



Operating Manual
for the
Cylinder and Line Pressure Regulators
of the **M51/M52/M53 series**
and **E51/E52/E53 series**



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1. Introduction

1.1 General

Validity

This operating manual is valid for the cylinder and line pressure regulators of the M51/52/53 and E51/52/53 series.

Manufacturer

Spectron Gas Control Systems GmbH
Fritz-Klatte-Straße 8
D-65933 Frankfurt
Germany
Phone: +49 69 38016-0
Fax: +49 69 38016-200
Email: info@spectron.de
Internet: www.spectron.de

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Retention and completeness

- This operating manual is a component of the cylinder and line pressure regulators of the M51/52/53 and E51/52/53 series and must be accessible to those with the relevant authorisation at all times.
- Under no circumstances should chapters be removed from this operating manual. If the operating manual is lost or if any chapters are missing –in particular the "For your safety" chapter – it or they must be replaced without delay.

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Updates

No update service is provided for this operating manual by Spectron Gas Control Systems GmbH.
Changes can be made to this operating manual without the need to notify anyone about them.

1.2 Description of the cylinder and line pressure regulators of the M and E series

The pressure regulators of the M51/52 and E51/52 series are single-stage pressure regulators with pressure gauges for measuring the inlet pressure and outlet pressure. Their main function is to reduce the inlet pressure to the outlet pressure required for the purpose.

The pressure regulators of the M53 and E53 series are two-stage pressure regulators. In the first pressure regulation stage, the inlet pressure is reduced to an intermediate pressure set at the factory. This is then reduced to the desired outlet pressure in the second regulation stage. In contrast to single-stage pressure regulators, two-stage pressure regulators maintain a virtually constant outlet pressure throughout the entire inlet pressure range.

1. Introduction

1.3 Intended use

Intended use

The M51/52/53 cylinder and line pressure regulators are intended for use with non-corrosive gases up to a purity grade of 6.0. The E51/52/53 cylinder and line pressure regulators are suitable, in addition, for corrosive gases up to a purity grade of 6.0. The permissible gases and pressure ranges are specified on the type plate. Cylinder and line pressure regulators reduce a variable inlet pressure to an outlet pressure that is as constant as possible.

The pressure is introduced via the inlet screw connection (e.g. the cylinder connecting piece). Appropriate measures must be taken to prevent the introduction of pressure via the pressure regulator outlet.

Pressure regulators without electrical components (such as a contact pressure gauge or pressure transducer) may be used in potentially explosive atmospheres, since they do not have a potential ignition source of their own (ignition hazard evaluated in accordance with DIN EN 13463-1).

The danger of ignition has to be taken into account with pressure regulators with electrical components. It is imperative that this is evaluated on the basis of the documentation of the electrical components, taking into consideration how they are incorporated into the system as a whole, in compliance with directive 2014/34/EU (ATEX 95) and 1999/92/EC (ATEX 137).

Foreseeable misuse

The following operating conditions are deemed to constitute misuse:

- Operation with gases that are not specified on the type plate
- Use with gases in their liquid state
- Operation outside of the permissible technical limit values
- Failure to heed and comply with any applicable legal regulations and other provisions
- Failure to follow the instructions in this operating manual
- Failure to carry out inspection and maintenance work
- Failure to heed the information on the type plate and in the product data sheet
- Pressurisation in reverse (against normal flow direction)

1. Introduction

1.4 Personnel requirements

Definition of an authorised person

An authorised person is a person with a technical training who has received technical instruction about the system as a whole and the associated hazards – gas cylinder – gas type – gas cylinder valve – pressure regulator – and has successfully completed training in the supply of pressurised gases.

Tasks of the operating personnel

The operating personnel must identify problems or irregularities and – if possible and permissible – resolve them.

Requirements to be met by the operating personnel

To be able to do their work, the operating personnel must meet the following requirements:

- The operating personnel must have received instruction in the operation of the pressure regulator from an authorised person and must have read and understood this operating manual in its entirety.

2. For your safety

2.1 Symbols used



Note!



Important!



Warning!



Danger!

Danger



This symbol indicates risk of fatal injury.

2.2 Essential safety information



Note

The safety information given below is to be regarded as supplementary information to the relevant national accident prevention regulations and legislation. All relevant accident prevention regulations and legislation must be observed under all circumstances.

Various laws, regulations, rules and directives have to be observed when handling pressurised gases, depending on the type of gas involved.

