Eilersen
The Weighing Experts

Kokkedal Industripark 4
DK-2980 Kokkedal
Denmark
info@eilersen.com
Tel +45 49 180 100
Fax +45 49 180 200

2029 ANALOG MODULE

Users guide for system with digital loadcells

Applies to:

Software:	Std.161111.1v0
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1) Contents

2) Operation

2.1 Introduction

This document describes the 2029 analog module from Eilersen Electric, when equipped with the software version stated on the front page.

With the software version specified on the front page, the 2029 analog module is capable of transmitting the weight for a system with up to 8 loadcells as an analog 4-20 mA signal (or 0-10V depending on factory settings). Each loadcell is connected to the 2029 analog module through a loadcell interface module.

The 2029 analog module is operated using a 6 digit display and 5 keys for viewing/configuring a series of system parameters.

By use of DIP switches it is possible to include one of 15 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.

2.2 Power-up sequence

When power is applied to the 2029 system, the following steps will be performed:

- The **D1** lamp (LED) will turn ON and back OFF shortly after.
- For 2 seconds all segments in the display will be lit like this:

This allows for inspection that display and all lamps are working.

- For 2 seconds the display will then show:

- For 3 seconds the display will show its program date like this:

- For 3 seconds the display will show its program revision like this:

During this period the 2029 system will start communicating with the loadcells and the **TXBB** lamp will turn ON.

- The 2029 system is ready and enters the normal operation mode showing the **LoAd** parameter.

2.3 Operator panel

The operator panel holds a 6 character LED display, a number of lamps, keys and DIP switches. The display will normally show the actual load indication or other parameters used to operate/configure the 2029 system. Below the display the five keys are located.

2.3.1 Lamp functionality

The different lamps located in the front panel of the 2029 system work as follows:

TXBB	Turns ON (green) when 2029 is communicating with the loadcells.
D1	Turns ON (yellow) when a key is activated or entry is in progress.
AN.ERR	Turns ON (red) if an error is detected on the analog output.

2.3.2 Key functionality

The general function of the keys in the front panel is as follows:

F	Step to next parameter in parameter list.
↑	Starts data entry of the selected parameter and increments value.
↓	Starts data entry of the selected parameter and decrements value.
Esc	Aborts data entry without change, or steps to previous parameter.
↵	Accepts adjusted value and terminates data entry. This key must be pressed in order to accept any change of a parameter.

Further description of the keys is made below in the chapter "Data entry".

2.4 General display and keyboard behavior

When a parameter is shown the display will alternately show "**XXXXXX**" and "**YYYYYY**". Here "**XXXXXX**" will be a text indicating the actual parameter name, and "**YYYYYY**" will indicate the actual value or request belonging to this parameter.

The next parameter in the parameter list (see below) can be shown by pressing the F key, and the previous key can be shown by pressing the Esc key.

By continuous holding down a key, a keyboard repeat feature will be activated after a while, which gradually increases the speed by which the key is automatically considered reactivated.

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

2.5 Parameter list

The 2029 system has the following parameters, which can be viewed and possibly changed using the user interface:

PARAMETER	DESCRIPTION
LoAd	Display current load on loadcells.
OutPut	Display current analog output signal (0.00-20.00mA).
PASS	Display/Change password for unlocking/locking data entry.
ZEro	Request zero of current load indication.
CAL.L.	Display/Change calibration load used.
CAL.	Perform system calibration.
CAL.F.	Display/Change system calibration factor (default is 524288).
n.Lc.	Display/Change number of loadcells connected.
n.Crn.	Display/Change number of supporting corners.
Int.PEr.	Display/Change integration period (measurement time in ms).
Unit	Display/Change weighing range unit (Kg, Lb., Gram, Tons).
dPno	Display/Change weighing range dpno (digits after decimal point).
div	Display/Change weighing range division.
SP. 1	Display/Change setpoint for controlling digital output OUT1.
SP. 2	Display/Change setpoint for controlling digital output OUT2.
An.SP.	Display/Change load value for full analog output signal.
An.Err.	Display/Change analog output value used during error (0.00-20.00).
An.tESt	Enter analog test mode and output different test values (0.00-20.00).
An.tyPE	Display/Change signal type transferred on analog output.
rS485	Display/Change signal type transferred on serial RS485 channel.
Lc. 0 - Lc. 7	Display individual loadcell signals/status for connected loadcells.

During normal operation the **LoAd** parameter should be selected for display of actual load on the loadcells. A complete description of the different parameters and their usage is given below.

2.6 Data entry and requests

In order to make changes to the different parameters or to perform requests from the keyboard (perform a zero etc.), the parameters have to be unlocked by setting the correct password as described later. Changing parameters (including the password) and performing requests from a parameter is done as follows.

