WIEGAND

MACHINERY WORLD

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WIEGAND

File 1

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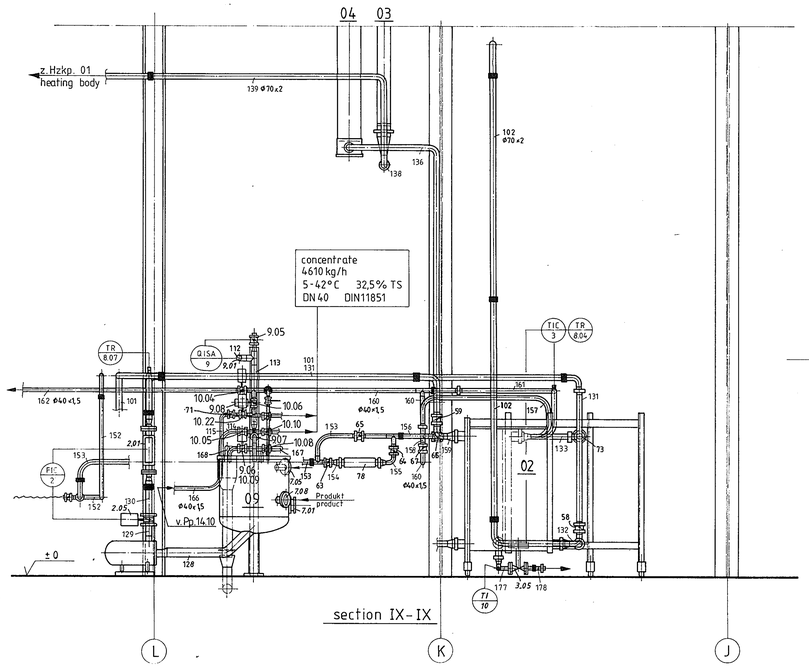

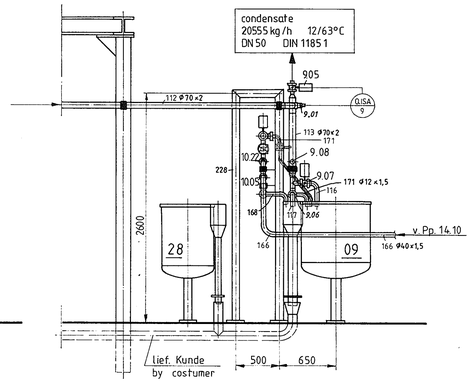

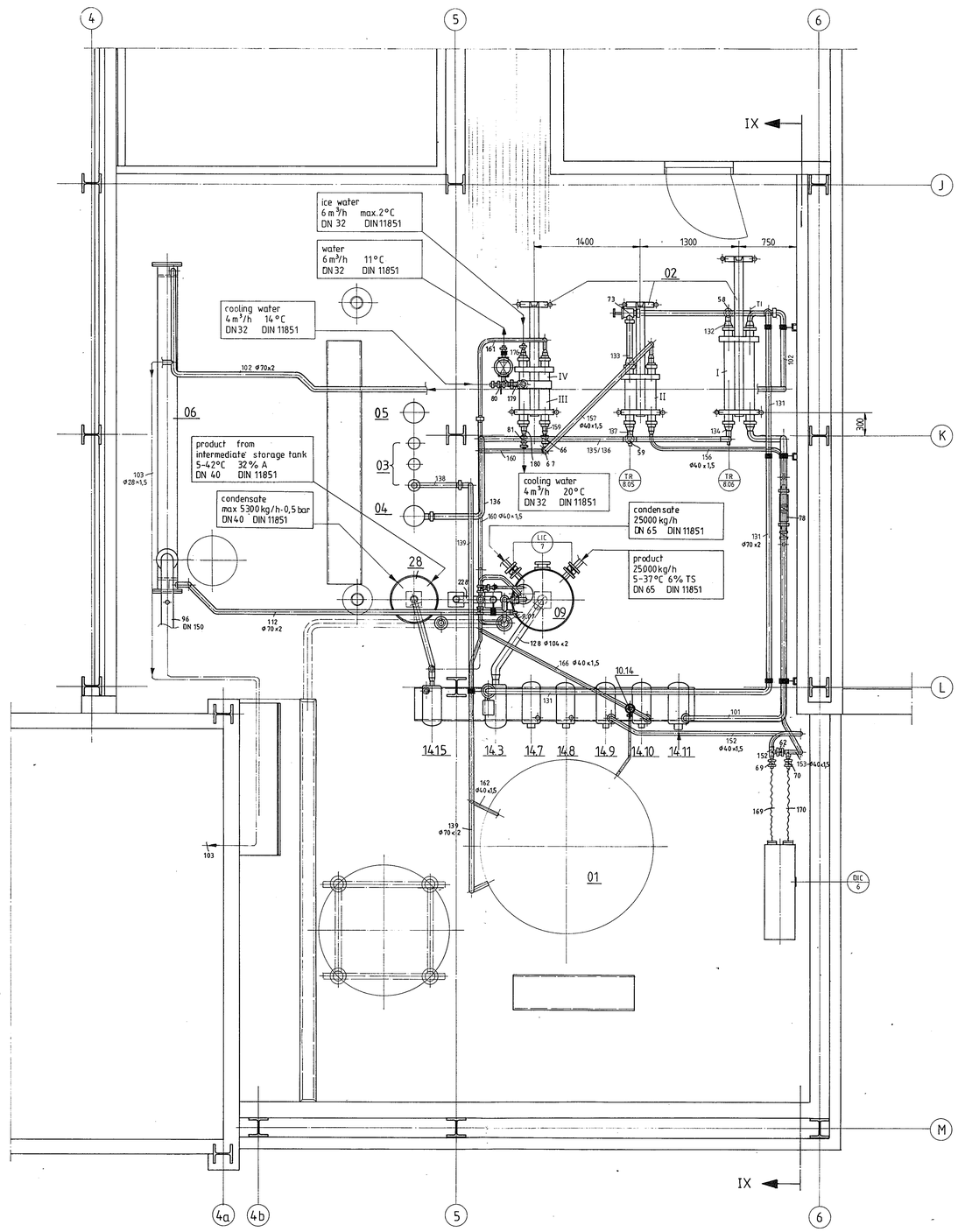

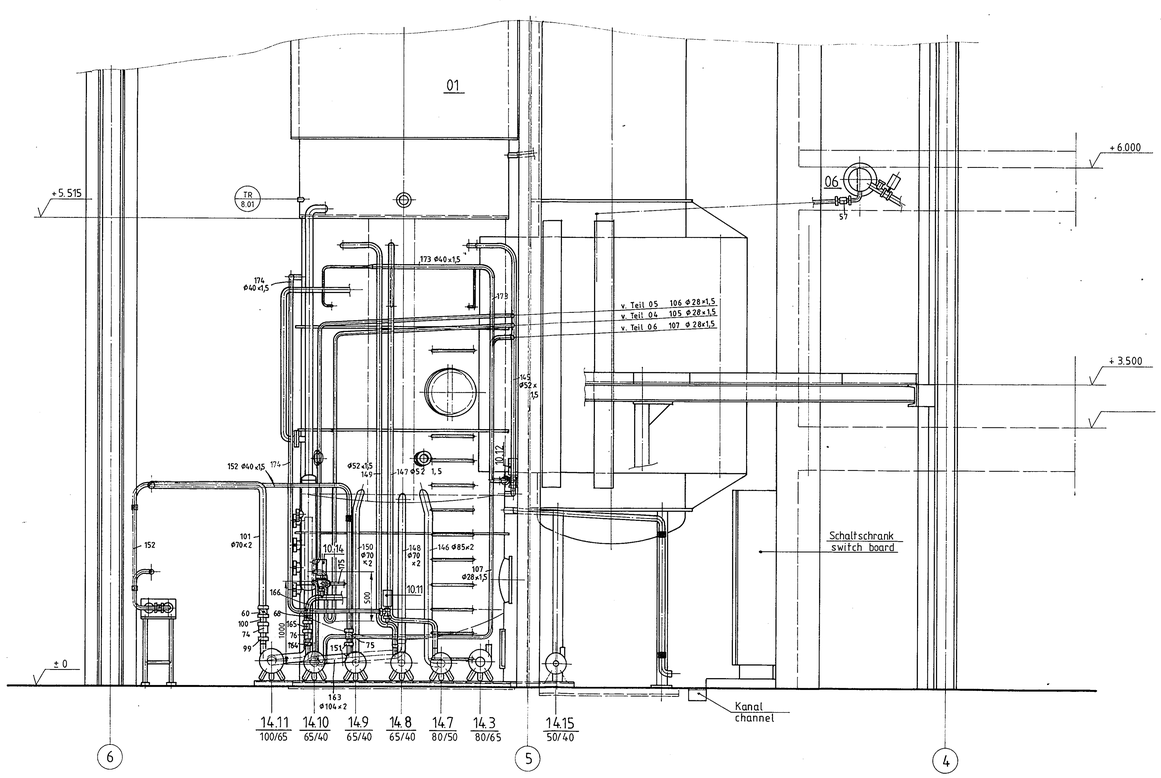

view X

MICROVERFILM?
19.01.1985

24. Jan. 1985

Blatt No. Recpl	Bezeichnung und Abänderung Description				Kd. Item No.	Zeichnung oder DIN-Nr. Drawing or DIN No.	Halbzeug Material	Gewicht nach DIN 50040 Certification	Bemerkung Remarks
1984	Datum Date	Name Name	Kom.Nr. Contract No.						
Gezeichnet Drawn	10.07.	Wie	2590-75-83.01 Maelor SDI						
Geprüft Checked									
Freigegeben Approved									
Maßstab Scale	1:25		View X section III+IX						
Änderung Alteration	Datum Date	Name Name							

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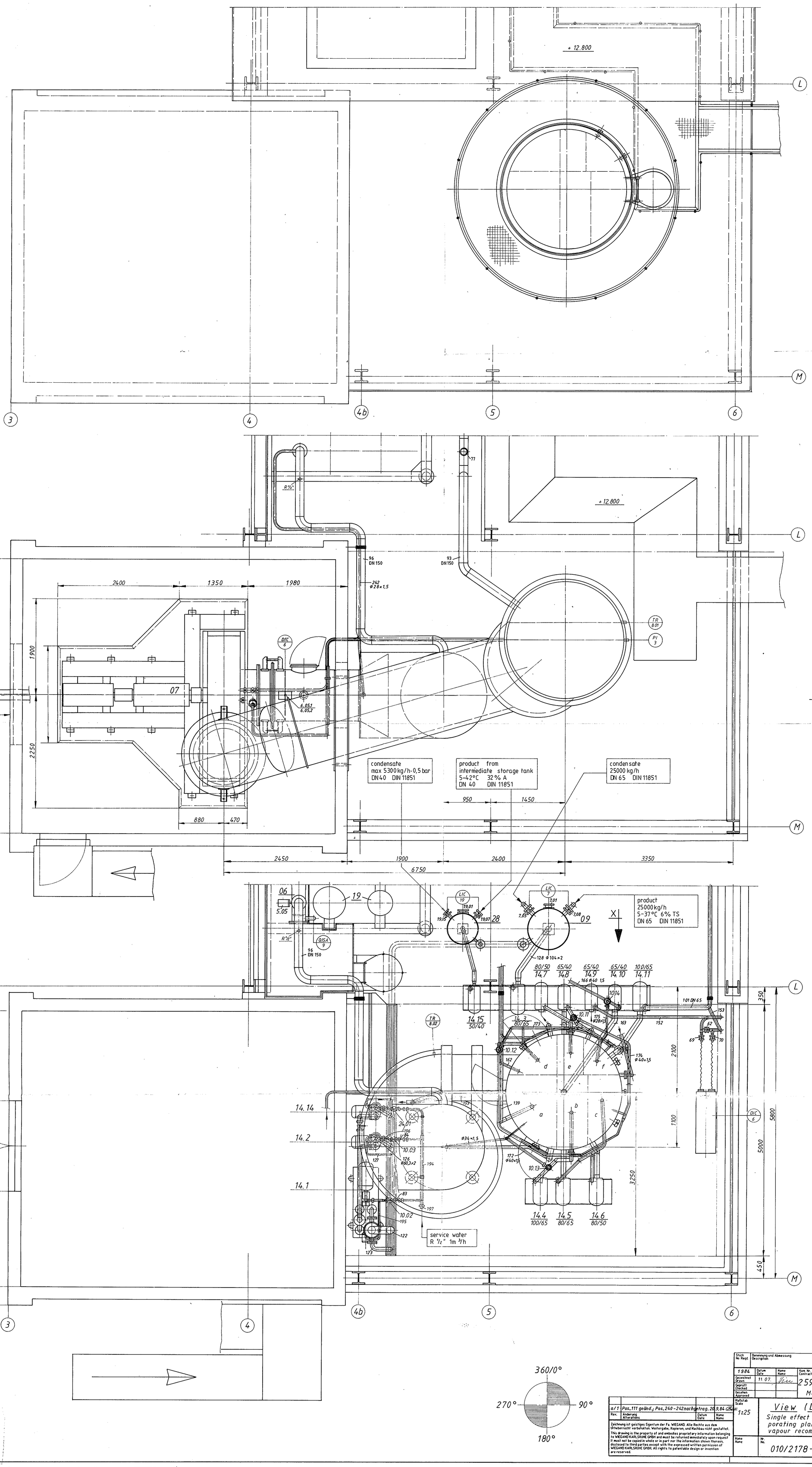
WIEGAND
Karlsruhe GmbH D-7505 Ettlingen

Name Name: Nr. No.: 010/2178-35
Rep.Nr. Rep.No.: 10-452
Ersetzt für Replaces
Ersetzt durch Canceled from
Zeichnung Nr. Drawing No.: 766-303-0
Ident-Zeichnung Nr. Related Drawing No.



24. Jan. 1985

Stück No. Reqd	Benennung und Abmessung Description	Teil Item No.	Zeichnung oder DIN-Nr. Drawing or DIN No.	Werkstoff Material	Zeugnis nach DIN 50049 Certification	Bemerkung Remarks
1984						

	Datum Date	Name Name	Kom. Nr. Contract No.
Gezeichnet Drawn	11.07.	Kuc	2590-75-83.01
Geprüft Checked			Maelor SDI
Gesehen Approved			

WIEGAND
Karlsruhe GmbH D-7505 Ettlingen

Rev.	Änderung Alterations	Datum Date	Name Name
a/1	Pos. 111 geänd.; Pos. 240-242 nachgetrag.	20.9.84	Chr

Maßstab Scale 1:25

View (Draufsicht)

Single effect falling-film-evaporating plant with mech. vapour recompresser

Zeichnung Nr. Drawing No. 764-303-0

Rev. a

Hierzu Zeichnung Nr. Related Drawing No.

Name Name

Nr. No. 010/2178-35

Reg. Nr. Reg. No. 10-449.1

Ersatz für Replaces

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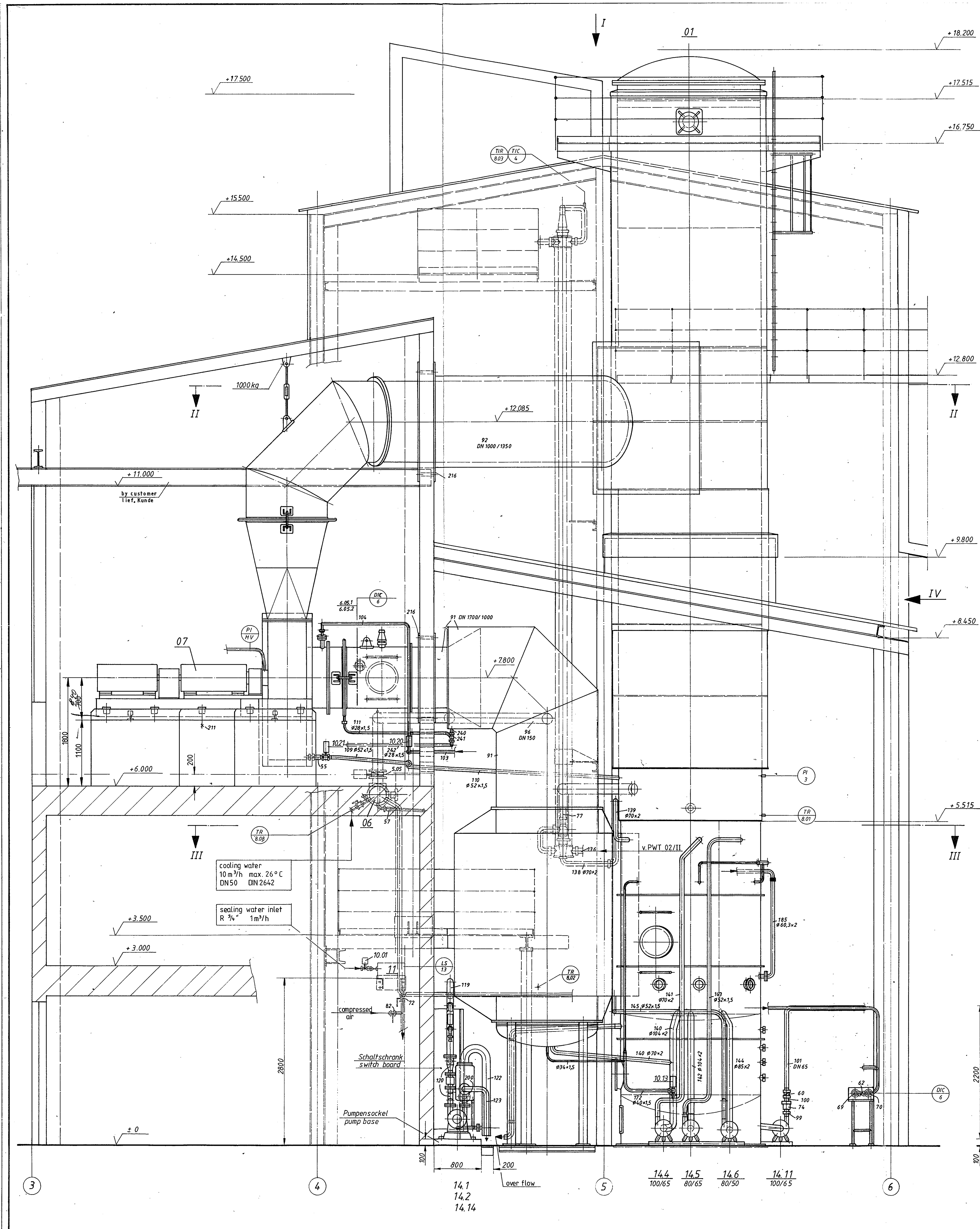

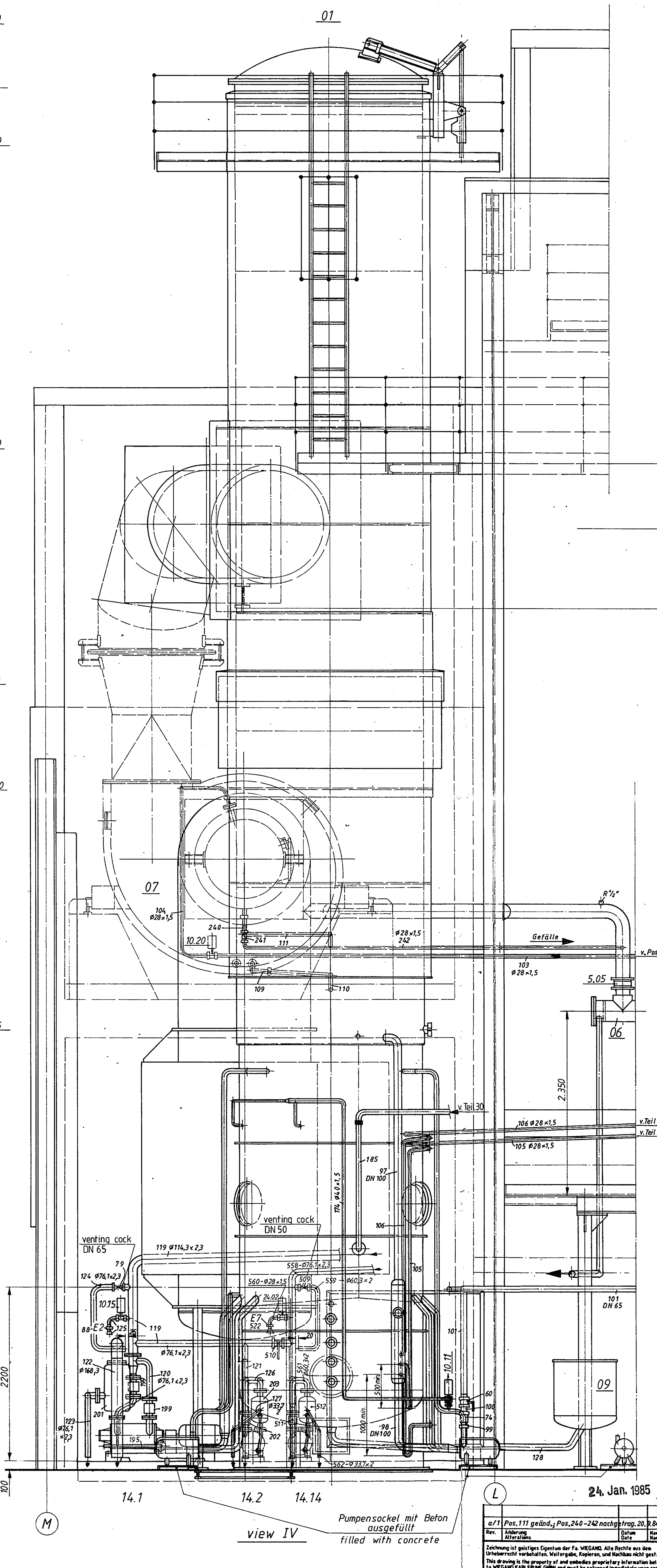

Orifice plates

de-aerating	E1 = φ	10 mm
	E2 = φ	8 mm
	E3 = φ	10 mm
	E4 = φ	8 mm
	E5 = φ	12 mm
	E6 = φ	5 mm
	E7 = φ	2 mm
condensate	K1 = φ	9 mm
	K2 = φ	5 mm
	K3 = φ	13 mm
	K4 = φ	5 mm

Orifice plates

condensate	K1 = φ	10 mm
de-aerating	E1 = φ	8 mm
"	E2 = φ	2 mm
steam	D1 =7× φ	13 mm
"	D2 = φ	3 mm

Stück No. Reqd.	Benennung und Abmessung Description	Teil Item No.	Zeichnung oder DIN-Nr. Drawing or DIN No.	Werkstoff Material	Zeugnis nach DIN 50049... Certification	Bemerkung Remarks
1	foundation plant		225-310-2a			
1	foundation plant		224-310-2c			
1	flow sheet (high concentr.)		515-302-0			
1	flow sheet		513-302-0			
1	arrangement drawg.		766-303-0			
1	arrangement drawg.		765-303-0			
1	arrangement drawg.		764-303-0			
1	arrangement drawg.		763-303-0			
	fitting and pipe list	35				
1	service platform	34	845-338-0	St/verz.		
1	platform +12.800, +14.500	33	847-338-0	St./verz.		
1	supporting frame	32	846-338-0	St./verz.		
1	water	31	A-558 d	St.		
1	steam distributor	30	186-328-2	St.		
1	condensate trap	29	767-329-2	1.4401	(1.4571)	
1	float balance tank	28	770-329-2	1.4401	(1.4571)	
1	flash vessel	27	263-326-2	1.4401	(1.4571)	
1	steam jet-vacuum pump	26	1053-334-4	1.4571		
1	thermo compressor	25	1292-333-4	1.4571		
1	thermo compressor	24	1290-333-4	1.4571		
1	surface condenser	23	520-323-1	1.4401	(1.4571)	
1	surface condenser	22	519-323-1	1.4401	(1.4571)	
1	straight tube preheater	21	625-324-1	1.4401	(1.4571)	
1	straight tube preheater	20	624-324-1	1.4401	(1.4571)	
1	3rd. effect evaporator	19	1204-313-1	1.4401	(1.4571)	
1	2nd. effect evaporator	18	1203-313-1	1.4401	(1.4571)	
1	1st. effect evaporator	17	1202-313-1	1.4401	(1.4571)	
1	local measuring instruments	16				
1	control equipment	15				
1	condensate pump	14.21	HYGIA - Bloc I/30a		5(3)kW	DN 50/40
1	concentrate pump	14.20	MOHNO-pump		2,2 kW	DN 65/65
1	intermediate supply pump	14.19	MOHNO-pump		2,2 kW	DN 65/65
1	intermediate supply pump	14.18	HYGIA - Bloc I/30a		4 kW	DN 50/40
1	intermediate supply pump	14.17	HYGIA - Bloc I/30a		4 kW	DN 50/40
1	intermediate supply pump	14.16	HYGIA - Bloc I/30a		4 kW	DN 50/40
1	feed pump	14.15	HYGIA - Bloc I/30a		3 kW	DN 50/40
1	vacuum pump	14.14			4 kW	
1	cooling water pump	14.13	HYGIA - Bloc II/30c		15(11)kW	DN 80/80
		14.12				
1	condensate pump	14.11	HYGIA - Bloc II/60a		7,5 kW	DN 100/65
1	concentrate pump	14.10	HYGIA - Bloc I/30a		3 kW	DN 65/40
1	concentrate pump	14.9	HYGIA - Bloc I/20b		3 kW	DN 65/40
1	intermediate supply pump	14.8	HYGIA - Bloc I/20b		2,2 kW	DN 65/40
1	intermediate supply pump	14.7	HYGIA - Bloc I/25b		3 kW	DN 80/50
1	intermediate supply pump	14.6	HYGIA - Bloc I/25b		3 kW	DN 80/50
1	intermediate supply pump	14.5	HYGIA - Bloc II/30b		4 kW	DN 80/50
1	intermediate supply pump	14.4	HYGIA - Bloc II/30b		4 kW	DN 100/65
1	feed pump	14.3	HYGIA - Bloc II/60a		7,5 kW	DN 80/65
1	vacuum pump	14.2	LPKA 30608		4 kW	
1	vacuum pump	14.1	LPHA 60527		18,5 kW	
1	condensate trap	13	765-329-2	1.4401	(1.4571)	
1	sealing water equiment	12	314-346-1			
1	sealing water tank	11	4-355-3	1.4401	(1.4571)	
1	concentrate tank	10		1.4401	(1.4571)	in item 01
1	float balance tank	09	764-329-2	1.4401	(1.4571)	
1	thermo compressor	08	1052-334-4	1.4571		
1	mech. vapour recompressor	07		V4A		
1	surface condenser	06	515-323-1	1.4401	(1.4571)	
1	straight tube preheater	05	617-324-1	1.4401	(1.4571)	
1	straight tube preheater	04	616-324-1	1.4401	(1.4571)	
1	double tube heater	03		1.4401	(1.4571)	
1	plate heat exchanger	02		1.4401		
1	1st. effect evaporator	01	1201-313-1	1.4401	(1.4571)	

24. Jan. 1985

1984	Datum Date	Name Name
Gezeichnet Drawn	06.07.	[signature]
Geprüft Checked		
Gesehen Approved		

Kom. Nr. Contract No. 2590-75-83.01
Maelor SDI

WIEGAND
Karlsruhe GmbH D-7505 Ettlingen

Rev.	Änderung Alterations	Datum Date	Name Name
a/1	Pos.111 geänd.; Pos.240-242 nachgetrag.	20.9.84	[signature]

Maßstab Scale 1:25

Single effect falling-film evaporating plant with mech. vapour recompressor

Zeichnung Nr. Drawing No. 763-303-0
Rev. a
Hierzu Zeichnung Nr. Related Drawing No.
Ersatz für Replaces
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Name Name
Nr. No. 010/2178-35
Reg. Nr. Reg. No. 10-448.1

2

3

4

Contents - LPH 60,000 and 70,000 series pumps

28 March 1996

O & M Reference No. 00.0701a.1.1

SIHI Pumps (UK) Limited, Bridgewater Road, Broadheath, Altrincham, Cheshire WA14 1NB. Tel:0161 928 6371 Fax:0161 928 3022

2. Brief description of equipment and operating limitations

2.1 General

SIHI liquid ring vacuum pumps are semi-positive displacement pumps of simple and robust construction. The shaft is mounted in ball bearings and sealing is effected by single mechanical seals or packing. The pumps are valveless, the only moving parts being the shaft and impeller assembly.

2.2 Principle of operation

The drawing below (Figure 2.1) is a cross section of a SIHI liquid ring pump showing the principle of operation.

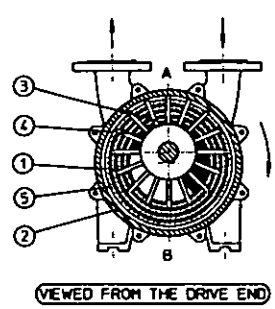
The impeller (1) rotates within the pump body (2) and is enclosed between two end plates. The suction opening (3) and the discharge opening (4) communicate with the suction and discharge nozzles of the pump.

Prior to start up the pump must be partially filled with a service liquid. On start up this liquid is flung outwards by the centrifugal force and forms a liquid ring (5) which rotates concentrically with the body.

Air chambers are formed between the impeller hub, the impeller blades and the liquid ring. These chambers increase in size during the rotation from A to B in the direction of the arrow and decrease in size from B to A. As the volume of the air chamber increases a depression builds up in them and air is drawn through the suction port (3). On further rotation the air chambers decrease again, the air is compressed and escapes through the discharge port (4). The principle of operation of the liquid ring pump is similar to that of a piston pump with the liquid enclosed between the impeller blades acting like a piston.

This method of operation allows the liquid ring pump to be used as a pump or as a compressor.

Figure 2.1



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2.3 Operating limitations

2.3.1 Application

The pump can handle any gases which do not affect the material of construction or the service liquid. Small quantities of liquid can be handled with the gases.

Medium handling:

maximum temperature: gas 100°C.

In the case of compressing condensable vapours a small quantity of incompressible gas during compression is required.

Service liquid:

maximum temperature: 80°C
maximum viscosity: 90 mm²/s

Pressures:

Using water with a temperature of 15°C as the service liquid and at a pressure of 1013 mbar at the pump discharge the lowest suction pressure economically achievable is approximately 33 mbar.

This value will change, if a different type of service liquid is used. SP(UK) will supply the pressures for other conditions given all the necessary physical properties of the service liquid e.g, vapour pressure, density, viscosity, temperature and gas solubility. Lower absolute pressures can be obtained by connecting SP(UK) gas ejectors in front of the pump.

Test and design pressures (pump and separator):

	Hydrostatic test pressure (overpressure) (bar)	Design pressure at 50°C (overpressure) (bar)
Liquid ring vacuum pump	3.0	---
Liquid ring overhead separator	1.0	0.5

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3. Safety information

3.1 General

3.1.1 SIHI Pumps sell fluid handling equipment for commercial and industrial applications.

3.1.2 All work on SIHI Pumps equipment must be carried out by suitably qualified personnel e.g., tradesmen, suitably trained site personnel etc. All local safety regulations must be followed.

3.1.3 Hazards can occur during lifting, installation, commissioning, operation and maintenance.

3.2 Lifting

3.2.1 When lifting any equipment take the following precautions. Failure to do so could result in the equipment swinging or falling and causing injury.

3.2.2 Check the lifting equipment to be used is adequate to take the weight of the supplied equipment. This weight will generally be shown on the despatch note or it can be obtained from SIHI Pumps.

3.2.3 Use lifting holes or lugs on the baseplate when fitted. Alternatively use slings around major cast components. If in doubt consult SIHI Pumps.

3.2.4 Never use a motor eyebolt for lifting a pump set. Motor eyebolts are for lifting motors only.

3.3 Installation

3.3.1 When installing the equipment take the following precautions.

3.3.2 Read the installation instructions in this manual.

3.3.3 Ensure pipework attached to the equipment does not exert an excessive load on the nozzles. Excessive loads can cause failures in casings resulting in leakage. If the fluid to be handled is hot, toxic, poisonous or corrosive it could cause injury. Excessive loading will result if pipework has to be "forced" into position using levers or drawn into position with the bolts. Inadequate support can also cause excessive loading. Maximum allowable forces and moments can be calculated for all nozzles dependent on type, size and material. If in doubt contact SIHI Pumps.

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3.3.4 Ensure supply cables to electric motors are capable of supplying full load current (as shown on the motor nameplate) without overheating or producing an undue voltage drop. Ensure all terminals are tightened securely. The pump unit shall be protected by an earth terminal against the build up of positive charge. The earth terminal shall be connected directly to an earth conductor. Unbonded pipe connections shall not be considered as providing a continuous earth path. Conductors shall be adequately sized for the maximum power load and insulated against the supply voltage and its tolerances, and be unambiguously identified by means of colour or other indicators (EN 60204-1 clauses 6,7,8,14,15 and 18). Failure to install the power supply in this manner could cause an electric shock or fire.

3.3.5 Pumps operating at elevated temperatures.

Steps shall be taken to minimise contact with or to warn operator/users of any surface which in normal operation will achieve a temperature exceeding those set out in the table below.

Maximum permitted temperature for unprotected accessible surfaces on the pump/pump unit during normal operation

	Surfaces required to be touched in normal operation, or which may be touched unintentionally in a restricted zone[1)]	Surfaces which may be touched unintentionally in an unrestricted zone
Metal[2)]	68°C	80°C
Ceramics	73°C	84°C
Plastic	80°C	90°C
1)	This table recognises that if a touched surface is in a position where withdrawal action may be delayed by restriction to movement (a restricted zone) the contact time may be extended unwillingly and a lower maximum temperature should be required.	
2)	Painted or unpainted	

3.4 Commissioning

3.4.1 Commissioning procedures should ensure that any safety hazards which can be removed prior to operation are removed. SIHI Pumps offer a commissioning service.

3.4.2 Read any special commissioning instructions included in this manual.

3.4.3 There is always a possibility of leakage from any fluid handling device. If the fluid being handled is hot, toxic, poisonous or corrosive then any leakage could be hazardous to health. Special safety precautions may be necessary in such cases.

3.4.4 When working on the equipment ensure the driver is isolated electrically and hydraulically and there is no possibility of it being started remotely.

3.4.5 In some installations it is possible for a pump to rotate due to fluid flowing through it, even though it is electrically isolated. Check and ensure that this does not happen.

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3.4.6 Ensure there is no possibility of the equipment operating outside its design parameters. This could lead to catastrophic failure.

3.4.7 Ensure that force is not necessary to connect the pipework to the pump as this causes excessive loads on the nozzles.

3.4.8 Ensure all joints are tight and that the system is pressure tested.

3.4.9 Ensure that any leakage of vapour from pump seal areas will be safely piped away, especially if it is hazardous to health.

3.4.10 If it is necessary to prime a pump by manually rotating the coupling, proceed as follows. Isolate the electrical supply to the motor ensuring it cannot be accidentally reconnected. Remove the coupling guard and turn the coupling to prime the pump. Replace the coupling guard. Reconnect the power to the motor.

3.4.11 Avoid sudden surges of hot fluid causing undue stress and possible failure to casings.

3.4.12 Open up valves gradually to ensure gradual temperature changes.

3.4.13 Packed gland pumps should be stopped whilst adjusting packing. If packed gland pumps must have the gland adjusted whilst the pump is running, take great care during this operation and where guards have to be removed ensure they are replaced after the adjustment has been made.

3.5 Operation

3.5.1 Take the following precautions to prevent injury from dangerous fluids, electrical shock or rotating parts.

3.5.2 Read the operation instructions in this manual.

3.5.3 Do not remove guards without ensuring the equipment cannot be started accidentally.

3.5.4 Keep the equipment clean and dry.

3.5.5 When washing down keep any water well away from any electrical connections or electrical devices unless they are hose proof.

3.5.6 Never operate the equipment outside the design limits. If in doubt contact SIHI Pumps with the equipment serial number.

3.5.7 If there is a danger of the product freezing whilst the equipment is not in operation drain it down.

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3.6 Maintenance

3.6.1 Read the maintenance instructions in this manual.

3.6.2 Electrically and hydraulically isolate the equipment before starting any work to ensure the equipment will not start accidentally.

3.6.3 Valve off all pipework before removing the equipment. This will prevent any injury from hot, toxic, poisonous or corrosive fluids after the equipment is removed.

3.6.4 Drain or collect any hot or dangerous fluid from the system before removing the equipment to prevent it causing injury to personnel.

3.6.5 Flush out any equipment handling fluids hazardous to health before dismantling. This will prevent injury to maintenance personnel.

3.6.6 Flush out any equipment handling flammable fluids with an inert gas before dismantling. This will prevent an explosive atmosphere being built up.

3.6.7 When replacing parts in the pump check that they are free from burrs to prevent injury during handling.

3.6.8 When using heat (eg., from a welding torch) to dismantle parts be careful not to overheat materials (e.g., paint, galvanic coatings) which could give off dangerous fumes or materials (e.g., Viton, PTFE, jointing compound) which could decompose into dangerous substances.

3.6.9 Use only genuine SIHI Pumps spare parts.

3.6.10 Prior to start up purge the air from any equipment which has been opened and which will handle flammable fluids. This will prevent an explosive mixture being formed.

3.6.11 Ensure all guards are replaced before restarting the equipment.

3.7 Noise

Equipment supplied by SIHI Pumps will normally have a noise level of less than 85 dB(A) LEP,d. If this limit is likely to be reached or exceeded information will be provided.

3.8 Change of duty/modifications

3.8.1 Equipment is usually supplied against a set of system conditions specified by the customer. If these conditions change significantly, especially in terms of pressures, temperatures or more aggressive media a safety hazard could develop. If the duty is to be changed consult SIHI Pumps to ensure the equipment will be safe.

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3.8.2 Modifications to mechanical seals, couplings, or guards etc., could also create a safety hazard. If a mechanical or electrical modification is to be made consult SIHI Pumps to ensure it will be safe.

3.9 Substances hazardous to health

3.9.1 General

Under normal conditions, pumps, valves and other equipment supplied by SIHI Pumps offer negligible risk to health. The substances listed in the following paragraphs may be present in SIHI equipment dependent on the specific product.

Good working and industrial hygiene practices should always be followed to keep risks to a minimum. If in any doubt about any substance contained in any SIHI product contact our Service Department.

3.9.2 Lubricating oils and greases

Care should be taken to avoid prolonged or repeated contact with the skin, eyes or mucous membranes. The quantities involved in SIHI equipment are very low and the risk of contact is minimal.

3.9.3 Corrosion inhibitor

Some equipment is despatched with a small quantity of corrosion inhibitor inside. The risk of any contact is minimal and only prolonged or repeated contact will constitute a hazard.

3.9.4 PTFE

PTFE can decompose at temperatures above 260°C to produce gases which can be hazardous to health. SIHI Pumps do not use PTFE on equipment intended for use at or above this temperature.

The possible contamination of tobacco with PTFE should be avoided as smoking is then a possible cause of fume fever (a syndrome with influenza type features).

3.9.5 Viton

Viton can decompose at temperatures above 300°C to produce hydrofluoric acid which is hazardous to the health. SIHI Pumps do not use Viton on equipment intended for use above this temperature.

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3.9.6 Asbestos

Some gaskets and some types of gland packing contain asbestos. Asbestos dust is hazardous to the health if inhaled. The presence of binding agents ensures these components are unlikely to give rise to significant levels of dust as a result of normal handling, fabrication or fitting. However, the following precautions should be observed.

If any cutting, drilling or scraping is necessary dampen the material and, to reduce dust, use only hand tools or low speed power tools.

If the components have become embrittled during use, dampen them before removing.

Remove any dust and loose debris by a dustless method (e.g., industrial vacuum machine fitted with a suitable exhaust filter).

Waste should be damped, placed in a sealed container and marked to ensure safe disposal.

3.9.7 Jointing compound

Compounds used and supplied by SIHI Pumps will not normally present a hazard to customers. The quantities involved are very small. Most compounds decompose at 400°C to produce acetic acid which is hazardous to the health. SIHI Pumps do not use jointing compound on equipment intended for use at or above this temperature.

When using jointing compounds ensure the area is well ventilated to prevent a build up of solvent fumes. Fumes can irritate the eyes and air ways. Avoid ignition from naked lights, smoking, electric tools etc. The compound can irritate eyes and skin so contact should be avoided.

3.9.8 Anti-seize paste

This paste can irritate the eyes and skin so contact should be avoided. The quantities involved are very small and the risk is negligible if the normal precautions used in dismantling equipment are followed.

3.10 Pump sealing

Whilst packing and mechanical seals are selected to be suitable for the duty specified it should be noted that (normally) packing and single mechanical seals offer no containment of the product in the event of failure.

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4. Handling and storage information

4.1 Handling

4.1.1 Read the safety instructions in this manual.

4.1.2 When slings are used to lift any equipment they must be positioned so as not to damage vulnerable parts e.g., motor cowl, seal harness etc.

4.2 General note on storage

4.2.1 Equipment should be stored in warm dry conditions free from vibrations which can damage bearings.

4.2.2 It may be necessary to disconnect a pump from its prime mover to enable it to be rotated, in which case electric motor shafts should be turned by hand on a regular basis (see paragraph 4.3.3).

4.2.3 On jobs with extended warranty, SIHI reserve the right to visit the storage site, before commissioning, to inspect the equipment and replace any parts as necessary, at the customers expense.

4.2.4 Failure to comply with these storage instructions will render the warranty void. Warranty conditions are shown in our Conditions Of Sale.

4.3 Storage up to six months

4.3.1 For pumps, drain all water and pour in a protective fluid (e.g., Vaporol). Ensure the instructions issued by the protective fluid supplier are followed.

4.3.2 Protect any exposed parts which may suffer from corrosion.

4.3.3 Rotate shaft five to ten times once every two weeks and record the date on a label attached to the equipment.

4.3.4 On helical rotor pumps where the rotor is made of Cr.Steel (DIN 1.2436) we recommend removing the stator and coating the rotor with grease.

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4.4 Storage over six months, up to two years

4.4.1 Remove pump mechanical seals or gland packing.

4.4.2 If applicable thoroughly clean and encapsulate mechanical seals.

4.4.3 Seal gap between shaft and seal seat with oiled paper or cloth. Lightly oil all accessible parts and if applicable fill pedestal with oil.

4.4.4 For pumps, drain all water and pour in a protective fluid (e.g., Vaporol). Ensure the instructions issued by the protective fluid supplier are followed. Seal flanges with tape and ensure they are airtight.

4.4.5 Enclose the equipment within a heavy gauge polythene sheet to form an air tight cover as far as is possible. A supply of desiccant such as silica gel should be included inside the enclosure.

4.4.6 Rotate the shaft five to ten times once every two weeks and record the date on a label attached to the equipment.

4.4.7 Once every six months dry or replace the desiccant. Check the equipment for moisture and pour new protective fluid into the pump.

4.4.8 On helical rotor pumps the stator should always be removed if shutting down for longer than one year, this prevents pressure joints in the elastomer.

4.5 Storage over two years

4.5.1 Storage over two years can require special instructions dependent on pump type. Please consult SIHI Pumps for further details.

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5. Installation

5.1 Code letter for Figures 1 to 4b

A	Waste liquid
B	Service liquid
F	Make-up liquid
K	Cooling liquid
U	Circulating liquid
MI	Medium handled - suction side
MII	Medium handled - discharge side
PF	Liquid pump
PG	Vacuum pump
XBa	Overhead liquid separator
XBp	Liquid separator
bK	Heat exchanger
hF	Shut off valve
hK	Shut off valve
iF	Regulating valve
iK	Regulating valve
iU	Regulating valve

1B	Service liquid line
1F	Make-up liquid line
1K	Cooling liquid pipeline
1MI	Suction pipeline
1MII	Discharge pipeline
mB	Manometer vacuum gauge
mU	Level gauge
t	Thermometer
tMI	Non-return valve
uA	Overflow
uB	Connection for service liquid
ue	Drain plug
u1	Connection for vent cock
uMI	Suction orifice
uMII	Discharge orifice
umI	Connection for level gauge
uSe	Plug for dirt disposal
uU	Connection circulating liquid .

5.2 Installation of the pump set (see figures on following pages for connections)

5.2.1 Ensure that all protective covers, bungs etc., are removed from the pump connections.

5.2.2 The pump should be installed in well ventilated conditions.

5.2.3 A minimum of 150mm between the motor fan cowl and the nearest obstruction is required to ensure adequate air flow to cool the motor.

5.2.4 The pipework should be installed and supported in such a way that it does not introduce stress into the pump casing. When this is impracticable we advise the use of flexible connections.

5.2.5 Sharp bends and abrupt changes in pipe diameter should be avoided particularly on the suction side of the pump.

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5.2.6 Joint rings should not be allowed to intrude into the pipework bore.

5.2.7 The bore of the suction and discharge pipes and all liquid lines, must not be smaller than the corresponding pump connections. Before putting the pump into operation check the pipework for leaks.

5.2.8 For alignment of couplings or belt drive see section 11.

5.2.9 A non return valve must be installed into the suction line and in the case of vacuum service an air supply cock at connection (u1).

5.2.10 A shut off device should be installed in the suction line and the pump is not to be put, or kept in operation while this shut off device is closed. Air has to be admitted via the air supply cock.

5.2.11 The discharge line must not run vertically or slope upwards by more than 1m.

5.2.12 The direction of rotation of the shaft and the flow direction of the gas are indicated by arrows on the pump casing.

5.2.13 If a shut off device is installed in the discharge line or in the discharge line of the liquid separator, ensure that the pump is not put, or kept in operation when the shut off device is closed.

5.2.14 When slings are used to lift pump/motor combinations, they are to be positioned so as not to damage vulnerable parts i.e., motor cowl, seal harness etc.

5.2.15 The system must be installed so that the liquid level should not be higher than the centre line of the pump.

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Figure 1

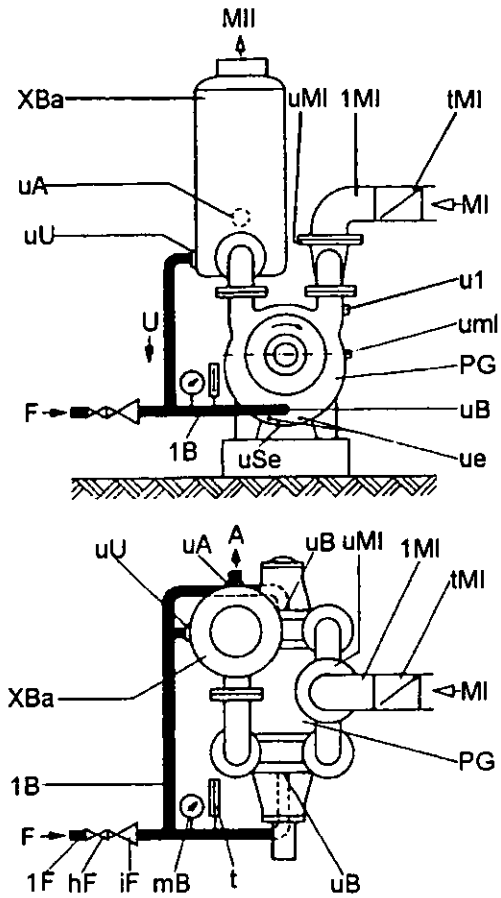
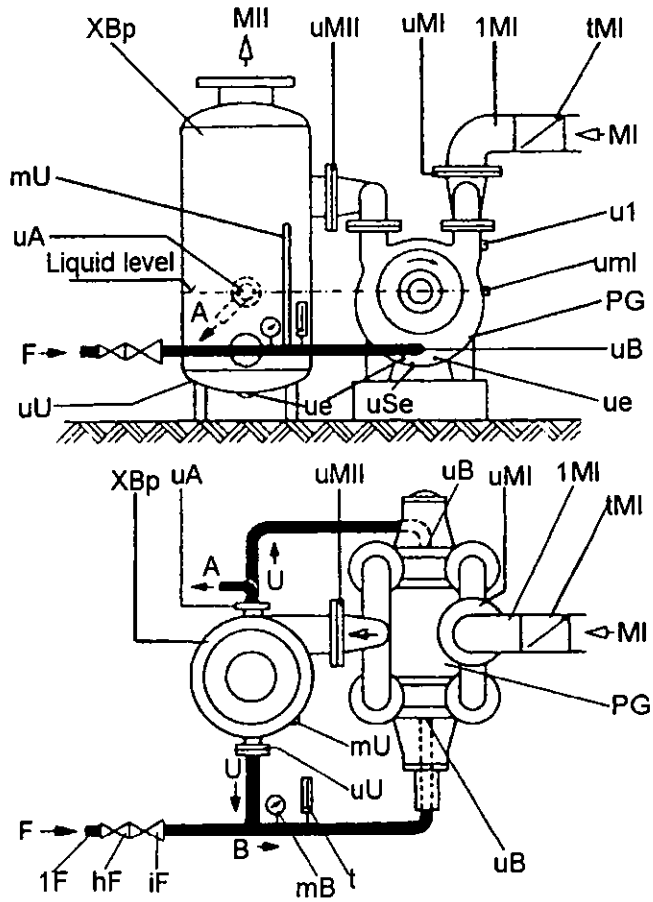


Figure 1a



Thermometer

Pressure gauge

Liquid pump

Non return valve

Solenoid valve

Gas flow

Regulating valve

Shut-off valve

Automatic pressure reducer

Thermostatic regulation valve

Float valve

Liquid flow

15 June 1995

O & M Reference No. 05.0701a.3.5

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Figure 2

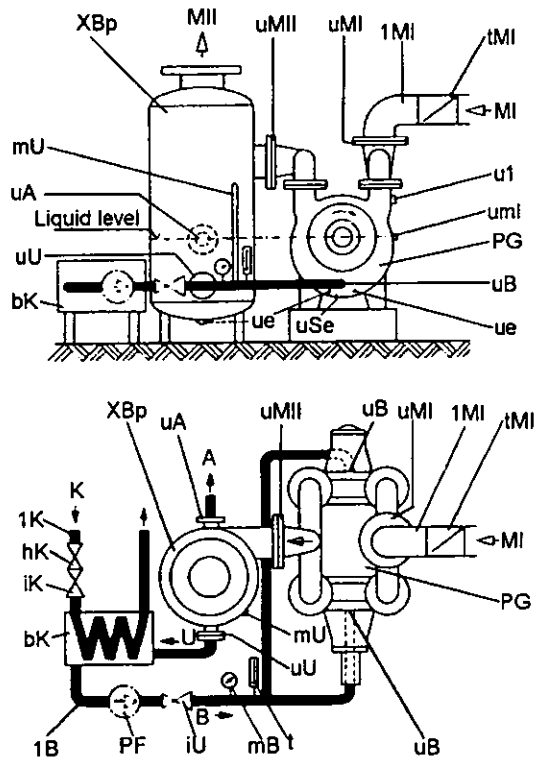


Figure 3

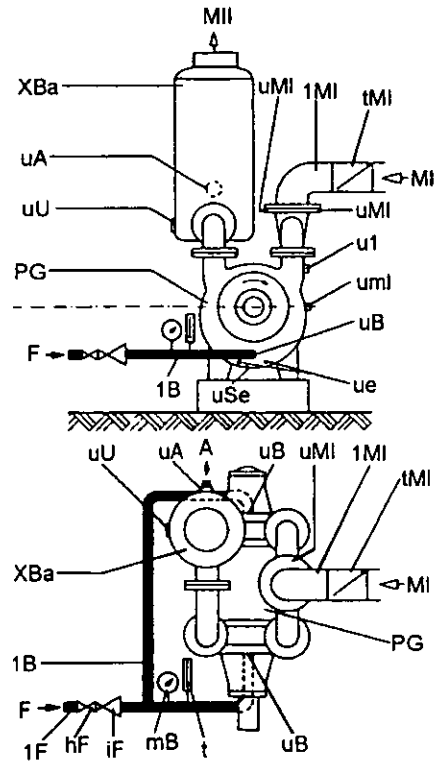


Figure 3a

Scheme for set up with container placed on side

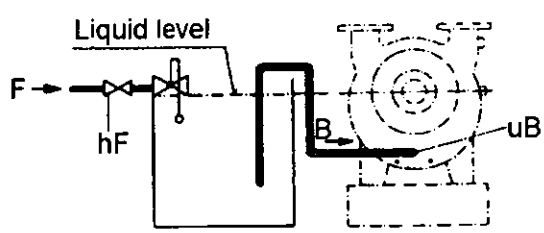
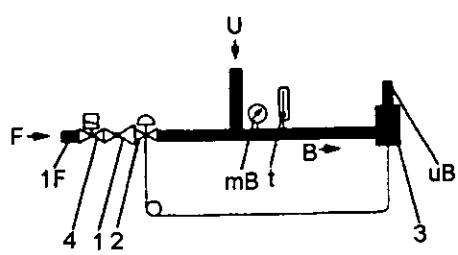


Figure 4

Scheme for thermostatically controlled service liquid temperature



1 Automatic pressure reducer
2 Thermostatic regulating valve
3 Temperature probe
4 Solenoid valve

22 October 1996

O & M Reference No. 05.0701a.4.5

Arrangement of connections

Figure 4a - LPH 60520, 60527, 70520, 70540

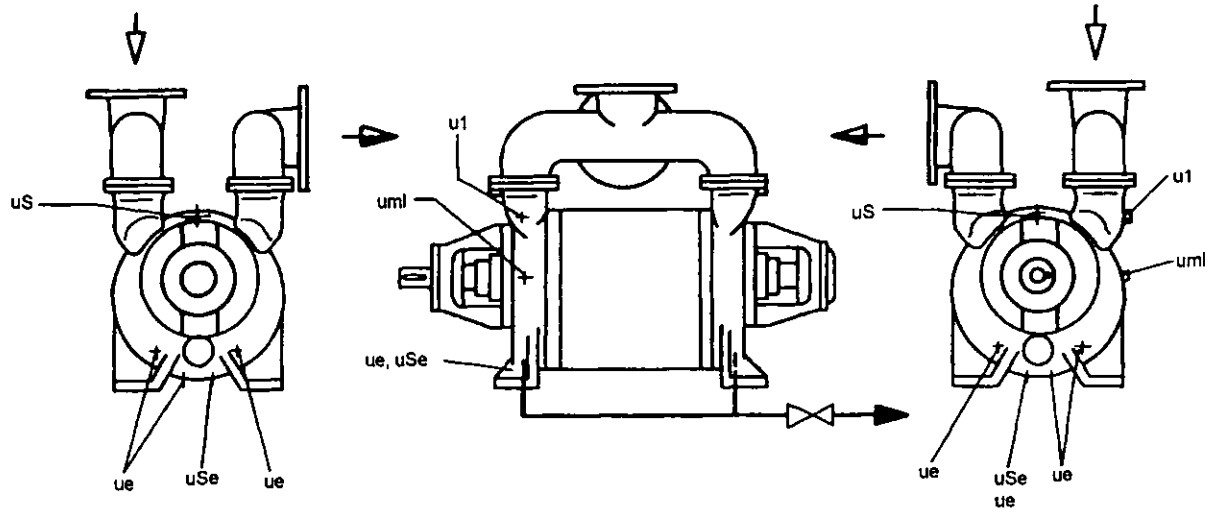
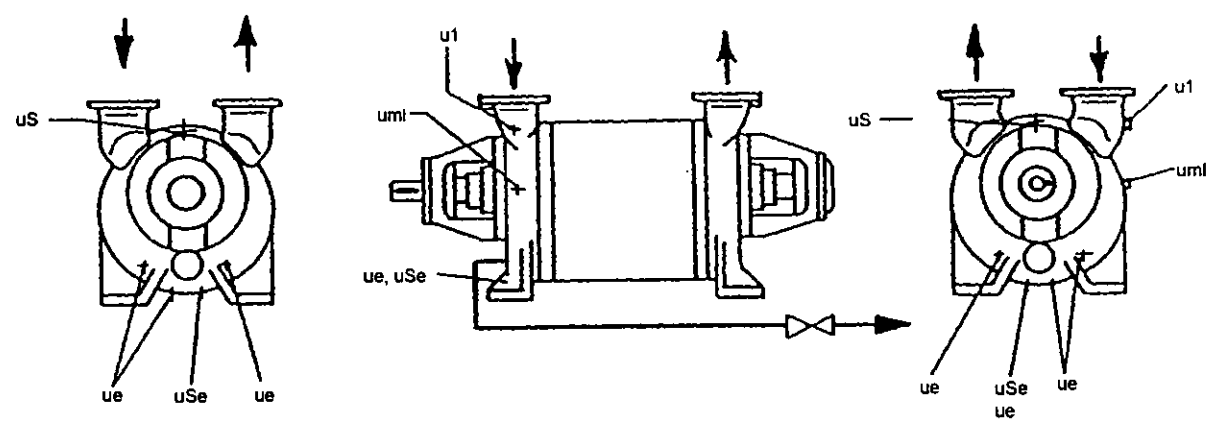


Figure 4b - LPH 70123



us	External seal flush if required
ue	Pump drain
uSe	Fine particles drain if required
uml	Connection for liquid level valve (supplied by customer)
u1	Connection for vacuum breaker cock (supplied by customer)

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6. Commissioning of equipment - vacuum pumps

6.1 Objective

The objective of commissioning equipment is to establish that the requirements necessary to ensure safe and satisfactory operation, and to avoid premature failure have been met.

6.2 Safety

Read the safety instructions in this manual.

6.3 General

6.3.1 Normally, during installation, all bungs, covers etc., will have been removed from the various connections, the coupling alignment will have been checked and adjusted, the pipework will have been checked for misalignment and the baseplate levelled, bolted down and grouted. However, if there is any doubt the commissioning engineer should arrange for these items to be checked.

6.3.2 Ensure the pump is filled with service liquid up to shaft level. This will allow it to operate and provide lubrication in the seal area. **Note: some mechanical seals will fail within seconds without lubrication.**

6.3.3 Before start-up, check that the suction and delivery valves are open. The suction valve may only be closed on start-up when a vacuum relief valve has been fitted into the suction line or vent connection U_1 opened. Correct valve settings will keep stresses generated in the equipment to a minimum.

6.3.4 Check shafts are free to rotate to ensure there is no build-up of foreign bodies or excess corrosion built up inside the equipment.

6.3.5 On electrically driven pumps ensure that the overload protection equipment is set correctly (i.e., set to +0 to +5% of current rating on motor nameplate).

6.3.6 Ensure the driver turns the equipment in the correct direction of rotation. The direction of rotation for these pumps is clockwise looking at the pump drive end as standard. A direction of rotation arrow is cast into the pump casing. Incorrect rotation will cause inefficiency in some equipment types and extensive damage in others.

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6.3.7 Listen for any strange sounds or vibration. If noise or vibration appears to be unusual stop the equipment immediately, isolate the driver and investigate.

6.3.8 Check for any significant rise in temperature, particularly in the seal and bearing areas.

6.4 Automatic controls

If equipment is operated under any form of automatic control ensure consideration has been given to prevent *"hunting"*. If the equipment *"hunts"* it can lead to serious motor, coupling, pump, and control equipment damage.

6.5 Precautions to be taken before start-up

6.5.1 General

Ensure internal cleanliness of pipework, vessels etc., to prevent pump ingesting foreign debris. Isolate the equipment and rotate the pump through 360° by hand to ensure freedom of movement.

6.5.2 Stuffing box (if fitted)

If applicable check the stuffing box for leakage. The gland should be adjusted until a small leak exists to cool and lubricate the packing. Under certain operating conditions it may be found that leakage ceases and air is drawn in. This is perfectly normal and of no concern unless the quantity of air is too great and affects the pump performance. In this case the gland may be tightened a little and monitored to ensure no excessive rise in temperature.

6.5.3 Lubrication

Some pumps are fitted as standard with sealed for life bearings. If greased bearings are fitted (grease nipples will be provided) a check must be made to ensure that the bearings have been lubricated correctly.

6.5.4 Check the direction of rotation

The direction of rotation must correspond with the direction arrow on the casing. Check the direction of rotation of the motor with the pump disconnected by giving the motor a short run. If the direction is incorrect isolate the electrical supply. Remove the terminal box cover and interchange the live and neutral on a single phase motor or interchange any two supply leads on a three phase motor. Replace the terminal box cover and turn on the electrical supply. Recheck the direction of rotation.

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6.6 Filling the pump with service liquid

6.6.1 Ensure the pump is electrically isolated.

6.6.2 Remove the level plug from the side of the pump casing.

6.6.3 Open the service liquid supply.

6.6.4 Ensure that the service liquid flows from the level orifice. Close the service liquid supply and wait until the liquid stops flowing from the level orifice.

6.6.5 Replace the level plug.

6.7 Start-up procedure (for diagrams see section 5)

6.7.1 Service liquid

Check that the pump and separator are filled with service liquid up to the level of the pump shaft (see 6.6).

6.7.2 Venting of vacuum pump

Before starting, with the suction line closed, open the vent at the connection U_1, (see Figures 5.1, 5.2, 5.3) closing the valve when the operating speed has been attained and suction line opened.

6.7.3 Direction of rotation

Check that the direction of rotation and speed are correct.

6.7.4 Combined liquid service

Open the shut off valve h_F.

If the suction has been shut down for a long period then the regulating valve i_F should be adjusted to the required flow of make-up liquid before closing the valve.

6.7.5 Circulating liquid service

Open the shut off valve h_K.

If the system has been shut down for a long period then the shut-off valve i_F should be adjusted when the operating speed is reached to the required flow of make-up liquid before being closed.

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6.7.6 Make-up liquid service

After achieving the correct operating speed, open the shut-off valve h_F.

If the system, has been shut down for a long period then the shut-off valve i_F should be adjusted when the operating speed is reached to the required flow of make-up liquid before being closed.

6.8 Shutting down (for diagrams see section 5)

6.8.1 Venting of the vacuum pump

Open the vent cock U_1.

6.8.2 Combined liquid service

Close shut-off valve h_F.

6.8.3 Circulating liquid service

Close shut-off valve h_K.

6.8.4 Make-up liquid service

Close shut-off valve h_F.

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7. Operation

7.1 General

7.1.1 Operators should be aware that these pumps performing at their maximum will be achieving vacuum very close to the vapour pressure of water. When using water at 15°C as service liquid and working with a delivery pressure of 1013 mbar (760 Torr) the lowest vacuum economically achievable at the suction branch is approximately 120 mbar (90 Torr) when passing service liquid through the pump at a rate indicated on our vacuum table. Using a screw driver as a stethoscope it is possible to listen carefully to the operation of the pump and should a crackling noise be detected, this indicates a degree of cavitation which should be eliminated by admitting more air to the pump under this condition. In the case where pumps are operating on very hard water, the pump will probably require to be opened every six months to remove lime deposit. Should the pump be allowed to cavitate continuously on hard water, lime deposits can damage the pump in much shorter periods than this.

7.1.2 These pumps can handle small particles, heavier than water, the particles will be centrifuged by the liquid ring and once having entered the pump can be continually discharged through plug for dirt disposal (uSe) to drain trench. It is recommended that a valve be fitted on the drain so this can be arranged to close when the pump is stopped otherwise all the service liquid will leave the pump.

7.1.3 The maximum temperatures are: Gas 100°C, Service liquid 80°C.

7.2 Arrangement

The liquid separator (XBp) should be installed adjacent to the vacuum pump such that the container overflow (uA) and the pump shaft centreline are on the same level (see Figures 1 and 2).

There are three principal arrangements as described in the following sections. The arrangement should be chosen according to the conditions of duty.

7.2.1 Operation with combined make-up and circulating liquid

This method of operation is most frequently used and is shown diagrammatically in Figure 1. The service liquid flow (B) through the pump comprises both make-up liquid (F) and recirculating liquid (U). A quantity of waste liquid (A), equal to the supplied quantity of make-up liquid (F), is continuously discharged through overflow (uA) of the circulating container. The make-up liquid should be supplied at a slight positive pressure (0.5 bar approximately). The pipe from the overflow connection (uA) should be fitted with an upwards facing branch which remains open or is connected to the container main vent pipe to prevent complete emptying of liquid from the system or siphon effects.

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7.2.2 Operation with circulating liquid only

This arrangement is applicable where service liquids are used which may not be mixed up, or where corrosive or detrimental gases are handled. With this arrangement as shown in Figure 2, the overflow (uA) should be blanked off and thus the service liquid flow (B) through the pump comprises the recirculated flow (U) only.

If the vacuum pump operates over a small compression range (i.e., at low vacuum) for periods in excess of 5 minutes, a small circulating pump must be fitted in the service liquid line (1B). It is not necessary to provide a heat exchanger if the periods of operation are less than this, as the pump will normally have cooled down sufficiently before the next start-up.

7.2.3 Operation with 'once through' liquid supplies

When there are adequate quantities of cheap liquid the circuit should be arranged as shown in Figure 3. The connection (uU) should be blanked off and the pump service liquid (B) thus comprising only the make-up liquid (F), which should be supplied at a slight positive pressure (0.5 bar approximately). If this supply pressure is likely to rise excessively upon occasions it is recommended that a 'break tank' with ball float inlet valve is fitted; the pump will then prime the service liquid out of the tank (see Figure 3a).

Should the gas and liquid not require separating before final discharge, then the circulating container can be dispensed with and it is sufficient merely to fit a discharge orifice pipe (uMII) to discharge into a convenient drain trench.

7.3 Other points of importance and points to watch

7.3.1 The circulation container where applicable should be cleaned from time to time since impurities such as rust, dirt etc., from the pipework may settle in this container.

7.3.2 The pump and the container must be drained when there is danger of frost.

7.3.3 If the pump is operated on very hard water the service liquid will have to be softened or alternatively the pump must be opened every six months in order to remove the lime deposit.

7.3.4 If it is necessary to empty the pump after operation, drain plugs are provided underneath the pump. When using a circulating container it should be emptied through the drain tapping.

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7.4 Starting up and shutting down

	Initial start-up following installation or a protracted shut down	Starting up	Shutting down
Service liquid	Before starting up fill the pump and circulating container with service liquid up to pump shaft level by adjusting suction orifice (uMI) and overflow (uA)		
Speed and direction of rotation	Check	Check	
Operation with combined make-up and circulating liquid (see 7.2.1)	Open valve (hF), adjust regulating valve (iF) to pass required quantity of make-up and lock it	Open valve (hF)	Shut valve (hF)
Operation with circulating liquid only (see 7.2.2)	Open valve (hK), adjust regulating valve (iK) to pass required quantity of cooling liquid	Open valve (hK)	Shut valve (hK)
Operating with 'once through' liquid (see 7.2.3)	When the pump is up to speed open valve (hF) adjust regulating valve (iF) to pass required quantity of make-up (see table), and lock it. When using a tank with float valve (see Figure 3a) this should be filled beforehand	When full speed is reached open valve (hF)	Before stopping pump shut valve (hF)
Anti-cavitation air supply	When starting against the closed suction open air cock (u1) and after reaching full speed close cock (u1)		Open air cock (u1)

7.5 Make-up water

For operation with combined make-up and circulating liquid or for operation with circulating liquid only, more make-up or cooling liquid, respectively must be used if the inlet water temperature approaches 15°C and the regulating valve (iF) or (iK) must be readjusted to maintain this temperature.

Where a heat exchanger is fitted this must be designed to assure that the temperature of the service liquid is maintained at 15°C.

Where water is used as service liquid through the pump the standard rated capacity will only be obtained if the water temperature does not exceed 15°C. Higher temperatures of up to 30°C can be accepted but the pump output will be reduced with the result of less service liquid being required. The following table states the service liquid requirements at various temperature differences. The temperature difference is the amount of difference in temperature between the service liquid and the circulated pump liquid (combined system). The lower temperature being that of the service liquid FB.

Note: The circulating liquid must not fall below 10°C since icing can occur in the pump suction at certain vacua.

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7.5.1 Make-up water requirements in m³/h

Suction pressure in mbar		120					400				
Pump	Speed rpm	KB temperature difference °C				FB	KB temperature difference °C				FB
		20	10	5	2		20	10	5	2	
LPH - 60520	1150	0.35	0.6	1	1.8	3.5	0.3	0.6	0.9	1.5	2.6
	1450	0.45	0.8	1.3	2.1		0.4	0.7	1.1	1.7	
	1750	0.55	1	1.5	2.3		0.5	0.8	1.3	1.8	
LPH - 60527	1150	0.4	0.7	1.2	2.1	3.8	0.4	0.7	1.1	1.7	2.7
	1450	0.55	1	1.5	2.4		0.5	0.9	1.3	1.9	
	1750	0.7	1.2	1.8	2.6		0.6	1	1.5	2	
LPH - 70123	880	0.6	1.1	1.7	2.6	4	0.6	1	1.5	2.1	3
	975	0.65	1.2	1.8	2.7		0.65			2.2	
	1175	0.85	1.4	2.1	2.9		0.8	1.2	1.8	2.3	
LPH - 70530	880	0.8	1.5	2.4	3.9	6.5	0.8	1.3	2.1	3.1	4.8
	975	0.9	1.6	2.6	4.1		0.9	1.5	2.3	3.3	
	1175	1.2	2	3	4.5		1	1.7	2.5	3.5	
LPH - 70540	880	1.1	1.9	3	4.5	7	1	1.7	2.4	3.5	5
	975	1.2	2	3.2	4.7		1.1	1.8	2.6	3.7	
	1175	1.5	2.5	3.7	5.1		1.4	2.2	3	4	

Suction pressure in mbar		600					900				
Pump	Speed rpm	KB temperature difference °C				FB	KB temperature difference °C				FB
		20	10	5	2		20	10	5	2	
LPH - 60520	1150	0.25	0.45	0.7	1.1	1.8	0.15	0.2	0.3	0.4	0.5
	1450	0.35	0.55	0.9	1.3		0.2	0.25	0.35	0.45	
	1750	0.45	0.7	1	1.4		0.25	0.3	0.4		
LPH - 60527	1150	0.3	0.5	0.8	1.2	1.8	0.15	0.25	0.35	0.4	0.5
	1450	0.4	0.7	1	1.4		0.25	0.3	0.4	0.45	
	1750	0.5	0.8	1.1	1.5			0.35			
LPH - 70123	880	0.5	0.8	1.1	1.5	2	0.25	0.35	0.45	0.5	0.6
	975	0.55	0.85	1.2	1.6					0.55	
	1175	0.65	1	1.3	1.7		0.3	0.4	0.5		
LPH - 70530	880	0.7	1.1	1.6	2.3	3.3	0.3	0.5	0.7	0.8	1
	975	0.8	1.2	1.8	2.4		0.4	0.6	0.8	0.9	
	1175	0.9	1.4	2	2.6		0.5	0.7			
LPH - 70540	880	0.8	1.3	1.9	2.6	3.5	0.4	0.6	0.8	0.9	1
	975	0.9	1.4	2.1	2.7		0.5	0.7			
	1175	1.1	1.7	2.3	2.9		0.6				

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The quantities of service liquid absorbed in the circulating liquid operation correspond to the values given under FB.

With circulating liquid operation, the position of the liquid at the liquid level gauge (mU) should be checked from time to time and replenished if necessary.

KB	=	Combined service liquid requirements
FB	=	Once through service liquid requirements

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8. Routine maintenance

8.1 Check the pump runs smoothly without vibration (but remember positive displacement pumps could have a pulsating output).

8.2 The suction head conditions should be within normal limits for the application and excessive reductions of the liquid level in the suction or feed tank should be corrected.

8.3 The current rating, as indicated on the motor nameplate, should not be exceeded except momentarily on start up.

8.4 If the pump is fitted with a packed gland, it should always drip slightly to remove frictional heat from the packings and provide lubrication. If the leakage is excessive and does not decrease when the gland is adjusted evenly, the gland packing must be renewed (see section 10).

8.5 If the pump is fitted with a mechanical seal no attention is required. However, during the running-in period occasional slight leakage may occur (see section 10).

8.6 When the pump is driven by an electric motor care must be taken that the baseplate surface is always dry. When washing down the pump the hose must be kept away from the motor and any electrical connections.

8.7 On a pump with oil lubrication the oil level can be checked through the oil level sight glass when the pump is at rest. The oil should be level with the mark in the middle of the sight glass. Care should be taken to prevent entry of water into the bearing frame during washing etc., as this will damage the lubricating properties of the oil and can give a false oil level reading.

8.8 If the pump or motor has grease lubricated bearings requiring replenishment of the grease (i.e., not sealed for life) lubricate them as recommended in the lubrication section.

8.9 If the pump is operating on hot liquid the throughput of cooling water must be checked. The flow must be regulated so that the temperature rise of the cooling water, inlet to outlet, does not exceed 15°C. Sudden temperature variation must be avoided.

8.10 The bearing temperature should not exceed 80°C.

8.11 The pump should never be allowed to run dry.

8.12 Any rise in temperature of the pump or motor should be investigated.

8.13 If there is a danger of the product freezing whilst the equipment is not in operation drain it down.

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9. Lubrication

9.1 Oil lubricated bearings (identified by oil level sight glass)

9.1.1 Before initial filling, thoroughly clean the bearing frame with a flushing oil. The bearing frame should then be filled through the filler hole until the oil level reaches the mark in the centre of the oil level sight glass. When checking oil, it must never exceed this level.

9.1.2 If a constant level oiler is fitted, it should be screwed into the tapped hole beside the oil level sight glass. On the standard design, this tapped hole is fitted with a plug.

9.1.3 To fill a pump when fitted with a constant level oiler, hinge back the container and fill with oil, allow it to spring back into position. The oil will now flow into the bearing frame. Repeat this procedure until no oil flows out of the container. The required oil level will then have been established **(Figures 9.1 and 9.2)**.

9.1.4 If the bearing temperature is always below 50°C the oil should be renewed once a year. For bearings operating at higher temperatures the oil should be changed at six monthly intervals.

9.2 Recommended oils

For lubrication of SIHI pumps, the use of lubricants shown in the table below or the equivalent lubricants of a reputable manufacture are recommended.

Manufacturer:	Up to 1500 rpm	Over 1500 rpm
BP	Energol CS 68	Energol CS46
Esso	NUTO H 68	NUTO H 68
Shell	Vitrea 68, Tellus 68	Vitrea 46, Tellus 46
Mobil	DTE Oil Medium	DTE Oil Medium
Texaco	Regal Oil R & O 68	Regal Oil R & O 46

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Figure 9.1 - Constant level oiler In closed position

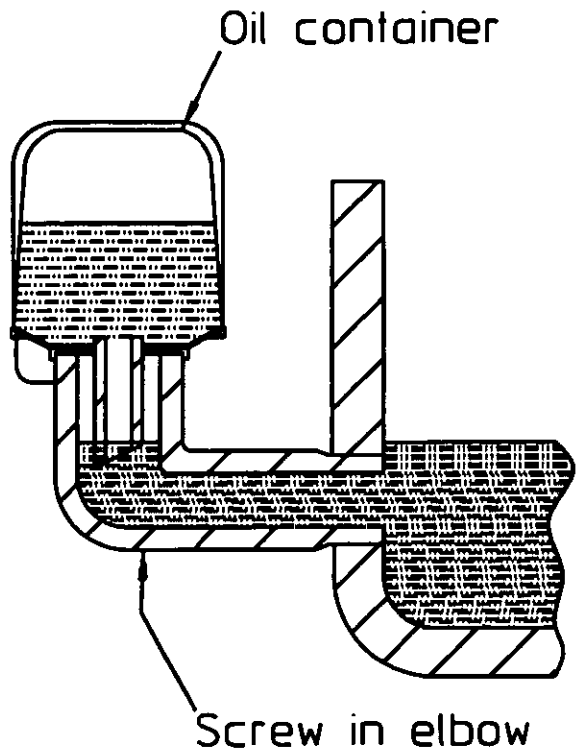
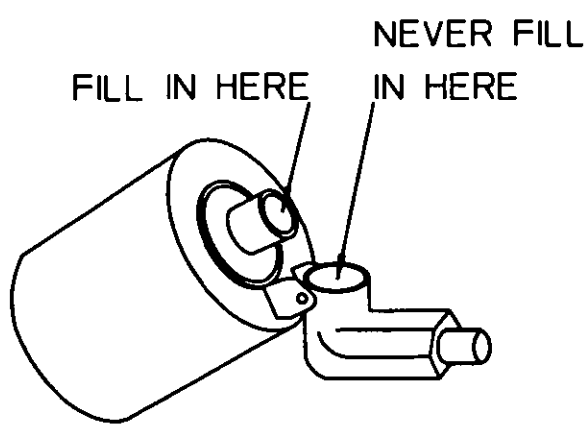


Figure 9.2 - Constant level oiler In open position



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9.3 Grease lubricated bearings (identified by grease nipples)

Ensure that the bearings are lubricated before running the pump.

Lubrication is carried out through the grease nipples provided.

Lubricate as follows:

Running at 1500 rpm: approximately every 3000 operating hours.

Running at 3000 rpm: approximately every 1500 operating hours.

Under very unfavourable operating conditions (dusty and wet conditions, high ambient temperature or when the pump is installed outdoors) the period for re-greasing must be far shorter.

9.4 Recommended greases

For lubrication of SIHI pumps, the use of lubricants shown in the table below or the equivalent lubricants of reputable manufacture are recommended.

Manufacturer:	All Speeds
BP	Energrease LS3
Esso	Beacon 3
Shell	Albida R2
Mobil	Mobilgrease HP103
Texaco	Marfak OO

9.5 Sealed bearings (identified by the lack of oil level sight glass or grease nipples)

Sealed bearings are sealed for life and require no further attention.

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10. Shaft sealing (See sectional arrangement drawing at the back of the manual)

10.1 Mechanical seals - general

10.1.1 The life of the mechanical seal depends on various factors such as the cleanliness of the liquid handled, its lubricating properties etc. Due to the great diversity of operating conditions, it is impossible to give definite indications as to the operating life.

10.1.2 Dry running of a mechanical seal, even for a few seconds, will cause severe damage and must be avoided.

10.1.3 When replacing components, or changing the mechanical seal, always check that the pump shaft runs true and ensure that the shaft sleeve surface is in perfect condition in the area of the mechanical seal. The sleeve should not have any sharp edges, scratches, marks etc., over which the seal would have to be pushed to install it. Seal components may be lubricated with soft soap or silicon grease to ease installation. Do not use mineral oil on rubber components. The need for cleanliness and care when fitting mechanical seals cannot be overstressed. A tapered fitting sleeve should be used where necessary.

10.2 Packed glands - general

The design of a standard packed box is such that leakage has to be allowed to cool and lubricate the packing. During initial running the packed box has to be carefully adjusted.

10.3 Packed glands - adjustment

10.3.1 Packed box adjustment is a gradual process of adjustment, running in and monitoring, resulting in a controlled leakage sufficient to cool and lubricate the packing.

10.3.2 During adjustment the gland nuts should be tightened evenly, one flat at a time, and the pump allowed to run for a reasonable time whilst the packing is monitored for leakage and any temperature rise.

10.3.3 From the point of view of the packing too much leakage is better than too little but care has to be taken to ensure that leakage does not cause injury or damage e.g., personnel may slip if leakage collects on the floor or a bearing may fail if leakage enters it.

10.3.4 During operation, check from time to time that leakage has not become excessive and adjust if necessary. If adjustment fails to give the desired result it will be necessary to re-pack the pump.

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10.4 Packed glands - repacking

10.4.1 The gland packing provided with the pump has been carefully selected for the particular application for which the pump has been supplied. When repacking becomes necessary the same grade of packing should be used.

10.4.2 Before repacking the pump, the old gland packing should be removed and the shaft and packed gland chamber thoroughly cleaned. The surface of the shaft sleeve should be examined to ensure that it is in good condition. If the shaft sleeve is scored it should be replaced.

10.4.3 If no preformed packing rings are available, packing material of the correct grade should be cut to suitable lengths using a template of the same diameter as the shaft sleeve or as shown in **Figure 10.1**. After fitting, a gap of up to 1mm between the ends of each ring provided will prove less detrimental than forcing packing rings which are too long into the packed gland, provided the gaps in each ring are staggered.

10.4.4 Preformed packing rings should be bent sideways and slipped over the shaft sleeve (**Figure 10.2**).

10.4.5 If the packed gland is to be provided with a sealing liquid, take care when repacking that the lantern ring is positioned in line with the sealing liquid connection (**Figure 10.3**). When square section packing rings are used, it is essential that two packing rings are placed in front of the lantern ring.

10.4.6 After repacking, the gland should be nipped up lightly and then the gland nuts released until they are finger tight. A check should be made to ensure that the shaft turns freely. A check should be made to ensure that the gland plate is square to the shaft. The gland should then be adjusted as above.

10.4.7 We recommend that gland tightening is done with the pump at rest, since experience has shown that over-tightening with the pump running can severely score the shaft sleeves.

10.5 Packed gland - cooling

If a liquid is pumped which would boil at atmospheric pressure and ambient temperature, it is essential that the packed gland area is cooled to prevent the gland packing running dry due to evaporation of the liquid handled. The regulating valve, which should be located in the outlet line, should be set to ensure that the temperature rise of the cooling liquid through the cooling chamber does not exceed 15°C.

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10.6 Packed glands - sealing liquid

If leakage of the liquid handled is unacceptable, or if the liquid handled contains solids, the sealing liquid supply must be from an external source of clean liquid. The sealing liquid pressure required depends on the particular type of pump and application. With a pump working under vacuum conditions, the above arrangements are necessary. For suction lift applications a sealing supply taken from the pump delivery generally suffices providing the medium handled is clean (**Figure 10.3**).

Figure 10.1
Making a packing ring

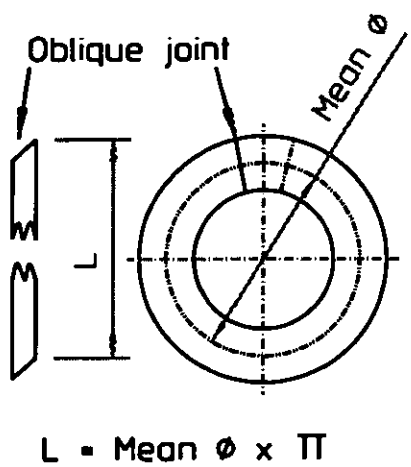


Figure 10.2
Fitting a pre-formed packing ring

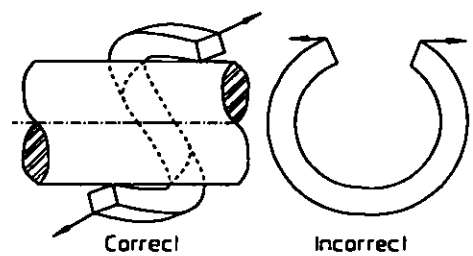
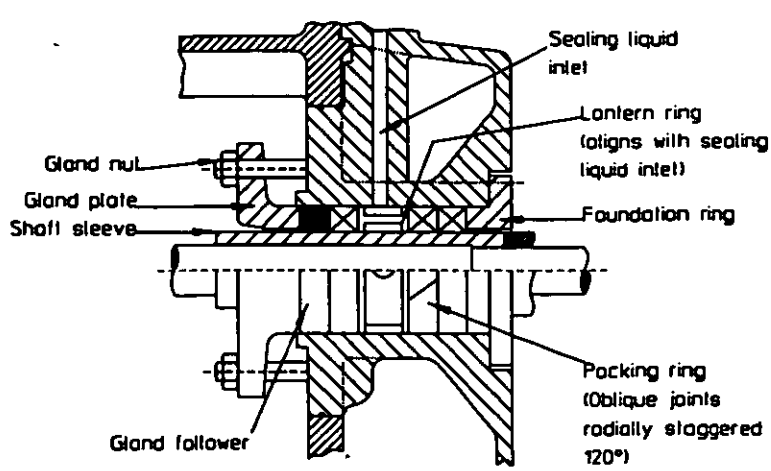


Figure 10.3
Lantern ring position for sealing liquid (Typical only)



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11. Transmission

11.1 Safety

Always ensure that pump and motor are hydraulically/electrically isolated before removing coupling guard or handling coupling or shaft.

11.2 SIHI standard non-spacer coupling - grub screw fitting

11.2.1 General

These couplings are suitable for either direction of rotation, reversing loads and inclined or vertical shafts.

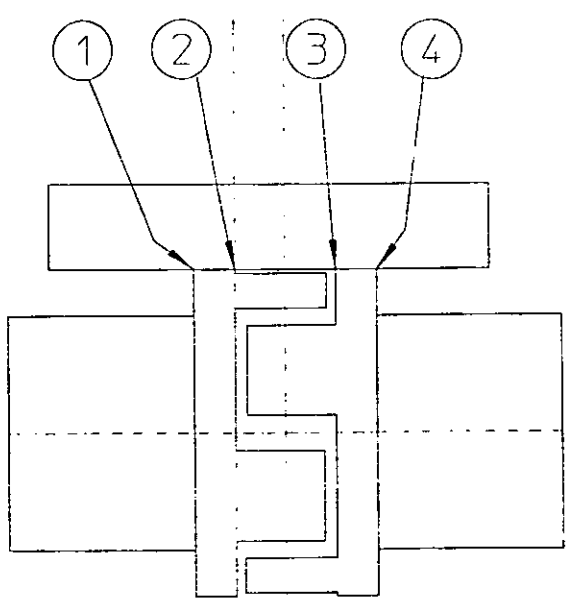
11.2.2 Installation

Locate hubs to shaft using grub screws or a retaining washer.

11.2.3 Parallel alignment

Place a straight edge across the coupling as shown below. The hubs will be in correct alignment when the straight edge is in contact with 1, 2, 3 and 4.

Figure 11.1 - checking parallel alignment with a straight edge



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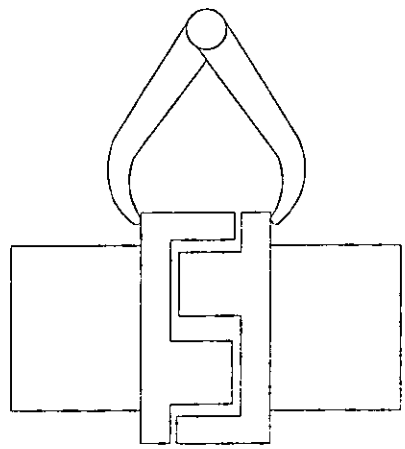
11.2.4 Angular alignment

Figure 11.2 - Checking angular alignment with callipers



Using callipers as shown in **Figure 11.2** and commencing at the top, take measurements at 90 deg. intervals as the coupling is rotated by hand. Repeat this procedure adjusting the shafts as necessary until four identical readings are obtained (see 11.1).

Accurate alignment is necessary to ensure trouble free running.

11.2.5 Permissable misalignment

The misalignment figures are as shown in the following table for both 1500 and 2900 rpm.

Coupling Size	Max. Angular Misalignment degs.	Max Parallel Misalignment (mm)	Max. Axial Misalignment (End float) (mm)
63	0.75	0.25	0.25
80	0.75	0.25	0.40
112	0.75	0.30	0.60
125	1.0	0.40	0.80
160	1.0	0.50	1.00
200	1.0	0.50	1.20
250	1.0	0.50	1.50

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11.2.6 Maintenance

These couplings do not require any maintenance, except for occasional checks to ensure that excessive backlash has not developed between the driving and driven shafts.

The flexible element should be replaced when it has worn down to two-thirds of its original thickness.

After moving the shaft to replace the flexible element, the coupling should be re-aligned.

11.3 SIHI standard non-spacer coupling - taper lock fitting

11.3.1 General

Taper lock couplings are suitable for either direction of rotation, reversing loads and inclined or vertical shafts.

Any combination of hubs may be used.

If high torque peaks or load fluctuations are present it is recommended that keys are fitted.

11.3.2 Installation

Fit hubs to shaft using bushes, see section 11.4.

11.3.3 Parallel alignment

Place a straight edge across the coupling as shown in **Figure 11.1**. The hubs will be in correct alignment when the straight edge is in contact with 1, 2, 3 and 4.

11.3.4 Angular alignment

Using callipers as shown in **Figure 11.2** and commencing at the top, take measurements at 90 deg. intervals as the coupling is rotated by hand. Repeat this procedure adjusting the shafts as necessary until four identical readings are obtained (see 11.1).

Accurate alignment is necessary to ensure trouble free running.

11.3.5 Permissable misalignment

The misalignment figures are as shown in paragraph 11.2.5.

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11.3.6 Maintenance

These couplings do not require any maintenance, except for occasional checks to ensure that excessive backlash has not developed between the driving and driven shafts.

The flexible element should be replaced when it has worn down to two-thirds of its original thickness.

After moving the shaft to replace the flexible element, the coupling should be re-aligned (see 11.1)

11.4 Taper lock bushes

11.4.1 To Install (see 11.1)

After ensuring that the mating tapered surfaces are completely clean and free from oil or dirt insert the bush into the hub so that the holes line up. (**Figure 11.3**).

If a key is to be fitted, place it in the shaft keyway before fitting the bush. It is essential that it is a parallel key with side fitting and top clearance.

Sparingly oil the thread and the point of grub screws, or the thread and under the head of cap screws. Place screws loosely in the threaded holes for "jacking in" (**Figure 11.7**). Clean the shaft and fit the hub and bush as one unit in the desired position (see **Figure 11.4**).

Using a hexagon wrench tighten the screws gradually and alternately until they are tight, **Figure 11.5**.

Drift against the large end of the bush using a block or sleeve (to prevent damage) to ensure that the bush is seated squarely in the bore. The screws will now turn a little more. Repeat the alternate drifting and tightening of the screws once or twice to achieve maximum grip on the shaft.

Fill any empty holes with grease to exclude dirt.

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Torque wrench settings for bush screws:

Bush Ref.	Setting Nm	Bush Ref.	Setting Nm
1108	6.2	2517	49
1210	20	2525	49
1215	20	3020	90
1310	20	3030	90
1610	20	3535	113
1615	20	4040	192
2012	32	4545	277
		5050	350

11.4.2 To remove

Slacken all screws by several turns, remove one or two according to the number of "jacking off" holes shown in **Figure 11.7**. Insert the screws in the holes after oiling the thread and the point of grub screws, or the thread and under the head of cap screws.

Tighten the screws alternately until the bush is loosened in the hub and the assembly is free on the shaft (see **Figure 11.6**).

Remove the assembly from the shaft.

Figure 11.3 Locate bush in coupling

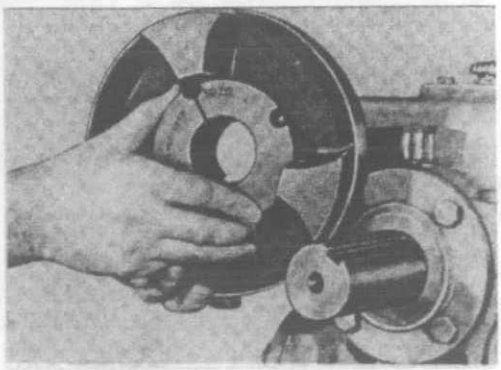

Figure 11.4 Insert screws and locate on shaft

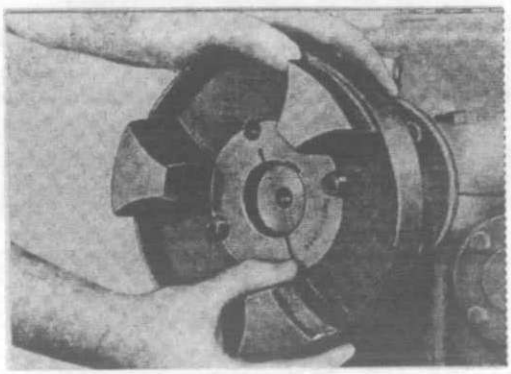

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Figure 11.5 Tighten screws alternately

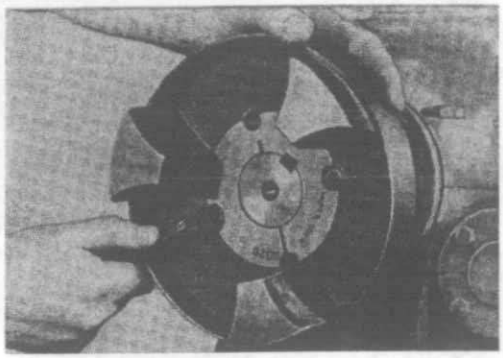


Figure 11.6 To remove - use screws for jacking out

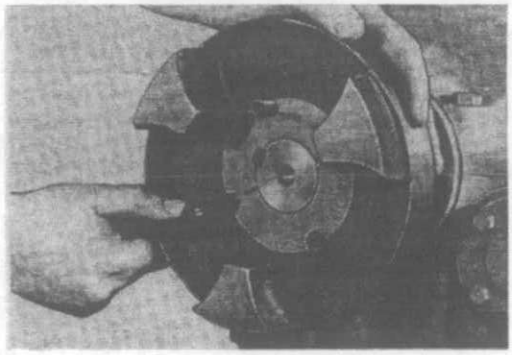
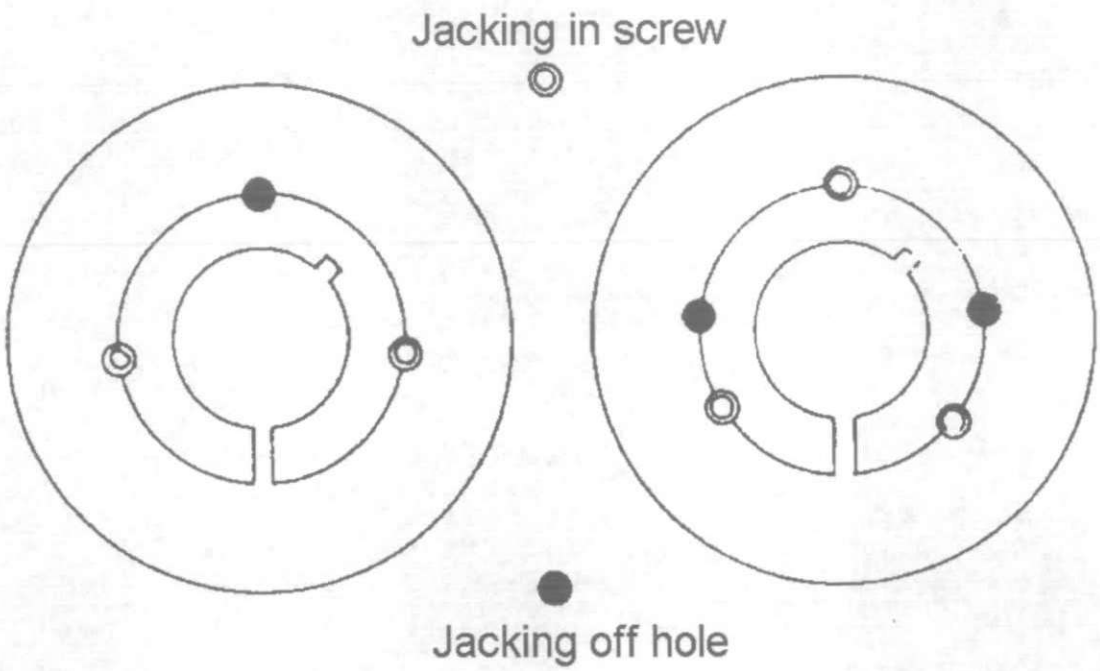


Figure 11.7 Jacking Holes



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13. Fault diagnosis

13.1 Modes of breakdown

In case of breakdown the following table may help locate the fault.

BREAKDOWN	IDENTIFICATION NUMBER FOR BREAKDOWN ELIMINATION				
	GENERAL Applicable to every pump type. Also see separate headings	Positive Displacement Pumps	Helical Rotor Pumps	Vacuum Pumps	Centrifugal Pumps
PRIMING PROBLEMS					
Pump loses its prime or does not prime	1,2,3,9,10,11,19,25, 32,35,37,38,39,67	30,31	33,34	18	
OUTPUT PROBLEMS					
Pump does not deliver	1,7,8,9,10,11,12,23, 25,32,35,37,38,39,51, 69	31,67	33,43		62
Pump performance reduced	1,2,3,4,5,6,7,8,9,10, 11,12,19,23,24,25,26, 32,38,39,66,67,69	20,31	34,43	18	62,63,64
Pump delivers too much	37,69				
Delivery is interrupted	1,2,3,6,7,8,9,10,11, 12,23,24,25,26,32,36, 37,51	21,31	43		62
MECHANICAL PROBLEMS					
After stopping, pump runs in reverse direction	17				
Very noisy	1,2,5,6,7,8,9,10,11, 12,14,15,16,22,23,24, 25,26,32,37,44,61	21	68	18	62,63
Unsteady running of pump	13,15,16,22,26,32,45, 46,53,54,55,57,58,60, 69				59,62,63
Pump rotor locked in standstill position	13,22,26,32,46				
Pump heating up and seizing	13,19,22,26,27,28,32, 46,47,48,49,50,44,60, 65	30,31	33		59

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BREAKDOWN	IDENTIFICATION NUMBER FOR BREAKDOWN ELIMINATION				
	GENERAL Applicable to every pump type. Also see separate headings	Positive Displacement Pumps	Helical Rotor Pumps	Vacuum Pumps	Centrifugal Pumps
MECHANICAL PROBLEMS (continued)					
Pump wears rapidly		31,19,66,22, 29,32,35,37, 49	33,34,43		62,63,64, 59
Bearing temperature high	13,15,16,22,26,27,28, 44,45,46,53,54,55,56, 57,58,60,61,69				62,63,64, 59
SEALING PROBLEMS					
Leakage from pump casing	22,52,70				63
Stuffing box leaks excessively	29,32,33,47,48,49,50, 53,60,61,65				63
Fumes from stuffing box	26,27,28,29,48,49,50, 65				
Mechanical seal leaking	26,29,32,35,51,60,61				63
DRIVER PROBLEMS					
Motor/Pump will not start	1,25,26,32,35,41		33,34		
Motor is difficult to start	13,22,25,26,37,40,41, 46,48,49,69				
Motor gets hot or burns	1,16,19,25,26,29,37, 40,41,42,46,48,49,69		33		

13.2 Causes - remedy

Identification Reference	Cause	Remedy
1	Suction filter or valve blocked	Clean filter and foot valve
2	Nominal diameter of suction line too small	Replace pipework
3	Suction pipework does not reach down far enough into the tank	Extend pipework
4	Face of suction pipe inlet too close to bottom of tank	Adjust clearance
5	Too many bends in suction line	Reroute pipework
6	Shut-off valve in the feed line in unfavourable position	Reposition valve

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Identification Reference	Cause	Remedy
7	Incorrect layout of suction line (formation of air pockets)	Reroute pipework
8	Valve in the suction and/or feed line not fully open	Check correct operation of valve
9	Screwed joints or flanges in the suction line not leakproof	Check and renew joints
10	Ingress of air via leaking valves in the suction line (stuffing box etc.)	Check valves, packing etc., and renew if necessary
11	Suction lift too great	Check NPSH required
12	Feed level too low (difference between pressure at suction connection and vapour pressure too low)	Increase head on suction side of pump or cool pumped liquid
13	Pipework under stress	Support and/or clamp pipework
14	Vibration of pipework	Check pipe connections and supports
15	Delivery flow too small	Open delivery valve. If it is fully open and frictional losses cannot be reduced a pump capable of operation at higher temperature must be used.
16	Delivery flow too great	Reduce flow by closing discharge valve
17	Non-return valve sticking	Strip down and adjust or replace parts as required
18	Pump operating with too large a vacuum	Adjust system - Contact SIHI Pumps (UK)
19	Counter pressure on discharge side too great	Adjust system - Contact SIHI Pumps (UK)
20	The relief valve is wrongly adjusted (positive displacement pumps)	Readjust relief valve
21	The return liquid pipe terminates above surface level of tank (positive displacement pumps)	Modify pipework to protect below liquid level
22	Pump casing under stress	Check pipework, re-pipe or fit damper flanges. Check baseplate is not twisted and that pump sits squarely on baseplate
23	Insufficient venting	Correct
24	Pumped liquid contains too much gas and/or air	Check for leaks along suction line. Check for vortices in suction vessel
25	Pumped liquid too viscous	Contact SIHI Pumps (UK)

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Identification Reference	Cause	Remedy
26	Separation of crystals from the pump liquid (falling below the temperature limit/equilibrium temperature)	Warm pump and pipework as necessary
27	Insufficient cooling water supply to supply box	Adjust supply
28	Sediment in the cooling water chambers to stuffing box . Wrong direction of flow through chamber causing air lock	Clean out, fit filters if practicable. Reverse flow
29	Contaminated pumped liquid	Check and rectify. Fit filters if practicable
30	Too high a liquid temperature reducing the lubricating properties (positive displacement pump)	Reduce temperature of liquid
31	Pump has been running without medium (positive displacement pump)	Ensure that pump always contains medium
32	Foreign bodies or deposits in pump	Flush or clean out pump
33	Medium at high temperature. Stator swollen (helical rotor pump)	Reduce temperature. Replace stator if necessary
34	Solids content too high/too abrasive (helical rotor pump)	Check pump specification
35	Medium solidifies or hardens	Check process conditions
36	Cut out level for start too high	Adjust
37	Number of revolutions too high	Check supply voltage and/or frequency against details on motor nameplate
38	Number of revolutions too low	Correct supply to motor or replace. If belt drive unit change ratio of drive
39	Incorrect direction of rotation (electric motor incorrectly connected)	See section 7
40	Voltage too low/power supply overloaded	Isolate motor until supply problem is rectified
41	Short circuit in the motor	Repair or replace motor
42	Setting of started for motor too high	Readjust
43	Stator is burnt (helical rotor pumps only)	Replace stator
44	Alignment of belts or coupling incorrect	Realign in accordance with instructions
45	Worn belt	Replace belt, check alignment of pulleys

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Identification Reference	Cause	Remedy
46	Drive parts touching the casing	Relieve if possible or replace
47	Sealing liquid contaminated	Check source of contamination and rectify.
48	Packing incorrectly fitted	Repack stuffing box in line with instruction in section 10
49	Gland tightened too much/slanted	Gland should be released and readjusted squarely
50	Packing material not suitable for operating conditions	Replace with suitable packing
51	Mechanical seal blocked, 'O' ring or stationary seal ring damaged	Check and replace necessary parts
52	Joint leaking	Strip joint and check for damage, replace joint. Check bearings for excessive play, replace if necessary
53	Bearing worn out	Replace bearing
54	Insufficient lubrication of bearings	Check amount of lubrication and adjust
55	Specified oil level not maintained	Check for leakage, repair
56	Ball bearing over lubricated	Check amount of lubricant and adjust by draining off some lubricant
57	Ball bearing incorrectly fitted	Refit bearings correctly - check for damage and renew if necessary
58	Bearing dirty or corroded	Clean if possible or replace
59	Axial thrust too great because of worn wear rings/ wear plates (centrifugal pumps)	Replace wear ring/wear plates
60	Shaft running untrue	Strip pump and check clearance on bearings and shaft, replace
61	Shaft bent	Replace shaft if damaged
62	Impeller blocked (centrifugal pumps)	Clear blockage
63	Impeller damaged (centrifugal pumps)	Repair or replace impeller
64	(Centrifugal Pumps) 1. Wear rings worn 2. Wear plates worn - Ryax 'O'	Replace wear rings Adjust or replace wear plates
65	Shaft or shaft sleeve worn in the region of packing	Repair or replace shaft sleeve or shaft
66	The wearing surfaces have been damaged by corrosion	Replace damaged parts or change material of construction - Contact SIHI Pumps (UK)

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Identification Reference	Cause	Remedy
67	Pump rotating parts worn	Replace or re-machine worn parts
68	Worn universal joint (helical rotor pumps)	Replace if necessary
69	Incorrect design of pump for operating conditions	Contact SIHI Pumps (UK)
70	Damaged diaphragm (rotary diaphragm pumps)	Replace diaphragm

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14. Dismantling and assembly instructions

14.1 General instructions

14.1.1 All parts, especially the sealing surfaces must be handled with care. Before assembly pipe threads and fittings (except the sealing surface) should be sealed with an anti-seize paste i.e., Belzona.

