# CEM-125

## Contact Expansion Module

*Instruction Manual*


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⚠ **WARNING:** California's Proposition 65 requires special warnings for products that may contain chemicals known to the state of California to cause cancer, birth defects or other reproductive harm. Please note that by posting this Proposition 65 warning, we are notifying you that one or more of the Proposition 65 listed chemicals may be present in products we sell to you. For more information about the specific chemicals found in this product, please visit https://www.basler.com/Prop65.

# Preface

This instruction manual provides information about the installation and operation of the CEM-125. To accomplish this, the following information is provided:

- Communication requirements
- Operations
- Mounting and connections
- Maintenance
- Product specifications

## *Conventions Used in this Manual*

Important safety and procedural information is emphasized and presented in this manual through warning, caution, and note boxes. Each type is illustrated and defined as follows.

| **Warning!** |
| --- |
| Warning boxes call attention to conditions or actions that may cause personal injury or death. |

| **Caution** |
| --- |
| Caution boxes call attention to operating conditions that may lead to equipment or property damage. |

| **Note** |
| --- |
| Note boxes emphasize important information pertaining to installation or operation. |

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**Warning!**

READ THIS MANUAL. Read this manual before installing, operating, or maintaining this equipment. Note all warnings, cautions, and notes in this manual as well as on the product. Keep this manual with the product for reference. Only qualified personnel should install, operate, or service this system. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

**Caution**

Installing previous versions of firmware may result in compatibility issues causing the inability to operate properly and may not have the enhancements and resolutions to issues that more recent versions provide. Basler Electric highly recommends using the latest version of firmware at all times. Using previous versions of firmware is at the user's risk and may void the warranty of the unit.

Basler Electric does not assume any responsibility to compliance or noncompliance with national code, local code, or any other applicable code. This manual serves as reference material that must be well understood prior to installation, operation, or maintenance.

For terms of service relating to this product and software, see the *Commercial Terms of Products and Services* document available at www.basler.com/terms.

This publication contains confidential information of Basler Electric Company, an Illinois corporation. It is loaned for confidential use, subject to return on request, and with the mutual understanding that it will not be used in any manner detrimental to the interests of Basler Electric Company and used strictly for the purpose intended.

It is not the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice. Over time, improvements and revisions may be made to this publication. Before performing any of the following procedures, contact Basler Electric for the latest revision of this manual.

The English-language version of this manual serves as the only approved manual version.

# Revision History

A historical summary of the changes made to this instruction manual is provided below. Revisions are listed in reverse chronological order.

Visit http://www.basler.com to download the latest hardware, firmware, and BESTCOMS*Plus*® revision histories.

**Instruction Manual Revision History**

| Manual Revision and Date | Change |
|---|---|
| A, Jun 2025 | • Added FCC compliance |
| –, Dec 2024 | • Initial Release |

# Contents

# 1 • Introduction

The CEM-125 Contact Expansion Module is a remote auxiliary device that provides additional contact inputs and outputs for excitation systems using DECS Digital Excitation Control Systems (including the DECS-250, DECS-250E, DECS-250N, and DECS-450).

## *Features*

The CEM-125 has the following features:

- 10 externally-wetted contact inputs
- 24 contact outputs
- Functionality of inputs and outputs assigned by BESTlogic™*Plus* programmable logic
- Communications via CAN Bus

# 2 • Communication

Control Area Network (CAN) is the standard interface that facilitates communication between the CEM-125 and the DECS. For communication to occur, the CEM-125 must be enabled with the correct J1939 address; typically, the default address is correct.

Connect the CEM-125 to an existing DECS setup using the following steps:

1. Open BESTCOMS*Plus*®.
2. Connect to the controller (Navigate to Communication → New Connection, and select the controller and connection method).
3. In the Settings Explorer, navigate to Communications → CAN Bus → Remote Module Setup (Figure 2-1).
4. Toggle the Contact Expansion Module option to Enabled.
5. Change the J1939 Address if there is a conflict with another device on network.
6. If the option is available, choose 24 Outputs in the CEM Outputs dropdown.

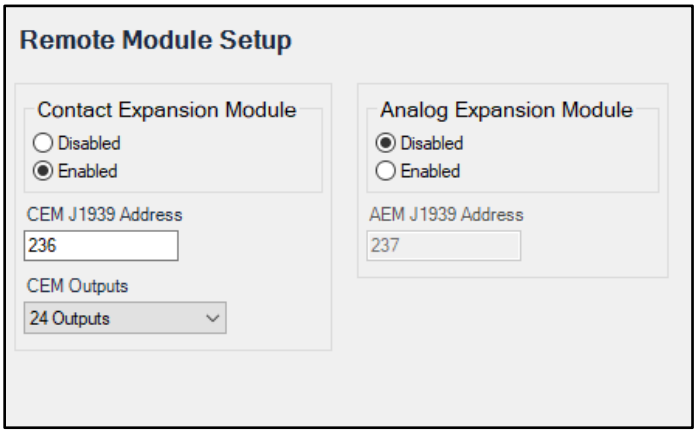


**Figure 2-1. Remote Module Setup**

# 3 • Operations

## *Functional Description*

### Contact Inputs

The CEM-125 provides 10 programmable contact inputs with the same functionality as contact inputs on a DECS. Because the CEM-125 is designed to work with DECS products which have 14 inputs, its inputs are numbered starting at 15.

