Operating Instructions

EMGZ492.EIP

Dual-channel measuring amplifier for ETHERNET/IP
EMGZ492.R.EIP for mounting on DIN rail
EMGZ492.W.EIP for wall mounting

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Diese Bedienungsanleitung ist auch in Deutsch erhältlich.

Bitte kontaktieren Sie Ihre lokale FMS Vertretung.

1 Table of Contents

2 Safety Information

All safety information, operating and installation regulations listed here ensure proper function of the device. Safe operation of the systems requires compliance at all times. Noncompliance with the safety information or using the device outside of the specified performance data can endanger the safety and health of persons.

Work with respect to operation, maintenance, retrofit, repair, or setting the device described here must only be performed by expert personnel.

2.1 Presentation of Safety Information

2.1.1 Danger that Could Result in Minor or Moderate Injuries

Danger, warning, caution

Type of danger and its source

Possible consequences of nonobservance

Measure for danger prevention

2.1.2 Note Regarding Proper Function

Note

Note regarding proper operation

Simplification of operation

Ensuring function

2.2 General Safety Information

⚠️ The function of the measuring amplifier is only ensured with the components in the specified layout to one another. Otherwise, severe malfunctions may occur. Thus, observe the mounting information on the following pages.

⚠️ Observe the local installation regulations.

⚠️ Improper handling of the electronics module can lead to damage to the sensitive electronics!

Do not work with a blunt tool (screw driver, pliers, etc.) on the housing!

Use suitable grounding (grounding wrist strap, etc.) when working on the electronics.

⚠️ The devices should have a distance of at least 15 mm to one another in the control cabinet for proper cooling.

3 Product Description

3.1 Block Diagram
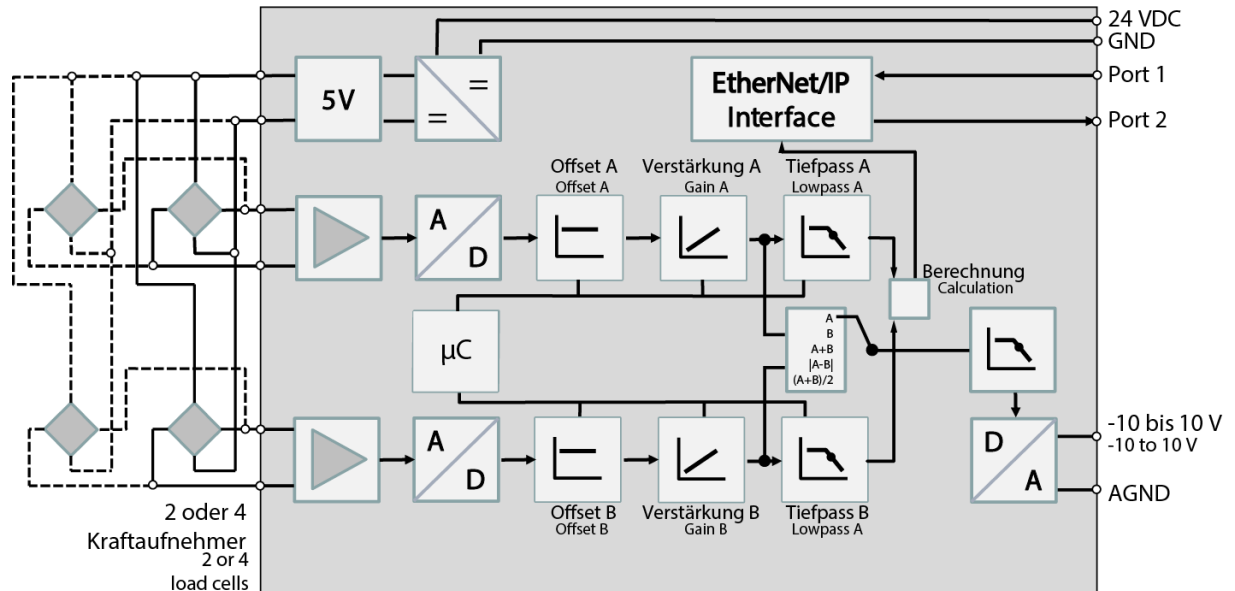
Figure 1: block diagramEMGZ492.EIP

3.2 System Description

The microprocessor-controlled measuring amplifier EMGZ492.EIP series is used in processing, amplifying, and relaying sensor signals in suitable form to downstream devices. The measured force values are available via ETHERNET/IP and an analog voltage output.

The measuring amplifiers are suitable for tension measurements using all FMS force sensors. Two force sensors A and B can be connected to the device. Both measuring values are available as individual signal (A and B), as sum signal (A + B), as differential signal |A – B| or as average value (A + B)/2 for the master controller.

Furthermore, device information, parameters, and system settings can be accessed via a web browser. Offset compensation and system calibration can also be performed via the web browser.

3.3 Scope of Delivery

The following is included in the scope of delivery

- Measuring amplifier
- Mounting and operating instructions

The following is not included in the scope of delivery

- AC/DC power supply, 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

The following is not included in the scope of delivery, but are available as accessories from FMS

- Patch cable with RJ45 plug (straight or 90°)
- Sensor cable for the connection of force sensor and measuring amplifier
- M12 plug, D-coded

4 Quick Guide/Quick Start

In these operating instructions, commissioning of the EMGZ492.EIP amplifier is limited to the installation procedure, offset compensation, and system calibration.

4.1 Preparations for Parameterization

- Read the operating instructions of the selected force sensor carefully.
- Check your requirements on the system, such as:
  - o Used units in the system
  - o Used outputs (-100 to 10V and bus)
- Filter settings for actual force value and analog output
- Create the connection diagram for your specific system layout (see chapter "Electrical Connection")

4.2 Mounting Sequence

- Mount the force sensors (mounting details can be obtained from the mounting instructions of the force sensors)
- Connect the force sensors to the amplifier (see 4.5)
- Connect the amplifier to the supply voltage. The voltage supply must be in the range of 18 to 36 VDC. (See 4.5)
- Perform offset compensation and calibration (see 5)
- Change the parameter settings as needed (see **Fehler! Verweisquelle konnte nicht gefunden werden.**)
- Amplifier integration into the ETHERNET/IP network (see **Fehler! Verweisquelle konnte nicht gefunden werden.**)

4.3 Mounting and Electrical Connections

Warning

To improve natural convection and keep heating of the amplifiers as low as possible, the devices installed in a cabinet should have a minimum distance of 15 mm.

Warning

The function of the measuring amplifier is only ensured with the components in the specified layout to one another. Otherwise, severe malfunctions may occur. Thus, the mounting information on the following pages must be followed

Warning

The local installation regulations ensure the safety of electrical

systems. They are not considered in these operating instructions. However, they must be met.

4.4 Force sensor Mounting

The force sensors are mounted in line with the mounting instructions of the respective products. The mounting instructions are included with the force sensors.

4.5 Electrical Connections

Two or four force sensors can be connected to the EMGZ492.EIP. When four sensors are used, two of them have to be connected in parallel. The force sensors and amplifier are connected using a 2x2x0.25 mm² [AWG 23] shielded, twisted cable.

4.5.1 EMGZ492.R.EIP

Spannungsversorg.		Kraftaufnehmer 1 oder Messwalze 1		Kraftaufnehmer 2 oder Messwalze 2		Analogausgang	
1	24 VDC	5	+ Speisung	9	– Speisung	13	± 10 V
2	GND	6	+ Signal	10	– Signal	14	GND
3	PE	7	– Signal	11	+ Signal	15	n.a.
4	Schirmung	8	– Speisung	12	+ Speisung	16	Schirmung

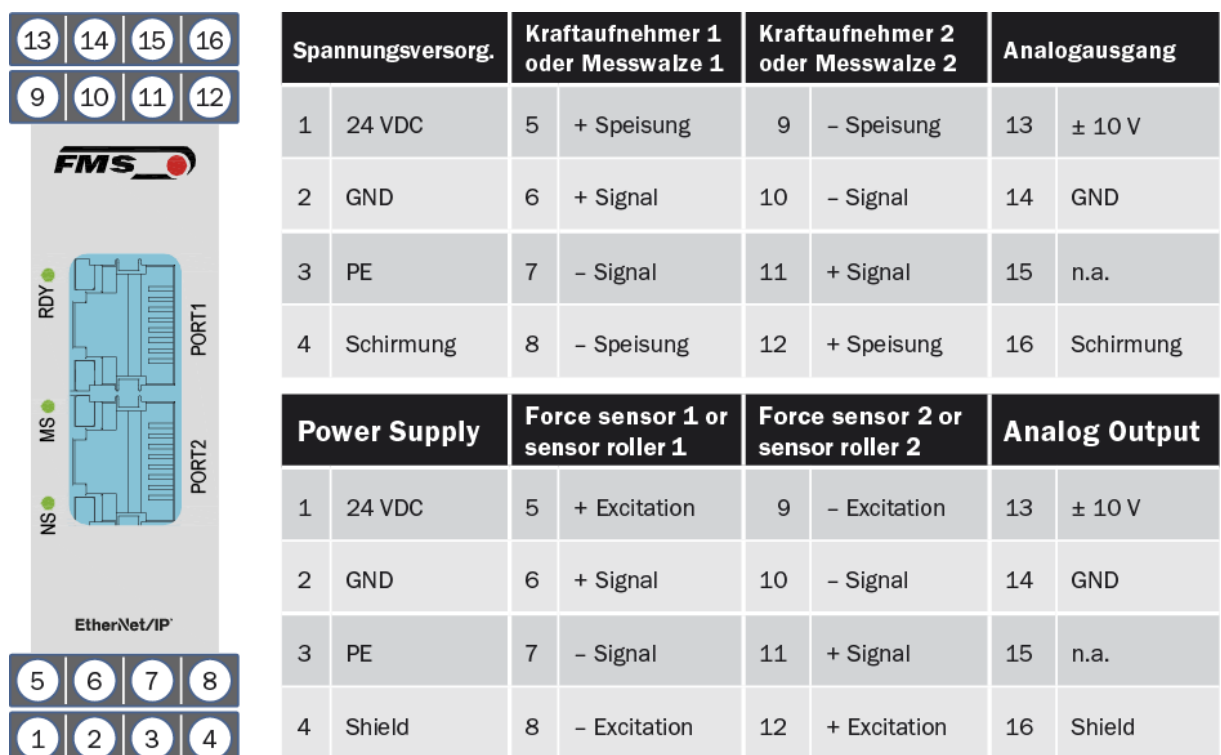| Power Supply		Force sensor 1 or sensor roller 1		Force sensor 2 or sensor roller 2		Analog Output	
1	24 VDC	5	+ Excitation	9	– Excitation	13	± 10 V
2	GND	6	+ Signal	10	– Signal	14	GND
3	PE	7	– Signal	11	+ Signal	15	n.a.
4	Shield	8	– Excitation	12	+ Excitation	16	Shield

Figure 2: EMGZ492.R.EIP electrical connections

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

For easier installation, the terminal blocks can be detached from the main housing.

