# Operating Manual
# EMGZ480
# EMGZ480.M16

Digital microprocessor controlled Tension Measuring Amplifier with integrated CAN-BUS® interface

Operating Manual Version 1.10 10/2007 ff

Firmware Version 1.01

GSD Version 1.00 08/06

This operating manual is also available in German.
Please contact your local representative.

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.
Bitte kontaktieren Sie die Vertretung im zuständigen Land.

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# 1 Safety Instructions

## 1.1 Warnings

**a) High danger of health injury or loss of life**


**Danger**

This symbol refers to high risk for persons to get health injury or loss life. Instructions have to be followed strictly.

**b) Risk of damage of machines**

**Caution**

This symbol refers to information, that, if ignored, could cause heavy mecanical damage. This warning has to be followed absolutely.

**c) Note for proper function**

**Note**

This symbol refers to important information about proper use of the devise. If not followed, malfunction can be the result.

## 1.2 List of Safety Instructions

⚠ The functionality of the Tension Measuring Amplifier is only guaranteed, if the components and their application are used as recommended by FMS. Arrangements other than the one recommended here can cause heavy malfunction. The installation instructions on the following pages must strictly be followed.

⚠ Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be strictly followed.

⚠ Improper handling may damage the fragile electronic equipment! Don’t use rough tools such as screwdrivers or pliers! Operators handling the processor board must wear a well earthed bracelet in order to discharge static electricity.

⚠ Bad earth ground connection may cause electric shock to persons, malfunction of the total system or damage of the electronic unit! It is vital to ensure that proper ground connection is done.

# 2 Definitions

**CAN (Controller Area Network):** CAN is an asynchronous, serial bus system. It was designed to reduce wires in cable harnesses. The CAN bus system works according the Carrier Sense Multiple Access / Collision Avoidance System. It's a very reliable system that is used in large numbers in the automotive industry since 1989.

**Offset:** Correction value for compensation of the roller or pulley weight. The offset adjustment ensured that a force of 0N will generate a signal of 0V exactly.

**Gain:** Amplification factor for the measuring signal. The proper value will set the measuring range of the sensor to the corresponding output range of the signal.

# 3 System Components

An EMGZ480/EMGZ480.M16 system consist of the following components (refer to Fig. 1 and Fig. 2):

**Force sensors**

- For mechanical/electrical conversion of the tension force
- Force measuring bearing
- *Force measuring roller*
- *Force measuring journal*

**Electronic unit EMGZ480**

- Supplying 1 or 2 force sensors
- With integrated CAN-BUS interface for operation and parametrisation
- Operates as CAN Open CiA-DS 301 Slave
- One analogue output
- Wall mounting version

**Electronic unit EMGZ480.M16**

- Optimised for rotating applications (M16 connector)
- Supplying 1 or 2 force sensors
- With integrated CAN-BUS interface for operation and parametrisation
- Operates as CAN Open CiA-DS 301 Slave
- Wall mounting version

**CAN-BUS master computer**

- For operation of the electronic unit EMGZ480 / EMGZ480.M16
- Operates as CAN Open CiA-DS 301 Master
- Any master computer or PLC suitable

*(Italic text indicates a variant or option)*

# 4 System Description

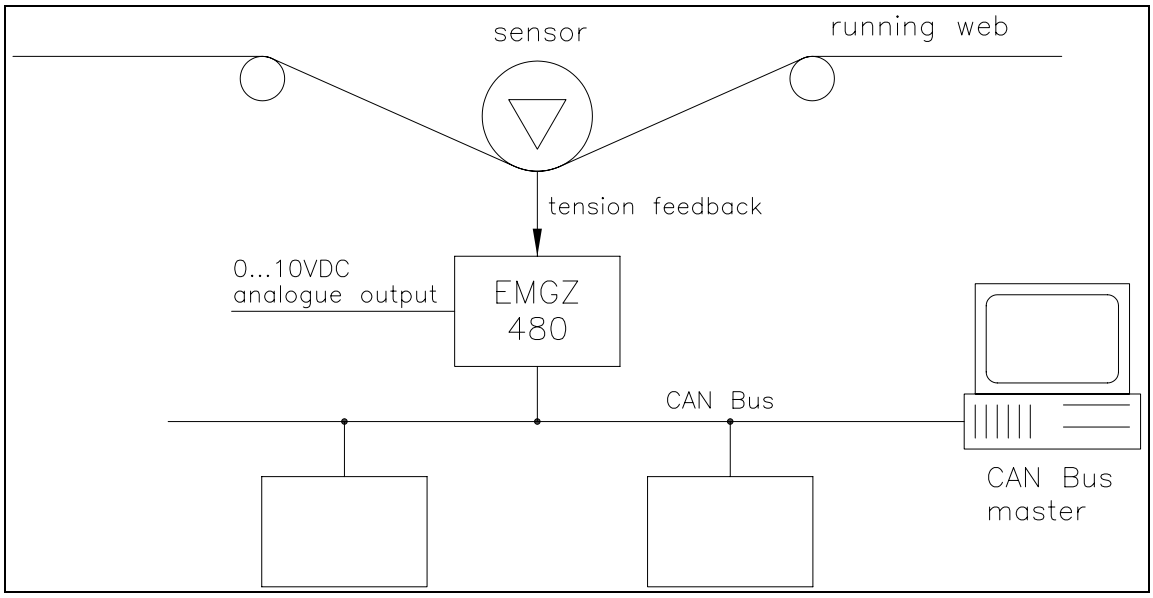


**Fig. 1: Basic application of the EMGZ480 Tension Measuring Amplifier** E480001e

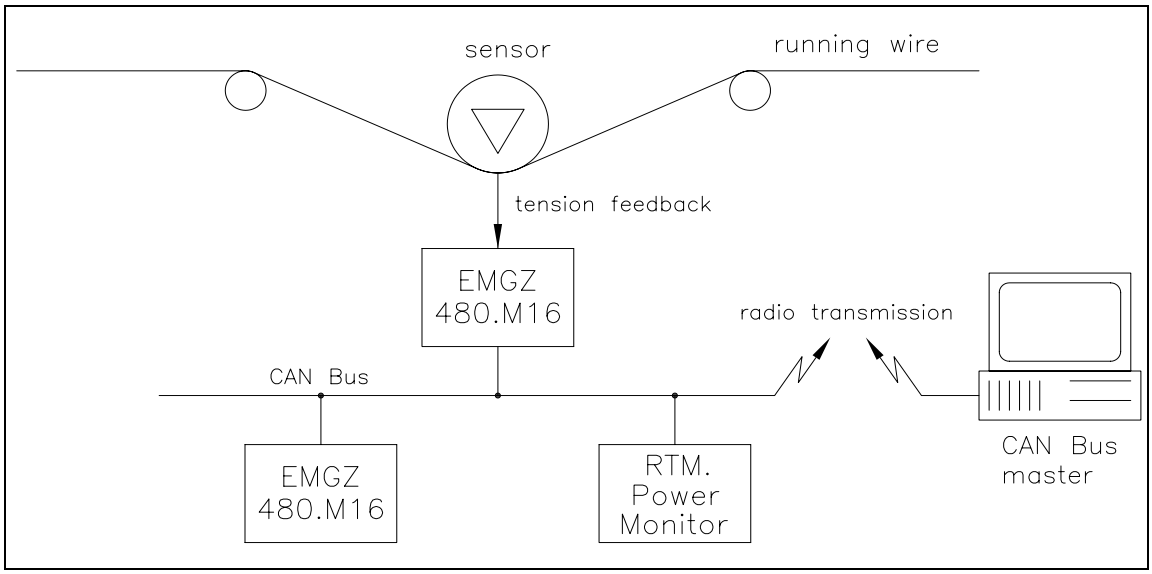


**Fig. 2: Basic application of the EMGZ480.M16 Tension Measuring Amplifier with wireless data transmission** E480015e

## 4.1 Functional Description

The force measuring sensor gathers the tension force in the material and transmits the value as a mV signal to the electronic unit. There the mV signal is amplified and conditioned depending on the chosen configuration. The resulting feedback value can be read by the CAN-BUS master. The application dependent calculations are done by the CAN-BUS master.

## 4.2 Force Sensor

The force measuring sensors base on the flexion or dual flexion beam principle. The flexion in the sensor body is measured by strain gauges as a mV signal. In order to minimize the power supply influence to the strain gauges Wheatstone Bridge and achieve a clean and accurate amplification, the force sensors are supplied with a very stable, controlled supply voltage.

## 4.3 Electronic Unit EMGZ480, EMGZ480.M16

**General Information**

A microprocessor in the electronic unit handles all calculation and communication tasks. The electronic unit contains a signal amplifier with a highly accurate sensor power supply section. The integrated CAN-BUS interface block handles the CAN-Bus protocol. EMGZ480 and EMGZ480.M16 can process the signals of two force sensors (sum signal).

**Strain Gauge Amplifier**

The strain gauge amplifier section provides the highly accurate 5V DC supply voltage for one or two force measuring sensors. A highly accurate, fixed difference amplifier raises the mV signal to the Volt-range (up to10V). This signal is fed to 14-Bit A/D converter. The microprocessor conditions the signal and calculates all application specific parameters like Offset, Gain, Filter and Limit values. The digitalised signal can then be read by the CAN-BUS master.

**CAN-BUS Interface**

The EMGZ480 and EMGZ480.M16 operate the CAN Open / CiA-DS 301 interface. The interface is galvanically isolated.

