Measuring System
MAK TIGER 3003

Service manual

SA 131128

Contents

Exclusion of liability

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

1   About this manual

The illustrations in this manual are intended to illustrate the information and descriptions. They cannot always be transferred unchanged and may differ slightly from the actual design of the device.

BARTEC GmbH reserves the right to make technical changes at any time.

BARTEC GmbH is under no circumstances responsible or liable for any indirect or consequential damages resulting from the use, operation or application of this user manual.

Please read the operating instructions carefully before using the product.

Signs and symbols

The following characters and symbols are used in this manual to highlight passages that need special attention.

Notes
This arrow indicates special features to be observed during operation.

Warning
This symbol draws your attention to passages that, if not followed or followed inaccurately, may result in damage to or destruction of parts of the system or loss of data.

Danger!
This symbol marks passages that, if not followed, endanger the health or life of humans.

Special notes that appear within the text are marked with a frame.

2 Safety precautions

2.1 General safety instructions

The equipment operator is responsible for complying with all regulations applicable to storage, transport and handling.

For safe installation and commissioning, the knowledge of the safety instructions and warnings in this service manual and their strict compliance are essential.

Careful handling and consistent adherence to instructions can help to prevent accidents, injuries and property damage.

All regulations and provisions shall remain in full force when operating the equipment with MAK units.

The units were built in compliance with the applicable regulations and left the factory in perfect condition. The units must be installed and serviced by duly skilled and qualified personnel.

- Make sure that the information and operating conditions specified by the manufacturer are observed.

- Follow the instructions on operating and servicing the units.

- If you notice any damage or deterioration on parts of the equipment, or if safe operation cannot be guaranteed for other reasons, do not start up the equipment or - if it is already running - switch it off immediately.
  Notify your service centre.

- You should also contact our service technicians if you notice malfunctions or defects during operation or if you have any doubts as to whether the units are working properly.

- The MAK units are not a replacement for the safety installations on the milk tanker or for the safety systems put in place by the customer.

2.2   Installation instructions

- Install the units as necessary in order to meet the ambient temperature specifications. Use enclosures, heating or cooling systems to protect them if necessary.

- The installation location should be as vibration-free as possible. Use sturdy retaining fixtures to protect all the components from vibrations.

- The printer must be installed in a permanently clean and dry location.

- **The power supply to the system must be stopped during welding work or assisted starting on the vehicle.**

- Take measures to keep the units clean during installation, especially the printer (e.g. protect from metal cuttings, etc.).

- Do not blank off unassigned cable glands.

- Remove the transportation lock from the printer before putting it into operation.

- All built-in solenoid valves must be shielded from interference (suppressor diode).

2.3   Wiring instructions

- The wiring must be undertaken by trained professionals.

- The installation must be carried out in accordance with the relevant national regulations.

- The unit must be wired with exclusive reference to, and in strict compliance with, the servicing instructions.

- The connection cables must be fitted in such a way as to eliminate any sagging.
  An allowance of approx. 15 - 20 cm is advisable for attachment with clips or cable ties.
  Extra care is needed when fitting the cables near the radiator, in the engine compartment, in parts of the truck frame and in the delivery cabin.
  Under no circumstances should there be any vulnerable points where the cables are kinked or susceptible to abrasion.

- Fit the cable ends with ferrules.

- Tighten the screws on non-assigned terminals.

2.4   Servicing and repair instructions

- Servicing and repairs must be carried out by trained professionals only.

- Switch the units off before servicing and repair work, and take measures to prevent them from being switched back on while servicing and repair work is in progress.

2.5 Maintenance schedule

First of all, pay attention to the maintenance intervals prescribed by the body manufacturer or measuring system installer for filters, hoses and liquids.

Daily:

- CIP

Weekly:

- Check service units for condensate residues and the contamination indicator for signs of discolouration
- Check pressure setting on service units
- Change sampler hoses (At least every 10 days)
- Check intake strainer

Monthly:

- Check hydraulic oil cooler for excessive levels of impurity
- Carry out vacuum test, if necessary, to check that measuring system is not leaking

Biannually:

- Check hydraulic oil level and top up if necessary
- Check full alarm sensors
- Carry out sampling process

Annually:

- Check all screws to make sure that none are loose
- Calibration
- Check hydraulic oil and oil filter for impurities and change
- Change milk hoses

Maintenance plan MAK Tiger 3003

BARTEC BENKE

Operator: _____   License plate: _____   Year: _____   Construction year: _____   Build number: _____

Weekly

Performed on: __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __ / __

- Maintenance units checked for condensate residues and clogging indicator for discoloration
- Check pressure at the maintenance units (ejector and valve terminal approx. 6 bar, blower approx. 4 bar)
- Change sample tubes (recommended after a maximum of 10 days)
- Check suction strainer

Performed by:

Monthly

Performed on:

- Check hydraulic oil cooler for function
- Check hydraulic oil cooler for contamination
- Perform a vacuum test to check the tightness of the measuring system (pressure min. 500hPa, pressure drop in 60s <30 hPa)

Performed by:

Half-yearly

Performed on:

- Check hydraulic oil level and top up if necessary
- Check full signaling sensors
- Perform test decrease

Performed by:

Yearly

Performed on:

- Change hydraulic oil and oil filter
- Calibration
- Change milk tubes
- Check tight fit of all screws

Performed by:

The oils and antifreeze used in the pneumatic system (including the compressor) must be suitable for use with food.

3 Block diagram measuring system MAK TIGER 3003

Compact Controller TIGER MAK, Type 6942-10

Measuring System TIGER, Type 6905-10

Printer, Type 6761-11

ULTRASAMPLER Controller, Type 6771-31

Bottle Drive, Type 6774-10 / or Type 6774-12

GPS-Receiver, Type 6722-18

Emergency Operation Unit, Type 6980-101

GPRS-ModuleType 6942-100 / or GPRS Data Modem 3003
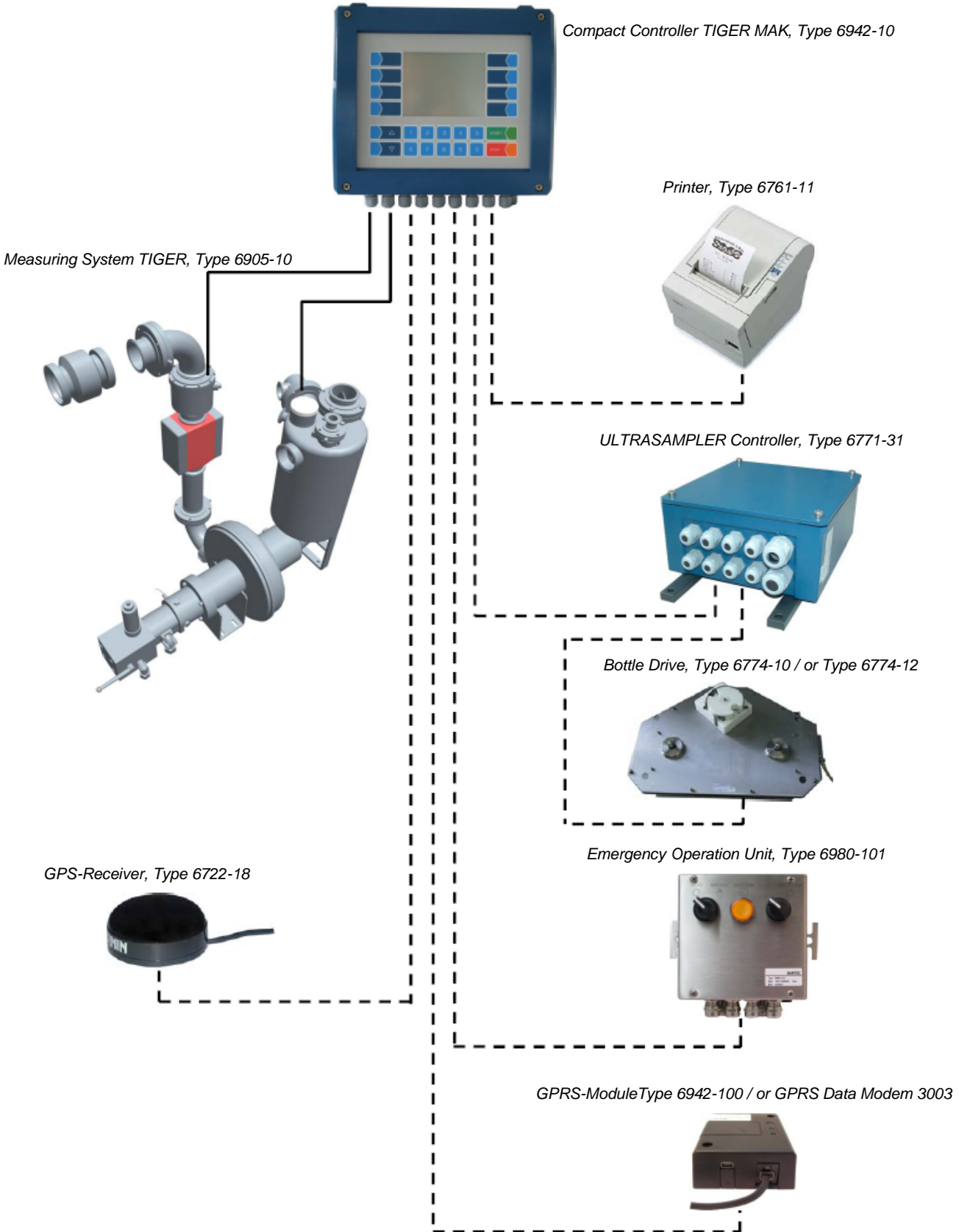
4 Compact Controller TIGER Type 6942-10 Serie C

Order no.: 386570

> ⚠️ **Attention:**
> "Fingers only" control

4.1 Technical data

Device specific data	
Nominal operating temperature	23 ± 2°C
Elektrical data	
Operating voltage	DC 24 V (9 - 36V) Bordnetz (load dump firm, stabilised)
CPU	
Processor	PowerPC™ MPC8270 (266MHz)
Hard coded memory	FLASH: 256 MB FLASH (programm memory)
	SDRAM: 128 MB SDRAM (random accsess memory)
	SRAM: 4 MB (battery backed, power failure proof data memory)
Exchangeable data memory	Compact Flash: all sizes
Real time clock	Battery backed
Display / Keyboard	
Display	LC-graphic display, 120 x 89 mm, monochrome, transflective
	Resolution 320x240 pixel
	adjustable LED background lighting
Keyboard	Resistive touch

Measuring system interface		
Current inputs	3 x DC 24 V, 0/4 - 20 mA	
Voltage inputs	2 x DC 24 V, 0 - 4V	1 x DC 12 V, 0 - 4V
Temperature sensors	2 x Pt 100, 4 conduction	
Pulser input	24V stabilized, max. 1kHz	
PWM-output	24V stabilized, max. 400Hz	
Analogue output (optional)	0/4 - 20 mA, R_B max. 500 Ω, 10 bit galvanically isolated	
Voltage outputs	16 x plus schaltend 1 A, 24 V stabilisiert (3 A total)	
Digital inputs	8 x optically isolated, input resistance 2.6 KΩ, bipolar, solid state	
Pulse counting	3 channel max. 100 Imp/s, Input optically isolated 5 kΩ pull-up	
Interface		
Interface printer	RS 232, RxD, TxD, CTS, RTS, 115 K galvanically isolated	
Interface Fieldbus	P-NET RS485, 76800 baud, galvanically isolated	
Interface Bluetooth	Bluetooth 2.0 radio modul (Class 2), reach max. 20m	
Interface CAN	CAN 2.0 A/B, 250kBaud	
	Communication profile: free protocol based on SAE J1939, FMS	
	CAN-Bus-termination: can be switched on and off	
Other	RS485, Ethernet 100 Mbit (auf CPU), several RS232 (3x without hand-shake, 1x with handshake)	
Ambient conditions		
Operating temperature	- 20 … + 50 °C	
Storage temperature	- 25 … + 60 °C	
Climate classification	ISF according to DIN 40050	
Protective type	IP 65 according to DIN 40040	
Mechanical data		
Dimensions	See drawing	
Material	Aluminium pressure die casting, coated blue	
Front screen	PES	
Weight	65 N (6,5 kg)	

4.2   Dimensions Compact Controller

280838_db.drw
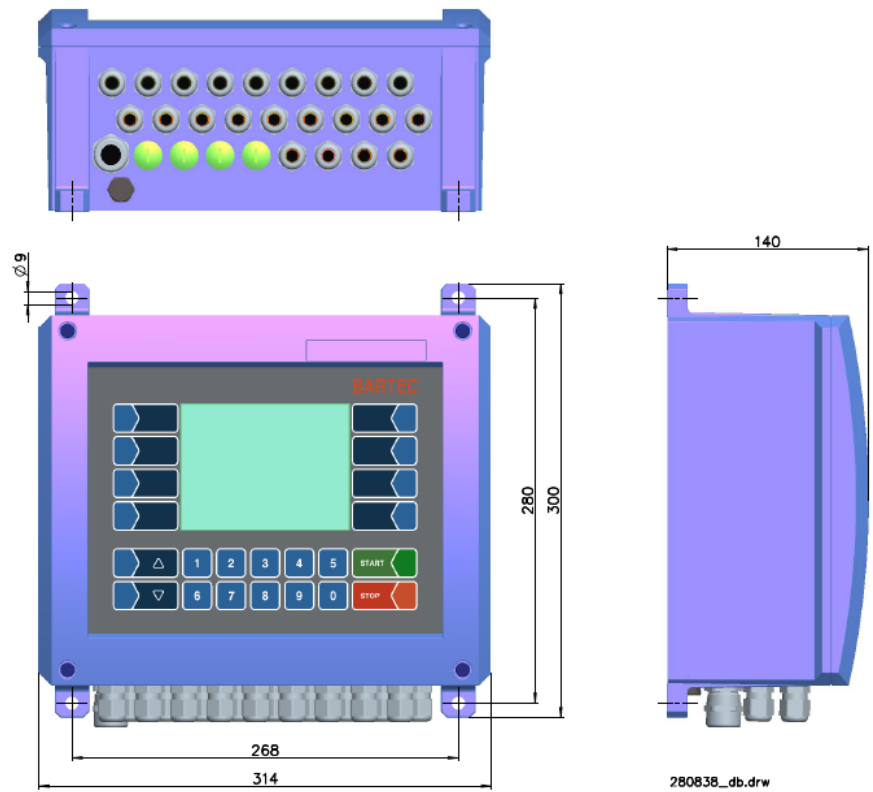
4.3 Blade-type fuses and LED displays on TIGER 3003 (on motherboard)

4.3.1 Motherboard without CAN-Bus
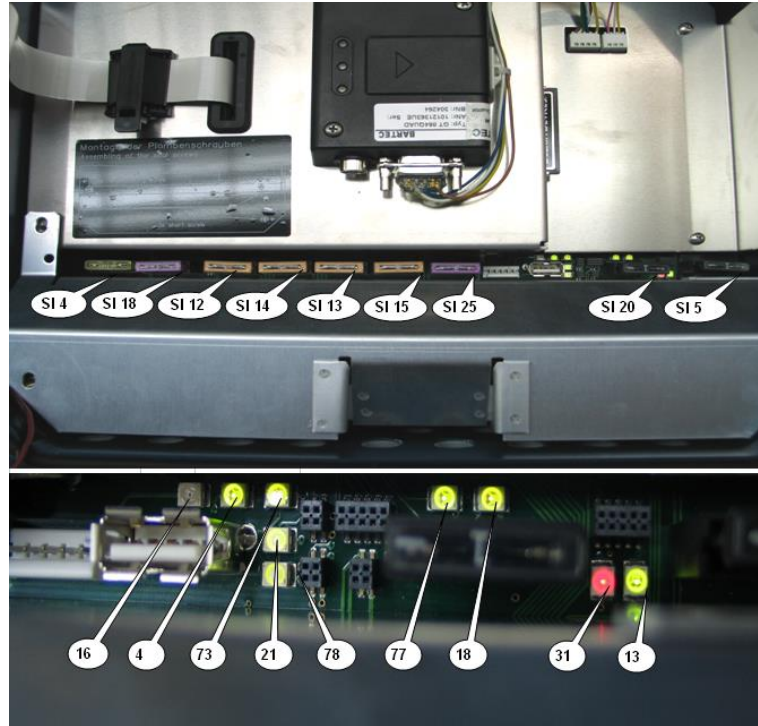
Standard blade-type motor vehicle fuses are fitted here with the following ratings:

Fuse no.	Rating	Voltage	Circuit/comments
SI 4	20 A	24V_S	Backup fuse for selective circuits SI18, SI12, SI13, SI14, SI15, SI25, SI5
SI 5	1 A	24V_0	4-20mA inputs; empty signal sensor; voltage inputs; turbine; FGS
SI 12	5 A	+UB_1-4	Supply outputs 1-4; terminals 14-21
SI 13	5 A	+UB_5-8	Supply outputs 5-8; terminals 22-29
SI 14	5 A	+UB_9-12	Supply outputs 9-12; terminals 76-83
SI 15	5 A	+UB_13-16	Supply outputs 13-16; terminals 84-91
SI 18	3 A	24V_COM	RS 485, GPS, printer, P-Net
SI 20	1 A	24V_GPRS	Supply for GPRS modem
SI 25	3 A	PWM out	Control of rotary pump, terminals 92-93

LED displays			Status
LED 4	5.5 supply for CPU, motherboard, electronic measuring equipment		Lights up
LED 13	Supply voltage 24 V_O/12 V_I analogue inputs		Lights up
LED 16	µ Controller power supply "busy"		Flashes
LED 18	USB communication, digital IN, analogue IO		Flashes
LED 21	µ Controller k_mif "busy" (PT100, 4-20 mA, U_IN,…)		Lights up
LED 31	µ Controller pulse counter "busy"		Lights up
LED 73	USB hub for GPRS, USB socket, P-Net		Lights up
LED 77	USB communication, P-Net, digital outputs		Flashes
LED 78	µ Controller k_pio "busy" (P-Net, digital outputs)		Flashes
LED CPU	Top	Supply voltage	Lights up
LED CPU	Bottom	Busy	Flashes

4.3.2   Motherboard with CAN-Bus
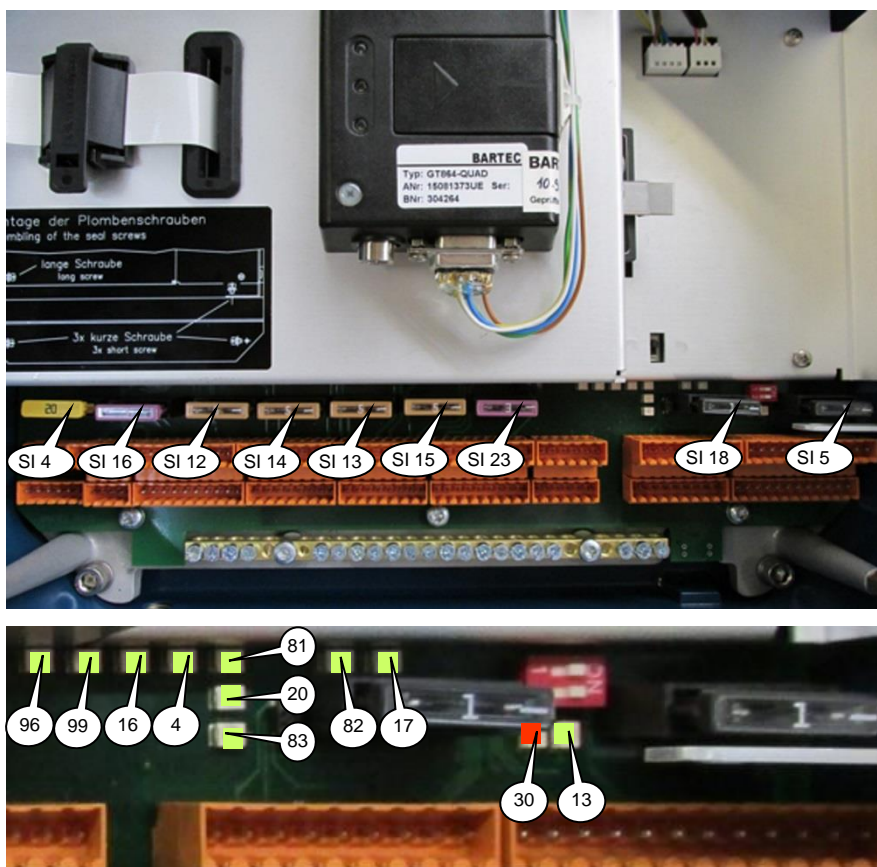
Standard blade-type motor vehicle fuses are fitted here with the following ratings:

Fuse no.	Rating	Voltage	Circuit/comments
SI 4	20 A	24V_S	Backup fuse for selective circuits SI16, SI12, SI13, SI14, SI15, SI23, SI5
SI 5	1 A	24V_0	4-20mA inputs; voltage inputs; pressure sensors; bubble sensors; dipstick
SI 12	5 A	+UB_1-4	Supply outputs 1-4; terminals 14-21
SI 13	5 A	+UB_5-8	Supply outputs 5-8; terminals 22-29
SI 14	5 A	+UB_9-12	Supply outputs 9-12; terminals 76-83
SI 15	5 A	+UB_13-16	Supply outputs 13-16; terminals 84-91
SI 16	3 A	24V_COM	RS 485, GPS, printer, P-Net, RS 232, CAN-Bus
SI 18	1 A	24V_GPRS	Supply for GPRS modem
SI 23	3 A	PWM out	Control of rotary pump, terminals 92-93

LED displays		Status
LED 4	5.5 supply for CPU, motherboard, electronic measuring equipment	Lights up
LED 13	Supply voltage 24 V_O/12 V_I analogue inputs	Lights up
LED 16	µ Controller power supply "busy"	Flashes
LED 17	USB communication, digital IN, analogue IO	Flashes
LED 20	µ Controller k_mif "busy" (PT100, 4-20 mA, U_IN,…)	Lights up
LED 30	µ Controller pulse counter "busy"	Lights up
LED 81	USB hub for GPRS, P-Net, CAN, display	Lights up
LED 82	USB communication, P-Net, digital outputs	Flashes
LED 83	µ Controller k_pio "busy" (P-Net, digital outputs)	Flashes
LED 96	USB-Communication CAN	Flashes

LED 99	µ Controller KCAN		Flashes
LED CPU	Top	Supply voltage	Lights up
LED CPU	Bottom	Busy	Flashes

4.4   Compact Flash card

Direction CF ——→

⚠️ **Attention:**
Make sure the equipment is currentless before changing the Compact Flash card!

4.5 Exchanging the motherboard/CPU board

**Type 6942-111 (without CAN-Bus),
Order no.: U891176942111A**

**Type 6942-112 (with CAN-Bus),
Order no.: U891176942112A**
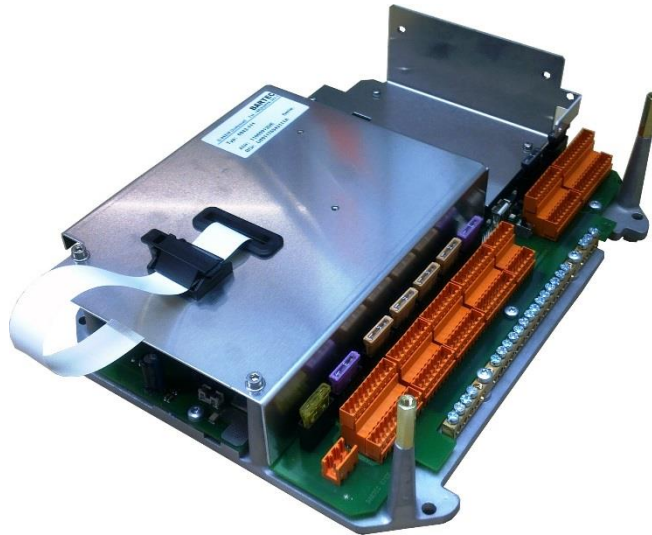
The following points must be noted when replacing the motherboard:

- The configuration can be transferred with the CompactFlash card. The configuration must first be saved on the CompactFlash card via the Service menu, then the configuration can be loaded from the CompactFlash card onto the new motherboard. Only if the calibration switch is closed will the calibration parameters not be loaded and will then have to be adjusted.

- To change the motherboard, the display must be unplugged (flip strip at end of ribbon cable), the terminal blocks disconnected, and the wires disconnected from the shield bar. The entire motherboard can now be unscrewed at all four corners (M6x12) and taken out.

- Apply heat transfer compound supplied with new motherboard and fit.

⚠️ **Attention:**
If it is necessary to remove the cover - in order, for example, to check that the ribbon cable is in the correct position for the display - it is essential to remove the CompactFlash card first.

4.6 Compact Controller wiring
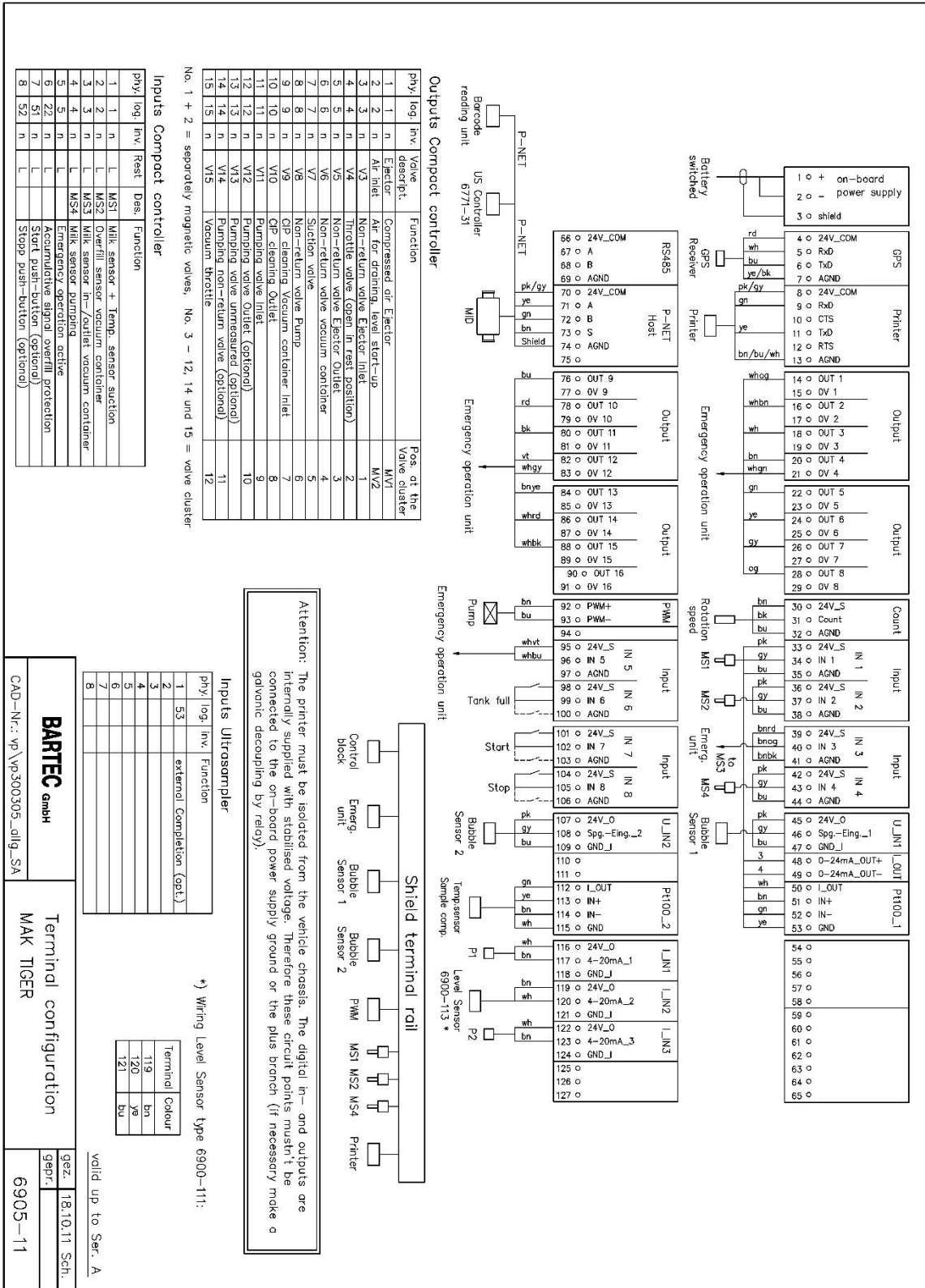
Note:

Note: Connections to external sources of voltage must be isolated. Plus and minus connections are required at each output.

4.6.1 Power supply

Attention:
Shielded 2.5 mm² cable (16 A fuse, earth and positive branch) is required for the 24 V power supply, including corresponding switch

The solenoid valves, all the measuring sensors and the ticket printer are supplied by the Controller (see general diagram on page 47).

4.6.2 Inputs

The inputs are user-configurable. The following assignment is recommended:

log.	inv.	Quiescent state	Designation	Function
1	n	L	MS1	Milk sensor + temperature intake
2	n	L	MS2	Vacuum tank overflow sensor
3	n	L	MS3	Milk sensor inlet/discharge vacuum tank
4	n	L	MS4	Milk sensor transfer pumping
5	n	L		Standby operation on
22	n	L		Group signal overfill monitor
51	n	L		Start button (optional)
52	n	L		Stop button (optional)

4.6.3 Outputs

The outputs are user-configurable. The following assignment is recommended:

log.	inv.	Valve designation	Function	Pos. in valve terminal
1	1	Ejector	Compressed air ejector	MV1
2	2	Air intake	Air for drainage, moving to level	MV2
3	3	V3	Ejector intake stop valve	1
4	4	V4	Restrictor valve (open in home position)	2
5	5	V5	Ejector outlet stop valve	3
6	6	V6	Vacuum tank stop valve	4
7	7	V7	Intake valve	5
8	8	V8	Pump stop valve	6
9	9	V9	Vacuum tank inlet cleaning valve	7
10	10	V10	Discharge cleaning valve	8
11	11	V11	Inlet transfer pumping valve	9
12	12	V12	Discharge transfer pumping valve (optional)	10
13	13	V13	Unmeasured transfer pump valve (optional)	
14	14	V14	Transfer pumping stop valve (optional)	11
15	15	V15	Vacuum restrictor	12

4.6.4 CAN bus termination (terminal resistor) (Series C)

The CAN bus line must be terminated at both ends. Using DIP switches (see picture below), the CAN bus termination/the terminating resistor on the compact controller can be switched on and switched off.

CAN bus termination deactivated or terminating resistors switched off.

CAN bus termination activated or terminating resistors switched on.

Attention:

CAN bus line:
It should be used a bus line which is isolated twisted and compliant to the CAN system (e.g. UNITRONIC BUS CAN 1x2x0.5 mm²).

CAN bus shielding:
The shield of the CAN bus line must be connected at one side.

CAN bus termination at FMS connection:
Via the DIP switch the CAN bus line must be terminated on the compact controller

4.6.5 Serial interfaces

4.6.5.1 Motherboard without CAN-Bus

Designation	Terminals	Interface on the system
GPRS	White plug	dev/usb/ttyUSB0
Bluetooth	Display connector	dev/usb/ttyUSB1
GPS	4-7	dev/ttyS3 (not changeable)
Printer	8-13	dev/ttySM0
RS485/RS232	66-69	dev/ttyS4

4.6.5.2 Motherboard with CAN-Bus

Designation	Terminals	Interface on the system
GPRS	White plug	dev/usb/ttyUSB0
Bluetooth	Display connector	dev/usb/ttyUSB1
GPS	4-7	dev/ttyS3 (not changeable)
Printer	8-13	dev/ttySM0
RS232	66-69	dev/ttyS4
RS485	128-131	dev/ttyS2
RS232_1	132-137	dev/ttySM1
RS232_2	138-141	dev/ttyS5

5   Measuring system MAK TIGER 3003

Order no.: 279855
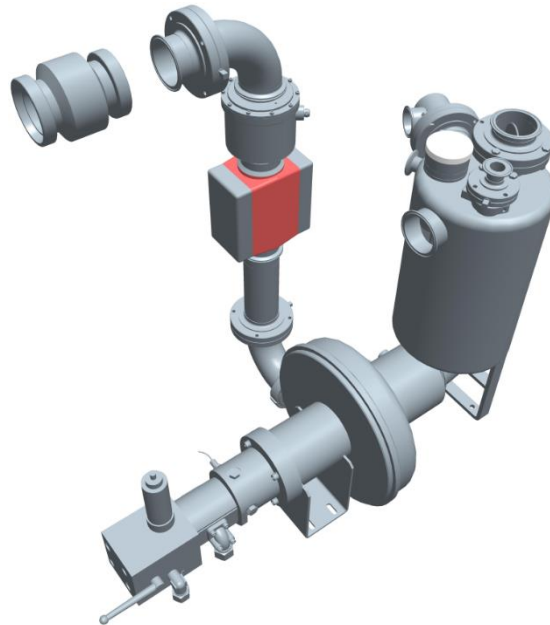
5.1   Introduction

The MAK TIGER® measurement system for milk collection trucks is designed for mobile use during the collection of milk.

It is the first self-priming measurement system working without a gas separator.

A modern sensor system measures the air content which inevitably develops during milk collection and calculates it accordingly.

This creates a very efficient intake situation as the previously limiting element, the gas separator, is not required any longer, which allows to realize a higher pump performance.

It is only possible to use this new technology in an optimal way, however, if certain boundary conditions are observed for the construction of the tank truck, which means that the designer of the tank truck has a decisive influence on the result.

Note:
Several patent applications have been filed for this measurement method.

5.2 Piping

The measurement system MAK TIGER has an inlet and an outlet with DN 80 (optional DN 100) connections.

The remaining equipment is furnished by the superstructure builder for the tank trucks. These additional superstructures have a significant influence on the performance of the milk collection truck.

Please note:

If possible, avoid any:

- changes in cross-section

- abrupt bows

- rectangular pipe outlets

- T-pieces

- inwardly protruding welding seams

- rough inside walls of pipes

- fittings protruding into the pipe

- everything that swirls the flow

- everything that impairs the flow

Particularly on the suction side, the piping system including the sampler and the flowmeter has to be carried out continuously in min. 3" to prevent pressure drops.

To maximize the transfer pump performance, the plumbing for the tank outlets, the tap and the transfer pump piping should have a diameter of at least DN 80. The transfer pump valve used by BARTEC BENKE corresponds to DN 80 (optional DN 100) in accordance with DIN 11850.

For the construction of the measurement system, it is of particular importance that the components of the measurement system are installed in a tension-free way. One possibility is to uncouple the pipework at suitable places by means of hose connections. If the components of the measurement system are fastened to different reference systems, these components have to be mounted by means of flexible fastening elements (e.g. rubber dampers).

5.3 System requirements

For an optimal functionality of the measurement system MAK TIGER, especially the following boundary parameters have to be observed for the construction of the milk collection truck:

- Hydraulic oil supply with at least 40 l/min, 200 bar, recommended oil HVLP46 DIN51524 T3 (Pourpoint under -35°C)

- Installation of an oil filter with 10 μm and an overpressure protection with max. 2 bar for the return oil filter

- A suitably sized oil cooler should be provided for the hydraulic oil. The cooling capacity must be at least 2 KW (at a temperature difference of 30 °C and an oil flow of 40 l/min).

- The pneumatic supply must be designed for 600 nl/min. The oils and antifreeze agents used in the pneumatic system (incl. compressor) must be safe for use in food production processes.

- For the electronic components, a power supply line with a cross-section of 2,5 mm^2 must be laid.The operating voltage should be 24 Volt. For 12-volt systems, a suitable voltage converter has to be inserted.

- By means of a main switch, an all-pole separation of the electronic components from the supply voltage has to be provided.

- In cold weather, the measurement system cubicle has to be heated.

- If the ejector cannot be sufficiently heated by means of the cubicle heating, a heating jacket has to be provided.

- Hydraulic return at least 22 mm diameter for return lines with max. 5 m in length and at least 25 mm for return lines longer than 5 m

Attention:
The hydraulic return must not fall below an inner diameter of 18 mm!

5.4 Technical data

Measuring system-specific data	
Operating voltage	DC 24 V (9 - 36V) on-board power supply (load dump fixed, stabilized)
Emergency operation	On-board power supply 24 V (valves)
Compressed air Ejector	5,6 bar (maintenance unit)
Valve terminal	6 bar (maintenance unit)
Compressed air / level	4 bar filter 0,01 µ
Air consumption of ejector	approx. 500 nl/min @ 5,6 bar
Suction power	typ. 1300 l/min during good intake conditions, max. 2000 l/min during pumping
Drive	Hydraulic motor 23,7 cm³
Flow rate of hydraulic oil	about 40 l/min @ 200 bar
Speed	about 1500 revs/min
Hydraulic connection	Forward side ≥ 16 mm , Return side ≥ 28 mm
Hydraulic fluid	≥60 l with oil cooler, HVLP DIN51524 T3
Connections level container	DIN 80 (optional DN 100) Clamp for pumping and sucking
Precision	≤ 0,5 %
Lowest intake quantity	100 l with 3" MID, optional 50 l with 2,5" MID
CIP	yes; ϑ max. 85 °C @ 2 bar
Mechanical data	
Material of milk conduit	V_2A; PTFE; PEEK, POM
Dimensions	See dimensional drawing
Weight	approx. 230 kg
Ambient conditions	
Operating temperature	0 … + 85 °C medium; - 20 … + 50 °C electronics
Storage temperature	- 20 … + 60 °C (without fluid)
Protection type	IP 65

5.5 Piping diagram
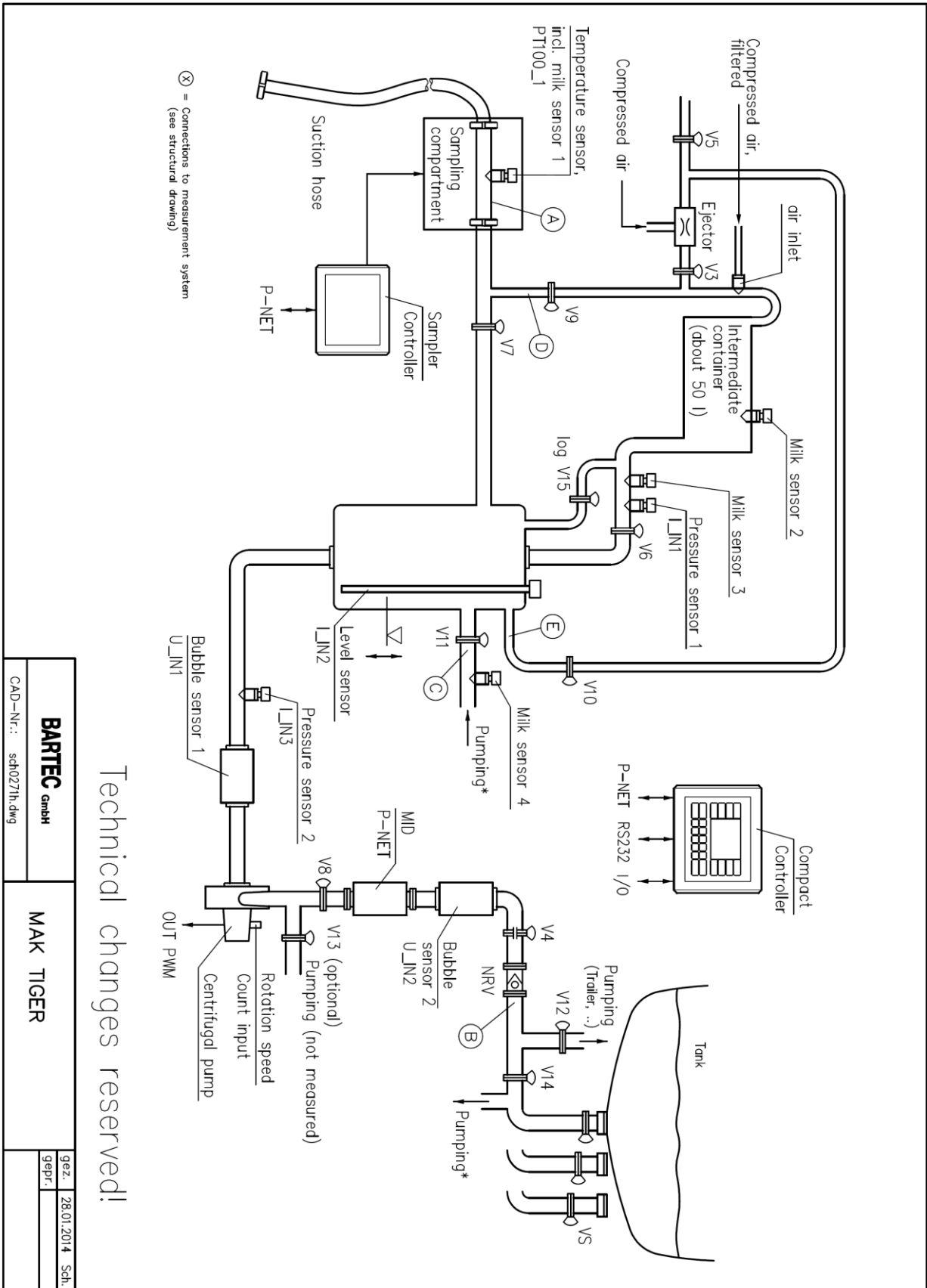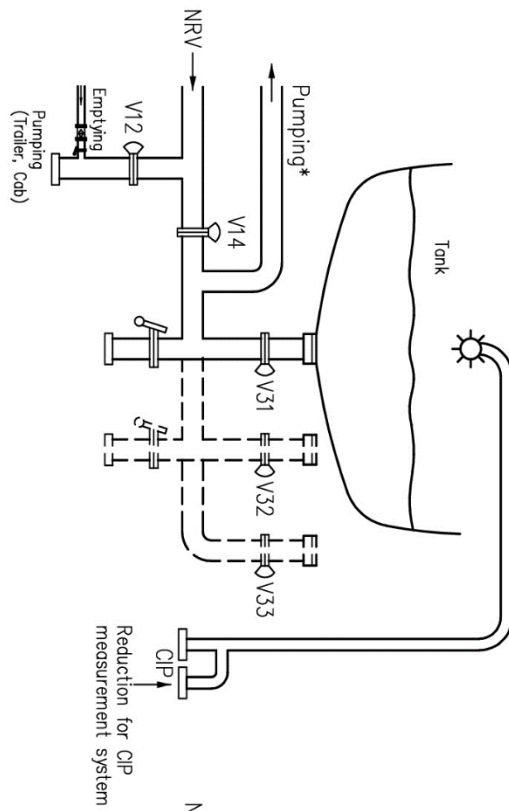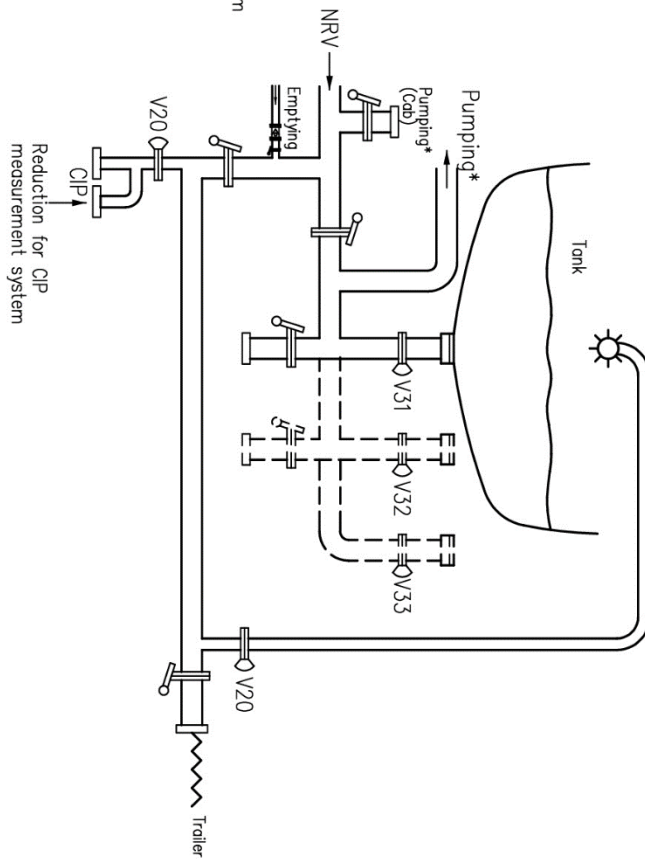
Type 1

Type 2

Technical changes reserved!

BARTEC GmbH

CAD−Nr.: sch0271h.dwg

MAK TIGER
Tanktype 1 and 2

gez.	15.02.18	Elbl
gepr.		

NRV

V12

Emptying
(Cab)

Pumping
(Cab)

Pumping*

V20

V16

Reduction for CIP
measurement system

CIP

Emptying
for manual V16 and V17

V14

Tank

V31

V32

V33

Type 3

V16

V20

V20

CIP Trailer

V17

V20

Tank

Trailer

V34

V35

V36
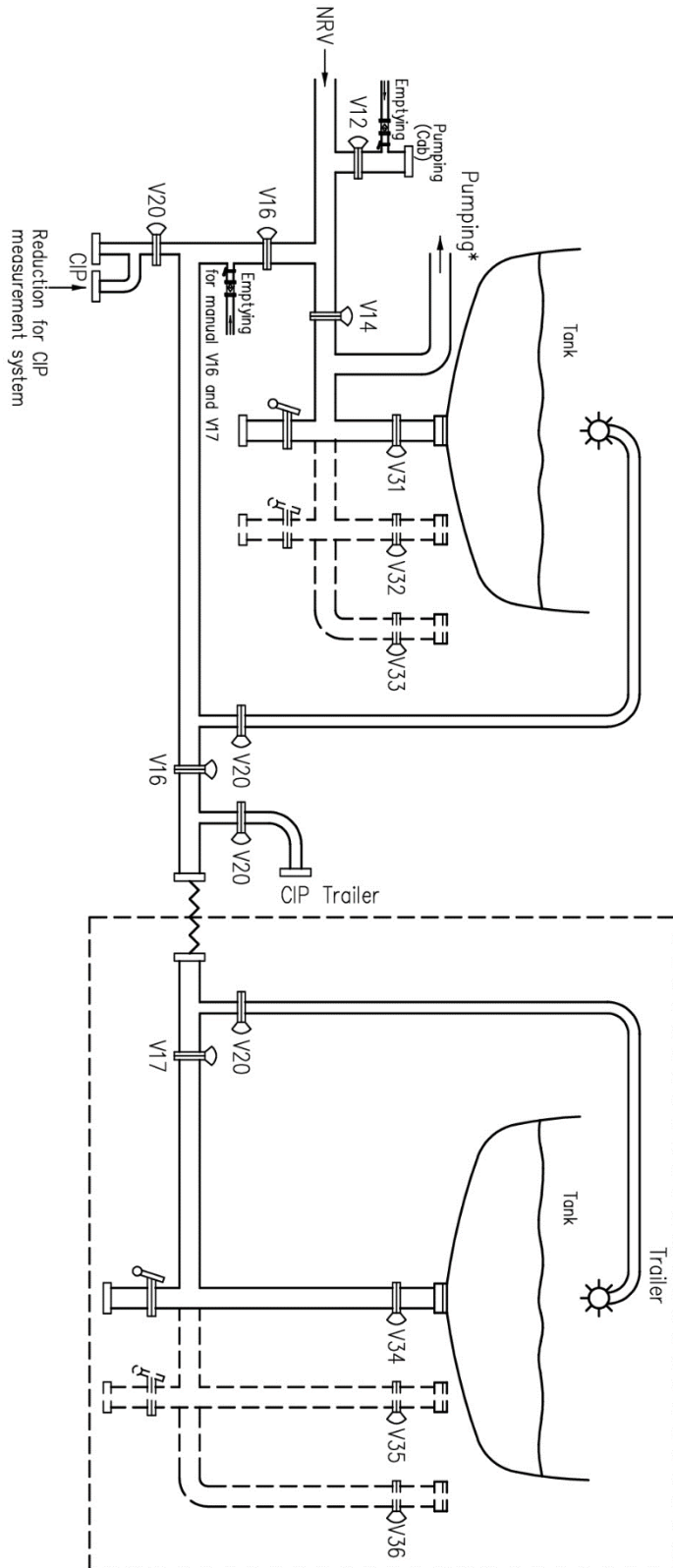
Technical changes reserved!

BARTEC GmbH

CAD–Nr.: sch027lh.dwg

MAK TIGER
Tanktype 3

	gez.	15.02.18 Elbl
	gepr.	

5.6 Structure of the measurement system

Basically, all TIGER measurement systems have the same structure (modular). They only differ slightly in the arrangement of the inlets and outlets. The arrangement and design of the vacuum container can be varied according to customer requirements. The vacuum container is not included in the delivery scope of the TIGER.

When designing the vacuum container, make sure it can be cleaned in place (CIP) and avoid any excessive suction (e.g. by means of shielding plates, see 4.4 Suggested design). Its minimum volume has to be 60 liters and it should rather be dimensioned too large than too small. For the design of the container, directive 2009/105 EC related to simple pressure vessels has to be complied with.

It is important that the vacuum container is drained automatically under all angles that the truck adopts during intake; for this purpose, it is mounted in a slanted position. The hydraulic block and the coupling housing of the pump have to be protected against milk or CIP fluid leaking out from the tap by means of a suitable protective cover.

The pump and the level container have to be mounted in a tension-free and vibration-damped way. It is important always to observe the basic dimensions of the measurement system arrangement.

