Operating Manual BMGZ

610A / 611A / 620A

Digital Microprocessor Controlled Belt Scale

Version 1.20 03/2011 pw / ff

Firmware Version: 3.03

Hardware Rev. D / GDS 1.03

This operation manual is also available in German
Please contact your local FMS representative.

Diese Bedienungsanleitung ist auch in Deutsch erhältlich.
Bitte kontaktieren Sie Ihren nächstgelegenen FMS Vertreter.

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

c) Note for proper function

Note

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 FMS belt scale 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.

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

Some contacts on the terminal board of the 230VAC version are under 230V tension! Mortal danger! Disconnect power supply before open the housing!

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2 Definitions

Measuring uncertainty: Each measuring device has some inaccuracy, but however, inaccuracy is in a small, defined range of tolerance. This deviation of the measuring value referring to the effective value is called measuring uncertainty.

Measuring accuracy: Its behaviour is the contrary to the measuring uncertainty: Increases the uncertainty, decreases the accuracy, and also in reverse mode.

Force measuring bearing: Measuring device using strain gauges, which converts the load of the measuring roller into electric signals.

Proxy switch: Inductive distance sensor which is used for gearless and contact-less switching

3 System Components

The Belt scale for bulk conveyors BMGZ600A consists of the following components (refer also to fig. 1):

Measuring roller

- For acquisition of roll load and belt speed
- Flat or troughed measuring roller
- Simple mounting also to existing systems thanks to the all-purpose mounting elements
- All parts are fully zinc galvanized

Evaluation electronic unit

- For excitation of the sensors and amplifying of the measuring signal
- With operation panel for parametrization
- It is possible to connect external displays
- *Interface RS232*
- *Interface PROFI-BUS®*
- Some different housings available
- For 1 measuring roller (BMGZ610A/611A) or 2 measuring rollers (BMGZ620A)
- Additional digital inputs and outputs for extended functions such as proportioning belt weighers, etc. (BMGZ611A)

External display

- *Telecounter to show the charge value*
- *Analogue display to show the actual flow rate*

External printer

- *For printing of charge values or daily output*
- *driven by RS232 interface*

(components in italic letters are option)

4 System Description

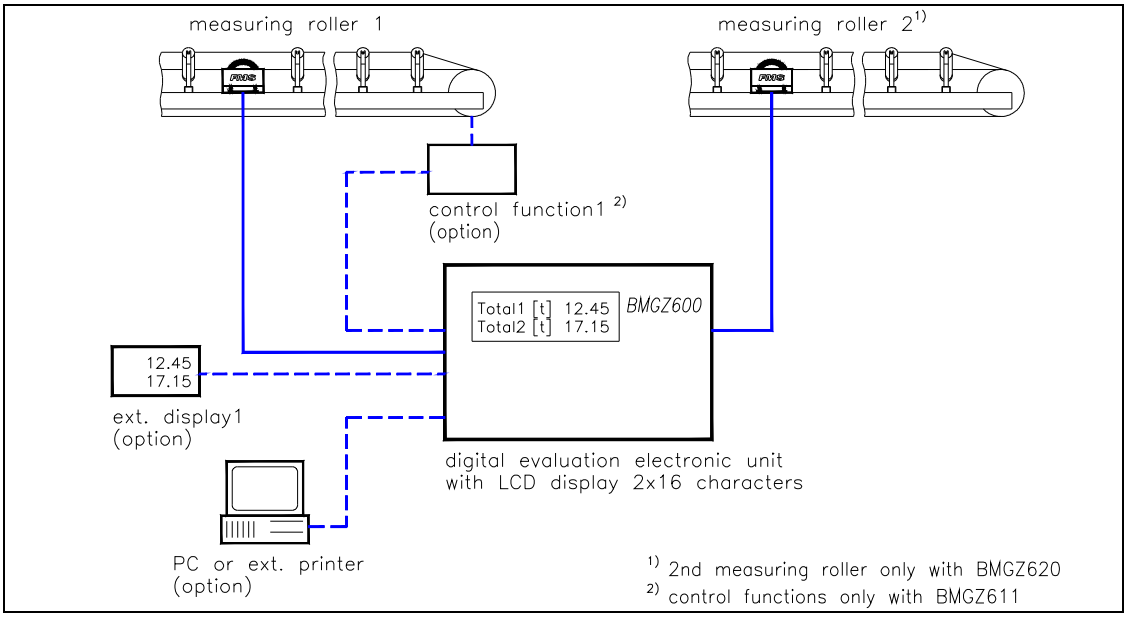

fig. 1: Basic structure of the belt scale BMGZ600A B620001e

4.1 Functional Description

The belt scale for bulk conveyors works according to the principle:
Flow rate = weight * speed
The measuring roller measures the load on the belt and the belt speed. This information are transmitted to the electronic unit, which calculates actual flow rate, charge weight and daily output. Using a printer, the raised quantity can be printed to a charge protocol at any time.

4.2 Measuring Roller

The measuring roller is mounted between 2 support rollers under the belt. The measuring roller whose shape corresponds to the shape of the belt is supported on both sides on FMS force measuring bearings. The measuring bearings take up the force directly at its origin and do not show any sensitivity to belt direction. Therefore, no force decoupling gear is necessary.
The measurement of belt speed is achieved by means of a pulse generator which is integrated in one of the force measuring bearings.
The maintenance-free, robust and compact design provides high reliability and durability.

4.3 Evaluation Electronic Unit

The evaluation electronic unit contains a micro-processor 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 6 keys and a 2x16 characters display in the front of the electronic unit. All inputs are saved in an EEPROM. The evaluation electronic unit has no jumpers or trimmers to keep most accurate long-time and temperature stability.

The versions BMGZ610A/611A provide evaluation of 1 measuring roller; version BMGZ620A provide evaluation of 2 measuring rollers. Versions BMGZ611A provide additional digital inputs and outputs which can be used for extended control functions such as proportioning belt scales, etc.
All versions support an RS232 interface. For ex. a master computer (PC) or an external printer may be connected to the RS232 interface. As options, an additional board with *PROFI-BUS®* interface and a printer are available.

4.4 External Displays

Analogue displays can be connected to the analogue outputs to show the actual flow rate. Telecounters can be connected to the digital pulse outputs (relays) to show the charge value.

4.5 Block Diagram

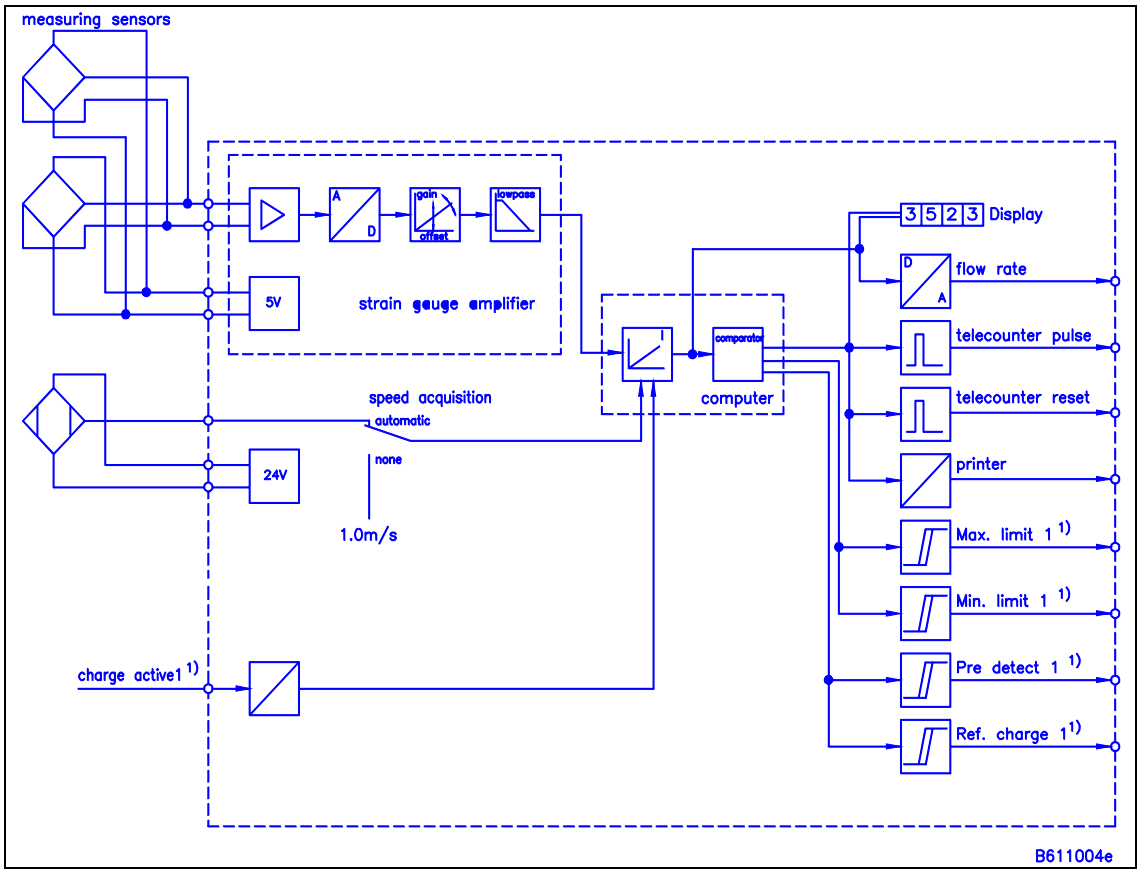

fig. 2: Block diagram of belt scale BMGZ611A B611004e

The block diagram above shows the function of the belt scale BMGZ611A. The BMGZ610A has no outputs *Min. limit 1*, *Max. limit 1*, *Pre detect charge 2* and *Ref. charge 2*, and has no inputs and as *charge activ 1*.
The belt scale BMGZ620A is designed according to the same principle, but all components are doubled to evaluate 2 measuring rollers.

5 Dimensions

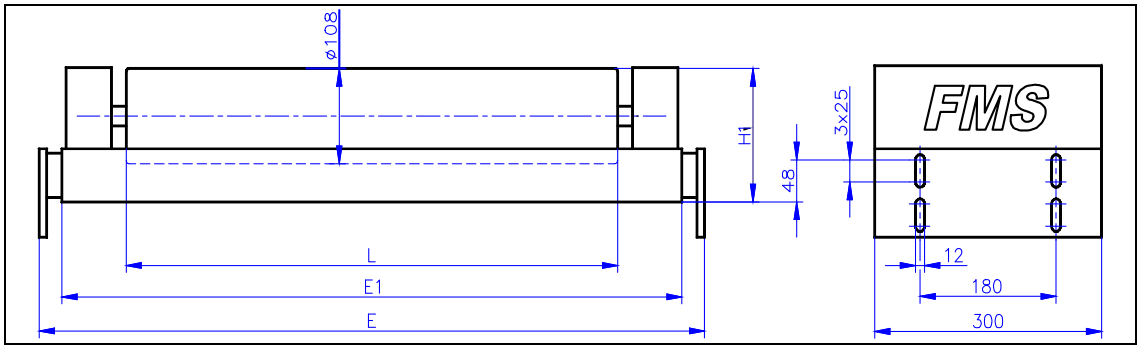

fig. 3: Dimensions of flat measuring roller B600014e

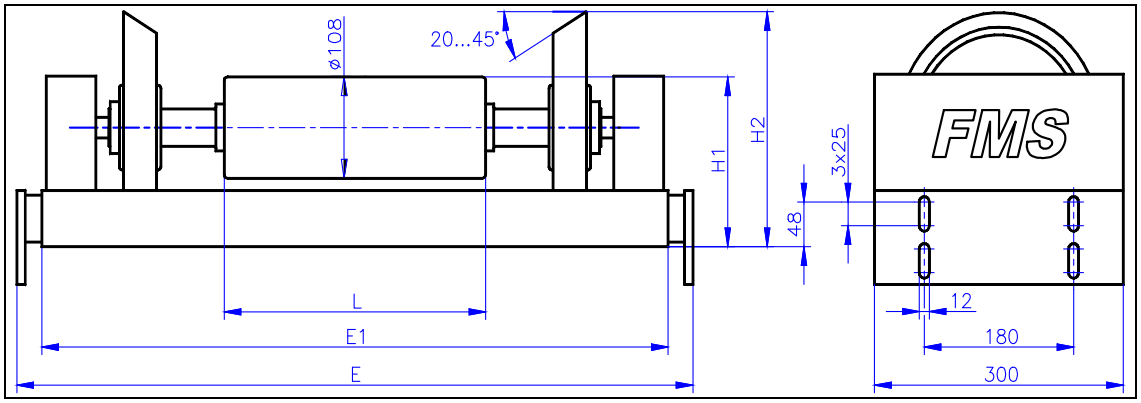

fig. 4: Dimensions of troughed measuring roller B600015e

belt width	type	L	E	E1	H1	H2
	flat measuring roller:					
400	BMGZ 021.020... 1)	400	620...970	580	150	
500	BMGZ 021.030...	500	720...1070	680	150	
650	BMGZ 021.040...	650	870...1220	830	150	
800	BMGZ 021.050...	800	1020...1370	980	150	
1000	BMGZ 021.060...	1000	1220...1570	1180	150	
	troughed measuring roller:					
500	BMGZ 041.02.... 1)	200	640...990	600	180	232
650	BMGZ 041.03....	250	740...1090	700	180	250
800	BMGZ 041.04....	315	850...1200	810	180	250
1000	BMGZ 041.05....	380	1065...1415	1025	240	352
1200	BMGZ 041.06....	465	1200...1550	1160	240	352

1) suffix for measuring bearing dimension will be determined basing on the application data.
(other versions on request.)

