Operating Manual EMGZ621A

Digital microprocessor controlled
Double Channel Tension Measuring Amplifier

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Firmware Version: ab 2.01
GSD Version ab 1.00
Hardware Rev. D

This operation 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.

1 Safety Instructions

1.1 Description conditions

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. It has to be followed strictly.

Risk of damage to machines

Caution

This symbol refers to risk of heavy mecanical damage. This warning has to be followed absolutely.

Notice 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 electronic unit 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 electrical equipment. They are not taken into consideration in this operating manual. However, they have to be followed strictly.
- Bad earth 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 earth connection is done.
- The processor board is mounted to the housing cover. Improper handling may damage the fragile electronic equipment! Don’t use rough tools such as screwdrivers or pliers! Touch processor board as little as possible! Touch earthed metal part to discharge static electricity before opening the housing!
- Wrong setting of the jumpers and solder bridges may cause malfunction of the electronic unit or the total system! Setting of the solder bridges and jumpers must be checked carefully prior to power on! Setting of the solder bridges should be carried out by trained personnel only!

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 zero exactly.

Gain: Amplification factor for the measuring signal. Use of an appropriate value will adjust the force sensor signal to the tension feedback value exactly.

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.

Subprint: Electronic extension module which can be plugged to the main board of the electronic unit if required. That way, the possibilities of the electronic unit can be extended easily.

3 System Components

An EMGZ621A system 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 EMGZ621A

- For supplying the force sensors and amplifying of the mV signal
- Two separated analogue inputs for the sensors of a single measuring point
- With operation panel for parametrization
- Digital inputs and outputs
- With robust aluminium housing
- Supports connection of external feedback displays
- Interface RS232
- *Interface CAN-Bus, PROFIBUS, DeviceNet*

(Variants and options in italic text)

4 System Description

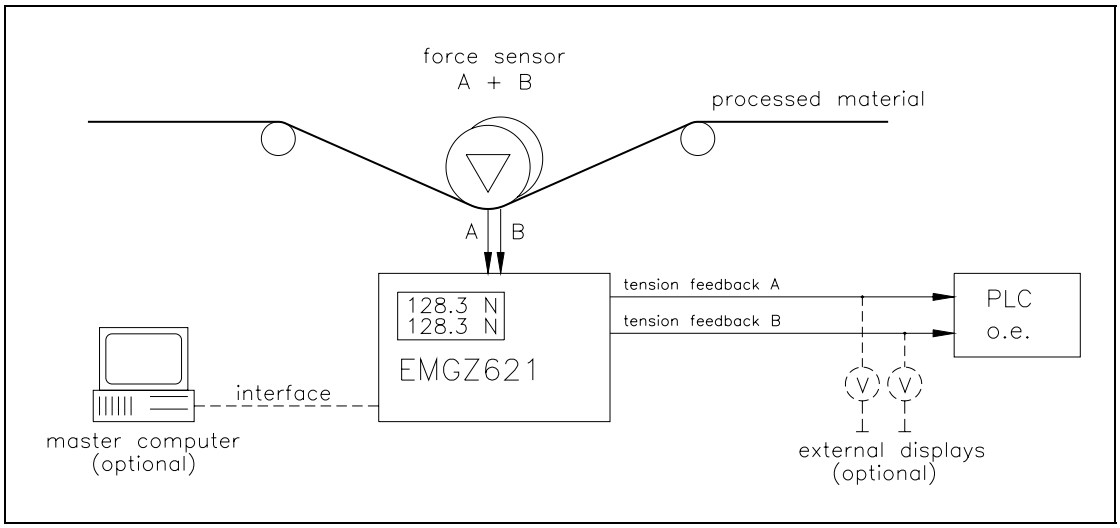

fig. 1: Basic structure of the EMGZ621A Tension Measuring Amplifier E621A001e

4.1 Functional Description

The EMGZ621A is a double channel strain gauge amplifier for a single measuring point. The material tension can be measured on both sides of the measuring roller independently.
The two force sensors of the measuring point measure the tension force in the material and transmit the measuring values as mV signals to the electronic unit EMGZ621A. The electronic unit amplifies the mV signals depending on configuration. The resulting feedback values are shown in the display in [N] (lbs if required). In addition, the feedback values are provided at the analogue outputs and various interfaces and can be evaluated by analog instruments, a PLC or equivalent devices.

4.2 Force Sensors

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 depending also to the power supply. So, the force sensors are supplied from the electronic unit by a very accurate power supply.

4.3 Electronic Units EMGZ621A

Common
The electronic unit is mounted to a robust aluminium housing. It contains a microprocessor to handle all calculations and communications, the highly accurate sensor power supply and the signal amplifiers for the measuring values of one measuring point. The electronic unit has no trimmers and only few jumpers to keep most accurate long-time and temperature stability.

Operation
The large backlit display with 2x16 characters, 4 LED's and large keys guarantee simple operation. All information is in plain text with the following languages selectable: English, German, French and Italian. Most of the functions may be paramterized. The parametrization can be done via the keys or the interfaces. All inputs are fail-safe stored in an EEPROM. Additional settings can be made with jumpers or solder bridges.

Strain gauge amplifier
The strain gauge amplifier provides the highly accurate power supply (5VDC or 10VDC) for 1 force sensor per channel. The force sensors can be wired using 4 wire circuit or 6 wire circuit. This allows accurate control of the bridge excitation even with very long cabling.
The power supply is equipped with current control. This allows to detect short circuit or cable break automatically and to output an error message if required.
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 does all application specific calculations with the digitized measuring value (such as offset, gain, lowpass filter, limit switches, etc). The resulting feedback value is provided as both tension and current signal at the same time.
Using digital inputs, the amplifier can be switched easily between 2 different gain values (for ex. to process different operating conditions). There is no reconfiguration required to switch the gain values.
The strain gauge amplifier section written above is integrated twice to provide independent evaluation of each force sensor.

Type	**Number of channels**	**Sensors per channel**	**Feedback signals**
EMGZ611	2	1	Difference A–B Sum A+B A B

Interface
As an option, there are RS232, PROFIBUS, CAN-Bus or DeviceNet interfaces available.

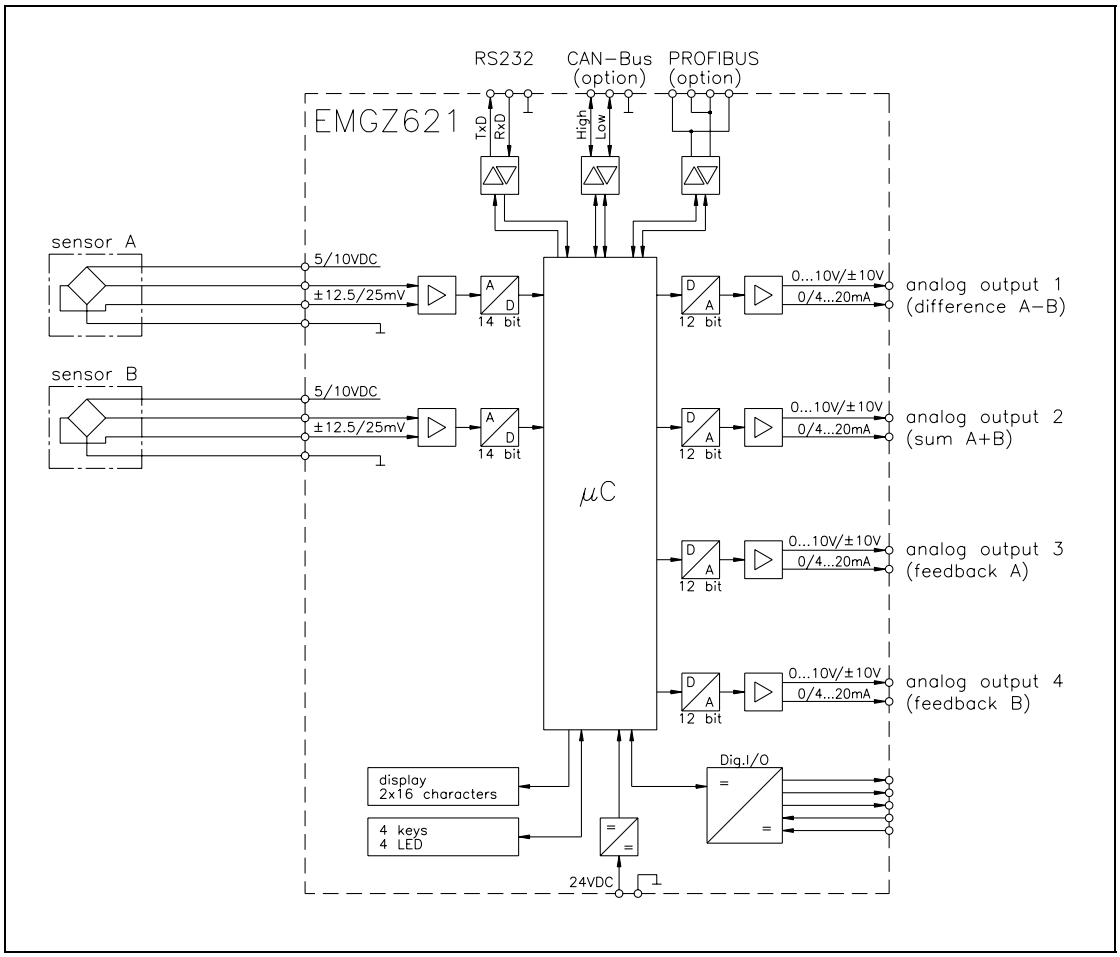

fig. 2: Block diagram of the electronic unit EMGZ621A E621A010e

5 Quick Installation Guide

- Check all your requirements such as:
  – configuration of the analogue inputs (power supply, 4 wire or 6 wire circuit)?
  – configuration of the analogue outputs (signal level)?
  – gain switching required?
  – linking by interface etc.?