14.1.2 Apply a coat of liquid sealing compound 'Epple 32' on the sealing surfaces, immediately before assembly.

14.2 Preparation for dismantling

14.2.1 Drain the pump by unscrewing plugs (130) and (133) at the bottom of suction casing (1) and delivery casing (2).

14.2.2 Remove the pump as a unit out of the plant.

14.2.3 Remove the pump coupling half.

14.3 Dismantling of the pump

14.3.1 Remove key (257). crossover pipes (7) and (8) (not fitted to 70123 pump), take off bearing covers (221) and (223), unscrew shaft nut (205), loosen bearing cover (222).

14.3.2 Remove bearing bracket (210) from casing (1) by using the threaded withdrawal holes in the bearing bracket flange. Withdraw the roller bearing (230) and remove bearing cover (222).

14.3.3 With the pump in the vertical position and the drive shaft end pointing downward force off the bearing bracket (210), remove roller bearing (231) by using a withdrawal nut, loosen tie bolts (160) and remove casing (2) complete with end plate (11) and mechanical seal/stuffing box housing (310) and (300). Take off middle body (35).

14.3.4 Withdraw upwards shaft (200) with vane wheel impeller (30), shaft sleeve (270) etc.

14.3.5 Remove mechanical seal/stuffing box housing (310) and (300). Unscrew valve assembly (340) and (347).

14.3.6 Unscrew shaft nut (288), draw off lockwasher (292) and shaft sleeve (270), then withdraw the vane wheel impeller (30) by means of M16 screws, screwed into the withdrawal holes provided in the hub.

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14.4 Assembly of the pump

14.4.1 All markings must be in alignment. If one or several parts are to be replaced which, by their axial length, can affect the running position of the rotor, then the rotor must be readjusted until the clearances between the vane wheel impeller and the end plates amount to half of the total impeller play.

The total play is 0.4 to 0.5mm.

14.4.2 If the mechanical seal is to be replaced, set a new seal in the shaft sleeve (270) as shown on the sectional arrangement drawing (at the back of this manual).

14.4.3 Fasten valve assembly (340)/(347) to end plates (10) and (11) using setscrews (177). Fit end plates (10) and (11) into casings (1) and (2) and secure with setscrews (171).

14.4.4 Fit shaft sleeve (270) with 'O' ring (80) and lockwasher (292) on to the non drive end of shaft (200) and lightly tighten shaft nut (288). Fit key (258) into the slot in the shaft. Set the impeller (30) on to the shaft. Set the impeller face the following distance from the relevant shoulder.

60,000 pump - 220mm from shoulder 45/51.8mm
70,000 pump - 280mm from shoulder 60/75mm

Fit the second shaft sleeve (220) with 'O' ring (80) on to the shaft, loosely assemble lockwasher (292) then tighten the locknut. Ensure that the impeller vanes are correctly orientated.

14.4.5 Place casing (2) on a flat surface with endplate (11) at the top. Place the shaft assembly with the drive end upwards on to endplate (11). Centralise middle body (357) on to casing (2). Fit casing (1) with endplate (10) over shaft and on to the middle body. Fit tie bolts (160) and tighten uts hand tight only.

14.4.6 Mount the mechanical seal with its housing of the stuffing box assembly to casings (1) or (2).

14.4.7 Position the bearing cover (222), the roller bearing (231) and distance piece (260) onto the shaft, tighten by means of the shaft nut (205) and secure with lockwasher (206). Fit the bearing bracket (210) onto casing (2).

14.4.8 Bring the pump to the horizontal position, align the feet on a flat base and tighten tie bolts (160) applying a force of 13 Kpm. Tighten shaft nut (288) on both ends and lock up.

14.4.9 After sliding bearing cover (222) over the shaft, push on roller bearing. Mount bearing bracket (210) on casing (1), screw up bearing cover (221) and (222) to the bearing bracket.

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14.4.10 Adjustment of the play

The rotor play can be measured by alternately tightening the bearing covers (222) and (223) until the rotor stops. Care must be taken that the cover in direction of the rotor movement is completely loosened before its counter part is tightened. The degree of this movement can be determined with a dial gauge put on the butt end of the shaft. Adjust the rotor to the middle of the play measured by adjusting the bearing covers (222) and (223), the cover that has been tightened last being loosened and the comparison cover being retightened until the dial gauge shows the correct value. Then screw tight the cover loosened before.

14.4.11 Mount the crossover pipe (7) and (8) (not fitted to 70123 pump) insert key (257), fit coupling half and reinstall the pump in the plant.

14.4.12 If packed box pump - repack stuffing box with 3 rings of packing and fit lantern ring (404). Fit a further 4 rings of packing, refer to packed gland instruction for detail/adjustment.

14.5 Replacement of bearing

14.5.1 Roller bearing (230) on the drive side

Disconnect pump or motor, remove coupling half, key (257), and bearing covers (221) and (222). Remove bearing bracket (210) from casing (1) by using the withdrawal holes in the bracket flange.

Withdraw roller bearing (230).

Reinstall in the reverse order.

14.5.2 Roller bearing (231) on the thrust bearing side

Unscrew bracket (210) from casing (2) by using the withdrawal holes in the bracket flange. Loosen withdrawal sleeve (232) by means of a withdrawal nut and remove roller bearing (231).

Reinstall in the reverse order.

Lubricate the bearing with a lithium-saponified grease, drop point approximately 180°C, through the grease nipples (295).

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15. Sectional arrangement drawings and parts lists

15.1 Parts list for LPH 60520, 60527, 70530, 70540 and 70123 BN.041 - packed gland arrangement

Item	Description
1	Suction casing
2	Delivery casing
7*	Crossover pipe
8*	Crossover pipe
10	End plate
11	End plate
30	Impeller
35	Middle body
50	Flange
51*	Blind flange
80	'O' ring
90*	Gasket
91	Gasket
130	Hexagon plug
131	Hexagon plug
132	Overflow plug
133	Hexagon plug
134	Air cock tapping
146	Gland stud
150	Locating pin

Item	Description
160	Tie bolt
167	Hexagon setscrew
168	Grubscrew
170	Hexagon setscrew
171	Socket head screw
172	Hexagon screw
173*	Stud
174*	Hexagon bolt
175	Hexagon setscrew
176*	Hexagon nut
177	Hexagon setscrew
180	Gland nut
182	Washer
200	Shaft
205	Shaft nut
206	Lockwasher
210	Bearing bracket
221	Bearing cover
222	Bearing cover
223	Bearing cover

Item	Description
230	Roller bearing
231	Roller bearing
232	Withdrawal sleeve
256	Key
257	Key
258	Key
260	Distance piece
261*	Distance piece
270	Shaft sleeve
288	Shaft nut
292	Lockwasher
295	Grease nipple
300	Stuffing box housing
320	Gland
340*	Valve
347	Valve
400	Gland packing
402	Foundation ring
404	Lantern ring

* Not fitted to LPH 70123 pump

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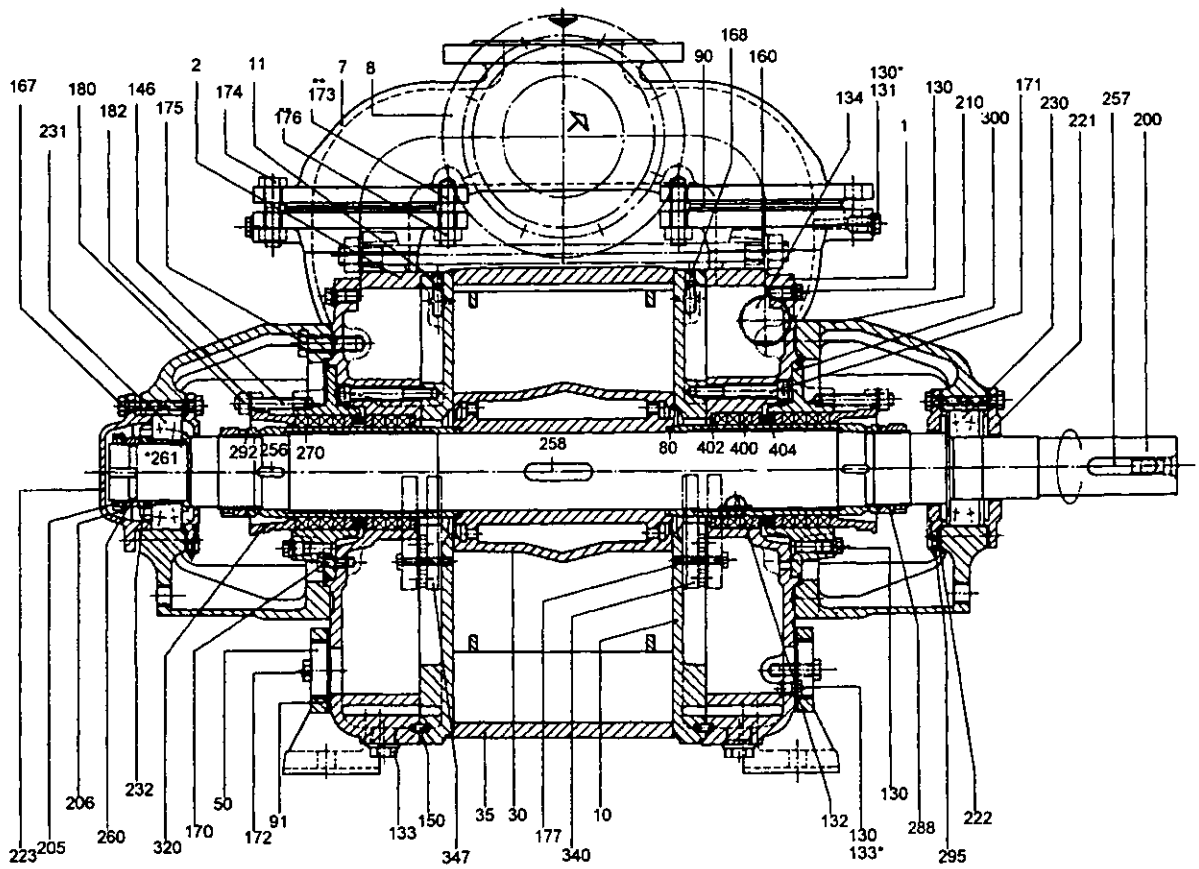
15.2 Sectional arrangement drawing for LPH 60520, 60527, 70530 and 70540 BN.041



* Item 130 for LPH 60,000 only
Item 133 for LPH 60,520 only
Item 261 for LPH 60,500 only

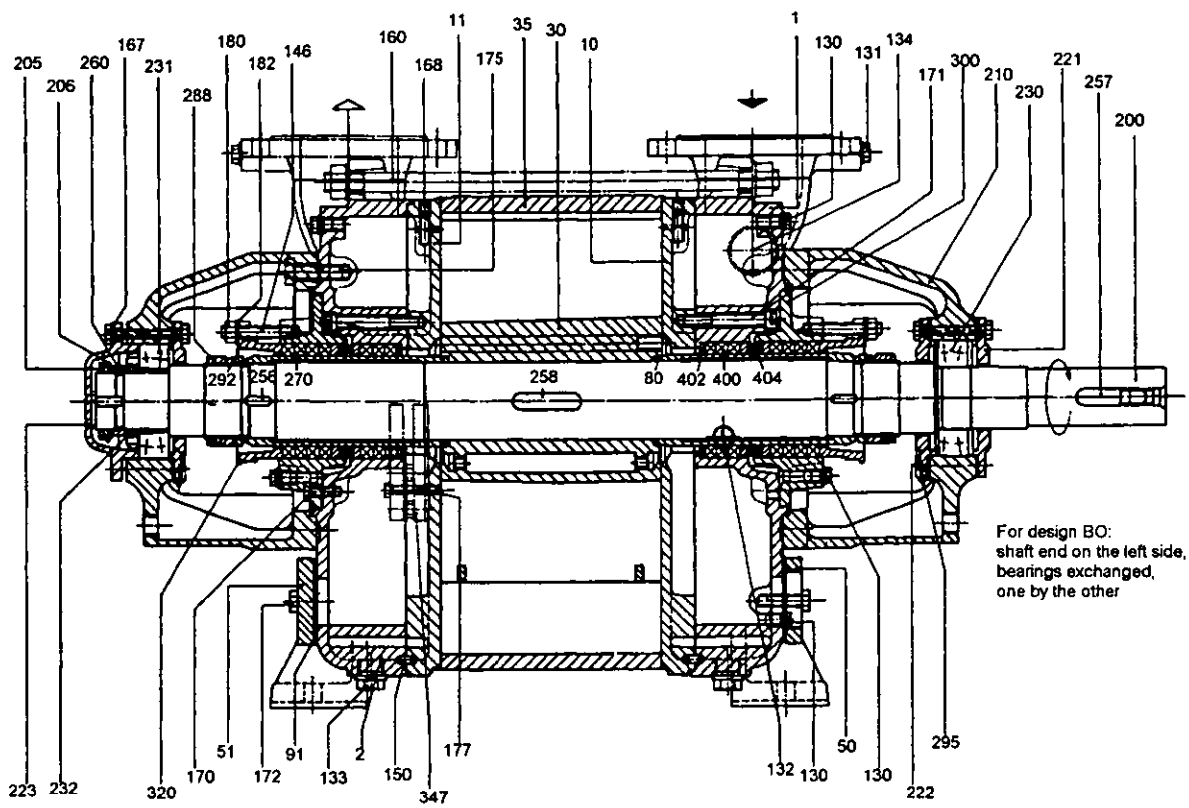
** Item 173 and 176 not for LPH 60,500

For design BO: shaft end on the left side, bearings exchanged, one by the other

15 June 1995

O & M Reference No. 15.0701a.2.6

15.3 Sectional arrangement drawing for LPH 70123 BN.041



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15.4 Parts list for LPH 60520, 60527, 70530, 70540 and 70123 BN.135 - mechanical seal arrangement

Item	Description
1	Suction casing
2	Delivery casing
7*	Crossover pipe
8*	Crossover pipe
10	End plate
11	End plate
30	Impeller
35	Middle body
50	Flange
51*	Blind flange
80	'O' ring
90*	Gasket
91	Gasket
130	Hexagon plug
131	Hexagon plug
132	Overflow plug
133	Hexagon plug
134	Air cock tapping
150	Locating pin

Item	Description
151	Locating pin
160	Tie bolt
167	Hexagon setscrew
168	Grubscrew
170	Hexagon setscrew
171	Socket head screw
172	Hexagon screw
173*	Stud
174*	Hexagon bolt
175	Hexagon setscrew
176*	Hexagon nut
177	Hexagon setscrew
200	Shaft
205	Shaft nut
206	Lockwasher
210	Bearing bracket
221	Bearing cover
222	Bearing cover
223	Bearing cover

Item	Description
230	Roller bearing
231	Roller bearing
232	Withdrawal sleeve
256	Key
257	Key
258	Key
260	Distance piece
261*	Spacer
262	Seal spacer
270	Shaft sleeve
288	Shaft nut
292	Lockwasher
295	Grease nipple
310	Mechanical seal housing
340*	Valve
347	Valve
500	Mechanical seal
600	Mechanical seal

*Not fitted to LPH 70123 pump

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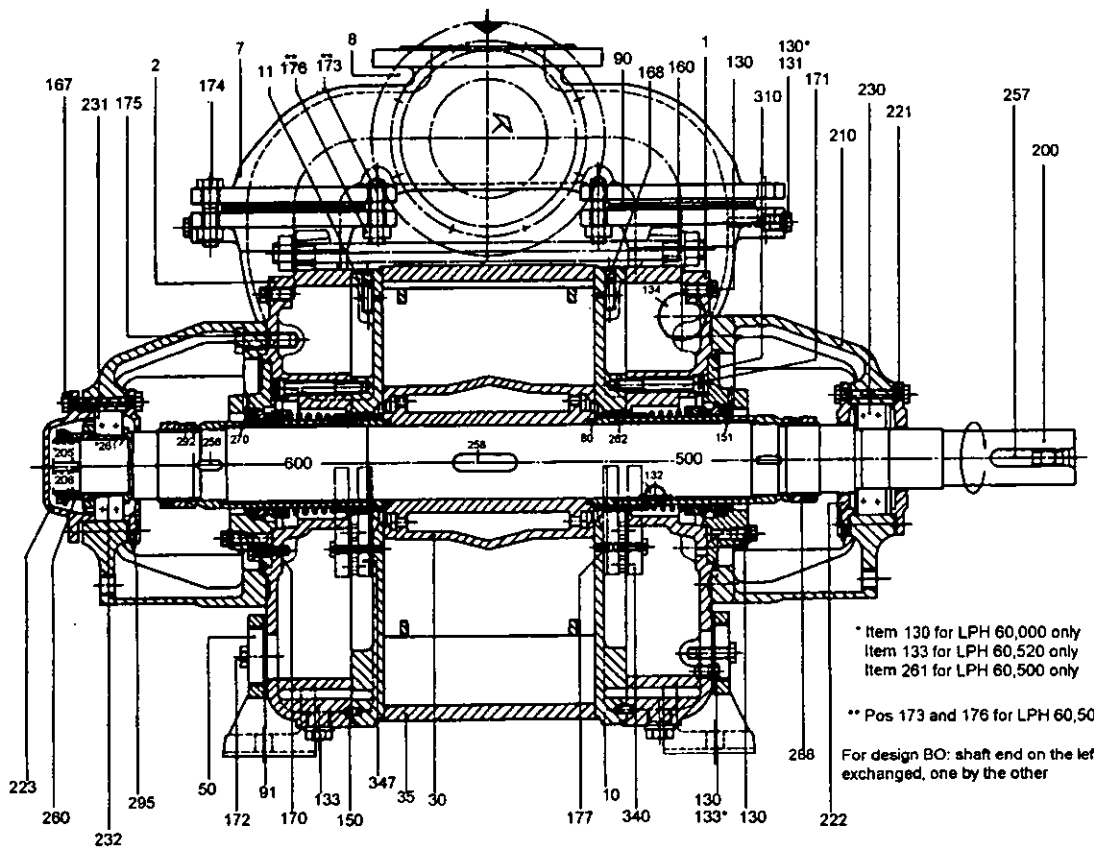
15.5 Sectional arrangement drawing for LPH 60520, 60527, 70530 and 70540 BN.135



* Item 130 for LPH 60,000 only
Item 133 for LPH 60,520 only
Item 261 for LPH 60,500 only

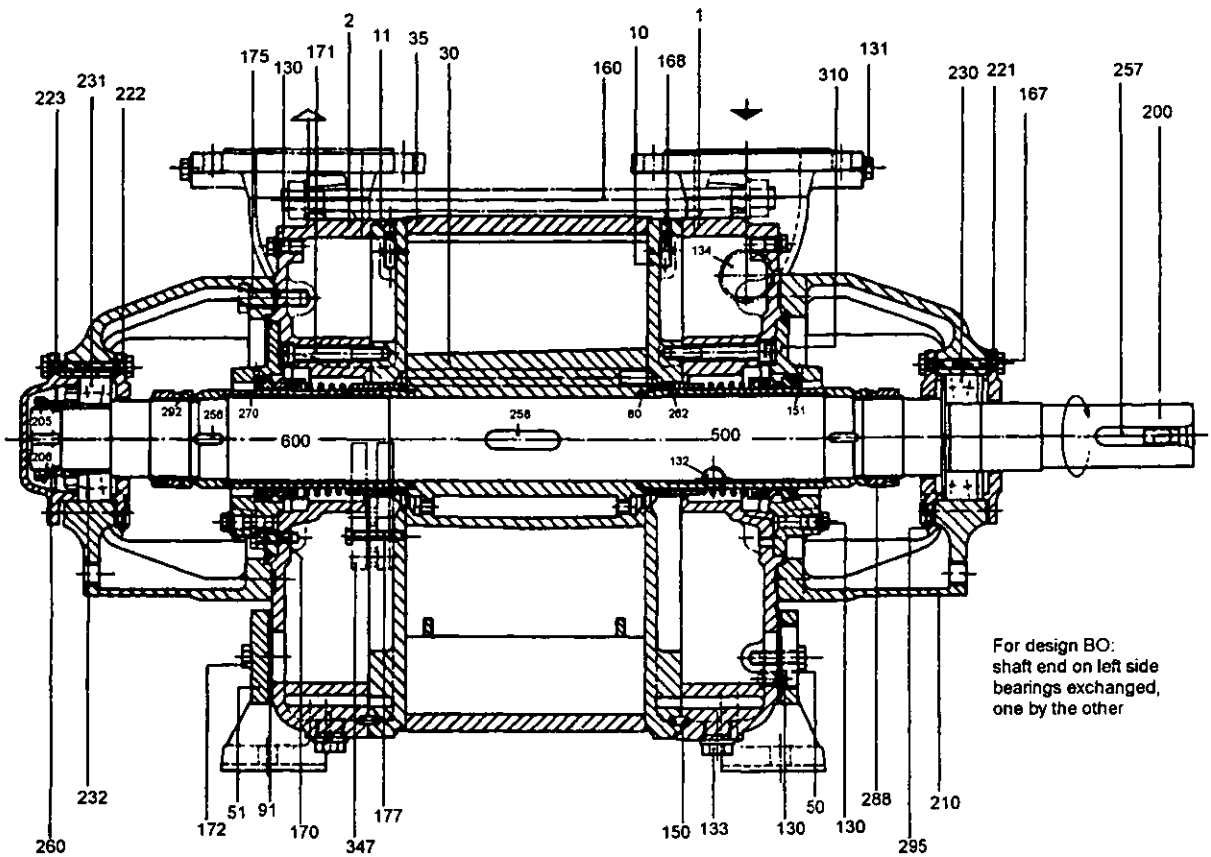
** Pos 173 and 176 for LPH 60,500 only

For design BO: shaft end on the left side, bearings exchanged, one by the other

15 June 1995

O & M Reference No. 15.0701a.5.6

15.6 Sectional arrangement drawing for LPH 70123 BN.135



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16. Special instructions

16.1 Forces and moments vacuum pumps and compressors

	Pump size	Flange norm Bore (mm)	Forces (N)			Moment (Nm)		
			Fx	Fy	Fz	Mx	My	Mz
LEHA	350/450	65	800			370		
	600/800	100	1000			360		
LEL/M	90-150	40	100	100	160	30	30	100
	250	50	160	160	220	50	50	140
LOHE	05501 AN	32	50			15 Discharge nozzle as BN		
	05501 BN	32	215			60		
	20103							
	25000 series							
LPHE	40106	40	320			100		
	40411	40	430			140		
	40516	50	430			140		
	45000 series	40	320			100		
LPHA	10054	300	3300			1200		
	10534	200	2200			800		
	11535	250	2800			1000		
	11055	350	3800			1400		
	11535	250	2800			1000		
	12056	400	4400			1600		
	505115	50	430			140		
	50523	65	510			200		
	55000 series	50	430			140		
	60000 sereis	100	1000			360		
	65000 series	65	800			270		
	70123	100	1000			360		
	70530	125	1320			470		
	70540							
	75000 series	100	1000			360		
	80000 series	200	220			800		
	85000 series	150	1600			600		
	90554	250	2800			1000		
	90567							
	95000 series	200	220			800		
KLH	35502	32	215			60		
	37202							
	47005							
	47105							
KPH	55206	50	430			140		
	55209							
	65112	80	800			270		
	65118							
	65127							
	65212							
	65218							
KSH	57412	50	430			140		
	57412 Suction end	65	510			200		

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Order notes and net weights

Order No. of a liquid ring vacuum pump consists of the data of the corresponding pump type, the construction and the order No. suffix serving for breakdown of material design and design.

pump type of the liquid ring vacuum pump	order No. suffix for material design 02	order No. suffix for material design 42	weight in kg for material design 02	weight in kg for material design 42
LPH · 60520 BN 041.				
pump with free shaft end	02.0 01	42.0 01	190	204
pump with coupling rough-drilled at motor side[1])	02.0 04	42.0 04	196	210
pump with coupling (rough-drilled at motor side) on base plate[1])	02.0 05	42.0 05	284	298
pump with coupling, contact safety device for shaft coupling and 3-phase AC motor (50 cs, 380 V) 15 kW mounted on base plate	02.0 UB	42.0 UB	422	436
LPH · 60520 BN 135.				
pump with free shaft end	02.0 01	42.0 01	190	204
pump with coupling rough-drilled at motor side[1])	02.0 04	42.0 04	196	210
pump with coupling (rough-drilled at motor side) on base plate[1])	02.0 05	42.0 05	284	298
pump with coupling, contact safety device for shaft coupling and 3-phase AC motor (50 cs, 380 V) 15 kW mounted on base plate	02.0 UB	42.0 UB	422	436
LPH · 60527 BN 041.				
pump with free shaft end	02.0 01	42.0 01	215	231
pump with coupling rough-drilled at motor side[1])	02.0 04	42.0 04	222	238
pump with coupling (rough-drilled at motor side) on base plate[1])	02.0 05	42.0 05	312	328
pump with coupling, contact safety device for shaft coupling and 3-phase AC motor (50 cs, 380 V) 18,5 kW mounted on base plate	02.0 VB	42.0 VB	470	486
LPH · 60527 BN 135.				
pump with free shaft end	02.0 01	42.0 01	215	231
pump with coupling rough-drilled at motor side[1])	02.0 04	42.0 04	222	238
pump with coupling (rough-drilled at motor side) on base plate[1])	02.0 05	42.0 05	312	328
pump with coupling, contact safety device for shaft coupling and 3-phase AC motor (50 cs, 380 V) 18,5 kW mounted on base plate	02.0 VB	42.0 VB	470	486

[1]) If the motor type provided is indicated, the ready-drilled coupling, a contact safety device for shaft coupling and the shims necessary for compensating the difference in height of center can also be supplied.

When ordering a motor please always indicate service voltage, speed, type of protection and starting.
Motor designation (e.g. UB) is valid for normal speed, order other speeds with text in clear.

Example for ordering: The complete order No. for the liquid ring vacuum pump LPH · 60520 BN 041. in material design 42 with coupling, contact safety device for shaft coupling and 3-phase AC motor (50 cs, 380 V) 15 kW mounted on base plate is:

LPH · 60520 BN 041.42.0 UB

Notes:

If desired, the liquid ring vacuum pumps are supplied also with other motors or with motors in explosion-proof design.
Always provide for a motor protection switch.

It is possible to extend the design by the measuring and regulating devices required for service liquid regulation.

LIQUID RING VACUUM PUMPS

LPH · 60520
LPH · 60527

SIHI VACUUM TECHNOLOGY

Operating pressure: 120–1013 mbar
Pumping speeds: approx. 200–800 m³/h

SIHI liquid ring vacuum pumps are displacement pumps of simple and robust construction. They have the following important features:

- Almost all gases and vapours can be pumped
- The gases being pumped can be saturated with vapour
- Small quantities of entrained liquid can be handled
- Compression of the gases and vapours being pumped is nearly isothermal
- SIHI liquid ring vacuum pumps do not require any lubricant in the working space
- Reliable operation with minimum maintenance
- Low noise and vibration levels
- Adaptable to most duties when correct choice of materials of construction and service liquid are made

The SIHI liquid ring vacuum pumps LPH · 60520 and LPH · 60527 are single-stage pumps. They can be applied without modification as compressors upto a compression pressure of 1,5 bar (see catalogue section K).

LPH · 60527

Construction: **Construction code:**

Bearing:
- 2 greased antifriction bearings — B ·

Sense of rotation:
- Clockwise, when viewed from the pump drive end — · N
- or
- anticlockwise, when viewed from the pump drive end — · O

Shaft sealing:
- Either by stuffing boxes with sealing chambers and incorporated self-sealing — 0 4 1
- or by mechanical seals with built-in flushing — 1 3 5
- Changing design 041. into 051., i.e. with externally sealed stuffing boxes, can simply be carried out subsequently at the ready-mounted pump.

Note:

During operation the pump must continuously be supplied with service liquid, normally water, in order to eliminate the heat resulting from gas compression and in order to replenish the liquid ring, because some of the liquid is leaving the pump together with the gas.
This liquid can be separated from the gas in a liquid separator (see catalogue section A). Reuse of the service liquid is possible.
The pumps are equipped with a device by which the service liquid contaminated can continuously be drained during operation if necessary.

TECHNICAL DATA

	unit	LPH · 60520			LPH · 60527		
speed	rpm	1150	1450[1])	1750	1150	1450[1])	1750
power of the electric motor provided for drive	kW	11	15	18,5	15	18,5	30
inertia moment of the rotating pump parts and water filling	kg · m²		0,27			0,36	
contents of liquid in the pump upto shaft level	liter		12			14	
heat to be eliminated when compressing air from 120 to 1013 mbar	kW	8,6	11,8	15,5	10,8	15	20
lowest suction pressure permissible for continuous operation at a service water temperature of 15 °C	mbar		120			120	
max. pressure difference permissible between suction and compression pressure	bar	1,8	1,6	1,5	1,6	1,5	1,2[2]) 1,5
min. pulley diameter permissible in case of V-belt drive	mm		200			200	
sound pressure level of measuring area at a suction pressure of 200 mbar	dB (A)	75	76	79	75	76	79
max. temperature permissible: service liquid 100 °C gas 120 °C		max. viscosity permissible of service liquid 90 mm²/s max. flow resistance of heat exchanger 0,2 bar					

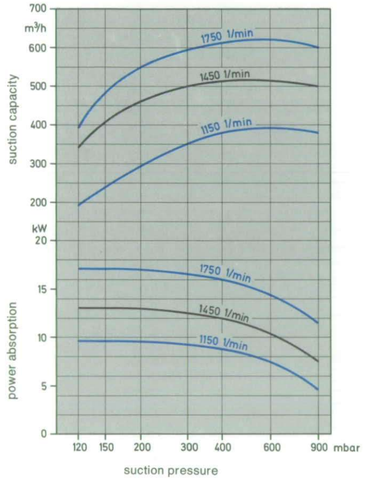
[1]) normal speed [2]) with V-belt drive

Material designs

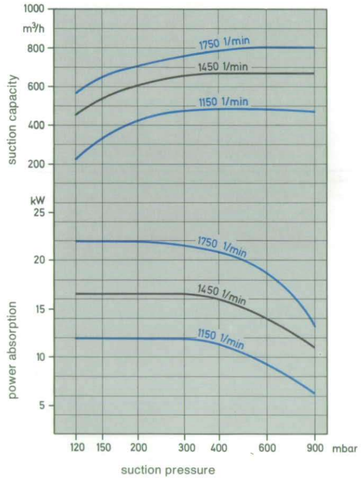
components	material design 02	material design 42
casing, guide disk	GG 25	G-X 10 Cr Ni Mo 18 9
central body	St 37-2	
vane wheel impeller	St 52-3	G-X 25 Cr Ni Mo 25 9
shaft (not in contact with medium to be handled)	St 60-2	
shaft sleeve	X 20 Cr 13	G-X 10 Cr Ni Mo 18 9
mechanical seal	carbon/Cr Ni-steel	carbon/Cr Ni Mo-steel
gland packing	soft packing	

Alternative materials on request

Suction capacity and power absorption



LPH · 60520



LPH · 60527

1 min = rpm

The values indicated for suction capacity and power absorption are valid for compression of dry air at 20 °C from suction pressure to atmospheric pressure (1013 mbar) with water at 15 °C as service liquid. Tolerance of the curve values is 10 %.

The data indicated change with deviating service conditions, such as deviating physical data of the gas to be handled or of the service liquid (vapour pressure, temperature, density, viscosity), when handling entrained liquid, at a compression pressure exceeding 1060 mbar absolute, when handling gas-vapour mixtures.

For determination of service data for deviating service conditions please see catalogue section TH; for precise (guaranteed) data please contact us.

Make-up water requirements in m³/h dependent on suction pressure, speed, mode of operation and temperature difference

suction pressure in mbar		120					400					600					900				
pump type	speed rpm	KB temperature difference °C 20	10	5	2	FB	KB temperature difference °C 20	10	5	2	FB	KB temperature difference °C 20	10	5	2	FB	KB temperature difference °C 20	10	5	2	FB
LPH · 60520	1150	0,35	0,6	1	1,8		0,3	0,6	0,9	1,5		0,25	0,45	0,7	1,1		0,15	0,2	0,3	0,4	
	1450	0,45	0,8	1,3	2,1	3,5	0,4	0,7	1,1	1,7	2,6	0,35	0,55	0,9	1,3	1,8	0,2	0,25	0,35	0,45	0,5
	1750	0,55	1	1,5	2,3		0,5	0,8	1,3	1,8		0,45	0,7	1	1,4		0,25	0,3	0,4		
LPH · 60527	1150	0,4	0,7	1,2	2,1		0,4	0,7	1,1	1,7		0,3	0,5	0,8	1,2		0,15	0,25	0,35	0,4	
	1450	0,55	1	1,5	2,4	3,8	0,5	0,9	1,3	1,9	2,7	0,4	0,7	1	1,4	1,8	0,25	0,3	0,4	0,45	0,5
	1750	0,7	1,2	1,8	2,6		0,6	1	1,5	2		0,5	0,8	1,1	1,5			0,35			

FB = make-up liquid service

KB = combined liquid service, service liquid 20 °C, 10 °C, 5 °C or 2 °C warmer than the make-up water

Accessories

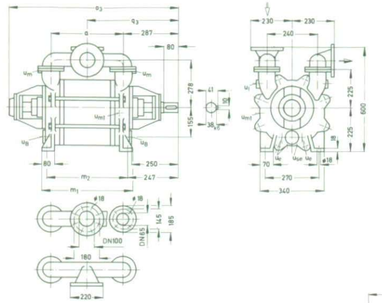
recommended accessories (at normal speed)		LPH · 60520	LPH · 60527
flexible coupling	type/weight	A 100/6 kg	A 160/7 kg
flexible coupling for (Ex)e G3	type/weight	PKZ 14/8 kg	PKZ 14/8 kg
base plate	SIHI part No./weight	271.436.100/88 kg	0110.00.487/90 kg
overhead liquid separator[1])	type/weight	XBa 5540/35 kg	XBa 5540/35 kg
service liquid line for XBa 5540	SIHI part No.	9141.025.45	9141.025.46
bend DN 65 for XBa 5540	SIHI part No.	9141.065.15	9141.065.16
liquid separator	type/weight	XBp 0913/53 kg	XBp 0913/53 kg
service liquid line for XBp 0913	SIHI part No.	9141.025.24	9141.025.25
make-up liquid tank	type/weight	XBw 1210/100 kg	XBw 1210/100 kg
float valve for XBw 1210	type/weight	XCs 25/1,1 kg	XCs 25/1,1 kg

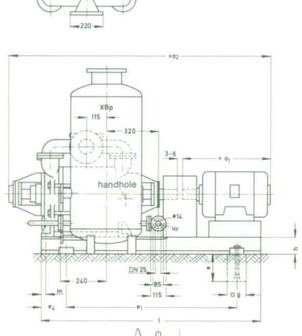
[1]) When using the overhead liquid separator XBa the Y-pipe at discharge side with lateral outlet is to be replaced by the bend.

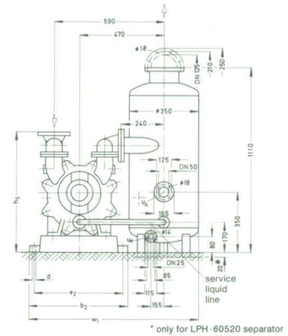
Dimension table/Arrangement drawing

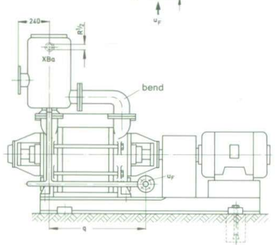
flange connections as per DIN 2501 PN 10
pump test overpressure 3 bar

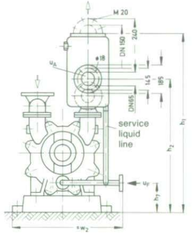
u_A = liquid drain
u_B = service liquid connection R 1
u_e = drainage (screwed plug) R ½
u_F = make-up liquid connection
u_l = air cock connection R ¾
u_m = pressure gauge connection R ¼
u_{m1} = drain valve connection R ⅜
u_{se} = contaminated service liquid drain R ½











pump type	motor size	kW	(Ex)e G3 kW	m	o_1*	o_2*
LPH · 60520	160 L	15	–	60	625	1490
	180 M	–	15	50	705	1570
LPH · 60527	180 M	18,5	–	100	650	1580
	180 L	–	17,5	80	740	1680

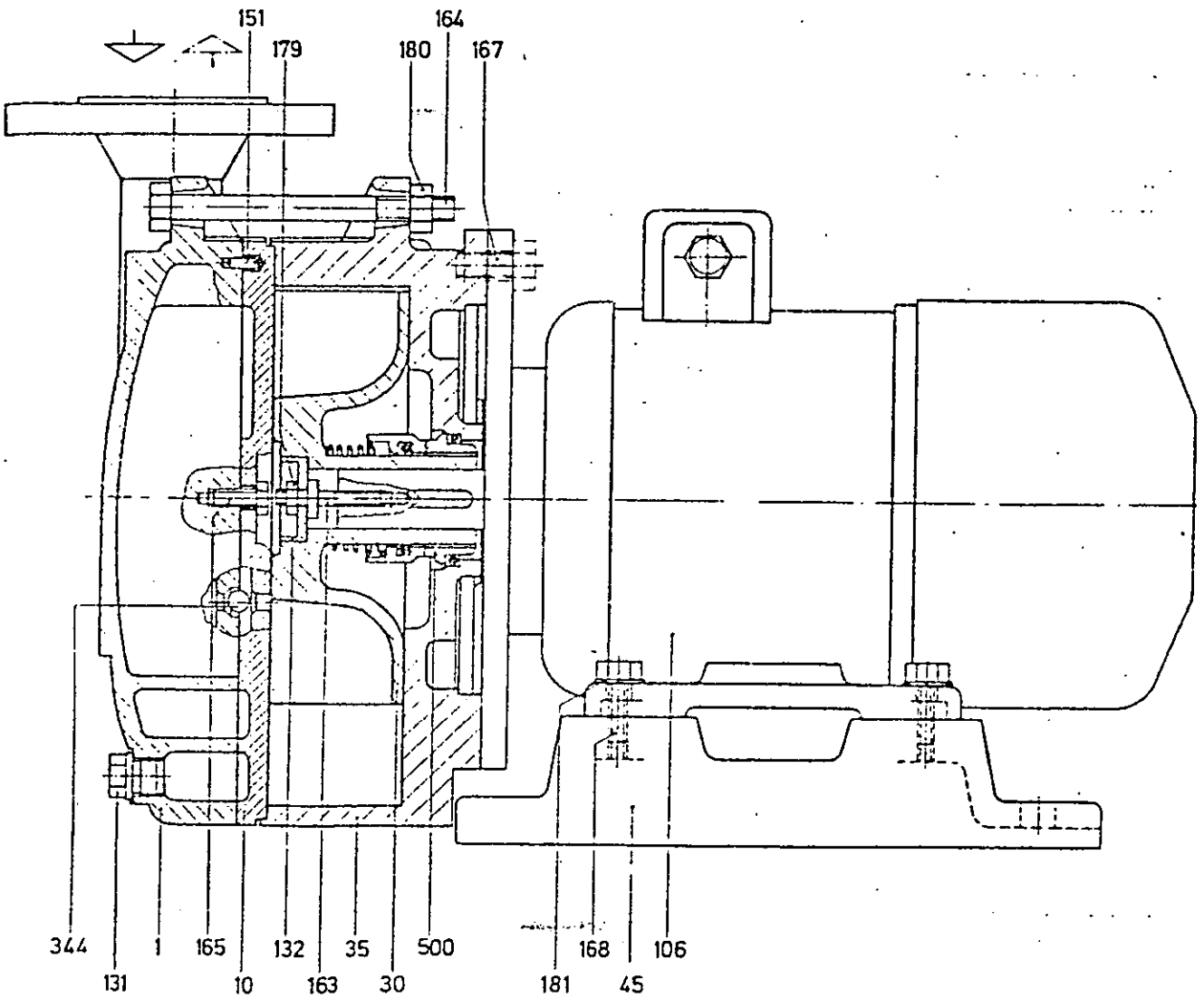
pump type	a	b_2	d	e	e_1	e_2	e_4	g	h	h_1	h_2	h_5	h_7	l	m_1	m_2	o_3	q	q_3	w_1	w_2	rag bolt DIN 529
LPH · 60520	350	540	24	200	840	490	215	85	80	1225	815	680	150	1270	490	430	863	420	462	920	600	M 20x200
LPH · 60527	416	610	28	250	940	550	240	100	100	1245	835	700	170	1400	556	496	929	490	495	950	635	M 24x250

* dependent on motor make, protection type IP 44

SECTIONAL DRAWING and ASSEMBLY INSTRUCTIONS

LIQUID RING VACUUM PUMPS
close coupled with standard motor

LPK · 30604. 30606 and 30608



1 cover	131 screwed plug	167 hexagon screw
10 guide disk	132 sealing cover	168 hexagon screw
30 vane wheel impeller	151 cylindrical pin	179 hexagon nut
35 central body	163 adjusting screw	180 hexagon nut
45 support foot	164 hexagon screw	181 disk
106 motor	165 hexagon screw	344 valve ball
		500 mechanical seal

1. Safety measures during assembly and disassembly:

During the assembly and the disassembly of the pump it has to be ensured that no toxic and aggressive media may escape from open pipe lines. The shutoff devices are to be secured against incompetent operation. The electrical connections must not be connected/disconnected before the corresponding safety devices are removed.

2. Instructions for disassembly of the pump

If a disassembly of the pump is necessary in order to clean it or to exchange parts, the following order has to be observed:

2.1 Disconnect the electrical supply line to the motor.
2.2 Dismount the complete pump out of the plant.
2.3 Drain the pump; flush it if necessary.
2.4 Unscrew the hexagon screws 164 of the cover 1.
2.5 Separate cover 1 and guide disk and central body 35; for that purpose a screw driver can be pushed into the centering slot. As sealing a liquid sealing compound is applied (e.g. Epple 33) therefore the parts are slightly sticked together.
2.6 Unscrew the counter nut 179 in the vane wheel impeller 30; in doing so, the adjusting screw 163 has to be held with a wrench. Then the vane wheel impeller is withdrawn by unscrewing the adjusting screw 163 out of the shaft end. This work can be made easier by unscrewing the hexagon screws 167 at the motor flange and by withdrawing the central body 35 from the motor by means of lever devices; at the same time the vane wheel impeller is pushed from the shaft end.
Unscrew the hexagon screw 165 and remove the guide disk 10 from the cover 1.

3. Instructions for assembly of the pump

Before the assembly all pump parts are to be cleaned carefully. The sealing surfaces must not have any scores and both surfaces of the guide disk have to be plane; if necessary they have to be planed with emery cloth.

Order of the assembly:

3.1 The motor is placed vertically, the adjusting screw 163 is screwed into the shaft end.
3.2 The stationary seal ring of the mechanical seal 500 is fitted into the central body; in doing so the correct seat of the O-ring has to be considered. The central body has to be fastened by the hexagon screws 167 to the motor flange.
3.3 Push the slide ring on the hub of the vane wheel impeller and the vane wheel impeller on the motor shaft; in doing so the correct seat of the key has to be considered. The narrowest place between vane wheel impeller 30 and central body 35 is at the top.
3.4 The vane wheel impeller has to be fastened on the shaft end by the adjusting screw 163 and the counter nut 179 in such a way that it stands back about 0,15 - 0,20 mm against the front edge of the central body. Then the vane wheel impeller has to be sealed against the shaft end by coating the adjusting screw 163 and the thread with liquid sealing compound. So the counter nut 179 is secured at the same time. After tightening of the counter nut 179 the play of the vane wheel impeller has to be checked again.
3.5 The valve balls are fitted into the cover 1 and the sealing surfaces are to be coated with liquid sealing compound. When putting on the guide disk 10, the correct position of the valve bores against the valve balls is to be considered. Fasten the guide disk by means of the hexagon screw 165 at the cover 1.
3.6 The sealing surface of the central body is coated with liquid sealing compound and the cover with guide disk are put on the central body in correct position (in case of horizontal assembly the orifices point upwards).
3.7 The hexagon screws 164 have to be tightened evenly and carefully. Subject the pump to a hydrostatic test at 3 bar overpressure and check on tightness.
3.8 Before the pump is installed into the plant it has to be checked by turning the motor fan whether the pump is of easy action. If the pump should be stuck, probably the vane wheel impeller is incorrectly adjusted. The fault has to be rectified.

Before starting up the pump the operation instructions No. 143.75152.5·.01 are to be observed.

4. Motor specification

Construction type B3 / B 5, dimensions as per DIN 42673 and DIN 42677, Mounting flange size A 250 as per DIN 42948, thread in shaft end M 10, fixed bearing at driving side.

SIHI VAKUUMTECHNIK

SIHI HALBERG

XCk

Wird eine Flüssigkeitsring-Vakuumpumpe außer Betrieb gesetzt (durch Abschalten oder Stromausfall) kann Luft oder Gas aus dem Druckstutzen durch die stehende Pumpe zur Saugseite gelangen. Dabei kommt es zu einem Rücksteigen der Betriebsflüssigkeit in die Saugleitung.

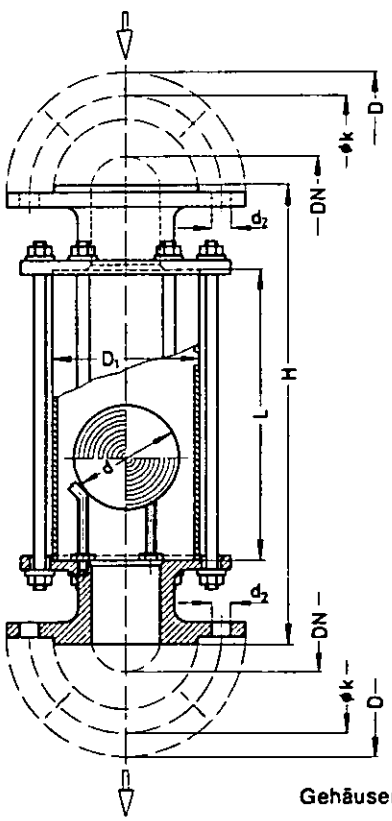
Durch den Einbau eines Kugel-Rückschlagventiles wird die plötzliche Belüftung der Saugleitung und damit des angeschlossenen Vakuumbehälters vermieden, gleichzeitig wird verhindert, daß Betriebsflüssigkeit zurückschlägt.

Die Ventilkonstruktion ist sehr einfach ausgeführt. Der beim Abschalten der Pumpe auftretende Druckanstieg preßt eine elastische Ventilkugel in den entsprechend geformten Sitz des oberen Ventilteiles.

Die Leckrate des geschlossenen Ventiles ist sehr gering. Wird eine besondere Dichtheit verlangt, wird zusätzlich nach dem Kugel-Rückschlagventil ein Vakuum-Sicherheitsventil installiert. (Siehe Katalog-Liste V 3).

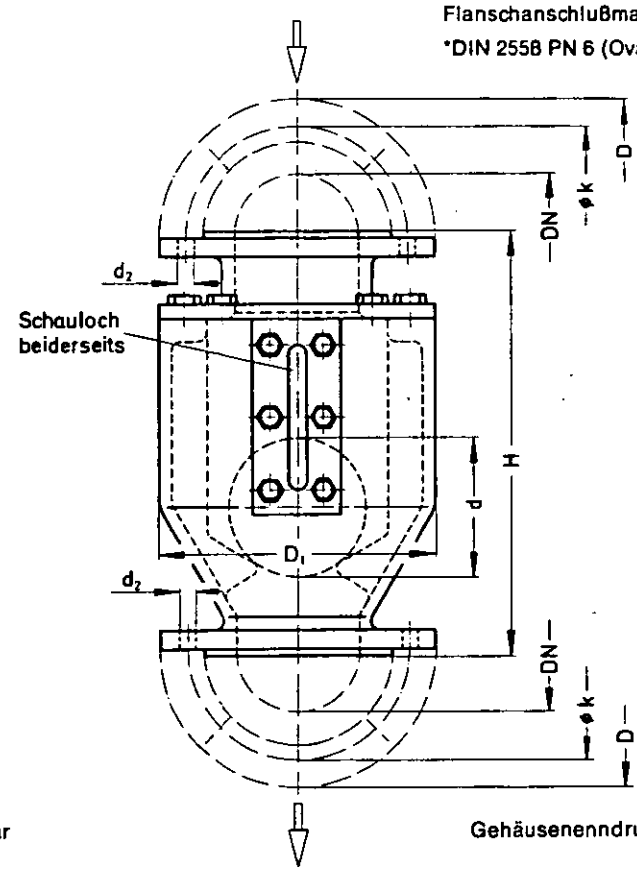
Im geöffneten Zustand sind die Druckverluste im Ventil sehr niedrig.

DIN 2501 PN 10
Flanschanschlußmaße nach
*DIN 2558 PN 6 (Ovalflansch)



Gehäusenenndruck 2 bar

Ausführung A



Gehäusenenndruck 10 bar

Ausführung B

Baureihe + Baugröße		Ausf.	DN	D	k	d_2 x Anzahl	d	D_1	H	L	Gewicht ca. kg
XCk	324	A	32*	118	90	14 x 2	50	70	190	60	7
	406		40	150	110	18 x 4	60	90	210	80	
	506		50	165	125		70	100	225	95	8,5
	656		65	185	145		80	120	240	110	10
	806		80	200	160		100	140	265	135	12
	1006	B	100	220	180	18 x 8	120	216	335	–	29

Werkstoffausführungen

Bauteile	Werkstoffausführung	
	763	764
Flansche und metallische Ventilteile	GG 25	
Zylinder	Jenaer Glas*	
Ventilkugel	Perbunan	Gaflon

* XCk 1006 wird mit Zylinder aus GG 25 geliefert

Bestellhinweise

Baureihe + Baugröße		Bestellnummern bei Werkstoffausführung	
		763	764
XCk	324	0648.532.40.763	0648.532.40.764
	406	0648.540.60.763	0648.540.60.764
	506	0648.550.60.763	0648.550.60.764
	656	0648.565.60.763	0648.565.60.764
	806	0648.580.60.763	0648.580.60.764
	1006	0648.600.60.763	–

Data regarding pump size — Instructions for placing orders

type	type of bearing + sense of rotation	shaft seal	material design	casing seal
	Z · two grease-lubricated antifriction bearings arranged in motor · N sense of rotation clockwise when looking from drive to the pump	135 non-balanced standard mechanical seal	01 standard design cast iron 02 as 01, but without nonferrous metal	0 liquid seal
LPK · 30604 LPK · 30606 LPK · 30608	ZN	135	alternatively 01 02	0

design	designation	motor selection table		
		motor n = 1450 1/min		
		kW	size	designation
This pump can be delivered only in design 7, i. e. pump with flanged-on motor, e. G. 3.0 kW three-phase AC motor (IP 54, 220/380 V, 50 Hz).	e. G. LB	2.2 3.0 4.0	100 L 100 L 112 M	KB LB MB

Three-phase AC motor: IP 54, 1450 rpm, 50 Hz
to incl. size 100 L 220/380 V;
from size 112 M 380 V on

Example for ordering:
The liquid ring vacuum pump LPK · 30606 ZN 135.01.0 in material design 01 complete with 3.0 kW three-phase AC motor (IP 54, 220/380 Hz) 1450 rpm has the complete order number: **LPK · 30606 ZN 135.01.0 LB**

On supply point (·) at the fourth place of the type denomination is replaced by a letter on our part.

LIQUID RING VACUUM PUMPS

in close-coupled design with standard motor

LPK · 30604
LPK · 30606
LPK · 30608

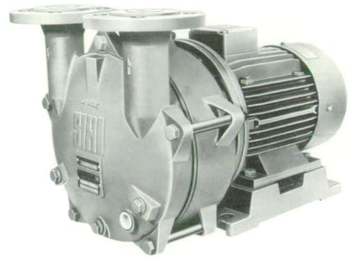
SIHI VACUUM TECHNOLOGY

Pressure range: 40 to 1013 mbar
Suction capacity: 30 to 120 m³/h

Close-coupled SIHI liquid ring vacuum pumps are displacement pumps of uncomplicated and robust construction with the following features:

- Almost all gases and vapours can be pumped
- The gases being pumped can be saturated with vapour
- Small quantities of entrained liquid can be handled
- Compression of the gases and vapours being pumped is nearly isothermal
- SIHI liquid ring vacuum pumps do not require any lubricant in the working space
- Reliable operation with minimum maintenance
- Low noise and vibration levels
- Adaptable to most duties when correct choice of materials of construction and service liquid are made
- The pump is fastened directly to the flange of a standard motor; thus a compact, space-saving unit is obtained.

The SIHI liquid ring vacuum pumps LPK · 30604, LPK · 30606 and LPK · 30608 are single stage.



LPK · 30606

Construction

Bearing:
Two grease lubricated antifriction bearings arranged in the motor.
Construction code: Z ·

Sense of rotation:
Clockwise when looking on the pump from the drive.
Construction code: · N

Shaft sealing:
The shaft is sealed by a mechanical seal.
Code number 135: Single standard mechanical seal, flushed by the service liquid.

Notes

During operation the pump must continuously be supplied with service liquid, normally water, in order to eliminate the heat resulting from the gas compression, and to replenish the liquid ring, because part of the liquid is leaving the pump together with the gas.
This liquid can be separated from the gas in a liquid separator. It is possible to re-use the service liquid.

TECHNICAL DATA

	unit	LPK · 30604	LPK · 30606	LPK · 30608
speed	1/min	1450	1450	1450
power of the electric motor provided for driver	kW	2.2	3	4
inertia moment of the rotating pump parts and the water filling	kg · m²	0.15	0.15	0.2
contents of liquid in the pump upto shaft level	liter	2.4	2.8	3.2
heat to be eliminated when compression air from 40 to 1013 mbar	kW	1.6	2.2	3.0
lowest suction pressure permissible for continuous operation at a service water temperature of 15 °C	mbar	40	40	40
maximum discharge overpressure	bar	0.3	0.3	0.3
sound pressure level of measuring area at a suction pressure of 80 mbar	dB (A)	65	65	64
max. temperatures permissible: service liquid 80 °C gas 100 °C		max. viscosity permissible of service liquid 4 mm²/s max. flow resistance of the heat exchanger 0.2 bar		

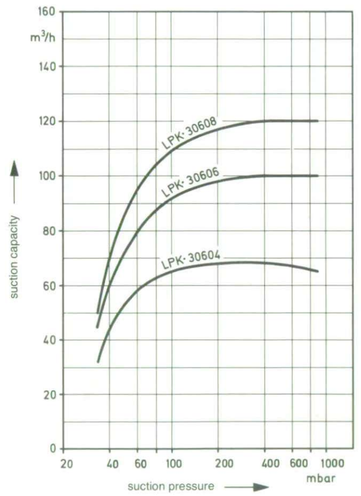
Notes

Smaller suction pressures till 8 mbar are attained through combination with SIHI gas ejectors

Material designs

components	material design 01	material design 02
cover, guide disc, central body	GG 25	
vane wheel impeller	G-Cu Sn 5 Zn Pb	G-X 20 Cr 14
mechanical seal	carbon/Cr Ni-steel/Perbunan	
seal	Epple 33/Polyamid A	

Suction capacity



The values indicated for the suction capacity are valid for the compression of dry air of 20 °C from suction pressure to atmospheric pressure (1013 mbar) by using water as service liquid having a temperature of 15 °C. The tolerance of the curve values is approximately 10 %.

The data indicated change with deviating operation conditions, as for example at deviating physical data of the gas to be handled or the service liquid (vapour pressure, temperature, density, viscosity), when additional liquid is being handled along with the medium, at a discharge pressure above 1060 mbar absolute, when pumping gas/vapour mixtures.

The motor sizes are selected for the above indicated conditions, which correspond to the normal application. For operation cases, where a higher power input arises, it is possible to use the next bigger motor. More details upon request.

For determination of the operating data at deviating operation conditions, please see catalog section TH. For precise (guaranteed) data please contact us.

Make-up water requirement in m³/h dependant on suction pressure, speed, mode of operation and temperature difference

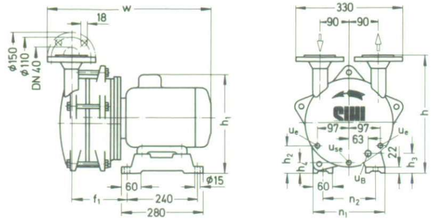
	speed	suction pressure in mbar: 40				200				600			
		KB temperature difference °C			FB	KB temperature difference °C			FB	KB temperature difference °C			FB
	rpm	10	5	2		20	10	5	2		20	10	5	2	
LPK · 30604	1450	0.12	0.21	0.40	1.0	0.08	0.14	0.25	0.44	0.9	0.07	0.13	0.21	0.35	0.6
LPK · 30606		0.15	0.26	0.47		0.10	0.18	0.30	0.50		0.09	0.16	0.26	0.39	
LPK · 30608		0.16	0.28	0.49		0.12	0.21	0.34	0.55		0.12	0.19	0.29	0.42	

FB = make-up liquid operation
KB = combined liquid operation, service liquid 20 °C, 10 °C, 5 °C or 2 °C warmer than the make-up water.

Accessories

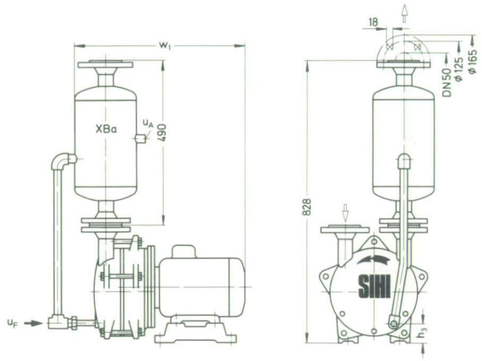
recommended accessories		LPK · 30604	LPK · 30606	LPK · 30608
overhead liquid separator (material design 062/steel painted)	type/weight	XBa 1040/9.7 kg		
base-mounted liquid separator (material design 062/steel painted)	type/weight	XBp 0672/37 kg		
service liquid line for XBa 1040 (material design 072/GTW 35 - St 35)	SIHI part No.	9141.015.93.072		
service liquid line for XBp 0672 (material design 072/GTW 35 - St 35)	SIHI part No.	9141.015.95.072		
discharge line for XBp 0672 (material design 070/RST 37-2 - St 35-PVC)	SIHI part No.	9142.040.33.070		

Dimension table — general arrangement plan

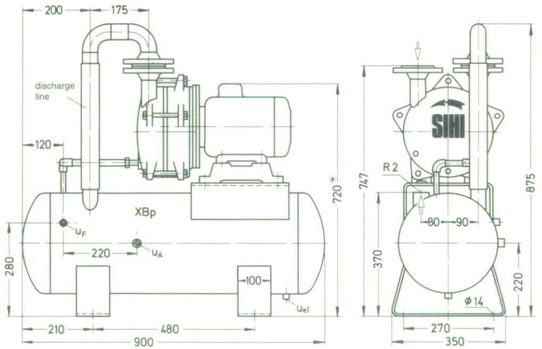


flange connections to DIN 2501 PN 10
hydrostatic test (overpressure) 3 bar

u_A = liquid drain R 1
u_B = connection for service liquid R 1/2
u_E = drainage R 3/8
u_{E1} = drainage
u_F = connection for make-up liquid R 1/2
u_{SE} = contaminated service liquid drain R 3/8



overhead liquid separator XBa
hydrostatic test (overpressure) 1 bar



base-mounted liquid separator XBp
hydrostatic test (overpressure) 1 bar

	f_1	h	h_1	h_2	h_3	h_4	n_1	n_2	w*	w_1*	pump kg	weight pump with XBa kg	pump with XBp kg
LPK · 30604	161	335	300	87	57	30	220	160	546	573	66	76	106
LPK · 30606	158								543	570	69	79	109
LPK · 30608	182	347	312	99	69	42	250	190	562	590	77	87	117

* dependent on motor make, protection type IP 54

LIQUID SEPARATORS

for Liquid Ring Vacuum Pumps

SIHI VACUUM TECHNOLOGY

During the operation of a liquid ring vacuum pump, a part of the service liquid is discharged through the discharge connection together with the process gas or vapour. In most cases it is therefore necessary to fit a liquid separator to the discharge line of the pump which separates the service liquid from the process gas.

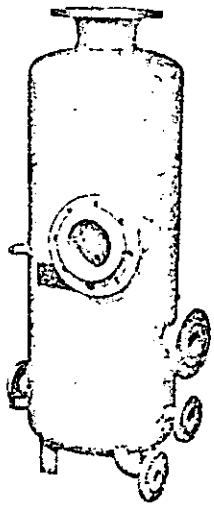
SIHI supplies a range of liquid separators for this purpose, and for connection to the discharge side of the liquid ring vacuum pumps. After the separation the gas contains only the part of the vapour corresponding to the saturated vapour pressure of the liquid in the separator. The size of the liquid separators depends on the pumped out gas flow, i. e. on the suction capacity of the connected liquid ring vacuum pump and on the service liquid flow rate.

SIHI liquid separators for liquid ring vacuum pumps are supplied in various designs:

Liquid separators type XBp as vertical containers; (opposite)

Liquid separators type XBa as integral containers;
(Integral flange mounted liquid separator)

Liquid separators for liquid ring vacuum pumps in close coupled construction and for compact vacuum plants.



Liquid Separator
(Vertical Container)
Type XBp

Type XBp liquid separators are installed close to the corresponding liquid ring vacuum pumps and connected to them by pipelines. Two or more liquid ring vacuum pumps can be connected to a single liquid separator if the correct rating is used.

Type XBa integral liquid separators are mounted directly on the discharge connection of the liquid ring vacuum pump, so making possible a space saving installation of the pump.

The liquid ring vacuum pumps are operated with different connections of the liquid separators, depending on the course of the gas and the service liquid. Figs. 1 to 8 on the next page show schematically the **most common methods** of operation.

a) Operation with once through service liquid
(if the service liquid shall not be re-used)

The entire liquid flow needed for the operation of the liquid ring vacuum pump is taken from a liquid system (e.g. water mains).

A liquid separator can be renounced if it is not necessary to discharge gas and liquid separately.

If the pressure of the make-up liquid (e.g. the water pressure in the mains) varies considerably, in this case the liquid should not be conducted directly into the liquid ring vacuum pump. It is advisable to conduct the make-up liquid into the pump through a pressure reducer with interposed solenoid valve; especially if using smaller liquid ring vacuum pumps, up to sizes LPH- 40000 resp. LPH- 45000. (see fig. 1)

If using liquid ring vacuum pumps with greater need of make-up liquid (more than 1.5 m³/h) it is advisable to conduct the make-up liquid firstly into a container (type XBw) with float valve (type XCs); out of it the connected liquid ring vacuum pump sucks the make-up liquid. It is advisable to install a separator into the discharge line of such a pump, so that gas and service liquid can be drained separately. (figs. 2 and 3)

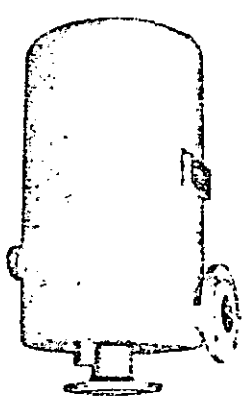
b) Operation with partial recirculation of the service liquid
(normal operation)

The service liquid consists of a mixture of make-up liquid, taken from a liquid system (i.e. water mains), and the circulating liquid taken from the liquid separator.

A liquid flow similar to the quantity of make-up liquid leaves the separator as discharge liquid through the outlet. (see figs. 4 – 6)

c) Operation with total recirculation of the service liquid

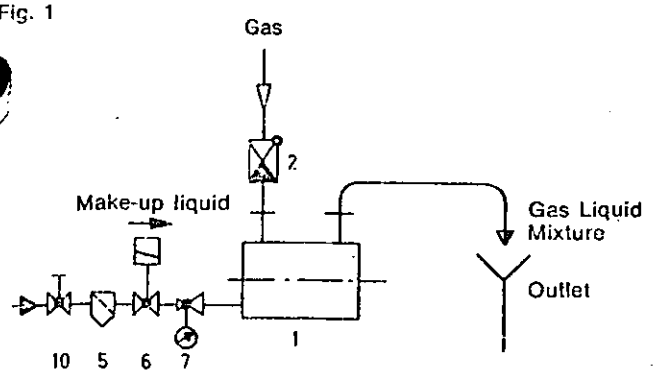
During this operation the entire liquid, separated from the gas (resp. vapour) in the separator, is re-used as service liquid. In case of continuous operation it is necessary to interpose a heat exchanger for the cooling of the service liquid, warmed up in the pump. (see figs. 7 and 8)



Liquid Separator as Integral Container
Type XBa

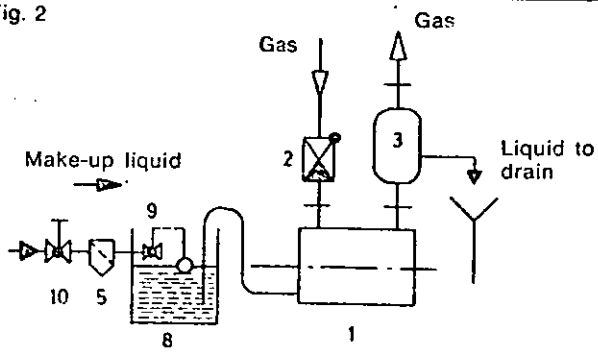
Upon request each liquid ring vacuum pump will be delivered complete with liquid separator or mounted ready for use.

Fig. 1



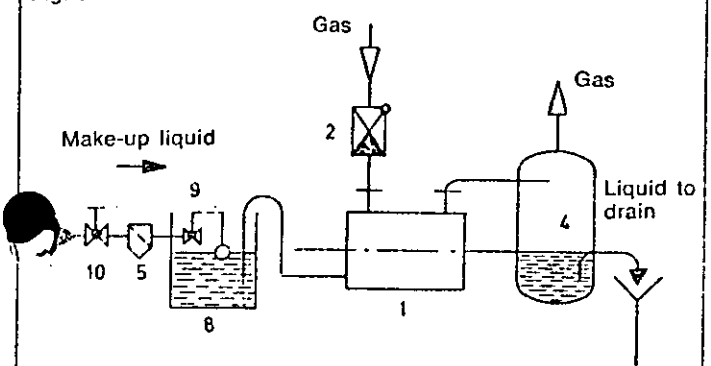
Operation with make-up liquid (once through liquid) (small pumps up to LPH· 40/45000)

Fig. 2



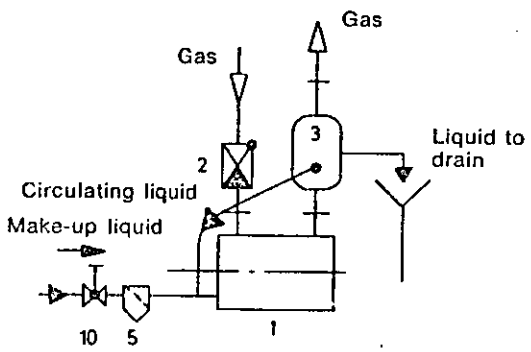
Operation with make-up liquid medium sized pumps up to LPH· 70/75000)

Fig. 3



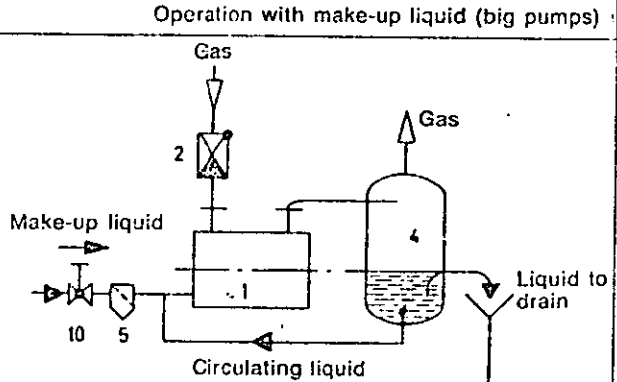
Operation with make-up liquid (big pumps)

Fig. 4



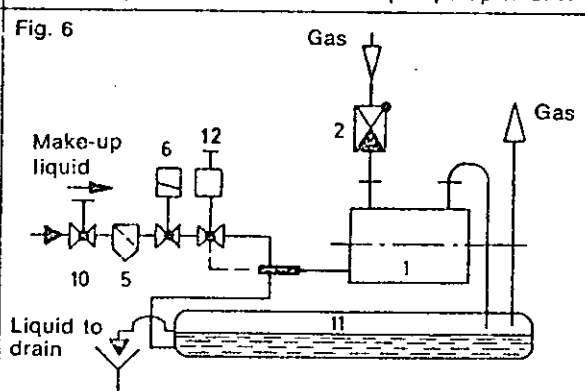
Combined liquid operation (partial recirculation) (small and medium sized pumps up to LPH· 70/75000)

Fig. 5



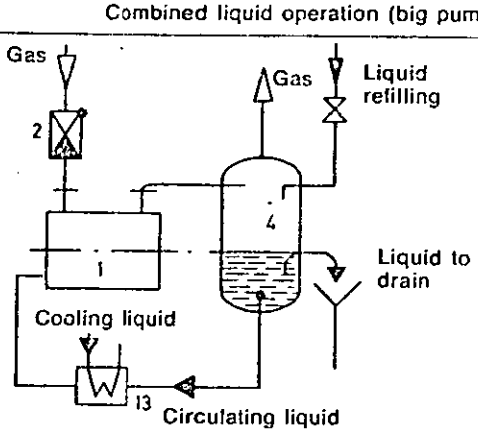
Combined liquid operation (big pumps)

Fig. 6



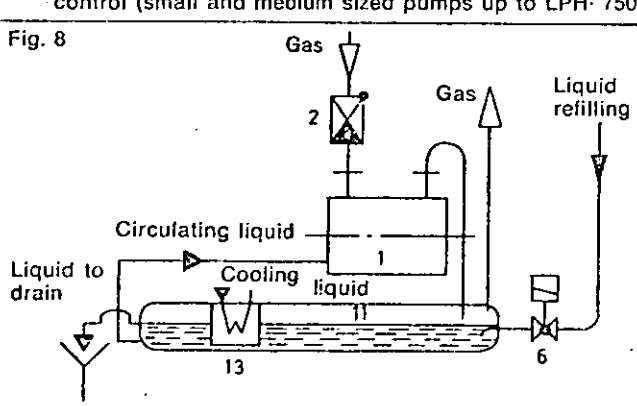
Combined liquid operation; compact plant with temperature control (small and medium sized pumps up to LPH· 75000)

Fig. 7



Circulation liquid operation (closed circuit) all sizes.

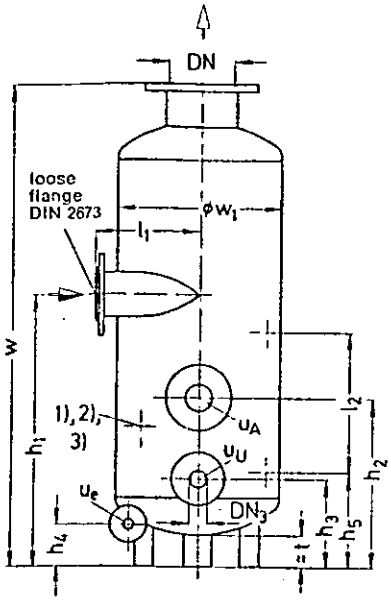
Fig. 8

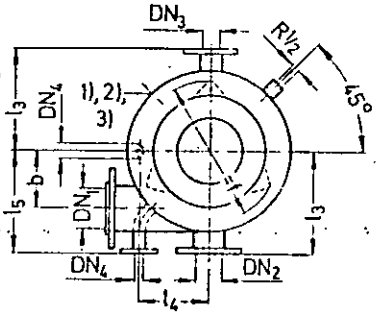


Circulation liquid operation (closed circuit) compact plant (up to LPH· 75000)

1 Liquid ring vacuum pump
2 Ball type non-return valve
3 Integral liquid separator type XBa
4 Liquid separator (vertical container) type XBp
5 Strainer
6 Solenoid valve
7 Pressure reducer with pressure gauge
8 Make-up liquid container type XBw
9 Float-valve type XCs
10 Shut-off valve
11 Liquid separator in compact vacuum plants
12 Thermostat valve
13 Heat exchanger

Dimension table





Liquid separator XBp
for the operation with one pump

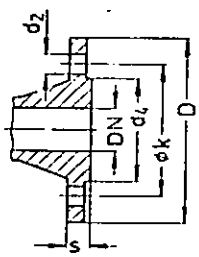
Operating overpressure	0,5 bar
Test overpressure	1,0 bar

u_A = Liquid outlet
u_U = Circulating liquid connection
u_e = Drain

1) Handhole lock 100 x 150
2) Manhole lock 320 x 420
3) Without special sighthole

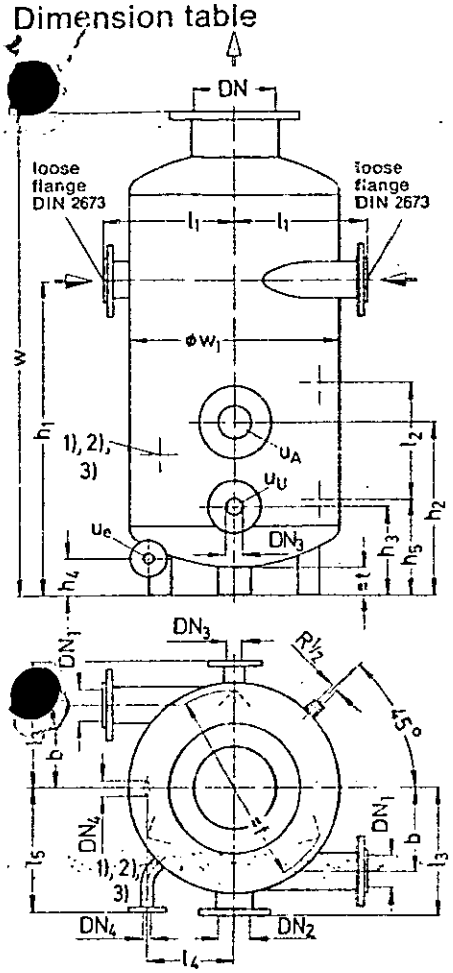
Contrary to the figures, DN_2 to DN_4 at the separators XBp 0413 and 0414 is executed as threaded sleeve.

SIHI type No.	Nom. cap. l	Approx. weight kg	Model	DN	DN_1	DN_2	DN_3	DN_4	b	f	h_1	h_2	h_3	h_4	h_5	l_1	l_2	l_3	l_4	l_5	t	w	w_1
XBp 0413	40	28	3)	50	40	R 1	R ½	R ½	105	240	595	235	125	75	125	210	300	170	95	—	75	860	273
XBp 0414		31		80	50	32			100		620	240	130		130			200				900	
XBp 0512	50	40		100					115	270	640		205	95	205			220	135	220	70	950	300
XBp 0912	90	51	1)		65	50	25		130	300	750	350				240	380						
XBp 0913		53		125	100				115		605		170	80	170			240	155	240	50	1110	350
XBp 2311	230	96		150		80		25	185	450	965	520	270	130	270	315		315		315	100	1490	500
XBp 2312		98		200	125		50		175		835						450						
XBp 5013	500	148			150				230	600	1275	680	325	110	325	380		390		380	80	1870	650
XBp 5014		156		250	200	100			205							400							
XBp 10112	1000	205		300					280	725	1625	800	430		450	500		480	—	400		2320	800
XBp 10212		212		350	250		80		260														
XBp 15112	1500	260	2)		200	125		50	355	850	1785	910	460	100	560	575	700	555		475	150	2470	950
XBp 15212		278		400	300				305														
XBp 20112	2000	325			250	150	100		350	900	2115	1040	515		690	600		580		500		2980	1000
XBp 20212		345		500	350				310														



	Flange connections acc. to DIN 2501 PN 10														
DN	25	32	40	50	65	80	100	125	150	200	250	300	350	400	500
k	85	100	110	125	145	160	180	210	240	295	350	400	460	515	620
D	115	140	150	165	185	200	220	250	285	340	395	445	505	565	670
d_2 x number	14 x 4	18 x 4	18 x 4	18 x 4	18 x 4	18 x 8	18 x 8	18 x 8	22 x 8	22 x 8	22 x 12	22 x 12	22 x 16	26 x 16	26 x 20
d_4	68	78	88	102	122	138	158	188	212	268	320	370	430	482	585
s	16	16	16	18	18	20	20	22	22	24	26	26	26	26	28

Dimension table



Liquid separator XBp
for the operation with **two** pumps

Operating overpressure 0,5 bar
Test overpressure 1,0 bar

u_A = Liquid outlet
u_U = Circulating liquid connection
u_e = Drain

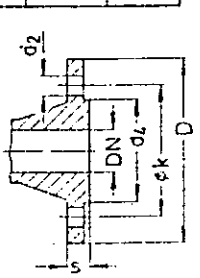
1) Handhole lock 100 x 150
2) Manhole lock 320 x 420
3) Without special sighthole

Contrary to the figures, DN_3 and DN_4 at the separators XBp 0423 and 0424 is executed as threaded sleeve.

SIHI type No.	Nom. cap. l	Approx. weight kg	Model	DN	DN_1	DN_2	DN_3	DN_4	b	f	h_1	h_2	h_3	h_4	h_5	l_1	l_2	l_3	l_4	l_5	t	w	w_1
Xp 0423	40	35	3)	65	40	32	R ½	R ½	105	240	595	235	125	75	125	210	300	195	95	—	75	850	273
XBp 0424		39		125	50	50			100		620	255	130		130			210				920	
XBp 1020	100	59	1)	150		65	25	25	165	360	640	355	200		200	260	380	280	—	280	50	1020	400
XBp 1720	170	67			65				200	450	695	360	170	105	170	315	300	310	210	300	75	1140	500
XBp 1721		77		200	100				185		605												
XBp 3920	390	117		250		100			255	600	965	530	270	110	270	400	380	390		380	80	1480	650
XBp 3921		123			125		50		240		635					420							
XBp 1020	100	245		300	150	125		40	380	650	1075	600	325	120	325	530	500	550		550	70	1980	950
XBp 1021		278		350	200				350							560							
XBp 15122	1600	275		400					380	900	1625	600	230		450	600		580	—	500		2250	1000
XBp 15222		285	2)	500	250	150	80		360														
XBp 20122	2000	355			200			50	430	1000	1785	910	460	100	560	650	700	630		550	150	2470	1100
XBp 20222		380		600	300				380														
XBp 30122	3000	462			250	200	100		480	1150	2115	1040	515		690	725		710		625		2900	1250
XBp 30222		525		700	350				430														

Flange connections acc. to DIN 2501 PN 10															
DN	25	32	40	50	65	80	100	125	150	200	250	300	350	400	500
k	85	100	110	125	145	160	180	210	240	295	350	400	460	515	620
D	115	140	150	165	185	200	220	250	285	340	395	445	505	565	670
d_2 x number	14 x 4	18 x 4	18 x 4	18 x 4	18 x 4	18 x 8	18 x 8	18 x 8	22 x 8	22 x 8	22 x 12	22 x 12	22 x 16	26 x 16	26 x 20
d_4	68	78	88	102	122	138	158	188	212	268	320	370	430	482	585
s	16	16	16	18	18	20	20	22	22	24	26	26	26	26	28

DN	600	700
k	725	840
D	780	895
d_2 x number	30 x 20	30 x 24
d_4	685	800
s	28	30



Installation Plan and Ordering Details for Liquid Separators XBp

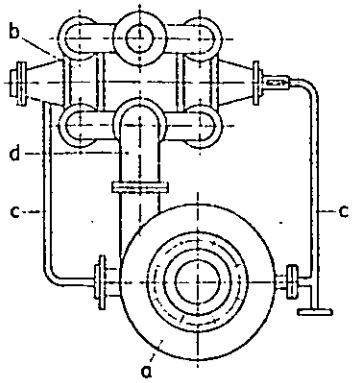


Fig. A

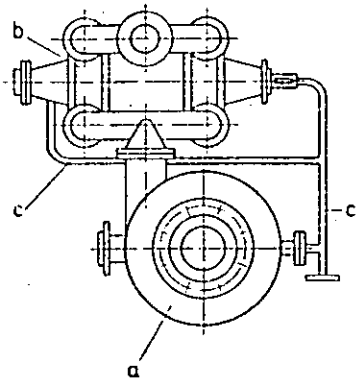


Fig. B

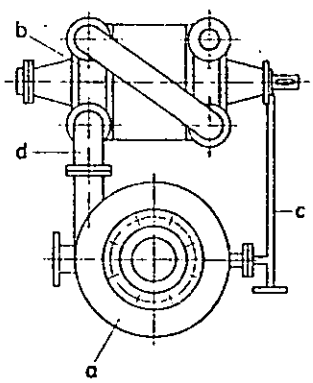


Fig. C

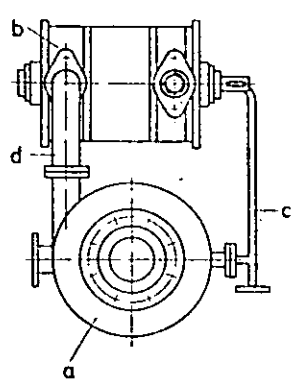
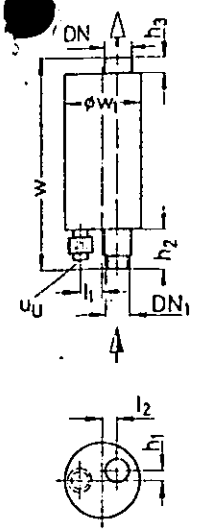


Fig. D

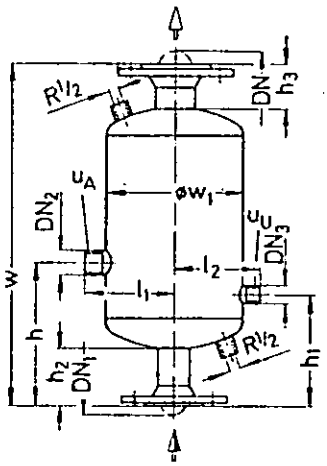
Liquid ring vacuum pump b	Acc. to fig.	Order No.[1]) of the bend d	For the operation with one pump: Liquid separator a	Order No.[1]) of the liquid separator	Order No.[1]) of the service liquid line c	For the operation with two pumps: Liquid separator	Order No.[1]) of the liquid separator	Order No.[1]) of the service liquid line c
LOH 05501	D	9141.040.11.	XBp 0413	0664.004.13.	9141.008.11.	XBp 0423	0664.004.23.	upon request
LOH 20103					9141.010.16.			
LOH 20107					9141.010.17.			
LOH 25003					9141.010.18.			
LOH 25007					9141.010.19.			
LOH 25309					9141.015.73.			
LPH 40106	C	9141.040.09.			9141.015.68.			
LPH 40411		9141.040.08.			9141.015.69.			
LPH 40516	A	9141.050.29	XBp 0414	0664.004.14.	9141.015.67.	XBp 0424	0664.004.24.	
LPH 45008	C	9141.040.09.	XBp 0413	0664.004.13.	9141.015.70.	XBp 0423	0664.004.23.	
LPH 45311					9141.015.71.			
LPH 45316		9141.040.12.			9141.015.72.			
LPH 50115		9141.050.29.	XBp 0512	0664.005.12.	9141.025.52.	XBp 1020	0664.010.20.	
LPH 50523	A	9141.065.14.	XBp 0912	0664.009.12.	9141.025.55.	XBp 1720	0664.017.20.	
LPH 55312	C	9141.050.29.	XBp 0512	0664.005.12.	9141.025.53.	XBp 1020	0664.010.20.	
LPH 55316					9141.025.57.			
LPH 55320					9141.025.54.			
LPH 60520	B	—	XBp 0913	0664.009.13.	9141.025.24.	XBp 1721	0664.017.21.	
LPH 60527					9141.025.25.			
LPH 65320	C	9141.065.18.	XBp 0912	0664.009.12.	9141.025.26.	XBp 1720	0664.017.20.	
LPH 65327					9141.025.34.			
LPH 70123		9141.100.03.	XBp 2311	0664.023.11.	9141.050.10.	XBp 3920	0664.039.20.	
LPH 70530	B	—	XBp 2312	0664.023.12.	9141.050.11.	XBp 3921	0664.039.21.	
LPH 70540					9141.050.12.			
LPH 75320	C	9141.100.03.	XBp 2311	0664.023.11.	9141.050.13.	XBp 3920	0664.039.20.	
LPH 75330					9141.050.14.			
LPH 75340					9141.050.15.			
LPH 80540	B	—	XBp 5014	0664.050.14.	9141.050.16.	XBp 11021	0664.110.21.	
LPH 80553					9141.050.17.			
LPH 85340	C	9141.150.01.	XBp 5013	0664.050.13.	9141.050.18.	XBp 11020	0664.110.20.	
LPH 85353					9141.050.19.			
LPH 90554	B	—	XBp 10212	0664.102.12.	9141.080.07.	XBp 15222	0664.152.22.	
LPH 90567					9141.080.08.			
LPH 95354	C	9141.200.01.	XBp 10112	0664.101.12.	9141.080.09.	XBp 15122	0664.151.22.	
LPH 95367					9141.080.10.			
LPH 10054	B	—	XBp 15212	0664.152.12.	9141.080.11.	XBp 20222	0664.202.22.	
LPH 10534	C	9141.200.01.	XBp 15112	0664.151.12.	9141.080.12.	XBp 20122	0664.201.22.	
LPH 11055	B	—	XBp 20212	0664.202.12.	9141.100.01.	XBp 30222	0664.302.22.	
LPH 11535	C	9141.250.01.	XBp 20112	0664.201.12.	9141.100.02.	XBp 30122	0664.301.22.	

[1]) Additional number for material design see last page.

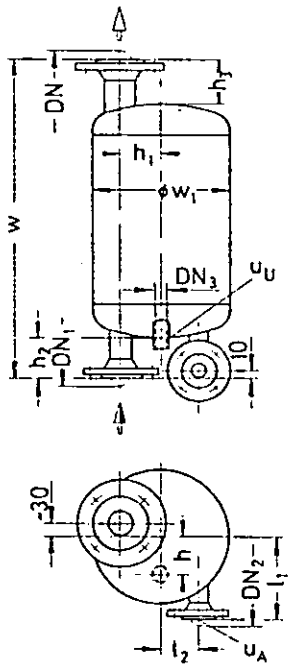
Dimension table
Integral liquid separator XBa



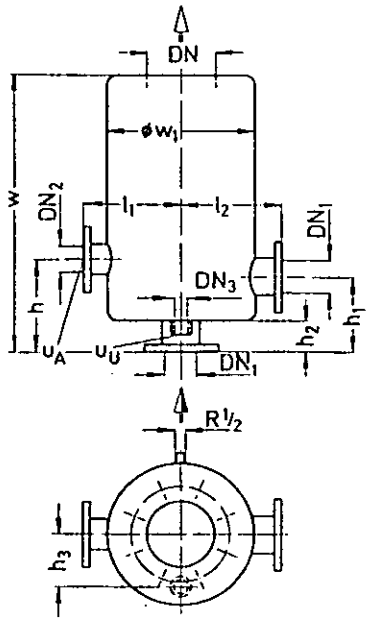
Model A



Model B/C*



Model D



Model E

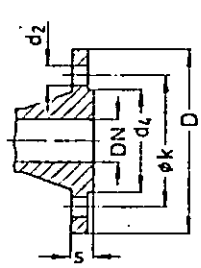
Models B, C*, D and E:
Operating overpressure 0,5 bar
Test overpressure 1,0 bar

u_A = Liquid outlet
u_U = Circulating liquid connection

SIHI type No.	Nominal capacity l	Approx. weight kg	Model	DN	DN_1	DN_2	DN_3	h	h_1	h_2	h_3	l_1	l_2	w	w_1
XBa 240	1,4	0,6	A	40	R 1	—	—	—	15	60	22	34	22	275	110
XBa 242	1,1	2,3		R 1 1/4										260	114
XBa 342	4	5	C*	32	32	R 3/4	R 3/8	175	145	70	45	104	101	345	152
XBa 1041	10	10		50		R 1	R 1/2	205	160	80		127	122	490	194
XBa 1040		9,7	B		40										
XBa 1140	11	16	D	65	50	40	R 1	70	52	75	60	160	60	500	220
XBa 1340	15	14	B	50	40	R 1 1/2	R 1/2	205	160	80		129	122	610	194
XBa 1341		15		65	50										
XBa 2040	20	24	D	80	65	40	R 1	80	56	75	75	180	75	645	244
XBa 2041		23		65	50										
XBa 5540	55	35	E	150	65	65	R 2	280	142	90	130	240	232	690	350
XBa 10040	100	70		200	100	80			230	95	160	290	300	850	450

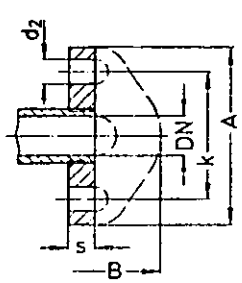
* This model is only deliverable with oval flanges

Flange connections acc. to DIN 2501 2501 PN 10							
DN	40	50	65	80	100	150	200
k	110	125	145	160	180	240	295
D	150	165	185	200	220	285	340
d_2 x number	18 x 4	18 x 4	18 x 4	18 x 8	18 x 8	22 x 8	22 x 8
d_4	88	102	122	138	158	212	268
s	16	18	18	20	20	22	24



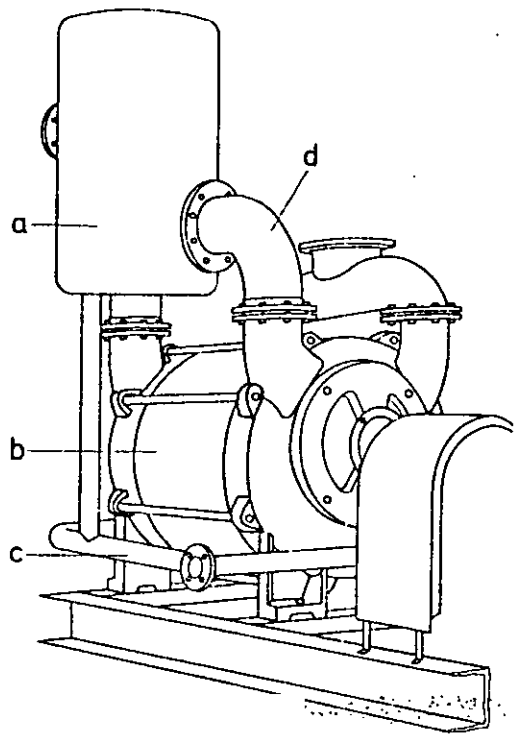
Model B, D, E

Flange connections acc. to DIN 2558 PN 6		
DN	32	50
k	90	110
A	118	140
B	85	100
d_2 x number	14 x 2	14 x 2
s	16	16



Model C*

Installation Plan and Ordering Details for Integral Liquid Separators XBa



Liquid ring vacuum pump b	Integral liquid separator b	Model	Order No.[1] of the integral liquid separator	Order No.[1] of the service liquid line c	Order No.[1] of the bend d
LRK 10603	XBa 240 XBa 242	A	0662.002.40.285 0662.002.42.172	9141.008.06.285 9141.008.08.172	
LRK 20605	XBa 240 XBa 242		0662.002.40.285 0662.002.42.172	9141.008.06.285 9141.008.08.172	
LOH 05501 LOH 20103 LOH 20107 LOH 25003 LOH 25007	XBa 342	C	0662.003.42.	9141.008.02. 9141.010.06. 9141.010.07. 9141.010.09. 9141.010.10.	
LOH 25309	XBa 1041		0662.010.41.	9141.015.57.	
LPH 40106	XBa 1040	B	0662.010.40.	9141.015.24.	
LPH 40411	XBa 1340		0662.013.40.	9141.015.23.	
LPH 40516	XBa 1341		0662.013.41.	9141.015.30.	
LPH 45008	XBa 1040		0662.010.40.	9141.015.27.	
LPH 45311 LPH 45316	XBa 1340		0662.013.40.	9141.015.28. 9141.015.29.	
LPH 50115	XBa 1140	D	0662.011.40.	9141.025.47.	
LPH 50523	XBa 2040		0662.020.40.	9141.025.56.	
LPH 55312 LPH 55316 LPH 55320	XBa 2041		0662.020.41.	9141.025.48. 9141.025.49. 9141.025.50.	
LPH 60520 LPH 60527 LPH 65320 LPH 65327	XBa 5540	E	0662.055.40.	9141.025.45. 9141.025.46. 9141.025.43. 9141.025.44.	9141.066.15.[2] 9141.065.16.[2] —
LPH 70123 LPH 70530 LPH 70540 LPH 75320 LPH 75330 LPH 75340	XBa 10040		0662.100.40.	9141.050.28. 9141.050.23. 9141.050.24. 9141.050.25. 9141.050.26. 9141.050.27.	9141.100.04.[2] 9141.100.05.[2] —

[1]) Additional number for material design see last page

[2]) If using the integral liquid separator, the Y-pipe with side outlet has to be replaced by the bend.

Material design:

	SIHI Material No.				
	062	070	130	172	285
Liquid separator	Steel painted	–	Galvanized steel	G-X 10 Cr Ni Mo Ti 18 10	PVC (only deliverable for XBa 240 with pertinent service liquid line)
Integral liquid separator					
Service liquid line	–	St 35			
Bend					

Example for ordering:

Liquid separator XBp 0912 galvanized model has the complete order No. **9664.009.12.130**

Service liquid line of St 35 for a liquid ring vacuum pump LPH 65320 with the liquid separator XBp 0912 has the complete order No. **9141.025.26.070**

BALL-TYPE NON-RETURN VALVES

XCk

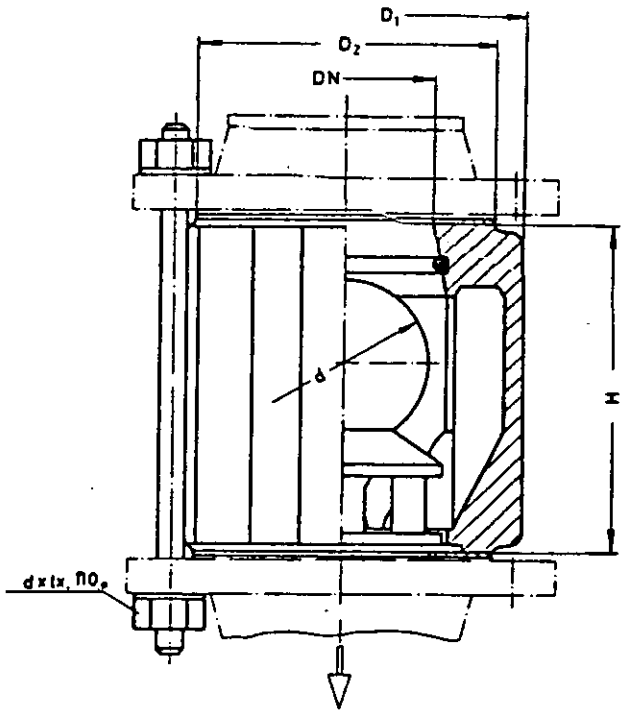
If a liquid ring vacuum pump is put out of operation (by switching off or by power failure), air or gas can enter the suction side out of the discharge orifice through the stopped pump. This causes a reflux of the service liquid into the suction line.

By installation of a ball-type non-return valve, a sudden ventilation of the suction line and at the same time of the connected vacuum tank, can be avoided; also the reflux of the service liquid will be prevented.

The construction of the valve is very simple. The pressure rise, occurring when the pump is switched off, presses an elastic valve ball into a correspondingly shaped seat in the upper part of the valve.

The leakage flow of the closed valve is very small. If an extreme tightness is required, a vacuum safety valve is installed additionally after the ball-type non-return valve. (see catalogue list V3)

The pressure losses in the valve are very low when it is opened.