Figure 3: Detachable terminal blocks: use a small slotted screwdriver as a lever

4.5.2 EMGZ492.W.EIP

The 4 screws of the cover with the PG glands and the M12 plug must be loosened for board access. You can slide out the board by approx. 2 cm (1 in.) and loosen the terminal blocks for easier connection of the wires.
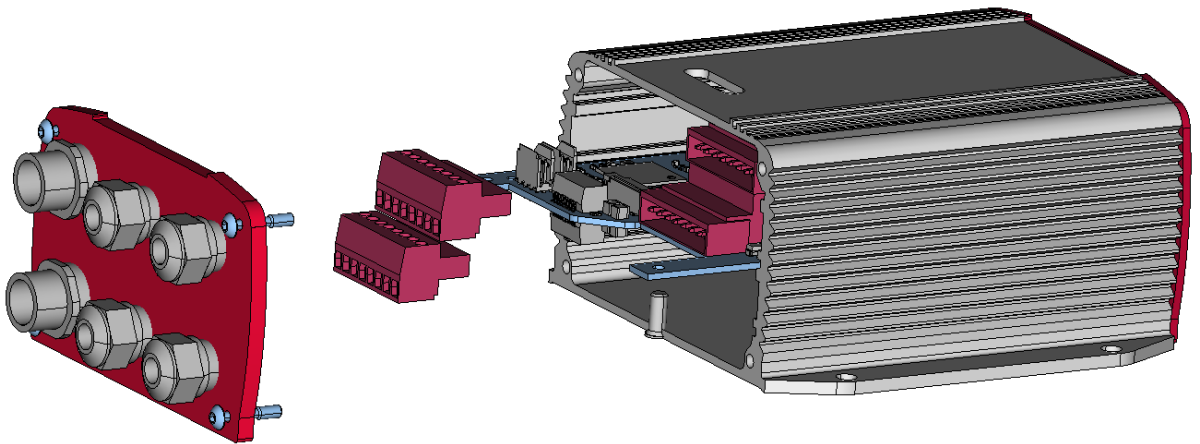

Figure 4: Pc board with removable terminal blocks
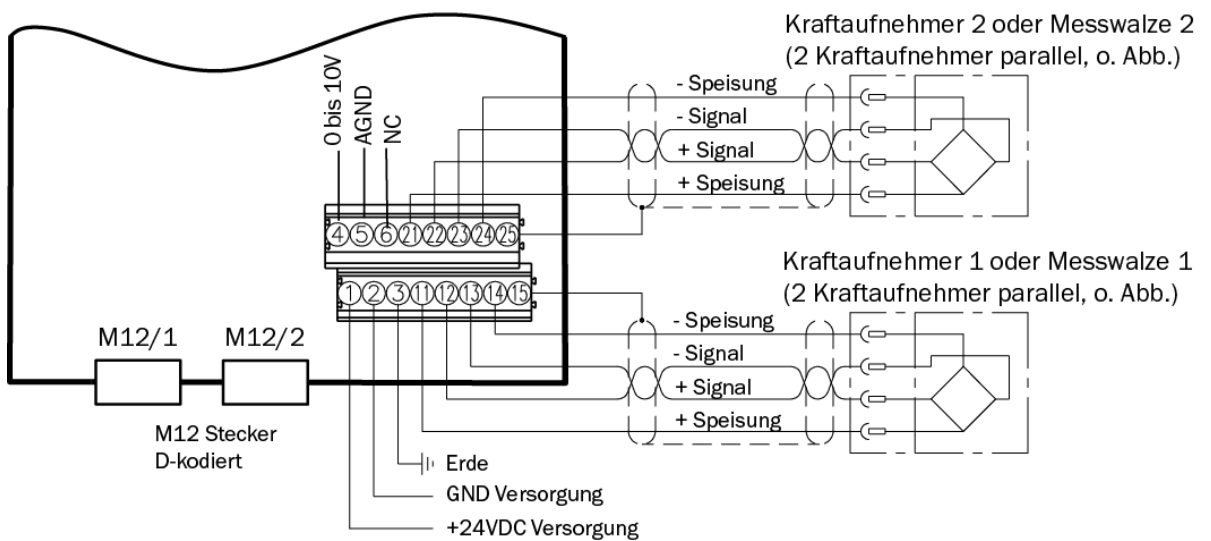
Figure 5: EMGZ492.W.EIP electrical connections

4.5.3 Ethernet Anschlüsse

Signal	Name	PROFINET	EIA T568B	Pin RJ45	Pin M12
TD+	Transmission Data +	YE	WH/OG	1	1
TD-	Transmission Data -	OG	OG	2	3
RD+	Receive Data +	WH	WH/GN	3	2
RD-	Receive Data -	BU	GN	6	4

Tabelle 1: Pin Belegung Ethernet Anschluss

Warning

Poor grounding can result in electric shocks for persons, malfunctions of the overall system or damage to the measuring amplifier! Proper grounding must always be ensured.

Note

Cable shielding may only be connected to one side of the measuring amplifier. On the side of the force sensor, shielding must remain open.

5 Calibration of the Measuring System

There are two options for performing the calibration:

- Via the web browser (see **Fehler! Verweisquelle konnte nicht gefunden werden.**)
- Directly in PLC

5.1 Offset Compensation

Using offset calibration, the weight of the measuring roller and the roller bearings is compensated and the measuring system "zeroed".

Offset compensation must always be executed prior to the actual calibration. The measuring roller must not be loaded during the procedure.

5.2 Calibration (Adjusting the Gain Factor)

Calibration is used for matching the gain factor with the force sensors. After calibration, the displayed force corresponds to the force effectively affecting the material. Two calibration methods are available. The first calibration method described here uses a defined weight. There is also a calculation method for the gain. The weight-based calibration method is simple and delivers more accurate results as it replicates the material profile (see the figure below) and considers the actual circumstances in the machine.
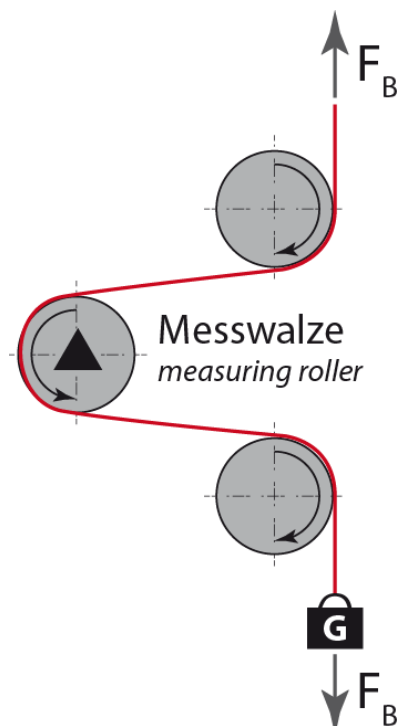

Figure 6: Replication of the material profile using a defined weight

5.3 Calibration

- Activate the web interface (see **Fehler! Verweisquelle konnte nicht gefunden werden.**) and click on "Offset/Calibration" from the menu (see **Fehler! Verweisquelle konnte nicht gefunden werden.**).
- Connect the first force sensor (see 4.5).
- The measuring signal must become positive for loads in measuring direction. If it is negative, the signal lines of the affected force sensors must be switches at the terminal block (see 4.5).
- Connect the second force sensor.
- The measuring signal must become positive for loads in measuring direction. If it is negative, the signal lines of the affected force sensors must be switched at the terminal block (see 4.5).
- Click on "Adjust Offset" in the web browser.
- Insert material or rope into the machine.
- Load material or rope with a defined weight (see 5.1).
- Click on "Calibrate Gain" in the web browser.

5.4 Gain

Depending on the material wound around the measuring roller, the applied force is not relayed to the sensors 1:1. Thus, the measured force does not correspond to the effectively applied force. To correct for this error, the measured force is amplified using a factor. The factor that is referred to as gain or gain factor is calculated such that the resulting force corresponds to the applied force. The gain is calculated per the following formula:

$$\text{Gain} = \frac{F_{Nom}\,\text{Digit} * F_{act}\,\text{N}}{F_{Nom}\,\text{N} * F_{act}\,\text{Digit}}$$

Option V05

The standard version uses a sensor feedback signal of ± 9 mV. Measuring amplifiers with the option V05 are designed for a sensor feedback signal of ± 2.5 mV. The other values in the following description are identical.

Explanations	
Variable	Description
F_{Nom} **Digit**	Is the nominal force as binary value after the A/D converter. This value is a constant with value 11'890. From the user's point of view, this value corresponds to an input signal of 9 mV. The amplifier can measure up to an overload of 37 %.
F_{act} **N**	Effectively applied force at the measuring system in Newtons.
F_{Nom} N	Is the nominal force of the measuring system in Newtons.

F_{act} Digit	Measured force at the measuring system as binary value after the A/D converter. From the user's point of view, this value corresponds to a voltage in mV, which is relayed by the measuring system to the amplifier.

Example

-   Nominal force at 9 mV = 11'890 digit
-   1 force sensors with 500 N nominal force, as per type plate; F_{sys} N = 500 N
-   Use of a defined weight of 50 kg (corresponds to approx. 500 N); F_{act} N = 500 N
-   Obtain measured force with suspended weight from the PLC, e.g., F_{act} Digit = 4'980

$$\text{Gain} = \frac{11'890 * 500N}{500N * 4980} = 2.388$$

Note

The gain factor needs to be calculated for both of the channels individually.

Note

This calculation is not required when calibrating via web browser.

5.5 Limit Value Violations

The amplifier checks the analog input and output for limit value violations. At the input, it is checked using the input voltage, whether the force sensor is mechanically overloaded (overload test). The measuring amplifier can measure an overload of 37 %. At the output, it is checked, whether the output voltage depending on the amplified input signal will be above or below the physically possible value. In this case, an overflow and/or underflow is present.

5.5.1 Overload Test

The overload test is performed using the raw value read on the ADC. It is thus not related to any force and can be applied independently from the nominal force to every force sensor.

Test rule:

The FMS force sensors deliver 9 mV at the output under nominal force load. In the case of a load up to the mechanical stop, approx. 12.4 mV are output. These values apply, if the force sensor is loaded in normal operating direction (red point). In reverse direction, the values are respectively negative. The amplifier checks overload in both directions.

The limit value for overload is fixed set to 12 mV and/or -12 mV. If one of these limit values is reached, the overload status bit of the respective force sensors is set. The bit is

removed again, as soon as the raw value is 0.5 mV below and/or above the triggering limit value.

5.5.2 Overflow and Underflow Test

The overflow and underflow test is performed with the output value that is relayed to the DAC, calculated from the gain. If the output value exceeds the maximum possible value, an overflow is present. If it undercuts the minimum possible value, an underflow is present.

Test rule

The output voltage is between 0 and +10 V. A hysteresis of +/-10 digits is used for the test so that the error bits do not trigger for every small over- and/or underflow. Thus, the overflow triggers, when the theoretically calculated output value of 10.05 V is reached. For underflow, the value is 0.05 V. When these limit values are reached, the respective bits are set in the status. The bits are removed, as soon as the output value is within the valid range again (above 0.05 V and below 9,95 V).

5.6 Description of the LEDs

LED	Description
PORT1	Port 1 Ethernet cable 1 connected and linked with counter point
PORT2	Port 2 Ethernet cable 1 connected and linked with counter point
MS	Green, on: in operation, ok Green, flashing: standby Green, red flashing: self-test Red, flashing: simple error Red, on: severe error
NS	Green, on: connected Green, flashing: not connected Green, red flashing: time-out connection Red, on: dual IP
RDY	Illuminates in green as soon as the voltage supply is connected and the processor is started.

Figure 7: Signal LEDs on EMGZ492.EIP

6 Integration into the EtherNet/IP Network

The measuring amplifiers of the EMGZ492.EIP series can operate in an EtherNet/IP network. Here, the amplifier operates as EtherNet/IP-adapter with the PLC which has the role of a EtherNet/IP-scanner.

6.1 EtherNet/IP Interface

EtherNet/IP is supported. The respective communication profile is selected by the controller (master) via the EDS file.

The EDS file from FMS will support the EDS-AOP License Key of Rockwell.

The EMGZ492.EIP transfers the actual value in digit and the status/error byte. In addition, parameters, such as offset actual value, gain actual value, filter actual value, filter analog output, as well as scaling analog output can be adjusted.

EDS and example files as well as a quick start guide are available in the download section on www.fms-technology.com.

The Quick Start Guide describes how to integrate the EMGZ491/492 into the PLC development environment.

EMGZ49x with software version up to 2.0.3, the EDS version 1.1 must be used.

