

Operating instructions EMGZ321

Digital microprocessor-controlled dual-channel measuring amplifier with integrated EtherNet/IP interface



EtherNet/IP

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.EIP

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	Product 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 amplifier, see 5.3 Installation 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 6 Calibration of the measuring system, p.14
- 5. If necessary, change the parameter settings, see 8 Configuration, 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:

- via the web interface
- directly on the measuring amplifier

6.1 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.

6.1.1 Directly on the device



- 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.

6.2 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 considers the actual conditions in the machine.





Figure9 : Simulation of the material flow with a defined weight

6.3 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: Adjust Gain. A1
- 6. Press
- 7. The display shows: NomForcA 1000.0 with the text flashing.
- 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 type plate.
- 9. Change the value using the buttons



i) NOTE



and

Pressing and holding the button will accelerate the change.





- 10.Confirm the change with \searrow
- 11. The display now shows the expected weight force, e.g. Calibra 250.0 N
- 12. The expected weight force refers to one channel or one side of the roller. Only half of the attached weight should be displayed here. Please note that the value is displayed in Newtons (N)!
- 13. Change the value of the expected force using the buttons







i note

The gain factor is changed in the background.



Pressing the buttons once briefly will only change the respective value slightly and you may not notice any change in the display.

Pressing and holding the button will accelerate the change , making it clearly visible..





16.Use V to switch to channel B. 17.Repeat steps 7. to 15. for channel B

6.4 Calibration with the web browser

The following procedure must be carried out accordingly for sensor A and sensor B.

- **1.** Connect the measuring amplifier to the laptop and open the web browser, then open the "Offset/Calibration" web page.
- 2. Connect the first force sensor.
- 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.
- 4. Connect the second force sensor.
- 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.



- 6. Make sure the measuring roller is not loaded and that it turns freely.
- 7. Click on "Adjust Offset" in the web browser.
- 8. Simulate the later web path of the material over the measuring roller with a cord or rope.
- 9. Hang a known weight on the rope. The weight should correspond approximately to the later material tension.
- 10. Make sure that the rope runs EXACTLY in the center of the measuring roller. If it runs off-center, the measurement result will be inaccurate!
- 11. Enter half of the attached weight under "Weight."
- **12**. Note the entry in Newton N. **1** kg corresponds to approx. **10** N.
- **13**.Click on "Calibrate Gain **1**" in the web browser.
- **14**. The gain factor is recalculated in the background.



7 Operation



Figure10 : Operating elements and display

User i	User interface				
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.

7.1 Display

You can switch between different display values by navigating with 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|

7.2 Default settings

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

"factory setting" parameter, see 8.3System parameter group page24 ff or

By simultaneously pressing the buttons the power supply to the measuring amplifier.

while switching on or applying

7.3 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		

 Table 4 : Example relay 1

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

Table 5 : 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.

7.4 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 8.1Amplifier parameter group, page 21ff.



Figure 11 : Two material gradients with different wrap angles

7.4.1 Level control of the digital inputs



Figure 12 : Level-controlled inputs



8 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

8.1 Amplifier parameter group

Offset A			LCD: Offset A	
Offset B			LCD: Offset B	
Purpose: The values determined with the O procedures are saved in the form parameter. The value is used to c			Offset A and Offset E of a digital value in ompensate for the r	B adjustment the Offset A and B oller weight
Unit	Parameter range		Selection	Default
ont	Min	Max		Derduit
Digit	-8000	+8000	-	0

Nominal for	rce Force sen	sor A	LCD: NominalForc.A		
Nominal force Force sensor B			LCD: NennKraf.B		
Purpose:	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.				
Unit	Para	Selection	Default		
	Min	Max		Dordun	
N, kN, g, kg, lb ¹) 1.0 100'0000.0		-	1000.0		

Gain A1, A2	2	LCD: Gain .A1 and	I A2		
Gain B1, B2	2	LCD: Gain .A1 and A2			
Purpose:	The amplification factors determined with the calibration adjustment procedure are saved in the parameters Verst.A1, A2, B1, B2. Two parameter sets (Verst.A1/B1 and Verst.A2/B2) 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.