2.6.1 Changing/adjusting parameters

Once a parameter is selected, then its value can be changed/adjusted by using the keys as follows:

↑ or ↓	Use the up and down keys until the desired value is reached.
↵	Once the desired value is reached, the ↵ key **MUST** be pressed in order to accept the new parameter value.
Esc or F	Aborts data entry without any changes to the parameter value.

Please note that some parameters can only be set to certain predetermined values. When parameter entry is in progress the yellow **D1** lamp will be ON to indicate this. The D1 lamp will turn OFF once the data entry is completed by pressing the ↵ key or aborted by pressing the Esc key or the F key.

Example - Changing calibration load from 0.000 to 1.250:

After having ensured the correct password is set use the [F] key (possibly the [Esc] key instead) to step forward (or backwards) to the **CAL.L.** parameter.

- Then use the [↑] key and the [↓] key until the display shows **1.250**.
- The yellow **D1** lamp will be ON during the above process.
- Press the [↵] key to accept the new value and complete the data entry.
- The yellow **D1** lamp will turn OFF once the data entry is completed.

2.6.2 Performing requests

Some parameters are used to perform requests (such as zeroing) instead of changing/adjusting a parameter. Once such a parameter is selected, then the corresponding request can be performed by using the keys as follows:

[↵] Press the [↵] key to perform the selected request.

Example – Performing a zero when display shows 0.120:

After having ensured the correct password is set use the [F] key (possibly the [Esc] key instead) to step forward (or backwards) to the **ZEro** parameter where the load indication shows **0.120**.

- Then press the [↵] key to perform the zero.
- Inspect that the request has been performed and that the load indication shows **0.000**.

2.6.3 Data locking and unlocking

When the power is turned on all parameters are locked. The parameters can be unlocked by setting the correct password in the **PASS** parameter. As long as the password differs from the correct password, **ALL** parameter change and user requests from the keyboard are locked. The password for unlocking and allowing parameter change is:

1357

Note: If the display is left showing the **LoAd** parameter without any keyboard activity for 5 minutes or more, the password will automatically reset to 0.

3) Parameter descriptions

The following is a description of each available parameter for this application.

3.1 LoAd parameter

When the **LoAd** parameter is selected the LED display toggle between showing the parameter name and the current load indication on the loadcells, as follows:

The load indication is shown in the unit specified by the weighing range parameters.

If the load is above the weighing range the display will show "**- OL -**".

If the load is below the weighing range the display will show "**- UL -**".

If an error is present a status code will be shown ("**-XXXX-**") instead of the load indication. In this situation the analog output signal will be determined by the **An.Err.** parameter instead of the actual load on the loadcells. A complete list of status codes is shown in the appendix section.

The F and Esc keys can be used to switch to other parameters.

3.2 OutPut parameter

When the **OutPut** parameter is selected the LED display toggle between showing the parameter name and the current analog output value controlled by the load indication, as follows:

The analog output value shown in the **OutPut** parameter is in mA (or V depending on factory settings/configuration).

The F and Esc keys can be used to switch to other parameters.

3.3 PASS parameter

When the **PASS** parameter is selected the LED display toggle between showing the parameter name and the current password, as follows:

The correct password for unlocking data entry and requests is **1357**. For all other password values entered, data entry and requests are NOT possible.

The ↑ , ↓ and ↵ keys can be used to change/adjust the password.

If the display is left showing the **LoAd** parameter without any keyboard activity for 5 minutes or more, the password will automatically reset to 0.

IMPORTANT: Always remember to clear the password when done changing parameters.

3.4 ZEro parameter

When the **ZEro** parameter is selected the LED display toggle between showing the parameter name and the current load indication on the loadcells, as follows:

The display shows the same load indication as in the **LoAd** parameter.

The ↵ key can be used to perform a zero request of the load indication on the loadcells. The zero should only be done with an empty and clean weighing platform.

A zeroed and empty system will cause the analog output signal to go to its minimum value (4mA or 0V). Note that on a 2029 analog module running in current configuration, the analog output signal can go below 4mA for negative load indications.

NOTE: A zero request is performed (as described earlier) by pressing the ↵ key.

NOTE: A zero request can also be performed by activating the digital ZERO input implemented on the digital I/O connector. Zeroing using the digital input can be performed regardless of password value and the selected display parameter.

3.5 CAL.L. parameter

When the **CAL.L.** parameter is selected the LED display toggle between showing the parameter name and the calibration load used during calibration, as follows:

If calibration is necessary the used calibration load must set using the **CAL.L.** parameter before the calibration is performed. The calibration load is shown in the same unit and resolution as the **LoAd** parameter. The calibration itself is performed in the **CAL.** parameter.

