Instructions for use
Medical Oxygen Gas Supply System

MED 100-V-D-CA 71835100 Druckreduzier- und Umschalteinrichtung für Q_N = 100 m³/h
MED 25-V-D-CA 71835025 Druckreduzier- und Umschalteinrichtung für Q_N = 25 m³/h
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Instruction for use
MED25 / MED100

1 General / Safety instructions

Validity
This operating manual is valid for the following pressure control panels:

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Germany
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Fax: +49 69 38016-200
E-Mail: info@spectron.de
Internet: www.spectron.de

Publication date
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The manufacturer can only ensure safe, reliable use of the gas supply system if the user complies with the following general instructions:

- The medical gas supply system must only be maintained, repaired and operated by trained specialised persons authorised by Spectron GCS. Detailed knowledge of these instructions for use is required.
- Commissioning and start-up of the system without the manufactures written consent are forbidden.
- Final checks, commissioning and start-up of the system has to be executed documented in accordance with ISO 7396-1.
- Use only accessories that are approved and CE marked and compatible by its designated use for the application with this medical product. In the event of any queries relating to the suitability of the accessories, please contact our medical product advisors (see rear cover for phone/fax numbers).
- Alterations and changes without prior written consent of the manufacturer are not allowed.
- All parts of the medical gas supply system must be kept clean from oil and grease.
- Do not expose the gas supply system to uv rays or direct sunlight for longer periods of time.
- Medical gases must only be fed into the gas supply system in gaseous phase (not in the liquid phase).
- Fire and explosion hazard! Please observe the national and local accident prevention regulations and for gases (particularly: Oxygen) and other regulations that might apply.
- When working with installations and pipework for oxidising gases observe the pertinent local fire prevention regulations. Sources of ignition and naked flames in the vicinity of the gas supply system are strictly prohibited.
- The gas supply system has to be checked for leak tightness at regular intervals.
- The gas supply system must only be used for the designated use.
- The place of installation should be well ventilated.
- Beware of quick connectors’ recoil when opening quick connectors on pressurised systems for maintenance purposes!
- This operating manual is a component of the MED Medical Oxygen Gas Supply System and must be accessible to those with the relevant authorisation at all times.
When in doubt about handling of the system or in case major interferences with the system are required we recommend to direct any such enquiries directly to the manufacturer Spectron GCS. The manufacturer refuses any liability if the system is manipulated without prior written consent of the manufacturer or if it is used for purposes other than the designated use. Repairs must only be carried out by the manufacturer or specialised staff authorised by the manufacturer using only original spare parts.

**Stop:** Before closing the supply of a medical gas make sure that no patient may be affected!

### 1.1 Standards / Classification

The following standards (amongst others) were used and complied with:

- ISO 7396-1  Medical gas pipeline systems
- ISO 10524-2  Pressure Regulators For Use With Medical Gases (Manifold regulators)
- ISO 15001  Anesthetic and respiratory equipment -- Compatibility with oxygen
- 93/42/EWG  Medical Device Directive

Classification according to medical devices directive 93/42/EWG: Class IIb

### 1.2 Pictograms

**Stop!**  **Stop!** Danger to patient or operator!

**Attention!**  **Attention!** Important operating instructing!

**Note!**  Useful advice for your work.

### 1.3 Intended use

The pressure reducing and switchover unit MED is an integral component of a medical gas supply system acc. to ISO 7396-1 and HTM 02:01. It resembles a control system for continuous supply of medical gases at the required operating pressure. The overall medical gas supply system requires approval as a medical product acc. to the directives in force (the pressure reducing and switchover unit MED is considered a part of it).

MED reduces the (variable) inlet pressure of up to 300 bar from 3 independent sources of medical oxygen in two reducing stages to a constant line pressure. It provides continuous supply of compressed medical oxygen to a distribution pipework by automatically switching from primary to secondary and emergency sources.

The pressure reducing and switchover unit is designed for 3 sources. When in use with a cryogenic vessel, the cryogenic vessel is always considered its primary source. The left and right cylinder banks are then considered the secondary and emergency sources respectively.

**NOTE.** This product does NOT comprise a third source of supply as defined by HTM02:01 – this is the end customers responsibility to supply.

According to the medical devices directive 93/42/EWG the pressure reducing and switchover unit MED is classified as a class IIb product.
Attention! The electronic control unit Flomed P has got 6 potential-free outputs, which must not be used as clinical emergency alarms or as operating emergency alarms. Only operating alarms and information signals may be relayed (ISO 7396-1, table 1).

1.4 Improper use

Stop!
Not to be used
- for gases that are not named on the labeling
- for the following applications:
  - automotive repair shops, paint shops, pressure booster stations, supply system for oxy-fuel torches
  - in locations which do not meet the requirements of ISO 7396-1 and other national or local standards / regulations which may apply
- for gases in liquid phase.
- for filling cylinders, cylinder bundles or cylinder banks.

1.5 Marking

The MED unit is marked (type and serial no.) on the base plate of the pressure reducing and switchover unit.

Example of the type plate:

Note! Pipeline systems have to be marked permanently with the gas type.
2 System layout

The main gas supply is provided from a storage vessel (VIE or PCC). Gas is fed at a supply pressure as given in the technical data (chapter 5) into the intermediate pressure part of the pressure reducing and switchover unit MED using the according connector. The intermediate pressure is then reduced to the line pressure of the distribution pipework by the second stage pressure regulators. The secondary and emergency sources (gas cylinders) are connected to the manifolds using high pressure pigtails. The manifolds are connected to the high pressure connectors located at the side of the pressure reducing and switchover unit MED. The (variable) inlet pressure of up to 300 bar is reduced to the intermediate pressure by the first stage pressure regulators.

