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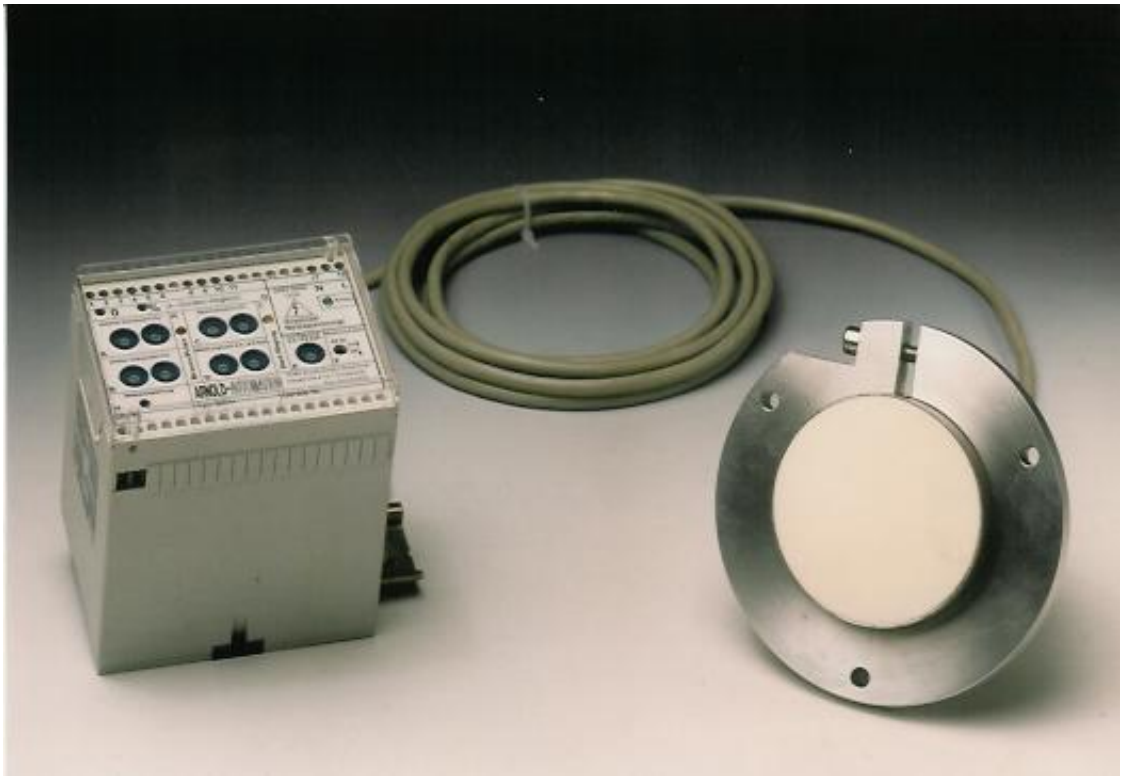
ARNOLD-MOISTURE MEASURING SYSTEMS



ARNOLD-Microprocessor-Controlled Average Value Calculator Type MB1-...

ARNOLD average value calculator signal signal processing device type MB1-...

Safety Instructions:
The connection to the mains may only be done by trained personal and switched off mains!
Compare supply voltage with indicated voltage on the label!
Do not use with open housing (or open the housing) if power is connected, because risk of electrical shock!

Content:

Chapter **Page**

1. Description and application of the ARNOLD average calculator type MB 1

The MP-controlled device MB1... is standing for a device family in the same housing for DIN-rail or wall mounting, with screw terminal connection facilities (look chapter 2 and 3).Following devices are available in this housing:
1. The average value calculator
2. The average value calculator combined with a signal signal processing device ***FMGM/(D)*** mono or duo for the ARNOLD moisture sensors.
3. The signal signal processing device ***FMGM/(D)*** for mono or dual channel (1 or 2 ARNOLD moisture sensors) [without the average value calculator].
The signal signal processing device ***FMGM/(D)*** has an output of 0...10 VDC (optional 0...20 mA) and 2 calibration potentiometers for (0) and the amplification (%) for each channel. The power supply for the sensors is provided by the internal power supply.

The MP-controlled average value calculator improves the measured signal, eliminates measuring faults and equalises the residual overlayed signals, which can be caused by not optimal location of the sensor or pressure deviations from the material etc.
Therefore suitable software programs were incorporated into this device.
To cover the most common applications in the field, the MB1 has different programmable modes of operation.
In addition many settings are possible for the different variations of application.

The first main operation mode is the **START / STOP average calculation**. Via a logic input (or optional for a potential free NO-contact) the measuring cycle can be started and stopped. The output signal from the MB1 has at any time the real average moisture value of the material, e.g. during dosage process from the start until to the stop of the material flow. After the stop signal the last output value **remains** at the output until the next start signal appears.
To activate the start / stop-function the standard input is 24 VDC. Optional an input to connect a potential free NO-contact is available.
In the additional function "**automatic material recognition"** the start / stop input is **not** needed. In this case the moisture sensor recognises automatically the material flow (dosage). As soon as a pre-set lower limit value is exceeded, the automatic average value calculation is started. If now the material flow (dosage) stops, the signal will underpass this lower limit value of the MB1 and stops the measuring cycle. This mode only works if the sensor is in contact with the material during the flow (dosage) process (e.g. location of the moisture sensor underneath the output of a silo).