**Operation**

The entire parameter setting is done over the CAN-BUS. Parameters and settings are stored in a none-volatile memory, completely fail-save

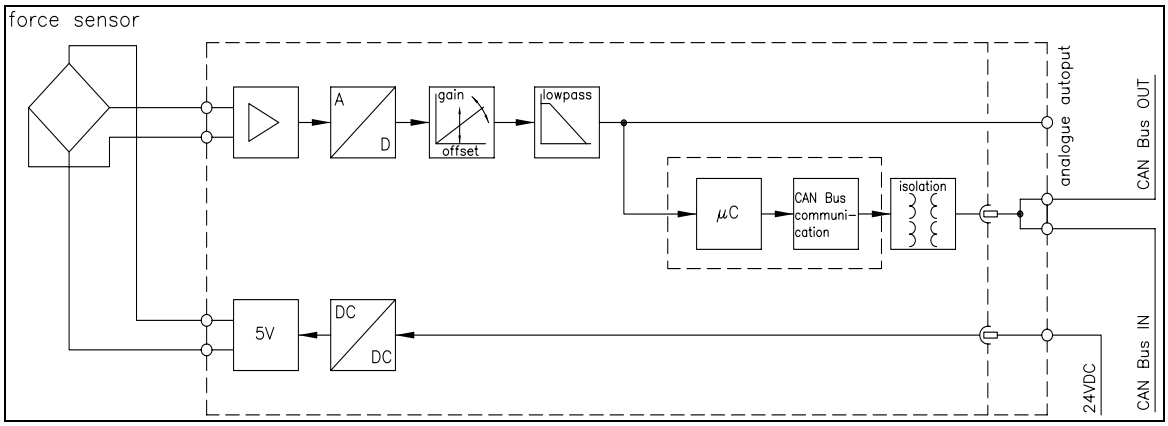


**Fig. 3: Block Diagram EMGZ480** E480005e

# 5 Quick Installation Guide

- Collect and check all your requirements such as: Configuration of the CAN-BUS interface (address number, data format, Baudrate, PDO cycle time, termination, etc), calibration mode (ref. to „8. Calibrating the measuring amplifier“).
- Draw your final wiring diagram according to FMS recommendations (refer to „7. Installation and wiring“)
- Install and wire all your components (refer to „7. 4Installation and wiring“)
- Set your parameters in the CAN-BUS master computer (ref. to „10. Specification of the CAN-BUS interface“)
- Put EMGZ480 measuring amplifier into operation and calibrate it by means of CA-BUS (refer to „8. Calibrating the measuring amplifier“)
- Turn system on and proceed with a test run with low speed
- If required, activate additional application-specific functions of the CAN-BUS master computer (DP master)

**Note**

If a real-time control loop is implemented with the CAN-BUS, you must ensure that the application-specific CAN-BUS protocol is time wise short enough to provide sufficient control dynamics.

# 6 Dimensions

## 6.1 Dimensions EMGZ480

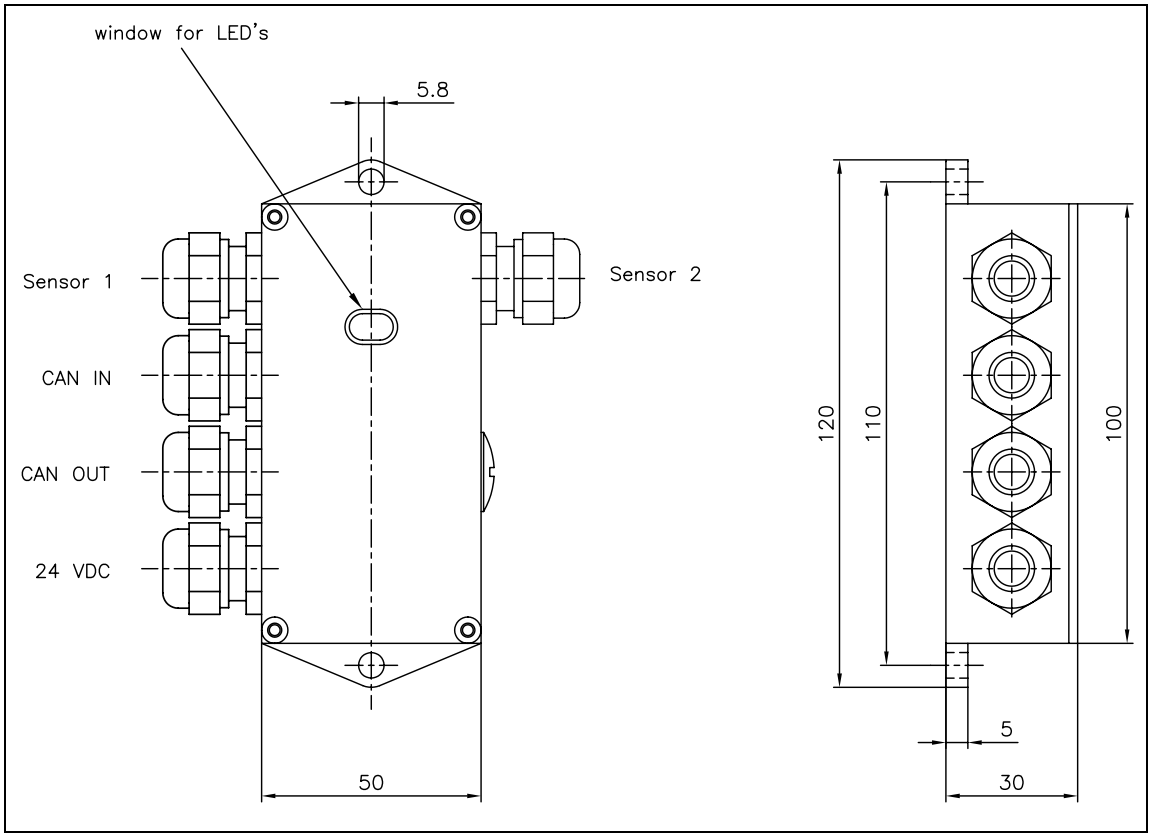


**Fig. 4: Outline drawing EMGZ480** C480017e

## 6.2 Dimensions EMGZ480.M16

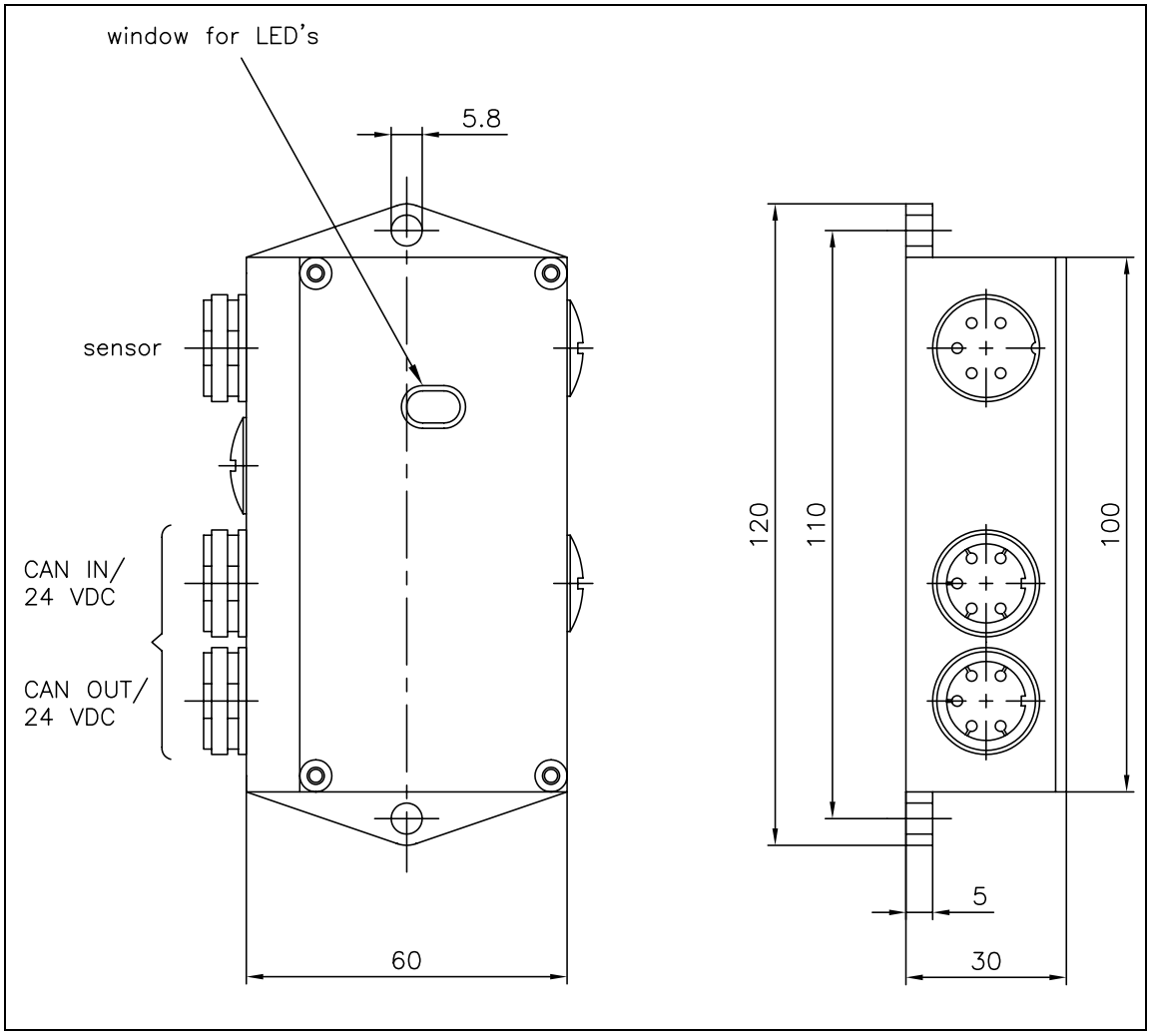


**Fig. 5: Outline drawing EMGZ480.M16** C480018e

EMGZ480 and EMGZ480.M16 come in robust and resilient aluminium housing. They were designed to work under the most stringent environmental conditions. The sealed housing is rated for a protection class of IP68.

# 7 Installation and Wiring

## 7.1 Mounting the Force Sensors

For mounting the force measuring sensors please consult the respective installation manual. The manual is always delivered together with the sensor. In rotating applications it is recommended mounting the Force Measuring Sensors as close as possible to the rotation axis.

**Note**

In rotating applications the force measuring sensors are mounted such that centrifugal forces are compensated. Using FMS RMGZ sensors this can be achieved by turning the Red Point parallel to the rotation axis and in direction of the positive force component (refer to Fig. 6).