- Draw your final wiring diagram according to the wiring diagram (refer to „7.2 Wiring diagram“)

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

- Parametrize and calibrate the measuring amplifier for each channel (refer to „8. Operating“)

- Put system into operation; proceed a test run with low speed

- If required, do additional settings (refer to „8.4 Additional settings“)

6 Dimensions

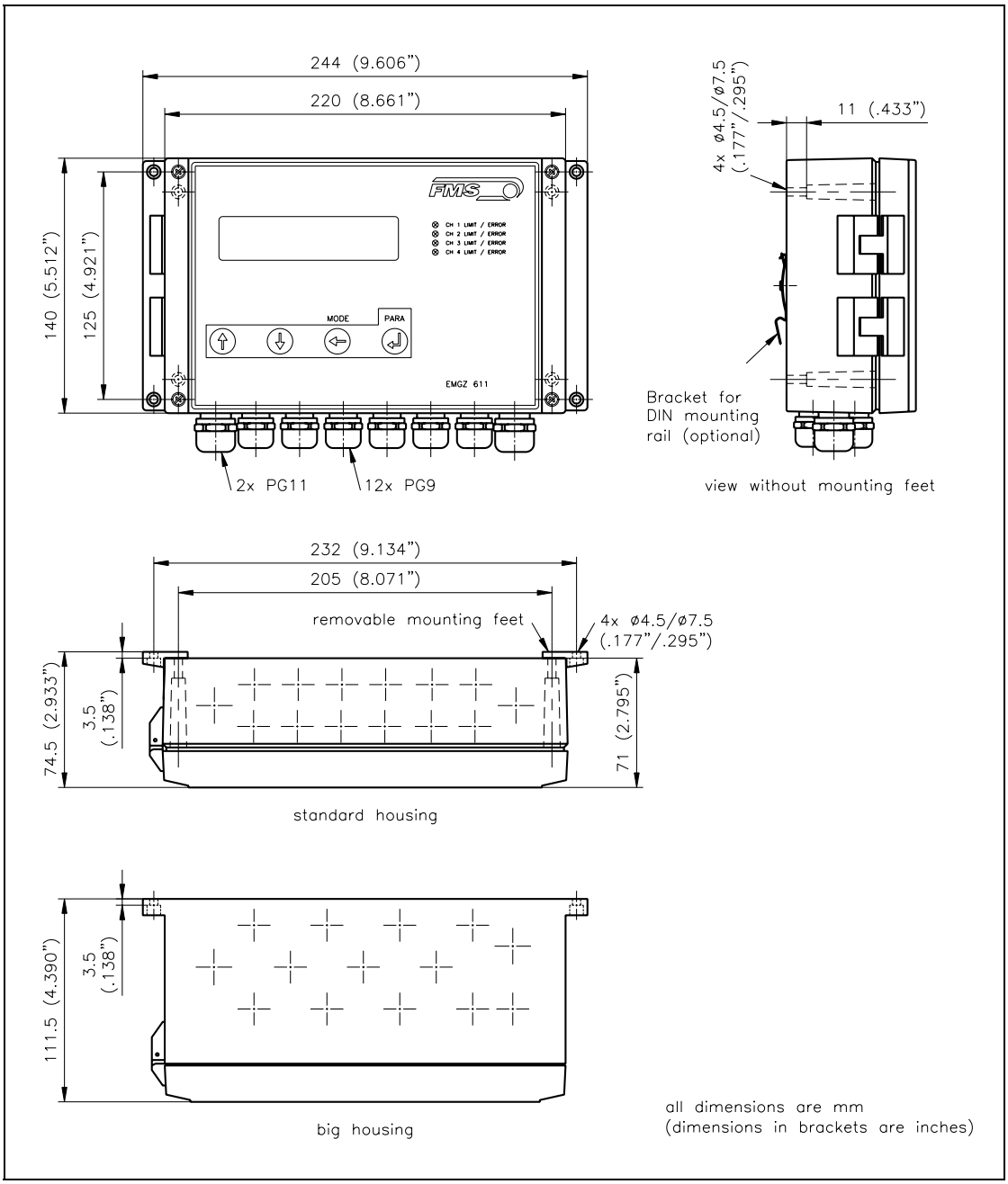

fig. 3: Dimensions E611002e

7 Installation and Wiring

Caution

Proper function of the electronic unit 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 electrical equipment. They are not taken into consideration in this operating manual. However, they have to be followed strictly.

Caution

Bad earth 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 earth connection is done.

7.1 Mounting the Electronic Unit

The housing can be mounted in a control cabinet or directly beside the machine. All connections are led into the housing through glands and are connected to the plug-in screw terminals according to the wiring diagram (fig. 6)

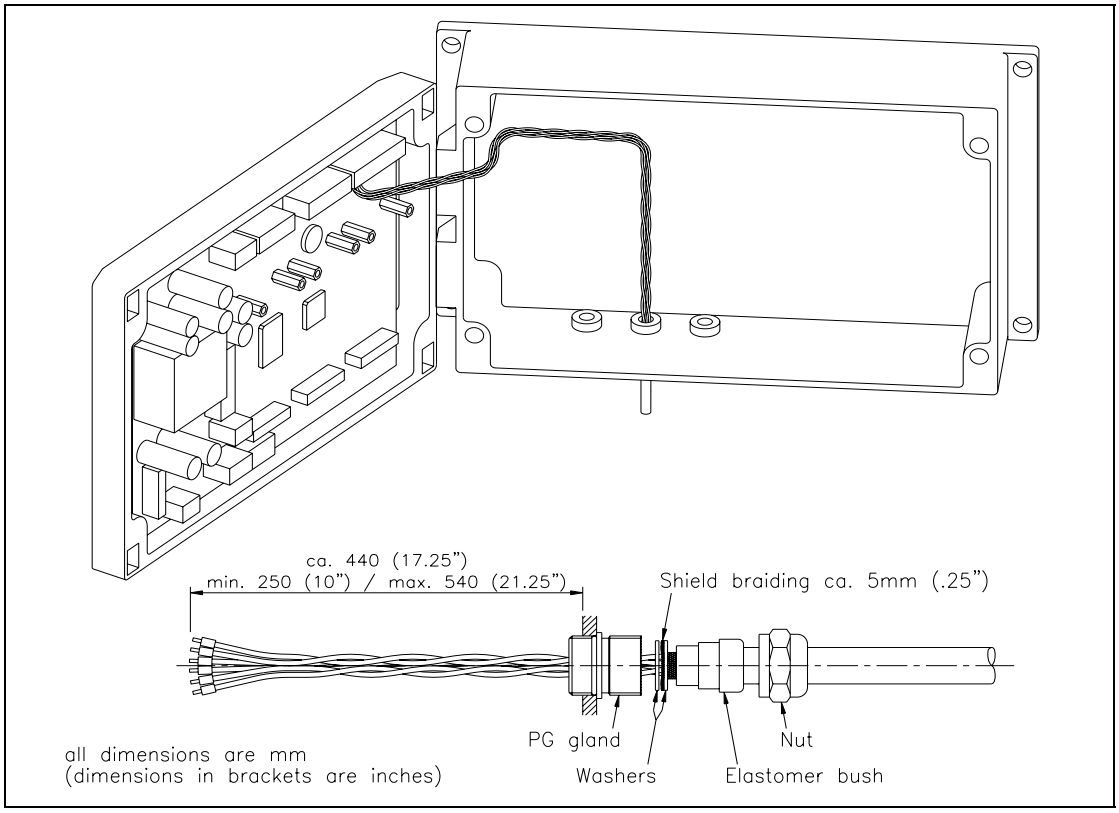

fig. 4: Wiring path inside the housing E600002e

Caution

The processor board is mounted to the housing cover. Improper handling may damage the fragile electronic equipment! Don't use rough tools such as screwdrivers or pliers! Touch processor board as little as possible! Touch earthed metal part to discharge static electricity before open the housing!

