Operation Manual EMGZ473/474

Digital microprocessor controlled Tension Measuring
Amplifier with integrated PROFIBUS® interface

Operation Manual Version 2.03 02/03 ff
Firmware Version 1.04 02/03
GSD Version 1.03 05/02

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

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.
Bitte kontaktieren Sie Ihren nächstgelegenen FMS Vertreter.

1 Safety Instructions

1.1 Description Conditions

a) Danger of health injury or loss of life

> **STOP** **Danger**
>
> This symbol refers to high risk for persons to get health injury or loss life. It has to be followed strictly.

b) Risk of damage of machines

> **⚠** **Caution**
>
> This symbol refers to informations, 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 an important information about proper use. If not followed, malfunction can be the result.

1.2 List of Safety Instructions

⚠ Proper function of the Tension Measuring Amplifier is only guaranteed with the recommended application of the components. In case of other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.

⚠ 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 followed strictly.

⚠ When putting the housing cover to the bottom you must ensure that the D-Sub connection in both bottom and cover is in the right position. The cover can only be mounted in the right position! If the cover is mounted forcibly the electronic unit may be damaged!

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

⚠ Improper handling may damage the fragile electronic equipment! Don't use rough tools such as screwdrivers or pliers! Touch earthed metal part to discharge static electricity before touching the electronic unit!

Table of contents

2 Definitions

Offset: Correction value for compensation of the zero point difference. Thanks to the offset, it is ensured that a force of 0N will generate a signal of 0V exactly.

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

Strain gauge: Electronic component that will change its resistance while its length has changed. Strain gauges are used in the FMS force sensors for acquisition of the feedback value.

3 System Components

The EMGZ473/474 consists of the following components (refer also to fig. 1):

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

Electronic unit EMGZ473/474
- For supplying 1 or 2 force sensors and amplifying the mV signal
- With intergrated PROFIBUS interface for operation and parametrization
- Operates as PROFIBUS DP slave according to EN 50170
- For wall mounting, set off of the force sensor (EMGZ473)
- For control cabinet mounting (EMGZ474)

PROFIBUS master computer
- For operation of the electronic unit EMGZ473/474
- Operates as PROFIBUS DP master according to EN 50170
- Any master computer or PLC suitable

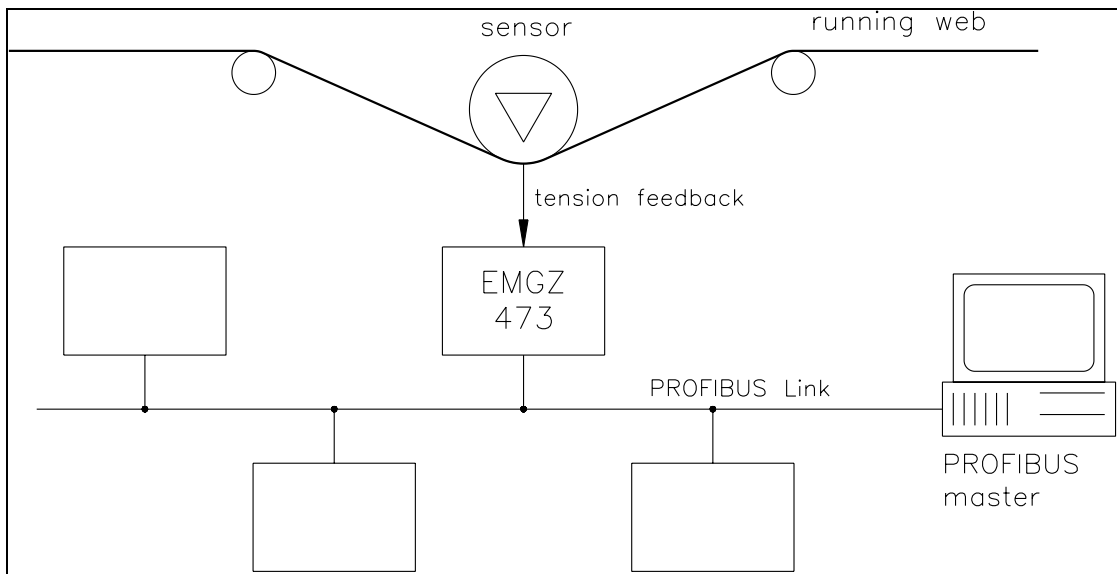*(Italic text indicates a variant or option)*

4 System Description

fig. 1: Basic structure of the EMGZ473 Tension Measuring Amplifier   E473001e

4.1 Functional Description

The force sensor measures the tension force in the material and transmits the measuring value as a mV signal to the electronic unit. The electronic unit amplifies the mV signal depending on configuration. The resulting feedback value can be read by the PROFIBUS master. The application specific calculations will be done by the PROFIBUS master.

4.2 Force Sensor

The force sensors are based on the flexion beam principle. The flexion is measured by strain gauges and transmitted to the electronic unit as mV signal. Due to the wheatstone wiring of the strain gauges, the measured value is according also to the power supply. So, the force sensors are supplied from the electronic unit by a very accurate power supply.

4.3 Electronic Unit EMGZ473/474

Common
The electronic unit contains a microprocessor to handle all calculations and communications, the highly accurate sensor power supply and the signal amplifier for the measuring value. In addition, a PROFIBUS interface is integrated to the electronic unit. The electronic unit can process the signals of two force sensors (sum signal).
EMGZ473: The EMGZ473 is built into a compact aluminium housing according to IP67. The cover has an electrical function identical to the PROFIBUS standard plug (connection of the cables and termination). This allows to disconnect the measuring amplifier from PROFIBUS without cutting the bus line.
EMGZ474: With control cabinet mounting, the EMGZ474 can be used. Connection is done with the PROFIBUS D-Sub-9 standard plug. This design is less robust against environmental influences (protection class IP00).

Strain gauge amplifier

The strain gauge amplifier provides the highly accurate 4V power supply. A highly accurate, fixed difference amplifier rises the mV signal up to 10V. This signal will be fed to the A/D converter. The microprocessor then calculates a standardized signal from the digitized measuring value, which is fed to the PROFIBUS interface.