8.2 Output parameter group

Output 1			LCD: Output 1		
Output 2	Dutput 2 LCD: Output 2				
Purpose:	Jrpose: 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 value 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	ter 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:	Purpose: The <i>Off1Mod</i> 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		Colostian	Default			
Ome	Min	Max		Delection	Delduit		
				+/- 10V			
				0 to 10V	+/-10V		
-	-	-	., 101				
		4 to 20mA					

Output mo	de 2			LCD: Out2Mod		
Purpose: Sets the type of voltage output on channel 2.						
linit Para		eter range		Selection	Default	
	Min	Max		Selection	Boldan	
-	-	-		0 to 10V +/- 10V	0 to 10V	



Force at the output				LCD: Out1force LCD: Out2force		
Purpose:	oose: 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 unwanted interference that is superimposed on the output signal. This parameter is used to set the cut-off frequency of the filter. The lower the cut-off frequency, the slower the output signal. This low-pass filter is independe of the display filter.				
Unit	Parameter range Selection Default				
0.110	Min	Max	0010000	Bolduit	
Hz	0.1	200.0	-	10	



8.3 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	ameter range		Selection	Default			
Onic	Min	Max						
_	_	_	No No					
		Yes						

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	ç	Selection	Default	
onne	Min	Max		boloodon	Boldult	
-	-	-	English German English			

LCD contrast			LCD: Contrast.			
Purpose: The <i>Contrast</i> parameter changes the contrast of the LCD display to achieve optimum readability.						
Param		meter range	Selection	Default		
onic	Min	lin Max Selection Deladi				
%	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.					
S 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	
onic	Min	Max		Scicotion	Doldalt	
				Ν		
			kN			
-	-	-	- g N			
				kg		
				lb		

Display fil	Display filterLCD: disp. filters					
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 range Selection Default					
onne	Min Max Deladit					
Hz	0.1	10.0		-	1.0	

Ethernet IP address				LCD: IP Adre			
Purpose:	ose: 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					
_	000.000	255.255.	5. 192.168				
_	000.000	255.255		_	000.090		



Subnet mask Address				LCD: Subnet				
Purpose:	se: 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	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	Parame	ter range		Selection	Default	
onic	Min	Max	Selection		Doldali	
MRPS	_	_	100		100	
	_	-		10	100	

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



System information			LCD: System Info			
Purpose:	The System Info parameter contains all system-relevant information to identify the product and recognize its software version. The data stored here is used for service purposes. This information must be available when contacting the FMS service department					
Unit	Parameter range		Selection	Default		
onic	Min	Max		Bolduit		
				Device type.		
			Device	Software		
-	-	-	Version	version.		
			SeriesNo	FMS serial number.		



8.4 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 output 1			LCD: Relay 1			
Relay output 2 LCD: Relay			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		Selection	Default		
onne	Min	Max	0010001011	boladic		
			Test A+B	Relay output		
			From	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> activated if the fallen below (* parameter.	L parameter determir e value stored under < <i>Limits)</i> . This also ap	nes whether the re <i>Limit</i> s is exceeded oplies analogously	lay should be I (> <i>Limits</i>) or to the <i>LimKond2</i>		
Unit	Parar	neter range	Selection	Default		
• · · · ·	Min	Max		Doradin		
				LimKond 1=		
			< Limit	< Limit		
-	-	-	> Limits	LimKond 2=		
				> Limits		

Limit 1			LCD: Limit	1 ⁴⁾		
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	Colocitori	Delduit		
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.



9 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.

9.1 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.

