

Operating instructions EMGZ321

Digital microprocessor-controlled dual-channel measuring amplifier with integrated ETHERNET interface



Read these instructions carefully before commissioning. Keep the document in a safe place.

Further information is available here



https://www.fms-technology.com/en/productfinder/detail/amplifier/EMGZ321

Diese Bedienungsanleitung ist auch in Deutsch erhältlich. Kontaktieren Sie Ihren FMS Vertriebspartner.



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2 Safety

Comply with local safety regulations and accident prevention guidelines.

Work relating to the operation, maintenance, retrofitting, repair or adjustment of the appliance described here may only be carried out by qualified specialist personnel. Qualified personnel are persons who are familiar with the installation, assembly, commissioning and operation of the product and who have the appropriate qualifications for their work:

- You are familiar with the safety concepts of automation technology and are familiar with them as project personnel. OR
- You are the operator of the machine and have been trained in handling the equipment. You are familiar with the operation of the equipment and technologies described in this documentation. OR
- You are a commissioning engineer or responsible for maintenance and have completed training that qualifies you to repair automation systems. You are also authorized to commission, ground and label circuits and devices in accordance with safety engineering standards.

2.1 Intended use

All the safety instructions, operating and installation instructions listed here are intended to ensure the proper functioning of the product. Observe them at all times to ensure safe operation of the equipment. Failure to comply with the safety instructions and use of the appliances outside their specified performance data may endanger the safety and health of persons.

2.2 Presentation of the safety instructions

indicates a potentially hazardous situation which, if the safety regulations are not observed, could result in death or serious injury.







i Note

Note on correct operation

Simplification of operation

Ensuring the function

2.3 General safety instructions

Marning - risk of breakage



If the force sensor is heavily overloaded, there is a risk of it breaking. This can pose a risk to the system's operating personnel.

Take suitable safety measures to prevent overloading or to protect against any resulting hazards.

The maximum possible loads are noted in the technical data.



▲ Loss of warranty claims

If you make unauthorized modifications, your warranty claims will become void.



3 Technical data

Technical data	
Sensor excitation	5 VDC, max. 60 mA
Temperature drift	< 0.01% / K [0.006% / °F]
Linearity	±0,05 %
Cycle time	1 ms
Operation	keypad, 2-line display
Interface for configuration	Ethernet via web browser
Voltage output	0 to 10 VDC or ±10 VDC min. 1000 Ω, 12 bit
Current output	0/4 to 20 mA, max. 500 Ω, 12 bit
Power supply	24VDC (18 to 36 VDC)
Power consumption	10 W
Temperature range	0 to+ 50°C
Protection class	EMGZ321.R IP40
	EMGZ321.S IP20
	EMGZ321.W: IP54

Table1 : Technical data



4 Product information

4.1 Product labeling

The type plate is located on the side of the housing.



Figure1 : Product identification, type plate

Produ	ict labeling
Pos.	Description
1	Order code
3	Nominal voltage Power supply
4	Serial number

Table2 : Product labeling, type plate

4.2 Order code



Figure2 : Order code

4.3 System description

The EMGZ321 is a dual-channel measuring amplifier for connecting one to four force sensors. In the main application, one force sensor is connected to each channel. This allows the tension on a measuring roller on both sides of the material web to be recorded independently of each other and thus also controlled.

The measuring amplifiers are suitable for tension measurement with all FMS force sensors. Two force sensors A and B are usually connected to the amplifier, whose measured values can be transmitted to the machine control system as individual signals (A and B), as a sum signal (A + B), as a difference signal |A - B| or as an average value (A + B)/2. Device information, parameters or system settings can also be accessed via a web browser. Offset compensation and system calibration can also be carried out via the web browser.



Other applications include, for example, the connection of two measuring rollers with two force sensors each, or the combination with force sensors from the LMGZD series. These examples can be found in the chapter 5.5.1 Connection of two measuring rollers with a total of four force sensors, p.11 f.

4.4 Bock diagram



Figure3 : Block diagram EMGZ321

4.5 Scope of supply

Included in the scope of supply

- Measuring amplifier
- Operating instructions

Not included in the scope of supply

- AC/DC power supply unit, minimum requirement: EMC immunity specifications EN61000-4-2, 3, 4, 5; EN55024 light industry level, criteria A, e.g. TRAKO TXL 035-0524D
- Cable for power supply

Not included in the scope of supply, available as an accessory from FMS

- Patch cable with RJ45 plugs (straight connector)
- Sensor cable for connecting force sensor and measuring amplifier
- M12 connector, D-coded



5 Quick guide / Quick start

Commissioning of the EMGZ321 amplifier is limited to the installation procedure, offset compensation and calibration of the system in these operating instructions.

5.1 Preparations for parameterization

- 1. Carefully read the operating instructions for the force sensor used
- 2. Check your requirements for the system, e.g:
 - Units of measurement used in the system
 - Outputs used (current or voltage output)
- 3. Filter settings for actual force values and analog output
- 4. Create the connection diagram for your specific system arrangement

5.2 Assembly sequence

- **1.** Install the force sensors (for installation details, please refer to the installation instructions for the force sensors)
- 2. Connect the force sensors to the amplifie, see 5.3Installation and electrical connections, p.9
- 3. Connect the amplifier to the supply voltage. The power supply must be in the range of 18 to 36 VDC.
- 4. Perform offset compensation and calibration, see 6Calibration of the measuring system, p.14
- 5. If necessary, change the parameter settings, see 8Configuration, p.21ff.

5.3 Installation and electrical connections



Warning

To improve natural convection and keep the heating of the amplifiers as low as possible, appliances installed in a built-in cabinet should be at least 15 mm apart.





