BRAN+LUEBBE
AN SPX BRAND

Job-No.	:	51136392.3000
Serial-No.	:	9174295
Type	:	DS500 Sanitary
PO-No.	:	
Customer	:	NESTLE
Date	:	04.02.2010
Revision	:	0

Original instructions

PROCAM

Tag-No.: 07100

SPX Process Equipment Delavan
XP2686-A THRU XP2691-A

SPX®

Table of contents

CE declaration

Read the instructions in this manual carefully before installing or starting the system. BRAN+LUEBBE GmbH will accept no liability for damages due to non-observance of this manual.

If the instructions in the operating manual are not adhered to or are inadequately adhered to, there shall be no entitlement to services under the warranty and the CE Declaration of Conformity shall cease to be valid.

Information in this manual is subject to change without notice and does not represent a commitment on the part of BRAN+LUEBBE GmbH.

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SPX PROCESS EQUIPMENT

1.0 Structure, Assignment, Marking, Ordering of Spare Parts

Structure of the user manual

Just like the metering or rather process pump, this user manual has a modular structure. Thus each manual only contains information on the pump supplied. For this reason, the pages and sections are not numbered in sequence throughout the whole document.

Finding the required information has been simplified by dividing the user manual into the following sections:

1. General remarks
2. Pump type
3. Components
4. Installation
5. Operation
6. Maintenance, Inspection, Cleaning
7. Troubleshooting
8. Transport, Intermediate Storage, Preservation
9. Drawings and Parts Lists
10. Motor / Accessories (*if* they exist)

CE declarations / Manufacturer declarations

In some sections of 3 "*Components*", 4 “*Installation*” and 5 “*Operation*” a sequential numbering of sections may not always be adhered to.
It is thus possible that point 3.3 "*Pump Head*" only contains section 3.3.3 "*PTFE series*", since the other series treated in sections 3.3.∗ are not relevant for your specific metering or process pump.

The page numbering in the footer is only carried out in sequence throughout a coherent section.

The pages are numbered according to the example "*Page 2/11*" (Page 2 of a total of 11 pages of the coherent section). In this way, the length of such a section can be determined.

The numbering of figures and the cross-references to figures and pages are only valid within a coherent section.

The right header indicates the section in which the reader actually is at the moment, e.g. “*1 General remarks – 1.1 Safety Instructions*”.

The item numbers used in the user manual in sections 1-8 are *not* identical with the item numbers referred to in the parts lists and associated drawings in Section 9!

Assignment of the user manual

The metering or process pump type and serial number are referred to on the cover, in Section 1.2.1 and on the nameplate of the metering or process pump.

Marking

The marking on the pump refers only to the pump part.

The coupling and motor must be examined separately.

There must be a manufacturer declaration for the coupling.

The drive is subject to its own examination.

Ordering of spare parts

Only the use of original BRAN+LUEBBE spare parts will ensure trouble-free operation and long service life of BRAN+LUEBBE products.

To ensure that parts can be delivered promptly and reliably, it is essential that the spare parts department is provided with the following information:

- **Serial No.** *(see cover, data sheet in section 1.2.1 or nameplate of the pump)*
- **Name of parts** *(see drawings and parts lists in Section 9)*
- **Parts Id. No.** (*see drawings and parts lists in Section 9*)

1.1 Safety instructions

Introduction

The metering and process pump complies with the requirements of the machinery directive 2006/42/EC.

The pump has been subjected to a safety test and acceptance inspection.

In case of incorrect operation or misuse there is a risk of danger to

- life and limb of the operator,
- the pump and other material assets of the owner-operator,
- and the efficient operation of the pump.

All persons involved in setting up, putting into service, operating, inspecting, servicing and repairing the pump must be appropriately qualified and observe this user manual exactly!

Your safety is at stake!

Symbols used

The following symbols are used in this user manual:

DANGER!

Designates an imminent danger. In case of non-observance of this information, there is a risk of death or severe injuries.

WARNING!

Designates a possibly dangerous situation. In case of non-observance of this information, death or severe injuries can occur.

CAUTION!

Designates a possibly dangerous situation. In case of non-observance of this information, severe injuries can occur.

ATTENTION!

Designates a possibly dangerous situation. In case of non-observance of this information, minor injuries can occur.

Designates an imminent danger. In case of non-observance of this information, there is a risk of death or severe injuries.

Designates both general hazards and hazards in an Ex area.

Designates important user tips and other useful information.

Intended usage

The metering or process pump is an oscillating positive displacement pump. It serves the purpose of conveying, dosing, compressing or mixing and/or filling of liquids and suspensions.

Do not use this pump as

- a generator, i.e. pressurised liquid is not allowed to drive the motor
- a device for cooling liquids
- a pulsator without a pressure valve
- a compressor for gases

The pump and this user manual are intended exclusively for commercial use.

Adhere to the operating data and limit values specified in the data sheet (*Section 1.1*).

WARNING!

Severe skin injuries can result from dangerous (e.g. aggressive, toxic, caustic) media!
Unsuitable media can damage the pump and escape into the surrounding area.

If you intend to use dangerous media, the materials used for the pump parts must have been designed for this kind of use.

Consult with BRAN+LUEBBE GmbH!

Unauthorised modifications to the pump are prohibited for safety reasons!

Any form of liability on the part of the manufacturer/supplier shall be excluded for damage resulting from unauthorised modifications.

If you intend to carry out any modifications to the pump, please note that each modification must be approved in writing by BRAN+LUEBBE.

When replacing defective parts, only use original spare parts or standard parts approved by the manufacturer.

DANGER!

When using the pump in areas where there is a risk of explosion, pay particular attention to the sections marked Ex.

Emissions

The sound emission of metering pumps is not determined exclusively by the constructional design. It also depends on many different operation-related parameters, such as the type and size of the pulsation dampers being used, customer-specific piping, type of installation, ambient temperature, and the physical properties of the product.

The determination of the exact A-rated, equivalent continuous sound pressure level as a series-related limit value is therefore only possible to a limited extent.

Tables 1.1 and 1.2 give **approximate values**, measured:

- at full capacity utilisation of the machines,
- under normal operating conditions,
- at room temperature,
- with water as the product.

The sound measurement was carried out in accordance with DIN 45635 Part 1.
The actual max. sound pressure level must be determined on site by the owner-operator.
The owner-operator is responsible for proper observance of the local, legal safety regulations for noise.

Please note the following information if the determined sound pressure level exceeds 80 dB(A):

Gear type	L (A) dB
H1	60
J, K, KH, H2	65
C, D, DH, H3, H4, ProCam G1*, G3*, D4*	70
ProCam G4*	72
ProCam D4*	73
CS, DS, DSH, H5	75
ProCam G2*	77
B	80

L(A) = max. sound pressure level at 1 m distance

***** The highest sound pressure level is produced by the drive (motor with variable speed controller). For noise levels of drives *see the manufacturers documentation (section 10)*

Table 1.1: Continuous sound pressure level Metering Pumps-single machines

Gear type	L (A) dB
NOVAPLEX 020	90
NOVAPLEX 040	95
NOVAPLEX 160	100

L(A) = max. sound pressure level at 1 m distance

Table 1.2: Continuous sound pressure level Process pump as Triplex

CAUTION!

Auditory damage due to noise.

Noise can result in loss of hearing or in other physiological impairments (e.g. loss of equilibrium, inattentiveness).

Wear ear protection!

Sources of danger

The BRAN+LUEBBE metering and process pumps comply with all mandatory legal safety requirements.

The dangers originating from the pumps have been reduced to a minimum by means of suitable construction and design measures. However, residual risks (explosive atmospheres and electrical, mechanical, thermal or biological hazards) cannot be excluded entirely during transport, installation, maintenance and repair work or regular operation.

IMPORTANT!

Please note the warning and safety information included in the following sections in order to prevent personal and material damage:

2 “Pump type”

3 “Components”

4 “Installation”

5 “Operation”

6 "Maintenance, Inspection, Cleaning"

8 "Transport, Intermediate Storage, Preservation"

Pumps must never be allowed to work against a closed fitting!

Install a safety valve in the pressure line before the fitting.

Workplaces

The workplaces of the operating personnel during production operations cannot be accurately defined.

In the case of operating, maintenance and repair tasks, the area next to the pump and the pump itself must be considered as being a workplace.

Authorised Operators

Only persons who have been authorised and trained by the owner-operator are allowed to work on the pump. The minimum age for operators is 16. The operator is responsible for third parties in the working area.

The responsibilities for the various activities performed on the pump must be clearly defined and observed. Unclear competences are a safety risk.

The owner-operator must make the user manual available to the operator and ensure that the operator has read and understood it.

IMPORTANT!

Maintenance, upkeep and electrical tasks should only be performed by technically competent, trained and/or qualified personnel.

Technically competent, trained and qualified personnel are defined as those persons that have sufficient knowledge in a specific field based on their specialised training and experience and are familiar with the appropriate relevant work safety and accident prevention regulations and the generally acknowledged technical regulations.

Personal Protective Equipment

CAUTION!

Oils, lubricants and cleaning agents can cause skin rashes and other damage to health.

Hot surfaces, sprayed-out hydraulic oil and/or caustic media can cause severe burns or acid burns.

Avoid skin contact.

Wash your hands thoroughly each time after coming into contact with these substances.

Wear protective equipment especially when you are performing any maintenance, inspection and cleaning tasks!

Safety Measures at the Installation Location

Place the pump on a level, stress-free foundation or frame.

Secure piping adequately by means of supports or retaining clamps. Clean the piping.

Use appropriate internal company instructions and checks to ensure that the area surrounding the workplace is clean and tidy at all times.

Protective devices

Protective devices

- are installed for the safety of operating personnel,
- must not be modified, removed or bypassed by means of any modifications on the pump under any circumstances.

The EMERGENCY-OFF switches on the pump can be used to shut down the pump immediately in the case of an emergency or malfunction.

EMERGENCY-OFF switches are not included in the BRAN+LUEBBE scope of supply! The owner-operator must provide EMERGENCY-OFF switches and install them at suitable places.

The EMERGENCY-OFF switches should be readily accessible and clearly visible.

Behaviour in case of emergency

An emergency exists whenever human life is endangered and/or other general risks exist. The source of danger can be the pump itself or may have some other origin.

- In the case of an emergency or malfunction, the pump must be switched off immediately.
- Rectify the fault.
- The pump must not be put into operation again until the malfunction has been corrected, and there are no personnel and/or objects in the immediate area of the pump.
- In case of fires, use only suitable fire-extinguishing agents.
- Warn other personnel in the case of any danger - even when the danger is only presumed.
- Stay calm!

1.2 Technical data

Data sheet and dimensional drawing for the ordered machine / component can be found on the following pages.

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Pump specification sheet 1.2.1

4.02.10 10:18:01

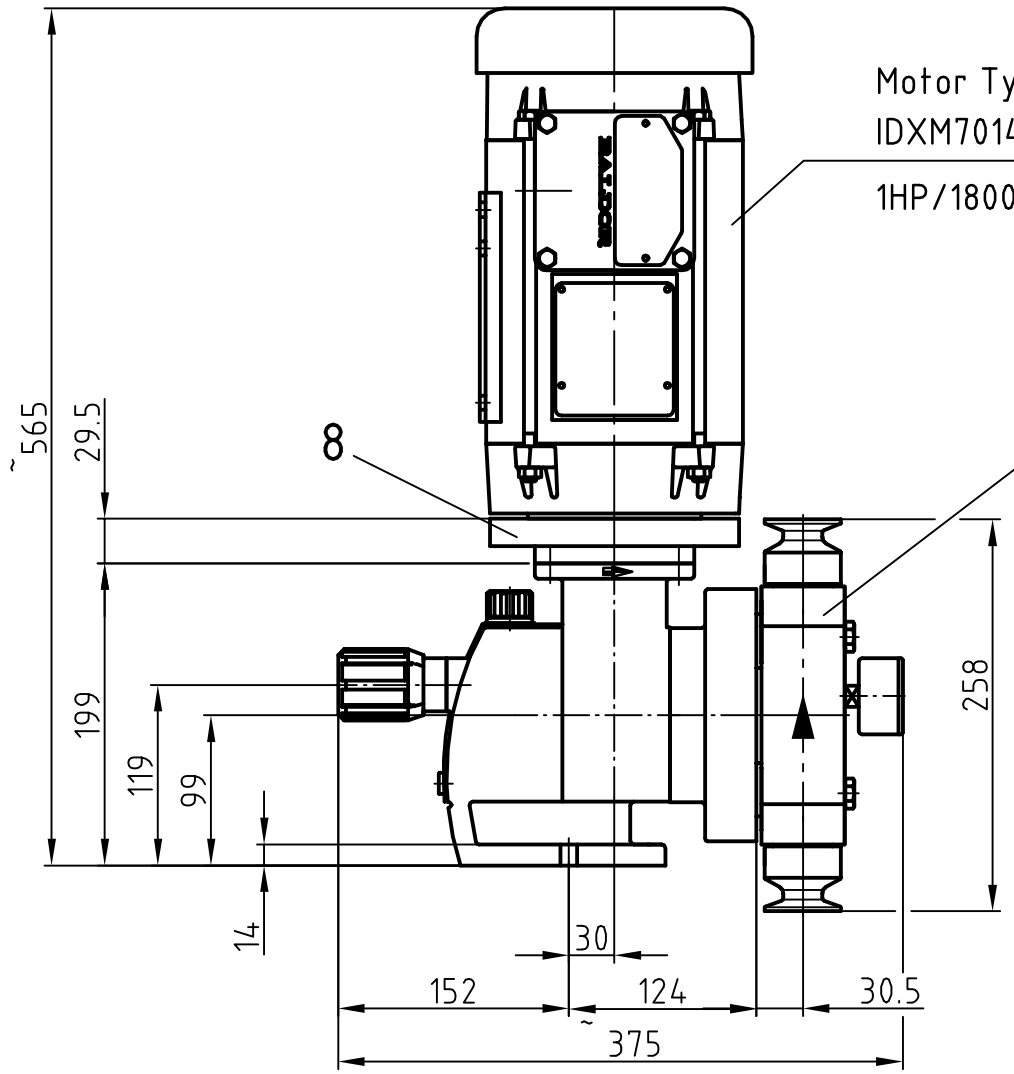
	1	Metering pump type	ProCam DS500 Sanitary			Order no.						
	2	Dimension sheet no.	13639230			Tag/Item no.	07100					
	3	Job no.	51136392.3000			Application	NESTLE					
	4	Serial no.	0009174295			CE	--					
	5	Quantity	001			Sheet no.	001	of	001			
Process data												
Process data	7	Liquid handled		Potassium Hydrox								
	8	Concentration %		Unknown								
	9	Solid % / Size mm		0 *	--							
	10	Density at OT g/cm³		1								
	11	Viscosity at OT m Pa s		< 10								
	12	Operat. temperature = OT °C		24 °C (72° F)								
	13	Ambient temperature °C		24 °C (72° F)								
	14	Press.	Discharge port min/max bar a	2.0 bara	5.0 bara	29 pisa	73 psia					
	15		Suction port min/max bar a	1.0 bara	2.0 bara	15 psia	29 psia					
Design												
Pumphead	17	Item on dimension sheet		1								
	18	Design (plunger, diaphragm)		Diaphragm								
	19	Drawing no.		PM2-025		surface RA=0.8µm						
	20	Plunger diameter mm										
	21	Capacity max. required / designed l/h		150-600	300							
	22	Stroke frequency 1/min		86								
	23	Operat. press./Relief valve set press. barg		4 #barg		60 psig	-- int.					
	24	Valve design suction/discharge side		Ball / Ball								
	25	Suction valve spring pressure barg		-								
	26	Discharge valve spring pressure barg		-								
	27	Plunger packing design		-								
	28	Lantern ring connection DN		-								
	29	Suction connection DN/PN		1"								
	30	Standard		TriClamp								
	31	Discharge connection DN/PN		1"								
	32	Standard		TriClamp								
	33	Heating jacket DN		-								
	34	Hydraulic oil l		-								
	35	MAWP acc. API / Hydrotestpressure bar g		-	6 #barg	-	87 psig					
Gear	36	Model / ratio 1:		G2	19							
	37	Max. stroke length mm		8								
	38	Crank phase angle °		--								
	39	Stroke length adjustment 1)		SBH								
	40	Stroke length feedback		--								
	41	Gear oil l		0.8		OPTILEP GT100						
Pumphead												
Materials	43	Frontcover resp. housing		316L								
	44	Plunger/Diaphragm		--	PTFE/FDA							
	45	Valve housing		316L								
	46	Valve seat		316L								
	47	Valve-ball/-cone/-plate		1.4401								
	48	Valve gasket		FD5/FDA								
	49	Plunger packing		--								
	50											

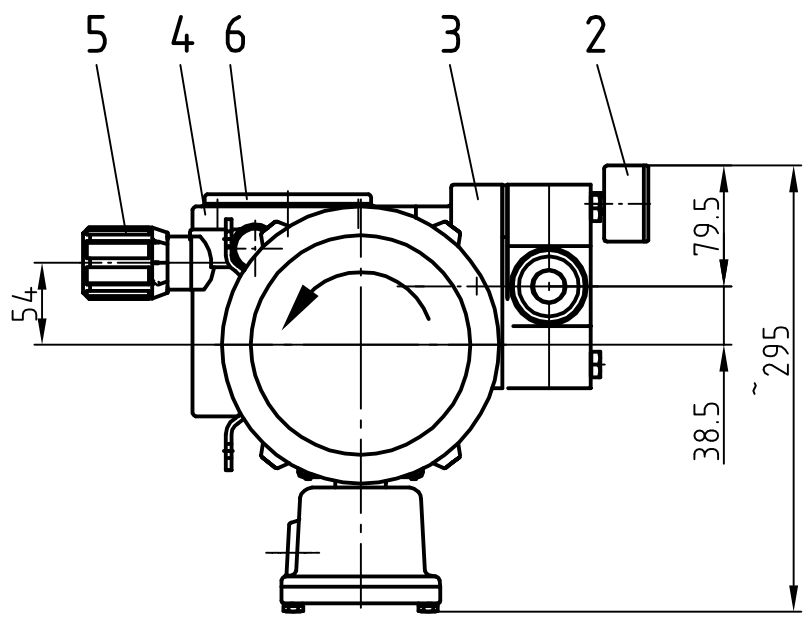
Motor	51	Motor brand BALDOR	Current 3 PH AC	Voltage V	Power 1 HP kW
		Type IDXM 7014T	Frequency 60 Hz	Speed 1800 1/min	Variable speed 1:5
		Thermistor	Pole-changing ---	Enclosure XPFC	Ex-Proof Cl.1 Div.1 Gr.D
	52	Speed variat	Brand	Adjustment	Feedback:
			Type	Range 1:	Max.Speed: 1/min

	53	Mountings	Pressure gauge for diaphragm rupture detection; Motor adapter flange NEMA 143TC		
	54	Accessories			
	55	Remarks	Rei-13.01.2010 Motor supplied and fitted by SPX USA	56 Weight Kg ~	< 45
	57	Painting	B+L specification 0	Colour	only primed

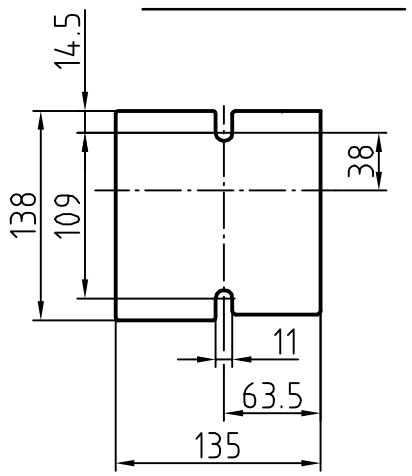
1)	SH: manual at standstill	SBH: manual at standstill and operation	SBE: electric.at standstill and operation	SBP: pneum. at standstill and operation

* Details were unknown when ordered. The specified data must be kept stated limits.





Auflagefläche
Base area



Gewicht / weight : ~ 45 kg
Ölmenge/oil quantity: 0.8l

Projektion ISO128-30
projection ISO128-30

BRAN+LUEBBE

TITLE 1 DOSIERPUMPE/METERING PUMP
TITLE 2 DS500

DRAWN	E.Deutschmann	13.01.2010	MATERIAL	IDENT.-NO.	REV.	0
CHANGED	E.Deutschmann	14.01.2010				
APPROVED	G.Reichelt	14.01.2010	FORMAT A3	SCALE 1:5	SHEET 1/1	DRAWING-NO. 13639230
RELEASED	E.Deutschmann	14.01.2010				

- CAD-DRAWING -

2.3 ProCam

Purpose of the metering pump

The operating conditions (lines 7 to 15) and the pump design data (lines 17 to 55) are stated in the specification sheet in *Section 1.2.1*.

If the operating data are not fully specified by the customer, the particulars of pressure, temperature, solid and viscosity entered in the factory must be maintained as limiting values.

CAUTION!

Gear unit damage possible!

Do <u>not</u> operate the pump in systems equipped with cathodic corrosion protection. Do <u>not</u> use the pump as a cooling unit for liquids, for the compression of gases or as a generator.

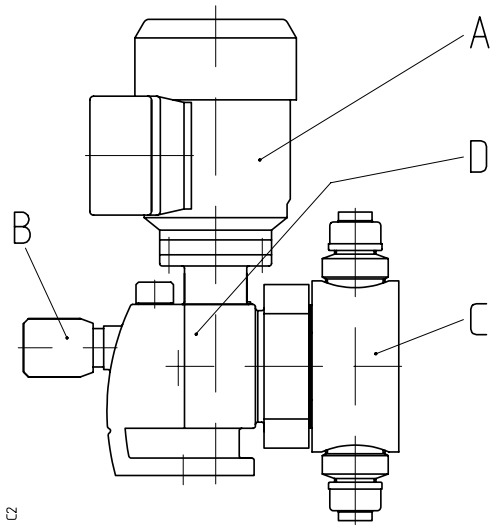
Construction of the metering pump

The metering pump is a reciprocating positive displacement pump.

It consists of the drive (A) and the components for stroke length adjustment (B), the pump head (C) and the gear unit (D) *(see Fig. 2.1)*

The function of the components is described in *Section 3*.

The metering pump fulfils European safety at work and accident prevention regulations.



A Drive unit
B Adjustment of the stroke length
C Pump head
D Gear unit

Fig. 2.1: Metering Pump
e.g. ProCam DP100 / M-Series M1

Safety information

WARNING!

Burns and other damage to health due to hot, dangerous medium. Increased wear and tear on the pump head and on the gear unit.

If the permissible counter pressure is exceeded, the pipework can split and hot or dangerous medium can spray out.

Take the necessary measures to prevent the permissible maximum counter pressure from being exceeded, e.g. by installing a safety valve. ***(See Section 4.3).***

Pumps must never be allowed to work against a closed fitting!

Install a safety valve in the pressure line before the fitting.

When opening safety and bleed valves, liquids and vapours must only be allowed to escape in areas where neither persons nor materials can be damaged.

Please note that when inflammable liquids or vapours escape, there can be a risk of explosion in the outlets of the safety and bleed valves.

Before opening pressurised parts (pump head, fittings, pipework) be sure to:

- relieve the pressure in all parts
- prevent the drives from being switched on
- thoroughly flush and clean the parts before opening if necessary
- observe any local safety measures
- take care when opening bleed valves. *See Section 3.7.*

The maximum permissible operating temperature is dependent on the permissible surface temperature in the hazardous area (required zone, explosion group and temperature class, *see data sheet, Section 1.2.1, Line 4*) and the suitability of the materials and lubricants used.

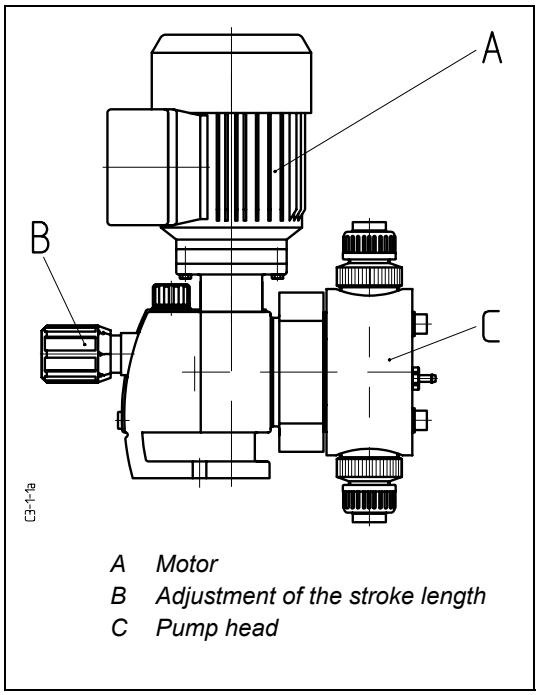
When using pumps in areas at risk of explosion, take particular care to avoid using inadmissible operating practices!

If this is not observed, the defined temperature class will be exceeded. ***(See data sheet, Section 1.2.1, Line 4).***

Check the surface temperature of the gear unit at the hottest external point or in the oil every week.

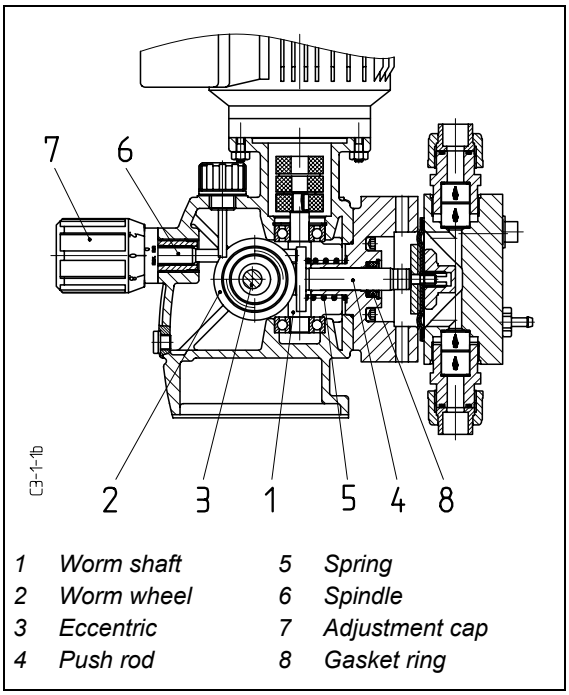
The gear unit must <u>not</u> be used if the surface temperature or the oil temperature is greater than 90°C!

3.1.15 Gear Models G1, G2, A1 and A2 for Metering Pumps ProCam



A Motor
B Adjustment of the stroke length
C Pump head

Fig. 3.1: View (Main Gear G1, G2)



1 Worm shaft
2 Worm wheel
3 Eccentric
4 Push rod
5 Spring
6 Spindle
7 Adjustment cap
8 Gasket ring

Fig. 3.2: Sectional View (Main Gear G1, G2)

Construction and function

For the construction and function of models G1 and G2 *see Fig.3.1* and *3.2*.

The rotary motion of the motor (A) is transmitted by the worm shaft (1) and the worm wheel (2) to the fixed eccentric (3) which moves the push rod (4) to the front dead centre. The spring (5) moves the push rod (4) back to the rear dead centre. At full stroke setting, the eccentric (3) is continuously in contact with the push rod (4).

Part-stroke settings are achieved by means of a "lost motion device" consisting of a spindle (6), which is connected to an adjustment cap (7).
A clockwise rotation of the spindle (6) displaces the rear dead centre of the push rod, as a result of which the eccentric temporarily looses contact with the push rod (4). At zero setting, the rear dead centre coincides with the front dead centre of the push rod (4) and consequently the push rod can no longer be moved by the eccentric (3).
To prevent leakage of gear oil, the push rod (4) is sealed by means of a gasket ring (8).

Suction and discharge strokes are both positive mechanical movements, but the suction stroke can be limited if the spring does not exert sufficient force to produce the necessary suction stroke.

The main gear units (G1, G2) can be combined with attachable gears (A1, A2) to form multiple pumps.

In this case, it must be ensured that the rated load of both the electric motor and the gear unit is not exceeded.
To avoid pulsations in the pipework and overload of the pump unit, a phase displacement of the reciprocating piston movements is recommended.

If multiple pump units are ordered, the optimum piston displacement will already have been preset in the factory. If an existing single pump or multiple pump unit is extended retrospectively, dismantling and readjustment of the necessary piston displacement will be required.

For applications requiring simultaneous delivery of the pump heads, please refer to BRAN+LUEBBE in all cases.

Stroke Length Adjustment (B)

See Section 3.2.

Oil Filling

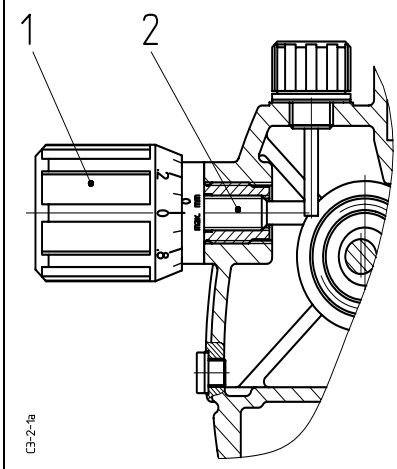
ATTENTION!

Gear unit damage possible due to inadmissible temperature rise and wear and tear!

The gear units are delivered <u>without</u> being filled with oil.

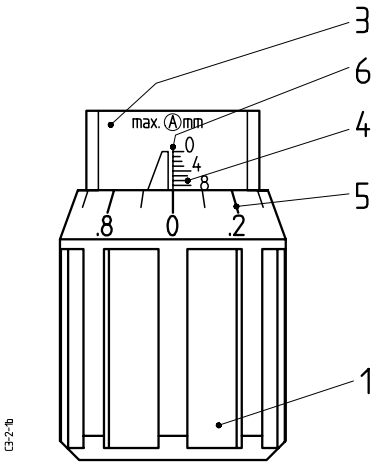
Fill with oil prior to putting into service *(see Section 5.1 and 5.2)*.

3.2.34 Manual Stroke Length Adjustment at Standstill and in Operation for Gear Models G1, G2, A1 and A2



1 Adjustment cap
2 Spindle

Fig. 3.1: Sectional View



1 Adjustment cap
3 Micrometer barrel
4 Linear scale (mm)
5 Ring scale (1/10 mm)
6 Longitudinal line

Ⓐ = 3 mm for G1, A1 gears with diaphragm pump head
Ⓐ = 8 mm for G1, A1 gears with plunger pump head
Ⓐ = 8 mm for G2, A2 gears with diaphragm pump head
Ⓐ = 15 mm for G2, A2 gears with plunger pump head

Fig. 3.2: View

Construction and function

The micrometer adjustment cap (1) is connected to the spindle (2).

A clockwise rotation of the adjustment cap (1) displaces the rear dead centre of the push rod towards the front dead centre via the spindle (2). As a result, the stroke length is reduced.

A counter clockwise rotation of the adjustment cap (1) increases the stroke length. *(See Fig. 3.1).*

Adjustment of the stroke length

ATTENTION!

Damage to the gear unit possible.

Do not screw the micrometer adjustment cap beyond the zero or the displayed maximum setting!

A rotation of the micrometer adjustment cap (1) varies the stroke length setting of the pump. The setting can be changed with the pump operating or at rest.
The linear scale (4) on the micrometer barrel (3) is graduated in mm and the ring scale (5) on the adjusting cap (1) is graduated in 1/10 mm.

To obtain a stroke length setting of 6.8 mm, for example, the adjustment cap (1) must be rotated until the 6 mm graduation is just visible with the ".8" graduation on the adjustment cap (1) coinciding with the longitudinal line (6) on the micrometer barrel (3).

Any required stroke length can be set up in a similar manner. *(See Fig. 3.2)*

Prevent static charging!

Clean the plastic parts of the stroke length adjustment with a moist cloth only!

Adjustment of capacity, *see section 5.4.2*

3.3.15 Diaphragm Model

Construction and function

The double diaphragm (5, 6), which is clamped at the circumference between cover (1) and yoke (2) and in the centre between the discs (7, 8), hermetically separates the product chamber (A) from the atmosphere (B). The movement of the eccentric is transmitted to the medium in the product chamber (A) via the push rod (9) and the double diaphragm (5, 6).

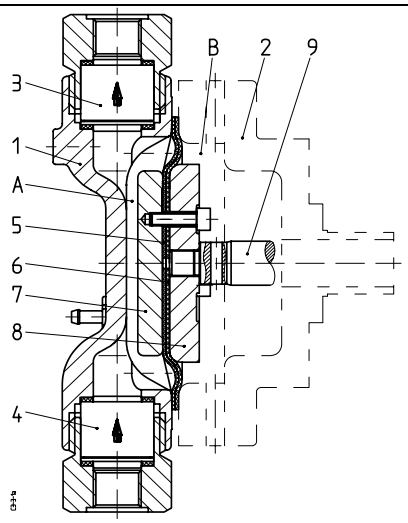
The suction (4) and discharge valves (3) are self-acting valves, which operate due to underpressure or overpressure in the product chamber (A).

