



Operating Manual CMGZ431

Digital microprocessor controlled tension control unit
for brakes on unwinding applications

Version 2.22 05/04 sd

This operation manual is also available in german and french.
Please contact your local representative.

Diese Bedienungsanleitung ist auch in deutsch und französisch erhältlich.
Bitte kontaktieren Sie die Vertretung im zuständigen Land.

Ce mode d'emploi est également disponible en français et en allemand.
Veuillez contacter la représentation locale.

1 Safety Instructions

1.1 Description conditions

a) High danger of health injury or loss of life

Danger

This symbol refers to high risk for persons to get health injury or loss life. It has to be followed strictly.

b) Risk of damage of machines

Caution

This symbol refers to informations, that, if ignored, could cause heavy mechanical damage.
This warning has to be followed absolutely.

c) Notice for proper function

Notice

This symbol refers to an important information about proper use. If not followed, malfunction can be the result.

1.2 List of safety instructions

Proper function of the Tension Controller is only guaranteed with the recommended application of the components. In case of other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.

Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be followed strictly.

The tension controller CMGZ431 can drive brakes with high kinetic energy. Depending on the kind of possible malfunctions, full braking („immediate stop“) or complete release (turn off power supply) may cause heavy damage of man and/or machine. Therefore, the person responsible for system design has to establish a security concept that is providing appropriate safety procedures for the possible malfunctions.

There is no „Emergency Stop“ function integrated to the FMS Tension Controller. If the digital input „Immediate Stop“ is activated (terminal b4 resp. 24), only the controller will be disabled (brake is released). Emergency Stop has to be ensured by the project responsible by installing general Emergency Stop circuits, etc.

Bad earth connection may cause electric shock to persons, malfunction of the total system or damage of the electronic unit! It is vital to ensure that proper earth connection is done.

The processor board is mounted directly behind the operation panel. Improper handling may damage the fragile electronic equipment! Don't use rough tools as screwdrivers or pliers! Don't touch processor board! Touch earthed metal part to discharge static electricity before removing operation panel!

Some contacts on the power supply are under 110V resp. 230V tension! Mortal danger! Disconnect power supply before open the housing!

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2 Definitions

Offset: Correction value for compensation of the zero point difference. Thanks to the offset, it is ensured that a force of 0N will generate a signal of 0V exactly.

Gain: Amplification factor for the measuring signal. Use of proper value will set the measuring range of the sensor exactly corresponding to the signal output range (0...10V).

Strain gauge: Electronic component that will change its resistance while its length has changed. Strain gauges are used in the FMS force sensors for acquisition of the feedback value.

Pilot control: If pilot control is activated, a reel diameter signal (for ex. from distance sensor, PLC o.e.) is taken into the calculation of the brake torque and the brake will be „pilot controlled“ with the calculated value. Then, the PI controller has only to control the variation of the material tension. Due to that, the stability of controlling will be improved.

3 System components

The FMS brake controller consists of the following components (refer also to fig. 1):

Force sensors

- For mechanical/electrical conversion of the tension force
- Force measuring bearing
- *Force measuring roller*
- *Force measuring journal*
- *Force measuring bearing block*

Electronic unit CMGZ431

- For supplying of the force sensors and amplifying of the mV signal
- With integrated digital PI-controller to drive the brake
- With operation panel for parametrization
- Interface RS232
- *Interface CAN-Bus*
- For mounting into insert card support block EMGZ555959 (by mounting into switch cabinet)
- *Mounted in separate housing (CMGZ431.E)*
- *Integrated brake amplifier CMGZ010 (by using separate housing)*
- *Integrated power supply (by using separate housing)*
- Supports connection of an external feedback display

External power amplifier to drive the brake

- many different products are suitable

Brake

- Electrical brake
- *Pneumatic brake (by using electric/pneumatic converter)*
- many different products are suitable

(Italic components as variant or option)

4 System description

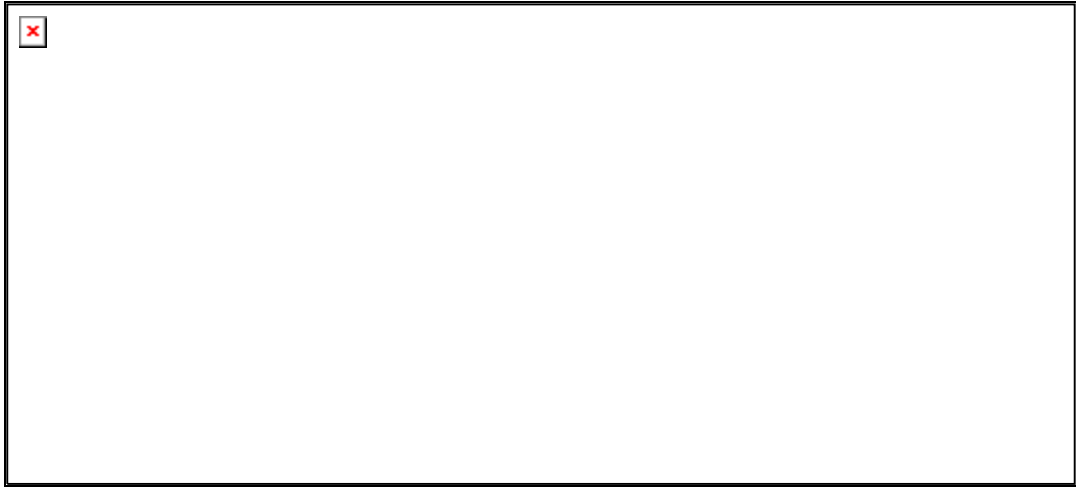


fig. 1: Basic structure of a brake control system on an unwinding application C431020e

4.1 Functional description

The force sensors measure the tension force in the material and transmit the measuring value as a mV signal to the electronic unit CMGZ431. The electronic unit amplifies the mV signal and calculates the error to the reference value. If the material tension is too low, the brake will be activated more; if the material tension is too high, the brake will be activated less.

4.2 Force sensors

The force sensors are based on the flexion beam principle. The flexion is measured by strain gauges and transmitted to the electronic unit as mV signal. Due to the wheatstone wiring of the strain gauges, the measured value is according also to the power supply. So, the force sensors are supplied from the CMGZ431 by a very accurate power supply.

4.3 Electronic unit CMGZ431

Common

The electronic unit contains a microprocessor to handle all calculations and communications, the highly accurate sensor power supply and the signal amplifier for the measuring value. As operation interface it provides 4 keys, 4 LED's and a 2x16 characters display in the front of the electronic unit. All inputs are saved in an EEPROM. The electronic unit has no jumpers or trimmers to keep most accurate long-time and temperature stability.

There can be connected one or two force sensors to the electronic unit.

Strain gauge amplifier

The strain gauge amplifier provides the highly accurate 4V power supply. A highly accurate, fixed difference amplifier rises the mV signal up to 10V. This signal will be fed to the A/D converter. The microprocessor then does all application-specific calculations with the digitized measuring value (such as offset, gain, low-pass filter).

Controller

The control unit compares the reference value with the measured feedback value and transmits the error to the PI controller. The PI controller calculates the output signal according to the difference. The output signal is in a range of 0...10V.

Interface

As standard, the electronic unit supports an RS232 interface. As an option, there is an additional board with CAN-Bus interface available.

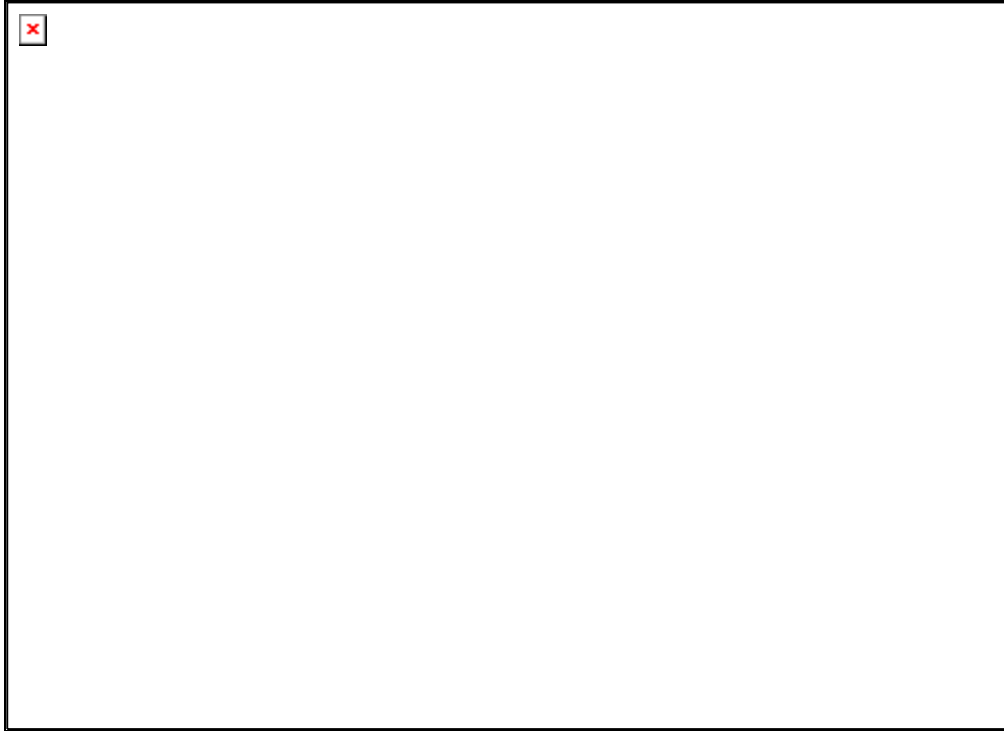


fig. 2: Block diagram of the electronic unit CMGZ431

C431021e

4.4 Power amplifier to drive the brake

The electronic unit can be ordered with integrated brake amplifier CMGZ010 (0...3.5A). If the electronic unit was ordered without brake amplifier, a separate power amplifier has to be used. The power amplifier drives the brake corresponding to the output signal of the electronic unit. Any power amplifier for brakes can be used.

4.5 Brake

Any electrical brake can be used or, by using an electric/pneumatic converter, any pneumatic brake.

5 Controller theory

5.1 Tension control loops

When manufacturing and processing foils, wires, ropes, paper and fabric sheets, it is important that the product is under constant tension when guided across the rollers. Tension may change when humidity, temperature, winding or unwinding diameters vary or when the sheets are being printed, coated, glued or pressed. Tension is measured constantly and maintained at the correct value with the FMS force measuring and control system.

5.2 PI controller

The function of any control loop is to maintain the feedback value exactly at the level of the reference and to minimize the influence of any interference on the control loop. In addition, the control loop must be stable under all operating conditions.

These aims can only be achieved if the dynamic behaviour of the control loop is adapted to the machine.

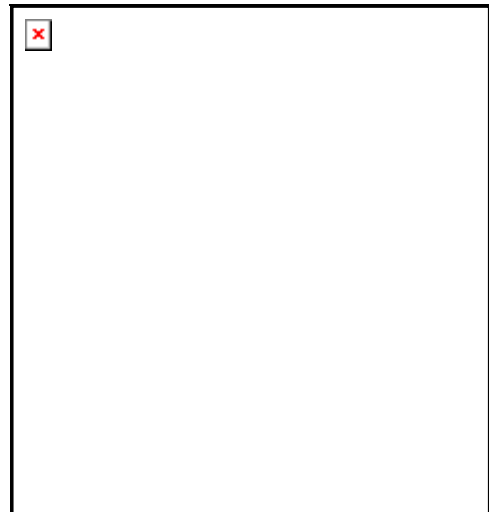
The PI controller used in the CMGZ431 calculates an output signal that corresponds to the addition of „P“ and „I“ component.

„P“ component

A controller with only a proportional component emits an output signal that is proportional to the error. If the error is zero, the output signal also will be zero. A small error only can create a small output signal which is not high enough to compensate the complete error. That means, that a controller with only a proportional component will have a steady error. The characteristic value of a „P“ controller is the proportional factor X_p .

„I“ component

A controller with an integral component adds the error to the output signal continuously and emits this output signal. Due to that, the output signal will be enlarged or reduced until the error is zero. This output signal is maintained until a new error occurs. The integral component therefore allows zero error in steady state. The characteristic value of an „I“ controller is the settling time T_n .



5.3 Advantages of digital controllers

Digital controllers have exactly reproducible behaviour, because every parameter is known as an exact number. Due to that, they have high long-time and temperature stability. This feature also allows to exchange an electronic unit without readjusting.

Digital units support an interface which allows easy integrating into complex systems. This simplifies starting operation, maintenance and service.

6 Quick installation guide

- Check all your requirements such as:
 - Characteristics of the brake (signal level, max. current, etc.)?
 - Controller output configuration (signal level)?
 - Feedback output configuration (signal level)?
 - Gain switching required?
 - Diameter input required?
 - Linking by interface etc.?
 - Emergency stop procedures?