The label text of each contact input is customizable and accepts an alphanumeric character string with a maximum of 64 characters.

The remote contact inputs are incorporated into a BESTlogic™*Plus* programmable logic scheme by selecting them from the *Programmable Inputs* group in BESTlogic*Plus*.

BESTCOMS*Plus*® settings for remote contact inputs are illustrated in Figure 3-1.

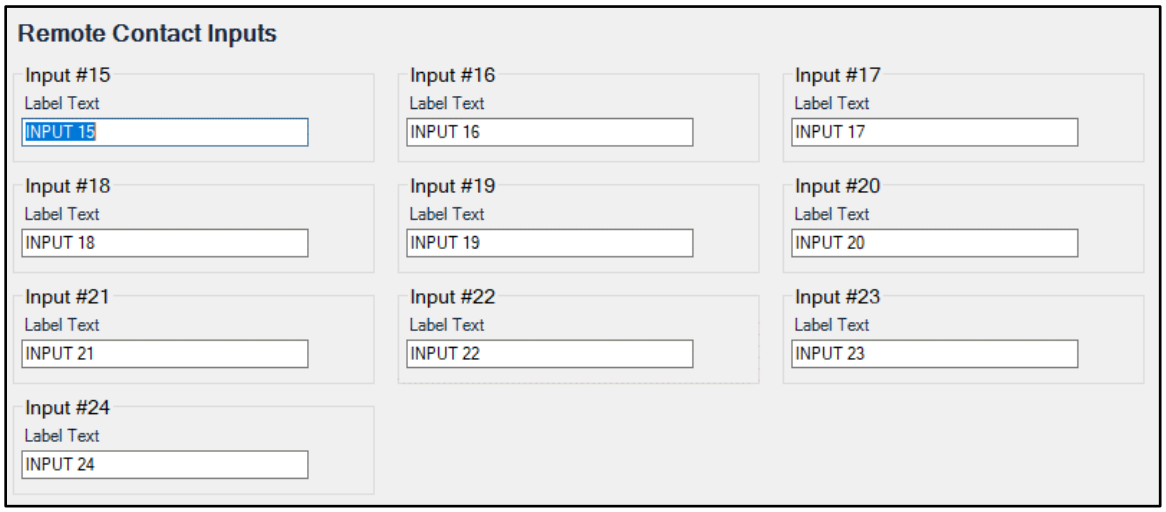


**Figure 3-1. Remote Contact Inputs Settings**

### Contact Outputs

The CEM-125 provides 24 programmable contact outputs with the same functionality as contact outputs on a DECS. Because the CEM-125 is designed to work with DECS products which have 11 outputs, its outputs are numbered starting at 12.

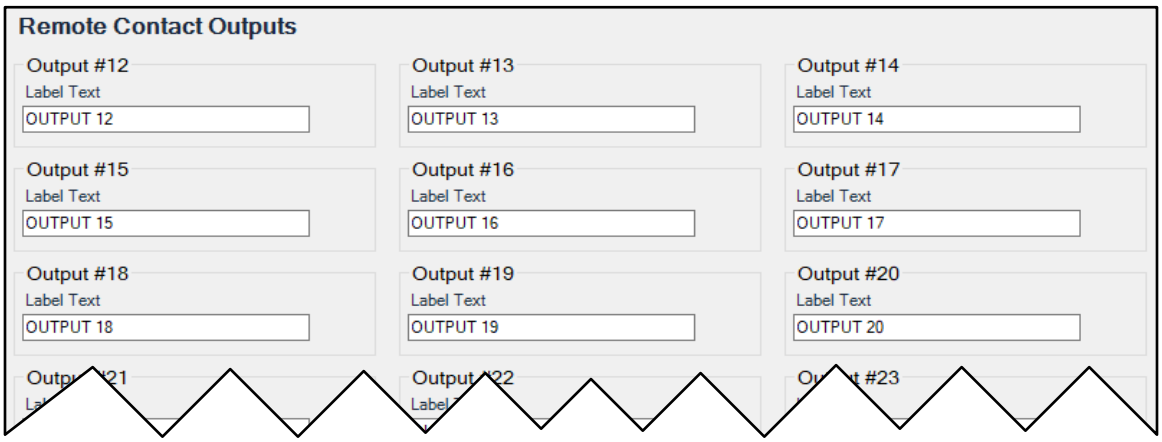


**Figure 3-2. Remote Contact Outputs Settings**

The label text of each contact output is customizable and accepts an alphanumeric character string with a maximum of 64 characters.