5.6.1 Measurement system basic set front view

Depending on mounting position, either clamp connection DN 3`` or tube nozzle DN 3`` towards non-return valve

Clamp connection DN 25, to vacuum container

Clamp connection DN 3``, to vacuum container

Thread nozzle DN 3`` welded, outlet to tap

993.45

922.7

789.9

644.2

633.5

263.701
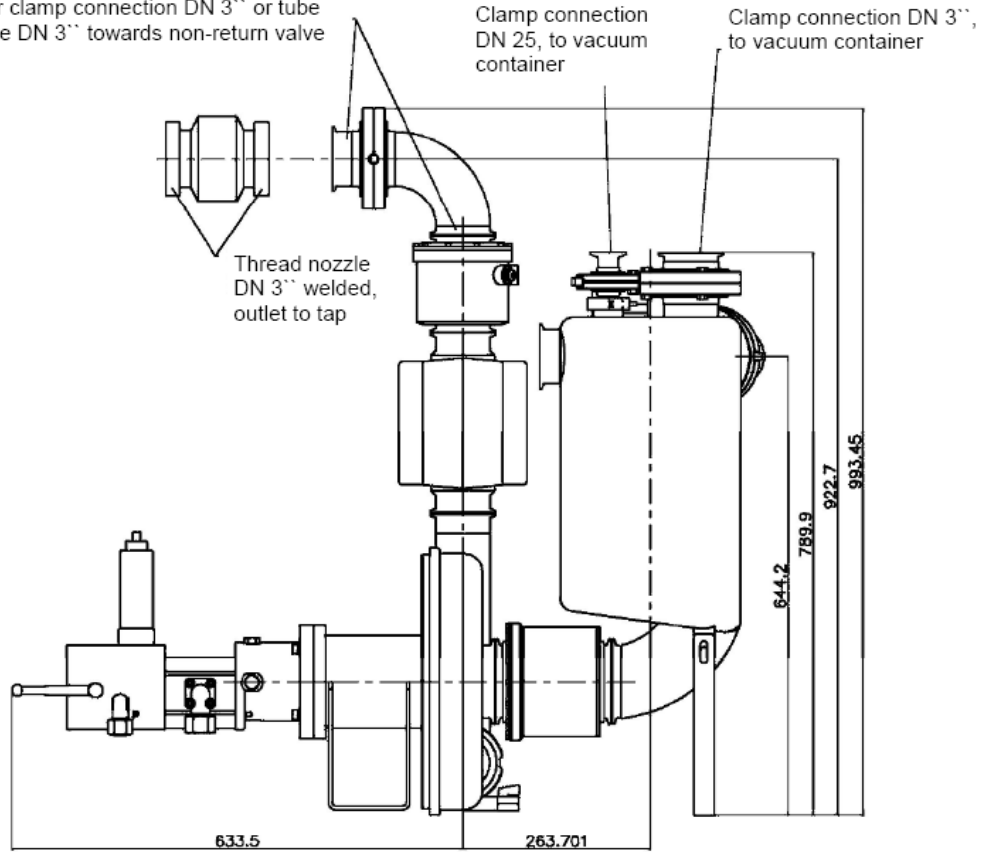
MAK-TIGER-GRUNDEINHEIT-4ZOLL.DRW

(Optional DN 100)

5.6.2 Measurement system, basic set, side view
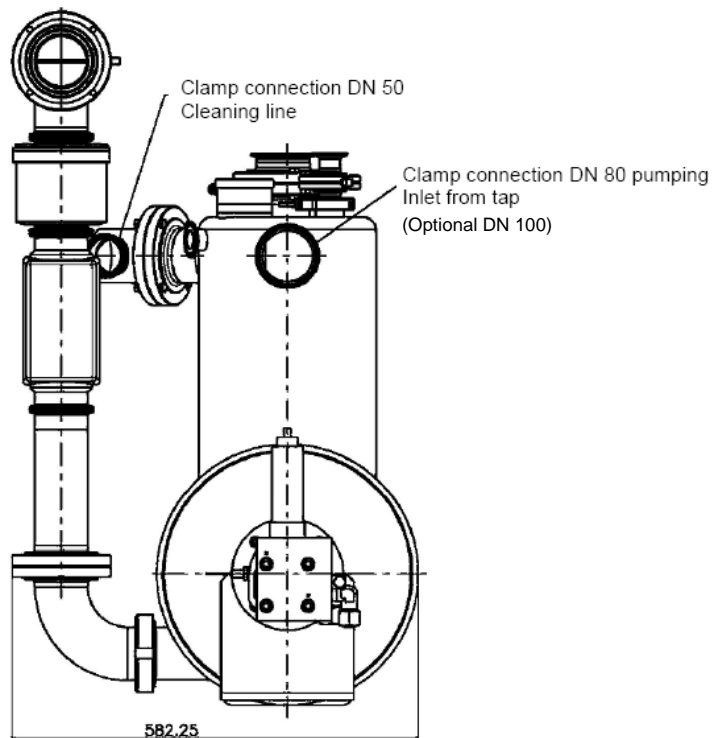
Mak-Tiger-Grundeinheit-4Zoll.drw

5.6.3 Measurement system, basic set, top view
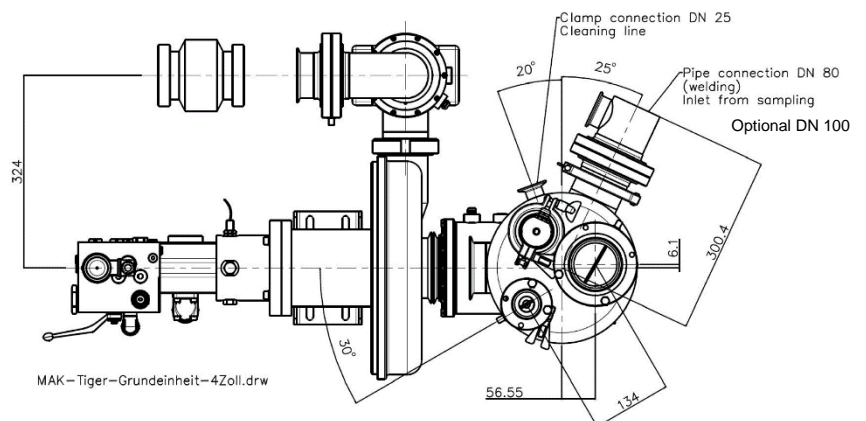
MAK-Tiger-Grundeinheit-4Zoll.drw

5.6.4 Ejector unit

Clamp or welded connection
DN 50 to vacuum container

Fitting for drain valve
Order no. 292710

Drain valve
Order no. 303147

Clamp connection DN 50
Cleaning line connected to V9

Valve V3

Ejector Order no. 306330
vertical mounting position

Clamp connection DN 25
Cleaning line via V10
to level container

Valve V5

Clamp connection DN 50
Exhaust air
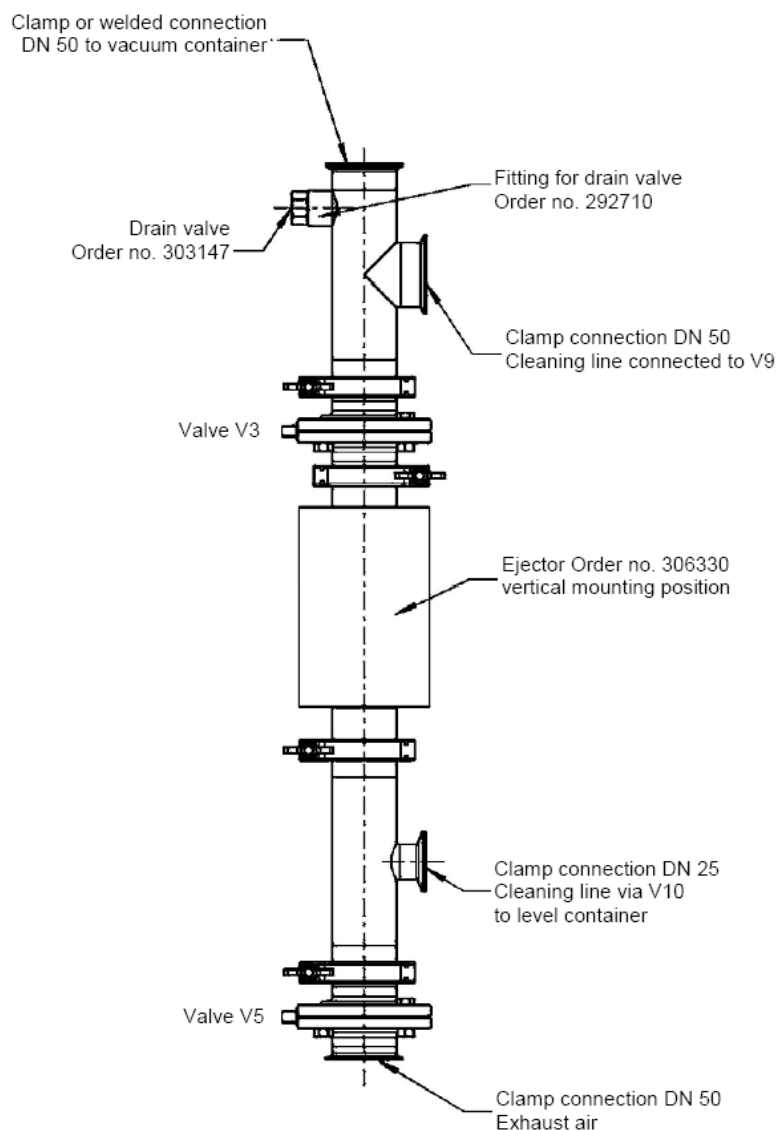
Mak-Tiger-Ejektoreinheit.jpg

5.7 Pneumatic plan

BARTEC BENKE delivery scope
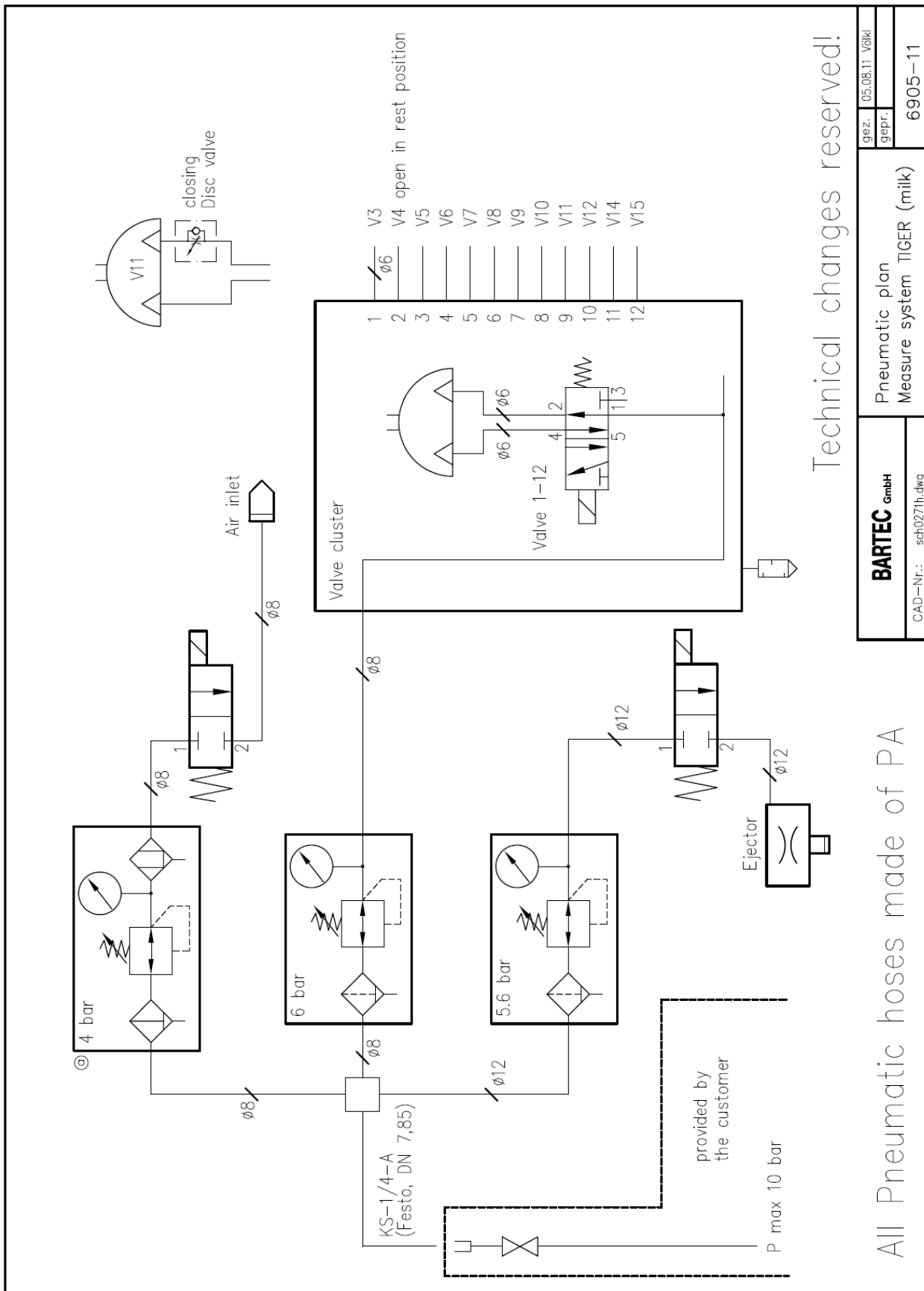
5.7.1   Information on the pneumatic system

In order to comply with food regulations, it is necessary to check the heavy-duty filter on component 292870 (air intake filter unit) to ensure proper drainage of condensation and to check the contamination indicator for signs of discolouration once a week.

Weekly checks are also required on the ejector control valve, the ejector and the V3, V5 and V10 valves to ensure that they are all working correctly. This is simply done by vacuum testing.

Any components showing signs of abnormality (heavy-duty filter, ejector, valves, control valve) must be replaced immediately!

Caution:
It is illegal to operate the system with defective components under food regulations!

It is also essential to ensure that all the oils used in the pneumatic system and any additives which may get into the pneumatic system, including any antifreeze agents, are confirmed absolutely safe for use in food production processes and comply with the relevant standards.

5.8 Valve terminal

Order no.: 292868
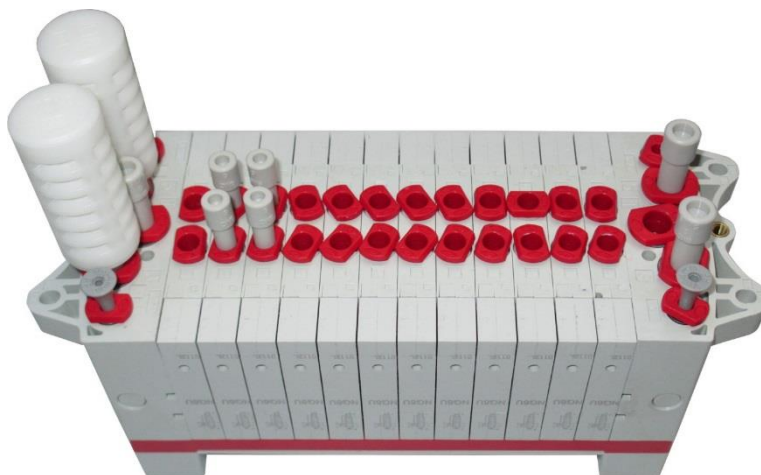
5.8.1 Technical data

Electrical data	
Operating voltage	24 V DC 0.6 W
Connection	25-pole cable
Ambient conditions	
Operating temperature	-5 … +50 °C
Protection class	IP 65
Mechanical data	
Housing specification	PPA copolymer
Dimensions (excluding silencer and sealing plug)	127.2 x 78.5 x 56
Operating pressure	Approx. 6 bar (max. 8 bar)
Air supply connection	$\varnothing$ 8 mm
Valve air connection	$\varnothing$ 6 mm
Accessories	
Designation	Order no.
Bracket for pneumatic unit	292852
Substitute solenoid valve 5/2	292897

5.9 Filter regulator

Order no.: 301644

5.9.1 Technical data

Device-specific data	
Operating pressure	Max. 12 bar
Adjustment range	0.3 to 10 bar
Air connections	IG 1/4"
Ambient conditions	
Operating temperature	-20 … +50 °C
Mechanical data	
Housing specification	PBT
Weight	0.28 kg
Drainage	Manual
Dimensions	224 x 75 x 69.5

5.10 Service unit including heavy-duty filter

Order no.: 292870

5.10.1 Technical data

Device-specific data	
Operating pressure	Max. 12 bar
Adjustment range	0.3 to 10 bar
Air connections	⌀ 8 mm
Filter unit	0.01 µm
Ambient conditions	
Operating temperature	-20 … +50 °C
Mechanical data	
Housing specification	PBT
Weight	0.48 kg
Drainage	Manual
Dimensions	224 x 120 x 69.5

5.11   Ejector

Order no.: 305145

5.11.1   Technical data

Device-specific data	
Operating pressure	Max. 7.5 bar, typ. 5.6 bar
Compressed airflow	430 Nl/min @ 5.6 bar
Air connection	$\varnothing$ 12 mm
Ambient conditions	
Operating temperature	-20 … +80 °C
Mechanical data	
Housing specification	Stainless steel
Connection	DN 50 clamp
Dimensions	225 x 108 x 108
Accessories	
Designation	Order no.
Ejector connection fitting 1/4"	391223

5.12 Kinetrol (small)

Order no.: 304537

5.12.1 Technical data

Device-specific data	
Operating pressure	Max. 7 bar
Air connection	IG 1/8"
Ambient conditions	
Operating temperature	-20 … +80 °C
Mechanical data	
Housing specification	Epoxy resin, powder-coated
Weight	0.44 kg
Dimensions	93 x 76 x 70
Accessories	
Designation	Order no.
Angle bracket, small, DN 25	304814
Threaded union QSML 1/8" 6 mm	202418

5.13   Kinetrol (medium)

Order no.: 304536
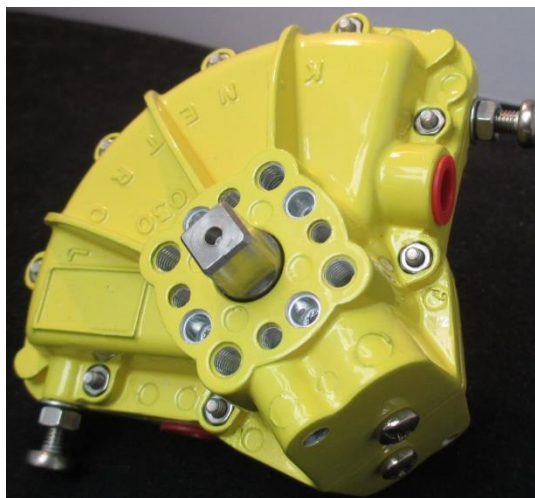
5.13.1   Technical data

Device-specific data	
Operating pressure	Max. 7 bar
Air connection	IG 1/8"
Ambient conditions	
Operating temperature	-20 … +80 °C
Mechanical data	
Housing specification	Epoxy resin, powder-coated
Weight	0.70 kg
Dimensions	113 x 91.4 x 84
Accessories	
Designation	Order no.
Angle bracket, medium, DN 40	304815
Angle bracket, medium, DN 50	306271
Threaded union QSML 1/8" 6 mm	202418

5.14 Kinetrol (large)

Order no.: 304535

5.14.1 Technical data

Device-specific data	
Operating pressure	Max. 7 bar
Air connection	IG 1/8"
Ambient conditions	
Operating temperature	-20 … +80 °C
Mechanical data	
Housing specification	Epoxy resin, powder-coated
Weight	1.24 kg
Dimensions	136 x 112 x 93
Accessories	
Designation	Order no.
Angle brackets, large, DN 3" and DN 80	304816
Threaded union QSML 1/8" 6 mm	202418

5.15 Emergency operation unit type 6980-101

Order no.: 293901

5.15.1 Technical data

Electrical data	
Operating voltage	24 - 30 V DC on-board power supply
Supply line	Min. 2.5 mm²
Ambient conditions	
Operating temperature	-20 … +50 °C
Storage temperature	-25 … +60 °C
Climate class	ISF as per DIN 40040
Protection class	IP 65
Mechanical data	
Weight	Approx. 1.7 kg
Dimensions	See scale drawing

5.15.2   Dimensions
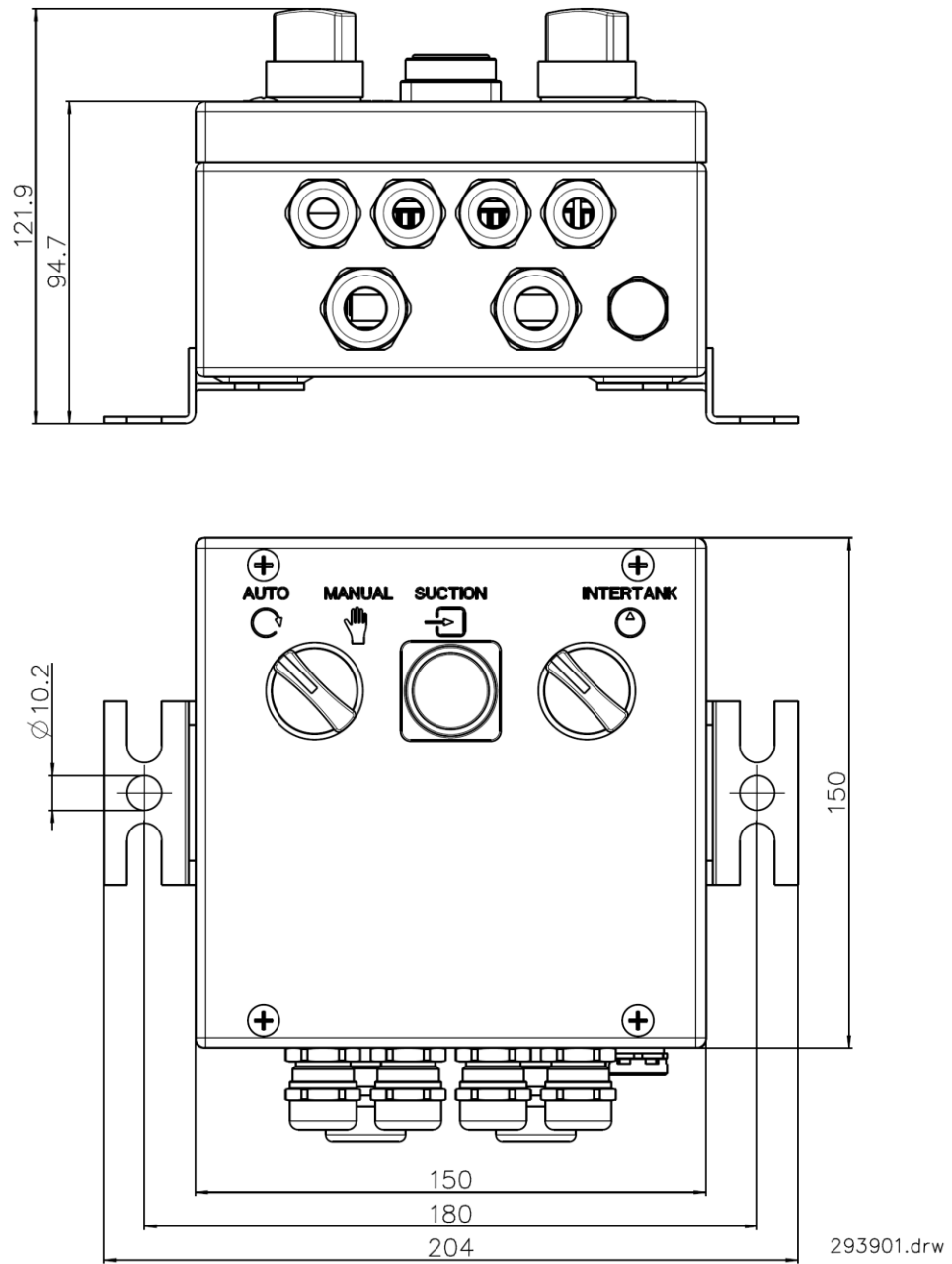
5.16   Suggested design of vacuum container

Not included in BARTEC BENKE delivery scope.
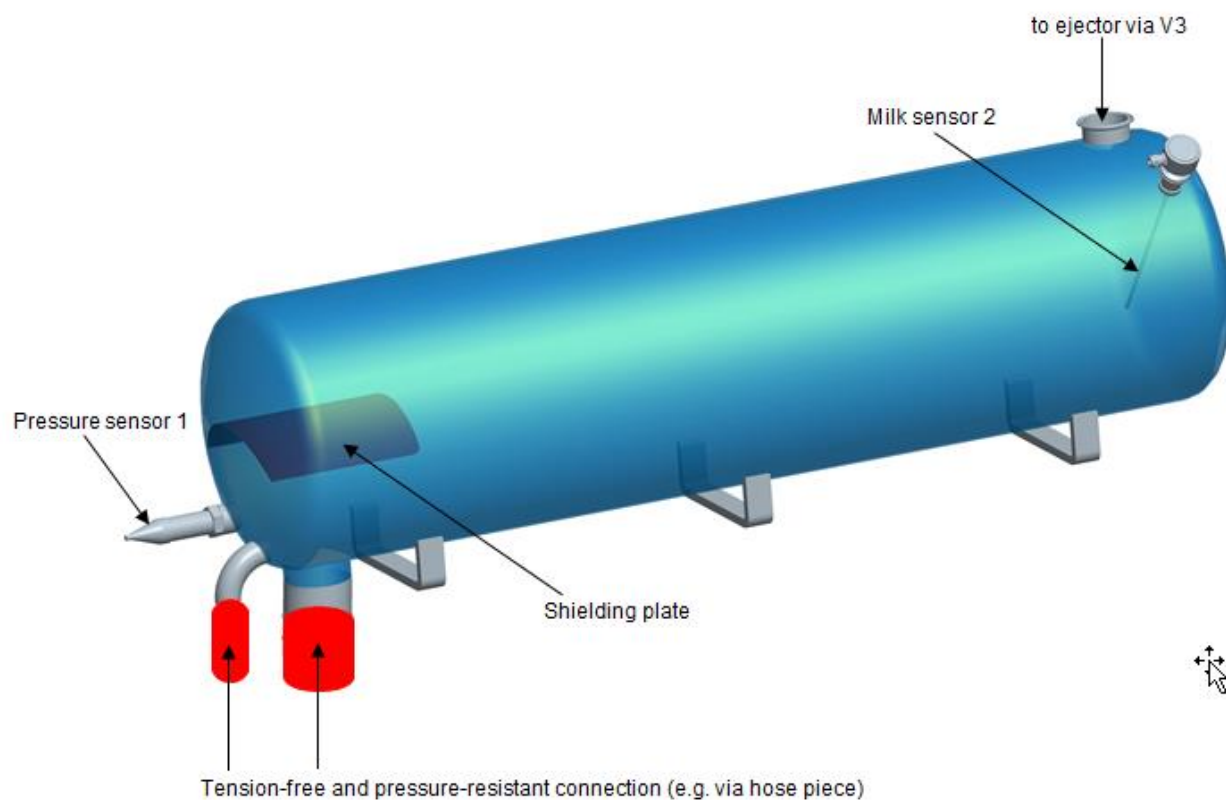
Note:

- Fasten the vacuum container via vibration decoupling (rubber damper)

- Cut milk sensor 2 to a length of 15 cm and strip 3 cm of insulation from the bar.

5.16.1 Suggested dimensions of vacuum container
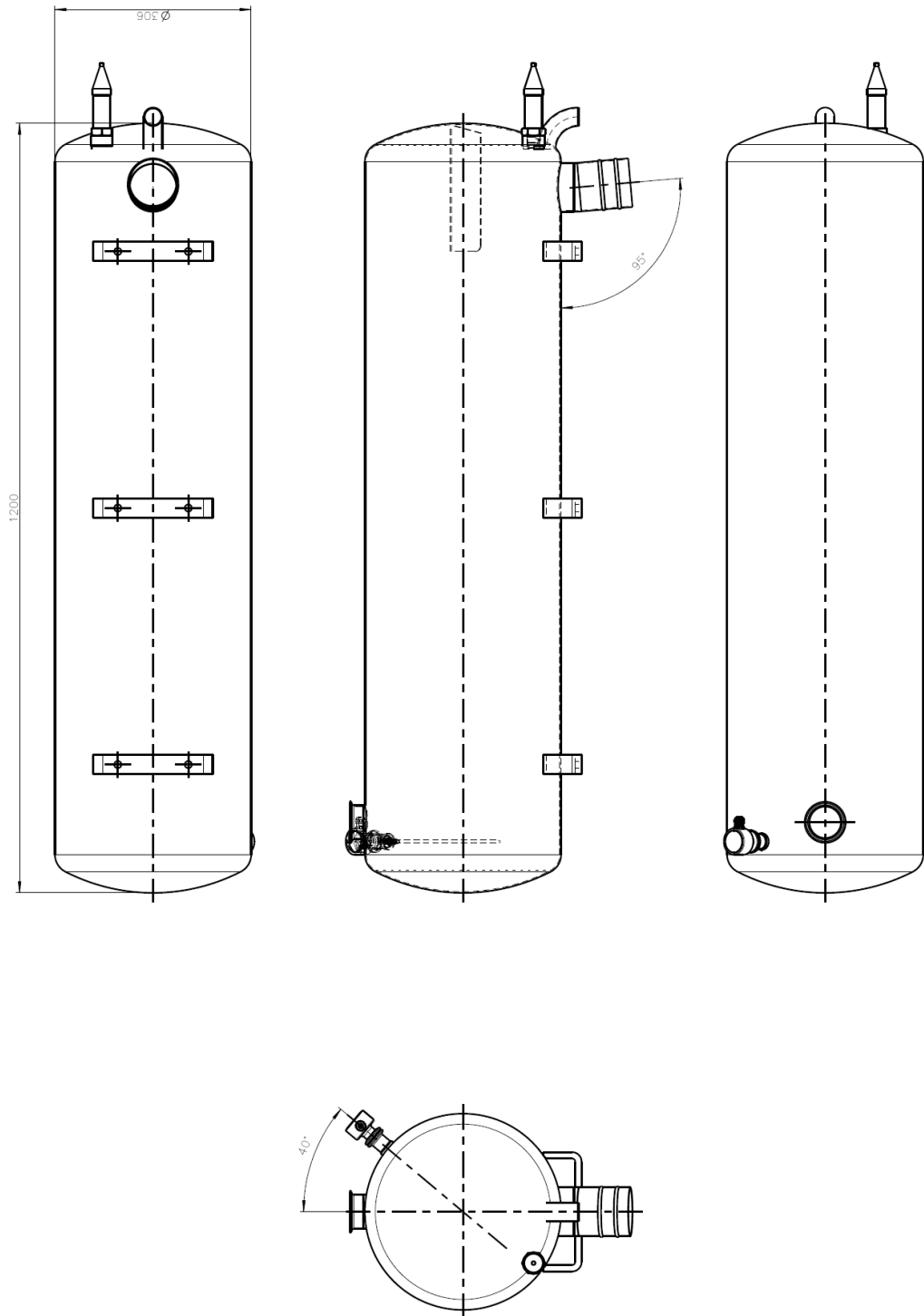
5.16.2   Dimensions of measurement system with suggested design
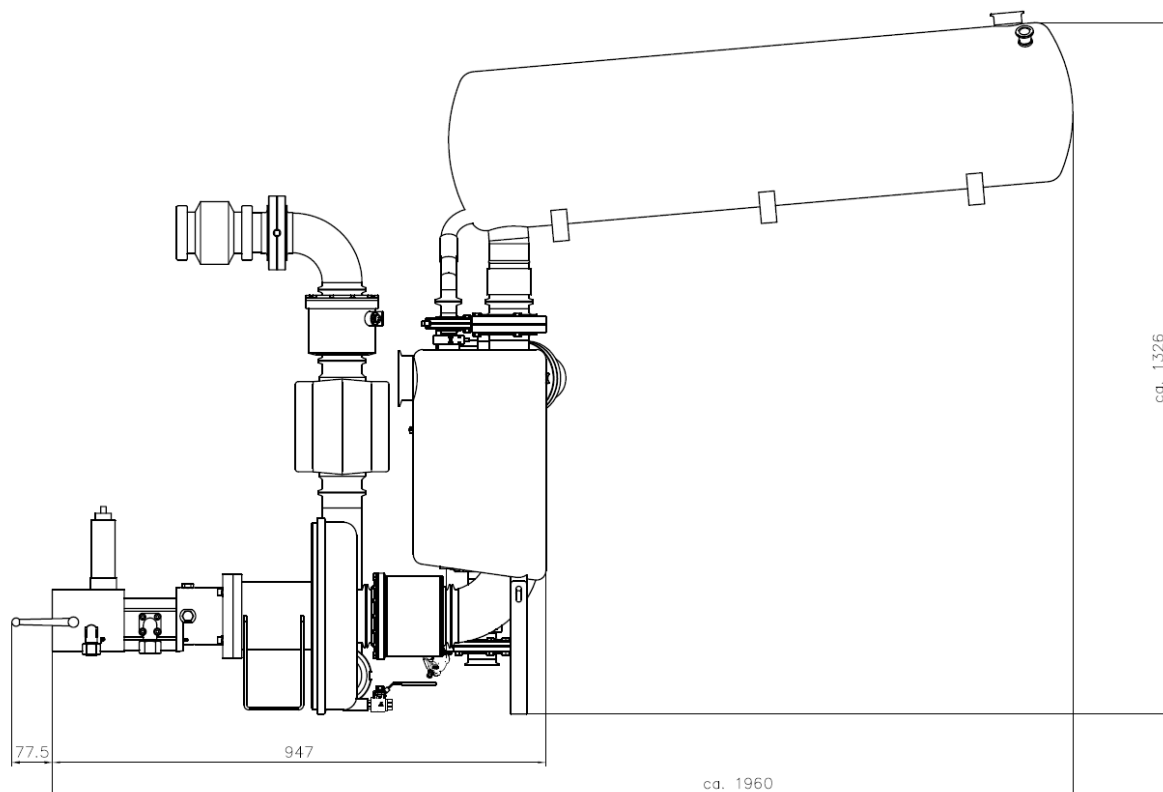
Mak-Tiger-4Zoll-kpl.jpg

5.17   Overview of the hydraulic

HVLP46
DIN 51524 T3
≥ 60 l
(Pourpoint<−35°C)

kundenseitig

provided by
the customer

coté−client

>= 2 KW / △t 30°C

40 l/min @ 200 bar   10µm

ø16

< 0,5m

P

ø28

M

T

Techn. Änderungen vorbehalten!
Technical changes reserved!
Tous changements techniques réservés

BARTEC GmbH	Hydraulikplan/Hydraulic plan/ Plan Hydraulique Messanlage TIGER (Milch) Measure system TIGER (milk) Installation de mesure TIGER (lait)	gez.	21.02.17 Eibl
		gepr.	
CAD−Nr.: sch0271h.dwg		6905−11	

5.17.1　Connection of hydraulic system to control block

Pressure connection

Return flow
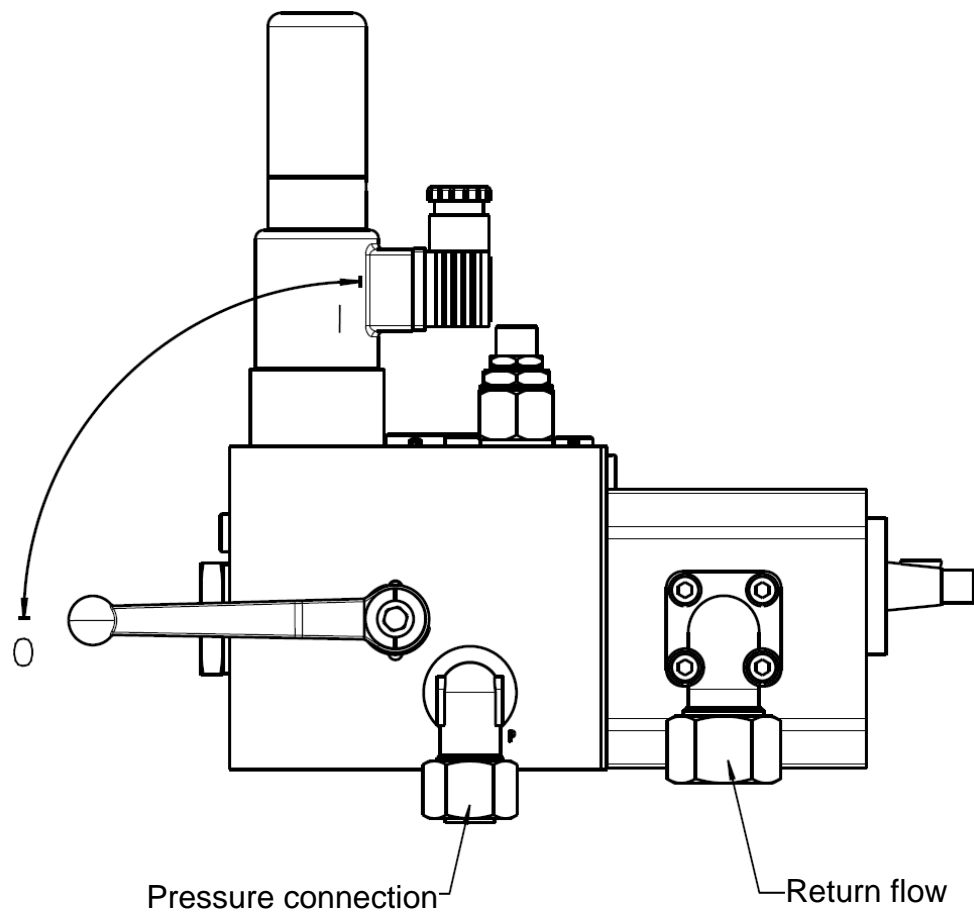
303148.pdf

5.18   Mounting of rotation sensor to rotary pump

- Install the proximity switch before the pump inlet is closed as afterwards the pump can only be turned by hand.

- Turn the knob of the rotary encoder disk in front of the desired mounting opening and screw in the proximity switch to the stop.

- Then turn it back by approx. 0.75 to maximally 1 rotation and lock it with both nuts.

- If there is no signal, screw the proximity switch in again with a quarter turn.

Attention:
Non-observance of these mounting instructions can result in the destruction of the proximity switch.

Proximity switch

Cap (possible mounting places)

Locking nuts

Disk of rotary encoder

Bottom opening must be open

Mount preferably in the direction of the rear wall

596.6

Ø 375

11

145

19

114

60   101.25   44.5

210
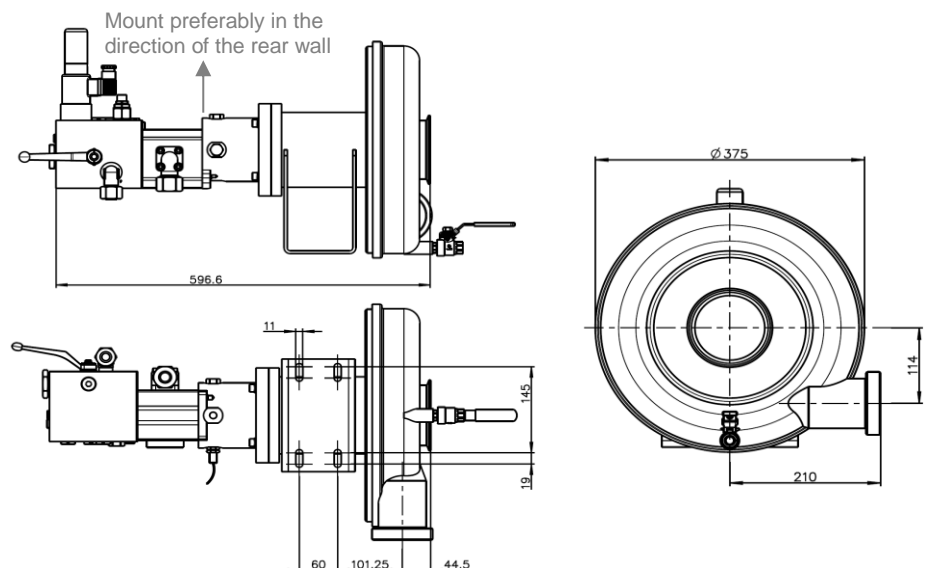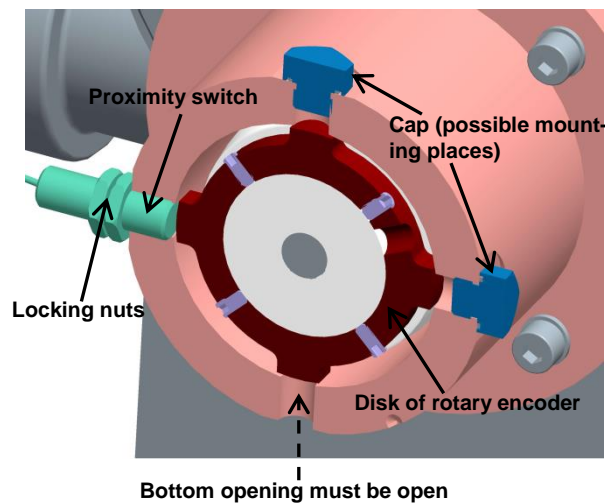
5.18.1   List of spare parts

Spare parts	
Designation	Order Number
Rotary pump (incl. control block)	303148
Seal kit for Packo pump MCP2 / 65-250	371308
Welding socket	292938
Gear motor for control block LT-30X44.1-K	367480
Seal kit Gear Motor, LT-30X44.1-K	307788
Ball valve	335128
Proximity switch	U496004
Gear motor for the control block, LT-70B21.0-K	374283
Seal kit Gear Motor, LT-70B21.0-K	373885
High-pressure WDR with molding disc, LT-70B21.0-K	408781

5.19 Electrical installation

5.19.1 Overview diagram
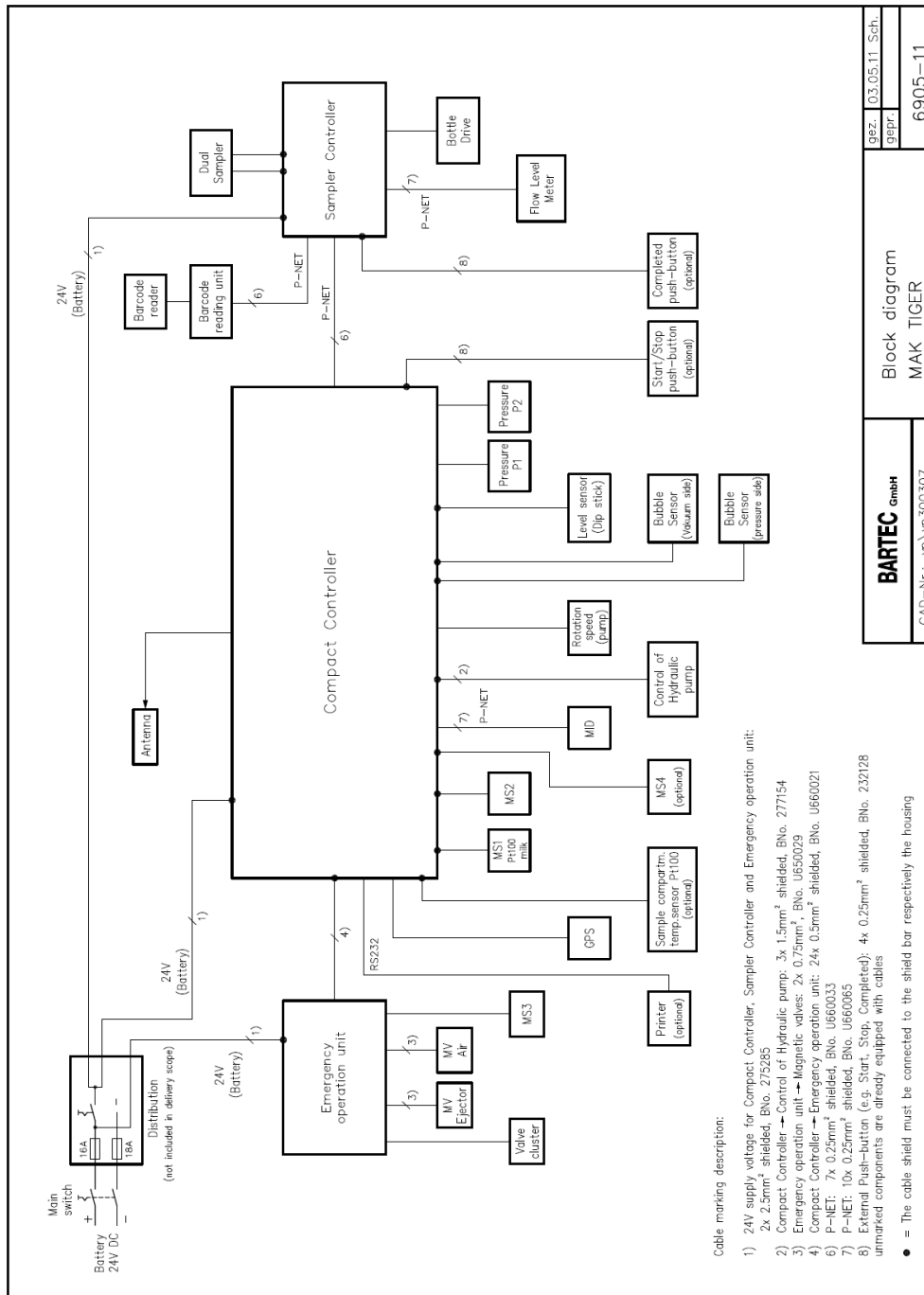
Note:
IMPORTANT - Mount GPS and modem antenna at the highest point of the truck, without any reception interferences.

5.19.2   Terminal connections of Bottle Drive

Bottle Drive with pneumatic lifting device type 6774-10
Inputs/ Outputs of Ultrasampler type 6771-31

Terminal	Signal designation	Colour	Connected to
25	+24V on-board power supply, auxiliary supply for sensor system		As required
26	Digital input IN 1		As required
27	Digital input IN 2		As required
28	Digital input IN 3		As required
29	Digital input IN 4		As required
30	Digital input IN 5		As required
31	Digital input IN 6, (bottle in position)	bl	Bottle Drive
32	Digital input IN 7, (star in position)	wire jumper	P-Star (terminal 49)
33	Digital input IN 8, (bottle down)	pi/wh	Bottle Drive
34	0 V on-board power supply, reference ground for IN 1-8		As required
42	Signal M-Up, bottle lifting motor	bn	
43	Signal M-Down, bottle lifting motor	rd	
44	Signal M-Outlet, engine of outlet cassette	ye	
45	Signal M-Inlet, motor of inlet cassette	gn	
46	Signal M-star, motor of star wheel drive	rs	
47	Signal P-star, self-holding contact for star wheel drive	pk	
48	Ground reference potential for signal P-star	gywh	
49	Signal P-star, feedback signal	wire jumper	IN 7 (terminal 32)
50	+ 24 V on-board power supply line for bottle drive	bk	
51	GND on-board power supply line for bottle drive	bnwh	
⏚	Shield connection for bottle drive cable		
⏚	Shield connection on-board power supply cable		
52	+ 24 V on -board power supply feed-in		Truck battery+
53	GND on-board power supply feed-in		Truck 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

5.19.3   Terminal connections of Bottle Drive Mini

Bottle Drive Mini type 6774-12
Outputs of Ultrasampler type 6771-31

Terminal	phy.	log.	inv.	Function
6	1			
7	2	82		Bottle UP/DOWN
8	3	83		Bottle transport
9	4	84		Magnetic plate motor (via relais)
10	⏚			Reference ground for OUT 1-4
11	5			
12	6			
13	7			
14	8			
15	⏚			Reference ground for OUT 5-8

5.19.4 Terminal connections of Bottle Drive ABO

Outputs of Ultrasampler type 6771-31

Terminal	phy.	log.	inv.	Function
6	1	81		Clip OPEN/CLOSE
7	2	82		Clip UP/DOWN
8	3	83		Bottle transport
9	4	84		Magnetic plate motor
10	⏚			Reference ground for OUT 1-4
11	5			
12	6			
13	7			
14	8			
15	⏚			Reference ground for OUT 5-8

5.19.5 Terminal connections of Bottle Drive Schwarte Monotrans

Outputs of Ultrasampler type 6771-31

Terminal	phy.	log.	inv.	Function
6	1			
7	2	82		Lower filling head
8	3	83		Bottle transport
9	4	84		Magnetic plate motor (via relay)
10	⏚			Reference ground for OUT 1-4
11	5			
12	6			
13	7			
14	8			
15	⏚			Reference ground for OUT 5-8

5.19.6   Wiring of Emergency operation unit

Valve cluster

Cable 24x0.5
BNo. U660021

Controller
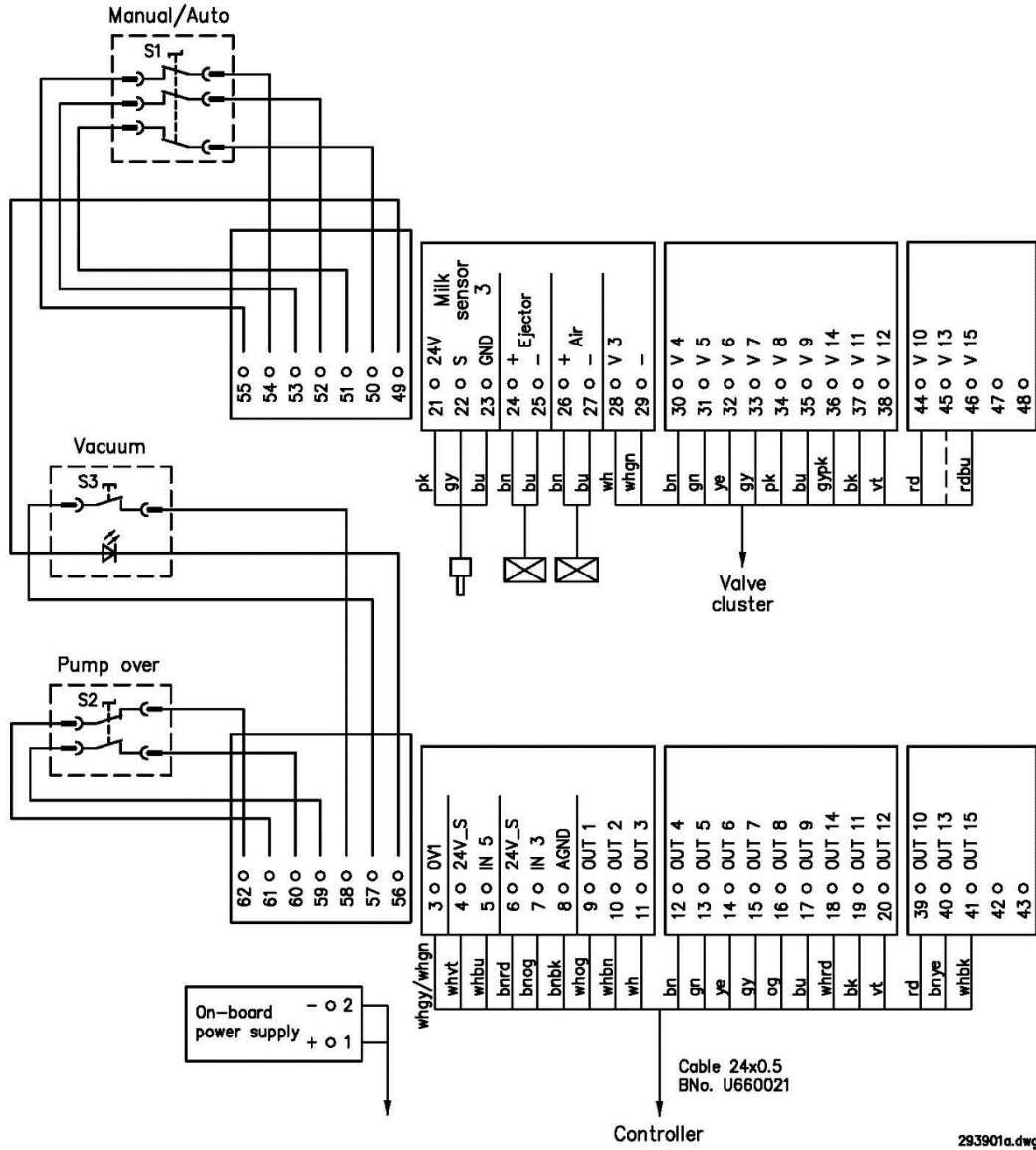
293901a.dwg

6 Measuring system MAK E-TIGER 3003
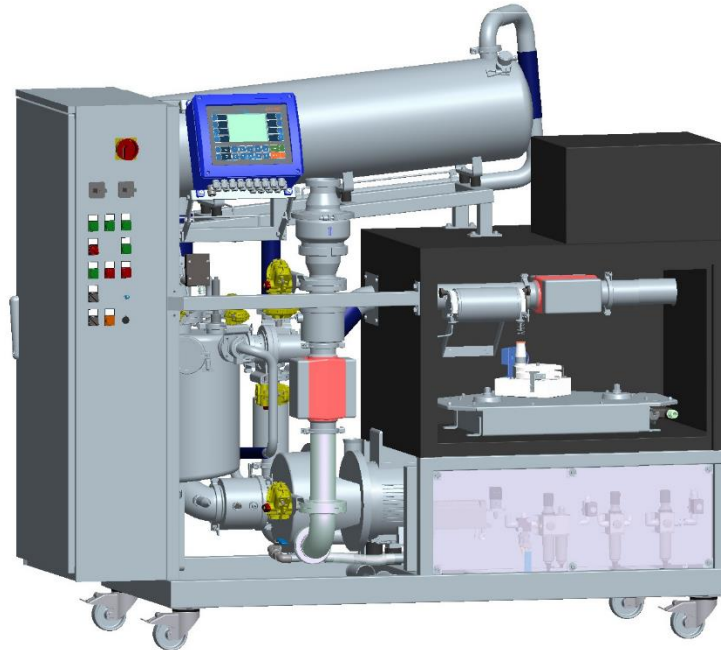
6.1 Introduction

The MAK E-TIGER® measuring system for dairies is designed for stationary use during milk collection.