PROFIBUS interface

The EMGZ473/474 operates as PROFIBUS DP slave according to EN 50170. All settings and the entire communication is done by the integrated PROFIBUS interface.
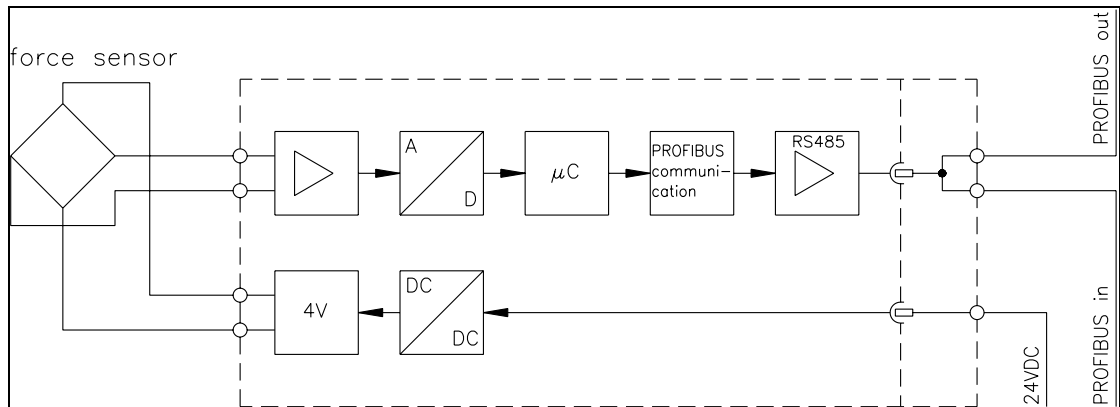
4.4 Block Diagram

fig. 2: block diagram EMGZ473   E473005e

5 Quick Installation Guide

- Check all your requirements such as: configuration of the PROFIBUS interface (address number, data format, required PROFIBUS cycle time, termination, etc), calibration mode (ref. to „9. Calibrating the measuring amplifier")?

- Draw your final wiring diagram according to the wiring diagram (refer to „7.4 Wiring diagram EMGZ473" / „7.5 Wiring diagram EMGZ474")

- Install and wire all your components (refer to „7. Installation and wiring")

- Make settings in the PROFIBUS master computer (DP master) (ref. to „8. PROFIBUS Interface Description")

- Set measuring amplifier into operation and calibrize it by PROFIBUS (refer to „9. Calibrating the measuring amplifier")

- Turn system on; proceed a test run with low speed

- If required, activate additional application-specific functions of the PROFIBUS master computer (DP master)

☞ **Note**

If a real-time control loop is implemented with the PROFIBUS, it has to be ensured that the application-specific PROFIBUS protocol is timewise short enough to provide sufficient control dynamics.

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6 Dimensions

6.1 Dimensions EMGZ473

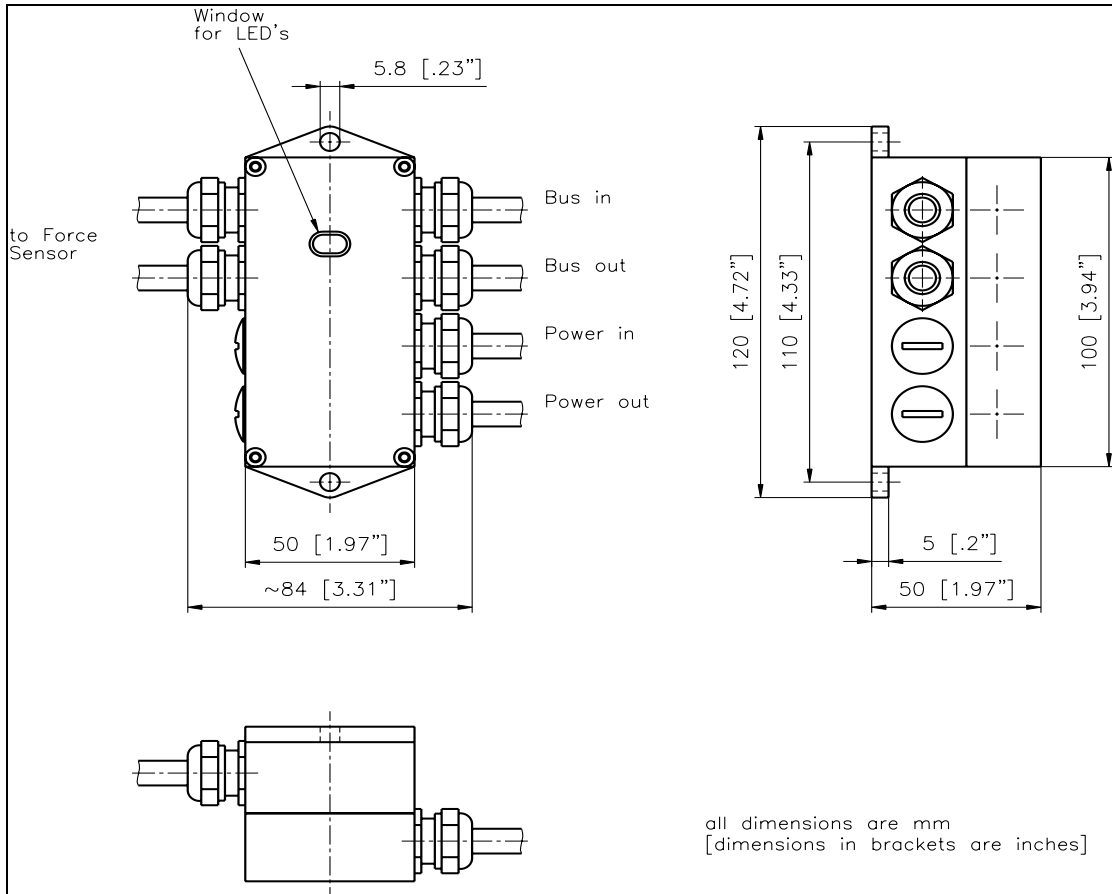**fig. 3 Outline drawing EMGZ473**   E473003us

