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# 4X29 ANALOG SYSTEM

**Transfer of weight using analog output signal**

Applies for:

Program no.: STD.120322.0

Document no.: 0322mu4X29-0a.DOC

Date: 2012-06-04

Rev.: 0a

# 1) CONTENTS

# 2) INTRODUCTION

## 2.1 Introduction

This document describes the use of an Eilersen Electric 4X29 analog output system unit. The 4X29 system unit consists internally of a 4029 analog output module (with the program listed on the front page) and a 4X44 loadcell module.

The 4X29 system unit is connected to X loadcells (1-4). With the program specified on the front page, the 4X29 analog unit is capable of transmitting the weight for a system with up to 4 loadcells as an analog 4-20 mA signal (or 0-10V depending on factory settings). The 4X29 system unit is normally delivered as a 4-20 mA system.

By use of DIP switches it is possible to include one of 3 different FIR filters, that will be used to filter the weight signal.

**IMPORTANT: Load cell modules and instrumentation must be placed outside the hazardous zone if the load cells are used in hazardous ATEX (Ex) area. Furthermore, only ATEX certified load cells and instrumentation can be used in ATEX applications.**

# 3) USER INTERFACE

## 3.1 Display, lamps and keyboard

The 4X29 system unit is operated using a display, a series of control lamps, 4 DIP-switches and 5 keys.

The control lamps have the following functions:

| | | |
|---|---|---|
| **TXBB** | (Green) | Lit when communicating with the connected loadcells. |
| **D1** | (Yellow) | Lit when a key is activated. |
| **AN.ERR.** | (Red) | Lit when the analog output signal is different from its programmed value. |

The 5 keys have the following functions:

| | |
|---|---|
| "**F**" | Cyclic change between different display modes etc. |
| "**Up**" | Increments desired value etc. |
| "**Down**" | Decrements desired value etc. |
| "**Esc**" | Regret desired value etc. |
| "**Enter**" | Accept of selected display value etc. This key must be pressed in order to accept any change of parameter |

The "**F**" key can be used to change between different display modes. In a given mode the display will alternately show "**XXXXXX**" and "**YYYYYY**". Here "**XXXXXX**" will be a text indicating the actual mode, while "**YYYYYY**" will indicate the actual value belonging to this mode.

By holding down the "**F**" key and then pressing "**Esc**" the **LoAd**" mode is selected.

If during power-on the display shows "**Par.SEt.**" this is because parameters have to be set. The "**F**" key can then be used to proceed to "**LoAd**" mode and the chapter describing "**Err.rEg.**" mode can be used for further information.

If at any time the display shows "**-OL-**" (OverLoad) or "**-UL-**" (UnderLoad) this is because the actual value to be shown in the display is too large/small.

## 3.2 Display modes

It is possible to select between the following modes:

| MODE | FUNCTION |
|---|---|
| "**LoAd**" | used during normal operation for display of gross weight. |
| "**OutPut**" | used for display of the actual analog output signal. |
| "**PASS**" | used during selection of password. |
| "**ZEro**" | used during zero of the weight indication. |
| "**CAL.L.**" | used during calibration of the weight indication. |
| "**CAL.**" | used during calibration of the weight indication. |
| "**CAL.F.**" | used to calculate the calibrated weight indication. |
| "**n.Lc.**" | used to indicate number of loadcells. |
| "**n.Crn.**" | used to indicate number of corners (supporting points). |
| "**Int.PEr.**" | used to indicate integration period (measurement time). |
| "**Unit**" | used to set desired weighing parameters (unit). |
| "**dPno**" | used to set desired weighing parameters (decimal point position). |
| "**div**" | used to set desired weighing parameters (division). |
| "**SP. 1**" | used to control digital output 1. |
| "**SP. 2**" | used to control digital output 2. |
| "**An.SP.**" | used to indicate weight value for full analog output signal. |
| "**An.Err.**" | used to set analog output signal used during status code indication. |
| "**An.tyPE.**" | used to select signal transferred on the analog output. |
| "**rS485**" | used to select signal transferred on the serial RS485 channel. |
| "**dAc.tSt.**" | used to test the analog output signal. |
| " **LC x** " | used to show loadcell status/signal for loadcell x. |
| "**Err.rEg.**" | used to show various error codes. |

### 3.2.1 LoAd mode

This mode is used during normal operation to show the actual gross weight. The weight indication is indicated in gram, kg or ton depending on the selected weighing parameters ("**Unit**" , "**dPno**" and "**div**"). If the 4X29 system unit detects a situation that results in a status code indication different from 0, the display will show the status code as "-xxxx-" instead of the weight indication, and it will output its error value (see "**An.Err.**" mode) on its analog output for the duration of this situation.

### 3.2.2 OutPut mode

This mode is used for indication of the actual analog output signal. The analog output signal is shown in mA/V depending on the hardware configuration of the 4X29 system unit.

