

**Komplette Betriebs- und Wartungsanleitung in englisch für
Kolbenmembranpumpen**

Typ

SP537NG

Stand: Juni 2005



EMMERICH-

Piston Diaphragm Pump

Type „SP“

DATA REGARDING THE PUMP

Pump No. :
Type :
Order No. :
Manufactured :
Capacity :
max. permissible operating pressure :

These particulars must always be listed when ordering spare parts.

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Arrangement of parts

Drive unit

It consists of a skew crown gear crankshaft drive in which the connecting rod is carried in a cross-head. The driving power is transferred from the motor by V-belt to the top anti-friction bearing-mounted pinion shaft.

Pump head

The pump head has a primary side (towards the material pumped) and a secondary or hydraulic side. The double diaphragm separates both sides from each other.

The secondary side consists mainly of pump cylinder, make-up tank, overflow valves, make-up devices.

The primary side consists of the diaphragm casing, which includes the diaphragm, of valves with interchangeable valve seats, and of discharge and suction pulsation dampener.

Pumping

The driving power from the drive unit is transferred to the piston sleeve carried in a liner. This sleeve transmits the pumping movement to the diaphragm by means of the actuating liquid.

During the suction stroke, the diaphragm deflects towards the secondary side. The vacuum created by this opens the suction valves and the pumped material flows into the diaphragm casing. During the pressure stroke, the material is forced by the pressure valve into the pressure line because of the diaphragm deflecting to the primary side.

The make-up device in the secondary circuit replaces any lost liquid automatically. The overflow valve opens at overpressure and draws actuating liquid from the cylinder. If the pressure drops, the cylinder is refilled automatically by the make-up device.

0. Introduction

0.1 General Information



This operator and maintenance manual contains instructions from the pump manufacturer. They need to be supplemented if necessary by instructions of the operating company for its employees.

Specific information on operating and maintaining the process-oriented system that is integrated in the pump are not covered here. They can be given only by those responsible for planning and installing the system (system manufacturer). Such specific information on operating and maintaining the process-oriented system integrated in the pump have priority over the instructions of the pump manufacturer. The limitations of use must be fundamentally observed by the system manufacturer.

Refer to the operator and maintenance manual from the system manufacturer.

0.1.1 Designation of the Pump

The precise designation can be found in the order-specific documentation (see "*PUMP DATA*").

0.1.2 Intended Use

The intended use of the pump is specified by the information in "*PUMP DATA*". The pumped liquids may not act upon the pump chemically or mechanically.

0.1.3 Construction Design

The pumps are constructed in various designs that mainly take into account different flow rates / feed pressures and the materials.

The descriptions and instructions given in this operator and maintenance manual concern the standard model of each type. That is why neither all the construction details and variants nor all possible coincidences and events that can occur during installation, operation or maintenance are taken into consideration here.

0.1.4 Performance Data

The precise performance data can be found in the pump production test document.

0.1.5 Warranty

Our liabilities for defective delivery are stipulated in our *sales terms and delivery conditions*. No liability is accepted for damages caused by ignoring the operator and maintenance manual and the limitations of use.

In case operational conditions change in the future (for example other fluids, flow rates, viscosity, or other temperature or feed conditions), then each condition needs to be inspected by us and confirmed if necessary whether or not the pump is suitable for it. As long as no special arrangements have been made by us, pumps delivered by us may be opened and changed only by us, the customer's technicians upon conferring with us, or our authorised service workshops during the warranty period, otherwise our liability for any defects lapses.

0.1.6 Inspection

All pumps undergo a leakage and pressure test before they leave the factory. Additional inspections are carried out only by special request.

0.1.7 Availability

We recommend basically that you purchase and store replacement pumps and parts in case the pumps supplied are crucial for the continuation of production or conveying processes. This avoids or minimises down-times.

0.1.8 Pressure Limit

The maximum feed pressure may be no more than the permissible inner pressure of the pump (see "PUMP DATA").

0.2 Safety

The operator and maintenance manual contains basic information that must be observed during installation, operation and maintenance. Therefore this operator and maintenance manual must essentially be read by the responsible technicians/operators and has to always be within reach of the machine / system.

Not only are the safety instructions described in this main chapter to be observed, but also those special safety notices added in the following major points.

0.2.1 Display of Warnings in the Operator and Maintenance Manual

The safety instructions contained in this operator and maintenance manual, which when ignored can pose a danger to persons, are specially identified by the general warning symbol



safety sign according to DIN 4844-W9

and for warning on electrical voltage by



safety sign according to DIN 4844-W8.

For safety instructions that when ignored can cause danger for the machine and its functions the word

ATTENTION

has been added.

Notifications that have been mounted on the machine directly, such as

- direction of rotation arrow
- identification and pump data

must always be observed and be kept in a completely legible state.

0.2.2 Personnel Qualification and Training

The personnel responsible for operation, maintenance, inspection and installation must have the appropriate qualification for these jobs. The responsibility range, competence and the supervision of the personnel need to be determined precisely by the owner. If the personnel does not have the necessary qualifications then they must be trained and instructed. This can be done if necessary by the manufacturer or supplier at the request of the owner. Finally the owner needs to make sure that the contents of the operator and maintenance manual are completely understood by the personnel.

0.2.3 Danger when Ignoring the Safety Instructions

Ignoring the safety instructions can lead to danger to persons as well as to the environment and to the machine. Ignoring the safety instructions leads to the loss of any claims for damage.

In the following cases for example dangers can occur due to ignoring:

- Failure of important functions of the machines / system
- Malfunction of prescribed methods for maintenance and service
- Danger to persons because of electrical, mechanical or chemical impact
- Danger to the environment because of dangerous materials

0.2.4 Safe Working

Observe the safety instructions written in this operator and maintenance manual as well as the existing national regulations on accident prevention and any internal work, corporate and safety regulations of the owner.

0.2.5 Safety Instructions for the Owner / Operator

- If hot or cold machine parts are dangerous, these parts must be protected on site against contact.
- Protective covers of moving parts such as V-belts may not be removed while the machine is in operation.
- If pumps are operated in dusty surroundings (such as mills, gravel works, etc.), then the pump's surfaces need to be cleaned regularly depending on the local concentration of dust in order to ensure the cooling and to prevent spontaneous ignition. See also explosion protection regulation (ZH 1/10).
- Leaks (at the shaft seal, for example) of dangerous flow material (e.g. explosive, poisonous, hot) have to be carried off in such a way so that there is no danger for people or environment. Legal regulations must be observed.
- Danger from electrical power has to be prevented (details can be found in the regulations of electrician societies or the local electrical company).

0.2.6 Safety Instructions for Maintenance, Inspection and Installation Work

The owner must ensure that all maintenance, inspection and installation work is carried out by authorised and qualified technicians that have informed themselves sufficiently by studying the operator and maintenance manual.

Basically work on the machine should be carried out only when it is stopped. The procedure for stopping the machine as described in the operator and maintenance manual must be strictly adhered to. Pumps or pump systems that transport health-hazardous material must be decontaminated. Immediately following the maintenance work all safety and protective devices have to be remounted and be functioning.

Before restarting, the points listed in the Chapter Installation need to be observed.

0.2.7 Arbitrary Rebuilding and Spare Parts Construction

Rebuilding and changing the machine are permitted only upon consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer serve safety purposes. The use of other parts lapses the liability for any of their consequences.

0.2.8 Improper Modes of Operation

The operational safety of the supplied machine is only warranted under the intended use as specified in paragraph 0.1.3, Section 1 of the operator and maintenance manual. The given value limits may not be exceeded under any circumstances.

0.3 Transport and Temporary Storage

0.3.1 Packaging

The pictures displayed on the packaging must be observed.

0.3.2 Transport



The pump or pump system has to be transported securely, if necessary by crane, to its installation site.

The regulations for lifting loads according to the employers' liability insurance association's regulation 9a need to be observed. Cranes and hoists need to be strong enough. Slings may not be attached to the motor's suspension shackle, unless it serves as an additional protection against flipping because of top-heaviness.

Transport to and from installation site.

Be sure that the device is securely transported in a stable condition. Flipping over because of top-heaviness needs to be prevented.

Transport damage

ATTENTION: Upon receiving the pump an inspection for transport damage has to be made. Any damage should be reported immediately.

0.3.3 Unpacking

The packaging may be labelled with information on the lay and position of the system.

The packing material has to be disposed of properly.

0.3.4 Storage

The system has to always be stored upright and dry and be protected against direct sunlight and frost (temperatures < 5°C).

0.4 Service

We will be glad to help the repair of malfunctions. The more precise the information on the type of malfunction is, the quicker it can be repaired.

In case of need contact our factory directly.

1. Commissioning

1.1 State of Supply

The pump is supplied without oil. All internal parts are protected against corrosion.

Rubberized pumps shall not be shipped, stored, mounted and operated at temperatures below + 5 °C. Careful treatment of rubberized parts is a must for long service life of the pump (Please refer to DIN 7716).

1.2 Pump Erection

- a) Place pump on suitable foundation.
- b) Align pump horizontally. If necessary, shim with plates and fix stress-free with rag bolts.
- c) Place suction and discharge pulsation dampener or diaphragm shock absorber, if any.
- d) Connect suction and discharge lines. Place piping stress-free.
- e) Relieve pump connection flanges by supporting suction and discharge lines.
- f) Re-fill gear oil.
- g) Place electrical motor and tension v-belt as required.
- h) Fix v-belt guard.

1.3 Suction conditions

An unobjectionable operation of the pump depends mainly on a correct laying and soundness of the suction line.

The suction line shall be as short as possible and never have a smaller dia. than the nominal dia. of the connecting flange at the suction side of the pump. It is very important that there are not any air pockets. Thus the suction line should continuously rise in the direction to the pump.

Do not use any T-pieces and elbows, but tube bends ($R_{min.} = 3 \times d$). Avoid reduction of cross section areas and installations of any kind within the pipe in order to keep the resistance to flow as low as possible.

Attention: The Piston Diaphragm Pump must not be operated under cavitation conditions in the suction and discharge line. In case of non-observance, damages at the pump may come about, as for example diaphragm failures, destruction of the inner parts of the valve, destruction of the piston rod and the piston, damage of the gear unit, etc.

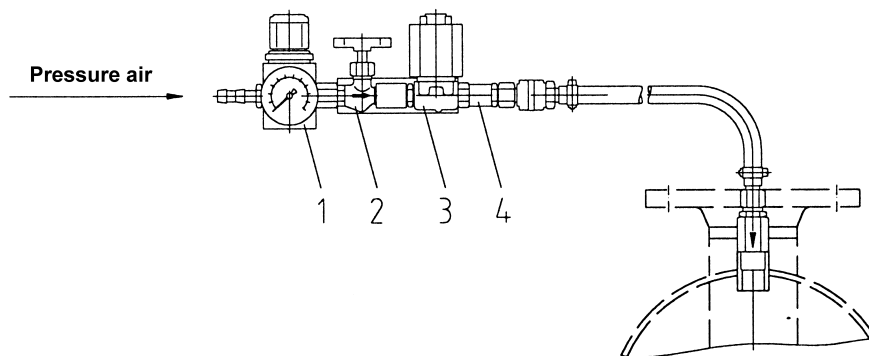
1.4 Air supply of pulsation dampeners

All pumps must be equipped with a pulsation device which can be either a normal pulsation dampener or a diaphragm these must be continuously fed with sufficient air during pump operation. The type of air supply is to be adapted to the working conditions of the pumps.

1.4.3 Air Supply Device

With all piston diaphragm pumps, the pulsation dampeners can be supplied with compressed air available at the plant. The air supply device consists of a pressure reducing valve (1), a needle valve (2), a solenoid valve (3) and two nonreturn valves (4). The pressure reducing valve is necessary for the adjustment of the air pressure required. The air pressure has to exceed the inlet pressure of the liquid to be handled by appr. 2 bar. The required amount of air is adjusted by the needle valve. The amount of air depends on the kind of liquid to be handled and amounts generally to 1 % - 5 % of the capacity. The solenoid valve is a shut-off valve which is closed if there is no current in the coil. This valve prevents air consumption if the pump is out of operation. Prior to connecting the coil, it should be made sure that the nominal voltage of the coil coincides with the supply voltage. The nonreturn valves prevent that the liquid to be handled penetrates into the compressed-air line.

Attention: If the piston diaphragm pump is out of operation, there must be no current in the solenoid valve.



Piston diaphragm pumps without suction pulsation dampener have the possibility to connect the air-supply device by means of an intermediate flange.

1.6 Diaphragm failure indicator

1.6.1. Visual Diaphragm Leakage Indicator

The pump is equipped with a double diaphragm. If the diaphragm is intact, the needle of the diaphragm leakage indicator will not deflect.

If one half of the diaphragm is damaged, the needle will deflect correspondingly.

At this time the second half of the diaphragm is still intact. In order to benefit of the safety effect of the double diaphragm, and thus to make sure that slurry and hydraulic liquid cannot mix, it is necessary to change the double diaphragm now.

Maintenance

After each change of diaphragm, the diaphragm leakage indicator (non-return valve, Pos. 659 and gauge, Pos. 658), as well as the connecting boreholes must be cleaned, or - in case of damage - be changed. If the non-return valve does not function, there is a certain risk that the new diaphragm might be damaged.

1.6.3. Electrical diaphragm leakage indicator with pressure switch

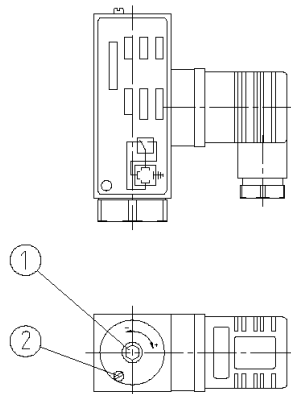
All double diaphragms of Emmerich-piston diaphragm pumps have got inside conduits. These conduits are directly connected with the visual / electrical diaphragm leakage indicator.

If one diaphragm-half breaks, the medium immediately gets to the visual / electrical diaphragm leakage indicator, which is installed at the pump and indicates by means of a visual and electrical signal the leakage. This signal can induce an acoustical or visual alarm and/or stop the current-supply of the pump-driving motor.

The conduits of the visual / electrical diaphragm leakage indicator have to be cleaned properly after each diaphragm leakage.

Pressure switch

The switching-pressure of the pressure-switch is adjusted by means of the hexagonal recess (1) and secured by the threaded pin (2). The switching pressure should be adjusted to approx. 2 bar.



Attention:

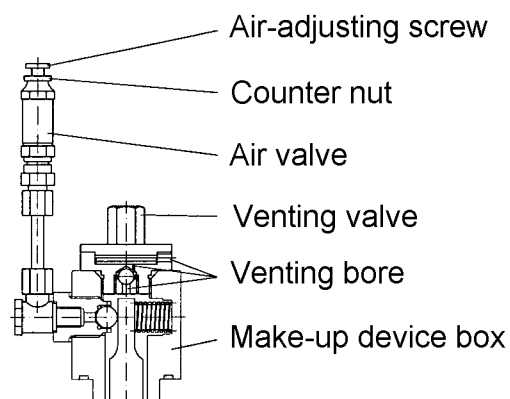
Regarding the electrical connections, the safety-provisions according to VDE 0100 have to be observed.

1.7 Automatic regulation of pressures and quantities for feeding filter presses

An actuating liquid transfers power from the piston to the diaphragm (1.8). The admissible filter press pressure, e.g. 16 bar, is set at an overflow valve located in the actuating liquid circuit. As soon as the press is filled and the pressure risen to the last third of its range, this valve will overflow. In other words, the hitherto constant volume between piston and diaphragm has lost liquid and the quantity of material handled is reduced by a smaller diaphragm amplitude. This process continues until the maximum set pressure is obtained. Actuating liquid is withdrawn from the circuit according to the counter pressure of the filter press and the quantity of material handled is automatically adjusted up to a minimum quantity (nearly zero) at maximum pressure. If the pressure drops below the set value, the make-up device delivers liquid at each suction stroke until the quantity of the material handled corresponds to the pressure.