- Draw your final wiring diagram according to the wiring diagrams (ref. to „8.4 Wiring diagram variant for insert card support block“ / „8.5 Wiring diagram variant with separate housing“ / „8.6 Wiring diagram variant with integrated brake amplifier). Don't forget digital input „Controller enabled“

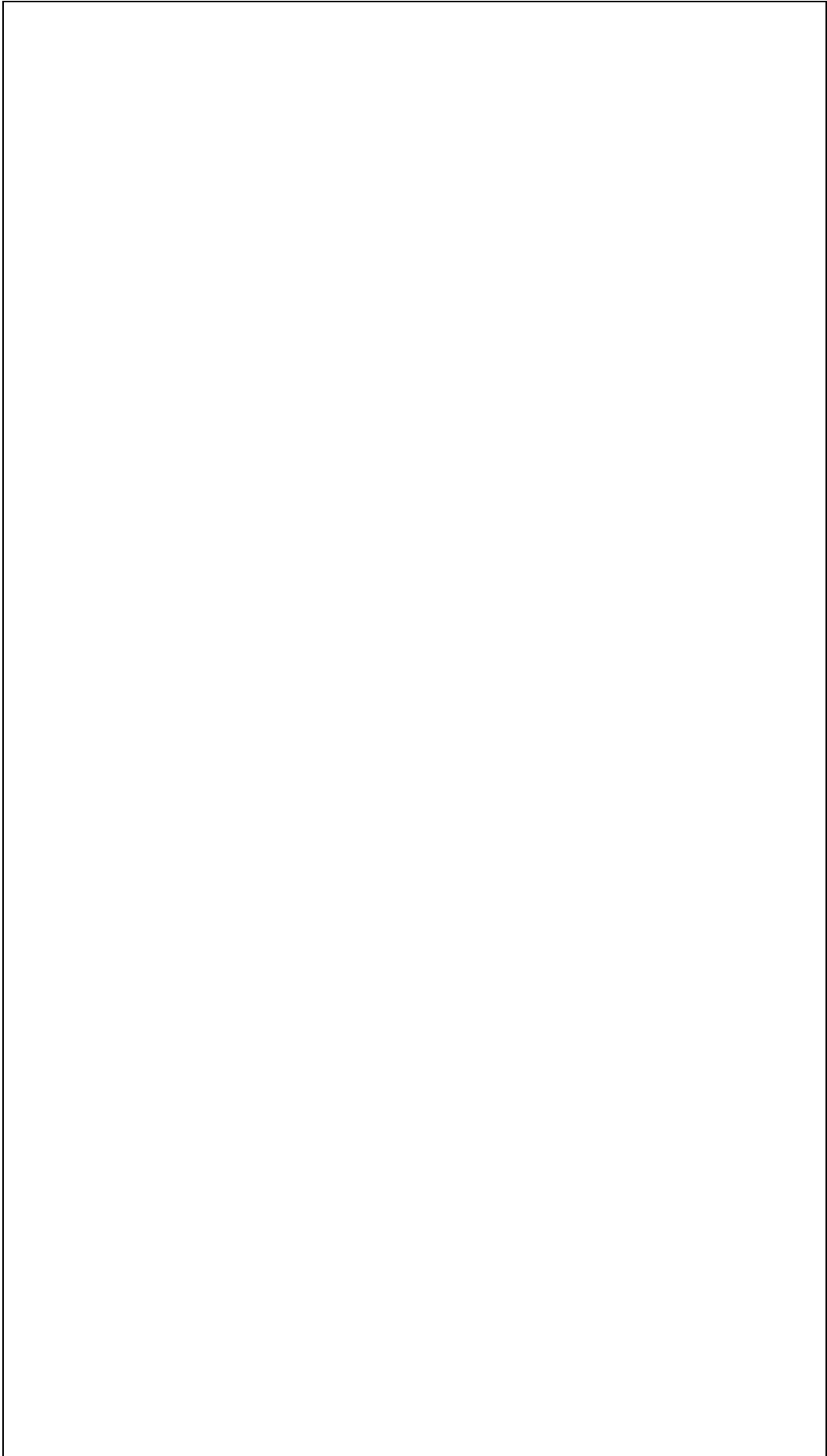
- Install and wire all components (ref. to „8. Installation and wiring“)

- Control unit: Parametrize and calibrate measuring amplifier (ref. to „9.4 Calibrating the measuring amplifier“)

- Proceed a test run with low speed and low material tension:
 - Input reference value (ref. to „9.5 Inputting the reference value“)
 - Determine PI control parameters and set machine into operation (ref. to „9.7 Definition of control parameters“)

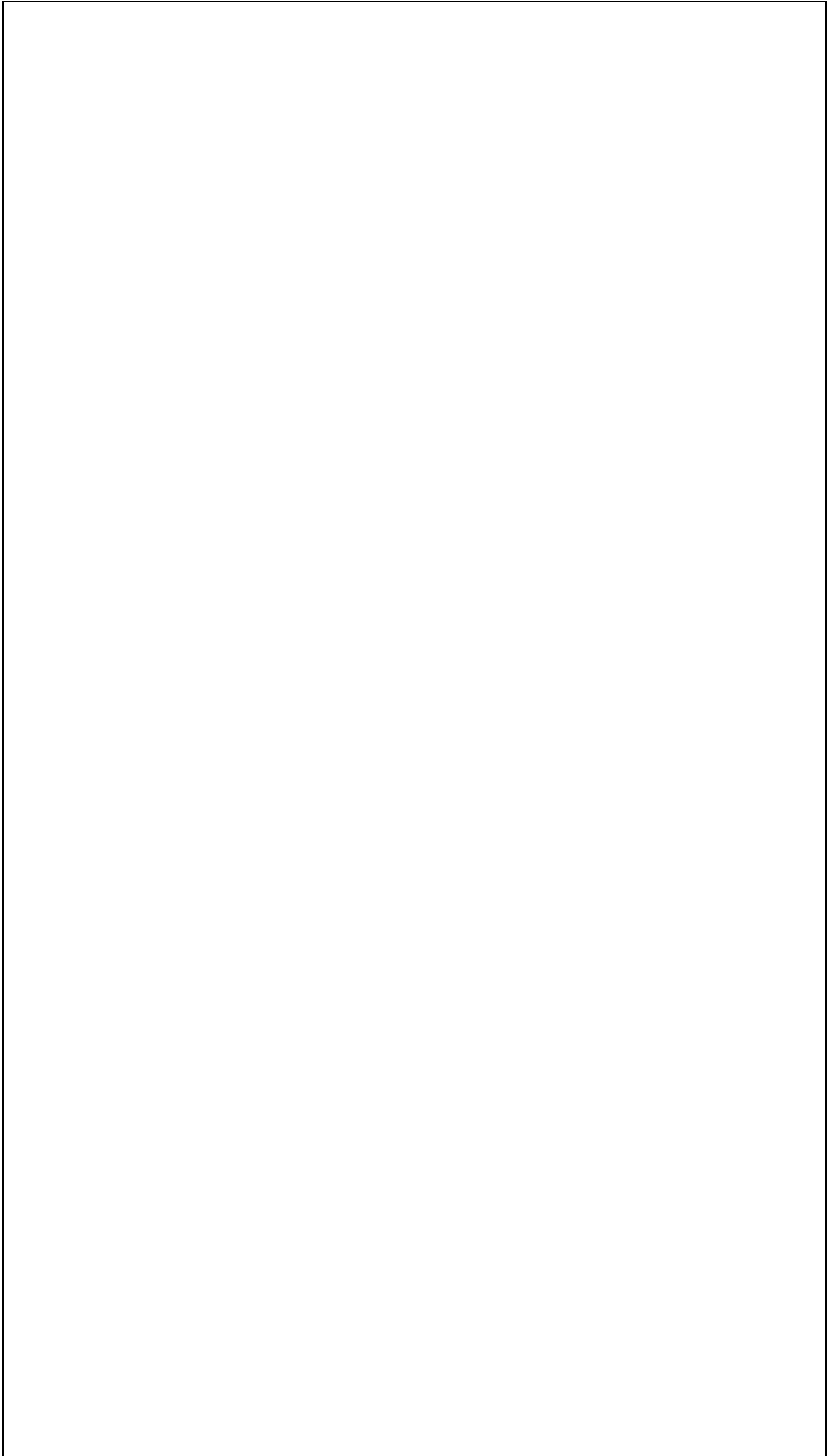
- If required, setup the pilot control (ref. to „9.10 Setup of pilot control“)

- If required, do additional settings (ref. to „9.11 Additional settings“)



Notice

It may be that the PI control parameters determined during the test run are no longer suitable for stable operation after setup of pilot control or increasing of material tension. Therefore it is useful to adjust the control parameters until the machine runs stable at the required reference values.



Notice

Starting and stopping of the machine takes increased requirements to any control loop. For stable operating also in these phases, you have to pay special attention to the starting resp. stopping behaviour of the whole machine. It is not enough to get stable operating during normal operating conditions.

7 Dimensions

7.1 Dimensions: Variant for insert card support block (CMGZ431)

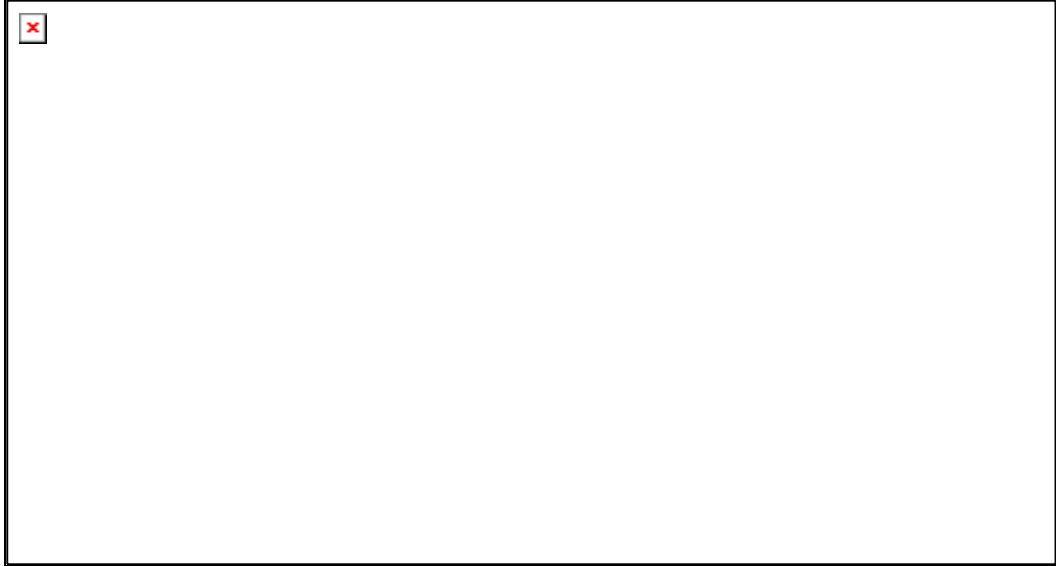


fig. 4: Dimensions of the variant using insert card support block (series CMGZ400).
The support block EMGZ555959 has to be ordered separately. C431006us

If the electronic unit should be mounted into a 19" rack, a multipoint plug is used instead of the support block.