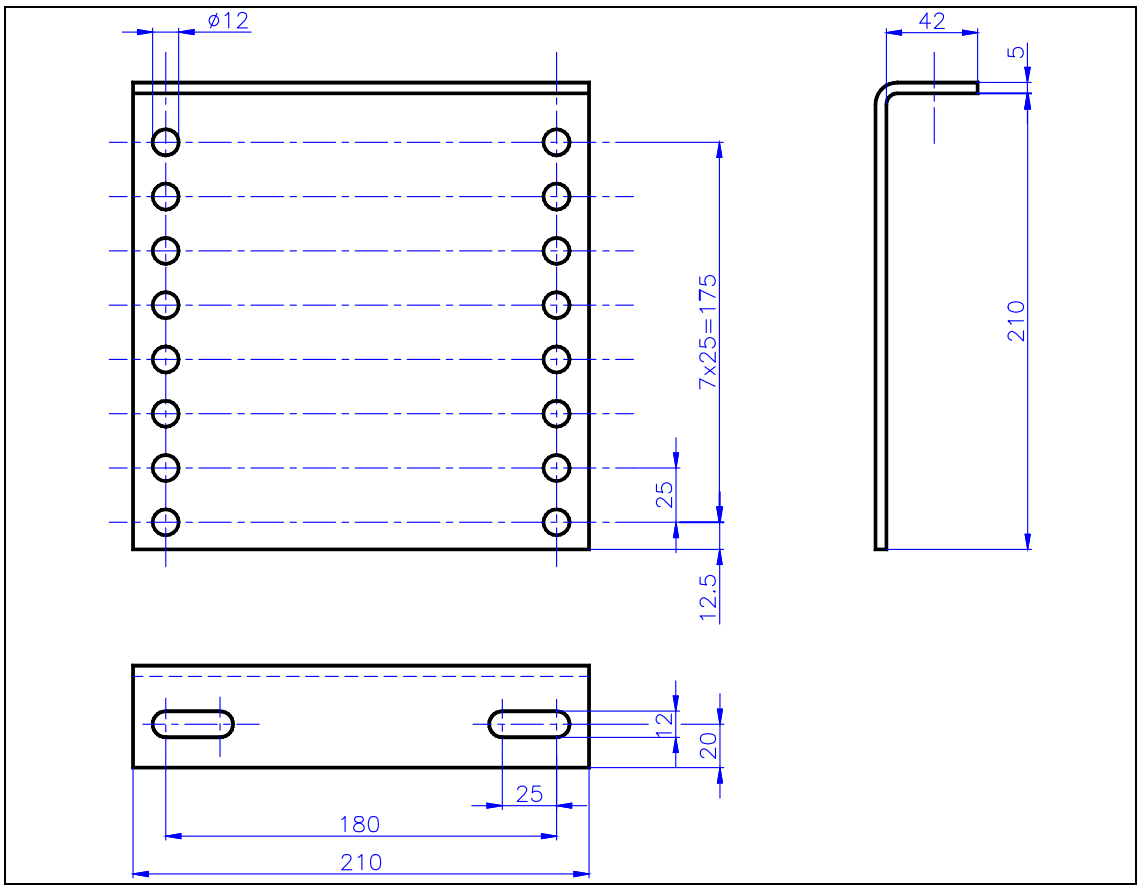

fig. 5: Dimensions of mounting brackets for measuring rollers B600016e

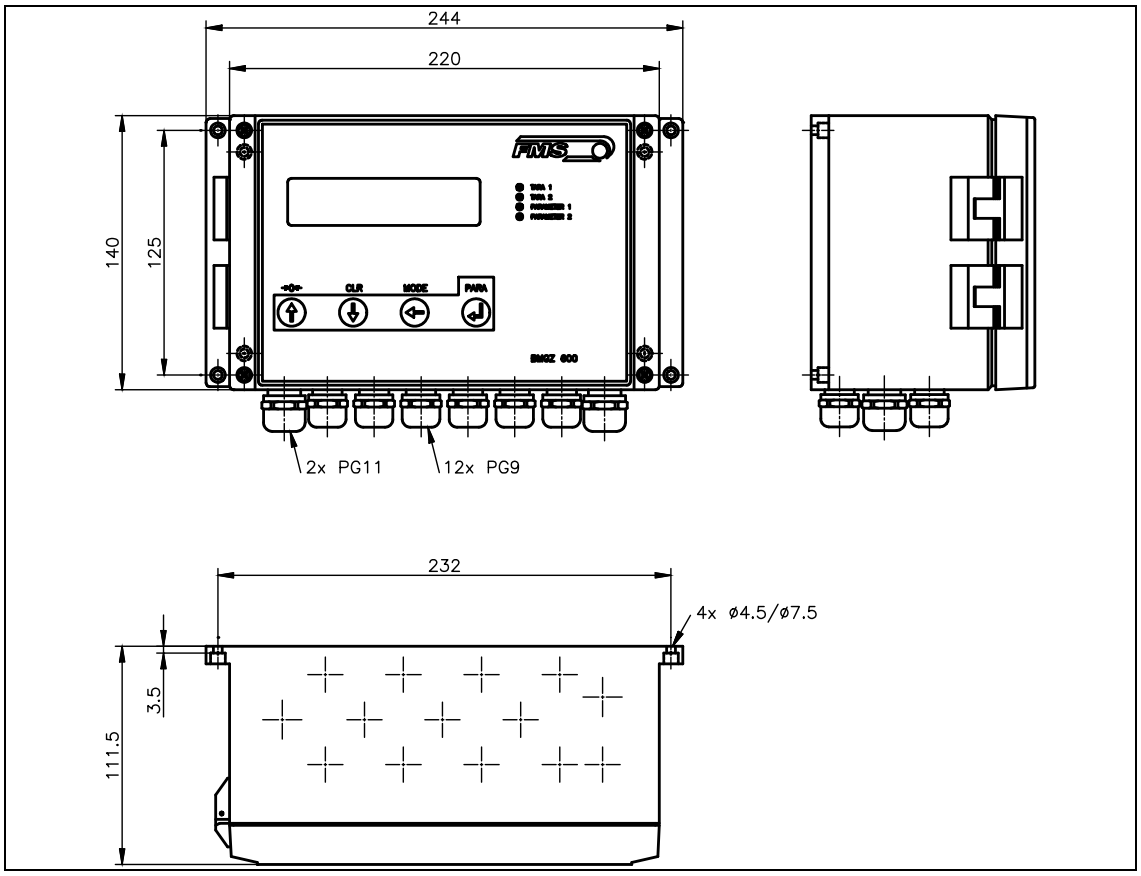

fig. 6a: Dimensions of the electronic unit (housing „W“). B600006e

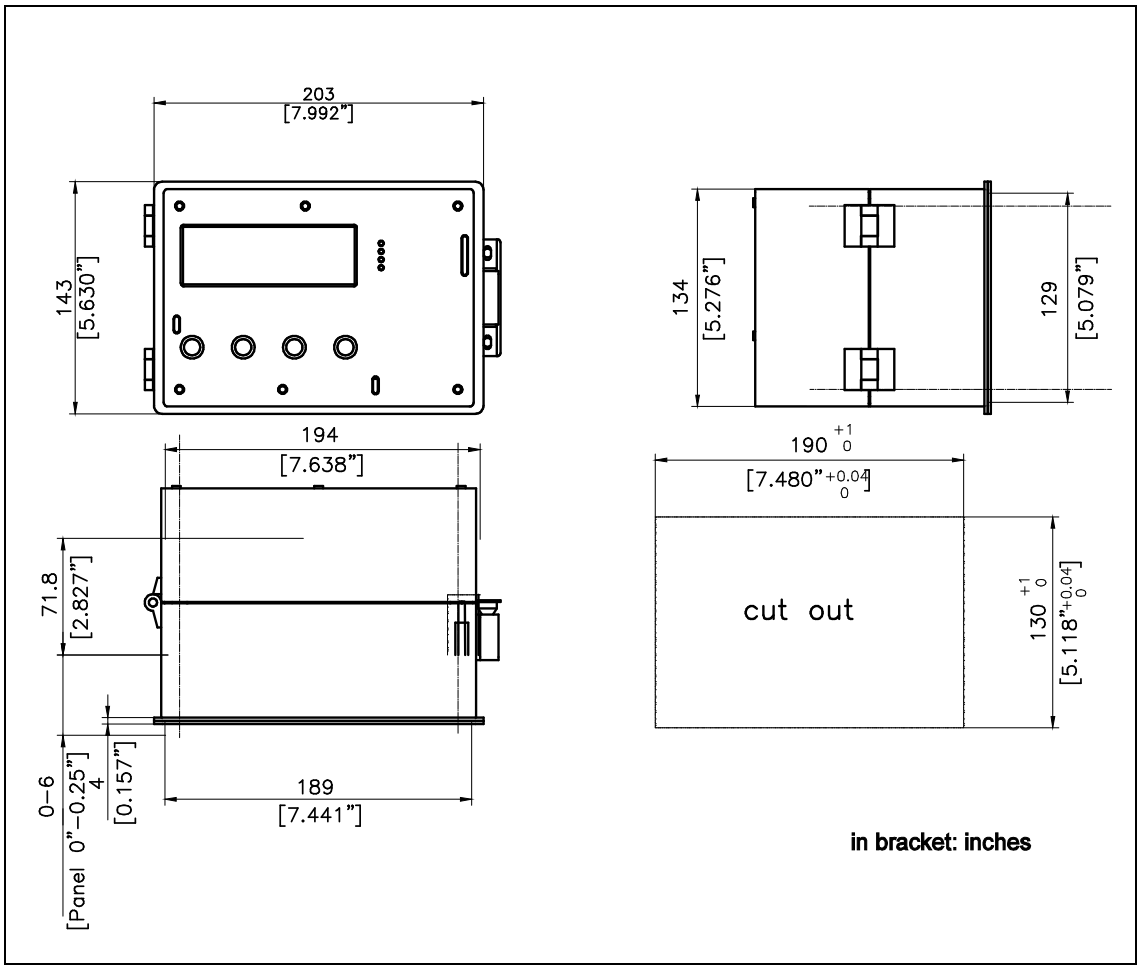

fig. 6b: dimensions of the electronic housing (panel mounting BMGZxxA.S)

B600033e

Housing variant	description
BMGZ6xxA.W	standard housing for wall mounting (fig. 6a)
BMGZ6xxA.S	housing for panel mounting (fig. 6b)
BMGZ6xxA.K	standard housing with additional steel cabinet 400x400x275mm

6 Installation and Wiring

> ⚠ *Caution*
>
> *Proper function of the FMS belt scale 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.*

6.1 Determination of Mounting Place of the Measuring Roller

To preserve fault-free operation and best accuracy, the following points should be observed when designing the conveyor and determining the location for the measuring roller:

- Belt tension should be kept constant. A weighted belt tensioner should be provided for this, if possible. Deviations of the belt tension have direct influence to the measuring result.
- Belt rise must be only as high as the bulk material on the belt cannot move downwards.
- Flow rate should be within a range of 20...100% of the rated nominal performance. If flow rate is lower, measuring accuracy will be less.
- The belt scale should be placed as far away as possible from the material feed to allow the bulk material to settle.
- The belt scale should be placed as far away as possible from the drive roller to minimize the influence of belt tension.
- The belt scale may only be installed in a straight section of belt with constant trough.

> ☞ *Note*
>
> *Movement of the bulk material on the belt or changes of the belt tension will cause immediately and non-controllable changes of the measuring value and will therefore enlarge the measuring uncertainty. Proper operation is provided only if the points above are followed.*

Mounting position

There are in fact three mounting positions possible: horizontal conveyor (fig. 7), inclined conveyor (fig. 8), and angled conveyor (fig. 9). In any way, the measuring roller should be located as far away as possible from the drive roller.

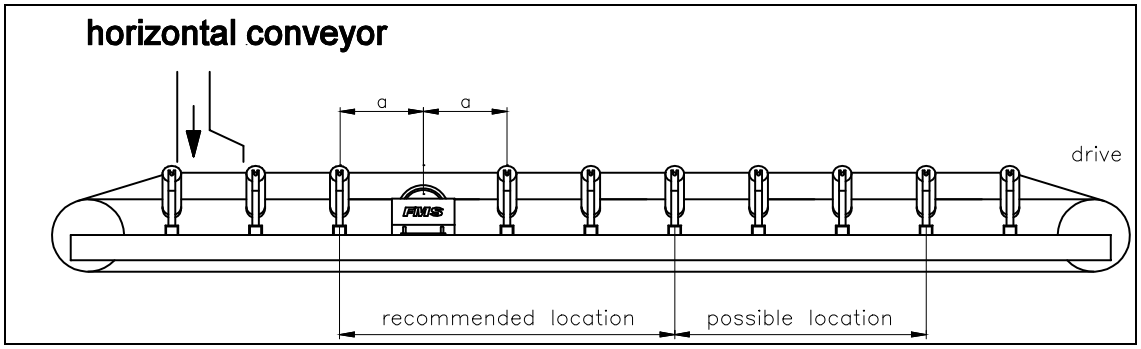

fig. 7: The measuring roller has to be placed as far away from the material feed as the bulk material may settle before passing the measuring roller. B600001e

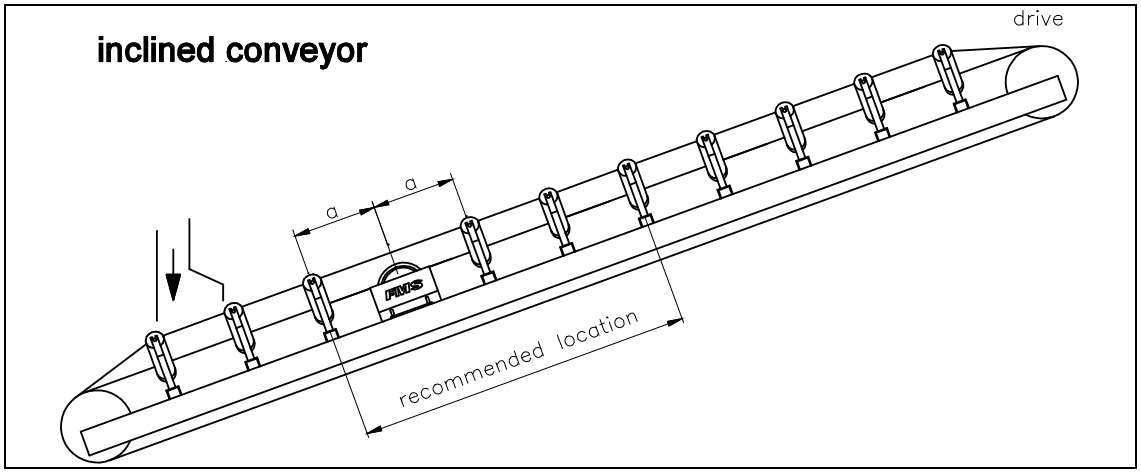

fig. 8: To minimize influences of the belt tension, the measuring roller should be located as far away as possible from the drive roller. B600002e

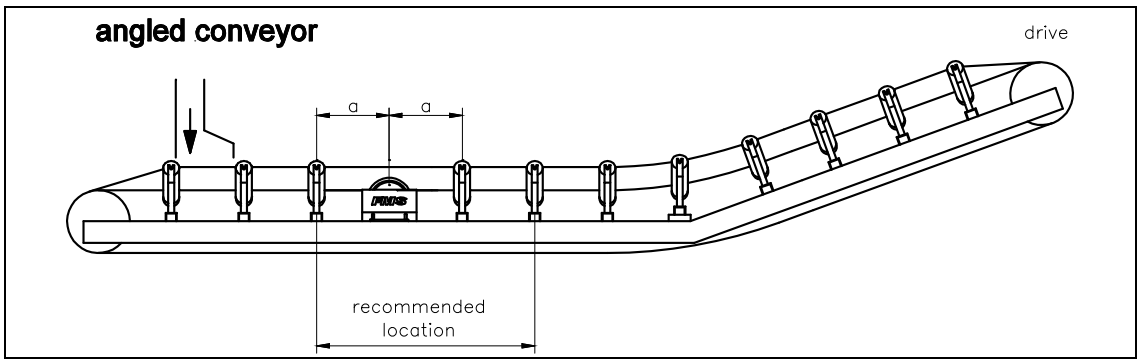

fig. 9: The measuring roller has to be placed as far away from the turn as the belt will be supported in the whole weighing range (measuring roller ±2...3m) under all conditions. B600003e

Note

When designing the belt scale, the size of the force measuring bearings was determined based on the maximum flow rate, belt speed and distance between the support rollers (dimension „a“). Therefore, the measuring roller has to be mounted equidistant to the neighbouring rollers (±25mm). Axis of measuring roller and neighbouring rollers must be parallel.

