BARTEC BENKE

MAK 3002

Service Manual

SA 971113

Contents

23.01.06

28.11.06

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BARTEC BENKE
Schulstraße 30
D-94239 Gotteszell

1   General instructions

The operating manual BA 970920 and the configuration instruction SAK 970916 are parts of the service manual SA 971113! It is imperative to observe all points described in the manual.

1. Observe the national regulations for startup.

2. This service manual only includes the data essential for the installation and connection of the devices/components.

3. For the complete technical data of the individual devices see the type-related data sheets. Available from BARTEC BENKE on request!

2 Safety instructions

2.1 General safety instructions

- All regulations and provisions remain valid as long as the system is operated with BARTEC BENKE devices.

- The BARTEC BENKE devices have been built by adhering to the regulations in force and have left the factory in perfect condition. Installation and maintenance of the devices to be carried out by qualified staff.

- Make sure that the data and operating conditions specified by the manufacturer are complied with.

- Observe the instructions for operating and servicing the devices

- If you discover any damage or breakage on any parts of the system, or if the safe operation cannot be guaranteed for any other reason, do not start the system or turn it off immediately.

- Contact your service representative.

- Get in touch with our service specialists if you discover any faults or defects during operation or if you have cause to doubt that the devices are working properly.

- BARTEC BENKE devices are no replacement for the safety equipment of the tanker or of the customer.

- To guarantee your own safety, always disconnect the complete system MAK 3002 from the power supply for maintenance and repair works.

Disclaimer

BARTEC BENKE GmbH and its vicarious agents only assume liability in the case of deliberate acts or gross negligence. The extent of liability in such a case is limited to the value of the order placed with BARTEC BENKE GmbH.
BARTEC BENKE accepts no liability for any damage resulting from non-observance of the safety regulations or from non-compliance with the operating instructions or operating conditions. Secondary damage is excluded from the liability.

EU-Declaration of conformity

We,BARTEC BENKE GmbH, Schulstraße 30, D-94239 Gotteszell,hereby declare, that this product is in compliance with the essential requirements of the relevant EU-Directives.

The EU-Declaration of conformity for this product can be obtained from
BARTEC BENKE GmbH, Schulstraße 30, D-94239 Gotteszell,
info@bartec-benke.de.

2.2 Mounting instructions

- Install the devices in such a way that the stipulated climatic and temperature values are not exceeded. If necessary, provide protection in the form of covers, heating or cooling (see table "Climatic classifications").

- Choose an installation site for the devices that is appropriate for their protection type (IPxx). For instance, printers, SSM cartridge station etc. have to be permanently protected against soiling and humidity by means of appropriate installation (e.g. drivers cab) (see 2.5.1 table "Protection types and climatic classifications").

- Choose a shock-proof and vibration-free installation site. All components have to be protected against vibrations by means of stable holders.

- During mounting the devices (above all the printer or any opened devices) have to be protected against soiling (e.g. metal filings etc.)

- Close tightly with blind plugs all cable glands that are not assigned.

- Remove the transport brace of the printer before putting it into operation. All built-in relays and solenoid valves have to be interference-suppressed (free-wheeling diode).

- At first only slightly screw in all fastening screws of the casing covers, check if the casing sealing fits correctly, then tighten screws diagonally.

- **Very important: If welding works are carried out at the vehicle, the positive and negative poles of the power supply line to the device have to be disconnected (disconnect on-board power supply or turn off with 2-pole switch)**

2.3 Wiring instructions

- Carry out installation in accordance with the regulations of the country concerned!

- Wiring of the devices only to be carried out in accordance with this service manual and by experienced staff

- When laying the connection cables, make sure that no parts are sagging. It is recommended to observe a fastening distance of about 15 to 20 cm by means of clamping pieces or cable ties.

- Particular caution is required for laying the cables in the surroundings of the cooler, in the motor space, in the frame parts of the truck and in the delivery cabin.

- Avoid by all means any weak spots where cables might be buckled, abraded, or exposed to inadmissible heat impact or any other mechanical strain.

- Observe the specified minimum lead cross-sections, and for clamping equip the lead ends with the suitable/prescribed wire end sleeves (clamping area l = 8mm). (see table 2.5.3 "Line cross-section depending on terminal type"). Colour and size of wire end sleeves depend on lead cross-section**.**

- Tighten screw terminals that are not assigned.

- Select cable diameter in accordance with the cable glands in order to guarantee a reliable and tight clamping (see table 2.5.2 "Recommended cable diameter per PG size").
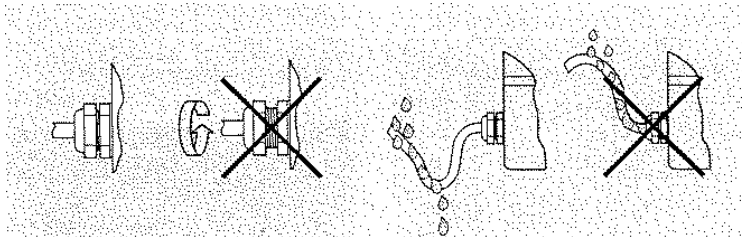
Make sure that the cables are securely connected and the cable screwings are firmly closed.

In a humid atmosphere make sure that no water can penetrate the device.

2.3.1 Additional instructions on ground routing and cable shielding

To comply with the CE and electromagnetic compatibility requirements and for the galvanic separation of the on-board power supply system of the collecting truck which is consistently carried out in the system MAK 3002, observe the following issues for the wiring.

Ground routing:

The ground wire (0 V/GND) of the MAK system may be connected to the vehicle chassis at only one spot (star-shaped wiring).
This is already guaranteed by the appropriate wiring in the current supply units (e.g. power supply plug-in unit, type 6757-101/-110). No additional measures are required.

To meet these requirements, system components whose signal GND has an electro conductive connection to the metallic casing have to be mounted electrically insulated against the metallic vehicle chassis.

This applies for instance to:
 ➢ GSM modem TC/MC 35
 ➢ GPS receiver, type 6722-16
 ➢ Thermal printer, type 6761-11

Please observe the appropriate instructions under chapter 3 referring to the individual components.

Cable shielding:

The following schematic diagrams show the different variants of the shield connection appropriate for each individual component.

Chapter 3 lists for each component the appropriate variant according to which the shield connection has to be carried out.

Variant 1:

Component with metallic casing which for installation reasons usually is electro conductively connected with the vehicle chassis.

The cable shield is not connected to the casing and has to be connected to the appropriate shield terminal at the slave.

For systems equipped with plug-in unit, type 6757-100, the shield connection should be central (asterisk-shaped) at the shield terminal block with strain relief, type 6757-109.

Make sure that the metallic casing of the slave / the shield terminal block has a reliable electro conductive contact to the vehicle chassis.

Variant 2:

Component with electrically insulating plastic casing.
The cable shield has to be connected to the appropriate shield terminal at the slave.

For systems equipped with plug-in unit type 6757-100, the shield connection should be central (asterisk-shaped) at the shield terminal block with strain relief, type 6757-109.

Make sure that the metallic casing of the slave / the shield terminal block has a reliable electro conductive contact to the vehicle chassis.

Variant 3:

Component with partly or completely metallic casing.
The cable shield and the signal GND of the electronic system are connected with the metallic casing part.

These components must be mounted electrically insulated against the vehicle chassis.

The cable shield mustn't be connected at the slave or at the shield terminal block.

Variant 4:

Component with metallic casing which for installation reasons is usually electro conductively connected with the vehicle chassis.

The cable shield is connected with the casing and mustn't be connected at the slave or at the shield terminal block.

Variant 5:

Component with partly or completely metallic casing which for installation reasons is usually electro conductively connected with the vehicle chassis.

The cable shield is used as signal GND in this case and must not be connected to the vehicle chassis via a shield connection.

Variant 6:

Cable with order no. U660033 as connection cable for fieldbus P-NET.

The cable shield is used as signal GND in this case and must not be connected to the vehicle chassis via a shield connection.

Variant 7:

Component with electrical insulating plastic housing.

Cable shield and signal-GND of the electronic are conductible connected with each other.

The cable shield mustn't be connected at the slave or at the shield terminal block.

Schematic diagrams:

Variant 1
e.g.
temperature sensor
type 6703-11

metallic
housing

Variant 2
e.g.
barcode reader
type 6727-40

plastic housing

Variant 3
e.g.
GPS-Receiver
type 6722-16

Variant 4
e.g.
dip stick for LAS
in V2000

Variant 5
e.g.
MID
type 6823-xx

Variant 6

P-NET cable
Order no. U660033

Variant 7
e.g.
GPS-Receiver
type 6722-18

plastic housing
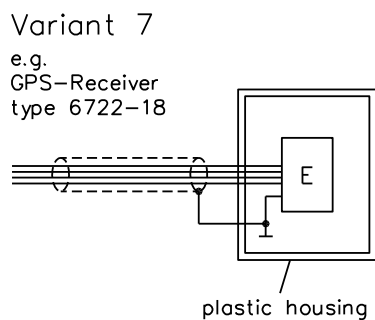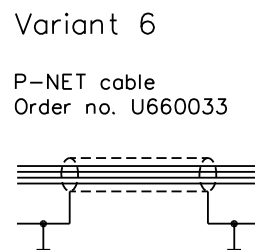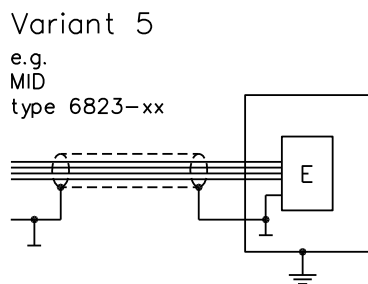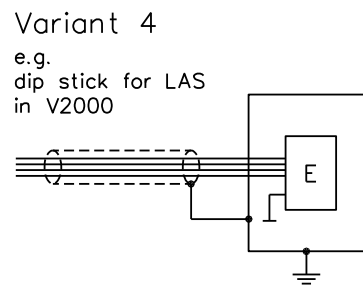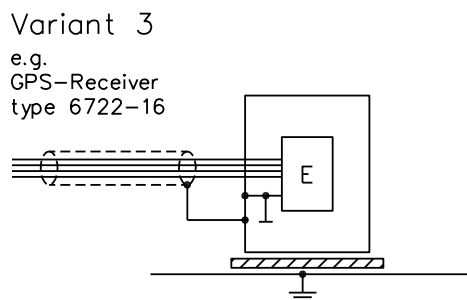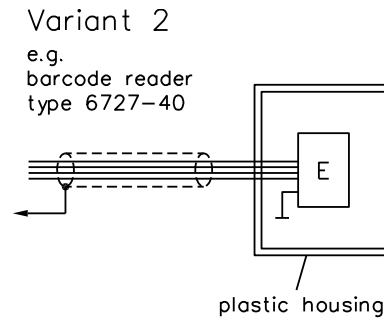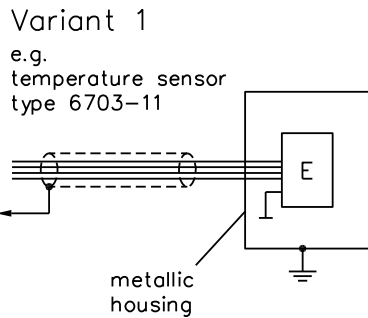
⏚ = Vehicle chassis

⊥ = GND/0V potential of electronics

sk3908.dwg

2.3.2 Cable for P-NET

Most of the system components (e.g. controller, power supply, etc.) are equipped with a P-NET fieldbus interface and are connected with each other by means of the P-NET cable described below. The wires have to be equipped with wire end sleeves!

Select size and clamping area of the wire end sleeves according to the appropriate device.

Cable assignment, order no. U660033

Wire colour	Signal
Yellow (ye)	P-NET / A
Green (gn)	P-NET / B
Brown (bn)	P-NET / S
pink/grey/white(pk/gr/wh)	+24 V / +
Shield	GND (0V) / -

Cut blue lead or insulate it appropriately.

2.4 Maintenance and repair

- Maintenance and repair only to be carried out by specialised staff!

- Before carrying out any maintenance or repair works, disconnect the main supply (positive and the negative pole) of the complete device.

2.5 Tables

2.5.1 Protection types and climatic classifications

Protection types
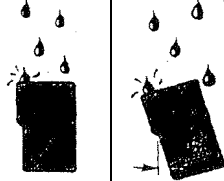
Definition of protection types in accordance with DIN 40050:

The protection types are named by a short sign consisting of two permanent code letters IP and two code numbers for the protection degree: e.g. IP 54.

Protection degrees for protection against contact and protection against foreign matters			Protection degrees for water protection		
First code number	Designation	Protection scope Explanation	Second code number	Designation	Protection scope Explanation
0	No protection	No particular protection of persons against direct contact with active or moved parts. No protection of equipment against penetration by solid foreign matters	0	No protection	No particular protection
			1	Protection against vertically falling dripping water	Water drops falling vertically mustn´t have a harmful effect
1	Protection against big foreign matters	Protection against accidental contact with active and internal mobile parts, e.g. with the hand, but no protection against deliberate access to these parts. Protection against penetration by solid foreign matters with a diameter > 50 mm.	2	Protection against dripping water falling perpendicularly	Water drops falling perpendicularly at any angle up to 15 degrees mustn´t have a harmful effect
2	Protection against foreign matters of medium size	Protection against contact with active or internal mobile parts. Protection against penetration by foreign matters with a diameter > 12 mm.	3	Protection against spray water	Water drops falling at any angle up to 60 degrees mustn´t have a harmful effect
3	Protection against small foreign matters	Protection against contact with active or internal mobile parts with tools, wires or similar objects having a thickness > 2.5mm. Protection against penetration by solid foreign matters with a diameter > 2.5 mm.	4	Protection against splash water	Water splashing from all directions against the equipment mustn´t have a harmful effect.
			5	Protection against water jets	A water jet from a nozzle splashing from all directions against the equipment mustn´t have a harmful effect.
4	Protection against grain-shaped foreign matters	Protection against contact of active or internal mobile parts with tools, wires or similar objects having a thickness > 1 mm.	6	Protection against flooding	In case of temporary flooding, e.g. caused by rough seas water mustn´t penetrate the equipment in a harmful way
			7	Protection in case of immersion	Water mustn´t penetrate the equipment in a harmful way if the equipment is immersed into water under defined pressure and time conditions.
5	Protection against dust deposit	Complete protection against contact with live parts or internal mobile parts. Protection against harmful dust deposits. Dust penetration cannot be completely prevented, but the dust mustn´t penetrate to an extent that the operating mode is impaired.	8	Protection in case of submersion	Water mustn´t penetrate the equipment in a harmful way if the equipment is submersed in water
6	Protection against dust penetration	Complete protection against contact with live parts or internal mobile parts. Protection against dust penetration.		Example Code letters IP 65 First index : Protection against contact with and penetration by foreign matters Second index: Protection against liquids	

Protection against penetration by liquids

	No pro-tection	Dripping water vertical	transversal	Spray water	Splash water	Water jet	Flooding	Immer-sion	Sub-mersion
Protection against	No pro-tection	Dripping water vertical	transversal	Spray water	Splash water	Water jet	Flooding	Immer-sion	Sub-mersion
IEC 529 DIN 40050	IP ... 0	IP ... 1	IP … 2	IP … 3	IP … 4	IP … 5	IP … 6	IP … 7	IP … 8
IP 0…	IP 00								
IP 1…	IP 10	IP 11	IP 12						
IP 2…	IP 20	IP 21	IP 22	IP 23					
IP 3…	IP 30	IP 31	IP 32	IP 33	IP 34				
IP 4…	IP 40	IP 41	IP 42	IP 43	IP 44				
IP 5…	IP 50			IP 53	IP 54	IP 55	IP 56		
IP 6…	IP 60					IP 65	IP 66	IP 67	

Climatic classifications:

1. Code letter	Lower temperature limit °C
A	
B	
C	reserved
D	
E	- 65
F	- 55
G	- 40
H	- 25
J	- 10
K	0
L	+ 5
Z	See individual regulation

2. Code letter	Upper temperature limit °C
A	400
B	350
C	300
D	250
E	200
F	180
G	170
H	155
J	140
K	125
L	110
M	100
N	90
P	85
Q	80
R	75
S	70
T	65
U	60
V	55
W	50
Y	40
Z	See individual regulation

3. Code letter	Limits of relative air humidity Maximum values				Remarks
	Average annual value	Permanently during 30 days of the year[1]	Permanently during 60 days of the year[1]	Occasionally during the remaining days[2]	
A*	$\leq$ 100 %	---	---	---	Permanent humidity
B					
C	$\geq$ 80 %	---	---	100 %	Bedewing
C*	$\leq$ 95 %	100 %	---	100 %	
R*	$\leq$ 90 %	100 %		95 %	
D	$\leq$ 80 %	---	---	100 %	
D*	$\leq$ 80 %	100 %	---	90 %	
E*	$\leq$ 75 %	95 %	---	85 %	Rare and slight be-dewing[3]
F u. F*	$\leq$ 75 %	95 %		85 %	No bedewing
G u. G*	$\leq$ 65 %	---	85 %	75 %	
H*	$\leq$ 50 %	---	75 %	65 %	
J u. J*	$\leq$ 50 %				
Z u. Z*	See individual regulation				

[1] These days should be distributed in a natural way
[2] By complying with the average annual value
[3] May occur, e.g. if devices installed outside are temporarily opened
*) These code letters refer to annex II

2.5.2 Table „Recommended cable diameter per PG size"

Screwing type	Cable diameter Clamping area [mm]
M 16 x 1.5	5 ... 10
M 16 x 1.5 EMV	6 ... 10
M 20 x 1.5	10 ... 14
M 32 x 1.5	11 ... 21
PG 7 KS	3 ... 6.5
PG 7 Ms	2 ... 6.5
PG 9 KS	4 ... 8
PG 9 Ms	3 ... 8
PG 11 KS	5 ... 10
PG 11 Ms	4 ... 10
PG 13.5 KS	6 ... 12
PG 13.5 Ms	5 ... 12
PG 16 KS	10 ... 14
PG 16 Ms	8 ... 14
PG 21 KS	13 ... 18
PG 21 Ms	11 ... 18

KS = plastic
Ms = brass

2.5.3 Table "Line cross-section depending on terminal type"

Terminal type	Line cross-section [mm²]
	max. 1.5
LPATOP	max. 1.5
LPA	max. 1.5
BLA	max. 2.5

2.5.4 Lead colours and abbreviations

black	bk
brown	bn
red	rd
orange	or
yellow	ye
green	gn
blue	bu
purple	vi
grey	gr
white	wh
pink	pk
turquoise	tk
gold	gd
silver	sr

Two-coloured leads are always designated as follows:
$\rightarrow$ Example: yellow green = yegn

If two ore more leads have to be connected to one pin, this is designated as follows:
$\rightarrow$ Example: pink/grey/white = pk/gr/wh

2.5.5   P-NET identification numbers of the system components

P-NET ID	Type	SW	Device designation	Function	Addr.
3000	PD 3000		Controller		
3100	PD 3100		I/O module		
3220	PD 3220		Universal Process Interface	Air separator regulation	4F
3920	PD 3920		Interface PC/P-NET		
5010	6862	FEIN	MAK 3001 driver unit		
5071	6841	M4K1	MAK 4001 data acquisition unit		
5101	6862-1	HKDK	MAK 3001 printer reading unit		
5101	6839-5	HKDK	MAK 3001 SSM cartridge reader		
5101	6839-6		MAK 3001 SSM cartridge reader		
5401	6820-1		MID NW50 (calibratable, Germany)		
5401	6820-3		MID NW50 (calibratable, Netherlands)		
5401	6820-4		MID NW65 (calibratabel, Germany)	Quantity measurement chamber 1	22
5401	6820-8		MID NW50 (calibratable, Switzerland)	Quantity measurement chamber 2	23
5401	6820-9		MID NW40 (calibratable, Switzerland)		
5401	6820-11		MID NW65 (calibratable, Switzerland)		
5401	6820-14		MID NW50 (calibratable, Austria)		
5402	6701/02/03		Temperature sensor MAK/PET for System 3002	Temp. of medium in measuring chamber 1 Temp. of medium in measuring chamber 2 Segment temperature Sampling box temperature	29 2A 2B 2C
5403	6704-10/-11		pH probe / Interface pH value	pH-/temperature measuring chamber 1 pH-/temperature measuring chamber 2	3E 3F
5404	6715/16		Pulse counter MAK/PET for System 3002	Quantity measuring chamber 1 Quantity measuring chamber 2	2D 2E
5808	6870-2		Ultrasampler 6870-2	Supplier sampling Tank sampling	25 26
5809	6864-2		I/O box	Inputs/outputs for control function	31 ... 34
5811	6863-4.1		Matrix printer		
5812	6881-1		Voucher printer	Printout	41
5901	6852-1-25		Barcode reader		
5902	4386-1		Interface P-NET/Centronics		
5904	4386-2		Interface P-NET/V.24		
5905	6723-10		Reader station for barcode	PFL barcode registration Supplier registration with barcode reader	46 47
5907	6721-10		Reader station Feldpl./Wiegand		
5908	6722-10		Reader station radio		
5913	6781-10		Series device	Voltage supply Acquisition of operating data Emergency voltage supply	5D
5914	6782-10		Converter P-NET/Current Loop		
5915	6782-20		Converter V.24/Current Loop		
5916	6722-11		Reading station radio/MAK 3001		
5916	6721-11		Reading station cable/MAK 3001	Supplier registration via read-head	3B
5917	6766-1x		SSM cartridge reading station	Data storage	48
5922	6753-101		I/O box Selectron	Inputs/outputs for control functions	35/36
5924	6771-xx		Stand-alone sampler		
5927	6761-10		Thermal printer		40
5930	4386-4		P-NET/V.24 converter	Data transfer via radio, GSM, WLAN, RS232	05
5930	4386-4		RS 232-Gateways via triple converter 4386-7, P-NET address is allocated automatically by the system	GPS receiver ARS300 TAG reader for sample bottle Printer EPSON TM-T88III Barcode scanner supplier ident. TAG reader driver ident. scales Barcode scanner for sample bottle	20 1F 1E 1D 1B 1C 1A

P-NET ID	Type	SW	Device designation	Function	Addr.
5933	6771-1x/2x		Stand-alone sampler		
5936	6728		TAG reader interface		
5938	6781-11		Series device with km registration	Voltage supply Km registration	5E
5941	6771-30		ULTRASAMPLER, Controller 6771-30	Supplier sampling step motor Supplier sampling Pump vario Tank sampling step motor Temperature measurement inputs/outputs for control functions	4B
5942	4386-6/7		Triple converter P-NET	Data transmission via radio, funk, GSM, WLAN, RS232	05
5942	4386-7		RS232 gateways via triple converter 4386-7, P-NET address is allocated automatically by the system	Connection of up to three RS232 devices via a triple converter	11...18
5944	6744-10	CADIF	CADIF, controller 6744-10		
5945	V 2000		V-2000-Modul 6750-427		4A

3 Mounting and installation

3.1 Temperature sensor, type 6701-10
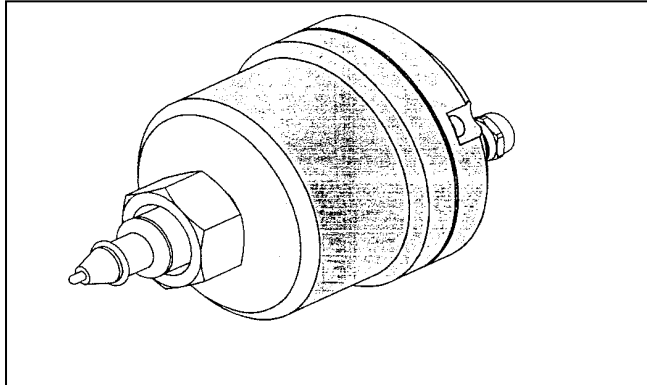
3.1.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V ± 20 % / 0,75 W
Connection type	Cable feed via PG9, internal screw terminals
Interface	Fieldbus interface (P-NET) P-NET ident-number: 5402
Ambient conditions	
Operating temperature	-20 ... +60° C
Storage temperature	-40 ... +85 °C
Climatic classification/protection type	JUF / IP65, suitable for CIP (in the measuring tube)
Mechanical data	
Casing	Robust aluminium diecast casing, blue powder-coating
Measuring tip	Stainless steel with teflon insulator
Weight	approx. 7.4 N ≅ 0,74 kg
Installation position	any
Temperature measurement system	
Measurement range	-25 ... +100 °C
Measuring element	Pt100 DIN IEC 751 Class A

Dimensions
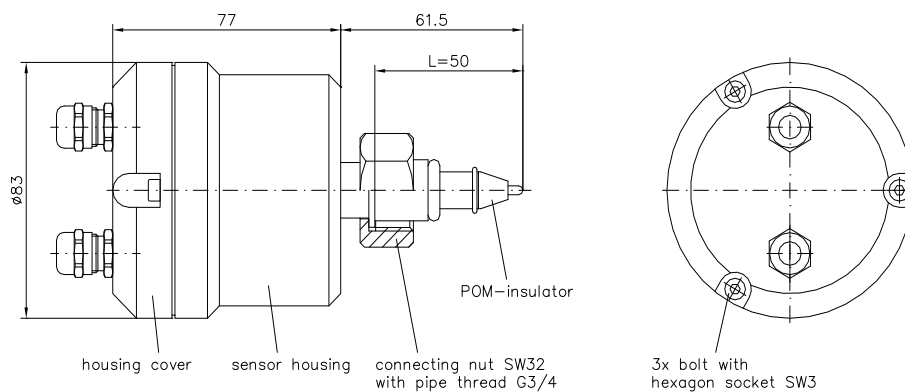
3.1.2 Wiring

The connecting terminals for P-Net and auxiliary energy are accessible after taking off the cover of the casing. Loosen three hexagonal socket screws in the casing cover.
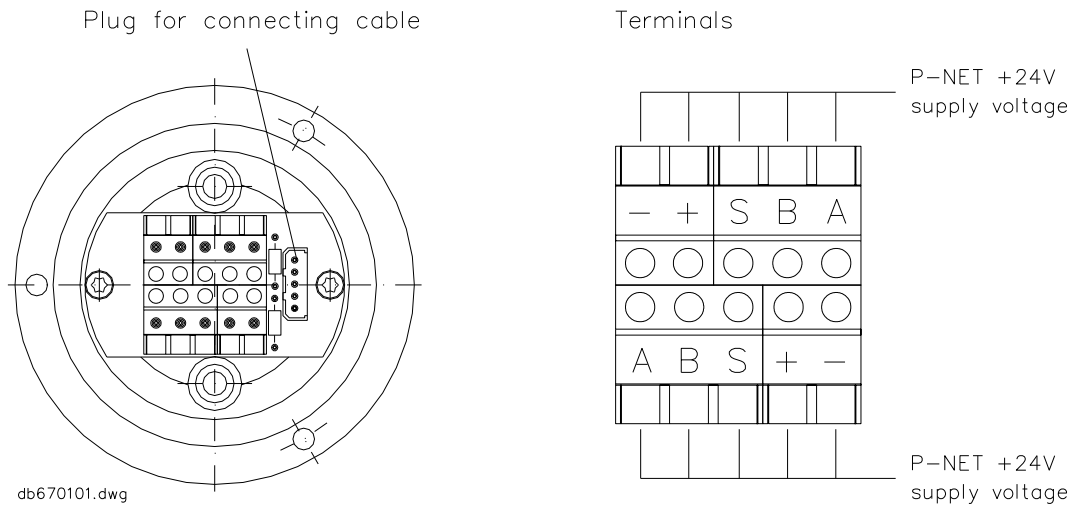
Cable shielding: Variant 6 pursuant to 2.3.1

3.1.3 Mounting/installation

Installation into milk pipeline by means of weldable socket, type 6806-02-02, or as sample compartment temperature sensors with mounting angle, type 6701-100, into the sample compartment.
Sensor is locked with union nut SW (width across flats) 32.
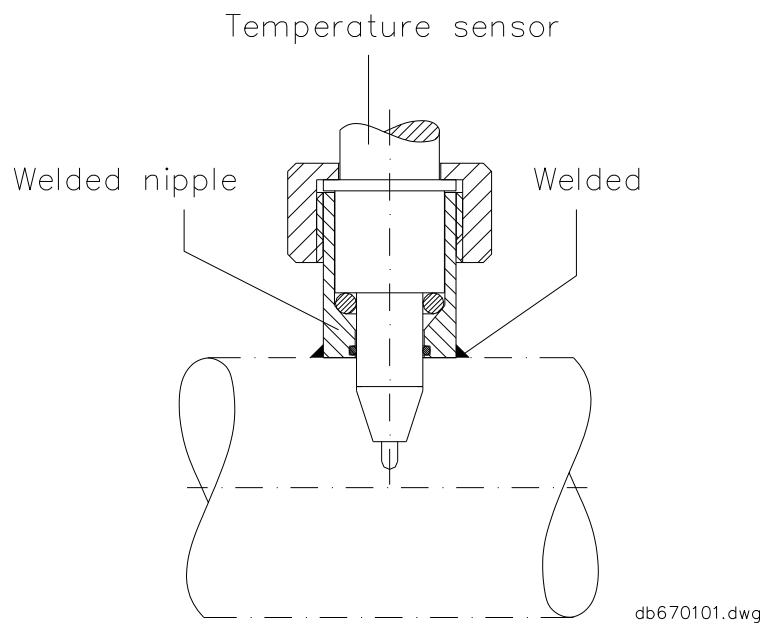
3.2   Temperature sensor with milk sensor, type 6703-10
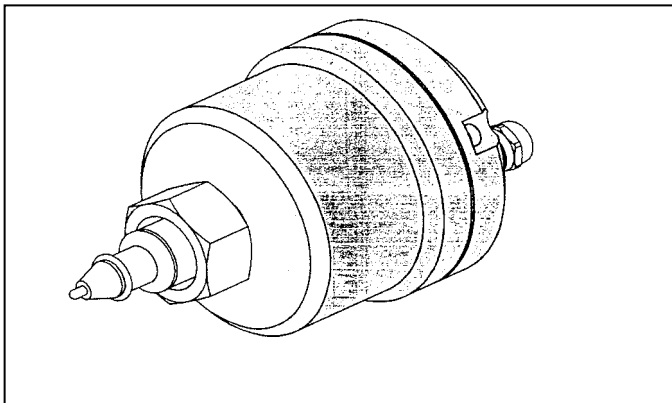
3.2.1   Technical data

Electrical data	
Auxiliary energy	DC 24 V ± 20 % / 0,75 W
Connection type	Cable feed via PG9 gland, internal screw terminals
Interface	Fieldbus interface (P-NET) P-NET ident number: 5402
Ambient conditions	
Operating temperature	-20 ... +60°C
Storage temperature	-40 ... +85°C
Climatic classification/protection type	JUF / IP65, suited for CIP (inside measuring tube)
Mechanical data	
Casing	Robust aluminium diecast casing, blue powder-coating
Measuring tip	Stainless steel with teflon insulator
Weight	approx. 7,4 N ≅ 0,74 kg
Installation position	Any, preferably vertical from above for milk sensor function
Temperature measurement system	
Measurement range	-25 ... +100 °C
Measuring element	Pt100 DIN IEC 751 Class A
Milk contact meter	
Measuring voltage	approx. AC 1.5 V / 20 kHz

Dimensions

Mounting and Installation

18
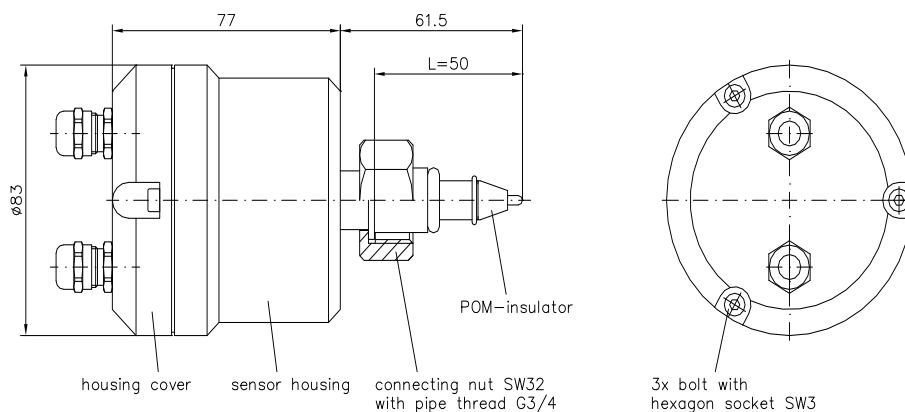
3.2.2   Wiring

The connecting terminals for P-NET and auxiliary energy are accessible after taking off the cover of the casing. Loosen three hexagon socket screws in the casing cover.

```
Plug for connecting cable          Terminals
```

P−NET +24V
supply voltage

| − | + | S | B | A |

| A | B | S | + | − |

P−NET +24V
supply voltage

db670101.dwg
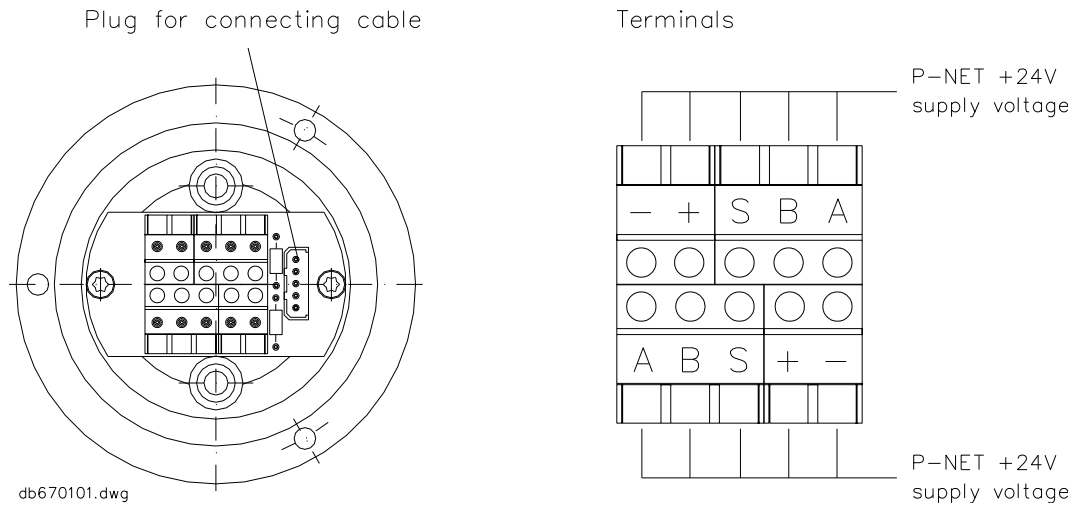
Cable shielding: Variant 6 pursuant to 2.3.1

3.2.3   Mounting/installation

Installation into milk pipeline by means of weldable socket type 6806-02-02.
Sensor is locked via union nut SW (width across flats) 32.

```
Temperature sensor
Welded nipple        Welded
```

db670101.dwg
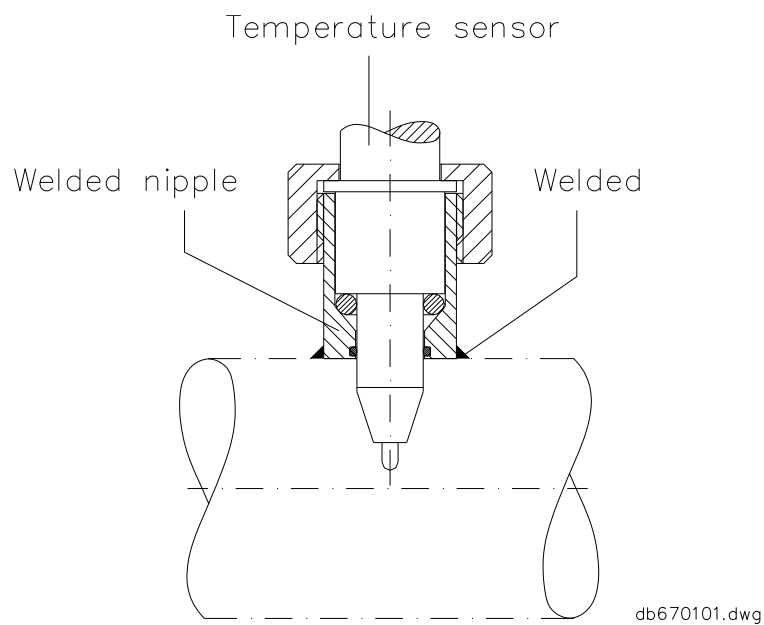
3.3   Temperature sensor, type 6865-1

Temperature sensor with integrated measurement transducer and digital interface (impulse frequency modulation). Only for connection to ULTRASAMPLER controller, type 6771-30.

3.3.1   Technical data

Device-specific data	
Measurement range	-5 … +60 °C, for a short time (max. 15 min/h) up to +100 °C
Measuring element	Pt 100 DIN IEC 751 Class A
Maximal output frequency	approx. 22 kHz
Response time	$T_{90} \leq 5$ s
Electrical data	
Auxiliary energy	9 … 15 VDC, max. 15 mA
Output	proportional to sensor 2100 Hz $\pm$ 10 % with 0 °C resolution 190 Hz/°C $\pm$ 2,5 % Calibration via evaluation device Data related to nominal condition
Ambient conditions	
Operating temperature	0 to 70 °C
Storage temperature	-20 to 70 °C
Mechanical data	
Casing	Stainless steel, material number 1.4301, protection type IP64A
Connection	3,5 m PVC cable
Weight	approx. 7,5 N ($\cong$ 750g)

Dimensions

PI68651.dwg
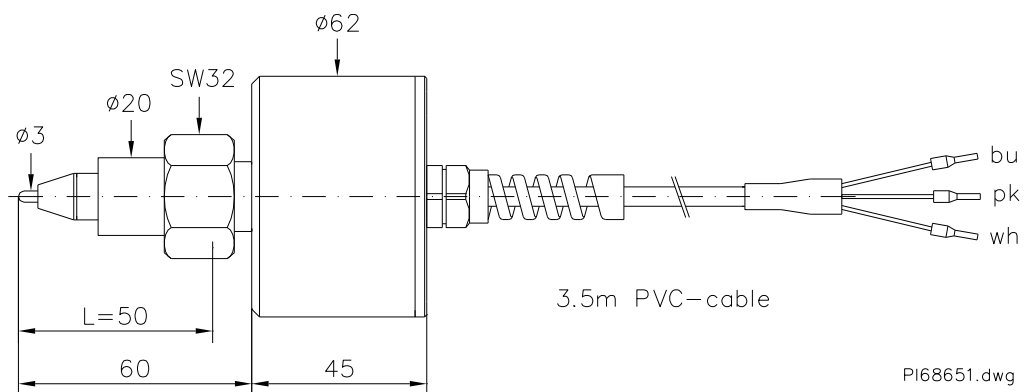
3.3.2 Mounting/installation

Installation into milk pipeline by means of weldable socket, type 6806-02-002,or as sample compartment temperature sensor with mounting angle, type 6701-100,into the sample compartment.
Sensor is locked with union nut SW (width across flats) 32.
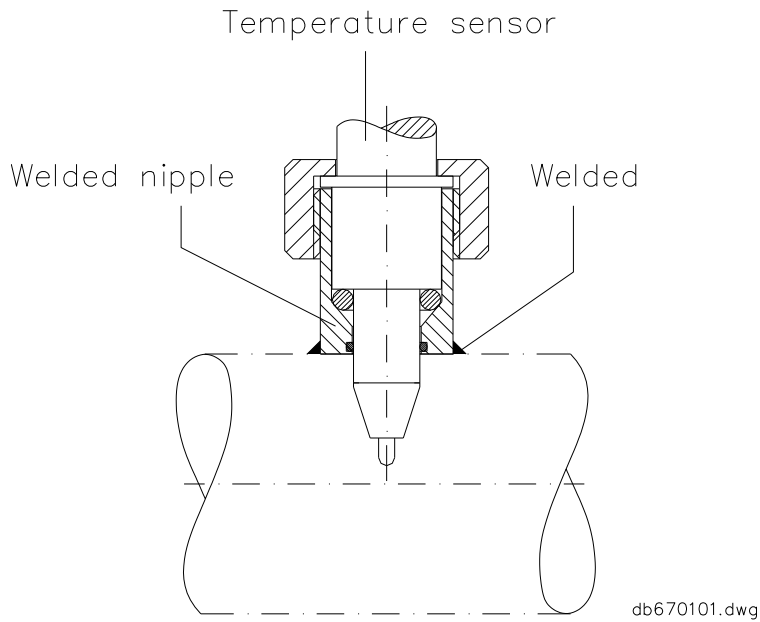
Connection diagram
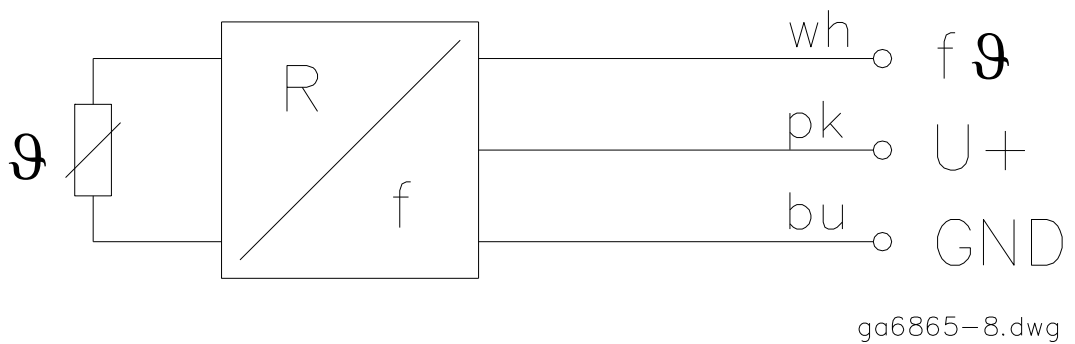
3.4 Temperature probe with milk sensor, type 6865-3

Temperature probe with conductivity sensor, measuring transducer and digital interface to monitor electro conductive liquids.
Only for connection to ULTRASAMPLER controller, type 6771-30.

3.4.1 Technical data

Device-specific data		
Measurement range	*Temperature measuring:* *Milk sensor:*	-5 to +60 °C, (for a short time up to +100 °C) Conductance 0,7 ... 10 mS
Measuring element	*Temperature measuring:* *Milk sensor:*	Pt 100 DIN IEC 751 Class A conductivity sensor
Maximal output frequency	*Temperature measuring:* *Milk sensor:*	approx. 22 kHz approx. 2700 Hz
Response time	*Temperature measuring:* *Milk sensor:*	$t_{90} \leq 5$ s $t_{90} < 1$ s
Electrical data		
Auxiliary energy	9 … 15 VDC, maximum current consumption 35 mA	
Output	*Temperature measuring:* proportional to sensor 2100 Hz $\pm$ 10 % with 0 °C resolution 190 Hz/°C $\pm$ 2,5 % $\Big\}$ calibration via evaluation device *Milk sensor:* approx. 2700 Hz for short circuit approx. 400 Hz for conductance 0 mS	
Ambient conditions		
Operating temperature	0 to 70 °C	
Storage temperature	-20 to 70 °C	
Mechanical data		
Design	Instruments and casing made of stainless steel, material number 1.4301, protection type IP64A	
Connection	3,5 m PVC cable, data lines shielded separately	
Weight	approx. 10 N ($\cong$ 1 kg)	

Dimensions
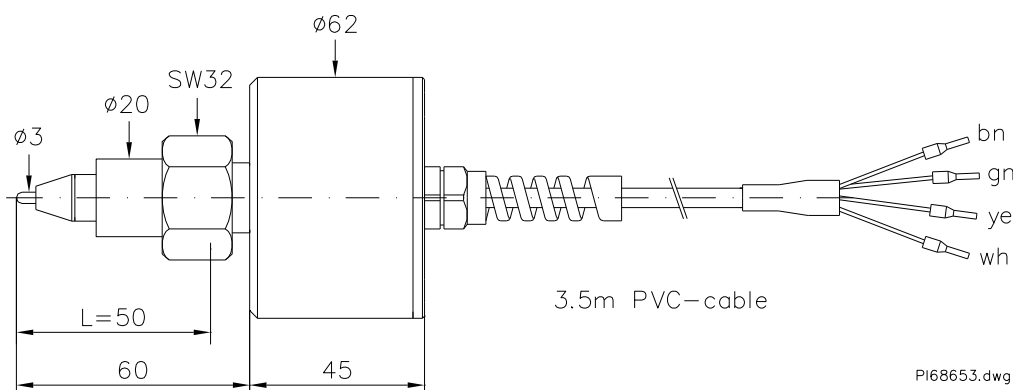
3.4.2   Mounting/installation

Installation into milk pipeline by means of weldable socket, type 6806-02-02.
Sensor is locked with a union nut, SW (width across flats) 32
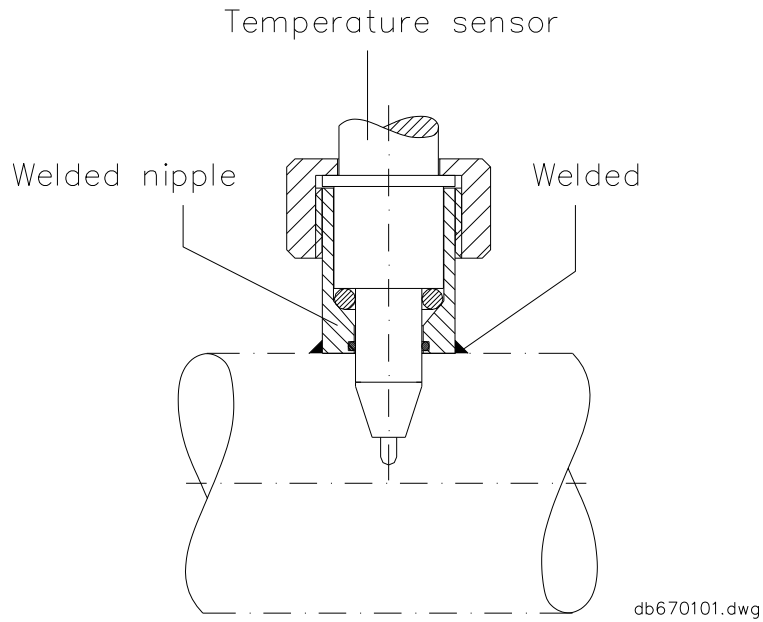
Connection diagram
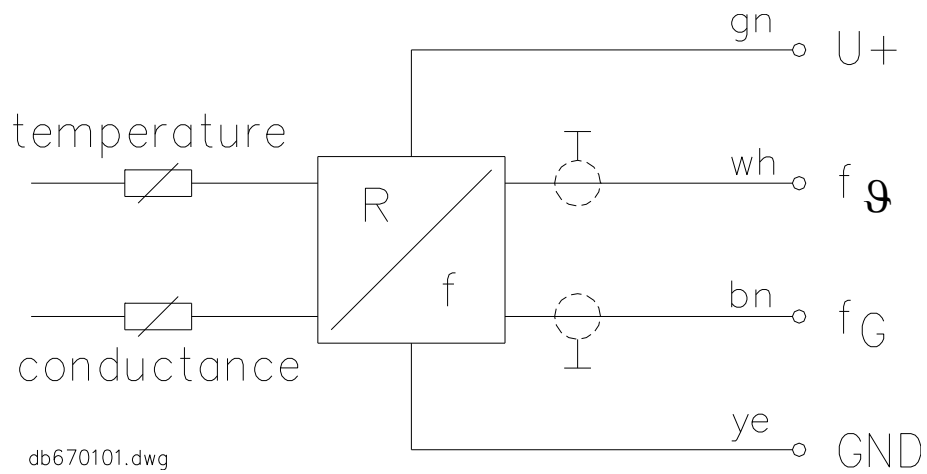
3.5 Temperature sensor, type 6701-11, Series A

3.5.1 Technical data

Device-specific data	
Measuring element	Pt 100 DIN IEC 751 Class A
Electrical data	
Connection	Cable 5 m (wire end sleeves)
Ambient conditions	
Operating temperature	- 20 ... + 60 °C
Temperature range of sensor element	- 20 ... + 100 °C
Climatic classification/protection type	JUC / IP 65
Mechanical data	
Casing	V$_2$A 1.430
Weight	0,5 kg
Mounting	Clamp DN 20
Installation position	any, preferably vertically from above for sensor function

Dimensions

terminal assignment	
WH	I_OUT
BN	IN +
GN	IN −
YE	GND
GNYE	shield

216273.dwg
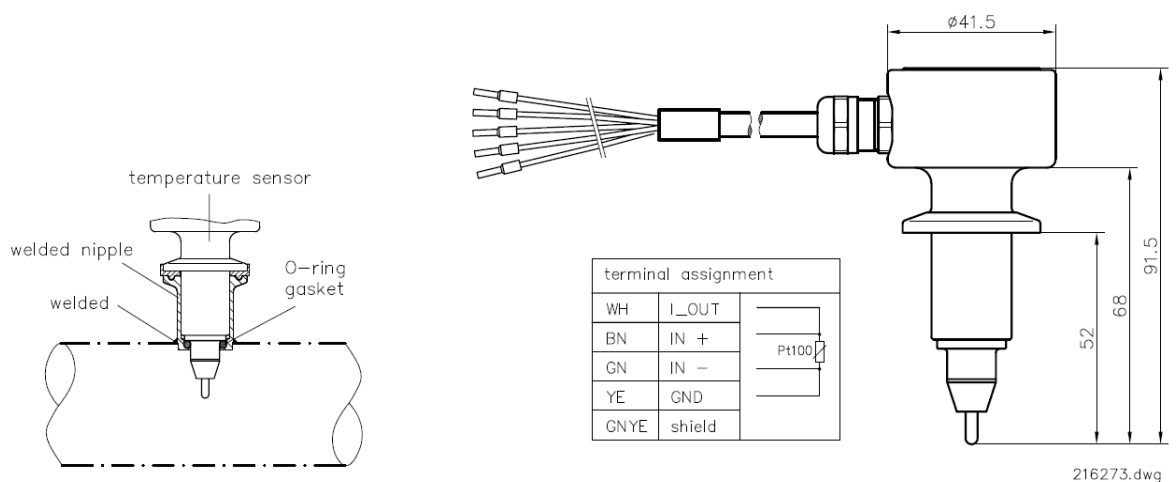
Cable shielding: Variant 1 in accordance with 2.3.1

3.5.2   Mounting/installation

Installation into milk pipeline by means of weldable socket, type 6701-00-021, as follows:

1) Weld the weldable socket into milk pipeline, smooth and clean the seams.

2) Slightly grease the O ring D12,0 x 3,0 (order no. U220751) delivered with the temperature sensor, insert it into the weldable socket carefully and put it with the finger tip into the O ring recess at the front end. Check if it fits in correctly and evenly by feeling with your finger tip.

3) Shove the clamp flat gasket DN 20 EPDM onto the sensor tip and insert the sensor cautiously into the weldable socket as far as it will go by slightly turning to the left and to the right.

4) Sensor is locked with double hinge clamp, the wing screw should only be hand-screwed.
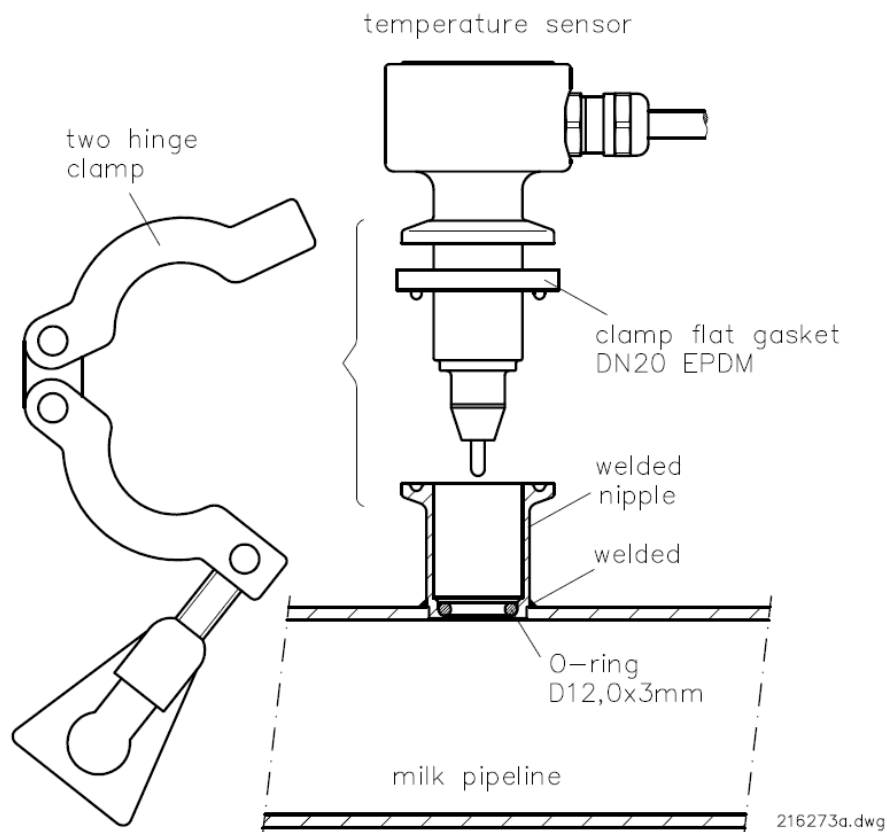
3.6   Temperature probe with sensor, type 6703-11, Series B

3.6.1   Technical data

Device-specific data	
Measuring element	Pt 100 DIN IEC 751 Class A
Electrical data	
Operating voltage	DC 24 V, 50 mA
Connection	Cable 5 m (wire end sleeves)
AC voltage of milk sensor	12 V AC, approx.1,5 kHz
Switching threshold of milk sensor	ca. 500 Ω
Output of milk sensor	Positive switching (DC +24 V) switching current $\leq$ 20 mA
Ambient conditions	
Operating temperature	- 20 ... + 60 °C
Temperature range of sensor element	- 20 ... + 100 °C
Climatic classification / protection type	JUC / IP 65
Mechanical data	
Casing	V$_2$A 1.4301
Weight	0.5 kg
Mounting	Clamp DN 20
Installation position	Any, preferably vertically from above for sensor function

Dimensions
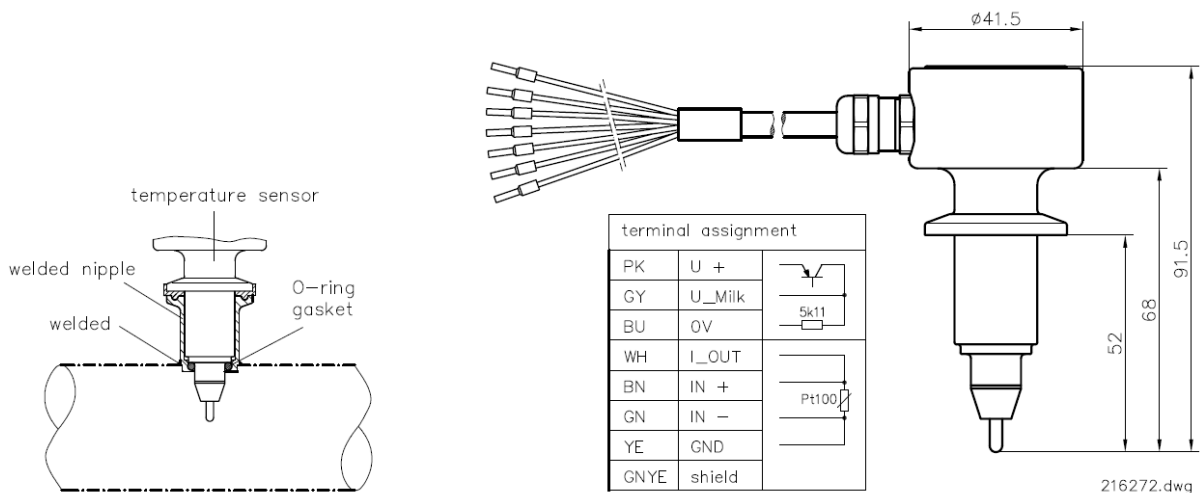
Cable shielding: variante 1 in accordance with 2.3.1

3.6.2   Mounting/installation

Installation into milk pipeline by means of weldable socket, type 6701-00-021, as follows:

1) Weld the weldable socket into milk pipeline, smooth and clean the seams.

2) Slightly grease the O ring D12,0 x 3,0 (order no. U220751) delivered with the temperature sensor, insert it into the weldable socket and carefully put it with the finger tip into the O ring recess at the front end. Check if it fits in correctly and evenly by feeling with your finger tip.

3) Shove clamp flat gasket DN 20 EPDM onto the sensor tip and insert the sensor cautiously into the weldable socket as far as it will go by slightly turning to the left and to the right.

4) Sensor is locked with double hinge clamp, the wing screw should only be hand-screwed.

3.7 Interface for pH value and temperature, type 6704-11

The interface makes possible to connect a commercially available standard pH electrode and optionally a standard temperature sensor via fieldbus P-NET to the system MAK 3002.

The pH electrode can be mounted into the weldable socket of the milk pipeline via a mechanic adapter.

It is mechanically compatible to the existing combination probe type 6704-10 for pH value + temperature and can replace it in case of new installations or repairs.

In this case the separate temperature sensor type 6703-11 has to be additionally installed into the pipeline via a separate weldable socket.
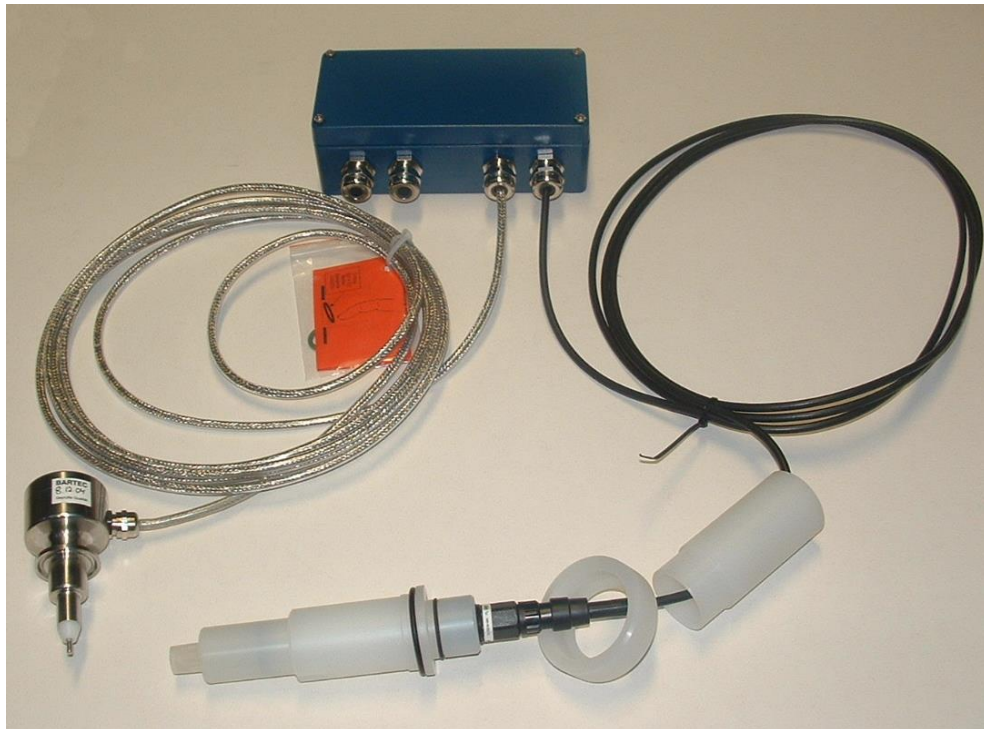
3.7.1 Technical data

Interface, type 6704-11

Electrical data	
Operating voltage	DC 24 V, 150 mA
Interface	P-NET, P-NET identification no.5403
	Pt 100 4 L connection including milk sensor and pH electrode connection
Electrical connection	Internal screw terminals, max. 1,5 mm²
	Cable feed via 4 x PG9
Ambient conditions	
Operating temperature	- 20 … 60°C
Storage temperature	- 20 … 60 °C
Protection type	IP 65
Mechanical data	
Installation position	Any, but cable feeds must not lead upwards

Temperature sensor

See ”Temperature sensor, type 6703-11“.

pH electrode

Operating temperature	0 … 60°C
Storage temperature	0 … 60°C
Electrode tip	Must always be kept wet with sufficient distilled water in the protective cap
Installation position	Measuring tip must point downwards (± 45° inclination permitted)

3.7.2 Wiring

Interface type 6704-11		P-NET bus general	Temp. sensor type 6703-11	pH electrode
Terminal	**Signal**	**Lead colour**	**Lead colour**	**Lead colour**
2 x A	P-NET A	yellow		
2 x B	P-NET B	green		
2 x S	P-NET S	brown		
2 x +	+ 24 V	pink/grey/white		
2 x -	0 V	Shield		
U +			pink	
U_Milk			grey	
0 V			blue	
I_Out			white	
IN +			brown	
IN –			green	
GND			yellow	
Shield			yellow/green (shield)	
EMK +				Middle wire (copper)
EMK -				Shield braiding*

* Contact the shield braiding appropriately with the short connection lead .

3.7.3 Configuration of pH probe

Select "Menu/Peripheral/pH-Te.-Sensor"

Select sensor 1, turn it on (key "1") and activate probe by entering the device no. (A. Nr.).

3.7.4 Calibration of pH probe

General information:

For devices with pH measuring, the pH measuring probe has to be calibrated every day before the first collection tour. Additionally see 3.7.5 "Instructions on pH measurement".

Each time you turn on the operating voltage of the system MAK 3002, you are asked to calibrate the pH probe.

You can skip the calibration procedure by pressing the softkey "abort".

In this case, the values of the last calibration remain valid. The calibration values remain stored even if the MAK 3002 is turned off or after a power blackout.

The calibration values as well as the skipping of the calibration procedure are additionally protocolled in the tour data.

The pH measurement probes must not deviate from the nominal value by more than $\pm$ 1 pH. Otherwise they cannot be calibrated.

If after pressing „OK" (= start of calibration) after about 10 seconds you are requested to carry out a pH7.00 or a pH4.00 adjustment, the pH measuring probe is outside the $\pm$ 1 pH tolerance.

The measuring probe has either reached the end of its lifetime or it is defective or the diaphragma is encrusted. Additionally see 3.7.5 "Instructions on calibration"

Preparation:

Remove protective cap from the tip of their measuring probe. Rinse measuring probe in clear water.

Turn on MAK 3002.

After the automatic boot procedure in the controller, the display shows "pH calibration, immerse probe into buffer solution pH7".

This is the request to immerse the pH measuring probe in the buffer solution "pH7" (green liquid).

Calibration procedure

Immerse the probe in buffer solution "pH7" (green) and press softkey "confirm".

In the display a scroll bar indicates the ongoing calibration procedure for the value pH7.

Stir the probe in the buffer solution to accelerate the calibration procedure which usually takes about 10 seconds.

When the calibration procedure for pH7 is completed, the message "pH calibration, immerse probe into buffer solution pH4" appears in the display.

This is the request to calibrate pH4 now.

Remove the measuring probe from buffer solution "pH7". Rinse measuring probe carefully in clear water.

Immerse the probe in buffer solution "pH4" (red) and press softkey "confirm".

In the display a scroll bar indicates the ongoing calibration procedure for the value pH4.

Stir the probe in the buffer solution to accelerate the calibration procedure which usually takes 10 seconds.

When the calibration procedure for pH4 is completed, the display shows the main menu of the controller. The calibration has been carried out completely.

Rinse measuring probe again in clear water and screw it into the milk line for milk intake.

3.7.5   Instructions on pH measurement

Calibration instructions

Calibrate the system once a day, if possible before the tour starts.

Only exact calibration values result in exact measurement results.

Always calibrate first with buffer solution pH7, then with buffer solution pH4.

CAUTION:

Make sure that not even a splash of one buffer solution gets into the other solution. Never mix up the bottle caps of the buffer solutions.

If this is not observed, the buffer solutions are spoilt and have to be replaced.

Careless handling of buffer solutions may result in faulty calibrations leading to complaints.

Any costs incurring for remedying these complaints shall not be borne by BARTEC GmbH.

If the measuring probe can only be calibrated very slowly, the diaphragma at the pH electrode may be slightly encrusted.

Scrape this encrustation off with the fingernail or with a match.

Maintenance of measuring probe:

Make sure the measuring head is always wet!

For this reason, put the measuring head in time into a container with clear water!

Always use the protective cap half filled with water!

Only use distilled water!

Hard water (10 dH and more) changes the calibration values and you have to carry out a new calibration.

If despite these steps the measuring head is dry:

Put the measuring head by all means into the pH7 buffer solution for at least one hour before carrying out a measurement.

Always take a supply bottle with fresh water with you during a collection tour.

If required, you can at any time refill the protective cap or rinse the measuring head.

Renew this water daily!

If the first milk supplier is more than 15 minutes away from the starting point or the calibration site, proceed as follows:

Remove protective cap immediately before starting to collect milk, and put pH measuring probe into the suction tube.

It is imperative not to suck in air for more than 10 seconds during milk intake.

Otherwise the measuring head might dry up or milk remainders might dry up.

Due to the atmospheric oxygen, the remaining milk can change chemically at the pH electrode.

This may result in an adulteration of the subsequent measurements.

If the last milk supplier is away more than 15 minutes from the delivery or cleaning site, proceed as follows after the last milk intake:

Pull measuring probe from the suction tube and put on the protective cap half filled with water.

After the collection tour has been completed, clean the pH measuring probe in the dairy or at the cleaning site. See 3.7.6.
If there are several tours per day it is urgently recommended to clean the pH measuring probe between the tours.

CAUTION:
Do not operate the pH electrode in temperatures below 0° C.

Temperatures below 0° C result in lasting modifications.

This results in faulty measurements.

If the external temperatures are below 0° C, store the measuring probe in a heated room over night.

Fill 3 mol KCL solution into the protective cap of the pH electrode.

3.7.6   Clean the pH measuring probe

Daily cleaning:

Disconnect the pH measuring probe from System MAK 3002.

Pull the plug out of the adapter cable.

CAUTION:
It is imperative to put the protective cap on the plug and screw it tight!

Remove the pH measuring probe from the suction tube.

If required for the tank cleaning, screw a blind plug on the suction tube. Make sure the sealing fits properly.

Clean the measuring probe with clear and warm water and a soft brush.

Remove any foreign substances, particularly residues from milk filters.

Rub off cautiously with your fingernail or the edge of a match any encrusted spots at the dia-phragma of the pH electrode.

Fill the protective cap half with water and put the protective cap back on the measuring head.

Weekly cleaning:

Clean in accordance with the instructions under "Daily cleaning".

Pour the provided cleaning fluid up to approx. 5 cm height into a container.

Insert the pH measuring head into the container so that it is completely surrounded by the cleaning fluid.

After about 15 minutes remove the pH measuring head from the cleaning fluid and rinse it with running warm water.

Fill the protective cap half with water and put the protective cap back on the measuring head.

NOTE:
Use cleaning fluid only once!

3.8 Milk sensor, type 6703-15, Series A

The milk sensor, type 6703-15, serves to measure the filling level in conductive liquids. The wall of the tank or of the pipe is used as counter-potential.

The stick electrode can be shortened to any length.