1.7.1 Automatic regulation of pressures and quantities for feeding filter presses with air valve

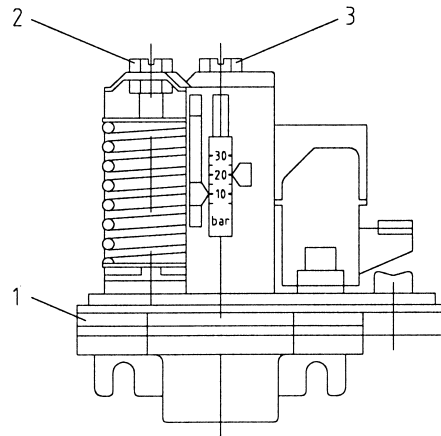
The regulation of pressures and quantities is described in point 1.7. When the filter press is filled, air is aspirated at the beginning of the capacity reduction into the hydraulic area of the pump by means of the air valve. Thus an internal additional pulsation dampening is achieved. The optimum amount of air is adjusted at our works by means of the air-adjusting screw, however this setting can be adjusted to the local conditions by loosening the counter nut and changing the setting of the air-adjusting screw. The venting bore of the venting valve must be tested for free passage when doing maintenance works.



1.7.2 Description of the Automatic Pressure Quantity Regulation of the Filter Press Feed for Pumps with Electrical Pressure Switch

The pressure quantity regulation is that as described in 1.7.1.

The solenoid-operated valve is closed by an impulse of the pressure switch (1) thus preventing the flow of the hydraulic liquid. Air is sucked into the hydraulic part of the pump by the vent valve.



Adjustment when the pump is not in operation:

- adjust the adjusting screw 3 (red) to approx. 60 % of the filtration end-pressure
- adjust the adjusting screw 2 (green) to 4 bar

1.7.2.1 Inspection of the Pulsation Dampener

Before inspecting the pulsation dampener, the blind flange and the complete controller must be removed. The thread joints of the line for supply air and the line for exhaust air must be loosened as well.

1.7.2.2 Changing of the Diaphragm

The same procedure as described in Point 1.7.2.1., has to be carried out when changing the diaphragm. First of all the 4 fillister head cap screws at the blind flange must be loosened and then the thrust ring of the diaphragm must be removed. Before mounting a new diaphragm, remains of dirt have to be thoroughly removed from the internal parts. After assembling, highly fluid oil (17 - 22 mm²/s (cSt) at 40 °C) is filled up by means of the closure screw at the upper edge of the blind flange. Please pay attention that no air is trapped when threading in the closure screw.

1.8 Oil, grease and working liquid

1.8.1 Working liquid between piston and diaphragm

1. Clear water with 2 % Muzin for temperatures of the pumped material up to about 50 °C. Muzin is a water-soluble mineral oil product - similar to drilling fluid - which protects against corrosion and lubricates the piston.
2. At temperatures above 50 °C take hydraulic oil of viscosity 1 to 22 mm²/s (cSt) according to ISO – VG / DIN 51519 at 40 °C.
3. For temperatures below the freezing-point (up to max. –20 °C), 60 % water with 6 % Muzin and 34 % antifreeze FR58 (antifreeze customary in trade is inadmissible) could be used.

1.8.2 The lubricant for the gearbox should be of gear oil with

viscosity of 460 mm²/s (cSt) according to ISO – VG / DIN 51519 at 40 °C for the following pump types:

SP537NG

The oil is available on the market under the following trade-mark:

ARAL	: Degol BMB 460 or Degol BG 460
DEA	: Falcon CLP 460
MOBIL	: Mobilgear 634
SHELL	: Omala Oil 460
ESSO	: Spartan EP 460
BP	: Energol GR-XP 460

1.8.4 Filling capacity

Pump type	Working liquid (approx. litres)	Gear oil (approx. litres)
SP537NG	54	9

Before start up it is necessary to check by means of filling-position-indicator (gauge glass/sight glass) the filling position of the hydraulic liquid filled in.

1.8.5 Lubricating intervals

Lubricating point	Gear box (hours)	Working liquid (hours)
Lubricating interval	Check 40	Check 8
Renewal of lubricating agent	1000-4000 or after 18 months at latest	at diaphragm fracture
Remark	first change after 300-600	---

1.9 Start - up

Remove any dirt and foreign matter accumulated on the equipment during transport and erection.

Fill gearbox and pump cylinder with the liquids mentioned under 1.8 above.

The exact quantity of oil depends on the marks shown on the oil gauge glass.

The dust washer in the air inlet valves (make-up vessel, gearbox) must be removed.

1.9.1 Filling working liquid

When filling the pump cylinder, completely remove first the venting valve in the make-up tank. There are two make-up devices in double-acting pumps and the removal of both venting valves shall be done simultaneously.

The piston rod of single-acting pumps shall be in front position and the piston rod of double acting pumps shall be in middle position.

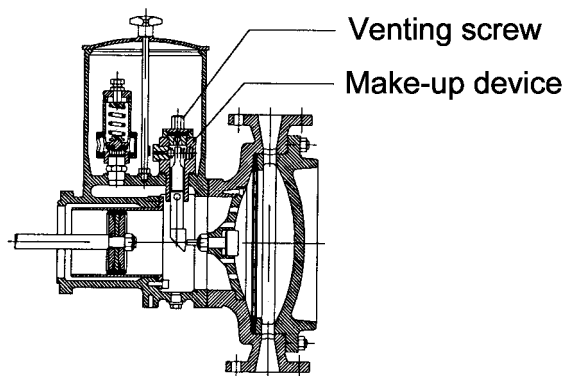
Thereupon, fill working liquid into the make-up tank. The pump cylinder is filled with hydraulic liquid by means of the make-up device. If the liquid level in the make-up tank remains constant, the cylinder is largely filled with liquid.

Fix venting valve and close tightly. Start pump. The sense of rotation must definitely correspond to that indicated on the drive unit. There must be free flow in suction and pressure lines.

When starting the pump, the air in the pump cylinder is evacuated through the venting bore of the venting valve.

Attention: During operating the pump the venting valve must not be untightened

Please take care that during this operation, there must always be sufficient liquid in the make-up tank.



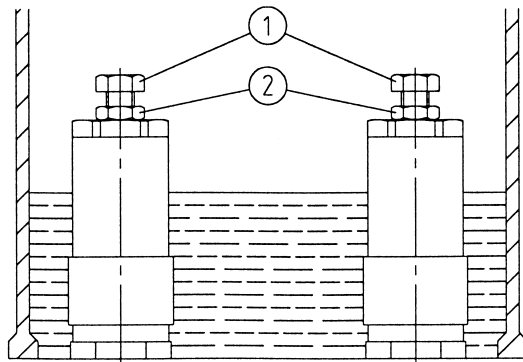
2. Important Adjustments

2.1 Overflow valve

2.1.2 Pressure Adjustment for double-acting acting Pumps with two Overflow valves

- 1) Open screws (1) of both overflow valves by unscrewing in anticlockwise direction.
- 2) Slowly close shutoff valve in the pressure line.
- 3) Now adjust the first of both valves by turning the screw (1) slowly in clockwise direction until the required operating pressure is shown on the manometer.
- 4) Tighten counter nut (2).
- 5) Now adjust the second valve in the same way as the first. But listen that the second deflection of pointer on the manometer has to show the same head as the first deflection during the discharge and suction stroke.
- 6) Tighten counter nut (2) of the second valve.

Attention: When changing the operating pressure of pumps with an electrical pressure switch, the pressure switch shall be re-adjusted respectively (please refer to 1.7.2)



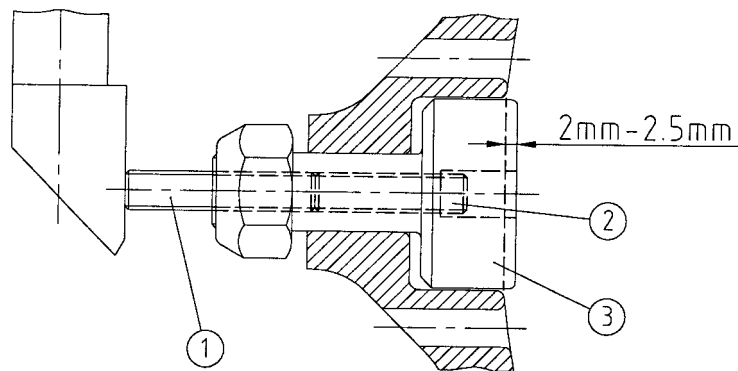
2.2 Make-up Device

The make-up tappet (3) actuated by the diaphragm must travel by about 2 to 2,5 mm from the first pressure to the end, when being pushed by hand in the direction of the piston. This is effected by the lever or the spring system of the make-up device.

A re-adjustment of the make-up device becomes necessary after its release or wear.

This re-adjustment (2 to 2,5 mm) is made by completely unscrewing the counter screw visible as threaded pin if seen from the front and changing the position of the threaded pin behind.

Re-adjustment or checking of the check measure shall be made ad least when replacing the diaphragm.



3. Monitoring and maintenance

General

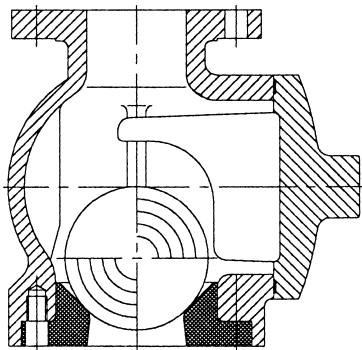
These functions include:

- a) Keeping the pump set in a clean state
- b) Checking all screws for tight fits
- c) Checking the pressure variations occurring simultaneously with the number of strokes and checking, if required, the pulsation dampeners
- d) Checking the venting valves (please refer to 1.7.1)
These valves operate satisfactorily if a small amount of priming liquid flows out of the vent bore at each pressure stroke
- e) Checking the electrical pressure switch (please refer to 1.7.2)
- f) Checking the noises of motor, gear unit and pump
- g) Checking the power input of motor with ammeter
- h) Checking the temperature of motor, gear unit, pump and priming liquid
- i) All elastomeres and plastics are subject to various ageing processes, which limit its service life. Pump parts made of elastomeres and plastics shall be checked and changed regularly.

3.1.1 Suction and pressure valves

These valves are usually ball valves and interchangeable with each other.

Wearing parts are valve balls and seats. For changing of valve balls, the valve cover shall be removed; for changing of valve seats, the valve casing has to be dismounted. Thereupon, the valve seat can be removed from the casing towards the bottom. Worn gaskets, if any, shall be replaced when re-installing seats.



3.2 Diaphragm leakage indicator

The diaphragm leakage indicator shall be checked daily. If the needle deflects accordingly (please refer to point 1.6.1), the pump shall be stopped immediately and the diaphragm changed. If this is not done, the cylinder bushing and the collar-type piston may be damaged.

3.3 Diaphragm change

At first, the priming liquid shall be removed by opening the drain plug at the bottom of the pump cylinder. Thereupon, the valve cover of the relevant suction valve shall be opened so as to allow the pumped liquid to flow out of the diaphragm casing. The diaphragm casing cover shall be dismantled and the diaphragm taken out. Cylinder chamber, make-up tank and make-up device shall be cleaned properly. In case of double-acting pumps also the hydraulic area of the second pump head shall be cleaned as well.

When mounting the diaphragm the brass-insert (leakage indicator) which is in the diaphragm, shall correspond to the bore of the leakage indicator which is mounted at the diaphragm casing. The screw connection at the diaphragm casing shall be tightened crosswise and uniformly with the required torque.

<u>Pump type</u>	<u>Thread diameter</u>	<u>Torque (Nm)</u>
SP537NG	M20	360

3.4 Collar-type piston

At first drain off hydraulic liquid through the respective borings. Thereupon remove cylinder cover or diaphragm compressor in the case of double-acting pumps, or diaphragm casing cover, diaphragm, diaphragm casing insert and make-up device in the case of single-acting pumps.

The extreme position of the piston rod is obtained by turning the v-belt pulley. Now, the self-locking nut can easily be removed. Return the piston rod to its original position by turning the v-belt pulley. The collar-type piston remains in its original position and can easily be replaced. For assembling reverse the above procedure.

(Take care for correct adjustment of make-up device of single-acting pumps)

Attention: The self-locking nut must be tightened with the following torque:

<u>Pump type</u>	<u>Thread diameter</u>	<u>Torque (Nm)</u>
SP537NG	M36x3	950

3.5 Drive unit

Check oil level regularly.

Change oil regularly according to lubrication schedule:

Change oil only in warm state of pump.

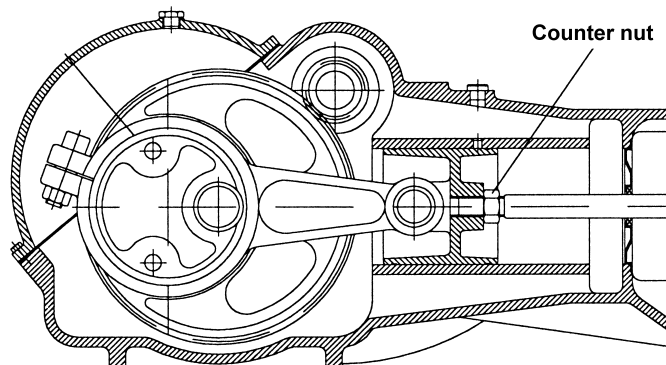
Drain off old oil completely.

When changing oil always check casing for water penetration or oil leakage.

In both cases, all gaskets and screw connections must be checked, especially the piston rod packing, and replaced if necessary.

3.6 Piston rod

In all cases in which the piston rod is involved, e.g. when replacing the collar-type piston, the counter nut must be tightened by applying the torques listed below. For this, a special key is necessary for pump type SP537NG.



Torques for counter nut

<u>Pump type</u>	<u>Torque (Nm)</u>
SP537NG	950

4. Trouble shooting

4.1. No pump suction

Check suction line for tightness. fill up pump, if necessary. Vent cylinder. Open valve cover and check valves for tightness.

Check suction line for blockage and rinse out, if necessary.

4.2 Pump fails to reach operating pressure

Check overflow valve for correct pressure.

Check piston rod sealing set for tightness.

Check venting valve for tightness.

Check overflow valve for tightness.

4.3 Pump operates intermittently

Feed pulsation dampener with air.

Material is too viscous, reduce suction head or thin down material.

Material too hot, reduce suction head or temperature.

Check valves for tightness and function.

4.4 Pump capacity gradually decreases

Check make-up device, clean and readjust, if necessary.

Check level in make-up tank.

Check piston rod sealing set for tightness.

Check venting valve for tightness.

4.5 Make-up tank loses much liquid

Remove diaphragms and check for breakage.

4.6 Hammering in the mechanism

Check connecting rod bearing clearance.

Check clearance in connecting rod bushing and main bearing sleeve.

Check antifriction bearing.

Check the backlash of teeth, and, if necessary, adjust anew.

4.7 Pump runs hot

Change gear oil.
Check antifriction bearing.
Check connecting rod clearance.
Check lubrication of crosshead guide.

