AIR LIQUIDE

Air Liquide AGS GmbH

As Built Documentation

Chapter 3.4.7 Backup pump

- LAR Backup Pump P48001 Type: CL-19/G2/EM-30
  Instruction Manual for Liquid Gas Centrifugal Pump

Instruction Manual
for
Liquid Gas Centrifugal Pump

LAR Backup Pump P48001

Pump - Type	:	C-19/G2/EM-30
Sefco Ref. No.	:	05.041
Customer	:	Air Liquide AGS GmbH
Customer Ref. No.	:	Order. No.: 4500023387 of 11.01.2005 Project: K70101 Project name: "ASU Košice"

Contents C - 19 / G2 / EM

ANNEX: C-19/G2

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Parts list of accessories	No. 05.041/13-1-2
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Suction strainer assembling	No. 4 11366
Temperature control at the pump	No. 4 13700
Performance curves	No. 229-04/2
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Test certificate for suction hose	
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Certificate of conformity E Motor	

1 Declaration by the Manufacturer

(according CE Directive 98/37/EEC, Article 4.2. and Annex II, sub B.)
Prohibition to put into service

Manufacturer : SEFCO AG

Address : Wuhrmattstrasse 15, Postfach
CH-4103 Bottmingen

Herewith declares, that

the Centrifugal Cryogenic Pump(s)

- **Type:** C-19/G2/EM-30
- **Ref. No.:** 05.041
- **Tag No.:** P48001
- **Customer :** Air Liquide AGS GmbH
- **Order No.:** 4500023387 of 11.01.2005
- **Project name:** "ASU Košice"

is/are designed and manufactured according to the standards:
- EN 13275 Cryogenic vessels - Pumps for cryogenic service
- EN 809 Pumps and pump units for liquids - Common safety requirements

and is/are intended to be incorporated into machinery or to be assembled with other machinery covered by Directive 98/37/EEC, as amended;

and furthermore declares, that it is not allowed to put the machinery into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of Directive 98/37/EEC and with national implementing legislation, i.e. as a whole, including the machinery referred to in this declaration.

This declaration becomes unvalid by modifications of original parts or by use of foreign products.

Bottmingen, May 10. 2005

G. Lachenmaier, Responsible technique

ppa.

2 Introduction

This instruction manual is based on a long theoretical and practical experience of SEFCO AG. It is helpful to the operating personnel to get familiar with the installation and operation of the delivered machines and components. Moreover, it points to possible dangers in connection with the use of these machines, and the means to avoid them. This manual must all time be available at the operating place of the machine.

Evidently, this instruction manual cannot cover all possible installation and operation conditions with the associated security precautions. In case of doubt, please consult SEFCO for further advice and guidance.

It is recommended by SEFCO that the owner/plant operator gives a profound training to his personnel according to the instruction manual; at the same time he makes sure, that the given instructions are understood and will be observed. Additional training at SEFCO is recommended.

It is expected that these machines/components will be operated exclusively by responsible and trustworthy professionals.

The responsibility of the owner/operator for installation, operation and safety (also in case of fire) will by no means be diminished through this instruction manual or a training at SEFCO.

In all cases the owner/operator is obliged to observe the current laws, regulations, instructions and recommendations.

In case of resale, modifications and/or alterations of the machine/installation, the information in the manual will have only limited validity; therefore a consultation of SEFCO is strongly recommended.

Spare parts must correspond with the technical requirements defined by SEFCO. This is guaranteed by original spare parts due to on-going quality systems. The use of spare parts of another origin can be a risk for safety. Spare parts of another origin can possibly change the features of the installation defined by design and cause significant defects and risks, SEFCO is not responsible for.
If for a product like electric motors a specific operation manual is attached to this manual it is relevant.

This manual was put together with greatest care. If you still need more information please contact:

SEFCO AG
Wuhrmattstrasse 15 / Postfach
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Switzerland

Tel: +41 (0)61 421 94 60
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3 Safety

3.1 Notes and symbols

The dangers are classified into several grades. The following list shows a summary of symbols, grades of danger, signal words for dangers and possible consequences.