6.2 Dimensions EMGZ474
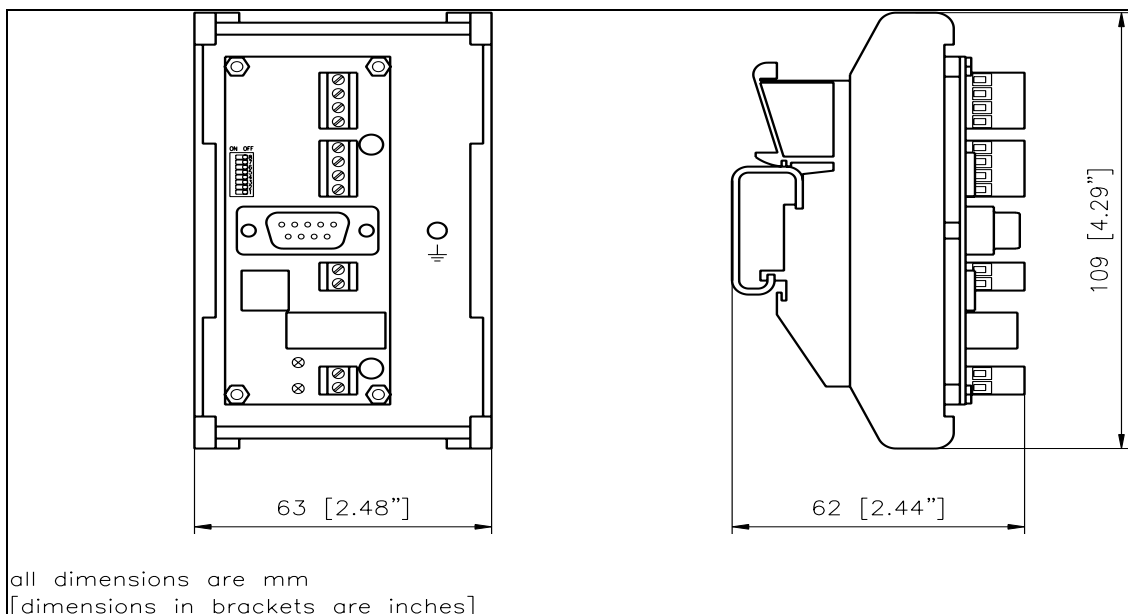

fig. 4 Outline drawing EMGZ474   E474001us

7 Installation and Wiring

⚠️ **Caution**

Proper function of the Tension Measuring Amplifier is only guaranteed with the recommended application of the components. In case of other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.

⚠️ **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 followed strictly.

⚠️ **Caution**

When putting the housing cover to the bottom you must ensure that the D-Sub connection in both bottom and cover is in the right position. The cover can only be mounted in the right position! If the cover is mounted forcibly the electronic unit may be damaged!

7.1 Mounting the Measuring Amplifier

EMGZ473: The housing with the measuring amplifier is mounted to the machine frame close to the force sensor.
EMGZ474: The measuring amplifier is snapped on a DIN mounting rail in a control cabinet.

7.2 Mounting the Force Sensors

Mounting of the force sensors is done referring to the FMS Installation manual which is delivered together with the force sensors. Wiring of the force sensor cables to the terminals is done according to the wiring diagram (fig. 6 and 7). This means all analogue wiring is done.

☞ **Note**

If the wiring to the force sensor is modified by the customer: Connecting the shield of the signal cable to the measuring amplifier *and* to the force sensor may cause ground circuits which may interfere the measuring signal massively. Malfunction can be the result. The shield should be connected only to the measuring amplifier. On the „force sensor side", the shield should stay open.

7.3 Setting Elements on the Electronic Unit

Bottom (EMGZ473/474)

DIP switch
PROFIBUS
Adresse

ON OFF

D-Sub-9
PROFIBUS standard jack

LED 1   LED 2

LED 1 = Power good
LED 2 = PROFIBUS communication active

Cover (EMGZ473 only)

jumper
park
position

2 jumpers for termination
(J10, J11 seated = terminated)

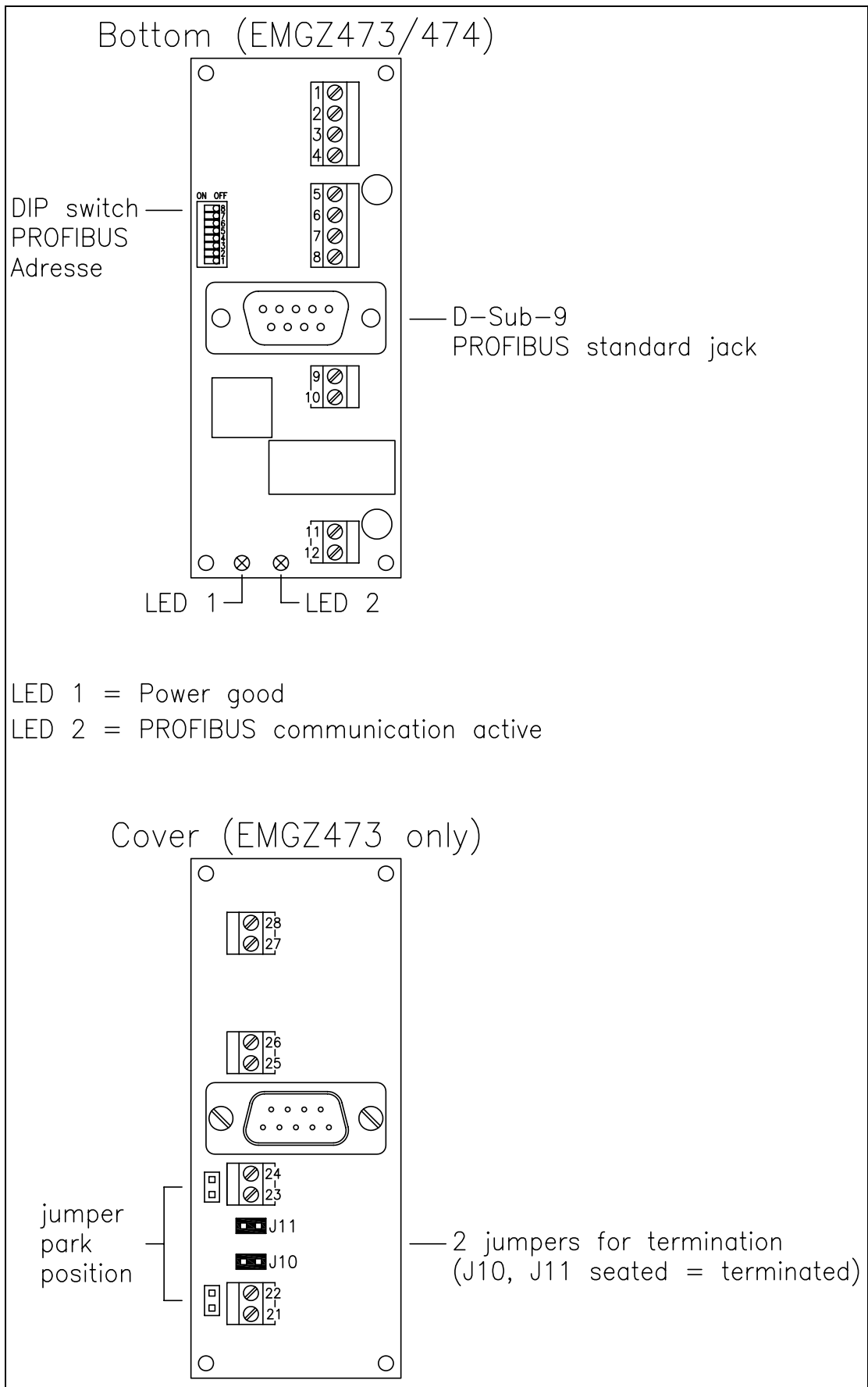**fig. 5: Setting elements on the electronic unit**   E473010e

