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A United Dominion Company

CLIENT	:-	TOMLINSON HALL / NESTLE ICE CREAM
PROJECT	:-	
P.O. No.	:-	SY 8834
EQUIPMENT	:-	CHOC COATING MET & COLOUR MIXING SYSTEM
ITEM Nos	:-	

(FOR CLIENT USE)

REV	REASON FOR ISSUE	DATE	ISSUED BY	COMMENTS
1	INFORMATION	8/3/00	L LANGLEY	TYPE TEST CERTS ADDED
0	INFORMATION	25/1/00	L LANGLEY	

BRAN+LUEBBE MACHINE No. 57550358	DOCUMENT TITLE OPERATING INSTRUCTIONS
TOTAL NUMBER OF SHEETS	DOCUMENT No 550358/X010
	CLIENT Ref.

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OPERATING MANUAL

Customer	:	Tomlinson Hall / Nestle Ice Cream
Order No.	:	SY 8834
B & L Ref.	:	57550358

CONTENTS

PUMPS DIVISION

BRAN+LUEBBE
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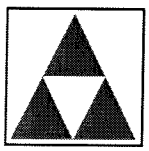
Metering Pumps

Operation Manual

Com No.	:	57550358
Serial No.	:	9136688-90
Type	:	N-P32
P.O. No.	:	SY 8834
Customer	:	Tomlinson Hall / Nestle Ice Cream

Table of Contents



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1

Structure, Assignments, Safety Instructions, Ordering of Spare Parts

1 Structure, Assignments, Safety Instructions, Ordering of Spare Parts

Structure of the manual

Just as the metering and process pump, the manual has a modular structure. Thus each manual only contains the individual information for a specific pump. For this reason, the pages and sections are not numbered in sequence throughout the whole document.

Easy reference has been achieved by dividing the manual into 8 main sections:

1. Structure, Assignments, Safety Instructions, Ordering of Spare Parts
2. Metering or Process Pump
3. Assembly Groups
4. Installation
5. Operation
6. Maintenance
7. Trouble Shooting
8. Storage and Preservation

In sections 3 "Assembly Groups", 4 "Installation" and 5 "Operation" a sequential numbering of sections may not always be adhered to. It is thus possible that section 3.3 "Pumphead" only contains section 3.3.3 "Diaphragm Model PML", since the other models 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 forming a 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.

For orientation of the reader, the right header indicates the main section, e.g. "*BRAN+LUEBBE Assembly Groups*".

The position numbers used in the descriptions (section 1 to 8) are *not* identical with the position numbers referred to in main manual section 9 "Drawings "!

Assignment of the Manual

Pump type and serial number are referred to on the cover, in section 1.1 and on the nameplate of the metering or process pump.

Safety Instructions

To avoid damage, please take notice of the following sections:

2 "Metering Pump or Process Pump"
4 "Installation"
5 "Operation"
6 "Maintenance"

Danger:
Electrical connections and maintenance must only be performed by qualified personnel!

Electrical elements have to be connected according to local regulations.

In hazardous areas special regulations must be adhered to.

Spare Parts Order

Only the use of original B+L spare parts will ensure proper operation, reliability, and long service life.

To ensure accurate and prompt parts delivery the following information must be provided when ordering parts:

- Serial number (see cover, section 1.1 or nameplate of the pump)
- Description (main manual section 9)
- Ident. Number (main manual section 9)

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Pump specification sheet 1.1

1.12.99 10:53:4

1	Metering pump type:	Cerex N-P32	Order no.:	SY 8834
2	Dimension sheet no.:	12008410	Building no.:	
3	Job-No.:	51120084	Application:	
4	Serial no.:	0009136688 --> 0009136690		
5	Quantity:	003	Sheet no.: 001 of: 001	

Process data

7	Liquid handled			Choc.Coating		Colour		
8	Concentration		%	Unknown		Unknown		
9	Solid % / Size		mm	0 *	--	-- *	--	
10	Density at PT		g/cm^3	1.1		1 *		
11	Viscosity at PT		m Pa s	400		1 *		
12	Process temperature = PT		°C	20 ... 45		20 ... 45		
13	Ambient temperature		°C	20 ... 40		20 ... 40		
14	Press	discharge port Pabs min/max	bar	2,0 *	3	2,0 *	3	
15		suction port Pabs min/max	bar	1,0 *	2,0 *	1,0 *	2,0 *	

Design

	17	Item on dimension sheet		--		--		
	18	Design (plunger, diaphragm)		Plunger		Plunger		
	19	Special design		--		--		
	20	Plunger diameter	mm	42		5		
	21	Max. capacity	l/h	163		2.3		
	22	Stroke frequency	1/min	100		100		
	23	Operat.press./set press.of relief valve	bar	3 max.	--	3 max.	--	
Pumphead	24	Valve design suction/discharge side		Ball / Ball		Ball / Ball		
	25	Suction valve spring pressure	bar	--		--		
	26	Discharge valve spring pressure	bar	--		--		
	27	Plunger packing design		Vee		Vee		
	28	Lantern ring connection	DN	--		--		
	29	Suction connection	DN/PN	1"		1/2" OD		
	30		Standard	SMS		Swagelock		
	31	Discharge connection	DN/PN	1"		1/2" OD		
	32		Standard	SMS		Swagelock		
	33	Heating jacket	DN	--		--		
	34	Hydraulic fluid	l	--		--		
	35	Air bleed valve	DN	--		--		
	36	Model / ratio		P31	28/1	P31	28/1	
	37	Max. stroke length	mm	20		20		
	38	Crank phase angle	°	0		180		
Gear	39	Stroke length adjustment	1)	SBH		SBH		
	40	Stroke length feedback		-		-		
	41	Oil quantity	l	0.25 ISO VG 100		0.25 ISO VG 100		

Pumphead

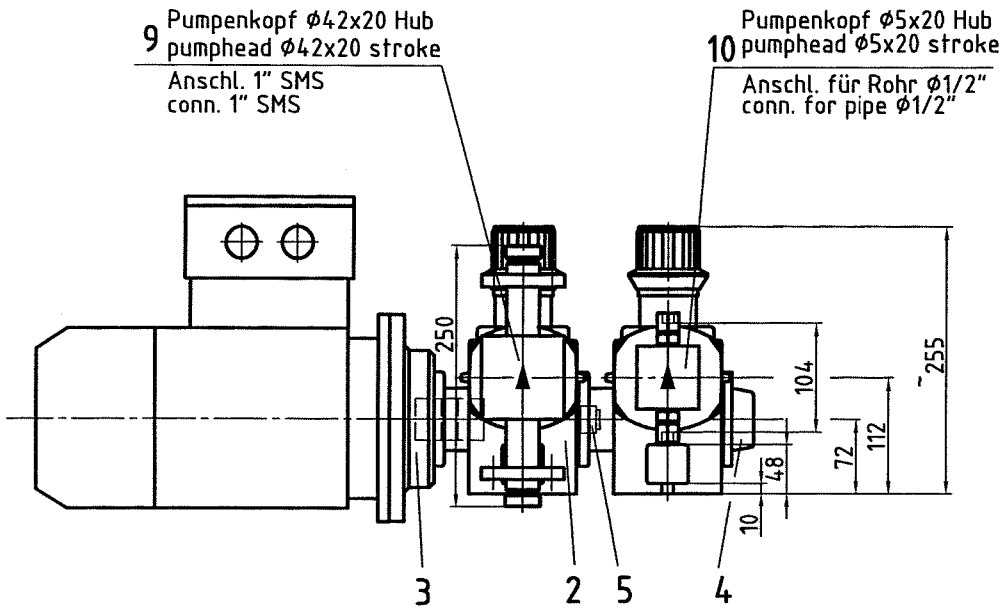
	43	Housing		1.4571		1.4571		
	44	Plunger/diaphragm		1.4571		1.4571		
	45	Valve housing		1.4571		1.4571		
	46	Valve seat		1.4581		1.4581		
	47	Valve-ball/-cone/-plate		1.4401		1.4401		
	48	Valve gasket		1.4571		1.4571		
Materials	49	Plunger packing		B3L		B3L		
	50							

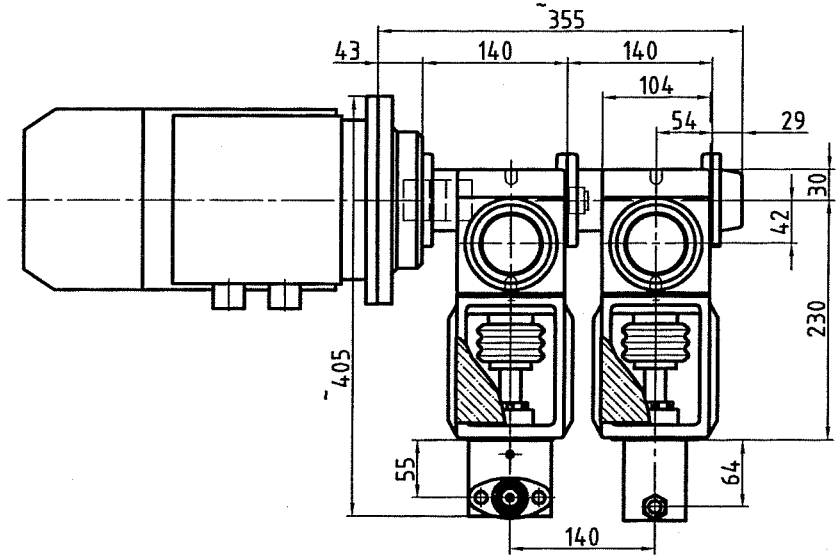
	51	Motor brand Brook	Current 3 PH AC		Voltage 400	V	Power 0.75 / 0.37	kW
		Type 90 Frame B5	Frequency 50	Hz	Speed 2800	1/min	Variable speed 2 Speed	
			Pole-changing --		Enclosure IP55		Ex-Proof--	
Motor	52	Speed variat	Brand		Adjustment		Feedback:	
			Type		Range 1:		Max.Speed:	1/min

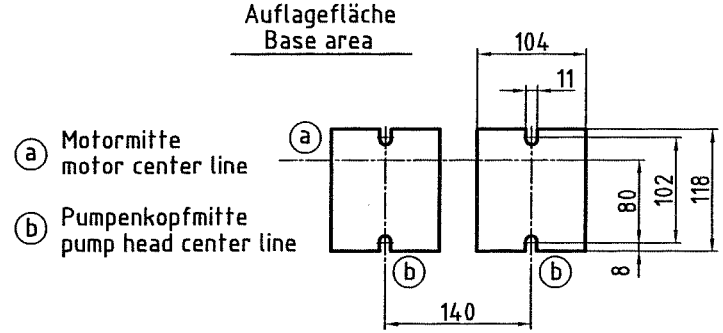
53	Mountings:	Motor flange B5-90/200. Drive Motor and Head 'A' Connections supplied and fitted at
54	Accessories:	Bran & Luebbe Brixworth.
55	Remarks:	S.W. 29/11/99
56	Painting:	B+L Specification No. 0 Colour: Primed Only.

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.







Gewicht ohne Motor /weight without motor: ~35 kg
Ölmenge/oil quantity: 0,5 l

BRAN+LUEBBE	TITLE 1 DOSIERPUMPE CEREX N-P32	
	TITLE 2 METERING PUMP CEREX N-P32	
DRAWN	F.Almao	30.11.99
CHANGED	F.Almao	01.12.99
APPROVED	K.Bargmann	01.12.99
RELEASED	H.Nieradzik	03.12.99

MATERIAL		IDENT.-NO.		REV. 0
FORMAT A3	SCALE 1:5	SHEET 1/1	DRAWING-NO. 12008410	

- CAD-DRAWING -

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2

Metering Pump

2.1 Metering Pump

Operating Conditions

The operating conditions (lines 7 to 15) and the pump design data (lines 17 to 55) are stated in the specification sheet in section 1.1. If no operating conditions are given with the order, the operating limits are filled in by BRAN+LUEBBE and should be adhered to.

Construction of the Metering Pump

The metering pump is a reciprocating positive displace-ment pump. Basic components are the drive (A), the gear unit (B), the pumphead (C), and the stroke length adjustment (D) (Fig. 2.1). The functions of the components are described in section 3 (Assembly Groups).

The design of the metering pump fulfills German safety and accident prevention regulations.

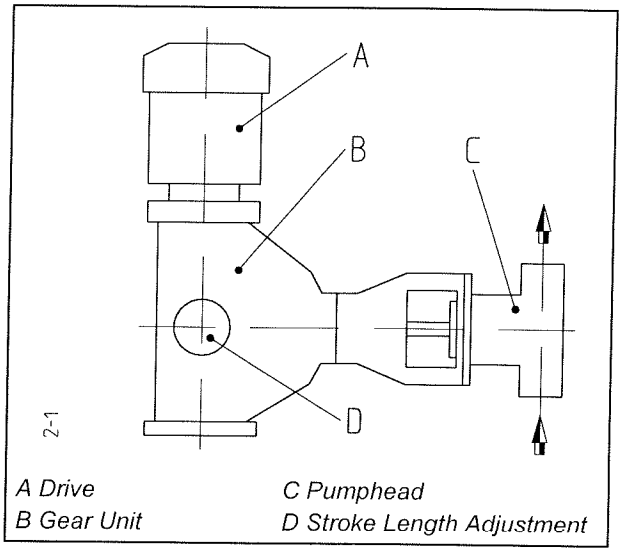

Fig. 2.1: Metering Pump

Safety Instructions

Warning:
Exceeding the max. allowed operating pressure must be prevented by all means (e.g. using a safety valve; see section 4.3).

Before starting to work on the metering pump check carefully that

- all pressurized parts (pumphead, piping) are depressurized
- the drive is disconnected from the power source
- personal protection is carried out according to local regulations
- parts being used in contact with aggressive substances are flushed before handling
- For safe operation of the bleed valve see section 3.7 (Bleed valve for product chamber).

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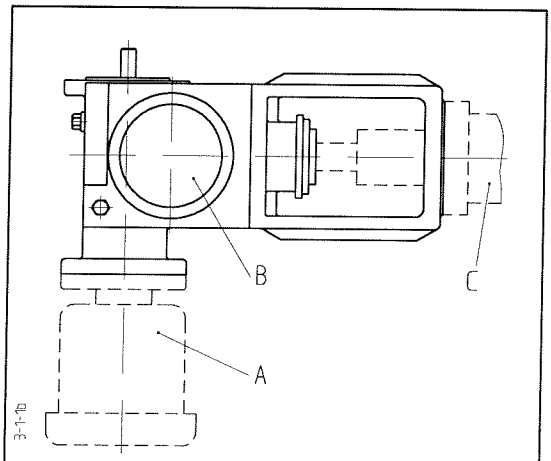
3

Assembly Groups

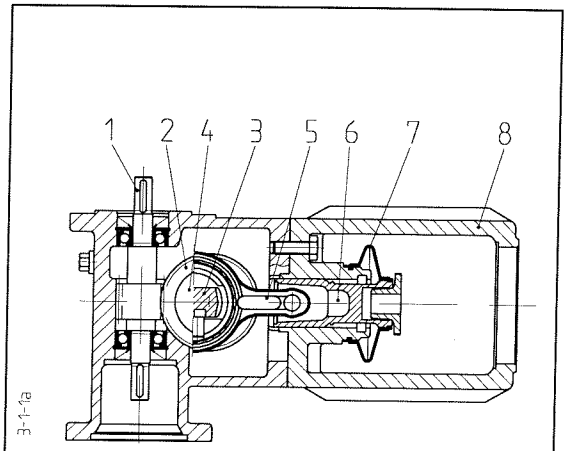
3.1 Gear Unit

3.1.1 Model P



A Motor
B Stroke Length Adjustment
C Pumphead

Fig. 3.1: Plan View



1 Worm Shaft
2 Worm Wheel
3 Crank Shaft
4 Eccentric
5 Connecting Rod
6 Crosshead
7 Bellow
8 Pump Yoke

Fig. 3.2: Sectional View

Construction and Function

For the construction and function of Model P 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 crankshaft (3). Then the crankshaft (3), eccentric (4), connecting rod (5), and cross head (6) convert the rotary motion into a linear, oscillating motion. The crosshead (6) is sealed by a bellow (7). The pumphead (C) is mounted on the pump yoke (8). The plunger is driven by the crosshead (6).

Gear units can be connected horizontally to drive multiple pumps. The worm shafts are connected by couplings and can be combined with the gear models KH, DH, and DSH.

Oil Filling

Attention:
The gear units are delivered without any oil. Every gear unit has to be filled with oil prior to start-up (see section 5.1 and 5.2).

Stroke Length Adjustment (B)

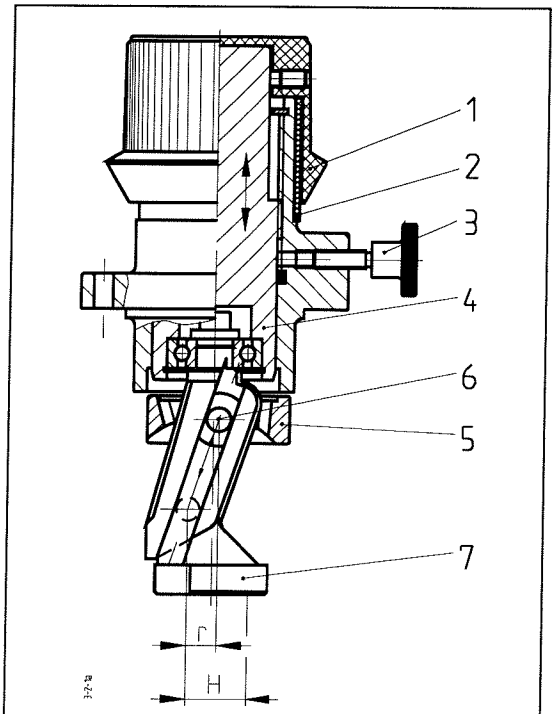
See section 3.2.

Checking Bellow

Check the bellow (7) for damage monthly. Replace broken or brittle bellows.

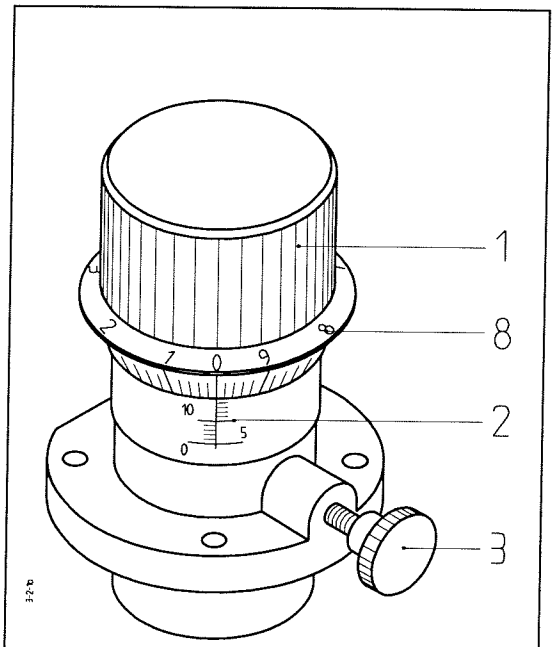
3.2 Stroke Length Adjustment

3.2.1 P Gear Manual Stroke Length Adjustment - at Standstill and in Operation



1 Adjustment Cap
2 Linear Scale
3 Knurled screw
4 Sleeve
5 Eccentric
6 Adjustment Pivot
7 Crankshaft
r Crank Radius
H Stroke Length

Fig. 3.1: Sectional View



1 Adjustment Cap
2 Linear Scale
3 Knurled Screw
8 Ring Scale

Fig. 3.2: Plan View

Construction and Function

Turning the adjustment cap (1) shifts the adjustment sleeve (4) and the crankshaft (7) along the longitudinal axis.

The adjustment pivot (6) is connected to the eccentric (5) and slides in the groove of the crankshaft (7). Thus the crank radius "r" and the stroke length "H" are varied. (See Fig.3.1).

Adjustment of the stroke length

See Fig. 3.2:

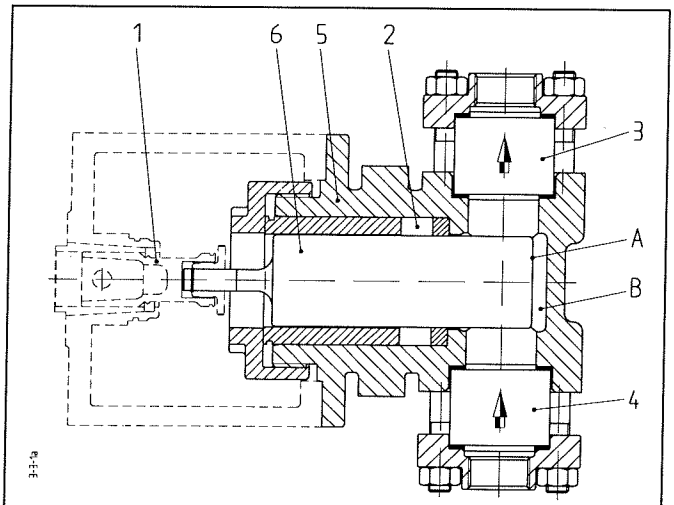
- Loosen the knurled screw (3) and turn the adjustment cap (1). The stroke length decreases with a clockwise rotation and increases with a counter clockwise rotation.
  The stroke length is indicated by the linear scale (2) in mm and by the ring scale (8) in 2/100 mm.
- Set the stroke length and then tighten the knurled screw (3).

3.3 Pumphead

3.3.1 Plunger Model

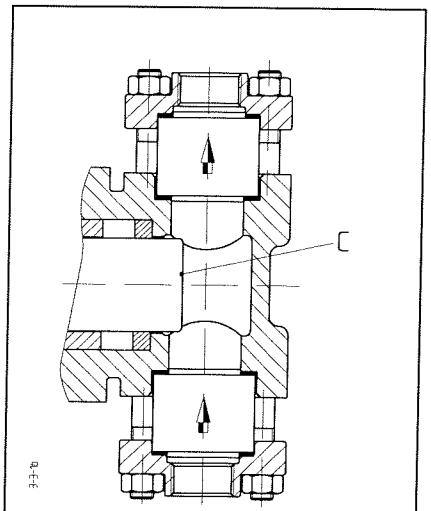
Construction and Function

The plunger packing (2) situated between plunger (6) and housing (5) seals the product chamber (B) to the atmosphere. The suction (4) and discharge valves (3) are selfacting valves. They are operated by pressure differences between the product chamber (B) and the discharge and suction pressures. The plunger (6) is connected to and driven by the crosshead (1). (See Fig. 3.1 and 3.2).



1 Crosshead
2 Plunger Packing
3 Discharge Valve
4 Suction Valve
5 Housing
6 Plunger
A Front Dead Center
B Product Chamber

Fig. 3.1: Plunger at Front Dead Centre



C Rear Dead Center

Fig. 3.2: Plunger at Rear Dead Centre

- **Suction stroke**: Movement from front (A in Fig. 3.1) to rear dead centre (C in Fig. 3.2).

  During the suction stroke the difference between the suction pressure and the pressure in the product chamber (B) causes the suction valve (4) to open so that the product chamber (B) is filled with product.

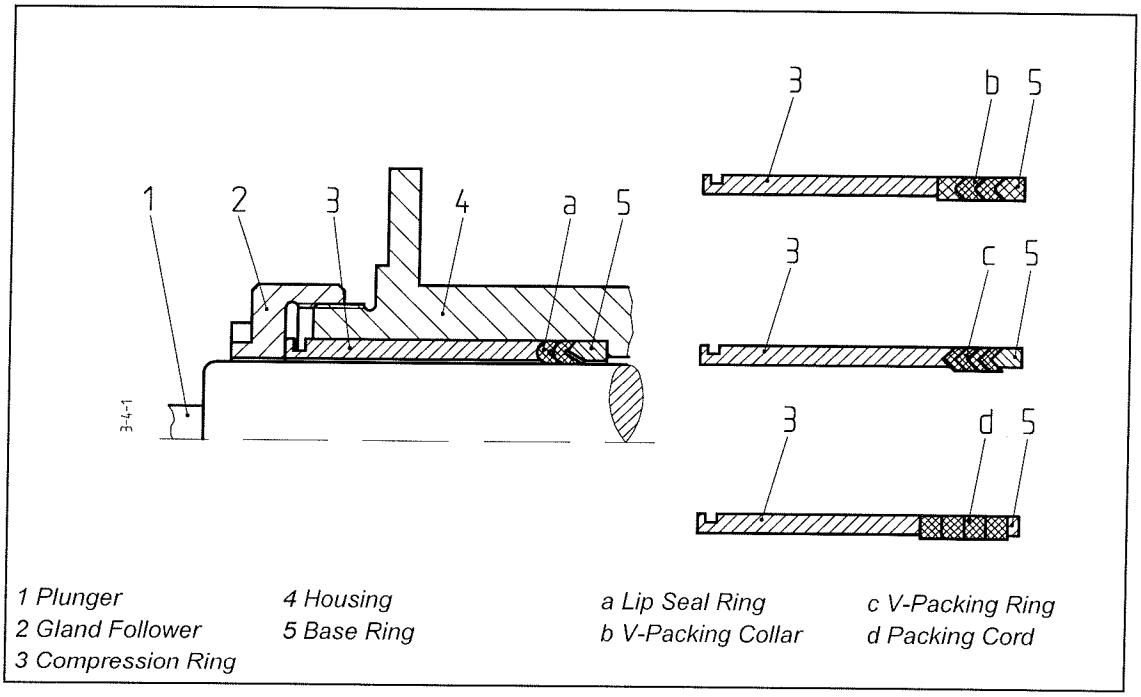
- **Discharge stroke**: Movement from rear (C in Fig. 3.2) to front dead centre (A in Fig. 3.1).

  During the discharge stroke the pressure in the product chamber (B) increases until it exceeds the pressure in the discharge line and the oppening pressure of the discharge valve (3). Then the flow medium is discharged from the product chamber (B) into the discharge line.

3.4 Plunger Packing

3.4.1 Without lantern ring

Assignment: pumphead



1 Plunger
2 Gland Follower
3 Compression Ring
4 Housing
5 Base Ring
a Lip Seal Ring
b V-Packing Collar
c V-Packing Ring
d Packing Cord

Fig. 3.1: Sectional View of Plunger Packing without Lantern Ring

Function (Fig. 3.1)

Constructions **a**, lip seal ring, and **b**, V-packing collar, are automatic sealing elements due to their shapes. Gland (2) must be tightened so that the plunger packing does not have any clearance.

Constructions **c**, V-packing ring, and **d**, packing cord, are pre-pressed by the gland (2) and the compression ring (3).

If the plunger packing is leaking, tighten the gland follower (2) carefully. Retightening may be necessary during operation.

Attention:
Overtigthening of the gland follower leads (2) to increased plunger and packing wear and overloads the drive unit.

For the packing elements see drawings in section 9 and the specification sheet in section 1.1.

3.5 Plunger Installation

3.5.1 Gear Unit Model P

Assignment:

Pumphead:
- plunger
- double acting
- diaphragm

Function

Fixed plunger installation

Assembly

For the assembly of the plunger see Fig. 3.1.

- Slide the plunger (3) through the nut (2).
- Mount the snap ring (4).
- Tighten nut (2) to the crosshead (1).

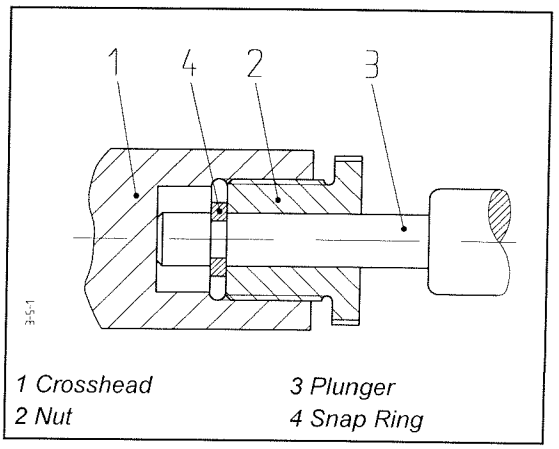


Fig. 3.1: Plunger Installation

3.6 Valves

3.6.1 Ball Model

Assignment: Pumphead (Fig. 3.4).

For the valve used in the pumphead see parts list and drawing in section 9.

Function

Suction and discharge valves are self-acting valves. They are operated by pressure differences between the product chamber and the suction and discharge lines respectively.

Mounting

Warning:
Incorrect installation of the valves will lead to diaphragm rupture or pump head failure, which may result in injury ! (See Fig. 3.1 to 3.4)

- **Suction valve:** arrow points to the product chamber
- **Discharge valve:** arrow points away from the product chamber

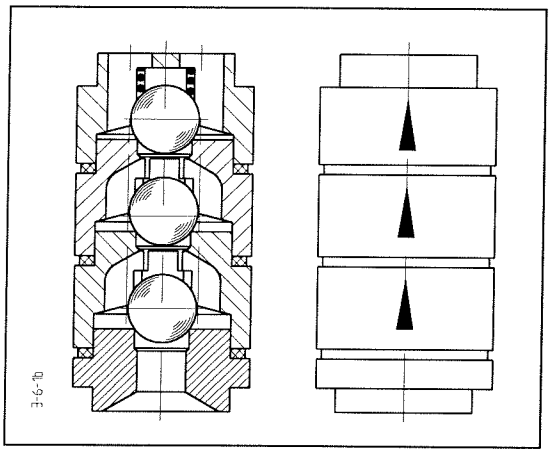


Fig. 3.1: Triple Ball Valve - Sectional and Plan View

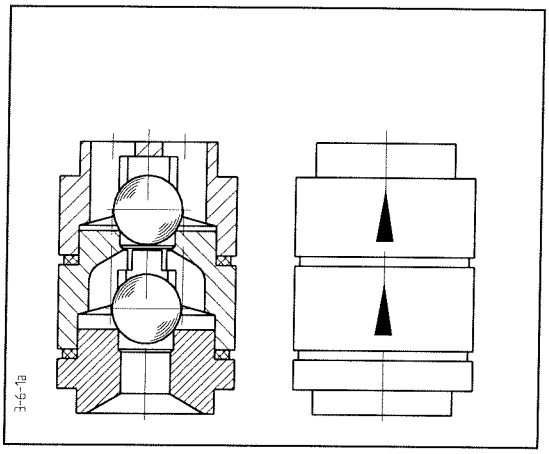


Fig. 3.2: Double Ball Valve - Sectional and Plan View

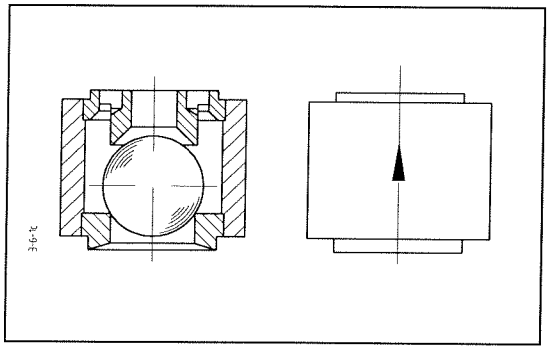


Fig. 3.3: Single Ball Valve - Sectional and Plan View

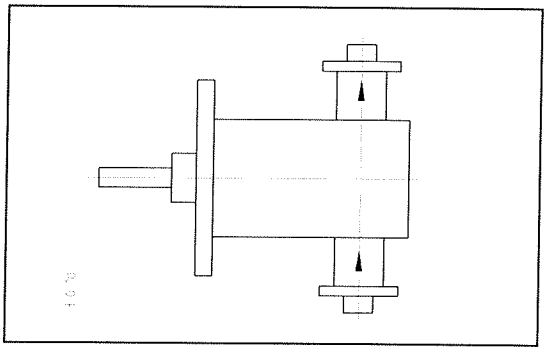
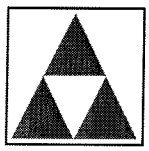


Fig. 3.4: Pumphead



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4

Installation

4.1 Installation and Erection

Prior to Installation

- Check the packing of the metering or process pump for damage. Open the package.
- Check metering or process pump and accessories for external damage.

Inform BRAN+LUEBBE immediately if anything is damaged!

Installation Location

If no other installation conditions are stated in the specification sheet (section 1.1), the location for installation should be dry and free of aggressive substances in the atmosphere.
For outdoor installation, additional shelter against rain, and direct sunlight, should be utilised.

The ambient temperature should not fall below -20 °C and should not exceed +40 °C.

Foundation and Installation

- Choose the height of the foundation so as to facilitate easy maintenance and handling. Stroke length adjustment, stroke length indicator (if present), oil refill, oil drain, and plunger packing should be easily accessible.
- Mount the pump *free of any strain* on its base or foundation.
- Fit pump by tightening the screws in the fastening holes (see general assembly drawing in section 1.2) leveling the piston axis horizontally and the valve axis vertically.

Electrical connection

Danger:
The motor should be connected in accordance with local regulations and only by qualified personnel.

Provide overload protection or temperature sensors.

Check voltage, frequency, motor speed and power.

Danger:
Electrical elements should be connected in accordance with local regulations and by qualified personnel.
In hazardous areas special regulations must be adhered to.

Pipework

- The piping should be free of stress and strain.
- Eliminate the pipe weight using clamps.
- Compensate for pipe expansion using fitting pipe bends.
- Connect the pipe work so as to facilitate removal of the valves and pumpheads.
- Clean the pipework thoroughly prior to assembly.

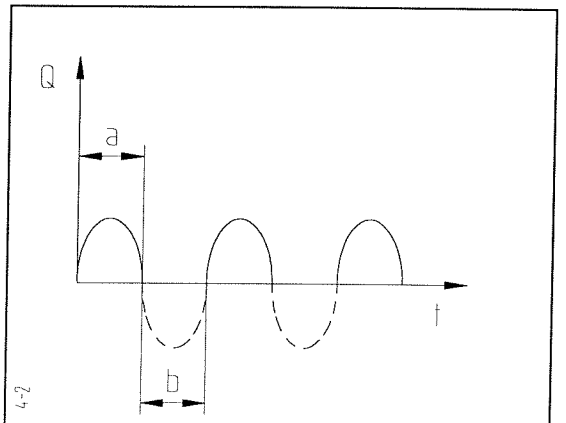
Lantern Ring

Warning:
If the pumphead is equipped with a lantern ring, it must be flushed with the suitable liquid (see Section 4.3.2 for examples of installation).

4.2 Suction and Discharge Lines

Warning:
The suction and discharge lines must be properly designed and connected to the pumphead. Otherwise the pump can be seriously damaged!

The suction and discharge lines should be designed so as to prevent cavitation, excess load or excess feeding, caused by the pulsating flow of the metering pump.



Q Delivered Volume *a Discharge Stroke*
t Time *b Suction Stroke*

Fig. 4.1: Delivered Volume of a Single Pumphead

Prevent	Cause	Result	Remedy
Cavitation	• suction pressure falling below the vapour pressure of the product	• loud noise • excessive valve wear • excess load	• avoid high suction lifts • keep the pipe length short • sufficient nominal diameters • use of pulsation dampeners • use of a pressure sustaining valve • decrease viscosity
Excessive Load	• pressure peaks exceeding the operating pressure	• fatigue failure • forced rupture	
Excessive Discharge	• suction or discharge line too long • suction pressure is higher than discharge pressure • pressure sustaining valve missing	• inaccurate dosing • loud noise • excessive valve wear	

If required BRAN+LUEBBE will check isometrics. For this, the following information must be given:

Product characteristics:

- Density
- Vapour pressure at operating pressure
- Viscosity
- Settling speed, if product is a suspension

Data of installation:

- Geodetic height
- Pressures on the suction and discharge side
- Length of the pipework
- Nominal diameter
- Number of pipe bends
- Fittings
- Isometrics

4.3 Installation - Examples

4.3.1 Suction and Discharge Piping

The recommended accessories for the installation on the suction and discharge side are listed in Fig. 4.1:

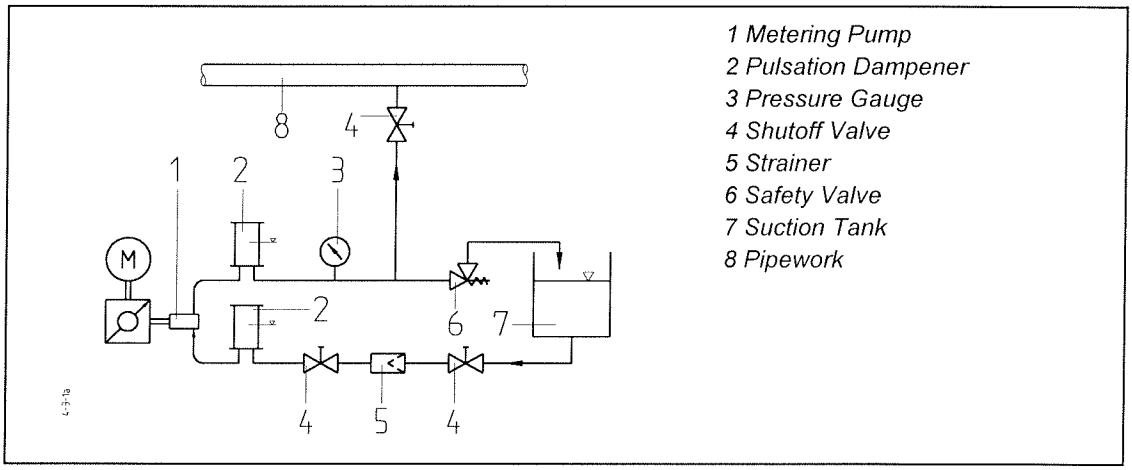


Fig. 4.1: Suction and Discharge Piping

Attention:
To avoid personal injury and damage to the pump or related equipment, we recommend to install a safety valve!

Installation of the Safety Valve (Fig. 4.2)

Aim:
Prevent overload of the pump.

Position:
Between the discharge flange and the *first* shutoff valve in the discharge line **or** behind the pulsation dampener if applicable.

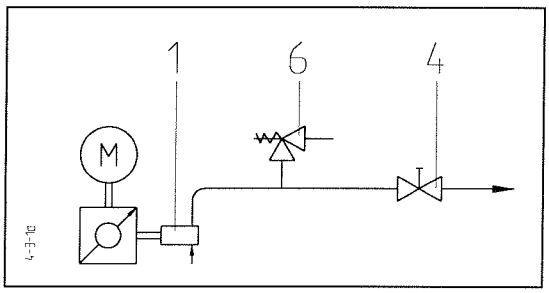


Fig. 4.2: Safety Valve

Mounting of Pulsation Dampers (Fig. 4.3)

Aim:
Dosing with less pulsations;
prevent of cavitation and overload.

Position:
Just in front of the suction flange and behind the discharge flange of the pump-head.

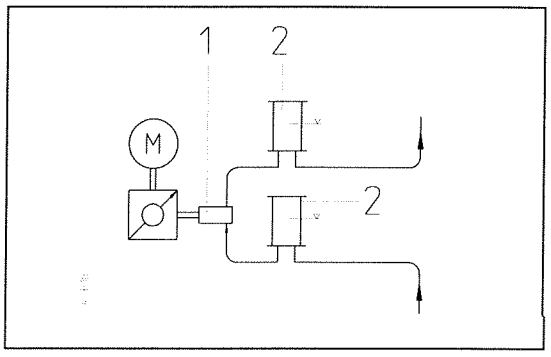
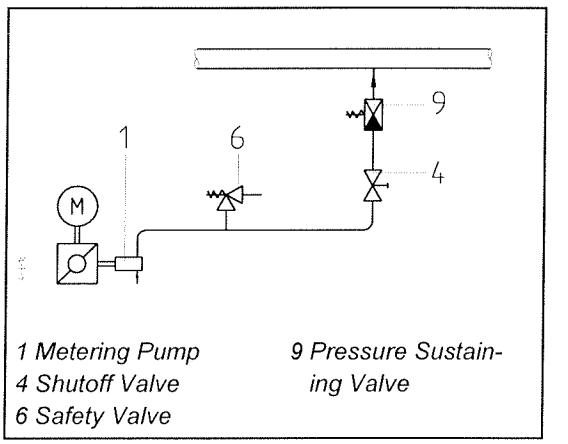


Fig. 4.3: Pulsation Dampener

Installation of the Pressure Sustaining Valve (Fig. 4.4)

Aim:
Prevent of excessive discharge and excessive mass acceleration.

Position:
Vertically at the end of the discharge line.



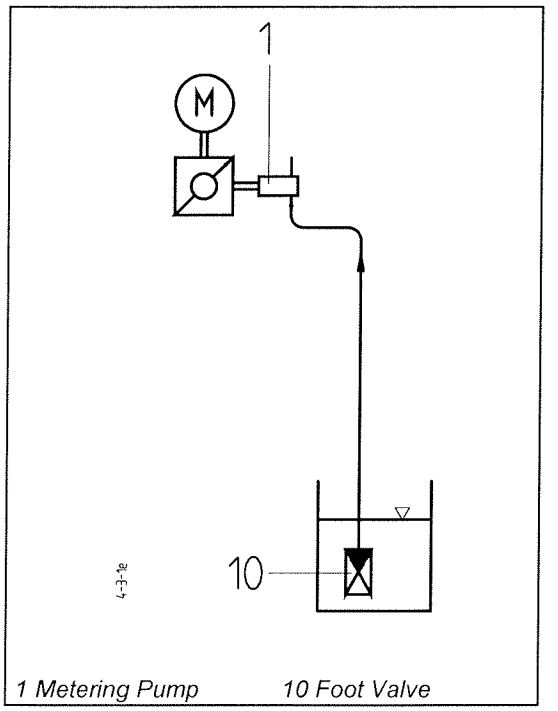
1 Metering Pump *9 Pressure Sustaining Valve*
4 Shutoff Valve
6 Safety Valve

Fig. 4.4: Pressure Sustaining Valve

Installation of a Foot Valve (Fig. 4.5)

Aim:
Prevent draining of a long suction line.

Position:
Vertically near the bottom of the reservoir.



1 Metering Pump *10 Foot Valve*

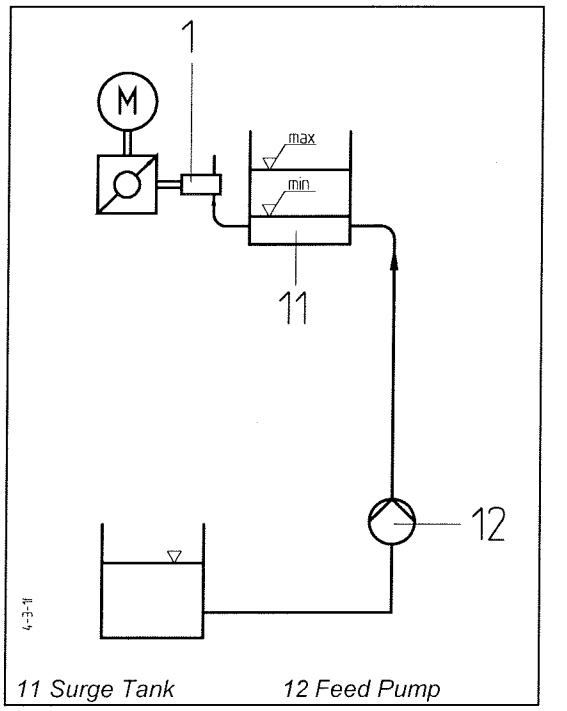
Fig. 4.5: Foot Valve

Installation of a Surge Tank (Fig. 4.6)

Aim:
Prevent suction lift.

Position:
Same level as the metering pump.

Filling:
Using a feed pump (12) with max./min. control.



11 Surge Tank *12 Feed Pump*

Fig. 4.6: Surge Tank

4.3 Installation - Examples

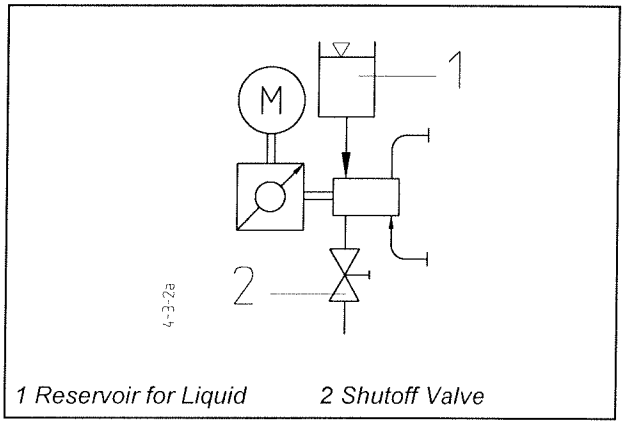
4.3.2 Lantern Ring

Static Barrier (Fig. 4.1)

Reservoir (1) is filled with barrier liquid and can be drained via the shutoff valve (2).

Application:

- Lubrication of plunger and packing.
- As barrier liquid.



1 Reservoir for Liquid *2 Shutoff Valve*

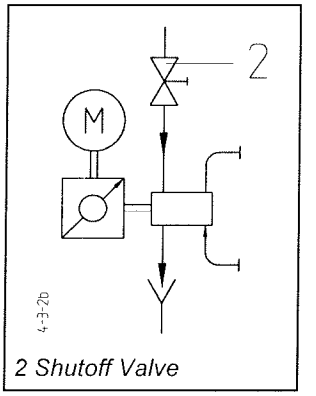
Fig. 4.1: Static Barrier

Running Water as Barrier Liquid (Fig. 4.2 and 4.3)

Water from the main flows through the lantern ring via the shutoff valve (2). The water is throttled to 5 to 20 l/h depending on pumpsize and application.
The direction of flow (Fig. 4.2 or 4.3) depends on the property of the metered fluid.

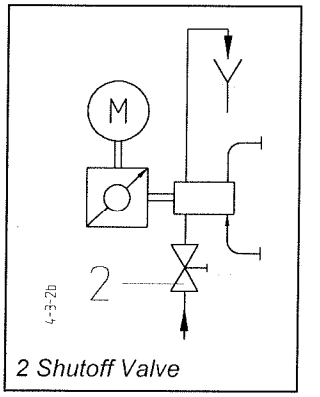
Application:

- Prevent build-up of solids on the plunger.
- Prevent contamination in food applications.



2 Shutoff Valve

Fig. 4.2



2 Shutoff Valve

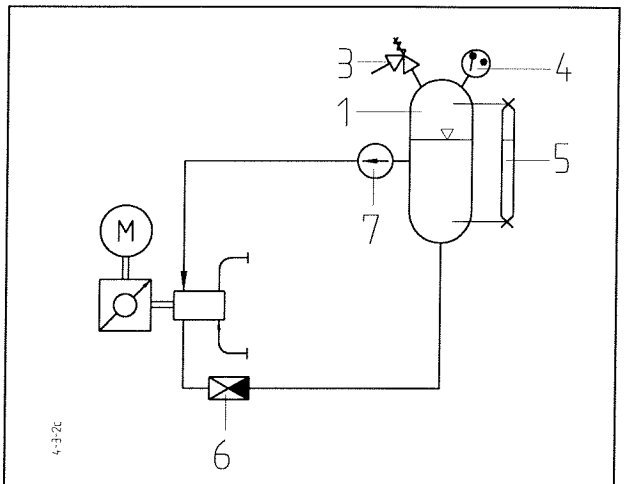
Fig. 4.3

Barrier Liquid Circulation (Fig. 4.4)

Barrier liquid is circulated by the circulation pump (7) against the pressure sustaining valve (6) in order to maintain a suitable pressure. The reservoir (1) is equipped with safety valve (3), level gauge (5) and pressure switch (4) for checking the liquid level and sounding an alarm when overfilling.

Application:

- High pressure applications.
- Elimination of frictional heat.
- Lubrication of plunger and packing.