EMGZ49x with software version from 2.0.4 or higher, the EDS version 2.1 must be used.

6.2 TCP/IP Configuration

The Ethernet settings must be known for PLC or web browser to communicate with the amplifier in an EtherNet/IP network. The system developer configures the address for every device and has thus a general overview of the address allocation in the network.

The IP address of the amplifier is factory pre-set to 192.168.0.90.

6.3 Data Exchange

The EMGZ492.EIP uses the communication types typical for EtherNet/IP. Cyclic data traffic is used for the fast transmission of measured data. Acyclic data traffic is used for parameterization. Cyclic data traffic is used for transmitting the limit value violations.

7 Configuration

The EMGZ492.EIP can be configured either via the web interface or via ETHERNET/IP.

The parameters "Low-pass filter active" and "Low-pass filter analog output active" cannot be accessed via the web interface.

7.1 Modify IP address with RLLinx
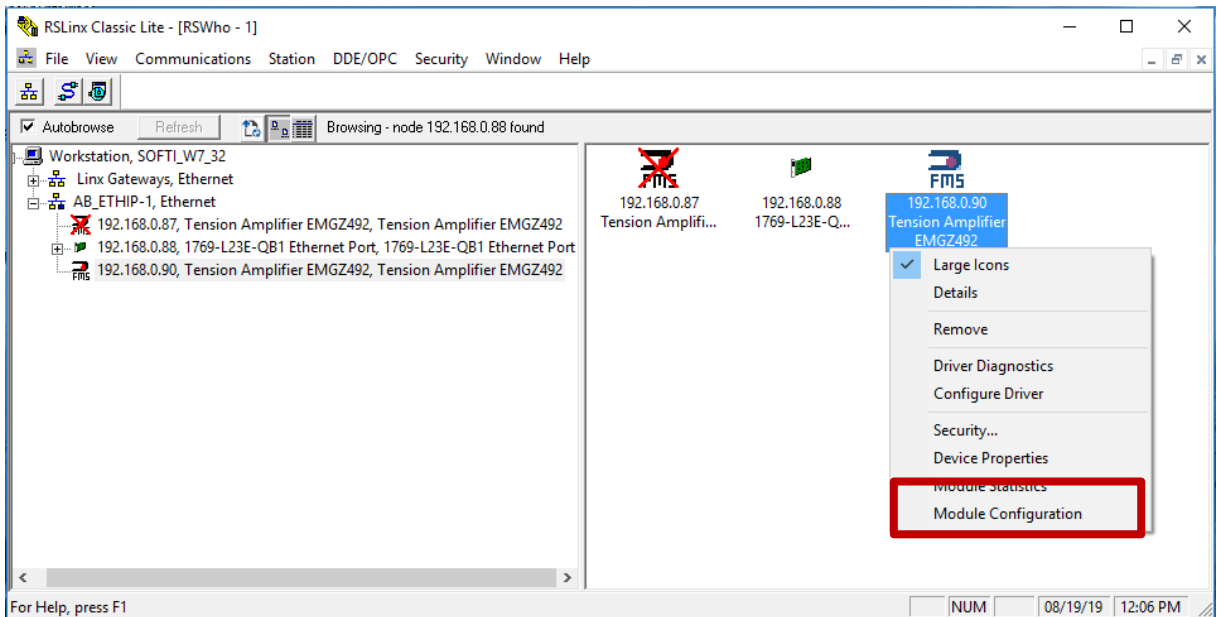
AB_ETHIP-1\192.168.0.90 Tension Amplifier EMGZ492 Configuration   ✕

| General | Port Configuration | Advanced Port Configuration | Network |

Port: 1 ⌄

◉ Manually configure IP settings
○ Obtain IP settings automatically using BOOTP
○ Obtain IP settings automatically using DHCP

IP Address: 192 . 168 . 0 . 90
Network Mask: 255 . 255 . 255 . 0

Gateway Address: 0 . 0 . 0 . 0

Primary Name
Server: 0 . 0 . 0 . 0

Secondary Name
Server: 0 . 0 . 0 . 0

Domain Name:

Host Name: Tension Amplifier EMGZ492

Status: Network Interface Configured

[OK] [Abbrechen] [Übernehmen] [Hilfe]

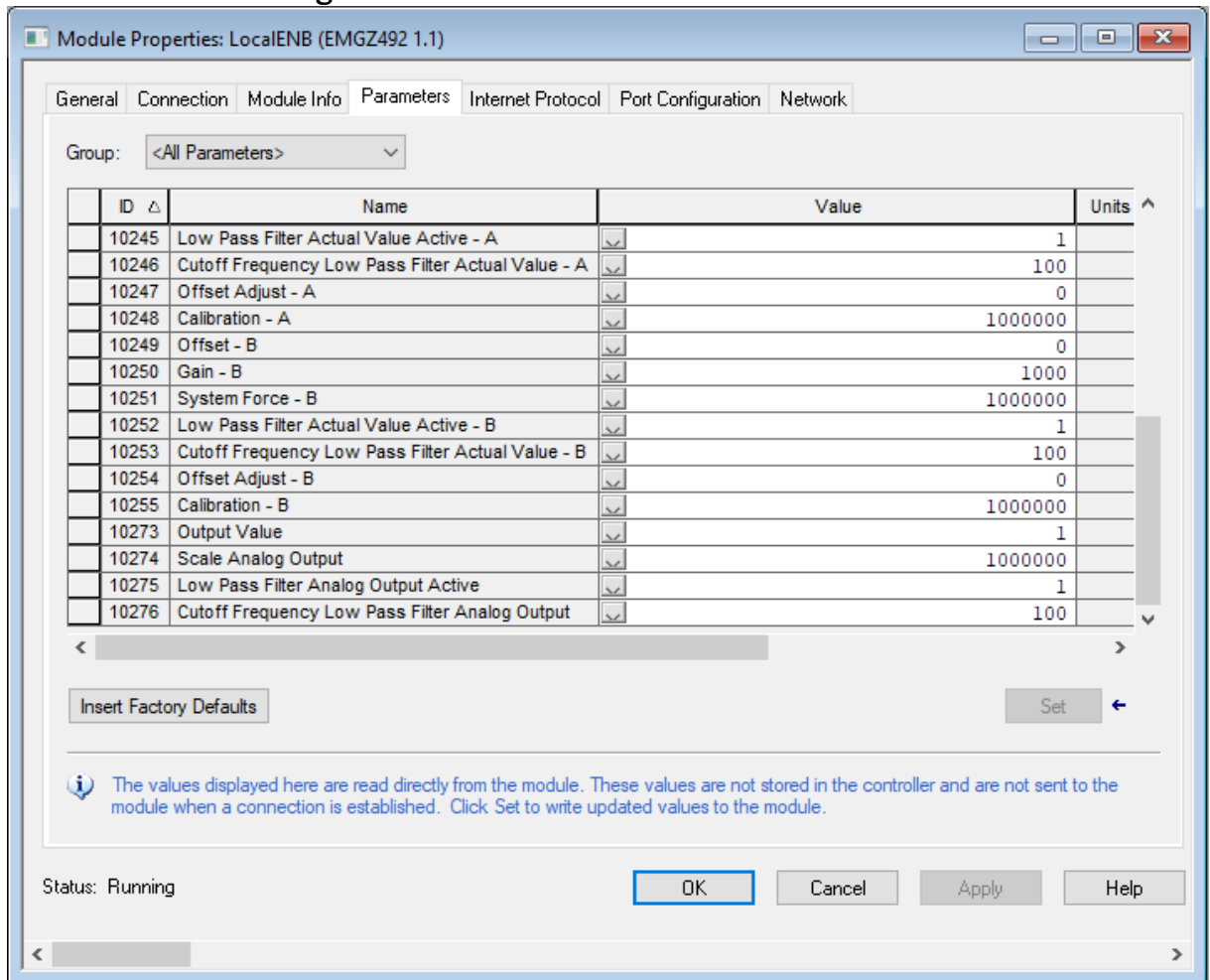ControlLogix Gateway Tool   ✕

⚠ Changing the IP Address of this modules will cause all
connections routed through this module to become broken.

Do you wish to continue?

[Ja] [Nein]

7.2 Parameter Description

Access data with RSLogix 5000

```
Module Properties: LocalENB (EMGZ492 1.1)

General  Connection  Module Info  Parameters  Internet Protocol  Port Configuration  Network

Group:  <All Parameters>
```

ID	Name	Value	Units
10245	Low Pass Filter Actual Value Active - A	1	
10246	Cutoff Frequency Low Pass Filter Actual Value - A	100	
10247	Offset Adjust - A	0	
10248	Calibration - A	1000000	
10249	Offset - B	0	
10250	Gain - B	1000	
10251	System Force - B	1000000	
10252	Low Pass Filter Actual Value Active - B	1	
10253	Cutoff Frequency Low Pass Filter Actual Value - B	100	
10254	Offset Adjust - B	0	
10255	Calibration - B	1000000	
10273	Output Value	1	
10274	Scale Analog Output	1000000	
10275	Low Pass Filter Analog Output Active	1	
10276	Cutoff Frequency Low Pass Filter Analog Output	100	

Insert Factory Defaults   Set

The values displayed here are read directly from the module. These values are not stored in the controller and are not sent to the module when a connection is established. Click Set to write updated values to the module.

Status: Running   OK   Cancel   Apply   Help

Parameter	
Name	**Description**
Unit	Here you select which unit of measurement is used. The label located on the sensor will indicate the nominal force in Newtons. Note: This input will also affect the unit of the cyclic process data. If lb (pound) is selected, the system switches from metric to imperial measuring units. Selection: N, kN, lb, g, kg. Specified value: N

Parameter	
Name	Description
Low-pass filter active A	Here, the status of the low-pass filter active value for the force sensor A is indicated. This parameter cannot be accessed via the web interface. Min. 0 Max. 1 Specified value 1 0 = no, inactive, 1 = yes, active
Offset A	The values determined with the "Offset Compensation" procedure are stored in the form of a digital value in the [Offset] parameter. The value is used for compensating for the roller weight of force sensor A. Min. -16'000 Max. 16'000 Specified value 0
Gain A	The gain factor ensures that the displayed force matches the effective force on sensor A. Min. 0.100 Max. 20.000 Specified value 1.000
Nominal force A	The nominal force indicates the measuring capacity of force sensor A. E.g., if a 500 N force sensor is installed 500 N must be entered. Unit N Min. 1.00 Max. 200'000.00 Specified value 1'000.00

Parameter	
Name	Description
Limit frequency low-pass filter actual value A	The amplifier features a low-pass filter that filters the measured value is relayed via ETHERNET/IP. This filter is used for suppressing undesired interference signals that are superimposed on the measuring signal. Using this parameter, the limit frequency of the filter of force sensor A is adjusted. The lower the limit frequency, the slower the measuring value. This low-pass filter is independent from the output filter. Unit Hz Min. 0.1 Max. 200.0 Specified value 10.0
Low-pass filter active B	Here, the status of the low-pass filter active value for the force sensor B is indicated. This parameter cannot be accessed via the web interface. Min. 0 Max. 1 Specified value 1 0 = no, inactive, 1 = yes, active
Offset B	The values determined with the "Offset Compensation" procedure are stored in the form of a digital value in the [Offset] parameter. The value is used for compensating for the roller weight of force sensor B. Min. -16'000 Max. 16'000 Specified value 0
Gain B	The gain factor ensures that the displayed force matches the effective force on sensor B. Min. 0.100 Max. 20.000 Specified value 1.000

Parameter	
Name	Description
Nominal force B	The nominal force indicates the measuring capacity of force sensor B. E.g., if a 500 N force sensor is installed 500 N must be entered.
	Unit N
	Min. 1.00
	Max. 200'000.00
	Specified value 1'000.00
Limit frequency low-pass filter actual value B	The amplifier features a low-pass filter that filters the measured value is relayed via ETHERNET/IP. This filter is used for suppressing undesired interference signals that are superimposed on the measuring signal. Using this parameter, the limit frequency of the filter of force sensor B is adjusted. The lower the limit frequency, the slower the measuring value.
	This low-pass filter is independent from the output filter.
	Unit Hz
	Min. 0.1
	Max. 200.0
	Specified value 10.0
Low-pass filter analog output active	Here, the status of the low-pass filter for the analog output is indicated.
	This parameter cannot be accessed via the web interface.
	Min. 0
	Max. 1
	Specified value 1
	0 = no, inactive, 1 = yes, active
Limit frequency low-pass filter analog output	The amplifier features a low-pass filter that filters the signal of the analog voltage output. This filter is used for suppressing undesired interference signals. Using this parameter, the limit frequency of the filter is adjusted.
	This low-pass filter is independent from the ETHERNET/IP filter.
	Unit Hz
	Min. 0.1
	Max. 200.0
	Specified value 10.0

Parameter	
Name	Description
Analog output scaling	This parameter determines, for which force the analog output outputs its maximum voltage (**10 V**). Note: **If lb (pound) is selected, the system switches from metric to imperial measuring units.** Unit N Min. 0.1 Max. 200'000.00 Specified value 1'000.00

7.3 Cyclic Data Traffic

After a successful system start, controller and the assigned devices can exchange cyclic process data. The table below shows the measured data and how they are transmitted.