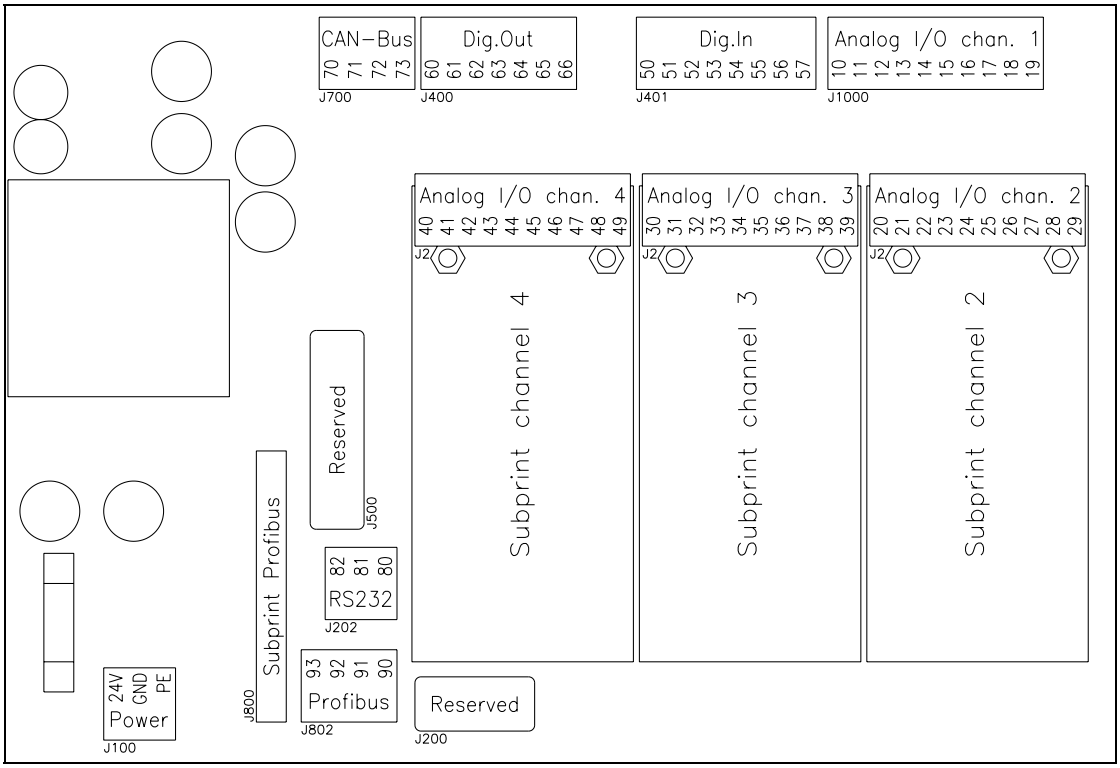

fig. 5: Screw terminal arrangement on the electronic unit E600003e

7.2 Wiring Diagram

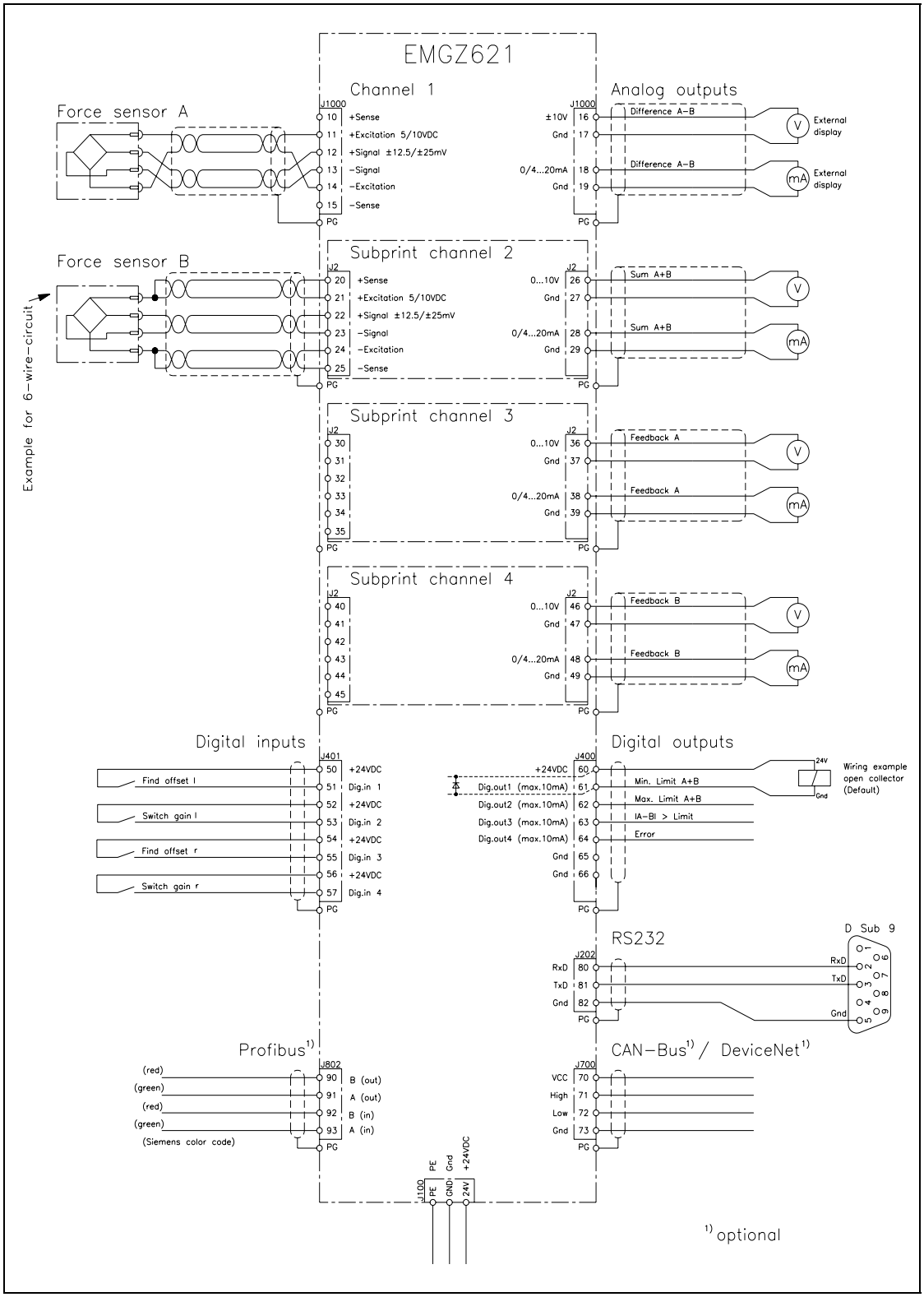

fig. 6: Wiring diagram EMGZ621A E621A0011e

7.3 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. The connection between the force sensors and the electronic unit is done using 2x2x0.75mm^2 [AWG 18] shielded twisted pair cable. (With cable length below 15m, 2x2x0.25 mm^2 [AWG 23] is also suitable.) The cable must be installed separate from power lines.
Wiring to the terminals of the electronic unit is done according to the wiring diagram (fig. 6). If two force sensors are used per measuring point, the cables are wired parallel (ref. to wiring diagram, channel 1). If wiring is made using 6 wire circuit (ref. to wiring diagram, channel 2) the solder bridges must be modified (ref. to „8.2 Configuring the electronic unit“).
Force sensor excitation can be made using 5VDC (default) or 10VDC (ref. to „8.2 Configuring the electronic unit“).

Note

The force sensor signal consists of only a few mV and is therefore susceptible to external influences to the cable. To increase immunity to interfering use one pair of the twisted pair cable for +signal and –signal.

Note

Connecting the shield of the signal cable to the electronic unit *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 electronic unit. On the „force sensor side“, the shield should stay open.