The function of the tension amplifier is only guaranteed if the components are arranged in the correct order. Otherwise, serious malfunctions may occur. The installation instructions on the following pages must therefore be strictly observed







The local installation regulations serve to ensure the safety of electrical systems. They are not included in these operating instructions. However, they must be observed in all cases.

5.4 Installing the force sensors

The force sensors are installed in accordance with the installation instructions for the respective products. The installation instructions are supplied with the force sensors.

5.5 Electrical connections

Two or four force sensors can be connected to the EMGZ321. When using four force sensors, two are connected internally in parallel. The connection between force sensor and amplifier is realized with a 2x2x0.25mm⁽²⁾ [AWG 23] shielded, twisted pair cable.



Figure 4 : Electrical connection, terminal assignment



5.5.1 Connection of two measuring rollers with a total of four force sensors



Figure5 : Two measuring rollers, each with two force sensors





Figure6 : Electrical connection of two measuring rollers, each with two force sensors, terminal assignment

When connecting 2 force sensors, the corresponding connecting wires in the terminals must be connected in parallel.

Color specifications (according to IEC60757) and coding only apply to FMS components!

5.5.2 Connection of two force sensors from the LMGZD-series



Figure7 : Electrical connection of two force sensors from the LMGZD series, each with two measuring ranges, terminal assignment





Figure8 : Electrical connection LMGZD-series, terminal assignment

When connecting 2 force sensors, the corresponding connecting wires in the terminals must be connected in parallel.

Color specifications (according to IEC60757) and coding only apply to FMS components!





Poor earthing can lead to electric shocks to persons, faults in the overall system or damage to the measuring amplifier! Good earthing must be ensured in all cases.



Note

The shielding may only be connected on the measuring amplifier side. The shielding must be left open at the force sensor connection.



6 Calibration of the measuring system

You can perform the calibration in two ways:



7 via the web interface (see 10Web interface

You can also configure the amplifier using a PC or laptop. The PC is connected to the amplifier via a peer-to-peer connection.

7.1 Peer-to-Peer connection with laptop

For this connection, your laptop must be assigned an IP address in the static block (not obtained via DHCP).

The IP address of the amplifier is set to 192.168.000.090 at the factory.

7.2 Assign static IP-address to laptop

The example shows the configuration for Windows 10 (with German interface). The display may vary depending on the operating system.

- 1. connect PC and amplifier with an RJ-45 patch cable
- 2. start PC and amplifier
- 3. click on the start button of your PC (bottom left corner of your screen)



- 4. Click settings
- 5. Click network and internet

	Wind	dows-Einstellungen		
E	Einstellung su	ichen	Q	
cker, Maus		Telefon Android-Smartphone oder iPhone verknüpfen		Netzwerk und Internet WLAN, Flugzeugmodus, VPN



6. Select Ethernet in navigation on the left hand side of the screen

Einstellungen		- 0)	×
Ĝ Startseite	Ethernet			
Einstellung suchen	MS.local Watworken	Verwandte Einstellungen Adapteroptionen ändern		
Netzwerk und Internet	Themet	Erweiterte Freigabeoptionen än	dern	
🔁 Status	Hard Nicht verbunden	Netzwerk- und Freigabecenter		
الله WLAN		Windows-Firewall		
😨 Ethernet		A Hilfe anfordern		- 82
P DFU		Feedback senden		
ego VPN				
4 Flugzeugmodus				4

7. Select change adapter options



- 8. select the desired adapter (of the Ethernet socket used on your laptop), here in the example: Ethernet, Unidentified network
- 9. double-click to select

lgemein Verbindung IPv4-Konnektivität: K IPv6-Konnektivität: K Medienstatus: Dauer: Übertragungsrate: Deträlis	ein Netzwerkzugriff ein Netzwerkzugriff Aktiviert 00:01:00 100,0 MBit/s
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Eigenschaften Deaktivieren	Diagnose
	Schließen

10.Select properties



letzwerk	Freigabe			
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Diana Va	hindung yopu	andat falaanda Elami	Konfigurieren	
	Datei-und Dru Trend Micro N QoS-Paketplar Internetprotok Microsoft-Multi Microsoft-Unulti	uckerfreigabe für Micr IDIS 6.0 Filter Driver ner oll, Version 4 (TCP/IF iplexorprotokoll für Ne B. Treiber	osoft-Netzwerke ?v4) stzwerkadapter	
<	MICrosoft-LLD	r-Treiber	>	~
Insta Beschr	llieren eibung	Deinstallieren	Eigenschafter	ı

11. Internet protocoll, Version 4 (CP/IPv4)

genschaften von Internetprotoko	II, Version 4 (TCP/IPv4) X
Allgemein	
IP-Einstellungen können automatisc Netzwerk diese Funktion unterstütz Netzwerkadministrator, um die geei	h zugewiesen werden, wenn das t. Wenden Sie sich andernfalls an den gneten IP-Einstellungen zu beziehen.
O IP-Adresse automatisch bezieł	nen
Folgende IP-Adresse verwend	en:
IP-Adresse:	192.168.0.88
Subnetzmaske:	255 . 255 . 255 . 0
Standardgateway:	
ODNS-Serveradresse automatis	ch beziehen
Folgende DNS-Serveradresser	n verwenden:
Bevorzugter DNS-Server:	
Alternativer DNS-Server:	
Einstellungen beim Beenden ü	iberprüfen
	Erweitert
	OK Abbrechen

12. activate "Use the following IP address"

- **13**. please check with your IT department which address you may enter here.
- 14. enter an IP address here.
- 15. Subnet mask is filled in automatically
- 16.confirm with OK.
- **17**.the laptop is now ready to communicate with the amplifier.