3.8.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V, 50 mA
Connection type	Cable 5 m (wire end sleeve)
Output (U-Milk)	Analog 0,0 ... 2,1 V DC
Measurement range	0 … 5 KΩ, $\cong$ 2,1 … 0,0 V
Ambient conditions	
Operating temperature/sensor element	- 20 … + 60 °C / suited for CIP in the measurement tube
Storage temperature	- 30 … + 70 °C
Climatic classification/protection type	JKC / IP 65
Mechanical data	
Mounting	Clamp DN 20
Installation position	horizontal to vertical (stick electrode points downwards = preferred position)
Weight	0,5 kg
Casing	
Connecting head	Stainless steel V2A 1.4301
Stick electrode	Stainless steel V4A 1.4571

Dimensions

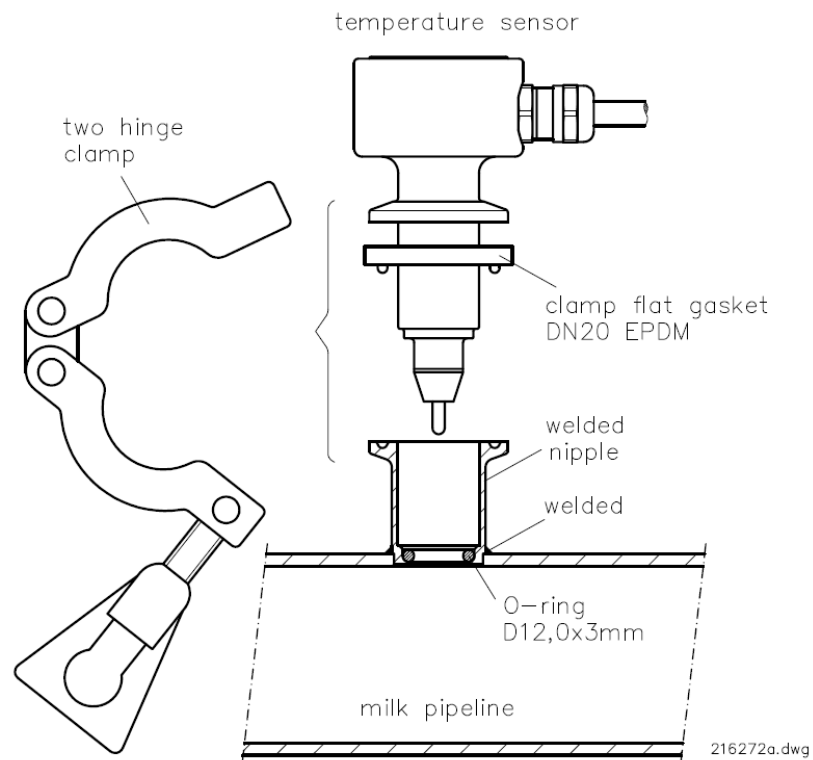| terminal assignment	
PK	U +
GY	U_Milk
YE	GND
GNYE	shield
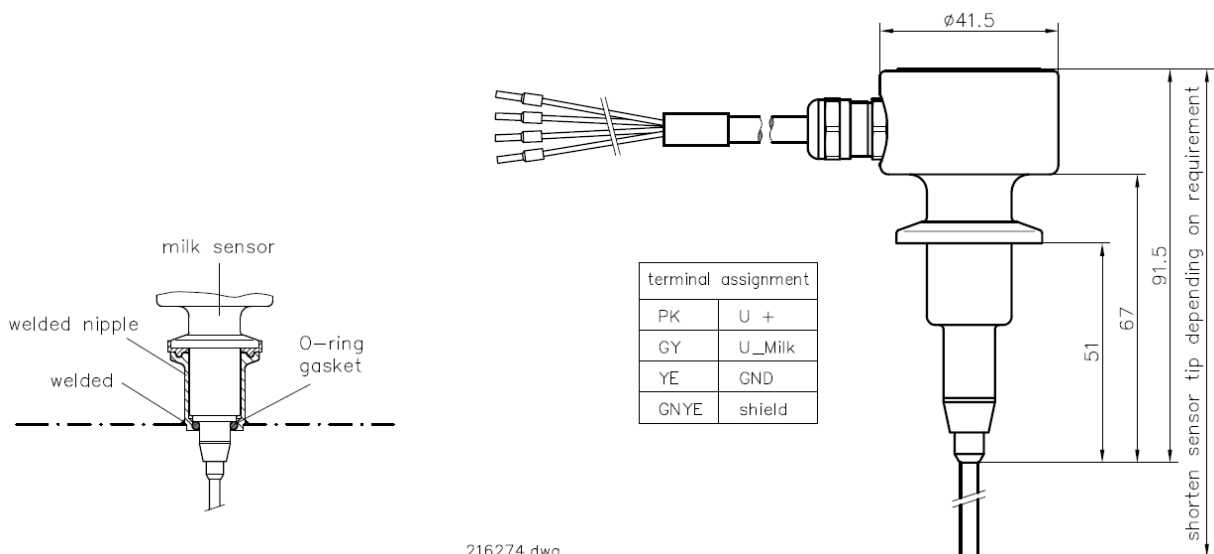
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Cable shielding: Variant 1 in accordance with 2.3.1

3.8.2   Mounting/installation

Installation into tank wall or pipe wall by means of weldable socket, type 6701-00-021, as follows:

1) Weld the weldable socket into tank wall or pipe wall, smooth and clean the seams.

2) Slightly grease the O ring D12,0 x 3,0 delivered with the milk sensor (order no. U220751), insert it into the weldable socket and carefully put it with your finger tip into the O ring recess at the front end. Check if it fits correctly and evenly by feeling with your finger tip.

3) Cautiously shorten the stick electrode of the milk sensor to the <u>required length</u> by means of a metal saw without damaging the insulation, and debur and smooth the cut surface.

   <u>Required length:</u>
   If it is installed into the pipe, the end of the measuring tip should be in the middle of the pipe, if it is installed into other containers, it should be located in accordance with the functional requirements.

4) Shove clamp flat gasket DN 20 EPDM onto the sensor tip and insert sensor cautiously into the weldable socket as far as it will go by slightly turning it left and right.

5) Sensor is locked with double hinge clamp, the wing screw should only be hand-screwed.
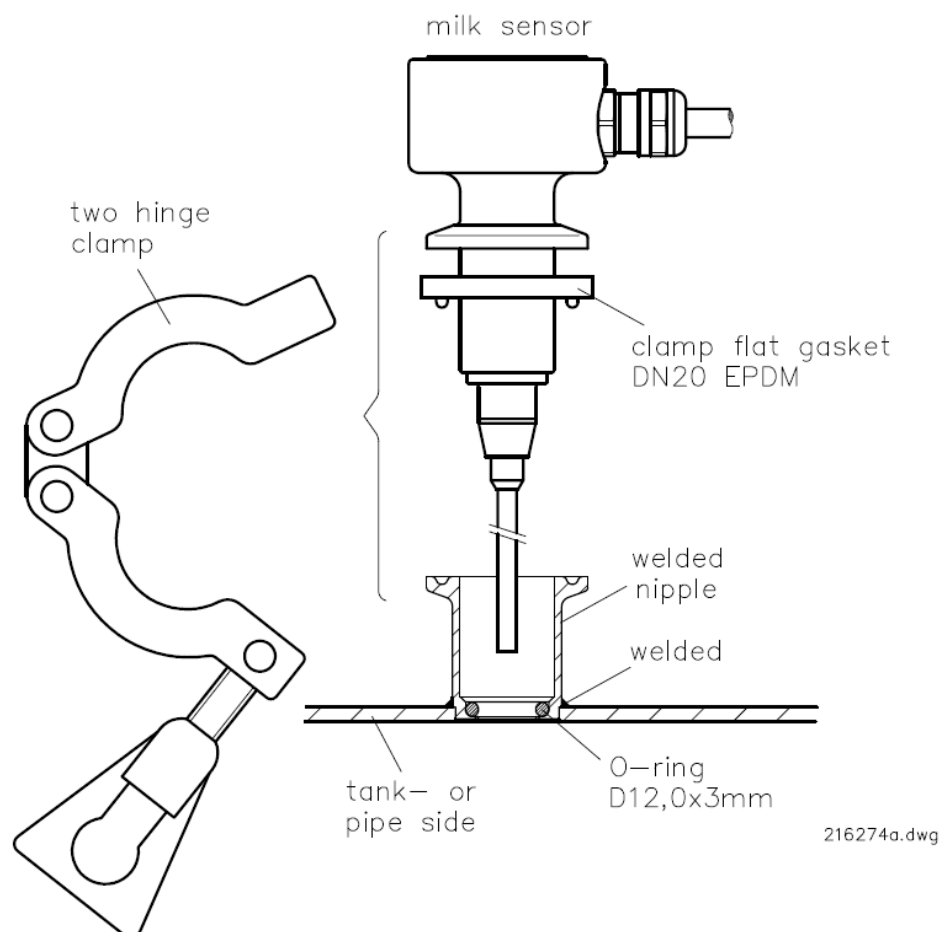
3.9 Milk sensor, type 6703-16, Series A

Via a plus-switching output, the milk sensor sends a signal if there is milk in the pipe.

3.9.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V (+ 10 … - 20 %), 50 mA
Connection type	Cable 5 m (wire end sleeve)
Output milk sensor	Plus switching (DC + 24 V) Switching current ≤ 20 mA
Threshold level of milk sensor	ca. 500 Ω
Alternating voltage milk sensor	12 V AC, ca. 1,5 kHz
Ambient conditions	
Operating temperature/sensor element	- 20 … + 60 °C / short-term up to + 80 °C
Storage temperature	- 30 … + 70 °C
Protection type	IP 65
Mechanical data	
Weight	0,5 kg
Housing	V2A 1.4301
Mounting	Clamp DN 20

3.9.2 Connection/Dimensions

terminal assignment		
PK	U +	
GY	U_Milk	
BU	0V	5k11
YEGN	shield	
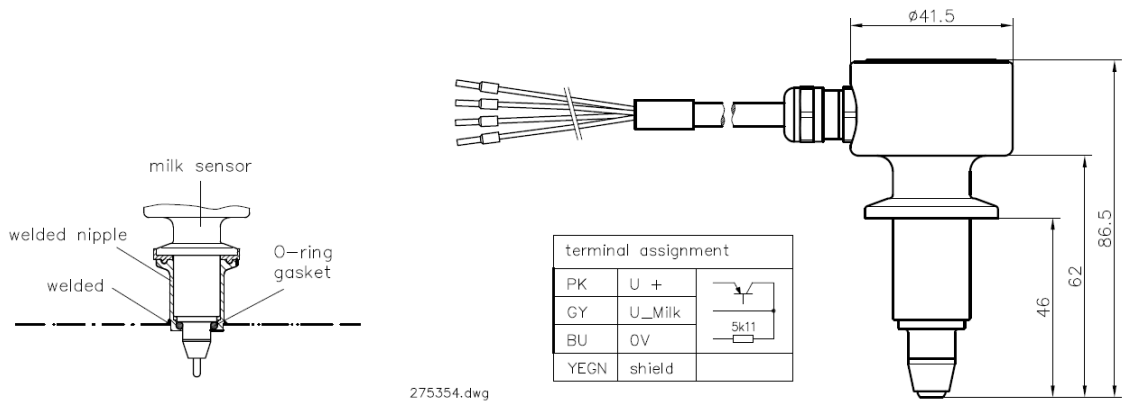
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3.9.3 Mounting/Installation

Installation into milk pipeline by means of weldable socket, type 6701-00-021, as follows:

1) Weld the weldable socket into milk pipeline, smooth and clean the seams.

2) Slightly grease the O ring D12,0 x 3,0 (order no. U220751) delivered with the temperature sensor, insert it into the weldable socket and carefully put it with the finger tip into the O ring recess at the front end. Check if it fits in correctly and evenly by feeling with your finger tip.

3) Shove clamp flat gasket DN 20 EPDM onto the sensor tip and insert the sensor cautiously into the weldable socket as far as it will go by slightly turning to the left and to the right.

4) Sensor is locked with double hinge clamp, the wing screw should only be hand-screwed.

3.10   Controller, type 6731-10 / Controller, type 6741-10

Controller, type 6731-10

Controller, type 6741-10

3.10.1   Technical data

Device-specific data	
Display	Graphic-capable LC display, 160 x 128 pixel, field of view approx. 96 x 77 mm
Electrical data	
Operating voltage	Nominal voltage: DC 24 V ± 20 %, nominal current: 0.3 A
Electrical connection	Screw terminals, cable feed via 4 x PG9
Interface	1 x P-NET (RS485) 1 x RS232
Ambient conditions	
Operating temperature	-20 ...+60 °C
Storage temperature	-20 ... +60 °C
Climatic classification/protection type	JSF / IP65
Mechanical data	
Weight	Type 6731-10: 47 N ≅ 4,7 kg Type 6741-10: 62 N ≅ 6,2 kg
Casing	Robust aluminium diecast casing, blue powder-coating, RAL 5001, Controller holder: aluminium shiny
Installation position	any, adjustment of the device according to ergonomic aspects, cable feed via PGs only admissible from below

Dimensions

Controller, type 6731-10

controller upper part
controller bottom part
controller holding

calibration switch with interlock

controller holding
with mounting holes ⌀9

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Controller AN, type 6741-10

controller upper part
controller bottom part
controller holding

calibration switch with interlock

controller holding
with mounting holes ⌀9

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3.10.2   Mounting and wiring

controller holding — cylinder head screw M8 — controller bottom part — copper–gasket — controller upper part

O–ring (3)

calibration switch with calibration bolt (1)

cylinder head screw M8x16 (2)   specific screw M6 (4)

(..) see introduction sheet

ga673002a.dwg

Mounting instructions for controller

The controller is mounted on a controller holder with 4 screws (2).

The controller should preferably be mounted in a way that a vertical view on the display and access to the keys is provided.

Mounting

- Loosen the 4 screws **(4)**, cautiously take off the top section of the controller and disconnect both flat ribbon cables.
- Loosen the screw in the calibration switch and remove the calibration bolt **(1)**. The calibration switch is at the lower left side of the controller casing (black turn switch next to cable screwing).
- Turn calibration switch anticlockwise to the left by 90°, so that the screw below **(2)** (in the controller) becomes visible.
- Loosen the 4 screws **(2)** and then take off the bottom section of the controller from the controller holder.
- Mount the controller holder in the vehicle.
- After the controller holder has been mounted, reinsert the 4 O rings **(3)** and put on the bottom section of the controller.
- Fasten the bottom section of the controller at the controller holder with the 4 screws **(2)**. Do not forget the Cu sealings!
- Before putting on the top section again, check if casing sealing fits correctly. If required, insert it carefully into the groove without twisting or bending it if necessary.
  Likewise, check if opposite part of the sealing at the top section is clean. If required, clean it.
  Screw in the 4 screws **(4)** of the top section only slightly at first, check if sealing fits correctly and then tighten the screws diagonally to make sure the sealing sits evenly and is evenly burdened at all sides.
- Turn calibration switch and reinsert calibration bolt (after start-up, setting of configuration data and system calibration have been finished).

Electrical connection of controller type 6731-10, controller AN type 6741-10

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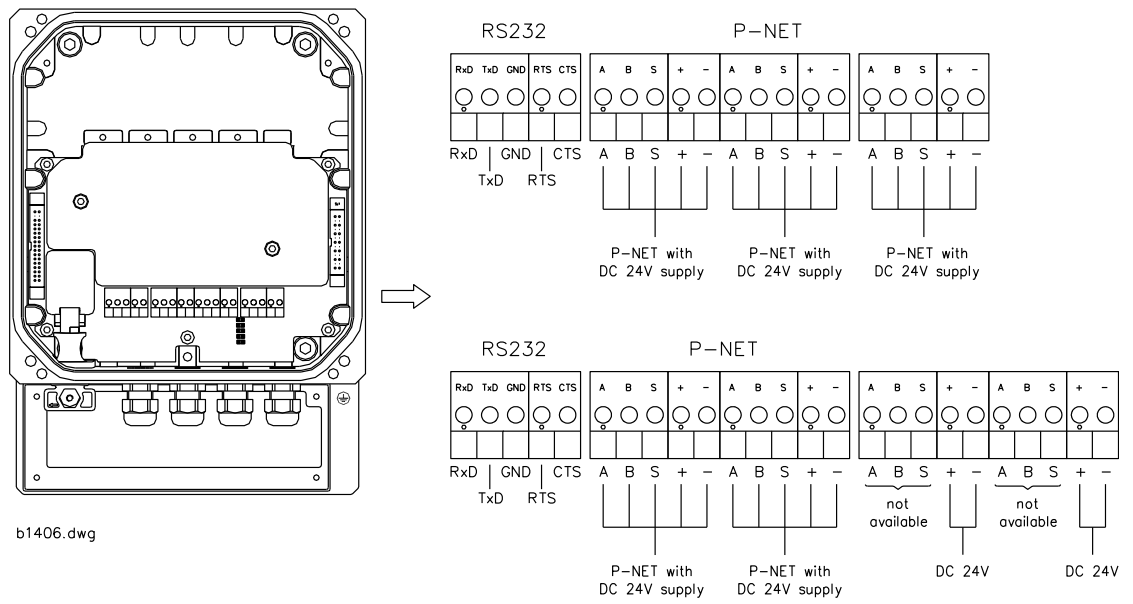
Stamp position diagram for controller type 6731-10, controller AN type 6741-10

Controller 673X

Calibration seal

Calibration mark
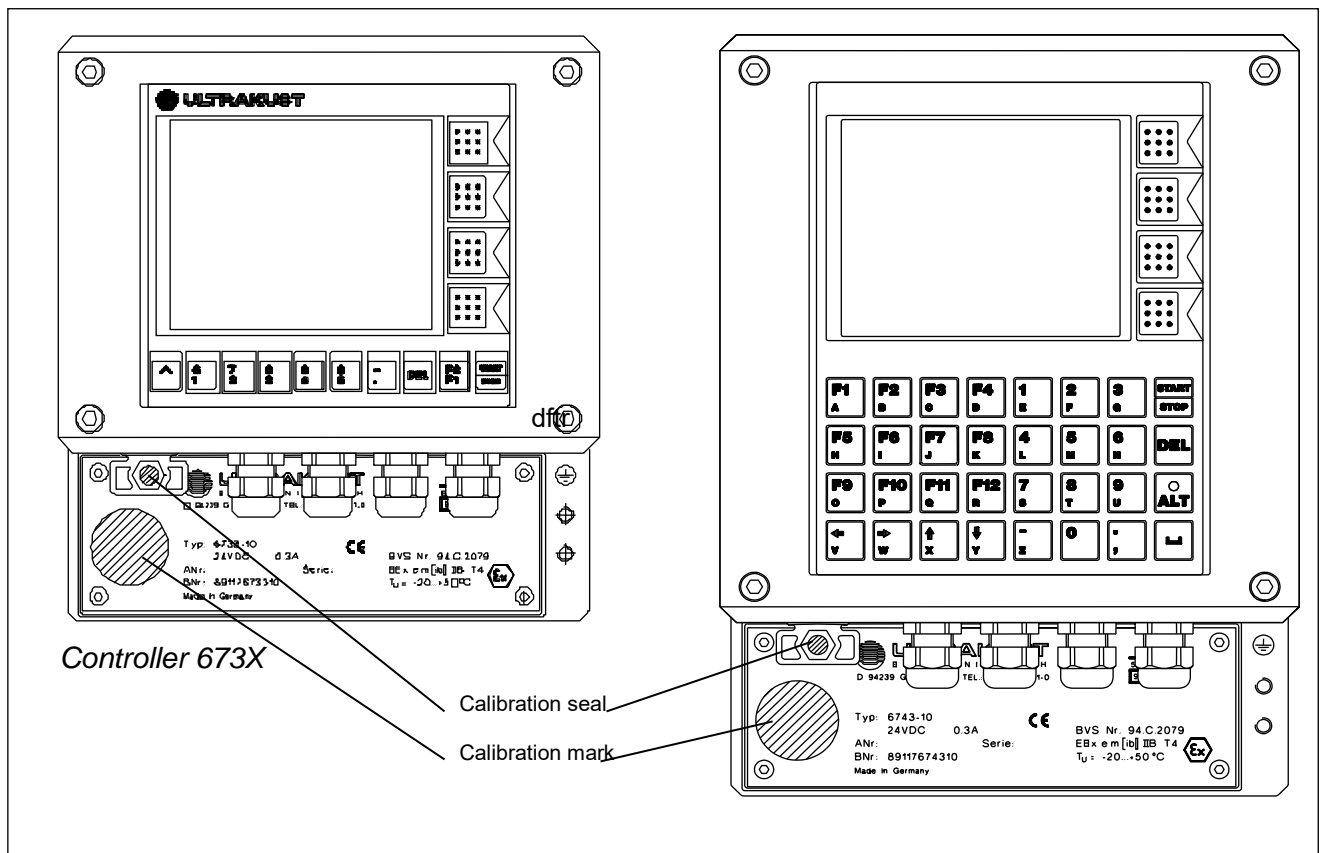
3.11 Controller MAK plus type 6744-10

3.11.1 Technical data

Electrical data	
Operating voltage (UB)	DC 9 - 33 V from on-board power supply, nominal current 0,25 A at DC 24 V, plus current load at digital outputs and P-NET fieldbus
External buffer battery	DC 24 V, nominal current 0,25 A (depending on national specifications, only if required)
Digital switch outputs (OUT1 + OUT2)	Output voltage $\cong$ operating voltage, maximum switching current 1 A, short.-circuit proof, galvanically separated
Digital switch inputs (IN1, IN2, IN3)	Output voltage $\cong$ operating voltage, input impedance = 5,11 KΩ $\cong$ 4,7 mA at DC 24 V, switchable to +UB or -UB, can be individually selected per input via jumpers, galvanically separated
Digital count input for distance (km)	External signal $\leq$ 1 V $\cong$ logical 0, 5 … 30 V $\cong$ logical 1 Input impedance 10 KΩ $\cong$ 2,4 mA with DC 24 V Maximum count frequency 300 Hz, galvanically separated
Temperature sensor and sensor input (Pt 100/Milk)	Pt 100 4 L, measuring current 1 mA, external signal $\leq$ 1 V $\cong$ logical 0 5 ... 30 V $\cong$ logical 1 input impedance = 5,11 KΩ $\cong$ 4,7 mA with DC 24 V, galvanically separated
Interfaces	1 x P-NET (RS 485), galvanically separated, DC 24 V/max. 1,0 A 1 x RS 232 (serial, adjustable up to a maximum of 9600 Baud)
Electrical connection	On-board power / Buffer battery / P-NET — Pluggable screw terminals, maximum wire cross-section 1,5 mm² OUT 1+2 / IN 1, 2 +3 / km / Pt 100/Milk / RS 232 — Pluggable screw terminals, Maximum wire cross-section 1,5 mm²
Cable feed	8 x PG9
Ambient conditions	
Operating temperature	-20 ... +60 °C
Climatic classification / protection type	JSF / IP 65
Mechanical data	
Display	Graphic LC display, 160 x 128 Pixel, field of view approx. 96 x 77 mm
Casing	Robust aluminium diecast casing, blue powder-coating, RAL 5001
Weight	65 N (6,5 kg)
Mounting plate	V$_2$A sheet
Installation position	Any, cable feed via PGs only admissible from below. Adjustment of the device according to ergonomic aspects

Dimensions

Screw **(4)**

3.11.2   Mounting and wiring

cylinder head screw M8

controller bottom part

controller upper part

controller holding

cylinder head screw M8x10 (2)

copper gasket

specific screw M6x30 (4)

O-ring (3)

housing gasket

calibration switch with calibration bolt (1)

(..) see introduction sheet

sch0271d.dwg
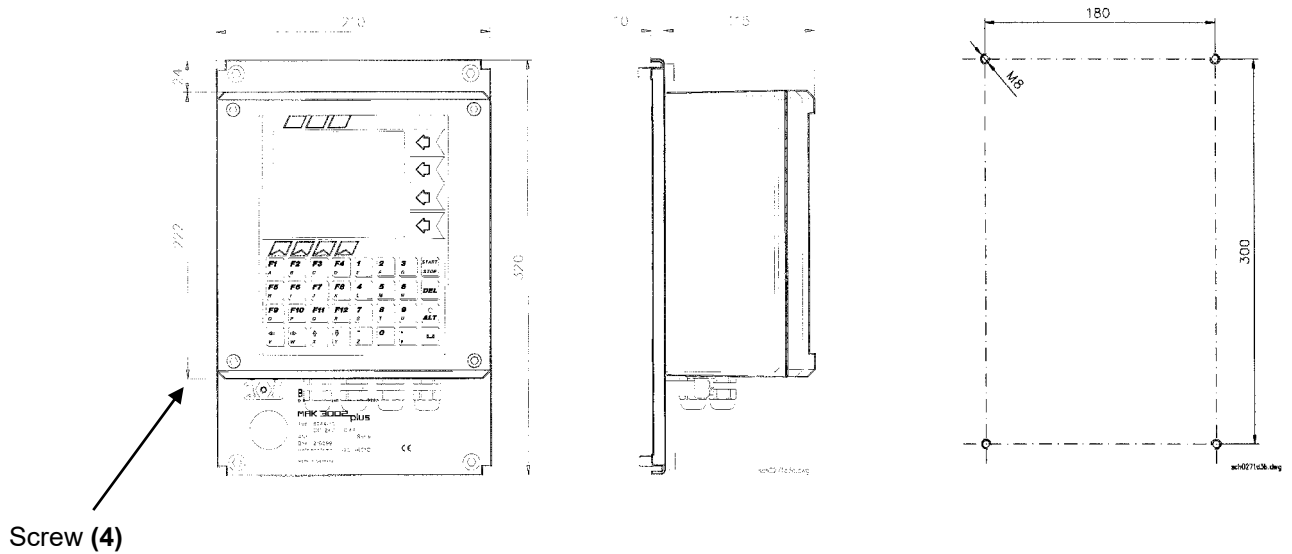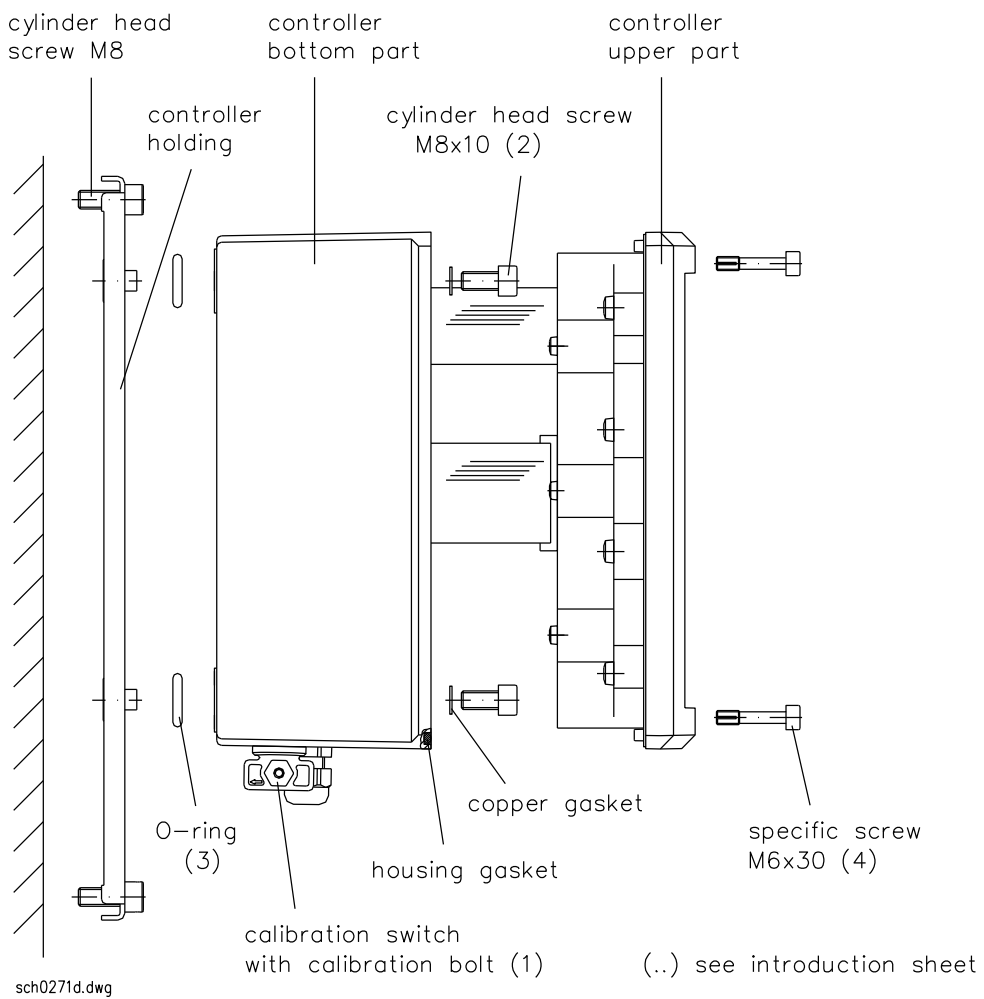
Mounting instruction for controller:

The controller is already pre-mounted on the mounting plate with 4 screws.

The complete device including the mounting plate can be mounted by means of the 4 freely accessible mounting bores in the mounting plate without having to open the device.

The controller should preferably be mounted in a way that a vertical view on the display and access to the keys is provided.

The calibration switch (can be opened by a 90° anticlockwise turn and closed by a clockwise turn) is secured with the calibration bolt and screw/seal only after startup, setting of configuration data and system calibration have been finished.

Electrical connection:

1) Loosen 4 screws **(4)**, lift top section of the controller cautiously and open to the right.

    In this position the top section is held by two plug-in hinges. It is not necessary to disconnect the two flat ribbon cables but it is possible to do so to get a better access (only admitted in if system is turned off).

    Then the top section can be completely taken off by simply pulling out the hinges from the bottom section of the controller.

2) All connections are carried out in the device by means of pluggable screw terminals.

    They are numbered from 1 ... 42, for the signal assignment see below.

3) Insert the connection cables in spatial assignment to the respective connection terminals via the cable glands.

    Tighten all cable glands carefully and make sure that even cable glands that are not used are sealed securely.

4) Before putting on the top section again, check if casing sealing fits correctly. If required, insert it into the groove without twisting or bending it.
    Likewise, check if the opposite side of the seal at the top section is clean, clean it if required.
    At first only slightly screw in the 4 screws (4) of the top section, check if sealing fits correctly and then tighten screws diagonally in order to guarantee that the sealing sits evenly and is evenly burdened at all sides.

Connection diagram

on board power supply −
DC 9−33V +

External
buffer battery
DC 24V/0.25A

P−NET Fieldbus and
DC 24V power supply *
(max. 1.0A)

OUT 1 R Load +
max. 1A −
OUT 2 R Load +
max. 1A −
km +
km −
IN 1 +
−
IN 2 +
−
IN 3 +
−

Temp. Probe
+ Sensor
Type 6703−11

pk	U+
gy	U_Milk
wh	I_OUT
bn	IN+
gn	IN−
ye/bu	GND
gnye	Shield

+24V	21
IN1	22
0V	23
+24V	24
IN2	25
0V	26
+24V	27
IN3	28
0V	29
30

Serial Interface
RS 232

| RTS |
| TxD |
| CTS |
| RxD |
| GND |
| Shield |

Jumper for switch logic of
digital inputs accessible
after removing the cover

Inputs IN1−3
switched to plus **

BR 6 (IN1)

BR 7 (IN2)

BR 8 (IN3)

Inputs IN1−3
switched to GND

sa300255a.dwg

* Take notice of product information Controller MAK vario,
type 6744−10 for installation within system MAK 3002

** Default setting at delivery

To connect the controller in different system variants, observe the following wiring in-
structions:

➢ Unlike the controller MAK type 6731-10 / 6741-10, the controller MAKplus type 6744-10
is not provided via P-NET fieldbus terminals [+] and [-].
It has a separate on-board power supply connection, and actively makes available DC
24 V / max. 1.0 A on the P-NET field terminals [+] and [-] for the provision of external
system components.

➢ These DC 24 V on the P-NET fieldbus terminals [+] and [-] of the controller MAKplus
mustn´t be connected via P-NET cable to other MAK 3002 system components which
are already provided with DC 24 V by another power supply unit (e.g. power supply plug-
in unit, type 6757-101, in the extension unit or series device, type 6781-11 / type 6861-
3).
By observing these conditions it is of course possible that individual or several 3002 sys-
tem components are powered with the DC 24 V of the controller MAKplus.
Please observe that the maximally admissible current is 1,0 A. It is for instance not pos-
sible to power the thermal printer type 6761-11 from it.

➢ Depending on the cabling, the leads of the P-NET cable for the supply voltage in the
controller MAKplus have to be looped through via separate terminals (see fig.1, ring line)
or to be insulated separately (see fig.2, branch line)

➢ The wiring examples below serve to illustrate the facts and to show you different wiring
possibilities.

Fig. 1
Connection diagram for ring line
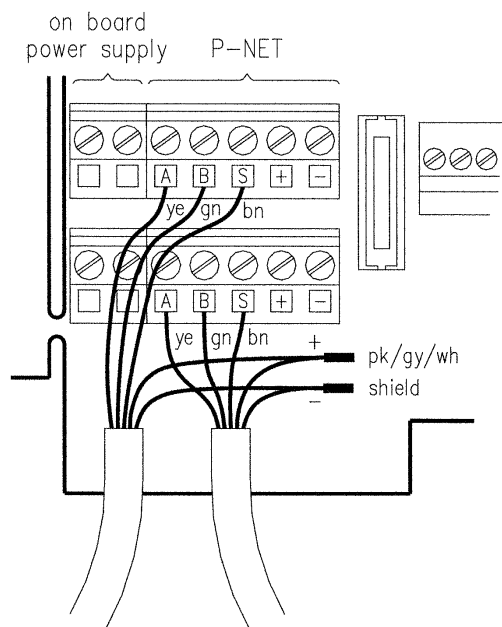
Fig. 2
Connection diagram for branch line
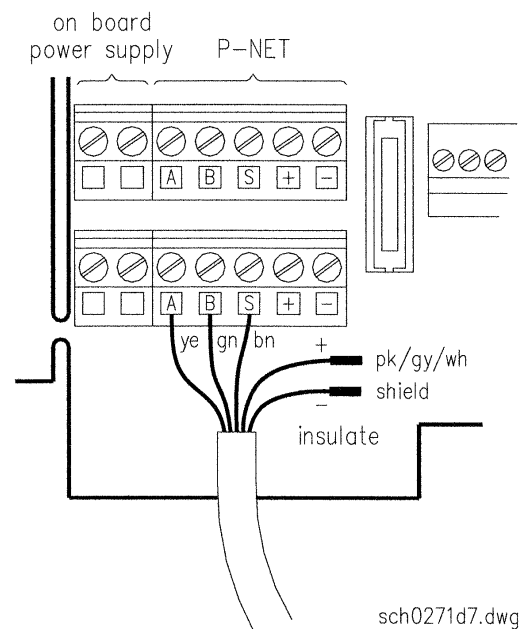
sch0271d7.dwg

Wiring examples in system MAK 3002plus

Example 1
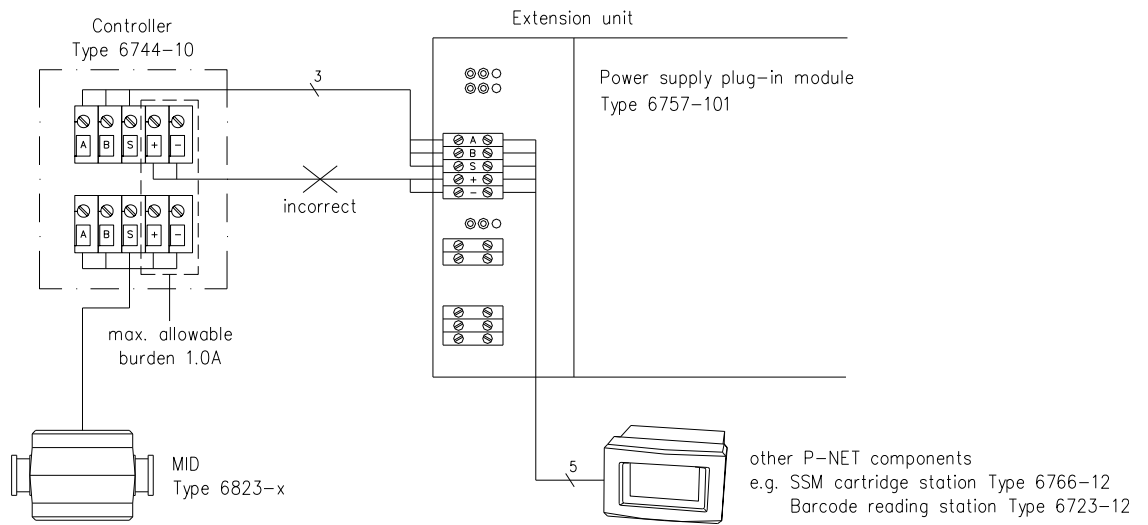
sa300254.dwg

Example 2

sa300254a.dwg

Example 3

Controller
Type 6744-10

max. allowable
burden 1.0A

MID
Type 6823-x

Extension unit

Power supply plug-in module 'Eco'
Typ 6757-110

other P-NET components
e.g. SSM cartridge station Type 6766-12
Barcode reading station Type 6723-12

sa300254b.dwg

Example 4

sa300253.dwg

Block diagram

U_BAT +(8)

buffer battery

UB +(1)
on board
power supply

UB −(2)

U_BAT −(9)

Si1
15A F

Si2
3A F   +24V

Si4
3A F

0V

Si3
3A F

km + (19)

km − (20)

OUT1 + (15)
OUT2 + (17)
OUT1 − (16)
OUT2 − (18)

+24V IN1 (21)
+24V IN2 (24)
+24V IN3 (27)
IN1 (22)
IN2 (25)
IN3 (28)
0V IN1 (23)
0V IN2 (26)
0V IN3 (29)

BR6 (IN1)
BR7 (IN2)
BR8 (IN3)

1 = switched to plus
2 = switched to GND

Display,
Keyboard
CPU

(10) P-NET A
(11) P-NET B
(12) P-NET S
(13) P-NET +
(14) P-NET −

(3) P-NET A
(4) P-NET B
(5) P-NET S
(6) P-NET +
(7) P-NET −

pin 3 P-NET A
pin 8 P-NET B
pin 5 P-NET S
pin 7 P-NET +
pin 2 P-NET −

Diagnostic plug

+24V   (30) U+
(31) U_Milk
(32) I_OUT
(33) IN+
(34) IN−
(35) GND
shield

Temp.
probe
+
Sensor

(37) RTS
(38) TxD
(39) CTS
(40) RxD
(41) GND
shield

RS232 −
Interface

sa300255c.dwg

Position of jumpers, melting fuses and diagnostic LEDs

Diagnosis LED's:
D12 — Busy
D11 — P—NET activ
D9 — Battery mode
 (battery voltage
 at device)

Jumper for switch logic
of digital inputs:

—— switched to plus ✱✱
—— switched to GND

✱✱ Default setting at delivery

so300255b.dwg
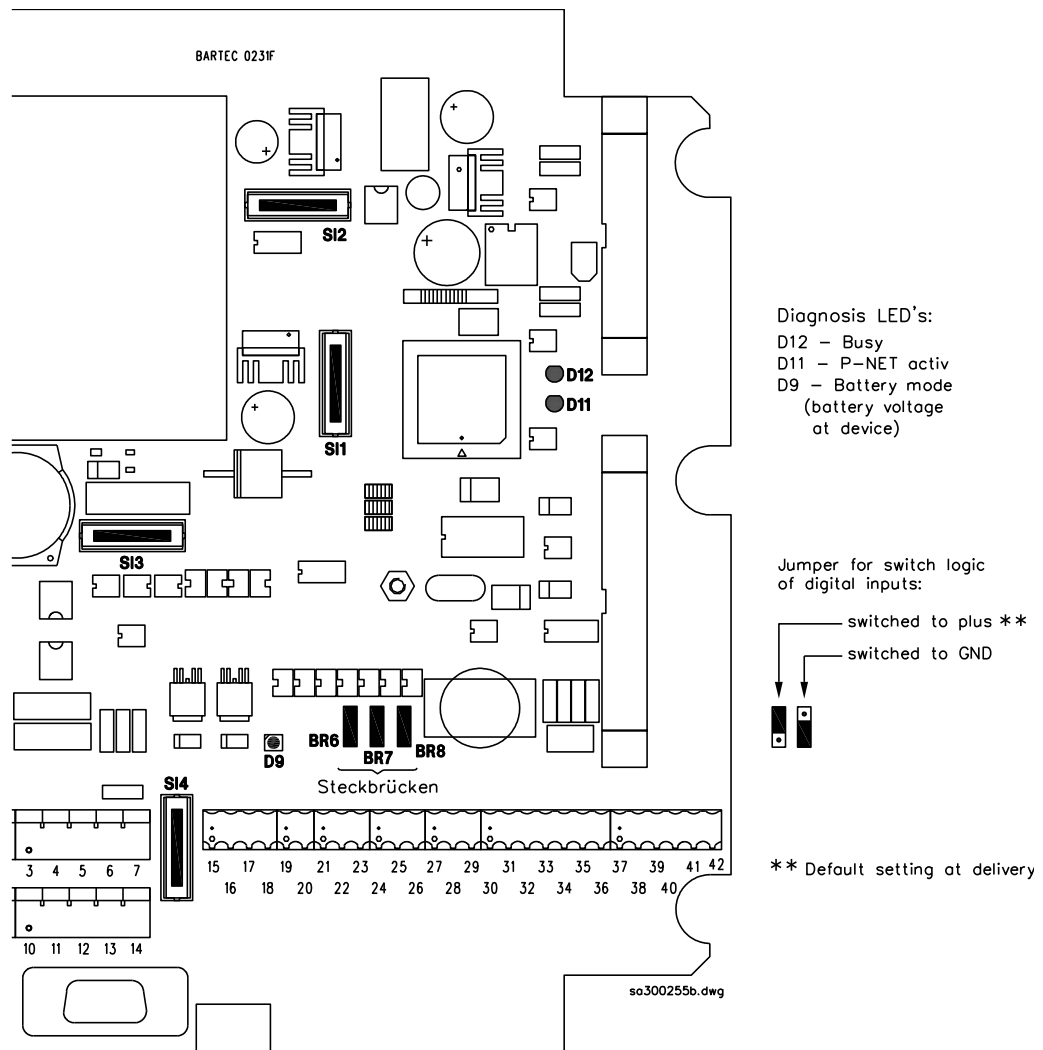
Si1 = 15 A F
Si2 = 3 A F
Si3 = 3 A F
Si4 = 3 A F

Stamp position diagram

seal

calibration mark
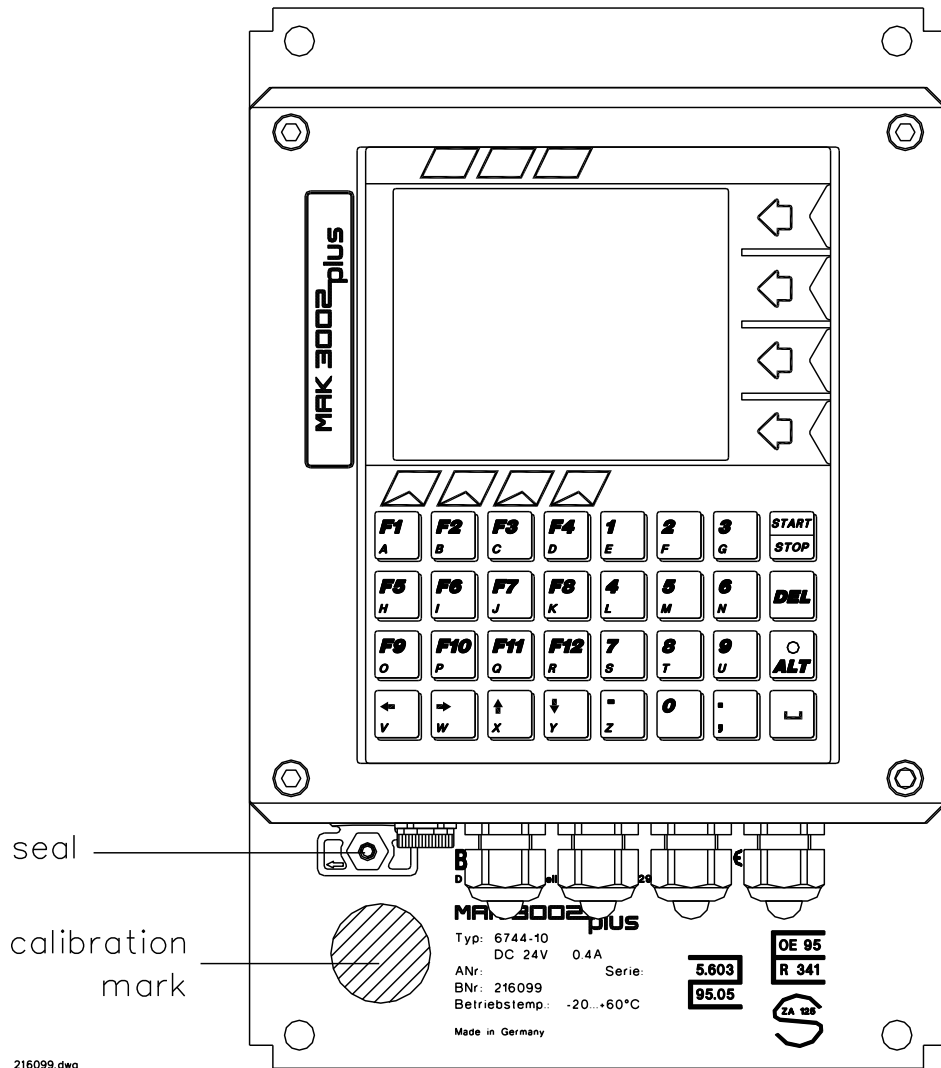
216099.dwg

3.12   Extension unit type 6757-xx

The extension unit serves to extend the system MAK 3002 plus in a flexible and system-specific way by means of service-friendly plug-in modules.

3.12.1   Plug-in frame, type 6757-100

The plug-in frame offers space for up to eight plug-in modules.
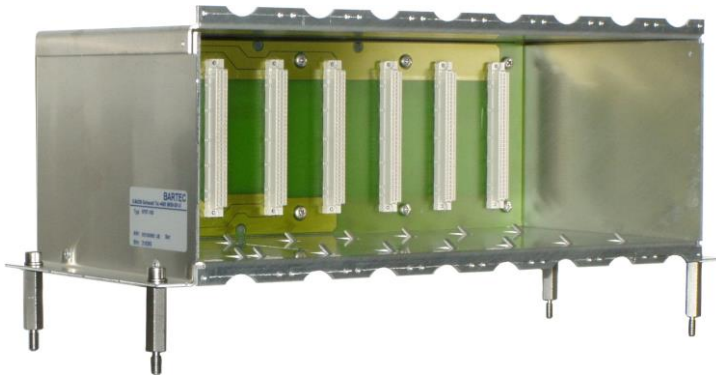
They are interconnected on the rear side by connectors on the motherboard.

All connections are clearly visible and easily accessible on the front side via plug-in terminals.

Plug-in modules with an assigned slot are code-protected against mix-up.

Plug-in modules with variable position can be arranged optionally according to the requirements.

Plug-in slots which are not needed are locked with dummy plates, a subsequent extension of the system with additional modules is possible any time without any extraordinary mounting effort.

Technical data

Ambient conditions	
Operating temperature	-10 ... +50 °C
Storage temperature	-20 ... +70 °C
Mechanical data	
Casing	Aluminium natural (AlMg 3)
Weight	2 kg without plug-in modules
Climatic classification / protection type	JWD / IP 20 for completely installed unit
Installation position	Any, preferably horizontal with opening on front
Installation site	According to climatic classification/protection type in a dry area protected against soiling, e.g. separate compartment

Dimensions and mounting bores

sch0271b.dwg
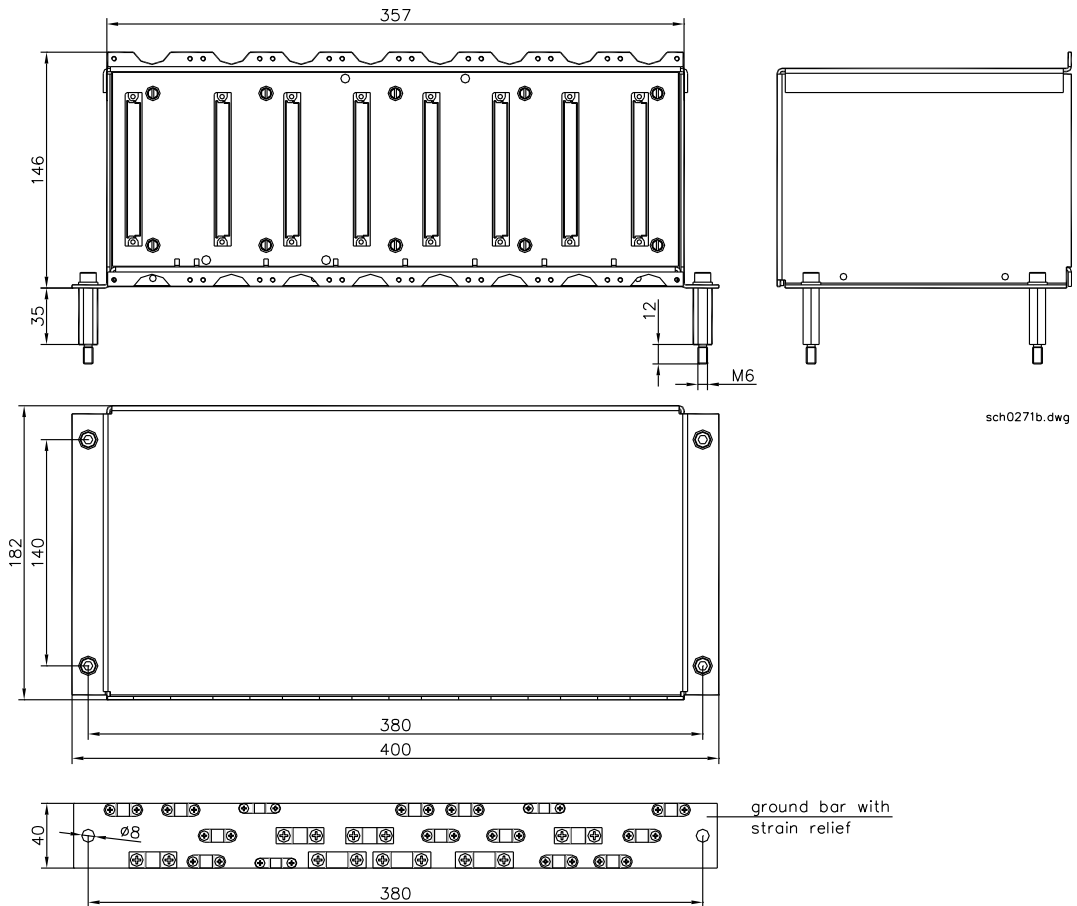
Instruction for cable connection

For strain relief and a better ground routing, an earth bar (shield terminal block with strain relief, type 6757-109, order number 220980) should be mounted before the plug-in frame.

Via a ground strap, a direct connection of the earth bar with the plug-in frame has to be established.

The shield of the connection cables (with some exceptions) has to be laid on this earth bar.

Please observe the detailed instructions on cable shielding under 2.3.1 and the respective details on cable shielding for the individual system components under chapter 3.

3.12.2   Power supply plug-in module, type 6757-101

Processing of the power supply from the on-board power supply system of the truck.

Power supply to all modules in the plug-in frame.

With this power unit, it is also possible to supply external components with stabilised voltage DC 24 V.

Technical data

Electrical data	
Input voltage	DC 9 V - DC 36 V from on-board power supply (load dump), miniature fuse 16 A
Output voltage U_1 For plug-in modules (internal)	DC 24 V ± 5 %, 3700 mA → continuous current, 4500 mA → short-term miniature fuse 6,3 A
Output voltage U_2 For plug-in modules (internal)	DC 5,1 V ± 1 %, 3000 mA Miniature fuse 3 A
Output voltage U_3 for components (external)	DC 24 V ± 5 %, 3700 mA → continuous current Safety fuse 6,3 A
Connections	Through terminals 2,5 mm
Interface	P-NET, with supply voltage DC 24 V ± 5 % for P-NET modules, 3700 mA
Ambient conditions	
Operating temperature	- 10 ...+ 50 °C
Storage temperature	- 20 ...+ 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Dimensions	Ca. T 190 x H 145 x B 55 mm
Material	Aluminium natural (AlMg 3)
Weight	Approx. 1 kg

Connection diagram

Designation	Signal
X101	P–NET A
X102	P–NET B
X103	P–NET S
X104	+ 24V
X105	– 0V
X106	+24V EXT
X107	0V EXT
X108	UB +
X109	UB –
X110	shield

5V test sockets/LED

24V test sockets/LED

24V$_{EXT}$ test sockets/LED

sch0271a2.dwg
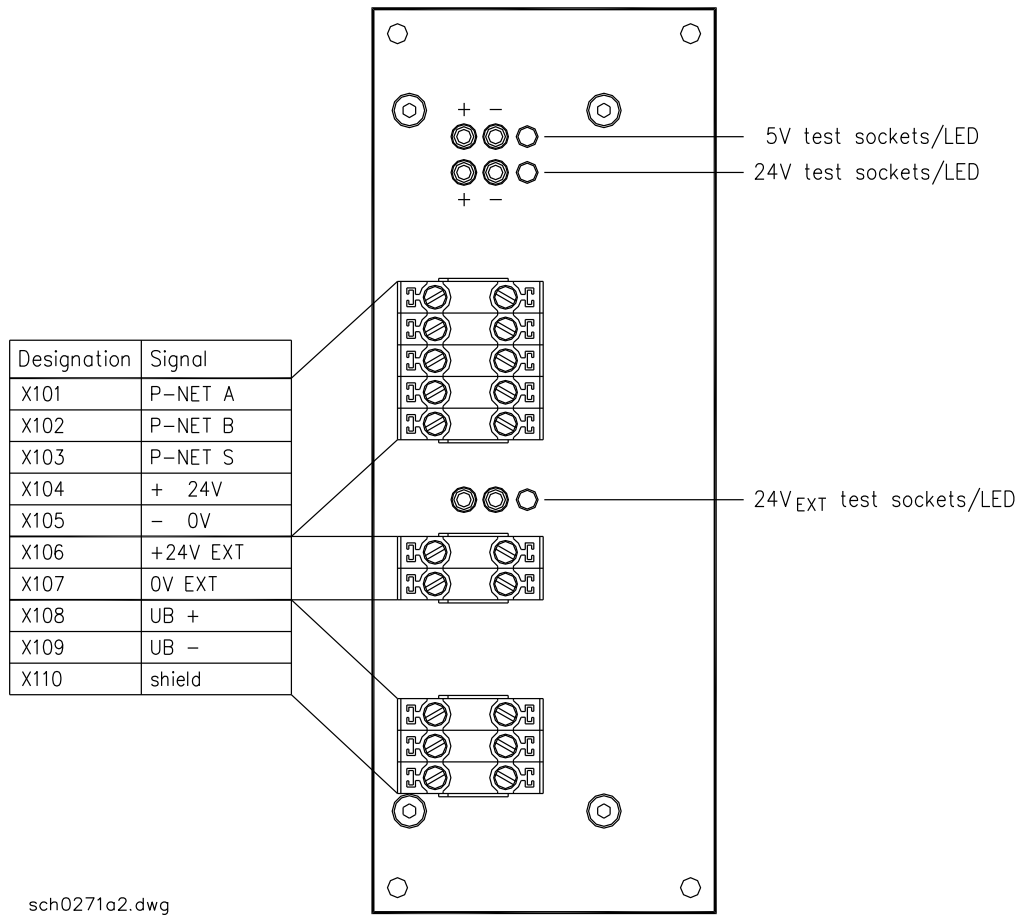
Module: power supply unit, type: 6757-101		
Terminal number	Designation	Wire colour
101	P-NET A	Yellow
102	P-NET B	Green
103	P-NET S	Brown
104	+ 24 V	pink/grey/white
105	- 0 V	Shield
106	+ 24 V EXT	
107	0 V EXT	
108	UB+	
109	UB-	
110	SHIELD	

Caution:
If there is a P-NET connection to the controller type 6744-10, these two lines mustn´t be connected (insulate appropriately and separately if required)

Supply on-board power connection via switch and line fuse (max. 7,5 A) with line cross-section $\geq$ 1,5 mm.

The on-board power lines UB+ / UB- have to be looped through to the respective connection terminals of the remaining plug-in modules with at least 1,5 mm.

3.12.3   Power supply Eco plug-in unit, type 6757-110

Processing of the DC 5.1 V logic voltage from the on-board power supply system of the truck for the power supply to the modules in the plug-in frame.

Feed-in and conduction of an externally processed DC-24-V supply voltage for the power supply to the modules in the plug-in frame and to external components.

Note:

The external voltage DC 24 V is supplied by the controller, type 6744-10.

For the respective system configuration (plug-in modules plus external components that have to be energised) the respective summated current has to be determined.

If the maximal admissible load (see technical data for type 6757-110 and type 6744-10) is exceeded, the more efficient power supply plug-in unit type 6757-101 has to be used.

Technical data

Electrical data	
Input voltage	DC 9 V - DC 36 V from on-board power supply, miniature fuse 5 A
Output voltage U_2	DC 5,1 V ± 1 %, 3000 mA, miniature fuse 3 A
Connections	Through terminals 2.5 mm
Interface	P-NET
Ambient conditions	
Operating temperature	- 10 ... + 50 °C
Storage temperature	- 20 ... + 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Dimensions	Approx. T 190 x H 145 x B 55 mm
Weight	Approx. 550 g
Material	Aluminium natural (AlMg 3)

Connection diagram

Designation	Signal
X101	P−NET A
X102	P−NET B
X103	P−NET S
X104	+ 24V
X105	− 0V
X106	+24V EXT
X107	0V EXT
X108	UB +
X109	UB −
X110	shield

5V test sockets/LED

24V test sockets/LED

24V$_{EXT}$ test sockets/LED

Permanently assigned slot 1

sch0271a2.dwg
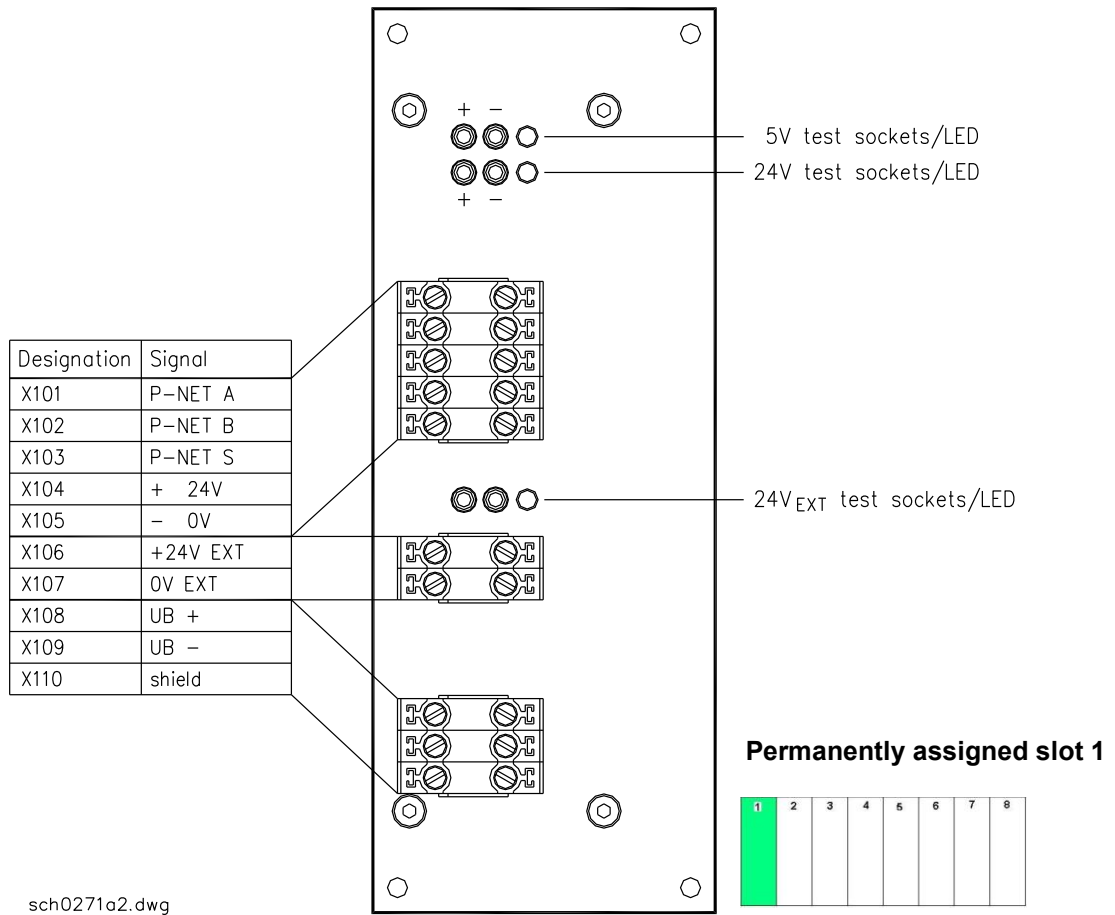
Module: power supply unit, type: 6757-110		
Terminal no.	Designation	Wire colour
101	P-NET A	yellow
102	P-NET B	green
103	P-NET S	brown
104	+ 24 V	pink/grey/white
105	- 0 V	Shield
106	+ 24 V EXT	
107	0 V EXT	
108	UB+	
109	UB-	
110	SHIELD	

to Controller, type 6744-10

Supply on-board power connection via switch and line fuse (max. 7,5 A) with line cross-section ≥ 1,5 mm .

The on-board power lines UB+ / UB- have to be looped through to the respective connection terminals of the remaining plug-in modules with at least 1,5 mm.

3.12.4   CPU plug-in unit, type 6757-102

Central control module.

Sample control system ULTRASAMPLER with flow-dependent pump control.

The functions of both Pt 100 4 l inputs can be configured freely, but usually they are used as follows:

1) Temperature measurement in the cooling department for sampling.

2a) Temperature sensor connection for second measuring section or

2b) Temperature and milk sensor connection for second measuring section in combination with ULTRASAMP-LER®+I/O plug-in unit, type 6757-103.
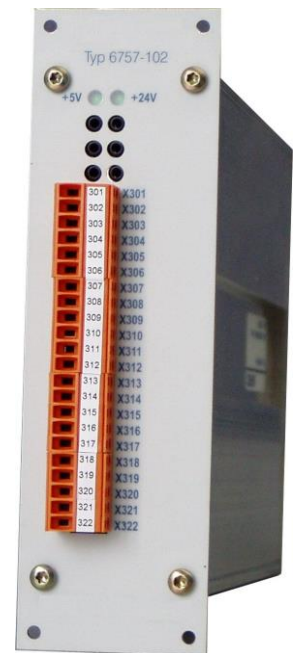
Technical data

Electrical data	
Operating voltage of electronics	DC 5,1 V ± 1 %, 120 mA, internal fuse 1A (MT)
Operating voltage of FLM	DC 24 V ± 5 % (internal), 300 mA, internal fuse 1A (MT)
Fieldbus interface	P-NET
P-NET ID	5941
Analog inputs	
Pt 100_1	Pt 100 4L 1 mA, - 20 – 100 °C, 0,04 °C resolution
Pt 100_2	Pt 100 4L 1 mA, - 20 – 100 °C, 0,04 °C resolution
FLM filling level	0,3 ... 2,3 V (0,3 V = 100 % full)
FLM flow	4 - 20 mA = 0 - 100% flow, 0,5 % resolution
Ambient conditions	
Operating temperature	- 10 … + 50 °C
Storage temperature	- 20 … + 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Material	Aluminium natural (AlMg 3)
Dimensions	Approx.190 x 145 x 55 mm
Weight	Approx. 500 g

Connection diagram

sch0271a6.dwg

Permanently assigned slot 3
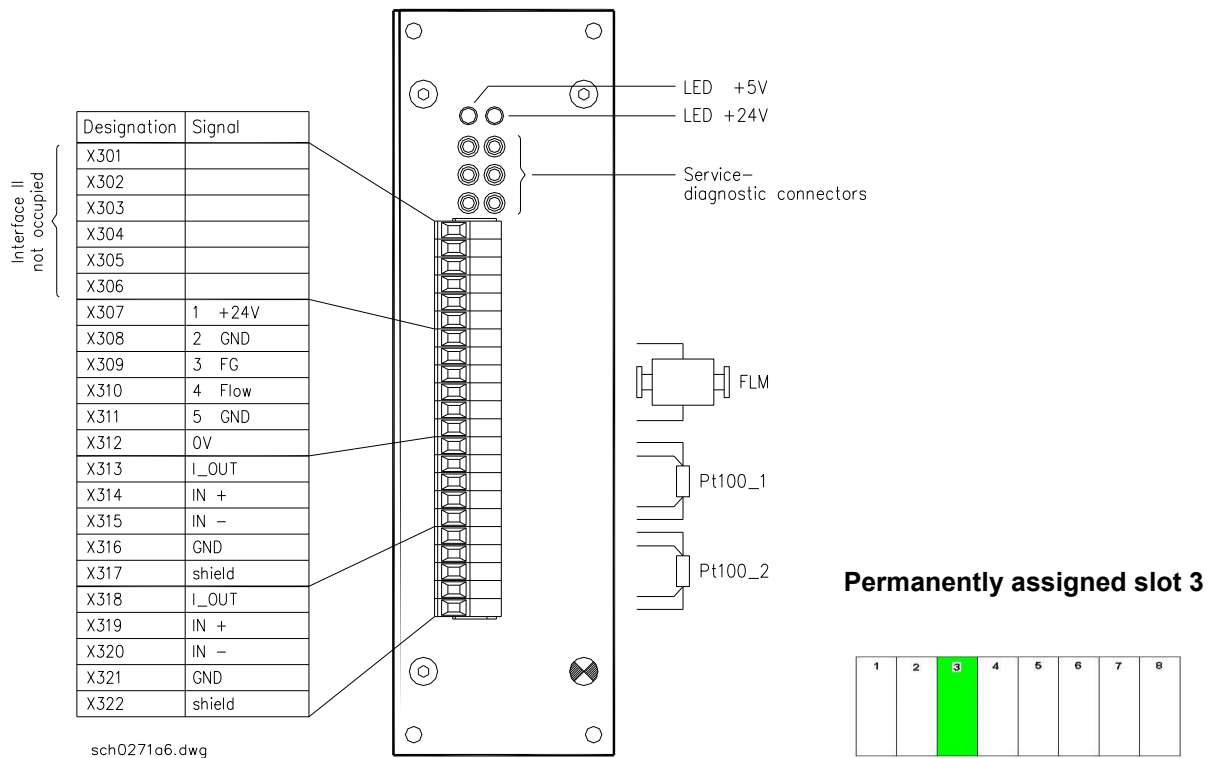
Module: CPU, type 6757-102				For second measuring section	
Terminal number	Designation	FLM type: 6826	Sample department sensor Pt 100	Temperature sensor type 6701-11	Temperature sensor type 6703-11
301 - 306	unused				
307	+ 24 V	pink/grey			
308	GND (FG)	brown			
309	FG (0,3 - 2,3 V)	yellow			
310	Flow (4 - 20 mA)	purple			
311	GND (Flow)	black			
312	0 V	shield			
313	I_Out		green		
314	IN+		yellow		
315	IN-		brown		
316	GND		white		
317	Shield 1)				
318	I_Out			white	white
319	IN+			brown	brown
320	IN-			green	green
321	GND			yellow/blue	yellow/blue
322	Shield 1)			yellow green	yellow green

- x 211	to plug-in	pink
- x 212 to x 219, depending on availability ⎬ module	grey
- x 220	type 6757-103	blue

1)   Observe instructions on cable shielding under 2.3.1

3.12.5 ULTRASAMPLER® +I/O plug-in module, type 6757-103

- Control logic with power element to drive the UL-TRASAMPLER pumps for individual samples and total tank samples.

- Control logic with power element for eight digital switching outputs and eight digital signal inputs.

Technical data

Electrical data	
Operating voltage of electronics	DC 5,1 V ± 1%, 50 mA, miniature fuse 0,5 A
Operating voltage inputs / outputs	On-board power supply, fuse 2 x 4 A, reversible
Current consumption of I/O	Max. 8 A
Operating voltage of step motor	On-board power supply, joint miniature fuse 4 A
Current consumption of step motor	Max. 4 A
Outputs	
Quantity	2 x 4
Galvanic separation	Optocoupler 2500 VRMS
Switching frequency	≤ 10 Hz
Switch type	High side solid state (MOSFET)
Switching level	0/24 V on-board power supply
Voltage	24V on-board power supply
Current per output	1 A DC, short-circuit-proof
R_{ON}	≤ 250 mΩ
Inputs	
Quantity	8
Galvanic separation	Optocoupler 2500 VRMS
U_s	24 V on-board power supply (5,11 kΩ)
Switch type	High side solid state (FET)
Sampler activation: individual sample and total tank sample	
Maximum step frequency	10 kHz (corresponding to 25 rev/sec. for 400 steps)
Quantity of sampler pumps	2
Ambient conditions	
Operating temperature	- 10 ... + 50 °C
Storage temperature	- 20 ... + 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Dimensions	Ca. T 190 x H 145 x B 55 mm
Material	Aluminium natural (AlMg 3)
Weight	Approx. 600 g

Connection diagram

Designation	Signal
X201	SM1 A
X202	SM1 B
X203	SM1 C
X204	SM1 D
X205	SM1 shield
X206	SM2 A
X207	SM2 B
X208	SM2 C
X209	SM2 D
X210	SM2 shield
X211	+24V B
X212	IN 1
X213	IN 2
X214	IN 3
X215	IN 4
X221	OUT 1
X222	OUT 2
X223	OUT 3
X224	OUT 4
X225	B GND
X231	UB +
X232	UB −

LED +5V$_{logik}$ (5V_D)

step motor 1

step motor 2

~4mA DC

Input 1−8

24V DC 1A vehicle power

Output 1−8

B GND

Designation	Signal
X216	IN 5
X217	IN 6
X218	IN 7
X219	IN 8
X220	B GND
X226	OUT 5
X227	OUT 6
X228	OUT 7
X229	OUT 8
X230	B GND

sch0271a4.dwg

Permanently assigned slot 2

1	2	3	4	5	6	7	8

Module: Ultrasampler, type 6757-103			
Terminal number	Designation	Type: 6871-x Ultrasampler Individual sample	Type 6871-x Total tank sample
201	SM1 A	blue	
202	SM1 B	white/brown	
203	SM1 C	green/yellow	
204	SM1 D	grey/pink	
205	SM1 Shield	yellow green 1)	
206	SM2 A		blue
207	SM2 B		white/brown
208	SM2 C		green/yellow
209	SM2 D		grey/pink
210	SM2 Shield		yellow green 1)
211	+ 24 V B		
212	IN 1		
213	IN 2		
214	IN 3		
215	IN 4		
216	IN 5		
217	IN 6		
218	IN 7		
219	IN 8		
220	B GND		
221	OUT 1		
222	OUT 2		
223	OUT 3		
224	OUT 4		
225	B GND		
226	OUT 5		
227	OUT 6		
228	OUT 7		
229	OUT 8		
230	B GND		
231	UB+		
232	UB-		

For initiators, solenoid valves etc., shunting terminals for 24 V and GND have to be available on site as only one contact point for + 24 V and GND respectively is available at the module, but there are connections available for eight inputs and eight outputs.

1) Observe instructions on cable shielding under 2.3.1.