1 Reservoir for Liquid
3 Safety Valve
4 Pressure Switch
5 Level Gauge
6 Pressure Sustaining Valve
7 Circulation Pump

Fig. 4.4: Barrier Liquid Circulation

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5

Operation

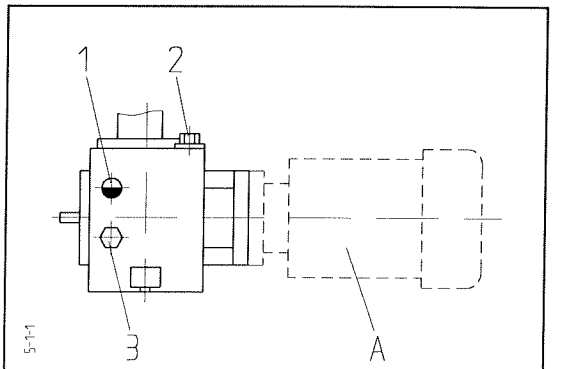
5.1 Oil Filling and Oil Changes

5.1.1 Gear Unit Model P

Attention:
The gear units are delivered without oil.

Fill all gear units with oil before the initial start-up.

Oil quantity: see section 1.1
Oil brand: see section 5.2



1 Oil Gauge *3 Oil Drain*
2 Oil Inlet *A Motor*

Fig. 5.1: Gear Unit Model P - Oil Filing

First Filling

See Fig. 5.1.

- Open oil inlet (2).
- Fill with oil to the middle of the oil gauge (1).
- Close the oil inlet (2).
- Start motor (A) for a short period of time.
- Check the oil level and refill, if necessary.

Oil Change

Change the oil after the first 300 hours of operation and then every 4000 hours.

Oil Draining

Open the oil drain (3) of each gear unit and drain the oil.

Oil Filling

See above "First Filling".

Checking the oil level

When the unit is not operating the oil level should be in the middle of the oil gauge (1).

5.2 Oil Quality for Gear Unit

5.2.1 For Gear Unit Models P, K, J, D, C, DS, CS, KH, DH, DSH, KA, DA, DF

For ambient temperatures from 0 °C to +40 °C *(32 °F to 104 °F)*

Suitable gear oils, of mineral oil compound with a nominal viscosity from *100* to *220* mm²/s (c.st) by approx. 40 °C *(104 °F)*. See table 5.1 for examples of suitable oils:

Brand	Brand Name	mm²/s (c.st) at approx. 40° C
ARAL	Aral Degol BG	*100* *For continuos ambient temperatures from 30 °C to 40 °C (86 °F to 104 °F) a higher nominal oil viscosity up to 220 is recommended.*
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: Oil Quality for Gear Unit

For ambient temperatures from -20 °C to +40 °C *(-4 °F to 104 °F)*

Suitable Multigrade gear oils, of mineral oil compound with a nominal viscosity from *70* to *100* mm²/s (c.st) by approx. 40 °C *(104 °F)*. See table 5.2 for examples of suitable oils:

Brand	Brand Name	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: Oil Quality for Gear Unit

Attention:
Gear oil operating temperature should NOT exceed 90°C (194°F) during operation.

5.3.1 Start-up Procedure - Check List

Consider the following points before starting the metering pump:

- Check oil filling (see section 5.1).
- Readjust stroke length, if necessary, e.g. after transport (see section 3.2).
- Add hydraulic fluid to diaphragm pumpheads (see section 3.3).
- Check if the metering pump is protected against overload. For safety valves see section 4.3.1.

Electrical connection:

- 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).

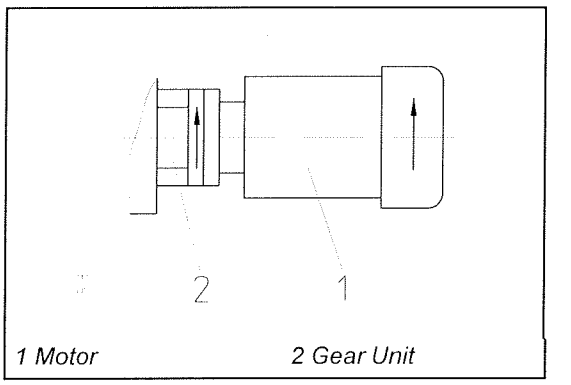


Fig. 5.1: Direction of the Motor Rotation

Attention:
The motor must only be connected by qualified personnel!

Warning:
Do not start the pump with the shutoff valves in the discharge and suction lines closed !
Do not close the shutoff valves in the discharge and suction lines when the pump is still in operation !

Start-up procedure

- If a separate oil pump exists:
  - Start oil pump.
  - Check oil flow.
- Open all shutoff valves in the suction and discharge lines.
- If the pumphead is equipped with a lantern ring, apply the lantern ring with a suitable barrier liquid (see section 4.3.2) or flushing liquid (see section 4.3.3).
- If heating or cooling is necessary, open all shut-off valves in the supply lines.
- Make sure that there is sufficient product.
- Adjust the stroke length to "0".
- If the motor speed is variable, set motor (1) to lowest speed.
- Start drive motor.
- Slowly increase speed and stroke length to the maximum.
- If possible, operate the metering pump pressureless for good venting of the pipework.
- Check the pipework and the packing of the pump for leaks during the start-up procedure.

If the suction head is too high and the metering pump does not prime,

- increase the suction pressure or
- reduce the suction lift.

When suction and discharge lines are filled and vented,

- slowly increase the pressure up to the operating pressure and
- adjust speed and stroke length to the required values.

5.4 Adjustment of the Capacity

The stroke length to be adjusted for a required capacity is calculated from the max. stroke length, the capacity required and the max. capacity. The max. capacity is calculated by BRAN+LUEBBE from:

- an assumed volumetric efficiency of 98 % and
- the number of strokes that result from the nominal speed of the motor.

Under normal operating conditions, it is sufficient to calculate the stroke length according to the following equation:

$$\text{stroke length (mm)} = \text{max. stroke length (mm)} \times \frac{\text{capacity required (l/h)}}{\text{max. capacity (l/h)}}$$

max. stroke length: see specification sheet, section 1.1, line 37
max. capacity: see specification sheet, section 1.1, line 21
capacity required: given by the user of the metering pump

Example

For the example, the following values are assumed:

max. stroke length:	20 mm
max. capacity:	245 l/h
capacity required:	200 l/h

$$\text{stroke length} = 20 \times \frac{200}{245}$$

$$\text{stroke length} = 16{,}33 \text{ mm}$$

Under special operating conditions, however, such as

- high operating pressures and
- small plunger diameters,

the stroke length calculated above should be corrected since the actual capacity is dependent on operating conditions such as operating pressure, viscosity, length of suction and discharge lines, arrangement etc. Thus an exact relationship between stroke length and capacity can only be determined under operating conditions.

In case of normal operating conditions you can directly proceed with section 5.4.1.

Correction of Stroke Length by Determining the Actual Capacity

To determine the actual capacity, measure

- the volume per 100 strokes and
- the actual stroke frequency.

Two ways of measuring the volume are described below:

Measuring the Volume on the Suction Side (Fig. 5.1)

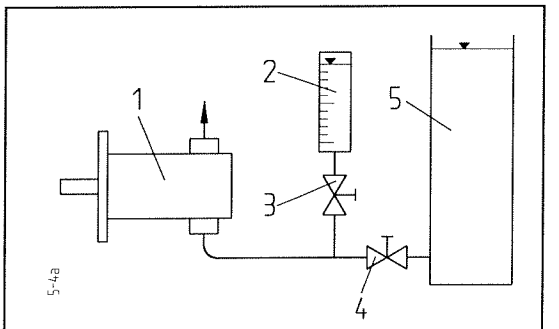
Prior to the measurement

- Fill and vent the suction and dis-charge lines.
- Operate the pump for a short time
- Adjust the stroke length to 16,33 mm, as calculated in example 1.

Measurement

- Open shutoff valves (3) and (4).
- Fill up burette (2).
- Close shutoff valve (4).
- Read volume drawn from the burette (2) for 100 strokes.

  measured volume = $V_{100\ strokes}$ (cm^3)



1 Pumphead *4 Shutoff Valve*
2 Burette *5 Suction Tank*
3 Shutoff Valve

Fig. 5.1: Measuring the Volume on the Suction Side

Measuring the Volume on the Discharge Side (Fig. 5.2)

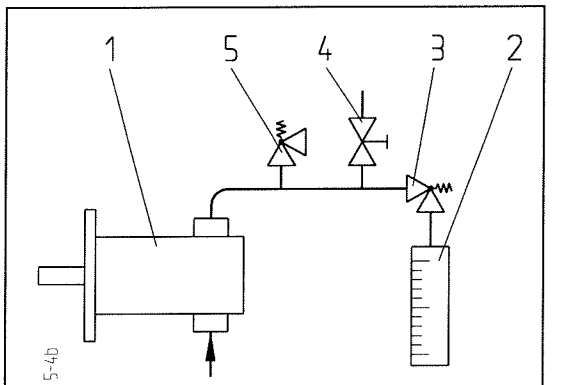
Prior to the measurement

- Fill and vent suction and discharge lines.
- Operate the pump for a short time
- Adjust the stroke length to 16,33 mm as calculated in example 1.

Measurement

- Adjust the pressure sustaining valve (3) to the operating pressure.
- Close the shutoff valve (4).
- Read the quantity delivered by 100 strokes.

  measured volume = $V_{100\ strokes}$ (cm^3)



1 Pumphead *4 Shutoff Valve*
2 Burette *5 Safety Valve*
3 Pressure Sustaining Valve

Fig. 5.2: Measuring the Volume on the Discharge Side

Determining the Actual Stroke Frequency

The actual stroke frequency is needed for the calculation of the actual capacity:

- Count the actual number of strokes per minute.

Actual capacity

With the volume $V_{100\ strokes}$ (Fig. 5.1 or 5.2) and the actual stroke frequency, the actual capacity can be calculated. $V_{100\ strokes}$ is assumed to be 2150 cm^3, stroke frequency 150 strokes/min:

$$\text{actual capacity} = V_{100strokes} \times \frac{\text{actual stroke frequency} \times 60}{100 \times 1000}\ (l/h)$$

$$\text{actual capacity} = 2150 \times \frac{150 \times 60}{100 \times 1000}$$

$$\text{actual capacity} = 193{,}5\ l/h$$

Correction of the stroke length under operating conditions

With the actual capacity (see above) and the stroke length (see Example, page 1/4), the corrected stroke length adjustment can be calculated:

$$\text{stroke length corr.} = \text{stroke length} \times \frac{\text{required capacity}}{\text{actual capacity}}$$

$$\text{stroke length corr.} = 16{,}33 \times \frac{200}{193{,}5}$$

$$\text{stroke length corr.} = 16{,}87\ mm$$

5.4.1 Flow Rate Curve

Another way of determining the corresponding stroke length for the required capacity is to use a flow rate curve. Due to the linear pressure metering characteristics it is easy to plot the flow rate curve for your specific pump under operating conditions:

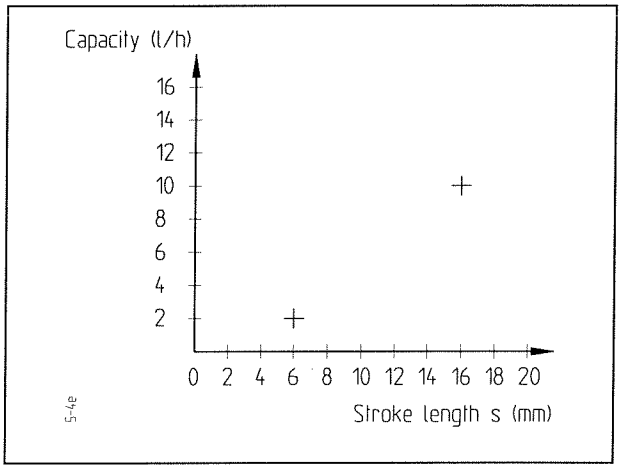
- Calculate the corr. stroke length (or the normal stroke length) for a required capacity, following the procedure described under 5.4. Repeat this for one further required capacity.

  The values in Table 5.1, chosen as an example, are based on a max. stroke length of 20 mm and an operating pressure of 200 bar.

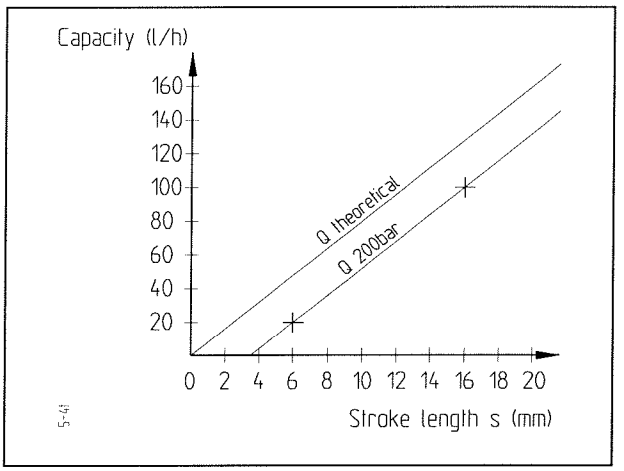
required capacity (l/h)	2	10
corr. (or normal) stroke length (mm)	6	16

Table 5.1: Example

- Plot the values onto a graph showing the corrected (or normal) stroke length on the x-axis against the capacity on the y-axis.



- Draw a line through the two points. The line does not meet the origin. A line meeting the origin would correspond to the optimal theoretical capacity with a volumetric efficiency of 100% not taking into account any operating conditions.



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

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6

Maintenance

6 Maintenance

Motor

The specifications and the type of motor are stated on the specification sheet in section 1.1.

The motor is not a BRAN + LUEBBE product so the maintenance instructions of the manufacturer should be followed. These documents can be found in section 2 of the main manual.

Gear Unit

Check the oil level weekly.

See section 5.1 for oil change.

See section 3.1 for gear units with bellow-protected crossheads.

Pumphead

See section 3.4 for plunger packing.

For the hydraulic fluid (for diaphragm pumphead) see "Hydraulic Fluid", section 3.3.3.5, 3.3.6.5, 3.3.7.4 or 3.3.9.4.

Accessories

If any maintenance is necessary the documents can be found in the appropriate sections in the rest of the manual.

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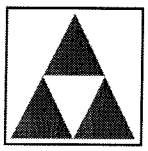
7

Trouble Shooting

7 Trouble Shooting

Problem	Possible Causes	Remedy
No Flow	• no voltage at the motor:	check fuses and leads
	• motor broken:	repair or replace motor
	• coupling broken:	replace the coupling and eliminate the cause of the overload
	• no product:	fill suction vessel
	• suction or discharge line shut off:	open the shut off valves
	• filter or pipe work clogged:	clean filter or pipe work
	• valves of pumphead incorrectly fitted:	fit the valves correctly (note the arrows!)
	• pump valves damaged or dirty:	clean or replace pump valves
	• gas or air in the product chamber:	vent and fill product chamber
	• discharge pressure too high:	check the adjustment of the safety valve, check discharge line for length and nominal width, carry out a calculation of the pipework (see section 4.2)
	• suction lift too high:	reduce suction head and, if necessary, increase supply pressure or install a surge tank (see section 4.3.1)
	• stroke length adjustment on "0" mm:	adjust stroke length
flow rate too high	• suction pressure higher than discharge pressure:	mount pressure sustaining valve or fit stronger spring to discharge valve
	• Suction or discharge lines too long or nominal diameter too small:	enlarge nominal width or install air vessel
	• stroke length set to the wrong value:	check stroke length adjustment and, if necessary, recalculate

Problem	Possible Causes	Remedy
flow rate too small	• pump valves are dirty or damaged:	clean, replace or regrind the pump valves
	• safety valve is leaking:	clean safety valve; replace or rework damaged parts
	• safety valve in operation because of excessive pressure loss in pressure line:	enlarge nominal diameter or install air vessel
	• stuffing box is leaking:	tighten stuffing box (see section 3.4.1); check piston for wear and, if necessary, replace packing
	• gas or air in the product:	increase suction pressure
	• wrong stroke length:	check and, if necessary, recalculate stroke length
	Diaphragm Pump:	
	• vent valve, replenishing valve, or relief valve are leaking:	clean valves; rework damaged parts
	• gas or air in product or hydraulic chamber:	vent product or hydraulic chamber
flow rate unsteady	• impurity of the flow medium:	flush pipework; if necessary, install strainer
	• valve seat, valve ball or cone damaged:	regrind or replace valve
	• varying supply pressure or viscosity:	check operating conditions



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8

Storage and Preservation

8.1 Storage and Preservation of Metering Pumps

For the test run in the BRAN+LUEBBE Company the metering pump is filled with oil that includes preservatives.

Before delivery the oil is drained. The inner parts of the gear unit remain covered with a protective oil film.

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

1. Storage in dry and vented places

In dry and vented places the pump can be stored for up to 2 years without making any special arrangements.

2. Storage in places with high humidity

The metering pump must be hermetically sealed and protected against perspiration using an adequate quantity of silicate gel. Then storage of 2 years is possible.

3. Storage outdoors

In addition to point 2 there should be a protection against rain, sand storms and direct sunlight.

4. Preservation of installed metering pumps

Before start-up, the metering pump should be filled with oil of the recommended quality and the specified quantity.

If the start of operation is delayed the metering pump must be switched on for approx. 1 hour every month with a stroke length of "0" mm.

The oil must be changed at least once every year.

Change the oil again prior to the definite start of operation. Then keep to the stated oil changes.

INSTALLATION & MAINTENANCE OF A.C. ELECTRIC INDUCTION MOTORS

INTRODUCTION

Your Brook Hansen motor is designed for long life, and low running costs. Careful installation and maintenance will ensure that you achieve reliable operation and optimum efficiency.

PRE-INSTALLATION REQUIREMENTS

⚠ WARNING

Handling and lifting of electric motors must only be undertaken by qualified personnel. Full product documentation and operating instructions must be available together with tools and equipment necessary for safe working practice.

RECEIPT

Before any motor is accepted on site it should be inspected carefully for damage or loss incurred during transit.

Packing materials may be damaged including sheeting and crate timbers.

Handling operations may have damaged fan cowls, terminal boxes or auxiliaries.

Where an instance of droppage or loss is evident or suspected, it may be necessary to unpack the goods to establish the full extent of the problem.

Wherever possible, damage should be recorded, photographed and witnessed.

Report any damage to the carriers and Brook Hansen as soon as possible, quoting the motor number and consignment note reference. The insurance company's agents shown on the insurance certificate should also be advised.

> *Note*
> *Bolts are always included with the slide rails but foundation bolts are not.*

⚠ LIFTING

Eyebolts and/or lifting trunnions supplied with the motor are designed to support only the weight of the motor, not the weight of the motor and any ancillary equipment attached to it. Be absolutely sure that cranes, jacks, slings and lifting beams are capable of carrying the weight of equipment to be lifted.

Where an eyebolt is provided with the motor, this should be screwed down until its shoulder is firmly against the face of the stator frame to be lifted. Eyebolts are normally designed for a vertical lift. For eyebolt/lifting lug torques, see opposite.

EYEBOLT/LIFTING LUG BOLT TORQUES

Typ.		Eyebolt Dia.	Cast Iron Frames	
Metric	Nema/ CSA	Lifting Lug Bolt Dia.*	Torque	
			Nm	Lbf.FT
63	–	–	–	–
71	–	–	–	–
80	56	–	–	–
90S/L	143/145	–	–	–
100L	–	–	–	–
112M	182/184	M12†	–	–
132S/M	213/215	M12†	–	–
160M/L	254/256	M12†	–	–
180M/L	284/286	M16†	–	–
200L	324	M10*	52	38
225S	326	M10*	52	38
255M	364	M10*	52	38
250S	365	M10*	52	38
250M	404	M16*	220	162
280M	405	M16*	220	162
280L	444	M16*	220	162
315S	445	M16*	220	162
315M	504	M20*	400	295
315L	505	M20*	400	295
355S/M/L	585/6/7	M20*	400	295

* WDF/WNDF design only. Lifting lugs secured with bolts and nuts. High tensile socket headed bolts and square nuts must be used.

† The eyebolt should be firmly screwed down (without over tightening), to ensure that the collar is fully seated.

Where two eyebolts/lifting lugs are used with inclined loading, the maximum safe working loads of BS 4278: 1984 should not be exceeded (ISO 3266).

TABLES OF APPROXIMATE WEIGHTS

CAST IRON CONSTRUCTION: Frames DF80 – DF200L

Typ.	Net Weight kg	Gross Weight kg	Cubage m³
DF80M	15	16.5	0.02
DF90S	19	20.5	0.03
DF90L	22	23.5	0.03
DF100L	24	26	0.03
DF112M	36	38	0.05
DF132S	65	67	0.08
DF132M	77	88	0.08
DF160M	129	138	0.15
DF160L	149	158	0.15
DF180M	192	203	0.21
DF180L	212	223	0.21
DF200L	285	300	0.30

CAST IRON CONSTRUCTION: Frames W-DF200L – W-DF355L

Typ.	Net Weight kg	Gross Weight kg	Cubage m³
W-DF200L	285	300	0.30
W-DF225S	320	335	0.37
W-DF225M	375	390	0.37
W-DF250S	420	460	0.63
W-DF250M	570	610	0.70
W-DF280S	660	721	1.2
W-DF280M	800	871	1.2
W-DF315S	1000	1095	1.8
W-DF315M	1100	1195	1.8
W-DF315L	1300	1395	1.8
W-DF355S	2000	2120	2.3
W-DF355M	2300	2420	2.3
W-DF355L	2500	2620	2.3

ALUMINIUM CONSTRUCTION: Frames W-DA63 – W-DA200

Typ.	Net Weight kg	Gross Weight kg	Cubage m³
W-DA63	5	5.4	0.010
W-DA71	6	6.4	0.010
W-DA80	9	10	0.020
W-DA90S	12.5	13.5	0.030
W-DA90L	14.5	15.5	0.030
W-DA100L	19	21	0.038
W-DA112M	27	29	0.050
W-DA132S	38	41	0.071
W-DA132M	46	49	0.076
W-DA160M	80	95	0.125
W-DA160L	100	112	0.125
W-DA180M	140	165	0.253
W-DA180L	148	174	0.253
DA200L	225	240	0.370

STEEL CONSTRUCTION: Frames 7-DS225S - 7-DS355LX

Typ.	Net Weight kg	Gross Weight kg	Cubage m³
7-DS225S	250	284	0.511
7-DS225M	280	314	0.511
7-DS250S	370	407	0.595
7-DS250M	440	477	0.595
7-DS280S	500	542	0.786
7-DS280M	565	607	0.786
7-DS315S	710	805	1.323
7-DS315M	750	845	1.323
7-DS315L	920	1015	1.323
7-DS355S	1225	1345	2.130
7-DS355M	1530	1650	2.130
7-DS355L	1710	1830	2.130
7-DS355LX	2080	2200	2.500

INSTALLATION & MAINTENANCE OF A.C. ELECTRIC INDUCTION MOTORS

STORAGE

If motors have to be stored before installation, precautions should be taken to prevent deterioration.

ENVIRONMENT

Depending on the site conditions it may be necessary to create a suitable stores area to hold the motor prior to installation. Packing cases are not waterproof.

Motors should be stored in a dry, vibration free and clean area at normal ambients (–20°C to 40°C), unless other arrangements have been agreed with Brook Hansen.

Where low temperature ambient storage is anticipated, special precautions should be taken with the type of grease, no plastic parts etc. to ensure trouble free start-up.

Motors must be stored away from corrosive or chemically damaging fumes.

Before placing motors into storage, machined components should be carefully inspected. Bearings and shafts are normally covered with a corrosion resistive barrier. If this coating is damaged it should be made good. The component should be cleaned and the protective coating reapplied.

Under no circumstances should rust be merely covered over.

DRAIN HOLES

Motors provided with drain holes have drain plugs provided loose in the terminal box up to frame size 180, and fitted on frames size 200 and above. Position the drain holes at the lowest point.

BEARINGS

To avoid static indentation the storage area should be vibration free. If this is not possible it is strongly recommended that the motors be stood on thick blocks of rubber or other soft material.

Shafts should be rotated by hand one quarter of a revolution weekly.

Where the exposure to some vibration is unavoidable the shaft should be locked in position to avoid static indentation of the bearings.

Roller bearings may be fitted with a shaft locking device. This should be kept in place during storage.

GREASE

Factory fitted bearings use a lithium based grease with a recommended shelf life of two years. If stored for a longer period, grease may need to be replaced.* Shielded bearings have a storage life of five years and a further two years operational life following installation.

*Wash all bearing parts with a non-contaminating solvent. Lightly pack the bearings with grease applying a 33% fill by volume into the bearing and housings.

HEATERS

Where space heaters are fitted, and the storage environment has wide humidity and temperature variations, it is strongly recommended they be energised.

Warnings should be placed on the motors to make operatives aware of the live heaters.

Supplies are normally 220-240 volt single phase, from a 380-415 volt three phase supply. See terminal box lid for details.

A low voltage DC supply could be used as an alternative (see E6).

INSULATION RESISTANCE

During extended storage a three monthly insulation test is recommended to avoid possible lengthy drying out periods when installing. Use a 500 volt d.c. Megger.

The insulation resistance between phases and between the windings and the frame should be checked.

The insulation resistance should be maintained above 10 megohm.

If a lower reading is measured, use one of the drying out methods recommended on page E6 until an acceptable reading is obtained. If heaters are fitted but not energised, they should be used in future. See also note on page E6.

WOUND ROTORS

Ideally, wound rotor motor brushes should not be in contact with the slip-rings during storage as there is a risk of corrosion. Brushes should either be lifted off the slip-rings or stored separately. This may not be possible with small motors (up to frame DWF180).

INSTALLATION

Work on hazardous area motors should only be carried out by Brook Hansen trained personnel or those trained to an equivalent standard.

Reference should be made to:-

a) Constructional standards EN50014, EN50018 (EEx d), EN50019 (EEx e), BS 5000 Part 16.

b) The approval certificate.

c) Codes of practice (BS 5345, IEC 79 Part 14).

All warning instructions and labels must be observed and retained with the motor.

Health & Safety at Work etc. Act 1974
It is essential equipment is installed, earthed and guarded in accordance with current legislation.

LOCATION

Motors must be installed with adequate access for routine maintenance. A minimum of 0.75m of working space around the motor is recommended. Adequate space around the motor, particularly at the fan inlet (50mm), is also necessary to facilitate airflow.

Where several motors are installed in close proximity, care must be taken to ensure that there is no recirculation of exhausted warm air. Foundations must be solid, rigid and level.

MECHANICAL

Drain Holes

Prior to installation remove drain plugs if fitted. If any water has accumulated, the integrity of all gaskets, sealants etc. should be checked. Drain plugs should be put back into place after draining.

Alignment

When the application calls for direct coupling, the shafts must be correctly aligned in all three planes. Bad alignment can be a major source of noise and vibration.

Allowance must be made for shaft end-float and thermal expansion in both axial and vertical planes. It is preferable to use flexible drive couplings.

Noise Levels

The noise levels published in current Sales Specifications are equal to or less than the limiting values for rotating machines specified in European and International Standards BS EN 60034 and IEC 34-9.

In most cases noise levels also meet limiting values for exposure to noise in the work place i.e. Guidance on regulations for Noise at Work issued by HMSO.

It is the responsibility of the purchaser to ensure that other overriding lower noise levels if required, eg Machinery Directive, are specified at the time of order, or that the installation incorporates noise attenuating measures.

Free Rotation

The rotor must be free to rotate within its housing. Where uneven or bumpy rotation occurs the bearings should be inspected to establish that they have not been damaged during transportation or storage.

Slide Rails

Slide rails are available for all motors in the Brook Hansen product range to provide adjustable mounting. Fabricated steel rails are the standard as they are suitable for all mounting arrangements. Alternative aluminium slide rails are available for floor mounting.

Installation

1. Slide rails must be installed on a flat surface.
2. Rails must have a secure location.
3. Drive and driven shafts must be parallel. See Appendix 1.

INSTALLATION & MAINTENANCE OF A.C. ELECTRIC INDUCTION MOTORS

⚠ ELECTRICAL CONNECTION

The connection diagram is shown on the leaflet enclosed in the motor terminal box or the diagram inside the terminal box lid. The cables used should be capable of carrying the full load current of the motor (see motor name-plate) without overheating or undue voltage drop.

Cable Terminations

All cable terminations should be tightly secured. Mains lead terminal lugs should be in face to face contact with the motor lead lugs and securing nuts and lockwashers screwed firmly over the connection. There should be no nuts or lockwashers fitted between the mains and motor lugs.

Wiring should be carried out or checked by a qualified electrician and equipment must be earthed in accordance with current regulations. The equipment must be correctly fused and isolated. All covers must be in position prior to running.

⚠ WARNING

Isolate power supply to motor before commencing any routine cleaning or maintenance work.

Drying Out Procedures

It is preferable to dismantle the motor to the point where the rotor is removed. This is not essential but the drying out process will take longer in the assembled state.

The temperature of the windings and the insulation resistance should be monitored at regular intervals. On initial application of heat the insulation resistance will drop quickly and then start to rise slowly until level. On discontinuation of the drying process, a further rise in resistance will occur.

There are several methods which can be used:-

1 Place the motor in a warm (typically 40°C), dry airstream (fan or convector heater) or in a warm oven with a temperature not exceeding 80°C. This method is preferred if the motor is dismantled.

2 Connect the motor to a low voltage* three phase supply and inject a current not exceeding 50% of the full load current into the stator winding (*approximately 10% of the line voltage). If this is carried out on an assembled motor, it is possible though unlikely that the motor will turn. If so the rotor should be locked in position.

3 Connect two phases in parallel, and the third in series. Inject a low voltage a.c. or d.c. supply up to a maximum of 50% of full load current. The stator winding temperature must not be allowed to exceed 80°C. In practice the frame should not be hot to the touch, to guard against internal overheating and consequent damage to the insulation.

4 Where heaters are fitted these can be energised.

Supply

It is important that a motor is operated within the limits of its design voltage and frequency.

Standard motors for the UK will operate without damage on any voltage in the range 94% to 106% of the nameplate voltage.

The supply cables must be capable of carrying the full load current of the motor (see motor nameplate) without overheating or excessive voltage drop under starting conditions.

Earthing

All motors are fitted with an earthing terminal, in or adjacent to the terminal box, to enable connection to an effective earthing bond. The terminal is designed for connecting the correct size of copper earth connector. If a different material is to be used please refer to Brook Hansen.

The motor must be earthed by connecting the shortest possible length of cable to the earth screws. The cable must have a capacity at least that of the main connections up to 16mm² phase conductors. Between 16 and 35mm² phase conductors, the earth should be a minimum of 16mm². Above 35mm² phase conductors, the earth conductor should be a minimum of half the phase conductor.

Phase conductor mm²	Earth conductor mm²
up to 16	at least equal
16-35	16 minimum
above 35	at least half

An earthing bond should not be terminated under the motor fixture bolts or terminal cover screws. The earth lead could be overlooked on reconnection after maintenance.

Heater Continuity

Heaters should be checked for continuity prior to connection to the control circuitry.

Thermistor Continuity

If fitted, it is recommended that thermistors be connected to the control circuit. Thermistors provide good thermal overload protection.

Auxiliary Electrical Items

Where auxiliaries are fitted, the characteristics should be checked. Example: RTD's (Resistance Temperature Detectors) should have their resistances checked against manufacturer's figures.

Do not megger across the thermistor. Do not apply more than 6V across the thermistor for continuity check.

Control Gear

Ensure all control gear and associated metering/protection circuits have been checked fully.

It is imperative that any overload trips and emergency shutdown circuits are working correctly before the motor is energised. All covers must be in position.

Where a motor is fitted with a separately driven fan unit, the interlocks and thermal overload protection circuits must be operative.

Connection Diagrams

Refer to the connection diagram supplied with the motor for supply details and the required winding connection.

Rotation

Before coupling the motor to the drive, run the motor briefly to check rotation.

All covers must be in place.

Motors fitted with angular contact or duplex bearings must be run in the correct mounting position e.g. vertical.

To reverse rotation interchange any two supply leads.

Wound Rotors

The stator of a wound rotor motor is similar to a cage motor but the rotor circuit is connected to a starting resistance. Take care to ensure that the brushes are in contact with the slip rings and that the rotor resistances are connected in the 'START' position.

Starting

Motors are rated by the output required, the number of starts per hour, the load curve/inertia, and environmental considerations.

Operating outside the contractual parameters may thermally overload the motor eg too many starts per hour, or mechanically stress components eg overspeeding.

Refer to starter literature for method of start and safety precautions to be taken.

Running

After one hour of running, check the general vibration levels. If these are excessive, check alignment (and belt tensioning if belt driven).

Some initial bearing noise may be present during the running in period. This is normal because the grease has to settle down within the bearing. The noise should disappear after a few hours of operation.

Check that the motor runs up smoothly and within the permitted run-up time. Note that repeated starting in quick succession may lead to a thermal overload of the motor.

MOTOR MODIFICATIONS
W Series
Multimount Modification
Cast Iron Motors
Frames (200-315)

⚠ SAFETY WARNING

Do not work under suspended load and use correct lifting equipment.

Changing Terminal Box

1 Lift motor, using two lifting lugs provided.
2 Slacken the two vertical foot fixing bolts on one foot.
3 Remove the two horizontal foot fixing bolts.
4 Pull the foot away from the frame.
5 Repeat stages 2 to 4 on the other foot.
6 Lower the motor onto two pieces of timber.
7 Remove both lifting lugs.
8 Rotate the motor until the terminal box is in the correct postion.
9 Refit the two lugs on the machined pads at the top of the motor on diagonally opposite corners. Ensure that lifting lugs are in contact with all machined faces and that the correct bolts and nuts are used. Tighten the bolts to the torque shown on page E4. NB Bolts are treated with 'Tuflok' patches.
10 Remove fan cover.
11 Remove the endshield bolts at both ends of the motor.
12 Slacken drive end bearing cap or clamping screws to allow endshield spigot to disengage.
13 Disengage both endshield spigots and rotate the endshields through 90 degrees until the grease nipples are at the top.
14 Refit endshield bolts and tighten to torque given on page E8.
15 Retighten the bearing cap or clamping screws at the drive end, replacing the Nyltite washers under the bolt heads. Tighten screws to the torque given on page E8.
16 Lift motor, using hooks in the two lifting lugs.
17 Strip paint from the pads where the feet are to be fitted and apply a thin film of grease for corrosion protection on bare surfaces.
18 Slide first foot into position, using vertical nuts and bolts for location purposes. Lightly tighten to prevent foot from falling out of the slots in the frame.
19 Insert horizontal bolts.
20 Ensure the feet are fully in contact with the machined faces. Tighten all bolts to the torque given on page E8. (NB Bolts are treated with 'Tuflok' patches.)
21 Repeat stages 18 to 20 on the other foot.
22 Prime and paint all machined surfaces left exposed by the changes.
23 Refit fan cover with the greasing hole in the correct position.

If in doubt ask Brook Hansen.

Bearings, Grease, Bearing Change

Grease

Bearings are prepacked with a lithium or lithium complex based grease.

Other lithium based greases of a similar consistency would be compatible. See Table 1 for some alternatives.

TABLE 1
Alternative Lithium Complex Greases

Grease	Reference	Manuf.
Energrease	LC2	B.P.
Castrol	LMX	Castrol
Luplex	M2	Century
Unirex	N2	Esso
Sovereign	LS	Gulf
Mobilgrease	HP	Mobil
Liplex	EP2	Shell
Hytex	EP2	Texaco
Retinax	LX	Shell
LGHT3		SKF

Where a special grease has been supplied this will be indicated on the motor nameplate.

Regreasing

Standard regreasing facilities, where provided, are situated on the periphery of the drive end and non drive endshields.

Grease relief is via a:-

a) diaphragm relief valve,
b) rotating grease relief flinger,
c) plugged grease chute.

STANDARD REGREASING FACILITIES

Typ.	Regreasing facility
63/180*	On request
200/355	Standard

* Bearings are double shielded and prepacked with grease for life.

Recommended relubrication intervals are shown in Appendix 2. Motors without grease nipples have sealed for life bearings and the intervals in Appendix 2 should be considered as bearing replacement recommendations.

An overgreased bearing will cause overheating of the bearing with the possible escape of the grease, loss of lubrication qualities, leading to ultimate bearing failure.

See Appendix 3 for replacement of a 'W' non-drive end bearing.

Lubrication procedure

The following procedure should be adopted.

1 Wipe clean the grease gun fitting and the regions around the motor grease fittings.
2 Remove the grease relief plug if fitted. Some motors will have one way grease valves which should be left in place.
3 Add a small quantity of grease, approximately 4 to 10 shots depending on frame size.
4 Allow motor to run for about ten minutes in order that excess grease may be expelled before refitting the relief plug. Bearings fitted with rotating grease relief or through grease valves will relieve automatically.
5 On initial start up or after relubrication, 'bearing noise' may result from the new grease moving around the bearing. This noise is normal and will disappear after a few hours of running.

Bearing change

When fitting new bearings the parts should be lightly lubricated with grease.

The bearing should be driven onto the shaft by pressure on the INNER RACE ONLY using a short length of tube placed over the motor shaft.

On larger motors it is easier to raise the temperature of the bearing using an oil bath, oven, or induction heating. The temperature must be controlled to 120°C maximum.

The bearing should then be quickly slipped into place, ensuring that the bearing is in contact with the shaft shoulder.

When cool, ensure that the bearing is clean and charge the bearing with the recommended quantity of grease.

Bearings and housings should be one third full.

INSTALLATION & MAINTENANCE OF A.C. ELECTRIC INDUCTION MOTORS

Fitting Flange Ring

1 If required, remove foot as detailed in terminal box position change.
2 If required, reposition terminal box and lifting lugs.
3 Clean paint off the drive end endshield spigot and remove all the plastic bolt-hole cover caps. Apply a film of Hylamar jointing compound on bare machined surfaces for sealing and corrosion protection.
4 Fit flange ring onto spigot, positioning fixing holes to provide either BS or DIN flange hole positions.
5 Bolt ring into position, using the same size socket head bolts as used on the feet. These are supplied with the flange ring kit. Use 'Tuflok' or similar on the threads.
6 Tighten the bolts to torque as given opposite, ensuring a progressive tightening sequence.

Change from Ball/Ball to Roller/Ball Construction

1 Isolate motor before commencing work.
2 Remove fan cover and fan.
3 Remove bearing cap screws.
4 Remove endshield at both ends.
5 Remove bearing circlips at both ends.
6 Remove preload washer at non-drive-end.
7 Replace drive-end ball bearing with new roller bearing and refit circlip.
8 Remove non-drive-end ball bearing and inner bearing cap.
9 Fit new non-drive-end inner bearing cap with shallow recess (identical to existing drive-end inner bearing cap).
10 Examine existing non-drive-end ball bearing and either refit or replace.
11 Refit non-drive-end bearing circlip.
12 Repack bearings with new grease in accordance with recommendations.
13 Ensure the lip, on both oilseals, is greased.
14 Refit both endshields and check that:-
   a. Spacer O/D is the same as the bearing O/D.
   b. Bearing spacer supplied is fitted into the non-drive-end endshield bearing recess.
   c. Slots in inner bearing caps are aligned with endshield grease chutes.
   d. Correct location for bearing cap by the use of a stud.
   e. Bolts are torqued up to recommended figures.
15 Refit bearing cap screws, ensuring correct torque to recommended figures.
16 Refit fan and fan cover.
17 Turn shaft by hand to ensure free rotaion.

ENDSHIELD FIXING BOLT TORQUES

Typ.		Bolt Dia.	W-DA Aluminium Frames		DF & W-DF Cast Iron Frames	
Metric	Nema/CSA		Torque		Torque	
			Nm	Lbf.FT	Nm	Lbf.FT
63	–	M4	1.5	1.1	–	–
71	–	M4	1.5	1.1	–	–
80	56	M5	5	3.7	5	3.7
90S/L	143/145	M5	5	3.7	5	3.7
100L	–	M6 (taptite)	8 – 10	5.9 – 7.4	20 – 24	14.7 – 17.7
112M	182/184	M6 (taptite)	8 – 10	5.9 – 7.4	20 – 24	14.7 – 17.7
132S/M	213/215	M6 (taptite)	8 – 10	5.9 – 7.4	28 – 32	20.5 – 23.6
160M/L	254/256	M8 (taptite)	29	21	28 – 32	20.5 – 23.6
180M/L	284/286	M10 (taptite)	52	38	38 – 42	27.8 – 30.7
200L	324	M10*	–	–	52	38
225S	326	M10*	–	–	52	38
225M	364	M10*	–	–	52	38
250S	365	M10*	–	–	52	38
250M	404	M16*	–	–	220	162
280M	405	M16*	–	–	220	162
280L	444	M16*	–	–	220	162
315S	445	M16*	–	–	220	162
315M	504	M20*	–	–	400	295
315L	505	M20*	–	–	400	295
355S/M/L	585/6/7	M20*	–	–	400	295

* High tensile socket headed bolts and square nuts must be used.

FOOT FIXING BOLT TORQUES

Typ.		Bolt Dia.	W-DA Aluminium Frames		W-DF Cast Iron Frames	
Metric	Nema/CSA		Torque		Torque	
			Nm	Lbf.FT	Nm	Lbf.FT
63	–	M5	6 – 7	4.5 – 5.2	–	–
71	–	M5	6 – 7	4.5 – 5.2	–	–
80	56	M8 (taptite)	24 – 25	17.7 – 18.4	–	–
90S/L	143/145	M8 (taptite)	24 – 25	17.7 – 18.4	–	–
100L	–	M8 (corflex)	32 – 35	23.6 – 25.8	–	–
112M	182/184	M8 (corflex)	32 – 35	23.6 – 25.8	–	–
132S/M	213/215	M8 (corflex)	32 – 35	23.6 – 25.8	–	–
160M/L	254/256	M10	68 – 72	50 – 53	–	–
180M/L	284/286	M10	68 – 72	50 – 53	–	–
200L	324	M10*	–	–	52	38
225S	326	M10*	–	–	52	38
225M	364	M10*	–	–	52	38
250S	365	M10*	–	–	52	38
250M	404	M16*	–	–	220	162
280M	405	M16*	–	–	220	162
280L	444	M16*	–	–	220	162
315S	445	M16*	–	–	220	162
315M	504	M20*	–	–	400	295
315L	505	M20*	–	–	400	295
355S/M/L	585/6/7	M20*	–	–	400	295

* High tensile socket headed bolts and square nuts must be used.

MAINTENANCE

ON-GOING MAINTENANCE

Induction motors by their very nature require very little maintenance. However a regular regime of inspection is recommended to ensure minor problems do not escalate to breakdowns. Typical intervals would be 2000 hours of operation or 3 months, whichever is the sooner.

Checklist

- No visible damage i.e. fans cracked, fan cowls bent, foot cracked etc.
- No accumulation of dust or fibres on the frame or around the fan inlet
- No significant corrosion of the lifting lugs/ eyebolts
- No excessive vibration
- No loose fasteners
- Cables and earths are sound
- Sealing of the motor and gland plate in good condition
- Insulation resistance adequate, imperative this is checked after a prolonged shut-down
- Note Fumex smoke extraction motors should be rewound after 5 years of operation. See specification sheet 26E
- Regrease required, particularly large output 2 pole motors
- Bearing condition

PERIODIC MAINTENANCE

Remove the cover and the fan which is keyed, clamped, pinned or knurl located to the shaft extension. Loosen and remove bearing cover screws and endshield bolts/studs. The endshields should then be eased off their spigots.

The rotor can now be carefully withdrawn from the stator, taking care not to damage the stator bore and both stator and rotor windings.

Having dismantled the motor, maintenance can be carried out to remove all dirt. For this purpose, the use of an air line supplying dry compressed air under comparatively low pressure is best, as a high velocity air-stream can force dirt into the spaces between the windings and insulation, etc. Grease-removing solvents should only be used very sparingly to avoid damage to impregnating varnish or insulation.

Motors should be re-assembled in the reverse order from dismantling, remembering to ease endshields onto bearings and spigots. DO NOT USE FORCE.

Before starting, check that the rotor revolves freely. Ensure that the electrical connections are correct and terminal nuts tight (see section – Electrical Connection).

Wound Rotor

Inspection

Brushes should be inspected every 1000 running hours or at three monthly intervals if this is a shorter period of time. The inspection should include checks for brush wear and tensioning. Build up of carbon dust should be removed using a suitable dust extraction unit.

Replacement of brushes is recommended when the brush is approximately a quarter of the way down the brush holder. On calliper type designs the brushes should be replaced when 1/4" (5mm) of brush remains.

It is important that the correct grade of brush be used as this significantly affects operation. If in doubt please refer to Brook Hansen.

Hazardous Area Motors

In addition to the conditions referred to, special requirements apply to motor types Ex N, Ex nA, EEx e, EEx d, EEx de. Refer to the approval certificate and appropriate codes of practice eg BS 5435.

SPARES AND REPAIRS

When ordering spares it is important to state the motor serial number to ensure that the correct spares will be supplied.

Notes:

(a) Fixing bolts, nuts, studs, screws, spacers or washers are not included with these parts and, if required, should be clearly specified on the order in addition to the part description number. The fixing duty and part description reference number for which they are required should also be clearly stated.

(b) Bearings ordered direct from bearing manufacturers must be specified as follows:
63-90 CN Bearing.
100-355 C3 Bearing.

ENQUIRIES

Please contact Brook Hansen or its Agents for information on any aspects of the motor performance that need clarifying.

CONTACT MUST BE MADE PRIOR TO ANY REMEDIAL ACTION BEING TAKEN UNDER GUARANTEE.

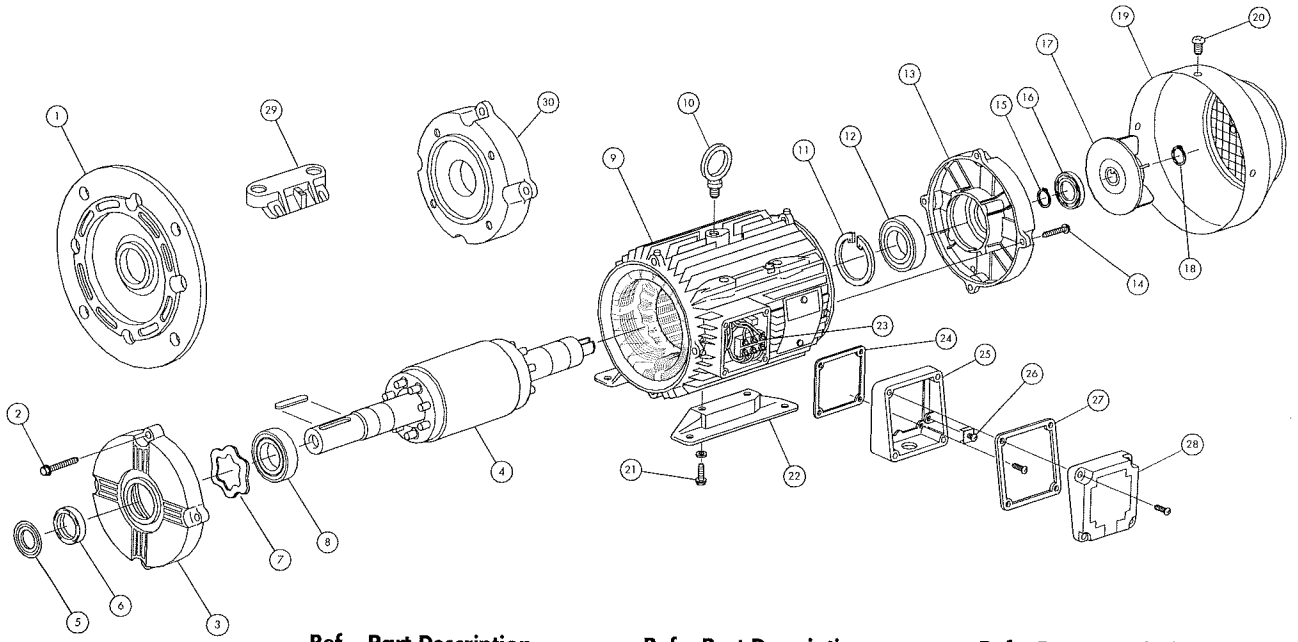
Please quote the motor number in all such cases with full details of the problem.