9.2 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			l
E	instellung su	ichen	Q		
ıcker, 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			σ	×	
		Ethernet				
	Einstellung suchen	문 MSiocal Vebranden	dte nge Adapteroptionen ändern	']		
	Netzwerk und Internet	Ethernet	E Francisco	n		
	Status	R Nicht verbunden	Netzwerk- und Freigabecenter			
	. WIAN		Windows-Firewall			
П	😨 Ethernet		A Hilfe anfordern			
	⇔ DFÙ		Feedback senden			
	98º VPN					
	B Fluazeuamodus			_	_	

7. Select change adapter options

> -	🔹 🛧 👰 > Systemsteuerung > A	Alle System	steuerungselemente > Netzwerkver	bindungen	>	~	ر الالتعام المعام الم	n durchsu	chen	م
gar		,		5						?
	Ethernet Nicht identifiziertes Netzwerk Realtek PCIe GbE Family Controlier		Ethernet 2 FMS.local Realtek USB GbE Family Controller	×	Ethernet 3 Netzwerkkabel wurde entfernt TAP-Windows Adapter V9	>	WLAN Nicht verbunden Intel(R) Wi-Fi 6 AX201 160MI	Hz		

- 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



10.Select properties



Verbindung herstellen üb	er:		
🚽 Realtek PCIe GbE	Family Controller		
		Konfiguriere	n
Diese Verbindung verwe	ndet folgende Eleme	nte:	
🗹 🌄 Client für Micros	soft-Netzwerke		^
Datei- und Druc	ckerfreigabe für Micro	osoft-Netzwerke	
Trend Micro NE	DIS 6.0 Filter Driver		
QoS-Paketplan	er		
Internetprotokol	II, Version 4 (TCP/IP	v4)	
Microsoft-Multip	lexorprotokoll für Ne	tzwerkadapter	
Microsoft-LLDP	-Treiber		~
<		,	•
Installieren	Deinstallieren	Eigenschafte	n
Beschreibung			
TCP/IP, das Standard	lprotokoll für WAN-N	letzwerke, das de	n
Datenaustausch über	verschiedene, miteir	nander verbunden	e
Netzwerke ermoglicht			

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.

9.3 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.



9.4 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_S Ø → 🕿 Ĉ × 💽 EMGZ3 Diogy	21 - Current Reading 🗙	- • • •
EMGZ321	Digital Micropro	cessor Controlled	d 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.