7.3 Connect device with laptop

- 1. open any web browser: Microsoft Internet Explorer, Mozilla Firefox, Edge, Chrome, or similar...
- 2. the factory setting for the IP address of the amplifier is 192.168.0.90.
- 3. if nothing has been changed, enter this IP address in the input field (e.g. http://192.16800.90) and confirm with "Enter".
- 4. the user interface of the web interface appears.
- , p.31ff.



- directly on the measuring amplifier

7.4 Offset compensation

Offset compensation is used to compensate for the weight of the measuring roller and the roller bearings and to "zero" the measuring system.

Offset compensation must always be carried out before the actual calibration. The measuring roller must not be loaded during the process.

- 7.4.1 Directly on the device
 - (>0<
 - 1. Press // for longer than 3 seconds.
 - 2. The display shows: Offset channel A
 - 3. Press the button to start the procedure
 - 4. Offset compensation runs automatically. As soon as the display shows "Offset corrected", the process for channel A is complete



- 5. Use \checkmark to switch to channel B.
- 6. Repeat steps 3 and 4.

7.5 Calibration (setting the amplification or gain factor)

Calibration is used to match the amplification factor with the force sensors. After calibration, the displayed force corresponds to the actual force acting on the material. Two calibration methods are available. The first calibration method described here uses a defined weight. There is also a mathematical method for amplification. The calibration method using the weight is simple and provides more accurate results because it simulates the material flow (see figure below) and takes into account the actual conditions in the machine.





Figure9 : Simulation of the material flow with a defined weight

7.6 Perform calibration on the device

- 1. Trace the subsequent course of the material over the measuring rollers with a cord or rope.
- 2. Hang a known weight on the rope. The weight should correspond approximately to the material tension later.
- 3. Make sure that the rope runs EXACTLY in the middle over the measuring roller. If it runs off-center, the measurement result will be inaccurate!



- 4. Press the button for longer than 3 seconds.
- 5. The display shows: Adjustment Verst. A1
- 6. Press
- 7. The display shows: NominalCr.A 1000.0 and the number flashes.
- 8. Here you enter the sum of the nominal forces of the force sensors connected to this channel. The nominal force of a force sensor can be found on its rating plate.

and

- 9. Change the value using the buttons
- 10.Confirm the change with 💛
- 11. The display now shows the changed nominal force, e.g. Calibri 250.0
- **12**. The next step is to enter the weight force. This is the weight that is attached to the rope. When entering the weight, please note that it is displayed in Newtons N!





8 Connect the measuring amplifier to the laptop and open the web browser, then open the "Offset/Calibration" web page. See 11Web interface

You can also configure the amplifier using a PC or laptop. The PC is connected to the amplifier via a peer-to-peer connection.

8.1 Peer-to-Peer connection with laptop

For this connection, your laptop must be assigned an IP address in the static block (not obtained via DHCP).

The IP address of the amplifier is set to 192.168.000.090 at the factory.

8.2 Assign static IP-address to laptop

The example shows the configuration for Windows 10 (with German interface). The display may vary depending on the operating system.

18. connect PC and amplifier with an RJ-45 patch cable

19.start PC and amplifier

20. click on the start button of your PC (bottom left corner of your screen)



21.Click settings 22.Click network and internet

	Wind	dows-Einstellungen		
ŧ	Einstellung su	chen	Q	
:ker, Maus		Telefon Android-Smartphone oder iPhone verknüpfen		Netzwerk und Internet WLAN, Flugzeugmodus, VPN

23. Select Ethernet in navigation on the left hand side of the screen

Einstellungen		-	٥	×
ŵ Startseite	Ethernet			
Einstellung suchen	F MSlocal	Verwandte Einstellungen Adapteroptionen ändern		
Netzwerk und Internet	versunden	Erweiterte Freigabeoptionen ä	ndern	
Status	Nicht verbunden	Netzwerk- und Freigabecenter		
🖉 WLAN		Windows-Firewall		
😨 Ethernet		A Hilfe anfordern		- 17
⊕ DFÜ		Feedback senden		
980 VPN				
🖏 Fluazeuamodus			-	

24. Select change adapter options

Drganisjeren ▼		
	· 🔟	•
Ethernet 2 Nicht identifiziertes Netzwerk Realtek PCIe GbE Family Controller Realtek USB GbE Family Controller Realtek USB GbE Family Controller WLAN Realtek USB GbE Family Controller Realtek USB GbE Family Controller Realtek USB GbE Family Controller		

25. select the desired adapter (of the Ethernet socket used on your laptop), here in the example: Ethernet, Unidentified network

26.double-click to select



lgemein			
/erbindung			_
IPv4-Konnektivität	:	Kein Netzwerkzug	riff
IPv6-Konnektivität	:	Kein Netzwerkzug	riff
Medienstatus:		Aktivi	ert
Dauer:		00:01	:00
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Details			
octalist.			
Aktivität —			_
Aktivität Ges	endet —	Empfar	ngen
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27.Select properties

Realtek PCIe Gt	bE Family Controller		
Diese Verbindung verw	vendet folgende Elemer	Konfigurieren	
💌 🛫 Datei- und Dr	uckerfreigabe fur Micro	soft-Netzwerke	
Trend Micro N QoS-Paketpla Internetprotok Microsoft-Mult Microsoft-LLD	NDIS 6.0 Filter Driver aner toll, Version 4 (TCP/IPv tiplexorprotokoll für Netz PP-Treiber	4) zwerkadapter	~
Trend Micro N GoS-Paketpla OS-Paketpla Internetprotok Microsoft-Mult Microsoft-LLD <	NDIS 6.0 Filter Driver aner coll, Version 4 (TCP/IPv tiplexorprotokoll für Netz)P-Treiber	4) zwerkadapter	~
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28. Internet protocoll, Version 4 (CP/IPv4)