The measuring system can be operated entirely from an electrical source via a 16A CEE plug socket.

It is the first self-priming measuring system to operate without gas separators.

The latest sensor technology is used to measure the air portion which unavoidably occurs during intake, and offsets it accordingly.

This significantly increases the efficiency of the intake because the gas separator with its limiting effect is not needed and thus the pumping output is increased.

This new technology can only be fully exploited, however, if the design and build of the tanker meet certain basic specifications, meaning the design engineer is crucial to the effective use of the system.

Note:

Several patents have been applied for in relation to the measuring process.

6.2   Pipework

The MAK E-TIGER stationary measuring system has an inlet and outlet with ND 3" (optionally ND 65) connections. The ejector exhaust air or flushing connector is ND 50. The centrifugal pump emptying system, or the refrigerator condensate drain, and the Samper rinsing hoses are all connected together on an ND 25 line.

Pressure and connection on the suction side is provided by the customer on site. This pipework has a substantial influence on the performance of the measuring system.

Some comments on this.

If possible, avoid:
- Changing the cross-sectional area
- Sharp elbows
- Right-angled outlets
- T-pieces
- Inward protruding welding seams
- Rough internal surfaces in the pipework
- Fittings projecting into the pipe
- Anything which causes turbulence in the flow
- Anything which impairs flow

The dust extraction hose should be as short as possible and in ND 65 (at least ND 50), particularly on the suction side, in order to avoid pressure losses.

When connecting the measuring system, be particularly sure that it is not under stress when installed. This can be achieved, for example, by decoupling the pressure and rinsing line with hose connections at suitable locations.

6.3   System requirement

In order for the MAK E-TIGER measuring system to operate at its optimum efficiency while stationary, it is essential that the connection or installation complies with the following boundary parameters:

- The oils and antifreeze agents used in the pneumatic system (and compressor) must be safe for use in food production processes.

- The compressed air supply must be sufficient (>500 nl/min at at least 7 bar) to guarantee the supply of compressed air, or an electrical auxiliary compressor must be installed.

- A power supply of at least 16 A CEE must be guaranteed for the measuring system. To facilitate fault-free operation, we recommend using an all-current sensitive FI circuit breaker and a circuit breaker with C characteristic for the motors in particular.

- A data network line of at least Cat. 5 must be installed for the data transfer.

- The measuring system must be heated in cold weather to prevent freezing.

- If there is a risk of the ambient temperature dropping below 5°C, an ejector heating seal must be provided.

6.4 Measuring system

6.4.1 Pipework diagram
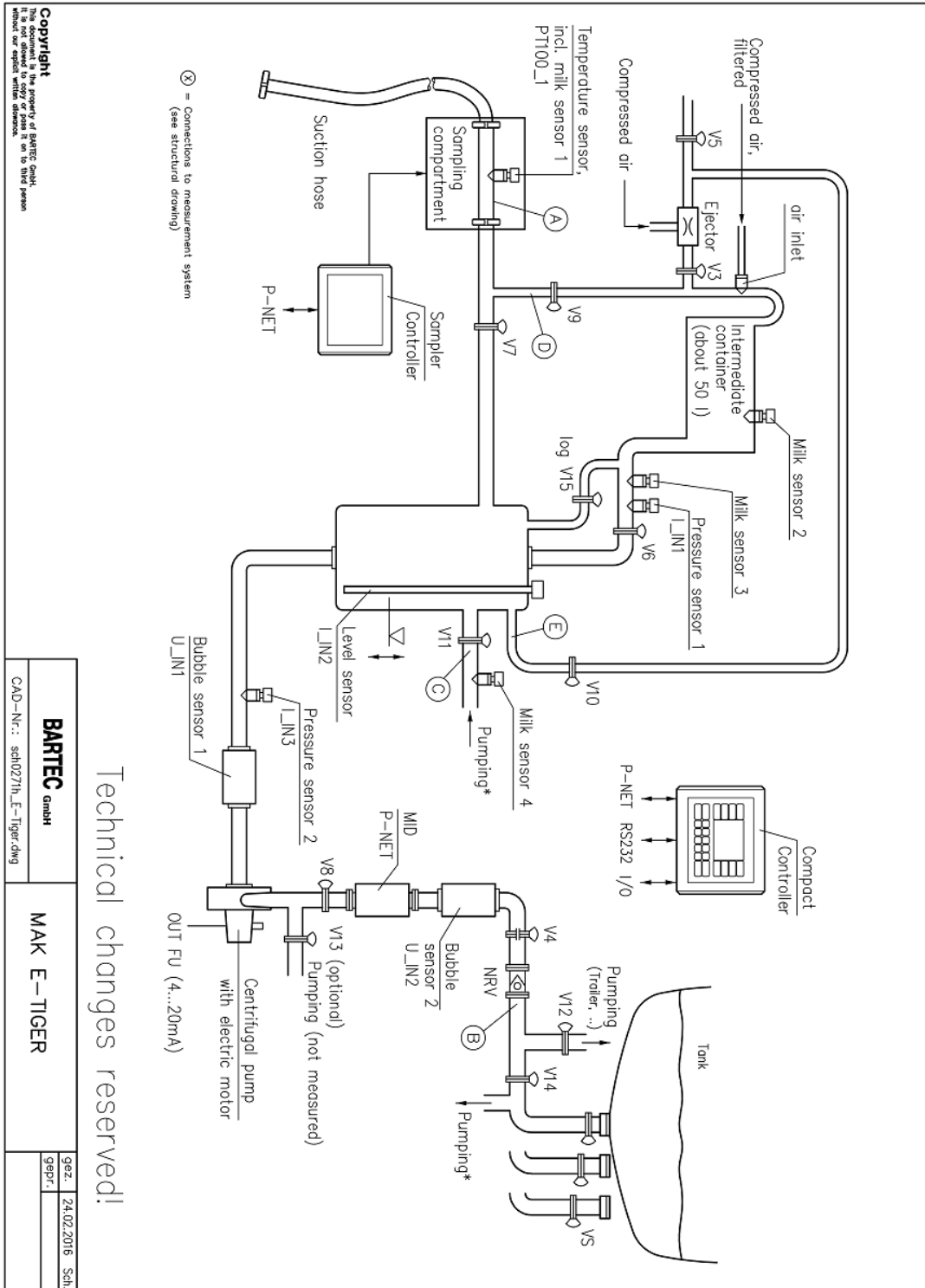
6.4.2 Dimensions of measuring system with large sample compartment

Measuring system, frontal view

US-Controller
TAG-Reader

Male
DN 3" welded,
outlet to tap

Cooling aggregate

Sampling box with
Flow level meter,
Sampler pump,
Bottle drive

1378

1465

984

233

246

130

Air supply for
Tube Ø13 mm

299.5

1700

1999.5
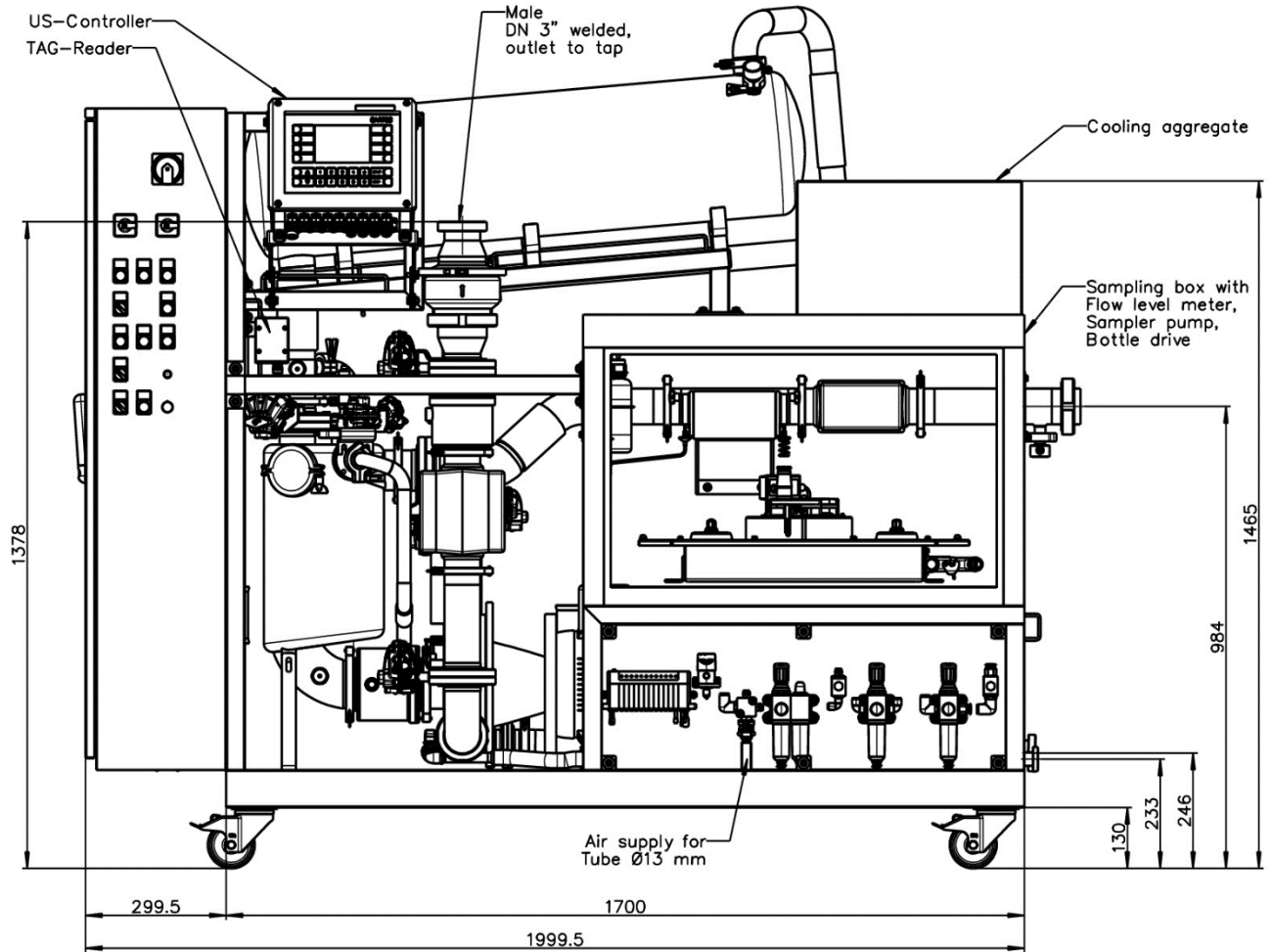
425375.drw

Measuring system, side view

1835

1619

800

425375.drw
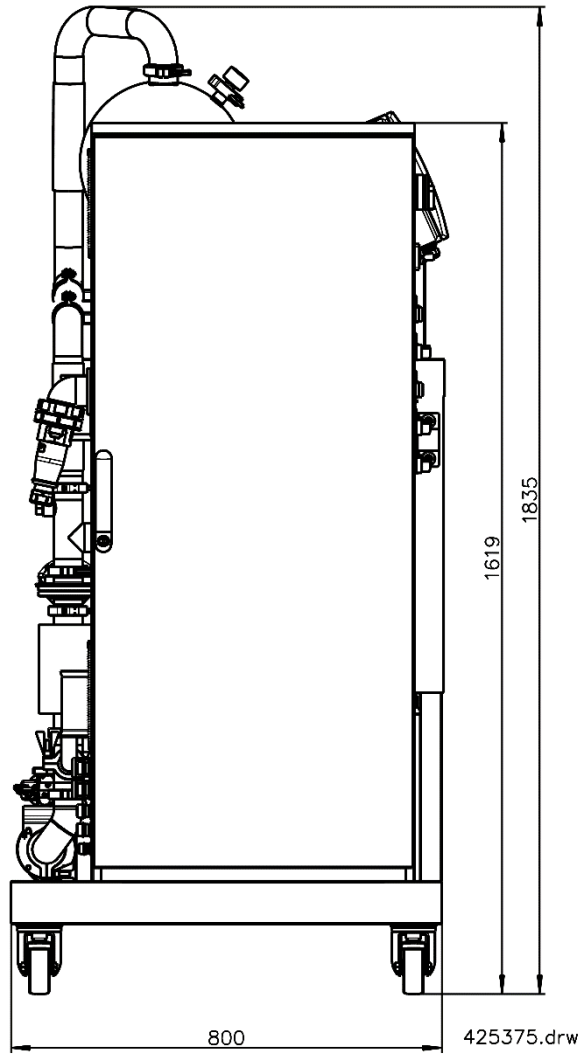
Measuring system, plan view

66

Male
DN 50
Ejektor
Exhaust air

252

477

Liner
DN 3"
Connection to
measurement system

Male
DN 25
Rotary pump
Drainage

650

1197

425375.drw
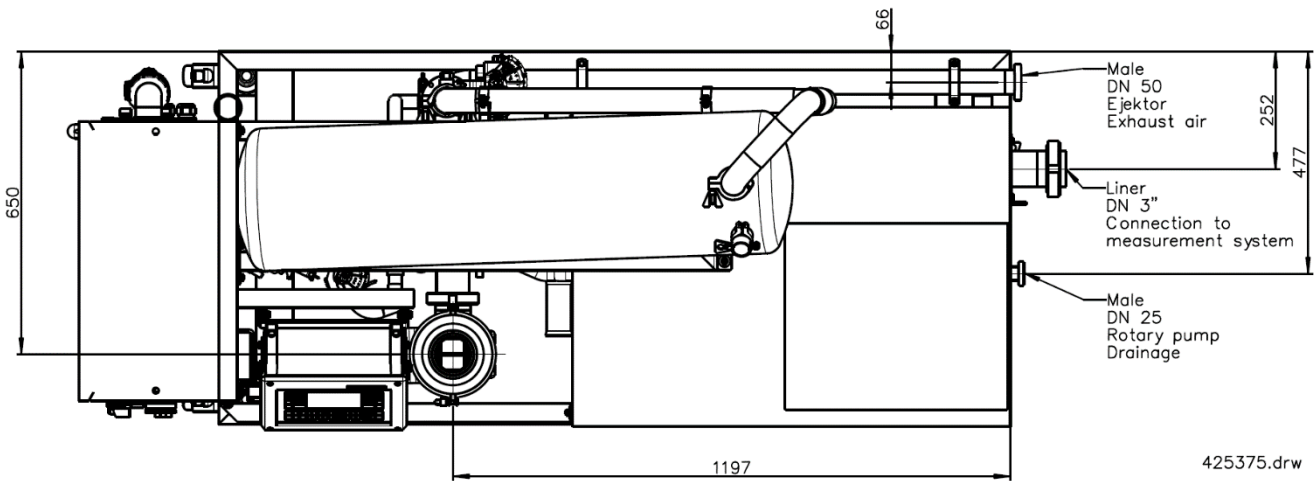
6.5   Pneumatic diagram

BARTEC BENKE scope of delivery
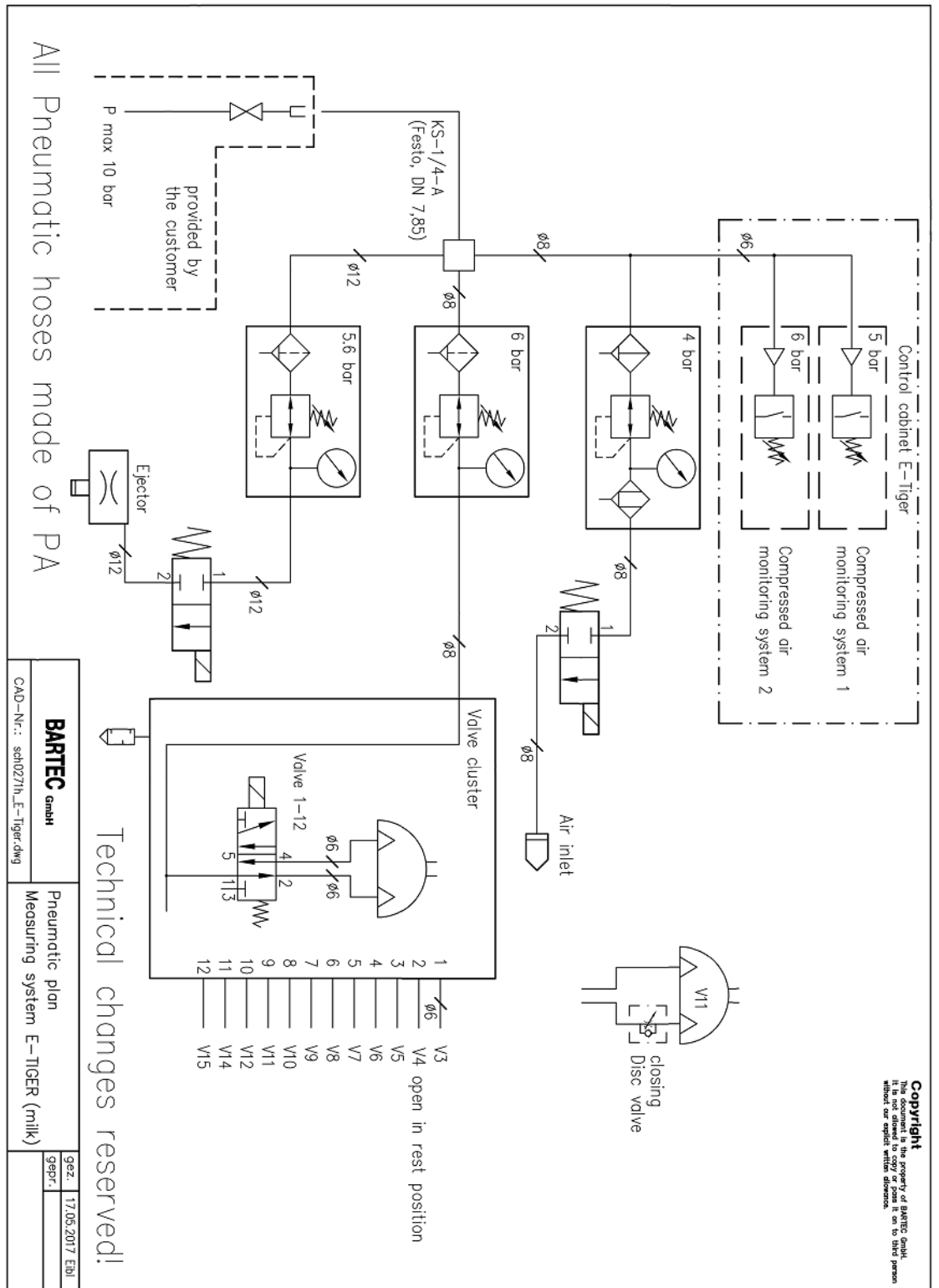
For information about the pneumatic system, see Chapter 5.7.1 Electrical installation

6.6 Electrical installation

6.6.1 Overview plan
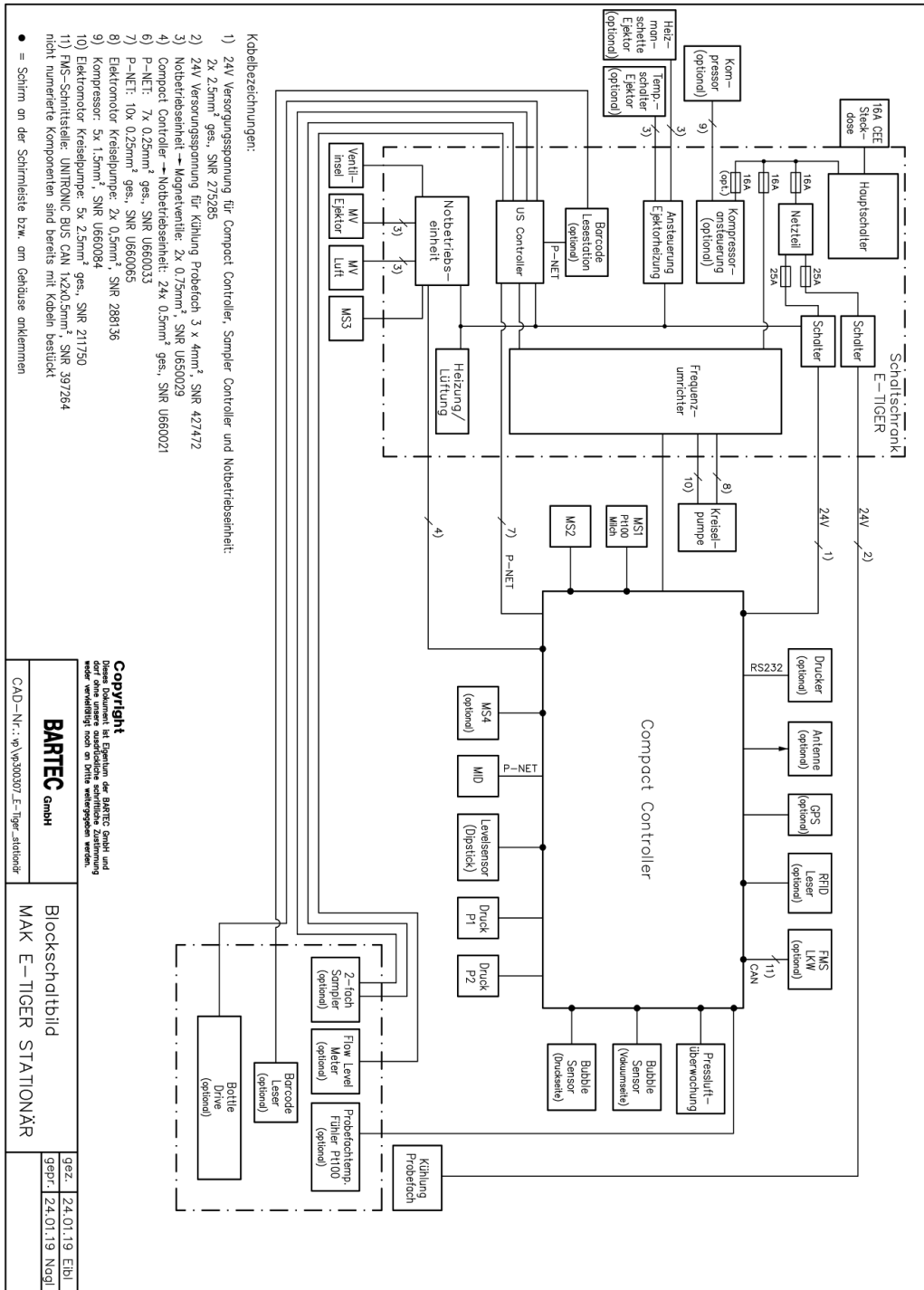
Note:

IMPORTANT: GPS and modem antenna must be installed at the highest point of the system, free of any hindrances to reception.

6.7 Overview of control cabinet
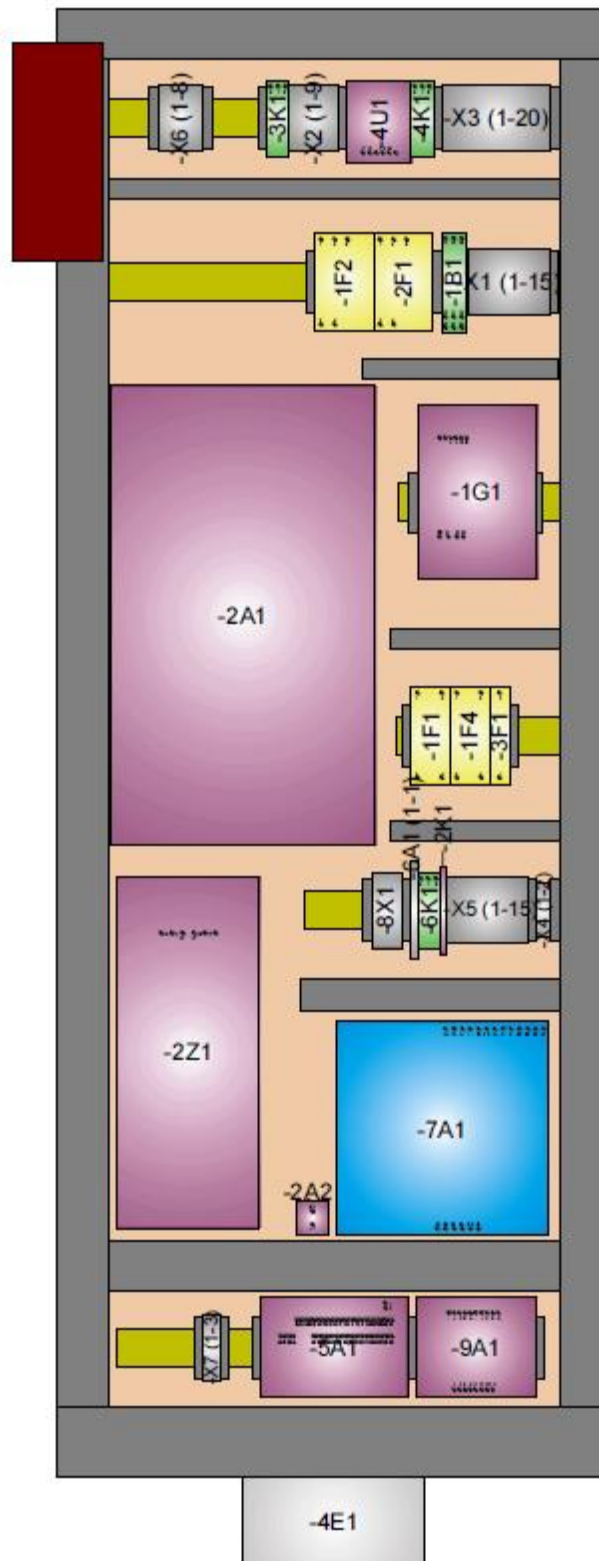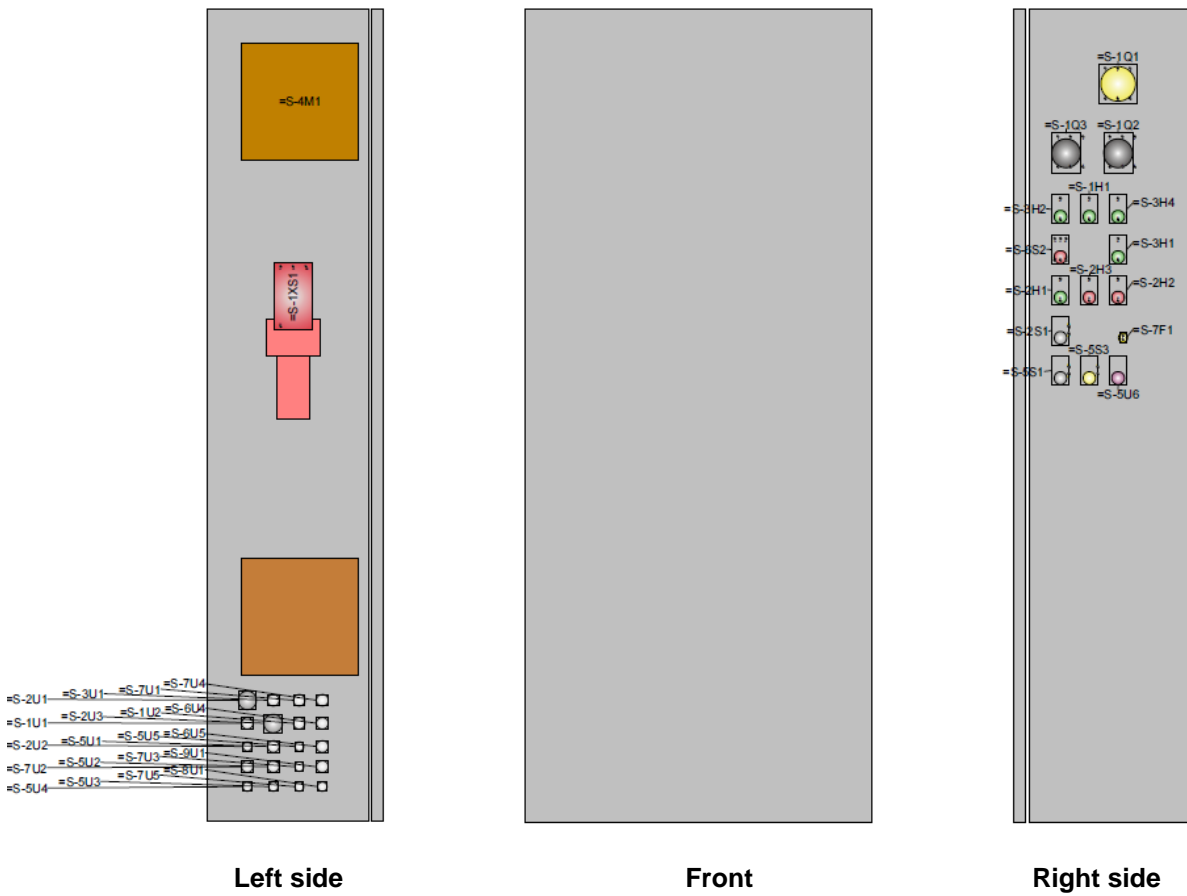
Left side   **Front**   **Right side**

Main switch
AC
-1Q1

Main switch   Main switch
Cooler   System 3003
-1Q3   -1Q2

Power   Power supply   Power
System 3003   24V   AC ok
-3H2   -3H4
-1H1

Ejector   Cabinet
Heating   Temp. Control
-6S2   -3H1

VFD   VFD   VFD
ready   Overcurrent   Alarm
-2H1   -2H2
-2H3

Pump   Bottledrive
Auto   0   Man.   Fuse
-2S1   -7F1

Auto   Manual   Suction   n. c.
-5S1
-5S3
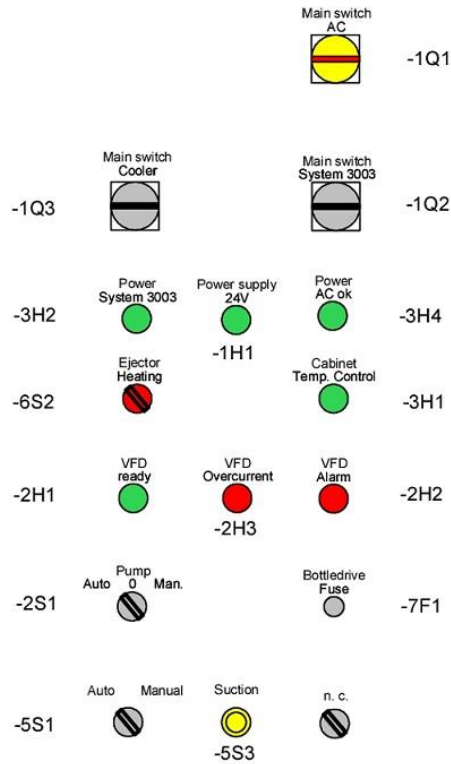
6.8 Connection diagram for control cabinet

BMK cable	Type	Core	N x Xmm² +ground +shield	Source	Destination	Comments
-W2	Ölfl.100 5x2.5 VDE0293f	Shield	5x2.5 mm² PE shield	-2Z1:shield	-2M1:	**Electric motor connection cable**
		gnyl		-2A1:PE	-2M1:PE	
		bk		-2Z1:U2	-2M1:U1	
		bl		-2Z1:V2	-2M1:V1	
		br		-2Z1:W2	-2M1:W1	
		bk				
-W3	Ölflex-110 CY	gnyl	2x0.5 mm²	-2A1:PE	-2M1:PE	**Electric motor temperature monitor**
		1		-2A1:50	-2M1:1	
		2		-2A1:53	-2M1:2	
-W5	AW G20 24x0.5 AWG Metro	Shield	24x2.5 mm² shield	-2A1:shield		**Control line FC**
		bk		-2A1:18	-X5:1	
		br		-2A1:5	-X5:15	
		rd				
		or		-2A1:29	-X5:3	
		yl		-2A1:2	-X5:14	
		gn		-2A1:6	-X5:5	
		bl		-2A1:20	-X3:3	
		vl		-2A1:54	-X5:6	
		gr		-2A1:19	-X5:2	
		wt		-2A1:33	-X3:2	
		wtbk				
		wtbr		-2A1:55	-X5:7	
		wtrd		-2A1:32	-X3:1	
		wtor				
		wtyl		-2A1:3	-X5:4	
		wtgn		-2A1:4	-X3:4	
		wtbl		-2A1:20	-2K1:A2	
		wtvi				
		wtgr		-2A1:27	-2K1:A1	
		brbk				
		brrd				
		bror				
		bryl				
		brgn				
-W6	Ölflex-110 CY	Shield	2x2.5 mm² shield		-8A1:shield	**Supply for compact controller**
		1		-X3:5	-8A1:1	
		2		-X3:10	-8A1:2	
-W7	M12 connection line	bl		-8A1:IN7	-3B1:3	**Compressed air monitor**
		bk		-8A1:102	-3B1:2	
		wt		-8A1:105	-3B1:4	
		bn		-8A1:101	-3B1:1	
-W8	LiYCY 7x0.25 DIN47100	Shield	7x0.25 mm² shield	-9U1:S	-9A1:1	**Barcode reader reading unit**
		wt				
		bn				
		gn		-9U1:gn	-9A1:11	
		yl		-9U1:yl	-9A1:12	
		gr		-9U1:gr	-9A1:4	
		pi		-9U1:pi	-9A1:3	

		bl			-9U1:bl	-9A1:2	
-W9	Ölflex-110	gnyl	3 x 4 mm² PE				**Cooler, sample compartment**
		1			-X4:1	+	
		2			-X4:2	-	
-W10	Ölfl.100 5x2.5 VDE0293f	Shield	5x2.5 mm² PE shield			-2A1:shield	**Supply FC**
		gnyl			-X1:PE	-2A1:PE	
		bn			-2F1:1	-2A1:L1	
		sw			-2F1:3	-2A1:L2	
		gr			-2F1:5	-2A1:L3	
		bl					
-W11	Ölfl.100 5x2.5 VDE0293f	Shield			-2A1:shield		**FC power choke**
		gnyl			-2A1:PE	-2M1:PE	
		bn			-2A1:U	-2Z1:U1	
		bk			-2A1:V	-2Z1:V1	
		gr			-2A1:W	-2Z1:W1	
		bl					
-W12	Ethernet Cat6	Shield			-8X1:shield		**Ethernet connection**
		wtor			-8X1:1		
		or			-8X1:2		
		wtgn			-8X1:3		
		bl			-8X1:4		
		wtbl			-8X1:5		
		gr			-8X1:6		
		wtbn			-8X1:7		
		bn			-8X1:8		
-W20	LiYCY 7x0.25 DIN47100	Shield	7x0.25 mm² shield				**PNET barcode reader unit**
		wt					
		bn			-9A1:S	-7A1:2S	
		gn			-9A1:B	-7A1:2B	
		yl			-9A1:A	-7A1:2A	
		gr					
		pi			-9A1:+	-7A1:2+	
		bl			-9A1:-	-7A1:2-	
-W101	Ölfl.100 2x0.75VDE0293ov/2	br	2x0.75 mm²		-5A1:24	1	**Solenoid valve for ejector**
		bl			-5A1:25	2	
-W102	Ölfl.100 2x0.75 VDE0293ov/2	br	2x0.75 mm²		-5A1:26	1	**Solenoid valve for discharge**
		bl			-5A1:27	2	
-W103	Valve terminal VM10 DIN47100	wt	25x0.5 mm²		-5A1:28		**Valve terminal connection cable**
		br			-5A1:30		
		gn			-5A1:31		
		yl			-5A1:32		
		gr			-5A1:33		
		pi			-5A1:34		
		bl			-5A1:35		
		rd			-5A1:44		
		bk			-5A1:37		
		vi			-5A1:38		
		grpi			-5A1:36		
		rdbl			-5A1:46		
		wtgn			-5A1:29		
		brgn					
		wtyl					
		ylbr					

		wtgr				
		grbr				
		wtpi				
		pibr				
		wtbl				
		brbl				
		wtrd				
		brrd				
		wtbk				
-W104	LiYCY 10x0.25 DIN47100	Shield	10x2.5 mm² shield			**PNET compact controller**
		wt		-2K1:14	-8A1:AGND	
		bn		-7A1:1S	-8A1:73	
		gn		-7A1:1B	-8A1:72	
		yl		-7A1:1A	-8A1:71	
		gr				
		pi		-2K1:13	-8A1:count	
		bl		-7A1:1-	-8A1:74	
		rd		-7A1:1+	-8A1:70	
		bk		-X5:7	-8A1:A_OUT1-	
		vi		-X5:6	-8A1:A_OUT1+	
-W105	AW G20 24x0.5 AWG Metro	Shield	24x2.5 mm² shield			**Valve compact controller**
		bk		-5A1:19	-8A1:80	
		br		-5A1:12	-8A1:20	
		rd		-5A1:39	-8A1:78	
		or		-5A1:16	-8A1:28	
		yl		-5A1:14	-8A1:24	
		gn		-5A1:13	-8A1:22	
		bl		-5A1:17	-8A1:76	
		vl		-5A1:20	-8A1:82	
		gr		-5A1:15	-8A1:26	
		wt		-5A1:11	-8A1:18	
		wtbk		-5A1:41	-8A1:88	
		wtbr		-5A1:10	-8A1:16	
		wtrd		-5A1:18	-8A1:86	
		wtor		-5A1:9	-8A1:OUT1-15	
		wtyl				
		wtgn		-5A1:3	-8A1:IN5	
		wtbl		-5A1:5	-8A1:96	
		wtvi		-5A1:4	-8A1:95	
		wtgr		-5A1:3	-8A1:83	
		brbk		-5A1:8	-8A1:41	
		brrd		-5A1:6	-8A1:IN3	
		bror		-5A1:7	-8A1:40	
		bryl		-5A1:40	-8A1:84	
		brgn				
-W106	LiYCY 7x0.25 DIN47100	Shield	7x0.25 mm² shield			**Milk sensor 3**
		wt				
		bn				
		gn				
		yl				
		gr		-5A1:22		
		pi		-5A1:21		
		bl		-5A1:23		

-W107	Ölflex 400 P	1	2x1.5 mm²	-X3:18	-6S1:1	Thermostat for ejector hea-ter
		2		-X3:19	-6S1:2	
-W108	Ölflex 400 P	1	2x1.5 mm²	-X3:20	-6E1:1	Ejector heater heating ele-ment
		2		-X3:17	-6E1:2	

6.9 Terminal assignments for compact controller

(Large terminal assignment wiring diagram — "Terminal configuration MAK E-TIGER STATIONÄR", BARTEC GmbH, CAD-Nr.: vb\vp300305_E-Tiger_stationär, gez. 18.01.19 Elbl, gepr. 18.01.19 Nagl)
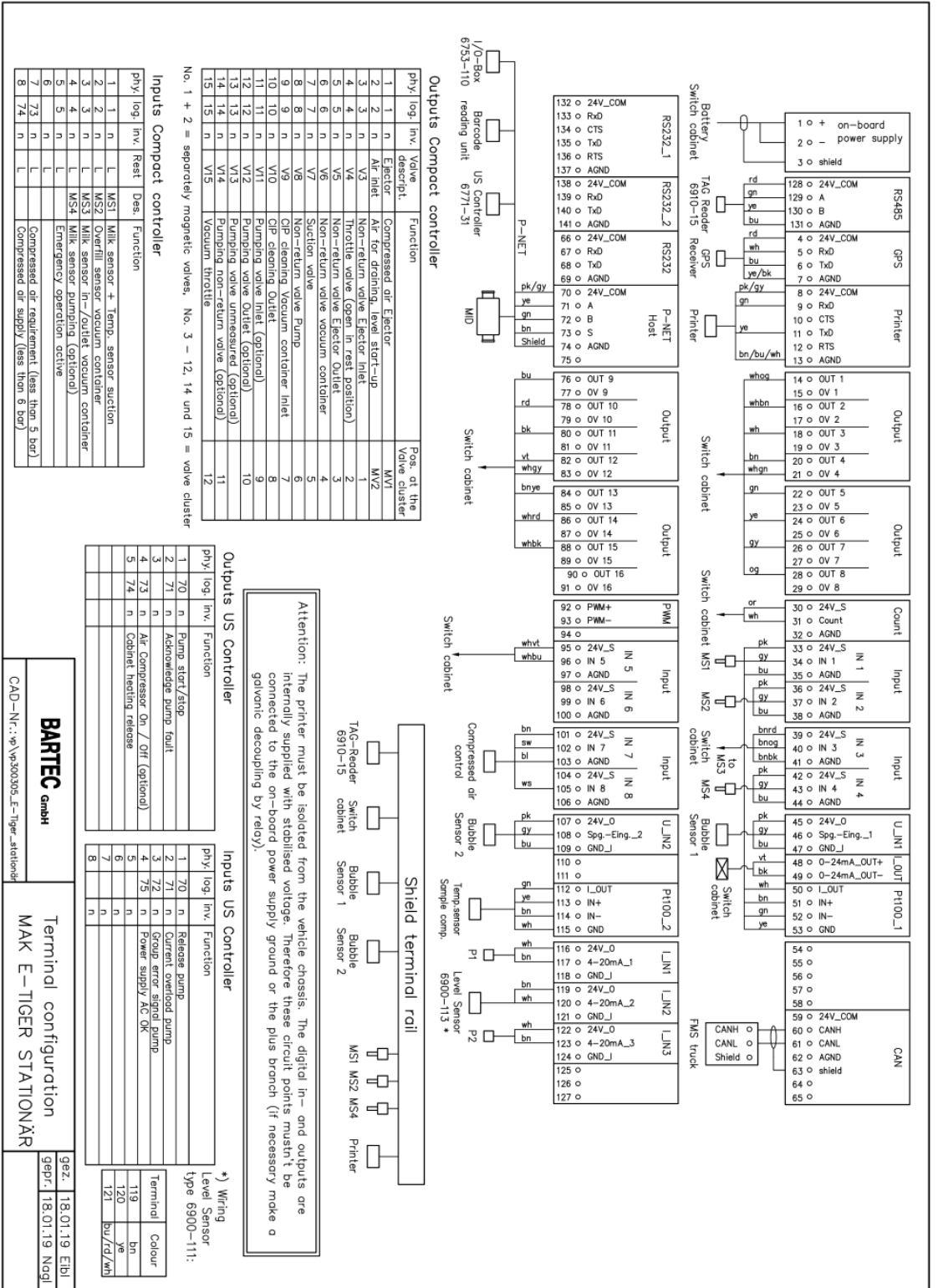
6.10 Terminal assignments for Ultra-sampler controller

Termi-nal	Signal designation	Colour	connected to
A (2x)	P NET A field bus	yl	P NET ring
B (2x)	P NET B field bus	gn	P NET ring
S (2x)	P NET S field bus	br	P NET ring
+ (2x)	+24 V supply from cut-in unit	rd	P NET ring
- (2x)	0 V supply from cut-in unit	bl	P NET ring
⏚	Frame ground for cable shielding		Cable shielding
RxD	RS 232 C interface		Inactive
TxD	RS 232 C interface		Inactive
CTS	RS 232 C interface		Inactive
RTS	RS 232 C interface		Inactive
GND	RS 232 C interface		Inactive
1	UB sensor (+24 V for FLM supply)	pi/gr	Flow level meter (FLM)
2	UB sensor (GND for FLM supply)	Shield	Type 6826
3	FLM level (0-2.5 V)	yl	cf. 1)
4	FLM flow rate (4-20 mA)	vi	
5	GND reference potential for fill level + flow rate	br/bk	
6	Digital output OUT 1	-X5:1	As required
7	Digital output OUT 2	-X5:2	As required
8	Digital output OUT 3		As required
9	Digital output OUT 4	-X5:13	As required
10	Reference ground for OUT 1-4		As required
11	Digital output OUT 5	-X5:8	As required
12	Digital output OUT 6		As required
13	Digital output OUT 7		As required
14	Digital output OUT 8		As required
15	Reference ground for OUT 5-8		As required
16	Sampler motor for individual sample, phase A	bl	Sampler motor for indi-vidual sample
17	Sampler motor for individual sample, phase B	br/wt	
18	Sampler motor for individual sample, phase C	gn/yl	
19	Sampler motor for individual sample, phase D	gr/pi	
20	UB sensor (+12 V for probe)		Inactive
21	Frequency input 1 (milk temperature, cf. 3)		
22	Frequency input 2 (milk sensor, cf. 3)		
24	UB sensor (GND for probe)		
20	UB sensor (+12 V for probe)		Inactive
23	Frequency input 3 (sample compartment temperature, cf. 3)		
24	UB sensor (GND for probe)		
25	+24 V on-board power supply, auxiliary supply for sensor system		As required
26	Digital input IN 1	-2A2:gr	As required
27	Digital input IN 2	-X5:5	As required
28	Digital input IN 3	-X5:4	As required
29	Digital input IN 4	1B1:14	As required
30	Digital input IN 5	-X5:11	As required
31	Digital input IN 6, (bottle in position)	bl	Bottle drive
32	Digital input IN 7, (star in position)	Wire jumper	P-Star (Terminal 49)
33	Digital input IN 8, (bottle down)	pi/wt	Bottle drive
34	0 V on-board power supply, reference ground for IN 1-8	-2A2:bl	As required

35	Sampler motor for tank sample, phase A	bl	Sampler motor for whole tank sample
36	Sampler motor for tank sample, phase B	br/wt	
37	Sampler motor for tank sample, phase C	gn/yl	
38	Sampler motor for tank sample, phase D	gr/pi	
39	+24 V on-board power supply from terminal 54	rd 1.5 mm²	Terminal 54
40	AGND on-board power supply from terminal 55	bl 1.5 mm²	Terminal 55
41	+44 V operating voltage for sampler motor for individual samples, supply from terminal 56	bk 1.5 mm²	Terminal 56
42	Signal M Up, bottle lifting motor	bn	
43	Signal M Down, bottle lifting motor	rd	
44	Signal M Out, magazine discharge motor	yl	
45	Signal M In, magazine infeed motor	gn	
46	Signal M Star, star drive motor	pi	
47	Signal P Star, self-holding contact for star drive	vi	
48	Ground reference potential for P-Star signal	grwt	
49	Signal P Star, check-back signal	Wire jumper	IN 7 (Terminal 32)
50	+ 24 V on-board power supply for bottle drive	bk	
51	GND on-board power supply for bottle drive	bnwt	
⏚	Shield connection for bottle drive cable		
⏚	Shield connection for on-board power cable		
52	+ 24 V on-board power supply		-7F1:1
53	GND on-board power supply		-X3:12
54	+ 24 V on-board power output	rd 1.5 mm²	Terminal 39
55	OGND on-board power output	bl 1.5 mm²	Terminal 40
56	+ 44 V operating voltage output for Sampler 1	bk 1.5 mm²	Terminal 41

6.11   Technical data

Measuring-system-specific data	
Voltage rating for electronics	DC 24 V (9 - 36V) from power supply
Operating voltage measuring system	AC 400V, 16 A CEE
Power connection	AC 400V, 16 A CEE plug, 3L+PE 6h
Emergency mode	Power supply 24 V (valves), 16 A CEE three-phase AC (centrifugal pump)
Drive	7.5 kW IE3 electric motor, frequency inverter controlled
Self-supply electronics	DC 24 V, max. 40 A
Control cabinet heater	DC 24 V; 150 W
Speed	approx. 2000 rpm
Compressor (optional)	250 l/min at 6 bar; max. 10 bar
Compressed air Ejector	5.6 bar (service unit)
Valve terminal	6 bar (service unit)
Compressed air level	4 bar (service unit), filter 0.01 µ
Air consumption ejector	approx. 500 nl/min @ 5.6 bar
Suction power	type. 1300 l/min. under good intake conditions
Suction and pressure side connections	ND 3" (optionally ND 65 or DN 50) milk pipe screw fitting
Connections ejector exhaust air/ emptying	ND 25 or ND 50) milk pipe screw fitting
Accuracy	≤ 0.5 %
Lowest intake rate	200 l with 3" MIF
CIP	yes; ϑ max. 85°C @ 2 bar
Mechanical data	
Material for milk line	V_2A; PTFE; PEEK, POM
Dimensions	See scale drawing
Weight including sampling and stand	Approx. 600 kg
Ambient conditions	
Operating temperature	0 to +85°C medium; -20 to +50°C electronics (frequency inverter required for cold start < 0°C heat-up time)
Storage temperature	-20 to +60°C (without fluid)
Protection class for measuring system	IP 55
Protection class for control cabinet	IP 55

6.12 Three-dimensional illustration
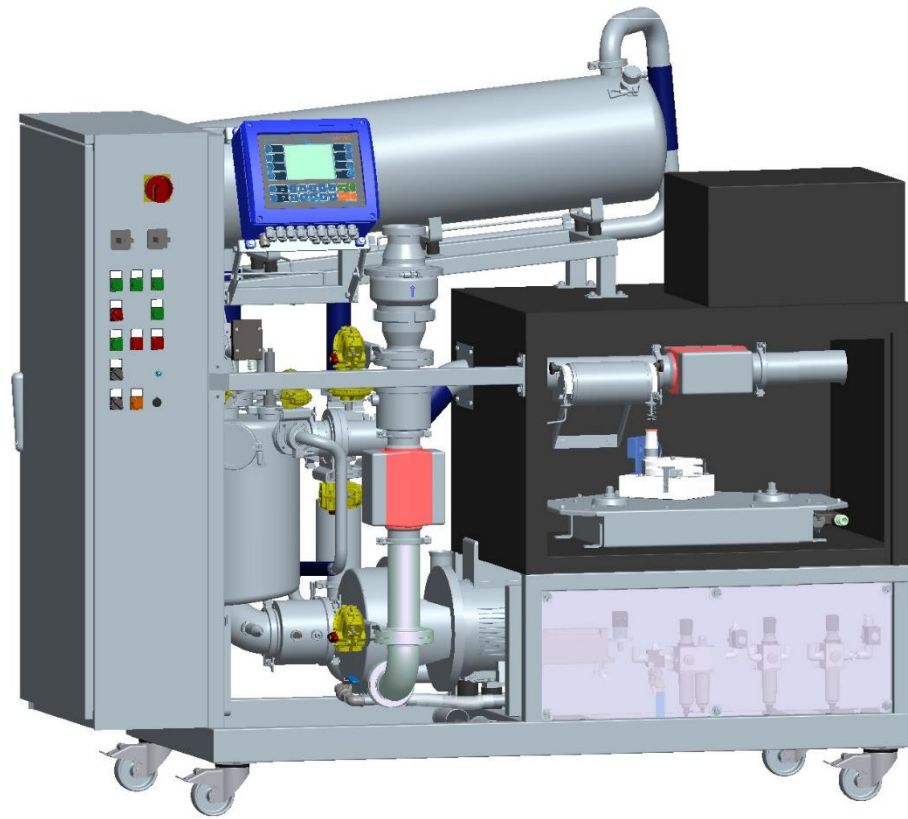
6.13 Components

6.13.1 Control cabinet

6.13.1.1 Frequency converter

Electrical data	
Supply voltage	380-480 V ±10 %
Mains frequency	50/60 Hz +4/-6 %
Typical shaft power	7.5 kW

Max. input current
    Continuous operation (1 x 380-440 V)
    Overload (1 x 380-440 V)
	
	14.4 A
	15.8 A

Output current
    Continuous operation (3 x 380-440 V)
    Overload (3 x 380-440 V)
	
	16 A
	17.6 A

Ambient conditions	
Min. ambient temperature under full load	0°C
Min. ambient temperature under reduced power	-10°C
Max. ambient temperature	50°C
Temperature during storage/ transport	-25 to +65/70°C

Max. height above sea level
    Without reduction in output
    With reduction in output
	
	1000 m
	3000 m

Protection class	IP55
Mechanical data	
Dimensions H x W x D	420 x 242 x 200 mm
Max. weight	14 kg

6.13.2   3-phase switching power supply, DC 24 V 40 A

Electrical data	
Input voltage	3 × 324-572 V AC/480-745 V DC
Input current	2.3 A (3 × 360 V AC); 1.6 A (3 × 500 V AC)
Frequency	50-60 Hz
Input fuse (internal)	3 x 6.3 A (slow-blow)
Output voltage	24 V DC (SELV), ±1%; 24-28 V adjustable
Power boost	Iout N x 150% (min. 5 s)
Output current	30 A (70°C); 40 A (60°C); 48 A (45°C)
Efficiency	93.7% (3 × 400 V AC); 93.5% (3 × 480 V AC)
Ambient conditions	
Relative humidity	5-95%, condensation not permitted
Temperature range	-40 to +70°C, to +70°C Derating (storage temperature -40 to +85°C)
Protection type	IP20
Connection type	Push-in spring-loaded terminals
Type of mounting	Snap-on mounting on mounting rail T H35 (EN 60715)
Equipment protection	short-circuit and overload-proof, permanently around 20% (up to 45°C)
LED display	LED (green): OK; LED (red): Overload, overheating or short-circuit
Mechanical data	
Dimensions H x W x D	

6.13.3   Phase monitoring relay

The unit monitors a three-phase supply for phase sequence, phase failure and phase asymmetry, undervoltage and overvoltage.