Control is Technology Control is Techn					
Image: Control & Control Distance Control		0.91/F_Parameter.htr 🔎 - 🗟 🖒 🗙 🧵	EMGZ321 - Parameters ×		↑ ★ ¤
Openet is technology Control of the					-
Constrained and a second and a sec	The Point is Techno	ology	FN	ns_•	
Digital Microprocessor Controlled Two Channel Amplifier Vere None Parameters Current Reading Remote Control Parameters A M P L I F I E R G R O U P OPERATIONS Parameters Sensor A - Offsel 0 Digit Sensor A - Offsel 0 Sensor A - Offsel 0 Sensor A - Offsel 0 Digit Sensor A - Offsel 0 Digit Sensor A - Offsel 0 Digit Sensor A - Offsel 0 Sensor A - Offsel 0 Digit Sensor A - Offsel 0 Digit Sensor B - Offsel 0 N Sensor					
Nome Current Reading Remote Control Parameters System Settings Parameters OPERATIONS Stream A - Officit 0 Diplet Some Changes System Settings Sensor A - Officit 0 Diplet System Settings Sensor A - Officit 0 Diplet Sensor A - Officit 0 Diplet Some Changes Sensor A - Officit 0 Diplet Some Changes Sensor A - Officit 0 Diplet Some Changes Sensor B - Officit 0 Diplet Some Changes Output 1 - Some Selection Tension A - B Output 1 - Some Selection No Output 2 - Some Selection Tension A + B Output 2 - Some Selection No Output 2 - Fin	EMGZ321	Digital Microproce	ssor Controlled Two Cha	annel Amplifier	
Nome Current Reading Remote Control Parameters Offise (Calibration Externet Settings System Settings A M P LIFFER GROUP OPERATIONS Sensor A Offiset 0 Digit Save Changes Sensor A Offiset 0 Digit Save Changes Sensor A Offiset 0 Digit Save Changes Sensor A Gain 1 1000 N Sensor A Gain 1 Digit Sensor B Offiset 0 Digit Sensor A Gain 1 Digit Sensor B Offiset 0 Digit Sensor A Gain 1 Digit Sensor B Offiset 0 Digit Sensor B Gain 1 Sensor B Gain 1 Sensor B Gain 1 Digit Sensor B Gain 1 1000 N Sensor B Gain 1 Digit Sensor B Gain 1 Sensor B Gain 2 Sensor B Gain 1 Digit Sensor B Gain 2 Sensor B Gain 2 Sensor B Gain 2 Sensor B Gain 1 Digit Sensor B Gain 1 Sensor B Gain 2 Sensor B Gain 1 Sensor B Gain 2 Sensor B Gain 1 Sensor B Gain 2	MENU				
Current Reading Remote Contrastion Extract Claibration Starsor A - Offset 0 Digit Sensor A - Offset 0 Digit Sensor A - Chantal Force 1000.0 N Sensor A - Cain 1 1.000 0 Digit Sensor A - Cain 1 0.000 Sensor A - Cain 1 1.000 N Sensor A - Cain	Home	Parameters			
Properties Offset 0 Digit System Settings Sensor A - Offset 0 Digit System Settings Sensor A - Gain 1 1.000 N Sensor A - Gain 1 1.000 Sensor A - Gain 2 1.000 Sensor B - Gain 1 1.000 Sensor B - Offset 0 Digit Sensor B - Gain 1 1.000 Sensor B - Offset 0 Digit Sensor B - Gain 1 1.000 Sensor B - Offset 0 Digit Sensor B - Gain 1 1.000 Sensor B - Offset 0 Digit Output 1 - Sensor Selection Tension A - B • Output 1 - Sensor Selection N Output 1 - Sensor Selection Tension A + B • Output 2 - Sensor Selection N Output 2 - Sensor Selection Tension A + B • Output 2 - Sensor Selection N Output 2 - Finiter 10.0 N N Output 2 - Sensor Selection N Output 2 - Finiter 10.0 N Output 2 - Finiter 10.0 N Output 2 - Finiter 10.0 N N N N	Current Reading Remote Control				
Offset Calibration Sensor A - Offset Digit Some Changes System Settings Sensor A - Offset 0 Digit Sensor A - Gain 1 1000 Sensor A - Gain 2 1000 Sensor A - Gain 2 Digit Sensor A - Gain 2 Sensor B - Offset 0 Digit Sensor B - Offset 0 Digit Sensor B - Gain 2 Dio0 N Sensor B - Offset 0 Digit Sensor B - Gain 2 Dio0 Sensor B - Gain 2 Dio0 Sensor B - Gain 2 1 Dio0 Sensor B - Gain 2 Dio0 Sensor B - Gain 2 Dio0 Sensor B - Gain 2 1 Dio0 Sensor B - Gain 2 Dio0 N Output 1 - Mode +/10V - Output 1 - Filter Dio0 N Output 2 - Sensor Selection Tension A + B - Output 2 - Sensor Selection Tension A + B - Output 2 - Filter Dio0 0 N Output 2 - Filter Dio0 0 N Output 2 - Filter Dio0 0 N Output 2 - Filter N Sensor - Couput 2 - Filter Sensor A - Co	Parameters	PROPERTIES			OPERATIONS
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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 - Function Tension < Limit		Output 2 - Sensor Selection	Tension A + B	·	
Output 2 - Tension1000.0NOutput 2 - Filter10.0HzR E L A Y G R O U PPROPERTIESVALUERelay 1 - FunctionCheck Tension A + BRelay 1 - Limit ConditionTension < Limit		Output 2 - Mode	010V	•	
Output 2 - Filter 10.0 Hz R E L A Y G R O U P PROPERTIES VALUE Relay 1 - Function Check Tension A + B • Relay 1 - Limit Condition Tension < Limit		Output 2 - Tension	1000.0	N	
RELAY GROUP PROPERTIES VALUE Relay 1 - Function Check Tension A + B Relay 1 - Limit Condition Tension < Limit		Output 2 - Filter	10.0	Hz	
PROPERTIESVALUERelay 1 - FunctionCheck Tension A + BRelay 1 - Limit ConditionTension < Limit			RELAY GROUP	_	
Relay 1 - FunctionCheck Tension A + BRelay 1 - Limit ConditionTension < Limit		PROPERTIES	VALUE		
Relay 1 - Limit ConditionTension < LimitRelay 1 - Tension Limit100.0Relay 2 - FunctionCheck Absolute Value Tension A - BRelay 2 - Limit ConditionTension > LimitRelay 2 - Tension Limit100.0N		Relay 1 - Function	Check Tension A + B	•	
Relay 1 - Tension Limit100.0NRelay 2 - FunctionCheck Absolute Value Tension A - B •Relay 2 - Limit ConditionTension > Limit •Relay 2 - Tension Limit100.0N		Relay 1 - Limit Condition	Tension < Limit		
Relay 2 - FunctionCheck Absolute Value Tension A - BRelay 2 - Limit ConditionTension > LimitRelay 2 - Tension Limit100.0		Relay 1 - Tension Limit	100.0	N	
Relay 2 - Limit Condition Tension > Limit Relay 2 - Tension Limit 100.0		Relay 2 - Function	Check Absolute Value Tension A - B	¥	
Relay 2 - Tension Limit 100.0 N		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.