7.4 Wiring Diagram EMGZ473

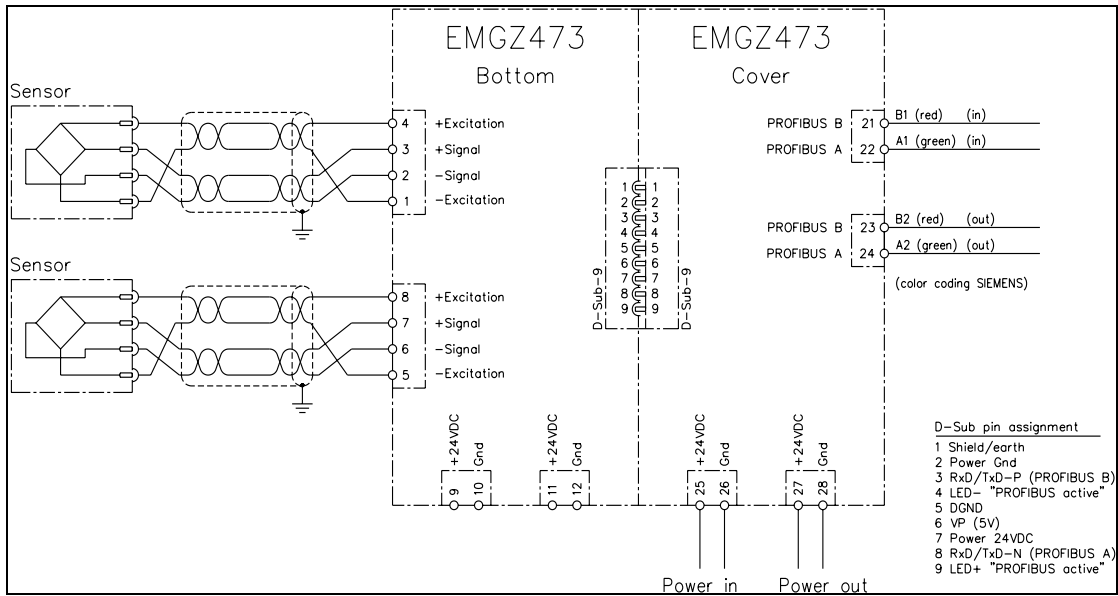**fig. 6: Wiring and Terminal Schematics EMGZ473**   E473009e

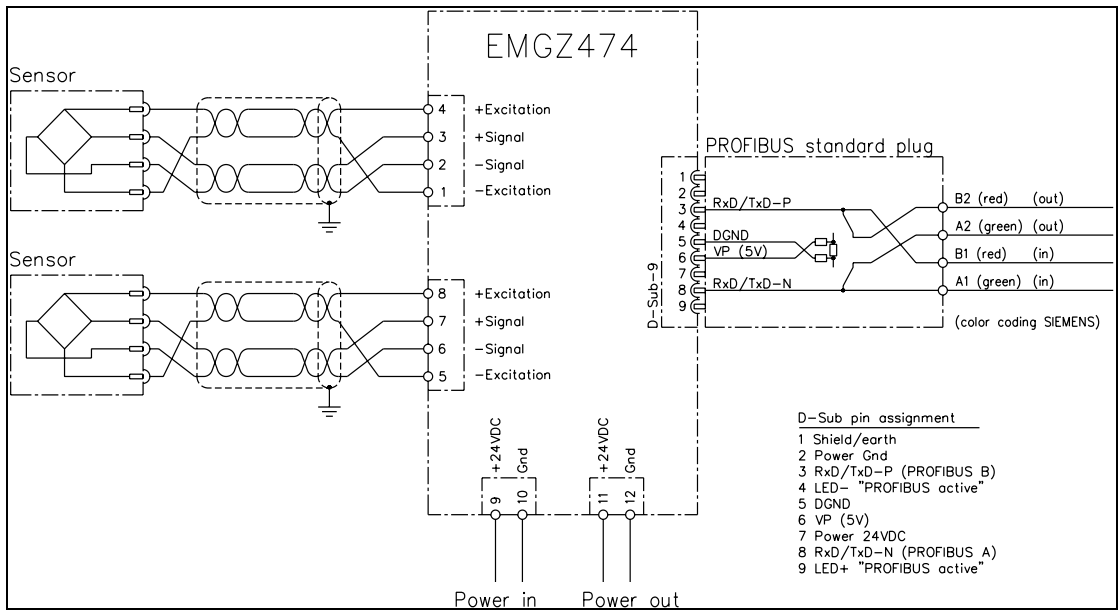## 7.5 Wiring Diagram EMGZ474

fig. 7: Wiring and Terminal Schematics EMGZ474   E474002e

7.6 Wiring of Power Supply and PROFIBUS Data Cable

Wiring of the power supply
Wiring of the power supply (24VDC) to the terminals in the housing cover is done according to the wiring diagram.