3.12.6 V-2000 plug-in unit, type 6757-105

Control module with power unit to control the measuring system V 2000.

Digital and analogous interface to control and evaluate the external actors and sensor of the measuring system V 2000.

Technical data

Electrical data	
Electronics	
Operating voltage	DC 5,1 V ± 1 % / 100 mA, internal fuse 0,2 AM
Operating voltage of sensor system	DC 24 V ± 5 % Reversible fuse 50 mA per sensor input
Operating voltage of I/O s	DC 24 V on-board power supply Reversible fuse 2 x 4A (4 outputs each)
Current consumption of I/O	Max. 8 A
Operating voltage of PWM	DC 24 V on-board power supply Reversible fuse 3 A
Outputs of of switch function	
Quantity	2 x 4
Galvanic separation	Optocoupler 2500 VRMS
Frequency	Max. ≤ 10 kHz
Switching level	0/24-V on-board power supply
Current per output	1A DC, short-circuit-proof
Switch type	High side solid state (MOSFET)
Frequency inputs	
Frequency-$_{imp}$ MID input	0 - 1 kHz (low side), U_s DC 24 V UB
Frequency-$_{imp}$ rotary encoder input	0 - 1 kHz (low side), U_s DC 24 V UB
Analog inputs	
Dipstick	0 - 20 mA, U_s DC 24 V, 0,25 % resolution
Pressure	4 - 20 mA, U_s DC 24 V, 1 % resolution
S1 (foam)	0 - 2,5 V, U_s DC 24 V, 1% resolution
S2 (reserve)	0 - 2,5 V, US DC 24 V, 1 % resolution
Ambient conditions	
Operating temperature	- 10 ...+ 50 °C
Storage temperature	- 20 ...+ 70 °C
Climatic classification / protection type	JWD / IP00
Mechanical data	
Dimensions	Ca. T 190 x H 145 x B 55 mm
Material	Aluminium natural (AlMg 3)
Weight	Approx. 500 g

Connection diagram

LED +5V ——— LED +24V
LED ERROR ——— LED BUSY

Designation	Signal	
X501	+	(24V)
X502	I +	
X503	I –	
X504	–	(GND)
X505	+	(24V)
X506	–	
X513	+	(24V B)
X514	IN 1	(SIGNAL)
X515	–	
X516	+	(24V B)
X517	IN 2	(SIGNAL)
X518	–	
X525	+	(SIGNAL)
X526	–	(GND B)
X527	+	(24V B)
X528	IN_Dreh.	(SIGNAL)
X529	–	(GND B)
X535	OUT_1 +	(24V B)
X536	OUT_1 –	(GND B)
X537	OUT_2 +	(24V B)
X538	OUT_2 –	(GND B)
X539	OUT_3 +	(24V B)
X540	OUT_4 +	(24V B)
X547	UB +	(24V B)
X548	UB –	

fuel level plunger
pressure
IN 1
IN 2
MID
rotary encoder
INT
on board supply system

Designation	Signal	
X507	+	(24V)
X508	–	(GND)
X509	In	(SIGNAL)
X510	+	(24V)
X511	–	(GND)
X512	In	(SIGNAL)
X519	+	(24V B)
X520	IN 3	(SIGNAL)
X521	–	
X522	+	(24V B)
X523	IN 4	(SIGNAL)
X524	–	
X530	I_OUT +	
X531	I_OUT –	
X532	frei	
X533	PWM +	(SIGNAL)
X534	PWM –	(GND B)
X541	OUT_5 +	(24V B)
X542	OUT_6 +	(24V B)
X543	OUT_7 +	(24V B)
X544	OUT_7 –	(GND B)
X545	OUT_8 +	(24V B)
X546	OUT_8 –	(GND B)

S 1
S 2
IN 3
IN 4
I OUT*
PWM*
INT

* hydraulic system (PWM)
* hydraulic system (analog signal)

sch0271a10.dwg

Slots 2 - 8

Terminal	Designation	LAS dipstick	Pressure sensor Serial no. 206518	6703-15 S1 foam separator	6703-15 S2-MID	6823-x MID	Proximity switch Ser no. 495595	Hydraulic valve (PWM)
	Module: V 2000, type: 6757-105							
501	+ 24V	Brown						
502	I + (dipstick)	Yellow						
503	I -	Blue						
504	- (GND)	Grey						
505	+ (24V PressureS)		brown (+)//black-1(+)					
506	-		blue (-)//black-2(-)					
507	+ (24V)			Pink				
508	- (GND)			Yellow				
509	In (Signal S1)			Grey				
510	+ (24V)				Pink			
511	- (GND)				Yellow			
512	In (Signal S2)				Grey			
513	+ (24V B)							
514	IN1 (Signal)							
515	-							
516	+ (24V B)							
517	IN2 (Signal)							
518	-							
519	+ (24V B)							
520	IN3 (Signal)							
521	-							
522	+ (24V B)							
523	IN4 (Signal)							
524	-							
525	+ (Signal MID)					purple		
526	- (GND B)					black		
527	+ (24V B)						brown	
528	IN_rotary (Signal)						white	
529	- (GND B)						blue	
530	I_OUT + (0-20 mA)							
531	I_OUT -							
532	Not assigned							
533	PWM+(Signal)							brown
534	PWM-(GND B)							blue
535	OUT_1+ (24V B)							
536	OUT_1- (GND B)							
537	OUT_2+ (24V B)							
538	OUT_2- (GND B)							
539	OUT_3+ (24V B)							
540	OUT_4+ (24V B)							
541	OUT_5+ (24V B)							
542	OUT_6+ (24V B)							
543	OUT_7+ (24V B)							
544	OUT_7- (GND B)							
545	OUT_8+ (24V B)							
546	OUT_8- (GND B)							
547	UB+							
548	UB-							

3.12.7 RS-232-3x/P-NET Converter plug-in unit, type 6757-106

Connection for maximally three components with RS-232 interface to the fieldbus P-Net used in the system MAK-3002.

For the supply of the external components, DC 24 V are available for each RS-232 interface.

Technical data

Electrical data	
Electronics	
Operating voltage	DC 5,1 V ± 1 %, 100 mA without load, internal fuse 1 AM
Operating voltage for RS-232 channels	DC 24 V ± 5 %, internal fuse 3 AM per channel
Interfaces RS 232 (0,1 + 2)	
Baudrate	Adjustable from 1200 – 38400

Maximum line length	2 - 24 m depending on baudrate
	  2 m for 38400 Baud
	  24 m for 1200 Baud

Galvanic separation	none
Ambient conditions	
Operating temperature	- 10 ...+ 50 °C
Storage temperature	- 20 ...+ 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Dimensions	Approx.190 x 145 x 55 mm
Material	Aluminium natural (AIMg 3)
Weight	Approx. 500 g

Connection diagram

Designation	Signal
X601	+24V
X602	RxD_0
X603	TxD_0
X604	CTS_0
X605	RTS_0
X606	GND_0
X607	shield
X608	+24V
X609	RxD_1
X610	TxD_1
X611	CTS_1
X612	RTS_1
X613	GND_1
X614	shield
X615	+24V
X616	RxD_2
X617	TxD_2
X618	CTS_2
X619	RTS_2
X620	GND_2
X621	shield

LED +5V logik
LED +24V input
LED +24V S0
LED +24V S1
LED +24V S2

Slots 2 - 8

sch0271a13.dwg

Module: 3x RS 232/P-net, type: 6757-106						
Terminal	Designation	Printer 6761-11	GPS 6722-16	GSM modem TC35, MC35	Radio transceiver 6722-13	WLAN adapter 6722-17
601	+ 24V	pink/grey				
602	RxD_0	green				
603	TxD_0	yellow				
604	CTS_0					
605	RTS_0					
606	GND_0	blue/white /brown				
607	Shield	1)				
608	+ 24V		red			
609	RxD_1		white			
610	TxD_1		blue			
611	CTS_1					
612	RTS_1					
613	GND_1		black			
614	Shield		1)			
615	+ 24V			Yellow/white	pink	pink
616	RxD_2			green	yellow	yellow
617	TxD_2			yellow	green	green
618	CTS_2			blue		
619	RTS_2			white		
620	GND_2			pink/brown	blue/brown	blue/brown
621	Shield			1)	Shield 1)	Shield 1)
				Connect pink+grey of RS-232 cable		

1) Observe instructions ond cable shielding under 2.3.1

Note:

Only interface 2 (designation xxx_2) is equipped for the operation of short-distance radio trans-mission (radio transceiver type 6722-13), WLAN (WLAN adapter type 6722-17) and GSM (GSM modem TC35/MC35).

For this reason, these components can only be connected here.

Depending on their availability, all other RS232 components (e.g. GPS receiver 6722-16 or thermal printer 6761-11) can be connected to each of the 3 interfaces.

3.12.8 Identification module plug-in unit, type 6757-107

The identification module serves to connect cable and radio-controlled read-heads for the en-coding block and TAG reading for supplier identification.
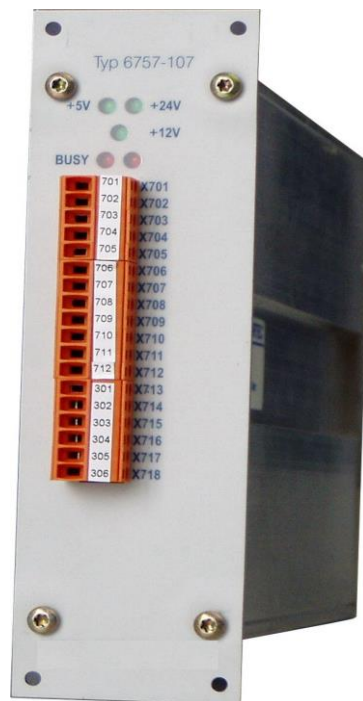
Technical data

Electrical data	
Operating voltage	DC 5,1 V ± 1 %, 50 mA, internal fuse 1 AM
External consumers	Cable read-head /receiving station DC 12 V, 100 mA, fuse 300 mA
Ambient conditions	
Operating temperature	- 10 ...+ 50 °C
Storage temperature	- 20 ...+ 70 °C
Climatic classification/ protection type	JWD / IP 00
Mechanical data	
Dimensions	Approx. 190 x 145 x 55 mm
Material	Aluminium natural (AlMg 3)
Weight	Approx. 500 g

Connection diagram

Designation	Signal
X701	EM_12V
X702	EM_A
X703	EM_B
X704	EM_0V
X705	shield
X706	+12V_OUT
X707	TACT
X708	CODE
X709	TA/LED1
X710	TA/LED2
X711	0V_OUT
X712	shield
X713	SI_12V
X714	
X715	+5V
X716	cable
X717	radio
X718	SI_0V

LED +5V
LED +24V
LED +12V
LED free
LED BUSY

receiving station

read head Wiegand
wired

cable-/
radio read head

Slots 2 - 8

sch0271a15.dwg

Module: supplier identification, type 6757-107			
Terminal number	Designation	Type: 6722-303	Type: 6834-06 Read-head adapter cable
701	EM_12V	White	
702	EM_A	Green	
703	EM_B	Yellow	
704	EM_0V	Blue/brown	
705	Shield	Shield 1)	
706	+ 12V_OUT		Blue
707	TAKT		Grey
708	CODE		White
709	TA/Led1		Green
710	TA/Led2		Transparent
711	0V_OUT		Black
712	Shield		
713	SI_12V		
714			
715	+ 5V		
716	Cable		
717	Radio		
718	SI_0V		

Encoded by enclosed terminal blocks

Jumper 715/716: Cable read-head activated
Jumper 715/717: Radio-controlled read-head activated

1) Observe instructions on cable shielding under 2.3.1

3.12.9 Bottle Drive plug-in unit, type 6757-112

The bottle drive plug-in unit is the interface with power unit for the CPU plug-in unit, type 6757-102, to control the automatic sample bottle transport system Bottle Drive, type 6774-10.

Technical data

Electrical data	
Electronics	
Operating voltage of electronics	DC 5,1 V ± 1 %, 50 mA, internal fuse 1 AM
Inputs	
Quantity	3
Galvanic separation	Optocoupler 2500 RMS, 24-V on-board power supply
Outputs	
Quantity	4
Fuse	Reversible, 3A per output
Switch type	Relay contact 24 V x 10 A, DC-24-V on-board power supply
Ambient conditions	
Operating temperature	- 10 ...+ 50 °C
Storage temperature	- 20 ...+ 70 °C
Climatic classification / protection type	JWD / IP 00
Mechanical data	
Dimensions	Approx. 190 x 145 x 55 mm
Material	Aluminium natural (AlMg 3)
Weight	Approx. 600 g

Connection diagram

Designation	Signal
X401	M.–UP
X402	M._DOWN
X403	M.–OUTLET
X404	M.–INLET
X405	M.–STAR
X406	+24V B
X407	GND B
X408	SH
X409	P.–STAR
X410	P.–BOTTLE
X411	P.–HUB
X412	UB +
X413	UB –

LED +5V
LED +24V

Bottle Drive

Bottle Drive

on board supply system

sch0271a19.dwg

Permanently assigned slot 4

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Module: Bottle Drive type 6757-112			
Terminal number	Designation	Type 6774-10 Bottle Drive pneumatic	Type 6864 Bottle Drive
401	M.-UP	brown	Black sw-1
402	M.-DOWN	Red	Black sw-2
403	M.-OUTLET	yellow	Black sw-4
404	M.-INLET	green	Black sw-5
405	M.-STAR	pink	Black sw-3
406	+ 24 V B	black	Black sw-10
407	GND B	brown/white	Black sw-11
408	SH (shield)		
409	P.-STAR	Purple	Black sw-7
410	P.-BOTTLE	Blue	Black sw-6
411	P.-LIFTING	pink/white	Black sw-13
412	UB+		
413	UB-		

3.13   Flow meter MID type 6823-x

3.13.1   General description

Magneto-inductive flow meters MID, type 6823-x, are precision measuring sensors to measure the volume of electro conductive liquids.

Due to their robust design and the material used they are particularly suited for the flow measurement in hygienically sensitive areas, for instance for milk volume measurement on collecting trucks.

All devices can be calibrated.

3.13.2   Technical data

Device-specific data	
Measured medium	Milk, conductivity $\geq 1 \mu$ S/cm, maximum pressure of measured medium: 10 bar
Maximum flow rate / nominal widths	Depending on nominal width: 2" (51mm) $\rightarrow$ 40m³/h, 2,5" (63,5 mm) $\rightarrow$ 80 m³/h, 3" (76 mm) $\rightarrow$ 120 m³/h Caution: If these values are exceeded, measuring head may be destroyed
Electrical data	
Operating voltage	AC 24 V, 50/60 Hz, $\pm$ 15 % or DC 24 V, $\pm$ 15 %, max. 6 W
Current interface	Two-wire current loop, 300 baud, internal source
Pulse output (only for 6823 and similar)	1 pulse per 0,1 l
Interface	P-NET, serial, asynchronous, 76800 bit/s
Ambient conditions	
Operating temperature	-10 ... +50 °C, measured medium -10 ... +100 °C
Maximum cleaning temperature	100 °C
Climatic classification / protection type	JWA / IP 67
Mechanical data	
Mechanical design	Plastic casing PP0 noryle, electrodes and measuring tube made of stainless steel AISI 316, measuring tube coated with teflon (FEP)
Mechanical connection	Connecting flange with milk pipe thread in accordance with DIN 11851
Electrical connection	PG11 cable glands, internal screw terminals, 5 m shielded connection cable, 10-wire with open ends
Weight	approx. 50 N ($\cong$ 5 kg)

Dimensions
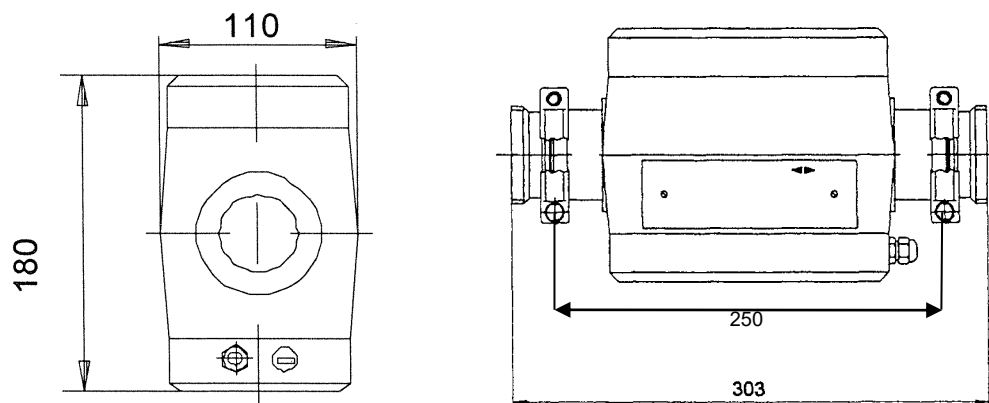
With milk pipe thread connecting piece

3.13.3   Mounting/installation

1	=	cover	5	=	flat gasket
2	=	fastening clamp	6	=	type plate
3	=	cable feed	7	=	hexagon head screw
4	=	connection	8	=	sealing ring
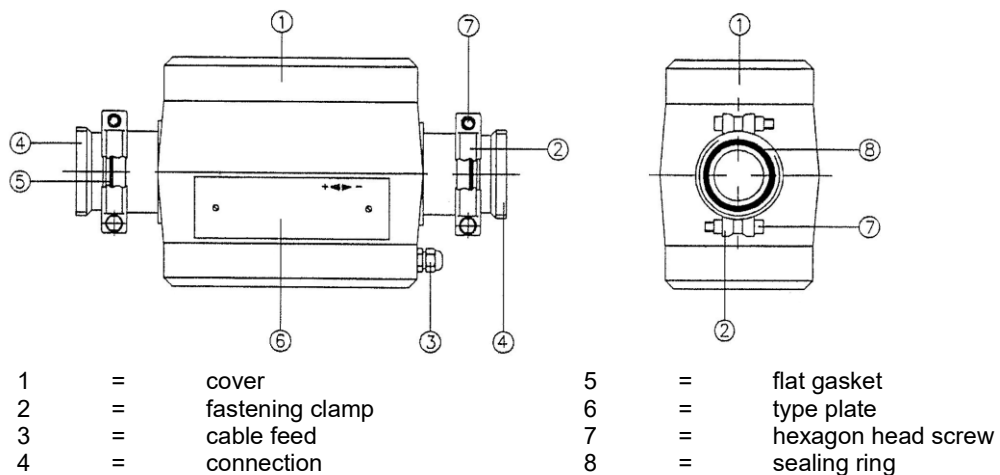
The flow meter can be mounted horizontally or vertically. Air separation must be possible at any time. By all means make sure there is a straight settling section of L ≥ 2 x nominal diameter D before and after the MID.

Horizontal installation position   **Vertical installation position**
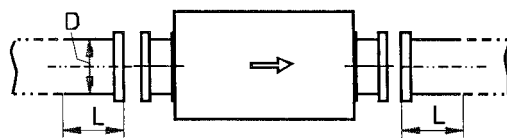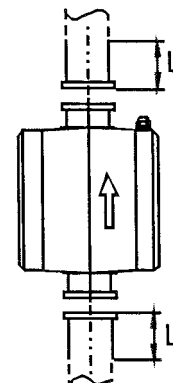
The positive flow direction is marked by an arrow on the type plate (6).

Installation position:

Horizontal/flat, slightly rising in flow direction so that gas bubbles can escape automatically, or vertical.
Operation only with settling section of L ≥ 2 x D on both sides.

During mounting or during dismounting, the flow meter must not be affected by any mechanical forces. Consequently the pipelines connected to the device at both sides have to be supported appropriately (see illustration below).
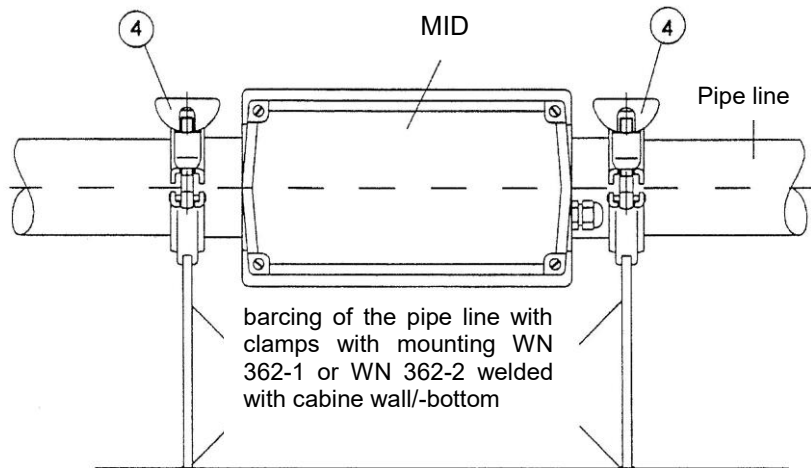
Mounting site:

- At the lowest point of the line system
- At a position where the MID is always filled with liquid
- Minimise gas content in the liquid as the entrained air influences the flow measurement.
  Therefore install flow meter at the position in the pipeline system where there is the
  maximum pressure. Here the air volume is at a minimum.
- After air separator if air can be sucked in with the liquid.
- Adhere to the admissible ambient temperature of - 10 ... + 50° C.
  The liquid flow (measured medium, cleaning fluid) through the device must not exceed the
  maximum temperature of + 100°C.
- Arrange flow meter in a position that is easily accessible in service case.

Important instruction for mounting/dismounting:
For MID fixtures with milk pipe thread connection socket it is imperative to carry out the follow-
ing working steps in the mentioned order in order to avoid strong mechanical impacts on the
MID (may cause destruction of the device).

Mounting:

    (1) Take off milk pipe thread connection socket if it is still fastened at the MID. Open clamp
           closures **(2)** at both sides and draw off the connection sockets from the MID.

           Caution: Do not lose sealings. Re-insert them carefully during mounting.

    (2) At first screw tight the milk pipe thread connection sockets on both sides of the pipe
           connections by means of the union nuts.

    (3) Then insert MID (do not forget flat gaskets (5)) and fasten with clamp closures (2). If
           required, first loosen the supports/fastenings of the pipelines in order to make mounting
           easier. ⇒ Tighten them again at the end.

Dismounting:

    (1) At first unfix the MID by removing the clamp closures (2) at both sides. If required, first
           loosen the supports/fastenings of the pipelines in order to make dismounting easier.

    (2) Only then take off milk pipe thread connection sockets if required, by loosening the un-
           ion nut.

           Caution: Do not lose the sealings, re-insert them carefully during mounting.

3.13.4 Wiring

The standard MID is delivered with 5 m connection cable wired in accordance with the diagrams below. For wiring please observe instruction manual of the slave!

Terminal	Colour	Signal
1	pink/grey	+ DC 24 V
2	Shield	- supply
7	white	+display unit
8	blue	- PD 210
13	brown	P-NET S
14	green	P-NET B
15	yellow	P-NET A
16	purple	Output 3(pulse output)
17	black	GND

MID is wired with P-NET, pulse output and display unit connection

Cable shielding: Variant 5 in accordance with 2.3.1

sa300215.dwg
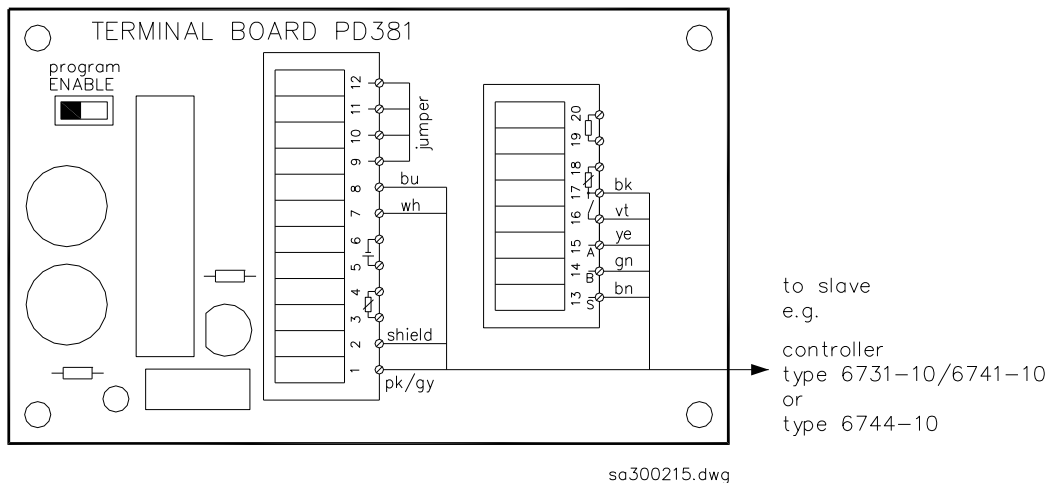
3.13.5 Maintenance and care

To clean the flow meter, use the food-safe detergents used in the dairy industry.
The cleaning fluid that is flowing through must not exceed the admissible maximum temperature + 100 °C.

3.13.6 Stamp position diagram
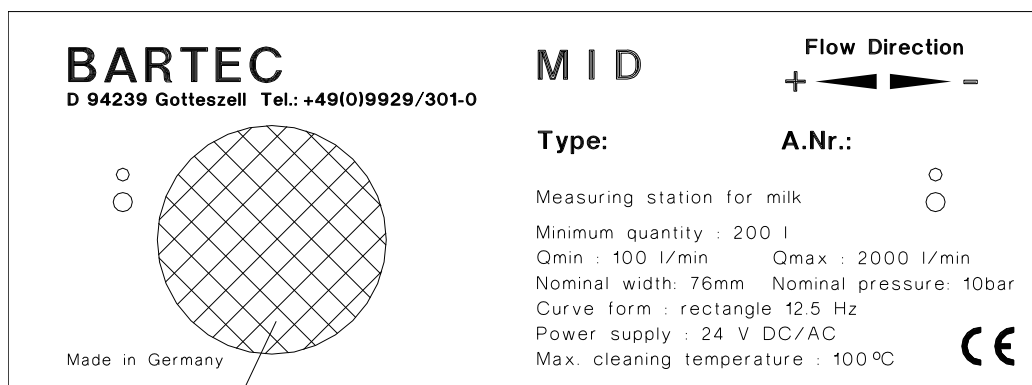
Calibration mark on type plate   e7625.dwg

3.14 Reading station for radio-controlled/cable read-head

type 6722-12
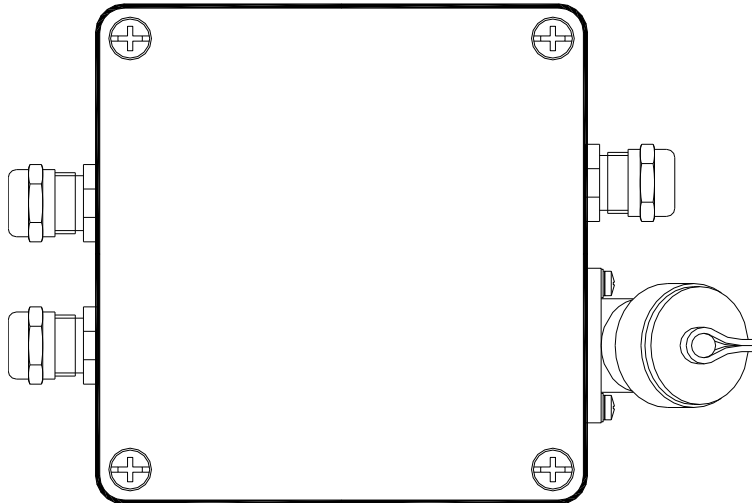
mz672201.dwg

Note:

For detailed information on reading station, receiving station and radio-controlled read-head, see the separate user manuals BA 980303 "Reading station for number blocks and TAGS" and BA 041201 "Reading system for encoding blocks and TAGs".
The reading station is the interface to all BARTEC read-heads equipped with radio connection or cable connection and provides the data received by the read-heads via the fieldbus P-NET for evaluation in the system MAK 3002.

Communication with the radio-controlled read-heads takes place via the separate receiving station type 6722-303. A right-angle connector is available for cable read-heads for direct-plug-in connection.

3.14.1   Technical data

Electrical data	
Operating voltage	DC 24 V
Current consumption	100 mA with cable read-head type 6834-4 (encoding block) 140 mA with cable read-head type 6834-5 (TAG) 105 mA with receiving station type 6722-303 180 mA with type 6834-5 and type 6722-303
Electrical connection	Terminals, cable feed via 3 x PG 9, right-angle connector for plug connection of cable read-head
Ambient conditions	
Operating temperature	-15 ... + 60 °C
Protection type	IP65
Mechanical data	
Casing	Aluminium diecast casing
Weight	Approx. 1 kg
Mounting site	Any, preferably in the intake cabin. For operation with receiving station type 6722-303 (5 m fixed cable length) make sure that it can be mounted appropriately in the outside area of the truck (additionally see receiving station type 6722-303)
Installation position	Any, but cable feeds mustn´t point upwards after having been mounted

3.14.2   Mounting and dimensions

Receiving station 6722-303

Radio-controlled read-head 6727-30 series B or 6727-31 (for TAG reading)

Controller 3002

Charging station 6781-23

Reading station 6722-12

P-NET 24V

Cable read-head 6834-4 or 6834-5 (for TAG reading)
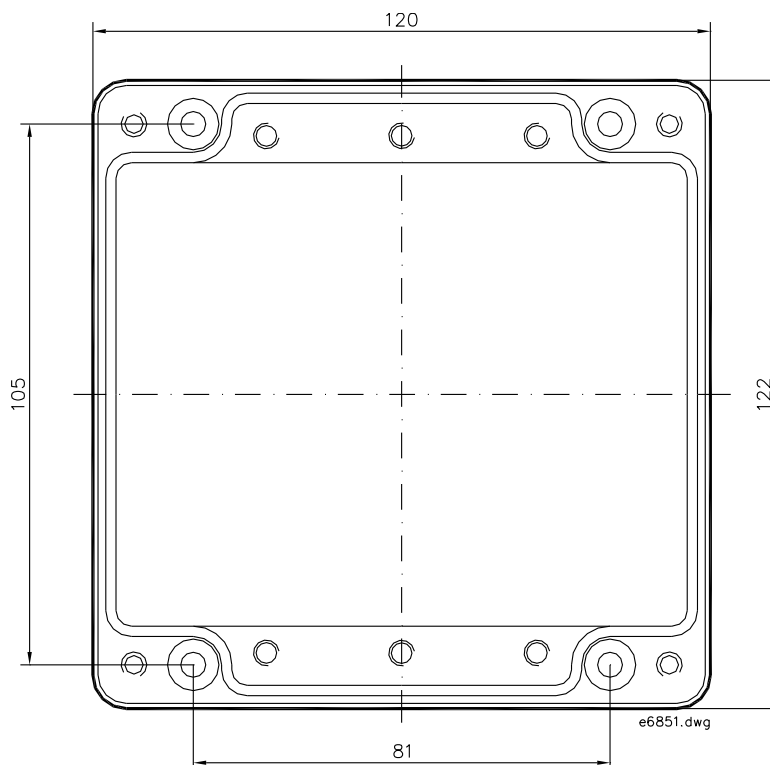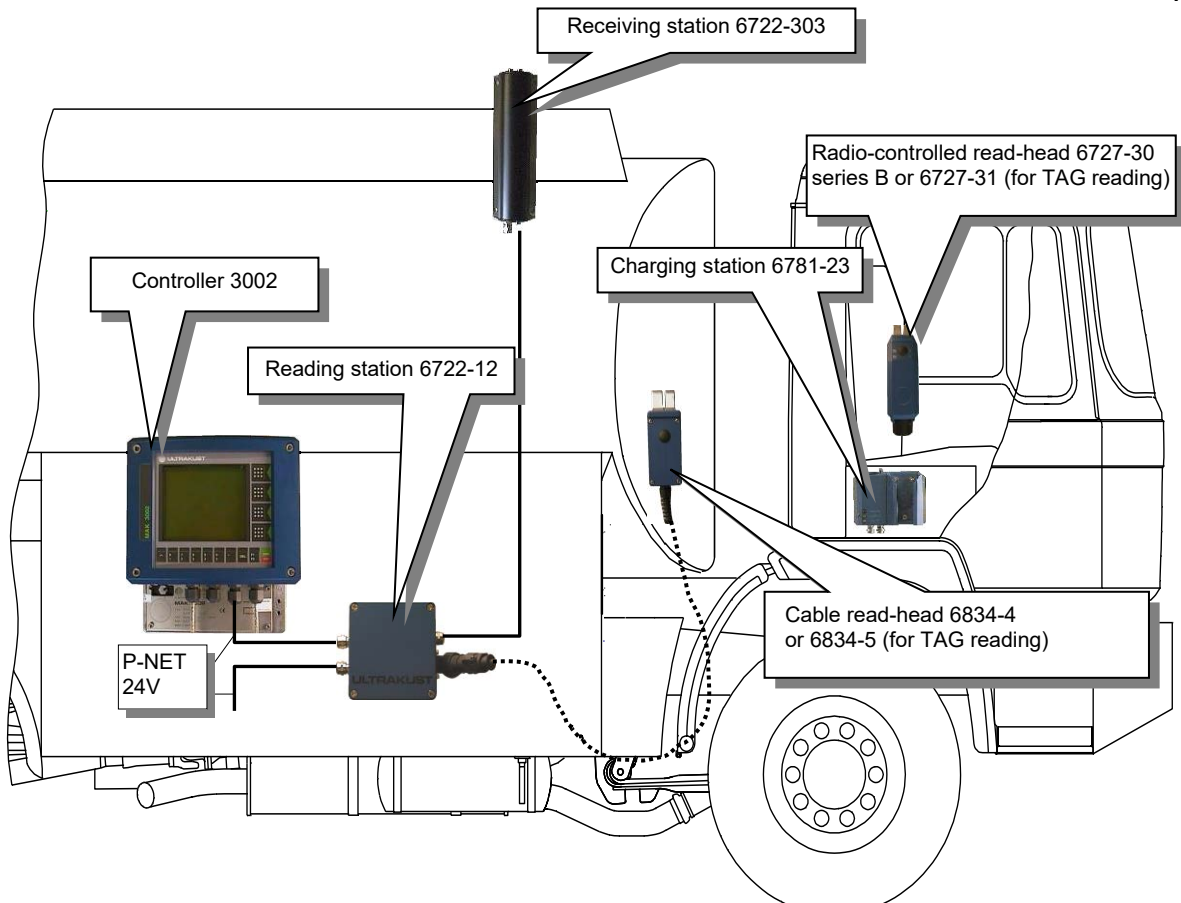
Configuration

Depending on the application, the reading station has to be configured before the supply voltage is applied.
For this purpose, turn the turn-switch on the circuit board to the required position.

1=Funk
2=Lesekopf
3=Wiegand
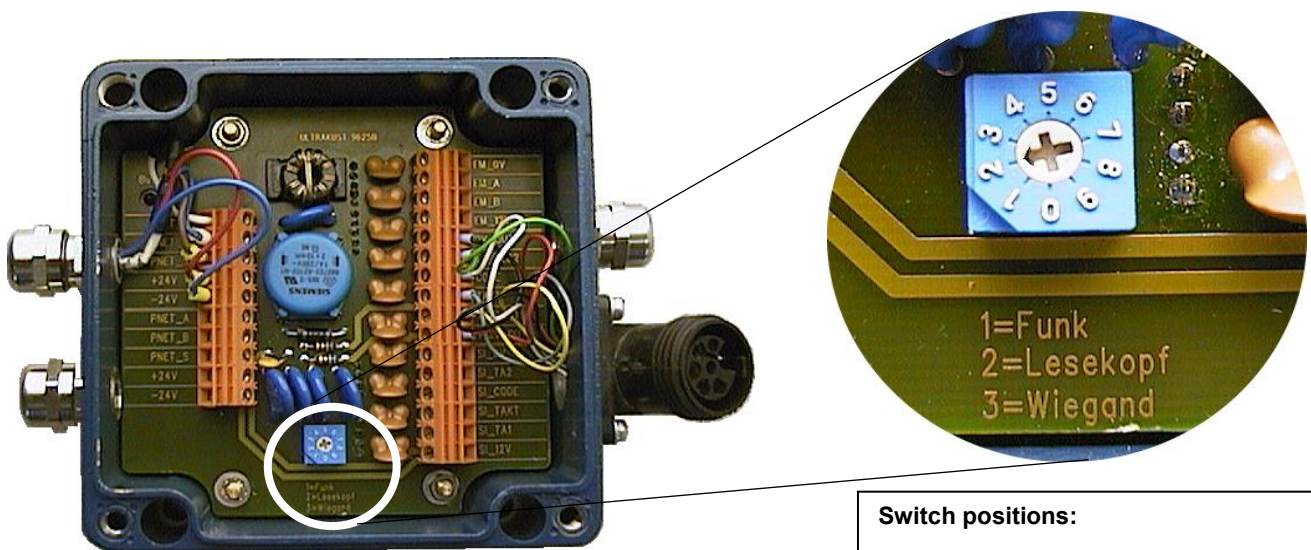
Switch positions:

0	Radio-controlled read-head MAK 3001
1	Radio-controlled read-head MAK 3002
2	Cable read-head
3	Wiegand card reader

3.14.3   Wiring
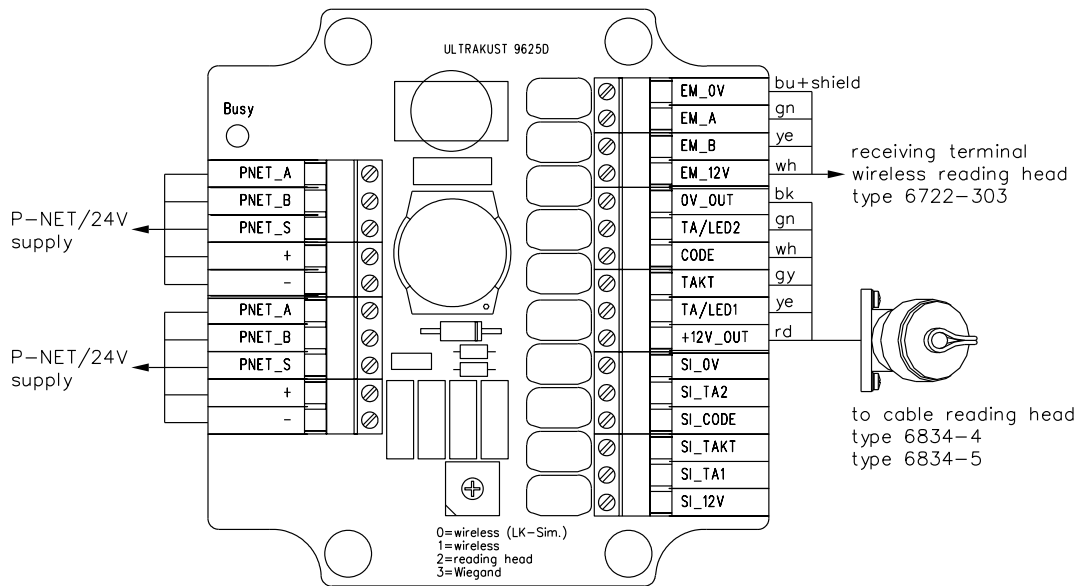
wiring plug socket

		function	wire	terminal
1	female	+12V_OUT	rd	12
2	female	TA/LED1	ye	11
3	female	TAKT	gy	10
4	female	CODE	wh	9
5	female	TA/LED2	gn	8
6	plug			
7	pin	0V_OUT	bk	7
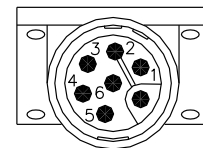
mz672201.dwg

3.14.4   Mounting of receiving station type 6722-303

Function

The receiving station receives data from the radio-controlled read-head. It includes a 433 MHz-receiver. The signal received is processed and transferred to the reading station type 6722-12.

Mounting site

Mount outside the intake cabin at a position where there is a good radio connection (visual contact) to the milk container identification system (encoding block or TAG) during collection. Do not install near sources of interference (e.g. radio aerial, motor etc.).

Installation position

Vertical, screw connection/cable outlet downwards.

Mounting
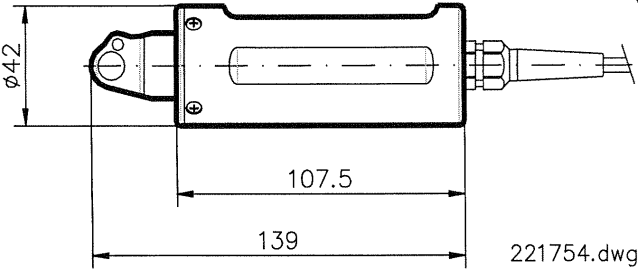
- Bore 4 holes at the designated location in accordance with the position of the 4 bores in the casing. Attach receiving station with secured screw connection.
- Observe the cable length of 5 m. The cable has to range to the reading station type 6722-12.
- Connection in accordance with wiring diagram of reading station, type 6722-12.

3.15   Cable read-head for encoding block, type 6727-11

(in addition see user manual BA 041201)

The cable read-head type 6727-11 serves to read in supplier numbers and special numbers from encoding blocks and via cable transfers the data to the reading station.

3.15.1   Technical data

Electrical data	
Auxiliary energy	DC 12 V ± 20 % 50 mA
Output	Digitalised code and time information; open collector with internal pull up (5k62), max. 20 mA
Connection	6 m cable with 6-pole round plug, suitable for System 3001 and reading station 6722-12 and 6757-107
Ambient conditions	
Operating temperature	- 20 ... + 60 °C
Storage temperature	- 20 ... + 70°C
Climatic classification / protection type	JUD / IP65
Mechanical data	
Casing	Plastic, ergonomic design, impact-proof, watertight
Sensor	Magnetoresistive
Weight	0,51 kg
Dimensions	

Display elements: 1 x LED red
                         1 x LED green

Operating elements: 3 x membrane keys (1 ... 3) with dome embossing

For safe storage, read-head holder type 6781-104 is available.
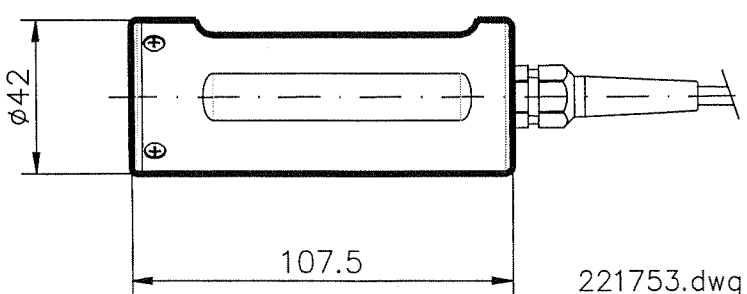
3.16 Cable read-head for TAG, type 6727-12

(in addition see user manual BA 041201)

The cable read-head type 6727-12 serves to securely read in supplier numbers and special numbers from transponders (TAG) and via cable transfers the data to the reading station.

Data is read out from the TAGs in non-contact and wear-free way.

3.16.1 Technical data

Electrical data	
Auxiliary energy	DC 12 V ± 20 % 50 mA
Output	Digitized code and time information; open collector with internal pull up (5k62), max. 20 mA
Connection	6 m cable with 6-pole round plug, suitable for System 3001 and reading station 6722-12 and 6757-107
Reading distance	0 ... 15 mm
Ambient conditions	
Operating temperature	- 20 ... + 60 °C
Climatic classification / protection type	JSD / IP65
Mechanical data	
Casing	Plastic, ergonomic design, shock-proof, watertight
Sensor	Transponder system 125 KHz
Weight	0,38 kg
Dimensions	

Display elements: 1 x LED red
        1 x LED green

Operating elements: 3 x membrane keys (1 ... 3) with dome embossing

For safe storage, read-head holder type 6781-104 is available.

3.17 Read-head holder, type 6781-104

For cable read-heads type 6727-11/12

3.17.1 Technical data

Mechanical data	
Casing	Plastic
Mounting site / installation position	Intake cabin/vertical, opening upwards
Weight	0,34 kg
Dimensions	

3.18 Radio-controlled read-head, type 6727-32 and type 6727-33

Type 6727-32 = radio-controlled read-head for encoding block
Type 6727-33 = radio-controlled read-head for TAG

(in addition see user manual BA 041201)

As the operating unit of the radio-controlled reading system, the radio-controlled read-head reads producer codes and special codes and transmits them wirelessly to the reading station at the collecting truck.

It checks if the data which is read in can be evaluated and is complete and transmits the data only after it has been read in correctly.

Between the collection tours and during the drive, the radio-controlled read-head is stored in the charging station in the drivers cab.

Commercial batteries type AAA which are made watertight by a screw cap and are easily replaceable provide the radio-controlled read-head with the required power.

Display functions of LED

	ON time	Function
green	About 1 sec.	Number has been read successfully
	About 1 sec.	Key pressed
	blinks	Charging operation (battery full)
red	About 1 sec.	Faulty reading
	5 sec.	After reading in the "learning number"
	blinks	Charging operation (battery is being charged)
red and green	About 2 sec.	After activating the read-head (end power-saving mode by : - pressing a key - removing from the charging station, - changing the battery)
	About 2 sec.	After activating the operating mode for manual entry of iden-tification number

After the batteries haven been inserted into the radio-controlled read-head, the red and the green LED flash for about 2 seconds.

During this time it is not possible to read in data.

Then the radio-controlled read-head is ready for operation.

If no function has been carried for about 4 minutes, the radio-controlled read-head switches to the power-saving mode.

This mode can be recognized by the fact that there is no response of the LEDs during the read-ing-in process, and there is no response at the collecting truck either.

Press any key to leave the power-saving mode. This is confirmed by the red and green LED flashing up for about 2 seconds.

If both LEDs do not flash up after the batteries have been inserted or after a key has been pressed, the batteries have to be charged.

For encoding on the transmitter side, the radio-controlled read-head reads an identification number (ID) when the system is installed.

This number is stored in the radio-controlled read-head and is transmitted as first piece of in-formation with each data transmission to the reading station.

The identification number is registered in the reading station and enables it to recognize the ap-propriate read-head.

Important:

The identification number stored on the encoding card or the TAG MAK belongs to the reading station type 6722-12.

If the radio-controlled read-head is replaced, the new read-head first has to read in this identifi-cation number.

If the reading station (top section) is replaced, the radio-controlled read-head first has to read the identification number of the new reading station.

3.18.1 Technical data of radio-controlled read-head, type 6727-32

and type 6727-33

Radio-controlled read-head for encoding block, type 6727-32	
Electrical data	
Auxiliary energy	Exchangeable battery 4 x 1,2 V 850 mAh, type AAA
Transmitter	FM, frequency 433,92 MHz, each radio-controlled reading system is coded on the transmitter and receiver side, approximate range 30 m, high reading and transmission reliability, postal approval
Number of readings	Minimum 1000 (with battery completely charged)
Displays/Operating elements	2 LED/3 buttons membrane keyboard
Rest position	Slot in the charging station
Ambient conditions	
Operating temperature/ storage temperature	- 20 ... + 60 °C - 20 ... + 70 °C
Climatic classification/protection type	JUD in accordance with DIN 40040 / IP 65 with inserted battery
Mechanical data	
Casing	Plastic, ergonomic design, impact-proof, watertight
Sensor	Magnetoresistive
Weight	0,36 kg
Radio-controlled read-head TAG, type 6727-33	
Electrical data	
Auxiliary energy	Exchangeable battery 4 x 1,2 V 850 mAh, type AAA
Transmitter	FM, frequency 433,92 MHz, each radio-controlled reading system is coded on the transmitter and receiver side, approximate range 30 m, high reading and transmission reliability, postal approval
Number of readings	Minimum 1000 (battery completely charged)
Reading distance	0 ... 15 mm
Display/ Operating elements	2 LED 3 buttons membrane keyboard
Rest position	Slot in the charging station
Ambient conditions	
Operating temperature/ storage temperature	- 20 ... + 60 °C / - 20 ... + 70 °C
Climatic classification/protection type	JUD in accordance with DIN 40040 / IP 65 with inserted battery
Mechanical data	
Casing	Plastic, ergonomic design, impact-proof, watertight
Sensor	Transponder system 125 KHz
Weight	0,23 kg

Dimensions of type 6727-32

221751.dwg
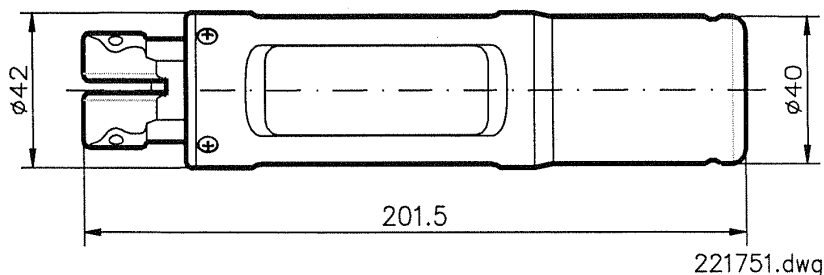
Dimensions of type 6727-33

221738.dwg
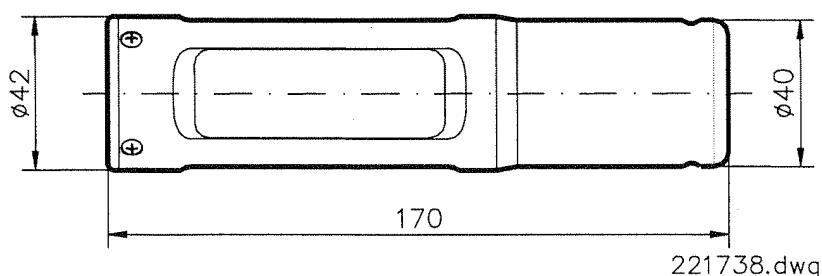
3.19 Charging station, type 6781-26

For radio-controlled read-heads, type 6727-32/33

3.19.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V ± 20 % max. 100 mA
Connection type	4 m connection cable, 2-wire (2 x 0.75), with open ends, cable feed via-PG gland, clamped internally, with reverse battery protection, connection to the on-board power supply of the collecting truck so that it cannot be switched off via ignition lock, protect with fuse 1 AM
Charging time of battery (empty)	about 20 hours
Ambient conditions	
Protection type	IP 10
Operating temperature	- 20 ... + 60°C
Mechanical data	
Casing	Plastic casing
Weight (unloaded)	6.9 N ≅ 0.69 kg with mounting plate
Mounting	Pre-mounted on mounting plate
Mounting site	Drivers cab
Installation position	vertical, inclined mounting admissible up to 45°

Dimensions and mounting bores

221737.dwg
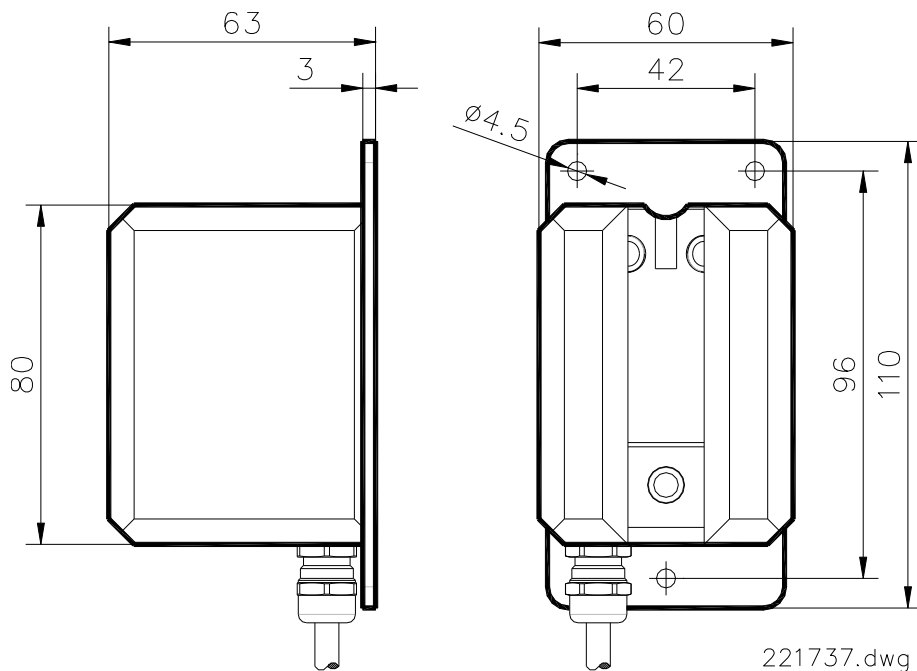
3.19.2 Mounting, wiring and startup of the charging station

The charging station, which is pre-mounted on a mounting plate, serves as storage site and charger for the radio-controlled read-head.

Mounting site:

In accordance with protection type IP10, it can only be mounted in the drivers cab.

Make sure not to exceed the admissible operating temperature (no solar radiation).

The mounting site has to be stable and vibration-free.

Possible positions: -   - center console
                              - dashboard
                              - rear wall of drivers cab

Connection to on-board power supply:

➢ Connect charging station to the on-board power supply by means of the pre-mounted connection cable.

The power supply has to be secured for battery recharging even with the ignition turned off.

⚠	- It is imperative to protect the on-board power supply connection with 1 A.
	- Observe the colour assignment of the connection cable,
	     + 24 V → brown
	     0 V → blue.
	- Avoid cable runs where there might be mechanical strain or heat exposure**.**

Startup:

Insert radio-controlled read-head into charging station as far as it will go.

During charging operation, the red LED blinks, when charging is completed, the green LED blinks.

To remove the radio-controlled read-head from the charging station, it has to be pulled out upwards.

3.20 Radio-controlled read-head, type 6727-30 and type 6727-31

Type 6727-30 = radio-controlled read-head for encoding block
Type 6727-31 = radio-controlled read-head for TAG

3.20.1 General description

As the operator unit of the wireless reading system, the radio-controlled read-head reads producer codes and special codes and transmits them wirelessly to the reading station at the collecting truck. It checks if the read-in data is evaluable and complete and only sends it after it has been read in correctly.

The handling of the radio-controlled read-head for reading in and in the function of the read-head button corresponds to the cable read-head. The readhead button has an additional function in the power-saving mode.

Between the collection tours and during the drive, the radio-controlled read-head is stored in the charging station of the drivers cab. A holder is available as an accessory to accommodate the read-head in the intake cabin during a tour.
An easily replaceable battery pack locked in place by a bayonet lock provides the radio-controlled read-head with the required power.

Two light-emitting diodes (LEDs) signalise different functions.

red LED

ON time	Function
approx 1 sec.	- During transmission to the reading station after reading in the producer code or special code
approx 3 sec.	- After replacing the battery pack - After taking out of the charging station holder - After activating in the power-saving mode
approx 5 sec.	- After reading in the encoding card L (code: A1A2A3/8) to program the ID number (for type 6727-30) - After reading in the TAG MAK (code: A1A2A3/8) to program the ID number (for type 6727-31)

green LED

ON time	Function
blinks	Blinks while a producer code or special code is read in (including encoding cards/ encoding TAG)
approx. 2 sec.	After successfully progamming the ID number (together with the red LED)

After inserting the battery pack into the radio-controlled read-head, the red LED lights up for about 3 sec. It is impossible to read in any new data during this time. Then the read-head is ready for use. If no function has been performed for a period of approx. 10 minutes, the read-head switches to the power-saving mode. This mode can be recognized if there is no response of the LEDs during the read-in process, and if there is no response at the collecting truck. Press the read-head button once to leave the power-saving mode, the red LED transmits an acknowledging signal for approx. 3 sec.

If the battery pack is empty, the radio-controlled read-head switches to the power-saving mode after about 2 minutes after the last reading or after 10 readings. This is an unmistakable sign that the battery pack has to be replaced.

For encoding on the transmitter side, the radio-controlled read-head reads an identification number (ID) when the system is installed. This code is stored in the radio-controlled read-head and is transmitted as first piece of information whenever data is transmitted to the reading station. The identification code is registered in the reading station and enables it to identify the respective read-head.

Important:

The identification code stored on the encoding card or TAG MAK belongs to the reading station. If the radio-controlled read-head is replaced, the new read-head has to read in this identification code first. If the reading station (top section) is replaced, the radio-controlled read-head has to read the identification code of the new station first.

3.20.2 Technical data of radio-controlled read-head, type 6727-30 and type 6727-31

Device-specific data	
Displays	2 light-emitting diodes (red + green)
Rest position	Slot in the charging station
Electrical data	
Auxiliary energy	DC 7,2 V; from easily replaceable battery pack; battery locked in place by bayonet lock; at least 250 readings when the battery is full
Transmitter	FM, frequency 433,92 MHz, each radio-controlled reading system is encoded on the transmitter and receiver side, range approx. 10 - 20 m, high reading and transmission security
Ambient conditions	
Operating temperature	-10 ... + 60 °C
Climatic classification / protection type	JUD in accordance with DIN 40040 / IP 65 with inserted battery
Mechanical data	
Casing	Plastic, practical form, waterproof, shock-resistant
Sensor	6727-30: Magnetoresistant sensor system 6727-31: touch-free, wear-free transponder system (TAG), reading distance 0 ... 15 mm
Weight without battery pack	6727-30: 2,9 N $\cong$ 0,29 kg 6727-31: 2,0 N $\cong$ 0,2 kg
Battery pack	
NiCd battery	cast-in
Nominal voltage	7,2 V
Weight	1,16 N $\cong$ 0,116 kg
Operating temperature	- 10 ... 60°C
Charging temperature	0 ... 45°C

Dimensions of type 6727-30
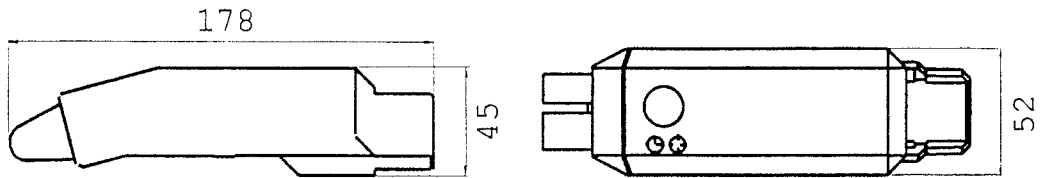
Dimensions of type 6727-31
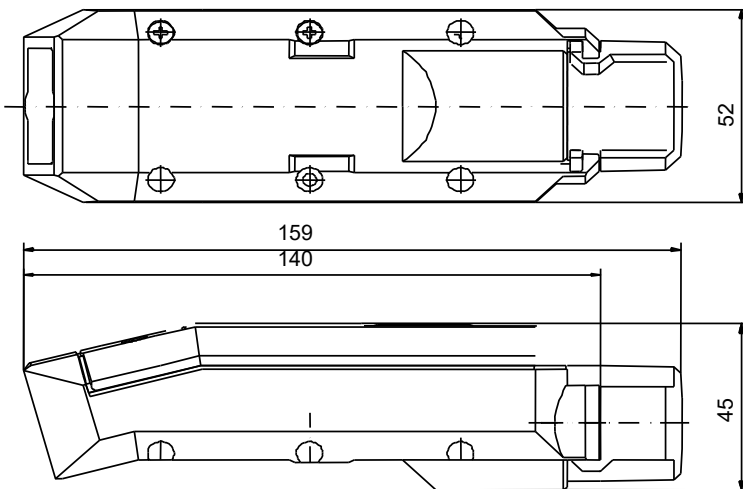
Dimensions of battery pack
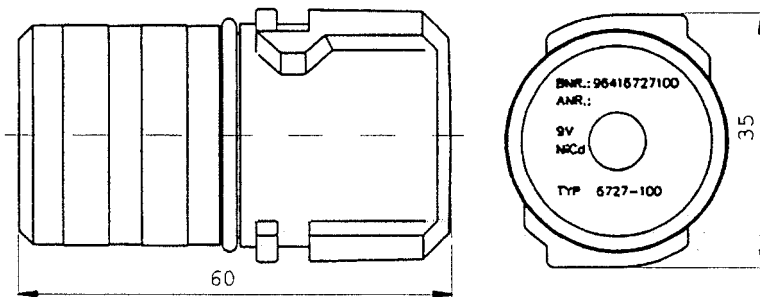
3.21 Charging station type 6781-23

For radio-controlled read-heads, type 6727-30/31, series A and higher.

3.21.1 Technical data

Device-specific data	
Display	3 light-emitting diodes (red, green, yellow)
Electrical data	
Auxiliary energy	DC 24 V, ca.250 mA
Connection type	4 m connection cable, 2-wire (2 x 0,75), with open ends, PG gland, internally clamped, with reverse battery protection, connection to the on-board power supply system so that it cannot be turned off via ignition lock , protect with M5A fuse
Charging time of battery (empty)	approx. 5 h
Ambient conditions	
Protection type	IP 10
Operating temperature	- 10 ... + 60°C
Mechanical data	
Casing	Plastic casing, mounting plate V_2A sheet
Equipment	Radio-controlled read-head plugged, replacement battery via bayonet fixing
Weight (unloaded)	6,9 N $\cong$ 0,69 kg with mounting plate
Mounting site	Drivers cab
Installation position	Vertical, slanting mounting admissible up to 45°

Three light-emitting diodes (LEDs) signalise different functions and states of the charging station.

Meaning of LEDs

➢ red LED is on – short circuit, error in battery pack
➢ red LED is on, green LED blinks – search mode, no battery pack plugged in
➢ green LED is on with short interruptions $<$ 0,2 sec. = quick charge up to 90% of capacity
➢ green LED lights up for 1 second in intervals of 3 seconds = normal charge up to 100% of capacity
➢ green LED lights up for 1 second in intervals of 13 seconds = conservation charging
➢ yellow LED lights up when temperature is above 40° C or below 0° C, at the same time the charging process is interrupted until the charging temperature is again between $0°C < T < 40\ °C$.

3.21.2 Dimensions and mounting bores

Mounting plate

ga672705.dwg
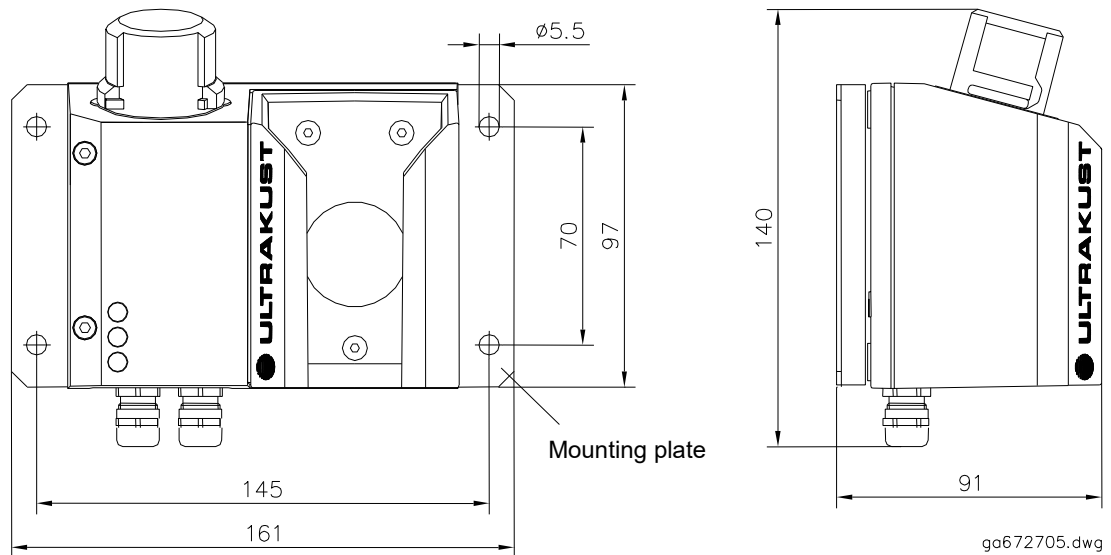
3.21.3 Mounting, wiring and startup of the charging station

The charging station pre-mounted on a mounting plate serves as depository and charger for the radio-controlled read-head and one battery pack.

Mounting site:

In accordance with protection type IP10, it can only be mounted in the drivers cab.
Make sure that the admissible operating temperature is not exceeded (no solar radiation)

The mounting site should be stable and vibration-reduced.

Possible positions: - center console
                             - dashboard
                             - rear wall of drivers cab

Connection to on-board power supply:

➢ Connect charging station to the on-board power supply system by means of the pre-mounted connection cable.

    The power supply has to be secured for battery recharge even with the ignition turned off.

⚠	- It is imperative to protect the on-board power supply connection with 5 A.
	- Observe the colour assignment of the connection cable,
	        + 24 V → brown
	          0 V → blue.
	- Avoid cable runs where there might be mechanical strain or heat exposure.

Startup:

Insert battery pack into charging station and turn it clockwise one quarter of a turn as far as it will go → bayonet lock.

To remove the battery pack from the charging station, turn the battery pack anticlockwise as far as it will go and then pull it out forcefully.

The charging of the battery pack is accelerated. It is optimally powered by the microprocessor-controlled charging connection and is ready for operation at any time. The intelligent charging connection measures temperature and charging voltage and only charges under conditions excluding an endangerment of the battery pack.

Wiring of the relay for the monitoring of "radio-controlled read-head in charging station"

To connect a cable to the potential-free relay contact, the charging station has to be opened. Carry out the following steps:

1) Take battery pack out of the charging station and remove 5A fuse from the supply line.

2) Unscrew the three hexagon socket countersunk flat head screws SW 2,5 and take off tubular.

3) Loosen the four hexagon socket head cap screws SW 3 and take off top section of casing. Additionally remove connector of the connecting cable between the top section and the bottom section of the casing.

countersunk screw with
hexagon socket SW 2,5

cheese head screw with
hexagon socket SW 3

terminal block

Pg 7

loading unit
bottom part

power supply
24V

brown(+)

blue(−)

4 5 6
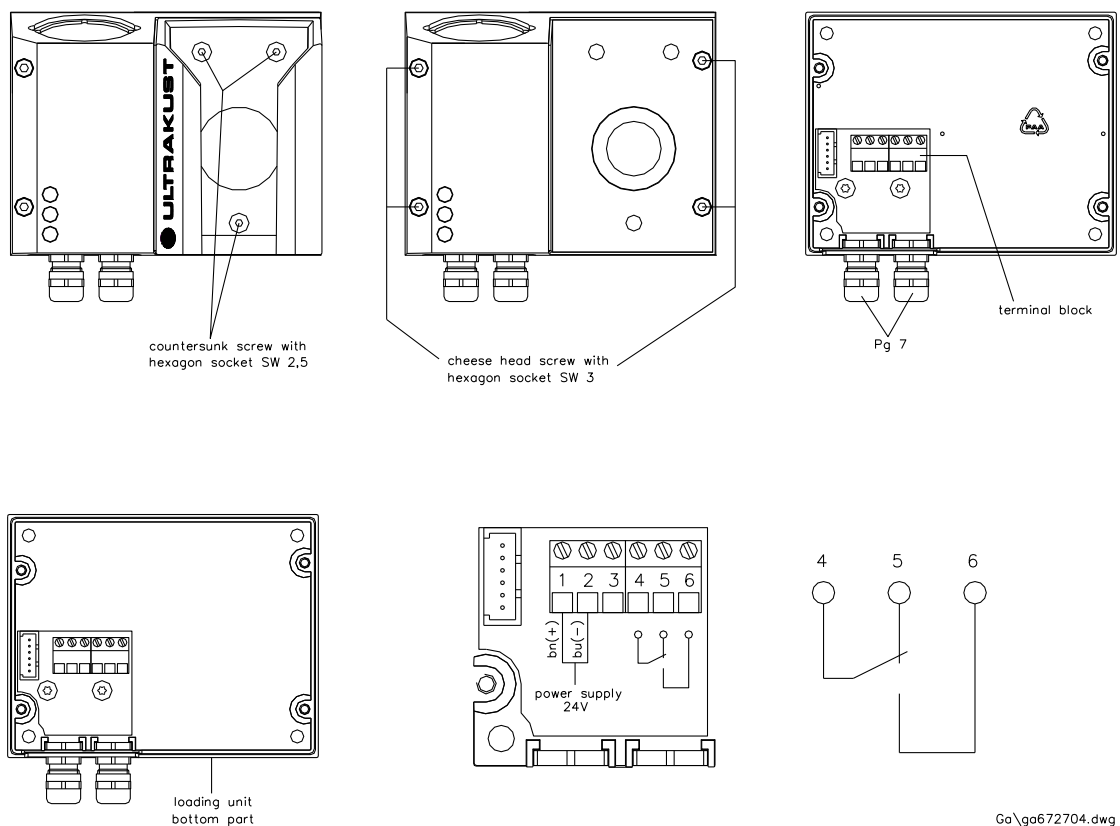
Ga\ga672704.dwg

The switching state of the relay shown above corresponds to "radio-controlled read-head not in the charging station". The relay is in rest position.

3.22 Reading station for barcode, type 6723-10

By means of the reading station for barcode type 6723-10, the pulse sequence of a connected barcode reader can be decoded and transmitted via P-NET for processing (RS485).

Barcode readers with TTL output level with "light" corresponding to low state and "dark" corresponding to high state are suitable for connection.

The reading station for barcode accepts the following seven barcodes if they contain the defined number of alphanumeric characters.

Barcode	Number of characters
Interleaved 2 of 5	4 ... 32
UPC/EAN	Fixed length
Code 39	1 ... 32
Code 128	1 ... 32

In the factory, the reading station for barcode has been adjusted to reading barcodes of the type "interleaved 2 of 5" with a required number of 10 characters.
The operating mode has been preset to "continuous reading".