The second operation mode is the **continuous average calculation** for a programmable measuring cycle time.
In this mode the sensor has contact to the material all the time (e.g. if the moisture sensor is installed inside of the silo). The measured values are stored for the programmed time and the actual average value is calculated and given out to the output. The programmed measuring cycle time determines the grade of smoothness of the output average value. As longer the programmed measuring cycle time as smoother the is the output curve (to avoid residual waves or jumps, e.g. at a non-linear dosage process).

For both operation modes the additional limit value function is available, which can also be switched off (muted). Two limit values (upper and lower) can be set directly in **% moisture**. All values, which are out of the limits are ignored for the measurement and they are not taken for calculating the average value.
So you can avoid measuring errors, which may occur for example by bubbles in (or lack of) the material.
The average value calculator MB1 without the signal signal processing device FMGM/(D) can be applied also to any other measuring (process) signals from 0...10 VDC (0...20 mA) [e.g.temperature, pressure, etc.].

2. Available types of MB1- devices

General:

Average value calculator (without signal signal processing device for moisture sensors, see Chapter 5, figure 2)

- Optional with current in- and output 0...20 mA (standard 0-10VDC)
- Optional with potential free NO-contact input
- With all above (both options)
- Special version: without start / stop function, but for the automatic recognition of material dosage processes. (Look chapter 5 figure 3)

Average value calculator with signal signal processing device for ARNOLD moisture sensors FS...(see chapter 5, figure 4)

- Optional with current in- and output 0...20 mA (standard 0-10VDC)
- Optional with potential free contact input
- With all above (both options)

Mono signal signal processing device (without average value calculator) for 1 ARNOLD moisture sensor FS... (see chapter 5, figure 5)

- Optional with current in- and output 0...20 mA (standard 0-10VDC)

Duo signal signal processing device (without average value calculator) for 2 ARNOLD moisture sensors FS... (see chapter 5, figure 6)

- Optional with current in- and output 0...20 mA (standard 0-10VDC)

(This signal signal processing device is also available for the special generation of the moisture sensors type FS 18 V.)

3. Type-key:

MB1 – X – X – X – X – X

M M1 (M2)	V G	FMGM FMGD (FMG90M)* (FMG90D)*	T DIG	UU UI IU II

In- and output of the measuring signal
U = voltage 0-10 V
I = current 0-20 mA
e.g. "UI" means: input = 0-10 V, output = 0-20 mA
Standard: "UU"

Calibration facilities of the signal processing device
T = with cal.-potentiometers
DIG = digital cal.-potentiometers
(available only for the mono-version)

Signal processing device type
FMGM = mono device (for one moisture sensor)
FMGD = duo device (for two moisture sensors)
(for a duo device it is not possible to integrate the MP- controlled average value calculator)

*(FMG90M) = for 18V moisture sensors upon request)
*(FMG90D) = for 18V moisture sensors upon request)

Start / Stop- input
V = 24V / 10 mA logic input
G = potential-free NO-contact input

Average value calculator / Special versions
M = integrated MP-controlled average value calculator
M1 = reduced version from "M" (chapter 5 fig. 3)

(M2 = reserved suffix)

4. Design

(see page 1, figure 1)

This electronic device is equipped with an integrated power supply and is incorporated completely in one housing. The screw-terminals are allocated at the long sides of the housing and are accessible from the front plate; the same for the calibration potentiometers (if a signal processing device is included). The terminals are numbered and explained on labels fixed on the housing. Also drawings and descriptions on the front plate show the connection of the MB1-device. The mains-terminal is marked separately in the upper right corner.

5. Setting elements

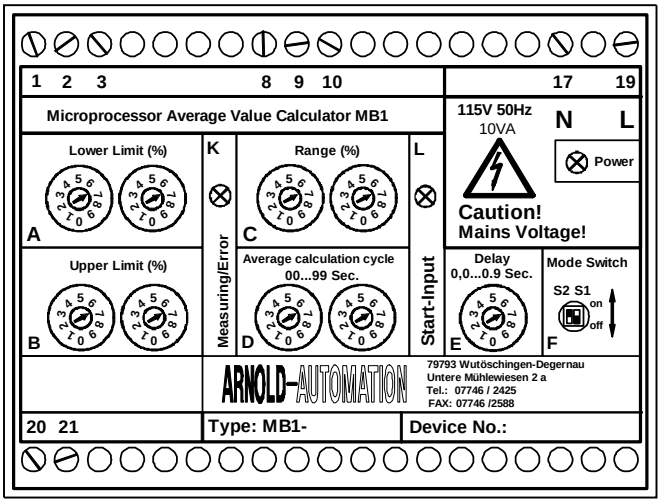


Figure 2:
Average value calculator without signal processing device FMGM/(D)