4.8 Frequent Diaphragm Failure

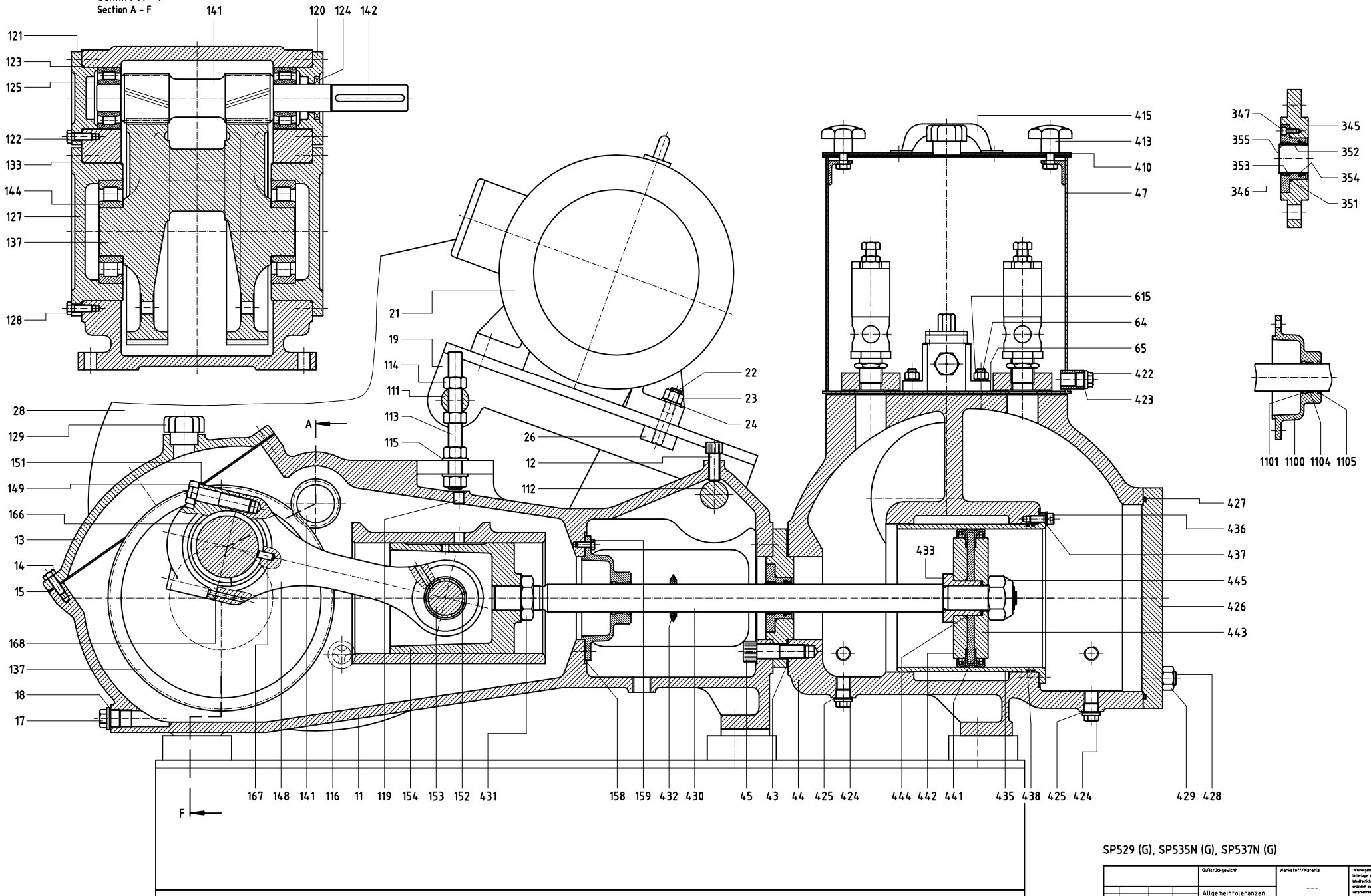
If the diaphragm is damaged after a short time of operation, the reason for the defect must be found and removed, and afterwards the diaphragm changed.

Please check / pay attention to:

- chemical resistance of the diaphragm material to the pumped medium
- is the diaphragm mechanically overstretched
- filling up hydraulic liquid when the piston is in the correct position
- the pump must not be operated in case of cavitation at the suction side
- adjustment, functioning and sealing of the make-up device
- condition and sealing of piston / cylinder bushing of double-acting pumps
- checking the venting bore of the venting valve for free passage
- functioning of the non-return valve and hermetic sealing of the diaphragm leakage indicator

The way a diaphragm breaks informs about the reason for the failure.
Should the reason not be found, we kindly ask you to refer to the manufacturer of pump.

Schnitt A - F
Section A - F



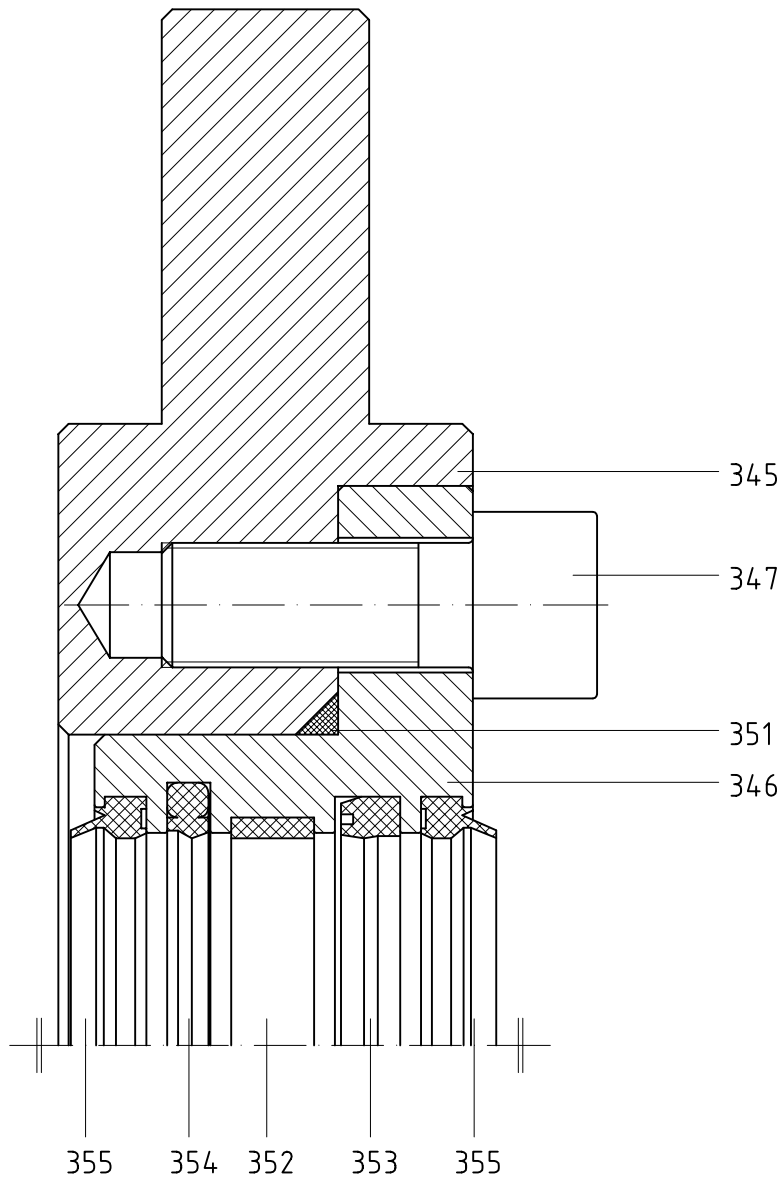
SP529 (G), SP535N (G), SP537N (G)

Luftleistung		Werkstoff/Material	
Allgemein toleranzen nach DIN 7168-mittel			
2306	Drehen	Hesse	Maßstab/Scale
03.01	Kreistruhr		1: 2.5
03.01			12 05 00 03
Zust.		Benennung/Description	
533		16.0101	
Kreistruhr		Kreistruhr	
Drehen		Drehen	
Hesse		Hesse	
Urspr.		Ersatz f.:	
Ersatz f.:		Ersatz f.:	

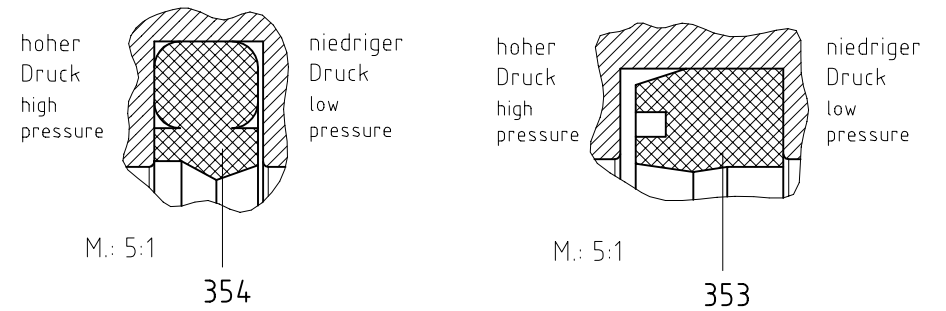
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 Tel. +49 2695 1920-0 Fax. 920197
 e-mail: info@EMERICH-PUMPENFABRIK.de


Kolbenmembranpumpe
 Piston diaphragm pump

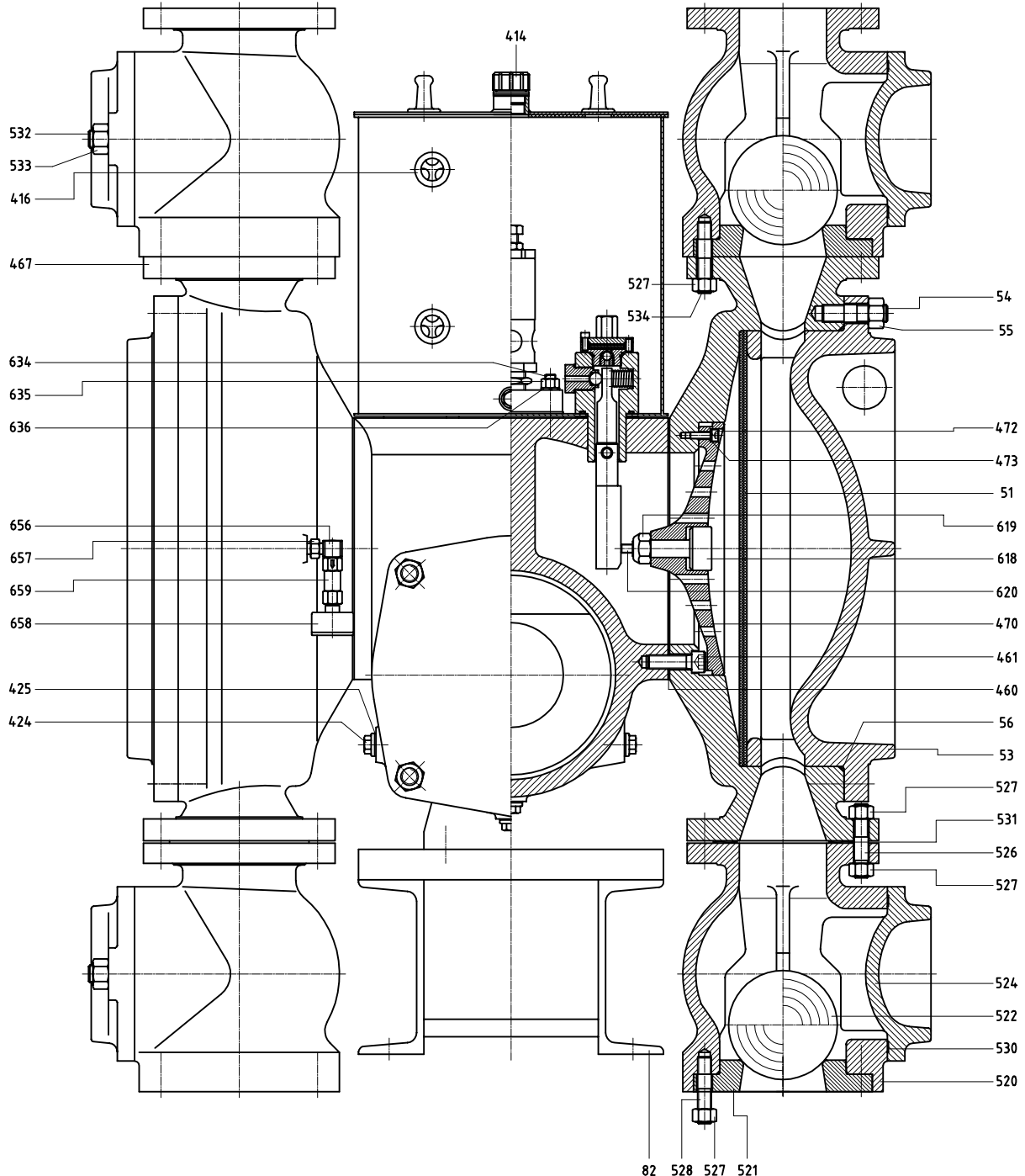
*Toleranzen sowie Verarbeitungsverfahren
 überprüfe, Verarbeitung und Prüfbildung bitte
 beachten! Nicht geprüfte, sondern nicht aus-
 schließlich inspektionen, Zustandserkundungen
 entsprechen zu. Sondermaße: Alle Maße
 für den Fall der Reparaturfertigung oder
 Nachschubfertigung vorzuziehen!



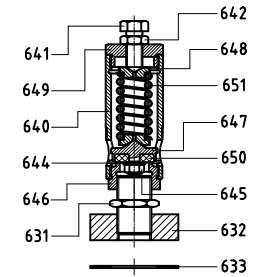
Einbaulage der Dichtungselemente Fitting position of the sealing elements



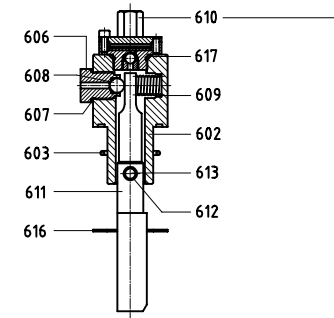
				Gußstückgewicht		Werkstoff/Material		"Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patenterteilung oder Gebrauchsmuster-Eintragung vorbehalten"	
				Allgemeintoleranzen nach ISO2768-mittel		---			
2006		Datum		Name		Maßstab/Scale		Zeichnungs-Nr./Drawing No	
gez.		04.05.		Körtgen		2 : 1		17 02 77 14	
freigege.		04.05.		Kreitmair				Benennung/Discription	
JOSEF EMMERICH PUMPENFABRIK GMBH D-53506 Hönningen-Liers/Ahr Tel.:(02695)9201-0 Fax:920127 e-mail info@EMMERICH-PUMPENFABRIK.de									Kolbenabdichtung Piston sealing
Zust.	Änderung	Datum	Name	Urspr.:	Ersatz f.:	Ersetzt d.:			



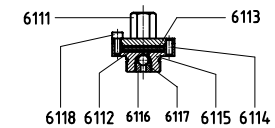
Überströmventil (630)
Overflow valve (630)




Nachholvorrichtung (61)
Make-up device (61)



Entlüftungsventil (610)
Venting valve (610)



SP535N (G), SP537N (G)

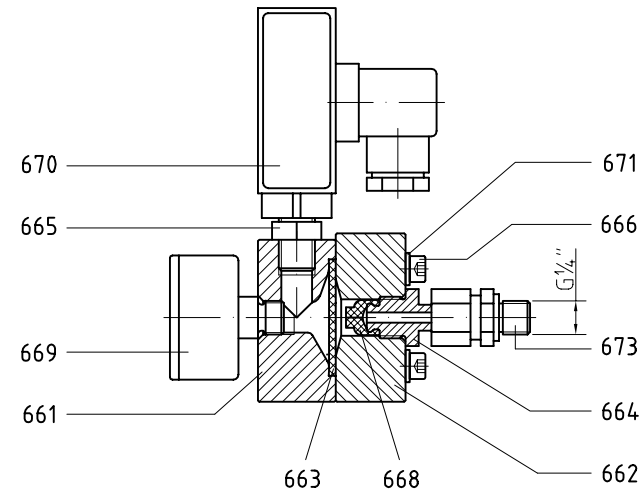
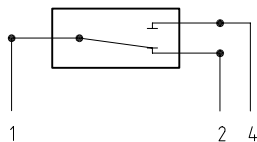
Gulftidsgewicht		Werkstoff/Material		*Vorbereitung sowie Veredelung dieser Überzüge, Verantwortung auf Produktion Seite, ist nicht garantiert, soweit nicht ausdrücklich spezifiziert. Zusätzliche Angaben verpflichten zu Sonderanfertigung. Alle Rechte für den Fall der Patentverletzung oder Sachschaden-Entschädigung vorbehalten!	
Allgemeintoleranzen nach DIN7168-mittel		---			
2005	Datum	Name	Maßstab/Scale	Zeichnungs-Nr./Drawing No	
gel.	23.05.	Körtgen	1: 2,5	12 35 00 95	
freigepr.	23.05.	Kreutzfeld			
JOSEF EMMERICH PUMPENFABRIK GMBH D-53506 Hönningen-Liers/Abt. Tel.: (0266)919100-0 Fax:959127 e-mail: info@EMMERICH-PUMPENFABRIK.de			 Benennung/Description Kolbenmembranpumpe Piston diaphragm pump		
Zust.	Änderung	Datum	Name	Umspr.	Ersatz f.
					Ersetzt d.