### 3.2.3 PASS mode

This mode is used to select password. To avoid unintended change of parameters the module is equipped with a password. To change parameters, zero or calibrate the weight indication from the keyboard the user has to set the actual password so that it equals ”**1357**”. Hereafter the ”**Enter**” key is pressed to accept the value.

**Remember** to clear the password in the same fashion when done.

### 3.2.4 ZEro mode

This mode is used during zero of the weight indication (gross weight). The zero should only be done with an empty and clean weighing platform. The display shows the actual weight as in ”**LoAd**” mode. The weight indication is indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”). If the 4X29 system unit detects a situation that results in a status code indication different from 0, the display will show the status code as “-xxxx-“ instead of the weight indication, and it will output its error value (see ”**An.Err.**” mode) on its analog output for the duration of this situation.

The zeroing is performed by pressing ”**Enter**”, if the correct password has been selected. A zeroed and empty system will cause the analog output signal to go to its minimum value (4mA or 0V). Note that on a 4029 analog module running in current configuration, the analog output signal can go below 4mA for negative weight indications.

The zeroing can also be made using the digital input **IN1**. Zeroing using the digital input **IN1** can be performed regardless of password value and the selected display mode.

### 3.2.5 CAL.L. mode

This mode is used during calibration of the weight indication. The display shows the desired calibration load to be used during calibration. The calibration load is indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”). The calibration itself is performed in ”**CAL.**” mode.

### 3.2.6 CAL. mode

This mode is used during calibration of the weight indication. The display shows the actual gross weight. The weight indication is indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”). If the 4X29 system unit detects a situation that results in a status code indication different from 0, the display will show the status code as “-xxxx-“ instead of the weight indication, and it will output its error value (see ”**An.Err.**” mode) on its analog output for the duration of this situation.

Calibration of the gross weight to match the calibration load entered in ”**CAL.L.**” mode is performed by pressing ”**Enter**”, if the correct password has been selected. The complete calibration procedure for calibration is described later.

### 3.2.7 CAL.F. mode

This mode is used during reading/adjustment of the calibration factor. The calibration factor is changed after each performed calibration and should be noted so that it is possible to re-establish the calibration. The calibration factor can be changed directly if the correct password is selected. The calibration factor lays in the interval 104858 to 943718 with 524288 as the standard calibration factor (corresponding to no calibration). By changing the calibration factor within this interval it is possible to change the weight indication with ±80%. The procedure for calibration is described below.

### 3.2.8 N.Lc. mode

This mode is used during installation to indicate the number of loadcells (1-4) connected to the 4X29 system unit. As an example, the "**n.Lc.**" parameter should be 1 in a system consisting of a three legged tank, where only one corner contains a loadcell. Note that changing the "**n.Lc.**" parameter will clear the "**SP. 1**" , "**SP. 2**" , "**An.SP.**" and the "**CAL.L.**" parameters. If a change is made to this parameter, it may be necessary to turn the power off and on for the change to take effect.

### 3.2.9 N.Crn. mode

This mode is used during installation to indicate the number of corners (supporting points) (1-8). Note that it is the total number of supporting points including corners supported by loadcells. As an example, the "**n.Crn.**" parameter should be 3 in a system consisting of a three legged tank. Note that changing the "**n.Crn.**" parameter will clear the "**SP. 1**" , "**SP. 2**" , "**An.SP.**" and the "**CAL.L.**" parameters.

### 3.2.10 Int.PEr. mode

This mode is used during installation to indicate the integration period (40ms, 100ms, 200ms, 400ms, 1000ms, 2000ms or 4000ms). This determines the time over which the loadcell(s) are sampled to determine a new weight reading, and thereby how often the analog output signal is updated.

### 3.2.11 Unit mode

This mode is used during installation to select the desired unit used when presenting weight indications in the display. The unit can be set to gram, kg or ton. Note that changing the "**Unit**" parameter will clear the "**SP. 1**" , "**SP. 2**" , "**An.SP.**" and the "**CAL.L.**" parameters.

### 3.2.12 dPno mode

This mode is used during installation to select the desired decimal point position used when presenting weight indications in the display. The decimal point position specifies the number of digits following the decimal point, and it can be selected from a range of predefined values. Note that changing the "**dPno**" parameter will clear the "**SP. 1**" , "**SP. 2**" , "**An.SP.**" and the "**CAL.L.**" parameters.

### 3.2.13 div mode

This mode is used during installation to select the desired resolution used when presenting weight indications in the display. The resolution (or division) can be selected from a range of predefined values. Note that changing the ”**div**” parameter will clear the ”**SP. 1**” , ”**SP. 2**” , ”**An.SP.**” and the ”**CAL.L.**” parameters.

### 3.2.14 SP. 1 and SP. 2 mode

This mode is used to set the two setpoints (SP1 and SP2) that are used for controlling the two level alarms implemented on digital outputs **OUT1** and **OUT2** as described later. The setpoints are indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”).