6.2 Mounting the Measuring Roller

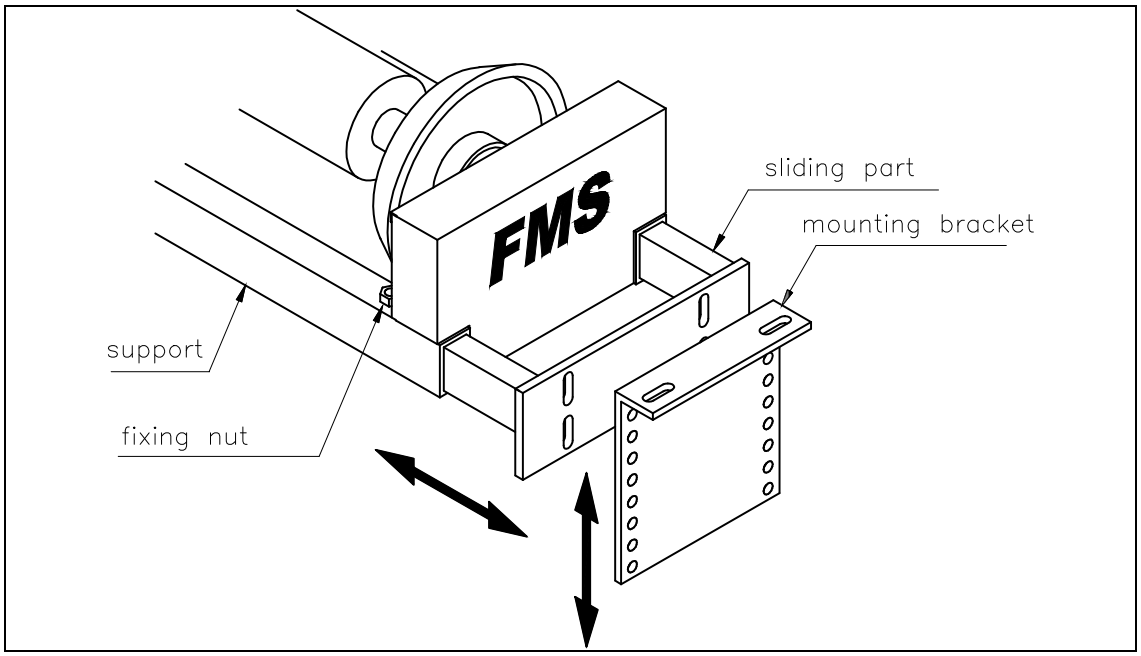

fig. 10: The mounting devices are adjustable in many ways to fit best to the channels.
B600018e

The measuring rollers have a sliding part on each side of the support for easy and flexible adapting to the width of the channels (fig. 10). The sliding parts allow variable adjusting of the width in a range of 350mm. They will be fixed with 4 fixing screws M12 (Pos. „1“ in fig. 12).
The sliding parts may be combined in any way with the mounting brackets, so that many different mounting positions are possible (fig. 11).

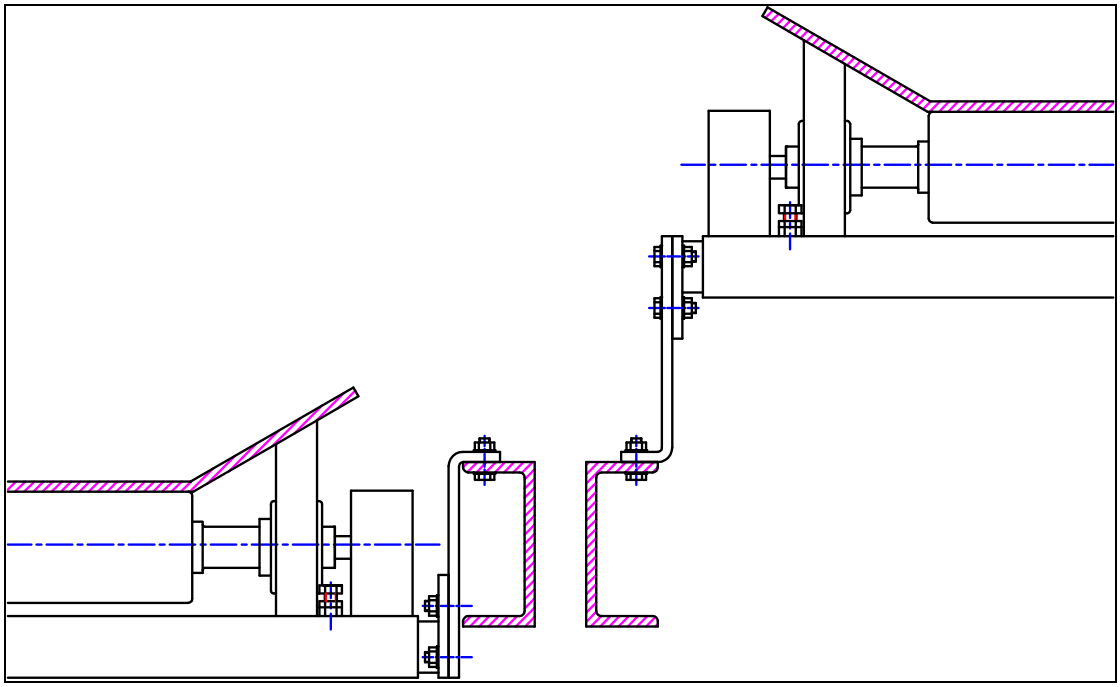

fig. 11: By good combination of the mounting devices, many different mounting positions are possible
B600019e

Aligning the height of the measuring roller

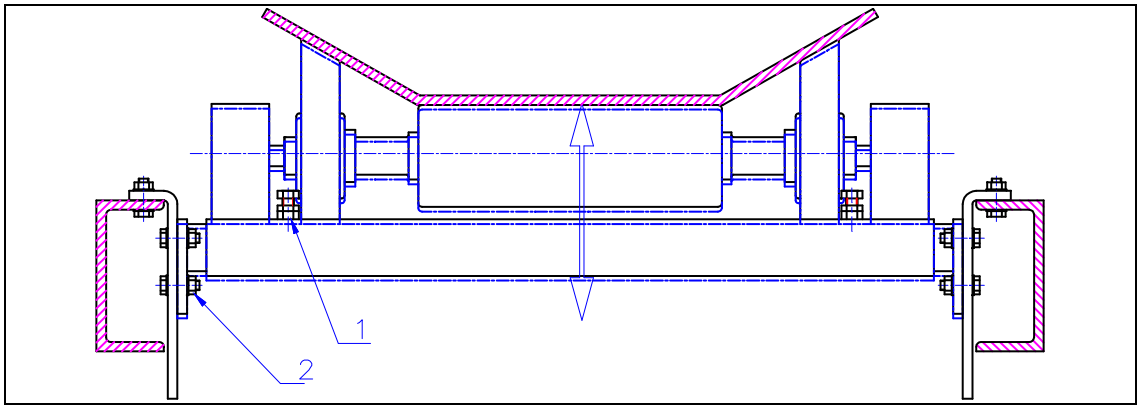

fig. 12: The middle part of the measuring roller must be aligned with the neighbouring support rollers. B600004e

After mounting the measuring roller on the channels, the height of the roller must be aligned to the neighbouring support rollers (fig. 12). This is done as follows:

- Lift belt with wooden block or equivalent.
- Put up 2 cords across the neighbouring support rollers.
- Loosen the sided fixing screws „2“ on mounting brackets and sliding parts carefully (Attention: Don’t loosen the fixing screws „1“ again!)
- Adjust the height of the measuring roller by knocking with a plastic hammer the sliding part until the measuring roller will just reach the cord.
- Tighten the sided fixing screws „2“ again.

Aligning the bevelled side disks (only troughed measuring roller)

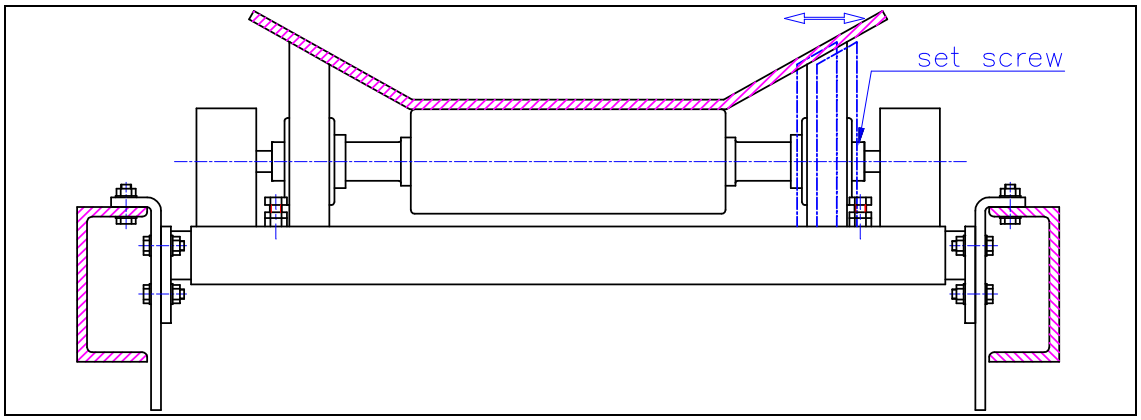

fig. 13: The side disks (only troughed measuring roller) have to be adjusted laterally until they are aligned with the neighbouring side rollers B600005e

The bevelled side disks have to be aligned as follows (fig. 13):

- Lift belt with wooden block or equivalent.
- Put up a cord across the neighbouring angled support rollers.
- Loosen the set screw on the set collar.
- Adjust the bevelled side disk.
- Tighten the set screw on the set collar.

- Repeat the procedure for the 2nd side disk.

6.3 Mounting the Electronic Unit

The evaluation electronic unit is available in variants as follows:

- BMGZ6xxA.W : Housing for wall mounting (aluminium; IP54) (fig. 6)
- BMGZ6xxA.S : Housing for panel mounting (aluminium; Front IP54, Back IP00)
- BMGZ6xxA.K : mounted in steel cabinet 400x400x275 (IP55)

Protection class IP55 is achieved only by closed cover otherwise IP54. For outdoor mounting, the robust steel cabinet version (BMGZ6xxA.K) is recommended.

6.4 Mounting the BMGZxxA.S

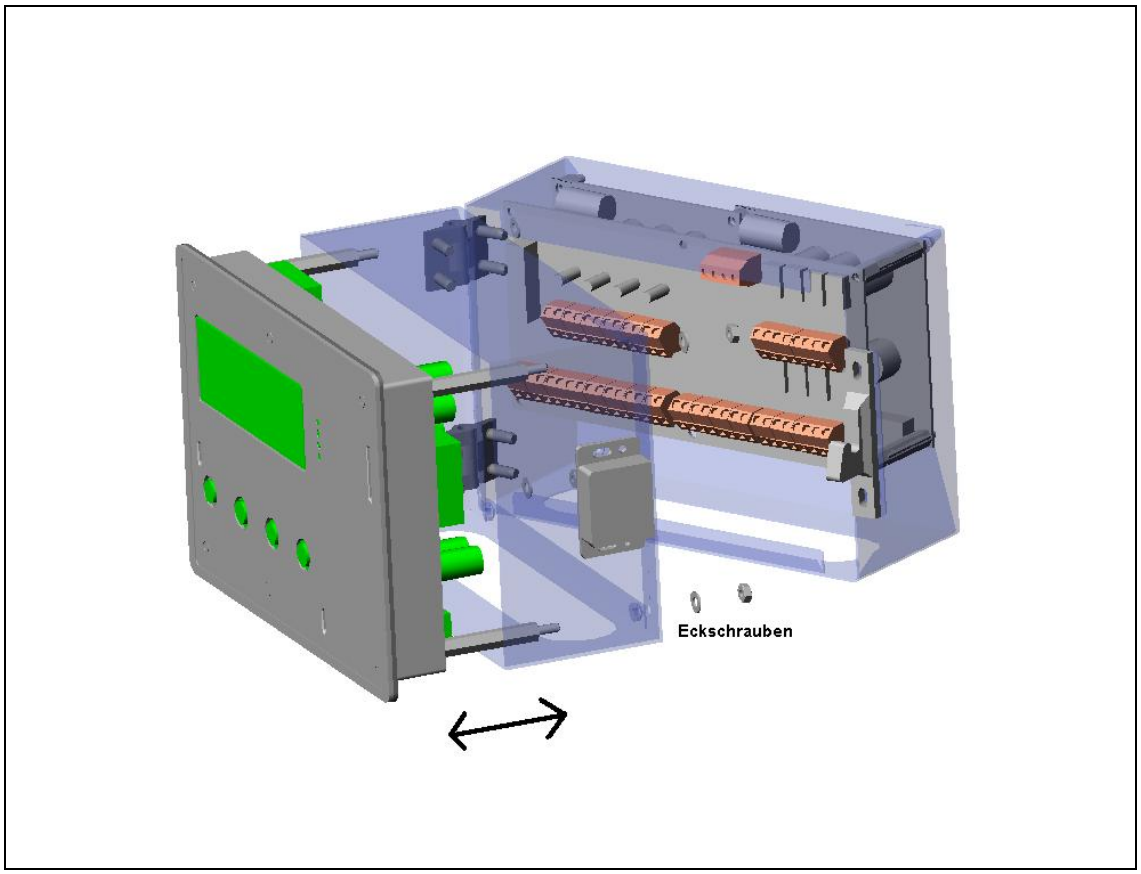

fig. 13b: mounting BMGZ610A, BMGZ611A, BMGZ620A **B600029d**

Mounting of the housing for panel:

1. Unscrew all 4 side screws (“Eckschrauben” see fig. 13b)
2. Remove all cables which are connected with the electronic board of the front panel (cables connectors).
3. Unscrew the earth cable of the electronic board.
4. Take away the front panel from the box.
5. Put the front panel into the opening in the cabinet from the front side.
6. Mount back and front side of the box on the back side of the cabinet
7. Put in place and screw the 4 fixations screw.