> ⚠ **Caution**
>
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>
> ⚠ **Caution**
>
> Improper handling may damage the fragile electronic equipment! Don't use rough tools such as screwdrivers or pliers! Touch earthed metal part to discharge static electricity before touching the electronic unit!

Wiring of the PROFIBUS cables
The standardized PROFIBUS cable type A (STP 2x0.34^2) [AWG 22] has to be used for the PROFIBUS data cable.
EMGZ473: The cables are bared referring to fig. 8 and connected to the terminals in the cover according to the wiring diagram.
EMGZ474: The cables are connected to the D-Sub-9 PROFIBUS standard connector according to manufacturer's instructions.

fig. 8: Preparation of the PROFIBUS cables E470010e
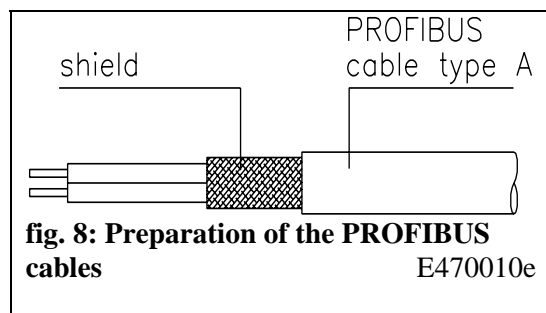
Both cables connected – Termination open
If both cables are connected (Bus in and Bus out), it has to be ensured that the connection is not terminated.
EMGZ473: The two termination jumpers (J10, J11) must be free (fig. 5).
EMGZ474: Termination is done according to the instructions of the plug manufacturer.

Only one cable connected – Termination set
If only one cable is connected (Bus in), the connection must be terminated properly.
EMGZ473: The two termination jumpers (J10, J11) have to be set (fig. 5).
EMGZ474: Termination is done according to the instructions of the plug manufacturer.

> ☞ **Note**
>
> The PROFIBUS network has to be terminated properly. Otherwise the installation cannot be set into operation. It has to be ensured that only the last device of the PROFIBUS chain is terminated.

7.7 Setting the PROFIBUS Address

The measuring amplifier requires a unique PROFIBUS address which indicates it definitely in the whole PROFIBUS network. Therefore no other PROFIBUS device in the network may use the same address. The address has to be between 0...125.

The PROFIBUS address is set with the DIP switch (fig. 9) and referring to the table below. After switching the measuring amplifier off an on, the new address is valid.
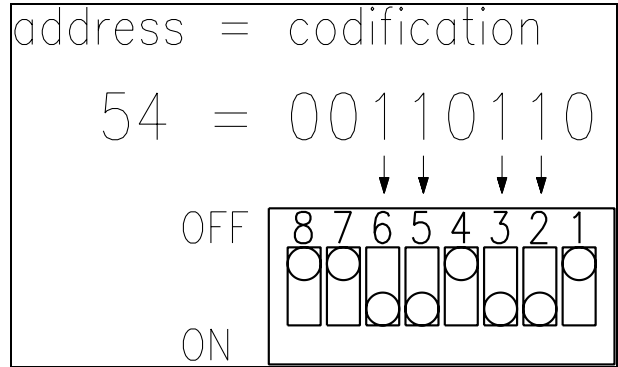
```
address = codification

  54 = 00110110
              ↓  ↓    ↓ ↓
OFF    8 7 6 5 4 3 2 1
        ○ ○  ○  ○
           ○  ○  ○ ○
ON
```

fig. 9: Coding of the PROFIBUS address (Example with address 54)   E470007e

Ad	DIP switch	Ad	DIP switch	Ad	DIP switch	Ad	DIP switch	Ad	DIP switch
0	0000 0000	25	0001 1001	50	0011 0010	75	0100 1011	100	0110 0100
1	0000 0001	26	0001 1010	51	0011 0011	76	0100 1100	101	0110 0101
2	0000 0010	27	0001 1011	52	0011 0100	77	0100 1101	102	0110 0110
3	0000 0011	28	0001 1100	53	0011 0101	78	0100 1110	103	0110 0111
4	0000 0100	29	0001 1101	54	0011 0110	79	0100 1111	104	0110 1000
5	0000 0101	30	0001 1110	55	0011 0111	80	0101 0000	105	0110 1001
6	0000 0110	31	0001 1111	56	0011 1000	81	0101 0001	106	0110 1010
7	0000 0111	32	0010 0000	57	0011 1001	82	0101 0010	107	0110 1011
8	0000 1000	33	0010 0001	58	0011 1010	83	0101 0011	108	0110 1100
9	0000 1001	34	0010 0010	59	0011 1011	84	0101 0100	109	0110 1101
10	0000 1010	35	0010 0011	60	0011 1100	85	0101 0101	110	0110 1110
11	0000 1011	36	0010 0100	61	0011 1101	86	0101 0110	111	0110 1111
12	0000 1100	37	0010 0101	62	0011 1110	87	0101 0111	112	0111 0000
13	0000 1101	38	0010 0110	63	0011 1111	88	0101 1000	113	0111 0001
14	0000 1110	39	0010 0111	64	0100 0000	89	0101 1001	114	0111 0010
15	0000 1111	40	0010 1000	65	0100 0001	90	0101 1010	115	0111 0011
16	0001 0000	41	0010 1001	66	0100 0010	91	0101 1011	116	0111 0100
17	0001 0001	42	0010 1010	67	0100 0011	92	0101 1100	117	0111 0101
18	0001 0010	43	0010 1011	68	0100 0100	93	0101 1101	118	0111 0110
19	0001 0011	44	0010 1100	69	0100 0101	94	0101 1110	119	0111 0111
20	0001 0100	45	0010 1101	70	0100 0110	95	0101 1111	120	0111 1000
21	0001 0101	46	0010 1110	71	0100 0111	96	0110 0000	121	0111 1001
22	0001 0110	47	0010 1111	72	0100 1000	97	0110 0001	122	0111 1010
23	0001 0111	48	0011 0000	73	0100 1001	98	0110 0010	123	0111 1011
24	0001 1000	49	0011 0001	74	0100 1010	99	0110 0011	124	0111 1100
								125	0111 1101

8 PROFIBUS Interface Description

8.1 GSD File

The PROFIBUS DP master has to know which devices are connected to the PROFIBUS network. For this purpose the GSD file is required. The GSD file for the EMGZ473/474 measuring amplifier can be taken from the following internet address:
http://www.fms-technology.com/gsd
The GSD file can also be supplied on a floppy disk on request. In this case please contact FMS customer service.

