Operating Manual EMGZ622A/642A

Digital Tension Measuring Amplifier
for Double Range Force Sensors

Version 1.13 02/2007 ff
Firmware Version 2.00
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.

Ce mode d'emploi est également disponible en Allemand.
Veuillez contacter la représentation locale.

Queste manuale d'installazione è disponibile anche in lingua tedesco.
Vogliate cortesemente contattare la locale rappresentanza.

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 EMGZ622A/642A system consists of the following components (refer also to fig. 1):

Force sensors

- Double range force measuring bearings
- For mechanical/electrical conversion of the tension force

Electronic unit EMGZ622A/642A

- For supplying the force sensors and amplifying of the mV signal
- 2...4 channels for 1...2 measuring points
- With operation panel for parametrization
- Digital inputs and outputs freely programmable
- LED’s freely programmable
- With robust aluminium housing
- Supports connection of external feedback displays
- *Interface CAN-Bus, PROFIBUS, DeviceNet, Interface RS232*

(Variants and options in italic text)

4 System Description

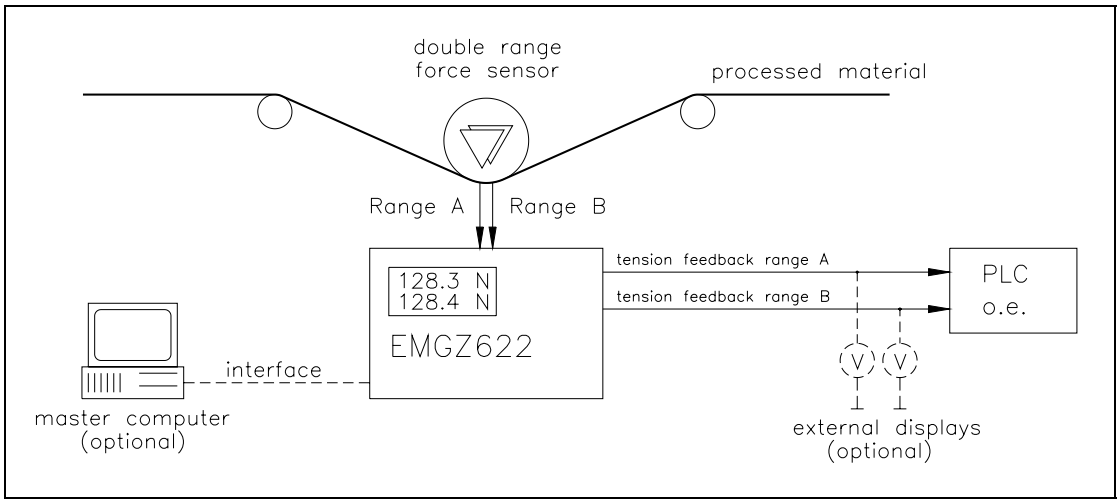

fig. 1: Basic structure shown with the EMGZ612A Tension Measuring Amplifier

E622001e

4.1 Functional Description

The double range force sensors of each measuring point measure the tension force in the material and transmit the measuring values as mV signals to the electronic units EMGZ622A/642A. The electronic unit amplifies the mV signals of each measuring range depending on configuration. The resulting feedback values are shown in the display in [N] (lbs if required) for each measuring range. In addition, the feedback values are provided at the analogue outputs and various interfaces and can be evaluated by analogue instruments, a PLC or equivalent devices.

4.2 Double Range 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 EMGZ622A/642A

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 up to two measuring points. The electronic unit has no trimmers and only few Dip-switch, 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 Dip switch, jumpers or solder bridges.

Strain gauge amplifier

The strain gauge amplifier provides the highly accurate power supply (5VDC or 10VDC) for 1 or 2 force sensors per measuring point. 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 breaks 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 separately for each channel to provide independent evaluation of each measuring range of each measuring point.

Type	Number of channels	Sensors per channel	Feedback signals
EMGZ622A	1	2	channel 1 = range 1A channel 2 = range 1B
EMGZ642A	2	2	channel 1 = range 1A channel 2 = range 1B channel 3 = range 2A channel 4 = range 2B

Interface

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

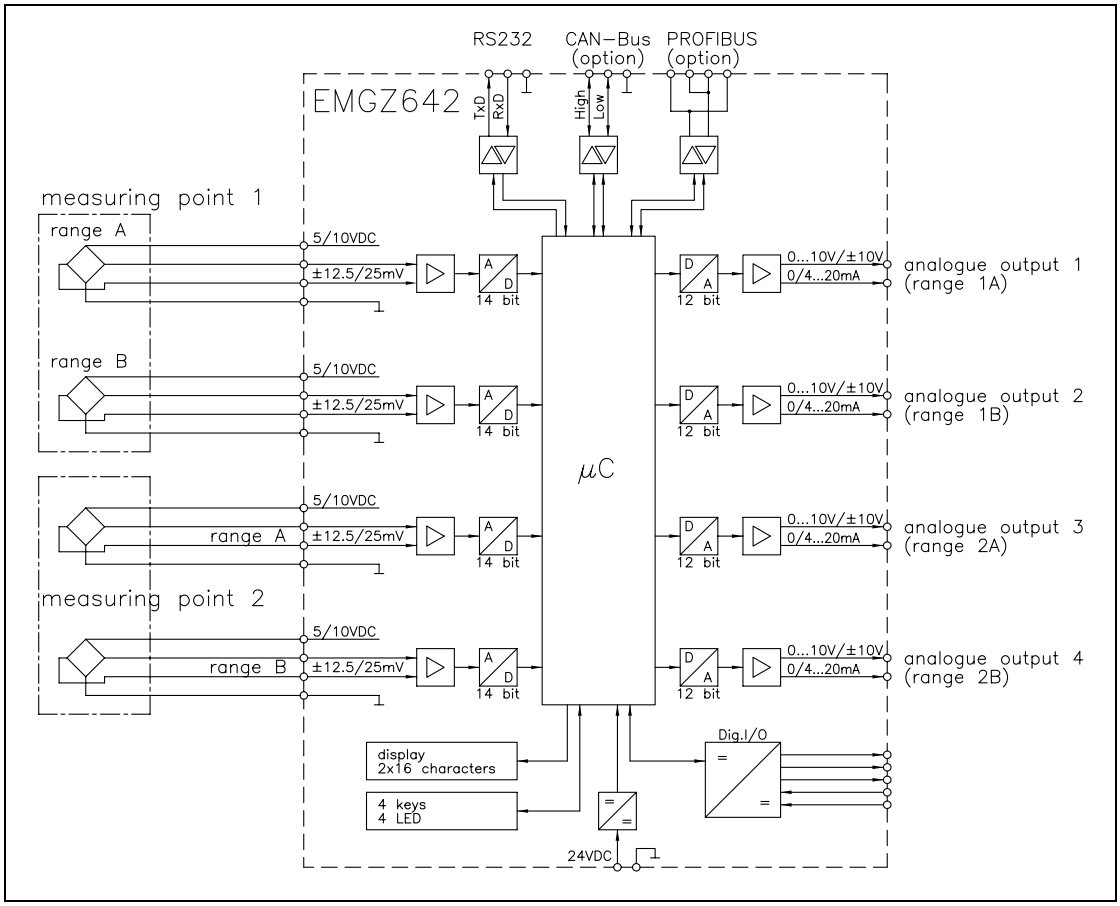

fig. 2: Block diagram of the electronic unit EMGZ642A E642001e

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?
  – digital input / output assignment?
  – 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