8 Operating

8.1 View of the Operating Panel

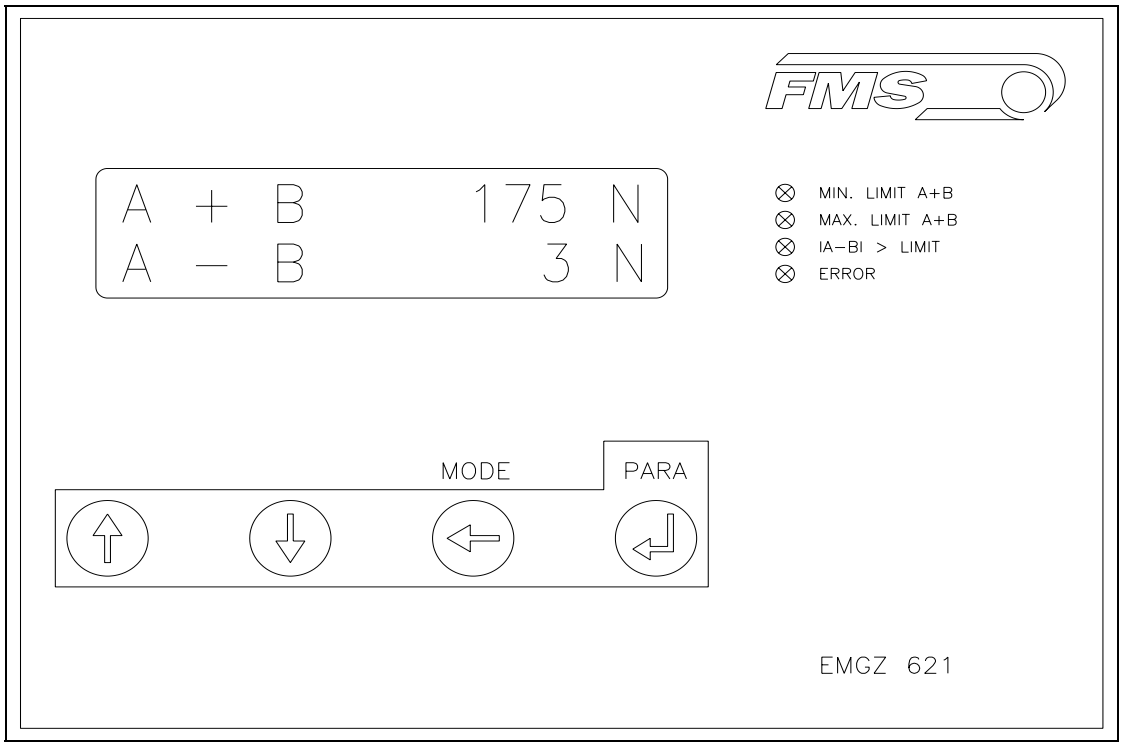

fig. 7: Operating panel EMGZ621A E621A007

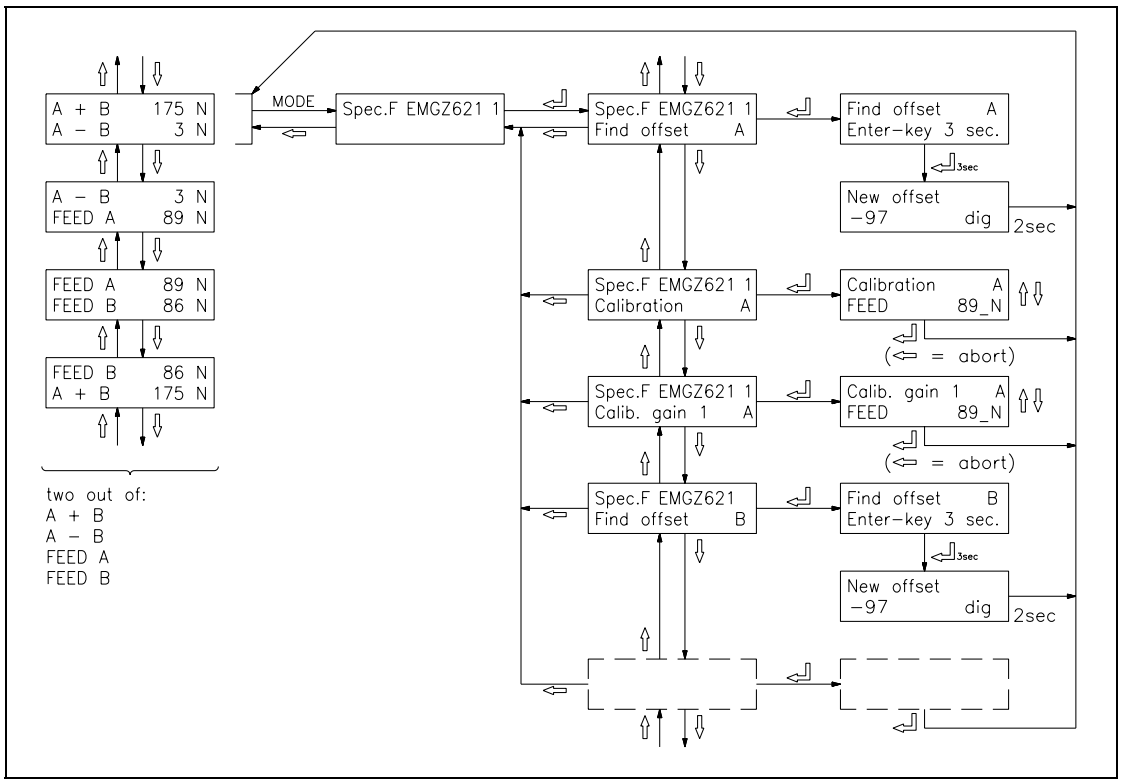

fig. 8: Main operating menu EMGZ621A E621A005e

8.2 Configuring the Electronic Unit

Prior to the first calibration, the following settings must be done (ref. to „9. Parametrization“):

System parameters	
Language	Required display language
Measuring system	Metric (default) or US standard

Parameters EMGZ621A	
Force of sensor	Ref. to nameplate of the force sensor
Unit of sensor	Ref. to nameplate of the force sensor
Sensitivity	FMS force sensors = 1.8mV/V (default)
Scale output 1...4	Which tension feedback refers to 10V resp. 20mA?
Config. output	*0-10V and 0...20mA* (default) or *0-10V and 4...20mA* or *-10V...+10V* *Notice: With a tension signal 0...10V, tension and current output are active at the same time.*

Jumpers for the analog outputs (ref. also to „14. Technical Reference“)	
Channels 1 / 2 / 3 / 4	0...10V (Default) or ±10V, corresponding to parameter *Config. output*

Note

Wrong setting of the parameters may cause malfunction of the electronic unit! Setting of the parameters must be done carefully prior to setting into operation!

8.3 Calibrating the Measuring Amplifier

The calibration is done for each channel separately. It can be calibrated using the „simulating method“ or the „mathematical method“:

Simulating Method (recommended)
The following instructions are referring to a setup and calibration on-site. The material tension will be simulated by a weight (fig. 9).

Check force sensors

- Connect both force sensors (A and B) (ref. to wiring diagram, fig. 6).
- Check if both values displayed (A and B) are positive when loading the sensors in measuring direction. If not, exchange terminals *+signal* and *–signal* of the referring channel on the measuring amplifier.

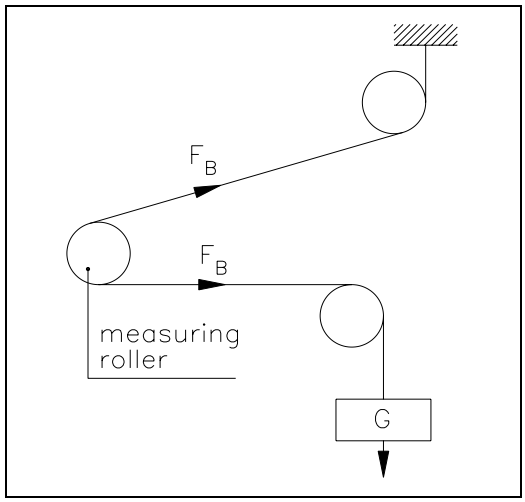

fig. 9: Calibrating the measuring amplifier C431011e

Find offset

- Insert material or a rope loosely to the machine.
- Press MODE key. Search and select the module *Spec.F EMGZ621A 1* and the special function *Find offset A* with the ↑ ↓ ↵ keys (fig. 8).
- Find offset for channel A by pressing the ↵ key for 3 seconds (fig. 8). The electronic unit calculates automatically the new offset value for channel A. The display will return to the main operating menu.
- Repeat the procedure written above with special function *Find offset B* (fig. 8). The electronic unit calculates automatically the new offset value for channel B. The display will return to the main operating menu.

(The offset may alternatively be found with the digital inputs *Find offset A / Find offset B*; ref. to wiring diagram.)

Find gain

- Load material or rope with a defined weight (fig. 9)
- Press MODE key. Search and select the module *Spec.F EMGZ621A 1* and the special function *Calibration A* with the ↑ ↓ ↵ keys (fig. 8).
- Set the force referring to **half of the applied weight** into the display with the ↑ ↓ keys and confirm with ↵ key (fig. 8). The electronic unit calculates automatically the new gain A value. The display will return to the main operating menu.
- Repeat the procedure written above with special function *Calibration B* (fig. 8). The electronic unit calculates automatically the new gain B value. The display will return to the main operating menu.

Note

Both bearings of a measuring roller bear each the half of the acting total force. Thus you must input only the half of the calibrating force during calibration of the gain factor! Otherwise the resulting material tension (A+B) will be calculated incorrect!

Mathematical method
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.

- Offset adjustment is done as written under „Simulating method“.
- The Gain value will be calculated by the following formula and then inputted in the parameters *Gain A / Gain B* (refer to „9.5 Description of the parameters EMGZ621A“).

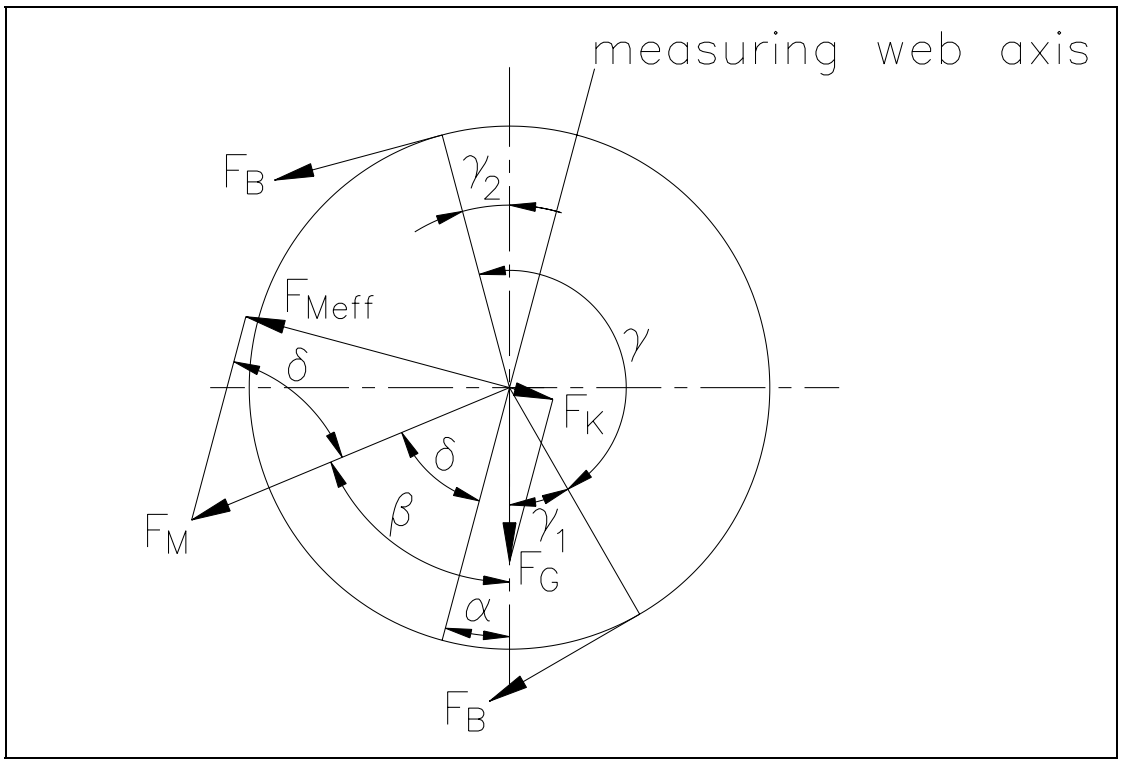

fig. 10: Force vectors in the FMS force measuring bearing C431012e

$$GainFeedba\,ckA = GainFeedba\,ckB = \frac{1}{\sin\delta \cdot \sin(\gamma / 2) \cdot 2}$$

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		
δ	Angle between measuring web axis and F_M		

8.4 Additional Settings

Setting the low-pass filters

The measuring amplifier provides 1 low-pass filter for the display and 1 low-pass filter for each output signal. They are used to prevent noise which is added to the signals.

The low-pass filters are configured by setting its cut off frequency to an appropriate value. The cut off frequency is set in the system parameter *Lowpass display* or in the parameter EMGZ621A *Lowpass output* (ref. to „9. Parametrization"). Signal variations which are faster than the cut off frequency are then suppressed. The lower the cut off frequency, the more sluggish the display value resp. the output signal will be.

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.

Setting the limit switches

The measuring amplifier provides 3 limit switches which can be tapped at the digital outputs. The limit switches are actuated when the feedback value exceeds (Max. Limit A+B) resp. undershoots (Min. Limit A+B) the force values stored in parameters *Min. limit A+B* resp. *Max. limit A+B*. The limit switch „|A–B| > limit" is actuated if the difference of the 2 measuring values is higher than the force stored in parameter *|A–B| > limit*.

Tapping of the limit switches is done according to the wiring diagram (fig. 6).

Gain switching

If a measuring point is operated with varying measuring conditions (i.e. different material paths), the gain value of each channel may be switched between two values depending on the material path. The additional gain values must be calibrated also during setup, using the special functions *Calib. gain 1A / Calib. gain 1B*. The procedure is identical as with *Calibration A / Calibration B* (ref. to „8.3 Calibrating the measuring amplifier").