3.22.1 Technical data

Electrical data	
Auxiliary energy	Nominal voltage: DC 24 V $\pm$ 20 % Nominal performance: 1,5 W (without barcode reader, without heating)
Melting fuse	2 x 1 A (slow)
Interface	P-NET (RS485), max. cable length 300 m
Electrical connection	
Connection	screw terminals 0,2 … 1,5 mm² 3 x cable glands PG9, cable diameter 4 … 8 mm
Barcode reader	Reader with TTL-compatible output "light" $\cong$ low, "dark" $\cong$ high
Barcode reader heating	12 or 24 V DC, max. 1,6 W
Barcode reader electronics	5 V DC, max. 50 mA
Ambient conditions	
Operating temperature	- 20 … + 60° C
Storage temperature	- 40 … + 85° C
Climatic classifiction/ protection type	JUF / IP 65
Mechanical data	
Casing	Aluminium diecast
Dimensions	120 x 122 x 80 (mm)
Weight	approx. 12 N $\cong$ 1,2 kg
Installation position	any, but cable feeds mustn´t point upwards

Dimensions

Fig. 1
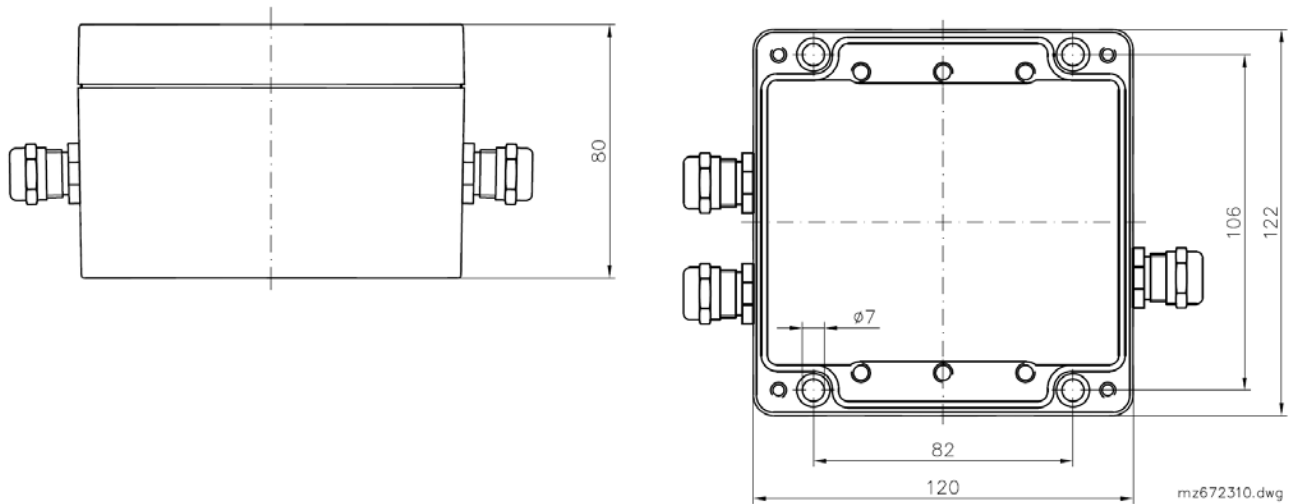
3.22.2 Installation

Mounting site:

Position at an appropriate low-vibration place near the barcode reader by taking into account its cable length.
It must be possible to clamp the connecting lines in the reading station for barcode in the mounted state.

Mounting:

The base of the casing is fastened with 4 x M6 mounting screws. For hole spacing and screw length see dimensions, fig. 1.

➢ To mount the reading station, loosen the four screws in the top section of the casing and take off top section.

3.22.3 Wiring

Barcode reader type 6727-40

Barcode reader type 6834-10

Terminal designation of reading station for barcode

INPUT SIDE			
Signal	**Designation**	**Terminal**	**Wire colour**
PNET-A	P-NET - A	A	yellow
PNET-B	P-NET - B	B	green
PNET-S	P-NET - S	S	brown
24 V +	Operating voltage	+	pink/grey/white
24 V -	Operating voltage	-	Shield
OUTPUT SIDE			
Signal	**Designation**	**Terminal**	**Wire colour**
HZG_12V -	Heating of barcode reader (-12 V), type 6834-10	14	yellow
HZG_12V +	Heating of barcode reader (+12 V), type 6834-10	13	green
HZG_24V -	Heating of barcode reader (- 24 V), type 6727-40	12	yellow
HZG_24V +	Constant-current source (KS_RD), type 6727-107	11	red
KS_GN	Heating of barcode reader (+24V), type 6727-40	screw terminal	green
SDI	Digital input signal (TTL level) (type 6727-40)	4	grey
+5V	+ operating voltage of barcode reader (type 6727-40)	3	pink
0V	- operating voltage of barcode reader (type 6727-40)	2	blue
SHIELD	Cable shielding (type 6727-40)	1	brown
SDI	Digital input signal (TTL level) (type 6834-10)	4	white
+5V	+ operating voltage of barcode reader (type 6834-10)	3	blue
0V	- operating voltage of barcode reader (type 6834-10)	2	brown/shield
SHIELD	Cable shielding (type 6834-10)	1	not assigned

Status displays and their meaning

Fuse
T 1A

SI 2x T 1A

BARTEC 0704

LED

BUSY

PNET

ERROR

Typ: 6720-495
ANr: Ser:
BNr: 275809
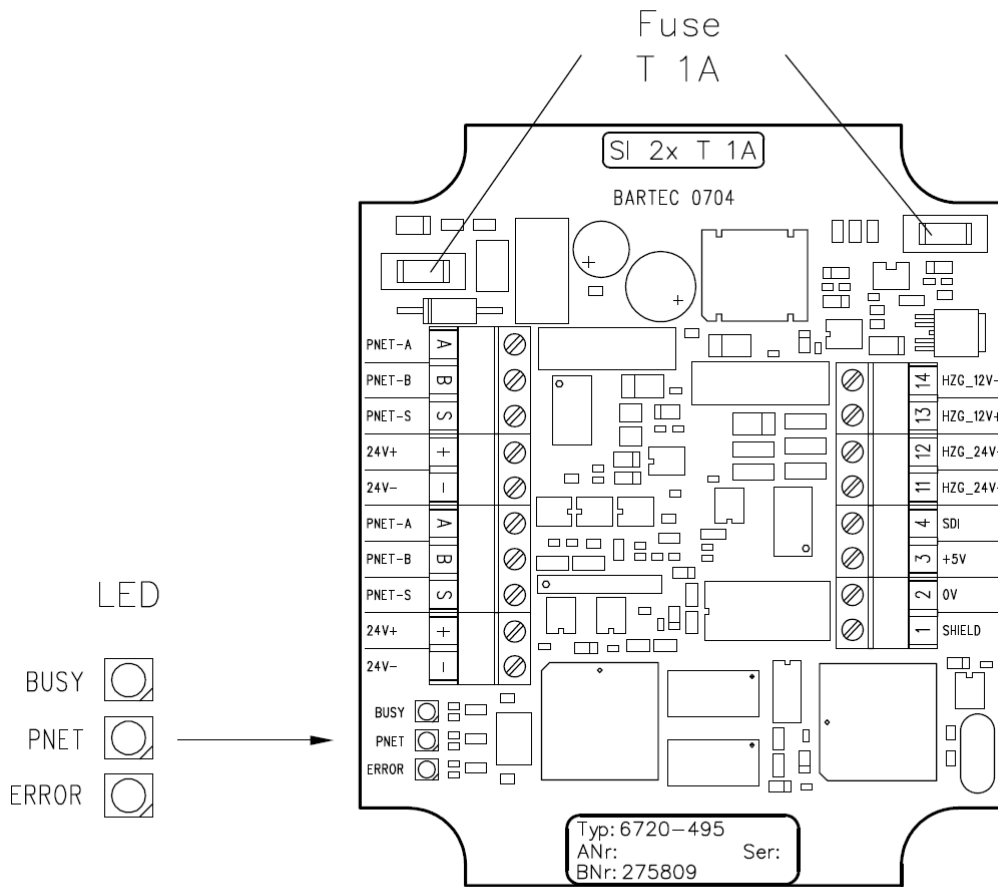
mz672310.dwg

LED	Display	Recognisable errors	Measures
BUSY	LED-BUSY Blinks with approx. 1 Hz after turning on. The processor system is working.	LED off: Internal error in processor system	- Reconfigure reading station for barcode if required; - read out errors via service channel P-NET if required
PNET	P-NET-ON LED blinks in case of write access / read access via P-NET to reading station for barcode.	LED off: Reading station for barcode is not addressed by P-NET	- check P-NET connections (A, B, S); P-NET might be defective; contact service staff.
ERROR	POWER ON LED on if 5 V DC is applied at the processors. (The 5 V are switched through from the processor to the display)	LED off: Operating voltage for processors is missing.	- Check if 24 V DC is applied; - connection cable fit properly; - check melting fuses

3.23   Barcode reader, type 6727-40

3.23.1   General description

The barcode reader type 6727-40 is a distance-type reader for barcodes. It serves to read barcode tags on BARTEC milk sample bottles of the type 6845-x in stationary and mobile systems. It is applied in combination with the barcode reading station type 6723-10.
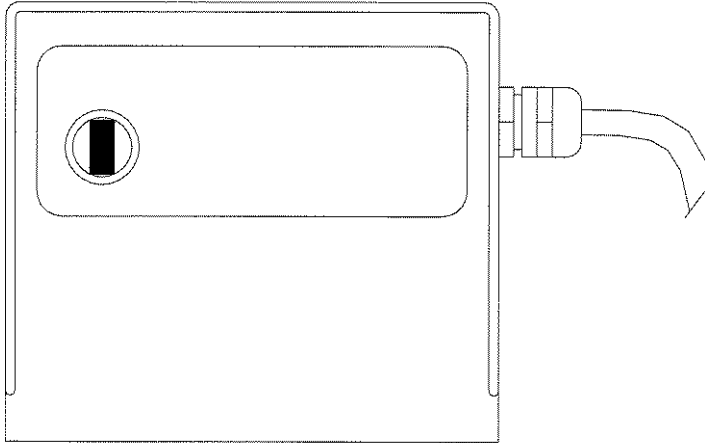
Mz\mz672701.dwg

3.23.2   Technical data

Electrical data	
Auxiliary energy	Operating voltage: DC 5 V, 17 ... 19 mA Heating: DC 24 V / 1.5 W
Electrical connection	2 m connection cable with open ends, closed with wire end sleeves, cable feed via PG7 gland
Output	TTL-compatible output, "light" ≅ low, "dark" ≅ high
Transmitter light	Infrared - 900 nm
Ambient conditions	
Operating temperature	- 10 ... + 50° C
Climatic classification/protection type	KUF / IP 65
Mechanical data	
Casing	Plastic casing
Dimensions	99,5 x 26 x 88,3
Height of transmitter light output	57 mm
Weight	Approx. 3,3 N ≅ 0,33 kg
Mounting	Screwing with 2 x M4 screws, hole spacing 61 mm, vertical mounting position (or in accordance with the barcode label)

Terminal assignment:

Lead colour	Assignment	Signal
Yellow	HZG -	Heating - reading window
Green	HZG +	Heating - reading window
Grey	SDI	Digital output signal
Pink	+ 5 V	Operating voltage
Blue	0 V	Operating voltage
Brown	Shield	Cable shielding

Cable shielding: Variant 2 in accordance with 2.3.1

Mounting/adjustment/dimensions:

The barcode reader has to be mounted in accordance to the drawing below.

Observe the following aspects:

The reading eye must be at a right angle to the sample bottle axis (a).

The distance between barcode reader and sample bottle has to be approx. 4 mm (b). You can use tools as for instance a 4 mm Allan key or the shaft of a 4 mm spiral drill. If there is no reliable barcode reading, the distance can be reduced step by step down to 2 mm.

The optical reading axis (transmitter light) of the barcode reader has to be approximately in the middle of the barcode bars (c).
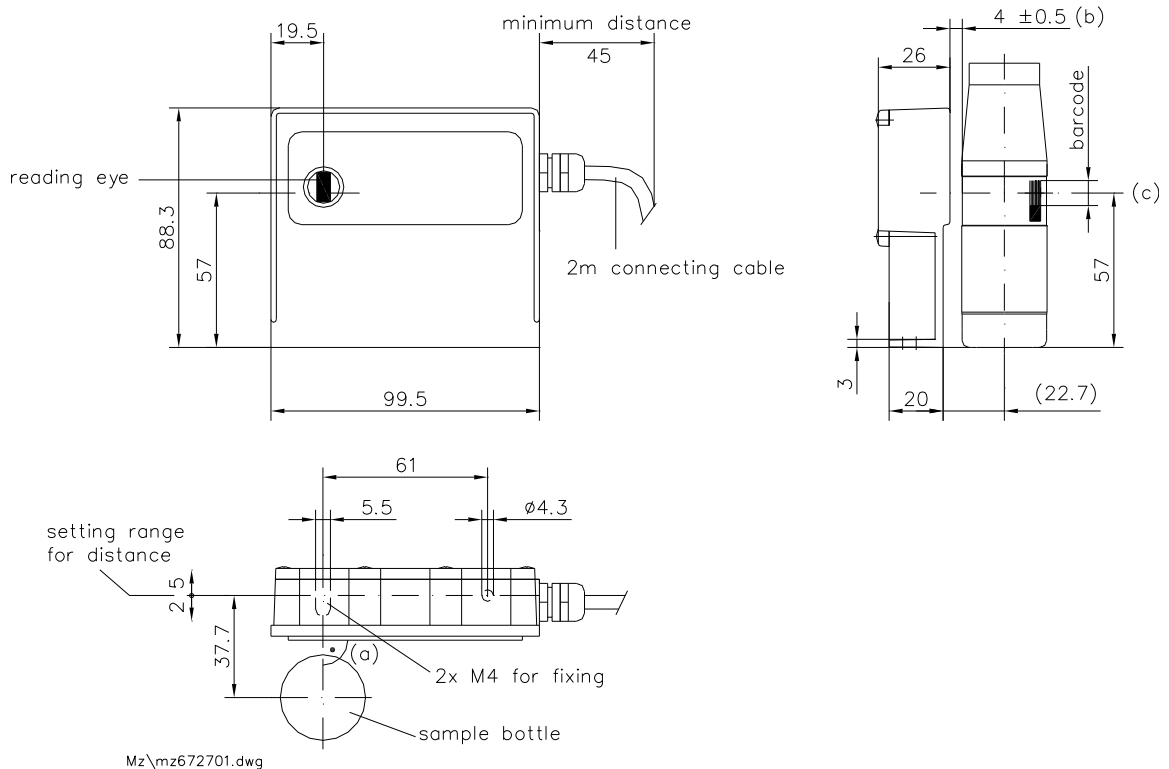
Test the barcode reading at the system MAK 3002:

To adjust and test the reliability of the barcode reading, an appropriate diagnostic function is available at the controller MAK 3002.

You can access it via the main menu (between tours).

Press the "menu" key, then select "PFL supply"

In this function, the reading process is carried out and the barcode is displayed until you terminate the function by pressing "Ready".

For further information, see user manual MAK 3002, BA 970502.

3.24 I/O box
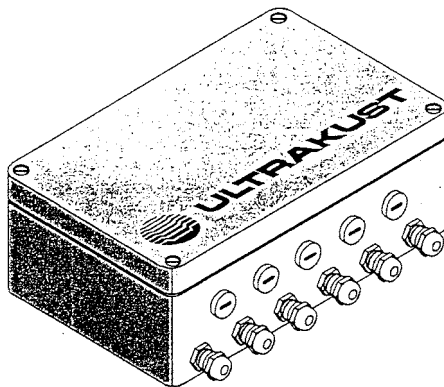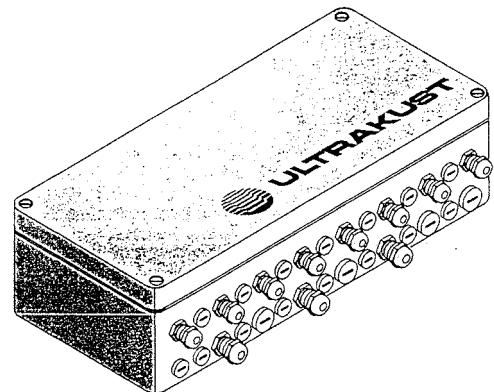
Vario 1, type 6753-50   Vario 2, type 6753-60

3.24.1 Technical data of VARIO 1, type 6753-50 and VARIO 2, type 6753-60

Electrical data	
Auxiliary energy	U_L = DC 24 V / 150 mA (I/O basic module), (U_{limit} = DC 16 ... 36 V)
Electrical connection	Internal screw terminals 5-pole (P-NET and U_L) basic and expansion modules, plugged. Connection lines up to 1,5 mm², Cable feed via PG9 glands**.**
Inputs	8 digital inputs, U_{IN} = 0 ... 24 V (U_{limit} = DC – 36 V ... + 36 V) Signal = 0 < DC + 5 V, signal = 1 > DC + 14 V (LED green ON). Input resistance: approx. 4 kΩ.
Outputs	8 semiconductor outputs FET, positive switching Potential separation of logic and outputs via optocouplers Minimum switching current 100 µA., maximum current per output with signal 1: ≤ 2 A (-20 ... 35°C); ≤ 1,5 A (up to + 45°C); ≤ 1 A (up to + 60°C) Total load capacity 8 A (-20 ... + 60°C) Limitation of inductive interrupting voltage with free-wheeling diode Supply voltage U_S: DC 24 V (18 - 36 V) Switching frequency - ohmic load: 100 Hz. Switching frequency inductive load: 2 Hz., max. output level with signal = 0: DC 2 V (no load)
Interface	Fieldbus interface P-NET, P-NET identification number: 5922
Ambient conditions	
Operating temperature	-20 ... 60°C
Climatic classification / protection type	JUF / IP 65

Dimensions/mounting bores /connection VARIO 1, type 6753-50

Casing	
Dimensions/Weight	160 x 260 x 90 mm / 20,1 N ≅ 2,01 kg 4 fixing lugs with oblong hole for screwing with M6 screws

I/O-box VARIO1, MAK

Optionally extendable with
- 1 x input extension module 8 DI
  6753-103
or
- 1 x output extension mudule 8 DO/2,0 A
  6753-105
or
- 1 x output relais module
  1 x 6 3/3x2,0 A 6753-106
or
- 1 x output relais module
  1 x 6,3/1x2,0 A 6753-107
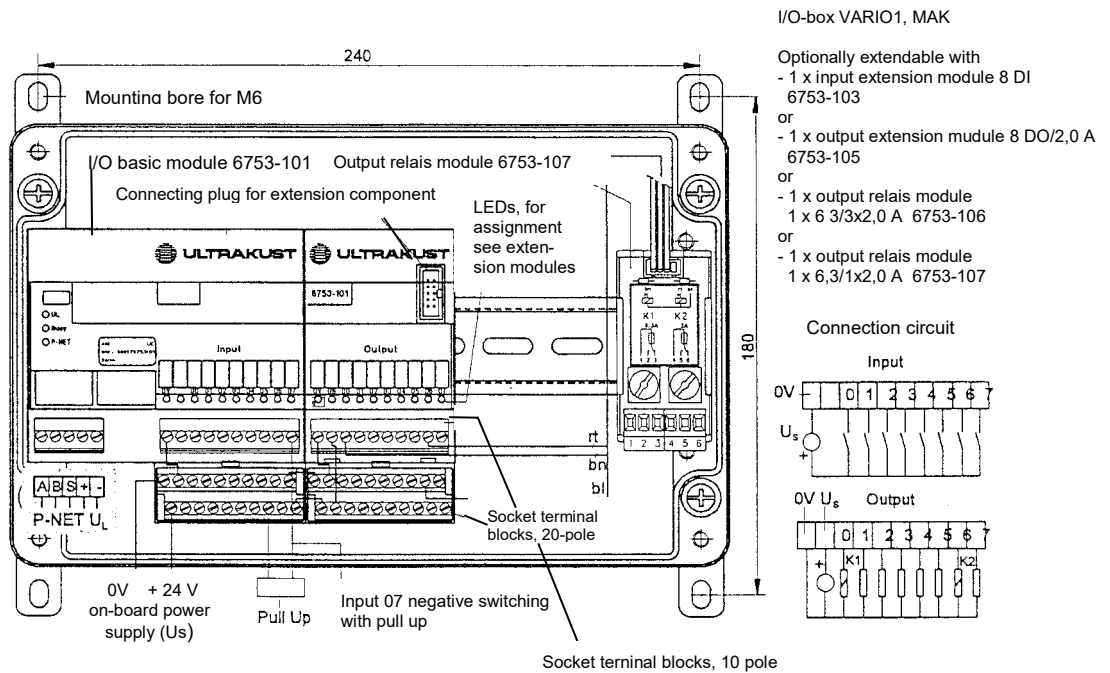
Dimensions/mounting bores /connection VARIO 2, type 6753-60

Casing	
Dimensions/Weight	160 x 360 x 90 mm / 30 N ≅ 3,0 kg 4 fixing lugs with oblong hole for screwing with M6 screws

I/O-box VARIO2, MAK

Optionally extendable with
- 1 x input extension module 8 DI
  6753-103
or
- 3 x output extension mudule 8 DO/2,0 A
  6753-105
or
- 3 x output relais module
  1 x 6 3/3x2,0 A 6753-106
or
- 5 x output relais module
  1 x 6,3/1x2,0 A 6753-107
or in combination
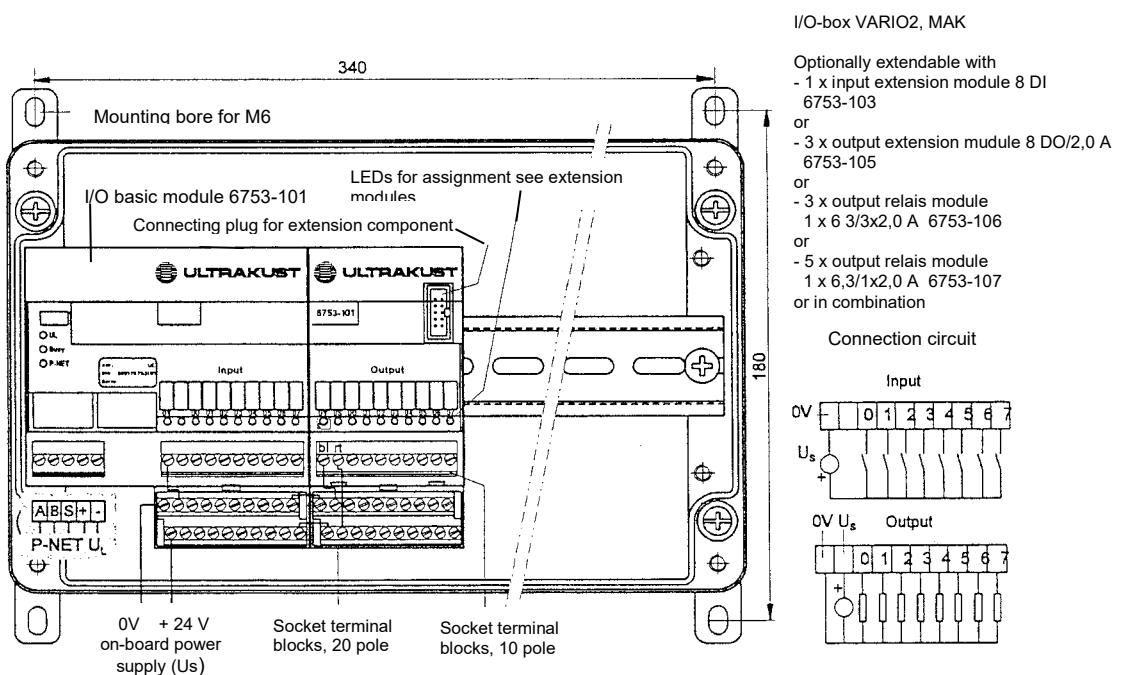
Instruction for type 6753-50/60 including extension modules:

The inputs and outputs are positive switching. If you want to connect a negative switching device (e.g. proximity switch) to an input, the constant current module type 6753-302 has to be installed as "pull-up" between + 24 V and the relevant input. See drawing, input 07 with vario 1, type 6753-50

- Terminal designations 00 to 07 correspond to input or output numbers 1 - 8
  (physical input/output).
- the functional modules of the software (logical inputs/outputs) are listed in the configuration
  instruction SA 960227, chapter "I/O boxes".

Extension modules:
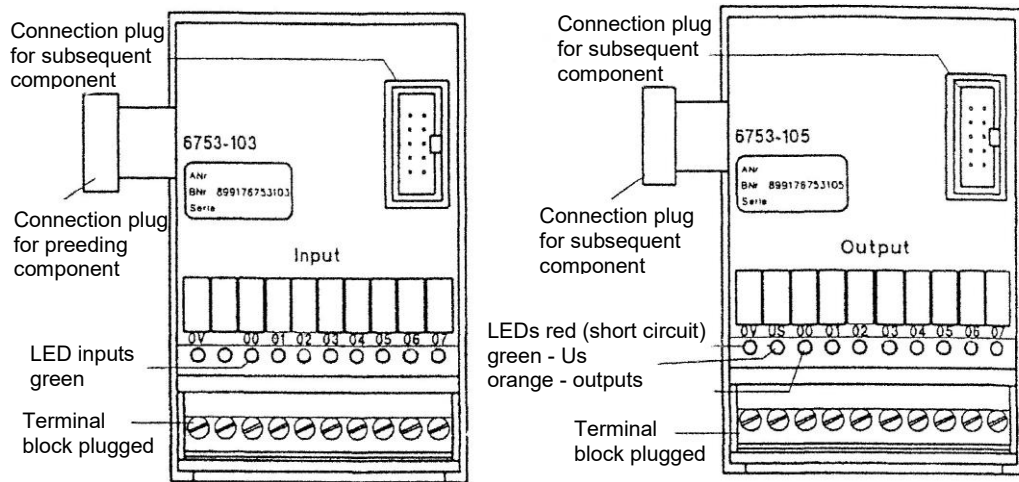
Input expansion module 8 DI, 6753-103   Output expansion module 8 DO / 2,0A, 6753-105

Dimensions (width x height x length):	55 x 85 x 58 mm
Input extension module, type 6753-103: **Power consumption (logic)** **Weight**	0,1 W 1,2 N ($\cong$ 0,12 kg)
Output extension module, 2,0 A type 6753-105: **Power consumption (logic)** **Weight**	0,2 W 1,5 N ($\cong$ 0,15 kg)
Max. current per output with signal 1:	$\leq$ 2 A (-20 ... 35°C), $\leq$ 1,5 A (up to + 45°C), $\leq$ 1 A (up to + 60°C) Total load capacity 8 A (- 20 ... + 60° C)

Output relay modules:
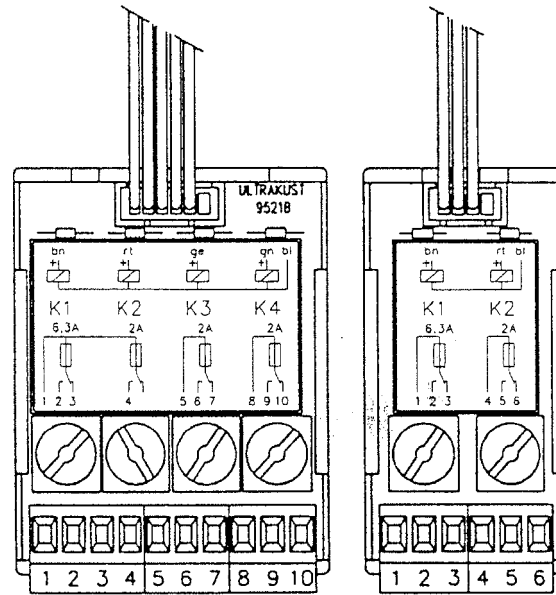
Output relay module:	**type 6753-106**	**type 6753-107**

Electrical connection:	blue $\rightarrow$ 0 V on-board power supply; brown, red, yellow, green $\rightarrow$ output
Connection lines:	30 cm
Max. switching voltage (relay):	AC/DC 50 V
Dimensions (width x height x length)/ Weight/version:	
6753-106:	55 x 74 x 65 mm / 1,5 N $\cong$ 150g / 1 x 6,3 A / 3 x 2,0 A
6753-107:	35 x 74 x 65 mm / 0,75 N $\cong$ 75 g / 1 x 6,3 A / 1 x 2,0 A

3.24.2   I/O box, type 6864
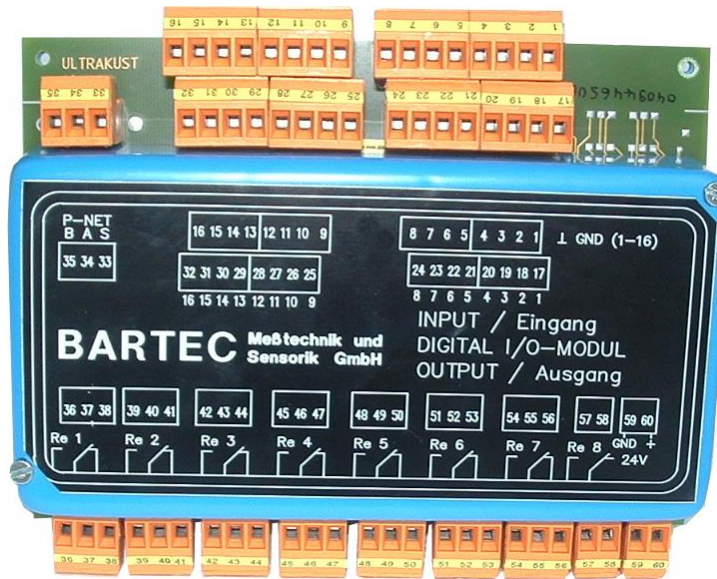
For the wiring of inputs and outputs see vehicle-specific documentation.

Signal	Wire colour
A	Yellow
B	Green
S	Brown
+	Pink/grey/white
-	Shield

CAUTION:

In the System MAK 3002, the I/O box type 6864 can only be applied

for serial number ("A"- number on type plate): 9005xxxx or higher!

Observe in any case the following conditions:

Series status: **B** or higher!
Software status: Version 2.00 or higher!

3.25   Slip printer, type 6881-1

3.25.1   Technical data

Electrical data	
Auxiliary energy	DC 24 V ± 10 %, max. 1,5 A
Connection type	Terminal connection, cable feed via cable gland PG9 in the printer holder
Interface	Fieldbus P-NET, P-NET identification no. = 5812
Ambient conditions	
Operating temperature	5 ... 40°C
Storage temperature	-10 ... + 50°C (without paper and ink ribbon)
Climatic classification/protection type	KYF / IP40
Mechanical data	
Casing	Slip printer = plastic casing, grey Printer holder = aluminium sheet, 3 mm
Weight	approx. 20 N ≅ 2,0 kg including printer holder
Mounting site	Only in dry and clean environments by complying with the admissible operating temperature and climatic classification. Preferably in the drivers cab.
Installation position	Preferably horizontal (vertical position with cable connection upwards is also possible)

3.25.2   Dimensions and mounting bores
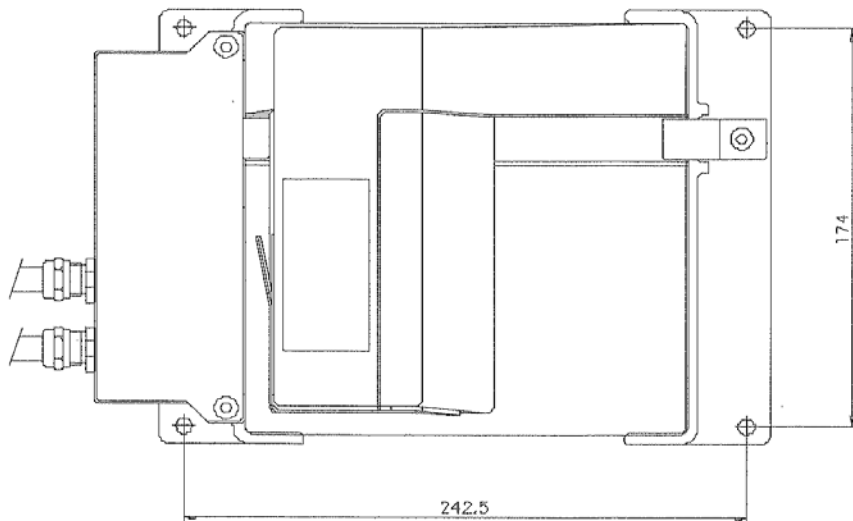
3.25.3　Wiring diagram

P-NET
+ 24 V supply voltage

mz68811a.dwg
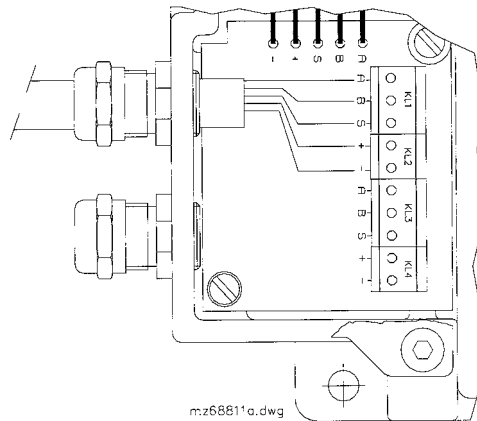
Signal	Wire colour
A	Yellow
B	Green
S	Brown
+	Pink/grey/white
-	Shield

3.25.3.1　Operating voltage limitation, type 6881-1-044

For operation of printer type 6881-1 at on-board power supply

hoockup wire
1mm

BARTEC 0421B

233458.dwg
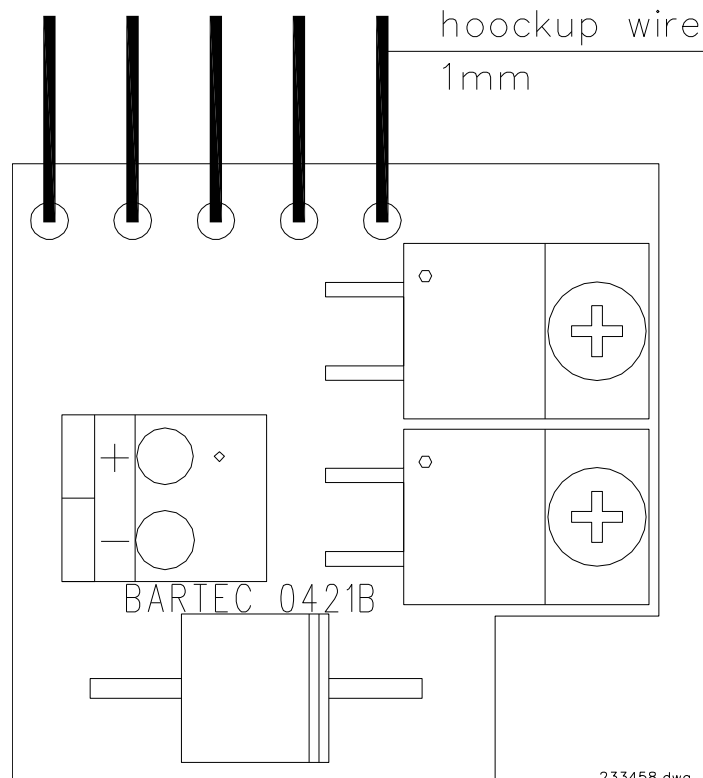
3.25.4   Change the ink ribbon

Loosen the screw **(6)** and take off the cover **(1)**. Hold the old ribbon cassette **(3)** at the handle and pull it off. Now insert the new ribbon cassette and press in firmly until it snaps into place. Finally, tension the ribbon by turning the button **(3b)** and put the cover **(1)** back on.
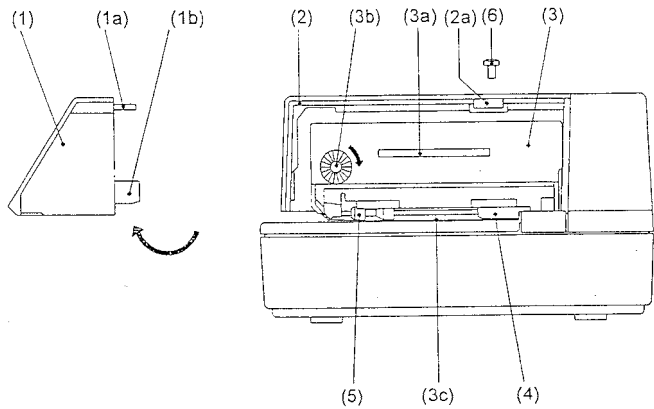
3.25.5   Stamp position diagram
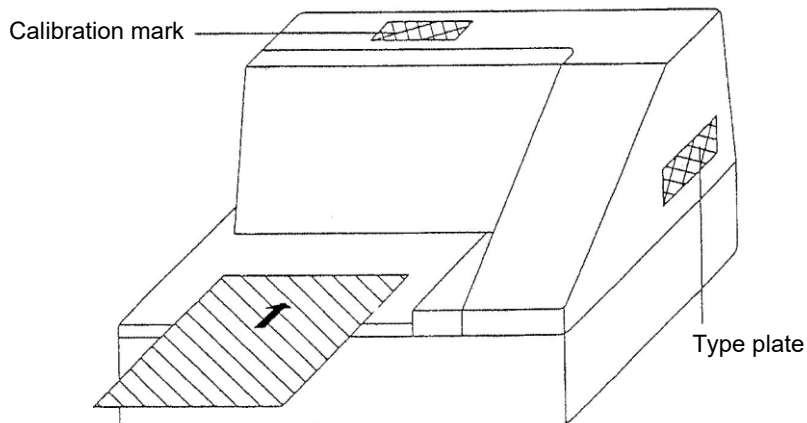
3.26   Thermal printer, type 6761-11

Attention: Printer type 6761-11 <u>Ser. A</u> requires program version ≥ 2.46 (070131)

Thermal printer for the simple and reliable registration of measurands and data.

The printer can either be connected directly to the RS 232 interface of the controller MAK type 6731-10 / 6741-10 / 6744-10 or controlled via an RS 232 / P-NET converter from the fieldbus P-NET.

Exchange the paper:

With only three steps you can easily and quickly insert the new paper roll by means of the well-tried drop-in procedure: open the printer, insert paper roll, close printer.

A detailed operation instruction by the original manufacturer Epson as well as a separate documentation "Connection variants of printer type 6761-11 to system MAK 3002 and MAK 3001" can be downloaded from the internet (**www.BARTEC.de/food**) and are available in printed form if required.

3.26.1   Technical data

Mechanical data	
Dimensions	145 mm x 195 mm x 148 mm
Installation position	Vertical or horizontal. For vertical installation see instructions on how to attach the suitable inscription strip and on how to change the paper sensor position.
Casing	Plastic, light grey
Weight	1,8 kg (without paper)
Connection	via 25-pole SUB-D plug connection, lockable, by means of suitable connecting cable and plug, cable length 15 m, can be shortened to any size.
Mounting site	Only in dry and clean environments by complying with the admissible operating temperature and climatic classification, preferably in the drivers cab
Electrical data	
Interfaces	Default: RS-232
Auxiliary energy	DC 24 V / max. 1,5 A
Ambient conditions	
Operating temperature	0 ... 50 °C
Storage temperature	- 20 ... 60 °C (without paper)
Climatic classification/protection type	KWF / IP 30

<u>**Accessories:**</u>

Paper: Thermal paper, width = 79,5 mm +/- 0,5
Maximum diameter: 83 mm

Signal assignment of the connection cable

PIN	Colour	Signal
2	green	TxD
3	yellow	RxD
7	brown	GND
9 + 10	pink/grey	+ 24 V
12 + 13	blue/white	0 V
Casing	shield	

Fasten connection cable with screws in the cable plug at the printer.

Cable shielding: variant 3 in accordance with 2.3.1

Important information:

The metallic base plate of the thermal printer is electrically connected to the Signal GND of the electronics and to the cable shield.

Therefore the printer has to be mounted electrically insulated against the vehicle chassis.

The cable shield mustn´t be connected to the slave or to the shield terminal block.

Instructions for vertical installation:

a)   The printer has to be mounted in such a way that the paper output is on top and the cable connection points downwards.

b)   Carefully glue the enclosed inscription strip over the inscription strip for the paper feed button and LEDs which is "upside down" in this position.

c)   Adapt paper sensor position to vertical installation position
    1.   Loosen the detector screw by turning it to the left, for instance with a coin (see illustration)
    2.   With your finger tip, press the key lever into the wall as far as it will go and keep it pressed
    3.   Turn the turning knob in the direction of the arrow until the key lever automatically snaps in place in the other wall hole.
    4.   Hold turning knob and retighten the detector screw by turning it to the right

Adjust the paper sensor position

Turning knob

Detector screw

Key lever
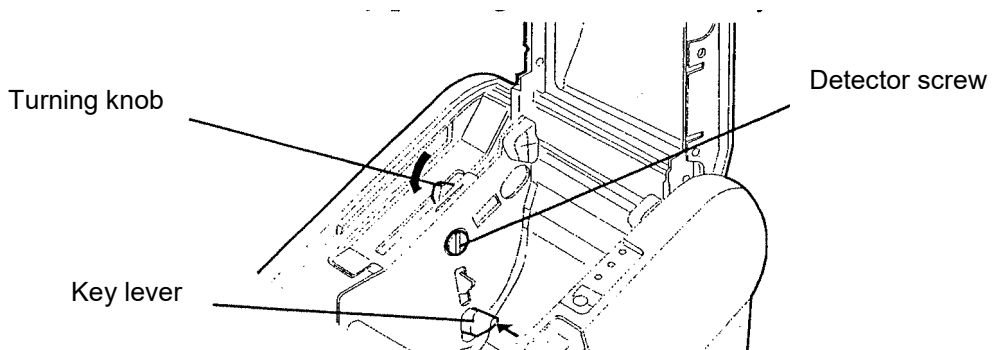
Mounting / dimensions of holder for vertical mounting
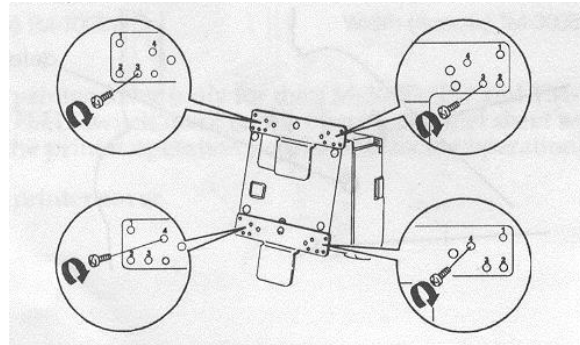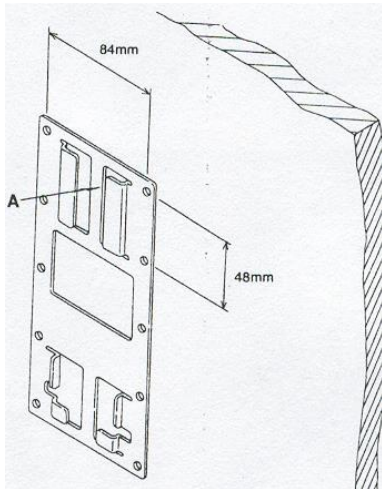
1. Mount holding plate,

2**.** Mount plug-in straps at the printer

   a) Fasten the upper plug-in strap via the holes marked with no. "3"
   b) Fasten the lower plug-in strap via the holes marked with no. "4" by using the enclosed screws
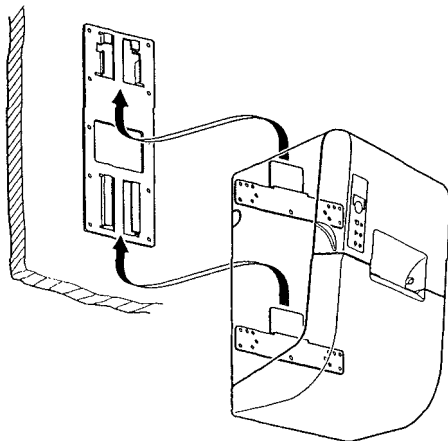
3. Put printer with straps into holding plate appliance A!

3.26.2   Printer operation

Control panel

You can control the elementary paper feed functions of the printer by means of the key on the control panel. The LEDs help you to monitor the printer status.

POWER

The LED "Power" flashes whenever the printer is turned on.

ERROR

This LED indicates an error. See 3.25.3 for information on how to proceed if this LED flashes.

PAPER OUT

This LED indicates the end of the paper roll is near. Insert a new paper roll to enable the printer to continue printing.

If this LED blinks, it indicates the standby state when printing the self-test or while carrying out a macro if the "execute macro" instruction is used.

FEED key

Deactivate this key with ESC c 5.

Press the FEED key once to advance the paper by one line. You can also keep the FEED key pressed to continuously advance the paper.
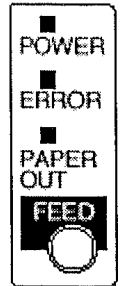
3.26.3   Attaching the roll-paper stopper (only for the TM-T88II/T88III)

1. Cut off the roll-paper stopper.
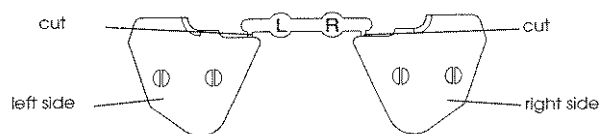
2. Open the printer cover and attach the roll-paper stopper. You should align the two tabs (projections) on the roll-paper stopper and press them into place.
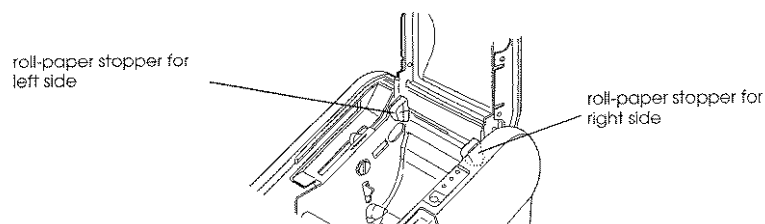
3.26.4 Troubleshooting

General problems

The LEDs on the control panel do not flash.

Make sure that the connection cable is connected correctly and the whole system is supplied with current.

Printing problems

The LED "Error" is ON (without blinking), but the printer does not print

If the LED "PAPER OUT" is ON, the paper roll has not been inserted or is almost used up. Insert a new paper roll.

If the LED "PAPER OUT" is OFF, make sure that the printer cover is closed correctly. Press the printer cover until it audibly snaps in.

The LED "ERROR" blinks and the printer does not print.

Turn the printer off and check if there is a paper jam.

If there is no paper jam and the printer has printed for quite a long time, the print head can be overheated. If the print head is overheated, the printer will go on printing as soon as the print head has cooled down (usually within two or three minutes).

If there is no paper jam and the print head is not overheated, turn the printer off and turn it on again after about 10 seconds.

The LED "ERROR" is OFF but the printer does not print.

Try to carry out a self-test in order to check if the printer works properly.

If the self-test works correctly, check the following:

➢ Check the connection at both ends of the connection cable.

➢ If the printer still does not print, contact your service partner or replace the printer.

Poor printing quality

Paper dust on the heating element of the thermal print head can impair the printing quality. Try to clean the print head as described below.

Clean the print head

CAUTION:
The print head may be very hot after printing. Do not touch it. Let it cool down before cleaning it.

Do not touch the print head with your fingers or with a hard object in order to prevent it from being damaged.

1.   Open the printer cover

2.   Clean the heating element of the print head with a cotton cloth moistened with an alcoholic solvent (ethanol, methanol or IPA).

Plate

Print head   Thermal element
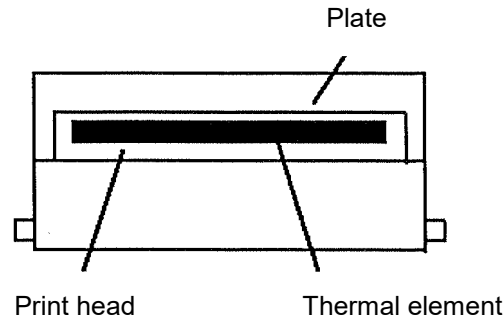
Problems with the paper feed

Paper jam in the printer

CAUTION:
The print head may be very hot after printing for a long time. Do not touch it.

Proceed as follows to remedy the paper jam:

1.   Turn the printer off and press the cover opening button to open the cover.

2.   Remove the jammed paper, put the paper roll back into the printer and close the cover.

3.   If the paper has got caught up in the automatic cutting mechanism and the printer cover cannot be opened, open the cover of the cutting mechanism as shown below.
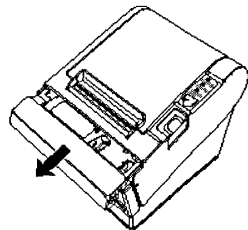
4.   Turn the button until you can look into the opening, as shown in the illustration below. The blade of the cutting mechanism is reset into the normal position. Next to the cutting mechanism you find a sticker for your support.

5.   Close the cover of the cutting mechanism.

6.   Open the printer cover.

7.   Remove the jammed paper.
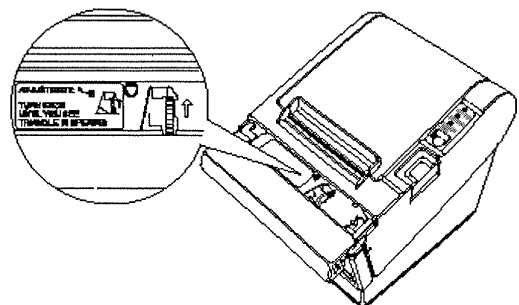
Problems with the automatic cutting mechanism

The cutting mechanism is blocked.

If a any foreign matter such as a drawing pin or a paper clip has fallen into the cutting mechanism and has blocked the cutting mechanism, the printer is in error status and automatically triggers a restoration procedure.

If the problem is not grave, the cutting mechanism returns into the normal position without any need for the user to intervene.

If the cutting mechanism does not automatically return into its normal position, proceed as follows to remedy the problem.

1. Pull the cover of the cutting mechanism in your direction so that you can turn the button of the motor of the cutting mechanism.

2. Follow the instructions on the sticker and turn the button until the blade appears in the opening.

3. Close the cover of the paper cutting mechanism.
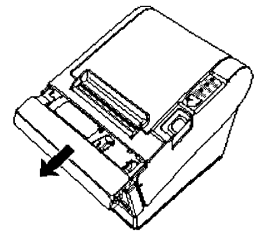
Self-test

The self-test enables you to find out if your printer works properly. It checks the control circuits, the printing mechanism, the printing quality, the ROM version and the DIP switch positions.

This test is independent of any other device or any other software.

Carry out the self-test

1. Make sure the printer is turned off and the printer covers are closed correctly.

2. Hold down the FEED key and activate the power supply of the printer in order to start the self-test. The self-test prints the printer settings and then the subsequent, cuts the paper and interrupts (LED "PAPER OUT" blinks).

Print the self-test

Press PAPER FEED.

3. Press FEED to continue printing. The printer prints a sample with the installed character font.

4. The self-test ends automatically and cuts the paper after the following line:

*** completed ***

The printer is ready to receive data as soon as the self-test is completed.

NOTE:
If you want to interrupt the self-test manually, press FEED. Press FEED again to continue the self-test.

3.27   Thermal printer, type 6761-10

Additionally see short operating instruction for thermal printer 6761-10, GA 971201
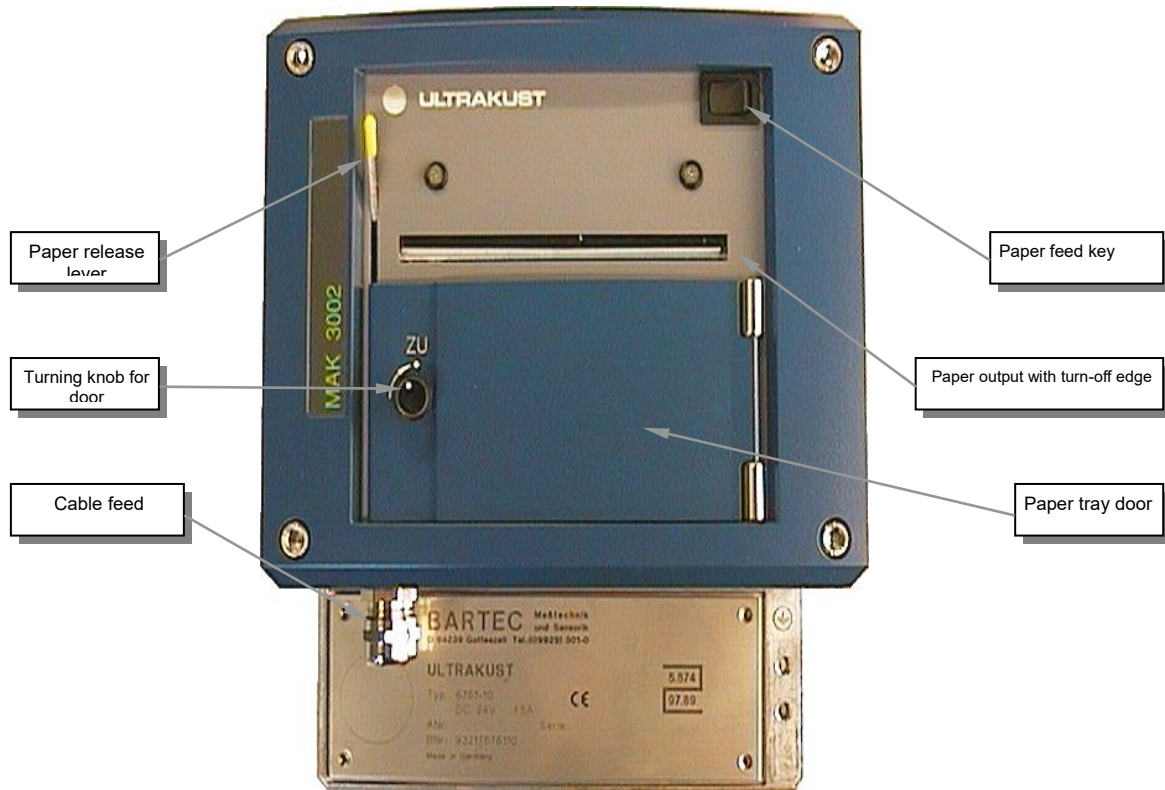
3.27.1   Technical data

Electrical data	
Auxiliary energy	DC 24 V / max. 1,5 A (19 – 32 V)
Electrical connection	Terminal connection, cable feed via cable gland PG9
Interface	Fieldbus interface (P-NET), P-NET identification no. 5927
Ambient conditions	
Operating temperature	0 ... +50°C
Storage temperature	-20 ... +60°C (without paper)
Climatic classification/protection type	KWF / IP 30
Mechanical data	
Casing	Aluminium diecast with holder
Weight	4,5 kg
Mounting position	vertical
Mounting site	Only in dry and clean environments by adhering to the admissible operating temperature and climatic classification. Preferably in the drivers cab.

Dimensions and mounting bores
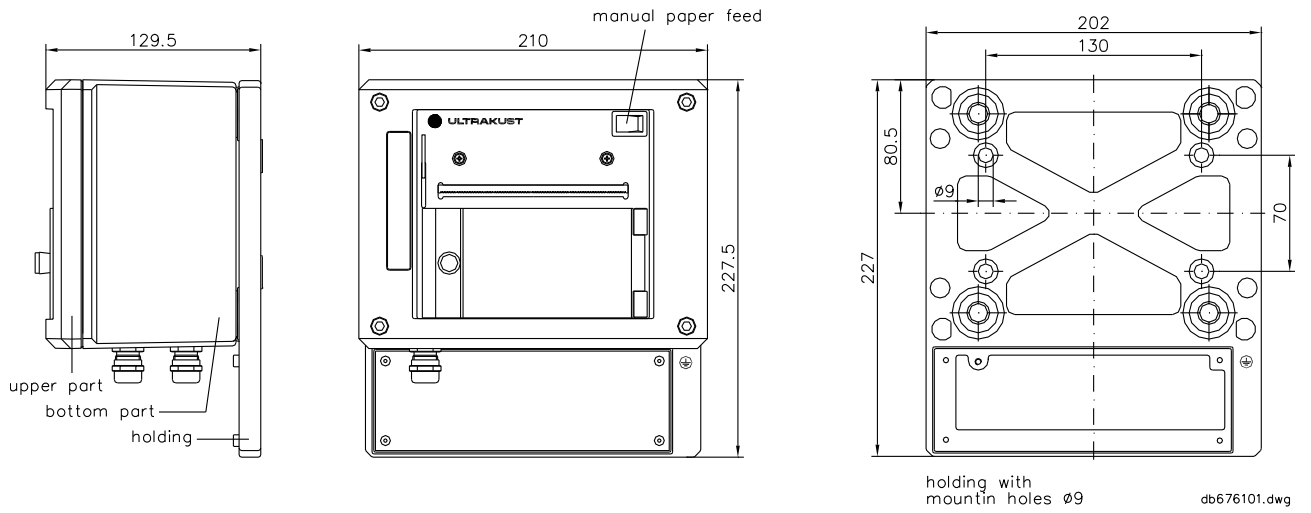
manual paper feed

upper part
bottom part
holding

holding with
mountin holes ∅9

db676101.dwg

3.27.2 Electrical connection

X1 X2 X3 X4 X5 X6

Power supply

P−NET

Power supply

P−NET

Connection clamps for
conductor diameter 1.5mm²

db676102.dwg
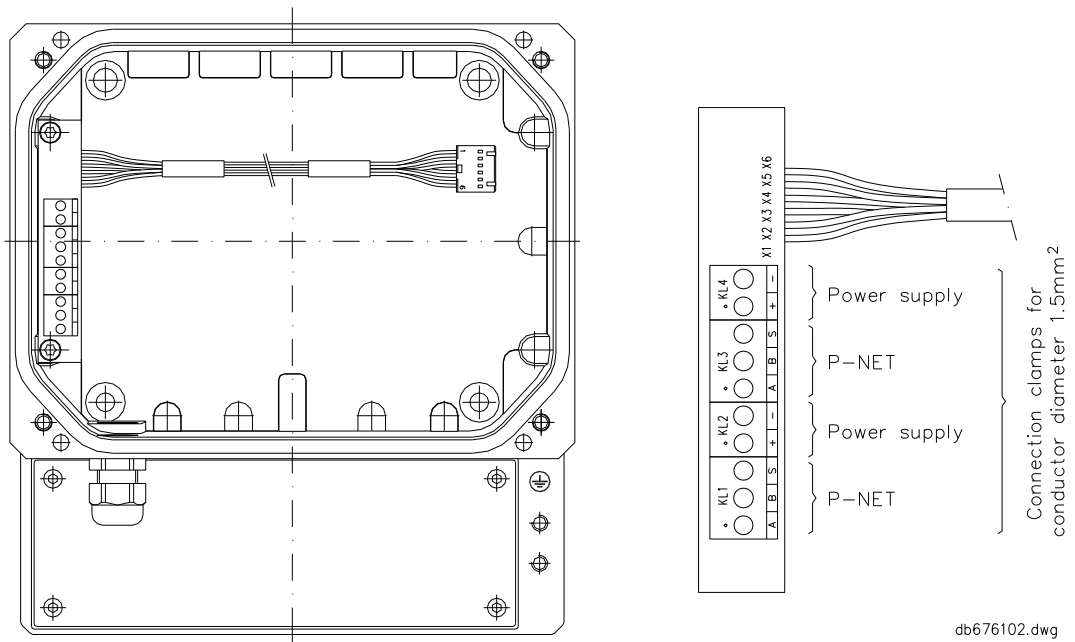
Signal	Wire colour
A	Yellow
B	Green
S	Brown
+	Pink/grey/white
-	Shield

Instructions on the printer operation

| **Paper** | • Only use the printing paper recommended by BARTEC (**thermal printing paper SNR 232192**) as only this paper guarantees a largely maintenance-free operation of the printer. If another thermal printing paper is used, any guarantee claims will be void. |

Storage: dark

dry (maximum air humidity 60%)

cool (max. 30 °C)

| **Paper tray door** | • The paper tray door must be **closed** during operation. The **turning knob** must be **turned right as far as it will go**! If the internal monitoring sensor displays the message "door open", the operation stops. When operated within the MAK system, the controller displays an error message. |

| **Paper release lever** | • Never press down the paper release lever for a longer time as this may result in a deformation of the printing plate. |

• If there is no paper any more and the paper release lever is in normal position (up), the paper feed is suppressed in order to prevent the printing plate from being damaged.

• If paper is available and the paper release lever is pressed down, the printer displays the same message as when there is no paper.

| **Exchange the paper** | • When the paper supply is running out, red stripes appear on the printing paper. The paper has to be replaced. |

• Open the paper tray door.

• Take the used-up roll out of the paper tray. To lift the roll, pull at the two plastic straps**.**

• Press the paper release lever down and pull out the paper.

• Insert the new paper roll into the paper tray so that the free end is at the upper rear end. The two straps have to be located under the paper roll in such a way that their ends look out at the front.

• Insert the free paper end into the slot until it is automatically transported to the printing position. If the paper stops earlier, press the paper feed button until the paper appears at the tear-off edge.

• If the paper is not parallel to the tear-off edge, press the paper release lever down and align the paper. Now press the paper release lever up again.

• Close the paper tray door and lock it by means of the turning knob.

| **Clean the printer** | • The printer is designed in a way that prevents soilings at the printing mechanism. |

• Remove any external soilings (papier residues) at the paper input slot and at the paper output slot in order to prevent paper jams.

Change the P-NET address:

The printer can be operated both with MAK 3001 and with MAK 3002. The printer has a different P-NET address in these systems:

MAK 3001: $0F
MAK 3002: $40

In the delivery status the P-NET address is $0F. If required, the P-NET address can be changed as follows:

- o   Turn on the printer.

- o   Open and close the paper tray door three times within three seconds.

- o   Immediately afterwards start the self-test by pressing the paper feed button two times. The pre-set address is printed at the end of the self-test.

- o   Turn the MAK system off and on again. The new address is initialized in the system.

- o   If this process is repeated, the address is changed again to $0F, and so on.

3.28   SSM cartridge station, type 6766-12

The SSM cartridge station type 6766-12 reads and writes on solid state memory cartridges (SSM cartridges) of the type 6765-1x as well as 6836-20 and 6836-40. In the system 3002, it is the external data storage unit with easily exchangeable data medium. Data is transferred via fieldbus interface (P-NET).

Three light-emitting diodes indicate different operating modes:

LED RED: Error of a general kind:
  ➢   No SSM cartridge in the shaft
  ➢   SSM cartridge defective
  ➢   Battery voltage of SSM cartridge too low

LED YELLOW: Lights up if there is a write/read access to SSM cartridge

LED GREEN: LED blinks - normal operation
                     LED does not blink - SSM cartridge station does not work any more.
                     To remedy any faults, it may be useful to turn the station off and on
                     again

SSM cartridges

SSM cartridges are replaceable, integrated, non-volatile mass storage media. They contain battery-buffered SRAMs as memory components and are available with different capacities of up to 4 MByte.

3.28.1   Technical data

Electrical data	
Auxiliary energy	DC 15 ... 35 V, (via series device type 6781-xx or the like) Nominal current with DC 24 V: approx. 60 mA
Electrical connection	Screw-type terminals for P-NET ring and operating voltage on circuit board inside the back panel. Cable feed via 2 x PG7
Interface 1	Fieldbus interface (P-NET): P-NET identification no. 5917
Interface 2	RS 232, 115 kbaud, maximally admissible line length = 3 m
Ambient conditions	
Operating temperature	-25 ... +60° C
Storage temperature	-30 ... +75°C
Climatic classification/protection type	HUF2 / IP30
Mechanical data	
Casing	Robust sheet steel casing, dark grey powder coating, frontal covering made of plastic, blue
Weight	approx. 13 N ≅ 1,3 kg
Mounting	With wall bracket, to be fixed with 4 x M5 Allen screws or with 4 x 4 blind rivets
Mounting site	Only in dry and clean environments by adhering to the operating temperature and climatic classification. Preferably in drivers cab
Installation position	Any, aim at ergonomic access to insert and remove the SSM cartridge
SSM cartridge, type 6765-10	
Dimensions	24,5 x 74 x 106 mm
Weight	Approx. 2 N ≅ 0,2 kg
Memory/memory capacity	Battery-buffered SRAMS, integrated. 128 KB, 1 MB, 2 MB, 4 MB

Dimensions and mounting

SSM cartridge station - vehicle model, dimensions

SSM cartridge station - office version

Truck type, mounting with console fixing device

Truck type, mounting with wall mounting device

Wiring

Signal	Wire colour
A	Yellow
B	Green
S	Brown
+	Pink/grey/white
-	Shield

For installation into vehicles, use connection kit for collecting truck, type 6766-101.

Connect the connection terminals for the fieldbus P-NET to the P-NET cable in the usual way.

The connection of SSM cartridge station 6766-12 as office version is pre-wired and is available as connection kit for office, type 6766-102 .

3.29 Current supply

3.29.1 Power supply unit, type 6861-3

The series device type 6861-3 is a powerful DC/DC converter and supplies a stable output voltage of DC 24 V.

Technical data

Electrical data	
Input voltage	DC 8 ... 35 V, fuse 16 A / 250 V (time lag)
Input current	max. 7,5 A
Output voltage	DC 24 V stabilized, short-circuit proof
Output current	
Max. 3 A	with DC 9,5 ... 35 V / -25 ... + 50°C
Max. 2 A	with DC 8 ... 35 V / -25 ... +70°C
Ambient conditions	
Operating temperature	-25 ... +70° C
Storage temperature	-25 ... +70°C
Construction	Built-in module consisting of holder, cable set and DC/DC converter
Protection type	IP30
Weight	approx. 16 N $\cong$ 1,6 kg

Wiring

Connection	Terminal	Wire colour
On-board power**+**	29	brown
On-board power **-**	32	blue
Output - (GND)	11	shield
Output +	8	pink/grey/white
Output ON/OFF	2	blue

For standard operation, the control output ON/OFF (terminal 2) has to be connected to GND (terminal 11) by means of a wire jumper.

LED:

(i)   =   red   = input ON / output OFF

(OK)   =   green   = input ON / output ON

(IoL)   =   red   = output overloaded

Shematic diagram
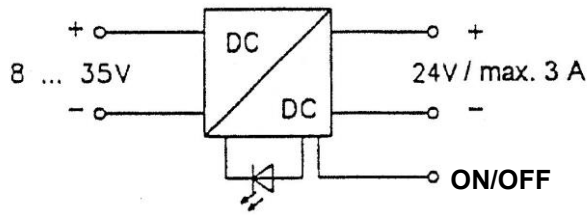
Dimensions
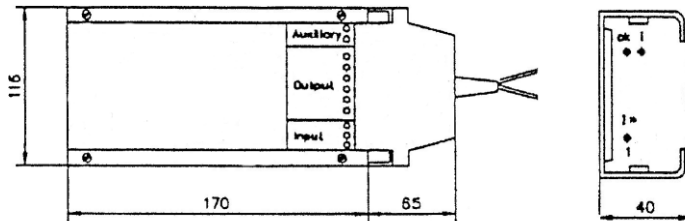
Mounting bores
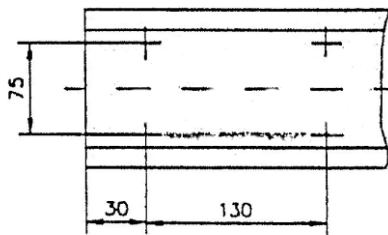
Connection:

Cable Output
L = 20 m
Open cable ends

Cable Input
L = 4 m
Open cable ends

Cable entry point

Strain relief

Sealing

Cable input

Cable output
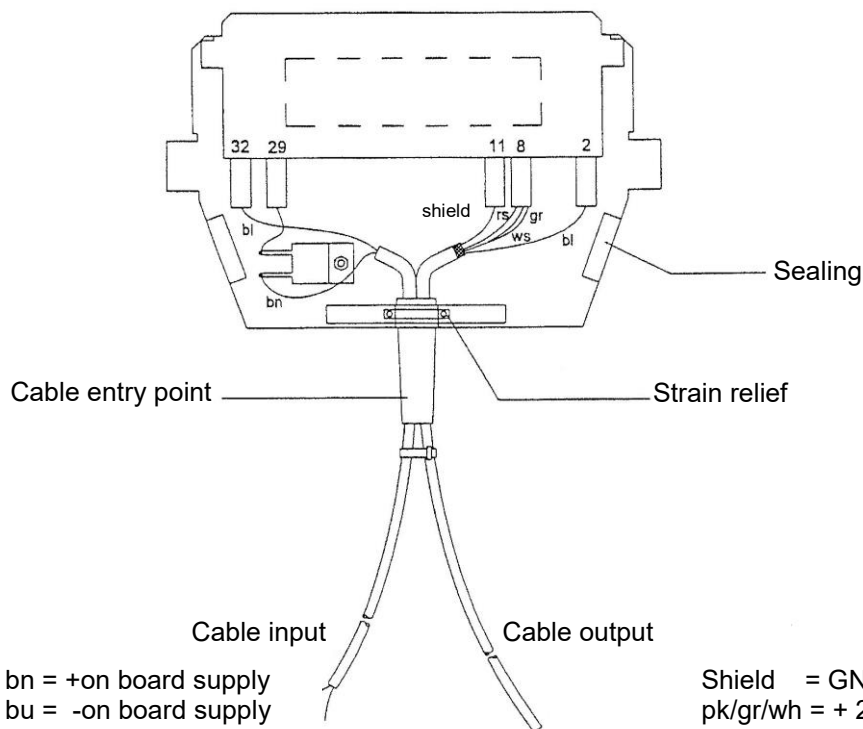
bn = +on board supply
bu = -on board supply

Shield   = GND
pk/gr/wh = + 24 V
bu   = ON/OFF
               (place on GND)

3.29.2   Power supply unit, type 6781-11

The power supply unit type 6781-11 is a supply device for direct current networks.
It filters interference signals and voltage peaks, bridges voltage drops and consequently guarantees a secure power supply to downstream equipment.