	91/8_Adjust 🔎 👻 🗟 🗙 🏹 💽 EMGZ321 - Offset/Calibra	ti ×	>	<u>- □ ×</u> ↑ ★ ‡
The Point is Technol	ogy	FMS	5_0	<u>^</u>
EMGZ321	Digital Microprocessor Contr	olled Two Chann	el Amplifier	
MENU				
Home Current Reading	Offset / Calibration			
Remote Control		Sensor A	_	
Parameters				
Offset/Calibration	OFFSET	CALI	BRATION	
System Settings	PROPERTIES VALUE	PROPERTIES	VALUE	
	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	Calibrate Gain	2
		Sensor B		- 1
	-			
	OFFSET	CALI	BRATION	
	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	Calibrate Gain	2
			-77	

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.



	8.0.91/2_L 🔎 🗕 🗟 🖒 🗙 🂽 EMC	5Z321 - Ethernet Settings 🗙	- □ - × ↑ ★ ☆
•The Point is Techno	ology		FMS_
EMGZ321	Digital Micropr	ocessor Controlled	Two Channel Amplifier
MENU			
Home	Ethernet Settings		
Current Reading			
Remote Control	PROPERTIES	VALUE	
Parameters	MAC address	00-1f-88-00-02-13	
Ethernet Settings	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	gs causes an immediate reset and r ie original settings will be returned. achable.	nust be validated within a period of 3 This ensures 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 🛛 🔎 🕶 🗟 🖒 1	🗙 💽 EMGZ321 - Firmware Update 🗴		÷ ↑
The Point is Techno	blogy		FMS_0	
EMGZ321	Digital Micropro	cessor Controlled Two	Channel Amplifier	
Home Current Reading Remote Control	System Settings	VALUE		
Parameters	Password	No	*	OPERATIONS
Offset/Calibration Ethernet Settings	Display Language	English	•	Save Changes
System Settings	Contrast intensity	65	%	
	Unit	N		

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.



10 EtherNet/IP Interface

Following chapters deal with the integration and operation of the EMGZ321 amplifier with an Allen-Bradley PLC. The project software RSLogix5000 from Allen-Bradley is required to program the PLC. Furthermore, it is assumed that a development system with PC and corresponding development software RSLogix 5000 from Rockwell Automation is available and the programmer is familiar with these tools.