Symbol	Damage for...	Signal word	Definition	Consequences are...
	Persons	**DANGER!**	Immediately threatening danger	Death or heavy injuries
	Persons	**DANGER!**	Immediately threatening danger by voltage	Death or heavy injuries
	Persons	**WARNING!**	Possibly dangerous situation	Possible middle to light injuries
	Goods	**CAUTION!**	Possibly dangerous situation	Possible damage to - product - its surrounding
		Note! Information! Recommendation!	Notes for application or other useful informations and recommendations	efficient operation

3.2 General notes about dangers

Observe local regulations for accident prevention with all kind of work at liquid gas centrifugal pumps!

DANGERS!

- Cryogenic fluids:

Cryogenic fluids cause blisters in case of contact with the skin. Always wear appropriate protective clothes and glasses. Touching extremely cold subjects with bare hands one gets stuck. Always wear suitable gloves!

- Liquid oxygen:

For transferring liquid oxygen, **pumps made of stainless steel are not allowed!** By handling liquid oxygen **danger of fire** may exist. All parts coming in contact with liquid oxygen **have to be free of oil and grease**. This also applies to workshops, spare parts as well as tools in use and hands ! Attention with oxygen saturated clothing! The increased concentration of oxygen in clothing can be stable over a longer period and is therefore a significant risk of fire together with possible sources of ignition like cigarettes a.o.

- Liquid hydrocarbon:

By handling liquid hydrocarbons exists the danger of explosion! Observe the relevant regulations; only use non sparking tools.

- Works at pump:

For all works at the pump make sure that the driving motor is standing still and a start up can be excluded under all circumstances! Start working only when the pump is no longer pressure containing and has warmed up to ambient temperature (to avoid ice formation by humidity)

- Sprinkling liquid:

Make sure that sprinkling liquid (leaking seals) doesn't come in contact with persons! Wear protective clothes and glasses! There is danger of burning the skin.

3.3 Important notes for operation

CAUTION!

- Operational data's:

On the pump's data sheet of this manual (§ 6) the specific operational data's are listed. These data's describe an admissible range of operation for the pump. Operating outside of this range needs the approval by SEFCO!

- Parallel Operation:

To secure an optimum operation, the following points have to be observed:

- stable pump performance curve
- separated suction lines
- pumps of the same type
- consultation of SEFCO

- Series Operation:

Only after consultation of SEFCO!

4 Machinery description

The machinery-design suits the heavy duty industrial requirements and is characterised as following:

- Centrifugal pump, directly driven by electric motor through a speed-up gearbox.
- Gearbox with lubricant slinger-disc directly flanged to the motor (motor front shield constitutes gearbox rear-cover). Additional, adequate lubricant-level in the bearing-casing cavity.
- Plug-in unit, consisting of the rotating assembly (shaft, bearings and gear) and support to which the pump cold-end is flanged. This plug-in can be easily dismounted as a complete unit from the gearbox-casing by loosening of four screws: quick and easy mounting/dismounting, replacement and maintenance.
- Centrifugal pump cold-end which consists of the casing, seal- and safety-, rotating-and performance components.
- Purge-gas connections at pump rear casing, standardwise built in..
- The rotating parts are carefully balanced. The critical clearances between impeller and casing are kept large (simple assembling, secure operation).

Material used

Cold-End	:	- all pump parts are of bronze alloy (Cu-content > 80 %), required for oxygen operation. - bronze nickeled available. - Mechanical seal and screwing are stainless-steel
Plug-in unit (rotating assembly)	:	- Casting is bronze-aluminium alloy - Pump shaft is stainless-steel
Gearbox Casing	:	- Aluminium alloy hard anodized

5 Additional Subsystems

The following subsystems can be provided on customer special demand. Appropriate connections are available on the machinery unit.

5.1 Cold End

- Purge gas subsystem, with leak-gas lead-off after the seal.
- The penetration of humidity is avoided by feeding gaseous (approx. 0,5 - 1 Nm^3/h), dry nitrogen (<2ppm); see also sectional drawing and spare parts list.

5.2 Gearbox

- Lubricant circulation subsystem providing heated lubricant, to warm up shaft and bearings for the pump in stand by position and being permanently flooded. Additional lubrication system with lubricant cooler connected at the place of the lubricant filler plug on the gearbox- casing.
- Temperature control of the bearings. Possibility to connect a PT 100 (resistance temperature detector) for monitoring the bearings.