Igemein	
P-Einstellungen können automatisch z Vetzwerk diese Funktion unterstützt. V Vetzwerkadministrator, um die geeign	ugewiesen werden, wenn das Wenden Sie sich andernfalls an den eten IP-Einstellungen zu beziehen.
O IP-Adresse automatisch bezieher	ı
Folgende IP-Adresse verwenden	:
IP-Adresse:	192 . 168 . 0 . 88
Subnetzmaske:	255.255.255.0
Standardgateway:	
ODNS-Serveradresse automatisch	beziehen
Folgende DNS-Serveradressen v	erwenden:
Bevorzugter DNS-Server:	
Alternativer DNS-Server:	
Einstellungen beim Beenden übe	rprüfen
	Erweitert
	OK Abbrechen

- 29. activate "Use the following IP address"
- 30. please check with your IT department which address you may enter here.
- 31. enter an IP address here.
- 32. Subnet mask is filled in automatically
- 33. confirm with OK.
- 34. the laptop is now ready to communicate with the amplifier.

8.3 Connect device with laptop

- 5. open any web browser: Microsoft Internet Explorer, Mozilla Firefox, Edge, Chrome, or similar...
- 6. the factory setting for the IP address of the amplifier is 192.168.0.90.
- 7. if nothing has been changed, enter this IP address in the input field (e.g. http://192.16800.90) and confirm with "Enter".
- 8. the user interface of the web interface appears.
- **1**. Web interface, page **31**ff.
- 2. Connect the first force sensor. See 5.5Electrical connections, page 10ff.
- 3. The measurement signal must be positive when a load is applied in the direction of measurement. If negative, the signal lines of the relevant force sensor must be swapped at the terminal block. See 5.5Electrical connections, page 10ff.
- 4. Connect the second force sensor. See 5.5Electrical connections, page 10ff.
- 5. The measurement signal must be positive when a load is applied in the direction of measurement. If negative, the signal lines of the relevant force sensor must be swapped at the terminal block. See 5.5Electrical connections, page 10 ff.
- 6. Insert material or rope loosely into the machine.
- 7. Click on "Adjust Offset" in the web browser. 7.5 Calibration (setting the amplification or gain factor), page14ff.
- 8. Load material or rope with a defined weight
- 9. Click on "Calibrate Gain" in the web browser.



9 Operation



Figure10 : Operating elements and display

User i	nterface
Pos.	Description
1	Control panel for navigation
2	LCD display
3	Parameterization, press and hold > 3 sec., corresponding LED display lights up
4	Calibration, press and hold > 3 sec., associated LED display lights up
5	Offset compensation, press and hold > 3 sec., corresponding LED display lights up
6	Increase values, holding the button accelerates the change
7	"Scroll" in the parameters or the views
8	Enter or confirmation button
9	"Scroll" in the parameters or the views
10	Decrease values, holding the button accelerates the change

Table3 : Operating elements and display

The language of the user interface can be set to German or English using the corresponding parameter.



9.1 Display

You can switch between different display values by navigating with the buttons



- A = Force on channel A B = Force on channel B
- or
- S = Sum of the channels A+ B
- D = Difference of the channels |A-B|

9.2 Default settings

The default settings of the EMGZ321 can be restored as follows:

"factory setting" parameter, see 10.3System parameter group page24 ff or

By simultaneously pressing the buttons 20^{-0} and 40^{-0} while switching on or applying the power supply to the measuring amplifier.

9.3 Relay outputs

These can be used, for example, to control a signal tower / signal light on the system. For example, the train could be monitored in 2 steps:

Relay 1			
Parameters	Display	Parameter setting	
Relay output 1	Relay 1	Test A	
Condition Limit 1	LimKond1	>Limite	
Value Limit 1	Limit 1	100.0	

Table4 : Example relay 1

Relay 2			
Parameters	Display	Parameter setting	
Relay output 2	Relay 2	Test A	



Relay 2				
Parameters	Display	Parameter setting		
Condition Limit 2	LimKond2	>Limite		
Value limit 2	Limit 2	120.0		

Table5 : Example relay 2

In the example, relay 1 would be energized as soon as tension value A rises above 100 N. This could activate the orange lamp, for example.

If the tension value continues to rise above 120 N, relay 2 would also pick up and could activate the red lamp.

9.4 Digital inputs, switching the amplification factors

This function is used, for example, when the system is operated with different material gradients. If the wrap angle changes, the gain factor must normally be redetermined by the calibration. This procedure is time-consuming and only makes sense if the changes to the wrap angle only occur infrequently. If you change back and forth between two web paths very frequently, the two corresponding gain factors can be stored in the respective parameters. See 10.1Amplifier parameter group, page 21ff.



Figure11 : Two material gradients with different wrap angles



9.4.1 Level control of the digital inputs



Figure 12 : Level-controlled inputs



10 Configuration

The EMGZ321 can be configured either via the web browser or the user interface on the device.

These parameters are organized into 4 parameter groups:

- Amplifier parameter group Basic functions of the measuring amplifier
- Output parameter group Configuration of the analog outputs
- Relay parameter group Configuration of the relay outputs
- System parameter group system settings, mainly for communication

10.1 Amplifier parameter group

Offset A			LCD: Offset A	
Offset B		LCD: Offset B		
Purpose:	Se: The values determined with the Offset A and Offset B adjustment procedures are saved in the form of a digital value in the Offset A and parameter. The value is used to compensate for the roller weight			B adjustment the Offset A and B oller weight
Unit	Parame	eter range Selection Defa		Default
onit	Min	Max	Celection	Derdan
Digit	-8000	+8000	-	0

Nominal force Force sensor A		LCD: NominalForc.A		
Nominal force Force sensor B		LCD: NennKraf.B		
Purpose: The parameter saves the buzzers of the nominal forces of the connected force sensors. If two force sensors are connected to one channel, you must enter the buzzers for the two nominal forces. The nominal force is noted on the rating plate of the force sensors. It must be entered individually for channels A and B.				
Parameter range Selection			Selection	Default
onic	Min	Max		Deraut
N, kN, g, kg, lb ¹⁾	1.0	100'0000.0	-	1000.0

Gain A1, A	Gain A1, A2		A2
Gain B1, B2		LCD: Gain .A1 and A2	
Purpose:	The amplification factors determined with the calibration adjustment procedure are saved in the parameters <i>Verst.A1, A2, B1, B2.</i> Two parameter sets (<i>Verst.A1/B1 and Verst.A2/B2</i>) can be saved.		
Unit	Parameter range	Selection	Default



	Min	Max		
-	0.100	20.000	-	1.000

¹⁾The LCD displays the unit of measurement that was previously selected.