**Caution**

It is of paramount importance to compensate the centrifugal forces caused by the rotating base plate of the strander. The measuring results will be wrong, if this rule is broken

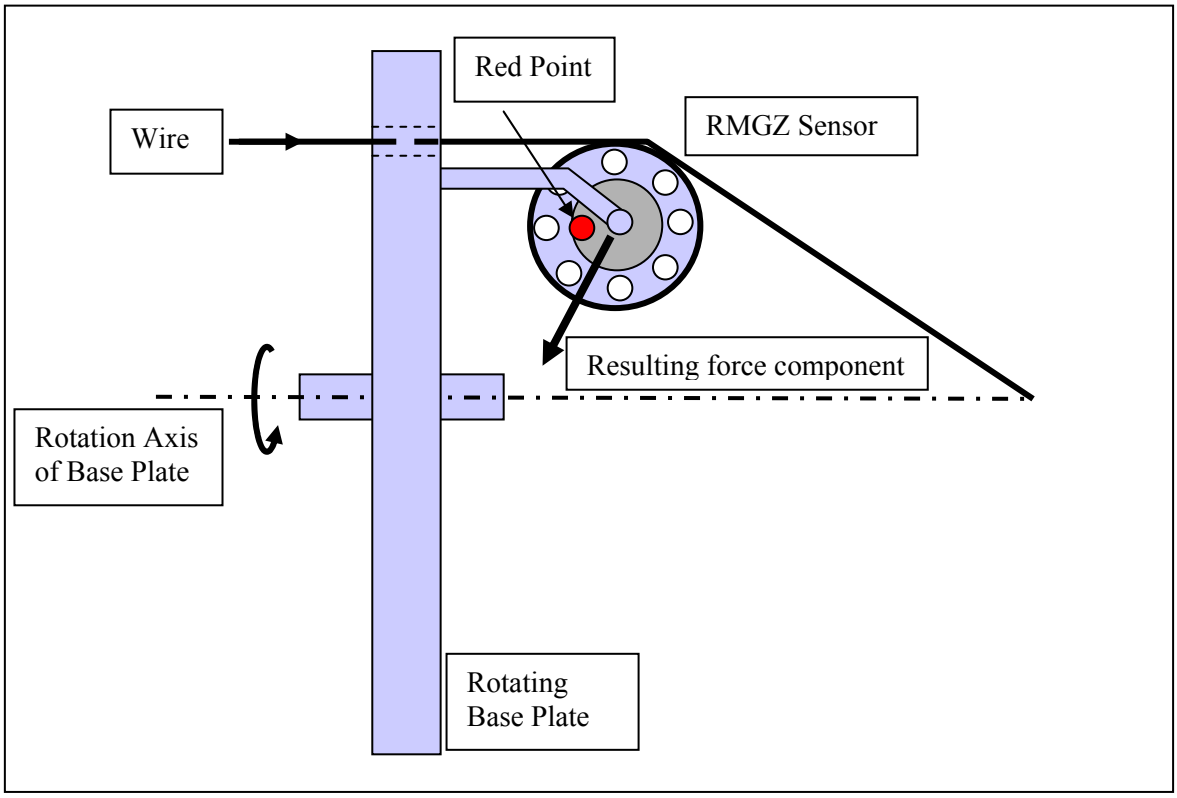


**Fig. 6: RMGZ Red Point alignment in strander applications** RTM00014e

## 7.2 Mounting the Measuring Amplifier

We recommend mounting the Measuring Amplifier EMGZ480/480.M16 as close as possible to the Force Measuring Sensor

**Caution**

Improper handling may damage the fragile electronic equipment! Don't use rough tools such as screwdrivers or pliers! Operators handling the processor board must wear a well earthed bracelet in order to discharge static electricity.

## 7.3 Connector Configuration and Setting Elements

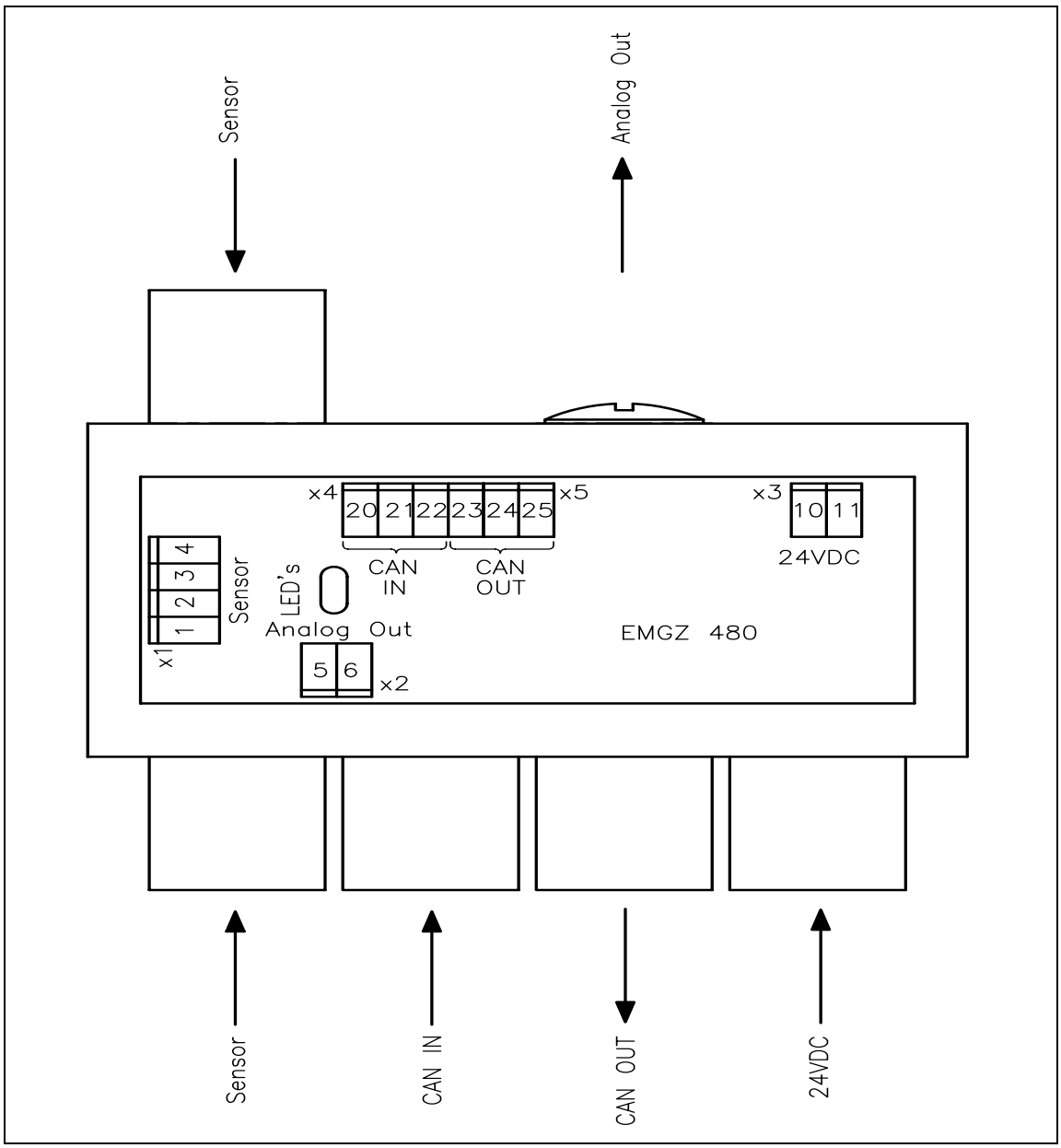


**Fig. 7: Connector configuration, setting (jumpers) EMGZ480** EMGZ480016e

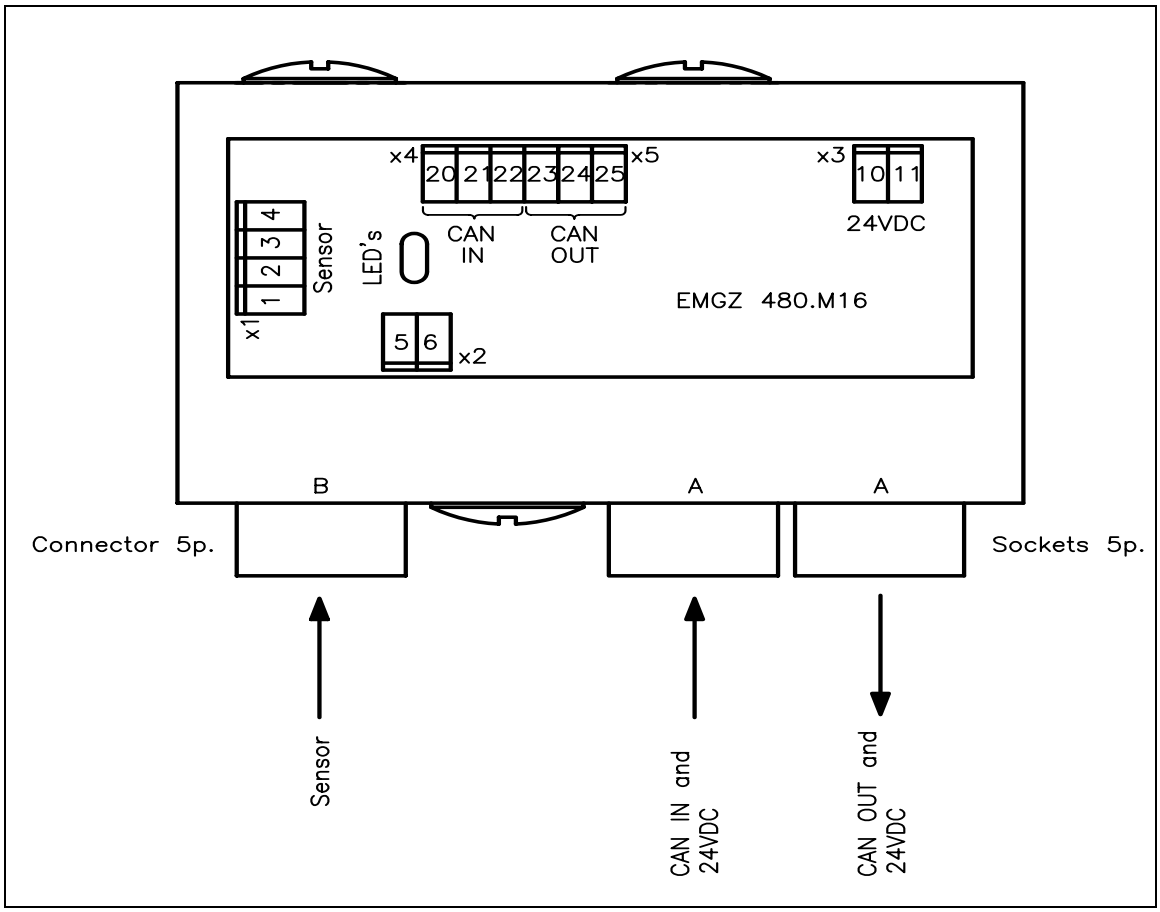


**Fig. 8: Connector configuration, settings (jumpers) EMGZ480.M16** EMGZ480018

**Note**

The CAN-BUS network must be terminated properly. Otherwise the installation cannot be set into operation. It has to be ensured that only the last device of the CAN-BUS chain is terminated.