**Attention:** Supply pressure from the cryogenic tank shall be maintained acc to the values given in the technical data (chapter 5)!

**Attention:** Refill an empty cryogenic tank as soon as possible!

If the supply pressure from the primary source drops, one of the connected cylinder banks (secondary or emergency source) may be activated by means of the control unit and one of the solenoid valves. It must be ensured that all cylinder valves, shut-off valves and ball valves of the secondary and emergency sources are open (even when the cryogenic tank is active). The vent valves must be closed. When the active secondary cylinder banks filling pressure drops, the other connected cylinder bank (emergency source) may be activated by means of the control unit. Accordingly the emptied secondary source may be deactivated using the other solenoid valve.

**Attention:** Low supply pressure could be caused by closed cylinder valves, shut-off valves, ball valves or by damaged pipework!

When in operation with a cryogenic tank the two cylinder banks are considered secondary and emergency sources. Their priority may be manually influenced using the control unit.

![Picture](Example of installation with primary source cryogenic tank (not on picture), secondary source (cylinder bank, 5 cylinders, left, and 5 cylinders, right); the pressure reducing and switchover unit MED is located between the two cylinder banks.)

2.1 System interfaces

**Sensors** ➔ see technical data (chapter 5)!

the pressure reducing and switchover unit contains sensors for monitoring and processing the following measurands:

- Inlet pressure left reserve bank (before 1. reducing stage on left pressure regulator)
- Inlet pressure right reserve bank (before 1. reducing stage on right pressure regulator)
- Supply pressure of primary source (before 2. reducing stage, upstream of the check valve)
- Line pressure of distribution pipework (after 2. reducing stage)

**Actuating elements** ➔ see technical data (chapter 5)!

Downstream of the two pressure regulators of the first pressure reducing stage (left / right) solenoid valves are installed; these are actuated according to the measurements explained above via the control unit.
3 Schematics

Cryogenic tank as primary source with two cylinder banks as secondary and emergency sources (incl. sensors and actuating elements; control unit is displayed symbolically):

Legend

F – Inlet filter
PCV – pressure regulator
SOV – Solenoid valve
V – Ball valve
N – Check valve
PSV – Safety valve
PRV – Blow-off valve
PT – Pressure transducer
PI – Pressure indicator
QC – Quick connector
4 Dimensions

Umschaltstation MED

Flexible Verbindung MSU

Batteriesystem MBS

Beispiel für eine zentrale Gasversorgung
5 Technical data / Ambient conditions

Materials
valves, regulators : Brass
diaphragm regulators: NBR
base plate: Stainless steel 1.4301

Weight
pressure reducing and switchover unit MED: 62 kg
bank manifold ~6 kg (varies acc. to type and no. of cylinders)
flexible connectors (pigtails) ~0,5 kg

Dimensions
pressure reducing and switchover unit MED: 1060 x 710 x 170 mm (H x B x T)
cylinder pressure, max.: 300 bar
tank supply pressure: 12 - 18 bar
nominal outlet pressure: 4 - 5 bar
Opening pressure of safety valve: in the distribution pipework area: 6 bar
nominal capacity MED 25 25 m³/h
nominal capacity MED 25 100 m³/h

Attention! For liquid gases the capacity depends considerably on the vaporisation process of the gas in the vaporiser.

Operating conditions
temperature: -30 to 60 °C
air humidity: < 90 % rel. humidity

Storage and transport conditions
temperature: -15 bis + 60 °C
air humidity: < 50% at 40°C
< 90% at 20°C
Do not expose to sunlight (uv-rays)

Attention! Do not expose to sunlight (uv-rays)!

Connections
inlet from vaporiser: 1" metal sealed with brazing adapter
inlet from cylinder banks: G ½" metal sealed
outlet: G ¾" female; metal sealed acc to EN 560
pressure gauge ports: G ¼" female
outlet blow-off valves (1.stage) MED 25: 1/8"-NPT female
MED100: G 3/8" metal sealed
outlet from safety valves: G ½" female
vent gas from cylinder bank manifold: G ¼" female

Leak rate < 10⁻³ mbar l/s He

Sensors
inlet pressure left/right bank PT1L/R: pressure transducer 4-20 mA, range 0 - 400 bar
inlet pressure primary source: pressure transducer 4-20 mA, range 0 - 25 bar
outlet pressure: pressure transducer 4-20 mA, range 0 - 16 bar

Actuating elements
solenoid valves MVR / MVL: 24 V DC, PN 50 bar, normally open
6  Installation

Attention! The installation must only be carried out by trained and authorised staff. ISO 7396-1 has to be observed.
Commissioning, start-up and hand-over must be recorded in writing acc to ISO 7396-1. All pipework and connections must always be kept free from oil and grease!
-> Explosion hazard!!!

Structural requirements

A central gas supply system for compressed gases must only be installed in a location especially designed or appropriately modified for this purpose. The installation location must be well ventilated and fireproof. Therefore all applicable regulations and standards must be observed!

6.1 Installation of C-rails

The pressure reducing and switchover unit MED is mounted to C-rails. Use water-level for alignment.