Parameter	
Name	Description
Actual value A in ADC	Value read in via the A/D converter. Data type int (signed 16 bit) Value range -16384 bis 16383 Value format ±##### The value is interpreted as integer without decimal place. E.g. 1000 = 1000 ADC raw value
Actual value A in Newton	Filtered actual value converted into Newton Data type long (signed 32 bit) Value range ±200'000'000 Value format ±######.### The value is interpreted as decimal number with 3 decimal places. E.g. 1500 = 1.500 N (1.5 N) Unit N
Actual value A in pound	Filtered actual value converted into pound. Data type long (signed 32 bit) Value range ±200'000'000 Value format ±######.### The value is interpreted as decimal number with 3 decimal places. E.g. 224820 = 224.820 lb (224.82 lb) Unit lb

Parameter	
Name	Description
Actual value A in unit	Filtered actual value converted into configured unit.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±#######.### for N, kN, kg, or lb
	The value is interpreted as decimal number with 3 decimal places. E.g. unit set to kN 100000 = 100.000 kN (100 kN)
	Value format ±#########.# for g
	The value is interpreted as decimal number with 1 decimal place. E.g. unit set to g 12340 = 1234.0 g (1234 g)
	Unit N, kN, g, kg, or lb
Actual value B in ADC	Value read in via the A/D converter.
	Data type int (signed 16 bit)
	Value range -16384 bis 16383
	Value format ±#####
	The value is interpreted as integer without decimal place. E.g. 1000 = 1000 ADC raw value
Actual value B in Newton	Filtered actual value converted into Newton
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±######.###
	The value is interpreted as decimal number with 3 decimal places. E.g. 1500 = 1.500 N (1.5 N)
	Unit N
Actual value B in pound	Filtered actual value converted into pound.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±######.###
	The value is interpreted as decimal number with 3 decimal places. E.g. 224820 = 224.820 lb (224.82 lb)
	Unit lb

Parameter	
Name	Description
Actual value B in unit	Filtered actual value converted into configured unit.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±#######.### for N, kN, kg, or lb
	The value is interpreted as decimal number with 3 decimal places. E.g. unit set to kN 100000 = 100.000 kN (100 kN)
	Value format ±#########.# for g
	The value is interpreted as decimal number with 1 decimal place. E.g. unit set to g 12340 = 1234.0 g (1234 g)
	Unit N, kN, g, kg, or lb
Actual value A + B in unit	Filtered actual values sum signal converted into configured unit.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±#######.### for N, kN, kg, or lb
	The value is interpreted as decimal number with 3 decimal places. E.g. unit set to kN 100000 = 100.000 kN (100 kN)
	Value format ±#########.# for g
	The value is interpreted as decimal number with 1 decimal place. E.g. unit set to g 12340 = 1234.0 g (1234 g)
	Unit N, kN, g, kg, or lb

Parameter	
Name	Description
Actual value |A - B| in unit	Filtered actual values differential signal converted into configured unit.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±#######.### for N, kN, kg, or lb
	The value is interpreted as decimal number with 3 decimal places. E.g. unit set to kN 100000 = 100.000 kN (100 kN)
	Value format ±#########.# for g
	The value is interpreted as decimal number with 1 decimal place. E.g. unit set to g 12340 = 1234.0 g (1234 g)
	Unit N, kN, g, kg, or lb
Actual value (A + B)/2 in unit	Filtered actual values medium signal converted into configured unit.
	Data type long (signed 32 bit)
	Value range ±200'000'000
	Value format ±#######.### for N, kN, kg, or lb
	The value is interpreted as decimal number with 3 decimal places. E.g. unit set to kN 100000 = 100.000 kN (100 kN)
	Value format ±#########.# for g
	The value is interpreted as decimal number with 1 decimal place. E.g. unit set to g 12340 = 1234.0 g (1234 g)
	Unit N, kN, g, kg, or lb
Status	The status contains information about the current process and operating condition.
	Every bit represents a separate event. The condition is active, if the bit is set.
	Data type byte (unsigned 8 bit)
	Bit 0 Overload (LSB) A
	Bit 1 Overload (LSB) B
	Bit 2 Analog output overflow
	Bit 3 Analog output underflow

7.4 Acyclic Data Traffic

After a successful system start, controller and the assigned devices can exchange acyclic requirement data. The following table shows the parameters and commands ad how they are transmitted using acyclic data traffic.

Parameter		
ID	Description	
10241	Unit	
	Access type	R/W
	Parameter command	unit
	Data type	byte (unsigned 8 bit)
	Value range	0 to 4 0=N; 1=kN; 2=lb; 3=g; 4=kg
	Value format	#
10242	Offset A	
	Access type	R/W
	Parameter command	offset
	Data type	int (unsigned 16 bit)
	Value range	-16'000 to 16'000
	Value format	±#####
10243	Gain A	
	Access type	R/W
	Parameter command	gain
	Data type	int (unsigned 16 bit)
	Value range	100 to 20'000
	Value format	##.###
10244	System force A	
	The system force is the maximum permissible force of the used measuring system.	
	Access type	R/W
	Parameter command	Nominal force
	Data type	long (unsigned 32 bit)
	Value range	100 to 200'000'000
	Value format	######.###
	Unit	N, regardless of configured unit

Parameter	
ID	Description
10245	Low-pass filter active A
	Switch the low-pass filter actual value on or off; 0 = off; 1 = on.
	Not remanent: The adjusted value is lost on a restart! This filter is switched on after a restart.
	This parameter cannot be accessed via the web interface.
	Access type R/W
	Parameter command low-pass filter actual value active (ETHERNET/IP)
	Data type byte (unsigned 8 bit)
	Value range 0 to 1
	Value format #
10246	Limit frequency low-pass filter actual value A
	Limit frequency of the low-pass filter for the actual value outputted via ETHERNET/IP.
	Access type R/W
	Parameter command limit frequency low-pass filter actual value (ETHERNET/IP)
	Data type int (unsigned 16 bit)
	Value range 1 to 2'000
	Value format ###.#
	Unit Hz
10247	Offset adjustment A
	Determine and store offset. The system is set to zero without material tension.
	Access type R/W
	Parameter command offset adjustment
	Data type byte (unsigned 8 bit)
	Value range 0 to 1
	Value format #
	To use the offset function a "1" must be written to the device. A reset is not necessary. Every time a "1" is written the offset is evaluated.

Parameter	
ID	Description
10248	**Calibration A**
	Calibrates the amplifier to the weight in Newton, which is handed over here. It must match the suspended weight.
	Access type R/W
	Parameter command calibration
	Data type long (signed 32 bit)
	Value range 0 to 200'000'000
	Value format ######.###
	Unit N, regardless of configured unit
	Every time a force in Newton is written the gain is evaluated. A reset to zero is not necessary.
10249	**Offset B**
	Access type R/W
	Parameter command offset
	Data type int (unsigned 16 bit)
	Value range -16'000 to 16'000
	Value format ±#####
	To use the offset function a "1" must be written to the device. A reset is not necessary. Every time a "1" is written the offset is evaluated.
10250	**Gain B**
	Access type R/W
	Parameter command gain
	Data type int (unsigned 16 bit)
	Value range 100 to 20'000
	Value format ##.###
	Every time a force in Newton is written the gain is evaluated. A reset to zero is not necessary.

Parameter	
ID	Description
10251	**System force B**
	The system force is the maximum permissible force of the used measuring system.
	Access type R/W
	Parameter command Nominal force
	Data type long (unsigned 32 bit)
	Value range 100 to 200'000'000
	Value format ######.###
	Unit N, regardless of configured unit
10252	**Low-pass filter active B**
	Switch the low-pass filter actual value on or off; 0 = off; 1 = on.
	Not remanent: The adjusted value is lost on a restart! This filter is switched on after a restart.
	This parameter cannot be accessed via the web interface.
	Access type R/W
	Parameter command low-pass filter actual value active (ETHERNET/IP)
	Data type byte (unsigned 8 bit)
	Value range 0 to 1
	Value format #
10253	**Limit frequency low-pass filter actual value B**
	Limit frequency of the low-pass filter for the actual value outputted via ETHERNET/IP.
	Access type R/W
	Parameter command limit frequency low-pass filter actual value (ETHERNET/IP)
	Data type int (unsigned 16 bit)
	Value range 1 to 2'000
	Value format ###.#
	Unit Hz

Parameter	
ID	Description
10254	Offset adjustment B
	Determine and store offset. The system is set to zero without material tension.
	Access type R/W
	Parameter command offset adjustment
	Data type byte (unsigned 8 bit)
	Value range 0 to 1
	Value format #
10255	Calibration B
	Calibrates the amplifier to the weight in Newton, which is handed over here. It must match the suspended weight.
	Access type R/W
	Parameter command calibration
	Data type long (signed 32 bit)
	Value range ± 200'000'000
	Value format ######.###
	Unit N, regardless of configured unit

Explanation of access types: R = Read, W = Write, R/W = Read and Write.

Parameter	
ID	Description
10273	Output value
	0 = (A +B)/2
	1 = A + B
	2 = |A - B|
	3 = A
	4 = B

Parameter	
ID	Description
10274	Analog output scaling
	Determines, at which force the analog output outputs the maximum value of 10 V.

	Access type	R/W
	Parameter command	analog output scaling
	Data type	long (unsigned 32 bit)
	Value range	100 to 200'000'000
	Value format	######.###
	Unit	N

10275	Low-pass filter analog output active
	Switch the low-pass filter analog output on or off; 0 = off; 1 = on.
	Not remanent: The adjusted value is lost on a restart! This filter is switched on after a restart.
	This parameter cannot be accessed via the web interface.

	Access type	R/W
	Parameter command	low-pass filter analog output active
	Data type	byte (unsigned 8 bit)
	Value range	0 to 1
	Value format	#

10276	Limit frequency low-pass filter analog output
	Limit frequency of the low-pass filter for the actual value outputted via the analog output.

	Access type	R/W
	Parameter command	limit frequency low-pass filter analog output
	Data type	int (unsigned 16 bit)
	Value range	1 to 2'000
	Value format	###.#
	Unit	Hz

Explanation of access types: R = Read, W = Write, R/W = Read and Write.

8 EtherNet/IP Communication

Using acyclic data exchange, IO devices (slaves) can be parameterized, configured, or status information read out. For this purpose, read/write frames via IT standard services using UDP/IP are used.