10.2 Output parameter group

Output 1			LCD: Output 1	
Output 2			LCD: Output 2	
Purpose:	These parameters determine the measured values that are applied to the outputs and displayed on the LCD. The user can choose between the sum or differential signal of sensors A and B or the individual values of A and B. The latter setting allows individual monitoring of the forces on the left and right side of the measuring roller.			
Unit	Parame	eter range	Selection	Default
•••••	Min	Max		
			Force IA-BI	Output 1=
_	_	_	Force A+B	Force IA-BI
		-	Force A	Output 2=
			Force B	Force A+B

Output mode 1			LCD: Out1Mod			
Purpose:	e: The Off1Mod parameter is used to specify whether a current or voltage output is to be used at output 1. The signal can be further processed in PLC controls or PID controllers.					
Unit	Parameter range			Selection	Default	
Onic	Min	Max		Selection	Delault	
				+/- 10V		
				0 to 10V +/-1(
-	-		(0 to 20mA	./ 101	
	4 to 20mA					

Output mode 2				LCD: Out2Mod		
Purpose: Sets the type of voltage output on channel 2.						
Unit	Parameter range			Selection	Default	
Onic	Min	Max		Selection	Belaut	
-	-	-		0 to 10V +/- 10V	0 to 10V	



Force at the output				LCD: Out1force LCD: Out2force		
Purpose:	e: These parameters are used to determine the force display that is shown when the analog output is at maximum.					
Unit	Parameter range			Default		
Unit	Min	Max				
N ¹⁾	0.1	100'000.0		-	1000.0	

Filter			LCD: Out1Filt					
			LCD: Out2Filt					
Purpose:	The EMGZ321 amplifier has a low-pass filter to filter out unwant interference that is superimposed on the output signal. This para is used to set the cut-off frequency of the filter. The lower the cut- frequency, the slower the output signal. This low-pass filter is indep of the display filter.							
Unit	Parame	ter range	Selection Default					
onic	Min	Max		bolaut				
Hz	0.1	200.0	-	10				



10.3 System parameter group

The system parameter group lists general parameters that affect the operation of the amplifier but do not influence its actual measurement performance.

password				LCD: Password				
Purpose:	Settings on the tension amplifier can be protected with a password. If password protection has been selected (select Yes), the system will request the password each time a parameter is changed. The password itself cannot be changed. It is always 3231							
Unit	Parame	arameter range		Coloction Default				
Offic	Min	Max						
-	-	-	No Yes No					

Language				LCD: Language		
Purpose:	The language on the display can be selected with this parameter. There are two languages to choose from: English and German. The menu navigation in the web browser is always in English.					
Unit	Parame	ter range	Ģ	Selection	Default	
Onic	Min	Max			Boldan	
-	-	-	English German English			

LCD contrast			LCD: Contrast.		
Purpose: The Contrast parameter changes the contrast of the LCD display to achieve optimum readability.					
Unit	Parameter range		Selection	Default	
Offic	Min	Max		Delduit	
%	1	100	-	65	



Units of measurement				LCD: Unit		
Purpose:	Purpose: The unit of measurement to be used is set here. The nominal force of the force sensor on the rating plate is always specified in N.					
Ser Note	Note: If you select <i>Ib</i> (pound), the system changes from metric to imperial units of measurement.					
Unit	Parame	ter range		Selection	Default	
onne	Min	Max		Scicotion	Doldalt	
				Ν		
			kN			
-	-	-	g N			
				kg		
				lb		

Display filter LCD: disp. filters					ers	
Purpose:	The amplifier has a low-pass filter to filter out unwanted interference on the display. This can be used to stabilize excessively fast or fluctuating display values on the LCD. This parameter determines the cut-off frequency of the filter. The low-pass filter of the display is independent of the filter for the amplifier output (see 7.5 "Description of output parameters").					
Unit	Parameter rangeSelectionDefaultMinMax					
Onit						
Hz	0.1	10.0		-	1.0	

Ethernet IP address			LCD: IP Adre				
Purpose:	This parameter can be used to assign an IP address to the amplifier. The user can then communicate with an EMGZ321 embedded in a network via a web browser. The IP address must be entered in four blocks (IP BI. 1; IP BI. 2; IP BI. 3; and IP BI. 4)						
Unit	Parame	ter range	S	election	Default		
Onic	Min	Max	Max				
	000.000	255.255.			192.168.		
-	000.000	255.255		-	000.090		



Subnet r	nask Address			LCD: Subne	t		
Purpose:	The parameter assigns the subnet mask in the Ethernet network to the EMGZ321. The user can communicate with the amplifier in the network via a web browser. The subnet mask must be entered in four blocks (sub. sheet 1; sub. sheet 2; sub. sheet 3; and sub. sheet 4)						
Unit	Paramet	ter range	S	election	Default		
onic	Min	Max					
	000.000	255.255.			255.255.		
-	000.000	255.255		-	255.000		