The ↑ , ↓ and ↵ keys can be used to change/adjust the calibration load.

3.6 CAL. parameter

When the **CAL.** parameter is selected the LED display toggle between showing the parameter name and the current load indication on the loadcells, as follows:

The display shows the same load indication as in the **LoAd** parameter.

The ↵ key can if necessary be used to perform a needed system calibration request of the load indication on the loadcells.

NOTE: A system calibration request is performed (as described earlier) by pressing the ↵ key.

The complete system calibration procedure for calibration is described below.

3.6.1 Performing a system calibration

If necessary, it is possible to perform a system calibration from the **CAL.** parameter by performing the following system calibration procedure:

- Allow calibration by entering correct password in the **PASS** parameter.
- Ensure the weighing scale is empty and clean.
- Use the **ZEro** parameter to zero the load indication if necessary.
- Use the **CAL.L.** parameter to enter the used calibration load. Please notice that the accuracy of the calibration is deeply dependent on the accuracy and size of the calibration load. Please select a load with a mass not less than the maximum load normally applied to the system.
- Place the calibration load on the weighing arrangement.
- Select the **CAL.** parameter, and to request the system calibration the ↵ key is now pressed.
- The load indication shown in the **CAL.** parameter and several other parameters will now match the used calibration load and the system calibration factor has been updated correspondingly.
- Use the **CAL.F.** parameter and note the achieved calibration factor, so that the calibration can be re-established later.
- The system is now calibrated and the calibration should be protected by clearing the password (set to 0).
- Select **LoAd** parameter verify that a given load results in a matching weight indication.

3.7 CAL.F. parameter

When the **CAL.F.** parameter is selected the LED display toggle between showing the parameter name and the system calibration factor used for system calibration of the load indication, as follows:

If manual inspection/change of the system calibration is necessary the system calibration factor can be viewed/changed using the **CAL.F.** parameter. The system calibration factor is changed whenever a new system calibration is performed using the **CAL.** parameter and should be noted so that it is possible to re-establish the system calibration.

The ↑ , ↓ and ↵ keys can be used to change/adjust the system calibration factor.

The calibration factor lays in the interval 104858 to 943718 with 524288 as the standard calibration factor (corresponding to no calibration). If the calibration factor is changed 1% (up or down), the load indication will also change 1% (up or down). By changing the calibration factor within the stated interval it is possible to change the load indication with ±80%. The procedure for calibration is described above.

NOTE: The following relationship between calibrated indication, uncalibrated indication and the calibration factor applies:

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

3.8 n.Lc. parameter

When the **n.Lc.** parameter is selected the LED display toggle between showing the parameter name and the number of loadcells for which the 2029 system is configured to, as follows:

During installation the actual number of loadcells (1-8) connected to the 2029 system must be configured using the **n.Lc.** parameter. The 2029 system can be connected to a maximum of 8 loadcells. 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.

The ↑ , ↓ and ↵ keys can be used to change/adjust the number of loadcells.

NOTE: If a change is made to this parameter, the power MUST be turned OFF and ON for the change to take effect.

3.9 n.Crn. parameter

When the **n.Crn.** parameter is selected the LED display toggle between showing the parameter name and the number of supporting corners (points) in the weighing arrangement, as follows:

During installation the actual number of supporting points (1-8) in the weighing arrangement must be configured using the **n.Crn.** parameter. 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.

The ↑ , ↓ and ↵ keys can be used to change/adjust the number of supporting points.

3.10 Int.PEr. parameter

When the **Int.PEr.** parameter is selected the LED display toggle between showing the parameter name and the integration period, as follows:

The integration period (measurement time) is the interval between each update of the load indication and must be specified in the **Int.PEr.** parameter during installation.

The ↑ , ↓ and ↵ keys can be used to change/adjust the integration period.

The integration period is entered in milliseconds (ms). A small value results in fast update of the display reading, while a larger value results in a more steady display reading.

NOTE: All loadcells are sampled/averaged over the time period selected in the **Int.PEr.** parameter (typical 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) analog output signal until new signals are achieved when the next sample/average period expires.

NOTE: A good initial starting value is 200 ms.

3.11 Unit parameter

When the **Unit** parameter is selected the LED display toggle between showing the parameter name and the weighing range unit with which load indications are shown, as follows:

During installation the desired weighing range unit (Kg, Lb., gram or tons) must be configured using the **Unit** parameter.

The ↑ , ↓ and ↵ keys can be used to change/adjust the weighing range unit.