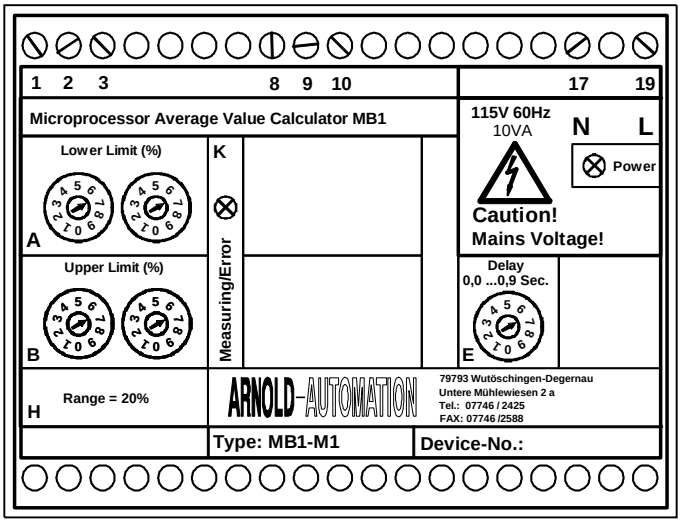


Figure 3:
Average value calculator without signal processing device FMGM/(D)
Special-version

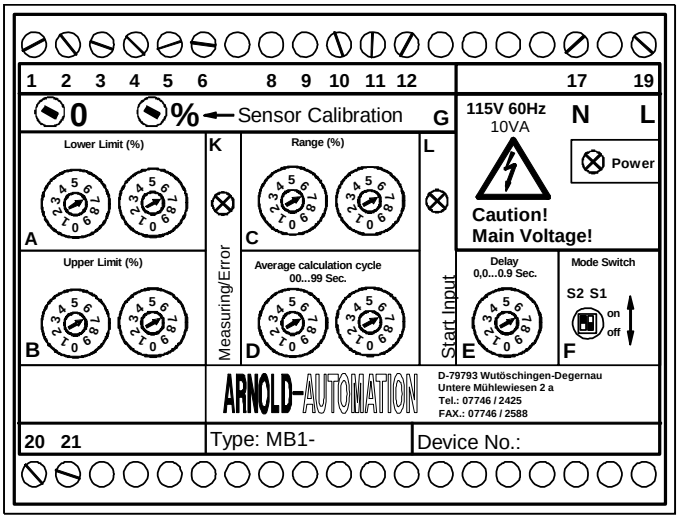


Figure 4:
Average value calculator with
signal processing device FMGM/(D)

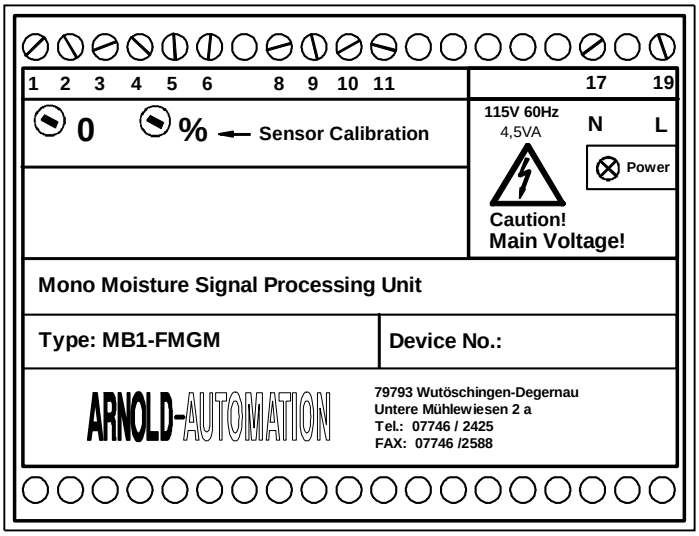


Figure 5:
Signal processing device FMGM/(D)
Mono
without average value calculator

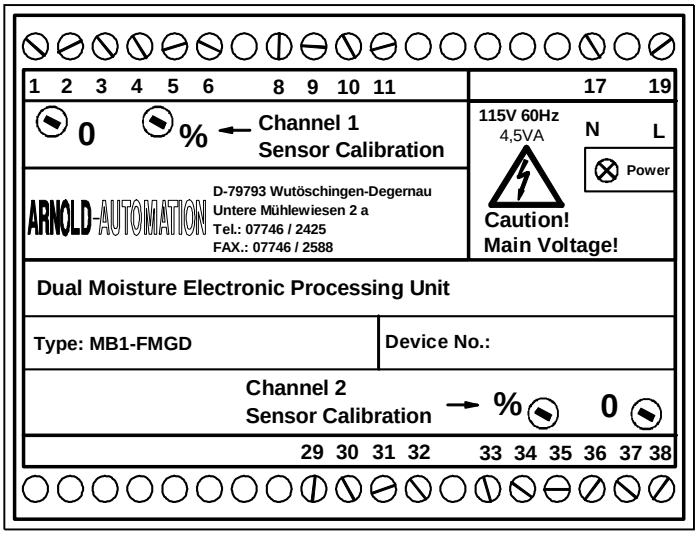


Figure 6:
Signal processing device FMGM/(D)
Duo
without average value calculator

The different setting fields are marked with capital letters and with a text for the setting.