In Germany the following legislation and publications are applicable (although this is not necessarily a complete list):

- EU Directive 2009/104/EC (Work Equipment Directive)
- EU Directive 1999/92/EC (ATEX 137)
- EU Directive 98/24/EC (Dangerous Substances Directive)
- Industrial health and safety ordinance (implementation of Directives 2009/104/EC and 1999/92/EC in German law)
- Ordinance on hazardous substances (implementation of Directive 98/24/EC in German law)
- TRBS (technical regulations on industrial safety and health) publications
- German technical rules for hazardous substances (TRGS)

2. For your safety

- TRAS (technical regulations on plant safety) publications
- BGV A1 German trade association basic accident prevention regulations
- BGR 104 German trade association rules on explosive prevention regulations
- BGR 132 German trade association rules for the avoidance of ignition hazards resulting from electrostatic charges
- BGR 500 2.26 German trade association rules on welding, cutting and related work procedures
- BGR 500 2.31 German trade association rules for working on gas lines
- BGR 500 2.32 German trade association rules for the operation of oxygen systems
- BGR 500 2.33 German trade association rules for the operation of systems that handle gas
- BG RCI leaflet M034
- EIGA documents
- Safety data sheets for the gases used

2.3 Safety features

The pressure regulator is equipped with an integrated relief valve to protect the fitting. The version with outlet pressures >100 bar do not have a relief valve. The user must ensure there is a suitable safety device downstream.



Note

The relief valve allows gas that has to be released as a result of an impermissible rise in the outlet pressure to be blown off.

It does not function as the safety valve for the entire gas supply system.



Important

In the event of the failure of the pressure regulator and its relief valve, a safety mechanism that meets the requirements of the regulations for operators must be incorporated to protect downstream fittings, pressure vessels and pipes from excess pressure.



Danger

With combustible, toxic, corrosive and other gases that are harmful to health or the environment, an exhaust pipe must be connected to the relief valve to take the gas away safely.

The factory setting of the relief valve must not be altered.

Possible hazard	Hazard-prevention measures
Danger of death If oxygen comes into contact with oil or grease, there is a risk of fire due to a chemical reaction.	Keep all parts that come into contact with oxygen free of oil and grease.
Danger of death Gas escaping into the ambient air can ignite; there is a risk of fire and explosion.	Smoking and naked flames are strictly prohibited near gas supply equipment.
Danger of death The pressure regulator may be damaged by unauthorised changes or alterations and may no longer work as intended. There is a risk of the system malfunctioning, catching fire or getting damaged.	No changes or alterations may be made without the written approval of the manufacturer's authorised technical personnel.

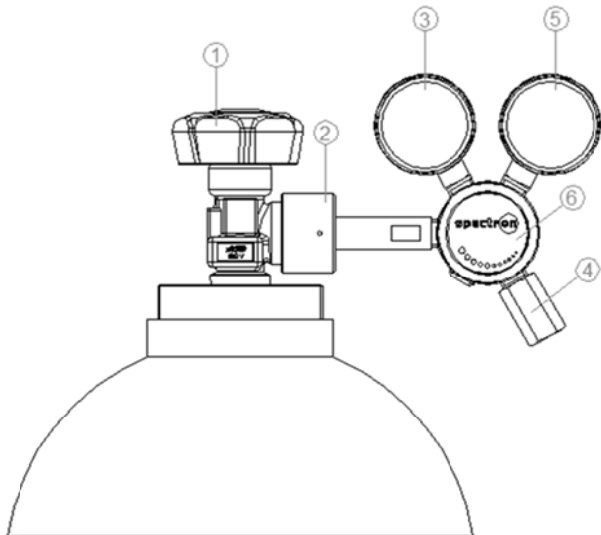
2. For your safety

<p>Risk of fatal injury! If gases are used that are not specified on the type plate, there is a risk of the system malfunctioning, catching fire or getting damaged.</p>	<p>Only use for the gases indicated on the device. If there are no gas types specified on the pressure regulator, you have to ask the manufacturer which gases it can be used with. On no account must the pressure regulator be put into operation without this information.</p>
<p>Risk of fatal injury! If the pressure regulator is operated with combustible, toxic or corrosive gases, the gas can be released into the environment when the relief valve opens.</p>	<p>Relief valves of pressure regulators for combustible, toxic or corrosive gases must have a pipe that brings the gases emitted to a safe recycling facility that complies with regulations.</p>
<p>Risk of fatal injury! Gas that escapes in an uncontrolled manner indoors can reduce the oxygen content of the air and be life-threatening.</p>	<p>Make sure that the outlet end of the blow-off pipe of systems operated indoors is outdoors. In the case of toxic or corrosive gases or gases that are harmful to the environment in some other way, dispose of the blown-off gas in accordance with the applicable regulations.</p>
<p>Risk of fatal injury! Oxygen that escapes in an uncontrolled manner indoors can result in a dangerous rise in the oxygen content of the air and an increase in the tendency of clothing and other objects to ignite.</p>	<p>Make sure that the outlet end of the blow-off pipe of oxygen systems operated indoors is outdoors, and do not start a fire or ignite a flame. Read the EIGA document SAG 79/04/E for more information.</p>
<p>Risk of fatal injury! The use of the pressure control panel with components or accessories that are not rated for the same pressure as the control panel itself can lead to serious damage or bursting.</p>	<p>Components or accessories (fittings, pipes etc.) connected to the pressure control panel must be rated for the pressure given on the type plate of the pressure control panel.</p>
<p>If the pressure regulator is used outside the specified ambient temperature range, there is a risk of the system malfunctioning, catching fire or getting damaged.</p>	<p>Do not use in ambient temperatures below -30 °C or over $+60\text{ °C}$.</p>
<p>If dirt particles get into the pressure regulator, this can damage it or cause it to malfunction.</p>	<p>It must be ensured that no dirt particles of any kind can get into the pressure regulator. That is why a filter is incorporated into the process gas inlet of the pressure control panel.</p>
<p>If the device is not handled properly and used as intended, this may be dangerous for the user and others and may damage it.</p>	<p>Use and handle the pressure regulator only as described in this operating manual.</p>
<p>If the connecting surfaces or gaskets of the fittings are damaged or missing, there is a danger of gas escaping in an uncontrolled manner.</p>	<p>Check the connecting surfaces for damage, and do not install if the connecting surfaces are damaged or gaskets are missing.</p>