The remote analog outputs are incorporated into a BESTlogic*Plus* programmable logic scheme by selecting them from the *Programmable Outputs* group in BESTlogic*Plus*.

BESTCOMS*Plus* settings for remote contact outputs are illustrated in Figure 3-2.

### Status LED

The LED illuminates solid during power up. When the power-up sequence is complete, the LED flashes to indicate that the CEM-125 is powered and functioning properly. If the LED does not flash after power up, contact Basler Electric.

## *Metering*

### Contact Inputs

The value and status of the remote contact inputs are shown on this screen. The status is TRUE when the corresponding LED is green. Refer to Figure 3-3.

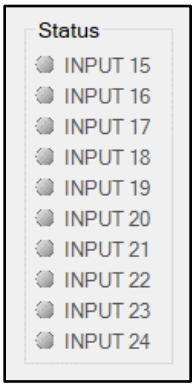


**Figure 3-3. Remote Contact Inputs Metering**

### Contact Outputs

The value and status of the remote contact outputs are shown on this screen. The status is TRUE when the corresponding LED is green. Refer to Figure 3-4.

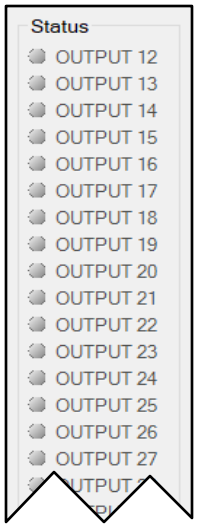


**Figure 3-4. Remote Contact Outputs Metering**

# 4 • Mounting

The CEM-125 is delivered in a sturdy carton to prevent shipping damage. Upon receipt of a module, check the part number against the requisition and packing list for agreement. Inspect for damage, and if there is evidence of such, immediately file a claim with the carrier and notify the Basler Electric regional sales office, your sales representative, or a sales representative at Basler Electric, Highland, Illinois USA.

If the device is not installed immediately, store it in the original shipping package in a moisture- and dust-free environment.

## Installation

The CEM-125 is intended to be mounted vertically as shown in Figure 4-1, but it may be mounted horizontally if required by space constraints. The recommended mounting fastener for the CEM-125 is a 10-32 screw.

See Figure 4-1 for CEM-125 overall dimensions. All dimensions are shown in inches with millimeters in parenthesis.

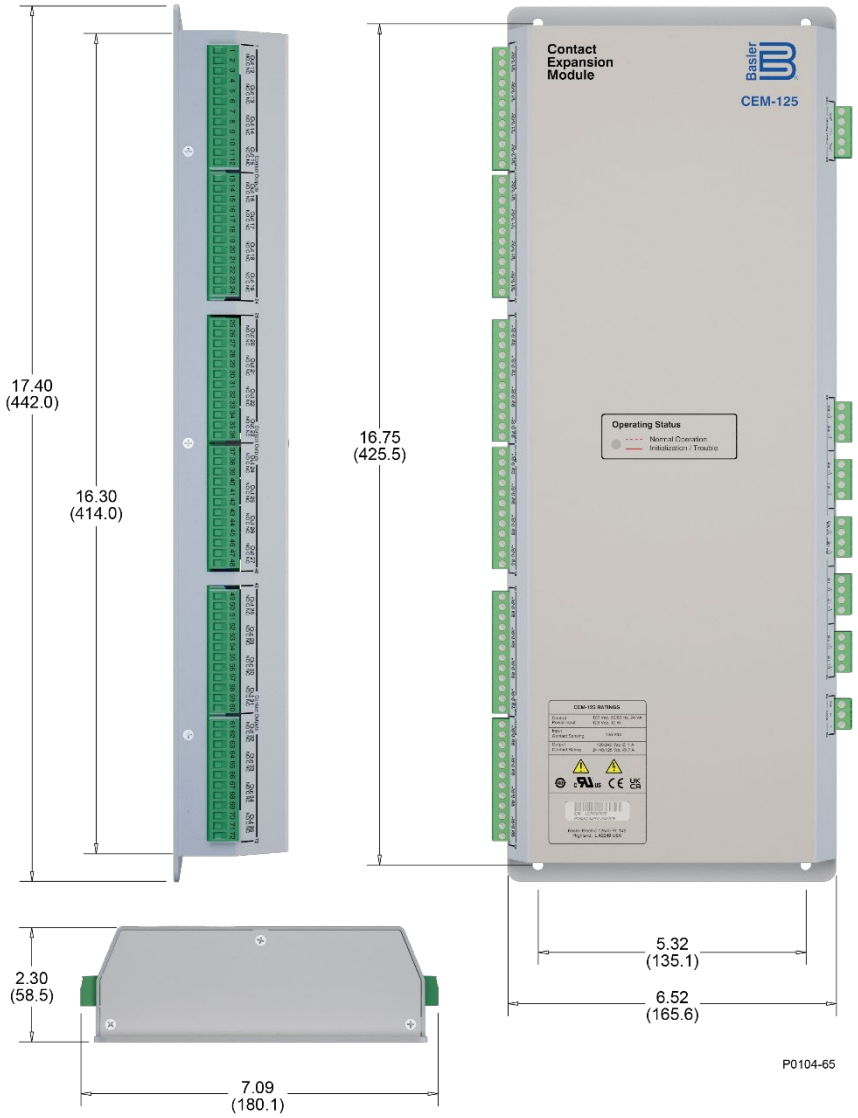


Figure 4-1. CEM-125 Overall Dimensions

# 5 • Connections

CEM-125 connections are dependent on the application. Incorrect wiring may result in damage to the module.