NOTE: The unit is set depending on the actual loadcells used.

3.12 dPno parameter

When the **dPno** parameter is selected the LED display toggle between showing the parameter name and the weighing range decimal point position with which load indications are shown, as follows:

During installation the desired weighing range decimal point position must be configured using the **dPno** parameter. The decimal point position is specified as the number of digits following the decimal point.

The ↑ , ↓ and ↵ keys can be used to change/adjust the weighing range decimal point position.

NOTE: The decimal point position is set depending on the actual loadcells used.

3.13 div parameter

When the **div** parameter is selected the LED display toggle between showing the parameter name and the weighing range division (resolution) with which load indications are shown, as follows:

During installation the desired weighing range division/resolution must be configured using the **div** parameter. The division/resolution can be selected from a range of predefined values.

The ↑ , ↓ and ↵ keys can be used to change/adjust the weighing range division.

NOTE: The division/resolution is set depending on the actual loadcells used.

3.14 SP. 1 and SP. 2 parameters

When the **SP. 1** or **SP. 2** parameter is selected the LED display toggle between showing the parameter name and the appropriate setpoint used for controlling the two level alarms implemented on the digital outputs (OUT1 and OUT2) described later, as follows:

or

The setpoints used to control the level alarms on the digital outputs must be set using the **SP. 1** or **SP. 2** parameter during installation if these outputs are to be used. The setpoints for the digital outputs are shown in the same unit and resolution as the **LoAd** parameter.

The ↑ , ↓ and ↵ keys can be used to change/adjust the setpoints.

3.15 An.SP. parameter

When the **An.SP.** parameter is selected the LED display toggle between showing the parameter name and the analog setpoint used for scaling the analog output signal, as follows:

The analog setpoint used to indicate the load resulting in full scale output signal must be set using the **An.SP.** parameter during installation. The analog setpoint is shown in the same unit and resolution as the **LoAd** parameter.

The ↑ , ↓ and ↵ keys can be used to change/adjust the analog setpoint.

NOTE: A good initial value for the analog setpoint could be the total capacity of all the loadcells connected to the 2029 system.

3.16 An.Err. parameter

When the **An.Err.** parameter is selected the LED display toggle between showing the parameter name and the analog error value used during error situations, as follows:

The analog error value (0-20mA or 0-10V) used to control the analog output during error situations must be set using the **An.Err.** parameter during installation.

The ↑ , ↓ and ↵ keys can be used to change/adjust the analog error value.

NOTE: A good initial value for the analog error value is 20.00mA.

3.17 An.tESt parameter

When the **An.tESt** parameter is selected the LED display toggle between showing the parameter name and the status of the analog test parameter, as follows:

The analog test parameter can be used to enable an analog test mode for testing the analog output signal. If test mode is enabled the value controlling the analog output normally determined by the load on the loadcells can be overwritten by a manually selected value.

The [↑] , [↓] and [↵] keys can be used to enable the analog test mode and change the value controlling the analog output.

Once the **An.tESt** parameter is selected the display will show "**OFF**" indicating that the analog test mode is disabled. To enable the analog test mode the [↵] key must be pressed. When the analog test mode is enabled, the display will instead 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 load indication) 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 [↑] or [↓] key. Thus it is possible to set 21 different predetermined values from 0.00 to 20.00 mA (or 0.00 to 10.00V).

The analog test mode is disabled by pressing the [Esc] key when still in **An.tESt** parameter. The analog test mode is also automatically disabled once the **An.tESt** parameter is left by pressing the [F] key. Once the analog test mode is disabled, the analog output signal will again be controlled by the actual load indication.

3.18 An.tyPE parameter

When the **An.tyPE** parameter is selected the LED display toggle between showing the parameter name and the actual signal type used to control the analog output signal, as follows:

The analog type (**LoAd** or **Lc. 0** – **Lc. 7**) which determines what signal type is used to control the analog output signal must be set using the **An.tyPE** parameter during installation.

LoAd can be selected causing the analog output signal to follow the load indication shown in **LoAd** parameter. Alternately **Lc. 0** through **Lc. 7** can be selected causing the analog output signal to follow one of the loadcell signals shown in **Lc. x** parameter.

The [↑] , [↓] and [↵] keys can be used to change/adjust the analog type.

NOTE: During normal circumstances the parameter should be set to **LoAd**.

3.19 rS485 parameter

When the **rS485** parameter is selected the LED display toggle between showing the parameter name and the actual signal type transmitted on the serial RS485 communication channel, as follows:

The RS485 type (**LoAd** or **Lc. 0** – **Lc. 7**) which determines what signal type is transmitted on the serial RS485 communication channel must be set using the **rS485** parameter during installation.

