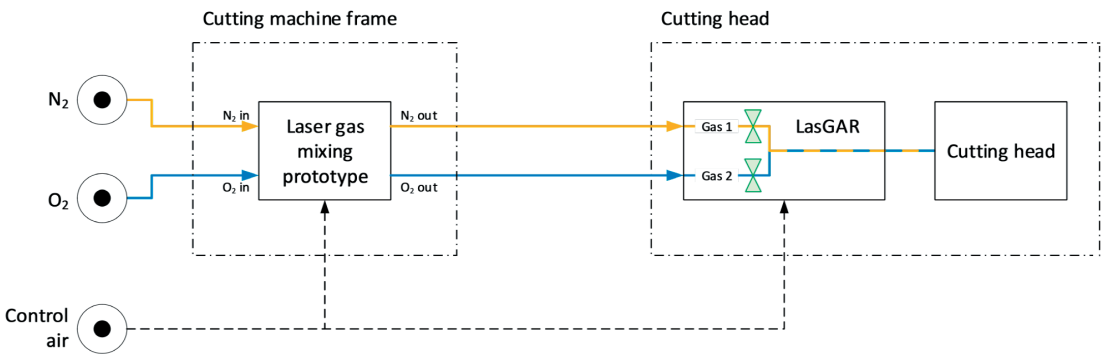
For Cutting with pure nitrogen just select **NITROGEN** mode by setting the PDO "**STATE_REQUEST**" to Cutting_Nitrogen value. The gas and control valves in the nitrogen line are fully opened and the $\%N_2$_reached flag will indicate that a pure nitrogen flow is set up. Moving the cutting head does not require to change into **HOLD** mode in this case.

COMMUNICATION
LasGAM

STATE DIAGRAM



SCHEMATIC SYSTEM DESIGN



PROCESS DATA OBJECTS (PDO) ETHERCAT/PROFINET

OBJECTS Brief description	FUNCTION/ SIZE	VALUE	DESCRIPTION
STATE	Output/ 1 Word	Low Byte	Off=0, Starting=1, Hold=2, Cutting=3, Cutting_Oxygen=4, Cutting_Nitrogen=5, Flow_Calib_Start=6, Flow_Calib=7, Flow_Calib_Ok=8, Flow_Calib_Fail=9, State_Error=10
		High Byte	Bit 0 READY (TRUE=1, FALSE=0)
			Bit 1 PC_O2_IN_RANGE (TRUE=1, FALSE=0)
			Bit 2 Invalid State Request
			Bit 3–7 RESERVED
PC_O2_DELTA		0...1000 digits = 0...100 %	Current value of tolerance band for O_2 concentration in range, used for calculation of PC_O2_IN_RANGE
PC_O2		0...1000 digits = 0...100 %	Current O_2 concentration in steps of 0.1 %
FLOW_N2		0...25000 digits = 0...2500 l/min	Current N_2 flow in steps of 0.1 l/min
FLOW_O2		0...10000 digits = 0...1000 l/min	Current O_2 flow in steps of 0.1 l/min
FLOW_TOTAL		0...35000 digits = 0...3500 l/min	Current total flow in steps of 0.1 l/min
P1_N2		0...50000 digits = 0...50.000 mbar	N_2 input pressure in mbar
P2_N2		0...50000 digits = 0...50.000 mbar	N_2 output pressure in mbar
P1_O2		0...30000 digits = 0...30.000 mbar	O_2 input pressure in mbar
P2_O2		0...30000 digits = 0...30.000 mbar	O_2 output pressure in mbar
SER_NO		Decimal number	Serial number
SW_VER		Decimal number	Software version
DIAGNOSTICS	Output/ 1 Word	Low Byte	Code of active Warning
		High Byte	Code of active Error
OUT_1			Reserved
OUT_2			Reserved
OUT_3			Reserved
STATE_REQUEST	Input/ 1 Word		0 = Off 2 = Hold 3 = Cutting_Mix 4 = Cutting_Oxygen 5 = Cutting_Nitrogen 7 = Flow_Calibration
P_MIX_DELTA		0...10000 digits = 0...10.000 mbar	Set delta for nitrogen pressure control Standard = 1000 (1 bar) (Minimum 1 digit = 1 mbar; 0 = 1000 mbar)
PC_O2_IN_ RANGE_DELTA		0...1000 digits = 0...100%	Set tolerance band for O_2 concentration in range in steps of 0.1 %
SETPOINT_PC_O2		0...1000 digits = 0...100%	Setpoint for O_2 concentration in steps 0.1 %
IN_1			Reserved
IN_2			Reserved
IN_3			Reserved

CONVERSION FACTORS

LasGAM

CONVERSION FACTORS

VALUE	UNIT	CONVERSION UNIT	FACTOR
Length	mm	in	0.03934
	in	mm	25.4
	m	ft	3.28084
	ft	m	0.3048
Weight	kg	lb	2.204622
	lb	kg	0.453592
Pressure	bar	psi	14.5035
	psi	bar	0.06895
	MPa	psi	145.035
	psi	MPa	0.006895
	bar	MPa	0.1
	MPa	bar	10
Temperature	°C	°F	1.8 °C + 32
	°F	°C	0.5556 °F – 32
Torque	Nm	ft/lbs	0.7375
	ft/lbs	Nm	1.3558

ADDITIONAL DOCUMENTATION

LasGAM

WWW.HOERBIGER.COM

This data sheet and additional documentation is available in the download area of the company's website.

www.hoerbiger.com

NOTES

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