### 3.2.15 An.SP. mode

This mode is used during installation to indicate the weight value that should result in maximum analog output signal (20mA or 10V). The analog setpoint that results in maximum analog output signal is indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”).

### 3.2.16 An.Err. mode

This mode is used during installation to indicate the analog value (0-20mA or 0-10V) that is transferred on the analog output when status indication is different from 0.

### 3.2.17 An.tyPE. mode

This mode is used during installation (or error finding) to indicate what signal type is used to determine the signal on the analog output. ” **LoAd**” can be selected causing the analog output signal to follow the gross weight indication in ”**LoAd**” mode. Alternately ”**Lc 0**” - ”**Lc 7**” can be selected causing the analog output signal to follow one of the loadcell signals in ”**LC x**” mode. During normal circumstances the parameter should be set to ”**LoAd**”.

### 3.2.18 rS485 mode

This mode is used during installation (or error finding) to indicate what signal is transferred on the serial RS485 communication channel. ”**LoAd**” can be selected causing the gross weight indication in ”**LoAd**” mode to be transferred. Alternately ”**Lc 0**” - ”**Lc 7**” can be selected causing one of the loadcell signals in ”**LC x**” mode to be transferred. During normal circumstances the parameter should be set to ”**LoAd**”.

### 3.2.19 dAc.tSt. mode

This mode can be used to test the analog output signal. Once the ”**dAc.tSt.**” mode is entered the display will show “**OFF**” indicating that the analog test mode is disabled. To enable the analog test mode the ”**Enter**” key must be pressed.

When the analog test mode is enabled, the display will show an analog test value that is sent out on the analog output. **NOTE** that this value overrides the normal analog output signal (based on the actual gross weight) for as long as the analog test mode is enabled. When the analog test mode is enabled, it is possible to change the analog test value by using the ”**Up**” or ”**Down**” key. Thus it is possible to set different values from 0mA (or 0V) to 20mA (or 10V) in increments of 1mA (or 0.5V).

The analog test mode is disabled by pressing the ”**Esc**” key when still in ”**dAc.tSt.**” mode. The analog test mode is also automatically disabled once the ”**dAc.tSt.**” mode is left by pressing the ”**F**” key. Once the analog test mode is disabled, the analog output signal will be controlled by the actual gross weight once again.

### 3.2.20 LC x mode

This mode is used to show the status or signal from loadcell x. Thus it is possible to read the status/signal of all connected loadcells. If no error is present on the selected loadcell, the display will show the weight indication measured on that loadcell. The weight indication is indicated in gram, kg or ton depending on the selected weighing parameters (”**Unit**” , ”**dPno**” and ”**div**”). If the 4X29 system unit detects a situation that results in a status code indication different from 0 for the selected loadcell, the display will show the status code as “-xxxx-“ instead of the weight indication.

### 3.2.21 Err.rEg. mode

If the 4X29 system unit detects an error a corresponding error code can be read in this mode. If present these errors are normally detected upon power up, causing the 4X29 system unit to produce a ”**PAr.SEt.**” message. In this situation, pressing the ”**F**” key will cause the module to enter ”**LoAd**” mode without clearing the error. The error can then be examined in the “**Err.rEg.**” mode for further information.

Please refer to the table describing the error codes for the cause and a possible solution.

Please note that these errors differ from the status codes that can be shown in the ”**LoAd**” , ”**ZEro**” and ”**CAL.**” modes. Also these error codes will **NOT** result in a error signal (see ”**An.Err.**” mode) on the analog output.

## 3.3 Level alarms

The 2 digital outputs on the 4X29 system unit can be used as level alarms.
Setpoints for the two alarms are set using the "**SP. 1**" or "**SP. 2**" modes.
The following applies to the two level alarms:

Level alarm 1:
- The alarm is implemented on the **OUT1** output.
- The level of activation is selected in the "**SP. 1**" mode.
- The alarm is active **BELOW** SP1.
- The alarm is active if the status code differs from 0.

Level alarm 2:
- The alarm is implemented on the **OUT2** output.
- The level of activation is selected in the "**SP. 2**" mode.
- The alarm is active **ABOVE** SP2.
- The alarm is active if the status code differs from 0.

## 3.4 Filtering

By use of DIP-switches it is possible to include one of 3 different FIR filters, that will be used to filter the weight signal. Thus it is possible, to send the unfiltered gross weight achieved over each integration period (Tavg) through one of the following FIR filters, before the result is displayed and send to the analog output:

| SW2.4 | SW2.3 | No. | Taps | Frequency | | | | | | | Damping |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Tavg 40ms | Tavg 100ms | Tavg 200ms | Tavg 400ms | Tavg 1000ms | Tavg 2000ms | Tavg 4000ms | |
| OFF | OFF | 0 | - | - | - | - | - | - | - | - | - |
| ON | OFF | 1 | 9 | 6.0 Hz | 2.4 Hz | 1.2 Hz | 0.6 Hz | 0.24 Hz | 0.12 Hz | 0.06 Hz | -80dB |
| OFF | ON | 2 | 21 | 3.0 Hz | 1.2 Hz | 0.6 Hz | 0.3 Hz | 0.12 Hz | 0.06 Hz | 0.03 Hz | -80dB |
| ON | ON | 3 | 85 | 0.75 Hz | 0.3 Hz | 0.15Hz | 0.075Hz | 0.03 Hz | 0.015Hz | 0.0075Hz | -80dB |