LoAd can be selected causing the load indication shown in **LoAd** parameter to be transferred. Alternately **Lc. 0** through **Lc. 7** can be selected causing one of the loadcell signals shown in **Lc. x** parameter to be transferred.

The ↑ , ↓ and ↵ keys can be used to change/adjust the RS485 type.

NOTE: During normal circumstances the parameter should be set to **LoAd**.

3.20 Lc. X parameter

When the **Lc. X** parameter is selected the LED display toggle between showing the parameter name and the loadcell signal for the selected loadcell (0-X), as follows:

The loadcell signal (for the selected loadcell) is zeroed and shown in the same unit and resolution as the **LoAd** parameter.

If an error is detected (such as disconnection of the loadcell) an appropriate status code will be shown ("**-XXXX-**") instead of the load indication.

The F and Esc keys can be used to switch to other parameters.

3.21 Level alarms

The 2 digital outputs on the 2029 analog module can be used as level alarms.

Setpoints for the two alarms are set using the **SP. 1** or **SP. 2** parameters.

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** parameter.
- 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** parameter.
- The alarm is active **ABOVE** SP2.
- The alarm is active if the status code differs from 0.

3.22 RS485 serial communication

The 2029 analog module communicates on its RS485 communication channel using the following serial parameters:

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

The 2029 analog module transmits status and measured weight every measurement period on its RS485 channel (9 pole sub-D connector) based on what has been selected in the **rS485** parameter.

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

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

If **Lc. 0** through **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** parameter. 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** parameter. 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** parameter. 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** parameter. This is a 6 character long value. Note that this field will be 7 characters long if a decimal point is used.

3.23 Filtering

By use of DIP-switches it is possible to include one of 15 different FIR filters, that will be used to filter the load signal. Thus it is possible, to send the unfiltered weight achieved over each integration period through one of the following FIR filters, before the result is displayed and send to the analog output:

SW2.4	SW2.3	SW2.2	SW2.1	Filter No.
OFF	OFF	OFF	OFF	0
ON	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	2
ON	ON	OFF	OFF	3
OFF	OFF	ON	OFF	4
ON	OFF	ON	OFF	5
OFF	ON	ON	OFF	6
ON	ON	ON	OFF	7
OFF	OFF	OFF	ON	8
ON	OFF	OFF	ON	9
OFF	ON	OFF	ON	10
ON	ON	OFF	ON	11
OFF	OFF	ON	ON	12
ON	OFF	ON	ON	13
OFF	ON	ON	ON	14
ON	ON	ON	ON	15

NOTE: With all switches OFF, no filtering is performed.

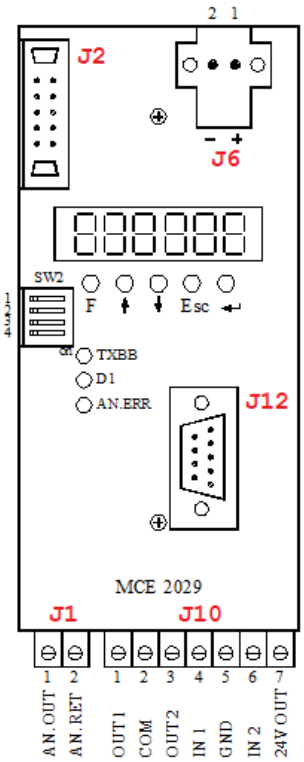
The actual filter characteristics of the selected filter is shown below in Appendix C.

NOTE: The DIP-switches are only read during power-on.

4) Hardware description

The following describes the main external and internal hardware features of the 2029 analog module. This includes connection of power, connection of loadcells, various other connectors, lamps (LEDs) and switches.

4.1 Front view



4.2 Connection of power

The 2029 system is powered by +24VDC which is connected to the 2 pole power connector (J6) located above the display. This powers the entire digital system including the connected loadcell(s).

J6 pin	FUNCTION
1	**+24V**
2	**GND**

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.

4.3 Loadcell connection

Loadcells are connected to the 2029 system directly through the 10 pole connector (J2) located above the display. This connector is connected to the corresponding 10 pole connectors on the loadcell interface modules (MCE2010) using the supplied ribbon cable with mounted connectors.