DN 32 oval flanges as per DIN 2558 PN 6

DN 40-150 dimensions as per DIN 2501 PN 10

nominal casing pressure 10 bar

Series and construction size		DN	d x l x number	d	D_1	D_2	H	weight approx. kg
XCk	32	32	M 12 x 150 x 2	50	70	–	80	2
	40	40	M 16 x 170 x 4	60	88		95	2.8
	50	50	M 16 x 190 x 4	70	102		105	3.6
	65	65	M 16 x 220 x 4	80	122		135	5.6
	80	80	M 16 x 250 x 8	100	176	138	165	10.5
	100	100	M 16 x 290 x 8	120	196	156	195	16
	150	150	M 20 x 370 x 8	185	300	212	270	38

material design		
767	783	784
GG 25		X 5 Cr Ni Mo 18 10 bzw. G-X 10 Cr Ni Mo 18 9
Perbunan	Teflon	

order number for material design		
	783	784
500.767	340.032.500.783	9340.032.50.784
00.767	340.040.500.783	9340.040.50.784
00.767	340.050.500.783	9340.050.50.784
00.767	340.065.500.783	9340.065.50.784
00.767	340.080.500.783	340.080.500.784
00.767	340.100.500.783	340.100.500.784
00.767	340.150.500.783	340.150.500.784

Make-up water flows in m³/h dependent on suction pressure, speed, mode of operation and temperature difference.

pump type	speed	suction pressure in mbar: 40 KB temperature difference °C 10	40 KB 5	40 KB 2	40 FB	200 KB 20	200 KB 10	200 KB 5	200 KB 2	200 FB	600 KB 20	600 KB 10	600 KB 5	600 KB 2	600 FB
	1/min														
LPK · 30604	1450	0,12	0,21	0,40		0,08	0,14	0,25	0,44		0,07	0,13	0,21	0,35	
	1750	0,16	0,27	0,48		0,11	0,20	0,33	0,53		0,11	0,18	0,28	0,41	
LPK · 30606	1450	0,15	0,26	0,47	1,0	0,10	0,18	0,30	0,50	0,9	0,09	0,16	0,26	0,39	0,6
	1750	0,20	0,33	0,55		0,13	0,23	0,37	0,60		0,12	0,20	0,30	0,43	
LPK · 30608	1450	0,16	0,28	0,49		0,12	0,21	0,34	0,55		0,12	0,19	0,29	0,42	
	1750	0,24	0,38	0,61		0,17	0,28	0,43	0,63		0,16	0,25	0,35	0,47	

FB = make-up liquid operation

KB = combined liquid operation

Example: LPK · 30606
speed: 1450 1/min
suction pressure: 40 mbar
service liquid inlet temperature required for the required suction capacity: 18 °C
temperature of the available make-up water: 13 °C
temperature difference: 18 °C - 13 °C = 5 °C
service liquid flow according to table FB = 1,0 m³/h
make-up water flow required to table KB 0,26 m³/h

The make-up water flows indicated in the table for combined liquid operation (KB) are applicable for compression of non-condensible gases. On compression of condensible vapours, the make-up water flows increase because of the condensation heat being eliminated additionally.

7. Maintenance

In case of frost danger, it is necessary to empty the pump, overhead liquid separator or base mounted liquid separator resp., as well as the pipes. When strong limy water is used as service liquid, the pump must be opened at least every six months to remove the lime deposits, otherwise the service liquid must be dehardened with a suitable phosphate agent.
Since impurities accumulate in the pump and the overhead liquid separator or base mounted liquid separator, it is necessary to clean them in certain intervals. The antifriction bearings of the motor are provided with continuous lubrication. The grease put in by the motor supplier, on installation, is normally sufficient for several years.

8. Troubles and correction of troubles

8.1 **Suction capacity of the pump insufficient:**
Check the suction line for tightness, check the temperature of the service liquid (catalogue resp. list values are based on water 15 °C). Check the pump for contamination.

8.2 **Pump causes noise:**
If the pump operates at considerable lower suction pressure than indicated in the catalogue or list, a crackling noise generates. To eliminate this noise it is necessary to put some fresh air into the suction line, or to combine the pump with a gas ejector which allows operation with low suction pressures.
ATTENTION: The pump shall not operate in the cavitation zone, that would damage the parts of the pump.

8.3 **Mechanical seal leaks:**
Liquid runs out between motor and pump. Exchange mechanical seal.

8.4 **Liquid at the gas outlet M_{II}:**
Drain liquid flow too little, overflow stopped up. Free the passage. Make-up liquid flow too great - throttle the flow.

9. Arrangement with gase ejector (only for LRK · 10603 and LRK · 20605)

In addition to the arrangement shown in para 6, fig. 6 shows an arrangement example for the combination of gas ejector and vacuum pump with base-mounted liquid separator. Detailed information is given in the Operation Instructions for gas ejector, No. 143.73100.5·.01.

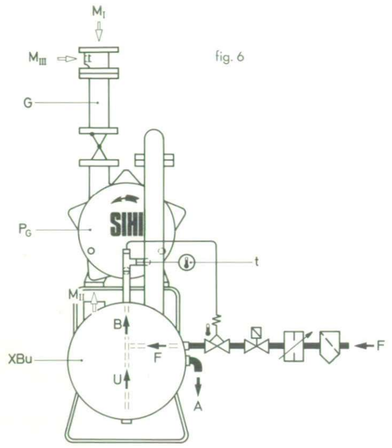


fig. 6

10. Arrangement for automatic controlled service liquid temperature

For saving make-up water, it is possible to install automatic controls in the make-up liquid line, see fig. 6 above. The complete make-up liquid line including armatures can be supplied by SIHI. Further details are given in the Operation Instructions for vacuum compact units 143 / 144 94101.5·.01.

11. Operation data and dimensions

Technical data like suction capacity and power required for liquid ring vacuum pumps see catalogue list LB 3.

1-V.83-1

OPERATION INSTRUCTIONS

SIHI

LIQUID RING VACUUM PUMPS close-coupled design

LPK · 30604
LPK · 30606
LPK · 30608

These instructions must be carefully studied before installing and starting up the pump.
(Fasten near pump, where it can be seen easily.)

1. Constructional features and operating principles

The pump operates to the liquid ring principle. The vane wheel impeller, arranged excentrically in the cylindrical pump casing, transmits the drive power to the liquid ring which is formed concentrically to the casing during startup of the pump. Through this arrangement the liquid enters and leaves piston-like the impeller cells. In the region of the outcoming liquid ring the impeller cells are filled, through a suction opening, with the gas being pumped. In the region of the liquid ring entering the impeller cells, the gas is compressed and discharged through the discharge opening.
During operation the pump must continuously be supplied with service liquid, in normal cases water, in order to eliminate the heat (built up by the gas compression) which is taken up mainly by the liquid ring, and to refill the liquid ring, because a certain portion of the liquid leaves the pump together with the gas. The gas can be separated from the liquid in the liquid separator. Re-using of the liquid as service liquid is possible. The shaft is sealed by mechanical seal.

2. Application

The pump can handle all the gases which are neutral towards the pump construction material and the service liquid. Small quantities of liquid can be pumped along with the gas.
The following limits of application should be observed:

2.1 Medium handled
Max. temperature 100 °C
A small flow of gas, not condensing during the compression process, is necessary for preventing cavitation damage.

2.2 Service liquid
Max. temperature 80 °C
Max. viscosity 4 mm²/s
Max. density 1,2 kg/dm³
For higher viscosity or higher density the next larger motor size should be selected (please check back with the manufacturer). For the combination with gas ejector, the min. service water temperature is 12 °C (danger of ice formation).

2.3 Pressures
Max. permissible pressure difference 1,1 bar
Max. permissible compression overpressure 0,3 bar
The test overpressure with water is:
Liquid ring vacuum pump 3 bar
Overhead liquid separator 0,5 bar
Base mounted liquid separator 0,5 bar
When using water of 15 °C as service liquid and a pressure of 1013 mbar at the discharge branch the smalles suction pressure admissible for continuous operation is 40 mbar. By combining the pump with a gas ejector the field of application is extended upto a suction pressure of 8 mbar.

3. Design

On request the liquid ring vacuum pump can be supplied with overhead liquid separator resp. base mounted liquid separator, including all pipings. The suitable gas ejector can be included as well. In any case, after mounting the pipes and power supply cables to the motor, the pumping set will be ready for operation.

4. Installation of the pumping set

4.1 In normal position the suction and discharge branches point vertically upwards. Picture 1-6. Apart from that the pump may be turned around its shaft axis by 90 degree, e. g. for lateral fastening. In this case the discharge branch must be located at the bottom and the discharge line must lead upwards to shaft level so that the pump is not emptied at standstill.

4.2 All connection openings have been closed up before delivery to prevent that foreign matters enter during transportation. The plugs and blanks used for closing up should not be removed, only when connecting the pipes. Heavy pipelines must be supported in order to avoid distortions at the pump and at the liquid separator.
The following branch loads are permissible: force 320 N, torque 100 Nm

4.3 The gas flow direction as well as the direction of shaft rotation are marked on the pump by arrows. Prior to first start-up the direction of rotation and the speed must be checked.

4.4 The suction and discharge lines as well as the service liquid lines must be as short as possible and their cross section must be at least as big as the mating pump connection. For longer pipes the cross section should be larger. The tightness of the piping should be checked before starting the pump.

4.5 A non-return t_{MI} must be fitted in the suction line (fig. 1 - 4 plus 6). For this application the SIHI non-return valve XCk has given good results. The pressure losses are real small with them.

4.6 If a shut-off member (slide valve etc.) is fitted in the suction line and if the pump is to be started with the shutoff member closed, it is necessary to add air via an air supply cock installed in the suction line. When using the combination with gas ejector, the shutoff member may be closed without adding air.

4.7 During the initial startup of the pump, the liquid level in the pump shall not exceed the shaft level. The service liquid is filled into the pump through the suction or discharge branch.

4.8 If a shutoff member is fitted in the discharge line, the pump shall neither be started nor kept in operation with the shutoff member closed.

4.9 If a pump with base mounted liquid separator is to run for a longer period without considerable pressure difference, for instance during evacuation of a large vessel, a throttling member must be fitted in the suction line.

LPK - 30604	Ø 16
LPK - 30606	Ø 18
LPK - 30608	Ø 20

4.10 If fine-grain dirt enters the pump together with the gas pumped or with the service liquid, it can be rinsed out by liquid during operation through the connection at the bottom u_{se} (R 3/8) in order to avoid wear (fig. 4). If much dirt enters, dirt drainage shall operate always. In this case a corresponding pipeline must be provided. It must be observed, however, that the pump is emptied nearly entirely through this line in case of standstill. Therefore close the dirt drainage line before shutting down, or the pump must be refilled upto shaft level prior to starting-up.

4.11 For the electrical connection the relevant VDE regulations and rules of te local power supply company shall be observed. The motor protection switch resp. overcurrent release must be adjusted to the rated power of the motor.

5. Safety Rules

For installation and operation of the pumping set, the safety rules "Compressor" (VGB 16) must be observed and all other applicable rules, regulations and laws.

Symbols and Definitions used in fig. 1 through 6

M_I	pumping medium, suction side	G	gas ejector	t	thermometer
M_{II}	pumping medium, discharge side	XBa	overhead liquid separator	t_{MI}	nonreturn valve
M_{III}	motive flow	XBu	base mounted liquid separator	u_A	liquid drain
A	drain liquid	b_K	heat exchanger	u_B	service liquid connection
B	service liquid	h_F	shutoff valve	u_e	drainage
F	make-up liquid	h_K	shutoff valve	u_F	make-up liquid connection
K	cooling liquid	i_F	regulating valve	u_{se}	dirt drainage
U	circulation liquid	i_K	regulating valve	u_U	circulation liquid connection
P_F	liquid pump	i_U	regulating valve		
P_G	vacuum pump	m_B	mano vacuum gauge		

6. Arrangement of the pump and operation

The arrangement of the pump and selection of the proper mode of operation depend in the first range on the operational requirements. A few typical modes of operation are explained below. Fig. 1 through 6 show the schematic arrangement of a liquid ring vacuum pump with corresponding accessories.

selecting the mode of operation

6.1 **combined liquid operation**
with overhead liquid separator (fig. 1)
mode of operation for:
simple arrangement with little space requirement. Less make-up liquid consumption.

6.2 **combined liquid operation**
with base mounted liquid separator (fig. 2)
mode of operation for:
for cases where larger liquid storage is necessary (for example when make-up liquid supply fails due to some operational failure).
Less make-up liquid consumption.

service liquid flow

The service liquid B consists of make-up liquid F and circulation liquid U. A portion of liquid equal to the make-up liquid F leaves the liquid separator, as drain liquid A, through the liquid drain U_A.
The make-up liquid shall have only a small overpressure (max. 0.2 bar).

schematic arrangement drawing

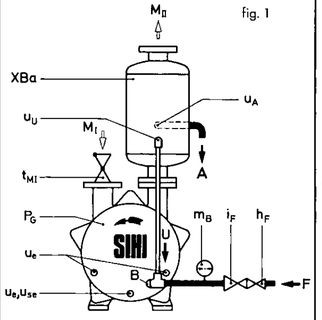


fig. 1

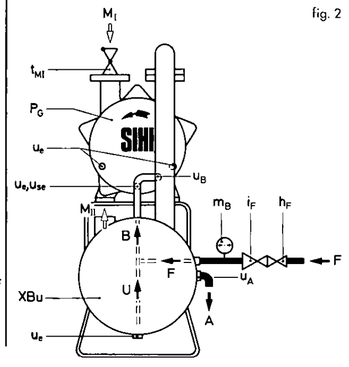


fig. 2

definition of symbols used in the drawing

thermometer	regulating valve	thermostatic regulating valve
mano vacuum gauge	shut-off valve	adjusting socket
liquid pump	float valve	dirt trap
nonreturn valve	solenoid valve	

instructions for arrangement

operation preparation

The pump shall never run dry; therefore prior to initial startup, the pump must be filled with service liquid up to shaft level, and the liquid separator up to overflow U_A.
Check direction of rotation[1]) and speed (switch on shortly).
With the pump running, open shut-off valve h_F and set the regulating valve i_F so that the pressure at the mano vacuum gauge m_B shows about 0 bar. If make-up water shall be saved, the service liquid flow is to be throttled at regulating valve i_F - the mano vacuum gauge shows then underpressure - till the temperature of the service liquid reaches a degree where the required suction capacity can be obtained safely. Lock the regulating valve i_F in that position. For max. permissible service liquid temperature see page 1. The vacuum pump then takes up the make-up liquid flow, indicated in the table page 5 under KB. The temperature difference means here that the make-up water F must be colder than the service liquid B by the value indicated.

adjustment of liquid flow

startup

switch on motor; open shut-off valve h_F.

stopping

close shut-off valve h_F and cut off the motor.

[1]) To prevent damages of the mechanical seal, the pump shaft is never to turn opposite the direction specified.

6.3 **Circulation liquid operation**
with base mounted liquid separator (fig. 3).
This mode of operation is preferred for service liquids which do not leave the process circuit, due to their properties, or which shall not come into contact with the cooling medium (if lye or acid is used as service liquid), or in case of waste water systems which shall not be contaminated by the service liquid or the gas dissolved therein, etc. The service liquid B consists of circulation liquid U and which is cooled down in the heat exchanger[2]) b_K to the required operation temperature.

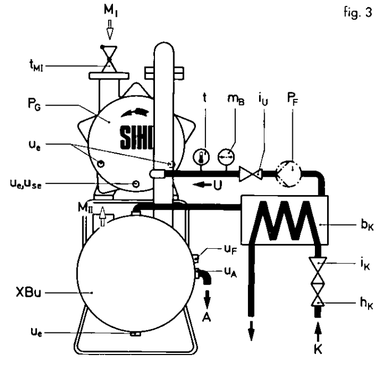


fig. 3

The make-up liquid connection u_F must be closed. The max. permissible resistance in the pipe between base mounted liquid separator and service liquid connection of the pump shall not exceed 0,2 bar (see 4.9). In case of higher resistance a liquid pump P_F is to be installed, and the pressure reading at mano vacuum gauge m_B of 0 bar (atmosphere pressure) to be set with regulating valve i_u. The heat exchanger can be left out when the vacuum pump runs only for a few minutes and cools down to ambient temperature till the next startup.

6.4 **Make-up liquid operation**
with overhead liquid separator (fig. 4).
If sufficient liquid is available which must not be re-used, the arrangement shall be as illustrated in fig. 4. If gas and liquid must not be separated, the overhead liquid separator can be left out. In the latter case a pipe must be run to a drain (gully).

The service liquid B consists of make-up liquid F, its pressure reading at the mano vacuum gauge m_B shall not exceed much 0 bar (atmospheric pressure).

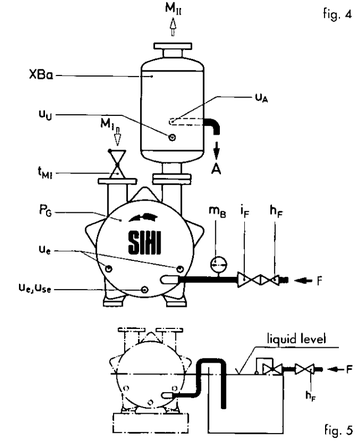


fig. 4

Circulation liquid connection u_U must be closed. If the pressure of the make-up liquid differs very much so that the overpressure of 0.2 bar at the mano vacuum gauge is exceeded, it becomes necessary to provide a pressure reduction valve, or to lead the make-up liquid into a vessel with float valve (fig. 5). The liquid level in this vessel shall be as high as shaft centerline.

The pump shall never run dry, therefore prior to initial startup, the pump must be filled with service liquid up to shaft level, and the liquid separator up to overflow u_A.
Check direction of rotation[1]) and speed (switch on shortly).
The cooling water flow K must be set via the regulating valve i_K with shut-off valve h_K open. For saving cooling liquid, the service liquid of the pump can be brought to a higher temperature, but still safe enough to reach the required suction capacity. The level in the base mounted liquid separator must be checked from time to time and corrected if necessary.

switch on motor, open shut-off valve h_K.

close shut-off valve h_K and switch off motor.

With the pump running, open shut-off valve h_F and set the regulating valve i_F so that the pressure at the mano vacuum gauge m_B shows 0 bar. Thus the make-up water flow corresponds to the values indicated in the table page 5, under FB.

switch on motor, open shut-off valve h_F at the same time.

close shut-off valve h_F, switch off motor.

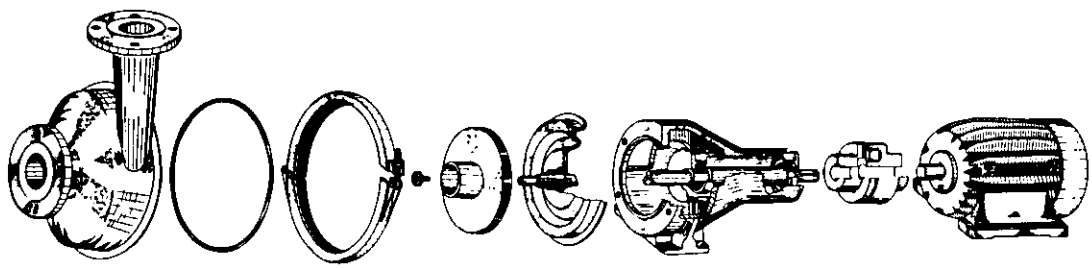
[2]) The heat exchanger must be rated so that abt. 80 to 90 % of the motor heat and possible condensation heat con be eliminated.

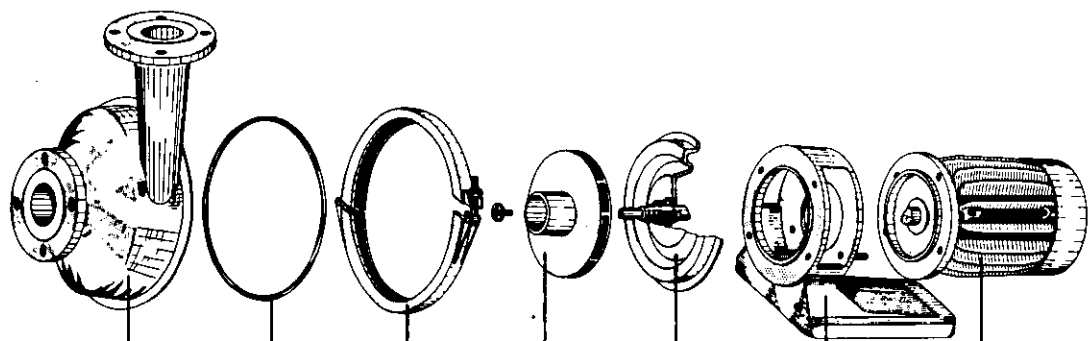
5

WEIG'AND EVAP PUMPS

G421	HYGIA-BLOCI/30A	3 KW
G418	HYGIA-BLOCI/30A	3 KW
G417	HYGIA-BLOCI/30A	4 KW
G416	HYGIA-BLOCI/30A	4 KW
G415	HYGIA-BLOCI/30A	3 KW
G411	HYGIA-BLOCII/60A	7.5 KW
G410	HYGIA-BLOCI/30A	3 KW
G409	HYGIA-BLOCI/20B	3 KW
G408	HYGIA-BLOCI/20B	2.2 KW
G407	HYGIA-BLOCI/25B	3 KW
G406	HYGIA-BLOCI/30A	4 KW
G405	HYGIA-BLOCII/30B	4 KW
G404	HYGIA-BLOCII/30B	4 KW
G403	HYGIA-BLOCII/60A	7.5 KW

Operating Instructions HYGIA®





Housing

Joint

Quick closure clamp

Impeller

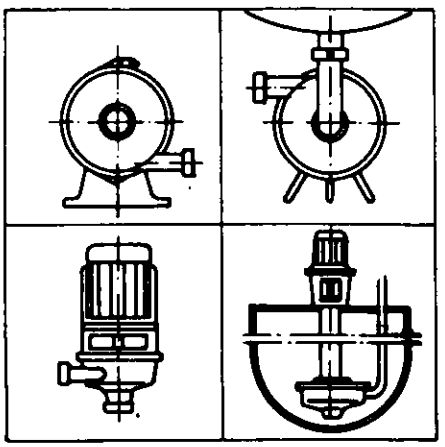
Pump plate with seal

Bearing support

Motor

INTRODUCTION

The stainless steel pump H Y G I A is an end suction centrifugal pump with open, closed, torque-flow impeller or channel impeller used for pumping clear, turbid or fatty liquids such as milk, whey, beer, starch solutions, charged water and dye. Open or torque-flow impellers may be chosen for these applications.

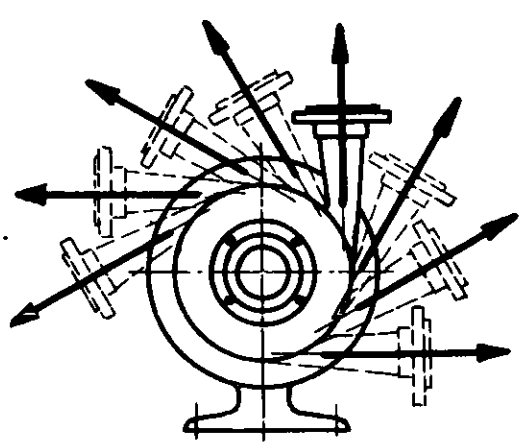


All parts coming into contact with the liquid are manufactured of non-porous stainless an acid-proof chrome nickel steel or chrome nickel molybdenum steel. The units are easy to operate. Spare parts are standardised according to 3 shaft diameters.

INSTALLATION

The delivery branch of H Y G I A can be adjusted to any desired degree within 360 ° by means of the quick closure. The piping must be laid free of strain. The pipe diameter should be such that the speed of flow does not exceed 2m/sec for beverages.

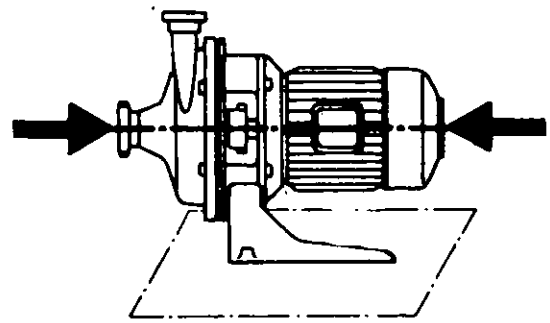
The suction piping must be absolutely tight and laid in such a way that air pockets cannot form. Flooded suction is a necessity. The diameter of the suction piping must not be less than that of the pump connection (in the case of extremely long suction piping it should be accordingly greater).



Bends in the suction piping should be avoided if possible in order to keep friction losses to a minimum. No valves should be installed in the suction piping. The actual suction head should not exceed that guaranteed for the pump. The diameter of the delivery piping should be at least as great as that of the delivery branch.

ERECTION

The monoblock and KK models are assembled ready for operation. The pump solely requires a firm and safe site.



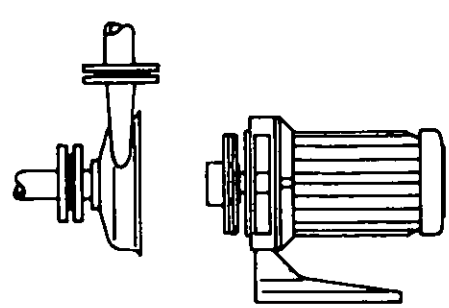
The CN model must be realigned by the coupling at site after erection on the final foundation. (Instructions to this effect are indicated on the pump unit.)

REMOVAL OF UNIT AND POSSIBLE DISTURBANCES

The H Y G I A pump can be removed in such a way that the casing remains in the piping and the pump itself is withdrawn, thus reducing the need for reserve pumps. The reserve pump should be selected for the greatest duty point (greatest output at highest counter-pressure).

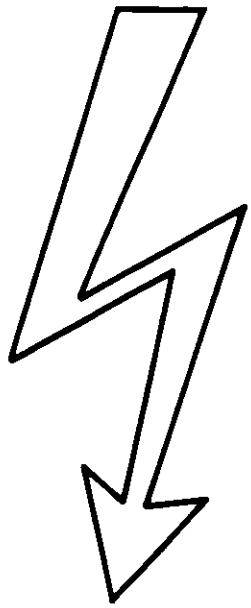
Possible disturbances

1. Insufficient output
   - 1.1. Wrong direction of rotation
   - 1.2. Housing, seal or suction piping not tight
2. No suction
   - 2.1. Housing and suction piping must be filled
   - 2.2. Air pocket in the piping
   - 2.3. Suction head too high
   - 2.4. Suction piping not tight
3. Excessive power consumption
   - 3.1. Output exceeds motor capacity = wrong dimensioning of pump
   - 3.2. Excessive friction losses resulting from too small pipe diameter
   - 3.3. Strain on the pump
4. Noisy operation
   - 4.1. Wrong direction of rotation
   - 4.2. Cavitation, pump NPSH exceeded
   - 4.3. Loose parts in the pump
   - 4.4. Air is being pumped
   - 4.5. Motor bearings defective



Each HYGIA pump is hydraulically tested at our test bench. Any failure to attain the specified duties must be the result of faulty installation.

ELECTRICAL CONNECTION



The pump is delivered ready for operation. The motor is adapted to the voltage indicated in the enclosed motor test card. The voltage indicated there must correspond to the working voltage; otherwise the motor connections must be changed by an electrician (see attached special sheet).

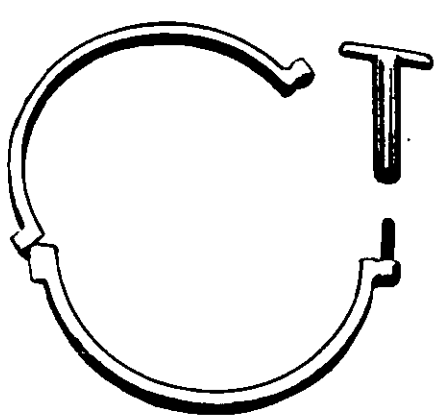
Please note: In any case it is advisable to provide a motor protection switch corresponding to local conditions. Take care that the direction of rotation is correct (the pump shaft must rotate clockwise as indicated by the arrow, as seen from the motor ventilation hood).

REGULATION OF OUTPUT

The output can be regulated by a slide valve or control valve in the delivery piping. When working at low heads throttle the quantity to the extent that the power consumption of the motor remains below the maximum power consumption in amperes indicated on the motor duty plate. Power consumption (motor load) is lowest when the delivery piping is closed.

Since we can make no guarantee claims at our motor works for damages caused by overloading we urgently advise heeding the above.

CLEANING THE PUMP



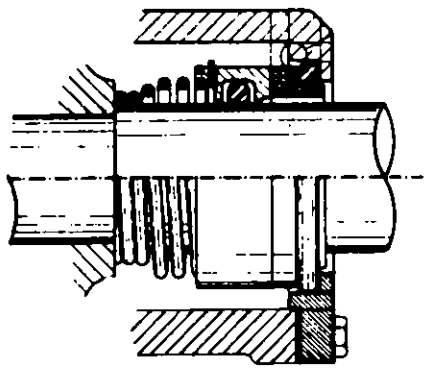
Cleaning the H Y G I A is quick and easy: Open the quick closure clamp and remove the pump cover. Loosen the impeller screw, using the Imbus key supplied with the pump, or loosen the counter-nut. Remove the impeller.

Instead of cleaning the pumps by hand, many users of H Y G I A pumps prefer to clean the entire system with piping and fittings by pumping through hot water or a detergent solution - a procedure which has shown excellent results.

THE SEALING UNIT OF HYGIA

The shaft seal is standardised, be it a single or double mechanical seal or a gland. The H Y G I A series I, II, III have only one shaft diameter each. The pump is supplied with the shaft seal best suited to the particular liquid. The HILGE mechanical seal requires no maintenance and can withstand short-term dry running. A D-sheet is attached to these operating instructions describing the type of shaft seal used. For repeat orders refer to this sheet, indicating the complete pump serial number which can be found engraved

1. on the type plate
2. on the support connecting pump and motor

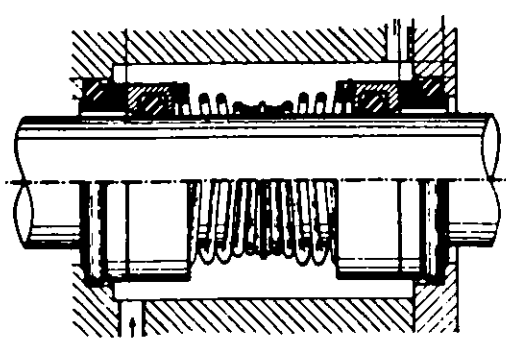


Double mechanical seal

The mechanical seals installed in pumps for the beverage industry are biologically perfect and self-cleaning for CIP. After pumping sticky or crystallizing liquids (such as liquid sugar, syrup, wort) rinse the pump carefully to prevent the sealing surfaces from becoming sticky.

For pumping hot liquids the elastic parts of the mechanical seal are made of heat-resistant materials.

Flushing or cooling connections must be connected to the flushing liquid so as not to be damaged by dry running. If the flushing liquid is water we recommend using treated water in order to avoid deposits in the sealing chamber. The flushing pressure must be 1 bar above the working pressure of the pump.



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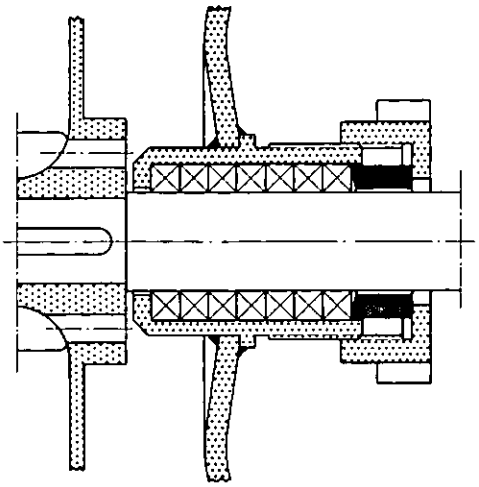

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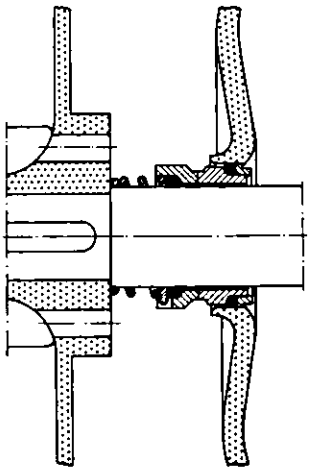

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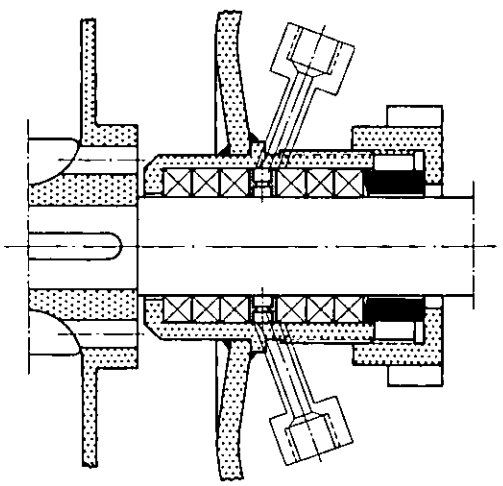

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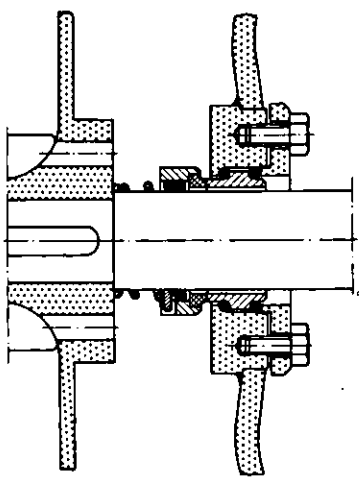

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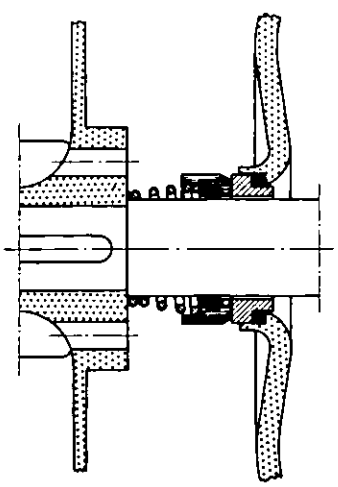

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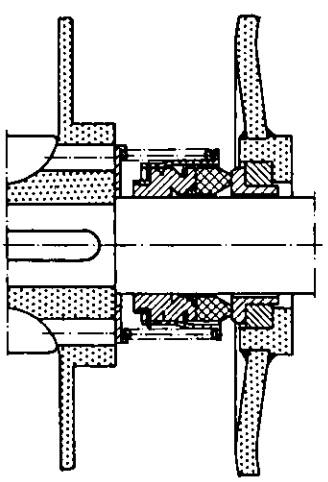


1. Single packed gland

2. Double packed gland with connection for cooling or sealing medium

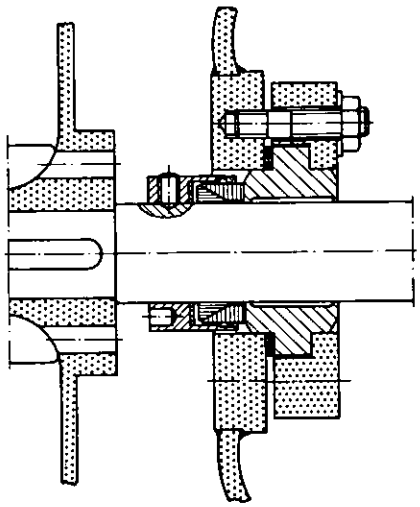
3. Single mechanical seal -Hilge

4. Single mechanical seal - Burgmann, type M 3

5. Single mechanical seal - Burgmann , type M 31

6. Single mechanical seal - Crane, type 2

7.



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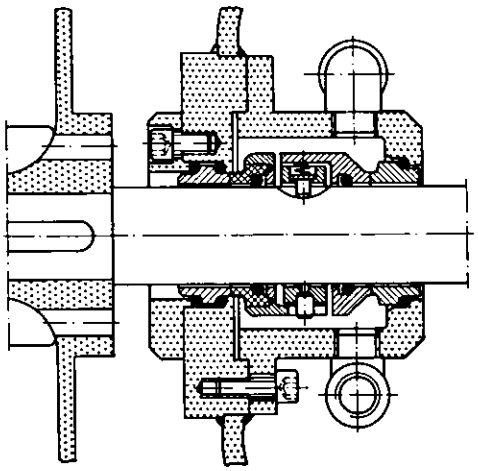

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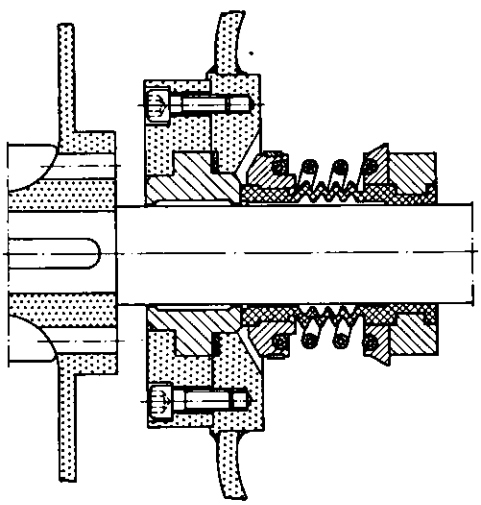

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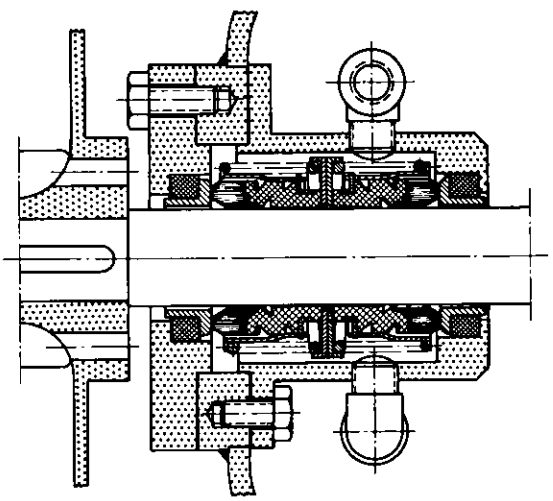

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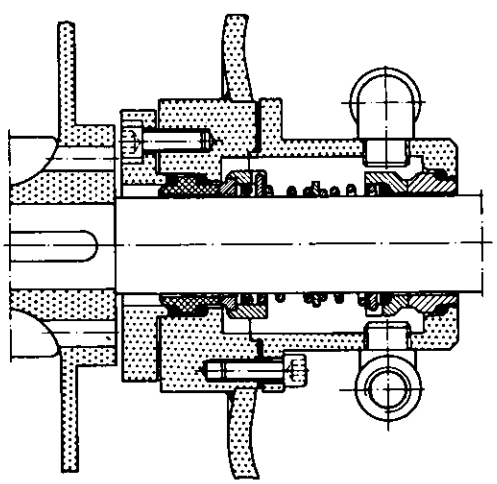
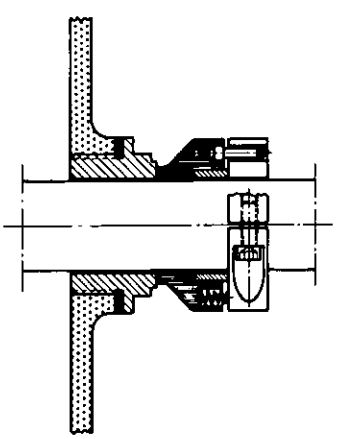


12.



7. Single mechanical seal - Crane, type 109

8. Outside fitted mechanical seal - Crane, type 10

9. Double mechanical seal - Burgmann, type back to back

10. Double mechanical seal - Burgmann, type M 42 D

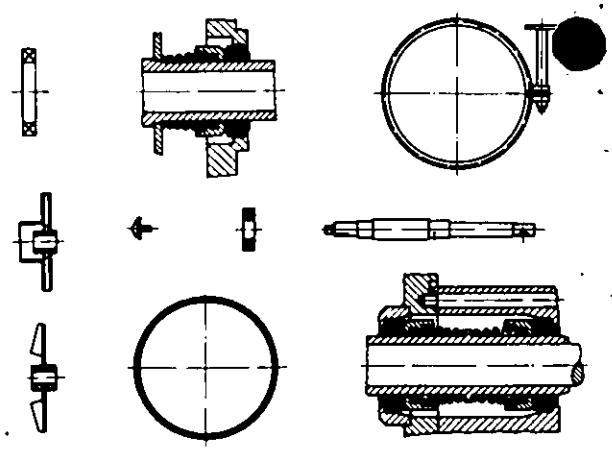
11. Double mechanical seal - Crane, type 2/2

12. Outside fitted mechanical seal - Goetze

MAINTENANCE AND SPARE PARTS

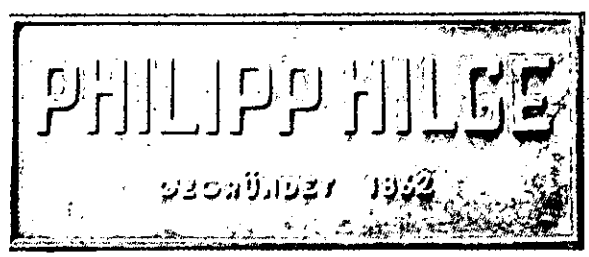
The H Y G I A requires no maintenance other than regular cleaning and inspection of the mechanical seal. For this reason our spare parts program is limited to a parts package comprising housing seals and mechanical seal only.

Instead of the usual repairs, we offer economical parts sets for renewing worn parts. When ordering new impellers be sure to note the original construction materials (material 1.4301 chrome nickel steel, material 1.4571 chrome nickel molybdenum steel, material 1.4577 chrome nickel molybdenum steel with increased nickel content, pure titanium).



THE HILGE GUARANTEE

provides a guarantee of 12 months. The company was founded in 1862 - which means more than a century of satisfying our customers.



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6

Number of confirmation order: 705 468/84

Operating Instructions

Type of machine: 2 NE 40A

Number of machine:

Important Note

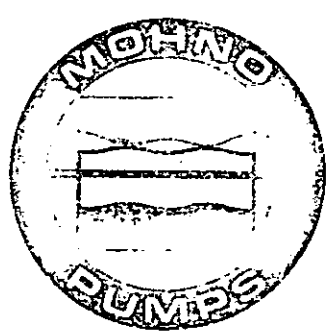
When a machine is required to work reliably for a long time, it must be maintained and cared for at regular intervals and strictly according to the instructions.

These instructions should therefore be always at the disposal of the operating- and maintenance staff and should be carefully followed by same.

We cannot accept responsibility for damages occurring due to nonobservance of these maintenance instructions.

When ordering spare parts, it is necessary to pay attention to the explanations mentioned in paragraph 8.

NETZSCH
MOHNOPUMPEN-GMBH
D-8264 WALDKRAIBURG



LIST OF CONTENTS – NE AND NL SERIES

1. GENERAL

1.1. Transportation and damage in transit

Unless otherwise specified by the customer, MOHNO pumps are delivered in knock-down rail containers or crated. Check on receipt for any damage received in transit and report any immediately to the forwarder.

1.2. Storing pumps for lengthy periods

Unless otherwise specified, the pumps are given protective treatment prior to transportation. If they are to be stored for lengthy periods before being used, make them weatherproof in the following manner. Coat all non-painted surfaces with non-acidic and resin-free grease. When the pump has an RCC rotor (material No. 2436), it is good practice to remove the stator. Then protect the rotor surface also with grease. Also remove the stuffing-box packing from pumps with such packing and coat both the shaft and cylinder of the stuffing-box housing with grease.
This protective treatment is not needed for pump parts made of stainless steel.

2. PUMP INSTALLATION AND CONNECTION TO THE PIPE SYSTEM

Draw the coupling halves or V-belt pulleys on using the threaded bore of the shaft stub: Never use a hammer!

Exact alignment of pump and drive assembly is a pre-requisite for trouble-free operation. This alignment is already carried out in production when the pump is delivered complete with drive and substructure. There is always the danger, however, that bolting to uneven foundations can twist the base plate, which can lead to misalignment between pump and drive. After bolting the base plate to its foundations removing the coupling protection should be followed by checking the coupling alignment using a straight edge. For our standard fitted „ROTEX" couplings the following are the maximum permitted misalignment values:

Radial misalignment: 1% of the largest external diameter.
Angular misalignment: 1°30'.

All MOHNO pumps are designed for clockwise and anti-clockwise rotation. You are recommended, however, to select anti-clockwise rotation – viewed from the drive end – so that the shaft packing and couplings are on the suction end.

This prevents the shaft packing (slipper seal and shaft) and the coupling seals from being exposed to additional loading due to fluid pressure.

Clean pipe system prior to connection to the pump.

If the shaft packing consists of slipper seal, also establish the connection for the sealing liquid before commissioning. Consult Section 5.4 of these maintenance instructions for more detailed information.

4. COMMISSIONING AND TROUBLE-SHOOTING

NEVER ALLOW THE PUMP TO RUN DRY! EVEN A FEW DRY TURNS ARE SUFFICIENT TO RUIN THE STATOR!

SINCE YOUR MOHNO PUMP IS A DISPLACEMENT-TYPE PUMP, IT MUST NEVER BE WORKED INTO A CLOSED VALVE!

Before turning the pump on for the first time, fill it up with the flow medium (e. g. via the screw plug on the casing). If the medium is very viscous, use a dilute one to fill up. This filling is absolutely essential for the lubrication of the rubber stator.

If the pump is shut down for a short while, enough liquid will be left inside to lubricate the pump properly when it is started up again. This can be assisted by arranging the inlet and delivery pipes appropriately.

Check direction of rotation by switching motor on for an instant.

Your MOHNO pump is a mature technical product which did not leave the works until tested thoroughly. If you use your pump in keeping with your order specification and treat it subject to our maintenance instructions, it will run satisfactorily for a long time.

FAULT												POSSIBLE CAUSE (corrective action overleaf)	Cons. No.
Pump fails to start	Pump fails to suck	Delivery too low	Pressure head too low	Delivery fluctuates	Pump is loud	Pump is jammed	Drive overloaded	Stator service life too short	Rotor service life too short	Shaft packing not tight			
X							X					When pump or stator is new: too much static friction.	1
X		X	X				X					Electrical data of pump do not suit mains. 2-phase operation.	2
		X					X	X	X			Pressure head too great.	3
X						X	X					Foreign matter in pump.	4
X						X	X	X	X			Temperature flow medium too high, stator expands too much.	5
X						X	X	X				Stator has swollen, elastomer not stable in flow medium.	6
X						X	X	X				Goods being conveyed contain too many solids, causing blockages.	7
X						X	X	X	X	X		Flow medium settles and hardens at rest.	8
		X	X	X								Air enters suction pipe.	9
	X	X	X	X								Suction pipe leaks.	10
	X	X	X	X								Shaft packing leaks.	11
		X	X									Speed not high enough.	12
	X	X	X									Undersize rotors: operating temperature not reached yet.	13
		X	X	X	X			X	X			Suction head too high or inlet head too low (cavitation).	14
		X	X		X	X	X	X				Pump running dry.	15
	X	X	X		X							Stator worn out.	16
	X	X	X		X			X	X			Stator material brittle.	17
	X	X	X		X			X				Rotor worn out.	18
					X							Joints loose.	19
					X							Pump axially set off against drive.	20
					X							Elastic intermediate member of coupling is worn out.	21
					X					X		Anti-friction bearings destroyed.	22
							X					Speed too high.	23
							X					Viscosity too great.	24
							X					Specific gravity too great.	25
							X			X		Stuffing box not tightened up properly.	26
										X		Type of packing not optimum for flow medium.	27
	X									X		Wrong direction of rotation.	28
										X		Slipper and casing rings of slipper seal	29
										X		Slipper seal O-rings damaged, swollen or embrittled.	30

No.	CORRECTIVE ACTION
1	Fill pump up and try to turn it by hand, using suitable aids. If necessary, introduce glycerine into the stator as a lubricant.
2	Check order specification. Test wiring.
3	Measure delivery head with manometer and compare with order specification.
4	Remove foreign matter and remedy any damage.
5	If temperature of flow medium cannot be reduced, use an undersize rotor.
6	Check whether flow medium corresponds to that indicated in order. Change stator material, if necessary.
7	Increase proportion of liquid of flotation.
8	Clean pump and rinse out always at end of delivery.
9	Increase level of suction liquid, stop inlet eddy, prevent air being included.
10	Check seals, tighten up pipe connections.
11	Tighten up stuffing-box or use fresh packing (see p. 3). Slipper seal: replace slipper rings or seals, remove any deposits.
12	Drive variable: set higher speed.
13	First heat pump (stator) up to operating temperature.
14	Reduce suction resistance; lower temperature of flow medium; install pump lower down.
15	Fill pump up; provide protection to stop dry running; lay pipes differently.
16	Renew stator.
17	Renew stator. Check whether flow medium corresponds to order specification; change stator material if necessary.
18	Renew rotor; establish cause: wear, corrosion, cavitation; if necessary, select fresh rotor material or coating.
19	Renew parts concerned and seal off carefully again.
20	Re-align assembly.
21	Use a new intermediate member and line unit up afresh.
22	Renew anti-friction bearings, lubricate and seal off afresh. Fairly high temperatures: observe bearing tolerance and lubricant.
23	Drive variable: set lower speed.
24	Measure viscosity and compare with that indicated in order.
25	Measure specific gravity and compare with that indicated in order.
26	Service stuffing;box from sheet 3; replace shaft; if scored.
27	Change packing type.
28	Reverse polarity.
29	Lap rings concerned or exchange for new ones.
30	Replace O-rings. Check whether flow medium corresponds to that indicated in order; change material, if necessary.

5. MAINTENANCE

5.1. Lubrication

MOHNO pumps have no items which need lubrication at short intervals. Remove the grooved ball bearings every 8000 operating hours at the most or after 2 years, clean them and pack with fresh grease.

Curved tooth gear couplings are sealed for life but we recommend changing the oil in the couplings and checking the seals should the pump need opening for other reasons.

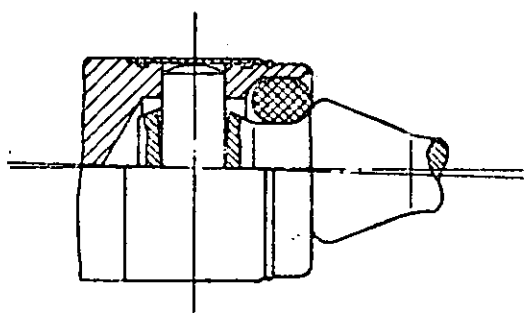
Lubricate the pin-type couplings at least when replacing worn parts. To do so, pack the whole space between the coupling-rod head and rotor or drive shaft bore with grease.

Recommended lubricants and quantities

a) **Anti-friction bearings and pin-type couplings:**

Lithium-saponified universal grease,

e.g. ARAL Grease HL2
BP Energrease LS 2
ESSO Beacon 2
SHELL Alvania 2

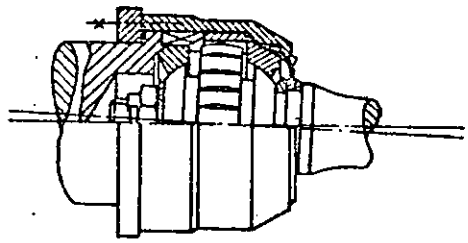


Pin-type coupling

If the flow medium is a product of the food industry, use only a corresponding food-compatible grease to lubricate the pin joints.

Pump size	g/bearing	g/joint
N.15(A), 2N.15(A), N.20B,	3	2
4N.15(A), N.20(A), 2N.20(A), N.30C,	5	3
N.30B, N.40C,	7	5
4N.20(A), N.30(A), 2N.30(A), N.40B, N.50C,	8	6
4N.30(A), N.40(A), 2N.40(A), N.50B, N.60C,	10	10
4N.40(A), N.50(A), 2N.50(A), N.60B, N.80C,	12	15
4N.50(A), N.60(A), 2N.60(A), N.80B, N.100C,	15	20
4N.60(A), N.80(A), 2N.80(A), N.100B, N.120C,	23	30
4N.80(A), N.100(A), 2N.100(A), N.120B, N.150C,	43	–
4N.100(A), N.120(A), 2N.120(A), N.150B	54	–

b) **Gear couplings:** Special-purpose joint oil



Curved-tooth gear coupling

Pump size	cm^3 /joint
4N.20(A), N.30(A), 2N.30(A), N.40B, N.50C,	8
4N.30(A), N.40(A), 2N.40(A), N.50B, N.60C,	15
4N.40(A), N.50(A), 2N.50(A), N.60B, N.80C,	30
4N.50(A), N.60(A), 2N.60(A), N.80B, N.100C,	50
4N.60(A), N.80(A), 2N.80(A), N.100B, N.120C,	90
4N.80(A), N.100(A), 2N.100(A), N.120B, N.150C,	180
4N.100(A), N.120(A), 2N.120(A), N.150B,	350

If our special-purpose joint oil is not to hand, the following gear oils can be used as a substitute if the relubricating intervals are shortened by about 20%:

SHELL – SPIRAX HD 90
SHELL – TIVELA WA

We have not tested any other types of oil and are not therefore in the position to recommend them.

c) **Torsion bar**

Should the torsion bar not be coated but provided in a protective hose, fill the latter with a suitable protective fluid such as, for example, oil, glycerine, normal antifreeze but without water.

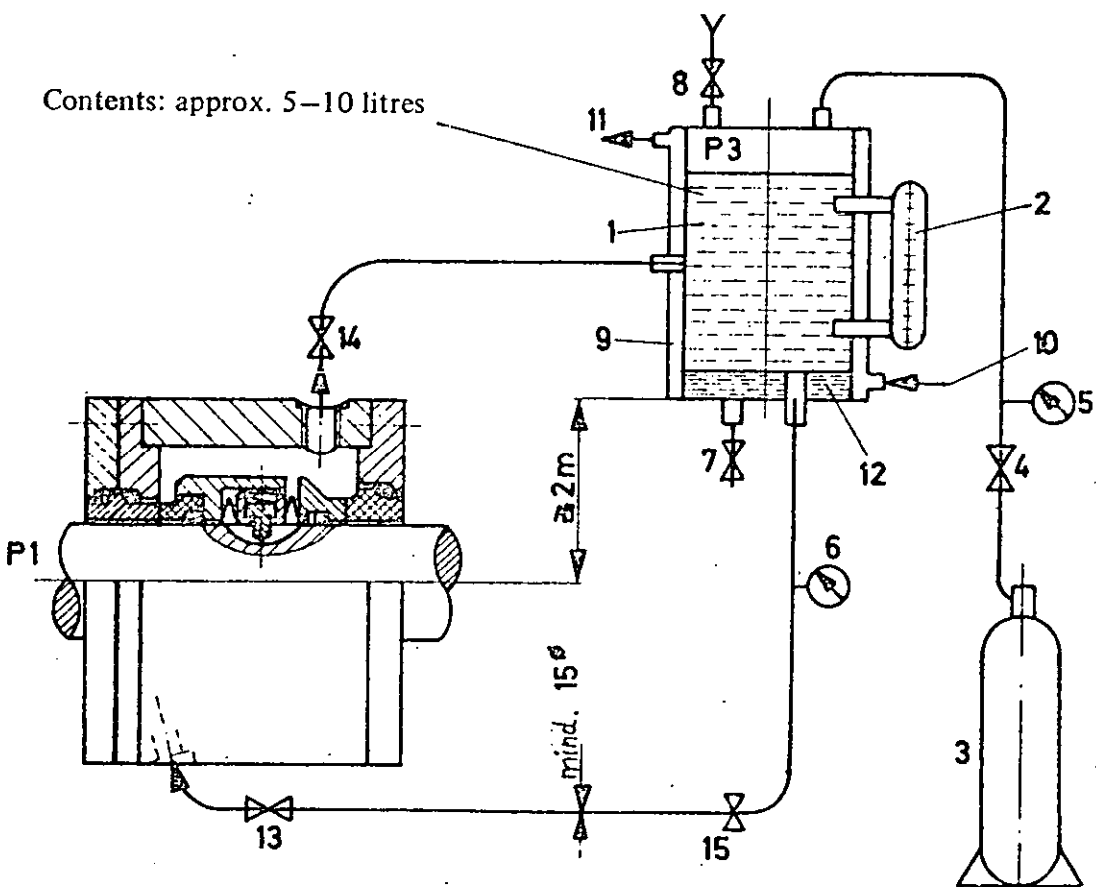
Pump size	Capacity dm^3
4N.20 up to 2N.40	0.1
4N.40 up to 2N.60	
4N.60 up to 2N.100	1.8
N.120	

5.4. **Shaft sealed by double-acting slipper seals with supply of sealing liquid**

In order to work properly, double-acting slipper seals need a sealing liquid which is designed to carry off the resulting heat of friction and to stop the flow medium from penetrating the sealing gap. The sealing liquid fills the space between the inside and outside sets of slipper seals of a double-acting unit.

The sealing medium you use may be any clean liquid, allowance being made for the resistance to corrosion of all parts touched and for neutrality towards the product being delivered. The sealing liquid has to be free of solids, must not tend towards deposits, it should have the highest possible boiling point and be able to conduct heat well. Clean water of low hardness satisfies these conditions to a high degree.

Pressure p_3 of the sealing liquid should be 0.5 to 2 atm. above pressure p_1 of the medium being sealed off. The outlet temperature should not exceed about 60°C and be about 40°C below the boiling point of the sealing liquid at normal pressure. The following diagram illustrates the most usual arrangement of a sealing pressure system based on the thermosyphon principle.



1 Supply tank
2 Level gauge (with minimum mark)
3 Nitrogen cylinder (or cylinder of compr. air)
4 Reduction and shut-off valve
5 Manometer = pressure gauge
6 Thermometer (possibly with trailing pointer)
7 Discharge valve
8 Refill attachment for sealing medium
9 Cooling jacket
10 Cooling water inlet
11 Cooling water outlet
12 Sump zone about 50 mm
13 Inlet valve
14 Outlet valve
15 Dirt drain

IMPORTANT ASSEMBLY NOTE:

To save space the wall thickness of the housings accommodating the mechanical seals is often relatively thin and thus prior to screwing on the connecting pipes or couplings the insertion depth must be checked with a depth gauge and the thread shortened accordingly, if required, to prevent the items protruding inwards and rubbing against the mechanical seal.

6.1. Removal and reassembly of end port, stator and pump casing

Undo inlet and delivery pipe connections. Remove the mounting screws between end port = Endstutzen (2005) and base plate. After removing cap nuts = Hutmuttern (3020) and spring washers = Federringe (3015), draw off end port = Endstutzen (2005). Unscrew casing screws = Gehäuseschrauben (3010). Pull stator = Stator (3005) forwards and off. A stator extractor which is available as a special accessory renders good service for this task. Remove cap nuts = Hutmuttern (2030) and lock washers = Federringe (2025), and draw pump casing = Pumpengehäuse (2010) and intermediate casing = Zwischengehäuse (2050) forwards and off.

Assemble in the reverse sequence, making sure that stator seals = Statordichtungen (8005) and – if provided – heating jacket seals = Heizmanteldichtungen (8030) are still in good order and fit into their seats properly. To push stator = Stator (3005) onto the rotor, you are advised to use glycerine as a lubricant.

6.2. **Removal and re-assembly of rotor, coupling rod and joint connecting sleeve on O-ring sealed pin-type couplings**

Remove snap rings = Sprengringe (5065) and pull off retaining sleeves = Sicherungshülsen (5115, 5110). After removing roll pins = Zylinderstifte (5075), take apart rotor, coupling rod and joint connecting sleeve = Gelenkanschlußhülse (5055) or drive shaft (1015). After pressing out roll pin = Zylinderstift (5070), pull joint connecting sleeve = Gelenkanschlußhülse (5055) off drive shaft = Antriebswelle (1015), when pump is provided with a joint connecting sleeve.

To assemble, proceed in the opposite order of sequence, making sure that the O-rings = O-Ringe (8060, 8065, 8070) are in satisfactory condition.

Using glycerine facilitates assembly.

6.4.1. **Removal and replacement of drive shaft together with shaft packing**

After undoing cheese-head screws = Zylinderschrauben (0045) or after removal of the securing ring = Sicherungsring (0315) and removing the bearing cover = Lagerdeckel (0015) or (0016) and Seeger circlip = Seegerring (0035), press drive shaft = Antriebswelle (1005) and whole packing unit out of bearing casing.

Pull anti-friction bearings = Wälzlager (0020) and spacer sleeve = Distanzhülse (0010) out of bearing casing = Lagergehäuse (0005).

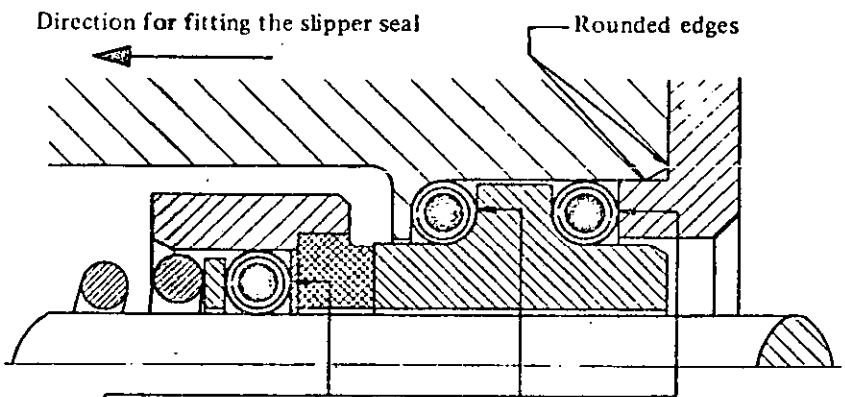
Assemble in the reverse sequence making absolutely sure that anti-friction bearings = Wälzlager (0020) and shaft ring = Simmerring (0030) are in good condition. Clean and regrease the bearings prior to replacement. After pressing drive shaft = Antriebswelle (1005) in together with the whole packing unit, ensure that Seeger circlip = Seegerring (0035) fits properly and securely behind the 2nd anti-friction bearing = Wälzlager (0020) and behind prop ring = Stützring (0055).

6.4.2. **Dismantling and assembling the shaft sealing unit removed with drive shaft, in slipper seal design**

Whatever job you are doing, make sure that everything is absolutely clean. In particular, damage to the sealing surfaces and sealing and bearing has to be avoided under all circumstances.

Dismantle the sealing unit on the shaft. After undoing the screw connections you can see, first pull the housing apart on the shaft; this housing may consist of several parts depending on the type of seal. Draw the separate housing parts carefully off the shaft, taking them off one by one with the parts of the slipper seal which are in them. Then press the parts of the slipper seal carefully out of the housing parts. Very great care has to be exercised in the assembly of sealing and bearing rings having a double Teflon jacket. The butt joint on the outer jacket must point in the opposite direction to the direction of assembly because the jacket may otherwise open and get pulled off. When pressing the sensitive counter-ring out of a special carbon brush, make sure that you distribute the pressure evenly. When dealing with fairly large rings, you are recommended to use an appropriate drift. When doing so, do not allow any foreign matter to contaminate the slipper surfaces.

To reduce the friction when you are fitting the seal, you should wetten the shaft and housing in the region of the sealing and bearing rings with glycerine.



8. RECOMMENDED SPARES AND LISTS OF SPARES
(for pumps with sealed pin-type couplings)

To minimize downtime, you are recommended to keep a certain stock of parts subject to wear. We advise you to stock sets of spares as follows:

Qty. large set	Qty. small set	Item No.	Description
1	1	3005	Stator = Stator
2	2	8005	O-ring = Runddichtring
1	1	8015	O-ring = Runddichtring
1	–	1998	Coupling rod = Kuppelstange
2	–	5075	Pin = Bolzen
2	–	8070	O-ring = Runddichtring
4	–	8060	O-ring = Runddichtring
2	–	5065	Snap ring = Sprengring
1	–	5110	Retaining sleeve = Sicherungshülse
1	–	5115	Retaining sleeve = Sicherungshülse
1	–	1999	Rotor = Rotor

To avoid wrong deliveries when ordering spare parts, the parts are to be identified according to the item number in the sectional drawing and spare parts list.
The following details are absolutely essential for proper ordering.

Quantity (column 2) – Description (column 3) – Identity No. (column 6).

The details as to the column refer to the spare parts list. (Compare the subsequent example).

ERSATZTEILSTÜCKLISTE 3.8.81

1	A	B	2	3	4	C	5	6	7	8
Teil VDMA	TEIL EURO	POS.	ST	Benennung	Zeichn.-Nr. • Werkstoff Abmess. • Norm • Werkst. • Oberfl.	TA		Ident-Nr.	BEMERKUNGEN	
	3410	0005	1	Lagergehäuse	850221*06020	3		850221		
	2910	0010	1	Distanzbuchse	850220*10308	3		850220		
	3520	0015	1	Lagerdeckel	850222*31645	3		850222		
		0020	1	Kugellager	6303 *D625	0		580504		
		0025	2	Stützscheibe	S 17x24x1,5*D988	Y		512181		

TA [illegible]ert: 0 = Kaufteil 1 = Rohmaterial 2 = Gußteil 3 = Eigenfertigung 4 = Baugruppe 6 = Vormont. Gruppe 6 = 7 = Motor, Getriebe 8 = Ei[illegible]teil 9 = Hilfsstoff Y = Greifteil Lager Z = Greifteil Montage

E R S A T Z T E I L S T L E C K L I S T E

25.07.84

1	A	B	2	3	4	C	5	6	7	8	
Teil C*A	TEIL ELRC	POS.	ST	Benennung	Zeichn.-Nr. * Werkstoff Abmess. * Norm * Werkst. * Oberfl.	TA		Ident-Nr.	BEMERKUNGEN		
		0005	1	BEARING PEDESTAL	872317*C6C2C*F.SICH.RC.	3		872317			1
		0010	1	DISTANCE SLEEVE	872315*10208*F.SICH.RING	3		872315			2
		0016	1	BEARING COVER	874242*1033C03*GEZCC.*VERZINKT	3		874242			3
		0020	2	BALL BEARING	6406 *0625	C		580604			4
		0030	1	RADIAL SHAFT SEAL	A 40X 60X10*C3760	Y		513371			5
		0035	1	CIRCLIP	A 30X1,5 L*N55165	Y		512316			6
		0041	1	RADIAL SHAFT SEAL	EVR30X 47X 7*P.VLIESDICHTLIPPE	Y		596526			7
		0050	2	GREASE RETAIN.RING	6406 JV*N6115C	Y		514065			8
		0055	1	SPACER RING	S 30 X 42X2,5 *0985	Y		512191			9
		0315	1	CIRCLIP	90X3 *0472	Y		512096			10
		0320	1	C-RING SEAL	84 X 3 B*C377C*N67C	Y		516588			11
		0365	1	ELBOW	C,50Z A4*C295C*EN92*VZK	Y		520096			12
											13
		1005	1	DRIVE SHAFT	886273*14571*LNVERCHROMT	3		886595			14
	6710	1010	1	KEY	A 8X 7X 45*C6885	Y		470313			15
		1996	1	COUPLING ROD	862344*14571	3		862345			16
		1999	1	ROTOR	863465*14571*60CRAD*0,25CHROM	3		877105			17
											18
	1310	2005	1	END SIDE	162129*14581*CN65*MILCHGEWINDE	5		162063			19
	1200	2010	1	PUMP HOUSING	159683*14571*CN65*MILCHGEWINDE	5		159683			20
		2015	1	DRAIN PLUG	G0,50A*0910*A4	2		500024			21
		2020	4	BOLT	M10X 30*0938*A4	2		954032			22
		2025	4	SPRING WASHER	A10*0127*14571	2		902199			23
		2030	4	HEXAGON.NUT	M 10 *0934*A4	2		901061			24
		2035	1	SUPPORT	867320*3258101	3		867320			25
		2040	4	HEXAGON.NUT	M 10 *0934*8	2		901069			26
											27
	1130	3005	1	STATOR	167016*EL/ST	3		167485			28
											29

ZWEITLISTE | CKZ 6

ERZEUGNIS	TYP U. GROESSE	NASCH.-GR.	ANZ. STELL.	SCHNITTZ.	KOMMIS.-NR.	Seite
MOHNG-PUMPE	2NE 40A	6C	03C03E	NEC36	7054*E/84/CC	1

Teilart: 0 = Kaufteil, 1 = Rohmaterial, 2 = Gußteil, 3 = Eigenfertigung, 4 = Baugruppe, 5 = Vormont. Gruppe, 6 =, 7 = Motor, Getriebe, 8 = [illegible]teil, 9 = Hilfsstoff, Y = Greifteil Lager, Z = Greifteil Montage

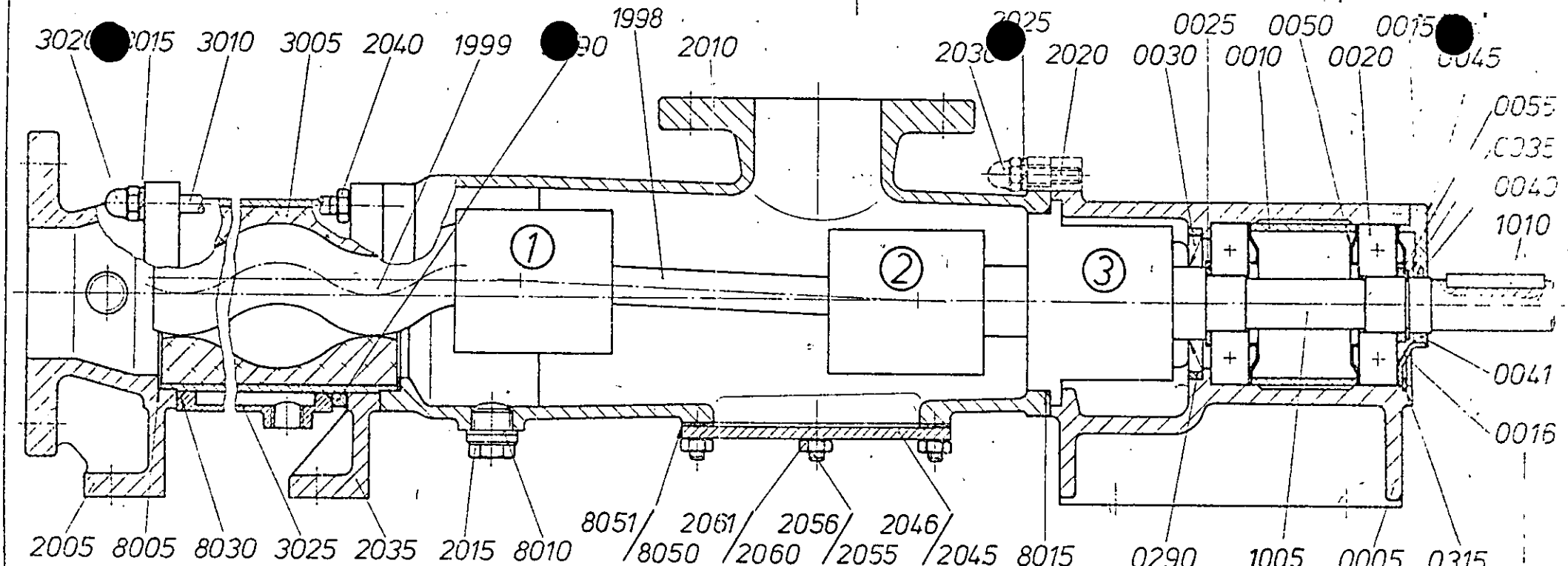
E R S A T Z T E I L S T U E C K L I S T E

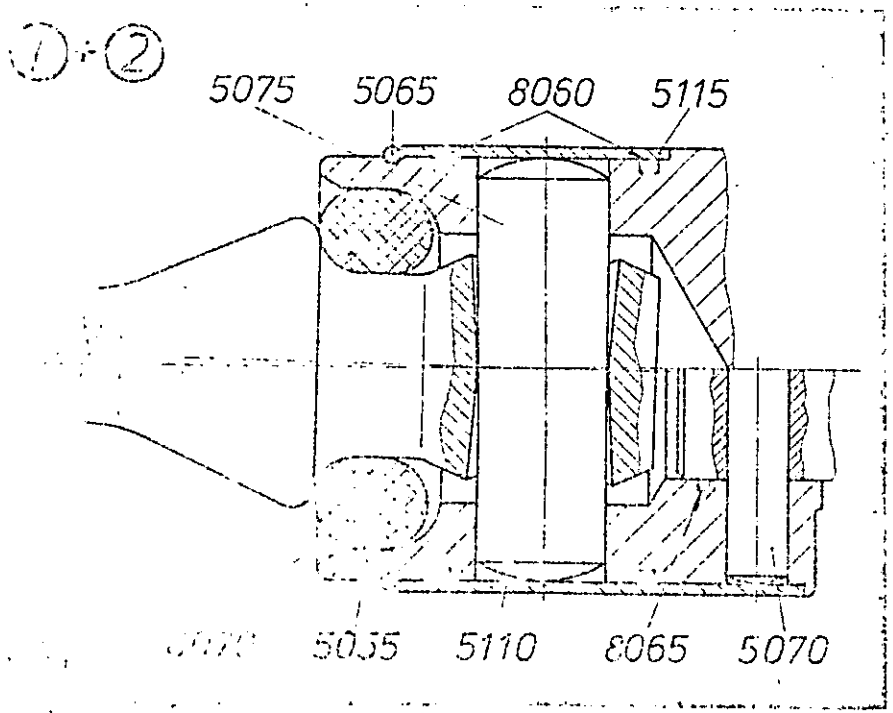
25.07.84

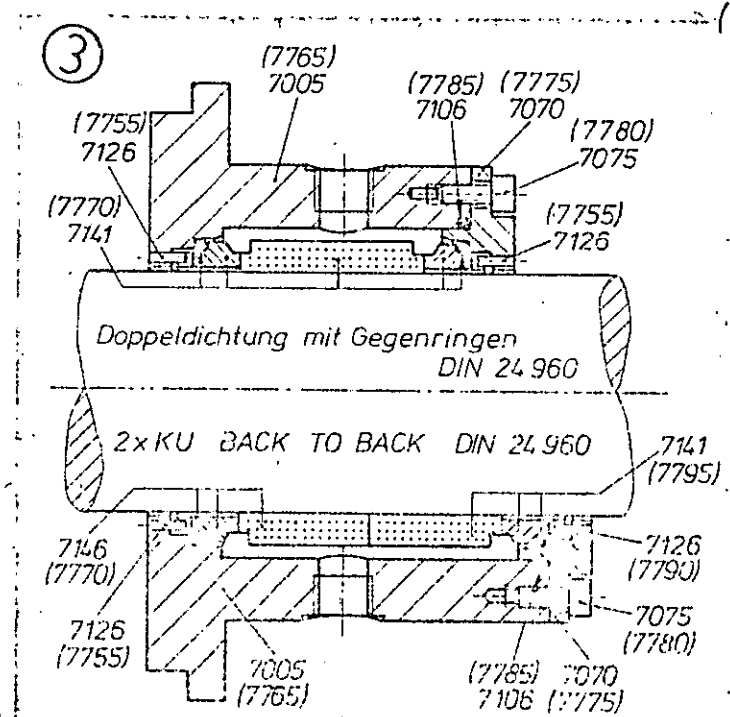
1	A	B	2	3	4	C	5	6	7	8	
Teil VGPA	TEIL ELNR	POS.	ST	Benennung	Zeichn.-Nr. * Werkstoff Abmess. * Norm * Werkst. * Oberfl.	TA		Ident-Nr.	BEMERKUNGEN		
		3010	4	THRU BOLT	ES0252*10531	3		EE7327			1
		3015	4	SPRING WASHER	A1C*0127*14571	Z		5C2155			2
		3020	4	HEXAGON.NUT	M 10 *0934*A4	Z		5C1CE1			3
		5065	2	CIRCLIP	E51528*14401	Y		512275			4
	2181	5075	2	PIN	ES1459*14571*ZCX54	Y		EE8E64			5
	2183	5115	2	SLEEVE	EE2347*14571	3		EE2247			6
		7005	1	MECH.SEAL HOUSING	E74205*14571*F.M7-D/4G	3		E74EEC			7
		7011	1	MECH.SEAL HOUSING	E74206*14571*F.M7-D/4G	3		E74EE1			8
		7126	2	BOLT	4 M8X 10*07*14571	C		554524			9
		7141	1	MECHANICAL SEAL	M7-D C4C DIN C13013VGG-S2E1VGG	S		558501			10
		7165	1	O-RING SEAL	7C X 3,5 B*D377C*V11CA	Y		516661			11
		8005	2	GASKET	422545*FERB.7C HELL * 8CX 94X3	Y		552657			12
		8010	3	GASKET	A 21 X 26 *07603*ITS	Z		422527			13
		8015	1	O-RING SEAL	9C X 3 B*D377C*NB7C	Y		516C4C			14
		8060	4	O-RING SEAL	65 X 3,5 B*D377C*NB7C	Y		517C2C			15
		8070	2	O-RING SEAL	46C112*NE6CHELL*24X13 *NE1051	Y		554161			16
											17
											18
											19
											20
											21
											22
											23
											24
											25
											26
											27
											28
											29

ZEITLISTE | DRZ e

ERZEUGNIS	TYP L. GROESSE	MASCH.-GR.	ANZ. STUFT.	SCHNITTZ.	KONFIS.-NR.	Seite
MCHNC-PUMPE	2NE 4CA	60	C3C03E	NEC36	7C54EE/E4/CC	2







B.P.M. Hol.
Sep. Br.
V1 Sep. V. P.

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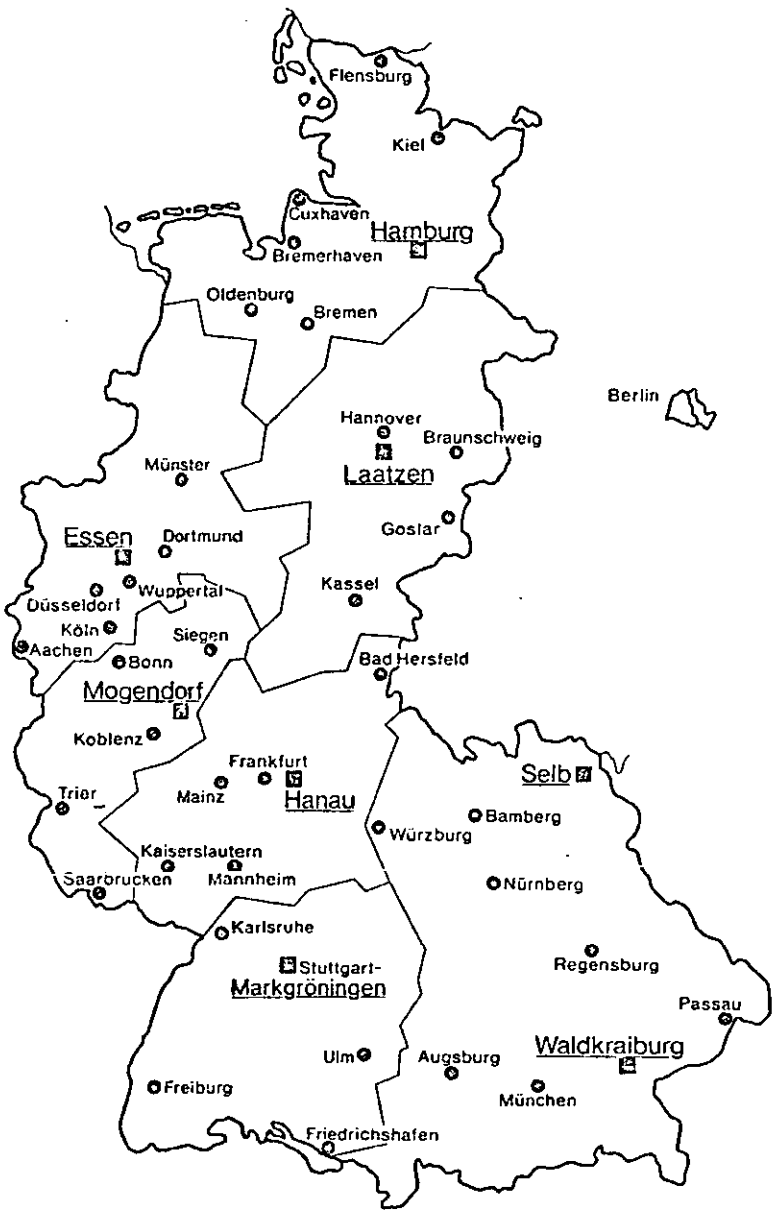
SCHNITTZEICHNUNGS-NR

NE 036

NM 401/01

NETZSCH-MOHNOPUMPEN GMBH



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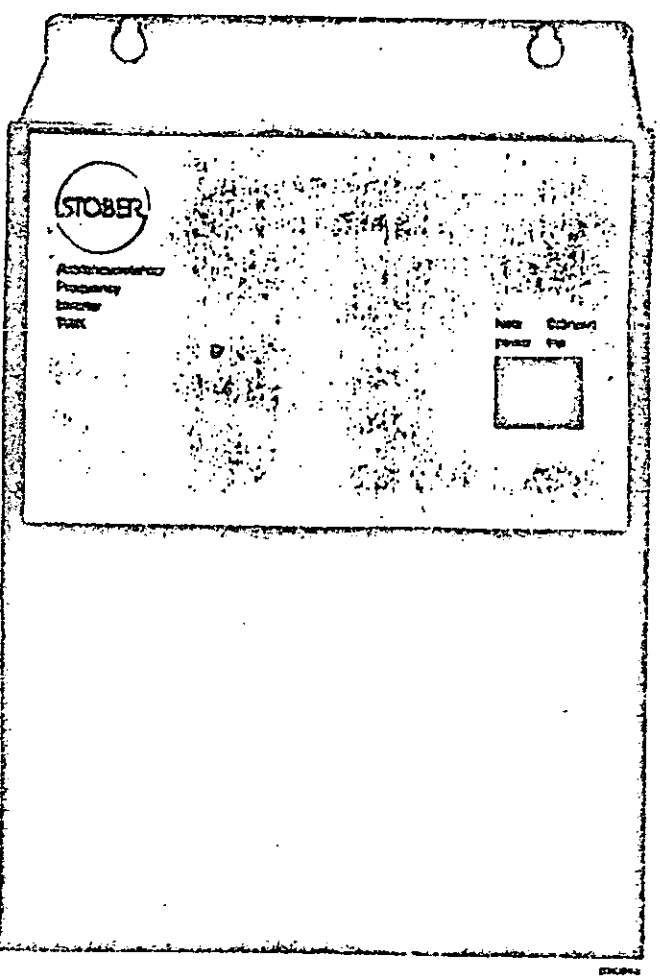
Ingenieurbüros und Servicestellen in den meisten Ländern Europas und in Übersee.

NM 401/01.060-07.84
CODE 9000

STÖBER

ANTRIEBSTECHNIK

VERITRON®-
AC Variable Frequency Drives
Types TWK
1.5 kVA . . . 60 kVA



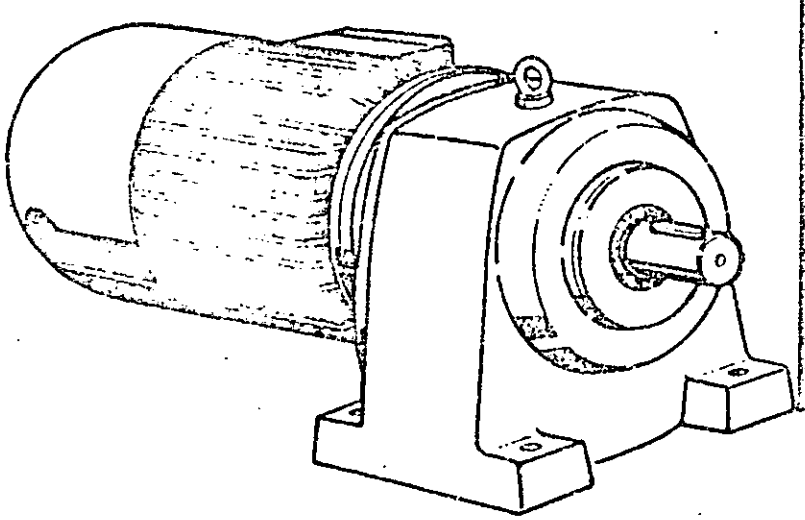


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TABLE OF CONTENTS

1. General

VERITRON® series TWK drives inverters are novel devices with sinusoidal pulse width modulation (PWM) for low-loss variable-speed control of sturdy standard squirrel-cage motors in the case of single and multiple drives.

Application examples

Single and multiple motor drives for textile machines, wood processing machines, packing machines, transport and conveyor systems, pumps, blowers, fans and centrifuges.

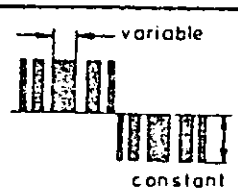
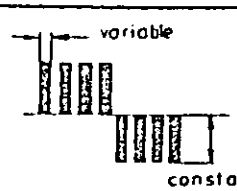
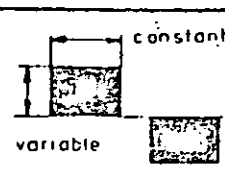
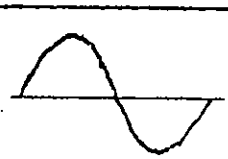
Design

The inverters are designed for panel mounting. Their power section consists of an uncontrolled rectifier with smoothing elements and an inverter. The signal electronics is isolated from the power section.

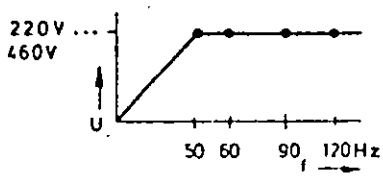
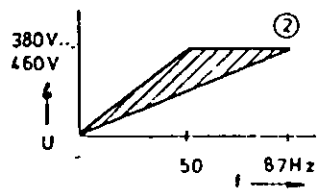
Features

- Ready use with standard motors, no need for special motors
- Low torque pulsation – in particular at low speeds – by sinusoidal pulse width modulation
- Unidirectional or bidirectional operation
- Particularly compact design
- Accomodation in closed casing – facilitates installation design in accordance with safety regulations VBG 4
- Sinusoidal current, hence low harmonic content, improved motor utilization, smoother running, higher drive efficiency
- No-load-proof design
- Presetting of desired speed:
  - on external potentiometer, connection to internal power pack
  - external voltage/current 0 . . . 10 V/0 . . . 20 mA/4 . . . 20 mA
- Preselection of direction of rotation by electronic signal or via contact
- Inching duty at about 5 Hz via contact (up to 10 kVA)
- Limit frequency adjustable: 1.5 kVA . . . 11 kVA by jumpers or via contact, 50/60/90/120 Hz
  22 kVA . . . 60 kVA continuously adjustable between 50 Hz and 87 Hz
- Electronics blocking signal (up to 11 kVA), e.g. for operation of motors with electromagnetic brake
- Adjusting potentiometers for:
  - running-up-time
  - running-down time

  } 1 s . . . 50 s (up to 11 kVA), 3 s . . . 50 s (from 22 kVA)
  - increased starting torque up to about 8 Hz by voltage increase
- Monitored operation
  - automatic disconnection at short circuits, undervoltage > 15 %
  - overvoltage in the DC link caused by regenerating (braking) results in the preset running-down time being extended; excessive overvoltage results in automatic disconnection
  - indication of faults by LEDs and floating changeover contact 220 V/2.5 A
- Accessories:
  - Braking feature TG 5831 for shortening the braking time. The number of braking features connected in parallel determines the degree to which the braking time is shortened.
  - Operating unit GG 6300 (operator) with setpoint potentiometer for speed selection, on-off switch, frequency indication.

	VERITRON® TWK	Other inverter circuits	
	Sinusoidal pulse width modulation (< 50 Hz)	Pulse width modulation	Pulse amplitude modulation
Output voltage			
Output current			

2. Technical data

INVERTER TYPE	TWK 01552	TWK 02552	TWK 03552	TWK 05553	TWK 11053	TWK 22053A	TWK 33053A	TWK 40053A	TWK 60053A
Rated output	1,5 kVA	2,5 kVA	3,5 kVA	5,5 kVA	11 kVA	22 kVA	33 kVA	40 kVA	60 kVA
Motor output rating ①	0,75 kW	1,5 kW	2,2 kW	3,7 kW	7,5 kW	15 kW	22 kW	30 kW	45 kW
Rated current	4,2 AC	7,5 AC	10,5 AC	8 AC	16 AC	32 AC	48 AC	58 AC	87 AC
Overload capacity	1,5 x I_N for 60 s					1,5 x I_N for 30 s			
Minimum load	no-load-proof					no-load-proof			
Supply voltage	200 ... 230 V/1 ph ± 10 %			380 V / 415 V / 440 V / 460 V / 3 ph ± 10 % ②					
Line frequency	47,5 Hz ... 62,5 Hz								
Output voltage	20 V ... 220 V/3 ph			35 V ... 380 V / 415 V / 440 V / 460 V / 2 ph					
Frequency of output voltage	2,5 – 50/60/90/120 Hz 					5 – 87 Hz 			
Frequency deviation	± 0,5 % of max. frequency					± 1 % of max. frequency			
Inching frequency	5 Hz					—			
Max. power loss	75 W	125 W	175 W	275 W	550 W	1100 W	1650 W	2000 W	3000 W
Recommended line fuses	10 A slow ③	16 A slow ③	20 A slow ③	10 A slow ③	20 A slow ③	75/80 A Semiconductor fuses ④	75/80 A	75/80 A Semiconductor fuses ④	160 A
Running-up/ running-down time (separately adjustable)	1 s ... 50 s					3 s ... 50 s			
Automatic disconnection at undervoltage	≦ 85 % supply voltage								
Relay contact rating (signal output)	220 V AC / 2,5 A								
Admissible coolant temperature	-10° C ... +40° C at relative air humidity ≦ 90 %								

① The shaft output available is 0.9 ... 0.95 x motor output rating (nameplate)
② Indicate, when ordering
③ Fuse base with screw cap E27
④ Fuse base GNT7 030 979 R1 (for dimension diagram, see chapter 5.2)

Degree of protection: IP 21

Protective features

To avoid damage, the inverter is blocked at the following instances:

At overcurrent of more than 150 % I_N for 60 s or 30 s. Only during running-up, any value exceeding 150 % I_N leads to interruption, and thus prolongation of running-up time (no disconnection)

At overload, if the current exceeds a value which is 1.2 ... 1.5 x I_N for more than 60 s or 30 s.

At overvoltage caused by motor regeneration; as a result the running-down period is interrupted (prolongation of running-down time). Excessively fast voltage increase leads to disconnection.

At undervoltage of the rated supply voltage of 15 %, the frequency converter switches off.

Short-time interruption: Disconnection takes place at a supply voltage interruption for more than 15 ms.

3. Block diagrams

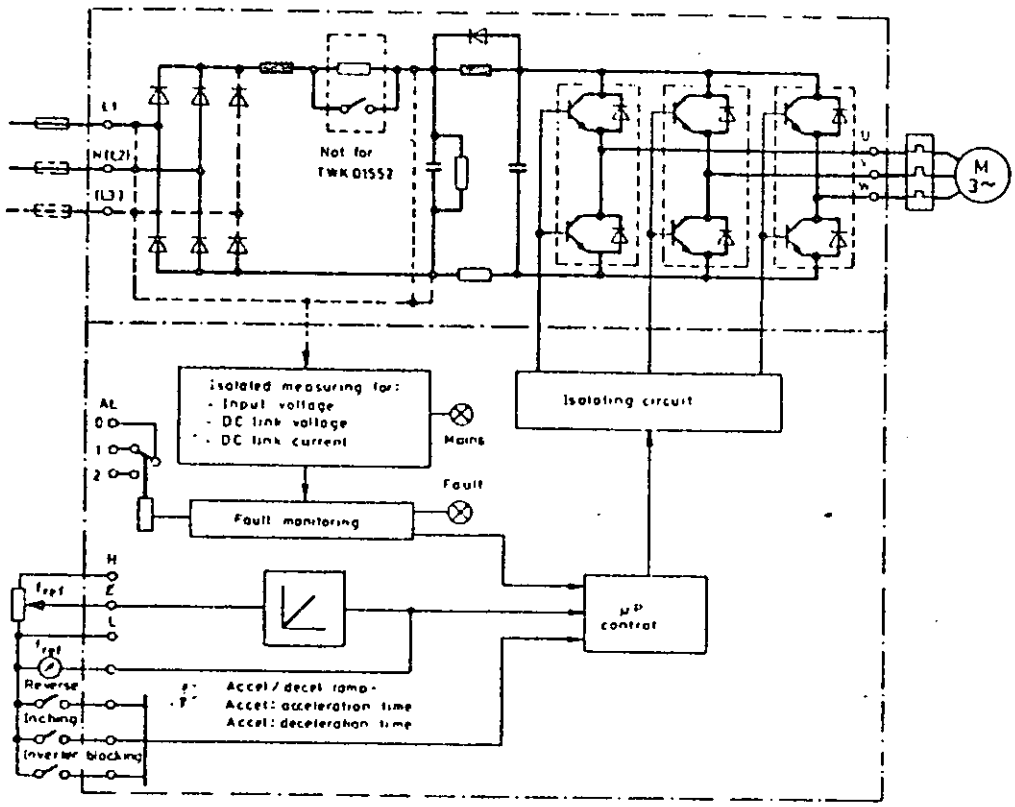


Figure 3./1 TWK 01552 . . . 11053

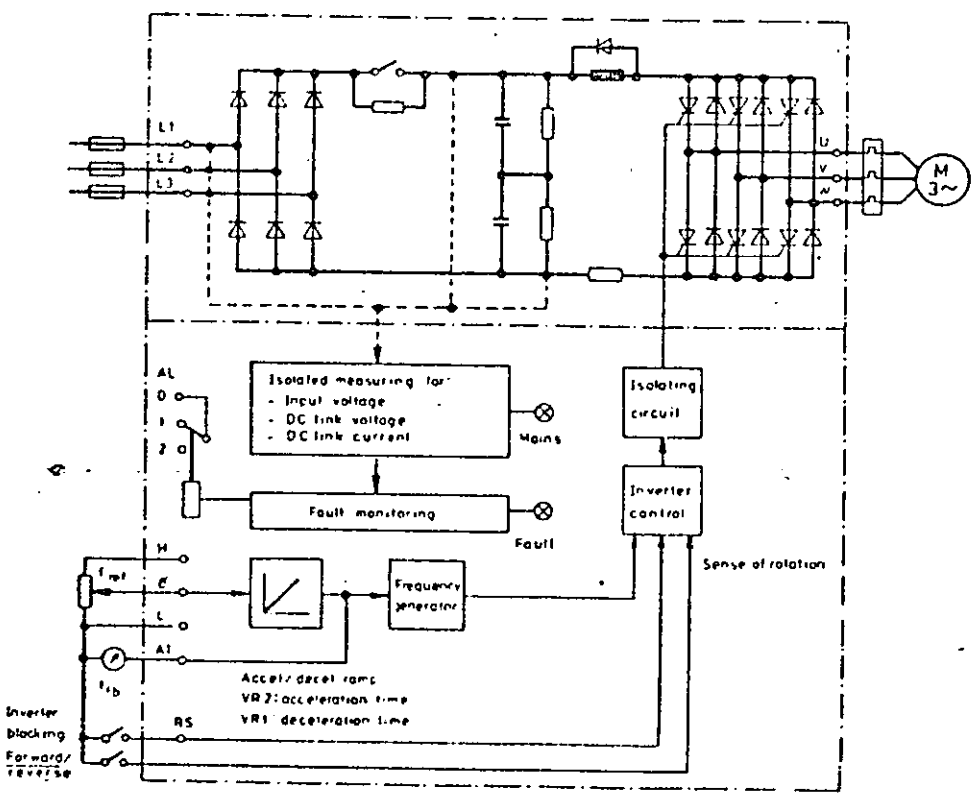


Figure 3./2 TWK 22053A . . . 60053A

4. Accessories

4.1 Operating unit (operator) GG 6300

The operating unit is mainly used for remote control of the VERITRON® inverters series TWK.

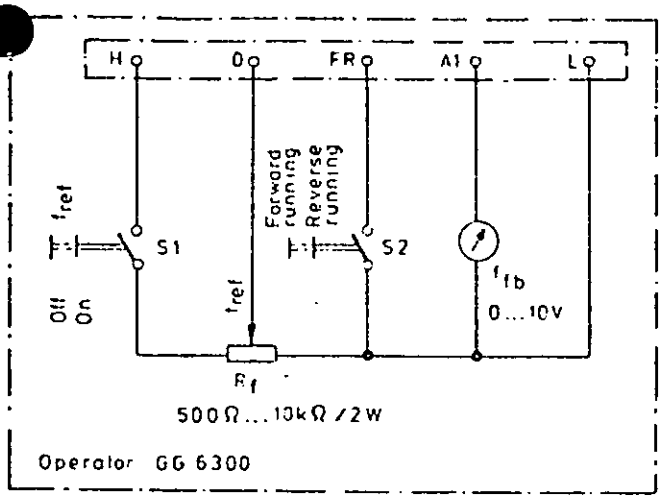


Figure 4.1/1

S1 : for frequency reference

: for changing the direction of rotation (reversing)

R_f : for adjusting the desired speed

The built-in voltmeter (0 . . . 10 V) with its speed indicating scale indicates the speed value.

4.2 Braking feature TG 5831

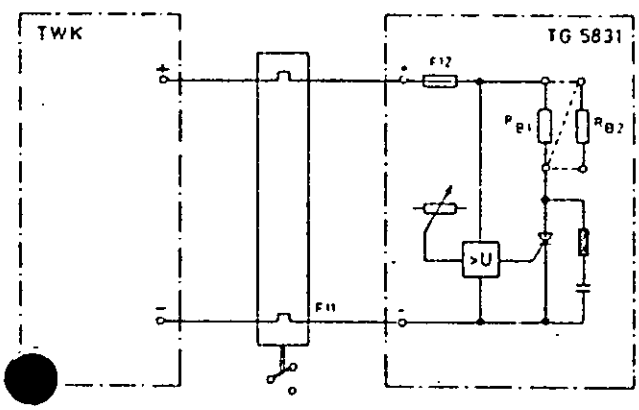


Figure 4.2/1

The braking feature TG 5831 shortens the braking time. It takes up the energy fed back via the inverter.

It is suitable for connection to all TWK inverters.

Data of the braking feature:

$P \leqq 5$ kW for 1 s

Permissible cycle ratio: 1 : 30 (e.g. 1 s "Braking", at least 30 s "OFF")

Connection to DC link voltage (terminals +/-)

Max. permissible supply voltage U_{max} = 800 V

Adjustment of response threshold by means of potentiometer

Further reduction of the braking time is possible by parallel connection of several braking features.

5. Dimension drawings

5.1 VERITRON® inverters of the TWK series

Important!