5.3 Additional Control-Subsystems

- Motor-monitoring-system:
  - Temperature control of winding by means of built-in PTC- sensors, alternative by RTD's (PT 100)
  - Temperature control of bearings by means of built-in PTC- sensors, alternative by RTD's (PT 100)
- Delivery-pressure monitoring-system:
  Machine shut down at a pressure falling below a set limit (pressure drop caused by cavitation), or at rising above a set limit (e.g. VFD operation)
- Other subsystems on customer request.

6 Machinery and Subsystems Data

6.1 Machinery Data

Fluid	:	LAR
Density (kg/l)	:	1.3687

Pump / Gearbox

Pump-Type	:	C-19
Material/Cold-End	:	bronze
Material/Impeller	:	bronze
Number of Stages	:	1
Impeller Standard ∅ (mm)	:	190/4,5
Impeller Effective ∅ (mm)	:	176
Impeller Rotating Speed (min^{-1})	:	approx. 6000
Differential Head Δ H (m)	:	177
Differential Pressure Δ p (bar)	:	23,8
Flowrate (lit/min.)	:	200
Required NPSH (m)	:	0,7
Gearbox-Type	:	G2 (i=2,03:1)
Lubricant	:	Lubcon turmoxygen LC40 fluid

Electric Motor

Manufacture	:	Theo Halter GmbH
Type	:	DDG 200 LA2
Frame Size	:	200L
Design-Form	:	IMB 35
Rated Power (kW)	:	30
Rated current (A)	:	52,7
Rated Frequency (Field weakening point) - (Hz)	:	50
Rated Rotating Speed (min^{-1})	:	2940 / max. admissible:
Protection / Insulation Class	:	IP55 / F
Max. ambient temperature / installation altitude (°C /m above sea level)	:	40 / 1000
Δ - Voltage / Frequency / Phases (V / Hz)	:	400 / 50 / 3

Variable Frequency Drive (VFD)

Manufacture	:	-
Type	:	-
Protection	:	-
Ambient Temperature (°C)	:	0 - 40
Mains Voltage / Frequency / Phases (V / Hz)	:	-
Rated output Current (A)	:	-
Field weakening point (Hz)	:	-
Max. output Frequency (Hz)	:	-
Max. Cable Length to the Motor (m)	:	-

6.2 Additional Subsystems and Components

- Suction strainer DN65
- Flexible suction hose DN65 PN6
- Flexible discharge hose DN40 PN40
- Seal leakage detection RTD's
- Purge gas regulation device

7 Pump preparation

7.1 Before delivery

Pump:

- Hydrostatic pressure test of cold-end casing at 1.5 times the maximum admissible discharge pressure of the pump
- Thorough mechanical checkouts
- Standardwise degreased for oxygen operation (independent of pumped liquid and application)

Gearbox:

- Greasing of bearings and gears with oxygen admissible lubricant
- Run in of the bearing casing support

Pump unit:

- Cold-test with liquid nitrogen

NOTE!

The gearbox is delivered with filled in lubricant.

7.2 On arrival at customer side

- Check for transportation damage

CAUTION!

If unit is not put immediately into operation:

„STORE IN DRY AND CLEAN ROOM"
protected from oil, dust and moisture

Keep material sealed/packed until required for use!

7.3 Handling

- Prepare suitable tools and hoists. Pay attention to the weight!

WARNING!

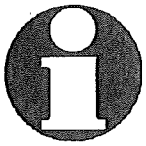
- Too poor dimensioned or damaged lifting equipment could tear!
- Always check the lifting equipment for correct size and faultless condition!
- Take care that no built up equipment is damaged by lifting

8 Pump installation

See installation-schematic No. E10200-1

8.1 Correct suction-line:

NOTE!



- **short** and well **insulated**.
- **simple** and **straight** ducting, without narrow bends and sudden section-changes.
- **continuous down-flow** towards pump, **no gas accumulation on suction side**.
- **optimum section** to minimise pressure-loss and heat-input.

Attention on errors!

- Narrow bends and sudden section-changes = higher pressure-loss.
- Long, narrow and poorly-insulated pipe = higher pressure-loss and heat-input.