Through this bus cable the 2029 analog module supplies the loadcell modules with +24VDC, and data can be transferred from the loadcell modules to the 2029 analog module. The 10 pole connector (J2) on the 2029 analog module has these connections:

2029 J2 CONNECTOR	FUNCTION
J2.1 – J2.2	RS485-B (DATA-)
J2.3 – J2.4	RS485-A (DATA+)
J2.5 – J2.6	0 VDC (GND)
J2.7 – J2.8	+24VDC
J2.9 – J2.10	I/O line

4.4 Digital I/O connector

The 7 pole connector (J10) located below the display on the 2029 analog module is used for connection of the digital inputs and digital outputs. Connection of the digital inputs and digital outputs is done as follows:

J10 pin	PIN DESIGNATION	FUNCTION
1	OUT1	**OUT1 - Digital Output 1** Level alarm controlled by SP1. Output is active below SP1.
2	COM	**Common** Voltage connected to this pin (normally 24VDC) is sent to outputs when they are active.
3	OUT2	**OUT2 - Digital Output 2** Level alarm controlled by SP2. Output is active above SP2.
4	IN1	**Digital Input 1 (IN1) – ZERO** Zeroing of gross weight. Must be active for at least 1 second. Closing switch to **$24VDC_{out}$**.
5	GND	**GND**
6	IN2	***Digital Input 2 (IN2)*** *Reserved for future use – NOT connected*
7	24V OUT	**$24VDC_{out}$** Used for activating digital inputs.

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

4.5 Light Emitting Diodes (LEDs)

The 2029 system is equipped with a number of lamps (LEDs). These lamps have the following functionality:

LED	FUNCTION
TXBB (Green)	**Communication with loadcells** 2029 analog module is communicating with the loadcells.
D1 (Yellow)	**Key is pressed** A key is activated or data entry is in progress.
AN.ERR (Red)	**Analog Error** An error has been detected on the analog output. The current on the analog output differs from its programmed value. This may be the case if the current-loop is broken.

4.6 DIP-switch settings

The 2029 system is equipped with a 4 pole DIP-switch block (**SW2**). The switches are only read during power-on, and have the following functionality:

SWITCH	FUNCTION
Sw2.1-Sw2.4	**Filtering** Used to select the desired filter as described in an earlier chapter.

4.7 Jumper settings

The 2029 system is equipped with a number of internal jumpers. These jumpers have the following functionality:

JUMPER	FUNCTION
J4	**Analog output type (mA or Volt)** Jumper on pin 1-2 : mA output (normal setting from factory) Jumper on pin 2-3 : Voltage output
JP1	**RS485 RX Connect** This jumper allows connection of the RX pin on the RS485 driver to the RX1 pin on the 2029 on-board microcontroller OFF: BOOT load operation (not mounted when J8 is used) ON: Normal RS485 operation (normal setting from factory)
JP2	**Analog output type (mA or Volt)** OFF: mA output (normal setting from factory) ON: Voltage output
JP11	**Reset** The jumper allows reset of the on-board microcontroller. OFF: Normal operation (normal setting from factory) ON: Reset of the 2029 on-board microcontroller
JP12	**BOOT Load** The jumper is used when downloading new software to the 2029 system using the J8 serial connector. OFF: Normal power-up/operation (normal setting from factory) ON: Download operation possible (see download description)

IMPORTANT: The placement of these should not be changed without consulting Eilersen Electric A/S.

NOTE:

- Ensure JP1 jumper is ON when RS485 connector (J12) is used.
- Ensure JP1 jumper is OFF when BOOT load connector (J8) is used.

4.8 Analog output connector

The 2 pole connector (J1) located below the display on the 2029 analog module is used for connection of the analog output signal. Connection of the analog output signal is done as follows:

J1 pin	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.

4.9 RS485 connector

The 2029 analog module is equipped with a 9 pole female sub-D connector for RS485 connection. The connector (J12) is used for connection to a PC for configuration/monitoring of the 2029 analog module. 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 (-)

NOTE: Ensure JP1 jumper is ON when RS485 connector (J12) is used.

4.10 Serial BOOT load connector

The 5 pin serial connector (J8) can be used for download of new program to the 2029 system by use of a special serial cable supplied by Eilersen Electric A/S. The serial connector can also be used for test purposes by Eilersen Electric. This connector has the following pin-out:

J8 pin	FUNCTION
1	**GND**
2	**3V3**
3	**UART1-Rx**
4	**UART1-Tx**
5	**BOOT0**

NOTE: Ensure JP1 jumper is OFF when BOOT load connector (J8) is used.