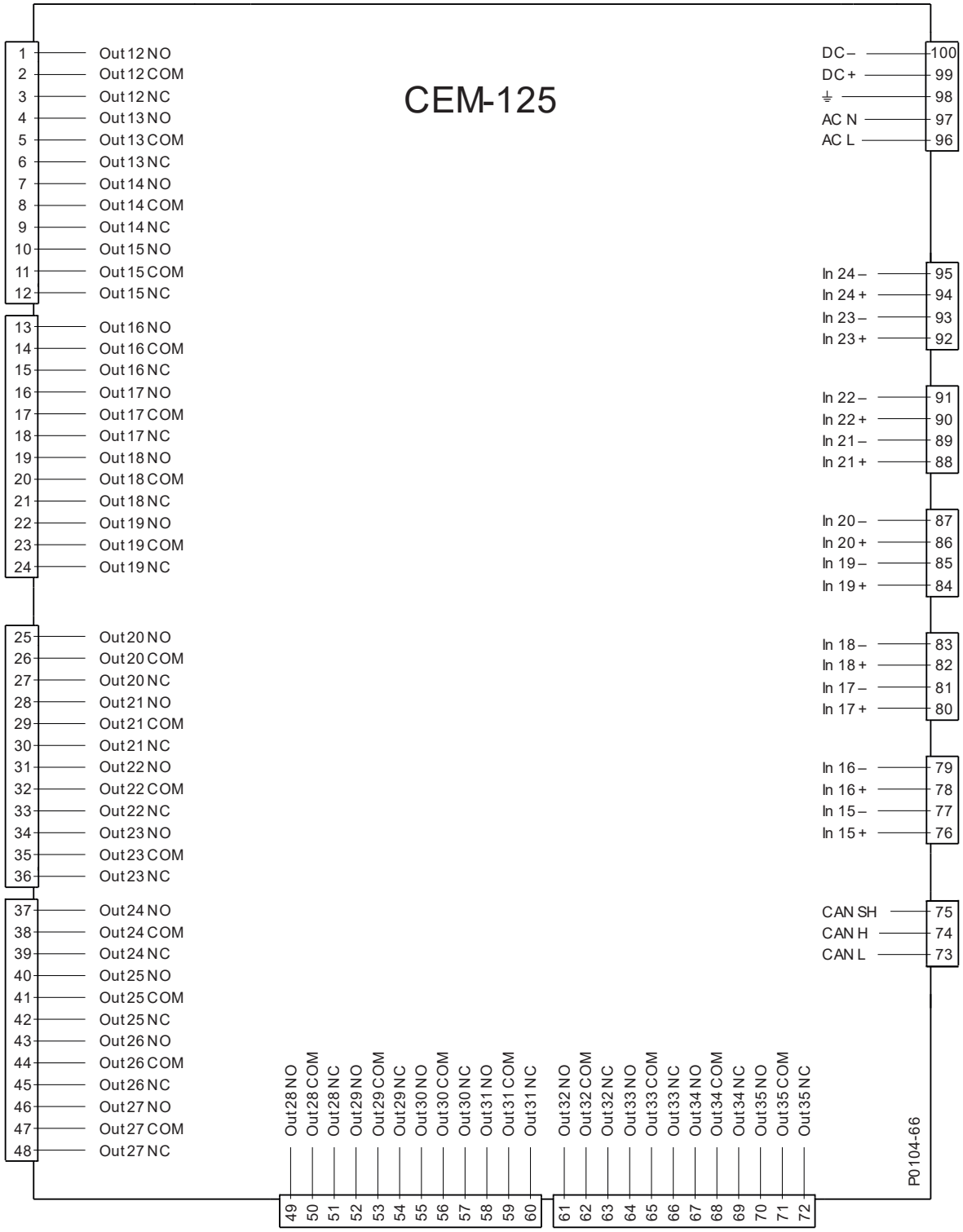


**Figure 5-1. CEM-125 Contact Terminals**

**Notes**

Control power from the battery must be of the correct polarity. Although reverse polarity will not cause damage, the CEM-125 will not operate.

Be sure that the CEM-125 is hard-wired to earth ground with no smaller than 12 AWG copper wire attached to the chassis ground terminal on the module.

## *Terminations*

The terminal interface consists of plug-in connectors with screw-down compression terminals.