Read in the GSD file into the PROFIBUS DP master
How to read in the GSD file into the control system (DP master) is depending on the used control system. For further information, refer to the documentation of the control system.

☞ **Note**

The GSD file version must match with the firmware version of the measuring amplifier. Otherwise there may be problems while setup. Version numbers of firmware and GSD file are printed to the cover page of this operating manual.

8.2 EMGZ473/474 DP Slave Functional Description

The measuring amplifier EMGZ473/474 supports a PROFIBUS link which operates according to the PROFIBUS DP protocol according to EN 50170. Hereby the measuring amplifier operates as DP slave and the control system as DP master. Several parameters have to be set and met by the control system.

8.3 Initial Parameters

Initial parameters are sent from the control system to the measuring amplifier once while initialization. They are normally set to a fixed value for a machine with the programming tool of the control system.
The first bytes of the parameter telegram are specified in the EN 50170 standard. An user segment of 4 bytes is defined manufacturer-specific for the measuring amplifier.

Byte	Use	Value	Meaning
0	Initial parameter	0	(Remain Offset unchanged)
		1	Find Offset
1	User Gain Reference, High Byte	0	(Remain Gain unchanged)
		$\neq 0$	Calibrate Gain: Tells the measuring amplifier
2	User Gain Reference, Low Byte		the force value which corresponds to the actual load.
3	Lowpass filter	0	Filter OFF
		$\neq 0$	Filter ON (ref. to „9.5 Configuring the Lowpass Filter")

Byte 0 (Find Offset) has priotity against Byte 1 + 2 (Calibrate Gain).

8.4 Configuration

The configuration defines how many process data (byte and word) are sent during the cyclic communication from the control system to the measuring amplifier and from the measuring amplifier to the control system. It is normally set to a fixed value for a program with the programming tool of the control system.

To ensure maximum flexibility using the measuring amplifier, there are different modules supplied. In a single measuring amplifier only one module can be set active at a time. The terms and structures are referring to the profile for variable speed drives of the PROFIBUS user organization.

Module 1: Full control

3 bytes (1 byte and 1 word) are transmitted from the control system to the measuring amplifier and also 3 bytes (1 byte and 1 word) from the measuring amplifier to the control system in each data cycle.

request telegram (master → slave)	control byte? **(STB)**	main reference value? **(HSW)**
response telegram (slave → master)	status byte **(ZSB)**	main actual value **(HIW)**

Module 2: Feedback with status

The control system cyclically sends an empty telegram. The measuring amplifier answers with the actual feedback value and with a status byte which indicates the quality of the feedback value. This configuration can be used if offset and gain adjustment are done and no process parameters of the measuring amplifier are read or modified, or if the whole evaluation of the feedback value (offset, gain, limit value monitoring) is done by the control system.

request telegram (master → slave)	empty	
response telegram (slave → master)	status byte **(ZSB)**	main actual value **(HIW)**

Module 2a: Feedback with status

Identical with module 2 but the status byte is transmitted as a 16 bit word. The upper 8 bit are not used and therefore = 0.

request telegram (master → slave)	empty	
response telegram (slave → master)	00000000 + status byte **(ZSB)**	main actual value **(HIW)**

8.5 Process Data

The number of process data specified in the configuration is transmitted cyclically. There are manin reference value, main actual value, control byte and status byte.

Control byte (STB)
The control byte transmits the required command to the measuring amplifier. (Module 1 only)

Master → Slave

STB	HSW

Bit #   7......0
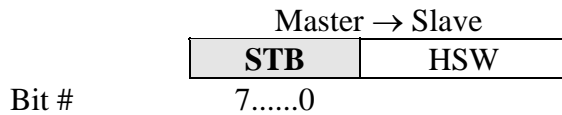
Value	Meaning	Remarks
00h	Default	Normal operating mode
09h	Read Device Type	
21h	Read User Offset	
23h	Write User Offset	HSW = User Offset to be written
25h	Find User Offset	Measuring value will be set to zero
29h	Read User Gain	
2Bh	Write User Gain	HSW = User Gain to be written
2Dh	Calibrate User Gain	HSW = Force value which corresponds to the actual material tension
F9h	Read Firmware Version	

Main reference value (HSW)
The main reference value transmits the actual parameter value. (Module 1 only)

Master → Slave

| STB	HSW

Bit #   15......0
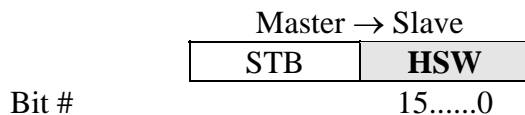
The main reference value is a 16 bit word (range ±32767). The high byte is transmitted before the low byte.
We recommend to set Offset and Gain in a way that loading the sensor at nominal force will give a feedback value of 10000 (default). (ref. to „9. Calibrating the measuring amplifier")

Status byte (ZSB)
The status byte indicates the status of the measuring amplifier.

Slave → Master

ZSB	HIW

Bit #   7......0
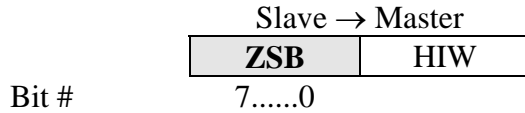
Value	Meaning	Remarks
00h	Ok	Acquiring of measuring value ok
02h	Overflow	The allowed measuring range is exceeded
04h	Error	An error appeared during acquiring of the measuring value
06h	Overload	The sensor power source is overload
09h	Read Device Type	EMGZ473/474: HIW = 2
21h	User Offset read	HIW = User Offset read
23h	User Offset written	HIW = User-Offset written
25h	User Offset found	HIW = User Offset found
29h	User Gain read	HIW = User Gain read
2Bh	User Gain written	HIW = User Gain written
2Dh	User Gain calibrated	HIW = User Gain calculated
F9h	Firmware Version	HIW = main version (high byte) + sub version (low byte)

Main actual value (HIW)
The main actual value transmits the actual measuring value.