8. Replace the earth cable and all the cables with connectors back to place.

6.5 Wiring of the Connection Cable

Wiring between measuring roller and evaluation electronic unit must be done with the shipped 8-wired, shielded twisted-pair cable (4x2x0.75mm²). Length of the cable is done according to customer specification (specify when ordering). The cable must be installed separate from power lines to prevent any inductive disturbances.

On the measuring roller side, the plastic sheath will be removed on a length of about 14cm. The white wire is not used. The shield will be connected to terminal 5.

On the electronic unit side, the plastic sheath will be removed on a length of about 25-54cm. The white wire is not used. The shield will be connected to the PG gland referring to fig. 14.

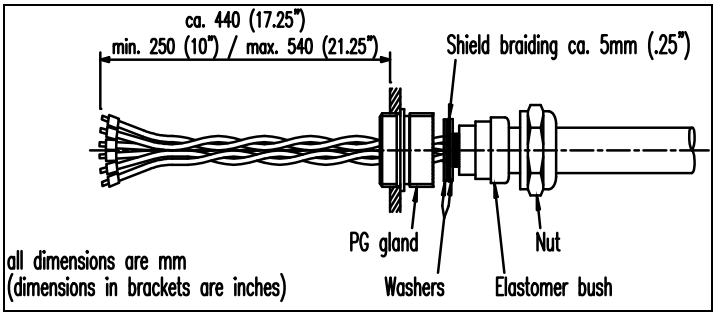

fig. 14: Shield connection to the electronic unit B600024e

The contacts will be made referring to fig. 15 or wiring table. The shield of the cable must be connected on both sides.

If a housing version „K“ (with steel cabinet) is used, the cable will be led through the steel cabinet using a 8-pole plug („13.3 List of parts“, Pos. 64).

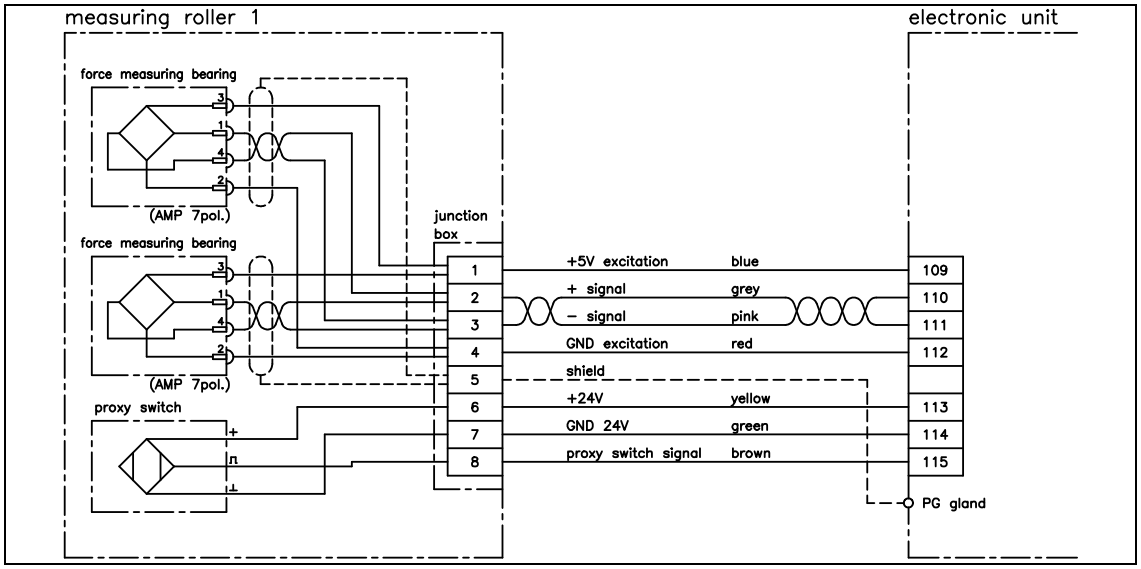

fig. 15: Wiring of the measuring roller to the evaluation electronic unit B610002e

6.6 Wiring Information

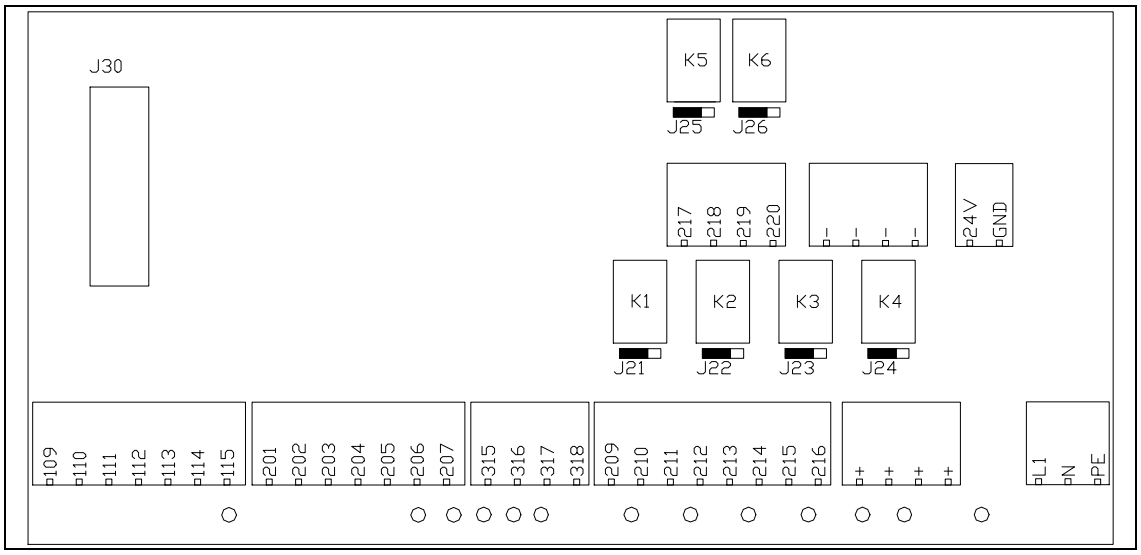

fig. 16: Terminal arrangement on terminal board B600007

Connection	wire colour	#
Measuring roller 1		
+5V excitation	blue	109
+ signal	grey	110
- signal	pink	111
Gnd excitation	red	112
+24V	yellow	113
Gnd 24V	green	114
Proxy switch signal	brown	115
Measuring roller 2 2)		
+5V excitation	blue	201
+ signal	grey	202
- signal	pink	203
Gnd excitation	red	204
+24V	yellow	205
Gnd 24V	green	206
Proxy switch signal	brown	207
Analogue outputs		
A1: 0...10V (roller 1)		16
Gnd		17
A1: 0/4...20mA(roller 1)		18
Gnd		19
A2: 0...10V (roller 2) 2)		26
Gnd		27
A2: 0/4...20mA (roller2)2)		28
Gnd		29
Telecounter		
Relay 1 (Pulse 1)		209
Relay 1		210
Relay 2 (Reset 1)		211
Relay 2		212
Relay 3 (Pulse 2) 2)		213
Relay 3		214
Relay 4 (Reset 2) 2)		215
Relay 4		216

Connection	wire colour	#
Digital inputs		
+24V		+
Gnd 24V		-
Print roller 1		315
Tare roller1		316
Charge active roller 1 1) Tare roller2 2)		317
Print roller 2 2)		318
Dig.output roller 1 1)		
Relay 1 (Imp. ext. counter)		209
Relay 1		210
Relay 2 (Reset ext. counter)		211
Relay 2		212
Relay 3 (Pre detect 1)		213
Relay 3		214
Relay 4 (Ref.charge 1)		215
Relay 4		216
Relay 5 (Min.limit 1)		217
Relay 5		218
Relay 6 (Max. limit 1)		219
Relay 6		220
RS232		
TxD		80
RxD		81
Gnd		82
Profibus		
B (out)		90
A (out)		91
B (in)		92
A (in)		93
Main supply		
24VDC		„24V“
Gnd 24VDC		„GND“
230VAC	brown	„L“
GND 230VAC	blue	„N“
Protection / earth	yellow green	PE

1) only BMGZ 611A
2) only BMGZ 620A

6.7 Wiring of Main Supply

The evaluation electronic unit is available for supply voltage of 24VDC or 230VAC. All electronic units have 6 terminals for wiring of main supply. But only the terminal pair corresponding to the nameplate is internally connected (refer to wiring table).
Main supply will be done with a power cord 3x1.0mm². The protection wire will be connected to the earth screw on the terminal board using a ring terminal for M3 screws. Arrangement of the terminals is shown on wiring table (fig. 16).

Caution

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

Danger

Some contacts on the terminal board of the 230VAC version are under 230V tension! Mortal danger! Disconnect power supply before open the housing!

6.8 Wiring Diagram External Displays

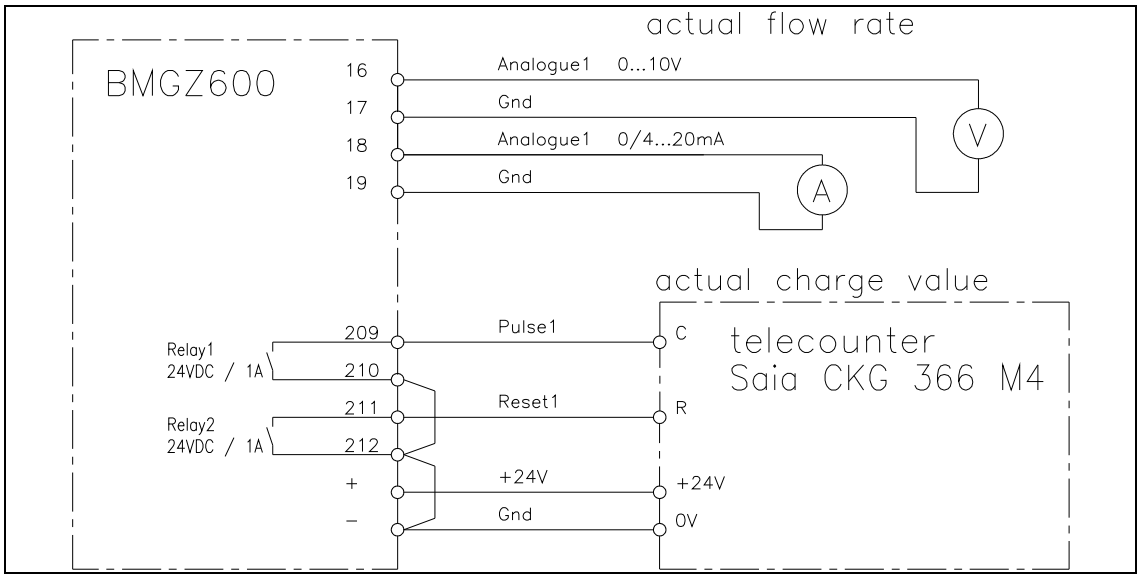

fig. 19: Wiring of the external displays for measuring roller 1 B600011e

Telecounter (actual charge value)

The evaluation electronic unit provides a pulse signal for each measuring roller which can be used to drive a telecounter or equivalent. With this, for ex. a charge value display for each roller can be made.
The telecounter for measuring roller 1 (for ex. Saia CKG 366 M4) will be wired according to wiring table and fig. 19. The telecounter for measuring roller 2 (only BMGZ620A) will be wired according to the different terminal assignment (refer to wiring table).

Scaling of the signal (how many kg for each pulse) is parametrized with the parameters Pulse o*utput 1* or. *Pulse output 2*.

Analogue display (actual flow rate)
According to the wiring table analogue signals which are proportional to the actual flow rate are provided. They can be used for external analogue displays. The analogue outputs for measuring roller 1 will be wired according to wiring table and fig. 19; the outputs for measuring roller 2 will be wired according to the different terminal assignment (refer to wiring table).
The output A1 (measuring roller 1) can be parametrized for a tension signal (0...10V) or a current signal (0...20mA or. 4...20mA). Refer to parameter *Analogue output 1*. Depending on parametrization, a voltage output or current output can be used.
Scaling and eventually filtering of the signals is parametrized with the parameters *Max. output 1...2* and. *Lowpass output 1...2*.

6.9 Wiring of the Additional Digital Inputs and Outputs

The version BMGZ611A has additional digital inputs and outputs. The digital inputs are activated by applying 24VDC (terminal +) (ref to fig. 20). There can also be used a external 24VDC source. But then, the external ground has to be connected with terminal „Gnd 24VDC“ (terminal -).
The digital outputs are led internally to relays 24V / 1A. The contacts can be taken from the terminals in any kind (J21...J26) (fig. 20).