## 7.4 Wiring Diagrams

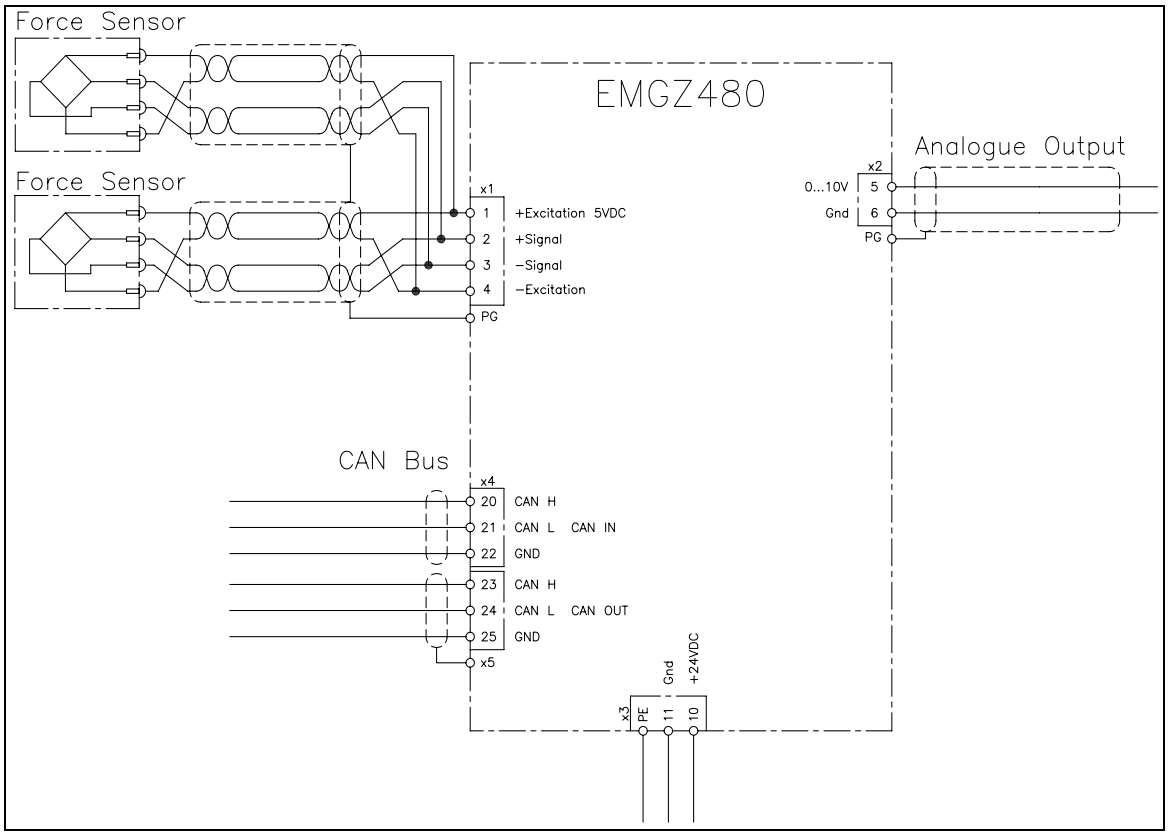


**Fig. 9: Wring Diagram EMGZ480** E480011e

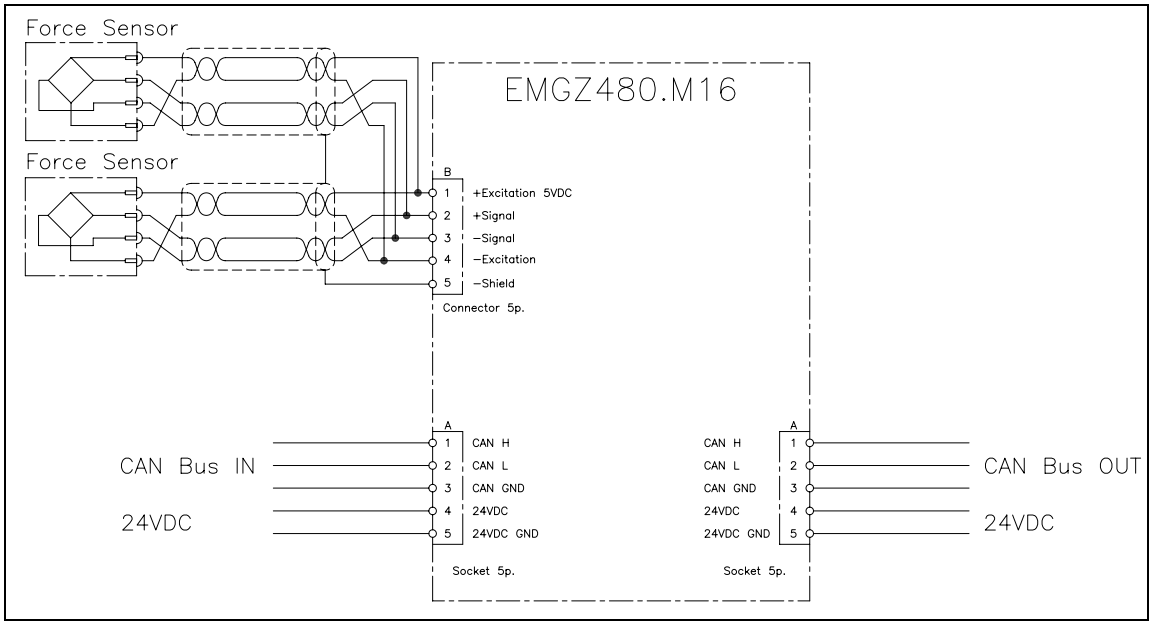


**Fig. 10: Wring Diagram EMGZ480.M16** E480011e

## Note

The connection of the shield must be done as indicated in our wiring diagram. The shield should be connected only to the measuring amplifier side. At the force sensor side, the shield should stay open. Other arrangements may cause ground/earth loops which may interfere with the measuring signal.

**Wiring of the CAN-BUS cables**

CAN-BUS devises must be connected with standardised cables of the type (1x2x0.34 $mm^2$) [AWG 22] or 2x2x0.25$mm^2$ [AWG 23] shielded 2 twisted pairs cables.

**EMGZ480:** The cables are assembled as shown in Fig. 11 and connected to the terminals on the amplifier board. Special attention must be paid to the shield and its connection.

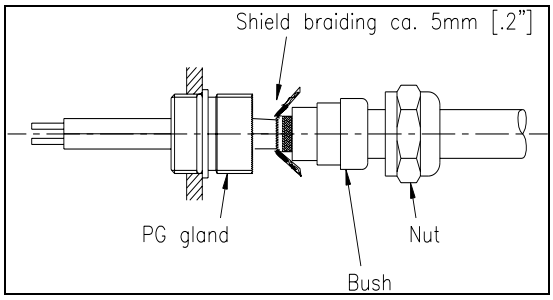


**Fig. 11: Assembly of CAN-BUS cables**
E470009e

**EMGZ480.M16:** The cables are delivered by FMS already with M16 connectors on both sides for easy assembly. For the EMGZ480.M16 amplifier version cables of the type 2x2x0.25 $mm^2$ [AWG 23] shielded 2 twisted pairs are used.

## Caution

The functionality of the Tension Measuring Amplifier is only guaranteed, if the components and their application are used as recommended by FMS. Arrangements other than the one recommended here can cause heavy malfunction. The installation instructions on the following pages must strictly be followed.

## Caution

Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be strictly followed.

## Caution

Bad earth ground connection may cause electric shock to persons, malfunction of the total system or damage of the electronic unit! It is vital to ensure that proper ground connection is done.

# 8 Calibrating the Measuring Amplifier

To get correct measuring values, offset and gain have to be set before putting the device into operation. There are several methods to do this:

## 8.1 Simulating Method, Calibration with the PLC or PC

The following instructions are referring to a setup and calibration inside the machine. The material tension will be simulated by a weight (Fig. 12). Offset and Gain calibration is done in the PLC or the master computer.

**Checking the Force Measuring Sensor**

- Connect Force Measuring Sensor to the EMGZ480 amplifier (ref. to 7.4 “Wiring Diagram”).
- Check whether a load in the processing direction results in a positive signal. If the output is negative, change the wires *+signal* and *–signal* in the amplifier.
- If a second Force Measuring Sensor is required, repeat previous point.

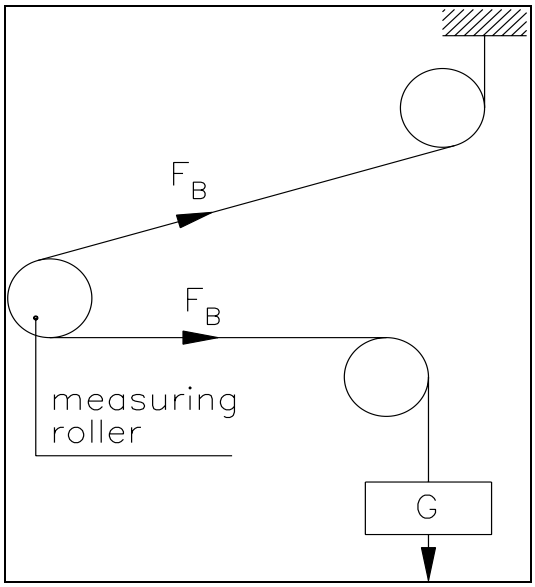


**Fig. 12: Calibrating the measuring amplifier** C431011e

**Offset Compensation**

- Align Force Measuring Sensor in the intended operation direction (red point).
- Insert material or a rope loosely to the machine.
- Find with CAN-BUS object 2051h the offset value. The measuring amplifier calculates automatically the offset value.
- The found value is stored in the object 2001h *Offset* in [Digit].