Cabinet:
- The Height (center) of the top C-rail above floor is 1770 mm. The distance between screws for wall mounting should be 600 mm.
- Install now the second C-rail 770 mm below first one. This is approx. 1000 mm above the floor.

Manifolds:
- The Height of the top C-rail above floor is 1770 mm. The distance between screws for wall mounting is 825 mm for a triple manifold panel and 525 mm for a double manifold panel.
- Install now the second C-rail 140 mm below first one.
- The height for the third C-rail for the cylinder holding devices is approx 1000 mm above the floor.
6.2 Installation of the cabinet to the C-rails

- Insert T-bolts (2x into upper and 2x into lower) into C-rail.
- Horizontal distance between T-bolts = 600mm (= distance of fixing bores inside cabinet)
- Put one washer onto each T-bolt and secure with M8 nut.

- Put one more washer onto each T-bolt. Put cabinet onto 4 T-bolts and secure with additional washers and nuts M8.

6.3 Connection of the manifold and the pigtails

- The connections in between the cabinet, the manifold systems and the pigtail are metal to metal sealed connections. No additional sealing material is needed.
- Tighten all connections by counter holding on side of the connection with a second wrench.
- Check afterwards all connections for leak tightness!
6.4 Vent lines

Attention! Vent lines from safety and/or relief valves and vent valves (vent valves on manifolds) must be run into the open. Vent lines from safety/relief valves of 1st reducing stage and from safety valves for the outlet (line) pressure must be run separately!

6.5 Connection from cryogenic tank to cabinet

The inlet connection comes with G 1” male connecting thread, equipped with a brazing adaptor.

Attention! During brazing lines must be purged with inert gas!

6.6 Connection from cabinet outlet to distribution pipework

The outlet connection comes with a G ¾” female connection acc to EN 560.
7 Commissioning and start-up

Commissioning, start-up and hand-over of the central gas supply system to the user must be carried out by specially trained Spectron GCS staff or other staff trained and authorized by Spectron GCS. This routine ensures all necessary function and safety tests, training of the operating technical staff and written record.

Recommissioning after maintenance or repairs must also be carried out by specially trained Spectron GCS staff or other staff trained and authorized by Spectron GCS.

Operation of the system (e.g., changing cylinders) must only be carried out by competent staff.

All connections must be completed as required by this manual (and local regulations where applicable):

- vent lines into the open for safety/relief valves
- cryo tank lines to the cabinet/panel
- reserve (secondary and emergency) sources (gas cylinders, gas cylinder banks or bundles)  
  (also refer to chapter 8: Changing cylinders)
- Electrical connection

Note! A closed ball valve can be identified by seeing its T-handle transversely to the flowdirection. A shut-off valve is closed when the indicator in the handwheel shows red.

7.1 Primary source (cryogenic tank)

1. Open ball valve V653 slowly
2. Open ball valves V654A and V654B slowly. Gas passes into inlet of second stage regulators PCV656A and PCV656B.
3. Adjust both pressure regulators to the values in the schematic in chapter 3 by slowly turning the adjusting handwheel clockwise.
5. Carefully fill the downstream pipework with the outlet pressure avoiding vibration by slowly opening the main ball valve V664. After opening V664 there may be slight deviations in the second stage outlet pressure values. Readjust PCV656A and PCV656B if required. Notice that both pressure regulators will show the higher of the two settings on the low pressure gauge after valves 659A/B have been opened.

7.2 Secondary and emergency source

7. For systems with additional shut-off valves per cylinder: open these slowly.
   The filling pressure will be visible at the pressure gauges on the main bank shut-off valve.
8. Close gas cylinder valves and then vent the manifolds through the vent valves. Depressurization to purge ambient air from cylinder manifold.
10. Slowly open gas cylinder valves.
11. Slowly open main isolation valves. Gas passes into the inlet side of the first stage pressure regulators PCV667A/B. These regulators are set to outlet pressure values lower than the cryogenic tank delivery pressure to the intermediate pressure area and are now in stand-by.

Attention! Recommissioning after maintenance or repairs must be carried out by specially trained Spectron GCS staff or other staff trained and authorized by Spectron GCS. Operation of the system (e.g., changing cylinders) must only be carried out by technical staff.

Stop! Ensure that before taking the system out of operation no patients are supplied by it!
8 Changing cylinders (secondary and emergency sources)

Attention! The filling pressure must be checked daily and empty cylinders have to be replaced with new ones as soon as possible. The cylinders need to be replaced as soon as the filling pressure drops below 18 bar. Cylinders should always have a residual pressure (higher than atmospheric pressure) to avoid contamination of the cylinder with dirt and ambient moisture.

Note! For the cylinder change no tools are required other than a cylinder valve key where required.

1. Close all cylinder valves of cylinder bank before cylinder change.
2. Isolate cylinder bank from the pressure reducing and change-over unit by closing the main isolation valve V672A or V672B.
3. Vent the high pressure manifold by opening the corresponding vent valve V501A or V501B. After opening the vent valve flow sounds can be heard. These sounds must cease after a few seconds. If it does not, one or more of the cylinder valves may still be open.
4. Close the vent valve again after venting of the manifold.
5. The high pressure connectors of the pigtails can be disconnected from the gas cylinder by loosening the union nuts. This should be feasible by hand. If stronger force is required, it is possible that the high pressure manifold is still pressurised. In this case vent the system again.
6. Once the high pressure cylinder connectors are disconnected from the gas cylinders, the empty cylinders can be exchanged for full cylinders.