POLICY

Our policy is one of continuous improvement and we reserve the right to alter any detail of our products at any time without giving notice.

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

ALUMINIUM CONSTRUCTION Frame Sizes W-DA63 to W-DA200*
ALUMINIUMSTOMME STORLEK WU-DA63 TILL WU-DA200*
ALUMINIUMSUTFØRELSE I BYGGESTØRRELSE WU-DA63 TIL WU-DA200*



Ref.	Part Description
1	Aluminium flange endshield, frames 100-132, Cast Iron flange frames 160-180
2	Endshield fixing bolt
3	Drive end endshield
4	Rotor assembly
5	Flinger
6	Drive end oil seal
7	Preload washer
8	Drive end bearing
9	Stator assembly with or without feet
10	Eyebolt (when fitted)
11	Bearing retention circlip
12	Non-drive end bearing
13	Non-drive end endshield
14	Endshield fixing bolt
15	Bearing circlip
16	Non-drive end oil seal
17	Fan
18	Fan circlip
19	Fan cover
20	Fan cover screw and washer
21	Foot fixing bolts and washer
22	Detachable feet
23	Terminal board
24	Terminal box to frame gasket
25	Terminal box
26	Internal earth terminal
27	Terminal box lid gasket
28	Terminal box lid
29	Pad mounting bracket
30	Face endshield

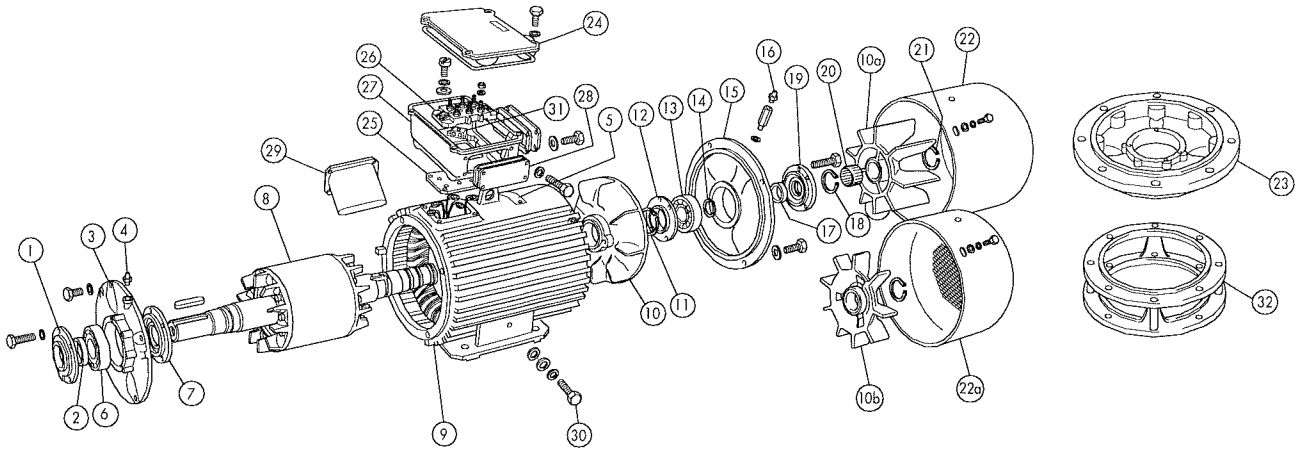
Nr.	Beskrivning
1	Aluminum flänslagersköld (100-132), Gjutjärn flänslagersköld (160-180)
2	Bult, lagersköld
3	Lagersköld, drivsida
4	Rotor med kil
5	Utkastaring
6	Radialtätning, drivsida
7	Fjäderbricka
8	Lager, drivsida
9	Statorpaket, med eller utan fötter
10	Lyftögla
11	Låsring för lager
12	Lager, icke-drivsida
13	Lagersköld, icke-drivsida
14	Bult, lagersköld
15	Låsring, lager
16	Radialtätning, icke-drivsida
17	Fläkt
18	Låsring, fläkt
19	Fläktkåpa
20	Skruv och bricka, fläktkåpa
21	Bult och bricka, fötter
22	Löstagbara fötter
23	Kopplingsplint
24	Packning, kopplingsbox mot stator
25	Kopplingsbox
26	Intern jordpunkt
27	Packning, kopplingsboxlock
28	Kopplingsboxlock
29	Klackmontering
30	B14-fläns lagersköld.

Nr.	Beskrivelse
1	Aluminium flenslagerskjold (100-132), Støpejern flenslagerskjold (160-180)
2	Bolt, lagerskjold
3	Lagerskjold drivside
4	Rotor med kile
5	Utkasterring
6	Akseltetning, drivside
7	Bølgefjær
8	Lager, drivside
9	Statorhus, med eller uten føtter
10	Øyebolt
11	Låsering, lager
12	Lager, vifteside
13	Lagerskjold, vifteside
14	Bolt, lagerskjold
15	Låsering, lager
16	Akseltetning, vifteside
17	Vifte
18	Låsering, vifte
19	Viftedeksel
20	Skrue og pakning, viftedeksel
21	Bolt og pakning, føtter
22	Avtakbare føtter
23	Klembrett
24	Pakning, koblingsboks og stator
25	Koblingsboks
26	Internt jordpunkt
27	Pakning, koblingsbokslokk
28	Koblingsbokslokk
29	Stag festebrakett
30	B14 flenseskjold

* This drawing typifies the range WU-DA100–WU-DA180. Details may vary for frames WU-DA63–90 and WU-DA200.
* Denna ritning omfattar WU-DA100 till WU-DA180. Vissa detaljer kan skilja på WU-DA63-90 och WU-DA200L.
* Denne tegningen omfatter WU-DA100 til WU-DA180. Visse detaljer kan være noe forskjellig for WU-DA63-90 og WU-DA200L.

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

STEEL CONSTRUCTION Frame Sizes 7-DS225 to 7-DS355
STÅLSTOMME 7U-DS225 TILL 7U-DS355
STÅLUTFØRELSE, byggestørrelse 7U-DS225 til 7U-DS355



Ref.	Part Description
1	Drive end outer bearing cap
2	Drive end oil seal (Labyrinth seals on Energy Efficient motors)
3	Drive end endshield (foot mounted)
4	Grease nipple
5	Nameplate
6	Drive end bearing
7	Drive end inner bearing cap
8	Rotor assembly
9	Stator frame with feet

Ref.	Part Description
10	Bi-directional internal fan
10A	Bi-directional external fan, for low noise option
10B	Bi-directional external fan
11	Fan circlip
12	Non-drive end inner bearing cap
13	Non-drive end bearing
14	Non-drive end bearing circlip
15	Non-drive end endshield
16	Grease nipple and extension pipe

Ref.	Part Description
17	Non-drive end oil seal (Labyrinth seals on Energy Efficient motors)
18	Fan circlip (replaced by shaft shoulder on some sizes)
19	Non-drive end outer bearing cap
20	Tolerance ring
21	Fan circlip
22	Fan cover, for low noise option
22A	Fan cover

Ref.	Part Description
23	Flange endshield
24	Terminal box lid
25	Terminal box gasket
26	Terminal board
27	Terminal box
28	Detachable gland plate (frame sizes 225-250)
29	Angled cable entry (frame sizes 280-355)
30	External earth terminal
31	Thermistor connection block
32	Adaptor for skirt mounting

Nr.	Beskrivning
1	Yttre lagerlock, drivsida
2	Radialtätning, drivsida
3	Lagersköld, drivsida (B3-montage)
4	Smörjnippel
5	Märkskylt
6	Lager, drivsida
7	Inre lagerlock, drivsida
8	Rotor med kil
9	Statorpaket med fötter

Nr.	Beskrivning
10	Intern fläkt
10A	Extern fläkt, för låg ljudnivå
10B	Extern fläkt standard
11	Låsring, fläkt
12	Inre lagerlock, icke driv-sida
13	Lager, icke-drivsida
14	Låsring, icke-drivsida
15	Lagersköld, icke-drivsida
16	Smörjnippel med förlängningsrör

Nr.	Beskrivning
17	Radialtätning, icke-drivsida
18	Låsring, fläkt. (Ersätts med axelskuldra på vissa storlekar)
19	Yttre lagerlock, icke-drivsida
20	Toleransring
21	Låsring, fläkt
22	Fläktkåpa, för låg ljudnivå
22a	Fläktkåpa, standard
23	Flänslagersköld
24	Kopplingsboxlock

Nr.	Beskrivning
25	Packning, kopplingsbox
26	Kopplingsplint
27	Kopplingsbox
28	Löstagbar förskruvningsplatta (225-250)
29	Vinklad kabelgenomföring (280-355)
30	Extern jordpunkt
31	Anslutningsblock, termistorer
32	Adapter för specialmontage

Nr.	Beskrivelse
1	Ytre lagerdeksel, drivside
2	Akseltetning, drivside
3	Lagerskjold, drivside (B3-montering)
4	Smørenippel
5	Merkeskilt
6	Lager, drivside
7	Indre lagerdeksel, drivside
8	Rotor med kile
9	Statorhus med føtter

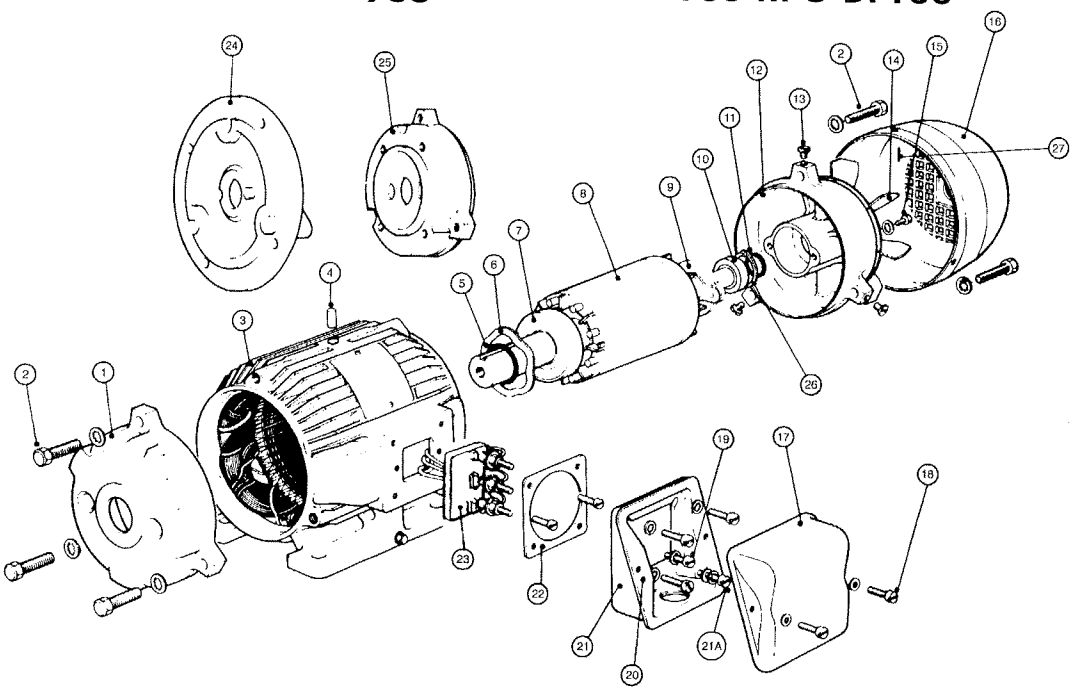
Nr.	Beskrivelse
10	Innvendig vifte
10A	Utvendig vifte, for lavt lydnivå
10B	Utvendig vifte, standard
11	Låsering for vifte
12	Indre lagerdeksel, vifteside
13	Lager, vifteside
14	Låsering, vifteside
15	Lagerskjold, vifteside
16	Smørenippel med forlengelsesrør

Nr.	Beskrivelse
17	Akseltetning, vifteside
18	Låsering, vifte (erstattes med aksselskulder på visse byggestørrelser)
19	Ytre lagerdeksel, vifteside
20	Toleransering
21	Låsering, vifte
22	Viftedeksel for lavt lydnivå
22A	Viftedeksel, standard
23	Flenslagerskjold

Nr.	Beskrivelse
24	Koblingsbokslokk
25	Pakning koblingsboks
26	Klembrett
27	Koblingsboks
28	Avtakbar gjennomføringsplate (225-250)
29	Vinkelgjennomføring
30	Utvendig jordingspunkt
31	Koblingspunkt termistor
32	Adapter for spesialmontering

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

CAST IRON CONSTRUCTION Frame Sizes DF80 to DF100
GJUTJÄRNSSTOMME U-DF80-U-DF100
STØPEJERNSUTFØRELSE i byggestørrelse U-DF80 til U-DF100



Ref.	Part Description
1	Drive end endshield
2	Endshield fixing bolts
3	Stator assembly with or without feet
4	Pack peg
5	Drive end oil seal (when fitted)
6	Preload washer
7	Drive end bearing

Ref.	Part Description
8	Rotor assembly
9	Non-drive end inner bearing cap
10	Non-drive end bearing
11	Non-drive end oil seal (when fitted)
12	Non-drive end endshield
13	Fan cover screws & washer
14	Fan

Ref.	Part Description
15	Non-drive end inner bearing cap screws
16	Fan cover
17	Terminal box lid
18	Terminal box lid screws
19	Internal earth terminal
20	Terminal box lid gasket
21	Terminal box
21A	Terminal box fixing screws

Ref.	Part Description
22	Terminal box to frame gasket
23	Terminal board
24	Flange endshield
25	Face endshield
26	Bearing circlip
27	Fan locating Pin

Nr.	Beskrivning
1	Lagersköld, drivsida
2	Bult, lagersköld
3	Statorpaket, med eller utan fötter
4	Pinne för statorpositionering
5	Radialtätning, drivsida
6	Fjäderbricka
7	Lager, drivsida

Nr.	Beskrivning
8	Rotor med kil
9	Inre lagerlock, icke-drivsida
10	Lager, icke-drivsida
11	Radialtätning, icke-drivsida
12	Lagersköld, icke-drivsida
13	Skruv och bricka, fläktkåpa
14	Fläkt

Nr.	Beskrivning
15	Skruv, inre lagerlock icke-drivsida
16	Fläktkåpa
17	Kopplingsboxlock
18	Skruv, kopplingsboxlock
19	Intern jordpunkt
20	Packning, kopplingsboxlock
21	Kopplingsbox

Nr.	Beskrivning
21A	Skruv, kopplingsbox
22	Packning, kopplingsbox mot stator
23	Kopplingsplint
24	Flänslagersköld
25	B14-fläns lagersköld
26	Låsring, lager
27	Låspinne, fläkt

Nr.	Beskrivelse
1	Lagerskjold, drivside
2	Bolt lagerskjold
3	Statorhus, med eller uten føtter
4	Pinne for statorposisjonering
5	Akseltetning, drivside
6	Bølgefjær
7	Lager, drivside

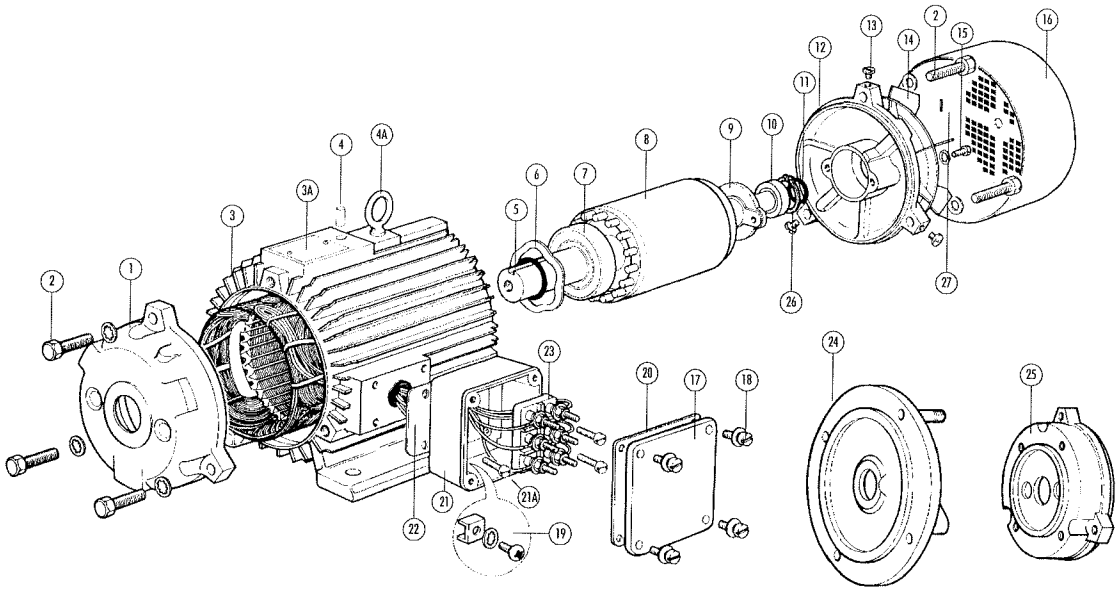
Nr.	Beskrivelse
8	Rotor med kile
9	Indre lagerdeksel, vifteside
10	Lager, vifteside
11	Akseltetning, vifteside
12	Lagerskjold, vifteside
13	Skrue og pakning for viftedeksel
14	Vifte

Nr.	Beskrivelse
15	Skrue, indre lagerdeksel vifteside
16	Viftedeksel
17	Koblingsbokslokk
18	Skrue koblingsbokslokk
19	Innvendig jordingspunkt
20	Pakning, koblingsbokslokk
21	Koblingsboks

Nr.	Beskrivelse
21A	Skrue, koblingsboks
22	Pakning, koblingsboks mot stator
23	Klembrett
24	Flenslagerskjold
25	B14 flens lagerskjold
26	Låsering, lager
27	Låsepinne, vifte

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

CAST IRON CONSTRUCTION Frame Sizes DF112 to DF200
GJUTJÄRNSSTOMME U-DF112 TILL U-DF200
STØPEJERNSUTFØRELSE i byggestørrelse U-DF112 til U-DF200



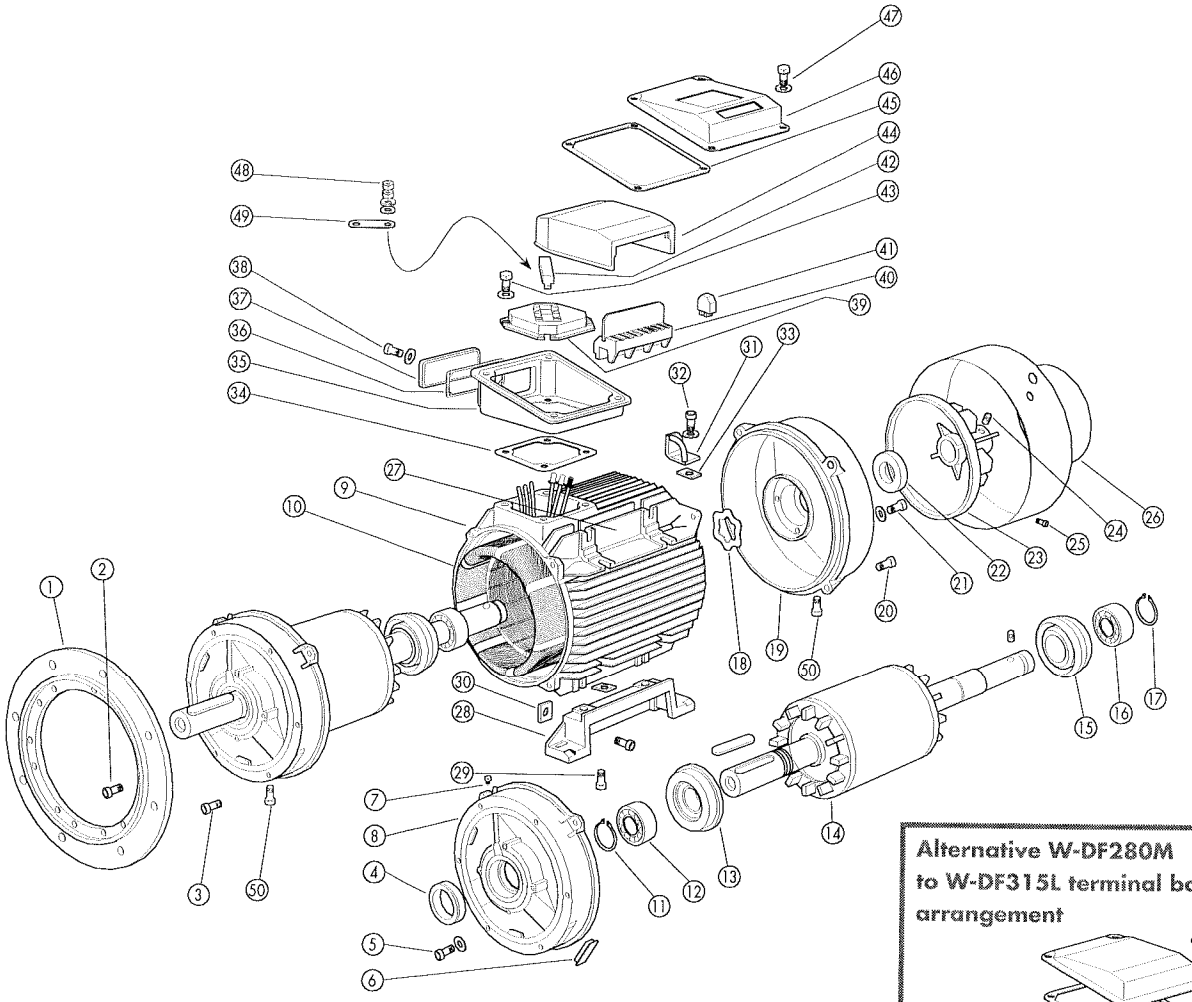
Ref.	Part Description
1	Drive end endshield
2	Endshield fixing bolts
3	Stator assembly with or without feet
3A	Facing for top mounted terminal box
4	Pack peg
4A	Eyebolt
5	Drive end oil seal (when fitted)
6	Preload washer
7	Drive end bearing
8	Rotor assembly
9	Non-drive end inner bearing cap
10	Non-drive end bearing
11	Non-drive end oil seal (when fitted)
12	Non-drive end endshield
13	Fan cover screws & washer
14	Fan
15	Non-drive end inner bearing cap screws
16	Fan cover
17	Terminal box lid
18	Terminal box lid screws
19	Internal earth terminal
20	Terminal box lid gasket
21	Terminal box
21A	Terminal box fixing screws
22	Terminal box to frame gasket
23	Terminal board
24	Flange endshield
25	Face endshield
26	Bearing circlip
27	Fan locating Pin

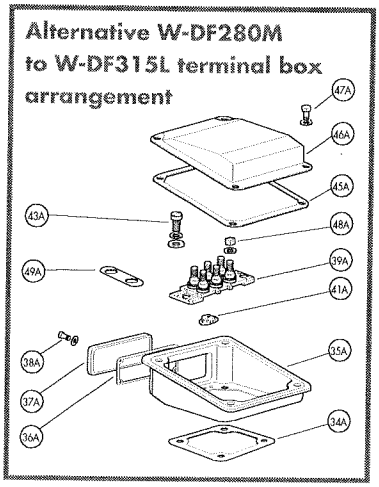
Nr.	Beskrivning
1	Lagersköld, drivsida
2	Bult, lagersköld
3	Statorpaket, med eller utan fötter
3A	Hål för toppmonterad kopplingsbox
4	Pinne för statorpositionering
4A	Lyftögla
5	Radialtätning, drivsida
6	Fjäderbricka
7	Lager, drivsida
8	Rotor med kil
9	Inre lagerlock, icke-drivsida
10	Lager, icke-drivsida
11	Radialtätning, icke-drivsida
12	Lagersköld, icke-drivsida
13	Skruv och mutter, fläktkåpa
14	Fläkt
15	Skruv, inre lagerlock icke-drivsida
16	Fläktkåpa
17	Kopplingsboxlock
18	Skruv, kopplingsboxlock
19	Intern jordpunkt
20	Packning, kopplingsboxlock
21	Kopplingsboxlock
21A	Skruv, kopplingsbox
22	Packning, kopplingsbox mot stator
23	Kopplingsplint
24	Flänslagersköld
25	B14-fläns lagersköld
26	Låsring, lager
27	Låspinne, fläkt

Nr.	Beskrivelse
1	Lagerskjold, drivside
2	Bolt, lagerskjold
3	Statorhus, med eller uten føtter
3A	Hull for toppmontert koblingsboks
4	Pinne for statorposisjonering
4A	Øyebolt
5	Akseltetning, drivside
6	Bølgefjær
7	Lager, drivside
8	Rotor med kile
9	Indre lagerdeksel, vifteside
10	Lager, vifteside
11	Akseltetning, vifteside
12	Lagerskjold, vifteside
13	Skrue og mutter for viftedeksel
14	Vifte
15	Skrue, indre lagerdeksel vifteside
16	Viftedeksel
17	Koblingsbokslokk
18	Skrue koblingsbokslokk
19	Innvendig jordingspunkt
20	Pakning, koblingsbokslokk
21	Koblingsbokslokk
21A	Skrue koblingsboks
22	Pakning, koblingsboks mot stator
23	Klembrett
24	Flenslagerskjold
25	B14 flens, lagerskjold
26	Låsering, lager
27	Låsepinne, vifte

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

CAST IRON CONSTRUCTION Frame Sizes W-DF200 to W-DF315L
GJUTJÄRNSSTOMME WU-DF200 TILL WU-DF315L
STØPEJERNSUTFØRELSE i byggestørrelse WU-DF200 til WU-DF315L





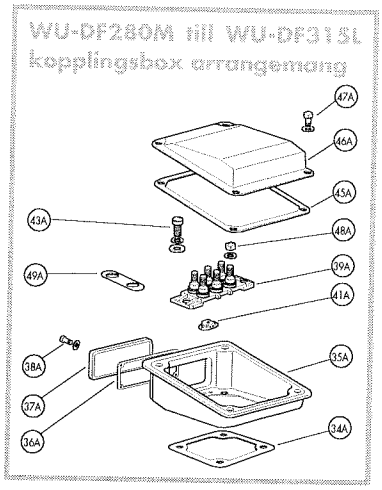
Ref.	Part Description
1	Flange adaptor (optional)
2	Flange adaptor fixing bolt (optional)
3	Endshield fixing bolt
4	Drive end oil seal
5	Drive end bearing cap fixing bolt and washer
6	Plug
7	Grease nipple
8	Drive end endshield
9	Stator frame assembly with or without feet
10	Stator core pack
11	Drive end bearing circlip
12	Drive end bearing
13	Drive end inner bearing cap
14	Rotor assembly
15	Non-drive end inner bearing cap
16	Non-drive end bearing
17	Non-drive end bearing circlip
18	Preload washer
19	Non-drive end endshield
20	Endshield fixing bolt
21	Non-drive end inner bearing cap fixing bolt and washer
22	Non-drive end oil seal
23	Fan
24	Fan locking screw
25	Fan cover fixing bolt and washer
26	Fan cover
27	Self adhesive nameplate
28	Multi-mount foot
29	Foot fixing bolt
30	Foot fixing nut
31	Lifting lug
32	Lifting lug fixing bolt and washer
33	Lifting lug nut
34(A)	Terminal box to frame gasket
35(A)	Terminal box
36(A)	Gland plate gasket
37(A)	Gland plate
38(A)	Gland plate fixing bolt and washer
39(A)	Main terminal block
40	Auxiliary terminal bracket
41(A)	Clip-in auxiliary terminal block
42	Main terminal retaining plug
43(A)	Main terminal block fixing bolt and washer
44	Mains terminal cover (optional)
45(A)	Terminal box lid gasket
46(A)	Terminal box lid
47(A)	Main terminal box lid fixing bolt and washer
48(A)	Terminal lock nuts, spring washer and plain washer
49(A)	Terminal link
50	Drain plug

SPARE PARTS, INSTALLATION & MAINTENANCE
RESERVDELAR, INSTALLATION OCH UNDERHÅLL
RESERVEDELER, INSTALLASJON OG VEDLIKEHOLD

Nr.	Beskrivning
1	Flänsring
2	Bult, flänsring
3	Bult, lagersköld
4	Radialtätning, drivsida
5	Bult och bricka, lagerlock
6	Plugg
7	Smörjnippel
8	Lagersköld, drivsida
9	Statorpaket, med eller utan fötter
10	Statorlindning
11	Låsring, lager drivsida
12	Lager, drivsida
13	Inre lagerlock, drivsida
14	Rotor med kil
15	Inre lagerlock, icke-drivsida
16	Lager, icke driv-sida
17	Låsring, lager icke-drivsida
18	Fjäderbricka
19	Lagersköld, icke-drivsida

Nr.	Beskrivning
20	Bult, lagersköld
21	Bult och bricka, inre lagerlock icke-drivsida
22	Radialtätning, icke-drivsida
23	Fläkt
24	Låskruv, fläkt
25	Bult och bricka, fläktkåpa
26	Fläktkåpa
27	Självhäftande märkskylt
28	Löstagbar fot
29	Bult, fot
30	Fyrkantsmutter, fot
31	Lyftögla
32	Bult och bricka, lyftögla
33	Mutter, lyftögla
34(A)	Packning, kopplingsbox mot stator
35(A)	Kopplingsbox
36(A)	Packning, förskruvningsplatta
37(A)	Förskruvningsplatta

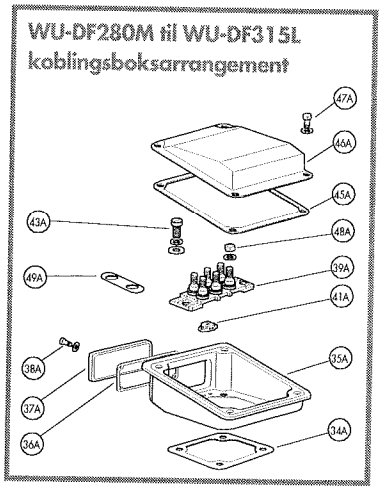
Nr.	Beskrivning
38(A)	Bult och bricka, förskruvningsplatta
39(A)	Kopplingsplint, huvudmatning
40	Tillbehörsbrygga
41(A)	Tillbehörsplint
42	Brygga, huvudmatning
43(A)	Bult och mutter, kopplingsplint huvudmatning
44	Beröringsskydd, huvudmatning (Tillbehör)
45(A)	Packning, kopplingsboxlock
46(A)	Kopplingsboxlock
47(A)	Bult och mutter, kopplingsboxlock
48(A)	Mutter och låsbricka, huvudmatning
49(A)	Kopplingsbleck
50	Dräneringsplugg



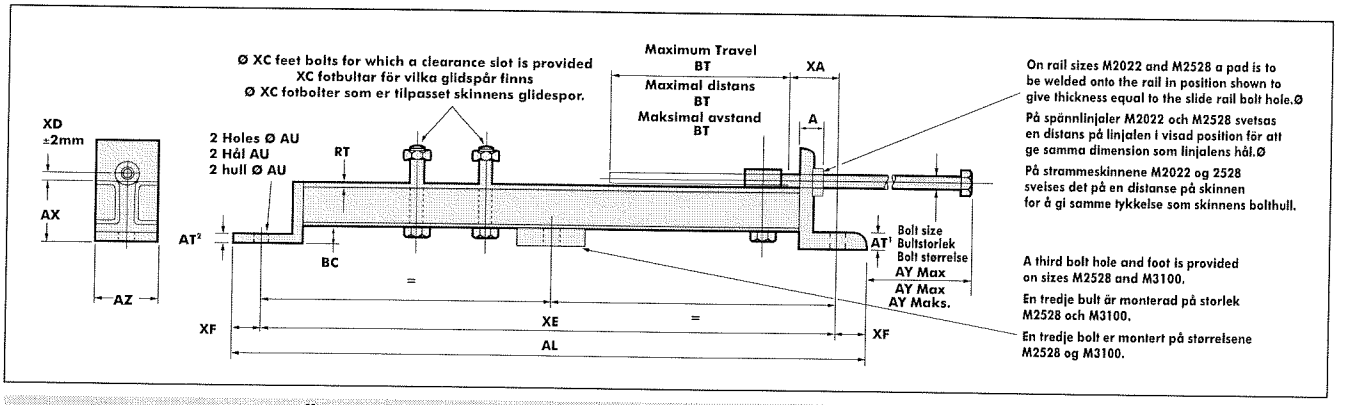
Nr.	Beskrivelse
1	Flensring
2	Bolt, flensring
3	Bolt, lagerskjold
4	Akseltetning, drivside
5	Bolt og pakning, lagerdeksel
6	Plugg
7	Smørenippel
8	Lagerskjold, drivside
9	Statorhus, med eller uten føtter
10	Statorviklinger
11	Låsering, lager drivside
12	Lager, drivside
13	Indre lagerdeksel, drivside
14	Rotor med kile
15	Indre lagerdeksel, vifteside
16	Lager, vifteside
17	Låsering, lager vifteside
18	Bølgefjær
19	Lagerskjold, vifteside

Nr.	Beskrivelse
20	Bolt, lagerdeksel
21	Bolt og pakning, indre lagerdeksel vifteside
22	Akseltetning, vifteside
23	Vifte
24	Låseskrue, vifte
25	Bolt og pakning, viftedeksel
26	Viftedeksel
27	Selvheftende merkeskilt
28	Avtakbar fot
29	Bolt, fot
30	Firkantmutter, fot
31	Øyebolt
32	Bolt og pakning, øyebolt
33	Mutter, øyebolt
34(A)	Pakning, koblingsboks mot stator
35(A)	Koblingsboks
36(A)	Pakning, gjennomføringsplate

Nr.	Beskrivelse
37(A)	Gjennomføringsplate
38(A)	Bolt og pakning, gjennomføringsplate
39(A)	Klembrett, matespenning
40	Tilbehørs klembrett
41(A)	Tilbehørs klips
42	Koblingsbrikke, matespenning
43(A)	Bolt og mutter for hovedklembrett
44	Berøringsbeskyttelse, tilførsel (tilbehør)
45(A)	Pakning koblingsbokslokk
46(A)	Koblingsbokslokk
47(A)	Bolt og mutter koblingsbokslokk
48(A)	Mutter og låseskive for terminalpinner
49(A)	Koblingslask
50	Dreneringsplugger

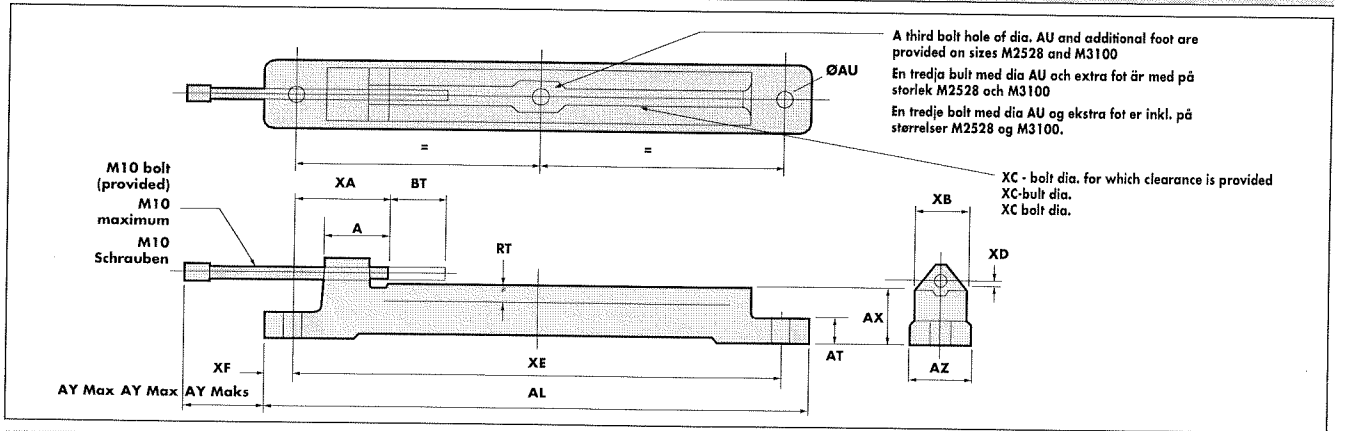


APPENDIX 1 SLIDE RAIL DIMENSIONS
BILAGA 1 SPÄNNLINJALER DIMENSIONER
VEDLEGG 1 DIMENSJONER STRAMMESKINNER



SLIDE RAIL (STEEL) SPÄNNLINJAL (STÅL) STRAMMESKINNER I (STÅL)

Typ.	Rail Ref. Storlek ref. Størrelse ref.	AL	A	AU	AX	BC	XF	XA	AZ	RT	XD	XE	Bolt Size Bultstorlek Bolt størrelse	BT	XC Foot Bolt XC Fotbult XC fotbolt	AY Max AY Max AY Maks	AT 1	AT 2
63	MO809	355	8	10	30	10	15	35	30	2	2	325	M8x140	130	M8x40	90	8	5
71	MO809	355	8	10	30	10	15	35	30	2	2	325	M8x140	124	M8x40	90	8	5
80	MO809	355	8	10	30	10	15	35	30	2	2	325	M8x140	124	M8x40	90	8	5
90	MO809	355	8	10	30	10	15	35	30	2	2	325	M8x140	124	M8x40	90	8	5
100	M1013	470	10	12	44	12	20	36	45	3	6	430	M10x200	124	M10x60	144	10	6
112	M1013	470	10	12	44	12	20	36	45	3	6	430	M10x200	124	M10x60	144	10	6
132	M1013	470	10	12	44	12	20	36	45	3	6	430	M10x200	124	M10x60	144	10	6
160	M1618	615	12	15	64	14	25	52	57	3.15	10	565	M12x220	124	M12x80	143	12	6
180	M1618	615	12	15	64	14	25	52	57	3.15	10	565	M12x220	124	M12x80	143	12	6
200	M2022	785	16	19	82	16	30	80	82	4	12	725	M16x280	210	M16x110	170	10	8
225	M2528	785	16	19	82	16	30	80	82	4	12	725	M16X280	140	M16x110	212	12	10
250	M2528	945	20	24	82	20	30	58	100	3.2 Box Section	16	885	M20x300	250	M20x130	212	12	10
280	M2528	945	20	(3 holes)	82	20	30	58	100	3.2 Box Section	16	885	M20x300	190	M20x130	212	12	10
315	M3100	1215	25	28	100	25	50	70	100	75x38 Channel	20	1115	M24x375	330	M24x150	255	25	25
355	M3100	1215	25	(3 holes)	100	25	50	70	100	75x38 Channel	20	1115	M24x375	330	M24x150	255	25	25



SLIDE RAIL (ALUMINIUM) SPÄNNLINJAL (ALUMINIUM) STRAMMESKINNER I ALUMINIUM

Typ.	Rail Ref. Storlek ref. Størrelse ref.	AL	A	AU	AX	XB	XF	XA	AZ	RT	XD	XE	Bolt Size Taille de la vis. Bolt størrelse	BT	XC Foot Bolt XC Fotbult XC fotbolt	AY Max AY Max AY Maks	AT
63	MO809	355	20	10	30	30	15	40	35	22	4	325	M10x140	120	M8x40	85	12
71	MO809	355	20	10	30	30	15	40	35	22	4	325	M10x140	115	M8x40	85	12
80	MO809	355	20	10	30	30	15	40	35	22	4	325	M10x140	90	M8x40	85	12
90	MO809	355	12	10	30	30	15	40	35	22	4	325	M10x140	70	M8x40	85	12

Notes:
Dimensions are to BS4999 Part 141. All dimensions are in millimetres. Aluminium rails for frames 100-280 not normally available. These are to aid slide rail manufacture. All dimensions are in millimetres.

Notera:
Dimensioner enligt BS4999 Del 141. Alla dimensioner är i millimeter. Aluminiumlinjaler för storlek 100-280 är ej tillgängligt.

Merk:
Dimensjoner iht. BS4999 Del 141. Alle dimensjoner er i millimeter.
Aluminiumsskinner for byggestørrelse 100-280 er ikke tilgjengelig.

APPENDIX 2 TEFV RELUBRICATION OR REPLACEMENT* INTERVALS (10^3 HOURS)

BILAGA 2. TEFV SMÖRJINTERVALL ELLER UTBYTESINTERVALL (10/3 TIMMAR)

VEDLEGG 2. TEFV SMØRE- ELLER UTSKIFTNINGSINTERVALL (10^3 TIMER)

Frame Size / Stomstorlek / Byggestorrelse			3000min^{-1}				1500min^{-1}				1000min^{-1}				750min^{-1}			
			Horizontal / Horisontell / Horisontal		Vertical / Vertikal / Vertikal		Horizontal / Horisontell / Horisontal		Vertical / Vertikal / Vertikal		Horizontal / Horisontell / Horisontal		Vertical / Vertikal / Vertikal		Horizontal / Horisontell / Horisontal		Vertical / Vertikal / Vertikal	
BS	NEMA	CENEL	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter	DE Antrieb	NDE Lüfter
D	**L**	**UD**																
63*			22	22	22	22	32	32	32	32	35	35	35	35	35	35	35	35
71*			22	22	22	22	32	32	32	32	35	35	35	35	35	35	35	35
80*			22	22	22	22	32	32	32	32	32	35	35	35	35	35	35	35
90S/L*	143/145*	90S/L*	22	22	22	22	32	32	32	32	35	35	35	35	35	35	35	35
DF	**LF**	**U-DF**																
100L*	164*	100L*	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	35
112S/M*	182/184*	112S/M*	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	35
132S/M*	213/215*	132S/M*	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	35
160M/L*	254/256*	160M/L*	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	35
180M/L*	284/286*	180M/L*	26	26	26	26	35	35	35	35	35	35	35	35	35	35	35	35
200M/L	324/326	200M/L	14.8	24.2	9.6	15.7	30	30	21.3	28.4	30	30	29.3	30	30	30	30	30
W-DF	**W-LF**	**WU-DF**																
200L/225S	324/326	200L/225S	12.6	12.6	8.2	8.2	30	30	20.3	20.3	30	30	27.8	27.8	30	30	30	30
225M	364	225M	11.3	11.3	7.4	7.4	29.5	29.5	19.2	19.2	30	30	26	26	30	30	30	30
250S	365	250ME	11.3	11.3	7.4	7.4	26.3	26.3	17.1	17.1	30	30	23.6	23.6	30	30	29.3	29.3
250M/280S	404/405	280SE/ME	11.3	11.3	7.4	7.4	23.4	23.4	15.2	15.2	30	30	21.3	21.3	30	30	27.8	27.8
280M/315S	444/445	315SE/ME	9.4	9.4	6.1	6.1	21.3	21.3	13.8	13.8	30	30	20.3	20.3	30	30	26	26
315M/L	504/505	315M/L	9.4	9.4	6.1	6.1	21.3	21.3	13.8	13.8	30	30	20.3	20.3	30	30	26	26
355S/M/L	585/587	355S/M/L	5.0	9.4	3.3	6.1	8.2	13.5	5.3	8.8	16.2	22.5	10.5	14.6	24.5	30.0	15.9	19.5
7-DS	**7-L**	**7U-DS**																
225S/M	364/365	225S/M	7.5	12.6	8.2	8.2	24.5	30	20.3	20.3	30	30	27.6	27.6	30	30	30	30
250S/M	404/405	250S/M	5.8	10	6.4	6.4	21.2	27.5	17.9	17.9	30	30	24.5	24.5	30	30	30	30
280S/M	444/445	280S/M	7.1	11.3	4.6	7.4	16.8	29.5	(10.8) 15.2	19.2	26.3	30	(17.1) 21.3	26	30	30	30	30
315S/L	504/506	315S/L	7.1	11.3	4.6	7.4	14.9	29.5	(9.7) 13.8	19.2	24.5	30	(15.9) 20.3	26	30	30	30	30
355S/L	585/587	355S/L	5	9.4	3.3	6.1	8.2	26.3	(5.3) 8.8	17.1	16.2	30	(10.5) 14.6	23.6	24.5	30	(24.5) 30	29.3
355LX		355LX					8.2	26.3			16.2	30			24.5	30		

* Bearings are double shielded and prepacked with grease for life. Figures quoted in brackets ( ) are for motors fitted with feet only.

* Lager är kapslade och förpackade med fett för sin livslängd. Siffror i parantes () är för motorer med fötter endast.

* Lager er kapslet og smurt med fett for livstid.

* Tallene i parentes ( ) er for fotmonterte motorer.

Note Figures quoted are maxima assuming no external axial and/or radial loading. For specific applications refer to Brook Hansen.

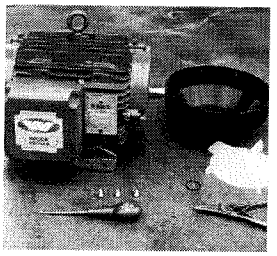
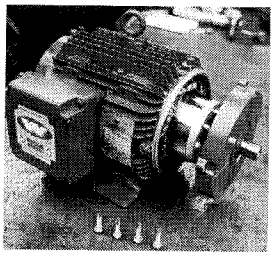
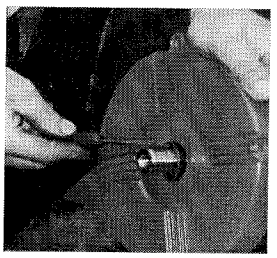
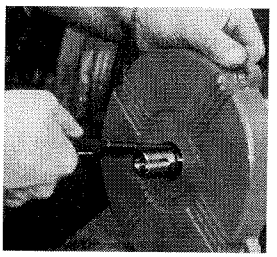
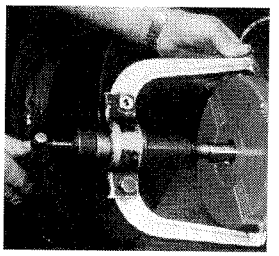
Notera Siffror är maximala under förutsättning ingen extern axiell och/eller radiell last. För specifika applikationer kontakta Brook Hansen.

Merk De oppgitte tallene er maksimale, og er forutsatt ingen eksterne aksial og/eller radial last. For spesifikke applikasjoner kontakt Brook Hansen.

APPENDIX 3 REPLACING NON-DRIVE END BEARING ON W-DA100 - W-DA180 FRAMES FITTED WITH INTERNAL CIRCLIP

BILAGA 3. UTBYTE AV ICKE-DRIVSIDA LAGER PÅ STORLEK WU-DA100 TILL WU-DA180 STORLEKAR MED INTERN LÅSRING

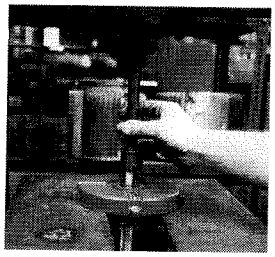
VEDLEGG 3. UTSKIFTING AV LAGER PÅ VIFTESIDEN PÅ BYGGESTØRRELSE WU-DA100 TIL WU-DA180 MED INNVENDIG LÅSERING

	BEARING REMOVAL	DEMONTERING AR LAGER	DEMONTERING AV LAGER
	1 Remove fan cover and fan.	1 Ta bort fläkt och fläktkåpa.	1 Ta av viftedeksel og vifte.
	2 Remove Non-Drive Endshield fixing bolts and withdraw Non-Drive Endshield with rotor assembly from stator.	2 Montera bort lagersköld icke-drivsida och dra ut rotorpacket med lagerskölden.	2 Demonter lagerskjold på viftesiden og dra ut rotoren med lagerskjoldet.
	3 Remove Non-Drive End oilseal levering with a screw driver.	3 Ta bort radialtätningen med en skruvmejsel.	3 Ta av akseltetningen med et skrujern.
	4 Remove bearing retaining external circlip from the shaft.	4 Ta bort låsringen för lagret med en tång.	4 Ta av låsering med en tang.
	5 Press shaft through and out of the bearing inner race, leaving the bearing inside the endshield.	5 Pressa axeln genom lagerskölden på inre lagerbanan, lagret kvar i lagerskölden.	5 Press akselen gjennom lagerskjoldet på indre lagerbane, lageret står igjen i lagerskjoldet.