The following clearances are required for the units:

- Floor and ceiling clearances: 100 mm
- Side clearances: 50 mm

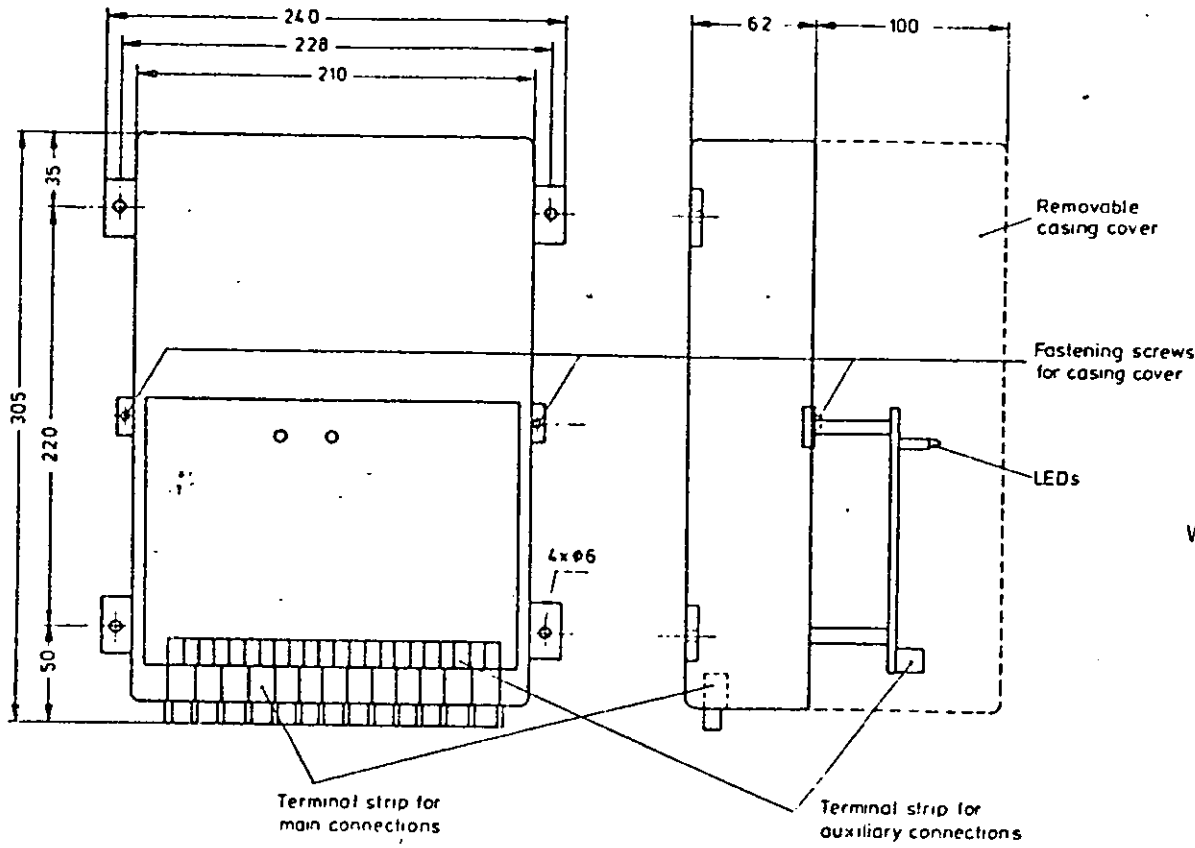


Figure 5.1/1 TWK 01552, 02552, 03552

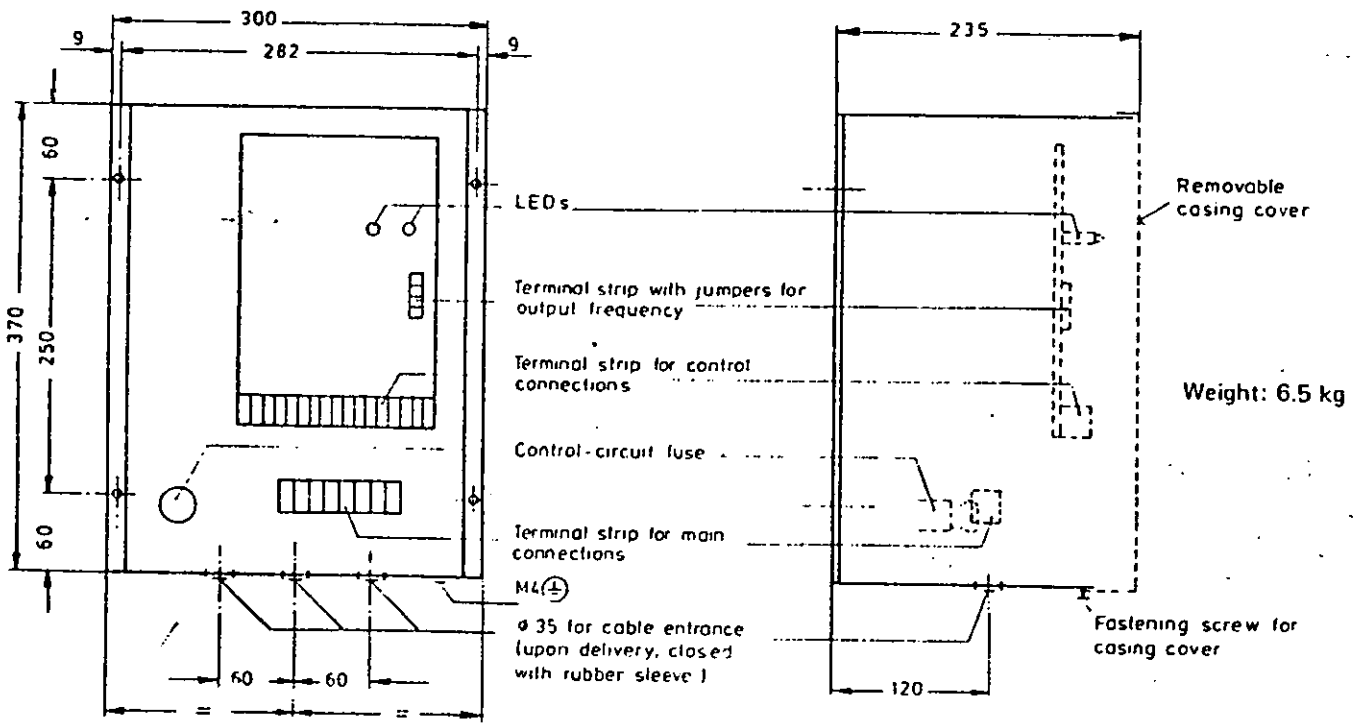


Figure 5.1/2 TWK 05553

Important!

The following clearances are required for the units:

– Floor and ceiling clearances: 100 mm

– Side clearances: 50 mm

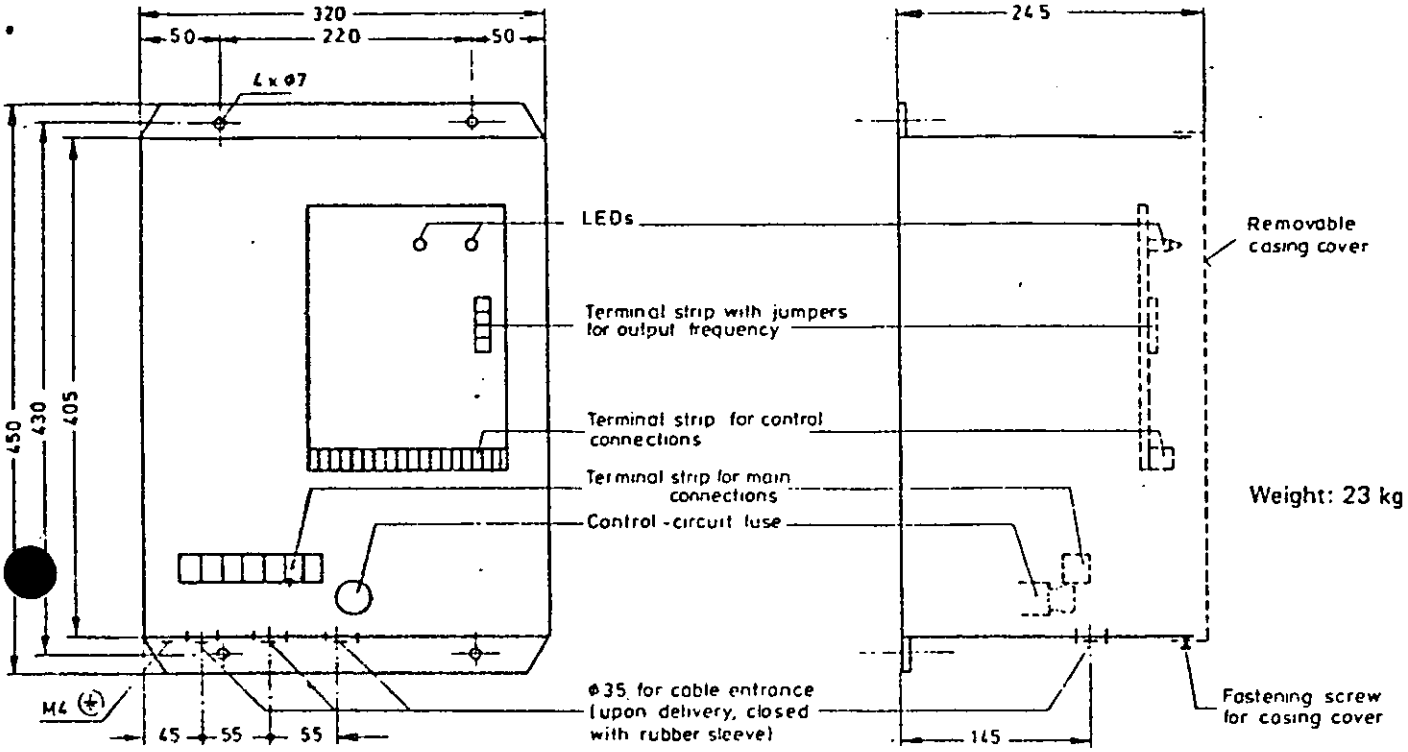
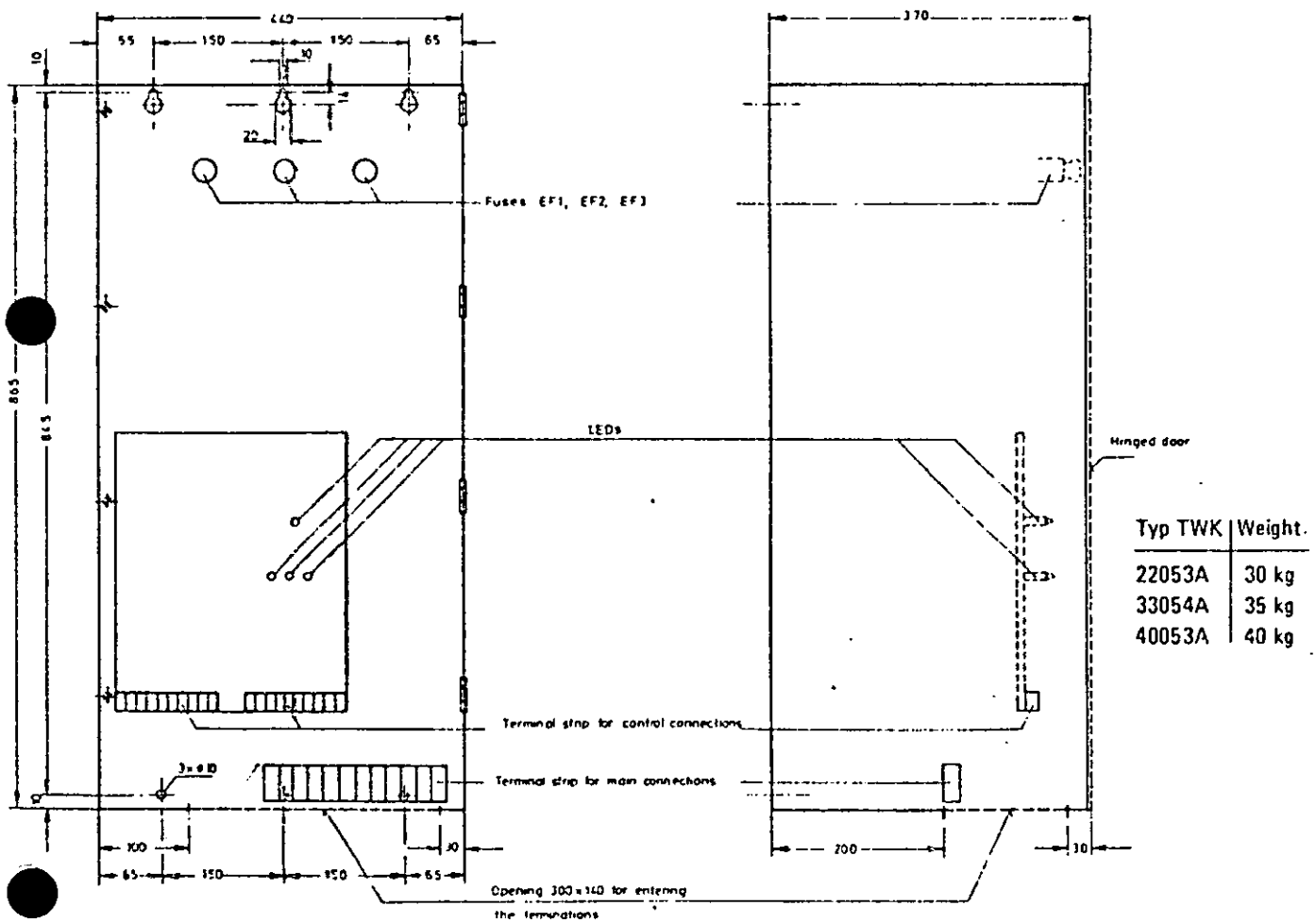


Figure 5.1/3 TWK 11053

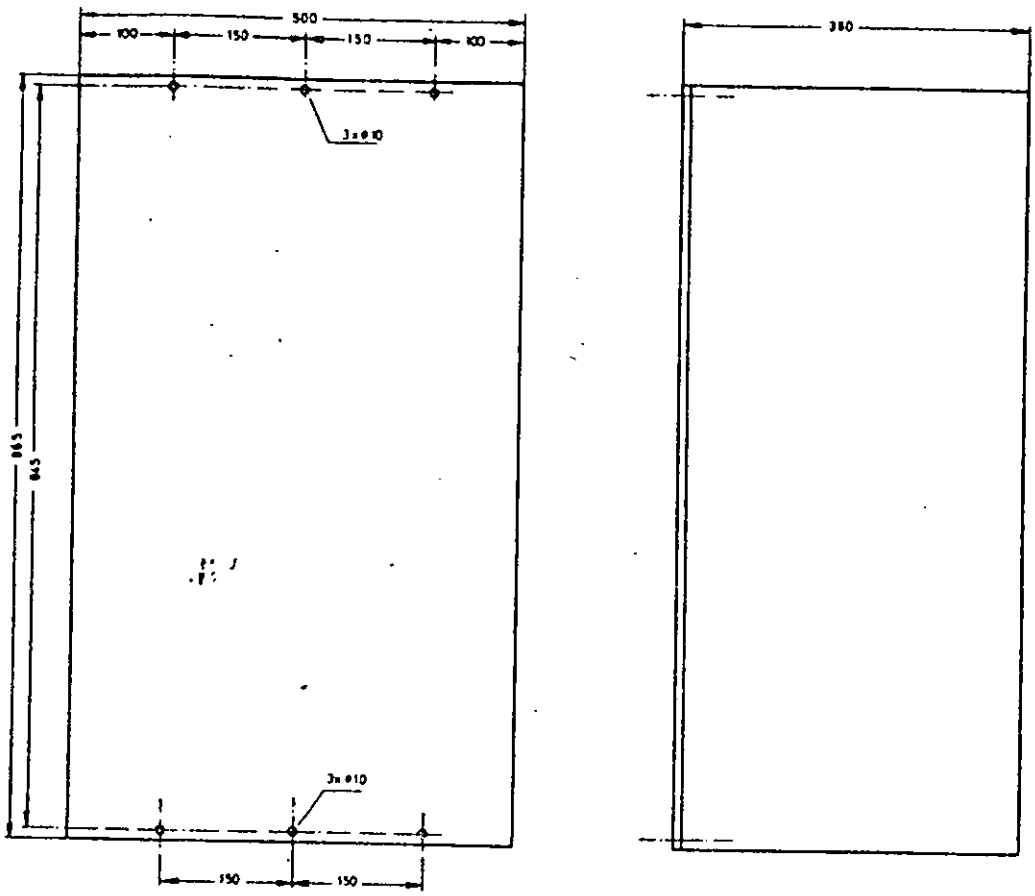


Typ TWK	Weight
22053A	30 kg
33054A	35 kg
40053A	40 kg

Figure 5.1/4 TWK 22053A, 33053A, 40053A

Important!

- The following clearances are required for the units:
  - Floor and ceiling clearances: 100 mm
  - Side clearances: 50 mm



Weight: 120 kg

Figure 5.1/5 TWK 60053A

5.2 Fuses base Ident.-No. GNT 7 030 979 R1

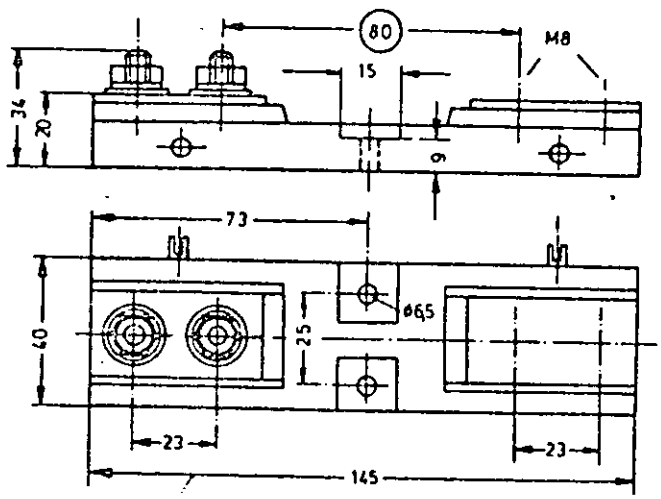
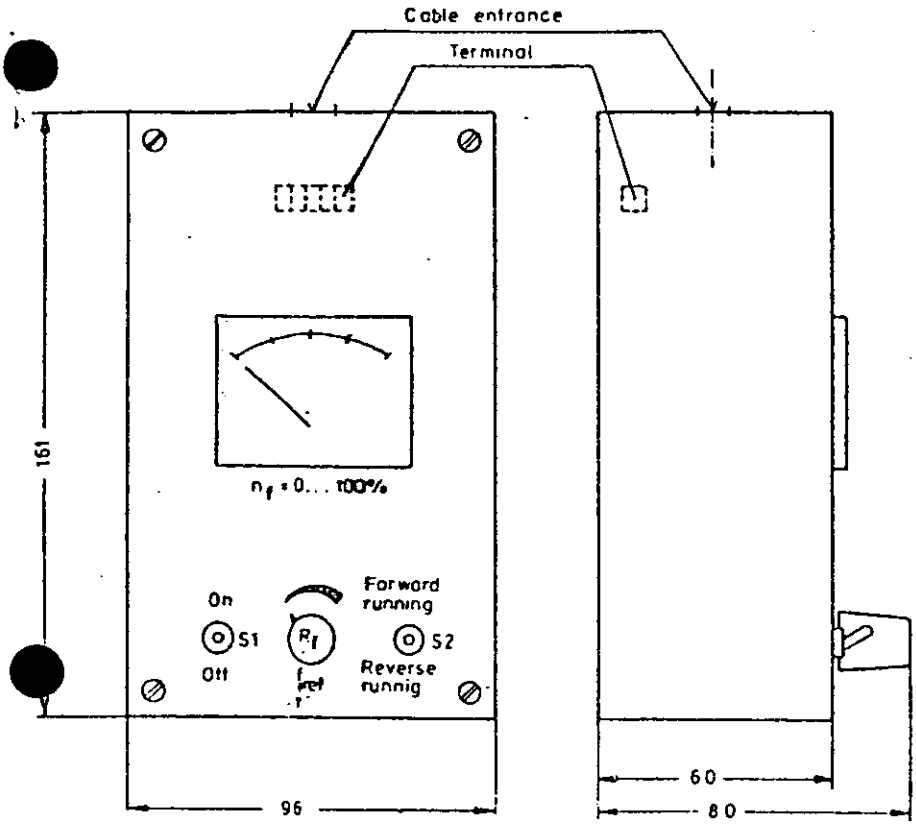


Figure 5.2/1



Weight: 0,60 kg

Figure 5.3/1 Operating unit GG 6300

6. Connection

6.1 Connection examples

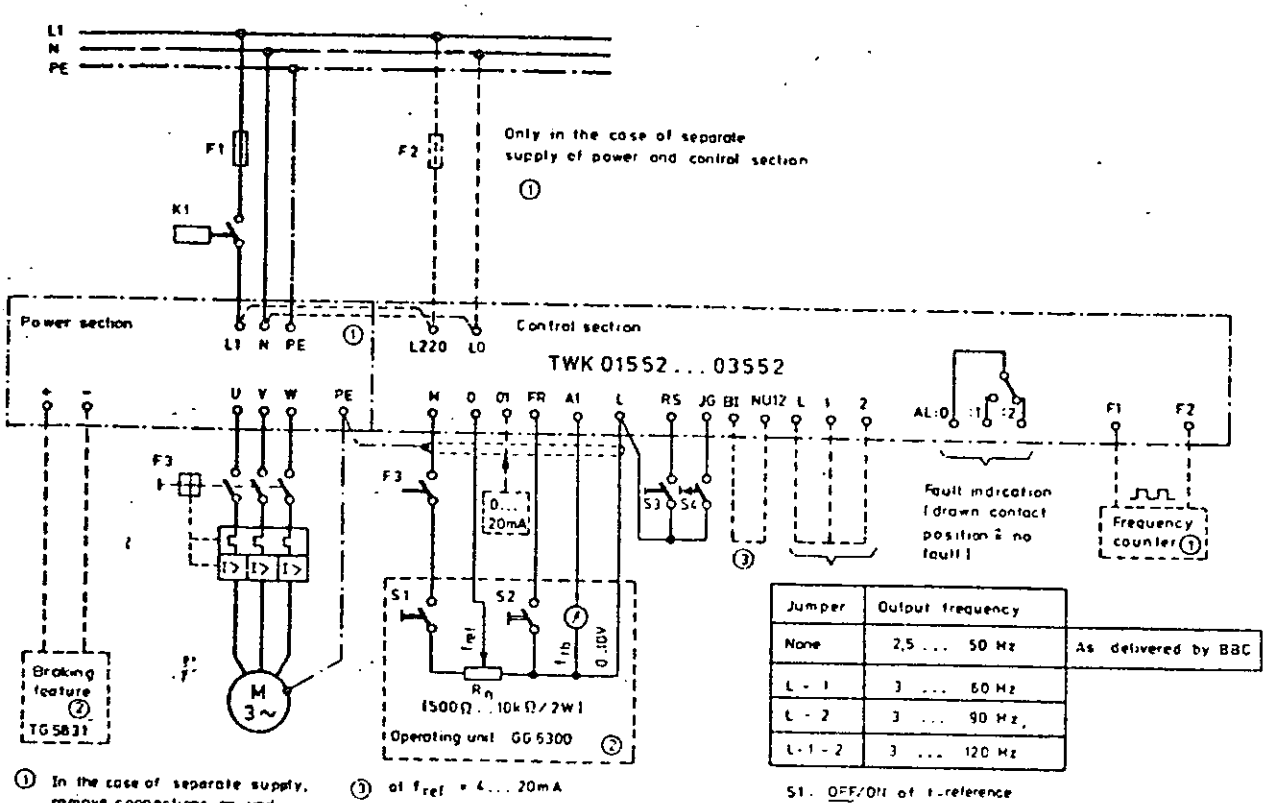


Figure 6.1/1 Connection example for inverters TWK 01552, 02552, 03552

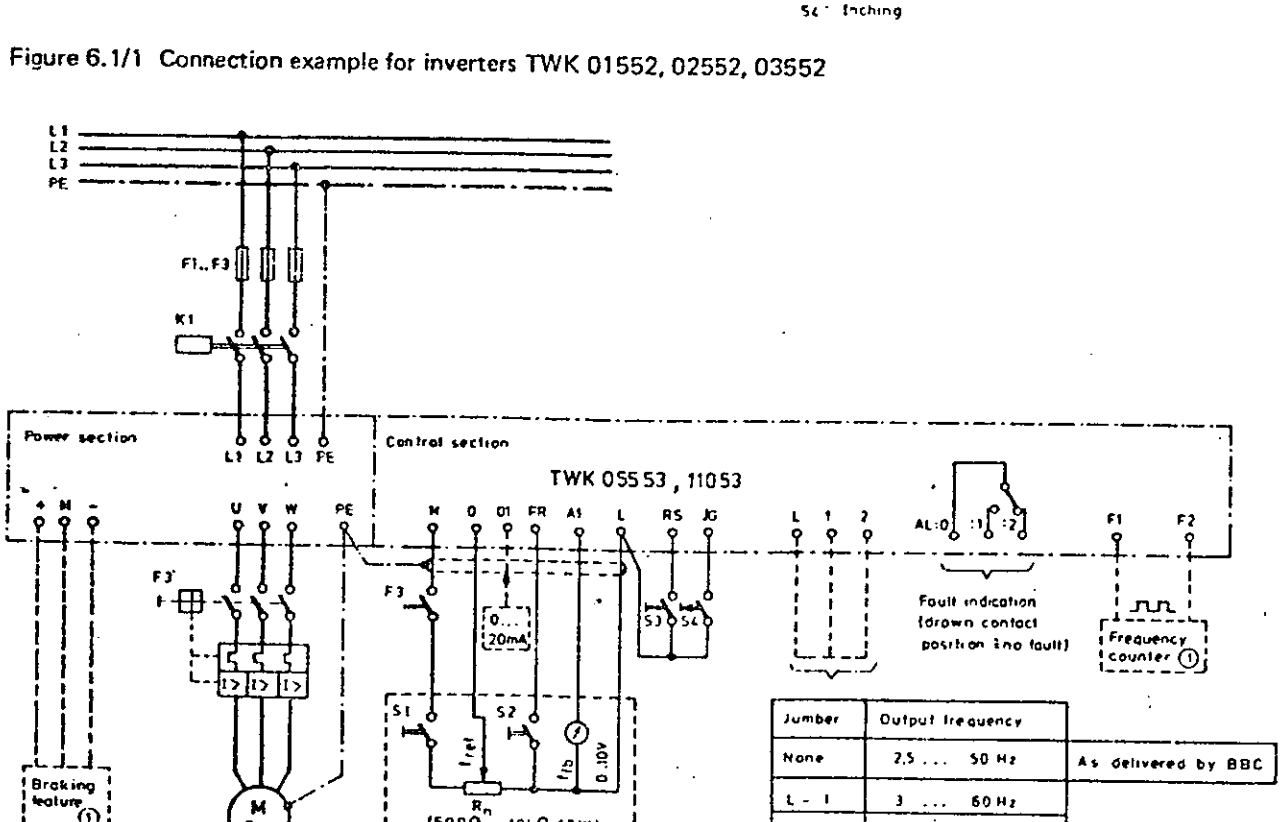


Figure 6.1/2 Connection example for inverters TWK 05553, 11053

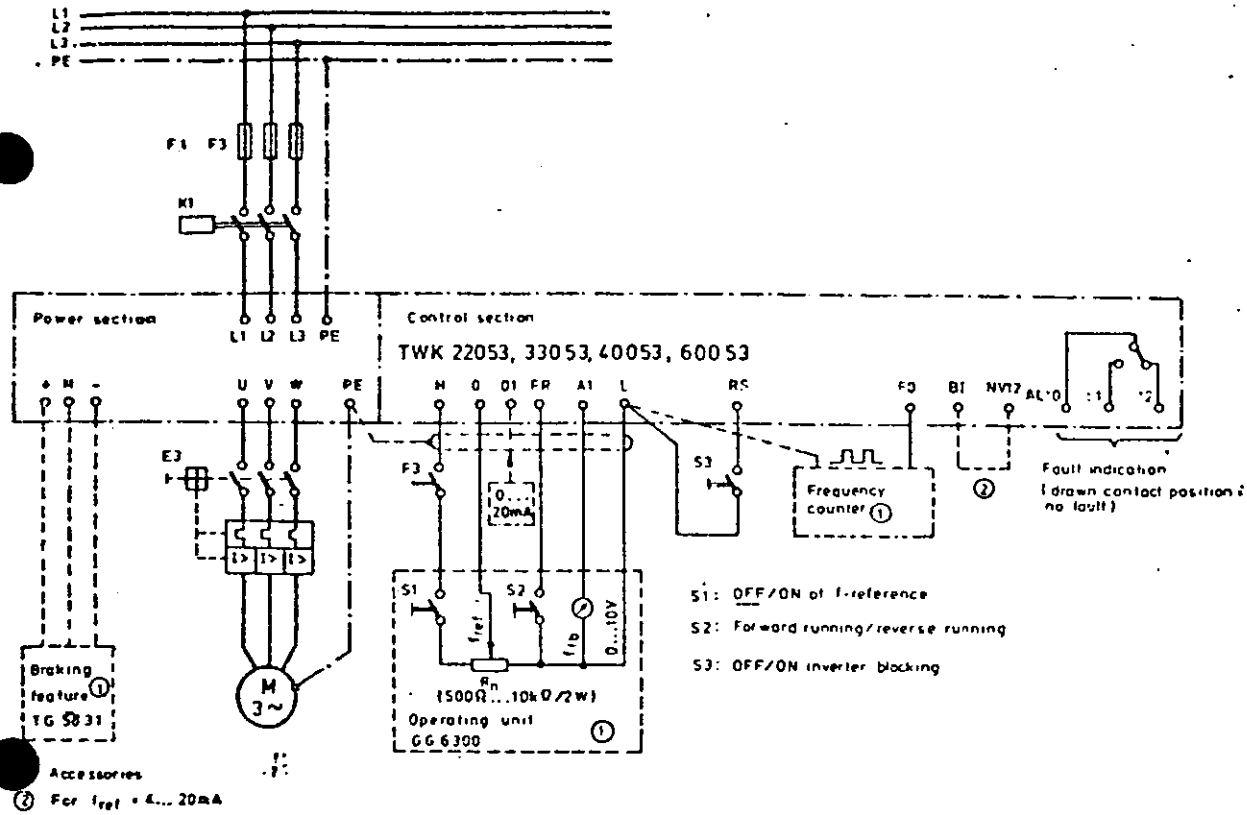


Figure 6.1/3 Connection example for inverters TWK 22053A, 33053A, 40053A, 60053A

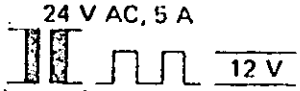
6.2 Wiring of terminals

TWK 01552, 02552, 03552

Power section

Terminal	Function
L1	Spare terminal | system connection 220 V AC
→	
N	
PE	Connection of protective earth conductor (connection to casing)
U	Motor connection 3 x 20 . . . 220 V AC
V	
W	
+	DC link
−	
L220	220 V AC | Electronics supply
L200	200 V AC
L0	

Electronics section

Terminal	Function	Remarks
TM11:AL1	Fault indication: change-over contact	Fault ≙ relay energized Contact rating: 220 V AC, 2.5 A 24 V AC, 5 A
AL2		
AL0		
F1	For digital frequency meter — isolated	 12 V I_{max} = 1 mA to terminal L (0 V)
F2		
BI	Change-over to reference 4 . . . 20 mA	To be connected with NV12 (-12 V)
NV12	-12 V	Load capacity: max. -10 mA
L	0 V	Regulator reference potential
1	Max. output frequency	
2		
3	Only for test purposes	
PV12	+12 V	Load capacity: max. +10 mA
RS	Inverter blocking	
L	0 V	
IG	Inching	
FR	Direction of rotation	Spare : CW rotating field 0 V : CCW rotating field $R_{input} \approx 4.7\ k\Omega$
A1	For analog frequency indication	+10 V to terminal L ≙ f_{max} I_{max} = 2 mA
A0	Only for test purposes	
H	Positive connection for reference potentiometer	+10 V bei R_{pot} = 500 Ω
0	Reference voltage input	0 . . . +10 V, $R_{input} \approx 20\ k\Omega$
01	Reference current input	0 . . . +20 mA, $R_{input} \approx 500\ \Omega$
L	0 V	Regulator reference potential

Power section

Terminal	Function
L1	System connection 380 V/3 ph
L2	
L3	
PE	Connection of protective earth conductor
U	Motor connection 35 . . . 380 V/3 ph
V	
W	
+	DC link, positive
M	DC link, centre tap
–	DC link, negative

Electronics section

Terminal	Function	Remarks
11:AL1	Fault indication: change-over contact	Fault ≙ relay energized Contact rating: 220 V AC, 2.5 A 24 V AC, 5 A
AL2		
AL0		
F1	For digital frequency meter	⎍⎍⎍ 12 V, I_{max} = 1 mA to terminal L
F2		
IP	Only for test purposes	
RS	Inverter blocking	
L	0 V	Regulator reference potential
IG	Inching	
FR	Direction of rotation	Spare: CW rotating field 0 V : CCW rotating field $R_{input} \approx$ 4.7 kΩ
A1	For analog frequency indication	+10 V to terminal L ≙ f_{max} I_{max} = 2 mA
A0	Only for test purposes	
H	Positive connection for reference potentiometer	+10 V at R_{pot} = 500 Ω
0	Reference voltage input	0 . . . +10 V, $R_{input} \approx$ 20 kΩ
01	Reference current input	0 . . . +20 mA, $R_{input} \approx$ 500 Ω
L	0 V	Regulator reference potential
E	Unit frame	
TM12:L	0 V	Regulator reference potential
1	Max. output frequency	
2		
3	Only for test purposes	

Power section

Terminal	Function
L1	System connection 380 V/415 V/440 V/440 V/460 V/3 ph ± 10 %
L2	
L3	
PE	Connection of protective earth conductor
U	Motor connection 3 x 40 . . . 380 V/415 V/440 V/460 V/3 ph, 5 . . . 50/87 Hz
V	
W	
+	DC link, positive
M	DC link, centre tap
–	DC link, negative

Electronics section

Terminal	Function	Remarks
TM1:H	Positive connection for reference potentiometer	+10 V at R_{pot} = 500 Ω
0	Reference voltage input	0 . . . +10 V, $R_{input} \approx 20$ kΩ
01	Reference current input	0 . . . +20 mA, $R_{input} \approx 500$ Ω
L	0 V	Regulator reference potential
FR	Direction of rotation	Spare: CW rotating field 0 V : CCW rotating field $R_{input} \approx 4.7$ kΩ
AL0	Fault indication: changeover contact	Fault ≙ relay energized Contact rating: 220 V AC, 2.5 A 24 V AC, 5 A
AL1		
AL2		
:F0	For digital frequency meter	12 V, I_{max} = 1 mA to terminal L
A1	For analog frequency indication	+10 V to terminal L ≙ f_{max} I_{max} = 2 mA
TM2:L	0 V	Regulator reference potential
PV12	+12 V	Load capacity: max. +10 mA
GND	0 V	Regulator reference potential
NV12	-12 V	Load capacity: max. -10 mA
RS	Inverter blocking/fault acknowledgement	
L	0 V	
BI	Change-over to reference 4 . . . 20 mA	To be connected with NV12 (-12 V)
AO	"Running-down" signal	0 . . . 2 V (gegen L) ≙ running-down
HR1	Thermal monitor	
HR2		
TM3:BU	Pulse outputs for gate drive	0 V ≙ pulse
BX		
BV		
BY		
BW		
BZ		
	Not used	
BK	Voltage supply for gate drive	+11.5 V
	Not used	
	Not used	

Terminal	Function	Remarks
TM4:BC	Not used	
P	Voltage measurement in DC link	
N		
NN	Current measurement in DC link	
N2		
	Not used	
	Not used	
1	12 V AC, phase 1	of mains transformer
MI	12 V AC, phase 2	
SI	12 V AC, phase 3	

7. Instructions for operation and application

7.1 Braking

TWK inverters are suitable for operation in 2 quadrants (driving in 2 directions). Braking is only possible by using an accessory.

Rapid reducion of the frequency reference causes the three-phase motor to changeover to regenerating. This leads to a DC link voltage increase. Prior to reaching the destruction limit, the inverter is electronically blocked. The output during regenerating depends on the moment of inertia of the drive and the rate of decrease in frequency.

The following modes of braking are possible:

- Rheostatic braking

  Upon voltage increase, the braking feature TG 5831 connects a load resistance to the DC link which takes up the recovered energy and thus decreases the voltage.

- Mechanical/magnetic braking

  In order to avoid that the inverter counteracts braking, the motor is made dead at the beginning of braking. This is achieved by the electronic inverter blocking (S3).

- Regenerative braking (energy recovery)

  For applications requiring regenerative braking, an additional converter unit with fully controlled three-phase bridge connection, a transformer as well as two smoothing reactors are required. Further details upon request.

7.2 Disconnection of motor

TWK inverters are no-load-proof. Disconnection of the motor (contactor) is permissible.

7.3 Connection of motor

Connection of the motor (contactor) to the operating inverter is only possible, when the motor starting current ($6 \ldots 8 \times I_N$) does not exceed the current value of 1.5 x rated inverter current.

7.4 Multiple motor operation

TWK inverters are suitable for multiple motor drives. The sum of all rated motor currents x 1.1 must not exceed the rated inverter current. The individual motors may have different output ratings.

Example:	Main drive:	5.5 kW/12 A
	Auxiliary drive (oil pump/conveyor system)	0.75 kW/2 A
	$I_\Sigma = 12\ A + 2\ A = 14\ A$	
	$I_\Sigma \times 1.1 = 15.4$ selected:	TWK 11053: $I_N = 16\ A$

7.5 Connection of single motors in the case of multiple motor drives

In the case of multiple motor drives, connection of single motors to the operating inverter is only possible, if the starting current of the connected motor(s) plus the rated current of the running motors does not exceed a current value of 1.5 x rated inverter current.

7.6 Disconnection of single motors in the case of multiple motor drives

Disconnection of single motors with the multiple motor drive being in operation is permissible.

7.7 Multiple drives

For several drives (motor + inverter), a common reference can be preset. Synchronous running mainly depends on load or slip of the individual motors. In this case, correction of the main reference via balancing potentiometer is recommendable.

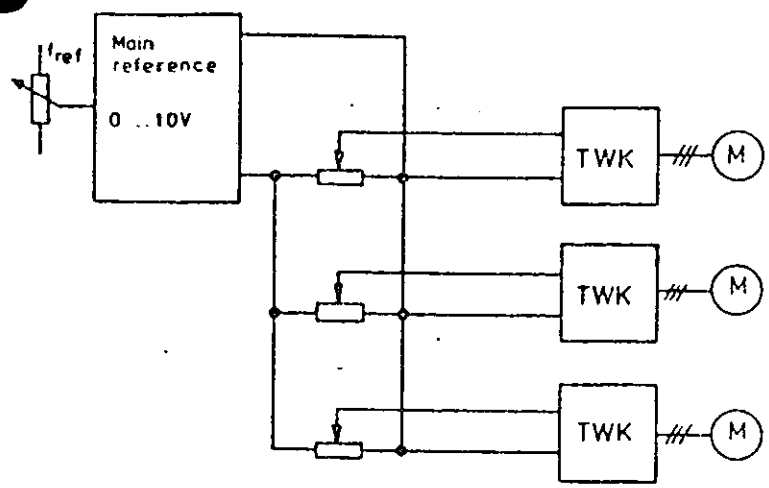


Figure 7.7/1

7.8 Torque characteristic of a three-phase AC motor on the static frequency converter

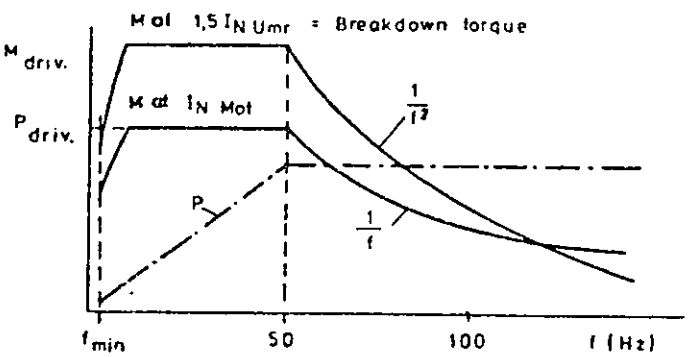


Figure 7.8/1

In order to begin with an increased starting torque, the voltage in the lower frequency range is increased. A value of 1,5 x rated current must not be exceeded, when doing so.

At values above the rated motor frequency (e.g. 50 Hz), the driving torque decreases reciprocally to the frequency, since the motor voltage cannot be increased any longer.

$$M = k \cdot \phi \cdot I = k \cdot I \cdot \frac{U}{f}$$

M = torque
k = motor constant
ϕ = magnetic flux
I = motor current
U = motor voltage
f = frequency

8. Start-up instructions

8.1 Important instructions:

These operating instructions apply to VERITRON® drive inverters of types TWK 01551 – 11053 for the supply of three-phase motors. In particular,

paragraph 8.3 applies to series TWK 01552 – 11053
paragraph 8.4 applies to series TWK 22053A – 60053A

Protect the equipment against overloading.

Do not bend any components or change any insulating distances when touching the equipment.

Avoid touching the electronic components, conductor paths and contacts. Observe the labels attached.

For start-up, adhere to the prescribed sequence of operation.

Observe the applicable safety regulations (e.g. VBG 4) when working on live equipment.

After disconnection of the system voltage, discharge of the capacitors lasts about 3 minutes.

Note for types TWK 22053A . . . 60035A:
The designated area on the electronics PCB has mains potential (up to 800 V), as long as pilot lamp CHG lights

8.2 Preparatory work

– Install inverter. In doing so, make sure to adhere to the required ceiling and floor clearances of 50 mm and the side clearances of 50 mm.

– Connect inverter and motor as shown in the connection example in paragraph 6.1:

for TWK 01552 . . . 03552 figure 6.1/1
for TWK 05553 . . . 11053 figure 6.1/2
for TWK 22053A . . . 60053A figure 6.1/3

– Release the mechanical lock (e.g. brake, clamping device) on the motor.

– Reference presetting:

TWK / Reference	Reference inputs (terminals)		
	01552 to 03552	05553 11053	22053A to 60053A
0 . . . +10 V	0 . . . L	0 . . . L	0 . . . L
0 . . . +20 mA	0 . . . L and 500 Ω	0 . . . L	0 . . . L and 500 Ω
0 . . . +16 mA	01 . . . L	–	01 . . . L
+4 . . . +20 mA	01 . . . L +BI – NV12 to be bridged	–	01 . . . L +BI-NV12 to be bridged

– Frequency indication: (if desired)

a) Analog indication: connection of a 10 V voltmeter ($R_i \geqq 1$ kΩ/V) between terminal A1 and L; indication of the frequency reference after the accel/decel ramp.

b) Digital indication: connection of a frequency measuring instrument ($R_i \geqq 10$ kΩ) as follows:

TWK 01552, . . . 11053 → terminals F1, F2
TWK 22053A . . . 60053A → terminals F0, L

8.3 VERITRON® drive inverters, types TWK 01552 – 11053

8.31 Adjustment measures prior to connection of the drive

– Set motor circuit-breaker to rated current of motor (see nameplate)

– Adjust the desired max. frequency using jumpers TM11 (for TWK . . . 52) or TM12 (for TWK . . . 53, position: centre, right) according to the following tabel:

Max. frequency	Max. motor speed 2-pole	4-pole	Jumpers TM11 or TM12
50 Hz	3000 min^{-1}	1500 min^{-1}	without
60 Hz	3600 min^{-1}	1800 min^{-1}	L – 1
90 Hz	5400 min^{-1}	2700 min^{-1}	L – 2
120 Hz	7200 min^{-1}	3600 min^{-1}	L – 1 – 2

– Set "ACCEL" (running-up time) and "DECEL" (running-down time) potentiometers to right-hand stop.

– Set "BOOST" (torque increase for starting) potentiometer to left-hand stop.

8.32 Adjustment measures on the connected drive

– Connect drive to the mains: → "POWER" lamp will light up.

– Close switch S1 "ON" and preset speed reference: motor will slowly run up to the preset speed.

Note: If the motor does not start and the "TRIP" lamp starts flashing after a while, the equipment is blocked or the set starting torque (voltage increase) is too low. By turning the "BOOST" potentiometer clockwise, the starting torque can be increase to about 8 Hz.

Important: In the case of drives operating at a frequency below 8 Hz during continuous operation, any increase in torque will result in inadmissible motor heating.

– Preset max. speed reference.

– Open and close the switch S1 "ON" several times, thus causing the motor to run up and down several times. While doing so, reduce the running-down time on the "DECEL" potentiometer when the speed decreases, and reduce the running-up time on the "ACCEL" potentiometer when the speed increases. The "TRIP" lamp should just want to come on, however, still remains dark.

For TWK 01552 . . . 03552 one potentiometer each is provided for coarse and fine adjustment of the running-up and running-down time:

VR1, VR2 → coarse adjustment
VR9, VR10 → fine adjustment

Note: The "TRIP" lamp is permanently flashing in the case of wrong adjustment of the running-up and running-down time or in the case of faults. The inverter is blocked; disconnection and reconnection of the system voltage or actuation of switch S3 relase the "Inverter blocking".

8.33 Elimination of faults

Fault	Fault indication Flashing cycle ON (sec)	OFF (sec)	Cause	Elimination
e switches off, "Fault" lamp flashes at given flashing cycle, in addition, a differential relay picks up	2	0,5	Missing phase	Check system fuses
			or	
	2	0,5	System undervoltage	Check system conditions
	–	–	Setting on "BOOST" potentiometer too low	Correct potentiometer setting
	1	1	Running-up time too short	Turn "ACCEL" potentiometer clockwise
			or	
	1	1	Motor is blocked (≙ overcurrent)	Eliminate blocking
	0,5	1	Load too high	Reduce load
			or	
			Setting on "BOOST" potentiometer too high	Correct potentiometer setting
	0,7	0,3	Running-down time too short (≙ overvoltage)	Turn "DECEL" potentiometer clockwise. If the max. setting time is too short, a braking feature is required.

8.34 Reversing operation

For this mode of operation a switch S2 is to be installed between terminals L and FR. Closing of the switch causes reversal of the direction of rotation. When the switch is operated while the motor is running, the drive will be stopped by synchronous deceleration. After a short while, it will be accelerated in the reverse direction until it reaches the preset speed (in accordance with the times set for running-down and running-up).

8.35 Inching duty

For this type of operation a switch S4 is to be installed between terminals L and JG. Closing of the switch will cause the motor to operate at 5 Hz if it has been at a standstill. This function is ineffective if the motor is running.

8.36 Mechanical brake

Where a mechanical brake (e.g. brake motor, sliding-rotor motor, ect.) is used for reducing the running-down period or for positioning purposes, the motor will become dead at once by closing switch S3 "Inverter blocking" between terminal RS an L.

8.4 VERITRON® drive inverters, types TWK 22053A . . . 60053A

8.41 Adjustment measures prior to connection of the drive

- The voltage/frequency characteristic is set at the factory in accordance with the order specifications. For changes, please consult our service department AT/AS1 – (Tel.: 0 62 06/503-473).
- Set motor circuit-breaker to rated current of motor (see nameplate).
- Set potentiometers VR1 (running-up time) and VR2 (running-down time) to right-hand stop.

8.42 Adjustment measures on the connected drive

- Connect drive to the mains:
  System pilot lamp "POWER" lights, fans are in operation
- Close switch S1 "ON" and preset frequency reference: motor will run up to the preset speed after a short time delay.

  Note: If the motor does not start or if the OC pilot lamp lights (overcurrent), the breakaway torque is too high (e.g. blocking).

  Clockwise turning of potentiometer VR (V-Boost) increases the motor voltage in the lower frequency range up to about 10 Hz (in the case of 50 Hz motors) or to about 12 Hz (in the case of 60 Hz motors) and thus increases the starting torque.

  Important! In the case of drives operating at frequencies below 10 Hz or 12 Hz during continuous operation, any increase in torque will result in inadmissible motor heating.
- Preset max. reference.
- Open and close the switch S1 serveral times, thus causing the motor to run up and down several times. While doing so, reduce the running-down time on the VR2 potentiometer (DECEL) when the speed decreases in a way that the OV signal (overvoltage) just wants to come on. When the speed increases, set the running-up time on the VR2 potentiometer (ACCEL) in a way that the OC indication (overcurrent) just wants to come on.

  Note: The inverter switches off in the case of overvoltage and overcurrent. Pilot lamp "TRIP" lights, the differential relay picks up. The inverter blocking is released by disconnection and reconnection of the system voltage or by closing of the switch S3 (inverter blocking).

8.43 Elimination of faults

Fault	Cause	Elimination
Drive switches off, thus causing the following lamps to light up:		
– Pilot lamp "TRIP"	System undervoltage	Check system conditions
	or	
	Missing phase	Check system fuse
– Pilot lamps "OC" and "TRIP" (≙ overcurrent)	Motor is blocked	Eliminate blocking
	or	
	Motor is overloaded	Reduce load on motor
– Pilot lamps "OC" and "TRIP" during running-up	Running-up time too short	Turn potentiometer VR1 clockwise
– Pilot lamps "OV" and "TRIP" during running-down	Running-down time too short	Turn potentiometer VR2 clockwise

Cancel "TRIP" indication and inverter blocking after elimination of the fault by disconnection and reconnection of the system voltage.

8.44 Reversing operation

For this mode of operation a switch S2 is to be installed between terminal L and FR. Closing of the switch causes reversal of the direction of rotation. When the switch is operated while the motor is running, the drive will be stopped by synchronous deceleration. After a short while, it will be accelerated in the reverse direction until it reaches the preset speed (in accordance with the times set for running-down and running-up).

8.45 Mechanical brake

By using a mechanical brake, the delay time may be considerably reduced. For delay times < 3 s, the motor must be made dead by applying the inverter blocking (S3) when mechanical braking starts.

7

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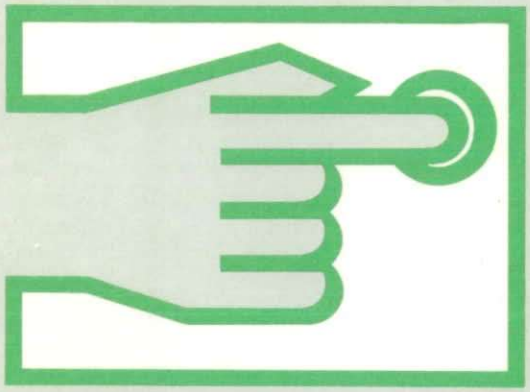
Telefon 05066/85-1
Telex 927377 geal d



Varitherm

Plattenwärmeaustauscher
Plate Heat Exchanger
Echangeurs de chaleur à plaques

Bedienungsanleitung

Maintenance Instructions

Instructions de service

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1. Beschreibung des Apparates

GEA AHLBORN-Plattenwärmeaustauscher „Varitherm" werden nach dem Baukastenprinzip zusammengesetzt. Standardisierte Bauteile, wie Wärmeaustauschplatten, Anschlußteile, Einspannvorrichtungen und Gestelle ergeben der jeweiligen Aufgabe entsprechend kompakte Wärmeaustauscher mit hoher Wärmeübertragungsleistung. Durch Hinzufügen oder Herausnehmen von Platten und Änderung der Schaltung ist es jederzeit möglich, den Plattenwärmeaustauscher „Varitherm" auf geänderte Betriebsbedingungen umzustellen.

2. System „Varitherm"

„Varitherm" bedeutet Erweiterung der Auslegungsmöglichkeit eines Plattenwärmeaustauschers durch den Einsatz zweier unterschiedlich profilierter Platten bei gleichen Anschluß- und Außenabmessungen. „Varitherm" bietet den gezielten Einsatz des einen oder anderen Elementes. Variationen in der Plattenlänge ergeben weitgehendst eine Annäherung an die optimale Lösungsmöglichkeit. Optimale Lösung heißt minimale Fläche und damit geringerer Investitionsaufwand.

3. Fließschema

Zu jedem Plattenwärmeaustauscher „Varitherm" werden ein Fließschema und eine Zusammenbauzeichnung mitgeliefert. Die Zusammenbauzeichnung zeigt die äußeren Abmessungen und Einzelheiten über die Art und Größe der Rohrleitungsanschlüsse. Im Fließschema sind in einer speziell für diesen Apparat entwickelten Form die Stoffströme, auch innere Schaltung genannt, dargestellt.

Hierzu folgende Erläuterungen:

Der Plattenwärmeaustauscher ist in der Seitenansicht dargestellt. Als Grundregel gilt:

Aussagen über die Platten sowie Kennzeichnung der Apparateteile sind aus der Draufsicht in Blickrichtung auf die Dichtung der W.A.-Platten abgeleitet. Somit sind die Möglichkeiten der Durchbrüche festgelegt:

Oben links – Durchbruch 1
Oben rechts – Durchbruch 2
Unten rechts – Durchbruch 3
Unten links – Durchbruch 4

In der Seitenansicht ergibt sich dann von oben nach unten die Darstellung der Durchbrüche zu
1 – 2 – 4 – 3

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1. Description of Unit

GEA AHLBORN Plate Heat Exchanger „Varitherm" is constructed on the module system. Standardized elements like heat exchanger plates, connections, insertions and frames will form a compact unit with high heat transfer capacity in correspondance with respective duties.

By adding or subtracting plates and changing of the flow scheme it is always possible to adapt the plate heat exchanger „Varitherm" to modified working conditions.

2. „Varitherm" system

The „Varitherm" system involves two different plate configurations having the same dimensions and connections. One configuration yields high heat transfer rates with correspondingly higher pressure drop. The other configuration is designed for low pressure drop with correspondingly lower heat transfer rates. By varying the plate length one may very closely reach the optimum solution. Optimum solution means the least heat transfer surface and thus lowest investment costs.

3. Explanation of Flow Diagram

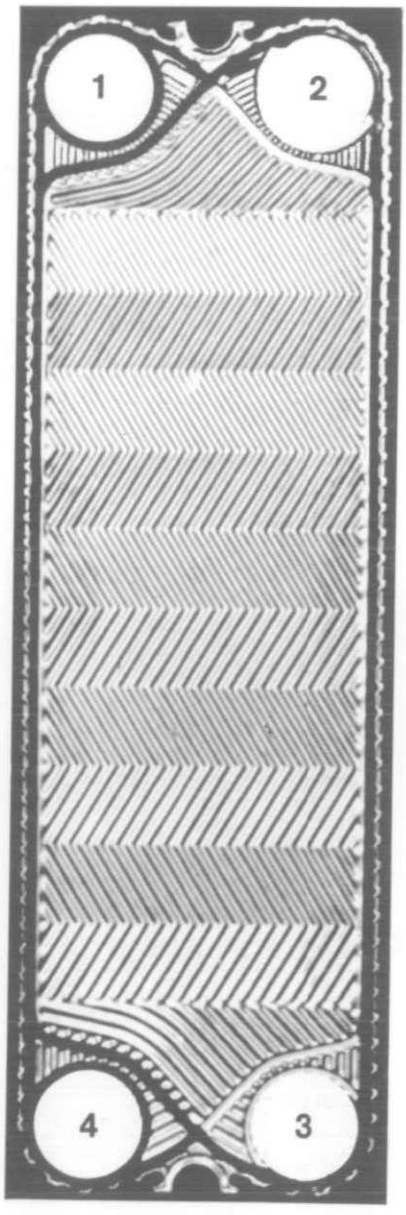
With each „Varitherm" plate heat exchanger a Flow Diagram and Assembly Drawing will be supplied. The Assembly Drawing shows the outer dimensions and details regarding type and size of pipe connections.

On the Flow Diagram the especially designed liquor stream within the plate back is illustrated. The diagram is a side view of the plate heat exchanger and identification marks on the unit and on the plates should be read by facing the gaskets of the plates.

This fixes the orientation of the plate ports as follows:

top left = port 1
top right = port 2
bottom right = port 3
bottom left = port 4

In the side view of the flow diagram the plate ports are appearing from top to bottom 1 – 2 – 4 – 3.



1. Description de l'appareil

Les échangeurs de chaleur à plaques GEA AHLBORN „Varitherm" sont fabriqués suivant le principe de construction par éléments. Les éléments standardisés comme les plaques d'échange de chaleur, raccords, pièces de compression et bâtis correspondent à chaque demande pour former un échangeur de chaleur compact à grand coefficient d'échange thermique.

L'échangeur de chaleur à plaques „Varitherm" peut être modifié à tout temps suivant les changements d'applications en enlevant ou en ajoutant des plaques ou en modifiant le couplage.

2. Système „Varitherm"

„Varitherm" veut dire adaption optimum d'un échangeur de chaleur à plaques par utilisation de plaques différemment profilées mais de mêmes dimensions.

„Varitherm" donne la possibilité d'utiliser l'un ou l'autre de ces éléments. Le rendement optimum est obtenu en utilisant rationnellement, et de façon adéquate les deux types de plaques. Le résultat est une surface d'échange minimale et par conséquent des frais d'investissement réduits.

3. Schéma de couplage

Chaque échangeur de chaleur à plaques „Varitherm" est livré avec un plan de couplage. Un autre plan d'encombrement donne des renseignements sur les cotes, le type et le diamètre des raccords. Sur le plan de couplage est indiqué, tout spécialement pour cet appareil, le passage des flux appelé couplage intérieur.

A cet effet quelques explications:

Pour déterminer les plaques et leur type il suffit de donner le nombre et l'emplacement du perçage en regardant la plaque de face du coté où est placé le joint.

Les plaques peuvent être percées ainsi:

en haut à gauche = perçage 1
en haut à droite = perçage 2
en bas à droite = perçage 3
en bas à gauche = perçage 4

Sur le schéma vu de profil le perçage est donné de cette manière soit de haut en bas 1 – 2 – 4 – 3.

In der Regel werden die W.A.-Platten von oben links nach unten links bzw. von oben rechts nach unten rechts beströmt, also von Durchbruch 1 nach Durchbruch 4 bzw. von Durchbruch 2 nach Durchbruch 3.
Der Plattentyp Varitherm 402 wird diagonal beströmt, also von Durchbruch 1 nach Durchbruch 3 bzw. von Durchbruch 2 nach Durchbruch 4.

Das gezeichnete Fließschema (siehe Abbildung) beginnt links mit dem Stativ. Daran anschließend sind die einzelnen Platten als dicker Strich und Stoffströme mit Richtungspfeil als dünner Strich gekennzeichnet. Stoffströme in der Seitenansicht des Fließschemas von vorn liegenden Durchbrüchen ausgehend sind als durchgehender Strich, von hinten liegenden Durchbrüchen ausgehend dagegen als unterbrochener Strich dargestellt.

Eine abgewandelte Darstellung zeigt der EDV-Ausdruck. Die Platten werden hier durch eine Sternchenreihe und die Durchgangsöffnungen durch Unterbrechungen der Sternchenreihe dargestellt. Die Durchströmrichtung ist im Text beschrieben. Unter den Sternchenreihen steht die Reihenfolgenummer jeder einzelnen Platte.
Die Lage der Anschlußstutzen an den Anschlußplatten (Zwischenstückchen) kann ebenfalls aus dem Fließschema entnommen werden.

Kleiner Kreis bedeutet: Waagerechte Stutzenstellung.
Kleines Kästchen bedeutet: Senkrechte Stutzenstellung nach oben bei Durchbruch 1 und 2 und nach unten bei Durchbruch 3 und 4.
Auf der Zeichnung steht unter dem Schema die innere Schaltung in Zahlen-Kurzform. So bedeutet beispielsweise:

$\frac{2 \times 3}{1 \times 6}$ (s. Schema)

Fließmedium R: Zwei Stufen mit je drei parallel geschalteten Fließspalten.

Fließmedium S: Eine Stufe mit sechs parallel geschalteten Fließspalten.

Über dem Fließschema ist auf der Zeichnung auf dem Verlängerungsstrich des betr. Einbauteiles die Sach- bzw. Ersatzteilnummer angegeben.

Die Lage und Anzahl der Durchbrüche ist gekennzeichnet durch eine Zahlenkombination hinter dem Schrägstrich der Sachnummer. So ist z.B. die W.A.-Platte 3.315–182/134 mit den Durchbrüchen 1, 3 und 4 versehen.

Ordinarily, the liquid runs from up left to down left on the PHE respectively from up right to down right, therefore from breakthrough 1 to breakthrough 4, respectively from breakthrough 2 to breakthrough 3. For the plates, type „Varitherm 402", the liquid diagonally runs. Therefore form breakthrough 1 to breakthrough 3, respectively from breakthrough 2 to breakthrough 4. The production scheme designed (s. dwg.) begins on the left with the support. Thereby the special plates then are earmarked with a thick line and a thin line for currents of liquid with arrows.

The computer-made Flow Diagram change in the representation. Here the plates are represented with a line of asterisks and the transit openings with an interruptedly line of asterisks, the way of run is discribed in the text. Under the line of asterisks is the succession of numbers for each special plate.

The position of connection sockets on the plates (intermediate pieces) are also indicated on the Flow Diagram as follows:

Small circuit means: Horizontal position of socket.
Small square means: Vertical position of socket. Top ports by the number 1 and 2. Bottom ports by the number 3 and 4.

On the Flow Diagram below the plate pack the flow system is shown as numbers, for example:

$\frac{2 \times 3}{1 \times 6}$ (as per scheme)

Liquor R has two stages each with three parallel flows between plates. Liquor S has one stage with six parallel flows between plates.

Above the plate pack the plate extension lines are numbered to give identification of plates in the scheme which may also be used when ordering spares. The location and number of ports is identified by a figure combination behind the fractions stroke of the number. For example the heat exchange plate 3.315–182/134 has the ports 1, 3 and 4.

D'habitude de liquide s'écoule d'en haut à gauche vers en bas à gauche sur les plaques des échangeurs de chaleur et de même d'en haut à droite vers en bas à droite, par conséquent du passage 1 vers le passage 4 et respectivement du passage 2 vers le passage 3.

Pour les plaques de type „Varitherm 402", le liquide s'écoule diagonalement par conséquent du passage 1 au passage 3 et de même du passage 2 au passage 4. Le schéma de production désigné (voir dessin) commence à gauche par le support. Les plaques spéciales y sont ensuite représentées par un trait épais et les courants de liquides avec des flèches par un trait fin. –

Le plan de couplage établé par computer indique un changement de la représentation. Les plaques sont ici représentées par une ligne d'astérisques et les ouvertures intermédiaires par des espaces dans la ligne d'astérisques. Le sens de l'écoulement est décrit dans le texte. En dessous de la ligne d'astérisques se trouve une suite de nombres correspondants à chaque plaque spéciale.

Un petit rond caractérise une position horizontale du raccord. Un petit carré caractérise une position verticale du raccord. S'ils sont placés en haut celà signifie qu'ils sont situés sur les passages 1 et 2; placés en bas, ils sont situés sur les passages 3 et 4. Les chiffres marqués sous le schéma indiquent le couplage de l'appareil.

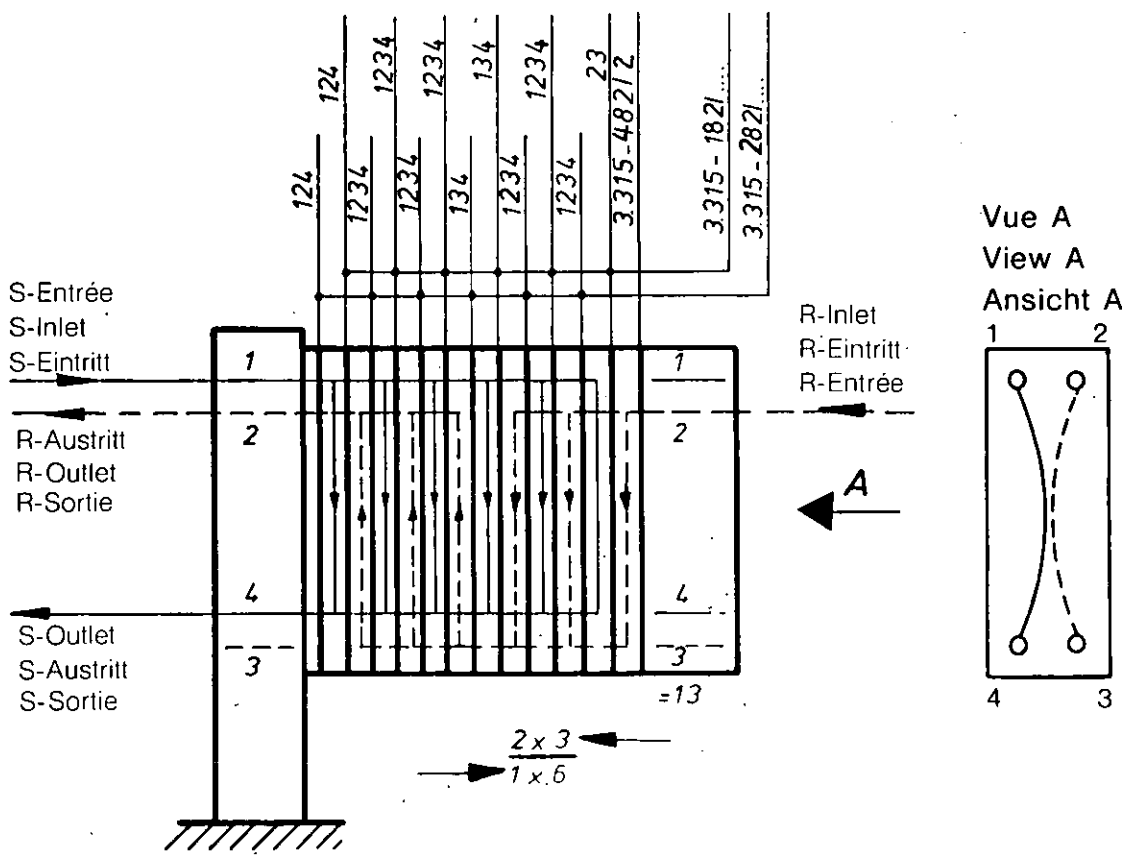
Exemple:

$\frac{2 \times 3}{1 \times 6}$ (voir schéma)

flux R: 2 passages à 3 flux parallèles chacuns
flux S: 1 passage à 6 flux parallèles

En haut du schéma chaque trait représentant un élément est rallongé. Sur chaque ligne sont indiqués les numéros de référence servant pour la commande de ces pièces détachées. L'emplacement et le nombre des passages est indiqué par une combinaison de chiffres placés derrière le trait oblique de chaque numéro de référence.

Exemple: La plaque 3.315–182/134 est percée en 1, 3 et 4.



4. Aufstellung und Zusammenbau

Plattenwärmeaustauscher „Varitherm" werden mit verschiedenen Gestellausführungen geliefert. Das Gestell mit Ein- oder Zweispindelanpressung, Ausführung A, AC, ist mit höhenverstellbaren Kalottenfüßen ausgerüstet. Es wird nicht im Fußboden verankert, sondern steht auf Druckplatten, die mit einem Bindemittel auf dem Fußboden befestigt werden.

Das Gestell mit Seitenbolzen, Ausführung B, ist auf ein Fundament zu setzen. Das Stativ steht auf zwei bauseits eingelassenen Stahlplatten; die Stütze wird mit zwei Fundamentbolzen fest mit dem Fundament verschraubt.
Die Chrom-Nickel-Stahlausführung dieses Typs, Ausführung BC, wird frei auf Druckplatten gestellt. Gestelle, Ausführung C, CC, sind für Paketlängen bis 250 mm bestimmt und können direkt auf den Fußboden gestellt werden.

Gestelle, Ausführung D oder DC, sind die Versionen C bzw. CC in Wandausführung. Die Befestigung erfolgt entweder mittels Flanschkonsolen, die auf die Wand geschraubt werden oder mittels Kastenträger, die in die Wand eingelassen werden.

Gestelle, Ausführung F, FC, mit leichtem Stützfuß, sind für mittlere Paketlängen bestimmt.

Gestellausführung GC für Varitherm 10 hat einen 2-Stangenverschluß und steht auf verstellbaren Schraubfüßen.

Die Wärmeaustauschplatten sind in der dem beigegebenen Fließschema entsprechenden Reihenfolge in das Gestell hineinzustellen oder einzuhängen. Dieses geschieht durch Schrägstellen und gleichzeitiges Hineindrehen in die Apparateebene.

Nachdem sämtliche W.A.-Platten und Einbauteile eingesetzt sind, wird die Spannplatte gegen das Plattenpaket geschoben. Anschließend werden die Hammerschrauben mit den Spannmuttern in die seitlich angebrachten Schlitze eingebracht; bzw. beim Spindelverschluß wird die Spindelverlängerung auf die Spindel gesetzt. Dann wird das Paket gleichmäßig gespannt und auf das auf dem Fließschema enthaltene Anpreßmaß a-max gebracht. Anpreßmaß ist das lichte Maß zwischen Stativ und Spannplatte.

Beim Öffnen des Apparates ist in umgekehrter Reihenfolge zu verfahren.

Das Anpreßmaß für die Einspannung bei neuen Dichtungen ist das Anpreßmaß a-max.
Das Maß a-min ist das minimale Anpreßmaß, welches bis zum Verschleiß der Dichtungen erreicht werden kann. Dieses Maß darf keinesfalls unterschritten werden.

Die Anpreßmaße a-max und a-min sind bei neuen Apparaten auch auf einem Schild angegeben, welches am Gestell befestigt ist. Dieses Schild enthält außerdem Bedienungshinweise für den Betrieb sowie für die maximal zulässigen Druck- und Temperaturbelastungen.

Der Apparat ist mit dem 1,3-fachen des angegebenen Maximaldruckes im kalten Zustand auf Dichtigkeit geprüft worden. Die zulässigen Druck- und Temperaturbelastungen dürfen nicht überschritten werden.

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4. Assembly of Unit

The „Varitherm" plate type heat exchanger can be supplied with different frames. The frame with single or two spindle compression, type A, AC is equipped with adjustable ball type feet. It is not fastened to the floor, but rests on pressure plates, which are glued to the floor.

The frame with bolt compression, type 'B', must be placed on a foundation. The stand rests on two steel plates placed on site, the support is screwed to the foundation with two bolts.

The chrome nickel steel design of this type BC will be placed on pressure plates. Frames of the type C and CC are destined for plate packs up to 250 mm length and may be placed directly on the floor.

Frames D or DC are the version C resp. CC in wall arrangement. The wall fastening takes place by means of flange supports, which are connected on the wall or by means of a steel construction, to support the phe, which is inserted in the wall.

Frames, types F, FC with light support are destined for middle lengths paquets.
The frame, type GC, for „Varitherm 10" has a fastening with 2 poles and stand on variable screwed feet.

The heat exchange plates must be inserted into the frame in the correct sequence according to the Flow Diagram. This is done by inserting at an angle and turning the plate parallel to the base. Starting at the front of the unit all plates are numbered consecutively, the numbers to be seen on the left edge of the plate.

After all plates and insertions are mounted, the compression plate is moved against the plate pack. Then the bolts are placed in the side slots. On the two spindle frame the spindle extensions are positioned. Then the plate pack is evenly compressed up to working size indicated on the flow scheme. The working size of the plate pack is the distance between base plate and compression plate.

When opening the unit you work in reverse sequence.

The compression size a-max is the working distance of the plate pack having new gaskets. The compression size a-min is the working distance of the plate pack up to which a compression of the plate pack can take place, until reaching the wear limit of the gaskets. Under no circumstances this size may be decreased,

The compression size a-max and a-min are indicated on a lable, which is fixed on the new frame. This lable as well gives service advices for the max. admissible pressure- and temperature charges.

The unit has been tested in cold condition with the 1,3 times max. pressure. The admissible pressure- and temperature charges may not be exceeded.

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4. Montage et assemblage

L'échangeur de chaleur à plaques „Varitherm" est livrable avec différents types de bâtis. Le bâti à serrage central par 2 broches filetées en exécution A, AC est livré pour montage sur pieds équipés de calottes, réglables en hauteur. Ce bâti ne doit pas être boulonné au sol; il est livré avec des plaques d'appui qui doivent être cimentées au sol.

Le bâti à serrage périphérique par boulons en exécution B doit reposer sur des fondations. La plaques support ou plaque de base doit reposer sur des plaques d'acier encastrées dans le sol; la poutre-béquille doit être boulonnée sur la fondation d'assise.

L'exécution d'acier chrome-nickel de ce type, appelée BC, est posée sur plaques d'assise. Les bâtis de l'exécution C et CC sont prévus à recevoir un paquet de max. 250 mm et doivent être montés directement sur sol.

Les bâtis de l'exécution D ou DC sont des versions de C resp. CC, mais en exécution murale. Le montage se fait par supports avec brides vissés au mur ou par supports encastrés au mur.

Les bâtis, modèle F, FC, avec un support léger sont destinés à des longueurs moyennes des paquets.
Le type de bâti GC pour „Varitherm 10" a une fermeture avec 2 tiges et est monté sur pieds vissés, réglables.

Les plaques d'échange de chaleur doivent être posées ou suspendues dans le bâti selon prescription dans le schéma de couplage.

Pendant cette opération la plaque doit être présentée de biais et tournée d'un quart de tour. Toutes les pièces d'insertion sont numérotées à la file en commençant par la plaque de base. Ce numéro est embouti au coin gauche de chaque plaque et peut servir de référence pour les commandes de pièces de rechange.

Les plaques et pièces intercalaires une fois montées, la plaque de compression doit être poussée contre le paquet de plaques. Puis les boulons de serrage sont posés dans les espaces latéraux, resp. pour le serrage par broches, l'allongement de broche sera posé sur la broche elle-même. Maintenant le paquet est pressé régulièrement et adapté à la mesure a-max. indiquée au plan de couplage. Cette mesure signifie la dimension entre support et plaque de serrage.

En ouvrant l'appareil, il faut opérer de manière inverse.

La mesure de serrage a-max est appliquable pour le renouvellement des joints.

Ces mesures a-max et a-min sont indiquées sur une plaque se trouvant sur le bâti de l'appareil neuf. De plus, elle contient des instructions de service ainsi que des indications concernant les pressions et températures admissibles.

L'appareil est examiné en état froid avec 1, 3 fois la pression indiquée max. en vue d'étanchéité. Les pressions et températures admissibles ne doivent pas être dépassées.

La mesure a-min signifie la limite minimale qui peut être reçue jusqu'à l'usure des joints, mais elle ne doit pas dépassée.

5. Anschlußplatten

Bei mehreren voneinander unabhängigen Prozessen werden Anschlußplatten eingebaut. Sie dienen einerseits zur Trennung der Plattenpakete, haben primär jedoch die Aufgabe, Anschlußstücke für die Zu- und Ableitung der Produkt- und Energieströme aufzunehmen.

Die Anschlußstücke der Apparate VT 10/40/405/80 sind auswechselbar nach Trennen mehrerer Heftschweißstellen.

Die Anschlußstücke der Apparate VT 20 sind fest mit der Anschlußplatte verbunden. Der Austausch einzelner Anschlußstücke ist also nicht möglich. Die Anschlußplatten sämtlicher Typen können jedoch nach Lösen der oberen Aufhängung und der unteren Führung gewendet oder in der Ebene um 180° gedreht werden.

6. Rohrleitungsanschluß

Rohrleitungen an der Spannplatte oder an Anschlußplatten sind beweglich in Längsrichtung des Plattenpaketes auszulegen, damit bei Verkürzung des Plattenpaketes durch Dichtungsverschleiß oder Verlängerung des Plattenpaketes durch Lockern der Spannvorrichtung die Rohrleitungen oder Apparateteile nicht verspannt werden.

7. Inbetriebnahme

Apparat erst nach Kontrolle des Anpreßmaßes a-max in Betrieb nehmen. Durch entsprechende Druck- und Temperaturmeßgeräte, welche in die Rohrleitung einzubauen sind, prüfen, ob die zulässigen Betriebswerte nicht überschritten werden. Stoßweise und intermittierende Belastungen vermeiden! Bei der ersten Inbetriebsetzung zunächst mit gedrosselter Leistung anfahren und langsam auf die Betriebswerte erhöhen. Bei Dampfbeheizung beachten, daß der Dampf nicht überhitzt ist.

8. Entspannen

Durch Lockerung der Anpreßeinrichtung während der Stillstandsperioden werden die Dichtungen geschont. Bei längeren Stillstandsperioden muß der Apparat vollkommen geöffnet und das Plattenpaket auseinandergezogen werden. Das Öffnen muß im kalten Zustand erfolgen.

9. Reinigung

9.1 CIP-Reinigung

Der Plattenwärmeaustauscher „Varitherm" ist auf Grund seines Konstruktionsprinzips und seiner Materialwahl geeignet für die CIP-Reinigung. Die umzuwälzende Reinigungsmenge ist so zu wählen, daß eine ausreichende Bespülung der im Apparat befindlichen verschmutzten Flächen erreicht wird. Plattenwärmeaustauscher für wasserähnliche wärmeaustauschende Medien werden in der Regel mit dem 0,8- bis 1,5-fachem der Nennleistung gereinigt. Die Auswahl des Reinigungsmittels hat nach dem Einsatzzweck des Plattenwärmeaustauschers zu erfolgen, wobei die Anwendungsanleitungen des Reinigungsmittel-Herstellers zu beachten sowie die Eignung von Plattenmaterial und Dichtung zu prüfen sind.

9.2 Manuelle Reinigung

Der Plattenwärmeaustauscher „Varitherm" kann ausserdem mit geringem Arbeitsaufwand manuell gereinigt werden. Beim Bürsten oder Spritzen ist zu beachten, daß Plattenflächen und Dichtungen nicht mechanisch beschädigt werden. Außerdem dürfen keine Metallteile in die Plattenoberfläche hineingearbeitet werden. Die Dichtungsflächen müssen nach der Reinigung von Fremdkörpern frei sein. Es empfiehlt sich, jede Plattenfläche ausreichend mit Wasser zu spülen und die Dichtungsflächen vor dem Zusammenschieben der Platten einer genauen Kontrolle zu unterziehen.

Achtung! Wir übernehmen keine Garantien für Schäden, die durch die Verwendung von ungeeigneten Reinigungs- und Desinfektionsmitteln entstehen. Vor dem Einsatz eines Reinigungsmittels sollte der Beratungsdienst des Reinigungsmittel-Lieferanten in Anspruch genommen werden.

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5. Intermediate pieces

Intermediate pieces are incorporated when operating with several different programs. In first place they are separating the plate packs. They contain the nozzles connections for the inlet and outlet of the product and energy flows.

The nozzle connections of the phe VT 40 / VT 405 are exchangeable by separating the connecting weld seams.

The nozzle connections of the phe VT 20/ VT 80 / VT 805 are fixed with intermediate pieces. An exchange of the different nozzles connections therefore is not possible. The intermediate pieces of all different phe types, however, can be exchanged and turned over by 180° , after having loosened the top guide roll and bottom guiding device.

6. Pipe Connections

Pipe connections to the nozzles of the compression plate or of the base plate should be made flexible in the direction of the plate pack, in order to secure that when the plate pack is shortened due to used-up gaskets, or when the plate pack is lengthened due to loosening of nuts or spindles, the pipes or parts of the unit are not damaged.

7. Commissioning

The unit may be commissioned after having controlled the compression size a-max. It is admissible to check by controlling the pressure gauges and thermometers incorporated in the pipe system, whether the admissible operation data are not exceeded. An intermitted and stepwise pressure charge should be avoided. During the initial commissioning it is recommendable to increase step by step the flow rate, in order to reach retarted the final operation conditions. If steam heating is applied please take care not to use overheated steam.

8. Expansion

By means of loosening the compression device during standstill periods the life time of gaskets can be increased. If there is a longer working-off period, the unit should be opened completely and the plates of the pack should be separated.

The opening of the appliance is to be realised only when this one is cold.

9. Cleaning

9.1 CIP Cleaning

The „Varitherm" plate type heat exchanger can be included into a CIP system on account of its design and choice of material.

The amount of cleaning solution to be circulated must be chosen to insure an efficient rinsing of all soiled areas. Plate heat exchangers for a water like product are cleaned in general with 0,8 to 1,5 times of the designed flow quantity. The choice of the cleaning solution has to be based on the application of the unit. Recommendations of the cleaning solution manufacturer should be observed.

9.2 Manual Cleaning

The plate heat exchanger „Varitherm" can also be cleaned manually with little effort. When brushing or spraying; care should be taken not to mechanically damage plate surface or gaskets. Metal particles must not be worked into the plate surface. The gaskets must be free of any dirt particles. It is recommended to sufficiently rinse each plate with water. Visually inspect before compressing the plate pack.

Attention! We do not accept any guarantee for damages caused by the use of unsuitable cleaning solutions and disinfectants. Before using a cleaning solution, the advice of the cleaning-solution-manufacturer should be asked for.

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5. Plaques de raccordement

Pour plusieurs procédés indépendants il y aura un montage des plaques de raccordement. Elles servent d'une part à séparer les paquets de plaques, mais premièrement elles doivent recevoir les pièces de raccordement destinées à faire passer et retourner les flux de produit et d'énergie.

Les pièces de raccordement des appareils VT 40 / VT 405 sont échangeables après avoir séparé plusieurs points soudés.

Les pièces de raccordement des appareils VT 20 / VT 80 / VT 805 sont montéas sur la plaque de raccordement de manière tres fixe. On ne peut pas échanger quelques pièces de raccordement. Mais les plaques de raccordement de tous les types peuvent être renversées ou bien tournées de 180%sur plan, après avoir détaché la suspension en haut et le guidage en bas.

6. Raccordement sur tuyauteries

Les tuyauteries sur plaque de serrage ou de raccordement sont à exécuter de manière mobile en direction longitudinale, afin qu'en diminuant le paquet de plaques par l'usure des joints ou bien en allongeant le paquet par desserrage du dispositif les tuyauteries et pièces d'appareils ne sont pas déformées.

7. Mise en service

Après avoir contrôlé la mesure a-max, la mise en service doit avoir lieu. Au moyen des appareils mesurant la pression et les températures, qui sont incorporés dans les tuyauteries, il faut constater, s'il n'y a pas de dépassage des valeurs de service admissibles. Il faut éviter des charges par choc ou interval. Pour la première mise en marche il est recommandé de commencer avec débit réduit et puis augmenter aux valeurs de service. En cas de chauffage à vapeur, veuillez bien garder la vapeur non trop chauffée.

8. Desserrage

En desserrant le dispositif de serrage pendant les périodes d'arrêt, les joints sont solgnés. En cas d'arrêt plus longtemps, l'appareil est à ouvrir entièrement et les plaques sont à éloigner l'une de l'autre.

L'ouverture de l'appareil doit être éffectuée à froid.

9. Nettoyage

9.1 Nettoyage CIP

L'échangeur de chaleur à plaques „Varitherm" est conçu pour le nettoyage CIP grâce à son principe de construction et au choix de son matériel. La quantité du produit de nettoyage passant en circuit fermé est proportionnelle au dégré d'encrassement des plaques. Pour des produits liquides semblables à l'eau on choisit en général un rapport Produit – Solution de nettoyage variant entre 0,8 et 1,5.
Le choix de la solution de nettoyage dépend du mode d'utilisation de l'échangeur et du produit qu'il traite. Les consignes du fabricant de produit de nettoyage doivent être bien sûr respectées, ainsi que verifier l'aptitude de matériel de plaques et de joints au moyen de nettoyage.

9.2 Nettoyage manuel

L'échangeur de chaleur à plaques „Varitherm" peut être aussi nettoyé manuellement sans demander beaucoup de travail. En passant l'appareil et les plaques au jet d'eau et à la brosse il faut veiller à ne pas endommager la surface des plaques ni leurs joints. Ne jamais utiliser des pièces métalliques pour nettoyer l'appareil et toujours s'assurer qu'aucunes traces ne restent sur les joints.
Un autre conseil: rincez bien la surface de chaque plaque et vérifiez consciencieusement l'état des joints avant chaque resserrage de l'appareil.

Attention! Nous déclinons toute responsabilité pour les dégats causés par l'utilisation de produits de nettoyage ou de désinfectants inadéquats. Consultez votre fournisseur de solutions de nettoyage et observez ses conseils.

10. Leckageraum

Primär- und Sekundärstrom werden im Bereich der Durchbrüche durch doppelte Abdichtung voneinander getrennt. Zwischen den Dichtungen liegt der sogenannte Leckraum. Dieser hat die Aufgabe, bei Undichtigkeiten in diesem Bereich Leckageflüssigkeit über die Lecknut nach außen abzuführen (s. Abb.).
Bei der Sichtkontrolle ist regelmäßig zu überprüfen, ob die eingelassenen Lecknuten (Unterbrechungen des Gummiprofils) noch wirksam sind. Im ungepreßten Zustand muß die Lecknut ca. 8 mm breit sein. sollte die Lecknut zusammengedrückt sein, dann muß sie mit einem scharfen Gegenstand nachgeschnitten werden.

11. Hartdichtungen

Hartdichtungen, wie IT 400, IT Ö, I T S o.ä. werden an der Dichtfläche mit einem Antihaftmittel behandelt, damit sie beim Pressen nicht ankleben.
Sollten sich im Laufe der Betriebsperiode Anklebespuren zeigen, ist die Behandlung mit Antihaftmittel zu wiederholen, um vorzeitigen Verschleiß durch Zerreißen der Dichtung zu verhindern.

12. Erneuerung von Dichtungen

Die Lebensdauer der Dichtungen wird im wesentlichen durch die örtlichen Betriebsgegebenheiten bestimmt. Sollte eine Erneuerung von Dichtungen erforderlich sein, so ist folgendermaßen zu verfahren:

1. Bereitstellung eines Tisches oder einer entsprechenden Arbeitsplatte.
2. Öffnung des Apparategestelles und Ausbau der Platten, welche neue mit Dichtungen zu belegen sind. Hierbei Reihenfolge-Nr. bzw. Fließschema beachten, damit beim Zusammenbau keine Fehler auftreten. Die Reihenfolge sollte vor dem Herausnehmen der Platten mit einem Filzstift gekennzeichnet werden.
3. Alte Dichtungen entfernen. Hierbei mit Lötpistole oder Heißluftgerät die Rückseite der Plattennut auf etwa 150° C anwärmen. Vorsicht!

   Überhitzung und Anlauffarben vermeiden. Dichtungs- und Klebereste mit schmaler Drahtbürste (aus Chromnickelstahl) bzw. stumpfem Gegenstand aus der Nut entfernen.
4. Die zu verklebenden Flächen der neuen Dichtung mit Schmirgelpapier aufrauhen.
5. Dichtungs- und Stahlflächen von Staub befreien und mit Lösungsmittel „SOLVENT H" reinigen.

   Beide Teile abtrocknen lassen!

   Dieser Arbeitsgang ist **besonders sorgfältig** auszuführen, da davon das Gelingen der Verklebung grundsätzlich abhängt!
6. BOSTIK-Kleber 1475 mit Härter mischen und gründlich verrühren.

   Misch-Verhältnis:

   10 Gewichtsteile BOSTIK 1475
   und
   1 Gewichtsteil Härter

   Die Mischung bleibt etwa vier bis sechs Stunden verarbeitungsfähig, wenn der Klebstoff während der Arbeitspausen stets verschlossen bleibt.

   Die Klebe-Mischung **darf nicht verdünnt werden.**
7. Stahl-Flächen der Platten-Nuten mit der Klebe-Mischung einmal dünn vorstreichen.
8. Platten zum Aushärten abstellen. Härtezeit: 1 – 2 Stunden!
9. Stahlflächen der Platten-Nuten zum zweitenmal und Gi-Flächen mit dem Kleber dünn einstreichen. Dieser Arbeitsvorgang sollte von zwei Arbeitskräften ausgeführt werden, wobei Arbeitskraft 1 die Platte von links nach rechts und Arbeitskraft 2 die Dichtung von rechts nach links einstreicht.
10. Klebestoff-Film ablüften lassen – und nach dem Finger-Test, d.h. wenn der Kleber nicht mehr am berührenden Finger selbst kleben bleibt, die Dichtung in die Gi-Nute der Platte einlegen.
11. Platte mit mäßigem Druck auf die Verklebung etwa eine Stunde lang ruhen lassen. Dieses kann im Apparate-Gestell erfolgen.
12. Komplett neu-gummierte Platten-Pakete mit Niederdruckdampf zwei Stunden beheizen und Kleber aushärten lassen.

    Bei der Hantierung mit dem Kleber sind außerdem die auf der Dose angegebenen Gebrauchsanweisungen, wie Vorsichtsmaßnahmen usw. zu beachten.

13. Bestellung von Ersatzteilen

In der Ersatzteilbestellung sind folgende Einzelheiten anzugeben:

1. Fabrik-Nummer des Apparates.
2. Nummer des gültigen Fließschemas.
3. Ersatzteil- oder Sachnummer der gewünschten Teile. Ersatzteilnummern können zum Teil den beigefügten Unterlagen entnommen werden.

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10. Leakage space

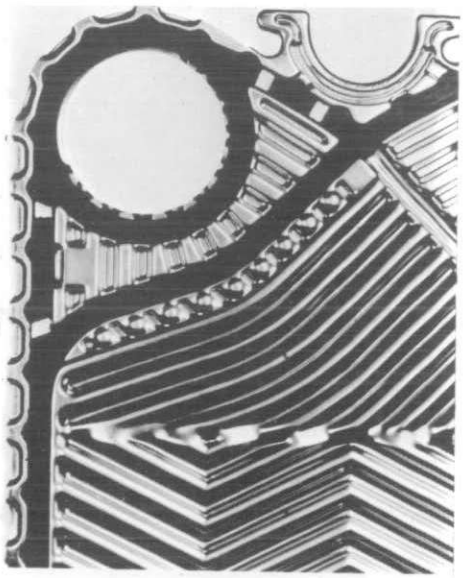
Primary and secondary stream are separated from each other, in the range of the plate ports by means of a double gasket. In between of both gaskets there is the leaking space. In case of leakage in this area the leakage medium is leaving the leakage space to the outside by means of leakage openings (see figure)

During visual control of the phe, the leakage openings have to be checked. In the non-compressed condition the leakage opening has a width of abt. 8 mm. In case the opening is pressed together, it has to be opened by cutting.

11. Hard gaskets

Hard gaskets, as It 400, It Ö, I T S or similar will be treated on the joint area with an antisticking agent, in order to avoid sticking at the opposite plate.

If during the operation period there are trales of sticking, the anti-sticking treatment should be repeated, in order to avoid an earlier wear and splitting of the hard gaskets.



12. Changing Rubber gaskets

The life expectancy of gaskets depends mainly on local working condition. In case a new set of gaskets is required, the following should be used.

1. Have available a table or a suitable work bench.
2. Open the plate pack and take out all plates, which require new gaskets. Pay attention to running number or to the flow scheme in order to avoid a mistake when assembling.

The serial is to be earmarked with a pen before the plates are removed.

3. Remove old gaskets. To do this, heat the back side of the gasket by torch or hot air appliance to about 150° C.

   Be careful of overheating as indicated by discoloration of steel. Remove rubber and adhesive with a small stainless steel wire brush or a blunt stainless steel tool.
4. Roughen up with sand paper the surface of the new gaskets to be glued.
5. Remove dust and rubber from steel surfaces and clean by using cleaning „Solvent H".

   Let the parts dry!

   This detail procedure must be carried out **very carefully** to insure good adhesion of the new gaskets.
6. Mix Bostik adhesive with hardener and stir throughly.
   Mixing ration:

   10 parts Bostik adhesive
   and
   1 part Bostik hardener

   The mixture remains workable for 4 – 6 hours if kept tightly closed during breaks in operation.

   The adhesive mixture **may not diluted**.
7. Apply a thin coat of the mixture to the steel surface of the groove.
8. Put the plates aside for harding. Hardening time: 1 – 2 hours.
9. Apply a second coat of the mixture to the steel surfaces of the grooves and to the gaskets. This procedure should be carried out by two people so that one works on the plate from left to right while the other works on the gasket from right to left.
10. Air dry the adhesive film until the adhesive does not stick to a touching finger and insert the gaskets into the grooves.
11. Leave the plate untouched with a light pressure over the gaskets for about an hour. This may be done within the plate pack.
12. Heat the complete plate pack having the gaskets fitted with low pressure steam for two hours and let the adhesive harden out.
13. When working with the adhesive, attention should be paid to instructions on the containers regarding safety measures.

13. Ordering of Spare Parts

In spare parts orders, please give the following particulars:

1. Factory number of unit,
2. Number of current flow scheme,
3. Spare parts or article number of the required parts.

Spare part numbers may also be taken from the documentation sent with the unit.

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10. Réservoir de fuite

Les flux primaire et secondaire sont séparés par double joints dans les parties des perçages. Entre les joints se trouve la place de fuite. Elle est destinée, en cas de fuite, de guider les liquides par la rainure de fuite (voir tableau). Pendant le contrôle visuel il faut constater que les rainures de fuite (ruptures du profil en caoutchouc) sont encore intactes.

En état non-pressé cette rainure doit avoir env. 8 mm de largeur. Une rainure de fuite serrée doit être coupée avec un outil bien affilé.

11. Joints durcis

Joints durcis comme IT 400, IT Ö, I T S ou semblables, sont couverts d'une couche inadhérente afin qu'ils ne collent pas pendant l'opération de serrage. Il faut renouveler la couche, s'il y se montrent des traces de collage pour éviter l'usure des joints prématuré.

12. Changement des joints

La durée des joints dépend surtout des conditions de service auquelles ils sont soumis. Si un changement de joints doit avoir lieu, procédez de façon suivante:

1. Préparez une table suffisamment grande.
2. Ouvrez l'appareil et retirez les éléments devant recevoir un nouveau joint. Notez à cette occasion les numéros de série et respectez le schéma de couplage pour éviter un mauvais placement lors du remontage.

   La série doit être marquée avec un crayon avant la sortie des plaques.
3. Enlever les joints usagés en utilisant un fer à souder ou un appareil à air chaud en passant derrière le joint jusqu'à une température d'environ 150° C.
   Attention! Evitez un surchauffage. Nettoyez les parties restées collées avec une brose métallique inox ou un outil émoussé.
4. Grattez la surface à coller du joint avec de la toile émerie.
5. Enlevez la poussière du joint et de la plaque et nettoyez les surfaces à coller au produit „Solvent H". Laissez sécher.

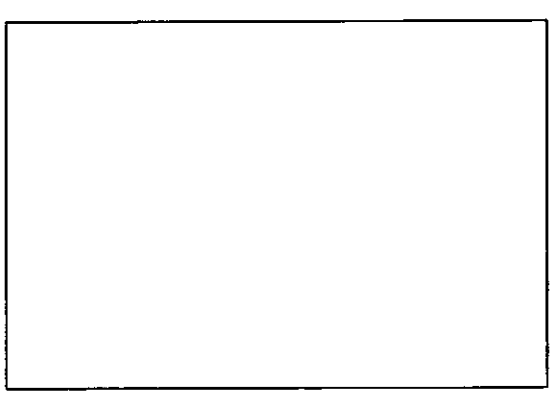
   Cette opération est **particulièrement importante** et doit être effectuée **avec le plus grand soin.** Sa réussite en depend.
6. Mélangez la colle Bostik 1475 et le durcisseur et remuez longuement. Pour 10 unités de Bostik 1475 prenez 1 unité de durcisseur. Le mélange rest malaxable environ 4 à 6 heures si la boîte de colle est refermée après chaque utilisation. **Ne jamais utiliser un dissolvent** pour ce mélange.
7. Etendez au pinceau une couche fine de ce mélange dans les rainures de la plaque.
8. Laissez sécher la plaque environ 1 à 2 heures.
9. Repassez une autre fine couche de colle dans les rainures et cette fois aussi sur les joints. Cette opération devrait être effectuée par deux personnes. L'une étend la colle sur la plaque de gauche à droite; l'autre étend la colle sur le joint de droite à gauche.
10. Laissez sécher quelques instants et après avoir verifié avec votre doigt que la colle ne reste plus collée sur le doigt, placez le joint dans la rainure de la plaque.
11. Compressez légèrement environ 1 heure le joint sur la plaque. Cette compression peut être faite dans le bâti.
12. Un paquet de plaques ayant reçu des nouveaux joints doit être pressé à la vapeur basse pression environ 2 heures puis laissez prendre.
13. Les consignes à prendre indiquées sur chaque boîte de colle doivent être observées.

13. Commande de pièces de rechange

Dans chaque commande doivent figurer les détails suivants:

1. Numéro de fabrication de l'appareil.
2. Numéro de schéma de couplage actuel.
3. Numéro de référence des pièces désirées.

Unsere Vertretung
our representative
notre représentation



GEA AHLBORN.

CONDENSATE PACK. E402.

VT40
171/1464.
MAX PRESSURE 1/6 BAR 2/6 BAR.

TEM 100°C

MAX LENGTH 904 MIN 874

VT40
171/1465,
PRESSURE 1/6 2/6 BAR.

TEMP. 100°C

MAX 382 MIN 369 LENGTH.

CHILLER.