- **Suction stroke:** Movement from front dead centre *(Fig. 3.1*) to rear dead centre *(Fig.* 3.*2*).

  In the suction stroke, the pressure valve (3) is closed. Here, the product flows from the suction line into the product chamber (A) via the suction valve (4), which is opened by the underpressure.

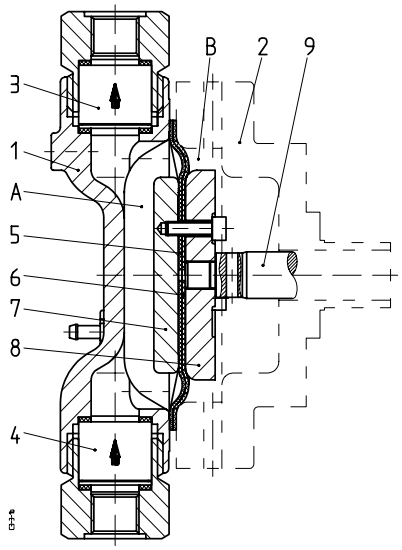
- **Pressure stroke:** Movement from rear dead centre *(Fig. 3.2*) to front dead centre *(Fig. 3.1*).

  In the pressure stroke, the suction valve (4) is closed. Here, the product flows from the product chamber (A) into the pressure line via the pressure valve (3), which is opened by the overpressure.



1	*Cover*	*7*	*Disc (product side)*
2	*Pump yoke*	*8*	*Disc (atmospheric side)*
3	*Pressure valve*	*9*	*Push rod*
4	*Suction valve*		
5	*Diaphragm*	*A*	*Product chamber*
6	*Diaphragm*	*B*	*Atmosphere*

Fig. 3.1: Diaphragm at Front Dead Centre



1	*Cover*	*7*	*Disc (product side)*
2	*Pump yoke*	*8*	*Disc (atmospheric side)*
3	*Pressure valve*	*9*	*Push rod*
4	*Suction valve*		
5	*Diaphragm*	*A*	*Product chamber*
6	*Diaphragm*	*B*	*Atmosphere*

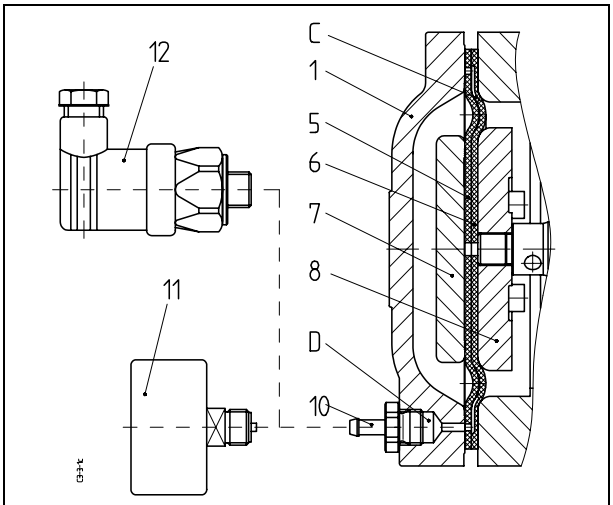
Fig. 3.2: Diaphragm at Rear Dead Centre

3.3.15.1 Double Diaphragm Assembly and Diaphragm Rupture Monitoring Device

The two diaphragms (5, 6) of the double diaphragm arrangement *(Fig. 3.3)* are clamped between the product side (7) and atmospheric side (8) discs so that their annular corrugations lie inside one another.

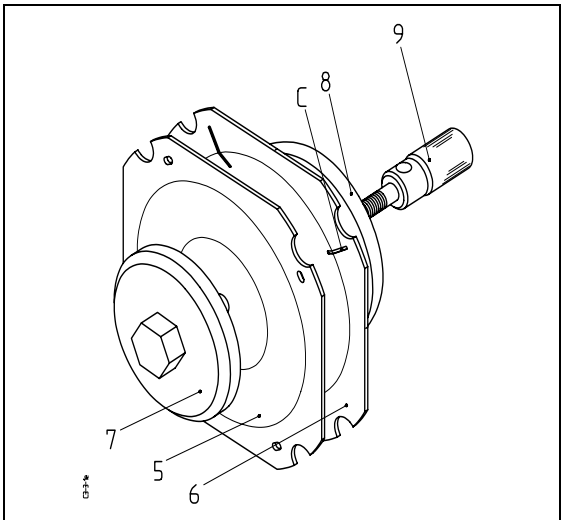
In the fitted state *(Fig. 3.3)*, there is a connection from the inner contact area between the two diaphragms via a groove (C) in the atmospheric side diaphragm (6), a bore in the product side diaphragm (5) and a bore (D) in the cover (1) to the hose nipple (10), the manometer (11) or the pressure switch (12).

If the diaphragm (5) on the product side should rupture, there will be an increase in pressure between the diaphragms approximating to the operating pressure. This increase in pressure causes product to escape via the hose nipple (10) into a receiving hose or to the pressure indicator of the manometer (11) or leads to actuation of the pressure switch (12). If a pressure switch (12) is fitted, the contact can be used to provide an alarm or to stop the metering pump.



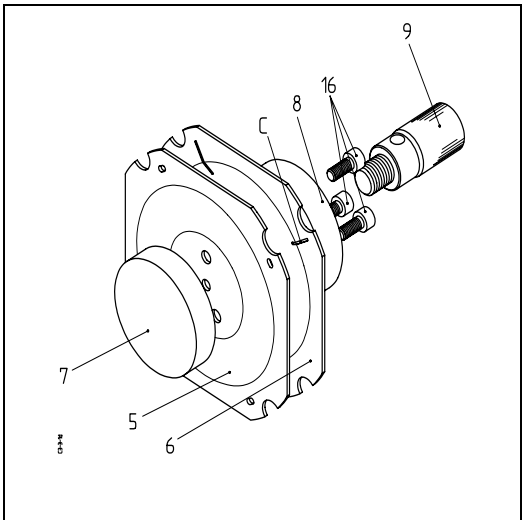
1 Cover
5 Diaphragm, product side
6 Diaphragm, atmospheric side
7 Disc, product side
8 Disc, atmospheric side
10 Hose nipple
11 Manometer
12 Pressure switch
C Groove
D Bore

Fig. 3.3: Diaphragm rupture monitoring device



9 Push rod

Fig. 3.4: Double diaphragm arrangement for pump head (Gear Models G1 and A1)



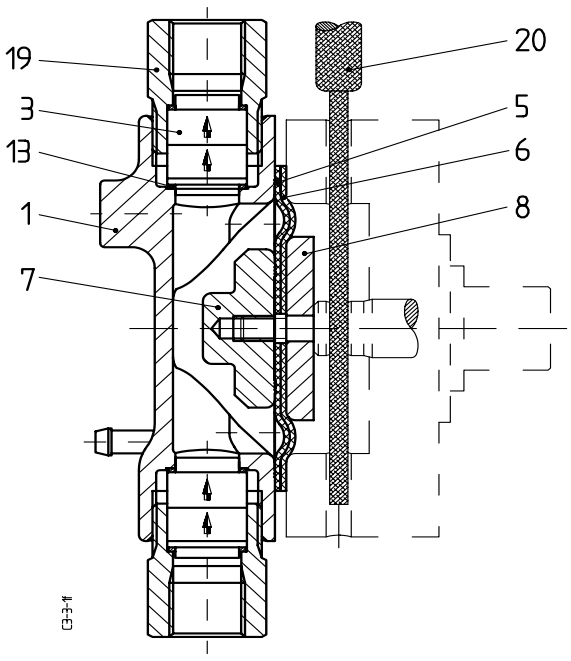
16 Screw

Fig. 3.5: Double diaphragm arrangement for pump head (Gear Models G2, A2, G3, D3, G4 and D4)

3.3.15.2 Replacement of the Diaphragm, Gear Models G1 and A1

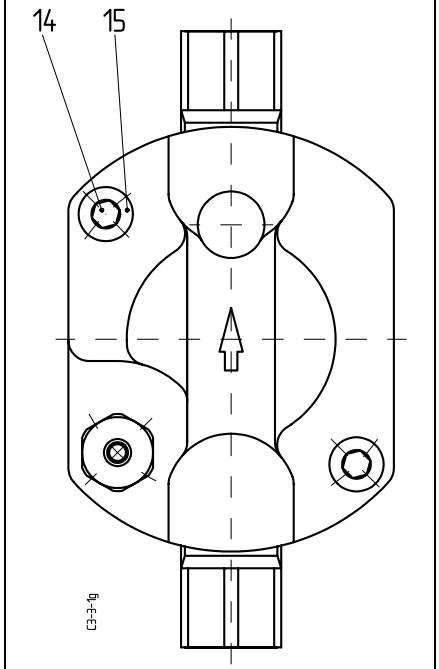
The replacement of the diaphragm in gear models G1 and A1 is shown in *Fig. 3.6 and Fig. 3.7.*

See assembly drawing PM2-01, PM2-03, PM2-08 and PM2-09 in Section 9.



1 Cover
3 Valve
5 Diaphragm
6 Diaphragm
7 Disc
8 Disc
13 Seal
19 Pipe connection
20 Locking pin

Fig. 3.6: Sectional View



14 Screw
15 Washer

Fig. 3.7: View

Removal

Please note safety information in Section 1 *"Safety"* and Section 2 *"Metering Pump"*.

- Flush the pump head.
- Close the suction and pressure lines.
- Undo the pipework.
- Undo the screws (14) uniformly and remove the cover (1).
- Set the gear to "0" mm stroke length so that the push rod is in the front dead centre position.
- To prevent movement of the push rod insert a screwdriver or a locking pin (20) through the bores in the yoke and push rod *(see Fig. 3.6)*.

- Dismantle the double diaphragm by unscrewing the disc (7).
- Remove the diaphragm rupture monitoring device. Check and clean. Replace if damaged.

ATTENTION!

If a diaphragm is ruptured, the complete double diaphragm must be replaced.

ATTENTION!

If both diaphragms are damaged, process fluid may have entered the yoke.

Please flush and clean carefully.
Replace push rod, if corroded.

Fitting

- Set the gear to "0" mm stroke length.
- To prevent movement of the push rod insert a screwdriver or a locking pin (20) through the bores in the yoke and push rod.
- Clean the concentric grooves in the cover (1) and the disc (7) and remove all liquid residues.
- Refit disc (8), double diaphragm (6, 5) and locking disc (7) in turn. Fix the double diaphragm by inserting the screws (14).
- Tighten disc (7) to the required torque *(see assembly drawing, Section 9).*
- Remove screws (14).
- Fit the cover (1), insert screws (14) and tighten to the required torque (see assembly drawing).
- Fit the diaphragm rupture monitoring device.

WARNING!

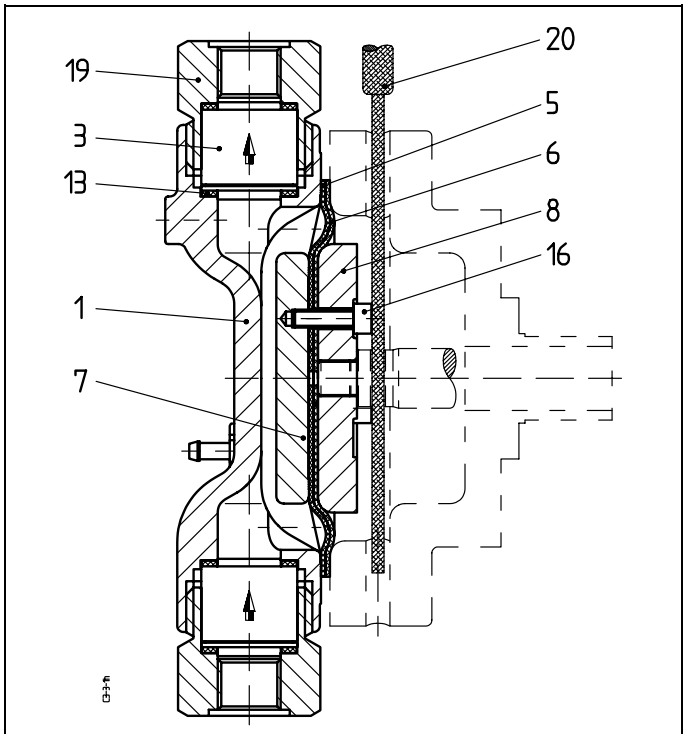
Risk of injury due to the loaded spring inside the gear unit.

If the pump yoke (2) is removed, the push rod (9) must be fixed by inserting a suitable tool (20) (screwdriver or locking pin) through the bores in the yoke and the push rod.

3.3.15.3 Replacement of the Diaphragm, Gear Models G2 and A2

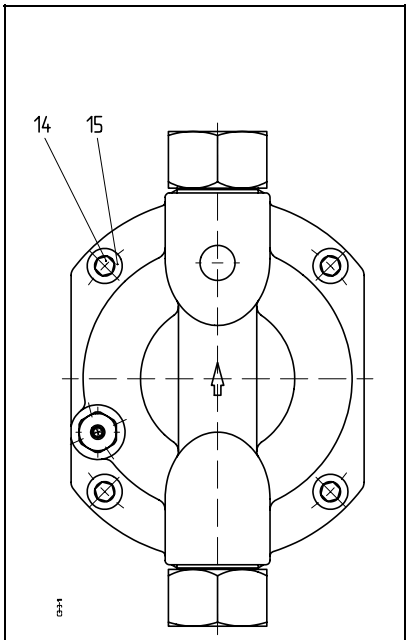
The replacement of the diaphragm in gear models G2 and A2 is shown in *Fig. 3.8 and Fig. 3.9.*

See assembly drawings PM2-02 and PM2-04 in Section 9.



1	*Cover*	*8*	*Disc*
3	*Valve*	*13*	*Seal*
5	*Diaphragm*	*16*	*Screw*
6	*Diaphragm*	*19*	*Pipe connection*
7	*Disc*	*20*	*Locking pin*

Fig. 3.8: Sectional View



14 Screw
15 Washer

Fig. 3.9: View

Removal

Please note safety information in Section 1 *"Safety"* and Section 2 *"Metering Pump"*.

- Flush the pump head.
- Close the suction and pressure lines.
- Undo the pipework.
- Undo the screws (14) uniformly in a crosswise manner and remove the cover (1).
- Set the gear to "0" mm stroke length so that the push rod is in the front dead centre position.
- To prevent movement of the push rod insert a screwdriver or a locking pin (20) through the bores in the yoke and push rod *(see Fig. 3.8).*

- Unscrew the double diaphragm assembly (5, 6, 7, 8, 16) counterclockwise and dismantle.
- Remove the diaphragm rupture monitoring device. Check and clean. Replace if damaged.

ATTENTION!

If a diaphragm is ruptured, the complete double diaphragm must be replaced.

ATTENTION!

If both diaphragms are damaged, process fluid may have entered the yoke.

Please flush and clean carefully.
Replace push rod, if corroded.

Fitting

- Set the gear to "0" mm stroke length.
- To prevent movement of the push rod insert a screwdriver or a locking pin (20) through the bores in the yoke and push rod.
- Clean the concentric grooves in the cover (1) and the disc (7) and remove all liquid residues.
- Assemble diaphragm assembly. Coat screw (16) with Loctite, insert and tighten to required torque *(see assembly drawing, Section 9)*.
- Screw the diaphragm assembly to the push rod. Tighten clockwise finger-tight. Move out of the end position until the recesses line up with the holes in the yoke.
- Fit the cover (1), insert screws (14) and tighten to the required torque *(see assembly drawing).*
- Fit the diaphragm rupture monitoring device.

WARNING!

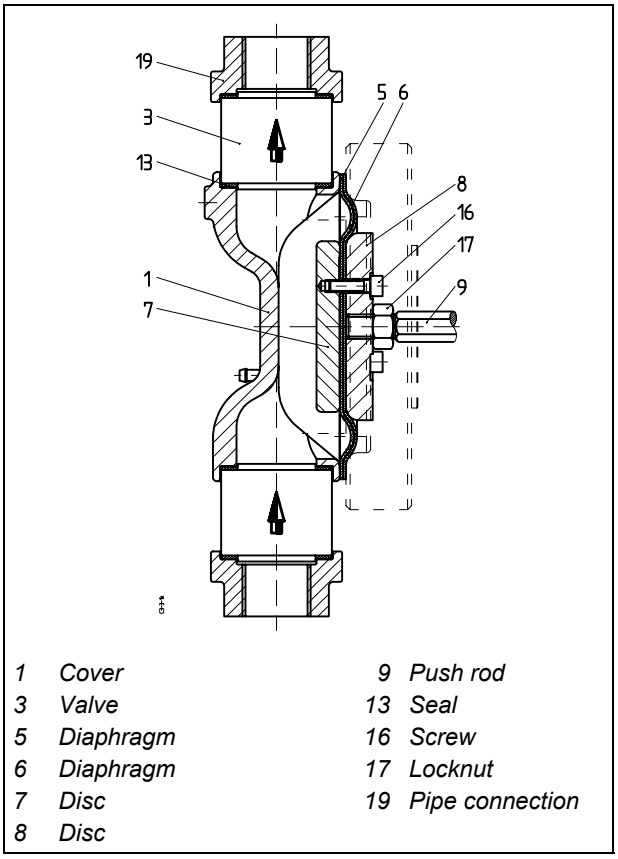
Risk of injury due to the loaded spring inside the gear unit.

If the pump yoke (2) is removed, the push rod (9) must be fixed by inserting a suitable tool (20) (screwdriver or locking pin) through the bores in the yoke and the push rod.

3.3.15.4 Replacement of the Diaphragm, Gear Models G3, G4, D3 and D4

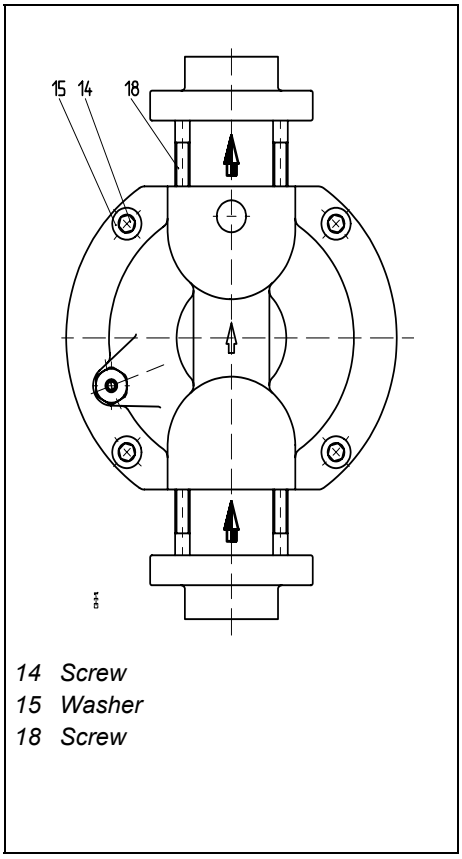
The replacement of the diaphragm in gear unit models G3, G4, D3 and D4 is shown in *Fig. 3.10, Fig. 3.11 and Fig. 3.12.*

See assembly drawings PM2-05 and PM2-06 in Section 9.



1 Cover
3 Valve
5 Diaphragm
6 Diaphragm
7 Disc
8 Disc
9 Push rod
13 Seal
16 Screw
17 Locknut
19 Pipe connection

Fig. 3.10: Sectional View



14 Screw
15 Washer
18 Screw

Fig. 3.11: View

Removal

Please note safety information in Section 1 *"Safety"* and Section 2 *"Metering Pump"*.

- Close the suction and pressure lines. Flush the pump head.
- Undo the pipework.
- Undo the screws (14) uniformly in a crosswise manner and remove the cover (1).
- Undo crosshead nut (21) and remove the push rod (9) with the diaphragm assembly. *(See Fig. 3.12).*
- Remove the double diaphragm by unscrewing the locknut (17) and the screws (16).
- Remove the diaphragm rupture monitoring device. Check and clean. Replace if damaged.

ATTENTION!

If a diaphragm is ruptured, the complete double diaphragm must be replaced.

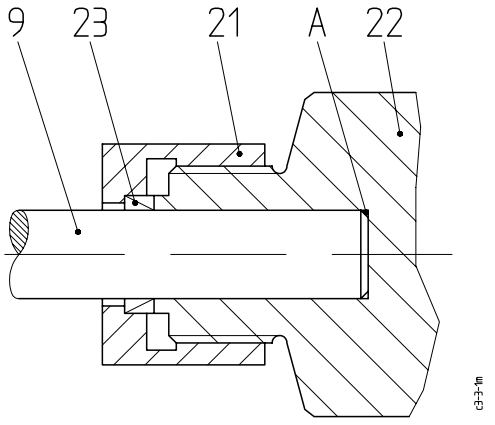
ATTENTION!

If both diaphragms are damaged, process fluid may have entered the yoke.

Please flush and clean carefully.
Replace push rod, if corroded.

Fitting

- Set the gear to "0" mm stroke length.
- Clean the concentric grooves in the cover (1) and the disc (7) and remove all liquid residues.
- Assemble diaphragm assembly. Coat screw (16) with Loctite, insert and tighten to required torque *(see assembly drawing, Section 9)*.
- Screw the locknut (17) finger-tight onto the push rod (9). Screw diaphragm assembly finger-tight onto the push rod (9) and secure by means of the locknut (17).
- Slide crosshead nut (21) and locking ring (23) onto the push rod (9). *(See Fig. 3.12).*
- Slide push rod (9) into the bore of the cross-head (22).



9 Push rod
21 Crosshead nut
22 Crosshead
23 Locking ring
A End of bore

Fig. 3.12: Push rod

ATTENTION!

Material damage to the pump and gear unit possible.

The push rod (9) must be fully inserted to the end of the bore (A).

- Align the recesses in the diaphragm with the holes in the pump yoke.
- Screw the crosshead nut (21) to the crosshead (22) and tighten.
- Fit the cover (1), insert screws (14) and tighten to the required torque *(see assembly drawing, Section 9).*
- Fit the diaphragm rupture monitoring device.

3.6 Valves

Configuration: Pump head *(see Fig. 3.1)*

For the valves used in the pump head see *"Drawings and parts lists" in Section 9*.

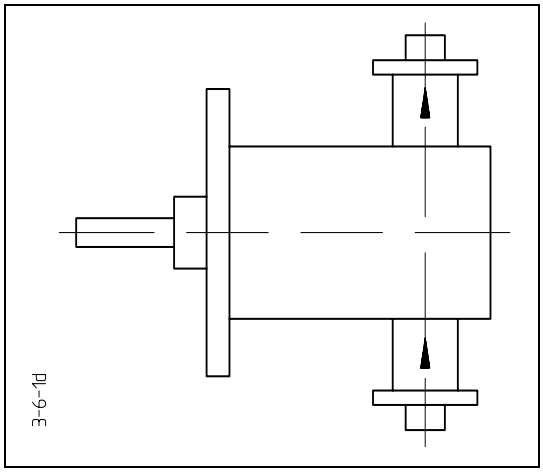


Fig. 3.1: Pump head

Function

The suction and discharge valves are self-acting valves, which operate due to underpressure or overpressure.

For the principle of operation, *see Section 3.3.*

Mounting

CAUTION!

Personal and material damage possible!

The following applies for plunger pumps:

If valves are inserted the wrong way round, this could lead to breakage of the pump head.

The following applies for diaphragm pumps:

If valves are inserted the wrong way round, the overflow valve opens. The hydraulic fluid heats up. This causes increased wear and tear. The diaphragms could be damaged!

Pay attention to the direction arrow of the valves *(see Fig. 3.1 to 3.8).*

- **Suction valve:** arrow points towards the product chamber
- **Pressure valve:** arrow points away from the product chamber

Impermissible heating of the hydraulic fluid can occur!

Prevent the overflow valve from opening for a longer period time. Ensure a constant form of temperature monitoring by means of

- **electrical alarm signal transmitting systems or**
- **regular checks.**

3.6.1 Ball version

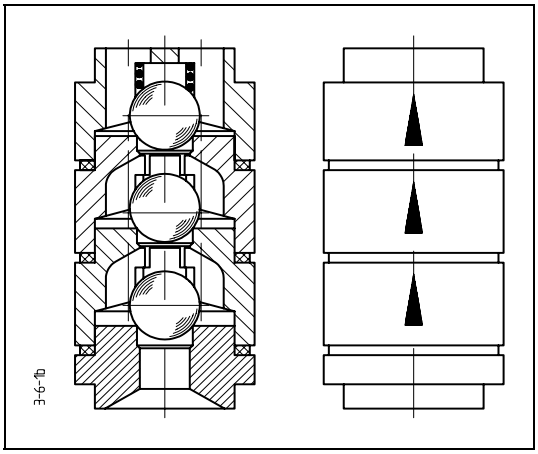


Fig. 3.2: Triple Ball Valve – Cross section and view

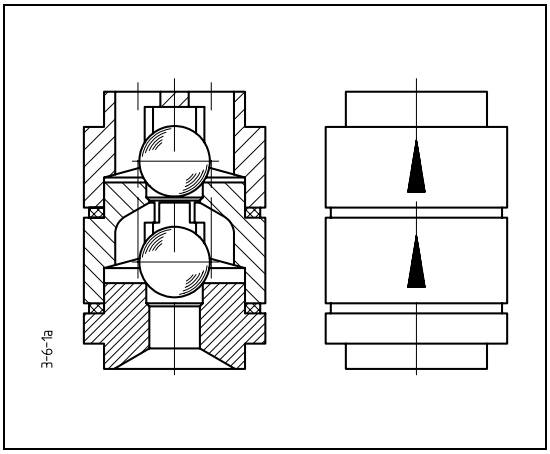


Fig. 3.3: Double Ball Valve – Cross section and view

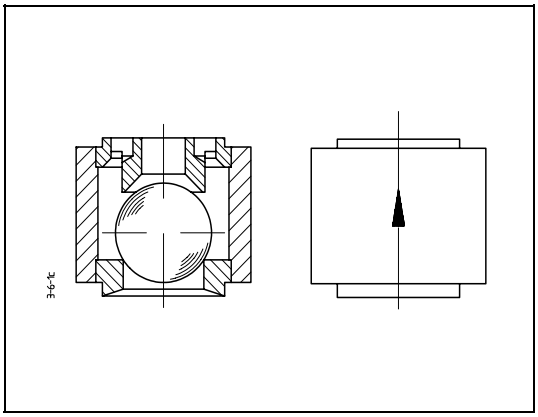


Fig. 3.4: Single Ball Valve – Cross section and view

3.6.2 Cone version

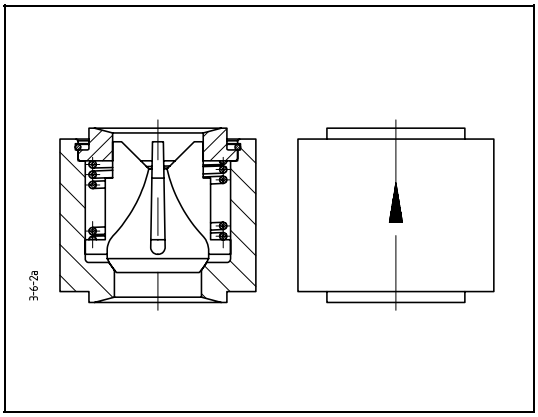


Fig. 3.5: Cone valve with spring – Cross section and view

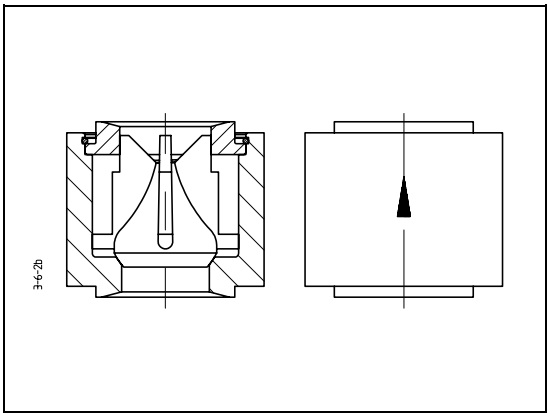


Fig. 3.6: Cone valve without spring -Cross section and view

3.6.3 Plate version

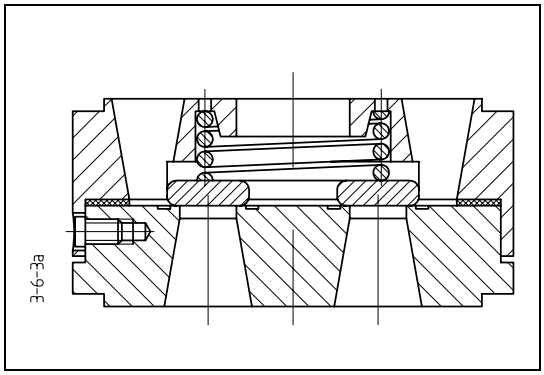


Fig. 3.7: Plate valve - Cross section

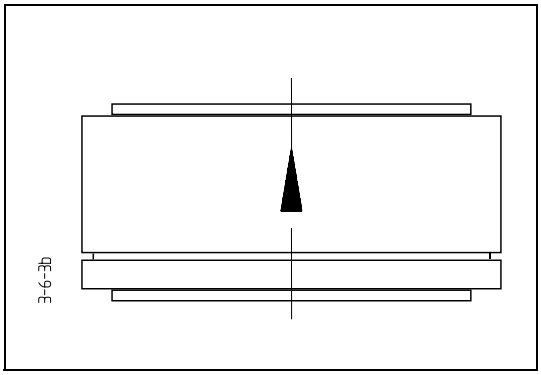


Fig. 3.8: Plate valve - View

4.1.1 Installation of machines

Prior to Installation

- Check the packaging of the metering or process pump for external damage. Open the packaging.
- Check the metering or process pump and its accessories for external damage.

BRAN+LUEBBE must be notified about any form of damage immediately.

Installation Location

If no alternative installation conditions have been agreed in the data sheet *(Section 1.2.1)*, the installation must be carried out in dry rooms without aggressive atmospheres.
In the case of outdoor installation, protection against precipitation, sandstorms and direct sunlight must be provided.

The ambient temperature must not be below -20°C (ProCam = 0°C) or above +40°C.

Foundations and Installation

WARNING!

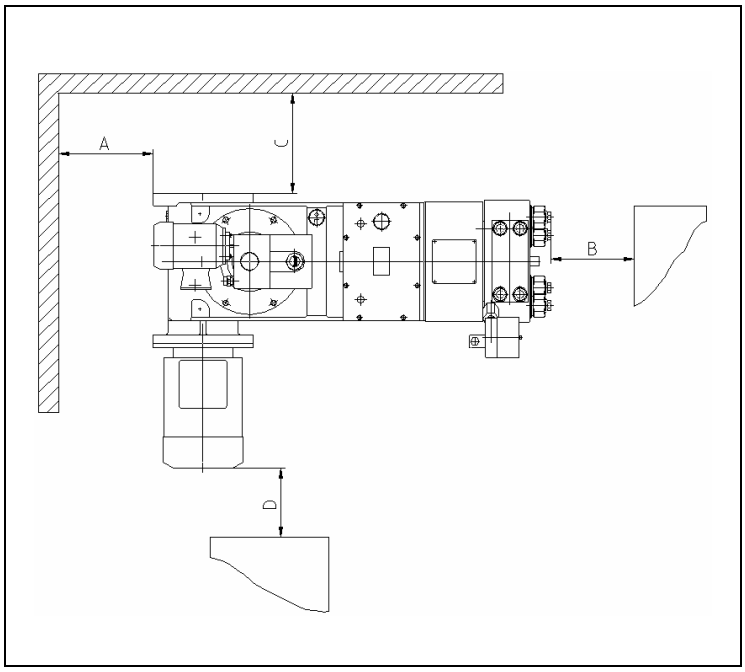
Note the overall weight of the metering/process pump! (*see the machine drawing* for details)

The foundations must be dimensioned in such a way as to bear the load of the overall weight of the pump plus all potential additional loads!

In particular, observe the max. permissible floor load when installing the pump in buildings!

It might be necessary to make an installation that is vibration dampened in order to prevent damage to parts of the building, system or machine caused by vibration stimulus.

The height of the foundation should be selected so that it is easy to carry out any operating or maintenance tasks.
Stroke length adjustment, stroke length display (if available), oil filling and oil draining, oil level inspection and plunger seal must be easily accessible.
When installing, make sure there is sufficient clearance space for maintenance work (e.g. for lifting equipment for dismantling operations during repair work) around and above the metering or process pump.