8.1 General Function

The read/write commands can be triggered, when the controller is connected to the IO device, hence a "Connect" took place.
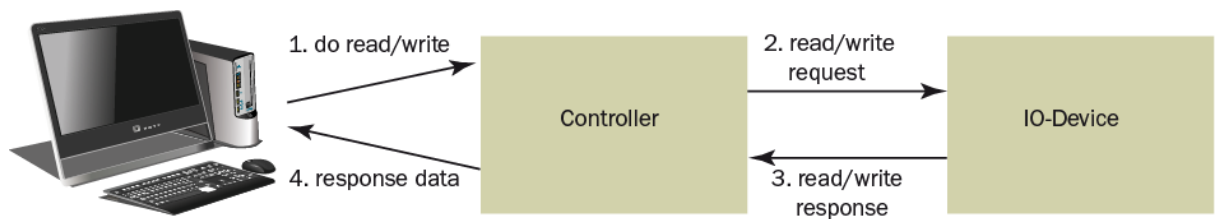
Figure 1: Read/Write cycle

A computer with the respective application can now request a "read" or "write" on the data model of the controller. The controller executes the read/write command via ETHERNET/IP and returns status and data to the computer.

8.2 Services and Protocols

The following services and protocols are used:

- Get_Attribute_Single
- Set_Attribute_Single
- gemäss CIP Spezifikation Volume 1 und Volume 2

All other services required for ETHERNET/IP are permissible as well.

The services above can be used with the EMGZ492.EIP at any time.

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.

> (i) **IP-address of PROFINET and Ethernet/IP devices**
>
> The IP address of PROFINET and Ethernet/IP devices is set to 0.0.0.0 at the factory, as these are usually configured via the PLC.
>
> If you want to configure these devices via the web interface, you must first set the IP address manually.

Gehen Sie dafür wie folgt vor:

Schritt 1: siehe 9.2 Assign static IP-address to laptop, Seite 35.

Schritt 2: siehe 9.5 Ethernet Device Configuration Tool, Seite 43

Schritt 3: siehe 9.4 Web interface, Seite 39

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**
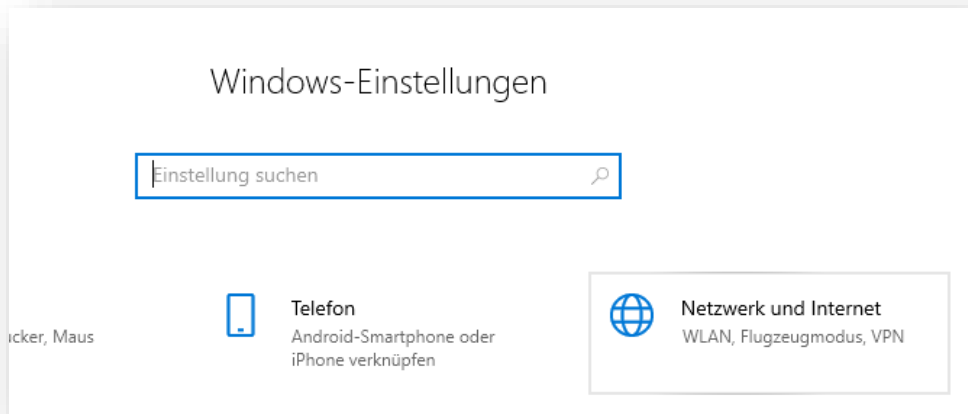
6. **Select Ethernet in navigation on the left hand side of the screen**
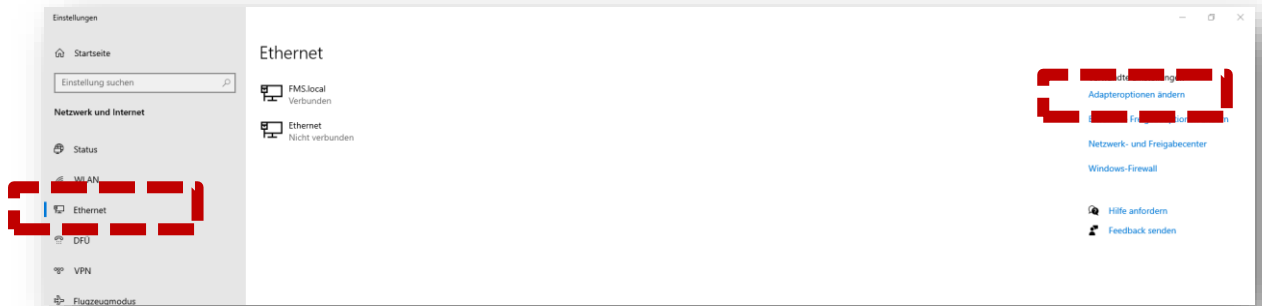
7. **Select change adapter options**
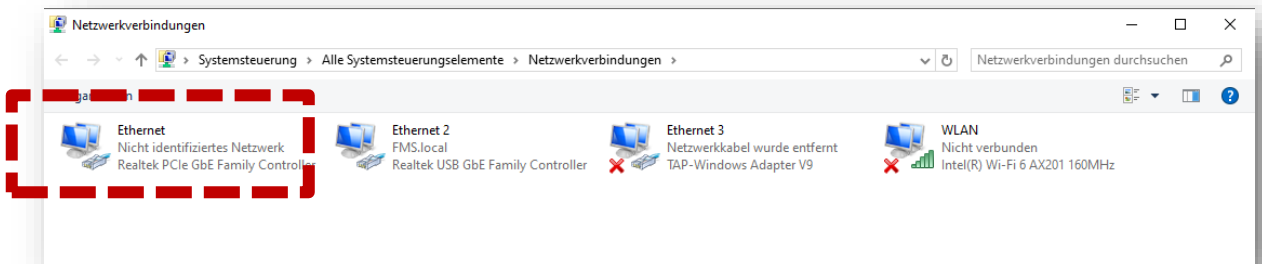
8. **select the desired adapter (of the Ethernet socket used on your laptop), here in the example: Ethernet, Unidentified network**
9. **double-click to select**
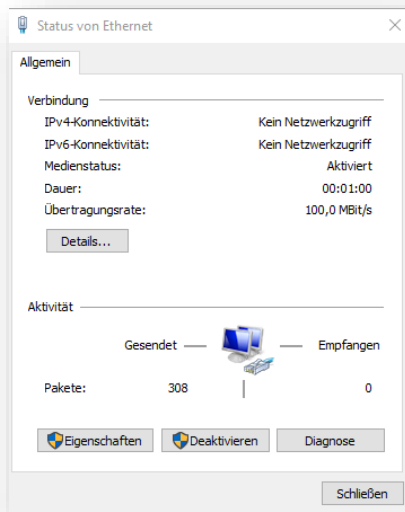
10. Select properties
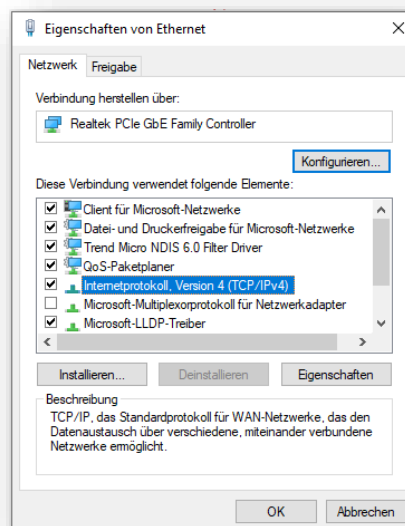
11. Internet protocoll, Version 4 (CP/IPv4)
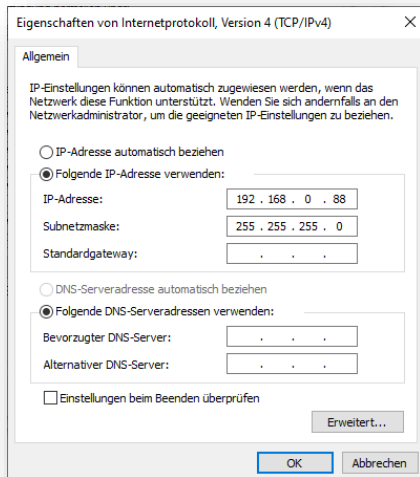
12. activate "Use the following IP address"
13. please check with your IT department which address you may enter here.
14. enter an IP address here.
15. Subnet mask is filled in automatically
16. confirm with OK.
17. the laptop is now ready to communicate with the amplifier.

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".

the user interface of the web interface appears.
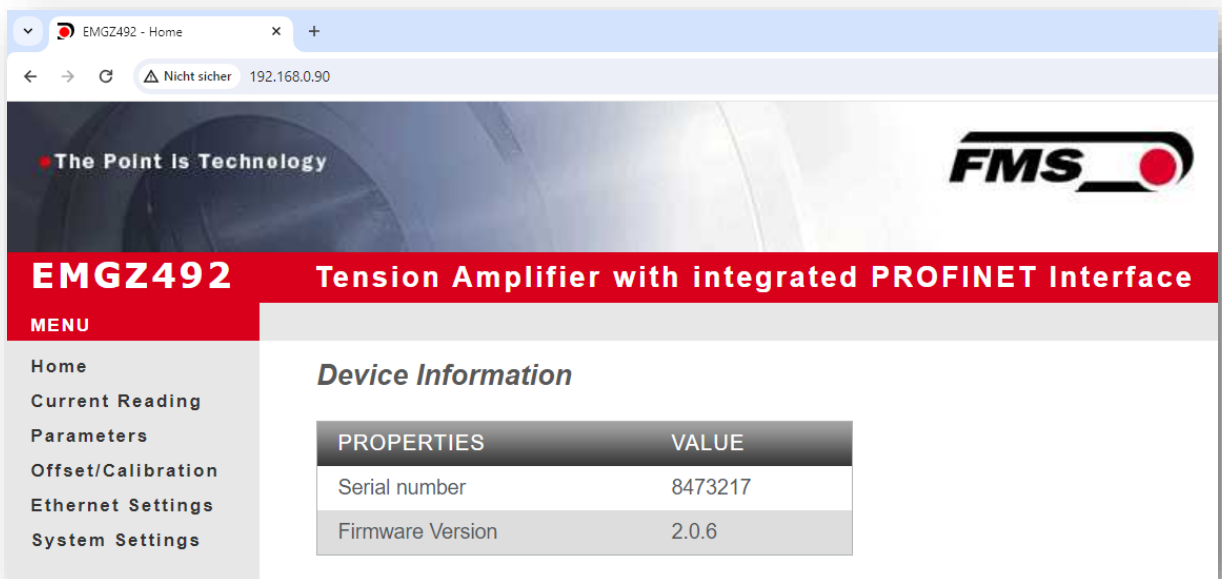
9.4 Web interface
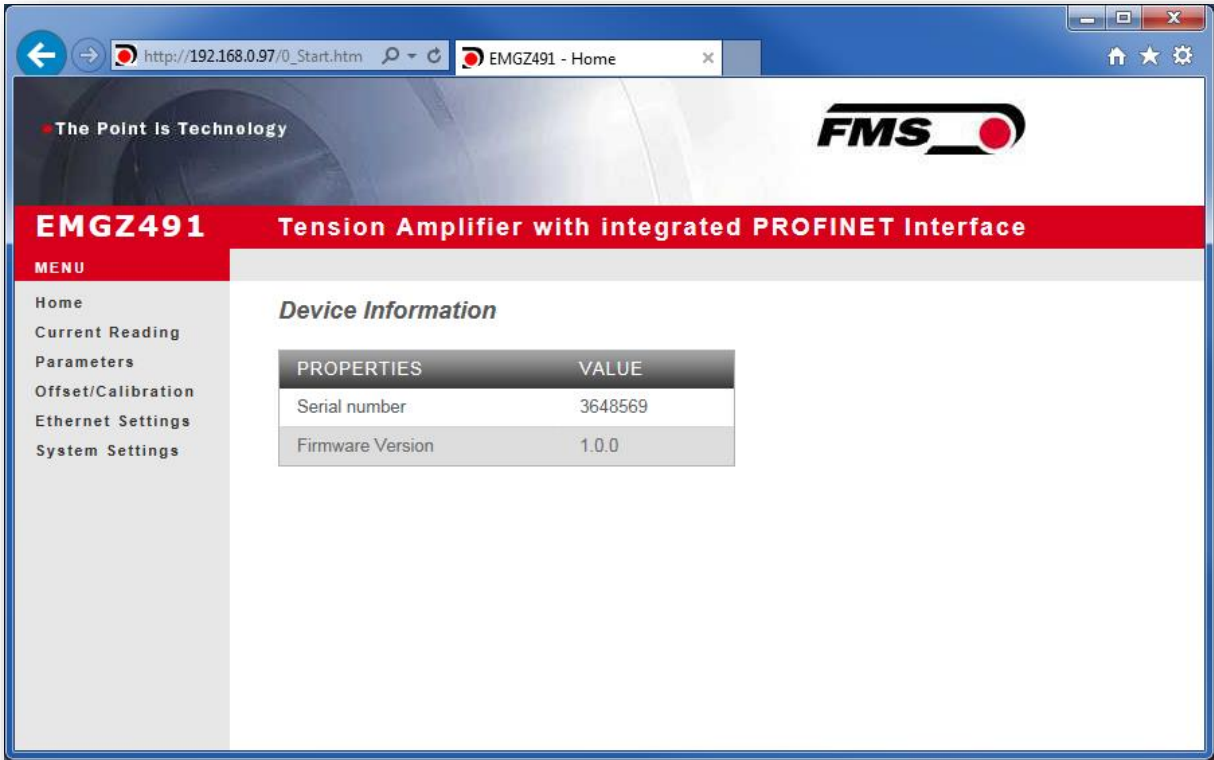
Figure 8: Home