LAN speed			LCD: LANspeed			
Purpose: Determines the data rate between the amplifier and the receiver, e.g. switch, hub or PC.						
Unit	Parameter range			Selection	Default	
onic	Min	Max		Sciedalon	Boldult	
MRPS	_	_	100		100	
		_		10	100	

Default (factory settings)				LCD: Default			
Purpose:	Purpose: This menu item is a command. It can be used to restore the factory settings. If <i>Not set</i> is selected, all parameters remain as set by the user. If Yes is selected, the factory settings are loaded						
Unit	Parame	ter range		Selection	Default		
onic	Min	Max					
-	-	-		Not set Yes	Not set		



System in	formation	L	LCD: System Info				
Purpose:	The System In identify the pro here is used fo when contacti	fo parameter of oduct and reco or service purp ng the FMS se	contains all system-re ognize its software ve oses. This informatio rvice department	elevant information to rsion. The data stored n must be available			
Unit	Parameter range		Selection	Default			
onic	Min	Max		Bolduit			
				Device type.			
			Device	Software			
-	-	-	Version	version.			
			SeriesNo	FMS serial number.			



10.4 Relay parameter group

The two relay outputs are software-controlled. They are electrically potential-free. They can be individually programmed and check various limit value violations

Relay out	put 1		LCD: Relay 1			
Relay output 2			LCD: Relay 2			
Purpose: The two relay outputs can be configured individually. They can evaluate one of the four conditions described below and trigger an alarm if they are violated.						
Unit	Parameter range			Default		
onne	Min	Max	0010001011	boldale		
			Test A+B From	Relay output 1=		
_	_	_	Test A	Test A+B		
-	-	-	Test B	Relay output		
			Test A-I	2=		
			IB	Test IA-BI		

Test A

Activate relay if sensor A violates the limit value (limit 1).

Test B

Activate relay if sensor B violates the limit value (limit 1).

Test A+B

Activate relay if the sum (A+B) violates the limit value.

Test A-B

Activate relay if the absolute value of the difference **IA-BI** violates the limit value.

From

Off deactivates the relay output. It always remains in the off state.



Condition	Limit 1		LCD: LimKond1 ⁴⁾			
Condition	Limit 2		LCD: LimKond2 ⁴⁾			
Purpose: The <i>LimKond1</i> parameter determines whether the relay should be activated if the value stored under <i>Limits</i> is exceeded (> <i>Limits</i>) or fallen below (< <i>Limits</i>). This also applies analogously to the <i>LimKond2</i> parameter.						
Unit	Parar	neter range	Selection	Default		
• III (Min	Max		Doradin		
				LimKond 1=		
			< Limit	< Limit		
-	-	-	> Limits	LimKond 2=		
				> Limits		

Limit 1			LCD: Limit	14)		
Limit 2	LCD: Limit 2 ⁴⁾					
Purpose:	In the parameter <i>Limit 1</i> , the pull limit value is saved if it is exceeded or not reached (depending on the selected limit value condition), the relay function is triggered. This also applies analogously to <i>limit 2</i> .					
Unit	Parameter range Selection Default					
Offic	Min	Max	Celection	Derault		
N ¹⁾	0.1	200'000.0	-	100.0		

¹⁾The LCD displays the unit of measurement that was previously selected.

⁴⁾These parameters are only displayed if the relay function has been selected.

⁵⁾ These functions can only be assigned once to a relay. Uses one relay is already using the function, it is no longer available for the other relay and is is therefore not displayed in the selection. The Off selection can be assigned to both relays can be assigned to both relays.



11 Service

11.1 Maintenance

FMS force sensors are maintenance-free. However, depending on the type of rolling bearing used, it may be necessary to relubricate them.

- 1. Remove one lid.
- 2. Clean the bearing of dirt and old lubricant.
- 3. Use lubricant according to the manufacturer's instructions.

Sin AXS d the force sensors are installed internally, the roller with the force measurement bearings must be removed from the machine frame so that the closed covers can be removed.

11.2 Waste disposal

Force sensors that are no longer usable must be disposed of separately from household waste in accordance with national and local regulations for environmental protection and recycling.



12 Web interface

You can also configure the amplifier using a PC or laptop. The PC is connected to the amplifier via a peer-to-peer connection.

12.1 Peer-to-Peer connection with laptop

For this connection, your laptop must be assigned an IP address in the static block (not obtained via DHCP).

The IP address of the amplifier is set to 192.168.000.090 at the factory.

12.2 Assign static IP-address to laptop

The example shows the configuration for Windows 10 (with German interface). The display may vary depending on the operating system.

 $\ensuremath{\mathsf{35.connect}}\xspace$ PC and amplifier with an RJ-45 patch cable

36.start PC and amplifier

37. click on the start button of your PC (bottom left corner of your screen)



38. Click settings 39. Click network and internet

	Wind	dows-Einstellungen		
ŧ	Einstellung su	chen	Q	
ıcker, Maus		Telefon Android-Smartphone oder iPhone verknüpfen		Netzwerk und Internet WLAN, Flugzeugmodus, VPN



40. Select Ethernet in navigation on the left hand side of the screen

	Einstellungen			σ	×	
	🛱 Startseite	Ethernet				
	Einstellung suchen	The Millional State Stat	dte nge Adapteroptionen ändern	•		I
	Netzwerk und Internet	Ethernet	Frightion	n		
	🗇 Status	TI Nicht verbunden	Netzwerk- und Freigabecente	r		
-			Windows-Firewall			l
	💭 Ethernet		A Hilfe anfordern			
	✿ DFŬ		Feedback senden			l
	% VPN					H
	🖏 Flugzeugmodus			-		ł

41. Select change adapter options

42.select the desired adapter (of the Ethernet socket used on your laptop), here in the example: Ethernet, Unidentified network