CEM-125 connections are made with one 3-position connector, five 4-position connectors, one 5-position connector, and six 12-position connectors with terminals that plug into headers on the CEM-125. The connectors and headers have dovetailed edges that ensure proper connector orientation.

Connectors and headers may contain tin- or gold-plated conductors. Only the 3-position connector has a gold-plated conductor; the rest are tin. Mate connectors to headers of the same metal only.

**Caution**

By mating connectors of dissimilar metals, galvanic corrosion could occur which deteriorates connections and leads to signal loss.

Connector screw terminals accept a maximum wire size of 12 AWG. Maximum screw torque is 5.31 in-lb (0.60 N•m).

## *Control Power*

Operating power must be of the correct polarity. Although reverse polarity will not cause damage, the CEM-125 will not operate. Refer to the *Specifications* chapter for CEM-125 operating power input requirements. Operating power terminals are listed in Table 5-1.

When both control power inputs are used, an isolation transformer is required for the ac input.

**Table 5-1. Operating Power Terminals**

| Terminal | Description |
|---|---|
| DC – | Negative side of Vdc operating power input |
| DC + | Positive side of Vdc operating power input |
| ⏚ | Chassis ground connection |
| ACN | Neutral side of ac operating power input |
| ACL | Live side of ac operating power input |

## Contact Inputs and Contact Outputs

The CEM-125 (Figure 5-1) has 10 contact inputs and 24 contact outputs. The contact inputs are externally-wetted and must be connected to a power source (Figure 5-2).

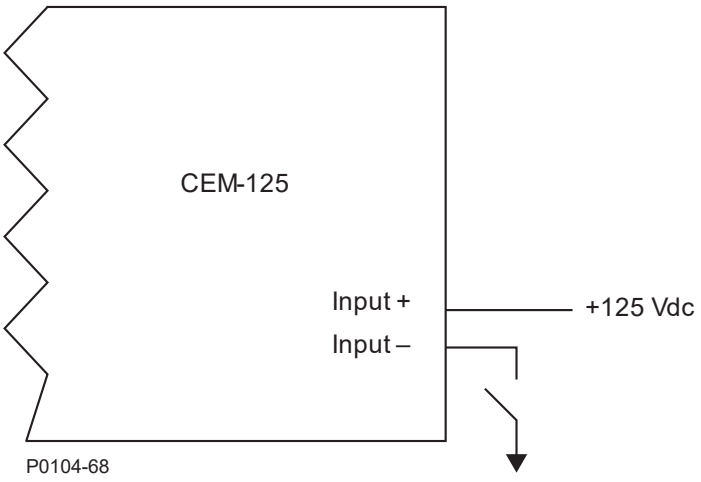


**Figure 5-2. CEM-125 Terminals**

Because the CEM-125 is designed to work with DECS products which have 14 inputs and 11 outputs, its inputs and outputs are numbered starting at 15 and 12 respectively.

## CAN Bus Interface

These terminals provide communication using the SAE J1939 protocol and provide high-speed communication between the CEM-125 and the DECS. Connections between the CEM-125 and DECS should be made with twisted-pair, shielded cable. CAN Bus interface terminals are listed in Table 5-2. Refer to Figure 5-3.

**Table 5-2. CAN Bus Interface Terminals**

| Terminal | Description |
|---|---|
| SH (CAN SH) | CAN drain connection |
| HI (CAN H) | CAN high connection (yellow wire) |
| LO (CAN L) | CAN low connection (green wire) |

**Note**

1. If the CEM-125 is providing one end of the J1939 bus, a 120 Ω, ½ watt terminating resistor should be installed across terminals LO (CANL) and HI (CANH).
2. If the CEM-125 is not part of the J1939 bus, the stub connecting the CEM-125 to the bus should not exceed 914 mm (3 ft) in length.
3. The maximum bus length, not including stubs, is 40 m (131 ft).
4. The J1939 drain (shield) should be grounded at one point only. If grounded elsewhere, do not connect the drain to the CEM-125.