**NOTE:** With both switches OFF, no filtering is performed.

## 3.5 Update times

The 4X29 system unit samples/averages the loadcell signals over the time period selected in "**Int.PEr.**" mode (40ms, 100ms, 200ms, 400ms, 1000ms, 2000ms or 4000ms). The hereby found loadcell signals are used to generate the weight reading and the 4-20 mA (or 0-10V) signal until new signals are achieved when the next sample/average period expires.

## 3.6 RS485 serial communication

The 4X29 system unit communicates on its RS485 communication channel using the following serial parameters:

| | |
|---|---|
| Baudrate: | 9600 bps |
| Data bits: | 8 |
| Parity: | None |
| Stop bits: | 1 |

The 4X29 system unit transmits status and measured weight every measurement period on its RS485 channel (9 pole sub-D connector) based on what has been selected in "**rS485**" mode.

If "**LoAd**" is selected the contents of the transmitted telegram is:

**<Status> , <Load> <LF> <CR>**

If "**Lc 0**" - "**Lc 7**" is selected the contents of the transmitted telegram is:

**<LcStatus[x]> , <LcSignal[x]> <LF> <CR>**

where:

- <LF> is a line feed character.
- <CR> is a carriage return character.
- <Status> is the status code as shown in the "**LoAd**" menu. This is a 4 character long hex number and should be 0000 during normal error free operation.
- <Load> is the gross weight as shown in the "**LoAd**" menu. This is a 6 character long value. Note that this field will be 7 characters long if a decimal point is used.
- <LcStatus[x]> is the status code as shown in the "**LC x**" menu. This is a 4 character long hex number and should be 0000 during normal error free operation.
- <LcSignal[x]> is the loadcell signal as shown in the "**LC x**" menu. This is a 6 character long value. Note that this field will be 7 characters long if a decimal point is used.

# 4) STATUS CODES

Status codes can be shown as a 4 digit hex number ("-xxxx-") instead of the actual gross weight in "**LoAd**" , "**ZEro**" and "**CAL.**" modes. If more than one of the status conditions listed below is present, the status codes are OR'ed together.

| CODE (Hex) | CAUSE |
|---|---|
| *0001* | *Reserved for future use* |
| *0002* | *Reserved for future use* |
| *0004* | *Reserved for future use* |
| *0008* | *Reserved for future use* |
| 0010 | **Power failure**<br>Supply voltage to loadcells is to low. |
| 0020 | **New loadcell detected or loadcells swapped**<br>Power the system off and back on.<br>Then verify that all parameters are acceptable. |
| 0040 | **No answer from loadcell**<br>Bad connection between loadcell and loadcell module? |
| 0080 | **No answer from loadcell**<br>Bad connection between loadcell module and master module? |
| *0100* | *Reserved for future use* |
| *0200* | *Reserved for future use* |
| *0400* | *Reserved for future use* |
| 0800 | **No loadcell answer**<br>Bad connection between loadcell and loadcell module?<br>Bad connection between loadcell module and master module? |
| *1000* | *Reserved for future use* |
| *2000* | *Reserved for future use* |
| *4000* | *Reserved for future use* |
| *8000* | **Wrong number of loadcells**<br>**(or no communication between master module and loadcell module)**<br>The expected number of loadcells found during power-on does not match the number indicated by the "**n.Lc.**" parameter. If the "**n.Lc.**" parameter setting is correct, it must be verified that the connections from loadcells to loadcell module and the connection from loadcell module to master module is ok.<br>If the **TXBB** LED is constantly lit, it might be the connection between the master module and the loadcell module that is not working. If the **TXBB** LED pulses, it might be that the set number of loadcells does not match the actual number detected. |

Please note that the above listed status codes are valid when the 4X44 loadcell module is equipped with standard program.

# 5) ERROR CODES

Error codes can be shown as a 4 digit hex number (“ xxxx “) in the ”**Err.rEg.**” mode. Please note that these error codes are different from the status codes that can be shown in ”**LoAd**” , ”**ZEro**” and ”**CAL.**” modes. If more than one of the error conditions listed below is present, the error codes are OR’ed together.