Optional functions:

- The power supply unit can be applied for the **registration of the driven distance**.

- Data **registration** in the system MAK 3002 takes place via system controller.

- **Turn on**:
  Depending on the version, the device or the system voltage is turned on either via an external ON/OFF switch in the on-board power supply line or via an external push button.

- **Turn off**:
  Depending on the version, the device or the system voltage is turned off by disconnecting it from the on-board power supply with a ON/OFF switch or controlled via the system controller. The device is put into the "standby mode" (power consumption ≤5 mA).

Technical data

Ambient conditions		
Casing	Material	Aluminium diecast
	Climatic classification/protection type	JSD/IP 65
	Dimensions	160x160x90 mm
Weight	2,5 kg	
Ambient conditions	Operating temperature	-20...+70°C
	Storage temperature	-40...+85°C
Electrical data		
Operating voltage U_{in}	Nominal input voltage	DC 24 V
	Input voltage range	DC 12...34 V
	Power consumption in stand-by mode $\leq$ 5 mA	
Performance data (with nominal conditions 22 ± 2°C)	Bridging of drops of input voltage U_{in}	U_{in} = 12 ... 24 V $\rightarrow$ U_{out} = 24 V ±5 % Output current: max. 1,25 A,
		U_{in} = 25 ... 34 V $\rightarrow$ U_{out} = U_{in} - 1 V Output current: max. 6,3 A *.
	Overvoltage cutout for U_{in} > DC 34 V	see diagram 2
	Pulse loading	max. 16 A / 10 ms
Counting inputs	Counting input I1 +	Low level 0 ... 1 V High level 5 ... 30 V Input resistance $\geq$ 10 KΩ Counting frequency $\leq$ 2000 Hz
	Count input I1 -	**-** On-board power supply (-Ub)
Connection	Terminals	TOP
	Cable feed	5x PG9
	Conductor cross section	max. 1,5mm^2
Fuses	Fuse 1:	6,3 A medium time lag
	Fuse 2:	8 A time lag
	Fuse 3:	3 A medium time lag
	All fuses are accessible after removing the casing cover	

Tachographs suitable for connection

The tachograph has to provide an output complying with the following technical data:

Output current of tachograph:	>2 mA at 24V
	>1 mA at 12 V
Output frequency:	max. 2000 Hz
Low level:	0...1V
High-level:	5...30V

For instance, almost all tachographs of the company VDO Kienzle can be included:

Type 1314: Tachograph with <u>one pulse output,</u> pulse distributor (amplifier) may be required

Type 1318: Tachograph with <u>two</u> pulse outputs (terminals B7, D3), in most cases one free output that can be used.

Type 1319: No direct connection at the tachograph is possible! Only possible via electronic module (PS module) of the vehicle. Must be carried out in an authorised service shop.

> The connection to the tachograph can <u>only</u> be carried out by a VDO-authorised service shop. These service shops also know the exact data and the connection assignment.
> It may be necessary to upgrade the tachograph with an appropriate output.

Due to the diversity of types, only an authorised service shop can provide exact information on the respective vehicle and tachograph types.

Diagram 1
Input voltage U$_{in}$ ≥ 25 V
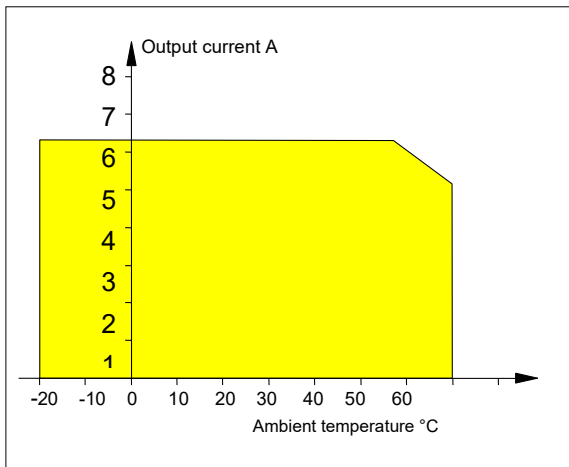
Diagram 2
Automatic overvoltage cutout
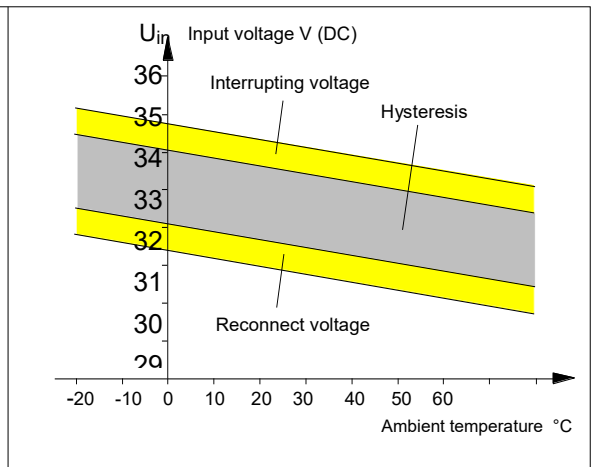
3.29.3   Dimensions and mounting bores
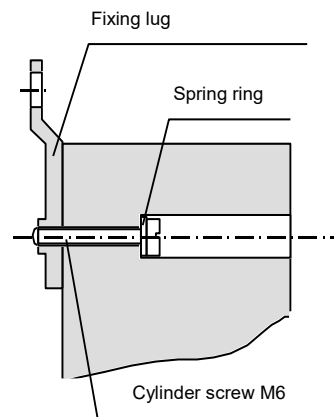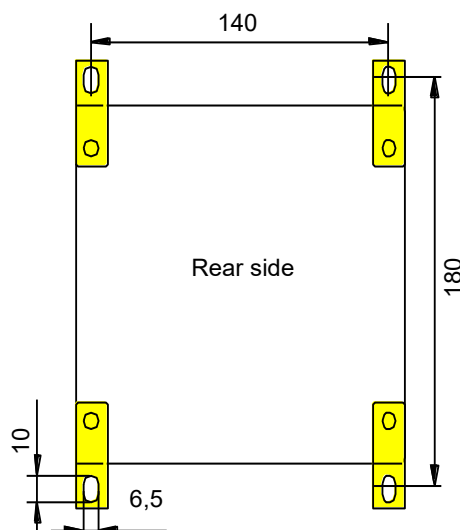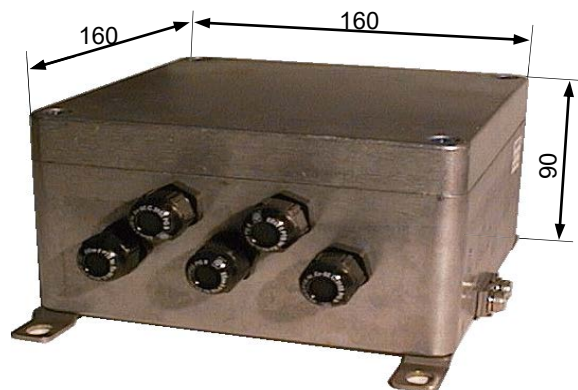
Connection diagram and position of melting fuses
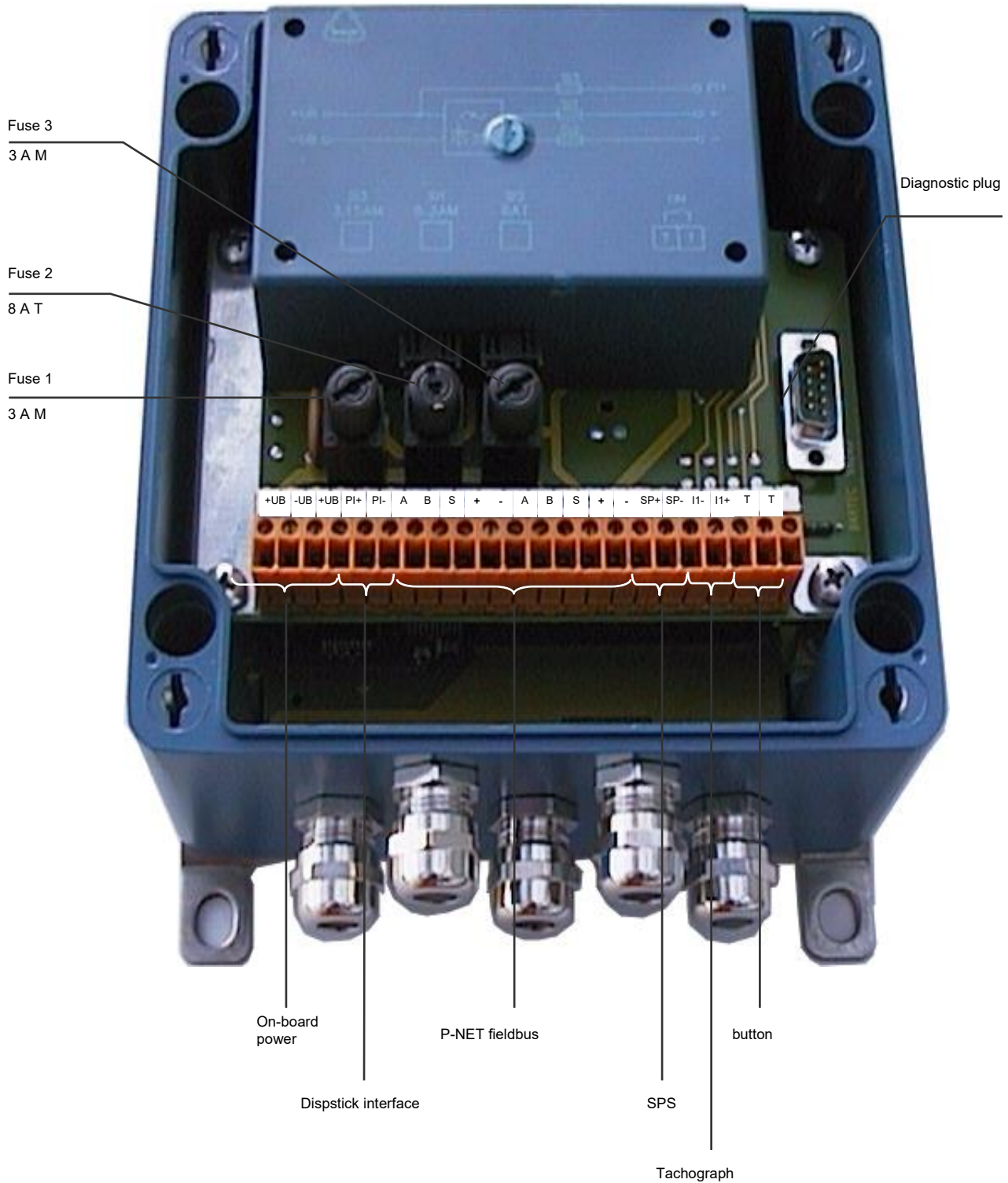
Diagnostic plug	Terminal des-ignation	Signal designation	Colour
	+ UB (2x)	+ on-board power supply	
	- UB (2x)	- on-board power supply	
	PI +	+ on-board power supply for dipstick inter-face	
	PI -	- on-board power supply for dipstick inter-face	
PIN 3	A (2x)	P-NET A fieldbus	yellow
PIN 8	B (2x)	P-NET B fieldbus	green
PIN 5	S (2x)	P-NET S fieldbus	brown
PIN 7	+ (2x)	+ supply of fieldbus (= Uout)	pink/grey /white
PIN 2	- (2x)	- supply of fieldbus (= Uout)	shield
	SP +	+ supply of SPS (= Uout)	
	SP -	- supply of SPS (= Uout)	
	I1 +	count input for tachograph	
	I1 -	ground wire for tachograph	
	T	key connection for turning on the device	
	T	key connection for turning on the device *)	
	*) If the terminals (T/T) are permanently connected, for ex-ample via a wire jumper, the device can only be turned on and off by turning on and off the on-board power supply line. In this case, the program-controlled turning-off through the system controller MAK 3002 via P-NET is deactivated.		

3.29.4 Block diagram

with km registration

ga678101.dwg
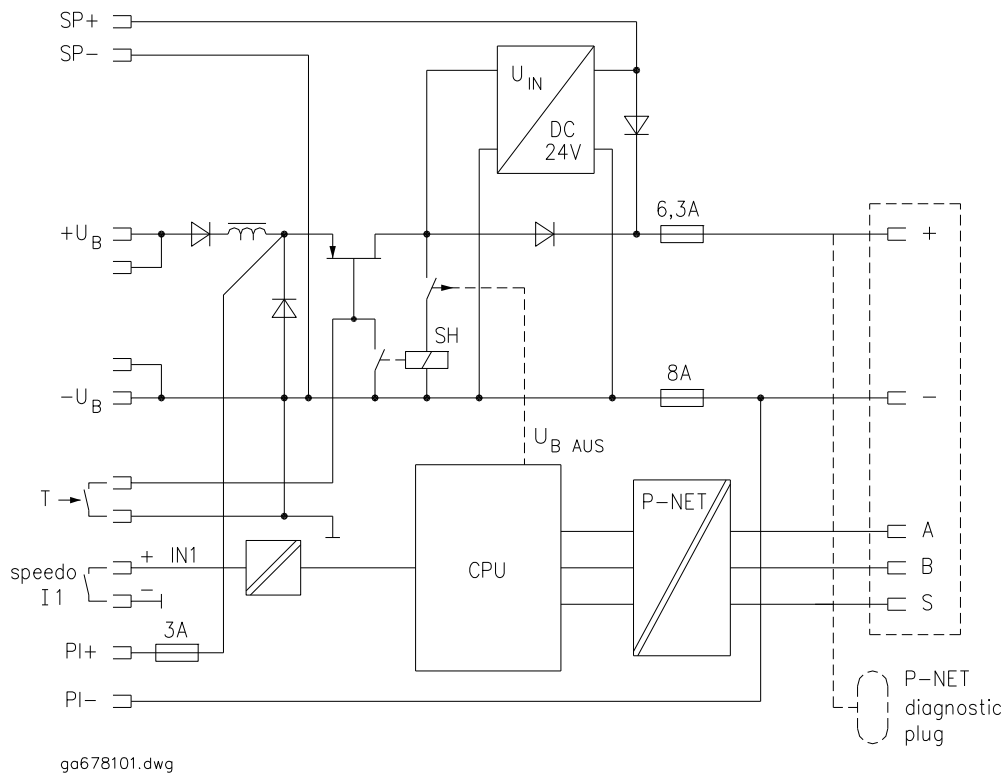
without km registration

ga678101.dwg
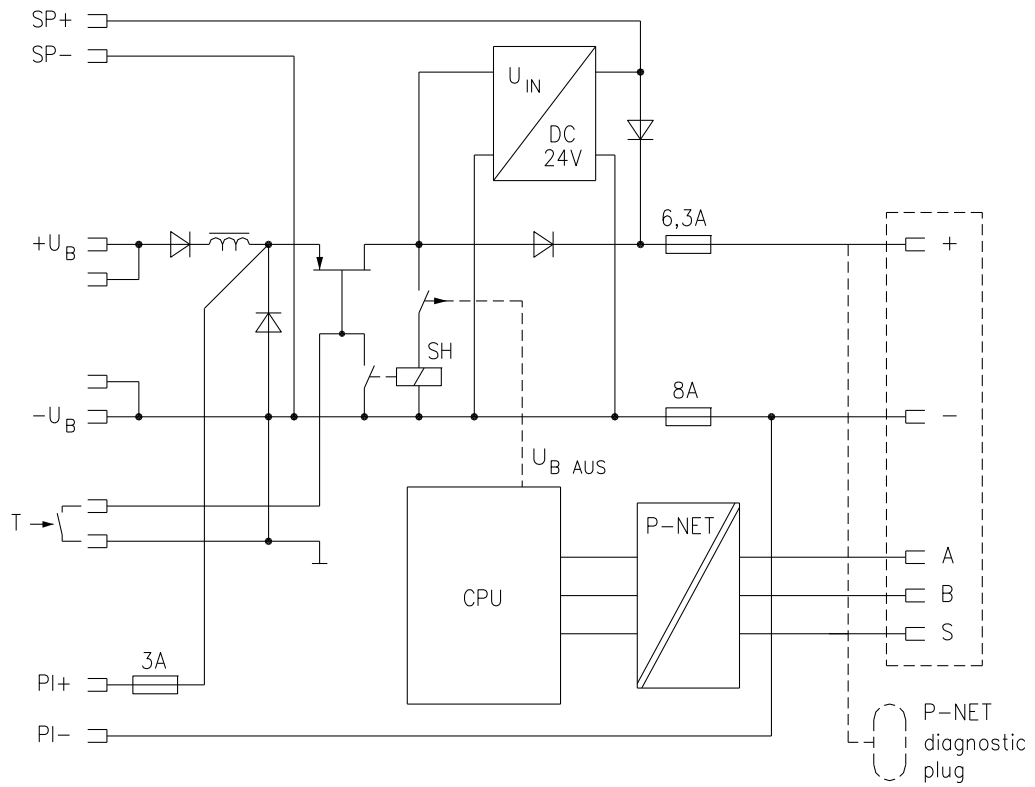
3.30 Vacuum switch type 6836-29
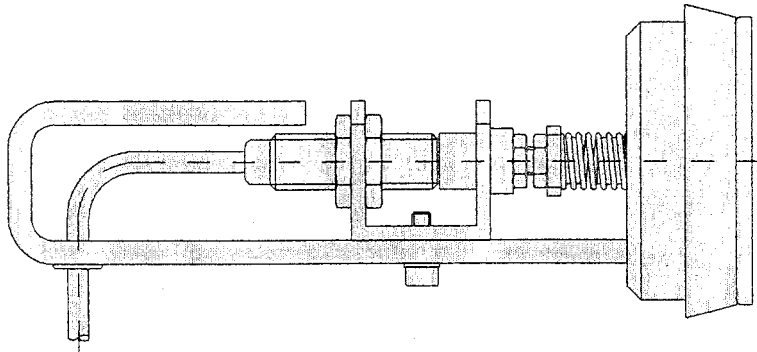
The vacuum switch is factory-set.

For the connection of the inductive proximity switch see "Inductive proximity switches"!

3.31 Inductive proximity switches

Survey / Summary of the applied inductive proximity switches

Type	Function	Symbol
A	npn, negative switching; closer	
B	npn, negative switching; opener	
C	pnp, positive switching; closer	
D	pnp, positive switching; opener	

Overview of the inductive proximity switches

Application in:	Function	Type	Order number
Bottle drive type 6874	Bottle in Position	A	U495716
	Star in Position	B	U495712
	Lifting gear below	A	U495721
Bottle drive type 6774-10	Bottle in Position	A	U495595
	Star in Position	B	203657
	Lifting gear below	A	U495595
Sample vial feeding type 6871-3-50	Bottle in Position	A	U495593
	Bottle below	B	U495590
Sample vial feeding type 6871-3-30	Bottle in Position	A	U495593
Vacuum switch type 6836-29	Vacuum-detection	B	U495590
Radial pump (V2000-measuring system)	Revolution registration	A	U495595

3.32 Terminal box, type 6836-18.1
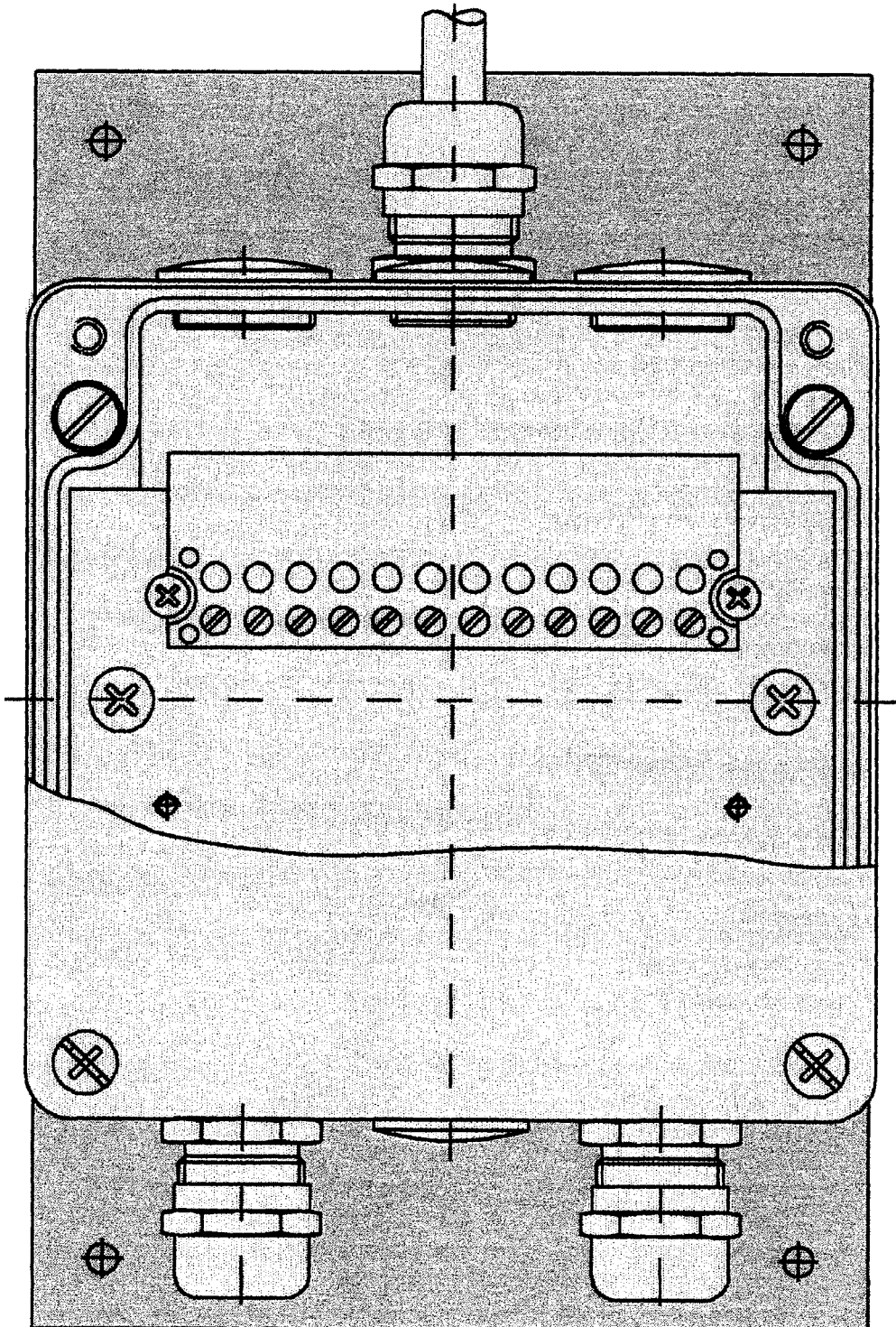
3.32.1 Wiring

Wiring of terminal box ABO-PFIS
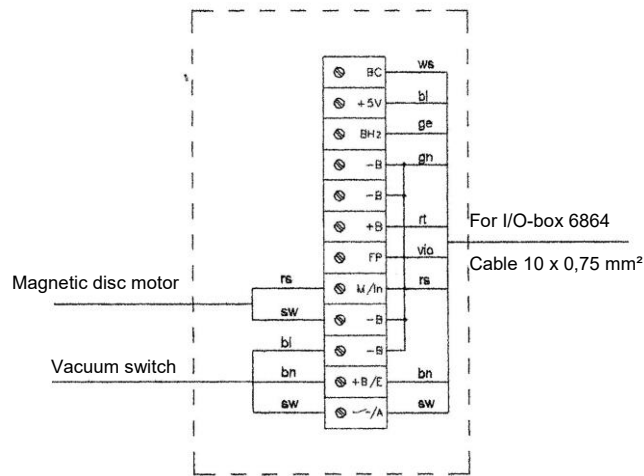
Wiring of terminal box Schwarte-PFIS
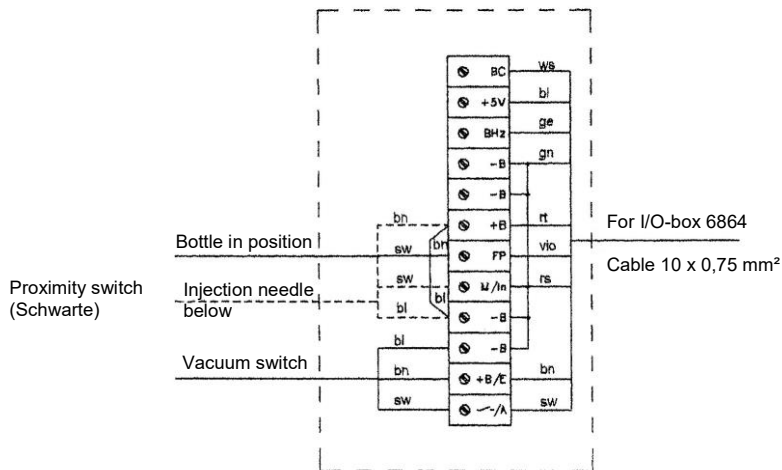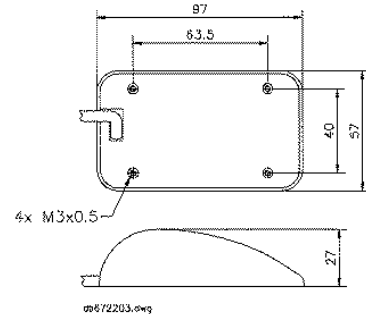
Wiring of terminal box Jansky-PFIS
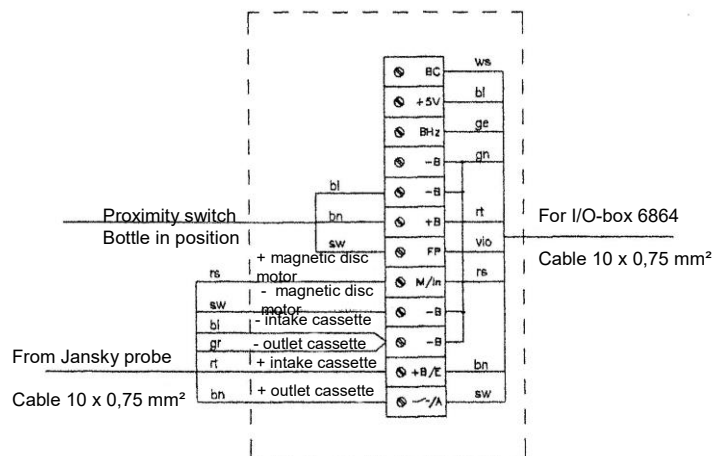
3.33 GPS receiver (RS 232), type 6722-16

In combination with system MAK 3002, automatic supplier identification by means of satellite-controlled vehicle localisation.

3.33.1 Technical data

Electrical data	
Auxiliary energy	DC 6 ... 40 V
Current consumption, typical	50 mA at DC 24 V
Receiver antenna	build in
Interfaces	RS 232
Electrical connection	5m cable length, open lead ends
Ambient conditions	
Operating temperature	- 30 … + 85° C
Storage temperature	- 40 … + 90° C
Climatic class/protection type	HQG/IP 65
Mechanical data	
Dimensions/mounting bores	
Mounting screws	150 g (excluding cable)
housing	Faceplate polyester, base plate metal

Wiring GPS-receiver type 6722-16

GPS receiver 6722-16		to	Controller 6731/6741-10	Controller 6744-10	Converter 4386-4	Converter 4386-6/7	RS 232x3 /P-NET converter Plug-in unit 6757-106		
Signal	Lead colour		See fig. 1	See fig. 1	Interface 1	Interface 0 + 1	Signal	Interface 0	Interface 1
DC 24 V	Red (rd)		Terminal "+" (P-NET)	Terminal "+" (P-NET)	Terminal "+" (Ub)	Terminal "+ 24 V" (Ub)	Terminal "+ 24 V"	601	608
GND	Black (bk)		Terminal „GND"	Terminal 41 „GND"	Terminal „GND"	Terminal „GND"	Terminal „GND"	606	613
R x D	Blue (bu)		Terminal „T x D"	Terminal 38 „T x D"	Terminal „T x D"	Terminal „T x D"	Terminal „T x D"	603	610
T x D	White (wh)		Terminal „R x D"	Terminal 40 „R x D"	Terminal „R x D"	Terminal „R x D"	Terminal „R x D"	602	609
			Jumper from terminal„GND" to „-" (P-NET)	Jumper from terminal„GND" to „-" (P-NET)					
Shield	Naked lead		Note 1)	Note 1)	Note 1)	Note 1)	Note 1)	607	614

Wires that are not in use have to be insulated separately.

Note 1): **Cable shielding:** Variant 3 pursuant to 2.3.1

Instructions for mounting:

As the antenna is integrated in the receiver, the receiver has to be mounted as horizontally as possible on top of the vehicle (e.g. on top of the rear cabin). Avoid by all means that the device is covered by metallic parts. Make sure there is at any time a free view to all sides.

Caution:

The metallic base plate has to be mounted electrical insulating against the faceplate.

BARTEC-attachment: mounting set for GPS-receiver type 6722-101, Order. no.: 234661

For system installations with simultaneous application of a W-LAN adapter type 6722-17 for data transmission, the adapter has to be mounted at the vehicle at a minimum distance of 1m to the GPS receiver in order to prevent interferences.

Ideal mounting: no visual contact between the devices, e.g. GPS receiver on top of the platform, W-LAN adapter at the side of the tank.

Figure 1:
Wiring Controller 6731-10/6741-10/6744-10

RS232

P-NET

RxD	TxD	GND

−	+	S	B	A

RxD   GND

− + S B A

TxD

jumper

signal	TxD	RxD	GND	+24V
color	wh	bu	bk	rd
GPS-receiver RS232 type 6722-16				

P-NET
+24V power supply
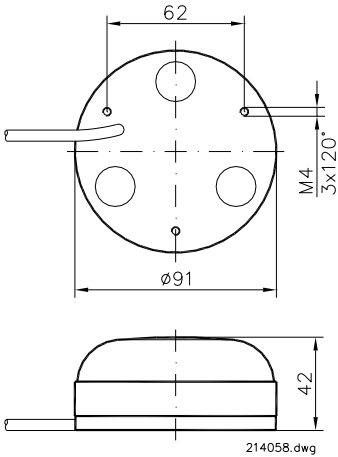
db672201.dwg

3.34   GPS receiver (RS 232), type 6722-18

In combination with system MAK 3002, automatic supplier identification by means of satellite-controlled vehicle localisation.

3.34.1   Technical data

Electrical data	
Auxiliary energy	DC 6 ... 40 V
Current consumption, typical	50 mA at DC 24 V
Receiver antenna	build in
Interfaces	RS 232
Electrical connection	5m cable length, open lead ends
Ambient conditions	
Operating temperature	- 30 … + 80° C
protection type	IP 67 (1 meter immersion depth for 30 minutes)
Mechanical data	
Dimensions/mounting bores	
Mounting screws	3 x M4, do not excess the maximum depth of winding of about 8,0 mm (risk of breakage)
Weight	330 g including 5 m cable

Wiring of GPS-Receiver 6722-18

GPS receiver 6722-18		to	Controller 6731/6741-10	Controller 6744-10	Converter 4386-4	Converter 4386-6/7	RS 232x3 /P-NET converter Plug-in unit 6757-106		
Signal	**Lead colour**		**See fig. 1**	**See fig. 1**	**Interface 1**	**Interface 0 + 1**	**Signal**	**Interface 0**	**1**
DC 24 V	Red (rd)		Terminal "+" (P-NET)	Terminal "+" (P-NET)	Terminal "+" (Ub)	Terminal "+ 24 V" (Ub)	Terminal "+ 24 V"	601	608
GND Remote ON/OFF	Black (bk) Yellow (ye)		Terminal „GND"	Terminal 41 „GND"	Terminal „GND"	Terminal „GND"	Terminal „GND"	606	613
R x D	Blue (bu)		Terminal „T x D"	Terminal 38 „T x D"	Terminal „T x D"	Terminal „T x D"	Terminal „T x D"	603	610
T x D	White (wh)		Terminal „R x D"	Terminal 40 „R x D"	Terminal „R x D"	Terminal „R x D"	Terminal „R x D"	602	609
			Jumper from terminal„GND" to „-" (P-NET)	Jumper from terminal„GND" to „-" (P-NET)					
Shield	Naked lead		Note 1)	Note 1)	Note 1)	Note 1)	Note 1)	607	614

Wires that are not in use have to be insulated separately.

Note 1): **Cable shielding:** Variant 7 pursuant to 2.3.1

Instructions for mounting:

As the antenna is integrated in the receiver, the receiver has to be mounted as horizontally as possible on top of the vehicle (e.g. on top of the rear cabin). Avoid by all means that the device is covered by metallic parts. Make sure there is at any time a free view to all sides.
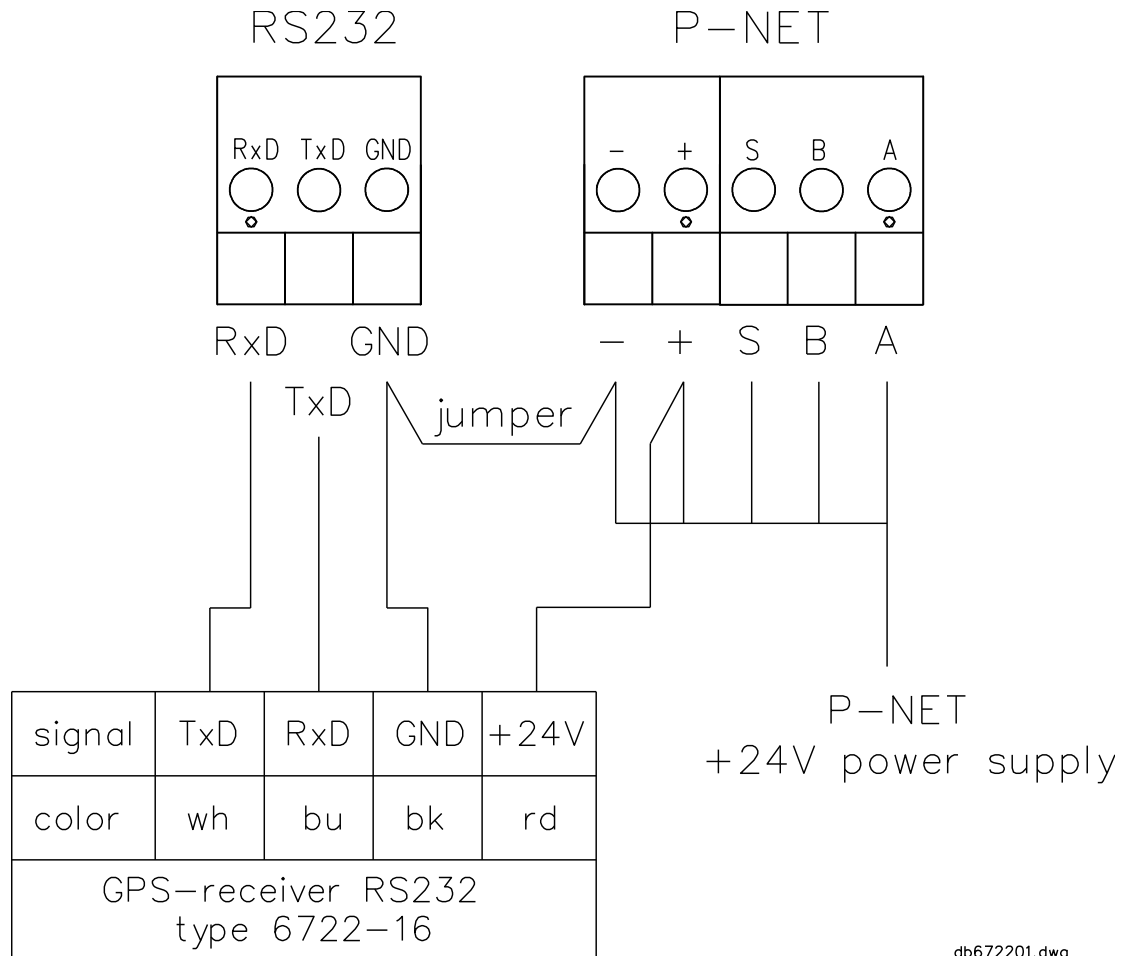
Caution:

For system installations with simultaneous application of a W-LAN adapter type 6722-17 for data transmission, the adapter has to be mounted at the vehicle at a minimum distance of 1m to the GPS receiver in order to prevent interferences.

Ideal mounting: no visual contact between the devices, e.g. GPS receiver on top of the platform, W-LAN adapter at the side of the tank.

General recommendation:

Mount the GPS-Receiver as far as possible (> 1 m) from all other radio antennas and electronic system components (for example: fan motor, magnetic valves, radio control units).

Do not direct the connecting cable on electrical system components and don`t direct it parallel to other cables.

Recommendation for mounting:

We recommend to mount the GPS-Receiver with silicon or another equal elastic mounting glue on a level mounting surface.

The whole adherent surface has to be filled with glue equally to prevent an infiltration of water under the receiver in order to exclude lift-off of the receiver at frost.

Fig.1:
Wiring of controller 6731-10/6741-10/6744-10

RS232   P−NET

| RxD | TxD | GND | | − | + | S | B | A |

| RxD | | GND | | | − | + | S | B | A |

TxD

jumper

signal	TxD	RxD	GND remote	+24V
colour	wh	bu	bk ye	rd
GPS−Receiver RS232 type 6722-18				

P−NET
+24V power supply
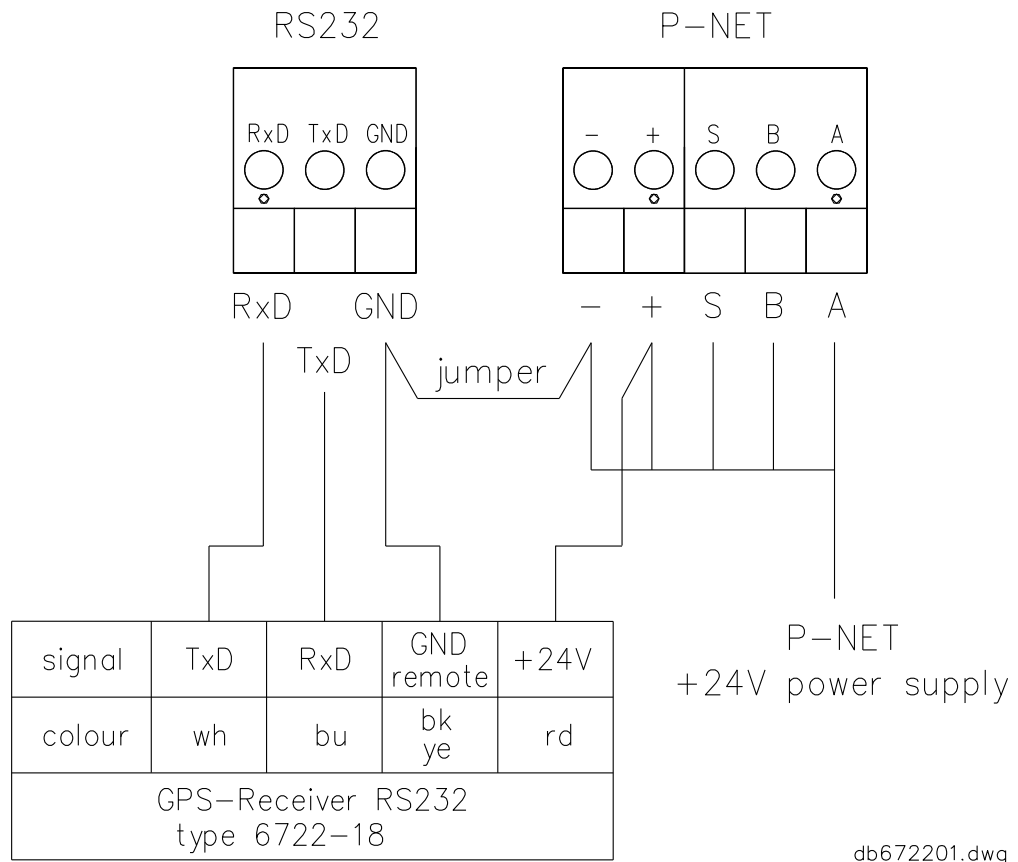
db672201.dwg

3.35   RS 232 / P-NET converter, types 4386-4 /-6 /-7/-8

The converters serve to operate any devices equipped with an RS 232 interface via the fieldbus P-NET.

Types 4386-4/-8 make possible the connection of one RS 232 device, types 4386-6 /-7 make possible the connection of up to three RS 232 devices.

4386-4

4386-6

4386-7/-8

3.35.1   Technical data

	4386-4	4386-8	4386-6	4386-7
Electrical data				
Auxiliary energy	DC 10 ... 36 V, 40 mA at DC 24 V		DC 10 ... 36 V, 0,15 A at DC 24 V	
Interfaces	1 x P-NET 1 x RS 232-C		1 x P-NET 3 x RS 232-C	
Fuses	300 mA (reversible)		300 mA (reversible)	
Ambient conditions				
Operating temperature	-10 ... +50°C		-10 ... +50°C	
Storage temperature	-20 ... +70°C		-20 ... +70°C	
Climatic classifica-tion/protection type	KWF / IP 40	KWF / IP 65	KWF / IP 40	KWF / IP 65
Mechanical data				
Connections	20 x terminals 1,5 mm² 4 x cable gland PG 9		31 x terminals 1,5mm² 6x cable gland PG 9	
Switching output	350 mA max. / 60 V galvanically separated			

Dimensions/mounting bores, type 4386-4
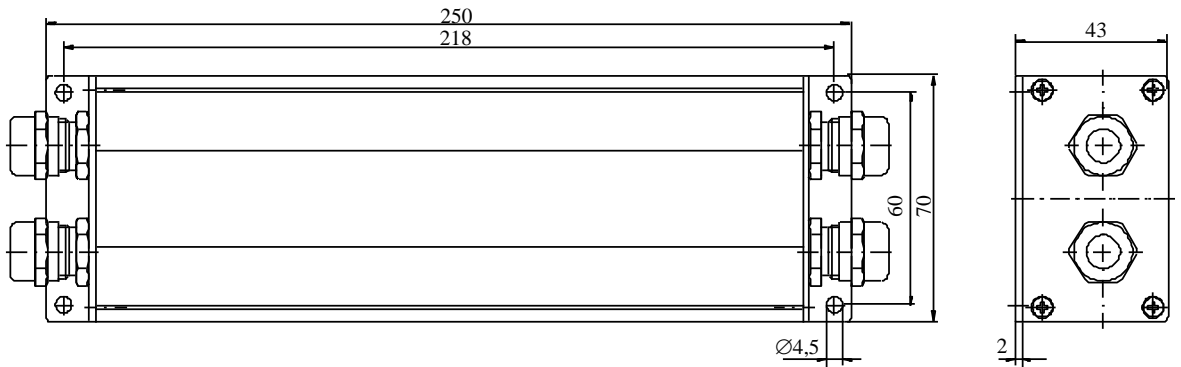
250
218
60
70
43
Ø4,5
2

Dimensions/mounting bores, type 4386-6

227.4
217.4
43
121
111

BARTEC
Typ: 4386-6
DC 24V 50mA CE
ANr: Serie:
BNr: 213724

Ø4,5

go438605.dwg

Dimensions/mounting bores, type 4386-7/-8

260
240
160
110
Ø6.3

A
B
S
24V +
−

A
B
S
24V +
−

0V
+24V
Schirm
GND_2
RTS_2
CTS_2
TxD_2
RxD_2
0V
+24V
Schirm
GND_1
RTS_1
CTS_1
TxD_1
RxD_1
0V
+24V
Schirm
GND_0
RTS_0
CTS_0
TxD_0
RxD_0

go438606.dwg
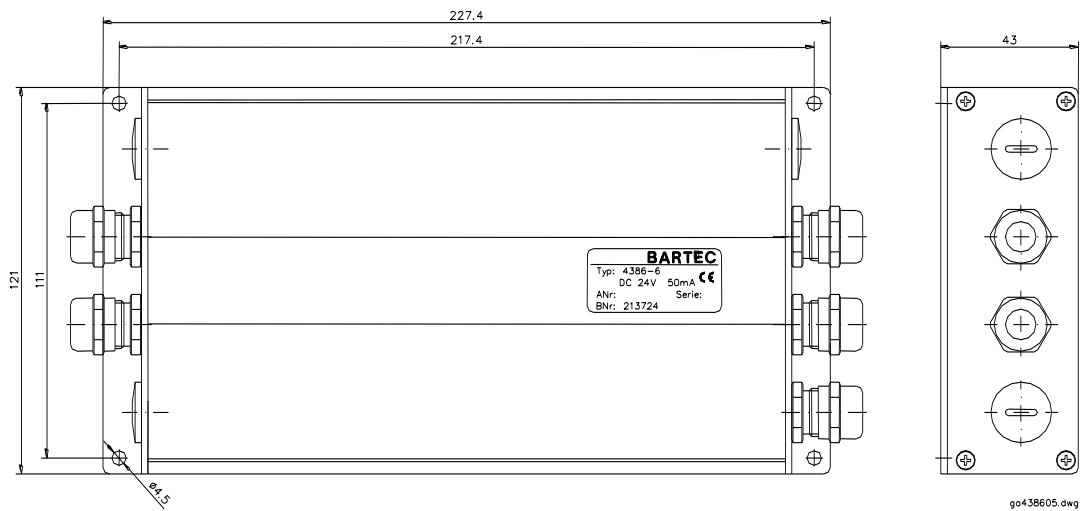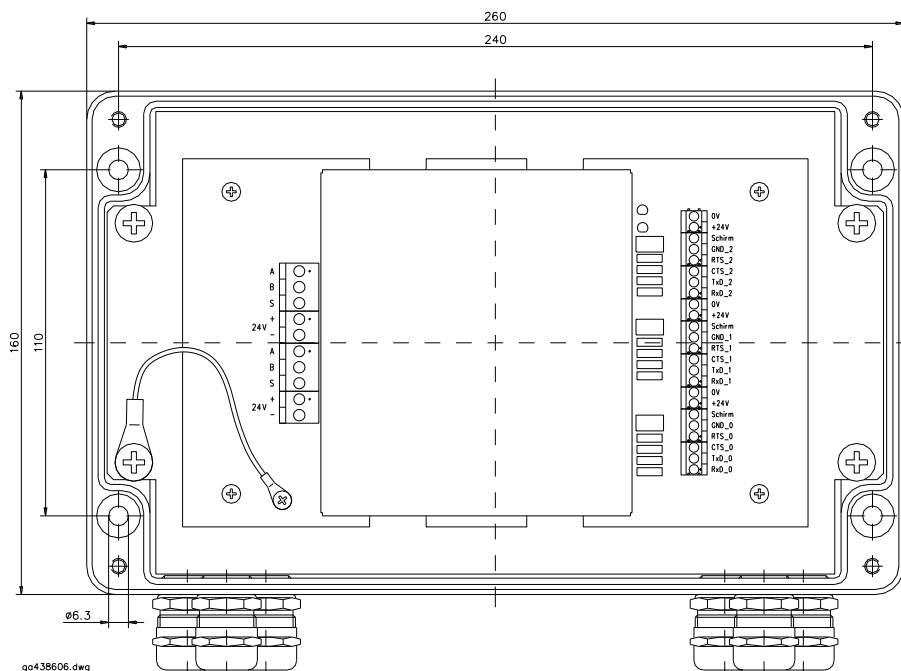
Connection/block diagram, type 4386-4/-8
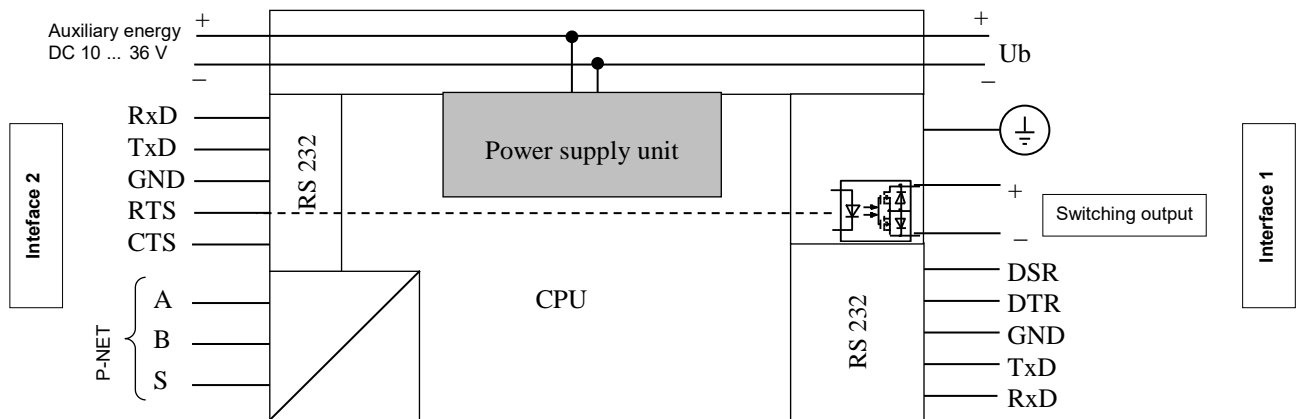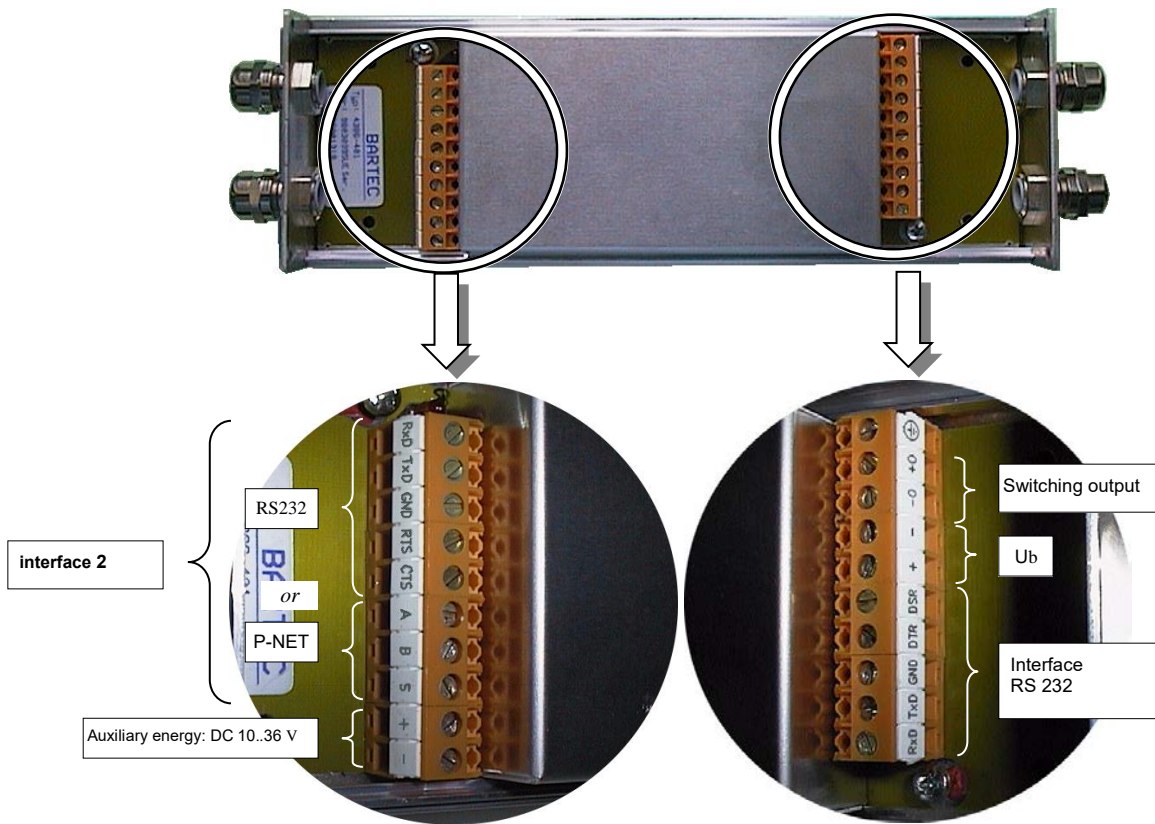
Connection/block diagram, 4386-6/-7
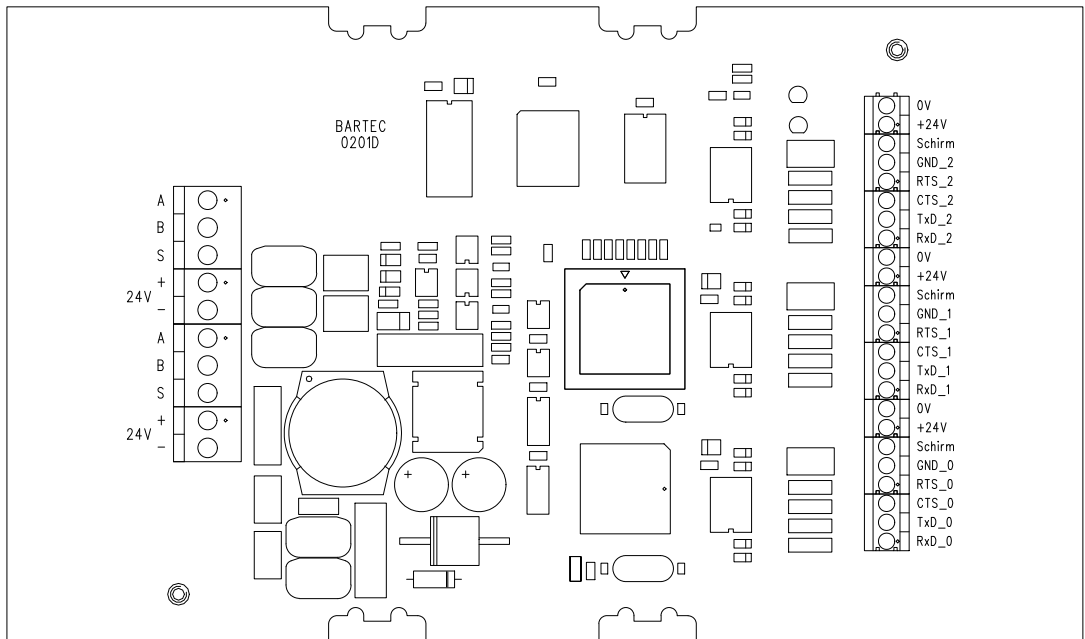
213360.dwg
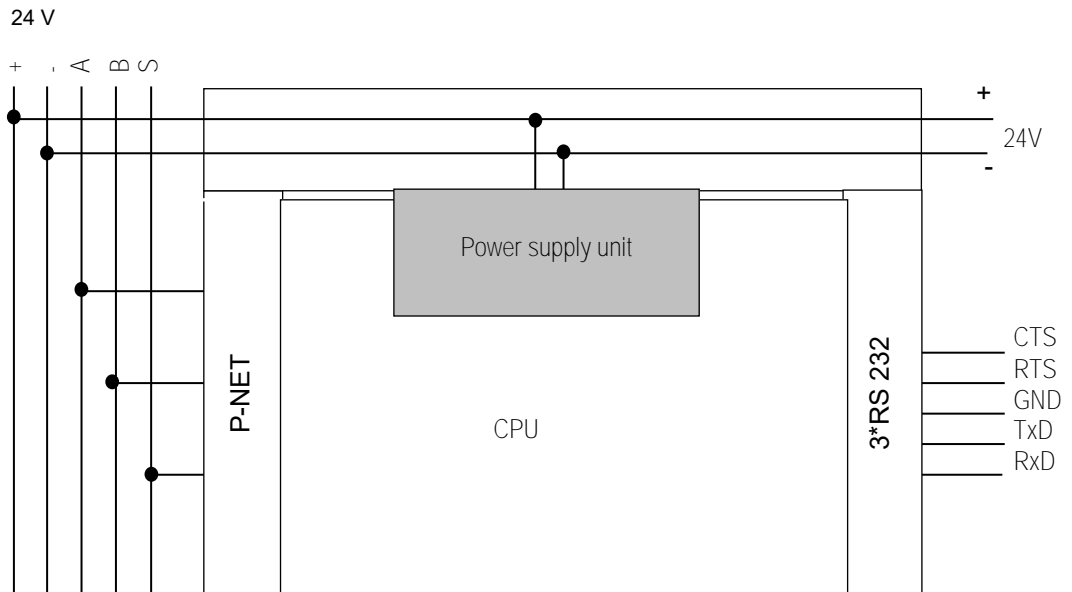
3.36 Radio transceiver, type 6722-13

Short-distance radio module for data transmission

3.36.1 Technical data

Electrical data	
Auxiliary energy	DC 8 ... 36 V
Operating frequency	433,25 ... 434,60 MHz
Current consumption	Transmitting mode: < 60 mA, receiving mode: < 50 mA
Range	Up to 400 m in free space
Interface /interface format	Serial RS 232 / 9600 Baud, 8 Bit, 1 stop bit, no parity
Ambient conditions	
Operating temperature	-10 ... +55°C
Storage temperature	-30 ... +80°C
Climatic classification/ protection type	JVG / IP 65
Mechanical data	
Casing	Material: Aluminium Total weight: 760 g Connection: PG 9, 6 x terminal 1,5 mm²
Dimensions/mounting bores	

Vertical mounting (antenna upwards), maximum admissible inclination 45°C, preferably on top side of the vehicle / free sight

Connection/wiring
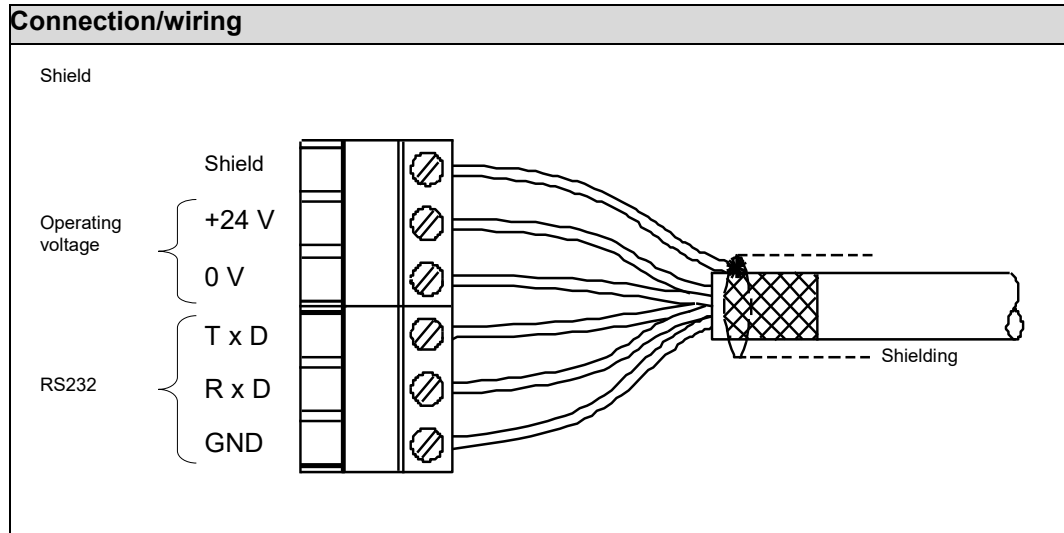
Signal/terminal	⏚	+ 24 V (+)	0 V (-)	T x D	R x D	GND
Wire colour cable U660033	Shield	pink	blue	yellow	green	brown

Cable shielding: Variant 1 or variant 4 in accordance with 2.3.1 admissible, depending on which variant offers the best shield contact.

3.37 Connection kit for radio transceiver, type 6720-305

Connection diagram for radio transceiver / PC
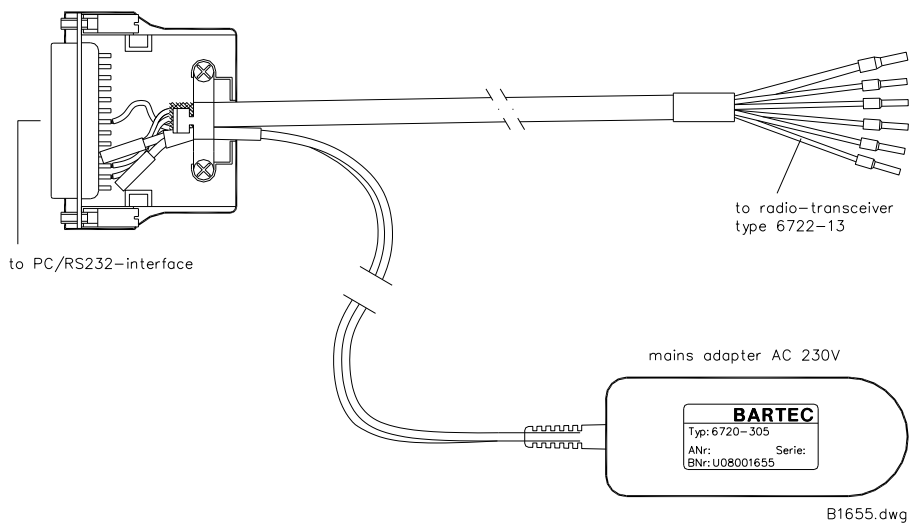
Connection of radio transceiver, type 6722-13

Signal/terminal	⏚	+ 24 V	0 V	T x D	R x D	GND
Wire colour	green-yellow	pink	blue	yellow	green	brown
Female plug (PIN)	Shield			3	2	7
Power supply adapter		ribbed (+)	smooth (-)			

3.38 W-LAN adapter, type 6722-17

The WLAN adapter 6722-17 makes possible to transmit data between a 3002 controller and a FTP server via a radio network in accordance with IEEE 802.11.
An appropriate access point is required on the server side.

3.38.1 Technical data

Electrical data	
Auxiliary energy	DC 9 ... 36 V, fuse 650 mA internal, reversible
Connection type	Cable feed PG 9, internally pluggable terminals 1,5 mm²
Interfaces	serial, RS 232-C
Ambient conditions	
Operating temperature	-10°C ... +60°C
Protection type	IP66
Mechanical data	
Installation position	Vertical, cable feed bottom
Mounting site	At a suitable and protected location on the outer side of the vehicle with free access to transmitter / receiver frequency **Note:** For operation in systems equipped with GPS receiver type 6722-16 observe a mounting distance > 1 m between the two devices in order to avoid mutual interferences. Ideal mounting: no visual contact between the devices, e.g. GPS receiver on top of the platform, W-LAN adapter laterally at the tank.
Dimensions/mounting bores	 208316.dwg

Wiring (with cable U660033)

W-LAN adapter type 6722-17		to	RS 232 / P-NET converter 4386-4	RS 232 x 3/ P_NET converter 4386-6/-7 interface 2	RS 232 x 3 / P-NET Converter plug-in 6757-106 interface 2
Signal/ Terminal	Colour				
+ (+ 24 V)	Pink		Terminal „+" (Ub)	Terminal „+ 24 V"	Terminal 615
- (0 V)	Blue		Terminal „–" (Ub)	Terminal „0 V"	Terminal 620
RTS*	-------		-------	-------	-------
T x D	Green		Terminal „R x D"	Terminal „R x D_2"	Terminal 616
D c D*	-------		-------	-------	-------
R x D	Yellow		Terminal „T x D"	Terminal „T x D_2"	Terminal 617
CTS*	-------		-------	-------	-------
GND	Brown		Terminal „GND"	Terminal „GND_2"	Terminal 620

* are not needed.

Cable shieldings: Variant 2 pursuant to 2.3.1

Meaning of internal LEDs (visible after opening the casing cover)

    W-LAN card: (green) LED 1: Card activated
                      (green) LED 2: Flashes up when data is being transmitted

    Main board: (red) LED 3:   Blinks in standby state
                    (red) LED 4:   Flashes in case of connection with the controller
                    (red) LED 5:   Flashes in case of connection with a WLAN
                    (red) LED 6:   Flashes after successful login at the server
                    (red) LED 7:   No meaning at present

3.39 GSM modem TC 35 / MC 35 including antenna

For radio-controlled data transmission between milk collecting truck and dairy centre

The GSM modem can only be operated via an RS 232 / P-NET converter type 4386-4/-8 or type 4386-6/-7 (interface 2) or type 6757-106 (interface 2).

3.39.1 Technical data

Operating voltage	DC 8 ... 30 V
Dimensions	65 x 74 x 33 mm
Weight	Approx. 130 g
Fastening	With two lens head screws M3 x 50 mm

Connections

Fig. 1 Front view

Connection of power adapter cable

RS 232 Interface
(9-pin D-Sub)

Antenna plug

Fig. 2 Rear view

LED Display

Telephone connection

Card holder
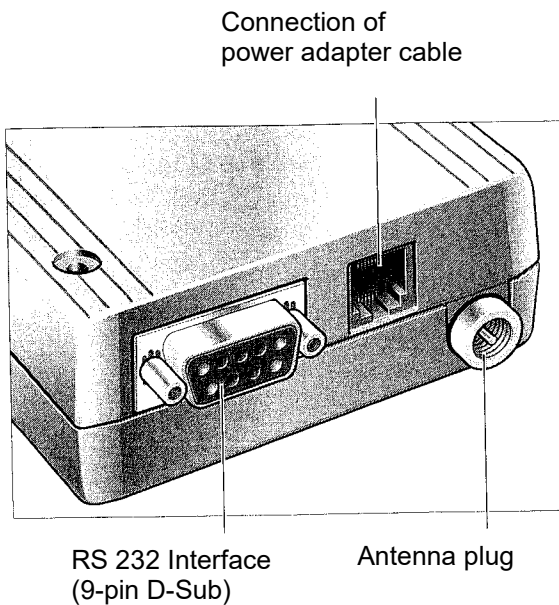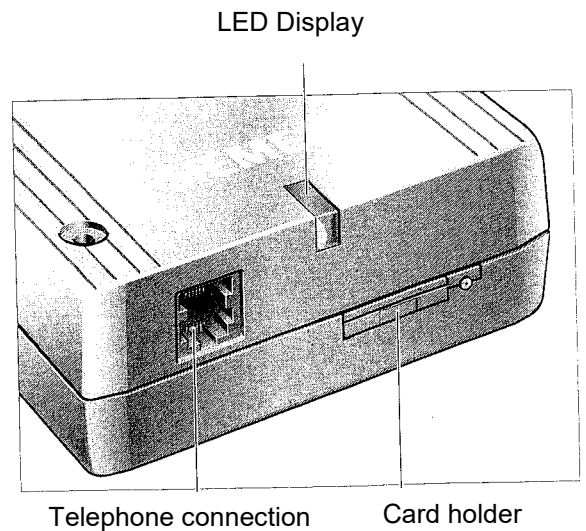
Insert SIM card

Fig. 3
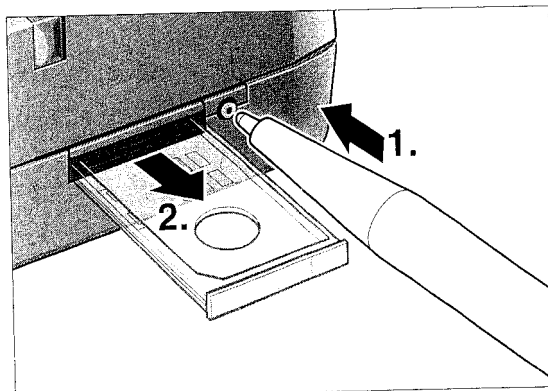
Fig.4
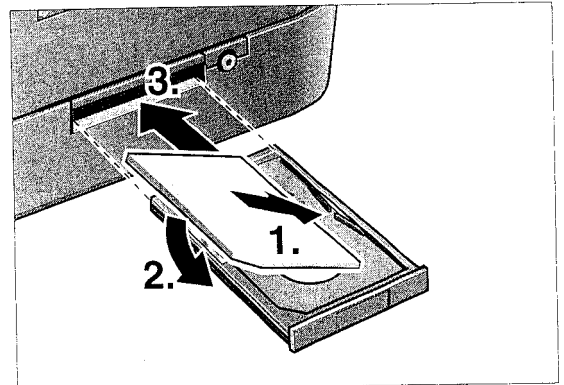
3.39.2 Mounting and wiring

Please proceed in the following order:

1. Mount the GSM modem at a place suitable for the open design, in a dry area of the vehicle that is free of dust and dirt.
   Please observe the respective cable lengths of the GSM antenna and of the RS 232 cable when selecting the site.

   In combination with RS 232/P-NET converter type 4386-7/-8, the GSM modem can also be installed into these converters with an appropriate protection.

   Caution:
   For mounting, please note that the metallic fastening screws of the GSM modem can have a connection to the GND potential. Consequently the modem has to be fastened electrically insulated against the vehicle chassis ground**.**

   BARTEC accessories: mounting kit for GSM modem type 6722-102, order no.: 234662

2. Fasten the GSM antenna (magnetic or adhesive holder depending on type) at a place where the receiving conditions are good (e.g. window pane or top side of vehicle).

3. Connection of RS 232 cable to the respective RS 232 / P-NET converter in accordance with connection diagram and to the 9-pole Sub-D female connector of the GSM modem.

4. **Important:**
   Before inserting the SIM card into the GSM modem, the PIN number of the card and other data (see recommendation below) have to be entered correctly at the controller MAK 3002.
   Then disconnect power supply, insert SIM card into GSM modem (see fig.3 + fig. 4) and insert card holder completely again.
   Connect power supply again.
   If you proceed in another order, the SIM card will be blocked!