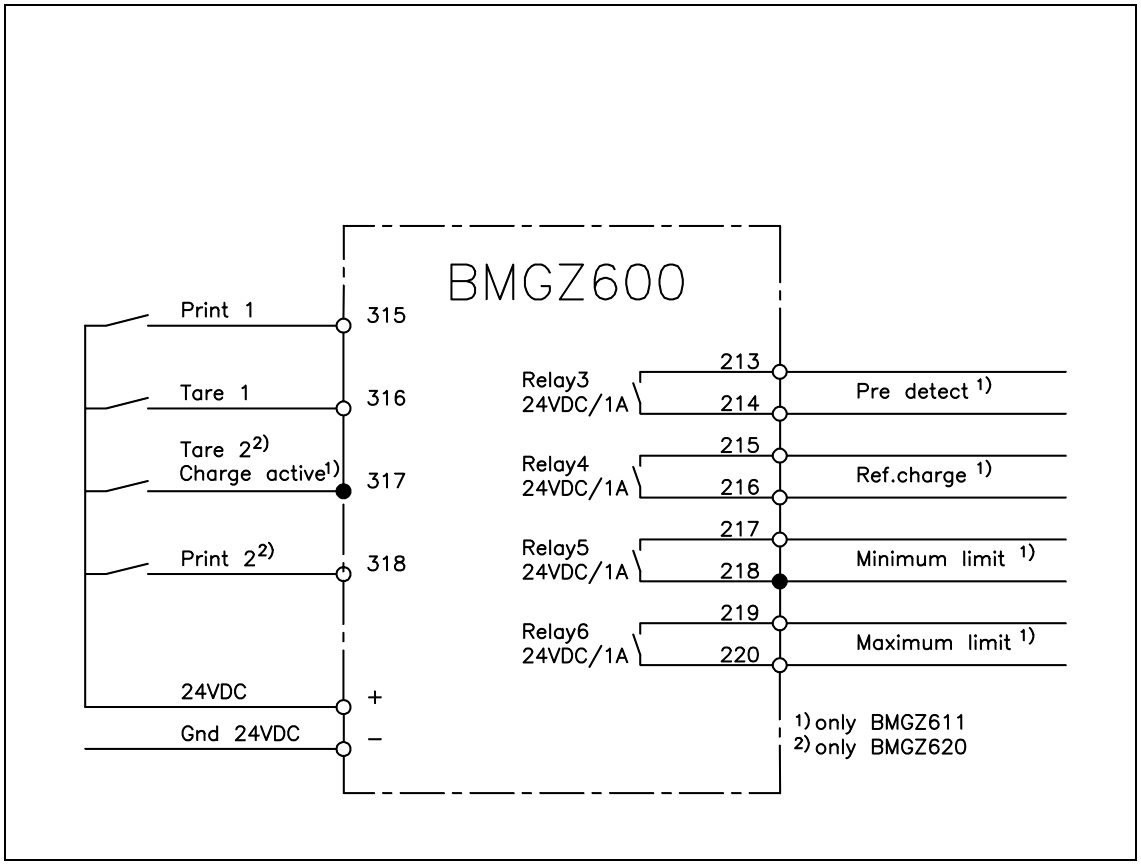

fig. 20: Wiring of the digital inputs and outputs B600025e

The additional digital inputs and outputs can be used for some control functions. Fig. 21 shows a suggestion for a proportioning belt scale:

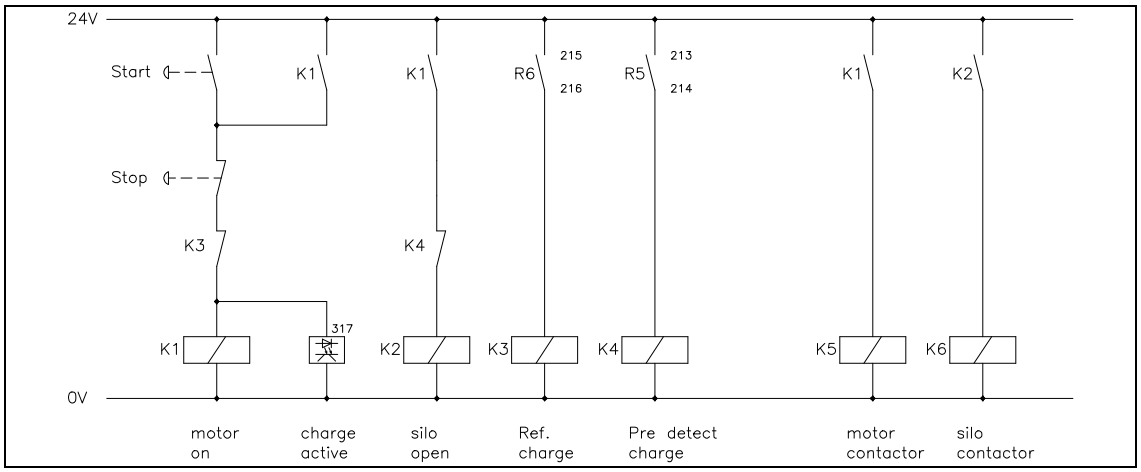

fig. 21: Wiring diagram for proportioning belt scale (The power part is not shown).

B611003e

In the diagram shown in fig. 21, a new charge is started by the start key. The conveyor belt will be stopped automatically when the reference charge value is reached. It can also be stopped manually by the stop key.
The power part with the wiring diagram for the motors is not shown in fig. 21. The motor wiring diagram must be designed from the installation designer individually.

Parametrization

For shutting the silo and stopping the conveyor belt, the evaluation electronic unit has to be told the needed charge weight. This is done by using the parameter *Ref. charge 1.* The silo will be closed when reaching the parameter *Predetect charge 1* (refer to „8.4 Description of the parameters“).

7 Operation

7.1 View of the Operating Panel

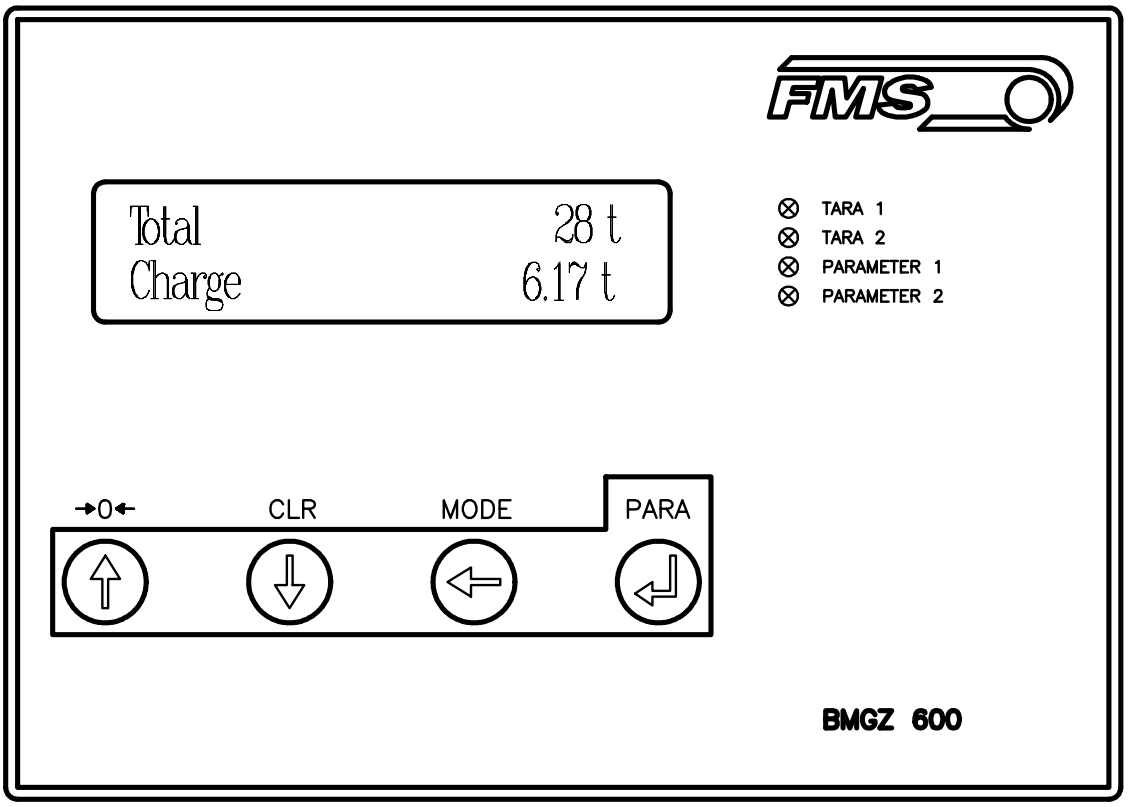

fig. 22: The operating panel BMGZ600A B600008e

7.2 State Diagram of Main Operating Menu

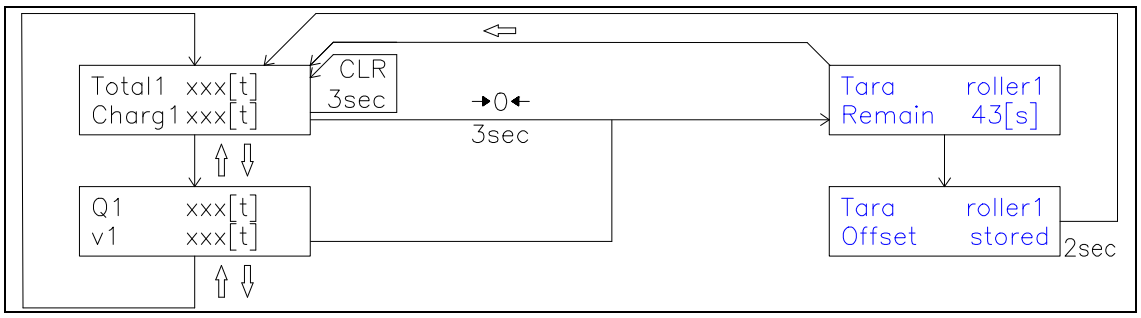

fig. 23: State diagram BMGZ610A/611A B600021e

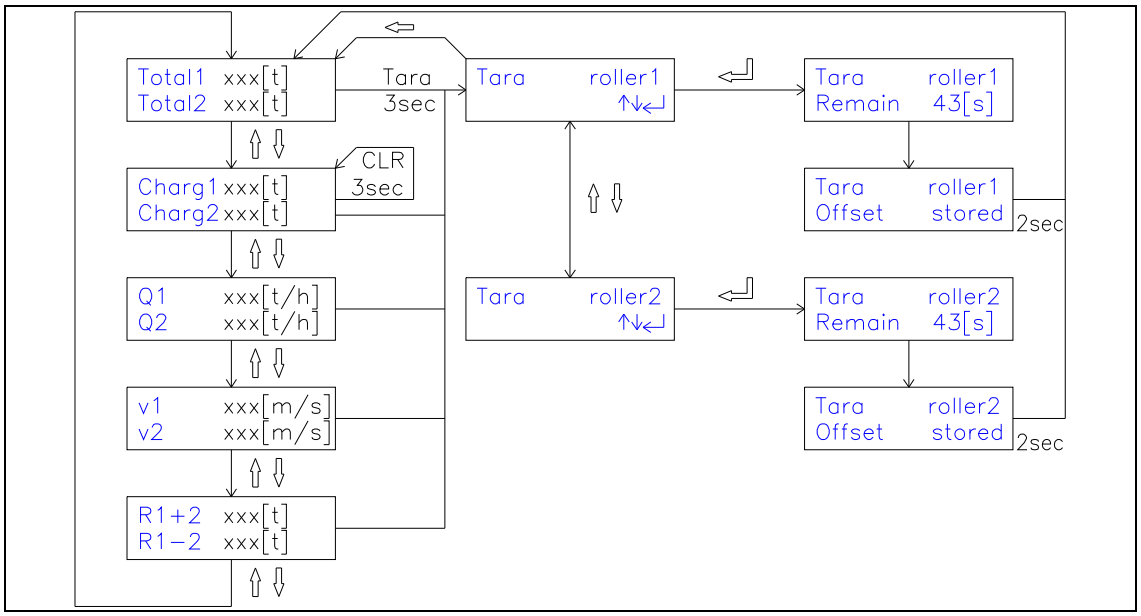

fig. 24: State diagram BMGZ620A B600022e

7.3 Setting the Installation-specific Parameters

For correct calculation of the flow rate, the following parameters must be set or checked during initial operation (refer to „8. Parametrization“):

- *Belt length roller 1*
- *Diameter roller 1*
- *Pulses roller 1*
- *Distance roller 1*
- *Nominal force roller 1*
- *Speed detection roller 1*
- *Speed belt roller 1* (if parameter *Speed detection roll 1* is set to „none“
- the speed will be 1m/s)

Using a evaluation electronic unit BMGZ620A (2 measuring rollers), the parameters above must be set also for the 2nd roller.

Note

The parameters above have direct influence to the accuracy of the belt scale. If the values differ from the real installation conditions, a useful weighing result is not available. Without inputting and checking of those parameters, the belt scale should not be set into operation!

7.4 Tare Program (Zero Alignment)

The display of the flow rate is set to zero by the tare program. To execute the tare program, proceed as follows (refer also to fig. 23/24):

- Start conveyor belt empty, without any load
- Start tare program with →0← key for 3 seconds
- **BMGZ620A:** Choose the roller to be tared with ↑ ↓ keys; confirm with ↵ key
- The evaluation electronic unit measures the empty belt for 2 complete rotations. The remaining time for completion is shown in the display. (The tare program can be aborted at any time with the ← key.)
- If the measurement is completed, the evaluation electronic unit calculates the new offset value from the average signal and saves it in the parameter *Offset roller 1* or into *Offset roller 2* depending on selected roller. The display shows the message „New offset saved!“ for 2 seconds. The tare program has then completed.
- **BMGZ620A:** The tare program must be run with the 2nd measuring roller.

> ***Note***
>
> *FMS recommends running the tare program daily to compensate eventual changes of belt tension, etc. If the belt scale begins to count slowly forwards or backwards with the belt running empty, it is time at the latest to run the tare program again.*

7.5 Calibration

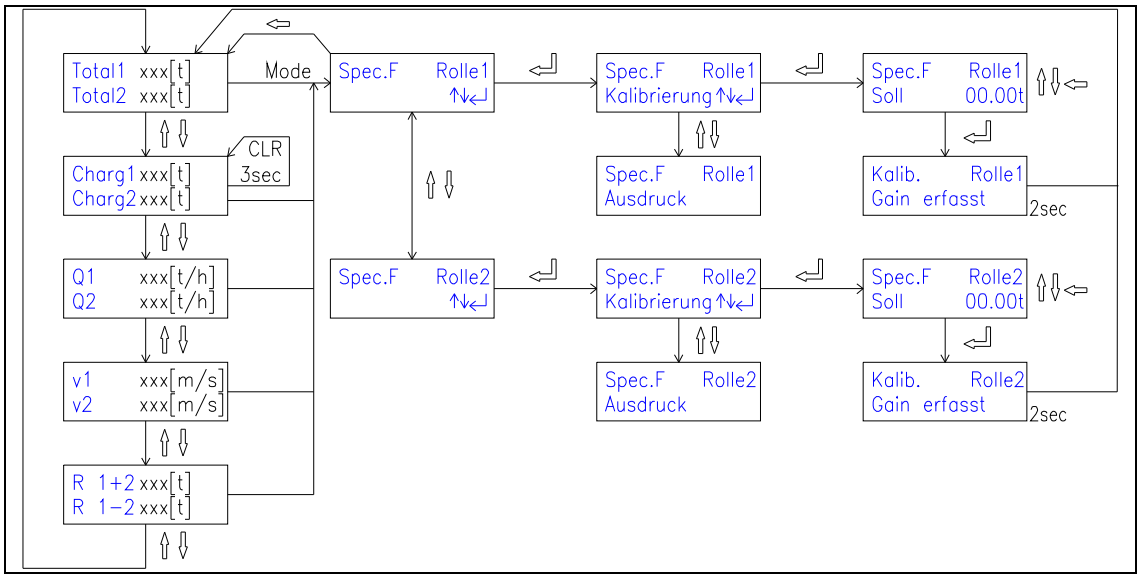

fig. 23: State diagram BMGZ620A B600028e

For accurate calculation of the flow rate, the measuring roller has to be calibrated during initial operation as follows:

- Tare the measuring roller (refer to „7.4 Tare program“)
- Switch display to „charge“ with ↑ ↓ keys; set charge to zero by pressing *CLR* key for 3 seconds

- Run a charge of any weight over the belt scale, for example 10 tons, and then load it into a truck of known tare weight (refer to „7.6 Weighing a charge (manual)“).
- Check the load on the weighbridge as exact as possible and compare with the value shown in the belt scale display
  - If the deviation is higher than 1...2% (stationary installations) and. 2...3% (mobile installations), the electronic unit must be told the effective weight determined by the weighbridge. This is done with the parameter function *Calibration roller 1* and *Calibration roller 2* (refer to „9.3 Description of the parameters“).
  - **BMGZ620A:** Calibration must be done for the 2nd measuring roller.