4.11 JTAG connector

The 8 pin JTAG connector (J5) allows connection of a PC to the 2029 system by use of proper hardware/software tools. This allows for download of program and debugging during development. This connector is reserved for use by Eilersen Electric only. The connector has the following pin out:

J5 pin	FUNCTION
1	**GND**
2	**3V3**
3	**JNRST**
4	**JTDI**
5	**JTMS**
6	**JTCK**
7	**JTDO**
8	**/RESET**

5) Appendices

5.1 Appendix A: 2029 Installation checklist

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

ACTION	PARAMETERS
1. Check loadcells	Check loadcells are mounted mechanically correct.
2. Check electrical connections	Check power supply, loadcells, digital I/O, analog interface and RS485 connection.
3. Check DIP switch settings	Check DIP switches on loadcell interface modules (MCE2010) selects correct addresses. Check DIP switches on 2029 analog module selects desired filtering.
4. Apply power and check software ID	Check software indication during power up sequence matches program name on front page.
5. Unlock parameters	Enter the correct password in the **PASS** parameter.
6. Configure loadcells used	Enter the correct number of connected loadcells in the **n.Lc.** parameter. Enter the correct number of supporting points in the **n.Crn.** parameter. If a change is made to these parameters, it may be necessary to turn the power off and on.
7. Power off/on and check loadcells	Check that the green **TXBB** lamps are ON (on both 2029 and all MCE2010 modules). Check that all other lamps on the MCE2010 modules behave as expected. Verify all loadcells found are without error indications in the **Lc. 0** to **Lc. X** parameters.
8. Unlock parameters once again	Enter the correct password in the **PASS** parameter.
9. Check system calibration factor	Check the system calibration factor is initially set to 524288 in the **CAL.F.** parameter.
10. Configure update rate	Enter the desired integration period (update rate in ms) in the **Int.PEr.** parameter.
11. Configure the weighing range	Depending on the used loadcells configure the weighing range unit in the **Unit.** parameter. Depending on the used loadcells configure the weighing range dpno in the **dPno** parameter. Depending on the used loadcells configure the weighing range division in the **div** parameter. The weighing range parameters should match/reflect the actual weighing system and its capacity.
12. Configure the level alarm setpoints	If the level alarms are to be used the setpoints should be configured in the **SP. 1** and **SP. 2** parameters.
13. Configure the analog output	Use the **An.SP.** parameter to indicate the load for full-scale signal (normally the total loadcell capacity). Use the **An.Err.** parameter to indicate the value set on the analog output during errors (normally 20.00mA). Optionally use the **An.tESt** parameter to check the analog connection. Use the **An.tyPE** parameter to select signal type controlling analog output (normally **LoAd** is selected). Check that the red **AN.ERR** lamp is OFF.
14. Configure the RS485 channel	Use the **rS485** parameter to select signal type controlling the RS485 channel (normally **LoAd** is selected).
15. Perform zero	Perform a zero with no load on weighing arrangement using the **ZEro** parameter or the ZERO input.
16. Perform load check (2029)	Verify the load indication with a known load using the **LoAd** parameter.
17. Perform load check (main system)	Verify the load indication on the J1 connector is transferred correctly to the main control system.
18. Perform system calibration? (Optional)	Optionally perform a system (span) calibration if desired/needed. Note system calibration factor.
19. Perform final load check (Optional)	If necessary verify the load indication in the **LoAd** parameter is ok using a known load. If necessary verify the load indication in the **LoAd** parameter is transferred correctly on RS485 channel. If necessary verify the load indication in the **LoAd** parameter is represented correctly on the analog output using the **OutPut** parameter and a measuring instrument. If necessary verify the load indication in the **LoAd** parameter is transferred correctly to the main control system.
20. Lock parameters	Lock parameter change by setting the password in the **PASS** parameter to 0.

5.2 Appendix B: 2029 Parameter list

This application contains the following parameters:

PARAMETER	DESCRIPTION
LoAd	Display current load on loadcells.
OutPut	Display current analog output signal (0.00-20.00mA).
PASS	Display/Change password for unlocking/locking data entry.
ZEro	Request zero of current load indication.
CAL.L.	Display/Change calibration load used.
CAL.	Perform system calibration.
CAL.F.	Display/Change system calibration factor (default is 524288).
n.Lc.	Display/Change number of loadcells connected.
n.Crn.	Display/Change number of supporting corners.
Int.PEr.	Display/Change integration period (measurement time in ms).
Unit	Display/Change weighing range unit (Kg, Lb., Gram, Tons).
dPno	Display/Change weighing range dpno (digits after decimal point).
div	Display/Change weighing range division.
SP. 1	Display/Change setpoint for controlling digital output OUT1.
SP. 2	Display/Change setpoint for controlling digital output OUT2.
An.SP.	Display/Change load value for full analog output signal.
An.Err.	Display/Change analog output value used during error (0.00-20.00).
An.tESt	Enter analog test mode and output different test values (0.00-20.00).
An.tyPE	Display/Change signal type transferred on analog output.
rS485	Display/Change signal type transferred on serial RS485 channel.
Lc. 0 - Lc. 7	Display individual loadcell signals/status for connected loadcells.