VT40
171/1466

PRESSURE 1/6 2/6

MAX 489 MIN 476

8

SCHIELE	MOUNTING-, OPERATING-AND MAINTENANCE INSTRUCTIONS	D 1.00.000 E

CODE WORD: MAELOR SDI

RADIAL-FAN

TYP: R 113/1500 KP

REGULATION: ———

SCHIELE ORDER: 124 112 00

CUSTOMERS ORDER-NO: 2590-75-83.01

CONSTRUCTION YEAR: 1984

LEVEL: 09.84

DATE: 24.09.1984 NAME: Bekel	G. SCHIELE & CO · ESCHBORN · TAUNUS	SCHIELE

SCHIELE

2) Index

D 2.30.009 E

Schiele ref.No.	124 112 00	Documentation No.
Customers order No.	2590-75-84.01	
Blower type	R 113/1500 KP	

SCHIELE ESCHBORN

OPERATING SPECIFICATION

D3.10.000 E

FAN TYP : R 113/1500 KP

~~DRAWING~~ / PARTS LIST NO.: 11.01-313-801/ (SM)

SCHIELE ORDER NO.: 124 112 00

MEDIUM HANDLED : WATER VAPOR

ANALYSIS (VOL.%) :

DUST CONTENTS (mg/m^3) :

RELATIVE HUMIDITY (%) :

INSTALLATION A. S. L. : _____ BAROMETRIC PRESSURE _____ (mbar)

OPERATING DATAS							
TEMPERATURE	SUCTION CONDITIONS	°C / ~~K~~	58				
PRESSURE		mbar	181,5				
DENSITY		kg/m^3	0,1171				
CAPACITY		m^3/min	2846				
DENSITY	NORMAL CONDITIONS	kg/m^3					
CAPACITY		m^3/h					
STATIC PRESSURE DIFF.		mbar / ~~daPa~~	42,49				
TOTAL PRESSURE DIFF.		mbar / ~~daPa~~	42,9				
FAN SPEED		min^{-1}	2900				
MOTOR SPEED		min^{-1}	2900				
ABSORBED FAN POWER		kW	231,5				
COUPLING POWER		kW					
MOTOR POWER		kW	315				

DATE : 24.05.1984 NAME : Betzel

G. SCHIELE & CO · ESCHBORN (TAUNUS)

SCHIELE ESCHBORN

SCHIELE ESCHBORN	Starting Torque M = f (n) (%) without Consideration of the Acceleration Work	SN 90.20-01 E

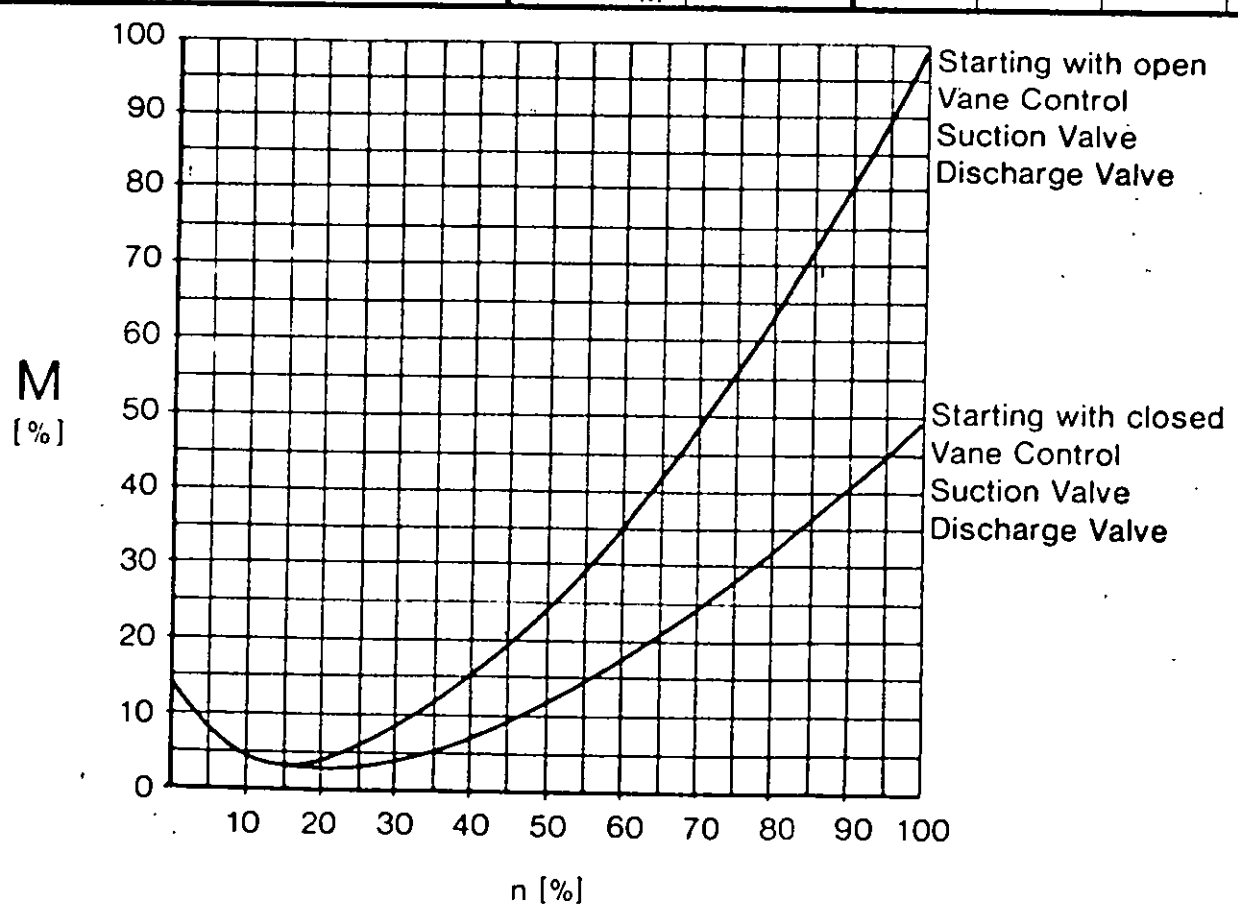
Fan Type: R 113/1500 KP

Drawing No.: 11.00 - 313 - 801 / (1)

Schiele ~~Offer~~ / Order No.: 124 112 00

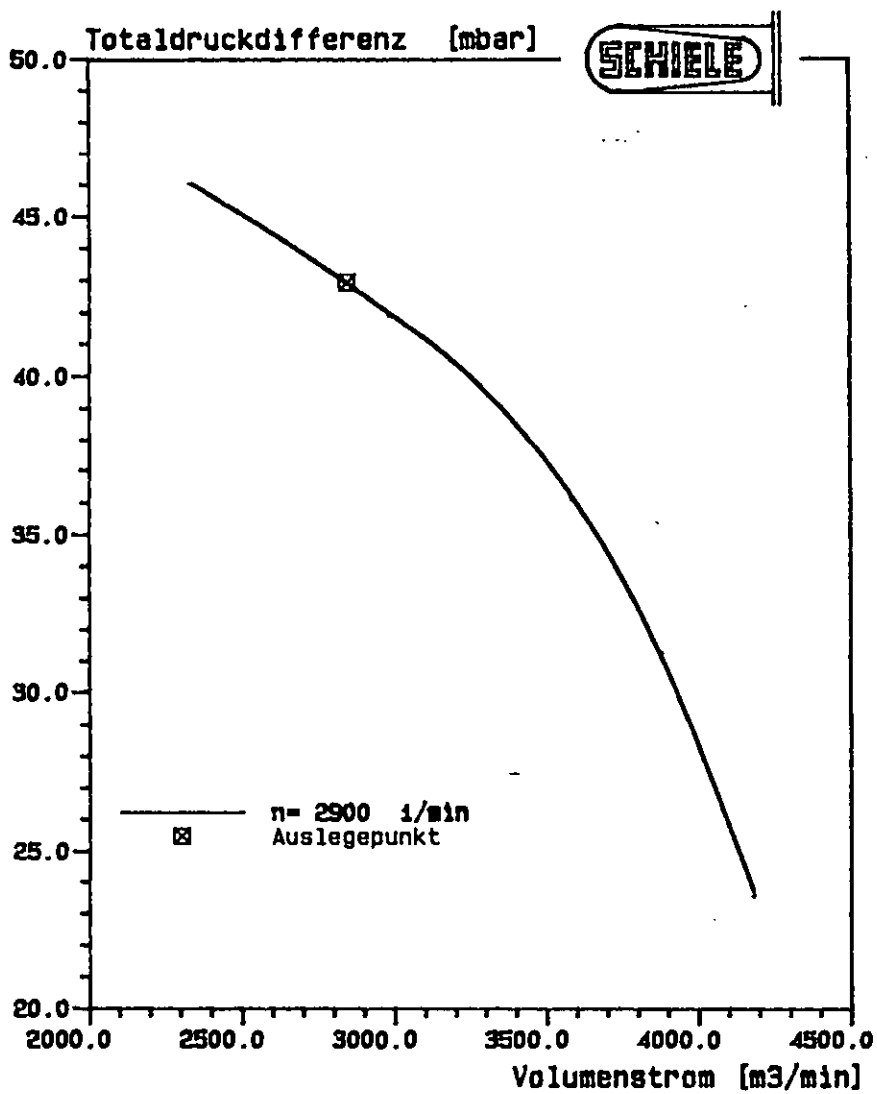
Customer: Wiegand Karlsruhe GmbH

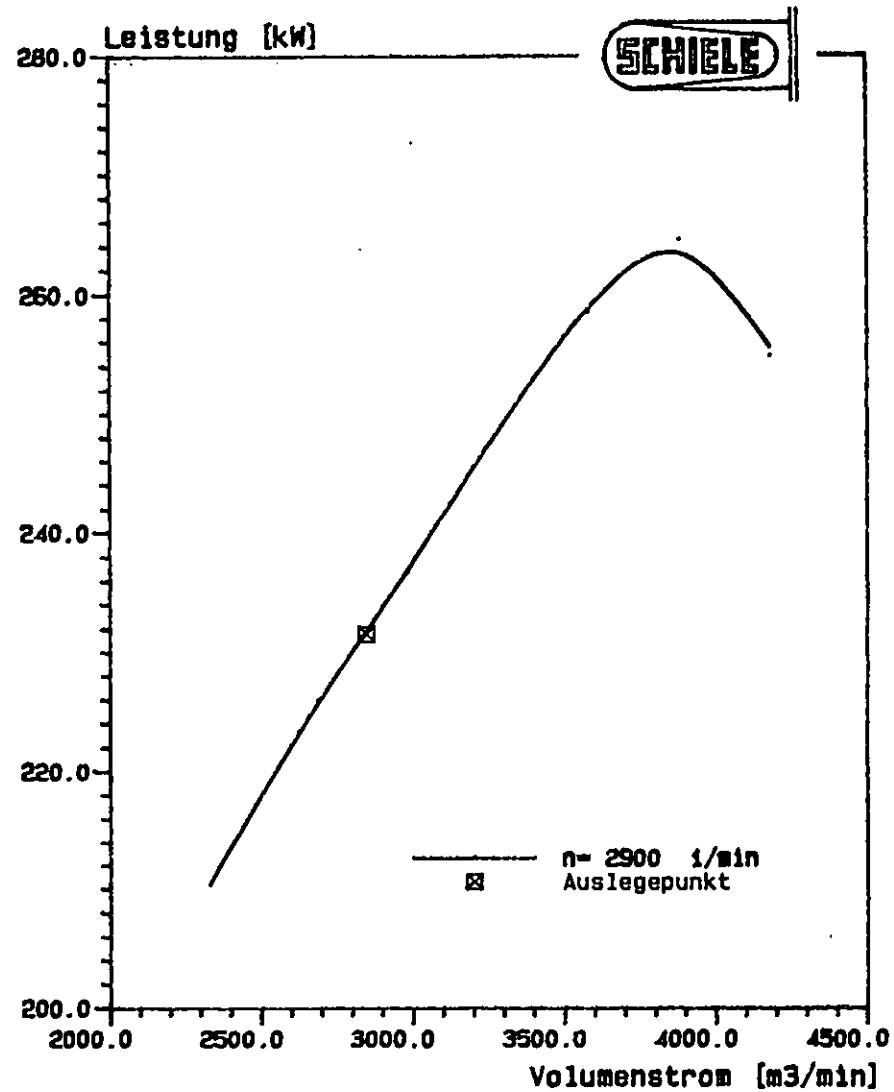
Flow	V	m^3/min	2846			
Density	ϱ	kg/m^3	0,1171			
Total pressure difference	Δp_t	mbar	42,9			
Fan power consumption	P	kW	231,5			
Fan speed	n_F	RPM	2900			
Fan torque	$M = \frac{9550 \times P}{n_F}$	Nm	762			
Motor speed	n_M	RPM	2900			
Mass moment of inertia	$J = \frac{GD^2}{4}$					
Fan	$J_F = \int r^2 \, dm$	kgm^2	350			
Coupling / Pulley	J_C	kgm^2	~ 1			
With regard to motor shaft	$J_M = J_F \left(\frac{n_F}{n_M}\right)^2$	kgm^2				



Date: 24.05.1984 Name: Betzel

G. SCHIELE & CO · ESCHBORN (TAUNUS) SCHIELE ESCHBORN





KA 13111 R 113/1500 KP 124 112 00

Brueden rho = 0.117 kg/m3

The single-entry blower is made in welded execution.

The impeller, arranged at the flying part of the shaft, is driven over a flexible coupling by means of a threephase motor.

The impeller shaft is carried in oil lubricated antifriction bearings. The bearing at the motor side is made as fixed bearing.

Between the shaft sealing at the blower casing and the beearing casing there is an aluminium cast disk arranged for cooling of the bearing.

Blower and motor are mounted on a two-part base frame.

The casing is split in such a way that the impeller can be easily mounted.

The gap width between shaft and suction socket is independent of the heat extension of the shaft.

The gap between shaft and casing is sealed by a special device.

For easy cleaning of the impeller there is a cleaning device at the suction pipe, which has to be connected to a water conduit.

At the bearing casing is a cleaning flap and at the lowest point of the casing is a water outlet socket which has to be connected to a draining line.

The bearing temperatures and the quietness of running are supervised (if necessary, at site) by special measuring devices.

The blower is conserved and packed according to the corresponding directions for a seaworthy transportation and a storage up to 6 months.

On arrival at site the number of packages has to be checked by means of the list of packages and the packing has to be examined for damages of transportation.

Determined transporation damages or missing packages have to be informed at once in writing to the carriers transport agency and to Messrs. G. Schiele & Co.

For the further transportation on the site fasten the lifting gears at the points which are foreseen for it.

Transport all packages without impact and strokes. Take special care during transportation to impeller with shaft.

If a longer storage before mounting is necessary, all parts have to be stored in a dry hall or have to be covered carefully with weather-proof tilts.

The packing has to be removed and the interiors of the machines and the bearing casings have to be checked for presence of water (rain or condensing water) and the corrosion protection has to be examined for damages.

In case water is determined, the corresponding flanges or covers have to be removed and the water has to be drained or the wet parts have to be dried and the corrosion protection has to be renewed (see 22) Means of preservation D 14.00.0 24E).

If the blower is supplied completely mounted, the securities for transportation at impeller and shaft have to be loosened.

The impeller has to be turned several times every week, to distribute the oil the bearings anew and to avoid standstill damages at the bearings.

If the blower has been supplied in dismantled condition, the piece parts have to be treated as described above.

Clean all parts before mounting and examine them for eventual damages.

After mounting the corrosion protection has to be renewed or checked.

6.1 Mounting of the Blower

The blower is supplied completely mounted on the base frame.

Casing and impeller bearings are carefully aligned in our works and are pinned and screwed with the base frame or the bearing pedestal.

Lift the blower with hanged-in stone screws onto the foundation and align it at the worked surfaces. Lift the motor frame part with hanged-in stone screws onto the foundation ang align it at the worked surfaces with the blower frame (admissible deviation 0,1 mm/m). Grout the stone screws, let them harden, tighten the screws.

6.2 Mounting of the motor

Before the mounting of the motor draw the coupling half onto the motor axle end.

See under 11) Enclosures: Mounting instruction coupling.

Place the motor onto the motor pedestal and aling it according to height, side and angular position with the coupling half of the blower, pin it, connect the motor electrically.

Mount the coupling guard.

6.3 Lines

Screw on the suction and pressure line free of tension, i.e. the pipe lines have to be propped near the blower flanges.

Deformations of the blower by not foreseen forces lead to touching of the impeller to the suction socket.

Connect water injection at the suction socket, condensate outlet at the blower casing and blocking steam line (if necessary) to the shaft sealing.

7.1 Checks before commissioning

Before the first commissioning of the blower the following checks have to be made:

Fill the bearings with oil according the lubricating instruction or check the oil filling.

Fill the labyrinth seals at the bearing casings with grease, turn the shaft slowly when doing so

Check once more the screws at the bearings, at the motor, at the flanges, at the coupling guard, etc.

Turn the blower impeller by hand.
The impeller must be easily pushed and run out slowly.
Pay attention to grinding noises.

Grinding noises can occur at the impeller gap, at the shaft sealing, at the coupling/protective grid.
Remove noticed noises.

Clean blower casing, pipe line, bearing and motor pedestal, etc.

Close the flap at the casing.

7.2 First switching-on of the electric motor

Medium handled cold, regard the current consumption.

The switching-on of the electric motor can only be effected by the competent responsible electrician if the blower has been released by the responsible blower erector.

All personnel has to leave the blower range.
It is only allowed to stay outside the range of the centrifugal force (safety measures in case of flying-away parts).

The first switching-on of the motor is only made for a short period to check the direction of rotation.

If the direction of rotation is all right and no extraordinary noises are to be heard, the blower can be driven up to full speed.

7.3 Test run

Medium handled cold, regard the current consumption.

During the test run the following checks have to be made and then wirtten down:

(At first) take the bearing temperatures every half hour.

Measure the quietness of running at the bearing points with a vibration measuring unit.

Check the bearing casing for tightness.

Regard the blower and listen to noises.

During the test run the future maintenance personnel has to be instructed.

Check after the test run all screws.

7.4 Blocking steam for shaft sealing

If the Espey shaft sealing is admitted with blocking steam, the steam temperature must not exceed 170° C.

The blocking pressure steam has to be adjusted such that at the maximum possible deviation of the pressure adjusting organ from the setting value (minimum) the atmospheric pressure will be just reached.

Example:
Exactness of adjustment of the adjusting valve: ± 0,1 bar.
Then the 0,1 bar has to be adjusted as a minimum.

8.1 Blower bearings

During normal operation the maintenance of the bearings is restricted to the check of the bearing temperatures and the relubrication.

For details see under 11) Enclosures:

Plan of the positions of the lubricating points
Lubricating instruction
Table of choice for lubricants
Operating and Maintenance instruction
Temperature supervision

8.2 Coupling

See under 11) Enclosures:

Mounting and operating instruction

8.3 Shaft sealing

See under 11) Enclosures

8.4 Impeller supervision

By contamination of the impeller during operation it has to be calculeted with increasing unquietness.

According to VDI 2056 machine group G, see under 11) Enclosures, is the quietness of running "good" up to V_{eff} = 1,8 mm/sec.
"pracitcable" up to V_{eff} = 4,5 mm/sec.
"still admissible" up to V_{eff} = 11,o mm/sec.

If V_{eff} = 7,1 mm/sec. is exceeded the cleaning device, see under 11) Enclosures, has to be actuated. After a thorough cleaning the quietness of running must be again at V_{eff} = 4,5 mm/sec. If no improvement of the quietness of running is reached, the impeller has to be checked during standstill.

Still existing dust deposits at vanes, base and cover disk have to be removed thoroughly.

In case of little wear the impeller has to be rebalanced.

In case of heavy wear the impeller has to be replaced.

8.5 General maintenance

About every week the blower has to be checked during operation by outer sight control.

Tighten screws (foundation, bearings, motor, etc.).

9.1 Changing of the impeller

At the suction side at first the pipe line parts have to be screwed off)e.g. vane control, flexible socket, silencers, etc.) to get enough room for the works to be done.

Dismantling:
Screw off the suction socket,
loose the hub locking device,
prop the impeller and draw it the the drawing-off device from the shaft.

Mounting:
Clean impeller hub bore and shaft pivot and spray it with Molykote,
draw on the impeller with the drawing-on device,
lock the hub (renew eventually damaged or destroyed locking elements),
screw on the suction socket (pay attention to an even gap),
mount pipe lines etc.

Test run, vibration measuring.

9.2 Changing of loose and fixed bearing

Loose and fixed bearing are comprised in a split casing body; Therefore, it is advisable to change at the same time loose and fixed bearing.

Loose and fixed bearing are dismountable in direction of the coupling.

Dismantle shaft sealing, cooling disk guard, cooling disk, coupling and motor.
Screw off the bearing casing and displace it in direction of the motor until the impeller sits close at the casing.
Screw off the bearing covers at the sides and the upper part of the bearing casing.
Lift the shaft up to the stop in the blower casing bore.
Loosen the shaft nut, draw off the distance bush.
Dismantle the bearing at the coupling side (if the bearing is no longer usable, the bearing can be destroyed), draw off the distance bush.
Dismantle the bearing at the blower side.

For mounting of the bearings see "Description and mounting instruction for two-bearing casing, type SDG, with distance bush" under 11) Enclosures.

The further mounting is made in the opposite sequence as desribed above.

Attention: When displacing the bearing casing it has to be regarded (open cleaning flap) that the impeller is correctly threaded into the suction socket.

9.3 Changing of the Shaft sealing

The parts which are subject to wear have to be changed if the sealing becomes untight.

For details about the changing of the wearing parts see mounting instruction of the shaft sealing under 11) Enclosures.

SCHIELE

10) List of Drawings

D 10. E

sheet 1 of 1

Schiele ref. No. 124 112 00

Customers order No. 2590-75-83.01

Blower type R 113/1500 KP

Designation	Schiele drawing No.	Customers drawing No.	size DIN
PARTS LIST TO MAIN DIMENSIONED RADIAL-FAN	11.01-313-801/		4
MAIN DIMENSIONED DRAWING RADIAL-FAN	11.00-313-801/		1
PARTS LIST ROTOR	11.01-313-800/0		4
ROTOR	00.05-021-240/0		3
PARTS LIST TO SHAFT SEALING	00.61-413-600/0		4
SHAFT SEALING	00.60-001-006/0		4
PARTS LIST PLUMMER BLOCK SDG 180	00.50-517-601/0		4
PLUMMER BLOCK SDG	00.50-000-130/0		1

Date: 3.07.1984 Name: Betzel

G. SCHIELE & CO · ESCHBORN · TAUNUS SCHIELE

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM- NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	1	00.73-241-947/1(SF)			1	FOUNDATION FRAME	RST37-2		BEARING PART		1008,0
	2	00.73-241-948/0(SF)			1	FOUNDATION FRAME	RST37-2		MOTOR PART		560,0
	3	11.20-513-800/0(SF)			1	CASING	1.4571				2500,0
	4	00.21-483-550/0(SF)			1	TRANSITION PIECE	1.4571				211,0
	5	00.50-517-601/0(SM)			1	SCHIELE PLUMMER BLOCK	GGG40	SDG 180 NU 1036M1C3 6036MC3			470,0
*	6	11.01-313-800/0(SM)			1	ROTOR	1.4313				1176,0
	7	00.28-233-013/00SF)			1	WATER INJECTION	1.4571				2,5
	8				1	SOLID CONE NOZZLE	1.4571	No.402 606.17 90° 3,1 L/min-2bar			
*	9	00.61-413-600/0(SM)			1	SHAFT SEALING	1.4301		THIS IS THE LABRYNTH	*	38,0
	10				1	COUPLING	ST	ARPEX NEN 200			21,0
	11	00.44-141-106-/0(SF)			1	COUPLING GUARD	ST37-2				15,7
	12	00.42-005-004/0(SF)			1	DEFLECTOR AND COOLING DISC					6,2
	13	00.44-261-021/0(SF)			1	DEFLECTOR AND COOLING DISC GUARD	ST37		GALVANIZED		4,3
	14	00.44-271-054/0(3)			1	ANCHORANGE FOR COOLING DISC GUARD	ST37-2		GALVANIZED		
	15				1	VIBRATION SUPERVISION UNIT		VIBROCONTROL 1000			
	16				30	HEXAGON SCREW DIN 933	1.4571	M 20 x 60			
	17				30	DISC DIN 126	1.4571	22			
	18				30	HEXAGON NUT DIN 934	1.4571	M 20			

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.
				1	12411200

DESIGNATION: RADIAL-FAN

TYPE: R 113/1500 KP

PARTS LIST NO. 11.01-313-801/ (SM)

DRAWING NO: 11.00-313-_01/ (1)

SHEET 1 OF 4

RETURN FOR:	DATE	NAME	CHECKED UP
REPLACED BY:	3.07.1984	Retzel	

TOT. WT. [KG]

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	19				1	PACKING CORD	TEFLON	7 mm x 3700 LENGTH			
	20				60	HEXAGON SCREW DIN 933	1.4571	M 20 x 80			
	21				60	DISC DIN 126	1.4571	22			
	22				60	HEXAGON NUT DIN 934	1.4571	M 20			
	23				1	PACKING CORD	TEFLON	7 mm x 5800 LENGTH			
	24				4	CLAMPING SLEEVE DIN 1481	1.4571	10 x 60			
	25				6	HEXAGON SCREW DIN 933	1.4571	M 20 x 50			
	26				6	DISC DIN 126	1.4571	22			
	27				6	HEXAGON NUT DIN 934	1.4571	M 20			
	28				4	HEXAGON SCREW DIN 933	5.6	M 36 x 160			
	29				4	DISC DIN 126	ST	39			
	30				4	SPRING WASHER DIN 127	SPRING STEEL	B 36			
	31				4	HEXAGON NUT DIN 934	5.	M 36			
	32				2	TAPER PIN DIN 258	ST	12 x 120			
	33				2	HEXAGON NUT DIN 934	5.	M 12			
	34				8	HEXAGON SCREW DIN 933	1.4571	M 12 x 50			
	35				8	DISC DIN 126	1.4571	14			
	36				1	PACKING CORD	TEFLON	7 mm x 1300 LENGTH			

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.
				1	12411200

DESIGNATION: RADIAL-FAN

TYPE: R 113/1500 KP

PARTS LIST NO. 11.01-313-801/ (SM)

DRAWING NO: 11.00-313-801/ (1)

SHEET 2 OF 4

RETURN FOR: / REPLACED BY:	DATE	NAME	CHECKED UP
	3.07.1984	Betzel	

TOT. WT. [KG]

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP	WT.
	37				6	STUD DIN 938	1.4571	M 10 x 25	SEALED BY MEANS OF PTFE-TAPE		
	38				6	DISC DIN 126	1.4571	11			
	39				6	HEXAGON NUT DIN 934	1.4571	M 10			
	40				1	PACKING CORD	TEFLON	7 mm x 250 LENGTH			
	41				4	HEXAGON SCREW DIN 933	5.6	M 12 x 35			
	42				4	DISC DIN 126	ST	14			
	43				4	HEXAGON NUT DIN 934	5.	M 12			
	44				4	HEXAGON SCREW DIN 933	5.6	M 10 x 25			
	45				4	DISC DIN 126	ST	11			
	46				4	HEXAGON NUT DIN 934	5.	M 10			
	47				4	HEXAGON SCREW DIN 933	5.6	M 8 x 25			
	48				4	DISC DIN 126	ST	9			
	49				4	HEXAGON NUT DIN 934	5.	M 8			
	50				8	HEXAGON SCREW DIN 933	5.6	M 24 x 120			
	51				4	SHEET METAL	ST37-2	⌀ 100 x 10			
	52				1	DRIVE MOTOR		TYPE 400 M	DELIVERY FA. WIEGAND		
	53				4	HEXAGON SCREW DIN 933	5.6	M 24 x 120			
	54				4	DISC DIN 126	ST	26			

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.
				1	12411200

DESIGNATION: RADIAL-FAN

TYPE: R 113/1500 KP

PARTS LIST NO. 11101-313-801/ (SM)

DRAWING NO: 11.00-313-801/ (1)

SHEET 3 OF 4

RETURN FOR:	DATE	NAME	CHECKED UP	TOT. WT. (KG)
REPLACED BY:	3.07.1984	Betzel		

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	55				4	HEXAGON NUT DIN 934	5.	M 24			
	56	00.72-321-005/0(4)			14	ANCHOR SCREW	ST 37	M 20 x 700	GALVANIZED		

SCHMELZ

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.
				1	12411200

DESIGNATION: RADIAL-FAN

TYPE: R 113/1500 KP

PARTS LIST NO. 11.01-313-801/ (SM)

DRAWING NO: 11.00-313-801/ (1)

SHEET 4 OF 4

RETURN FOR:	DATE	NAME	CHECKED UP	TOT. WT. [KG]
REPLACED BY:	3.07.1984	Retzel		

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	1	11.00-313-800/0(SF)			1	IMPELLER	1.4313	Ø 1610			760,0
	2	00.12-933-800/0(2)			1	HUB	1.4313	Ø 280/140 x 165	ONE UNIT		41,0
	3	00.13-953-002/0(4)			1	HUB CONE	1.4313	12 mm			51,5
	4	00.40-819-606/0(2)			1	SHAFT	C 35	Ø 190 x 1734			312,0
	5				1	FITTING KEY DIN 6885/1	ST60	A 36 x 20 x 140			0,8
	6				1	FITTING KEY DIN 6885/1	ST60	A 22 x 14 x 80			0,2
*	7	00.42-309-010/0(4)			1	SHAFT PROTECTIVE SLEEVE	1.4313	Ø 200/165 x 151	LABYNTH RUNS ON THIS SLEEVE	*	3,8
	8				1	ROUND CORD RING	VITON	L Ø 180 x 4			
	9				1	ROUND CORD RING	VITON	L Ø 165 x 4			
	10				1	PACKING CORD	TEFLON	GORE-TEX 3 mm x 300 LENGTH			
	11	00.41-003-607/0(SF)			1	HUB SAFETY DEVICE	1.4571	Ø 140			5,8
	12				2	THREADED PIN	5.6				
	13	00.14-493-004/0(SF)			1	HOLDING FIXTURE FOR DINAMIY COUNTERWEIGTH					
	14										
	15										
	16										
	17										
	18										

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.
				1	12411200

DESIGNATION: ROTOR, LEFT

TYPE: R 113/1500

PARTS LIST NO. 11.01-313- 00/(SM)

DRAWING NO 00.05-021-240/0(3)

SHEET 1 OF 1

RETURN FOR:	DATE	NAME	CHECKED UP
REPLACED BY:	3.07.1984	Retzel	

TOT. WT. [KG] 1170,0

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM- NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	1	00.52-217-600/0(1)			1	BEARING CASING	GGG 40				362,0
	2	00.55-117-654/0(2)			2	BEARING COVER	GGG 40				47,0
	3				1	GROOVED BALL BEARING	SP. ST	6036 M. C 3			11,0
	4				1	CYLINDRICAL ROLLER BEARING	SP. ST	Nu 1036 M 1 C 3			10,9
	5	00.55-411-603/0(SF)			1	DISTANCE BUSH	St 37				24,7
	6				1	GROOVE NUT	St 34	KM 36			3,7
	7				1	LOCKING PLATE	St	MB 36			0,26
	8	00.42-109-015/0(4)			1	DISTANCE BUSH	C 15/St	Ø 205/174 x 76			5,3
	9	00.42-109-016/0(4)			1	DISTANCE BUSH	C-15/St	Ø 205/190 x 100			3,8
	10				2	GREASE NIPPLE DIN 3404	5,8	M 10 x 1			
	11				1	VENTILATION FILTER		BF 15			
	12				1	GASKET	V.FIBER	27 x2201x15			
	13				4	HEXAGON SCREW DIN 933	5,6	M 16 x 50			
	14				4	DISC DIN 126	St	18			
	15				4	HEXAGON NUT DIN 934	5,	M 18			
	16				16	HEXAGON SCREW DIN 933	5,6	M 10 x 35			
	17				16	SPRING WASHER DIN 127	SPRING STEEL	B 10			
	18				12	HEXAGON SCREW DIN 933	5,6	M 20 x 70			

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.

DESIGNATION: SCHIELE PLUMMER BLOCK

TYPE: SDG 180

PARTS LIST NO. 00.50-517-601/0(SM)

DRAWING NO: 00.50-000-130/0(1

SHEET 1 OF 2

RETURN FOR:	DATE	NAME	CHECKED UP
REPLACED BY:	3.07.1984	Retzel	

TOT. WT. [KG] 470,0

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	19				12	DISC DIN 126	St	12			
	20				12	HEXAGON NUT DIN 934	5,	M 20			
	21				2	TAPER PIN DIN 258	8,8	M 10 x 65			
	22				2	HEXAGON NUT DIN 934	5,	M 10			
	23				1	ANGULAR OIL LEVEL INDICATOR	MS	No. 8.1701 R 1/2" H = 73 mm			
	24				1	DRAIN SCREW DIN 910	4,6	R 1/2"	ON BACK		
	25				1	GASKET DIN 7603	V.FIBER		ON BACK		
	26					SEALING COMPOUND		EPPLE TYP: 39			
	27										
	28										
	29					LEVEL = 58 mm					
	30					MINIMUM-MAXIMUN = 8 mm					
	31										
	32										
	33										
	34										
	35										
	36										

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.

DESIGNATION: SCHIELE PLUMMER BLOCK

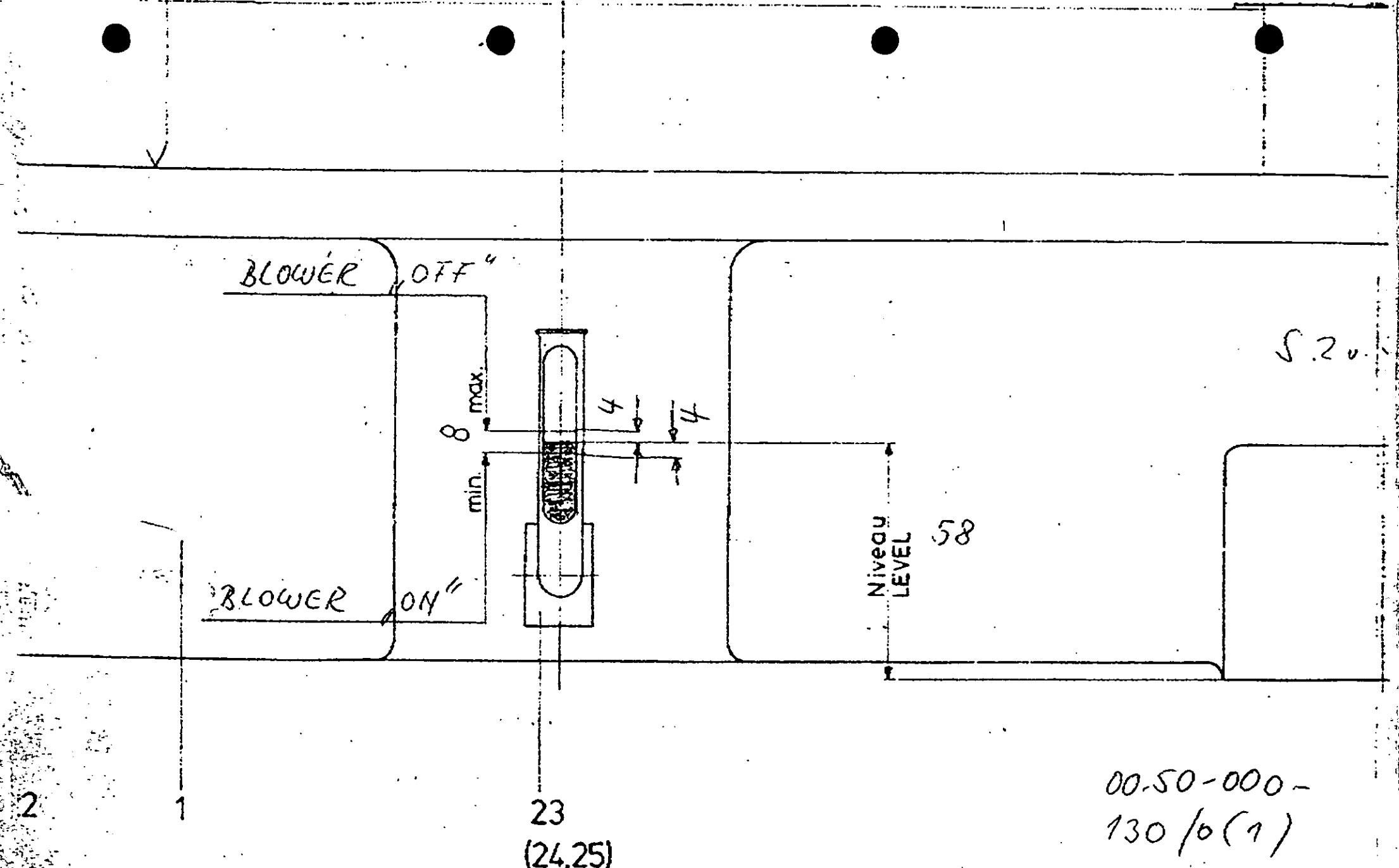
TYPE: SDG 180

PARTS LIST NO. 00.50-517-601/0(SM)

DRAWING NO 00.50-000-130/0(1)

SHEET 2 OF 2

RETURN FOR:	DATE	NAME	CHECKED UP	TOT. WT. [KG]
REPLACED BY:	3.07.1984	Bekel		470,0

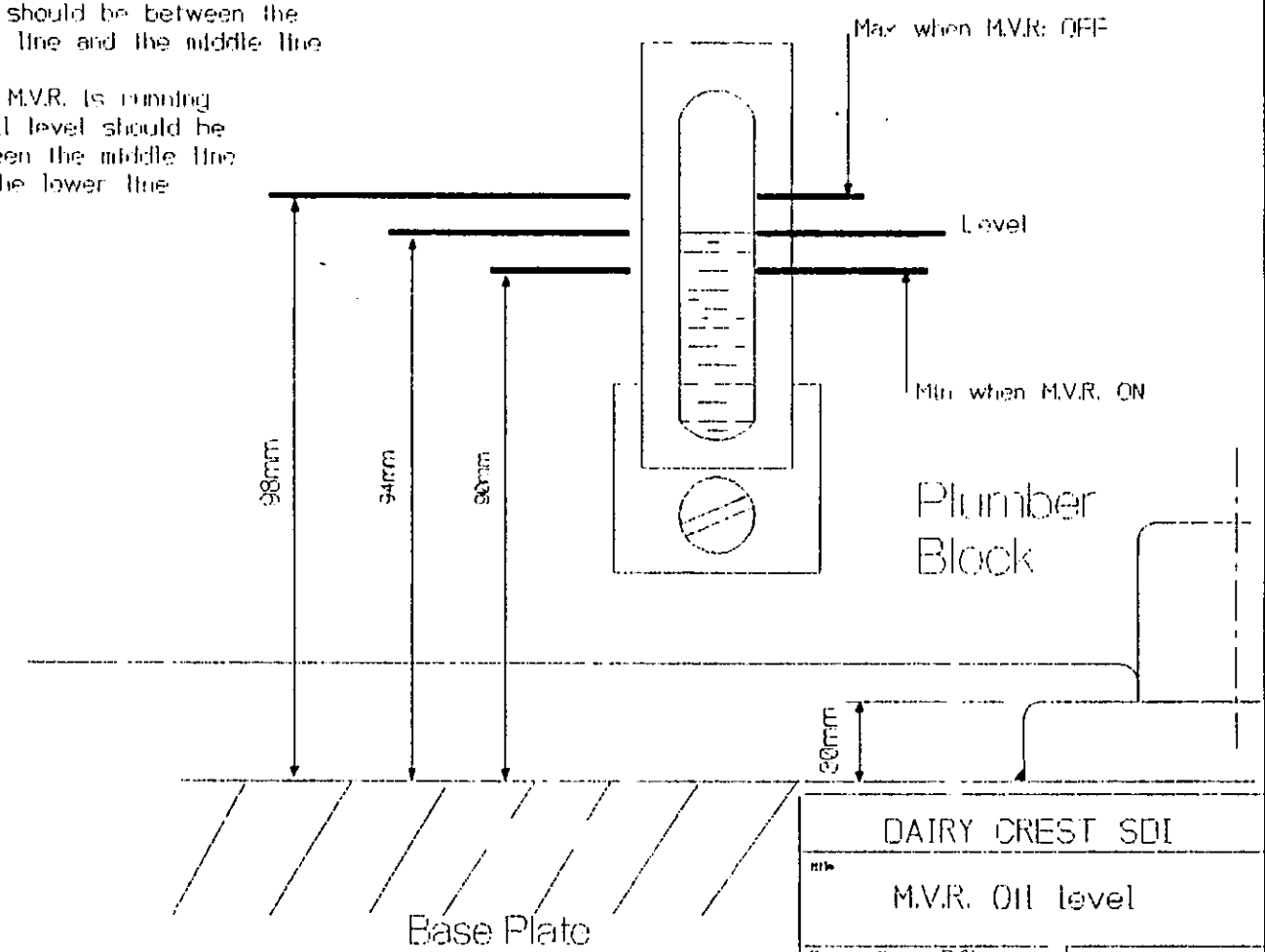


00.50-000-
130/0(1)

Niveau: siehe Stückliste
LEVEL: SEE PART LIST

When M.V.R. is OFF the Oil level should be between the upper line and the middle line

When M.V.R. is running the Oil level should be between the middle line and the lower line



DAIRY CREST SDI

Title: M.V.R. Oil level

Drawn By:- P.Shore

Date:- 21st August 1995

Scale N.T.S.

Drawing No. MAE/SDI/101

SCHIELE	11) Enclosures	D 11. E sheet 1 of 1

Schiele ref. No. 124 112 00
Customers order No. 2590-75-83.01
Blower type R 113/1500 KP

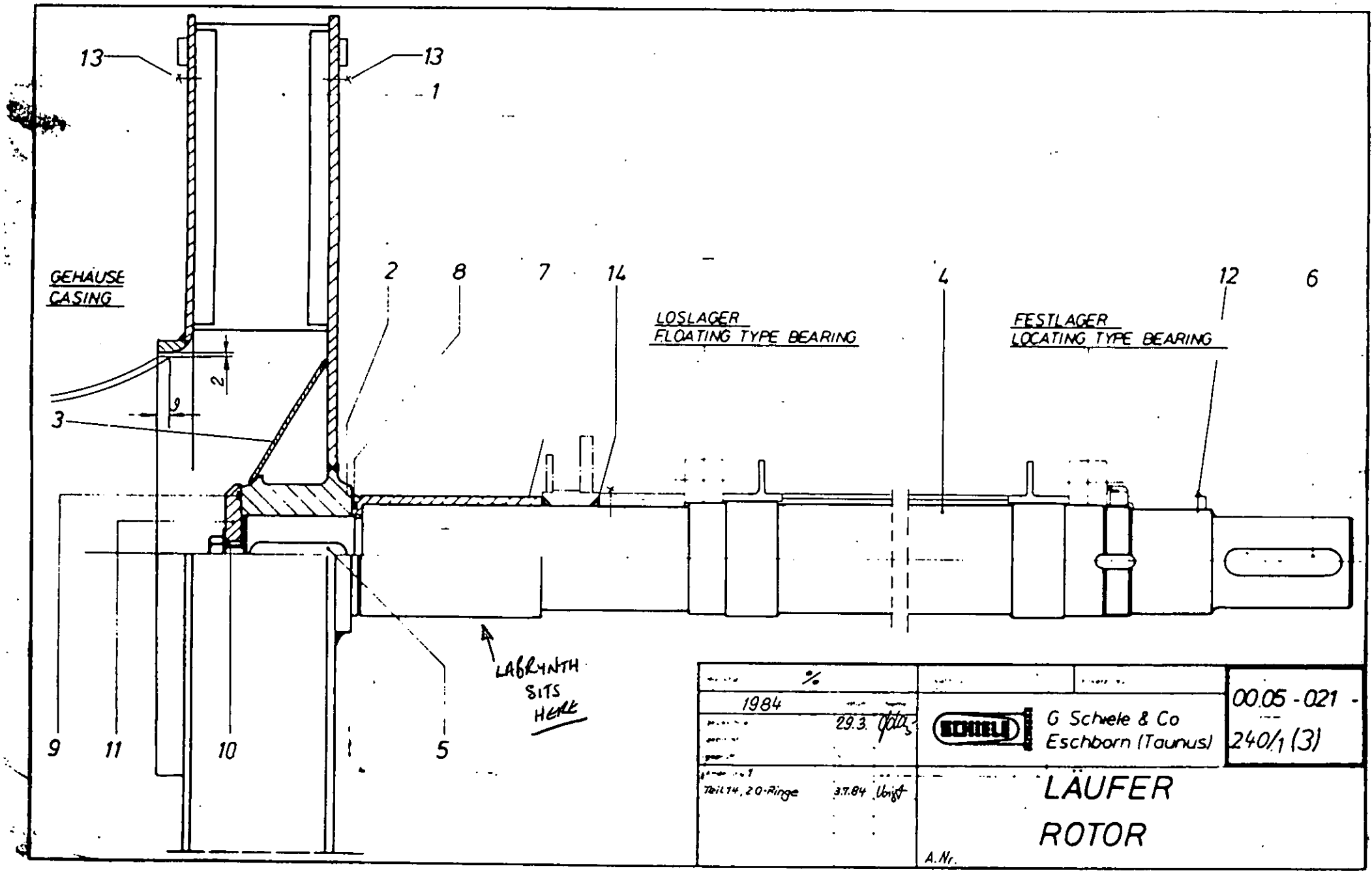
Designation	Documentation No.	Firm	sheet Nos.
MEANS OF PRESERVATION	D 14.00.024 E	SCHIELE	1
MOUNTING INSTRUCTION SHAFT SEALING			
LUBRICATION INSTRUCTION	00.56-600-475/0(3)	SCHIELE	1
PLAN OF THE POSITIONS OF THE LUBRICATING POINTS	11.00-313-801/ (1)	SEE UNDER 10)	
OPERATING INSTRUCTION BEARINGS			
TEMPERATURE SUPERVISION BEARINGS			
OPERATING INSTRUCTION COUPLING	ARPEX NEN 200	FLENDER	
VIBRATION SUPERVISION UNIT	VIBROCONTROL 1000	SCHENK	
LIMIT OF JUGMENT OF THE QUALITY OF VIBRATION	D 16.00.002 E	SCHIELE	1
MEASURING OF THE QUIETNESS OF RUNNING	D 16.00.004 E	SCHIELE	1
WATER INJECTION			

Type	Protecting film	Application for	especially necessary characteristics	Duration of preservation
A	oily	inside preservation of gears and bearing casings	later it must be compatible with the used lubricating oils	preservation for transportation, minimum 12 months
B	lipoid	preservation of polished parts, sealing surfaces	it must not give off any acids, it must be washable with petroleum	longtime preservation, minimum 12 months
C	waxy firm	preservation of shafts couplings spare parts	it must protect against salt-water and be scratch resistant	continuous preservation for machine parts, minimum 12 months

S u p p l i e r s

Type	Esso	Shell	Valvoline	Mobil		
A	RS 335	Ensis oil L	Textyl Ritzol R 6 Ritzol RC6 511M	Mobil arma 523/' 524		
B	RS 393	SDC	502 C			
C	RB 324	MD	846 K19 506	Mobil arma 633		

In oil supply units type A must not build up any residues which block up the fine filters of the oil circuit.



%			00.05 - 021 - 240/1 (3)
1984	29.3.	G Schiele & Co Eschborn (Taunus)	
1 Teil 14, 20 Ringe	3.7.84	LÄUFER ROTOR	
		A.Nr.	

1	2	3	4	5	6	7	8	9	10	11	12
E	PART	DRAWING- PARTS LIST NO. ITEM - NO.	INDEX	CH	PIECE	DESIGNATION STANDARD SPECIFICATION	MATERIAL	DIMENSION	REMARK	DISP.	WT.
	1				1	CASING	1.4301		TWO-PART		
	2				7	SEALING RING	E 10 K		IN THREE PARTS OR SECTION		
	3				7	SPRING	1.4571				
	4				7	STOP PIECE	1.4571				
	5										
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										
	16										
	17										
	18	*									

INDEX	CHANGE NO.	DATE	NAME	PIECE	ORDER-NO.

DESIGNATION: SHAFT SEALING

TYPE: ESPEY WDG 201/4, SHAFT Ø 200

PARTS LIST NO.00.61-413-600/0(SM)

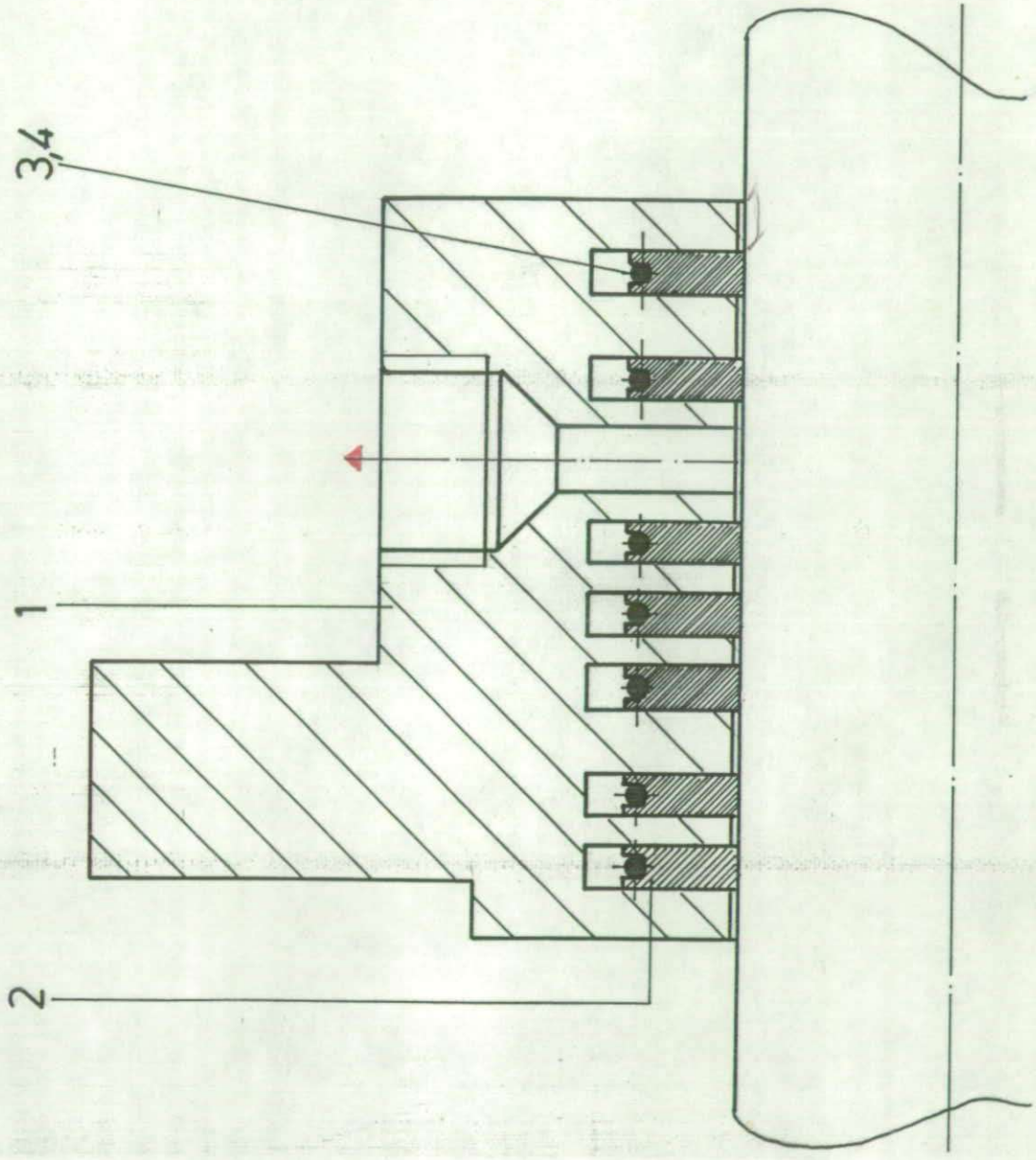
DRAWING NO: 00.60-001-006/0(4

SHEET 1 OF 1

RETURN FOR:	DATE	NAME	CHECKED UP	TOT. WT. [KG]
REPLACED BY:	3.07.1984	Bekel		

Espey - Wellenabdichtung
Espey - SHAFT SEAL
Espey - dispositif d étanchéité sur l'arbre

00.60-001-
006/0 (4)



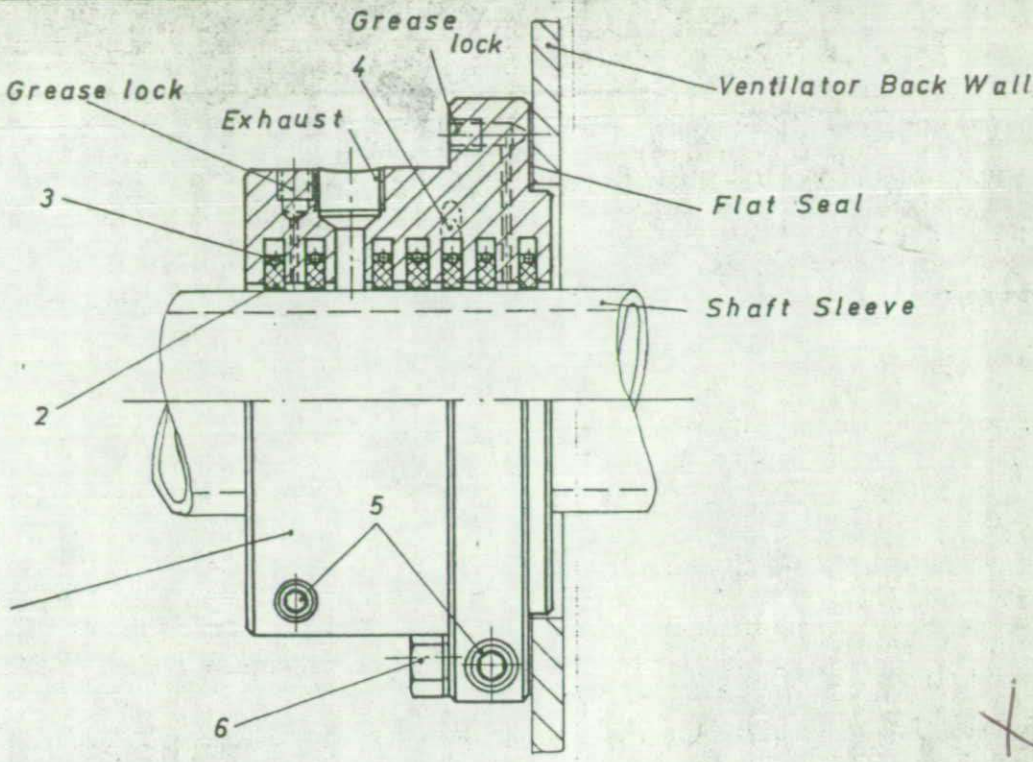


Abb.1

ASSEMBLY AND OPERATING INSTRUCTIONS

1. Check concentric running of shaft sleeve.
2. The shaft sleeve must be ground smooth to nominal dimension with fit h6 (For repair work undersized rings can be made).
3. Insert flat seal.
4. Place hose spring Item 3 with lock piece Item 4 around the shaft and hook in.
5. Insert the segments of the seal ring Item 2 into the closed spring according to their identification mark (see picture 2). It is to be observed that the locking piece is placed into the locking groove of the ring segment.
6. Aligne the seal rings Item 2 according to the chamber spacing of the housing Item 1 on the shaft.
7. Grease housing chambers slightly with special grease (see § 13).
8. Push the bottom housing half (with locking grooves) onto the seal rings Item 2, whereby a slight readjustment of the seal rings Item 2 is required.
9. Turn the housing half downwards and insert the locking pieces Item 4, into the locking grooves of the bottom housing half.
10. Put top housing half in place and screw on with the bolts Item 5.
11. Aligne the housing Item 1 to the shaft and screw to the ventilator (Item 6).
12. Connect any possible suction - or sealing gas conduit pipes.
13. In case of shaft seals with grease locks, it is important when selecting the grease to pay attention to the operating temperature and to the compatibility with the conveying medium. At normal temperature of 40°C a hot bearing grease having a dripping point of 190°C is sufficient, at higher temperatures special grease (like E 600) is to be used.

    Existing grease chambers to be filled with grease.

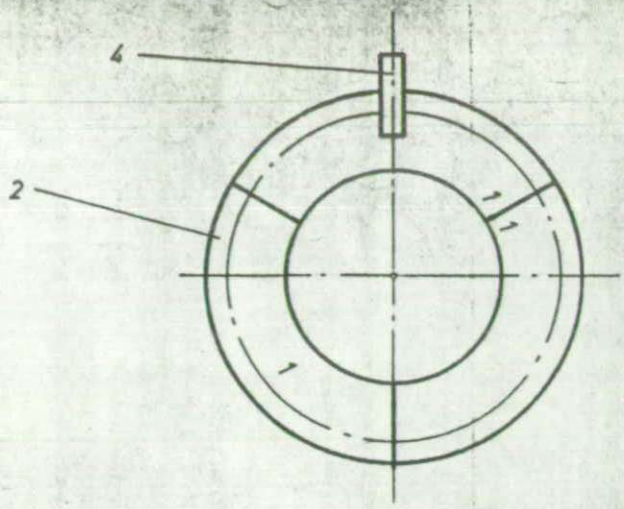


Abb. 2

The grease has to be supplied slowly to the grease chambers while the rotor is rotating. The required grease quantity is obtained as soon as the resistance during pushing increases (use only handpress or stauffer bush!). It is not permitted to force additional grease in, since otherwise the part sections of the adjacent seal rings could be forced apart.

14. A further resupply with grease should only take place if the shaft seal leaks.

15. If a maintenance-free operation is desired, suitable grease supply supply devices can be delivered.

Maintenance

Each sealing assembly should once a year be disassembled during the inspection of the blower and cleaning and checking of the seal rings should take place.

The diameter fit on the running surface of seal ring and shaft sleeve is good if the seal ring envelopes the shaft sleeve without play.

If the play becomes too large, the seal rings have to be replaced.

Quality Assurance Department

The following image quality is
poor due to original page quality

www.cleardata.co.uk
tel: 01670 356 734 fax: 01670 356 439

LUBRICATING INSTRUCTIONS FOR
RADIAL FAN TYP R113/1500 KP

Schmieranweisung zum
Radial-Ventilator Typ R113/1500 KP

CUSTOMER-ORDER-No.: / Kunden-Bestell-Nr.:	2590-75-83.01 MAELOR	SCHIELE-ORDER-No.: / Schiele-Auftr.-Nr.:	124 112 00
LUBRICATING POINT SEE DRAWING / Schmierstellen siehe Zeichnung			11.00-313-801/0 (1)
DATE, NAME / Datum, Name	5.7.1984 Ad.	LIST-No.: / Listen-Nr.:	00.56-600-475/0 A3

KIND OF LUBRICATION	1) LUBRICATING NIPPLE	2) FLOODED LUBRICATION	3) GREASE FILLING	4) GREAS CENTRAL LUBRICATION	5) OIL CIRCULATING LUBRICATION	6) SPRAY LABRICATION
Art der Schmierung	1) Schmiernippel	2) Tauchschmierung	3) Fettfüllung	4) Fettzentralschmierg.	5) Ölumlaufschmierung	6) Sprühschmierung

1	2	3	4	5	6	7	8	9	10
LUBRICATING POINT No	QUANTITY	DESIGNATION	KIND OF LUBRICATING	LUBRICANT	QUANTITY PER LUBR. POINT OIL (L)/GREASE (cm3) FIRST FILL.	RE FILLING	LUBRICATIONS INTERVALS (TIME OF OPERATI.)	LUBRICATIONS CHANGING (TIME OF OPERATI.)	REMARKS
Schmierstellen Nr	Anzahl	Bezeichnung	Art der Schmierung	Schmierstoff	Menge je Schmierstel. Öl in l / Fett in cm3 Erstfüllg.	Nachfüllg.	Schmier-intervall (Betriebsstunde)	Schmierstoff-wechsel (Betriebsstunde)	Bemerkungen
I	1	BEARING / Lager	2	VG CL 100	9	—	—	2000	
II	2	GREASE CHAMBER-BEARING / Fettkammer-Lager	1	K 2 r	—	—	1000	—	RE LUBRICATE UNTIL FRESH GREASE COMES OUT OF THE SHAFT ENTRY. / nachschmieren bis frisches Fett aus dem Wellendurchgang austritt.

The temperature supervision is made over firmly mounted measuring units with/without contact device, thermo elements/resistance thermometers as temperature tracer, which measure the temperature at the outside of the bearing outer ring,
with local and/or remote indication.

Measuring unit: make . . . . . type . . . . . .

Supply: Schiele/customer

The bearing temperature is determined by the following factors:

loss output of the bearing
heat supply from neighbouring heat sources
heat emission to the surroundings

Location of the blower . . . . . .

Protected by a roof . . . . . .

Ambient temperature max. . . . . °C

Medium bearing temperature abt. . . 60 . . . °C

Alarm release at bearing temperature . . . . . 80 . . . °C

Switching off of the blower at bearing temperature . . . . . 100 . . . °C

The reason for the temperature rise has to be found out.

1) Check of the oil level
(oil level height during standstill max. . . . . mm

oil level height during operation, measured from the lower surface of the bearing casing) min. . . . . mm

remedy refill oil

2) Check of the oil quality
(appearance, contamination, analysis)

remedy changing of the oil

3) Listening to the bearings for extraordinary noises which point at damages of the bearings

remedy changing of the bearing
ask a bearing expert for advice

1. Description

In the split bearing casing, a cast construction, loose and fixed bearing which are oil lubricated are arranged.

At the lower part of the bearing casing is at one side an oil level indicator with oil level marks and at the other side an oil outlet screw.

In the upper part of the casing is a threaded bore for the ventilating filter, through which the oil is filled in. The split bearing covers have at the outside grease chambers which are connected with lubricating nipples over bores, and at the inner side are oil catching grooves with draining bores in the lower part.

The grease filled chambers prevent the entry of dirt into the bearing casings and the oil catching grooves prevent the penetration of oil.

On the shaft beside the bearings are centrifugal disks, which dip into the oil and if they turn they spray the oil for lubrication into the bearings.

2. Mounting

2.1 Mounting of the bearings onto the shaft

Clean the shaft and check the tolerance compliance of the bearing seats.

Heat the complete bearing, respectively the bearing inner ring in a clean oil bath to about 80° C.

! When handling the bearings only clean rags, which do not unravel, have to be used.

At the fixed bearing an arrow on the outer ring shows the direction of the axial force arising at the shaft.
The heated first bearing will be pushed onto the bearing seat up to the stop, it must sit close on the whole circumference.
Push the distance bush onto the shaft.
Push the heated second bearing up to the distance bush.
Turn locking sheet and shaft nut tightly to the bearing.
After cooling down of the bearings retighten shaft nut and lock it.
Push the distance bushes onto the shaft and lock them.

2.2 Mounting of the shaft into the bearing casing

Clean the bearing casing and check the bearing seats.
Place the shaft carefully into the lower part of the bearing casing.

Do not tilt the shaft, it must be easily turnable.
Clean the division joints of the bearing casing and apply the luting agent thinly.
Place the upper part of the bearing casing carefully onto the lower part and bring it over the guide pivots into the right position.
Screw the casing parts together.
Clean the bearing covers, apply luting agent and screw them on.
The shaft must be turnable by hand.

When mounting the impeller and coupling use a drawing-on device, if not, the shaft has to be propped in such a way that no impacts can be transmitted from the bearings.

3. Commissioning

Before commissioning the corresponding oil (see table of choice for lubricants) is filled in through the bore for the ventilating filter slowly until the oil level is at the marking at the oil level indicator.

Screw in the ventilating filter with gasket at once so that the oil will not be contaminated.

Then the sealing grease (see table of choice for lubricants) will be pressed through the lubricating nipples into the grease chambers until it penetrates at the shaft entry.

During this the shaft has to be turned slowly by hand so that the grease will be equally distributed in the chambers (remove excess grease).

After commissioning of the machine check the bearing temperatures at first in shorter intervals and write them down.
See "Temperature supervision".
The bearing temperature increases at first, reaches after several hours its highest point and then decreases to its final height.

Listen to extraordinary noises of the bearings.

4. Maintenance

After the first 300 to 500 operating hours the oil filling will be drained, the condition of the oil be checked and fresh oil will be filled in.

The further oil changes have to be effected according to the operating conditions respectively according to the statements in the "Lubricating instruction".

During normal operation the maintenance of the bearings is restricted to the check of the bearing temperatures, the listening of the bearings for extraordinary noises, the refilling of oil up to the stated mark at the oil level glass and the repressing of grease into the grease chambers.
The higher the contamination danger the more often grease has to be repressed.

In case of untightnesses retighten the screws at the division joints.

5. Dismantling

When dismantling the sequence is, after draining of the oil, opposite to mounting.

If the bearings during dismantling must not be destroyed or damaged, they have to be dismantled by means of a drawing-off device. The drawing-off device has to be put on to the inner ring or at the cylindric part of the oil conveying ring.

1. Information

1.1. ARPEX couplings are equally suitable for clockwise and anti-clockwise rotation, also for reversing operation; in special design they can be installed vertically or inclined.

1.2. Coupling parts 1 and 2 can be fitted to either of the shaft ends to be connected.

1.3. A gap remaining in many applications between mounted hub and shaft shoulder can be filled by a keywayed spacer bush. A sleeve of this type is not, however, essential for proper functioning of the coupling.

1.4. When ordered with finished bores, ARPEX couplings are supplied in single parts ready for mounting.

2. Safety

The user should guard rotating parts to prevent accidents, taking into account local and national safety regulations.

3. Finishing of rough bores

3.1. Maximum bore diameters listed in catalogue K 430 must not be exceeded when finish boring hubs supplied with rough bores.

3.2. When finishing rough bores, surfaces marked by bold lines (⌐) in fig. 1.1 should be used as reference faces for correct bore concentricity.

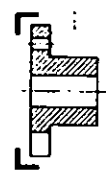


Fig. 1.1

3.3. Where hubs are fitted with shaft keys we recommend the following ISO fits for bores and keyways.

ISO specification for parallel key connection:

Shaft end tolerances	Bore tolerances
h6	P7
h8	S7
k6	M7
m6	K7
n6	J7
p6	H7
s6	F7

Hub keyway width to ISO P9 tolerances.

3.4. For heavy duty operating conditions, i. e. reversing under load, a tight or shrink fit resp. should be selected.

4. Installation

4.1. Before assembly the shaft ends and coupling parts must be carefully cleaned.

4.2. Hubs should preferably be mounted with the aid of special tools available for this purpose. When mounting couplings with a "B" hub and for miniature series couplings AWM, design A, AB and C, check whether minimum clearance P is available (see figs. 2.1 and 2.2). Dimension k3 must be taken into account also. In case minimum clearance P is not available, the close fitting bolts must be inserted before mounting the hubs (see table 5.1 for dimensions of P and k3). With miniature series couplings type AWM, design C and CD, prior to fitting the hubs, the plate pack must be mounted on one hub, in design D on both hubs first.

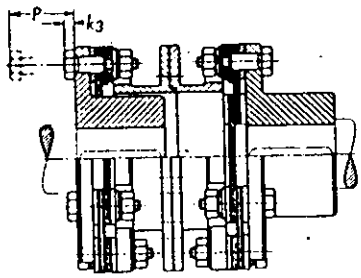


Fig. 2.1

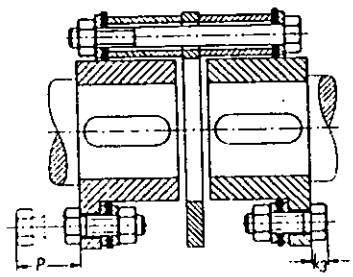


Fig. 2.2

4.2.1. Uniform heating of hubs will facilitate mounting, In case of shrink fits, heat hubs to approx. 200 - 240 °C.

4.3. Final assembly (standard series)

4.3.1. Bolt plate packs to spacer or a coupling hub resp. (See figs. 2.3 and 2.4 for position of plate pack.) For couplings with spacer, be sure to position nuts on the spacer side.
The plate packs of types with intermediate shaft or U-spacer must be mounted to be mirror inverted.

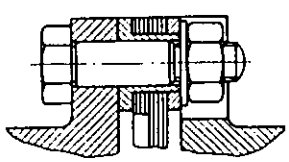


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Fig. 2.3

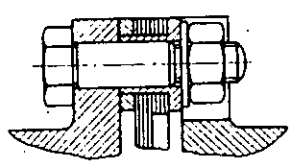

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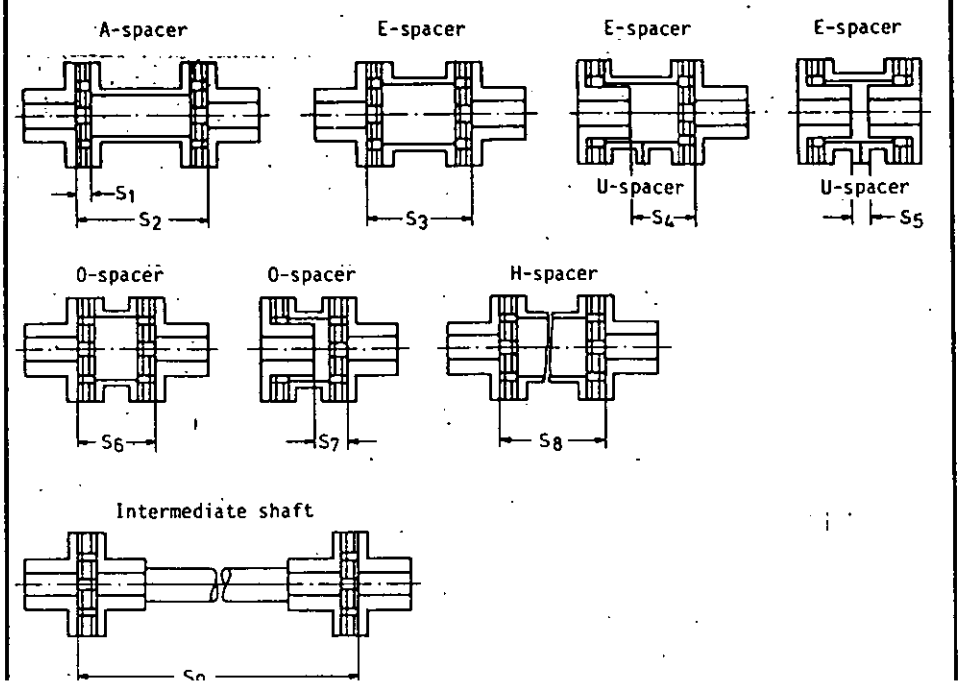
Fig. 2.4

4.3.2. Types BEB, BEN, BED, BEC, BEF, BON, BOD, BOF, BUB: Bolt spacer to a hub (support spacer). Move machines to be coupled together. Align coupling (see section 5) and bolt other side of spacer to other hub.

For all other coupling types: Move machines to be coupled together, align coupling (see section 5), mount spacer or intermediate shaft resp. and bolt parts together.

S_1 to S_9 dimensions according to table 5.I also bolt tightening torques. In case no suitable torque spanner is available, the applied tension can be determined through elongation measurements. For this purpose determine exact bolt'length before tightening the nut and check repeatedly during assembly. Elongation values can also be found in table 5.I.

4.3.3. The bolt settling action is largely concluded about 4 hours after applying the tightening torque. It is therefore advisable to check bolt tightness or bolt elongation again after this period. If necessary, retighten the bolts.



4.4. Final assembly (high torque series, sizes 575 - 1160)

4.4.1. Bolt plate packs to spacer (see fig. 3.1)

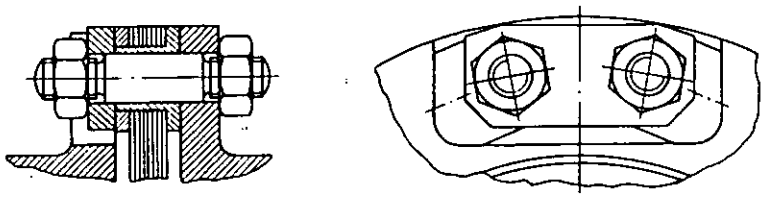


Fig. 3.1

4.4.2. For types BEB, BEN, BED, BEC, BEF, BON, BOC, BOF, BUB: Bolt spacer to one coupling hub (support spacer). Move machines to be connected together, align (section 5) and bolt spacer to the other hub.

For all other types: Move machines to be coupled together, align (section 5) mount spacer and bolt all parts together.

S_1, S_3, S_4, S_5, S_6, S_7, S_8 values according to table 6.I. The bolt tightening torque applied can be determined through bolt elongation measurements. For this purpose measure exact length of bolt before applying torque on the nut and check repeatedly during assembly. Bolt elongation values are listed in table 6.I.

Bolt torque must be applied via the nut located on the flange.

4.5. Final assembly (high torque series, sizes 1290 - 2400)

4.5.1. Loosely bolt plate packs to spacer (fig. 4.1).

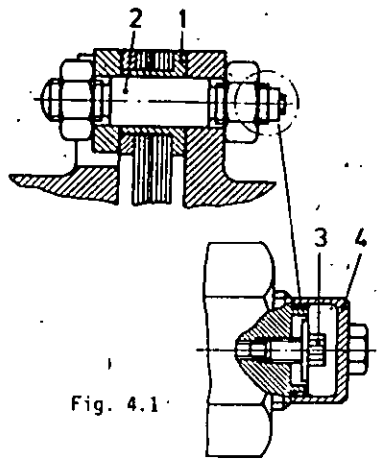


Fig. 4.1

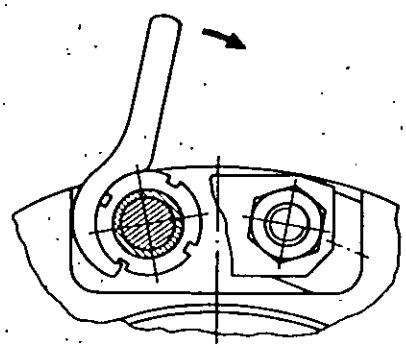


Fig. 4.2

4.5.2. For types BEB, BEN, BED, BEC, BEF, BON, BOD, BOF, BUB: Loosely bolt spacer to one coupling hub (support spacer); compensate manufacturing tolerances by turning the excentric bush (part No. 1), see section 4.5.3. Bring machines to be coupled together and bolt together other side. Align coupling (see section 5).

For all other types: Bring equipment to be coupled together, align (see section 5), install spacer; compensate manufacturing tolerances by turning excentric bush (part No. 1) and bolt parts together (see section 4.5.3.).

Dimensions S_1, S_3, S_4, S_5, S_6, S_7, S_8 according to table 6.I.

4.5.3. Adjust plate packs on the aligned coupling to be without play. The single plates of a plate pack are mounted on an excentric bush (part No.1) whose rim is furnished with slots for a hook spanner. An arrow marking indicates the tightening direction (see fig. 4.2). By turning the bush in the direction of the arrow each plate pack can be adjusted to be with play. In order to avoid plate tilting during tightening, counterhold well on the bolt head.

4.5.4. Tighten nuts and check bolt elongation. Bolts (part No. 2) are supplied with an elongation measuring attachment (see fig. 4.1). On a bolt without pre-stressing, zero markings on nut and measuring screw (part No. 3) are in line. The measuring screw has vernier markings on its circumference. After tightening the nut, the bolt elongation can be read off the vernier scale after screwing down the measuring screw; one graduation mark = 0.1 mm bolt elongation. In order to simplify elongation measurements all close fitting bolts, size M 30 up, in coupling sizes 350 and larger are furnished with measuring balls at the end faces.

Bolt torque must be applied on the nut located on the flange.

After installation, protect measuring device against ambient influences by replacing cap (part No. 4). See table 6.I for bolt elongation values.

Table 5.I

Cpl. size	S_1 mm	S_2 mm	S_3 mm	S_4 mm	S_5 mm	S_6 mm	S_7 mm	S_8	S_9	T_A Nm	Elongation mm	Width across flats mm	P mm	k_3 mm
80	8±0.2	100 140	60	32	4	-	-	acc. to order	acc. to order	10	-	10	29	4
92	8±0.2	100 140	70	37	4	44	11			10	-	10	29	4
102	8±0.2	100 140	80	42	4	49	11			10	-	10	29	4
128	11±0.3	100 140 180	96	50	4	60	14			25	-	13	38	5,5
145	11±0.3	100 140 180	116	60	4	70	14			25	-	13	38	5,5
168	14±0.3	100 140 180 250	136	70	4	83	17			50	-	17	45	7
180	15±0.4	100 140 180 250	140	72	4	86	18			85	0.11	19	53	8
200	15±0.4	140 180 250	140	73	6	86	19			85	0.13	19	60	10
205	20±0.4	140 180 250	140	73	6	91	24			200	0.14	24	65	10
215	20±0.4	140 180 250	160	83	6	101	24			200	0.14	24	65	10
235	23±0.5	180 250	170	88	6	109	27			400	0.17	30	81	13
250	23±0.5	180 250	170	88	6	109	27			400	0.17	30	81	13
270	23±0.5	180 250	190	98	6	119	27			400	0.17	30	81	13
300	27±0.6	180 250	200	105	10	128	33			700	0.20	36	95	15
320	27±0.6	180 250	220	115	10	138	33			700	0.20	36	95	15
350 370 400	32±0.7	-	240 250 290	125 130 150	10	153 158 178	38			1400	0.25	46	116	19
440 460 480	38±0.9	-	300 320 350	155 165 180	10	190 200 215	45			2400	0.29	55	133	23
500	38±0.9	-	370	190	10	225	45			2400	0.29	55	133	23
520	44±1		370	191	12	231	52			3900	0.35	65	156	26
540	44±1		380	196	12	236	52			3900	0.35	65	156	26
560	44±1	-	400	206	12	246	52			3900	0.35	65	156	26
600	50±1.2		410	211		257	58			5800	0.4	75	175	30
620	50±1.2		440	226		272	58			5800	0.4	75	175	30
660	50±1.2	-	480	246	12	292	58			5800	0.4	75	175	30
690	50±1.2		500	256		302	58			5800	0.4	75	175	30
720	60±1.4		510	261		317	68			9400	0.46	85	205	35
740 770 820	60±1.4	-	520 560 620	266 286 316	12	322 342 372	68			9400	0.46	85	205	35

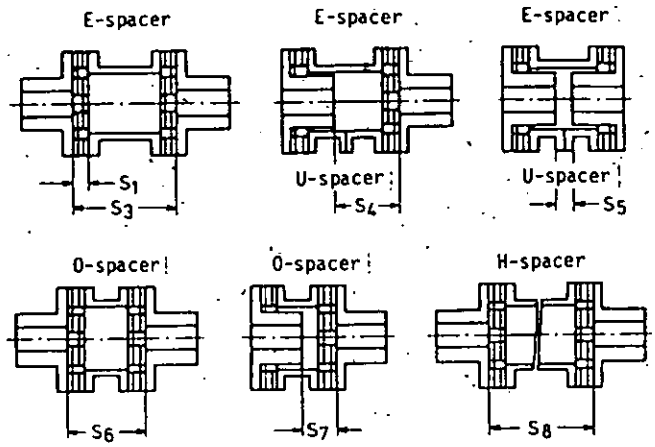


Table 6.I

Coupling size	S_1 mm	S_3 mm	S_4 mm	S_5 mm	S_6 mm	S_7 mm	S_8 mm	Elongation mm	Width across flats mm	P mm	k_3 mm
575	38 ± 1	436	226	16	300	40		0.27	55	155	35
635	38 ± 1	456	236	16	310	90		0.27	55	155	35
680	44 ± 1.3	464	240	16	354	130		0.33	65	185	41
745	44 ± 1.3	504	260	16	374	130		0.33	65	185	41
785	50 ± 1.6	558	289	20	399	130		0.39	75	210	46
875	50 ± 1.6	598	309	20	419	130		0.39	75	210	46
935	60 ± 1.9	628	324	20	464	160		0.46	85	245	54
1030	60 ± 1.9	688	354	20	494	160		0.46	85	245	54
1080	66 ± 2.2	726	376	26	510	160		0.52	90	270	57
1160	70 ± 2.3	836	431	26	565	160		0.57	95	290	60
1290	82 ± 2.6	946	486	26	620	160		0.66	105	340	67
1410	92 ± 2.8	1040	535	30	685	180		0.74	115	375	73
1530	105 ± 3	1100	565	30	785	250		0.87	130	435	81
1670	115 ± 3.4	1210	620	30	860	270		0.97	145	475	90
1830	125 ± 3.7	1320	680	40	950	310		*	155	520	97
2000	130 ± 4	1450	745	40	1015	310			170	555	105
2200	140 ± 4.4	1600	820	40	1090	310		*	185	585	113
2400	140 ± 4.8	1760	900	40	1170	310			200	610	122

*Values on request

5. Alignment

5.1. ARPEX couplings will compensate deviations in the relative positions of shafts to be connected.

5.2. However, the parallel offset and angular misalignment of shafts to be connected should be kept as small as possible. Alignment must be carried out in two perpendicular axial planes. An acceptable alignment can be obtained using a straightedge (parallel offset) and feeler gauge (angular misalignment). More accurate alignment can be got by using a dial indicator.

5.2.1. When using straightedge and feeler gauge or sliding calipers, checks should be made on a number of positions around the circumference. When using dial indicators, rotate one coupling half.

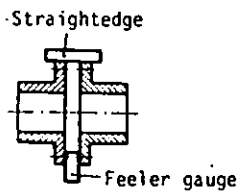


Fig. 7.1

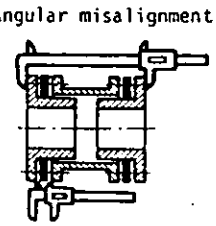


Fig. 7.2

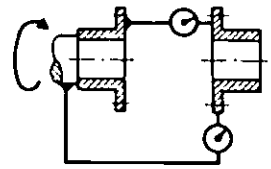


Fig. 7.3

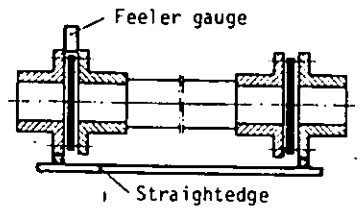


Fig. 7.4

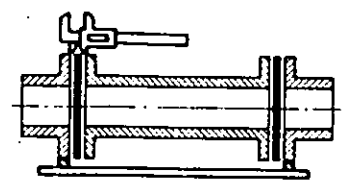


Fig. 7.5

5.2.2. Fig. 7.1 illustrates one way to align an ARPEX coupling type NN.

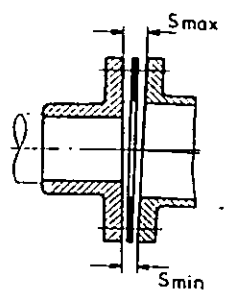
5.2.3. Fig. 7.2 check for angular misalignment with slide caliper rule.

5.2.4. Fig. 7.3 illustrates alignment of a coupling type with two N hubs, using a dial indicator.

5.2.5. Figs. 7.4 and 7.5 show alignment of type NN with intermediate shaft and type NHN, using a straightedge and feeler gauge or slide caliper rule resp.

5.2.6. Anologous alignment of coupling types not illustrated.

5.3. Angular misalignment Δk_w can be determined as shown in fig. 7.6. The listed values for ΔS (tables 8.I, 8.II) refer to an angular misalignment of 0.2^{o}. In the event of larger misalignment, see page 7 of catalogue K 430.



$S = S_{max.} - S_{min.}$

Fig. 7.6

Table 8.I

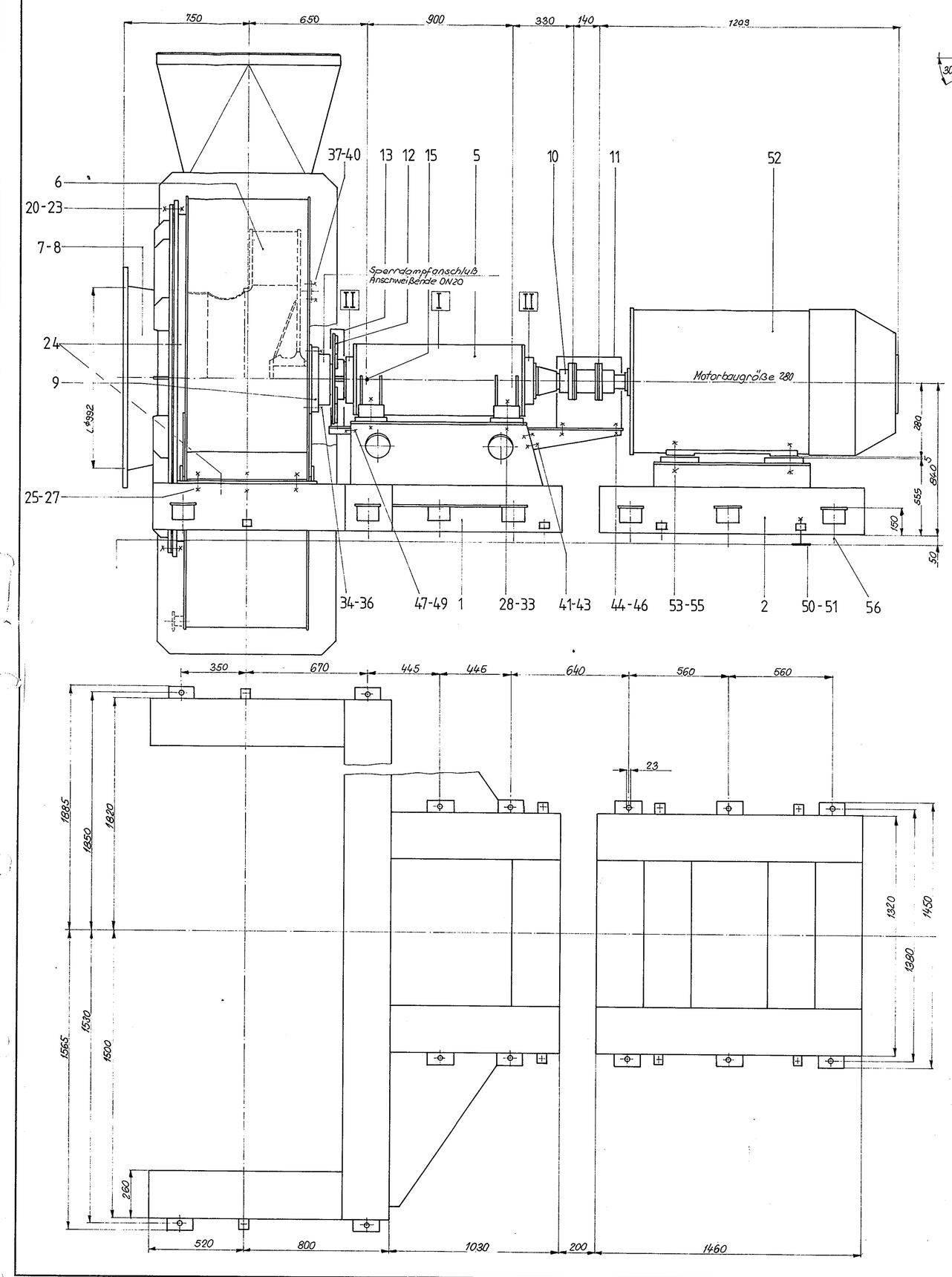
Standard series					
Coupling size	ΔS mm	Coupling size	ΔS mm	Coupling size	ΔS mm
80	0.28	250	0.85	520	1.8
92	0.32	270	0.95	540	1.85
102	0.35	300	1.05	560	1.95
128	0.45	320	1.1	600	2.1
145	0.5	350	1.2	620	2.15
168	0.55	370	1.3	660	2.3
180	0.6	400	1.4	690	2.4
200	0.7	440	1.5	720	2.5
205	0.7	460	1.6	740	2.55
215	0.75	480	1.65	770	2.65
235	0.8	500	1.75	820	2.85

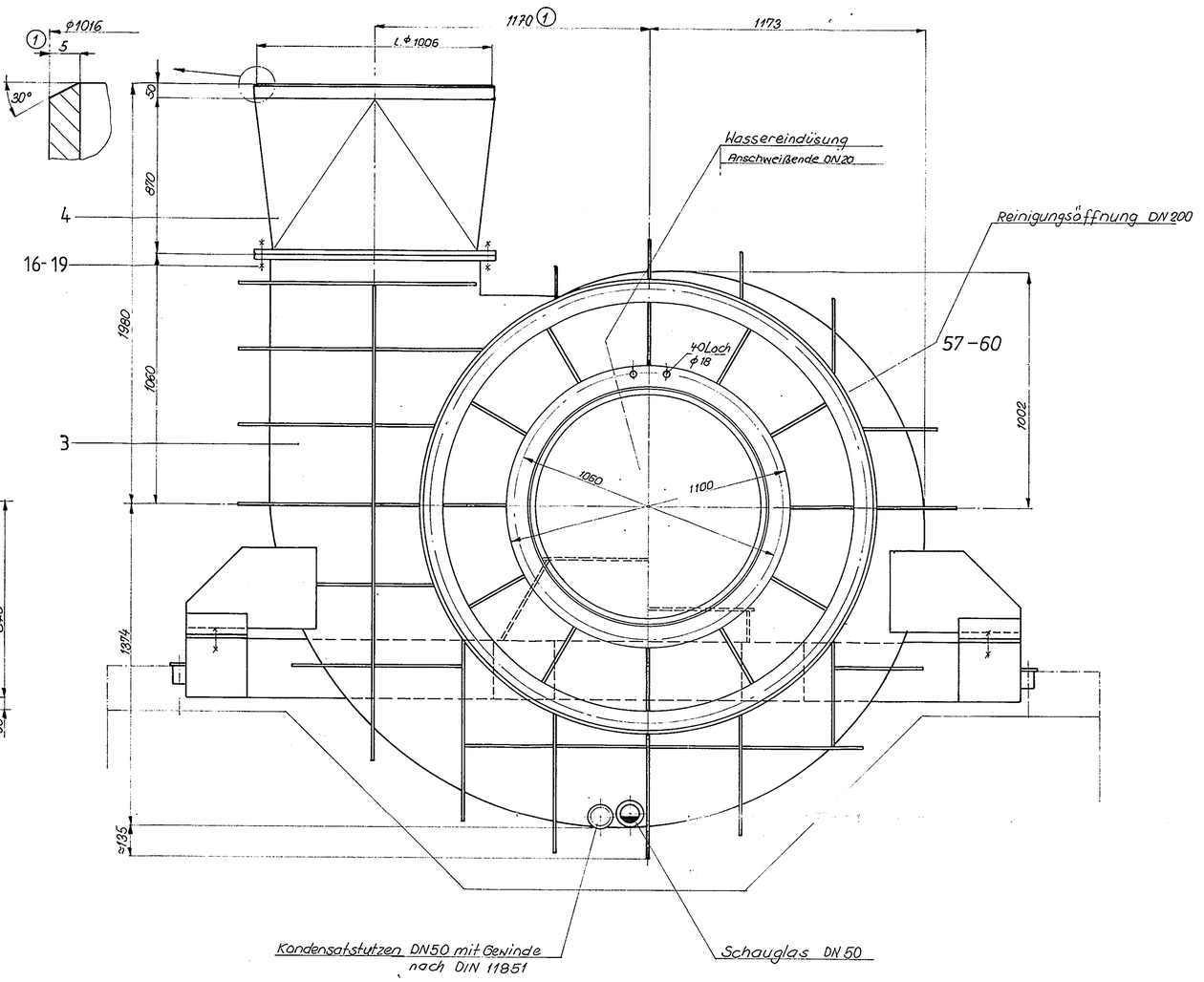
Table 8.II

High torque series			
Coupling size	ΔS mm	Coupling size	ΔS mm
575	2	1160	4.05
635	2.21	1290	4.5
680	2.37	1410	4.9
745	2.6	1530	5.35
785	2.74	1670	5.8
875	3.05	1830	6.4
935	3.26	2000	7
1030	3.59	2200	7.7
1080	3.77	2400	8.4

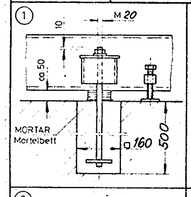
6. Operation

6.1. Before first start-up check again alignment of drive and tightness of bolts; correct if necessary.

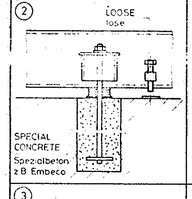




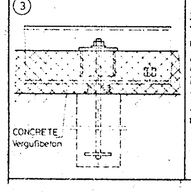
Arbeitsablauf der Grundrahmenmontage



1. Grundrahmen mit eingehängten Fundamentschrauben auf Betonsockel setzen. Mit Ausrichtschrauben ausrichten. Mit Unterlegblechen im Bereich der Fundamentschrauben unterfüttern. Unterstes Blech in Mörtelbett einlegen.



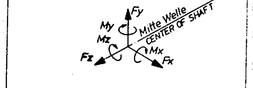
2. Fundamentschrauben mit Spezialbeton vergießen. Beton abbinden lassen, Ausrichtschrauben lösen. Fundamentschrauben anziehen. Ausrichtung kontrollieren. Falls erforderlich, nachrichten (Ausrichtschrauben lösen).



3. Montage Motor, Gebläse, Turbine usw. Fundamentrahmen einschalen, mit Vergußbeton vergießen. Betonoberfläche mit ölfester Farbe streichen. Nach dreitägigem Betrieb des Ventilators Fundamentschrauben nachziehen.

Max. zulässige Kräfte und Momente an den Ventilatorstutzen
MAX. PERMISSIBLE FORCES AND MOMENTS ON THE FAN CONNECTIONS

Saugstutzen FAN INLET		Druckstutzen FAN OUTLET	
Fx = 3000	N	Fx = 3000	N
Fy = 3000	N	Fy = 5000	N
Fz = 5000	N	Fz = 3000	N
Mx = 500	Nm	Mx = 500	Nm
My = 500	Nm	My = 500	Nm
Mz = 500	Nm	Mz = 500	Nm



Angaben zur Auslegung der Stützkonstruktion

Gesamtgewicht: (Gehäuse, Laufrad, Lagerung, Grundrahmen, Motor/Turbine)	G =	6150 kg
Gewicht der rotierenden Teile: Ventilator (Laufrad, Welle usw.)	G_V =	1176 kg
Motor (Anker, Kupplung usw.)	G_M =	— kg
Drehzahl: Ventilator/Verdichter	n_V =	2900 1/min
Motor	n_M =	2900 1/min
Massenträgheitsmoment: Ventilator/Verdichter	J_V =	350 kgm²
auf Motordrehzahl bezogen	J_{VM} =	350 kgm²
Motor	J_M =	— kgm²
Leistung: Ventilator/Verdichter	P_V =	2315 kW
Motor	P_M =	315 kW
Bei schwingungsisolierter Aufstellung: Abstimmung n_V/n_E =	n_M/n_E =	—
Isolierwirkungsgrad	ηi =	— %

Die angegebenen Gewichte und Kräfte beinhalten keine Zuschläge.
Für die schwingungstechnisch und festigkeitsmäßig richtige Dimensionierung der Stützkonstruktion ist der Auftraggeber verantwortlich.
Wegen schwingungsisolierter Aufstellung saug- und druckseitige Kompensatoren erforderlich.
Rohrleitungen spannungsarm anschließen.

Freimaßtoleranzen n. DIN 7168 Genauigkeitsgrad fein, mittel, grob
Freimaßtoleranzen n. DIN 8570 Blatt 1 Genauigkeitsgrad A

Stück	Benennung	Teil Nr.	Zeichnungs-Nr.	Normblatt	Werkstoff	Abmessung	Disp.	Gewicht
1								

Bearbeitung:
Oberfläche Reihe ... DIN 3141
Fertig-Gewicht (kg)
Maßstab: 1:12,5
Ersatz für:
Ersetzt durch:

	Datum	Name
1984		
gezeichnet	26.3.	
gepaust		
geprüft		
Änderung 2		
Motorabmessung, Saug- u. Druckstutzen!	22.5.84	
3.) Motorabmessung	20.7.84	

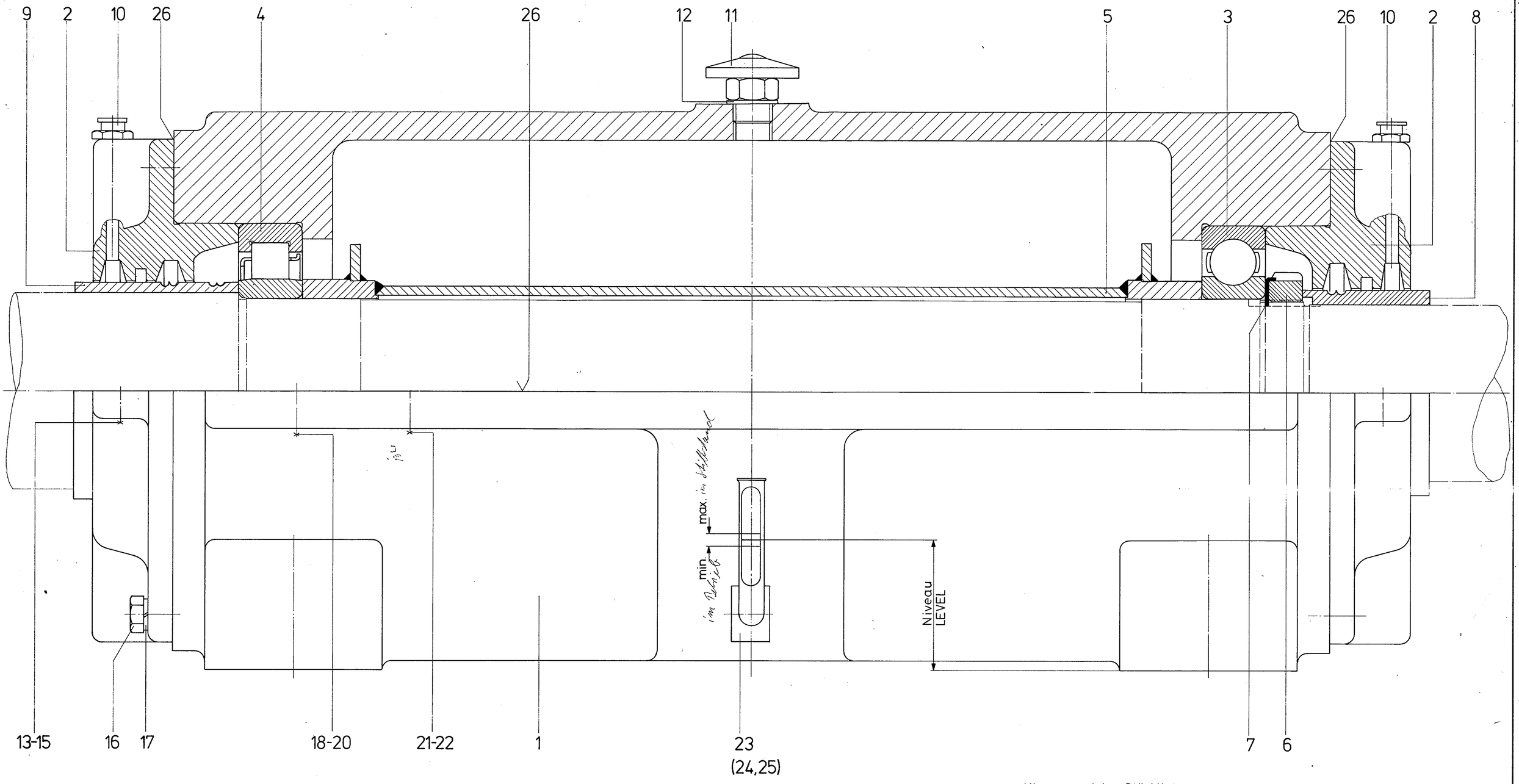
1 Stück | 124 112 00 Auftrags-Nr.