Attention! The high pressure pigtails should be bent as little as possible. Any additional bending of the pigtails will weaken them by stress and strain. This poses a safety risk in the long run.

7. Check the sealing surfaces of the cylinder valves and the high pressure pigtails for wear or damage. Use only original spare parts!
8. Connect the high pressure pigtails to the cylinders. When all high pressure pigtails of the bank are connected to the gas cylinders again, make sure the vent valve and the main isolation valve is closed. Open the cylinder valves slowly to avoid pressure surges to the main manifold.
9. When all gas sources are open again, open the isolation valves V672A or V672B slowly and fully to ensure the full flow capacity.
10. Finally check the operating function by means of the pressure gauges and other connected readout or control units.
9 Control unit for medical gases c/w interface box

9.1 Preview
FLOMED P is an integrated system satisfying all the requirements concerning local and remote control of compressed medical gases. Besides functions habitually managed by popular instrumentations and systems, FLOMED P performs many innovative and powerful functions:

- Local monitoring of cylinders levels and distribution pressure
- Alarm local monitoring, in accordance with medium and high priority, operating and clinical alarm definitions as to the definitions of ISO 7396-1.
- Switch over management using (solenoid valves) and several control instrumentation (pressure switches or pressure and weight 4...20 mA transmitters)
- Management of sources up to four primary and backup systems, using actuators and instrumentation mentioned above
- Remote alarm system

9.2 Installation
The control unit comes preinstalled with medical gas control panel MED 25 or MED 100. Refer to drawings at the end of this chapter for technical information concerning wiring, cabling required, shape, mounting and other technical details.

9.3 Earth connection
FLOMED P unit needs an earth connection to protect circuitry from surges and electrical discharges through power and phone networks (see connection layout).

⚠️ Attention! To safeguard equipment from over-voltages and for safety reasons, the earth connection must always be present and utilised. The manufacturer will not be held liable for any damage to people and other equipment, due to the lack of the earth connection.
9.4 Keyboard operations

Programming, reading and command operations are carried out by the use of four blue buttons on the front panel, through a series of menus.

Push \( \uparrow \), \( \downarrow \) and \( \leftarrow \) keys for about five seconds, until the display shows the MAIN MENU, to enter the programming mode. If a password has been set up before, enter this to proceed to the MAIN MENU.

In PROGRAMMING MODE, keys assume following functions:

- \( \uparrow \) \( \downarrow \)
  - selecting options and menus
  - scroll pages pertaining to same menu
  - return to upper menu

- \( \leftarrow \)
  - entering into selected menu
  - setting variables values and alphanumeric charters
  - setting options

System disables keyboard functions and returns in running mode selecting the exit option from main menu, or by keyboard time-out, after 120 seconds.

9.4.1 Programming

Selecting Programming option (by \( \uparrow \) \( \downarrow \)) from MAIN MENU. Pushing \( \leftarrow \) makes the system enter the Programming Menu

9.4.2 System setup

This Menu includes network, alarm classification and system setting.

Net address

This numerical variable assigns an identification code to each FLOMED P belonging to same local network. Valid settings are numeric values from 1 to 31 and "—", corresponding to "undefined variable".

Attention! The undefined Ind condition disables the local network functions! Units belonging to same network must have addresses contiguous and starting from 1 (1, 2, 3,...): different criteria of address assignment surly cause the loss of the network connection. Failures will occur if above instructions are neglected.
**Buzzer volume**
Numeric parameter with range from 1 to 10 and the OFF option, corresponding to buzzer disabled.

**Alarms classification**
Alarms monitoring mode acc to operating or clinical alarms definition of ISO 7396-1.

**Buzzer recovery time**
Recovery time of alarm acoustic signal, in minutes.
This function restores the acoustic signal in case the alarm status duration exceeds the recovery time from last acknowledgment.

Available settings are:
- 1 to 99 minutes, with alarm classification operating
- 1 to 15 minutes, with alarm classification clinical,
- OFF, to disable the recovery function

⚠️ **Attention!** In accordance to ISO 7396-1, the maximum recovery time must not exceed 15 minutes!
Also for operating alarms.

**Language**
User interface languages:
- Eng = English
- Deu = German
- Ita = Italien

**Relay mode**
Out relay operation:
- **CNO (CNC)** Normally Open (Closed) Cumulative Alarms
  Energized (de-energized) by one or more active alarms.
- **CAS** Continue Auxiliary Hooter
  Always ON when the internal buzzer is ON
- **IAS** Intermittent Auxiliary Hooter
  Same logic of CAS, with same envelope of the internal buzzer.

**Password**
Set or modify the password to open the MAIN MENU: valid settings are numeric values from 001 to 999 and the --- option, corresponding to Password disabled.
9.4.3 Switch over system

The control instrument line contains information about storage control instrumentation: 4...20 mA transmitters or switch sensors.

The user can select two different system types:

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<th>Two banks in switch over configuration activated by the input 4; low level alarms monitored by 4…20 mA transducers.</th>
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<tr>
<td>4/20 mA transmitters</td>
<td>Bank LF      Bank RG</td>
</tr>
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<table>
<thead>
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<th>Switch Over Syst. 2</th>
<th>Two banks in switch over configuration always active; low level alarms monitored by 4…20 mA transducers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/20 mA transmitters</td>
<td>Bank LF      Bank RG</td>
</tr>
</tbody>
</table>

After selecting system type, push \( \text{ } \) key to open the Bank identifiers menu and assign an identification string to each bank as follows:

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<th>BANK IDENTIFIERS</th>
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<tr>
<td>LF   RG  ..........</td>
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</table>

After setting the identification strings, push \( \text{ } \) key to confirm.