| CODE (Hex) | CAUSE/SOLUTION |
|---|---|
| *0001* | *Reserved for future use* |
| 0002 | **Invalid calibration factor**<br>The calibration factor was out of range during power-up, or the scale is not calibrated yet. Perform a calibration, or manually enter a new calibration factor different from the current, to achieve a valid calibration. Power the system off and back on to verify the problem has been solved. |
| 0004 | **Invalid zero**<br>The zero was invalid during power-up, or the scale has not been zeroed yet. Perform a zero to achieve a valid zero. Power the system off and back on to verify the problem has been solved. |
| *0008* | *Reserved for future use* |
| 0010 | **Invalid weighing range parameter(s)**<br>One or more weighing range parameters (”**Unit**” , ”**dPno**” and ”**div**”) were invalid or haven’t been selected yet. Change all weighing range parameters to a new value different from their current value. Then change all weighing range parameters to their desired value. Power the system off and back on to verify the problem has been solved. |
| 0020 | **Invalid configuration parameter(s)**<br>One or more configuration parameters (“**n.Lc.**” , “**n.Crn.**” , “**Int.PEr.**” , ”**SP. 1**” , ”**SP. 2**” and ”**An.SP.**”) were invalid or haven’t been selected yet. Change all configuration parameters to a new value different from their current value. Then change all configuration parameters to their desired value. Power the system off and back on to verify the problem has been solved. |

# 6) TROUBLE SHOOTING

## 6.1 Status code indication

If the 4X29 system unit detects a situation that results in a status code indication different from 0, the 4X29 system unit will output its error value (see ”**An.Err.**” mode) on its analog output, and the level alarms will both be active, no matter what the current load is. As described earlier the actual status code will then be shown instead of the actual gross weight in the ”**LoAd**” , ”**ZEro**” and ”**CAL.**” modes. It will then be possible to use the ”**LC x**” modes to try and locate the error.

## 6.2 Error code indication

If the 4X29 system unit detects an error a corresponding error code can be read in the ”**Err.rEg.**” mode as described earlier.

If present these errors are normally detected upon power up, causing the 4X29 system unit to produce a ”**PAr.SEt.**” message. In this situation, pressing the ”**F**” key will cause the module to enter ”**LoAd**” mode without clearing the error. The error can then be examined in the “**Err.rEg.**” mode for further information.

Please refer to the table describing the error codes for the cause and a possible solution.

Please note that these errors differ from the status codes that can be shown in the ”**LoAd**” , ”**ZEro**” and ”**CAL.**” modes. Also these error codes will **NOT** result in a error signal (see ”**An.Err.**” mode) on the analog output.

## 6.3 Analog output error

If the build-in DA-converter detects that the analog output signal is different from its programmed value, the **AN.ERR.** light emitting diode will be lit. This will for example be the case if the current-loop is broken in a system where the module is in its current configuration.

# 7) INSTALATION OF SYSTEM

## 7.1 Checklist during installation

During installation of the system the following should be checked/performed:

1) The loadcells are mounted mechanically and connected to the 4X29 system unit using the BNC connectors.

2) Check that the RS485 channel, the digital I/O and the analog connections of the 4X29 analog module are made as described in the hardware description.

3) Select the desired filter using the DIP switches (Sw2.3-Sw2.4). Power is applied.

4) Verify that the green **TXBB** LED on the 4X29 system unit is lit.

5) Verify that no "**PAr.SEt.**" message is produced at power-up. Upon power-up the 4X29 system unit will automatically produce this message if errors are detected, or enter the "**LoAd**" mode if no errors are detected. Refer to the chapter describing error codes on how to solve/remove errors.

6) Verify that the red **AN.ERR.** LED on the 4X29 system unit is OFF.

7) Select "**PASS**" mode (using the "**F**" key), set the password to 1357 (using the arrow keys) and accept the value (using the "**Enter**" key).

8) Select "**n.Lc.**" mode and set the number of loadcells connected to the 4X29 system unit. If a change is made to this parameter, it may be necessary to turn the power off and on. Remember to set the password to 1357 once again, if power is turned off and on, and further settings have to be made.

9) Select "**n.Crn.**" mode and set the number of corners (supporting points).

10) Select "**Int.PEr.**" mode and set the desired integration period (40ms, 100ms, 200ms, 400ms, 1000ms, 2000ms or 4000ms).

11) Verify that the 4X29 system unit has found the correct number of loadcells and that no status codes (loadcell errors) are indicated. The "**Lc X**" modes may be used to locate the origin of any errors present.

12) Select proper weighing range parameters using the "**Unit**" (unit), "**dPno**" (decimal point position) and "**div**" (division) modes. The weighing range parameters should match/reflect the actual weighing system and its capacity.

13) If the two level alarms implemented on digital outputs **OUT1** and **OUT2** are to be used set their controlling setpoints using the "**SP. 1**" and "**SP. 2**" modes.

14) Select "**An.SP.**" mode and set the load corresponding to 20mA (or 10V).

15) Select "**An.Err.**" mode and set value (0-20mA or 0-10V) transferred on the analog output when status code indication is different from 0.

16) Select "**An.tyPE.**" mode and check that "**LoAd**" is selected, so "**LoAd**" mode determines the analog signal.

17) Select "**rS485**" mode and check that "**LoAd**" is selected, so "**LoAd**" mode determines the signal on the RS485 channel.