**Gain Determination**

- Load material or rope with a defined weight (Fig. 12). The roller configuration must correspond to the real configuration in the machine (wrap angle, distance of the rollers etc.)
- Enter the force in [N] or [lbs] corresponding to the used weight in the CAN-BUS object 2052h. This will initiate the calibration process.
- The calculated Gain value is stored in the parameter CAN-BUS object 2002h *Gain*.

## 8.2 Mathematical Method

If the material tension cannot be simulated with weights as described in paragraph 8.1, the calibration has to be done by calculation. This way of calibrating is less accurate because the exact angles are often unknown. The actual mounting conditions, which usually deviate from the ideal world, can also not be taken into account.

**Mathematical base for calculating the Gain factor:**

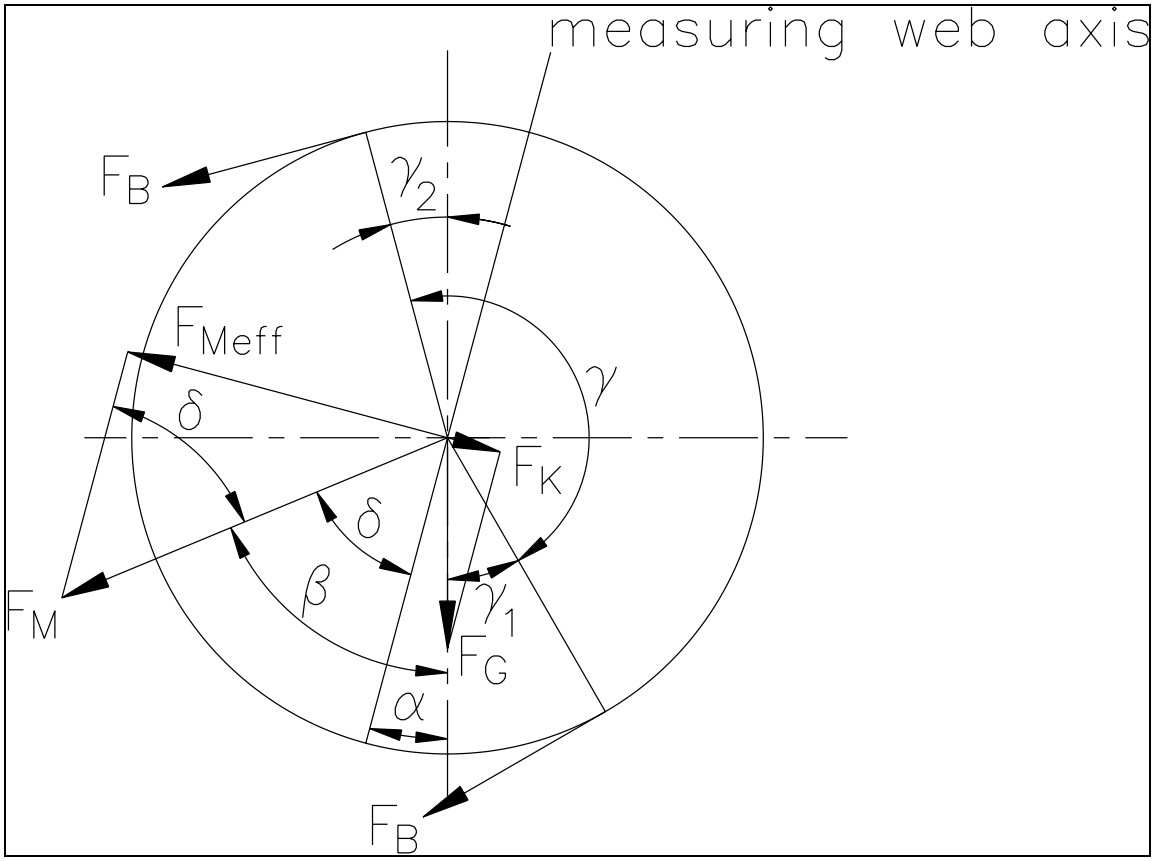


**fig. 13: Force vectors in the FMS force measuring bearing** C431012e

$$GainFactor = \frac{1}{\sin \delta \cdot \sin (\gamma / 2) \cdot n}$$

**Definition of symbols:**

| | | | |
|---|---|---|---|
| $\alpha$ | angle between vertical and measuring web axis | $F_B$ | material tension |
| $\beta$ | angle between vertical and $F_M$ | $F_G$ | roller weight |
| $\gamma$ | wrap angle of material | $F_M$ | measuring force resulting from $F_B$ |
| $\gamma_1$ | entry angle of material | $F_{Meff}$ | effective measuring force |
| $\gamma_2$ | exit angle of material | n | number of force sensors |
| $\delta$ | Angle between measuring web axis and $F_M$ | | |

**Example:**

- Please do the offset adjustment as described in „8.1. Simulating Method, Calibration with PLC or PC“.
- Calculate the Gain factor using the formula above.
- Enter the calculated Gain value in the parameter CAN-BUS object 2002h *Gain*.
- Offset and Gain are now fail safe stored in the measuring amplifier.

## 8.3 Scaling of Analogue Output

The analogue output in the EMGZ480 (see schematics in Fig.9) can be scaled to any nominal force. E.g. 500N must correspond to 10V the maximal output signal of the amplifier.

- Calibrate sensor and amplifier as shown in “8.1. Simulating Method, Calibration with the PLC or PC”.
- Enter the nominal force that should correspond to the maximum output of the amplifier in CAN-BUS object 2040h.
- The value has 4 digits. The decimal point depends on the CAN-BUS Object 2003h “*Force of sensor”*.
- The scaling factor is now fail safe stored in the measuring amplifier.

## 8.4 Configuring the Lowpass Filter

The lowpass filter in the EMGZ480/480.M16 suppresses faulty signal variations that may be caused by unbalanced rollers, vibrations of the machine, or similar instances. Signal variations that are faster than the cut-off frequency of the filter are suppressed. The lowpass filter is configured by setting the cut-off frequency and its filter order. The table below shows the value that has to be sent to CAN-BUS object 2005h.

| **Lowpass filter cut-off frequency** | **Setting value for filter of 1st order** | **Setting value for filter of 2nd order** |
|---|---|---|
| (Filter OFF) | 00h | 00h |
| 1 Hz | 43h | C3h |
| 2 Hz | 44h | C4h |
| 5 Hz | 45h | C5h |
| 10 Hz | 46h | C6h |
| 20 Hz | 47h | C7h |
| 50 Hz | 48h | C8h |
| 100 Hz | 49h | C9h |

**Note**

If the cut-off frequency is set too low, the output signal will become sluggish. In such a case it could happen that the feedback value is no longer suitable for control loop applications. The best trade off for the cut-off frequency must be found by considering the control loop limitations.

# 9 Parameter Setting

## 9.1 List of System Parameters

| Parameter | Unit | Min | Max | Default |
|---|---|---|---|---|
| Language | German, English | | | - |
| Unit-System | Metric or US standard | | | Metric |
| Baud-rate | kBit | 50, 100, 125, 250 | | 250 |
| Cycle time PDO | [ms] | 50, 100, 200, 500 | | 100 |

## 9.2 List of Parameter EMGZ 480 / 480.M16

| Parameter | Unit | Min | Max | Default |
|---|---|---|---|---|
| Offset | [Digit] | –8000 | 8000 | 0 |
| Gain | [-] | 0.100 | 32.000 | 1.000 |
| Force of Sensor | [N, kN, cN] | 1 | 9999 | 1000 |
| Unit of Sensor | [N, cN, kN] or [lb, clb, klb] | | | N |
| Lowpass output | [Hz] | 0.1 | 200.0 | 50.0 |
| Limit Value 1 min or max | Min, Max | | | Min |
| Limit Value 1 | [1] | [2] | | 0 |
| Limit Value 2 min or max | Min, Max | | | Max |
| Limit Value 2 | [1] | [2] | | 0 |
| Scaling Analogue Output | [1] | [2] | | 0 |

[1] If unit-system Metric = [N, cN, kN] / If unit-system US standard = [lb, clb, klb]
[2] A force value can be entered. The value must contain 4 digits. The decimal point depends from the parameter *Nom. Force of Sensor*

**Note**

Wong parameter settings can cause malfunctions during operation. Prior to commissioning the configuration of the system (parameter setting) must be done conscientiously.

## 9.3 Description of the System Parameters

The system parameters can be read or written with the CAN-BUS Objects

### Language

| | | | |
|---|---|---|---|
| **Use:** | This parameter determines the display language on the CAN-Master (e.g. PC or PLC) | | |
| **Range:** | English, German | **Default:** | English |
| **CAN Object:** | 2080h | | |

### Measuring system

| | | | |
|---|---|---|---|
| **Use:** | This parameter indicates the measuring system that will be displayed. If it is set to *metric*, all force values are shown in [N, cN, kN]. If it is set to *US standard*, all force values are shown in [lb, clb, klb]. | | |
| **Range:** | Metric, US standard | **Default:** | Metric |
| **CAN Object:** | 2081h | | |

### Baudrate

| | | | |
|---|---|---|---|
| **Use:** | This parameter sets the speed of the CAN-BUS interface. If this parameter is changed the electronic unit must be reset (power off – on). | | |
| **Range:** | 50, 100, 125, 250 | **Default:** | 250 |
| **CAN Object:** | 2082h | **Unit:** | [kBit] |

### Cycle time PDO

| | | | |
|---|---|---|---|
| **Use:** | The parameter determines the cycle time (frequency) of the PDO transmission in the CAN-BUS interface. If this parameter is changed the electronic unit must be reset (power off – on). | | |
| **Range:** | 50, 100, 200, 500 | **Default:** | 100 |
| **CAN Object:** | 2083h | **Unit:** | [ms] |

# 9.4 Description of Parameters EMGZ480 / 480.M16

## Offset

| | | | | | |
|---|---|---|---|---|---|
| **Use:** | This parameter stores the value determined by the CAN-Object 2051 *Find offset* in [Digit]. | | | | |
| **Range:** | –8000 | to | 8000 | **Default:** | 0 |
| **Increment:** | 1 | | | **Unit:** | [Digit] |
| **CAN Object:** | 2001h | | | | |