Switching capacity


alternating current 50Hz	direct current
24V/6 A	24V/0.8 A
60V/6 A	60V/0.35A
110V/6 A	110V/0.2 A
220V/6 A	220V/0.1 A
380V/1.6A	

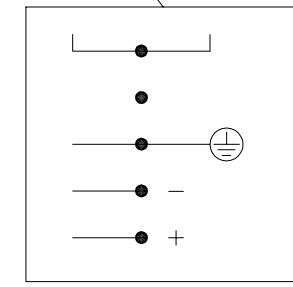
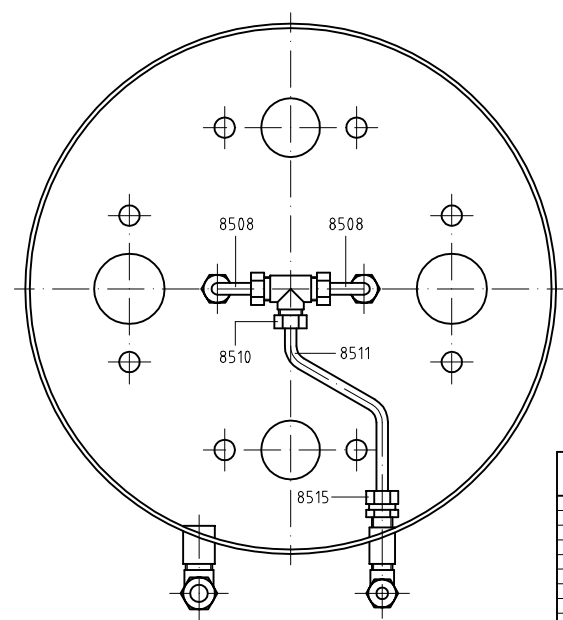
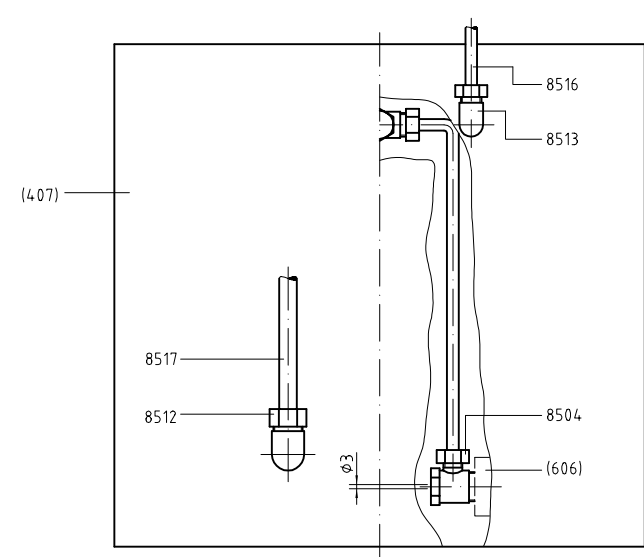
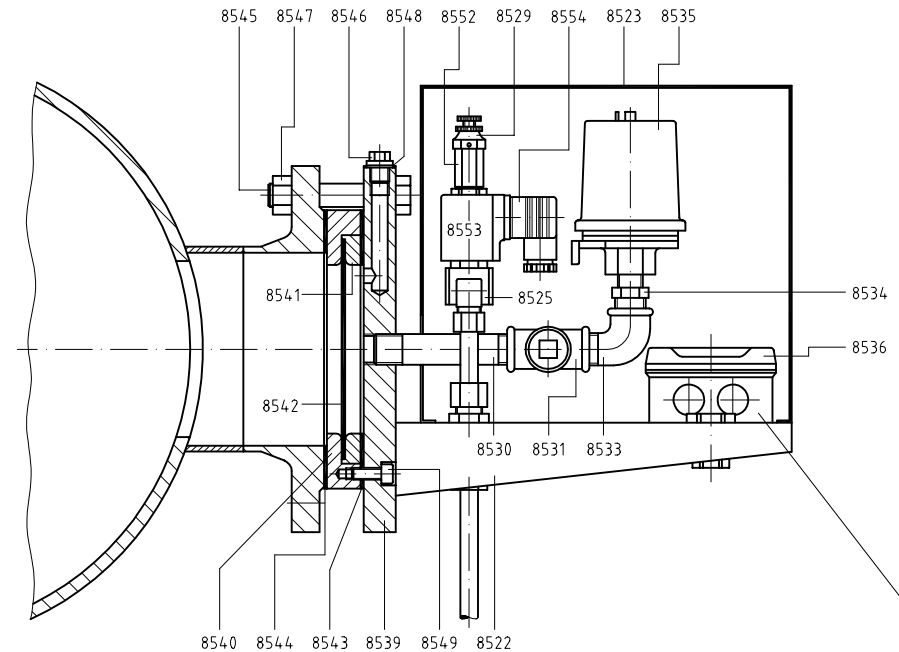
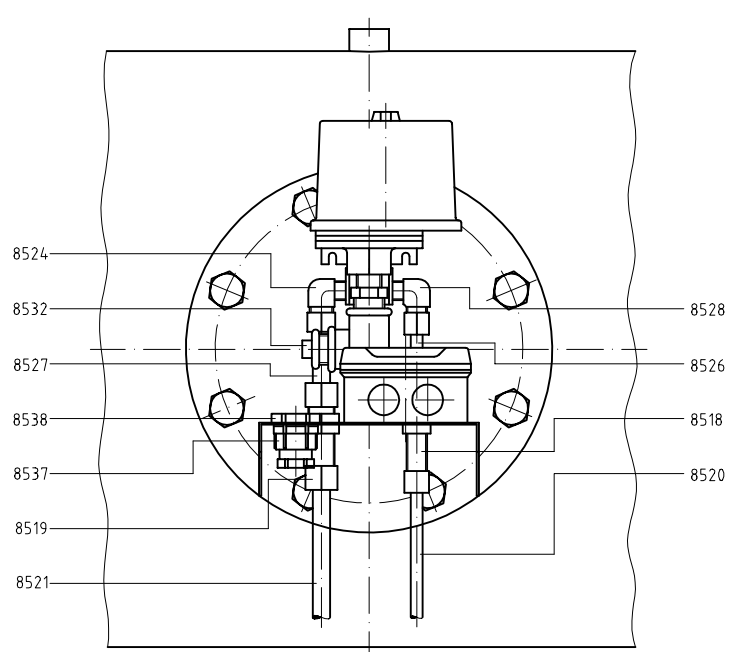
Switching function

Single-pole switch commutator with silver-spring-contact.



- 674 Hydraulic oil of viscosity max. 22mm²/s (cSt) according to ISO-VG/DIN51519 at 40°C
- 673 Pipe union
- 671 Washer
- 670 Pressure switch
- 669 Diaphragm rupture indicating device (visual)
- 668 rubber socket
- 667 Hexagonal nut
- 666 Hexagon head screw
- 665 Nipple joint
- 664 External screw part
- 663 Diaphragm
- 662 Diaphragm rupture indicator-plate
- 661 Diaphragm rupture indicator-cover

				Gußstückgewicht	Werkstoff/Material	"Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patenterteilung oder Gebrauchsmuster-Eintragung vorbehalten"
				Allgemeintoleranzen nach DIN7168-mittel	---	
		2005	Datum	Name	Maßstab/Scale 1 : 2.5	Zeichnungs-Nr./Drawing No 17 30 55 00
		gez.	02.09.	Kreifmair		
		freigege.	02.09.	<i>[Signature]</i>		
				JOSEF EMMERICH PUMPENFABRIK GMBH D-53506 Hönningen-Liers/Ahr Tel.:(02695)9201-0 Fax:920127 e-mail: info@EMMERICH-PUMPENFABRIK.de		 Benennung/Discription Diaphragm leakage indicator with pressure switch
Zust.	Änderung	Datum	Name	Urspr.:	Ersatz f.:	Ersetzt d.:



	Gußstückgewicht	Werkstoff/Material	"Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patenterteilung oder Gebrauchsmuster-Eintragung vorbehalten"			
	Allgemeintoleranzen nach DIN7168 - mittel	---				
1993	Datum	Name	Maßstab/Scale 1 : 2.5			
gez.	09.11.	Kreifmair				
freigege.	09.11.					
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Zust.	Änderung	Datum	Name	Urspr.:	Ersatz f.:	Ersetzt d.:

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
11	1	Getriebegehäuse	Gearbox	SP537-G0-112
12	1	Sechskantschraube	Hexagon head screw	732040
13	1	Getriebedeckel	Gear cover	22252701
14	12	Sechskantschraube	Hexagon head screw	731235
15	1	Dichtung	Gasket	073647
17	1	Verschlußschraube	Screw plug	883491
18	1	Dichtring	Sealing ring	062732
19	2	Motorspannwippe	Rocker of motor	EK962
---	4	Sechskantschraube	Hexagon head screw	731635
1100	1	Schutzdeckel	Guard cover	22350805
1101	1	Nutring	U-packing ring	254048
1104	1	Führungsband	Guide band	130840
1105	1	Abstreifring	Scraper ring	015040
111	1	Spannstange	Holding down bar	SP537-A4-097,2
112	1	Rundstahl	Round steel	12055802,1
113	1	Gewindestange	Threaded rod	162426
114	4	Sechskantmutter	Hexagon nut	702448
115	4	Scheibe	Washer	631025
116	1	Ölstandsauge m. Dichtung	Oil level indicator with gasket	471080
119	1	Gewindestift	Threaded pin	161216
120	1	Deckel	Cover	SP537-G3-114,1
121	1	Deckel	Cover	SP537-G3-114,2
122	8	Sechskantschraube	Hexagon head screw	731030
123	2	O-Ring	O-ring	483130
124	1	Radial-Wellendichtring	Oil seal ring	575880
125	2	Zylinderrollenlager	Cylinder roller bearing	612312
127	2	Exzenterdeckel	Eccentric cover	SP535-G2-0096
128	16	Sechskantschraube	Hexagon head screw	731030
129	1	Entlüftungsschraube	Venting srew	031042
133	2	O-Ring	O-ring	483200
137	1	Zahnscheibenkurbelwelle	Crankshaft gear wheel	SP537-G0-115,1
141	1	Ritzelwelle	Pinion shaft	SP537-G0-115,2
142	1	Paßfeder	Adjusting spring	501610
144	2	Zylinderrollenlager	Cylinder roller bearing	610314
148	1	Pleuelstange	Connecting rod	SP537-K1-020
149	2	Sechskantschraube	Hexagon head screw	722090
151	2	Sicherungsscheibenpaar	Pair of locking washer	123320
152	1	Pleuelstangenbuchse	Connecting rod bush	EK858
153	1	Kreuzkopfbolzen	Crosshead bolt	24352501,2

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412

Seite / Page 1

Zugehörige Schnittzeichnung

Accompany sectional drawing

12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
154	1	Kreuzkopf	Crosshead	24352501,1
---	2	Sicherungsring	Guard ring	785020
158	1	Dichtung	Gasket	12001502
159	4	Sechskantschraube	Hexagon head screw	730820
166	1	Lagerschale, geteilt (1 Stk = 2 Hälften)	Bearing shell	SP537-K3-019
167	1	Zylinderstift	Cylinder pin	991020
168	2	Spannstift	Clamping pin	510636
21	1	Motor	Motor	360001
22	4	Stiftschraube	Stud bolt	791660
23	4	Sechskantmutter	Hexagon nut	701648
24	4	Scheibe	Washer	631017
26	4	Flach	Flat-bar steel	22325806
---	6	Keilriemen	V-belt	246280
28	1	Keilriemenschutz	V-belt guard	SP537-G2-098
---	1	Motorkeilriemenscheibe	V-belt pulley of motor	371762
---	1	Spannbuchse	Clamping bush	820955
---	1	Pumpenkeilriemenscheibe	V-belt pulley of pump	557162
---	1	Spannbuchse	Clamping bush	821455
---	1	Keilriemenschutzhalter	V-belt guard holder	12033803
---	1	Sechskantschraube	Hexagon head screw	730820
---	1	Sechskantschraube	Hexagon head screw	730820
---	1	Sechskantmutter	Hexagon nut	700848
---	2	Sechskantschraube	Hexagon head screw	730820
---	1	Sechskantschraube	Hexagon head screw	730820
345	1	Gehäuse	Box	17027715
346	1	Deckel	Cover	17027716
347	6	Zylinderschraube	Hexagon socket head cap screw	981230
351	1	O-Ring	O-ring	483060
352	1	Führungsband	Guide band	130840
353	1	Nutring	U-packing ring	254048
354	1	Wellendichtung	Shaft packing	570040
355	2	Abstreifring	Scraper ring	015040
43	1	Dichtung	Gasket	12301503
44	1	Zylinder	Cylinder	12359401
45	4	Zylinderschraube	Hexagon socket head cap screw	982070
47	1	Nachholbehälter	Make-up tank	12356004
410	1	Nachholbehälterdeckel	Make-up tank cover	12356005
413	2	Sterngriff	Grip for clamp screw	771263
414	1	Entlüftungsschraube	Venting srew	031042

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412

Seite / Page 2

Zugehörige Schnittzeichnung

Accompany sectional drawing

12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
415	2	Hohlgriff	Grip	182516
416	2	Ölstandsauge m. Dichtung	Oil level indicator with gasket	471080
422	1	Verschlußschraube	Screw plug	881291
423	1	Dichtring	Sealing ring	062126
424	6	Verschlußschraube	Screw plug	881291
425	6	Dichtring	Sealing ring	062126
426	1	Zylinderdeckel	Cylinder cover	12359501
427	1	O-Ring	O-ring	485280
428	4	Stiftschraube	Stud bolt	792050
429	4	Sechskantmutter	Hexagon nut	702048
430	1	Kolbenstange	Piston rod	12353702
431	1	Sechskantmutter	Hexagon nut	713602
432	1	Spritzscheibe	Splash ring	647040
433	1	Sechskant	Hexagon	SP535-Z3-0125,2
435	1	Zylinderbuchse	Cylinder bushing	12359601
436	8	Zylinderschraube	Hexagon socket head cap screw	981030
437	8	Scheibe	Washer	630010
438	2	O-Ring	O-ring	484202
441	1	Doppeltopfmanschette	Collar-type piston	092050
442	1	Stützscheibe	Supporting disc	SP537-Z3-123,7
443	1	Stützscheibe	Supporting disc	SP537-Z3-123,5
444	1	O-Ring	O-ring	483050
445	1	Selbstsichernde Mutter	Self locking hexagon nut	743602
460	2	Dichtung	Gasket	12351505
461	16	Zylinderschraube	Hexagon socket head cap screw	981660
467	2	Membrangehäuse	Diaphragm casing	12355008
470	2	Membranteller	Diaphragm casing insert	12355204
472	8	Zylinderschraube	Hexagon socket head cap screw	980825
473	8	Sicherungsscheibe		123208
51	2	Doppelmembrane (Flachmembrane)		EK-A2-1254,2
53	2	Membrangehäusedeckel	Diaphragm casing cover	SP537-V0-074
54	24	Stiftschraube	Stud bolt	792050
55	24	Sechskantmutter	Hexagon nut	702048
56	2	O-Ring	O-ring	485490
520	4	Ventilgehäuse	Valve box	12358515
521	4	Ventilsitz	Valve seat	12358733
522	4	Ventilkugel	Valve ball	861502
524	4	Revisionsdeckel	Valve cover	12358615
526	16	Stiftschraube DIN939-8.8 M24 x 75	Stud bolt	792475

