CALMS d.o.o.

Getting started with CAL-CFC kit

Product:	CALMS flow controller (CFC)
Version:	4.0.0
Release date:	May 2025

1. Introduction

This document provides a practical introduction to working with the **CAL-CFC**, designed to support technicians during installation, setup, and initial configuration. It includes essential information, wiring guidelines, and configuration tips to ensure a smooth and reliable integration of the CAL-CFC into your system.

The CAL-CFC is a smart, efficient, and compact solution for regulating compressed air systems. To achieve correct functionality, it must be properly connected. This guide is focused on helping field technicians understand the basics, avoid common mistakes, and get the device up and running as quickly and efficiently as possible.

Whether you're setting up the CAL-CFC for the first time or assisting with on-site troubleshooting, this guide will serve as a quick reference to ensure proper handling and configuration.

All CFC kit are designed and calculated based on application reference condition! **Model selection is based on pressure, flow and temperature specification!**

2. CAL-CFC kit

The **CALMS Flow Controller** is a flow regulation valve designed for use with the CAL-PM-X control box, enabling precise regulation and online optimization of compressed air systems.

Each CFC kit includes:

✓	**Electrically actuated valve DN 50-150 assembly**	Specially designed butterfly disc valve, integrated electric positioner, flow direction indicator
✓	**2x Pressure transducers**	4...mA analog signal, measuring inlet and outlet pressure
✓	**Junction box**	Connects the components to the CAL-PM device via EtherCAT
✓	**Control software**	

Connection to a **CALMS CAL-PM** device is mandatory for proper operation of the CFC!

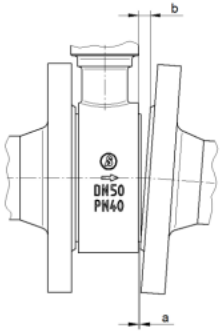
3. Mechanical installation

Remove all packaging materials from the valve.

Before installation, check the pipework for contamination and impurities and clean if necessary.

The control valve must be installed in the pipeline in accordance with the flow direction. The flow direction is indicated by an arrow on the body. The sliding gate valve shuts off the medium only in the direction of flow (arrow direction). If operating conditions exist in which the inlet pressure falls below the outlet pressure, we recommend the use of check valves in the outlet pipe.

Gaskets according to to EN 1514-1 or ANSI B16.21 in the respective nominal pressure level must be used as flange gaskets. Serrated metal gaskets, spiral wound gaskets or other gaskets with metal rings are not suitable. We recommend flange gaskets made of pure graphite with a stainless steel inlay. Before installing the valve between the flanges, it must be checked whether the flanges are aligned with and parallel to the connection flanges. Flanges that are not aligned / not parallel can generate inadmissible stresses in the pipeline and thus damage the valve and cause leaks. The following deviations for the parallelism of the flanges must not be exceeded:



DN	a-b [mm]
15 – 25	0.4
32 – 150	0.6
200 – 250	0.8

Austenitic nuts and bolts must be used for valves with stainless steel bodies. Tempered steel nuts and bolts must be used for valves with bodies made of carbon steel. The use of expansion bolts, e.g. conforming to DIN 2510, is recommended in the case of wide variations in temperature and temperatures exceeding 300 °C. Stud bolts should not be reused after the connection has been loosened as this can lead to overstretching of the bolts.

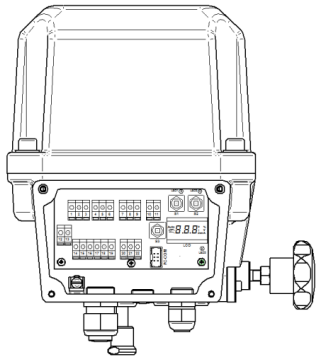
The threads of the bolts must be greased. The bolts must be tightened crosswise. Apply 30% of the nominal tightening torque with the first tightening sequence, 60% with the second and 100% with the third. The procedure should then be repeated with 100% of the nominal tightening torque until the nuts cannot be turned any further when applying the nominal tightening torque. With regard to the flange mounting, the guidelines of the VCI (Verband der Chemischen Industrie e.V.) for the respective application must be referred to.

The function of the fully installed valve must be checked before commissioning the system. The proper function of the completely mounted valve has to be checked prior to putting the installation into service.

4. Electrical installation

The electrical connection is made at the terminal box integral with the actuator.