43.double-click to select

Verbindung			
IPv4-Konnektivität:	ĸ	ein Netzwerkzugriff	
IPv6-Konnektivitat:	ĸ	ein Netzwerkzugriff	
Medienstatus:		Aktiviert	
Dauer:		00:01:00	
Ubertragungsrate:		100,0 MBit/s	
Aktivität Gese	ndet —	Empfangen	
AktivitätGese Pakete:	ndet — 🐙 308	── Empfangen ℱ	-
Aktivität Gese Pakete: ©Eigenschaften	ndet — 💭 308 ODeaktivieren	Empfangen 0 Diagnose	_

44.Select properties



erzweik	Freigabe				
Verbindur	ng herstellen	über:			
📄 Re	altek PCIe G	bE Family Controller			
			Konfigu	urieren.	
Diese Ver	rbindung verv	vendet folgende Eleme	nte:		
	Datei- und Dr Trend Micro I QoS-Paketpla Internetprotol	uckerfreigabe für Micro NDIS 6.0 Filter Driver aner coll, Version 4 (TCP/IP	vsoft-Netzwe	rke	
	Microsoft-Mul Microsoft-LLE	tiplexorprotokoll für Net)P-Treiber	zwerkadapt	er	~
└ ↓ ✓ ↓ <	Microsoft-Mul Microsoft-LLC	tiplexorprotokoll für Net DP-Treiber Deinstallieren	zwerkadapte	er >	~

45. Internet protocoll, Version 4 (CP/IPv4)

igenschaften von Internetprotokoll	, Version 4 (TCP/IPv4)
Allgemein	
IP-Einstellungen können automatisch Netzwerk diese Funktion unterstützt. Netzwerkadministrator, um die geeigi	zugewiesen werden, wenn das Wenden Sie sich andernfalls an den neten IP-Einstellungen zu beziehen.
O IP-Adresse automatisch beziehe	n
Folgende IP-Adresse verwende	n:
IP-Adresse:	192.168.0.88
Subnetzmaske:	255 . 255 . 255 . 0
Standardgateway:	
ODNS-Serveradresse automatisch	n beziehen
Folgende DNS-Serveradressen	verwenden:
Bevorzugter DNS-Server:	
Alternativer DNS-Server:	
Einstellungen beim Beenden üb	erprüfen
	Erweitert
	OK Abbrechen

46. activate "Use the following IP address"

- 47. please check with your IT department which address you may enter here.
- 48. enter an IP address here.
- 49. Subnet mask is filled in automatically
- 50. confirm with OK.
- 51. the laptop is now ready to communicate with the amplifier.

12.3 Connect device with laptop

- 9. open any web browser: Microsoft Internet Explorer, Mozilla Firefox, Edge, Chrome, or similar...
- 10.the factory setting for the IP address of the amplifier is 192.168.0.90.
- 11. if nothing has been changed, enter this IP address in the input field (e.g. http://192.16800.90) and confirm with "Enter".
- **12**.the user interface of the web interface appears.



12.4 Interface of the web interface



Figure13 : Homepage with device information

The Home page provides information about general device properties such as the serial number and software version.

The menu on the left-hand side of the screen allows you to navigate around the page.

The Point is Techno	.0.91/6_5 Ø → 🗟 Ċ 🗙 🂽 EMGZ3 Diogy	21 - Current Reading 🗙	+ ★ ☆
EMGZ321	Digital Micropro	cessor Controlled	1 Two Channel Amplifier
Home Current Reading	Current Reading		
Remote Control	PROPERTIES	VALUE	
Parameters	Tension A + B	1071 N	
Ethernet Settings	Tension A - B	943 N	
System Settings	Tension A	1007 N	
	Tension B	64 N	
			*

Figure14 : Current Reading (current measured values)

The Current Reading website shows all the current values of the amplifier.



• nttp://192.108.		EMGZ321 - Parameters		
The Point is Techno	ology	FR		
1 1 -				
ENCZODI	Distal Illinesses			
EMGZ3ZI	Digital Microproces	ssor Controlled Two Cha	annel Amplifier	
Home				
Current Reading	Parameters			
Remote Control	A M P L I F I E R G R O U P OPERATIONS			
Parameters	PROPERTIES	VALUE		Save Changes
Ethernet Settings	Sensor A - Offset	0	Digit	- Gave Ghanges
System Settings	Sensor A - Nominal Force	1000.0	N	
	Sensor A - Gain 1	1.000		
	Sensor A - Gain 2	1.000		
	Sensor B - Offset	0	Digit	
	Sensor B - Nominal Force	1000.0	N	
	Sensor B - Gain 1	1.000		
	Sensor B - Gain 2	1.000		
		OUTPUT GROUP		2
	PROPERTIES	VALUE	_	
	Output 1 - Sensor Selection	Tension A - B	·••	
	Output 1 - Mode	+/-10V	·	
	Output 1 - Tension	1000.0	N	
	Output 1 - Filter	10.0	Hz	
	Output 2 - Sensor Selection	Tension A + B		
	Output 2 - Mode	010V	-	
	Output 2 - Tension	1000.0	N	
	Output 2 - Filter	10.0	Hz	
		RELAY GROUP		
	PROPERTIES	VALUE		
	Relay 1 - Function	Check Tension A + B	•	
	Relay 1 - Limit Condition	Tension < Limit		
	Relay 1 - Tension Limit	100.0	N	
	Relay 2 - Function	Check Absolute Value Tension A - B	•	
	Relay 2 - Limit Condition	Tension > Limit	•	
	Relay 2 - Tension Limit	100.0	N	

Figure15 : Parameters

The Parameters page offers the option of configuring the amplifier via the web interface.



i Confirmation of the entry

To confirm your entry, always use the "save changes" button and NOT the Enter key.