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412

Seite / Page 3

Zugehörige Schnittzeichnung

Accompany sectional drawing

12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
527	64	Sechskantmutter	Hexagon nut	702448
528	16	Stiftschraube	Stud bolt	792470
---	4	O-Ring	O-ring	484164
530	4	Revisionsdeckeldichtung	Gasket for valve cover	071620
531	4	Dichtung	Gasket	071319
532	8	Stiftschraube	Stud bolt	792495
533	8	Sechskantmutter	Hexagon nut	702448
534	16	Stiftschraube DIN939-8.8 M24 x 75	Stud bolt	792475
61	2	Nachholvorrichtung komplett	Make-up device	10306260
602	2	Nachholvorrichtungsgehäuse	Make-up device box	10306220
603	2	O-Ring	O-ring	484050
64	4	Stiftschraube	Stud bolt	791235
65	4	Sicherungsscheibenpaar	Pair of locking washer	123312
606	2	Nachholventilsitz	Make-up valve seat	10306249
607	2	Dichtring	Sealing ring	062732
608	2	Ventilkugel	Valve ball	291435
609	2	Druckfeder	Compression spring	SP520-A4-0172
610	2	Entlüftungsventil	Venting valve	10306231
6111	2	Entlüftungsventildeckel	Venting valve cover	10306227
6112	2	Dichtscheibe	Sealing ring	10306228
6113	2	Scheibe	Washer	10306229
6114	2	Zylinderstift	Cylinder pin	990616
6115	2	Entlüftungsventilgehäuse	Venting valve casing	10306226
6116	2	Gewindestift	Threaded pin	10306230
6117	2	Ventilkugel	Valve ball	291035
6118	4	Zylinderschraube	Hexagon socket head cap screw	980616
611	2	Hebel	Lever	12353207
613	2	Bolzen	Pin	10306223
---	4	Splint	Cotter pin	760216
615	4	Sechskantmutter	Hexagon nut	701248
616	2	Ovaldichtung	Oval gasket	10001501
617	2	O-Ring	O-ring	483533
618	2	Nachholstößel	Make-up tappet	SP530S-V4-0037
619	2	Selbstsichernde Mutter	Self locking hexagon nut	742000
620	2	Gewindestift	Threaded pin	161050
---	2	Gewindestift	Threaded pin	161040
630	2	Überströmventil	Overflow valve, complete	10308003
631	2	Doppelnippel	Duplex nipple	411128
632	2	Ovalflansch	Oval flange	SP530S-A4-0054

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412

Seite / Page 4

Zugehörige Schnittzeichnung

Accompany sectional drawing

12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
633	4	Ovaldichtung	Oval gasket	10001502
634	4	Stiftschraube	Stud bolt	791245
635	4	Sechskantmutter	Hexagon nut	701248
636	4	Sicherungsscheibenpaar	Pair of locking washer	123312
640	2	Überströmventilgehäuse	Overflow valve box	10308003,5
641	2	Sechskantschraube	Hexagon head screw	10308003,1
642	2	Sechskantmutter	Hexagon nut	701698
644	2	Scheibe	Washer	10308003,10
645	2	Selbstsichernde Mutter	Self locking hexagon nut	741000
646	2	Ventilsitz	Valve seat	10308003,11
647	2	Druckring	Thrust ring	10308003,8
648	4	Führungsring	Guide ring	10308003,4
649	2	Ventilkappe	Valve cap	10308003,3
650	2	Dichtscheibe Vulkollan-Dichtring	Sealing ring	10308003,9
651	2	Druckfeder	Compression spring	SP530S-A4-0075
---	2	Membranbruchanzeige m. Druckschalter	Diaphragm leakage indicator with pressure	17305500
661	2	Membranbruchanzeigendeckel	Diaphragm rupture indicator-cover	17305501
662	2	Membranbruchanzeigeplatte	Diaphragm rupture indicator-plate	17305502
663	2	Membrane	Diaphragm	17305503
664	2	Einschraubstück	External screw part	17305504
665	2	Doppelnippel	Duplex nipple	411401
666	8	Zylinderschraube	Hexagon socket head cap screw	980640
668	2	Gummilippe	Rubber lip	00002401
669	2	Zeigerinstrument	Pointer instrument	341401
670	2	Druckschalter	Pressure switch	088202
671	8	Scheibe	Washer	630006
673	2	Schwenkverschraubung	Swivel joint	891007
---	1	Druckwindkessel	Discharge pulsation dampener	32350006
---	16	Sechskantschraube	Hexagon head screw	722485
---	16	Sechskantmutter	Hexagon nut	702448
---	1	Saugwindkessel	Suction pulsation dampener	32357123
82	1	Fundamentrahmen	Base frame	SP537-F1-118
---	2	Sechskantschraube	Hexagon head screw	722090
---	2	Sechskantmutter	Hexagon nut	702048
---	2	Scheibe DIN434-Stahl verzinkt d22	Washer for U-support	633022
---	2	Sechskantschraube	Hexagon head screw	722010
---	2	Sechskantschraube	Hexagon head screw	732050
---	4	Sechskantmutter	Hexagon nut	702048
---	1	Plattenfederanometer	Diaphragm pressure gauge	341003

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412

Seite / Page 5

Zugehörige Schnittzeichnung

Accompany sectional drawing

12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
---	1	Elektr. Zusatzdruckregler	Electrical pressure switch	42000008,22
8504	2	Schwenkverschraubung	Swivel joint	42001401
8508	2	Rohr	Pipe	600800
8510	1	T Verschraubung	T-union	890811
8511	1	Rohr	Pipe	600800
8512	1	Winkel-Einschraubverschraubung	Pipe union	891238
8513	1	Winkel-Einschraubverschraubung	Pipe union	890815
8515	1	Gerade Einschraubverschraubung	Pipe union	890814
8516	1	Rohr	Pipe	600800
8517	1	Rohr	Pipe	601200
8518	1	Gerade Schottverschraubung	Pipe union	890801
8519	1	Gerade Schottverschraubung	Pipe union	891201
8520	1	Rohr	Pipe	600800
8521	1	Rohr	Pipe	601200
8522	1	Bodenplatte	Base plate	42000001,2
8523	1	Schutzkasten	Protection cap	42000001,1
8524	1	Winkel-Einschraubverschraubung	Pipe union	891214
8525	1	Magnetventil	Solenoid valve	343002
8526	1	Rohr	Pipe	600871
8527	1	Rohr	Pipe	601270
8528	1	Winkel-Einschraubverschraubung	Pipe union	890816
8529	1	Schnüffelventiloberteil	Sniffing valve, upper part	42007501
8530	1	Rohrdoppelnippel	Pipe duplex nipple	411210
8531	1	T-Stück	T-iron	831201
8532	1	Stopfen m. Rand	Threaded plug with edge	881292
8533	1	I-A Winkel	I-A angle	212212
8534	1	Doppelnippel reduziert	Duplex nipple, reducing	411253
8535	1	Druckschalter	Pressure switch	080032
8536	1	Kabelabzweigdose	Cable distribution plug socket	239025
8537	1	Konus Kabel Verschraubung	Cone-cable-union	892516
8538	1	Sechskantmutter	Hexagon nut	712016
8539	1	Blindflansch	Blind flange	SP528-A3-077
8540	1	Druckring	Thrust ring	12001701
8541	1	Stützring	Thrust ring	12007601
8542	1	Membrane	Diaphragm	42004901
8543	1	Dichtung	Gasket	10351501
8544	1	Dichtung	Gasket	10351502
8545	8	Sechskantschraube	Hexagon head screw	721690
8546	1	Verschlußschraube	Screw plug	881491

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Kolbenmembranpumpe SP537NG

Piston diaphragm pump

Pumpe-Nr., Pump-No.: 6407 - 6412


Seite / Page 6

Zugehörige Schnittzeichnung

Accompany sectional drawing

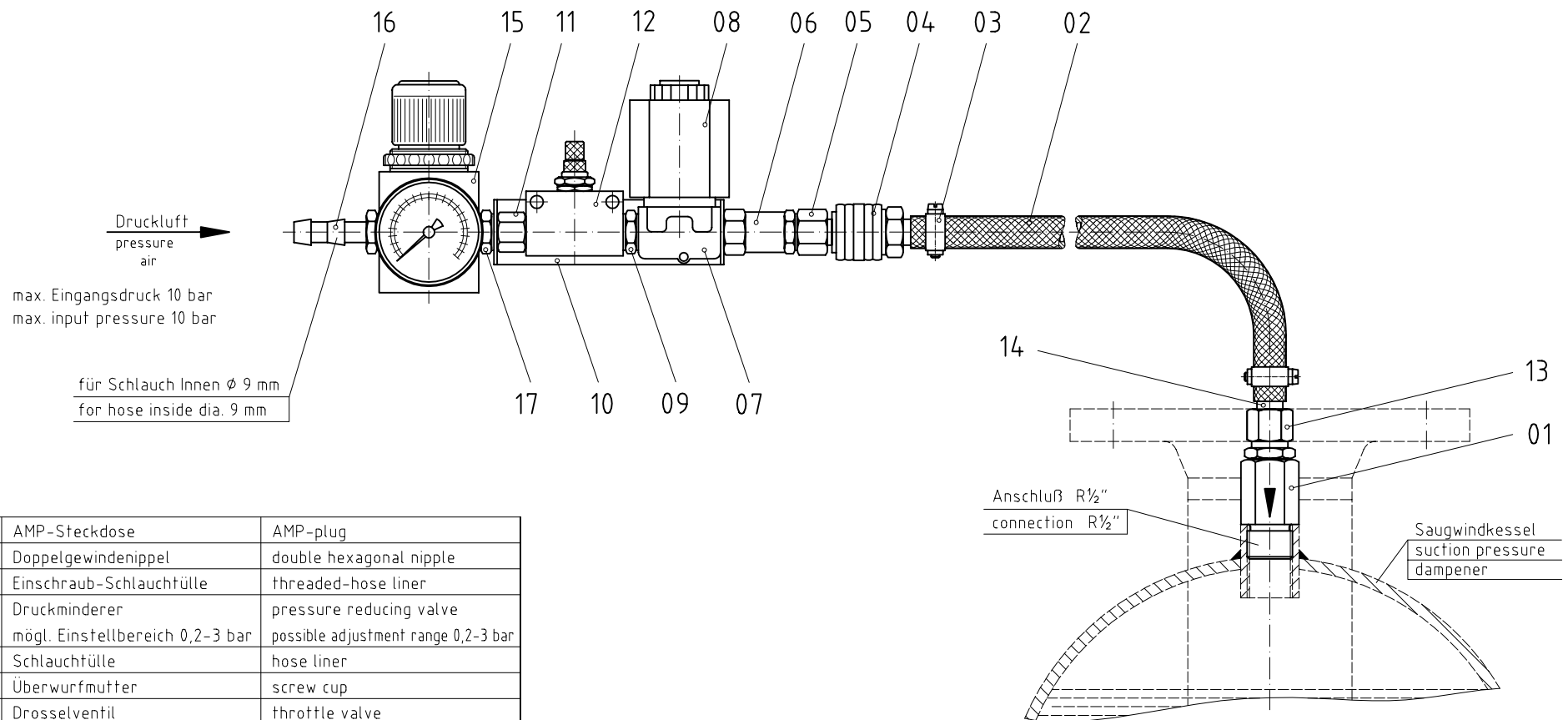
12 05 00 03 + 12 35 00 95

1	2	3	4	5
Pos	Stk	Benennung	Designation	Art.-Nr / Article No.
8547	8	Sechskantmutter	Hexagon nut	701648
8548	1	Dichtring	Sealing ring	061418
8549	4	Zylinderschraube	Hexagon socket head cap screw	980830
8552	1	Muffe	Socket	391814
8553	1	Spule f. Magnetventil	Coil for solenoid valve	760242
8554	1	AMP Steckdose	AMP-plug	774201
---	1	Luftbeschickungsarmatur	Air-supply device	40300030
---	1	Spule für Magnetventil	Coil for solenoid valve	760142

JOSEF EMMERICH PUMPENFABRIK GMBH D-53506 Hönningen-Liers ☎.: (02695) 9201-0 Fax: -27 e-mail: info@EMMERICH-PUMPENFABRIK.de		Kolbenmembranpumpe SP537NG Piston diaphragm pump	
		Pumpe-Nr., Pump-No.: 6407 - 6412	Seite / Page 7
		Zugehörige Schnittzeichnung Accompany sectional drawing	
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Zur Befestigung am Fundament bzw. Pumpenständer