A change-over contact is used for the alarm or disconnection in the event of power failures (voltage or asymmetry), the second change-over contact only responds to an incorrect phase sequence. This can cause the direction of rotation to be corrected automatically in association with a contactor reversing combination.

With adjusted closed current principle
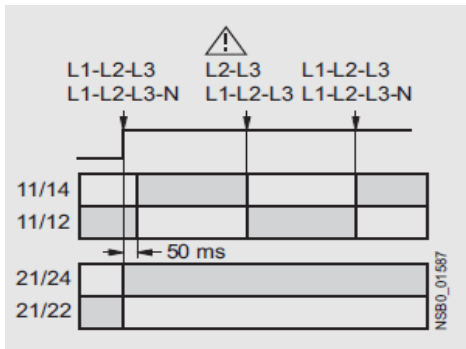
Phase failure
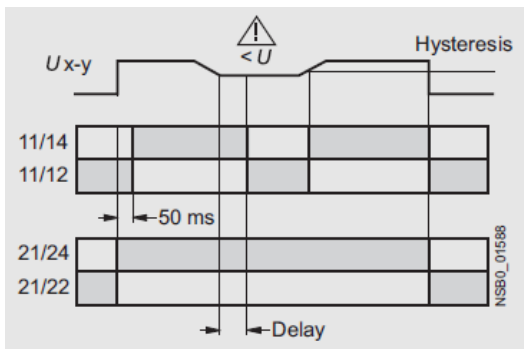
Undervoltage
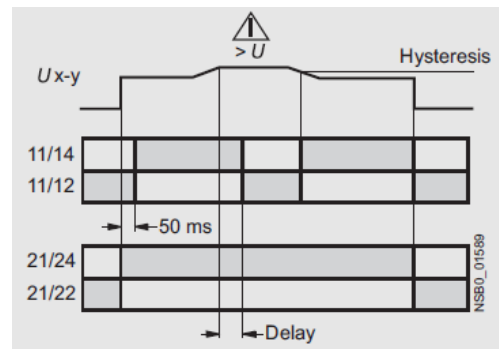
Overvoltage

Electrical data	
Rated control supply voltage Us	160-690 V
Rated frequency	50/60 Hz
Ambient conditions	
Permissible ambient temperature	
• during operation	-25 to +60°C
• during storage	-40 to +85 °C
Connection type	Screw terminals
Protection type	IP20
Mechanical data	
Overall width	22.5 mm

Dimensions

W   92 mm

NSB0_01606b

Wiring diagram

NSB0_01536a

NSB0_01609
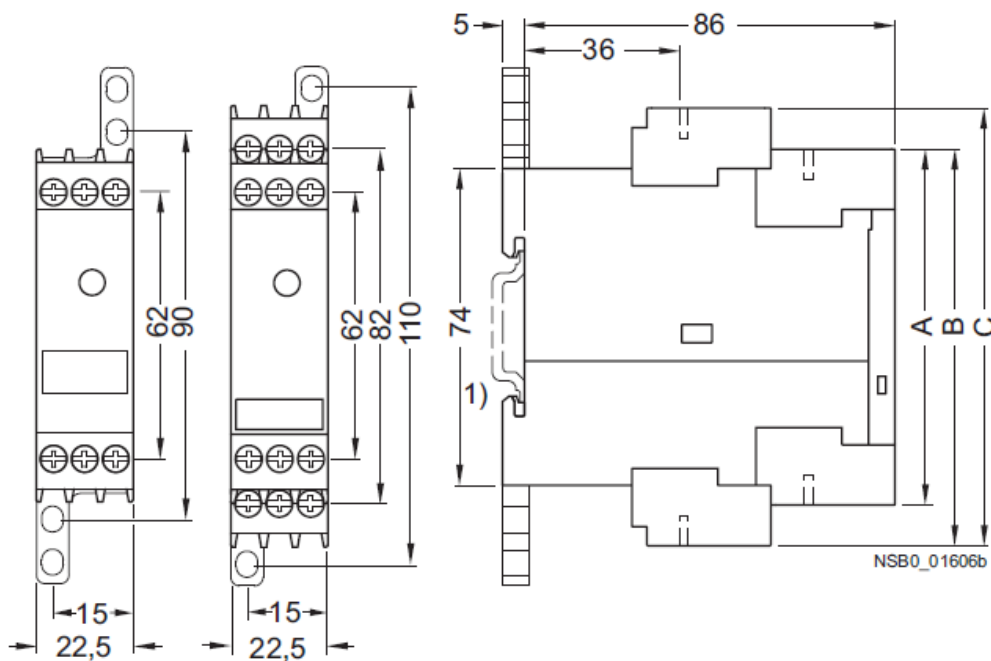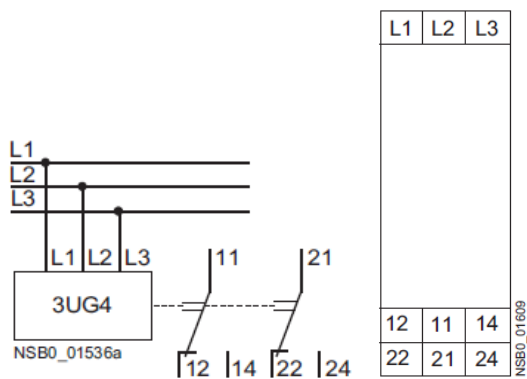
6.13.4 Control cabinet temperature controller

6.13.4.1 Control cabinet thermostat

S. no 394928

Electrical data	
Number of contacts	1 NC* and 1 NO*
Contact material	AgNi
Max. switching current DC1 30 V	1 A
Ambient conditions	
Adjustable temperature range	0-60°C
Ambient temperature	-20 to +80°C
Protection class	IP20
Mechanical data	

Dimensions

Wiring diagram

*Contact opens and contact closes is in relation to the rise in temperature. The NC contact for the heater opens and the NO contact for the fan closes when the specified value is exceeded.

6.13.4.2 Filter fan control cabinet

Electrical data	
Nominal voltage	±10% 24 V DC
Power consumption	0.21 A
Air flow rate free-blowing IP55	100 / 110 m³/h
Air flow rate in combination (PF + PFA 30,000) IP55	55 / 64 m³/h
Ambient conditions	
Noise level according to EN ISO 3741 IP55	40 dB (A)
Temperature range	-40 to +55°C
Protection class according to EN 60529 / UL 50	IP55 with NEMA Type 12 – folded filter
Mechanical data	

Dimensions

	mm
X	202
Y	202
Z1	6
Z2	81
A1	177
B1	177

1 for material thickness up to 2 mm
+1 mm for material thickness > 2 mm ≤ 3 mm

Accessories	
Name	**Order number**
Filter fleece with housing IP55	365086

6.13.4.3   Control cabinet heater S. no. 395023

Electrical data	
Voltage	24 V DC
Power	150 W
Ambient conditions	
Connection	Silicone cable 3 x 0.75 mm²
Protection type	IP52
Mechanical data	
Weight	534 g

Dimensions

Dimensions   166 x 80 x 62 mm

6.13.5   Network connection

6.13.5.1   Transfer module RJ45

Order number 409688

The compact controller 6942-10 is already connected to the MAK E-Tiger stationary 6905-370 control cabinet via an RJ45 patch cable. In the control cabinet, a transfer module is installed for the RJ45 permanent network connection. A permanently laid network cable can be connected as follows.
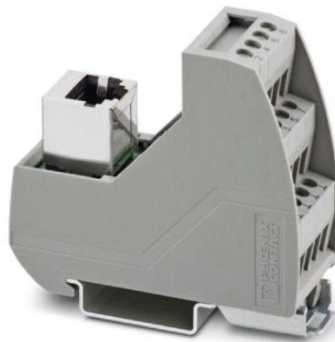
Electrical data	
Max. permissible operating voltage	48 V AC/DC
Max. permissible current (per branch)	1 A
Max. permissible current (all branches)	4 A
Pole number	8
Installation position	any
Connection data Connection 1	
Connection designation	Field level
Connection in accordance with standard	IEC / EN
Connection type	Screw connection
Stripping length	8 mm
Screw thread	M 3
Conductor cross section rigid	0.2 mm² 4 mm²
Conductor cross section flexible	0.2 mm² 2.5 mm²
Conductor cross-section	AWG 24-12
Connection data Connection 2	
Connection designation	Control level
Connection type	RJ45 socket
Pole number	8
Ambient conditions	
Ambient temperature (operation)	-20°C to 50°C
Ambient temperature (storage/transport)	-20°C to 70°C

Mechanical data	
Dimensions W x H x D:	26.9 x 69 x 62 mm
Pin assignment according to TIA 568B	**Terminal** **Wire colour** 1 white-orange 2 orange 3 white-green 4 blue 5 white-blue 6 green 7 white-brown 8 brown *The above pin assignment can be tested using the network cable tester (Order no. 401907).*

6.13.6   Large sample compartment with cooler

Electrical data	
Cooling capacity	L6/L30
Adjustment range	To be defined by the customer
Accuracy at 50-100%	To be regulated by the customer
Evaporator cold side	Copper aluminium
Condenser	Resistant to seawater and cleanable with compressed air
Ventilation hot side	1x compact fan, installed internally, speed regulated Protection class IP67
Ventilation cold side	1x compact fan, installed internally Protection class IP67
Evaporator defrost	Hot Gas Bypass, with thermostat regulation
Compressor	Yes, 2x Aspen 1.9
Refrigerant	R 134a (FCHC-free)
Supply voltage	24 V DC via 2 cables +/-
Voltage monitor	Yes, battery monitor included as standard
Power consumption	Max. 30 A
Ambient conditions	
Ambient temperature (operation)	+15°C to +40°C
Ambient temperature (storage/transport)	+5°C to 75°C

Mechanical data

Dimensions

Boden 40mm isoliert.
Seitenteile, Rückwand, Klappe und Decke 20mm isoliert.
Kühlung vermittelt und bündig zur Klappe montiert.
Kühlung ist soweit wie möglich nach rechts montiert.
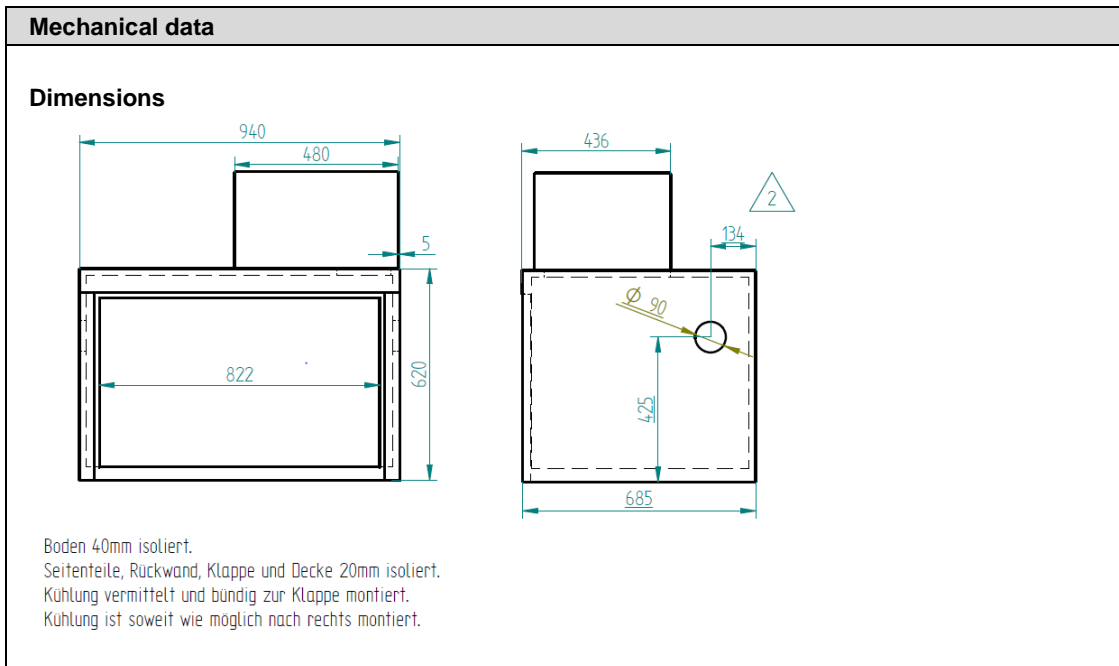
Settings
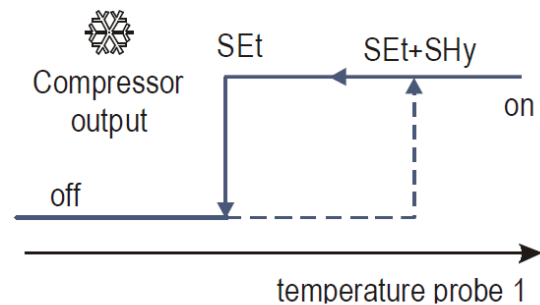
To adjust the lower temperature level [°C]: (delivery state 2°C)

Press "Enter", select "Set" using the "arrow keys" and confirm with "Enter". The lower desired temperature can be adjusted using the "arrow keys". The temperature selected is saved by pressing the "Enter" key and holding it down for approx. 15 seconds. After the temperature is saved, the display automatically jumps to the current-temperature display.

To adjust the hysteresis: (delivery state 2°C)

Press "Enter" for 6 seconds, select "SHy" using the "arrow keys" and confirm with "Enter". The desired hysteresis can be adjusted using the "arrow keys". The hysteresis selected is saved by pressing the "Enter" key and holding it down. After the temperature is saved, the display automatically jumps to the current-temperature display.

6.13.7   Electronic push switch with display

Electrical data	
Auxiliary power	15-35 V DC
Output signal	two switching outputs (PNP) Max. switching current without IO link 250 mA
Measuring range	Absolute pressure 0-16 bar
Process connection	Internal thread 1/4 inch
Electrical connection	Round plug connector M12x1, 4 pole

Anschlussschema

Rundstecker M12 x 1 (4-polig)

U+	1
U-	3
S+	2
SP1 / C	4
SP2	2

Legende:

U+	Positive Hilfsenergie
U-	Bezugspotential
SP1	Schaltausgang 1
SP2	Schaltausgang 2
C	Kommunikation mit IO-Link
S+	Analogausgang

Ambient conditions	

Permissible temperature ranges
   Process medium
   Environment:
   Storage:
	
	-20 to +85°C
	-20 to +80°C
	-20 to +70°C

Humidity	45-75% r.h.
Protection type	IP67

Accessories	
Name	**Order number**
Angle bracket	426537
Sensor connection line M12	362582
Push-in screw fitting ¼ inch 6 mm	282322

7 Temperature probe with milk sensor series B type 6703-11

Order no.: 216272

7.1 Technical data

Electrical data	
Operating voltage	DC 24 V (+ 10 … - 20 %), 50 mA
Connection	5 m cable (wire end ferrules)
Milk sensor output	Positive switching (DC +24 V) impulse current $\leq$ 20 mA
Milk sensor alternating voltage	12 V AC, approx. 1.5 kHz
Milk sensor switching threshold	Approx. 500 Ω
Ambient conditions	
Operating temperature	- 20 ... + 60 °C / briefly up to + 80° C
Sensor element temperature range	- 20 ... + 100 °C
Protection class	IP 65 (Verguss)
Mechanical data	
Housing specification	V$_2$A 1.4301
Weight	0.5 kg
Fitting	DN 20 clamp
Specific data	
Measuring element	Pt 100 DIN IEC 751 class A

7.2 Dimensions

216272.dwg
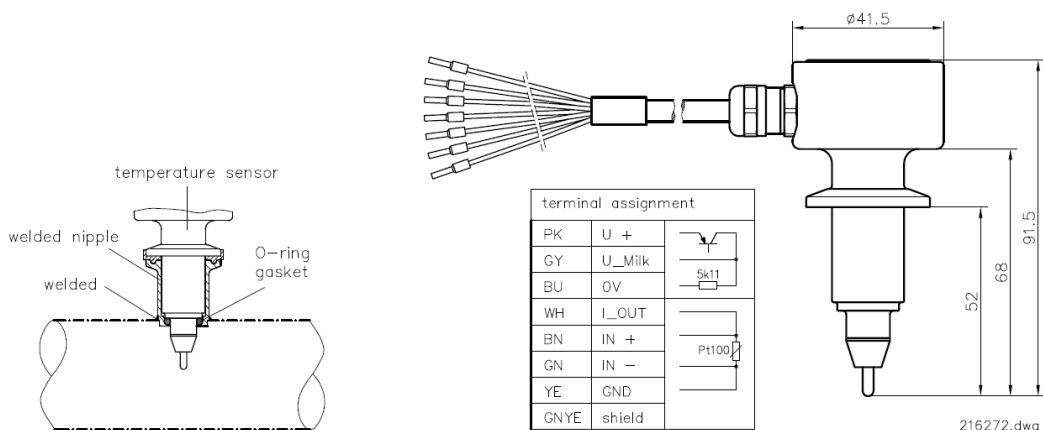
7.3   Assembly/installation

Follow the instructions below for installation in the milk pipeline by means of welded nipple type 6701-00-021:

- Weld the nipple into the milk pipeline, mask joints and clean.

- Apply a light coating of grease to O-ring D 12,0 x 3,0 VMQ 70 FDA (Best.Nr. 335326) (attached to temperature probe), insert it in the welded nipple and, using a fingertip, fit it carefully in the O-ring groove at the front end. Adjust and use fingertip to check that it is seated evenly.

- Fit clamp-type flat gasket DN 20 EPDM on tip of probe and insert probe carefully in welded nipple as far as it will go, making slight turns to the left/right to ease it in.

- Lock the probe in position with the two-hinged clamp, tightening the wing bolt by hand only.
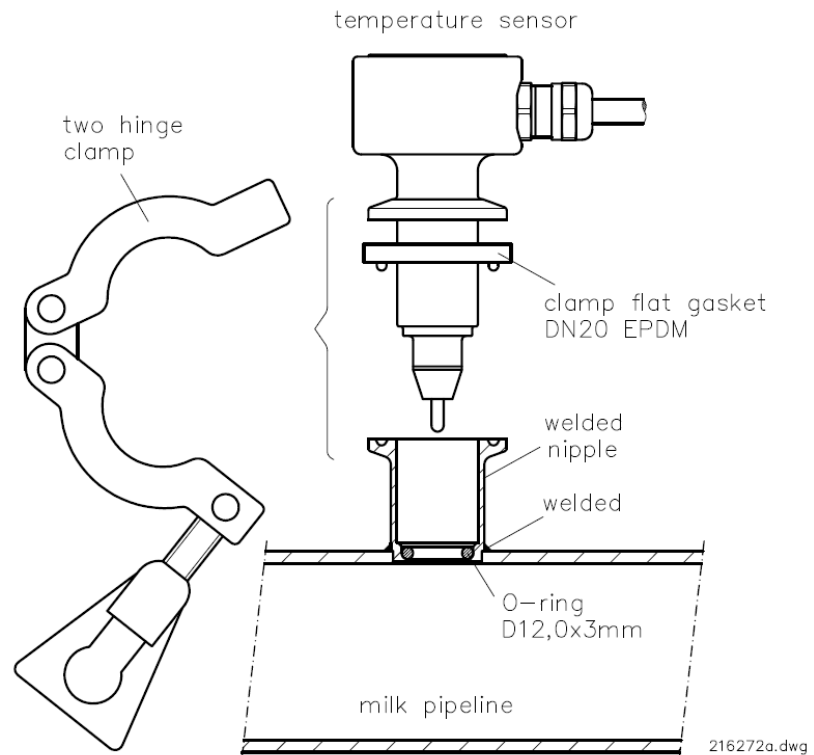
8 Milk sensor, series A type 6703-17

Order no.: 303502

The milk sensor type 6703-17 is used in conductive liquids to measure the level. The wall of the tank or pipe is used to counter the charge. The electrode rod can be shortened to any length.

8.1 Technical data

Electrical Data	
Operating voltage	DC 24 V (+ 10 … - 20 %), 50 mA
Connection	Cable 5 m (conductor and sleeves)
Output milk sensor	Plus-switching (DC +24 V)
	Switching current $\leq$ 20 mA
Threshold level of milk sensor	Approx. 500 Ω
AC voltage of milk sensor	12 V AC, approx.1.5 kHz
Ambient conditions	
Operating temperature/sensor element	- 20 … + 60 °C/briefly up to + 80 °C
Storage temperature	- 30 … + 70 °C
Protection type	IP 65
Mechanical Data	
Weight	0,5 kg
Casing	V_{2A} 1.4301
Assembly	Clamp DN 20

8.2 Dimensions
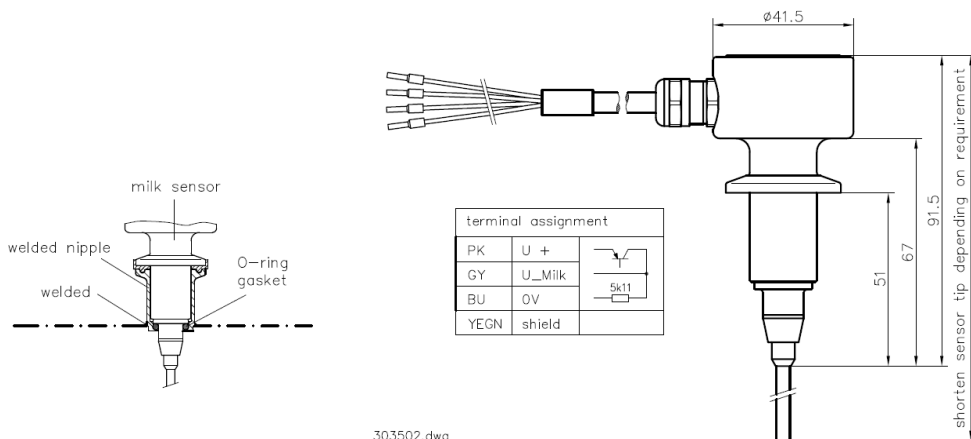
303502.dwg

8.3   Assembly/installation

Follow the instructions below for installation in the wall of the tank or pipe using welded socket type 6701-00-021:

- Weld the socket into the wall of the tank or pipe, mask joints and clean.

- Apply a light coating of grease to O-ring D 12,0 x 3,0 VMQ 70 FDA (order no. 335326) (attached to milk sensor), insert it in the welded socket and, using a fingertip, fit it carefully in the O-ring groove at the front end. Adjust and use fingertip to check that it is seated evenly.

- Using a hacksaw, carefully cut the electrode rod on the milk sensor to the <u>required length</u> and strip the isolation approx. 1.5 cm, taking care not to damage the insulation, then smooth and finish the cut surface.

  <u>Required length:</u>
  If fitted in the pipe, the sensor tip should go to the middle of the pipe; if fitted elsewhere, it should end where required according to the function.

- Fit clamp-type flat gasket DN 20 EPDM on the sensor tip and insert sensor carefully in the welded socket as far as it will go, making slight turns to the left/right to ease it in.

- Lock the sensor in position with the two-hinged clamp, tightening the wing bolt by hand only.
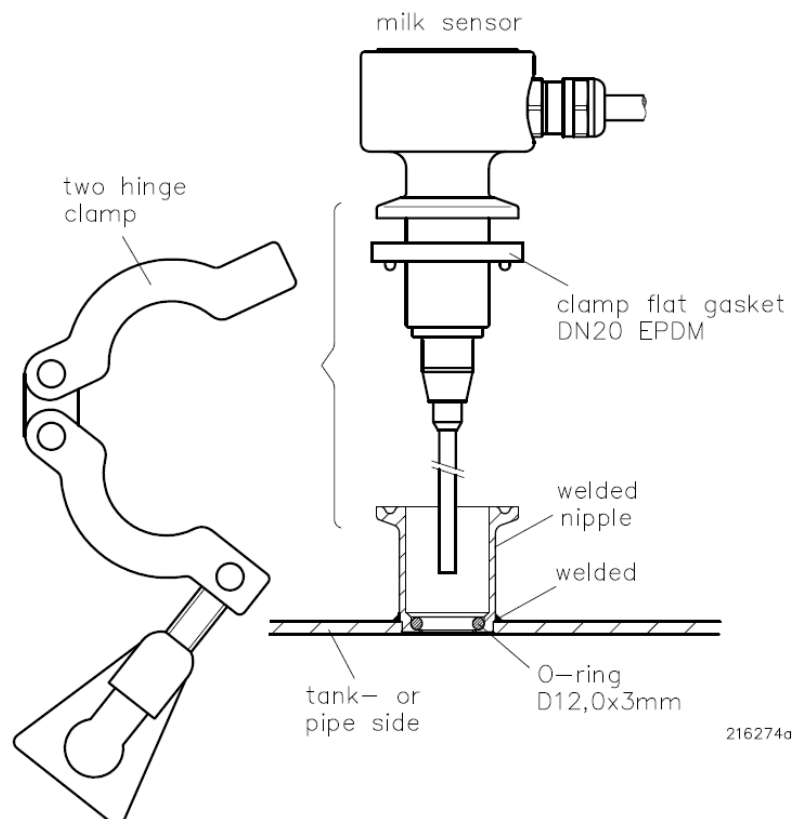
9 Milk sensor, series B type 6703-16

Order no.: 275354

The milk sensor type 6703-16 signals when milk is in the pipe via a positive output.

9.1 Technical data

| Electrical data	
Auxiliary power	DC 24 V (+ 10 ... - 20 %), 50 mA
Connection type	5 m cable (wire end ferrule)
Milk sensor output	Positive (DC + 24 V) Switching current ≤ 20 mA
Milk sensor switching threshold	Approx. 500 Ω
Milk sensor alternating voltage	12 V AC, approx. 1.5 kHz
Ambient conditions	
Operating temperature/sensor element	- 20 ... + 60 °C / briefly up to + 80 °C
Storage temperature	- 30 ... + 70 °C
Protection class	IP 65 (grouting)
Mechanical data	
Weight	0.5 kg
Housing specification	V_{2A} 1.4301
Fitting	Clamp DN 20

9.2 Dimensions
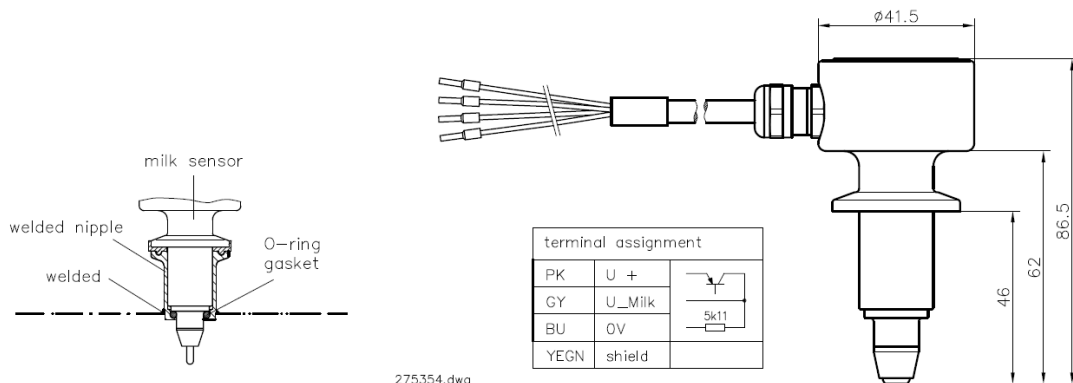
9.3   Assembly/installation

Follow the instructions below for installation in the milk pipeline by means of welded socket type 6701-00-021:

- Weld the socket into the milk pipeline, mask joints and clean.

- Apply a light coating of grease to O-Ring D 12,0 x 3,0 VMQ 70 FDA (Best.Nr. 335326) (attached to temperature probe), insert it in the welded socket and, using a fingertip, fit it carefully in the O-ring groove at the front end. Adjust and use fingertip to check that it is seated evenly.

- Fit clamp-type flat gasket DN 20 EPDM on tip of probe and insert probe carefully in welded socket as far as it will go, making slight turns to the left/right to ease it in.

- Lock the probe in position with the two-hinged clamp, tightening the wing bolt by hand only.
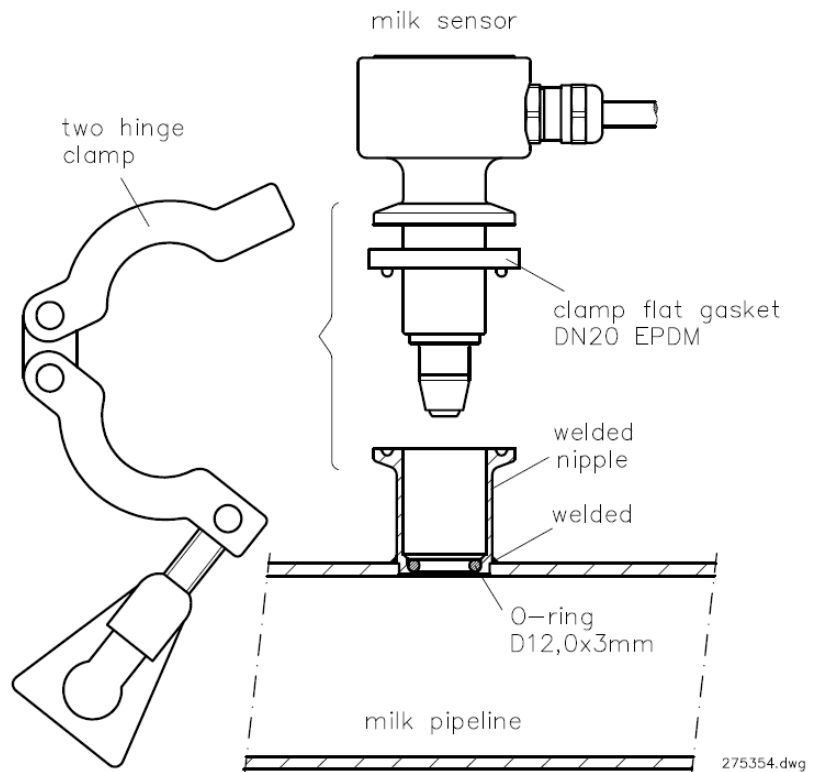
10 Milk sensor, series B type 6703-15

Order no.: 216274

Milk sensor 6703-15 delivers a milk output proportional output span.

10.1 Technical data

Elektronical data	
Auxiliary energy	DC 24 V (+ 10 ... - 20 %), 50 mA
Connection type	Cable 5 m (wire end ferrule)
Output (U_Milk)	Analog 0,0 ... 2,1 V
Measuring range	0 ... 5 KΩ
Ambient conditions	
Operating temperature/sensor element	- 20 ... + 60 °C/briefly until + 80 °C
Store temperature	- 30 ... + 70 °C
Protection class	IP 65 (grouting)
Mechanical data	
Weight	0,5 kg
Housing specification	V$_{2A}$ 1.4301
Fitting	Clamp DN 20

10.2   Dimensons

milk sensor

welded nipple

welded

O-ring
gasket

ø41.5

terminal assignment	
PK	U +
GY	U_Milk
YE	GND
GNYE	shield

91.5

67

51

shorten sensor tip depending on requirement

216274.dwg
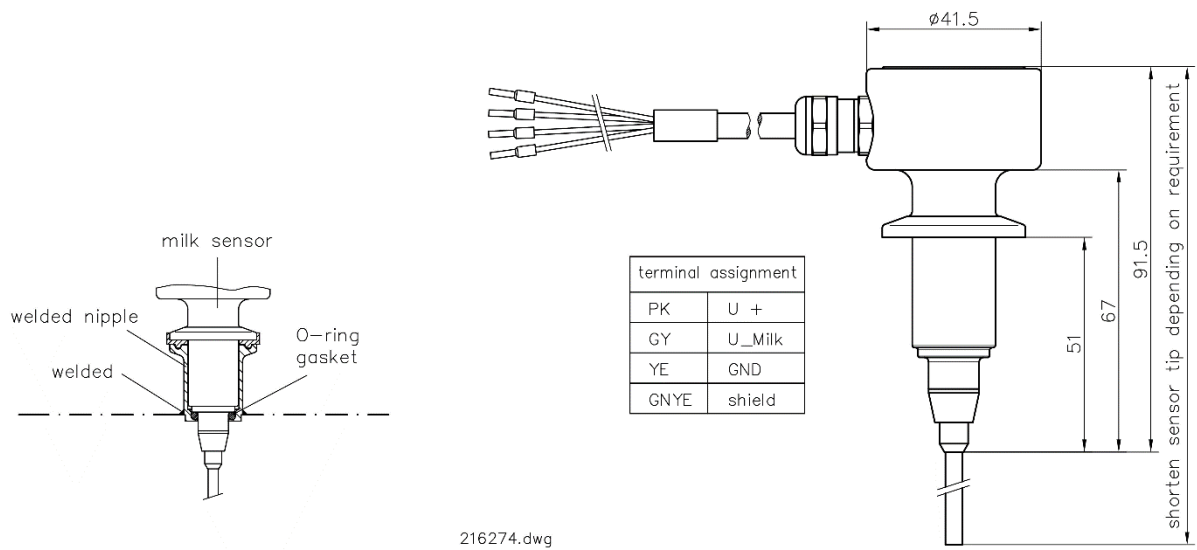
10.3   Assembly/ Installation

Installation in the tank or pipe wall by means of welding socket Type 6701-00-021 as follows:

- Weld the welding socket into the tank or pipe wall, smooth and clean the seams.

- Slightly grease the O-ring D 12.0 x 3.0 VMQ 70 FDA (Order No. 335326) supplied with the milk sensor, insert it into the welding socket and insert it carefully with the fingertip into the O-ring groove at the front end. Check correct, even fit by fingertip scanning.

  Carefully cut the electrode rod of the milk sensor with an iron saw to the required length without damaging the insulation and strip off approx. 1.5 cm. Then deburr and smooth the interface.

  Required length:
   When installed in the pipe, the measuring tip should end in the middle of the pipe, when installed in other containers according to functional requirements.

- Push the clamp gasket DN 20 EPDM onto the sensor tip and carefully insert the sensor into the weld-in socket with slight left / right turns as far as it will go.

- Locking the sensor with a double-jointed clamp, only tighten the thumbscrew "hand-tight".
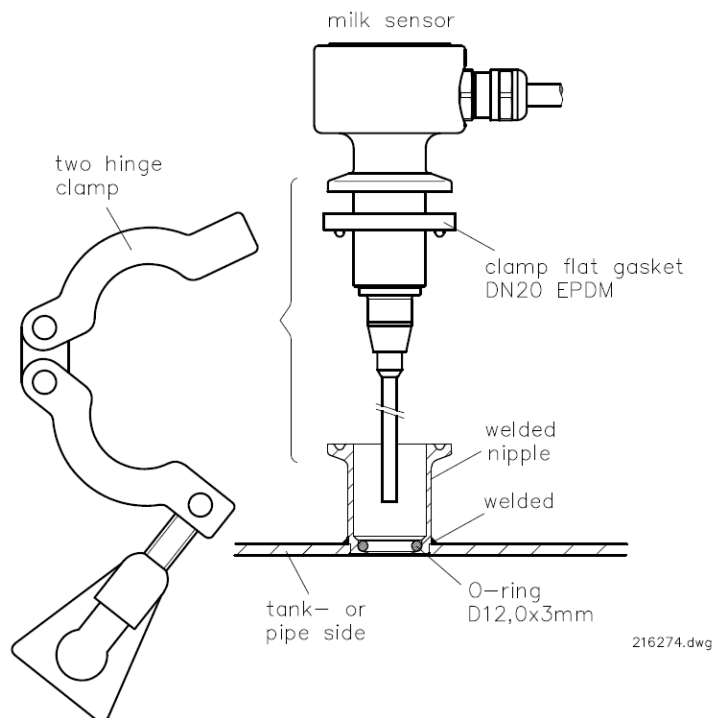
11 Pressure sensor G ½"

Order no.: 292600

The pressure sensor is used to measure relative pressures in viscous liquids and gases.

11.1 Technical data

Electrical data	
Operating voltage	24 V DC
Output signal	4 … 20 mA
Measuring range	-1/+2 bar
Connection	2-wire
Ambient conditions	
Fluid temperature	-20 … +90 °C
Operating temperature	-20 … +80 °C
Mechanical data	
Housing specification	Nickel chromium steel 1.4301
Specification of parts coming into contact with fluid	Nickel chromium steel 1.4435
Connecting cable	5 metres
Range of application	Pressure relief up to max. 10 bar
Housing dimensions	Approx. ∅ 30 x 100 mm
Fitting	Welded socket ½"
Accessories	
Designation	Order no.
Pressure sensor mounting	292601

12   Bubble Sensor 3", series A type 6900-17

Order no.: 294298

The 3" air bubble sensor is used for precise online detection of air pockets still existing in the milk intake.

12.1   Technical data

Device-specific data	
Measuring ranges	0 … 30 % air (in case of homogeneous liquid)
Accuracy/resolution	2 % / 0.3 %
Rated conditions	23 °C ± 2 °C, 1,013 hPa
Other machine-related data	Flow-calming section 5 x nominal diameter
Electrical data	
Auxiliary power	DC 24 V ± 5 %, 50 mA
Connection type	Cable approx. 7 m
Inputs and outputs	2.5 … 0 V fill level
Ambient conditions	
Operating temperature	0 … 80 °C, fluid, - 10 … + 50 °C electronics
Storage temperature	- 10 … + 50 °C (empty)
Climate class	IWF as per DIN 40040
Protection class	IP 66 as per DIN 40050
Ambient pressure	950 … 1,050 hPa
Internal pressure	100 … 2,000 hPa
Mechanical data	
Dimensions	See scale drawing
Nominal widths	NW 3"
Weight	Approx. 35 N (3.5 kg)
Housing specification	1.4301
Fixing	Clamp

12.2   Dimensions

Ø129   Ø139

110
135

Fill level
detection
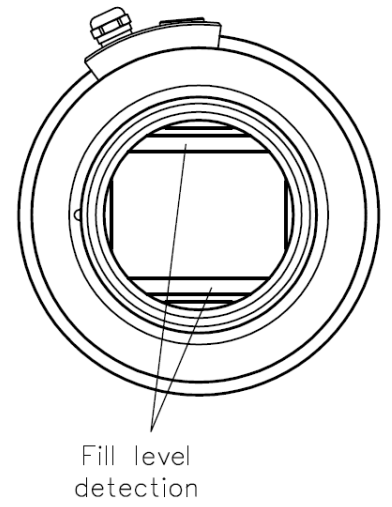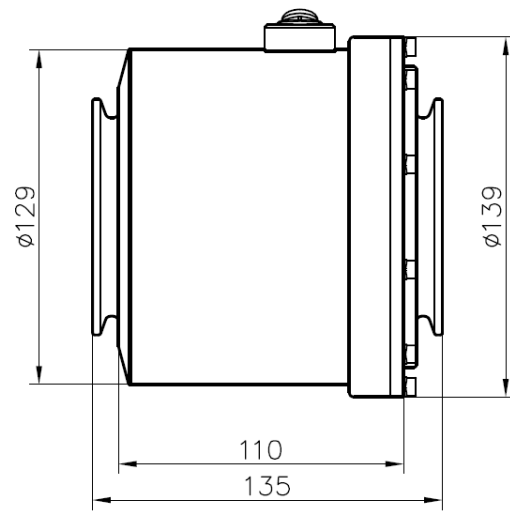
13   Bubble sensor 4", series A type 6900-19

Order no.: 294386

The 4" air bubble sensor is used for precise online detection of air pockets still existing in the milk intake.

13.1   Technical Data

Device-specific data	
Measuring ranges	0 … 30 % air (in case of homogeneous liquid)
Accuracy/resolution	2 % / 0.3 %
Rated conditions	23 °C ± 2 °C, 1,013 hPa
Other machine-related data	Flow-calming section 5 x nominal diameter
Electrical data	
Auxiliary power	DC 24 V ± 5 %, 50 mA
Connection type	Cable approx. 7 m
Inputs and outputs	2.5 … 0 V fill level
Ambient conditions	
Operating temperature	0 … 80 °C, fluid, - 10 … + 50 °C electronics
Storage temperature	- 10 … + 50 °C (empty)
Climate class	IWF as per DIN 40040
Protection class	IP 66 as per DIN 40050
Ambient pressure	950 … 1,050 hPa
Internal pressure	100 … 2,000 hPa
Mechanical data	
Dimensions	See scale drawing
Nominal widths	NW 4"
Weight	Approx. 60 N (6.0 kg)
Housing specification	1.4301
Fixing	Clamp

13.2   Dimensions

Fill level
detection

Ø154

Ø164

127

162
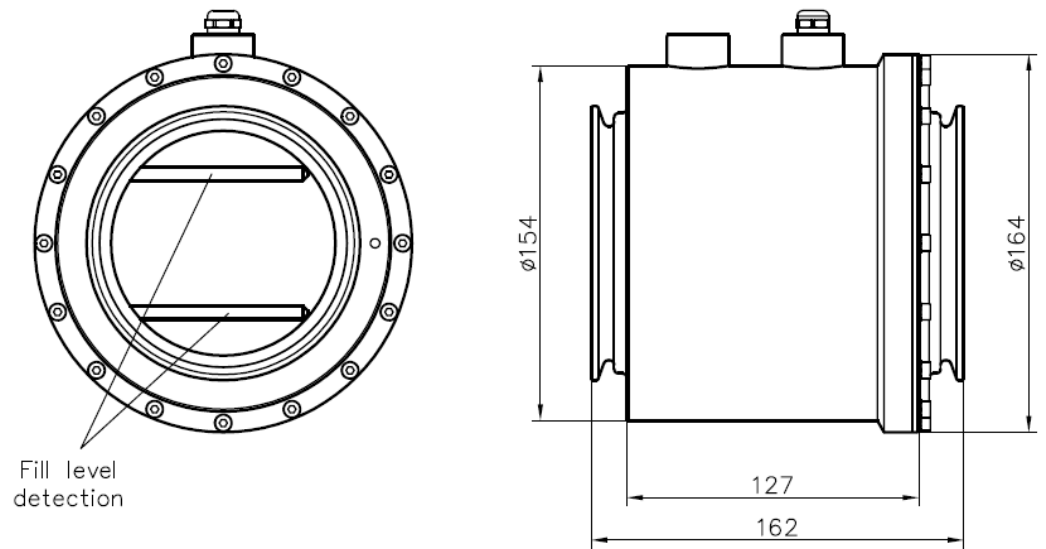
➡️ **Note:**
Please take into account when installing the sensor that the open ends of the electrodes face downwards.

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14   Level sensor type 6900-111

Order no.: 308328

14.1   Technical data

Electrical data	
Output current	4 … 20 mA
Supply voltage	DC 24 V ± 4 V
Connection	5 m cable (wire end ferrules)
Ambient conditions	
Operating temperature	-40 … +80 °C
Mechanical data	
Housing specification	Stainless steel
Protection class	IP 68
Dimensions	See drawing

Dimensions of level sensor
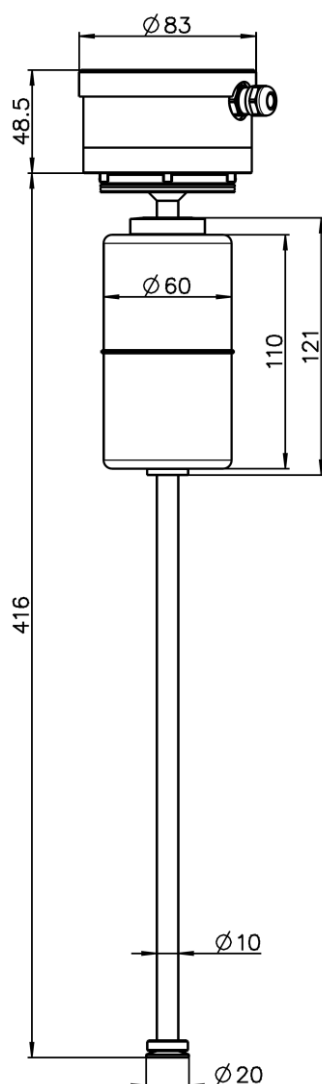
15   Level sensor without float type 6900-113

Order no.: 362583

15.1   Technical data

Electrical data	
Output current	4 … 20 mA
Supply voltage	DC 24 V ± 4 V
Connection	M12-plug 4-pole
Ambient conditions	
Operating temperature	-40 … +70 °C
Storage temperature	-40 … +85 °C
Medium temperature	-10 … +140 °C, 143 °C max. 120 Min.
Mechanical data	
Housing specification	Stainless steel
Protection class	IP 69K
Process connection	Tri-clamp 2"
Dimensions	See drawing
Accessories	
Designation	Order no.
Sensor-Connection cable M12 5 m	365282
Seal Clamp DN50	304621
Clamp-bracket DN2"/50	U495080
Level sensor without flout complete, type 6900-113	362728

Dimensions of level sensor

2:5
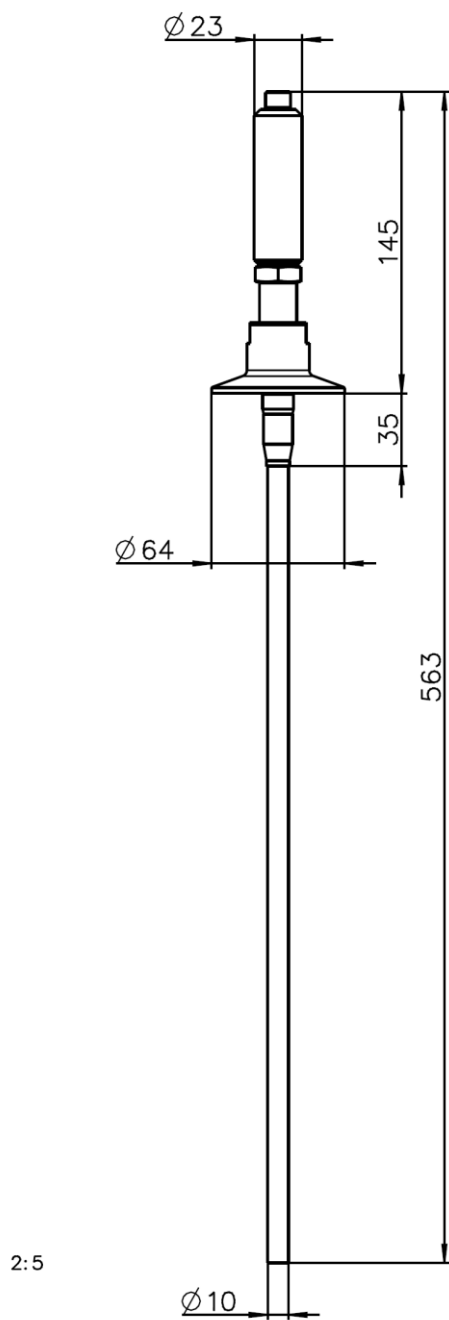
16   Flow Meter MID type 6823-x

Order no .: see technical data

Magnetic-inductive MID flow rate meters, type 6823-x, are precision sensors designed to measure the volume of electrically conductive liquids. Their robust build and material specification make them particularly suitable for flow measurement applications in areas subject to strict hygiene standards, such as the measurement of milk quantities on collection vehicles. All the products can be calibrated.