Switching is done using the digital inputs „Switch Gain A" / „Switch Gain B" (ref. to parameters *Gain 1 A / Gain 1 B*).

Wiring of the dig. inputs is done according to the wiring diagram (fig. 6).

9 Parametrization

9.1 Schematic Diagram of Parametrization

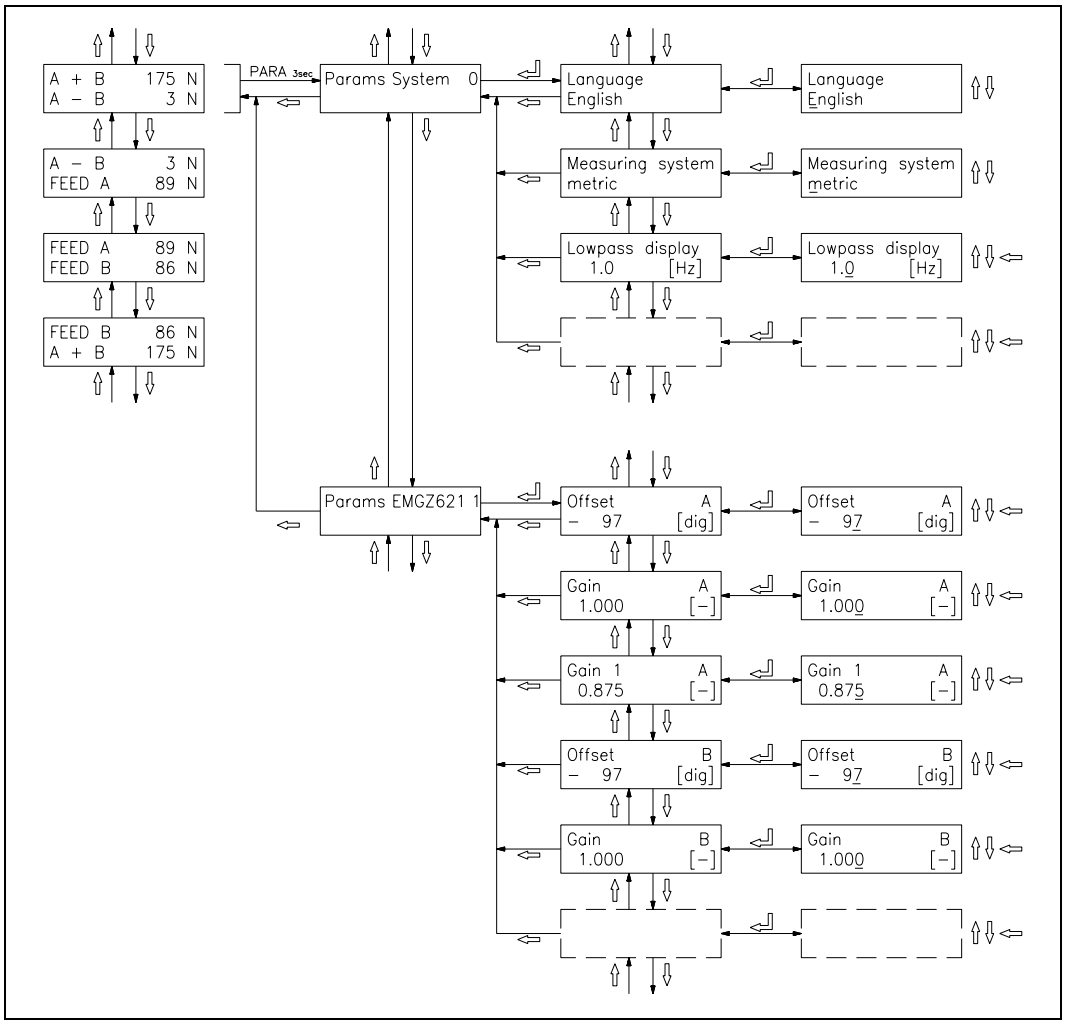

fig. 11: Parametrization EMGZ621A E621A006e

The parameters are split into the modules *system parameters* and parameters *EMGZ621A 1*. The parameter changing mode is activated by pressing the PARA ↵ key for 3 seconds. The required module is then searched with the ↑ ↓ keys and selected with the PARA ↵ key (fig. 11). Each module has its own parameter set. Generally, the parameters are settable using the keys as follows:

↵	choose and enter
↑ ↓	switch the selections or increase / decrease numeric values, as well as change the sign
←	change the decimal (while inputting a numeric value) or abort setting

9.2 List of the system parameters

Parameter	Unit	Min	Max	Default	Selected
Language	English, French, Italian, German				
Measuring System	Metric, US standard			Metric	
Lowpass display	[Hz]	0.1	10.0	1.0	
Identifier	[-]	0	255	0	
Baud rate	2400, 4800, 9600, 19200			9600	

9.3 List of the parameters EMGZ621A

Parameter	Unit	Min	Max	Default	Selected
Offset A	[Digit]	–8000	8000	0	
Gain A	[-]	0.100	9.000	1.000	
Gain 1 A	[-]	0.100	9.000	1.000	
Offset B	[Digit]	–8000	8000	0	
Gain B	[-]	0.100	9.000	1.000	
Gain 1 B	[-]	0.100	9.000	1.000	
Force of sensor	[N, kN, cN]	1	9999	1000	
Unit of sensor	N, kN, cN			N	
Sensitivity	[mV/V]	0.1	3.0	1.8	
Min. limit	[1]	[2]		0	
Max. limit	[1]	[2]		0	
|A–B| > limit	[1]	[2]		-	
Lowpass output 1 (A–B)	[Hz]	0.1	200.0	10.0	
Scale output 1 (A–B)	[1]	[2]		-	
Config. output 1 (A–B)	0...20mA, 4...20mA			0...20mA	
Lowpass output 2 (A+B)	[Hz]	0.1	200.0	10.0	
Scale output 2 (A+B)	[1]	[2]		-	
Config. output 2 (A+B)	0...20mA, 4...20mA			0...20mA	
Lowpass output 3 (A)	[Hz]	0.1	200.0	10.0	
Scale output 3 (A)	[1]	[2]		-	
Config. output 3 (A)	0...20mA, 4...20mA			0...20mA	
Lowpass output 4 (B)	[Hz]	0.1	200.0	10.0	
Scale output 4 (B)	[1]	[2]		-	
Config. output 4 (B)	0...20mA, 4...20mA			0...20mA	

[1] [N, cN, kN] if measuring system = metric
[lb, clb, klb] if measuring system = US standard

[2] A force value can be input. The value consists of 4 digits. The position of the decimal point depends on the parameter *Force of sensor*

9.4 Description of the system parameters

The parameter changing mode is activated by pressing the PARA ↵ key for 3 seconds. By pressing the PARA ↵ key again, the system parameters are selected (ref. also to fig. 11).

Language

Use: This parameter stores the display language.

Range: English, French, Italian, German

Measuring system

Use: This parameter indicates the measuring system to be used. If it is set to *metric*, all force values are shown as [N, cN, kN]. If it is set to *US standard*, all force values are shown as [lb, clb, klb].

Range: Metric, US standard **Default:** Metric

Lowpass display

Use: The electronic unit provides a lowpass filter to prevent noise which is added to the integrated display. This parameter stores the cut off frequency. The lower the cut off frequency, the more sluggish the output signal will be. Due to this filter, the value shown in the display will be much more stable in the case of high fluctuations of the force value.
The lowpass display filter is independent to the other filters.

Range: 0.1 to 10.0 **Default:** 1.0

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

Identifier

Use: This parameter stores the ident number of the device when linked to PROFIBUS, CAN-Bus resp. DeviceNet.

Range: 0 to 255 **Default:** 0

Increment: 1 **Unit:** [-]

Baud rate

Use: This parameter stores the speed of the serial interface (RS232). The other settings are fixed: 8 data bits, even parity, 1 stop bit („8 e 1“).

Range: 2400, 4800, 9600, 19200 **Default:** 9600

Unit: [Baud]

9.5 Description of the Parameters EMGZ621A

The parameter changing mode is activated by pressing the PARA ↵ key for 3 seconds. The module *Params EMGZ621A 1* is then searched with the ↑ ↓ keys and selected with the PARA ↵ key (ref. also to fig. 11).

Offset A

Use:	This parameter stores the value determined with special function *Find offset A* in [Digit]. It is not necessary to note this parameter because a new offset adjustment is done very easy; also when changing the whole electronic unit. The offset can also be inputted manually with the ↑ ↓ ← keys.				
Range:	–8000	to	8000	**Default:**	0
Increment:	1			**Unit:**	[Digit]

Gain A

Use:	This parameter stores the value determined with special function *Calibration A*, or you must input a value calculated using the formulas written under „8.3 Calibrating the measuring amplifier“, if the material tension cannot be simulated.				
Range:	0.100	to	9.000	**Default:**	1.000
Increment:	0.001			**Unit:**	[-]

Gain 1 A

Use:	Identical with *Gain A* but the value stored here was determined by special fuction *Calib. gain 1 A*. The value stored here is used if the dig. input „Switch gain A“ is activated (ref. to wiring diagram, fig. 6).				
Range:	0.100	to	9.000	**Default:**	1.000
Increment:	0.001			**Unit:**	[-]

Offset B

Use:	Identical with *Offset A* but the value was determined by special fuction *Find offset B.*				
Range:	–8000	to	8000	**Default:**	0
Increment:	1			**Unit:**	[Digit]

Gain B

Use:	Identical with *Gain A* but the value was determined by special fuction *Calibration B.*				
Range:	0.100	to	9.000	**Default:**	1.000
Increment:	0.001			**Unit:**	[-]

Gain 1 B

Use: Identical with *Gain B* but the value was determined by special fuction *Calib. gain 1 B*. The value stored here is used if the dig. input „Switch gain B“ is activated (ref. to wiring diagram, fig. 6).