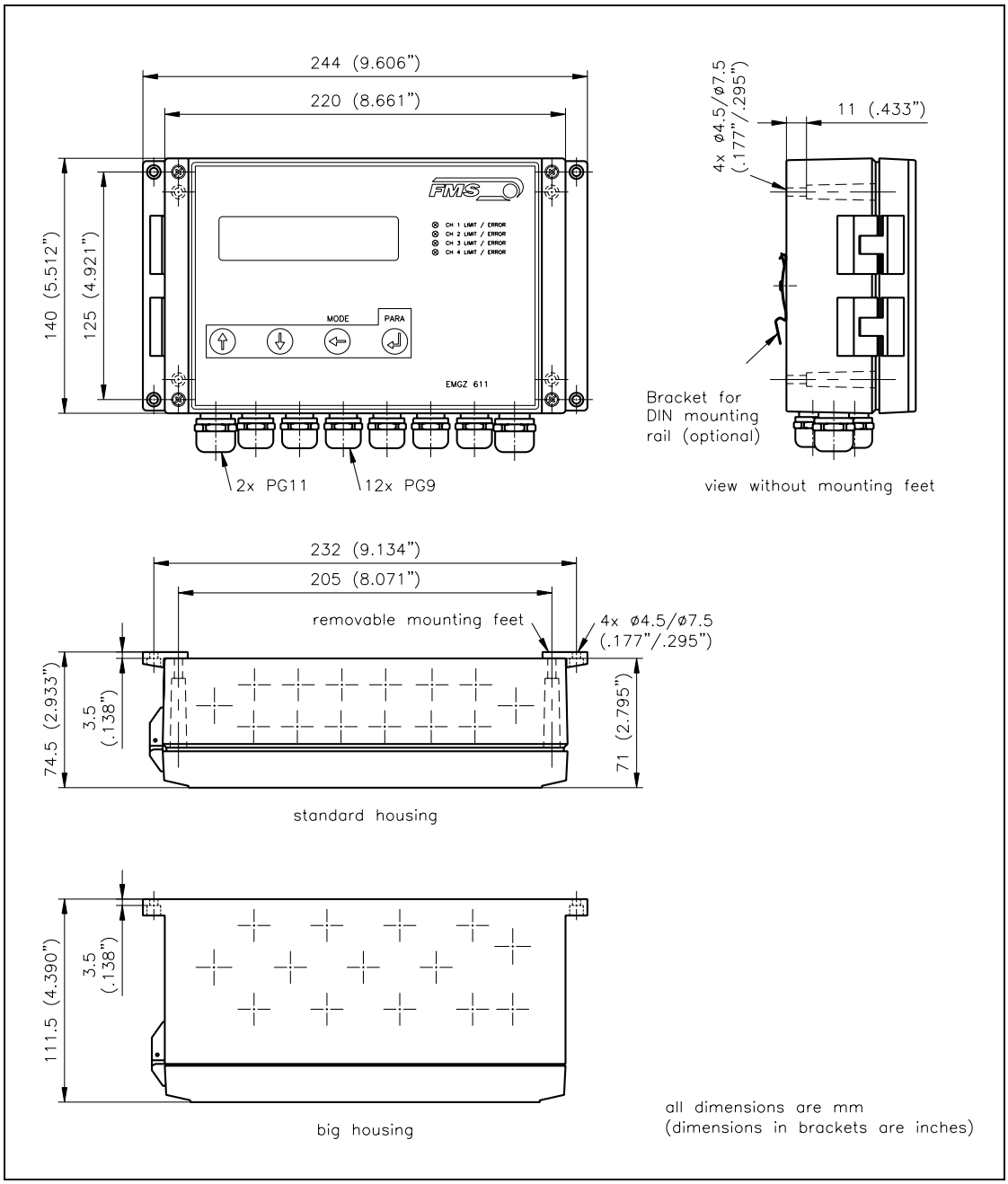

fig. 3: Dimensions E611002e

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).

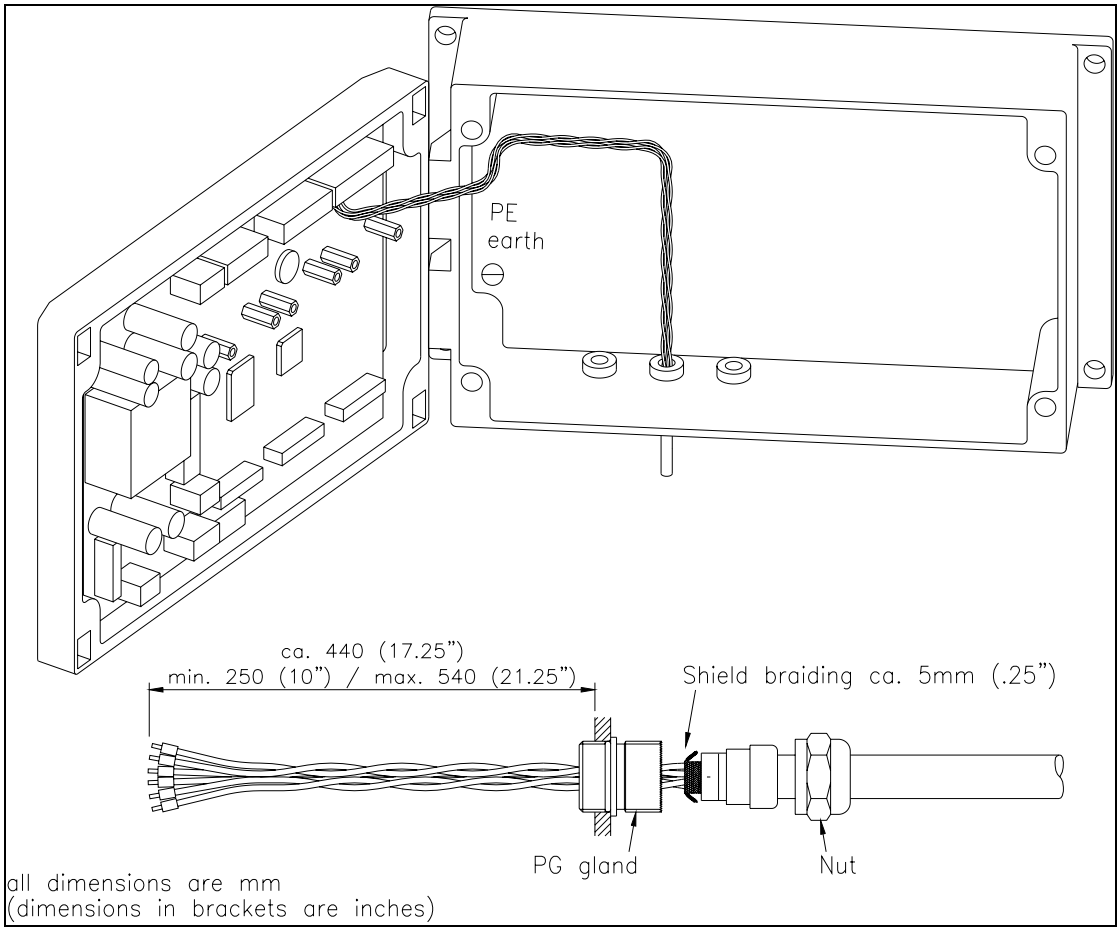

fig. 4: Wiring path inside the housing E600011e

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!