9.4.4 Input setup

The menu allows defining monitoring parameters, classification, transmitters and sensors associated to analog and digital inputs.

<table>
<thead>
<tr>
<th>Transducer Inputs</th>
<th>Push ( \text{ } ) and ( \text{ } ) to move the cursor on the desired field; ( \text{ } ) to select it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4</td>
<td></td>
</tr>
<tr>
<td>Switch Sensor Inputs</td>
<td>Push ( \text{ } ) and ( \text{ } ) to move the cursor on the desired field; ( \text{ } ) and ( \text{ } ) to edit the value / option.</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td></td>
</tr>
</tbody>
</table>

4...20 mA ANALOG INPUTS CONFIGURATION

Page 1: Measurement

<table>
<thead>
<tr>
<th>Setup AN1 4/20mA</th>
<th>Push ( \text{ } ) and ( \text{ } ) to move the cursor on the desired field; ( \text{ } ) and ( \text{ } ) to edit the value / option.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Unit of measure</td>
<td></td>
</tr>
<tr>
<td>Zero 0</td>
<td>FS</td>
</tr>
</tbody>
</table>

Identifier

Alphanumeric string defining the measurement associated to the input, with maximum length 8 characters.
When the input is reserved for the switch over system, the identifier can be only assigned and modified from Bank identifiers menu.

**Unit**
Units of measurement associated to the input.
Following options are available: bar, mbar, Kg, pH, psi, %, ton.

**Zero – FS (Full Scale)**
Limits of range of the transducer, with measurement units defined by the selected in measurement unit parameter.
Zero and FS values correspond to the measurements supplied by the analog transducer when the output current is respectively 4 and 20 mA.

**Page 2: ALARM**

Setup AN1 4/20mA

<table>
<thead>
<tr>
<th>Setup ANI 4/20mA</th>
<th>Setup AN 4/20mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Alarm</td>
<td>Alarm thresholds</td>
</tr>
<tr>
<td>Low Prealarm</td>
<td>low ... Hi</td>
</tr>
<tr>
<td>Loc</td>
<td>Loc</td>
</tr>
<tr>
<td>Prior. Mid</td>
<td>Prior. Mid</td>
</tr>
</tbody>
</table>

**Low, (High) Alarm**
Minimum and maximum alarms thresholds.
Values must be set within the interval Zero – FS.

**Low Prealarm**
Minimum and maximum alarms thresholds.
Values must be defined within the range Low Alarm – FS.

**Loc**
Alarm status associated to the input.
Following options are available:
Measure input does not generate alarm status
Loc input generates a local alarm status

**Priority**
Alarm signals in accordance to ISO 7396-1.
Available options are: High or Medium priority.

**Digital inputs configuration**

<table>
<thead>
<tr>
<th>Setup DIG 1</th>
<th>Name ........ NO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loc Prior. Medium</td>
</tr>
</tbody>
</table>

Push and to move the cursor on desired field; and to edit it.

**NO**
Status of the sensor associated to the normal conditions (non-alarm or non-active). Available options are:
NO normally open, NC normally closed.

For remaining fields refer to analog inputs configuration section.
9.4.5 Manuel operations

MANUAL/ AUTOMATIC

Select the Manual/Automatic option from the MAIN MENU to open the Control Mode menu.

This menu transfers the control of the switch over system function in manual mode. The page shows current system selected in Switch Over System menu.

Automatic / Manual

Switches the control of the system in automatic or manual mode. In manual mode, the remote control functions remain disabled and the message MANUAL CONTROL MODE appears cyclically on display.

ON / OFF

Press or to switch the status of the corresponding valve. This command is only available in manual mode.

9.4.6 Maintenance

MAINTENANCE

Select maintenance option from MAIN MENU to open current menu.

This page allows switching the system in maintenance or running status. During the maintenance status, all local network functions remain disabled and the message MAINTENANCE appears cyclically on display.

9.4.7 Re-activating keyboard editor

Programming parameters set in local and in remote are stored in a non-volatile E²PROM memory and preserved also in power down condition. After transferring the control of the system from local to remote, all editing operations by the local keyboard are disabled; in this case, the E² memory must be deleted to restore the programming functions by keyboard.

Push button below the hole near to the battery switch, using a pointed plastic object, to erase the E² memory. During this operation, the display shows the blinking message **E2CANC**. If the sequence ends successfully, the message will become fixed, else the error message **ERR** will appear.

Attention! The operation does not affect all local programming parameters programmed by keyboard. The operation causes the loss of the remote control parameters.

9.5 Running functions

9.5.1 Signal monitoring

During running mode, the display shows monitoring pages, containing up to four measurements and/or status. In case the number of signals exceeds the number of four, more monitoring pages will appear on display in sequence, with a refresh period of 5 seconds. The monitoring criterion consists of filling the display lines as far as possible, to minimize the number of pages.
9.5.2 Pre-Alarm indication

When a bank pre-alarm status arises, the display will switch between standard scrolling and a blinking page containing the pre-alarm information. No acoustic or other visual indications are available.