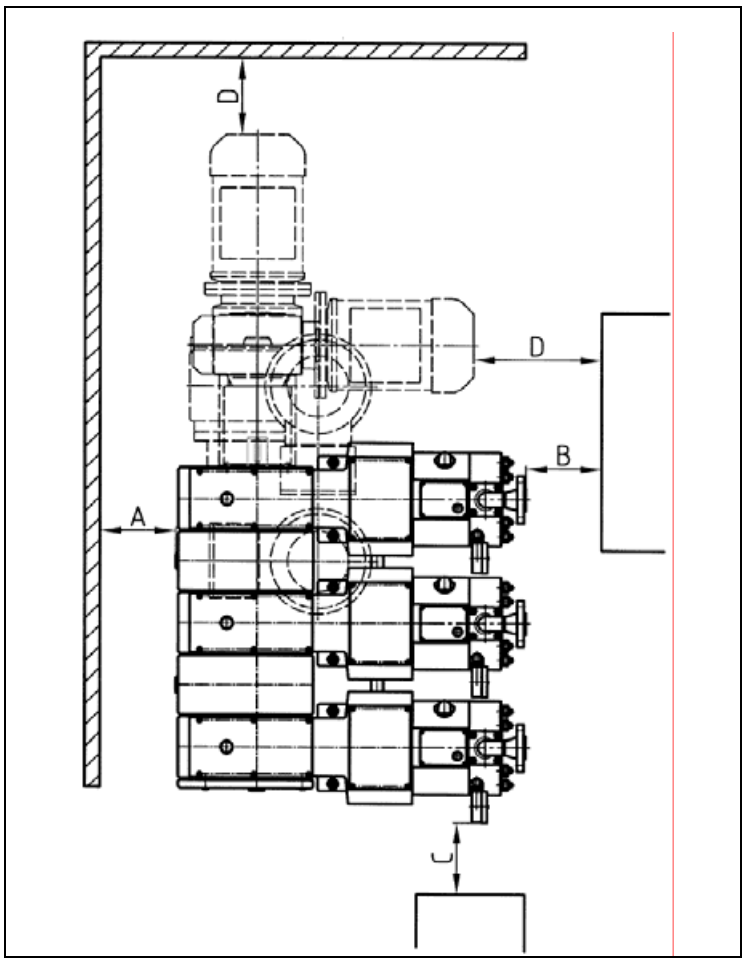


	H1 – H4	H5, H6
A	0.8m	1m
B	0.8m	1m
C	0.4m	0.5m
D	0.4m	0.5m
E*	0.8m	1m

** E= space above the pump*

The space requirements are standard values recommended by BRAN+LUEBBE!

Fig. 4.1: Installation plan for NOVADOS series



	N-020 N-040	N-080 N-160
A	1.2m	1.5m
B	1.2m	1.5m
C	0.8m	1m
D	1.2m	1.5m
E* Motor horizontal	1.2m	1.5m
E* Motor vertical	1.5m	1.8m

** E= space above the pump*

Fig. 4.2: Installation plan for NOVAPLEX series

- Place the metering or process pump on a foundation, frame, etc. so that it is *free from stress*.

WARNING!

Especially when at standstill, the roller bearings in the pump can be damaged by adjacent equipment units.

Protect these roller bearings against vibrations by means of a suitable (vibration-damping) foundation.

Install the pump in such a way that the maintenance staff can check the oil level without any problems.

- Screw the pump onto the fastening holes with fastening screws.
  Whereby they should be aligned so that the plunger axis is horizontal and the valve axis is vertical.

Electrical Connection

DANGER!

Electric shocks can kill you!

Any work on the electrical equipment must only be carried out by expert electrical personnel!
Electrical connections must comply with local regulations.

- **Dangerous voltages can be present due to faulty earthing. Carry out all work only when the system is de-energised!**
- **Prevent electrostatic charging!**
  Connect all electrically conductive parts securely to the equipotential bonding device.
- **If not included in the scope of supply, install an EMERGENCY OFF device. Without an EMERGENCY OFF device, accident prevention is not sufficiently guaranteed in the case of malfunction or incorrect operation of the pump.**
- **Use only those types of EMERGENCY-OFF switches that correspond to the equipment safety class *(see data sheet, Section 1.2.1)*.**
- **Provide overload protection or temperature monitoring.**

- Check the voltage, frequency, speed and power.
- Note the direction of rotation of the drive.

All earths, potential equalisation connections and monitoring devices are to be connected electrically.

Connection of the Pipework

- Clean the pipes thoroughly before connecting.
- Connect the pipes so as to be free from stress.
- Connect the pipework so that it is easy to remove the valve and dismantle the pump head.
- Support the pipe weight by means of retaining clamps.
- Compensate for pipe expansion by means of pipe bends.

CAUTION!

Personal and material damage possible!

Oscillating positive-displacement pumps can cause vibrations in the case of freely suspended pipework sections. Pipework can break off and injure you severely.

Secure the pipework at an adequate number of points with supports and/or retaining clamps.

Do not use the pipes as a climbing aid!

Lantern ring

CAUTION!

Damage to the pump head and gear /drive unit possible!

The following applies for pumps heads with a lantern ring:

Lubricate the lantern ring with a suitable liquid.
(See Section 4.3.2. "Installation examples")

General remarks

Danger through static charging!

When setting up in zone 1, do not attach any plastic signs or stickers which are larger than

100 cm² (Gas group II A / II B) or 20 cm² (Gas group II C).

4.2 Suction and Pressure Piping

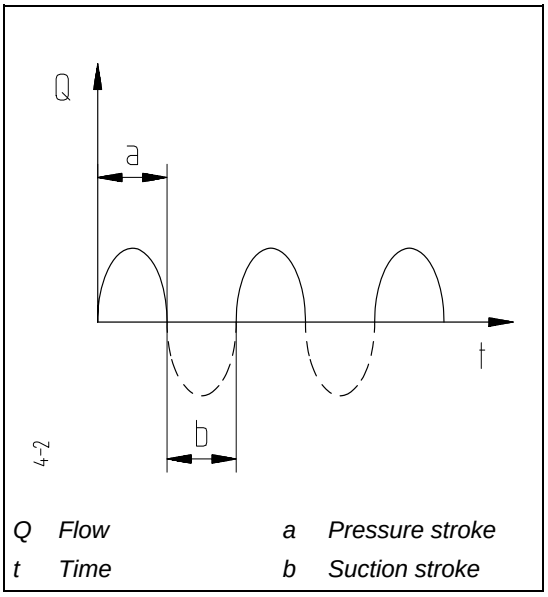
WARNING!

The suction and pressure piping must be properly de-signed and connected to the pump head.

Otherwise the pump head can be seriously damaged.

The pumps must never be allowed to work against a closed fitting!

Install a safety valve in the pressure line before the fitting.



Q Flow *a Pressure stroke*
t Time *b Suction stroke*

Fig. 4.2: Flow of a pump head

When opening safety and bleed valves, liquids and vapors must only be allowed to escape in areas where neither persons nor materials can be damaged.

Please note that when inflammable liquids or vapors escape, there can be a risk of explosion in the outlets of the safety and bleed valves.

When designing the suction and pressure lines, care must be taken to ensure that cavitation, overload and excessive demand do not occur due to the pulsating flows of the metering pump (*Fig. 4.2)*.

Prevention of	Cause	Result	Remedy
Cavitation	• pressure falling below the vapor pressure of the product	• loud noise • excessive valve wear • overload	• avoid high suction lifts • keep the pipe length as short as possible • sufficient nominal diameters • fit pulsation damper • fit pressure sustaining valve • decrease viscosity
Overload	• pressure peaks exceed the operating pressure	• permanent damage • forced rupture	
Excessive demand	• suction or pressure piping too long • suction pressure is higher than discharge pressure • pressure sustaining valve missing	• inaccurate metering • loud noise • excessive valve wear	

BRAN+LUEBBE will calculate the pipe work system on request.

For this, the following information will be required:

Product characteristics:

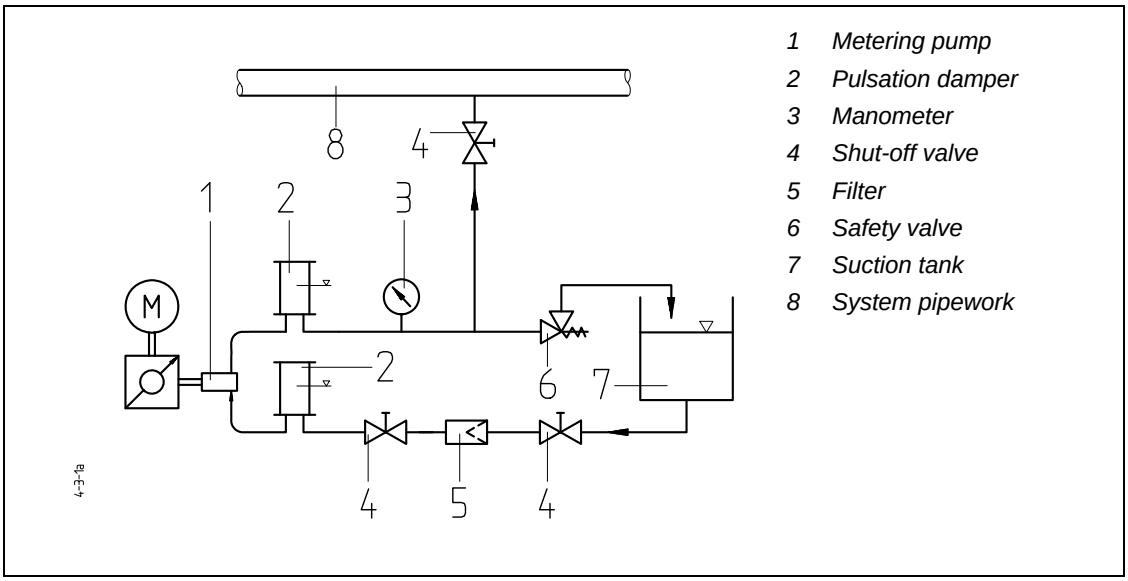
- Density
- Vapor pressure at working temperature
- Viscosity
- Settling speed, if product is a suspension

System data:

- Geodetic height
- Pressures on the suction and pressure side
- Length of pipe work
- Diameter of pipe work
- Number of bends
- Fittings
- Pipe work isometrics

4.3.1 Suction and Pressure Piping

The recommended accessories for installation on the suction and pressure side are listed in *Fig. 4.3.1*:



1 Metering pump
2 Pulsation damper
3 Manometer
4 Shut-off valve
5 Filter
6 Safety valve
7 Suction tank
8 System pipework

Fig. 4.3.1: Suction and Pressure Piping

WARNING!

To avoid personal injury and damage to the pump or related equipment, we recommend the installation of a safety valve!

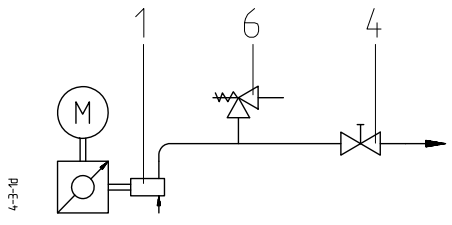
Installation of the Safety Valve *(Fig. 4.3.2)*

Aim:

To prevent the maximum permissible counter pressure from being exceeded.

Mounting position:

Between the pump pressure connection and the *first* shut-off valve. If a pulsation damper is fitted, the safety valve is fitted after the pulsation damper.



1 Metering Pump
4 Shut-off valve
6 Safety valve

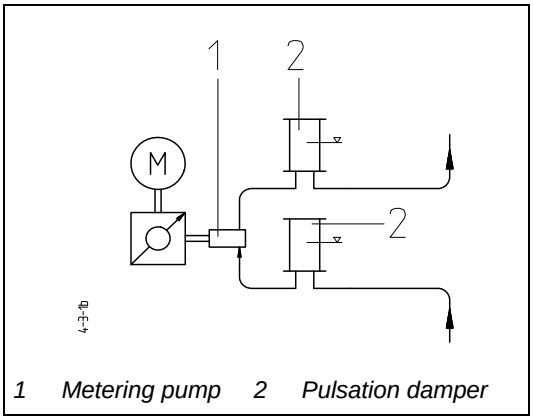
Fig 4.3.2: Safety valve

Mounting of Pulsation Dampers *(Abb. 4.3.3)*

Aim:
Dosing with fewer pulsations;
prevention of cavitation and overload.

Mounting position:

Directly in front of the suction connection or behind the pressure connection of the pump head.



1 Metering pump 2 Pulsation damper

Fig. 4.3.3: Pulsation damper

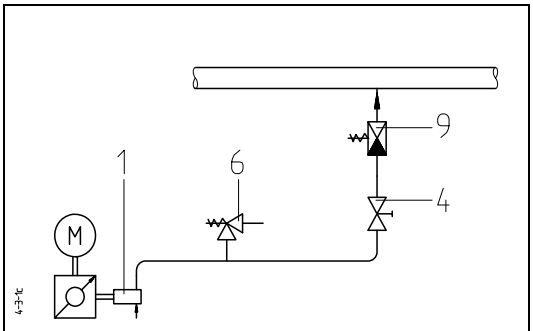
Installation of the Pressure Control Valve *(Fig. 4.3.4)*

Aim:

Prevention of excessive conveyance and excessive mass acceleration.

Mounting position:

Vertically at the end of the pressure line.



1 Metering pump
6 Safety valve
4 Shut-off valve
9 Pressure control valve

Fig. 4.3.4 Pressure control valve

Prevent the pump from running dry during operation!

If this is not done, explosive gas mixtures can form inside the pump head.

If necessary, install protective equipment to prevent lack of product, e.g.

- **level switch in the supply or intermediate tank (if necessary, an additional foot valve.)**
- **flow monitors in the suction line**

When product is lacking, the protective equipment must activate the automatic shut off of the pump or generate an alarm which will lead to the immediate shut off of the pump by the operator.

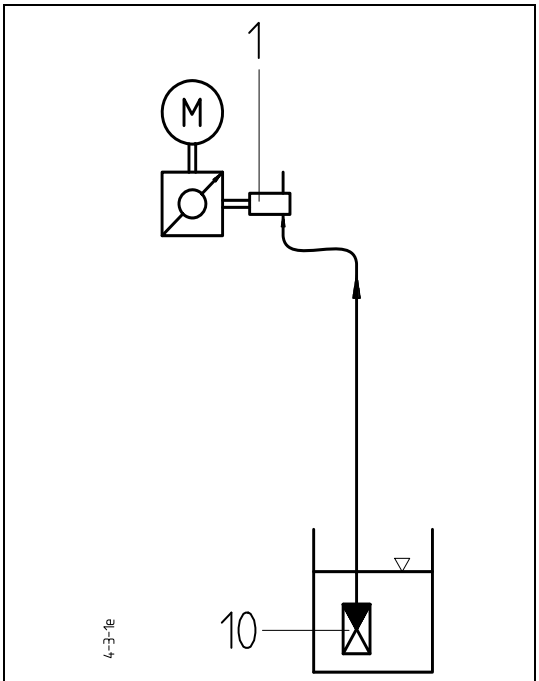
Installation of a Foot Valve *(Fig. 4.3.5)*

Aim:

To prevent the suction line from running dry in the case of high suction lifts.

Mounting position:

Vertically near the bottom of the reservoir.



1 Metering pump 10 Foot valve

Fig. 4.3.5: Foot valve

Installation of a Surge Tank *(Fig. 4.3.6)*

Aim:

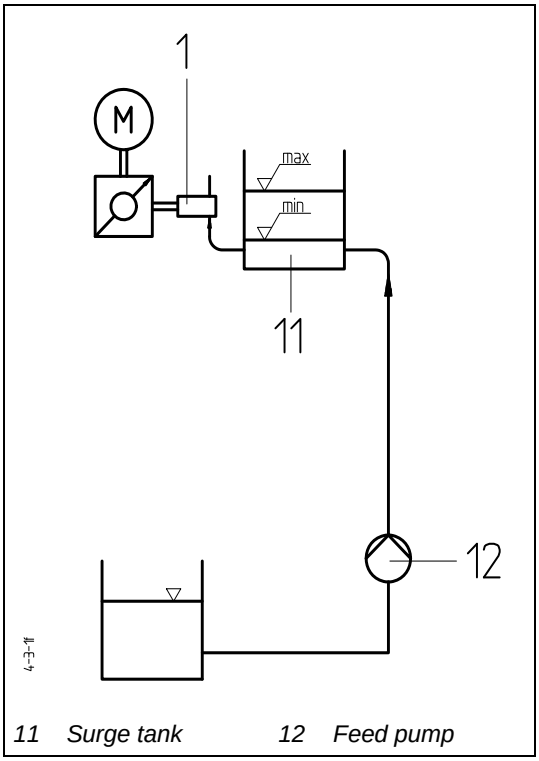
Reduction of suction lift.

Mounting position:

Same level as the metering pump.

Filling:

Via a feed pump (12) with max./min. control.



11 Surge tank 12 Feed pump

Fig. 4.3.6: Surge tank

5.1.21 ProCam Gearbox

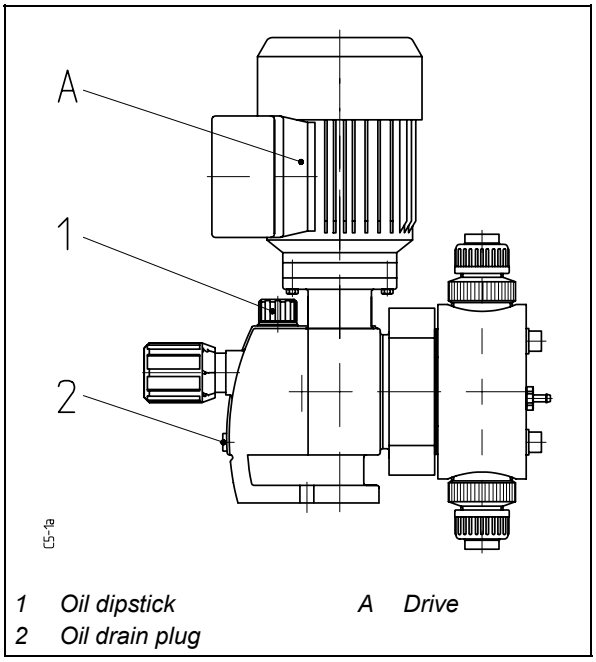
ATTENTION!

Gear unit damage possible due to inadmissible temperature rise and wear and tear!

The gear units are delivered <u>without</u> being filled with oil.

Fill with oil prior to putting into service.
(See Section 5.1 and 5.2).

Oil quantity: *(see Section 1.1), Data sheet*
Oil brand: *see Section 5.2*



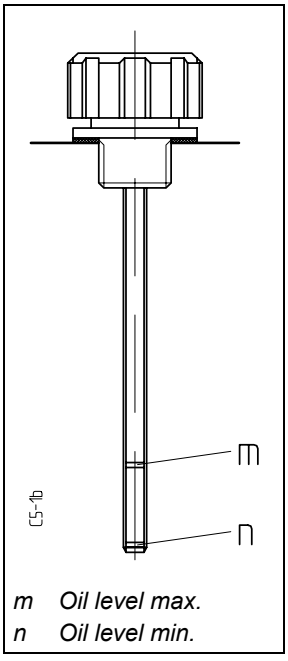
1 Oil dipstick
2 Oil drain plug
A Drive

Fig. 5.1: View, e.g. Gear G1

Refer to *Fig.5.1 and 5.*2 in connection with the following instructions.

First Filling

- Unscrew the oil dipstick (1).
- Fill with required amount of oil.
- Screw in the oil dipstick (1).
- Start drive (A) for a short period.



m Oil level max.
n Oil level min.

Fig. 5.2: Oil dipstick

Checking the Oil Level

Make sure that the oil is always up to the minimum level; make good any oil loss.

Check the oil level at least once a week if there is no continuous automatic monitoring of the oil level.

If the oil falls below the minimum permissible level, switch off the pump immediately!

- Switch off the drive (A).
- Unscrew the oil dipstick (1) and wipe off the oil.
- Screw in the oil dipstick (1) and unscrew it again.
- The oil level must be between max. and min. *(see Fig. 5.2*).
- If an oil gauge is fitted, the oil level should be visible in the middle of the gauge.

Oil change

Every 4000 operating hours / half-yearly.

Oil Draining

CAUTION!

Gear oil heats up during normal operation and can be sprayed out when being drained. Severe burns in the face and on the hands possible.

Avoid skin contact.

Wash your hands properly each time after coming into contact with gear oil.

Wear protective equipment!

Use sufficiently large collecting containers.

Open the oil drain plug (2) and drain the oil.

Oil Filling

See "First Filling".

5.2.1 For gears of the H1, ProCam, K, J, D, C, DS, CS, KH, DH, DSH, KA, DA, DF, F series

For ambient temperatures of between 0°C and +40°C (32°F and 104°F)

Suitable gear oils are mineral oil based gear oils with a nominal viscosity of approx. 100 to 220mm²/s (c.st) at 40°C (104°F).

You will find examples of oil types in Table 5.1:

Brand	Gear oil	mm²/s (c.st) at approx. 40°C
ARAL	Aral Degol BG	100 A nominal oil viscosity higher than 220mm²/s is recommended for continuous ambient temperatures of between 30°C and 40°C (86°F and 104°F).
BP	BP Energol GR-XP	
ESSO	Spartan EP	
FUCHS	Renep Compound	
MOBIL	Mobilgear	
SHELL	Shell Omala Öl	
DEA	Astron HLP Falcon CLP	
TEXACO	Meropa	
Wintershall	Ersolan	

Table 5.1: Gear oil

For ambient temperatures of between - 40°C and +50°C (- 40°F and 122°F)

Suitable oils are multi-grade, mineral oil based gear oils with a nominal viscosity of approx. 70 to 100mm²/s (c.st) at approx. 40°C (104°F).

You will find examples of oil types in Table 5.2:

Brand	Gear oil	mm²/s (c.st) at approx. 40°C
ARAL	HYP SYNTH	78
DEA	Deagear SX 75W-90	97
ESSO	GX 75W-90	100
SHELL	HD 75W-90	77

Table 5.2: Gear oil

WARNING!

The temperature of the gear oil should NOT exceed 90°C (194°F) during operation.

If a higher oil temperature is reached during operation, the service life of the oil will be reduced!

Comply with the notes in *Section 5.1.*

5.3.5 ProCam

The following instructions must be followed before starting the metering pump:

- Check oil filling
  (see Section 5.1).
- Readjust stroke length with indicator dial, if necessary, e.g. after transport
  (see Section 3.2).
- Check whether the metering pump is protected against overpressure.
  For safety valves *see Section 4.3.1*.

Electrical Connection

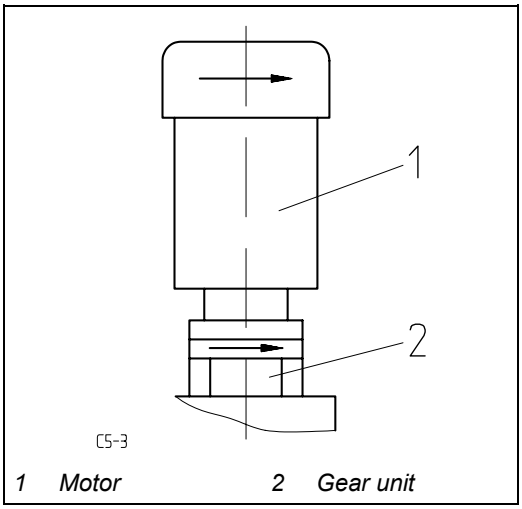
DANGER!

Electric shocks can kill you!

The motor must only be connected by qualified personnel!

The pumps must be included in the equipotential bonding system of the pump installation (e.g. by means of the motor earth).

- Connect drive motor (1).
- Check the direction of rotation of the drive motor (1).
  An arrow on the fan cover of the motor and the gear unit indicates the direction of rotation *(see Fig. 5.1*).



1 Motor *2 Gear unit*

Fig. 5.1: Direction of Motor Rotation

ATTENTION!

An enormous rise in pressure can result in an inadmissible build-up of heat in the pump head and cause damage to parts of the pump head.

- **Do not start up the pump with closed shut-off valves in the pressure and suction lines.**
- **Install a safety valve in the pressure line.**
- **Do not close the shut-off valves in the pressure and suction lines when the pump is still in operation.**

For machines with frequency converters, the following information applies:

Do not change any data (e.g. frequency range and torque characteristics) adjusted by BRAN+LUEBBE until you have consulted with BRAN+LUEBBE first!

The pumps must never be allowed to work against a closed fitting!

Install a safety valve in the pressure line before the fitting.

Prevent the presence of gas bubbles in the pumping space of the pump head and in the suction and pressure pipeline system!

When the pump is started up and is being operated, the pumping chamber of the pump head and the suction and pressure pipeline system must be filled with liquid at all times.

If this cannot be guaranteed by the owner-operator, he must provide for the necessary monitoring measures. An available option is the use of a bleed valve on the pump head (not part of the standard equipment!).

When opening safety and bleed valves, liquids and vapours must only be allowed to escape in areas where neither persons nor materials can be damaged.

Please note that when inflammable liquids or vapours escape, there can be a risk of explosion in the outlets of the safety and bleed valves.

Permissible ambient temperature = 0°C to +40°C.

The following applies for diaphragm pumps:
Maximum permissible product temperature = 90°C.

The following applies for plunger pumps:
Maximum permissible product temperature = 80°C.

Prevent letting the pump run dry during operation! If this is not done, explosive gas mixtures can form inside the pump head.

If necessary, install protective equipment to prevent lack of product, e.g.

- **level switch in the supply or intermediate tank (if necessary, an additional foot valve.)**
- **flow monitors in the suction line**

When product is lacking, the protective equipment must activate the automatic shut off of the pump or generate an alarm which will lead to the immediate shut off of the pump by the operator.

Diaphragm pumps, which pump inflammable liquids, must only be used with a diaphragm rupture monitoring device.

The rupture of a diaphragm should be indicated automatically when inflammable liquid is pumped.

Switch the pump off immediately if a membrane ruptures.

Please also note the following information when using **plunger pumps**:

Increased risk of explosion due to unintentional change of zone!

When inflammable media are pumped by means of plunger pumps, permanently explosive atmospheres can be produced by impermissible leakage.

- **Check the plunger seals for impermissible leakage every week;**
- **Switch off the plunger pump immediately in the case of impermissible leakage.**
  Replace the seals with original spare parts!

Also observe the details in section 3.3.16.1 *"Plunger Seal".*

Commissioning

- Open all shut-off devices in the suction and pressure lines.
- Open all shut-off devices if heating or cooling pipes are present.
- Make sure that product is available.
- Set stroke length to "0" mm.
- In the case of a variable-speed drive (1), said the speed to low.
- Start the drive.
- Set the stroke and speed slowly up to maximum.
- Allow the metering pump to run without pressure so that the pipework is well vented.
- Check the seals on the pump head and pipework and inspect during commissioning.

If the metering pump does not prime due to the suction lift being too great:

- supply pressure must be generated on the suction side, or
- the suction lift must be reduced. *(See Section 4.3.1).*

When the suction and the pressure lines are filled and vented,

- increase the pressure slowly up to the operating pressure.
- set the torque and stroke length to the required values.

5.4.2 Adjustment of the capacity for metering pumps with variable stroke lengths

The stroke length to be set for a required capacity is calculated from the max. stroke length, the required capacity and the max. capacity.

The max. capacity is calculated by BRAN+LUEBBE from the following data:

- An assumed volumetric efficiency of 98% and
- a number of strokes, which has been calculated from the nominal speed of the drive motor.

Under normal operating conditions, it is sufficient to determine the stroke length using the following equation:

$$\text{Stroke setting (mm)} = \text{Stroke}_{\text{max}}\text{(mm)} \times \frac{\text{Capacity}_{\text{required}}\text{(l/h)}}{\text{Capacity}_{\text{max.}}\text{(l/h)}}$$

or

$$\text{Stroke setting (\%)} = 100\ \text{(\%)} \times \frac{\text{Capacity}_{\text{required}}\text{(l/h)}}{\text{Capacity}_{\text{max.}}\text{(l/h)}}$$

Stroke $_{max}$: *see Data sheet, Section 1.2.1, line 37*
Capacity $_{max}$: *see Data sheet, Section 1.2.1, line 21*
Capacity $_{required}$: specified by the owner-user of the metering pump

Example

The following values are assumed in the example:

Stroke $_{max}$: 8 mm
Capacity $_{max}$: 245 l/h
Capacity $_{required}$: 200 l/h

$$\text{Stroke setting} = 8\,\text{mm} \times \frac{200}{245} = \underline{\underline{6.53\,\text{mm}}}$$

or

$$\text{Stroke setting} = 100\,\% \times \frac{200}{245} = \underline{\underline{81.6\,\%}}$$

Under special operating conditions however, such as:

- High operating pressures and
- low plunger diameters,

the stroke length setting calculated above should be corrected, as it depends on operating data such as operating pressure, viscosity, length of suction and pressure lines, arrangement etc. An exact configuration of the stroke length setting to capacity can therefore only be determined under operational conditions.

When normal operating conditions prevail, you can continue directly with *Section 5.4.2.1.*

Correcting the stroke length setting by determining the capacity

To determine the capacity during operation, you measure

- the volume that is pumped in 100 strokes, and
- the actual number of strokes.

Two possible ways of measuring the volume are described below:

Measuring the volume on the suction side *(Fig. 5.1)*

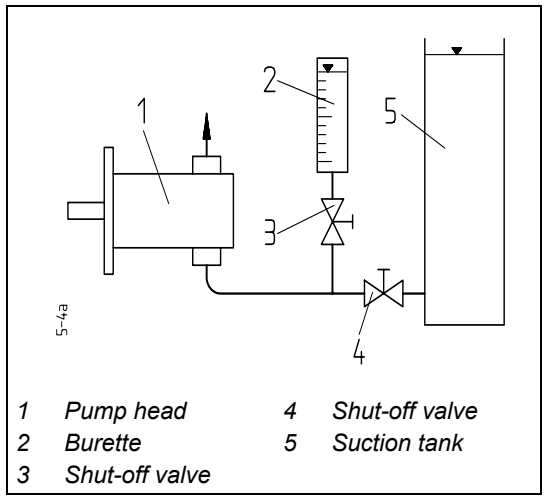
Prior to the measurement:

- Fill and vent suction and pressure lines.
- Operate the metering pump for a short time.
- Adjust the stroke length to 6.53 mm or 81.6% as calculated in the example.

Measurement

- Open shut-off valves (3) and (4).
- Fill the burette (2) up to the calibration mark.
- Close the shut-off valve (4).
- Meter 100 strokes from the burette (2).

  Measurement result = $V_{100\ strokes}$ (cm^3)



1 Pump head
2 Burette
3 Shut-off valve
4 Shut-off valve
5 Suction tank

Fig. 5.1: Measuring the volume on the suction side

Measuring the volume on the pressure side *(Fig. 5.2)*

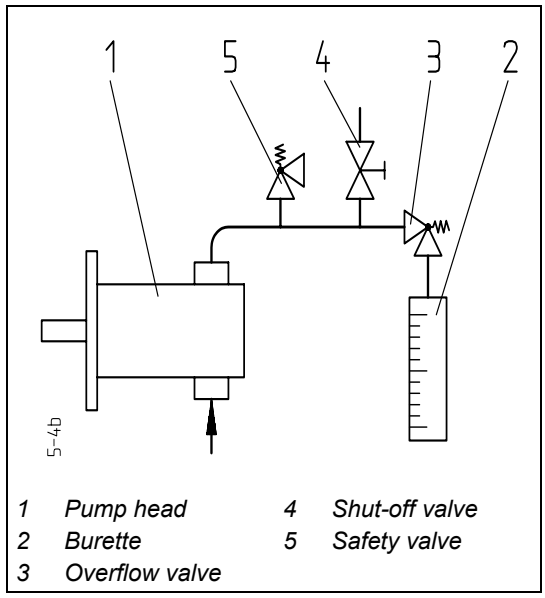
Prior to the measurement:

- Fill and vent suction and pressure lines.
- Operate the metering pump for a short time.
- Adjust the stroke length to 6.53 mm or 81.6% as calculated in the example.

Measurement

- Set the overflow valve (3) to operating pressure.
- Close the shut-off valve (4).
- Meter 100 strokes from the burette (2).

  Measurement result = $V_{100\ strokes}$ (cm^3)



1 Pump head
2 Burette
3 Overflow valve
4 Shut-off valve
5 Safety valve

Fig. 5.2: Measuring the volume on the pressure side

Determining the number of strokes under operating conditions

The actual number of strokes is required for converting the measured volume to the measured capacity:

- Count the actual number of strokes per minute.