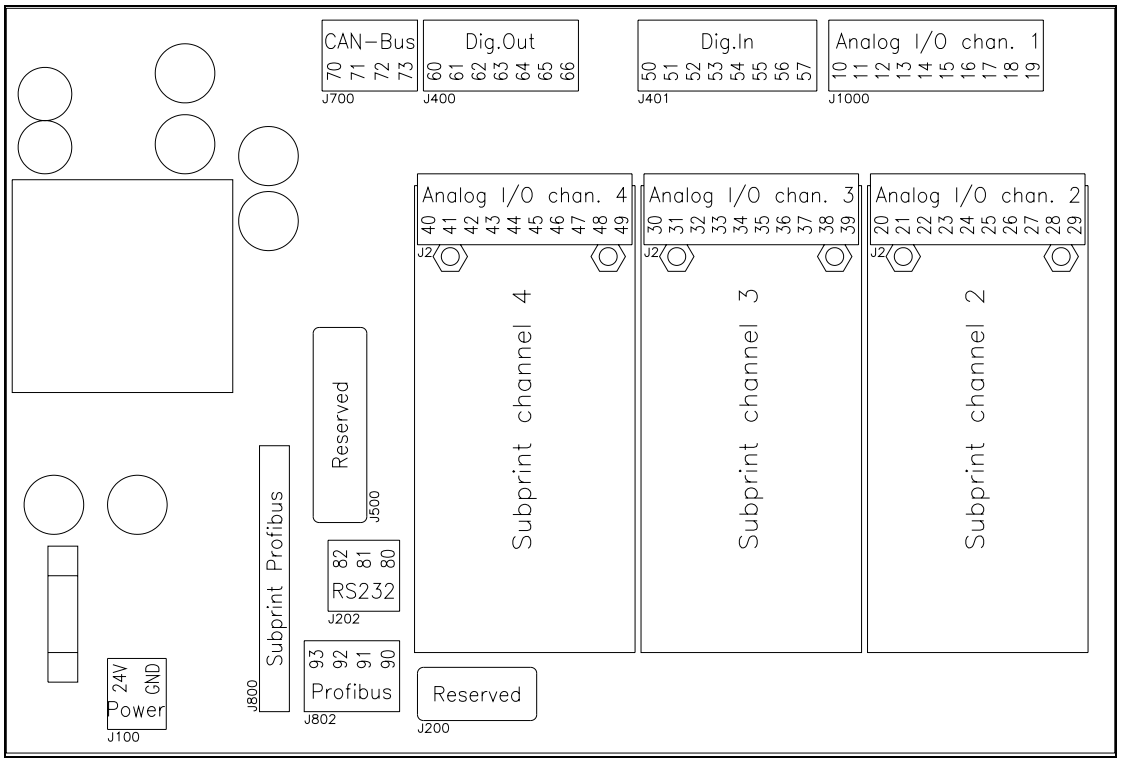

fig. 5: Screw terminal arrangement on the electronic unit E600012e

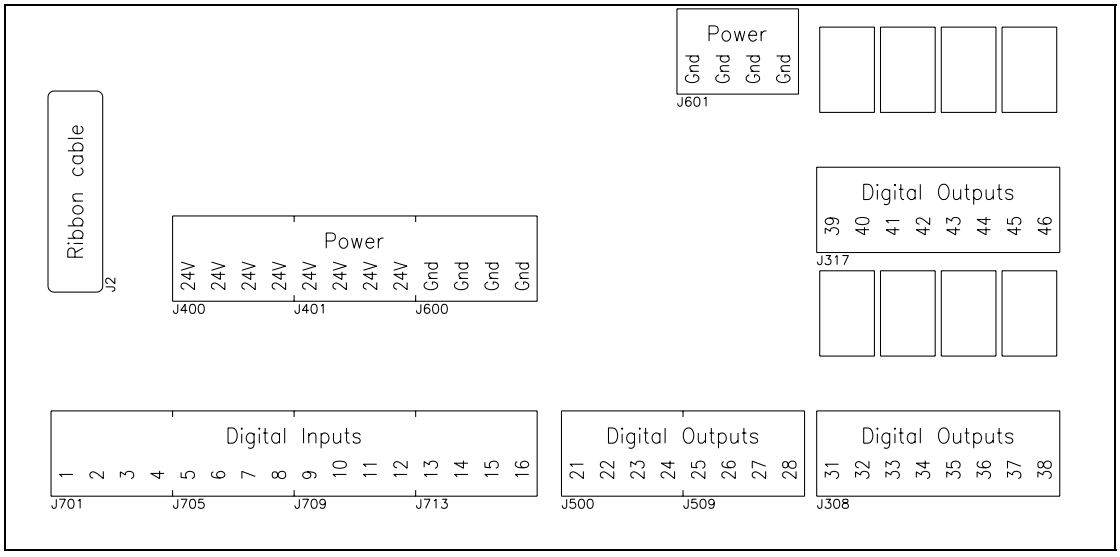

fig. 6: Screw terminal arrangement on the extension board (EMGZ642A only)

E600009e

7.2 Wiring Diagram

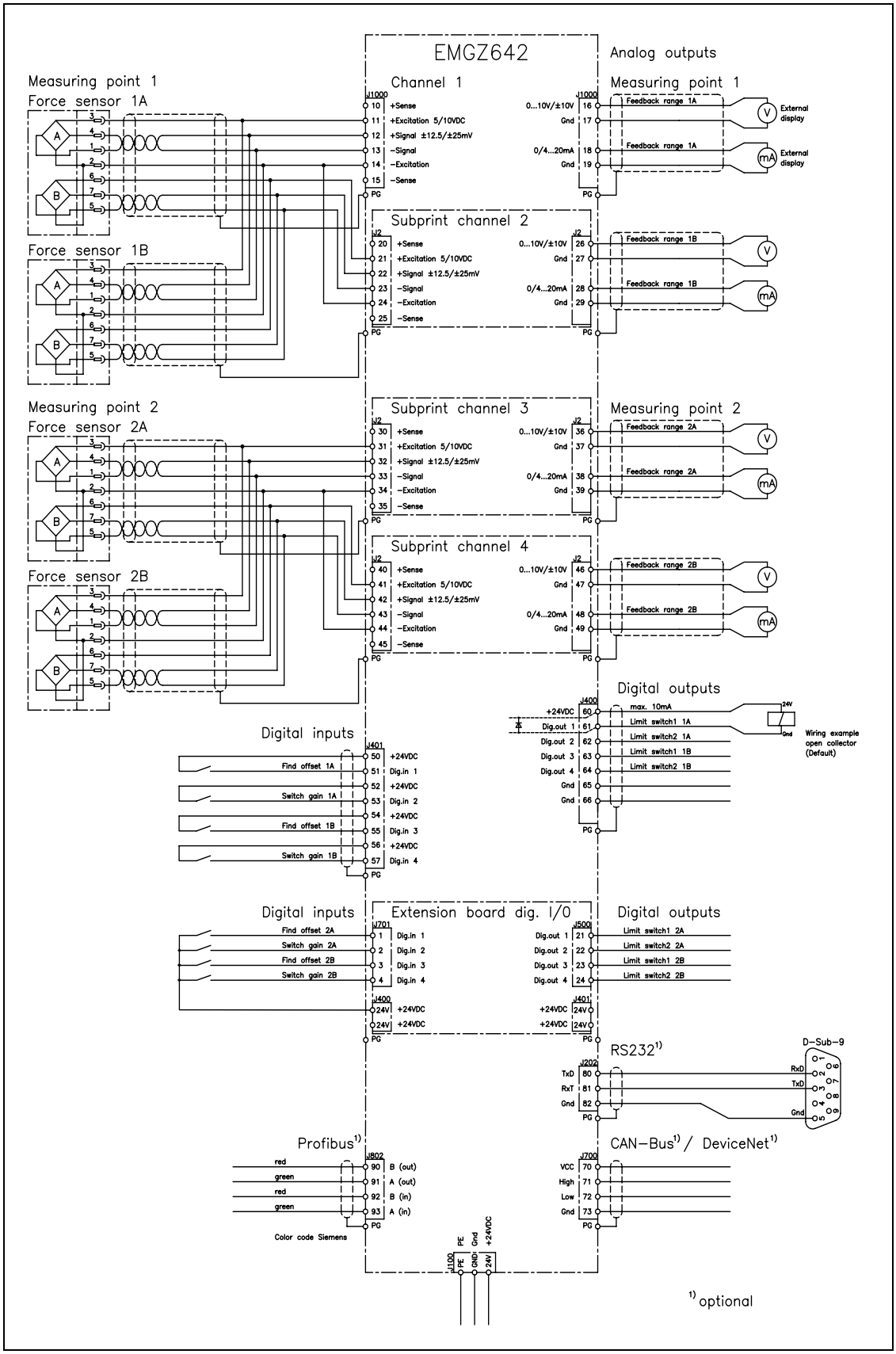

fig. 7: Wiring diagram EMGZ642A. The version EMGZ622A has only channels 1 and 2.