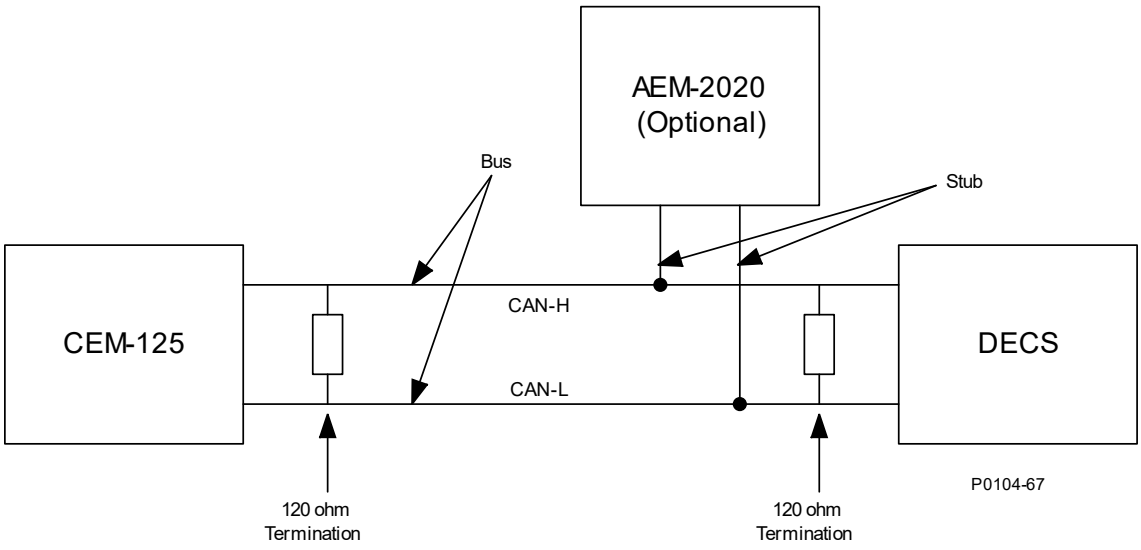


**Figure 5-3. CAN Bus Interface with CEM-125 providing One End of the Bus**

# 6 • Maintenance

Preventive maintenance consists of periodically checking that the connections between the CEM-125 and the system are clean and tight. The CEM-125 is manufactured using surface-mount technology. As such, Basler Electric recommends that no repair procedures be attempted by anyone other than Basler Electric personnel.

## Storage

This device contains long-life aluminum electrolytic capacitors. For devices that are not in service (spares in storage), the life of these capacitors can be maximized by energizing the device for 30 minutes once per year.

## Firmware Updates

The CEM-125 is used in conjunction with a DECS. When upgrading the firmware in any component of this system, the firmware in ALL of the components of the system should be upgraded to ensure compatibility of communications between the components

**Warning!**

Before performing any maintenance procedures, remove the CEM-125 and DECS from service. Refer to the appropriate schematics to ensure that all steps have been taken to properly and completely de-energize the CEM-125 and DECS.

**Caution – Save Settings!**

Saving settings prior to updating firmware is recommended. BESTCOMS*Plus*® can be used to download settings and save the settings in a file so that they can easily be restored if needed. Refer to *Settings File Management* for help with saving a settings file.

**Note**

The latest version of BESTCOMS*Plus* software should be downloaded from the Basler Electric website and installed before performing a firmware upgrade.

**Caution**

The order in which the components are upgraded is critical. Assuming a system of a CEM-125 and DECS is in a state where the CEM-125 is communicating with the DECS, **the CEM-125 must be upgraded before the DECS.** This is necessary because the DECS must be able to communicate with the CEM-125 before the DECS can send firmware to it. If the DECS were upgraded first, and the new firmware included a change to the CEM-125 communication protocol, it is possible that the CEM-125 could no longer communicate with the upgraded DECS. Without communications between the DECS and the CEM-125, upgrading the CEM-125 is not possible.

The following procedure is used to upgrade firmware in the expansion modules.

1. Remove the DECS and CEM-125 from service. Refer to the appropriate site schematics to ensure that all steps have been taken to properly and completely de-energize the DECS.
2. Apply only control power to the DECS and CEM-125.
3. Connect to the DECS through the USB or Ethernet port if not already connected.
4. Enable the CEM-125. If it has not already been enabled, enable the Contact Expansion Module in the BESTCOMS*Plus* Settings Explorer > Communications > CAN Bus > Remote Module Setup screen.
5. Verify that the DECS and the CEM-125 are communicating. This can be verified by examining the alarm status using the Metering Explorer in BESTCOMS*Plus* or from the front panel by navigating to Metering > Status > Alarms. When communications are functioning properly, there should be no active CEM Communications Failure alarms.
6. Select Upload Device Files from the Communication pull-down menu.
7. You will be asked to save the current settings file. Select Yes or No.