Capacity in operation

The Capacity $_{op.}$ is calculated from the Volume $V_{100\ strokes}$ *(Fig. 5.1 or 5.2)* and the actual number of strokes. For the example calculation, it is assumed that $V_{100\ strokes}$ = 2,150 cm^3 and the actual number of strokes = 150 strokes/min.

$$\text{capacity}_{\text{op.}} = V_{100\ \text{strokes}} \bullet \frac{\text{actual number of strokes} \bullet 60}{100 \bullet 1{,}000}\ (\text{l/h})$$

$$\text{capacity}_{\text{op.}} = 2150 \bullet \frac{150 \bullet 60}{100 \bullet 1{,}000}$$

$$\text{capacity}_{\text{op.}} = 193.51\ \text{l/h}$$

Determining the stroke length setting under operating conditions

The corrected stroke length setting is calculated from the Capacity $_{op.}$ and the stroke setting calculated in the example on Page 1:

$$\text{stroke length setting}_{\text{corr.}} = \text{stroke length setting}_{\text{theo.}} \bullet \frac{\text{capacity}_{\text{required}}}{\text{capacity}_{\text{op.}}}$$

$$\text{stroke length setting}_{\text{corr.}} = 16.33 \bullet \frac{200}{193.5} = 6.75\ \text{mm}$$

$$\text{stroke length}_{\text{corr.}} = 81.6\% \bullet \frac{200}{193.5} = 84.3\%$$

5.4.2.1 Determining the flow rate curve

Another way in which to determine the appropriate stroke length setting for the required capacity is to use a flow rate curve. A flow rate curve can be produced very easily for the specific operating conditions due to the linear dosing characteristic of the pump:

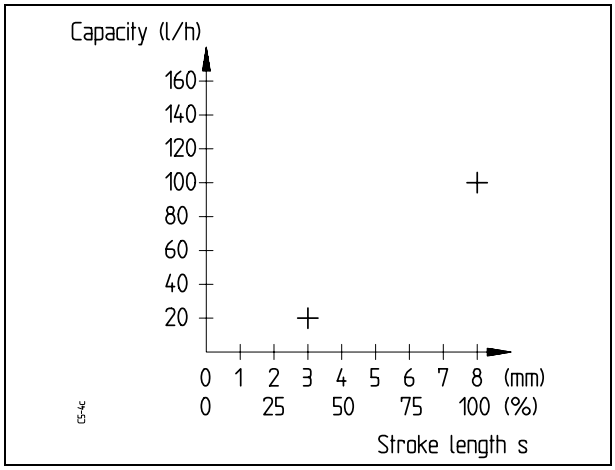
- Calculate the corrected or normal stroke length setting for a required capacity according to the method described under 5.4. Repeat the calculation for a further required capacity.

  The example values in *Table 5.1* are based on a max. stroke of 8 mm and an operating pressure of 10 bar.

Required capacity (l/h)	20	100
Corrected (normal) stroke setting in mm: or in %:	3 37.5	8 100

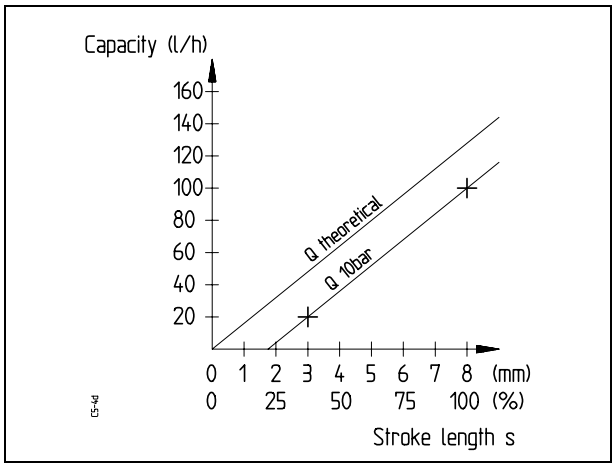
Table 5.1: Example

- Enter the values into a graph, which has the corrected or normal stroke length setting as its x-axis and the capacity as its y-axis.



- Draw a straight line through the two points.

  The straight line does not pass through the origin. A straight line through the origin would correspond to the theoretical capacity of a volumetric efficiency of 100%, which does not take into account the operating conditions.



The flow rate curve is only valid as long as the operating conditions (e.g. operating pressure and type of medium) stay the same!

6.1.1 Maintenance and Inspection

General remarks

The performance of regular, complete and conscientiously performed maintenance, inspection and cleaning work by technically competent, trained and qualified personnel guarantees trouble-free operation of the pump, increases the product quality and avoids interruption to production.

CAUTION!

Improper maintenance of the pump can result in personal and material damage.

Have all maintenance, inspection and cleaning work carried out by technically competent, trained or qualified personnel only.

Fundamentally, all maintenance, inspection and cleaning work on the pump must only be carried out with the pump in a properly protected, safe condition.

CAUTION!

Prior to performing any maintenance, inspection and cleaning work, all connections of the pump to sources of energy must be disconnected.

In particular, isolate the connections to the pneumatic source and the electrical connection.

Make sure that all auxiliary systems, drives and additional equipment (piping, pipework) of the pump to be maintained / repaired are switched off and depressurised.

On completion of the maintenance, inspection and cleaning work, all external objects such as tools, cleaning agents, cleaning rags, etc. must be removed from the pump area.

After maintenance, inspection and cleaning work has been completed, check whether all protective devices have been re-installed and are fully operational again.

Checks during production are also necessary in addition to the maintenance, inspection and cleaning work. *(See Table 6.1 to 6.8)*

Drive

The name and the type of drive can be found in the data sheet *(see Section 1.2.1)*.

Since the drive is not a BRAN+LUEBBE product, please observe the maintenance regulations of the manufacturer. These documents are included in *Section 10 "Accessories"*.

Gears

The following Table 6.1 includes information regarding checks and maintenance.
Applicable for the NOVADOS series, types B, BS, C, CS, D, DA, DF, DH, DS, DSH, J, K, KA, KH, KK, H1.

What		When		Who	Reference (Section)
		Normal atmosphere	Ex Zone		
Oil level	***Check***	weekly		Operator	5.1.
Surface temperature gear housing (oil temperature)	***Check***	-	weekly	Operator	5.1.
Oil change B*, BS*		annually every 8,000 h		Specialist	5.1.
B*, BS*, C, CS, D, DA, F, DF, DH, DS, DSH, J, K, KA, KH, KK, H1		half-yearly every 4,000 h			
Bellows B, BS, CS, DS, DSH, KA, KK, H1, (J, C **)	***Check***	monthly		Operator	3.1.
Plunger restraint	***Check***	half-yearly	quarterly	Operator	3.5
Coupling (between motor and gear)	***Check***	in accordance with manufacturer instructions		Specialist	3.1.
	Change	when the wear limit is reached			
Coupling(s) (between multiple gears)	***Check***	after 25,000 h at the latest in accordance with manufacturer instructions		Specialist	3.1.
	Change	when the wear limit is reached			
Toothed belt KK	***Check***	every 4,000 h	monthly	Specialist	3.1.
	Change	every 8,000 h			

Table 6.1: Maintenance Intervals Gears

h = hours of operation

* *In adverse conditions half-yearly oil change*

** *Special model for operation in Ex - zones*

Gears of the H series

The following Table 6.2 includes information regarding checks and maintenance.
Applicable for the NOVADOS series, types H2, H3, H4, H5 and H6.

What		When		Who	Reference (Section)
		Normal atmosphere	Ex-Zone		
Oil level	***Check***	weekly		Operator	5.1.
Surface temperature gear housing (oil temperature)	***Check***	-	weekly	Operator	5.1.
Oil change		every 2 years * every 16,000 h *		Specialist	5.1.
Plunger restraint	***Check***	half-yearly	quarterly	Operator	3.5
Crosshead seal	***Check***	quarterly	monthly	Specialist	3.1.
	Change	every 16,000 h			
Coupling (between motor and gear)	***Check***	in accordance with manufacturer instructions		Specialist	3.1.
	Change	when the wear limit is reached			
Coupling(s) (between multiple gears)	***Check***	after 25,000 h at the latest in accordance with manufacturer instructions		Specialist	3.1.
	Change	when the wear limit is reached			

Table 6.2: Maintenance interval for H series gears

h = hours of operation

* ***Applies only to oil operating temperatures up to max. 80°C.***

If the operational oil temperature exceeds 80°C, an oil change is recommended after 8.000 hours of operation (continuous operation) or after 1 year of operation (intermittent operation).
Alternatively the working life of the oil can be determined by half-yearly oil analyses (e.g. by the lubricant manufacturer).

Gears of ProCam

The following *Table 6.3* includes information regarding checks and maintenance recommended by BRAN+LUEBBE.
Unless mentioned separately elsewhere, this information applies to gear units G1, G2, A1, A2, G3, G4, D3 and D4.

What	When *h = hours of operation*	Who	Reference (section)
Oil level ***Check***	weekly	Operator	5.1.
Oil temperature ***Check***	weekly	Operator	5.1.
Oil change	half-yearly / every 4,000 h	Specialist	5.1.
Plunger clamping ***Check***	half-yearly	Operator	3.5

Table 6.1: Maintenance Intervals Gear Unit

NOVAPLEX and NOVAPLEX *Integral* drive units

The following Table 6.4 includes information regarding checks and maintenance.
Applicable for the NOVAPLEX / NOVAPLEX *Integral* series, types NT010, NT020, NT040, NT080 and NT160.

What		When		Who	Reference (Section)
		Normal atmosphere	⟨Ex⟩-Zone		
Oil level	***Check***	weekly		Operator	5.1.
Surface temperature gear housing (oil temperature)	***Check***	-	weekly	Operator	5.1.
Oil	***Change***	annually * every 8,000 h *		Specialist	5.1.
Plunger restraint	***Check***	half-yearly	quarterly	Operator	3.5
Coupling(s) (in drive chain)	***Check***	in accordance with manufacturer instructions		Specialist	3.1.
	Change	when the wear limit is reached			
Crosshead seal	***Check***	quarterly	monthly	Specialist	3.1
	Change	every 16,000 h			
Bellows **	***Check***	half-yearly	quarterly	Operator	3.1

Table 6.4: Maintenance intervals NOVAPLEX drive units

h = hours of operation

* *Alternatively the working life of the oil can be determined by half-yearly oil analyses (e.g. by the lubricant manufacturer).*

** ***Not** for NOVAPLEX Integral*

Observe the following ⟨Ex⟩ instructions for all gears and drive units:

Oil deficiency and loss of oil lead to an impermissible rise in temperature!

If no electrical monitoring devices are connected, check the oil level in the gears/drive unit weekly.

Immediately replace damaged sealing elements such as the bellows (if there is one) or U-packing rings with original spare parts.

Compensate any loss of oil.

If no electrical monitoring devices are connected, check the surface temperature of the gear / drive unit at the hottest external point or in the oil every week.

The gear / drive unit must not be used if the oil temperature is higher than 90°C!

Roller bearing

The roller bearings fitted in your pump have been dimensioned in accordance with internationally recognized rules and regulations.

In the NOVADOS series, the nominal, rated life cycle of the roller bearing is approx. 25,000 operational hours.
In the NOVAPLEX/NOVAPLEX *Integral* series, the nominal, rated life cycle of the roller bearing is approx. 50,000 operational hours.*****
Nevertheless, the working life achievable for roller bearings depends to a significant degree on the actual operating conditions and can therefore be very different in practice.

- **Ensure there is adequate lubrication!**
- **Follow instructions for checking and changing lubricants!**
- **Only use lubricants recommended by BRAN+LUEBBE!**
- **Look out for unexpected noises developing, vibrations and increased oil temperatures. These can be indications of incipient or advanced damage to bearings!**
- **BRAN+LUEBBE recommends renewing roller bearings when the nominal, rated life cycle is reached, even if there are no detectable signs of bearing damage!**

Depending on their condition, roller bearings can be replaced by using recognized testing methods (e.g. structural sound measurement with appropriate signal analysis and signal evaluation ➔ refer to VDI 3832)

***** *Special model crosshead pivot bearing as roller bearing:*
The nominal, rated life cycle of this roller bearing is approx. 25,000 operational hours.

Roller bearing	Recommended replacement intervals	Who	Reference (Section)
NOVADOS series **Roller bearing (crankshaft worm gear and crosshead)**	every 25,000 h every 36 months	Specialist	3.1
NOVAPLEX, **NOVAPLEX *Integral* series** **Roller bearing (crankshaft, connection-rod main bearing)**	every 50,000 h every 72 months	Specialist	3.1
Special model **Roller bearing (crosshead pin)**	every 25,000 h every 36 months	Specialist	3.1

Table 6.5: Maintenance intervals roller bearings

Avoid unacceptable temperature increases or sparks forming as a result of bearing damage!

Check roller bearings regularly using recognized testing methods (e.g. structural sound measurement with appropriate signal analysis and signal evaluation ➔ refer to VDI 3832).

<u>Monitoring interval:</u>

In general, it is impossible to prescribe the time interval to be chosen between two diagnostic measurements. It depends on:

- **The operating conditions of the bearing,**
- **The advance warning needed (which again should consider the difficulty of tracking damage to a bearing which has not yet been detected).**

Intervals of a few weeks are usually acceptable in the case of intermittent monitoring (offline systems).

However, the maximum degree of safety will only be achieved by continuous monitoring with installed sensors (online systems).

If diagnostic monitoring methods are used in online or offline procedures, roller bearings can be replaced in dependence on their condition on reaching defined signal thresholds.

If diagnostic inspection of the roller bearings is not possible, alternative measures must be taken to prevent inadmissible temperature rises or sparking effectively, e.g. by using temperature and/or oil level sensors!

In this case BRAN+LUEBBE recommends the preventive replacement of roller bearings if they have reached their nominal, calculated service life!

Diaphragm pump head (hydraulic actuation)

The following Table 6.6 includes information regarding checks and maintenance.

What		When		Who	Reference (section)
		Normal atmosphere	Ex-Zone		
Hydraulic oil fluid	***Fill level check***	monthly	weekly	Operator	3.3.
	Oil temperature check	weekly			
	Oil change	annually every 8,000 h		Specialist	
Plunger seal	***Check***	*see "fill level check of hydraulic fluid"*		Operator	3.3.
	Change	annually every 8,000 h		Specialist	
Flange joints of suction and pressure valve	***Leak tightness check***	monthly	weekly	Operator	
	Seal replacement	not tight/leakage*		Specialist	
Flange joints of the pipe connections	***Leak tightness check***	monthly	weekly	Operator	
Diaphragms	***Check***	weekly		Operator	3.3.
Rupture indicator	***Replacement of diaphragm***	annually every 8,000 h every 4,000 h **		Specialist	

Table 6.6: Maintenance intervals diaphragm pump head

h = hours of operation

* ***Recommendation:***

Whenever the diaphragm is being changed, always replace the valve seals with original spare parts.

** *Applies to diaphragm pumps for metering of low volumes (see Section 3.3.10)*

If no electrical monitoring devices are connected, check the hydraulic oil temperature on the diaphragm pump head every week!

A diaphragm pump head must not be used if the oil temperature exceeds the prescribed maximum temperature!

(See Section 2, Table 2.1)

Loss of hydraulic oil can be caused by a defective plunger seal on the pump head.

If no electrical monitoring devices are connected, check the hydraulic oil level of the pump head every week.

Replace damaged sealing elements with original spare parts immediately.

Compensate any loss of hydraulic oil.

Chapter ”Plunger Seal” *see Section 3.4.*

Section “Hydraulic fluid“ for diaphragm pump head
see Sections 3.3.3.5, 3.3.6.5, 3.3.7.4, 3.3.9.4, 3.3.11.5.

Plunger pump head (Types plunger piston / double-acting disc piston)

The following Table 6.7 includes information regarding checks and maintenance.

What		When		Who	Reference (section)
		Normal atmosphere	Ex-Zone		
Housing temperature near plunger seal	***Check***		weekly	Operator	3.3.
If there is a closed loop flushing system	***Temperature measurement, flushing medium***		weekly	Operator	4.3.
Plunger seals	***Leak tightness check***	weekly		Operator	3.4.
	Seal replacement	if unacceptable leakage		Specialist	
Flange joints of suction and pressure valve	***Leak tightness check***	monthly	weekly	Operator	
	Seal replacement	if unacceptable leakage		Specialist	
Flange joints of the pipe connections	***Leak tightness check***	monthly	weekly	Operator	

Table 6.7: Maintenance intervals plunger pump head

Pump head of the ProCam

The following *Table 6.8* includes information regarding checks and maintenance recommended by BRAN+LUEBBE.

What		When *h = hours of operation*	Who	Reference (section)
Plunger seals **(plunger pumps only)**	***Check***	monthly	Operator	3.3.16
	Change	in case of leakage	Specialist	
Seals **Flange connection of suction and pressure lines**	***Check***	monthly	Operator	3.3.
	Change	in case of leakage *	Specialist	
Diaphragms **(rupture indicator) (diaphragm pumps only)**	***Check***	weekly	Operator	3.3.15
	Change	yearly / every 8,000 h	Specialist	

Table 6.8: Maintenance Intervals Pump Head

* ***Recommendation:***
Always replace the seals with original spare parts whenever the diaphragm is changed or the suction and pressure lines dismantled.

See chapter on "Plunger seal", *Section 3.3.16.*

6.1.2 Cleaning

Prevent static charging!

Keep the pump free of dust by regular cleaning.

Clean plastic components with a damp cloth only!

In the case of operation in Zone 22:

- **Prevent layers of dust building up on the surfaces of the pump!**
- **Remove all layers of dust immediately as soon as they reach a thickness of 5mm!**
- **Only used methods of cleaning that avoid any unnecessary dispersal of the layer of dust!**

CAUTION!

Aggressive cleaning agents can cause skin rashes and other damage to health. Corrosion damage to metal parts is possible.

Whenever you pump hazardous (caustic, aggressive or toxic) media, there may still be residues of these in the pump head.

These can cause skin rashes and other forms of injury to health.

Avoid skin contact.

Wash your hands thoroughly each time after coming into contact with these substances.

Wear protective equipment!

Clean the pump with chemically compatible cleaning agents only

Clean the gear/drive unit or rather gear/drive unit parts with cold cleaning agents (e.g. WBC 16)

CAUTION!

Risk of burns due to hot surfaces of the gear/drive units.

Do not clean gear/drive units until they have cooled down!

Clean the pump head or pump head parts with water only.

Protect the environment!

Handling and disposal of mineral oils and cleaning agents are subject to legal regulations.
Take old oil and cleaning waste materials to an authorised waste collection point.

6.2 Technical information and examples for the most important inspection work on BRAN+LUEBBE metering and process pumps

List of contents

6.2.1 Inspection intervals - general

Inspections are intended to prevent damage to machines that could lead to

- a risk for life and limb
- environmental pollution due to hazardous materials.

The intervals between the inspections have been selected in such a way as to ensure safe continuous operation of the machine under the installed and operational conditions. Wear and tear or failure conditions on the machine can be detected in good time.

Comply with the specified inspection intervals for your own safety as well as to ensure fulfilment of the obligation of due care with respect to the operator of the machine.

Should it be difficult or even impossible (e.g. due to special production processes, inaccessible production equipment) to comply with the inspection interval or the measures it requires (e.g. shutdown of the machine), please consult with BRAN+LUEBBE to find suitable measures that will ensure the safety of the machinery.
This could entail:

- using suitable sensors (permanent monitoring)
- carrying out alternative methods of inspection
- determination of system-specific inspection intervals that make allowance for the operational conditions and re-evaluation of potential hazards.

Whereby allowance must made for the question of what potential hazards could arise if a wear, fault or defect condition is detected too late or not at all thus causing damage to the machine (e.g. if a component breaks or snaps off or inadmissible heating of operating materials or components occurs).

The measures mentioned for ensuring safety of the machinery can also be carried out by the user himself on his own responsibility. This does, however, require the appropriate specialist expertise. Approved state-of-the-art technology and applicable rules and regulations must be used when selecting the sensors and carrying out the alternative methods of inspection.

The highest degree of safety is generally achieved by using sensors that have an automatic electronic self test or by installing redundant sensor systems.

Any measures undertaken by the user himself to ensure safety of the machinery and that deviate from the operating and inspection regulations of the original user manual must be documented.
Potential hazards within the scope of the Accident Prevention Regulations (UVV) must be evaluated. Any resulting warning or safety instructions or any operational procedures that deviate from the original user manual must be made available to the operator of the machinery.

In particular Directive 1999/92/EC must be allowed for in explosive atmospheres.

6.2.2 Potentially explosive atmospheres Particular importance of inspections in explosion-hazardous areas

As a basic principle the operation of machinery and equipment in explosion-hazardous areas represents a higher safety risk. Mixtures of air with combustible/flammable substances such as gas or dust could be ignited by sparks, flames or hot surfaces. The risk of explosion depends on the frequency with which explosive atmospheres can occur and on the ignition energy or ignition temperature required to ignite the explosive mixture.

Allowance must not only be made for the hazard posed by electrical components (e.g. sparking during switching processes, extreme heat build-up due to currents caused by an overload or short circuit) when evaluating the risk.
Mechanical components with moving parts also represent a hazard because elevated temperatures or sparking can occur due to operational malfunctions, wear and tear or the breakdown of components (e.g. in the case of frictional or striking processes between metals).
In addition allowance must be made for hazards caused by electrostatic discharges on surfaces that could become charged (e.g. plastics).

The requirements for machinery and equipment with regard to their safe operation in explosion-hazardous atmospheres are defined exactly in the European Directive 94/9/EG (also called ATEX).

BRAN+LUEBBE metering and process pumps marked for use in Ex areas comply with the requirements of the Directive 94/9/EC.

Whereby the metering and process pumps intended for use in Ex areas are classified as **Category 2G or 3G** (under certain circumstances also 3D).

The required machinery safety is achieved by means of “safe construction”. This means that there is no risk of ignition under normal operational conditions nor if a predictable failure occurs (e.g. normal wear and tear, temporary opening of the over overflow valve in the diaphragm pump head).

It is unavoidable that an element of risk also remains in explosion-hazardous areas.
These operating instructions are intended to reduce the remaining element of risk to a minimum. As a consequence inspection and maintenance regulations are of particular importance.
The highest possible level of safety can only be achieved if the prescribed inspection and maintenance work is adhered to and executed meticulously.

Texts marked with the Ex sign generally indicate potential hazards in Ex areas and their prevention.

Inspection and maintenance work in Ex areas that require particular attention are also marked with this sign (see Section 1).

6.2.2.1 Inspection intervals in Ex areas

The general meaning of inspection intervals has already been described in Section 6.1.1. This also applies without restriction to Ex areas.

Shorter intervals are prescribed for some inspection work on applications in Ex areas than is the case for applications not in explosion-hazardous areas.
This allows for the higher potential risk of certain equipment components in Ex areas.

The tables in Section 6 compare the required intervals for different inspection and maintenance work for operation in non-explosion-hazardous atmospheres with those for operation in Ex areas.

6.2.2.2 Use of sensors / permanent electronic monitoring of components or operating fluids

Due to the safe constructive design of BRAN+LUEBBE metering and process pumps there is no normative regulation requiring permanent monitoring of components or operating fluids with sensors for applications in the equipment category 2G or the temperature classes T1 to T4.

Visual and manual execution of the mandatory inspections (e.g. control measurements of temperatures and fill levels) are sufficient to fulfil the level of safety required for the equipment category mentioned.

However, in many cases permanent electronic monitoring makes the required inspections considerably easier, thus affording an even greater level of safety.

6.2.2.3 Selection of suitable sensors

Contact BRAN+LUEBBE for advice on the most suitable sensors for your pump, application and system control.

Should you select the sensors yourself, please pay particular attention to the following instructions:

Only ever use sensors that are suitable for use in your Ex area and that have the appropriate approval!

Comply with the applicable standards and regulations for the connection of electrical devices!

6.2.2.4 Additional inspection and maintenance work

The following work must be carried out in Ex areas in addition to the standard inspection and maintenance work:

- **Couplings in the drive chain must be regularly inspected and replaced in compliance with the individual manufacturer's specifications.**

  This applies to the following couplings:

Series:	Coupling
NOVAPLEX	Coupling between drive motor and reduction drive and coupling between reduction drive and drive unit *(see Section 3.1)*
NOVAPLEX Integral	Coupling between drive motor and integrated reduction drive *(see Section 3.1)*
NOVADOS	Coupling between drive motor and gear unit (*see Section 3.1*)

- **Roller bearings must be regularly inspected using approved testing methods (e.g. structure-borne sound measurement with appropriate signal analysis and signal evaluation ➔ refer to VDI 3832).**

  Monitoring interval:

  In general, it is impossible to prescribe the time interval to be chosen between two diagnostic measurements. It depends on:

  The operating conditions of the bearing and the advance warning needed (which again should allow for the severe consequences of non-detected bearing damage). Intervals of a few weeks are usually acceptable in the case of intermittent monitoring (offline systems). However, the maximum degree of safety will only be achieved by continuous monitoring with installed sensors (online systems).

  If diagnostic monitoring methods are used in online or offline procedures, roller bearings can be replaced in dependence on their condition on reaching defined signal thresholds.

  If diagnostic inspection of the roller bearings is not possible, alternative measures must be taken to prevent inadmissible temperature rises or sparking effectively, e.g. by using temperature and/or oil level sensors!

  In this case BRAN+LUEBBE recommends the preventive replacement of roller bearings if they have reached their nominal, calculated service life!

  Please refer to Section 6 for specifics regarding the bearings of the gear and drive unit series concerned and their expected service life.

6.2.3 Pump head

6.2.3.1 Diaphragm – equipment condition monitoring

See Section 3.3 **for instructions concerning the diaphragm- equipment condition monitoring**

BRAN+LUEBBE double diaphragm have been designed in such a way that incipient cracks or breaks caused by operational wear and tear initially occur only on the diaphragm that is in contact with the product. The second diaphragm (safety diaphragm) ensures that any contamination of the product with hydraulic oil or any potential sequential damage is as good as impossible.

In most applications it is not necessary to switch off the pump, safe operation is still guaranteed for a short time.

The remaining life span of the safety diaphragm after the diaphragm in contact with the product has broken depends on several factors:

- cause of the damage to the diaphragm
- physical properties of the discharge medium (aggressiveness, solids content)
- operating conditions (discharge pressure, primary pressure, temperature, pressure pulsation)

In any case the pump must be switched off as quickly as possible and it must be repaired professionally.

If you are discharging hazardous or toxic mediums, switch the pump off immediately when the break signal is given!

Devices for diaphragm monitoring

BRAN+LUEBBE uses the following devices for diaphragm monitoring. Special models or manufacturers are available on request of the customer.

Monitoring device	**S**tandard **/ O**ption	Recognition diaphragm defect	Model
Manometer	**S**	• Visual inspection • (Manometer indicates virtual discharge pressure)	• Various nominal sizes • Various accuracy classes • With / without oil filling
Contact manometer	**O**	• Electric alarm and/or emergency stop function • Visual inspection (additional)	• Standard • Intrinsically safe • Pressure resistant casing
Pressure switch	**O**	• Electric alarm and/or emergency stop function	• Standard • Intrinsically safe • Pressure resistant casing

Manometers are intended as standard solutions for all application areas and can be used safely and without problem even in explosion-hazardous areas.

Contact manometers or pressure switches are used for triggering electric alarms or an automatic machine switch-off.

Due to the safe constructive design of BRAN+LUEBBE diaphragm pump heads and their approved areas of application there is no normative regulation requiring the use of these alarm devices. However, their use makes the inspections required for safe operation considerably easier, thus affording an even greater level of safety because permanent monitoring is possible.

Determination of the inspection intervals for diaphragm monitoring

The interval (1 week) prescribed by BRAN+LUEBBE for diaphragm monitoring allows for medium to high hazards, such as those that occur in Zone 1 explosion-hazardous areas *(see 6.1.1).*

This fulfils the required level of safety for the equipment category to be used.

For the far rarer applications with the highest hazard, the user should provide for permanent electronic monitoring e.g. by using a pressure switch.

6.2.3.2 Hydraulic oil

The hydraulic oil is heated to the so-called operating temperature by the frictional heat that occurs on the piston seals and in the hydraulic liquid itself during pumping.

Additional heat development occurs by:

- the temperature of the discharged medium (heat exchange)
- ambient temperature
- heat conduction from the gear box
- failures e.g. opening of the overflow valve / cavitation in the hydraulic chamber

This is why hydraulic oil temperature in particular is of vital importance. Continuing failures can be recognised by a rising temperature of the hydraulic oil.

A sufficient minimum level of hydraulic oil is as equally important for ensuring the basic function of the displacement transmission.

Limit temperature(s)

Definitions:

Working temperature range (min. /max.).	**Application temperature range hydraulic oil (min. / max.).**
These values are specified in the data sheet and might include required limit temperatures e.g. for temperature classes in ex-areas or design temperatures of the pump head construction.	These are material property values that restrict the safe use of the oil with regard to its flow behaviour (viscosity) and ageing.

- **Standard:** max. admissible hydraulic oil temperature is 80° C
- **High temperature applications:** the max. admissible hydraulic oil temperature is specified in the data sheet.

Carrying out temperature control measurements

Ideally a temperature control measurement should be made directly in the hydraulic oil. Any commercial thermometers or temperature sensors that are approved for immersion in fluids are suitable for this.

CAUTION!

Risk of injury from squirting hot hydraulic oil!

Only remove the cover of the oil reservoir when the machine is not in use!

Measurement of the temperature while the machine is in operation:

As an alternative, the measurement of the oil temperature can be carried out on the outer side of the oil reservoir housing. The measuring point must be below the oil fill level. Carry out several measurements at different points to ensure a true reading (Fig. 6.1).

Any commercial contact thermometers that are approved for measuring on metallic surfaces are suitable. Electronic devices in which the measuring sensors have short response times are particularly recommended (Fig. 6.2).

The accuracy of the measurement is optimised if a heat-conductive paste is used. The difference between the temperature in the hydraulic oil and the surface temperature of the oil reservoir housing can be neglected.

Only ever use calibrated measuring devices!

Never use contact-free temperature sensors under any circumstances (radiation pyrometer)!
These devices give false readings on metal surfaces.

Fig. 6.1: Control of the hydraulic oil temperature
Measurement on the outer side of the oil reservoir

Fig. 6.2: Control of the hydraulic oil temperature
Measurement on the outer side of the oil reservoir

Fig. 6.3: Example of an electronic contact thermometer

Determination of the inspection intervals for hydraulic oil monitoring

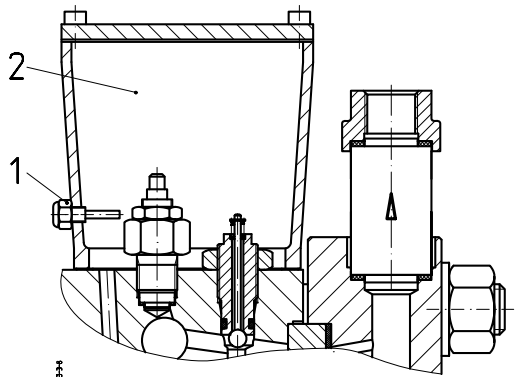
The interval (1 week) prescribed by BRAN+LUEBBE for temperature monitoring of the hydraulic oil is sufficient to fulfil the level of safety required for general operation and also that for operation with medium to high hazards, such as those that occur in Zone 1 explosion-hazardous areas.
For applications that require a higher level of safety, the user should install an electronic monitoring system.

Permanent monitoring of the hydraulic oil temperature:

Permanent electronic monitoring of the hydraulic oil temperature affords a maximum level of safety and ease of inspection. Installation of a PT-100 sensor into the oil reservoir, in compliance with Diagram 6.4, is an economical solution that is easy to realise.

Depending on the hazard potential of the pump application, the sensor used should be connected electrically in such a way that an alarm is triggered in a switch room or an automatic shutdown of the machine is triggered if the defined maximum temperature is reached.

Other types of temperature sensors can be used as an alternative to the PT-100 sensors.
Types that combine the temperature and the fill level measurements in one sensor are also possible.



1 PT-100 Temperature sensor
2 Hydraulic fluid reservoir

Fig. 6.4: Sensor installation

Fill level of the hydraulic oil

A sufficient amount of hydraulic oil is extremely important for the fulfilment of the basic function of the diaphragm pump head. Loss of hydraulic oil can be caused by a defective plunger seal for example, or by leaks in the diaphragm restraint or by leaks in the reservoir. As oil loss due to the signs of wear mentioned above is usually very slow and as, depending on the type of pump head, there is a sufficient mount of reserve oil, an inspection interval of 1 month is prescribed for normal applications.
An inspection must be carried out weekly for applications with higher safety requirements (e.g. Zone 1 explosion-hazard areas) in order to ensure the required level of safety.

Inspection of the fill level of the hydraulic oil is carried out visually depending on the type of oil reservoir

- by removing the oil dipstick.
  Optimum fill level: the level on the dipstick is above the marking.
- By means of a transparent cover.
  Optimum fill level: approx. 10mm above the top edge of the air escape valve.
- By means of an inspection window screwed into a metal cover.
  Optimum fill level: approx. 10mm above the top edge of the air escape valve.
- By means of an oil gauge glass in the side of the container.
  Optimum full level: middle of the gauge glass).

CAUTION!

Risk of injury from squirting hot hydraulic oil!

Only remove the cover of the oil reservoir when the machine is not in use!