3.39.3 Connection diagram

GSM-Modem TC 35				zu	RS 232/P-NET Konverter Typ 4386-4		RS 232/P-NET Konverter Typ 4386-6/-7 Schnittstelle 2	RS 232 x 3/P-NET Konverter-Einschub Typ 6757-106 Schnittstelle 2
RS 232 cable	Signal	Colour	PIN			Note 2)		
	T x D	green	2		Terminal R x D	Terminal R x D	Terminal R x D_2	Terminal 616
	R x D	yellow	3		Terminal T x D	Terminal T x D	Terminal T x D_2	Terminal 617
	GND	brown	5		Terminal GND	Terminal GND	Terminal GND_2	Terminal 620
	CTS	white	7		Connect with	Terminal DTR	Terminal RTS_2	Terminal 619
	RTS	blue	8		luster terminal	Terminal DSR	Terminal CTS_2	Terminal 618
	DSR	pink	4		Connect with luster terminal			
	DTR	grey	6					
	Shield	yellow green	Casing		Note 1)			
Power adaptercable MC 1213115-2	+ Ub Ignition 0 V	white yellow pink			Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + 24 V Terminal + 24 V Terminal 0 V	Terminal 615 Terminal 615 Terminal 620
Power adapter-cable (new) MC 1213115-1	+ Ub Ignition 0 V	white green blue			Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + 24 V Terminal + 24 V Terminal 0 V	Terminal 615 Terminal 615 Terminal 620
Power adapter-cable (new) MC 1213115-6	+ Ub Ignition 0 V	white yellow red			Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + (Ub) Terminal + (Ub) Terminal - (Ub)	Terminal + 24 V Terminal + 24 V Terminal 0 V	Terminal 615 Terminal 615 Terminal 620

Note 1): *cable shielding:* Variant 3 pursuant to 2.3.1

3.39.4 Recommended Default-Settings

Menu/configuration/data logging

Data transfer	6 = GSM
Telephone no.	Number of dairy
Journal	0 = V110
PIN	PIN-number of telephone card
Auto	Automatical data transfer ON/OFF

Menu/configuration/Peripherals: V 24 - P-NET-Converter

	Type 4386-4		4386-6/-7 and 6757-106
Port2-Mode	2 = Modem		2 = Modem
Port2-Baud	2 = 4800	4 = 19200 **Note 2)**	4 = 19200
Handshake	OFF	ON **Note 2)**	ON
Mo.Ini.Str.	Not entry		No entry
Kom.Ti.Out	5 s		5 s
HSK.Ti.Out	0 s		0 s

Note 2) From Software 2.46 (070131)

3.40   GPRS modem FASTRACK including antenna

For wireless data transmission between milk collecting truck and dairy centre.

The GPRS modem can be operated via the RS 232 interface of the controller type 6731-10, 6741-10, 6744-10 or via an RS 232 / P-NET converter type 4386-6/-7 (interface 2) or type 6757-106 (interface 2).

Attention: With program version ≥ 2.46 (070131) also converter type 4386-4 available.

3.40.1   Technical data

Operating voltage	DC 5,5 ... 32 V / approx. 70 mA for 24 V
Dimensions	93 x 54 x 25 mm
Weight	ca. 82 g
Fastening	With two lens head screws M3 x 8 mm
Operating temperature	-20 ... +55° C
Storage temperature	-25 ... +70° C

Connections

Fig. 1 Front view

Connection for power adapter cable

RS 232 Interface (15-pin D-Sub)

Fig. 2 Rear view

Card holder

Antenna plug

Insert SIM card

Fig. 3

1.

2.

Fig. 4

3.

1.

2.
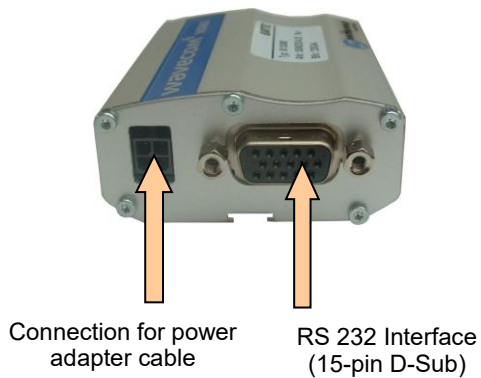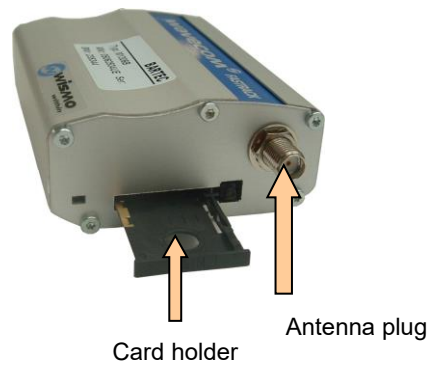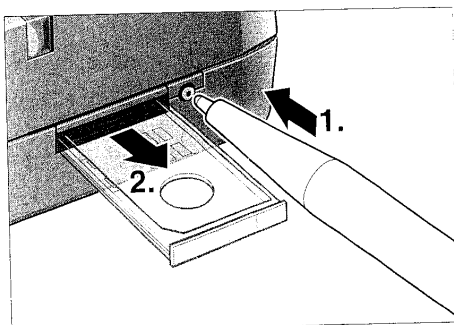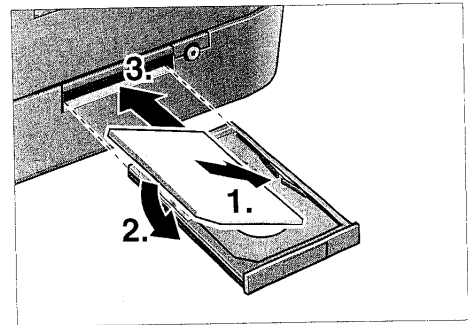
3.40.2   Mounting and wiring

Please proceed in the following order:

1.   Mount the GPRS modem at an appropriate location suitable to the open design, in a dry area of the vehicle that is free of dust and dirt.

Observe the relevant cable lengths of the GSM antenna and of the RS 232 cable when choosing the location.

In combination with RS 232 / P-NET converter type 4386-7/-8, the GPRS modem can also be installed into these converters with an appropriate protection.

Caution:
For mounting, please note that the casing and the metallic fastening screws of the GPRS modem can have a connection to the GND potential. Consequently the modem has to be fastened electrically insulated against the vehicle chassis ground.

BARTEC accessories: mounting kit for GPRS modem type 6722-103, order no.: 238862

2.   Fasten the GSM antenna (magnetic or adhesive holder depending on type) at a site where the receiving conditions are good (e.g. window pane or top side of the vehicle).

Connection to GPRS modem with enclosed GPRS antenna adapter.

Caution:
The metallic screwing between antenna and antenna adapter has also to be insulated appropriately in order to prevent an electrical connection of the signal GND to casing parts, i.e. to the vehicle chassis.

3.   Connection of the RS 232 cable to the appropriate RS 232 / P-NET converter in accordance with the connection diagram, (Alternative 1 or 2).

Important:
Before inserting the SIM card into the GPRS modem, the PIN number of the card and other data have to be entered correctly at the controller MAK 3002.

Menu/configuration/peripherals: V 24 - P-NET Converter (Default Setting)

Port 2-Mode: 2 = Modem
Port 2-Baud: 4 = 19200
Handshake: ON
Mo.Ini.Str.:   No entry.
Kom.Ti.Out: 5 s
HSK.Ti.Out: 0 s

Then disconnect power supply, insert SIM card into GPRS modem (see fig. 3 + 4) and insert card holder completely again.
Turn on power supply again.
If you proceed in another order, the SIM card will be blocked!

3.40.3 Connection diagram Alternative 1

in combination with GPRS- and RS 232 data cable

GPRS-Modem FASTRACK				to	RS 232/P-NET Converter Type 4386-6/-7 Interface 2	RS 232 x 3/P-NET Converter-Plug-In Type 6757-106 Interface 2	RS 232/P-NET Converter Type 4386-4
RS 232-cable	**Signal**	**Colour**	**PIN**				
	TxD	green	2		Terminal RxD_2	Terminal 616	Terminal RxD
	RxD	yellow	3		Terminal TxD_2	Terminal 617	Terminal TxD
	GND	brown	5		Terminal GND_2	Terminal 620	Terminal GND
	CTS	white	7		Terminal RTS_2	Terminal 619	Terminal DTR
	RTS	blue	8		Terminal CTS_2	Terminal 618	Terminal DSR
	DSR	pink	4		connect with luster terminal		
	DTR	grey	6				
	Shield	yellow green	Casing		note 1)		
Power adapter cable	+ Ub	red			Terminal + 24 V	Terminal 615	Terminal +
	0 V	black			Terminal 0V	Terminal 620	Terminal -

Note 1): *Cable shielding:* Variant 3 in accordance with 2.3.1

3.40.4 Connection diagram, Alternative 2

Only with modified GPRS data cable

When connecting the RS 232 interface of the GPRS modem to the RS 232 / P-NET converter, you can do without the 7-pole RS 232 cable if you want (makes only sense if modem is installed into the converter).

In this case, the enclosed GPRS data cable ($\approx$ 0.5 m long, 9-pole Sub-D female socket, 15-pole Sub-D plug, order no.: 235661) is applied as follows for the connection:

1.) Cut off cable next to the 9-pole Sub-D female socket

2.) Insulate cable covering for approx. 60 mm

3.) Insulate free individual leads for approx. 10 mm and attach suitable wire end sleeves.

4.) Connect to converter as follows:

GPRS-Modem FASTRACK				to	RS 232/P-NET Converter Type 4386-6/-7 Interface 2	RS 232/P-NET Converter Type 4386-4
GPRS-data cable 15pole Sub-D plug	Signal	Colour	PIN			
	TxD	brown	6		Terminal RxD_2	Terminal RxD
	RxD	red	2		Terminal TxD_2	Terminal TxD
	GND	yellow	9		Terminal GND_2	Terminal GND
	CTS	blue	12		Terminal RTS_2	Terminal DTR
	RTS	purple	11		Terminal CTS_2	Terminal DSR
	DSR	orange	8		connect with luster terminal	
	DTR	green	7			
		white*				
		black*				
		shield*				
Power adapter cable	+ Ub	red			Terminal + 24 V	Terminal +
	0 V	black			Terminal 0V	Terminal -

* are not needed, insulate separately and appropriately.

Note:
If due to manufacturer conditions the lead colours in the data cable mentioned above (order no.: 235661) change or another suitable cable is applied, make sure via the ohmic continuity test that in any case the connection of the respective PIN at the 15-pole plug leads to the corresponding signal at the converter 4386-6/-7/-4.

Example: PIN 6 must have connection to terminal RxD_2 or RxD.

3.41 Barcode scanner, type CLV 420 and type CLV 210

CLV 210: previous version, no longer available

The CLV 42x automatically scans and decodes barcodes. For this purpose it has to be mounted stationarily.
Via its interface the CLV 42x transmits the data contents of the barcodes to the MAK controller.

3.41.1 Technical data CLV 420

Electrical data	
Auxiliary energy	DC 10 ... 30 V / $\leq$ 3,5 Watt
Scanner version	Line
Reading field range from ... to	50 ... 370 mm
Resolution from ... to	0,2 ... 1 mm
Data transmission rate from … to	300 ... 57.600 Bit/s
Scan frequency from ... to	400 ... 1.200 Hz
Scan line length up to	300 mm
Light type/wavelength	Red light / 650 mm
Laser class	2
Maximal reading interval	50 ... 370 mm
Ambient conditions	
Operating temperature	0 ... +40°C
Storage temperature	-20 ... +70°C
Protection type	IP 65
Weight	250 g

The CLV is ready for operation with the factory default setting.
(interface: RS-422/485, 9 600 baud, 8 databits, 1 stop bit, no parity)

For instructions on mounting, electrical connection, configuration, operation and technical data, see operating instruction CLV 42x (No. 8 009 0078 German version).

3.41.2 Electrical connection

	Scanner CLV 420 Scanner CLV 210		to	Controller 6731/6741-10	Controller 6744-10	Converter 4386-4	Converter 4386-6/7	RS 232x3/P-NET Converter plug-in unit 6757-106		
PIN	Signal	colour				Interface 1	Interface 0 + 1	Signal	Interface 0	1
1	V$_S$, DC 10 ... 30 V	red		Terminal "+" (P-NET)	Terminal "+" (P-NET)	Terminal "+" (P-NET)	Terminal "+ 24 V" (UB)	Terminal "+24 V"	601	608
2	R x D (Terminal)	purple		Terminal „TxD"	Terminal 38 „TxD"	Terminal „TxD"	Terminal „TxD"	Terminal „TxD"	603	610
3	T x D (Terminal)	yellow		Terminal "RxD"	Terminal 40 "RxD"	Terminal "RxD"	Terminal "RxD"	Terminal "RxD"	602	609
5	GND	black		Terminal "GND"	Terminal 41 "GND"	Terminal "GND"	Terminal "GND"	Terminal "GND"	606	613
--	Shield	white/ green		Note 1)	Note 1)	Note 1)	Note 1)	Note 1)	607	614
4	Sensor 2	red/ black								
6	RD + (RS-422/485)	light blue								
7	RD - (RS-422/485); R x D (RS-232)	blue								
8	TD + (RS-422/485)	turquoise								
9	TD - (RS-422/485); T x D (RS-232)	green								
10	CAN H	grey								
11	CAN L	pink								
12	Result 1	brown								
13	Result 2	orange								
14	Sensor 1	white								
15	Sensor GND	white/ black								

Wires not in use have to be insulated separately.

Note 1): **Cable shielding:** Variant 4 pursuant to 2.3.1

3.42   TAG reading unit for sample bottles

The TAG reading unit consists of the TAG interface type 6728-12 and the TAG reader type 6727-103.

Mounting

Instead of the barcode reader, the TAG reader is fastened on the bottle drive, it serves to read and write the TAG on the TAG sample bottle.

The TAG interface should be mounted in the sample compartment near the TAG reader and has to be connected to the RS-232 interface of the controller.

Wiring

Controller 3002
Type 6731-10
or
Type 6741-10

GND
RxD
TxD
0V
+24V
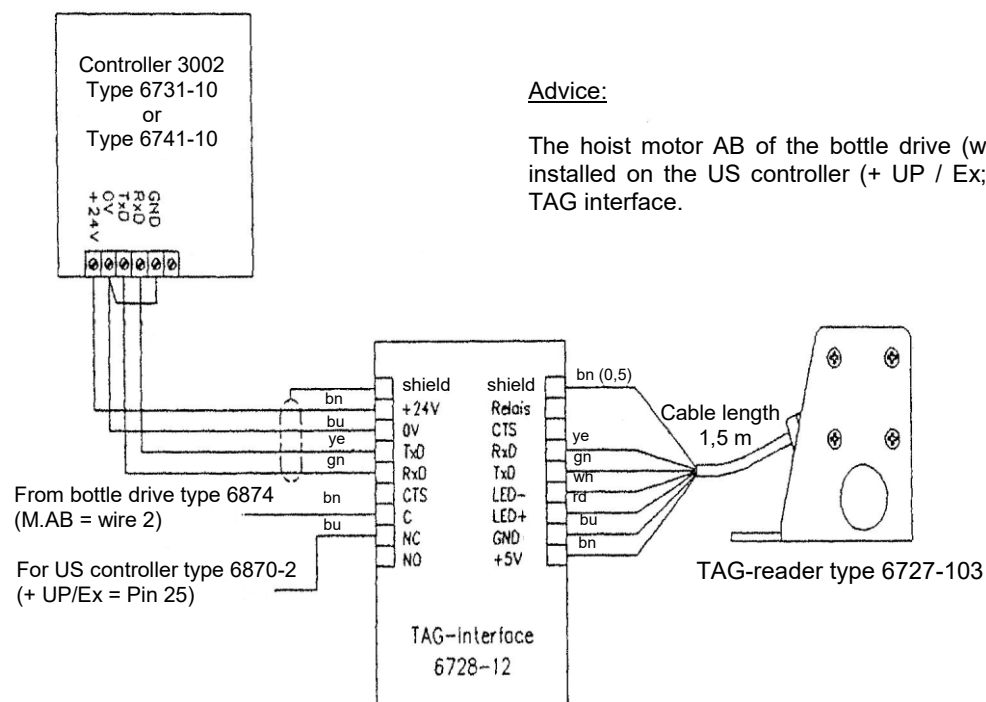
Advice:

The hoist motor AB of the bottle drive (wire 2) has to be installed on the US controller (+ UP / Ex; Pin 25) via the TAG interface.

From bottle drive type 6874
(M.AB = wire 2)

For US controller type 6870-2
(+ UP/Ex = Pin 25)

shield   shield
+24V   Relais
0V   CTS
TxD   RxD
RxD   TxD
CTS   LED−
C   LED+
NC   GND
NO   +5V

bn
bu
ye
gn
bn
bu

TAG−Interface
6728−12

bn (0,5)
ye
gn
wh
rd
bu
bn

Cable length
1,5 m

TAG-reader type 6727-103

Setting of RS 232 interface of the controller for TAG reader

In BIOS-SETUP (see operation manual):

* V 24 Config *
Port: RS 232
Baudrate: 9600
Data/Par.: 8 bit/no
Handshake: NO

Note:
Please observe the controller parameter setting of "Sample bottle identification" (see configuration instruction)

3.43 BARTEC level probe for MID release

3.43.1 Technical data

Electrical data	
Auxiliary voltage	15 … 36 V DC
Output active output	Auxiliary voltage -10 %, 0,5 A short-circuit proof
Connection type	Cable screwing PG9, 3-pole terminal
Electrode length	4 mm
Operating pressure	max. 6 bar
Input electrode E1	Electrode voltage. 1,5 ... 2 V AC/ 300 Hz
Sensitivity	Adjustable, 4 steps 0,1 kΩ, 1 kΩ, 10 kΩ, 100 kΩ
Function full/empty	Switchable (jumper)
Time delay fixed	0,5 sec.
Ambient conditions	
Protection type	IP 67
Operating temperature	0 ... +150° C
Mechanical data	
Material	Head / threaded pipe connection: stainless steel V2A 1.4305, $\varnothing$ 55mm/SW22 Insulating part: PEEK Stick electrode: stainless steel 1.4571, $\varnothing$ 8 mm

3.43.2 Mount the level probe

The level probe has to be mounted by means of the appropriate weldable socket after the MID (next to the MID) in a rising pipeline.
Choose a position of the level probe where the MID is securely and completely filled before the probe is immersed in milk and releases the MID for measuring.

For the first calibration, the flow volume must be determined and set in the system.

3.43.3   Wiring

Level probe Order no.. U496672		to	I/O box 6864	I/O box 6753	US controller 6771-30	Controller MAKplus 6744-10	Terminal		
Signal	Terminal						IN 1	IN 2	IN 3
+Ub	+		+24 V	+24 V	+24 V(terminal 25)	+24 V	21	24	27
GND	-		GND	GND	GND (terminal 34)	0 V	23	26	29
Output	A		Input 1)	Input 2)	Input 1)	Input 3)	22	25	28

Input: One free physical input per device can be used.
In the system configuration, the logical input no. 13 (inhibit 1) has to be assigned to the respective physical input.

Input 1)   Important instruction for the operation of the positive switching level probe at devices equipped with ground-switching digital inputs:

Connection only in combination with "switching module type 6756-300 order no. U08001692" in accordance with the following drawing:
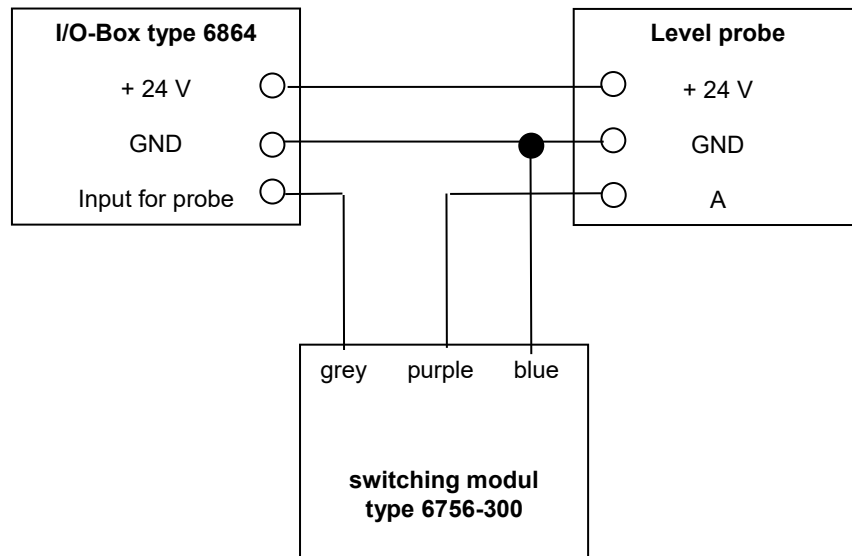
Input 2)   Connection to "positive switching" digital inputs in accordance with the following schematic drawing:
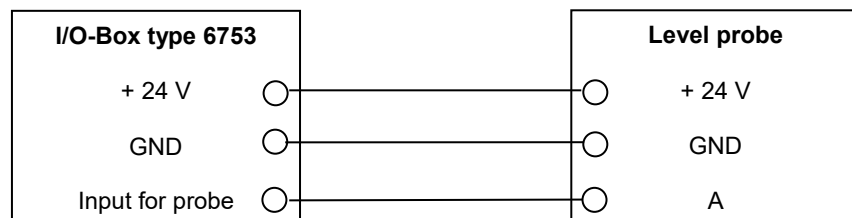
Input 3)   In controller type 6744-10, the switching logic of the applied digital input has to be set to "positive switching" via jumper (see controller MAKplus type 6744-10).

Adjustment of sensitivity

a) Cover probe with the medium to be measured (milk)

b) Plug jumper "sensitivity" to position 1 kΩ.

c) If the LED "probe" still does not flash up, subsequently set the sensitivities 1 kΩ, 10 kΩ, 100 kΩ (see illustrations) until LED "probe" flashes up.
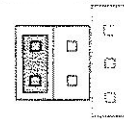
Sensitivity 0,1 kΩ   Sensitivity 1kΩ
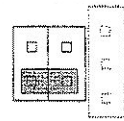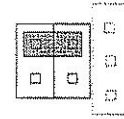
Sensitivity 10 kΩ   Sensitivity 100 kΩ
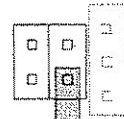
Setting of the function "full / empty message"

The jumper has always to be plugged for a function.

- "full": probe is immersed → output active
- "empty": probe gets free → output active
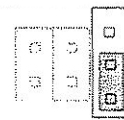
Function „full"   Function „empty"

Connection diagram

Auxiliary voltage
15 ... 36 V DC

Electrode
probe

Active
output

Ground
probe

Jumper
full/empty

LED
probe

M E A + -
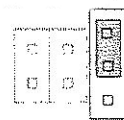
Jumper sensitivity
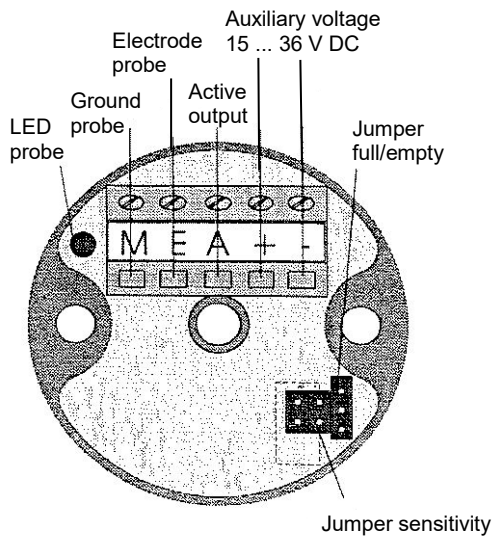
Standard settings in system MAK 3002

Sensitivity: 1 kΩ
Output active with: function „full"

Please place jumpers accordingly.

4 Sampling system ULTRASAMPLER®

4.1 Description

The sampling system ULTRASAMPLER® is a system for automatic sampling in the milk collecting truck in combination with the milk intake and control system MAK 3002.

Sampling is "on line" during milk intake and is always proportional to the volume flow.

If a double pump system is applied, individual samples and total tank samples can be taken simultaneously.

Manual as well as fully automatic appliances are available for the supplying of the empty sample bottles.

Barcode and transponder (TAG) systems are available for sample bottle identification.

The following components are included in the family of the ULTRASAMPLER system:

> ➢ Sampler controller, type 6870-2/-3, 6771-30, 6757-10x

> ➢ Sampler pump, type 6871-x

> ➢ Flow level meter, type 6826

> ➢ Bottle drive, type 6874/6774-10

> ➢ Manual sample bottle feed, type 6871-3-30

> ➢ Semi-automatic sample bottle feed, type 6871-3-50

The system configuration depends on specific national regulations and individual customer requests.

> ➢ To increase the precision and representativity of the sample, it is recommended to apply the flow level meter (FLM), particularly for milk quantities < 300 litres.

4.1.1 Position of ULTRASAMPLER

Sampler pump and flow level meter are installed into the milk transport line of the collecting truck and are flown through by the milk sucked into the collecting truck.

The control is located at an appropriate place near the sampling system.

Systems equipped with a bottle drive for the automatic transport and identification of sample bottles (barcode or TAG) are usually installed in a closed cooling compartment.

The temperature of the cooling compartment is regularly measured by MAK 3002, any values above or below the preset limit values are recorded.

Fig.1 shows a schematic arrangement of the ultrasampler in the sampling box with cooling.
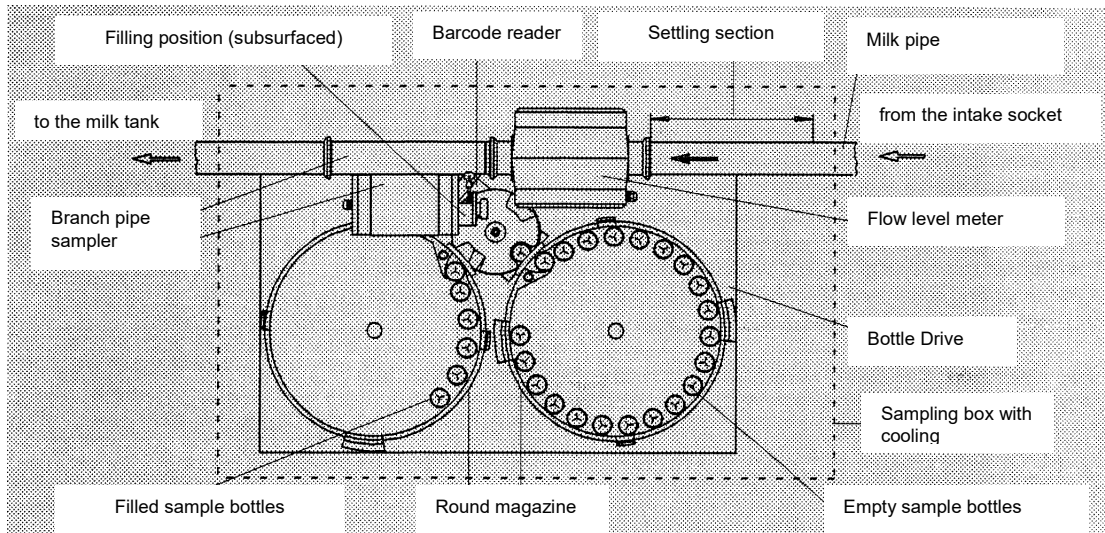
Fig. 1: Ultrasampler in the sampling box with cooling (plan view)

4.1.2   Functions of ULTRASAMPLER

Sampling sequence

As soon as milk is sucked into the collecting truck, the sampler takes the sample in the branch pipe and pumps it into a sample bottle that is in filling position and has been correctly identified.

For the definition of the required pump capacity, before each milk intake the control receives default data from the MAK 3002 about the expected milk quantity, the suction capacity of the collecting truck and the sample volume to be filled in.

From these default data, the available sampling time and the resulting pump speed of the sampler for the sampling are calculated.

If the total tank sample (GTP) is available and turned on, at the same time a volume-proportional branch from each supplier within a tour is filled into the tank sample bottle.

Operation with flow level meter

For ULTRASAMPLER equipped with flow level meter, the control continuously receives data on the milk flow sucked into the collecting truck from the flow level meter.

This makes possible to control very exactly pump speed in dependence of the actual flow rate. If there is no flow level meter, the pump speed is controlled via default performance parameters of the measurement system.

Sample bottle transport

Together with the MAK 3002, the control controls and monitors the automatic sample bottle transport of the bottle drive.

Before each sampling procedure, the bottle drive puts the empty sample bottle into filling position below the sampler.

Beforehand, the sample bottle is identified via barcode or TAG. Faulty bottles are sorted out without being used. After sampling, the bottle drive deposits the filled sample bottle in a round magazine.

Via barcode or TAG, the MAK 3002 assigns the milk sample to the respective milk supplier and thus secures the correct assignment of the data for their later evaluation in the laboratory.

Fig. 2 shows the flow of the data and control signals between the functional units of UL-TRASAMPLER and of MAK 3002.

so300257.dwg
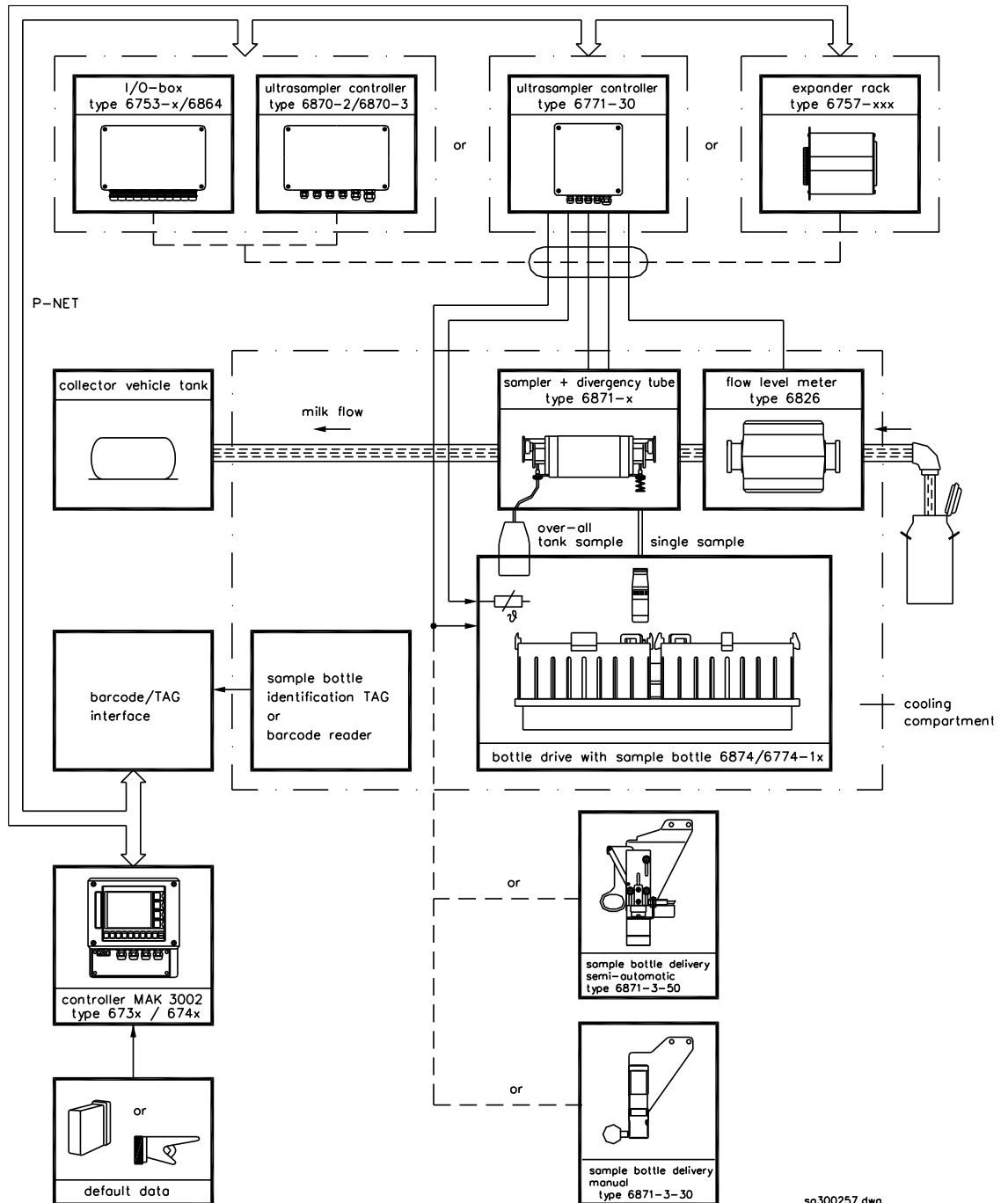
4.1.3   Additional instructions on ULTRASAMPLER

In principle, sampling does not depend on the delivery quantity.

However, for the bottling of a utilisable sample a minimum delivery quantity between 20 and 40 l is required, depending on the suction capacity of the intake system.

To secure the sampling even for small delivery quantities, MAK 3002 can activate a pump capacity reduction of the collecting truck.

Intake time is prolonged in proportion to the reduction of the suction capacity.

Consequently, the sampling time for the ULTRASAMPLER is also prolonged.

By means of the expected delivery quantity (= default data), MAK 3002 decides on an appropriate reduction.

The technical implementation depends on the construction of the collecting truck.

Low-contamination sampling

A special rinsing procedure in the sampler before each sampling procedure largely prevents residual milk in the sampling section from contaminating the new sample bottle.

For this purpose, at the beginning of the milk intake the sampler pumps milk from the branch pipe towards the sample bottle until the milk front reaches the sampler output.

Then the sampler reverses the pump direction and conveys residual milk and rinsing milk back into the branch pipe.

Quantity exceedance during sampling

If the delivery quantity exceeds the specified quantity by a preset value (e.g. 20 %), the sampling procedure will be terminated.

At this point of time, the sample bottle also contains for instance 20 % more sample liquid than the configured nominal value (e.g. 35 ml).

When milk collection is finished, MAK 3002 displays a message for the operator: ”Filling limit reached“.

You can avoid overfilling by comparing the expected delivery quantity with the actual delivery quantity and - if there are considerable deviations - by manually correcting the delivery quantity at the MAK 3002 before milk intake starts.

Installation of a settling section

In the milk pipeline, a settling section with a minimum length of 5 times the nominal width has to be arranged before the flow level meter.

For operation without flow level meter, this settling section has to be arranged before the sampler.

Air bubbles which might adulterate the measurement result of the flow level meter or affect the sampling carried out by the sampler are largely avoided by this settling section.

4.2 ULTRASAMPLER controller, type 6870-2, 6870-3

For type 6870-3 a separate operation manual, document no. GA 961014, is available.
Available from BARTEC on request.
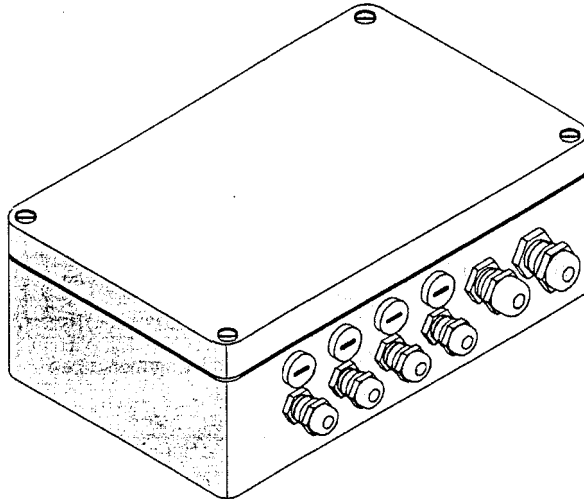
4.2.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V ($\pm$ 10 %), 150 mA, fuse 0,5 A (medium time-lag)
Auxiliary energy for sampler motor	DC 24 ... 30 V, max. 2 A, fuse 2 A (medium time-lag)
Electrical connection	Terminal plug-in connections, feed via PGs
Interfaces	Serial fieldbus interface, P-NET (RS485)
Ambient conditions	
Operating temperature	-10 ... + 50°C
Climatic classification / protection type	JWFN / IP 65
Mechanical data	
Casing	Aluminium diecast casing
Dimensions	260 x 160 x 90 mm
Weight	approx. 32 N $\cong$ 3,2 kg
Mounting plate	Stainless steel; 315 x 160 x 2 mm

4.2.2 Dimensions and mounting bores

6 bores for rivet connection with collecting truck
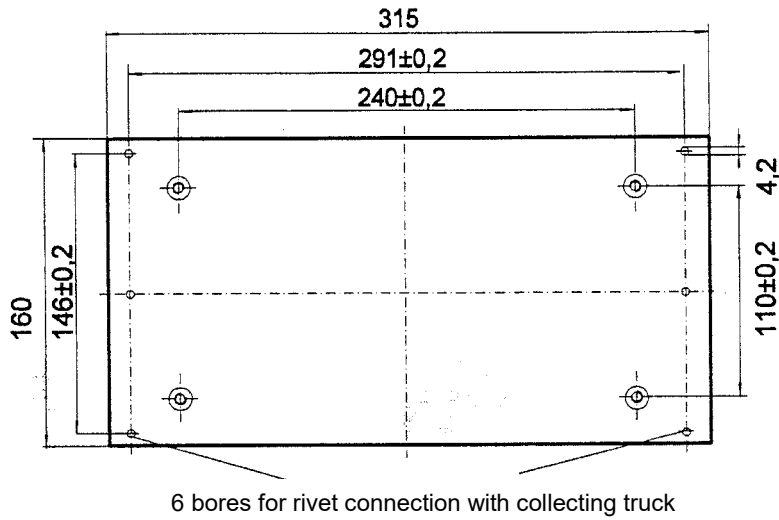
4.2.3 Terminal assignment
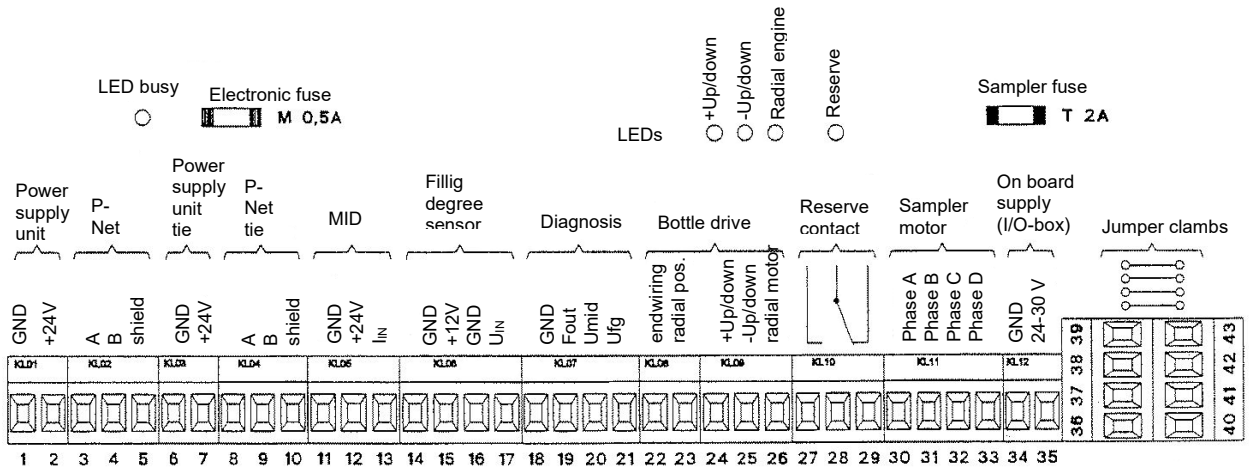
4.2.4 Wiring
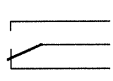
Wiring of controller for tank sampling in combination with supplier sampling
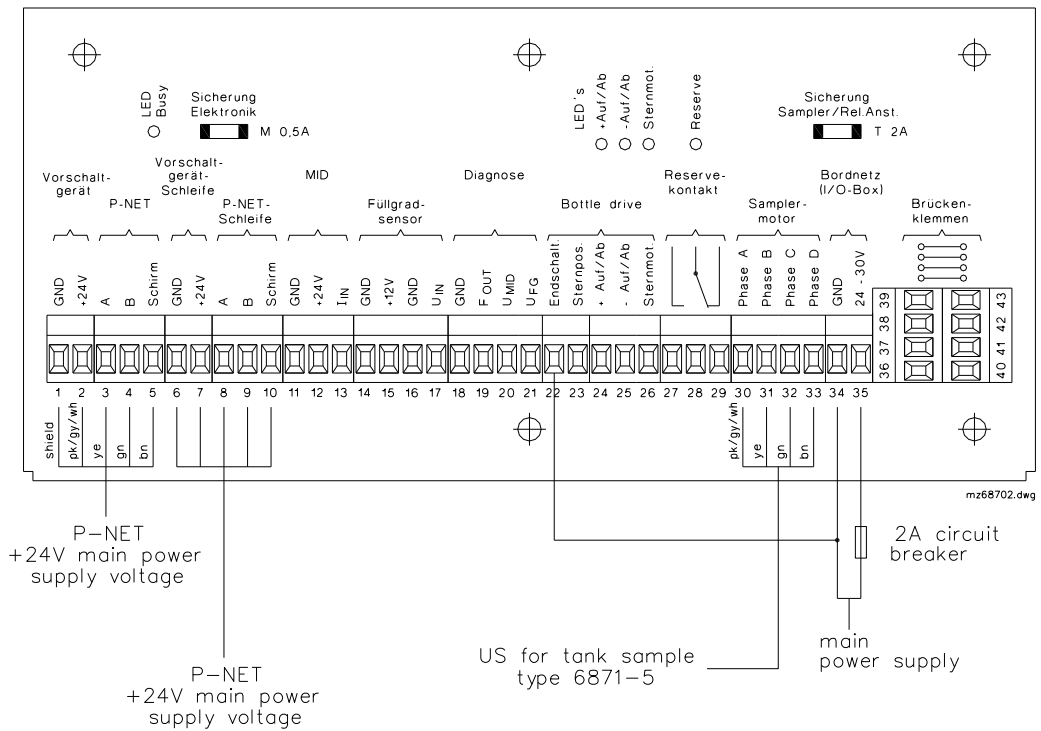
Wiring of controller for supplier sampling
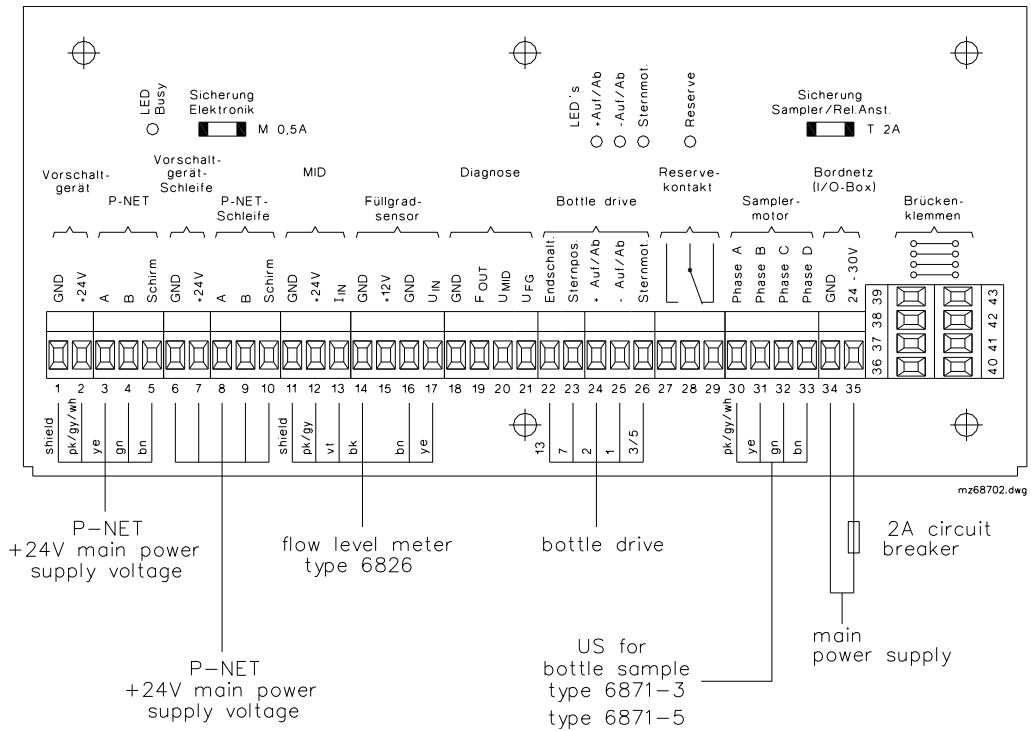
Connections of the controller with signal designation and specification of the required wire cross-sections:

Terminal		Assignment	Signal	Line (mm²)
KL 01	PIN 01 PIN 02	GND + 24 V	Supply voltage 24 V DC (input of ring, from series device)	∅ min. 3 x 0,25
KL 02	PIN 03 PIN 04 PIN 05	P-NET / A P-NET / B P-NET / S	P-NET interface (input of ring line)	(shielded) ∅ min. 0,25 (shielded)
KL 03	PIN 06 PIN 07	GND + 24 V	Supply voltage 24 V DC (output of ring line)	∅ min. 3 x 0,25 ∅ min. 0,25 (shielded)
KL 04	PIN 08 PIN 09 PIN 10	P-NET / A P-NET / B P-NET / S	P-NET interface (output of ring line)	
KL 05	PIN 11 PIN 12 PIN 13	GND + 24 V I in	Input "Flow Level Meter" Flow meter I in = 4 ... 20 mA	∅ min. 0,25
KL 06	PIN 14 PIN 15 PIN 16 PIN 17	GND + 12 V GND U in	Input "Flow Level Meter" Filling level meter U in = 0 ... 2,5 V	∅ min. 0,25
KL 07	PIN 18 PIN 19 PIN 20 PIN 21	GND Fout U MID U FG	Diagnostic output: 0 ... 10 kHz 0,4 V (start) ... 2 V (end) 0,3 V (full) ... 2,3 V (empty)	∅ min. 0,14
KL 08 KL 09	PIN 22 PIN 23 PIN 24 PIN 25 PIN 26	End switch Star position + Up / down - Up / down STAR motor	BOTTLE-DRIVE max. 2 A	∅ min. 0,75
KL 10	PIN 27 PIN 28 PIN 29		Relay output (reserve contact) max. 2 A	∅ min. 0,75
KL 11	PIN 30 PIN 31 PIN 32 PIN 33	Phase A Phase B Phase C Phase D	Output of step motor (to Ultrasampler, e.g. type 6871-3)	∅ min. 0,50
KL 12	PIN 34 PIN 35	GND + 24 V DC	Supply of step motor and Bottle Drive (on-board power supply, from I/O box / fuse)	∅ min. 1

Display with light-emitting diodes (LEDs)

D03	Blinks after turning on the device and after short controller self-test. Diode indicates that the microprocessor control is working.
D09	Light signal for activation of the motor of the lifting device anticlockwise (bottle lifting)
D11	Light signal for activation of the motor of the lifting device clockwise (barcode reading)
D13	Light signal for activation of the transport star motor and the drive motor for the inlet magazine
D07	Light signal for activation of reserve contact

When the cover of the controller casing is removed, the five LEDs can be seen on the main board.

Errors in the transport sequence of the bottle drive can be localised by means of these LEDs.

Melting fuse Si1:

Protection of the supply voltage 24 V DC from series device to protect the components on the controller PCBs.

Melting fuse Si2:

Protection of the on-board voltage processed by the controller for the operation of the sampler motor.

4.3 ULTRASAMPLER®-vario controller, type 6771-30

The ULTRASAMPLER®-vario controller serves as electronic control unit for the ULTRASAMPLER® sampling system.

4.3.1 Technical data

Electrical data	
Auxiliary energy	
Operating voltage	DC 24 V / 250 mA, (16 - 35 V), from series device, reverse battery protection
Fuse 1	1 A (medium time-lag)
Sampler control Vario	
Operating voltage	24 - 30 V DC
Current consumption	6 A DC, 50 A (peak) - observe for wiring!!! (2,5 mm²)
Fuse	30 A F
Revolution speed	0 - 3000 rev/min
Pulses	1 000/U
Line length	1 m max.!
Control of sampler motor for individual sample and total tank sample	
Operating voltage	24 - 30 V
Fuse	3,15 A (medium time-lag)
Maximum step frequency	10 kHz (= 25 rev/sec. at 400 steps)
Interface 1 (interface 2 not active)	
Fieldbus interfaces (P-NET)	serial, asynchronous RS 485, P-NET identification number 5941

Ambient conditions	
Climatic classification/protection type	IWFN / IP 65
Operating temperature	- 10 ... + 50 °C
Storage temperature	- 20 ... + 70 °C
Digital outputs	
Quantity	8, OUT 1 - 4 / OUT 5 - 8, each group protected with reversible fuse 4 A
Switching logic	FET switch, positive switching to on-board power supply + 24 V
Switching current	Max. 1 A DC per output, short-circuit proof
Relay outputs (bottle drive)	4 (24-V on-board power supply), each output protected with reversible fuse 4 A
Digital inputs	
Quantity	8
Input resistance	2,2 KΩ (IF $\leq$ 10 mA/DC 24 V)
Switching logic	To on-board power supply GND
Count inputs for temperature and milk sensor of sensor type 6865-1/3	
Quantity	3 frequency inputs
f max.	25 kHz, (typ. 0 ... 20 kHz)
Operating voltage for type 6865-1/3	DC12 V, 100 mA
Input of flow level meter (filling level/ flow)	
Filling level	0 - 2,5 V (0 V $\cong$ 100 %, 2,5 V $\cong$ 0 % filling level)
Flow	4 - 20 mA (= FLM configuration)
Mechanical data	
Casing	Aluminium diecast
Weight	approx. 50 N = 5 kg

Dimensions

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4.3.2 Block diagram

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extension board

Connection diagram

Terminal	Signal designation	Colour	Connected to
A (2x)	P-NET A fieldbus	yellow	P-NET ring
B (2x)	P-NET B fieldbus	green	P-NET ring
S (2x)	P-NET S fieldbus	brown	P-NET ring
+ (2x)	+ 24 V supply from series device	pk/gr/wh	P-NET ring
- (2x)	0 V supply from series device	Shield	P-NET ring
⏚	Casing earth for cable shielding		Cable shielding
RxD	RS 232 C interface		Not activated
TxD	RS 232 C interface		Not activated
CTS	RS 232 C interface		Not activated
RTS	RS 232 C interface		Not activated
GND	RS 232 C interface		Not activated
1	UB-Sensor (+24 V for supply to FLM)	pink/grey	Flow level meter (FLM)
2	UB-Sensor (GND for supply to FLM)	Shield	Type 6826
3	FLM filling level (0 ... 2,5 V)	yellow	Note1)
4	FLM flow (4 ... 20 mA)	purple	
5	GND reference potential for filling level + flow	bn/bk	
6	Digital output OUT 1		If required
7	Digital output OUT 2		If required
8	Digital output OUT 3		If required
9	Digital output OUT 4		If required
10	Reference ground for OUT 1 - 4		If required
11	Digital output OUT 5		If required
12	Digital output OUT 6		If required
13	Digital output OUT 7		If required
14	Digital output OUT 8		If required
15	Reference ground for OUT 5 - 8		If required
16	Sampler motor for supplier sample, phase A	blue	Sampler motor for supplier sample
17	Sampler motor for supplier sample, phase B	bn/wh	
18	Sampler motor for supplier sample, phase C	gn/ye	
19	Sampler motor for supplier sample, phase D	gr/pk	
20	UB sensor (+12 V for sensor)	green	Sensor
21	Frequency input 1 (milk temperature **note 3**)	white	Type 6865-3
22	Frequency input 2 (milk sensor, **note 3**)	brown	
24	UB sensor (GND for sensor)	yellow	
20	UB sensor (+12 V for sensor)	pink	
23	Frequency input 3 (sampling box temperature, **note 3**)	white	Sensor type 6865-1
24	UB sensor (GND for sensor)	blue	
25	+ 24 V on-board power supply, auxiliary voltage for sensor system		If required
26	Digital input IN 1, bottle in position, **note 2**)	6 or blue	Bottle drive
27	Digital input IN 2		If required
28	Digital input IN 3		If required
29	Digital input IN 4		If required
30	Digital input IN 5		If required
31	Digital input IN 6		If required
32	Digital input IN 7, star in position, **note 2**)		P star (terminal 48)
33	Digital input IN 8, bottle down, **note 2**)	13 or pink	Bottle drive
34	0V on-board power supply, reference ground for IN 1-8	white	If required
35	Sampler motor for tank sample, phase A	blue	Sampler motor for total tank sample
36	Sampler motor for tank sample, phase B	bn/wh	
37	Sampler motor for tank sample, phase C	gn/ye	
38	Sampler motor for tank sample, phase D	gr/pk	
39	+ 24 V on-board power supply, feed of terminal 49	red	Via leads with terminals 49 + 50
40	0 V on-board power supply, feed of terminal 50	blue	

Terminal	Signal	Colour	Connected to
41	Signal M up, bottle lifting motor	1 or brown	Bottle drive
42	Signal M down, bottle lifting motor	2 or red	Leads according to colours for
43	Signal M outlet, motor of outlet cassette	4 or yellow	type 6774-10
44	Signal M inlet, motor of inlet cassette	5 or green	Leads according to numbers for
45	Signal M star, motor of star drive	3 or pink	type 6874
46	Signal P star, self-holding contact for star drive	7 or purple	
47	Ground reference potential for signal P star	grey white	
48	Signal P star, check-back signal		IN 7 (terminal 32)
49	+ 24 V on-board power supply line	10 or black	
50	GND on-board power supply line	11 or bn/wh	
49	+ 24 V on-board power supply feed-in		Vehicle battery+
50	GND on-board power supply feed-in		Vehicle battery -
51	+ 5 V supply for rotary encoder	red	ULTRASAMPLER vario pump
52	CHA, pulse channel A from rotary encoder	green	type 6871-50
53	CHB, pulse channel B from rotary encoder	white	
54	GND - supply for rotary encoder	black	Cable 2
55	+ 12 V supply for hall sensors	purple	
56	SA sensor A	yellow	
57	SB sensor B	grey	
58	SC sensor C	orange	
59	GND supply for hall sensors	brown	
60	R	1	
61	S	2	Cable 1
62	T	3	

Notes:

1) Insulate individually the remaining connection leads of the FLM type 6826 (red, white, blue) as they are not needed.

2) The digital inputs IN 7 (star in position) and IN 8 (bottle down) are exclusively reserved for bottle drive signals.

3) This is the default assignment.
   In principle, each function can be configured freely.

The signal "bottle in position" from the bottle drive can be wired to every free input IN 1 - IN 6, in this case to IN 1.

In case of configuration, the logical input 3 has to be assigned to the applied input.

Caution:

For configuration "external bottle drive control", input IN 6 is permanently reserved for "bottle in position".

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Additional instructions for wiring:

*1) Connect the leads connected to terminals 49 (red) and 50 (blue) (on-board power supply) with the terminals 39 (red) and 40 (blue).

*2) For bottle drive operation, a jumper has to be placed with a lead between terminal 32 (IN7) and terminal 48 (P star).

*3) Moreover make sure there is a suitable clamp connection of the on-board power lead to the bottle drive (parallel to terminal 49/50).

Position of fuses on the extension board
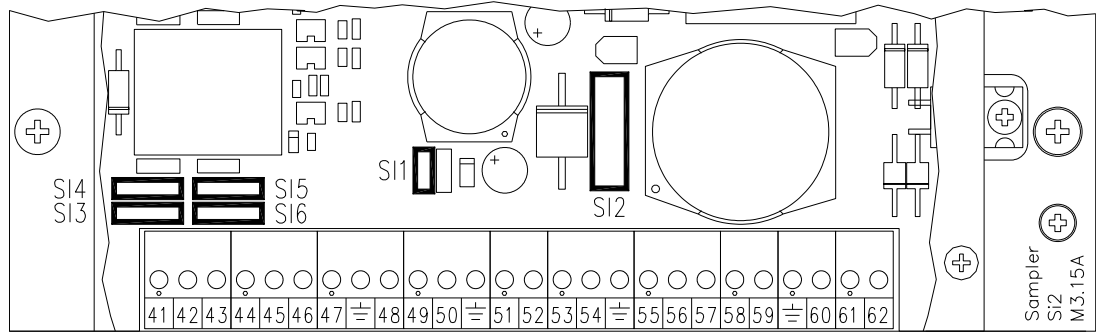
sa300256.dwg

Position of fuses:

Melting fuse Si2 (30A F) is accessible after removing the aluminium cover.

Si1, Si3 - Si6 are reversible fuses which are ready for operation again after the overload has been remedied and after a short cool-down time (no replacement required!).

Position of fuses on the main board
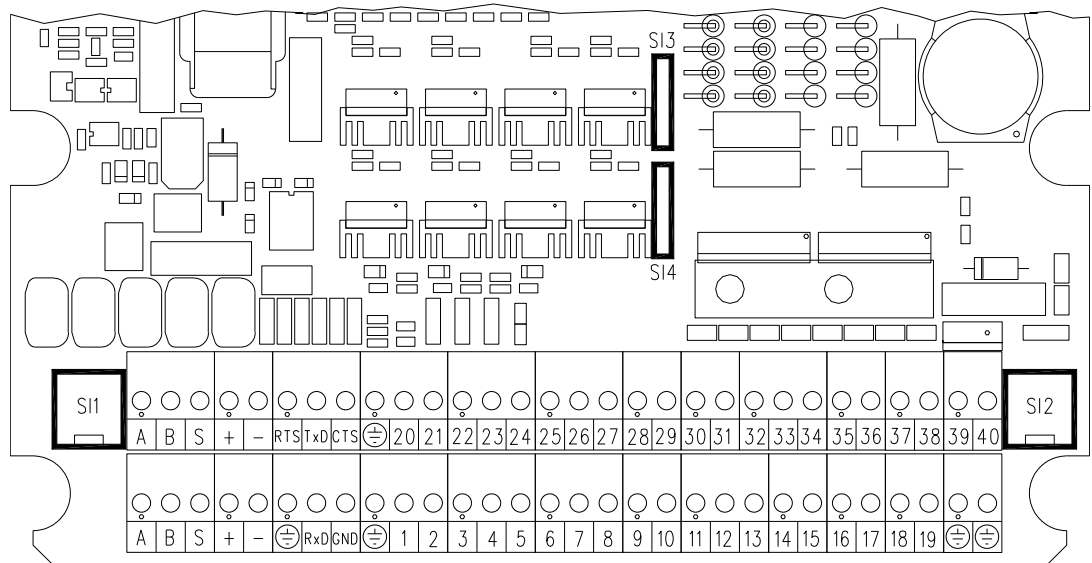
sa300256.dwg

Position of fuses:

Melting fuse Si1 (1 AM) and melting fuse Si2 (3,15 AM) are accessible if the respective fuse holders are opened.

Si3 and Si4 are reversible fuses which are ready for operation again after the overload has been remedied and after a short cool-down time (no replacement required!).

4.4 ULTRASAMPLER®-controller type 6771-31

Control unit for ULTRASAMPLER®-sampling system with elevated step motor power for specimen (supplier probe).

4.4.1 Technical data

Electrical data	
Auxiliary energy	
Operating voltage	DC 24 V / 250 mA, (16 - 35 V), from series device, reverse battery protection
Fuse Si1	1 A (medium time-lag)
Operating voltage for Bottle Drive	+ 24 V power supply, fuse Si5 = 1,0 A
Operating voltage for I/O-Logic	+ 24 V power supply, fuse Si6 = 10 A
Control of sampler motor for supplier sample	
Operating voltage	DC 44 V (internal generation from production of DC 24 V)
Fuse Si7	3 A
Maximum step frequency	10 kHz (= 25 rev/sec., at 400 steps)
Control of sampler motor for total tank sample	
Operating voltage	24 - 30 V
Fuse Si2	3,15 A (medium time-lag)
Maximum step frequency	10 kHz (= 25 rev/sec. at 400 steps)
Interface 1 (interface 2 not active)	
Fieldbus interfaces (P-NET)	serial, asynchronous RS 485, P-NET identification number 5941

ATTENTION!

Please note the following instructions. Otherwise the device will be destroyed!

The device may be used only in connection with following software:

From MAK@ 2.46 (060511) or HLW@ 2.46 (060511).

The power supply, clamp 52/53, must be led over the main switch of the data capture system. In case that the data capture system is not in operation, the power supply must be interrupted.

Ambient conditions	
Climatic classification/protection type	IWFN / IP 65
Operating temperature	- 10 ... + 50 °C
Storage temperature	- 20 ... + 70 °C
Digital outputs	
Quantity	8, OUT 1 - 4 / OUT 5 - 8, each group protected with reversible fuse 4 A (Si3, Si4)
Switching logic	FET switch, positive switching to on-board power supply + 24 V
Switching current	Max. 1 A DC per output, short-circuit proof
Relay outputs (bottle drive)	4 (24-V on-board power supply), each output protected with reversible fuse 3 A (Si8, Si9, Si10, Si11)
Digital inputs	
Quantity	8
Input resistance	2,2 KΩ (IF $\leq$ 10 mA/DC 24 V)
Switching logic	To on-board power supply GND
Count inputs for temperature and milk sensor of sensor type 6865-1/3	
Quantity	3 frequency inputs
f max.	25 kHz, (typ. 0 ... 20 kHz)
Operating voltage for type 6865-1/3	DC12 V, 100 mA
Input of flow level meter (filling level/ flow)	
Filling level	0 - 2,5 V (0 V $\cong$ 100 %, 2,5 V $\cong$ 0 % filling level
Flow	4 - 20 mA (= FLM configuration)
Mechanical data	
Casing	Aluminium diecast
Weight	approx. 50 N = 5 kg

Dimensions

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4.4.2   Block diagram type 6771-31
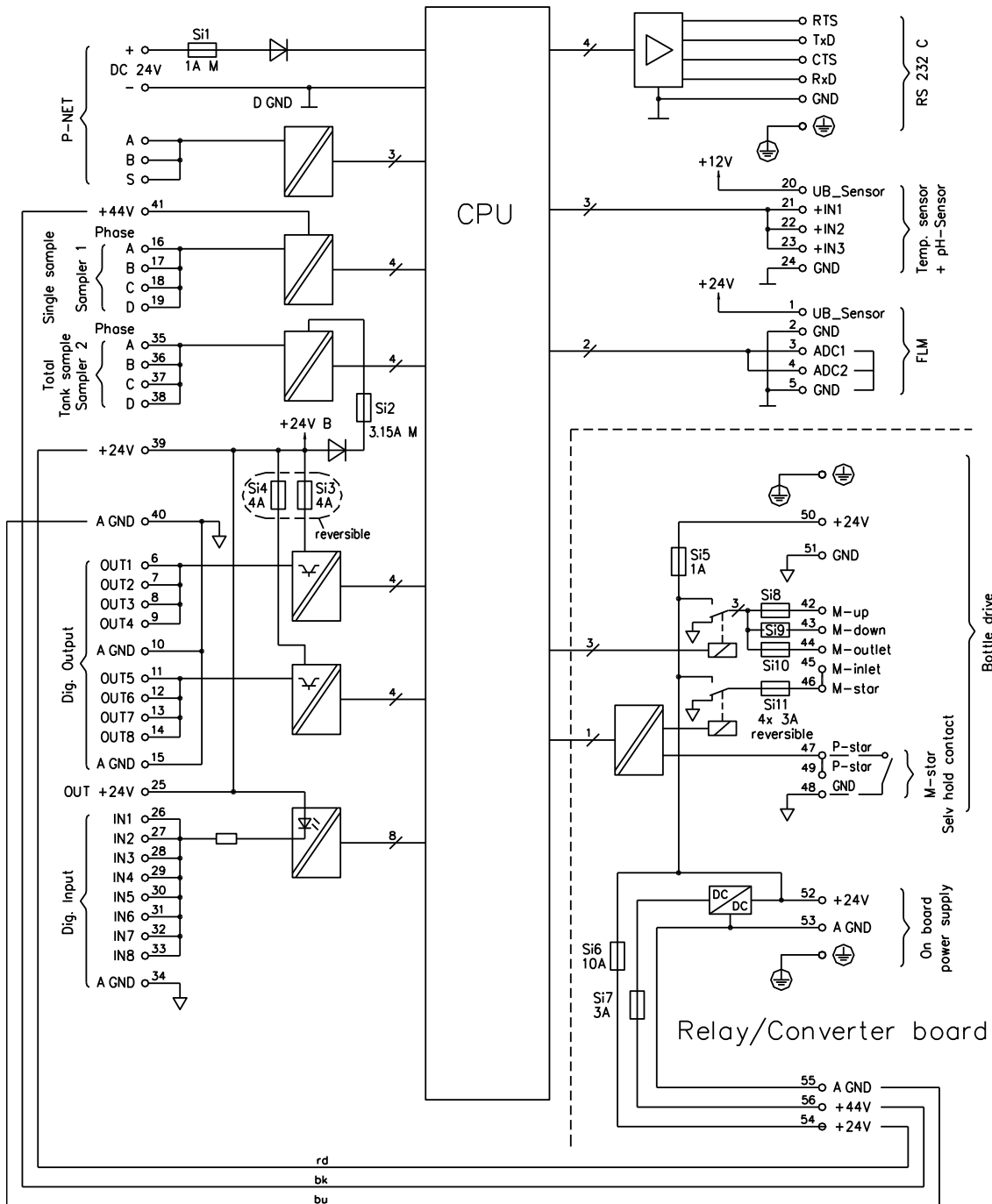
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Position of fuses on the relay-/ converter board
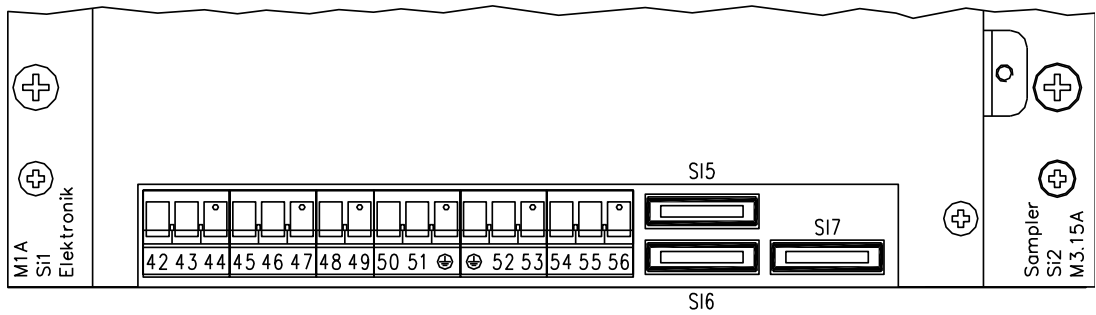
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Fuse Si5 = 1,0 A
Fuse Si6 = 10 A
Fuse Si7 =   3 A

Position of fuses on the sampler board
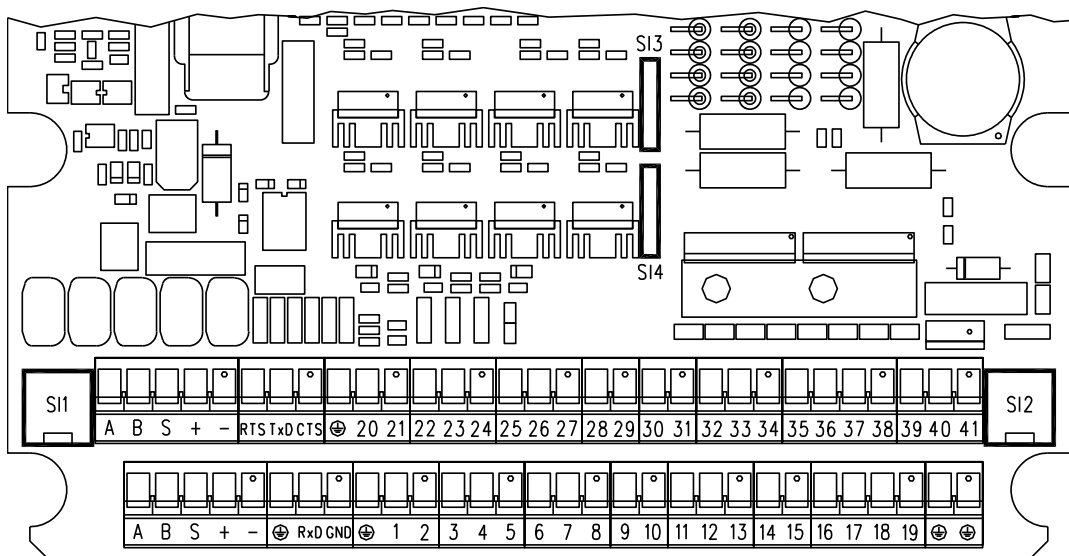
sa300255.dwg

Position of fuses:

Melting fuse Si1 (1 AM) and melting fuse Si2 (3,15 AM) are accessible if the respective fuse holders are opened.

Si3 and Si4 are reversible fuses which are ready for operation again after the overload has been remedied and after a short cool-down time (no replacement required!).