E642002e

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 4x2x0.75mm^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). If wiring is made using 6 wire circuit the Dip-switch, 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

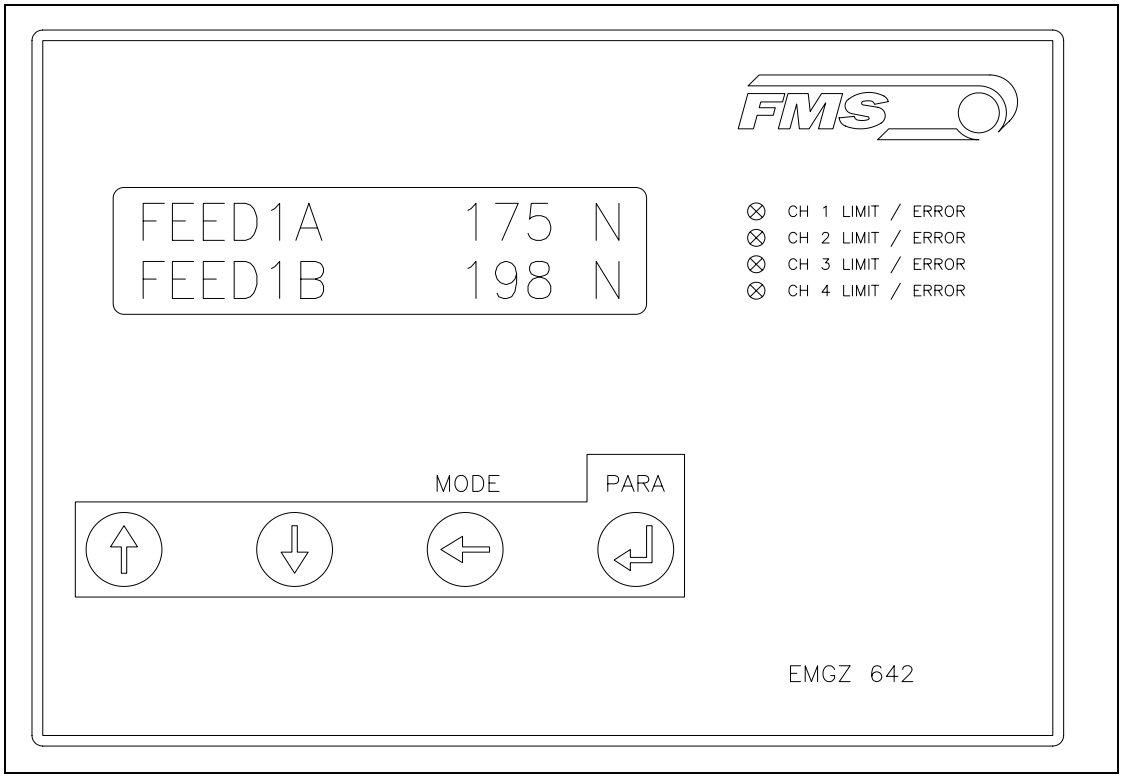

fig. 8: Operating panel EMGZ622A/642A E642006e

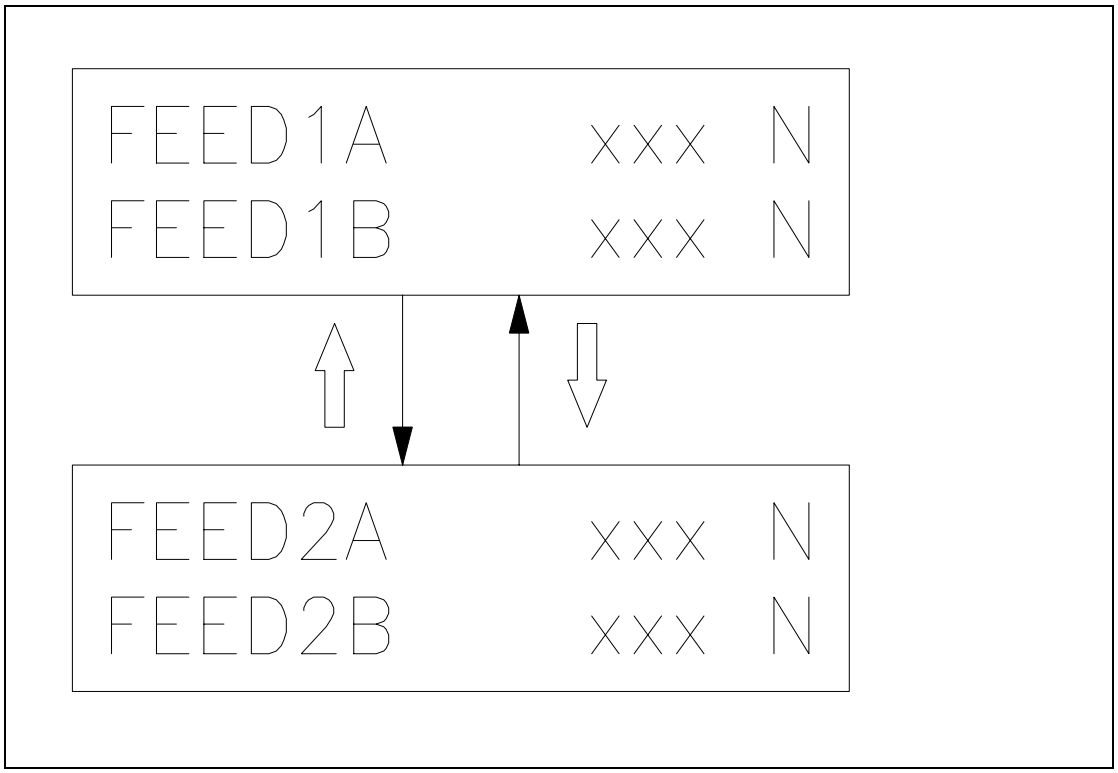

fig. 9: Switching between the tension feedback values E642003e

8.2 Configuring the Electronic Unit

The use of the input channels provided is as follows:

Input Channel assignment (ref. also to wiring diagram)		
	EMGZ622A	**EMGZ642A**
Channel 1	Range 1A (low force range)	Range 1A (measuring point 1, low force range)
Channel 2	Range 1B (high force range)	Range 1B (measuring point 1, high force range)
Channel 3	–	Range 2A (measuring point 2, low force range)
Channel 4	–	Range 2B (measuring point 2, high force range)

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

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

Channel parameters	
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	Which tension feedback refers to 10V resp. 20mA?
Config. output	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!