7.2 Dimensions: Variant with separate housing (CMGZ431.E)

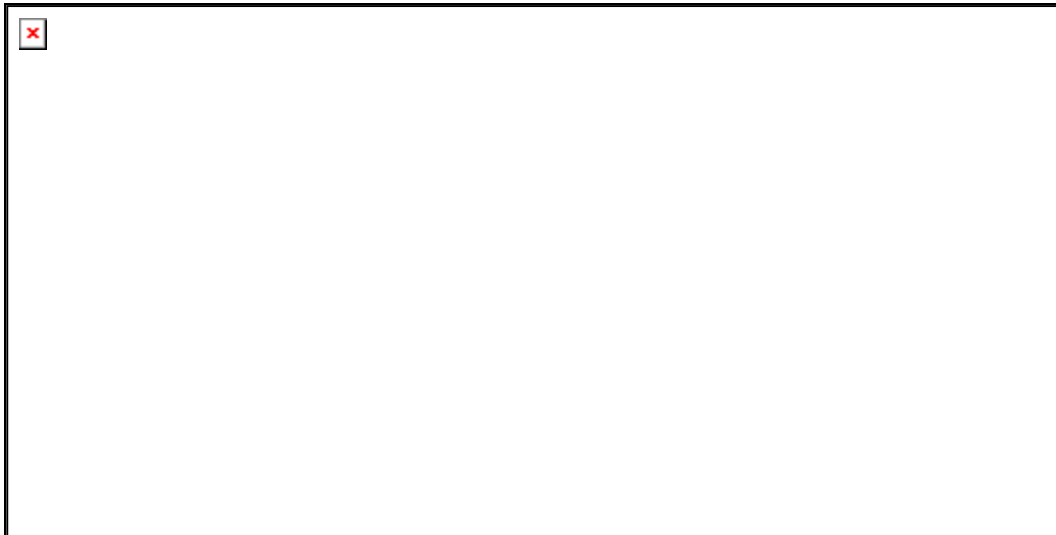
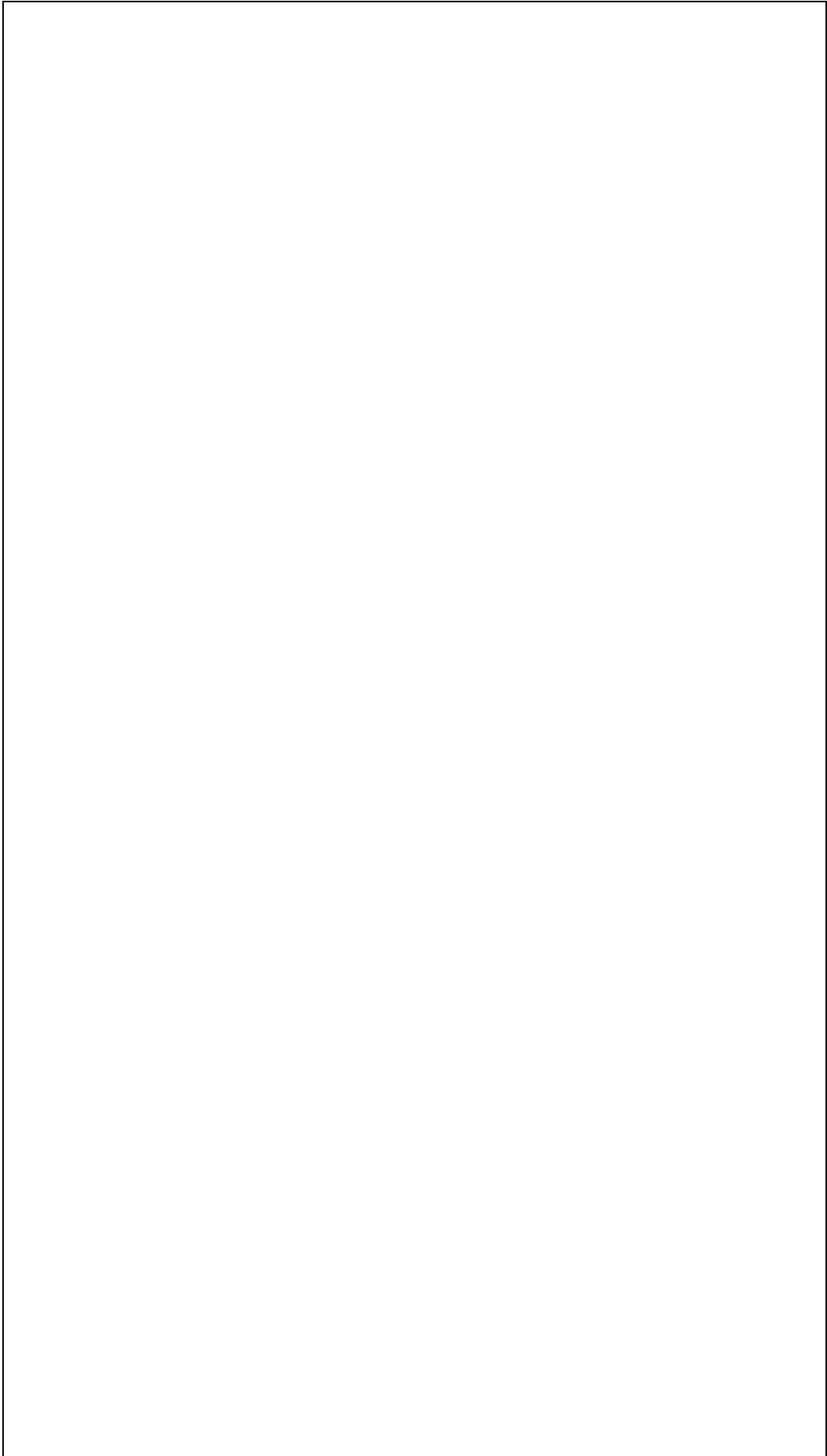


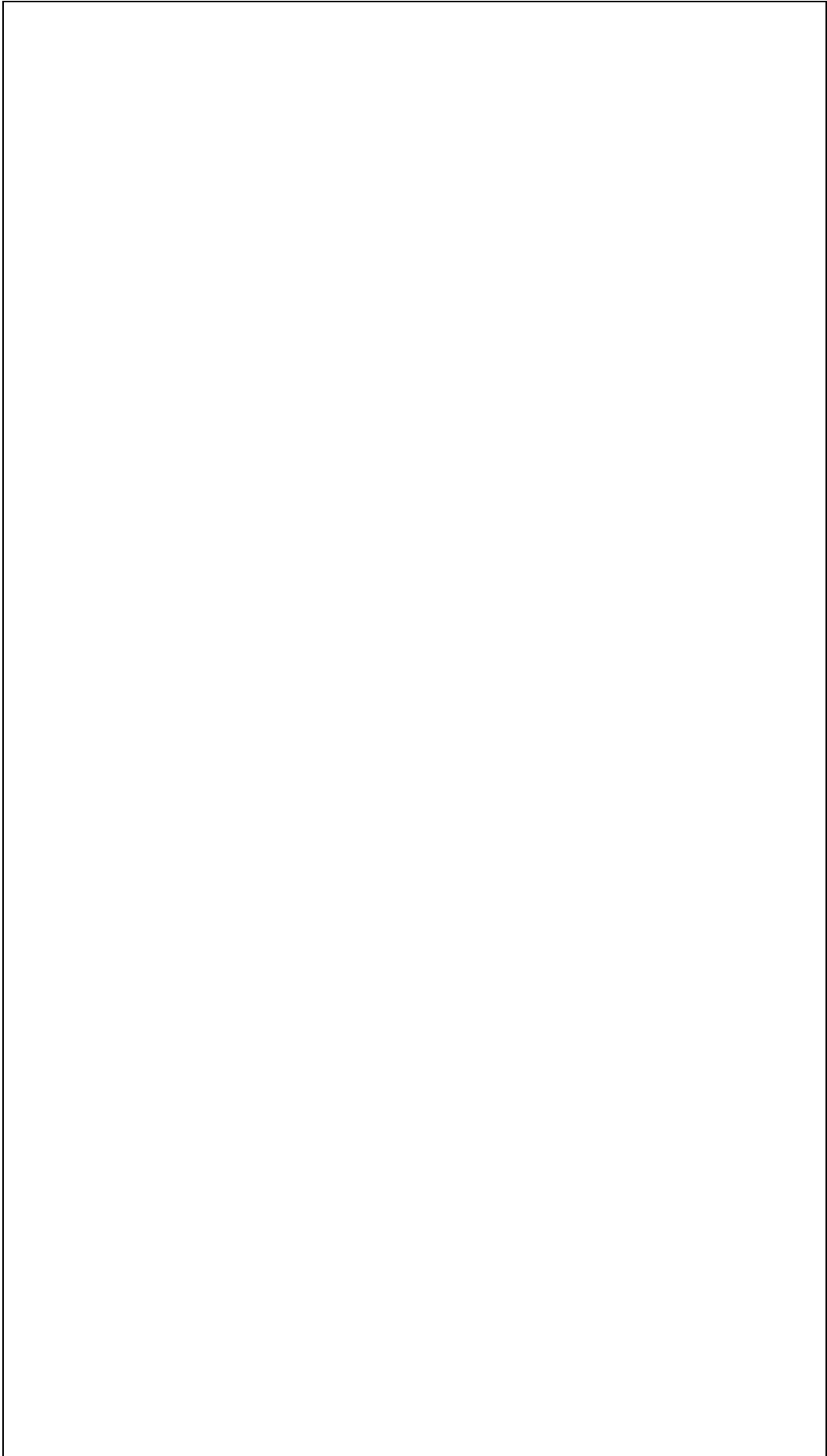
fig. 5: Dimensions of the variant using separate housing (Option, series CMGZ400.E)
C431003e

8 Installation and wiring



Caution

Proper function of the Tension Controller is only guaranteed with the recommended application of the components. In case of other arrangement, heavy malfunction can be the result. Therefore, the installation instructions on the following pages must be followed strictly.



Caution

Local installation regulations are to preserve safety of electric equipment. They are not taken into consideration by this operating manual. However, they have to be followed strictly.

Danger

The tension controller CMGZ431 can drive brakes with high kinetic energy. Depending on the kind of possible malfunctions, full braking („immediate stop“) or complete release (turn off power supply) may cause heavy damage of man and/or machine. Therefore, the person responsible for system design has to establish a security concept that is providing appropriate safety procedures for the possible malfunctions.

8.1 Mounting and wiring of the electronic unit

Variant for insert card support block (CMGZ431)

The insert card support block can be mounted in a control cabinet. Wiring to the terminals is done according to „8.4 Wiring diagram: Variant for insert card support block“ (fig. 6). The electronic card then will be inserted into the insert block. It will be locked by a stop hook (fig. 4).

Variant with separate housing (CMGZ431.E)

The housing can be mounted in a control cabinet or directly beside the machine. All connections are led through glands to the screw terminals and connected according to „8.5 Wiring diagram: Variant with separate housing“ respectively „8.6 Wiring diagram: Variant with integrated brake amplifier“ (fig. 7 or 9).

8.2 Mounting the force sensors

Mounting of the force sensors is done referring to the FMS Installation manual which is delivered together with the force sensors.

Wiring to the terminals of the electronic unit is done according to wiring diagram (fig. 6, 7 or 9).



Notice

Connecting the shield of the signal cable to the electronic unit *and* to the force sensor may cause ground circuits which may interfere the measuring signal massively.

Malfunction can be the result. The shield should be connected only to the electronic unit. On the „force sensor side“, the shield should stay open.

8.3 Mounting the brake and the brake power amplifier

CMGZ431 without integrated brake amplifier:

The brake and the brake amplifier will be mounted according to manufacturer's specification. Herein is no additional information written due to the wide variety of suitable types. Wiring is done according to the wiring diagram (fig. 6 or 7).



Danger

There is no „Emergency Stop“ function integrated to the FMS Tension Controller. If the digital input „Immediate Stop“ is activated (terminal b4 resp. 24), only the controller will be disabled (brake is released). Emergency Stop has to be ensured by the project responsible by installing general Emergency Stop circuits, etc.

CMGZ431 with integrated brake amplifier (option):

The brake amplifier CMGZ010 is ex works fully integrated into the controller unit. The brake will be mounted according to manufacturer's specification. Herein is no additional information written due to the wide variety of suitable types. Wiring is done according to the wiring diagram (fig. 9).

The emergency stop function is written under „8.6 Wiring diagram: Variant with integrated brake amplifier“.

8.4 Wiring diagram: Variant for insert card support block (CMGZ431)



fig. 6: Wiring diagram: Variant for insert card support block

C431022e



Caution

Bad earth connection may cause electric shock to persons, malfunction of the total system or damage of the electronic unit! It is vital to ensure that proper earth connection is done.

8.5 Wiring diagram: Variant with separate housing (CMGZ431.E)

The housing of the electronic unit will be opened by unscrewing the 4 philips screws on the operation panel and swinging out the operation panel to the right side.



Caution

The processor board is mounted directly behind the operation panel. Improper handling may damage the fragile electronic equipment! Don't use rough tools as screwdrivers or pliers! Don't touch processor board! Touch earthed metal part to discharge static electricity before removing operation panel!



Danger

Some contacts on the power supply are under 110V resp. 230V tension! Mortal danger! Disconnect power supply before open the housing!



fig. 7: Wiring diagram: Variant with separate housing

C431024e

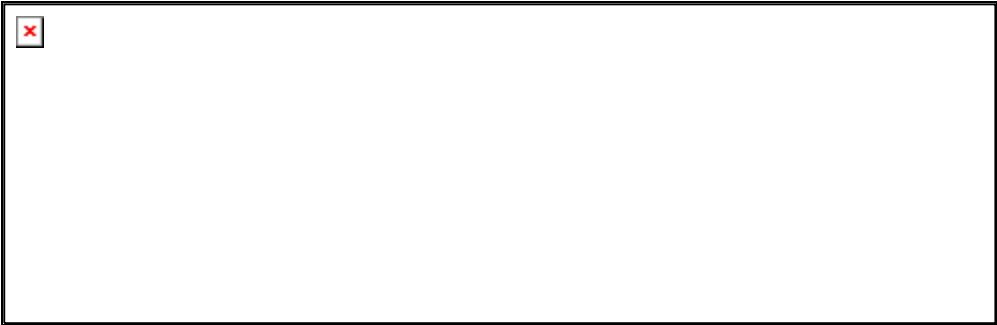


fig. 8: Screw terminal arrangement on Terminal board and brake amplifier

C431018e

8.6 Wiring diagram: Variant with integrated brake amplifier

If the FMS Tension Controller was ordered with separate housing (CMGZ431.E) and integrated brake amplifier CMGZ010, the brake amplifier is already full wired. Connection of the brake is done to terminals B+ / B- (fig. 8 and 9).



fig. 8: Wiring of the brake using the integrated brake amplifier

C431025e

Emergency stop function

Using the integrated brake amplifier CMGZ010, terminals 19 and 21 resp. 20 and 22 are bridged as factory default. Otherwise the brake cannot be set into operation. An emergency switch is inserted into the bridge between terminals 19 and 21 referring to fig. 9. Full braking actually is activated by disconnecting the 24V tension of terminal 21 (refer to fig. 9). Then, the output of the brake amplifier has maximum tension (24V / 3.5A).