Range: 0.100 to 9.000 **Default:** 1.000

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

Force of sensor

Use: This parameter stores the nominal force of the sensors. It is printed to the nameplate of the force sensors.

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

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

Unit of sensor

Use: This parameter stores the measuring unit of the sensors. It is printed to the nameplate of the force sensors.

Range: N, kN, cN **Default:** N

Sensitivity

Use: This parameter stores the sensitivity of the force sensors, that means how much signal per volt excitation the sensor will give when loaded with nominal force. Standard for FMS force sensors is 1.8mV/V.

Range: 0.1 to 5.0 **Default:** 1.8

Increment: 0.1 **Unit:** [mV/V]

Min. limit

Use: The digital output and the LED „Min. Limit A+B“ will be activated if the tension feedback passes under the threshold value stored here.
If the parameter contains a zero value, limit switch monitoring is inactive.

Range: A force value can be input. The value consists of 4 digits. The position of the decimal point depends on the parameter *Force of sensor*.

Default: 0

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

Max. limit

Use: The digital output and the LED „Max. Limit A+B“ will be activated if the tension feedback passes over the threshold value stored here. All other function is identical with *Min. limit*.

|A–B| > limit

Use: The digital output and the LED „|A–B| > limit“ will be activated if the difference of material tension A minus material tension B exceeds the value stored here. All other function is identical with *Min. limit*.

Lowpass output 1 (A–B)

Use: Each channel provides a lowpass filter to prevent noise which is added to the output signal. This parameter stores the cut off frequency. The lower the cut off frequency, the more sluggish the output signal on the terminals will be (ref. to wiring diagram, fig. 6). Due to this filter, the output signal will be much more stable in the case of high fluctuations of the force value. The lowpass filter of the each output is independent to the other filters.

Range:	0.1	to	200.0	**Default:**	10.0
Increment:	0.1			**Unit:**	[Hz]

Scale output 1 (A–B)

Use: This parameter stores which tension feedback value will give the maximum signal (10V resp. 20mA) at the output.

Range: A force value can be input. The value consists of 4 digits. The position of the decimal point depends on the parameter *Force of sensor*.

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

Configuration output 1 (A–B)

Use: This parameter configures the current output signal.

Range:	0...20mA, 4...20mA	**Default:**	0...20mA

Lowpass output 2 (A+B)

Use: Identical with *Lowpass output 1* but the filter acts to the output 2 (A+B).

Scale output 2 (A+B)

Use: Identical with *Scale output 1* but the parameter acts to the output 2 (A+B).

Configuration output 2 (A+B)

Use: Identical with *Configuration output 1* but the parameter acts to the output 2 (A+B).

Lowpass output 3 (A)

Use: Identical with *Lowpass output 1* but the filter acts to the output 3 (A).

Scale output 3 (A)

Use: Identical with *Scale output 1* but the parameter acts to the output 3 (A).

Configuration output 3 (A)

Use: Identical with *Configuration output 1* but the parameter acts to the output 3 (A).

Lowpass output 4 (B)

Use: Identical with *Lowpass output 1* but the filter acts to the output 4 (B).

Scale output 4 (B)

Use: Identical with *Scale output 1* but the parameter acts to the output 4 (B).

Configuration output 4 (B)

Use: Identical with *Configuration output 1* but the parameter acts to the output 4 (B).

9.6 Service Mode

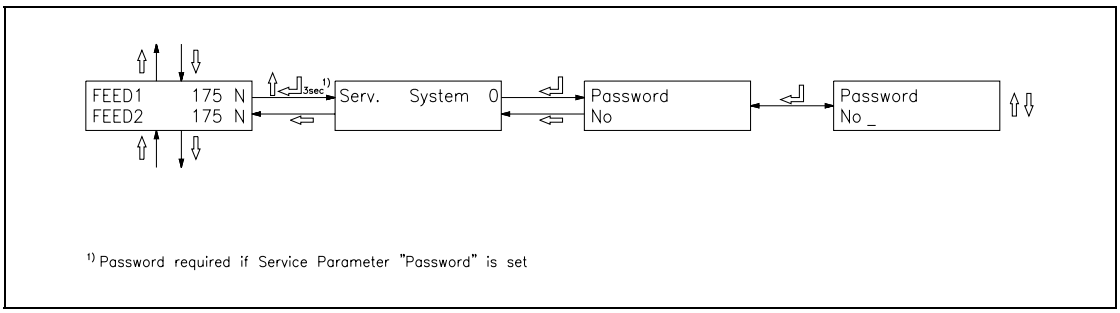

fig. 13 E614012e

The service mode contains internally used values. These need usually no modification. However they could be helpful while trouble shooting. Each function module has its own set of service parameters.

Note

Bad setting of the service mode parameters may result in heavy malfunctions! Therefore, these settings should be made by specially trained personnel only!

The service mode is activated by pressing the ↑ and ↵ keys for 3 seconds. Generally the service mode parameters can be modified the same way as the other parameters.

Password

Use: This parameter defines if a password is required to access the parameters and several special functions. This allows enhanced security against modifications. The password is „3231“.

Range: No, Yes **Default:** No

10 Serial Interface (RS232)

(Optional)

11 PROFIBUS Interface Description

11.1 Wiring of the PROFIBUS Data Cable

Wiring of the PROFIBUS cables
The standardized PROFIBUS cable type A (STP 2x0.34^2) [AWG] has to be used for the PROFIBUS data cable. The cables are bared referring to fig. 6 and connected to the terminals according to the wiring diagramm.
The shield is connected with the bracket to the shoulder inside the housing.

Caution
The shield of the PROFIBUS cable is only grounded if the bracket inside the housing clamps directly to the shield If the bracked clamps to the plastic mantle, no grounding is done!
Therefore the plastic mantle has to be fixed only with the PG gland (referring to fig. 6)

Termination
If both cables are connected (Bus in and Bus out), if has to be ensured that the two termination dip switches are in off position.
If only one cable is connected (Bus in), both termination dip switches have to be set in on position.

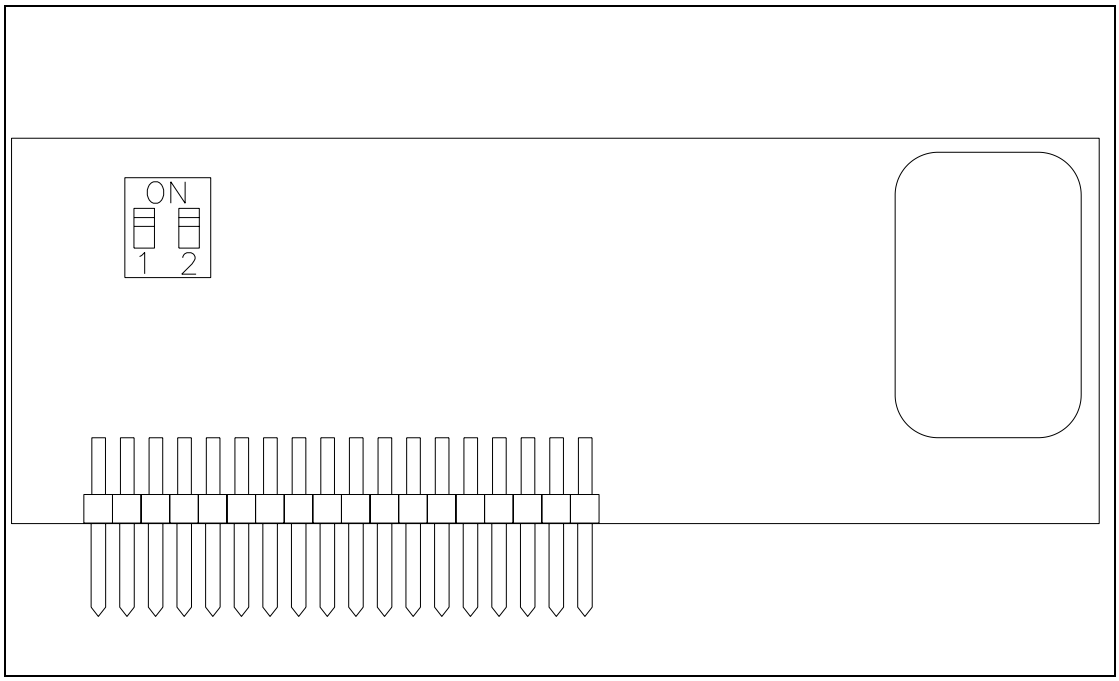

fig 23: Profibus board E621009

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.

11.2 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 2...125.
The PROFIBUS address is set with the system parameter *Identifier*. (See 14.4 Description of the system parameters). After switching the measuring amplifier off and on, the new address is valid.

12 PROFIBUS Interface Description

12.1 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 EMGZ600A-series measuring amplifiers can be taken fron 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 tension controller.
Otherwise there may be problems while setup. Version numbers of firmware and GSD file are printed to the cover page of this opeating manual.

12.2 EMGZ621A DP Slave Functional Description

The measuring amplifiers of the EMGZ621A P-series supports a PROFIBUS link which operates according to the PROFIBUS DP protocoll 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.

12.3 Initial Parameters

Initial parameters are sent from the control system to the measuring amplifier once while initialization. They are nomally 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	(not used)
1		0	(not used)
2		0	(not used)
3		0	(not used)

12.4 Configuration

The configuration defines how many process data (byte and word) are sent during the cyclic communication from the control system to the tension controller and from the tension controller to the control system.
To ensure maximum flexibility using the measuring amplifier, there are different modules supplied. In a single measuring amplifiers only one module can be set active at a time.

Module 1: Basic telegram
4 bytes (2 word) are transmitted from the control system to the tension controller and also 4 bytes (2 word) from the tension controller to the control system in each data cycle.

	byte 0	byte 1	byte 2	byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Modul 2: Reserved

Modul 3: Basic telegram and 4 word operation value
The measuring amplifier response with 4 bytes of the basic telegram and the 4 word (feedback, reference, control error, output per channel).