CAUTION!

Higher pressure-loss and heat-input
↓
„Poor NPSH (§ 9)"
↓
Low suction performance, gas-formation, cavitation
↓
Poor pump performance, pressure-fluctuation, pump vibration
↓
„Pump and seal damage"

WARNING!

- Installation of a **strainer**, especially for oxygen operation!
  foreign particles may damage the pump and could cause fire or explosion.
- Installation of a **safety-valve** between main closing-valve up-stream and pump inlet (set about 1,5 bar above operational suction pressure), to avoid inadmissible pressure build-up.

Piping system and components:

We recommend a piping-system according to schematic No. E10200-1.

TION!

„Piping forces on the pump casing have to be kept at a minimum"
(see list „Maximum nozzle loading")

E!

Suction- and pressure pipes should be straightened and adjusted!
Take care of pipe-shortening due to cold (contraction).
Accordingly install **„Fix points"** and use **„Flexible Pipes"** on the pump suction- and pressure side.

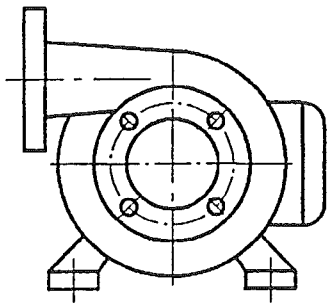
It is recommended to finally fix the holding down bolts of the machine only in cooled down condition.

Minimise flow disturbances at pump-inlet.

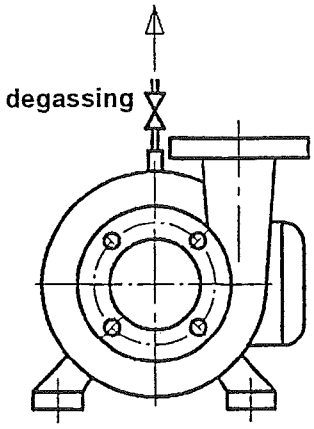
E!

Flange- position on delivery side: (only for horizontal pumps)

In order to cool and degas the pump optimally, the following flange positions should be applied



optimum
(for correct piping)



Only permitted with built-in device for degassing

For other flange positions refer to SEFCO first

According to performance and design, the machinery manufacturer determines experimentally the required NPSH for each pump type:

NPSH = f (flow rate, rpm)

NOTE!

To improve the NPSH:

- Increase the flow suction head.
- Increase the tank pressure (only efficient for a short time, as temperature will adapt again to the pressure level).
- Subcool the liquid (decrease vapour-pressure)
- Insulate the suction pipe and minimise pressure losses well
- Add an inducer (axial impeller) to increase the flow static pressure at the radial impeller leading-edge

10 Pump Operation Start-Up

10.1 Before start-up

Check lubricant level, top up if necessary.
To fill in/top up, remove lubricant filler plug on gearbox and fill in appropriate lubricant for secure operation. (see § 11.2)

WARNING!

For LOX operation as well as for other liquids, in the gearbox **uniquely the use of oxygen admissible lubricants is allowed**

CAUTION!

- Lubricant level to be at half height of check glass (in horizontal position). In order to insure sufficient lubrication, the position of the gearbox must not exceed the following limits:
  - turning of longitudinal axis max. ± 15 °
  - gradient of longitudinal axis max. ± 5 °

NOTE!

- **Rotate** machine by hand, acting on motor fan-blade or slinger-disc, to check the shaft for free rotating.
- **Check rotational sense** (only on **cooled-down pump**) for correct electric-motor connection as following:

  Short electric motor start. The observer stands behind the motor looking in direction cold-end: the fan-blade must rotate in counter-clockwise direction, while the pump-impeller rotates in clockwise direction (observe slinger-disc).

10.2 Operation start-up (see schematic No. E10200-1)

CAUTION!

Pump should not run dry, otherwise seal will be damaged!

10.2.1 Cool-down of the pump (cold-end)

WARNING!

Observe chapter 3 „ Safety " when operating the pump.