A sudden total loss of hydraulic oil can occur in the case of a double diaphragm break, for example, or extreme damage on the plunger seal. Permanent electronic monitoring of the fill level of the hydraulic oil is recommended in order to ensure timely recognition of such rare failures or to make inspections and service work easier.

There are different types of suitable sensors:

- Vibrating fork sensors
- Capacitive sensors
- Opto-electrical sensors
- Float switches

These can either be installed in the cover or in the side of the oil reservoir depending on sensor type and size of the pump head.
BRAN+LUEBBE staff would be glad to advise you on the best choice of sensor for your pump head type, your application and the electronic system control you use.

Plunger seal

The plunger seal in diaphragm pump heads is a multi-piece construction with a so-called locking ring. The locking ring provides lubrication and cooling of the actual sealing elements (various types of lip seals) using the hydraulic oil. This means that damage on the plunger seal can be recognised by the regular inspection of the hydraulic oil fill level as described above.

6.2.3.3 Overflow valve

The overflow valve is a safety device intended to prevent damage to the diaphragm as well as to the complete pump head in the case of an unforeseeable increase in pressure in the piping system (e.g. in the case of a fault status in the process or unintentional closing of the pressure line).

IMPORTANT!

The overflow valve is NOT a substitute for the safety valve in the pressurized tubing!

The opening pressure of the overflow valve is set by the manufacturer at 10% higher than the working pressure of the pump head. When the overflow valve opens, hydraulic oil flows out of the working chamber and into the reservoir. If the valve is open permanently the hydraulic oil circulates in pump head. This fault status in the pump head drastically reduces the pumping effect on the medium to be pumped or stops it altogether.

ATTENTION!

An overflow valve that is open permanently causes wear and tear (leakage)!
Inadmissible heating of the hydraulic oil and the pump head impair the life span of the complete pump.

Prevent the overflow valve from opening continuously!

Occasional opening of the overflow valve (e.g. during startups or process-related fluctuations in the working pressure) is not at all critical, as long as the max. permissible temperature of the hydraulic oil is not exceeded.

If the overflow valve in your application opens too often despite rectification of process-related faults, ask BRAN+LUEBBE to inspect the layout of the pump and piping system.

6.2.4 Gear / Drive unit

6.2.4.1 Gear oil (temperature and fill level)

The gear oil lubricates and cools all moving parts in the gear/drive unit, the bearings and shaft seals. The frictional heat that is generated is transferred to the gear/drive unit housing by the oil.

Heat is dissipated on the surface of the housing to the ambient air by means of convection. This leads to a heat equilibrium with an appropriate oil operating temperature for longer operational periods.
The oil operating temperature that occurs depends on

- The design and size of the gear/drive unit
- their load factor,
- the ambient temperature,
- the coefficient of heat transfer at the place of installation (among other things dependent on airflow rates and humidity).

In addition the oil temperature can be influenced by the discharge of hot media due to heat transfer via the pump head mounting and the housings of the gear/drive unit.

The viscosity of the oil changes depending on the temperature:

- low temperatures cause higher viscosity ⇨ semi fluid oil
- high temperatures cause low viscosity ⇨ fluid oil.

This temperature-dependent viscosity is specified in the so-called viscosity index.
The viscosity index can vary considerably in the same viscosity class (nominal viscosity, measured at 40°C) depending on the chemical composition and the quality of the oil.

A distinction is made between:

- mineral oil
- partial or full synthetic oils
- unblended and blended oils (oils upgraded by blending in additives).

Moreover the operating temperature of the oil that arises influences its maximum service. This, however, depends to a great extent on the quality of the oil used.

In order to achieve optimum oil distribution and lubricating effect on the gear parts and the bearings, gear oil in BRAN+LUEBBE gear/drive units may only be used within specific temperature limits.

Higher wear on the gear parts, bearings and shaft seals can result if temperatures are outside of this range, because oil that is too fluid does not provide a sufficient lubricating film, for example, or oil that is too viscous can no longer lubricate the parts needing lubrication sufficiently.

Oil qualities suitable for the various ambient temperature ranges are listed in a table for the respective gear and drive unit types. For the reasons mentioned above, the oil temperature limits must be complied with!

ATTENTION!

Inadmissible oil operating temperatures lead to a considerable reduction in the service life of the oil and lead to premature wear of the sealing elements used.

The maximum operating temperature of the oil must NOT exceed 90°C!

If this temperature limit cannot be complied with due to extremely high ambient temperatures, oil cooling must be provided.

Even the use of high blend synthetic oils with an excellent viscosity index may not provide sufficient lubrication in cases of extremely low ambient temperatures. Pre-warming of the oil before a machine startup or permanent tempering is necessary in such cases.

Continuous cooling/tempering of the gear/drive unit oil can usually only be achieved with external lubrication of the gear/drive units using the appropriate intercepting and supply pipes, oil pump(s), oil filters and a suitable heat exchanger. BRAN+LUEBBE staff would be glad to advise you with the planning of the best oil supply system for your pump application.

Carrying out temperature control measurements

Ideally a temperature control measurement should be made directly in the gear oil. Any commercial thermometers or temperature sensors that are approved for immersion in fluids are suitable for this.

CAUTION!

Risk of injury from squirting hot gear oil and moving parts inside the gear/drive unit!

Only measure the oil temperature when the machine is not in use!

NOVADOS series: Remove the oil filling plug or the dipstick from the oil filling opening. Insert the measuring sensor into the oil filling opening vertically until it dips into the gearbox oil *(see 6.5)*.

Make sure the measuring sensor is dipped in long enough to get a measured value that is as accurate as possible.

Only ever use calibrated measuring devices!

The temperature measurement can also be carried out as described below if the machine cannot be shutdown for process reasons or if special filters are installed in the oil filling opening (special models).

Fig. 6.5: Measuring the temperature of the gear oil in a NOVADOS gear with the machine shutdown.

Measurement of the temperature while the machine is in operation

NOVADOS and NOVAPLEX series:

As an alternative, the measurement of the oil temperature can be carried out on the outer side of the gear/drive unit housing. The measuring point must be below the oil fill level. Carry out several measurements at different points to ensure a true reading. Suitable measuring points are shown in *Fig. 6.6 and Fig. 6.7*

Any commercial contact thermometers that are approved for measuring on metallic surfaces are suitable. Electronic devices in which the measuring sensors have short response times are particularly recommended. The accuracy of the measurement is optimised if a heat-conductive paste is used.
The difference between the temperature in the gear oil and the surface temperature of the gear/drive unit housing can be neglected.

Only ever use calibrated measuring devices!

Never use contact-free temperature sensors under any circumstances (radiation pyrometer)!
These devices give false readings on metal surfaces.

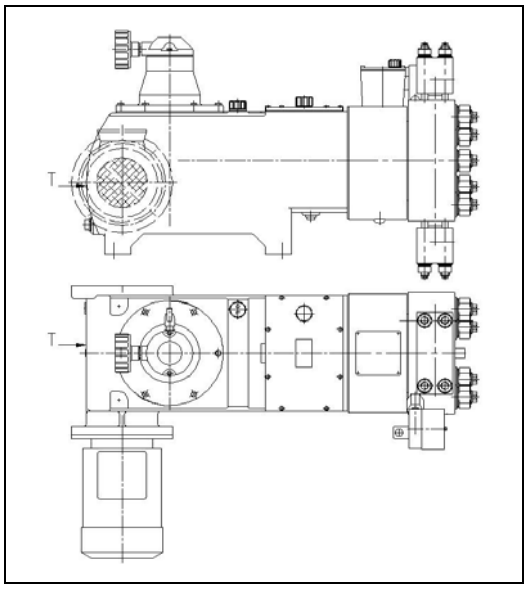


Fig. 6.6: NOVADOS series

Suitable measuring point T for controlling the temperature of the gear oil from the outer side of the housing

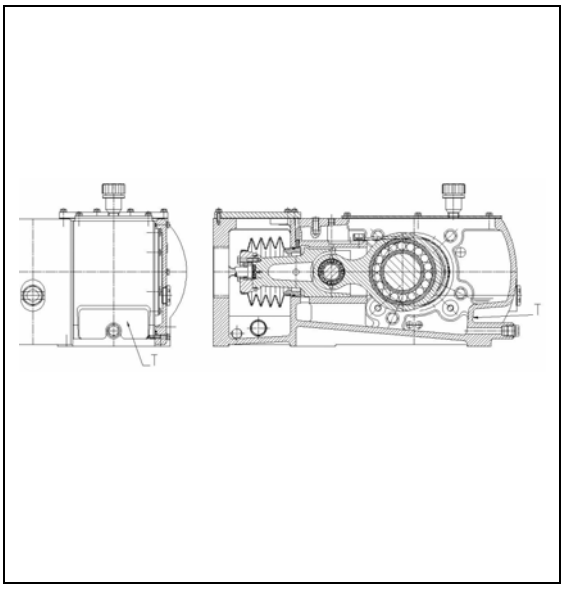


Fig. 6.7: NOVAPLEX series

Suitable measuring point T for controlling the temperature of the drive unit oil from the outer side of the housing

Determination of the inspection intervals for gear oil monitoring

The interval of 1 week prescribed by BRAN+LUEBBE for temperature monitoring of the gear oil allows for operation with medium to high hazards, such as those that occur in Zone 1 explosion-hazardous areas, for example.
For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis or he should install an electronic monitoring system.

No control measurement of the gearbox oil temperature is required under normal operating conditions (no or only low hazard) and ambient temperatures of between 0°C and 40°C if a lubricant is used that has been approved for operation by BRAN+LUEBBE.

Continuous monitoring of the gear oil temperature

Continuous electronic monitoring of the gear oil temperature affords a maximum level of safety and ease of inspection. Installation of a PT-100 sensor in the housing of the gear/drive unit is an economical solution that is easy to realise.
The installation point in the housing of the gear/drive unit depends on the type of gear/drive unit and the type of temperature sensor selected.

Please contact BRAN+LUEBBE for installation examples for your pump application.

Depending on the hazard potential of the pump application, the sensor used should be connected electrically in such a way that an alarm is triggered in a switch room or an automatic shutdown of the machine is triggered if the defined maximum temperature is reached.

Other types of temperature sensors can be used as an alternative to the PT-100 sensors.

Fill level of the gear/drive unit oil

Lubrication and cooling of all moving parts in the gear/drive unit, the bearings and shaft seals is only guaranteed if there is sufficient lubricant.

Insufficient lubricant causes higher wear on these components and can even lead to the total loss of the whole gear/drive unit.
Insufficient lubrication can also lead to inadmissible heating of the gear oil itself as well as of the gear/drive unit components and housing surfaces!
Insufficient lubricant or loss of the lubricant can occur in the case of wear on the seals of the drive shaft or the crosshead seal.

The way in which the fill level control is carried out depends on the gear/drive unit type, either a dip stick or a gauge glass is used (*see Section 5.1*).

Determination of the inspection intervals for monitoring the fill level of the gear/drive unit oil

The interval of 1 week prescribed by BRAN+LUEBBE for monitoring the fill level of the gear oil is sufficient to fulfil the level of safety required for general operation and also that for operation with medium to high hazards, such as those that occur in Zone 1 explosion-hazardous areas.
For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis or he should install an electronic monitoring system.

Continuous monitoring of the fill level of the gear oil

Continuous electronic monitoring of the gear oil fill level in the housing of the gear/drive unit affords a maximum level of safety and ease of inspection.
There are different types of suitable sensors:

- vibrating fork sensors
- capacitive sensors
- opto-electrical sensors
- float switches

The installation point in the housing of the gear/drive unit depends on the type of gear/drive unit and the functional principle of the temperature sensor selected.

Please contact BRAN+LUEBBE for installation examples for your pump application.

Depending on the hazard potential of the pump application, the sensor used should be connected electrically in such a way that an alarm is triggered in a switch room or an automatic shutdown of the machine is triggered if the defined minimum fill level is reached.

6.2.4.2 Crosshead seal

NOVADOS series gear type H2 to H6, NOVAPLEX Integral series

The crosshead in these models is sealed with a heavy-duty seal. There is only little wear under normal operating conditions and if oil filling of the gear is carried out as prescribed and a service life of over 8000 operational hours can be expected.

In the case of wear on the seal, gear oil collects on the bottom of the pump head mount. This can be seen in a visual inspection. For this the cover of the pump head mounting must be removed.

CAUTION!

Risk of injury!

Only carry out this work when the machine is not in use.
Prevent accidental starting of the machine.

Determination of the inspection intervals for controlling the crosshead seal

BRAN+LUEBBE prescribes the following intervals:

- 3 months for normal applications with low potential hazard
- 1 month for applications with medium to high hazards (e.g. in Zone 1 explosion-hazardous areas)

For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis.

If there is continuous electronic monitoring of the gear oil fill level, visual inspection of the crosshead seal is not necessary.

If there is an increasing occurrence of insufficient lubricant, the crosshead seal must be inspected by a specialist and if necessary replaced.

NOVADOS series gear type H1

The crosshead in this model is sealed with a bellows. If there is wear on the bellows of if it is damaged, gear oil can escape and then collect on the underside of the bellows or on the bottom of the pump head mounting.

Inspect the bellows visually for damage or oil build-up. For this the cover of the pump head mounting must be removed.

CAUTION!

Risk of injury!

Only carry out this work when the machine is not in use.

Prevent accidental starting of the machine.

Determination of the inspection intervals for controlling the bellows

The interval prescribed by BRAN+LUEBBE is 1 month for normal operating conditions and for applications with medium to high hazards (e.g. in Zone 1 explosion-hazardous areas).

For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis.

If there is continuous electronic monitoring of the gear oil fill level, visual inspections of the bellows is not necessary.
If there is an increasing occurrence of insufficient lubricant, the bellows must be inspected by a specialist and if necessary replaced.

NOVAPLEX series:

The crosshead in this series is sealed with a bellows. If there is wear on the bellows of if it is damaged, drive unit oil can escape and then collect on the underside of the bellows or on the bottom of the pump head mounting.

Inspect the bellows visually for damage or oil build-up. For this the cover of the pump head mounting must be removed.

CAUTION!

Risk of injury!

Only carry out this work when the machine is not in use.

Prevent accidental starting of the machine.

Determination of the inspection intervals for controlling the bellows

BRAN+LUEBBE prescribes the following intervals:

- 3 months for normal applications with low potential hazard
- 1 month for applications with medium to high hazards (e.g. in Zone 1 explosion-hazardous areas)

For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis.

If there is continuous electronic monitoring of the oil fill level in the drive unit, visual inspection of the bellows is not necessary.
If there is an increasing occurrence of insufficient lubricant, the bellows must be inspected by a specialist and if necessary replaced.

6.2.4.3 Plunger restraint

The plunger restraint functions as a mechanical coupling of the crank drive on the pump head. The plunger restraint allows the oscillating motion of the crosshead to be transmitted to the discharge medium.

2 different constructional versions of plunger restraints are used depending on the size of the gear/drive unit and the type of pump head:

- Fixed plunger restraint
- Self-centering plunger restraint

See also Section 3.5.

Both versions are extremely rugged and if mounted correctly and under normal operating conditions of the pump can usually be operated over longer periods of time without any recognisable wear and tear.

However, faulty mounting or rough operating conditions (frequent startups, cavitation in the suction pipe or in the hydraulic chamber of the pump head) can lead to

- loosening of the screw connections (both types) and
- enlargement of the axial play (self-centering version).

This leads to progressive wear and even to breaking of the plunger restraint. Sequential damage to the pump head and gear /drive unit is possible.

As higher frictional heating or sparking is to be reckoned with as a result of the wear processes described above, these must be avoided under all circumstances in explosion-hazardous areas!

Carrying out the inspection of the plunger restraint

CAUTION!

Risk of injury!

Only carry out this work when the machine is not in use.

Prevent accidental starting of the machine.

Fixed plunger restraint

The mounting nut must be tightened hard! It must not be possible to turn the piston in the restraint by hand nor must it be able to move it axially.
The end of the piston shaft must rest against the bottom of the bore in the crosshead (*See Figure in Section 3.5*).

If you are not sure of the correct state of the plunger restraint, remove it completely and install it carefully following the instructions in Section 3.5.

Self-centering plunger restraint

The mounting screws must be tightened with the torque specified in *Section 3.5* (check this with a torque wrench)!
The axial play of the plunger must not deviate from the specified value.
If mounted correctly the plunger can be turned by hand, but movement in the axial direction is hardly noticeable (both are usually very stiff in large machines or large plunger diameters).

Such manual control of the self-centering plunger restraint suffices completely for an inspection.

It is possible to carry out an exact measurement of the axial play by fixing a dial gauge on the plunger shaft in such a way that the measuring sensor rests vertically on the clamping collar of the plunger restraint. In the case of pressureless piping systems, the plunger can moved backwards and forwards to the front dead-point postion by turning the drive shaft by hand (e.g. on the fan wheel of the electric motor). The difference between the dial gauge readings for forward and return stroke is approximately the existing axial play.
If you are not sure of the correct state of the plunger restraint, remove it completely and install it carefully following the instructions in *Section 3.5*!

Determination of the inspection intervals for controlling the plunger restraint

BRAN+LUEBBE prescribes the following intervals:

- 6 months for normal applications with low potential hazard
- 3 months for applications with medium to high hazards (e.g. in Zone 1 explosion-hazardous areas)

For applications that require a higher level of safety, the user should determine shorter intervals within the scope of his own hazard analysis.

7 Troubleshooting

Fault	Possible causes	Remedy
No flow rate	• No voltage at the motor:	Check fuses and leads
	• Motor defective:	Repair or replace motor
	• Coupling broken:	Replace the coupling and eliminate the cause of the overload
	• No product available:	Fill suction container
	• Suction or pressure line shut off:	Open the shut-off devices
	• Filter or suction line blocked:	Clean filter or suction line.
	• Pump valve fitted incorrectly:	Fit pump valve in the direction of the arrow
	• Pump valves dirty or damaged:	Clean or replace pump valves
	• Gas/air in product chamber:	Increase suction pressure; vent and/or fill product chamber.
	• Counter pressure too high:	Check setting of safety valve. Check pressure line for length and nominal diameter. Carry out pipework calculation. *(See Section 4.2)*
	• Suction lift too high:	Reduce suction lift and, if necessary, create supply pressure or install a surge tank. *(See Section 4.3.1)*
	Only metering pump: • Stroke set at "0" mm:	Adjust stroke length.
Flow rate too high	• Supply pressure higher than counter pressure:	Fit pressure control valve. possibly install a pump pressure valve with a stronger spring load.
	• Suction or pressure lines too long or nominal diameter too small:	Enlarge nominal width or install air receiver/pressure storage device
	• Wrong stroke length:	Check and, if necessary, recalculate stroke length.

Fault	Possible causes	Remedy
Flow rate too low	• Pump valves dirty or damaged:	Clean, re-grind or replace pump valves
	• Safety valve leaking:	Clean safety valve; repair or replace damaged parts.
	• Safety valve operates because of excessive pressure loss in pressure line:	Enlarge nominal width or install air receiver/pressure storage device
	• Stuffing box leaking:	Tighten stuffing box*(see Section 3.4.1)* possibly replace sealing rings and at the same time check plunger for wear
	• Gas/air in product chamber:	Increase suction pressure; vent and/or fill product chamber.
	• Cavitation:	Increase suction pressure; vent and/or fill product chamber.
	Only metering pump: • Wrong stroke length:	Check and, if necessary, recalculate stroke length.
	Diaphragm pump head: • Bleed, refill or overflow valve leaking:	Clean valves, repair damaged parts
	• Gas/air in product or hydraulic chamber	Bleed product or hydraulic chamber
Flow rate unstable	• Contamination of the product:	Flush the pipework possibly fit filter
	• Pump valve seat, valve ball or cone damaged:	Re-grind or replace valve
	• Varying supply pressure or changes in viscosity:	Check operating conditions

8.1.1 Transport

General remarks

During the trial run performed by the factory, the gear unit is filled with a type of oil that possesses preservation properties.
The oil is drained again prior to shipping. However, the internal parts of the gear unit remain coated with a protective film of oil.

Be sure to use a proper form of transport in order to prevent damage to the pump in packaged and/or unpackaged condition.

During transport and later during storage the metering pump must be protected against moisture, salt-water, rain, sand storms, and direct sunlight

Only use suitable transport equipment in order to transport the pump, such as:

– elevating trucks, fork-lift trucks and/or lifting cranes, and

– transport ropes and lifting chains that are approved for the respective weight of the pump that is being transported.

For dimensions and weights of pump and pump components
see shipping order and *dimensioned drawing (sections 1.2 and 9)*.

Delivery

- Upon delivery, check the packaging for any signs of damage.
  Complaints about external damage to the packaging must be reported to the respective transport company **immediately**.
- Remove the packaging.
- Remove all fastening screws and fastening elements on the packaging.

Safety instructions for transport

Before transporting the pump, please pay attention to the following instructions:

WARNING!

Risk of injury due to falling load!
Parts of the body can be crushed when the load is set down.

Do not stand beneath the load, and maintain an adequate safety distance.

Remain outside the danger zone when the load is being lifted.

Wear a safety helmet, safety shoes and safety gloves.

- **Do not use sling steel cables or chains around the pump!**
- **Make sure that the transport ropes have been attached correctly and that there is sufficient load-carrying capacity.**
- **Do not screw transportation bolts into the threaded holes in the gear unit or pump head housing to lift the entire pump!**
- **Do NOT use the lifting eyes of a fitted electric motor to lift or transport the pump!**
- **When transporting with a lifting crane:**
  Only attach load attachment rigging (transport ropes and/or lifting chains) to the lifting eyes that are fitted to the base frame of the pumps.
  Do not release the transport suspension equipment until the pump has been securely anchored at the installation location.

Transport

1. Place transport ropes around the pump (see lifting suggestions on following pages)
2. With multiple pumps:
   Secure load attachment rigging (transportation cables and/or lifting chains) to the provided lifting eyes on the base frame
3. Slowly lift the pump above the centre of gravity
4. During transportation, make sure that the pump remains in a horizontal position and that it cannot slip out of the transport suspension equipment
5. Carefully and slowly set down the pump(s) at the installation location
6. Ensure that the pump cannot tip over
7. Align pump in final position
8. Remove transport ropes and other auxiliary equipment
9. Secure pump in intended installation location

8.1.1.1 Lifting suggestions for transporting the NOVADOS H series

Individual and multiple pumps (up to 3 pumps of identical size) can be lifted out of the packaging and transported.

In order to do this the transport ropes must be attached to the pump in suitable locations.

The load must be distributed around 3 to 4 support or fastening points (attachment points) and the centre of gravity of the pump must be inside these points (A, B and C).
(see Fig. 8.1 and 8.2.).

Suitable attachment points for slinging with transport ropes are;

- Motor attachment flange (A)
  (motor next to motor attachment flange),
- Gear unit housing (underside) (B) and
- Pump head (C)

Fig. 8.1: Lifting suggestions with transport ropes

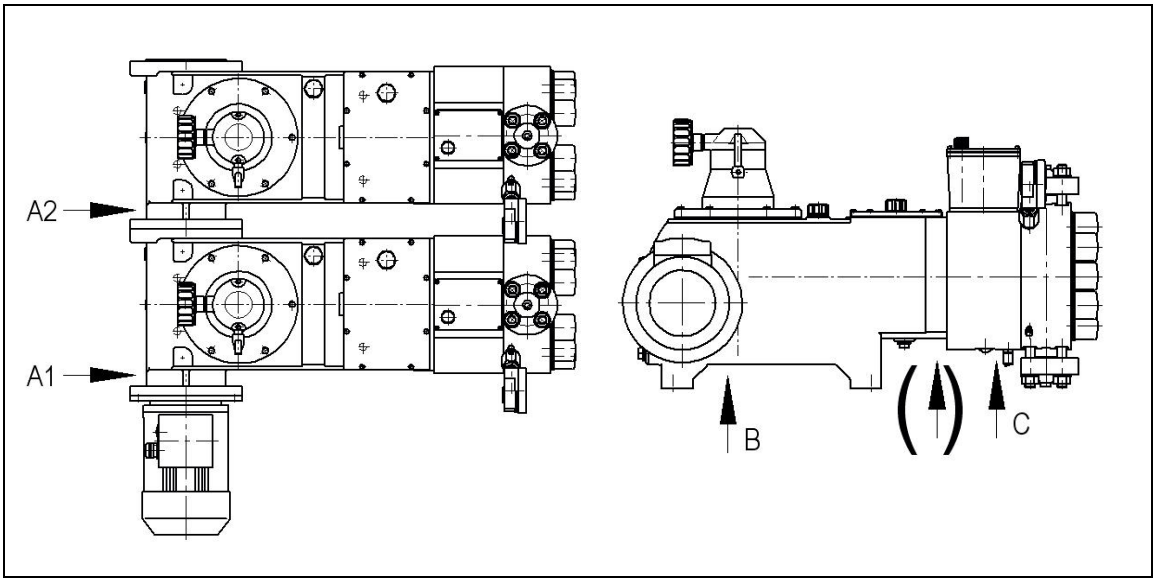


Fig. 8.2: Attachment points

8.1.1.2 Slinging the transport ropes

Fig. 8.3: Slings around motor attachment flange and gear unit housing

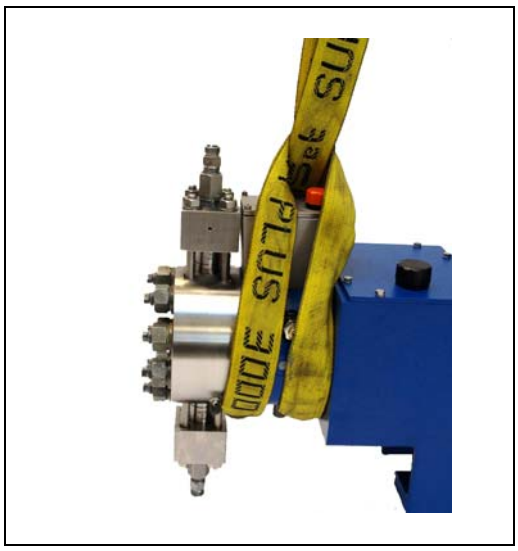


Fig. 8.4: Sling around pump head

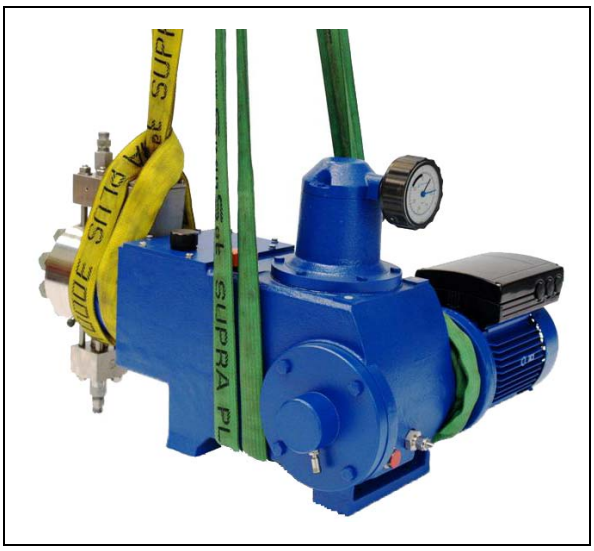


Fig. 8.5:
Finished slings with 3 attachment points and internal centre of gravity

Bran+Luebbe can optionally provide special transport plates for some pump models in the NOVADOS H series *(see Fig. 8.6)*.

These plates are attached to the recess in the gear unit housing in order to make the pumps safer and easier to lift.

See section entitled Models H2, H3 and H4 for more information.

Fig. 8.6: Transport plate option

To compensate for different transport cable lengths,
use adjustable lifting chains *(see Fig. 8.7)*.

Fig. 8.7: Transport ropes with lifting chain

8.1.1.3 Lifting suggestions for different pump types

NOVADOS, model H1

Individual pump with manual stroke adjustment

Individual pumps of size H1 can be lifted with slings at just 2 attachment points.

Depending on the weight of the pump head and the motor, the pump may be in a slightly tilted position when it is lifted.

This is not critical provided that the transport ropes are carefully slung around the attachment points and the pump cannot slip out.

1st attachment point: Sling around the motor connection flange.

2nd attachment point: Sling around the pump head or the pump holder (with extremely large diaphragm pump heads).

Fig. 8.8:
NOVADOS H1 with diaphragm pump head

Fig. 8.9:
NOVADOS H1 with piston pump head

NOVADOS, model H1

Individual pump with pneumatic or electric stroke adjusting facility

When using pumps with a pneumatic or electric stroke length adjuster, please ensure that the transport ropes do not damage the lines of the stroke length adjuster or the controller!

1st attachment point (A): Sling around the motor connection flange.

2nd attachment point (B): Sling around the pump head or the pump holder (with extremely large diaphragm pump heads).

3rd attachment point (C): Sling around the connecting flange between the gear unit housing and the stroke length adjuster

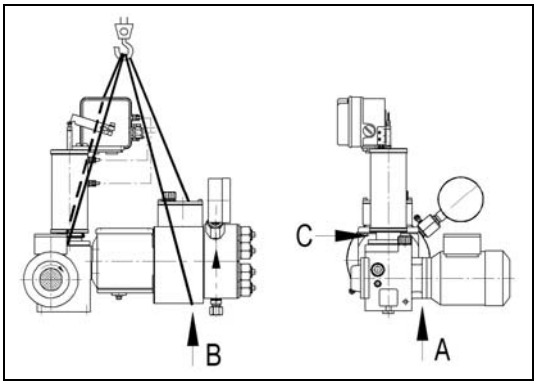


Fig. 8.10: Slings around pump type H1 with pneumatic stroke length adjuster

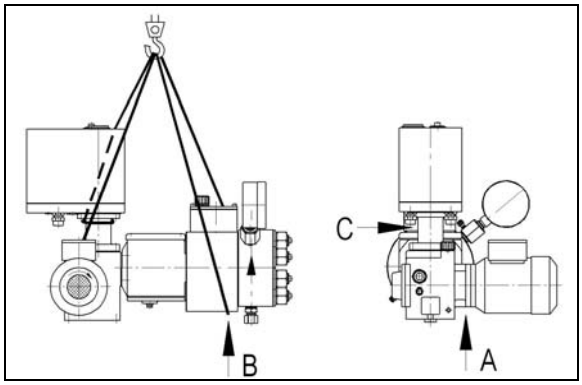


Fig. 8.11: Slings around pump type H1 with electric stroke length adjuster

Multiple pumps with max. 6 pumps

1st attachment point: Sling around the motor connection flange.

2nd attachment point: Sling around the connecting flange between last and next to last gear unit housings.

3rd attachment point: with 2-way pump:
Sling around all pump heads or pump yokes.
3-way (or more) pump:
Sling around all middle pump head or pump yoke.

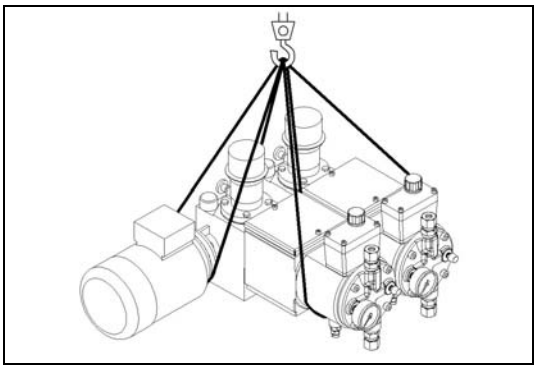


Fig. 8.12: Slings around 2-way pumps

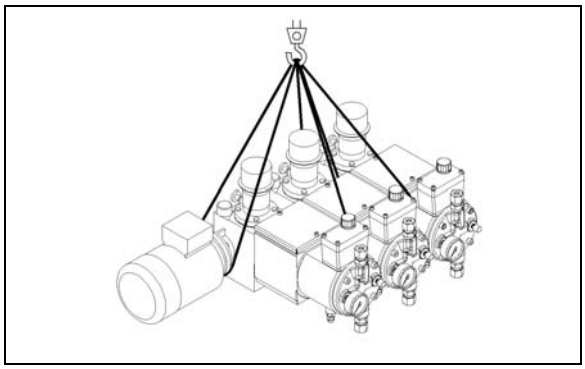


Fig. 8.13: Slings around 3-way pumps

NOVADOS, model H2, H3 und H4

Individual pumps with manual, pneumatic or electric stroke length adjuster

When using pumps with a pneumatic or electric stroke length adjuster, please ensure that the transport ropes do not damage the lines of the stroke length adjuster or the controller!

Bran+Luebbe provides special transport plates for these pump models.
These plates are installed at the recess of the gear unit housing.
The smaller hole is used to accommodate a shackle or a load hook *(see Fig. 8.14)*.

1st attachment point: Sling around the motor connection flange.

2nd attachment point: Sling around the pump head or the pump holder (with extremely large diaphragm pump heads).

3rd attachment point: Stop at transport plate (with shackle or lifting hook).