	Byte 0	Byte 1	Byte 2	Byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Word 0	Word 1	Word 2	Word 3
Feedback A (HB)/(LB)	Feedback B (HB)/(LB)	Feedback A+B (HB)/(LB)	Feedback A-B (HB)/(LB)

Modul 4: Reserved

12.5 Function Code

Master → Slave

Function Values

Value	**Meaning**	**Remarks**
01h	Feedback A	Istwert Messaufnehmer A
02h	Feedback B	Istwert Messaufnehmer B
03h	Feedback A+B	Sum A+B
04h	Feedback A-B	Difference A-B
05h	A/D-value gross A	A/D-value force sensor A
06h	A/D-value gross B	A/D-value force sensor B

The tension controller transmits the response with the response telegram.

13 Interface CAN-Bus

(Option)

14 Interface DeviceNet

(Option)

15 Technical Reference

15.1 Additional Setting Elements

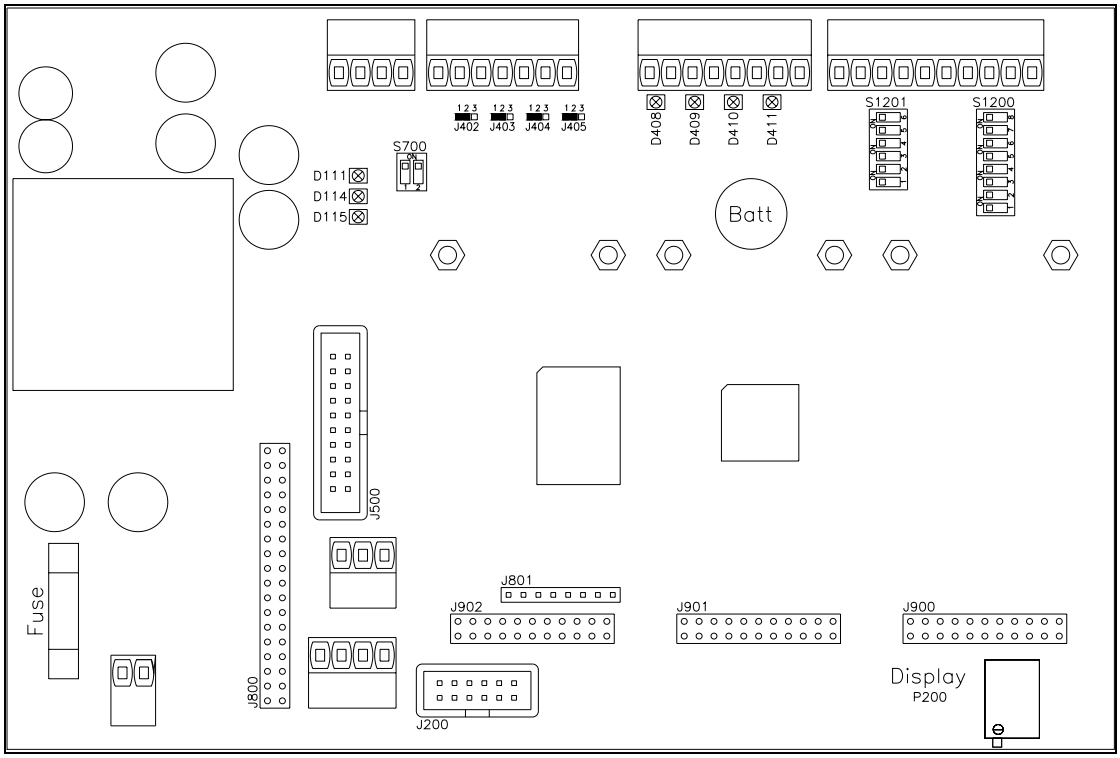

fig. 14 View of main board K600028e

Element	Function
D111	Status LED power supply: VCC ok
D114	Status LED power supply: +15VDC ok
D115	Status LED power supply: –15VDC ok
D408	Status LED dig. input 1
D409	Status LED dig. input 2
D410	Status LED dig. input 3
D411	Status LED dig. input 4
J200	(Reserved)
J402...405	Solder bridges for dig. output 1...4 (open collector)
J500	Add-on board for dig. I/O
J800	Socket subprint PROFIBUS
J801	(Reserved)
J900	Socket subprint channel 2
J901	Socket subprint channel 3
J902	Socket subprint channel 4
P200	LCD display contrast
S700	CAN Bus termination
S1200	Dip-switch (sensor exitation, sensor signal, 4-wire or 6-wire circuit)
S1201	Dip-switch (sensor exitation, sensor signal, 4-wire or 6-wire circuit)
Battery	Buffer battery for the internal clock
Fuse	Fuse of the power supply, 1A / 250V (fast blow)

15.2 Dip-switch for the Analogue Inputs / Outputs

15.2.1 Main Board

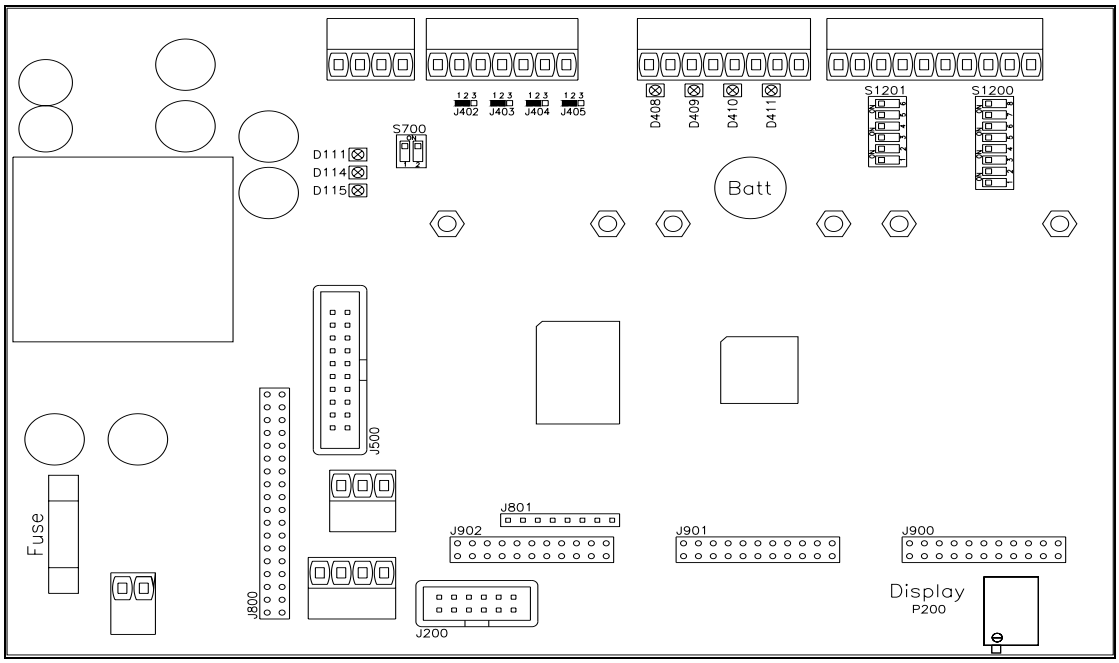

fig. 16 View of main board K600028e

Setting of the Dip-switch

	Sensor excitation		Sensor signal		4/6-wire circuit	
Dip-switch	**5VDC factory set.**	**10VDC**	**±9mV factory set.**	**0...10V**	**4-wire factory set.**	**6-wire**
1201						
1	**0**	**1**				
2			**1**	**0**		
3			**1**	**0**		
4			**0**	**1**		
5			**0**	**1**		
6			**1**	**0**		

1200						
1	**1**	**0**				
2	**0**	**0**				
3	**1**	**1**				
4	**0**	**0**				
5	**1**	**1**				
6					**1**	**0**
7					**1**	**0**
8						

Note

The Dip-switch, jumpers and solder bridges are factory set and need no customization.