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.
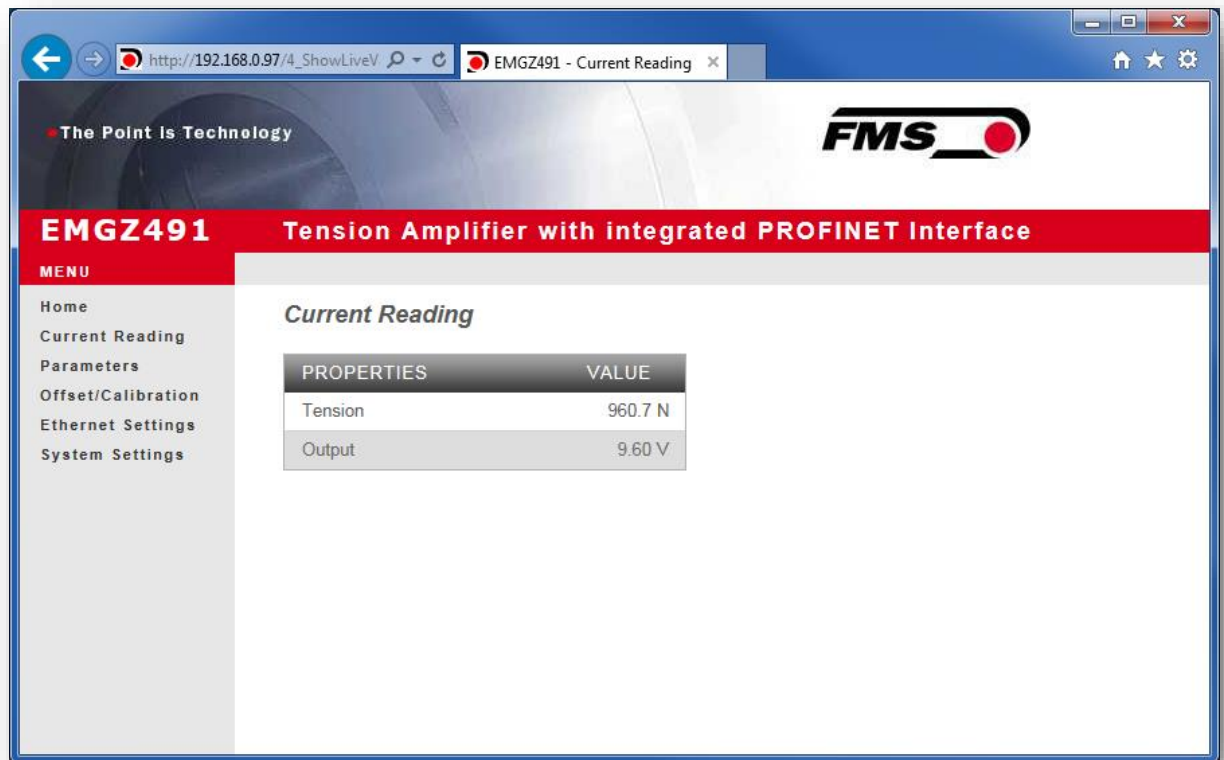
Figure 9: Current Reading

The Current Reading web page displays all current values of the amplifier. The first line Tension shows the tension measured at the input in the set unit of measurement. The second line Output shows the output voltage in volts.
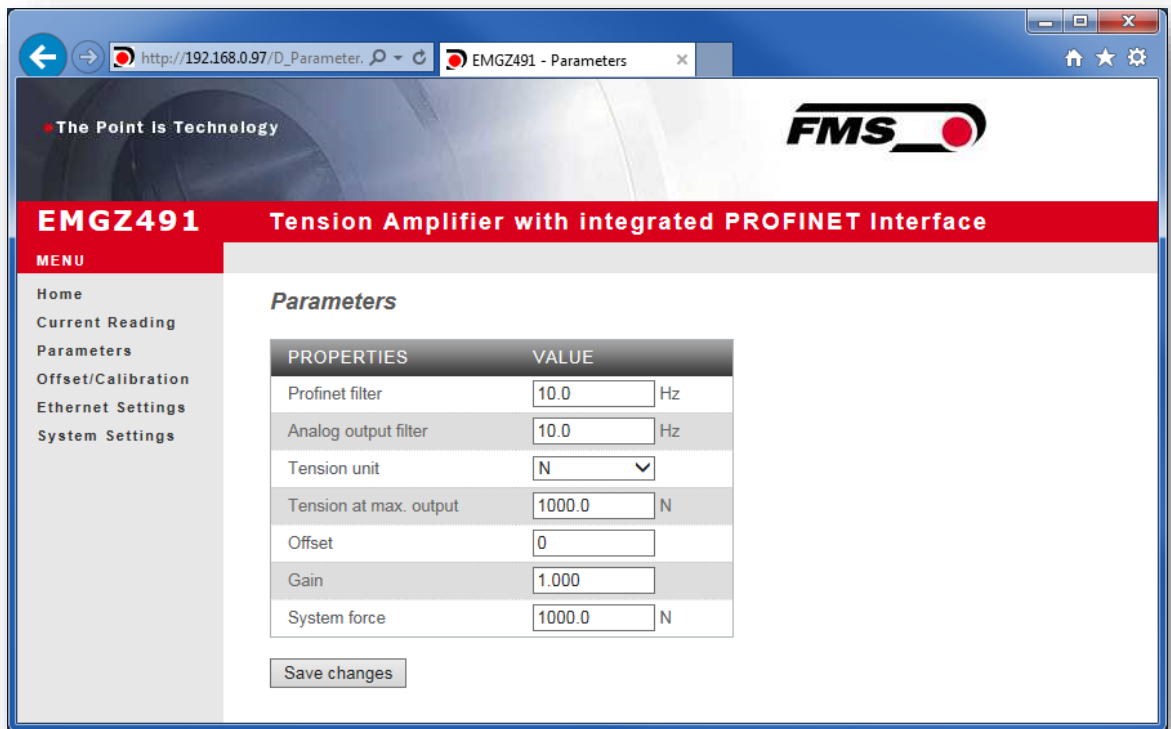
Figure 10: Parameters

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

The parameters "Low-pass filter active" and "Low-pass filter analog output active" cannot be accessed via the web interface.
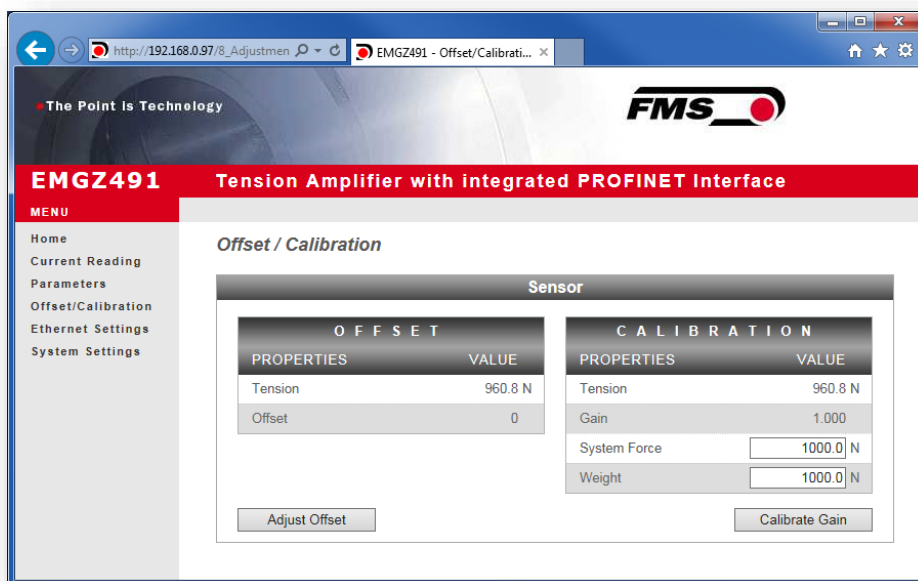
Figure 11: Offset/Calibration

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

These functions are also available via the PLC. If the values for offset and gain are known, they can also be assigned directly to the corresponding parameters.

> **ⓘ Confirm input**
>
> Always use the button "save input" to confirm your input and NOT the Enter key.
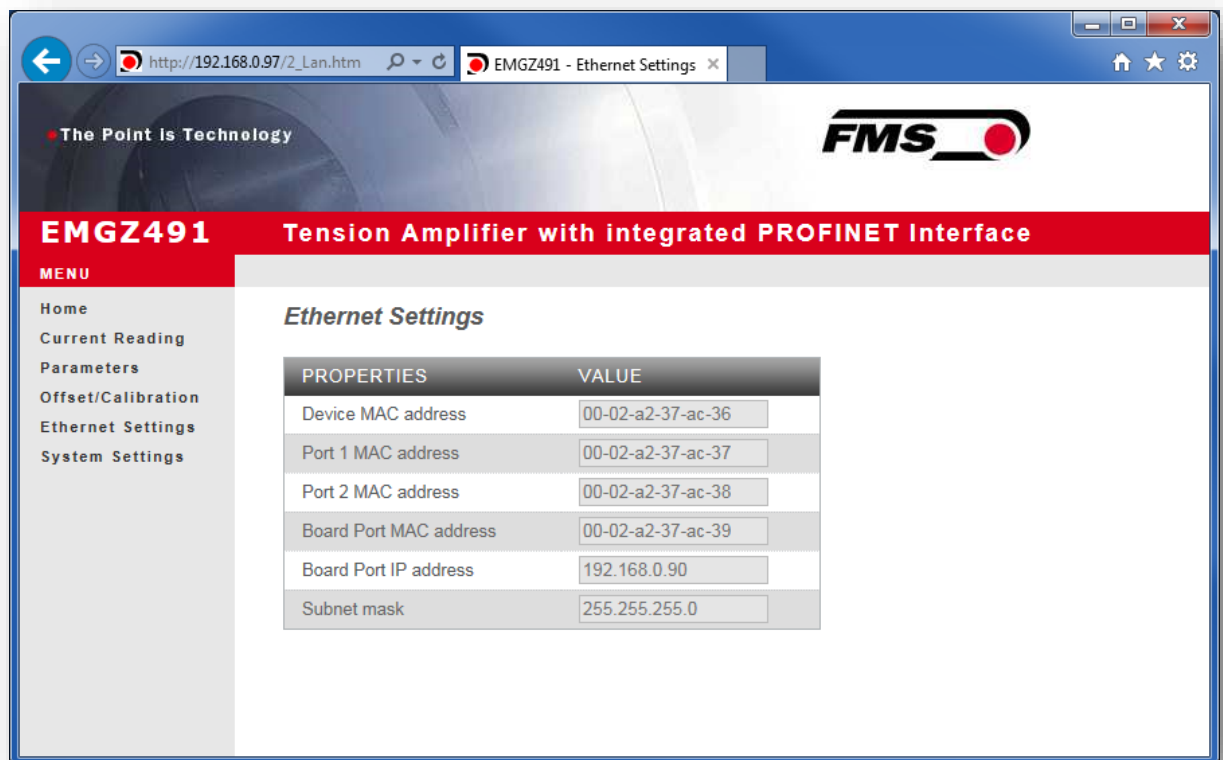
Figure 12: Ethernet settings