16.1   Technical data

Specical Data	
Measure range	100 l/min to 2000 l/min, depending on version see table
Accuracy	≤ 0,3 % (In the above measuring range)
Conductivity	> 5 µS/cm
Pressure	max. 10bar
Electrical Data	
Auxiliary voltage	24V DC ±15%
Power consumption	max. 6W
Outputs	PNET/ 3-Chanal (open collector)
Pulse output	0 – 1000 Hz
	volumetric measurement signal for counter
	indication of the current flow
3 channel pulse output	as 1 channel pulse output with direction signal and error signal
	as 2- or 3 channel pulse output
Analog output	4 ... 20 mA (external source)
Connection	7 m connection cable10x0,25mm² shielded, with open ends
	PG11 cable bushings, internal screw-type terminals.

Connection cable assignment	MID-terminal	Wire color	Signal	
	1	pk/gy	+24V	
	2	Shield	GND	
	7	wh	+ Display	
	8	bu	- Display	
	13	bn	S	
	14	gn	B	P-NET
	15	ye	A	
	16	vt	Output 3	
	17	bk	GND	Output 3

Connection three-channel pulse output				
	MID (terminal)	**1 channel**	**2 channel 90°**	**3 channel 120°**
	3 – 4	Phase 1	Error	Phase 1
	18 – 17	Error	Phase 1	Phase 2
	16 – 17	UP/DOWN	Phase 2	Phase 3

Ambient conditions	
Admissible operating temperature	-10 … +50°C
Admissible storage temperature	-10 … +50°C
Protection class	IP 67
Mechanical data	
Dimensions	See drawing
Weight	Approx 5kg
Material	Stainless steel teflon coated, stainless steel, PPO Noryle
Connection	Clamp NW 2", NW 2,5", NW 3" ISO 2852

Order information MID							
MAK 3003		**MAK 3002**		**Connect**	**Flow min.**	**Flow max.**	**Country**
Device type	**Order No..**	**Device type**	**Order No..**				
		6823-1	U950 20 68231	NW 2"	25 l/min	500 l/min	20 l	D, A, CH
		6823-3	U950 20 68233	NW 2"	66 l/min	660 l/min		NL
		6823-4	U950 10 68234	NW 2,5"	75 l/min	1000 l/min	50 l	D, A, CH
		6823-4.1 (für V2000)	U950 10 682341	NW 2,5"	75 l/min	1000 l/min	50 l	D, A, CH
		6823-4.2	247094	NW 2,5"	100 l/min	1250 l/min	100 l	D
6823-4.3	387985			NW 2,5"	83 l/min	1333 l/min	50 l	D, A, CH
		6823-5	215774	NW 2,5"	83 l/min	1167 l/min	50 l	NL
		6823-6	242839	NW 3"	50 l/min	2000 l/min	100 l	NL
		6823-9.1	247093	NW 3"	100 l/min	1400 l/min	200 l	D
6823-9.2	301246			NW 3"	200 l/min	2000 l/min	100 l	
		6823-9.3	303361	NW 3"	200 l/min	2000 l/min	200 l	D
		6823-15	U950 20 682315	NW 2"	25 l/min	500 l/min	50 l	B
		6823-16 ****	U950 10 682316	NW 2,5"	75 l/min	1000 l/min	50 l	D
		6823-17 ****	U950 10 682317	NW 2"	25 l/min	500 l/min	20 l	D
		6823-19	U950 20 682319	NW 2,5"	75 l/min	1000 l/min	100 l	B
		6823-18	U950 20 682318	NW 2"	25 l/min	500 l/min	20 l	D
		6823-19.1	U950 20 6823191	NW 2,5"	75 l/min	1000 l/min	50 l	B
		6823-20 **	U950 20 682320	NW 3"	100 l/min	2000 l/min	200 l	NZ
		6823-25	U950 20 682325	NW 2,5"	75 l/min	100 l/min	50 l	D
		6823-28 *	U950 20 682328	NW 2"	25 l/min	500 l/min	20 l	PL

16.2 Dimensions

electrodes

Top view

180

110

250
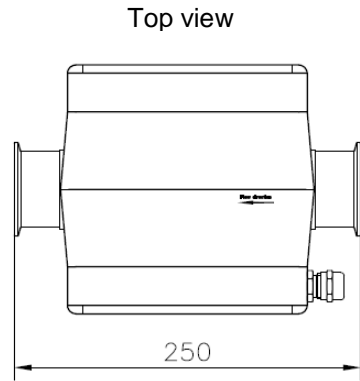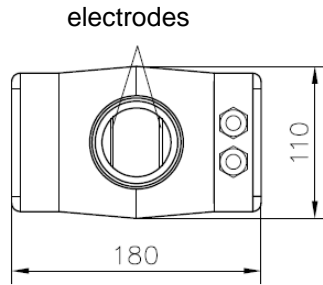
407364.dwg

16.3 Assembly/installation

Draufsicht

387985.dwg
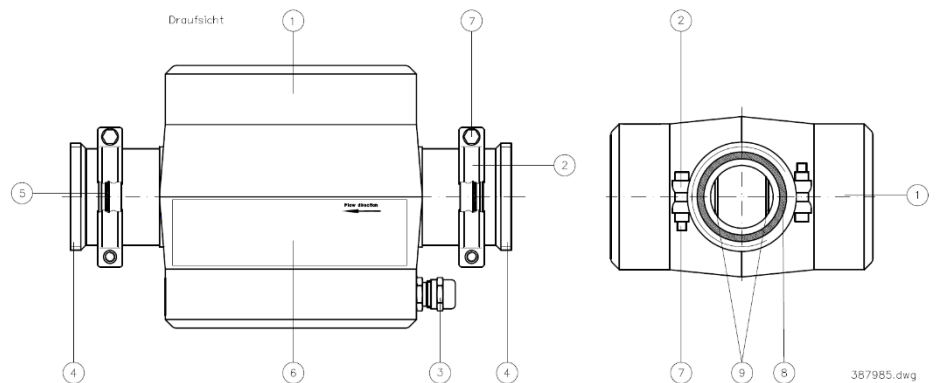
1	cover	5	flat gasket	9	electrodes
2	fastening clamp	6	type plate		
3	cable feed	7	hexagon head screw		
4	connection	8	sealing ring		

The flowmeter can be mounted in the flow direction rising 15 ° to 90 °. The position of the EMF must be chosen so that it is always filled with liquid, installed after the air separator and at the point with the maximum pressure in the pipeline.

It is strictly mandatory to provide a straight flow-calming section upstream $L \geq 3$ x nominal diameter D and downstream of the MID of $L \geq 2$ x nominal diameter D.

Installation

2xDN DN

15 – 90°

3xDN

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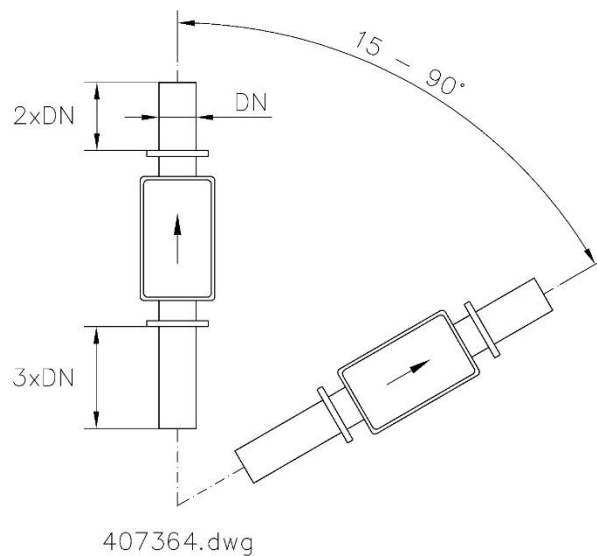
The positive direction of flow is indicated by an arrow on the type plate (6).

Flow direction

Installation position:

Horizontal/flat, rising slightly in the direction of flow so as to allow trapped gases to escape, or vertical.
May only be operated with flow-calming section on both sides of $L \geq 2 \times D$.

There must be not be any mechanical forces on the flow rate meter either during assembly/disassembly or during operation. The pipes which are connected to the unit on both sides must therefore be duly supported (see diagram below).
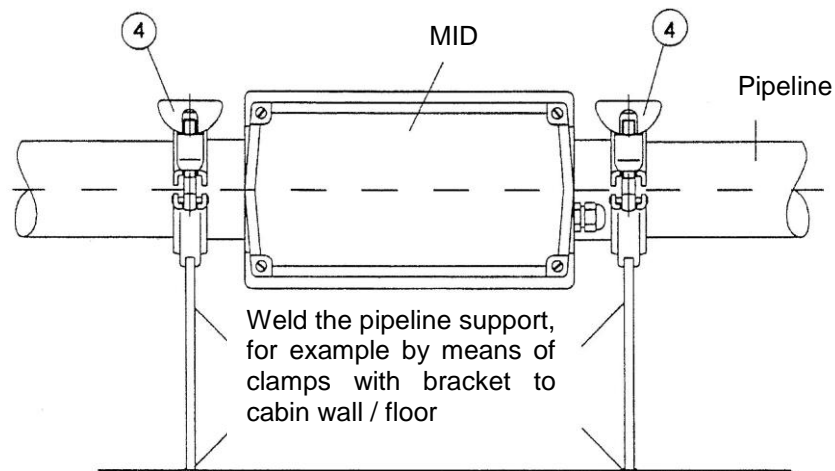
Installation location:

- At the lowest point of the pipe system, rising slightly in the direction of flow

- Position at which the MID is always filled with liquid.

- Reduce amount of gas in the liquid to a minimum as entrained air can also affect the flow measurement. Therefore install the flow rate meter in the pipe system at the point of maximum pressure where the air volume is minimal.

- After air separator, if air can be sucked in.

- The ambient temperature at the place of installation must be within the permissible range of -10...+50°C. The liquid flow (measuring medium, cleaning fluid) through the device must not exceed the maximum temperature for CIP cleaning 100 ° C.

- Position the flow rate meter so that it can be easily accessed for servicing.

- The electrodes in the MID always have to be aligned vertically.

- **Important information for assembly/disassembly:**

When installing MID units with dairy pipe thread connections, it is essential to follow the instructions below in the order listed in order to prevent strong mechanical forces on the MID unit (which can damage or destroy the unit).

Installation:

- First remove the threaded milk pipe adapter, if still attached to the MID. To do this, open the fastening clamps (2) on both sides and remove the pipe connections from the MID.

Attention:
Do not lose the seals and put them back carefully when reassembling.

- First screw the threaded milk pipe adapters with the union nuts on both sides of the pipe connections.

- Then fit the MID (not forgetting the flat gaskets (5)) and secure with the fastening clamps (2). It might be easier if the pipe supports/anchors are slightly loosened first. $\Rightarrow$ Tighten again at the end.

Disassembly:

- First take out the MID by removing the fastening clamps (2) on both sides. It might be easier if the pipe supports/anchors are slightly loosened first.

- If necessary at this point, take off the threaded milk pipe adapters by undoing the union nuts.

Attention:
Do not lose the seals and put them back carefully when reassembling.

16.4 Wiring

The MID is supplied as standard with 5 m of cable which is connected as shown on the diagram below. Please follow the directions for use of the follow-on device when wiring.

Terminal	Colour	Signal
1	pk/gy	+DC 24 V
2	Shield	-Supply
7	wh	+Display unit
8	bu	-PD 210
13	bn	P-NET S
14	gn	P-NET B
15	ye	P-NET A
16	vt	Output 3 (pulse output)
17	bk	GND
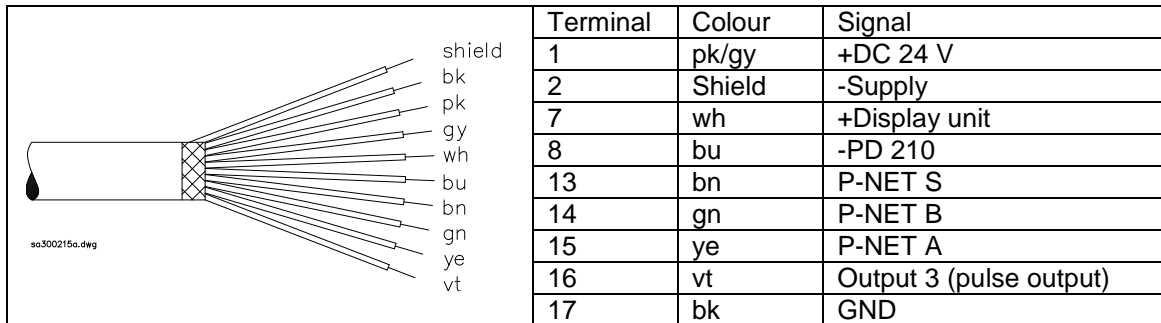
MID wired with P-NET, pulse output connection and display unit connection.
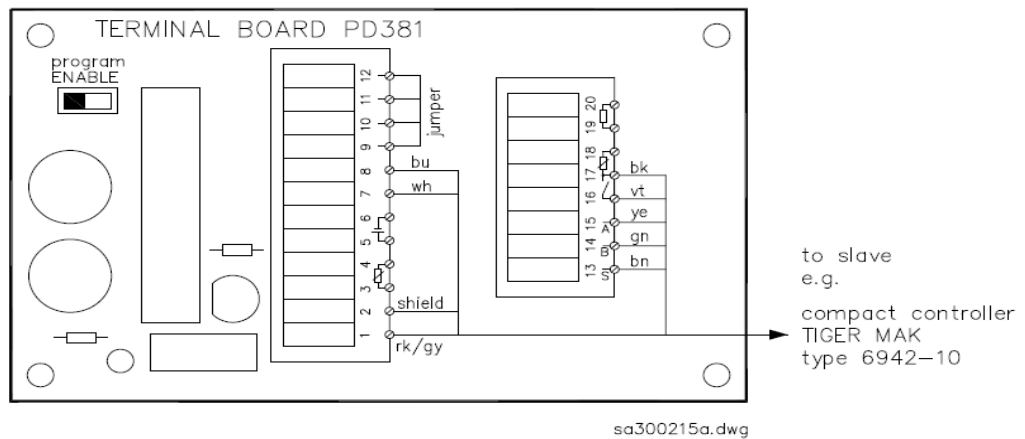
16.5 Maintenance and servicing

The usual cleaners approved for use with food in the dairy industry can be used to clean the flow rate meter.
The cleaning fluid passing through the system must not exceed the temperature limit of max. + 100 °C.

17   V2000 Modul, type 6757-14 Ser. A

Order-No. 279051

The V 2000 module, type 6757-14 Ser. A, forms the heart of the control unit with power unit for the measuring system system V 2000 and V3003.

17.1   Technical data

Specifical Data	
Normal conditions	23 ± 2 °C
Elektrical data	
Elektronics	
Operation voltage	DC 24 V ± 5 % Reversible fuse 1,1 A
Current consumption	100 mA
Operating voltage of sensors	DC 24 V ± 5 % (internal voltage) Reversible fuse 50 mA for each sensor input
Operating voltage I/O and PWM	DC 24 V on-board supply system Reversible fuse 2 x 4A (4 outputs each) Reversible fuse 3 A für PWM
Current consumption I/O	Max. 8 A
Outputs switch function	
Quantity	2 x 4
Galvanic isolation	Optocoupler 2500 VRMS
Frequency	Max. ≤ 10 kHz
Switching level	0/24-V on-boarder supply system
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
Analogous 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
Protective type	IP 20
Mechnanical data	
Dimensions	Approx. T 190 x H 145 x B 55 mm
Material	Aluminium nature (AlMg 3)
Weight	Approx. 500 g

17.2 Connection scheme

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

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

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* / NT

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

279051.dwg

Front Back

Designation	Signal
−	PNET_−
+	PNET_+
S	PNET_S
B	PNET_B
A	PNET_A
GND	GND
RxD	RxD
TxD	TxD

279051.dwg

Modul: V 2000, Type: 6757-14								
Clamp	Designation	LAS dipstick	Pressure sensor	6703-15 S1-foam se-parator	6703-15 S2-MID	6823-x MID	Proximity switch Snr. 495595	Hydraulic valve (PWM)
501	+ 24V	bn						
502	I + (Peilst.)	ye						
503	I -	gy						
504	- (GND)	bu						
505	+ (24V DruckS)		wh					
506	-		bn					
507	+ (24V)			pk				
508	- (GND)			ye				
509	In (Signal S1)			gy				
510	+ (24V)				pk			
511	- (GND)				ye			
512	In (Signal S2)				gy			
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)					vt		
526	- (GND B)					bk		
527	+ (24V B)						bn	
528	IN_Dreh (Signal)						wh	
529	- (GND B)						bu	
530	I_OUT + (0-20 mA)							
531	I_OUT -							
532	unbelegt							
533	PWM+(Signal)							bn
534	PWM-(GND B)							bu
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-							

-	Schirm							
+	pk/gy							
S	Bbn							
B	gn							
A	ye							
GND	GND							
RxD	RxD							
TxD	TxD							

17.3 Pipeline scheme

Output V2000 Modul
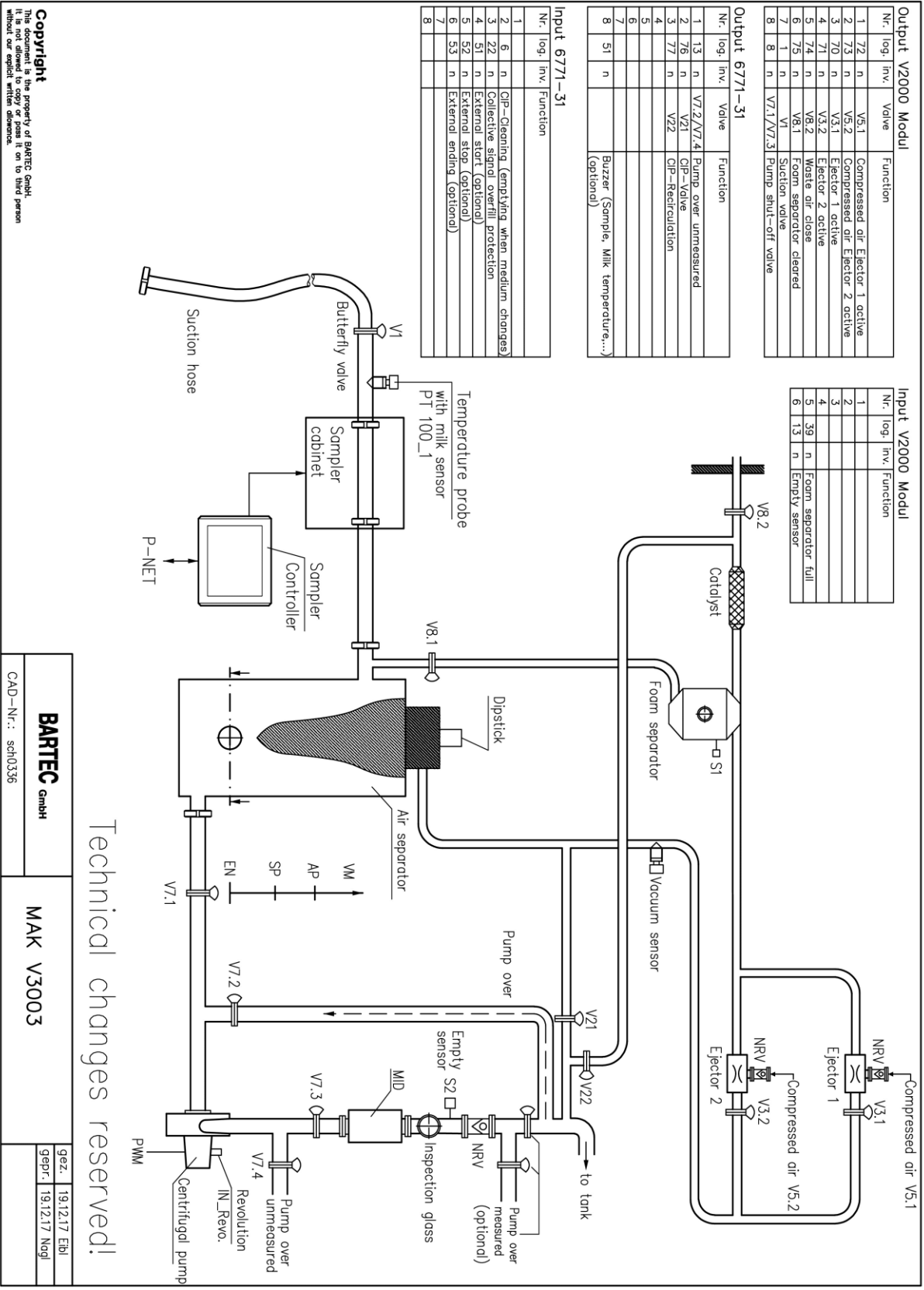
Nr.	log.	inv.	Valve	Function
1	72	n	V5.1	Compressed air Ejector 1 active
2	73	n	V5.2	Compressed air Ejector 2 active
3	70	n	V3.1	Ejector 1 active
4	71	n	V3.2	Ejector 2 active
5	74	n	V8.2	Waste air close
6	75	n	V8.1	Foam separator cleared
7	1	n	V1	Suction valve
8	8	n	V7.1/V7.3	Pump shut-off valve

Output 6771-31

Nr.	log.	inv.	Valve	Function
1	13	n	V7.2/V7.4	Pump over unmeasured
2	76	n	V21	CIP-Valve
3	77	n	V22	CIP-Recirculation
4				
5				
6				
7	51	n		Buzzer (Sample, Milk temperature,...)
8				(optional)

Input 6771-31

Nr.	log.	inv.	Function
1			
2	6	n	CIP-Cleaning (emptying when medium changes)
3	22	n	Collective signal overfill protection
4	51	n	External start (optional)
5	52	n	External stop (optional)
6	53	n	External ending (optional)
7			
8			

Input V2000 Modul

Nr.	log.	inv.	Function
1			
2			
3			
4			
5	39	n	Foam separator full
6	13	n	Empty sensor

Technical changes reserved!

BARTEC GmbH

CAD-Nr.: sch0336

MAK V3003

| | gez. | 19.12.17 | Elbl |
| | gepr. | 19.12.17 | Nagl |

18 TAG-Reader 13,56 MHz, Type 6910-15

Order no.: 384603
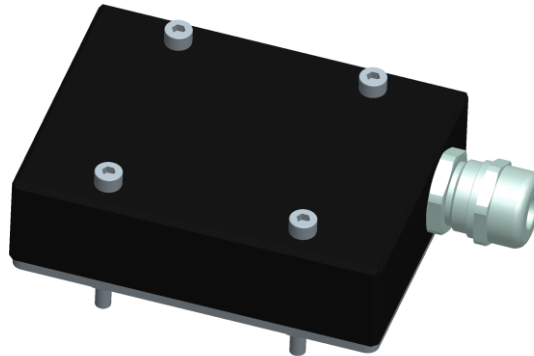
18.1 Technical data

Device-specific data	
Nominal conditions	23 ± 2 °C
Electrical data	
Power supply	DC 24 V ± 5 %
Current consumption	< 100 mA
Interface	RS 485
Baud rate	9600 bit/s
Cable length	11,8 m
Connection	Cable, 6-wire, shielded
Protocol	ISO 15693
Frequency	13,56 MHz
Read-write distance	Direct coupling
Ambient conditions TAG	
Operating temperature	- 10 ... + 50 °C
Storage temperature	- 20 ... + 70 °C
Protection type	IP 66
Climatic classification	JWF according to DIN 40040
Mechanical data	
Dimensions	See dimensional drawing
Materials	PA, PV, 1.4301
Weight	Approx. 0.2 kg
Assembling	4 x screws M4

18.2   Dimensions and connection
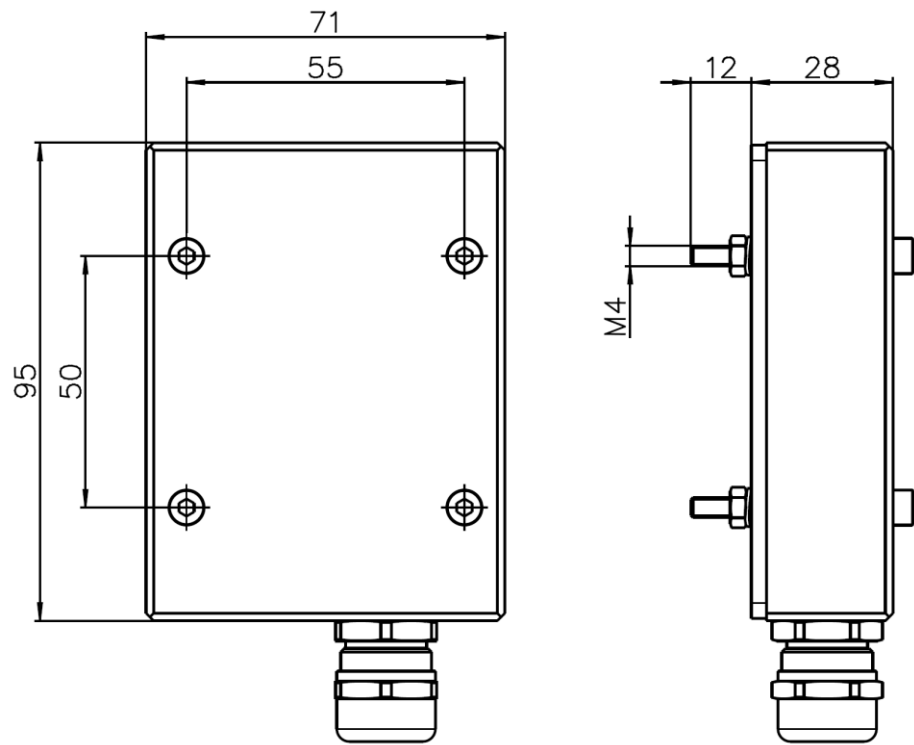
Connection

Colour	Signal
rd	+24V
bu	0 V
ye	B
gn	A

19 Barcode reading unit type 6723-10

Order no.: U96417672310

The bar code reading unit type 6723-10 can be used to decode the pulse sequence of a connected bar code reader and to transmit the data via P-NET (RS485) for further processing.

Bar code readers with TTL output level can be connected, where "bright" corresponds to low and "dark" corresponds to high.

The bar code reading unit will accept the following four types of bar code if they contain the mandatory number of alphanumeric characters.

Bar code	Number of characters
Interleaved 2 of 5	4 … 32
UPC/EAN	Fixed length
Codabar	1 … 32
Code 11	1 … 32
Code 39	1 … 32
Code 128	1 … 32
MSI Code	1 … 32

The bar code reading unit is set at the factory to read bar codes of the "Interleaved 2 of 5" type with the mandatory 10 characters. The default operating mode is "continuous scanning".

19.1 Technical data

Electrical data	
Auxiliary power	Rated voltage: DC 24 V $\pm$ 20 % Rated output: 1.5 W (excluding bar code reader, excluding heating)
Fuse	2 x 1 A (time-lag)
Fieldbus interface	P-NET (RS485), max. line length 300 m
Electrical connection	
Connection	Screw terminals 0.2 … 1.5 mm² 3 x cable fitting PG9, cable diameter 4 … 8 mm
Bar code reader	Scanner with TTL-compatible output, "bright" $\cong$ low, "dark" $\cong$ high
Bar code reader heater	12 or 24 V DC, max. 1.6 W
Bar code reader electronics	5 V DC, max. 50 mA
Ambient conditions	
Operating temperature	- 20 ... + 60° C
Storage temperature	- 40 … + 85° C
Climate class/protection type	JUF / IP 65
Mechanical data	
Housing specification	Die-cast aluminium
Dimensions	120 x 122 x 80 (mm)
Weight	Approx. 12 N $\cong$ 1.2 kg
Installation position	Optional, but cable inlets must not face upwards

19.2 Dimensions
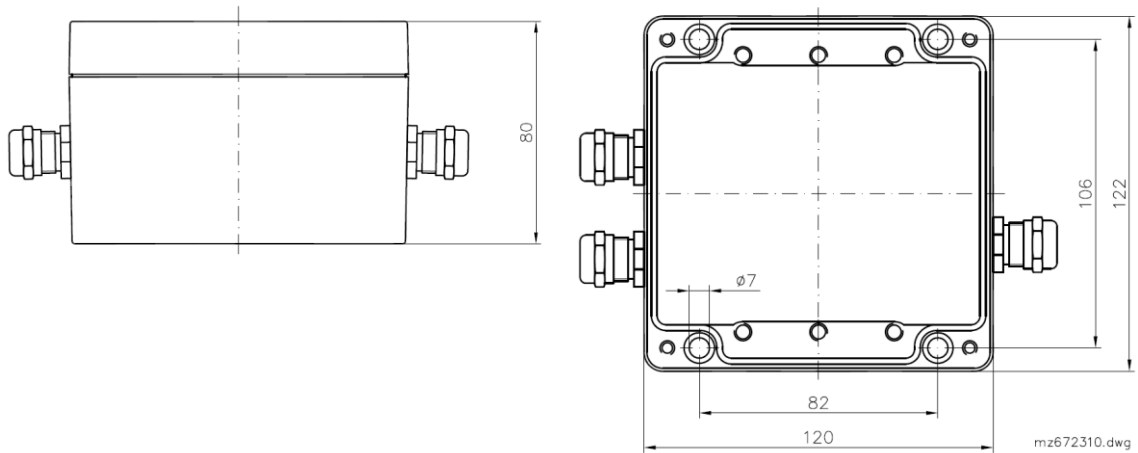
# 19.3 Installation

Installation location:

Position at a suitable location not subject to major vibrations near the bar code reader, taking due account of the length of its cable.
It must be possible to attach the connection leads in the bar code reader unit when installed.

Installation:

Affix lower section of housing with 4 x M6 mounting bolts. See section on dimensions for hole spacing and bolt length.

To install, undo the four bolts in the top housing section and remove the top housing section.
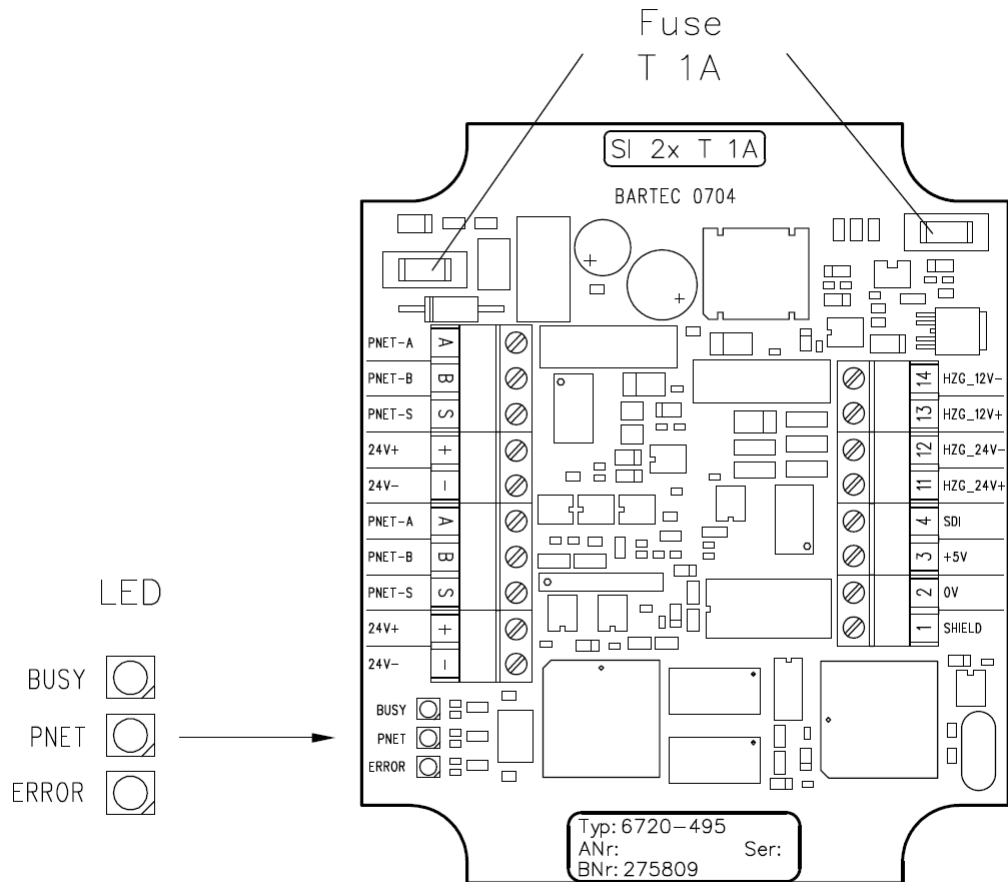
19.4 Wiring
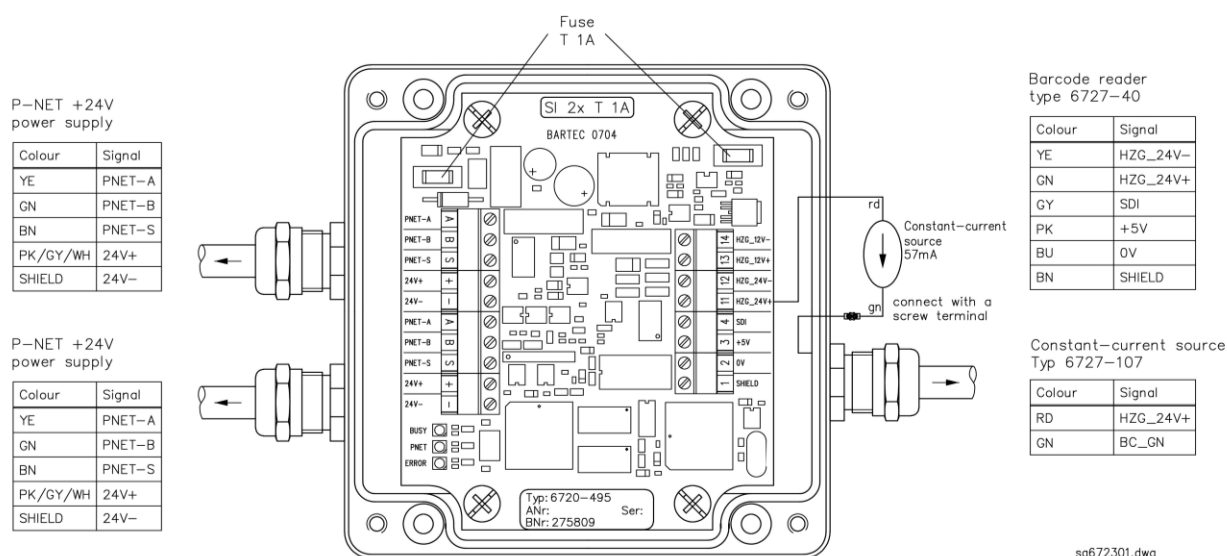
Terminal designation of bar code reading unit

INPUT SIDE			
Signal	**Designation**	**Terminal**	**Wire colour**
P-NET - A	P-NET - A	A	ye
P-NET - B	P-NET - B	B	gn
P-NET - S	P-NET - S	S	bn
24 V +	Operating voltage	+	pk/gy/wh
24 V -	Operating voltage	-	Shield
OUTPUT SIDE			
Signal	**Designation**	**Terminal**	**Wire colour**
HZG_24V-	Bar code reader heating (-24 V), type 6727-40	12	ye
HZG_24V+	Constant current source (KS_RT), Type 6727-107	11	rd
KS_GN	Heating barcode reader (+24V), type 6727-40	Luster terminal	gn
SDI	Digital input signal (TTL level), type 6727-40	4	gy
+5V	+ Bar code reader operating voltage, type 6727-40	3	pk
0V	- Bar code reader operating voltage, type 6727-40	2	bu
SHIELD	Cable shielding, type 6727-40	1	bn

Status display messages and their meaning

mz672310.dwg

LED	Display	Apparent fault	Remedial action
BUSY	LED BUSY Flashes after switch-on (approx. 1 Hz). The processor system is running.	LED off: Internal fault in processor system	- Bar code reading unit may need to be reconfigured - Fault may need to be read out via P-NET service channel
P-NET	P-NET ON LED flashes via P-NET on the bar code reading unit on write access or read access.	LED off: Bar code reading unit is not eliciting any response from P-NET	- Check P-NET connections (A,B,S); P-NET may be defective - Notify service centre
ERROR	POWER ON LED when 5 V DC is applied to the processors. (The 5 V are routed through to the display by the processor)	LED off: Absence of voltage supply for the processors	- Check for presence of 24 V DC - Check connection cable - Check fuses

20 Barcode reader type 6727-40 Series A

Order no.: U96410672740

The bar code reader type 6727-40 is a distance scanner for bar codes. It is used to read bar code labels on BARTEC milk sample bottles of type 6845-x in stationary and mobile systems.
It is used in conjunction with bar code reading unit type 6723-10.

20.1 Technical data

Electrical data	
Auxiliary power	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 ferrules, cable inlet PG7
Output	TTL-compatible output, "bright" $\cong$ low, "dark" $\cong$ high
Transmitter light	Red light - 900 nm
Ambient conditions	
Operating temperature	- 10 ... + 50° C
Climate class/protection type	KUF / IP 65
Mechanical data	
Housing specification	Plastic housing
Dimensions	99.5 x 26 x 88.3
Height of transmitter light emission	57 mm
Weight	Approx. 3.3 N $\cong$ 0.33 kg
Assembly	Screw fitting with 2 x M4 bolts, hole spacing 61 mm, vertical installation position (according to bar code label)

Terminal assignment

| Wire colour	Assignment	Signal
ye	HZG-	Scanner window heating
gn	HZG+	Scanner window heating
gy	SDI	Digital output signal
pk	+5V	Operating voltage
bu	0V	Operating voltage
bn	Shield	Cable shielding

20.2　Dimensions/Installation

Install the bar code reader as illustrated in the diagrams below.

The following points are important:

The scanner eye must be at right angles to the sample bottle axis (a).

There should be a distance of approx. 4 mm (b) between the bar code reader and the sample bottle. A 4-mm hexagon wrench or the shank of a 4-mm twist drill are examples of possible aids which can be used. The distance can be reduced gradually to as little as 2 mm if the bar code reading cannot be guaranteed to be reliable.
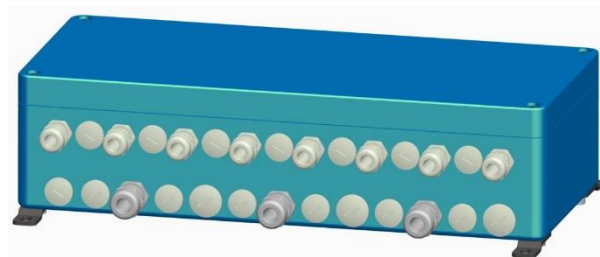
The optical axis (transmitter light) of the bar code reader must be roughly in the middle of the bars in the bar code (c).
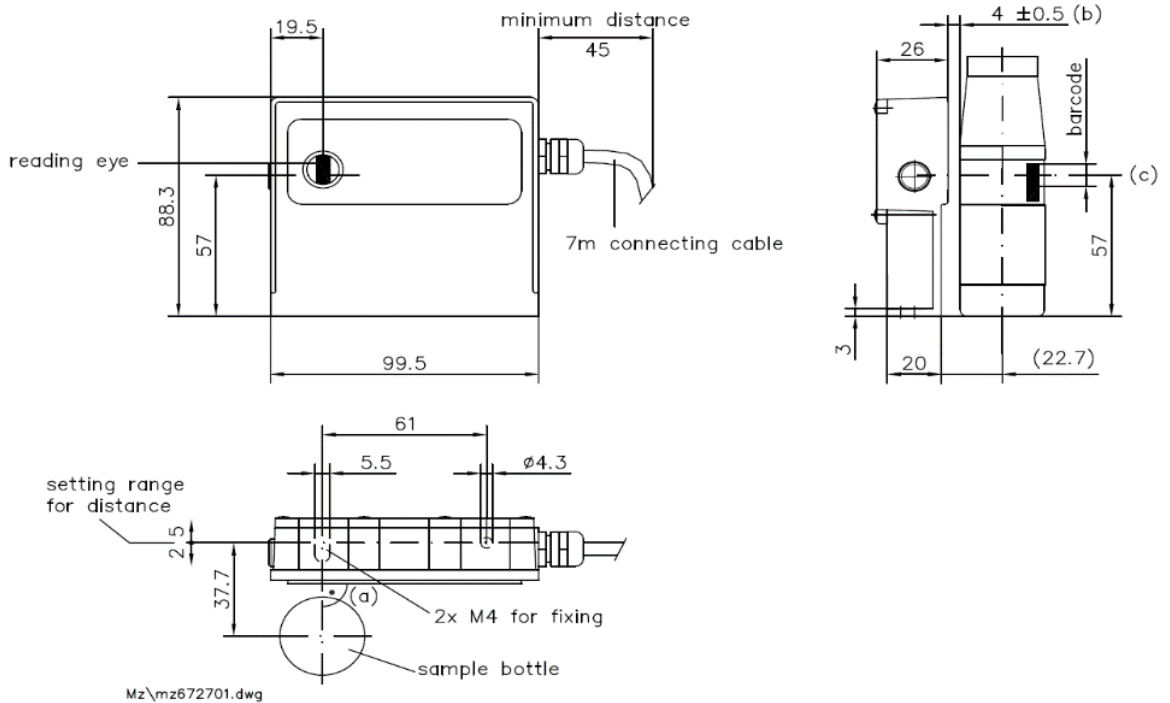
21   I/O-Box type 6753-xx
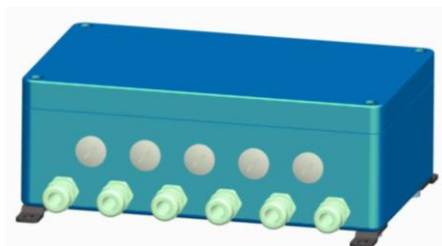
Type 6753-51
**Order no.: 276866**

Type 6753-61
Order no.: 276865

21.1   Technical Data

Electrical data	
Auxiliary power	U_L = DC 24 V/80 mA (I/O basic module), (U_{Limit} = 16 … DC 36 V) 2 A fine-wire fuse
Connection type	Internal 5-pole screw terminals (P-NET and U_L) Basic and extension modules, connected. Connection leads up to 1.5 mm². PG9 cable inlets.
Inputs	8 digital inputs, U_{In} = 0 … 24 V (U_{Limit} = - 36 V … +36 V DC) Signal = 0: < DC + 5 V Signal = 1: > DC + 14 V (green LED on) Input resistance: 4 kΩ
Outputs	8 FET semiconductor outputs, positive. Electrical isolation of logic circuit and outputs via optocoupler. Min. switching current 100 µA. Max. current per output at signal 1: < 1 A (up to + 60 °C) Total load capability 8 A (-20 … + 60 °C). Voltage induced on circuit interruption limited by freewheeling 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 at signal = 0: DC 2 V (no load)
Interfaces	P-Net fieldbus interface: serial, asynchronous. Baud rate 76,800 bit/s. Line length max. 1000 m P-Net ID number: 5922.
Ambient conditions	
Operating temperature	- 20 … 60 °C
Storage temperature	- 25 … 80 °C
Storage temperature	IUF as per DIN 40040
Protection class	IP 65

Dimensions/mounting holes/connection, type 6753-51

| Housing	
Dimensions/weight	Housing dimensions: 160 x 260 x 90 mm Weight of housing: 2.01 kg Weight of basic module: 0.4 kg 4 mounting plates with oblong holes for M6 screw fittings

I/O box MAK plus 1, type 6753-51
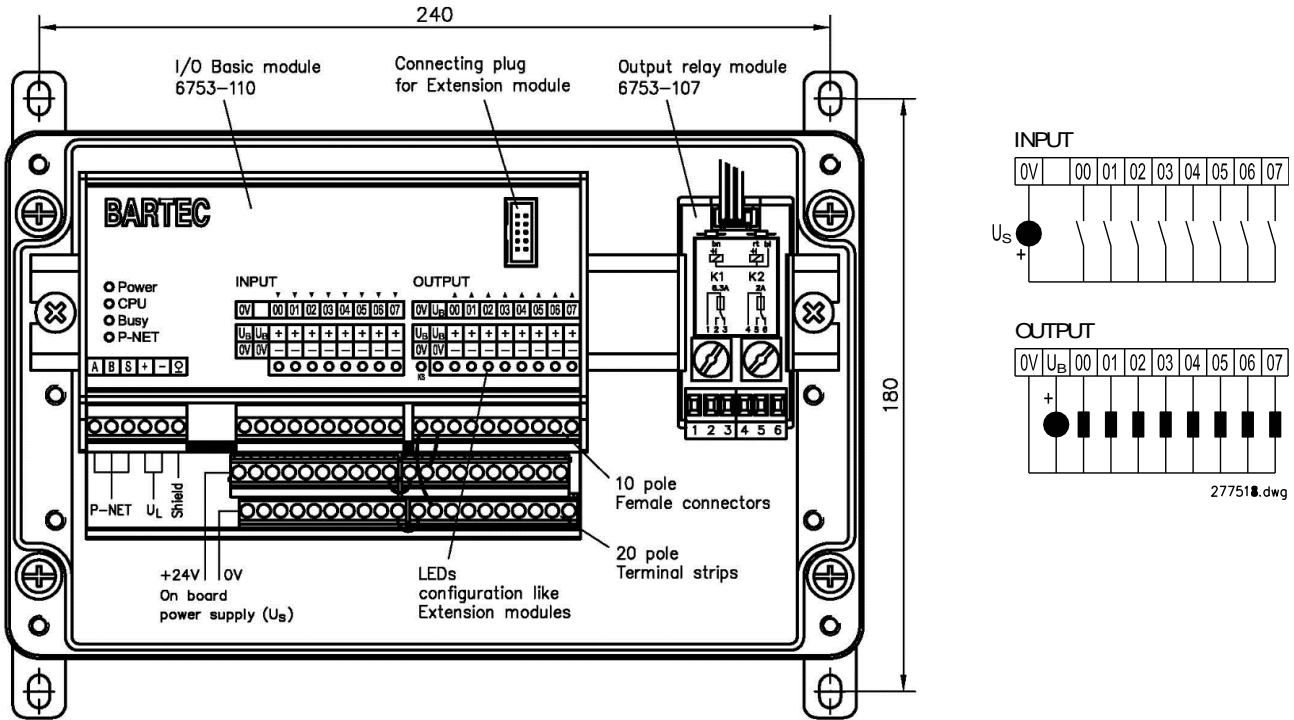
I/O box MAK plus 1
Optional add-ons:

1 x input extension module 8 DI, type 6753-111
or
1 x output extension module 8 D0/2.0 A, type 6753-112
or
1 x output relay module 1 x 6.3/3 x 2.0 A, type 6753-106
or
1 x output relay module 1 x 6.3/1 x 2.0 A, type 6753-107

Dimensions/mounting holes/connection, type 6753-61

Housing	
Dimensions/weight	Housing dimensions: 160 x 360 x 90 mm
	Weight of housing: 2.7 kg
	Weight of basic module: 0.4 kg
	4 mounting plates with oblong holes for M6 screw fittings
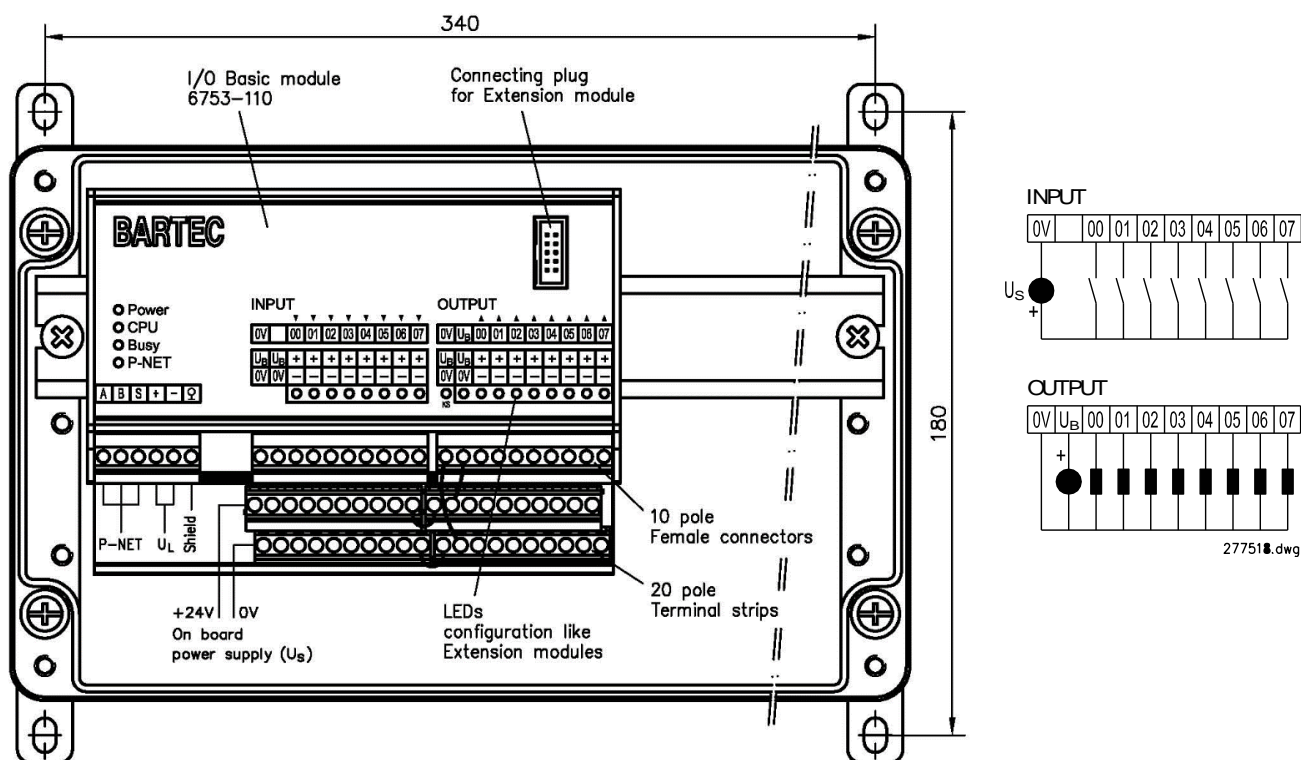
I/O box MAK plus 2, type 6753-61