## Gain

| | | | | | |
|---|---|---|---|---|---|
| **Use:** | This parameter stores the value determined with the CAN Object 2052 *Calibration*. If the material tension cannot be simulated, you can also enter a calculated value using the formulas in „8.2 Mathematical Method (Module 1 only) “ | | | | |
| **Range:** | 0.100 | to | 32.000 | **Default:** | 1.000 |
| **Increment:** | 0.001 | | | **Unit:** | [-] |
| **CAN Object:** | 2002h | | | | |

## Force of sensor

| | | | | | |
|---|---|---|---|---|---|
| **Use:** | This parameter stores the nominal force of the sensor. This value can be found on the label of the force sensor. | | | | |
| **Range:** | 1 | to | 9999 | **Default:** | 1000 |
| **Increment:** | 1 | | | **Unit:** | [N, kN, cN] |
| **CAN Object:** | 2003h | | | ? | [lb, clb, klb] |

## Unit of sensor

| | | | | | |
|---|---|---|---|---|---|
| **Use:** | This parameter stores the measuring unit of the sensor. | | | | |
| **Range:** | N, kN, cN | | | **Default:** | N |
| **CAN Object:** | 2004h | | | | |

## Lowpass output

**Use:** The electronic unit contains a low-pass filter to prevent noise from interfere with the output signal. This parameter determines the cut off frequency of the filter. The lower the cut off frequency, the more sluggish the signal on the output terminals will be. Due to this filter, the output signal will be much more stable irrespective of the fluctuations of the force value.

**Range:** 0.1 to 200.0 **Default:** 50.0

**Increment:** 0.1 **Unit:** [Hz]

**CAN Object:** 2005h

## Limit value 1 min or max

**Use:** Through this CAN-BUS object the minimum or maximum limits of the parameter „*Limit value 1*“ can be configured. In the CAN-BUS Object 6508.1 the status of the *Limit value 1* can be seen.

**Range:** Min, Max **Default:** Min

**CAN Object:** 2006h

## Limit value 1

**Use:** CAN-BUS Object 6508.1 „*Limit value 1*“ is activated, if the defined threshold value is over- or under-run (irrespective of the parameter *Limit value 1 min or max*). This threshold value can be set with this CAN-BUS Object. If the parameter is set to 0, the limit value monitoring is deactivated.

**Range:** A force value can be entered. The decimal point is dependent on the CAN-BUS Object 2003h (*Force of sensor*) and the unit on the CAN-BUS Object 2004h (*Unit of force*).

**Default:** 0 **Unit:** [N, kN, cN] or [lb, klb, clb]

**CAN Object:** 2007h

## Limit value 2 min or max

**Use:** Through this CAN-BUS object the minimum or maximum limits of the parameter „*Limit value 2*“ can be configured. In the CAN-BUS Object 6508.2 the status of the *Limit value 2* can be seen.

**Range:** Min, Max **Default:** Max

**CAN Object:** 2008h

## Limit value 2

**Use:** CAN-BUS Object 6508.2 „*Limit value 2*“ is activated, if the defined threshold value is over- or under-run (irrespective of the parameter *Limit value21 min or max*). The threshold value can be set with this CAN-BUS Object. If the parameter is set to 0, the limit value monitoring is deactivated.

**Range:** A force value can be entered. The decimal point is dependent on the CAN-BUS Object 2003h (*Force of sensor*) and the unit on the CAN-BUS Object 2004h (*Unit of force*).

**Default:** 0 **Unit:** [N, kN, cN] or [lb, klb, clb]

**CAN Object:** 2009h

## Scale analogue output

**Use:** The parameter determines which tension feedback value corresponds to the maximum signal at the analogue output (10V respectively 20mA).

**Range:** A force value can be entered. The value has 4 digits. The decimal point depends on the CAN-BUS Object 2003 “*Force of sensor”*.

**Default:** 1000 **Unit:** [N, kN, cN] or [lb, klb, clb]

**CAN Object:** 2040h

# 10 Specification of the CAN-Bus Interface (Devise profile)

The following pages describe the CAN-BUD interface of the EMGZ480 / 480.M16. The CAN open „Communication Profile" bases on the CiA Draft Standard 301. In addition the EMGZ480 / 480.M16 amplifiers have some device specific CAN objects.

## 10.1 General Remarks

The *Object Class* is always „*mandatory*".

## 10.2 Summary of Objects (application specific)

| Index | Name |
|---|---|
| 1008 - 100A | Device Identification 1st part |
| 2000 – 2009<br>2040 | Parameter |
| 2051 | Find Offset |
| 2052 | Calibration |
| 2080 - 2083 | System Parameter |
| 7100 | Operation value A/D-converter (gross value) |
| 7130 | Operation value feedback |
| 2210 | Action Parameter, set Default Value |
| 2100 | Operation Status |
| 6150 | Status Analogue Output |
| 6508 | Alarms |
| 2090 - 2091 | Device Identification 2nd part |
| 2010 – 2039,<br>2041 – 2049,<br>2053 – 2079,<br>2084 – 2089,<br>2092 – 2099,<br>2101 – 2209,<br>2211 - 2299 | Reserved |

## 10.3 Device Identification

| | | |
|---|---|---|
| Object 1008 | Device Name: | "FMS EMGZ 480"*) |
| Object 1009 | Hardware Version: | "Revision A"*) |
| Object 100A | Software Version: | '1.00 '*) |
| | *(8 digits, unused digits are blank $20_{hex}$)* | |

*) *according CiA Draft Standard 301, page e 10-9*

# 11 CAN Bus Object Catalogue

The parameter name is always in the Sub-Index 2. The unit of the parameter is determined in the Sub-Index 3, which is defined as a Visible String.

## 11.1 Object 2001: Parameter Offset

**Offset**

| | | | | | |
|---|---|---|---|---|---|
| **Use:** | With the CAN-BUS object 2051 „ *find Offset*“ the found offset will be stored in a [Digit] value. This value can be manually changed. | | | | |
| **Range:** | –8000 | to | 8000 | **Default:** | 0 |
| **Increment:** | 1 | | | **Unit:** | [Digit] |
| **CAN Object:** | 2001h | | | | |

Object description:

| | |
|---|---|
| Index | 2001 |
| Name | Parameter Offset |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | -8000 ... +8000 |
| Default Value | 0 |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Offset feedback |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [Dig] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | -8000 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | +8000 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 11.2 Object 2002: Parameter Gain

**Gain**

**Use:** This parameter stores the value determined with the CAN Object 2052 *Calibration*. If the material tension cannot be simulated, you can also enter a calculated value using the formulas in „8.2 Mathematical Method (Module 1 only) “

**Range:** 0.100 to 32.000 **Default:** 1.000

**Increment:** 0.001 **Unit:** [-]

**CAN Object:** 2002h

Object description:

| | |
|---|---|
| Index | 2002 |
| Name | Parameter Gain |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. .07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 100 .. 32000 |
| Default Value | 1000 |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Gain feedback |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [-] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 3 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 100 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 32000 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1000 |

## 11.3 Object 2003: Parameter Force of Sensor

### Force of Sensor

**Use:** This parameter stores the nominal force of the sensor. This value can be found on the label of the force sensor.

**Range:** 1 to 9999 **Default:** 1000

**Increment:** 1 **Unit:** [N, kN, cN]

**CAN Object:** 2003h [lb, clb, klb]

Object description:

| | |
|---|---|
| Index | 2003 |
| Name | Parameter Force of sensor |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 1 .. 9999 |
| Default Value | 1000 |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Nominal force |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ]  dependent on object 2004 [N], [kN], [cN] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 9999 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1000 |

## 11.4 Object 2004: Parameter Unit of Sensor

**Unit of Sensor**

**Use:** This parameter stores the measuring unit of the sensor.
**Range:** N, kN, cN **Default:** N
**CAN Object:** 2004h

Object description:

| | |
|---|---|
| Index | 2004 |
| Name | Parameter Unit of sensor |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 2 |
| Default Value | 0 -> N |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Unit of sensor |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [N] falls 0, [kN] falls 1, [cN] falls 2 |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 2 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 -> N |

## 11.5 Object 2005: Parameter Lowpass Filter

### Lowpass Filter

**Use:** The electronic unit contains a low-pass filter to prevent noise from interfere with the output signal. This parameter determines the cut off frequency of the filter. The lower the cut off frequency, the more sluggish the signal on the output terminals will be. Due to this filter, the output signal will be much more stable irrespective of the fluctuations of the force value.

**Range:** 0.1 to 200.0 **Default:** 50.0

**Increment:** 0.1 **Unit:** [Hz]

**CAN Object:** 2005h

Object description:

| | |
|---|---|
| Index | 2005 |
| Name | Parameter Low Filter |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| Sub-Index | 1 |
|---|---|
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 1 .. 2000 |
| Default Value | 500 |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Lowpass feedback |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [Hz] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 2000 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | Ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 500 |

## 11.6 Object 2006: Parameter Limit value 1 min or max

**Limit value 1 min or max**

**Use:** Through this CAN-BUS object the minimum or maximum limits of the parameter „Limit value 1“ can be configured. In the CAN-BUS Object 6508.1 the status of the Limit value 1 can be seen.