15.2.2 Subprint (Rev. D)

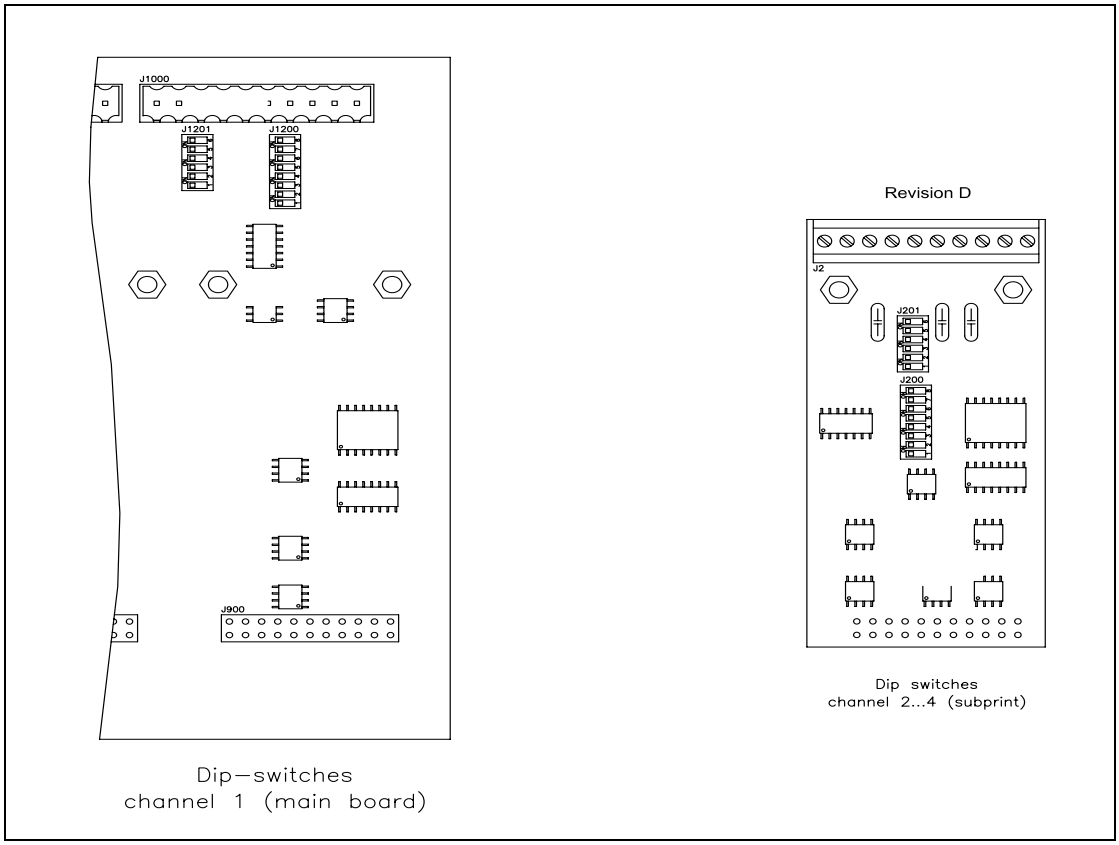

fig. 17: The Dip-switch and solder bridges E600014e

Setting of the Dip-switch

	Sensor exitation		**Sensor signal**		**4/6-wire circuit**	
Dip-switch	**5VDC factory set.**	**10VDC**	**±9mV factory set.**	**0...10V**	**4-wire factory set.**	**6-wire**
201						
1	**0**	**1**				
2			**1**	**0**		
3			**1**	**0**		
4			**0**	**1**		
5			**0**	**1**		
6			**1**	**0**		

200						
1	**1**	**0**				
2	**0**	**0**				
3	**1**	**1**				
4	**0**	**0**				
5	**1**	**1**				
6					**1**	**0**
7					**1**	**0**
8						

Note

The Dip-switch, jumpers and solder bridges are factory set and need no customization.

Caution

Wrong setting of the Dip-switches and solder bridges may cause malfunction of the electronic unit or the total system! Setting of the solder bridges, Dip-swtitch and jumpers must be checked carefully prior to power on! Setting of the solder bridges should be carried out by trained personnel only!

15.2.3 Subprint (Rev. C)

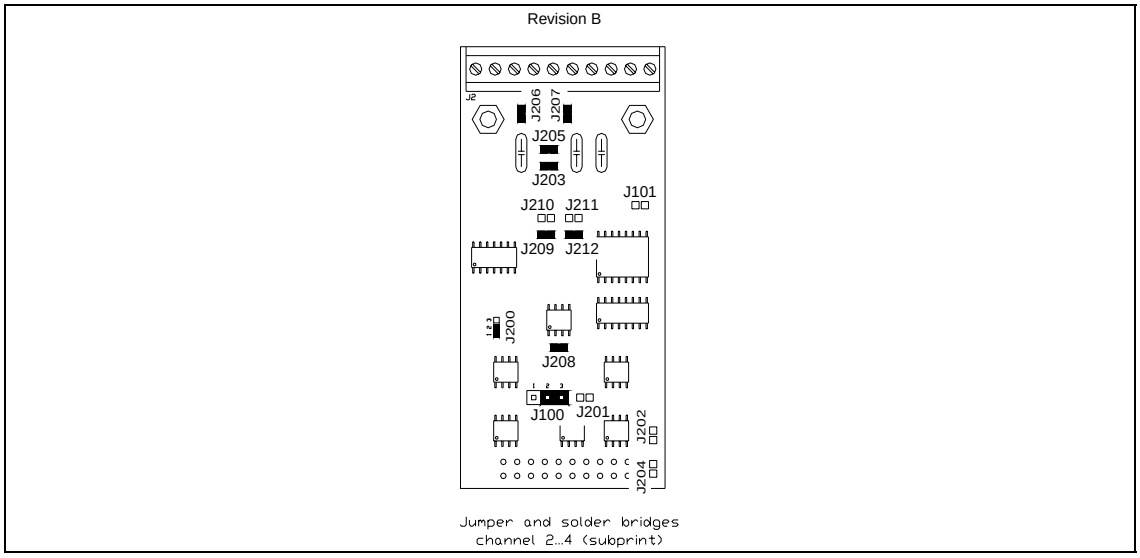

fig. 18: The Jumpers and solder bridges E600015e

Channel 2...4 (subprint)	Analogue output ±10V	Analogue output 0...10V
J100	**1-2**	**2-3**

Setting the sensor excitation (solder bridges)

Channel 2...4 (subprint)	Sensor excitation		
	5VDC (default)	10VDC	24VDC
J200	**1-2**	**2-3**	**2-3**
J201	open	**closed**	**closed**
J202	open	open	**closed**
J203	**closed**	**closed**	open
J204	open	open	**closed**
J205	**closed**	**closed**	open

Setting the sensor signal (solder bridges)

Channel 2...4 (subprint)	Sensor signal ±12.5 or ±25mV (default)		Sensor signal 0...10V
J201	open[1)]	**closed**[1)]	**closed**
J208	**closed**		open
J209	**closed**		open
J210	open		**closed**
J211	open		**closed**
J212	**closed**		open

[1)] Depending on sensor excitation, see above

Setting to 4 wire or 6 wire circuit (solder bridges)

Channel 2...4 (subprint)	4 wire circuit (default)	6 wire circuit
J206	**closed**	open
J207	**closed**	open

15.3 Technical Data

Number of measuring points	1
Connection of force sensors	2 separately wired force sensors of 350Ω for each channel
Excitation of force sensors	5VDC (default) or 10VDC (with automatic current control)
Input signal voltage	0...9mV (max. 12.5mV) or 0...18mV (max. 25mV) (depending on force sensor excitation)
Resolution A/D converter	±8192 Digit (14 Bit)
Measuring error	<0.05% FS
Cycle time	2ms
Operation	4 keys, 4 LED's, LCD display 2x16 characters (8mm height)
Analog output channel 1...4	0...10V (default) / ±10V and 0...20mA (default) / 4...20mA (12 Bit)
Digital output 1...4	Open collector, max. 10mA, galvanically isolated, with recovery diode
Digital input 1...4	24VDC, galvanically isolated (signal must be on for min. 100ms)
Interface RS232	Optional
Interface PROFIBUS	PROFIBUS DP (EN50170), optional
Interface CAN-Bus	Optional
Interface DeviceNet	Optional
Power supply	24VDC (18...36VDC) / 10W (max. 1A)
Temperature range	0...45°C (32...113°F)
Weight	1.5kg (3.35lbs)

16 Trouble Shooting

If the electronic unit detects an error, the LED and the digital output *Error* is activated. In addition, the error state can be read by the interface.

Error	Cause	Corrective action
Display shows `not determinable`	A function can't be performed at that time (i.e. wiring error)	Check wiring, parametrization and overall system shape
Feedback value of channel n is > 0 even though material is loose	Offset badly adjusted	Proceed again for offset adjustment of channel n
	Current output is set to 4...20mA	Adjust Parameter *config. output* if a signal 0...20mA is required
	If current output shows 10...12mA: Jumper for tension output is set wrong	Set jumper for tension output of channel n to 0...10V
Feedback value of channel n is < 0 even though material is loose	Jumper for tension output is set wrong	Set jumper for tension output of channel n to 0...10V
Feedback value of channel n is not stable even though material tension doesn't change	Cut off frequency of the filters set too high	Adjust cut off frequency (ref. to „8.4 Additional Settings“)
	Grounding (PE) not connected	Connect grounding (PE)
	Electrical interference on the cable to the force sensor	Check connection of the shield. Use one twisted pair for +signal and –signal (ref. to „7.3 Mounting the force sensors“)
Feedback value of channel n does not correspond with the effective material tension	Gain badly adjusted	Proceed again for sensor calibration of channel n
	If gain switching is used: Wrong gain value used	Switch the dig. input used for gain switching
	Output signal wrong scaled	Set channel parameter *scale output* to an appropriate value
	Sensor excitation set wrong	Check solder bridges for sensor excitation of channel n (ref. to „14.2 Jumper for the Analog Inputs / Outputs“)
	Sensor signal level set wrong	Check solder bridges for sensor signal of channel n (ref. to „14.2 Jumper for the Analog Inputs / Outputs“)
	If using 6 wire circuit: Solder bridges set wrong	Check solder bridges for 6 wire circuit of channel n (ref. to „14.2 Jumper for the Analog Inputs / Outputs“)

Error	Cause	Corrective action
Limit switches of channel n do not work	Limit values wrong parametrized	Set parameter *Min. limit / Max. limit* to an appropriate value
Dig. outputs do not work	Wiring error	Check wiring of the dig. outputs (open collector, ref. to wiring diagram)
`C.n Overcurrent`	Excitation of channel n detects overcurrent (short circuit)	Check force sensors and wiring of channel n
`C.n Cable break`	Excitation of channel n detects cable break	Check force sensors and wiring of channel n
`C.n HW error`	Hardware of channel n defect	Contact FMS customer service
	Subprint of channel n is not detected	Check if subprints are seated correctly (ref. to „14.1 Additional Setting Elements“) Contact FMS customer service
`Subprint missing contact FMS AG`	One or more subprints are missing or are not detected	Check if subprints are seated correctly (ref. to „14.1 Additional Setting Elements“) Contact FMS customer service
`System Error contact FMS AG`	Electronic unit defect	Contact FMS customer service
No message on the display	Display contrast setting is bad	Set display potentiometer P200 correctly (ref. to „14.1 Additional Setting Elements“)
	Fuse blown	Replace fuse (ref. to „14.1 Additional Setting Elements“)
	Power supply not correct	Check status LED’s of the power supply (D111...D115, ref. to „14.1 Additional Setting Elements“) Check / correct power supply
	Electronic unit defect	Check status LED’s of the power supply (D111...D115, ref. to „14.1 Additional Setting Elements“) Contact FMS customer service
Electronic unit does not answer to interface commands	Interface not yet supported	Contact FMS customer service

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