8.7 Mounting the distance sensor

If the control loop is operated with pilot control (processing of reel diameter), the actual reel diameter has to be transmitted to the electronic unit. For this purpose the actual reel diameter is detected with a distance sensor and the distance signal is fed to the analog diameter input (terminals d6 / d8 resp. 7 / 8).

It has to be ensured that the measuring axis of the distance sensor is straight radial to the reel (refer to fig. 1 and 10).

Optical distance sensor CMGZ581934

FMS recommends to use the optical distance sensor CMGZ581934 because its accuracy and signal output is adapted to the FMS measuring amplifiers and Tension Controllers.

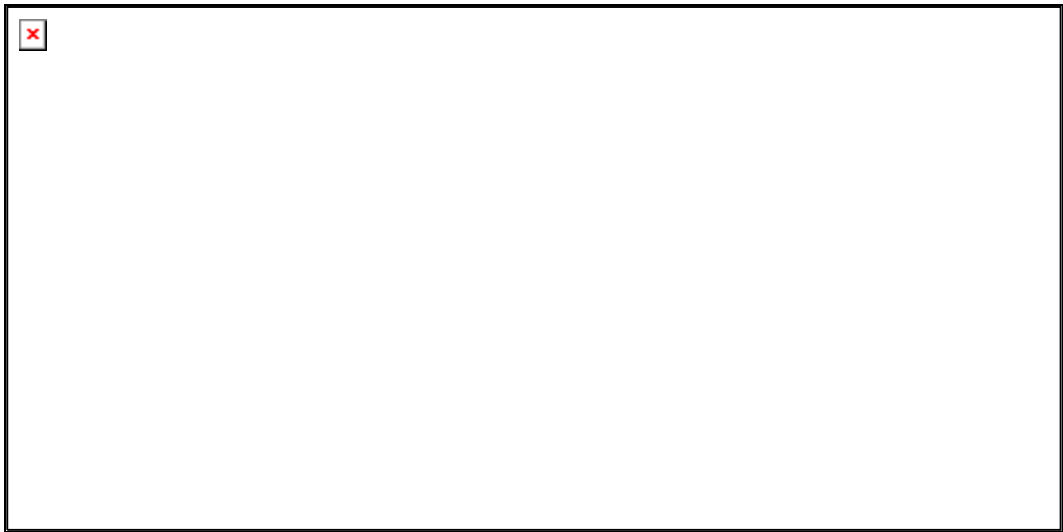


fig. 10: Mounting of the distance sensor CMGZ581924

E411012e

The distance sensor operates with the 3-beam-correction principle. It is considerable insensible to secondary light and changes of the surface colour of the detected object. But while mounting it must be ensured that the sensor is mounted in „horizontal“ position (fig. 10).

The output signal is proportional to the reel radius: Small radius = small signal; large radius = large signal.

Technical data distance sensor CMGZ581934

Type	HT77MGV80, Infrared light 880nm
Measuring range	1000mm [40“]
Ø Measuring distance	800mm [32“]
Min. measuring distance	300mm [12“]
Max. measuring distance	1300mm [51“]
Resolution	0.2...30mm [.008...1.2“] depending on width of spot
Reaction time	10ms
Linearity	2%
Temperature drift	0.5mm / K [.01“ / °F]
Supply voltage	18...30VDC / 70mA
Temperature range	-10...+60°C [14...140°F]
Protection class	IP67

9 Operation

9.1 View of the operating panel

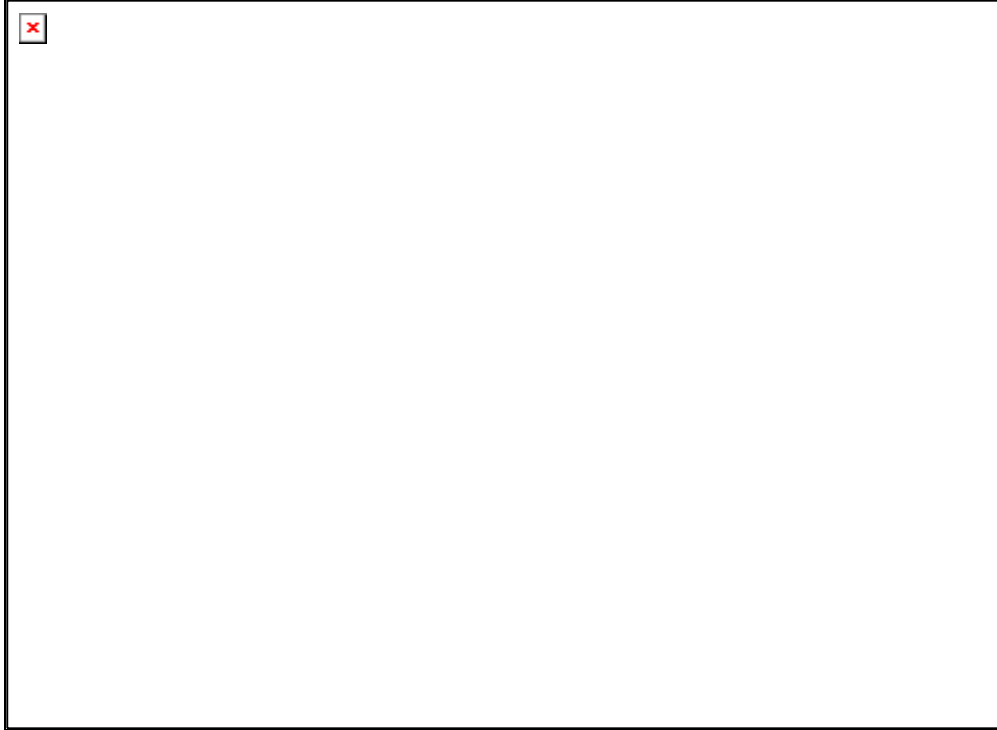


fig. 11: Operating panel: Variant for insert card support block (CMGZ431) C431014e



fig. 12: Operating panel: Variant with separate housing (CMGZ431.E) C431002e

9.2 Schematic diagram of main operating menu



fig. 13

C431010e

9.3 Checking the parameters

Before the initial setup is done, the following parameters have to be set resp. you have to check if they correspond with the effective machine conditions (ref. to „11. Parametrization“):

Measuring amplifier parameters

- *Nominal force*
- *Unit of force*
- *Sensitivity*
- *1 or 2 sensors*

PI controller parameters

- *Lowpass output* (reset to default)
- *Pilot control* (for the time being set to *None*)
- *Offset output* (reset to 0%)
- *Current limit* (set according to the brake used)
- *Output* (set according to the brake used)
- *Ramp diameter* (reset to default)
- *Ramp reference* (reset to default)
- *Reference* (depending on machine configuration)
- *Scale ref. input* (if reference potentiometer is used)
- *Torque in use* (for the time being set to *No*)
- *Holding torque* (for the time being set to 0.00)

9.4 Calibrating the measuring amplifier

Simulating Method (recommended)

The following instructions are referring to a setup and calibration on-site. The material tension will be simulated by a weight (fig. 14).

- Connect the first force sensor
- Check, if a positive value is displayed when loading the sensor in measuring direction. If not, exchange terminals z6 / z8 (resp. 2 / 3)
- If used, connect the second force sensor
- Check, if a positive value is displayed when loading the sensor in measuring direction. If not, exchange terminals z6 / z8 (resp. 2 / 3)
- Insert material or a rope loosely to the machine
- Adjust offset by activating the parameter function *find offset* and pressing the ↵ key for 3 seconds. The electronic unit calculates automatically the new offset value.
- Load material or rope with a defined weight (fig. 14)
- Activate parameter function *calibrate feedback*. Input the force referring to the applied weight (refer to „11. Parametrization“). The electronic unit calculates automatically the new gain value.
- Quit calibration with *Home* key.



fig. 14: Calibrating the measuring amplifier C431011e

Mathematical method

If the material tension cannot be simulated, calibration has to be done by calculation. This way of calibrating is less accurate because the exact angles are often unknown and the effective mounting conditions, which usually deviate from the ideal, are not taken into account.

- Offset adjustment has to be done as described under „Simulating method“.
- The Gain value will be calculated by the following formula and then inputted in the parameter *gain feedback* (refer to „11. Parametrization“).

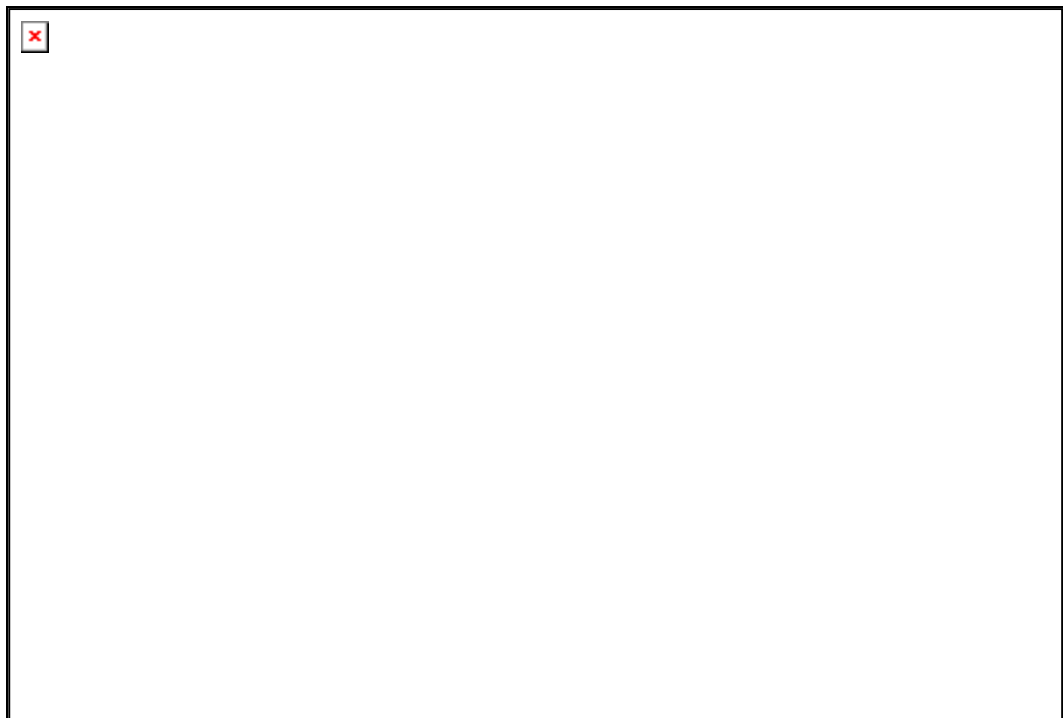
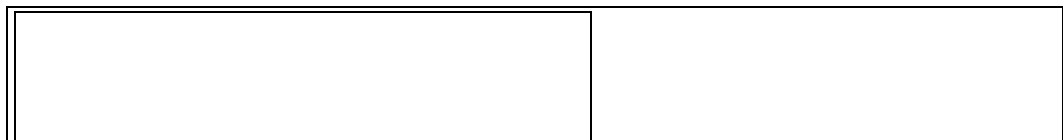


fig. 15: Force vectors in the FMS force measuring bearing

C431012e



Definition of symbols:

α	angle between vertical and measuring web axis	F_B	material tension
β	angle between vertical and F_M	F_G	roller weight
γ	wrap angle of material	F_M	measuring force resulting from F_B
γ_1	entry angle of material	F_{Meff}	effective measuring force
γ_2	exit angle of material	n	number of force sensors
δ	Angle between measuring web axis and F_M		

9.5 Inputting the reference value

The material tension reference value can be inputted by the operating panel resp. interface, or by the analog input:

reference input by operating panel resp. interface

- Set parameter *reference internal / external* to *internal*
- Press „REFERENCE“ key in the main operating menu for 3 seconds (refer to fig. 13). Input new reference value using the keyboard. Quit change mode and save the new reference in the EEPROM by using the ↵ key. (If change mode is quit by using „HOME“ key, the new reference is taken only into RAM and will be lost while power-off or changing a parameter.)
- Alternatively: Send reference value by interface to the electronic unit (refer to „10. Serial interface“).

reference input by analog input

- Set parameter *reference internal / external* to *external*
- Apply 0...10V source to the analog input (terminals z2 / d2 resp. 10 / 11)
- Set parameter *scale ref. input* to the needed reference value range (refer to „11. Parametrization“)

9.6 Inputting the holding torque

The unwinding reel can be held by the brake while the machine is stopped. For that purpose the holding torque has to be set in parameter *Holding torque* (ref. to „11. Parametrisation“). This allows to avoid pivoting, for ex.

If parameter *Torque in use* is set to *No*, the holding torque is output only while the controller is enabled.

If parameter *Torque in use* is set to *Yes*, the holding torque is output also while the controller is disabled.