This page shows the current TCP/IP configuration. It cannot be changed via the web interface, only read.
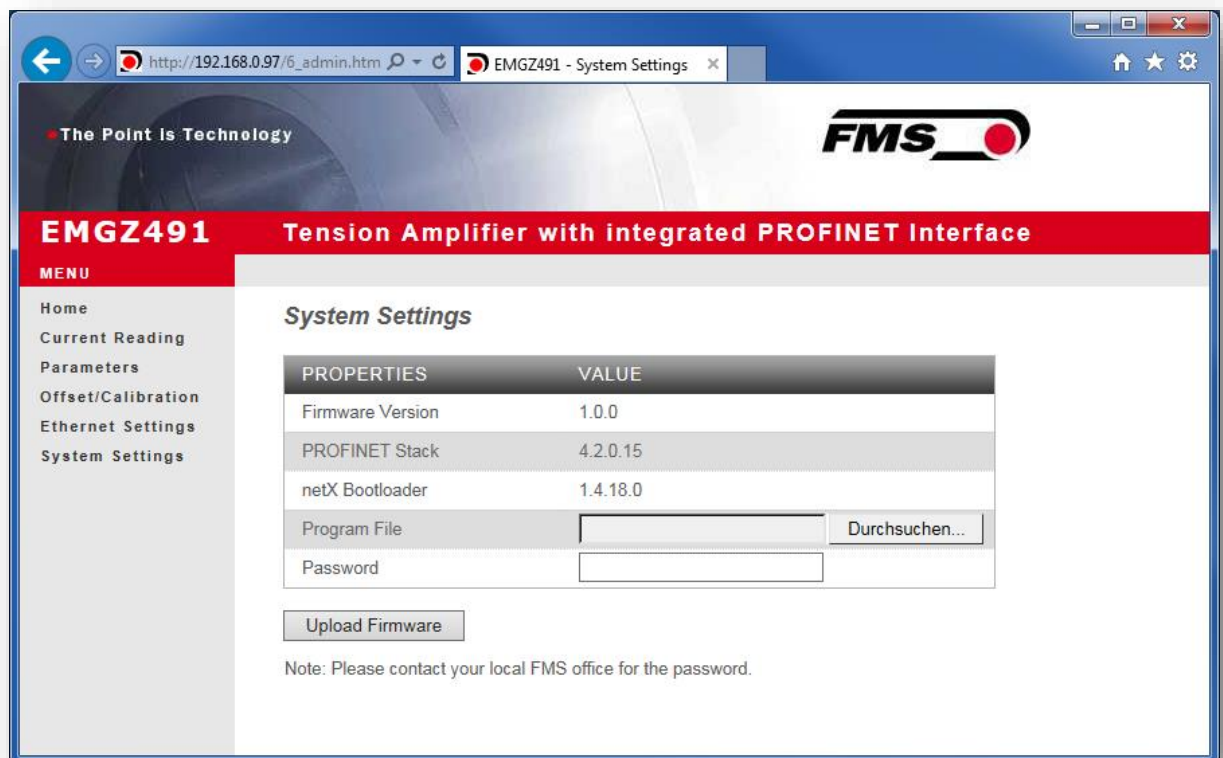
Figure 13: System-Einstellungen

The internal firmware version can be viewed on the System Settings page. New firmware can also be loaded here.

Current firmware files can be found in the download area on our website.

9.5 Ethernet Device Configuration Tool

To change the IP address on the amplifier, use the free "Ethernet Device Configuration" program. It can be downloaded here free of charge.

https://www.fms-technology.com/en/downloadcenter/profinet

If you accidentally change the IP address during configuration in the PLC, you can use this software to find the device again in the network environment at any time.

The following steps were created with PROFINET device. The views for Ethernet/IP may differ.

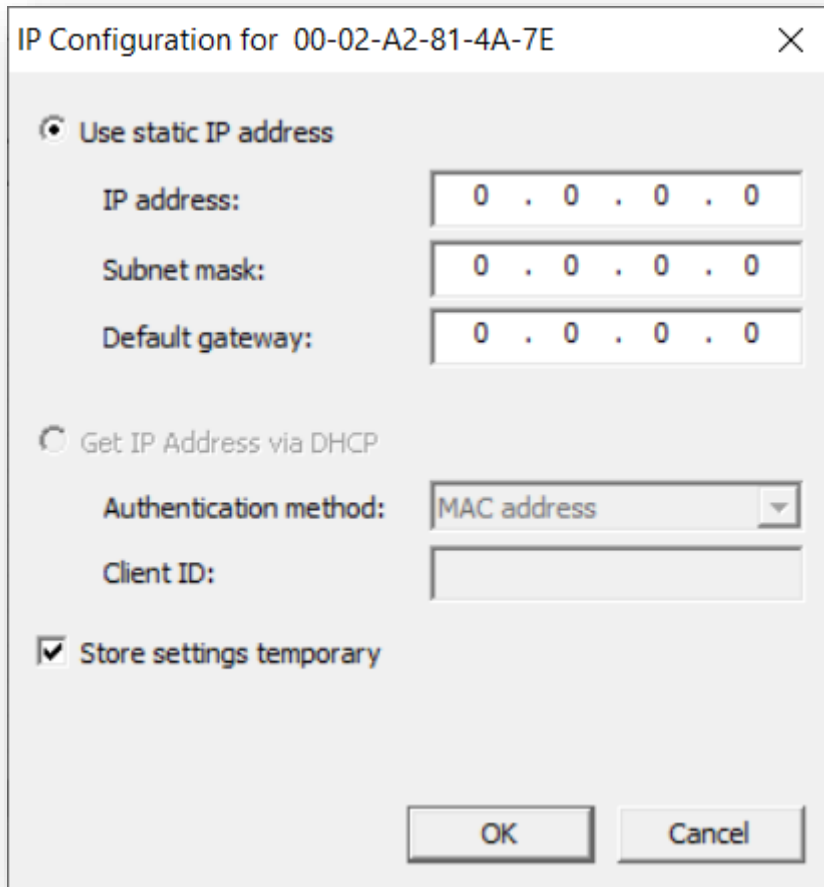1. start the program via the icon on the desktop

2. press «search devices»
3. a list of all devices is displayed
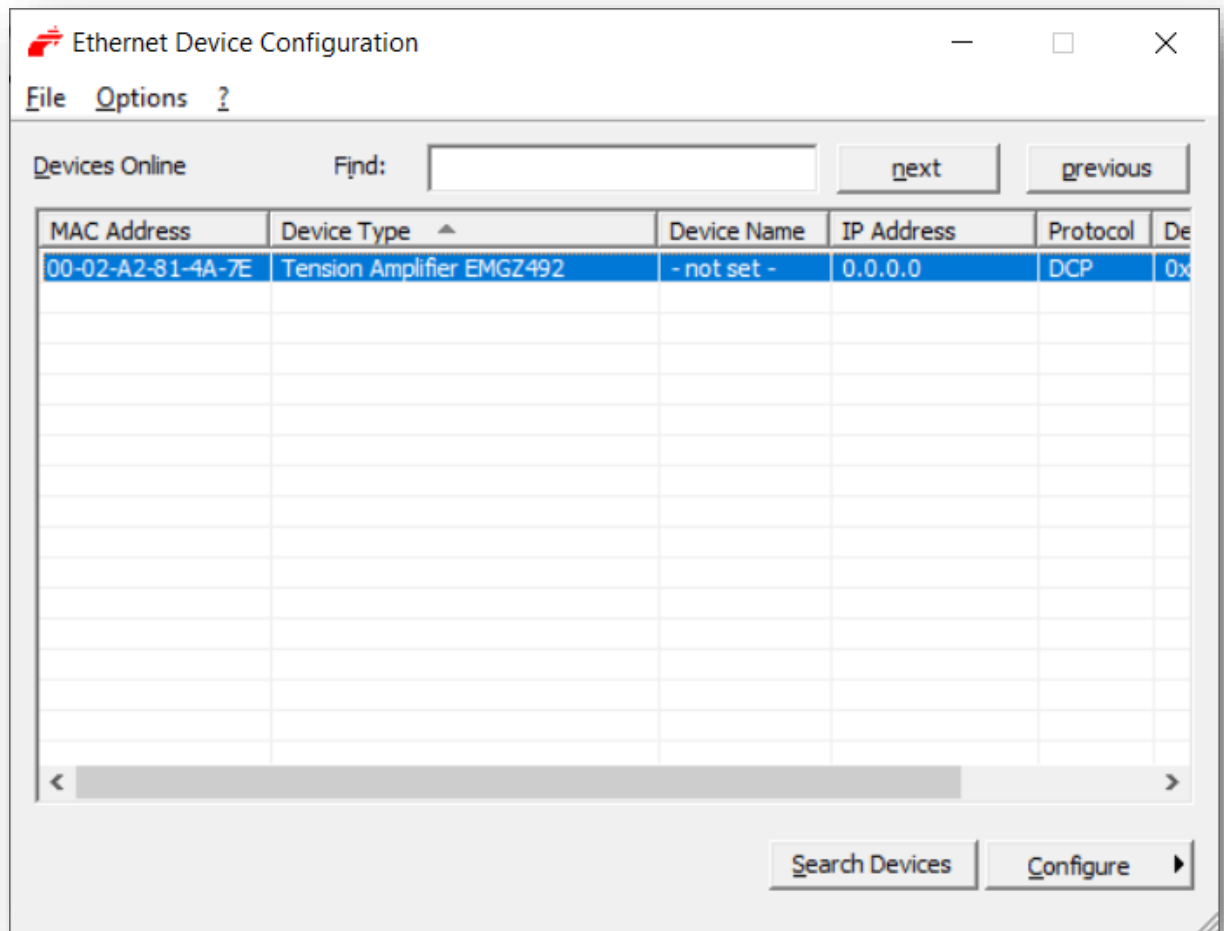
4. select the line with the corresponding device
5. press the "Configure" and "Set IP address..." button
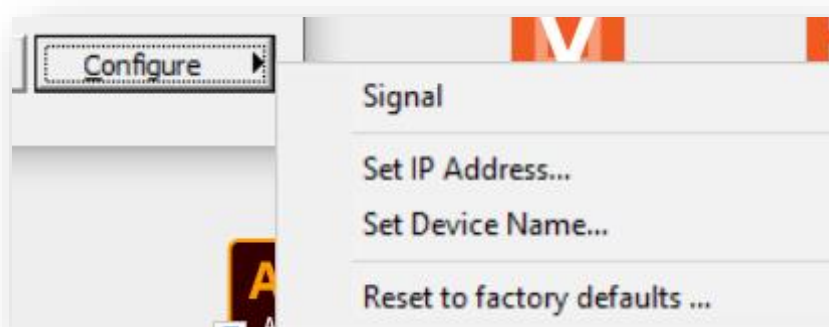
6. if you only want to save the changes temporarily - until the measuring amplifier is restarted - activate the "Store settings temporarily" button