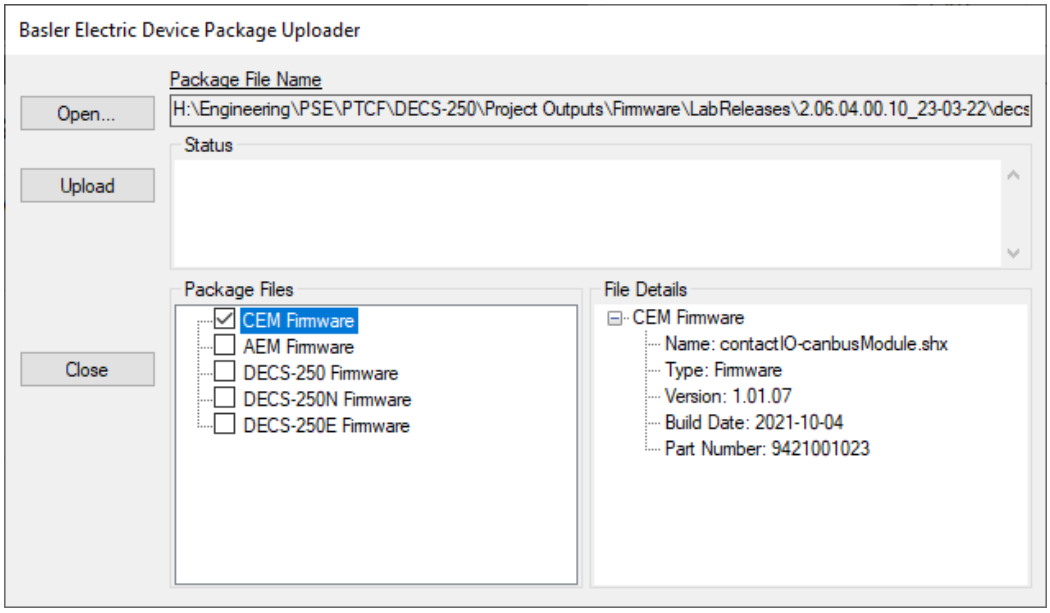


**Figure 6-1. Basler Electric Device Package Uploader**

8. When the Basler Electric Device Package Uploader screen (Figure 6-1) appears, click on the Open button to browse for the device package you have received from Basler Electric. The Package Files along with File Details are listed. Place a check in the boxes next to the individual files you want to upload.

9. Click on the Upload button and the Proceed with Device Upload screen will appear. Select Yes.
10. After selecting Yes, the DECS Selection screen will appear. Select the desired communication method.
11. After file(s) have been uploaded, click the *Close* button on the Basler Electric Device Package Uploader screen and disconnect communication to the DECS.

## *Settings File Management*

The CEM-125 has no settings files; all CEM-125 settings are managed by the host DECS and its settings file.

It is important to note that settings and logic can be uploaded to the DECS separately or together, but are always downloaded together.

### Opening a Settings File

To open a DECS settings file with BESTCOMS*Plus*, pull down the *File* menu and choose *Open*. The *Open* dialog box appears. This dialog box allows you to use normal Windows techniques to select the file that you want to open. Select the file and choose *Open*. You can also open a file by clicking on the *Open File* button on the lower menu bar. If connected to a device, you will be asked to upload the settings and logic from the file to the current device. If you choose *Yes*, the settings displayed in BESTCOMS*Plus* instance will be overwritten with the settings of the opened file.

### Saving a Settings File

Select *Save* or *Save As* from the *File* pull-down menu. A dialog box pops up allowing you to enter a filename and location to save the file. Select the *Save* button to complete the save.

### Upload Settings and/or Logic to Device

To upload a settings file to a DECS, open the file or create a new file through BESTCOMS*Plus*. Then pull down the *Communication* menu and select *Upload Settings and Logic to Device.* If you want to upload operational settings without logic, select *Upload Settings to Device.* If you want to upload logic without operational settings, select *Upload Logic to Device*. You are prompted to enter the username and password. The default username is "**A**" and the default password is "**A**". If the username and password are correct, the upload begins and the progress bar is shown.

### Download Settings and Logic from Device

To download settings and logic from a DECS, pull down the *Communication* menu and select *Download Settings and Logic from Device*. If the settings in BESTCOMS*Plus*® have changed, a dialog box will open asking if you want to save the current settings changes. You can choose *Yes* or *No*. After you have taken the required action to save or discard the current settings, downloading begins. BESTCOMS*Plus* reads all settings and logic from the DECS and loads them into BESTCOMS*Plus* memory.

# 7 • Specifications

## Control Power

AC Input
- Nominal Input.....120 Vac
- Input Range .....82 to 132 Vac, 50/60 Hz, single-phase
- Burden .....24 VA

DC Input
- Nominal Input.....125 Vac
- Input Range .....90 to 150 Vdc
- Burden .....12 W

## Contact Inputs

The CEM-125 contains 10 externally-wetted contact inputs with a nominal input voltage of 125 Vdc.

## Contact Outputs

The CEM-125 contains 24 Form C contact outputs.

Make and Break Ratings (Resistive)
- 24 Vdc.....7.0 Adc
- 48 Vdc.....0.7 Adc
- 125 Vdc.....0.2 Adc
- 120/240 Vac.....7.0 Aac

Carry Ratings (Resistive)
- 24/48/125 Vdc.....7.0 Adc
- 120/240 Vac.....7.0 Aac

## Communication Interface

The CEM-125 communicates with the DECS through CAN1.

### CAN Bus

Differential Bus Voltage.....1.5 to 3 Vdc
Maximum Voltage .....–32 to +32 Vdc with respect to negative battery terminal
Communication Rate.....125 or 250 kbps

## Type Tests

### Shock

Withstands 15 G in 3 perpendicular planes.

### Vibration

Swept over the following ranges for 12 sweeps in each of three mutually perpendicular planes with each 15-minute sweep consisting of the following:

5 to 29 to 5 Hz.....1.5 G peak for 5 min.
29 to 52 to 29 Hz.....0.036” Double Amplitude for 2.5 min.
52 to 500 to 52 Hz.....5 G peak for 7.5 min.