9.7 Definition of control parameters

Experimental determination of control parameters (recommended)

If the behaviour of the control loop is unknown, tuning is done by means of a systematic approach (fig. 16):

- Set parameter *Integral I* very high (100.00s)
- Set parameter *Proportional P* very small (for ex. 1.00)
- Enable controller
- If control loop is not oscillating: Increase *Proportional P*
- If control loop is oscillating: decrease *Proportional P*
- Repeat this procedure until the control loop is stable and nearly oscillating. The controller can remain enabled; the controller parameters may be changed during automatic operation.
- If the control loop is running stable with the „P“ component, the „I“ component can be decreased until the steady error disappears.
- If the „I“ component is too small, the control loop will become unstable again.
- If the control loop is running stable, the parameters *Proportional P* and *Integral I* should be noted for eventually re-setup.



fig. 16: Transient effect of the control system C431013e

Mathematic determination of control parameters

- If the behaviour of the control loop is known, the control parameters may be calculated by the known mathematical procedures and saved in the parameters *Proportional P0...P3* resp. *Integral I0...I3*. (There is only the parameter pair active which is chosen by the BCD inputs; refer to „9.8 Switching the control parameters“.)
- If the control loop is oscillating, the control parameters will be fine-tuned as described under „Experimental determination of control parameters“.

Notice

There can be saved 4 different P- and I- values (P0...P3; I0...I3). This allows easy and flexible adjustment of the controller to different materials. (There is only the parameter pair active which is chosen by the BCD inputs; refer to „9.8 Switching the control parameters“.) The instructions above is valid for all 4 pairs of parameters. But for better understanding, the instruction is written in common form.

Notice

Correct setting of the control loop can be difficult. To judge the adjustment of the control parameters, an oscilloscope may be helpful to record the behaviour of the feedback value. The oscilloscope shows if the control loop operates stable, and if there is no more static error.

Notice

The controller must be adjusted so that the feedback reaches the reference in the shortest possible way but without overshooting. If the feedback overshoots, this is seen on the display or with an oscilloscope.

9.8 Switching the control parameters

There can be saved 4 different P- and I- values (P0...P3; I0...I3). Due to that, it is possible to adjust the control loop flexibly to different material characteristics. However, switching to another pair of parameters is only possible if the controller is disabled. Switching is done by using the digital inputs „BCD cipher 0“ and „BCD cipher 1“ according to table below:

dig. input BCD cipher 1	dig. input BCD cipher 0	Binary code	BCD code	Parameter pair
open	open	0 0	0	P0 / I0
open	24VDC	0 1	1	P1 / I1
24VDC	open	1 0	2	P2 / I2
24VDC	24VDC	1 1	3	P3 / I3

9.9 Automatic operation

State „Controller disabled“

After power on, the controller is disabled. Its output value is 0 resp. refers to the parameter *Holding torque* (depending on parameter *Torque in use*).

Enable controller

The controller will be enabled by digital input „Controller enabled“ or by serial interface. The controller then starts from the „Holding torque“ and drives to the reference value resp. the pilot control value (depending on parameter *Pilot control*; refer to „11. Parametrization“). The digital output „Controller ok“ will be activated.

Change of control parameters while automatic operation

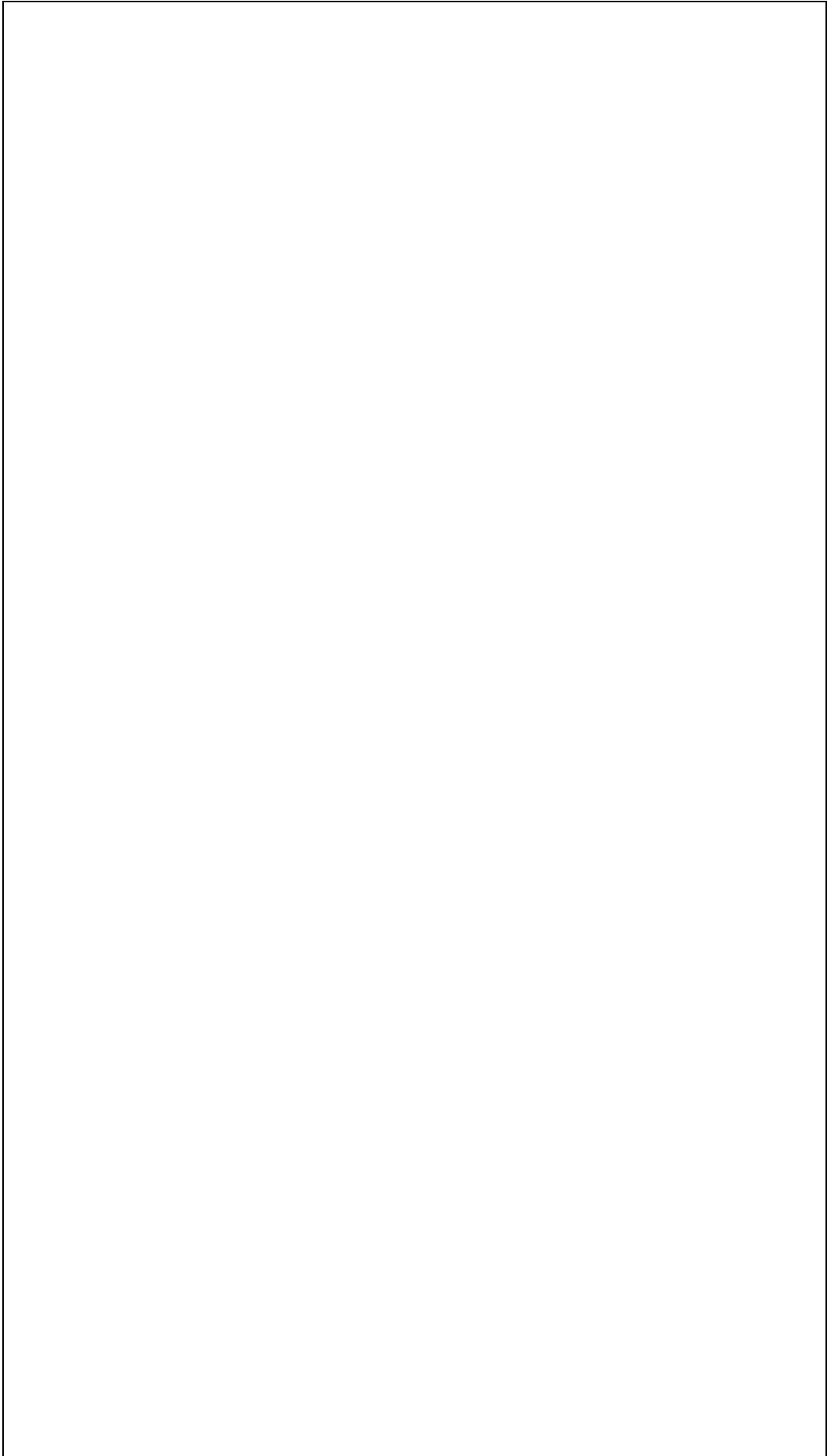
The control parameters $P0...P3 / I0...I3$ and *Influence of PI* can be changed while the controller being enabled. Setting is done as written in „11.3 Description of the parameters“. The new values are taken for the control loop when parameter mode is quit.

Change of reference value while automatic operation

The reference value can be changed while automatic operation as written in „9.5 Inputting the reference value“.

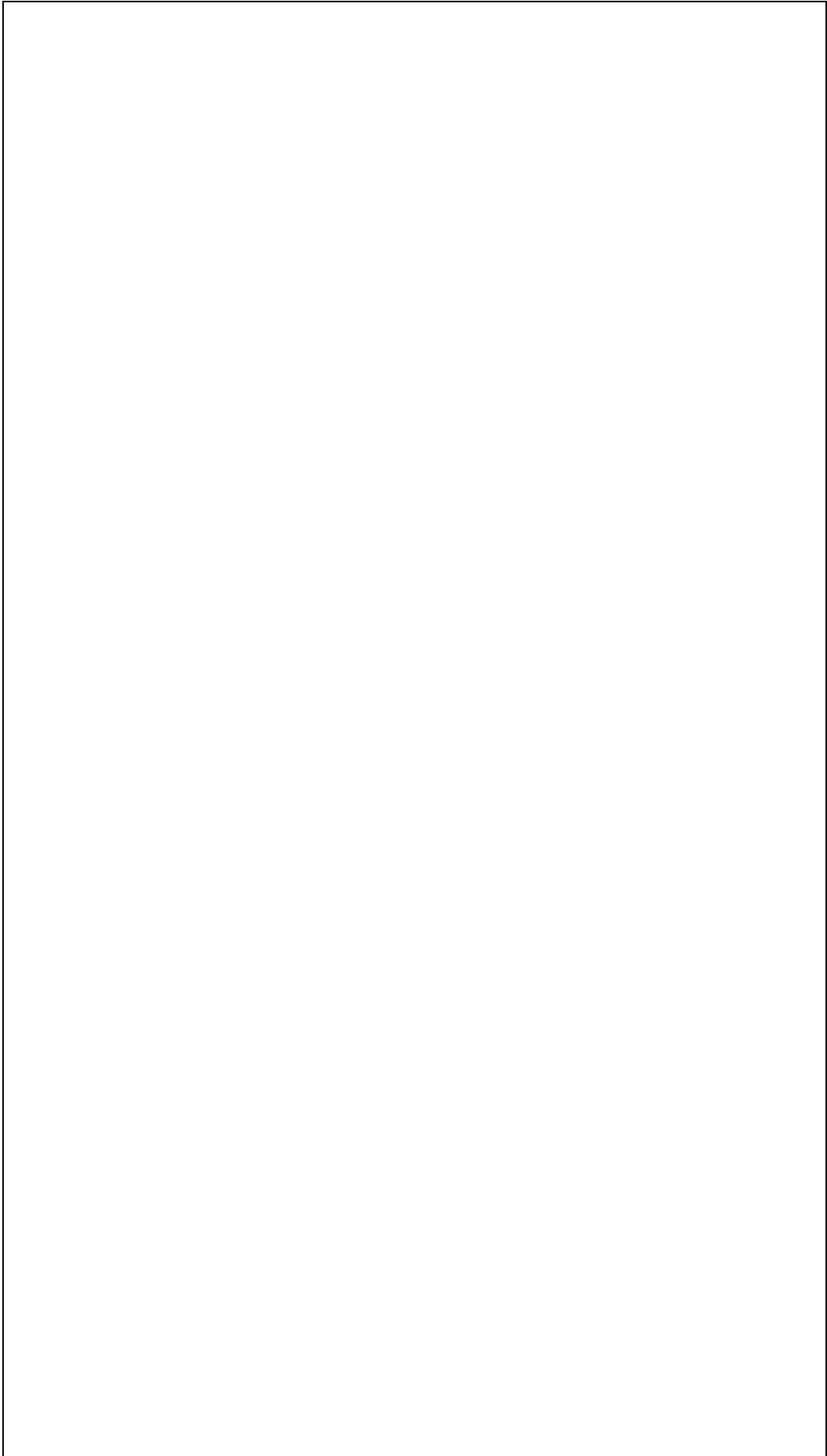
Disable controller

To terminate controlling, the controller has to be disabled. If enabling was done by interface, disabling must be done also by interface. After disabling the controller, the output value will be set to 0 resp. to the value stored in parameter *Holding torque* (depending on parameter *Torque in use*). The digital output „Controller ok“ will be cancelled.



Notice

The digital input „Immediate Stop“ disables the controller immediately. Enabling the controller is only possible if digital input „Immediate Stop“ is not active.



Notice

Longer down-time may cause that the roller and/or the brake get stuck. Due to that, the static friction will be greater than during normal use. To avoid breakage of material, start-up must be done very smoothly after longer down-time.

9.10 Setup of pilot control

The pilot control enables to evaluate the actual reel diameter and to calculate a brake torque adapted to the reel diameter (pilot control signal). In addition, the PI control parameters are dynamically adapted to the reel diameter continuously. Therefore the controller now is only responsible for the non-synchronous part. This will increase controlling stability.

Transmission of diameter signal

To transmit the actual reel diameter to the electronic unit, an analog signal 0...10V (from a distance sensor or other source) is fed to the analog input (terminals d6 / d8 resp. 7 / 8; refer to „8.7 Mounting the distance sensor“)

Diameter adjustment

To get the electronic unit knowing the actual reel diameter, the distance sensor signal has to be assigned to a diameter range:

- Set parameter *Pilot control* to *Yes*
- Insert reel with small diameter to get a signal according to the small diameter from the distance sensor
- Proceed parameter function *Auto. diameter adjustment* (ref. to „11. Parametrisation“ and fig. 17). Input the actual reel diameter into „1. diameter“. After confirmation with ↵ key the diameter is saved together with the referring voltage signal.



fig. 17: Program flow „Auto. diameter adjust“

C431015e

- Insert reel with large diameter to get a signal according to the large diameter from the distance sensor
- Proceed parameter function *Auto. diameter adjustment* (ref. to „11. Parametrisation“ and fig. 17). Input the actual reel diameter into „2. diameter“. After confirmation with ↵ key the diameter is saved together with the referring voltage signal.