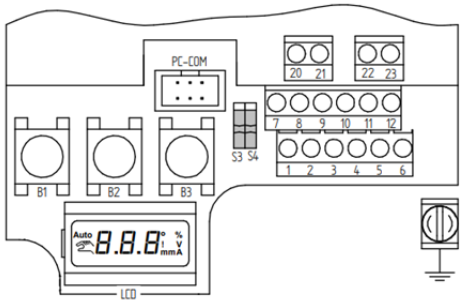
The minimum core cross section for all supply and signal conductors is 0.5 mm² (AWG 21). The terminals are designed for a maximum core cross section of 2.5 mm² (AWG 14). For long supply lines (>5m), a larger core cross section must be used so that the voltage drop does not fall below the specified range of 24V ± 10%. Wire-end sleeves are to be used to ensure a safe contact.



The electrical installation must only be carried out by qualified personnel. Please note the applicable national safety regulations for installation, start-up and operation of the device. All work has to be carried out isolated from the power supply. Disregarding the relevant regulations may cause serious physical injuries and/or property damage.

1.1. Terminal layout

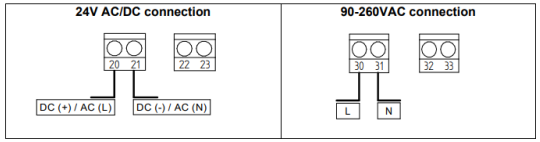
The layout of the terminals is provided on a circuit diagram on the reverse side of the cover for the terminal box. The connection terminals and ground terminal are marked accordingly.



Terminal	Abbreviation	Function
1	I in / U in	Set point input 0(2)-10 V / 0(4)-20 mA
2	0	Set point input (-) (signal ground)
3	I out / U out	Position feedback 0(2)-10 V / 0(4)-20 mA
4	0	Position feedback (-) (signal ground)
5	Bin in	Binary input (+)
6	Bin 0	Binary input (-)
7	S1	Limit switch 1 (lower limit switch)
8	S1 0	Limit switch 1 COM
9	S2	Limit switch 2 (upper limit switch)
10	S2 0	Limit switch 2 COM
11	Alarm	Alarm output
12	Alarm 0	Alarm output COM
20	L +	Voltage supply L for AC, (+) for DC (24V)
21	N -	Voltage supply N for AC, (-) for DC (24V)
22	L +	Heating resistor L for AC, (+) for DC (24V)
23	N -	Heating resistor N for AC, (-) for DC (24V)
30	L	Voltage supply L (90-260V)
31	N	Voltage supply N (90-260V)
32	L	Heating resistor L (110-260V)
33	N	Heating resistor N (110-260V)

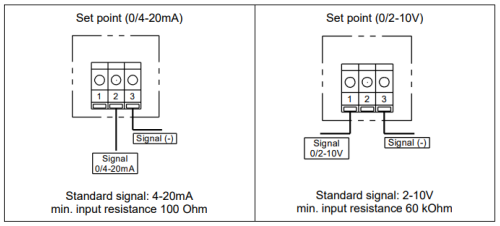
1.2. Supply voltage

The voltage values for the supply voltage can be read off the nameplate of the actuator.



1.3. Control signal (setpoint)

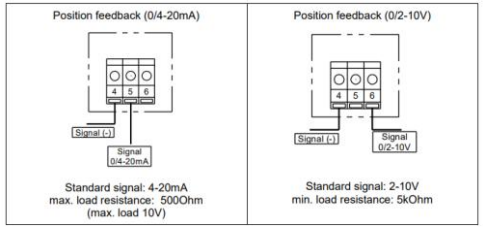
The actuator can be operated by a setpoint represented both by a current signal (0/4...20mA) as well as by a voltage signal (0/2-10V).



The signal range can be changed!

1.4. Position feedback (actual value)

The actuator can feed back its actual position both by a current signal (0/4-20mA) as well as by a voltage signal (0/2-10V).



The signal range can be changed!

Terminal numbers may vary depending on the type of selected valve. For accurate electrical connections, please refer to the wiring diagram included in valve's technical documentation!

1.5. Electrical connections CFC - CAL-PM device

Terminal blocks and individual terminal markings may vary depending on the selected CFC type, which is why wiring diagrams **are customised**!

A tailored wiring diagram is included in the package with the oredered CFC.

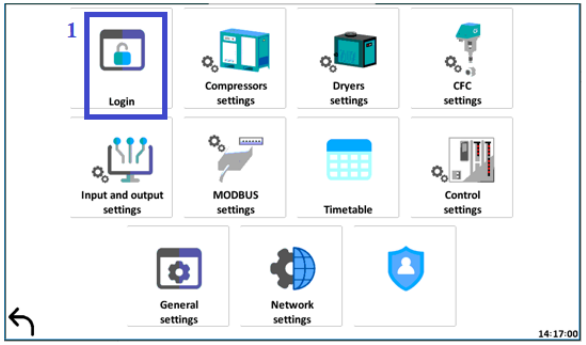
5. HMI configuration

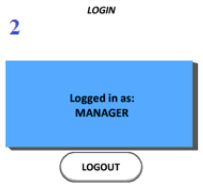
This section describes the configuration of the CFC via operator panel / HMI located on the CAL-PM device. The interface allows switching between Manual and Auto modes and adjusting key control parameters.