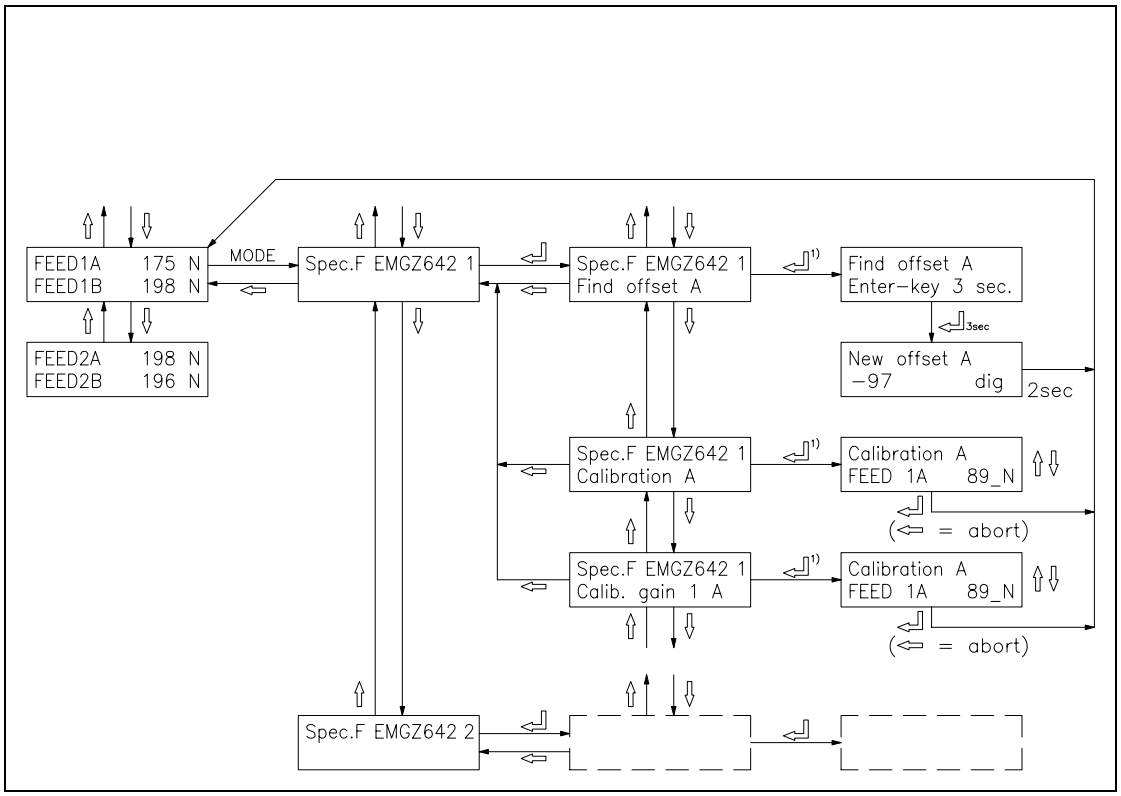

fig. 10: Switching between the tension feedback values E642007e

8.3 Calibrating the Measuring Amplifier

The calibration is done for each channel separately.

Channel assignment	
Channel 1	Range 1A (measuring point 1, low force range)
Channel 2	Range 1B (measuring point 1, high force range)
Channel 3	Range 2A (measuring point 2, low force range)
Channel 4	Range 2B (measuring point 2, high force range)

It can be calibrated using the „simulating method“ or the „mathematical method“:

8.4 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 the first force sensor (ref. to wiring diagram).
- Check if a positive value is displayed when loading the sensor in measuring direction. If not, exchange terminals *+signal* and *– signal* on the measuring amplifier.
- If used, connect the second force sensor.
- Check if a positive value is displayed when loading the sensor in measuring direction. If not, exchange terminals *+signal* and *– signal* on the measuring amplifier.

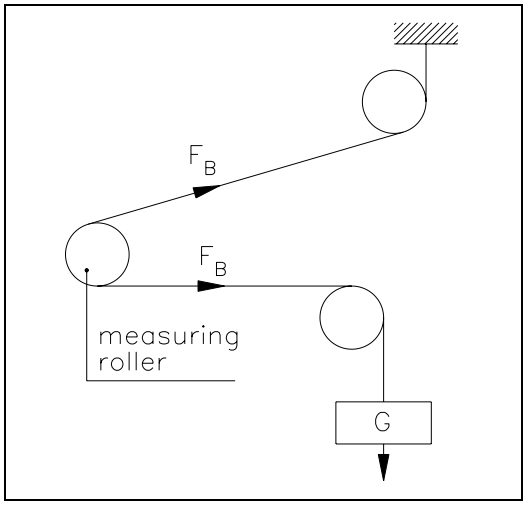

fig. 11: Calibrating the measuring amplifier C431011e

Find offset

- Insert material or a rope loosely to the machine.
- Press MODE key. Search and select the module *Spec.F EMGZ642 1/2* and the special function *Find offset* with the ↑ ↓ ↵ keys (fig. 9).
- Find offset by pressing the ↵ key for 3 seconds (fig. 9). The electronic unit calculates automatically the new offset value. The display will return to the main operating menu.

(The offset may also be determined alternatively with the digital input *Find Offset*; refer to wiring diagram.)

Find gain

- Load material or rope with a defined weight (fig. 10)
- Press MODE key. Search and select the module *Spec.F EMGZ642 1/2* and the special function *Calibration* with the ↑ ↓ ↵ keys (fig. 9).
- Set the force referring to the applied weight into the display with the ↑ ↓ keys and confirm with ↵ key (fig. 9). The electronic unit calculates automatically the new gain value. The display will return to the main operating menu.

8.5 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 parameter *Gain* (refer to „9.5 Description of the parameters: EMGZ622A/642A“).

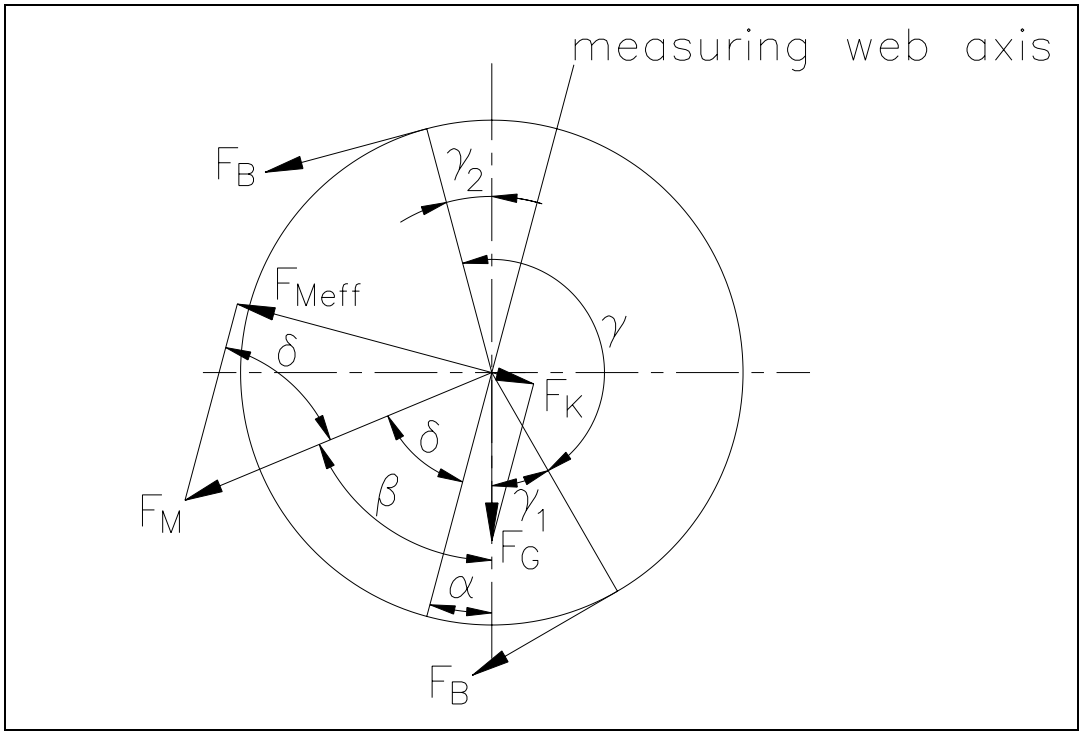

fig. 12: Force vectors in the FMS force measuring bearing C431012e

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

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		

8.6 Additional Settings

Setting the low-pass filters
The measuring amplifier provides 1 low-pass filter for the display and 1 low-pass filter for the output signal of each channel. 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 parameter *Lowpass display* resp. *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 a min and a max limit switch per channel. The threshold values may be set freely using the channel parameters *Min. limit / Max. limit* (ref. to „9.5 Description of the parameters: EMGZ622A/642A"). If the electronic unit detects exceeding of the values set, it can switch on an LED and / or a dig. output.
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 (ref. to „9.5 Description of the parameters: EMGZ622A/642A", parameter function *Calib. gain 1*).
Switching is done using a digital input.
Wiring of the dig. inputs is done according to the wiring diagram (fig. 6).