9.5.3 Alarms local management

Alarm and status monitoring follows same philosophy, with same differences, assigning highest priority to the unacknowledged alarms:

- When an alarm status arises, the display suspends the standard scrolling and shows a blinking page containing alarm information (alarm page), until the acknowledgement operation;
- After the acknowledgement, the display restarts scrolling, showing a sequence of blinking alarm pages and fixed status pages.

When necessary, the current alarms appears on more pages, each of which requires an acknowledgement operation; in this case, the display resumes scrolling after acknowledging all the alarm pages.

The acknowledgement of each alarm page occurs by pushing the ACK button on front panel while it appears on display.

The acoustic signal starts with each new alarm event and stops after acknowledging all the alarm pages. The light signal switches on with the acoustic signal and switches off at the end of all alarm events; the yellow light indicates alarm events of medium priority only, the red light indicates one or more high priority alarm events.

Refer to paragraph MODE RELAY for information about the operation of the relay alarm output.

Typical ALARM PAGE

<table>
<thead>
<tr>
<th>Bank Id.</th>
<th>RG fail</th>
<th>Ident.1</th>
<th>min.</th>
<th>Ident.2</th>
<th>min.</th>
</tr>
</thead>
</table>

This example shows an Alarm Page including Bank RH fail and two min. alarms given by the analog transducers.

The system manages alarms and fails listed below:

- Maximum alarms from 4...20 mA analog transducers: delay 6 sec.
- Minimum alarms from 4...20 mA analog transducers: delay 6 sec.
- Alarms from switch sensors: delay 2 sec.
- Fail of 4...20 mA transducers: delay 6 sec.
- Fail bank LH/ RH: delay 6 sec.

9.5.4 Alarm pages acknowledgment

The acknowledgement of each alarm page occurs by pushing the ACK pushbutton on front panel while it appears on display.

In presence of more unacknowledged alarm pages, the display resumes the scrolling after acknowledging all the alarm pages.

The ACK push-button results disabled and the buzzer turned off after acknowledging all the alarm pages.

In case a new alarm arises with all current alarm pages already acknowledged, the buzzer turns on immediately and the display stops on the alarm pages with new alarm information.

In case the alarm status duration exceeds the recovery time, (see programming section), the buzzer resumes, but in this condition, only one acknowledgement operation is enough to turn off it.
9.5.5 Switch over control

The blue light (OK) testifies the Switch over system is operating.
Management criteria of switch over systems controlled by levels transmitters consist of assigning highest priority to bundle with lower content.

Switch over logic for System 1 - Emergency source

<table>
<thead>
<tr>
<th>Input condition</th>
<th>Output command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank pressure</td>
<td>Right VALVE</td>
</tr>
<tr>
<td>low</td>
<td>N = Left</td>
</tr>
<tr>
<td>N = Left</td>
<td>N = Right</td>
</tr>
<tr>
<td>low</td>
<td>N &gt; Left</td>
</tr>
<tr>
<td>N &gt; Left</td>
<td>low</td>
</tr>
<tr>
<td>low</td>
<td>N (pf)</td>
</tr>
<tr>
<td>N (pf)</td>
<td>C</td>
</tr>
<tr>
<td>low</td>
<td>N</td>
</tr>
<tr>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>N</td>
<td>low</td>
</tr>
</tbody>
</table>

*Where: low = lesser than the minimum alarm threshold / alarm condition
  N = greater than the minimum alarm threshold / normal condition
  (pf) = possible fail condition of the bank*

Switch over logic for System 2 - Main source

<table>
<thead>
<tr>
<th>Input condition</th>
<th>Output command</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right LEVEL</td>
<td>Left LEVEL</td>
</tr>
<tr>
<td>N = Left</td>
<td>N = Right</td>
</tr>
<tr>
<td>N &lt; Left</td>
<td>N &gt; Right</td>
</tr>
<tr>
<td>N &gt; Left</td>
<td>N &lt; Right</td>
</tr>
<tr>
<td>low</td>
<td>N (pf)</td>
</tr>
<tr>
<td>low</td>
<td>N (pf)</td>
</tr>
<tr>
<td>low</td>
<td>low</td>
</tr>
</tbody>
</table>

*Where: low = lesser than the minimum alarm threshold / alarm condition
  N = greater than the minimum alarm threshold / normal condition
  (pf) = possible fail condition of the interested bank*

9.5.6 Monitoring

In the following the monitoring status of switch over system is shown

Switch over Syst. 1

Identifier >>
L value un R value
Line pressure value
Pressure tank

The Symbol “<<” indicates that left bank is supplying. The symbol “>>” vice versa.
9.5.7 System failures

Bank failure
FLOMED P notifies the Bank Fail as confirmation of a “possible fail” condition (see logic tables, (pf) conditions), in case the switchover operation restores normal values of line pressure. The sequence of bank fail investigation starts from the following condition:
Operating and spare banks full (level > low threshold) & pressure line low (line pressure < low threshold). When this condition arises, the unit switches over to the spare bank and then notifies either bank fail related to previous operating bank, in case the pressure line returns above low threshold. Low line pressure alarm appears, in case line pressure remains below the same threshold. If operating bank full & spare bank empty & line pressure low, the unit immediately notifies low line pressure alarm, omitting the rest of the sequence. Warning! – The notification of the bank fail stops by the acknowledgement:
This operation also closes the fail condition.