BEARING REMOVAL

DEMONTERING AR LAGER

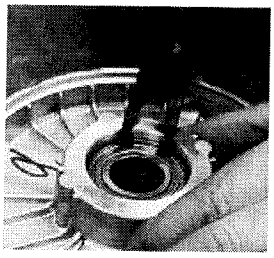
DEMONTERING AV LAGER



6 Experience shows that the bearing housing and circlip will not be damaged.

6 Erfarenheten visar att lagerhuset och låsring inte blir skadat.

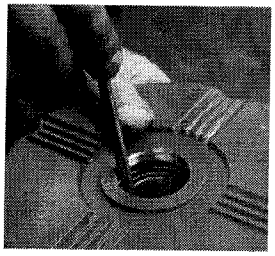
6 Erfaringer tilsier at lagerhus og låsering ikke blir skadet.



7 Using reverse action circlip pliers, remove internal circlip from bearing housing.

7 Använd tång och ta bort låsringen från lagersätet.

7 Benytt en tang og fjern låseringen fra lagerhuset.



8 Bearing can easily be removed using hand tools.

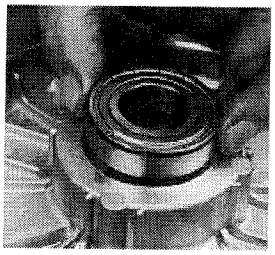
8 Lagret kan nu pressas ut enkelt.

8 Lageret kan nå presses ut med håndmakt.

BEARING REPLACEMENT

LAGERBYTE

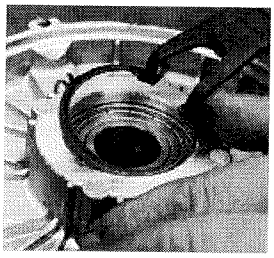
LAGERSKIFT



1 Place endshield on flat surface with inside facing upwards and insert the replacement bearing.

1 Placera lagerskölden på en platt yta med insidan uppåt och placera det nya lagret i lagersätet.

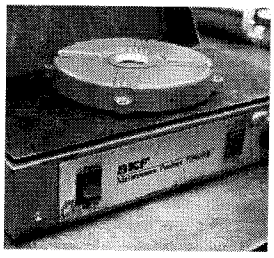
1 Plasser lagerskjoldet på et plant underlag med innsiden opp, og plasser det nye lageret.



2 Fit internal circlip.
Note - the bevel on the circlip must be away from the bearing.

2 Montera inre låsring. *Notera: Upphöjningen på låsringen skall ut från lagret.*

2 Monter indre låsering. *Merk. Forhøyningen på låseringen skal ut fra lageret.*

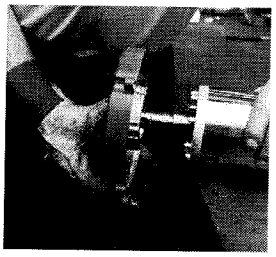


3 Heat new endshield bearing assembly using bearing induction heater or hotplate type bearing heater (obtainable from bearing manufacturer).

3 Värm upp lagret med lagerskölden med induktionsvärmare eller liknande.

3 Varm opp lageret og lagerskjoldet med en induksjonsvarmer eller lignende.

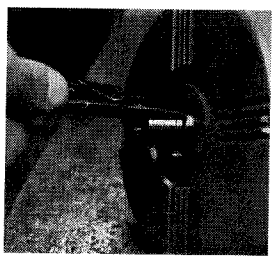
BEARING REPLACEMENT	LAGERBYTE	LAGERSKIFT



4 Push/press the endshield/ bearing assembly onto the shaft, using the bearing inner race as an abutment, until the bearing is located against the shaft shoulder.

4 Pressa på lagerskölden med lagret på axeln, pressa mot inre lagerbanan till dess att lagret ligger an mot axelskuldran.

4 Press lagerskjold med lager inn på akselen, press mot indre lagerbane til lageret ligger an mot akselskulderen.



5 Allow to cool.

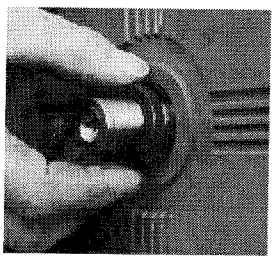
5 Låt kallna.

5 Avkjøl.

6 Refit external circlip to secure bearing.

6 Montera tillbaka den yttre låsringen.

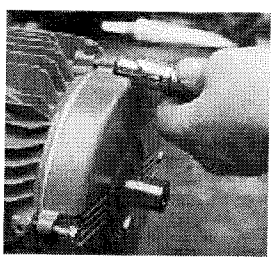
6 Monter den ytre låseringen.



7 Fit new oilseal with its open side facing outwards. Take care NOT to damage the oilseal lip.

7 Sätt tillbaka radialtätningen, byt vid behov. Se till att inte skada läppen på tätningen.

7 Monter tilbake akseltet ningen, bytt ved behov. Pass på ikke å skade leppene på tetningen.



8 Reassemble motor.

8 Montera ihop motorn.

8 Monter motoren sammen.

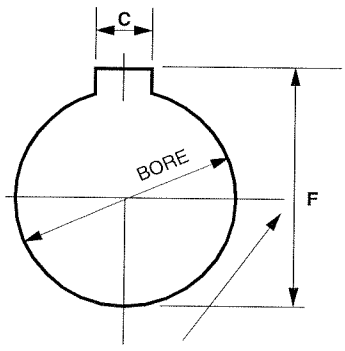
ENDSHIELD FIXING BOLT TORQUES (Nm)				
LAGERSKÖLD ÅTDRAGNINGSMOMENT				
TILTREKKINGSMOMENT LAGERSKJOLD				
W-DA100	**W-DA112**	**W-DA132**	**W-DA160**	**W-DA180**
8-10	8-10	8-10	29	52

APPENDIX 4: DETAILS OF BORE AND KEYWAY FOR V-BELT PULLEY

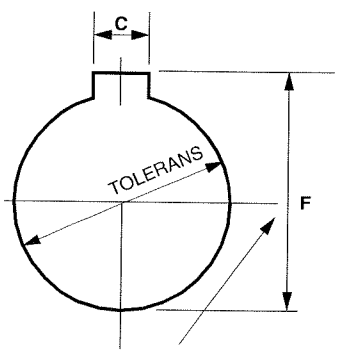
BILAGA 4. DIMENSIONER FÖR BORRNING OCH KIL FÖR KILREMSSKIVOR.

VEDLEGG 4: DIMENSJONER FOR BORING OG KILE FOR REMSKIVER

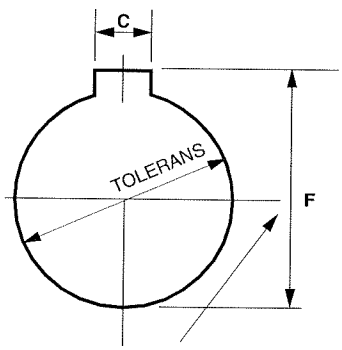
Typ. /Typ/ Type	A	Bore / Hål / Hull	C	F
63	17	10.985 ◄► 11.006	4	12.9
71	24	13.985 ◄► 14.006	5	16.4
80	34	18.985 ◄► 19.006	6	22
90	44	23.985 ◄► 24.006	8	28
100	54	27.985 ◄► 28.006	8	32
112	54	27.985 ◄► 28.006	8	32
132	74	37.982 ◄► 38.007	10	40.5 ◄► 40.7
160	104	41.982 ◄► 42.007	12	44.5 ◄► 44.7
180	104	47.982 ◄► 48.007	14	51.0 ◄► 51.2
200	104	54.988 ◄► 55.018	16	59.3 ◄► 59.9
225 2 pole pol polet	104	54.988 ◄► 55.018	16	59.3 ◄► 59.9
225 4 pole up 225 4 pol och upp 225 4 polet og oppover	134	59.988 ◄► 60.018	18	64.4 ◄► 64.6
250 2 pole pol polet	134	59.988 ◄► 60.018	18	64.4 ◄► 64.6
250 4 pole up 250 4 pol och upp 250 4 polet og oppover	134	69.988 ◄► 70.018	20	74.9 ◄► 75.1
280 2 pole pol polet	134	64.988 ◄► 65.018	18	69.4 ◄► 69.6
280 4 pole up 280 4 pol och upp 280 4 polet og oppover	164	79.988 ◄► 80.018	22	85.4 ◄► 85.6
315 2 pole pol polet	134	64.988 ◄► 65.018	18	69.4 ◄► 69.6
315 4 pole up 315 4 pol och upp 315 4 polet og oppover	164	84.987 ◄► 85.022	22	90.4 ◄► 90.6
355 2 pole pol polet	134	74.988 ◄► 75.018	20	79.9 ◄► 80.1
355 4 pole pol polet	204	99.987 ◄► 100.022	28	106.4 ◄► 106.6



To top of keyway
(at deepest end when tapered)



Till toppen på kilspår.
(Till djupaste punkten vid konisk axel)



Til toppen på kilesporet
(Til dypeste punkt ved konisk aksel)

All dimensions in millimeters.
Alla dimensioner i millimeter.
Alle dimensjoner i millimeter.

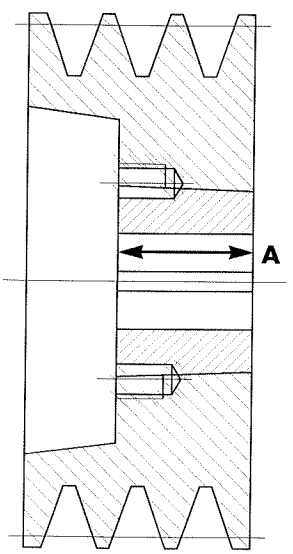
BROOK HANSEN MAGIC-LOCK

Typ. /Typ/ Type	BUSH / BUSSNING / BOSS
63	1108 - 1210
71	1108 - 1210 - 1610 - 1615 - 2012
80	1108 - 1210 - 1610 - 1615 - 2012 - 2517
90	1108 - 1210 - 1610 - 1615 - 2012 - 2517
100	1210 - 1610 - 1615 - 2012 - 2517 - 3020
112	1210 - 1610 - 1615 - 2012 - 2517 - 3020
132	1610 - 1615 - 2012 - 2517 - 3020 - 3030 - 3535
160	2012 - 2517 - 3020 - 3030 - 3535 - 4040
180	2012 - 2517 - 3020 - 3030 - 3535 - 4040
200	2517 - 3020 - 3030 - 3535 - 4040 - 4545
225 2 pole pol polet	2517 - 3020 - 3030 - 3535 - 4040 - 4545
225 4 pole up 225 4 pol och upp 225 4 polet og oppover	2517 - 3020 - 3030 - 3535 - 4040 - 4545
250 2 pole pol polet	2517 - 3020 - 3030 - 3535 - 4040 - 4545
250 4 pole up 250 4 pol och upp 250 4 polet og oppover	3020 - 3030 - 3535 - 4040 - 4545 - 5050
280 2 pole pol polet	2517 - 3020 - 3030 - 3535 - 4040 - 4545
280 4 pole up 280 4 pol och upp 280 4 polet og oppover	3535 - 4040 - 4545 - 5050
315 2 pole pol polet	2517 - 3020 - 3030 - 3535 - 4040 - 4545
315 4 pole up 315 4 pol och upp 315 4 polet og oppover	3535 - 4040 - 4545 - 5050
355 2 pole pol polet	3020 - 3030 - 3535 - 4040 - 4545 - 5050
355 4 polet og oppover	4040 - 4545 - 5050

For full details of 'MAGIC-LOCK' pulleys see catalogue No. 892 01 EFD 101.

För vidare detaljer om Magic-lock se katalog 892 01 EFD 101.

For utfyllende spesifikasjoner om Magic-lock se katalog 892 01 EFD 101.



Available shaft extension

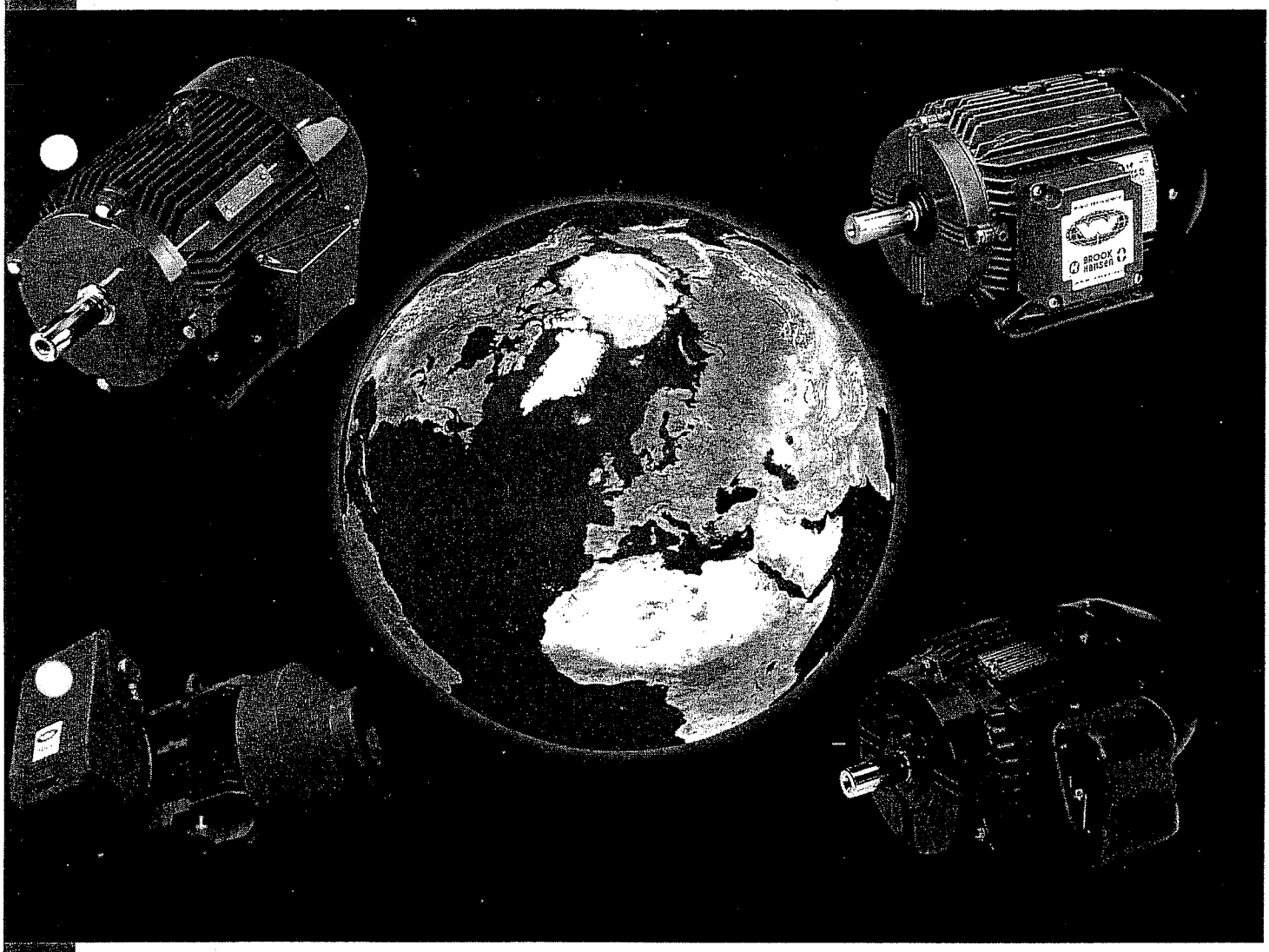
Tillverkning och montering i:

Tilgjengelig akseltappforlenger

BROOK HANSEN

ELECTRIC MOTORS CUSTOMER SAFETY AND INSTALLATION INSTRUCTIONS

A.C. INDUCTION MACHINES (50-1000V A.C.)



BROOK Hansen™

POWERFUL CONNECTIONS

INTRODUCTION

Motors are designed for use in industrial areas, and as such should be installed by qualified personnel. In compliance with all current regulations, laws and technical standards.

Warning: During use motors can get very **HOT.**

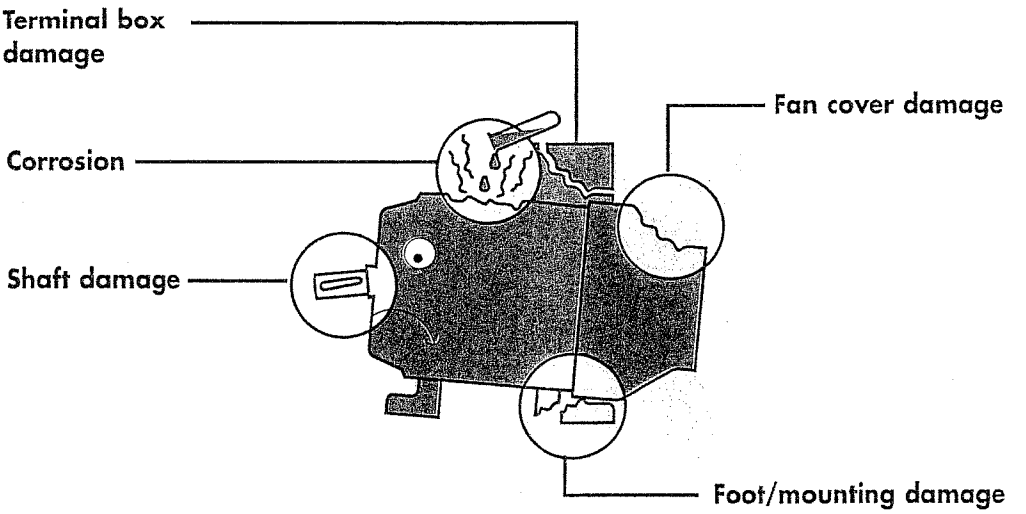
DIRECTIVES AND CE MARKING

CE

DIRECTIVE	DESCRIPTION
73/23/EEC	Low Voltage Directive: Motors are CE marked in compliance
93/68/EEC	Declaration of Conformity on page 28
98/37/EC	Machinery Directive: motors are outside of scope
91/368/EEC	Certificate of Incorporation available on request
93/44/EEC	
89/336/EEC	Electromagnetic Compatibility Directive: motors comply
92/31/EEC	EN 50 081-1 & 2 on Sinusoidal supplies
93/68/EEC	For other supplies, refer to controls or system supplier

PRE-INSTALLATION CHECKS

Before accepting a motor on site, check for the following conditions:

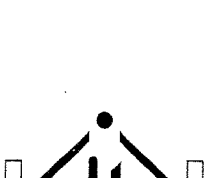


- Check that nameplate details are correct against the order.
- Check motor rating and duty, match the application.

STORAGE

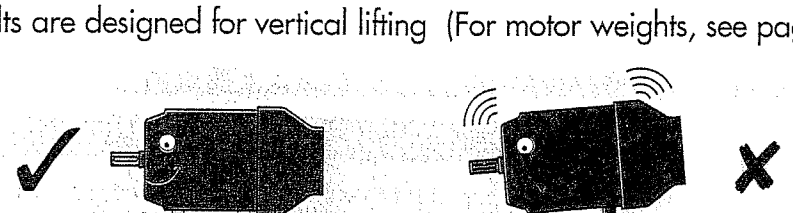
- Keep the motor dry and clean.
- Store within the temperature range (-20°C - +40°C).
- Energise heaters if fitted, or use desiccant.
- Rotate the shaft weekly.
- Every 3 months, check the insulation resistance. If less than 10MΩ dry out.

MECHANICAL INSTALLATION



LIFTING

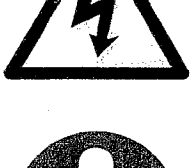
- Always use correct lifting facilities.
- Note : Maximum hand lift is 20kg below shoulder, and above ground level.
- The eyebolts are to support the motor only.
- Eyebolts are designed for vertical lifting (For motor weights, see page 27).



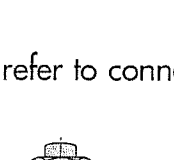
- Ensure a level mounting surface.
- Ensure correct fastner torques.
- Ensure gaskets, seals and guards are correctly fitted.
- Ensure adequate ventilation and space for maintenance.

- Before working on a machine, ensure that it is switched off, and the power source is isolated.

- Check insulation resistance of all windings with 500V dc Megger. If less than 10MΩ dry out.
- Check overload setting.
- Heaters, if fitted, will be live when the motor is stationary.
- Mains cables must be correctly sized

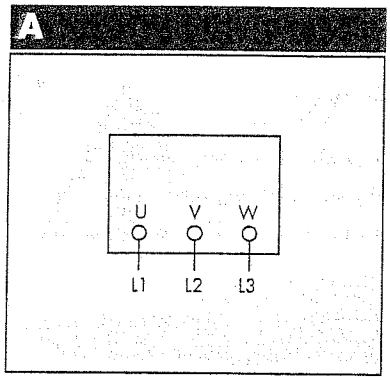


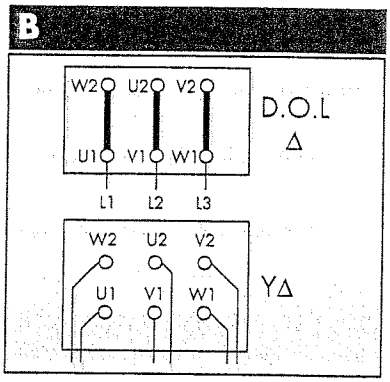
- For typical connection diagrams, see page 26 And also refer to connection diagram supplied with the motor.
- Check terminal arrangements; Tight connections; Driven equipment is free; And rotation (uncoupled).
- Terminal box lids must be fitted after connection and testing.

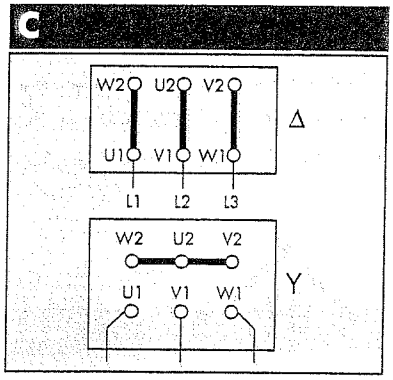


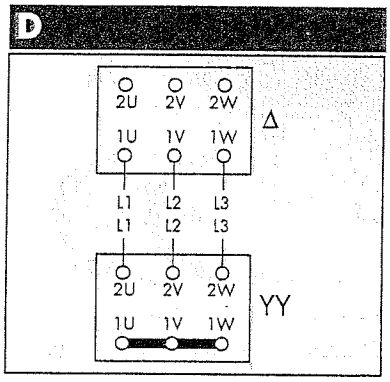
MAINTENANCE AND SPARE PARTS

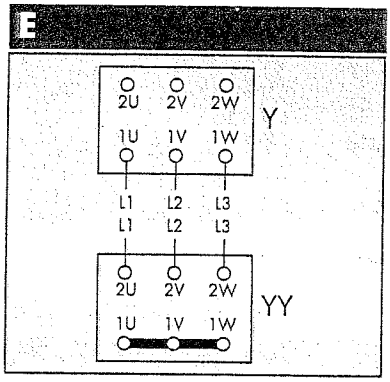
- Remember to isolate power source before any maintenance.
- Periodic maintenance should be done every 2000 running hours, or every 3 months.
  e.g. check for visible damage, such as cracked fans, covers, feet, frames etc.
- Clean free of dust, dirt, fibres etc, from motor frame and fan cover.
- Secure fastners, cables and earth leads.
- Replace bearings every 3 years.
- Never hammer a bearing. Always use an extractor.
- Avoid damaging windings, when removing a rotor.
- Extra maintenance information, see leaflet 103-4EFD.
- 'Fumex' smoke extraction ac motors. Refer to leaflet 26E.
- When ordering spare parts, please state the motor serial number. Contact numbers can be found on the back page.

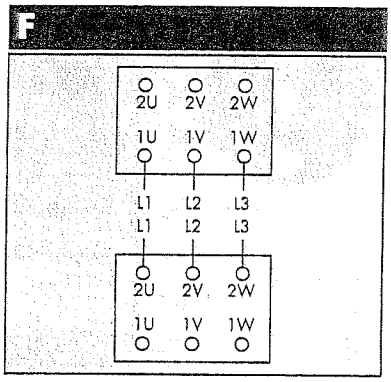






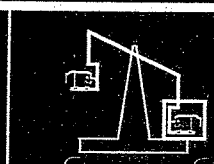
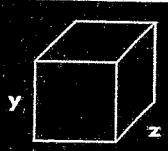




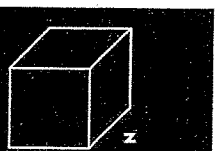


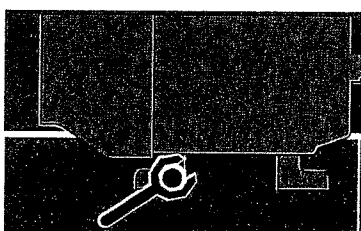
A: Direct-on-line	Direct-on-line	Conexión directa	**直接接线**
Direct en ligne	Direkt start	Directa-em-linha	Прямой оперативный режим
Direktes Anlassen	Diretto in linea	ダイレクト・オンライン	مباشر على الخط
B: Star Delta	Sterdriehoek	Estrella triángulo	**星形三角形结线**
Etoile-triangle	Y/D-start	Estrela triângulo	Звезда - треугольник
Sterndreieck-Anlassen	Star Delta	スター・デルタ	توصيل نجمي مثلثي (ستار – دلتا)
C: Dual Voltage (Δ/ Y)	Dubbele spanning	Bitensión	**双电压**
Bitension	Dubbelspänning	Tensão dupla	дьойное напржение
Doppelspannung	Doppia tensione	デュアル電圧	فولطية مزدوجة
D: Two Speed Pole Change (Δ/ YY)	Tweetoerige poolomschakeling	Dos velocidades con cambio del número de polos	**双速换极**
Inversion de pôles deux vitesses	Polomkoppling med två hastigheter	Mudança de pólo de duas velocidades	Переключение полюсов две скорости
Zweifach polumschaltbar	Cambiamento di poli a due velocità	二速極数切り換え	تغيير القطب بسرعتين
E: Two Speed Pole Change (Y/YY)	Tweetoerige poolomschakeling	Dos velocidades con cambio del número de polos	**双速换极**
Inversion de pôles deux vitesses	Polomkoppling med två hastigheter	Mudança de pólo de duas velocidades	Переключение полюсов две скорости
Zweifach polumschaltbar	Cambiamento di poli a due velocità	二速極数切り換え	تغيير القطب بسرعتين
F: Two Speed Dual Wound (Y/Y)	Tweetoerig dubbelgewikkeld	Dos velocidades con dos bobinados	**双速复绕**
Double enroulement deux vitesses	Dubbel burlindning med två hastigheter	Enrolamento duplo de duas velocidades	Двойная обмотка две скорости
zweifach drehzahlumschaltbar, Doppelwickluing	Avvolgimento a due velocità	二速デュアル巻き	ملف مزدوج بسرعتين

Al

Typ.	 kg	kg	 x m³
63	5.0	5.4	0.010
71	6.0	6.4	0.010
80	9.0	10.0	0.020
90	14.5	15.5	0.030
100	19	21	0.038
112	27	29	0.050
132	46	49	0.076
160	100	112	0.125
180	148	174	0.253

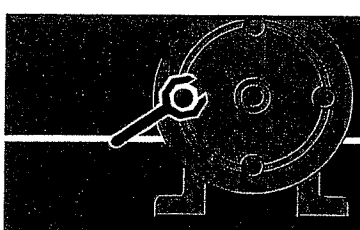
Fe

Typ.	 kg	kg	 x m³
80	15	16.5	0.02
90	22	23.5	0.03
100	24	26	0.03
112	36	38	0.05
132	77	88	0.08
160	149	158	0.15
180	212	223	0.21



Al

Typ.	Bolt Dia	Nm	Lbf.FT
63	M5	6-7	4.5-5.2
71	M5	6-7	4.5-5.2
80	M8 Taptite	24-25	17.7-18.4
90	M8 Taptite	24-25	17.7-18.4
100	M8 Corflex	32-35	23.6-25.8
112	M8 Corflex	32-35	23.6-25.8
132	M8 Corflex	32-35	23.6-25.8
160	M10	68-72	50-53
180	M10	68-72	50-53



		Fe		Al	
Typ.	Bolt Dia	Nm	Lbf.FT	Nm	Lbf.FT
63	M4	-	-	1.5	1.1
71	M4	-	-	1.5	1.1
80	M5	5	3.7	5	3.7
90	M5	5	3.7	5	3.7
100	M6 Taptite	20-24	14.7-17.7	8-10	5.9-7.4
112	M6 Taptite	20-24	14.7-17.7	8-10	5.9-7.4
132	M6 Taptite	28-32	20.5-23.6	8-10	5.9-7.4
160	M8 Taptite	28-32	20.5-23.6	29	21
180	M10 Taptite	38-42	27.8-30.7	52	38

ISO 9001 : 1987
Certificate Nos:
FS00623 FM1237 FM229

BROOK Hansen™

LOW VOLTAGE DIRECTIVE

(73/23/EEC amended by 93/68/EEC)

DECLARATION OF CONFORMITY

We,

BROOK HANSEN Small Industrial Motors St Thomas' Road Huddersfield HD1 3LJ England	BROOK HANSEN Small Industrial Motors Hope Bank Works Honley HD7 2QG England	BROOK HANSEN Large Industrial Motors Netherfield Road Guiseley Leeds LS20 9NZ England	BROOK HANSEN FSE Tamel S.A. Elektryczna Str, 6 33-100 Tarnów Poland	ELECTRODRIVES Cakemore Road Rowley Regis West Midlands B65 0QT England

declare that ac induction machines manufactured by us, having open or totally enclosed construction to all standard IP protection and IC cooling forms, with outputs up to 850kW, with imperial or metric frame designations and dimensions, are in conformance with the relevant sections of EN60034 (IEC 34) in the voltage range 50 to 1000 volts ac and therefore follow the provisions of the Low Voltage Directive.

Huddersfield
December 1998

S. Williamson
Technical Director

ELECTROMAGNETIC COMPATIBILITY DIRECTIVE

(89/336/EEC amended by 91/263/EEC and 92/31/EEC)

STATEMENT

We also declare that

ac induction machines manufactured by us, operating from a correctly applied, sinusoidal (ac) supply, comply with the essential requirements of this Directive, and that electromagnetic emission and immunity levels are within the limits defined in the generic EMC standards, both for industrial and for residential, commercial and light industrial environments ie., EN50081 Parts 1 and 2 - Emissions and EN50082 Parts 1 and 2 - Immunity.

BROOK Hansen™

POWERFUL CONNECTIONS

Brook Hansen incorporates the following brand names:
Brook Crompton, Bull Electric and Brook Crompton Controls.

ISO 9001 : 1987
Certificate Nos:
FS00623 FM1237 FM229

BROOK Hansen™

MACHINERY DIRECTIVE

(98/37 EC)

CERTIFICATE OF INCORPORATION

(In accordance with Article 4(2) and Annex IIB of the above directive)

We,

BROOK HANSEN	BROOK HANSEN	BROOK HANSEN	BROOK HANSEN	ELECTRODRIVES
Small Industrial Motors	Small Industrial Motors	Large Industrial Motors	FSE Tamel S.A.	Cakemore Road
St Thomas' Road	Hope Bank Works	Netherfield Road	Elektryczna Str, 6	Rowley Regis
Huddersfield	Honley	Guiseley	33-100 Tarnów	West Midlands
HD1 3LJ	HD7 2QG	Leeds LS20 9NZ	Poland	B65 0QT
England	England	England		England

declare that ac induction machines manufactured by us, having open or totally enclosed construction to all standard IP protection and IC cooling forms, including Ex enclosures, with outputs up to 850kW, must be installed in accordance with our Customer Safety instructions, and must not be put into service until the machinery into which they are incorporated has been declared to be in conformity with the Machinery Directive.

Huddersfield
December 1998

S. Williamson
Technical Director

BROOK Hansen™

POWERFUL CONNECTIONS

Brook Hansen incorporates the following brand names:
Brook Crompton, Bull Electric and Brook Crompton Controls.

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Fax: +1 414 643 2597

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BROOK Hansen™

POWERFUL CONNECTIONS

MDR 14255/SB/200M/1/99 Printed in England

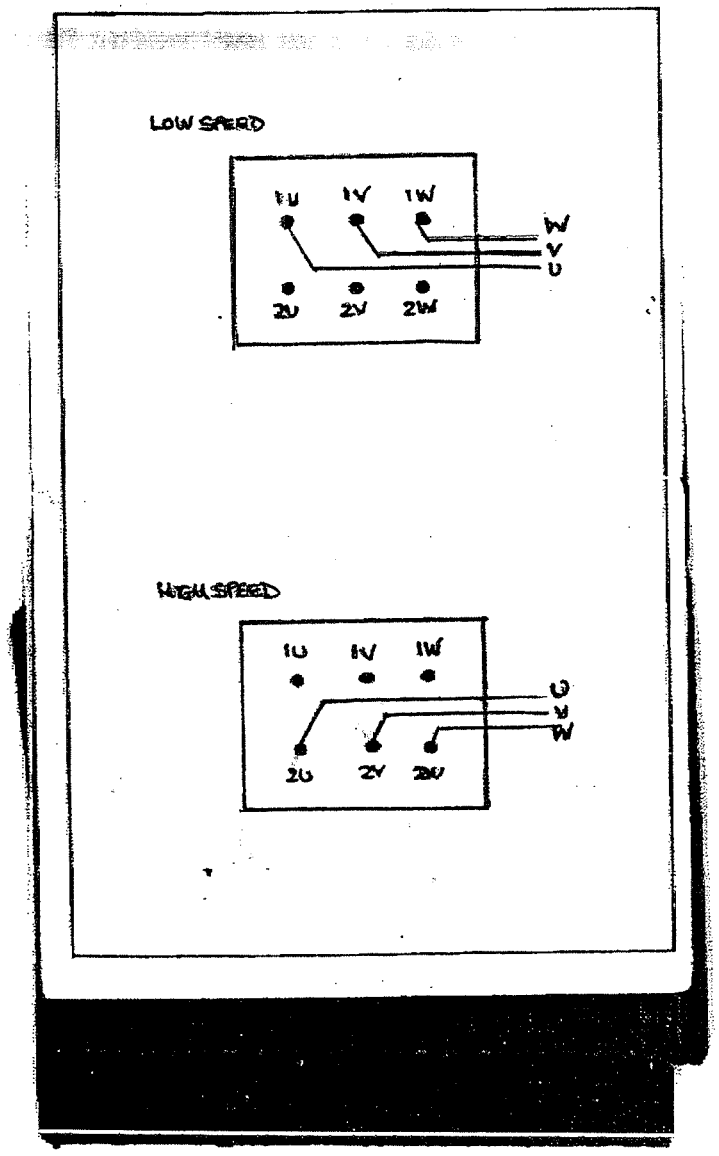
WIRING DIAGRAM

MOTOR NOS J339329/31

TWO SPEED

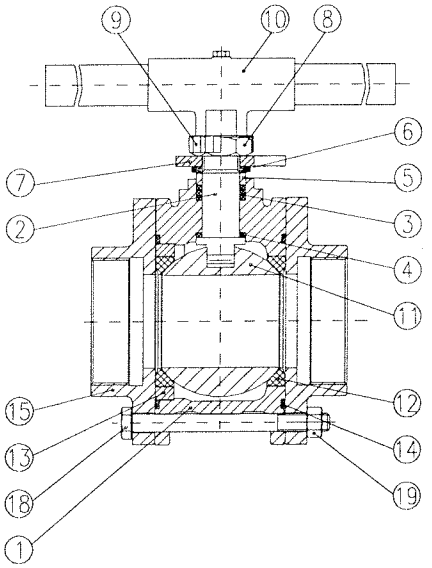
TWO WINDINGS

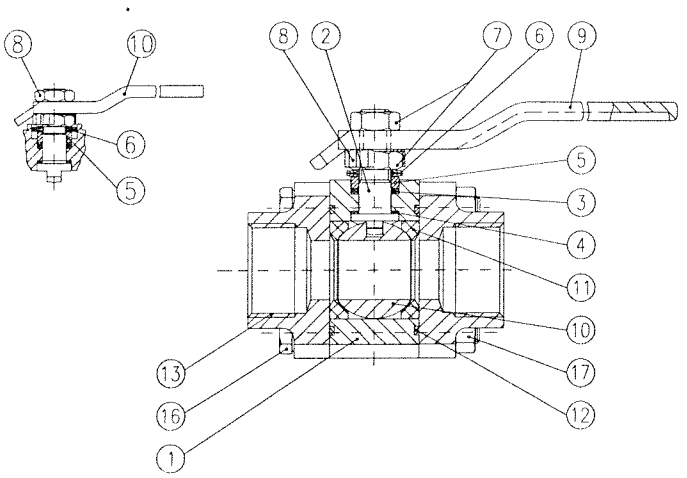
No. 64 SEPARATE WINDINGS



Installation and maintenance instructions for VALTACO ball valves

Series 26 DN 65/50 Series 15/15i/16/17/17i





DN 65 FB – 150 RB

DN 8 FB – 50 RB

15	26	
1	1	Body
2	2	Stem
3	3	Stem seal
4	4	Thrust washer
-	4.1	Washer
4.2	4.2	Thrust washer
5	5	Stem seal follower
6	6	Plate spring
-	7	Stop-Plate
7	8	Handle nut
8	9	Lock cap
9	10	Handle
10	11	Ball
11	12	Seat
-	13	Center ring
12	14	Body seal
13	15	Screwed end
16	18	Body bolt
17	19	Body nut

	Tightening torque Nm Body Screws	
	CS	SS
M5	4.5	3.2
M6	7.8	5.5
M8	19.7	14
M10	38.3	27
M12	67.0	47
M14	106.2	75
M16	162.4	114
M20	323.8	228

Tightening torque for pos. 16 and 17
(Series 15-17i) and for Pos. 18 and 19 (Series 26)

1. General

The valve may be fitted in any position in the pipework.

Before installing, the pipes must be flushed clean of dirt, burrs and welding residues.

The pipe must be free of tension.

Missaproppriated use, incorrect manipulation, unprofessional repair work, technical changes or the use of non-original spares may be dangerous for the user. In that case we will refuse all warranty and liability claims.

2. Installation of threaded connections series 15 - 26

Using conventional sealant, such as hemp core, PTFE, etc., apply the wrench only on the valve ends. Tightening by using the valve body or handle can lead to serious damage.

3. Installation of welding ends series 15 - 26

Spot weld the valve into the piping.

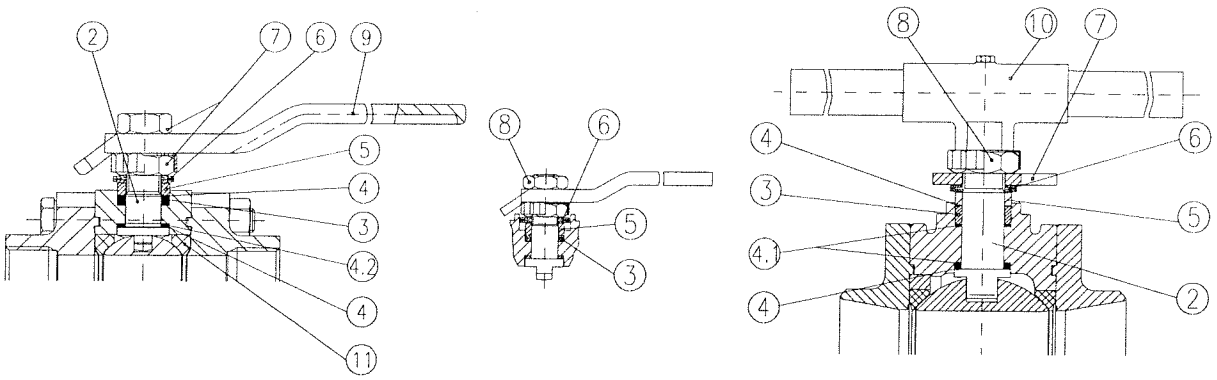
Remove bolts (16) (18) and body nuts (17) (19) with the exception of one bolt and nut which remain in position but slackened off. Pivot out the centre section (1) with the valve in **open position.** Secure seats (11) (12) against falling out (e.g. with tape). After completion of the welding operation, swing back the center section (1), replace the bolts (16) (18) and nuts (17) (19) and tighten them **according to the tightening torque table.**

4. Installation of the series 15 AF and 26 AF, Firesafe

The firesafe series valves are installed **whithout disassembling** of the body (1). When welding be careful not to **overheat the ends**, as otherwise the seats (11) (12) will be damaged. For this reason we recommend electric welding with the valve in the open position.

OSTACO AG, Steinackerstrasse 6, CH 8902 Urdorf, Switzerland, ☎ ++ 41'1' 735'55'55, Fax ++ 41'1' 735'55'02
Schweizerischer Bankverein Zürich, Swiss Bank Corporation Zürich

Series 15 AF DN 65/50 Series 26 AF



5. Putting into operation

Open the ball valve, flush pipe thoroughly again. If there is a leakage between body (1) and the ends, tighten bolts(16) (18) and nuts (17) (19) .

6. Replacement of seats and seals in series 15 - 26

Set valve in **open position** and remove complete body (1).

Close the valve and remove seats (11) (12), ball(10) (11), and body seals(12) (14). For series 26 also remove center ring (13). Be careful not to damage the ball.

Remove handle nut (7) (8) and handle (9) (10) and unscrew the stem retaining nut. Remove handle and lock cap (8) (9) and unscrew the handle nut (7) (8).

Take off plate springs (6), for series 26 remove stop plate (7), remove stem seal follower (5). Push stem (2) into the valve body (1) and remove carefully.

Clean all parts, especially the sealing surfaces of ends, stem and ball.

Assembly

Put one stem seal (4) on stem (2) and insert the stem from the inside of the body .

Add to the stem (2) two further stem seals (3), (for sizes DN 80-DN 150 add 3 pieces), then add stem seal follower (5) and 2 plate springs (6) or stop plate (7) for series 26.

Replace stem retaining nut (7) (8) and tighten* . Be sure to avoid rotating stem (2) by applying a suitable wrench.

Replace handle (9) (10) and handle nut (7) (8).

Insert ball (10) (11), seats (11) (12) and body seals (13) (14). For series 26 insert also centre ring (13). Replace complete body (1) **in open position** between the ends and tighten bolts and nuts.

Check for ease of operation.

7. Replacement of seats and seals in series 15 AF and 26 AF, firesafe valves

Set ball valve in **open position** and remove body bolts (16) (18) and body nuts (17) (19). As the body and the flanges are located by a tongue and groove connection, push the flanges 3-5 mm away from the body (1), so that the body can be removed. All other operations are the same as for series 15 - 26.

Assembly

15 AF Put one PTFE-thrust washer (4) and one Graphite thrust washer (4.2.) to the bottom of the stem (2). After inserting the stem (2) into the body (1) add 2 conical stem seals (3) and 1 PTFE/carbon thrust washer (4), then the stem seal follower (5), plate spring (6),
handle nut (7), lock cap (8) handle (9), secured with the handle nut (7).

26 AF Put one 1 PTFE / carbon thrust washer(4), 1 Graphite – thrust washer (4.2) and 1 thrust washer (4.1) to the bottom of the stem (2).
After inserting the stem (2) into the body (1) add 1 washer (4.1) and Graphite-stem seal(3). Then follow PTFE / carbon thrust washer(4), stem seal follower (5), 2 plate springs (6), stop plate (7) and the stem retaining nut (8).

8. Maintenance

The ball valves are maintenance free. They should be stored with the protection caps.

Technical modifications reserved.

***Torque figures for stem only, before assembling ends.**

DN	8-15	20	25	32	40	50	65	80	100	150
	1/4"-1/2"	3/4"	1"	11/4"	11/2"	2"	21/2"	3"	4"	6"
Nm	2	2	2.5	2.5	4.5	4.5	7	15	15	15

Above refer to ball valves with reduced bore

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MAINTENANCE INSTRUCTIONS FOR NON RETURN VALVES

WAVERLEY Non return valves are manufactured to the highest specification and should provide you with long and trouble free service, but under some circumstances it may become necessary to replace the seals and spring. In order to maintain the safe operation of our valves please purchase the recommended seal kit (see recommended spares sheet) and follow these instructions.

IMPORTANT: Before commencing any work, make sure that the system to be worked on is drained and depressurized and that any hazardous chemicals are handled incordance with the manufacturers instructions.

1. Remove valve from line or system.
2. Place valve in a vice and tighten down on the body (A) leaving the seat (F) clear of the end of the vice.
3. Using the correct size spanner or adjustable wrench unscrew the seat (F) and remove the piston (C) and spring (B) from the body.
4. Remove the piston seal (D) off the piston. If PTFE seals are fitted you will have to cut the seal off useing a sharp stanley knife, take care not to damage the piston . Now find the smaller of the 2 seals in the kit and stretch the seal over the piston (taking care not to damage the seal) until it sits in the grove. If PTFE seals are being replaced it will assist you, if you warm the seal up first, for a few miniutes before fitting.
5. Remove the seal (E) off the of the seat (F) and replace with the remaining seal from the kit.
6. Remove old spring and replace with the new one.
7. Reassemble the valve and toque up the seat (F) to the correct setting (see attached spec. sheet) Make sure that the piston is free to bounce without jamming.

Please note: If PTFE seals are fitted it will be necessary to re seat the piston into the seat in order to create the correct sealing face. This is done by pressurising the valve to 3000 PSI (200 bar) for 30 seconds.

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RECOMMENDED SPARES LIST AND TORQUE SETTINGS FOR NON RETURN VALVES

SEAL KITS

VALVE SIZE	PART NO's
1/4	CV2 SEALS
3/8	CV3 SEALS
1/2	CV4 SEALS
3/4	CV6 SEALS
1"	CV8 SEALS

Seal kits consist of :1- Piston Seal (D), 1- Body Seal (E),1- Spring (B)

When ordering replacement seal kits please specify which seal materal is required ie: PTFE or VITON.