- Open bypass-valve **10**, fully open Suction-valve **1**.
- Valve **7** and **8** closed
- Actuate pressure build-up system (if available), in case of low suction pressure (NPSH, see § 9): open valve **11** for a short or longer time and observe pressure build-up on pressure gauge **4**.
- Observe frost formation on cold-end casing.
- Pump is sufficient cooled down for start-up, once the cold-end casing is covered with frost and is completely degassed; Check by short opening of degassing-valve **8**.
- Slightly throttle bypass-valve **10** and start-up motor! After a short delay the pump will come to operation and reach operating pressure. Control the by-pass valve **10** accordingly so that the maximum admissible performance of the electric motor according to the design-flowrate is not exceeded.

CAUTION!

- Do never fully open the bypass valve **10**, as there is low counter-pressure downstream. Valve **10** must act as a throttle-valve!

  At fully open valve **10**, the flowrate and hence the electric power largely exceed allowable values: the electrical overload protection should immediately shut-down the power supply, otherwise the pump through-flow will stall, causing dangerous cavitation and vibrations!
- Should the pump not come to operation pressure at first start-up, stop motor immediately, cool-down and degas the pump further (2-3 minutes), then start-up again.

CAUTION!

At **excessive** cool-down (frost covering bearing-casing), **do not start-up pump**, shaft could be blocked by **shrunked bearings**:
Check the shaft for free rotation, acting by hand on slinger-disc (with gloves!). If it is rotating freely, the pump can still be started, otherwise the bearing casing support has to be warmed up.

10.2.2 Operation of the pump

- Close slowly bypass valve **10** and open progressively valve **7** to consumer.
- Bypass valve **10** completely closed.
- Adjust valve **7** to meet design-pressure **9** and flowrate: a reference value is the flow measurement or the electric motor power consumption, which can be controlled with an amperemeter.

CAUTION!

Do not use suction valve 1 for regulation purpose! A reduction of the suction pressure could cause cavitation (bad NPSH!)

Fluctuations in pressure and flow (pulsations) as well as impacts of liquids lead to an increased and uncontrollable load on the bearings as well as to an extreme stress for the mechanical seal- and driving parts.

10.2.3 Stop of the pump

- Cut off electric current to motor.
- Open bypass valve **10**, close valves **7** and **1**.
- Use valve **12** to release tank pressure.
- Close valve **10**. Release pipe pressure with valve **8**.

10.3 Operation disturbances

WARNING!

Observe chapter 3 „ Safety " when operating the pump.

Disturbance	Possible reason	Correction pump *not operating*
Pump does not perform (Pressure and Flowrate)	Wrong direction of rotation Insufficient suction pressure Gas formation Suction filter blocked	Reverse motor pole connection Raise tank pressure Cool-down/degas pump well Clean suction filter
Pressure and Flowrate too low	Gas-liquid mixture (bad NPSH) Suction filter blocked Impeller- Labyrinth-clearance excessive Impeller damaged Inducer damaged	Check suction piping (see § 8.1) Raise tank pressure Clean suction filter Replace wear-rings Replace impeller Replace inducer
Power consumption too high	Electrical defects	Check electrical system
Pump vibration	Gas-liquid mixture / cavitation (flowrate too high or low) Unbalance caused by damaged impeller, inducer or shaft	Check suction-piping (increase required NPSH) Replace damaged parts or possibly re-balance. (SEFCO)
Unusual noises	Motor bearings or pump shaft bearings damage Bad motor bearings lubrication Bad bearing lubrication in the gearbox Unbalance External tubing forces too high for the pump casing	Replace bearings Regrease or replace life greased bearings Check lubricant level / complete Replace impeller or inducer or possibly re-balance (SEFCO) Check fix points Exactly align pump and tubing (see § 8.2)

Operation disturbances (continuing)

Disturbance	Possible reason	Correction pump *not operating*
Unusual bearing temperature	Unsatisfactory lubrication	Check lubricant level, lube-system, slinger-disc in the gearbox. Regrease motor bearings
	Used up/dirty lubricant	Replace lubricant, regrease motor bearings
	Bearings damaged	Replace bearings
Pump leaks	Mechanical seal damaged	Check/replace mechanical seal

Disturbance	Possible reason	Correction pump *operating*
Power consumption too high	Max. flowrate exceeded	Reduce flowrate
Pump vibration	Gas-liquid mixture / cavitation (flowrate too high or low)	Check suction-piping (increase required NPSH) Adjust flowrate
Pressure and Flowrate too low	Low rotation speed	Check rotation speed
Unusual noises	Flowrate too high or low	Adjust flowrate

11 Overhaul and maintenance

Repair and service must only be done by **qualified** and **especially trained** personnel. Such training can be provided at SEFCO.