I/O box MAK plus 2
Optional add-ons:

1 x input extension module 8 DI, type 6753-111
or
1 x output extension module 8 D0/2.0 A, type 6753-112

or
1 x output relay module 1 x 6.3/3 x 2.0 A, type 6753-106
or
1 x output relay module 1 x 6.3/1 x 2.0 A, type 6753-107

Extension modules, type 6753-51/61:

Each additional I/O module which is installed must be allocated its own bus address (not P-Net). This address can be configured via a switch on the right of the module. Therefore the order in which the modules are positioned is important. The basic module has the static address $\varnothing$. The address of every additional module is consecutively numbered (e.g. basic module = $\varnothing$; first extension module = 1; second extension module = 2, etc.)
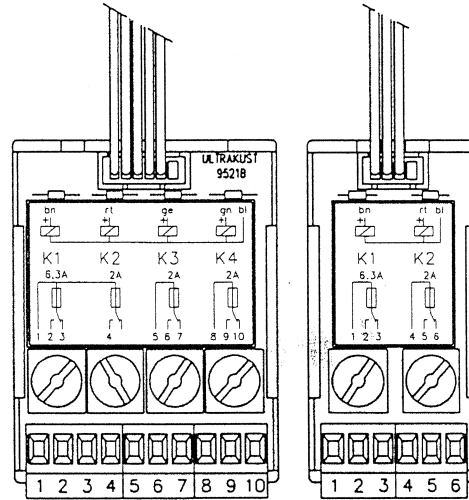
Input extension module 8DI, type 6753-111
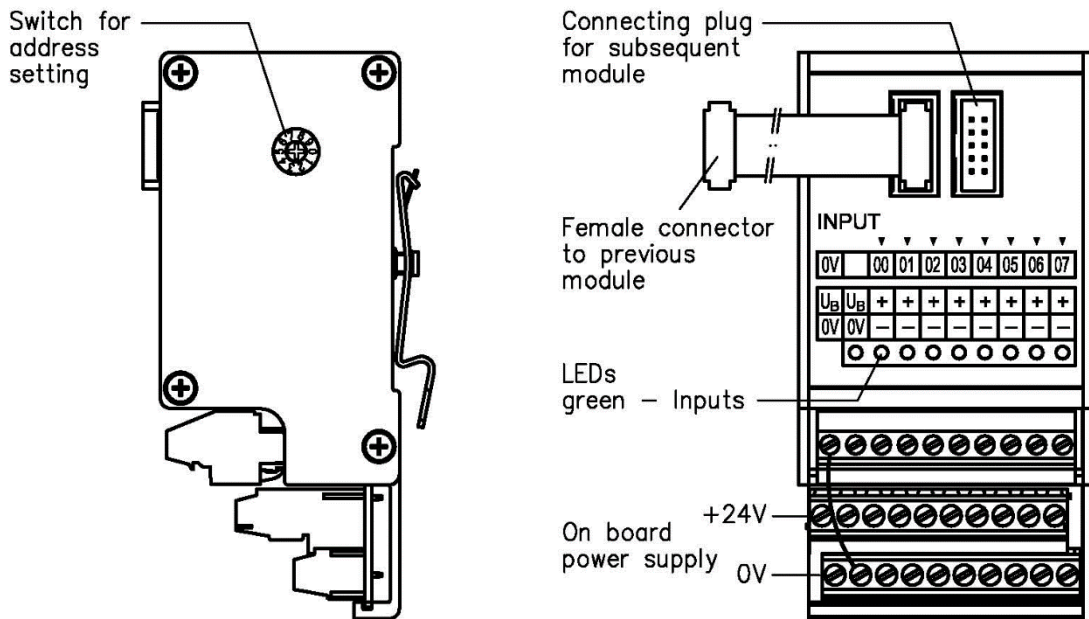
Dimensions (W x H x D)	55 x 85 x 58 mm
Power consumption (logic circuit)	0.29 W
Weight	1.2 N (= 0.12 kg)

Output extension module 8D0/2, 0A, type 6753-112
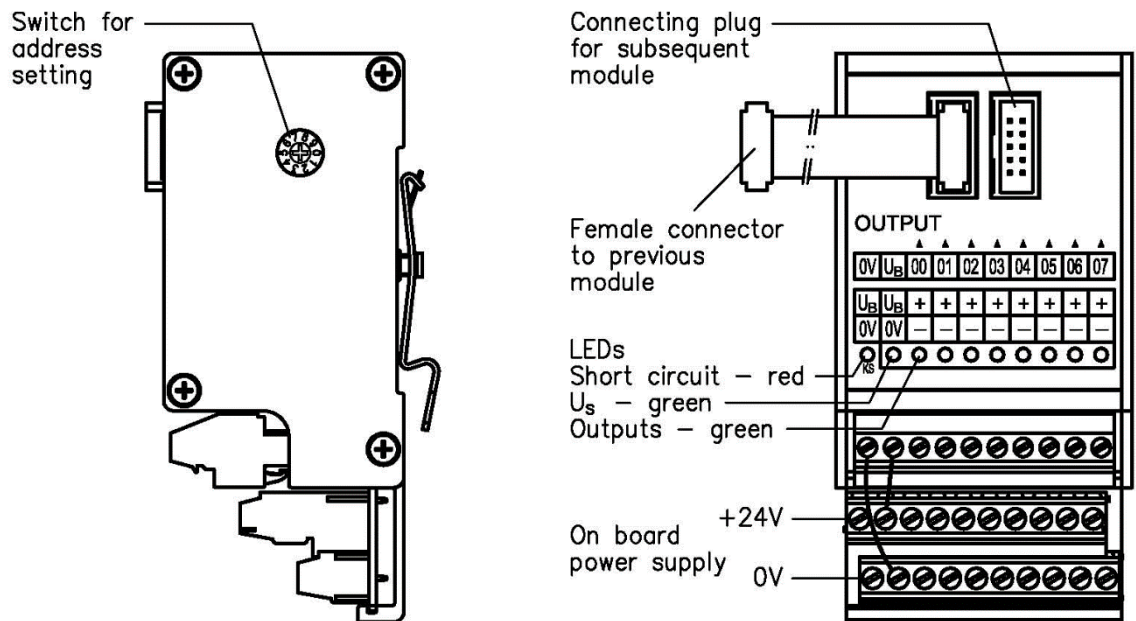
Dimensions (W x H x D)	55 x 85 x 58 mm
Power consumption (logic circuit)	0.325 W
Weight	1.5 N (= 0.15 kg)
Max. current per output at signal 1	< 1 A (up to +60 °C) Total load capability 8 A (-20…+60 °C)

Output relay modules:

Output relay module: *Type 6753-106*   *Type 6753-107*

Electrical connection:	bl → 0 V on-board power supply; bn, rd, yl, gn → output
Connection leads:	30 cm
Max. switching voltage (relay):	AC/DC 50 V
Dimensions (W x H x D) Weight/format 6753-106: 6753-107:	55 x 74 x 65 mm / 1.5 N ≈ 150 g / 1 x 6.3 A / 1 x 2.0 A 35 x 74 x 65 mm / 0.75 N ≈ 75 g / 1 x 6.3 A / 1 x 2.0 A

Order details

Accessories/replacements	
I/O basic module, 8DI/8D0, type 6753-110	276817
Input extension module, 8DI, type 6753-111	276819
Output extension module, 8D0/2, 2.0 A, type 6753-112	276818
Output relay module 1 x 6.3 A/3 x 2.0 A, type 6753-106	U899176753106
Output relay module 1 x 6.1 A/1 x 2.0 A, type 6753-107	U899176753107
Pillar terminal block 3-pole	216968
Pillar terminal block 4-pole	216432
Pillar terminal block 5-pole	222010
Pillar terminal block 6-pole	275016
Pillar terminal block 10-pole	275017

22   Thermal printer type 6761-11

Order no.: 215004

Thermal printer for simple and reliable recording of measurements and data. The printer can either be connected directly to the RS 232 interface on the MAK Controller type 6942-10 or controlled via an RS 232 / P-NET converter from the P-NET fieldbus.

<u>Changing the paper:</u>
The tried-and-tested drop-in method of inserting the new paper roll consists of just three quick and easy steps: open printer, insert paper roll, close printer.

22.1   Technical data

Mechanical data	
Dimensions	W x D x H: 145 mm x 195 mm x 148 mm
Installation position	Vertical or horizontal. In case of vertical installation, please note the instructions for attaching the correct labelling strip and changing the paper sensor position.
Housing	Plastic, light grey
Weight	1.8 kg (excl. paper)
Connection	25-pin D-SUB connector, lockable, connection cable incl. plug, cable length 15 m, can be cut to required length
Installation location	In dry, clean areas only within operating temperature limit and climate class, preferably in the driver's cab
Electrical data	
Interfaces	Standard: RS-232
Auxiliary power	DC 24 V / max. 1.5 A
Ambient conditions	
Operating temperature	0 ... 50 °C
Storage temperature	- 20 ... 60 °C (excl. paper)
Climate class/protection type	KWF / IP 30

<u>Accessories:</u>
Paper: Thermal paper (order no. 215115)
Width: 79.5 mm ± 0.5
Max. diameter: 83 mm
Connection cable (order no. 215127)

Connection cable signal assignment

PIN	Colour	Signal
2	gn	TxD
3	ye	RxD
7	bn	GNG
9 + 10	pk/gy	+24 V
12 + 13	bu/wh	0 V
Housing	Shield	

Fit connection cable to printer with the screws in the cable plug.

Attention:
The metal base plate of the thermal printer has an electrical connection to the GND signal of the electronic system and to the cable shield.

The printer must therefore be insulated from the vehicle chassis.

The cable shield must not be connected to the follow-on device or the shield bar.

Instructions for vertical installation:

a) Install the printer so that the paper comes out at the top and the cable connection is facing down.

b) The labelling strip for feed button and LEDs is "upside down" in this position and must be carefully covered over with the labelling strip provided.

c) Change the paper sensor position to vertical installation position:
   - Undo detector screw by turning anticlockwise, e.g. using a coin (see diagram)
   - Using a fingertip, press key lever to the side as far as it will go and hold
   - Rotate turning knob in the direction of the arrow until the key lever automatically clicks into the hole in the other side
   - Keep hold of turning knob and tighten detector screw again by turning clockwise

Changing the paper sensor position

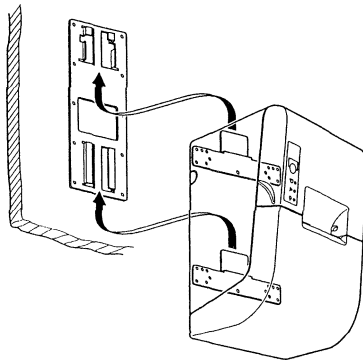Turning knob

Detector screw

Key lever
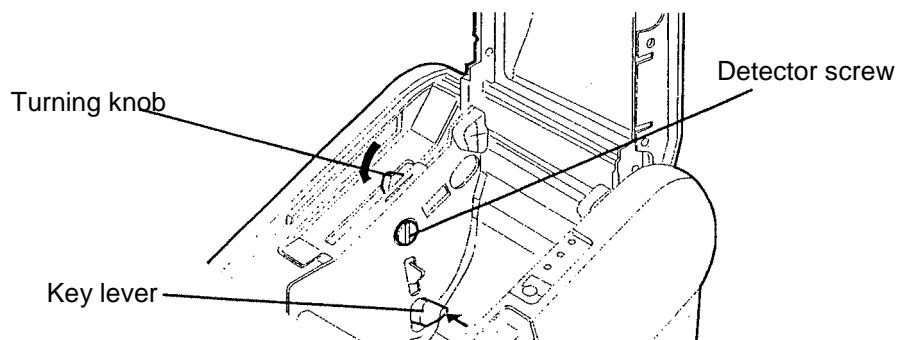
Installation/dimensions for bracket in case of vertical installation
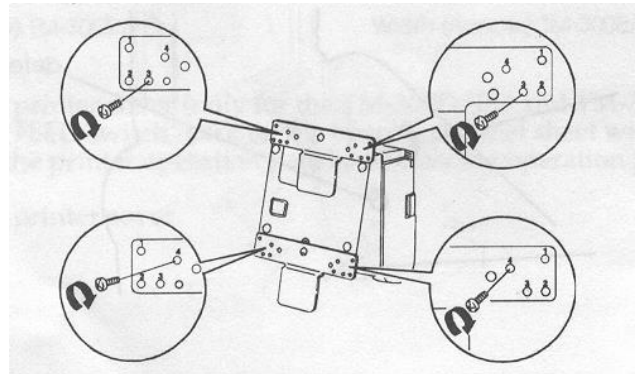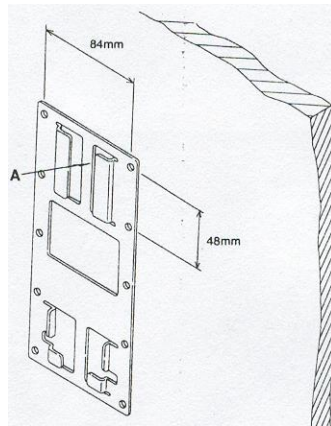
1. Fit retaining plate

2. Fit screw plates on printer

   a)   Affix the top plate through the holes marked no. "3"

   b)   Affix the bottom plate through the holes marked no. "4" using the screws provided

3. Fit printer by screw plates in retaining plate A!

22.1.1   Printer operation

Control panel

You can control the basic paper feed functions on the printer with the button on the control panel. The LEDs will help you to monitor the printer status.

POWER

The POWER LED lights up whenever the printer is switched on.

ERROR

This LED indicates a malfunction.

PAPER OUT

This LED indicates that the roll of paper is running out. Put in a new roll of paper so that the printer can continue printing.

When this LED flashes, it indicates standby status during the self-test printout or during the execution of a macro if the execute macro command is used.

FEED button

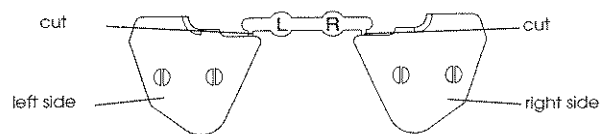This button can be deactivated with the ESC c 5 command.

Press the FEED button once to advance the paper by one line. You can also press and hold the FEED button down to keep advancing the paper.
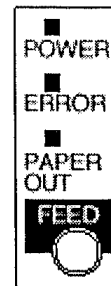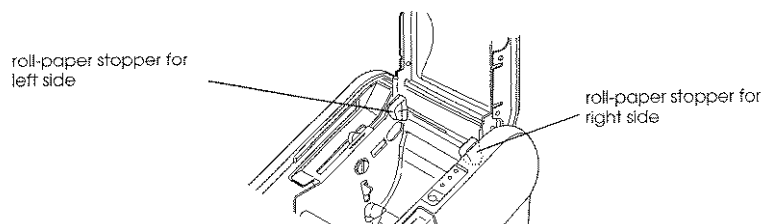
22.1.2   Fitting the paper roll holder

1. Detach the paper roll holder.

2. Open the printer cover and attach the paper roll holder by pressing both fittings into the holes, as shown in the diagram below.

22.1.3   Troubleshooting

General problems

The LEDs on the control panel do not light up.

Make sure that the cable is correctly connected and check that power is being supplied to the entire system.

Printing problems

The ERROR LED is on (not flashing) and the printer will not print.

If the PAPER OUT LED is on, it means that the roll of paper is not fitted or is almost used up. Fit a new roll of paper.
If the PAPER OUT LED is not on, make sure that the printer cover is closed properly. Press the printer cover down until it clicks into place.

The ERROR LED is flashing and the printer will not print.

First turn the printer off and check if there is a paper jam.
If there is not a paper jam and the printer has been printing for a relatively long time, the printhead may have overheated. If the printhead has over-heated, the printer will continue printing as soon as the head has cooled down (usually within two to three minutes).
If there is no paper jam and the printhead has not overheated, switch off the printer and switch it on again after approx. 10 seconds.

The ERROR LED is not on but the printer will not print.

Try to run the self-test to check if the printer is working properly.
If the self-test works correctly, make the following checks:
Check the connection on both ends of the cable.
If the printer still will not print, contact your after-sales service centre or re-place the printer.

The print quality is poor.

Dust or lint on the heating element of the thermal printhead can affect the print quality. Try to clean the printhead, as instructed below.

Cleaning the printhead

Caution:
The printhead can be very hot after printing. Do not touch it. Allow it to cool down before cleaning it.
Do not touch the printhead with your fingers or with a hard object in order to avoid damaging it

1. Open the printer cover.

2. Clean the heating element of the printhead with a cotton cloth dampened with an alcohol-based solvent (ethanol, methanol or IPA).

Plate

Printhead   Thermal element
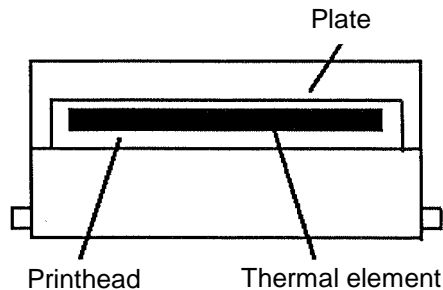
Problems with the paper feed

There is a paper jam in the printer.

Caution:
The printhead can become very hot after prolonged continuous use.
Do not touch it.

1. Follow the instructions below to clear a paper jam:

2. Switch the printer off and press the relevant button to open the cover.

3. Remove the jammed paper, put the roll back in the printer and close the cover.

4. If paper has caught in the automatic cutter and the printer cover will not open then open the cover on the cutter indicated in the diagram below.
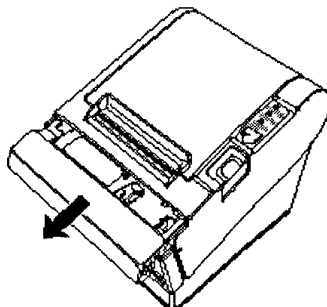
5. Then turn the button until you can see into the opening, as shown in the diagram below. This will reset the cutter blade to normal position. There is a sticker near the cutter as a guide.
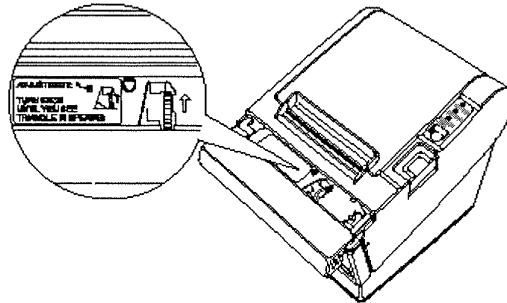
6. Close the cover on the cutter.

7. Open the printer cover.

8. Remove the jammed paper.

Problems with the automatic cutter

The paper cutter is blocked.

If a foreign object, such as a drawing pin or paper clip, has fallen into the cutter and caused a blockage, the printer will be in error state and will automatically start a recovery process.

If the problem is not serious, the cutter will return to its normal position and no intervention will be required from the user.

If the cutter does not automatically return to its normal position then follow the instructions below to remedy the problem.

1. Pull the cover on the cutter towards you so that you can turn the button for the cutter motor.

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

3. Close the cover on the paper cutter.
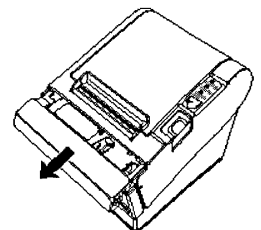
Self-test

The self-test allows you to see whether the printer is working correctly. It checks the control circuits, print mechanism, print quality, ROM version and DIP switch settings.

This test is independent of any other unit or software.

Running the self-test

1. Make sure that the printer is switched off and the covers are properly closed.

2. Press and hold the FEED button and switch on the power supply to the printer in order to start the self-test. The self-test prints out the printer settings and then the following, cuts off the paper and waits (the PAPER OUT LED will flash).

Self-test printout

Press the PAPER FEED button.

1. Press the FEED button to continue the printing process. The printer will print out a sample with the character set.

2. The self-test will end automatically and the paper will be cut off after the following line:

*** completed ***

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

Note:
Press the FEED button if you want to interrupt the self-test manually. Press the FEED button again to continue the self-test.

23   Printer type 6881-30

Order no.: 235934

> ⚠️ **Attention:**
> The printer and the printer holder must be protected from moisture!

23.1   Technical data

Device-specific data	
Printing format	Alphanumerical character set with 96 ASCII characters (font 5 x 7 / 7 x7)
	32 international characters and 128 x 3 graphical characters (font 6 x 7 / 10 x 7)
	4 letter sizes:
	Standard, font 5 x 7 (35 characters per line)
	Normal, font 7 x 7 (42 characters per line)
	Wide, font 5 x 7 (17 characters per line)
	Wide, font 7 x 7 (21 characters per line)
	Line feed: 4.2 mm
Printing procedure	Needle printer 7 x 7
	Unidirectional printing
Printing speed	1.9 ... 2.3 lines per second
Printing paper	Standard, carbon and self-copy paper
	Total thickness 0.09 ... 0.35 mm
	Paper width at least 80 mm
	Paper length at least 80 mm
	Printing width max. 60 mm
	Max. 4 copies with self-copy paper (25° C)
Colour ribbon	Colour ribbon cassette black
	Life expectancy approx. 1.5×10^6 characters
Data interface type 6961-100	Serial interface (RS 232)
	Cable length max. 10 m

Electrical data	
Power supply	DC 24 V ± 10 %, max. 1.0 A, ripple ≤ 150 mV eff.
Connection	25-pole socket (RS 232), 3-pole plugs (power supply DC 24 V)
Ambient conditions	
Operating temperature	+5° C … +40 °C
Storage temperature	-10° C … +50 °C
Climatic class	KYF
Protective system	IP 40
Mechanical data	
Dimensions	180 x 102 x 195 mm (W x H x D)
Weight	Approx. 20 N (≅ 2 kg)
Housing	Plastic tabletop housing, grey

23.2   Dimensions
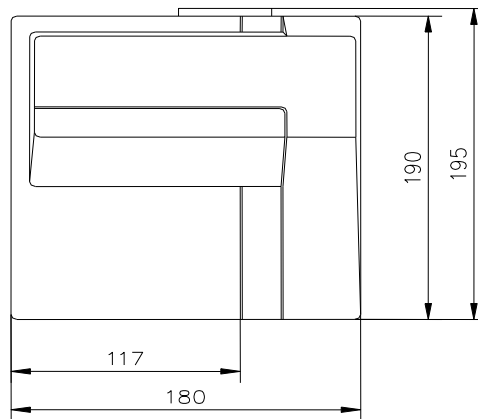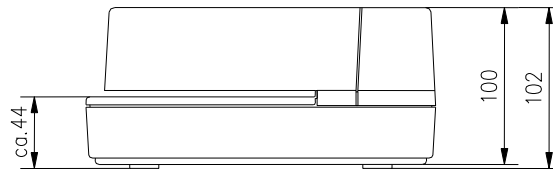
db68811.dwg

23.3   Printer mount type 6961-100

Order no.: 279562

23.3.1   Printer mount connection

Connection of printer mount <u>without series</u>

Terminal	Terminal connection Printer mount type 6961-100
8	24 V (rd)
9	RxD (ye)
10	
11	TxD (gn)
12	
13	GND (bu)
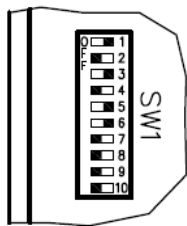
Connection of printer mount <u>from series A</u>

Terminal	Terminal connection Printer mount type 6961-100
8	24 V (rd+wh)
9	RxD (ye)
10	
11	TxD (gn)
12	
13	GND (bu+bk)

DIP switch setting (bottom):

Remove the adhesive label to change the DIP switch setting.

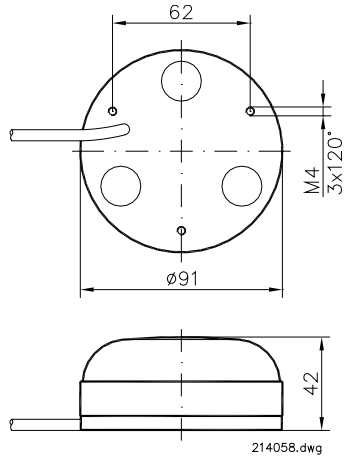| DIP switch no.	Printer mount type 6961-100
1	ON
2	OFF
3	ON
4	OFF
5	ON
6	ON
7	OFF
8	OFF
9	OFF
10	OFF

24 GPS-Receiver (RS 232) type 6722-18

Order no.: 241920

Automatic supplier identification based on satellite tracking of vehicle location in conjunction with MAK 3003 system.

24.1 Technical data

Electrical data	
Auxiliary power	DC 6 ... 40 V
Typical power consumption	50 mA at DC 24 V
Receiver aerial	Inbuilt
Interfaces	RS 232
Electrical connection	5m of cable, open wire ends
Ambient conditions	
Operating temperature	- 30 ... + 80°C
Protection class	IP 67 (1 m immersion depth for 30 min)
Mechanical data	
Dimensions/mounting holes	
Mounting bolts	3 x M4, max. thread depth of 8.0 mm not to be exceeded (risk of breakage)
Weight	330 g incl. 5 m of cable

24.1.1   Wiring of GPS receiver 6722-18

See Compact Controller wiring page 14.

24.1.2   Connection

5 m length of cable supplied with the product, 130 mm of insulation stripped from cable end.

Assignment:

Signal	+ DC 24 V	GND/Remote	RxD	TxD
Colour	Red	Black/yellow	Blue	White

24.1.3   Fitting

The aerial is built into the receiver therefore the receiver must be fitted on top of the vehicle (e.g. on the rear cabin) and must be as horizontal as possible. The unit must never be covered by metal parts and must be able to "see" as well as possible in all directions on all sides.

25   GPRS modem with Magnetic antenna

- The modem housing (DGND) must not be in contact with the chassis. The modem is therefore installed with the insulation set.

- Please also check that the antenna adapter and antenna are unearthed.

25.1   GPRS Module, Type 6942-100

**Order no.: 290337**

25.1.1   Technical data

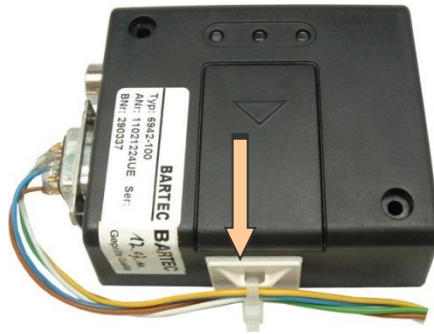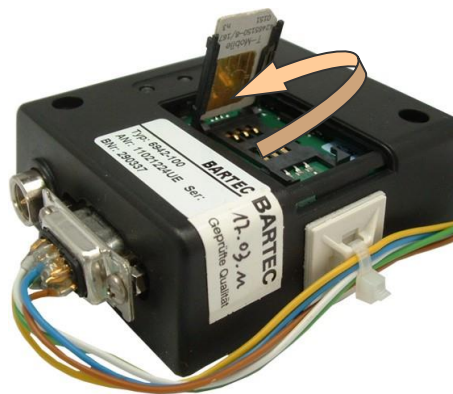|	
Operating voltage	DC 5 ... 36 V / approx. 83 mA at 24 V
Dimensions	77 x 67 x 26 (L x W x H)
Weight	Approx. 90 g
Fixing	Two M3x30 mm countersunk rounded-head screws on plastic
Operating temperature	- 30...+ 75 °C
Storage temperature	- 40...+ 85 °C

25.1.2   Connections

Attention:
The modem must be affixed with plastic bolts.

Front view   Rear view

Power cable
connection

RS 232 interface
(15-pin D-sub)

Aerial socket
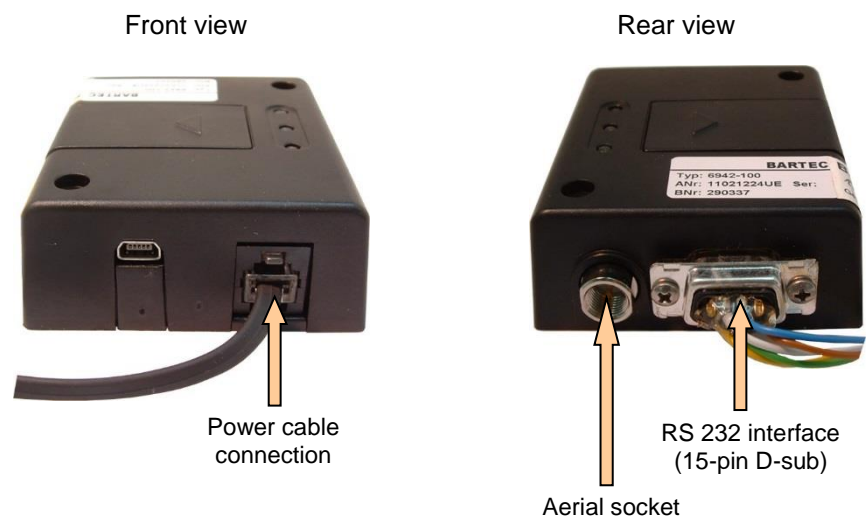
Inserting the SIM card

1. Open the cover.

2. Open the slot and insert the SIM card.

25.2 Magnetic antenna

Order no.: 360422

Ø 60mm / H: 13 mm
Antenna length: 5 m

Attention:

Fit the antenna in a location with good reception. The magnetic antenna may not be used in potentially explosive atmospheres..

First enter PIN in configuration then insert SIM card while the system is switched off.

25.3   2. GPRS data modem type Telit GT864-Quad (optional)

- The modem housing (DGND) must not contact the chassis at any point. For this, the modem is fitted with the isolation set.
- Please also check the floating ground of the aerial adapter or the aerial.
- The shield bar must also not be in contact with the aerial adapter or the modem housing.
- The length of the modem cable is limited to 10 m. Any measures to lengthen the cable must be avoided.

25.3.1   Technical Data

Operating voltage	DC 5 ... 36 V / ca. 83 mA bei 24 V
Dimensions	77 x 67 x 26 (L x B x H)
Weight	Approx. 90 g
Mounting	With two oval countersunk head screw M 3x30mm on plastic
Operating temperature	- 30...+ 75 °C
Storage temperature	- 40...+ 85 °C
Ordering details	
Designation	Order number
GPRS data modem type Telit GT864-Quad	304264

25.3.2   Terminal assignment for 2. GPRS data modem

Motherboard from series C

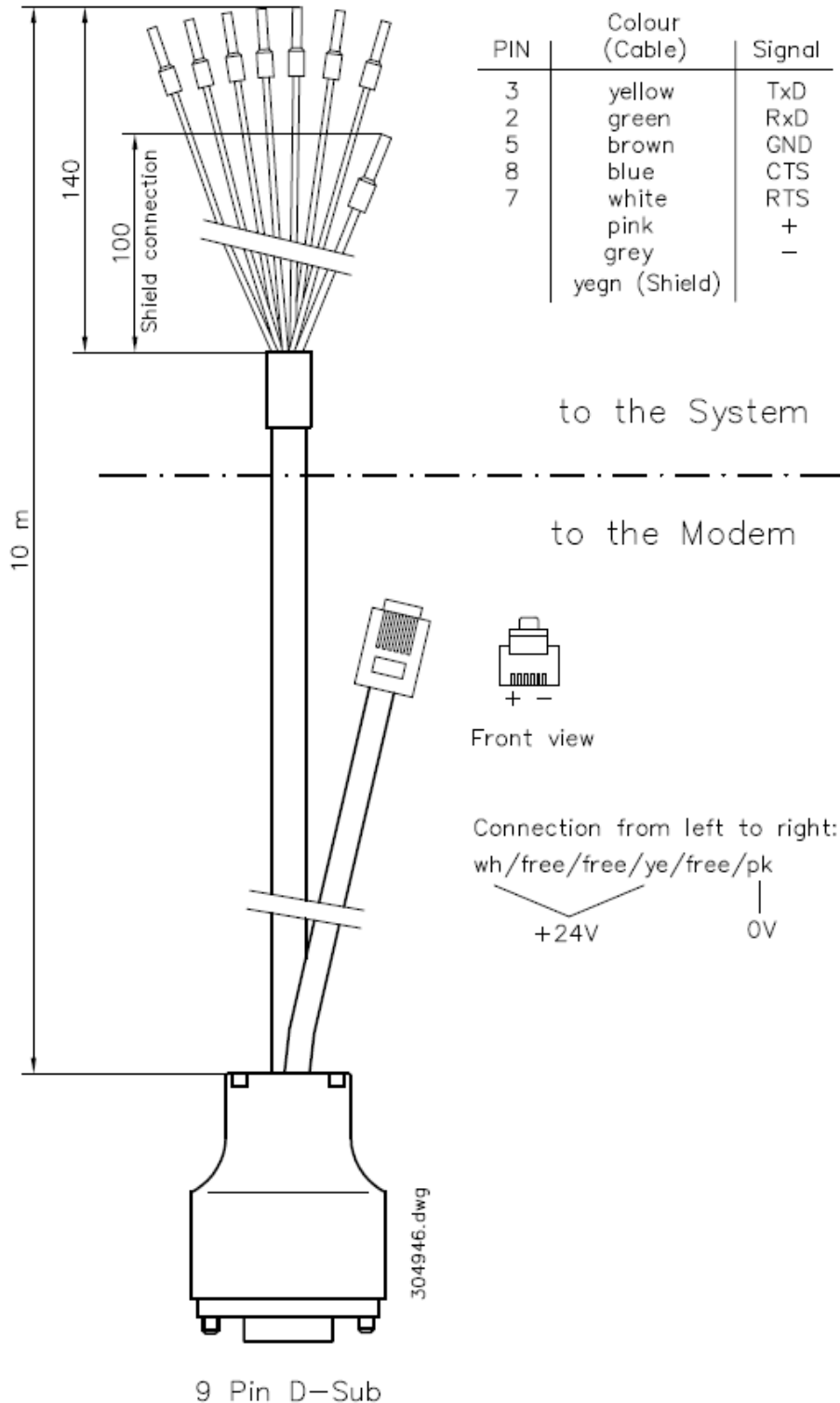| Clamps RS 232_1	Modem cable 4386-306
132 24V_COM 133 RxD 134 CTS 135 TxD 136 RTS 137 AGND	pk gn bu ye wh bn + gy
Shield terminal → Shield ye/gn replace	

Note:
RS 232_1 corresponds to the interface on the system dev/ttySM1

25.3.3 Connection cable for 2. GPRS data modem Telit GT864-Quad type 4386-306

(BNr. 304946, Länge 10m)

PIN	Colour (Cable)	Signal
3	yellow	TxD
2	green	RxD
5	brown	GND
8	blue	CTS
7	white	RTS
	pink	+
	grey	−
	yegn (Shield)	

to the System

to the Modem

Front view

Connection from left to right:
wh/free/free/ye/free/pk

+24V   0V

Shield connection

140

100

10 m

304946.dwg

9 Pin D-Sub
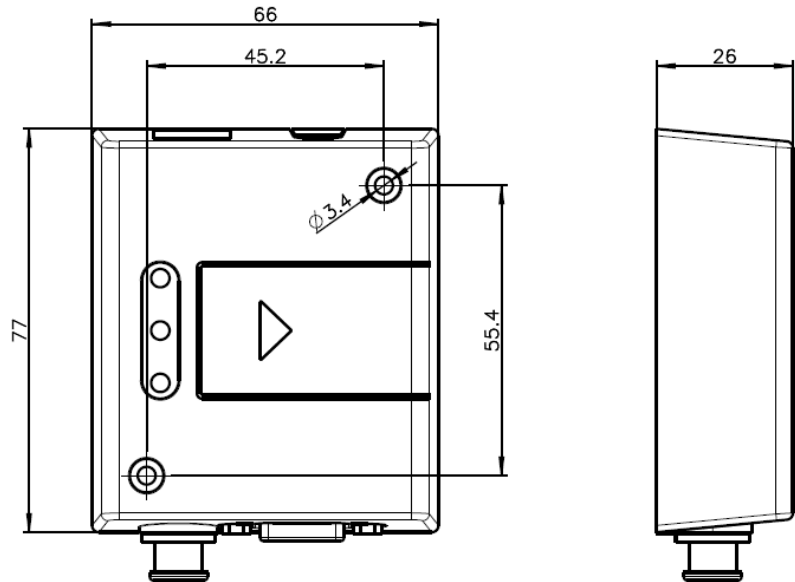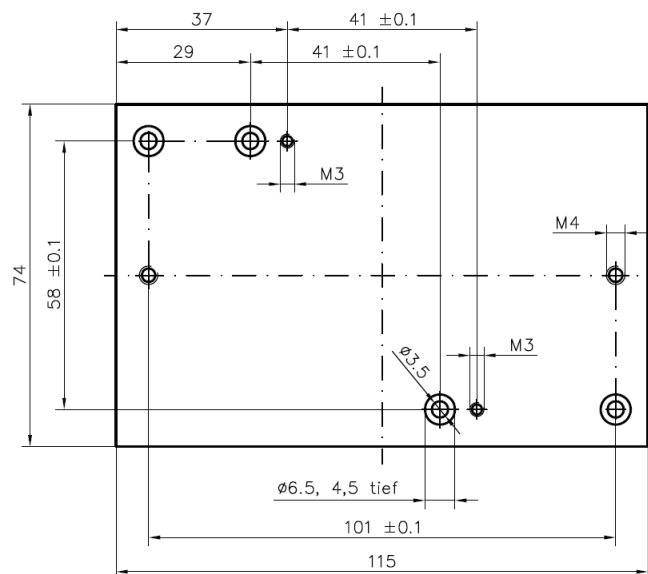
25.3.4   Dimensions and mounting

Fit the modem in a dry, dust-free and dirt-free area in a non-hazardous area where it is not exposed to much vibration.

Dimensions and mounting holes

Installation set, type 6722-103 (Order no. 238862)

t = 10 ±0.5

25.4 SIM card specifications for the 3003 system

The following connections must be set up by the provider in order to guarantee efficient online support.

Service	Port	Description
SSH	22	Connection from 3003 system to office
SSH	22	Connection from office to 3003 system
HTTP	80	Connection from office to 3003 system
HTTPS	443	Connection from 3003 system to office
Ping		Connection from 3003 system to office

Additional options for office link-up via FTL and FTP (optional):

Service	Port	Description
FTP *1) (passive)	21 / all ports above 1023	Office link-up for Tiger MAK / PETRO and Petro 3003

Note:

The IMEI number of the modem must be activated and supported by the network operator/provider.

*1) FTP connections can also be protected via SSL. This is subject to the provider allowing FTP via SSL. Communications are then no longer in plain text but in SSL encryption form.

26 ULTRASAMPLER® sample collection system

26.1 Description

The ULTRASAMPLER® system is an automatic sampling system for milk collection vehicles in conjunction with the MAK 3003 milk intake and monitoring system.

The sample is taken "on line" during the milk intake and is always proportional to the volume flow rate.

If a dual pump system is used, it is possible to take individual samples and samples from the whole tank (GTP) at the same time.

There is a choice of manual to fully automatic infeed systems for the empty sample bottles.

There are bar code and transponder (TAG) systems for the sample bottle identification.

The following units belong to the ULTRASAMPLER sample collection system range:

- Sampler controller, type 6771-31

- Sampler pump, type 6871-x

- Flow level meter, type 6826

- Bottle drive, type 6774-10/6774-12

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

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

- Bar code reader, type 6727-40

- Bar code reading unit, type 6723-10, B series

The system configuration depends on the regulations in force in the relevant country and on the individual customer specifications.

- It is advisable to use the flow level meter (FLM) to increase the accuracy and representativeness of the sample, especially for milk quantities < 300 litres.

26.1.1   Position of the ULTRASAMPLER

The sampler pump and flow level meter are built into the milk pipeline on the collection vehicle and are flowed through by the milk taken into the collection vehicle.

The control unit is positioned at a suitable place near the sample collection system.

Systems with bottle drive for automatic sample bottle transport and sample bottle identification (bar code or TAG) are usually integrated in a closed refrigerator section.

The temperature of the refrigeration section is measured regularly by the MAK 3003 system and is recorded if it is above or below the stipulated limits.

Fig. 1 shows the position and arrangement of the Ultrasampler in the refrigerated sample collection box.
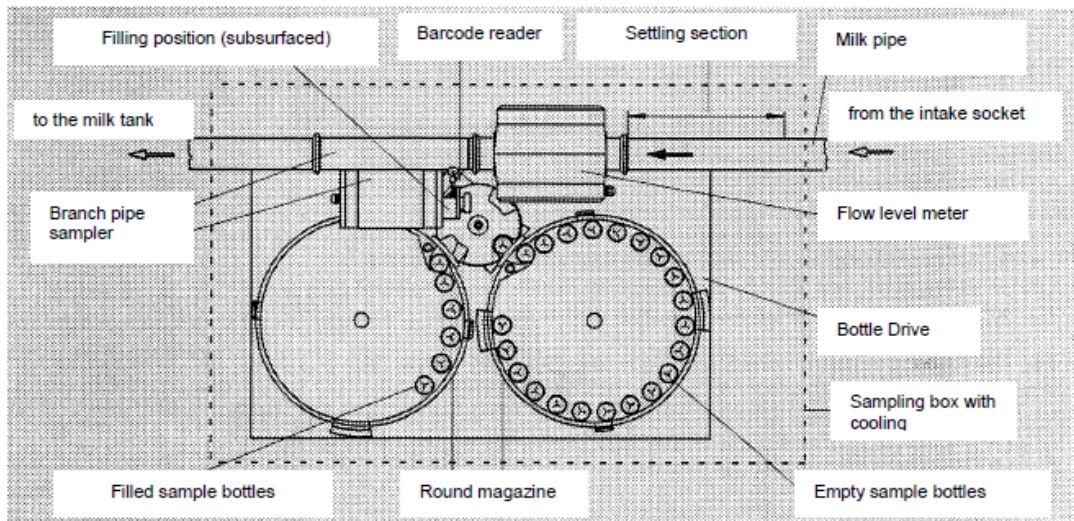

Fig. 1: Ultrasampler in the sampling box with cooling (plan view)

26.1.2   Mode of operation of the ULTRASAMPLER

Sample collection process

As soon as milk is taken into the collection vehicle, the sampler takes the sample in the branch pipe and pumps it into a correctly identified sample bottle waiting in position to be filled.

Before every milk intake, the control unit receives the input data from the MAK 3003 system so that it can determine the required pump output for the expected quantity of milk, the throughput of the collection vehicle and the number of samples to be taken.

The input data are used to calculate the available sample collection time and the resulting pump delivery rate of the sampler for the sample collection process.

If there is a facility to take samples from the whole tank (GTP) and if this function is enabled then, at the same time, a branch in proportion to the volume will be taken into the tank sample bottle from every supplier on a round.

Operation with flow level meter

If the ULTRASAMPLER has a flow level meter, the control unit receives a continuous stream of data from the flow level meter on the quantity of milk taken into the collection vehicle.

This enables high-precision control of the pump delivery rate subject to the actual flow rate. If there is no FLM, the pump output is controlled by default parameters for the performance of the measuring system.

Sample bottle transport

The control unit works with the MAK 3003 system in controlling and monitoring the automatic bottle drive.

Before every sample collection process, the bottle drive brings an empty sample bottle into the filling position under the sampler.

The sample bottle is identified beforehand by bar code or TAG. Faulty bottles are rejected without being used. After every sample collection process, the bottle drive sets the filled sample bottle down in a round magazine.

MAK 3003 matches the milk sample to the milk producer on the basis of the bar code or TAG, thereby ensuring that the data will be correctly attributed for the subsequent laboratory analysis.

Fig. 2 illustrates the flow of the data signals and control signals between the functional units of the ULTRASAMPLER and MAK 3003.

26.1.3   Additional information about the ULTRASAMPLER

The sample collection is generally independent of the delivery quantity.

A minimum delivery quantity of between 20 and 40 l is required for the bottling of a usable sample, however, depending on the throughput of the intake system.

The MAK 3003 system can enable a pump output reduction on the collection vehicle to ensure that samples are also taken in the case of smaller delivery quantities.

The intake time will increase in proportion to the decrease in throughput.

The time for the sample to be taken by the ULTRASAMPLER will then also be longer.

MAK 3003 decides on an appropriate reduction on the basis of the expected delivery quantity (= input data).

How the system works in practice depends on the design of the collection vehicle.

Efficient sample collection

A special rinsing process in the sampler before every sample collection process largely prevents any residual milk in the sampling line from being carried into the new sample bottle.

At the start of the milk intake process the sampler pumps milk out of the branch pipe towards the sample bottle until the milk working point reaches the sampler exit.

The sampler then reverses the pumping direction and pumps milk and rinse residues back into the branch pipe.

Excess quantities in sample collection process

If the delivery quantity exceeds the specified amount by a set percentage (e.g. 20 %), the sample collection process will be stopped.

The sample bottle will also contain, e.g. 20 %, more liquid at this time than the configured nominal value (e.g. 35 ml).

MAK 3003 relays a message for the operator at the end of the milk intake process reading "Full".

Overfilling can be avoided by comparing the expected delivery quantity with the actual delivery quantity and, if there are major discrepancies, by adjusting the delivery quantity manually on the MAK 3003 system before the milk intake process starts.

Installing a flow-calming section

A flow-calming section is to be incorporated in the milk pipeline upstream of the flow level meter with a minimum length of five times the nominal width.

If the system is operated without a flow level meter, this flow-calming section should be positioned upstream of the sampler.

Pockets of air which falsify the flow level meter readings and which affect the sampling process are largely eradicated by the flow-calming section.

26.2 ULTRASAMPLER®-Controller type 6771-31

Order no.: 242222

Control unit for the ULTRASAMPLER® sample collection system with high-performance stepper motor for individual samples (supplier samples).

26.2.1 Technical data

⚠️ **Attention:**
Failure to heed this information will lead to the destruction of the unit!
The power supply, terminal 52/53, must be routed via the main switch of the data logging system. If the data logging system is not in operation, the power supply must be interrupted.

| Auxiliary energy (electronics)	
Operating voltage	24 V DC, 16 - 35 V
Current consumption	250 mA without stepper motors and load
Fuse	1 A (medium time-lag)
Sampler control - suppliers sample	
Operating voltage	40 V DC
Fuse	3 A (medium time-lag)
Maximal step frequency	10 kHz (corresponds to 25 r/sec. with 400 steps)
Sampler control - tank sample	
Operating voltage	24 - 30 V DC
Fuse	3,15 A (medium time-lag)
Maximal step frequency	10 kHz (corresponds to 25 r/sec. with 400 steps)
Interface 1	
Fieldbus interface (P-NET)	serial, asynchronous RS 485
Baud rate	76 800 bit/s
Galvanic separation	500 V DC
Maximum line length	1 200 m ring, 100 m branch line
P-NET-ident-no.	5941
Cable connection	Clipped connection

Interface 2	
RS 232	Host interface
Protocol	P-NET
Baud rate	Adjustable 150 - 38 400 b/s
Galvanic separation	None
Maximum line length	2 - 30 m depending on baud rate
Cable connection	Clipped connection
Ambient conditions	
Climate class	JWD (DIN 40040)
Permissible operating temperature	- 10 ... + 50 °C
Permissible storage temperature	- 20 ... + 70 °C
Nominal conditions	23 ± 2 °C

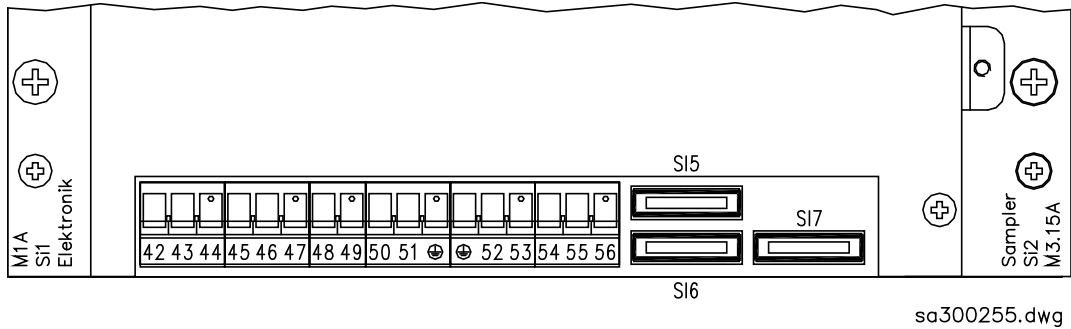# 26.2.2   **Dimensions**
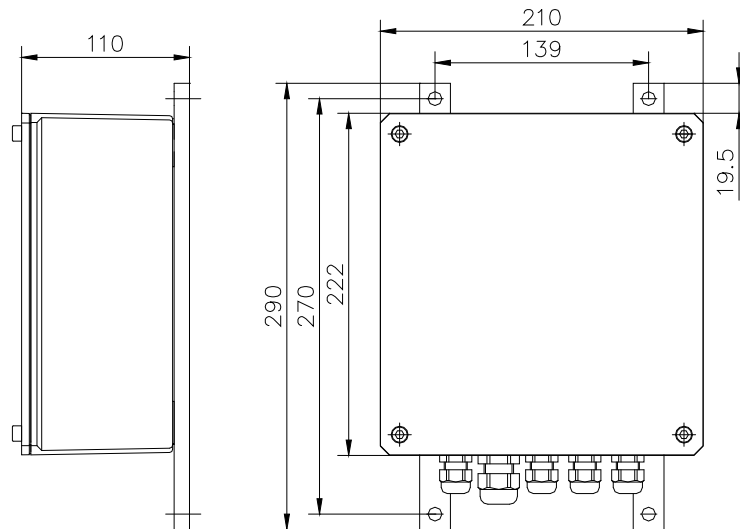
web0062.dwg

26.2.3   Block diagram
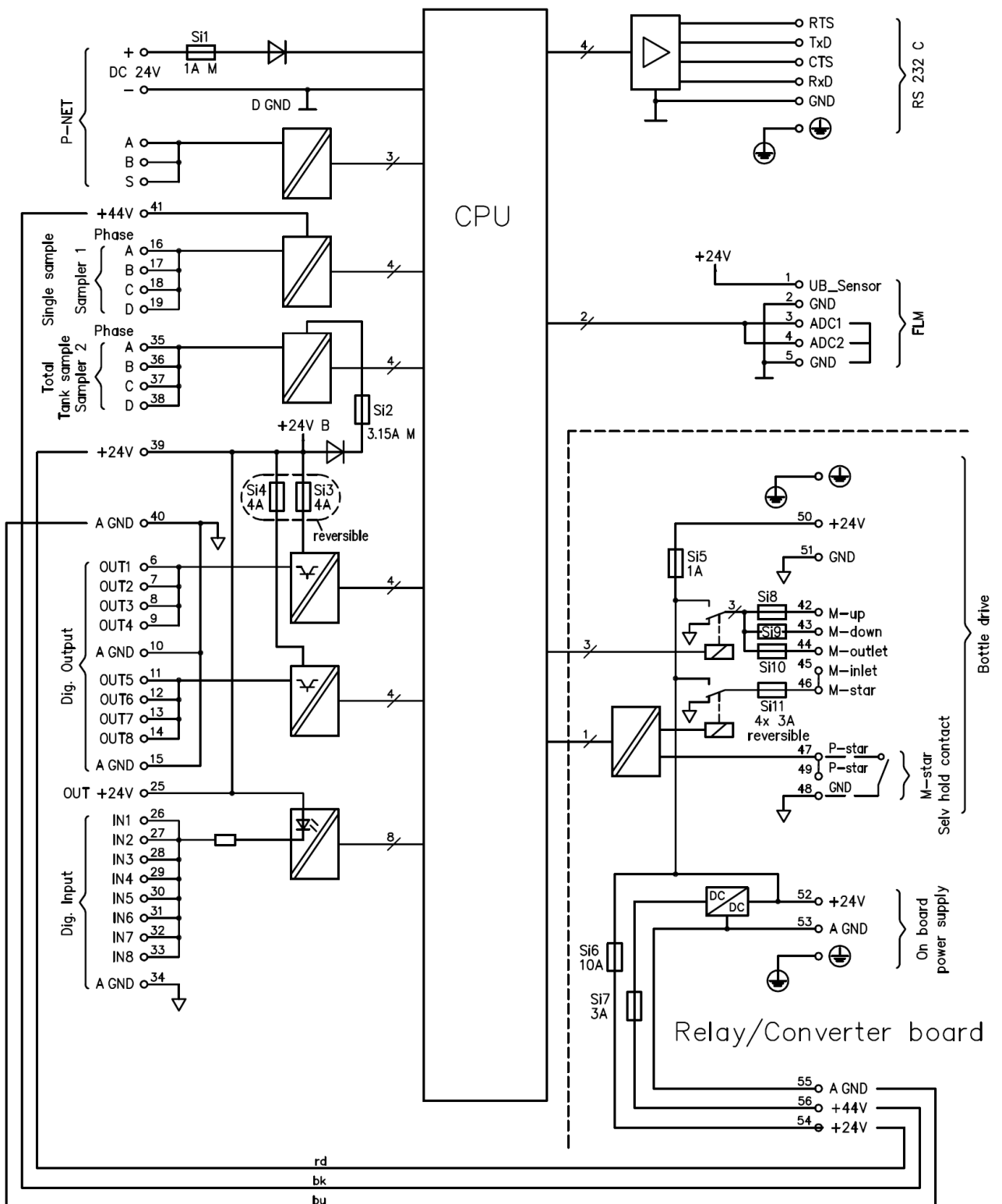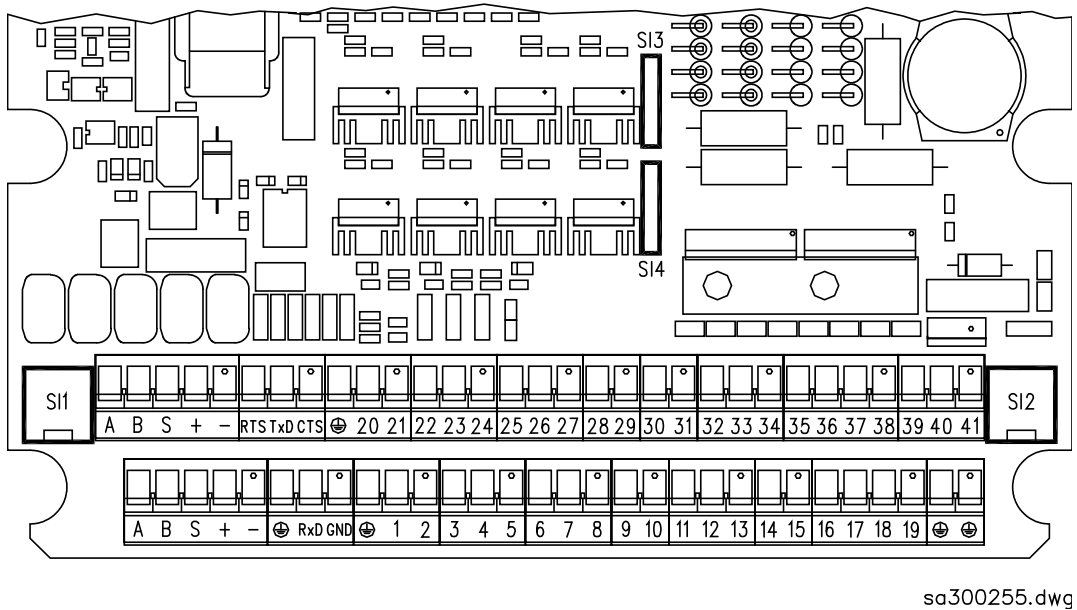

bs677102.dwg

Position of fuses on relay circuit board/converter board

sa300255.dwg

Fuse Si5 = 1.0 A
Fuse Si6 = 10 A
Fuse Si7 =   3 A

Position of fuses on sampler circuit board

sa300255.dwg

Position of fuses

Fusible cut-out Si1 (1 AM) and fusible cut-out Si2 (3.15 AM) can be accessed by opening the respective fuse holder.