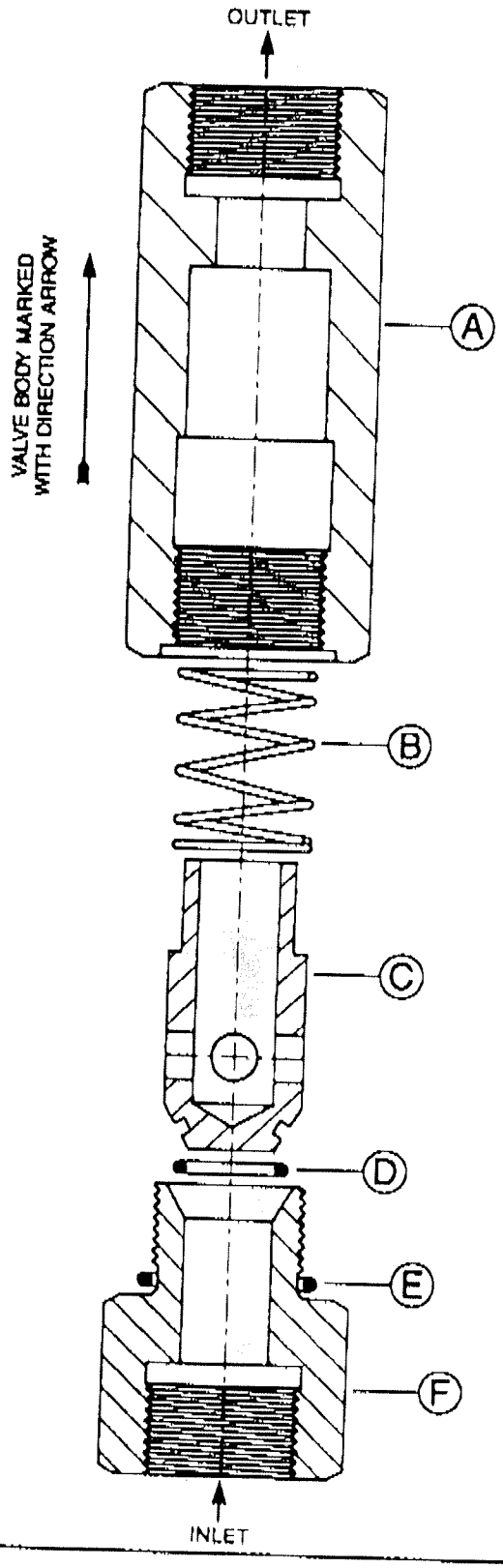
TORQUE SETTINGS

VALVE SIZE	SETTING
1/4	30 ft lbs
3/8	40 ft lbs
1/2	60 ft lbs
3/4	100 ft lbs
1"	100 ft lbs

Registered No. 240279

DESIGN SPECIFICATIONS

PARTS BREAKDOWN



PARTS LIST

PART	DESCRIPTION
A	VALVE BODY
B	SPRING
C	PISTON
D	PISTON SEAL
E	BODY SEAL
F	VALVE SEAT

OTHER INFORMATION

Seals – P.T.F.E. supplied as standard
Viton can also be supplied

Please note, the use of P.T.F.E. seals with valves up to 3/8" containing low pressure springs (2–5 psi), combined with a low back pressure, can lead to difficulty in forming a leak tight seal between the piston seal and the cone seat.

This is overcome by using either Viton seals or a stronger spring.

Valve opening pressures of 35 psi are available up to 1/2" to order. 2–5 psi only 3/4" and upwards.

SEAL KITS

Replacement seal kits are available and consist of:

1 – Piston Seal (D)
1 – Body Seal (E)
1 – Spring (B)

IN LINE FILTERS

A filter should always be placed upstream of the non return valve when the media has solids suspended in it.

If a filter is not used the piston seal may become damaged, so allowing the media to flow back upstream.

FIRTOP
FILTERS

Important

All information and recommendations contained in this manual are to the best of our knowledge correct. Since the conditions of use are beyond our control, users must satisfy themselves that the equipment/products are suitable for the intended process and uses.

We reserve the right to change product design and properties without notice.

INSTALLATION, OPERATING AND MAINTENANCE MANUAL

FLANGED Y – TYPE STRAINERS
SCREWED & SOCKET WELD CONNECTIONS

INSTALLATION OPERATING AND MAINTENANCE INSTRUCTIONS

FOR Y - TYPE STRAINERS SCREWED & SOCKET WELD CONNECTIONS

(SCREWED COVER)

INSTRUCTIONS FOR USE OF MANUAL

This manual has been prepared to assist customers to install, operate and maintain equipment as covered by this Manual. The Manual has been clearly sub-divided into appropriate sections as detailed in the list of contents.

HEALTH AND SAFETY AT WORK ACT

Barton Firtop Engineering Company Limited, assume that when the unit is to be installed in a hazardous service or environment, operators and maintenance personnel will be adequately protected in accordance with the latest governing legislation, including **COSHH regulations**.

The equipment has been designed and manufactured to provide safety and prevent risk to health when properly used for the purpose for which it is intended. Because the manufacturer has no control over the method of operation, the responsibility for ensuring that the equipment is not operated in a manner which is unsafe, or is a risk to health, rests entirely with the user.

GENUINE FIRTOP PARTS AND EQUIPMENT

It is our policy to manufacture our products to high levels of integrity which is required by current legislation applicable to **Health and Safety at Work.** It is therefore imperative that all spares used are genuinely labelled or marked Firtop parts. **Barton Firtop Engineering Company Limited** undertake no responsibility for alternative imitations or copies, without written consent.

LIST OF CONTENTS

SECTION 1

INSTALLATION

1.1 **Barton Firtop Y-Type Strainers** are delivered completely assembled and apart from checking that the adjoining pipelines are clean and free from obstructions, the strainer can be fitted directly into the pipeline.

1.2 **The following notes and checklist should be observed before installation :-**

1.2.1 Y-Type Strainers are designed to be self supporting for installation in both horizontal and vertical positions (See Appendix 1)

1.2.2 The Strainer must be fitted in the line with the bottom of the screen facing the oncoming flow. (Note the direction arrow is clearly marked on the strainer body). (See Appendix 1.)

1.2.3 Check adjoining pipework for cleanness and obstructions.

1.2.4 For flanged connections ensure that the correct bolts and gaskets or ring joints are used in accordance with the size, type and rating of the interface flanges.

1.2.5 For screwed connections ensure that the mating threads are to the same standard and are not damaged or defective, also refer to section 1.3 for recommendations on sealing.

1.2.6 For socket weld and butt weld connections refer to section 1.4.

1.2.7 The strainer wherever possible should be mounted into adjoining pipework in such a way as to avoid excessive induced stress. All adjoining pipework should be adequately supported.

1.2.8 The fitting of a differential pressure gauge is recommended to monitor pressure differentials and to indicate when the screen should be cleaned. These can be supplied and fitted upon request by **Barton Firtop Engineering Co. Ltd.**

1.2.9 The fitting of a blowdown valve on the drain connection where fitted should also be considered as this can assist and reduce maintenance. These can be supplied and fitted upon request by **Barton Firtop Engineering Co. Ltd.**

1.3 SCREWED CONNECTIONS

1.3.1 Taper Threads

Pressure tight joints of screwed connections with taper threads are achieved by the application of a sealant to the surface of the external male thread. This also eliminates the possibilities of galling the threads during make up of the joint.

SECTION 1 - cont'd

1.3.2 PTFE Tape

PTFE tape should comply with BS 4375 with dimensions of 12mm wide by 0.075mm +10% thick.
The procedure for applying PTFE tape should be as follows :-

A) Commencing with the first thread, five layers of tape should be applied, pulling the tape firmly into the threads without breakage.

B) The tape should always be wrapped in the direction of the thread helix.

C) After five layers of tape have been applied the remaining exposed threads should be covered with tape using a 50% overlay.

D) The tape should be inspected to verify that no tape overhangs the front of the screwed fitting/pipe and that the tape has not been shredded.

1.3.3 Sealing Compounds and Liquid Sealants

Apart from polymer joint compounds and air-drying liquid sealants, the most common thread seal is an anaerobic synthetic resin which cures in the absence of air.
Following assembly and tightening, the curing process is induced by a catalytic reaction between the resin and the metal. Resins that contain PTFE ease disassembly. For applications in food related industries, the thread sealant must be to a specified food grade. Connections are normally ready for operation following one hour curing time, complete curing may take up to 24 hours.

1.3.2 Parallel Threads

Pressure tight joints of screwed connections with parallel threads are achieved by placing a seal between the two machined faces.

1.3.4 Flat Seals

Washers and rings are manufactured in may different materials including fully annealed stainless steel 316, copper, aluminium, fibre, and plastics.
The tightening torque at assembly will vary according to the tensile strength of the fitting material, and the elasticity of the peripheral seal. The torque should be carefully selected to avoid compressing soft seals to the point of extrusion. As a general rule the fitting should be wrench tightened approximately 1/4 turn from the finger tight position.

SECTION 1 - cont'd

1.3.5 Bonded Seals

Elastomer sealing rings bonded into metal washers. Bonded seals are reusable and cater for a variation in the quality of the machined sealing surfaces.

1.4 SOCKET WELD & BUTT WELD CONNECTIONS

1.4.1 Socket Weld Connections

A) All socket weld dimensions should be in accordance with ANSI b16.11.
B) Upon set up a clearance of 1mm to 2mm must be allowed for expansion between the end of the pipe and the base of the socket. See Appendix 5 .
C) All joints should be clean and free from oil, grease and any other foreign matter.
D) The fillet weld should have a 6mm minimum throat thickness and the profile of weld should present a smooth transition between the unit and the pipe there by eliminating high stress points which are undesirable.
E) All Welding should be carried out by approved welders to EN 287/ASME IX in accordance with an approved weld procedure and supporting procedure qualification record.
F) Upon completion of all welding it is recommended that the welds be examined by dye penetrant inspection.

1.4.2 Butt Weld Connections

A) Ensure joints are square and pipe schedules match.
B) All joints should be clean and free from oil, grease and any other foreign matter.
C) Ensure weld preparation bevels are equal and at least 37½° with at a 1mm minimum land. See Appendix 4.
D) There should be 1mm to 2mm gap between the unit and the adjoining pipe, this can be achieved by fitting removable spacers when tacking into position.
E) Once the unit has been tacked into position, the spacers can be removed and the unit can be fully welded in accordance with an approved weld procedure and supporting procedure qualification record.
F) All welding should be carried out by approved welders to EN 287/ASME IX in accordance with an approved weld procedure and supporting procedure qualification record.
G) Upon completion of all welding it is recommended that the welds be examined by dye penetrant inspection and radiography where possible on class 1 pipework.

1.5 IMPORTANT NOTES

1.5.1 **NEVER** utilise packing/protection bolting to secure flanges.

1.5.2 Always tighten bolts gradually in a diagonal sequence, **DO NOT OVER TORQUE BOLTS**

SECTION 1 - cont'd

1.5.3 Ensure that there is adequate clearance for the drain connection, and where fitted adjoining pipework.

1.5.4 Ensure that there is adequate clearance for strainer screen removal, there should be no obstructing pipework in the area.

SECTION 2

COMMISSIONING

2.1 Ensure that the strainer has been installed in accordance with section 1 of this manual.

2.2 Check flange bolting or screwed fittings have been adequately tightened to the correct torque.

2.3 The unit should be pressurised gradually from the inlet nozzle up to approximately 50% of the expected working pressure of the unit. If possible allow the unit to stand isolated from any flow, during which time intensive checks should be made to detect any leaks.

2.4 Any detected leaks must be rectified accordingly.

2.5 Check any instrumentation where fitted in accordance with manufacturers instructions.

2.6 Upon satisfactory completion of all necessary checks, pressurise unit gradually upto full working pressure and flowrate.

2.7 Re-check for lcaks and rectify accordingly.

2.8 SPARES LIST

For Spares information refer to Section 5 of this Manual.

2.9 SPECIAL TOOLS LISTING

There are no special tools required for this type of equipment. We would recommend that a calibrated torque wrench be used for tightening closure nuts.

2.10 FAULT FINDING/CORRECTIVE ACTION

Refer to Section 6 of this Manual.

SECTION 3

OPERATION

3.1 **Barton Firtop** Y-Type Strainers are mechanical devices for removing solids and other contaminants from the process fluid by means of a perforated plate/mesh screen which is located and secured by machined recesses within the strainer body and cover.

3.2 The function of the strainer is to prevent and retain solid particles of a specific size from passing downstream of the strainer, this is achieved by a combination of both surface and depth filtration techniques.

3.3 Y-Type Strainers are extremely simple in design and have no moving parts - hence no external operating procedure is required.

SAFETY

3.4 **Barton Firtop Engineering Co Ltd** assume that when the unit is to be installed or maintenance work is to be carried out, particularly in hazardous services or environments, that all operator's and maintenance staff will be adequately protected in accordance with the relevant governing legislation and codes of practice.

3.5 It is also assumed that the Health & Safety at Work Act is strictly adhered to.

TRAINING

3.6 No special training is required for this type of equipment however we would recommend that all installation and maintenance work to be carried out by a skilled/qualified fitter.

SECTION 4

MAINTENANCE

4.1 The only maintenance required for this type of equipment is to remove and clean the screen periodically, which will depend largely upon the amount of contaminants in the process fluid. The cleaning interval can best be determined from the installation of a differential pressure gauge or by operational experience and scheduled maintenance periods.

4.2 Before attempting any maintenance whatsoever, it is essential that the process line is depressurised by either a by-pass system or by closing the inlet/outlet valves (if fitted) or by whatever means necessary to **ENSURE THAT THE PRESSURE AND FLOW HAVE BEEN SHUT-OFF AND THE PIPELINE IS DE-PRESSURISED OF ANY INTERNAL PRESSURE OR VACUUM.**

CAUTION !

Opening a closure can be a hazardous activity and certain precautions should be strictly exercised. All instructions should be carefully read by all personnel engaged in the operation and maintenance of this equipment.

4.3 Where possible the pipe and strainer should be adequately vented.

4.4 Slacken screwed cover gradually using a suitable wrench whilst supporting the strainer body with another wrench. This is to prevent over stressing the screwed or welded interface joints.

4.5 Remove the cover and the strainer screen.

4.6 SCREEN CLEANING

4.6.1 The screen should be cleaned by washing in a suitable cleaning solution compatible with the fluid being handled and should be handled carefully to avoid damage (Diagram 1) **DO NOT** bang or hammer the screen, a gentle tap with a piece of soft wood is all that is necessary.

SECTION 4 - cont'd

4.6.2 Where compressed air is available, the dirt may be blown off the screen by applying the air to the **OUTSIDE** - (Diagram 2 & 4 Appendix 2)

CAUTION !!! - Never blow into the screen, especially those screens made of fine woven mesh supported by perforated plate, otherwise the dirt may be forced into the mesh and may be difficult, if not impossible, to remove.

4.6.3 Coarse screens may be cleaned using a wire brush (Diagram 3 Appendix 2).

4.7 SCREEN REPLACEMENT

4.7.1 Always inspect screen for damage or wear. Damaged or broken screens should always be replaced with the correct **Barton Firtop** replacement which is carefully made to match the strainer and the duty. (See Section 5 - Spare Parts)

4.7.2 Refit the new or cleaned screen, make sure it is properly located in the machined recesses within the strainer body and cover.

4.7.3 Always renew the cover seal and lubricate with a smear of silicone grease or equivalent providing it is compatible with the process fluid.

4.7.4 Clean the cover thoroughly to remove any dirt on the threads. Ensure that the cover screws freely into the strainer body.

4.7.5 Carefully fit the cover seal or gasket into position, and reposition and fit the cover.

4.7.6 Screw in the cover hand tight only and then tighten :-

1/4 turn for 'O'-Ring Seals and 80 Nm for stainless steel metal clad gaskets.

4.8 GENERAL MAINTENANCE

4.8.1 GASKETS & SEALS

All gaskets and seals should be inspected upon installation and at regular scheduled maintenance intervals, and replaced if any damage or deterioration is suspected. Location and seating surfaces should also be monitored and dept in a lean condition, free from any foreign matter.

4.8.2 BOLTING

All flange bolting should be checked periodically for tightness and re-tightened as necessary to full torque value (See Appendix 3). Lubricate bolts periodically with an approved lubricant.

SECTION 4 - cont'd

4.8.3 PAINTWORK

Periodic inspections should be made to monitor corrosion and damage to paintwork. Corrective action should be carried out accordingly in accordance with approved procedures.

4.8.4 INTERNAL CORROSION & EROSION

A suitable allowance for corrosion and erosion has been included in the mechanical design of the strainer housing in accordance with international pressure vessel codes of practice and project specifications. However it is highly recommended that the corrosion and erosion be monitored and inspected at least every 3 years with suitable calibrated ultrasonic thickness scanning equipment.

4.8.5 LUBRICATION

There are no lubrication points on this type of equipment

4.8.6 PRESERVATION

Periodic inspections should be made to monitor corrosion and damage to paintwork, see para's 4.8.3and 4.8.4 above.

SECTION 5

SPARE PARTS

5.1 All parts are specified on the equipment data sheet (See Appendix 4).

5.2 All damaged or worn units should be replaced with new units.

5.3 To ensure correct replacement parts are used, all spares should be obtained direct from **Barton Firtop Engineering Company Limited** or an approved distributor.

5.4 Always quote assembly number and job number specified on the front sheet of this manual.

IT IS HIGHLY RECOMMENDED ALWAYS TO HAVE AT LEAST TWO SPARE COVER SEALS AND ONE SPARE SCREEN AT ALL TIMES.

SECTION 6

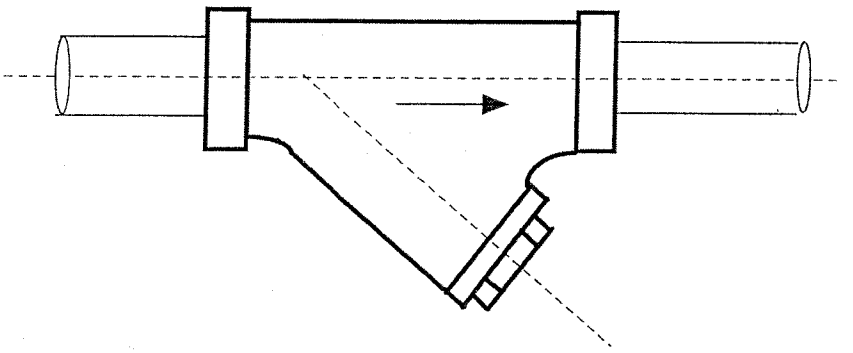
FAULT FINDING

FAULT	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Leaking through screwed interface connections	Screwed Fitting loose	Retighten Fitting
	Thread Seal damaged or defective	Renew Thread seal
	Damaged threads	Repair threads, or renew fittings
2. High pressure loss across Strainer	Clogged strainer screen	Clean or replace screen
	Process change i.e. increased flowrate, viscosity, dirt levels etc.	Check process characteristics and adjust accordingly to design data
3. Decreased flowrate	Process fault	Check process
	Clogged screen	Clean or replace screen
	Pipeline blockage	Check pipeline
	Major leak	Rectify leaks
4. High dirt carryover	Damaged strainer screen	Replace screen

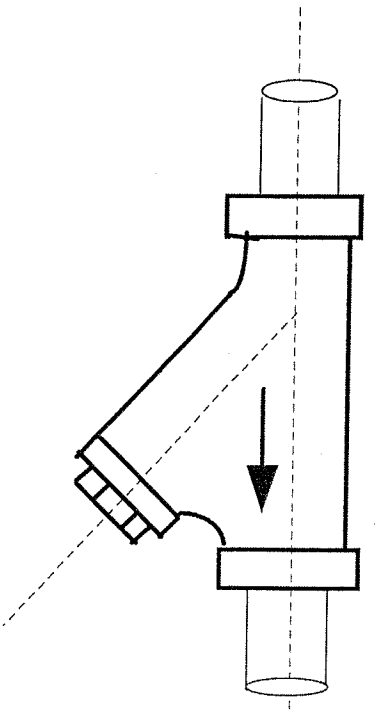
APPENDIX 1

Y - TYPE STRAINER INSTALLATION

HORIZONTAL INSTALLATION

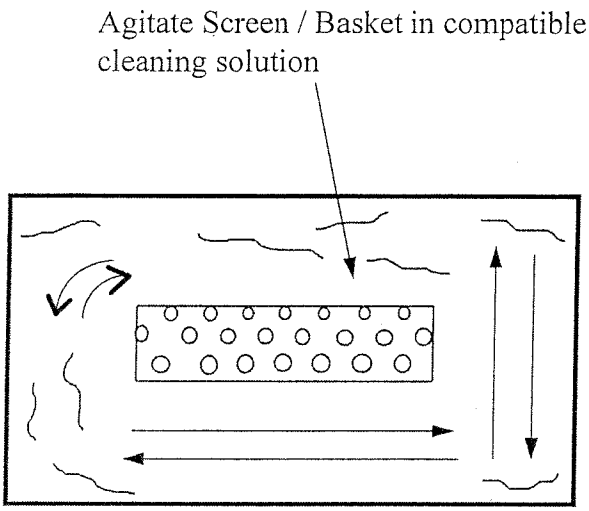


VERTICAL INSTALLATION



APPENDIX 2 - 1

RECOMMENDED BASKET CLEANING TECHNIQUES



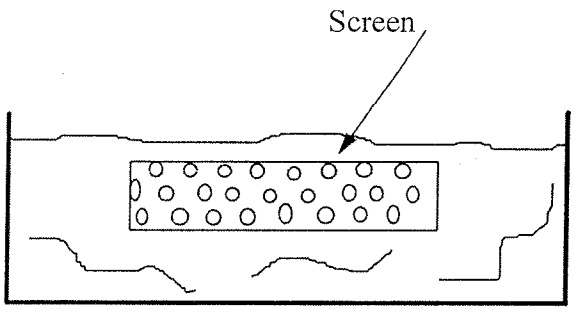


DIAGRAM 1

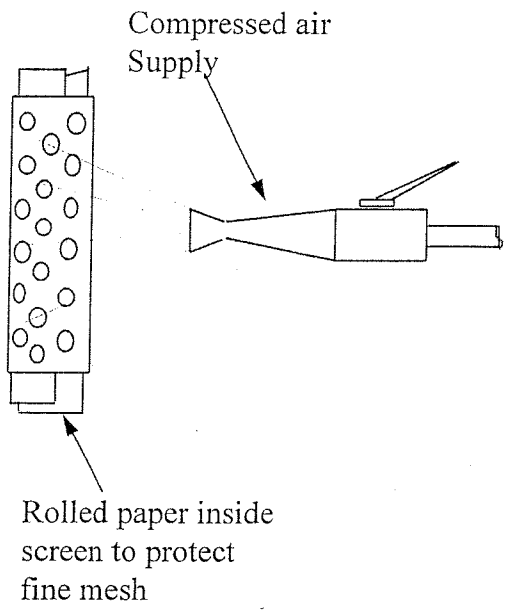


DIAGRAM 2

CLEANING FINE MESH SCREENS & BASKETS

APPENDIX 2 - 2

RECOMMENDED BASKET CLEANING TECHNIQUES

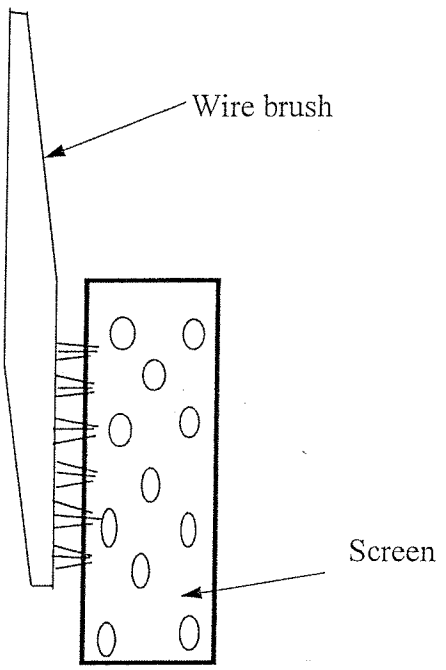


DIAGRAM 3

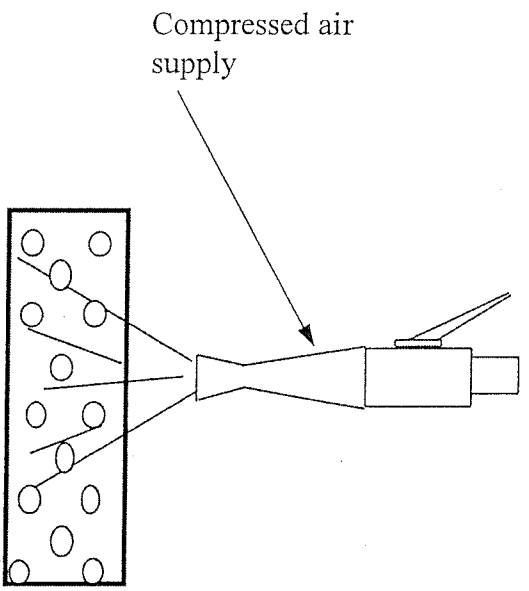


DIAGRAM 4

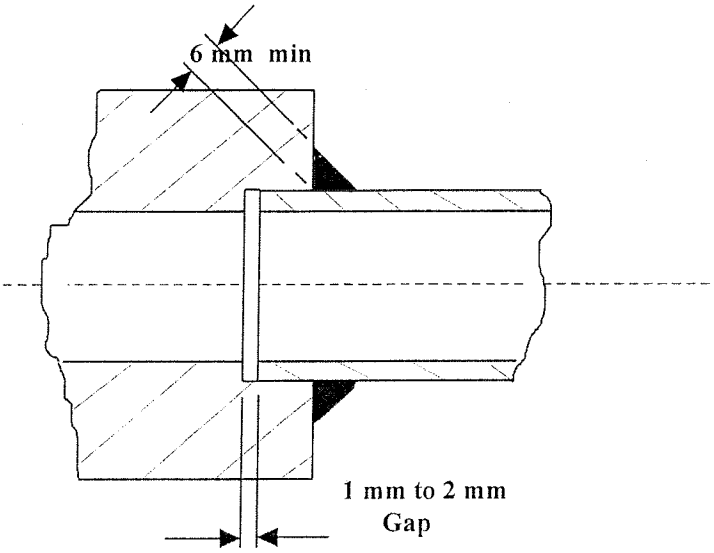
CLEANING COARSE MESH SCREENS & BASKETS

APPENDIX 3

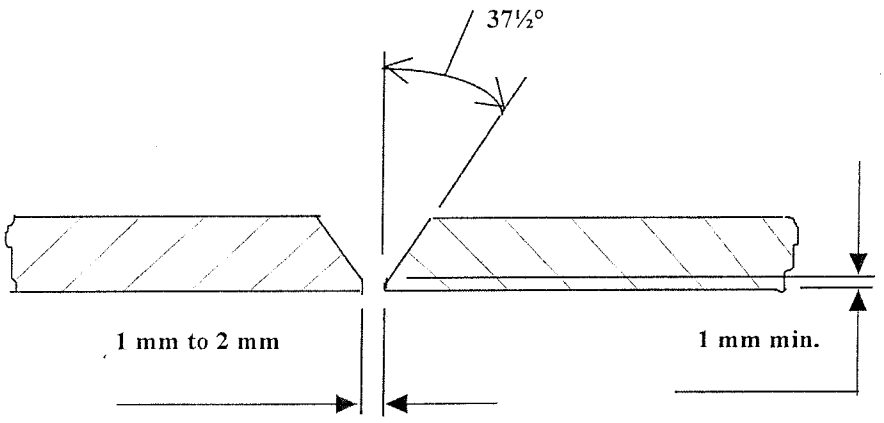
RECOMMENDED BOLT TORQUE VALUES

Nominal Diameter of Bolt	BOLT STRESS					
	30,000 PSI (210 N/mm^2)		45,000 PSI (305 N/mm^2)		60,000 PSI (420 N/mm^2)	
	Torque Ft-Lbs	Torque Nm	Torque Ft-Lbs	Torque Nm	Torque Ft-Lbs	Torque Nm
1/4" (6 mm)	4	5	6	8	8	11
5/16" (8 mm)	8	11	12	16	16	22
3/8" (10mm)	12	16	18	24	24	32
7/16" (11mm)	20	27	30	41	40	54
1/2" (12mm)	30	41	45	61	60	81
9/16" (14mm)	45	61	68	92	90	122
5/8" (16mm)	60	81	90	122	120	163
3/4" (19mm)	100	135	150	203	200	271
7/8" (22mm)	160	217	240	325	320	434
1" (25mm)	245	332	368	499	490	665
1-1/8" (28mm)	355	482	533	723	710	963
1-1/4" (32mm)	500	678	750	1017	1000	1357
1-3/8" (35mm)	680	922	1020	1384	1360	1846
1-1/2" (38mm)	800	1085	1200	1628	1600	2171
1-5/8" (41mm)	1100	1492	1650	2239	2200	2985
1-3/4" (44mm)	1500	2035	2250	3053	3000	4071
1-7/8" (48mm)	2000	2714	3000	4071	4000	5428
2" (50mm)	2200	2985	3300	4478	4400	5971
2-1/4" (57mm)	3180	4316	4770	6473	6360	8631
2-1/2" (63mm)	4400	5971	6600	8957	8800	11942
2-3/4" (70mm)	5920	8034	8880	12051	11840	16068
3" (76mm)	7720	10477	11580	15715	15440	20954

APPENDIX 4



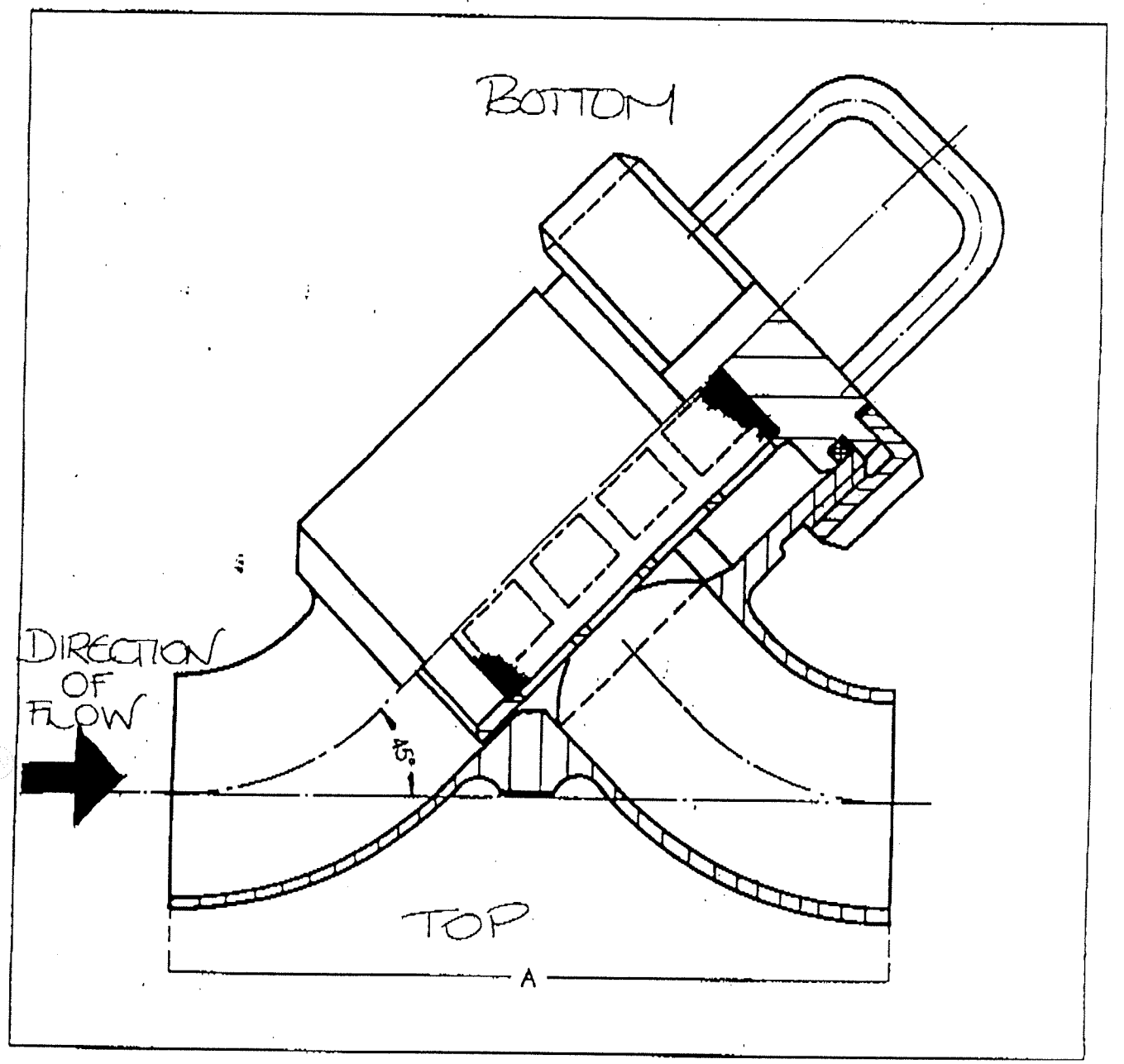
TYPICAL SOCKET WELD CONNECTION SET UP



TYPICAL BUTT WELD CONNECTION SET UP

Strainer 10M.

Manufactured in 304 or 316 Stainless Steel.
Selection of Mesh Sides available and replacement Baskes available with RJT, IDF, DIN, Clamp, SMS, BSP and Plain Ends.



Size	INS	1	1.5	2	2.5	3	4
A	MM	78	116	152	194	222	294

TECHNICAL INFORMATION

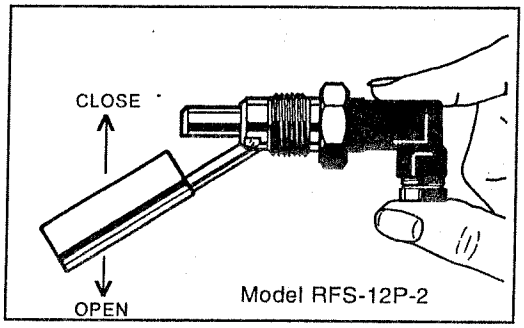
Stainless steel, side entry float switch RFS-12P-2

FEATURES

- ❑ All Stainless Steel
- ❑ High temp. 120°C
- ❑ 1/2"BSPT thread
- ❑ Mini DIN plug
- ❑ N/O or N/C contacts

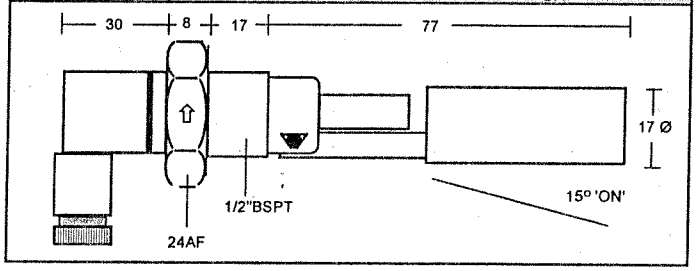
APPLICATIONS

- ❑ Storage tank alarms
- ❑ Pump control etc

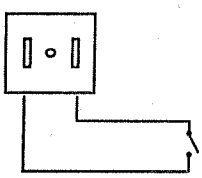


Model RFS-12P-2

DIMENSIONS - SLS-12P (External fitting with DIN Plug)



WIRING



SPARE PARTS
No spare parts are available for this product.

FITTING
The RFS-12P-2 has a 1/2"NPT tapered thread which is almost indistinguishable from1/2"BSPT.

This switch can be fitted from outside the tank by screwing it into a maximum10mm deep threaded boss.

The switch can be rotated through 180° to give either Normally Open or Normally Closed contacts.

SPECIFICATION - RFS-11A-2, RFS-12-2 & RFS-12P-2			
Contact Rating	50 VA	Temp Range	-40°C ~ +120°C
Max Switching Voltage	220Vac	Max Pressure	5 bar
Max Switching Current	0.5A AC/DC	Specific Gravity	0.70 +/- 0.04
Dielectric Strength	600V DC	Material (All s/steel)	Float = 316; Body = 304 grade
Contact Resistance	200 mOhms		
Insulation Resistance	10 mOhms	Thread (External))	1/2" BSPT

Bran + Luebbe Ltd
Tel: 01604 880751
Fax: 01604 880145
Scaldwell Road, Brixworth
Northants, NN6 9UD

B+L-1516

Installation Guide-Lines

RIKO Liquid Level Switches

This leaflet is intended as a general guide for the installation of the float switch with which you have been supplied. If any aspects are unclear please call or fax our Sales/Technical Department.

MECHANICAL

- Do not apply excessive force to the flying lead wires.
- Do not bend the stem.
- Do not move the retainer that locates the floats.
- Do not over-tighten the mounting threads.
- Do not allow the stem or floats to foul the sides, base or internal baffles of the tank.
- Do not drop, or subject the units to excessive shock.
- Do not immerse flying lead wires in liquid.
- Do not allow near to magnetic fields or magnetic materials.
- Do not allow any corrosive vapours or liquids onto flying lead wires.
- Do not exceed switches electrical rating. (see electrical section)
- Do not allow to vibrate as this may cause electrical chattering.
- Do not mount more than 15° off vertical/horizontal
- Do not use with liquids which are not compatible with materials of construction.

ELECTRICAL

All Riko Switches work on the simple, reliable and effective magnet-reed switch principle. If reed switches are used within their parameters, they should have an expected life in excess of 1 million operations. However, should the parameters be exceeded, their life can be shortened to only a few switch operations.

Riko reed switches are available in 2 electrical ratings:

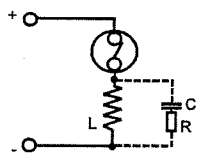
Type 1 - (10VA) max 100v AC/DC 500mA resistive. Usage – Logic switching and zero current only.
Type 2 – (50/60VA) max 240v AC/DC 500mA resistive. Usage – as above and Small Relays.

When switching loads, we recommend using the relays and protection modules listed below. These are available from RS components. Alternatively if you use your own relays, we suggest you use suppression. A number of recommended circuits are shown below.

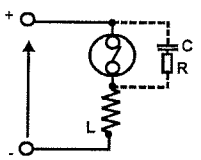
Relays	RS component No:
12 Amp SPCO	
12V d.c.	198-6933
24V d.c.	198-6949
115V a.c.	200-1954
230V a.c.	200-1960
Protection Modules	
a.c. RC module 115/230V a.c. 802-979	
d.c. Back EMF Module	802-935
Mounting Base	
Base 3.5mm RT/RY socket & clip	802-890

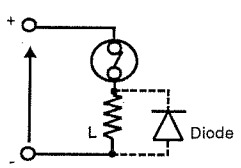
Supression Circuits

AC — **Low switching currents**



DC — **Higher switching currents**





PRESSURE-VACUUM-LEVEL LTD
Unit 9, Lexden Lodge Industrial Estate, Jarvis Brook,
Crowborough, East Sussex, TN6 2EG U.K.
Tel: +44(0)1892 66 44 99 Fax: +44(0)1892 66 36 90
Web: www.pvl.co.uk Email: info@pvl.co.uk

PVL *Switched on to Industry*

Issue -A/03/99

Chocolate/Flavouring Metering and Mixing System.

Nestle Ice Cream
Telford

Introduction.

The Metering and Mixing System supplied for installation at Nestle Ice Cream, Telford is controlled by relay logic utilising Telemecanique control gear with Omron type MK3 control relays and Omron type H3DR timing relays. The system being housed in a Rittal type AE 1012.600 stainless steel enclosure having overall dimensions of 760mm High x 600mm Wide x 210mm Deep.

System Description.

The system is designed to control 3 off individual 2 speed pumps, each being associated with an individual product line and flavouring header tank.

Under normal low speed operation the pump start/stop is controlled either locally via push button units mounted on the control panel door or remotely via a client generated volt free contact closure.

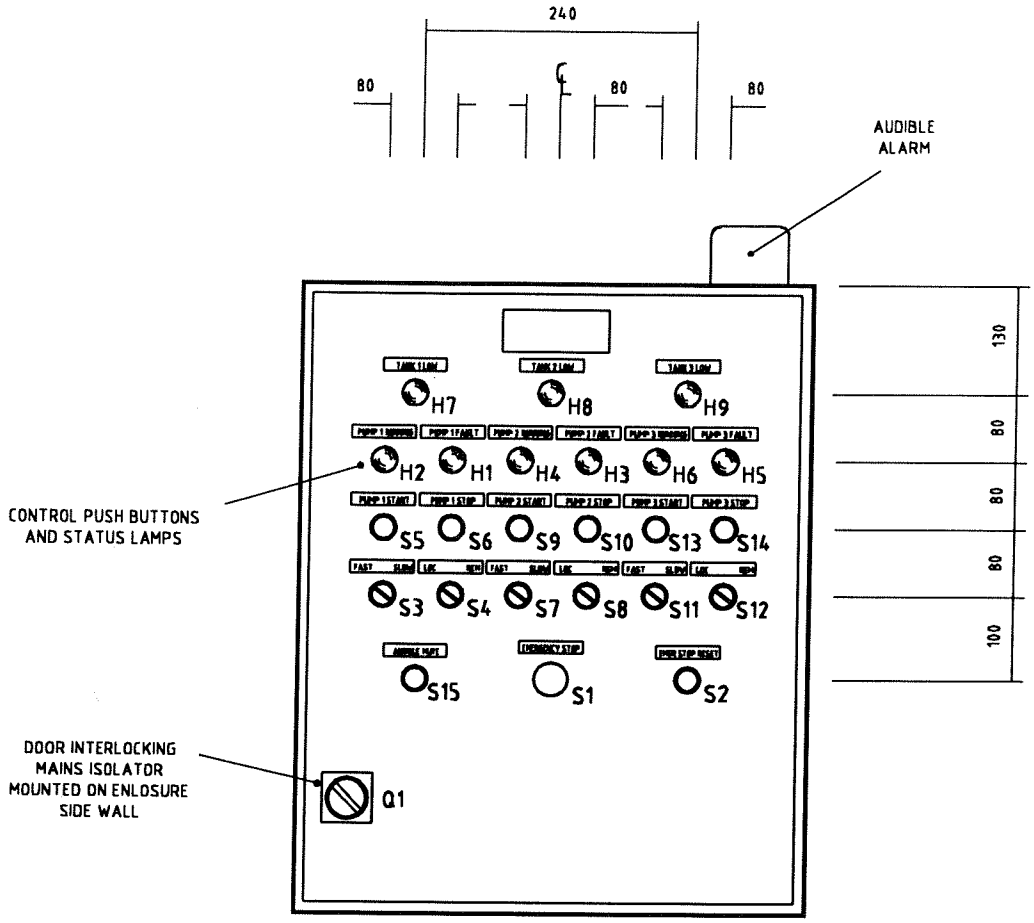
For initial outlet tank filling, high speed pump operation is available, in this condition pump start/stop is controlled only via the control panel mounted push buttons.

Individual indicator lamps for pump running and pump faults are provided on the control panel door.

Provision is made for an interlock with the outlet tank high level alarm sensors, the interlock being used to immediately stop the associated pump if a tank high level is reached.

Pump operation is also interlocked with the associated header tank low level sensor, on detection of a low level the associated low level lamp will be illuminated, initially pump operation is not affected, however if the low level is not recovered with a given time period the associated pump is stopped and an audible alarm initiated.

Orange
Orange Instruments Ltd. Northampton U.K.
Tel 01604 790490 Fax 01604 790690



FRONT PANEL LAYOUT

NOTE.

ENCLOSURE RITTAL TYPE AE 1012.600

OVERALL DIMENSIONS 760mm HIGH x 600mm WIDE x 210mm DEEP

MATERIAL OF CONSTRUCTION STAINLESS STEEL

PROTECTION CLASS IP56

REV	DATE	DRAWN	CHECKED	DESCRIPTION

CLIENT. NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

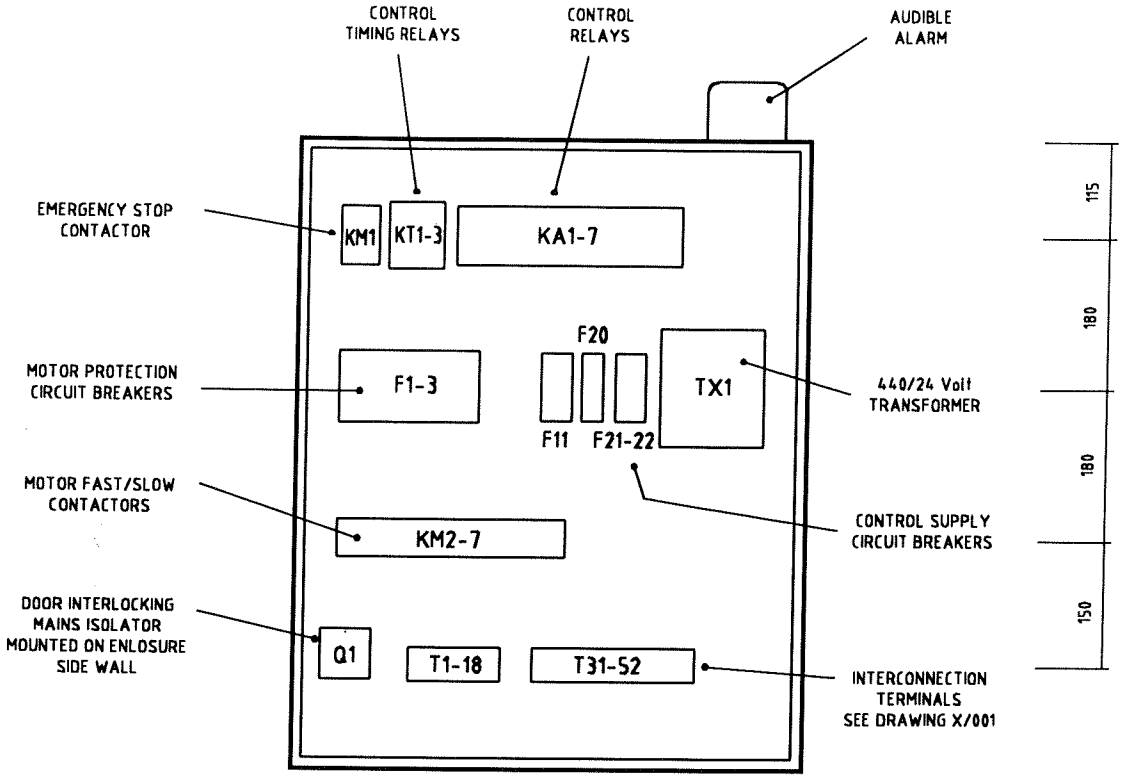
	NAME	DATE
DRAWN	GMD	05/01/00
CHECKED		06/01/00

TITLE
CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM
FRONT PANEL LAYOUT

JOB NO. J9718/861

DRAWING No. 9718/A/001

REV. A



INTERNAL PANEL LAYOUT

VIEWED WITH DOOR REMOVED

NOTE.