> ☞ *Note*
>
> *The belt scales BMGZ610A/611A/620A are calibrated by the customer. Measuring errors done when weighing the calibration charge have direct influence to the accuracy of the belt scale. Therefore, the charge value in the display must not be cancelled during calibration, and the charge weight has to be verified as exact as possible.*
>
> ☞ *Note*
>
> *Since the accuracy of the belt scales BMGZ610A/611A/620A is under massive influence of customer manipulations, they are not certified by the Bureau of Standards. This is to take into account by the customer or operating personal.*

7.6 Weighing a Charge Manually

To weigh a charge, proceed as follows:

- Start empty conveyor belt
- Switch display to „charge“ with ↑ ↓ keys; set charge to zero by pressing 3 seconds the *CLR* key
- Open silo; run needed bulk material over the conveyor belt
- Shut silo. Wait until belt is empty
- In the display, the feed quantity is shown under „charge“.

7.7 Weighing a Charge Automatically (only BMGZ611A)

If a proportioning belt scale is installed (refer to „6.9 Wiring of the additional digital inputs and outputs“), a charge can be weighed also automatically:

- Input needed charge weight in parameter *Ref. charge 1* (refer to „9. Parametrization“)
- Press „Start“ key (refer to fig. 20); conveyor belt starts and silo opens automatically. The bulk material runs over the belt scale. When Pre detect value

is reached (parameter *Pre detect charge*), the silo will be shut automatically. The conveyor belt is still running.

- If the charge is completely weighed (parameter *Ref. charge 1*), the conveyor belt stops automatically.
- With the „stop“ key, the silo can be shut and the conveyor belt can be stopped at any time.

7.8 Operating the Printer (optional)

Manual printing of charge protocol

The actual charge values may be printed out on a printer for protocol purposes. Printing is started by pressing the *Mode* key in with *Special functions* Mode according to fig. 25 (for measuring roller 1 or measuring roller 2). After printing the charge protocol, the charge number is incremented. The charge value has to be reset to zero by pressing the *CLR* key for 3 seconds.
The printing can also be started by applying 24VDC to the digital inputs *Prt1* (terminal 315) or. *Prt2* (terminal 318).

Automatic printing of charge protocol (BMGZ611A)

If the parameters *Ref. charge 1* contain values higher than zero, the procedure described under „manual printing of charge protocol“ will be started at each time the digital input „charge active“ (terminal 317) is reset.

Protocol printer

To drive the protocol printer, the parameter *RS232-Mode* must be set to „Protocol printer“.

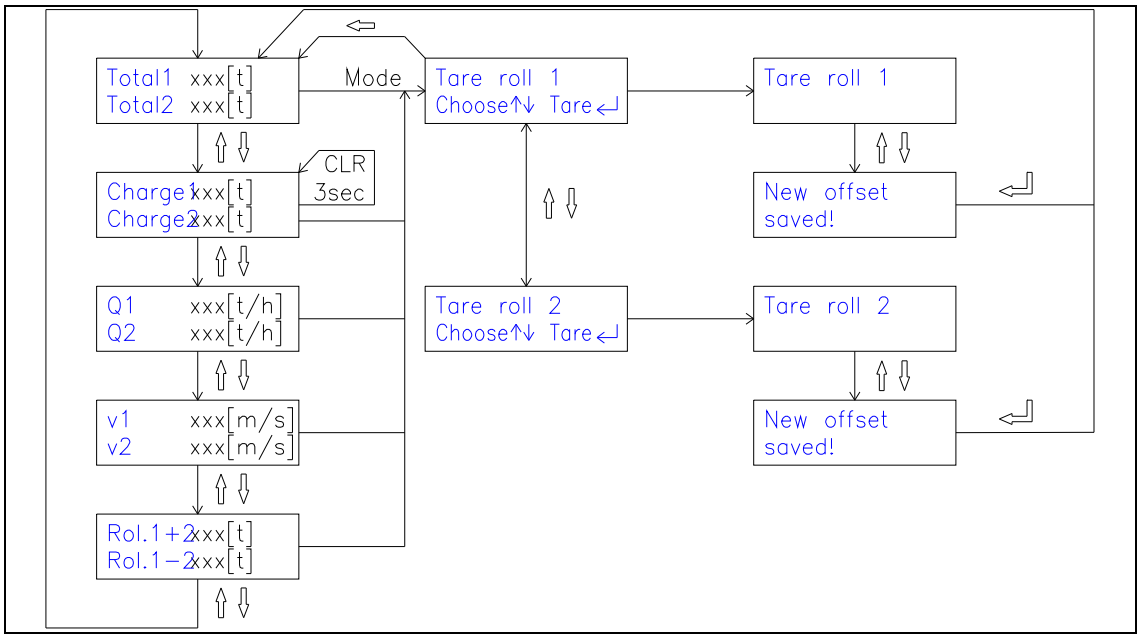

fig. 25: State diagram overview level B600023e

8 Serial Interface RS232

A RS232 interface command consists of 6 ASCII characters. It is always terminated with <CR> (e.g. XRV001 <CR>). The first ASCII character determines the module number. A replay telegram consists of 7 ASCII characters including decimal point (XXXXXXX). Unused characters are filled with "space" characters. The replay doesn't contain the command anymore (e.g. XRV001). It contains only the requested data.

8.1 RS232 Interface Commands for BMGZ600 Series

The belt scale controllers of the BMGZ600 series have following operation parameters:
Totalizator, Charge Counter, Flow Rate, Belt Speed, gross A/D-Value and Identifier.

Operation Parameters:

Read Operation Parameters	Description	RS232 Command	Replay Telegram
BMGZ610/611/620	Read Totalizator	1RV001<CR>	XXXXXX<CR>
BMGZ 620	Read Totalizator 2	2RV001<CR>	XXXXXX<CR>
BMGZ610/611/620	Read Charge Counter	1RV002<CR>	XXXX.XX<CR>
BMGZ 620	Read Charge Counter 2	2RV002<CR>	XXXX.XX<CR>
BMGZ610/611/620	Read Flow Rate	1RV003<CR>	XXXXX.X<CR>
BMGZ 620	Read Flow Rate 2	2RV003<CR>	XXXXX.X<CR>
BMGZ610/611/620	Read Belt Speed	1RV004<CR>	XXXX.XX<CR>
BMGZ 620	Read Belt Speed 2	2RV004<CR>	XXXX.XX<CR>
BMGZ610/611/620	Read gross A/D-Value	1RV005<CR>	XXXXX<CR>
BMGZ 620	Read gross A/D-Value 2	2RV005<CR>	XXXXX<CR>

Example for Charge Counter (185.55):
1RV002<CR> 185.55<CR>
1234567 (characters)

Identification of Operation Values:

Read Operation Values	Description	RS232 Command	Replay Telegram
BMGZ 610 / 611	Identification	1RV009<CR>	BMGZ 610<CR> BMGZ 611<CR>
BMGZ 620	Identification	1RV009<CR>	BMGZ 620<CR>

9 Parameter Setting

9.1 Parameter List System

Parameter	Unit	Default	Min	Max	Actual
Language	German, English, French, Italian				_____
Lowpass display	[Hz]	1.0	0.1	9.0	_____
Identifier	[-]	84	2	199	_____
Baud rate	[-]	9600	2400	19200	_____
Time/date	[-]				_____

9.2 Parameter List Roller 1/2[2)]

Parameter	Unit	Default	Min	Max	Actual
Gain	[-]	1.000	0.100	9.000	_____
Offset	[Digit]	0	-8000	8000	_____
Belt length	[m]	10	1	5000	_____
Diameter roller	[mm]	108	10	1000	_____
Pulses roller	[-]	4	1	100	_____
Distance	[mm]	2000	100	5000	_____
Nominal force	[N]	1000	1	5000	_____
Max. flowrate	[t/h]	0	0	5000	_____
Speed detection	Auto, none	Auto			_____
Pulse output	[kg]	100		1, 10, 100, 1000	_____
Analogue Outputs	0-10V, 0-20mA	0-10V, 4-20mA			_____
	0-10V, 4-20mA				
Lowpass output	[Hz]	10.0	0.1	20.0	_____
Max. output	[t/h]	1000.0	1.0	3200.0	_____
Charge number	[-]	1	0	10000	_____
Predicted charge [1)]	[t]	0.00	0.00	100.00	_____
Ref. Charge [1)]	[t]	0.00	0.00	320.00	_____
Min. limit switch [1)]	[t/h]	10.0	0.0	3200.0	_____
Max. limit switch [1)]	[t/h]	1000.0	0.0	3200.0	_____

[1)] only with BMGZ611A

9.3 State Diagram Parameter Setting

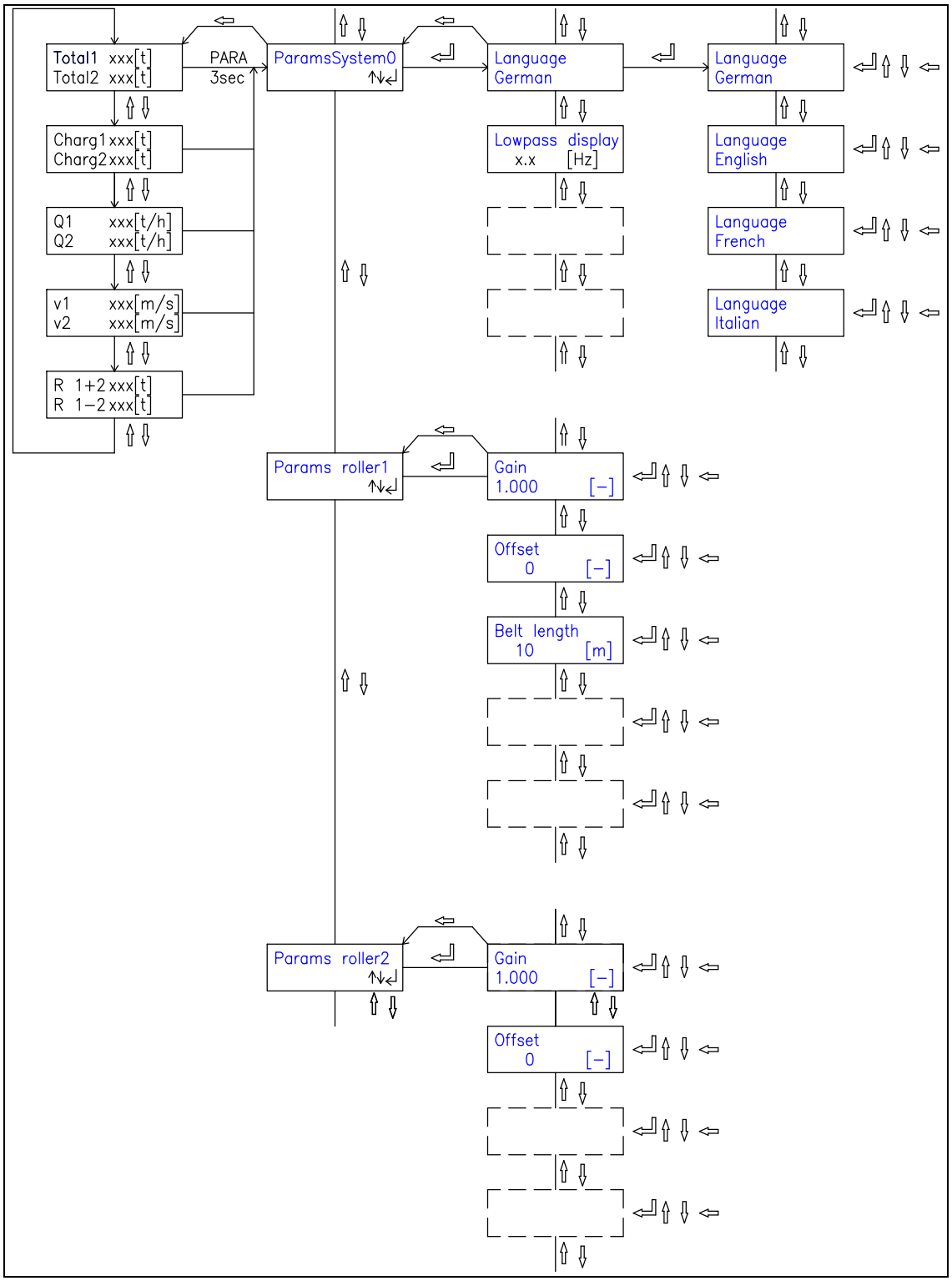

fig. 26: State diagram BMGZ610A/620A. The version BMGZ621A has its own but equivalent parameter menu. B600020e

9.4 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

> ☞ *Note*
> ***Not all parameters described below are supported from each belt scale. „9.1 Parameter list" shows which version supports which parameters.***

Language

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

Range: German, English, French and Italian

Lowpass display

Use: The electronic unit provides a lowpass filter to prevent noise which is added to the display values. This parameter stores the limit frequency.
The lowpass display filter is independent of the other filters.

Range:	0.1 to	10.0	**Default:**	1.0
Increment:	0.1		**Unit:**	[Hz]

Identifier

Use: This parameter is used to identify the electronic unit when connecting PROFIBUS®, CAN-Bus or Device Net©.

Range:	2 to	127	**Default:**	84
Increment:	1		**Unit:**	[-]

Baud rate RS232

Use: Setting of the transmission rate of the RS232 interface.