Sensor power fault
FLOMED P periodically checks the status of the additional power source destined to the switch sensors (digital inputs) and notifies POWER FAULT TO SENSOR in case of failure.
This condition requires the intervention of a qualified operator or the replacement of the control unit. Classification and notification follow same standard of high priority alarms.

System fault
The continuous blinking or burning of the red light labeled FAIL indicates a hardware failure of the equipment. The equipment must not be commissioned and must not be used in this condition; the intervention of a qualified engineer is required or the complete control unit must be replaced.

9.6 Dimensions
9.7 Cable glands / electrical connections

9.7.1 Main control unit bottom view

For some versions of MED an additional electrical terminal box is added to the FLOMED P. Its layout is as follows:

CN1/R BANK FAIL
CN2/R LOW PRESSURE TANK
CN3/R LOW PRESSURE LINE
CN4/R HIGH PRESSURE LINE
CN5/R ALARM BANK
CN6/R PRE-ALARM BANK

Left (top):
Electrical schematic of the connections available in the terminal box
Please observe that the “Low level Tank” signal is an external signal only wired into the terminal box for easier connection of all signal lines to the building management system (central monitoring).

Details of the main control units electrical connections are explained in chapter 9.7.

Left (bottom):
Connector layout inside electrical terminal box

9.8 Flomed P motherboard electrical connections

<table>
<thead>
<tr>
<th>CN7</th>
<th>Analog 4...20 mA</th>
<th>CN5</th>
<th>Digitals 1–5 1–5</th>
<th>CN6</th>
<th>Digitals 6–10 6–10</th>
<th>CN_/R</th>
<th>Relay output card</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin</td>
<td>Input</td>
<td>Pin</td>
<td>Input</td>
<td>Pin</td>
<td>Input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>+ AN 1</td>
<td>1</td>
<td>+ D 1</td>
<td>1</td>
<td>+ D 6</td>
<td></td>
<td>CN1/R Low pressure Tank</td>
</tr>
<tr>
<td>2</td>
<td>– AN 1</td>
<td>2</td>
<td>– D 1</td>
<td>2</td>
<td>– D 6</td>
<td></td>
<td>CN2/R Bank fail</td>
</tr>
<tr>
<td>3</td>
<td>+ AN 2</td>
<td>3</td>
<td>+ D 2</td>
<td>3</td>
<td>+ D 7</td>
<td></td>
<td>CN3/R Low pressure line</td>
</tr>
<tr>
<td>4</td>
<td>– AN 2</td>
<td>4</td>
<td>– D 2</td>
<td>4</td>
<td>– D 7</td>
<td></td>
<td>CN4/R High pressure line</td>
</tr>
<tr>
<td>5</td>
<td>+ AN 3</td>
<td>5</td>
<td>+ D 3</td>
<td>5</td>
<td>+ D 8</td>
<td></td>
<td>CN5/R Alarm bank</td>
</tr>
<tr>
<td>6</td>
<td>– AN 3</td>
<td>6</td>
<td>– D 3</td>
<td>6</td>
<td>– D 8</td>
<td></td>
<td>CN6/R Pre-alarm bank</td>
</tr>
<tr>
<td>7</td>
<td>+ AN 4</td>
<td>7</td>
<td>+ D 4</td>
<td>7</td>
<td>+ D 9</td>
<td></td>
<td>CN7/R Solenoid valve control left</td>
</tr>
<tr>
<td>8</td>
<td>– AN 4</td>
<td>8</td>
<td>– D 4</td>
<td>8</td>
<td>– D 9</td>
<td></td>
<td>CN8/R Solenoid valve control right</td>
</tr>
<tr>
<td>9</td>
<td>COM –</td>
<td>9</td>
<td>+ D 5</td>
<td>9</td>
<td>+ D 10</td>
<td></td>
<td>CN9/R 24Vdc Valve – left</td>
</tr>
<tr>
<td>10</td>
<td>Erde</td>
<td>10</td>
<td>– D 5</td>
<td>10</td>
<td>– D 10</td>
<td></td>
<td>CN10/R 24Vdc Valve – left</td>
</tr>
</tbody>
</table>
## 9.9 Flomed P internal electrical connections

### PIN CONNECTIONS

<table>
<thead>
<tr>
<th>Pin</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+24Vdc</td>
</tr>
<tr>
<td>2</td>
<td>-24Vdc</td>
</tr>
<tr>
<td>3</td>
<td>Earth</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pin</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-24Vv</td>
</tr>
<tr>
<td>2</td>
<td>+24Vv</td>
</tr>
<tr>
<td>3</td>
<td>Earth</td>
</tr>
</tbody>
</table>

### PIN CONNECTIONS Power Supply 24V DC

<table>
<thead>
<tr>
<th>Pin</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>230 Vac</td>
</tr>
<tr>
<td>2</td>
<td>Erde</td>
</tr>
<tr>
<td>3</td>
<td>230 Vac</td>
</tr>
</tbody>
</table>

### PIN CONNECTIONS Power Supply 230V AC

<table>
<thead>
<tr>
<th>Pin</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CN4</td>
</tr>
<tr>
<td>2</td>
<td>CN2</td>
</tr>
<tr>
<td>3</td>
<td>CN10 (*)</td>
</tr>
</tbody>
</table>

**Legend:**
- B: Input
- COM: Common
- NC: Normally Closed
- NA: Normally Open
- AN: Analog Input
- DC: Direct Current
- AC: Alternating Current
9.10 Technical data FLOMED P