5.3 Appendix C: Trouble shooting

5.3.1 Trouble shooting – Status code indication

If the 2029 analog module detects a situation that results in a status code indication different from 0, the 2029 analog module will output its error value (see **An.Err.** parameter) on its analog output, and the level alarms will both be active, no matter what the current load is. The actual status code will then be shown instead of the actual load in the **LoAd** , **ZEro** and **CAL.** parameters. It will then be possible to use the **Lc. X** parameter to try and locate the error.

5.3.2 Trouble shooting – Analog output error

If the build-in Digital to Analog Converter (DAC) detects an over temperature or detects that the analog output signal is different from its programmed value, then 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.

5.4 Appendix D: Actual filter characteristics

The filter frequency depends on the weight display reading update rate (integration period). Examples are given in the table below depending on the filter number selected using the DIP switches as described above:

Update period (ms)			20	100	200	400
Filter			Filter frequency (Hz) and total settling time (ms/s)			
No.	Taps	Damping				
0	-	-	No filter enabled			
1	7	-60dB	12 Hz 140 ms	2,4 Hz 700 ms	1,2 Hz 1,4 s	0,6 Hz 2,8s
2	9	-60dB	10 Hz 180 ms	2,0 Hz 900 ms	1,0 Hz 1,8 s	0,5 Hz 3,6 s
3	9	-80dB	12 Hz 180 ms	2,4 Hz 900 ms	1,2 Hz 1,8 s	0,6 Hz 3,6 s
4	12	-60dB	8 Hz 240 ms	1,6 Hz 1,2 s	0,8 Hz 2,4 s	0,4 Hz 4,8 s
5	12	-80dB	10 Hz 240 ms	2,0 Hz 1,2 s	1,0 Hz 2,4 s	0,5 Hz 4,8 s
6	15	-80dB	8 Hz 300 ms	1,6 Hz 1,5 s	0,8 Hz 3 s	0,4 Hz 6 s
7	17	-60dB	6 Hz 340 ms	1,2 Hz 1,7 s	0,6 Hz 3,4 s	0,3 Hz 6,8 s
8	21	-80dB	6 Hz 420 ms	1,2 Hz 2,1 s	0,6 Hz 4,2 s	0,3 Hz 8,4 s
9	25	-60dB	4 Hz 500 ms	0,8 Hz 2,5 s	0,4 Hz 5 s	0,2 Hz 10 s
10	32	-80dB	4 Hz 640 ms	0,8 Hz 3,2 s	0,4 Hz 6,4 s	0,2 Hz 12,8 s
11	50	-60dB	2 Hz 1,0s	0,4 Hz 5 s	0,2 Hz 10 s	0,1 Hz 20 s
12	64	-80dB	2 Hz 1,28 s	0,4 Hz 6,4 s	0,2 Hz 12,8 s	0,1 Hz 25,6 s
13	67	-60dB	1,5 Hz 1,34 s	0,3 Hz 6,7 s	0,15 Hz 13,4 s	0,075 Hz 26,8 s
14	85	-80dB	1,5 Hz 1,70 s	0,3 Hz 8,5 s	0,15 Hz 17 s	0,075 Hz 34 s
15	100	-60dB	1 Hz 2,0 s	0,2 Hz 10 s	0,1 Hz 20 s	0,05 Hz 40 s

5.5 Appendix E: Status codes

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

CODE (Hex)	CAUSE
0001	**Invalid/missing 'sample' ID** Bad connection between 2029 analog module and loadcell module.
0002	**Loadcell timeout** Bad connection between loadcell and loadcell module.
0004	**Loadcell not synchronized** Bad connection between loadcell and loadcell module.
0008	**Hardware synchronization error** Cable between loadcell modules shorted or disconnected.
0010	**Power failure** Supply voltage to loadcells is too low.
0020	**Overflow in weight calculation** Internal error in loadcell module.
0040	**Invalid/missing 'latch' ID** Bad connection between 2029 analog module and loadcell module.
0080	**No answer from loadcell module** No data is received from loadcell module. This can be caused by the removal of a loadcell module, no power to the module or that the connection between loadcell module and 2029 analog module is broken.
0100	*Reserved for future use*
0200	*Reserved for future use*
0400	*Reserved for future use*
0800	**No loadcell modules answer** Bad connection between 2029 analog module and loadcell module. Not all telegrams from 2029 analog module are received in loadcell module.
1000	*Reserved for future use*
2000	*Reserved for future use*
4000	*Reserved for future use*
8000	**Wrong number of loadcells** 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 examined that all loadcell module addresses are correct.