LOGIN CREDENTIALS

On the home screen of the HMI, press the SETUP button to open configuration menu. Access to configuration settings requires MANAGER access.

USERNAME	MANAGER
PASSWORD	321





5.1. List of terms

CFC inlet pressure	The pressure sensed on inlet side od CFC. Measured by pressure transducer PT.01
CFC outlet pressure	The pressure sensed on the outlet side of CFC. Measured by pressure transducer PT.02. Outlet pressure is usually system pressure.
CFC position feedback	A signal that indicates the current position od the valve.
CFC control signal	A signal that regulates the CFC valve position.
Pressure setpoint	Target value for CFC outlet pressure
Close position	The valve opening percentage at which it is considered closed.
Close pressure	If the inlet pressure stays below threshold for 10 seconds, the CFC closes automatically. CFC will reopen once the inlet pressure remains above the setpoint for at least 3 seconds.
Fade speed	Defines how quickly the CFC adjusts during the »stabilization« function.
Noise reduction	

5.2. Input and output configuration

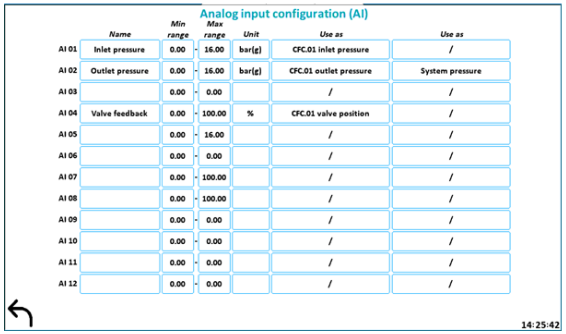
After logging in, begin with the configuration of **analog inputs and outputs**.

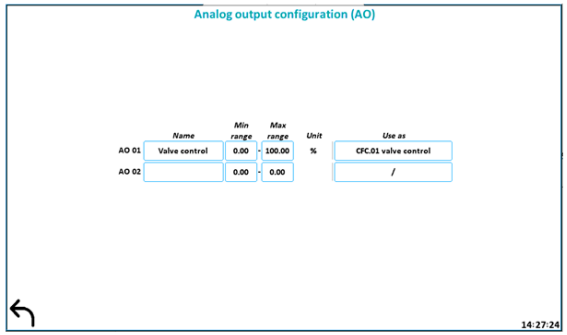
On the home screen of the HMI, press the SETUP button to open input and output settings.

This includes:

- **Labeling/Naming:** Assign a descriptive name to each parameter.
- **Range Settings:** Define the appropriate signal range (minimum and maximum values).
- **Unit Selection:** Set the measurement unit (e.g., bar, °C, A).

All parameters must be configured correctly to ensure proper system functionality.





5.3. CFC settings

On the home screen of the HMI, press the SETUP button to open CFC settings.

The CFC valve operates in two modes.

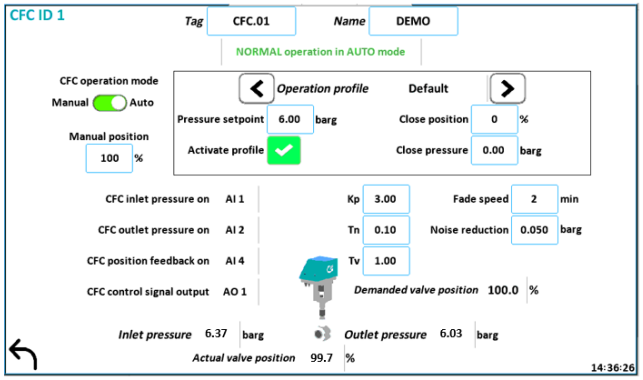
Manual mode	The valve remains fixed at a user-defined opening percentage (0-100 %) and does not respond to pressure changes or the setpoint. This mode is intended primarily for testing and system initialization.
Automatic mode	The valve continuously adjusts its position to maintain the desired outlet pressure. It compares the outlet pressure with the setpoint: - If the outlet pressure is higher than setpoint, the valve begins to close. - If the outlet pressure is lower than setpoint, the valve begings to close.