5.1. Limit functions (see figure 2)

Field C: Range in (%)

Setting range 00 until 99
Please set the maximum range in **%** referring to the output voltage of 10 VDC. For a range of e.g. 25% the left switch has to be set onto „2“ and the right switch onto „5“.
(This setting of the range is necessary, because the programmable upper and lower limit values refer to this range and they are set in **%**.)

Field A: Lower limit value in (%)

Setting range 00 until 99
Setting of the lower limit value **in %**. E.g. 2%, the left switch has to be set onto „0“ and the right switch onto „2“.
(The lower limit value always has to be set smaller than the upper limit value and at the same time the upper limit value must be set smaller than the selected range.)

Field B: Upper limit in (%)

Setting range 00 until 99
Setting of the upper limit in %. E.g. 18%, please set the left switch onto „1“ and the right switch onto „8“.
(The upper limit value always has to be set higher than the lower limit value and at the same time the upper limit must be set smaller than the selected range.)

5.2. Other setting elements (look figure 2)

Field D: average calculation cycle time 00 until 99 sec.

Setting range 00 until 99 seconds
The average calculation cycle time refers to the **continuous operation mode**, and **not** for the start /stop operation mode.
Here you can set the calculation cycle time in seconds, for calculating the average value to smoothen more or less the output signal.

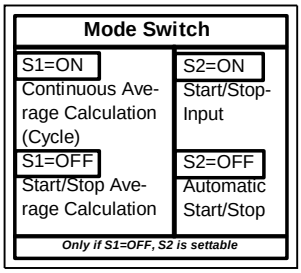
Field E: Delay 0,0...0,9 sec.

Setting range 0,0 until 9,9 seconds
Here you can set a time delay from starting the measurement in the **start / stop operation mode** or **automatic start /stop operation mode.** This means, after the MB1 device gets the start-signal for the measuring, a pause is being effected and after this pre-set time (pause) the device starts with the average value calculation. Depending on the allocation of the moisture sensor this can be advantageous, due to lack of material in front of the sensor or bubbles in the beginning of the material flow, to fade out distortions in the beginning of the process.

Field F: Mode switch

With the switch S1 you can select one of the two main operation modes. **Start / stop operation** mode or **continuous average value calculation**.
Note: Only in the start / stop mode you can select with the switch S2 either start / stop input connection, or automatic material recognition.

Figure 7: Switch positions S1/S2:



Both miniature switches can be switched best with a small pin e.g. measuring pin or cal.-screw driver.

5.3 The functions and the indication of the LED's will be explained in chapter 7.4.

5.4 Moisture sensor calibration (only with the signal processing device FMGM/(D))

The type MB1 average value calculator with signal processing device contains two calibration potentiometers **0** and **%**. With these potentiometers you can calibrate the external connected ARNOLD moisture sensor.
For the signal processing device for two moisture sensors **FMGD** (only available without average value calculator) these potentiometers are provided for each channel (sensor) separately.

6. Detailed functions

6.1. Generals

The MB1 device-family is devided into 4 main-groups:

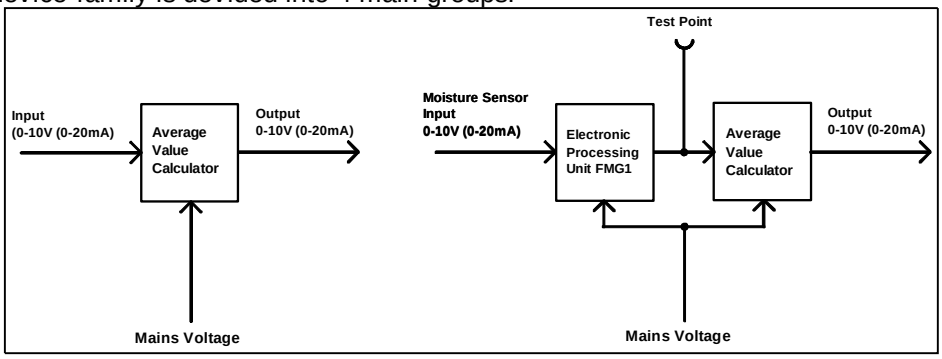


Figure 8: Average value calculator **without** signal processing device FMGM/(D)

Figure 9: Average value calculator **with** signal processing device FMGM/(D)