ENCLOSURE RITTAL TYPE AE 1012.600

OVERALL DIMENSIONS 760mm HIGH x 600mm WIDE x 210mm DEEP

MATERIAL OF CONSTRUCTION STAINLESS STEEL

PROTECTION CLASS IP56

REV	DATE	DRAWN	CHECKED	DESCRIPTION

CLIENT. NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

	NAME	DATE
DRAWN	GMD	05/01/00
CHECKED		06/01/00

TITLE
CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM
INTERNAL PANEL LAYOUT

JOB NO. J9718/861

DRAWING No. 9718/A/002

REV. A

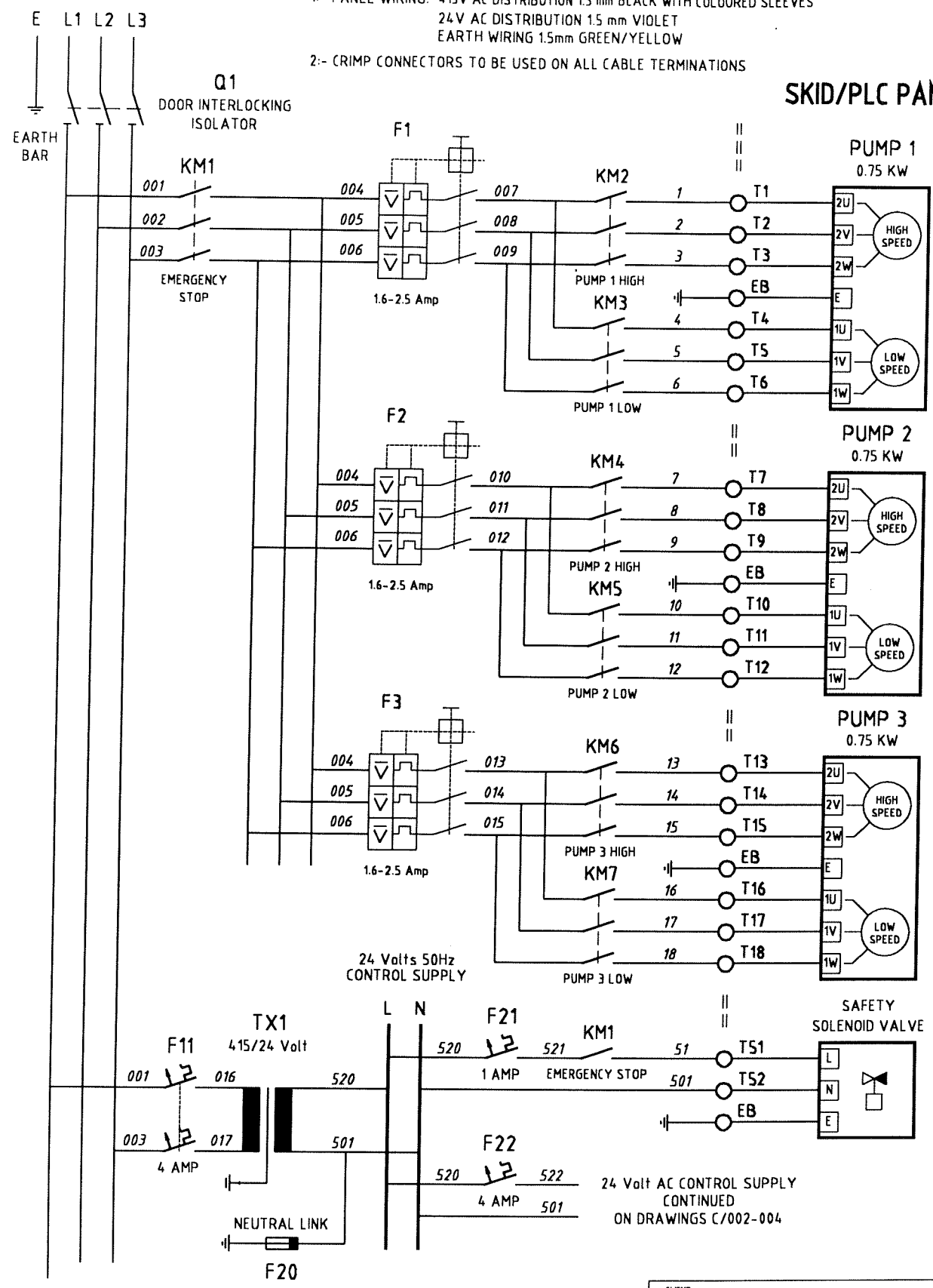
415 Volts 3 PHASE SUPPLY
WIRED DIRECT TO ISOLATOR

NOTE.

1:- PANEL WIRING. 415V AC DISTRIBUTION 1.5 mm BLACK WITH COLOURED SLEEVES
24V AC DISTRIBUTION 1.5 mm VIOLET
EARTH WIRING 1.5mm GREEN/YELLOW

2:- CRIMP CONNECTORS TO BE USED ON ALL CABLE TERMINATIONS

SKID/PLC PANEL



CLIENT: NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

REV	DATE	DRAWN	CHECKED	DESCRIPTION
B	04/01/00.	G M Dines		AS BUILT MODIFICATIONS

IF IN DOUBT ASK.

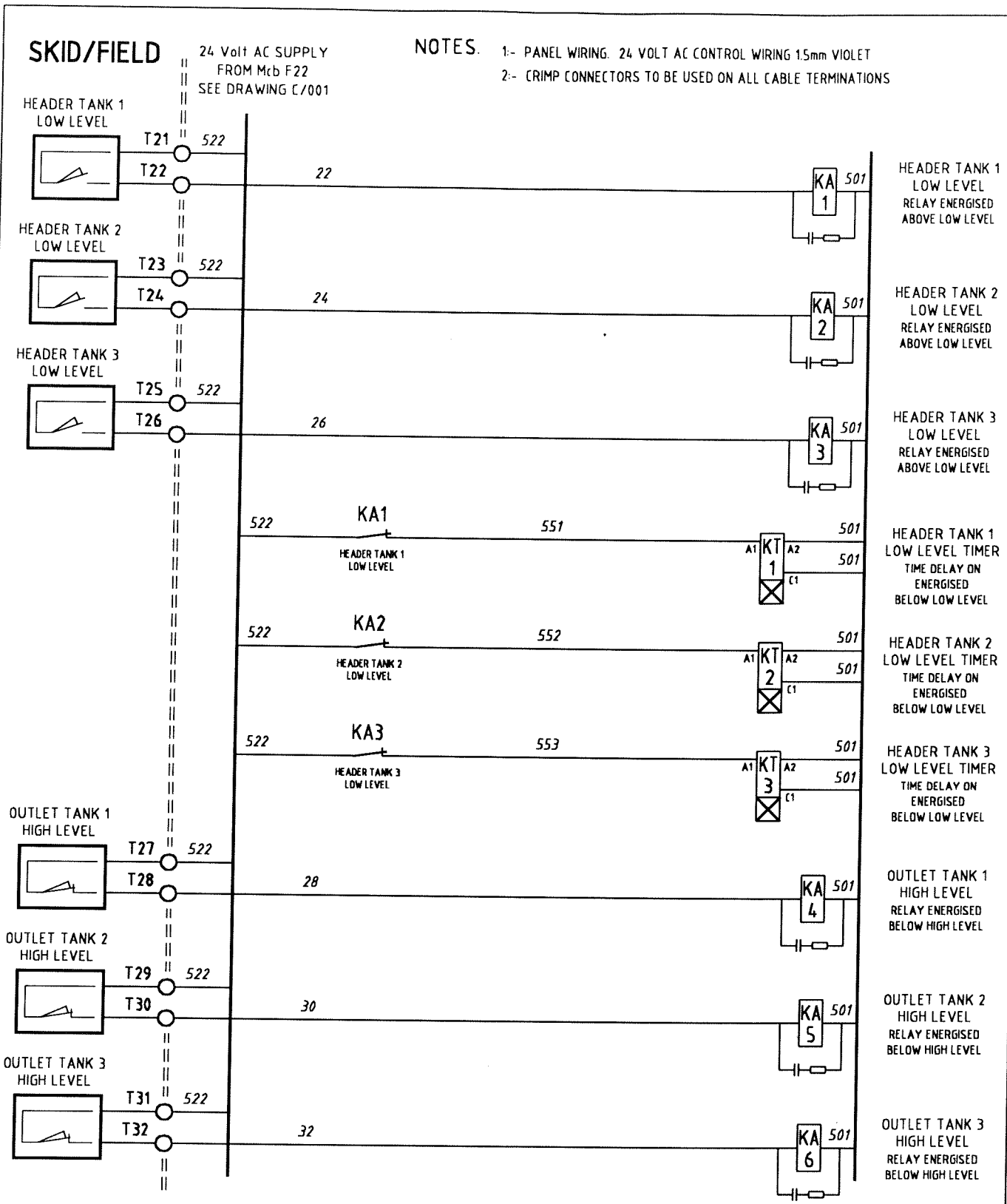
	NAME	DATE
DRAWN	GD	14/12/99
CHECKED	BLD	15/12/99

TITLE: CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM PUMP CONTROL CIRCUIT

JOB NO. J9718/861

DRAWING No. 9718/C/001

REV. B



CLIENT: NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

REV	DATE	DRAWN	CHECKED	DESCRIPTION

IF IN DOUBT ASK.

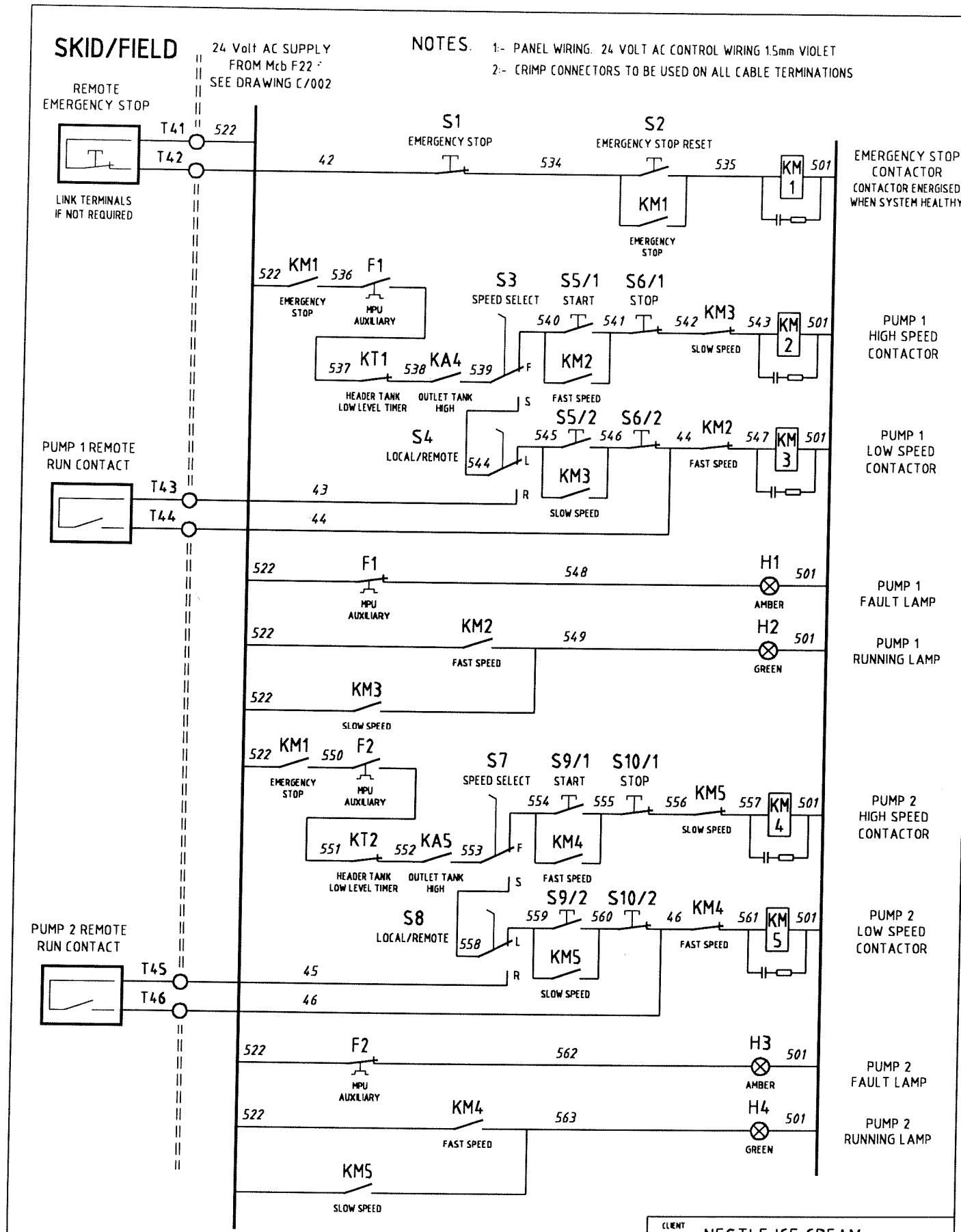
	NAME	DATE
DRAWN	GMD	06/12/99
CHECKED	RCD	15/12/99

TITLE: CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM PUMP CONTROL CIRCUIT

JOB NO. J9718/861

DRAWING No. 9718/C/002

REV. A



CLIENT: NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

REV	DATE	DRAWN	CHECKED	DESCRIPTION

IF IN DOUBT ASK.

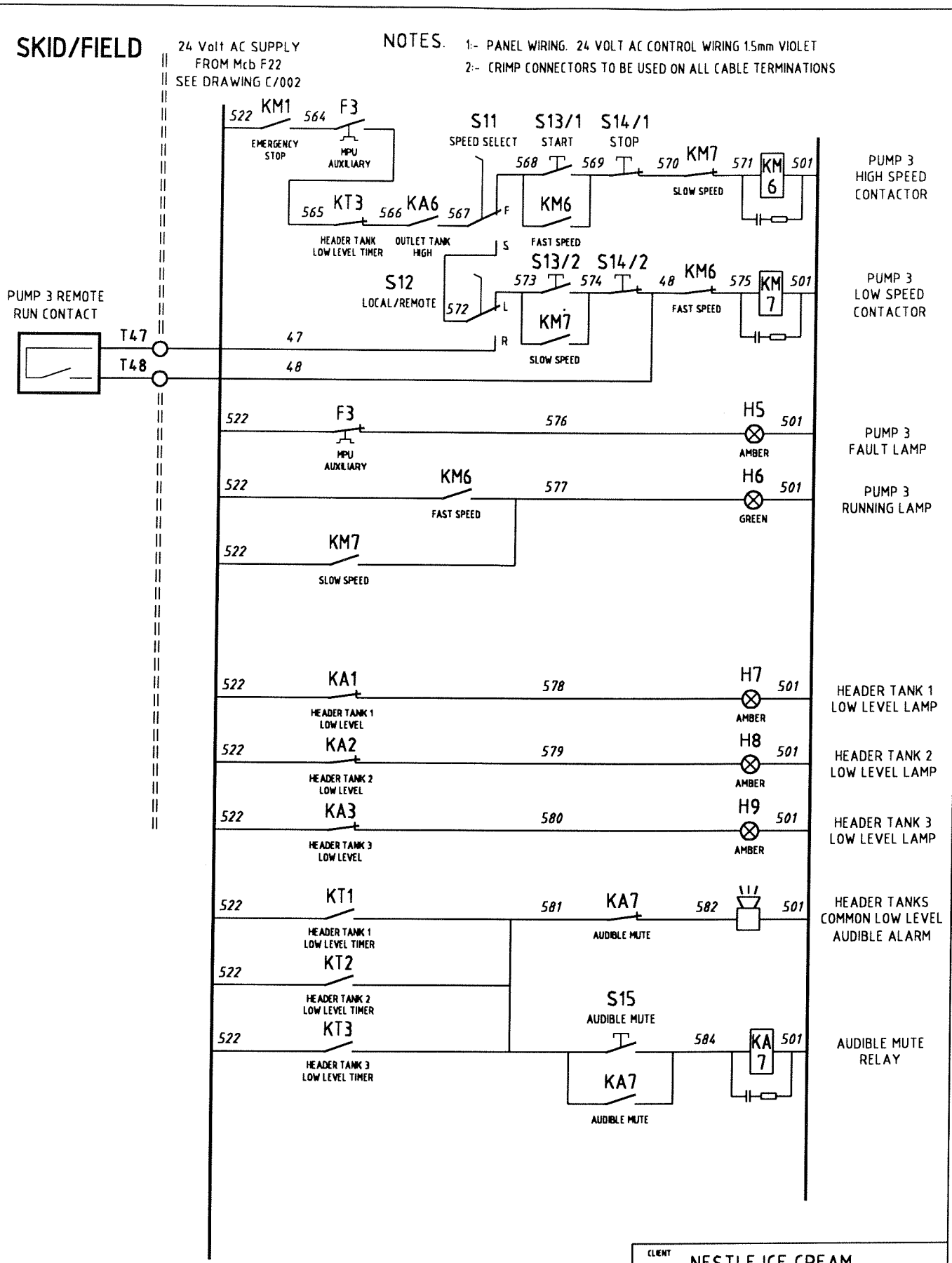
	NAME	DATE
DRAWN	GMD	06/12/99
CHECKED		

TITLE: CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM PUMP CONTROL CIRCUIT

JOB NO. J9718/861

DRAWING No. 9718/C/003

REV. A



CLIENT NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

REV	DATE	DRAWN	CHECKED	DESCRIPTION
B	04/01/00	G M Dines	BLD	AS BUILT MODIFICATIONS

IF IN DOUBT ASK.

	NAME	DATE
DRAWN	GMD	06/12/99
CHECKED	BLD	15/12/99

TITLE
CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM PUMP CONTROL CIRCUIT

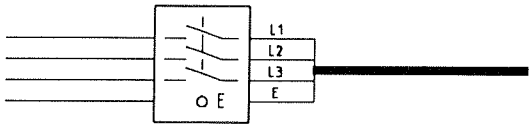
JOB NO. J9718/861

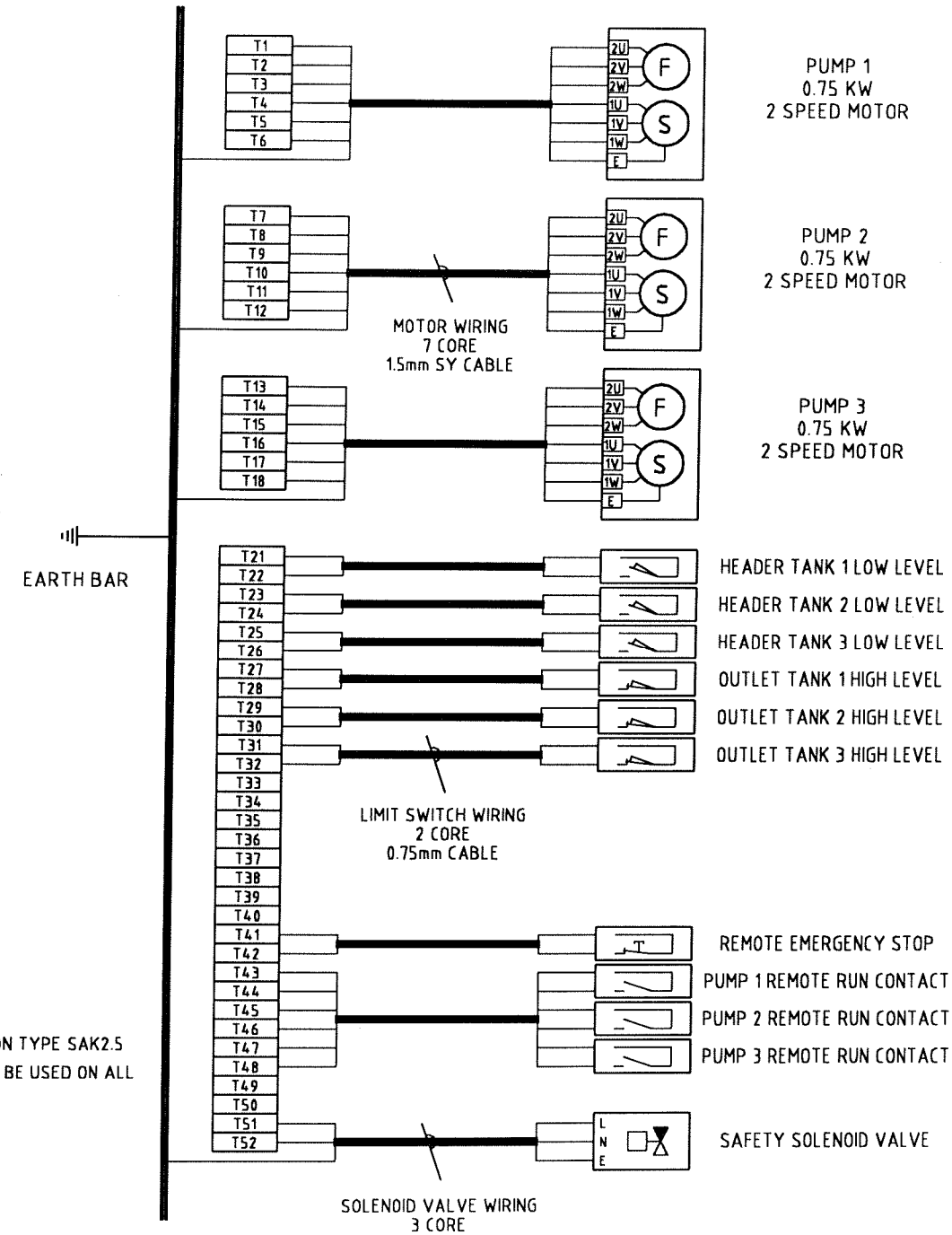
DRAWING No. 9718/C/004

REV. B

CONTROL PANEL

SKID/FIELD





NOTES.

1:- ALL TERMINALS KLIPPON TYPE SAK2.5

2:- CRIMP CONNECTORS TO BE USED ON ALL CABLE TERMINATIONS

CLIENT: NESTLE ICE CREAM

BRAN + LUEBBE LTD.
BRIXWORTH NORTHAMPTON NN6 9UD
Tel :- 01604 880751 Fax :- 01604 880145

REV	DATE	DRAWN	CHECKED	DESCRIPTION

	NAME	DATE
DRAWN	GMD	06/01/00
CHECKED		06/01/00

TITLE: CHOCOLATE/FLAVOURING METERING AND MIXING SYSTEM INTERCCONNECTIONS

JOB NO. J9718/861

DRAWING No. 9718/X/001

REV. A

Remarks

Name STB	Date 6.01.00	Customer-No. 2241956		Order-No. 575503581000		
Pos.	Quantity	Description	Drawing-No.	Material	Ident-No.	Remarks	ME
001	3,000	***METERING PUMP TYPE N-P32			55035810001		1
002	3,000	***ELECTRIC MOTOR 2800/1400RPM	WDA90SKC		55035810006		1
003	3,000	***25LITRE VESSEL	TAV550358	AISI316	55035810007	C/W LID AND SIEVE	1
004	6,000	***BALL VALVE 1/2"NPT.CONNECTI	1666	AISI316	5797066310006		1
005	3,000	***BALL VALVE 1"O/D CONNECTION	1666	AISI316	55035810002		1
006	3,000	***Y STRAINER 40MESH	YSF/CON/015/NPT/351	TP316L	143565	1/2"NPT 600#	1
007	3,000	***Y-STRAINER 1"O/D CONNECTION		AISI316	55035810003	FITTED WITH HEATING	1
008	3,000	***LEVEL SWITCH 1/2"BSPT	RFS-12-P	AISI316	18523-011	C/W DIN PLUG	1
009	1,000	***BASEFRAME	BAF550358/1	AISI304	55035810008		1
010	3,000	***PRESSURE SUSTAINING VALVE 1		AISI316	05882		
011	3,000	***1"SMS MIXER 16 ELEMENT	EPV1283	AISI316	05881	C/W HEATING JACKET	
012	1,000	***CONTROL PANEL			55035810004		1
013	1,000	***SKID WIRING			55035810005		1
014	6,000	***CONNECTION 1"SMS (PV32)	EPC3083	AISI316	05888		
015	2,000	***CASTOR 5" FIXED	TFG125PT1H	REVVOTHAN	55035810009		1
016	2,000	***CASTOR 5" SWIVEL WITH LOCK	TSG125PT1HW		55035810010		1
017	3,000	***NON RETURN VALVE	CV40D		135612	1/2"OD CV40D	1
018	9,000	***90' PLAIN BEND 1"OD 16SWG		AISI316	137289	FOOD QUALITY	1
019	2,000	***90' PLAIN BEND 2"OD 16SWG		AISI316	137291	FOOD QUALITY	1
020	12,000	***MALE ELBOW 1/2"NPT:1/2"OD	8MSEL8N	AISI316	143814	PARKER	1
021	3,000	***HEX NIPPLE 1/2"NPT	8-8MHN	AISI316	144372	PARKER	
022	12,000	***LINER 1"SMS.WELD TYPE		AISI316	05654		
023	3,000	***LINER 21/2"SMS WELD TYPE		AISI316	55035810011		1
024	3,000	***MALE PART 1"SMS.WELD TYPE		AISI316	05653		
025	2,000	***MALE PART 2"SMS WELD TYPE		AISI316	55035810012		1
026	3,000	***MALE TEE 1/2"NPT:1/2"OD	8MRT8N	AISI316	143858	PARKER	1
027	46,000	***MSC 1/2"NPT:1/2"OD	8MSC8N	AISI316	143721	PARKER	1
		<<<<>>>>					

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

ME:1=Piece,2=Kg,3=Litre,4=Metre,5=m²

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran+Luebbe GmbH	PACKAGE UNIT			1,000		1

Remarks

Name STB | Date 6.01.00 | Customer-No. 2241956 | Order-No. 575503581000

Pos.	Quantity	Description	Drawing-No.	Material	Ident-No.	Remarks	ME
028	9,000	***NUT 1"SMS		AISI304	05655		1
029	6,000	***1"OD PIPE CLAMP		AISI304	142823	FOOD QUALITY	1
030	5,000	***2"OD PIPE CLAMP		AISI304	130519	FOOD QUALITY	1
031	2,000	***21/2"O/D PIPE CLAMP		AISI304	5755015411001	FOOD QUALITY	1
032	1,000	***PIPE CLAMP 3"OD FQ AISI304			13977-192		1
033	14,000	***MOUNTING PLATE	BAF550347/C	AISI304	5755035810013		1
034	1,000	***PULLED TEE 21/2" O/D FOOD Q		AISI316	55035810014		1
035	3,000	***REDUCING TEE 2"OD:1"OD 16SW		AISI316	138121	FOOD QUALITY	1
036	15,000	***GASKET 1"SMS		EPDM	05656		1
037	3,000	***PIPE CLAMP ADAPTOR 1":1/2"O		POLYPROP	142824		1
038	3,000	***MALE ADAP 1/2"OD:1/2"NPT	8MA8	AISI316	140283	PARKER HANNIFIN	1
039	3,000	***THREADOLET 1"O/D-1/2"NPT		AISI316	55035810015		1
040	2,000	***EQUAL TEE 1/2"OD	8ET8	AISI316	143798	PARKER	1
041	18,000	***TUBE 1/2"ODX0.064"WT	ASTM A269	TP316	980146316		4
042	4,000	***TUBE 1"OD 16SWG		AISI316	980184316	FOOD QUALITY	4
043	5,000	***TUBE 2"OD 16SWG		AISI316	980186316	FOOD QUALITY	4
044	2,000	***TUBE 21/2"OD 16SWG		AISI316	16099-004	FOOD QUALITY	4
045	2,000	***TUBE 3"OD 16SWG		AISI316	980187316	FOOD QUALITY	4
046	26,000	***END CAP 50.8X25.4X3THK		AISI316	13977-304		1
047	8,000	***END CAP 3"-2" DIA X3MM THIC			55035810016		1
048	6,000	***HEX HEAD SCREW M10X30	DIN931	AISI304	M10X30B2		1
049	22,000	***WASHER M10	DIN125	A2	101506		1
050	6,000	***HEX HEAD BOLT M12X40		ST.STL	M12X40B2		1
051	6,000	***WASHER M12	DIN125	A2	101507		1
052	6,000	***NUT M12	DIN934	AISI304	100291		1
053	16,000	***M10X20 HEX. HD. SCREW		A2	M10X20B2		1
054	28,000	***HEX.HEAD BOLT M5X 20		AISI304	55035810017		1
		<<<<>>>>					

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

ME:1=Piece,2=Kg,3=Litre,4=Metre,5=m²

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran+Luebbe GmbH	PACKAGE UNIT			1,000		2

Remarks

Name	Date	Customer-No.	Order-No.
STB	6.01.00	2241956	575503581000

Pos.	Quantity	Description	Drawing-No.	Material	Ident-No.	Remarks	ME
055	28,000	***HEX NUT M5	DIN934	AISI304	M5H2		1
056	40,000	***BOSS 25MM DIA X10MM THICK T		AISI316	05880		
		<<<<>>>>					

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

ME:1=Piece,2=Kg,3=Litre,4=Metre,5=m²

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran+Luebbe GmbH	PACKAGE UNIT			1,000		3

1.12.99

Remarks

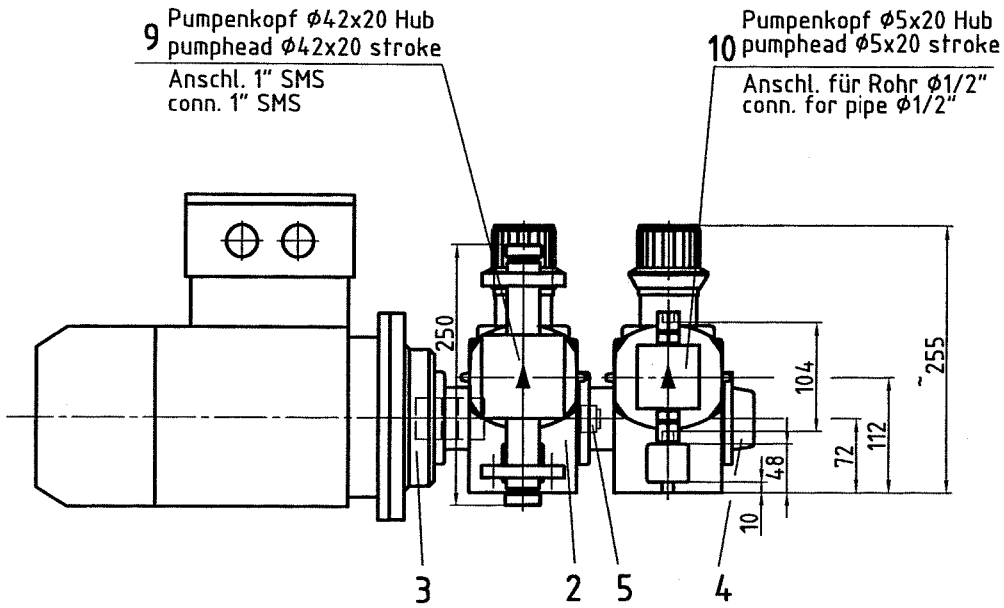
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

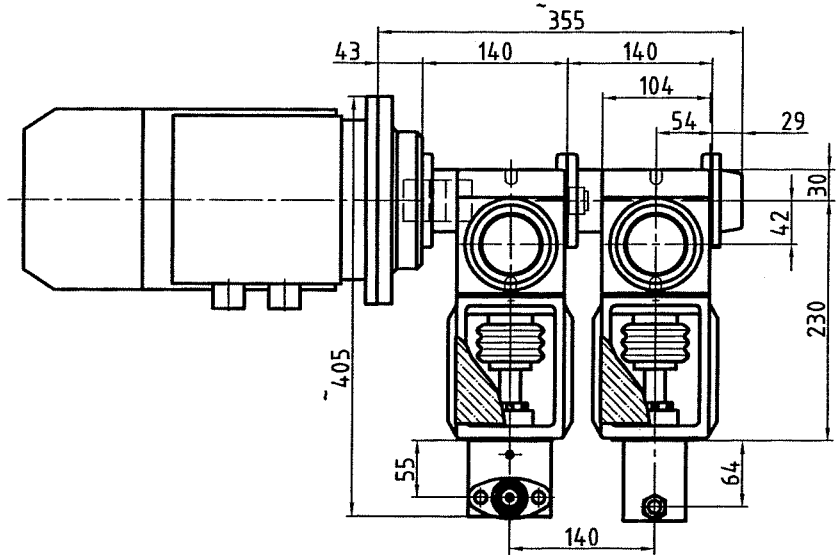
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
101	1,000	METERING PUMP CEREX N-P32 <<<<>>>>	12008410			(LESS MOTOR)	1

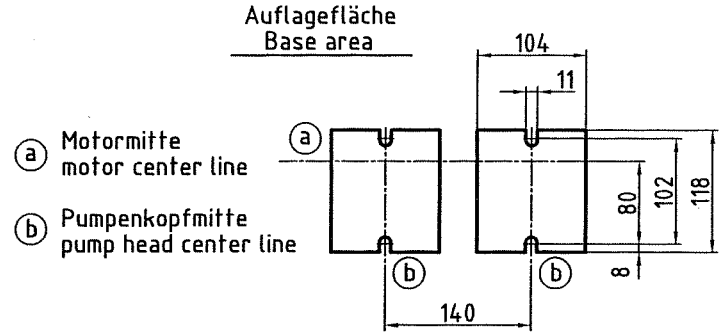
For ordering parts : For Ident-No. with alphabetic appendix Order-No. is mandatory.

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	AUFTRAG 10 N-P32 METERING PUMP			3,000	9136688 - 9136690	1







Gewicht ohne Motor /weight without motor: ~35 kg
Ölmenge/oil quantity: 0,5 l

BRAN+LUEBBE	TITLE 1 DOSIERPUMPE CEREX N-P32	
	TITLE 2 METERING PUMP CEREX N-P32	
DRAWN	F.Almao	30.11.99
CHANGED	F.Almao	01.12.99
APPROVED	K.Bargmann	01.12.99
RELEASED	H.Nieradzik	03.12.99

MATERIAL		IDENT.-NO.		REV. 0
FORMAT A3	SCALE 1:5	SHEET 1/1	DRAWING-NO. 12008410	

- CAD-DRAWING -

1.12.99

Remarks

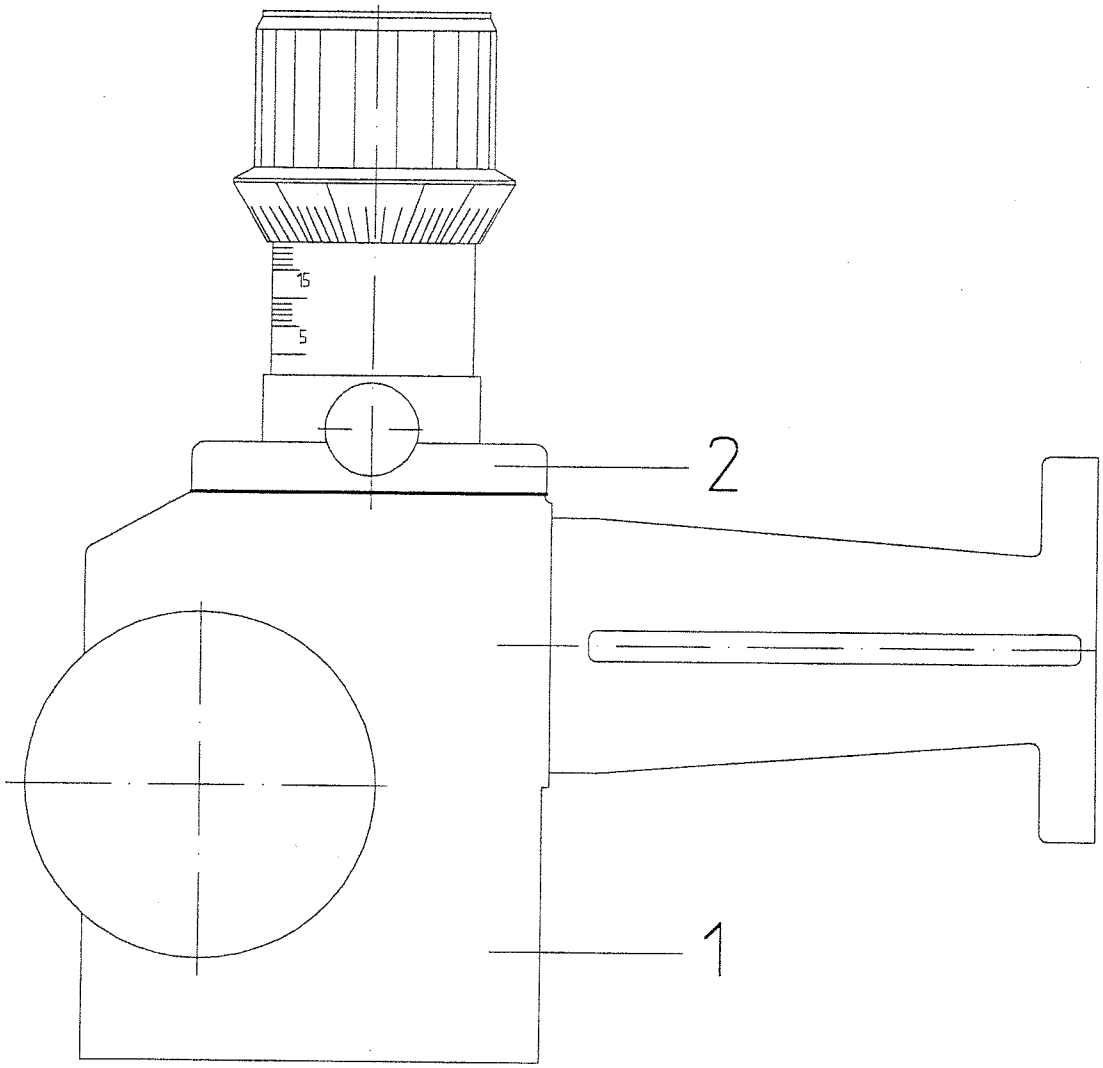
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

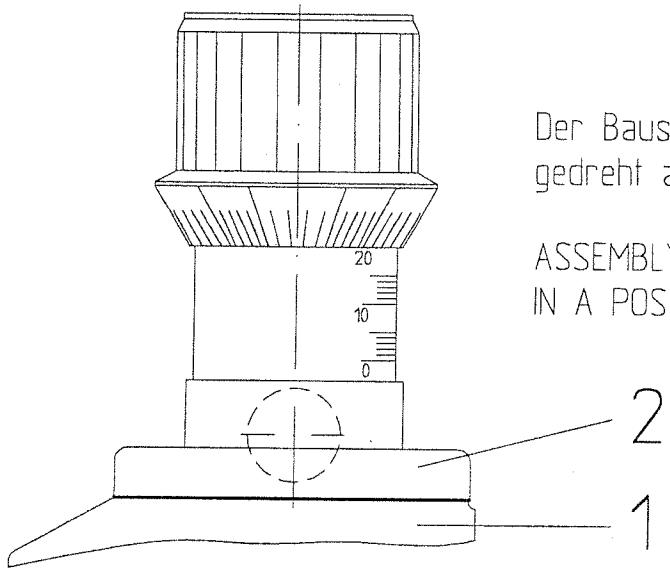
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
002	2,000	GEAR BOX (MIT P-319!)	P31-05/1		400651S	P31-05-28/1	1
003	1,000	CONNECTOR P-GETR.-MOT.	CM-020 B		243058S	B 5-90/200 (FLA-1208	
004	1,000	ASSEMBLY P-GETR./DECKEL	CM-022 A		243050S		
005	1,000	CONNECTOR P/P-GETR.ABST.0	CM-021/1 A		243060S		
009	1,000	PUMP HEAD 42 X 20 B3L	PK-02/1		510671SV	P242H-031-V1S1	1
010	1,000	PUMP HEAD 5 X 20 B3L	PK-01/2		510171SV	P205S-031-M1S1	1
100	1,000	PLATE, LABEL 52X74 GERMANY	SCHI-941/1	VA	155261	CEREX, ENGLISCH	1
		< < < < > > > >					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	METERING PUMP CEREX N-P32 (LESS MOTOR)	12008410		3,000	9136688 - 9136690	1





Der Bausatz Pos.2 darf auch um 180° gedreht angebaut werden.

ASSEMBLY ITEM 2 CAN ALSO BE MOUNTED IN A POSITION ROTATED 180°

DRAWN	W. Naundorf	25. 07. 95
CHANGED	W. Naundorf	07. 06. 96
APPROVED	Th. van Hamme	07. 06. 96
RELEASED	Th. van Hamme	08. 06. 96

BRAN+LUEBBE

TITEL 1 GETRIEBE P31

TITEL 2 GEAR P31

- CAD-DRAWING -

MATERIAL	IDENT-NO.	REV.
		1

FORMAT	SCALE	SHEET	DRAWING NO
A4	1: 2	1/1	P31-05

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

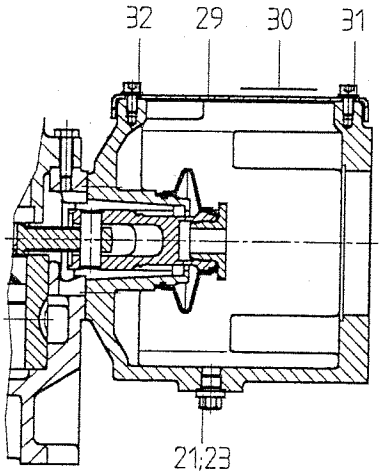
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	1,000	GEAR BOX BASIS- (MIT P-319!)	P-016/2		401042	P01-01-28/1	1
02	1,000	ASSEMBLY	P3-06/8		429126		1
		< < < < > > > >					

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

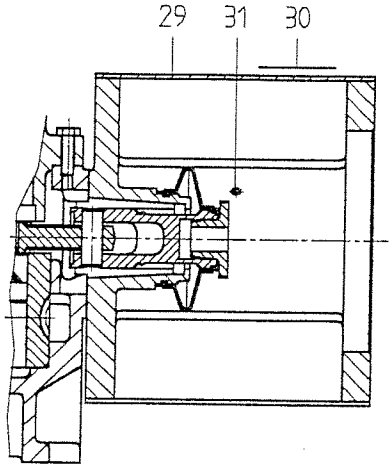
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

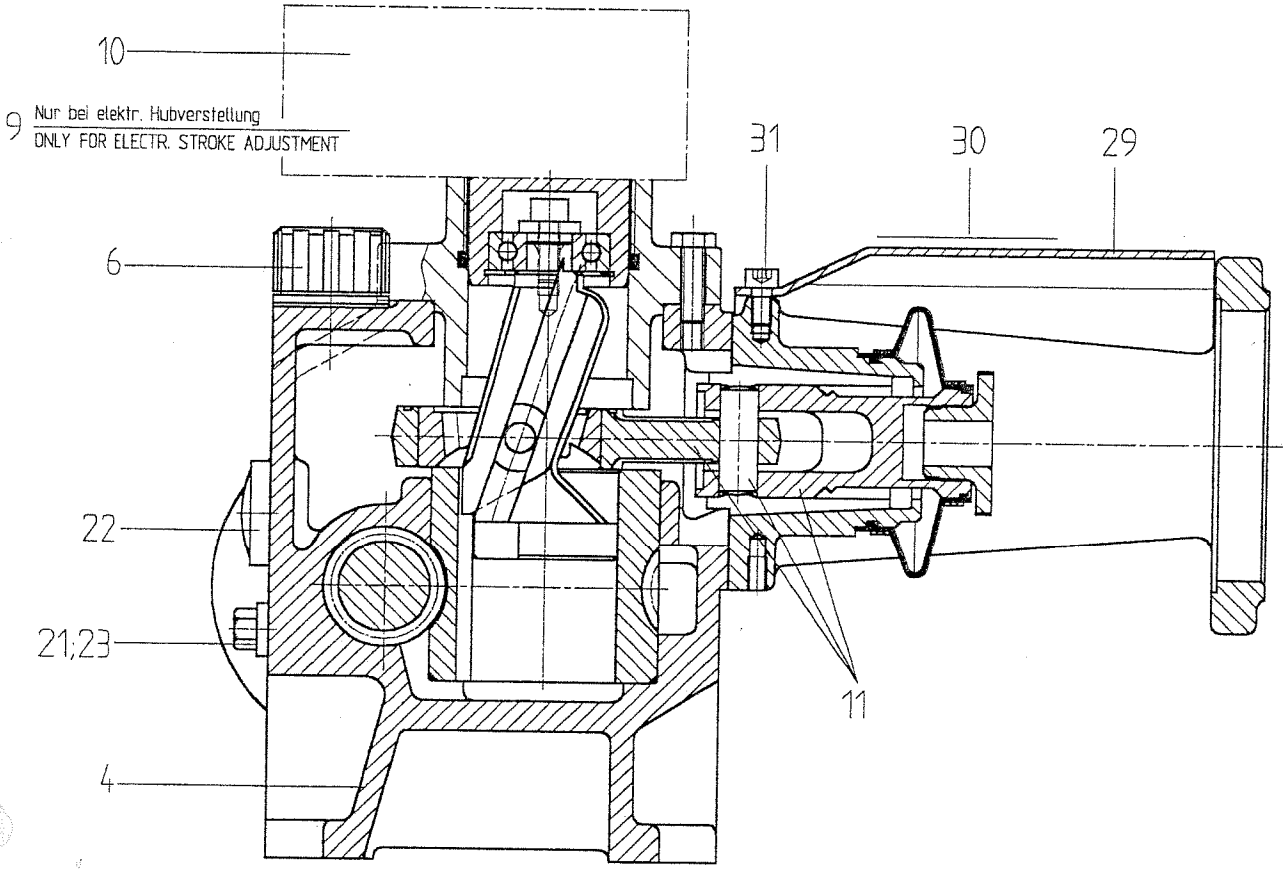
Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	GEAR BOX (MIT P-319!) P31-05-28/1	P31-05/1	400651S	6,000	9136688 - 9136690	1

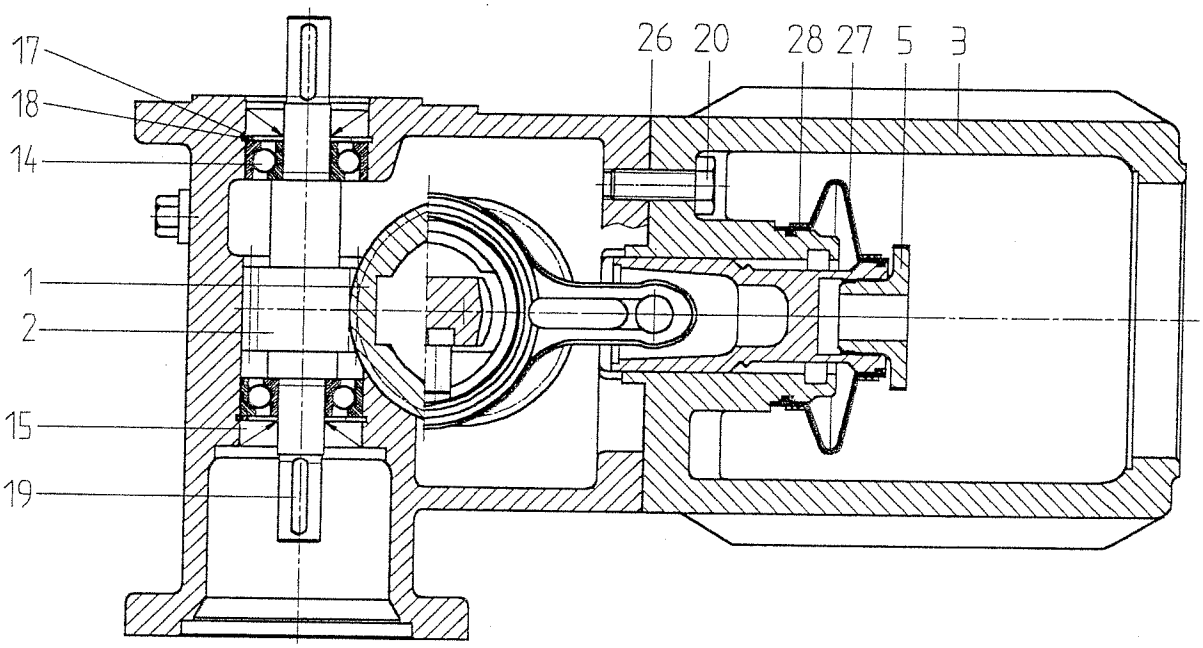
Ausführung mit Pumpenhalter P-333 ; P-334 ; P-335
ARRANGEMENT FOR PUMP YOKE P-333 ; P-334 ; P-335



Ausführung mit Pumpenhalter P-248
ARRANGEMENT FOR PUMP YOKE P-248







DESIGNED	D.Petersen	15.11.91	TITLE 1	P-GETRIEBE	REV. 2
BRAN+LUEBBE			TITLE 2	P-GEAR	
DRAWN	W.Neundorf	26.10.94	MATERIAL		DRAWING-NO.
CHANGED	W.Neundorf	10.03.98			SHEET
APPROVED	D.Petersen	10.03.98	FORMAT	SCALE	