3. Description

3.1 Overview of the pressure regulator

Drawing of the cylinder pressure regulator



Elements and environment of the cylinder pressure regulator

Item	Designation	Description
1	Gas cylinder valve	In accordance with the applicable national standard
2	Cylinder connection	In accordance with the applicable national standard
3	Inlet pressure gauge	Indicates the current cylinder or inlet pressure.
4	Relief valve	Protects the cylinder pressure regulator against excess pressure.
5	Outlet pressure gauge	Indicates the current outlet pressure.
6	Handwheel	Used to set the outlet pressure.



Note

Line pressure regulators work in the same way as cylinder pressure regulators and have the same elements. Depending on the version involved, certain elements may be missing (e.g. connectors, pressure gauge, relief valve).

3. Description

3.2 Functional description

The pressure regulators of the M51/52 and E51/52 series are single-stage pressure regulators with pressure gauges for measuring the inlet pressure and outlet pressure. Their main function is to reduce the inlet pressure to the outlet pressure required for the purpose.

The pressure regulators of the M53 and E53 series are two-stage pressure regulators. In the first pressure regulation stage, the inlet pressure is reduced to an intermediate pressure set at the factory. This is then reduced to the desired outlet pressure in the second regulation stage. Two-stage pressure regulators maintain a virtually constant outlet pressure throughout the entire inlet pressure range.

3.3 Technical data



Note

The technical data can be taken from the Spectron data sheet for the relevant product. If this is not available, you can view and download it at www.spectron.de.
The maximum inlet and outlet pressures and the gas type are indicated on the type plate.

3.4 Connection options

- Inlet pressure connector: 1/4" NPT female thread
Cylinder pressure regulators are generally equipped with a country- and gas type-specific cylinder connecting piece.
- Outlet pressure connector: 1/4" NPT female thread
- Relief valve: 1/4" NPT female thread

4. Operation

4.1 Labelling

Labelling example

Hydrogen (H₂)

FM52-L-300-20-DIN14-M-M-0-A-B-H2

P1: 300 bar

P2: 10 bar



Note

There is a stamp imprinted on the back of the pressure regulator to certify that it has passed leakage and functional tests. The gas type must be specified on the pressure regulator. If the gas type is not specified on the type plate, it must be done using the attached gas-type adhesive labels before the device is put into operation for the first time.



Warning

Only the gas type for which the pressure regulator was ordered may be specified on it.


4. Operation

4.2 Installation of a cylinder pressure regulator by way of example



Important

The connecting thread and connecting surfaces of the gas cylinder valves and gaskets must be checked to ensure they are in perfect condition.

Step	Activity
1	Ensure that the relevant gas type is marked on the cylinder pressure regulator and that the connector of the gas cylinder valve is clean and not damaged in any way.
2	Connect the cylinder pressure regulator to the still closed gas cylinder valve. In the case of manual connectors, this should be done without a tool. Connectors with flat faces for tightening are tightened with a suitable spanner until they are gas-tight.
3	Establish a connection between the cylinder pressure regulator and the consumer. NPT screw connections must be wrapped in PTFE tape. The first two thread turns must be kept free of PTFE tape.  For oxygen or other gases with an oxidation potential greater than air, only use PTFE tape that has BAM approval.
4	In the case of combustible and toxic gases, connect a blow-off pipe to the relief valve and ensure that the gas blown off is safely taken away and dealt with in accordance with the applicable legislation.
5	Check all connections for leakage.