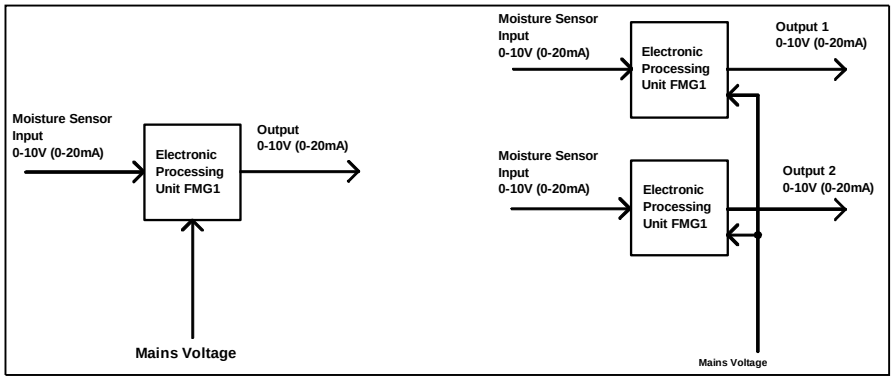


Figure 10: Signal processing device FMGM (mono)
without average value calculator

Figure 11: Signal processing device FMGD (duo) **without** average value calculator

6.2. Signal processing device FMGM (mono) / FMGD (duo) [if ordered]

6.2.1. Direct signal transmission (loop) for the calibration with the average value calculator

As described in chapter 6.1 the signal processing device can be regarded as a separate bloc in the whole device. In this combination with the average value calculator the output signal of the moisture sensor can be transmitted directly to the average value calculation. This is done by setting the upper and lower limit value onto “99” (for the calibration with the signal processing device). The flashing LED “Measuring/Error” in field **K** on the front plate reminds you to reset the limit values after calibration.
Also it is possible to measure the output signal at the “measuring point for calibration” on terminal 12. This point is not used for any internal process, it is only a measuring point.

6.2.2. Signal In- and Outputs

The ARNOLD moisture sensors type FS... are available with voltage output 0...10 VDC or optional with current output 0...4 mA. The current output should be selected if the wire length is extremely high(>300 meters), to avoid influence on the measured value from the voltage drop of the wire.
The input of the signal processing device FMGM/(D)must be ordered according to the type of output from the sensor either voltage or current. The standard in- and outputs are voltage 0...10 VDC.

6.2.3. Temperature input / Wear-out protection input

The moisture sensor input on terminal 6 (temperature) is only a terminal point without further internal connection.
So you can use it to connect the existing 6th wire (yellow) of the moisture sensor lead wire.
(For further details see in the catalogue: FS1 in document D100018)

6.2.4. Protection of the in- and outputs

All signal in- and outputs are protected against over voltage, wrong polarity and short circuit.

6.2.5. Calibration with the moisture signal processing device FMGM/(D)

For the version signal processing device FMGM with average calculator look setting as described in chapter 6.2.1. (direct signal transmission to the average value calculator)
For the calibration of the moisture sensors FS... you should provide enough material on the sensor surface (approx. 100mm...150 mm high). During start you should set the %-potentiometers to the middle position. Please set first the range e.g. 10% or 20%. At a range of 10% and a maximum output voltage of 10 VDC you get 1 VDC per percent moisture. Accordingly for a 20%-range it would be 0,5 VDC per % moisture. For the calibration you need a material sample with low moisture (or dry material) and some moist sample material. Please note: If using a duo-device (for two moisture sensors), pls. note that the correct sensor is calibrated with the according calibration potentiometers (channel 1 or channel 2) !

Zero calibration (min.):

- Please put the dry material onto the sensor(s) (e.g.2,5%). The exact moisture content for the sample material has to be determined before by dehydration and weighing or other methods.
- Please adjust the 0-potentiometer in a way that the display or the output-voltage has the according value. At a range of 10% and a sample material of 2,5% this would be 2,5 VDC. At a range of 20% you should adjust to 1,25 VDC.

Range calibration (max.):

- Please put the moist material onto the sensor(s) (e.g.8,5%). The exact moisture content for the sample material has to be determined before by dehydration and weighing or other methods.
- Please adjust the %-potentiometer so that the display or the output-voltage has the according value. At a range of 10 % and a sample material of 8,5 % this would be 8,5 VDC. At a range of 20 % and a sample material of 10 % you should adjust to 7,5 VDC.

Note: For an optimal result you should repeat this procedure several times, unless there is no more changement of the values, due to the fact, that both potentiometers have influence on each other.

6.3. Limit functions

The limit functions are operating in each mode of this device and can be switched off (muted), if not desired. If both switches (upper and lower limit) are set on “00” the limit function is switched off.
With this limit function you set a window for the values, which are taken for the average value calculation. The values out of the pre-set limit values are ignored for the average value calculation. If an actual value is out of the limit the previous average value signal remains at the output as long as a new value comes in again within the limit values.
At the automatic start / stop function the exceeding of the lower limit is used for the automatic start of the measurement. If now the lower limit is underpassed again the measurement will be stopped. This also means that you have to set the lower limit to any value, otherwise at a setting of “00” you obtain a permanent measurement.

6.4. Start / stop operation mode

6.4.1. Control of the measurement by the start / stop input (S1=OFF, S2=ON)

This input is a logic input for 24 VDC and optional for a potential free NO-contact.
The start / stop input controls the start and the end of the measurement. During the measurement 100 measurements per second are effected and stored in the internal memory.
If the measurement is stopped the output maintains the last average value signal until the next measurement.