Connection diagram

Terminal	Signal designation	Colour	Connected to
A (2x)	P-NET A fieldbus	yellow	P-NET ring
B (2x)	P-NET B fieldbus	green	P-NET ring
S (2x)	P-NET S fieldbus	brown	P-NET ring
+ (2x)	+ 24 V supply from series device	pk/gr/wh	P-NET ring
- (2x)	0 V supply from series device	Shield	P-NET ring
⏚	Casing earth for cable shielding		Cable shielding
RxD	RS 232 C interface		Not activated
TxD	RS 232 C interface		Not activated
CTS	RS 232 C interface		Not activated
RTS	RS 232 C interface		Not activated
GND	RS 232 C interface		Not activated
1	UB-Sensor (+24 V for supply to FLM)	pink/grey	Flow level meter (FLM)
2	UB-Sensor (GND for supply to FLM)	Shield	Type 6826
3	FLM filling level (0 ... 2,5 V)	yellow	**Note1)**
4	FLM flow (4 ... 20 mA)	purple	
5	GND reference potential for filling level + flow	bn/bk	
6	Digital output OUT 1		If required
7	Digital output OUT 2		If required
8	Digital output OUT 3		If required
9	Digital output OUT 4		If required
10	Reference ground for OUT 1 - 4		If required
11	Digital output OUT 5		If required
12	Digital output OUT 6		If required
13	Digital output OUT 7		If required
14	Digital output OUT 8		If required
15	Reference ground for OUT 5 - 8		If required
16	Sampler motor for supplier sample, phase A	blue	Sampler motor for supplier sample
17	Sampler motor for supplier sample, phase B	bn/wh	
18	Sampler motor for supplier sample, phase C	gn/ye	
19	Sampler motor for supplier sample, phase D	gr/pk	
20	UB sensor (+12 V for sensor)	green	Sensor
21	Frequency input 1 (milk temperature **note 3**)	white	Type 6865-3
22	Frequency input 2 (milk sensor, **note 3**)	brown	
24	UB sensor (GND for sensor)	yellow	
20	UB sensor (+12 V for sensor)	pink	
23	Frequency input 3 (sampling box temperature, **note 3**)	white	Sensor type 6865-1
24	UB sensor (GND for sensor)	blue	
25	+ 24 V on-board power supply, auxiliary voltage for sensor system		If required
26	Digital input IN 1, bottle in position, **note 2)**	6 or blue	Bottle drive
27	Digital input IN 2		If required
28	Digital input IN 3		If required
29	Digital input IN 4		If required
30	Digital input IN 5		If required
31	Digital input IN 6		If required
32	Digital input IN 7, star in position, **note 2)**	jumper	P star (terminal 49)
33	Digital input IN 8, bottle down, **note 2)**	13 or pink	Bottle drive
34	0V on-board power supply, reference ground for IN 1-8	white	If required
35	Sampler motor for tank sample, phase A	blue	Sampler motor for total tank sample
36	Sampler motor for tank sample, phase B	bn/wh	
37	Sampler motor for tank sample, phase C	gn/ye	
38	Sampler motor for tank sample, phase D	gr/pk	
39	+ 24 V on-board power supply, feed of terminal 54	rd 1,5 mm²	terminal 54, relay-/ converter board
40	AGND on-board power supply, feed of terminal 55	bu 1,5 mm²	terminal 55, relay-/ converter board
41	+ 44 V operating voltage for sampling motor supplier sample, feed of terminal 56	bk 1,5 mm²	terminal 56, relay-/ converter board

Terminal	Signal	Colour	Connected to
42	Signal M up, bottle lifting motor	1 or brown	Bottle drive
43	Signal M down, bottle lifting motor	2 or red	Leads according to colours for
44	Signal M outlet, motor of outlet cassette	4 or yellow	type 6774-10
45	Signal M inlet, motor of inlet cassette	5 or green	Leads according to numbers for
46	Signal M star, motor of star drive	3 or pink	type 6874
47	Signal P star, self-holding contact for star drive	7 or purple	
48	Ground reference potential for signal P star	grey white	
49	Signal P star, check-back signal	jumper	IN 7 (terminal 32)
50	+ 24 V on-board power supply line for Bottle Drive	10 or black	
51	GND on-board power supply line for Bottle Drive	11 or bn/wh	
⏚	Shield connection Bottledrive cable		
⏚	Shield connection on-board power supply cable		
52	+ 24 V on-board power supply feed-in		Vehicle battery+
53	AGND on-board power supply feed-in		Vehicle battery -
54	+ 24 V on-board power supply output	rd 1,5 mm²	terminal 39, sampler board
55	AGND on-board power supply output	bu 1,5 mm²	terminal 40, sampler board
56	+ 44 V operating voltage output for Sampler 1	bk 1,5 mm²	terminal 41, sampler board

Notes:

1.) Insulate individually the remaining connection leads of the FLM type 6826 (red, white, blue) as they are not needed.

2.) The digital inputs IN 7 (star in position) and IN 8 (bottle down) are exclusively reserved for bottle drive signals.

3.) This is the default assignment.
   In principle, each function can be configured freely.

The signal "bottle in position" from the bottle drive can be wired to every free input IN 1 - IN 6, in this case to IN 1.

In case of configuration, the logical input 3 has to be assigned to the applied input.

Caution:

For configuration "external bottle drive control", input IN 6 is permanently reserved for "bottle in position".

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Additional instructions for wiring:

*1) Connect the leads connected to terminals 54 (red) 55 (blue) and 56 (black) (on-board power supply and sampling motor power supply) with the terminals 39 (red), 40 (blue) and 41 (black)

*2) For bottle drive operation, a jumper has to be placed with a lead between terminal 32 (IN7) and terminal 49 (P star).

4.5 ULTRASAMPLER type 6871-x

The sampler type 6871-x is a motor-driven sampler for the system ULTRASAMPLER® which makes possible a representative milk sampling at the collecting truck

Via a sampler branch pipe it is connected to the milk intake line.

The branch pipe consists of a flow-through pipe and a suction cannula defined by flow direction and pipe diameter.

Through a weldable socket located at the flow-through pipe, the suction cannula reaches into the flow-through pipe.

During sampling, the sampler takes milk from the flow-through pipe via the suction cannula.

The motor-driven peristaltic pump conveys the sample through an injection needle into the sample bottle which is lifted for the filling process by the sample bottle transport system.

The injection needle pierces the rubber plug and reaches into the sample bottle.

After sampling, the filled bottle is lowered.

The pressure spring affixed to the sampler pushes the sample bottle off the injection needle.

The motor of the peristaltic pump is activated by the controller.

The illustration below shows the sampler with the branch pipe.
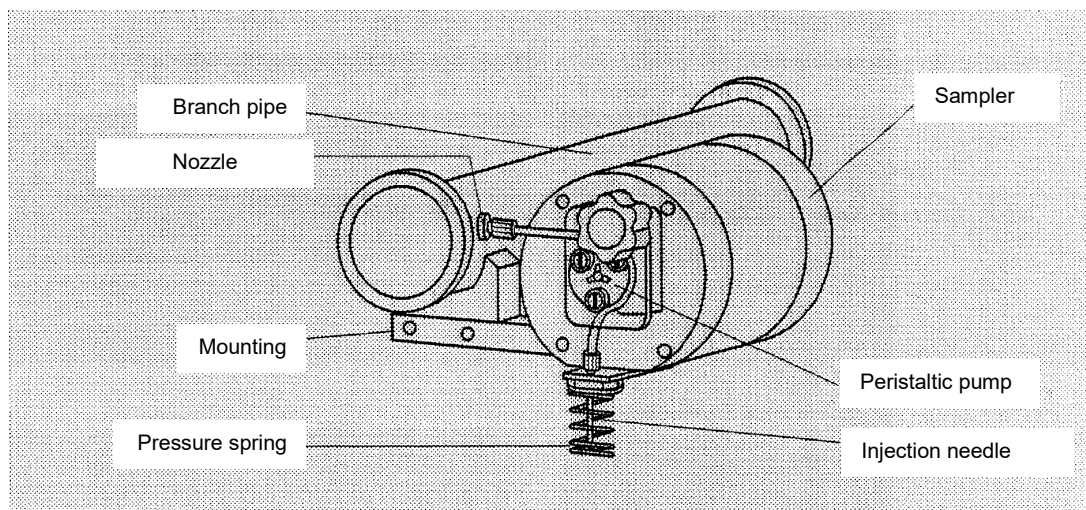
Mounting

The branch pipe for the sampler is installed in the cooled sampling box in the intake line of the collecting truck. The connection at both sides to milk pipe flanges / the connection to the flange of the flow level meter takes place via sealing ring and fastener. If the Ultrasampler is not equipped with a flow level meter, a settling section is arranged before the sampler (otherwise settling section before flow level meter). Settling section > 5 times the nominal width.

4.5.1 Technical data

Electrical data	
Auxiliary energy	24 ... 30 V, max. 2,5 A
Electrical connection	Four-wire connection cable, approx. 200 mm long, with 6-pole round plug
Pump performance	Maximum 6.75 ml/s
Ambient conditions	
Operating temperature	0 ... 50°C
Maximum cleaning temperature	100°C
Cleaning type	CIP
Climatic classification	JWA
Mechanical data	
Mechanical connection	NW 1 = 2" (51 mm) NW 2 = 2,5" (63,5 mm) NW 3 = 3" (76 mm) Via connection flanges in accordance with DIN 32676, connection with fastener and sealing ring
Design	Sampler casing, branch pipe, pump wheel and holders made of stainless steel; rotor protection made of plexiglass
Weight	Sampler approx. 42,5 N $\cong$ 4,25 kg Branch pipe NW 50 approx. 8,5 N $\cong$ 0,85 kg Branch pipe NW 65 approx. 13,1 N $\cong$ 1,3 kg Branch pipe NW 76 approx. 16 N $\cong$ 1,6 kg
Installation	Branch pipe horizontal (for operation without flow level meter, observe settling distance $>$ 5 x nominal width before sampler)

4.5.2 Dimensions

Dimensions of type 6871-3 (flow from right to left)
Dimensions of type 6871-4 (flow from left to right)
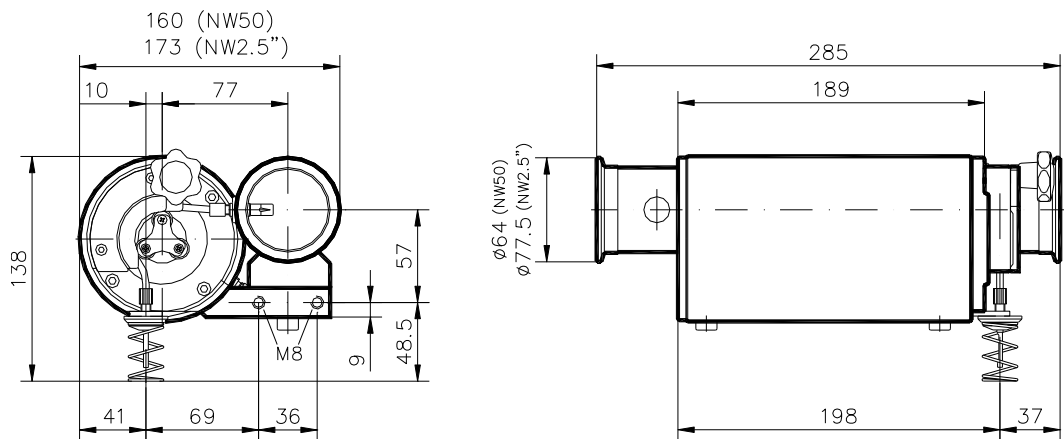
Db687102.dwg

Dimensions of type 6871-5 (flow in both directions possible)
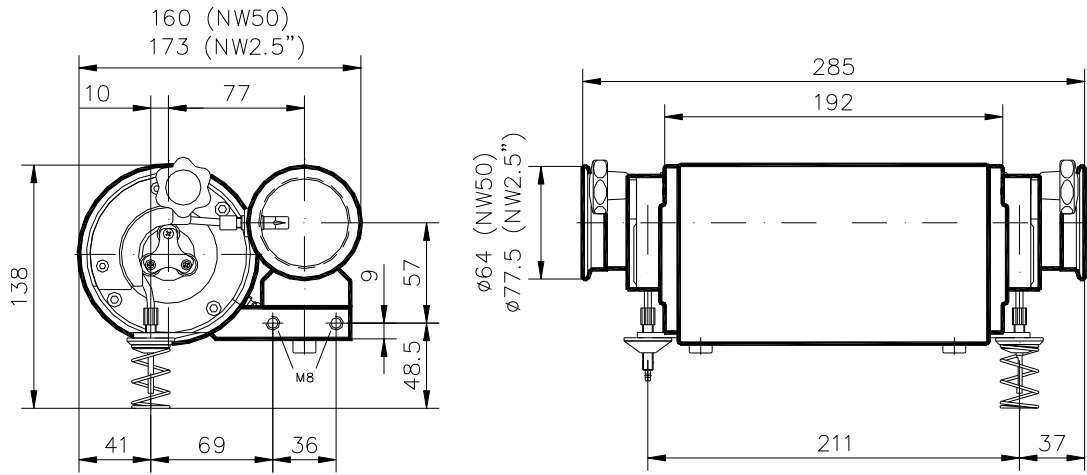
Db687102.dwg

Dimensions of type 6871-8 (flow from right to left)
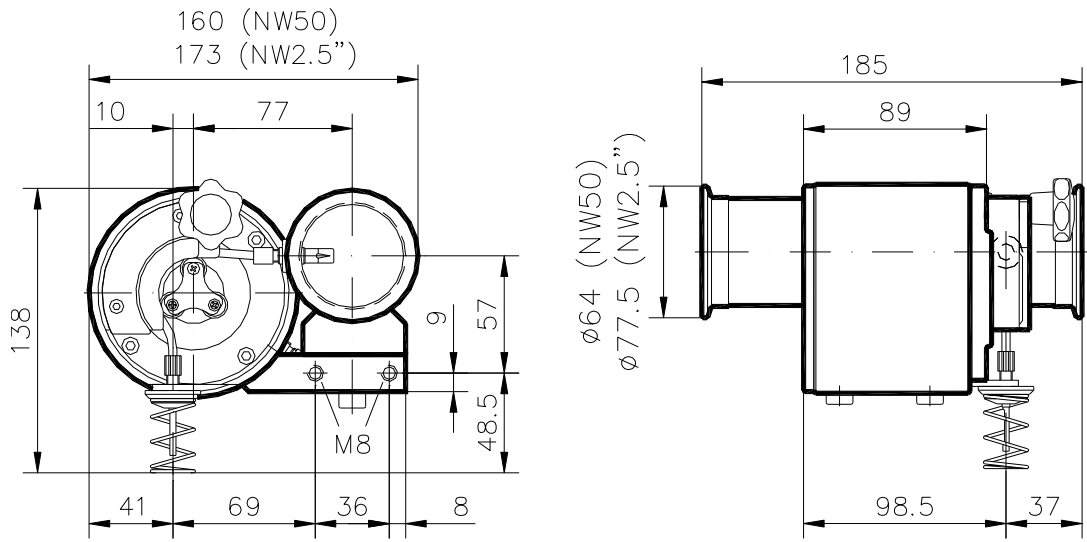
mz687117.dwg

Sampler type 6871-3 (flow from right to left)
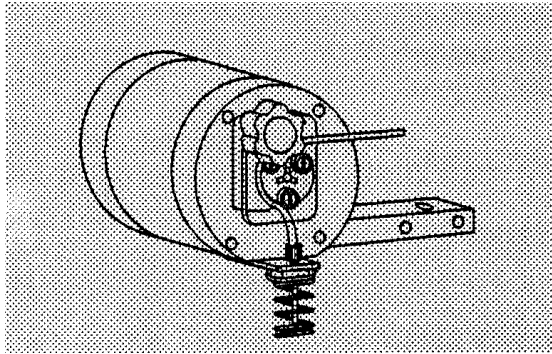
Sampler type 6871-4 (flow from left to right)
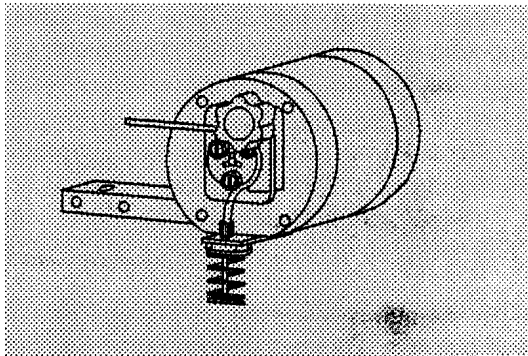
Versions of branch pipes

The sampler variants 6871-3/4/5 are accompanied by the appropriate branch pipes with the nominal widths NW 50 and NW 65 as well as by sampler cannulas of the "type C right" and "type C left" which are independent of the nominal width.

Depending on the respective sampler pump, one of the two outlet openings in the branch pipe has to be closed with the sampler pipe blind plug.

6871-3:   left
6871-4:   right
6871-5:   none

Installation of sampler cannulas
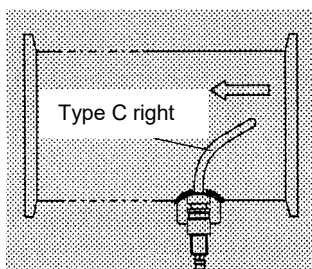
Flow from right side with suction cannula type C - right
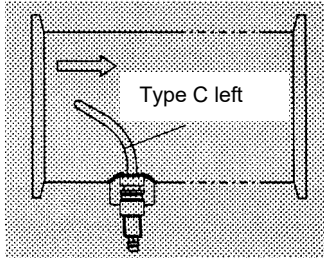
Flow from left side with suction cannula type C - left

Apart from the sampler cannula type C, one "straight" sampler cannula is available for both flow directions and nominal widths.

Sampler cannulas to be applied

Sampler type		Type 6871-3	Type 6871-4	Typ 6871-5		6871-8
		Individual sample	Individual sample	Individual sample	Total tank sample	Total tank sample
Milk flow from left	NW 50	---------	Type C, left, NW 50	Type C, left, NW 50	Type "straight"	Type "straight"
	NW 65	---------	Type C, left, NW 65	Type C, left, NW 65	Type "straight"	Type "straight"
Milk flow from right	NW 50	Type C, right, NW 50	---------	Type C, right, NW 50	Type "straight"	Type "straight"
	NW 65	Type C, right, NW 65	---------	Type C, right, NW 65	Type "straight"	Type "straight"

For large nominal pipe widths and high milk quantities (> 1000 litre), it may be generally convenient to apply the sampler cannula of the "type straight" for individual samples.

Suction cannulas: Type C, left   Type C, right
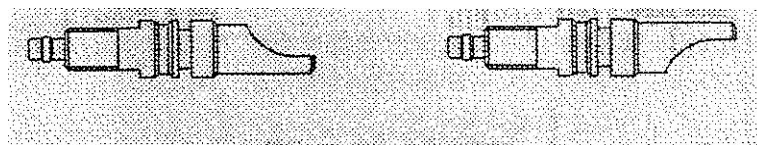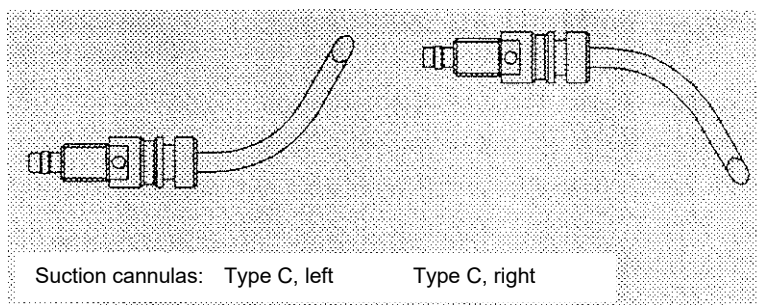
Suction cannula "straight"

Components of the sampler

The branch pipe is screwed with the holders of the sampler.
The illustration below shows an exploded drawing of easily mountable parts.

Sampler cannula Branch pipe Stud screw

Cylinder screw M8 x 20

Pump hose

Union nut M6 x 0,75

Sealing ring on suction cannula

Union nut M6 x 0,75

Star handle for rotor protection

Rotor protection - pump wheel

Injection needle with pressure spring
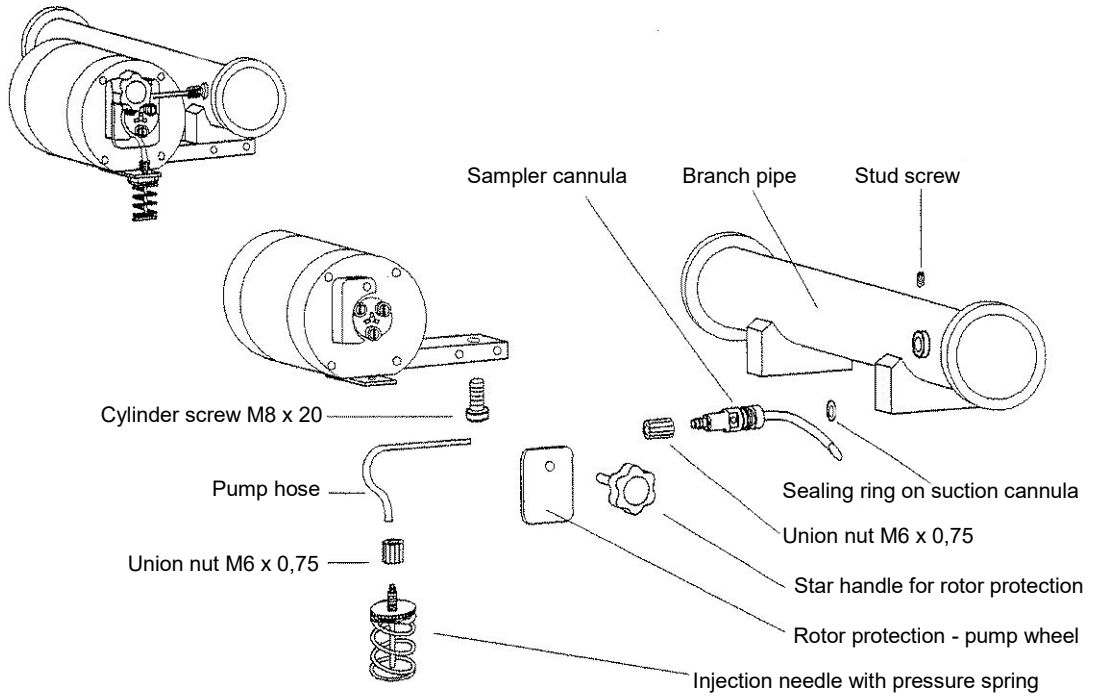
4.6   Flow level meter, type 6826-x

The flow level meter serves as an additional control unit of the ULTRASAMPLER sampling system.

From the measured data of the flow level meter - i.e. flow speed and filling level in the measuring tube - the ULTRASAMPLER calculates the milk volume that has been sucked in order to control the milk sampling.

4.6.1   Technical data

Electrical data	
Auxiliary energy	DC 24 V ± 10 %, max. 6 W
Electrical connection	5 m connection cable via PG-11 feed and internal terminals, open cable ends
Outputs	Flow meter: analogue output 4 ... 20 mA Filling level sensor: analogue output approx. 0,3 ... 2,3 V (0,3 V = 100% filled)
Liquid to be measured	Milk, temperature: 0 ... 100°C, pressure: max. 10 bar
Maximum volume flow	Flow level meter for NW 50: maximum volume flow 500l/min. Flow level meter for NW 65: maximum volume flow 1000l/min.
Flow direction	In accordance with direction sign on the metal type plate (arrow)
Ambient conditions	
Operating temperature	-10 ... +50°C
Maximum cleaning temperature	100°C
Cleaning type	CIP
Climatic classification/protection type	JWA / IP 67
Mechanical data	

Mechanical connection	Pipeline connection
	NW 50: connecting flange, connection via sealing ring and fastener
	       in accordance with DIN 32676 NW 50
	NW 65: connecting flange, connection via sealing ring and fastener
	       in accordance with ISO 2853 NW 2,5"

Casing	Plastic casing PPO noryle with stainless steel measuring tube, stainless steel measuring tube teflon-coated
Installation	Measuring tube only horizontal, with upstream settling section > 3 x NW
Weight	approx. 50 N ≅ 5 kg

Dimensions
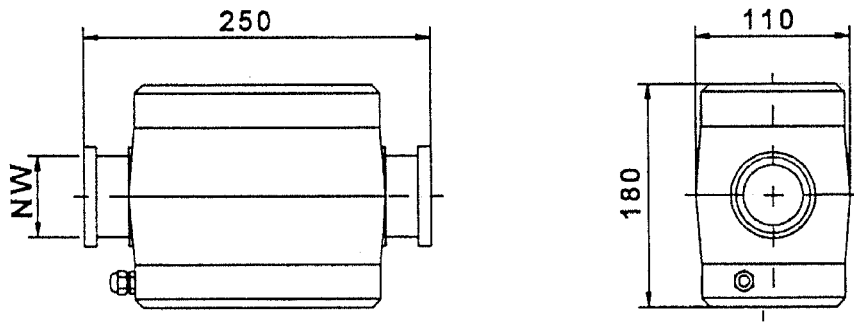
Mounting

Depending on the device version, the flow level meter can be installed either horizontally or endwise horizontally**.**

The milk pipe has always to be arranged in horizontal position.

Horizontal (flat) installation, order designation "horizontal"
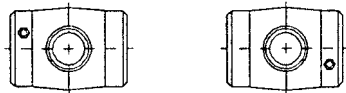
(Endwise horizontal) vertical installation, order designation "vertical"
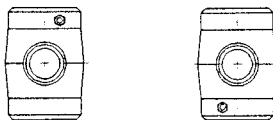
Caution: Observe flow direction (arrow on type plate)

Construction
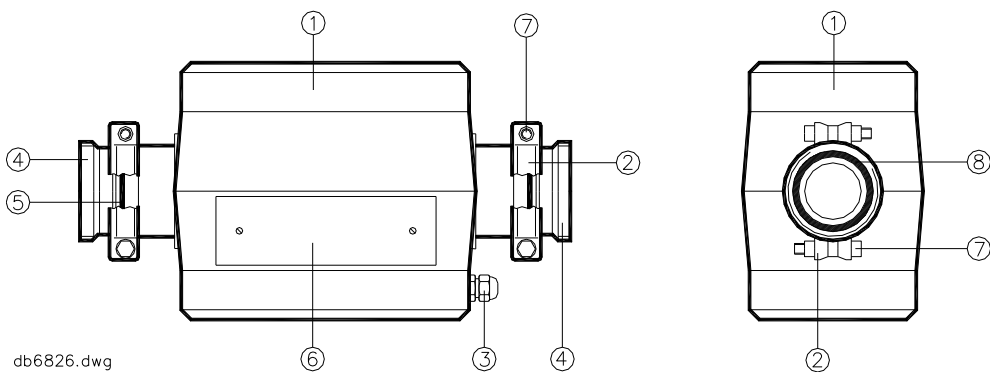
db6826.dwg

1	=	cover	5	=	flat gasket
2	=	clamp closures	6	=	type plate
3	=	cable feed	7	=	hexagon head screw
4	=	connecting piece	8	=	sealing ring

Instructions on mounting and dismounting:

(1) If milk pipe thread connecting piece is still attached at the FLM, remove it. Open the clamp closures (2) at both sides and draw off the connection from the FLM.

Caution: **Do not lose sealings and re-insert them carefully during mounting.**

(2) First screw milk pipe thread connecting pieces tight with the union nuts at both sides of the pipe connections.

(3) Then insert FLM (do not forget flat gaskets (5)) and fasten with clamp closures (2) . If required, loosen the supports/fastenings of the pipelines first to make mounting easier. ⇒ Tighten them again at the end.

Dismounting:

(1) First release the FLM by removing the clamp closures (2) at both sides. If required, loosen the supports/fastenings of the pipelines first to make dismounting easier.

(2) Only now draw off the milk pipe thread connection from the FLM if required.

Caution: **Do not lose sealings and re-insert them carefully during mounting.**

4.6.2 Wiring

By default, the FLM is delivered with a 5 m connection cable wired in accordance with the drawing below. For wiring, additionally observe the instruction manual of the slave!
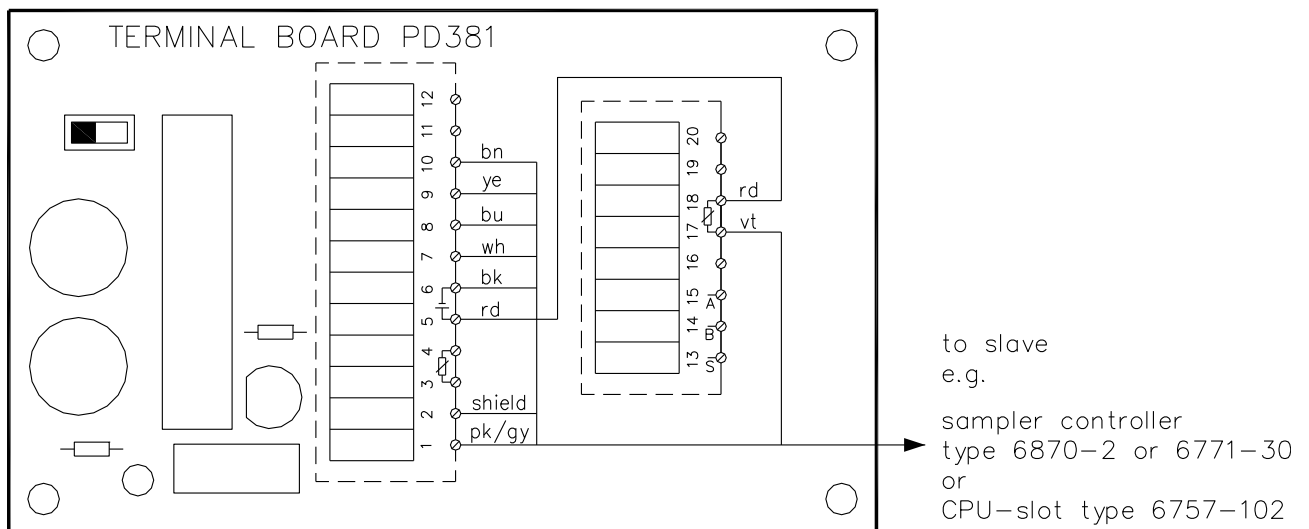
db6826.dwg

4.6.3   Electrical terminal assignment

Terminal	Signal	Colour	6870-2	6771-30	6757-102
1	DC + 24 V $\pm$ 15 %	pink/grey	12	1	307
2	0 V (GND)	shield	11	2	312
5	Auxiliary voltage analogue output	red			
6	GND (Output 3)	black	14	5	308
7	+ Display ⌐ (led out but not connected)	white			
8	- Display ⌐	blue			
9	0,3 / 2,5 V filling level U_{IN}	yellow	17	3	309
10	GND filling level	brown	16	5	311
17	4 - 20 mA I_{IN} (Output 3)	purple	13	4	310
18	Auxiliary voltage analogue output	red			

Wires not in use have to be insulated separately.

Cable shielding: Variant 5 pursuant to 2.3.1

4.7 Bottle drive, type 6874

The bottle drive ensures a fully automatic feeding and depositing of the sample bottles during the ULTRASAMPLER® sampling and an easy inserting and removing of the round magazines of the type 6875. It is in the cooled sampling box of the collecting truck and accommodates the empty and filled sample bottles in two round magazines.

4.7.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V, max. 1,5 A per motor
Fuses	No internal fuses, protection via control system
Electrical connection	17-pole round socket at the stainless steel casing; 10 m connection cable with 17-pole round connector, with open ends at one side for connection to superordinate unit
Ambient conditions	
Operating temperature	-10 ... +50°C
Climatic classification	JWA
Mechanical data	
Weight	442 N $\cong$ 44,2 kg (with round magazines)
Design	Base plate, casing made of stainless steel, transport star and round magazines made of plastic; powerful motors with reduction gearing, dip-coated to be water-proof .
Installation	horizontal, by taking into account the position of the sampler
Sample bottles	50 ml sample bottles with triple-recessed rubber plugs; max. 72 sample bottles per magazine
Barcode reader	Stationary barcode reader 6834-10 or 6727-40
Inductive proximity switches	
Lifting device down	closer, negative switching
Bottle in position	closer, negative switching
Rotary star in position	Opener, negative switching
Voltage via proximity switch	open = U - 3 V, closed $\leq$ 0,3 V
Maximum proximity switch current	$\leq$ 200 mA, short-circuit-proof, no-load current $\leq$ 20 mA
Electrical connection	2 m connection cable, 3-wire, open cable ends
Protection type	IP 67
Admissible temperature range	-25 ... +70°C

4.7.2 Sequence control during sampling

Three inductive proximity switches control / monitor the sequence within the bottle drive. They monitor the position of the sample bottle after it leaves the outlet magazine and the lower final position of the lifting device. A proximity switch controls the exact positioning of the transport star when the bottles are transported further.

1. As soon as within a collection tour the "sampling" function is selected, the bottle drive starts. The outlet magazine containing the empty sample bottles turns until a bottle arrives at the position "FP" (bottle in position).

2. The transport star and the inlet magazine start up simultaneously. The transport star pushes the empty sample bottle onto the magnetic disk "M" of the lifting device.

3. The lifting device turns the magnetic disk with the sample bottle clockwise for 8 seconds for a barcode reading.

4. If the tag is illegible or if its barcode is repeated, transport star and inlet magazine start up and put down the unfilled sample bottle in the inlet magazine. At the same time the transport star transfers the next sample bottle from "FP" to the magnetic disk.

5. If the sample bottle tag is accepted, the lifting device turns anticlockwise and lifts the sample bottle into filling position.

6. Now the milk is sampled and bottled. When this process is completed, the lifting device turns clockwise and lowers the full sample bottle.

7. Transport star and inlet magazine start up again. The transport star pushes the full sample bottle into the inlet magazine and at the same time transfers the next empty sample bottle from "FP" onto the magnetic disk. The "FP" position is monitored by a proximity switch. Its return signal activates the motor of the outlet magazine if position "FP" is vacant, until the next empty sample bottle arrives at position "FP".

On this position the bottle sample number is read and the bottle filled.
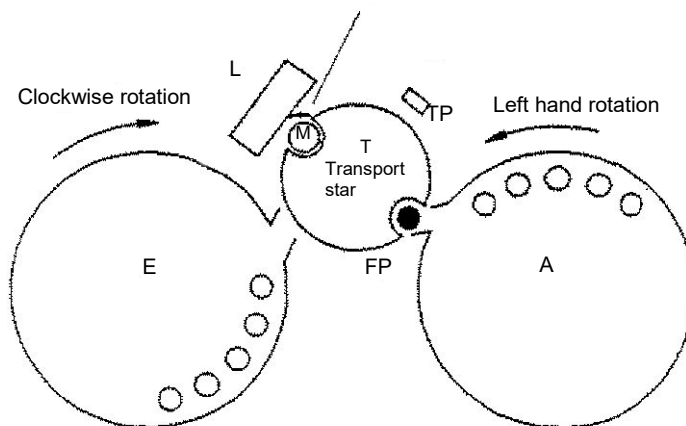
A	=	Outlet magazine (engine)
E	=	Inlet magazine (engine)
T	=	Transport star (engine)
M	=	Magnetic disc (engine)
L	=	Barcode reader
FP	=	Proximity switch "bottle in position"
TP	=	Proximity switch "star in position"

Adjustment of the steel angles on the transport star

> ➢ If the transport sequence is correct, manually put the empty sample bottle to position "FP".

> ➢ By means of a pushbutton for manual bottle transport, push the sample bottle onto the magnetic disk. If it is correctly positioned, the sample bottle lands audibly and concentrically on the magnetic disk.

> ➢ If it is positioned incorrectly, loosen steel angles (see illustration), shift them within the oblong holes and fasten them again.

> ➢ Check positioning again and repeat procedure until the turning off of the transport star motor triggered by the two steel angles ensures an optimal depositing of the sample bottles on the magnetic disk.

 WARNING!

The drive of the inlet magazine always runs as long as the transport star is turning!
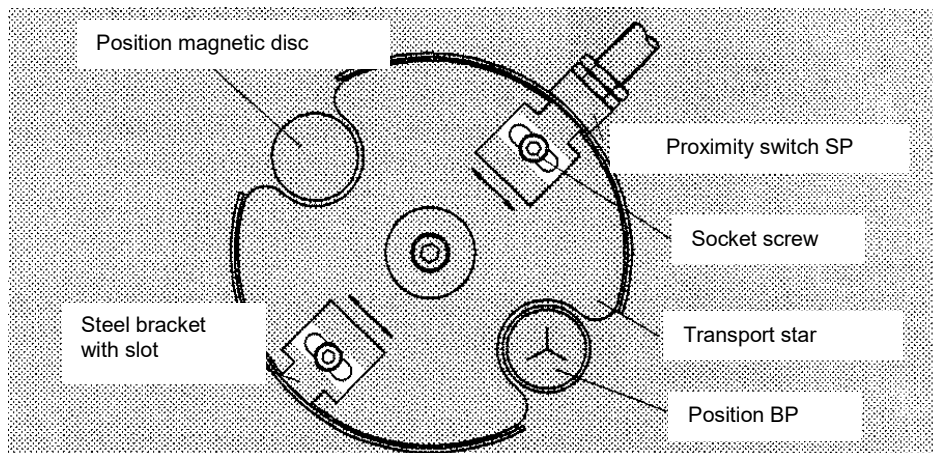
Alignment of sampler injection needle to sample bottle

After having placed a sample bottle on the magnetic disk, check if the tip of the injection needle is vertical above the hole in the sample bottle plug (see illustration, error 1).

In case of deviations, turn branch pipes with sampler appropriately.

In case of lateral deviations ≥ 1,5 mm from the centre of the sample bottle (see illustration, error 2), the bottle drive has to be shifted for correction (change via holes to oblong holes if required).
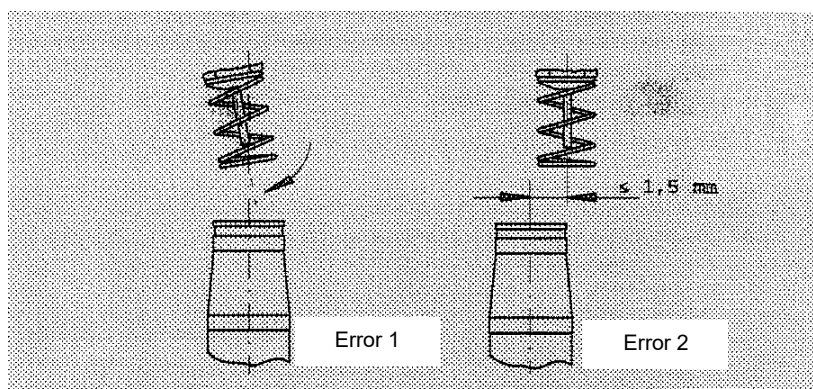
4.7.3   Mounting and dimensions

Mounting

The bottle drive is installed horizontally in the sampling box with cooling. The opening has to make sure that the bottle drive can be inserted and removed in horizontal position. The reference point for the spatial arrangement is the sampler with its position in the sampling box. After installation, a trouble-free replacement of the round magazines must be ensured. In the base plate, there are four via holes for a screw connection to the sampling box.

Caution:

The injection needle of the ULTRASAMPLER has to be vertical and central above the sample bottle in filling position.

Dimensions
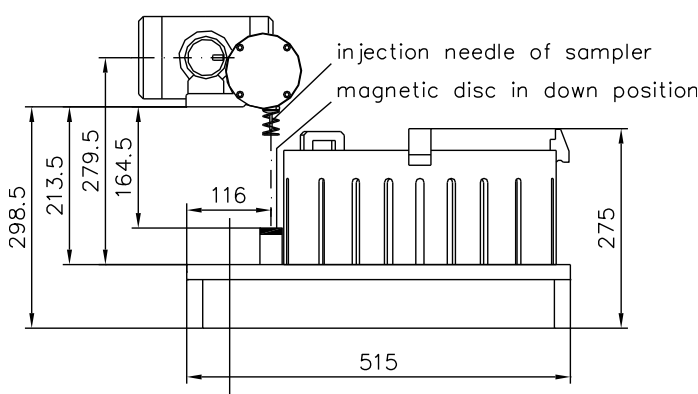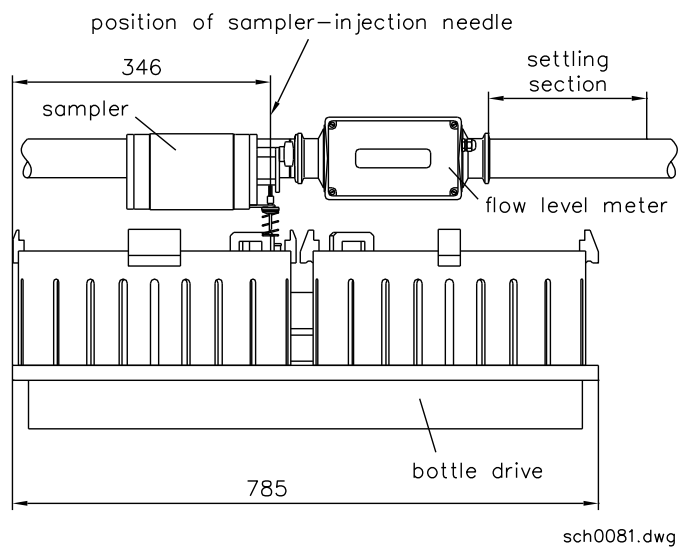
sch0081.dwg

Mounting bores in the base plate
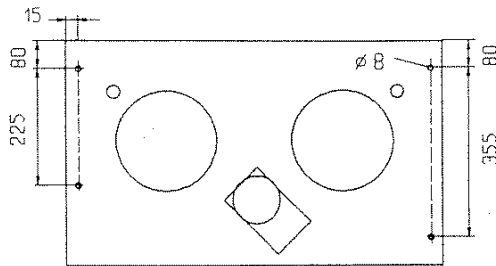
Put on the round magazines
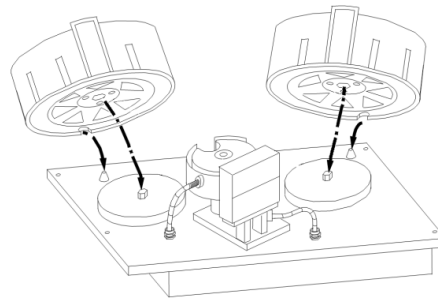
4.7.4 Terminal assignment

Plug-in contact	Signal	Wire no.	Connection socket
A	Lifting motor up	1	
B	Lifting motor down	2	
C	Motor Star	3	
D	Motor Outlet magazine	4	
E	Motor Inlet magazine	5	
F	Proximity switch FP	6	
G	Proximity switch TP	7	
K	+ 24 V on-board power supply	10	
L	0 V on-board power supply	11	
N	Proximity switch HP	13	
S	Casing GND	yellow green	

View from the outside

Connection cable: U 944 1 687 4 13
Proximity switch FP: U 495 7 16
Proximity switch TP: U 495 7 12
Proximity switch HP: U 495 7 21

4.8 Bottle drive with pneumatic lifting device, type 6774-10

The bottle drive ensures a fully automatic feeding and depositing of the sample bottles during the ULTRASAMPLER® sampling and an easy inserting and removing of the round magazines of the type 6875.

It is located in the cooled sampling box of the collecting truck and accommodates the empty and the filled sample bottles in two round magazines.

4.8.1 Technical data

Electrical data	
Auxiliary energy	DC 24 V
Fuses	No internal fuses, protection via control system
Electrical connection	Connection plug with female insert (F), type Han 16 A (16-pole)
Compressed air connection	Plug-in connection for hose, external diameter 5,0 mm (see connection diagram!), 10 bar maximum pressure, oil-free
Ambient conditions	
Operating temperature	-10 ... +50°C
Storage temperature	-10 ... +70°C
Climatic classification / protection type	JWA / IP 51
Mechanical data	
Casing	Stainless steel, plastic (POM)
Weight	28 kg (without round magazines)
Round magazine	Type 6875 with sample bottles type 6845: max. 72 sample bottles per magazine
Barcode reader	Fastening possibility for barcode reader, e.g. type 6834-10, 6727-40 (not included in delivery scope)

Analogously, the following explanations also apply:

> ➢ Sequence control for sampling
> ➢ Adjustment of the steel angles on the transport star
> ➢ Alignment of the sampler injection needle to the sample bottle

pursuant to chapter 4.6.2 of bottle drive, type 6874.

Installation

Installation

Horizontal, under consideration of the position of the ULTRASAMPLER® sampler and the service instruction for ULTRASAMPLER®, type 6870-2.

After installation, a trouble-free replacement of the round magazines must be ensured (see drawing).

Connection

Establish compressed air connection (see drawing!).

Wiring

Connect connection cable for bottle drive (type 6774-304, L = 7 m) to the respective control system.

Dimensions and position of the connections

Connecting plug

Compressed air connection
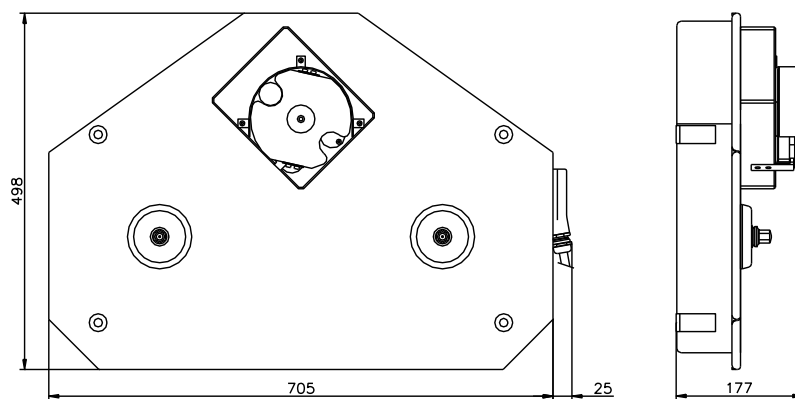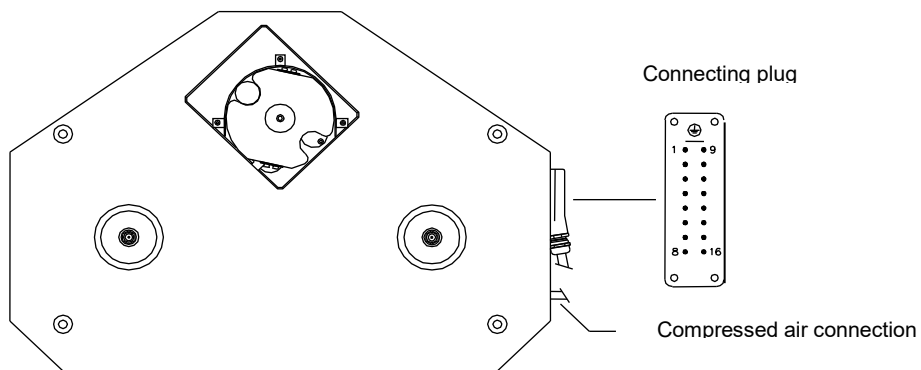
db677401.dwg

Terminal assignment

signal	wire color	I/O-box type 6753 type 6864 terminal	ultrasampler controller type 6870-2 terminal	ultrasampler controller type 6771-30 terminal	bottle drive type 6757-112 terminal	wrap connection
stroke valve (motor up)	BN		25	41	401	BL1-1
motor barcode (motor down)	RD		24	42	402	BL1-2
motor star	PK		26	45	405	BL1-3
motor outlet	YE	free output)1		43	403	BL1-4
motor inlet	GN		26	44	404	BL1-5
position bottle	BU	free input)2		26	410	BL1-6
position star	VT		23	46	409	BL1-7
nc	GY					BL1-8
nc	WH					BL1-9
+24V	BK	+24V *	35 *	49	406	BL1-10
0V	WHBN	0V *	34 *	50	407	BL1-11
0V	WHGY	0V *	34 *	47		BL1-12
position stroke valve (bottle down)	WHPK		22	33	411	BL1-13
nc	WHYE					BL1-14
nc	WHGN					BL1-15
						BL1-16
housing	WHBU			⏚	408	BL1-PE

sa300246.dwg

nc not connected
 * 24V main power supply
)1 for MAK3001 connect to output 5
)2 for MAK3001 connect to input 9

4.8.2   Dimensions and mounting

View from top

web0058.dwg

View from front

web0058.dwg

View from left side

523.6

361

295

156

113

271

ca. 518
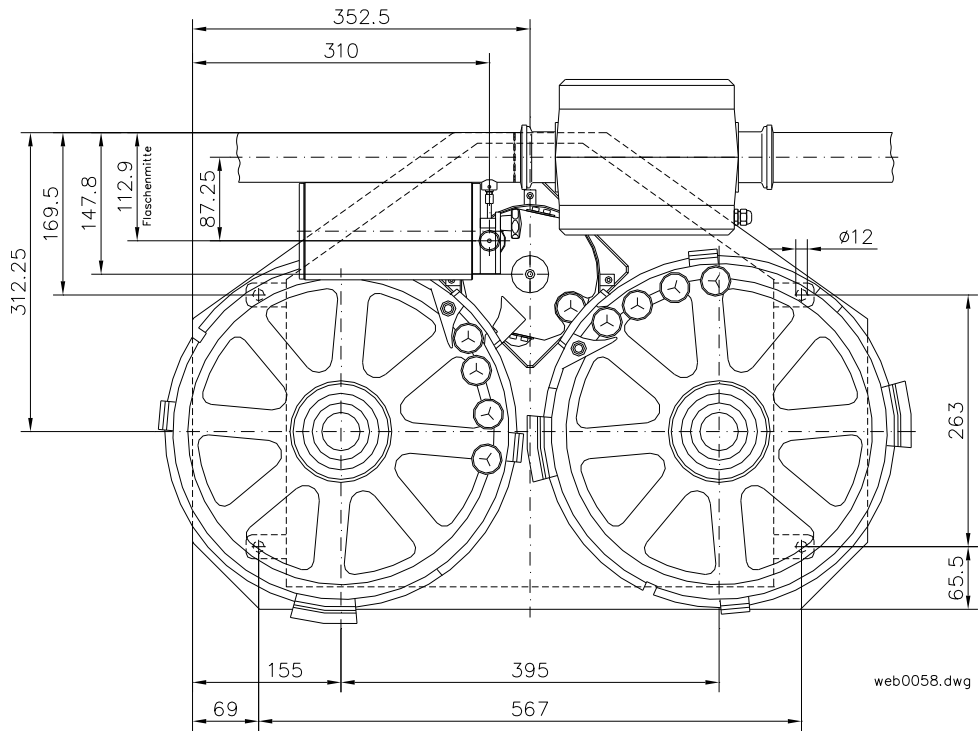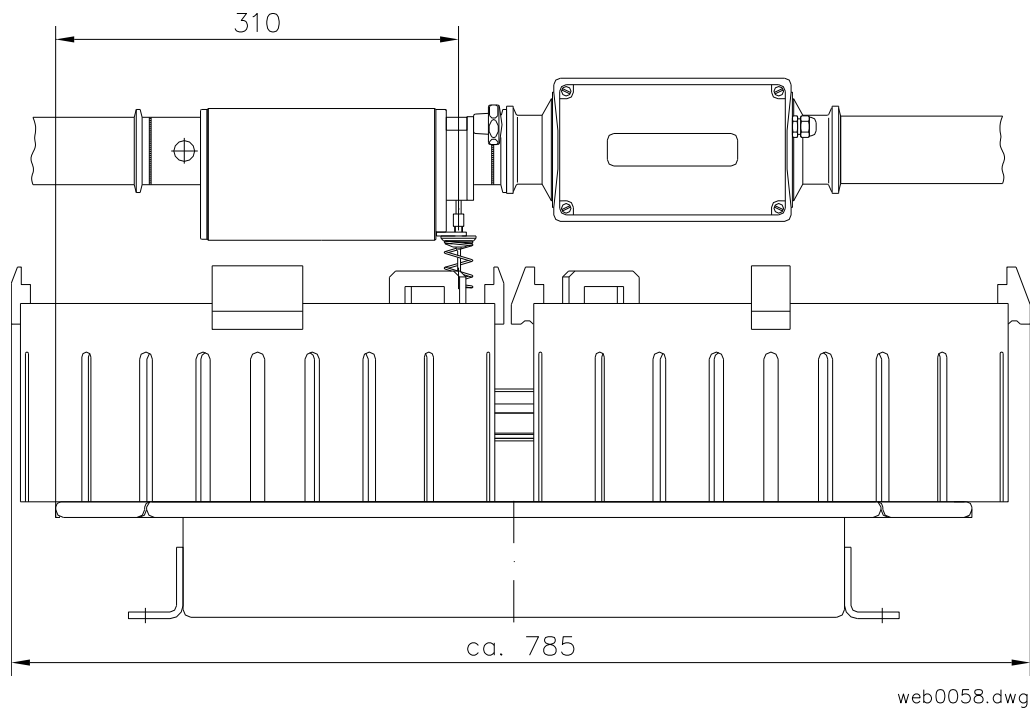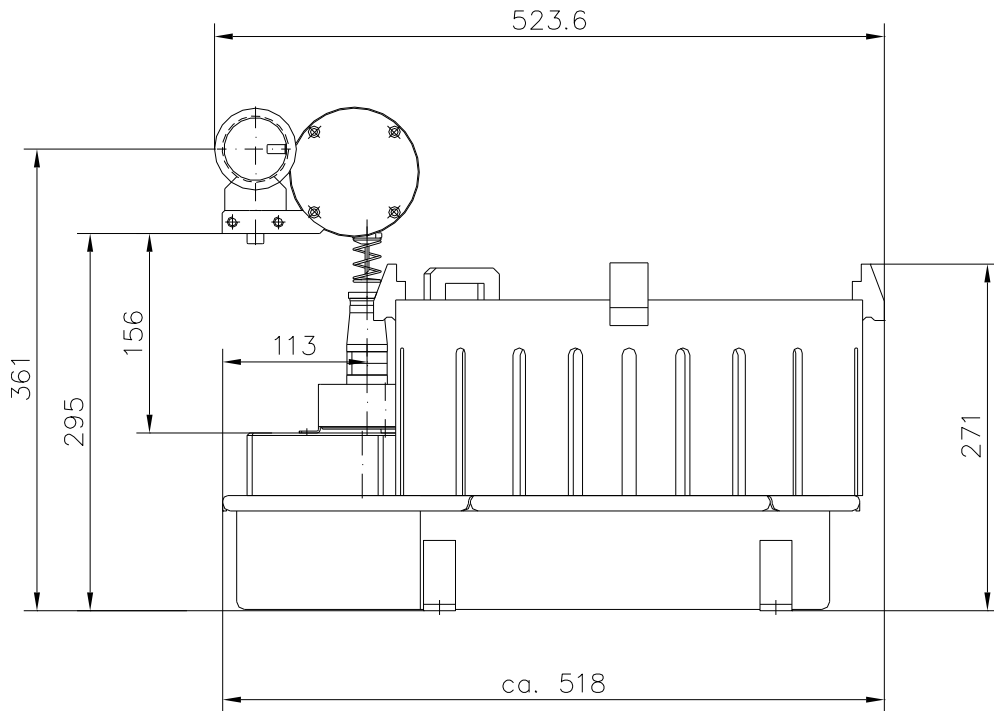
web0058.dwg

View from bottom

proximity switch
(position bottle)

motor star

proximity switch
(position star)

magnet valve S12

lifting gear

air restrictor

absorbing duct

connecting
cable

mounting
plates

air connection

round magazine
drive outlet

terminal box
(intern)

proximity switch
(bottle below)

round magazine
drive inlet
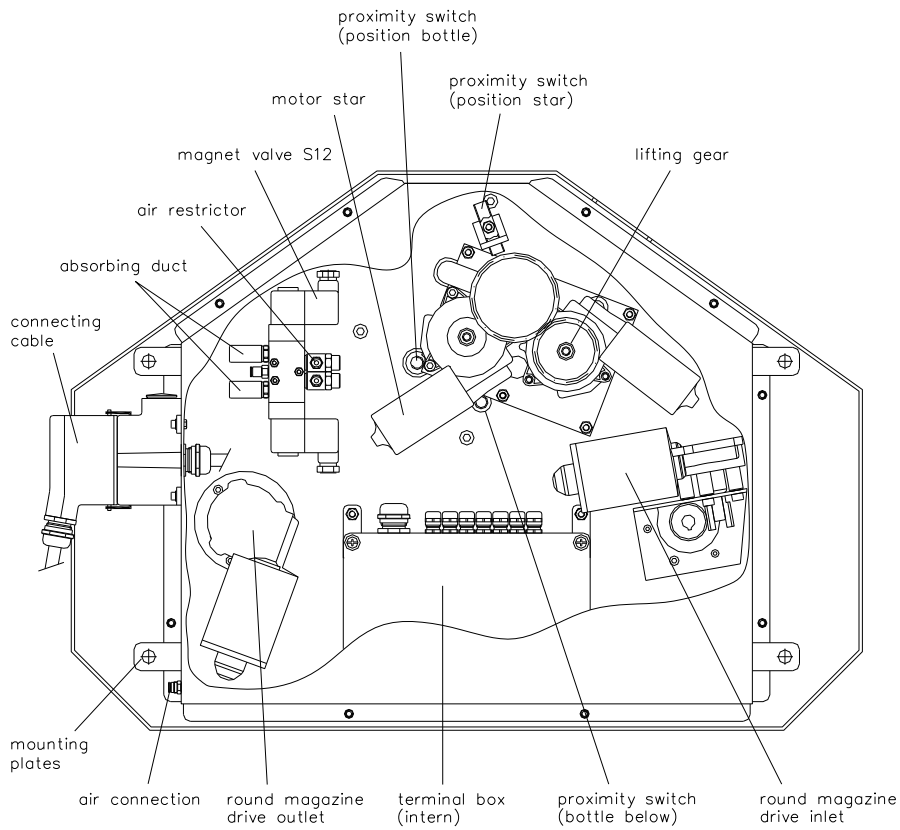
sa300244.dwg

4.8.3 Internal wiring

terminal box bottle drive
type 6774-302

below   above

Y1 12 ... 14   stroke valve
MFH-5-1/8

B1   proximity switch
position stroke valve
bottle below
U495595

M2   motor barcode

M1   motor star

B2   proximity switch
position star
203657

M3   motor outlet

M4   motor inlet

B3   proximity switch
position bottle
U495595

cable 16x0,75

A2
+24V
0V

control
motor star
M+
M-
6770-404

A1
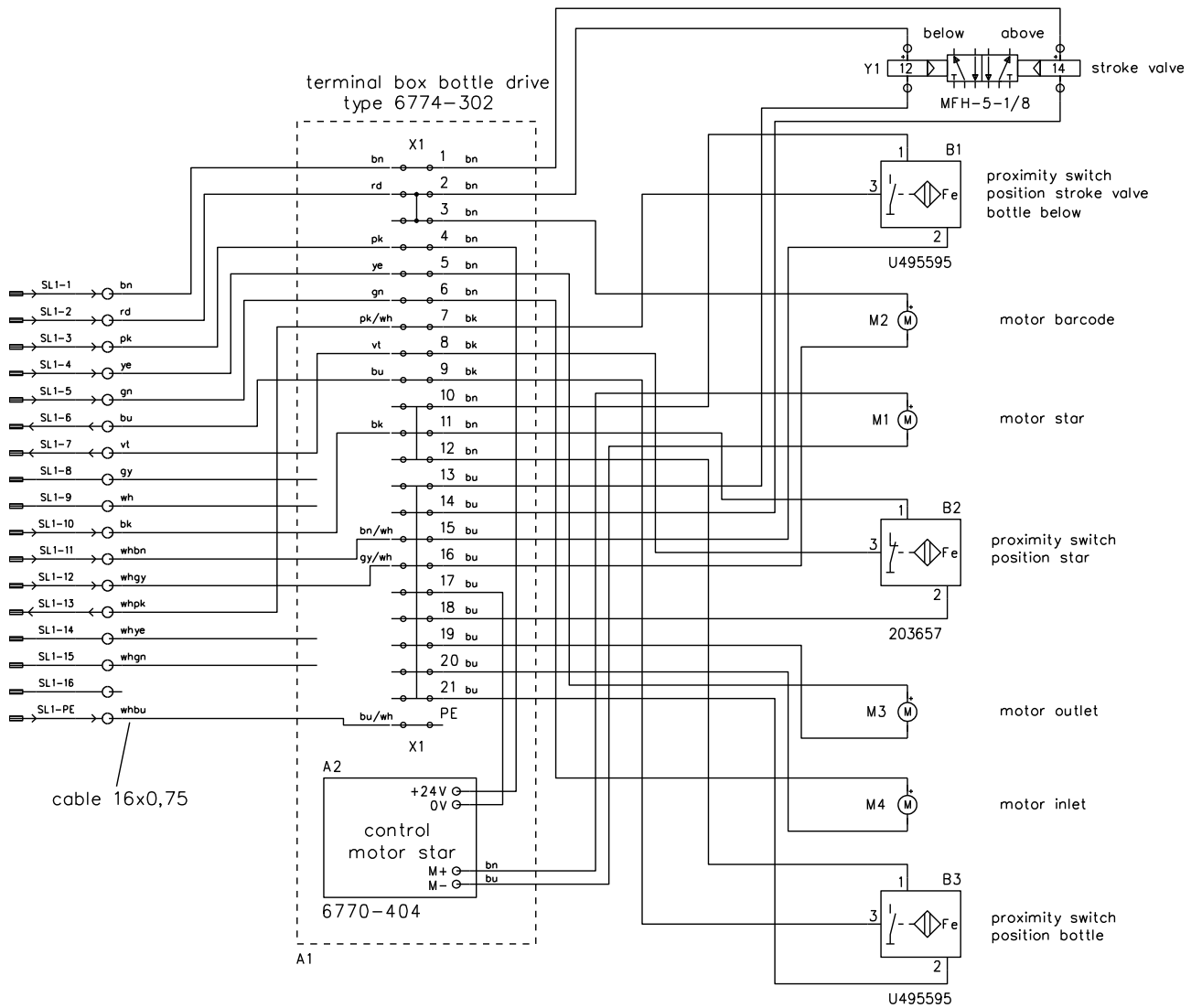
sa300245.dwg

4.9 Manual lifting device for sample bottles, type 6871-3-30

The manual lifting device for sample bottles serves to lift the sample bottles into filling position and to deposit the filled sample bottles by means of an operating lever.

It is screwed to the sampler and when mounted it is located below the peristaltic pump. In filling position, the injection needle of the sampler pierces the plug cap of the sample bottle. A proximity switch which can be optionally integrated into the lifting device recognizes the filling position and makes possible an automatic start of the milk collection procedure.

Versions

The lifting device is suited for being mounted on the right side of the sampler (milk flow from the right to the left side).

4.9.1 Technical data

Mechanical data	
Construction	Stationary and mobile parts made of stainless steel, sliding disks made of teflon, inductive proximity switch is screwed in and tightened
Weight	approx. 7 N ≅ 0,7 kg
Usable sample bottles	BARTEC sample bottle type 6845 with triple-recessed plug caps
Electrical data	
Inductive proximity switch "Bottle in position"	Closer, ground switching or positive switching, maximum current ≤ 200 mA, short-circuit proof, no-load current ≤ 20 mA
Electrical connection	2 m connection cable, 3-wire, open cable ends
Ambient conditions	
Climatic classification/protection type	JWA / IP 67
Admissible temperature range	-25 ... +70°C

Wiring

Proximity switch NPN Order no.U495593 Ground switching	Controller 1) MAKplus 6744-10	US controller 6771-30	I/O box 6864, inputs	ULTRASAMPLER I/O plug-in unit 6757-103
Brown	+ 24 V IN 1 - 3	+ 24 V terminal 25	+ 24 V	+ 24 V B terminal 211
Blue	0 V IN 1 - 3	GND terminal 34	GND	B-GND terminal 220
Black	Free input IN 1 - 3	Free input IN 1 - 8 Terminals 26 ... 33	Free physical input	Free input IN 1 - 8 212 ... 219
Proximity switch PNP order no. U496004 Positive switching	**Controller 1) MAK vario 6744-10**		**I/O box 6753, inputs**	
Brown	+ 24 V IN 1 - 3		+ 24 V	
Blue	0 V IN 1 - 3		GND	
Black	Free input IN 1 - 3		Free physical input	

Note:

If a ground-switching proximity switch has to be connected to a device (e.g. I/O box 6753) with positive-switching inputs, this can be done by interposing the constant current module type 6753-302 as a pull-up between + 24 V and the appropriate input (see fig. 1).

1) By default, the digital inputs of the controller MAKplus 6744-10 are encoded as "positive switching".
   By changing the jumper coding (see type 6744-10), each input can be changed individually to "GND-switching".

Fig. 1
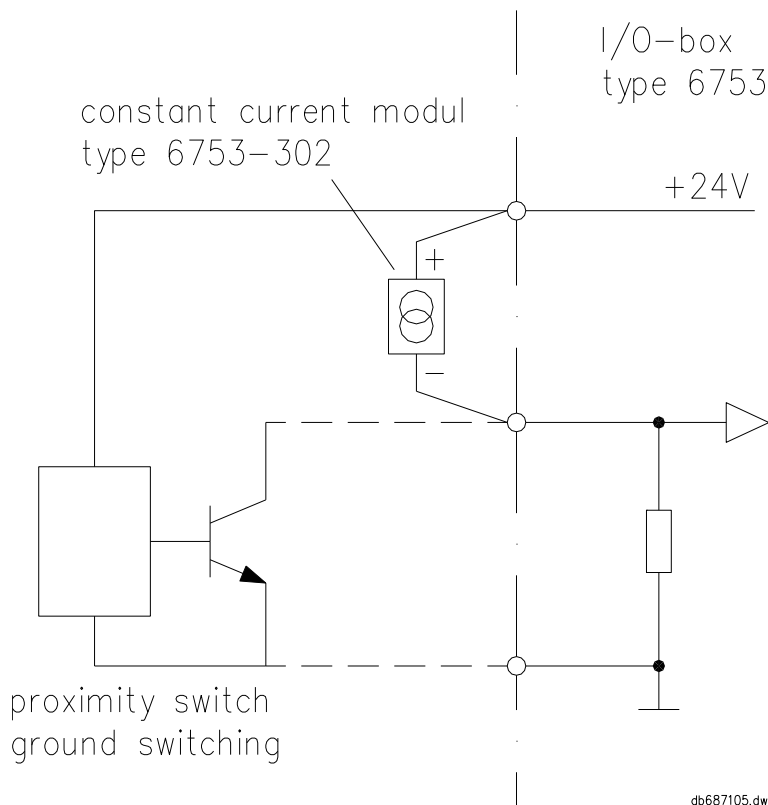
Controller settings

In the controller (peripherial I/O-Box), the logical input "3" has to be assigned to the applied physical input.

Controller configuration

Basic function:

Menu Options:
Basic functions: Sampler sample   = OFF
Sequence control: Sequence control   = ON
                  Sampling   = ON
                  PFL-Ident   = ON

Set all items in the menu "program parameter PFL Ident" to OFF:

Dimensions

194
133
188
db687106.dwg

292
37
65
inductive
proximity switch
(optional)
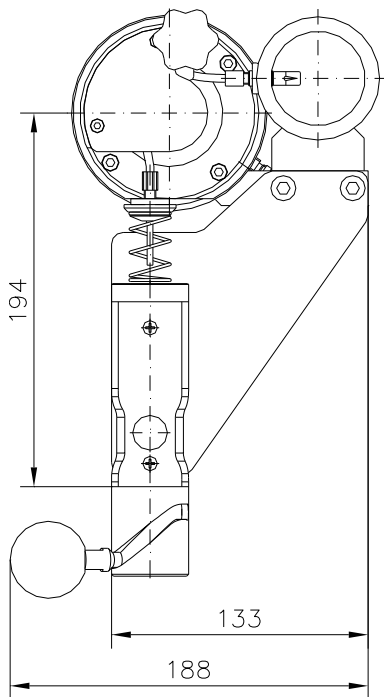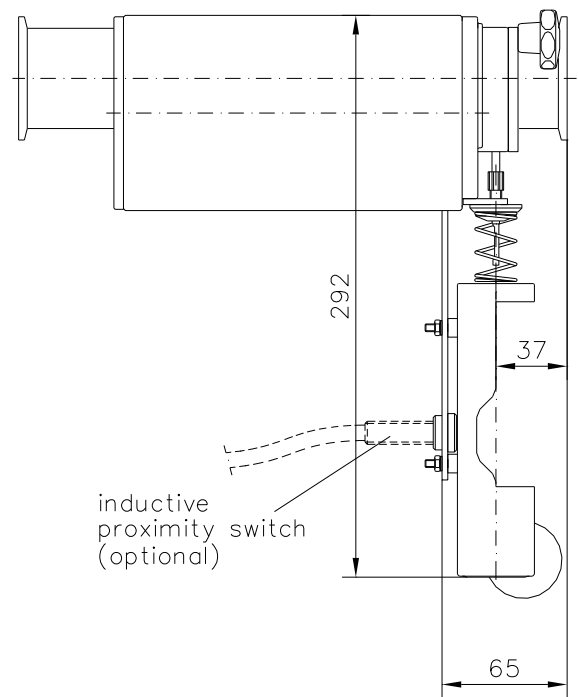
4.10   Semi-automatic sample bottle feed, type 6871-3-50

Technical data

See data sheet! Available on request.

4.10.1   Mounting

Mounted at ULTRASAMPLER like manual lifting device type 6871-3-30.

4.10.2   Wiring

Proximity switch NPN Order no. U495593 GND-switching	Controller 1) MAKplus 6744-10	US controller 6771-30	I/O box 6864, inputs	ULTRASAMPLER I/O plug-in unit 6757-103
Brown	+ 24 V IN 1 - 3	+ 24 V terminal25	+ 24 V	+ 24 V B terminal211
Blue	0 V IN 1 - 3	GND terminal34	GND	B-GND terminal220
Black	Free input IN 1 - 3	Free input IN 1 – 8 Terminals 26 ... 33	Free physical input	free input IN 1 – 8 212 ... 219
Proximity switch PNP Order no. U496004 Plus-switching	**Controller 1) MAK vario 6744-10**		**I/O box 6753, inputs**	
Brown	+ 24 V IN 1 - 3		+ 24 V	
Blue	0 V IN 1 - 3		GND	
Black	Free input IN 1 - 3		Free physical input	

Note:

If a GND-switching proximity switch has to be connected to a device (e.g. I/O box 6753) with positive-switching inputs, this is possible by interposing the constant current module type 6753-302 as a "pull-up" between + 24 V and the appropriate input (see fig. 1).