4.3 Putting the pressure regulator into operation

Step	Activity
1	Use the handwheel to release the adjustment spring. Slowly open the gas cylinder valve and use the handwheel to set the desired outlet pressure. Adjust the setting again if necessary.



Note

Line pressure regulators are installed and put into operation in the same way. On the inlet side, however, the pressure regulator is connected to a pipe installation, not a gas cylinder.



Warning

With cylinder pressure regulators, it is not permissible to use cylinder pressure-reducing adapters between the gas cylinder valve and inlet. The connected accessories must be suitable for the gas type and the pressure range of the pressure regulator variant used.

Furthermore, there must be a satisfactory connection between the device and accessories that is appropriate for the forces applied and the media used.

If you are unsure about the suitability of the accessories, you can contact our product consultants (see the back of this operating manual).

4. Operation

4.4 Changing the cylinder



Important

Each time you change the cylinder, check that the gasket is in perfect condition and replace it if necessary.

Step	Activity
1	Close the gas cylinder valve of the gas cylinder to be replaced.
2	Ensure that both pressure gauges indicate 0 bar and thus that the cylinder pressure regulator is fully relieved.
3	Fully release the adjustable cylinder pressure regulators.
4	Loosen the cylinder pressure regulator on the gas cylinder valve and connect it to the new gas cylinder.
5	Always open the gas cylinder valve slowly, and, in the case of adjustable cylinder pressure regulators, use the handwheel to set the desired outlet pressure. Adjust the pressure setting again if the pressure drops.
6	Check the gas cylinder connector and any other detachable connections for leakage.

4.5 Taking the equipment out of operation

Taking out of operation or interrupting operation for a short period

When interrupting operation for a short period, all you need to do is close the gas cylinder valve.

Taking out of operation or interrupting operation for a longer period

Step	Activity
1	Close the gas cylinder valve. Turn the grip clockwise.
2	Entirely relieve the pressure on the pressure regulator by removing the gas.
3	Carry out a visual check of the pressure gauge to ascertain whether the pressure has been reduced.

5. Problems

Problem/cause	Remedy
Gas is released from the relief valve. Impermissible increase in the outlet pressure.	Close all valves immediately. Have the pressure regulator checked immediately by the manufacturer or an authorised specialist company.
The pressure regulator is making noises. This indicates a defect.	Close all valves immediately. Have the pressure regulator checked immediately by the manufacturer or an authorised specialist company.
The pressure regulator is frozen. This indicates that too much gas is being drawn.	Reduce the amount of gas drawn or – if technically, chemically and physically possible – add a heater to pre-heat the gas.
There is a leak. This indicates a defect in a pressure regulator component.	Close all valves immediately. Have the pressure regulator checked immediately by the manufacturer or an authorised specialist company.
The outlet pressure level is unstable and is not adhering to the usual range of variation. This indicates that too much gas is being drawn.	Reduce the amount of gas drawn. It is also possible that there is dirt in the inlet filter. In this case, the pressure regulator must be checked by the manufacturer or an authorised specialist company.

6. Maintenance, cleaning and repairs

6.1 Regular maintenance work and visual inspections

Regular maintenance work

To ensure the pressure regulator remains in perfect working order and a constantly high level of operational safety and reliability is maintained, it should be checked by a specialist once a year.

Regular visual inspections

Visual inspection of all parts for	Interval
<ul style="list-style-type: none"> • Damage • Correct functioning • Leaks • Integrity/stability • Corrosion 	Regular inspections at intervals of 12 months and each time the device is put into operation make an important contribution to the cost-effectiveness and preservation of the value of the fittings.



Note

If you find defects during the visual inspection, do not put the pressure regulator into operation. Have the pressure regulator checked immediately by the manufacturer or an authorised specialist company.

6.2 Regular cleaning



Warning

Detergents or disinfectants can corrode and ruin gaskets inside the fittings. Do not use detergents or disinfectants.

If the device gets very dirty, this can interfere with operation. If it becomes necessary to clean the pressure regulator, use only a damp, lint-free cloth.

6.3 Repair information



Important

Repairs may only be carried out by specialist personnel in authorised repair workshops. After repairs, the entire pressure regulator must be checked in accordance with the original Spectron inspection instructions.

Safe and reliable operation can only be guaranteed if original spare parts are used.



Note

The manufacturer accepts no liability for damage resulting from unauthorised repairs or modifications carried out by the user or third parties without the express written approval of the manufacturer.

6.4 Returns

If the pressure regulator is returned to the manufacturer for testing, maintenance or repair, and it has been in contact with corrosive and toxic gases, it is imperative that it is purged with inert gas.

Spectron Gas Control Systems GmbH
Fritz-Klatte-Straße 8
D-65933 Frankfurt
Germany
Phone: +49 69 38016-0
Fax: +49 69 38016-200
Email: info@spectron.de
Internet: www.spectron.de