18) Select "**ZEro**" mode, and with an empty weighing system zero the system by pressing "**Enter**".

19) Perform a calibration of the system as described below.

20) Select "**OutPut**" mode and verify using an instrument that the physical analog output signal behaves as expected depending on the actual load. If desired the "**dAc.tSt.**" mode can be used in addition to manually generate different analog test signals.

The system is now installed and a final zero can be made before the password is cleared (set to 0 and press the "**Enter**" key) and the module is set to "**LoAd**" mode.

## 7.2 Calibration procedure

Calibration of the 4X29 system unit and the connected loadcells is made using the following procedure:

1) Allow calibration by selecting the correct password (1357) in "**PASS**" mode.
2) Check that the weighing arrangement is empty and clean.
3) Zero the system using "**ZEro**" mode.
4) Check that the weight indication is zero. Zero again if necessary.
5) Place the calibration load on the system. The load should be as close to the maximum load as possible. In order to achieve a correct calibration of the system it is recommended, that the used calibration load is at least 50% of the system capacity.
6) Select "**CAL.L.**" mode and set the calibration load to match the applied load
7) Select "**CAL.**" mode and calibrate the system by pressing the "**Enter**" key. Hereby the calibration factor is changed so that the weight indication matches the actual load. This is verified in "**LoAd**" mode. Note that it is only possible to calibrate within an interval of ±80%. If this is not enough, the mechanical part of the system should be checked, since this is most likely the cause to the problem.
8) Select "**CAL.F.**" mode and note the achieved calibration factor, so that the calibration can be re-established later.
9) The system is calibrated and the calibration should be protected by clearing the password (set to 0). Select "**LoAd**" mode and verify that a given load results in a matching weight indication.

The weight indication can also be calibrated directly by changing the calibration factor in "**CAL.F.**" mode. The following relationship between calibrated indication, uncalibrated indication and the calibration factor applies:

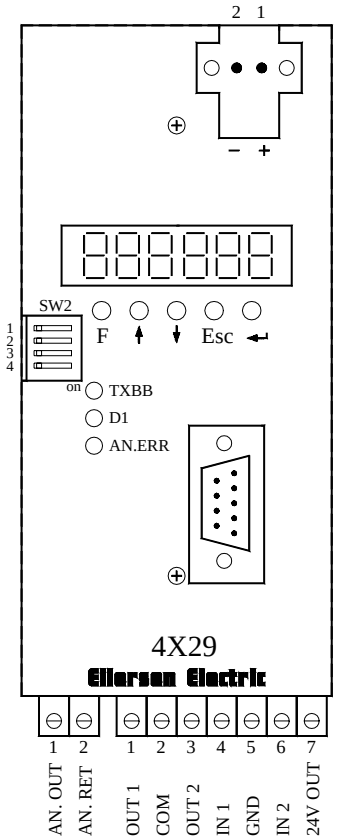
$$Weight_{CAL.} = [(CALFAC) / 524288] * Weight_{UNCAL.}$$

Note that the standard calibration factor of 524288 results in no calibration.

# 8) HARDWARE DESCRIPTION

## 8.1 4X29 overview

The following figure is an overview of a 4X29 analog system unit with 4 loadcell connections (i.e. a 4429 system unit):




## 8.2 4X29 front panel description

This chapter describes the connections, DIP-switch settings and lamp indications that are available on the front panel of the 4X29 system unit.

### 8.2.1 Connection of power

The 4X29 system unit is powered by applying +24VDC on the green two pole connector (J6) located **above** the display, as specified on the front panel of the 4X29 system unit. This powers the entire 4X29 system unit including the loadcells.

**IMPORTANT:** The used power supply must be stable and free of transients. It may therefore be necessary to use a separate power supply dedicated to the weighing system, and not connected to any other equipment.

### 8.2.2 Connection of loadcells

The loadcells must be connected to the available BNC connectors in the bottom of the 4X29 system unit.

### 8.2.3 Analog output connector

The bottom of the 4X29 system unit is equipped with a 2 pole connector (J1), that is used for connection of the analog output signal. Connection of the analog output signal is done as follows:

| PIN NO. | PIN DESIGNATION | FUNCTION |
|---|---|---|
| 1 | AN. OUT | **Analog output** |
| 2 | AN. RET | **Analog return** |

**NOTE:**

The analog output is an active output, and should NOT be connected to an active input.