Range:	2400, 4800, 9600, 19200 baud	**Default:**	9600

Time/date

Use: The electronic unit has a built-in real time clock. To adjust the clock, the actual time and date will be stored in this parameter. This procedure provides for ex. switching between summer time and winter time.

Date and time are printed on the charge protocols.

Range: 00:00 01.01.2000 to 23:59 31.12.2100

Gain roller 1/2

Use: This parameter stores the value determined with *Calibration roller 1*. If automatic calibration cannot be proceeded, a manually determined value can be inputted here.

Range:	0.100	to	9.000	**Default:**	1.000
Increment:	0.001			**Unit:**	[-]

Offset roller 1/2

Use: This parameter stores the value determined with the tare program (refer to „7.4 Tare program“) in [digit]. If the automatic tare program cannot be proceeded, a manually determined value can be inputted here.

Range:	-8000	to	8000	**Default:**	0
Increment:	1			**Unit:**	[Digit]

Belt length roller 1/2

Use: This parameter stores the winding length of the belt of measuring roller 1. This value is needed for the tare program.

Range:	1	to	5000	**Default:**	10
Increment:	1			**Unit:**	[m]

Diameter Roller 1/2

Use: This parameter stores the diameter of the measuring roller 1 (refer to nameplate of measuring roller). FMS measuring rollers have a standard diameter of 108mm.

Range:	10	to	1000	**Default:**	108
Increment:	1			**Unit:**	[mm]

Pulses roller 1/2

Use: This parameter stores the number of vanes of the pulse generator (refer to nameplate of the measuring roller). The value corresponds to the number of pulses for each roller rotation.

Range: 1 to 100 **Default:** 4

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

Distance roller 1/2

Use: This parameter stores the distance between 2 neighbouring support rollers (2 x dimension „a“; refer to fig. 7...9).

Range: 100 to 5000 **Default:** 2000

Increment: 1 **Unit:** [mm]

Max. flowrate roller 1/2

Use: With this parameter the maximum flowrate of the belt scale is set. If the flowrate is lower then 5% of set value it is not counted. When this parameter is set to 0 the 5% limit is switched off and the counter integrates always the value.

Range: 0 to 5000 **Default:** 0

Increment: 1 **Unit:** [t/h]

Nominal force roller 1/2

Use: To get correct values, the evaluation electronic unit has to know the nominal force of the used force measuring bearings (refer to nameplate of the measuring roller). The nominal force is done according to customer specification.

Range: 1 to 5000 **Default:** 1000

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

Speed detection roller 1/2

Use: If this parameter is set to „automatic“, the belt speed is acquired with the pulse generator integrated to the measuring roller (standard setting).
If this parameter is set to „none“, belt speed is not acquired. The flow rate then is calculated using the fixed value of 1m/s. If the belt is running or not is indicated by the digital input „Belt running roller 1“ (terminal 317; only BMGZ611A).

Range: Automatic, None **Default:** Automatic

Pulse output roller 1/2

Use: The pulse output of the measuring roller shows a single pulse after a known feeding quantity. This parameter is used to determine how many kg correspond to one pulse.

Range: 1, 10, 100, 1000 **Default:** 100

Unit: [kg]

Analogue output 1/2

Use: The analogue output provides a voltage signal (0...10V) and a current signal alternativ 0...20mA or 4...20mA. The signal is proportional to the actual flow rate of the measuring roller.

Range: 0...20mA, 4...20mA **Default:** 0...20mA

Lowpass output 1/2

Use: The electronic unit provides a lowpass filter to prevent noise which is added to the analogue output (flow rate, programmable signal). This parameter stores the limit frequency. This filter is independent of the other filters.

Range: 0.1 to 20.0 **Default:** 10.0

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

Max. Output 1/2

Use: The flow rate value stored in this parameter provides an analogue signal of 10V or 20mA. Resolution is 12 bit.

Range: 1.0 to 5000.0 **Default:** 1000.0

Increment: 0.1 **Unit:** [t/h]

Charge number 1/2

Use: This parameter contains the number of the actual charge. After each printing of a protocol (refer to „7.8 Operating the printer“), the value is incremented by 1.
Here, the charge number may be manually reset to zero.

Range: 0 to 100000

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

Pre detect charge roller 1 (BMGZ611A)

Use: If the difference between *Ref. charge roller 1* and actual charge weight of roller 1 is smaller than the value stored in this parameter, the relay 3 (terminals 213/214) will be activated. With this, for ex. a kind of braking ramp or shutting of the silo can be programmed.

The value stored in this parameter should nearly correspond to the bulk material weight which is still on the conveyor belt after shutting the silo and which still has to pass the belt scale.

Range: 0.00 to 100.0 **Default:** 0.00

Increment: 0.01 **Unit:** [t]

Ref. charge roller 1 (BMGZ611A)

Use: If the actual charge weight of measuring roller 1 reaches the reference value stored in this parameter, the relay 6 (terminals 215/216) will be activated. With this, for ex. a proportioning belt scale can be programmed.

Range: 0.00 to 500.0 **Default:** 0.00

Increment: 0.01 **Unit:** [t]

Min. limit roller 1 (BMGZ611A)

Use: The relay 5 (terminals 217/218) is activated as long as the flow rate of roller 1 remains under the minimum limit value stored here.

Range: 0.0 to 5000.0 **Default:** 10.0

Increment: 0.1 **Unit:** [t/h]

Max. limit roller 1 (BMGZ611A)

Use: The relay 6 (terminals 219/220) is activated as long as the flow rate of roller 1 exceeds the maximum value stored here.

Range: 0.0 to 5000.0 **Default:** 1000.0

Increment: 0.1 **Unit:** [t/h]

9.5 Service Mode 1

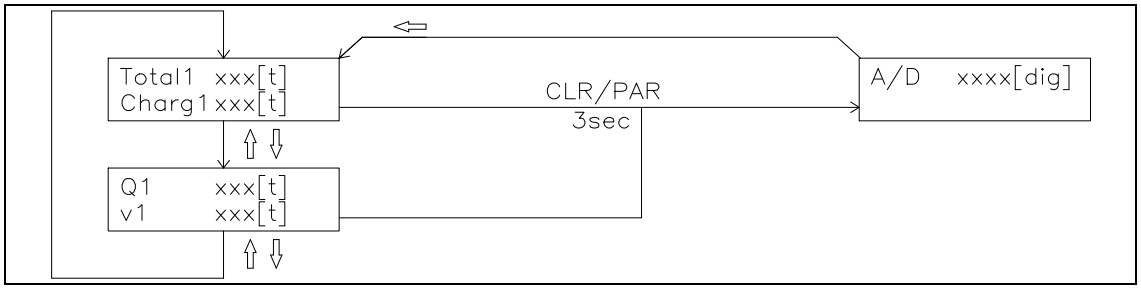

fig. 27: Service mode 1 menu BMGZ610A/611A. The versions BMGZ620A have its specific but equivalent service mode menu. B600026e

The service mode 1 contains parameter for checking the AD value of the force sensors which are integrated into the measuring roller. The service mode 1 is activated by pressing the CLR and PAR keys for 3 seconds.

AD value roller 1/2

Use: This parameter shows the source signal of the corresponding measuring roller before offset compensation. It may be helpful for trouble shooting.

Range: –8192 to 8191 **Unit:** [Digit]
(to be inspected only)

9.6 Service Mode 2

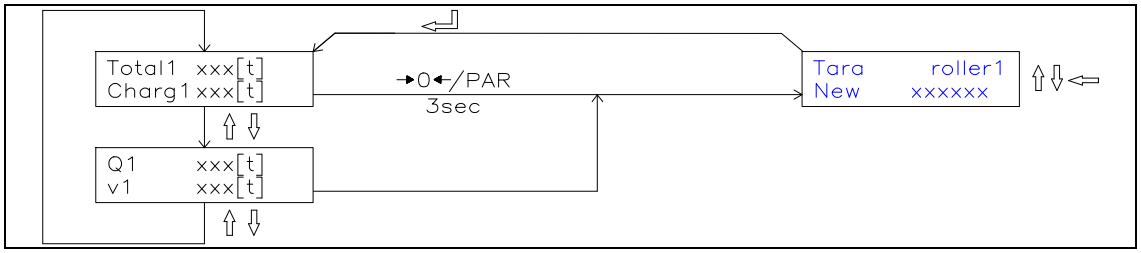

fig. 27: Service mode menu 2 BMGZ610A/611A. The versions BMGZ620A have its specific but equivalent service mode menu. B600027e

The service mode 2 contain the parameter to set the totalizator, when changing the electronic unit for example. **The service mode should only be activated by trained service personal.** The service mode 2 is activated by pressing the →0← and PAR keys for 3 seconds. Generally, the service parameter can be changed the same way as the other parameters.

Set Totalizator 1/2

Use: When replacing an evaluation electronic unit, the values of the totalizators can be taken from the old to the new electronic unit. Therefore, note the totalizator values before dismounting the old electronic unit and store the values here after mounting the new unit.

Range: 0 to 1000000 **Default:** 0

Increment: 1 **Unit:** [t]

10 PROFIBUS Interface

10.1 Wiring of the PROFIBUS Data Cable

Wiring of the PROFIBUS cables

The standardized PROFIBUS cable type A (STP 2x0.34[2]) [AWG] has to be used for the PROFIBUS data cable. The cables are bared referring to fig. 6 and connected to the terminals according to the wiring diagramm.
The shield is connected with the bracket to the shoulder inside the housing.

> ***Caution***
>
> *The shield of the PROFIBUS cable is only grounded if the bracket inside the housing clamps directly to the shield. If the clamps to the plastic mantle, no grounding is done! Therefore the plastic mantle has to be fixed only with the PG gland (referring to fig. 6)*

Termination

If both cables are connected (Bus in and Bus out), if has to be ensured that the two termination dip switches are in off position.
If only one cable is connected (Bus in), both termination dip switches have to be set in on position.

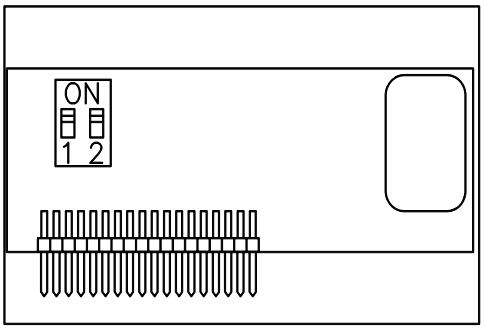

fig. 29: Profibus board E621009

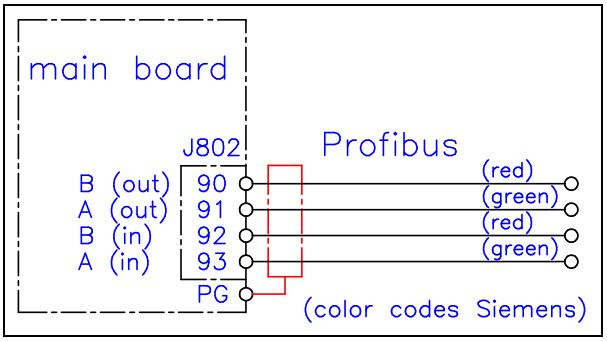

fig. 30: connection Profibus B600030e

> ***Note***
>
> *The PROFIBUS network has to be terminated properly. Otherwise the installation cannot be set into operation. It has to be ensured that only the last device of the PROFIBUS chain is terminated.*

10.2 Setting the PROFIBUS Address

The electronic unit requires a unique PROFIBUS address which indicates it definitely in the whole PROFIBUS network. Therefore no other PROFIBUS device in the network may use the same address. The address has to be between 2...125.
The PROFIBUS address is set with the system parameter *Identifier*. (See 9.4 Description of the system parameters). After switching the measuring amplifier off and on, the new address is valid.

11 PROFIBUS Interface Description

11.1 GSD File

The PROFIBUS DP Master has to know which devices are connected to the PROFIBUS network. For this purpose the GSD file is required. The GSD file for the BMGZ600A-series measuring amplifier can be taken from the following internet address:
http://www.fms-technology.com/gsd
The GSD file can also be supplied on a floppy disk on request. In this case please contact FMS customer service.

Read in the GSD file into the PROFIBUS DP Master
How to read in the GSD file into the control system (DP Master) is depending on the used control system. For further information, refer to the documentation of the control system.

Note

The GSD-file version must match with the firmware version of the electronic unit. Otherwise there may be problems while setup. Version numbers of firmware and GSD file are printed to the cover page of this operating manual.

11.2 BMGZ610A/611A/620A DP Slave Functional Description

The electronic unit of the BMGZ600A.P-series supports a PROFIBUS link which operates according to the PROFIBUS DP protocol according to EN 50170. Hereby the measuring amplifier operates as DP slave and the control system as DP Master. Several parameters have to be set and met by the control system.

11.3 Initial Parameters

Initial parameters are sent from the control system to the electronic unit once while initialization. They are normally set to a fixed value for a machine with the programming tool of the control system.
The first bytes of the parameter telegram are specified in the EN 50170 standard. The user segment of 4 bytes is defined customer specific for the measuring amplifier.

Byte	Use	Value	Meaning
0	initial parameter	0	(not used)
1		0	(not used)
2		0	(not used)
3		0	(not used)

11.4 Configuration

The configuration defines how many process data (byte and word) are sent during the data communication from the control system to the measuring amplifier and vice versa. To ensure maximum flexibility different modules are provided in a single measuring amplifier. Only one module can be set active at a time.

Module 1: Basic telegram

4 bytes (2 word) are transmitted from the control system to the belt scale and also 4 bytes (2 word) from the belt scale to the control system in each data cycle.

	byte 0	byte 1	byte 2	byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Modul 2: Reserved

Modul 3: Basic telegram and 4 word operation value

The belt scale response with 4 bytes of the basic telegram and additionally 4 words for the belt scale data “Total” and “Charge”.

	Byte 0	Byte 1	Byte 2	Byte 3
request telegram (master → slave)	function code	module number	empty	empty
response telegram (slave → master)	function code	module number	data (higher byte)	data (lower byte)

Word 0	Word 1	Word 2	Word 3
Total HW (HB)/(LB)	Total LW (HB)/(LB)	Charge HW (HB)/(LB)	Charge LW (HB)/(LB)

Modul 4: Reserved

11.5 Function Code

Master → Slave

Function Values

Value	Meaning
01	Total HW
02	Total LW
03	Charge HW
04	Charge LW
05	Flow rate of conveyor
06	Speed of the conveyor belt
07	A/D-Input-Value brutto

The measuring amplifier transmitts the response with the response telegram.