Si3 and Si4 are reversible fuses which are ready for use again after a short cooling time after a case of overload has been remedied (do not need replacing!).

26.2.4   Terminal connection plan

Terminal	Signal name	Colour	Connected to
A (2x)	P-NET A fieldbus	ye	P-NET ring
B (2x)	P-NET B fieldbus	gn	P-NET ring
S (2x)	P-NET S fieldbus	bn	P-NET ring
+ (2x)	+24 V supply from cut-in unit	pk/gy/wh	P-NET ring
- (2x)	0 V supply from cut-in unit	Shield	P-NET ring
⏚	Frame ground for cable shielding		Cable shielding
RxD	RS 232 C interface		Inactive
TxD	RS 232 C interface		Inactive
CTS	RS 232 C interface		Inactive
RTS	RS 232 C interface		Inactive
GND	RS 232 C interface		Inactive
1	UB sensor (+24 V for FLM supply)	pk/ gy	Flow level meter (FLM)
2	UB sensor (GND for FLM supply)	Shield	Type 6826
3	FLM fill level (0…2.5 V)	ye	cf. 1)
4	FLM flow rate (4…20 mA)	vt	
5	GND reference potential for fill level + flow rate	bn/bk	
6	Digital output OUT 1		As required
7	Digital output OUT 2		As required
8	Digital output OUT 3		As required
9	Digital output OUT 4		As required
10	Reference ground for OUT 1-4		As required
11	Digital output OUT 5		As required
12	Digital output OUT 6		As required
13	Digital output OUT 7		As required
14	Digital output OUT 8		As required
15	Reference ground for OUT 5-8		As required
16	Sampler motor for individual sample, phase A	bu	Sampler motor for single
17	Sampler motor for individual sample, phase B	bn/wh	sample
18	Sampler motor for individual sample, phase C	gn/ye	
19	Sampler motor for individual sample, phase D	gy/pk	
20	UB sensor (+12 V for probe)	gn	Inactive
21	Frequency input 1 (milk temperature, cf. 3)	wh	
22	Frequency input 2 (milk sensor, cf. 3)	bn	
24	UB sensor (GND for probe)	ye	
20	UB sensor (+12 V for probe)	pk	Inactive
23	Frequency input 3 (sampling cabinet temperature, cf. 3)	wh	
24	UB sensor (GND for probe)	bu	
25	+24 V on-board power supply, auxiliary supply for sensor system		As required
26	Digital input IN 1		As required
27	Digital input IN 2		As required
28	Digital input IN 3		As required
29	Digital input IN 4		As required
30	Digital input IN 5		As required
31	Digital input IN 6, bottle in position, cf. 2)	bu	Bottle drive
32	Digital input IN 7, star in position, cf. 2)	Wire jumper	P-Star (terminal 49)
33	Digital input IN 8, bottle down, cf. 2)	pk/wh	Bottle drive
34	0 V on-board power supply, reference ground for IN 1-8		As required
35	Sampler motor for tank sample, phase A	bu	Sampler motor for whole
36	Sampler motor for tank sample, phase B	bn/wh	tank sample
37	Sampler motor for tank sample, phase C	gn/ye	
38	Sampler motor for tank sample, phase D	gy/pk	

| Terminal	Signal name	Colour	Connected to
39	+24 V on-board power supply from terminal 54	rd 1.5 mm²	Sampler motor for
40	AGND on-board power supply from terminal 55	bu 1.5 mm²	whole tank sample
41	+44 V operating voltage for sampler motor for individual samples, supply from terminal 56	bk 1.5 mm²	
42	Signal M-Up, bottle lifting motor	bn	Bottle drive
43	Signal M-Down, bottle lifting motor	rd	Wires according to colour for type 6774-10
44	Signal M-Out, magazine discharge motor	ye	
45	Signal M-In, magazine infeed motor	gn	
46	Signal M-Star, star drive motor	pk	
47	Signal P-Star, self-holding contact for star drive	vt	
48	Ground reference potential for P-Star signal	gy/wh	
49	Signal P-Star, check-back signal	Wire jumper	IN 7 (terminal 32)
50	+24 V on-board power supply for bottle drive	bk	
51	GND on-board power supply for bottle drive	bn/wh	
⏚	Shielded connection for bottle drive channel		
⏚	Shielded on-board power supply connection		
52	+24 V on-board power supply entry		Vehicle battery+
53	GND on-board power supply entry		Vehicle battery-
54	+24 V on-board power supply exit	rd 1.5 mm²	Terminal 39, sampler circuit board
55	AGND on-board power supply exit	bu 1.5 mm²	Terminal 40, sampler circuit board
56	+44 V operating voltage output for sampler 1	bk 1.5 mm²	Terminal 41, sampler circuit board

Annotation:

1. Insulate other pigtail leads individually for FLM, type 6826 (rd, wh, bu); these are not needed.

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

3. This is the standard assignment. Any configuration is basically possible.

Note:
On configuration of "3003", input IN 6 is strictly reserved for "Bottle in position".
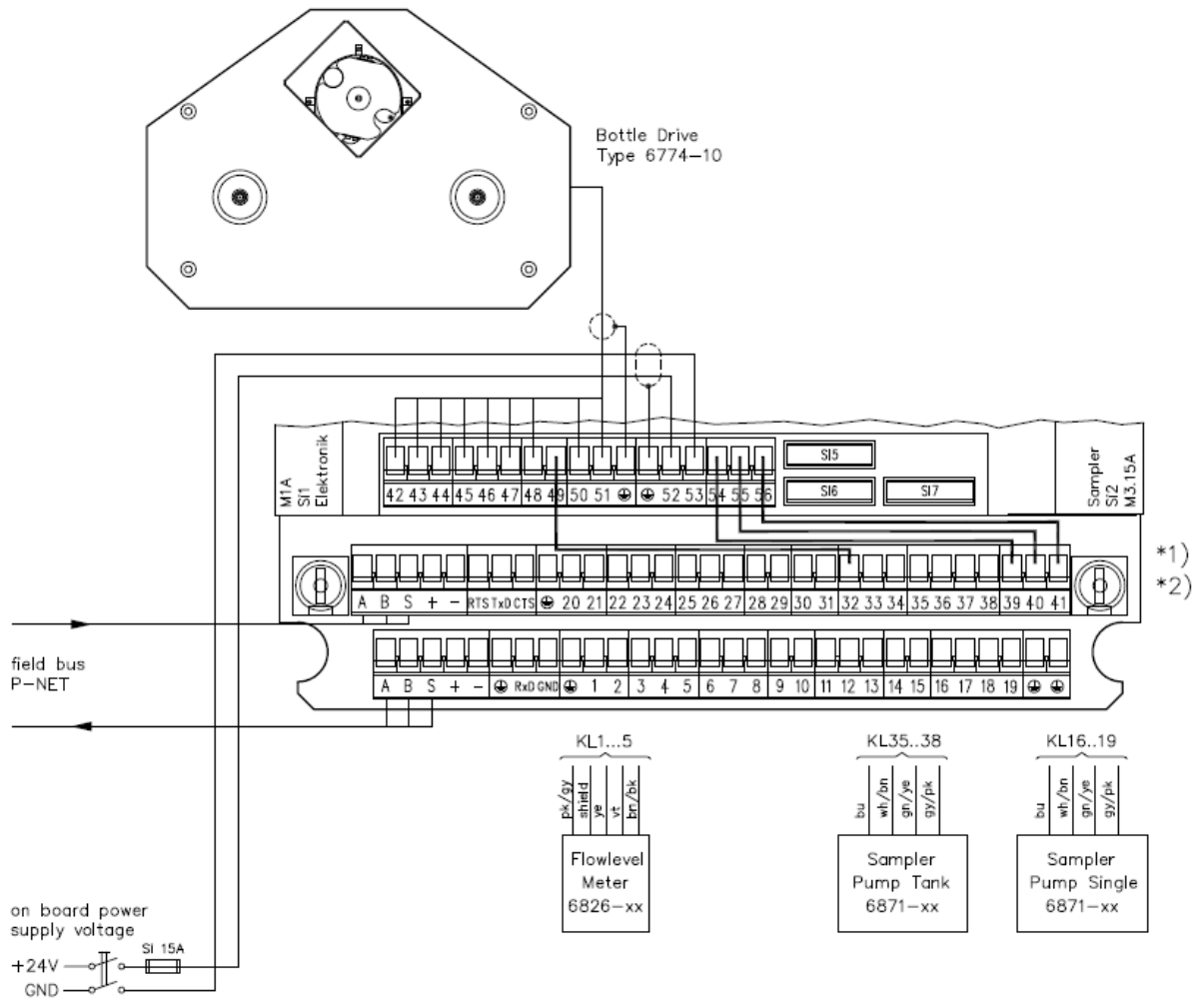
26.2.5   Wiring

Additional instructions for wiring:

*1) The outgoing wires from terminals 54 (red), 55 (blue) and 56 (black) (= on-board power supply + sampler motor voltage) have to be connected to terminals 39 (red), 40 (blue) and 41 (black).

*2) For bottle drive operation, a wire jumper is needed between terminal 32 (IN7) and terminal 49 (P-Star).
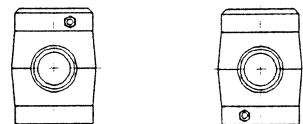
26.3   Flow Level Meter type 6826-x

Order no..: see technical data

26.3.1   Technical data

Device-specific data	
Liquid to be measured	milk
Medium temperature	0 °C … +100 °C
Pressure	max. 10 bar
Electrical data	
Auxiliary energy (voltage, current)	24 V DC ± 10 % max. 6 W
Volume flow rate	
NW 50	max. 500 l/min
NW 65	max. 1000 l/min
NW 76	max. 1400 l/min
Flow direction	In accordance with direction given on the metal type plate (+ direction)
Sensors	Magneto-inductive flow sensor with µP-controlled function monitoring; measurement of filling degree via conductivity sensor
Electrical outputs	
Magneto-inductive flow meter	analog output 4 … 20 mA
Filling level sensor	analog output approx. 0,3 … 2,3 V
Electrical connection	5 m connection cable via PG-11 feed and internal terminals, open cable ends
Ambient conditions	
Operating temperature	-10 °C … +50 °C
Maximum cleaning temperature	100 °C
Cleaning type	CIP cleaning
Climatic class	IWA in accordance with DIN 40040
Mechanical data	
Dimensions	250 x 180 x 110 mm
Weight	approx. 50 N (= 5 kg)
Pipe connections	

NW 50	Connecting flange, connection via sealing ring and clamp in accordance with DIN 32676 NW 50
NW 65	Connecting flange, connection via sealing ring and clamp in accordance with ISO 2852 NW 2,5"
NW 76	Connecting flange, connection via sealing ring and clamp in accordance with ISO 2852 NW 3"
Layout	Red plastic casing PPO Noryle with stainless steel measuring tube Stainless steel measuring tube, teflon-coated
Mounting	Measuring tube only horizontal, with upstream smoothing section > 3 x NW

Ordering details	
Designation	**Order number**
Horizontal mounting (flat):	
Flow Level Meter 2", type 6826-10	U950 17 682610
Flow Level Meter 2,5", type 6826-20	U950 17 682620
Flow Level Meter 3", type 6826-30	302063
Mounting position	
Vertical mounting (edgewise):	
Flow Level Meter 2" 90°, type 6826-11	U950 17 682611
Flow Level Meter 2,5" 90°, type 6826-21	U950 17 682621
Flow Level Meter 3" 90°, type 6826-31	304782
Mounting position	
Note: Please mind flow direction (arrow on type plate) !	

| **Accessories:**	
Sealing ring for clamp 2"	U495077
Clamp foldable 2"	U495080
Sealing ring for clamp 2,5"	U495059
Clamp foldable 2,5"	U495056
Sealing ring for clamp 3"	U495031
Clamp foldable 3"	U495065

26.3.2   Dimensions/Installation
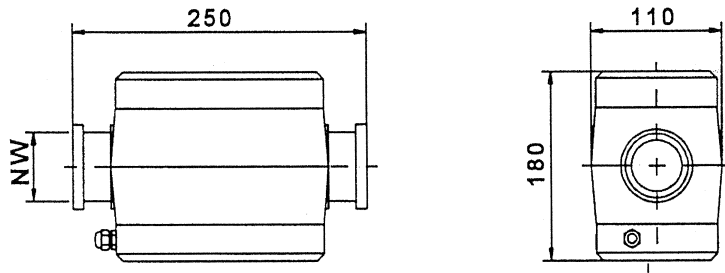
Fitting

The flow level meter can either be laid flat or fitted upright depending on the design of the unit.

The milk pipe must always be horizontal.

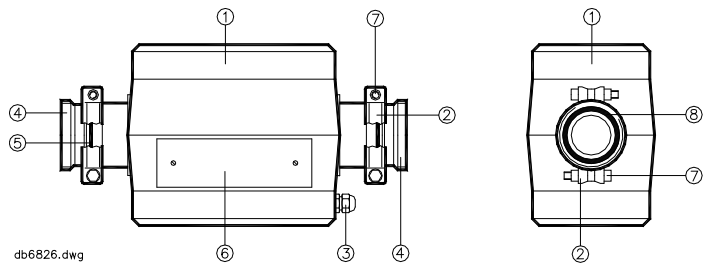Horizontal (flat) installation: order "Horizontal" version
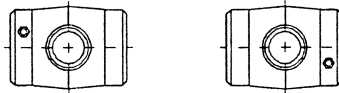
Vertical (upright) installation: order "Vertical" version
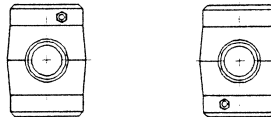
Attention:
Note direction of flow (arrow on type plate)

Build

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1	=	Cover	
2	=	Fastening clamp	
3	=	Cable feed	
4	=	Connection	

5	=	Flat gasket
6	=	Type plate
7	=	Hexagon head screw
8	=	Sealing ring

Instructions for mounting and dismounting:

1. First remove threaded milk pipe adapter, if still attached to FLM. To do this, open the clamp fasteners (2) on both sides and remove the pipe connections from the FLM.

⚠️ **Attention:**
Do not lose the seals and put them back carefully when reassembling.

2. First screw the threaded milk pipe adapters with the union nuts on both sides of the pipe connections.

3. Then fit the FLM (not forgetting the flat gaskets (5)) and secure with the fastening clamps (2). It might be easier if the pipe supports/anchors are slightly loosened first. $\Rightarrow$ Tighten again at the end.

Dismounting:

1. First take out the FLM by removing the fastening clamps (2) on both sides. It might be easier if the pipe supports/anchors are slightly loosened first.

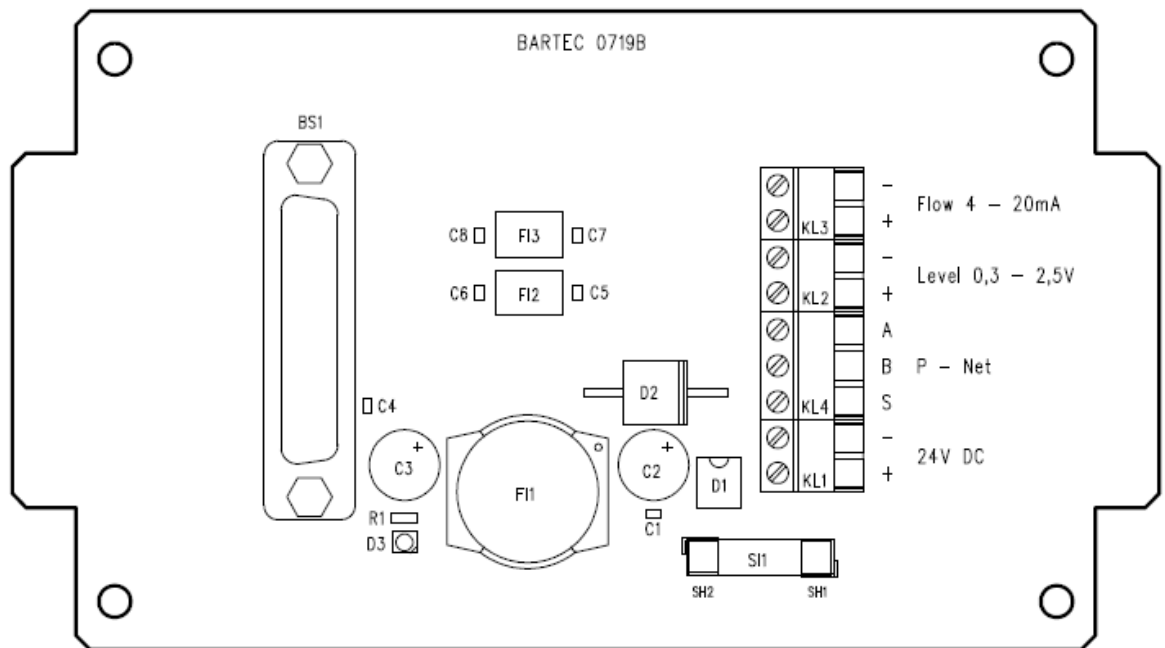2. Then, if necessary, remove the threaded milk pipe adapters from the FLM.

⚠️ **Attention:**
Do not lose the seals and put them back carefully when reassembling.

26.3.3 Wiring

The FLM is supplied as standard with 5 m of cable which is connected as shown on the diagram below. Please follow the directions for use of the fol-low-on device when wiring.

26.3.4 Electrical terminal assignment

Terminal block	Signal	Colour	6771-31
3	- Flow 4 - 20 mA	bk	5
3	+Flow 4 - 20 mA	vt	4
2	- Level 0.3 - 2.5 V	bn	5
2	+ Level 0.3 - 2.5 V	ye	3
4	P-NET A	wh	Insulated
4	P-NET B	bu	Insulated
4	P-NET S	---	---
1	- 24 V DC (GND)	Shield	2
1	+ 24 V DC	pk/gy	1

Please insulate any non-required conductors individually.

26.4 Sampling cabinet monitoring sensor Pt 100 (optional)

Order no.: 216529

26.4.1 Technical Data

Electrical data	
Measuring insert	Pt 100 DIN EN 60 751
Tolerance class	B
Connection	Four-wire connection
Ambient conditions	
Operating temperature	-5 ... +100 °C
Mechanical data	
Housing specification	Stainless steel
Connecting cable	PVC / l = 5 m

26.5 Bottle drive, type 6774-10

Bottle drive with pneumatic lifting gear

Order no.: U9441677410

The bottle drive is a hands-free system for the delivery and positioning of the sample bottles for the ULTRASAMPLER® sample collection process and for the simple insertion and removal of the round magazines of type 6875.

It is located in the refrigerated sample collection box on the collection vehicle and holds the empty and full sample bottles in two round magazines.


26.5.1 Technical data

| Electrical data	
Auxiliary power	DC 24 V
Fuses	No internal fuses, fused via drive system
Electrical connection	Connector plug with inset socket (F), type Han 16 A (16-pin)
Compressed air connection	Plug-in connection for hose with outer diameter of 5.0 mm (see connection diagram!), 10 bar max. pressure, oil-free
Ambient conditions	
Operating temperature	-10 ... +50°C
Storage temperature	-10 ... +70°C
Climatic category / protection class	JWA / IP 51
Mechanical data	
Housing specification	Stainless steel, plastic (POM)
Weight	28 kg (excl. round magazines)
Round magazine	Type 6875 with sample bottles type 6845: max. 72 sample bottles per magazine
code reader	Fitting facility for bar code reader, e.g. type 6834-10 6727-40 (not supplied with the product)

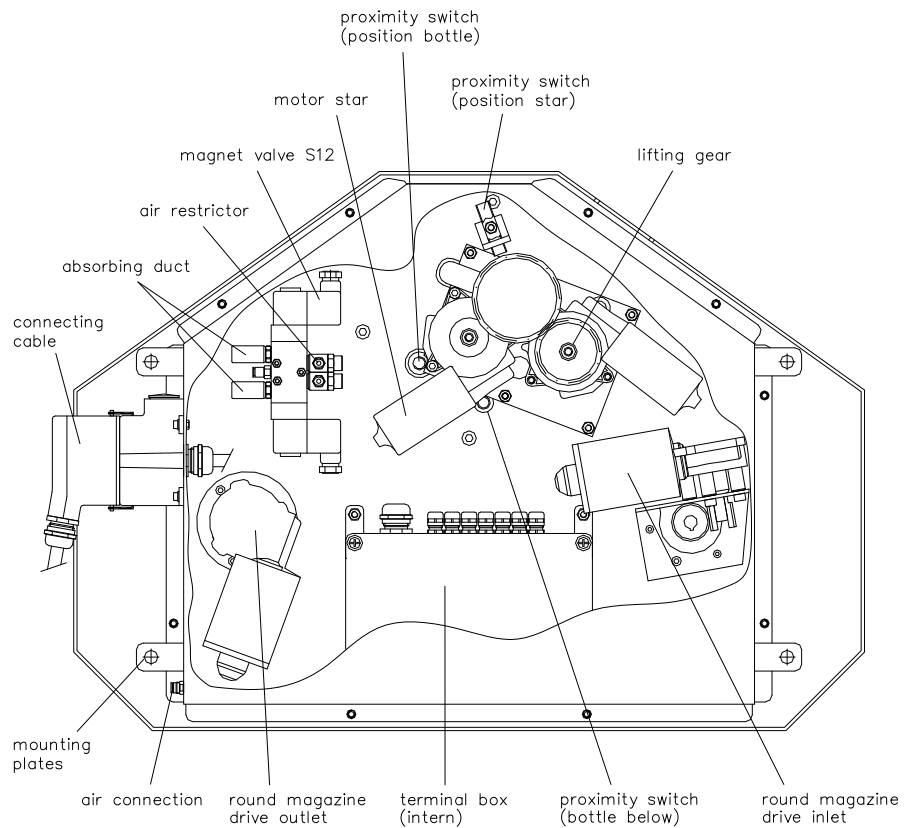# 26.5.2   Dimensions/Mounting

View from above
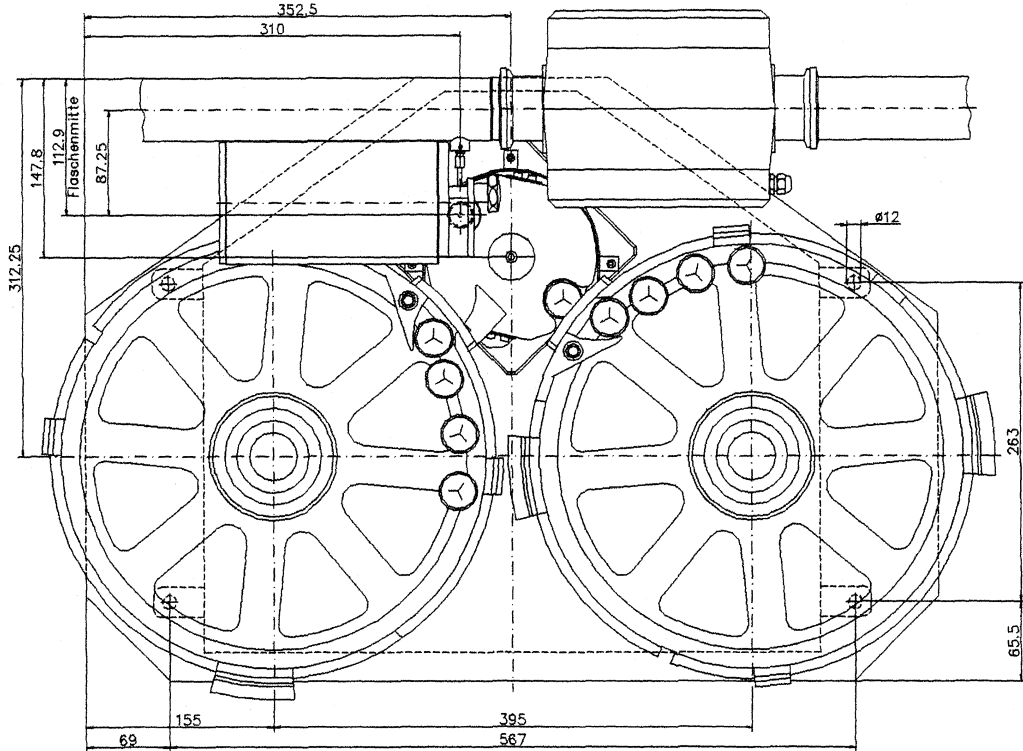
View from the front
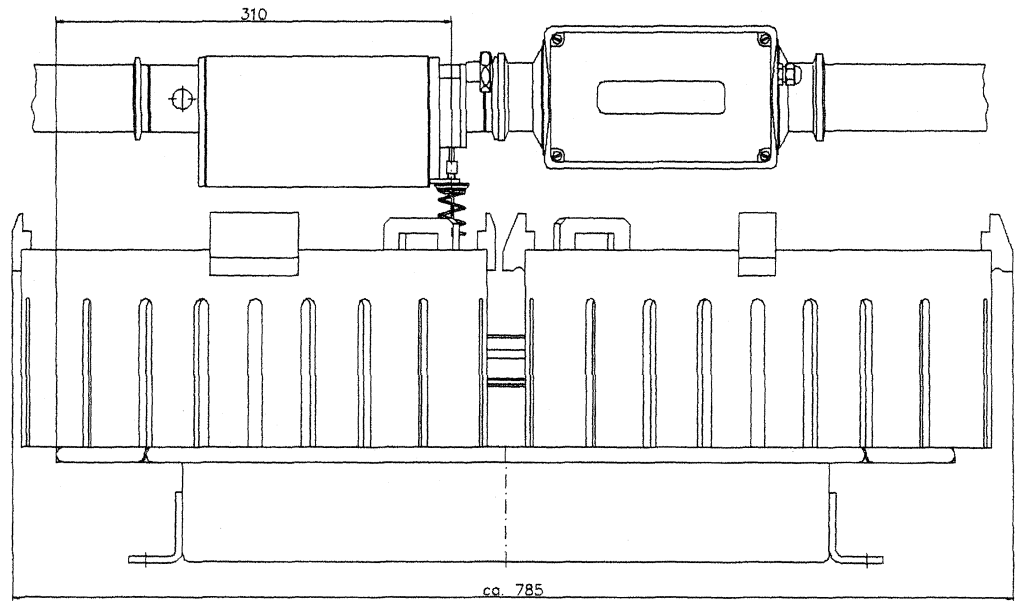
View from the left
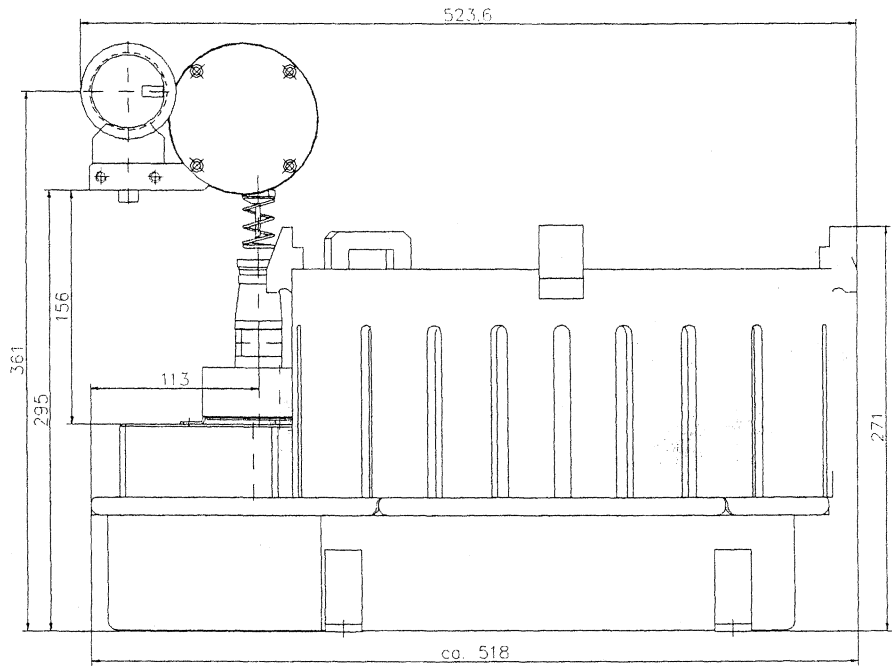
View from below

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26.5.3 Installation

Installation

Installation

Horizontal, with reference to the position of the ULTRASAMPLER®.

It must be possible to change the round magazines easily afterwards (see diagram).
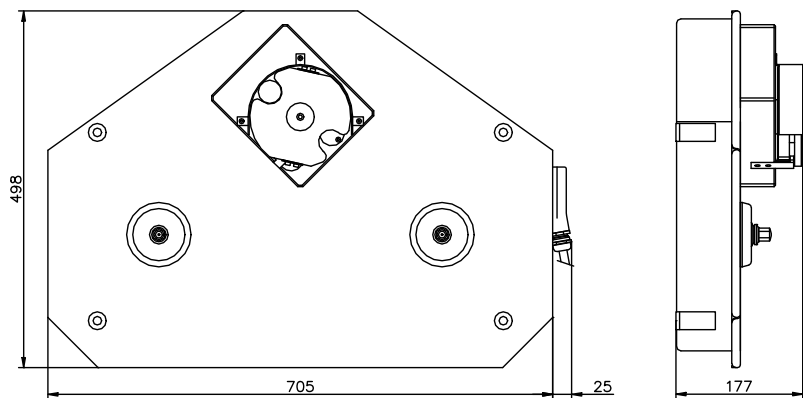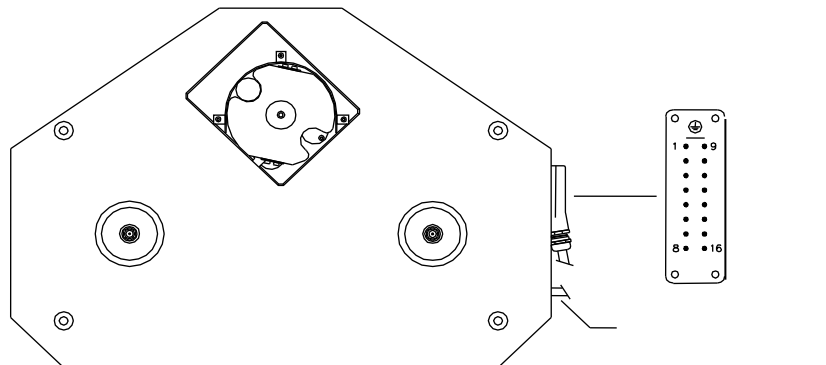
Connection

Establish compressed air connection (see diagram!).

Wiring

Connect cable for bottle drive (type 6774-304, L = 7 m) to the relevant drive system.
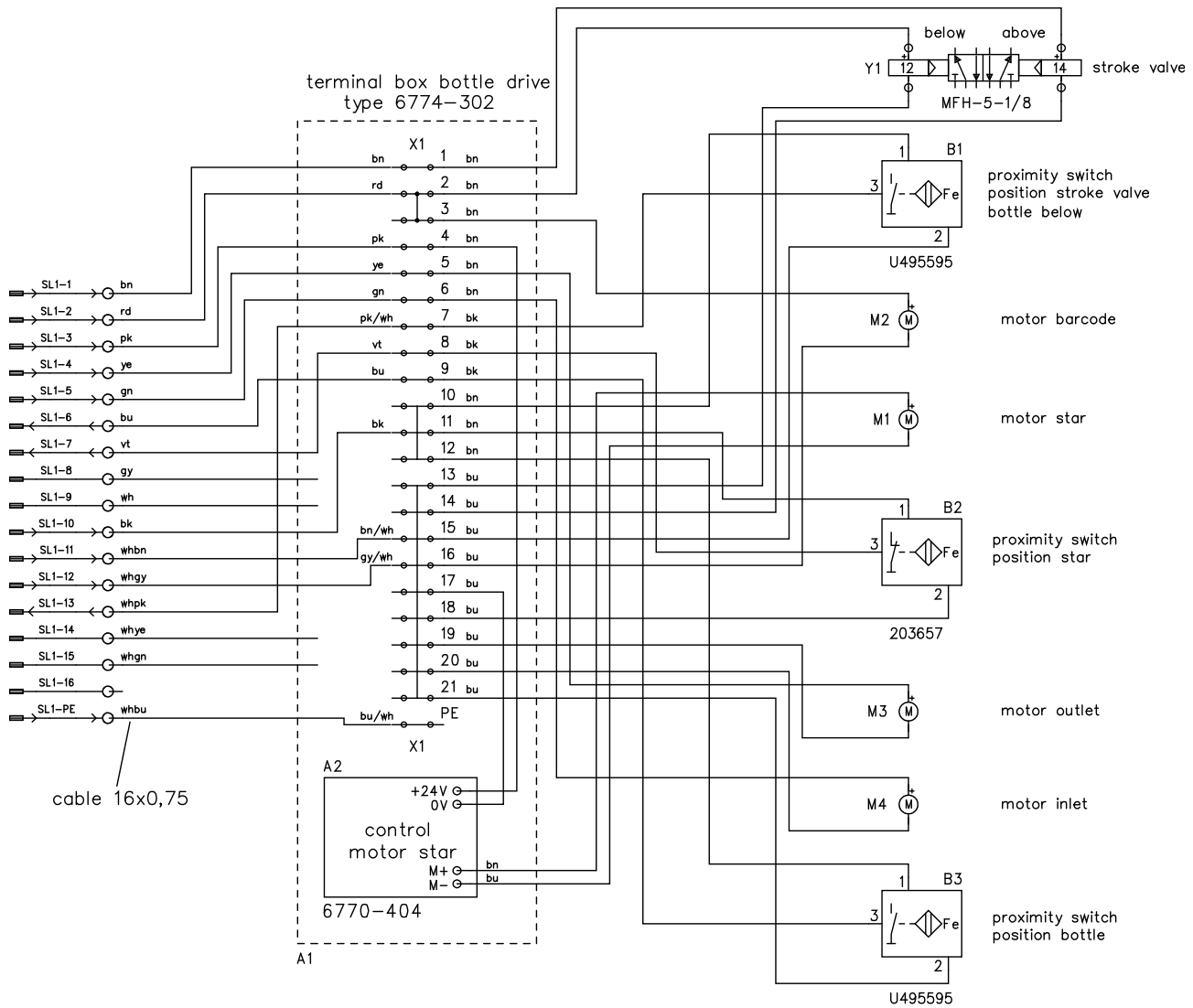
Dimensions and location of connections

db677401.dwg

26.5.4   Wiring/terminal assignment

Wiring internally

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Terminal assignment

Signal	Wire colour	I/O-Box type 6753 Terminal	Ultrasampler Controller type 6771-31 Terminal	PIN
Stroke valve (motor up)	bn		41	BL1-1
Motor barcode (motor down)	rd		42	BL1-2
Motor star	pk		45	BL1-3
Motor outlet	ye	free output	43	BL1-4
Motor inlet	gn		44	BL1-5
Position bottle	bu	free input	26	BL1-6
Position star	vt		46	BL1-7
nc	gy			BL1-8
nc	wh			BL1-9
+24V	bk	+24V *	49	BL1-10
0V	whbn	0V *	50	BL1-11
0V	whgy	0V *	47	BL1-12
Position stroke valve (bottle down)	whpk		33	BL1-13
nc	whye			BL1-14
nc	whgn			BL1-15
				BL1-16
Housing	whbu		⏚	BL1-PE

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nc = not connected
* 24V main power supply
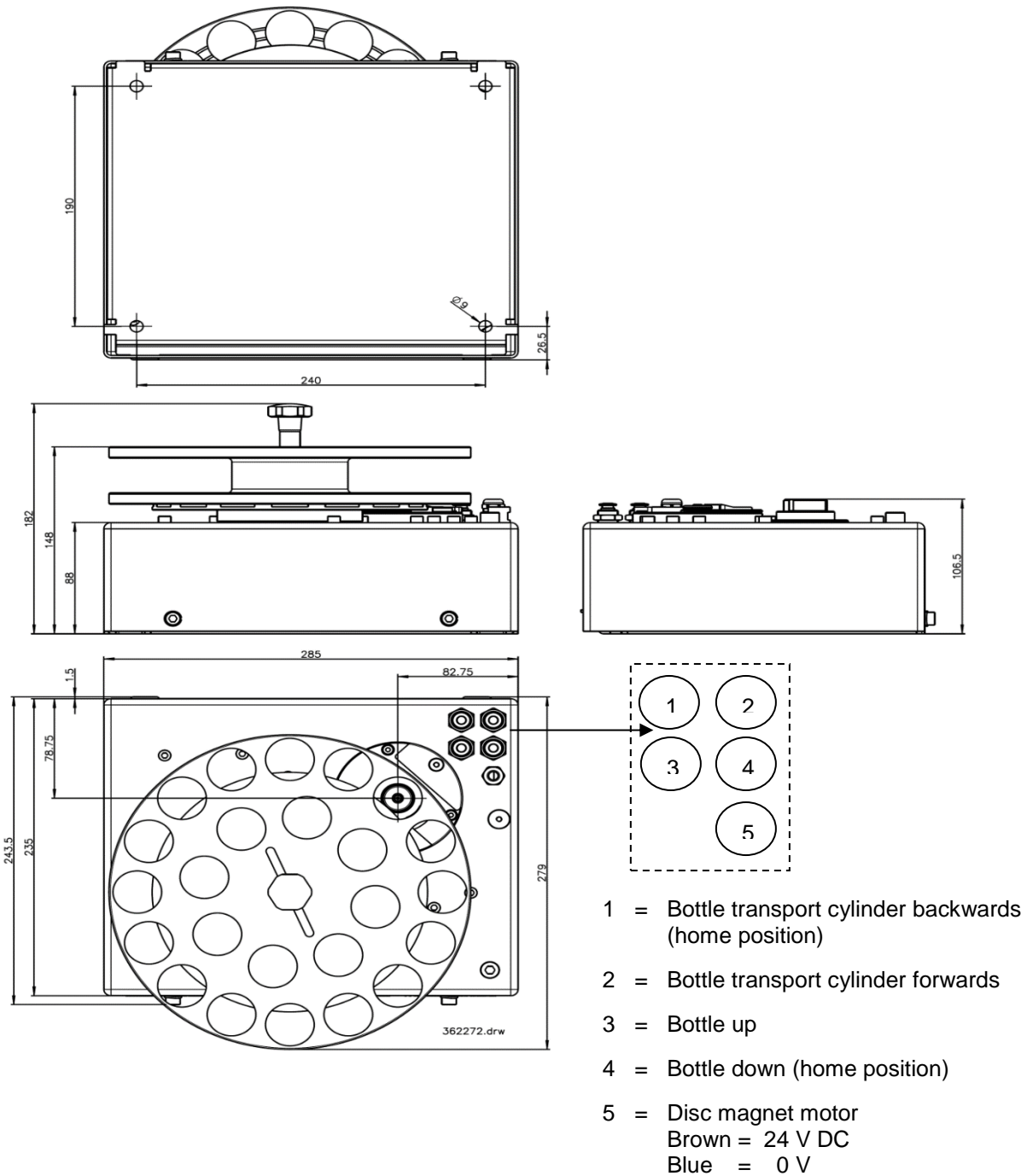
26.6 Bottle Drive Mini (max. 16 bottles) type 6774-12

Order no.: 362272

26.6.1 Technical Data

Device-specific data	
Number of sample bottles	Max. 16 (optional capacity for 8 spare bottles)
Barcode reader	Fitting facility for bar code reader, e.g. type 6727-40 (not supplied with the product)
Connection cable	7 m oil resistant flexible cable, 2 x 0.75 mm²
Input voltage	24 V DC, must be conducted via relay with freewheeling diode
Fuses	No internal fuses, approx. 3 A, must be fused via drive system
Pneumatic supply	Plug-in connections for pneumatic hose with 6 mm outer diameter
Ambient conditions	
Operating temperature	-10 °C …+50 °C
Storage temperature	-10 °C …+70 °C
Protection class	IP 20
Mechanical Data	
Dimensions	285 x 279 x 170 mm (incl. bottle holder) 285 x 243.5 x 106.5 mm (excl. bottle holder)
Mounting holes	4 x diameter 9 mm, 240 x 190 mm
Weight incl. bottle holder	Approx. 6 kg
Weight of bottle holder	Approx. 1,1 kg
Housing specification	Stainless steel, plastic (POM)
Bottle holder	Type 6774-306 for 16 sample bottles (Optional capacity for 8 spare bottles)

Spare parts and accessories	
Designation	**Order number**
Holder for 16 bottles, type 6774-306	362571
Magnetic holder, type 6774-305	362535
Plastic hose PAN 6 x 1,00 mm (silver)	306004

26.6.2   Dimensions and Assembly

362272.drw

1 = Bottle transport cylinder backwards
       (home position)

2 = Bottle transport cylinder forwards

3 = Bottle up

4 = Bottle down (home position)

5 = Disc magnet motor
       Brown = 24 V DC
       Blue   =   0 V

Note:

When de-energized the bottle transport cylinder must be retracted, the star can be turned by hand counter-clockwise! If the cylinder is extended, it clacks loud when turning the star counterclockwise.

26.7 Manual lifting device for sample bottle type 6871-3-30 / type 6871-4-30

Order-No.: **Type 6871-3-30** **U94416871330**
Type 6871-4-30 **U94416871430**

The manual sampler lifting device is used to lift the sample bottle into the filling position and settle the filled sample bottle with the aid of an operating lever. The manual sample bottle lifting device is screwed onto the sampler and is mounted under the peristaltic pump. In the filling position, the injection needle of the sampler pierces the sealing plug of the sample bottle. The proximity switch, integrated in the lifting device, detects the filling position and allows control of the milk intake process.

Types

The lifting device is for right-side mounting on the sampler (milk flow from right to left) suitable.

26.7.1   Technical Data

Electrical data	
Operating voltage	24 V DC
Ambient conditions	
Operating temperature	-10 … +50 °C
Store temperature	- 10 … + 70 °C
Protective system	IP 68
Mechanical data	
Construction	Fixed and mobile parts made of stainless steel, sliding disks made of Teflon; inductive proximity switch is screwed in and tightened
Weight	ca. 7 N ≅ 0,7 kg
Usable sample bottles	50 ml Sample bottles with triple slotted sealing plug

26.7.2   Wiring

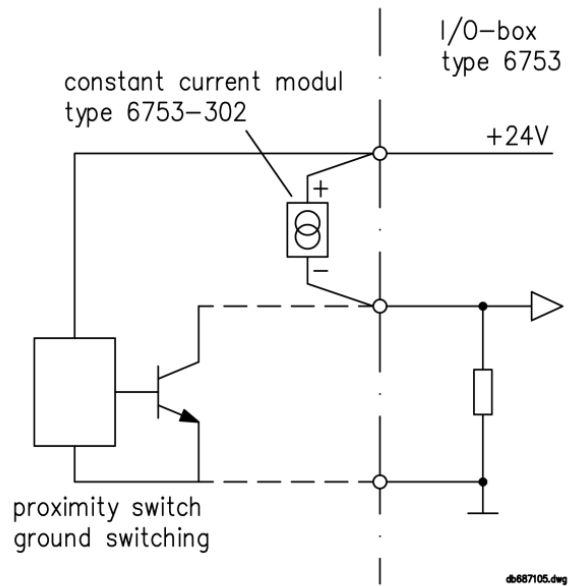| Proximity switch NPN Order.No. U495593 Ground switching	Controller 1) MAK compact-Controller 6942-10	US-Controller 6771-31		
brown (bn) + 24V_S	IN 1 – 8	+ 24 V clamp 25		
blue (bu) AGND	IN 1 - 8	GND clamp 34		
black (bk)	Free inputs IN 1 - 8	Free inputs IN 1 – 8 clamp 26 ... 33		
Proximity switch PNP Order.No. U496004 Positiv switching	**Controller 1) MAK Compact-Controller 6942-10**		**I/O-Box 6753, Inputs**	
brown (bn)	IN 1 – 8		+ 24 V	
blue (bu)	IN 1 - 8		GND	
black (bk)	Free inputs IN 1 - 8		Free inputs IN 1-8	

Note:

If a ground-switching proximity switch is to be connected to a device (eg I / O box 6753) with posi-tive-switching inputs, this can be done by interposing the constant current module Type 6753-302 as a "pull up" between + 24 V and the corresponding input (see Fig. 1)

The digital inputs of the compact controller 6942-10 are configured as "positive switching" by de-fault.
By changing the configuration (see Type 6744-10) each input can be customized also be switched to "mass switching".
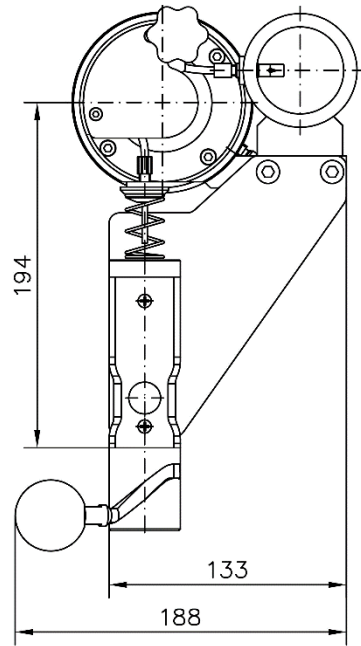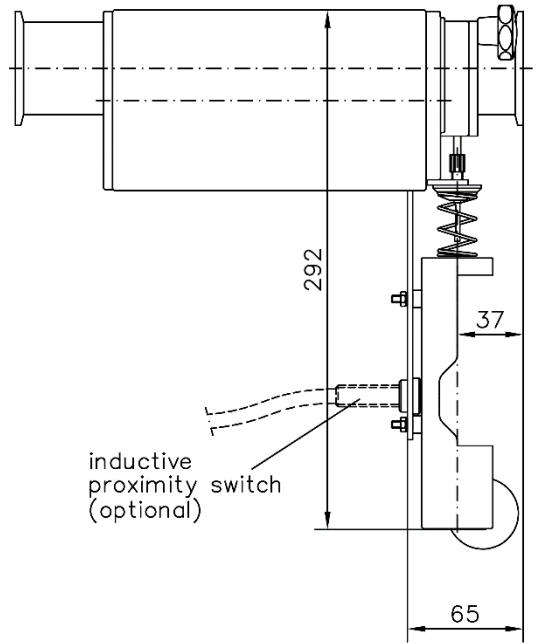
Picture 1

Controller-Settings

In the controller (periphery), the physical input used must be assigned the logical input "56".