### 8.2.4 Digital output and input connector

The bottom of the 4X29 system unit is equipped with a 7 pole connector, that is used for connection of the digital outputs and digital inputs. Connection of the digital outputs and digital inputs is done as follows:

| PIN NO. | PIN DESIGNATION | FUNCTION |
|---|---|---|
| 1 | OUT1 | **OUT1 - Digital Output 1**<br>Level alarm controlled by SP1. Output is active below SP1. |
| 2 | COM | **Common**<br>Voltage connected to this pin (normally 24VDC) is sent to outputs when they are active. |
| 3 | OUT2 | **OUT2 - Digital Output 2**<br>Level alarm controlled by SP2. Output is active above SP2. |
| 4 | IN1 | **Digital Input 1 (IN1) – ZERO**<br>Zeroing of gross weight. Must be active for at least 1 second.<br>Closing switch to **24VDC$_{out}$.** |
| 5 | GND | **GND** |
| 6 | IN2 | ***Digital Input 2 (IN2)***<br>*Reserved for future use – NOT connected* |
| 7 | 24V OUT | **24VDC$_{out}$**<br>Used for activating digital inputs. |

**IMPORTANT:** Connection of the digital I/O signals to external equipment must be made using solid-state-relays (SSR).

### 8.2.5 RS485 connector

The front panel of the 4X29 system unit is equipped with a 9 pole female sub-D connector for RS485 connection. The connector (J12) is used exclusively by Eilersen Electric A/S for connection to a PC for configuration/monitoring of the 4X29 system unit. The connector (J12) has the following pin out:

| 9 pole subD (J12) | FUNCTION |
|---|---|
| J12.5 | RS485-GND |
| J12.6 | RS485-A (+) |
| J12.9 | RS485-B (-) |

### 8.2.6 SW2 settings

The front panel of the 4X29 system unit is equipped with a 4 pole DIP switch block called SW2. The switches are only read during power-on and have the following function.

| SWITCH | FUNCTION |
|---|---|
| *Sw2.1-Sw2.2* | *Reserved for future use.* |
| Sw2.3-Sw2.4 | **Filtering**<br>Used to select the desired filter as described in an earlier chapter. |

### 8.2.7 Light Emitting Diodes (LEDs)

The front panel of the 4X29 system unit is equipped with a number of status lamps (light emitting diodes). These have the following functionality:

| LED | FUNCTION |
|---|---|
| TXBB<br>(Green) | **Communication with loadcells**<br>4029 analog module is communicating with loadcells. |
| D1<br>(Yellow) | **Key is pressed**<br>A key on the keyboard is pressed. |
| AN.ERR.<br>(Red) | **Analog Error**<br>The current on the analog output differs from its programmed value. This may be the case if the current-loop is broken. |

## 8.3 Hardware Selftest

During power-on the 4X29 analog system unit will perform a hardware selftest. The test will cause all the displays to turn on while the light emitting diodes **D1** will turn on and off shortly.

# 9) APPENDIX

## 9.1 4029 Analog module

This chapter describes possible connections, DIP-switch settings and jumper settings that are available internally on the 4029 analog module. These will normally be set from Eilersen Electric and should only be changed in special situations.

### 9.1.1 Jumper settings

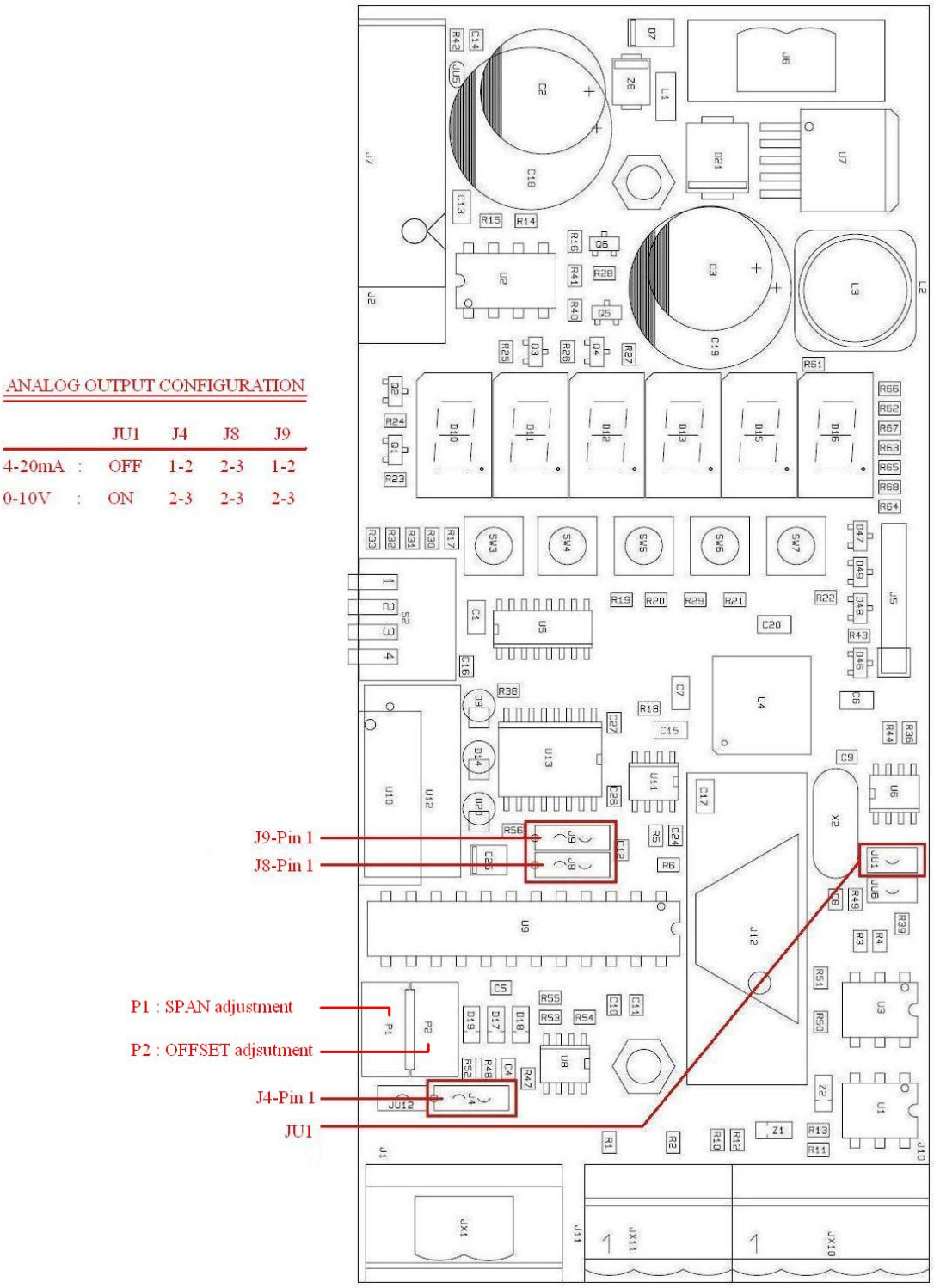
The 4029 analog module is internally equipped with 8 jumpers. These jumpers are only read at power-on, and they have the following functions:

| JUMPER | FUNCTION |
|---|---|
| JU1 | **Analog output type (mA or Volt)**<br>Jumper OFF : mA output (normal default factory)<br>Jumper ON : Voltage output |
| *JU6* | *Reserved for future use*<br>*(normal default factory setting is OFF)* |
| *JU7* | *Reserved for future use*<br>*(normal default factory setting is OFF/UNSOLDERED)* |
| *JU8* | *Reserved for future use*<br>*(normal default factory setting is OFF/UNSOLDERED)* |
| JU12 | **$REF_{IN}$ – $REF_{OUT}$ short**<br>(setting must always be OFF) |
| J4 | **Analog output type (mA or Volt)**<br>Jumper on pin 1-2 : mA output (normal default factory)<br>Jumper on pin 2-3 : Voltage output |
| J8 | **DAC Range Select 1**<br>Jumper on pin 1-2 : not used<br>Jumper on pin 2-3 : mA or Voltage output (normal default factory) |
| J9 | **DAC Range Select 2**<br>Jumper on pin 1-2 : mA output (normal default factory)<br>Jumper on pin 2-3 : Voltage output |

**IMPORTANT:** The placement of these should not be changed without consulting Eilersen Electric A/S. Changing jumper settings subsequently requires a fine adjustment of the hardware calibration of the analog output using the potentiometers P1 (SPAN/GAIN) and P2 (OFFSET/ZERO)

## 9.2 4029 Component layout

The following figure is an overview of the component layout on the 4029 analog module:



### 9.2.1 JTAG connector

The 4029 analog module is equipped with an internal JTAG connector. The connector (J5) is used exclusively by Eilersen Electric A/S for download of new software.

## 9.3 4x44 Loadcell module

This chapter describes possible settings and features available internally on the 4x44 loadcell module. These will normally be set by Eilersen Electric and should therefore only be changed/used in special cases.

### 9.3.1 Light Emitting Diodes (LEDs)

The 4x44 loadcell module is internally equipped with 10 light emitting diodes. These light emitting diodes have the following function when the 4x44 module is equipped with standard program, as D8 is the light emitting diode located furthest away from the loadcell BNC connectors:

| LED | FUNCTION |
|---|---|
| TxBB<br>(D8, Green) | **4x44 communication with master module (internal)**<br>Lit when communicating with the internally connected master module. |
| TxLC<br>(D1, Yellow) | **4x44 communication with loadcells**<br>Lit when communicating with the connected loadcells. |
| -<br>*(D13, Red)* | *Reserved for future use* |
| -<br>*(D14, Red)* | *Reserved for future use* |
| LC1<br>(D4, Red) | **Status for loadcell 1**<br>Bad connection, loadcell not ready or other error detected. |
| LC2<br>(D5, Red) | **Status for loadcell 2**<br>Bad connection, loadcell not ready or other error detected. |
| LC3<br>(D9, Red) | **Status for loadcell 3**<br>Bad connection, loadcell not ready or other error detected. |
| LC4<br>(D10, Red) | **Status for loadcell 4**<br>Bad connection, loadcell not ready or other error detected. |
| -<br>*(D11, Red)* | *Reserved for future use* |
| -<br>*(D12, Red)* | *Reserved for future use* |