Adjustment of pilot control

To get the electronic unit calculating the pilot control correct, a certain brake torque has to be assigned to a certain diameter:

- Set parameter *Pilot control* to *No*
- Proceed for a test run. If the control loop runs stable at a diameter as large as possible, the actual reference value and, after pressing the „Mode“ key, the actual output value can be read from the display. Note these two values:

Actual reference value REF = _____ [N]

Actual output value OUTPUT = _____ [V, mA]

The brake torque for the pilot control is now determined.

- Terminate test run
- Set parameter *Pilot control* to *Yes*
- Proceed parameter function *Adjustment of pilot control* (ref. to „11. Parametrisation“ and fig. 18). The reel diameter has to be the same as during the test run.

First, select the polarity of the diameter signal.

Input the formerly noted output value into „%-torque“ (for ex. output value = 7.2V => %-torque = 72%, or output value = 12.0mA => %-torque = 60%, etc.)

Input the formerly noted reference value [N] into „Reference“.

After confirmation with ↵ key the calculated pilot control is saved together with the actual diameter signal.

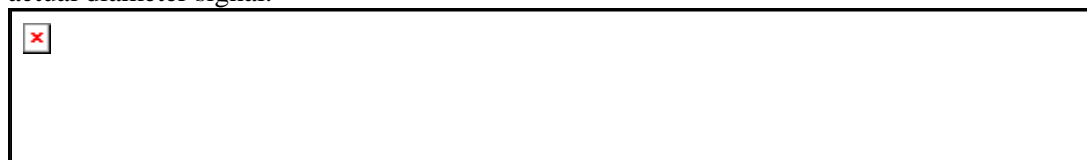
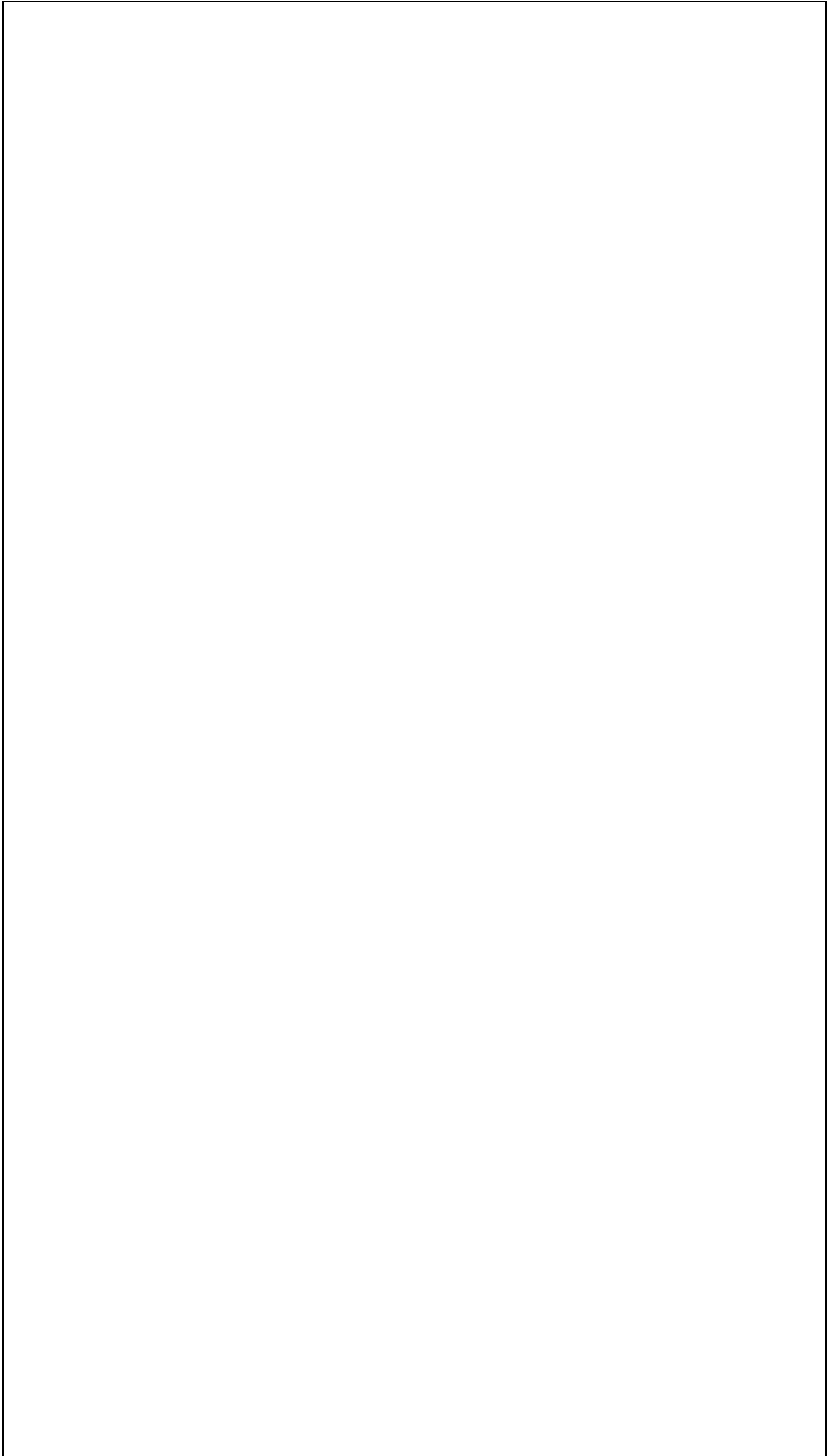


fig. 18: Program flow „Adjustment of pilot control“

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Notice

While changing parameter *Output*, the adjustment of pilot control is lost. If parameter *Output* will be changed after pilot control already being adjusted, you have to proceed again for adjustment of pilot control!

Partition the output into pilot control signal and PI output signal

- Set parameter *Influence of PI* to an appropriate value, for ex. „10%“
- Proceed for a test run. Adjust PI control parameters and parameter *Influence of PI* until the control loop will run stable under all conditions.

9.11 Additional settings

Setting of the lowpass filters

The control unit provides 3 lowpass filters independently adjustable from each other. They are used to prevent noise which is added to the signals. Signal variations which are faster than the cut-off frequency are then suppressed. The lower the cut-off frequency, the more sluggish the output signal will be.

The lowpass filters are configured by setting its cut-off frequency to an appropriate value. The cut-off frequency is set in the parameter *Lowpass output*, *Lowpass instrument* resp. *Lowpass display* (ref. to „11. Parametrisation“).

Notice

If the cut-off frequency is set to a value too low, the output signal will become sluggish. It may be that the feedback value is no longer suitable for control loop applications. You have to pay attention that the cut-off frequency is set to a suitable value.

Setting of the limit switches

The control unit provides 2 limit switches which can be tapped at the digital outputs (terminals b14 and b16 resp. 29 and 30). The limit switches are actuated when the feedback value exceeds resp. undershoots (depending on parameter *Limit 1 min / max* resp. *Limit 2 min / max*) the force values stored in parameters *Limit value 1* resp. *Limit value 2*.

Tapping of the limit switches is done according to wiring diagram (fig. 6..9).

Scaling of the analog outputs

With default setting, the feedback output gives the maximum signal (10V) when the nominal force of the sensors is reached. The output signal level can be customized with the parameter *Scale instrument*.

9.12 Emergency Stop resp. Immediate Stop

CMGZ431 without integrated brake amplifier:

There is no „Emergency Stop“ function integrated to the FMS Tension Controller. If the digital input „Immediate Stop“ is activated (terminal b4 resp. 24), only the controller will be disabled and the display shows the following picture:

Immediate Stop!
REF [N] xxx.x

Emergency Stop has to be ensured by the project responsible by installing general Emergency Stop circuits, etc.

CMGZ431 with integrated brake amplifier (option):

If the digital input „Immediate Stop“ is activated (terminal 24), the controller will be disabled and the display shows the following picture:

Immediate Stop!
REF [N] xxx.x

Full braking is activated by disconnecting the 24V tension of terminal 21 (refer to fig. 9). Then, the output of the brake amplifier has maximum tension (24V / 3.5A).

10 Serial interface (RS232)

The serial interface is operated for example by a personal computer as a kind of „question and answer“ game: The PC sends a question resp. a command; the electronic unit will send an answer back. If the answer is missing, the electronic unit or the connection cable may fail.

10.1 Wiring diagram: RS232 interface



fig. 19: Wiring diagram RS232 interface

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Reliable connection using maximum baudrate (9600) is guaranteed up to wire length of 10m. If the baudrate is reduced and/or good conditions prevail, considerably greater distances can be bridged in some cases.

Connection to a PC etc. is done with a 9- or 25-pole Sub-D connector.

10.2 Command list

command	answer	purpose
DAKT<CR>	XXXXXX<CR>	read actual diameter
DIFF<CR>	DIFY<CR> / DIFN<CR>	read alarm control error
DIFR<CR>	DIFRXXXX.X<CR>	actual control error in %
ERR?<CR>	XXXX<CR>	read actual erros Pos.1...4 : Err1...Err4 Value of Pos. = 0 : No Err; Value of Pos. = 1 : Err active
FREI<CR>	PACC<CR> / FAIL<CR>	enable controller
IDNT<CR>	CMGZ431 V2.03 1098 < Typ > <Version> <S >	10 characters type, fix 10 characters version, fix 4 characters serial number, fix
INRS<CR>	PACC<CR> / FAIL<CR>	initialize interface (for ex. after loading of new interface parameters)
LOCK<CR>	PACC<CR> / FAIL<CR>	disable conbtrroller
REMR<CR>	PACC<CR> / FAIL<CR>	turn off remote mode (enabling of the keys on the operating panel)
REMS<CR>	PACC<CR> / FAIL<CR>	turn on remote mode (disabling of the keys on the operating panel)
SOLLXXXXXXXX<CR>	PACC<CR> / FAIL<CR>	write new tension reference value into RAM (The new reference will be lost while power-off or changing a parameter.)
SRMP<CR>	XXXXXX<CR>	read actual tension reference value
STEL<CR>	XXXX.X<CR>	read actual output value
SWRTXXXXXXXX<CR>	PACC<CR> / FAIL<CR>	write new tension reference value into EEPROM
STAR<CR>	XXXXXXXXXXXXXXXXXXXXXX<CR>	general status information 1-6 : feedback 7-11 : output value 12-16: reference after ramp 17 : error evaluation 18 : control error
VALS<CR>	XXXXXX<CR>	read feedback value

10.3 Read parameter

command	answer	purpose
RP01<CR>	XXXXX<CR>	offset feedback
RP02<CR>	X.XXX<CR>	gain feedback
RP03<CR>	XXXX<CR>	sensor, nominal force
RP04<CR>	X<CR>	sensor, force unit
RP05<CR>	X.X<CR>	sensor, sensitivity
RP06<CR>	X<CR>	number of sensors
RP07<CR>	XXX.X<CR>	lowpass, feedback
RP08<CR>	XX.X<CR>	lowpass, instrument
RP09<CR>	XX.X<CR>	lowpass, display
RP10<CR>	XX.XX<CR>	scale of instrument
RP11<CR>	X<CR>	limit 1 min / max
RP12<CR>	XXXXX<CR>	limit value 1
RP13<CR>	X<CR>	limit 2 min / max
RP14<CR>	XXXXX<CR>	limit value 2
RP15<CR>	X<CR>	language
RP16<CR>	X<CR>	pilot control
RP17<CR>	XXX.X<CR>	influence of PI
RP18<CR>	XXX.XX<CR>	proportional P0
RP19<CR>	XXX.XX<CR>	integral I0
RP20<CR>	XXX.XX<CR>	proportional P1
RP21<CR>	XXX.XX<CR>	integral I1
RP22<CR>	XXX.XX<CR>	proportional P2
RP23<CR>	XXX.XX<CR>	integral I2
RP24<CR>	XXX.XX<CR>	proportional P3
RP25<CR>	XXX.XX<CR>	integral I3
RP26<CR>	XXX.X<CR>	alarm limit error
RP27<CR>	XX.X<CR>	Offset output
RP28<CR>	XXX.X<CR>	current limit
RP29<CR>	X<CR>	Output
RP30<CR>	XX.XX<CR>	ramp diameter
RP31<CR>	XX.X<CR>	ramp reference
RP32<CR>	X<CR>	reference internal / external
RP33<CR>	XXXX<CR>	scale of reference
RP34<CR>	X<CR>	holding torque in use?
RP35<CR>	XXX.XX<CR>	holding torque
RP36<CR>	XXX<CR>	Identifier
RP37<CR>	X<CR>	baudrate interface
RP38<CR>	X<CR>	data bit interface
RP39<CR>	X<CR>	stop bit interface
RP40<CR>	X<CR>	parity bit interface

All parameter numbers refer to the parameter list.