For assembling at the foundation or the pump base frame

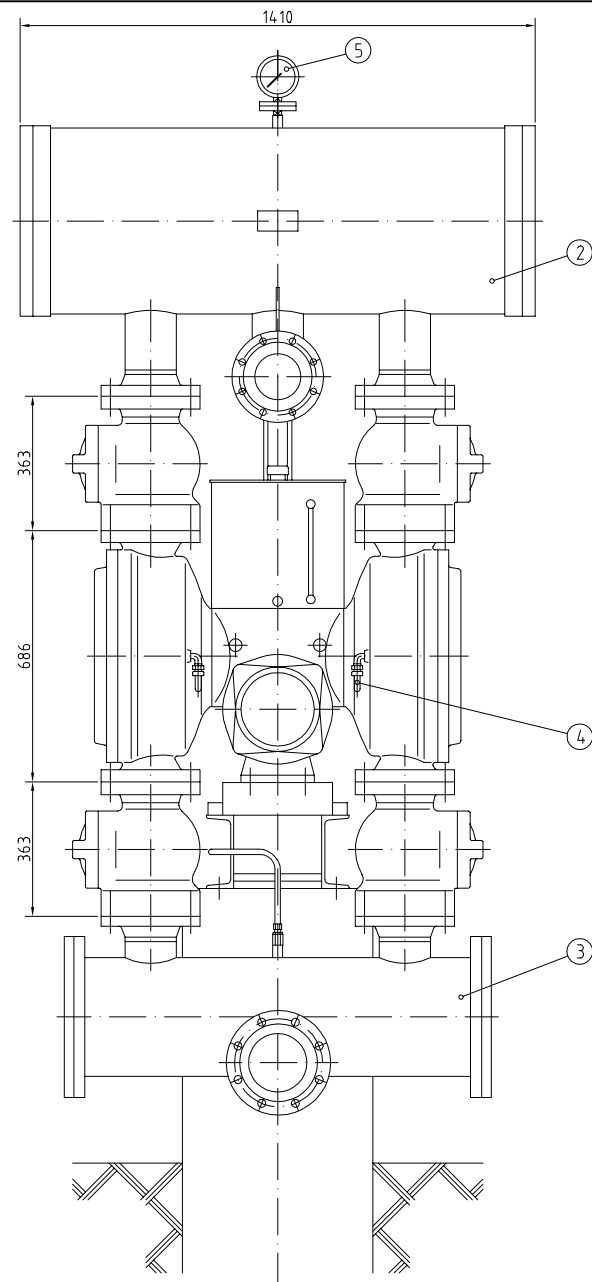


max. Eingangsdruck 10 bar
max. input pressure 10 bar

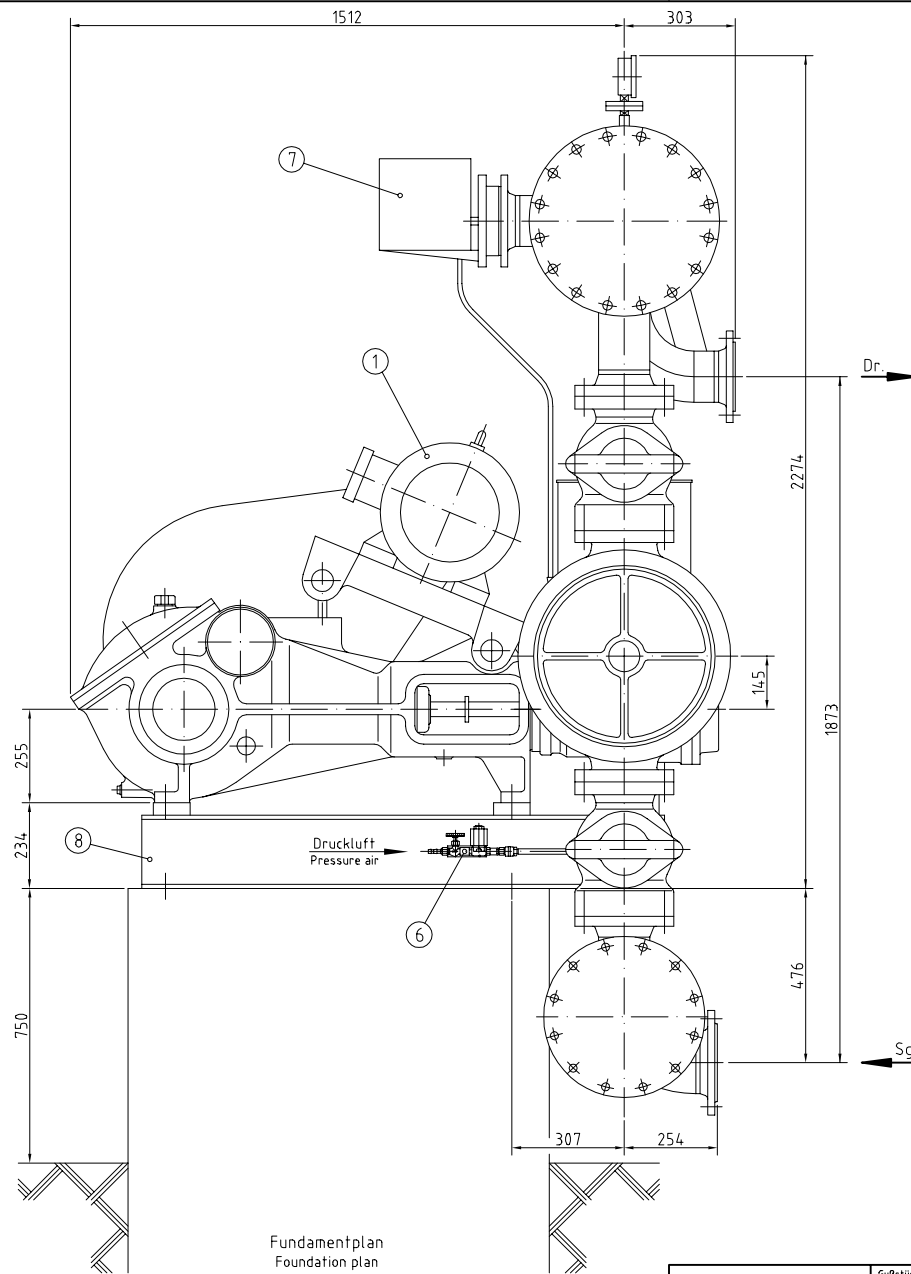
für Schlauch Innen \varnothing 9 mm
for hose inside dia. 9 mm

--	1	AMP-Steckdose	AMP-plug
17	1	Doppelgewindenippel	double hexagonal nipple
16	1	Einschraub-Schlauchtülle	threaded-hose liner
15	1	Druckminderer mögl. Einstellbereich 0,2-3 bar	pressure reducing valve possible adjustment range 0,2-3 bar
14	1	Schlauchtülle	hose liner
13	1	Überwurfmutter	screw cup
12	1	Drosselventil	throttle valve
11	1	Reduziernippel	reducing nipple
10	1	Halterung	holder
09	1	Doppelgewindenippel	double hexagonal nipple
08	1	Spule für Magnetventil gew. Anschlußspannung angeben	coil for solenoid valve indicate desired supply voltage
07	1	Magnetventil ohne Spule	solenoid valve without coil
06	1	Rückschlagventil	nonreturn valve
05	1	Einstecknippel	inserting nipple
04	1	Kupplung	hose coupling
03	2	Schlauchschnelle	hose clip
02	1	PVC - Gewebeschauch	PVC - hose
01	1	Rückschlagventil Werkstoff: PP	nonreturn valve material: PP
Pos.	Stk.	Benennung	Discription

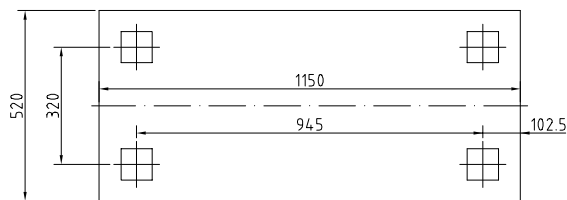
				Gußstückgewicht	Werkstoff/Material		"Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patenterteilung oder Gebrauchsmuster-Eintragung vorbehalten"
				Allgemeintoleranzen nach DIN7168-mittel	---		
		2004	Datum	Name	Maßstab/Scale	Zeichnungs-Nr./Drawing No	
		gez.	22.06.	Kreifmair		1:2	40 30 00 30
		freigege.	23.06.	<i>[Signature]</i>	Benennung/Discription		Luftbeschickungsarmatur Air supply device
				JOSEF EMMERICH PUMPENFABRIK GMBH D-53506 Hönningen-Liers/Ahr Tel.:(02695)9201-0 Fax:920127 e-mail: info@EMMERICH-PUMPENFABRIK.de			
Zust.	Änderung	Datum	Name	Urspr.:	Ersatz f.:	Ersetzt d.:	



Steinschrauben FM20x4.00 DIN529
Foundation bolt
Steinschraubenlöcher □85x450
Foundation bolt holes




Fundamentplan
Foundation plan



- ① Antriebsmotor
Driving motor
- ② Druckwindkessel
Discharge pressure damper
- ③ Saugwindkessel
Suction pressure damper
- ④ Membranbruchanzeige
Diaphragm leakage indicator
- ⑤ Glyzeringedämpftes Plattenfedermanometer
Glycerin damped diaphragm gauge
- ⑥ Luftbeschickungsarmatur
Air supply device
- ⑦ Elektrischer Zusatzdruckregler
Electrical pressure switch
- ⑧ Grundrahmen
Base frame

Druckstutzen [Dr.] Flansch DIN2633 DN125
Pressure flange [Dr.]

Saugstutzen [Sg.] Flansch DIN2633 DN150
Suction flange [Sg.]

SP537NG		Gußstückgewicht	Werkstoff/Material		*Werte für die Verfertigung dieser Unterlage, Vervielfältigung und Weitergabe sind gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte für den Fall der Patenterteilung oder Gebrauchsmuster-Eintragung vorbehalten.	
Allgemeintoleranzen nach DIN7168-mittel		---		Zeichnungs-Nr./Drawing No		
2001	Datum	Name	Maßstab/Scale		12 35 00 66	
gez.	24.08.	Kreitlmair	1 : 10			
gepr.	24.08.				Benennung/Description	
JOSEF EMMERICH PUMPENFABRIK GMBH					Kolbenmembranpumpe Piston diaphragm pump	
D-53506 Honninghen-Liers/Ahr Tel.: (02695) 9201-0 Fax: 920127 e-mail: info@EMMERICH-PUMPENFABRIK.de						
Zust.	Änderung	Datum	Name	Urspr.:	Ersatz f.:	Ersetzt d.:

Low Voltage Motors

Manual for Low Voltage Motors

*Installation, operation and
maintenance manual*

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**More languages – see web site
www.abb.com/motors&drives > Motors > Document library**





EC Declaration of Conformity

The Manufacturer :- *(Name and address of the manufacturer)*

hereby declares that

The Products :- *(Product identification)*

are in conformity with provisions of the following Council Directives :

Low Voltage Directive 73/23/EEC (amended by 93/68/EEC),

and, as components, with the essential requirements of the following :

EMC Directive 89/336/EEC (amended by 92/31/EEC and 93/68/EEC), regarding the intrinsic characteristics to emission and immunity levels,

and are in conformity with :

EN 60 034-1

Additional Information :-

By design, the machines, considered as components, comply with the essential requirements of

Machinery Directive 98/37/EEC provided that the installation be correctly realised by the manufacturer of the machinery (for example : in compliance with our Installation Instructions and EN 60 204 "Electrical Equipment of Industrial Machines").

Certificate of Incorporation (Directive 98/37/EEC, Art 4.2 and Annex II, Sub B) :

The machines above must not be put into service until the machinery into which they have been incorporated have been declared in conformity with the Machinery Directive.

Year of CE marking : CE00.

Signed by

Title

Date

Translations into other languages are available from ABB.

Low Voltage Motors

Installation, operation and maintenance manual

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1. General

NOTE!

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of anyone who installs, operates or maintains this equipment. Ignoring the instruction may invalidate the warranty.

1.1 Declaration of Conformity

Declarations of Conformity with respect to the Low voltage Directive 73/23/EEC amended by Directive 93/68 EEC are issued separately with individual machines.

The Declaration of Conformity also satisfies the requirements of a Declaration of Incorporation with respect to the Machinery Directive 98/37/EEC, Art 4.2 Annex II, sub B

1.2 Validity

The instructions are valid for the following ABB electrical machine types, in both motor and generator operation.

series MT*, MBT*, MXMA,
series M2A*/M3A*, M2B*/M3B*, M2C*/M3C*,
M2F*/M3F*, M2L*/M3L*, M2M*/M3M*, M2Q*,
M2R*/M3R*, M2V*/M3V*

in frame sizes 56 - 450.

There is a separate manual for e.g. Ex motors 'Low voltage motors for hazardous areas: Installation, operation and maintenance Manual' (Low Voltage Motors/Manual for Ex-motors).

Additional information is required for some machine types due to special application and/or design considerations. Additional information is available for the following motors:

- roller table motors
- water-cooled motors
- open drip proof motors
- smoke venting motors
- brake motors
- permanent magnet motors

2. Installation

2.1 Putting into service (starting)

2.1.1 Reception check

Immediately upon receipt check the machine for external damage and if found, inform the forwarding agent without delay.

Check all rating plate data, especially voltage and winding connection (star or delta). The type of bearing is specified on the rating plate of all motors except the smallest frame sizes.

Remove transport locking if employed. Turn shaft by hand to check free rotation.

Do not exceed permissible loading values of bearings stated in the product catalogue.

Motors equipped with roller bearings: Running the motor with no radial force applied to the shaft may damage the roller bearing.

Motors equipped with angular contact bearing: Running the motor with no axial force applied in the right direction to the shaft may damage the angular contact bearing.

Motors equipped with regreasing nipples: When starting the motor for the first time, or after long storage of the motor, apply the specified quantity of grease until grease is forced out of the grease outlet.

For details see section "Manual lubrication" on page 9.

2.1.2 Insulation resistance check

Measure insulation resistance before commissioning and when winding dampness is suspected.

Resistance, measured at 25°C, shall exceed the reference value, i.e. 10 M ohm (measured with 500 V dc Megger)

WARNING

Windings should be discharged immediately after measurement to avoid risk of electric shock.

Insulation resistance reference value is halved for each 20°C rise in ambient temperature.

If the reference resistance value is not attained, the winding is too damp and must be oven dried.

Oven temperature should be 90°C for 12-16 hours followed by 105°C for 6-8 hours.

Drain hole plugs, if fitted, must be removed and closing valve, if fitted, must be opened during heating.

Windings drenched in seawater normally need to be rewound.

2.1.3 Direct-on-line or star/delta starting

The terminal box on standard single speed machines normally contains 6 winding terminals and at least one earth terminal.

Earthing must be carried out according to local regulations before the machine is connected to the supply voltage.

The voltage and connection are stamped on the rating plate.

Direct-on-line starting (DOL):

Y or D winding connections may be used.

e.g. 660 VY, 380 VD indicates Y-connection for 660 V and D-connection for 380 V.

Star/Delta starting (Y/D):

The supply voltage must be equal to the rated voltage of the machine in D-connection.

Remove all connection links from the terminal block.

For two-speed, single phase and special machines, supply connection must follow the instructions inside the terminal box.

If direct-on-line starting lasts for more than 10 seconds or Y/D starting more than 30 seconds, consult ABB Sales Office or see the publication 'The Motor Guide' (also available on the internet on www.abb.com/motors&drives).

2.1.4 Terminals and direction of rotation

Direction of rotation is clockwise when viewing the shaft face at the machine drive end, when the line phase sequence L1, L2, L3 is connected to the terminals as shown in the figure 1.

To alter the direction of rotation, interchange the connection of any two line cables.

If the machine has a uni-directional fan, ensure that the direction of rotation is according to the arrow marked on the machine.

2.2 Handling

2.2.1 Storage

The machine should always be stored indoors, in dry, vibration free and dust free conditions.

Unprotected machined surfaces (shaft-ends and flanges) should be protected with anti-corrosive treatment.

It is recommended that shafts be rotated periodically by hand to prevent grease migration.

Anti condensation heaters, if fitted, should preferably be energised.

The characteristics of electrolytic capacitors, if fitted to single-phase motors, will require "reforming" following periods of storage exceeding 1-2 years. Contact ABB Sales Office for details.

2.2.2 Transportation

Machines fitted with cylindrical-roller and/or angular contact bearings must be fitted with locking devices during transport.

2.2.3 Lifting

Lift the motor using the lifting lugs only, if not otherwise stated in the separate lifting instruction.

The center of gravity of motors with the same frame may vary due to different outputs, mounting arrangements and auxiliary equipment.

Check that eyebolts or the lifting lugs integrated with the motor frame are undamaged before lifting. Damaged lifting lugs must not be used.

Lifting eyebolts must be tightened before lifting. If needed the position of the eyebolt must be adjusted with suitable washers.

Ensure that proper lifting equipment is used and that the sizes of the hooks are suitable for the lifting lugs.

Care must be taken not to damage auxiliary equipment and cables attached to the motor.

2.2.4 Machine weights

Total machine weight can vary within the same frame size (center height) depending on different output, mounting arrangements and added features.

The following table shows estimated maximum weights for machines in their basic versions as a function of frame material.

The actual weight of all our motors is stated on the rating plate except the smallest frame sizes.

Frame size	Aluminum		Cast iron	Steel
	Weight kg	Add. for brake	Weight kg	Weight kg
56	4.5	-	-	-
63	6	-	-	-
71	8	5	13	-
80	12	8	20	-
90	17	10	30	-
100	25	16	40	-
112	36	20	50	-
132	63	30	90	-
160	110	30	175	-
180	160	45	250	-
200	220	55	310	-
225	295	75	400	-
250	370	75	550	-
280	405	-	800	600
315	-	-	1700	1000
355	-	-	2700	2200
400	-	-	3500	3000
450	-	-	5000	4500

Table 1

2.3 Installation

2.3.1 Cooling

Normal ambient temperatures should not exceed 40°C (marine standard +45 or +50°C) if standard performance is to be achieved. Check that the motor has sufficient airflow. Ensure that no nearby equipment, surfaces or direct sunshine, radiate additional heat to the motor. For more information about higher ambient temperatures and cooling, see "the Motor Guide" or contact ABB Sales Office.