SCHIELE ESCHBORN — G. Schiele & Co. Eschborn (Taunus)

11.00-313 - 801/3(1)

Radial-Ventilator gezeichnet: G L 360
Baumuster: R113/1500 K P
Auftr Nr. 124 11200 Ausführung: Gehäusestellung GL

FA = fertig v. auswärts VA = vorgearb. v. auswärts RA = roh v. auswärts RL = roh ab Lager VL = vorgearb. ab Lager FL = fig. ab Lager



Niveau: siehe Stückliste
LEVEL: SEE PART LIST

Stück	Benennung	Teil Nr	Zeichnungs-Nr	Normblatt	Werkstoff	Abmessung	Dsp.	Gewicht
Bearbeitung	—		Oberfläche Reihe — DIN 3141			Fertig-Gewicht (kg)		—
Maßstab	—		Ersatz für		Ersetzt durch			
1984	Datum	Name						
gezeichnet	4.4.							
gepaust								
geprüft								
Änderung								

SCHIELE ESCHBORN — G. Schiele & Co. Eschborn (Taunus)

00.50 - 000 - 130/0(1)

Stehlager SDG
PLUMMER BLOCK SDG

Stck | Auftrags-Nr

FA = fertig v. auswärts VA = vorgearb. v. auswärts RA = roh v. auswärts RL = roh ab Lager VL = vorgearb. ab Lager FL = flg. ab Lager

SCHENCK

VIBROCONTROL 1000

Series C

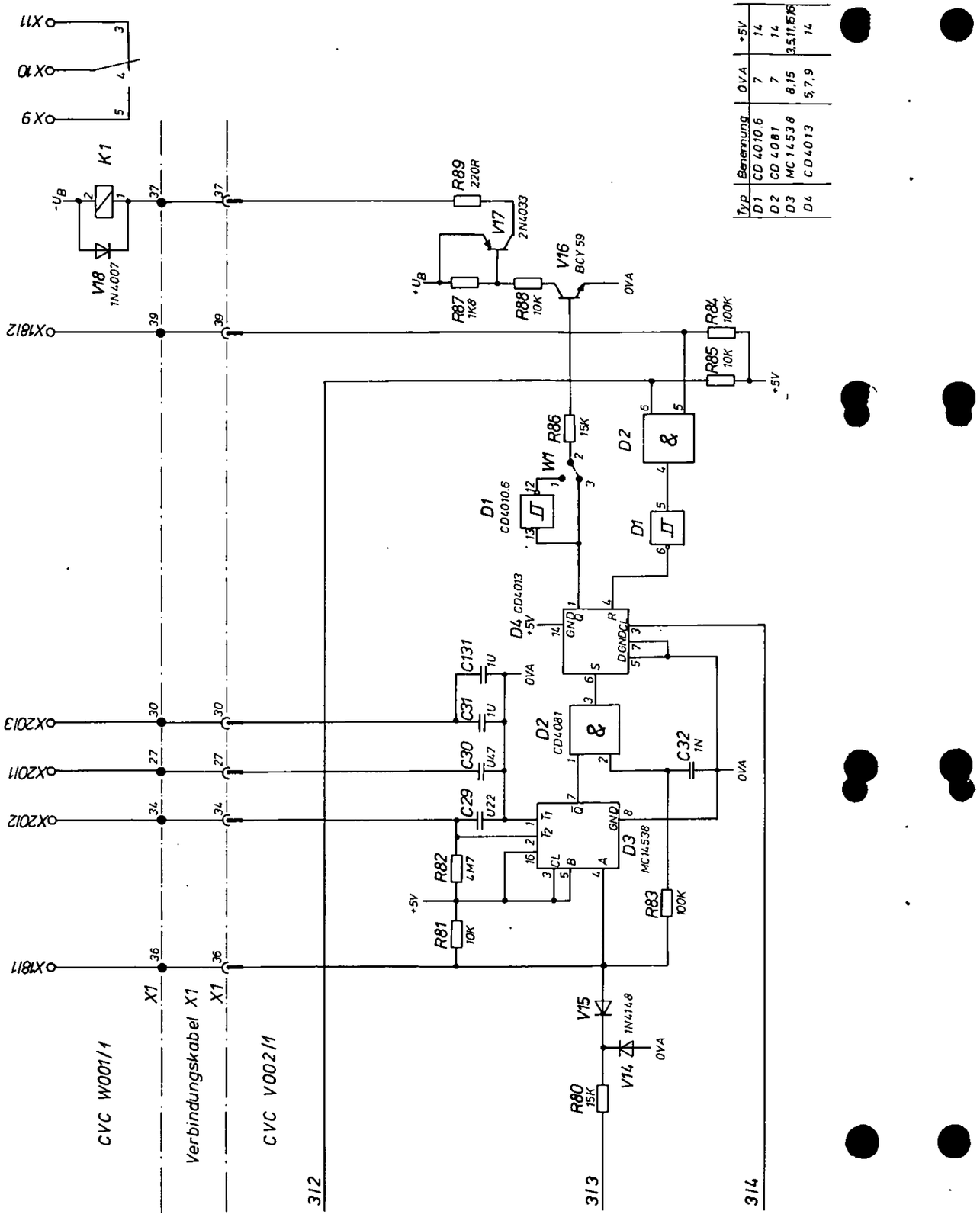
Measuring and monitoring of machine bearing vibration

Description
Operation
Application

CARL SCHENCK AG
Postf. 4018 · D-6100 Darmstadt 1 · Tel. (06151) 8821 · Tx. 4196940 csd

1-0100.0782 HD

3370.066



Typ	Benennung	0VA	+5V
D1	CD 4010.6	7	14
D2	CD 4081	7	14
D3	MC 14538	8,15	3,5,11,15,16
D4	CD4013	5,7,9	14

C O N T E N T S

Attachment Type approval certificate
Test certificate of German National Physical Institute Nr. III B/E - 24 304
Circuit diagrams

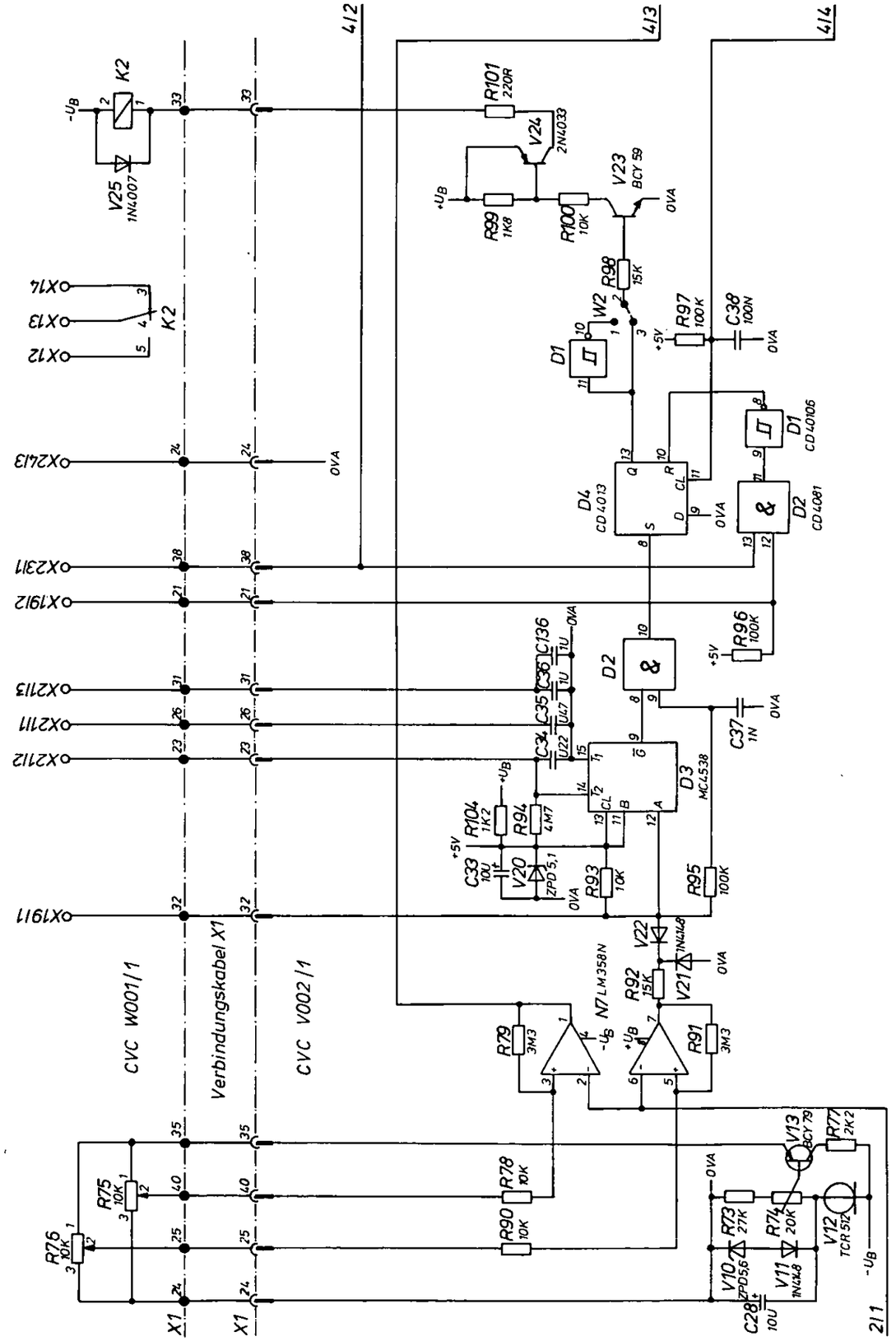
1. Introduction

VIBROCONTROL 1000 vibration monitoring systems series C are used to measure and monitor machine bearing vibration. The system measures the rms value of vibration velocity in accordance with VDI guideline 2056, ISO standards 2372 ISO/DIN standards 2373 and British Standard BS 4675:1971. Change-over to measurement and monitoring of vibration displacement is possible.

Eight models of the VIBROCONTROL 1000 system series C are available:

Purpose \ Type	C1	CR1	C2	CR2	C31	CR31	C32... C36	CR32 ...CR36
Measuring (with output 0/4 to 20 mA and 0 to 10 V)	●	●	●	●	●	●	●	●
Monitoring (with settable alarm limits)		●		●		●		●
Additional indicating instrument			●	●				
Additional 1-colour dot recorder					●	●		
Additional multicolour dot recorder for 2 to 6 bearings (measuring points)							●	●

Table 1 : Description of standard models



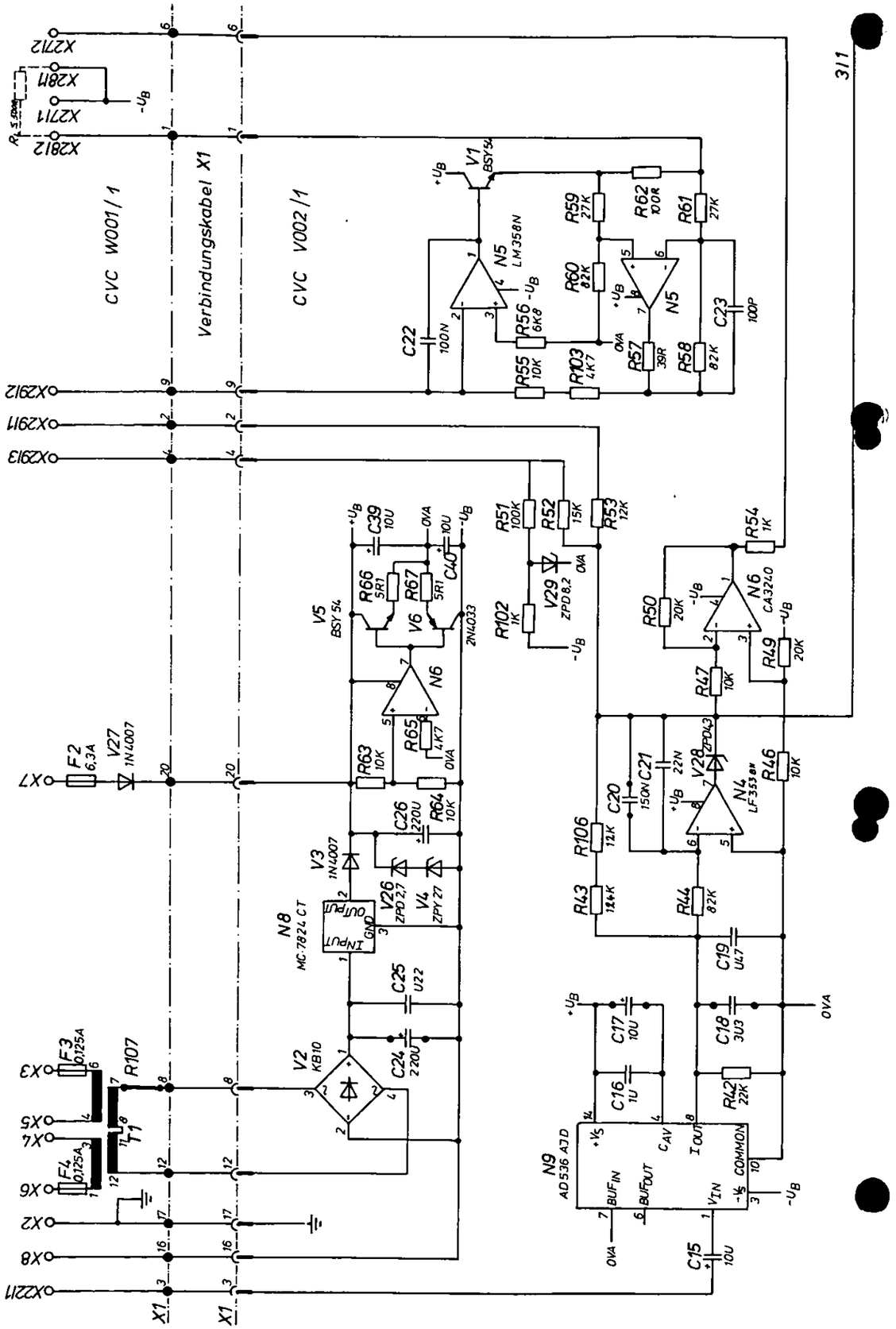


Table 2 shows the scope of supply for the different models :

Type	C1	CR1	C2	CR2	C31	CR31	C32...C36	CR32...CR36
Sensor VS 068/69; Technical data as per page 11	1	1	1.	1	1	1	2 ... 6	2 ... 6
Measuring amplifier CV-111, standard model; Technical data as per page 15	1		1		1		1	
Monitoring amplifier CV-110, standard model; Technical data as per page 15		1		1		1		1
Moving coil instrument, 0 ... 20 mA; Technical data as per page 21			1	1				
Single-colour dot recorder; Technical data as per page 18					1	1		
Multi-colour dot recorder; Technical data as per page 18							1	1

Table 2 : Scope of supply for standard package

2. Principle of operation

Electro-dynamic vibration sensors convert mechanical vibration into an analogue electrical signal. The output voltage supplied by the sensor is proportional to the vibration velocity.

The a.c. signal supplied by the sensor is amplified, rectified and adapted to the measuring span in the measuring / monitoring amplifier. At the output of these circuits, a d.c. voltage signal of 0 to 10 V or a d.c. current signal of 0 to 20 mA or 4 to 20 mA is available, which can be applied to various instruments such as plotters, indicating instruments or alarm signalling devices. Figures 3 to 5 show 3 basic circuit arrangements for VIBROCONTROL 1000 monitoring systems series C.

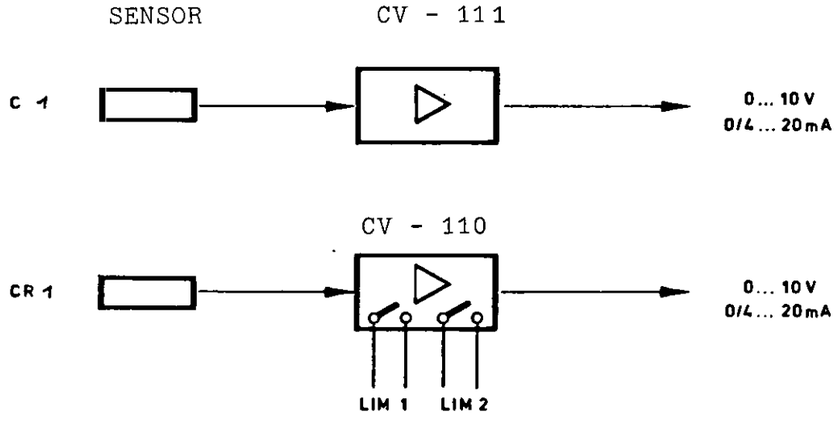
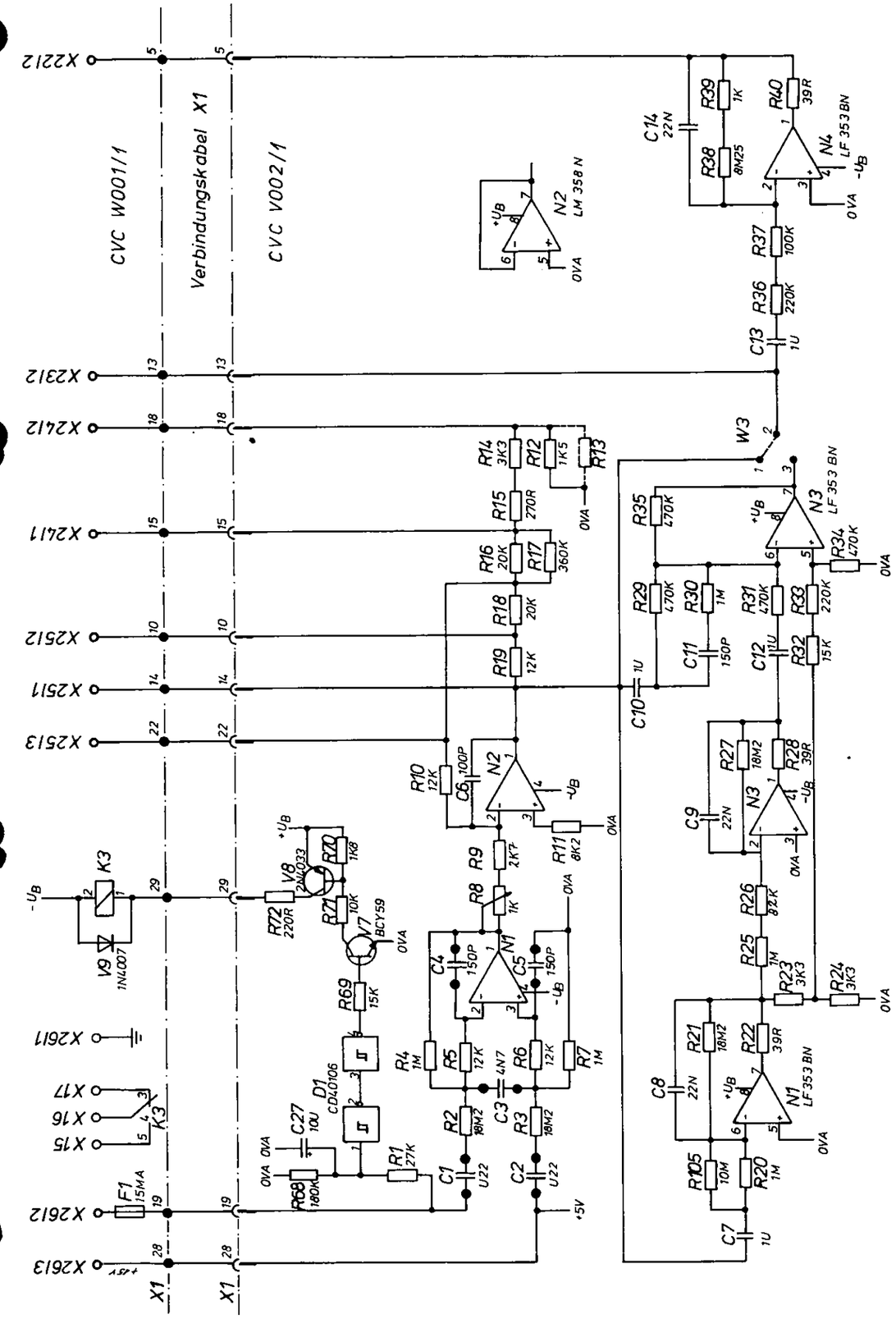


Fig. 3 : Block diagrams of models C1 (top) and CR1 (bottom)



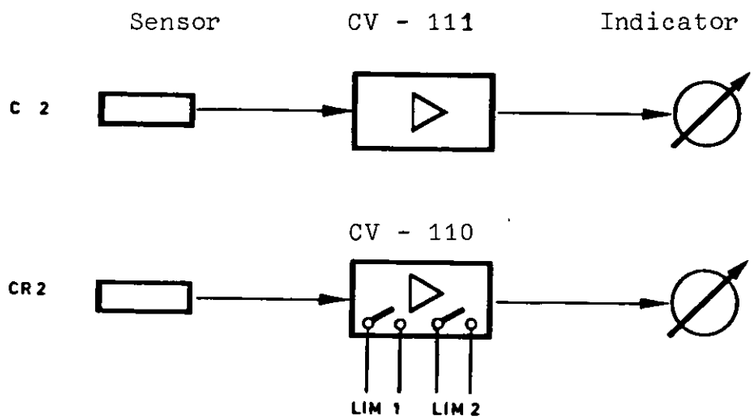


Fig. 4: Block diagrams of models C2 (top) and CR2 (bottom)

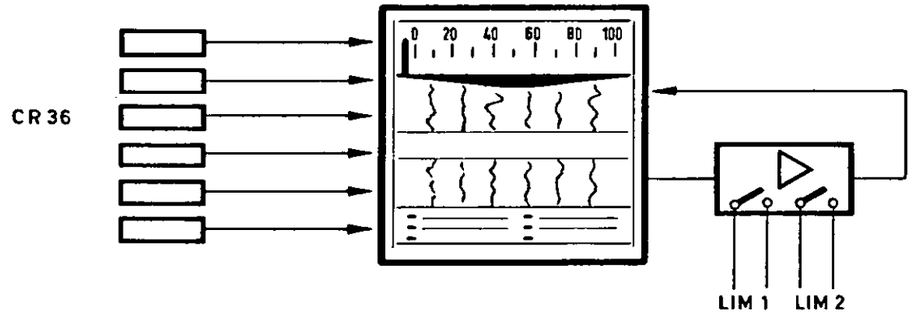


Fig. 5: Block diagram for CR36 model.
For C36 models, the measuring amplifier CV-111 (without relay) is used in the place of the monitoring amplifier CV-110 (with relay).

Each system has five calibrated measuring ranges for vibration velocity or for vibration displacement. In addition, the monitoring amplifier CV-110 enables 2 alarm limits to be set. A power relay is provided for each of the alarm limits, the throw-over contacts of which can be used to trip an alarm or to shut down the machine concerned.

A supplementary OK relay monitors the power supply and the sensor circuit by means of a d.c. current passing through the sensor coil.

The application of the VIBROCONTROL 1000 system increases the operational reliablility of machines and contributes towards maintaining the value of plant, and avoiding down-times.

Blatt 2 zum Prüfungsschein PTB Nr. III B/E-24 304

Prüfungsunterlagen

1. Beschreibung (3 Blatt) unterschrieben am 15.10.73
2. Zeichnung Nr. 042 248) 042557) 042 530) 042 556) unterschrieben am 16.10.73
   AP8 296 unterschrieben am 4.12.73
3. Prüfmuster

Die Anlagen zu diesem Prüfungsschein (Unterlagen zu 1. und 2.) wurden zur Festlegung der Bauart und der Ausführung mit dem Dienstsiegel der Physikalisch-Technischen Bundesanstalt versehen.

Beurteilung

Der Schwingungsaufnehmer Typ T 70 entspricht in seiner Bauart den Bestimmungen VDE 0171/1.69; er ist zum Einsatz in Betriebsstätten geeignet, die durch brennbare Stoffe aller Explosionsklassen im Bereich der Zündgruppen G1 bis G5 explosionsgefährdet sind.

Jedem Schwingungsaufnehmer ist eine - seinem Nennstrom entsprechende - mittelträge Sicherung vorzuschalten (Zusatzschild).

Dieser Prüfungsschein gilt für jeden Schwingungsaufnehmer des genannten Typs, für den eine Stückprüfung nach VDE 0171 erfolgreich durchgeführt worden ist.

Physikalisch-Technische Bundesanstalt
D-33 Braunschweig, den 21.1.1974 Abteilung 3
Bundesallee 100 Im Auftrage

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT 3/2

(Dipl.-Ing.Schebsdat)
Oberregierungsrat

19342 F1

Physikalisch-Technische Bundesanstalt

Prüfungsschein

PTB Nr. III B/E- 24 304

Typenprüfung des Schwingungsaufnehmers
Typ T 70

der Firma Carl Schenk Maschinenfabrik GmbH, Darmstadt

auf Explosionsschutz nach VDE 0171 in der Schutzart "Sonderschutz" (Ex)s G5.

Die elektrischen Bauteile sind vollständig in Gießharz gekapselt.

Der Schwingungsaufnehmer dient zur Übertragung kleiner mechanischer Schwingungen in ein elektrisches Ausgangssignal.

Elektrische Daten

Ausgangsspannung	10 V~
Nennstrom	≦ 25 mA
Innenwiderstand	ca 4 kΩ

-2-

PTB-Formblatt 3.4-1 1973 19383 FI

3. Definitions:

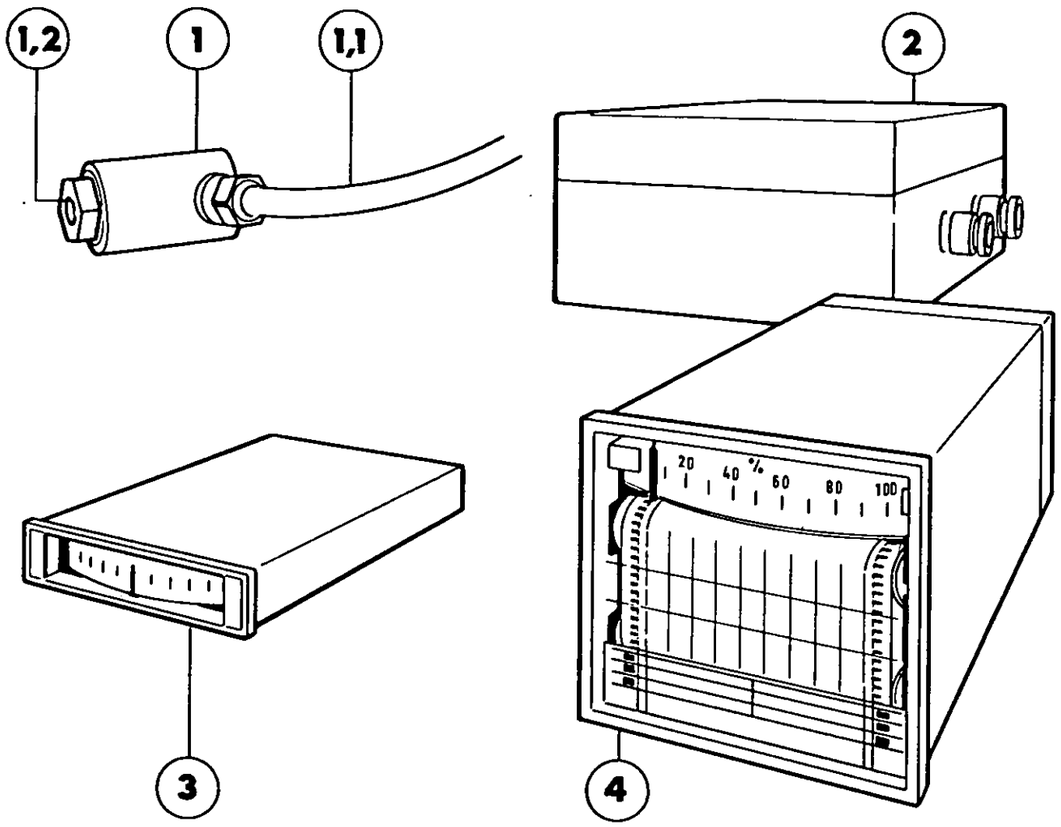


Fig. 6: Vibration sensor, measuring amplifier, indicating instrument and plotter

1	Vibration sensor (type VS)
1.1	Connecting cable
1.2	Connecting thread
2	Measuring or monitoring amplifer
3	Indicating instrument
4	Recorder

4. Technical specifications

4.1 Vibration sensors type VS-068/069/077/079

VS-068/069/077/079

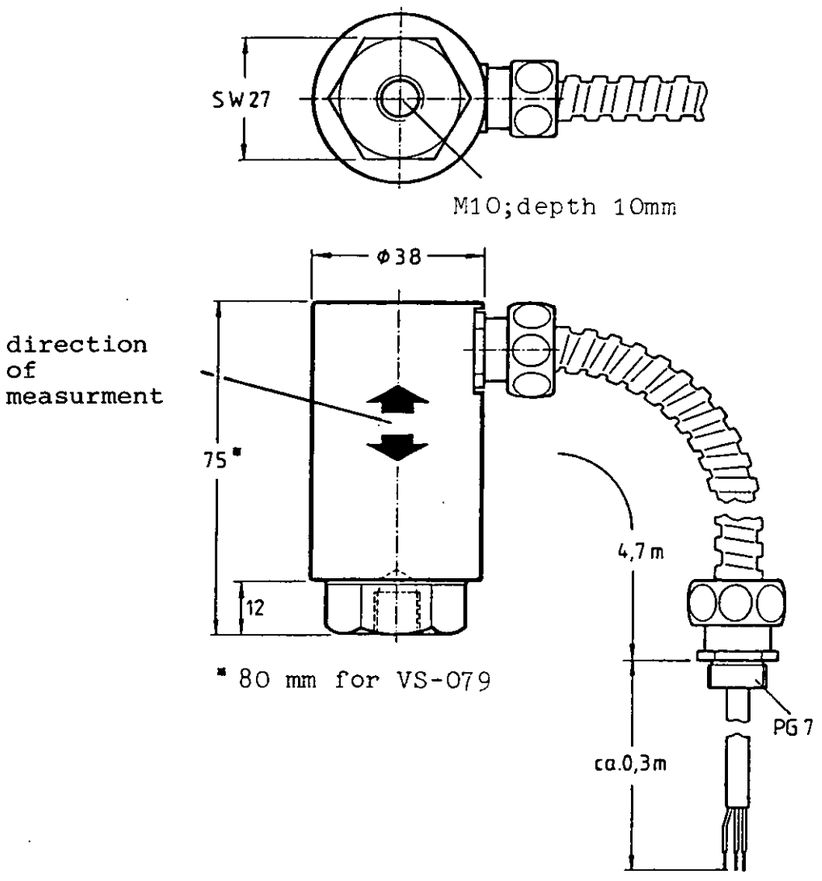


Fig. 7: Absolute vibration sensors type VS- ...

Der Hessische Sozialminister 62 Wiesbaden, den 19. März 1974

BAUARTZULASSUNGS-BESCHEINIGUNG

Nach § 5 der Verordnung über elektrische Anlagen in explosionsgefährdeten Räumen vom 15.8.1963, zuletzt geändert durch Verordnung vom 29.1.1968 (BGBl. I S. 109), wird das von der Firma

Carl Schenck, Maschinenfabrik GmbH.,
Darmstadt

hergestellte elektrische Betriebsmittel,

der Schwingungsaufnehmer Typ T 70

unter Bezugnahme auf den anliegenden Prüfungsschein der Physikalisch-Technischen Bundesanstalt vom 21.1.1974 PTB Nr. III B/E 24 304 zugelassen.

Der Prüfungsschein ist Bestandteil dieser Bauartzulassungs-Bescheinigung.

Das elektrische Betriebsmittel muß mit dem Zulassungskennzeichen

PTB Nr. III B/E 24 304

und den Angaben (Ex) s G5

versehen sein.

I C 6a - Az.: 53g 621

Im Auftrage:

(Dipl.-Phys.Hinrichs)

CARL SCHENCK AG
D-61 Darmstadt · Postf. 4018 · Tel. (06151) 8821 · Telex: 419611

Beilage zur Betriebsanleitung für die
Schwingungsüberwachungs-Anlage

Die vorliegende Schwingungsüberwachungs-Anlage Typ VIBROCONTROL ist mit einem Schwingungsaufnehmer in ex-geschützter Ausführung ausgestattet. Dadurch ergeben sich gegenüber der Bedienungsanleitung folgende Änderungen:

Schwingungsaufnehmer

Typ und Meßrichtung:
Typ T 70 H (Ex) sG5: horizontal
Typ T 70 V (Ex) sG5: vertikal
Der Typ T 70 (Ex) sG5 entspricht in seiner Bauart den Bestimmungen der Schutzart "Sonderschutz" (Ex) sG5 nach VDE 0171/1.69.
Er ist zum Einsatz in Betriebsstätten geeignet, die durch brennbare Stoffe aller Explosionsklassen im Bereich der Zündgruppen G1 bis G5 explosionsgefährdet sind (siehe beiliegenden PTB-Prüfungsschein Nr. III B/E - 24 304).

ES WIRD DARAUF AUFMERKSAM GEMACHT, DASS SICH DER EX-SCHUTZ AUSSCHLIESSLICH AUF DEN SCHWINGUNGSAUFNEHMER ERSTRECKT.

Das elektronische Überwachungsgerät bzw. das Kontaktinstrument mit Abgleich- und Gleichrichterschaltung muß in einer außerhalb des exgefährdeten Raumes liegenden Schaltwarte installiert werden. Das abgeschirmte Verbindungskabel zwischen beiden Bauteilen kann ohne weiteres bis zu 200 m, in besonderen Fällen auch bis zu 500 m, lang sein.

Die im PTB-Prüfungsschein vorgeschriebene Vorschalt-Sicherung ist bereits im Werk in den Eingangskreis des Überwachungsgerätes bzw. der Abgleich- und Gleichrichterschaltung eingebaut worden.

Zur Verlängerung des Schwingungsaufnehmerkabels innerhalb des ex-gefährdeten Bereiches ist eine Kabelabzweigdose mit "Ex-Schutzzertifikat" der PTB zu verwenden.

Achtung: Wird ein Kupplungsstecker mitgeliefert, so ist unbedingt darauf zu achten, daß eine Kabelverbindung mittels dieses Steckers außerhalb des Ex-Bereiches vorgenommen wird.

Ordering codes and ordering example

Absolute velocity sensors

Design	VS	Ordering codes
Direction of measurement and working temperatures -34°C...	horizontal +100°C vertical +100°C hor/vert +100°C hor/vert +200°C	068 069 077 079 → VS- □□□
Electrical connection	5 m long cable, steel protective tubing, BNC connector	1 2 → □
Terminal protective enclosure type AC-121/2/1/0/124 1)	no yes	1 *2 → □
Polarity	positive negative (BNC connector only)	1 2 → □
Special agreements?	no yes	0 *1 → □
Check sum (sum of above codes)		□□□

1) Terminal protection enclosure see specification AC-121

* Extra-cost option

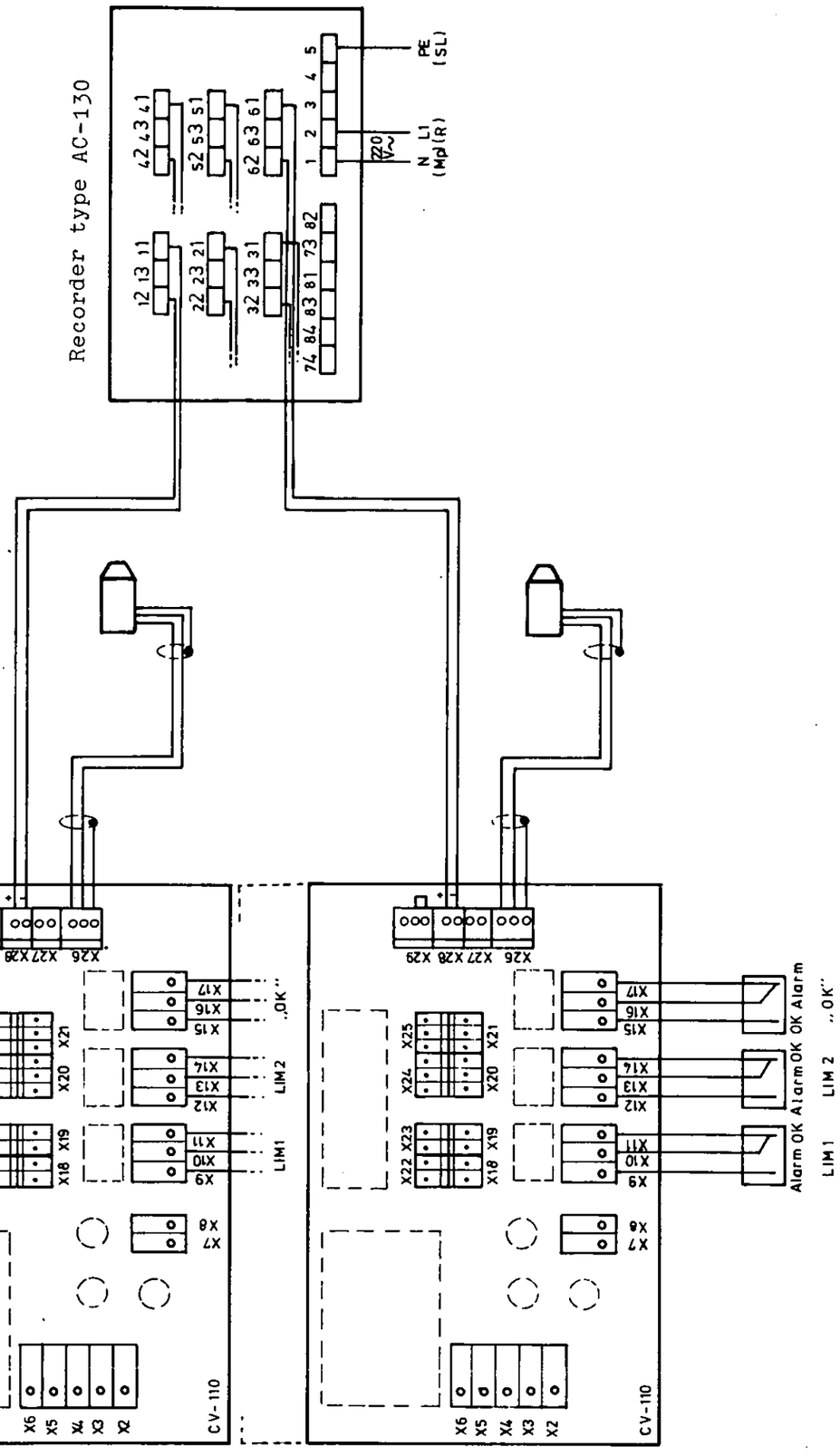
Ordering example

Order code VS-068 / 1 / 1 / 1 / 0 / 071
Horizontal direction of measurement
5 m long teflon cable with steel tubing
Without terminal protection enclosure
Positive polarity
No special agreements
Check sum

Technical specifications:

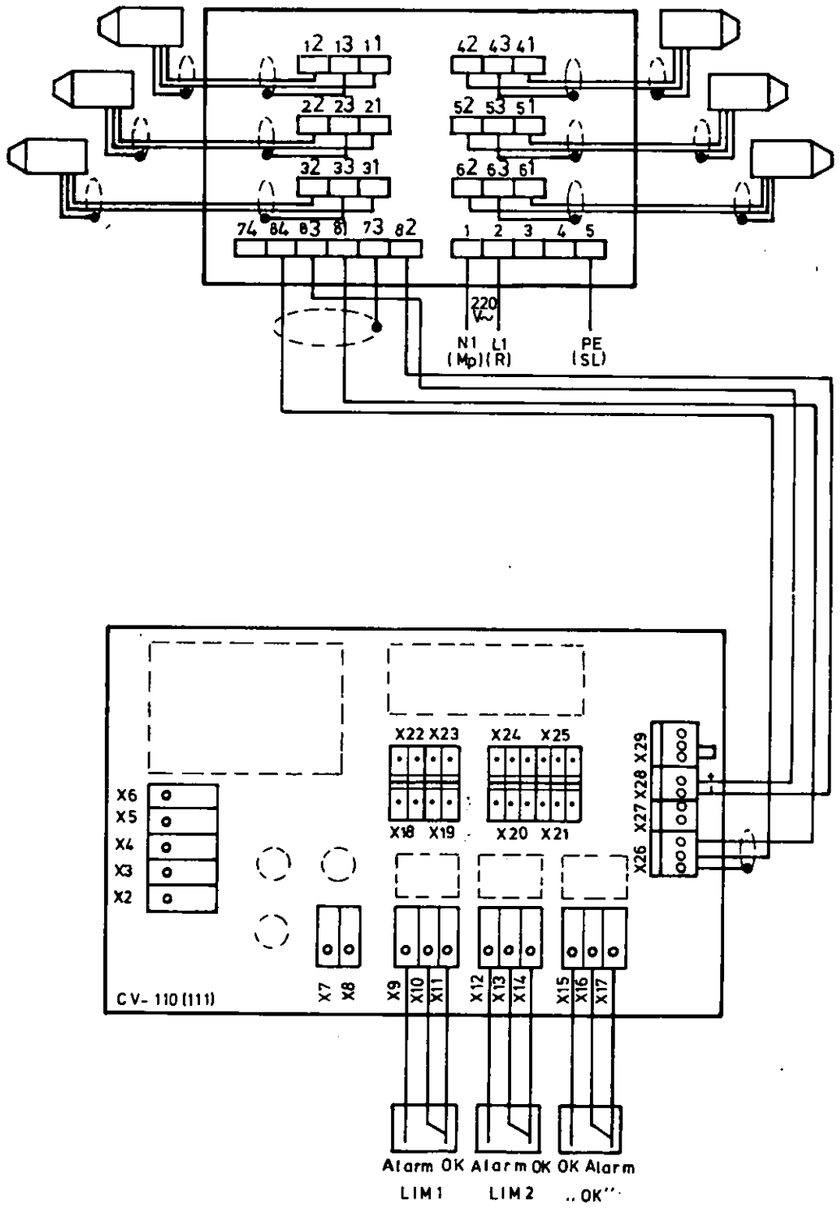
Measuring principle:	electrodynamic absolute sensor
Direction of measurement: (see page 13a)	VS-068 horizontal ± 10° VS-069 vertical ± 30° VS-077/079 vertical ± 105°
No-load voltage	VS-068/069 approx. 100 mV/mm/s(AC) VS-077/079 approx. 75 mV/mm/s(AC)
Natural frequency:	VS-068/069 approx. 8 Hz VS-077/079 approx.15 Hz
Working frequencies:	VS-068/069 10 to 2000 Hz 1 to 2000 Hz with frequency response linearization circuit in the measuring unit VS-077/079 15 to 2000 Hz 2 to 2000 Hz with frequency response linearization circuit in the measuring unit
Dimensions:	Diameter 38 mm Overall length 75 mm Connecting thread M10 Spanner SW 27
Weight:	approx. 0.35 kg (0.66 lbs)
Limit loading:	in the main direction of measurement: ± 1.0 mm or 500 m/s^2 transverse to the main direction of measurement: 50 m/s^2
Internal impedance:	VS-068/069 4 kOhm ± 5 % VS-077/079 3.4 kOhm ± 5 %
Special features:	Totally enclosed in stainless-steel housing, thus also suitable for use in a chemically aggressive atmosphere and for outdoor application. Vibration sensor non-repairable
Enclosure protective rating:	IP-68 according to DIN 40050 (Protected against ingression of dust, and protected against immersion)

Special type: 1 to 6 measuring points are continuously monitored



CR 36 model
(C 36 model without relays)

Recorder Type AC-130



SENSOR INSTALLATION RANGES

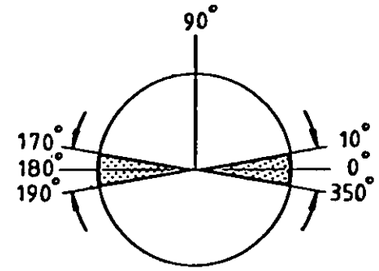


Fig. 7a: Horizontal direction of measurement: VS-068, T-70 H (ex)

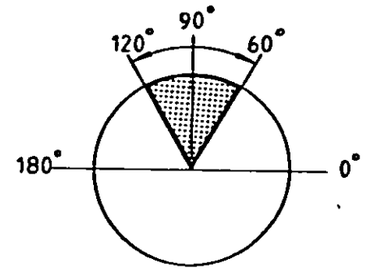


Fig. 7b: Vertical direction of measurement: VS-069, T-70V (ex)

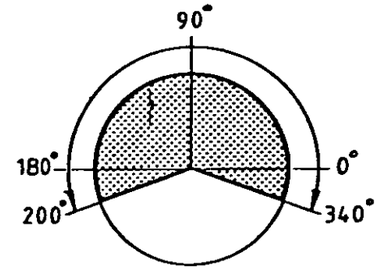


Fig. 7c: Horizontal and vertical direction of measurement
VS-077/079, T-078 (ex)

4.2 Sensor with explosion-proof certification for (Ex) sG5, type T-70H/70V/078

For VIBROCONTROL 1000 vibration monitoring systems used in areas subject to explosion hazard, sensors type VS-068, VS-069 or VS-077 must be replaced by sensors type T-70H(Ex)sG5, T-70V (Ex)sG5, or T-078 (Ex)sG5.

Important: The explosion proofing refers only to the sensors!

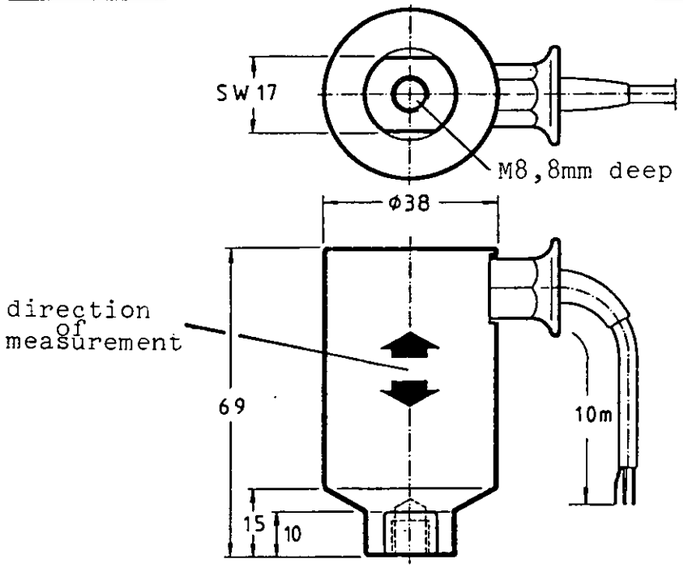
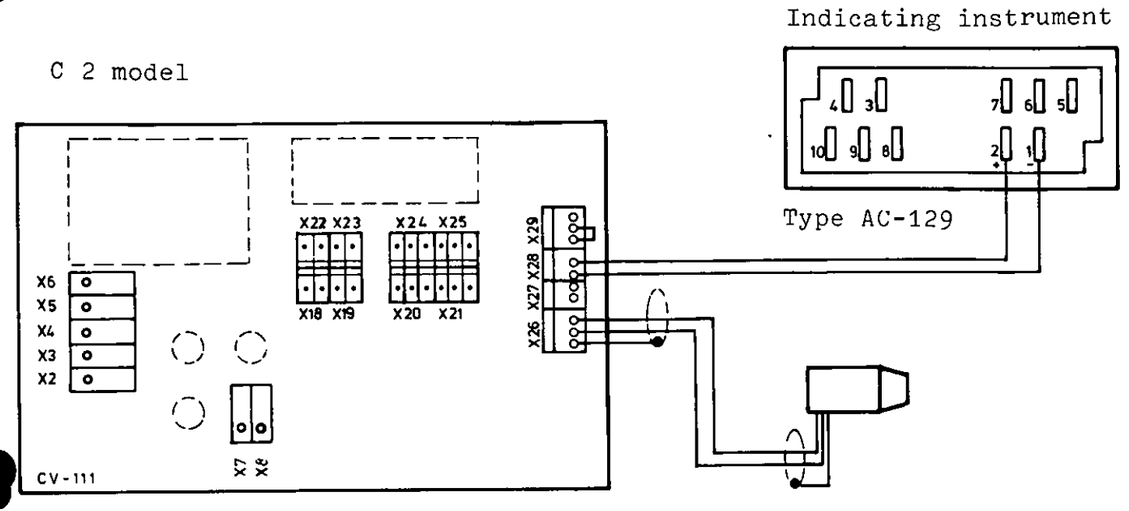


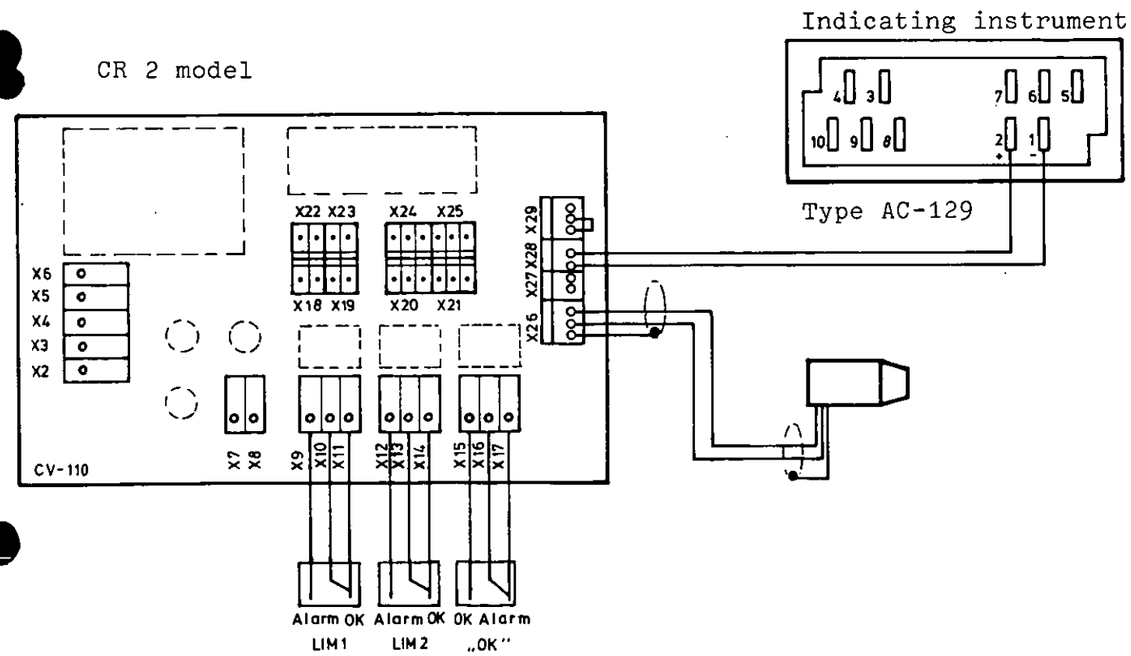
Fig. 8: Vibration sensors type T-..., with explosion protection.

Ordering codes and ordering example:
Absolute vibration sensors with explosion-proof certification for (Ex) sG5

Design:	T	Ordering code:
Direction of measurement - working temperature range: -34°C to +90°C	horizontal vertical hor/vert	70H 70V 078 → □□□
Terminal protective enclosure	no yes	1 *2 → □
Special agreements:	no yes	0 *1 → □
Check sum (sum of above codes)		□□□

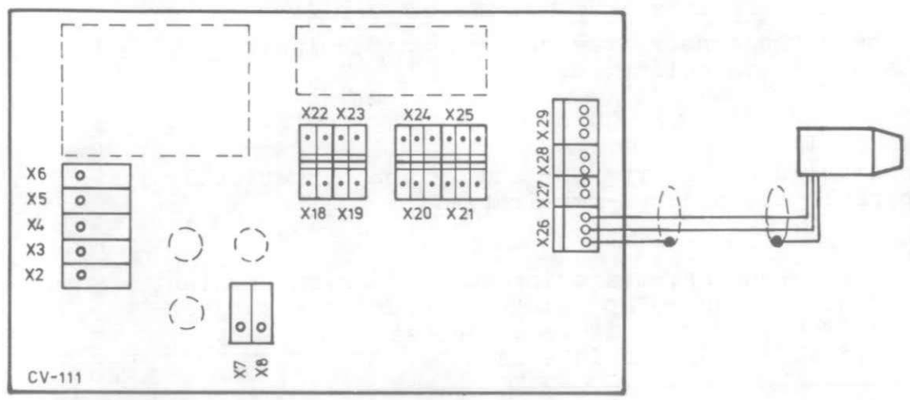
*Extra-cost option 1) Terminal protective enclosure type AC-121/2/2/0/125 see specification



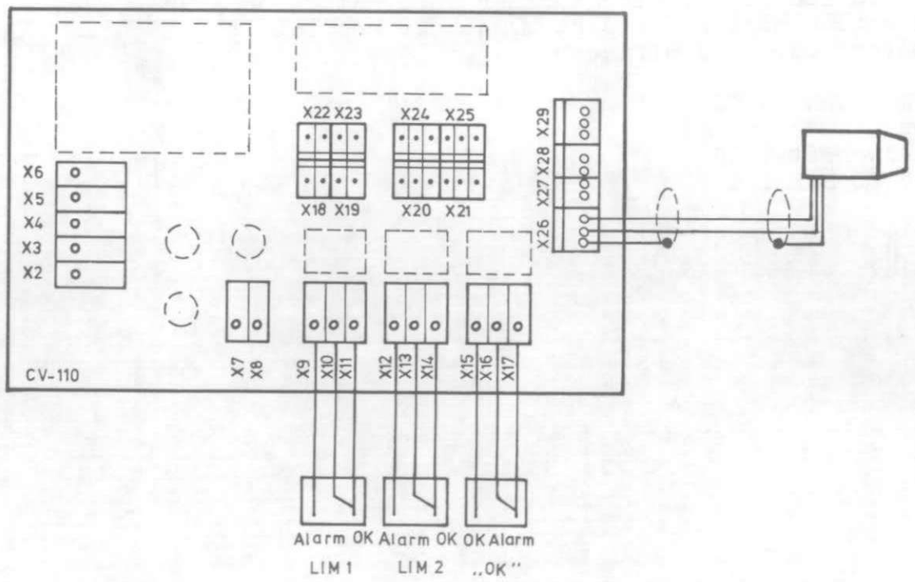


C O N N E C T I O N D I A G R A M S

C1 model



CR 1 model



Example of order

Ordering code T-70H / 1 / 0 / 071

Horizontal direction of measurement

Terminal protective enclosure

No special agreements

Check sum

All other technical data are the same as for the corresponding VS sensors (T-70H - VS-068; T70V - VS-069; T-078 - VS-077).

4.3 Measuring or monitoring amplifier

Fig. 9: CV-111 or CV-110 measuring or monitoring amplifier.

Ordering codes and ordering example:

Order data: Vibrocontrol 1000 vibration monitoring system

	Design			Ordering code
Type	CV-110 (monitoring) CV-111 (non-monitoring)			CV- □□□
Sensor type, measuring parameter and working frequency range	VS-068 VS-069 T-70ex	Vibration velocity: 10 ... 1000 Hz 1 ... 1000 Hz	* *	1 2
		Vibration displacement: 10 ... 1000 Hz	*	3
	VS-077 VS-079 T-78ex	Vibration velocity: 15 ... 1000 Hz 2 ... 1000 Hz	* *	4 5
		Vibration displacement: 15 ... 1000 Hz	*	6
	Special sensors	Without linearization With linearization	* *	7 8
				→ □
Measuring range	0 .. 10 mm/s 0 .. 2 mm/s 0 .. 5 mm/s 0 .. 20 mm/s 0 .. 50 mm/s	0 ...100 µm 0 ... 20 µm 0 ... 50 µm 0 ...200 µm 0 ...500 µm	 * * * *	1 2 3 4 5
				→ □
Direct current/ voltage output	0 ... 20 mA and 0 ... 10 V 4 ... 20 mA and 0 ... 10 V		*	1 2
				→ □
Data in the area marked with a bold frame are required only for type CV-110 These codes are not required for type CV-111				
Alarm Relay LIM 1	normally-energized normally-deenergized		*	1 2
				→ □
	latching non-latching		*	1 2
				→ □
Alarm relay LIM 2	normally-energized normally-deenergized		*	1 2
				→ □
	latching non-latching		*	1 2
				→ □
Alarm delay for LIM 1 (warning)	1 sec 3 sec 10 sec		 * *	1 2 3
				→ □
Alarm delay for LIM2 (main alarm)	1 sec 3 sec 10 sec		 * *	1 2 3
				→ □
Adjustment of alarm limits:	on site in the factory, Settings: LIM 1: ... LIM 2 :...		 *	1 2
				→ □
Designed for connection of	non explosion -proof sensors explosion-proof sensors		 *	1 2
				→ □
Power supply	230 V AC or 24 V DC 115 V AC or 24 V DC		 *	1 2
				→ □
Tropicalization	no yes		 *	1 2
				→ □
Special agreements ?	no yes		 *	0 1
				→ □
Check sum (sum of above codes)				□□□

*Extra-cost option

8. Trouble-shooting

Should any malfunction occur on the vibration monitoring system, first check the following:

1. Check the mains voltage
2. Check the sensor, the connection terminals, and the connecting cables.

Vibration sensors type VS- and T- are hermetically encapsulated, and non-repairable.

Vibration sensors, measuring amplifiers and contact instruments require no maintenance, are not subject to any wear, so that it is unnecessary to keep individual components in stock.

If 10 units and more are used, we recommend to keep a complete vibration monitoring system in stock, to enable fast replacement in the event of a malfunction.

Should you require any further information on your vibration monitoring system, do not hesitate to contact our head office:

CARL SCHENCK AG
Dept. CTV
Landwehrstr. 55
D-6100 Darmstadt

Tel. 06151 / 882-1
Telex: 4 196 940 csd d

7. Explosion-proof sensors

Vibration sensors type T-70 (ex) sG5 and type T-78 (Ex) sG5 comply with the requirements for the protective rating "Special protection" (Ex) sG5 in accordance with the German standards VDE 0171/1.69.

They are suitable for operation at operating sites subject to explosion hazard by combustible substances of all explosive classes within the ignition groups G1 to G5 (see enclosed certificate of the German National Physical Institute Nr. III B/E - 24304).

YOUR ATTENTION IS DIRECTED TO THE FACT THAT THE EXPLOSION PROTECTION REFERS ONLY TO THE VIBRATION SENSOR .

The measuring amplifier and the contact instrument should be installed in a separate control centre outside the hazardous area. The screened cable between the two components can be up to 200 m long.
In the event of an order being placed, the series-mounted fuse specified in the test certificate of the German National Physical Institute must be inserted in the measuring amplifier's input circuit in the factory. This is a soldered 15 mA quick-acting fuse, which is placed between the terminal block to which the sensor is connected, and the setting potentiometers for adjusting the alarm limits.

A cable distribution box with an "explosion-proof certificate"of the German PTB must be used to extend the sensor cable within the hazardous area.

Important: If a connector is included in the delivery, the latter must not be used as cable connector unless outside the hazardous area.

Ordering example:

Ordering code: CV-110/1/1/1/2/1/2/1/1/1/1/1/1/1/1/0/125

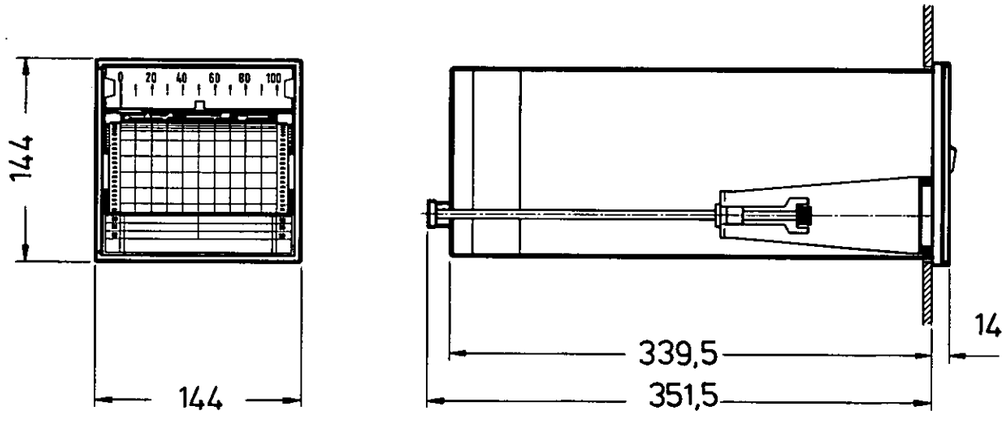
- Electronic monitoring unit CV-110
- VS-068 sensor for vibration velocity, 10 - 1000 Hz
- Measuring range 0 - 10 mm/s
- Output 0 ..20 mA, 0 ... 10 V
- LIM 1 relay normally-deenergized
- LIM 1 relay latching
- LIM 2 relay normally-deenergized
- LIM 2 relay latching
- LIM 1 alarm delay 1 sec
- LIM 2 alarm delay 1 sec
- Limit adjustment on site
- Sensors non-explosionproof
- Power supply 230 V AC or 24 V DC
- No tropicalization
- No special agreements
- Check sum

Technical specifications:

Connected load for d.c. voltage or current outputs	burden	≤ 500 Ohm
	load	≥ 100 kOhm
Ambient temperature	0 to 65 °C	

Storage temperature	- 40 to 100°C
Humidity	up to 95 % max.,non-condensing
Enclosure	aluminium pressure-die casting
Enclosure protective rating:	IP 65 to DIN 40050
Paint finish:	as per RAL 7032 (grey)
Dimensions:	220 x 120 x 90 mm
Weight:	approx. 2 kg
Position of installation:	arbitrary
For monitoring unit CV-110 only:	
Relay breaking capacity:	AC max. 400 VA, 250 V DC max. 10 - 100 Watt (depending on voltage)

4.4 Recorder for 1 to 6 sensor positions 1)



Panel opening 138 x 138 mm as per DIN 43 831
Fig. 10 : Dot recorder type AC-130

1) only for types C 31 ... C 36 and CR 31 ... CR 36

6.7 OK- supervision

A separate OK relay is provided to signal that the unit is ready for operation.

Fig. 26 : OK relay (always normally-energized)

A breakage in the sensor winding, a broken lead in the connecting line between the sensor and the measuring or monitoring unit, defective plugged or soldered connections, or failure of the power supply will cause the OK relay to automatically emit an alarm signal.

Signalling devices with a breaking capacity of 400 VA at an a.c. voltage of 250 V, or 10 to 100 kW at a corresponding d.c. voltage (max. 2 A) can be connected to the relay terminals.

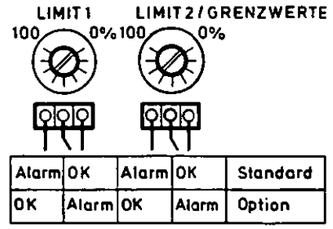


Fig. 25: Potentiometers for adjustment of limit values (LIM 1 and LIM 2).

Both potentiometers have an annular scale with graduations from 0 to 10, where 10 corresponds to 100% of the selected measuring range.

Example:

Selected measuring range: 0 ... 20 mm/s

Response levels:

Alarm limit 1: 6 mm/s

Alarm limit 2: 10 mm/s

Turn the setting scales of the potentiometer with the help of a screw driver, until the marking points to the selected response level.

Limit 1 : 6 mm/s = 30 % of the selected full scale
= position 3

Limit 2 : 10 mm/s= 50 % of the selected full scale,
= position 5

Ordering codes and ordering example:

ORDER DATA: Recorder for 1 to 6 measuring positions

	Design	Ordering codes:
Type	AC-130	AC- □□□
No. of colours	1 2 3 6	1 *2 *3 *4 → □
Measuring range:	0 ... 20 mA 4 ... 20 mA	1 *2 → □
Scaling	0 ... 100% - 100 ... 0 ...+100%	1 2 → □
Power supply:	220 V AC 110 V AC 24 V DC	1 *2 *3 → □
Special agreements	no yes	0 *1 → □
Unit price in accordance with selected code:		
Check sum (sum of above codes)		□□□

*Extra-cost option

ORDERING EXAMPLE:

Ordering code: AC- 130/ 1 / 1 / 1 / 1 / 0 / 134

Dot recorder type AC-130
Single-colour
Measuring range 0...20 mA
Scale 0 ... 100%
Power supply 220 V AC
No special agreements
Check sum

Technical specifications:

Measuring method:	Internal change-over of measuring points, moving-coil instrument 0 ... 20 mA
Class	1.0
Scaling	0 ... 100 % or -100% ... 0 ...+ 100 %
Recording Width:	100 mm
Visible length of diagram:	80 mm
Length of paper tape	32 m (equivalent to 60 days of operation at 20 mm/h).
Paper feed	20/120 mm/h
Sequence of colours:	violett- red-black-green-blue-brown as per DIN 43831
Succession of dots:	20 s
Electrical connections:	screw termianls at the rear of the unit for 1.5 mm^2 max.
Position of installation:	vertical $\pm$ 10° as per VDE 0410
Minimum distance to adjacent equipment:	horizontal or vertical 0 mm
Enclosure:	sheet steel, grey as per RAL 7032
Protective rating:	IP 54 (connection terminals for supply lines IP 20) to DIN 40050
Front frame:	144 x 144 mm
Control panel opening	138 x 138 mm as per DIN 43831
Unit depth	352 mm
Mounting:	with the help of two mounting elements as per DIN 43834 for a max. panel thickness of 40 mm
Weight	5.5 ... 6 kg
Ambient temperature	0 ... 50°C

Machine Class		Grade (v_{eff})			
VDI	ISO	Good	Admissible	Still admissible	Not admissible
K	I	< 0.7	0.7 ...1.8	1.8 ... 4.5	> 4.5 mm/s
M	II	< 1.1	1.1 ...2.8	2.8 ... 7.1	> 7.1 mm/s
G	III	< 1.8	1.8 ...4.5	4.5 ... 11	>11 mm/s
T	IV	< 2.8	2.8 ...7.1	7.1 ... 18	>18 mm/s

Machine Classes are defined as follows:

Class K (I): Small machines (in particular electric motors) firmly coupled to the foundation, with drive powers up to approx. 15 kW.

Class M (II): Medium-sized machines (particularly electric motors) firmly coupled to the foundation, with drive powers between 15 and 75 kW.

Class G(III): Large machines, mounted on stiff or heavy foundations, with drive powers above 75 kW.

Class T (IV): Machines mounted on foundations which are relatively soft in the direction of vibration measurement ("flexibly supported").

For a detailed description of the individual machine classes and the related diagrams, please refer to the VDI guideline 2056, which can be obtained from Beuth Verlag, Berlin.

These limit values enable the response levels to be selected. Alternatively, the user can set the alarm limits on the basis of his own experience.

The adjustment of the response levels of the two alarm relays. is carried out with the help of pots LIM1 and LIM2 (Fig. 25).

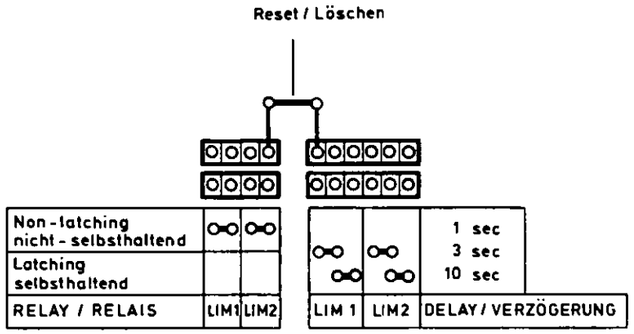


Fig. 24 : Terminal layout for relay adjustment

To avoid alarms being triggered in response to short-term noise pulses, alarms are not triggered unless the alarm limit 1 or 2 has been exceeded throughout the selected delay time. The response delay can be set to 1 sec, 3 sec., or 10 sec. by inserting the required jumpers as shown in the right-hand table. The delay can be adjusted separately for both relays.

6.6 Adjustment of the alarm limits (for CR types)

The measuring range and the response levels should be adapted to the machine to be monitored. In this context, VDI guideline 2056 and ISO standard 2372, and the DIN-ISO standards 2373 may be of assistance, which specify limit values for a total of four machine groups.

4.5 Indicating instrument (only for types C2 and CR2)

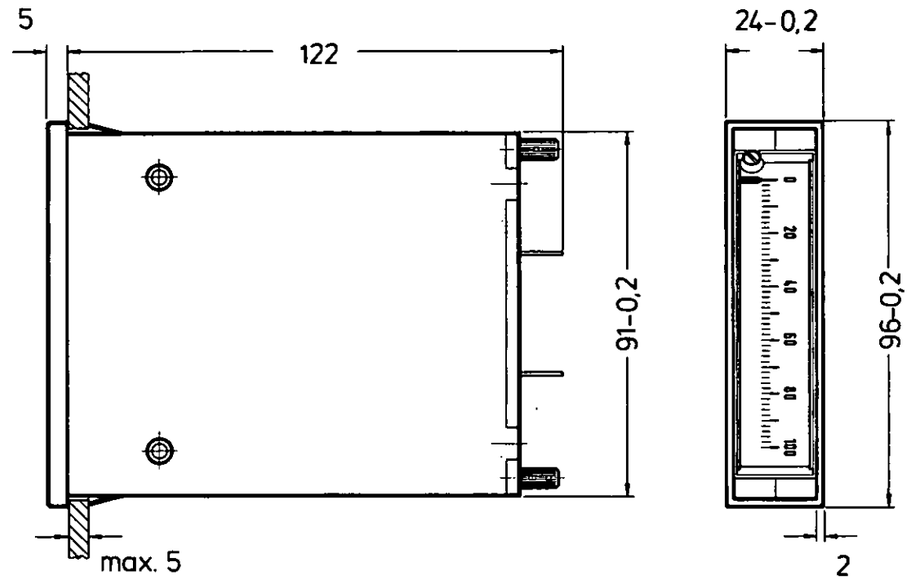


Fig. 11: Indicating instrument type AC - 129

Ordering code and example of order:

ORDER DATA: VIBROCONTROL indicating instrument

	Design	Ordering code
Type	AC - 129	AC - □□□
Measuring range	0 ... 20 mA 4 ... 20 mA	1 *2 → □
Position of installation vertical :	horizontal scale vertical scale	1 *2 → □
Scaling	0 ... 100 % -100 % ... 0 ... +100 %	1 2 → □
Special agreements	no yes	0 *1 → □
Unit price as per selected code		
Check sum (sum of above codes) :		□□□

* Extra cost options

EXAMPLE OF ORDER

Ordering code AC-129/ 1 / 1 / 1 / 0 / 132

- Indicating instrument type AC-129
- Measuring range 0 ... 20 mA
- Scaling 0 ...100 %
- Horizontal scale
- No special agreements
- Check sum

Technical specifications

Design	Robust moving-coil instrument
Scaling:	0 ... 100 % - 100 %... 0 ... + 100%
Scale length	63 mm
Class	1.5
Front frame	96 x 24 mm
Control panel opening	91 x 22 mm
Unit depth	122 mm
Weight	approx. 0.6 kg
Working temperatures	- 25 ^{o} to + 40 ^{o}C

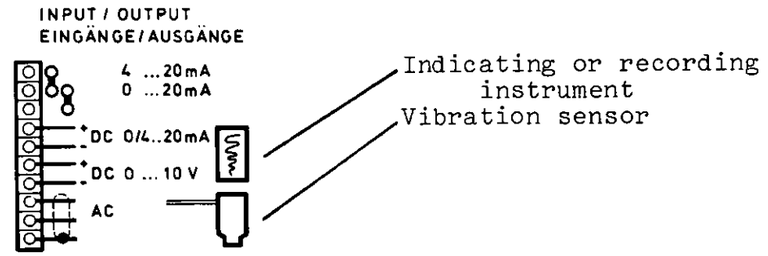


Fig. 23: Input/Output terminal block

With the suitable jumpers, the upper three terminals serve to adjust the "current" output signal to the range of 0 ... 20 mA or 4 ... 20 mA (live zero).

6.5 Adjustment of the alarm relays (only for CR types)

Alarm signals are triggered by two power relays, which can actuate signal lamps, horns, or even disconnect the plant upon throw-over.

In the standard design, the relays are of the normally-deenergized type, i.e. no current passes through their coils in normal operation. The alarm relays are optionally available in a normally-energized version (as shown in the above illustations). The OK relay is always normally-energized.

The connection diagram shows the alarm relays with mains disconnected. Each relay is assigned a terminal block for connection of external signalling devices or cut-out devices. The signal line is connected to the central terminal, the contact tag shown there points to the OK side (relay normally-deenergized) or to the alarm side (relay normally energized).

The relays can be connected either latching (no jumper) or non-latching (two jumpers in the positions shown in Fig. 24).

As opposed to the non-latching version, the alarm status will be maintained even after elimination of the cause of the alarm with the latching version. The alarm status is cancelled by a jumper inserted into the "RESET" terminals (Fig. 24). To facilitate resetting, a pushbutton can be connected between these two terminals.

F3: 0.125A,semi time-lag

F4: 0.125A,semi time-lag

6.3 Setting the measuring parameter and the measuring range

The measuring parameter and the measuring range are set at the factory to the values specified in the order or in the order confirmation.

If subsequent re-adjustment to a new measuring parameter is required, this can be done in accordance with Figs 21 (vibration velocity) and 22 (vibration displacement) by inserting wire jumpers.

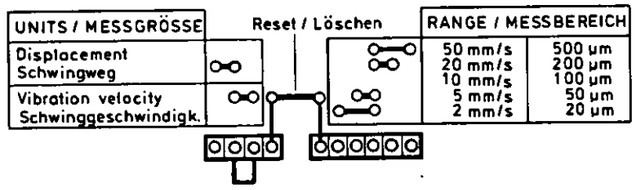


Fig. 21: Measuring parameter: Vibration velocity

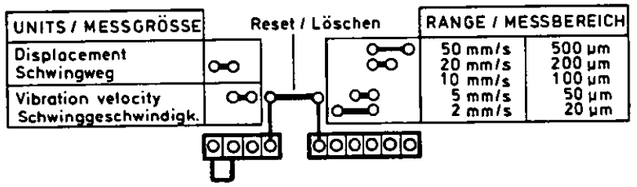


Fig. 22: Measuring parameter: Vibration displacement

In the same way, the measuring range can be changed by inserting, re-positioning or removing wire jumpers, in line with the terminal assignment shown.

6.4 Input and output signals

Fig. 23 shows the terminal block used for connecting the vibration sensor and the indicating or monitoring units.

5. Installation of the system

Installation and commissioning of the VIBROCONTROL 1000 system series C is described in the following sections. For connection diagrams for all available variants, please refer to pp 38 ff.

5.1 Installation of the sensor

The vibration sensor serves to convert mechanical vibration into an analogue electrical signal. It should be installed on the machine to be monitored in such a way that its centreline intersects the rotor axis at a right angle. Any position on the machine case or on the supporting structure will be sufficient as mounting position, provided that it is situated in the bearing plane. However, the sensor should not be fastened to parts which may themselves be subject to resonance, such as sheet metal linings, pipework, etc. Any fastening angles that may be required should be as stiff as possible.

If it is not required to monitor each bearing position, the mounting position should be chosen such that the sensor is installed in that position which experience has shown to be most liable to suffer damage. If the best position of the sensor is difficult to determine, preliminary measurements should be made to determine the maximum vibration occurring at a critical point of the machine and its angular position.

In many cases, however, it is sufficient to position the sensor in the vicinity of the vulnerable bearing at a feasible angle within the tolerance range of the sensor, if optimum positioning is impossible.

Vibration sensors type VS-068 (T-70H)are installed horizontally $\pm 10^{o}$, type VS-069 (T-70V) vertically $\pm 30^{o}$, types VS-077 (T-078) and VS-079 vertically $\pm 105^{o}$ (see page 13 a) .

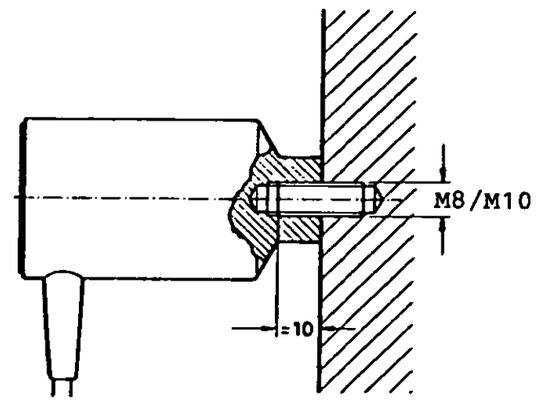


Fig. 12: Screwing the sensor on by means of a central thread.

The vibration sensor is provided with a female thread M10 (VS types) or M8 (T types) for mounting. Flat surfaces for application of a spanner (SW27 or SW17) are provided.

The position of the connecting cable is irrelevant.

5.2 Installation of the electronic measuring or monitoring unit

The measuring or monitoring unit amplifies the signals supplied by the sensors, adds the component vibrations, and provides at its output an electrical signal adjusted to the measuring range. For CV-110 models, the sum of the vibrations is also compared electronically to preset limits, and the associated relay is tripped in the event of a limit being exceeded.

Its compact design enables the measuring or monitoring unit to be installed in a control desk, behind a control panel, or at any other place.

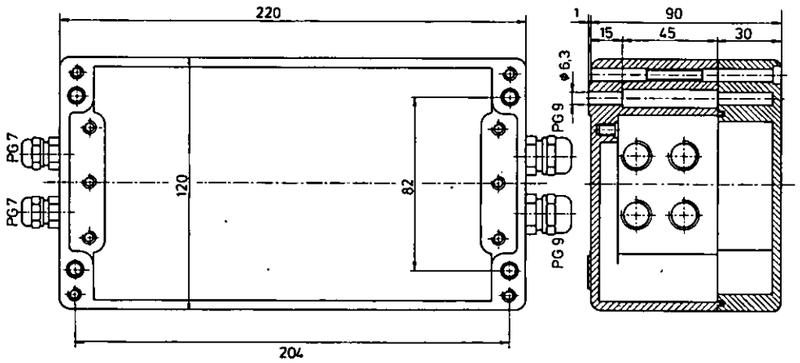


Fig. 13: Hole pattern on the enclosure

The units are mounted with the cover removed, by means of four M6 bolts. The position of installation is irrelevant. The unit is protected against ingression of dust, and hoseproof.

6.2 Checking and adjusting the mains voltage

The amplifier can be connected to an a.c. mains of a frequency of 50 to 60 Hz, and a voltage of either

230 V + 10% / - 15%

or 115 V + 10% / - 15%

or to a d.c. power supply of

+ 24 V +/- 15%

The amplifier is adjusted at the factory to the voltage specified in the order, or in our order confirmation. If subsequent change-over to a new operating voltage is required, this can be done in accordance with the following circuit diagrams. (VDI 0100 regulations specify that the housing must be connected to a central, external earthing point at the earth screw provided).

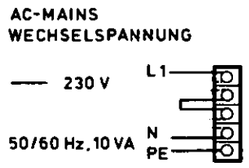


Fig. 18: Power supply 230 V AC

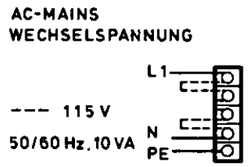


Fig. 19: Power supply 115 V AC

Fig. 20: Power supply + 24V DC

The built-in fuses are:

F2 : 1 A , delay-action

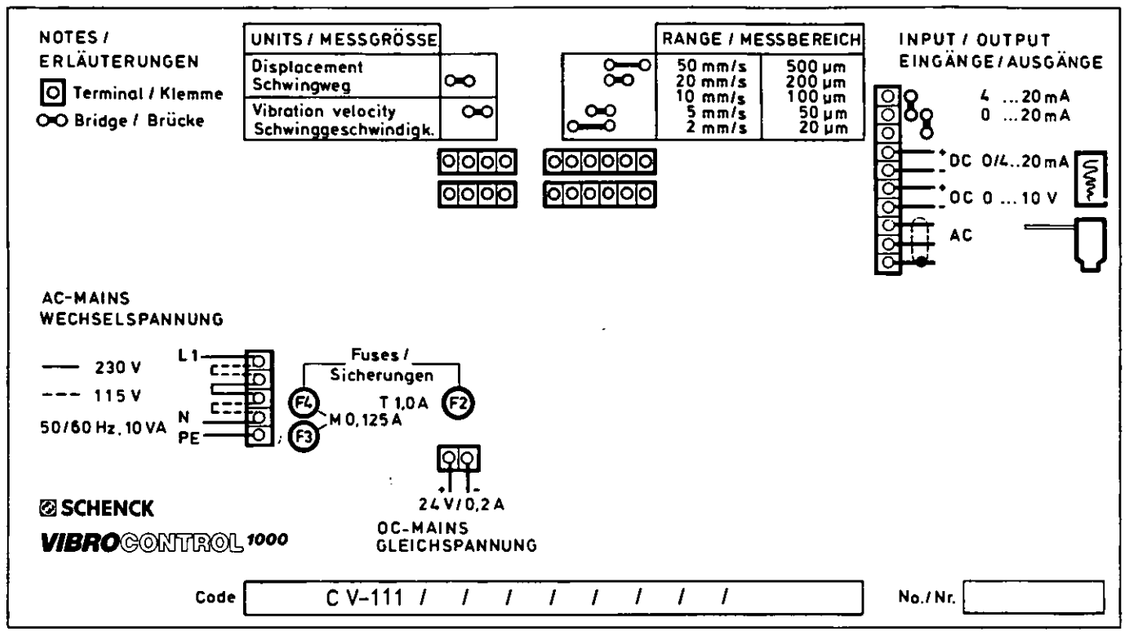


Fig. 16: Connection diagram for the CV-111 measuring amplifier

The individual areas of adjustment and connection are marked with a black frame in Fig. 17, and identified with the number of the section in which the corresponding procedure is outlined.

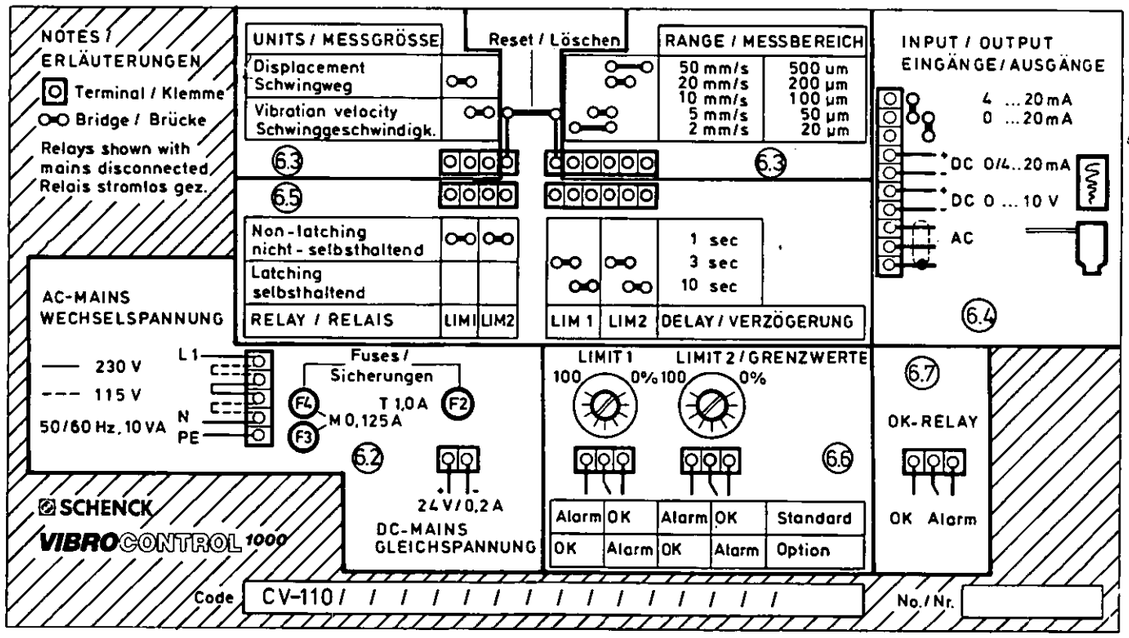


Fig. 17: Subdivision of the connection diagram

5.3 Installation and connection of the indicating or recording instrument

The indicator type AC-129 is provided for installation in a control desk or control panel. Its low space requirements enable the unit to be installed even in existing systems. The unit should always be installed and operated vertically, and the maximum thickness of the supporting panel should not exceed 5 mm.

Electrical connections are made to two soldering tags at the rear of the unit, whereby the positive line from amplifier is connected to the soldering tag no. 2, and the negative line to the soldering tag no. 1.

The dot recorder type AC-130 enables up to six channels to be displayed and recorded. A built-in measuring point selector automatically samples all channels consecutively, displays the measuring value and records it on paper.

Depending on the measurement task, the sensor signals applied to the recorder can thus be supplied to a single electronic measuring or monitoring unit, with the output of the electronic unit permanently connected to the measuring device of the recorder. Alternatively, the d.c. signals of up to 6 electronic measuring or monitoring units can be supplied to the measuring device of the dot recorder. This variant enables continuous monitoring of all measuring points.

The unit should be set up vertically, or fastened to a control panel (max. thickness 40 mm) by means of two standardized brackets (as per DIN 43834)

All connection terminals are situated at the rear of the recording instrument under a transparent plastic cover. The terminals are numbered and arranged as shown in Fig. 14.

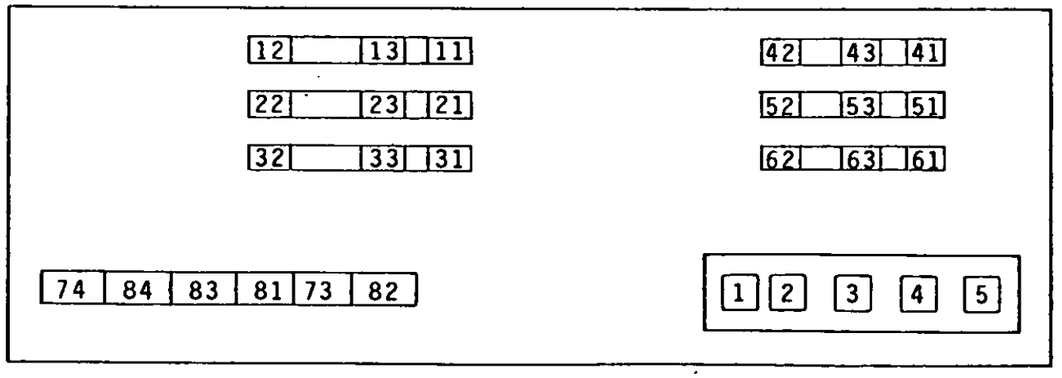


Fig. 14: Terminal layout of the recorder type AC-130

Connections are made as follows:

The sensors are connected to terminals 11 to 13, 21 to 23, 31 to 33, 41 to 43, 51 to 53 and 61 to 63, in line with the channel numbers, whereby the first digit of the 2-digit number identifies the corresponding channel. If less than 6 sensors are used, the last few terminal blocks remain unused. The two signal cables are connected to the terminals numbered with 1 and 2 as their last digit, the protective conductor to the terminals having 3 as their last digit.

The sensor signal is connected to the measuring or monitoring amplifier at terminals 81 and 84, by means of a screened 2-conductor cable (screen connected to terminal 73). The d.c. signal supplied by the amplifier, which is used for indication and recording, is connected to terminals 83 (+) and 82 (-). The power supply is connected to connection terminals 3 and 4, the protective earth to terminal no.5.

5.4 Installation of connecting cables

Vibration sensor - measuring amplifier

The sensor is linked to the measuring or monitoring amplifier , or, in the case of multi-channel systems, to the recording instrument, by means of a two-conductor screened cable (e.g. 2 x 0.5 mm^2). The cable should not be installed in the immediate vicinity of power cables. Its length can be up to 200 m. If longer cables are required, please contact the SCHENCK head office. Suitable oil-proof cables can be supplied by SCHENCK.

To connect the extension cable to the connecting cable already attached to the sensor and sealed in a sealing compound, a terminal box with the required protective rating should be used. Suitable terminal protective enclosures can be supplied by SCHENCK. This protective enclosure is for the connection of 1 or 2 vibration sensors and 1 common signal cable.
Measuring or monitoring amplifier - indicating instrument (recorder).

If a measuring or monitoring amplifier is used, the connecting cable between the amplifier and the indicating instrument does not need to be screened. Please note that a maximum burden of 500 Ohm should not be exceeded, or, if a voltmeter is used, that the load should be greater than 100 kOhm.

6. Connection and adjustment of the measuring/monitoring amplifier

6.1 Connection diagram for the amplifier

The stuck-on diagram on the inside of the cover of each amplifier shows a rough sketch of the physical lay-out of the terminals. As is described below, the lines are either connected directly, or, for adjustment purposes, various terminals are connected by means of wire jumpers.

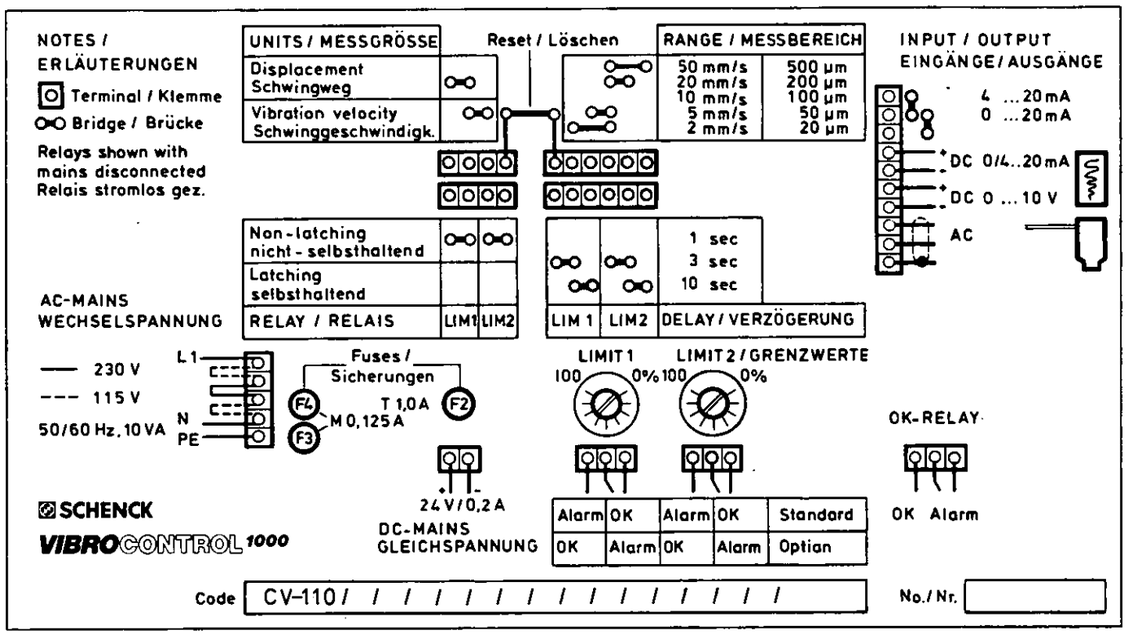


Fig. 15: Connection diagram for the CV-110 monitoring.

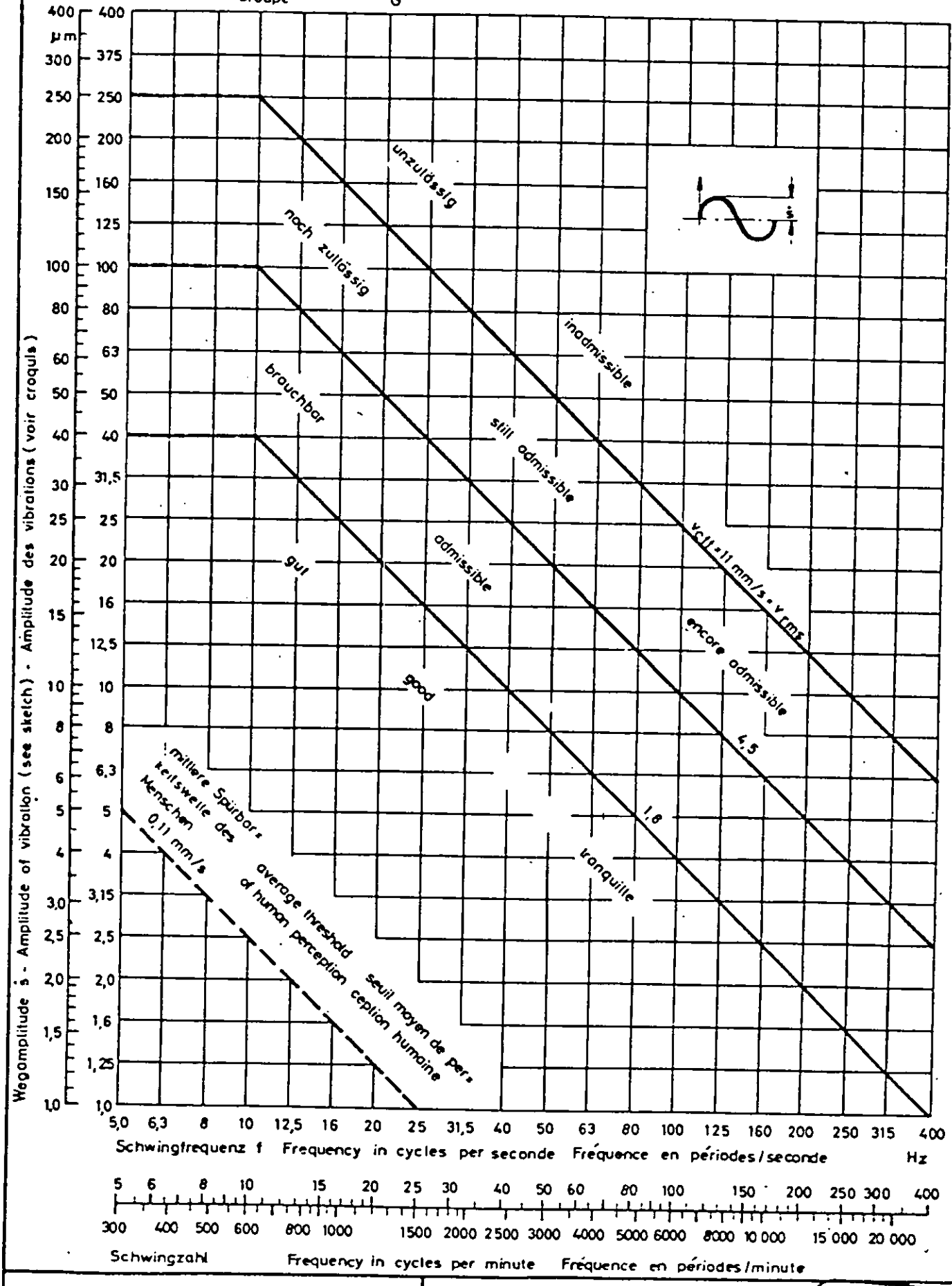
SCHIELE

Beurteilungsgrenze der Schwinggüte
Rating of smoothness of operation
Classement de la tanquillité de marche

D 16.00.002

Maschinengruppe G
Group G
Groupe G

VDI 2056



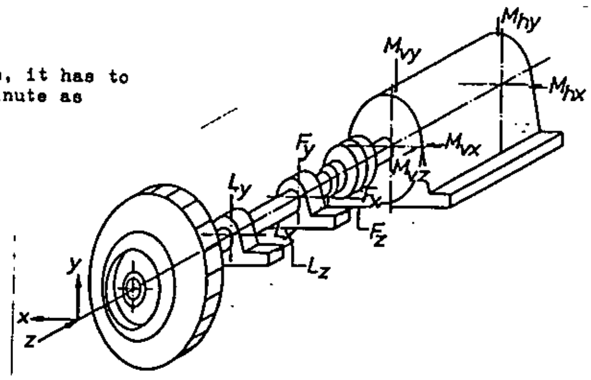
G. SCHIELE & CO · ESCHBORN : TAUNUS · SCHIELE

ESCHBORN

SCHIELE	Measuring of the Quitness of Running Impeller overhung-mounted	D 16.00.004 E

		s	v
Order No. :	s (µm)		
Blower type:		µm.	mm /s
Blower speed (RPM):	good up to		
Machine group acc. to VDI 2056:	practicable up to		
Measuring unit:	still admissible up to		

Measuring with the portable vibration measuring unit:
1) Blower, at loose bearing and fixed bearing
2) Motor, at the coupling side and end side the amplitudes s resp. the vibration speeds v have to be measured in all three planes.
(X-direction: horizontally transverse to the shaft axle,
Y-direction: vertically, Z-direction: axially)
If a measuring is not exactly possible in the corresponding plane, it has to be measured parallel to it at massiv points in a distance as minute as possible.



Measuring points: loose bearing : Lx, Ly, Lz
fixed bearing : Fx, Fy, Fz
motor in front : Mvx, Mvy, Mvz
motor at the back: Mhx, Mhy, Mhz

Attach the vibration receiver of the vibration supervision unit at the measuring point Lx.

Date	Vane control	s	µm	Blower						Motor				
	n	v	mm/s	loose bearing			fixed bearing			loose bearing		fixed bearing		
	o 1/min			x	y	z	x	y	z	x	y	x	y	z

Date: ______________ Name: ______________

SCHIELE GMBH ESCHBORN

The water injection serves for quick cleaning of the impeller in case of moist dust containing mediums handled for avoiding of greater unbalances.

The intervals between the water injection depend on the dust load of the medium handled, of the adherence and of the density of the dust, and has to be found out during operation.

In case of heavy dust load and of heavy, strongly adherent dust the water injection will be carried out in shorter intervals, and in case of little dust load and of light, little adherent dust the water injections will be carried out in longer intervals.

So that the machine attendant knows when the cleaning has to be done, he must observe the quietness of running or the vibration supervision unit.

At the latest after exceeding the range "still admissible" (VDI 2056) the water injection has to be put in action.

Whether the cleaning of the impeller vanes is effected during operation at full or reduced speed or during standstill (turn by hand) depends on the geometry of the impeller and of the water pressure which is at hand.

~~The used flat stream nozzles are arranged in such a way that the~~ stream widths ~~throw the water onto the whole~~ width of the vane. ~~The slits of the nozzles must also stand parallel to the vane inlet edge.~~

So that the water level in the casing in case of water injection does not rise up to the impeller, it has to be taken care for a good water draining at the casing. If the quickly turning impeller dips into the water or the blower is started if the impeller is dipped into the water the impeller will be destroyed by water strokes. (For this no guarantee is granted.)

~~Designing of the water injection~~

Schiele ref. _____ Blower type _____

Blower speed _____ RPM

For an efficient cleaning are necessary:

water pressure p = _____ bar

__ Nos. of nozzles at the impeller inlet

nozzle type: _____ make: _____ material: _____

water volume flow per nozzle V = _____ l/min at p = _____ bar

~~total water volume flow V = _____ l/min~~

Production date — WIEGAND Evaporator V 1/

Product _____ **start** _____ **end** _____ **running time** _____ **date** _____

time																	
inlet:																	
quantity lbs/hr; kg/h																	
concentration % TS																	
temperature ° F; ° C																	
outlet:																	
density % Ref.																	
densitymeter-% scale																	
densitymeter % solids																	
temperatures: ° F; ° C																	
preheating																	
pasteurizing temp.																	
high heating																	
detensioner																	
stage																	
stage																	
stage																	
stage																	
stage																	
steam: psig; kp/cm²																	
prior to distributor																	
in the distributor																	
recompressor																	
press. in heater																	
press. in highh.																	
vacuum: inch Hg; m WS																	
stage																	
stage																	
condensate 1 lbs/hr; kg/h																	
condensate 2 lbs/hr; kg/h																	
cooling water temp. ° F; °C																	
warm water temp. ° F; ° C																	
sealing water o.k.																	
air supply psig; kp/cm²																	
Notes: pH-value % lactic acid etc.																	

Production date — WIEGAND Evaporator V 1/

Product _____ **start** _____ **end** _____ **running time** _____ **date** _____

time																
Inlet:																
quantity lbs/hr; kg/h																
concentration % TS																
temperature ° F; ° C																
outlet:																
density % Ref.																
densitymeter-% scale																
densitymeter % solids																
temperatures: ° F; ° C																
preheating																
pasteurizing temp.																
high heating																
detensioner																
stage																
stage																
stage																
stage																
stage																
steam: psig; kp/cm²																
prior to distributor																
in the distributor																
recompressor																
press. in heater																
press. in highh.																
vacuum: inch Hg; m WS																
stage																
stage																
condensate 1 lbs/hr; kg/h																
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cooling water temp. ° F; °C																
warm water temp. ° F; ° C																
sealing water o.k.																
air supply psig; kp/cm²																
Notes: pH-value % lactic acid etc.																

Production date – WIEGAND Evaporator V 1/

Product _____ **start** _____ **end** _____ **running time** _____ **date** _____

time																
inlet:																
quantity lbs/hr; kg/h																
concentration % TS																
temperature ° F; ° C																
outlet:																
density % Ref.																
densitymeter-% scale																
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temperatures: ° F; ° C																
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steam: psig; kp/cm²																
prior to distributor																
in the distributor																
recompressor																
press. in heater																
press. in highh.																
vacuum: inch Hg; m WS																
stage																
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condensate 1 lbs/hr; kg/h																
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cooling water temp. ° F; °C																
warm water temp. ° F; ° C																
sealing water o.k.																
eir supply psig; kp/cm²																
Notes: pH-value % lactic acid etc.																

THRIGE ELECTRIC

Moteurs à courant continu / DC-motors / Gleichstrommotoren

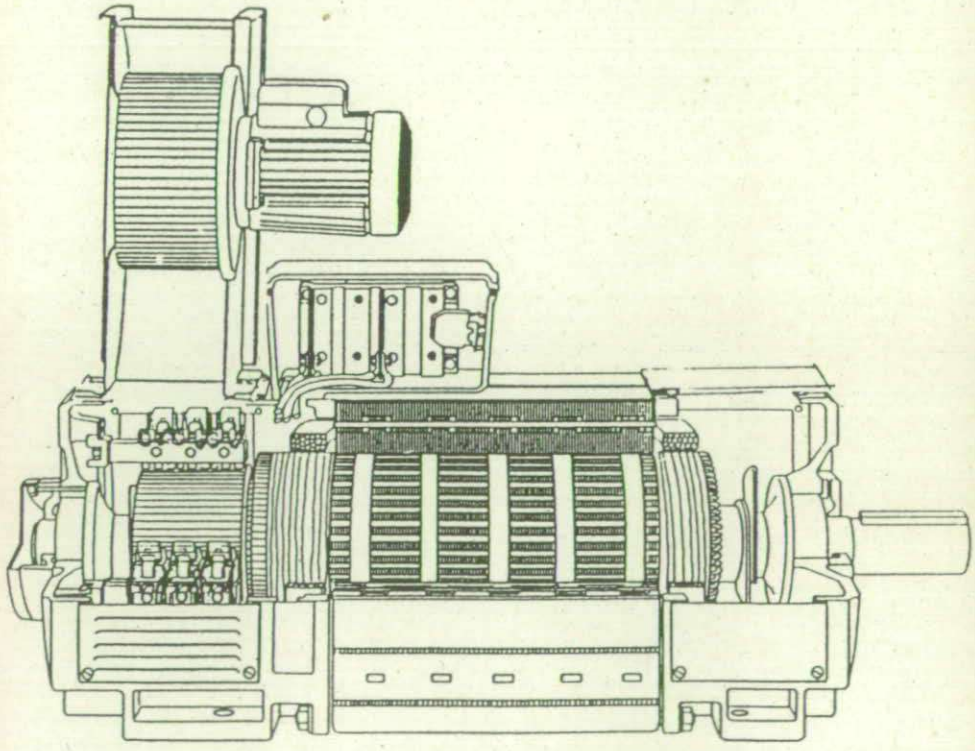
Edition
Janvier 96
Instruction
January 96
Instruktion
Januar 96

LAK 4180-4280

Installation et entretien

Installation and maintenance

Augstellung und Instandhaltung



Types LAK 4180-4280

ATTENTION !

L'utilisation d'engins tournants présente certains dangers. Les machines électriques tournantes doivent être manipulées avec précaution. Leur installation et leur entretien doivent être confiés à un personnel qualifié.