Slave → Master

ZSB	HIW

Bit #   15......0
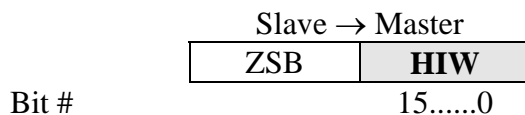
The main actual value is a 16 bit word (range ±32767) which transmits the processed measuring value of the measuring amplifier. The high byte is transmitted before the low byte.

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9 Calibrating the Measuring Amplifier

To get correct measuring values, offset and gain have to be determinated while setting into operation. There are several methods for this task:

Method	Use with	Advantage
Simulating method calibration within the PLC	Module 1+2	No settings required for the measuring amplifier
Simulating method calibration using initial parameters	Module 1+2	Can be done without programming
Simulating method calibration using control byte	Module 1	Highest flexibility
Mathematical method	Module 1	Less accurate than simulating method

9.1 Simulating Method, Calibration within the PLC

The following instructions are referring to a setup and calibration on-site. The material tension will be simulated by a weight (fig. 10). Offste and Gain calibration is done within the PLC or the master computer.

- Insert material or a rope loosely to the machine.
- The offset corresponds to the actually transmitted main actual value (HIW):

$$offset = HIW$$

- Load material or rope with a defined weight (fig. 10)
- The gain factor now is calculated from the actually transmitted main actual value (HIW):

$$gain = \frac{F_{Calib} \cdot 10000}{F_{No\min al} \cdot (HIW - offset)}$$

- The determined values for gain and offset are used by the control system

fig. 10: Calibrating the measuring amplifier   C431011e

to calculate the actual material tension in [N] from the main feedback value:

$$F_{Beff} = gain \cdot \frac{F_{Nominal}}{10000} \cdot (HIW - offset)$$

Definition of symbols:
F_{Calib} applied calibration load [N or lbs] (refer to fig. 11)
$F_{Nominal}$ nominal force of sensor [N or lbs]
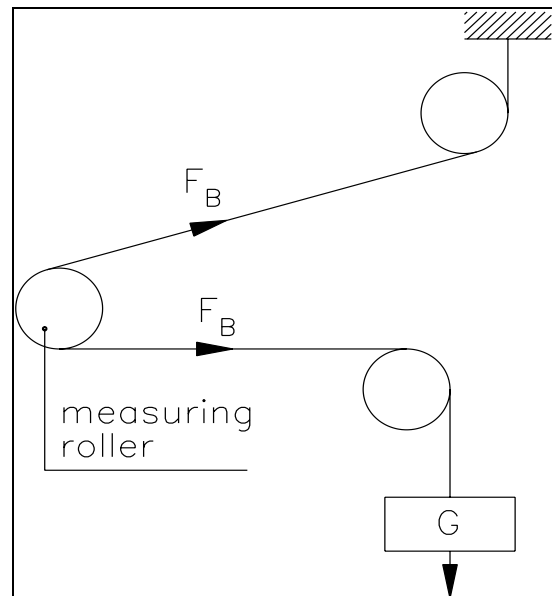F_{Beff} actual material tension [N or lbs]
HIW main actual value

9.2 Simulating Method, Calibration using Initial Parameters

The following instructions are referring to a setup and calibration on-site. The material tension will be simulated by a weight (fig. 10).

Offste and Gain calibration is done in the measuring amplifier using the initial parameter (ref. also to „8.3 Initial Parameter").

- Insert material or a rope loosely to the machine.
- Set initial parameter byte 0 to „1". The measuring amplifier calculates automatically the new offset value.
- Reset initial parameter byte 0 to „0".
- Load material or rope with a defined weight (fig. 10)
- Set initial parameter byte 1+2 to a measuring value corresponding to the applied weight (ref. to „8.3 Initial Parameter"). The measuring amplifier calculates automatically the new gain value.
- Reset initial parameter byte 1+2 to „0".
- Offset and Gain are now fail safe stored in the measuring amplifier.

☞ **Note**

The main actual value (HIW) must also be capable to show overload values correctly. Therefore the calibration must be done in a way that the HIW range (±32767) is not fully used at nominal load. We recommend to set Offset and Gain so that loading the sensor at nominal force will give a feedback value of 10000.

9.3 Simulating Method, Calibration using Control Byte

The following instructions are referring to a setup and calibration on-site. The material tension will be simulated by a weight (fig. 10).

Offste and Gain calibration is done in the measuring amplifier using the control byte and the main reference value (module 1 only; ref. also to „8.5 Process Data").

- Insert material or a rope loosely to the machine.
- Set control byte of a request telegram to „25h". The measuring amplifier calculates automatically the new offset value. The new offset value is transmitted in the related response telegram (ref. to „8.5 Process Data").
- Load material or rope with a defined weight (fig. 10)
- Set control byte of a request telegram to „2Dh" and the main reference value (HSW) to a measuring value corresponding to the applied weight (ref. to „8.3 Initial Parameter"). The measuring amplifier calculates automatically the new gain value. The new gain value is transmitted in the related response telegram (ref. to „8.5 Process Data").
- Offset and Gain are now fail safe stored in the measuring amplifier.
- If required you can switch now to module 2 (feedback with status) (ref. to „8.4 Configuration"). These telegrams are 3 bytes shorter which allows faster cycle times.

9.4 Mathematical method (Module 1 only)

If the material tension cannot be simulated, calibration has to be done by calculation. This way of calibrating is less accurate because the exact angles are often unknown and the effective mounting conditions, which usually deviate from the ideal, are not taken into account.

fig. 11: Force vectors in the FMS force measuring bearing   C431012e

- Offset adjustment has to be done as described under „Simulating method, calibration using control byte".