1) By default, the digital inputs of the controller MAKplus 6744-10 are encoded as "positive switching".
   By changing the jumper coding (see type 6744-10), each input can be changed individually to "GND-switching".

Fig. 1
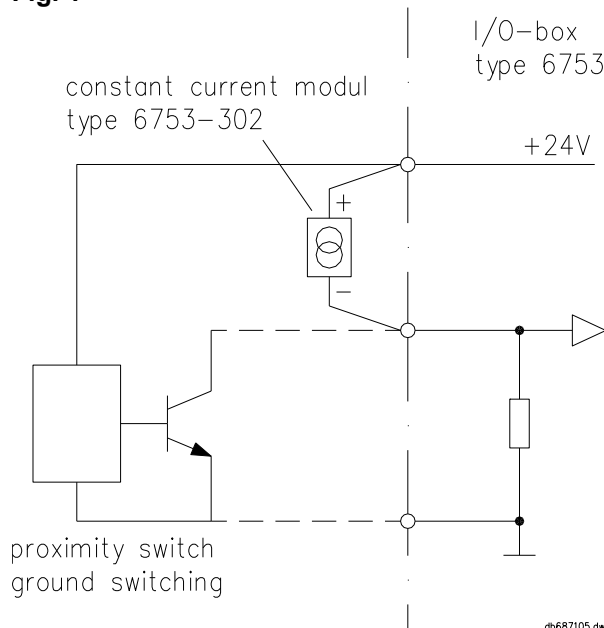
Wiring of magnetic disk motor

Motor	US-Controller type 6870-2	US-Controller 6771-30	Bottledrive plug-in unit type 6757-112
Wire 1 (+ 24 V)	Terminal 24	Terminal 42	Terminal 402
Wire 2 (0 V)	Terminal 34 Jumper from terminal 22 to terminal 18 (GND)	Terminal 47 (GND) Jumper from terminal 33 (IN 8) to terminal 34 (GND)	Terminal 407 (GND) Jumper from terminal 411 to terminal 407 (GND)

Stabilisation 12 V/24 V for magnetic disk motor, type 6870-400
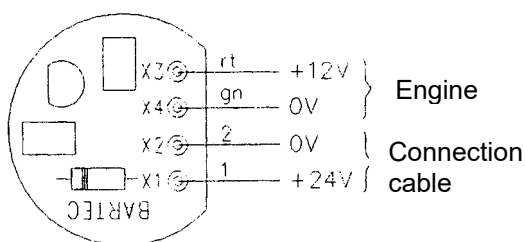
Barcode reader, type 6727-40

The barcode reader is connected to the reading station type 6723-10.

For wiring and settings see the appropriate chapters of this manual!

Spare parts

Proximity switch: Order no.: U496004, positive switching
Proximity switch: Order no.: U495593, GND-switching
Motor 12 V: Order no.: U371061
Stabilisation 12 V/24 V: Order no.: U06001398

Software settings at the controller

Under **OPTIONS:**

Basic functions → Sampler sample: OFF
Sequence controls: ON
Sampling: ON
PFL-Ident: ON

PROG.PARAMETER:

PFL-Ident →   Barcode reading: ON
                Reading emergency OFF: ON
                Switch OFF everything else!

PERIPHERAL:

At the respective I/O box assign the logical input "3" to the applied physical input for proximity switches.

4.11   Installation

4.11.1   Mounting of sampling box with cooling

Requirements to sampling box with cooling

With the exception of the controller, all structural components of the ultrasampler are located in a special sampling box with cooling.

This sampling box has to be constructed for the installation into the ultrasampler and has to be mounted in the intake cabin of the collecting truck or at another suitable place.

The following aspects have to be taken into consideration for designing and positioning:

➢   It must be possible to implement the spatial assignment of sampler and bottle drive in the sampling box (fig. 2, fig. 3).

➢   The bottle drive is in horizontal position in the sampling box and can also be inserted and removed in horizontal position.

➢   It must be possible to insert and remove the round magazines of the bottle drive without any problems.

➢   The milk transport line of the collecting truck has to be led through the sampling box with cooling at an ascending slope of $1 \pm 0,5$ % (towards the intake socket).
Neither during mounting nor during operation, the connection flanges must be affected by any mechanical forces.

➢   It must be possible to attach the branch pipe at the ceiling of the sampling box with two holders**.**
The holders have to be at the ends of the branch pipe.

Fig. 1 - ULTRASAMPLER in sampling box with cooling

Fig. 2

Position of the sampler-injection needle

346

Sampler

Settling section

Flow Level Meter

Bottle Drive

785

Fig. 3

Injection needle of the sampler

Magnetic disc - deposed

Bottle drive

298,5

213,5

164,5

116

275

515
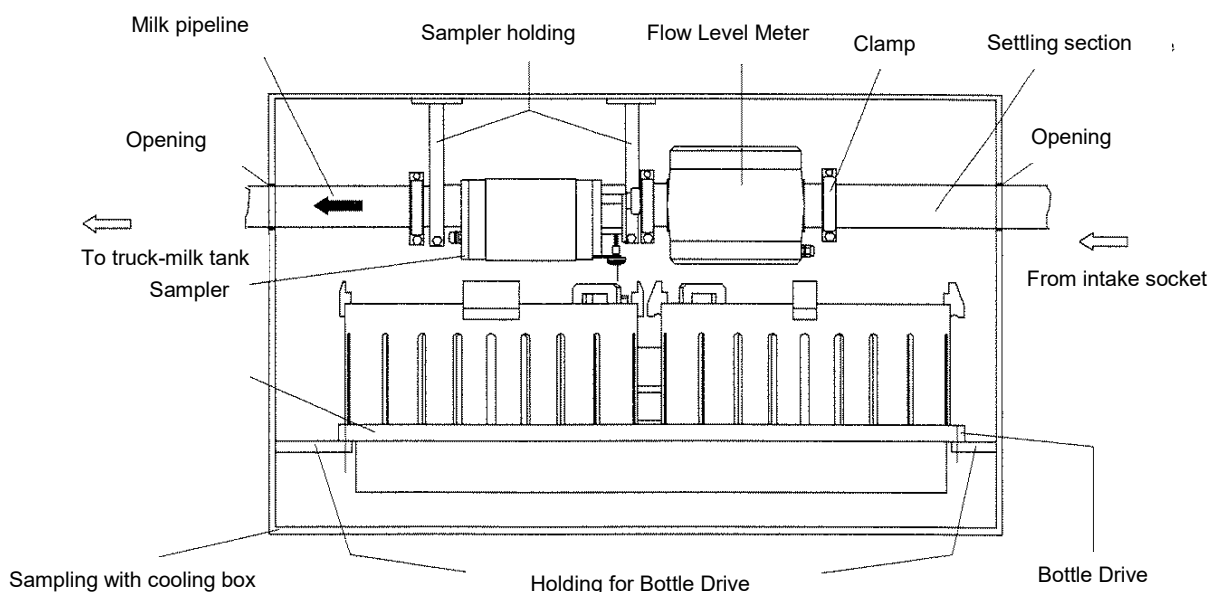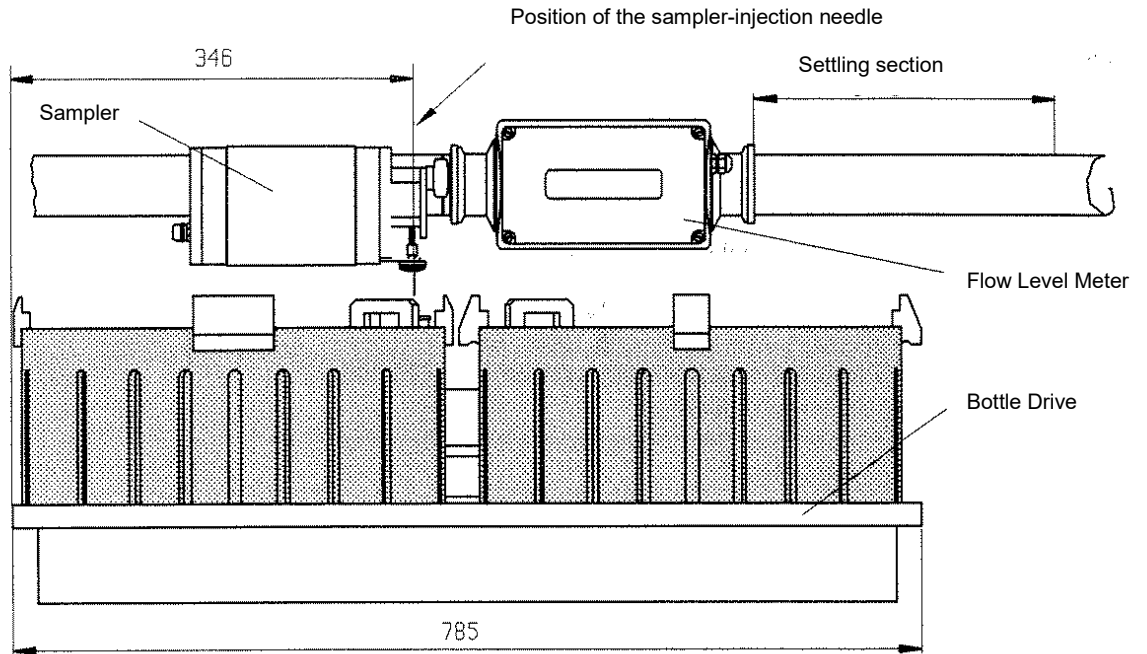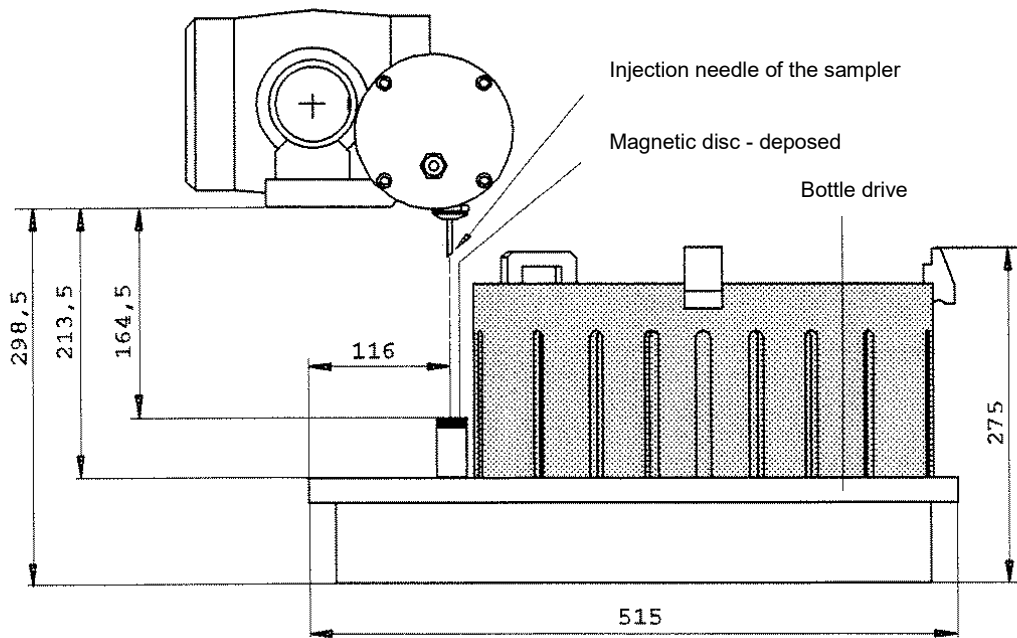
Fig.2 and fig. 3 show dimensions valid for the spatial assignment of sampler and bottle drive.

➢ A straight section of the milk pipe (length $\geq$ 5 x NW) before the flow level meter serves as settling distance.

The settling distance can exceed the sampling box.

➢ In the base plate of the bottle drive, there are four via holes for a screw connection to the sampling box.

NOTE!

➢ For dimensioning the sampling box with cooling, observe the selection of the sampler type (chapter 4.4) and the mounting variants.

➢ Please note that it is also possible to use a flow level meter with installation position "vertical" (in fig. 2 and fig. 3: horizontal installation).

Fit in the milk pipeline

The branch pipe of the sampler and the flow level meter are fitted into the milk pipeline in the sampling box.

The milk pipeline, which has been installed under consideration of the spatial assignment of sampler and bottle drive, has to be cut open at the site designed for branch pipe and flow level meter (or to be composed from separate pipe pieces).

Exact position and length of the cut point have to be defined when designing the sampling box.

Weld a connection flange (norm part) with the appropriate nominal width to both milk pipe ends of the cut point.

If the milk pipeline is attached outside the sampling box, an axial play must be available for the mounting/dismounting of sampler and flow level meter after the milk pipeline has been loosened.

Aim for a stable and vibration-free position of the sampler in the sampling box.

4.11.2   Mounting of ULTRASAMPLER components

Mounting of sampler, type 6871-3/4/5

Mounting and dismounting of sampler and branch pipe can take place either separately or jointly as a screwed unit.

Mounting of branch pipe:

➢ Attach sealing rings at the flanges of the branch pipe.

➢ Flange the branch pipe to both sides of the milk pipeline (if flow level meter is used: flange it at the appropriate side). Slightly tighten fasteners.

➢ Turn branch pipe until weldable socket is in horizontal position. Tighten fasteners.

NOTE!

Turn branch pipe into the exact position only after having mounted sampler and bottle drive.

Sampler branch pipe

Clamp   Sealing ring   Offset tube   Steel section   Weldable socket
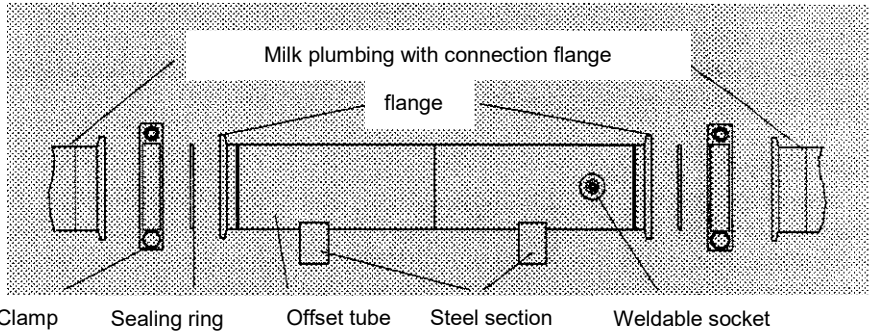
Fit the sampler to the branch pipe

➢ Attach the two holders of the sampler from below to the steel segments of the branch pipe.

Fasten each holder with one Allan screw M 8 x 20 at the steel segments.

Screwing of sampler and branch pipe
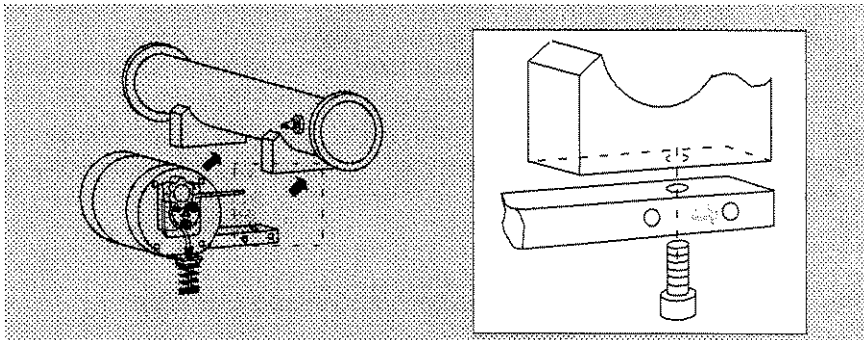
➢ Push union nut M 6 x 0,75 onto the free end of the pump hose (1)

Attach pump hose to suction cannula in weldable socket (2) and tighten union nut (3).

Connect pump hose with suction cannula
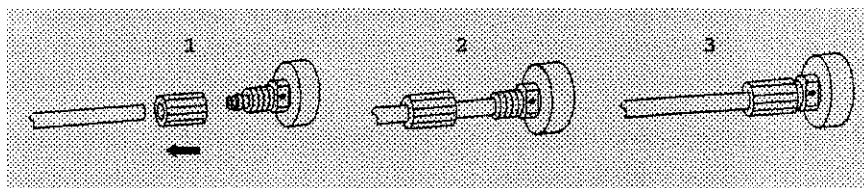
Additional fastening of branch pipe

Attach additional holders at the branch pipe ends and connect them with the cover of the sampling box.

These holders should be easily removable if the branch pipe is dismounted..

Check the position of the suction cannula in the weldable socket with regard to the following aspects:

➢ Granulation points against the direction of the milk flow (granulation and opening of the suction cannula point to the same direction)

➢ The granular area is vertical.

➢ The granular area is flush with the face of the weldable socket.

Any deviations have to be remedied in accordance with chapter 4.11.3.

Suction cannula in the weldable socket
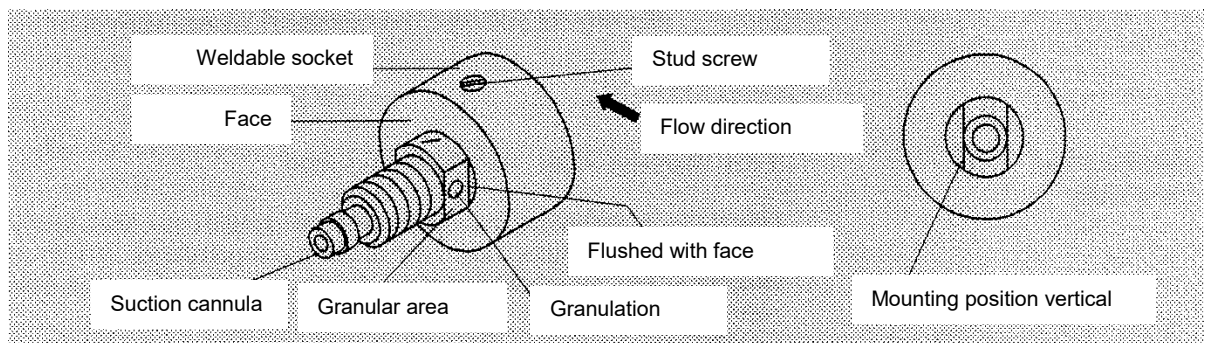
Dismounting of sampler, type 6871-3/4/5

Analogously to the mounting procedure, the sampler and the branch pipe can be dismounted either as a joint functional unit or one after the other.

It is possible without any problems to exchange the sampler without having to remove the branch pipe from the milk pipeline.

CAUTION!

Only dismount the sampler or the branch pipe when the motor of the collection truck is switched off and the system MAK 3002 is turned off!

Dismount the sampler

> ➢ Unscrew union nut from suction cannula and draw off pump hose.

> ➢ Disconnect sampler connection cable.

> ➢ Screw out each of the two cylinder screws M 8 x 20 at the bottom side of the sampler holders and take off sampler (see chapter 4.10.2 "Fit the sampler to the branch pipe").

Dismount the branch pipe (with or without sampler)

> ➢ Loosen the holders which fasten the branch pipe to the cover of the sampling box.

> ➢ For dismounting with sampler, disconnect connecting cable of sampler.

> ➢ Loosen additional milk pipe locking device (if any) outside the sampling box until milk pipeline gets an axial play.

> ➢ Take off fasteners from the branch pipe flanges and take out branch pipe (with or without sampler).

Mounting of flow level meter type 6826

The flow level meter is located between the branch pipe of the sampler and the settling distance and is flanged to both sides.

The milk sucked into the collection truck first flows through the flow level meter and then through the sampler.
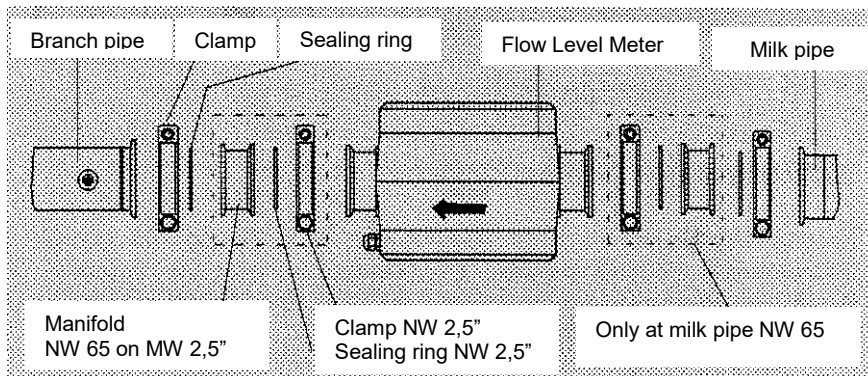
Observe the mounting instructions on the metal type plate of the flow level meter referring to flow direction and installation position!

> ➢ The flow direction is indicated by an arrow.

> ➢ The installation position in accordance with the type plate is horizontal or vertical.

Installation positions of the flow level meter, type 6826

| horizontal | vertical |
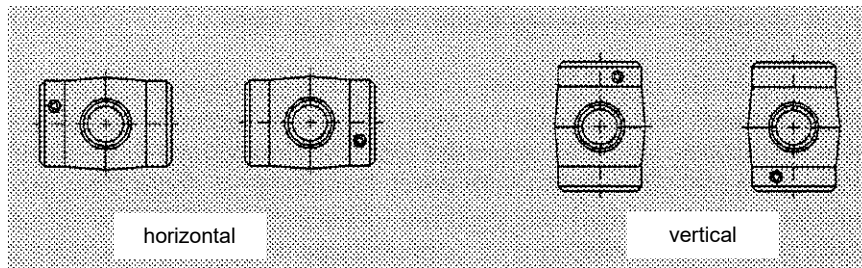
NOTE!

Mount the flow level meter in a way that the terminal box is accessible.

In case of unfavourable room conditions, attach the connection cable before mounting.

Flow level meter with nominal width NW 65:

The connection flanges of the flow level meter with NW 65 actually are 2,5" flanges.

To connect the sampler branch pipe, an adapter piece of NW 2,5" to NW 65 has to be inserted.

This also applies to the connection with the milk pipeline (settling section).

In the latter case, the adapter piece can be avoided by welding a connection flange with NW 2,5" to the milk pipeline.

For the connection of the 2,5" flanges, appropriate sealing rings and fasteners with a nominal width of 2,5" are required.

Dismount the flow level meter, type 6826

CAUTION!

Only dismount the flow level meter when the motor of the collecting truck is switched off and the system MAK 3002 is turned off!

Dismount the flow level meter

➢ Loosen locking devices of the milk pipeline outside the sampling box (achievement of axial play).

➢ Disconnect connecting cable.

➢ Loosen the fasteners above the flanges and take out flow level meter.

Mount/dismount the bottle drive, type 6874/6774-10

The bottle drive is screwed horizontally into the sampling box with cooling.

For this purpose, there are four mounting bores of ∅ 8 mm in the base plate at whose bottom four welded spacer bushings follow the bores.

The mounted bottle drive can sit on these spacer bushes (distance to the upper edge of the base plate 25 ... 26 mm)

The illustrations below show the position of the via holes in the base plate.

Mounting bores in the bottle drive
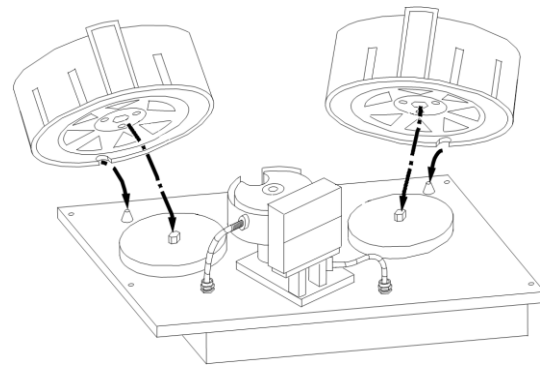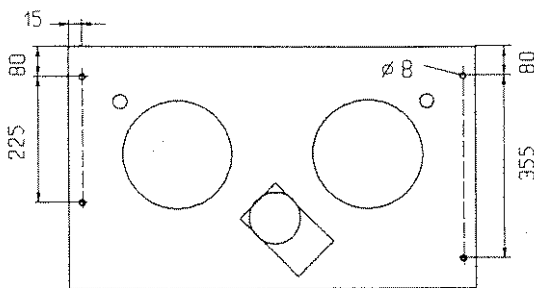
The holders for screwing the bottle drive with the sampling box have to implement the spatial assignment to the sampler (see 4.10.1 fig. 2 and fig. 3)

The position in relation to the sampler has to be stable and vibration-free.

Mounting tolerance:

Apart from the tolerances in fig. 2 and fig. 3 (chapter 4.10.1), a value of ≤ ± 1,5 mm applies to the radial deviation of the injection needle center from the magnetic disk center of the bottle drive.

CAUTION!

Mount and dismount the bottle drive only when the motor of the collecting truck has been switched off and system MAK 3002 has been turned off!

NOTE!

Carry out mounting / dismounting without round magazines.

Mounting of bottle drive

> ➢ Insert the bottle drive into the sampling box with cooling.

> ➢ Depending on the room conditions, first plug in connecting cable.

> ➢ Fasten bottle drive with four M6 screws, protect screw connections.

> ➢ Loosen fasteners of the branch pipe.
> Turn branch pipe with sampler until tip of injection needle points to the center of the magnetic disk.
> Tighten fasteners again.

Dismounting of bottle drive

> ➢ Loosen the four M6 screws. Remove bottle drive.

> ➢ Depending on the room conditions, disconnect plug of the connecting cable before or after the removal.

Mounting of manual sample bottle lifting device, type 6871-3-30

The manual sample bottle lifting device type 6871-3-30 is screwed to the holder of the sampler type 6871-/3/4/5 located on the pump side.

Screwing is carried out by means of two cylinder head screws M8 x 15 and spring rings.

During mounting, the sampler can either be separate or connected to the branch pipe.

Sampler and branch pipe can be available either installed in the sampling box or unmounted.

For equipment with proximity switch:
Screw proximity switch into the manual sample bottle lifting device as far as it will go and lock with nut.

Dimensions of the manual sample bottle lifting device

db687106.dwg
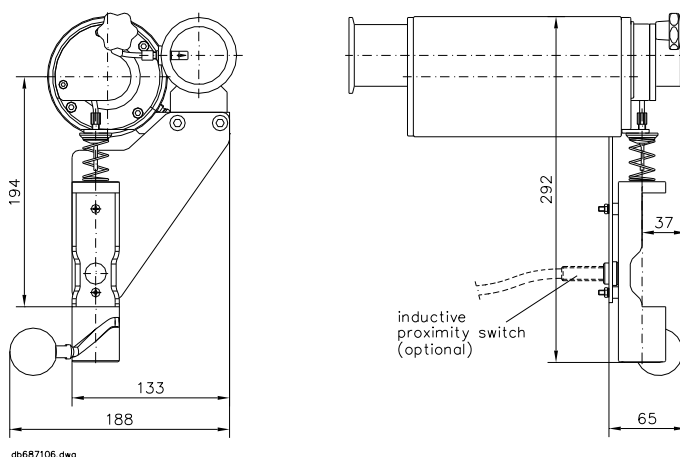
Mounting of semi-automatic sample bottle feed, type 6871-3-50

Analogous to lifting device type 6871-3-30.

4.11.3   Additional functional units

Filter operation

The filters (sieves) applied in the intake socket (or intake area) by the collection truck manufacturers have no influence on the operating behaviour of the ULTRASAMPLER.

The required length of the settling section is a prerequisite.

Mounting of a suction capacity reduction device

If milk quantities below 40 l are sucked in, the sampling time may be too short to sufficiently fill the sample bottles.

To guarantee a satisfactory filling level even in this case, the time for milk intake and consequently the sampling time has to be prolonged by reducing the suction capacity of the milk intake system.

By means of the expected delivery quantity (delivery quantity is included in the default data) MAK 3002 decides on an activation of this suction capacity reduction.

Depending on the design of the collecting truck, there are several possibilities to implement this technically.

The solution explained below makes possible the defined aeration of the air separator for suck-through systems equipped with a vacuum pump.

Suck-through systems with vacuum pump:

For suck-through systems with vacuum pump, the vacuum pump generates an underpressure in the air separator.

For milk intake, the milk is sucked into the air separator and in dependence of the filling level is pumped from there into the milk tank.

The underpressure in the air separator, which depends on the capacity of the vacuum pump, defines the suction capacity of this intake system.

The reduction of the underpressure is effected by a flow control unit.

4.12 Maintenance

Apart from the internal and external cleaning, the maintenance of the ULTRASAMPLER consists of a periodical change of the pump hose at the sampler.

It may be required to replace the suction cannula or injection needle if they are damaged.

4.12.1 Internal and external cleaning of ULTRASAMPLER

External cleaning of ULTRASAMPLER

> ➢ For the external cleaning of the individual functional units of the ULTRASAMPLER, use a humid sponge without any additional detergent.

> ➢ Clean the round magazines of the bottle drive in water baths under the following conditions.

Maximum cleaning time :	once a week for 5 minutes
Maximum cleaning temperature:	50 °C
Cleaning medium:	water bath (recirculated)

Internal cleaning of ULTRASAMPLER

Internal cleaning is related to the surfaces in the branch pipe and in the flow level meter moistened by the milk and takes place within the process of the collection truck cleaning.

In parallel, the sampling section of the sampler is rinsed in accordance with a special ULTRASAMPLER cleaning program.

For this purpose, the sampler pumps the cleaning fluid from the branch pipe into the sample bottle.

The cleaning program is triggered (independent of the installation):

1. by the menu item CIP in the MAK 3002 software

2. by a special switch for the collecting truck cleaning.

CAUTION!

The cleaning of the sampler reduces quality and cross-section of the pump hose.
This results in a decreasing filling level of the sample bottles.
Exchange the pump hose after each cleaning procedure, at the latest after 10 days.

4.12.2   Exchange the pump hose

The pump hose can be exchanged at any time but not during sampler operation.

Remove old pump hose

➢   Loosen star handle and take off rotor protection (plexiglass pane).

➢   Unscrew union nut at injection needle and suction cannula.

➢   Pull out old pump hose, remove union nut.
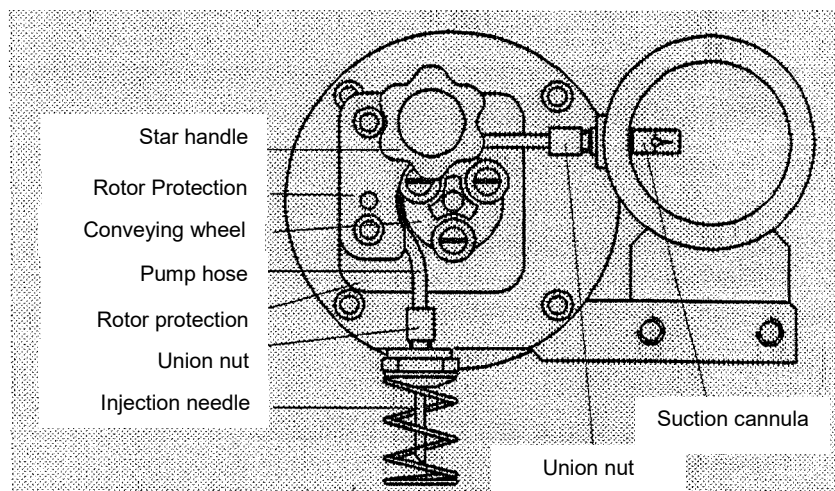
Install new pump hose

Note!

Do not twist the pump hose when inserting it!

Check if sample bottles are sufficiently filled after the hose exchange!

➢   Put new pump hose on injection needle and tighten union nut.

➢   Position the conveyor wheel as shown in the illustration and insert pump hose into the groove of the counterpiece.
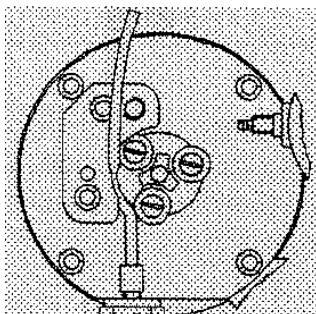
➢ Turn conveyor wheel clockwise and insert pump hose until pump hose is completely in-serted into the groove.
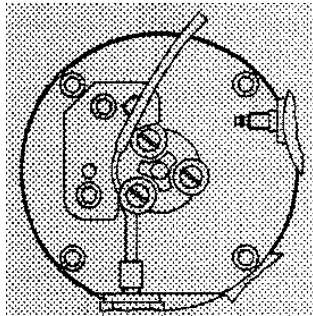
➢ Push union nut on pump hose.

➢ Put pump hose on suction cannula and tighten union nut.

➢ Put on rotor protection and screw in star handle.
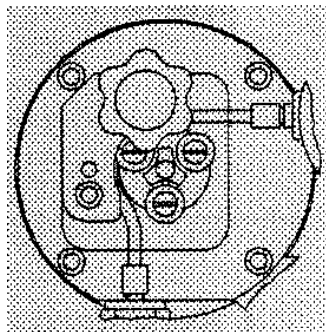
4.12.3   Mount the suction cannula
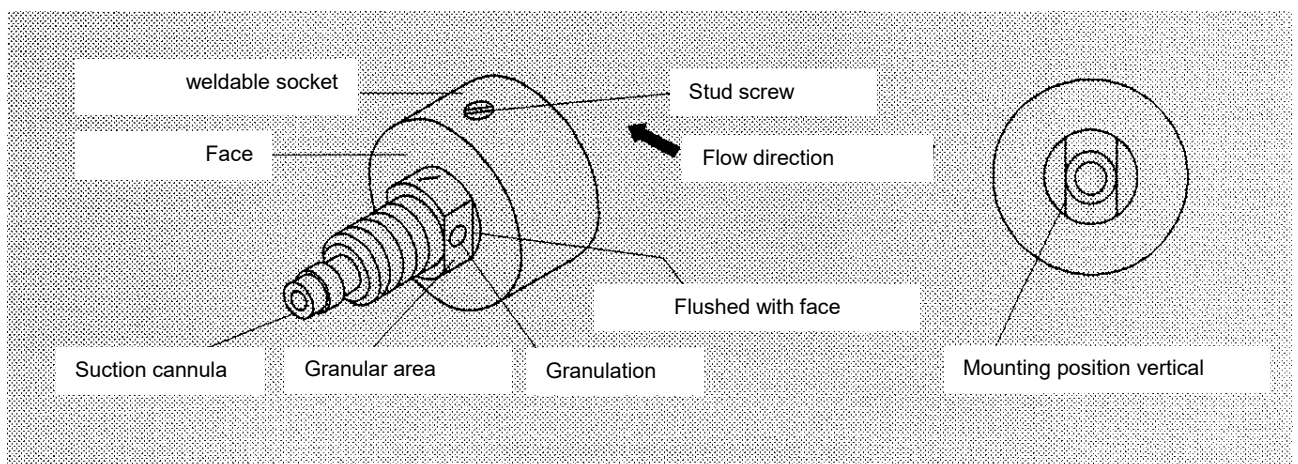
Remove suction cannula

> ➢ Unscrew union nut and take off pump hose.

> ➢ Unscrew stud screw in the weldable socket and remove suction cannula.

Install suction cannula

> ➢ Depending on the installation position, insert suction cannula into weldable socket.

> ➢ Tighten stud screw.

> ➢ Attach pump hose and screw union nut on.

INSTALLATION POSITION:

- Granular area is vertical

- Rear edge of the granular area is flush with face of weldable socket

- Granulation points against milk flow direction

4.12.4   Mount the injection needle
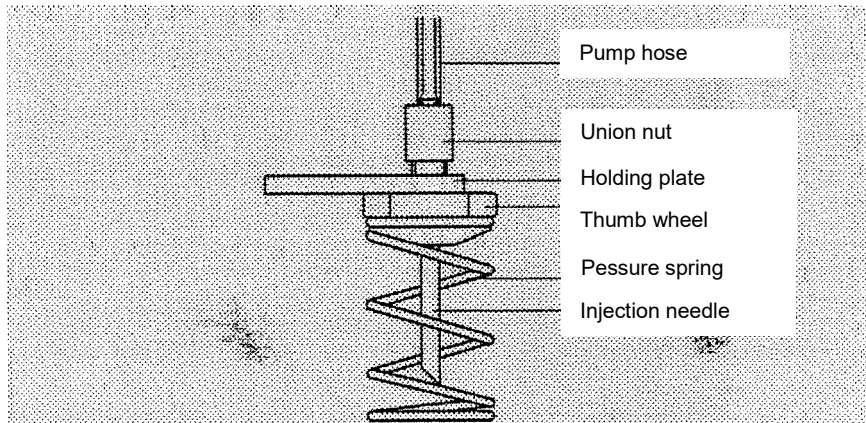
Remove injection needle:

Injection needle, thumb wheel with thread socket for union nut form a unit.

> ➢ Unscrew union nut and draw off pump hose

> ➢ Twist off spiral spring

> ➢ Screw injection needle out of the holder plate (turn thumb wheel)

For installation, proceed in reverse order

5 Startup

5.1 Sequence and instructions

The operating instruction MAK 3002, BA 970502, and the configuration instruction MAK 3002, SAK 960227, are included in this instruction. The issues described therein have to be complied with.

The startup of the system should essentially take place in the following sequence:

1. Before switching on the on-board voltage, check if the wiring of the complete system has been carried out correctly.

2. Set all parameters at the controller.
   Follow successively the items of the menu structure of the configuration instruction.

   It is not absolutely necessary to comply with this sequence, but all menu items should be handled!
   For the individual menus, their meaning and their setting options, and for the assignment and meaning of the inputs and outputs and vehicle-specific settings, see the configuration instruction.

Note:

After the startup has been successfully completed, it is recommended to print the parameters (for your vehicle documents).
The pre-set configuration data can be stored on an SSM cartridge and reloaded if required (EEP menu).

CAUTION:

Devices operated in system 3002 (such as printer) can only be applied in system 3001 after the address has been reprogrammed.
At present this can only be carried out by BARTEC.

5.2 Assignment of P-NET addresses for Sys. 3001 and Sys. 3002

CAUTION:

Devices operated in system 3002 (such as printers) can only be applied in system 3001 after the address has been reprogrammed.
At present this can only by carried out by BARTEC.

Printer, type 6863-3
System 3001: PNET address 0F H
System 3002: PNET address 40 H

MID 6820-1D
System 3001: PNET address 0 2 H,
Register E8 = 342002

MID 6823-1
System 3002: PNET address 22H,
Register E8 = 342022

ULTRASAMPLER controller 6870-2
Supplier sampler 3001: PNET address 14 H
Supplier sampler 3002: PNET address 25 H

Tank sampler 3001: PNET address 19 H
Tank sampler 3002: PNET-address 26 H

I/O box 6864
Supplier sampler 3001: PNET address 19 H
Supplier sampler 3002: PNET address 31 H

P-NET addresses are given in HEX format ($).

5.3   Instruction for the setting and adjustment of Ultrasampler

1. Correct installation

To guarantee the correct functioning of the Ultrasampler, all components have to be installed and connected correctly in accordance with chapter 4.

Pay particular attention to the following issues:

- The suction hose should not be longer than 6 m.
- There should be a screen at the place where the suction hose is screwed in.
- Take care that no external air is sucked in through leaks (valves, screw connections etc.).
- The flow level meter must be a straight section (no bow) which stretches as long as possible. This settling distance has to be at least 5 times longer than the nominal width of the pipe.
- The suction cannula has to be mounted correctly.
- Use only BARTEC pump hoses.
- The sampler has to be positioned at the highest point of the piping system so that no residual milk can remain in the system and impair subsequent samples.
- The injection needle has to be positioned vertically above the middle of the bottle (plug) (see chapter 4.6.2 Alignment of sampler injection needle to sample bottle).

2. First startup

The first startup has to be carried out in accordance with the following explanations and conditions.

2.1 Admissible maximal suction capactity in dependence of the intake quantity

The maximum suction capacity in dependence of the intake quantity is defined by the technical data of the ULTRASAMPLER.

As the ULTRASAMPLER works with a peristaltic pump, its maximally conveyed volume is limited by physical and mechanical parameters (e.g. viscosity of the hose or maximal acceleration of the step motor). The step motor applied here requires 400 steps per revolution, with a maximum frequency of 10 kHz.

Consequently, the maximum number of rev/sec. is: $\dfrac{10\ kHz}{400\ Hz} = 25\ \dfrac{revolutions}{s}$

With normal underpressure (approx. 0,3 bar) , the pump conveys about 0,27 ml per revolution. (This value corresponds to the calibration factor of the hose = 270.)

With a maximum frequency of 10 kHz, the pump conveys: 25*0,27 ml = 6,75 ml per second.

The start-up and braking time of the step motor is approx. 0,5 seconds.

Filling time (limit value of the pump) required to fill a 35 ml sample bottle up to 100 %:

$$35 / 6{,}75 + 0{,}5 \text{ sec} = \textbf{5,7 sec}.$$

To get a representative sample, the suction procedure mustn´t be shorter than the calculated amount of 5,7 seconds.

If pre-rinsing is activated, this time is additionally extended by a pre-rinsing time of approx. 0,5 seconds.

Assuming that

underpressure:	approx. 0,3 bar
calibration factor (hose):	approx. 270
sample bottle volume:	35 ml
settling distance:	5xNW (with NW50 = 250 mm),

the following guiding values for a minimum intake quantity have to be applied:

Intake quantity	Max. suction capacity without pre-rinsing	Max. suction capacity with pre-rinsing
20 l	200 l/min	180 l/min
40 l	400 l/min	380 l/min
80 l	800 l/min	760 l/min
160 l	1600 l/min	1520 l/min

NOTES:

As it is rather difficult to run the suction pump in different stages, it is possible to suck quantities of 20 l or 40 l with low capacity and the remaining quantities with high capacity.

In each case at least a single-stage reduction of the suction capacity must be provided.

If the throttling is activated for a certain period, this period has to be selected in such a way that the entire suction procedure is carried out with the throttled capacity, i.e. for a suction capacity 200 l/min a throttling period of at least 6 seconds has to be set.
The control is carried out automatically via an output of the data acquisition system
(time setting in MAK 3002 controller).

As with small intake quantities the suction capacity is increased continuously and is highest at the end, the suction capacity of the system should not be approached to the performance limit of the sampler, otherwise power peaks cannot be regulated and consequently the required rep-resentativity cannot be achieved.

Preparatory steps for functional test

Prepare 160 l salt water for intake.

Concentration approx. 500 g salt (1 packet) on 150 l water.

The saline solution should generate an output voltage of 0,3 ... 0,4 V at the level sensor output when the pipe is full.

It is advisable to suck in this quantity of salt water into the collecting truck two times.

While the first 160 l stay in the air separator and in the milk pipes, the second 160 l can be re-moved from the collecting truck (discharged) for further test runs.

Prepare collecting truck for intake, immerse the intake socket in the salt water.

2.2 Adjustment and settings of the ULTRASAMPLER system

After the mounting has been successfully completed, and after is has been made sure that the limit data of the sampler are not exceeded, the electrical adjustment is carried out.

Proceed as follows:

Default settings at the MAK Controller 3002 in combination with ULTRASAMPLER Controller type 6870-2: (e.g. with Ultrasampler controller software version 2.32)

Flow Level Meter:	ON	flushing:	ON
Calm down:	ON	Fill limit:	120 %
(if there is settling section)			
Whirl.slow:	OFF	Calib. factor:	270
Powermatch:	OFF	On-delay:	0,0 s
Deducted quantity:	0,0 ml	Error-delay:	8,0 s
Sample volume:	35 ml	Corr.factor:	
Off delay:	0,0 s	low	0 % 1/x
Flush quantity:	19 l	medium	0 % 1/x
Start delay:	0,0 s	high	0 % 1/x
Start quantity	0 l	Dyn.adaptn:	OFF

Default settings at the MAK Controller 3002 in combination with ULTRASAMPLER Controller type 6771-30:

Flushing:	ON	Sample volume:	35 ml
Flush quty.:	19 l	Fill limit:	120 %
Corr.factor:		Calib.factor:	
Low	0 % 1/x	Low	270 μl/U
Medium	0 % 1/x	Medium	270 μl/U
High	0 % 1/x	high	270 μl/U
FLM E5:	28,8 m3/h (NW 50)	On-delay:	0,0 s
	57,6 m3/h (NW 65)	Off-delay:	0,0 s
Dyn.adaptn:	OFF	Deducted quantity:	0,0 ml

Control of sampler flushing

The intake quantity of 160 l is higher than the quantity of 39 l (defined in the parameters) from which a sampler flushing has to be carried out.

The sampler starts the flushing at the ULTRASAMPLER without flow level meter after the check-back signal from MAK 3002.

A milk sensor operated by MAK 3002 reports the salt water front.

In case of ULTRASAMPLER with flow level meter, the flow level meter signalises the beginning of the salt water flow.

The rinsing process of the sampler can be recognised if there are some revolutions of the peristaltic pump, first in sampling direction, then in the opposite direction, shortly after the start of the intake.

Then the lifting device must lift the sample bottle onto the filling position.

Setting of the filling volume of the sample bottle

Step 1:

Intake of a larger quantity ($\geq$ 80 l) with the pump not being throttled. This quantity must correspond to the pre-set default quantity.

Step 2:

Check if the displayed value of the pumped sample bottle volume (MAK 3002 Controller) corresponds to the pre-set value to 2-3 ml (this has nothing to do yet with the hose calibration factor!)

Adjustment of the scaling:

The default setting for a flow level meter is as follows:

For NW 50 mm = 28.0 m³/h. This corresponds to a current output of 4 - 20 mA bei 0 - 480 l/min.

For NW 65 mm = 57,6 m³/h. (4 – 20 mA for 0 – 960 l/min.)

Practice has shown, however, that the flow part of the flow level meter (which unlike the normal MID is not always filled with liquid) differs slightly depending on the suction system (vacuum/impeller and others).
Often the flow is higher by 5 – 10 % as, depending on the suction system, the milk that is sucked in is already aerated (air bubbles). To compensate for this, the value of register E5 has to be adjusted as follows:

for NW 50:   between 28.0 and 32.0

for NW 65:   between 57,6 and 62,0

After having changed the setting, the first step and the second step have to be repeated each time until the volume values are approximately the same.

NOTES:

Only expert staff can carry out these adjustments.

Make sure that the measuring range of 480 l/min (for NW 50) is sufficient, i.e. that there are reserves upward.
A remedy can be found if the scaling is changed from 480 l/min to 960 l/min. This is achieved by changing the nominal width in the MAK controller from 50 mm to 65 mm although actually the pipeline has NW 50. At the same time, register E5 has to be set to a value between 57,6 and maximally 60,0.

Entry of parameters for flow level meter

The parameters of the flow level meter are pre-set by BARTEC and are not subject to any adjustment to the collecting truck type. The parameters can only be read and changed with the display unit PD 210.

It may be required to intervene into the factory setting, for example if there are differences in the sample bottle filling (refers to E5).

Parameter	Content-NW50	Content-NW65	Explanation
E1	xx.xxxx	xx.xxxx	Do not change factory default value
E2	.xxxxxx	.xxxxxx	Do not change factory default value
E3	.xxxxxx	.xxxxxx	Do not change factory default value
E4	.xxxxxx	.xxxxxx	Cannot be changed
E5	32.000	64.000	
E6	444444	444444	
E7	210100	210100	
E8	102000	102000	

Parameter adjustment of E5 with display unit PD 210

Parameter E5 defines the power output (4 ... 20 mA) in dependence of the flow rate.

➤ Turn MAK 3002 off and remove terminal box of flow level meter.

➤ Lead two-wire cable through PG into the terminal box and connect PD 210 to terminals 7 (+) and 8 (-). Observe polarity!

➤ Turn locking switch of TERMINAL BOARD to "ON".

➤ Reconnect terminal box and turn MAK 3002 on.

➤ Press **[E]** and then **[5]**.
„5" appears on the left side as parameter number, followed by the content.

➤ Use **[0]** ... **[9]** to enter new parameter value and press [=] to confirm. The new parameter value has been entered.

➤ Turn off MAK 3002, remove terminal box, disconnect connection cable and turn the locking switch OFF. Screw terminal box on again.

<u>Step 3:</u>

Fine adjustment of the bottle volume:

After the adjustment described above has been finished and the values are in agreement with each other, the filled sample bottle volume can be adapted by means of the hose calibration factor.

An increase of this factor means that a lower quantity is filled in because the sampler controller assumes that the peristaltic pump conveys more with one revolution and consequently fewer revolutions or steps are required to achieve the same volume.

After this value has also been adjusted, the pumped volume of the sampler should be approximately correct even for small quantities. If this is not the case, it has to be checked if the maximum values of the sampler - especially for small quantities - are not exceeded.

Measurement accuracy:

The display of the pumped sample bottle volume at the MAK 3002 already indicates if the sample that has been taken is representative or if the limit values of the sampler (se 2.1) have been reached.
In the normal case, i.e. when the actual default quantity corresponds to the entered default quantity and the ULTRASAMPLER system has been duly adjusted and is working properly, this value should be equal to the preset sample bottle volume.

As the intake procedure is not constant but capacity and air content continuously change, only an approximate measurement can take place. Moreover, a change of the suction capacity results in a change of the underpressure and consequently the hose calibration factor slightly varies.

Consequently, the displayed (pumped) sample bottle volume should be considered as a rough check-back signal. Due to the intake process which is not always constant (as mentioned above), the value can deviate by approx.10 % (about 2 – 3 ml) from the default sample bottle volume without affecting the representativity.

Ensure the representativity of the samples

To guarantee representativity, all issues mentioned above have to be observed.

It may nevertheless happen that the fat value of the automatic sample does not immediately correspond to the fat value of the manual sample.

One reason may be that the flow and the level cannot be measured properly as the milk is highly swirled at the place where the flow level meter is located (e.g. if there is a bow immediately before)

This can be remedied:

  - by a mechanical change of the pipeline (best solution!)
                          or
 - by telling the controller that the milk is highly swirled
   (calm down = OFF)

Then the controller valuates the air content of the milk much more highly. As a result, with the activation of this mode the controller assumes at the end of the suction procedure (i.e. when much air is in the milk) that the air content is higher, i.e. that less milk passes and less milk is branched off. As at the end of the suction procedure mainly milk with a high fat content is sucked in, the sample taken automatically has a lower fat content. This method is usually only effective for low quantities (up to approx. 100 l) as for high quantities the remainder is not valuated so highly in percentual terms.

For higher suction capacities (500-1000 l/min) this setting can even cause an improvement for higher intake quantities as the last milk can be highly swirled due to the high suction capacity.

4. What can you do if there are above-average fat values or below-average fat values?

If a below-average fat value or an above-average fat value is stated in the approval test of the Ultrasampler, you have to proceed as follows:

Check basic settings and conditions:

    a)   Remove the suction cannula and check if it is leakproof and not clogged.
    b)   Check correct mounting/installation of the suction cannula (opposite the flow path, correct distance to the pipe wall, has the needle been soldered?).
    c)   Replace sampler hose.
    d)   In the setting "Control times", set the time for throttling in such a way that it has expired in the last third for an intake quantity of 40 litres.
    e)   Check if the sampling volume that has been filled in corresponds to the sampling volume indicated on the controller.
            If there is a deviation of more than 10 %, the programming of register E5 of the flow level meter has to be corrected.
            In many cases there is something wrong with this setting and this often leads to complaints!
            Have the limiting values of the sampler been complied with (throttling for small quantities, suction capacity)?
    f)   Is the flow level scaling sufficient (480 l/m for NW 50 mm)?

Below-average fat value:

If a below-average fat value s stated in all collected quantities, the parameter "Start-up delay" (in peripheral/ULTRASAMPLER) makes possible to increase the fat value (note: parameter is not the same as in versions 2.17 and 2.20).
By means of this parameter, the start of the sampler can be influenced. As at the beginning of the milk intake, low-fat milk is sucked in, a delayed start of the sampler results in the fact that less low-fat milk is filled in, which leads to a general increase of the fat content of the sample.

Parameter "Start delay" in MAK 3002 software 1.34 and higher (only in combination with 2.32 U.S. software):

Configuration - peripheral - ULTRASAMPLER:

        Start delay: 0,4 s.

(begin with a value between 0,4 and 0,7; carry out with a milk quantity, measure fat value, correct value if required, test again!)

Above-average fat value:

Possibility 1 (default):

If a general above-average fat value is stated, the parameter calm down = OFF makes possible to reduce the fat content.

Possibility 2 (only in exceptional cases and for milk collecting trucks with high suction capacity):

On milk collecting trucks with high suction capacities in combination with the ULTRASAMPLER sampling system, high intake quantities (80 l and 160 l) resulted in above-average fat values whereas low intake quantities (40 l) showed slightly below-average fat values. This is why the following changes were introduced (for software version 2.32 and higher of ULTRASAMPLER Controller and for collecting truck software MAK 1.34 and higher).

> **CAUTION:**
>
> It is only necessary to apply ULTRASAMPLER software on 2.32 if high intake quantities (80 l and 160 l) result in above-average fat values whereas low intake quantities show slightly below-average fat values.
>
> For ULTRASAMPLER software version 2.30 and higher, all functions of the versions such as 2.14, 2.17, 2.19 and 2.20 are integrated.
>
> The MAK 3002 software version 1.43 and higher also works with older ULTRASAMPLER software versions.
>
> If the software 1.43 and higher is imported for the first time into the MAK controller, the parameters for the ULTRASAMPLER configuration (peripheral) have to be entered again (reason: parameter structure has shifted).

3 new parameters (one for each intake quantity) were introduced. With these parameters, the filling level curve between proportional (more fat) and 1/X (less fat) can be adjusted to the UL-TRASAMPLER control.

These 3 parameters only appear in the controller if software 2.32 is applied in the UL-TRASAMPLER. As soon as software 2.32 is installed in the sampler controller, the 3 parameters (correction factors) have to be set to ZERO (0) at first.

The 3 parameters in peripheral/ULTRASAMPLER are defined as follows:

Correction factors (correction factor) low, middle and high are deduced from the preset switching thresholds of the pump (sequence control/pump configuration).

Correction factor low is effective for:
  ➢   Intake quantities below the preset switching threshold low/middle.

Correction factor middle is effective for:
  ➢   Intake quantities between the settings of the switching thresholds low/middle and middle/high.

Correction factor high is effective for:
  ➢   Intake quantities above the preset switching threshold middle/high.

Default settings of the correction factors: setting range = 0 to 100
                                                                             setting range = 0 to 10
                                                                             (is preset for older versions)

> 0 = curve is still proportional, i.e. like before
>   the filling level in the pipe is linear to the FLM signal (see drawing)

> 100 = curve is now 1/X, i.e. the filling level in the pipe is not linear (1/X function)
>   to the FLM signal (see drawing).

"Calm down" must be ON so that the correction factors can be effective!

SPECIAL NOTES on the calculation of the correct settings:

The setting of the correction factors has to be defined with milk in each case.

First of all begin with 2 (middle and high), with higher intake quantities.

After having analysed the fat values, a higher or lower value can be set due to the tendency. This means that the correct settings have to be ascertained by practical tests at the respective truck.

Diagram for the explanation of the correction factors:

Filling
level in
pipe

100 %

Proportional
(+ fat)
corr.fact. = 0

1/x

(-fat)

Corr.fact. = 100

FLM Signal
(2,3 V)

6 Calibration

6.1 Calibration of MAK 3002

For calibration observe the following issues:

6.1.1 Check parameter setting

This is possible in menu/1: configuration/7:calibration parameters. All calibration-relevant parameters are listed there.
It is better to print the parameter list (Menu/1:configuration/6:parameter print) and then check the parameters by means of this list. The parameters subject to calibration are marked with an asterisk there.

6.1.2 Check / adjust calibration factor setting

Calibration of MID:

1. Set the MID for programming

Screw open the MID terminal box (into which the cable is laid). In the top left corner of the terminal box PCB you will find the switch "programenable". To change the calibration factor, move the switch to "ON" position. Re-fit the terminal box.

For software version x.132 and higher, it can stay on the "ON" position during normal measuring operation. For older versions under x.132, the switch has to be put on "OFF" position again.

2. Collect the calibration volume

Start normal collection procedure and suck in the calibration volume. When the counter stops, note the measured value, end the collection.

3. Display or enter the set calibration factor

If you select the menu item "Calibration parameters" , all software modules of the system that are subject to calibration are listed on the display.
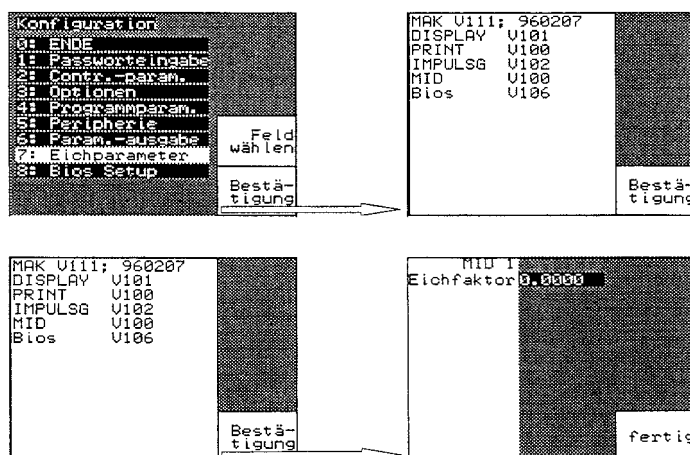
If the calibration switch on the MAK controller is turned off, the calibration factor is only displayed.
If the calibration switch is turned on, the new calibration factor can be entered here.

4. Calculate and enter a new calibration factor

To determine the new calibration factor, the displayed calibration factor has to be entered as "old calibration factor" into the formula below:

> **New calibration factor = old calibration factor * (calibrated volume/measured value)**

Example:
Old calibration factor (read)   40,0000
Calibrated volume   500,0 l
Measured value (displayed by counter)   502,1 l

New calibration factor = 40,0000 * (500 / 502,1) = 39,8237

The new calibration factor has to be entered as shown under 3.

5. Control measurement

The calibrated volume should then be collected again in order to control if the setting is correct. If required, correct the factor as described above.

6. Reset MID and controller into measuring mode

For software version x.132 and higher, the switch can remain "ON" , for lower software versions it has to be reset to "OFF".

Re-fit the terminal box and screw tight. Turn off and seal the calibration switch at the controller.

NOTE:

After having entered the new calibration factor, the correct setting of the calibration factor has to be checked by means of another intake of the calibration volume. If required, correct the factor again as described above.

6.1.3   After the calibration

After the calibration, move the calibration switch on the bottom of the controller to horizontal position and seal it. It is imperative for the system to be in the main menu when this operation is performed ("BARTEC" at the top edge of the display). In the unprotected state (calibration switch open) a large E blinks in the centre of the main menu display. When the calibration switch is in horizontal position, this E disappears and the parameters subject to calibration are locked. You can then check for instance if it is impossible now to change the calibration factor.

It is not necessary to complement the measuring system type plate attached to the system as the type plate at the controller is permanently connected to the entire measurement system due to the sealing process. This seal simultaneously protects the fastening screws for the bottom section of the controller and the type plate. As there is also a general license, is not necessary to replace the type plate of the measurement chamber. Data provided by the manufacturer remains valid.

Enclosed preliminary test certificates have to be collected and submitted to the calibration official.

6.2 Calibration-related instructions for servicing the MAK 3002

Before starting the servicing works, print out the parameters - where possible - or record the parameter settings manually.

When the servicing works are completed, recheck all the parameters against the previously compiled list.

1. Devices with calibration marks may only be replaced by pre-tested parts. These devices usually include the MID, the printer and the controller (either complete or alternatively only top section or bottom section).

2. The repair engineers mark may only be attached if the calibration term (indicated on the main stamp) has not yet expired and if the repair has really been carried out by an authorised repair company.

3. The repair engineers mark has to be attached on the replaced or repaired part. If any security stamps have been damaged (lead seals), the main stamp (calibrated until…) has also to be cancelled. The repair engineers stamp has to be attached. The date has to be entered with waterproof ink on the repair engineers mark.

4. Damaged lead seals have to be replaced by new ones and stamped with the repair engineers mark. Every authorised repair engineer has a metal stamp for this purpose.

5. The responsible weights an measures authorities have to be notified immediately that the repair engineers stamp has been attached.

6. If any works have to be carried out on the MID, it is recommended to carry them out in the presence of a calibration official, as after a repair on the MID has been completed, the calibration official is no longer able to check whether the calibration factor has been changed. The MID calibration factor is stored and sealed in the MID. The controller only serves as a display and editing medium.

7. If the top section of the controller is exchanged, there is usually no need to set any parameters. For safety reasons, however, it is imperative to check the parameters. The issues described above have to be observed.
   If the bottom section of the controller is exchanged, all parameters have to be entered again. The data of the previously made print-out have to be entered with absolute accuracy. If due to a defect the parameters relevant for calibration cannot be read, the repair engineers mark mustn´t be attached after the end of the works. The responsible weights an measures authorities have to be notified immediately. This applies also if there is the slightest doubt in the measurement accuracy of the system (for any other reasons).

8. Preliminary test certificates accompanying any replacement parts have to be handed over to the customers contact person.

7 Troubleshooting

7.1 If everything else fails!

> **Only apply in extreme emergencies and after consulting the BARTEC service staff!**

7.1.1 Main menu does not appear when system is turned on

If for instance after upload, exchange of top section, first startup etc., the basic menu is not displayed on the controller after turning on the system, proceed as follows.

- **If display remains dark after turning on the device:**

  Check complete system wiring or make sure that the ribbon cables are properly connected between the top section and the bottom section.

- **If the display shows the test menu and then stops:**

  1. Confirm all error messages with (Abort) or (OK) until the main menu appears. If this is not possible, press (DEL) during the booting procedure in order to get to BIOS. Then proceed as described in 2*****.

  2. To delete the internal memories, proceed as follows:

     | Delete EEPROM: | Menu |
     | | Configuration |
     | | BIOS |
     | ***** | Config |
     | | System Config |
     | | Time/Date/RAM |
     | | EEPROM clear |
     | | Quit |

     | Delete RAM : | RAM or |
     | | Quit |

     Wait for the main menu to appear after booting.

  3. Interrupt voltage for approx. 5 sec.

  4. Confirm all error messages with (abort) or (OK) until the main menu appears.

  5. Set the language by means of the following key combinations:
     menu
     configuration
     contr.config
     language select
     German
     end
     Confirm until basic menu appears

6. Carry out further configuration steps in accordance with the operating instruction. The configuration is not stored until you have returned to the main menu.

- If the main menu does not appear, an additional program upload is necessary:

    1. If it is necessary to reload the program, connect SSM cartridge shaft

    2. Apply voltage

    3. Turn off calibration switch (switch in vertical position)

    4. Confirm all error messages with (Abort) or (OK) until the main menu appears. If this is not possible, press the (DEL) key during the booting procedure in order to get to BIOS. Then proceed as described under 5*****.

Key sequence:	Menu
	Configuration
	BIOS
*****	Prog.Load
	From HLK
	Quit

        Wait until the main menu appears or until the first error message is displayed.

    5. Interrupt voltage for approx. 5 sec.

    6. Carry out further configuration steps in accordance with operating instruction. The configuration is not stored until you have returned to the main menu.

7.1.2   Problems during activation of a peripheral (I/O box)

To activate a device, actuate the appropriate "ON" in the *PERIPHERAL* menu, then enter the serial number ("A" no.). If any error messages appear during activation of a device, they have to be ignored at first. Activate all other devices (1st run).

If there are still error messages after the activation of all devices ("No Response" or "Wrong serial number"), repeat the procedure (2nd run). Delete the respective "A".no. and enter it again. After this 2nd run everything should work, and there should not be any error messages.

If there are still error messages, the device is defective or the wiring is not correct.

7.2　Software reset

7.2.1　Controller

If the controller – like a PC – stops or does not run any more, it can be booted by means of a reset. After the reset the test routines run through, then the main menu appears. Error messages have to be confirmed.

A reset can only be carried out when the calibration switch is turned off (horizontal position).

➢ For controller type 6744-10, the following keys have to be pressed simultaneously:

Softkeys [1] and [4] and [ALT].

➢ For controller type 6741-10, the following keys have to be pressed simultaneously:

Softkeys [1] and [4] and [ALT].

➢ For controller type 6731-10, the following keys have to be pressed simultaneously:

Softkeys [1] and [4] and [SHIFT].

8   Replacement of devices

All serial numbers ("A" no.) of the devices are registered in the controller (peripherals). If a device is defective and has to be replaced, the "A" no. of the new device has to be entered. Basically the procedure is the same as for startup. Delete the "A" no. of the defective device in the menu "configuration/peripheral" and enter the new "A" no.

> Calibration and configuration data is stored in EEPROMs in the bottom section of the controller. If the bottom section has to be replaced, a recalibration is necessary.

Replacement of devices explained at the example of the I/O box, with controller type 6741-10:

1. Turn the system off!

2. Disconnect the defective I/O box and remove it from the holder.

3. Mount and connect the replacement I/O box.

4. Then enter the serial number ("A" no. on the type plate) of the I/O box at the controller, as otherwise it cannot be addressed.

Proceed as follows:
Turn on system and confirm all error messages.
The main menu appears, and you have two possibilities:
Enter **"Tour start"** or **"Menu"** (softkeys at the right side of the display)

Press:	`[Menu]`
Select field:	**1: Configuration**
Confirm selection:	`[OK]`
Select field:	**1: Entry of password**
Confirm selection:	`[Confirmation]`
Enter user password or service password	
Selct field:	**5: Peripheral**
Confirm selectionl:	`[OK]`
Select field:	**I/O box**
Confirm selection:	`[OK]`

There are different messages indicating there is "no response". Consequently a dialog between controller and device is not possible.

Confirm the messages with the softkey `[Abort]` (right of the display).

The following menu appears:

I/O box:	ON
Serial no.:	new
A no.	
Version:	

Select the field *Serial no.* and press any numeric key, e.g. 1.

Additionally the following 2 softkeys are displayed:
`[<|_ASCII]` und `[>|_ABC]`
By means of these keys, you can move the cursor to the left or right side.
Move the cursor to the extreme right with: `[>|_ABC]`.

Then delete the old serial number digit after digit by repeatedly pressing the `[DEL]` key.

Enter the *new* "A" number from the type plate of the printer.

Please note the double assignment of the numeric keys! To change over, press the left key (arrow upwards).

After the entry press `[CONFIRMATION]`.

The following message appears:

I/O box
Module activated

Then this menu is displayed:

I/O box:	ON
Serial no.:	new
A no.	
Version:	

Then press `[Ready]`

Then press `[OK]` until you are back in the main menu.

The replacement is finished.

9 Software

9.1 Upload program

This chapter describes how to carry out a program update. The program is on an SSM cartridge (1 MB / 2 MB) which can only be used for this purpose. Please note the instructions accompanying the SSM cartridge which contains the appropriate program!
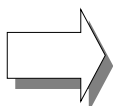
Proceed as follows:

Put cartridge containing the program into the SSM cartridge station.

Turn on the system and confirm all error messages.

The main menu appears.
Turn off the calibration switch, the display shows a blinking **E**.

Press [menu] (softkey on the right side of the display)

> Carry out a parameter print at first (in submenu "configuration").
> It is required only in few cases to delete the EEPROM areas.

Select field: **1:configuration**
Confirm selection: **[OK]**

Select field: **8: BIOS-Setup**
Confirm selection: **[OK]**

Menu *BIOS SETUP* appears.

Press softkey: **[Progr.-File-load]**
2nd menu appears with 3 softkeys:

Press softkey: **[from_HLK]**

A message on the contents of the SSM cartridge appears (program name, version etc.)
Press softkey: **[Quit]**

Now the program loading starts, the old program is erased first. The whole procedure takes about 10 minutes. The percentage of loading is displayed. Then there is a check if everything has been transmitted correctly. The display shows an hour-glass. After about 1 minute the main menu appears. The loading procedure has been successfully completed!
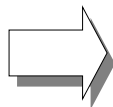
Some error messages and warnings may appear on the basic menu after the up-load.
They can be ignored and deleted with [confirm].

Please make sure that by no means the voltage supply is interrupted during the upload procedure.
Otherwise the upload procedure is disturbed and the controller has to be repro-grammed!

Delete EEPROM areas (if required):

Select field: **1:configuration**
Confirm selection: `[OK]`

Select field: **2:contr. parameter**
Confirm selection: `[OK]`

Select field: **4:delete EEPROM**
Confirm selection: `[OK]`

The menu *Delete **EEPROM*** appears

All of the 3 EEPROM areas should be deleted:
        CPU-EEPROM
        Calibration EEPROM
        Config-EEPROM

To delete them, select the 1st field (CPU-EEPROM) and press `[confirm]`.
The program asks you again: **„Warning: delete EEPROM?"**
Confirm with: `[yes].`

Proceed in the same way to delete the two other EEPROM areas!

After deleting the 3 EEPROMs, return to the main menu!

Press the softkey   `[menu]`

After the successful upload, all configuration parameters have to be entered again in accord-ance with the parameter printout (if the EEPROM areas are deleted!).

9.2   BIOS setup

See separate operating manual "Bios Setup, System 3002"
This manual describes the BIOS setup of the controller for system 3002. The settings required in individual cases are dependent on the respective system configuration and can be found in the documentation of the respective devices.

The BIOS setting parameters are pre-set when the device is delivered. Modifications are only necessary in special cases. Incorrect settings may result in serious malfunctions. Contact our service staff if necessary!

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