Accurate regulation in AUTO mode depends on proper tuning of the PID parameters!

Operation profiles

Default profile	The standard operational mode where the valve adjusts automatically to maintain the setpoint.
Closed profile	The valve remains closed in the closed position, with no pressure adjustments.
Night shift profile	Designed for low activity periods, reducing valve response to conserve energy.

Custom profiles	Allow users to create tailored profile for specific requirements.



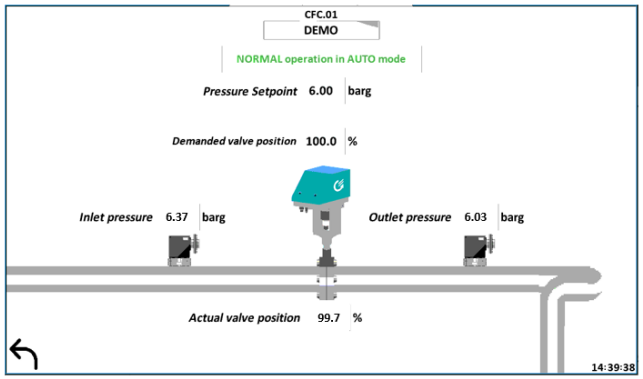
6. CFC status

On the home screen of the HMI, press the STATUS button to open CFC status.

The status page provides a real-time overview of the system's performance:

Operation mode	Indicates the current operational mode.
Inlet pressure	Displays the current pressure at valve's inlet.
Outlet pressure	Shows the current pressure at valve's outlet.
Demanded valve position	Shows the desired valve position based on control settings.
Actual valve position	Displays the current actual position of the valve.

This page allows easy monitoring and ensures that all key parameters are visible at a glance.



7. Service

To ensure safe and efficient servicing of the CALMS Flow Controller (CFC), follow these guidelines:

- **Mounting location:**

Install the CFC valve in a location that is easily accessible for maintenance and service. Avoid placing the valve in tight or obstructed areas, as regular access may be required for inspection, cleaning, or part replacement.

- **Visual inspection:**

Periodically inspect the valve for visible signs of wear, dirt buildup, or damage. Check electrical connections, wiring, and mounting for any looseness or corrosion.

- **Valve operation check:**

Monitor the valve’s response in both Manual and Automatic modes to ensure it operates smoothly and within the expected range.

- **Software updates:**

Keep the CFC controller software up to date to ensure optimal performance and compatibility with CALMS monitoring systems. Updates may include bug fixes, performance improvements, or new features. Software updates are provided by CALMS technical support.

8. Troubleshooting

You may encounter some issues during the commissioning or operation of the CALMS Flow Controller (CFC). Below are common problems and suggested solutions. For any issues not listed here, please contact your CFC supplier.

8.1. Commissioning troubles

8.1.1. CFC inlet/outlet pressure shows 0 bar(g), although pressure is present

- Check the wiring of the PT.01 and PT.02 sensors inside the CAL-PM device.
- Verify and adjust the analog input minimum and maximum range settings for the inle and outlet pressure transducers.
- Test for a faulty analog input by connecting to another input channel.

8.1.2. Actual valve position does not change, even though the valve is moving

- Check wiring of the CFC feedback signal inside the CAL-PM device.
- Measure the 4–20 mA feedback loop using a milliamp meter.
- If needed, test another analog input to rule out a fault.

8.2. Operation troubles

8.2.1. CFC not responding to manual position request

Check if the **“Demanded valve position”** matches the manual request:

- **YES**

Measure the analog output signal (4–20 mA) from the main box to the CFC. If the mA signal **changes** when adjusting the manual position, the issue is likely wiring or a faulty valve.

- **NO**

If the mA signal **does not change**, the analog output is likely faulty. Contact your supplier.

8.2.1.1. CFC not responding although outlet pressure is above / below setpoint

- Confirm the controller is in **AUTO mode**.
- Check the **deadband** setting — if too wide, regulation will pause.
- Review the **PID parameters** and restore to default values if needed.
- Measure the analog output signal (4–20 mA) from the CAL-PM device to the CFC:

- If the mA signal **changes correctly** with outlet pressure and setpoint, suspect wiring or valve fault.
- If the mA signal **does not change**, the analog output is likely faulty. Contact your supplier.

9. Contact and support

If you experience any issues that cannot be resolved using this manual, please contact your CFC supplier or system integrator.

For technical assistance, software updates, or spare parts, provide the following information when reaching out:

- Product name
- Serial number (located on the device label)
- Description of the issue

- Error messages (if any)
- Steps already taken to resolve the issue

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