This start / stop mode can be selected either if the sensor is always in contact with the material e.g. in silos or also for the case that material gets in touch with the moisture sensor only when the dosage process starts.

6.4.2. Control of the measurement by automatic material recognition (S1=OFF, S2=OFF)

Instead of the start / stop function you can also select the measuring time automatically, by the dosage process itself. In this mode the select switch for the lower limit is set on a low limit value and if this limit is exceeded the measuring process is automatically started. This can only be applied, if material is flowing over the moisture sensor, e.g. in a silo when the sensor is allocated outside under the outlet at a slide valve or in an impact plate.
This mode does not work, if there is permanent contact with the material e.g. if the sensor is allocated in the silo. Then you should refer to the start / stop mode.

6.4.3. Delay of measuring start

In the start / stop mode and in the automatic start / stop mode average value calculation a delay time of 0,0 seconds until 0,9 seconds is programmable. After the start signal or after recognition of the material (depending on the mode) there is a pause and after this programmed pause the measuring is started.
With this feature the measuring conditions can be optimised e.g. time until full material flow, opening time for the silo outlet etc.

6.5 Operation in a defined cycle average calculation mode (S1=ON, S2=no influence)

In this mode an internal memory is filled with the measured actual values, which depend on the programmed average value calculation cycle (time) of 00 sec. until 99 seconds. During this cycle (period of time) the value is measured 100 times a second and also recalculated 100 times a second and transmitted to the output. After each new measurement an old value is deleted in the memory and a new value is added. Short signal distortion or measuring errors are stabilised and smoothened.
This is a permanent measurement and the signal value is smoothened during the programmed cycle time.

7. Help functions

7.1 Indication of wrong switch set-ups

At following combinations of the switches the yellow LED “Measuring / Error” in in the field “K” of the front plate of the MB1 will flash:

If LED “Measuring / Error” is flashing	
Switch combinations (Field „A“, Field „B“, Field „C“)	**Function or fault**
Lower limit = 99 Upper limit = 99	The input signal will be transferred directly 1:1 to the average value calculator (Test and calibration aid)
Setting the upper limit smaller than the lower limit	The upper limit must be set larger than the lower limit
Setting of the upper limit larger than range	The upper limit may not be set larger than the programmed range

7.2 Switching off (muting) the limit function

If the switches for the upper and lower limit values are set on “00”, the limit function is deactivated.
Note: At the automatic start / stop function the lower limit may not be set on “00”, because the lower limit value determines the start / stop criteria.

7.3 Direct transmission of the measured signal

At a setting of “99” either at the upper or lower limit value, the input signal will be directly transmitted to the output without calculating the average value. This is necessary for taking the device into operation and especially if a signal processing device FMGM/(D) or an external signal processing device FMG1 or power supply F15 is used before the average value calculator. (look chapter 6, figure 9).

7.4 Display LED’s

Display	Function
Green LED “Power” is lit	Device is operating Power is connected
Yellow LED “Measuring / Error” is flashing (field K)	Mal-setting of the switches (look chapter 5.1)
Yellow LED “Measuring / Error” is lit	Measuring mode
Yellow LED START INPUT is lit	Start / stop signal is activated (24 VDC is on, or if optional ordered, NO-contact is closed)

7.5 Reference voltage output

The devices with a signal processing device FMGM/D are equipped with terminals for a reference voltage of +10 VDC, to connect an external auto / manual circuit. The terminal numbers are: 11 for the FMGM (mono) and 29 for the FMGD (duo). The external auto / manual circuit can be realised as follows:

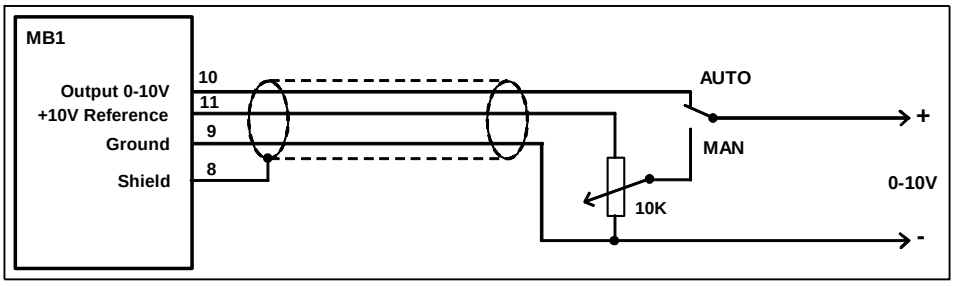


figure 12 : connection of the reference voltage output

With this circuitry a manual signal of 0...10 VDC can be provided for driving the process, instead of the measured moisture value of 0...10 VDC. The potentiometer scale could be adjusted accordingly to %

7.6 Measuring point for calibration with FMGM/(D) mono

At a MB1 version where a FMGM is combined with the average value calculator the output signal 0...10 VDC from the signal processing device FMGM can be measured on terminal 12 (look chapter 6.1 figure 9).
So you have the opportunity to calibrate the moisture sensor and to check directly the input signal of the average value calculator. However, it is possible to transmit this signal directly through to the average value calculator by setting the upper or lower limit values onto “99” (as a reminder: the LED “Measuring / Error” is flashing then).
If you want to report the signal before and after the average value calculator you can connect a high resistive recorder or writer to this measuring point.