1.12.99

Remarks

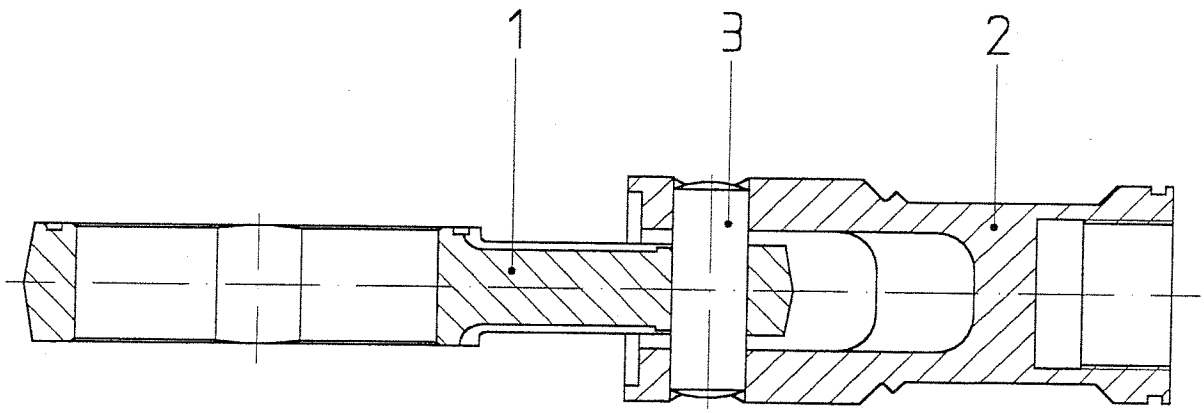
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

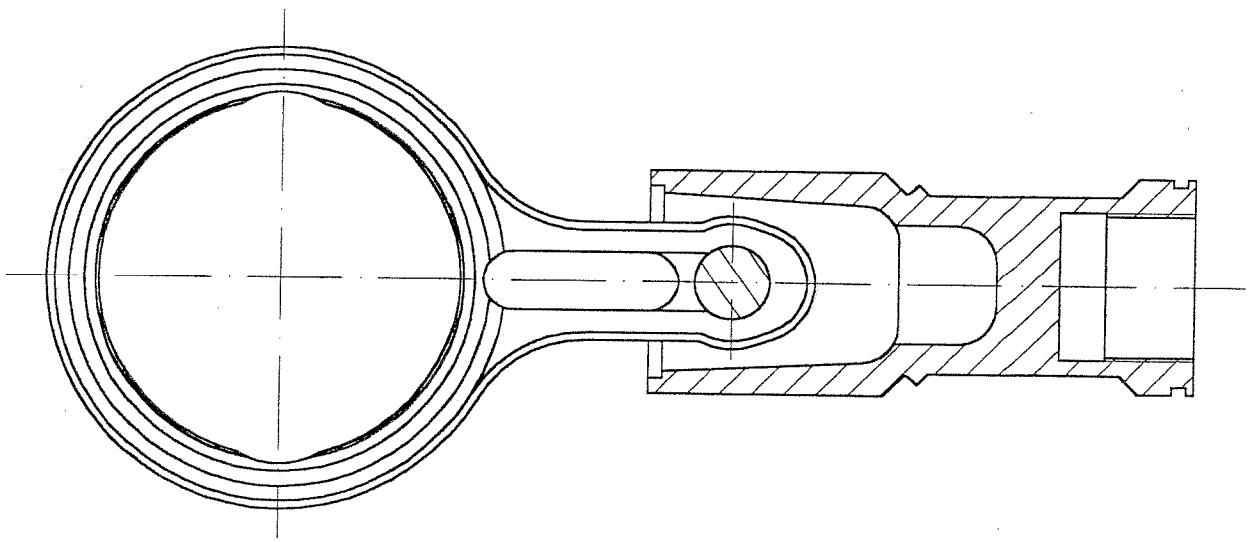
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	1,000	WORM WHEEL 28/1	P-14/5	2.1060.03	250912		1
02	1,000	WORM SHAFT 28/1	P-13/5	C 45	250911		1
03	1,000	PUMP YOKE, SPACER	P-319/1	GG 20	202017		1
04	1,000	HOUSING	P-250/3	GG 20	250943		1
05	1,000	SCREW, BOLT	P-121/3	9SMN28 K	250996		1
06	1,000	SCREW, BOLT G 3/8 -A1	GN 552 (GANTER)	KUNSTST	155017		1
11	1,000	ASSEMBLY	P-03		429200S		1
14	2,000	BEARING 7201 BE	DIN 628		120010		1
15	2,000	SEAL RING A 12 X 32 X 7	DIN 3760	NBR	150011		1
17	2,000	RETAINING RING, CIRCLIP 32 X 1	DIN 472	FEDERST	101614		1
18	3,000	WASHER, DISC 22X 32 X0,2	DIN 988	ST	101528		1
19	2,000	PARALLEL KEY A 4 X 4 X 20	DIN 6885	ST 50-1K	100146	F.P-GETR.	1
20	4,000	SCREW, BOLT M 8 X 22	ISO 4017	A 2	100245		1
21	1,000	SCREW, BOLT G 1/8	DIN 910	5.8 ZN	100099		1
22	1,000	INSPECTION GLASS R 1/2"		PLEXIGLAS	155005		1
23	1,000	SEAL RING C 10 X 14	DIN 7603	FD 12	150227		1
26	1,000	GASKET, SEALING	P-251	FD 3	150317		1
27	1,000	BELLOWS	P-25/2	CR 50SHA	250940		1
28	2,000	CABLE STRIP	PLT 3 S-MO	SCHWARZ	155054		1
29	1,000	PROTECTION	PN- 1904/2	PC	313112	ABDECKG.F.P-319/+271	1
30	1,000	PLATE, LABEL	SCHI-872/2	PVC	155083	F.PU.HALTER-ABDECKUN	1
31	1,000	SCREW, BOLT M 5 X 10	DIN 912	A 2-70	815431		1
		<<<<>>>>					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	GEAR BOX BASIS- (MIT P-319!) P01-01-28/1	P-016/2	401042S	6,000	9136688 - 9136690	1





DESIGNED	Dötze	03. 02. 72
DRAWN	W. Naundorf	15. 02. 95
CHANGED		
APPROVED	D. Petersen	27. 02. 95
RELEASED	D. Petersen	28. 02. 95

BRAN+LUEBBE

TITEL 1 BAUSATZ

TITEL 2 ASSEMBLY

- CAD-DRAWING -

MATERIAL	IDENT-NO.	REV.
		0

FORMAT	SCALE	SHEET	DRAWING NO
A4	1: 1	1/1	P-03

1.12.99

Remarks

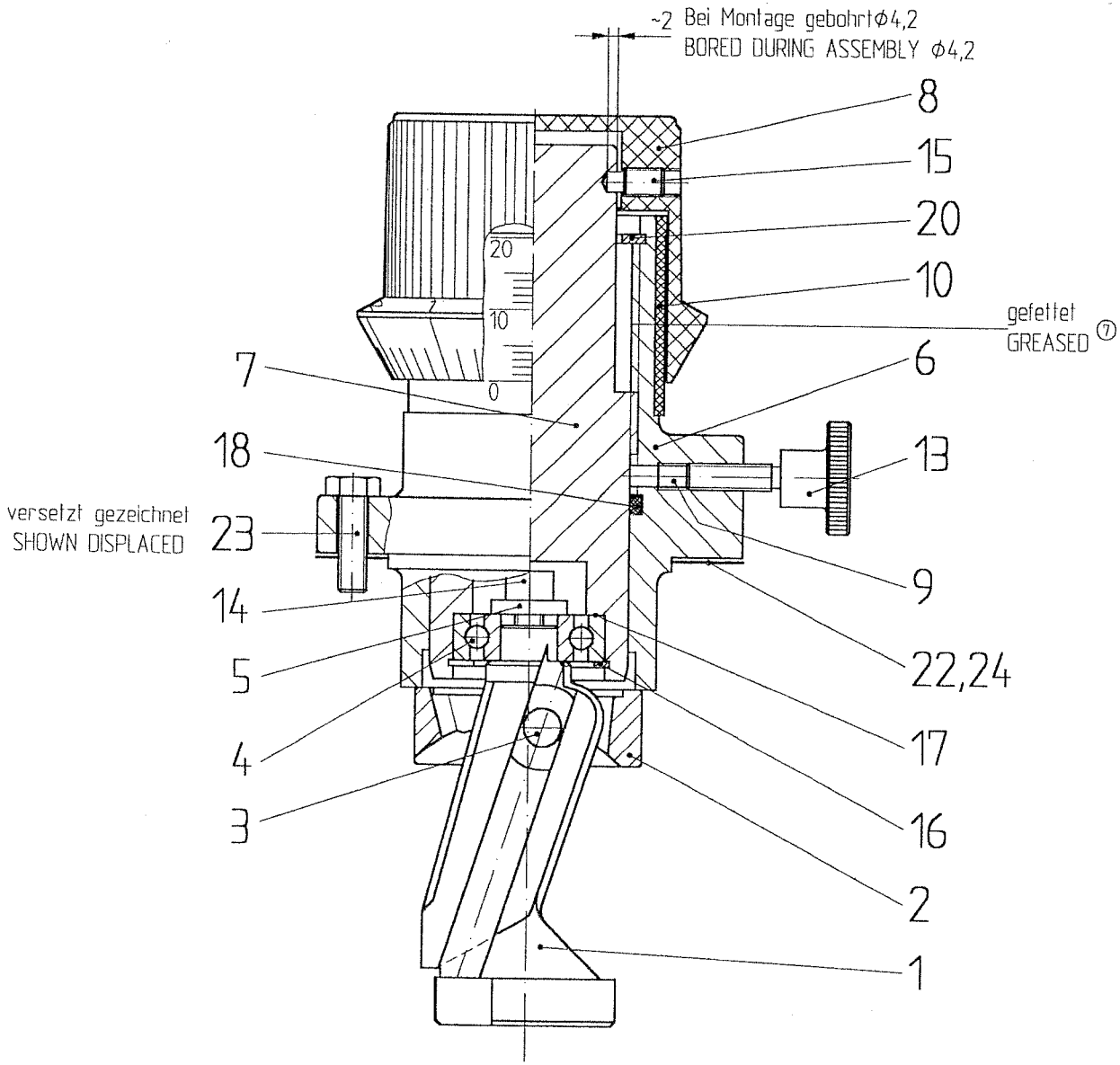
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	1,000	CONNECTING ROD	P-8/6	UNIFONT90	250906		1
02	1,000	CROSSHEAD	P-61/3	GGG 40	250957		1
03	1,000	PIN	P-48	9SMNPB28K	102079		1
		<<<<>>>>					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	ASSEMBLY	P-03	429200S	6,000	9136688 - 9136690	1



BRAN+LUEBBE			TITEL 1 BAUSATZ P3			
			TITEL 2 ASSEMBLY P3			- CAD-DRAWING -
DRAWN	W. Naundorf	10. 06. 96	MATERIAL	IDENT-NO.		REV. 8
CHANGED	W. Naundorf	10. 06. 96				
APPROVED	D. Petersen	10. 06. 96	FORMAT A3	SCALE 1: 1	SHEET 1/1	DRAWING NO P3-06
RELEASED	D. Petersen	11. 06. 96				

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

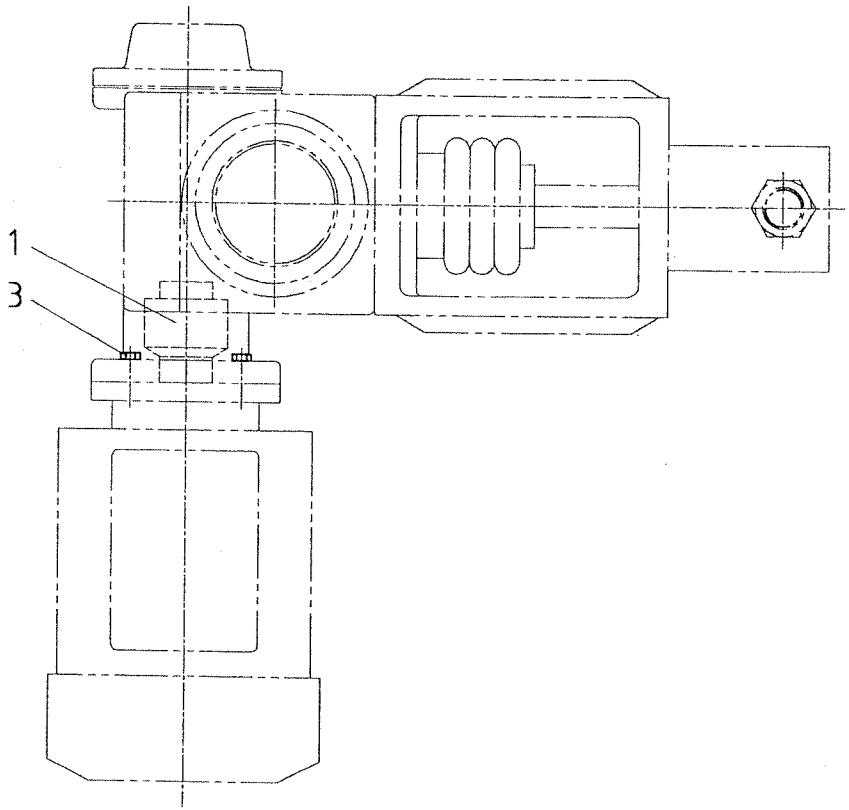
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	1,000	CRANK SHAFT	P-5/8	GGG 40	250903		1
02	1,000	ECCENTRIC	P-3/3	GGG 40	250901		1
03	1,000	PIVOT	P-10/5	C 45 K	250908		1
04	1,000	BEARING 6201-2RS	DIN 625		120002		1
05	1,000	WASHER, DISC	P-12	ST 37	250910		1
06	1,000	COVER	P-245/6	GG 20	251018		1
07	1,000	SLEEVE	P-246/5	9SMN28 K	251017		1
08	1,000	CAP	P-202/1	MAKROLON	250915		1
09	1,000	PIN	P-19/4	PA-6	102078		1
10	1,000	SLEEVE	P-203	MAKROLON	250921		1
13	1,000	SCREW, BOLT M 6 X 20	DIN 464	ST CD	100067		1
14	1,000	SCREW, BOLT M 6 X 16	DIN 912	8.8	100120		1
15	1,000	SLOTTED SCREW M 6 X 12	DIN 915	A 2	073118		1
16	1,000	RETAINING RING, CIRCLIP 32 X 1	DIN 472	FEDERST	101614		1
17	1,000	WASHER, DISC 22X 32 X0,1	DIN 988	ST	101518		1
18	1,000	O-RING 42 X 3		NBR	152009		1
20	1,000	RETAINING RING, CIRCLIP JV45		FEDERST	101710		1
22	2,000	GASKET, SEALING 0,25DICK	P-20/1	FD 3	150068		1
23	4,000	SCREW, BOLT M 6 X 20	ISO 4017	A 2-70	100234		1
24	1,000	GASKET, SEALING 0,1 DICK	P-20/1	PAPIER	150067		1
		< < < < > > > >					

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

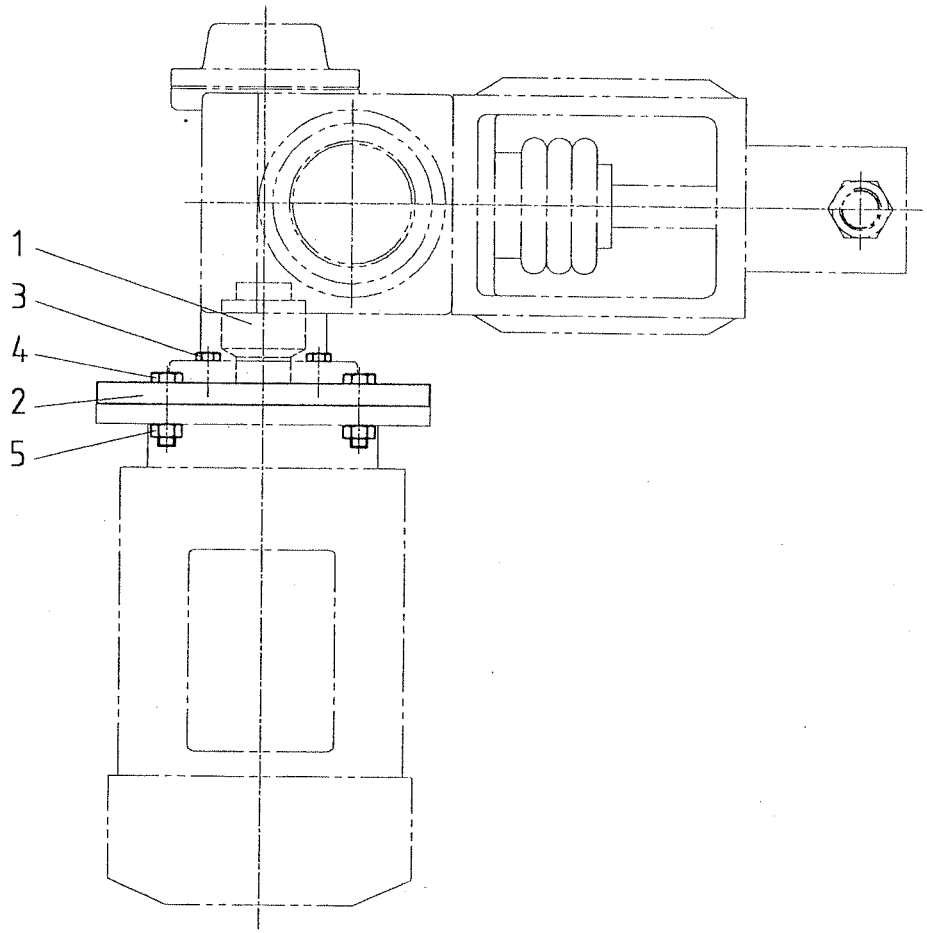
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	ASSEMBLY	P3-06/8	429126S	6,000	9136688 - 9136690	1

CM-020 A



CM-020 B



Ausführung und Abmessungen siehe Auftrag
Execution and dimensions acc. order

BRAN+LUEBBE	TITLE 1 Verbinder P-Getriebe – Motor	
	TITLE 2 connector P-gear – motor	
DRAWN A.Remers 21.01.99	MATERIAL	IDENT.-NO. REV. 0
CHANGED A.Remers 26.01.99		
APPROVED H.Rohlfs 26.01.99	FORMAT SCALE SHEET	DRAWING-NO.

- CAD-DRAWING -

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
001	1,000	COUPLING T1=11 T2=24		ST	240076	ROTEX 19/24	1
002	1,000	FLANGE	FLA-1208/1	ST 52-3	179317		1
003	4,000	SCREW, BOLT M 6 X 16	ISO 4017	8.8	100230	DIN933 ALT	1
004	4,000	SCREW, BOLT M 10 X 25	DIN 933	8.8	100254		1
		<<<<>>>>					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	CONNECTOR P-GETR.-MOT. B 5-90/200 (FLA-1208)	CM-020 B	243058S	3,000	9136688 - 9136690	1

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

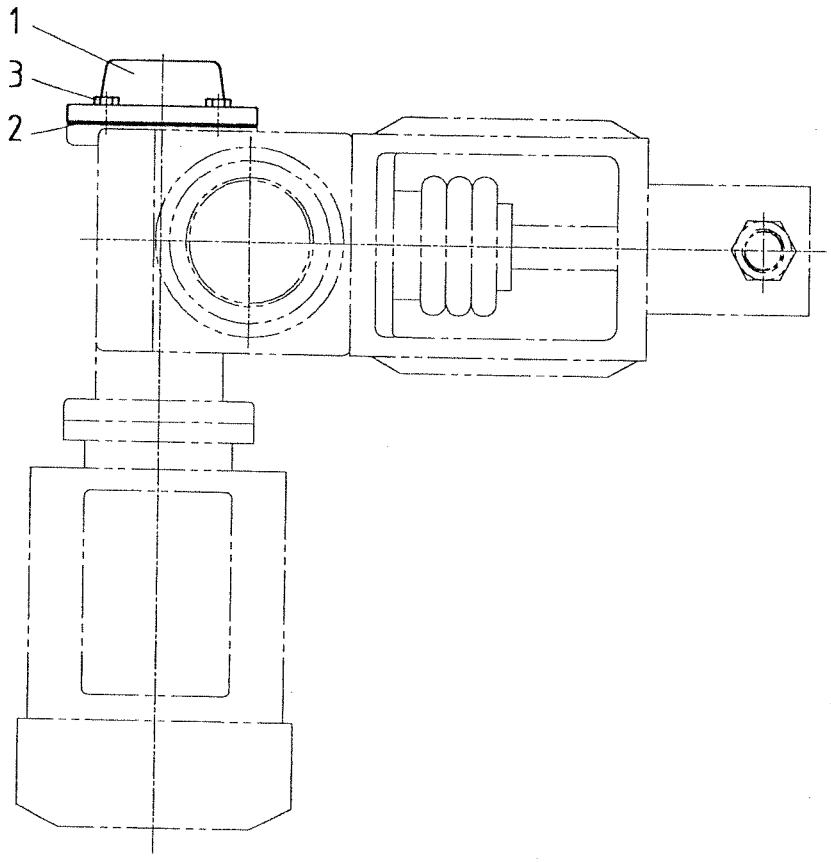
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
	1,000	COUPLING KLT11 TT19 <<<<>>>>		ST	240074		1

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

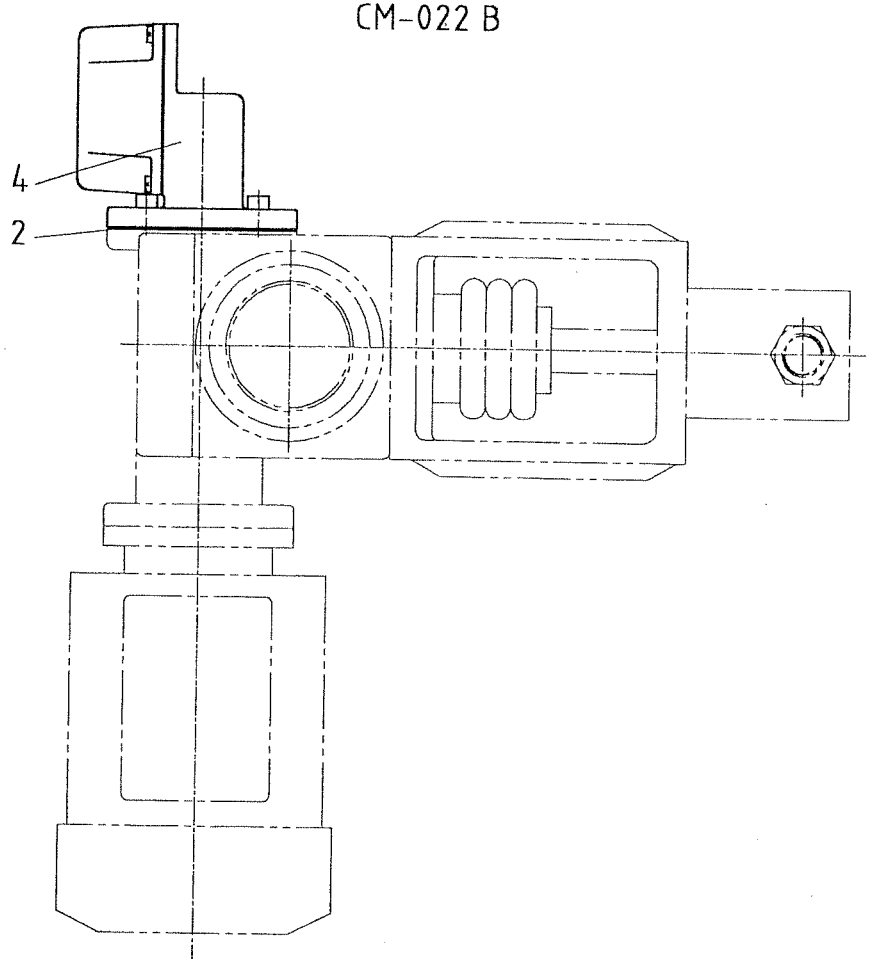
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	COUPLING T1 = 11 T2 = 24 ROTEX 19/24		240076	3,000	9136688 - 9136690	1

CM-022 A



CM-022 B



BRAN+LUEBBE			TITLE 1 Bausatz Abschluß P-Getriebe			
			TITLE 2 assembly end P-gear			
DRAWN	A.Remers	20.01.99	MATERIAL	IDENT.-NO.		REV. 0
CHANGED	A.Remers	27.01.99				
APPROVED	H.Rohlfs	27.01.99	FORMAT A3	SCALE X:X	SHEET 1/1	DRAWING-NO.
RELEASED						

- CAD-DRAWING -

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

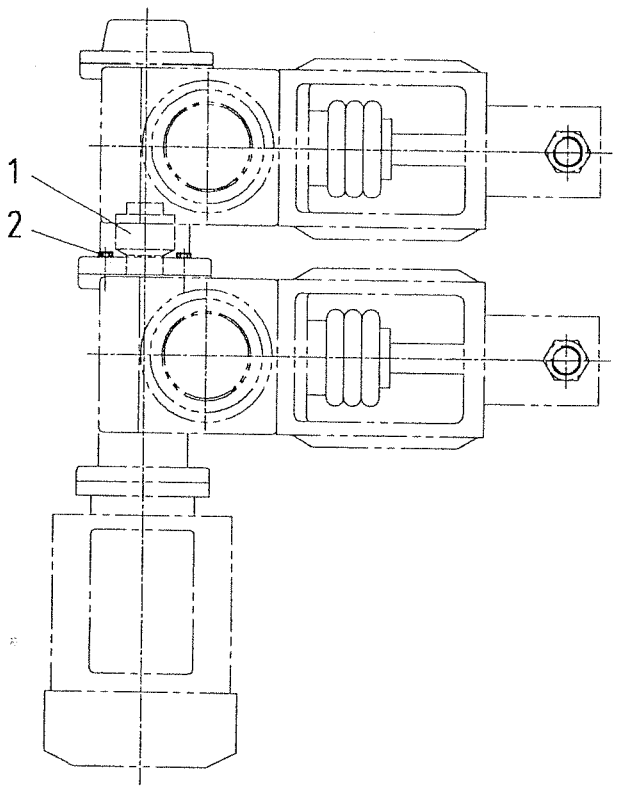
Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
001	1,000	COVER	P-22	PS	250918		1
002	1,000	GASKET, SEALING	P-338	NBR	150489	F.P-GETR.(ABSCHL.DEC	1
003	4,000	SCREW, BOLT M 6 X 16	ISO 4017	8.8	100230	DIN933 ALT	1
		<<<<>>>>					

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

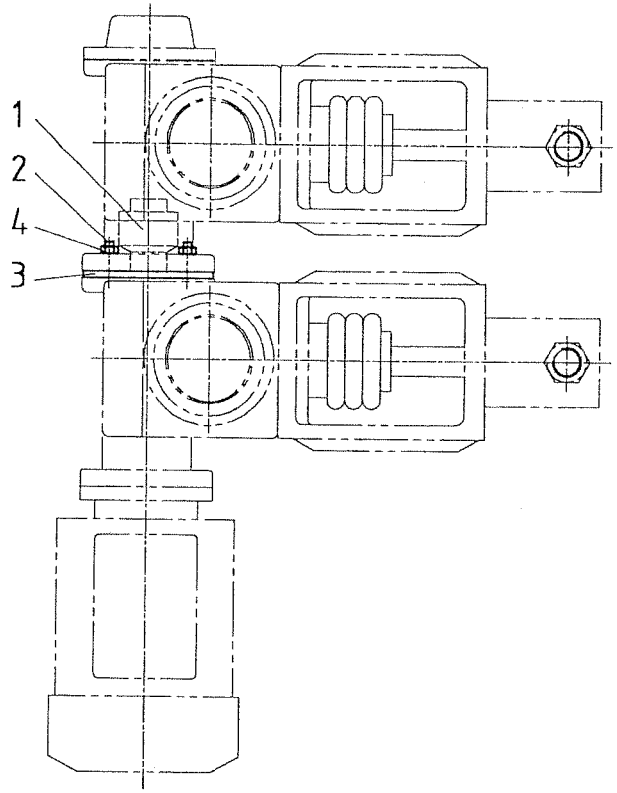
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	ASSEMBLY P-GETR./DECKEL	CM-022 A	243050S	3,000	9136688 - 9136690	1

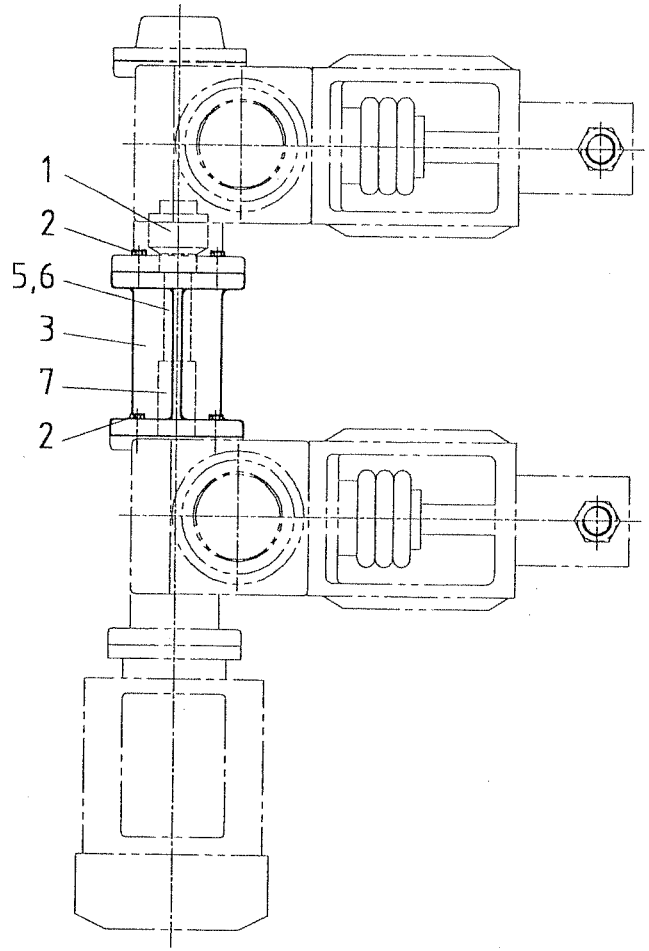
CM-021 A



CM-021 B



CM-021 C



Ausführung und Abmessungen siehe Auftrag
Execution and dimensions acc. order

BRAN+LUEBBE		
DRAWN	A.Remers	20.01.99
CHANGED	A.Remers	25.01.99
APPROVED	H.Rohlfs	26.01.99

TITLE 1 Verb. P-Getriebe – P-Getriebe
TITLE 2 connector P-gear – P-gear

MATERIAL		IDENT.-NO.	REV. 0
FORMAT	SCALE	SHEET	DRAWING-NO.

- CAD-DRAWING -

1.12.99

Remarks

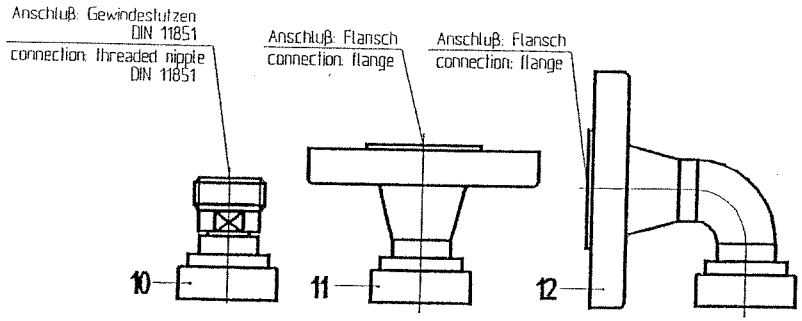
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
001	1,000	COUPLING KLT11 TT11		KUNSTST	240072	BOWEX JUNIOR 14	1
002	4,000	SCREW, BOLT M 6 X 20	ISO 4017	8.8	100232	DIN933 ALT	1
		< < < < > > > >					

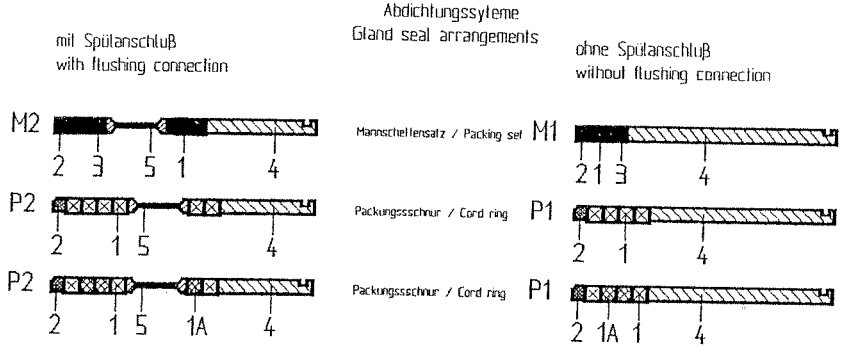
For ordering parts : For Ident-No. with alphabetic appendix Order-No. is mandatory.

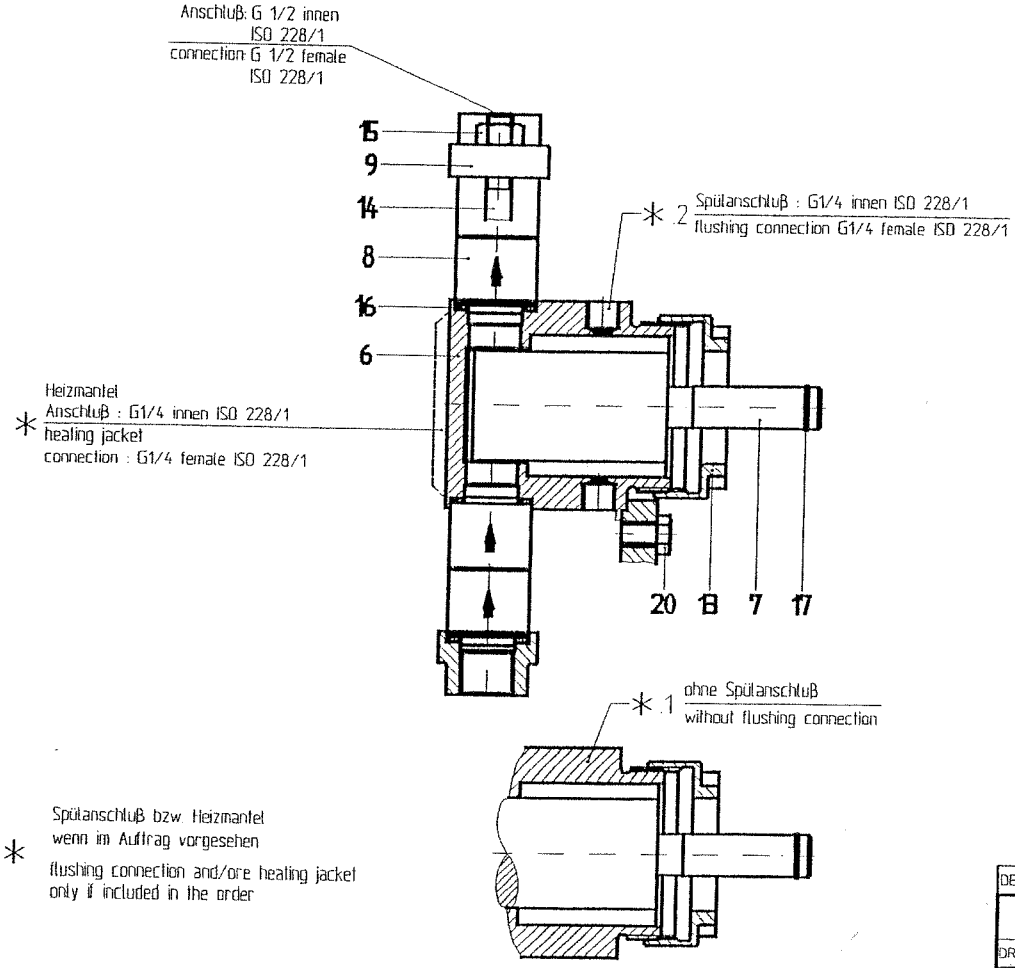
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	CONNECTOR P/P-GETR.ABST.0	CM-021/1 A	243060S	3,000	9136688 - 9136690	1



Abdichtungssysteme
Gland seal arrangements





* Spülanschluß bzw. Heizmantel
wenn im Auftrag vorgesehen

flushing connection and/ore heating jacket
only if included in the order

Φ30+42x20 Hub/stroke

DESIGNED	Wüstefeld	20. 04. 95
DRAWN	W. Naundorf	21. 04. 95
CHANGED	W. Naundorf	21. 04. 95
APPROVED	R. Wuestefeld	26. 04. 95
RELEASED	R. Wuestefeld	27. 04. 95

BRAN+LUEBBE

TITLE 1 PUMPENKOPF
TITLE 2 PUMPHEAD
- CAD-DRAWING -

MATERIAL	IDENT.-NO.	REV.
		1

FORMAT	SCALE	SHEET	DRAWING-NO
A3	1:2	1/1	PK-02

1.12.99

Remarks

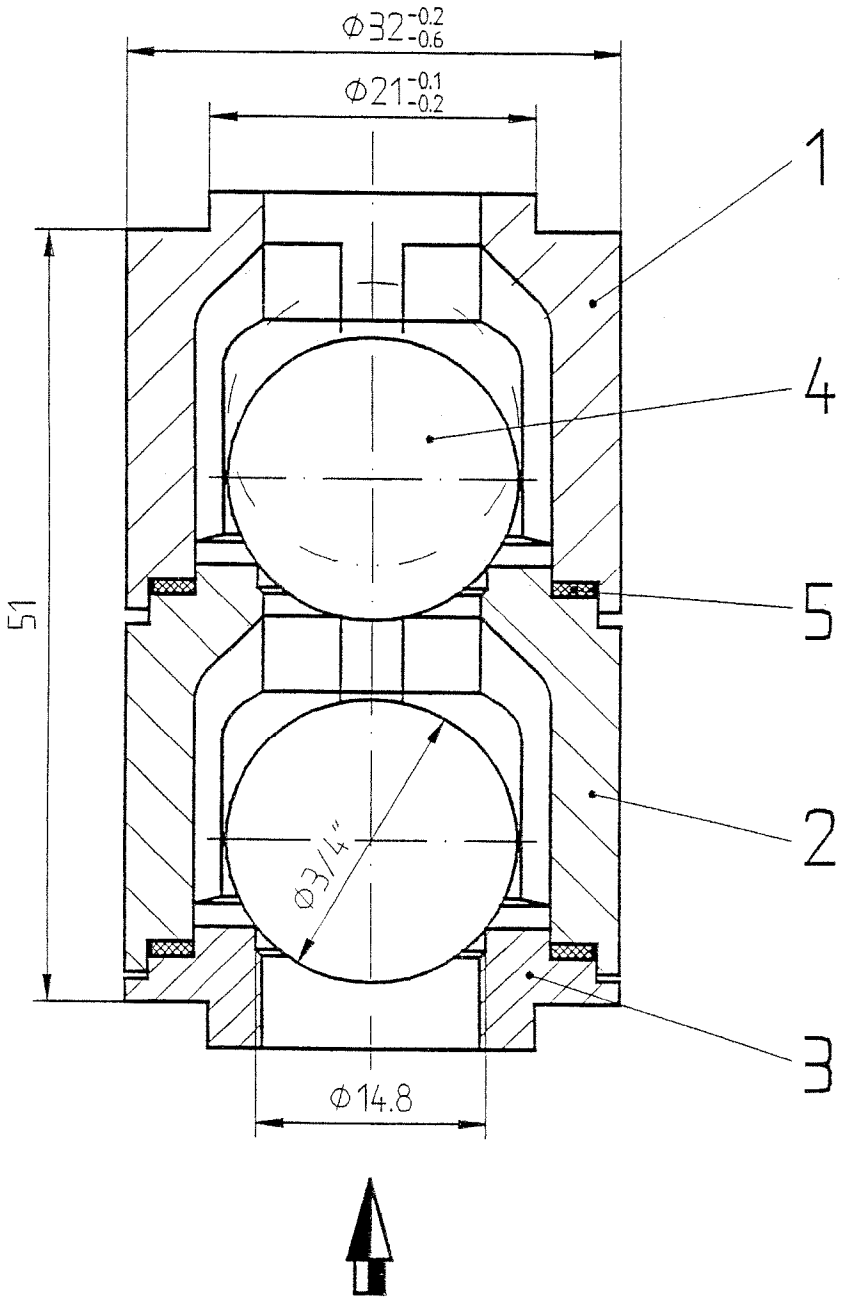
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	2,000	V-PACKING COLLAR 42 X 54 B3L	1160	B3L	359513		1
02	1,000	BASE RING 42 X 54 B3L	1161	B3L	359538		1
03	1,000	COMPRESSION RING 42 X 54 B3L	1162	B3L	359563		1
04	1,000	COMPRESSION RING M 42 (1) 20	PN- 239/2	1.4571	306382		1
06	1,000	HOUSING	P 242 H2-1/1	1.4571	340843	V/	1
07	1,000	PISTON, PLUNGER 42 20HUB	PN- 222/1	1.4571	314906		1
08	2,000	VALVE	PV 32-0128/2	1.4581	540082		1
13	1,000	GLAND, SCREW CONNECTION 44 (MA	PN- 21/3	1.4581	312663		1
14	4,000	SCREW, BOLT M 10 X 70	DIN 938	A 2	100325		1
15	4,000	NUT M 10	DIN 934	A 2	100287		1
16	4,000	GASKET 21,5X 31,5X 2		FD 10	150120		1
17	1,000	SNAP RING 12	DIN 7993	FEDERST	101624		1
20	2,000	SCREW, BOLT M 8 X 25	ISO 4017	8.8 ZN	100246		1
		<<<<>>>>					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	PUMP HEAD 42 X 20 B3L P242H-031-V1S1	PK-02/1	510671SV	3,000	9136688 - 9136690	1



DRAWN	T. Stingemore	14. 04. 94
CHANGED	T. Stingemore	21. 07. 94
APPROVED	R. Wuestefeld	22. 07. 94
RELEASED	R. Wüstefeld	26. 07. 94

BRAN+LUEBBE

TITEL 1 KUGELVENTIL 2 FACH

TITEL 2 DOUBLE BALL VALVE

- CAD-DRAWING -

MATERIAL	IDENT-NO.	REV.
		2

FORMAT	SCALE	SHEET	DRAWING NO
A4	2: 1	1/1	PV32-0128

1.12.99

Remarks

Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
001	1,000	HOUSING	PV 32-250/2	1.4581	341504		1
002	1,000	HOUSING	PV 32-249/2	1.4581	341503		1
003	1,000	VALVE SEAT	PV 32-247/3	1.4571	341507		1
004	2,000	BALL 3/4"	ISO 3290 G28	1.4401	120517	(DIN5401)	1
005	2,000	GASKET, SEALING 23,5X 28,5X 1 < < < < > > > >		FD 10	150300		1

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

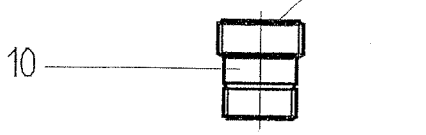
UOM: 1 = Piece, 2 = Kg, 3 = Litre, 4 = Metre, 5 = m^2

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	VALVE DICHTG.FD10	PV 32-0128/2	540082S	6,000	9136688 - 9136690	1

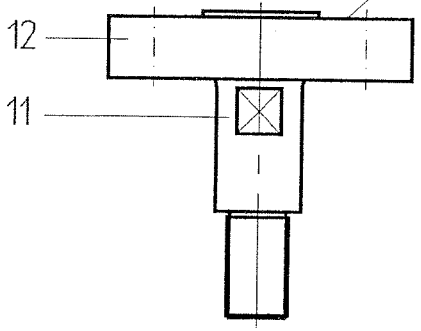
✳ Spülanschluß bzw. Heizmantel wenn im Auftrag vorgesehen.

✳ flushing connection or heating jacket only if included in order.