Digital inputs
The digital inputs may be used for various purposes. Wiring is done according to the wiring diagram (fig. 6).

Digital outputs
The digital outputs may be used for various purposes. Configuration is done by setting the channel parameters *dig. output 1&2for each channel* to an appropriate value (ref. to „9.5 Description of the parameters: EMGZ622A/642A").
The dig. outputs are operated as „open collector" outputs. Wiring is done according to the wiring diagram (fig. 6).

LED on the operating panel
The LED on the operating panel may be used for various purposes. Configuration is done by setting the channel parameters *Config. of LED* to an appropriate value (ref. to „9.5 Description of the parameters: EMGZ622A/642A").

9 Parametrization

9.1 Schematic Diagram of Parametrization

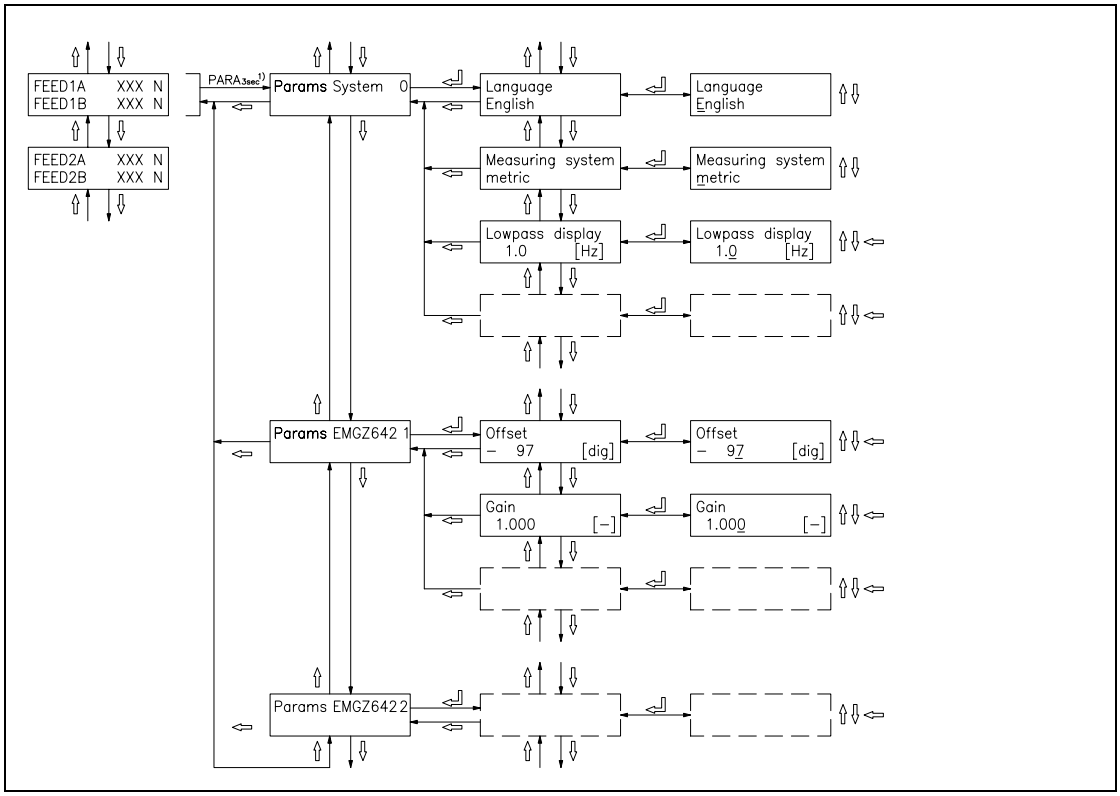

fig. 13: Parametrization EMGZ642A E642005e

9.2 Parameter List: 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 EMGZ622A/642A

Channel assignment	
Channel 1	Range 1A (measuring point 1, low force range)
Channel 2	Range 1B (measuring point 1, high force range)
Channel 3	Range 2A (measuring point 2, low force range)
Channel 4	Range 2B (measuring point 2, high force range)

Parameter	Unit	Min	Max	Default	Selected
Offset A/B	[Digit]	–8000	8000	0	
Gain A/B	[-]	0.100	9.000	1.000	
Gain 1 A/B	[-]	0.100	9.000	1.000	
Force of sensor A/B	[N, kN, cN]	1	9999	1000	
Unit of sensor A/B	N, kN, cN			N	
Sensitivity A/B	[mV/V]	0.1	5.0	1.8	
Min. limit A/B	[1]	[2]		0	
Max. limit A/B	[1]	[2]		1000	
Config LED A/B	Min., Max., Error, Okay			Max.	
Dig. Out 1 A/B	Min., Max., Error, Okay			Min.	
Dig. Out 2 A/B	Min., Max., Error, Okay			Max	
Lowpass output	[Hz]	0.1	200.0	10.0	
Scale output A/B	[1]	[2]		1000	
Config. Output A/B	0–10V and 0...20mA, 0–10V and 4...20mA, –10V...+10V			0–10V and 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 Parameters: System Parameters

The parameter changing mode is activated by pressing the PARA ↵ key for 3 seconds. By pressing the PARA ↵ key again, the global parameters are selected (ref. also to fig. 11). Generally, the parameters are settable using the keys as follows:

↵	choose
↑ ↓	switch the selections or increase / decrease numeric values
←	change the decimal (while inputting a numeric value)
↵	enter

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 low-pass 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 low-pass 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 127 **Default:** 84

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 EMGZ622A/642A

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 (ref. also to fig. 12).

Offset

Use:	This parameter stores the value determined with special function *Find offset* 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

Use:	This parameter stores the value determined with special function *Calibration*, 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

Use:	Identical with *Gain* but the value stored here was determined by special function *Calibration gain 1*. The value stored here is used if the digital input „switch gain“ is activated (ref. to wiring diagram).				
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 sensor. It is printed to the nameplate of the force sensor.				
Range:	1	to	9999	**Default:**	1000
Increment:	1			**Unit:**	[N, kN, cN]

Unit of sensor

Use:	This parameter stores the measuring unit of the sensor. It is printed to the nameplate of the force sensor.				
Range:	N, kN, cN			**Default:**	N

Sensitivity

Use: This parameter stores the sensitivity of the force sensor, 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 event „Min. limit passed under“ will be performed 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 5 digits. The position of the decimal point depends on the parameter *Force of sensor*.

Default: 0

Unit: [N, kN, cN]

or [lb, klb, clb]

Note: The event can be shown using a LED (ref. to parameter *Config. of LED*) or fed to the digital outputs (ref. to parameters *Dig.Out.1* and *Dig.Out.2*).

Max. limit

Use: The event „Max. limit passed over“ will be performed if the tension feedback passes over the threshold value stored here. All other function is identical with *Min. limit*. **Default:** 1000

Config. of LED

Use: This parameter defines which event will activate the LED on the operating panel.

Range: Min., Max., Error, Okay **Default:** Max.

Dig.Out.1

Use: This parameter defines which event will activate the digital output 1. The digital output is operated as „open collector“ output (ref. to wiring diagram).

Range: Min., Max., Error, Okay **Default:** Min.

Dig.Out.2

Use: This parameter defines which event will activate the digital output 2. The digital output is operated as „open collector“ output (ref. to wiring diagram).

Range: Min., Max., Error, Okay **Default:** Max.

Lowpass output

Use: Each channel provides a low-pass 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). Due to this filter, the output signal will be much more stable in the case of high fluctuations of the force value.
The low-pass filter of each channel is independent to the other filters.

Range: 0.1 to 200.0 **Default:** 10.0

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

Scale output

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 5 digits. The position of the decimal point depends on the parameter *Force of sensor*.

Default: 1000

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

Configuration output

Use: This parameter configures the analogue output signal.