10.4 Write parameter

command	answer	purpose
WP01XXXXX<CR>	PACC<CR> / FAIL<CR>	offset feedback
WP02X.XXX<CR>	PACC<CR> / FAIL<CR>	gain feedback
WP03XXXXX<CR>	PACC<CR> / FAIL<CR>	sensor, nominal force
WP04X<CR>	PACC<CR> / FAIL<CR>	sensor, force unit
WP05X.X<CR>	PACC<CR> / FAIL<CR>	sensor, sensitivity
WP06X<CR>	PACC<CR> / FAIL<CR>	number of sensors
WP07XXX.X<CR>	PACC<CR> / FAIL<CR>	lowpass, feedback
WP08XX.X<CR>	PACC<CR> / FAIL<CR>	lowpass, instrument
WP09XX.X<CR>	PACC<CR> / FAIL<CR>	lowpass, display
WP10XX.XX<CR>	PACC<CR> / FAIL<CR>	scale of instrument
WP11X<CR>	PACC<CR> / FAIL<CR>	limit 1 min / max
WP12XXXXX<CR>	PACC<CR> / FAIL<CR>	limit value 1
WP13X<CR>	PACC<CR> / FAIL<CR>	limit 2 min / max
WP14XXXXX<CR>	PACC<CR> / FAIL<CR>	limit value 2
WP15X<CR>	PACC<CR> / FAIL<CR>	language
WP16X<CR>	PACC<CR> / FAIL<CR>	pilot control
WP17XXX.X<CR>	PACC<CR> / FAIL<CR>	influence of PI
WP18XXX.XX<CR>	PACC<CR> / FAIL<CR>	proportional P0
WP19XXX.XX<CR>	PACC<CR> / FAIL<CR>	integral I0
WP20XXX.XX<CR>	PACC<CR> / FAIL<CR>	proportional P1
WP21XXX.XX<CR>	PACC<CR> / FAIL<CR>	integral I1
WP22XXX.XX<CR>	PACC<CR> / FAIL<CR>	proportional P2
WP23XXX.XX<CR>	PACC<CR> / FAIL<CR>	integral I2
WP24XXX.XX<CR>	PACC<CR> / FAIL<CR>	proportional P3
WP25XXX.XX<CR>	PACC<CR> / FAIL<CR>	integral I3
WP26XXX.X<CR>	PACC<CR> / FAIL<CR>	alarm limit error
WP27XX.X<CR>	PACC<CR> / FAIL<CR>	Offset output
WP28XXX.XX<CR>	PACC<CR> / FAIL<CR>	current limit
WP29X<CR>	PACC<CR> / FAIL<CR>	Output
WP30<CR>	PACC<CR> / FAIL<CR>	ramp diameter
WP31XX.X<CR>	PACC<CR> / FAIL<CR>	ramp reference
WP32X<CR>	PACC<CR> / FAIL<CR>	reference internal / external
WP33XXXXX<CR>	PACC<CR> / FAIL<CR>	scale of reference
WP34X<CR>	PACC<CR> / FAIL<CR>	holding torque in use?
WP35XXX.XX<CR>	PACC<CR> / FAIL<CR>	holding torque
WP36XXX<CR>	PACC<CR> / FAIL<CR>	identifier
WP37X<CR>	PACC<CR> / FAIL<CR>	baudrate interface
WP38X<CR>	PACC<CR> / FAIL<CR>	data bit interface
WP39X<CR>	PACC<CR> / FAIL<CR>	stop bit interface
WP40X<CR>	PACC<CR> / FAIL<CR>	parity bit interface

All parameter numbers refer to the parameter list. Depending on the value being ok or not, the electronic unit replies PACC<CR> (value accepted) or FAIL<CR> (value not accepted).

11 Parametrization

11.1 Parameter list

Parameter	Unit	Default	Min	Max	Actual
Find offset	(Parameter function)				
Calibration feedback	(Parameter function)				
Auto. diameter adjust	(Parameter function) ¹⁾				
Adjustm. of pilot control	(Parameter function) ¹⁾				
Offset feedback	[Digit]	0	-4000	4000	_____
Gain feedback	[-]	1.000	0.100	9.000	_____
Nominal force	[N,kN]	1000	1	9999	_____
Unit of force	[N,kN]	N	N	kN	_____
Sensitivity	[mV/V]	1.8	0.1	3.0	_____
1 or 2 sensors	[-]	1	1	2	_____
Lowpass output	[Hz]	50.0	0.1	200.0	_____
Lowpass instrument	[Hz]	1.0	0.1	10.0	_____
Lowpass display	[Hz]	1.0	0.1	10.0	_____
Scale instrument	[-]	1.00	0.01	10.00	_____
Limit 1 min / max	Min, Max	Max			_____
Limit value 1	[N,kN]	0	-9999	9999	_____
Limit 2 min / max	Min, Max	Min			_____
Limit value 2	[N,kN]	0	-9999	9999	_____
Language	English, German, French, Italian				
Pilot control	No, Yes	No			_____
Influence of PI ²⁾	[%]	100.0	0.1	100.0	_____
Proportional P0 ²⁾	[-]	1.00	0.01	100.00	_____
Integral I0 ²⁾	[s]	1.00	0.01	100.00	_____
Proportional P1 ²⁾	[-]	1.00	0.01	100.00	_____
Integral I1 ²⁾	[s]	1.00	0.01	100.00	_____
Proportional P2 ²⁾	[-]	1.00	0.01	100.00	_____
Integral I2 ²⁾	[s]	1.00	0.01	100.00	_____
Proportional P3 ²⁾	[-]	1.00	0.01	100.00	_____
Integral I3 ²⁾	[s]	1.00	0.01	100.00	_____
Alarm limit error	[%]	10.0	0.1	100.0	_____
Offset output	[%]	0.0	0.0	50.0	_____
Current limit	[%]	100.0	10.0	100.0	_____

¹⁾ Is displayed only if *pilot control* is set to *yes*

²⁾ These parameters may be changed also while the controller is enabled. Setting is done as written under „11.3 Description of the parameters“. The new values are taken for the control loop when parameter mode is quit.

Output	0...10V, 0...-10V, 0...20mA, 4...20mA			_____	
Ramp diameter	[s]	1.0	0.1	60.0	_____
Ramp reference	[s]	1.0	0.1	20.0	_____
Reference	Internal, External		Internal		_____
Scale ref. input	[N,kN]	10	0	9999	_____
Torque in use	Yes, No				_____
Holding torque	[%Out]	0.00	0.00	100.00	_____
Identifier	[-]	0	0	127	_____
Baud rate RS232	300, 600, 1200, 2400, 4800, 9600				_____
7 or 8 databit	[-]	8	7	8	_____
1 or 2 stopbit	[-]	1	1	2	_____
Parity bit RS232	None, Odd, Even				_____

11.2 Schematic diagram of parametrization

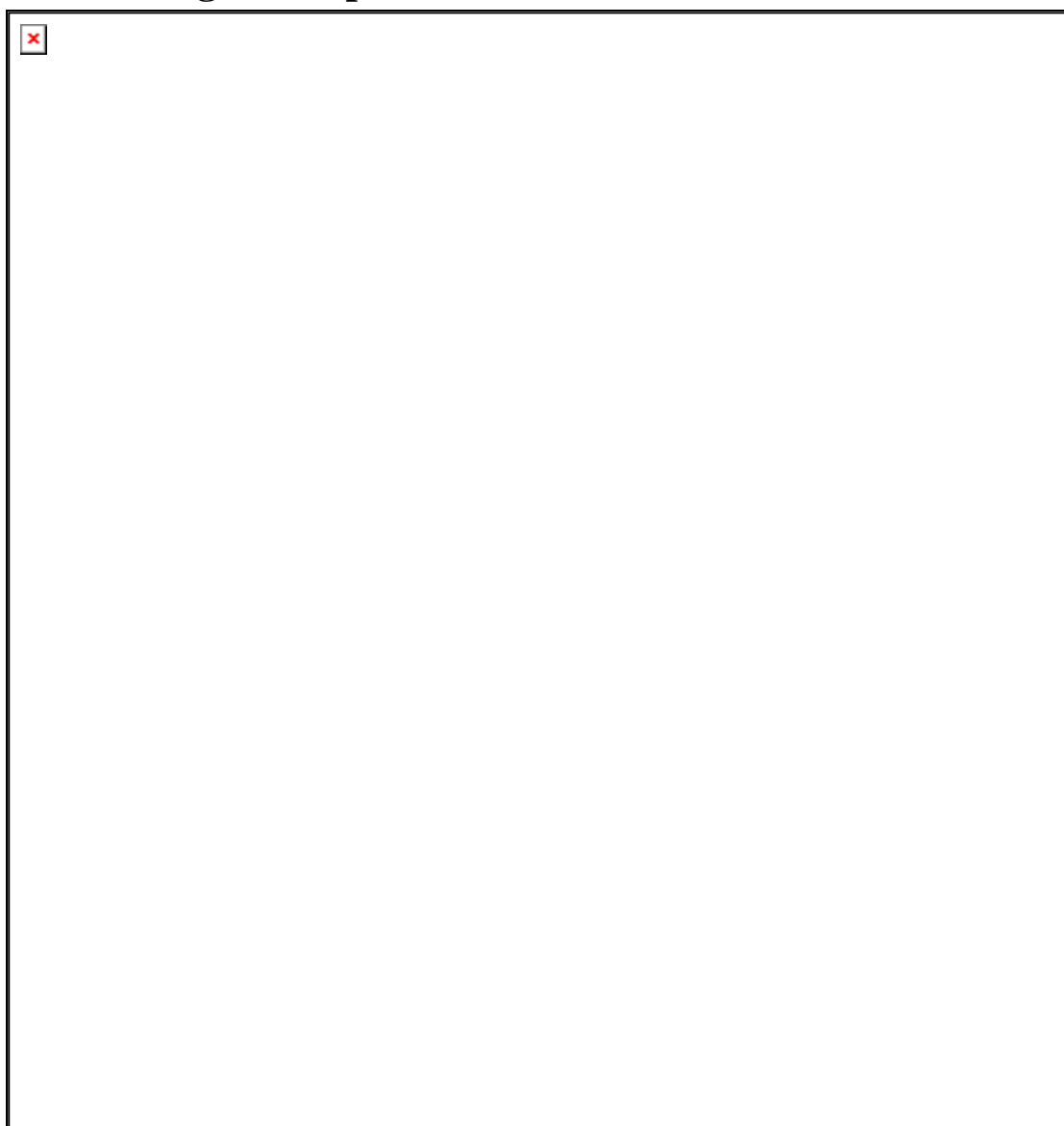


fig. 20

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11.3 Description of the parameters

The parameter changing mode will be activated by pressing the ↵ key for 3 seconds. Generally, the parameters are settable using the keys as follows:



choose



switch the selections or increase / decrease numeric values



change the decimal (while inputting a numeric value)



enter

Find offset

Use: The actual force value will be saved by pressing the ↵ key for 3 seconds. This is used to compensate the weight of the material and the roller. The determined value will be shown for 2 seconds and then stored under parameter *Offset feedback*.

Calibration feedback

Use: In this parameter, using the ↑ ↓ keys you can input the force value referring to the calibration load you applied to the sensor (force feedback value). The processor then calculates the actual gain value and stores it under parameter *Gain feedback*.

Notice: The input can be aborted with the ← key. In this case the previously saved value remains.

Range: 1 to 9999 **Default:** 1000
Increment: 1 **Unit:** [N,kN]

Auto. diameter adjust

Use: (Is displayed only if *pilot control* is set to *yes*.)
 By pressing the ↵ key for 3 seconds, an adjustment program is started which will assign a diameter range to the 0...10V analog input signal coming from a distance sensor, etc. (refer to „9.10 Setup of pilot control“)

Adjustment of pilot control

Use: (Is displayed only if *pilot control* is set to *yes*.)
 By pressing the ↵ key for 3 seconds, an adjustment program is started which will record the characteristic of the connected brake. (refer to „9.10 Setup of pilot control“)

Offset feedback

Use: This parameter stores the value determined with *Find offset* in [Digit]. It is not necessary to note this parameter, because a new offset adjustment is done very easy; also when changing the whole electronic unit.
The offset can also be inputted by using the ↑ ↓ ← keys.

Range: -4000 to 4000 **Default:** 0

Increment: 1 **Unit:** [Digit]

Gain feedback

Use: This parameter stores the value determined with *Calibration feedback*, resp. you can input a value calculated using the formulas described under „9.4 Calibrating the measuring amplifier“, if the material tension cannot be simulated.

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

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

Nominal force of sensor

Use: To get the correct force value,, the electronic unit has to know the nominal force of the sensors.

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

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

Unit of force

Use: This parameter stores the force unit of the sensor.

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

Sensitivity of sensor

Use: To get the correct force value,, the electronic unit has to know the sensitivity of the force sensors, that means how much signal the sensor will answer by nominal force. Standard for FMS force sensors is 1.8mV/V.

Range: 0.1 to 3.0 **Default:** 1.8

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

1 or 2 sensors

Use: To get the correct force value, the electronic unit has to know if the measuring roller is beared by one or two force sensors.

Range: 1 to 2 **Default:** 1

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

Lowpass output

Use: The electronic unit provides a lowpass filter to prevent noise which is added to the feedback signal, caused by unbalanced rollers or interference. This parameter stores the limit frequency. The filtered feedback value will be fed to the PI controller.
The lowpass output filter is independent of the other filters.
Notice: The lower the cut-off frequency, the more sluggish the output signal will be. If the limit frequency is set too low, the control dynamics may be reduced dramatically!