Attp://192.168	8.0.91/8_Adjust 🔎 マ 🗟 Ċ 🗙 🂽 EMGZ321 - Offset/Calibrati 🗴	► \	- □ × ↑ ★ ☆	
The Point is Techno	ology	FMS_	*	
EMGZ321	Digital Microprocessor Controlle	d Two Channel Amplif	ier	
MENU				
Home Current Boading	Offset / Calibration			
Remote Control	Sens	or A		
Parameters				
Offset/Calibration	OFFSET	CALIBRATIC	D N	
Ethernet Settings System Settings	PROPERTIES VALUE	PROPERTIES VALUE		
ojotom oottingo	Tension 1007 N	Tension 1007 N		
	Offset 0	Gain 1 1.000		
		Gain 2 1.000		
		Nominal Force 1000.0	N	
		Weight 1000.0	N	
	Adjust Offset	Calibrate Gain 1 Calibra	te Gain 2	
	Sensor B			
	О FFSET	CALIBRATIO	D N	
	PROPERTIES VALUE	PROPERTIES VALUE		
	Tension 64 N	Tension 64 N		
	Offset 0	Gain 1 1.000		
		Gain 2 1.000		
		Nominal Force 1000.0	N	
		Weight 1000.0	N	
	Adjust Offset	Calibrate Gain 1 Calibra	te Gain 2	
			-	

Figure16 : Offset compensation and calibration

The Offset/Calibration page is available for adjusting the amplifier. This page can be used to adjust the offset and then perform the calibration.



i Confirmation of the entry

To confirm your entry, always use the "save changes" button and NOT the Enter key.



(C) () () () () () () () () () () () () ()	.0.91/2_L 🔎 🗕 🗟 🗙 🂽 EMG	Z321 - Ethernet Settings 🗙	- □ × ↔
• The Point is Techno	ology		-MS_
EMGZ321	Digital Micropro	ocessor Controlled Two (Channel Amplifier
MENU			
Home Current Reading	Ethernet Settings		
Remote Control	PROPERTIES	VALUE	
Parameters	MAC address	00-1f-88-00-02-13	
Offset/Calibration	Device IP address	192.168.0.90	
System Settings	Subnet mask	255.255.255.0	
	Ethernet speed	100M 💿 10M 🔘	
	Save Changes Note: Saving of new setting minutes otherwise th render a device unrea	is causes an immediate reset and must be va e original settings will be returned. This ensu achable.	alidated within a period of 3 res that invalid settings do not ft — — — — — — — — — — — — — — — — — — —



This page shows the current TCP/IP configuration. It cannot be changed via the web interface, only read.

← → <a>> http://192.168.	0.91/4_admin.htm 🛛 🔎 🔫 🗟 🗘 🕽	🗙 🏹 EMGZ321 - Firmware Update 🗙		÷ *
•The Point is Techno	logy		FMS_0	
EMGZ321	Digital Micropro	cessor Controlled Two	o Channel Amplifie	ər
MENU Home Current Reading	System Settings			
Parameters	PROPERTIES	VALUE		OPERATIONS
Offset/Calibration	Display Language	English	•	Save Changes
System Settings	Contrast intensity	65	%	
	Unit	N		
				I STATE STOLEN ST

Figure18 : System settings





Figure19 : Remote control

Via this interface, you can access the corresponding sub-functions such as "Offset and calibration" and the parameter settings with a few mouse clicks.





Figure20 : Dimensions EMGZ321.W













Figure 21 : Dimensions EMGZ321.R





Figure 22 : Dimensions EMGZ321.S



14 Troubleshooting / fault rectification

Troubleshooting / fault rectification			
Error image	Possible cause	Solution	
Output values are not as expected	Roller weight not correctly compensated	Repeat offset compensation procedure (see chapter 6.3)	
	Incorrect nominal force Forget to enter both nominal forces of sensor A and sensor B.	Repeat the calibration procedure and enter the correct values. For example, if the roller is equipped with two 250N sensors, enter 250N for sensor A and 250N for sensor B.	
	Wrong reinforcement determined	Repeat calibration procedure	
	Incorrect gain set when using gain switching	Check "Digital inputs" and gain switching.	
Sensor A or B shows values that are >>0.1, although the measuring roller is unloaded.	Output set to current value 420mA.	Set the correct output mode. Set the parameter Off1Mod to 020mA if necessary.	
Output value of sensor A or B unstable	Cut-off frequency of the output filter set to high.	Reduce the cut-off frequency	
Output values of sensor A or B unstable	Earthing problem (PE) has poor contact.	Check earthing strands or cable shields for poor contact.	
	Electrical interference on sensor cable	Check the contacting of the shields. Use stranded cable pairs.	
Relay outputs do not behave as desired.	Limit values set incorrectly	Check parameters LimKond and Limiet 1 and 2 for plausible values	
LCD display is dark.	No supply voltage present	Check wiring	

 Table 6 : Troubleshooting, fault rectification



15 Standards, guidelines

15.1 EU Declaration of Conformity

FMS Force Measuring System AG declares that our products (force sensors, measuring amplifiers) comply with the basic requirements set out in the

- Directive 2014/30/EU (EMC Directive) and the
- RoHS Directive 2011/65/EU

are defined and, in accordance with the labeling obligation, the

- CE marking

received.

The following standards were used:

- EN 61000-6-4
- EN 61000-6-2

15.2 Machinery Directive, Declaration of Incorporation

FMS Force Measuring Systems AG declares that the

- Machinery Directive 2006/42/EC
- Low Voltage Directive 2014/35/EU

do not apply to your products (force sensors, measuring amplifiers).

When installing these products in systems that are affected by the application of these directives, commissioning is prohibited until it has been established that the system complies with the provisions of the directives.

15.3 Address of the manufacturer

FMS Force Measuring Systems AG Aspstrasse 6 8154 Oberglatt Switzerland





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