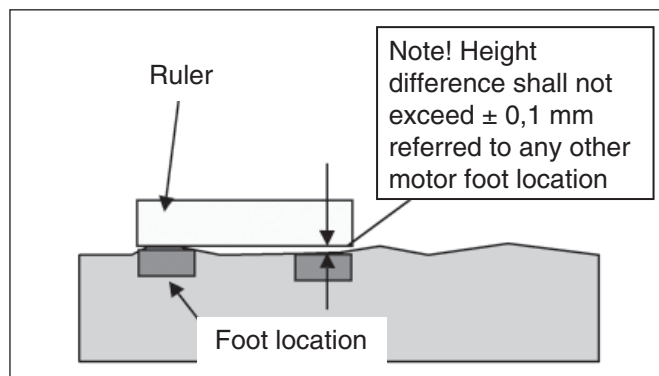
2.3.2 Foundation

The purchaser bears full responsibility for preparation of the foundation.

Metal foundations should be painted to avoid corrosion.

Foundations must be even, and sufficiently rigid to withstand possible short circuit forces. They shall be dimensioned as to avoid the occurrence of vibration due to resonance.

Before mounting the motor, the foundation surface for the shims or for the feet must be clean from thick paint, paint drops and dirt. Then it should be checked in order to discover any height differences between the individual foot locations. Also, the smoothness within each footprint area has to be checked. The requirements are noted in the figure below.



Foundation studs

Bolt the foundation studs to the feet of the motor and place a 1-to-2 mm shim between the stud and the feet.

Align the motor directly using appropriate means.

Grout the studs with concrete, check alignment and drill holes for locating pins.

Drain holes

Always check that open drain holes face downward.

In extremely dusty environments, all drain holes should be closed.

2.3.3 Alignment

Correct alignment is essential to avoid bearing failures, vibrations and possible fractured shaft extensions.

2.3.4 Slide rails and belt drives

- Fasten the machine to the slide rails as shown in figure 2.
- Place the slide rails horizontally on the same level.
- Check that the machine shaft is parallel with driven, or driving, shaft.
- Any belt must be tensioned according to the supplier's instructions.

WARNING

Excessive belt tension will damage bearings and can cause shaft breakage.

Do not exceed the maximum belt forces (i.e. radial bearing loading) stated in the relevant product catalogues.

2.4 Connection

Normal machine design has the terminal box on top with cable entry possible from both sides.

Some machines are available with top mounted terminal boxes rotatable 4 x 90°, and some with side mounted terminal boxes.

Availability of these solutions is described in the product catalogues.

Unused cable entries must be closed.

As well as main winding and earthing terminals, the terminal box can also contain connections for thermistors, standstill heating elements, bimetallic, switches, or PT 100 resistance elements.

WARNING

Voltage may be connected at standstill inside the terminal box for heating elements or direct winding heating.

Connection diagrams for auxiliary elements are found inside the terminal box cover or in additional labels on the frame of the machine.

WARNING

The capacitor in single-phase motors can retain a charge that appears across the motor terminals, even when the motor has reached standstill.

2.4.1 Connection for variable speed drive

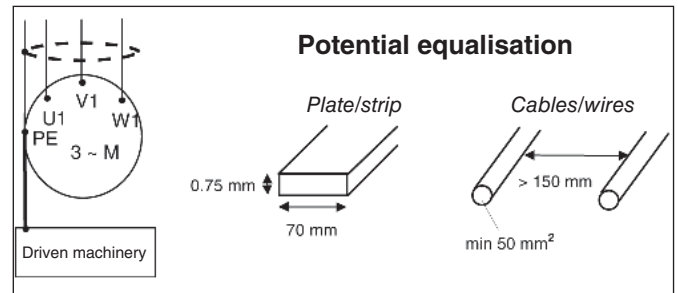
Variable speed drives cause higher voltage stresses than the sinusoidal supply on the winding of the motor and may cause high frequency shaft voltages and bearing currents. Therefore the winding and the bearing insulation of the motor as well as the filter at the converter output must be dimensioned according to "Selection rules for VSD applications/Insulation" (3GZF500930-2), available on request from ABB.

In variable speed drives the motor ($P_n > 30$ kW) must be cabled by using shielded symmetrical cables and cable glands providing 360° bonding (also called EMC glands). More information can be found in ABB's manual "Grounding and cabling of the drive system" (3AFY61201998).

In frequency converter applications motor frame external earthing must be used for equalising the potential between the motor frame and the driven machine, unless the two machines are mounted on the same metallic base.

For motor frame sizes above IEC 280, use 0.75 x 70 mm flat conductor or at least two 50 mm² round conductors. The distance of the round conductors must be at least 150 mm from each other.

This arrangement has no electrical safety function; the purpose is to equalise the potentials. When the motor and the gearbox are mounted on a common steel fundament, no potential equalisation is required.



To comply with EMC-requirements, use only cables and connectors approved for this purpose. (See instruction for frequency converters.)

The highest permissible rotational speed of a cast iron motor used in variable speed drive (M2BA/M3BP) must not exceed maximum permissible speeds as stated in the table 2 below or the speed stamped on the rating plate. For information on the highest permissible rotational speed for other motor sizes and types, please contact ABB. Bearing lubrication should follow the directions mentioned later.

Frame size	Speed r/min	
	2 pole	4 pole
280	3600	2600
315	3600	2300
355	3600	2000
400	3600	1800
450	3600	1800

Table 2

If there is uncertainty concerning the suitability of the motor for the variable speed drive, please contact ABB.

WARNING

The maximum operating temperature of the grease and bearings must not be exceeded.

2.5 Balancing

The rotor of the machine is dynamically balanced.

As standard, balancing has been carried out using **half key**, and the shaft is marked **with a RED tape**, with the text "Balanced with half key". In case of motors delivered without any tape defining the type of balancing, these motors are also balanced with **half key**.

To avoid vibration the coupling-half or pulley must be balanced with half key after the keyway has been machined.

In the event of balancing **with full key** the shaft is marked **with a YELLOW tape**, with the text "Balanced with full key".

In case balancing **without key**, the shaft is marked **with a BLUE tape**, with the text "Balanced without key".

3. Operating

3.1 Use

3.1.1 Operating conditions

The machines are intended for use in industrial drive applications.

Normal ambient temperature limits are -20° to +40°C.

Maximum altitude 1000 m above sea level.

3.2 Safety considerations

The machine is intended for installation and use by qualified personnel, familiar with relevant safety requirements.

Safety equipment necessary for the prevention of accidents at the installation and operating site must be provided in accordance with the local regulations.

WARNING

Small motors with supply current directly switched by thermally sensitive switches can start automatically.

3.2.1 Points to observe

1. Do not use the machine to step on.
2. The temperature of the outer casing of the machine may be hot to the touch during normal operation.
3. Some special machine applications require special instructions (e.g. using frequency converter supplies).
4. Lifting lugs must only be used for lifting the motor. They must not be used to lift the motor when it is attached to other equipment.

3.3 Assembly and dismantling

3.3.1 General

Dismantling and assembly of machines must be carried out by qualified personnel using only suitable tools and working methods. All repairs must be carried out according to the standard IEC-60079-19.

3.3.2 Bearings

Special care should be taken with the bearings. These must be removed using pullers and fitted by heating or using special tools for the purpose.

How to replace bearings is described in detail in a separate instruction leaflet available from ABB Sales Office.

3.3.3 Fitting coupling halves and pulleys

Coupling halves and pulleys must be fitted using suitable equipment and tools that do not damage the bearings.

Never fit a coupling half or pulley by hammering into place or remove it using a lever pressed against the body of the machine.

Mounting accuracy of coupling half:

check that the clearance **b** is less than 0.05 mm and that the difference **a1** to **a2** is also less than 0.05 mm. See figure 3.

4. Maintenance

4.1 Maintenance and lubrication

4.1.1 General inspection

- Inspect the machine at regular intervals.
- Keep the machine clean and ensure free ventilation airflow.
- Check the condition of shaft seals (e.g. V-ring) and replace if necessary.
- Check the condition of connections and mounting and assembly bolts.
- Check the bearing condition by listening for unusual noise, vibration measurement, bearing temperature, inspection of spent grease or SPM bearing monitoring.

* When changes of condition occur, dismantle the machine, check the parts and replace if necessary.

4.1.2 Lubrication

WARNING

Beware of all rotating parts!

WARNING

Grease can cause skin irritation and eye inflammation. Follow all safety precautions specified by the manufacturer.

4.1.3 Machines with permanently greased bearings

Bearings are usually permanently greased bearings of either Z or ZZ types.

Bearing types are specified in the respective product catalogues and on the rating plate of all our motors except smaller frame sizes.

As a guide, adequate lubrication for sizes up to 200 can be achieved for the following duration, according to L1 (i.e. that 99 % of the motors are sure to make the interval time) at ambient temperature of 25°C. For duties with ambient temperatures higher than 25°C, see the respective product catalogue.

Frame size	Poles	Duty hours
56-80	2-8	for life
90-112	2-8	40 000
132	2-8	40 000
160	2-8	40 000
180	2-8	40 000
200	2	27 000
200	4	40 000

Table 3

Depending on application and load conditions, see applicable product catalogue.

Hours of operation for vertical motors are half of the above values.

Motors with roller bearings have considerably shorter grease life. For continuous operation regreasing nipples should be considered.

4.1.4 Motors with regreasing nipples

Lubrication information plate and general lubrication advice

If the machine is fitted with a lubrication information plate, follow the given values.

On the lubrication information plate, regreasing intervals with regard to mounting, ambient temperature and speed of rotation can be defined.

During the first start or after a bearing lubrication it may appear a temporary temperature rise, appr. 10-20 hours. ABB policy is to have reliability as a vital issue in bearing lubrication intervals. That is why we follow the L1-principle.

A. Manual lubrication

Regreasing while motor is running

- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open
- Press the specified amount of grease into the bearing.
- Let the motor run 1-2 hours to ensure that all excess grease is forced out of the bearing.
Close the grease outlet plug or closing valve if fitted.

Regreasing while motor is at a standstill

Regrease motors while running. If this is not possible, lubrication can be carried out while the machine is at a standstill.

- In this case, use only half the quantity of grease, then run the motor for a few minutes at full speed.
- When the motor has stopped, press the rest of the specified amount of grease into the bearing.
- After 1-2 running hours close the grease outlet plug or closing valve if fitted.

B. Automatic lubrication

The grease outlet plug must be removed permanently with automatic lubrication or open closing valve if fitted.

Some motors may be equipped with a collector for old grease. Follow the special instructions given for the equipment.

We recommend only the use of electromechanical systems. Contact your local ABB Sales Office.

The amount of grease per each lubrication interval stated in the tables 4-5 should be doubled if an automatic regreasing system is used.

If 2-pole motors are being automatically regreased, the note (NOTE!) concerning lubricant recommendations given for 2-pole motors in the chapter Lubricants shall be followed.

4.1.5 Lubrication intervals and amounts

Frame size	Amount of grease g/bearing	3600 r/min	3000 r/min	1800 r/min	1500 r/min	1000 r/min	500-900 r/min
Ball bearings							
Lubrication intervals in duty hours							
112	10	10000	13000	18000	21000	25000	28000
132	15	9000	11000	17000	19000	23000	26500
160	25	7000	9500	14000	17000	21000	24000
180	30	6000	8000	13500	16000	20000	23000
200	40	4000	6000	11000	13000	17000	21000
225	50	3000	5000	10000	12500	16500	20000
250	60	2500	4000	9000	11500	15000	18000
280	70	2000 ¹⁾	3500 ¹⁾	8000	10500	14000	17000
315	90	¹⁾	¹⁾	6500	8500	12500	16000
355	120	¹⁾	¹⁾	4200	6000	10000	13000
400	120	¹⁾	¹⁾	4200	6000	10000	13000
400 M3BP	130	¹⁾	¹⁾	2800	4600	8400	12000
450	140			2400	4000	8000	8800

Table 4

Roller bearings							
Lubrication intervals in duty hours							
160	25	3500	4500	7000	8500	10500	12000
180	30	3000	4000	7000	8000	10000	11500
200	40	2000	3000	5500	6500	8500	10500
225	50	1500	2500	5000	6000	8000	10000
250	60	1300	2200	4500	5700	7500	9000
280	70	1000 ¹⁾	2000 ¹⁾	4000	5300	7000	8500
315	90	¹⁾	¹⁾	3300	4300	6000	8000
355	120	¹⁾	¹⁾	2000	3000	5000	6500
400	120	¹⁾	¹⁾	2000	3000	5000	6500
400 M3BP	130	¹⁾	¹⁾	1400	2300	4200	6000
450	140			1200	2000	4000	4400

Table 5

¹⁾ Values for IEC sizes 280 to 450 (cast iron and steel motors) in certain motor types (3600 and 3000 r/min), see tables 6-7.

Lubrication intervals and amounts, 2-pole, IEC frame sizes 280 to 450

Frame size	Amount of grease g/bearing	3600 r/min	3000 r/min
Ball bearings			
Lubrication intervals in duty hours			
280	M2B*, M2C*, M3B*	35	2000 3500
315	M2B*, M2C*, M3B*	35	2000 3500
355	M2B*, M2C*	45	1200 2000
355	M3B*	35	1200 2000
400	M2B*, M2C*	45	1200 2000
400	M3B*	40	1000 1600
450	M3B*	40	1000 1600

Table 6

Roller bearings			
Lubrication intervals in duty hours			
280	M2B*, M2C*, M3B*	35	1000 1800
315	M2B*, M2C*, M3B*	35	1000 1800
355	M2B*, M2C*	45	600 1000
355	M3B*	35	600 1000
400	M2B*, M2C*	45	600 1000
400	M3B*	40	500 800
450	M3B*	40	500 800

Table 7

Factors influencing the lubrication intervals

Lubrication intervals for vertical machines are half of the above values.

The lubrication intervals are based on bearing operating temperature 80°C (ambient temperature of about + 25°). Note! An increase in the ambient temperature raises the temperature of the bearings correspondingly. The values should be halved for 15°C increase in bearing temperature and may be doubled for 15°C decrease in bearing temperature.

WARNING

The maximum operating temperature of the grease and bearings must not be exceeded.

4.1.6 Lubricants

WARNING

Do not mix different types of grease.
Incompatible lubricants may cause bearing damage.

When regreasing, use only special ball bearing grease with the following properties:

- good quality grease with lithium complex soap and with mineral- or PAO-oil
- base oil viscosity 100-160 cST at 40°C
- consistency NLGI grade 1.5 - 3 *)
- temperature range -30°C - +120°C, continuously.

*) For vertical mounted motors or in hot conditions a stiffer end of scale is recommended.

Grease with the correct properties is available from all major lubricant manufacturers.

Admixtures are recommended, but a written guarantee must be obtained from the lubricant manufacturer especially concerning EP admixtures, that admixtures do not damage bearings or the properties of lubricants at the operating temperature range.

WARNING

Lubricants containing EP admixtures are not recommended in high bearing temperatures in frame sizes 280 to 450.

If the ambient temperature is below -25°C or above +55°C, or bearing temperature is above 110°C, consult ABB Sales Office regarding suitable grease.