### HALT (Highly Accelerated Life Testing)

HALT is used by Basler Electric to prove that our products will provide the user with many years of reliable service. HALT subjects the device to extremes in temperature, shock, and vibration to simulate years of operation, but in a much shorter period span. HALT allows Basler Electric to evaluate all possible design elements that will add to the life of this device. As an example of some of the extreme testing conditions, the CEM-125 was subjected to temperature tests (tested over a temperature range of –80°C to +130°C), vibration tests (of 5 to 50 G at +25°C), and temperature/vibration tests (tested at 10 to 20 G over a temperature range of –60°C to +100°C). Combined temperature and vibration testing at these extremes proves that the CEM-125 is expected to provide long-term operation in a rugged environment. Note that the vibration and temperature extremes listed in this paragraph are specific to HALT and do not reflect recommended operation levels.

## *Environment*

Temperature
- Operating .....–40 to +70°C (–40 to +158°F)
- Storage .....–40 to +85°C (–40 to +185°F)

Altitude .....Up to 3,300 ft (1000 m) above sea level
Humidity .....IEC 60068-2-78
Salt Fog .....IEC 60068-2-52

## *Agency Standards and Regulatory Directives*

### CE Compliance

This product complies with the requirements of the following EC Directives:
- Low Voltage Directive (LVD) 2014/35/EU
- Electromagnetic Compatibility (EMC) 2014/30/EU
- Hazardous Substances (RoHS 2) 2011/65/EU

### China RoHS

The following table serves as the declaration of hazardous substances for China in accordance with PRC standard SJ/T 11364-2014. The EFUP (Environment Friendly Use Period) for this product is 40 years.

| **PRODUCT:** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 零件名称 Part Name | 有害物质 Hazardous Substances | | | | | | | | | |
| | 铅 Lead (Pb) | 汞 Mercury (Hg) | 镉 Cadmium (Cd) | 六价铬 Hexavalent Chromium ($Cr^{6+}$) | 多溴联苯 Polybrominated Biphenyls (PBB) | 多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE) | 邻苯二甲酸二丁酯 Dibutyl Phthalate (DBP) | 邻苯二甲酸丁苄酯 Benzyl butyl phthalate (BBP) | 邻苯二甲酸二酯 Bis(2-ethylhexyl) phthalate (BEHP) | 邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP) |
| 金属零件 Metal parts | O | O | O | O | O | O | O | O | O | O |
| 聚合物 Polymers | O | O | O | O | O | O | O | O | O | O |
| 电子产品 Electronics | X | O | O | O | O | O | O | O | O | O |
| 电缆和互连配件 Cables & interconnect accessories | X | O | O | O | O | O | O | O | O | O |

| PRODUCT: | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 零件名称 Part Name | 有害物质 Hazardous Substances | | | | | | | | | |
| | 铅 Lead (Pb) | 汞 Mercury (Hg) | 镉 Cadmium (Cd) | 六价铬 Hexavalent Chromium ($Cr^{6+}$) | 多溴联苯 Polybrominated Biphenyls (PBB) | 多溴二苯醚 Polybrominated Diphenyl Ethers (PBDE) | 邻苯二甲酸二丁酯 Dibutyl Phthalate (DBP) | 邻苯二甲酸丁苄酯 Benzyl butyl phthalate (BBP) | 邻苯二甲酸二酯 Bis(2-ethylhexyl) phthalate (BEHP) | 邻苯二甲酸二异丁酯 Diisobutyl phthalate (DIBP) |
| 绝缘材料 Insulation material | O | O | O | O | O | O | O | O | O | O |

本表格依据 SJ/T11364 的规定编制。

O: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

X: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

This form was prepared according to the provisions of standard SJ/T11364.

O: Indicates that the hazardous substance content in all homogenous materials of this part is below the limit specified in standard GB/T 26252.

X: Indicates that the hazardous substance content in at least one of the homogenous materials of this part exceeds the limit specified in standard GB/T 26572.

### FCC Requirements

This product complies with FCC 47 CFR Part 15.

### IEEE Standards

The CEM-125 meets the following IEEE standards:

- IEEE 421.2: Performance Testing
- IEEE 421.3: High Pot Testing
- IEEE 421.4: Guide for the Preparation of Excitation System Specifications
- ANSI/IEEE C37.90.1: Surge Withstand Test
- ANSI/IEEE C37.90.1: Fast Transient

### REACH

The CEM-125 complies with the European Union Regulation (EC) No 1907/2006 – Registrations, Evaluation, and Authorization of Chemicals (REACH).

### UL Approval

The CEM-125 is a Recognized Component for the US and Canada under UL file E97035 (CCN-FTPM2/FTPM8) covered under the Standards below:

- UL/ULC 6200 Edition 1 5/31/2019

## *Physical*

Weight .....4.58 lb (2.08 kg)
Dimensions.....See *Mounting* chapter for more information.

**www.basler.com**


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