**4...20 mA Analog Inputs**
- **Compatibility**: 4...20 mA transmitters
- Maximum voltage (open circuit): 24 Vdc
- Minimum voltage @ I = 20 mA: 16 Vdc
- Short circuit current: 25 mA
- Resolution: 10 bit

**Digital Inputs**
- **Compatibility**: Switch sensors
- Maximum voltage (open circuit): 15 Vdc
- Short circuit current: 15 mA

**Alarm relay output**
- Maximum switching voltage: 250 Vac / Vdc
- Maximum switching current: 100 mA

**Power supply**
- Supply voltage: 220 Vac – 50 Hz
- Maximum Power: 60 VA

**Mechanical protection degree**
- IP 55

=> FLOMED P is manufactured by AMBRA Sistemi s.r.l., Grugliasco (TO), Italy
10 Maintenance by the user

**Attention:** Maintenance work must only be carried out by trained specialist staff!

**Stop**

If the unit is used for purposes other than the intended use or in case of arbitrary modifications or repairs to the unit, the manufacturer refuses any liability. Repairs must only be carried out by the manufacturer or specialist staff authorised by the manufacturer using original spare parts only and observing all safety requirements in place for the product/system.

**Stop**

Beware of quick connectors’ recoil when opening quick connectors on pressurised systems for maintenance purposes!

The gas supply system has to be technically checked and safety-tested at least once per year by a service partner authorized by Spectron Gas Control Systems GmbH.

Spectron Gas Control Systems GmbH
Fritz-Klatte-Str. 8
65933 Frankfurt

Telephone:  +49.69.38016-0
Telefax:  +49.69.38016-200

Please observe maintenance manual, Spectron no. 718.35028

10.1 Visual inspection and leak test

A visual check and a leak test should be carried out on the complete gas supply system regularly. Of particular interest are:

- External contamination of the pressure reducing and changeover unit; clean with cloth if necessary; use no detergents
- Electrical cabling in good condition (contact authorised service partner in case of damaged cables)
- Gas leaks (contact authorised service partner in this case)

**Stop**

Particularly for oxygen service:
Always ensure the system components are kept free from oil and grease! (increase of fire hazard)!

10.2 High pressure connections (pigtails)

The flexible tubing of the high pressure connections were bent into shape for service with the gas cylinders during installation / start-up. Any further bending of the high pressure tubing should be restricted to a minimum. Any further bending of the tubing weakens the structure of the tubing material by strain and (torsional) stress and will constitute safety risk in the long run!

Please notice: Should frequent bending of the high pressure connections be inevitable (due to extreme differences in cylinder heights for example), the high pressure connections should be regularly checked visually for any conspicuous signs of weakened tubing material due to frequent bending.

**Stop**

If any such signs are observed, replace the high pressure connections with new ones immediately for safety reasons!
10.3 Shut off of medical gas supply for repair works
For some repair or maintenance works it is necessary to close valves in the cabinet. These must only be closed by trained technical staff authorised by the operator of the gas supply system.

Hinweis! A closed ball valve can be identified by seeing its T-handle transversely to the flowdirection.

Stop! Before closing the supply of a medical gas make sure that no patient may be affected! Before shutting of the supply of a medical gas a provisional gas supply line must be ensured!

11 Problems

11.1 Damaged pressure regulators
Pressure regulator are subject to wear depending on the operating conditions! Furthermore strong contamination (coming from the gas cylinders for example) may interfere with the function of the regulators (even with filtration elements in place). In the first reducing stage contaminants usually result in an altered outlet pressure of one or two regulators. This in turn could affect the change-over function. Accidental opening of the safety valve on the pressure regulator could occur resulting in a loss of gas. In the second stage, such malfunctions are to be expected very rarely. If a humming sound is observed on a regulator, have the regulator replaced by authorised trained staff.

11.2 Freezing and condensation water
During high gas consumption or at very low ambient temperatures, freezing of the pressure regulators can occur. Due to the reason that MED is a fully redundant supply system, the side having not been in use should automatically take over the supply in such situations.

In oxygen service internal freezing can only occur if moisture from inside the gas cylinders enters the regulators. Therefore always ensure that gas cylinder contents meet their general requirements. External condensation freezing of condensation is harmless.

11.3 Capacity overload
At very high withdrawal rates (exceeding the design flow rates of the gas supply system significantly) the distribution pipework pressure may drop below the design pressure range. Such capacity overload situations could be caused by damaged (leaking) pipes or fittings. This can be detected by a drop in the intermediate pressure area in between the two regulator stages even before the distribution pipework pressure drops below the design pressure range.

11.4 Problems during gas cylinder change
If the cylinder connections cannot be untightened manually:
Never try to untighten the union nut from the gas source by using any tools!
If the gas supply systems high pressure part was not vented properly, the union nut cannot be untightened. Thorougly vent the high pressure area first!
If the union nut still cannot be disassembled, contact the authorised service partner immediately. The spanner flats on some union nut must not be used for tightening or loosening the union nut!

11.5 Help
In case of breakdown of the gas supply system immediately contact the authorised service partner. All maintenance and repair work must be recorded in writing.
Manufacturer:

Spectron Gas Control Systems GmbH
Fritz-Klatte-Str. 8
D-65933 Frankfurt

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Telefax: +49.69.38016 - 200
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