Range: 0.1 to 200.0 **Default:** 50.0

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

Lowpass instrument

Use: The electronic unit provides a lowpass filter to prevent noise which is added to the analog output of the instrument (terminals z18 / z22 resp. 15 / 18). This parameter stores the limit frequency. The lower the cut-off frequency, the more sluggish the output signal will be. Due to this filter, the display on the instrument will be much more stable in the case of high fluctuations of the force value.
The lowpass instrument filter is independent of the other filters.

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

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

Lowpass display

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

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

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

Scale instrument

Use: The analog output for the external instrument (0...10V) provides the nominal voltage when reaching the nominal force value. Using a setting of 1.00, the nominal voltage will be 10V. The nominal voltage is decreased when decreasing the setting value; it is increased when increasing the setting value.

Range: 0.01 to 10.00 **Default:** 1.00

Increment: 0.01 **Unit:** [-]

Limit 1 min / max

Use: The digital output „Limit value 1“ can be set as a min or a max limit switch. That means, that the digital output will be activated when passing over resp. passing under the value set under parameter *Limit value 1*.

Range: Min, Max **Default:** Max

Limit value 1

Use: The digital output „Limit value 1“ will be activated if the threshold value stored in this parameter is passed over resp. under (according to setting in parameter *Limit 1 min / max*).

Range: -9999 to 9999 **Default:** 0

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

Limit 2 min / max

Use: The digital output „Limit value 2“ can be set as a min or a max limit switch. That means, that the digital output will be activated when passing over resp. passing under the value set under parameter *Limit value 2*.

Range: Min, Max **Default:** Min

Limit value 2

Use: The digital output „Limit value 2“ will be activated if the threshold value stored in this parameter is passed over resp. under (according to setting in parameter *Limit 2 min / max*).

Range: -9999 to 9999 **Default:** 0

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

Language

Use: With this parameter, the language in the display can be chosen.

Range: English, German, French, Italian

Pilot control

Use: With this parameter, the pilot control will be turned on resp. turned off. That means, that the utilization of the reel diameter signal will be activated resp. de-activated.

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

Influence of PI

Use: If pilot control is activated, this parameter defines the percentage participation of the PI controller which will be added to the pilot control signal.
 „10%“ means 10% of the actual pilot control signal.
 If parameter *Current limit* is set to less than 100% the influence value stored here should be adjusted accordingly. For ex. Current limit = 80% and pilot control (from adjustment of pilot control) = 60% => Influence of PI should be increased (for ex. 20%) to get a useful control loop stability.
 If pilot control is not activated, the effective influence of PI is 100%, independent of this parameter.

Range: 0.1 to 100 **Default:** 100.0

Increment: 0.1 **Unit:** [%]

Proportional P0

Use: This value determines the behaviour of the „P“ component of the controller. It is active if the BCD inputs are set to „0“. If the value stored here is 1.00 the P controller will produce an output signal of 0.5V resp. 0.5mA at a control error of 100N.
 This parameter can be changed while the controller is enabled. The new value is taken for the control loop when quit parameter mode.

Range: 0.01 to 100.00 **Default:** 1.00

Increment: 0.01 **Unit:** [-]

Integral I0

Use: This value determines the behaviour of the „I“ component of the controller. It is active if the BCD inputs are set to „0“. If the value stored here is 1.00 the I controller will produce an output signal changement of 1V/s resp. 1mA/s at a control error of 100N.
 This parameter can be changed while the controller is enabled. The new value is taken for the control loop when quit parameter mode.

Range: 0.01 to 100.00 **Default:** 1.00

Increment: 0.01 **Unit:** [s]

Proportional P1

Use: Description and function see *Proportional P0*. Active if the BCD inputs are set to „1“.

Integral I1

Use: Description and function see *Integral I0*. Active if the BCD inputs are set to „1“.

Proportional P2

Use: Description and function see *Proportional P0*. Active if the BCD inputs are set to „2“.

Integral I2

Use: Description and function see *Integral I0*. Active if the BCD inputs are set to „2“.

Proportional P3

Use: Description and function see *Proportional P0*. Active if the BCD inputs are set to „3“.

Integral I3

Use: Description and function see *Integral I0*. Active if the BCD inputs are set to „3“.

Alarm limit error

Use: The digital output „Alarm controller error“ and the LED „Alarm controller error“ will be activated if the control error exceeds the tolerance set in this parameter.

Range: 0.1 to 100.0 **Default:** 10.0

Increment: 0.1 **Unit:** [%]

Offset output

Use: If the brake is activated although the control unit gives no signal to the brake, the faulty brake torque can be compensated here. The value stored here is active only if the controller is enabled.
 „10%“ means 10% of the maximum current value (refer to parameter „Current limit“).

Range: 0.1 to 50.0 **Default:** 0.0

Increment: 0.1 **Unit:** [%]

Current limit

Use: This parameter defines the range for the output signal. „80%“ refers to „±8V“ resp. „0...8V“ resp. „0...16mA“ resp. „4...16.8mA“, depending on parameter *Output*. Due to that, a current limitation for the brake power can be realized indirectly.
 Using the CMGZ431.E with integrated brake amplifier (optional), this parameter has to be set according to the max. current of the brake. „100%“ correspond to a max. current of 4.0A; „87.5%“ corresponds to max. 3.5A; „40%“ corresponds to max. 1.6A, etc.

Range: 0.1 to 100.0 **Default:** 100.0

Increment: 0.1 **Unit:** [%]

Output

Use: With this parameter you can select the output signal provided by the controller output.
 Using the CMGZ431.E with integrated brake amplifier (optional), the output has to be set to „0...10V“ (default setting).
Notice: If the controller is operated using pilot control, adjustment of pilot control has to be proceed again after changing of parameter *Output*.

Range: 0...10V, 0...-10V, 0...20mA, 4...20mA **Default:** 0...10V

Ramp diameter

Use: To optimize the controller against disturbances, the diameter should not change too fast. For this, the diameter signal is led internally to a ramp. Its rate of rise is defined using this parameter. The length of the ramp defines the time the diameter will take for a changement of 1mm.

Range: 0.1 to 60.0 **Default:** 1.0

Increment: 0.1 **Unit:** [s]

Ramp reference

Use:	To optimize the controller against disturbances, the reference value should not change too fast. For this, the reference value signal is led internally to a ramp. Its rate of rise is defined using this parameter. The length of the ramp defines the settling time the reference will take to set to the new value.		
Range:	0.1	to	20.0
			Default: 1.0
Increment:	0.1		Unit: [s]

Reference

Use:	If the reference value will be set using the operating panel or the interface, this parameter has to be set to <i>internal</i> . If the reference value will be set using a 0...10V signal led to the analog input, this parameter has to be set to <i>external</i> .		
Range:	Internal, External		Default: Internal

Scale reference input

Use:	This parameter defines how many N resp. kN are assigned to the 0...10 V signal on the analog input. If no 10V signal is available, you can use a signal with any tension range, but you must scale the entry in this parameter corresponding to the tension range. If you have for ex. only a 4V tension (for ex. terminals d4 / d10 resp. 6 / 9), the needed nominal force value has to be multiplied with the factor ($10V / 4V = 2.5$).		
Range:	0	to	9999
			Default: 10
Increment:	1		Unit: [N,kN]

Torque in use

Use:	If this parameter is set to <i>no</i> , the output value will be 0V while the controller is disabled. When enabling the controller, the value set under parameter <i>holding torque</i> will be output. So, the controller starts from the holding torque value when enabling it. If this parameter is set to <i>yes</i> , the output value will be as defined in parameter <i>Holding torque</i> constantly while the controller is disabled. So, the controller brakes all the time constantly with the holding torque while disabled. When enabling the controller, it starts from the holding torque and returns to the holding torque if the controller is disabled again.		
Range:	Yes, No		Default: Yes

Holding torque

Use:	This parameter defines the holding torque that is active during machine stopped. It has to be set in a way that the reel is held during stop, but no material breakage can appear during start up. If parameter <i>Torque in use</i> is set to <i>No</i> the holding torque will be output only when the controller is getting enabled. If parameter <i>Torque in use</i> is set to <i>Yes</i> the holding torque is already output even the controller is disabled. „10“ means „10%Out“, that is 10% of 10V = 1.0V.				
Range:	0.0	to	100.0	Default:	0.0
Increment:	0.1			Unit:	[%Out]

Identifier

Use:	This parameter is to identify the device when using a CAN-Bus interface. For future applications.				
Range:	0	to	127	Default:	0
Increment:	1			Unit:	[-]

Baud rate RS232

Use:	Setting of the transmission rate of the RS 232 interface.			
Range:	300, 600, 1200, 2400, 4800, 9600	baud	Default:	9600

7 or 8 data bit

Use:	Setting of the number of data bits of the RS 232 interface.				
Range:	7	to	8	Default:	8
Increment:	1			Unit:	[-]

1 or 2 stop bit

Use:	Setting of the number of stop bits of the RS 232 interface.				
Range:	1	to	2	Default:	1
Increment:	1			Unit:	[-]

Parity bit RS232

Use:	Setting of the parity of the RS 232 interface.			
Range:	none, odd, even		Default:	none

12 Trouble shooting

Error	Cause	Corrective action
„Err1“ is displayed: A/D-converter receives values < -9.7mV continuously	Force sensors are wrong connected	Exchange wires on terminals z6 / z8 (resp. 2 / 3)
	Parting of the cable	Replace connection cable between force sensor and elektronik unit
„Err2“ is displayed: A/D-converter receives values > 9.7mV continuously	Force sensors are wrong connected	Exchange excitation and signal (terminals z4 ... z10 resp. 1 ... 4)
	Short circuit in the plug or connection cable	Check and correct wiring
	Force sensor overload	Use sensor with higher nominal force
	Force sensor has too much sensitivity	Set parameter <i>sensitivity</i> to the correct value or use other sensor
„Alarm controller error“ is displayed	The control error has exceeded the tolerance band set in parameter <i>Alarm limit error</i>	Enlarge parameter <i>Alarm limit error</i> or adjust controller parameters (P; I) more accurate and restart controlling (enable controller again)
Brake gives maximum torque („full braking“)	The dig. input „Immediate stop“ is active; display shows „Emergency stop!“	Clear dig. input „Immediate stop“
	Controller is enabled, but material is not tight	Tighten the material carefully to build-up a material tension
	Using pilot control, the diameter signal gives „0“; diameter sensor defect	Check diameter sensor and wiring to the terminals d6 / d8 (resp. 7 / 8); replace if needed
Brake releases very slow and with great delay	Parameter <i>current limit</i> too high	Set parameter <i>current limit</i> correct depending on the brake used
No message on the display	Display contrast setting is bad	Set display potentiometer correctly. (It is located on the processor board on the upper right edge beside the ribbon connector)
	Fuse blown	Replace fuse on power supply
	Power supply not correct	Check / correct power supply
	Electronic unit defect	Contact FMS customer service

13 Technical data CMGZ431

Connection of force sensors	1 or 2 parallel force sensors of 350Ω
Excitation of sensors	4VDC
Input signal voltage	9.9mV
Resolution A/D-converter	±4095 Digit (13 Bit)
Measuring error	<0.05% FS
Cycle time	4ms
Operation	4 keys, LCD display 2x16 characters, 4 LED
Setting of reference value	Alternatively: Operating panel Analog input 0...10V RS232 CAN-Bus (option)
Configuration	Brake for unwinding applications
Integrated brake amplifier	3.5A / 24V (option; only available with CMGZ431.E)
Analog output 1 (output value)	0...10V (12 Bit)
Analog output 2 (tension feedback)	0...10V (12 Bit)
Analog output 3 (not connected)	0...5V (8 Bit) Ri=500Ω
Analog output 4 (not connected)	0...5V (8 Bit) Ri=500Ω
Digital output 1 (controller ok)	Open Collector, galvanic separated
Digital output 2 (alarm controller error)	Open Collector, galvanic separated
Digital output 3 (limit value 1)	Open Collector, galvanic separated
Digital output 4 (limit value 2)	Open Collector, galvanic separated
Digital input 1 (enable controller)	24VDC galvanic separated
Digital input 2 (immediate stop)	24VDC galvanic separated
Digital input 3 (BCD cipher 0)	24VDC galvanic separated
Digital input 4 (BCD cipher 1)	24VDC galvanic separated
Interface RS232	standard
Interface RS485 galvanic separated	Option
Interface CAN-Bus	Option
Power supply	24VDC (18...36VDC) 0.15A (CMGZ431.E: 230VAC, 110VAC or 24VDC)
Main connector	DIN41612 version F b+d+z
Temperature range	0...50°C [32...122°F]
Weight	0.22kg [0.5lbs]



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

FMS Italy
Via Baranzate 67
I-20026 Novate Milanese
Tel: +39 02 39487035
Fax: +39 02 39487035
fmsit@fms-technology.com

FMS USA, Inc.
2155 Stonington Ave. Suite 119
Hoffman Estates, IL 60169 USA
Tel. +1 847 519 4400
Fax +1 847 519 4401
fmsusa@fms-technology.com

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