CAUTION !

As with any form of rotating equipment, there is always a risk involved in the handling of rotating electrical machinery. The greatest care must always be exercised during installation and maintenance this be carried out by authorized personnel.

WARNUNG !

Der Umgang mit elektrischen Maschinen sowie anderen rotierenden Ausrüstungen birgt Risiken in sich. Aufstellung und Instandhaltung sollte daher von ausgebildetem Personal vorgenommen werden.

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RECEPTION

Procéder à l'inspection de la machine dès sa livraison et nous avertir immédiatement en cas d'avarie par le transport.

Précautions générales

Les machines qui sont emmagasinées pendant un temps prolongé (plus d'un mois) avant leur mise en service feront l'objet d'une attention particulière. Ce sont surtout les balais, le collecteur et les paliers qui risquent d'être endommagés si certaines précautions ne sont pas prises.

Ces dommages peuvent être causés par :

1. Les poussières et la saleté.
2. L'humidité et la condensation dans les locaux où les changements de température sont importants.
3. La corrosion, en particulier lorsque les locaux de stockage contiennent une atmosphère corrosive.
4. Les sollicitations mécaniques (vibrations par ex.).

Stockage

Précautions appropriées :

a) Soulever tous les balais.
b) Protéger la surface du collecteur, par exemple au moyen d'une bande de papier enroulée.
c) Fermer toutes les ouvertures de ventilation.
d) Envelopper la machine dans un emballage étanche à la poussière et à l'humidité.
e) Eviter de placer la machine sur un support susceptible de vibrer.

Choisir pour le stockage un local tempéré, où les variations de température sont pratiquement négligeables.

Pour éviter la condensation sur les enroulements, il faut maintenir ceux-ci à une température supérieure à la température ambiante. Un dispositif de chauffage est à conseiller. La corrosion, en particulier celle du collecteur, peut se produire même en atmosphère normale. En présence de gaz corrosifs, elle peut être difficile à éviter. L'anhydride sulfureux (SO_2), le chlore (Cl_2) et l'ammoniac (HN_3) sont parmi les plus dangereux.

Ce sont surtout les paliers qui peuvent être endommagés quand la machine repose sur un support vibrant. Pour éliminer ce risque, il suffit de tourner l'induit de quelques tours une fois par mois.

Protéger le bout d'arbre et s'il y a lieu la bride en les enduisant d'une graisse antirouille.

Manutention, levage

Les machines sont munies de 2 oeillets de levage, qui sont dimensionnés pour soulever le poids de la machine avec ses accessoires.

Installation

Conformité

La conception de ces moteurs satisfait aux dispositions des directives basse tension (BT) et de compatibilité électro magnétique (CEM). Elle permet de les utiliser dans des appareils, des installations ou des systèmes soumis à l'application de ces directives et de la directive machine, sous réserve que leur intégration ou leur assemblage soit effectué selon les règles de l'art.

ACCEPTANCE CONTROL

Check the machine consignment upon arrival, and notify us immediately of any possible damage the machine might have sustained during transport.

General storage directives

Particular attention must be given to machines which are to be stored for long periods (more than 1 month) before being installed. Brushes, commutator and bearings are the main components that can sustain damage if suitable precautions are not taken.

The main causes of damage are as follows :

1. *Dust and dirt.*
2. *Moisture and condensation when stored in locations where there is a frequent variation of temperature.*
3. *Corrosion. This applies particularly to atmospheres containing corrosive gases.*
4. *Mechanical influences, such as vibration, etc.*

Suitable storage precautions

a) Lift all brushes from the commutator and secure them in their holders.
b) Wind a wrapping of paper or the like around the commutator.
c) Keep all ventilation openings covered.
d) Wrap the entire machine in a dust-and waterlight material.
e) Do not store the machine on a foundation that is exposed to vibrations.

Store the machine in a temperate location, i.e., a location in which temperature variations are practically non-existent. Avoid condensation in the windings by means of a heating arrangement that ensures a higher temperature than the ambient temperature.

Corrosion, particularly on the commutator, can also be caused by the normal pollution-free air, but becomes rapidly intensified if the air contains corrosive gases. The worst of these are sulphur dioxide (SO_2), chlorine (CL_2) and ammonia (NH_3).

Bearings in particular can become damaged if the machines are stored on a vibrating floor. The effect of vibrational damage can, however, be eliminated by turning the armature a few turns each month.

Protect the shaft extension and/or flange against the formation of rust by coating with a rust-preventive oil.

Handling (lifting of machine)

All motors are provided with 2 lifting eyes. The eyes are sufficiently dimensioned to enable the machine with accessories to be lifted.

Installation

Conformity

The design of these motors satisfies the provisions of the guidelines for low tension (LT) and electromagnetic compatibility (EMC). This permlis their use in equipment, installations or, systems subjected to the application of these guidelines and to machine guidelines, provided that their adjustment or their assembly be made according to the accepted standards of the industry.

ANLIEFERUNG

Prüfen Sie die Anlieferung und geben Sie bei eventuellen Transportschäden unverzüglich Nachricht an uns.

Allgemeine Verhaltensregeln

Maschinen die für längere Zeit gelargert werden müssen (über 1 Monat) sollte man besondere Aufmerksamkeit zukommen lassen. Insbesondere können die Kohlebürsten, der Kommutator und die Lager Schaden nehmen wenn die richtigen Verhaltensregeln außer acht gelassen werden.

Schäden können auftreten durch :

1. *Staub und Schmutz.*
2. *Feuchtigkeit und Kondenswasser bei Lagerung in Räumen mit größeren Temperaturschwankungen.*
3. *Korrosion bei Lagerung in aggressiver Atmosphäre.*
4. *Mechanische Einwirkungen (Stösse, Vibrationen und dgl.).*

Lagerung der Maschinen

Geeignete Verhaltensregeln :

a) Abheben aller Kohlebürsten.
b) Schutz des Kommutators durch eine Papiermanschette.
c) Verschließen aller Öffnungen.
d) Verpacken der Maschine in staub-oder wasserdichtes Material.
e) Die Maschine nicht auf vibrierende Unterlagen stellen.

Eine Maschine sollte in einem temperierten Raum, d.h. in einem Raum ohne größere Temperaturschwankungen gelagert werden.

Kondensatbildung in den Wicklungen kann vermieden werden wenn deren Temperatur höher als die Raumtemperatur gehalten wird. Daher werden Maßnahmen zur Erwärmung der Wicklungen empfohlen. Korrosion - besonders am Kommutator - kann schon bei normaler Atmosphäre entstehen wobei die Probleme kritischer werden, wenn die Luft besonders aggressiv ist, hierzu gehören beispielsweise Schwefeldämpfe, Chlor - und Ammoniakdämpfe.

Werden die Maschinen auf Unterlagen abgestellt die vibrieren können, treten Lagerschäden auf. Um diesen zu begegnen ist es ratsam, einmal für feste Unterlagen zu sorgen und zum anderen die Anker der Maschinen einmal im Monat einige Male zu drehen.

Für eine rostsichere Abschirmung der Wellenenden und der Anschlußflansche ist ebenfalls zu sorgen.

Versetzen (Anheben) der Maschinen

Alle größeren Maschinen sind mit 2 Tragösen versehen die so bemessen sind, daß sie die Gesamtlast der Maschine einschließlich Zubehör zu tragen vermögen.

Aufstellung

(oder einbau)

Die Bauweise dieser Motoren entspricht den Richtlinien über die Niederspannung und die elektromagnetische Verträglichkeit. Dadurch können diese Motoren in Geräte, Vorrichtungen oder Systeme, die der Anwerdung dieser Richtlinien und der Maschinen-richtlinie unterliegen, eingebaut werden unter der Bedingung, daß deren Einbau oder Zusammenbau fachmännsich ausgeführt wird.

Emplacement
S'assurer tout d'abord que l'emplacement de la machine est propre et que l'installation électrique permet d'effectuer les connexions nécessaires. Vérifier les possibilités d'accès pour la révision et l'entretien. Contrôler que la ventilation puisse se faire sans entrave.

Support
Celui-ci doit être suffisamment robuste pour pouvoir supporter le poids de la machine, absorber le couple de réaction et, dans le cas d'entraînement par courroie, l'effort de traction exercé par celle-ci.

Fixation de l'accouplement ou de la poulie
Les organes d'accouplement doivent être équilibrés soigneusement avant leur montage. Nettoyer le bout d'arbre et graisser avec une huile fluide. Pour faciliter le montage, il est conseillé d'utiliser le trou taraudé situé en bout d'arbre. En aucun cas il ne faudra frapper sur l'organe d'accouplement pour le mettre en place. Pour les plus grosses machines, il peut être indiqué de préchauffer l'accouplement ou la poulie. Il est difficile de préciser la température nécessaire, mais un jeu de 0,2 à 0,3 mm est suffisant. Faire tourner l'arbre pendant le refroidissement pour éviter sa déformation.

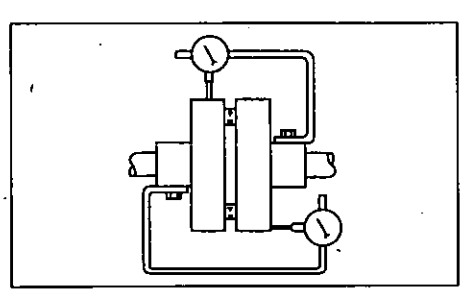
Equilibrage
Le rotor est équilibré avec une demi clavette (norme ISO 8821).

Alignement de l'accouplement
Contrôler l'alignement des arbres en mesurant la distance entre les bords extérieurs des plateaux à l'aide d'un calibre d'épaisseur. En faisant tourner les deux plateaux à la fois, faire quatre mesures espacées d'un quart de tour. Il ne doit pas y avoir plus de 0,05 mm d'écart entre la plus grande et la plus petite distance. Pour vérifier la concentricité des arbres, placer une règle en acier sur la surface extérieure usinée d'un des plateaux. Faire tourner les plateaux de la même façon et mesurer la distance entre la règle et l'autre plateau tous les quart de tour. La distance maximale et la distance minimale ne doivent pas différer de plus de 0,02 mm.

Nota : L'alignement doit être effectué avec soins. Un mauvais alignement risque d'endommager l'arbre et les paliers.

Le moyen le plus sûr d'obtenir un alignement correct consiste à employer deux comparateurs à cadran montés comme l'indique la figure ci-contre. Un comparateur est placé sur chaque plateau de façon à indiquer l'écart axial et radial entre les deux plateaux.

Pour corriger l'alignement, on emploiera des cales appropriées placées entre les pattes et le socle. Si des instructions spéciales sont données par le fournisseur de la machine entraînée, il faudra bien entendu s'y conformer.



Make sure the site is clean, and that supply connection facilities are available. Also ascertain there are reasonable facilities for servicing and maintenance. Check that there is no possibility of machine ventilation becoming obstructed.

Foundation
This shall be strong enough to bear the machine, and to withstand torque reaction and stresses from possible belt drive.

Mounting of coupling or pulley

Carefully balance the half-coupling or pulley prior to mounting on the shaft extension, which should be clean and smeared with thin oil. Mounting is simplified by using the threaded hole in the shaft end. Under no circumstances must the half-coupling or pulley be forced on by striking, or this would damage the bearings. In the case of larger frame sizes it is expedient to heat the half-coupling or pulley before fitting. No definite heating temperature can be stated, but a play of 0.2 to 0.3 mm is sufficient. Turn the shaft during the cooling period to avoid it becoming distorded.

Balancing
The armature is balanced with half key in accordance with ISO standard 8821.

Alignment of half-couplings
Faulty alignment can cause bearing failure, vibration, and in extreme cases, fractured shaft extensions. After fitting the couplings check that the shafts are aligned in relation to each other.

Angle/centering alignment
Check this by measuring the distance between the outer edges of the half-couplings with a feeler gauge. Turn both half-couplings simultaneously through one complete rotation and measure the distance between the outer edges at 90°, 180° and 270° of rotation. The difference between the largest and smallest measurements recorded must no exceed 0.05 mm.
Check centering alignment by placing a steel ruler parallel with the shafts on the finished outer circumference of one of the half-couplings. Then repeat the measuring procedure as outlined in "Angle alignment" above. The difference between the largest ans smallest measurements recorded must no exceed 0.02 mm.

NB : Correct alignment gives better operation and reduces wear. Poor alignment can cause damage to shafts and bearings.

The best means of obtaining a correct alignment is by fitting two dial gauges as shown in the sketch below.

Fit a dial gauge on each half-coupling, one axially and the other radially, and adjust alignment by inserting shims between the base of the machine and the foundation. If special alignment instructions have been issued by the manufacture of the driven machine, these must also be observed.

Der Ort an dem die Maschine aufge-stellt werden soll muß sauber und für die Aufstellung sowie den Anschluß derselben hergerichtet sein. Die Platzverhältnisse sollten eine ungehinderte Wartung ermöglichen und auch die Be- und Entlüftung muß unbehindert sein.

Das Fundament
Dieses muß nicht nur die Maschine tragen, sonderen auch Drehmomente und Riemenzug aufnehmen können.

Aufziehen von Kupplungshälften und Riemenscheiben
Diese Teile müssen sorgfältig ausgewuchtet sein. Das Wellenende ist vor dem Aufziehen zu reinigen und mit einem dünnen Ölfilm zu versehen. Die Gewindezentrierung im Wellenende erleichtert das Aufziehen. Auf keinen Fall dürfen Schlagwerkzeuge benutzt werden, weil die Lager dadurch geschädigt werden. Bei größeren Typen ist es zweckmässig, di aufzuziehenden Teile zu erwärmen. Die Erwärmungstemperatur kann hier nicht angegeben werden, man sollte ein Spiel von 0,2 - 0,3 mm anstreben. Um Wellenschlag zu vermeiden ist der Anker während des Abkühlens der aufgezogenen Nabe zu drehen.

Auswuchtung
Der Anker ist mit einer Halbpaßfeder dem ISO Standard entsprechend ausgewuchtet.

Ausrichten der Kupplungshälften
Falsches Ausrichten kann Vibrationen, Schäden am dem Lagerschild und in Extremfällen gebrochene Wellenenden verursachen. Nach dem Ausrichten muß kontrolliert werden, ob die Wellenenden im Verhältnis zueinander ausgerichtet sind.

Winkelrechtes Ausrichten
Die Winkelabweichung der Wellenden-den wird untersucht, indem mit einer Fühllehre der Abstand an den Außenkanten der Kupplungen gemessen wirk. Beide Hälften werden einmal voll gedreht und es wird bei jeweils 90°, 180° und 270° gemessen. Die Abweichung zwischen Größtmaß und Kleinstmaß sollte nicht mehr als 0,05 mm betragen.

Zentriertes Ausrichten
Ob die beiden Wellenen zentrisch zueinander laufen, wird durch ein auf der bearbeiteten Außenfläche befestigtes Stahllineal geprüft. Die Kupplung wird einmal voll gedreht und bei jeweils 90°, 180° und 270° der Abstand zwischen Lineal und zweiter Kupplungshäfte gemlessen. Hierbei sollte die Abweichung zwischen Kleinst - und Größtmaß nicht mehr als 0,02 mm betragen.

NB : Die Ausrichtung der Kupplungen muß sehr sorgfältig vorgenommen werden wenn Schäden an Welle und Lager vermieden werden sollen.

Das beste Hilfsmittel sind zwei Meßuhren die nach nebenstehender Skizze angebracht werden.

Hier werden axiale und radiale Abweichungen angezeigt und können durch geeignete Zwischenlagen zwischen Fuß und Fundament ausgeglichen werden. Eventuelle besondere Vorschriften vom Lieferanten der Arbeitsmaschine sind zu beachten.

Charges radiales pour roulements à billes (arbre horizontal - durée de vie : 20.000 heures)

Max. radial forces - ball bearings (horizontal shaft - operating life 20,000 hours)

Max. radiale Belastung - Kugellager (horizontales Wellenende - Lebensdauer, 20.000 St.)

Type *Frame* *Typ*	Distance de l'épaulement de l'arbre (mm) *Distance from shaft shoulder (mm)* *Abstand vom Wellenbund (mm)*	Effort radial F en Newtons *Max. radial force F in Newton* *Max. radiale Kraft F in Newton*							
		500 min^{-1}	1000 min^{-1}	1500 min^{-1}	2000 min^{-1}	2500 min^{-1}	3000 min^{-1}	3500 min^{-1}	4000 min^{-1}
LAK 4180A	70	5700	4430	3820	3430	3155	2945	2775	2635
LAK 4180B		5710	4420	3800	3405	3120	2910	2735	2595
LAK 4180C		5675	4370	3745	3345	3060	2845	2670	2530
LAK 4200A	70	6620	5130	4405	3950	3615	3370	3170	3010
LAK 4200B		6605	5085	4350	3885	3550	3295	3095	2930
LAK 4200C		6530	5000	4255	3785	3445	3190	2990	2820
LAK 4225A	85	8965	6915	5920	5300	4840	4505	4230	—
LAK 4225B		8910	6845	5840	5210	4750	4410	4135	—
LAK 4225 C		8780	6710	5710	5080	4620	4280	4000	—
LAK 4250A	85	11,520	8870	7570	6755	6175	5735	—	—
LAK 4250B		11,430	8750	7440	6615	6030	5590	—	—
LAK 4250C		11,330	8625	7305	6475	5885	5440	—	—
LAK 4280A	105	12,920	9860	8375	7440	6755	—	—	—
LAK 4280B		12,770	9690	8185	7240	6550	—	—	—
LAK 4280C		11,300	9420	7920	6975	6285	—	—	—

Charges radiales pour roulements à billes et arbre vertical. Dimensionnement courroies. Consulter nos services commerciaux.

Maximum radial force for roller bearings and for vertical shaft - pease contact our sales offices.
For dimensioning V-belt drive - please contact our sales offices.

Maximale radiale Belastung für die Kugellager und für vertikale Wellenenden - nehmen Sie bitte mit unserer Verkaufsabteilung Kontakt auf.
Für die Dimensionierung des Keilriemens - nehmen Sie bitte unserer Verkaufsabteilung Kontakt auf.

Ventilation

La ventilation est montée en standard sur le dessus du moteur côté collecteur.
Montage latéral sur demande.

La ventilation est fournie sans filtre.
Filtre fourni sur demande.

Blower position

The blower is as standard mounted on top of the motor at commutator.

Blower mounting on the side of the motor on request.
Blower is supplied without filter as standard.
Filter on request.

Lüfteranordnung

In Standardausführung ist der Lüfter oben auf der A-Seite montiert.

Lüfter an den Seiten oder oben auf der B-Seite auf Anfrage.
In Standardausführung wird der Lüfter ohne Filter geliefert.
Filter auf Anfrage.

Caractéristiques de refroidissement

Cooling data

Kühldaten

Type *Frame* *Typ*	Type de refroidissement IC 06/17/37 *Cooling form IC 06/17/37* *Kühlart IC 06/17/37*	
	Volume d'air (m³/h) *Air volume (m³/h)* *Luftmenge (m³/h)*	Chute de pression dans le moteur N/m² *Pressure drop in motor N/m²* *Druckabfall im Motor N/m²*
LAK 4180	950	950
LAK 4200	1050	1150
LAK 4225	1850	1450
LAK 4250	2700	2100
LAK 4280	3600	2600

MISE EN SERVICE

Avant toute intervention à l'intérieur de la machine, s'assurer qu'elle est bien déconnectée. Certaines parties peuvent être sous tension bien que la machine ne tourne pas.

Inspection avant la mise en marche.

Lorsque la machine est mise en marche
- pour la première fois,
- ou après une longue période d'arrêt,
- ou après une révision importante.

Contrôler :

1. Que tous les balais sont à leur place, que les ressorts-rouleaux appuient sur les balais, et que ceux-ci peuvent glisser librement dans les porte-balais.
2. Que les dispositifs de protection (par exemple la protection thermique) fonctionne correctement.
3. Si la machine comporte un ventilateur adossé, que celui-ci tourne dans la bonne direction, suivant le sens de la flèche placée sur l'enveloppe.
4. Qu'il n'y a pas d'obstacle à la circulation de l'air de ventilation.
5. Que l'accouplement et les autres parties mécaniques sont fixés correctement.
6. Que les cables de connexion sont bien attachés et qu'ils sont branchés selon le schéma de connexion.
7. Que les roulements sont garnis de graisse, les roulements sont équipés de graisseurs.
8. Que la résistance d'isolement est suffisante (voir paragraphe suivant).

Mesure de la résistance d'isolement

Avant de mettre une machine électrique en service pour la première fois ou après une longue période d'arrêt, sa résistance d'isolement doit être contrôlée.

L'isolement des machines neuves ou des machines rebobinées est généralement satisfaisant, toutefois des conditions défavorables de transport et d'emmagasinage peuvent être la cause d'une absorption d'humidité importante qui se manifeste par une diminution de la valeur de résistance d'isolement au dessous du niveau acceptable.

Il peut en être de même pour une machine qui n'a pas fonctionné depuis longtemps, si les conditions ambiantes sont défavorables.

La résistance d'isolement d'une machine neuve doit être d'environ 2 à 3 mégohms. Sur une machine qui a fonctionné pendant une période plus ou moins longue, par contre, il peut se produire un abaissement de la résistance d'isolement dû à l'encrassement des surfaces, et une valeur 1 méghom par exemple peut être considérée comme acceptable.

Inspection après la mise en marche.

(Après un fonctionnement de courte durée). Il faudra être attentif à des bruits de paliers anormaux, à une coloration ou une usure anormale du collecteur, à des vibrations et à des températures anormales.

COMMISSIONING

Disconnect the supply before touching any inner part of the machine, as certain parts can be alive even though the machine is not in rotation.

Inspection prior to starting

- Before initial starting.
- Starting after a long period of standstill.
- Starting after comprehensive servicing.

Check :

1. *That all brushes are in place, that the roller springs apply pressure to the brushes, that the brushes slide easily in their holders.*
2. *That protective devices, such as thermal relays, function correctly.*
3. *That the blower, if such is fitted, rotates in the right direction - see arrow on blower housing.*
4. *That the cooling air inlet is not obstructed.*
5. *That couplings and other mechanical parts are securely tightened.*
6. *That supply cables are securely fastened and connected in accordance with the diagram of connections.*
7. *That the bearings are lubricated. Bearings are provided with lubricating nipples.*
8. *That the insulation resistance is measured (see below).*

Measuring of insulation resistance

Before a machine is initially put into service, and particularly if the machine has had a long period of standstill, its insulation resistance must be checked.

The insulation of new machines, or machines that have been re-wound, usually has a good resistance, but the situation can arise that a machine is exposed to a good deal of moisture during transport or under poor storage conditions; with the result that its insulation resistance has become too low.

This can also happen to a machine that has been inoperative for a long period due to unsuitable conditions at site.

The insulation resistance of a new machine should be from 2 to 3 megohms. On the other hand, a machine that has been in operation for some time can have a deposit of dirt on the windings, and in such case a lower value of insulation can be accepted, e.g., 1 megohm.

Inspection after starting

(After a short period of operation).
Pay particular attention to abnormal noise from the bearings, and to visual changes such as wear and discolouring of the commutator. Check for abnormal vibrations and temperatures.

INBETRIEBNAHME

Bevor man mit den inneren Teilen einer Maschine in Berührung kommt muß man sich davon überzeugen, daß die Maschine stromlos ist. Auch stillstehende Maschinen können unter Spannung stehen.

Durchzuführende Kontrollen vor der Inbetriebnahme

- Bei der ersten Inbetriebnahme.
- Nach längerem Stillstand.
- Nach gründlicher Überholung.

Es ist zu prüfen :

1. *Daß alle Kohlebürsten richtig angeordnet sind, die Rollbandfedern gut aufliegen und die Bürsten in ihren Haltern einwandfrei gleiten können.*
2. *Daß eventuelle Schutzanordnungen gegen Überwärmung wirken.*
3. *Daß eventuell aufgebaute Fremdlüfter die richtige Drehrichtung haben (siehe Pfeil am Gehäuse).*
4. *Daß die Kühluft frei ein-und ausströmen kann.*
5. *Daß Kupplungen und andere mechanische Teile korrekt angebracht sind.*
6. *Daß die Anschlußkabel fest und dem Schaltbild entsprechend installiert sind.*
7. *Daß die Lager mit Fett versehen sind. Die Lager sind mit Schmiernippeln versehen.*
8. *Daß der Isolationswiderstand in Ordnung ist (siehe nächsten Abs.).*

Messen des Isolationswiderstandes

Bevor eine elektrisches Maschinen in Betrieb genommen wird, insbesondere nach längerer Pause, sollte der Isolationswiderstand gemessen werden.

Neue Maschinen und solche mit neuen Wicklungen haben einen Isolationswe von 2-3 Megohm. Ungünstige Transport verhältnisse oder Lagerung können den Isolationswert durch eingedrungenen Staub oder Freuchtigkeit herabgesetzt haben. Dies kann auch bei Maschinen der Fall sein, die längere Zeit außer Betrieb waren.

Ein in solchen Fällen gemessener Wert von 1 Megohm kann, noch akzeptiert werden.

Inspektion nach der Inbetriebnahme

(Nach kürzerer Betriebszeit).
Die Aufmerksamkeit ist zu richten au anomale Geräusche der Lager, Verfä bung oder Verschleiß des Kommutators sowie Vibrationen und Temperatur.

Attention !

HAUTE TENSION !

Soyez toujours prudent lors de l'inspection et du contrôle des machines en fonctionnement.

Lubrification

Les roulements sont lubrifiés à la graisse. Les roulements sont équipés de graisseurs. La lubrification doit être effectuée pendant la marche de la machine. Pour la fréquence de graissage et la quantité de graisse, voir plaque de lubrification sur le moteur.

Appareillage de contrôle

Contrôler que les instruments de mesure et de protection n'indiquent rien d'anormal.

ENTRETIEN ET REVISION

Paliers

Toutes les machines LAK sont normalement équipées de 2 roulements à billes à gorge. Les roulements sont muni d'un graisseur. Les roulements sont graissés en usine avec de la graisse Chevron SR1 Grease 2.

Cette graisse ou une graisse de qualité similaire devra être utilisée pour le regarnissage. Les intervalles normaux de graissage des roulements à graisseur sont compris entre 3000 et 6000 heures et dépendent de la vitesse et du type de service de la machine.

Il est recommandé que les roulements des machines ayant un service de 8 heures ou plus soient démontés, nettoyés et regarnis de graisse neuve au moins une fois par an. L'usure des roulements peut être généralement constaté au toucher avec la main, à l'oreille ou en mesurant leur température.

En service difficile, la température des paliers peut atteindre 85°C. Une température normalement haute ou un bruit anormal indiquent une lubrification insuffisante ou une usure importante du roulement.

Il faut toutefois beaucoup d'expérience pour pouvoir estimer l'usure d'un roulement à l'oreille.

Balais et porte-balais

Contrôler :

- Que la couronne porte-balais et les porte-balais proprement dits sont solidement fixés.
- Que les balais peuvent glisser librement dans les porte-balais.
- Que les balais usés sont remplacés à temps.
- Que les porte-balais sont suffisamment propres.

Longueur minimale des balais : 24 mm.
Longueur d'usure des balais :
26 mm pour LAK 4180,
40 mm pour LAK 4200-280.

Warning !

HIGH TENSION !

Always exercise the greatest care then inspecting and checking machines that are in operation.

Lubrication

The bearings are grease-lubricated. Bearings are fitted with lubricating nipples, and lubrication should be carried out while the machine is running. Lubrication intervals and grease quantity see lubrication plate on the motor.

Control instrumentation

Check that all measuring and monitoring instruments connected to the machine register the nominal values.

MAINTENANCE

Bearings

All LAK machines in standard design are fitted with two race-type ball-bearings. The bearings are fitted with lubricating nipples.

All bearings are charged with Chevron SR12. grease before leaving the Works, and it is recommended that the same or a similar quality of grease be used when re-charging the bearings.

Lubricating intervals are from 3000 to 6000 operational hours, dependent upon the operating speed and the type of duty.

Under any circumstances it is recommended that the bearings of machines which operate an 8-hour duty, or more, be dissasembled, cleaned, and re-charged with the new grease at least once a year.

It is possible to check the condition of the bearings by one of the following methods. Touch the bearing with the hand to ascertain whether it has become unduly heated. Listen for any unusual noise that may be emitted from the bearing.

Measure the temperature.

The temperature of heavy-duty machines can be up to 85°C. Unduly high temperature or unusual noise is a sign to too little lubricant, or wear and tear of the bearing.

To be able to assess the condition of the bearing by ear alone demands a great deal of experience.

Brushes and brush-holders

Check the folowing :

- *That the brush-rocker and brush-holders are firmly secured.*
- *That the brushes slide easily in their holders.*
- *That brush-holders are free from dirt.*
- *Replace all worm brushes.*

Minimum lenght of brushes : 24 mm.
Wear lenght of brushes :
26 mm for LAK 4180,
40 mm for LAK 4200-280.

Warnung !

HOCHSPANNUNG !

Bei der Inspektion und Kontrolle in Betrieb befindlicher Maschinen ist äußerste Vorsicht geboten.

Schmierung

Die Lager sind fettgeschmiert. Die Lager mit Schmiernippeln versehen und Nachschmierung muß unter Betrieb vorgenommen werden. Nachschmierungsintervalle und Fettmenge siehe Nachschmierschild auf dem Motor.

Kontrollausrüstung

Die angeschlossenen Meßinstrumente und Wächter sind auf ihre normalen Anzeigen hin zu überwachen.

INSTANDHALTUNG

Lager

Alle LAK-Maschinen sind normal mit 2 Rillenkugellagern ausgerüstet. Die Lager sind mit Schmiernippeln versehen.

Vom Werk aus sind alle Lager mit Chevron SR12 versogt. Bei Nachschmierung sollte nur dieses oder ein gleichwertiges Fett verwendet werden.

Normal kann mit einem Nachschmierinterval von 3000-6000 Stunden gerechnet werden, dies ist von Drehzahl und Betriebsverhältnissen abhängig.

Für Maschinen mit 8-Stunden-Betrieb oder mehr ist unbedingt zu empfehlen, daß die Lager einmal im Jahr ausgebaut, gereinigt und mit neuem Fett versorgt werden.

Der Zustand eines Lagers kann unter den folgenden Methoden kontrolliert werden. Fühle mit der Hand nach, ob die Lager außergewöhnlich warm geworden sind. Achte auf ungewöhnliche Geräusche, die von den Lagern rühren.

Messe die Temperatur.

Bei hartem Betrieb kann die Lagertemperatur auf 85°C steigen.

Wird dieser Wert überschritten oder ungewöhnliche Geräuschbildung wahrgenommen, ist dies ein Zeichen von Fettmangel oder Verschleiß.

Das Abhören setzt einige Erfahrungen voraus.

Kohlebürsten und Bürstenhalter

Es ist zu kontrollieren, daß :

- *Die Bürstenbrücke und die Bürstenhalter fest verschraubt sind.*
- *Die Kohlebürsten in den Haltern leicht gleiten können.*
- *Die Bürstenhalter frei von Schmutz sind.*
- *Abgenutzte Kohlebürsten ausgewechselt werden.*

Die minimale Länge der Kohlebürsten :
26 mm for LAK 4180,
40 mm for LAK 4200-280.

Traitement des porte-balais à ressort-rouleau

1. Ne pas dérouler entièrement le ruban de ressort pour le lâcher ensuite brusquement.
2. Le ruban est légèrement incurvé, et il ne doit pas être recourbé dans l'autre sens.
3. Le rouleau ne doit pas être pincé ou comprimé.
4. Débloquer le support de ressort lors du remplacement des balais.

Les balais neufs doivent toujours être rodés.

Rodage des balais

Introduire une bande de papier de verre de grain moyen (pas de toile émeri) entre le collecteur et les balais, avec le côté papier tourné vers le collecteur. Les balais étant appuyés avec la tension de ressort normale, faire glisser le papier de verre en suivant la courbure du collecteur.

Après rodage, relever les balais et souffler la poussière déposée sur les balais, les porte-balais et le collecteur. Pour ce rodage final, utiliser une pierre douce.

Collecteur

Le collecteur doit avoir une patine unie. Celle-ci peut avoir une apparence très variable selon les conditions de service. En cas de noircissement inégal ou de traces de brûlures, il est nécessaire de repolir le collecteur avec un papier de verre de grain fin (jamais de toile émeri).

Nota : En ce qui concerne les moteurs alimentés par thyristors ou par redressseurs, il faudra toujours examiner le collecteur à la suite de troubles de fonctionnement, rupture de fusibles, etc... De telles irrégularités peuvent donner lieu à de fortes étincelles sur le collecteur et risquent de provoquer des dégâts importants. On ne se contentera pas de rétablir le circuit d'alimentation. Il faudra contrôler le collecteur et au besoin l'usiner au tour.

Tournage du collecteur

Le tournage d'un collecteur usé ou ovalisé nécessite beaucoup de soins et de précision. Afin d'obtenir un résultat satisfaisant, la vitesse de coupe ne sera pas inférieure à 200 m/min (métal dur) avec une avance de 0,08 à 0,1 mm.

Le tournage au diamant permet d'obtenir un résultat très supérieur, mais il nécessite une vitesse de coupe beaucoup plus grande.

Dans les deux cas, la profondeur de coupe doit être limitée à 0,05 mm.

Après usinage, le faux-rond du collecteur ne doit pas dépasser 0,02 mm avec une rugosité $0,9 \leq Ra \leq 1,8$ µm. Lorsque la machine est en fonctionnement, un faux-rond de 0,04 mm est acceptable s'il est dû à une ovalité, mais le décalage des lames voisines doit rester inférieur à 0,02 mm.

Les collecteur sont dimensionnés de façon à pouvoir être tournés plusieurs fois jusqu'aux diamètres minimmaux suivants :

Type	Diam. min. du collecteur
LAK 4180	162 mm
LAK 4200	174 mm
LAK 4225	196 mm
LAK 4250	218 mm
LAK 4280	246 mm

Handling of brush-holders having roll-type springs

1. Do not entirely unroll the spring and then let it go suddenly.

2. The spring band has a slightly arched profile ans must, therefore, not be bent against the arch.

3. The roll-type spring must not be exposed to pressure by compression.

4. Loosen the spring-holder when replacing brushes.

New brushes must always be bedded-in to conform to the curvature of the commutator.

This is done by inserting a strip of medium-rough sandpaper (not emery paper) between the commutator and the brush, with the paper side towards the commutator.

Load the brush with its nominal spring tension and pull the strip of paper in the direction of curvature of the commutator. After bedding-in the brush, lift it from the commutator and blow away all carbon dust from the brush-holder.

Finish the bedded-in surface with a stand-stone.

Commutators

The commutator shall have an even patina which, dependent on conditions of operation, can vary a great deal in appearance. If the commutator becomes blackened or slightly burnt in places it can be restored by careful polishing with fine sandpaper (never with emery paper).

NB : In the case of machines which are thyristor or rectifier controlled, always inspect the commutator immediately after any operational dusturbance or blowing of fuses, etc., in the supply or in the control circuits. Such irregularities can cause heavy sparking at the commutator with resultant serious damage. It is not sufficient to rectify the fault in the supply circuit without checking the commutator afterwards.

Turning of commutator

If the commutator becomes worn or is not true, it is necessary for it to be turned, and this must be done carefully and correctly. The best turning result is with a minimum cutting speed of 200 m/min (hard metal) at a feed rate of 0,08 to 0,1 mm revolution.

The cutting speed is considerably larger if diamond turning is employed, and this gives by far the best result. In either case the cutting depth shall be limited to 0,05 mm. The maximum eccentricity of a newly turned commutator must no exceed 0,02 mm, with a maximum surface roughness $0,9 \leq Ra \leq 1,8$ µm. A larger eccentricity is accepted in the case of oval turning. If, however, the segments cause the brushes to chatter the eccentricity of 0,02 mm must not be exceeded.

The commutators are so constructed that they can be turned several times during their lifetime.

Minimum commutator diameters are tabulated below :

Machine frame size	*Min. commutator Stator diamet.*
LAK 4180	*162 mm*
LAK 4200	*174 mm*
LAK 4225	*196 mm*
LAK 4250	*218 mm*
LAK 4280	*246 mm*

Handhabung der Bürstenhalter mit Rollbandfeder

1. Die Feder darf nicht ganz abgerollt und dann frei gegeben werden.

2. Das Federband ist leicht bogenförmig u[nd] darf nicht entgegengesetz gebogen werden.

3. Die Federrolle darf durch Quetschdruck nicht belastet werden.

4. Beim Auswechseln der Kohlebürsten muß der Federhalter gelöst werden.

Neue Kohlebürsten müssen stets eingeschliffen werden.

Zwischen Kommutator und Bürste wird ein Streifen mittelgrobes Sandpapier gelegt (kein Schmirgelleinen), mit der Papierseite zum Kommutator.

Die Bürsten werden durch den normalen Federdruck belastet und das Sandpapier über die Kommutatorkrümmung gezogen bis die Bürste die Krümmung des Kommutators angenommen hat. Nach erfolgtem Einschleifen sind die Bürsten abzuheben und alle Teile vom Kohlestaub zu reinigen.

Die eingeschliffene Oberfläche ist mit einem Bimsstein zu polieren.

Der Kommutator

Er soll eine gleichmässige Patina zeigen d[ie] allerdings abhängig von den Betriebsverhä[lt]nissen, ein verschiedenartiges Aussehen haben kann. Sind Brandmarken oder ungleiche Färbung festgestellt worden, muß der Kommutator mit feinem Sandpapier (niemals Schmirgelleinen) abgezogen werden.

NB ! Bei den Motoren die über Thyristorsteuerungen oder Gleichrichter betrieben werden ist der Kommutator immer zu kontrollieren wenn Betriebsunregelmässigkeiten, Durchbrennen der Sicherungen oder ähnliche Störungen aufgetreten sind. Diese Störungen können eine solche starke Funkenbildung am Kommutator hervorrufen, daß nachfolgende Ausfälle nicht auszuschließen sind. Es genügt also nicht, den Fehler in der Versorgung zu beheben, es muß auch der Kommutator kontrolliert und gegebenenfalls abgedreht werden.

Abdrehen des Kommutators

Erweist es sich als notwendig, einen abgenutzen oder unrunden Kommutator abzudrehen, ist es entscheidend, daß diese Arbeit richtig und sorgfältig vorgenommen wird. Das beste Ergebnis erreicht man wenn die Schnittgeschwindigkeit mindestens 2[00] m/min (für Hartmetall) und der Vorschub 0,[08] - 0,1 mm beträgt.

Bei Diamantabdrehung, was das weitaus beste ist, muß die Schnittgeschwindigkeit erheblich höher liegen. In beiden Fällen soll die Abspanung auf 0,05 mm begrenzt bleiben. Ein neu abgedrehter Kommutator sollte nicht mehr als 0,02 mm Schlag haben bei einer Oberflächenrauheit von 4 µm. Im Betrieb kann ein Schlag von $0,9 \leq Ra \leq 1,8$ µm werden wenn es sich um Ovalität handelt eine Lamellenverschiebung darf degegen 0,02 mm nicht überschreiten.

Die Kommutatoren sind so bemessen, daß mehrere Nachbearbeitungen vorgenommen werden können.

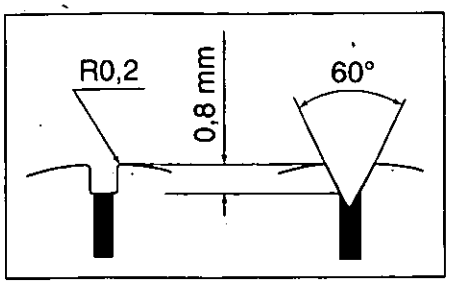
Folgende Mindestdurchmesser sind einzuhalten :

Motortyp size	*Min. Kommutator Ø*
LAK 4180	*162 mm*
LAK 4200	*174 mm*
LAK 4225	*196 mm*
LAK 4250	*218 mm*
LAK 4280	*246 m[m]*

Généralement, le collecteur doit être tourné après l'usure de trois jeux de balais. Il peut être nécessaire de régler la position des porte-balais après plusieurs tournages du collecteur. La distance séparant le collecteur de la cage du porte-balais doit être comprise entre ,5 et 2,5 mm.

Chaque tournage doit être suivi d'un grattage ou d'un fraisage des entrelames en micanite à une profondeur d'environ 0,5 mm. Il ne doit pas rester de mica sur les flancs des lames. Après grattage des entrelames, on procèdera au chanfreinage des bords de lames. Le résultat final doit avoir l'aspect d'une des deux figures suivantes :

Figures :



INSPECTION ET NETTOYAGE

L'état de propreté de la machine et de ses alentours a une importance primordiale pour la fiabilité de fonctionnement. Il faudra prévenir l'accumulation de poussière, d'huile et d'autres impuretés produites par le fonctionnement des machines elles-mêmes ou qui viennent de l'extérieur en entrant par les fenêtres et les ouvertures de ventilation.

Contrôles périodiques préventifs

L'étendue et la fréquence de ces contrôles dépend du mode de service de la machine. Il faudra souvent, lors de la préparation d'un programme de contrôle, tenir compte des conditions spécifiques telles que le programme de travail de la machine, le milieu ambiant, la propreté de l'air, etc... Pour cela, on s'appuiera sur l'expérience acquise en examinant la machine et ses accessoires, et en observant en particulier l'usure des balais et l'encrassement des filtres.

Un tel contrôle initial permet de simplifier et de justifier les contrôles périodiques ultérieurs. Par exemple, une machine nouvellement installée peut être soumise à un contrôle hebdomadaire général jusqu'à ce que l'expérience acquise permette d'espacer les contrôles.

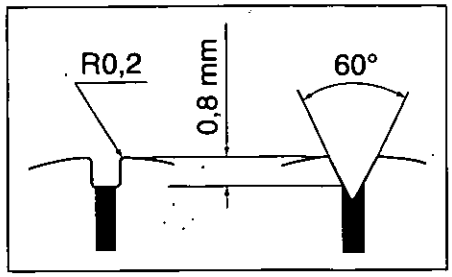
On profitera des arrêts, qu'ils soient ou non prévus à l'avance, pour effectuer le nettoyage jugé nécessaire et possible dans le temps alloué, ainsi que pour un examen général.

On contrôlera en particulier qu'il n'y a pas de jeu dans les bobinages, que les balais ne sont pas usés et qu'ils ne sont pas coincés dans les porte-balais.

When a commutator has been turned several times it may be necessary to re-position the brush-holders, which shall be positioned so that there is a minimum distance of 1,5 and a maximum distance of 2,5 mm between the brush-holder and the commutator.

After every turning of a commutator it is necessary to undercut the mica between the segments to a depth of 0,8 mm, and there must be no wafers of mica left on the sides of the segments.

The segment edges of a commutator that has been turned end undercut should be bevelled as indicated in the sketches below.



INSPECTION AND CLEANING

A decisive factor for operational reliability is the cleanliness of the machine and of its surroundings. Dust, oil and other impurities which are deposited during operation, or have entered the locality through open windows or ventilation openings, should be removed at frequent intervals.

Routine inspection

This inspection may vary as regards extend and frequency, all dependent upon the type of duty. Local conditions such as the operating programme of the machine, the general environment, the pollution content of the ambient air, etc., can also be decisive influences in the programming of inspections. Another determining factor is the experience in the operation of the machine and its accessories, gained after a time by following the condition and wear of the brushes and the clogging of air filters, etc.

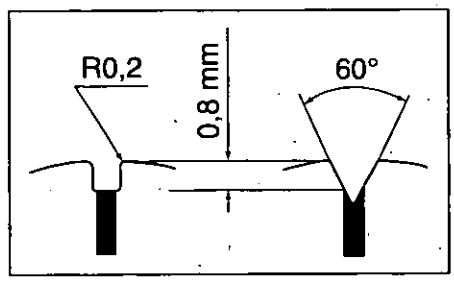
Frequent checking of these points serves to simplify routine inspections. For example, a weekly inspection of a newly installed machine could be considered reasonable, and the period could be lengthened as more experience is gained.

When it is decided to take a machine out of operation, or if a machine is stopped for other reasons, it should be cleaned to the extent necessary and within the time available, and at the same time given a general inspection. This should include a check of winding securement, the wear and tear of the brushes, and that the brushes slide freely in their holders.

Ist der Kommutator mehrmals nachgedreht worden, müssen die Bürstenhalter eventuell nachgestellt werden. Der Abstand zum Kommutator soll min. 1,5 mm und max. 2,5 mm betragen.

Nach jeder Nachbearbeitung sind die Micaisolationen zwischen dem Lamellen auf eine Tiefe von ungefähr 0,8 mm auszuschaben. Es ist darauf zu achten, daß keine Micareste seitlich stehen bleiben.

Die Lamellenkanten sind anschließend so zu brechen wie aus nachsthender Abb. ersichtlich.



INSPEKTION UND REINIGUNG

Diese müssen, was Umfang und Häufigkeit anbelangt, den Betriebsverhältnissen entsprechen. Die lokalen Gegebenheiten wie beispielsweise das Arbeitsprogramm der Maschine, Umgebung, Luftreinheit u.s.w. sind bestimmend hierfür.

Routineinspektion

Die Inspektion muß, was Umfang und Häufigkeit anbelangt, den Arbeitsbereichen entsprechen. Die lokalen Gegebenheiten wie Beispielsweise das Arbeitsprogramm der Maschine, Umgebung, Luftreinheit u.s.w. sind bestimmend hierfür. Beobachtungen und Erfahrungen über den Bürstenverschleiß, die Verschmutzung von eventuellen Filtern und dgl. geben entsprechende Hinweise.

Eine regelmässige Untersuchung dieser Faktoren erleichtert die Routineinspektion. Für eine neu installierte Maschine ist eine wöchentliche Untersuchung angebracht. Die hierbei gewonnenen Erkenntnisse bestimmen dann den weiteren periodischen Untersuchungsverlauf.

Bei vorausbestimten oder auch anderen Betriebsunterbrechungen können, soweit es die Zeit erlaubt und es angebracht erscheint, Reinigung und Untersuchung der Maschine vorgenommen werden. Der feste Sitz der Wicklungen, Bürstenverschleiß sowie das einwandfreie Gleiten der Bürsten in den Haltern können bei dieser Gelegenheit geprüft werden.

DEMONTAGE ET REMONTAGE

Démontage

- Déconnecter la machine et le motoventilateur s'il y a lieu.
- Démonter les gaines de ventilation s'il y a lieu.
- Démonter les accessoires s'il y a lieu.
- Enlever les portes de visite, relever les balais et bloquer ceux-ci en position relevée à l'aide des ressorts de porte-balais.
- Démonter le couvre-roulement extérieur du côté collecteur.
- Débrancher les câbles de connexion des balais.
- Dévisser les vis de fixation des paliers-flasques. Démonter ensuite le palier-flasque (collecteur) avec la couronne porte-balais. Ne pas oublier de tourner l'induit de telle sorte que les ailettes d'équilibrage n'empêchent pas le passage des porte-balais.
- Sortir ensuite l'induit et le palier-flasque (côté opposé collecteur) du stator.
- Enlever les couvre-roulements avant de démonter le palier-flasque (côté opposé collecteur).
- Toujours envelopper les roulements dans un emballage approprié pour ne pas les salir.

Remontage

On procédera aux mêmes opérations en sens inverse. Si les roulements sont démontés, il faudra les remonter avec leurs couvre-roulements intérieurs. Il est important qu'aucune impureté n'y pénètre. En remplaçant l'induit, faire attention de ne pas endommager l'enroulement ni le collecteur. Serrer toutes les vis et contrôler que toutes les connexions sont correctes et bien fixées.

Réglage de la couronne porte-balais

Les machines sont livrées avec la couronne porte-balais réglée sur la ligne neutre, la machine pouvant fonctionner dans les deux sens. Cette position est repérée sur la couronne porte-balais (vis d'indexation).
S'il est nécessaire de vérifier cette position, par exemple en cas de remplacement de l'induit, on procédera de la façon suivante :

- Avant de déterminer la position correcte, les charbons doivent être rodés soigneusement. Débrancher l'alimentation et connecter un voltmètre pouvant mesurer quelques volts entre les porte-balais.
- Débrancher l'une des connexions de l'enroulement d'excitation et appliquer à celui-ci une tension d'accumulateur comprise entre 3 et 12 volts.
- L'interruption et le rétablissement rapides du courant provoque l'induction d'une tension dans l'induit qui est indiquée par le voltmètre.
- La déviation du voltmètre augmente lorsqu'on s'écarte de la ligne neutre. Elle est minimale, ou même nulle, sur la ligne neutre.
- Mesurer la position ainsi trouvée. Faire un repère sur la couronne porte-balais et serrer les vis.

DISASSEMBLY AND RE-ASSEMBLY

Disassembly

- *Remove the supply connections to the machine and the blower (if the latter is mounted).*
- *Remove possible air pipe connections.*
- *Dismount possible accessories.*
- *Remove the inspection covers, lift the brushes off the commutator, and retain them in the lifted position by means of the brush-holder springs.*
- *Remove the protection cover and then the inner ball-bearings covers of the N-endshield.*
- *Disconnect the leads to the brushes.*
- *Loosen and remove the endshield screws and dismount the N-endshield together with the brush gear.*
- *Take the armature and the D-endshield out of the frame.*
- *Remove the bearing covers before disassembling the D-endshield.*
- *Always protect the bearings against pollution with a suitable packing.*

Re-assembly

This is usually carried out in the opposite sequence to "Di-sassembly". If the bearings have been removed assemble these first, together with the inner ball-bearings covers. Make certain the bearings are clean.

Be careful not to damage the windings and commutator when replacing the armmature. Tighten all screws and check that supply cables are properly connected and secured.

Adjustment of brush-rocker

When the machine is supplied, the brush-rocker is set and marked for the neutral position (indexing screw).

Should it be necessary to check this in the event of a replacement of armature, use the following procedure :

- *Before the position is determined, make sure the brushes are bedded-in correctly.*
- *Disconnect the supply to the machine, and connect a voltmeter having a measuring range of a few Volts across two consecutive brush pins.*
- *Disconnect one of the leads to the field coil, and connect the field coils to a battery having a capacity of 3 to 12 Volts.*
- *By rapidly switching the voltage on and off the field coils, a voltage is induced in the armature and a deflection is registered on the voltmeter.*
- *This deflection becomes greater the further the brushes are turned away from the neutral position. The deflection is least (possibly Zero) in the neutral position.*
- *Measure this position, and mark and secure the brush-rocker.*

DEMONTAGE UND MONTAGE

Demontage

- *Alle Anschlußkabel, auch die eventueller Lüftermotore sind abzuschließen.*
- *Eventuelle Rohranschlüsse und Zubehör abbauen.*
- *Bedienungsklappen entfernen, Bürsten abheben und sie mit den Rollbandfedern in abgehobener Stellung festklemmen.*
- *Äußeren Lagerdeckel abnehmen und den inneren Kugellagerdeckel an der Bürstenseite abschrauben.*
- *Die Anschlußkabel für die Kohlebüsten abnehmen.*
- *Schrauben der Lagerschilde lösen, der büstenseitige Lagerschild kann nun mitsamt der Bürstenbrücke abgehoben werden.*
- *Den Anker jetzt mitsamt dem antriebseitigen Lagerschild aus dem Ständer nehmen.*
- *Zur Demontage des antriebseitigen Lagerschildes ist der äußere Kugellagerdeckel abzunehmen.*
- *Die Lager gegen Verunreinigung durch geeignete Abdeckung schützen.*

Montage

Wird generell in entgegengesetzter Reihenfolge vorgenommen. Sind sie Kugellager abgezogen worden, müssen diese zusammen mit den inneren Kugellagerdeckeln aufgesetzt werden. Bei den Kugellagern sorgfältig darauf achten, daß sie nicht verschmutzt werden und bei Einbau des Ankers aufpassen, daß Wicklungen und Kommutator nicht beschädigt werden.

Alle Schrauben und elektrischen Verbindungen fest anziehen.

Einstellen der Bürstenbrücke

Die Maschinen werden mit neutral eingestellter also drehrichtungsunabhängiger Bürstenbrücke geliefert. Die Stellung ist markiert (Einstell-Schraube).

Ist die Überprüfung der Brückenstellung notwendig, beispielsweise nach dem Austausch des Ankers, geht man folgendermaßen vor :

- *Vor der Überprüfung müssen die Kohlebürsten gut eingeschliffen sein.*
- *Die Maschine ist stromlos zu machen und ein Voltmeter mit einem Meßbereich von einigen wenigen Volt wird an 2 Bürstenhalter angeschlossen.*
- *Wird der Stromkreis zu den Feldspulen nun abwechselnd schnell geschlossen und getrennt, induziert sich eine Spannung im Anker und das Voltmeter schlägt aus.*
- *Der Ausschlag ist umso größer, je weiter die Bürsten aus der neutralen Stellung stehen. In neutraler Stellung ist der Auschlag am geringsten (evtl. gleich Null).*
- *Diese Stellung wird ausgemessen, markiert und die Bürstenbrücke festgeschraubt.*

Nettoyage du filtre

Filtre non régénérable.
Nettoyage par soufflage énergique.

Le média filtrant (tissu de fibre synthétique) peut être nettoyé 2 à 3 fois maximum (selon précautions de nettoyage) après démontage de son support.

Si nécessaire l'élément filtrant peut être changé, sans changer le support.

Nettoyage de l'échangeur air/air

Prévoir périodiquement leur nettoyage par écouvillonnage.

Pour cela, démonter le panneau arrière côté opposé bout d'arbre ainsi que le filtre.

L'entrée du faisceau se trouve face à l'observateur. Passer un écouvillon à travers chaque tube, ouvrir les portes du collecteur, souffler ensuite la chambre du collecteur à l'air comprimé.

Ensuite, effectuer un nettoyage par souffage d'air comprimé des poussières à l'extérieur des tubes du faisceau, afin de permettre le passage de l'air entre ces tubes.

La fréquence de nettoyage des échangeurs dépend de l'ambiance du lieu d'utilisation.

Nettoyage de l'échangeur air/eau

Le seul nettoyage à prévoir est celui du filtre interne (voir plus haut "Nettoyage du filtre", filtre non régénérable).

Cleaning of the filter

Non regenerated filter
Cleaning by strong blowing.

The filtering medium (with synthetic fiber fabric) may be cleaned 2 or 3 times (according to precautions of cleaning) after removal from its holder.

If necessary, the filtering element may be replaced without replacing the holder.

Cleaning the air/air exchanger

Give the exchanger a good clean up at regular intervals. For that, take off the back panel, opposite main shaft end side.

The inlet of the bundle stands right opposite the observer.

Passe a cleaning brush through each tube, open the doors of the commutator, then blow the commutator housing through, with forced-draught air. Set the back panel back.

Then, with forced-draught air, blow off the dust surrounding the tubes of the bundle, so as to let the passage of air between these tubes.

The frequency of such clean-ups is up to the surroundings atmosphere.

If the exchanger is fitted with an inner filter proceed as indicated in the paragraph "Cleaning the filter".

Cleaning the air/water exchanger

If the exchanger is fitted with an inner filter it is only to clean the filter (see paragraph "Cleaning the filter").

Filterreinigung

Nicht-regenerierbare Filter
Reinigung durch kräftiges Ausblasen.

Die Filtermatte (aus synthetischer Faser) kann nach dem Herausnehmen aus der Halterung zwei bis dreimal gereinigt werden.

Falls erforderlich, kann die Filtermatte ersetzt werden, ohne die Halterung auszutausehen.

Reinigung des Luft-Luft-Kühlers

Der Kühler sollte in regelmäßigen Abständen sorgfältig gereinigt werden. Hierfür ist die Abdeckung an der Rückseite gegenüber dem Antriebswellenende abzunehmen.

Die Eintrittsöffnungen des Rohrbündels liegen dann dem Betrachter genau gegenüber. Säubere jedes Rohr mit einer Rohrbürste, öffne die Kommutatorabdeckungen und blase den Kommutatorraum mit Druckluft aus. Befestige wieder Rückwand.

Dann entferne mit Druckluft den Staub auf der Oberfläche der Rohrbündel, um den Luftdurchtritt zwischen den Rohren zu gewährleisten.

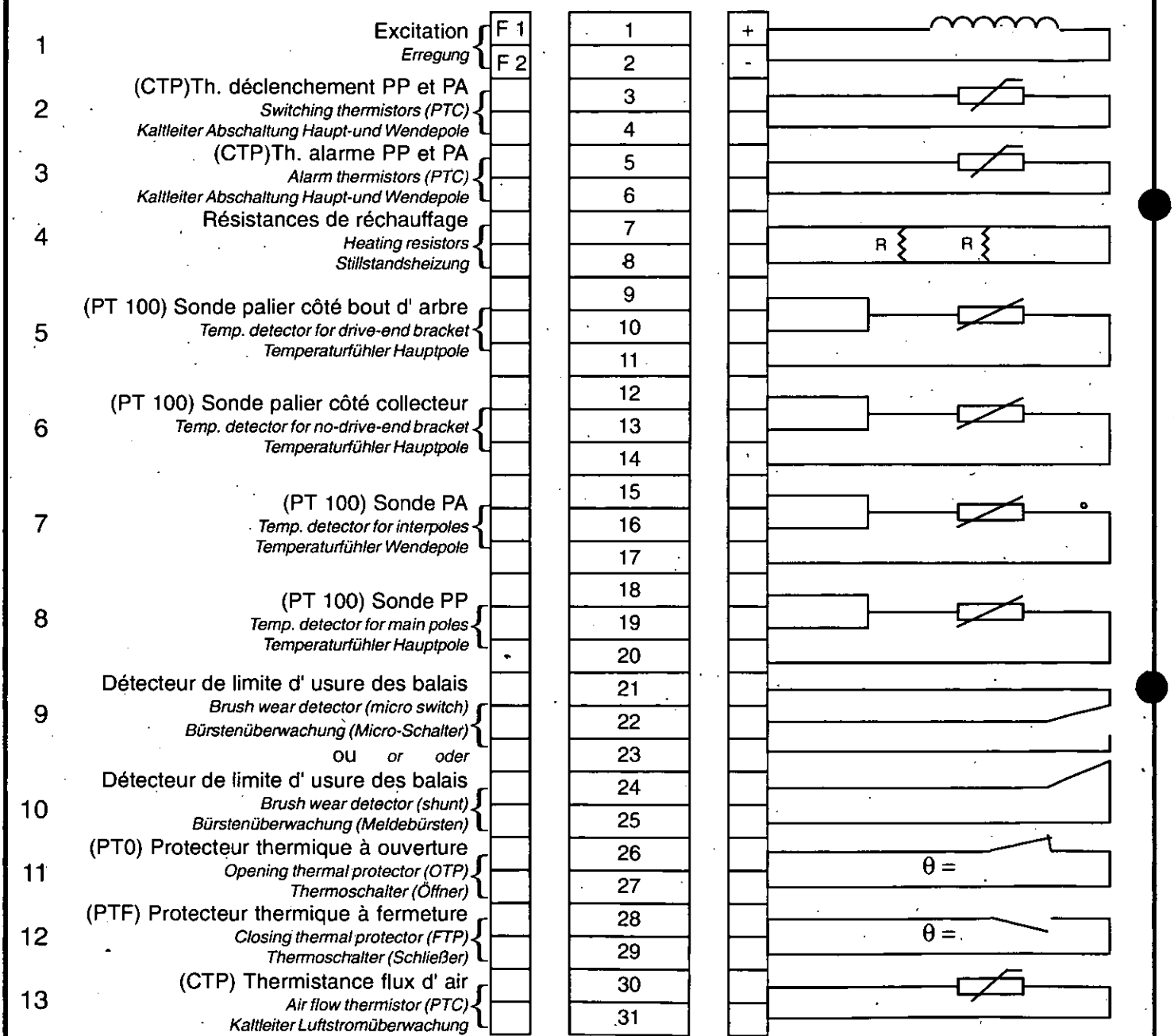
Die Häufigkeit dieser Reinigung hängt von der umgebenden Atmosphäre ab.

Wenn der Wärmestauscher mit einem inneren Filter ausgestattet ist, verfahre wie im Abschnitt "Filterreinigung" angegeben.

Reinigung des Luft-Wasser-Kühlers

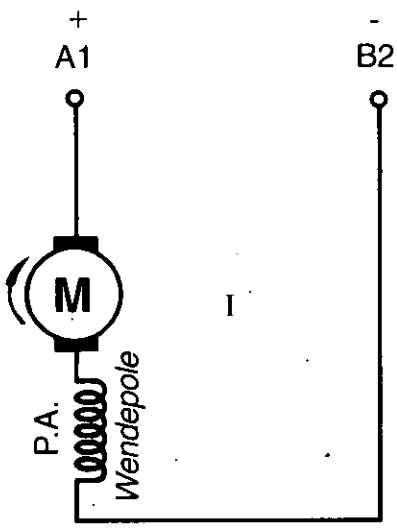
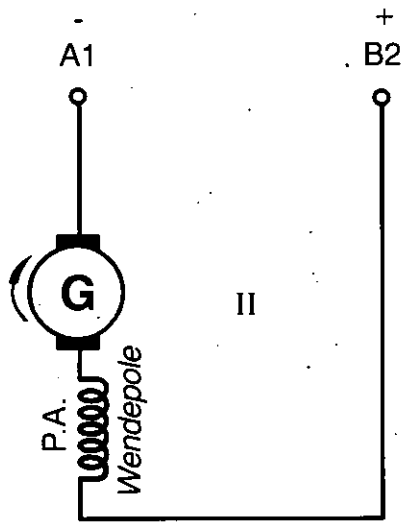
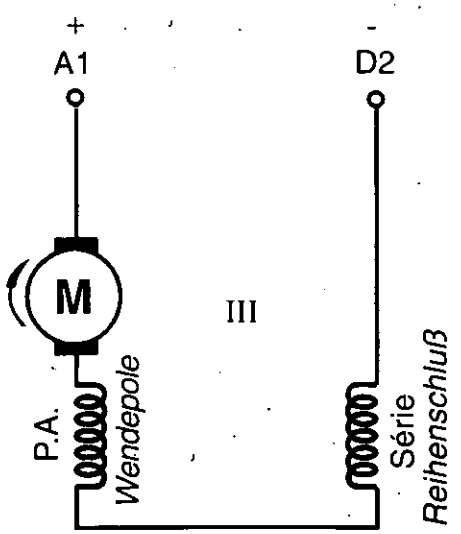
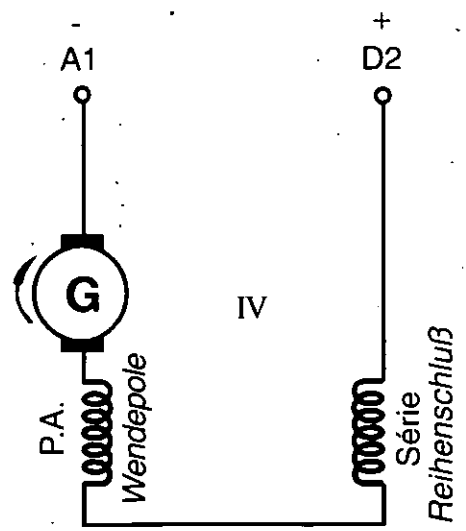
Wenn der Wärmestauscher mit einem inneren Filter ausgestattet ist, muß nur der Filter gereinigt werden (siehe Abschnitt "Filterreinigung").

Récapitulatif bornes d' excitation et bornes auxiiiaires
Terminals for field and accessories
Erreger und Hilfsklemmen

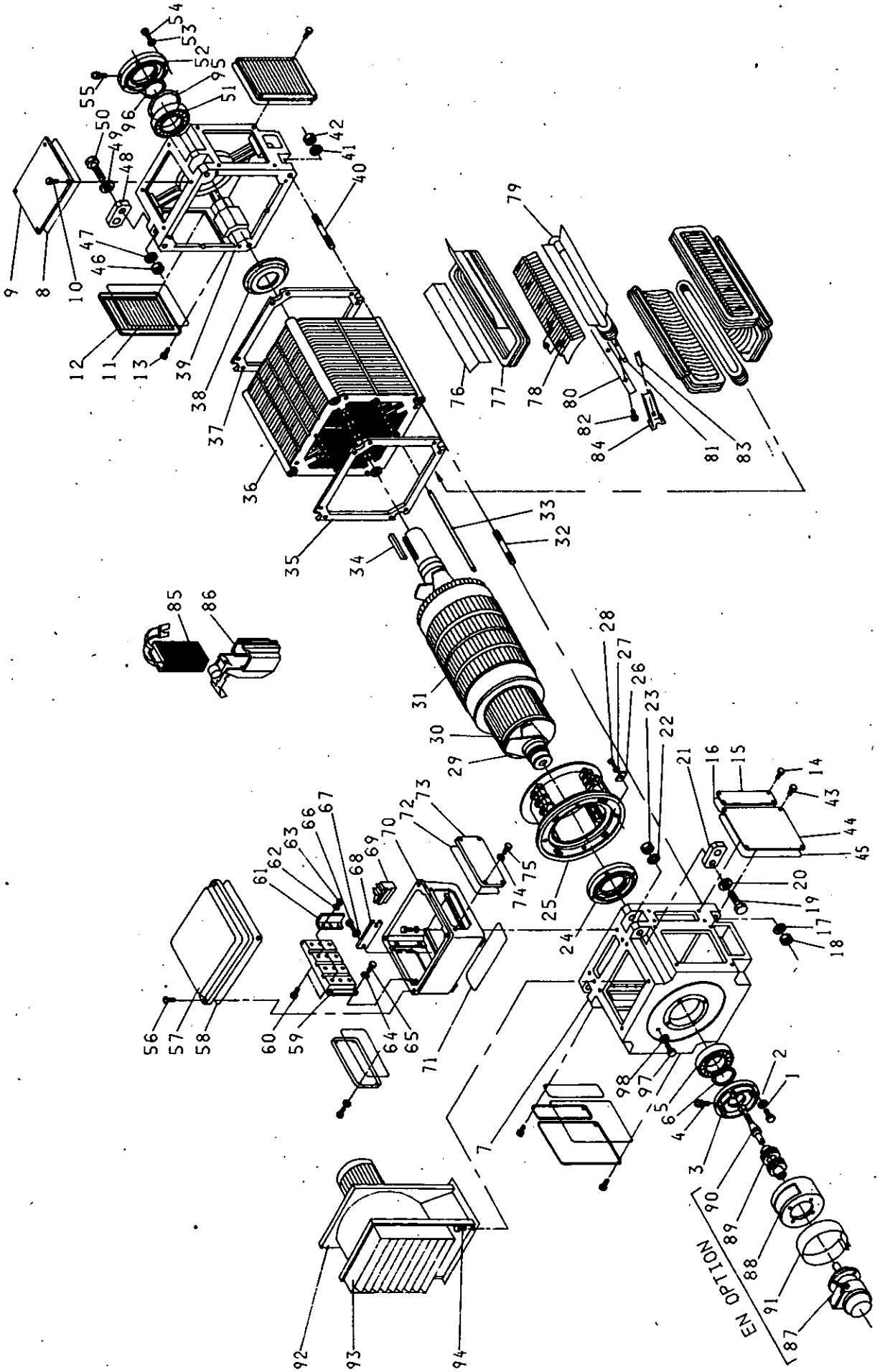


SCHEMA DE BRANCHEMENT
CONNECTION DIAGRAM
ANSCHLUß-SCHEMA

Bornes de puissance
Power terminals
Leistungs Klemmen

Branchement Connection-Schaltung	**Moteur** Motor	**Générateur** Generator
Shunt *(separated* *-* *Nebenschluß)*		
Composé *compound* *(Shunt separated* *& series* *-* *Nebenschluß mit* *Hilfsreihenschluß)*		

MOTEURS A COURANT CONTINU LAK 4180-4280
D.C. MOTORS TYPES LAK 4180-4280
GLEICHSTROMMOTOREN LAK 4180-4280



LAK 4180-4280
Légende

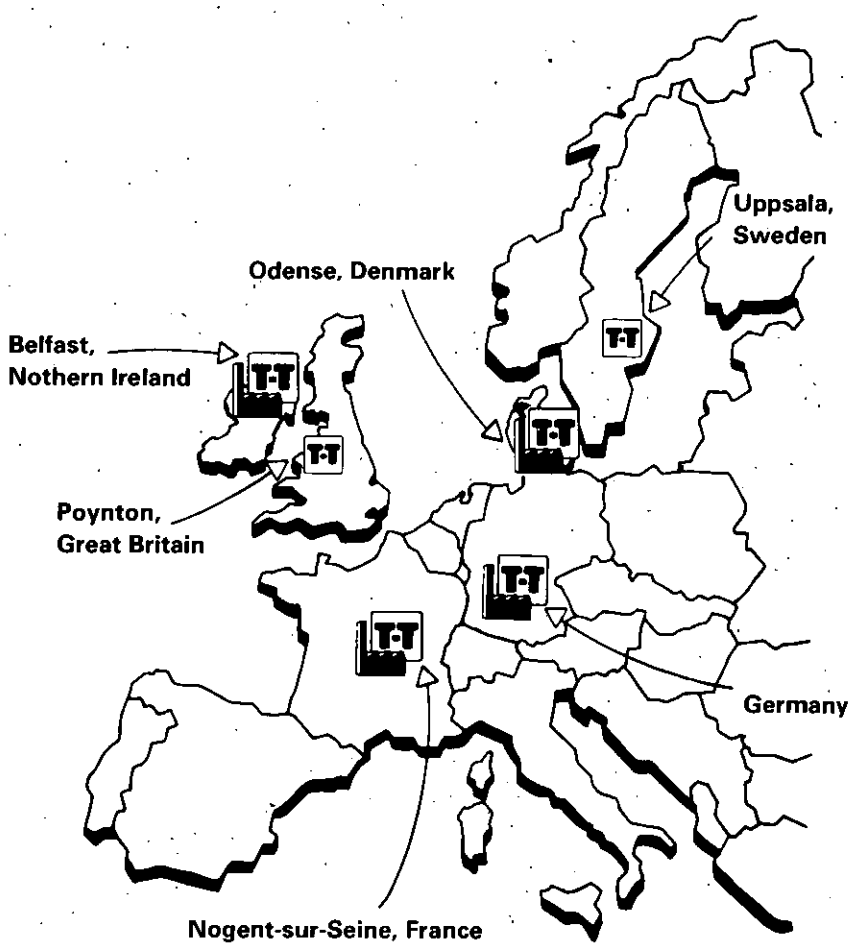
1 Vis pour 3
2 Rondelle pour 3
3 Couvre-roulement extérieur, côté collecteur
4 Graisseur
5 Roulement à billes, côté collecteur
6 Circlips
7 Palier flasque, côté collecteur
8 Joint pour 9
9 Porte pleine
10 Vis pour 9
11 Joint pour 12
12 Porte à auvent, côté collecteur
13 Vis pour 12
14 Vis pour 15
15 Couvercle de flasque, côté collecteur
16 Joint pour 15
17 Rondelle pour 7
18 Ecrou pour 7
19 Vis pour 7
20 Rondelle pour 21
21 Anneau de levage
22 Rondelle pour 21
23 Ecrou pour 21
24 Couvre roulement intérieur, côté collecteur
25 Couronne porte-balais
26 Vis pour 25
27 Rondelle pour 25
28 Ecrou pour 25
29 Disque d'équilibrage, côté collecteur
30 Collecteur
31 Induit complet
32 Goujon pour stator
33 Tige de fixation des pôles principaux
34 Clavette de bout d'arbre
35 Joint
36 Carcasse
37 Joint
38 Couvre roulement intérieur, côté bout d'arbre
39 Palier flasque, côté bout d'arbre
40 Goujon pour stator
41 Rondelle pour 36
42 Ecrou pour 36
43 Rondelle pour 41
44 Couvercle de flasque, côté bout d'arbre
45 Joint pour 41
46 Ecrou pour 48
47 Rondelle pour 45
48 Anneau de levage
49 Rondelle pour 45
50 Vis pour 45
51 Roulement, côté bout d'arbre
52 Couvre-roulement, côté bout d'arbre
53 Rondelle pour 49
54 Vis pour 49
55 Graisseur
56 Vis pour 54
57 Couvercle de boîte à bornes
58 Joint pour 54
59 Plaque à bornes
60 Vis pour 56
61 Pièces de contact
62 Rondelles pour 58
63 Ecrou pour 58
64 Rondelle pour 56
65 Vis pour 56
66 Vis pour 65
67 Rondelle pour 65
68 Butée d'arrêt
69 Bornes Entrelec
70 Boîte à bornes
71 Joint pour 67
72 Joint pour 70
73 Plaque de boîte à bornes
74 Rondelle pour 70
75 Vis pour 70
76 Isolant pour pôle principal
77 Bobinage de pôle principal
78 Pôle principal
79 Pôle auxiliaire
80 Câle pôle auxiliaire
81 Barre de pôle auxiliaire
82 Vis pour 78
83 Pièce d'extrémité
84 Console de pôle auxiliaire
85 Balais pour 86
86 Porte-balais
87 Dynamo tachymétrique
88 Support D.T.
89 Accouplement D.T.
90 Axe d'accouplement D.T.
91 Sangle de protection D.T.
92 Motoventilateur
93 Filtre
94 Vis pour 92
95 Rondelle de précharge roulement
96 Circlips
97 Vis d'indexation couronne porte-balais
98 Rondelle pour 97

D.C. Machines,
Types LAK 4180-4280

1 Screw for 3
2 Washer for 3
3 External bearingcover, commutator side
4 Grease nipple
5 Ball-bearing, commutator side
6 Circlips
7 Bearing endshield, commutator side
8 Gasket for 9
9 Solid cover
10 Screw for 9
11 Gasket for 12
12 Grid plate, commutator side
13 Screw for 12
14 Screw for 15
15 Covering plate, commutator side
16 Gasket for 15
17 Washer for 7
18 Nut for 7
19 Screw for 7
20 Washer for 21
21 Lifting ball
22 Washer for 21
23 Nut for 21
24 Internal bearingcover, commutator side
25 Brush rocker
26 Screw for 25
27 Washer for 25
28 Nut for 25
29 Balancing disc, commutator side
30 Commutator
31 Complete armature
32 Pin screw for stator
33 Fixing bars for main poles
34 Shaft-end key
35 Rubber gasket
36 Stator
37 Rubber gasket
38 Internal bearing-cover, shaft-end side
39 Bearing entshield, shaftend side
40 Pin screw for stator
41 Washer for 36
42 Nut for 36
43 Screw for 41
44 Covering plate, shaftend side
45 Gasket for 41
46 Nut for 48
47 Washer for 45
48 Lifting ball
49 Washer for 45
50 Screw for 45
51 Bearing, shaftend side
52 External bearingcover, shaftend side
53 Washer for 49
54 Screw for 49
55 Grease nipple
56 Screw for 54
57 Terminal box cover
58 Gasket for 54
59 Terminal board
60 Screw for 56
61 Contact pieces
62 Washer for 58
63 Nut for 58
64 Washer for 56
65 Screw for 56
66 Screw for 65
67 Washer for 65
68 Plate
69 Terminal plate
70 Terminal box
71 Gasket for 67
72 Gasket for 70
73 Terminal box cover
74 Washer for 70
75 Screw for 70
76 Insulation for main pole
77 Main pole coil
78 Main pole
79 Interpole coil
80 Interpole packing
81 Bar for interpole
82 Screw for 78
83 Specing piece
84 Interpole consol
85 Brushes for 86
86 Brush holders
87 Tacho
88 Tacho adapter
89 Tacho coupling
90 Stube shaft for tacho
91 Cover of adapter for tacho
92 Ventilation motor
93 Filter
94 Screw for 92
95 Washer pre loading bearing
96 Circlips
97 Indexing screw brush rocker
98 Washer for 97

Gleichstrommotoren
Typen LAK 4180-4280

1 Schraube für 3
2 Scheibe für 3
3 Außerer Lagerdeckel BS
4 Nachschmiernippel
5 Kugellager BS
6 Seegerring
7 Lagerschild BS
8 Dichtung für 9
9 Deckel
10 Schraube für 9
11 Dichtung für 12
12 Gitterplatte BS
13 Schraube für 12
14 Schraube für 15
15 Abdeckplatte BS
16 Dichtung für 15
17 Scheibe für 7
18 Mutter für 7
19 Schraube für 7
20 Scheibe für 21
21 Tragöse
22 Scheibe für 21
23 Mutter für 21
24 Innerer Lagerdeckel BS
25 Bürstenring
26 Schraube für 25
27 Scheibe für 25
28 Mutter für 25
29 Auswuchtscheibe BS
30 Kommutator
31 Anker komplett
32 Stiftschraube für Stator
33 Befestigungsstäbe für Hauppel
34 Paßfeder
35 Gummidichtung
36 Stator
37 Gummidichtung
38 Innerer Lagerdeckel AS
39 Lagerschild AS
40 Stiftschraube für Stator
41 Scheibe für 36
42 Mutter für 36
43 Schraube für 41
44 Abdeckplatte AS
45 Dichtung für 41
46 Mutter für 48
47 Scheibe für 45
48 Tragöse
49 Scheibe für 45
50 Schraube für 45
51 Lager AS
52 Äußerer Lagerdeckel AS
53 Scheibe für 49
54 Schraube für 49
55 Nachschmiernippel
56 Schraube für 54
57 Klemmenkastendeckel
58 Dichtung für 54
59 Klemmenbrett
60 Schraube für 56
61 Kontaktstücke
62 Scheibe für 58
63 Mutter für 58
64 Scheibe für 56
65 Schraube für 56
66 Schraube für 65
67 Scheibe für 65
68 Platte
69 Klemmen
70 Klemmenkasten
71 Dichtung für 67
72 Dichtung für 70
73 Klemmenkastendeckel
74 Scheibe für 70
75 Schraube für 70
76 Isolation für Hauptpol
77 Hauptpol-Wicklung
78 Hauptpol
79 Wendepol-Wicklung
80 Wendepol Paket
81 Stab für Wendepol
82 Schraube für 78
83 Abstandstück
84 Wendepolstütze
85 Bürsten für 83
86 Bürstenhalter
87 Tacho
88 Tacho-Adapter
89 Tacho-Kupplung
90 Wellenstumpf für Tacho
91 Abd. für Tacho-Adapter
92 Fremdlüfter
93 Filter
94 Schraube für 92
95 Lagerausgleichscheibe
96 Seegerring
97 Schraube für Bürstenring
98 Scheibe für 97



THRIGE ELECTRIC

F:
Thrige-Enco S.A.
Av. du Gén. de Gaulle
F-10400 Nogent-sur-Seine
Tél : 25 39 51 00
Fax : 25 39 02 45

D:
Thrige Electric GmbH
Industriestraße 8
92334 Berching
Tel : 08462 204 400
Fax : 08462 204 450

Schabmüller GmbH
Industriestraße 8
92334 Berching
Tel : 08462 204-0
Fax : 08462 18 41

GB:
Thrige-Scott Ltd.
Acumen Centre
First Av., Poynton
GB-Cheshire SK 12 1FJ
Tél : 0625 85 94 24
Fax : 0625 85 94 93

S:
Thrige Electric
Lefflersgatan 1
S-751 46 Uppsala
Tél : 018 15 65 60
Fax : 018 10 74 78

Int:
Thrige Electric A/S
Tolderlundsvej 3
DK-5000 Odense C
Tél : 66 11 13 15
Fax : 66 12 42 64

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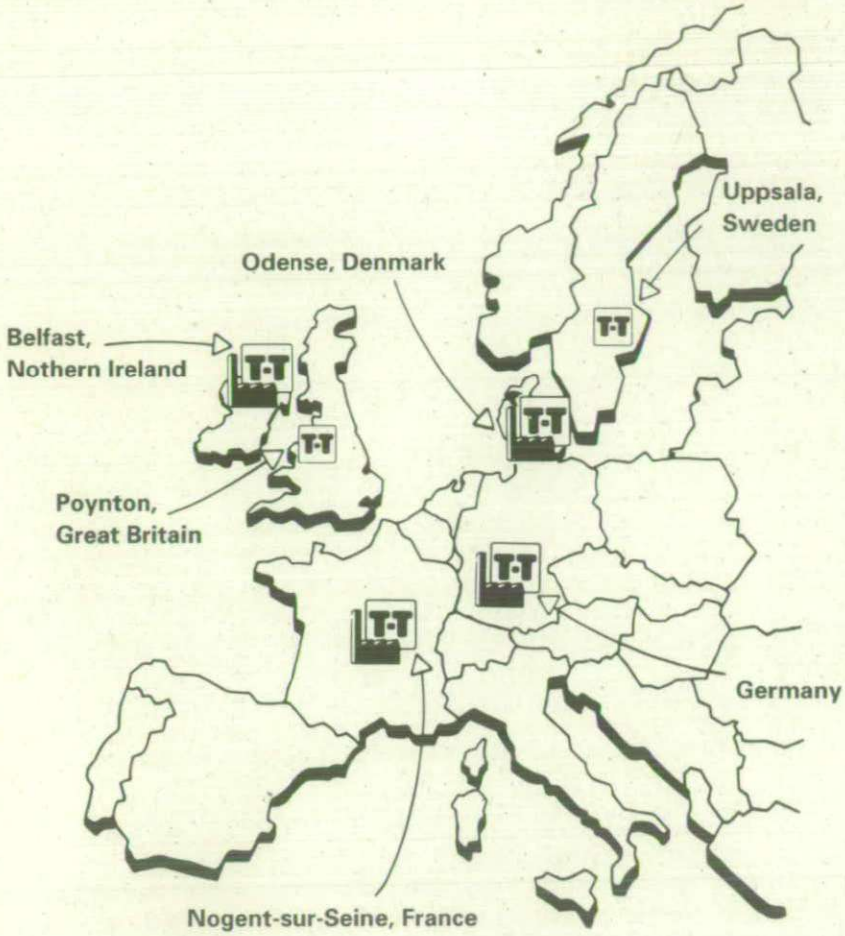

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Fax : 018 10 74 78

Int:
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Tolderlundsvej 3
DK-5000 Odense C
Tél : 66 11 13 15
Fax : 66 12 42 64

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THRIGE-SCOTT

ATTN. PAUL SHORE

ORDER CONFIRMATION

WORKS NO.	96/2150-1
DATE	17/06/96

PLEASE CHECK AGAINST REQUIREMENTS

CUSTOMER	Dairy Crest Foods Maelor Creamery Marchwiel Nr Wrexham Clwyd LL13 0UE	DESPATCH TO	Customer SER NO 410 022-020/1
ORDER NO.	962050/17/K/01	LABELLING	O/No. 962050/17/K/01 Attn Paul Shore
DATE	15/05/96		

QUANTITY	1	PRICE	£9,800.00	EACH	nett		
FRAME	LAK 4225C	TYPE	DC Shunt Motor		IEC Standards		
OUTPUT	265 / 265 kW	RATING	S	S1	INSL		
RPM	1900 / 2900	ROTATION		Reversing	AT	DE	
VA	480	CONTROLLED.	VF	220 / 110			
IA	588		IF	12.4 / 6.8			
ENCLOSURE IP	23	COOLING IC	06	MOUNTING IM	1001		
BLOWER	LCLF-1-025-5	380-420V / 3ph / 50Hz	4.7A	AMPS			
TACHOGENERATOR							
PROTECTION	2 x Thermostat						

SPECIAL FEATURES

BRUSHES 16-20/2x32x64 EG295AC MORGAN

T-S Order No. TT16361
T-E Order No. C6050072
T-E Serial No. 605072-020

Finish: Standard

Packing	Standard	Despatch	26/07/96	Week	96-30.5

028990 457225

Thrige-Scott Ltd.
314 Ravenhill Road
Belfast BT6 8GN
N. Ireland

Tel.:
Fax: 01232-732031
Telex: 747827 trisco g
Reg. No. N.I. 16121

Thrige-Titan Group

13003

THRIGE-SCOTT

Standard Terms and Conditions of Sale

1. GENERAL
The following Terms and Conditions shall be binding on every person, firm or company (hereafter called the Buyer) not withstanding any provision at variance with these Conditions contained in the Buyers order or other communication with Thrige-Scott Ltd. (hereafter called the Company).

Modification or alterations to the Conditions can only be accepted if expressly agreed in writing by the Company.

The conditions shall also apply to service and repair works, cf clause 12.

2. QUOTATIONS AND ORDERS
Unless expressly stated, quotations submitted by the Company shall remain valid for 30 days from date of issue, and are subject to prior sale of the goods quoted.

All prices quoted or listed are exclusive of Value Added Tax and other tariffs or duties which may be in force from time to time.

No agreement between the parties will be deemed binding until the Company has accepted the Order by issuing an order of confirmation.

3. ORDERS AND DELIVERY
All orders are supplied at the confirmed price and time of delivery, but with reservations for alteration of prices and delivery times which may arise after acceptance of orders and due to circumstances beyond the control of the Company, e.g. labour disputes, strikes, lock-outs, changes in trade conditions or public authority restrictions, failure of raw material supplies, fluctuations in currency exchange rates, fire, war, mobilization or unforeseen military conscription of equal extent, acts of sabotage, requisition, embargo, currency restrictions, insurrection, shortage of transport, general shortage of materials, power supply restrictions, shortage of goods or delays in deliveries from sub-suppliers, which can be attributed to any or several of the circumstances stated above.

All delivery times are given ex the Company's works.

The given terms of delivery are according to our best judgement. If, for any reason, the Company is unable to effect delivery at the agreed time or foresee a probable delay, the Buyer will be notified of this and at the same time advised of the anticipated date of delivery.

The Company shall in no circumstances be liable for loss of production, loss of profits, or any other indirect losses suffered by the Buyer or his customer as a result of delayed deliveries.

If the buyer is able to substantiate other losses resulting from delayed deliveries, the Company's liabilities will be restricted to a maximum of 5% of the value of that part of the Company delivery that the Buyer cannot put to the use intended.

Cancellation of an order can only be accepted if agreed upon and by payment of all direct and indirect expenses sustained by the Company up to the date of cancellation.

Should the Buyer fail to comply with the agreed conditions or terms of payment the Company shall be entitled to terminate the contract or to withhold whole or part deliveries, and morover the Company will be entitled without previous warning to change the terms of payment for future deliveries.

4. PASSING OF RISK
Unless otherwise specified in writing the goods shall be deemed to be sold "c.i.f.", cf Incoterms 1980.

5. PACKING
Re-usable packing which is not charged as a separate item will not be credited.

Re-usable packing which is charged as a separate item will be credited at the invoiced amount if returned carriage paid and in undamaged condition within 3 months from the date of delivery, unless otherwise stated in the invoice.

6. TERMS OF PAYMENT
Unless otherwise stated all goods are to be paid current month plus 30 days nett. The Buyer has no right to withhold payment owing to possible claims against the Company, which have not been approved by the Company.

If, through no fault of the Company, the Buyer does not make payment at the correct time, the Company has the right to charge overdue payment interest at the rate stated in the order confirmation, invoice or statement of accounts with effect from the original date of payment.

7. TITLE OF GOODS
The title of goods shall not pass to Buyer until payment has been made of the full contract price and in case of non-payment we shall be entitled to repossess or trace the goods or the proceeds of sale in your hands or in the hands of any liquidator or receiver.

8. LIABILITIES FOR DEFECTS
The Company undertakes to remedy any defects in or failure of the goods supplied which arise solely from faults in design, materials or workmanship within a period of 12 consecutive months from the date of delivery.

This liability does not apply to defects caused by the omission of the Buyer to maintain and use the goods in full accordance with the given instructions, or if remedy is carried out by other than the workshops approved by the Company or if the goods are put to incorrect or inappropriate use, or are modified or technically changed without the prior written consent of the Company, or are subjected to extraordinary climatic influences, or if unoriginal spare parts have been used.

Parts subject to wear and tear are not covered by the guarantee.

Complaints pertaining to defects shall be submitted in writing immediately the defect has been found. Delayed complaints will not be accepted. The defective parts must be returned to the Company's works, carriage paid, and the necessary repair will be undertaken as quickly as possible within normal working hours. Repaired or replacement parts will be delivered ex works.

Remedying of defects does not cover mounting or installation.

After risk of delivery has been passed to the purchaser, the Company has no further liability for defects over and above those stated in the foregoing. The Company accepts no liability for any consequential losses such as production loss or time loss suffered by the Buyer or his customer.

9. CLAIMS
Claims which are not covered by clause 8 shall be submitted to the Company not later than 8 days after receipt of the goods.

10. LIABILITY FOR DAMAGES CAUSED BY THE GOODS (PRODUCT LIABILITY)
If any damage is caused by the goods supplied, the Company shall be liable for personal injury only if it is proved that such injury was caused by fault or negligence on the part of the Company or other for whom the Company is responsible.

The Company accepts no liability for damage to real property or personal property.

The Company accepts no liability for production losses, loss of profit or other consequental loss.

The Company accepts no liability for damage caused by goods delivered more than 5 years before the damage occurs.

To the extent that the Company might incur product liability towards any third party, the Buyer shall indemnify the Company as far as the Company's liability has been limited by the four preceding sub-paragraphs.

Any claim lodged by a third party against the Company or the Buyer must be notified to the other without delay.

The Company and the Buyer shall be mutually obliged to let themselves be summoned to the court for examination of claims for damages lodged against one of them on the grounds of damage allegedly caused by the goods supplied.

11. ORDER HANDLING FEE
A special handling fee will be charged for order involving minor quantities of goods.

12. SERVICE AND REPAIR WORKS
Prices stated for service and repair works are calculated to the best of our judgment on the basis of available information, and shall be considered as rough estimates unless otherwise specified in writing. The main prerequisite for the performance of a correct and punctual job by the Company is that the Buyer ensures free and unobstructed access to the site of work.

The Buyer shall ensure that the job does not take place in unhealthy or dangerous environments, and shall make sure that all possible requirements at the site of work as laid down by law and regulations are met.

The Buyer shall, without expense to the Company, ensure the availability at the site of work of water, compressed air and electric current.

In the event of default by the Company to carry out the job at the pre-arranged time, the Buyer shall in writing give the Company a reasonable period of time in which to carry out the job. Should the Company fail to carry out the job and there is no situation as stipulated in clause 3, the Buyer shall be entitled to terminate the contract but will not be entitled to compensation as a result of the non-fulfilment of contract. As regards service and repair works the Company's liability comprises solely those spare parts provided by the Company and repair and modifications carried out by the Company.

Clauses 1, 2, 3, 6, 7, 8, 9, 10 and 13 with necessary adaptions apply also to service and repair works.

Buyer's goods serviced and repaired at the Company's works are insured against fire.

13. SETTLEMENT OF DISPUTES - ARBITRATION
Any disputes arising out of contract and its allied conditions shall be finally settled by arbitration and in accordance with the law of Northern Ireland including customary law and business usage.

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THRIGE-SCOTT

ATTN. PAUL SHORE

ORDER CONFIRMATION

Page 2 of 2

WORKS NO.
96/2150-2
DATE
17/06/96

PLEASE CHECK AGAINST REQUIREMENTS

CUSTOMER	Dairy Crest Foods Maelor Creamery Marchwiel Nr Wrexham Clwyd LL13 0UE		DESPATCH TO	Customer	
ORDER NO.	SDI / 7131		LABELLING	O/No. 962050/17/K/01 Attn Paul Shore	
DATE	15/05/96				
QUANTITY	1	PRICE	£155.00	EACH	nett
FRAME		TYPE			
OUTPUT			RATING S		INSL
RPM			ROTATION		AT DE
VA			CONTROLLED. VF		
IA				IF	
ENCLOSURE IP		COOLING IC		MOUNTING IM	
BLOWER					AMPS
TACHOGENERATOR					
PROTECTION					

SPECIAL FEATURES

Tacho adaptor & coupling

T-S Order No. TT16361
T-E Order No. C6050072
T-E Serial No.

Finish: Standard

Packing	Standard	Despatch	26/07/96	Week	96-30.5

Thrige-Scott Ltd.
314 Ravenhill Road
Belfast BT6 8GN
N. Ireland

Tel.: 01232-457225
Fax: 01232-732031
Telex: 747827 trisco g
Reg. No. N.I. 16121

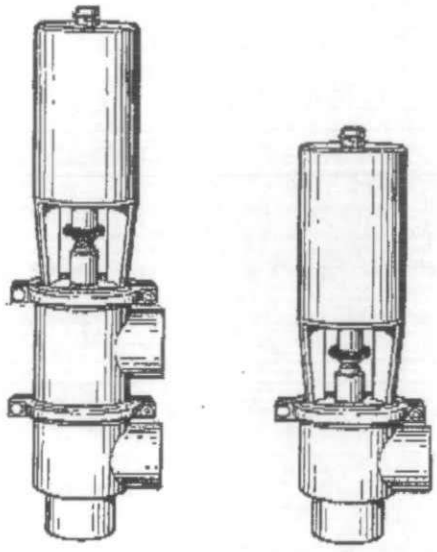
Thrige-Titan Group

13003

⇦ Return to menu

Spare Parts

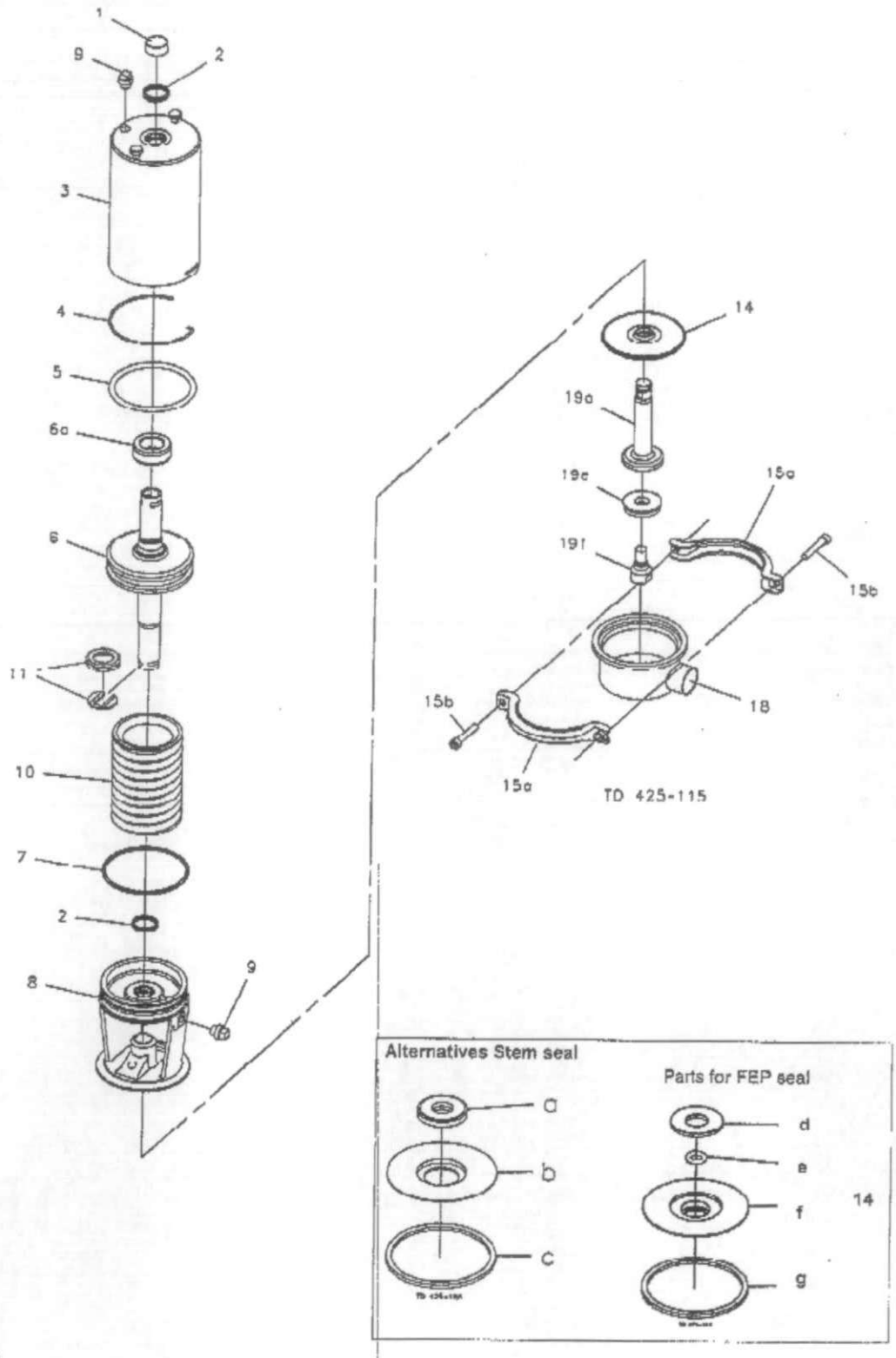
SRC Sanitary Remote-Controlled Valve



⇦ Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 25 mm/DN25 - Type SRC

2



Reg.: 2001-01
Intro.: 9910

Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 25 mm/DN25 - Type SRC

ACTUATOR

Pos.	Qty	Denomination	DN25 25 mm
		Actuator -1, complete (NO)	9612-6087-01
		Actuator -2, complete (NC)	9612-6087-02
		Actuator -3, complete (A/A)	9612-6087-03
1	1	Cap	31801-0525-6
2Δ	2	O-ring	223406 26
3	1	Cylinder	31353-0139-1
4Δ	1	Lock Wire	31353-0151-1
5Δ	1	O-ring	223401-74
6	1	Piston -1, -2	31353-0621-1
	1	Piston -3	31353-0621-2
6a	1	Stop ring	9612-6021-01
7Δ	1	O-ring	9611-99-0396
8	1	Bonnet	31353-0133-1
9*	2	Plug	31353-0154-1
10a*	1	Spring assembly (standard black)	31353-0625-1
11Δ	1	Clip, complete	31353-0793-1
Δ		Service kit	9611-92-0008

* Only for actuator -1 and -2.