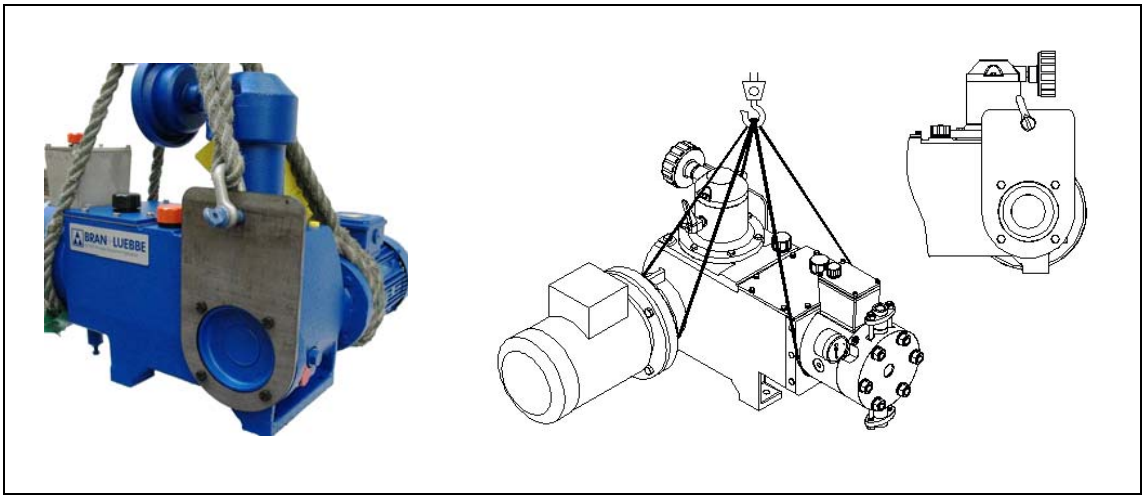


Fig. 8.14: Attachment to pump model H2-H4 with the aid of a transport plate

Individual pumps can also be lifted without transport plates.

For lifting suggestions with attachment points and slings
see Figs. 8.1 –8.5 and Fig. 8.7

NOVADOS, model H2, H3 und H4

Multiple pumps up to max. 3 pumps

1st attachment point:	Sling around the motor connection flange.
2nd attachment point:	with 2-way pump: Sling around all pump heads or pump yokes. with 3-way pump: Sling around all middle pump head or pump yoke.
3rd attachment point:	Sling around the connecting flange between last and next to last gear unit housings. Alternatively, the transport plate of the last gear unit housing can be used. Stop with shackle or lifting hook. *See figs. 8.15a and 8.16a*

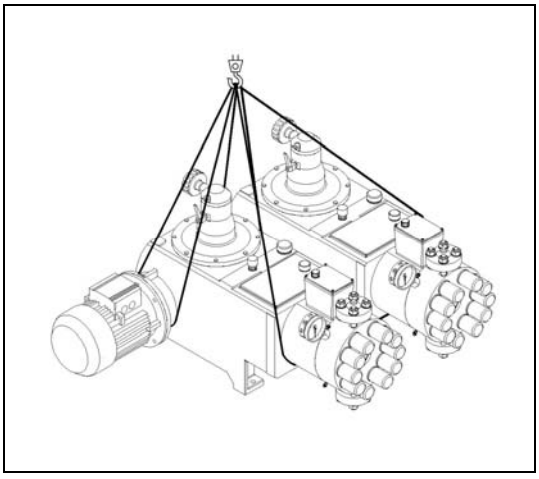


Fig. 8.15: Slings around 2-way pumps

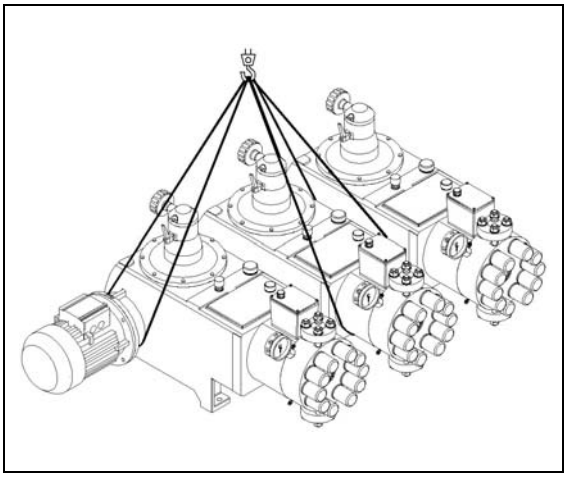


Fig. 8.16: Slings around 3-way pumps

Alternative with transport plate

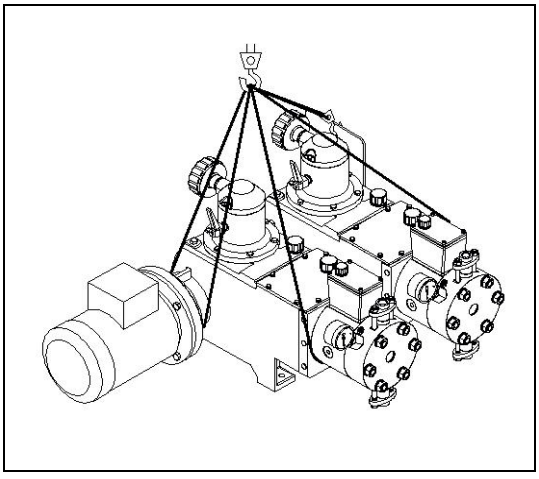


Fig. 8.15a

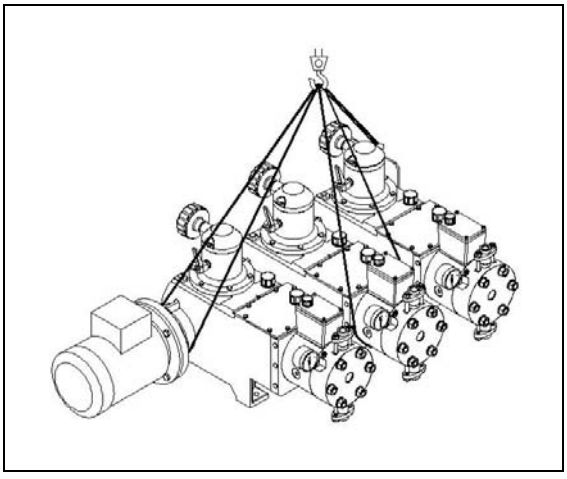


Fig. 8.16a

NOVADOS, model H5 and H6

Individual pumps with manual, pneumatic or electric stroke length adjuster

When using pumps with a pneumatic or electric stroke length adjuster, please ensure that the transport ropes do not damage the control lines of the stroke length adjuster or the controller!

For lifting suggestions with attachment points and slings *see Figs. 8.1 –8.5 and Fig. 8.7*

Multiple pumps with max. 3 pumps

1st attachment point:	Sling around the motor connection flange.
2nd attachment point:	Sling around the connecting flange between last and next to last gear unit housings.
3rd attachment point:	with 2-way pump: Sling around all pump heads or pump yokes. with 3-way pump: Sling around all middle pump head or pump yoke.

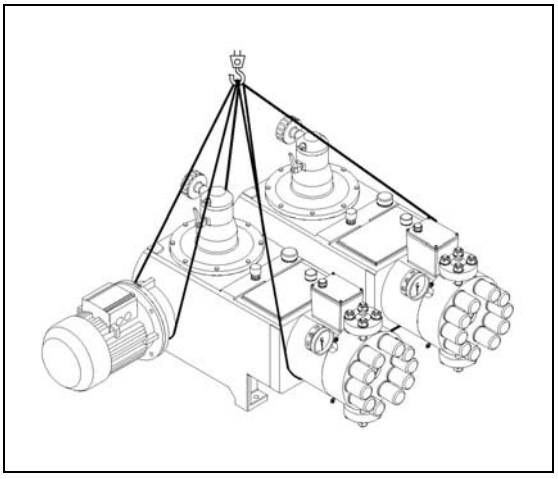


Fig. 8.17: Slings around 2-way pumps

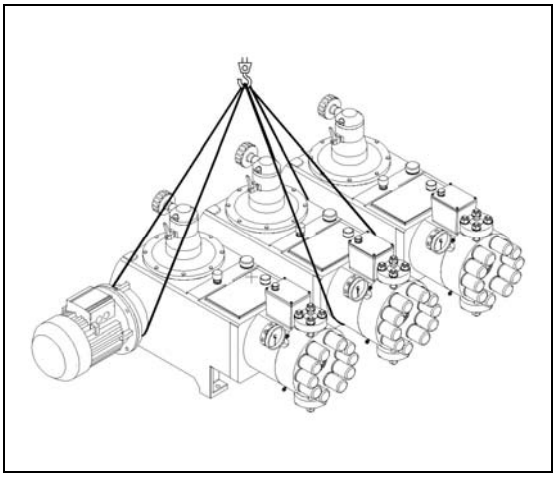


Fig. 8.18: Slings around 3-way pumps

NOVADOS, model J, C and CS

Multiple pumps with 2 or more pump heads and with manual, pneumatic or electric stroke adjustment

When using pumps with pneumatic stroke adjustment, ensure that the transport ropes do not damage the oil supply pipelines!

- Remove motor
  to prevent damage to the ventilation plate
- 1st & 2nd attachment points:

  Loop two transport ropes around the upper gear unit housing. Place sling tight against the housing at both sides (area of flange connection to pump yoke) and tighten. *See Figs. 8.19 & 8.20, item 1*
- 3rd attachment point:

  Attach transport rope in a loop around the motor connection flange and lead upwards at the front of the gear unit. *See Figs. 8.19 & 8.20, item 1*

Ensure that the loops are firmly seated!

If transport rope length adjustment required:

- Use adjustable lifting chains;
- Secure all 3 transport ropes to a 3-strand lifting chain. *See Fig. 8.7*

The arrangement shown in Fig. 8.19 allows the pump to be lifted close to the centre of gravity and transported.

The slight tilting of the pump during the lifting procedure is non-critical, provided that the load is lifted slowly and swinging is avoided.

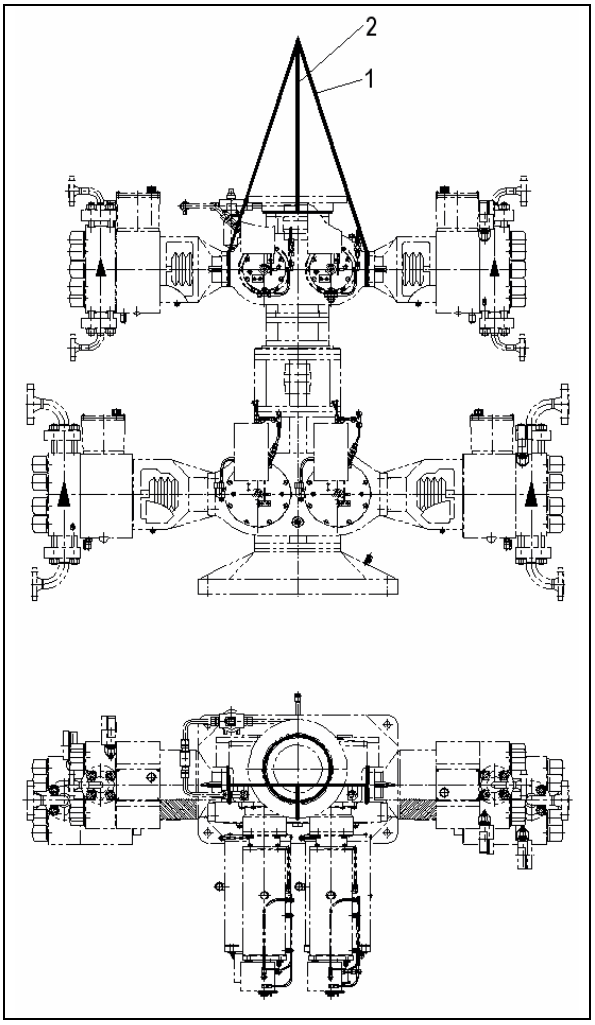


Fig. 8.19: Lifting suggestion with transport ropes

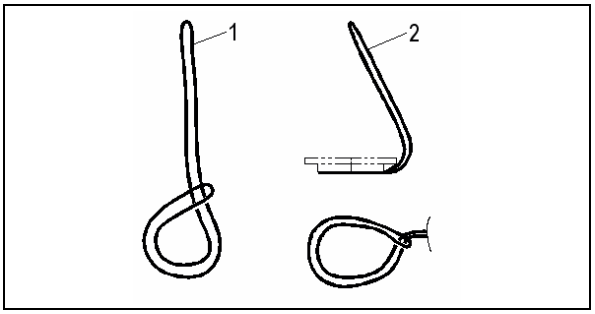


Fig. 8.20: Loop-shaped transport rope slings

Model ProCam, gear unit size G1 and G2

Individual pumps with manual stroke adjustment

Individual pumps of size G1 and G2 can be lifted with slings at just 2 attachment points.

Depending on the weight of the motor, the pump may be in a slightly tilted position when it is lifted.

This is not critical provided that the transport ropes are carefully slung around the attachment points and the pump cannot slip out.

1st attachment point:
Sling around the motor connection flange.

2nd attachment point:
Sling around the pump head or the pump holder.

Fig. 8.21

Fig. 8.22

Fig. 8.23

Multiple pumps with max. 6 pumps

1st attachment point:	Sling around the motor connection flange. Rope routed to lifting hook between motor and pump head.
2nd attachment point:	Sling around the connecting flange between last and next to last gear unit housings.
3rd attachment point:	with 2-way pump: Sling around all pump heads or pump yokes. 3-way (or more) pump: Sling around middle pump head or pump yoke.

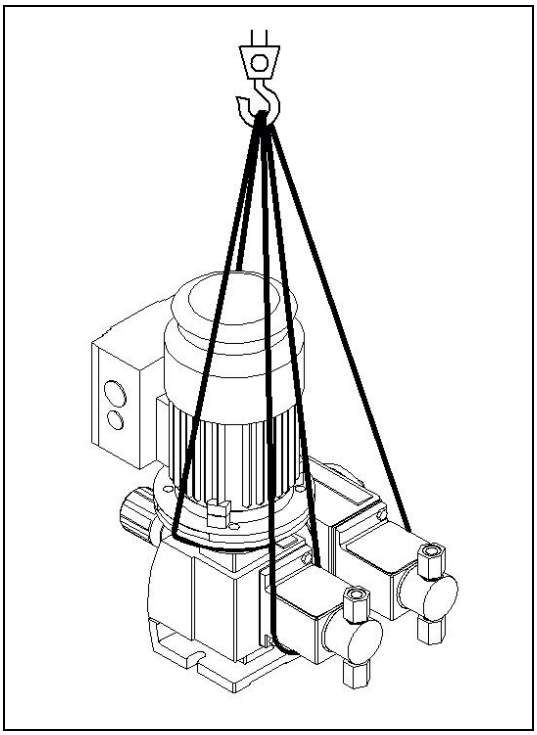


Fig. 8.24:
Slings around 2-way pumps

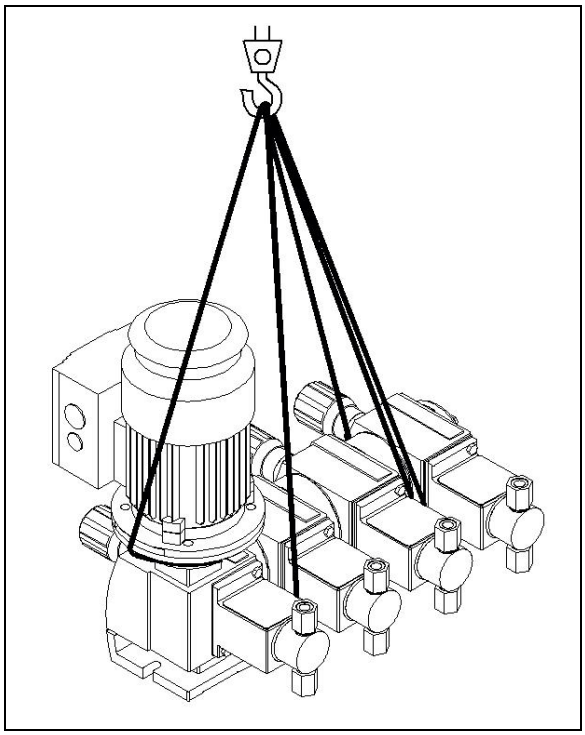


Fig. 8.25:
Slings around multiple pumps

8.1.2 Storage

1. Storage in dry and well ventilated rooms

ATTENTION!

Especially when the machine is stationary, the roller bearings in the pump can be damaged by adjacent equipment units.

Protect these roller bearings from vibration using a suitable (vibration-damping) foundation.

A storage period of up to 2 years is possible without any special precautionary measures.

2. Storage in rooms with high levels of humidity

The pump must be sealed air-tight in plastic film and be protected from condensation by means of a suitable quantity of silica gel. A storage period of up to 2 years is then possible.

3. Storage outdoors

In addition to the measures mentioned in Item 2, protection against precipitation, sandstorms and direct sunlight must be provided.

8.1.3 Preservation

Preservation of installed pumps

Fill up the pump with oil of the recommended quality in the specified quantity
(See data sheet 1.2.1, and Section 5.1.).

The following applies for diaphragm pumps:
Fill the reservoir with hydraulic oil in order to prevent condensation build-up.
(See data sheet 1.2.1, and Section 3.3.).

The following applies to pumps with electrical stroke adjustment:
Apply voltage to the heating resistors or electric position controllers.
(See data sheet 1.2.1, and Section 3.2.).

If the start of operation is delayed the pump must be switched on for approx. 15 min. every month in order to wet all the exposed places in the gear/drive unit with oil again.

ATTENTION!

<u>In the case of plunger pump heads</u>, damage to sealing elements and to the plunger is possible!

The plunger must not be used if dry.

Make sure that the plunger is coated by the product or a flushing medium.

Remove the plunger from the cross head. Move the plunger to the front dead centre position.

Change the oil once a year.

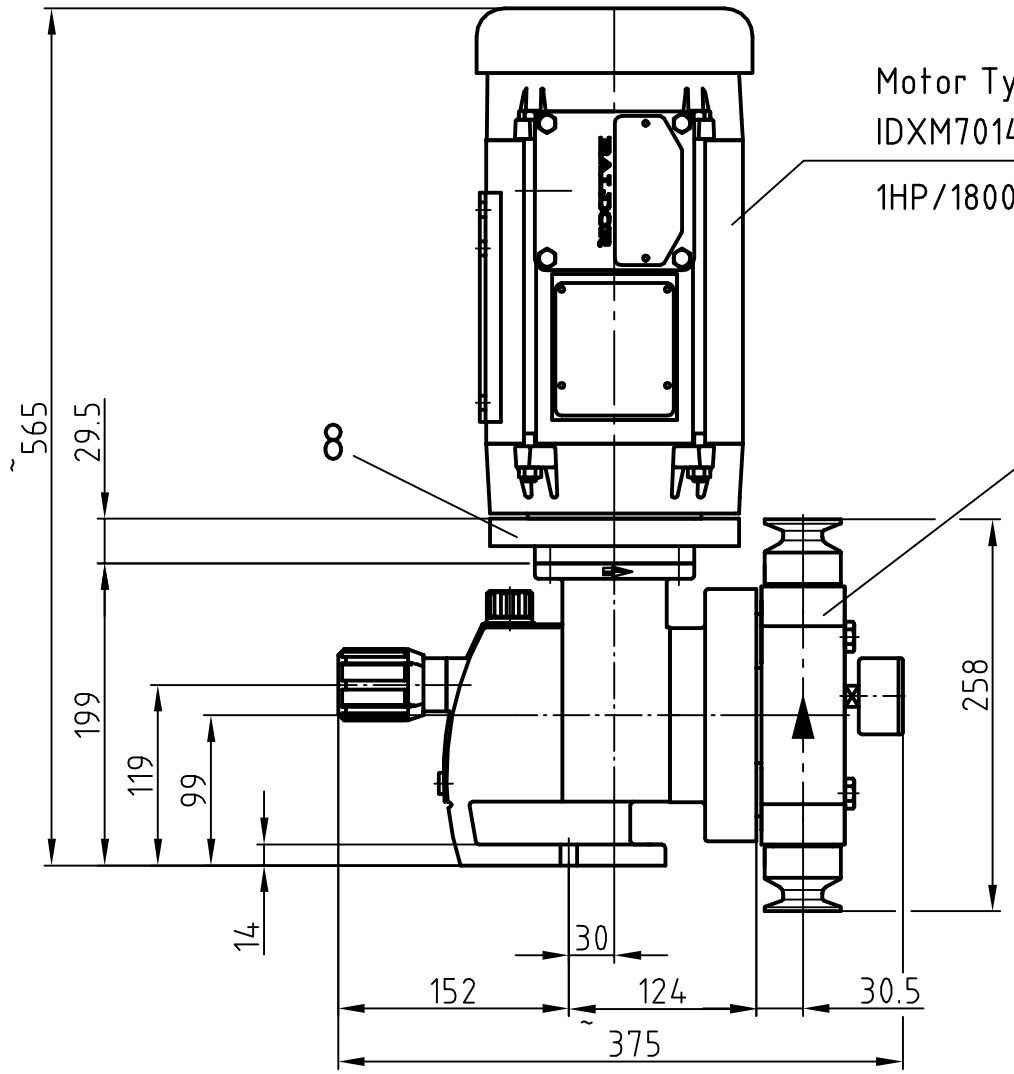
It will be necessary to change the oil before the final start of up the pump. The specified oil-change intervals must then be observed *(see Section 6)*.

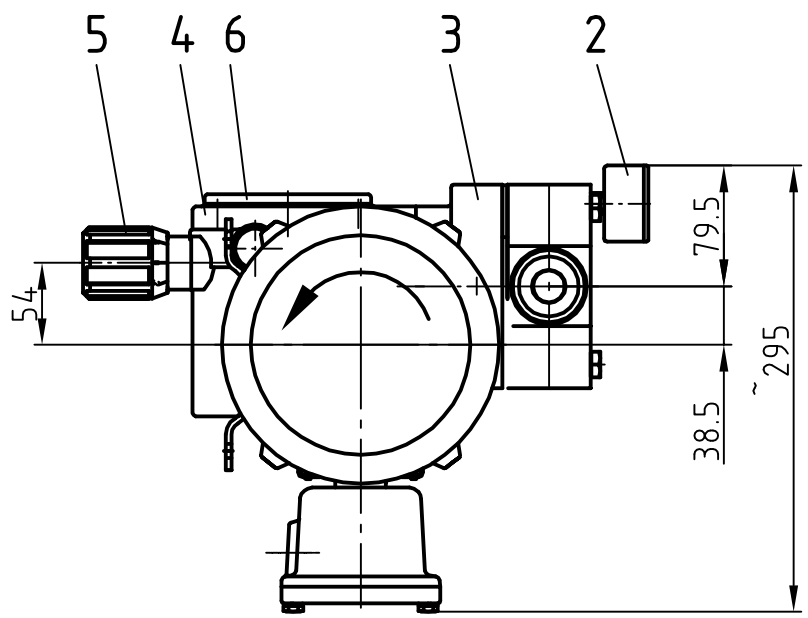
9 Drawings and Parts Lists

Machine drawings and part lists for the machine can be found on the following pages.

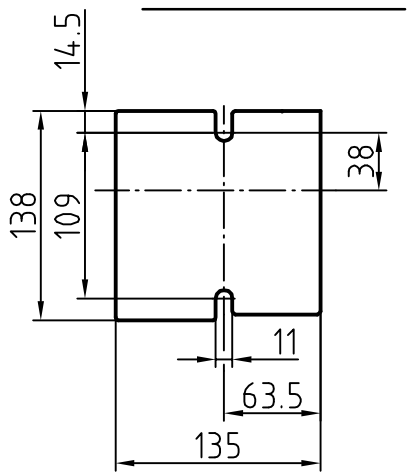
If you want to order spare parts, you will find the respective item numbers on the relevant drawing.

The part identification number for the item number can then be taken from the parts list.





Auflagefläche
Base area



Gewicht / weight : ~ 45 kg
Ölmenge/oil quantity: 0.8l

Projektion ISO128-30
projection ISO128-30

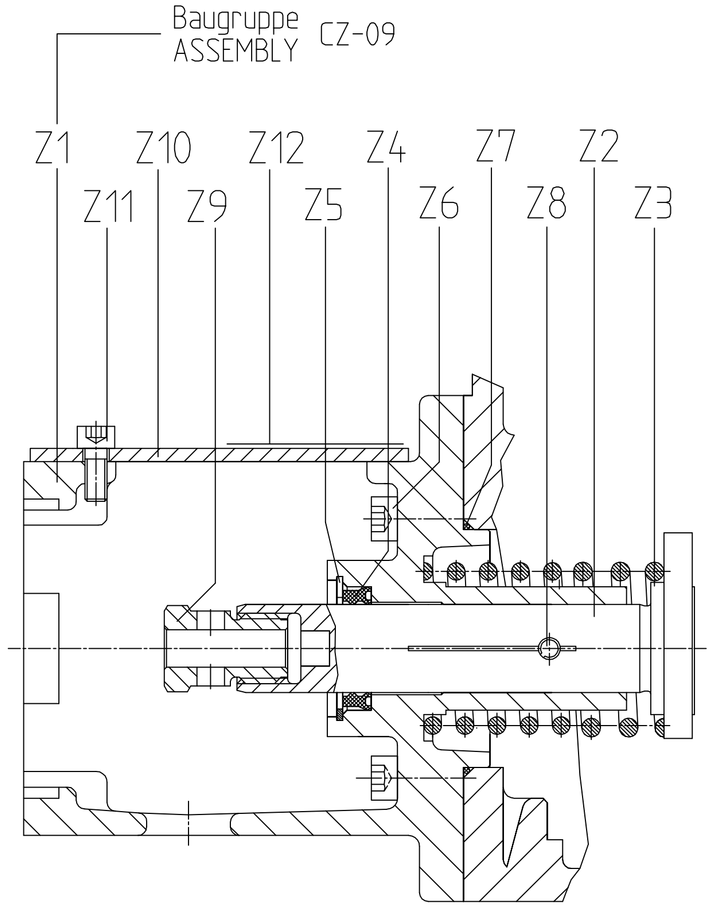
BRAN+LUEBBE

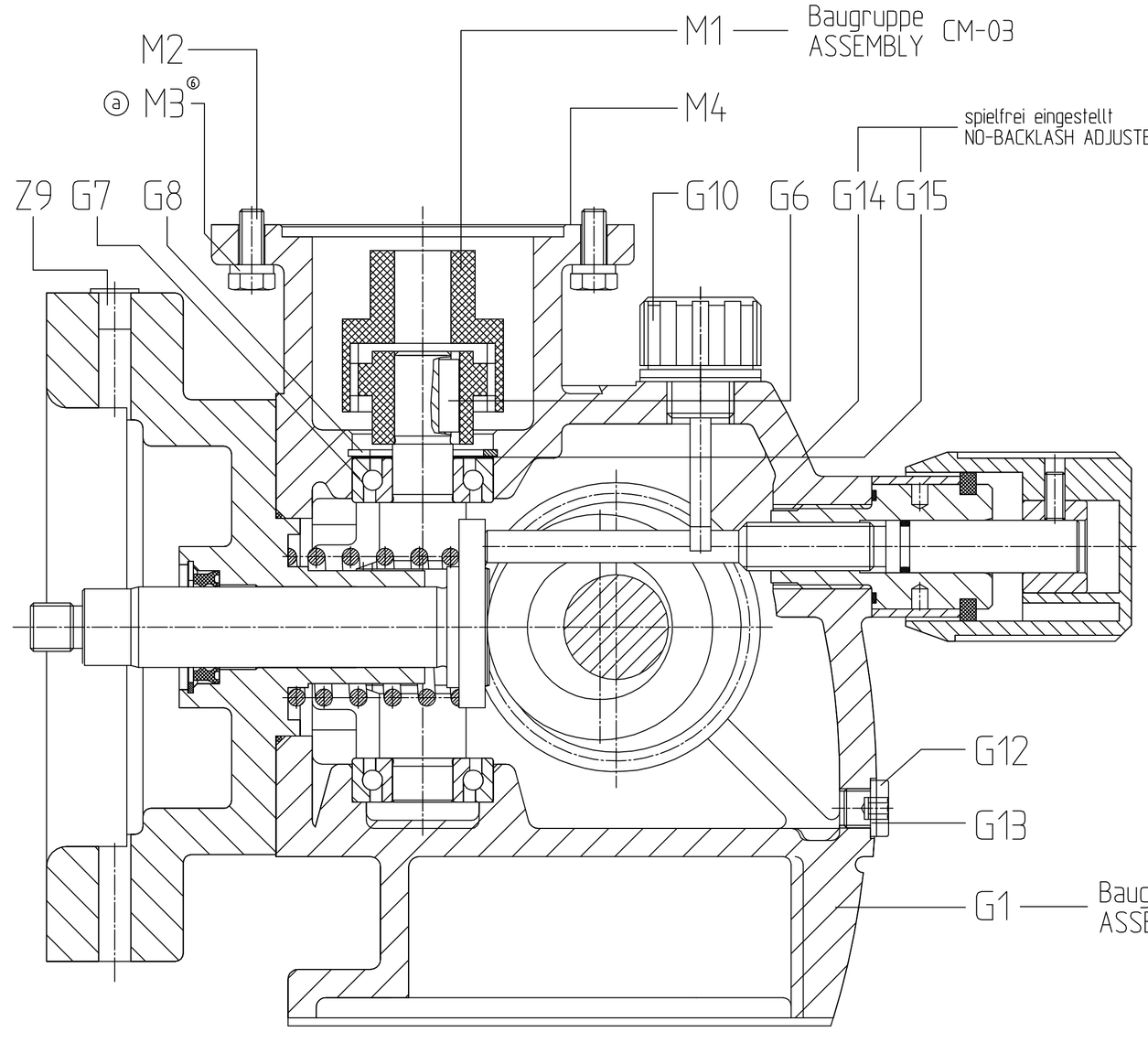
TITLE 1 DOSIERPUMPE/METERING PUMP
TITLE 2 DS500

DRAWN	E.Deutschmann	13.01.2010	MATERIAL	IDENT.-NO.	REV.	0
CHANGED	E.Deutschmann	14.01.2010				
APPROVED	G.Reichelt	14.01.2010	FORMAT A3	SCALE 1:5	SHEET 1/1	DRAWING-NO. 13639230
RELEASED	E.Deutschmann	14.01.2010				