8. Wiring

8.1. Power supply 115V, 60Hz or other voltages upon request

(look connection diagram front plate chapter 5)

Safety advise:
The connection may only be done by trained personnel and with disconnected power.
Check the supply voltage with the operating voltage on the label of the device.
To open the case/housing under power and the operation of an open case/housing is prohibited, due to the risk of electrical shock!

The supply voltage is connected to the terminals 17 and 19. Please observe your local safety guidelines and instructions!
Please observe a proper installation of all wires. Finger protection!
Before switching the main power on, check again that the terminals 17 / 19 are correctly selected, connected and the screw are securly fastened!

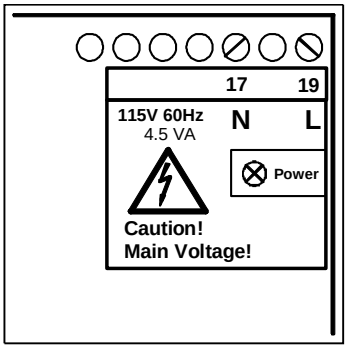


Figure 13: Main connection

8.2. Device input 4...20 mA or ARNOLD moisture sensor connection

Type of device	Terminal No	Connection	Wire-colour
Average value calculator without signal processing device FMGM/(D) (figure 2, chapter 5)	1 2 3	Wire shield Ground Input 4-20 mA	
Signal processing device FMGM (mono) with average value calculator (figure 4, chapter 5)	1 2 3 4 5 6	Wire shield Ground – 15 V power supply + 15 V power supply Measuring signal 4-20mA Temperature*	– grey brown white green yellow
Signal processing device without average value calculator (figure 5, chapter 5)	1 2 3 4 5 6	Wire shield Ground – 15 V power supply + 15 V power supply Measuring signal 4-20mA Temperature*	– grey brown white green yellow
Signal processing device FMGD (duo) without average value calculator (figure 6, chapter 5) Input 1 Input 2	1 2 3 4 5 6 38 37 36 35 34 33	Wire shield Ground – 15 V power supply + 15 V power supply Measuring signal 4-20mA Temperature* Wire shield Ground – 15 V power supply + 15 V power supply Measuring signal 4-20mA Temperature*	– grey brown white green yellow – grey brown white green yellow

* This is only a support terminal without further internal connection, for external use only.

8.3. Device outputs 4-20 mA

Type of device		Terminal No.	Connection
Average value calculator without signal processing device FMGM (figure 2, chapter 5)		8 9 10	Shield Ground Moisture output 4-20 mA
Signal processing device FMGM (mono) with average value calculator (figure 4, chapter 5)		8 9 10 11 12	Shield Ground Moisture output 4-20 mA Reference voltage + 10 VDC Measuring point f. calibration
Signal processing device FMGM (mono) without average value calculator (figure 5, chapter 5)		8 9 10 11	Shield Ground Moisture output 0-10 VDC Reference voltage + 10 VDC
Signal processing device FMGD (duo) without average value calculator (figure 6, chapter 5)	Output 1	8 9 10 11	Shield Ground Moisture output 4-20 mA Reference voltage + 10 VDC
	output 2	32 31 30 29	Shield Ground Moisture output 4-20 mA Reference voltage + 10 VDC

8.4. Start/Stop-input

Type of device	Input	Terminal No.	Connection
Average value calculator with signal processing device FMGM (mono) (figure 4, chapter 5)	24 VDC Logic input	20 21	Start/Stop-input (+24 VDC) Start/Stop-input Ground
	Potential free NO-contact	20 21	Potential free NO-contact Potential free NO-contact
Average value calculator without signal processing device FMGM (figure 2, chapter 5)	24 V Logic input	20 21	Start/Stop-input (+24V) Start/Stop-input Ground
	Potential free NO-contact	20 21	Potential free NO-contact

9. Installation and Wiring

9.1. Installation

Dust protection

This device should be located in a dust protected area e.g. cabinet etc.

Air

The ambient air should not contain corrosive or chemical particles, which could cause damages to the device.

Vibrations

Heavy permanent vibrations can cause electrical and mechanical damages.

Electromagnetic fields

The devices should be kept in distance from strong electromagnetic fields, because of possible distortions.

9.2. Wiring

Please note during installation and wiring to separate the device of surges and distorted lines. All measuring lines and signal wires shall be shielded and grounded according to the local regulations (look also chapter 10, lightning protection). The minimum distance to power lines should be at least 0,5 m. Also the measuring- and signal lines should not be put in parallel to main lines or other surged lines due to possible distortions in the industrial environment.

Advantageous is the allocation of the MB1 inside of a metal housing e.g. cabinet or inside a machine with metal housing instead of an open wiring.

Undesired potential transmissions can interfere and can cause distortions, which can be eliminated by galvanic insulation devices like ARNOLD FGUI.

For a bad and spiky power-net it is recommended to use a net filter or a voltage stabiliser.