Range: 0–10V and 0...20mA,
0–10V and 4...20mA, –10V...+10V

Default: 0–10V and 0...20mA

9.6 Service Mode

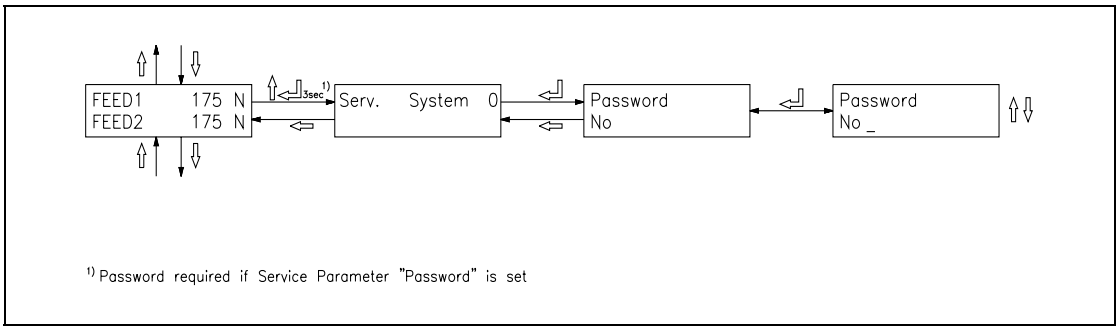

fig. 14 Accessing service mode E614012e

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 diagram.
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 PG-gland connector is properly mounted. The bracket inside the housing must directly clamp the shield. The plastic isolation 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.

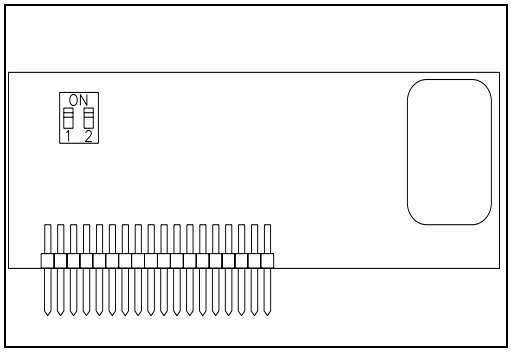

fig.15: Profibus board E621009

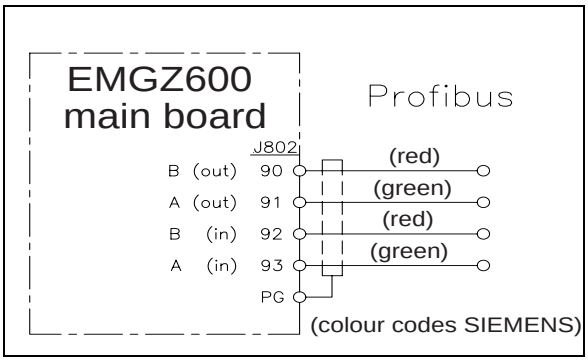

fig.16: connection setting Profibus E621012e

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 amplifier 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 measuring amplifier. Otherwise there may be problems while setup. Version numbers of the firmware and GSD file are indicated in the cover page of this operating manual.

12.2 EMGZ622A DP Slave Functional Description

The measuring amplifier of the EMGZ600A.P-series 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.

12.3 Initial Parameters

During the initialization the initial parameters are sent from the control system to the measuring amplifier once. They are set to a fixed value for a particular 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 exchanged during the cyclic communication between control system and measuring amplifier.
Several modules enable a flexible use of the measuring amplifier. In a single measuring amplifier only one module can be set active at the time.

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

	Byte 0	Byte 1	Byte 2	Byte 3
Request telegram (master → slave)	Function code	Measuring point	Empty	Empty
Response telegram (slave → master)	Function code	Measuring point	Data (higher byte)	Data (lower byte)

Module 2: Reserved

Module 3: Basic telegram and 4 word operation value
The measuring amplifier responses with 4 bytes of the basic telegram and the 4 word.

	Byte 0	Byte 1	Byte 2	Byte 3
request telegram (master → slave)	Function code	Measuring point	Empty	Empty
response telegram (slave → master)	Function code	Measuring point	Data (higher byte)	Data (lower byte)

EMGZ622			
EMGZ642			
Word 0	Word 1	Word 2	Word 3
Measuring point Range A (HB)/(LB)	Measuring point Range B (HB)/(LB)	Measuring point Range A (HB)/(LB)	Measuring point Range B (HB)/(LB)

Module 4: Reserved

12.5 Function Code

Master → Slave

Function Values

Value	Meaning	Remarks
01h	Range A	Lower measuring range
02h	Range B	Higher measuring range
05h	A/D-value gross range A	A/D-value amplifier lower measuring range
06h	A/D-value gross range B	A/D-value amplifier higher measuring range

The measuring amplifier responses with the response telegram.

13 Interface CAN-Bus

(Optional)

14 Interface DeviceNet

(Optional)