- CAD-DRAWING -

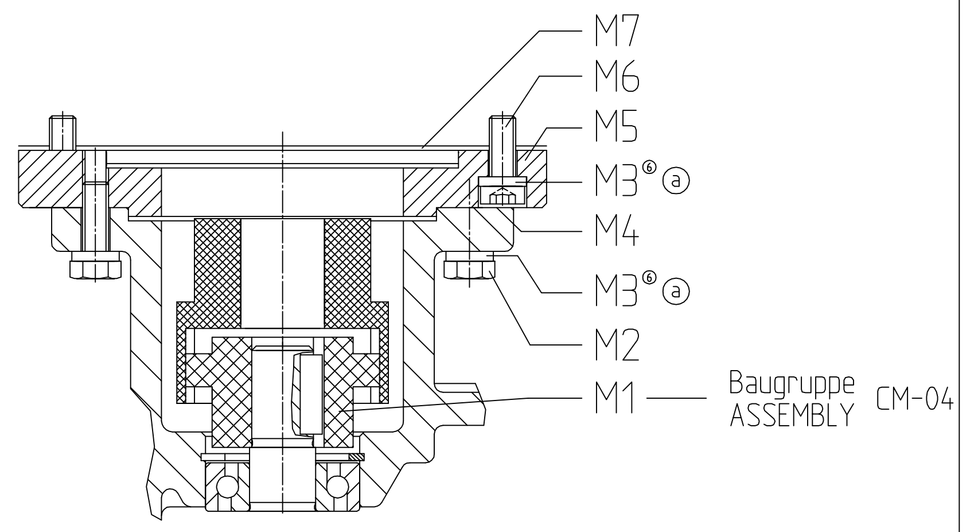
- CAD-DRAWING -

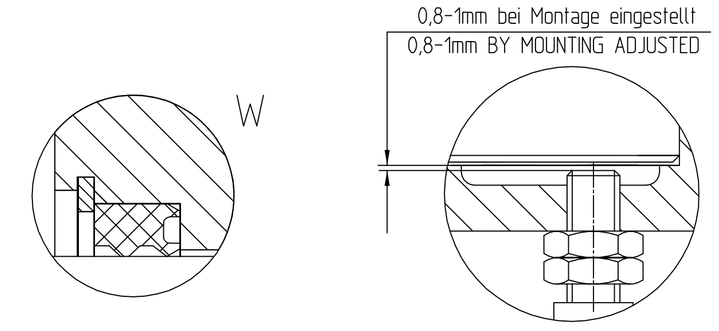


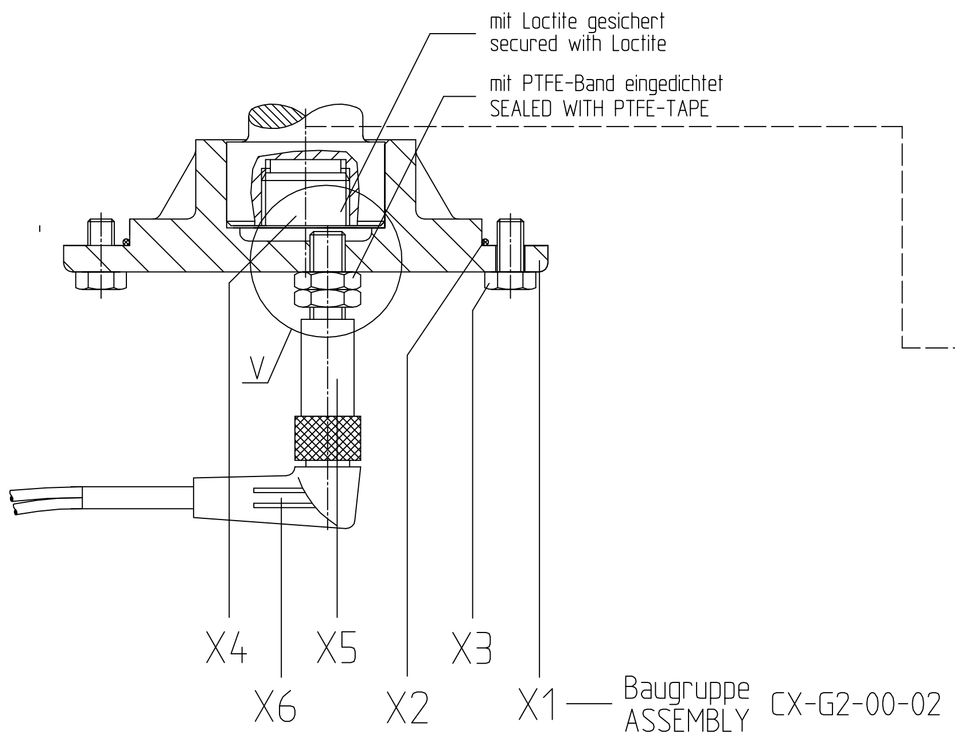


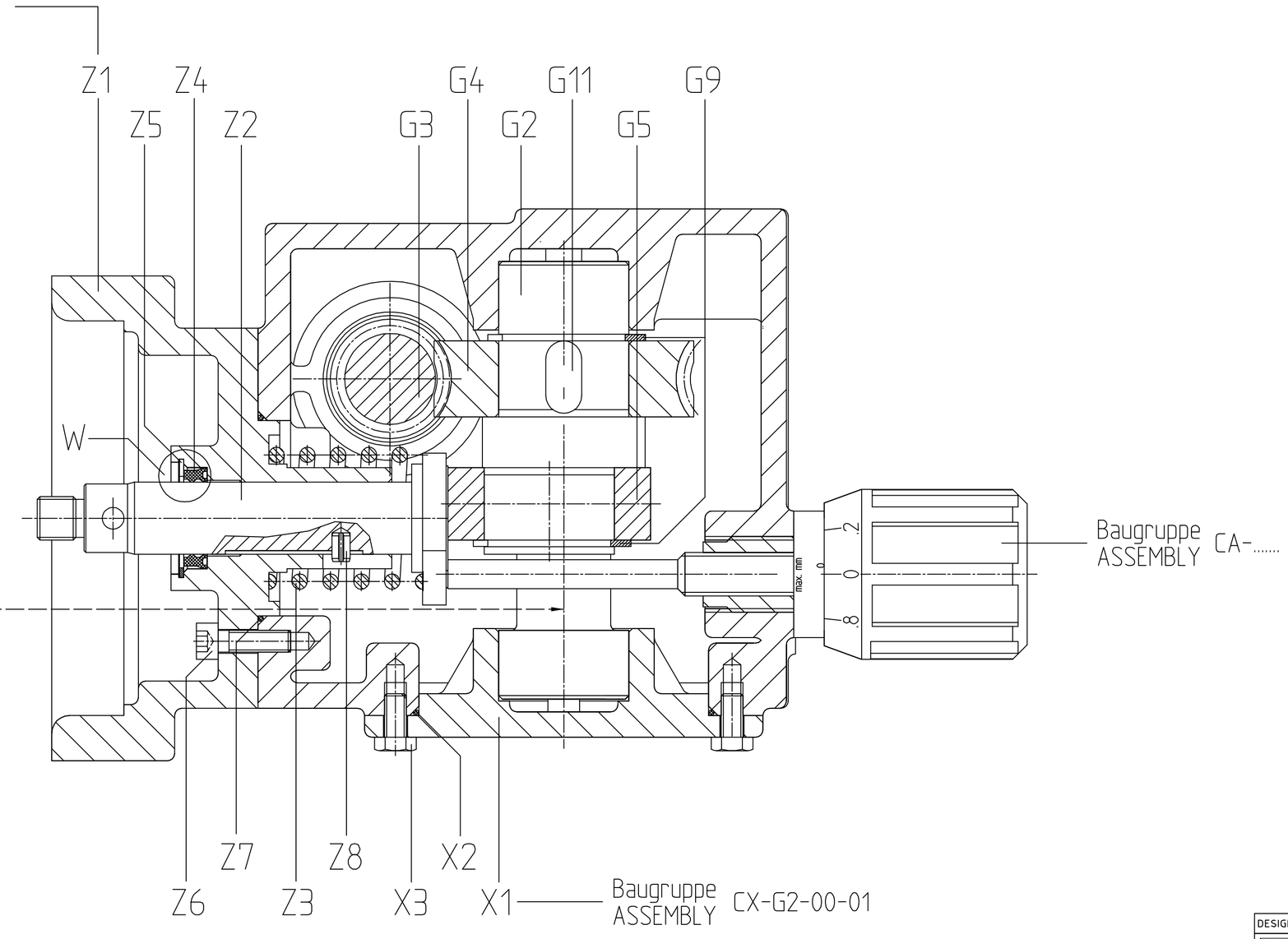
CG-G2-01-08-38/2
CG-G2-01-15-38/2
CG-G2-01-08-28/1
CG-G2-01-15-28/1

CG-G2S-01-08-38/2
CG-G2S-01-15-38/2
CG-G2S-01-08-28/1
CG-G2S-01-15-28/1









ⓐ Beim Einsatz der Pumpen in explosionsgefährdeten Bereichen (s. Auftrag) sind bei der Montage des Antriebsmotors die Unterlegscheiben für die Befestigungsschrauben lt. Stückliste zwingend zu verwenden.

In areas subject to explosion hazards (refer to order) the use of washers on the bolts for the mounting of the drive motor is mandatory (refer to parts list)

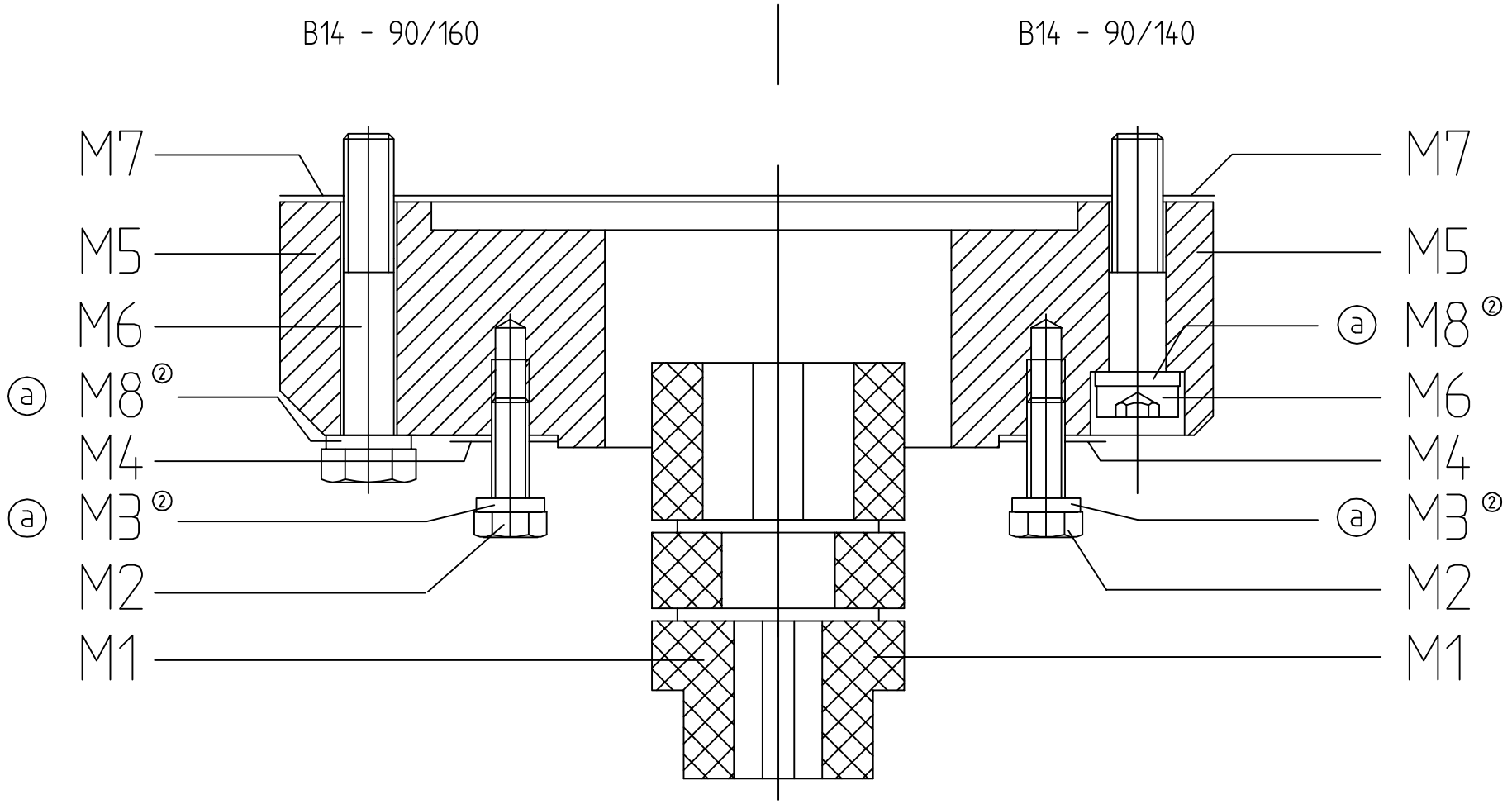
DESIGNED	D.Petersen	10.12.93
DRAWN	W.Naundorf	01.10.96
CHANGED	W.Naundorf	09.03.04
APPROVED	D.Petersen	07.04.04
RELEASED	D.Petersen	07.04.04

BRAN+LUEBBE

TITLE 1 GETRIEBE G2
TITLE 2 GEAR G2

MATERIAL	IDENT.-NO.	REV.
		6

FORMAT	SCALE	SHEET	DRAWING-NO.
A1	1:1	1/1	CG-G2-01



Bei ATEX-Ausführung :
Gewindestifte zur Befestigung der Kupplungsnabe mit Loctite 243 gesichert
For ATEX-application :
Set screwfor coupling-hub mouting are secured with 243 Loctite

ⓐ Beim Einsatz der Pumpen in explosionsgefährdeten Bereichen (s. Auftrag) sind bei der Montage des Antriebsmotors die Unterlegscheiben für die Befestigungsschrauben lt. Stückliste zwingend zu verwenden.

In areas subject to explosion hazards (refer to order) the use of washers on the bolts for the mounting of the drive motor is mandatory (refer to parts list)

DESIGNED	D.Petersen	11.11.96
DRAWN	W.Naundorf	11.11.96
CHANGED	W.Naundorf	19.03.04
APPROVED	D.Petersen	07.04.04
RELEASED	D.Petersen	07.04.04

BRAN+LUEBBE

TITLE 1 ANTRIEB F. BAUGR. 90
TITLE 2 ASSEMBLY

MATERIAL	IDENT.-NO.	REV.
		2

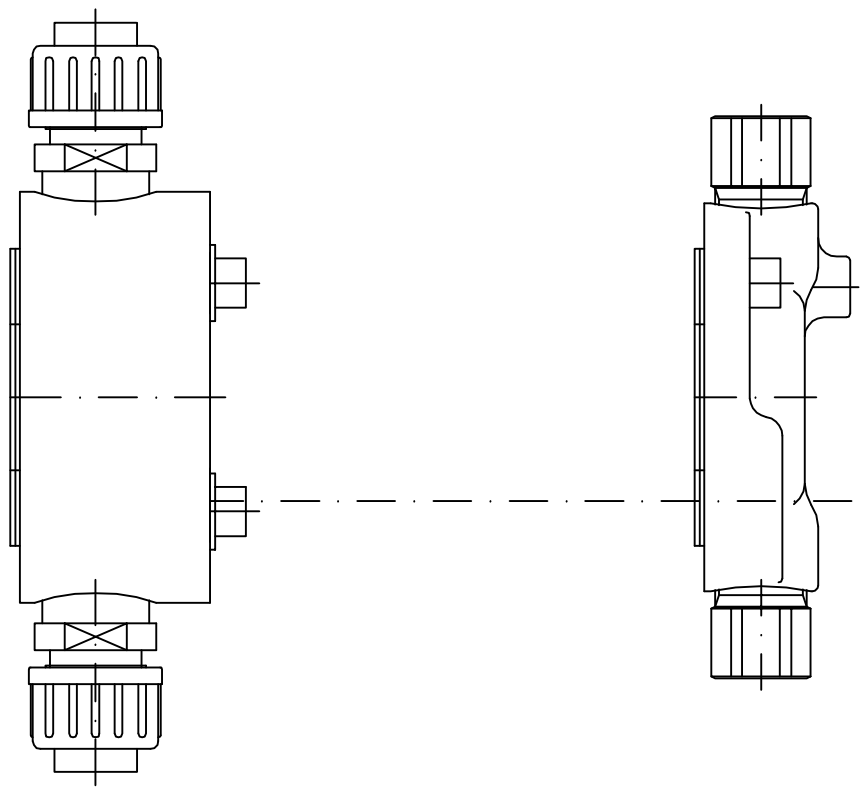
FORMAT	SCALE	SHEET	DRAWING-NO.
A3	1:1	1/1	CM-014

- CAD-DRAWING -

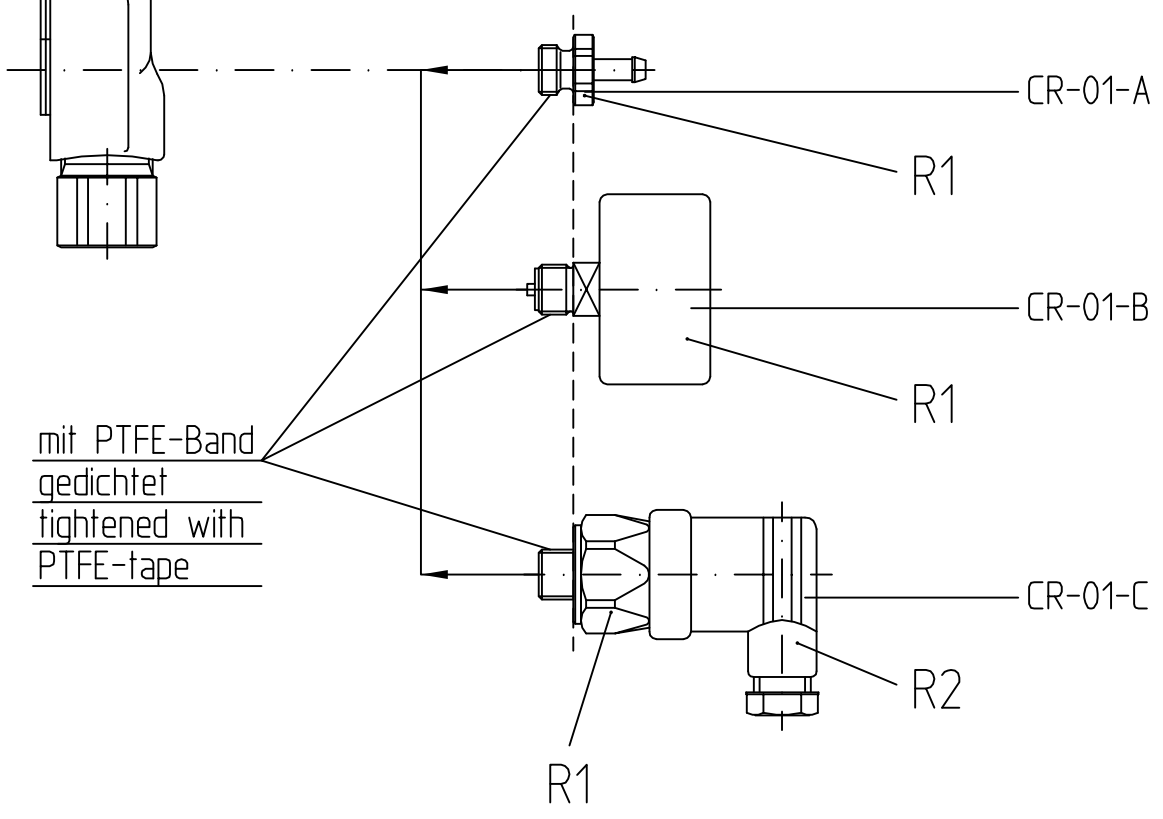
Pumpenkopf:
pump head:

Kunststoffausf?hrung
plastic design

Metallausf?hrung
metal design



Baugruppe:
assembly:



Nippel
nipple

Manometer
pressure gauge

Druckschalter mit
Steckdose
pressure switch
with plug connection

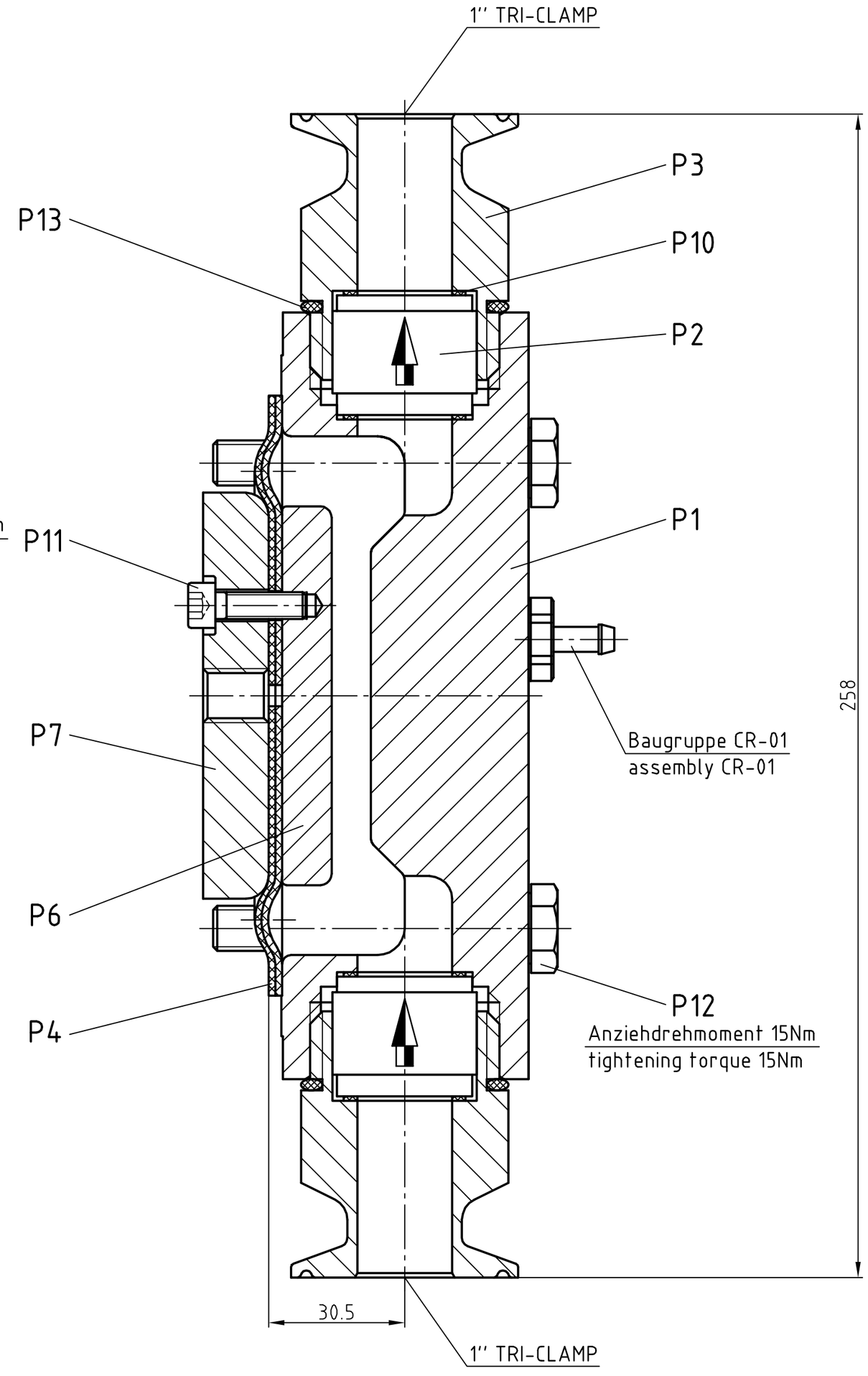
DESIGNED	R. Bräuer	11. 12. 93
BRAN+LUEBBE		
DRAWN	K. Sturm	08. 12. 93
CHANGED		. .
APPROVED	R. Braeuer	11. 12. 93
RELEASED	R. Braeuer	08. 04. 94

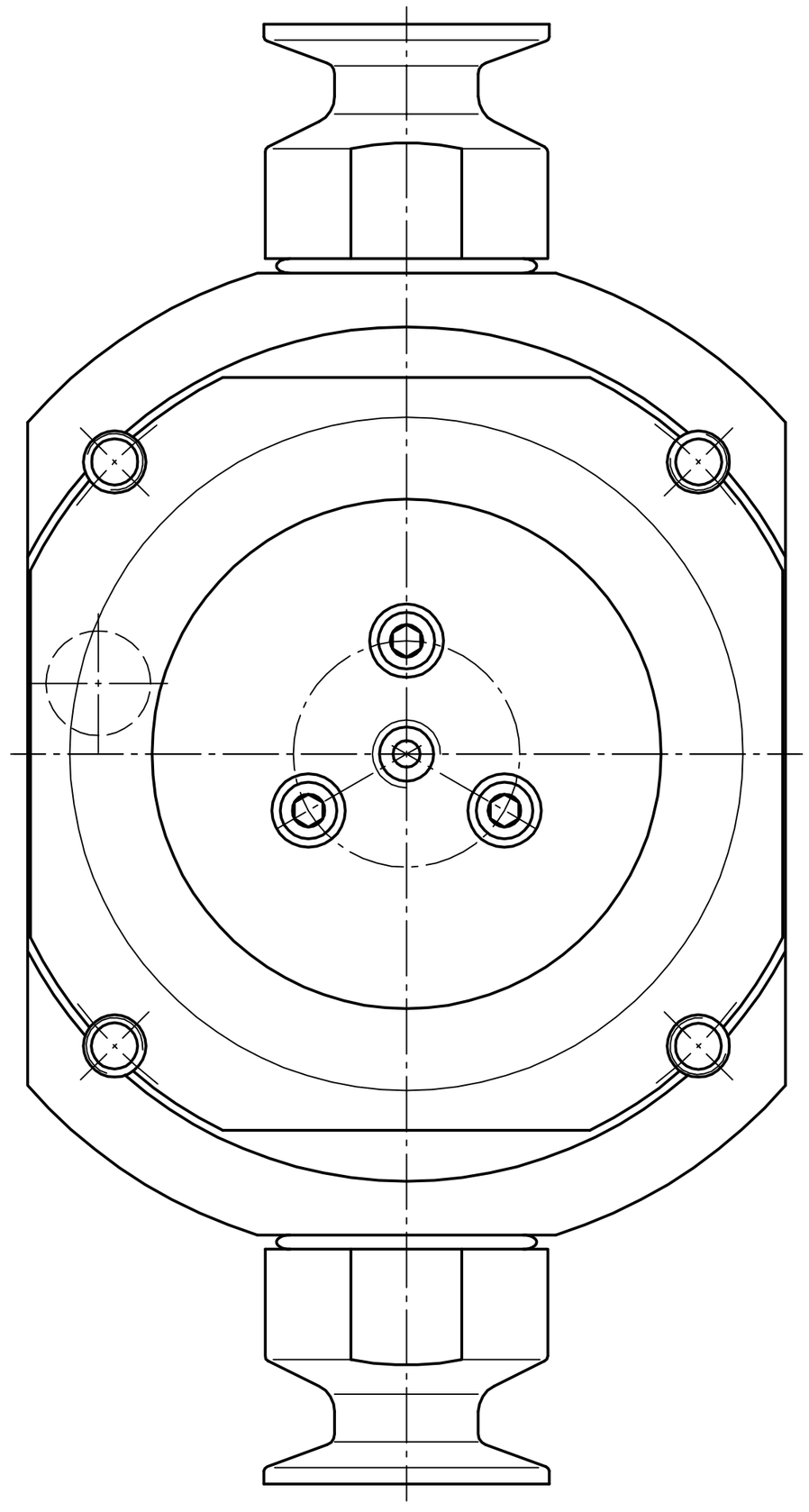
TITEL 1 MEMBRANBRUCHÜBERWACHUNG
TITEL 2 DIAPHRAGM RUPTURE MONITO. - CAD-DRAWING -

MATERIAL	IDENT-NO.	REV.
		0

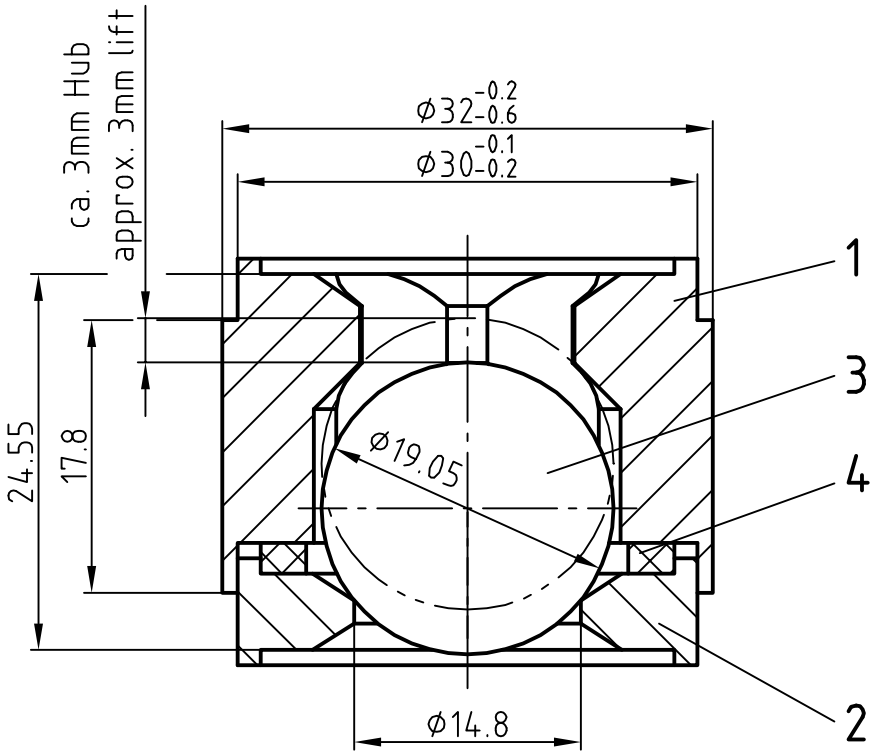
FORMAT	SCALE	SHEET	DRAWING NO
A3	1: 2	1/1	CR-01

- CAD-DRAWING -





DESIGNED	Reichelt	16.11.2006				
BRAN+LUEBBE			TITLE 1 MEMBRANPUKO DS500 TITLE 2 DIAPHRAGM PUMPHEAD			
DRAWN	V.Mildenberger	16.11.2006	MATERIAL	IDENT.-NO.	REV. 0	
CHANGED	V.Mildenberger	21.11.2006				
APPROVED	G.Reichelt	21.11.2006	FORMAT A2	SCALE 1:1	SHEET 1/1	DRAWING-NO. PM2-025
RELEASED	V.Mildenberger	21.11.2006				



Uroriginal / Original-No.
PV32
Kom.-Nr. / Job-No.
51132004

DESIGNED	**Reichelt**	**16.11.2006**
DRAWN	V.Mildenberger	16.11.2006
CHANGED	V.Mildenberger	21.11.2006
APPROVED	G.Reichelt	08.01.2007
RELEASED	L.Gabriel	08.01.2007

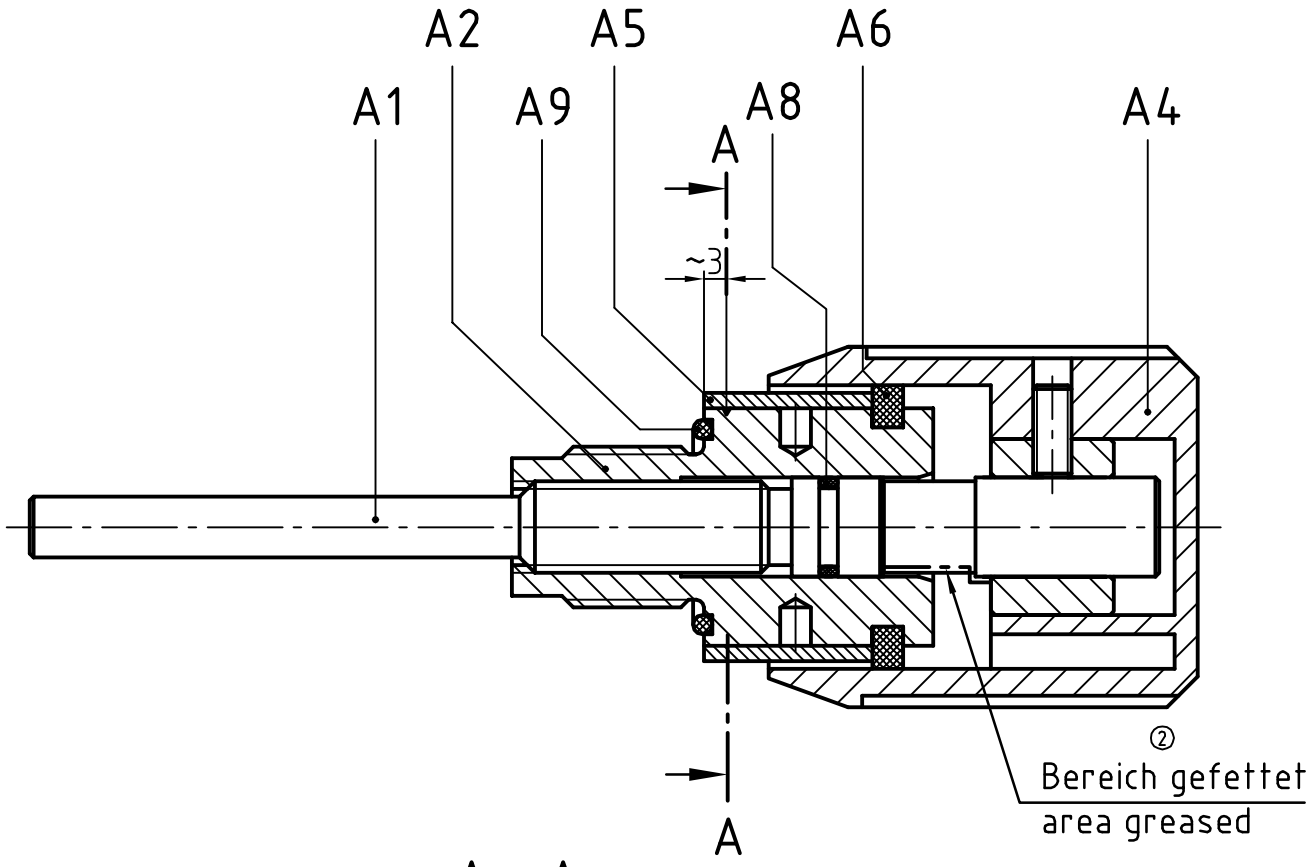
- CAD-DRAWING -

BRAN+LUEBBE

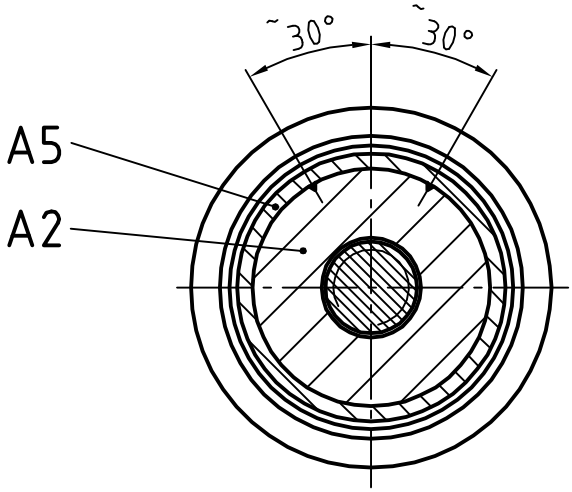
TITLE 1 Ventil
TITLE 2 valve

MATERIAL	IDENT.-NO.	REV.
		0

FORMAT	SCALE	SHEET	DRAWING-NO.
A4	2:1	1/1	PV32-0173



A - A



Bei Montage :