10. Lightning Protection

Especially at the outdoor installation of the moisture sensors, damages can be caused by lightning. To reduce the risk you should note the local lightning protection regulations and eventually put the sensor and the signal processing device onto the same potential.
Shielded wires have to be grounded in common on both sides.

11. Technical Data

11.1. General technical data

Power supply

mains:	115 V ± 15%, 60 Hz (230 V ± 15 %, 50 Hz upon request)
power consumption:	4.5 VA max.
fusing:	50 mA slow blowing
type of fuse:	Wickmann TR5 or Schurter MSF250 pluggable
internal power supply:	± 15V DC, +5V

11.2. Technical Data Signal processing Device FMGM/(D)

In- and outputs :

Input protection	ESD-protection (static loads) Protection against over voltage Protection against wrong polarity
Output protection	ESD-protection (static loads) Protection against over voltage Protection against wrong polarity Short circuit protection
Signal input:	4-20 mA (0-20 mA and 0-10VDC optional)
Signal output	4-20 mA (0-20 mA and 0-10VDC optional)
Reference output	+10 V DC
In- and output resistances	
Input resistance	voltage input (U) 100 kΩ current input (I) 500 Ω 0.1% TK25 (optional)

Calibration and Display

Calibration elements 0 and %:20 gear precision potentiometer

Moisture display:	0-20% and others depending on the material
Programmable (U/I):	Only available at current option. In- and outputs are independent programmable for current (I) or voltage(U).
Amplification factor (%):	approx. 0.3 to 4 times
Offset adjustment (0):	approx. ± 3 V

11.4 Technical Data Average Value Calculator

In- and Outputs

Input protection	ESD-protection (static loads) Protection against over voltage Protection against wrong polarity
Output protection	ESD-protection (static loads) Protection against over voltage Protection against wrong polarity Short circuit protection
Signal input:	4-20 mA (0-20 mA and 0-10VDC optional)
Signal output	4-20 mA (0-20 mA and 0-10VDC optional)
Start/Stop-input	24V / 10 mA (optional potential free NO-contact)

Average value functions

- Average value calculation activated by Start / stop input
- Average value calculation and measuring cycle effected by automatic recognition of the lower limit value
- Permanent average value calculation, adjustable averaging cycle time

Limit functions

Programmable range by upper and lower limit, only settings in the main range are accepted.

Generals

MP self-surveillance	Auto-Reset at distortions
Cycle time	100 per second
Average calculations	100 per second
Actualising of the output	100 per second
Maximum Start/Stop measuring time	655,33 seconds

Settings

Lower limit value (%)	00 until 99 %
Upper limit value (%)	00 until 99 %
Range (%)	00 until 99 %
Average calculation cycle (sec.)	00 until 99 seconds
Delay (sec.)	0,0 until 0,9 seconds
Mode switch	2-pole shift-miniature switch

12. Accessories

Miniature-spare fuse TR5 250 V/ 50 mA slow blowing (type Wickmann TR5 or Schurter MSF 250, pluggable)

Analogue moisture display. Horizontal or vertical scale. Standard scale 0-20 %. Others upon request.

Digital moisture display type FT 1 for programmable range.

13. Warranty

The common warranty regulations for the electrotechnical industry are valid.

14. Potential Error Sources

Error	Possible reason	Possible solution
Power-LED is not lit	Main power is not connected	Check main fuse or wire to main term.
	Internal fuse is blown	Replace fuse (look chapter 12 accessories)
Connected moisture sensor can not be calibrated	Wrong polarity of the sensor wire	Check the connection and try again
The power supply for the sensor at terminal 3 and 4 is not available or wrong	Short circuit of the sensor wire	Take off wire and check
	Short circuit in the sensor	Disconnect sensor , check voltages again and change sensor if available
Voltage output of the sensor does not change if you put your hand on the sensor surface	Prolongation line of the sensor is defect or wrong connection of the sensor	Check wiring and correct
	Moisture sensor defect	Change moisture sensor
No output voltage 0-10 V, even if calibration potentiometer 0 and % are fully open	Short circuit at the output terminals 0-10 VDC	Disconnect output and check wiring
Yellow LED “Measuring / Error” in field K is flashing	Lower limit is set larger than upper limit	Set the lower limit smaller than the upper limit value
	Upper limit is set larger than the range	Reduce the upper limit value underneath the range
	Upper and lower limit are set on “99”	Set limit values
The yellow LED “Start-input” is not lit, if the logic input gets a signal 24VDC	Wrong polarity of signal	Change polarity
	Voltage is wrong or not available	Check voltage
Average value calculator does not operate or operates faulty	Wrong setting of the mode switch	Check and change settings
During calibration of the signal processing device the output of the average value calculator is reacting too slow	Average calculation is already active	Activate transmission mode 1:1 with setting the lower and upper limit values onto “99”
In the automatic start / stop-mode the measuring cycle does not start	Lower limit value is set too high	Set the value lower
Automatic-Start/Stop mode works, but does not stop	Lower limit value is set on “00”	Set lower limit larger than “00”