10.1 Hardware Environment

The EMGZ321 must be connected to an Ethernet switch which in turn is in the same network as the PLC. Only in this way a communication between amplifier and PLC can take place. Several EMGZ321 amplifiers or other Ethernet devices can be connected to the same network.

10.2 IP Configuration

In an industrial environment the IP addresses are normally assigned fix to the EIP devices. This holds also for the EMGZ321 amplifier that needs a fix IP address in the network. The IP address configuration must take place before the amplifier is integrated in a network. This is done over the operation panel or over the web interface. See 9 Web interface, page 30ff

10.3 Integration in a Project

Before starting the development system RSLogix5000 the PLC and amplifier need to be connected to the network and powered-up. Now a new project or an existing project can be opened in RSLogix5000. Search in the tree structure Controller Organizer for the listing Ethernet and make a right mouse click.



Diffine INO Forces No Edits Controller EMGZ309_Test I/0 Controller Tags Controller Fault Handler Power-Up Handler Power-Up Handler MainTask MainTask MainTask MainTask MainRoutine Unscheduled Programs Motion Groups Motion Groups Motion Groups Data Types Add-On Instructions Data Types Add-On-Defined Fredefined Frede	ile Edit View Search Logic Communications	Tools	Window	Help
Controller EMG2309_Test Controller Tags Controller Fault Handler Power-Up Handler Tasks MainTask MainProgram Program Tags MainRoutine Unscheduled Programs Motion Groups Ungrouped Axes Add-On Instructions Data Types User-Defined Strings Add-On-Defined Strings Add-On-Defined Module-Defined Trends I/O Configuration I 1769-L23E-QB1 EMG2309_Test I 1769-L23E-QB1 Ethernet Port LocalENB Steiner I 1769-L23E-QB1 Ethernet Port LocalENB CompactBig/S323E-QB1 System I 1769-L23E-QB1 Ethernet Port LocalENB CompactBig/S323E-QB1 Ethernet Port LocalENB CompactBig	Iffline I RUN o Forces C RUN o Edits I I/O			Path: Ag.
	Controller EMGZ309_Test Controller Tags Controller Fault Handler Power-Up Handler Tasks MainTask MainProgram Program Tags Molion Groups Ungrouped Axes Add-On Instructions Data Types User-Defined Strings Add-On-Defined Predefined Module-Defined Module-Defined Trends I/O Configuration CompactLogix5323E-QB1 System T69-L23E-QB1 Ethernet Port Loc Has Info9-L23E-QB1 Ethernet Port Loc	calENB rete_Inp rete_Out	outs puts	

Figure20 : Controller Oganization

In this example CompactLogixL23E-QB1B is used. If a different hardware is used, one may find the listing Ethernet in another place. However, the principal approach is always the same. After a right mouse click on Ethernet a dialog window will open up. Left mouse click on New Module and a new window will open up.



Select Module		P		
Module Communications Digital Drives HMI	Description	<u> </u>	2	Vendor
By Category	By Vendor Fo	avorites	Find	Add Favorite

Figure21 : Module Selection

Open plus-sign [+] in front of Communications to see all the other listings.

Module	Description	Vendor
- 1788-ENBT/A	1788 10/100 Mbps Ethernet Bridge, Twisted-Pair Media	Allen-Bradley
-1788-EWEB/A	1788 10/100 Mbps Ethernet Bridge w/Enhanced Web Serv.	. Allen-Bradley
1794-AENT/A	1794 10/100 Mbps Ethernet Adapter, Twisted-Pair Media	Allen-Bradley
- 1794-AENT/B	1794 10/100 Mbps Ethernet Adapter, Twisted-Pair Media	Allen-Bradley
Drivelogix5730 Eth	10/100 Mbps Ethernet Port on DriveLogix5730	Allen-Bradley
ETHERNET-BRIDGE	Generic EtherNet/IP CIP Bridge	Allen-Bradley
ETHERNET-MODULI	E Generic Ethernet Module	Allen-Bradley
EtherNet/IP	SoftLogix5800 EtherNet/IP	Allen-Bradley
PH-PSSCENA/Ă	Ethernet Adapter, Twisted-Pair Media	Parker Hannif
庄 Digital		
Drives		
H HMI		
•		
	Find	Add Favorite
	landar Esucritas	

Figure22 : Module Selection open

Select ETHERNET-MODULE Generic Ethernet Module and confirm with OK.