Körnerschlag in Teil A2 , als Verdrehsicherung für Teil A5

DURING ASSEMBLY :

SET PUNCH MARK AT PART A2 TO PREVENT TORSION OF PART A5

DESIGNED	D.Petersen	10.12.93
DRAWN	W.Naundorf	10.12.1993
CHANGED	J.Thomsen	31.01.2008
APPROVED	D.Petersen	07.02.2008
RELEASED	D.Petersen	07.02.2008

- CAD-DRAWING -

BRAN+LUEBBE

TITLE 1 Verstellung
TITLE 2 adjustment

MATERIAL	IDENT.-NO.	REV.
		3

FORMAT	SCALE	SHEET	DRAWING-NO.
A4	1:1	1/1	CA-3-01

4.02.10

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
001	1,000	METERING PUMP DS500 <<<<>>>>	13639230			--/07100	1

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m 2

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	AUFTRAG 30 DS500			1,000	9174295 -	02/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
001	1,000	PROCAM			078041SV	DS500/86	1
093	1,000	PLATE, LABEL ÖL EINFÜLLEN	SCHI-1066	PVC	155505	D/E/F OIL	1
095	1,000	PLATE, LABEL KLEIN	DIN4844-2	PVC FOLIE	155502	WARNING ELECTRICITY	1
097	1,000	DIRECTION ARROW	SCHI-1072	SCOTCHCAL	155510		1
099	1,000	PLATE, LABEL 80 X 17 B+L LO	SCHI-1050/3	AL/ELOX	155470	H1 MASCHINEN/METERIN	1
100	1,000	PLATE, LABEL PROCAM	SCHI-1061	VA	155489	E/D	
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	METERING PUMP DS500 --/07100	13639230		1,000	9174295 -	03/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
1	1,000	PUMP HEAD 1" TRICLAMP	PM2-025	316L/3.1	091551S	V/ DS500 I+A:RA=0,8µ	
2	1,000	PRESSURE GAUGE -1-25 BAR/-14,5-360	CR-01		440023S	V/ CR-01-B	1
3-6	1,000	GEAR BOX BASIS G2			440348SV	CZGAX-D500-38/2	1
		MOT.SUPPL.+FITT.BY CUSTOMER	NEMA 143TC 1HP/1800	CL1DIV1D			
8	1,000	CONNECTOR G2	CM-014/2		078825S	V/ NEMA 143 TC (FF-1	
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m 2

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	PROCAM DS500/86		078041SV	1,000	9174295 -	04/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
P1	1,000	COVER RA=0,8 EL.POL.	PM2-108 A	316L/3.1	091552	DS500	
P2	2,000	VALVE BALL(1X) 3/4" SS316	PV32-0173	316L/3.1	091555	I+A:RA=0,8µ EL.POL.(	
P3	2,000	CONNECTING PIECE 1"TRI-CLAMP BL.1C	PM2-109/1 A	316L/3.1	091553	PV32/I+A:RA=0,8 EL.P	
P4	1,000	DIAPHRAGM, MEMBRANE MEHRL- AUSF.B	PM2-67B	PTFE	320140	FDA ZERTIFIKAT	1
P6	1,000	PLATE RA=0,8 EL.POL.	PM2-110 A	316L/3.1	091554	DS500 (PU)	
P7	1,000	PLATE	PM2-26/1	1.4034	320014		1
P10	4,000	GASKET, SEALING 21 X 27 X 2	STYLE3500	FD 5	080216	FDA ZERTIFIKAT; HAUT	1
P11	3,000	SCREW, BOLT M 6 X 20	DIN 912	A 4-80	100837		1
P12	4,000	SCREW, BOLT VIS HM10X70 EL.POL.		A4	091619	DS100/DS200/DS500	
P13	2,000	O-RING 40 X 4		EPDM	091558	FDA ZERTIFIKAT	
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	PUMP HEAD 1" TRICLAMP V/ DS500 I+A:RA=0,8µ EL.POL.	PM2-025	091551S	1,000	9174295 -	05/ 1

4.02.10

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
001	1,000	HOUSING RA=0,8 EL.POL.	PV32-353 A	316L/3.1	091556	PV32-0173	
002	1,000	VALVE SEAT RA=0,8 EL.POL.	PV32-354 A	316L/3.1	091557	PV32-0173	
003	1,000	BALL 3/4" (19,05)	ISO 3290 G28	1.4401	120517	(DIN5401)	1
004	1,000	GASKET, SEALING 21 X 27 X 2	STYLE3500	FD 5	080216		1
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	VALVE KUG(1X) 3/4" SS316 I+A:RA=0,8µ EL.POL.(FD5)	PV32-0173	091555S	2,000	9174295 -	07/ 1

4.02.10

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
R1	1,000	PRESSURE GAUGE -1-25 BAR/-14,5-360 <<<<>>>>	NG50	1.4571	600605	131.11 RÜCKSEITIG Z	1

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	PRESSURE GAUGE -1-25 BAR/-14,5 V/ CR-01-B	CR-01	440023S	1,000	9174295 -	05/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
003	1,000	PUMP YOKE, SPACER D.500	CG-G2-01/6		440064SV	CZ-05	1
004	1,000	GEAR BOX F.SINGLE-HEAD+W/O IM	CG-G2-01/6		440113S	CG-G2S-01-08-38/2	1
005	1,000	ADJUSTER HAND	CA-3-01/3		440001S	CA-3-01-08	1
006	1,000	COVER	CG-G2-01/6		440053S	CX-G2-00-01	1
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

2

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	GEAR BOX BASIS G2 CZGAX-D500-38/2		440348SV	1,000	9174295 -	05/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
Z1	1,000	PUMP YOKE, SPACER D500	CV-2/3	GG 20	202038		1
Z2	1,000	TAPPET	CV-14/7	9CR18MOV	303566		1
Z3	1,000	SPRING DRUCK-	CV-151	VD	190254		1
Z4	1,000	GROOVED RING, SLOTRING 20 X 28 X 5,7		Z20 (AU)	369609	TYP: U32I	1
Z5	1,000	RETAINING RING, CIRCLIP 31 X 1,2	DIN 472	FEDERST	101648		1
Z6	4,000	SCREW, BOLT M 6 X 20	DIN 912	A 4-70	100124	V	1
Z7	1,000	O-RING 54 X 2		NBR	152176		1
Z8	1,000	PIN 5 X 8	ISO 8752	FEDERST	102001		1
Z9	1,000	CAP <<<<>>>>		PE	170209		1

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	PUMP YOKE, SPACER D.500 CZ-05	CG-G2-01/6	440064SV	1,000	9174295 -	06/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
G1	1,000	HOUSING	CV-17/2	GG 25	229711		1
G2	1,000	SHAFT	CV-124/2	16MNCR5	251041		1
G3	1,000	WORM SHAFT 38/2	CV-21/1	C 45	224055		1
G4	1,000	WORM WHEEL 38/2	CV-20/1	2.1060	223006		1
G5	1,000	RING	CV-37/1	16MNCR5	229713		1
G6	1,000	PARALLEL KEY A 5 X 5 X 18	DIN 6885	ST 50-1K	100531		1
G7	2,000	BEARING 7202 BE	DIN 628		120071		1
G8	1,000	RETAINING RING, CIRCLIP 35 X 1,5	DIN 472	FEDERST	101615		1
G9	2,000	RETAINING RING, CIRCLIP 36 X 1,75	DIN 471	FEDERST	101649		1
G10	1,000	SCREW, BOLT G 3/8 -B2	CV-73/2	KUNSTST	078557		1
G11	1,000	PARALLEL KEY A 10 X 8 X 20	DIN 6885	ST 50-1K	100710		1
G12	1,000	SCREW, BOLT G 1/8"	DIN 908	A 4	100097		1
G13	1,000	SEAL RING A 10 X 14 X 1	DIN 7603	CU	150287		1
G14	2,000	WASHER, DISC 25X 35 X0,1	DIN 988	ST	101546		1
G15	1,000	WASHER, DISC 25X 35 X0,3	DIN 988	ST	101550		1
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	GEAR BOX F.SINGLE-HEAD+W/O IM CG-G2S-01-08-38/2	CG-G2-01/6	440113S	1,000	9174295 -	06/ 1

4.02.10

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
A1	1,000	SPINDLE	CV-25/3	C45	201695		1
A2	1,000	GLAND, SCREW CONNECTION	CV-23/3	15 Y	303382		1
A4	1,000	CAP VERSTELL- F.HANDVERST.	CV-166	PA	201033		1
A5	1,000	SCALE	CV-69/3	PBT	155077		1
A6	1,000	RING	CV-71/1	ZELL-PUR	220101		1
A8	1,000	O-RING 10 X 2		NBR	152119		1
A9	1,000	O-RING 23 X 1,5		NBR	152174		1
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	ADJUSTER HAND CA-3-01-08	CA-3-01/3	440001S	1,000	9174295 -	06/ 1

4.02.10

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
X1	1,000	COVER	CV-5/1	GG 25	229704		1
X2	1,000	O-RING 80 X 2		NBR	152180		1
X3	3,000	SCREW, BOLT M 6 X 12	ISO 4017	8.8	100229		1
		<<<<>>>>					

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	COVER CX-G2-00-01	CG-G2-01/6	440053S	1,000	9174295 -	06/ 1

Remarks

Name	Date	Customer No.	Com.No.
REI	11.01.10	2046888	**511363923000**

Line	Quantity	Description	Drawing-No.	Material	Part-No.	Remark	UOM
M1	1,000	COUPLING T1=14 T2=7/8"		KUNST/ST	078836	NEMA 143/145TC / G2-	
M2	4,000	SCREW, BOLT M 6 X 16	ISO 4017	8.8	100230		1
M4	1,000	GASKET, SEALING	CV-50	FD 3	150431		1
M6	4,000	SCREW, BOLT 3/8-16 X 1-1/4		8.8 ZN	006832		1
M7	1,000	GASKET, SEALING <<<<>>>>	CV-152	FD 3	150494		1

For ordering parts : For Part-No. with alphabetic appendix Order-No. is mandatory.

UOM: 1=Each,2=Kg,3=Litre,4=Metre,5=m

Producer	Description	Drawing-No.	Part-No.	Quantity	Serial-No.	Page
Bran+Luebbe	CONNECTOR G2 V/ NEMA 143 TC (FF-1038)	CM-014/2	078825S	1,000	9174295 -	05/ 1

10 Motor / Accessories

Machine drawings and part lists for the machine can be found in the sections below on the following pages.

Fittings and Accessories

If maintenance is required, these documents can be found in *Section 10 "Accessories"*.

Pump fittings and accessories (e.g. drive and technical measurement monitoring systems) must have an explosion protection designation that is at least equal to the pump itself.

BALDOR • RELIANCE

Product Information Packet

IDXM7014T

1HP,1765RPM,3PH,60HZ,143TC,3524M,XPFC,F1

Product Detail

Revision:	E	**Status:**	PRD/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod Type:**	3524M	**Elec. Spec:**	35WGP529	**CD Diagram:**	CD0005
Enclosure	XPFC	**Mfg Plant:**		**Mech Spec:**	35N256	**Layout:**	35LYN256
Frame:	143TC	**Mounting:**	F1	**Poles:**	04	**Created Date:**	08-01-2007
Base:	RG	**Rotation:**	R	**Insulation:**	F	**Eff. Date:**	09-02-2009
Leads:	9#18	**Literature:**		**Elec. Diagram:**		**Replaced By:**	

Nameplate NP0887XP

NO.		**TEMP CODE**	T3C						
SPEC.	35N256P529G1	**MX RPM**	2700						
CAT.NO.	IDXM7014T	**INV.TYPE**	PWM						
HP	1	**C HP FR**	60	**C HP TO**	90				
VOLTS	230/460	**CT HZ FROM**	6	**CT HZ TO**	60				
AMPS	3/1.5	**VT HZ FROM**	6	**VT HZ TO**	60				
RPM	1765	**DES**	B	**WK2**	0.142	**PH**	3	**CL**	F
HZ	60	**SER.F.**	1.00	**NOM.EFF.**	87.5	**SL HZ**	1.2		
MAG CUR	2/1								
RATING	40C AMB-CONT								
FRAME	143TC								
S/N		**BLANK**	55C RISE						

Parts List

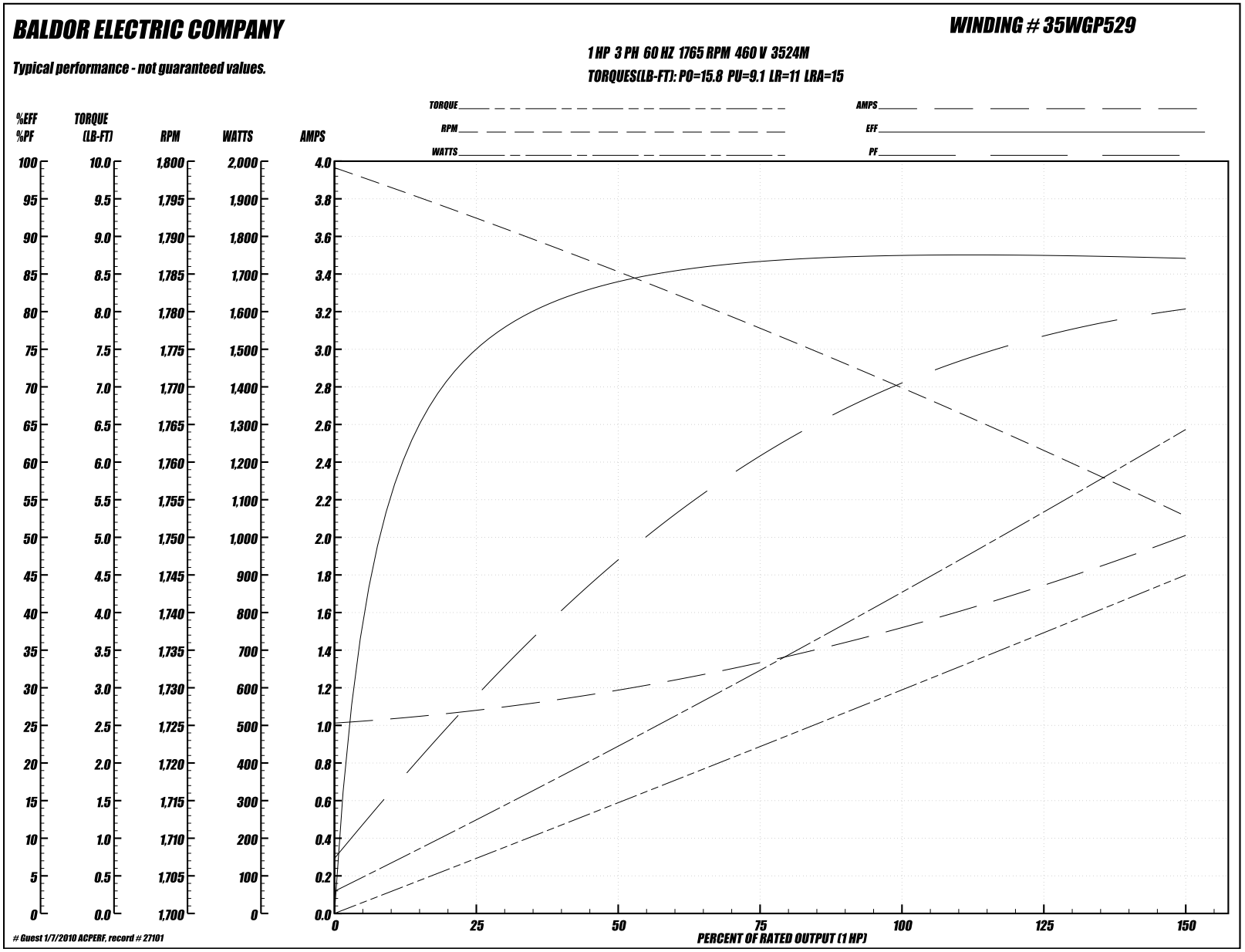
Product ID	Description	Quantity
SA161703	SA 35N256P529G1	1.000
RA150247	RA 35N256P529G1	1.000
34FN3002B01	EXTERNAL FAN, PLASTIC, .637/.639 HUB W/	1.000
35CB3001A02SP	EXPL PROOF CONDUIT BOX, 3/4"PIPE TAP LEA	1.000
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000
HW3001B01	BRASS CUP WASHER, FOR #8 SCREW	1.000
35EP3700A01SP	FR ENDPLATE, XPFC	1.000
HW5100A03SP	WAVY WASHER (W1543-017)	1.000
35EP3702A01SP	PU EP-205 BRG-35X-56C-143-5TC	1.000
51XN1032A16	10-32 X 1.000 HX WS SL SR	2.000
HA3013A01	1/2-20X5/8 SPL.HX BOLT (WELKER)	2.000
HW3021C06	3/32 DI X .625 PIN (F/S)	2.000
XY3118A12	5/16-18 HEX NUT DIRECTIONAL SERRATION	4.000
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000
35CB3500A01SP	CONDUIT BOX LID, MACH	1.000
10XN2520A16	1/4-20 X 1 HEX HEAD CAP SCR, ZINC PLATED	4.000
HW1001A25	LOCKWASHER 1/4, ZINC PLT .493 OD, .255 I	4.000
HW2501D13SP	KEY, 3/16 SQ X 1.375	1.000
HA7000A01	KEY RETAINER 7/8" DIA SHAFT	1.000
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	6.000
MJ1000A02	MOBIL POLYREX EM/35LB	0.050
35FH4005A01SP	IEC FH NO GREASER W/AUTOPHORETIC PRIMER	1.000
MG1025Z20	ACTIVATOR WILKOFAST 060.32	0.010
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000

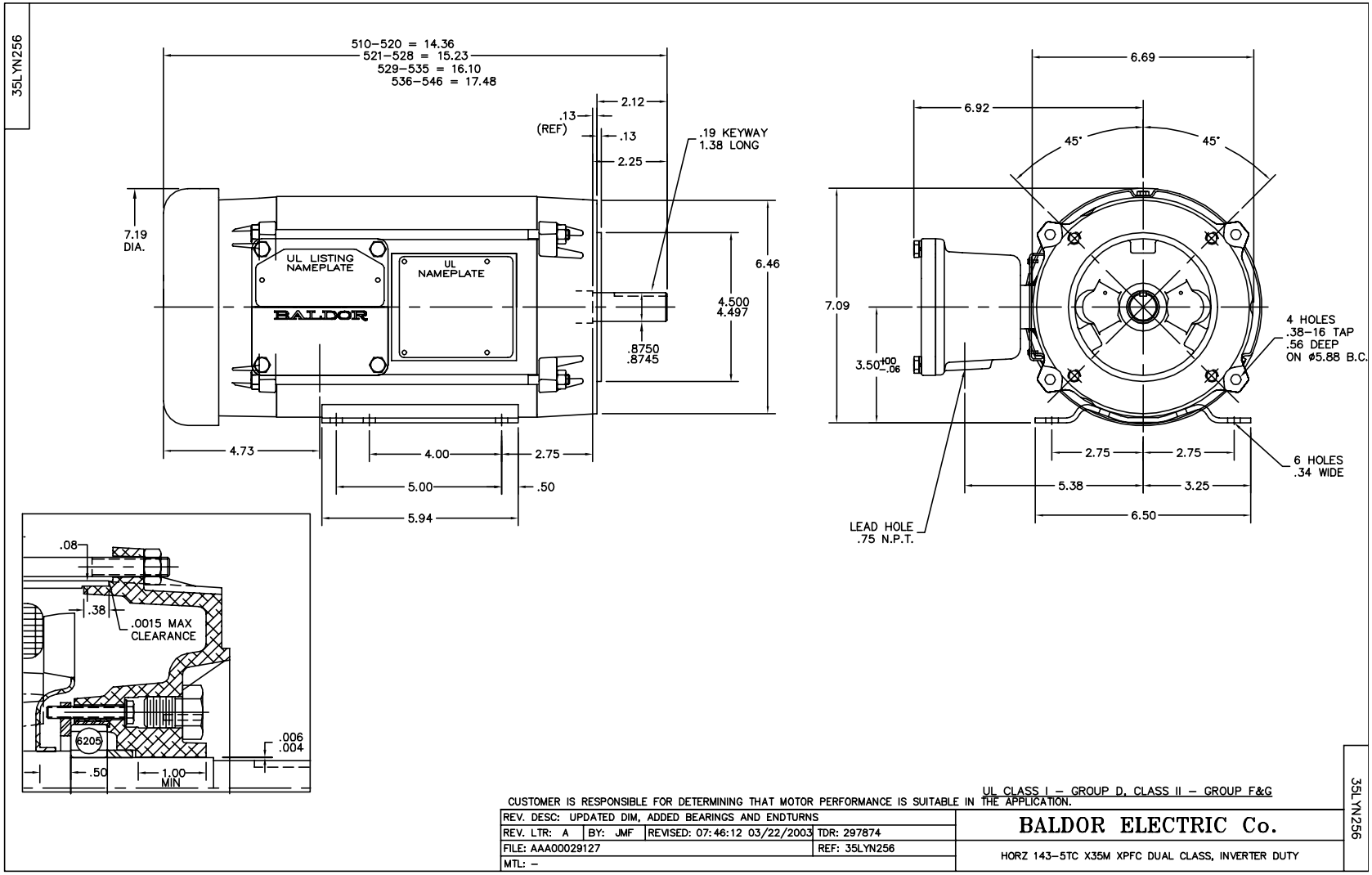
Parts List (continued)

Product ID	Description	Quantity
MG1025G29	PAINT 789.205 DARK GRAY METALLIC (USE W/	0.017
NP0018	NP- XP CONDUIT BOX	1.000
HA3104A08	THRUBOLT-5/16-18X9.375 X X	4.000
LB1119		1.000
LB1125C01	STD (STOCK) CARTON LABEL BALDOR WITH FLA	1.000
LC0145B01	CONNECTION LABEL	1.000
NP0887XP	UL/CSA, CLI GP-D,CLII GP-F&G,INV	1.000
36PA1000	PACK GROUP W/LB5001	1.000

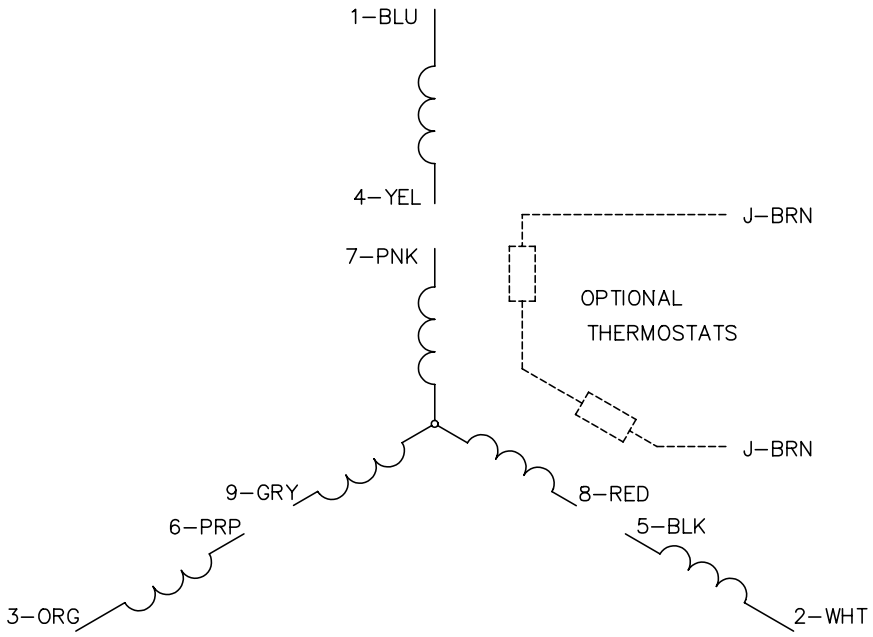
Performance Data at 460V, 60Hz, 1.0HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	2.99 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	1.02 Amps			**Break-Down Torque:**		15.8 LB-FT	
Line-line Res. @ 25°C.:	12.0 Ohms A Ph / 0.0 Ohms B Ph			**Pull-Up Torque:**		9.1 LB-FT	
Temp. Rise @ Rated Load:	26ºC			**Locked-Rotor Torque:**		11.0 LB-FT	
Temp. Rise @ S.F. Load:	0ºC			**Starting Current:**		15.0 Amps	
Load Characteristics							
% of Rated Load:	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	28.0	48.0	60.0	70.0	77.0	81.0	0.0
Efficiency:	74.8	84.4	87.0	87.9	87.7	87.3	0.0
Speed:	1793.0	1785.0	1778.0	1770.0	1761.0	1753.0	0.0
Line Amperes:	1.07	1.18	1.33	1.53	1.76	2.0	0.0

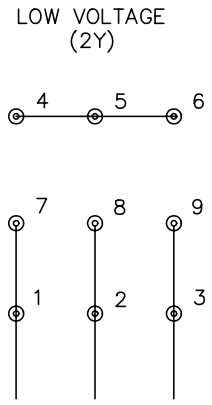
Performance Graph at 460V, 60Hz, 1.0HP (Typical performance - Not guaranteed values)

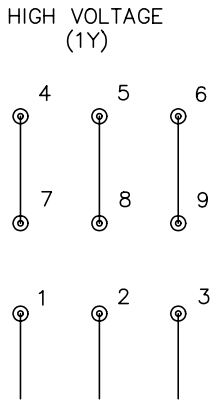



35LYN256
510-520 = 14.36
521-528 = 15.23
529-535 = 16.10
536-546 = 17.48
2.12
.13
(REF)
.13
.19 KEYWAY
1.38 LONG
2.25
7.19
DIA.
UL LISTING
NAMEPLATE
UL
NAMEPLATE
BALDOR
6.46
4.500
4.497
.8750
.8745
4.73
4.00
2.75
5.00
.50
5.94
6.69
6.92
45°
45°
7.09
3.50 +.00 -.06
4 HOLES
.38-16 TAP
.56 DEEP
ON ø5.88 B.C.
2.75
2.75
6 HOLES
.34 WIDE
5.38
3.25
6.50
LEAD HOLE
.75 N.P.T.
.08
.38
.0015 MAX
CLEARANCE
6205
.006
.004
.50
1.00
MIN
UL CLASS I – GROUP D, CLASS II – GROUP F&G
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT MOTOR PERFORMANCE IS SUITABLE IN THE APPLICATION.
REV. DESC: UPDATED DIM, ADDED BEARINGS AND ENDTURNS
REV. LTR: A
BY: JMF
REVISED: 07:46:12 03/22/2003
TDR: 297874
FILE: AAA00029127
REF: 35LYN256
MTL: –
BALDOR ELECTRIC Co.
HORZ 143-5TC X35M XPFC DUAL CLASS, INVERTER DUTY
35LYN256

CD0005







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

Operating Instructions

Pressure Gauges

Examples:

Model 213.40

Model 432.36, Overpressure safety up to 400 bar

Model 732.14, Overpressure safety up to 400 bar

WIKA

Part of your business

Notes according to Pressure Equipment Directive 97/23/EC

- The pressure gauges are "pressure accessories" in accordance with article 1, paragraph 2.1.4
- The volume of the pressure bearing housings of WIKA pressure gauges is < 0.1 L
- The pressure gauges carry the CE marking for fluid group 1G in accordance with annex 2, table 1 when their permissible working pressure exceeds 200 bar

  Pressure gauges that do not carry the CE marking are manufactured in accordance with article 3, paragraph 3 "sound engineering practice".

Applied standard

EN 837-1	Bourdon tube pressure gauges, Dimensions, metrology, requirements and testing
EN 837-2	Selection and installation recommendations for pressure gauges
EN 837-3	Diaphragm and capsule pressure gauges, Dimensions, metrology, requirements and testing

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www.wika.de

2408976 09/2006

1. Safety instructions

The user must ensure that the appropriate pressure gauge with regard to scale range and performance and the appropriate wetted material (corrosion) for the specific measuring conditions of the respective application is selected. In order to guarantee the accuracy and long-term stability specified, the corresponding load limits are to be observed. Specifications: see data sheet under www.wika.de

Only qualified persons authorised by the plant manager are permitted to install, maintain and service the pressure gauges.

Dangerous pressure media such as Oxygen, Acetylene, flammable gases or liquids, toxic gases or liquids as well as for refrigeration plants or compressors requires attention above the standard regulations. Here the specific safety codes or regulations must be considered.

After an external fire pressure media can leak out particularly at soft solder joints. All gauges have to be checked and, if necessary, replaced before recommissioning the plant.

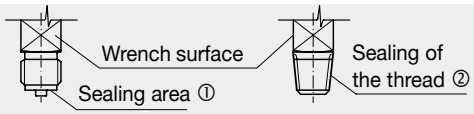
Serious injuries and/or damage can occur should the appropriate regulations not be observed.

2. Mechanical connection

According to the general technical regulations for pressure gauges, respectively (i.e. EN 837-2). When screw-fitting the gauges the force required for this must not be applied through the case or terminal box but just through the spanner flats (with suitable tool) provided for this purpose.

Installation with open-ended spanner

Correct sealing of pressure gauge connections with parallel thread ① shall be means of a suitable sealing ring, sealing washer or WIKA profile seals. The sealing of tapered threads (e.g. NPT threads) is made by providing the thread ②, with additional sealing material like, for example, PTFE tape (EN 837-2).



The torque depends on the seal used. With standard G-type pipe thread, gauge connection by means of a union nut or a LH-RH adjusting nut is recommended to simplify correct orientation of the gauge. When a blow-out device is fitted to a pressure gauge it shall be resistant to blocking by debris and dirt.
With safety pattern gauges (see dial symbol Ⓢ) you need to pay attention to the fact that the free space behind the blow-out back will be at least 15 mm.

2.1 Requirements for the installation point

If the measuring point is not adequately stable a measuring instrument support such as a bracket or flange should be used for fastening (and possibly via a flexible capillary line). If the pressure gauge is exposed to vibration or pulsating pressure or both, then a liquid filled pressure gauge may provide considerably better performance and readability. Instruments should be protected against coarse dirt and wide fluctuations in ambient temperature. EN 837-2 "Selection and installation recommendations for pressure gauges" should be complied with.

3. Admissible ambient and working temperatures

When installing the pressure gauge it has to be ensured that, taking the influence of convection and heat radiation into consideration, no upper or lower deviation from the permissible ambient and medium temperatures can occur. The influence of temperature on the class accuracy is to be observed.

4. Storage

The pressure gauge should remain in its original packing until installation. The gauge should be protected from external damage during storage.
Storage temperature: -40 °C ... +70 °C.
Pressure gauges removed from service should be protected from dust and humidity.

5. Maintenance and servicing / Repairs

The instruments require no maintenance or servicing. Tests should be carried out on a regular basis to guarantee the measuring accuracy of the pressure gauge. The tests or recalibrations have to be carried out by qualified persons with the appropriate equipment.

Remainder of the pressure medium contained in the pressure element may be hazardous or toxic. This should be considered when handling and storing the removed pressure gauge.

CE declarations / Manufacturer declarations

CE declarations / Manufacturer declarations for the machine and/or accessories can be found on the following pages.

EC Declaration of conformity 2006/42/EC

The manufacturer Bran + Luebbe GmbH
Werkstraße 4
D - 22844 Norderstedt

hereby declares that the machinery below is complying with all essential requirements of the Machinery Directive 2006/42/EC.
In addition the machinery is in conformity with the EC Directives 2006/95/EC relating to electrical equipment and 2004/108/EC relating to electromagnetic compatibility, as far as the scope of delivery is applicable.

Equipment ProCam DS500 Sanitary
Serial No. 9174295
Job No. 51136392.3000

Directive 2006/42/EC : EU-Machinery directive

Applied harmonised standards and national technical specifications, in particular:

EN ISO 12100-1, EN ISO 12100-2, EN 809, DIN 24289-1, DIN 24289-2
EN 60204 ²

² = acc. to scope of supply

The person authorised to compile the relevant technical documentation :
Mr. Uwe Schade
Bran+Luebbe GmbH
Werkstraße 4
D - 22844 Norderstedt

Signed **CE-Representative** **Date : 02.02.2010**