**Range:** **Min, Max** **Default:** **Min**

**CAN Object:** 2006h

Object description:

| | |
|---|---|
| Index | 2006 |
| Name | Parameter Limit value 1 min or max |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 1 |
| Default Value | 0 |

| Sub-Index | 2 |
|---|---|
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Limit 1 min/max |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 11.7 Object 2007: Parameter Limit value 1

| **Limit value 1** | |
|---|---|
| **Use:** | CAN-BUS Object 6508.1 „*Limit value 1*“ is activated, if the defined threshold value is over- or under-run (irrespective of the parameter *Limit value 1 min or max*). This threshold value can be set with this CAN-BUS Object. If the parameter is set to 0, the limit value monitoring is deactivated. |
| **Range:** | A force value can be entered. The decimal point is dependent from the CAN-BUS Object 2003h (*Force of sensor*) and the unit from the CAN-BUS Object 2004h (*Unit of force*). |
| **Default:** | 0 |
| **Unit:** | [N, kN, cN] or [lb, klb, clb] |
| **CAN Object:** | 2007h |

Object description:

| | |
|---|---|
| Index | 2007 |
| Name | Parameter Limit value 1 |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | Ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 9999 |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |

| | |
|---|---|
| Default Value | Limit value 1 |
| Sub-Index | 3 |
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] dependent on object 2004 (Unit of sensor) and US-Standard |

| | |
|---|---|
| Sub-Index | 4 |
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0, dependent on object 2003 (Force of sensor) |

| | |
|---|---|
| Sub-Index | 5 |
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 6 |
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 9999 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 11.8 Object 2008: Parameter Limit value 2 min or max

| **Limit value 2 min or max** | | | |
|---|---|---|---|
| **Use:** | Through this CAN-BUS object the minimum or maximum limits of the parameter „*Limit value 2*“ can be configured. In the CAN-BUS Object 6508.2 the status of the *Limit value 2* can be seen. | | |
| **Range:** | Min, Max | **Default:** | Max |
| **CAN Object:** | 2008h | | |

Object description:

| | |
|---|---|
| Index | 2008 |
| Name | Parameter Limit value 2 min or max |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | Ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 1 |
| Default Value | 1 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Limit 2 min/max |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

## 11.9 Object 2009: Parameter Limit value 2

| **Limit value 2** | | | |
|---|---|---|---|
| **Use:** | CAN-BUS Object 6508.2 „*Limit value 2*“ is activated, if the defined threshold value is over- or under-run (irrespective of the parameter *Limit value21 min or max*). This threshold value can be set with this CAN-BUS Object. If the parameter is set to 0, the limit value monitoring is deactivated. | | |
| **Range:** | A force value can be entered. The decimal point is dependent from the CAN-BUS Object 2003h (*Force of sensor*) and the unit from the CAN-BUS Object 2004h (*Unit of force*). | | |
| **Default:** | 0 | **Unit:** | [N, kN, cN] or [lb, klb, clb] |
| **CAN Object:** | 2009h | | |

Object description:

| | |
|---|---|
| Index | 2009 |
| Name | Parameter Limit value 2 |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 9999 |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |

| | |
|---|---|
| Default Value | Limit value 2 |
| Sub-Index | 3 |
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ]  dependent on object 2004 (Unit of sensor) und US-Standard |

| | |
|---|---|
| Sub-Index | 4 |
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0,  dependent on object 2003 (Force of sensor) |

| | |
|---|---|
| Sub-Index | 5 |
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 6 |
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 9999 |

| | |
|---|---|
| Sub-Index | 7 |
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 11.10 Object 2040: Parameter scaling analogue output

### Scaling analogue output

**Use:** This parameter determines which tension feedback value will correspond to the maximum signal at the analogue output (10V respectively 20mA).

**Range:** A force value can be entered. The value has 4 digits. The decimal point depends from the CAN-BUS Object 2003 "*Force of sensor*".

**Default:** 1000

**Unit:** [N, kN, cN] or [lb, klb, clb]

**CAN Object:** 2040h

Object description:

| | |
|---|---|
| Index | 2040 |
| Name | Parameter Scaling analogue output |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 … 9999 |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Scale analogue output |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] dependent on object 2004 (Unit of sensor) and US-Standard |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0,  dependent on object 2003 (Force of sensor) |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 9999 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 11.11 Object 2051: Parameter Find offset

| **Find offset** |
|---|

**Use:** The CAN Bus Object 2051 *Find offset* determines the offset value of the analogue input. The found value is stored in the object 2001 *Offset* in [Digit].

**Range:** 0: No to 1: Yes **Default:** 0: No
**CAN Object:** 2051h

Object description:

| | |
|---|---|
| Index | 2051 |
| Name | Parameter Find offset |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Find offset |
| Data type | Integer 16 |
| Access | wo |
| PDO Mapping | No |
| Value Range | 0 … 1 |
| Default Value | 0 |

## 11.12 Object 2052: Parameter Calibration

| **Calibration** |
|---|

**Use:** The CAN-BUS Object 2052 *Calibration* determines the gain of the feedback value. The material tension is simulated with a known weight. This value can then be entered in [N] or [lbs]. The gain is calculated and stored in the object 2002 *Gain*. If 0 is entered, no gain value will be calculated.
The decimal point depends on the CAN-BUS object 2003 *Force of sensor.*

| | |
|---|---|
| Fnom ≥ 1000 | Digits after decimal point: 0 |
| Fnom < 1000 und Fnom ≥ 100 | Digits after decimal point: 1 |
| Fnom < 100 und Fnom ≥ 10 | Digits after decimal point: 2 |
| Fnom < 10 | Digits after decimal point: 3 |

**Range:** 0 to 9999 **Default:** 0

**CAN Object:** 2052h

Object description:

| | |
|---|---|
| Index | 2052 |
| Name | Parameter Calibration |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Calibration |
| Data type | Integer 16 |
| Access | wo |
| PDO Mapping | No |
| Value Range | 0 … 999999 |
| Default Value | 0 |

# 12 CAN-BUS Catalogue System Parameter Objects

## 12.1 Object 2080: System Parameter Language

| **Language** | | | |
|---|---|---|---|
| **Use:** | This parameter determines the display language on the CAN-Master (e.g. PC or PLC) | | |
| **Range:** | English, German | **Default:** | English |
| **CAN Object:** | 2080h | | |

Object description:

| | |
|---|---|
| Index | 2080 |
| Name | System Parameter Language |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 … 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | Rw |
| PDO Mapping | No |
| Value Range | 0 |
| Default Value | 1 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Language |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 12.2 Object 2081: System Parameter Measuring System

| **Measuring System** | | | |
|---|---|---|---|
| **Use:** | This parameter indicates the measuring system that will be displayed. If it is set to *metric*, all force values are shown in [N, cN, kN]. If it is set to *US standard*, all force values are shown in [lb, clb, klb]. | | |
| **Range:** | Metric, US standard | **Default:** | Metric |
| **CAN Object:** | 2081h | | |

Object description:

| | |
|---|---|
| Index | 2081 |
| Name | System Parameter Mass-System |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 … 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0 .. 1 |
| Default Value | 0 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Measuring System |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ ] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

## 12.3 Object 2082: System Parameter Baudrate

| **Baudrate** | | | |
|---|---|---|---|
| **Use:** | This parameter sets the speed of the CAN-BUS interface. If this parameter is changed the electronic unit must be reset (power off – on). | | |
| **Range:** | 0:50, 1:100, 2:125, 3:250 | | **Default:**3:250 |
| **CAN Object:** | 2082h | **Unit:** | [kBit] |

Object description:

| | |
|---|---|
| Index | 2082 |
| Name | System Parameter Baudrate |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0: 50, 1: 100, 2: 125, 3: 250 |
| Default Value | 3: 250 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Baud rate |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [kBit] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0: 50 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 3: 250 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 3: 250 |

## 12.4 Object 2083: System Parameter Cycle time PDO

| **Cycle time PDO** | | | |
|---|---|---|---|
| **Use:** | The parameter determines the cycle time (frequency) of the PDO transmission in the CAN-BUS interface. If this parameter is changed the electronic unit must be reset (power off – on). | | |
| **Range:** | 0:50, 1:100, 2:200, 3:500 | | **Default:**100 |
| **CAN Object:** | 2083h | **Unit:** | [ms] |

Object description:

| | |
|---|---|
| Index | 2083 |
| Name | System Parameter Cycle time PDO |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 1 .. 07h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Parameter value |
| Data type | Integer 16 |
| Access | rw |
| PDO Mapping | No |
| Value Range | 0: 50, 1: 100, 2: 200, 3: 500 |
| Default Value | 1: 100 |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Parameter name |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | Time slice PDO |

| Sub-Index | 3 |
|---|---|
| Description | Parameter unit |
| Data type | Visible String |
| Access | ro |
| PDO Mapping | No |
| Value Range | String |
| Default Value | [ms] |

| Sub-Index | 4 |
|---|---|
| Description | Parameter decimal places |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0 |

| Sub-Index | 5 |
|---|---|
| Description | Parameter minimum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 0: 50 |

| Sub-Index | 6 |
|---|---|
| Description | Parameter maximum value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 3: 500 |

| Sub-Index | 7 |
|---|---|
| Description | Parameter default value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | Constant |
| Default Value | 1: 100 |

# 13 CAN-BUS Catalogue Operating System Objects

## 13.1 Object 7100: Cross values A/D-Converter

This object contains the cross A/D-converter value of analogue input in Digit.

Object description:

| | |
|---|---|
| Index | 7100 |
| Name | A/D-converter value (cross) |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | A/D-converter analogue input gross value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | -8191 … +8191 |
| Default Value | No |

## 13.2 Object 7130: Feedback value

This object contains the feedback value of the amplifier. The decimal point depends on the CAN-BUS object 2003 *Force of sensor.*

The gain is calculated and stored in the object 2002h *Gain* and on the CAN-BUS object 2004h Unit of force sensor).

| | |
|---|---|
| Fnom ≥ 1000 | Digits after decimal point: 0 |
| Fnom < 1000 und Fnom ≥ 100 | Digits after decimal point: 1 |
| Fnom < 100 und Fnom ≥ 10 | Digits after decimal point: 2 |
| Fnom < 10 | Digits after decimal point: 3 |

Object description:

| | |
|---|---|
| Index | 7130 |
| Name | Feedback value |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Feedback value |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | PDO 0 |
| Value Range | 0 … 32767 (can also contain a negative value, if the offset was badly set) |
| Default Value | No |

# 14 CAN-BUS Catalogue Action Objects

## 14.1 Object 2210h: Parameter Set Default Parameters

This object restores the default parameter set which in the same time the factory settings.

0: No
1: Yes, restore default parameter set

Object description:

| | |
|---|---|
| Index | 2210h |
| Name | Set default parameters |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Restores default parameter set |
| Data type | Integer 16 |
| Access | wo |
| PDO Mapping | No |
| Value Range | 0 .. 1 |
| Default Value | 0: Nein |

# 15 CAN-BUS Catalogue Status Objects

## 15.1 Object 2100: Operating status

This object indicates the actual operating status.