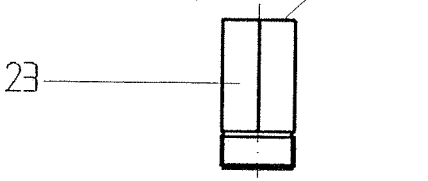
Anschluß: Gewindestutzen DIN 11851
connection: threaded nipple DIN 11851



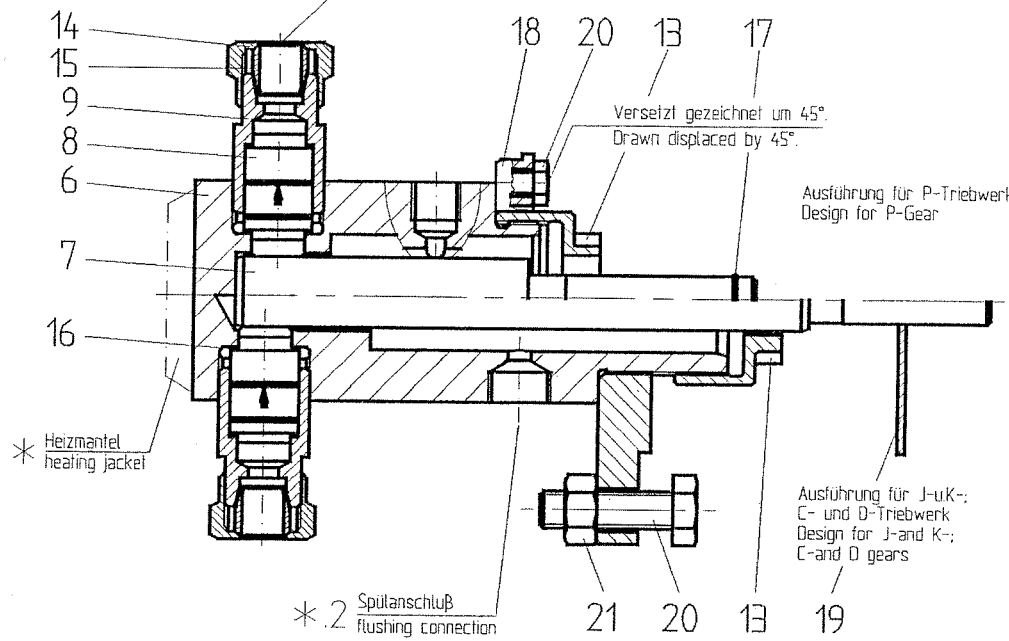
Anschluß: Flansch
connection: Flange

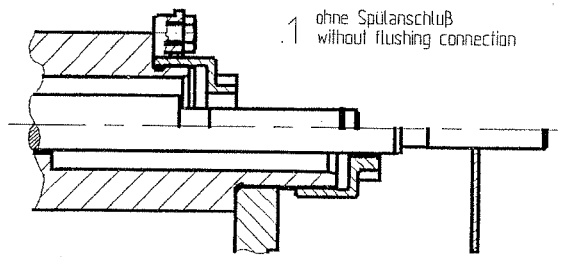


Anschluß: Gewindestutzen
connection: Threaded Nipple



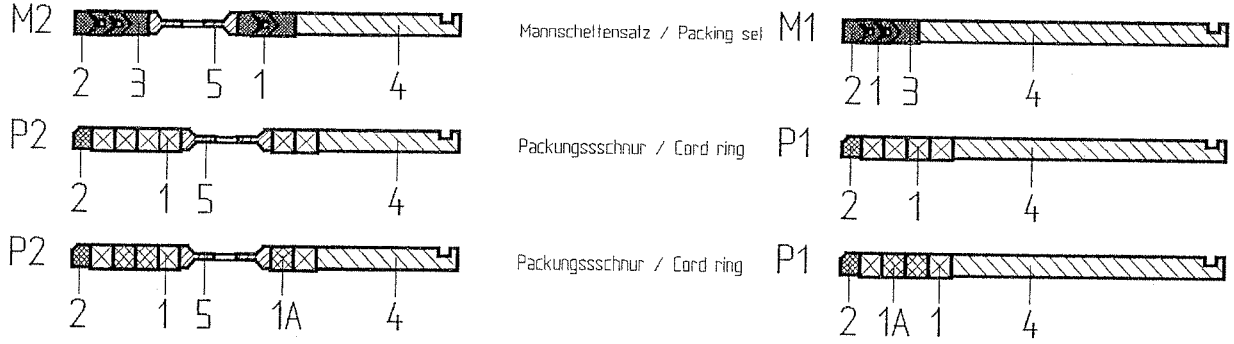
Anschluß: Rohr ⌀ 12x 2 DIN 2353
connection: pipe ⌀ 12x 2 DIN 2353





Dichtungssysteme
Seal arrangements

mit Spülanschluß with flushing connection		ohne Spülanschluß without flushing connection
M2	Manschettensatz / Packing set	M1
P2	Packungsschnur / Cord ring	P1
P2	Packungsschnur / Cord ring	P1



⌀3-20x20mm Hub
⌀3-16x30mm Hub
⌀3-12x60mm Hub

⌀3-20x20mm Stroke
⌀3-16x30mm Stroke
⌀3-12x60mm Stroke

BRAN+LUEBBE			TITLE 1 PUMPENKOPF		
			TITLE 2 PUMP HEAD		- CAD-DRAWING -
DRAWN	J. Woolhouse	12. 12. 94	MATERIAL	IDENT.-NO.	REV 2
CHANGED	J. Woolhouse	07. 02. 95			
APPROVED	R. Wuestefeld	07. 02. 95	FORMAT	SCALE	SHEET DRAWING-NO

1.12.99

Remarks

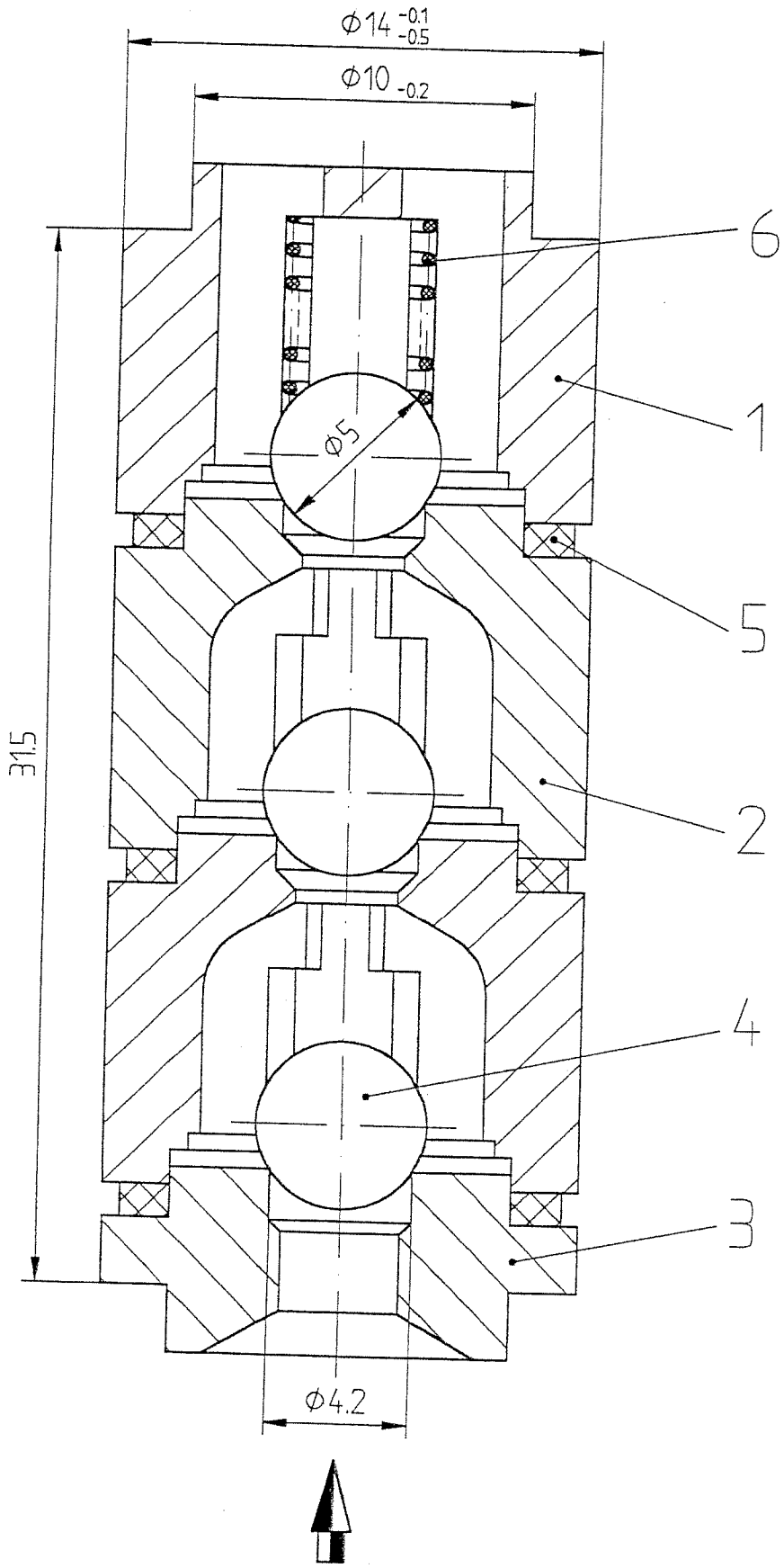
Name	Date	Customer No.	Com.No.
SW	1.12.99	2000165	511200841000

Line	Quantity	Description	Drawing-No.	Material	Ident-No.	Remark	UOM
01	2,000	V-PACKING COLLAR 5 X 17	1160	B3L	359502		1
02	1,000	BASE RING 5 X 17	1161	B3L	359527		1
03	1,000	COMPRESSION RING 5 X 17	1162	B3L	359552		1
04	1,000	COMPRESSION RING M 5 (1) 20	PN- 239/2	1.4571	306377		1
06	1,000	HOUSING	P 205 S2-1/1	V4A	340801		1
07	1,000	PISTON, PLUNGER 5 20HUB	PN- 222/1	1.4571	314901		1
08	2,000	VALVE	PV 14-016	1.4571	540373		1
09	2,000	GLAND, SCREW CONNECTION 1/2 OD	NI-1326/3		130352	/V(EPC-530)	1
10	2,000	NUT 1/2" OD SWAGELOK	SS-812-1	1.4571	130386	V/	1
11	2,000	RING KLEMM- VORN 1/2" OD	SS-813-1	1.4571	130387	V/	1
12	2,000	RING KLEMM- HINTEN 1/2" OD	SS-814-1	1.4571	130388	V/	1
13	1,000	GLAND, SCREW CONNECTION 8 (MAS	PN- 20/2	1.4581	312630		1
16	4,000	GASKET, SEALING 10 X 13 X 1		1.4571	150108		1
17	1,000	SNAP RING 12	DIN 7993	FEDERST	101624		1
18	1,000	FLANGE	PN- 240/1	ST	179305		1
20	2,000	SCREW, BOLT M 6 X 20	ISO 4017	8.8 ZN	100233		1
		<<<<>>>>					

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

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

Producer	Description	Drawing-No.	Ident-No.	Quantity	Serial-No.	Page
Bran + Luebbe GmbH	PUMP HEAD 5 X 20 B3L P205S-031-M1S1	PK-01/2	510171SV	3,000	9136688 - 9136690	1



DESIGNED	Bergmann	09. 09. 92
DRAWN	T. Stingemore	05. 04. 94
CHANGED		. .
APPROVED	R. Wuestefeld	19. 04. 94
RELEASED	R. Wüstefeld	22. 04. 94

BRAN+LUEBBE

TITEL 1 KUGELVENTIL 3-FACH

TITEL 2 TRIPPLE BALL VALVE

- CAD-DRAWING -

MATERIAL	IDENT-NO.	REV.
		0

FORMAT	SCALE	SHEET	DRAWING NO
A4	5: 1	1/1	PV14-016

1.12.99

Bemerkungen

Name	Datum	Kunden-Nr.	Kom.Nr.
SW	1.12.99	2000165	511200841000

Pos.	Menge	Benennung	Zeichnungs-Nr.	Werkstoff	Ident-Nr.	Bemerkung	ME
001	1,000	HOUSING	PV 14-7/2	1.4581	341490		1
002	2,000	HOUSING	PV 14-8/3	1.4581	341491		1
003	1,000	VALVE SEAT	PV 14-9/3	1.4571	341492		1
004	3,000	BALL 5	DIN 5401	1.4401	120500		1
005	3,000	GASKET, SEALING 10 X 13 X 1		1.4571	150108		1
006	1,000	SPRING 0,4 X 4 X 5 X 7		1.4571	190011		1
		< < < < > > > >					

Für Teilebeschaffung: Bei Ident-Nr. mit alphabetischem Anhang ist zusätzlich Kom.-Nr. erforderlich.

ME: 1 = Stück, 2 = Kg, 3 = Liter, 4 = Meter, 5 = m^2

Hersteller	Benennung	Zeichnungs-Nr.	Ident-Nr.	Menge	Serien-Nr.	Blatt
Bran + Luebbe GmbH	VALVE	PV 14-016	540373S	6,000	9136688 - 9136690	1

BRAN+LUEBBE
A United Dominion Company

Section Ten

CERTIFICATES

BRAN+LUEBBE

THE POWER OF PRECISION

CE DECLARATION OF CONFORMITY

MANUFACTURER: BRAN + LUEBBE

ADDRESS: SCALDWELL ROAD, BRIXWORTH
NORTHANTS, NN6. 9UD

TELEPHONE: 01604 880751 TELEFAX: 01604 880145

WE HEREBY DECLARE THAT THE DESIGN OF THE FOLLOWING EQUIPMENT CORRESPONDS WITH THE APPROPRIATE DEFINITIONS OF THE ESSENTIAL HEALTH AND SAFETY REQUIREMENTS FOR DESIGN AND CONSTRUCTION OF MACHINERY AND MACHINERY DIRECTIVE 91/368/EEC.

EQUIPMENT DESCRIPTION: N-P32x3 COLOUR MIXING SYSTEM

SERIAL NO: 9136688 - 9136690

ORDER NO: B+L 575503580000

APPLIED HARMONISED STANDARDS:
EN292 PART I, PART II
EN294/EN349

APPLIED TECHNICAL SPECIFICATIONS:
GENERALLY IN ACCORDANCE WITH API 675

SIGNED: [signature] POSITION: SYSTEMS SALES MANAGER DATE: 25 JAN 2000

For and on behalf of Bran + Luebbe Ltd

CE DECLARATION OF MANUFACTURE

MANUFACTURER Bran+Luebbe GmbH

ADDRESS Werkstr. 4

22844 Norderstedt

TELEPHONE 040/52202-0 FAX: 040/52202-444 TELEX: 2174691

WE HEREBY DECLARE THAT THE DESIGN OF THE FOLLOWING EQUIPMENT HAS BEEN MANUFACTURED IN ACCORDANCE WITH THE MACHINERY - 89/392/EC DIRECTIVE.

EQUIPMENT DESCRIPTION Metering Pump CEREX N-P 32

SERIAL NO. 9136688 - 9136690

ORDER NO. 51120084.1000

AND CAN BE INCORPORATED INTO A MACHINE / THE ASSEMBLY WITH OTHER MACHINES AND THAT THE COMMISSIONING OF SUCH MACHINES AS A WHOLE IS IN COMPLIANCE WITH THE APPROPRIATE REQUIREMENT OF EC MACHINE LAW 91/368/EC. IT IS NOT ALLOWED TO PUT THIS EQUIPMENT INTO SERVICE UNTIL THE MACHINERY INTO WHICH IT IS INCORPORATED HAS BEEN DECLARED TO BE IN CONFORMITY WITH THE MACHINERY DIRECTIVE.

APPLIED HARMONIZED STANDARDS:

EN292 PART I, PART II

EN294 /EN349

APPLIED NATIONAL TECHNICAL SPECIFICATIONS:

DIN24295

SIGNED _____ POSITION: PRODUCTION MANAGER DATE 30.11.99

For and on behalf of Bran + Luebbe GmbH

ecerkle

BRAN+LUEBBE

THE POWER OF PRECISION

STANDARD TEST CERTIFICATE

CUSTOMER		
TOMLINSON HALL / NESTLE ICE CREAM	CUSTOMER ORD NO	SY 8834
	ITEM NO / TS NO	-
	PUMP NO / ALGO NO	57550358
	PUMP TYPE	3 X N-P32 (PACKAGE)

THIS IS TO CERTIFY THAT:-

3 OFF BRAN + LUEBBE METERING PUMPS TYPE N-P32 MANUFACTURED AGAINST THE ABOVE MENTIONED ORDER, WAS SUBJECTED TO A WITNESS AND HYDRAULIC TEST, AND WAS FOUND TO BE SATISFACTORY.

ORIGINAL

	PLUNGER Ø	STROKE	CAPACITY		PRESSURE
9136688 A	42MM	20MM	170.712	L/HR	2 BAR G
	42MM	10MM	82.116	L/HR	2 BAR G
B	5MM	20MM	2.328	L/HR	2 BAR G
	5MM	10MM	1.056	L/HR	2 BAR G
9136689					
A	42MM	20MM	172.152	L/HR	2 BAR G
	42MM	10MM	83.40	L/HR	2 BAR G
B	5MM	20MM	2.334	L/HR	2 BAR G
	5MM	10MM	1.086	L/HR	2 BAR G

HYDRAULIC TEST

PRESSURE	3 BAR G
DURATION	30 MINS
TORQUE	-
RELIEF VALVE	-
REPLENISHING VALVE	-

CERT NO 7380

FOR BRAN+LUEBBE	FOR CUSTOMER	DATE
S.P. WALKER		21.1.00

BRAN+LUEBBE

THE POWER OF PRECISION

STANDARD TEST CERTIFICATE

CUSTOMER	CUSTOMER ORD NO	SY 8834
TOMLINSON HALL / NESTLE ICE CREAM	ITEM NO / TS NO	-
	PUMP NO / ALGO NO	57550358
	PUMP TYPE	3 X N-P32 (PACKAGE)

THIS IS TO CERTIFY THAT:-

3 OFF BRAN + LUEBBE METERING PUMPS TYPE N-P32 MANUFACTURED AGAINST THE ABOVE MENTIONED ORDER, WAS SUBJECTED TO A WITNESS AND HYDRAULIC TEST, AND WAS FOUND TO BE SATISFACTORY.

ORIGINAL

9136690

	PLUNGER Ø	STROKE	CAPACITY		PRESSURE
A	42MM	20MM	172.764	L/HR	2 BAR G
	42MM	10MM	83.796	L/HR	2 BAR G
B	5MM	20MM	2.328	L/HR	2 BAR G
	5MM	10MM	1.050	L/HR	2 BAR G

HYDRAULIC TEST

PRESSURE	3 BAR G
DURATION	30 MINS
TORQUE	-
RELIEF VALVE	-
REPLENISHING VALVE	-

CERT NO 7887

FOR BRAN+LUEBBE	FOR CUSTOMER	DATE
S.P.WALKER		21.1.00

ISO 9001

Certificate No. FS 00623

BROOK Hansen

St.Thomas' Road, Huddersfield HD1 3LJ.
Telephone: (01484) 422150 Telex: 51388
Telefax: (01484) 510848

TYPE TEST CERTIFICATE

SUPPLIED TO

BRAN & LUEBBE LTD.,
SCALDWELL RD.,
BRIXWORTH,
NORTHAMPTON,
NN6 9EN

PURCHASE ORDER REF 55035810006
5734944100

ACCOUNT No. 3861

FRAME REF. W-DA90SK-H
'W' ALUMINIUM

OUTPUT	VOLTS	HERTZ	IC	AMPS	REV/MIN	POLES	RATING/DUTY	SEC.VOLTS	SEC.AMPS	PHASES	INSULATION	COS Ø	IP
.37 .75 KW	DUAL WOUND 415	50	IC411	1.00/ 1.58	1440/ 2870	4	S1			3	F	.72	55

LOCKED - ROTOR

CONN	VOLTS	AMPS	Nm	%FLT	%FLC
DOL	400	5.2	6.6	260	520

CALCULATION OF THE EFFICIENCY FROM THE SUMMATION OF LOSSES

TOTALLY ENCLOSED IP55 (HOSEPROOF)
IC411 FAN VENTILATED

PERFORMANCE FIGURES

OUTPUT kW	VOLTS	AMPS	INPUT kW	Hz	REV/MIN	Nm	EFFY %	P.F.	SLIP %
NO LOAD	400	0.63	0.063	50	1500				
0.185	400	0.78	0.270	50	1478	1.19	68.5	.500	1.48
0.277	400	0.87	0.380	50	1460	1.81	73.0	.630	2.67
0.370	400	1.01	0.503	50	1440	2.45	73.5	.720	4.00
0.466	400	1.15	0.638	50	1416	3.14	72.5	.800	5.60

COLD RESISTANCE

AMBIENT TEMP.°C	STATOR BETWEEN LINES	ROTOR BETWEEN RINGS
20.0	46.0 Ω	Ω

RESISTANCE @ 75 °C

STATOR BETWEEN LINES	ROTOR BETWEEN RINGS
55.9 Ω	Ω

TEMPERATURE RISES (°C) AFTER 5 HRS FULL LOAD

AMBIENT TEMP.°C	STATOR FRAME	STATOR WINDING	ROTOR WINDING	ROTOR RINGS
20.0	12.0	19.7		

OPEN CIRCUIT SEC.VOLTS	INSULATION RESISTANCE STATOR	INSULATION RESISTANCE ROTOR	HIGH-VOLTAGE (ONE MINUTE) STATOR	HIGH-VOLTAGE (ONE MINUTE) ROTOR	DATE OF ISSUE	ISSUED BY
V	50 MΩ	MΩ	2000 V	V	25/01/00	CDO

REMARKS

SECTION 10 PAGE 4

I CERTIFY THAT MOTOR No.(s)
J339329/31

IS/ARE REPRESENTATIVE OF THE SAME RATING AS THAT SHOWN ABOVE & IS/ARE ROUTINELY TESTED IN ACCORDANCE WITH INTERNATIONAL STANDARDS BEFORE DESPATCH FROM OUR WORKS. (PERFORMANCE FIGURES SUBJECT TO TOLERANCES)

Cert Ref. S316032
Int Ref. 00316032 01

ISO 9001

Certificate No FS 00623

BROOK Hansen

St.Thomas' Road, Huddersfield HD1 3LJ.
Telephone: (01484) 422150 Telex: 51388
Telefax: (01484) 510848

TYPE TEST CERTIFICATE

SUPPLIED TO

BRAN & LUEBBE LTD.,
SCALDWELL RD.,
BRIXWORTH,
NORTHAMPTON,
NN6 9EN

PURCHASE ORDER REF 55035810006
5734944100

ACCOUNT No. 3861

FRAME REF. W-DA90SK-H
'W' ALUMINIUM

OUTPUT	VOLTS	HERTZ	IC	AMPS	REV/MIN	POLES
.37 .75 KW	DUAL WOUND 415	50	IC411	1.00/ 1.58	1440/ 2870	2

RATING/DUTY	SEC.VOLTS	SEC.AMPS	PHASES	INSULATION	COS Ø	IP
S1			3	F	.88	55

LOCKED - ROTOR

CONN	VOLTS	AMPS	Nm	%FLT	%FLC
DOL	400	9.6	6.0	240	610

CALCULATION OF THE EFFICIENCY FROM THE SUMMATION OF LOSSES

TOTALLY ENCLOSED IP55 (HOSEPROOF)
IC411 FAN VENTILATED

PERFORMANCE FIGURES

OUTPUT kW	VOLTS	AMPS	INPUT kW	Hz	REV/MIN	Nm	EFFY %	P.F.	SLIP %
NO LOAD	400	0.75	0.098	50	3000				
0.371	400	1.08	0.50	50	2952	1.20	75.0	.670	1.60
0.555	400	1.25	0.71	50	2913	1.82	79.0	.820	2.89
.750	400	1.58	0.96	50	2870	2.50	78.0	.880	4.33
.926	400	1.95	1.22	50	2818	3.14	77.0	.900	6.07

COLD RESISTANCE

AMBIENT TEMP.°C	STATOR BETWEEN LINES	ROTOR BETWEEN RINGS
20.0	21.3 Ω	Ω

RESISTANCE @ 75 °C

STATOR BETWEEN LINES	ROTOR BETWEEN RINGS
25.9 Ω	Ω

TEMPERATURE RISES (°C) AFTER 5 HRS FULL LOAD

AMBIENT TEMP.°C	STATOR FRAME	STATOR WINDING	ROTOR WINDING	ROTOR RINGS
20.0	14.0	26.1		

OPEN CIRCUIT SEC.VOLTS	INSULATION RESISTANCE STATOR	INSULATION RESISTANCE ROTOR	HIGH-VOLTAGE (ONE MINUTE) STATOR	HIGH-VOLTAGE (ONE MINUTE) ROTOR	DATE OF ISSUE	ISSUED BY
V	50 MΩ	MΩ	2000 V	V	25/01/00	CDO

REMARKS 4/2 POLE D/W

SECTION 10 PAGE 4A

I CERTIFY THAT MOTOR No.(s)
J339329/31

IS/ARE REPRESENTATIVE OF THE SAME RATING AS THAT SHOWN ABOVE &
IS/ARE ROUTINELY TESTED IN ACCORDANCE WITH INTERNATIONAL STANDARDS BEFORE DESPATCH FROM OUR WORKS. (PERFORMANCE FIGURES SUBJECT TO TOLERANCES)

Cert Ref. S316033
Int Ref. 00316032 01

VALTAC LTD

SUBSIDIARY OF OSTACO A.G. SWITZERLAND

29 Upper Mills Estate, Bristol Road,
Stonehouse, Glos. United Kingdom, GL10 2BJ

VALTAC
FOR
VALVES & ACTUATORS

Telephone: +44 (0) 1453 825484
Fax: +44 (0) 1453 825771

11th JAN 2000

COMPANY: Bran & Luebbe (GB) Ltd

ADDRESS: Scaldwell Road
Brixworth
Northampton
Northamptonshire
NN6 9EN

NM/OL

CERTIFICATE OF TEST & CONFORMITY

The valves listed below which were supplied against your order dated:- 25/11/99
Reference no:- 57349419 and our Reference no:- 2046
have been tested and comply in accordance with the manufacturer's standards as given below:-

SIZE & FIG NO	ENDS	MATERIALS OF CONSTRUCTION			TEST PRESSURES	
		BODY	TRIM	SEAT	BODY	SEAT
6 x ½" 0151666NPT	CF3M	CF8M	316L	PTFE Virgin	63 bar	130 bar
3 x 1" 0251566TBWOD	CF3M	CF8M	316L	PTFE Virgin	63 bar	130 bar

letter of conformity

16 Caxton Way
Watford Business Park
Watford
Herts WD1 8UA
United Kingdom

tel +44 (0)1923 255433
fax +44 (0)1923 256427
www.waverley316.co.uk
info@waverley316.co.uk

WAVERLEY COMPONENTS AND PRODUCTS LTD

deliver to

BRAN AND LUEBBE
[G.B.] LTD.
SCALDWELL ROAD
BRIXWORTH
NORTHANTS
NN6 9UD
PART NO'S ON BAGS

transport	date	customer a/c no	customer order no
[illegible]	[illegible]	[illegible]	[illegible]

item no	description	unit	quantity	bin location
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		
	[illegible]			
[illegible]	[illegible]	[illegible]		
[illegible]	[illegible]	[illegible]		

Dear Sirs,
We confirm that the whole
the supplies detailed here
have been inspected, test
and unless otherwise state
conform in all respects to t
specification(s), drawing(s
contract/order relative the

Yours faithfully,
Waverley Components
and Products Limited

SECTION 10 PAGE 6

FINAL INSPECTION
*RELEASE/REJECT NOTE

FIRTOP FILTERS

*RELEASE / REJECT No:
FIR No. 7224
Date: 26.11.99

Distribution
Master File.....White
Recipient.....Blue

*B H E / Customer / Sub - Contractor: BRAN & LUEBBE GB LTD

P.O. No.: 5734941800 BHE Job Nos. 19275

ITEM	QTY.	TAG / EQUIP. No.	DESCRIPTION	MATERIAL
01	3		15MM (½") NB Y TYPE STRAINER, SCREWED	ST.ST.
			NPT (FEMALE), 40 MESH RETENTION.	
			YSF/CON/015/NPT/351	

CHECKLIST

CHECK	N/A	A	R	COMMENTS/REASON FOR REJECTION
CORRECT MATERIALS / SPECS. & IDENTIFICATION		✓		
DIMENSIONAL AND NOZZLE ORIENTATIONS CORRECT		✓		
ASSEMBLY / FITTING CORRECT		✓		
PRESSURE TEST / NDT COMPLETE & SATISFACTORY		✓		
CLEANLINESS (Internal and External)		✓		
FINISH (Flange Faces, M/C Faces, Painting etc.)		✓		
PRESERVATION (Corrosion Inhibitor applied)	✓			
PROTECTION & PACKING (Flanges, connections, Spec's)		✓		
DOCUMENTATION / REVIEW P.O. REQUIREMENTS		✓		

☐ **REJECTION** THE ABOVE ITEMS HAVE NOT BEEN ACCEPTED FOR REASONS SHOWN.

☑ **RELEASE** THE ABOVE ITEMS HAVE BEEN RELEASED FOR DESPATCH SUBJECT TO:
(List any specific requirements on Punch List)
SECTION 10 PAGE 7

☐ PART ORDER ☑ ORDER COMPLETE ☐ PUNCH ISSUED No.....

BARTON FIRTOP QA

By: D M SMITH
(PRINT NAME)
Signed:
Date: 26.11.99

BARTON FIRTOP ENGINEERING CO. LTD. QUALITY ASSURANCE DEPT.

CLIENT INSPECTION

By:-.....
Signed:.....
Date:.....

C.A./T.P.I. INSPECTION

By:-.....
Signed:.....
Date:.....

QD/FIR/01

BARTON FIRTOP ENGINEERING CO. LTD.

Registered Office:
STOKE HEATH WORKS, HANBURY ROAD
BROMSGROVE, WORCS B60 4LT
TELEPHONE: (01527) 831644
FAX: (01527) 832638 TELEX: 338180

TEST CERTIFICATE

CERTIFICATE No:-
L01/ 19275/1

CLIENT: BRAN & LUEBBE GB LTD

P.O No: 5734941800 **ITEM/TAG No:** ITEM 01

PROJECT: **FIRTOP JOB No:** 19275

TEST PRESSURE: 2000 PSIG **DURATION** 30 MINUTES

MEDIUM USED: MAINS WATER **TEMPERATURE:** AMBIENT (7°C MIN)

GAUGE SERIAL No: 15739:1

CALIBRATION CERTIFICATE No: 039808

HEAT/CAST IDENTIFICATION No: 8U (Cast Units Only)

TESTED BY: I HUNT **DATE OF TEST:** 26.11.99

This is to certify that the:

3 OFF 15MM ($\frac{1}{2}$") NB Y TYPE STRAINERS

SECTION 10 PAGE 8

subject to above conditions has been Hydrostatically Pressure Tested and has proved satisfactory.

BARTON FIRTOP QA	CLIENT INSPECTION	C.A.INSPECTION
By:- D M SMITH (PRINT NAME)	By:- ..... (PRINT NAME)	By:- ..... (PRINT NAME)
Signed:- Signed	Signed:-	Signed:- .....
Date:- 26.11.99	Date:-	Date:- .....

BARTON FIRTOP ENGINEERING CO. LTD. QUALITY ASSURANCE DEPT.

BARTON FIRTOP ENGINEERING CO. LTD

Registered Office
STOKE HEATH, HANBURY ROAD
BROMSGROVE, WORCS., B60 4LT
Telephone: (01527) 831644
(01527) 575211
Fax: (01527) 832638 Telex: 338180

CERTIFICATE No:-

LO3 19275/1

PROJECT: .....

CLIENT: BRAN & LUEBBE GB LTD

P.O. No: 5734941800

DESCRIPTION: Y TYPE STRAINERS

ITEM/TAG No's: ITEM 01

FIRTOP JOB No: 19275

CERTIFICATE OF COMPLIANCE

This is to Certify:

3 OFF 15MM ($\frac{1}{2}$") NB STAINLESS STEEL Y TYPE STRAINERS, SCREWED NPT (FEMALE), 40 MESH RETENTION

YSF/CON/015/NPT/351

HAVE BEEN MANUFACTURED IN ACCORDANCE WITH THE ABOVE REFERENCED PURCHASE ORDER AND ISO 9001, 1994.

	CAST NUMBER	CERTIFICATE NUMBER
BODY	8U	83376
CAP	C02	83376/2

SECTION 10 PAGE 9

BARTON FIRTOP ENGINEERING CO. LTD. QUALITY ASSURANCE DEPT.

Signed: ..... Date: 20.11.99

Print Name: Signed D M SMITH

Date .....

For and behalf of BARTON FIRTOP ENGINEERING COMPANY LIMITED.

QD02/01

MATERIAL TEST CERTIFICATE (EN 10204-3.1B)

Customer: BARTON FIRTOP ENGINEERING CO., LTD.

Order No: BN15617 Products Name: Y-STRAINER

Certificate No: 83376

Date: SEP.19'98 Page: 1

聯達實業有限公司
CONCORD INTERNATIONAL IND. LTD.

SECTION 10 PAGE 10

Chemical Composition%

Specification		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Ti	Nb			Material
Heat no	Material	MAX 0.08	1.50	1.50	0.04	0.04	9~12	18~21	2~3							Specification
8U	CF8M	0.045	0.943	1.14	0.034	0.004	9.95	18.14	2.49							Y-STRAINER 1/2" BODY
B8X	CF8M	0.039	0.926	1.15	0.033	0.005	9.86	18.51	2.34							Y-STRAINER 3/4" & 1" BODY
E01	CF8M	0.059	0.958	1.30	0.035	0.006	9.65	18.56	2.27							
F01	CF8M	0.057	0.943	1.29	0.036	0.004	9.68	18.71	2.25							Y-STRAINER 1" BODY
D8X	CF8M	0.043	0.893	1.08	0.034	0.004	10.0	18.45	2.33							Y-STRAINER 1" BODY
A8X	CF8M	0.041	0.864	1.10	0.032	0.004	9.58	18.40	2.38							Y-STRAINER 3/4" BODY
N8V	CF8M	0.048	0.964	1.30	0.032	0.005	9.55	18.35	2.39							Y-STRAINER 1" & 1-1/2" BODY
O8V	CF8M	0.046	0.970	1.31	0.028	0.003	9.33	18.20	2.55							Y-STRAINER 1-1/2" & 2" BODY
K8V	CF8M	0.041	0.918	1.31	0.035	0.006	9.90	18.40	2.39							Y-STRAINER 1-1/2" & 2" BODY
L8V	CF8M	0.040	9.400	1.22	0.031	0.004	9.61	18.34	2.42							Y-STRAINER 2" BODY
M8V	CF8M	0.039	0.907	1.19	0.032	0.005	9.74	18.42	2.32							Y-STRAINER 2" BODY
																Y-STRAINER 2" BODY

Heat Treatment

Method of Treatment	Holding Temperature	Holding Time	Cooling Medium
Solution	1120°C	2 hours	
	1180°C	4 hours	Nitrogen (Air)

Test Coupon:
Type of Specimen
Tensile Test:
Bending Test:
Impact Test:

Total: 960 PCS

Tensile Test Specimen
Gage Length
Diameter
Area

Mechanical Properties

Item of Test	Tensile Test				Hardness Test	Test Pressure	
Specification	Tensile Strength	Yield Strength	Elongation	Reduction of Area		Air	Hydrostatic
	Kg/mm²	Kg/mm²	(%)	(%)	(HB)		
Heat no / Material			60M/M				
8U CF8M	64.2	32.1	53.6		150~170	80 PSI	2000 PSI
B8X CF8M	63.2	33.0	52.0		150~170	80 PSI	2000 PSI
E01 CF8M	60.0	31.9	51.2		150~170	80 PSI	2000 PSI
F01 CF8M	63.3	32.0	55.0		150~170	80 PSI	2000 PSI
D8X CF8M	65.4	33.1	53.2		150~170	80 PSI	2000 PSI
A8X CF8M	64.9	34.2	54.1		150~170	80 PSI	2000 PSI
N8V CF8M	68.2	32.2	53.1		150~170	80 PSI	2000 PSI
O8V CF8M	61.2	32.1	52.0		150~170	80 PSI	2000 PSI
K8V CF8M	61.4	33.2	54.2		150~170	80 PSI	2000 PSI
L8V CF8M	62.5	34.1	52.3		150~170	80 PSI	2000 PSI
M8V CF8M	65.1	31.5	51.6		150~170	80 PSI	2000 PSI

Remarks

CERTIFIED TRUE COPY OF THE ORIGINAL
Signed .....
Date 26/11/98
BARTON FIRTOP Q.A.

Approval:
Inspector:

聯達實業有限公司 TEL:2797-2257 12254056

MATERIAL TEST CERTIFICATE (EN 10204-3.1B)

Customer: BARTON FIRTOP ENGINEERING CO., LTD.

Certificate No: 83376/2

Order No: BN15617 Products Name: Y-STRAINER

Date: ~~AUG 13 '99~~ Page: 1

聯達實業有限公司
CONCORD INTERNATIONAL IND. LTD.

Chemical Composition%

Specification		C	Si	Mn	P	S	Ni	Cr	Mo	Cu	V	Ti	Nb			Material
Heat no	Material	MAX 0.08	1.50	1.50	0.04	0.04	9~12	18~21	2~3							Specification
COZ	CF8M	0.063	0.979	1.230	0.037	0.004	9.91	18.36	2.42							Y-STRAINER 1/2" CAP
K5Y	CF8M	0.057	0.874	1.200	0.035	0.006	9.91	18.77	2.57							Y-STRAINER 1/2" CAP
AB	CF8M	0.059	1.020	1.030	0.027	0.010	10.57	18.88	2.31							Y-STRAINER 1/2" CAP 500PCS
M9G	CF8M	0.058	0.879	1.230	0.032	0.005	9.56	18.35	2.43							Y-STRAINER 3/4" CAP 200PCS

Heat Treatment

Method of Treatment	Holding Temperature	Holding Time	Cooling Medium
Solution	1120°C	2 hours	
	1180°C	4 hours	Nitrogen (Air)

Test Coupon:
Type of Specimen
Tensile Test:
Bending Test:
Impact Test:

Total: 900 PCS

Tensile Test Specimen
Gage Length
Diameter
Area

Mechanical Properties

Item of Test		Tensile Test				Hardness Test	Test Pressure	
Specification		Tensile Strength	Yield Strength	Elongation	Reduction of Area		Air	Hydrostatic
		Kg/mm²	Kg/mm²	(%)	(%)	(HB)		
Heat no	Material							

Remarks

CERTIFIED TRUE COPY OF THE ORIGINAL
Signed .....
Date 26/8/99
BARTON FIRTOP Q.A.

Approval:
Inspector:

Attn: Mr. Graham Usher
SECTION 10 PAGE 11

Y-Strainer

B.D.E. (Northampton) Ltd.

SUPPLIERS OF BREWERY & DAIRY EQUIPMENT

14 ROSS ROAD BUSINESS CENTRE, WEEDON ROAD INDUSTRIAL ESTATE, NORTHAMPTON, NN5 5AX
TEL: (01604) 750380 FAX NO: (01604) 750377

January 7th 2000

Bran & Luebbe Limited
Scaldwell Road
Brixworth
Northampton
NN6 9UD

Dear Sir,

We are writing to confirm that the goods supplied on your order number 5734931400, 5734943400 and 5734995100 are manufactured in 316 stainless steel.

Yours Sincerely.

Mr R.C.Lewis
Managing Director
B.D.E (Northampton) Limited

SECTION 10 PAGE 12

Bran & Luebbe Ltd
Scaldwell Road
Brixworth
Northants
NN6 9UD

PVL

Unit 9, Lexden Lodge,
Jarvis Brook, Crowborough,
East Sussex TN6 2EG

Tel: 01892 66 44 99
Fax: 01892 66 36 90
Website: www.pvl.co.uk

Certificate of Conformity

Your Order Number	5734941700
Our Reference Number	T 13709
Date	04.01.00
Item	Stainless Steel Level Switch
Quantity	3
Our Model Number	RFS-12P-2 SUS 304
Your Part Number	

MECHANICAL SPECIFICATION

Body Material	Stainless Steel Grade 304
Float Material	Stainless Steel Grade 316
Stem Thread Size	1/2" NPT (BSPT) Male
Float Specific Gravity	0.70 +/- 0.04
Float Maximum Pressure	5 Bar
Temperature Range	-40°C to +120°C

ELECTRICAL SPECIFICATION

Switch Rating	50VA DC/AC
Contact Resistance	max 200 mOhms
Maximum Switching Voltage	350 VDC/300VAC
Maximum Switching Current	0.5 Amp AC/DC
Insulation Resistance	10 m Ohms min

We hereby certify that the goods detailed above, conform with the requirements of the Contract/Purchase Order

Signed ..... **Date** 4.1.00

Signed ..... **Date** 4.1.00

SECTION 10 PAGE 13

PANEL FINAL INSPECTION CHECK SHEET

Orange

Job Number 9718 05 Serial No. 29634 Date 23 12 99

REFER TO "AS-BUILT" DRAWINGS, LAYOUTS & HANDBOOKS FOR INSPECTION

1. INSIDE PANEL

OJL 23

- ☑ *Data label fitted and completed with Serial No, Date, Job No and test stamps*
- ☑ *All test wires removed, all components in place, trunking lids fitted*
- ☑ *All components labelled, gland plates fitted, no loose items in panel*
- ☑ *Earth straps in place, all internal instrument covers fitted and secured*
- ☑ *All MCB and MPU trips to be left in OFF position*

2. OUTSIDE PANEL

OJL 23

- ☑ *Paint surface free of blemishes, indicator covers and actuators scratch-free*
- ☑ *Correct indicator and actuator colours*
- ☑ *All controls labelled, labels accurate, mounted squarely and scratch-free*
- ☑ *Interlocked isolator and door latches operate smoothly*
- ☑ *Panel and door sealing gaskets fitted, lifting eyes fitted - if specified*

3. OJL 23

- ☑ *Collect together, keys, special tools, configuration equipment supplied with items in the panel. Identify, bag and include on the panel delivery note.*
- ☑ *Make out a delivery note for panel and accompanying items*
- ☑ *Wrap the panel for protection whilst awaiting shipment*

Record deviations found during Inspection. Stamp Section 7.2 of DMCR and comment on any faults found.

SECTION 10 PAGE 14

PANELS FUNCTIONAL TEST SHEET

Orange

Job Number 9718/05 Serial No. 29634 Date 23/12/99

REFER TO "AS BUILT" ISSUES OF CIRCUITS AND LAYOUTS DURING TESTS

1. INCOMING CIRCUITS AND INTERNAL SUPPLIES - +/-10% of nominal supplies

Check correct voltage at main isolator and function of isolator
Check correct control supply at transformer, check control supply breakers
Check instrumentation and auxilliary supplies

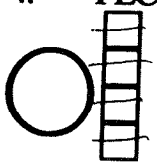
2. MAIN POWER CIRCUITS - +/-10% of nominal supplies

Fixed Speed Motors
Connect any motors to relevant terminals, or measure voltage with contactors energised
Variable Speed Drives
Refer to manufacture's guide and set up drive parameters
Check correct running using either the drive manual controls or injected signal

3. CONVENTIONAL CONTROL CIRCUITS

Connect up switches and indicators to simulate external plant
Check correct function of panel in AUTO mode, with reference to Handbook
Check correct function of panel in MAN mode, with reference to Handbook

4. PLC CIRCUITS



Toggle digital inputs and check appropriate channel indicators show
Check continuity of digital outputs from PLC
Check continuity of analog inputs and outputs
If possible force digital and analog outputs and read analog inputs using a programmer system

5. VOLT-FREE CONTACTS

Check wiring and sense of all volt free contacts out by switching relays

6. EMERGENCY STOP CIRCUITS

Check emergency stop circuits disable all relevant drives and latches

7. FAULT CIRCUITS

Check that internal and external fault circuits operate and can be reset

Record deviations from "as-built" drawings and other non-conformities in the test. Stamp section in 7.2 of DMCR and comment on faults

SECTION TO PAGE 15

PANELS SAFETY TEST SHEET

Orange
NORTHAMPTON ENGLAND

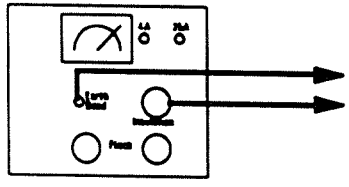
Job No. 9718 05 Serial No. 29634 Date 23 12 99 Test Equipment PAT 10+ Serial No. CE 1214

REFER TO "AS BUILT" ISSUES OF CIRCUITS AND LAYOUTS DURING TESTS

Complete sections on this and further sheets if necessary, for each circuit having terminals with a potential greater than 120V. All panel metalwork must be strapped to earth. Take care to isolate any sensitive electronic equipment, eg. VSD, PLC's, etc. before carrying out tests. A visual inspection of the circuits is recommended before proceeding with the following tests.

INSULATION TEST PAT101 (Test 3)

To check the insulation between each phase, phase and earth, and phase & neutral is greater than 20M Ohms. Place tick in box if above 20M Ohms and stamp section.

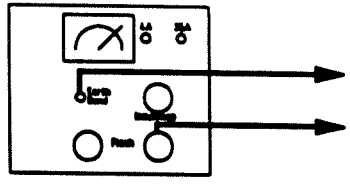


	Earth	Neutral	Phase 2	Phase 3
Phase 1	✓	—	✓	✓
Phase 2	✓	—		✓
Phase 3	✓	—		
Neutral	—		✓	✓
Motor Outputs	✓	—		
Supply Outputs	—	—		

Insulation test carried out by (stamp) OTL 23

Flash Test PAT101 (Test 6)

To check insulation on supply cabling to the control panel only, (at 1.5KV) for 60 seconds, is less than 4mA.

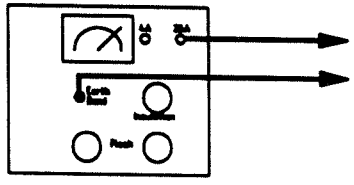


	Earth
Phase 1	✓
Phase 2	✓
Phase 3	✓
Neutral	—

Insulation test carried out by (stamp) OTL 23

Earth Bond PAT101 (Test 1)

Checking that all metalwork is correctly earthed. This test should first be carried out on the test leads & the resistance recorded. All other Earth bond tests should be less than 10m Ohms after subtracting the lead resistance



Test Lead Resistance	18
	Incomer Earth Terminal
Chassis Plate	✓
Door	✓
Terminal Rail	✓

Insulation test carried out by (stamp) OTL 23

Record any deviations from "as built" drawings and other non-confermities.

SECTION 10 PAGE 16

Steel

INSPECTION CERTIFICATE acc to
EN 10 204 3.1.B

INSPECTION STAMP
QA-TUBE

SANDVIK LTD
MANOR WAY
HALESOWEN
WEST MIDLANDS B62 8QZ
ENGLAND

Customer References

P419392 B

Customer order 1999-07-06

180-04357 T W METALS

Sandvik References

Order No.	Subs No.	ABSS Dispatch note
	42274	28032/54
ABSS No.	C.Code	
300-45215	03	

Material description
SEAMLESS STAINLESS COLD FINISHED
INSTRUMENTATION TUBING

Steel making process
Electric furnace

Steel/material Designations

Sandvik	AISI
3R60	TP316/TP316L

Technical requirements
ASTM A-213-95A AW, ASTM A-269-96
NACE MR 01-75

TW METALS
TEST CERTIFICATE CHECKED
Sig
Date 28/9/99

EXTENT OF DELIVERY

It	Product designation	Heat	Lot	Pieces	Kg	M
03	XTST-3R60-12.7-1.63 12.70 X 1.63	446879	37361	51	136.0	306.00
			Total	51	136.0	306.00

TEST RESULTS

Chemical composition (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
446879	0.014	0.41	1.72	0.029	0.008	17.33	12.88	2.57

Heat	Co
446879	0.11

Chemical composition, product (weight%)

Heat	C	Si	Mn	P	S	Cr	Ni	Mo
446879	0.011	0.41	1.72	0.029	0.007	17.36	12.89	2.56

Heat	Co
446879	0.11

SECTION 10 PAGE 17

Quality assurance - Anders Sjödén/QA Precision tube division
Anita Runsten / Certificates

Tensile test at room temperature

Lot	Yield strength N/mm2 Rp0.2	Tensile strength N/mm2 Rm	Elongation % 2"
37361	335	582	57
	333	582	59

Hardness test

Lot	Min HRB	Max HRB
37361	78.0	80.0

Following controls/tests have been satisfactorily performed:
- Flattening test
- Flaring test
- Material Identification with spectroscope
- Leak test: Eddy current test acc to ASTM A-450
- Visual inspection and dimensional control.

The number of tests is based on the size of the manufacturing lot before cutting to finished lengths.

The delivered products comply with the requirements of the order.

The material is manufactured according to a Quality system, approved and registered to ISO 9001.

The certificate is produced with EDP and valid without signature

SECTION 10 PAGE 18

B.D.E. (Northampton) Ltd.

SUPPLIERS OF BREWERY & DAIRY EQUIPMENT

14 ROSS ROAD BUSINESS CENTRE, WEEDON ROAD INDUSTRIAL ESTATE, NORTHAMPTON, NN5 5AX
TEL: (01604) 750380 FAX NO: (01604) 750377

January 6th 2000

Bran & Luebbe Limited
Scaldwell Road
Brixworth
Northampton
NN6 9UD

Dear Sir,

We are writing to confirm that the 2" Bends polished o/d, supplied on your order number 5735011800 are manufactured in 316L stainless steel.

Yours Sincerely.

P.P Mr R.C.Lewis
Managing Director
B.D.E (Northampton) Limited

SECTION 10 PAGE 19

Dairy Pipe Lines is a business name of Glynwed Pipe Systems Ltd.

Manufacturers of hygienic Stainless Steel fluid handling equipment.

Shire Hill
Saffron Walden
Essex CB11 3AX
England
Tel. 01799 522885 - Sales
Fax. 01799 525916 - Sales

Tel. 01799 520188 - Accounts
Fax. 01799 520183 - Accounts

DPL

FM 12289
ISO 9002

03/12/99 9:41:16

Certificate of Conformity

SIGNED ON BEHALF OF DAIRY PIPE LINES LTD.

DATE 6/12/99

The itemized goods detailed hereon have been produced, procured, inspected, tested and stored subject to DPL Quality System Procedures and in accordance with our BS EN ISO 9002 Part 2 registration. All items conform to the order and relevant specification as acknowledged by DPL.

Registered Office: Headland House,
New Coventry Road, Sheldon,
Birmingham B26 3AZ

Registered No.: 411732 England
VAT No. : GB 100 5835 13

DELIVER TO:

Bran & Luebbe Limited
Accounts Payable, Scaldwell Rd
BRIXWORTH
Northants.
NN6 9UD

OUR ORDER No.	YOUR ORDER REFERENCE	DATE RECEIVED	DATE REQUIRED	ORDER ANALYSIS DATA	ACCOUNT No.	DESPATCH No.
074122	5734963700	03/12/99	06/12/99	TW 0 01	BRA100	D/ 074122

W/H PRODUCT CODE	DESCRIPTION	QUANTITY	QTY. DESPATCHED	REMARKS
DP R151014	1.5"RJT HEXAGON NUT:304	3.0000	3	B034
INT	INTERLINK	1.0000		

SECTION TO PART 20