7. enter the desired IP address and set the subnet mask to 255.255.255.0

IP Configuration for 00-02-A2-81-4A-7E

● Use static IP address

IP address: 192 . 168 . 000 . 097

Subnet mask: 255 . 255 . 255 . 0

Default gateway: 0 . 0 . 0 . 0

○ Get IP Address via DHCP

Authentication method: MAC address

Client ID:

☑ Store settings temporary

OK   Cancel
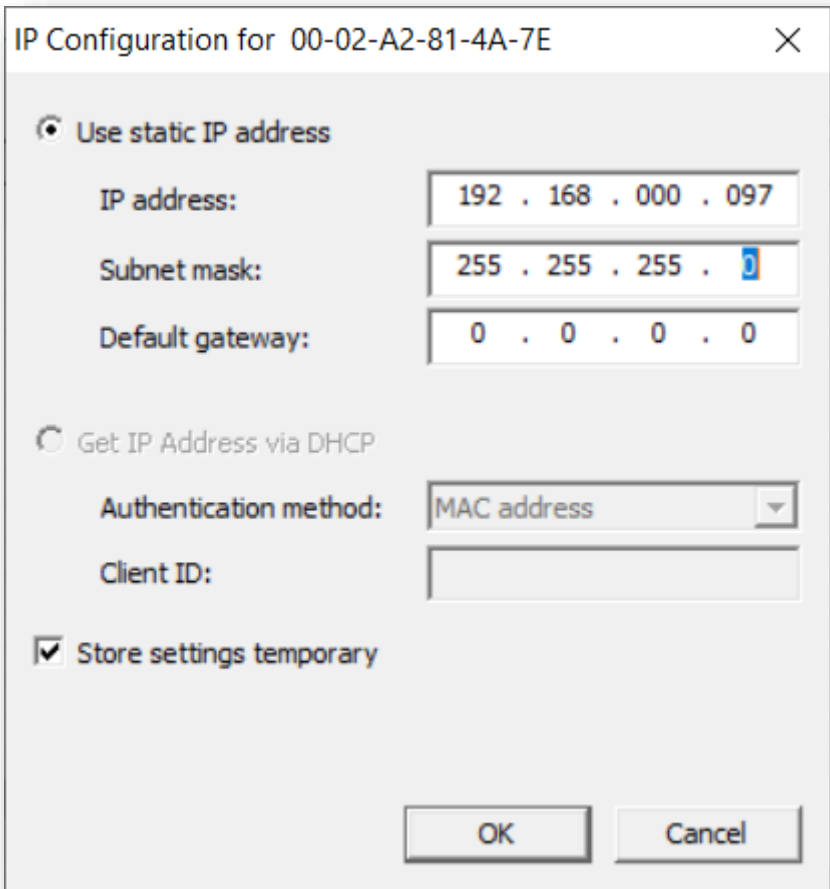
8. **Press OK to store the changes**
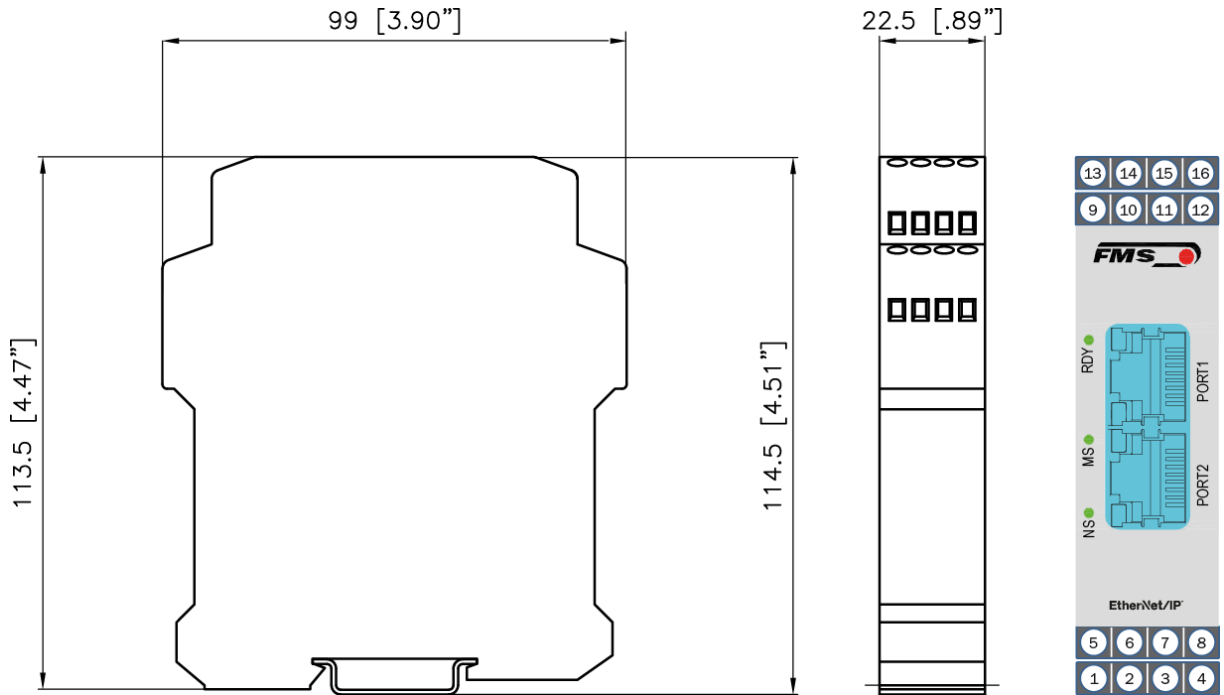
10 Dimensions

Figure 14: EMGZ492.R.EIP housing for DIN rail mounting
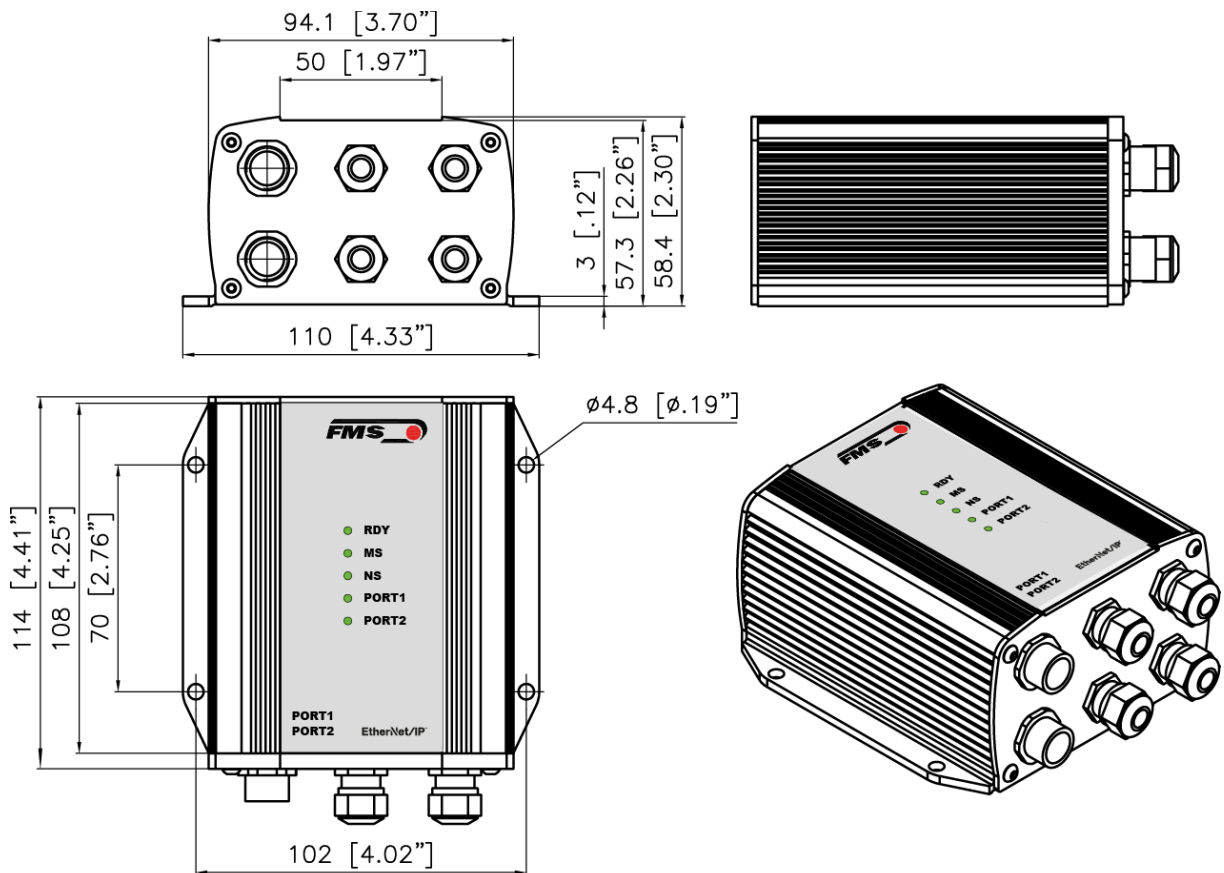
Figure 15: EMGZ492.W.EIP housing for wall mounting

11 Technical Data

Technische Daten	
Number of channels	2 channels for 2 or 4 force sensors
	2 force sensors for left / right signal processing of a single measuring roller
	4 force sensors for individual processing of 2 measuring rollers, with 2 force sensors each
Excitation voltage	5 VDC
Sensor feedback signal	± 9 mV (max. 12.5 mV)
	Option V05 ± 2.5 mV
A/D converter resolution	± 32'768 Digit (16 Bit)
D/A converter resolution	0 bis 4'096 (12 Bit)
Measuring inaccuracy	< 0.05 % FS
Connector for interface	EMGZ 492.R: 2 x RJ-45
	EMGZ 492.W: 2 x M 12 4-pole, D-coded
Configuration	via ETHERNET/IP or web server
Protection class	IP 20 (.R Version)
	IP 65 (.W Version)
Power supply	24 VDC (18 to 36 VDC)
Power consumption	5 W
Temperature range	–10 to +50 °C (14 to 122 °F)
Weight	370 g / 0.82 lbs (.R Version);
	470 g / 1.04 lbs (.W Version)

EtherNet/IP characteristics	
Cycle time	≥ 1 ms
IO Connection Types (implicit)	Exclusive Owner; Listen Only; Input only
Number of Message Connections	Explicit message connections (10); Implizit message connections (5)
IO Connection Trigger Types	Cyclic
Baud Rate	10 or 100 Mbit/s
Cyclic process data	For channels A and B individually: Actual value in digits (ADC); actual value in (N); actual value in (lbf); Actual value in configured unit; status; Actual value sum (A + B); actual value difference (A - B); mean value (A + B)/2
Acyclic Services	Get_Attribute_Single; Set_Attribute_Single; according to CIP spezification Volume 1 and Volume 2; ...
Ring Topology	DLR (Device Level Ring)
Predefined Standard Objects	Identity Object; Message Router Object; Assembly Object; Connection Manager; DLR Object; QoS Object; TCP/IP Interface Object; Ethernet Link Object
Features	DLR (Device Level Ring), beacon based ring node; ACD (Address Conflict Detection); DHCP, BOOTP; Integrated Switch
Web interface	Configuration, measuring data queries via http (alternative configuration via EtherNet/IP)
Certification	according CT15