15 Technical Reference

15.1 Additional Setting Elements

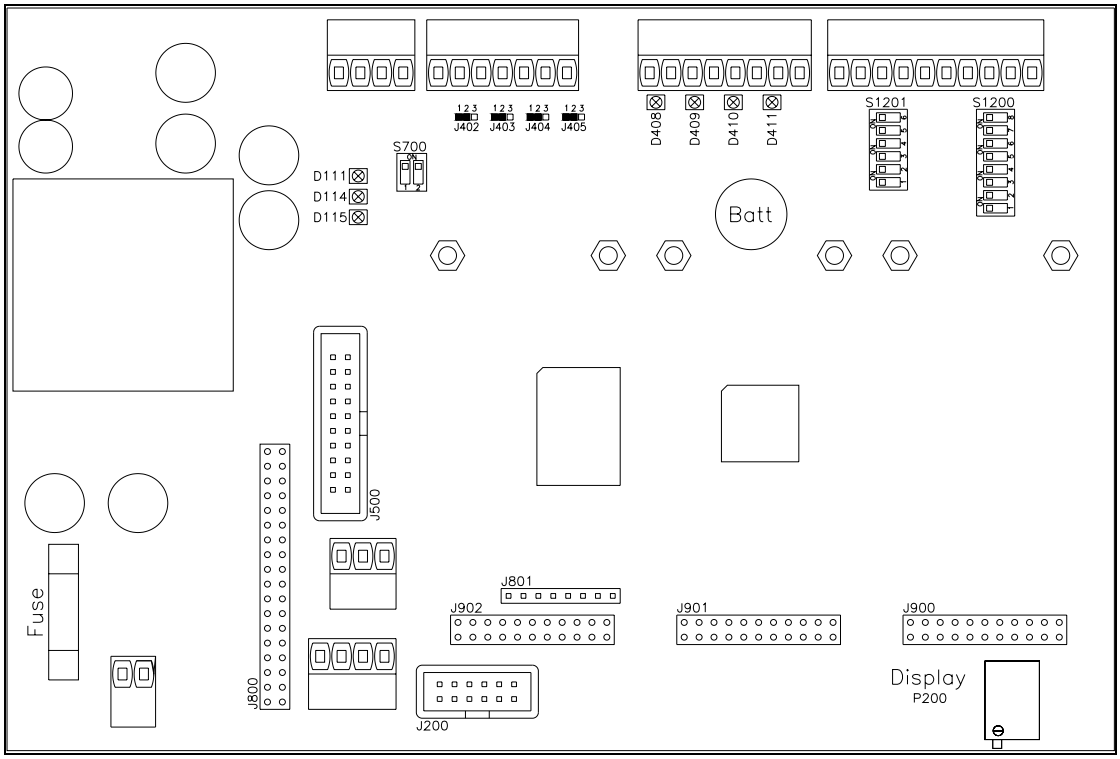

fig. 17 View of main board K600028e

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

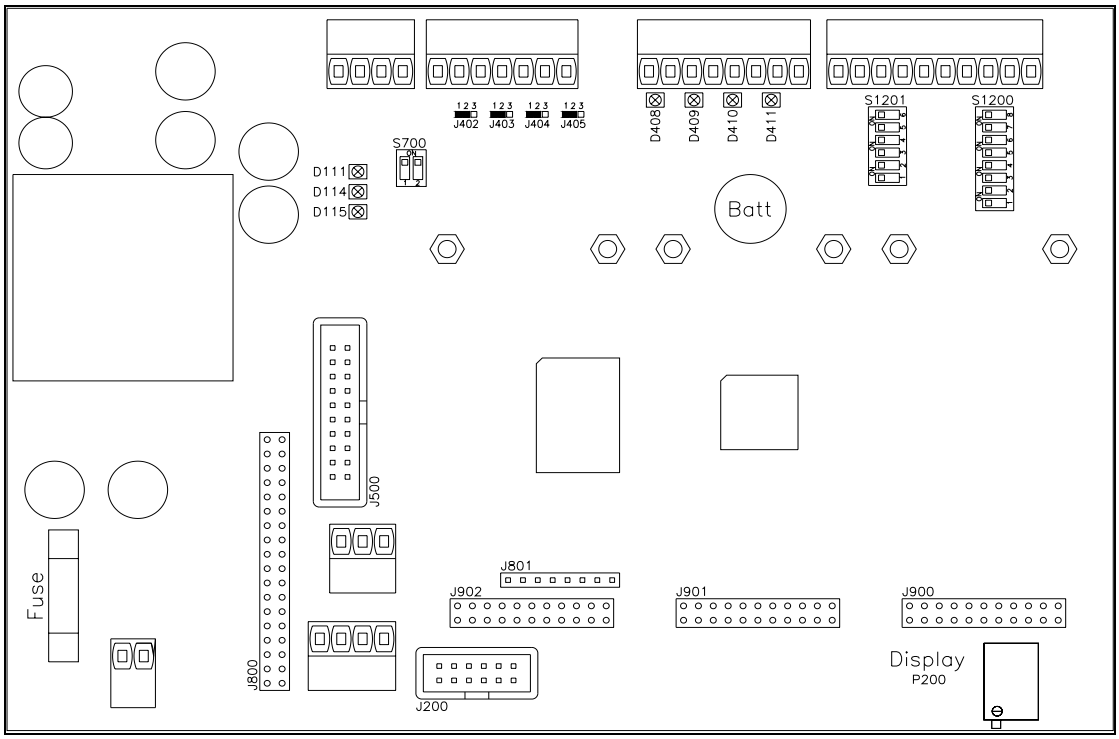

fig. 18 View of main board K600028e

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**
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						

15.2.2 Sub-board (Rev. D)

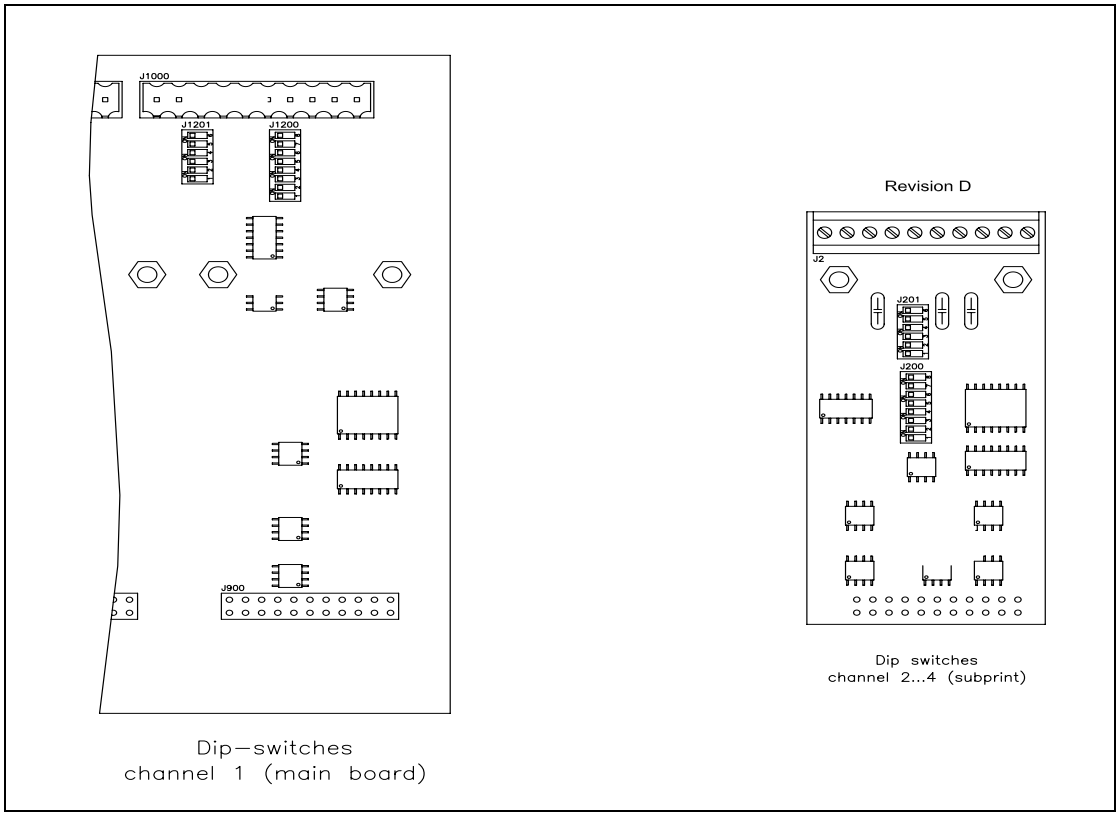

fig. 19: The Dip-switch and solder bridges E600014e

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**
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!

15.3 Technical Data

Number of measuring points	1...2 (depending on device type)
Connection of force sensors	2 parallel wired double range force sensors of 2 x 350Ω for each measuring point
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)
Analogue output channel 2/4 (EMGZ622/642)	0...10V (default) / ±10V and 0...20mA (default) / 4...20mA (12 Bit)
Digital output 4/8 (EMGZ622/642) (freely programmable)	Open collector, max. 10mA, galvanically isolated, with recovery diode
Digital input 4/8 (EMGZ622/642) (freely programmable)	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, a digital output and / or an LED on the operating panel is activated. If the dig. output resp. the LED is parametrized to *Error* (ref. to *Config. of LED, Dig. Out1/2*).
If the dig. output resp. the LED is parametrized to *Ok*, the dig. output and / or the LED is turned off. 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 channel 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
Gain of channel n cannot be switched	The dig. input used is wrong parametrized	Set global parameter *dig. input 1...4* to *Switch gain C.n*
Limit switches of channel n do not work	Limit values wrong parametrized	Set channel parameter *Min. limit / Max. limit* to an appropriate value
	The dig. outputs used are wrong parametrized	Set global parameters *dig. output 1...4* to *Min. limit n / Max. limit n*
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
While power failure, no error message is provided	Dig. output is parametrized to *Error*	Parametrize dig. output to *Ok* and invert signal input of the following evaluating device
Electronic unit does not answer to interface commands	Interface wrong parametrized	Parametrize interface correct (ref. to „10. Serial Interface“ ... „13. Interface DeviceNet“)
	Interface wrong connected	Check / correct wiring (ref. to wiring diagram)

FMS Force Measuring Systems AG
Aspstrasse 6
8154 Oberglatt (Switzerland)
Tel. +41 44 852 80 80
Fax +41 44 850 60 06
info@fms-technology.com
www.fms-technology.com

FMS USA, Inc.
925 East Rand Road Suite 207
Arlington Heights, IL 60004 (USA)
Tel. +1 847 392 7872
Fax + 1 847 392 7873
fmsusa@fms-technology.com

FMS (UK)
Highfield, Atch Lench Road
Church Lench
Evesham WR11 4UG (Great Britain)
Tel. +44 1386 871023
Fax. +44 1386 871021
fmsuk@fms-technology.com