Type: Vendor:	ETHERNET-MODULE Generic Ether Allen-Bradley	net Module		
Parent:	LocalENB			
Na <u>m</u> e:	EMGZ321_92	Connection Para	ameters Assembly	Circu
Description:	·	Input	Instance:	5ize:
		Output:	101	
Comm <u>F</u> ormal	t Input Data - DINT 🗾 💌	Configuration:	102	116 ÷ (8-bit)
-Address / H	lost Name		_	
• IP Addr	ess: 192 . 168 . 0 . 92	<u>S</u> tatus Input:		
C Host Na	ame:	Status Output:		

Figure23 : New Module

Following window opens in which the Name EMGZ321_91, the Comm Format

Input Data - DINT and the IP Address (e.g. 192.168.0.91) need to be entered. On the Connection Parameters side the values Input=100 with Size 11, Output= 101 (leave empty) and Configuration= 102 with Size 116 must be entered. Confirm with OK

The dialog window (Module Properties) will open up. Here, one can enter the cycle time. This determines how often the data will be propagated in the network. The minimal cycle time is 2ms. Default setting is 10ms. Basically, the cycle time must be set so that the maximum speed requirements of the system are fulfilled. A fast cycle time leads to more data traffic in the network. That can create communication bottlenecks. Especially when using several EMGZ321 amplifiers and other EIP devices in the same network a well-balanced data speed is important.

Module Properties Report: PI1_00_Comm05 (ETHERNET-MODULE 1.1)
General Connection* Module Info
Requested Packet Interval (RPI): 10.0 + ms (1.0 - 3200.0 ms)
Inhibit Module
Major Fault On Controller If Connection Fails While in Run Mode
Use Unicast Connection over EtherNet/IP
Module Fault
•
Status: Offline OK Cancel Apply Help

Figure24 : Module Properties





i) Note

Untick the box "Use Unicast Connection over EtherNet/IP". The use of this feature is not allowed as it will cause communication problems.

10.4 Access to the force readings



Figure25 : RSLogix

After the integration of the amplifier in the network the tension data are available in the global input tags of the controller and that in the defined cycle time. In our example the amplifier was named **EMGZ321_92**. The tension values can therefore be found under the controller tags **EMGZ321_92:I** >> **EMGZ321:I** Data

The access to the data in its values is marked red

Index 0 to 10. Where the values are assigned to the indices as follows:

Index	Value
0	Tension value in digits channel A
1	Tension value in Newton with 3 decimals channel A
2	Tension value in Pounds [lbs] with 3 decimals channel A
3	Tension value in the configured unit with 3 decimals channel A
4	Tension value in digits channel B
5	Tension value in Newton with 3 decimals channel B
6	Tension value in Pounds [lbs] with 3 decimals channel B
7	Tension value in the configured unit with 3 decimals channel B
8	Actual value channel A+B in units
9	Absolute value channel IA-BI in units
10	Bit 0 is the state of Relay 1; Bit 1 is the state of Relay 2 $$





Figure26 : Dimensions EMGZ321.W













Figure 27 : Dimensions EMGZ321.R





Figure 28 : Dimensions EMGZ321.S



12 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



13 Service

13.1 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.

13.2 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.



14 Standards, guidelines

14.1 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

14.2 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.

14.3 Address of the manufacturer

FMS Force Measuring Systems AG Aspstrasse 6 8154 Oberglatt Switzerland



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