Valve Body Part

Pos.	Qty	Denomination	DN 25 25 mm
Stem Seal			
14Δ	1	Lip seal, EPDM (standard)	31353-0155-1
	1	Lip seal, HNBR	31353-0155-4
	1	Lip seal, FPM	31353-0155-3
Clamp			
15a+b	1	Clamps and screws	31320-0027-3
Valve Body			
18	1	Valve body, 2 ports ISO	9612-5987-01
	1	Valve body, 2 ports DIN	9612-5988-01
	1	Valve body, 3 ports ISO	9612-5987-02
	1	Valve body, 3 ports DIN	9612-5988-02
Valve Plug			
19	1	Plug,single,complete EPDM (standard)	9612-5998-01
	1	Plug,single,complete NBR	9612-5998-02
	1	Plug,single,complete FPM	9612-5998-03
e	1	Stem	9612-5995-01
eΔ●	1	Seal ring, EPDM (standard)	9612-5996-01
	1	Seal ring, NBR	9612-5996-02
	1	Seal ring, FPM	9612-5996-03
	1	Seal ring, PTFE	9612-6279-01
f	1	Screw	9612-5997-01

Pos.	Qty	Denomination	DN 25 25 mm
Valve Body with 0.8 Ra finish inside			
18	1	Valve body, 2 ports ISO	9612-5987-03
	1	Valve body, 2 ports DIN	9612-5988-03
18	1	Valve body, 3 ports ISO	9612-5987-04
	1	Valve body, 3 ports DIN	9612-5988-04
Valve Plug with 0.8 Ra finish			
19	1	Plug,single,complete EPDM (standard)	9612-5998-04
	1	Plug,single,complete NBR	9612-5998-05
	1	Plug,single,complete FPM	9612-5998-06
e	1	Stem	31353-1007-9
f	1	Screw	9612-5997-02
Δ		Service kit EPDM	9611-92-0535
Δ		Service kit NBR	9611-92-0536
Δ		Service kit FPM	9611-92-0537

Parts marked with Δ are included in the service kits

Alternatives

Stem seal

14	1	Lip seal kit, EPDM (standard)	9611-92-0078
	1	Lip seal kit, NBR	9611-92-0079
	1	Lip seal kit, FPM	9611-92-0080
e●	1	Lip seal, EPDM	9612-2806-01
	1	Lip seal, NBR	9612-2806-02
	1	Lip seal, FPM	9612-2806-03
b	1	Plate	9612-2805-01
c●	1	Seal ring, EPDM	31353-0128-1
	1	Seal ring, NBR	31353-0128-2
	1	Seal ring, FPM	31353-0128-3

Stem seal

14d	1	Washer	31353-0452-1
e●	1	O-ring FEP/Silicone	9611-99-2909
f	1	Holder	31353-0453-1
g●	1	Valve body packing	31353-0451-1

Service kits special lip seals (marked ●)

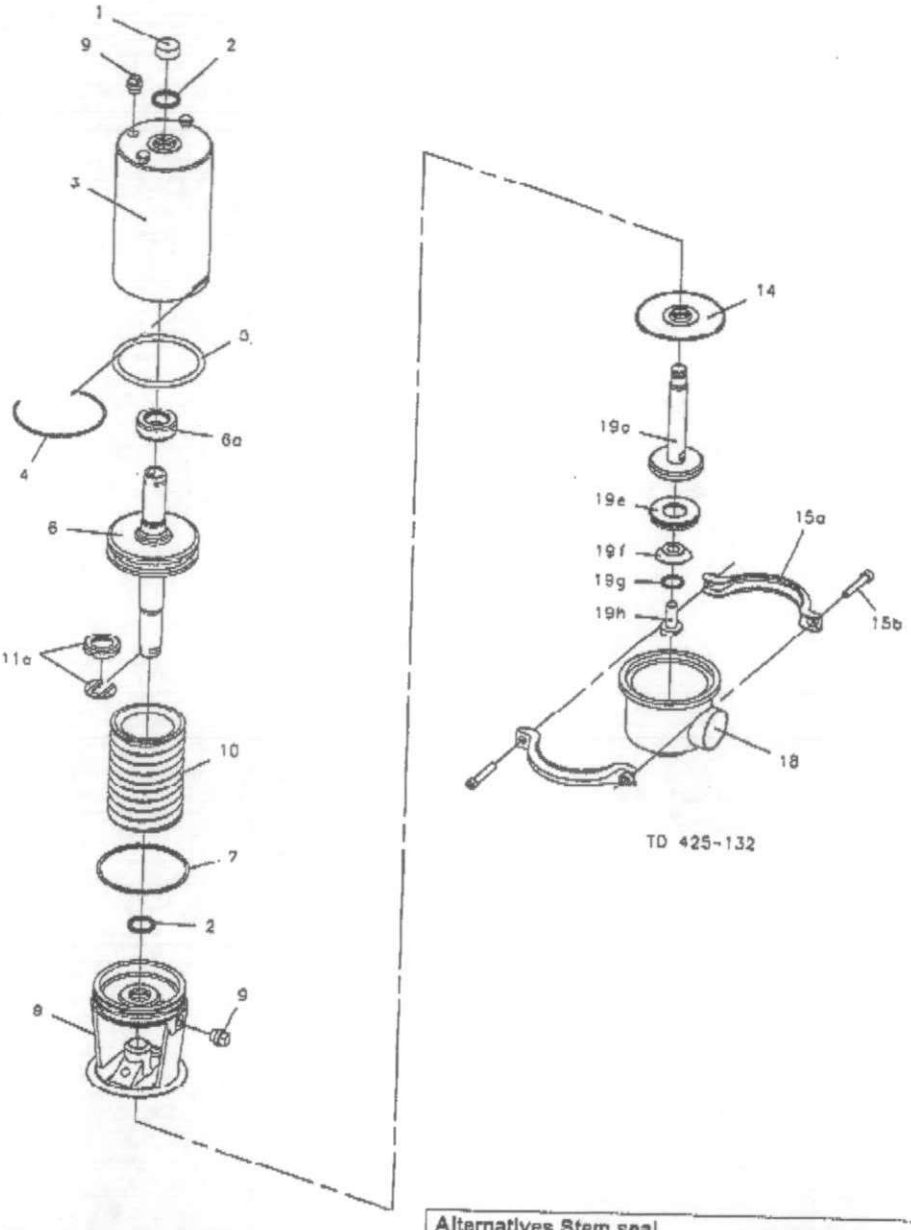
●	Service kit EPDM	9611-92-0538
●	Service kit NBR	9611-92-0539
●	Service kit FPM	9611-92-0540
●	Service kit FEP	9611-92-0541

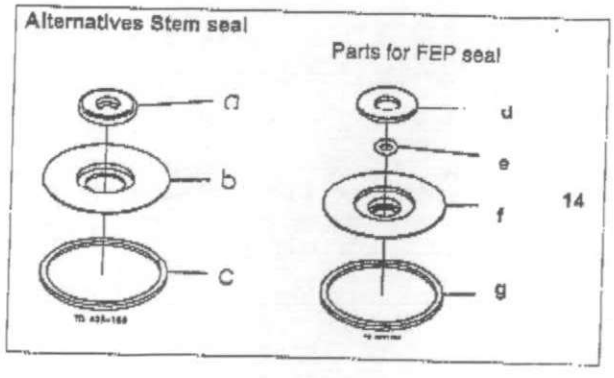
Recommended spare parts: Service kits.
900-088/1

⇦ Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 38-101.6 mm/DN40-100 - Type SRC

4





Reg.: 2001-01
Intro.: 8301

⇦ Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 38-101.6 mm/DN40-100 - Type SRC

ACTUATOR

Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80	DN 100 101.6 mm
		Actuator -1, complete (NO)	31353-0206-1	31353-0206-1	31353-0206-1	31353-0214-1	31353-0214-1	31353-0214-1
		Actuator -2, complete (NC)	31353-0206-2	31353-0206-2	31353-0206-2	31353-0214-2	31353-0214-2	31353-0214-2
		Actuator -3, complete (A/A)	31353-0206-3	31353-0206-3	31353-0206-3	31353-0214-3	31353-0214-3	31353-0214-3
1	1	Cap	31801-0525-6	31801-0525-6	31801-0525-6	31801-0525-5	31801-0525-5	31801-0525-5
2Δ	2	O-ring	223406-25	223406-25	223406-25	223406-49	223406-49	223406-49
3	1	Cylinder	31353-0139-1	31353-0139-1	31353-0139-1	31353-0185-1	31353-0185-1	31353-0185-1
4Δ	1	Lock Wire	31353-0151-1	31353-0151-1	31353-0151-1	31353-0189-1	31353-0189-1	31353-0189-1
5Δ	1	O-ring	223401-74	223401-74	223401-74	223401-75	223401-75	223401-75
6	1	Piston -1, -2	31353-0621-1	31353-0621-1	31353-0621-1	31353-0619-1	31353-0619-1	31353-0619-1
	1	Piston -3	31353-0621-2	31353-0621-2	31353-0621-2	31353-0619-2	31353-0619-2	31353-0619-2
6a	1	Stop ring (only for actuator-3)	31353-1217-2	31353-1217-2	31353-1217-2			
7Δ	1	O-ring	9611-99-0396	9611-99-0396	9611-99-0396	223406-17	223406-17	223406-17
8	1	Bonnet	31353-0133-1	31353-0133-1	31353-0133-1	31353-0190-1	31353-0190-1	31353-0190-1
9*	2	Plug	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1
10a*	1	Spring assembly (standard black)	31353-0625-1	31353-0625-1	31353-0625-1	31353-0622-1	31353-0622-1	31353-0622-1
10b*	1	Spring assembly with extra strong spring (white).	31353-0625-2	31353-0625-2	31353-0625-2	31353-0622-2	31353-0622-2	31353-0622-2
11aΔ	1	Clip, complete (period 84.08-)	31353-0793-1	31353-0793-1	31353-0793-1	31353-0793-2	31353-0793-2	31353-0793-2
11b	1	Clip, (period 68.02 - 84.07)	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1
Δ		Service kit	9611-92-0008	9611-92-0008	9611-92-0008	9611-92-0009	9611-92-0009	9611-92-0009

* Only for actuator -1 and -2.

Alternatives

Special actuator (dia 133mm) -1, complete (NO)	31353-0504-1	31353-0504-1	31353-0504-1	
Special actuator (dia 133mm) -2, complete (NC)	31353-0504-2	31353-0504-2	31353-0504-2	
Special actuator (dia 133mm) -3, complete (A/A)	31353-0504-3	31353-0504-3	31353-0504-3	

Valve Body Part

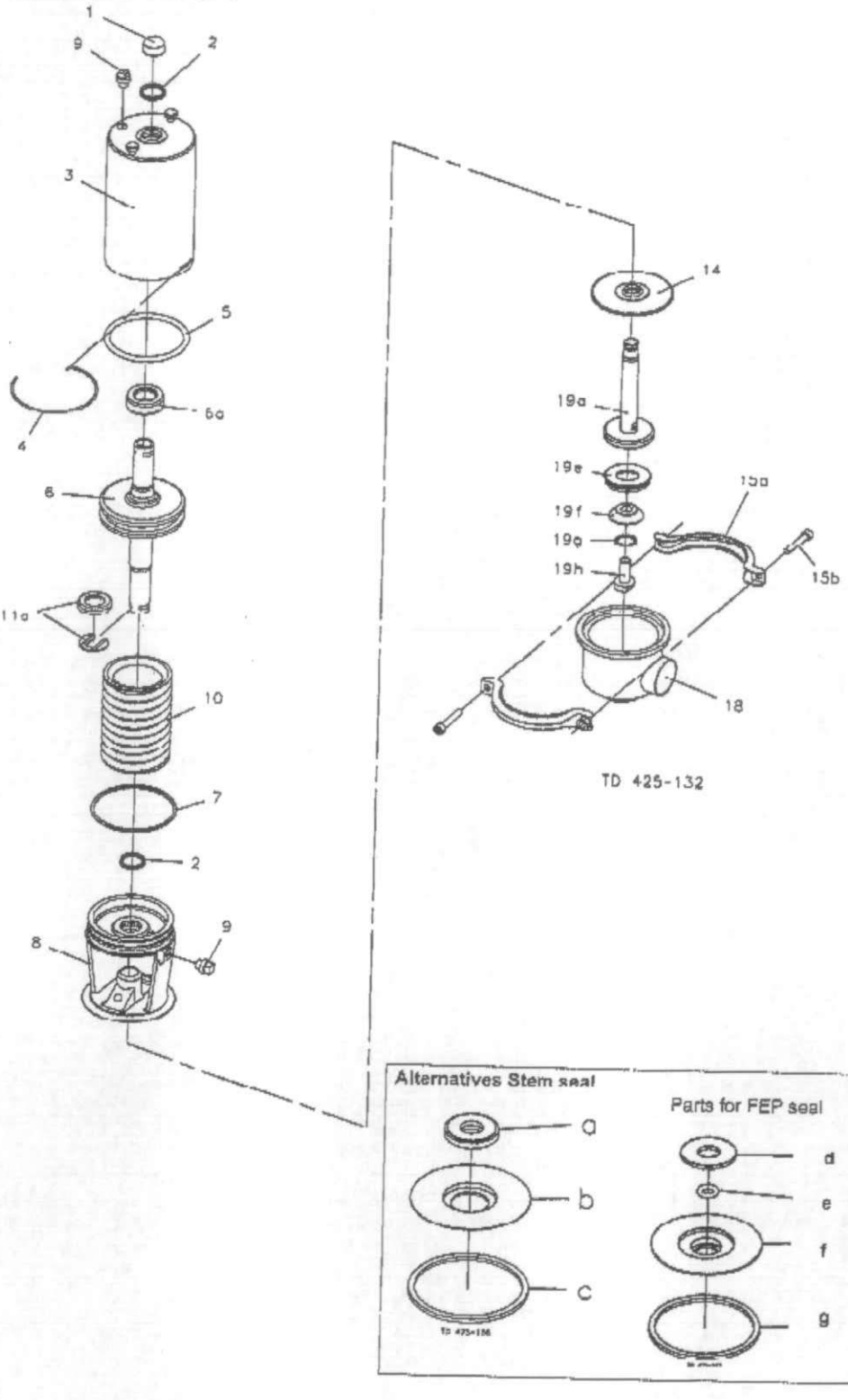
Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80	DN 100 101.6 mm
Stem Seal								
14Δ	1	Lip seal, EPDM (standard)	31353-0155-1	31353-0155-1	31353-0155-1	31353-0188-1	31353-0188-1	31353-0188-1
	1	Lip seal, NBR	31353-0155-2	31353-0155-2	31353-0155-2	31353-0188-2	31353-0188-2	31353-0188-2
	1	Lip seal, FPM	31353-0155-3	31353-0155-3	31353-0155-3	31353-0188-3	31353-0188-3	31353-0188-3
Clamp								
15a+b	1	Clamps and screws (Period 9209-)	31320-0027-3	31320-0027-3	31320-0027-3	31320-0027-2	31320-0027-2	31320-0027-2
15a	2	Clamp half (Period -9209)	31320-0022-1	31320-0022-1	31320-0022-1	31320-0021-1	31320-0021-1	31320-0021-1
15b	2	Screw (Period -9209)	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18
Valve Body								
18	1	Valve body, 2 ports ISO	31353-0375-1	31353-0376-1	31353-0380-1	31353-0381-1		31353-0026-1
	1	Valve body, 2 ports DIN	9612-0940-01	9612-0941-01	9612-0942-01		9612-0943-01	9612-0944-01
18	1	Valve body, 3 ports ISO	31353-0375-6	31353-0376-6	31353-0380-6	31353-0381-6		31353-0026-6
	1	Valve body, 3 ports DIN	9612-0940-02	9612-0941-02	9612-0942-02		9612-0943-02	9612-0944-02

⇦ Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 38-101.6 mm/DN40-100 - Type SRC

6

(Same drawing as on page 4)



Reg.: 2000-07
Intro.: 8301

Return to menu

Sanitary Remote Controlled Valve
Stop Valve - 38-101.6 mm/DN40-100 - Type SRC

Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80	DN 100 101.6mm
Valve Plug								
19	1	Plug,single,complete EPDM (standard)	31353-0330-1	31353-0331-1	31353-0332-1	31353-0333-1	31353-0333-4	31353-0334-1
	1	Plug,single,complete NBR	31353-0330-2	31353-0331-2	31353-0332-2	31353-0333-2	31353-0333-5	31353-0334-2
	1	Plug,single,complete FPM	31353-0330-3	31353-0331-3	31353-0332-3	31353-0333-3	31353-0333-6	31353-0334-3
e	1	Stem	31353-0340-1	31353-0377-1	31353-0378-1	31353-0341-1	31353-0341-2	31353-0379-1
cΔ●	1	Seal ring, EPDM (standard)	31353-0320-1	31353-0321-1	31353-0322-1	31353-0324-1	9612-0950-01	31353-0325-1
	1	Seal ring, NBR	31353-0320-2	31353-0321-2	31353-0322-2	31353-0324-2	9612-0950-02	31353-0325-2
	1	Seal ring, FPM	31353-0320-3	31353-0321-3	31353-0322-3	31353-0324-3	9612-0950-03	31353-0325-3
	1	Packing PTFE	31353-1211-1	31353-1212-1	31353-1213-1	31353-1214-1	31353-1225-1	31353-1215-1
f	1	Washer	31353-0357-1	31353-0358-1	31353-0359-1	31353-0360-1	31353-0360-2	31353-0361-1
gΔ●	1	O-ring, EPDM (standard)	990034-01	990034-01	990034-01	990034-01	990034-01	990034-01
	1	O-ring, NBR	223404-21	223404-21	223404-21	223404-21	223404-21	223404-21
	1	O-ring, FPM	223404-35	223404-35	223404-35	223404-35	223404-35	223404-35
	1	Seal ring, PTFE	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01
h	1	Screw	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1
Valve Body with 0.8 Ra finish inside								
18	1	Valve body, 2 ports ISO	31353-0375-2	31353-0376-2	31353-0380-2	31353-0381-2		31353-0026-2
	1	Valve body, 2 ports DIN	9612-0940-03	9612-0941-03	9612-0942-03		9612-0943-03	9612-0944-03
18	1	Valve body, 3 ports ISO	31353-0376-3	31353-0376-3	31353-0380-3	31353-0381-3		31353-0026-3
	1	Valve body, 3 ports DIN	9612-0940-04	9612-0941-04	9612-0942-04		9612-0943-04	9612-0944-04
Valve Plug with 0.8 Ra finish								
19	1	Plug,single,complete EPDM (standard)	31353-1090-1	31353-1091-1	31353-1092-1	31353-1093-1	31353-1093-4	31353-1094-1
	1	Plug,single,complete NBR	31353-1090-2	31353-1091-2	31353-1092-2	31353-1093-2	31353-1093-5	31353-1094-2
	1	Plug,single,complete FPM	31353-1090-3	31353-1091-3	31353-1092-3	31353-1093-3	31353-1093-6	31353-1094-3
e	1	Stem	31353-1007-1	31353-1007-2	31353-1007-3	31353-1007-4	31353-1007-6	31353-1007-5
f	1	Washer	31353-1010-1	31353-1010-2	31353-1010-3	31353-1010-4	31353-1010-6	31353-1010-5
h	1	Screw	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1
Δ		Service kit EPDM	9611-92-0010	9611-92-0013	9611-92-0016	9611-92-0019	9611-92-0105	9611-92-0022
Δ		Service kit NBR	9611-92-0011	9611-92-0014	9611-92-0017	9611-92-0020	9611-92-0106	9611-92-0023
Δ		Service kit FPM	9611-92-0012	9611-92-0015	9611-92-0018	9611-92-0021	9611-92-0107	9611-92-0024

Parts marked with Δ are included in the service kits

Alternativee
Stem seal

14	1	Lip seal kit, EPDM (standard)	9611-92-0078	9611-92-0078	9611-92-0078	9611-92-0142	9611-92-0142	9611-92-0142
	1	Lip seal kit, NBR	9611-92-0079	9611-92-0079	9611-92-0079	9611-92-0143	9611-92-0143	9611-92-0143
	1	Lip seal kit, FPM	9611-92-0080	9611-92-0080	9611-92-0080	9611-92-0144	9611-92-0144	9611-92-0144
a●	1	Lip seal, EPDM	9612-2806-01	9612-2806-01	9612-2806-01	9612-3088-01	9612-3088-01	9612-3088-01
	1	Lip seal, NBR	9612-2806-02	9612-2806-02	9612-2806-02	9612-3088-02	9612-3088-02	9612-3088-02
	1	Lip seal, FPM	9612-2806-03	9612-2806-03	9612-2806-03	9612-3088-03	9612-3088-03	9612-3088-03
b	1	Plate	9612-2805-01	9612-2805-01	9612-2805-01	9612-3087-01	9612-3087-01	9612-3087-01
c●	1	Seal ring, EPDM	31353-0128-1	31353-0128-1	31353-0128-1	31353-0205-1	31353-0205-1	31353-0205-1
	1	Seal ring, NBR	31353-0128-2	31353-0128-2	31353-0128-2	31353-0205-2	31353-0205-2	31353-0205-2
	1	Seal ring, FPM	31353-0128-3	31353-0128-3	31353-0128-3	31353-0205-3	31353-0205-3	31353-0205-3
Stem seal								
14d	1	Washer	31353-0452-1	31353-0452-1	31353-0452-1	31353-0452-2	31353-0452-2	31353-0452-2
e●	1	O-ring FEP/Silicone	9611-99-2909	9611-99-2909	9611-99-2909	9611-99-2910	9611-99-2910	9611-99-2910
f	1	Holder	31353-0453-1	31353-0453-1	31353-0453-1	31353-0454-1	31353-0454-1	31353-0454-1
g●	1	Valve body packing	31353-0451-1	31353-0451-1	31353-0451-1	31353-0451-2	31353-0451-2	31353-0451-2
Service kits special lip seals (marked ●)								
●		Service kit EPDM	9611-92-0447	9611-92-0451	9611-92-0455	9611-92-0459	9611-92-0463	9611-92-0467
●		Service kit NBR	9611-92-0448	9611-92-0452	9611-92-0456	9611-92-0460	9611-92-0464	9611-92-0468
●		Service kit FPM	9611-92-0449	9611-92-0453	9611-92-0457	9611-92-0461	9611-92-0465	9611-92-0469
●		Service kit FEP	9611-92-0450	9611-92-0454	9611-92-0458	9611-92-0462	9611-92-0466	9611-92-0470

Recommended spare parts: Service kits.
900-089/1

⇦ Return to menu

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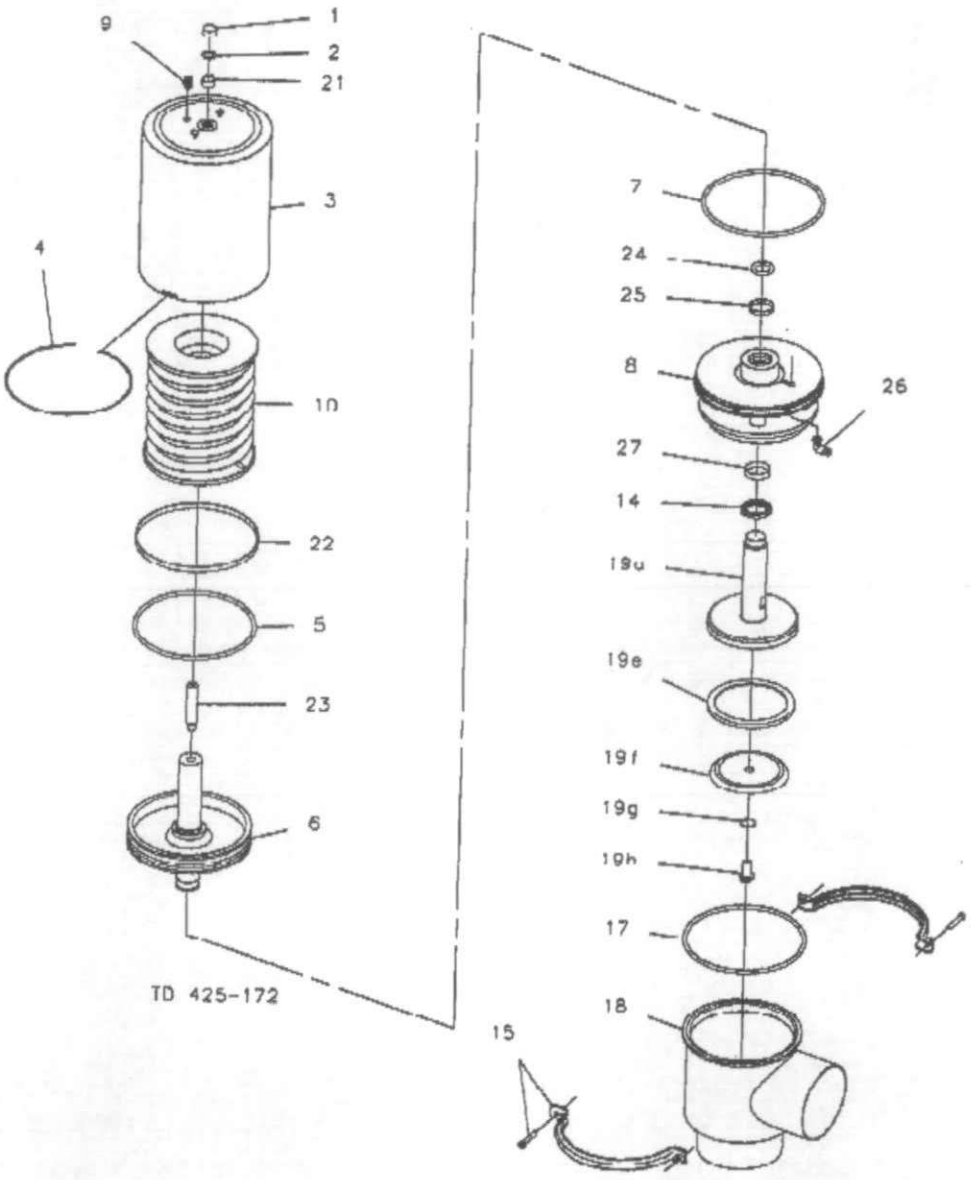
Sanitary Remote-Controlled Valve
Stop Valve - DN125-150 - Type SRC



Reg.: 9805
Intro.: 9603

⇦ Return to menu

Sanitary Remote-Controlled Valve
Stop Valve - DN125-150 - Type SRC

Actuator

Pos.	Qty.	Denomination	NC	NO
		Actuator, complete	9612-4657-01	9612-4657-02
1	1	Cap	9611-99-3060	9611-99-3060
2●	1	O-ring	9611-99-3006	9611-99-3006
3	1	Cylinder	9612-4655-01	9612-4655-01
4●	1	Lock wire	9612-3805-01	9612-3805-01
5●	1	O-ring	9611-99-3008	9611-99-3008
6	1	Piston	9612-4411-01	9612-4411-02
7●	1	O-ring	9611-99-2892	9611-99-2892
8	1	Bonnet	9612-5080-01	9612-5080-01
9	1	Plug	31353-0154-1	31353-0154-1
10	1	Spring packet	9612-4413-01	9612-4413-01
21●	1	Guide ring	9612-2926-18	9612-2926-18
22●	1	Guide ring	9612-2926-23	9612-2926-23
23	1	Top pin	9612-4408-01	9612-4408-01
24●	1	O-ring	9611-99-3012	9611-99-3012
26	1	Air fitting	9611-99-1988	9611-99-1988
25●	1	Guide ring	9612-2926-20	9612-2926-20
27●	1	Guide ring	9612-2926-21	9612-2926-21
●		**Service kit**	**9611-92-0296**	**9611-92-0296**

Parts marked with ● are included in the service kit.

Valve Body Part

Pos.	Qty	Denomination	DN 125	DN 150
14△	1	Lip seal, EPDM (standard)	9612-3204-07	9612-3204-07
	1	Lip seal, NBR	9612-3204-08	9612-3204-08
	1	Lip seal, FPM	9612-3204-09	9612-3204-09
Clamp				
15	1	Clamp complete	9611-31-105-8	9611-31-105-8
Valve Body				
17△	1	Valve body seal ring, EPDM (standard)	9611-99-2937	9611-99-2937
	1	Valve body seal ring, NBR	9611-99-2938	9611-99-2938
	1	Valve body seal ring, FPM	9611-99-2939	9611-99-2939
18	1	Valve body, 2 ports DIN	9612-4406-01	9612-4406-01
	1	Valve body, 3 ports DIN	9612-4405-02	9612-4406-02
Valve Plug				
19	1	Plug,single,complete EPDM (standard)	9612-4380-01	9612-4380-04
	1	Plug,single,complete NBR	9612-4380-02	9612-4380-05
	1	Plug,single,complete FPM	9612-4380-03	9612-4380-06
e	1	Stem	9612-4383-01	9612-4383-02
e△	1	Seal ring, EPDM (standard)	9612-4385-01	9612-4385-01
	1	Seal ring, NBR	9612-4385-02	9612-4385-02
	1	Seal ring, FPM	9612-4385-03	9612-4385-03
f	1	Washer	9612-4384-01	9612-4384-01
g△	1	O-ring, EPDM (standard)	9611-99-2674	9611-99-2674
	1	O-ring, NBR	9611-99-2675	9611-99-2675
	1	O-ring, FPM	9611-99-2676	9611-99-2676
h	1	Screw	9612-4387-01	9612-4387-01

Recommended spare parts: **Service kits.**

⇦ Return to menu

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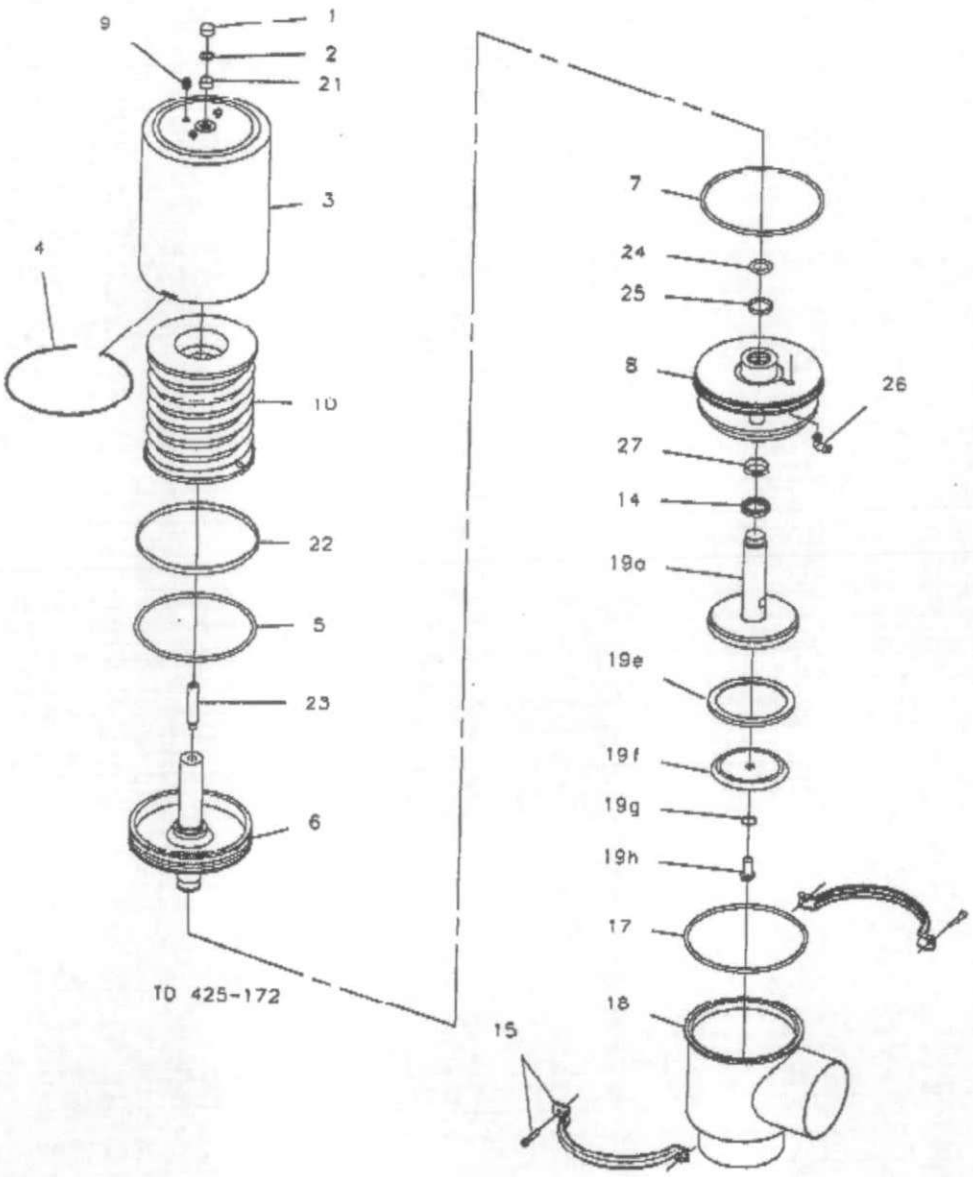
Sanitary Remote-Controlled Valve
Stop Valve - DN125-150 - Type SRC

(Same drawing as on page 8)



Reg.: 9805
Intro.: 9603

⇦ Return to menu

Surface roughness, product wetted parts: Ra ≤ 0.8 µm

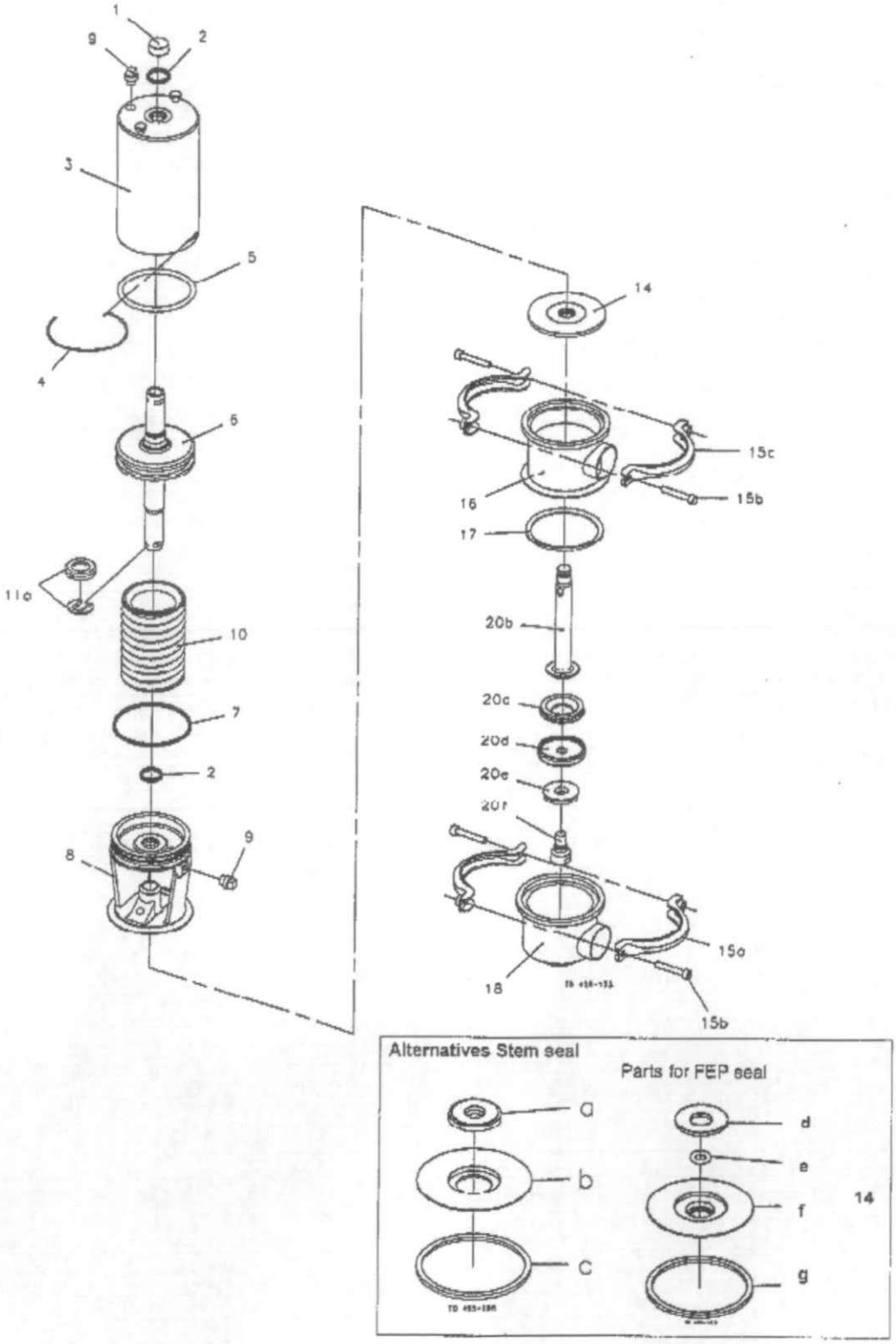
Pos.	Qty.	Denomination	DN 125	DN 150
Valve Body				
18	1	Valve body, 2 ports DIN	9612-4405-03	9612-4408-03
	1	Valve body, 3 ports DIN	9612-4405-04	9612-4408-04
Valve Plug				
19	1	Plug,single,complete EPDM (standard)	9612-4380-07	9612-4380-10
	1	Plug,single,complete NBR	9612-4380-08	9612-4380-11
	1	Plug,single,complete FPM	9612-4380-09	9612-4380-12
a	1	Stem	31363-1007-6	31363-1007-7
f	1	Washer	9612-4384-02	9612-4384-02
h	1	Screw	9612-4387-02	9612-4387-02
Δ		Service kit EPDM	9611-92-0355	9611-92-0355
Δ		Service kit NBR	9611-92-0356	9611-92-0356
Δ		Service kit FPM	9611-92-0357	9611-92-0357

Parts marked with Δ are included in the service kits

⇦ Return to menu

Sanitary Remote-Controlled Valve
Change-over Valve - 25 mm/DN25 - Type SRC

12



Reg.: 2001-01
Intro.: 9910

Sanitary Remote-Controlled Valve
Change-over Valve - 25 mm/DN25 - Type SRC

ACTUATOR

Pos.	Qty	Denomination	DN 25 25 mm
		Actuator -1, complete (NO)	31353-0208-1
		Actuator -2, complete (NC)	31353-0208-2
		Actuator -3, complete (A/A)	31353-0208-3
1	1	Cap	31801-0525-6
2Δ	2	O-ring	220400-25
3	1	Cylinder	31353-0139-1
4Δ	1	Lock Wire	31353-0151-1
5Δ	1	O-ring	223401-74
6	1	Piston -1, -2	31353-0621-1
	1	Piston -3	31353-0621-2
7Δ	1	O-ring	9611-99-0396
8	1	Bonnet	31353-0130-1
9*	2	Plug	31353-0154-1
10a*	1	Spring assembly (standard black)	31353-0625-1
10b*	1	Spring assembly with extra strong spring (white).	31353-0625-2
11Δ	1	Clip, complete	31353-0793-1
Δ		Service kit	9611-92-0008

* Only for actuator -1 and -2.

Valve Body Part

Pos.	Qty	Denomination	DN 25 25 mm
Stem Seal			
14Δ	1	Lip seal, EPDM (standard)	31353-0155-1
	1	Lip seal, HNBR	31353-0155-4
	1	Lip seal, FPM	31353-0155-3
Clamp			
15a+b2		Clamps and screws (Period 9209-)	31320-0027-3
Valve Body			
16	1	Valve body, upper, 1 port ISO	9612-5991-01
	1	Valve body, upper, 1 port DIN	9612-5992-01
16	1	Valve body, upper, 2 ports ISO	9612-5991-02
	1	Valve body, upper, 2 ports DIN	9612-5992-02
17Δ●	1	Valve body seal ring, EPDM (standard)	31353-0128-1
	1	Valve body seal ring, NBR	31353-0128-2
	1	Valve body seal ring, FPM	31353-0128-3
	1	Valve body packing, PTFE	31353-0451-1
18	1	Valve body, lower, 2 ports ISO	9612-5987-01
	1	Valve body, lower, 2 ports DIN	9612-5988-01
18	1	Valve body, lower, 3 ports ISO	9612-5987-02
	1	Valve body, lower, 3 ports DIN	9612-5988-02
Valve Plug			
20	1	Plug,double,complete EPDM (standard)	9612-6006-01
	1	Plug,double,complete NBR	9612-6006-02
	1	Plug,double,complete FPM	9612-6006-03
b	1	Stem	9612-6004-01
c△●	1	Seal ring, upper, EPDM (standard)	31353-0320-1
	1	Seal ring, upper, NBR	31353-0320-2
	1	Seal ring, upper, FPM	31353-0320-3
	1	Packing upper, PTFE	31353-1211-1
d	1	Middle piece	9612-6005-01
eΔ●	1	Seal ring, lower, EPDM (standard)	9612-5996-01
	1	Seal ring, lower, NBR	9612-5996-02
	1	Seal ring, lower, FPM	9612-5996-03
	1	Packing, PTFE	9612-6279-01
f	1	Screw	9612-5997-01

Pos.	Qty	Denomination	DN 25 25 mm
Valve Body with 0.8 Ra finish inside			
16	1	Valve body, upper, 1 port ISO	9612-5991-03
	1	Valve body, upper, 1 port DIN	9612-5992-03
16	1	Valve body, upper, 2 ports ISO	9612-5991-04
	1	Valve body, upper, 2 ports DIN	9612-5992-04
18	1	Valve body, lower, 2 ports ISO	9612-5987-03
	1	Valve body, lower, 2 ports DIN	9612-5988-03
18	1	Valve body, lower, 3 ports ISO	9612-5987-04
	1	Valve body, lower, 3 ports DIN	9612-5988-04
Valve Plug with 0.8 Ra finish			
20	1	Plug,double,complete EPDM (standard)	9612-6006-04
	1	Plug,double,complete NBR	9612-6006-05
	1	Plug,double,complete FPM	9612-6006-06
b	1	Stem	31353-1008-9
d	1	Middle piece	9612-6005-02
f	1	Screw	9612-5997-02
Δ		Service kit EPDM	9611-92-0542
Δ		Service kit NBR	9611-92-0543
Δ		Service kit FPM	9611-92-0544

Parts marked with Δ are included in the service kits.

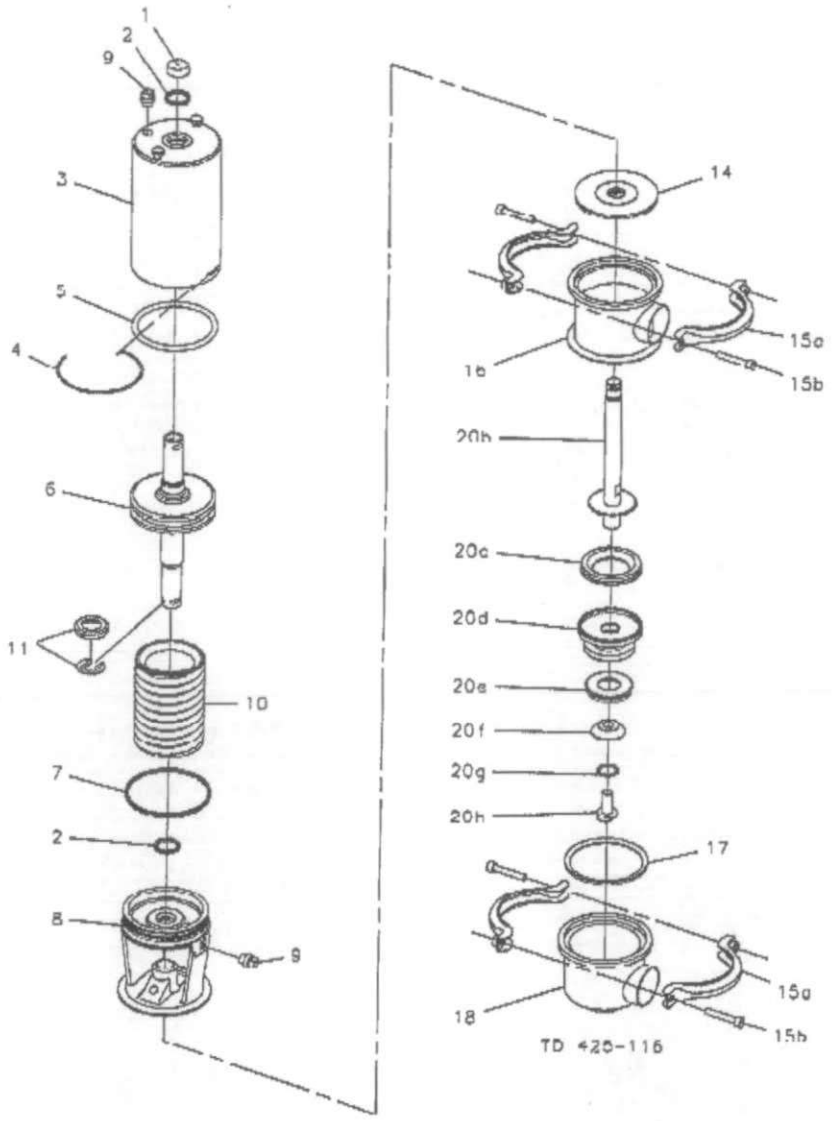
Alternatives

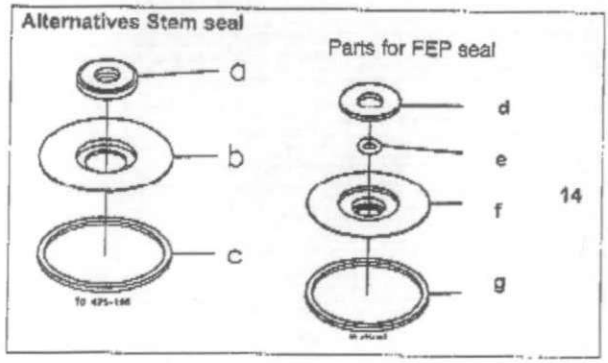
Stem seal			
14	1	Lip seal kit, EPDM (standard)	9611-92-0078
	1	Lip seal kit, NBR	9611-92-0079
	1	Lip seal kit, FPM	9611-92-0080
a●	1	Lip seal, EPDM	9612-2806-01
	1	Lip seal, NBR	9612-2806-02
	1	Lip seal, FPM	9612-2806-03
b	1	Plate	9612-2805-01
c●	1	Seal ring, EPDM	31353-0128-1
	1	Seal ring, NBR	31353-0128-2
	1	Seal ring, FPM	31353-0128-3
Stem seal			
14H	1	Washer	31353-0452-1
a●	1	O-ring FEP/Silicone	9611-99-2909
f	1	Holder	31353-0453-1
g●	1	Valve body packing	31353-0451-1
Service kits special lip seals (marked ●)			
●		Service kit EPDM	9611-92-0545
●		Service kit NBR	9611-92-0546
●		Service kit FPM	9611-92-0547
●		Service kit FEP	9611-92-0548

Recommended spare parts: Service kits.
999-091/1

⇦ Return to menu

Sanitary Remote-Controlled Valve
Change-over Valve - 38-101.6 mm/DN40-100 - Type SRC





Reg.: 2001-01
Intro.: 8301

⇦ Return to menu

Sanitary Remote-Controlled Valve
Change-over Valve - 38-101.6 mm/DN40-100 - Type SRC

ACTUATOR

Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80	DN 100 101.6 mm
		Actuator -1, complete (NO)	31353 0206 1	31353 0206-1	31353-0206-1	31353-0214-1	31353-0214-1	31353-0214-1
		Actuator -2, complete (NC)	31353-0206-2	31353-0206-2	31353-0206-2	31353-0214-2	31353-0214-2	31353-0214-2
		Actuator -3, complete (A/A)	31353-0206-3	31353-0206-3	31353-0206-3	31353-0214-3	31353-0214-3	31353-0214-3
1	1	Cap	31801-0525-6	31801-0525-6	31801-0525-6	31801-0525-5	31801-0525-5	31801-0525-5
2Δ	2	O-ring	223406-25	223406-25	223406-25	223406-49	223406-49	223406-49
3	1	Cylinder	31353-0139-1	31353-0139-1	31353-0139-1	31353-0185-1	31353-0185-1	31353-0185-1
4Δ	1	Lock Wire	31353-0151-1	31353-0151-1	31353-0151-1	31353-0189-1	31353-0189-1	31353-0189-1
5Δ	1	O-ring	223401-74	223401-74	223401-74	223401-75	223401-75	223401-75
6	1	Piston -1, -2	31353-0621-1	31353-0621-1	31353-0621-1	31353-0619-1	31353-0619-1	31353-0619-1
	1	Piston -3	31353-0621-2	31353-0621-2	31353-0621-2	31353-0619-2	31353-0619-2	31353-0619-2
7Δ	1	O-ring	9611-99-0396	9611-99-0396	9611-99-0396	223406-17	223406-17	223406-17
8	1	Bonnet	31353-0133-1	31353-0133-1	31353-0133-1	31353-0190-1	31353-0190-1	31353-0190-1
9*	2	Plug	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1	31353-0154-1
10a*	1	Spring assembly (standard black)	31353-0625-1	31353-0625-1	31353-0625-1	31353-0622-1	31353-0622-1	31353-0622-1
10b*	1	Spring assembly with extra strong spring (white).	31353-0625-2	31353-0625-2	31353-0625-2	31353-0622-2	31353-0622-2	31353-0622-2
11aΔ	1	Clip, complete (period 84.08-)	31353-0793-1	31353-0793-1	31353-0793-1	31353-0793-2	31353-0793-2	31353-0793-2
11b	1	Clip. (period 68.02 - 84.07)	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1
Δ		Service kit	9611-92-0008	9611-92-0008	9611-92-0008	9611-92-0009	9611-92-0009	9611-92-0009

* Only for actuator -1 and -2.

Alternatives

Special actuator (dia 133mm) -1, complete (NO)			31353-0504-1	31353-0504-1	31353-0504-1			
Special actuator (dia 133mm) -2, complete (NC)			31353-0504-2	31353-0504-2	31353-0504-2			
Special actuator (dia 133mm) -3, complete (A/A)			31353-0504-3	31353-0504-3	31353-0504-3			

Valve Body Part

Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80	DN 100 101.6 mm
Stem Seal								
14Δ	1	Lip seal, EPDM (standard)	31353-0155-1	31353-0155-1	31353-0155-1	31353-0188-1	31353-0188-1	31353-0188-1
	1	Lip seal, NBR	31353-0155-2	31353-0155-2	31353-0155-2	31353-0188-2	31353-0188-2	31353-0188-2
	1	Lip seal, FPM	31353-0155-3	31353-0155-3	31353-0155-3	31353-0188-3	31353-0188-3	31353-0188-3
Clamp								
15a+b	2	Clamps and screws (Period 9209-)	31320-0027-3	31320-0027-3	31320-0027-3	31320-0027-2	31320-0027-2	31320-0027-2
15a	4	Clamp half (Period -9209)	31320-0022-1	31320-0022-1	31320-0022-1	31320-0021-1	31320-0021-1	31320-0021-1
15b	4	Screw (Period -9209)	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18
Valve Body								
16	1	Valve body, upper, 1 port ISO	31353-0055-1	31353-0054-1	31353-0055-1	31353-0056-1		31353-0056-1
	1	Valve body, upper, 1 port DN	9612-0945-01	9612-0946-01	9612-0947-01		9612-0948-01	9612-0949-01
16	1	Valve body, upper, 2 ports ISO	31353-0063-6	31353-0054-6	31353-0055-6	31353-0056-6		31353-0056-6
	1	Valve body, upper, 2 ports DN	9612-0945-02	9612-0946-02	9612-0947-02		9612-0948-02	9612-0949-02
17Δ●	1	Valve body seal ring, EPDM (standard)	31353-0128-1	31353-0128-1	31353-0128-1	31353-0205-1	31353-0205-1	31353-0205-1
	1	Valve body seal ring, NBR	31353-0128-2	31353-0128-2	31353-0128-2	31353-0205-2	31353-0205-2	31353-0205-2
	1	Valve body seal ring, FPM	31353 0128 3	31353-0128-3	31353-0128-3	31353-0205-3	31353-0205-3	31353-0205-3
	1	Valve body packing, PTFE	31353-0451-1	31353-0451-1	31353-0451-1	31353-0451-2	31353-0451-2	31353-0451-2
18	1	Valve body, lower, 2 ports ISO	31353-0375-1	31353-0376-1	31353-0380-1	31353-0381-1		31353-0026-1
	1	Valve body, lower, 2 ports DN	9612-0940-01	9612-0941-01	9612-0942-01		9612-0943-01	9612-0944-01
18	1	Valve body, lower, 3 ports ISO	31353-0375-6	31353-0376-6	31353-0380-6	31353-0381-6		31353-0026-6
	1	Valve body, lower, 3 ports DN	9612-0940-02	9612-0941-02	9612-0942-02		9612-0943-02	9612-0944-02
Valve Plug								
20	1	Plug,double,complete EPDM (standard)	31353-0335-1	31353-0336-1	31353-0337-1	31353-0338-1	31353-0338-4	31353-0339-1
	1	Plug,double,complete NBR	31353-0335-2	31353-0336-2	31353-0337-2	31353-0338-2	31353-0338-5	31353-0339-2
	1	Plug,double,complete FPM	31353-0335-3	31353-0336-3	31353-0337-3	31353-0338-3	31353-0338-6	31353-0339-3
b	1	Stem	31353-0349-1	31353-0349-2	31353-0349-3	31353-0350-1	31353-0350-3	31353-0350-2
cΔ●	1	Seal ring, upper, EPDM (standard)	31353-0321-1	31353-0321-1	31353-0323-1	31353-0324-1	31353-0324-1	31353-0325-1
	1	Seal ring, upper, NBR	31353-0321-2	31353-0321-2	31353-0323-2	31353-0324-2	31353-0324-2	31353-0325-2

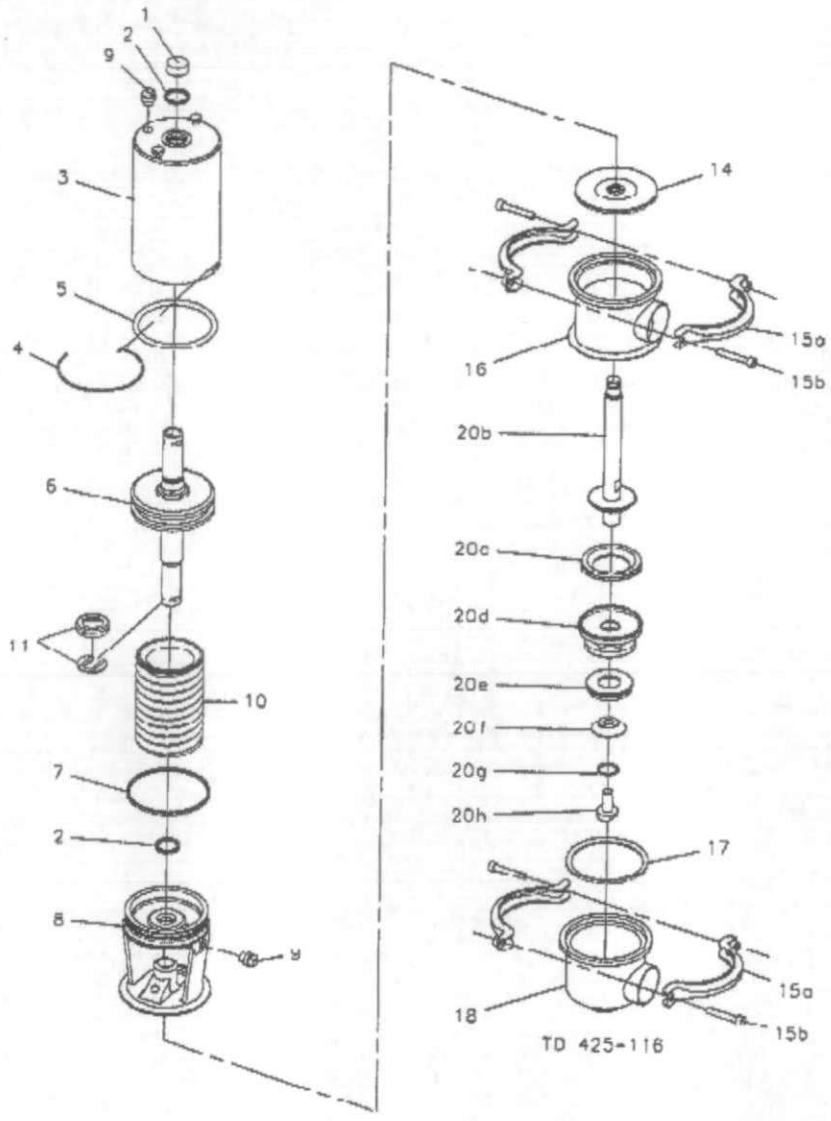
⇦ Return to menu

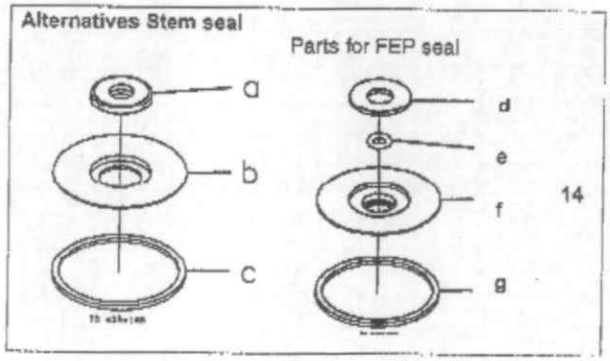
Sanitary Remote-Controlled Valve

Change-over Valve - 38-101.6 mm/DN40-100 - Type SRC

16

(Same drawing as on page 14)





Reg.: 2000-07
Intro.: 9910

Return to menu

Sanitary Remote-Controlled Valve
Change-over Valve - 38-101.6 mm/DN40-100 - Type SRC

Pos.	Qty	Denomination	DN 40 38 mm	DN 50 51 mm	DN65 63.5 mm	76 mm	DN 80 101.6 mm	DN 100
	1	Seal ring, upper, FPM	31353-0321-3	31353-0321-3	31353-0323-3	31353-0324-3	31353-0324-3	31353-0325-3
	1	Packing upper, PTFE	31353-1212-1	31353-1212-1	31353-1218-1	31353-1214-1	31353-1214-1	31353-12151
d	1	Middle piece	31353-0363-1	31353-0364-1	31353-0365-1	31353-0366-1	9612-0984-01	31353-0367-1
eΔ●	1	Seal ring, lower, EPDM (standard)	31353-0320-1	31353-0321-1	31353-0322-1	31353-0324-1	9612-0950-01	31353-0325-1
	1	Seal ring, lower, NBR	31353-0320-2	31353-0321-2	31353-0322-2	31353-0324-2	9612-0950-02	31353-0325-2
	1	Seal ring, lower, FPM	31353-0320-3	31353-0321-3	31353-0322-3	31353-0324-3	9612-0950-03	31353-0325-3
	1	Packing, PTFE	31353-1211-1	31353-1212-1	31353-1213-1	31353-1214-1	31353-1225-1	31353-1215-1
f	1	Washer	31353-0357-1	31353-0358-1	31353-0359-1	31353-0360-1	31353-0360-2	31353-0361-1
gA●	1	O-ring, EPDM (standard)	990034-01	990034-01	990034-01	990034-01	990034-01	990034-01
	1	O ring, NBR	223404-21	223404-21	223404-21	223404-21	223404-21	223404-21
	1	O-ring, FPM	223404-35	223404-35	223404-35	223404-35	223404-35	223404-35
	1	Seal-ring PTFE	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01	9612-4330-01
h	1	Screw	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1
Valve Body with 0.8 Ra finish inside								
16	1	Valve body, upper, 1 port ISO	31353-0053-2	31353-0054-2	31353-0055-2	31353-0056-2		31353-0058-2
	1	Valve body, upper, 1 port DN	9612-0945-03	9612-0946-03	9612-0947-03		9612-0948-03	9612-0949-03
16	1	Valve body, upper, 2 ports ISO	31353-0053-3	31353-0054-3	31353-0055-3	31353-0056-3		31353-0058-3
	1	Valve body, upper, 2 ports DN	9612-0945-04	9612-0946-04	9612-0947-04		9612-0948-04	9612-0949-04
18	1	Valve body, lower, 2 ports ISO	31353-0375-2	31353-0376-2	31353-0380-2	31353-0381-2		31353-0026-2
	1	Valve body, lower, 2 ports DN	9612-0940-03	9612-0941-03	9612-0942-03		9612-0943-03	9612-0944-03
18	1	Valve body, lower, 3 ports ISO	31353-0375-3	31353-0376-3	31353-0380-3	31353-0381-3		31353-0026-3
	1	Valve body, lower, 3 ports DN	9612-0940-04	9612-0941-04	9612-0942-04		9612-0943-04	9612-0944-04
Valve Plug with 0.8 Ra finish								
20	1	Plug,double,complete EPDM (standard)	31353-1095-1	31353-1096-1	31353-1097-1	31353-1098-1	31353-1098-4	31353-1099-1
	1	Plug,double,complete NBR	31353-1095-2	31353-1096-2	31353-1097-2	31353-1098-2	31353-1098-5	31353-1099-2
	1	Plug,double,complete FPM	31353-1095-3	31353-1096-3	31353-1097-3	31353-1098-3	31353-1098-6	31353-1099-3
b	1	Stem	31353-1008-1	31353-1008-2	31353-1008-3	31353-1008-4	31353-1008-8	31353-1008-5
d	1	Middle piece	31353-1008-1	31353-1008-2	31353-1008-3	31353-1008-4	31353-1008-8	31353-1008-5
f	1	Washer	31353-1010-1	31353-1010-2	31353-1010-3	31353-1010-4	9612-1009-06	31353-1009-5
h	1	Screw	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1	31353-1010-6	31353-1010-5
Δ		Service kit EPDM	9611-92-0025	9611-92-0026	9611-92-0031	9611-92-0034	31353-1011-1	31353-1011-1
Δ		Service kit NBR	9611-92-0026	9611-92-0029	9611-92-0032	9611-92-0035	9611-92-0108	9611-92-0037
Δ		Service kit FPM	9611-92-0027	9611-92-0030	9611-92-0033	9611-92-0036	9611-92-0109	9611-92-0038
							9611-92-0110	9611-92-0039

Parts marked with Δ are included in the service kits.

Alternatives

Stem seal

14	1	Lip seal kit, EPDM (standard)	9611-92-0078	9611-92-0078	9611-92-0078	9611-92-0142	9611-92-0142	9611-92-0142
	1	Lip seal kit, NBR	9611-92-0079	9611-92-0079	9611-92-0079	9611-92-0143	9611-92-0143	9611-92-0143
	1	Lip seal kit, FPM	9611-92-0080	9611-92-0080	9611-92-0080	9611-92-0144	9611-92-0144	9611-92-0144
a●	1	Lip seal, EPDM	9612-2806-01	9612-2806-01	9612-2806-01	9612-3088-01	9612-3088-01	9612-3088-01
	1	Lip seal, NBR	9612-2806-02	9612-2806-02	9612-2806-02	9612-3088-02	9612-3088-02	9612-3088-02
	1	Lip seal, FPM	9612-2806-03	9612-2806-03	9612-2806-03	9612-3088-03	9612-3088-03	9612-3088-03
b	1	Plate	9612-2805-01	9612-2805-01	9612-2805-01	9612-3087-01	9612-3087-01	9612-3087-01
c●	1	Seal ring, EPDM	31353-0128-1	31353-0128-1	31353-0128-1	31353-0205-1	31353-0205-1	31353-0205-1
	1	Seal ring, NBR	31353-0128-2	31353-0128-2	31353-0128-2	31353-0205-2	31353-0205-2	31353-0205-2
	1	Seal ring, FPM	31353-0128-3	31353-0128-3	31353-0128-3	31353-0205-3	31353-0205-3	31353-0205-3

Stem seal

14d	1	Washer	31353-0452-1	31353-0452-1	31353-0452-1	31353-0452-2	31353-0452-2	31353-0452-2
e●	1	O-ring FEP/Silicone	9611-99-2909	9611-99-2909	9611-99-2909	9611-99-2910	9611-99-2910	9611-99-2910
f	1	Holder	31353-0453-1	31353-0453-1	31353-0453-1	31353-0454-1	31353-0454-1	31353-0454-1
g●	1	Valve body packing	31353-0451-1	31353-0451-1	31353-0451-1	31353-0451-2	31353-0451-2	31353-0451-2

Service kits special lip seals (marked ●)

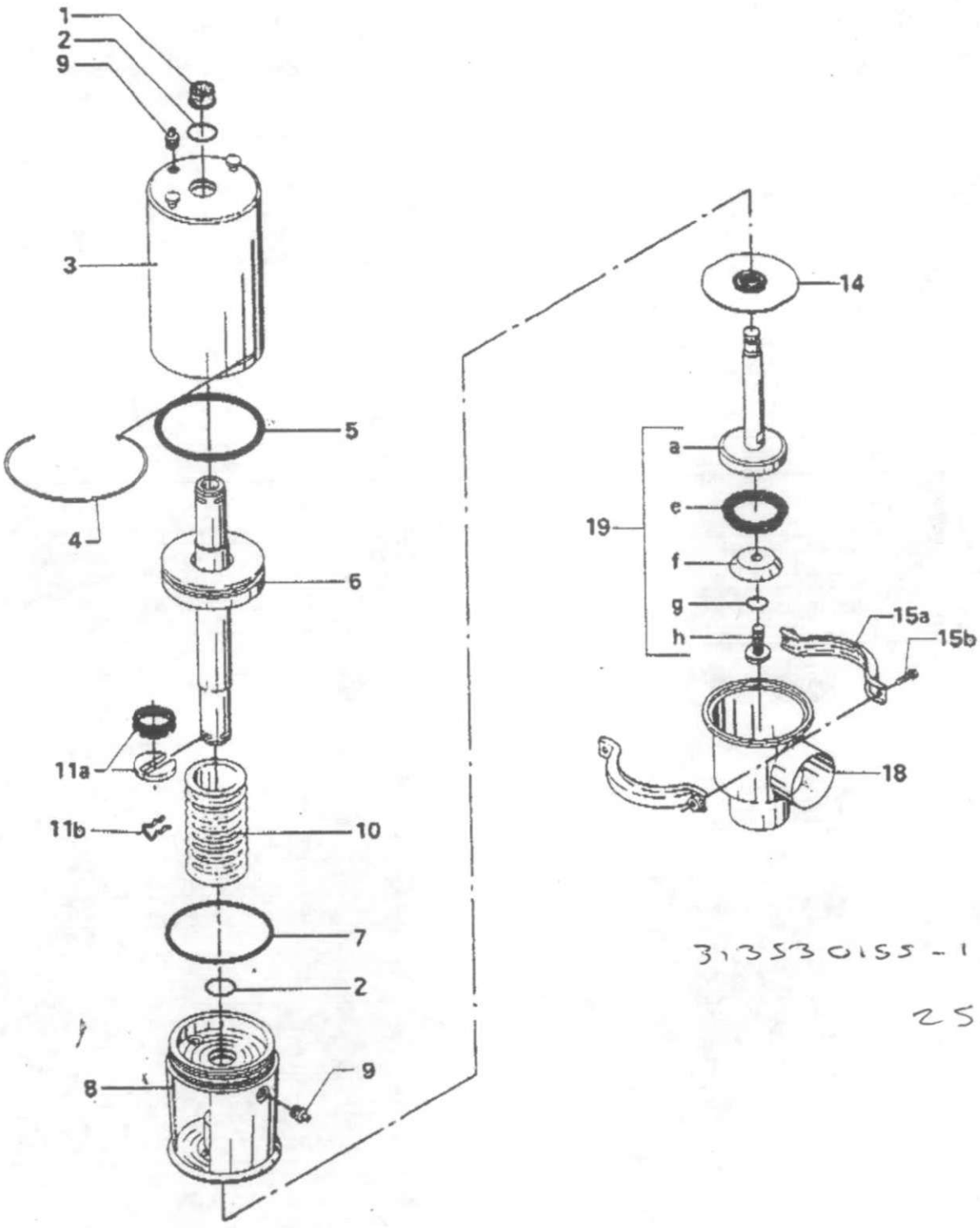
●	Service kit EPDM	9611-92-0471	9611-92-0475	9611-92-0479	9611-92-0483	9611-92-0487	9611-92-0491
●	Service kit NBR	9611-92-0472	9611-92-0476	9611-92-0480	9611-92-0484	9611-92-0488	9611-92-0492
●	Service kit FPM	9611-92-0473	9611-92-0477	9611-92-0481	9611-92-0485	9611-92-0489	9611-92-0493
●	Service kit FEP	9611-92-0474	9611-92-0478	9611-92-0482	9611-92-0486	9611-92-0490	9611-92-0494

Recommended spare parts: Service kits.

Sanitary Remote Controlled Valve
Stop Valve - Type SRC

H.CON 24.07 - 24.11

DV40



3,3530155-1

25.25

Sanitary Remote Controlled Valve
Stop Valve - Type [illegible]

Alfa Laval Flow Limited, LKM division

ACTUATOR

Pos.	Qty	Denomination	NW 40 38 mm	NW 50 51 mm	NW65 63.5 mm	76 mm	NW 80	NW 100 101.6 mm
		Actuator -1, compl.	31353-0205-1	31353-0205-1	31353-0205-1	31353-0214-1	31353-0214-1	31353-0214-1
		Actuator -2, compl.	31353-0206-2	31353-0206-2	31353-0206-2	31353-0214-2	31353-0214-2	31353-0214-2
		Actuator -3, compl.	31353-0206-3	31353-0206-3	31353-0206-3	31353-0214-3	31353-0214-3	31353-0214-3
1	1	Cap	31801-0525-6	31801-0525-6	31801-0525-6	31801-0525-6	31801-0525-6	31801-0525-6
2*	2	O-ring	223408-26	223408-26	223408-26	223408-49	223408-49	223408-49
3	1	Cylinder	31353-0139-1	31353-0139-1	31353-0139-1	31353-0185-1	31353-0185-1	31353-0185-1
4*	1	Lock Wire	31353-0151-1	31353-0151-1	31353-0151-1	31353-0151-1	31353-0151-1	31353-0151-1
5*	1	O-ring	223401-74	223401-74	223401-74	223401-75	223401-75	223401-75
6	1	Piston -1, -2	31353-0621-1	31353-0621-1	31353-0621-1	31353-0619-1	31353-0619-1	31353-0619-1
	1	Piston -3	31353-0621-2	31353-0621-2	31353-0621-2	31353-0619-2	31353-0619-2	31353-0619-2
7*	1	O-ring	223408-67	223408-67	223408-67	223408-17	223408-17	223408-17
8	1	Bonnet	31353-0135-1	31353-0135-1	31353-0135-1	31353-0190-1	31353-0190-1	31353-0190-1
9*	2	Plug	31353-0184-1	31353-0184-1	31353-0184-1	31353-0184-1	31353-0184-1	31353-0184-1
10a*	1	Spring assembly (std. black)	31353-0625-1	31353-0625-1	31353-0625-1	31353-0622-1	31353-0622-1	31353-0622-1
10b*	1	Spring assembly with extra strong spring (white).	31353-0626-2	31353-0626-2	31353-0626-2	31353-0622-2	31353-0622-2	31353-0622-2
11a*	1	Clip, compl. (period 94.05 -)	31353-0793-1	31353-0793-1	31353-0793-1	31353-0793-2	31353-0793-2	31353-0793-2
11b	1	Clip, (period 88.02 - 94.07)	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1	31353-0130-1
*		Service kit	9611-92-0008	9611-92-0008	9611-92-0008	9611-92-0009	9611-92-0009	9611-92-0009

* Only for actuator -1 and -2.

Valve Body Part

Pos.	Qty	Denomination	NW 40 38 mm	NW 50 51 mm	NW65 63.5 mm	76 mm	NW 80	NW 100 101.6 mm
Stem Seal								
14*	1	Lip seal, EPDM (std)	31353-0186-1	31353-0186-1	31353-0186-1	31353-0186-1	31353-0186-1	31353-0186-1
	1	Lip seal, NBR	31353-0186-2	31353-0186-2	31353-0186-2	31353-0186-2	31353-0186-2	31353-0186-2
	1	Lip seal, FPM	31353-0186-3	31353-0186-3	31353-0186-3	31353-0186-3	31353-0186-3	31353-0186-3
Clamp								
15ab	1	Clamps and screws (Period 9709-)	31320-0027-1	31320-0027-1	31320-0027-1	31320-0027-2	31320-0027-2	31320-0027-2
15a	2	Clamp half (Period -9709)	31320-0021-1	31320-0021-1	31320-0021-1	31320-0021-1	31320-0021-1	31320-0021-1
15b	2	Screw (Period -9709)	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18	2210936-18
Valve Body								
16	1	Valve body, 2 ports ISO	31353-0376-1	31353-0376-1	31353-0380-1	31353-0381-1		31353-0026-1
	1	Valve body, 2 ports DIN	9612-0940-01	9612-0941-01	9612-0942-01		9612-0943-01	9612-0944-01
16	1	Valve body, 3 ports ISO	31353-0376-6	31353-0376-6	31353-0380-6	31353-0381-6		31353-0026-6
	1	Valve body, 3 ports DIN	9612-0940-02	9612-0941-02	9612-0942-02		9612-0943-02	9612-0944-02
Valve Plug								
19		Plug,single,compl. EPDM (std.)	31353-0330-1	31353-0331-1	31353-0332-1	31353-0333-1	31353-0333-1	31353-0334-1
	1	Plug,single,compl. NBR	31353-0330-2	31353-0331-2	31353-0332-2	31353-0333-2	31353-0333-2	31353-0334-2
		Plug,single,compl. FPM	31353-0330-3	31353-0331-3	31353-0332-3	31353-0333-3	31353-0333-3	31353-0334-3
8	1	Stem	31353-0340-1	31353-0377-1	31353-0378-1	31353-0341-1	31353-0341-1	31353-0379-1
20*	1	Seal ring, EPDM (std.)	31353-0320-1	31353-0321-1	31353-0322-1	31353-0324-1	9612-0950-01	31353-0326-1
	1	Seal ring, NBR	31353-0320-2	31353-0321-2	31353-0322-2	31353-0324-2	9612-0950-02	31353-0326-2
	1	Seal ring, FPM	31353-0320-3	31353-0321-3	31353-0322-3	31353-0324-3	9612-0950-03	31353-0326-3
1	1	Washer	31353-0337-1	31353-0338-1	31353-0338-1	31353-0380-1	31353-0380-1	31353-0381-1
6*	1	O-ring, EPDM (std.)	990034-01	990034-01	990034-01	990034-01	990034-01	990034-01
	1	O-ring, NBR	223404-21	223404-21	223404-21	223404-21	223404-21	223404-21
	1	O-ring, FPM	223404-39	223404-39	223404-39	223404-39	223404-39	223404-39
h	1	Screw	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1	31353-0362-1
Valve Body with 0.8 Ra finish inside								
16	1	Valve body, 2 ports ISO	31353-0376-2	31353-0376-2	31353-0380-2	31353-0381-2		31353-0026-2
	1	Valve body, 2 ports DIN	9612-0940-03	9612-0941-03	9612-0942-03		9612-0943-03	9612-0944-03
16	1	Valve body, 3 ports ISO	31353-0376-3	31353-0376-3	31353-0380-3	31353-0381-3		31353-0026-3
	1	Valve body, 3 ports DIN	9612-0940-04	9612-0941-04	9612-0942-04		9612-0943-04	9612-0944-04

Valve Plug with 0.8 Ra finish

Pos.	Qty	Denomination	NW 40 38 mm	NW 50 51 mm	NW65 63.5 mm	76 mm	NW 80	NW 100 101.6 mm
19		Plug,single,compl. EPDM (std)	31353-1090-1	31353-1091-1	31353-1092-1	31353-1093-1	31353-1093-4	31353-1094-1
	1	Plug,single,compl. NBR	31353-1090-2	31353-1091-2	31353-1092-2	31353-1093-2	31353-1093-5	31353-1094-2
		Plug,single,compl. FPM	31353-1090-3	31353-1091-3	31353-1092-3	31353-1093-3	31353-1093-6	31353-1094-3
8	1	Stem	31353-1007-1	31353-1007-2	31353-1007-3	31353-1007-4	31353-1007-5	31353-1007-6
1	1	Washer	31353-1010-1	31353-1010-2	31353-1010-3	31353-1010-4	31353-1010-5	31353-1010-6
h	1	Screw	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1	31353-1011-1
*		Service kit EPDM	9611-92-0010	9611-92-0013	9611-92-0016	9611-92-0019	9611-92-0105	9611-92-0022
*		Service kit NBR	9611-92-0011	9611-92-0014	9611-92-0017	9611-92-0020	9611-92-0106	9611-92-0023
*		Service kit FPM	9611-92-0012	9611-92-0015	9611-92-0018	9611-92-0021	9611-92-0107	9611-92-0024

Parts marked with * are included in the service kits

Recommended spare parts: Service kits

LKM

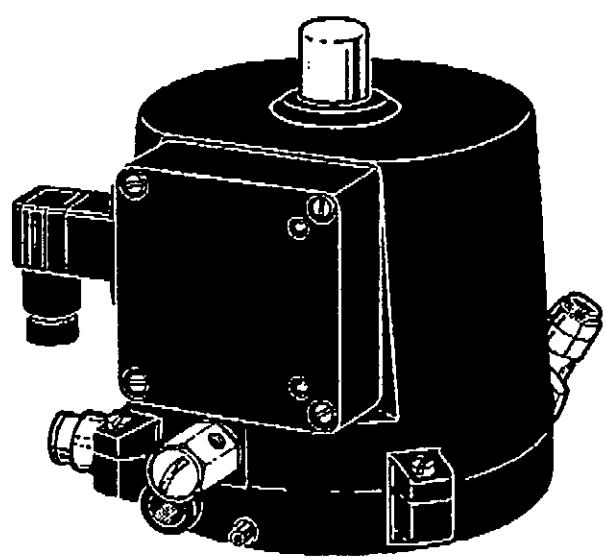
Reg 4.18.1 - SP70007 9503
Intro. 8301

0121 351 9131
01276 63383 SPARES

Alfa Laval

INSTRUCTION
MANUAL

LKT-N
Top Unit



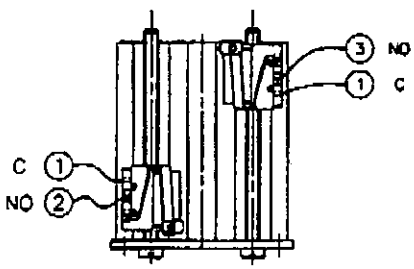
IM 70742-GB6
9411

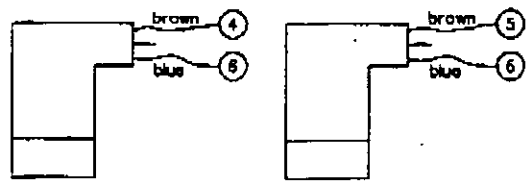
LKM

Electrical connection (internal) for: LKLA-T (LKB valves)

Inside in the Top Unit there is an arrangement for electrical connection. This feature makes it possible to change single components e.g. a solenoid valve or a switch. The instructions below must be used for wiring between the switches, the solenoids and the internal connection terminal.

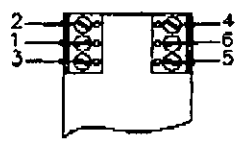
Micro switches and positive activation(s) of the solenoid valve(s)

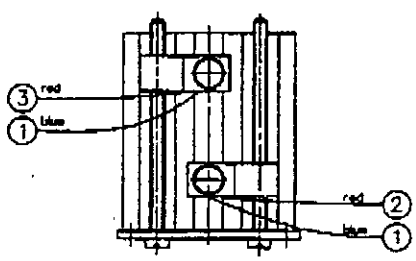




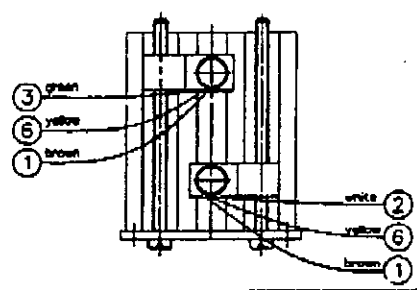
Solenoid valve 1 Solenoid valve 2

Inductive prox. (Namur) and negative activation(s) of the solenoid valve(s)

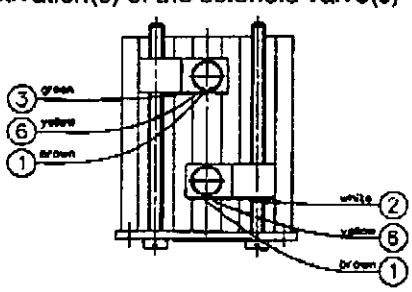


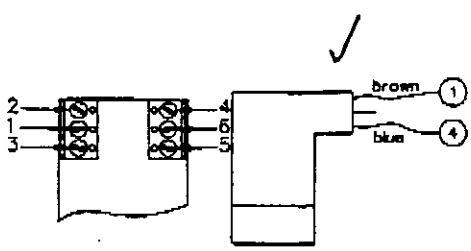


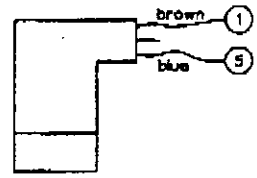
Hall prox. NPN and positive activation(s) of the solenoid valve(s)



Hall prox. PNP and negative activation(s) of the solenoid valve(s)

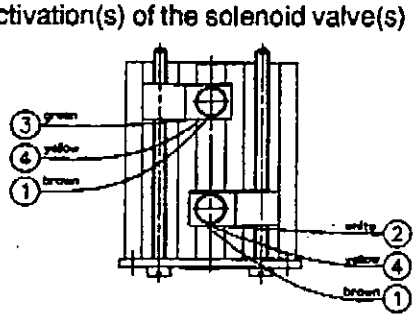


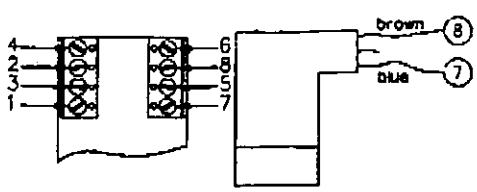


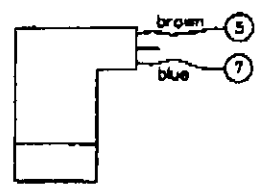


Solenoid valve 1 Solenoid valve 2

Hall prox. PNP and positive activation(s) of the solenoid valve(s)







Solenoid valve 1 Solenoid valve 2

Standard connection is for NC-actuator. If NO-actuator and the LED signals have to be in the same position A and B at the LKT-N box, please change the following wires:
Micro, Hall, Inductive: Change ② and ④

Instructions for:

Top Unit LKT-N for Hall PNP 8-30 V DC and Solenoids 24 V DC or 24 V AC. NB: Positive activation of the solenoid valve(s)

Code no.: SRC/ARC/SMP-SC/SMP-BC: 9612-0896-01, 9612-0860-27/28 ; SMP-EC: 9612-0896-02, 9612-0861-16; LKLA-T: 9612-0896-03, 9612-0862-19/20

Issued by:	Dept.:	Date:	Page:	No. of pages:
Wolfgang Grell	QDA	28.11.91	1	1

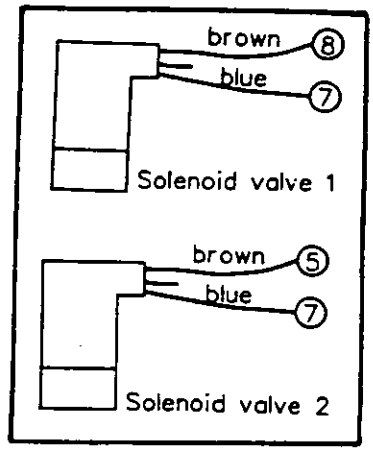
Other instructions valid:

IM70742-E1, IM70739-E1, IM70740-E1 and IM70741-E1 excl. the below mentioned

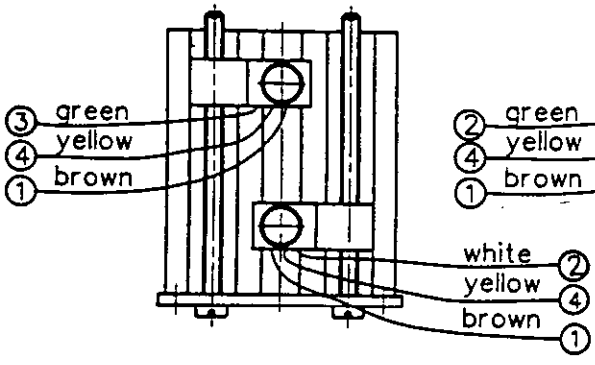
1)

The terminal inside the box has 8 connections instead of 6.

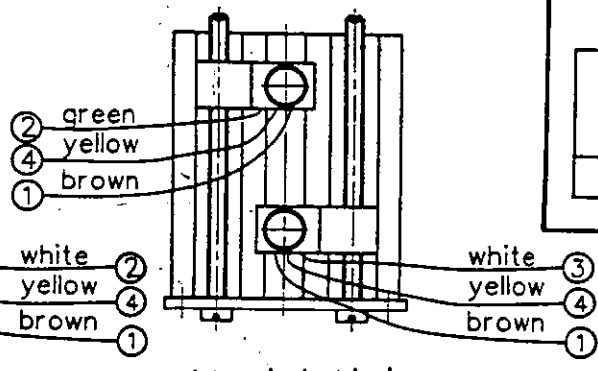
Arrange the internal wiring as follows:



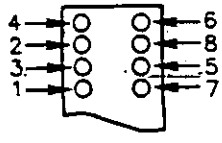
(Only for LKLA-T (LKB valve))



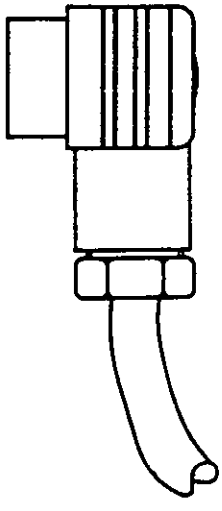
(For SRC / ARC and SMP valves)



Internal, electrical connection



2) How to connect the outside fermale plug or cable:

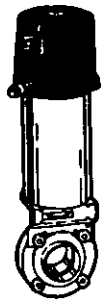


White	(1)	+ supply sensors (common), 8-30 V DC
Brown	(2)	Output signal A (open valve)
Green	(3)	Output signal B (closed valve)
Yellow	(4)	+ Solenoid 1, 24 V DC or 24 V AC
Grey	(5)	+ Solenoid 2, 24 V DC or 24 V AC
Pink	(6)	- /N sensors / solenoids (common) solenoid and sensors

LKM

INSTALLATION INSTRUCTIONS

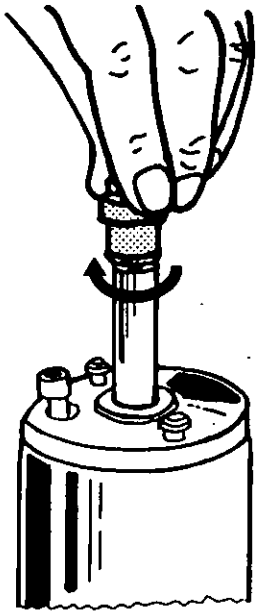
Top Unit LKT-N used on LKLA-T



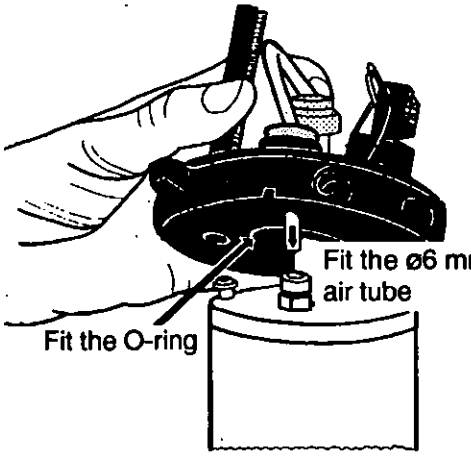
IM 70741-GB6
9501

WE RESERVE THE RIGHT TO MINOR CHANGES IN DESIGN AND FUNCTION

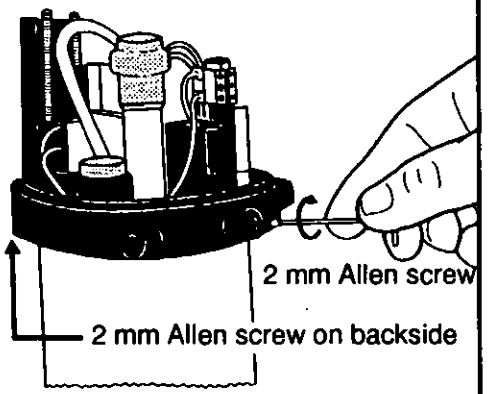
LKM



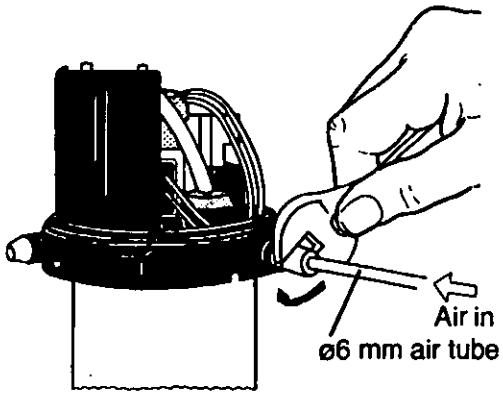
1.



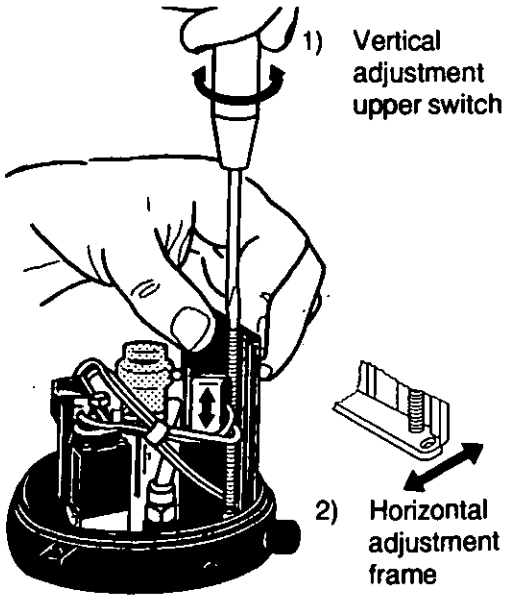
2.



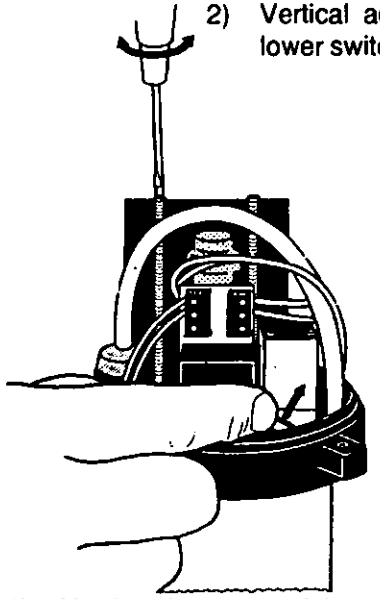
3.



4.



5.

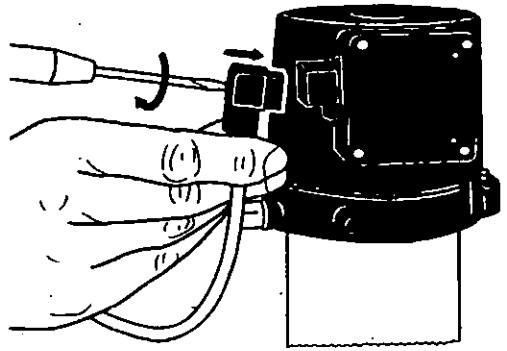


1) Use hand operator of the solenoid valve to activate the actuaor.

6.

Electrical connection, see picture on page 13

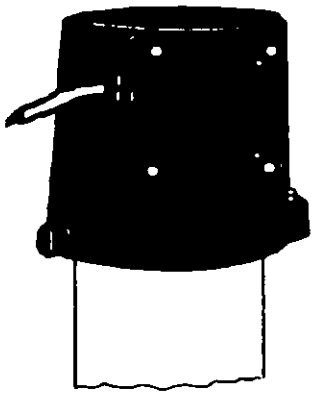
Electrical connection by soldering



Top with plug-connection

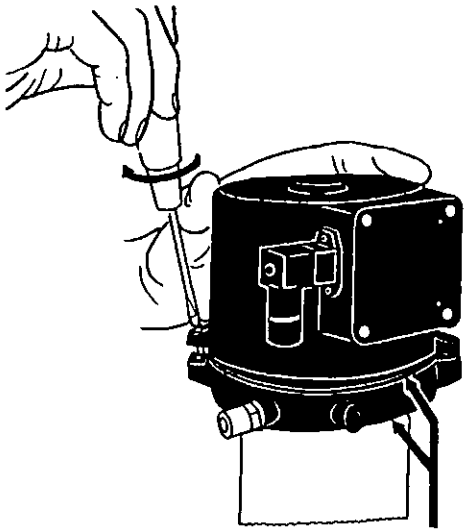
7.

Electrical connection see picture on page 13



Top with 5 meter cable

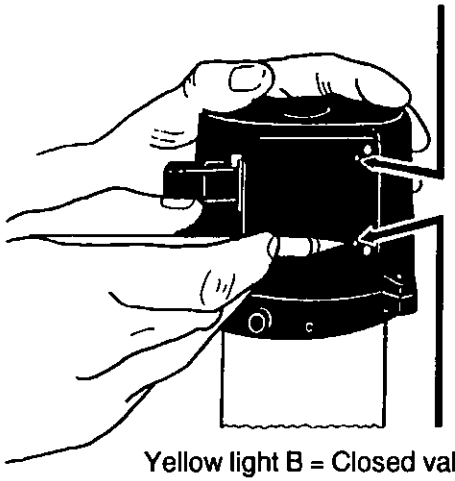
8.



Remember O-rings.

9.

Yellow light A = open valve



Yellow light B = Closed valve

10.

For LKT-N without Solenoid valves

- Connect air in (ø6 mm air tube) at "Out 1" terminal
- Follow picture 2 for inside air tube connections

11.

EDENG

EDENG CO.LTD
THE OLD STATION
ST.CLEARS
DYFED,SA33 4DQ
Tel: (01994) 230881
Fax: (01994) 231243

CABLE TERMINATION SCHEDULE

SHEET No.

	DATE	NAME
DRAWN		
CH'KD		
APP'D		

CONTRACT TITLE :

NOTES :

ISS	AMMENDMENTS	DATE	NAME

CABLE No	CABLE TYPE & SIZE	ROUTE LTH	VOLT DROP	LOAD	CORE CODE	FROM	TERM No	TO	TERM No	COMMENTS	APPROX LOC'N
	7C x 1.0YY				1 2 3 4 5 6 7	~~MAGIC~~ CONTROL ROOM		~~SAIB~~ EVAP	WHITE BROWN GREEN YELLOW PINK.	NEW VALVE WITHIN EVAP. OPEN F/B CLOSED F/B SOLENOID 0-V COMMON SPARE SPARE.	24M/C
	7c x 1.5YY				1 2 3 4 5 6 GY GY	Control Room		EVAP 1 2 3 4 5 6 GY	WHITE BROWN GREEN YELLOW GREY PINK	24v DC +ve OPEN Signal CLOSED Signal -NEG Solenoid — -NEG Sensors	

Instructions for:

Modified Top Unit LKT-N with 5 metre cable

Code no.:
SRC/ARC/SMP-SC/SMP-BC: 9612-0896-01, SMP-EC: 9612-0896-02, LKLA-T: 9612-0896-03

Issued by:	Dept.:	Date:	Page:	No. of pages:
Finn Cramer	QDA	92.08.05	1	1

Other instructions valid:
IM70742-E1, IM70739-E1, IM70740-E1 and IM70741-E1 excl. the below mentioned

1) **We have modified the Top Unit as follows:**
   - **Changed to 5 metre "Flying cable" instead of plug**

Electrical connection

LKT-N with 2 solenoid-valves and different switch systems					
Connection to the cable	Micro switches	Inductive prox. switches	Hall prox. switches		
			NPN	Negative activation of solenoid valves PNP	Positive activation of solenoid valves PNP
White ①	+/P supply micro switches (common)	- sensors (common)	+ supply sensors (common)	+/P supply sensors and solenoids (common)	+ supply sensors (common)
Brown ②	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)
Green ③	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)
Yellow ④	+/P Supply solenoid 1	- solenoid 1	+/P Supply solenoid 1	-/N solenoid 1	+/P solenoid 1
Grey ⑤	+/P Supply solenoid 2	- solenoid 2	+/P Supply solenoid 2	-/N solenoid 2	+/P solenoid 2
Pink ⑥	-/N micro-switches/ solenoids (common)	+ supply solenoid (common)	-/N Sensors/ solenoids (common)	- sensors (common)	-/N Sensors/ solenoids (common)

Note!

1) Symbols used in the above chart for electrical connection

DC current
+ positive polarrity for DC
- negative polarity for DC

AC current
P phase for AC
N Neutral for AC

2) If both types of current (AC/DC) are used, correct in the following way:
-/N Polarities must be connected together at the power supply.
+/P polarities must be connected together at the power supply.

3) PNP Hall prox. switches have positive or negative activations of the solenoid valve(s). Please check!

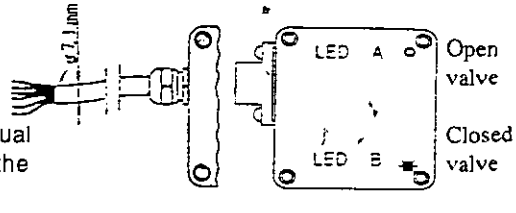
4) For inductive prox. switches (NAMUR) without solenoids:
24 V DC supply in addition to 8 V DC mesassary if indication of lights (LED) tooperate.

Cable specification:

- Standard = DIN 47.100
- Unscreened PVC cable (Grey)
- Core = 6x0.5 mm²
- Outside diameter = ø7.3 mm

The LKT-N box, normal position on a vertically installed valve.

NB: Valid for LKLA-T NC.
If NO - see instruction manual IM 70742-E1 for changing the wires.



LKM

S H MARLBOROUGH.
M. WORTH
SUT COFFEE
BTG & AL

Instructions for:

Modified Top Unit LKT-N with 5 metre cable

Code no.:
SRC/ARC/SMP-SC/SMP-BC: 9612-0896-01, SMP-EC: 9612-0896-02, LKLA-T: 9612-0896-03

Issued by:	Dept.:	Date:	Page:	No. of pages:
Finn Cramer	QDA	92.08.05	1	1

Other instructions valid:
IM70742-E1, IM70739-E1, IM70740-E1 and IM70741-E1 excl. the below mentioned

1) **We have modified the Top Unit as follows:**
   - **Changed to 5 metre "Flying cable" instead of plug**

Electrical connection

LKT-N with 2 solenoid-valves and different switch systems					
Connection to the cable	Micro switches	Inductive prox. switches	Hall prox. switches		
			NPN	Negative activation of solenoid valves PNP	Positive activation of solenoid valves PNP
White ①	+/P supply micro switches (common)	- sensors (common)	+ supply sensors (common)	+/P supply sensors and solenoids (common)	+ supply sensors (common)
Brown ②	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)	Output signal A (open valve)
Green ③	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)	Output signal B (closed valve)
Yellow ④	+/P Supply solenoid 1	- solenoid 1	+/P Supply solenoid 1	-/N solenoid 1	+/P solenoid 1
Grey ⑤	+/P Supply solenoid 2	- solenoid 2	+/P Supply solenoid 2	-/N solenoid 2	+/P solenoid 2
Pink ⑥	-/N micro-switches/ solenoids (common)	+ supply solenoid (common)	-/N Sensors/ solenoids (common)	- sensors (common)	-/N Sensors/ solenoids (common)

Note!

1) Symbols used in the above chart for electrical connection

DC current	AC current
+ positive polarrity for DC	P phase for AC
- negative polarity for DC	N Neutral for AC

2) If both types of current (AC/DC) are used, correct in the following way:
   -/N Polarities must be connected together at the power supply.
   +/P polarities must be connected together at the power supply.

3) PNP Hall prox. switches have positive or negative activations of the solenoid valve(s). Please check!

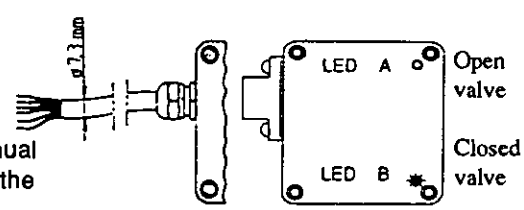
4) For inductive prox. switches (NAMUR) without solenoids:
   24 V DC supply in addition to 8 V DC mesassary if indication of lights (LED) tooperate.

Cable specification:

- Standard = DIN 47.100
- Unscreened PVC cable (Grey)
- Core = 6x0.5 mm²
- Outside diameter = ø7.3 mm

The LKT-N box, normal position on a vertically installed valve.

NB: Valid for LKLA-T NC. If NO - see instruction manual IM 70742-E1 for changing the wires.



LKM

Production date — WIEGAND Evaporator V 1/

Product _____ **start** _____ **end** _____ **running time** _____ **date** _____

time																
inlet:																
quantity lbs/hr; kg/h																
concentration % TS																
temperature ° F; ° C																
outlet:																
density % Ref.																
densitymeter-% scale																
densitymeter % solids																
temperatures: ° F; ° C																
preheating																
pasteurizing temp.																
high heating																
detensioner																
stage																
stage																
stage																
stage																
stage																
steam: psig; kp/cm²																
prior to distributor																
in the distributor																
recompressor																
press. in heater																
press. in highh.																
vacuum: inch Hg; m WS																
stage																
stage																
condensate 1 lbs/hr; kg/h																
condensate 2 lbs/hr; kg/h																
cooling water temp. ° F; °C																
warm water temp. ° F; ° C																
sealing water o.k.																
air supply psig; kp/cm²																
Notes: pH-value % lactic acid etc.																