12 Trouble Shooting

Message	Cause	Corrective action
neg. feedback roller 1/2	Parting of the cable	Check connection cable to measuring roller 1/2
	Cable is wrongly connected	Change wires on terminals 110/111 roller 1 (202/203 roller 2)
	Error at measuring roller 1/2 Input signal >-1mV	Check internal wiring and measuring bearings of measuring roller 1/2
overload	Load on measuring roller to high	Check load of measuring roller 1/2
	Short circuit in the cable; input signal >127mV	Check connection cable to measuring roller 1/2
Output Roller 1/2 < min.	Analogue output 1/2 is driven with values < 0V. Actual flow rate is negative for more than 5s	Run tare program for measuring roller 1/2
Output Roller 1/2 > max.	Analogue output 1 is driven with values > 10V	Check load of measuring roller 1/2; adjust parameter *Max. output 1/2*
Message „Belt not running“	Tare program was started while belt was not running	Start conveyor belt; run tare program again
	Proxy switch of measuring roller defect	Replace proxy switch
Automatic weighing a charge: Conveyor belt doesn’t stop	Conveyor belt is empty before Ref. charge is reached	Stop charge manually; then decrease parameter *Pre detection charge* a little
No message on the display	Power supply not correct	Check / correct power supply; Check fuses in the supply line
	Evaluation electronic unit defect	Contact FMS customer service

12.1 Position of the Fuses

F1 fuse 24VDC 1.0A T ; F100 fuse 230VAC 0.5A T

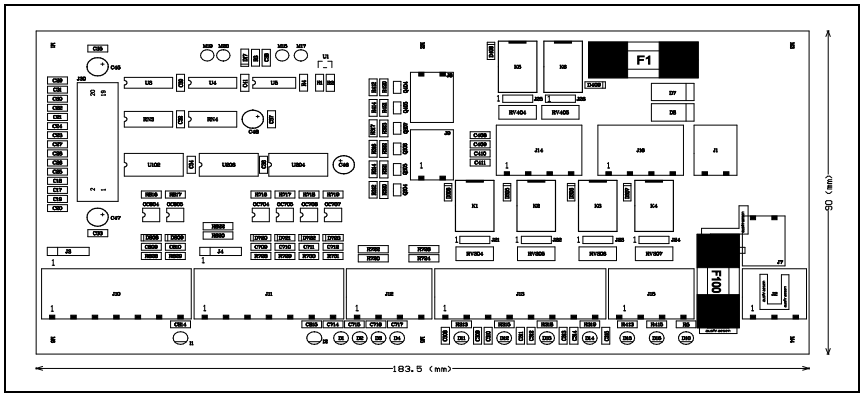

Bild 31: Interface board B600034

13 List of Spare Parts

13.1 Assembly Drawing Flat Measuring Roller

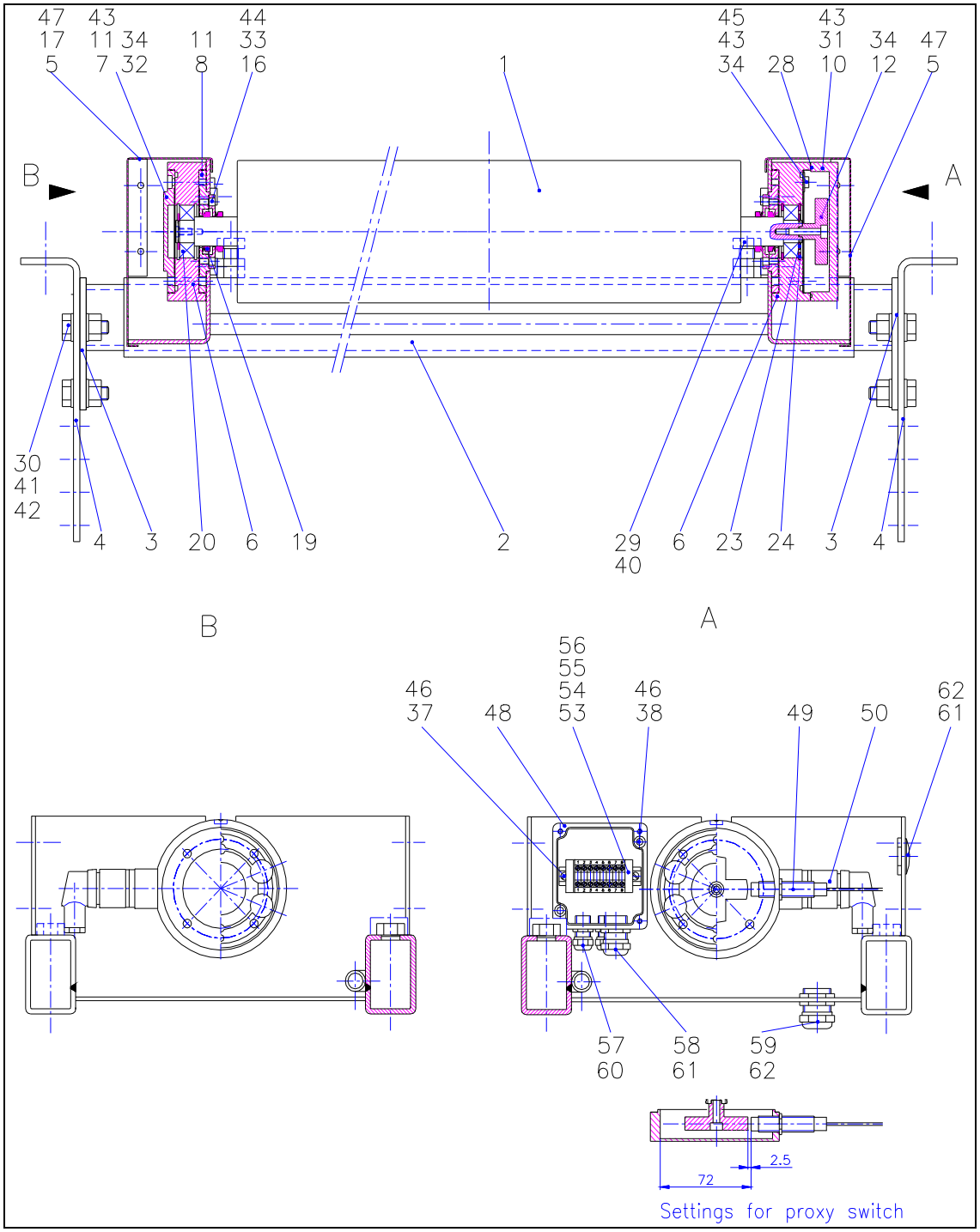

fig. 31: Flat measuring roller B400013e

13.2 Assembly Drawing Troughed Measuring Roller

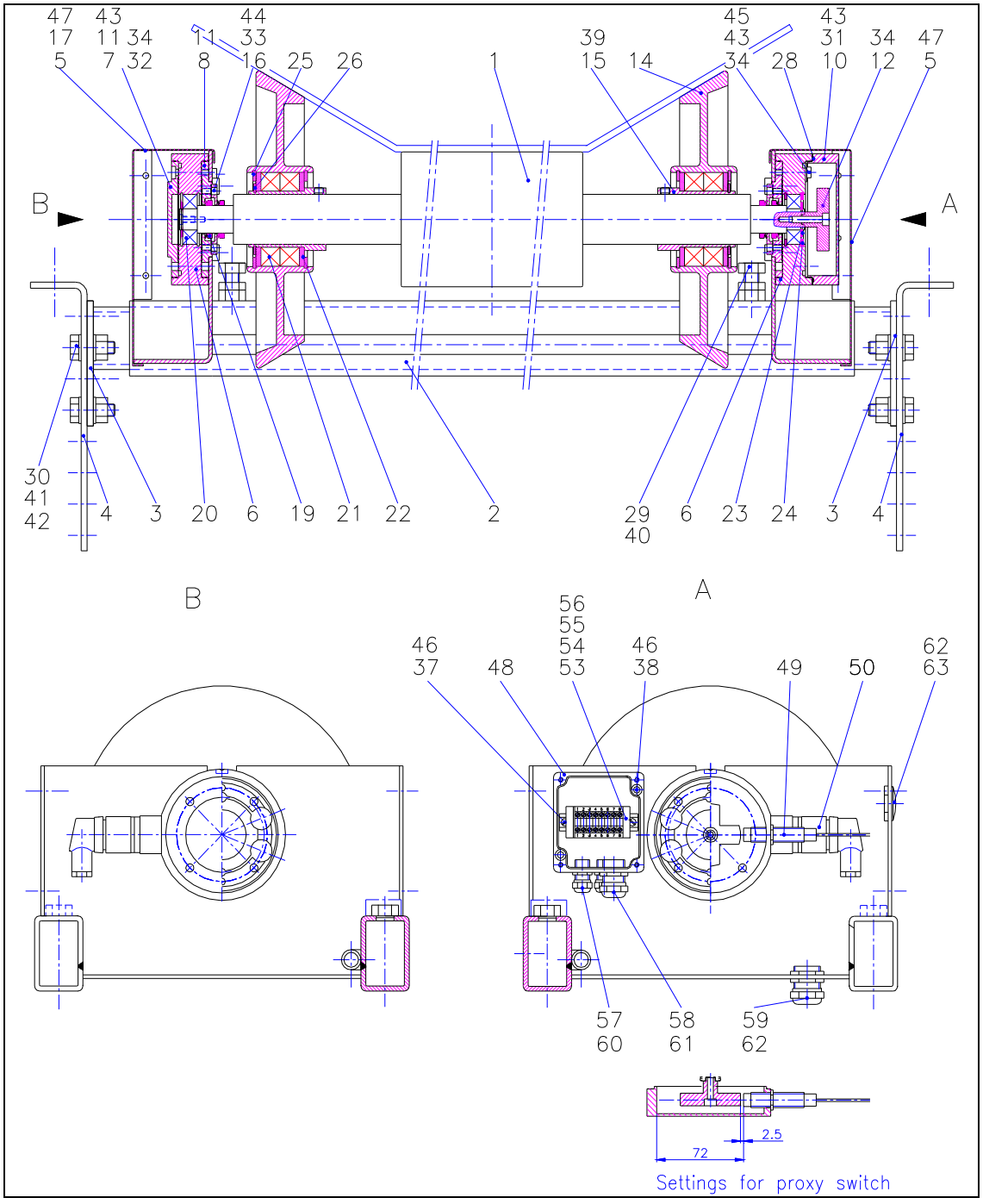

fig. 32: Troughed measuring roller. Rollers with Belt widths greater than 1000mm may have more than 1 pair of bevelled side disks. B400012e

13.3 Part List

Pos.#	Description
1	Middle roller
2	Support
3	Sliding part
4	Mounting bracket
5	Cover
6	Force measuring bearing LMGZ203
7	Cover A
8	Cover B
9	--
10	Cover F
11	Paper seal LMGZ203
12	Pulse generator Ø50, 4 vanes
13	--
14	Bevelled side disk
15	Bearing sleeve
16	Cover G
17	Name plate
18	--
19	V-ring seal V-22A
20	Self aligning ball bearing 1203TV
21	Grooved ball bearing 6009.2ZR
22	Nilos ring LSTO 45x75
23	Locking ring A17
24	Locking ring J40
25	Locking ring J75
26	Locking ring A45
27	--
28	O-ring 95x1.78
29	Hex screw M12x30
30	Hex screw M10x30
31	Hex screw M6x65
32	Hex screw M6x40
33	Hex screw M5x10
34	Hex socket screw M5x25
35	--

Pos. #	Description
36	--
37	Pan head screw M4x8
38	Pan head screw M4x16
39	Set screw M8x6
40	Hex nut M12, 0.5xD
41	Hex stop nut M10
42	Washer M10
43	Washer M6
44	Washer M5
45	Washer Ø15/5.3x1.2
46	Spring washer M4
47	Self-tapping pan head screw 4.2x6.5 F
48	Aluminium housing A105
49	Proxy switch M12x1
50	Junction box 90°, 7-pole
51	Flex cable STP 2x2x0.25mm^2
52	Cable binder
53	terminals MBK 2.5E
54	Cover D-MBK 2.5E
55	Mounting rail, perforated NS15
56	Wire end ferrules 1mm^2
57	Screwed gland PG7
58	Screwed gland PG11
59	Screwed gland PG16
60	Hex nut PG7
61	Hex nut PG11
62	Hex nut PG16
63	Sealing cover PG16
64	Plug connection PG Amph. 8-pole 1)
65	
66	
67	
68	
69	
70	

1) only version „K“ (with steel cabinet)

14 Technical Data

Evaluation electronic unit	BMGZ610A	BMGZ611A	BMGZ620A
Evaluation of 1 measuring roller	Yes		
Evaluation of 2 measuring rollers	-	-	Yes
Min and Max limit relays	-	Yes	-
Additional digital in-/ outputs (galvanically isolated)	-	Yes	-
Belt speed monitoring	yes		
Operation	6 keys, LCD display 2x16 characters		
Display possibilities	total output conveyed [t] daily output / charge [t] actual flow rate [t/h] Belt speed [m/s]		
Daily output resp. charge counter	0...1000t: Resolution 10kg 1000...10000t: Resolution 100kg 10000....99999t: Resolution 1000kg		
Totalizator	0...1 Mio t: Resolution 1000kg		
Printer for charge protocol	Protocol or external A4 connected to RS232 (optional)		
Analogue output 1 (roller 1)	0...10V and 0/4...20mA, free scalable, 12 bit		
Analogue output 2 (roller 2)	-		0...10V and 0/4...20mA, free scalable, 12 bit
Analogue output 3 (roller 1)	0...5V, free scalable, 8 bit		
Analogue output 4 (roller 2)	-		0...5V, free scalable, 8 bit
Relay-driven pulse output (for ex. for telecounter)	contact bond strength 24VDC / 1A pulse length 12ms; max. 40 cycles per second		
Interface RS232	optional		
PROFI BUS®	optional		
Measuring bearing connection	350Ω force measuring bearings		
Measuring bearing excitation	5VDC		
Measuring bearing signal	0...9mV (max. 12.5mV)		
Cycle time	4ms		
Power consumption	5W		
Temperature range	-10...+40°C		
Protection class	IP54		
Weight	1.5kg		
Power supply	24VDC (standard) / 230VAC (optional)		

Measuring bearings (integrated in measuring roller)	
Accuracy class	±0.5%
Tolerance of sensitivity	<±0.2%
Temperature coefficient	±0.1% / K
Temperature range	–10...+60°C
Input resistance	350Ω
Supply voltage	1...12V
Nominal load	depending on max. flow rate (customer specific)
Overload protection	150% of nominal load
Breaking load	>1000% of nominal force
Axial load allowed	20% of nominal load

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