The following high performance grease can be used

- Esso Unirex N2, N3 or S2 (lithium complex base)
- Mobil Mobilith SHC 100 (lithium complex base)
- Shell Albida EMS 2 (lithium complex base)
- SKF LGHQ 3 (lithium complex base)
- Klüber Klüberplex BEM 41-132 (special lithium base)
- FAG Arcanol TEMP110 (lithium complex base)

Lubrication intervals for other grease fulfilling the required properties, contact your local ABB Sales Office.

NOTE!

Always use high speed grease for high speed machines and some other models, e.g. M2BA 355 and 400 2-pole machines, where the speed factor is higher than 400 000 (calculated as $Dm \times n$ where Dm = average bearing diameter, mm; n = rotational speed, r/min).

The following grease can be used:

- FAG L69 (polyurea base)
- Klüber Klüber quiet BH 72-102 (polyurea base)
- Lubcon Turmogrease PU703 (polyurea base)

If other lubricants are used, check with the manufacturer that the qualities correspond to those of the above mentioned lubricants, or if the compatibility of the lubricant is uncertain, contact your local ABB Sales Office.

WARNING

Especially in high rotational speed (the speed factor > 400000) over greasing may cause damage.

4.1.7 Frequency converter drives

Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals. Consult your local ABB Sales Office in such cases.

Typically a doubling of speed will require a reduction of lubrication intervals to approx. 40 % of values tabulated above.

WARNING

The constructional maximum speed of the motor must not be exceeded (see table 2).

Suitability of bearings for high speed operation must be checked.

4.1.8 Spare parts

When ordering spare parts, the full type designation and product code, as stated on the rating plate, must be specified.

If the machine is stamped with a serial manufacturing number, this should also be given.

For more information, please visit our web site www.abb.com/partsonline.

4.1.9 Rewinding

Rewinding should always be carried out by qualified repair shops.

Smoke venting and other special motors should not be rewound without first contacting ABB.

5. Environmental requirements**5.1 Noise levels**

Most of our motors have a sound pressure level not exceeding 82 dB(A) refer to 50 Hz sinusoidal supply conditions, tolerance ± 3 dB(A).

Values for specific machines can be found in the relevant product catalogues.

For sound pressure levels for 60 Hz sinusoidal supply and with non-sinusoidal supplies, contact ABB Sales Office.

Sound pressure levels for all machines having separate cooling systems and for series M2F*/M3F*, M2L*/M3L*, M2R*/M3R*, M2BJ/M3BJ and M2LJ/M3LJ are indicated in separate Manuals.

6. Troubleshooting

These instructions do not cover all details or variations in equipment nor provide for every possible condition to be met in connection with installation, operation or maintenance. Should additional information required, please contact the nearest ABB Sales Office.

Motor troubleshooting chart

Your motor service and any troubleshooting must be handled by qualified persons with proper tools and equipment.

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor rating plate and load factor.
	Improper line connections	Check connections with diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections. Also, ensure that all control contacts are closed.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator Poor stator coil connection	Indicated by blown fuses. Motor must be rewound. Remove end bells, locate with test lamp.
	Rotor defective	Look for broken bars or end rings.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult manufacturer.
	Overload	Reduce load.
	Low voltage	Ensure the rating plate voltage is maintained. Check connection.
	Open circuit	Fuses blown, check overload relay, stator and push buttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, to fuses and to control.
Motor does not come up to speed	Not applied properly	Consult supplier for proper type.
	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check load motor is supposed to carry at start.
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required, as repairs are usually temporary.
	Open primary circuit	Locate fault with testing device and repair.
Motor takes too long to accelerate and/or draws high amp	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Adequate wire size.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Get power company to increase power tap.
Wrong rotation	Wrong sequence of phases	Reverse connections at motor or at switchboard.

TROUBLE	CAUSE	WHAT TO DO
Motor overheats while running underloaded	Overload	Reduce load.
	Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads are well connected.
	Grounded coil	Locate and repair.
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base.
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearings.
	Bearings not in line	Line up properly.
	Balancing weights shifted	Rebalance motor.
	Contradiction between balancing of rotor and coupling (half key - full key)	Rebalance coupling or motor.
	Polyphase motor running single phase	Check for open circuit.
	Excessive end play	Adjust bearing or add shim.
Scraping noise	Fan rubbing fan cover	Remove interference.
	Fan striking insulation	Clear fan.
	Motor loose on bedplate	Tighten holding bolts.
Noisy operation	Airgap not uniform	Check and correct bracket fits or bearing.
	Rotor unbalance	Rebalance.
Hot bearings ball	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away	Move pulley closer to motor bearing.
	Pulley diameter too small	Use larger pulleys.
	Misalignment	Correct by realignment of drive.
	Insufficient grease	Maintain proper quality of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than 1/2 filled.
	Overloaded bearing	Check alignment, side and end thrust.
Broken ball or rough races	Replace bearing, first clean housing thoroughly.	

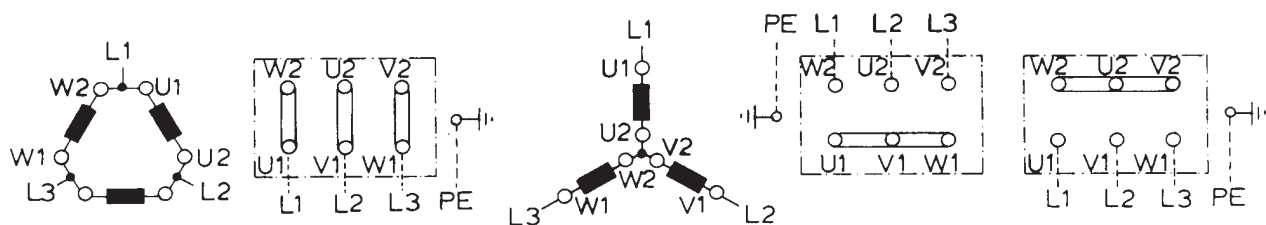


Figure 1. Connection diagram

Bild 1. Anschlußdiagramm

Figure 1. Connection

Figura 1. Conexión

Figura 1. Collegamento

Figur 1. Anslutningdiagramm

Kuva 1. KytKentäkaavio

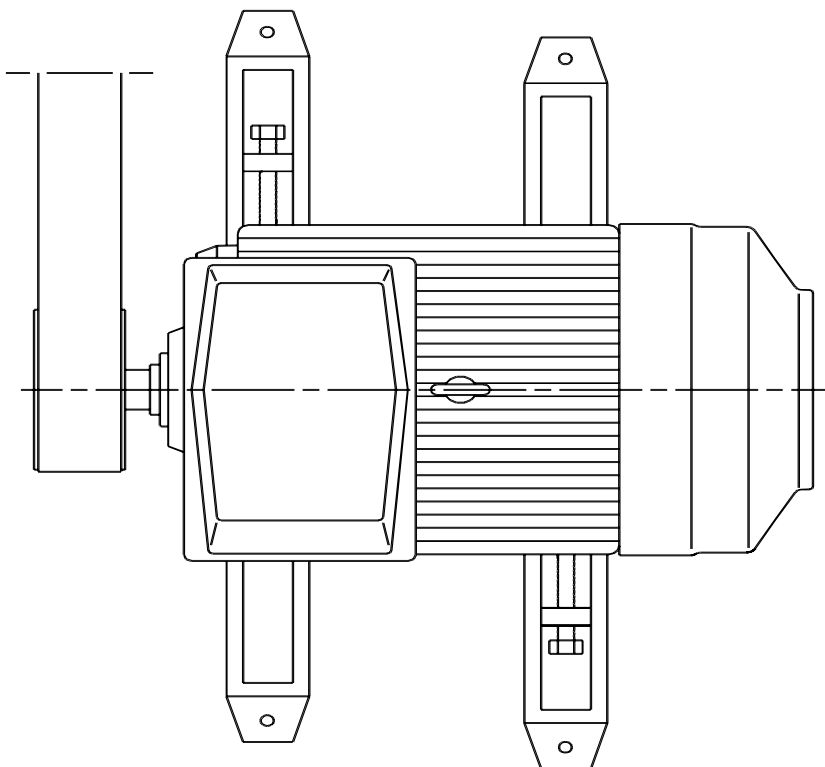


Figure 2. Belt drive

Bild 2. Riementrieb

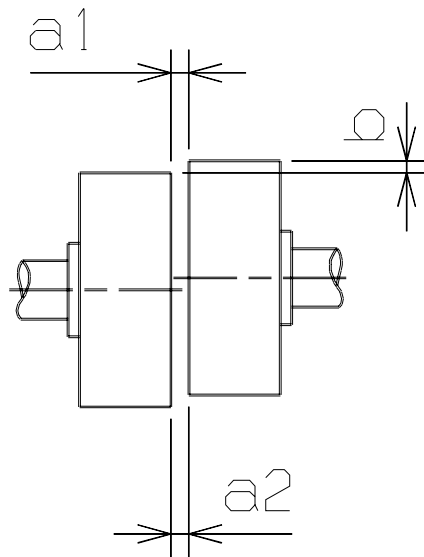
Figure 2. Glissières et entraînements à courroie

Figure 2. Carriles tensores y correas

Figura 2. Slitte tendicinghia e pulegge

Figur 2. Remdrift

Kuva 2. Hihnakäyttö



- Figure 3. Mounting of half-coupling or pulley
 Bild 3. Anbau von Kupplungshälften und Riemenscheiben
 Figure 3. Montage des demi-accouplements et des poulies
 Figura 3. Montaje de mitades de acoplamiento y poleas
 Figura 3. Montaggio di semigiunti e pulegge
 Figur 3. Montering av kopplinshalvor och drivskivor
 Kuva 3. Kytinpuolikkaan ja hihnapyörän asennus

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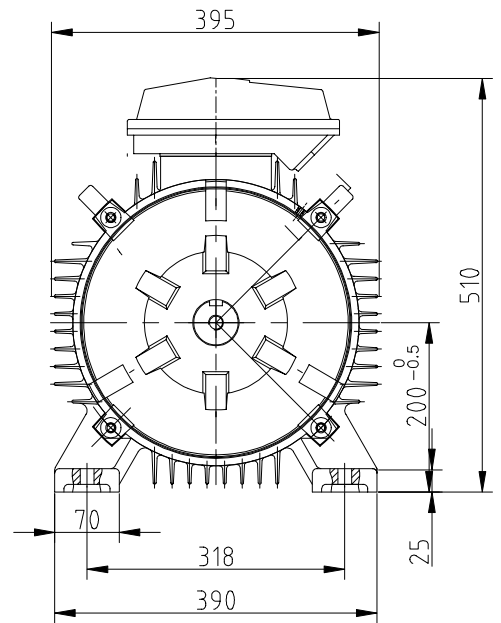
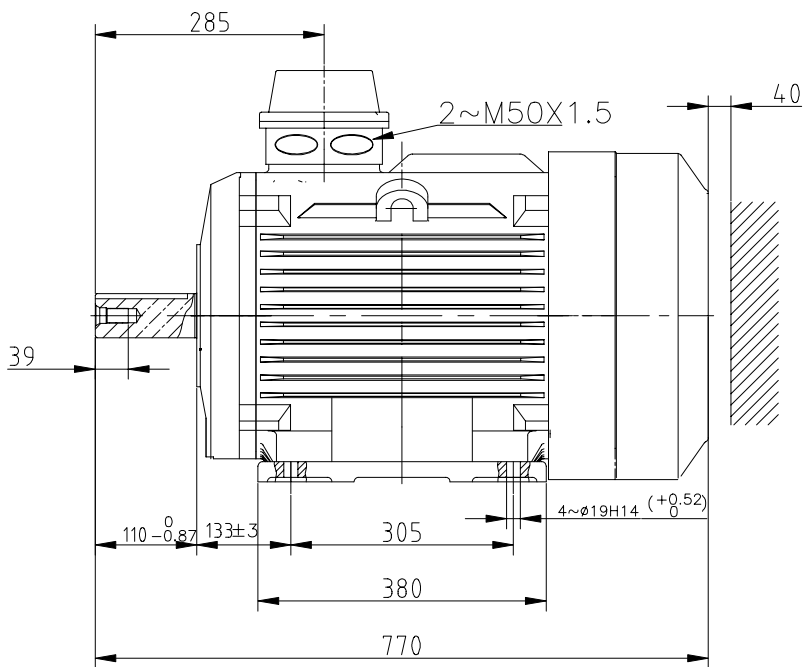
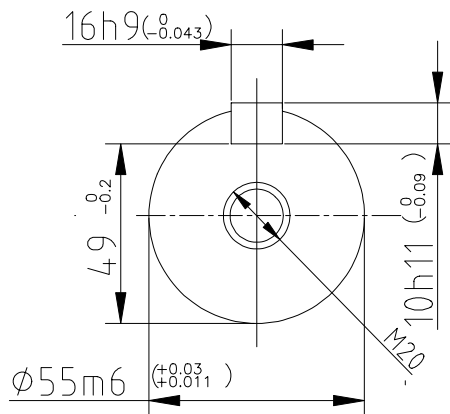
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ABB Electrical Machines LV Motors		Technical Data Sheet			
		Project	Location		
Department/Author		Customer name Josef Emmerich	Customer ref. BE-06-1239	Item name 1,001	
Our ref. .15323640		Rev/Changed by A	Date of issue 13.04.2007	Saving ident untitled.xls	Pages 1(3)
No.	Definition	Data	Unit	Remarks	
1	Product	TEFC, 3-phase, squirrel cage induction motor			
2	Product code	3GQA 202 501-ADA			
3	Type/Frame	M2QA 200 L4A 4			
4	Mounting	IM1001, B3(foot)			
5	Rated output P _N	30	kW		
6	Service factor	1			
7	Type of duty	S1(IEC) 100%			
8	Rated voltage U _N	400	VD	+4, -4 % (IEC 60038)	
9	Rated frequency f _N	50	Hz	+3, -3 % (IEC 60038)	
10	Rated speed n _N	1470	r/min		
11	Rated current I _N	53	A		
12	No-load current	22	A		
13	Starting current I _s /I _N	6,5			
14	Nominal torque T _N	195	Nm		
15	Locked rotor torque T _s /T _N	2,2			
16	Maximum torque T _{max} /T _N	2,9			
17	Minimum torque T _{min} /T _N	1,2			
18	Speed at minimum torque	285	r/min		
Load characteristics (IEC 60034-2)		Load %	Current A	Efficiency %	Power factor
19		100	53	92,2 / Eff2	0,88
20		75	41	91,8	0,86
21		50	31	91	0,77
22		Start	345		0,5
23	Maximum starting time from hot	15	s		
24	Maximum starting time from cold	27	s		
25	Insulation class / Temperature class	F / B			
26	Ambient temperature	40	°C		
27	Altitude	1000	m.a.s.l.		
28	Enclosure	IP55			
29	Cooling system	IC411 self ventilated			
30	Bearing DE/NDE	6312 ZZC3 - 6212 ZZC3			
31	Type of Grease				
32	Sound pressure level (LP dB(A) 1m)	71	dB(A)	at load	
33	Moment of inertia J = ¼ GD2	0,2819	kg-m2		
34	Balancing				
35	Vibration class				
36	Position of terminal box	Top			
37	Terminal box entries; no, dimens.				
38	Number of power terminals				
39	Direction of rotation	CW or CCW			
40	Weight of rotor	62	kg		
41	Total weight of motor	254	kg		
42	Dimension drawing no.				
43					
44					
45					
Ex-motors					
46					
47					
48					
Option Variant Codes / Definition					
50					
50					
51					
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54					
55					
Remarks:					
Data based on situation 18.11.2005					
All data subject to tolerances in accordance with IEC					



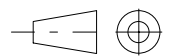
Motor Dimension Print

Motor Type:
M2QA 200L IM1001(B3)

Document No:
M2QA20XXXX-ADA

Description:

Three phase motor, foot mounted, terminal box top-mounted



Unit: ABB Yuejin Motors

Issued by: JunLiang Weng

Replaces:

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