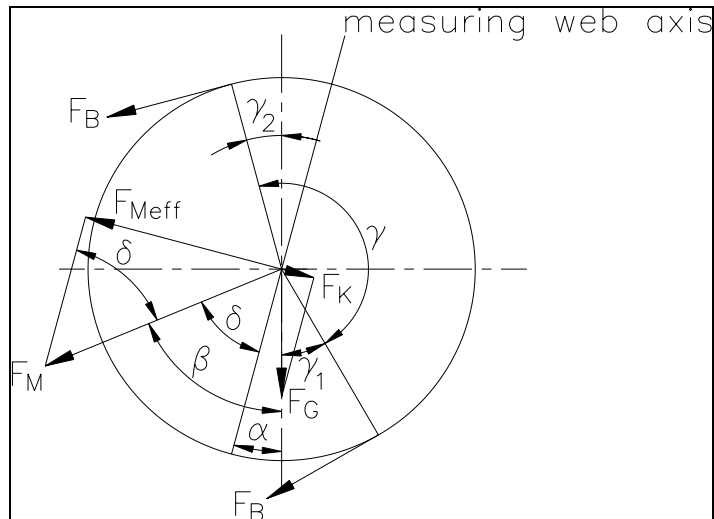- The Gain value will be calculated by the following formula:

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

Definition of symbols:

α	angle between vertical and measuring web axis	F_B	material tension
β	angle between vertical and F_M	F_G	roller weight
γ	wrap angle of material	F_M	measuring force resulting from F_B
γ_1	entry angle of material	F_{Meff}	effective measuring force
γ_2	exit angle of material	n	number of force sensors
δ	Angle between measuring web axis and F_M		

- Set control byte of a request telegram to „2Bh" and the main reference value (HSW) to the calculated gain value (ref. to „8.5 Process Data"). The measuring amplifier stores the gain value. The new gain value is transmitted in the related response telegram (ref. to „8.5 Process Data").
- Offset and Gain are now fail safe stored in the measuring amplifier.
- If required you can switch now to module 2 (feedback with status) (ref. to „8.4 Configuration"). These telegrams are 3 bytes shorter which allows faster cycle times.

9.5 Configuring the Lowpass Filter

The measuring amplifier provides a lowpass filter. It is used to eliminate faulty signal variations which may be caused by unbalanced rollers, vibrations of the machine, or equivalent. Signal variations which are faster than the cut-off frequency are then suppressed. The lower the cut-off frequency, the more sluggish the output signal will be.

There can be used a filter of 1st or 2nd order. A filter of 2nd order has a greater clearness of tuning than a filter of 1st order.

The lowpass filter is configured by setting its cut-off frequency and order level appropriate. For this purpose a setting value is determined in the table below and the setting value is sent to the measuring amplifier using the initial parameters, byte 3 (ref. to „8.3 Initial parameters").

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 to a value too low, the output signal will become sluggish. It may be that the feedback value is no longer suitable for control loop applications. You have to pay attention that the cut-off frequency is set to a suitable value.

10 Trouble Shooting

Error	Cause	Corrective action
Status byte (ZSB) Bit 2+1 = OVERFLOW:	Force sensor wrong connected / cabling defect	Correct sensor cabling
The sensor gives a signal too big (> ±9.92mV)	Force sensor defect	Replace force sensor
Status byte (ZSB) Bit 2+1 = ERROR	A general error has appeared while measuring	– Turn machine off and back on. – If the problem persists, check wiring to the force sensor. – If the wiring is ok and the problem persists, contact FMS customer service.
Status byte (ZSB) Bit 2+1 = OVERLOAD:	Cabling defect (short cut)	Correct sensor cabling, replace cable if necessary
The sensor power supply is overload	Force sensor defect	Replace force sensor
Feedback value is > 0 even though material is loosely	Offset badly calculated	Proceed for offset adjustment again (refer to „8.6 Calibrating the measuring amplifier")
Feedback value doesn't correspond with the effective material tension	Gain badly calculated	Proceed for measuring amplifier calibration again (refer to „8.6 Calibrating the measuring amplifier")
Measuring amplifier does not respond by PROFIBUS (LED2	DIP switch and station address (setting in the PROFIBUS DP master) don't match	Verify / correct DIP switch and station address
lights)	Application in PLC / master computer reads from a wrong I/O address of the PROFIBUS DP master	Detect correct I/O address of the PROFIBUS DP master and set it in your application
	Program error; the answer given by the measuring amplifier is badly evaluated	Correct program of the control system
Measuring amplifier does not respond by PROFIBUS (LED 2	Wrong address set	Set slave address to correct value (refer to „7.6 Setting the PROFIBUS address") or modify the program
doesn't light)	PROFIBUS data cable badly terminated	Terminate data cable correctly; check position of the jumpers (refer to „7.4 Wiring of power supply and PROFIBUS data cable / Termination")
	PROFIBUS wires (A and B) reversed	Reverse PROFIBUS wires (A and B) in the terminal block
	Power supply not correct	Check / correct power supply. The LED1 must light (fig. 5)
	Electronic unit defect	Contact FMS customer service

11 Technical Data

Connection of force sensors	1 or 2 force sensor of 350Ω
Excitation of sensors	4VDC
Input signal voltage	0...7.2mV (max. 9.92mV)
Resolution A/D converter	±2048 Digit (12 Bit)
Measuring error	<0.05% FS
Cycle time	2ms
Operation	entirely by PROFIBUS
Feedback value	10000 at nominal force of force sensor (7.2mV)
Limit value monitoring	to be developed – ask FMS customer service
PROFIBUS protocol	PROFIBUS DP slave according to EN 50170
PROFIBUS data transfer rate	up to 12Mbaud
PROFIBUS address	set by DIP switch (0...125)
PROFIBUS operating modes	Full control, Feedback with status
Connection (Bus in, Bus out, Power)	EMGZ473: cables ø8...10mm [.3"... .4"], led through PG glands to screw terminals EMGZ474: PROFIBUS D-Sub-9 standard plug
Required cables	PROFIBUS cable type A, STP $2x0.34^2$ [AWG 22]
Power supply	24VDC (18...36VDC) / 0.1A
Temperature range	–10...60°C [14...140°F]
Protection class	EMGZ473: IP67 EMGZ474: IP00