Object description:

| | |
|---|---|
| Index | 2100 |
| Name | Operating status |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Shows actual operating status |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | PDO 1 |
| Value Range | 0 .. FFFF |
| Default Value | 0 |

| | |
|---|---|
| Bit 7: 0/1 ⇒ Reserved | inactive/active |
| Bit 6: 0/1 ⇒ Reserved | inactive/active |
| Bit 5: 0/1 ⇒ Overload of analogue input | inactive/active |
| Bit 4: 0/1 ⇒ Limit value 2 | inactive/active |
| Bit 3: 0/1 ⇒ Limit value 1 | inactive/active |
| Bit 2: 0/1 ⇒ Reserved for CMGZ 480 | inactive/active |
| Bit 1: 0/1 ⇒ Reserved for CMGZ 480 | inactive/active |
| Bit 0: 0/1 ⇒ Reserved for CMGZ 480 | inactive/active |

| | |
|---|---|
| Analogue input: | Shows whether the analogue input has a positive or negative overload |
| Limit value 2: | Shows whether the Limit value 2 activated |
| Limit value 1: | Shows whether the Limit value 1 activated |

## 15.2 Object 6150: Analogue Input Status

This object contains the status of the analogue input. Bit 1 and bit 2 cannot be set at the same time.

MSB LSB

| Reserved | Negative overload | Positive overload | Error |
|---|---|---|---|
| 7 3 | 2 | 1 | 0 |

Remarks:

| Value | Meaning |
|---|---|
| 00h | No error at the analogue input |
| 03h | Positive overload |
| 05h | Negative overload |

Object description:

| | |
|---|---|
| Index | 6150 |
| Name | Analogue input status |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | no |
| Value Range | 01h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Analogue input status |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 0, 3, 5 |
| Default Value | No |

## 15.3 Object 6508: Alarms

Object 6508 contains the alarms of the CAN-BUS amplifiers (tension values).

Remarks:

| Value | Meaning |
|---|---|
| 00h | No alarm |
| 01h | |
| 02h | Equal or exceeded |
| 03h | Went below limit |

Object description:

| | |
|---|---|
| Index | 6508 |
| Name | Alarms |
| Object Code | ARRAY |
| Data Type | Integer 16 |
| Category | Mandatory |

Input description:

| | |
|---|---|
| Sub-Index | 0 |
| Description | Number of entries |
| Data type | Unsigned 8 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 01 … 02h |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 1 |
| Description | Min. / Max. Limit value 1 |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 0, 2, 3 |
| Default Value | No |

| | |
|---|---|
| Sub-Index | 2 |
| Description | Min. / Max. Limit value 2 |
| Data type | Integer 16 |
| Access | ro |
| PDO Mapping | No |
| Value Range | 0, 2, 3 |

# 16 Communication Profile

## 16.1 PDO_0 (1800 / 1A00) ID: 180h + Node ID

1: Object 7130 (Feedback value)

Data is sent periodically. The cycle time is determined with object 2083 (cycle time PDO).

## 16.2 PDO_1 (1801 / 1A01) ID: 280h + Node ID

1: Object 2100 (operating status)

Data is sent periodically. The cycle time is determined with object 2083 (cycle time PDO).

# 17 Complete Object Overview

| Index | Type | Name |
|---|---|---|
| 1000 | Unsigned32 | Device type / C0191h according to Draft Standard 401 |
| 1005 | Unsigned32 | COB-ID SYNC-message |
| 1008 | Vis-String | Manufacturer device name |
| 1009 | Vis-String | Manufacturer hardware version |
| 100A | Vis-String | Manufacturer software version |
| 180+ID | PDOCommPar | 1. Transmit PDO Parameter (PDO 0) |
| 280+ID | PDOCommPar | 2. Transmit PDO Parameter (PDO 1) |
| 1A00 | PDOMapping | 1. Transmit PDO mapping |
| 1A01 | PDOMapping | 2. Transmit PDO mapping |
| 2001 | Integer 16 | Parameter Offset |
| 2002 | Integer 16 | Parameter Gain |
| 2003 | Integer 16 | Parameter Force of sensor |
| 2004 | Integer 16 | Parameter Unit of senor |
| 2005 | Integer 16 | Parameter Lowpass Filter |
| 2006 | Integer 16 | Parameter Limit value 1 Minimum or Maximum |
| 2007 | Integer 16 | Parameter Limit value 1 |
| 2008 | Integer 16 | Parameter Limit value 2 Minimum or Maximum |
| 2009 | Integer 16 | Parameter Limit value 2 |
| 2040 | Integer 16 | Parameter Scaling analogue output |
| 2010-39 | | Reserved |
| 2041-50 | | Reserved |
| 2051 | Integer 16 | Parameter Find offset |
| 2052 | Integer 16 | Parameter Calibration |
| 2053-79 | | Reserved |
| 2080 | Integer 16 | System Parameter language |
| 2081 | Integer 16 | System Parameter Measuring system |
| 2082 | Integer 16 | System Parameter Baudrate |
| 2083 | Integer 16 | System Parameter Cycle time PDO |
| 2084-89 | | Reserved |
| 2092-99 | | Reserviert |
| 2100 | Integer 16 | Operating status |
| 2101-99 | | Reserved |
| 2200-09 | | Reserved |
| 2210 | Integer 16 | Action Parameter Set default parameters |
| 2211-99 | | Reserved |
| 6150 | Integer 16 | Analogue input status |
| 6508 | Integer 16 | Status Alarms |
| 7100 | Integer 16 | A/D-converter value (cross) |
| 7130 | Integer 16 | Feedback value |

# 18 Non-Volatile Data Memory (EEPROM)

Following objects are fail-save stored in a EEPROM memory and after booting-up the last used parameter set is loaded in the system.

| ***Object*** | ***Item*** |
|---|---|
| 2000 – 2009, 2040 | Parameter |
| 2080 - 2083 | System Parameter |

Following objects are hardwired in the program code and are not changeable.

1000 Device type
1008 Device name
1009 Hardware version
100A Software version

# 19 Technical Reference

## 19.1 Other Elements for Settings of EMGZ 480

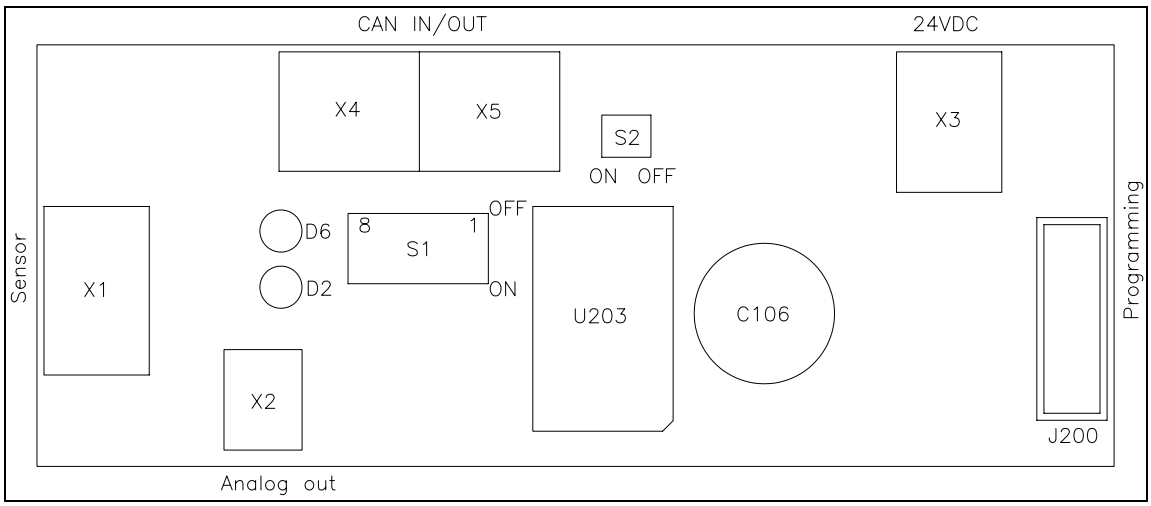


**Fig. 9: Setting Elements on the Electronic Board** E480014d

| Element | Function |
|---|---|
| S1 | Addressing of CAN-Bus |
| S2 | Line termination of CAN-Bus |
| D2 | CAN-Bus LED (red) |
| D6 | VCC Power LED (green) |
| J200 | Programming Connector (Tyco 12p). |

## 19.2 Function of the CAN-Bus LED (red)

| Element | Function |
|---|---|
| D2 off | No communication |
| D2 blinking | Pre-operational |
| D2 lon | Operational (communication OK) |

# 20 Trouble Shooting

From the system recognised errors can be requested in the CAN-BUS Object 2100h.

| Error | Cause | Corrective Action |
|---|---|---|
| **Feedback value is > 0 despite loose material** | Offset is wrongly compensated | Re-do Offset Compensation |
| **Feedback is not stable, although material tension is not changing** | Filter cut–off frequency is et too high. | Correct cut-off frequency (ref „8.6 Configuring lowpass filter“) |
| | Earth ground (PE) is not connected | Check earth ground connection and re-wire if necessary |
| | Electrical noise because of cross talk on cables | Check shild connection on sensor cable or bus cables. Use recommended twisted pairs cables (ref „7.4 Wiring diagrams“) |
| **Feedback value doesn’t correspond to actual material tension** | Gain value wrongly programmed | Re-calibrate sensor and amplifier (ref. to 8 “Calibration of Measuring Amplifier”) |
| **Limit value switch of one channel is not working** | Limit value wrongly programmed | Repeat setting of parameters (ref. to 9. “Parameter Settings” and „9.4 Description of Parameters“ page 24) |

# 21 Technical Data

| | |
|---|---|
| Number of measuring points | 1 |
| Sensor terminals | Max. 2 parallel wired sensors @ 350Ω per measuring point |
| Sensor supply voltage | 5.00VDC |
| Input Signal Range | 0...9mV (max. 12.5mV) |
| Resolution A/D-Converter | ±8192 Digit (14 Bit) |
| Measuring Error | <0.05% FS |
| Cycle Time | 2ms |
| Operation | Over CAN-BUS |
| Analogue Output | 0...10VDC |
| Power Supply | 24VDC (18...36VDC) / max. 50mA |
| Protection Class | IP68 |
| Temperature Range | -10...60°C |
| Weight | ca. 300g |

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