Dimensions

194

133

188

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292

37

inductive
proximity switch
(optional)

65

26.8 Semi automatic lifting device for sample bottle type 6871-3-50

Order-No.: U94416871350

The semi-automatic sampler lifting device is used for bottle identification and positioning in milk sample filling.

Lifting the sample bottle to the filling position and depositing the filled sample bottle is done by means of an operating lever.

The semi automatic sample bottle lifting device is screwed onto the sampler and is mounted under the peristaltic pump. In the filling position, the injection needle of the sampler pierces the sealing plug of the sample bottle. Two proximity switches, integrated in the lifting device, detect the bottle and the filling position and allows control of the milk intake process

26.8.1 Technical data

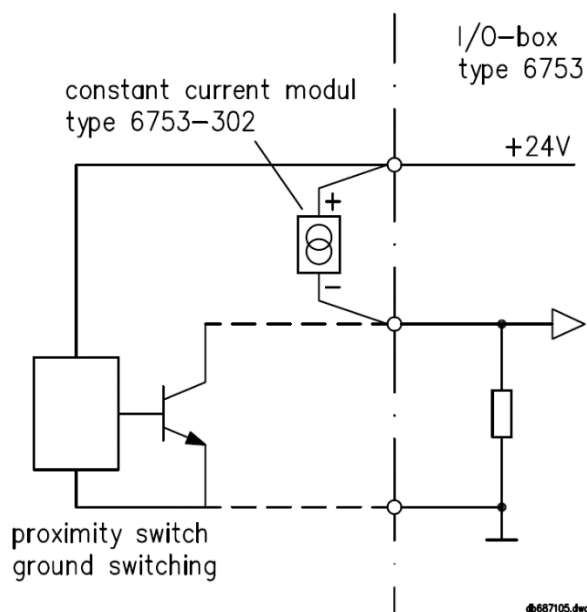| Electrical data	
Operating voltage	24 V DC
Connection turning device	3m Ölflex 3 x 0,5mm²
Ambient conditions	
Operating temperature	-10 … +50 °C
Store temperature	-10 … + 70 °C
Protective system	IP 68
Mechanical data	
Construction	Fixed and mobile parts made of stainless steel, sliding disks made of Teflon; inductive proximity switch is screwed in and tightened
Weight	ca. 2,3kg
Usable sample bottles	50 ml Sample bottles with triple slotted sealing plug

26.8.2   Wiring

Proximity switch NPN Order.No. U495593 Ground switching	Controller 1) MAK compact-Controller 6942-10	US-Controller 6771-31		
brown (bn) + 24V_S	IN 1 – 8	+ 24 V clamp 25		
blue (bu) AGND	IN 1 - 8	GND clamp 34		
black (bk)	Free inputs IN 1 - 8	Free inputs IN 1 – 8 clamp 26 ... 33		
Proximity switch PNP Order.No. U496004 Positiv switching	**Controller 1) MAK Compact-Controller 6942-10**		**I/O-Box 6753, Inputs**	
brown (bn)	IN 1 – 8		+ 24 V	
blue (bu)	IN 1 - 8		GND	
black (bk)	Free inputs IN 1 - 8		Free inputs IN 1-8	

Note:

If a ground-switching proximity switch is to be connected to a device (eg 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 corresponding input (see Fig. 1)

The digital inputs of the compact controller 6942-10 are configured as "positive switching" by default.
By changing the configuration (see Type 6744-10) each input can be customized
also be switched to "mass switching".

Picture 1

Wiring magnet disk motor

Motor	US-Controller Type 6870-2	US-Controller 6771-30	Bottledrive-Insert Type 6757-112
Ader 1 (+ 24 V)	Clamp 24	Clamp 42	Clamp 402
Ader 2 (0 V)	Clamp 34 Bridge from clamp 22 to clamp 18 (GND)	Clamp 47 (GND) Bridge from clamp 33 (IN 8) to clamp 34 (GND)	Clamp 407 (GND) Bridge from clamp 411 to clamp 407 (GND)

Stabilization 12 V/24 V for magnetic disc motor, type 6870-400
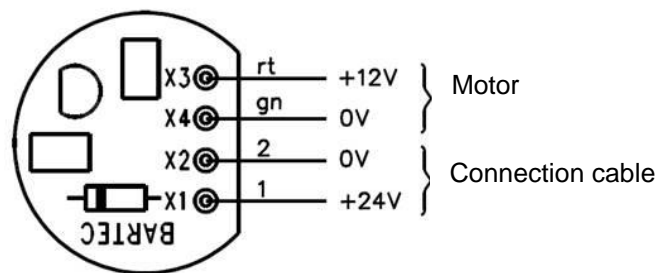
u94416871350.drw

Barcode reader type 6727-40

The barcode reader is connected to the reading station Type 6723-10.

The wiring and settings can be found in the corresponding chapters of this manual!

Spare parts

Proximity switch: Order-No..: U496004, plus switching
Proximity switch: Order-No.: U495593, ground switching
Motor 12 V: Order-No.: U371061
Stabilization 12 V/24 V: Order-No.: U06001398

Controller Settings

In the controller (periphery), the logical inputs "55, 56" must be assigned to the physical input used.

26.9   Installation

26.9.1   Fitting the refrigerated sample collection box

Standards required of the refrigerated sample collection box

All the Ultrasampler units, except for the Controller, are located in a special refrigerated sample collection box.

This sample collection box has to be made to fit the Ultrasampler assembly and installed in the intake cable of the collection vehicle or another suitable location.

The following points need to be factored into the design and positioning:

- There must be space for the sampler and bottle drive in the sample collection box (Fig. 2, Fig. 3).

- The bottle drive is seated horizontally in the sample collection box and also needs to be kept horizontal during its insertion and removal.

- It must be possible to insert and remove the round magazines of the bottle drive easily.

- The milk pipeline on the collection vehicle should be routed through the refrigerated sample collection box at an incline of $1 \pm 0.5\ \%$ (towards the intake socket). There must be not be any mechanical forces on the connecting flanges either during assembly or during operation.

- It must be possible to fix the branch pipe with two holders on the cover of the sample collection box. The holders should sit on the branch pipe ends.

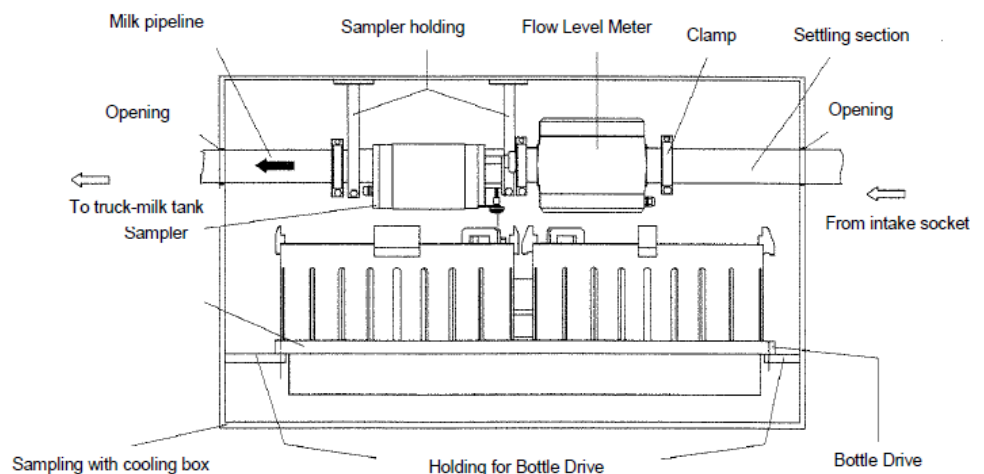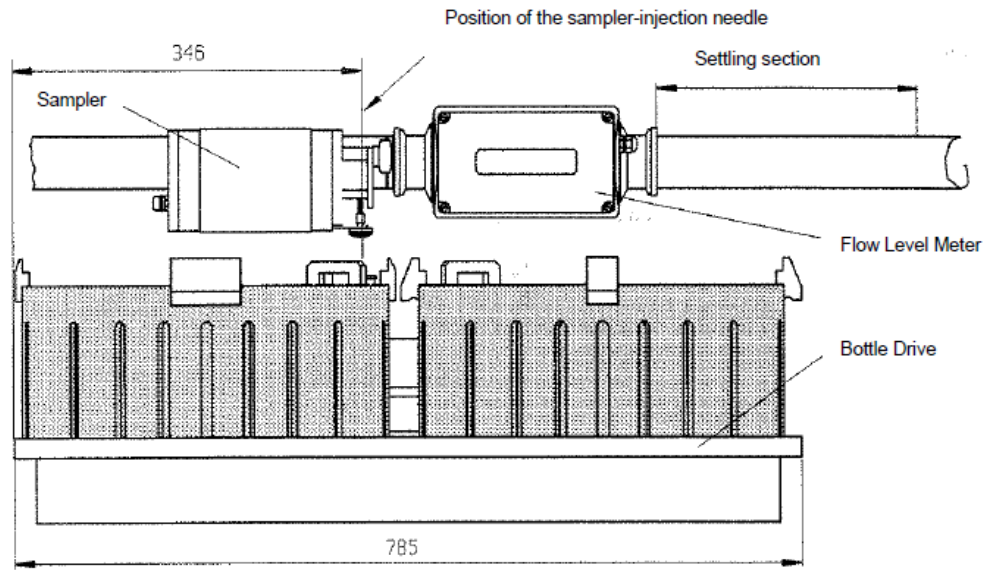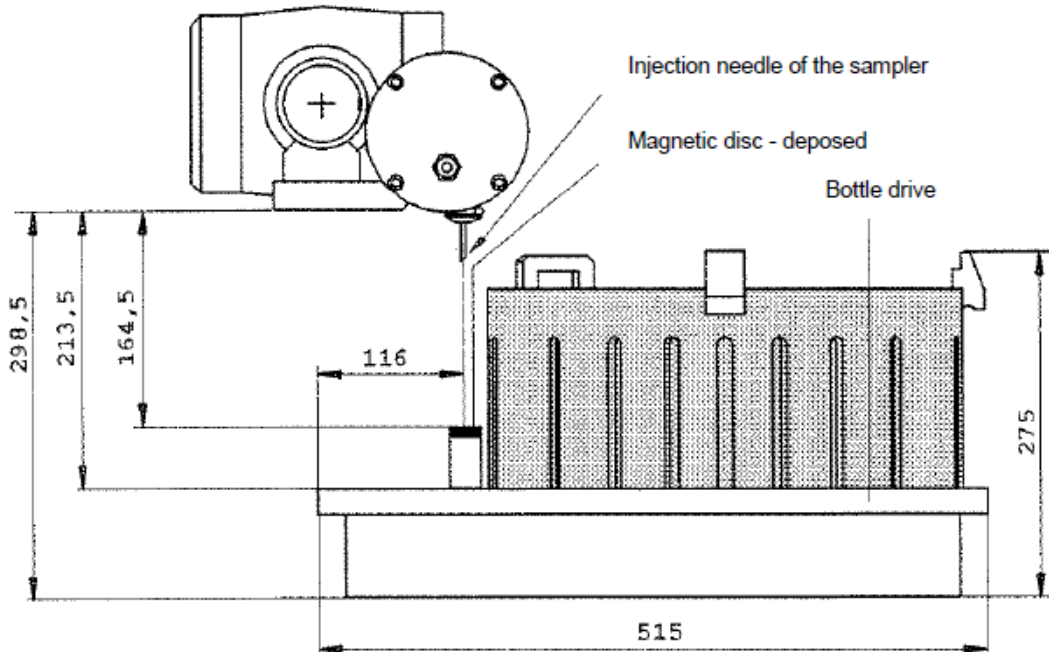**Fig. 1 - ULTRASAMPLER in refrigerated sample collection box**

Fig. 2

Fig. 3

Fig. 2 and Fig. 3 show the dimensions for the sampler and bottle drive layout.

- A straight piece of milk pipe (length ≥ 3 x NW) serves as a flow-calming section upstream of the flow level meter.

- The flow-calming section can extend out of the refrigerated sample collection box.

- There are four holes in the base plate of the bottle drive for connection with the sample collection box.

Note:

• When calculating the dimensions of the refrigerated sample collection box, take due account of the choice of sampler and the installation options.
• Allow for the possible use of a flow level meter with "vertical" installation position (installed horizontally in Fig. 2 and Fig. 3).

Fitting the milk pipeline

The branch pipe of the sampler and the flow level meter are integrated in the milk pipeline in the sample collection box.

Duly allowing for the space required by the sampler and bottle drive, the milk pipeline must be disconnected at the place designated for the branch pipe and flow level meter (or must be assembled from individual pipe sections).

The exact position and length of the disconnection must be decided when the sample collection box is being designed.

A connecting flange (standard part) of the corresponding width must be welded onto both ends of the milk pipe at the disconnection point.

If the milk pipeline is fitted outside the sample collection box, there must be axial clearance for the installation and removal of the sampler and flow level meter when it has been released. The aim is to install the sampler firmly in the sample collection box in a vibration-free location.

26.9.2   Installation of the ULTRASAMPLER units

Installation of sampler type 6871-3/4/5

The sampler and branch pipe can be installed and removed either as two separate units or as one unit screwed together.

### Installation of branch pipe:

- Fit sealing rings on the flanges of the branch pipe.

- Mount the branch pipe on the milk pipeline by the flanges on both sides (if using the flow level meter mount this on the flange on the corresponding side). Tighten fasteners slightly.

- Turn branch pipe until welded socket is horizontal. Tighten fasteners.

> **Note:**
> Do not turn the branch pipe until the sampler and bottle drive have been fitted in the exact position.

Sampler and branch pipe

Clamp   Sealing ring   Offset tube   Steel section   Weldable socket
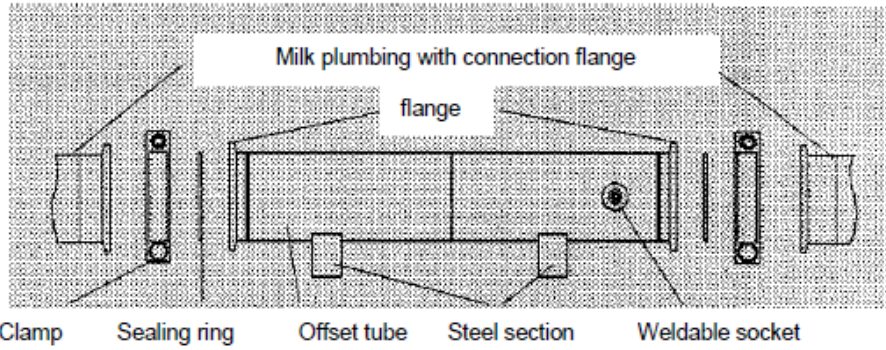
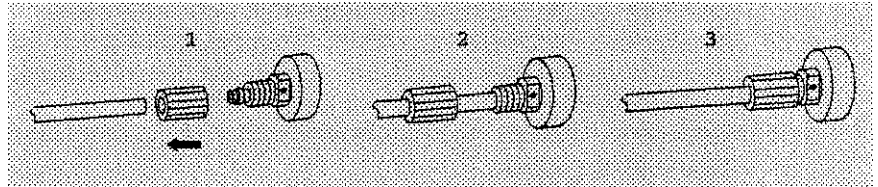### Fitting the sampler on the branch pipe

- Attach the two sampler holders to the steel sections of the branch pipe from below. Screw each of the holders onto the steel sections with an M8 x 20 hexagon socket screw.

Connecting the sampler and branch pipe
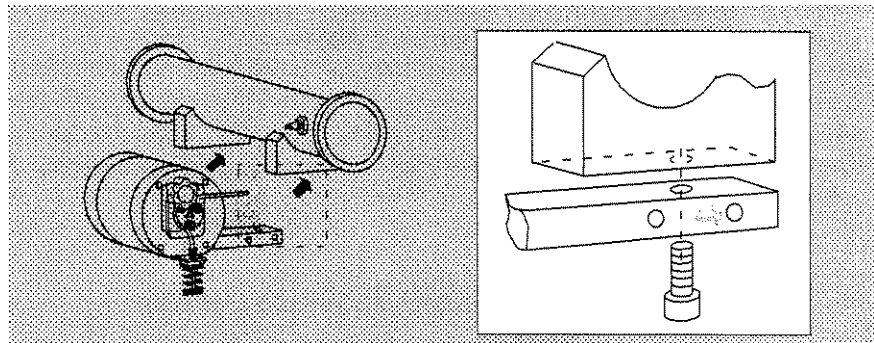
- Fit M6 x 0.75 union nut on the free end of the pump hose (1). Fit pump hose on intake cannula in welded socket (2) and tighten union nut (3).

Connecting pump hose to intake cannula

**Additional fixation of branch pipe**

Additional holders need to be fitted on the ends of the branch pipe and connected to the cover of the sample collection box.

These holders should be easy to take off again when the branch pipe is removed.

Check the fitting of the intake cannula in the welded socket with reference to the following points:

- Rough area pointing against the direction of milk flow (rough area and opening of intake cannula pointing in the same direction).

- The roughened surface is upright.

- The roughened surface is flush with the end face of the welded socket.

Intake cannula in welded socket
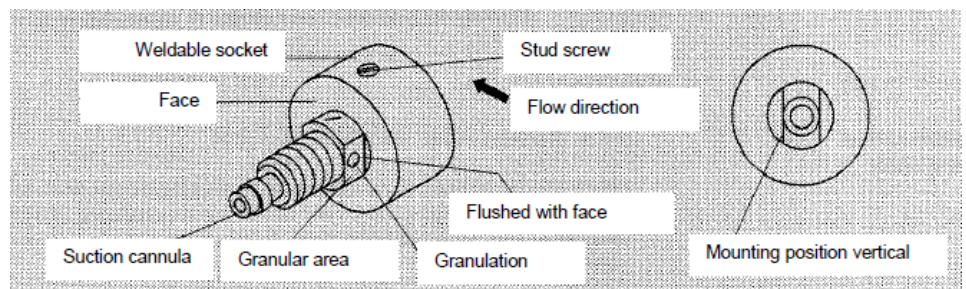
Deinstallation of sampler type 6871-3/4/5

As with their installation, the sampler and branch pipe can be removed together as one unit or one after the other.

It is possible and quite straightforward to replace the sampler without removing the branch pipe from the milk pipeline.

Caution:
Never remove the sampler or branch pipe while the collection vehicle is running and the MAK 3003 Tiger system is switched on!

Removing the sampler

- Undo union nut on intake cannula and detach pump hose.

- Unplug sampler connection cable.

- Unscrew and remove the two M8 x 20 pan head screws on the underside of each sampler holder and remove sampler.

Removing the branch pipe (with or without sampler)

- Undo the fittings holding the branch pipe on the cover of the sample collection box.

- If the sampler is also being removed, unplug the sampler connection cable.

- Loosen additional milk pipe restraint outside the sample collection box (where fitted) until the milk pipeline has some side clearance.

- Remove fasteners from the branch pipe flanges and remove branch pipe (with or without sampler).

Installation of flow level meter, type 6826

The flow level meter sits between the branch pipe of the sampler and the flow-calming section and is mounted on both sides.
The milk taken into the collection vehicle flows through the flow level meter first and then through the sampler. See section 26.3.2. for installation instructions.

Note:
Mount the flow level meter in such a way that the terminal box remains ac-cessible.
If space is limited, fit the connection cable before installing the meter.

Demontage Flow Level Meter Typ 6826

Caution:
Never remove the flow level meter while the collection vehicle is running and the MAK 3003 LYNX system is switched on!

Removing the flow level meter

- Undo any locks on the milk pipeline outside the sample collection box (to generate axial play).

- Disconnect the connection cable.

- Resolve clamps on the flanges and take out flow level meter.

Installing the bottle drive

- Fit bottle drive in refrigerated sample collection box.

- Plug connection cable in first if necessary because of space constraints.

- Screw down bottle drive with four M6 screws and protect screw fittings.

- Loosen branch pipe fasteners. Turn branch pipe with sampler until the tip of the injection needle is pointing to the centre of the magnetic disc. Tighten fasteners again.

Removing the bottle drive

- Undo the four M6 screws. Remove the bottle drive.

- Unplug the connection cable before or after the removal process depending on space constraints.

**Fitting the manual sample bottle lifter
Type 6871-3-30**

The manual sample bottle lifter, type 6871-3-30, is screwed onto the holder of the sampler, type 6871-3/4/5, which is on the pump side.

The connection is made with two M8 x 15 pan head screws and lock washers.

The sampler can be fitted alone or connected to the branch pipe.

The sampler and branch pipe can be fitted in the sample collection box or left unfitted.

Assembly with proximity switch:
Screw proximity switch into manual sample bottle lifter as far as it will go and fit locknut.

Dimensions of manual sample bottle lifter

db687106.dwg
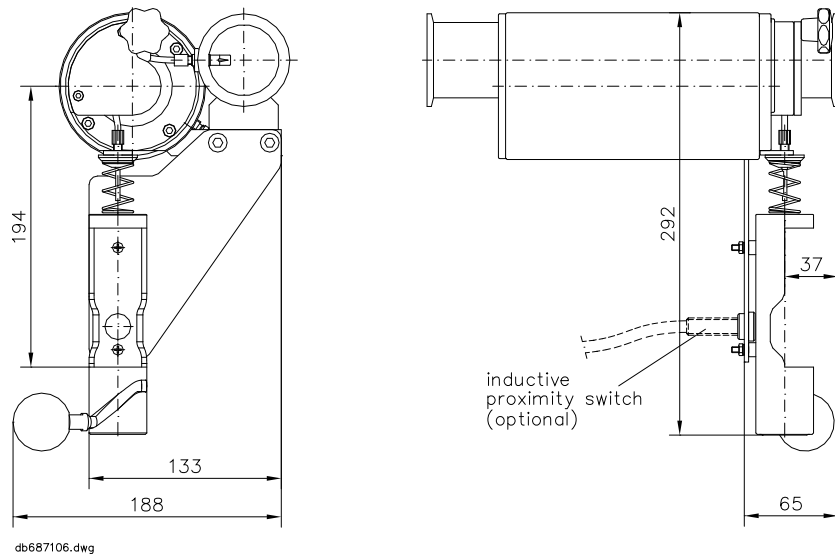
26.10 Maintenance

The pump hose on the sampler needs to be changed periodically otherwise the only maintenance required on the ULTRASAMPLER is to clean the inside and outside.

The intake cannula or injection needle may need to be replaced if damaged.

26.10.1 Cleaning the inside and outside of the ULTRASAMPLER

Cleaning the outside of the ULTRASAMPLER

- Wipe down the outside of the functional units of the ULTRASAMPLER with a damp sponge without any added detergents.

- The round magazines of the bottle drive can be cleaned in a water bath under the following conditions:

    Max. cleaning time: 5 minutes once a week

    Max. cleaning temperature: 50 °C

    Cleaning method: Water bath (circulated)

Cleaning the inside of the ULTRASAMPLER

The parts requiring cleaning in this case are the surfaces in the branch pipe and in the flow level meter contacted by the milk, and this internal cleaning routine is included in the collection vehicle cleaning process.

Parallel to this, the sampling line of the sampler is rinsed down in a special ULTRASAMPLER cleaning cycle.

During this cycle, the sampler pumps an alkaline cleaning solution out of the branch pipe into the sample bottle.

How to start the cleaning cycle (subject to installation):

1. Select menu item CIP in the MAK 3003 Tiger software

2. Activate special switch for collection vehicle cleaning

Attention:
The quality and width of the pump hose are affected by the sampler cleaning process.
This gradually lowers the amount put into the sample bottles.
Ideally the pump hose should therefore be changed after each cleaning cycle but, failing that, after no more than 10 days.

26.10.2   Changing the pump hose

The pump hose can be changed at any time but not while the sampler is in operation.

Removing the old pump hose

- Undo star handle and remove rotor protection (Plexiglas).

- Unscrew union nut on injection needle and intake cannula.

- Take out old pump hose, remove union nut.
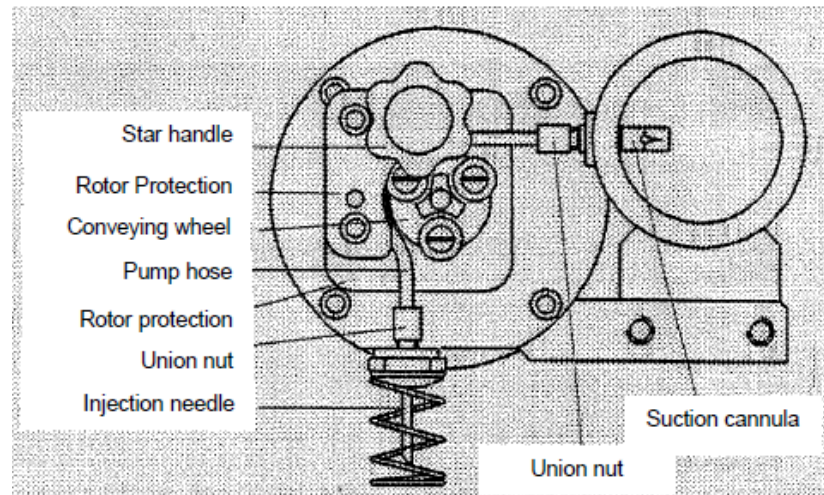

Fitting the new pump hose

NOTE:

Make sure that the new pump hose is not twisted when it is fitted.

Check that the sample bottles are being filled properly after changing the hose.

- Fit new pump hose on injection needle and tighten union nut.

- Put the conveying wheel in the position shown in the diagram and fit pump hose in the groove opposite.
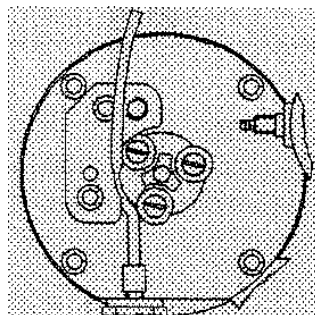
- Continue turning the conveying wheel clockwise and fitting the pump hose until the pump hose is fully fitted in the groove.
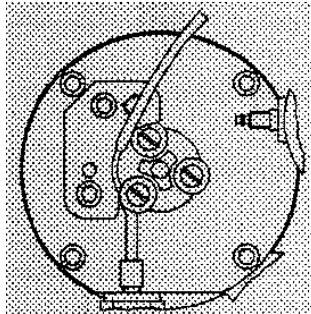
- Place union nut on pump hose.

- Fit pump hose on intake cannula and tighten union nut.

- Fit rotor protection and screw down star handle.
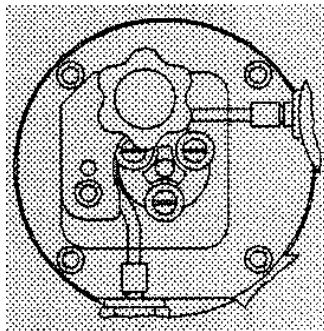
26.10.3   Injektionsnadel montieren
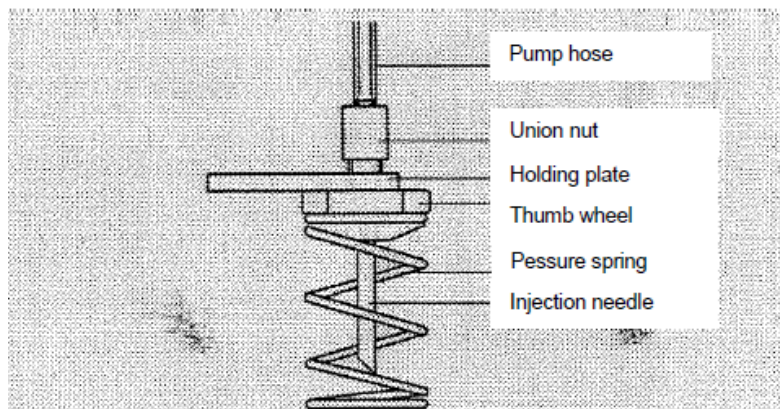
Disassembling the injection needle

The injection needle and thumb wheel (with thread for union nut) form one unit.

- Unscrew union nut and remove pump hose

- Remove pressure spring

- Unscrew injection needle from holding plate (turn thumb wheel)

To assemble, follow the steps in reverse order.

27 Start of operation

27.1 Process and instructions

The MAK Tiger 3003 operating instructions and the configuration instructions are constituent parts of this manual. Strict adherence to all these instructions is required.

The basic procedure for starting up the system is as follows:

1. Check that the entire system is wired correctly before switching on the wiring system voltage.

2. Set all the parameters on the Controller. The menu structure of the configuration instructions can be followed. It is not absolutely necessary to follow the order but all the menu items should be completed. The configuration instructions cover the individual menus, including their meaning and possible settings, and they also cover the assignment and meaning of the inputs, outputs and vehicle-specific settings.

Note:
After start of operation, it is advisable to print out the parameter settings (to file with your vehicle documents).

27.2   Attribution of PNET address system 3003 and 3002

> **Attention:**
> Machines which have been operated in the 3003 system (e.g. printers) cannot be used in the 3002 system until the address has been reprogrammed. This can currently only be done at BARTEC BENKE.

MID 6823-X
System 3002: PNET address 22 H
System 3003: PNET address 22 H
Register E8 = 342022

I/O box 6753-110
Supplier sampler 3002: PNET address 35 H
Supplier sampler 3003: PNET address 35 H

Bar code reading station 6723-10
System 3002: PNET address 46 H
System 3003: PNET address 46 H

V2000 Modul 6757-14
System 3002: PNET-Adresse 4A H,
System 3003: PNET-Adresse 4A H

ULTRASAMPLER controller 6771-31
System 3002: PNET address 4B H
System 3003: PNET address 4B H

Dual sampler controller 6970-30
Unit 1 system 3003: PNET address 4C H

Unit 2 system 3003: PNET address 4D H

Flow level meter 6826-X (connect to PNET for configuration only)
System 3003: PNET address 60 H

PNET addresses are written in HEX format ($).

27.3 Setting/adjustment instructions

For ULTRASAMPLER system with flow level meter

27.3.1 Correct installation

In order to guarantee that the Ultrasampler will work properly, all the components must be correctly installed and connected.

The following points are of particular importance:

- The intake hose should not be longer than 6 m.

- At the Screw fitting of the suction hose or at the front of the suction hose a strainer should be mounted.

- No air must be allowed to enter through unsealed points (valves, screw fittings, etc.).

- In front of the Flow Level Meter there must be the longest possible straight line (no bends). This flow-calming section must be at least three times as long as the nominal pipe width.

- The intake cannula must be correctly fitted.

- Only BARTEC pump hoses may be used.

- The sampler must be fitted at the highest point of the piping system to prevent milk residues from remaining in the system and affecting subsequent samples.

- The injection needle must be positioned vertically over the middle of the bottle (stopper).

27.3.2 Initial operation

The following instructions and conditions must be heeded when putting the system into operation for the first time.

Maximum throughput is subject to intake quantity

The ULTRASAMPLER specifications and technical data stipulate the maximum throughput subject to the intake quantity.

The ULTRASAMPLER has a peristaltic pump therefore its maximum delivery volume is limited by physical and mechanical variables (e.g. the viscosity of the hose or the maximum acceleration of the stepper motor). The stepper motor needs 400 steps for one revolution where the maximum frequency is 10 kHz.

The maximum rotational speed is therefore as follows:
$$\frac{10 \text{ kHz}}{400 \text{ Hz}} = \frac{25 \text{ revolutions}}{s}$$

At normal pressure (approx. 0.3 bar), the pump delivers about 0.27 ml per revolution (which corresponds to the hose calibration factor = 270).

The pump delivery at the maximum frequency of 10 kHz is as follows:
25*0.27 ml = 6.75 ml per second.

The starting and braking time of the stepper motor is approx. 0.5 seconds.

Time required (pump threshold limit) to fill one sample bottle with 35 ml to 100 %:

35 / 6.75 + 0.5 sec = 5.7 sec.

In order to obtain a representative sample, therefore, the intake process must not be shorter than 5.7 seconds.

If the pre-rinse function is activated, the pre-rinse time of approx. 0.5 seconds must be added to this time.

Basis for calculation:
Pressure: Approx. 0.3 bar
Calibration factor (hose):   Approx. 270
Sample bottle volume: 35 ml
Flow-calming section: ≥ 3 x NW (NW50 = 150 mm, NW76 = 228 mm)

Taking these figures as a reference, the following table can be used as an approximate guide at minimum intake quantity:

Intake quantity	Max. throughput Without pre-rinse	Max. throughput With pre-rinse
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

Note:
It is relatively difficult to operate the intake pump at different levels therefore it is possible to use the low output for 20 l and 40 l, for example, and the high output for the other quantities.

In any case there must be provision for at least a single-stage reduction of throughput.

If the restrictor is activated for a certain time, this time must be selected so that the entire intake process is completed with this restricted output, i.e. a time setting of at least 6 seconds is required at a throughput of 200 l/min. The system is actuated automatically via an output on the MAK 3003 data logging system at pre-sample setting and intake quantity < 80 l.

The suction capacity with small intake quantities is continually increased and is greatest at the end therefore the throughput of the system should not be taken to the performance limit of the sampler as it is then no longer possible to adjust power peaks and therefore the required representativeness cannot be achieved.

Preparations for the operational check

Prepare 500 l of saltwater for intake.

Concentration: approx. 500 g of salt (1 pack) to 200 l of water.

The saline solution should generate an output voltage of 0.3 ... 0.4 V on the fill level sensor output when the pipe is full.

It is advisable to put this amount of saltwater through the collection vehicle twice.

Prepare the collection vehicle for the intake, immersing the intake socket in the saltwater.

Adjustment and settings on the ULTRASAMPLER system

Once the installation process has been duly completed and all the checks have been made to ascertain that the maximum ratings of the sampler are not being exceeded, the electrical settings can be configured.
See configuration instructions 3003_TIGER_MAK_SAK_110625.pdf

Standard settings on the MAK 3003 controller in conjunction with ULTRASAMPLER controller type 6771-31:

Basic settings

Control mode	Current loop
Flow rate at 20 mA:	1400 l/min
Set pre-sample quantity:	80 l
Pump stop:	85 %
Correction factors:	
Low volume range:	0 % (1/X)
.. operative up to:	150 l
Mid volume range:	0 % (1/X)
.. operative up to:	250 l
High volume range:	0 % (1/X)
Start delay with high volume:	2.0 s
Standard rinse:	Yes
Firmware version:	2.34

Sampler 1

Sample mode:	Single sample
Sample bottle volume:	35 ml
Overflow tolerance:	120 %
Start delay:	0.0 s
Calibration factor:	270 µL
Pre-rinse from set point:	19 l
Rinse steps:	650
Minimum number of steps:	10
Minimum stepping frequency:	50

Sampler pre-rinse check

Lift the sample bottle lifting gear to filling position.

At 160 l, for example, the intake quantity is above the quantity of 19 l specified in the parameters from which a sampler pre-rinse is required.

The sampler begins the pre-rinse on the ULTRASAMPLER <u>without</u> flow level meter after return signal from the MAK 3003. A milk sensor operated by the MAK 3003 signals the start of the saltwater flow.

On the ULTRASAMPLER <u>with</u> flow level meter, the flow level meter signals the start of the saltwater flow.

The sampler rinse cycle is apparent from a few revolutions of the peristaltic pump, first in sampling direction then in the other direction, shortly after start of intake.

Adjusting the sample bottle fill volume

<u>Step 1:</u>

Take in a relatively large quantity ($\geq$ 400 l) without restricting the pump intake. This quantity must accord with the default setting.

<u>Step 2:</u>

Check whether the pumped sample bottle volume on the display (MAK 3003 Controller) concurs exactly with the setting to within 2 - 3 ml (this has nothing to do with the hose calibration factor at this stage!).

Adjusting the scaling

The standard setting for a flow level meter is as follows:

At NW 76 mm = 84 m³/h (4 - 20 mA at 0 - 1400 l/min)

Practice has shown, however, that the flow section of the flow level meter (which is not always filled with liquid like the normal MID) varies somewhat depending on the suction system (vacuum/impeller, etc.). The flow is often 5 - 10 % higher because the incoming milk is already aerated (with air bubbles) depending on the intake position. The parameter "Flow rate at 20 mA" must be included in the basic settings to compensate for this.

At NW 76:   between 1300 l/min and 1500 l/min.

After changing the setting, repeat Step 1 and Step 2 until the volume levels are roughly the same.

Note:
These settings may only be adjusted by trained specialist staff.
It is important to make sure that the measuring range from 1400 l/min (at NW 76) is sufficient, i.e. there is still reserve capacity to adjust upwards.
A change of the scaling from 1400 l/min to 1600 l/min can be helpful in this regard. This is achieved by providing the flow rate of 1400 l/min to 1600 l/min at 20 mA in the MAK controller. At the same time, the E5 tab in the FLM must be set to a value between 84 and max. 96. This can only be changed by a BARTEC BENKE service engineer.

Step 3:

Fine adjustment of bottle volume:

If the above adjustment has been carried out and the values tally then the filled sample bottle volume can be aligned with the hose calibration factor.

An increase in the factor means that less will be put into the bottles because the sampler controller assumes that the peristaltic pump will deliver more in one revolution and that therefore fewer revolutions or steps are needed to obtain the same volume.

If this value is also adjusted, the pumped volume of the sampler should be about right, even with small quantities. If this is not the case, however, it is necessary to check whether the maximum limits of the sampler are being exceeded, especially with small quantities.

Accuracy of measurement

The pumped sample bottle volume is displayed on the MAK 3003, indicating whether the sample which has been taken is representative or whether the limits of the sampler have been reached (cf. 2.1). This value should normally be equal to the sample bottle volume setting if the actual set quantity tallies with the input quantity and if the ULTRASAMPLER system has been set properly and is working correctly.

The intake process is not constant, however, but is subject to continual changes in output and air content, therefore it is only possible to obtain an approximate measurement. Another factor to bear in mind is that the change in throughput is accompanied by a change in pressure and therefore the hose calibration factor varies slightly.

The (pumped) sample bottle volume which is displayed should therefore be regarded as a rough indication only. On account of the fact that the intake process is not always constant (see above), the value can vary by about 10 % (approx. 2 - 3 ml) from the set sample bottle volume without affecting the representativeness.

Guaranteeing the representativeness of the samples

All of the above points must be observed in order to guarantee that the samples are representative. It may be the case, however, that the fat level in the automatic sample does not tally straight away with the fat value of the manual sample.

One reason for this may be that the flow and the level cannot be measured correctly because the milk is swirling vigorously at the place where the flow level meter sits (e.g. if a bend has been installed recently).

Possible remedies in this case:
- either a mechanical change in the pipeline (ideal solution!)
  or
- correction factors settings of low, medium and high

The controller then takes less account of the overrun of the milk. As a result, it is assumed at the end of the intake process (i.e. when a lot of air is present) that the overrun is greater, i.e. less milk is flowing past and less is being channelled off. The milk drawn in at the end of the intake process is mainly the milk with the fat content therefore the sample which is taken will automatically be lower in fat. This method is usually only effective with small quantities (up to approx. 100 l) because with large quantities the remainder is not so heavily assessed as a percentage.

With higher throughputs (500 - 1000 l/min) this setting can also bring about an improvement with larger intake quantities because the milk can be swirling very vigorously at the end due to the high throughput.

What action must be taken if fat values are above or below average?

The following action should be taken if the fat values are found to be below or above average at the inspection and acceptance process for the ULTRASAMPLER:

Check basic settings and parameters:

a) Remove intake cannula and check whether it is leaking or blocked
b) Check that the intake cannula is fitted and installed properly (against the direction of flow, correct distance from pipe wall, needle bent?)
c) Replace sampler hose
d) Check whether the bottled sample volume tallies with the sample volume displayed on the controller

If the values vary by more than 10 %, the parameter "Flow at 20 mA" will need to be adjusted.

This setting is incorrect in many cases and is a frequent cause of complaints!

e) Are the limits of the sampler being observed (restrictor for small quantities, throughput)?
f) Is the flow level scaling adequate (1400 l/m at NW 76 mm)?

Start delay setting in case of below-average fat values:

The start of the sampler can be changed with this parameter. The milk at the start of the intake is low in fat therefore, by delaying the start of the sampler, less low-fat milk is taken into the bottle, leading to a general increase in the fat content in the sample.

Start delay parameter in MAK 3003.

Configuration - Periphery - ULTRASAMPLER:

Start delay: 0.4 s

(Start with a value between 0.4 and 0.7, run a test with one quantity of milk, take the fat reading, adjust the setting if necessary and run the test again!)

In case of above-average fat values:

Option 1 (only in exceptional cases and with milk collection vehicles with high throughputs):

Above-average fat levels were measured in the higher quantities (80 l and 160 l) in the case of milk collection vehicles with high throughputs in conjunction with the ULTRASAMPLER system therefore, although there was a slightly lower than average fat level in the small quantity (40 l), the following changes were introduced (from software version 2.32 of the ULTRASAMPLER controller).

3 new parameters were introduced (1 per intake quantity), allowing the level curve to be set between proportional (more fat) and 1/X (less fat) on the ULTRASAMPLER controller.

The 3 parameters in sample collection/basic settings are defined as follows:

Low correction factor:
Effective for intake quantities which are below and equal to the low/medium switching threshold.

Medium correction factor:
Effective for intake quantities which are between the low/medium and medium/high switching thresholds.

High correction factor:
Effective for intake quantities which are above and equal to the medium/high switching threshold.

Correction factor settings: Setting range = 0 to 100

0 = curve is still proportional, i.e. as before, the level in the pipe is linear to the FLM signal (see graph)

100 = curve is now 1/X, i.e. the level in the pipe is not linear (1/X function) to the FLM signal (see graph)

GUIDE to calculating the correct settings:

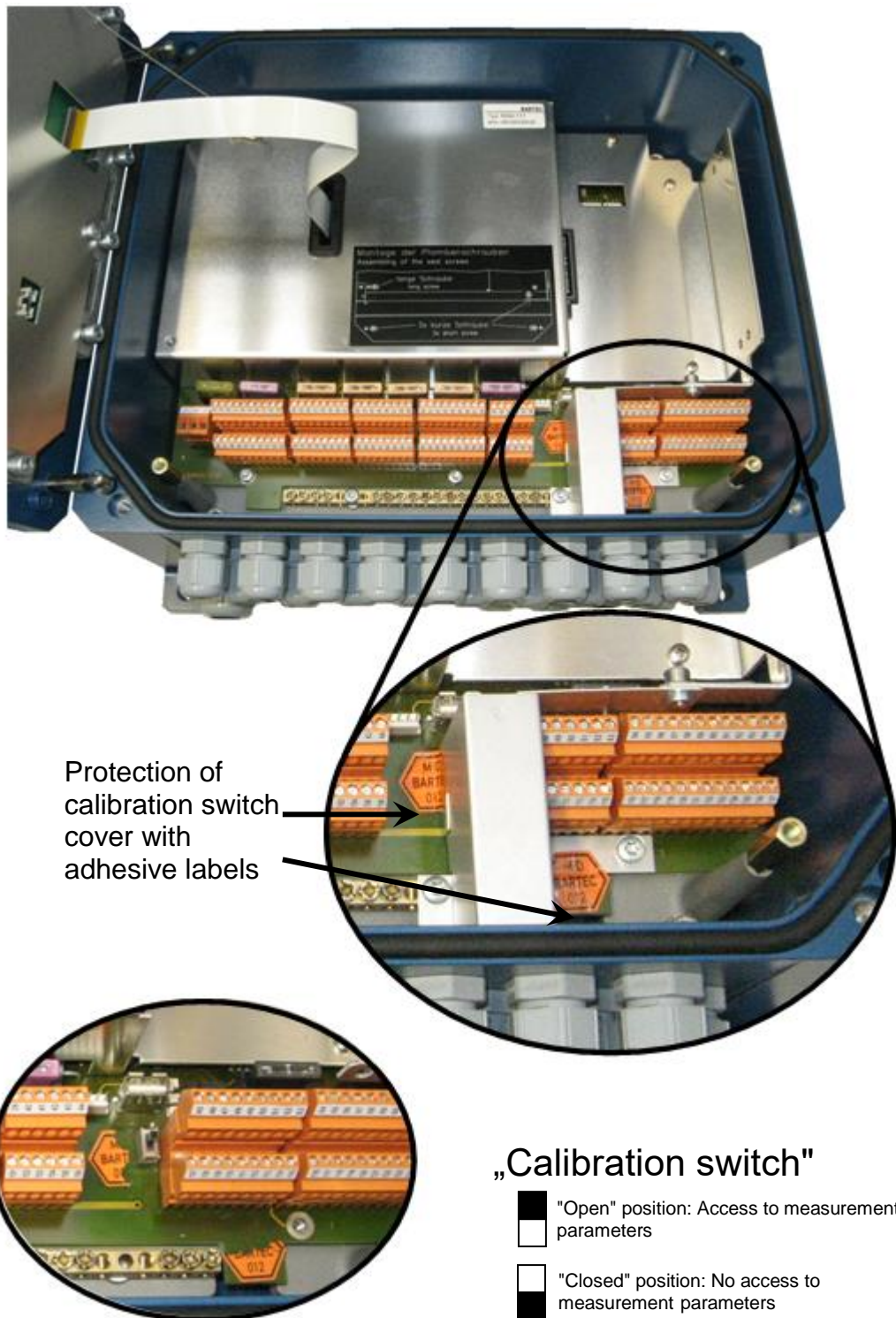All the correction factor settings need to be calculated with milk.

It is advisable to start with 20 (for low and medium) with the small intake quantities. After analyzing the fat levels, a higher or lower setting can then be selected based on the tendency, i.e. the correct settings need to be calculated in tests on the actual vehicle in any given case.
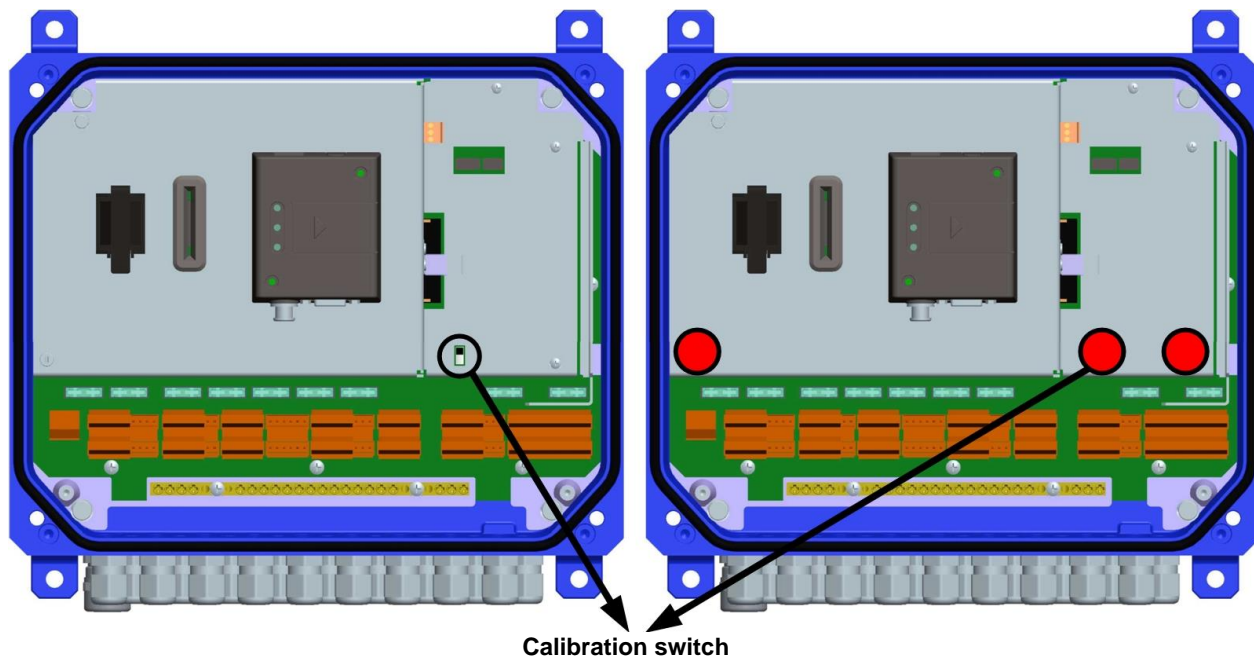
Graph illustrating the correction factors:

Level in
pipe
100 %

Proportional
(+ fat)
Crr.factor = 0

1/x
(-fat)
Crr.factor = 100

FLM Signal
(2.3 V)
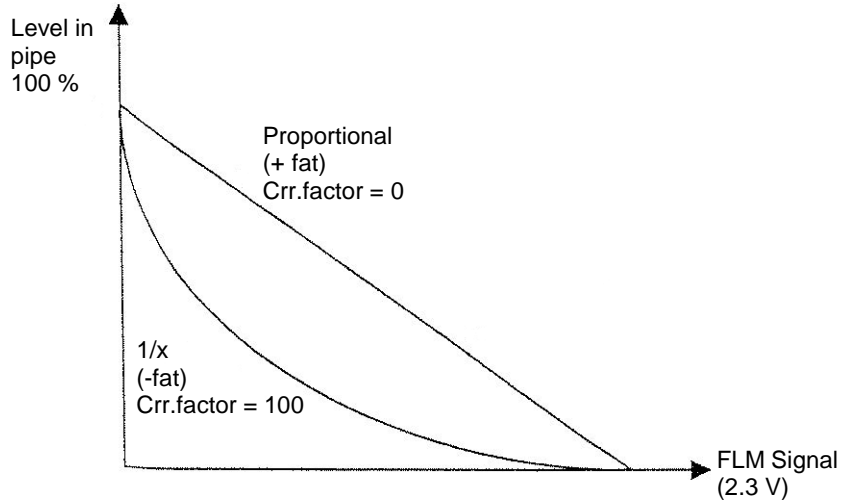
28 MAK TIGER 3003 Measuring System seal diagram

28.1 Seal diagram for Compact Controller, type 6942-10 until series B

Protection of calibration switch cover with adhesive labels

„Calibration switch"

"Open" position: Access to measurement parameters

"Closed" position: No access to measurement parameters

28.2   Seal diagram for Compact Controller, type 6942-10 from series C

Calibration switch

Sealing of Compact Controller		
Calibration switch		
Open Access to measurement parameters	**Closed** No access to measurement parameters	**Sealed** with adhesive labels - calibration switch - cover

28.3   Seal diagram for MID, type 6823-x

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