11.1 General requirements

at leakage of the mechanical seal or other disturbances:

- Dismantle the pump and if required gearbox and shaft-bearing assembly
- Clean all parts and degrease carefully for oxygen operation
- Check and replace all worn-out parts
- Inspection of the electric motor:
  - Check the condition of the bearings
  - Check the insulation resistance

11.2 Lubrication

- Gearbox

WARNING!

For LOX operation as well as for other liquids, in the gearbox **uniquely the use of oxygen admissible lubricants is allowed**:

- **LUBCON TURMOXYGEN LC40 FLUID**, alternatively:
- **KLÜBER OXYGENOEX S4 FLUID**

CAUTION!

These two lubricants are mixable among themselves, **but not with others!**

Lubricant-level: Periodical checks of gearbox to be at mid show glass. Lubricant content of the gearbox is approximately 2,0 litres. (in exceptional cases up to 4,0 litres).

Lubricant-change: Every 1000 operating-hours or once a year.

- Electric motor

CAUTION!

- Motors without regreasing device are life greased and don't need any servicing. (Recommendation: preventive bearing change approximately every 20.000 operating hours).
- Motors with regreasing device: Intervals, grease amount and grease type according to specific tagging on the motor.
- Do not grease during standstill.
- Electric motor bearing grease: Universal bearing-grease (Lithium based)

11.3 Repairs and Spare parts

It is most recommended to hold spare parts stored:
Fast replacement / repairs without delay (see spare-parts list).

Indicate on spare-parts order:

- **Pump type**
- **Customer-Ref. No.**
- **Sefco Ref.-No.**
- **Part name and position** (according to spare parts list)

For larger repairs and complete overhaul, we recommend to send the machine to SEFCO. (for planning purposes and shipping formalities, please contact SEFCO first).

12 Disassembling

12.1 Pump disassembling (Drawing No. 2 12000)

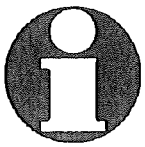
WARNING!

Observe chapter 3 " Safety " when working at the pump.

- The machine is electrically dead and checked for de-energizing. All tubing is at ambient temperature and not pressurized).
- Remove suction- and pressure pipe.
- Remove complete plug-in unit (cold-end and bearing assembly) from gearbox.
- Place plug-in unit in vertical position on appropriate dismounting frame (gear downwards).
- Remove hexagon nuts **66**, washers **65** and dismount pump casing **61**.
- Remove screws **63** and wear ring **62** from pump casing only if necessary to change **(using take -off device)**.
- Remove flattened seal-cord **67** (casing-seal).
- Remove circlips **72**, screws **69**, washers **70** and **71** only if diffusor **68** has to be changed.
- Remove circlip **60**, safety screw **59**, screw **58** and strain washer **57** and draw-off impeller cap **54** or inducer **55**.
- Draw-off impeller **52** with keys **53** from shaft.
- Draw-off rotating seal-ring **51** and shims **50** from shaft.
- Remove screws **47**, washers **48**, **49** and dismount mechanical-seal **44** and seal-washer **46**.
- Remove screws **38**, washers **37** and rear-casing **33** from bearing-casing support **21**, (observe position). Remove labyrinth outer-bushing **36** only if necessary to change.
- Remove screws **35** and wear ring **34** from rear-casing only if necessary to change **(using take -off device)**.
- Remove insulation-ring **32**, draw-off labyrinth shaft-bushing **42** and labyrinth-bushing **41** from shaft.
- Remove screws **31** and pull off slinger disc **30**.
- Remove screws **20**, washers **19** and cover **17**.

- Turn around the bearing-casing support, gear on top.
- Remove shaft nut **15**, safety-washer **14**, pull off gear **26**, remove keys **13** and ring **12**.
- Remove circlip **11** and pull out shaft **1** with bearings from bearing-casing support **21**.

RECOMMENDATION!



This dismounting procedure is made easier by heating up the bearing-casing on bearing-seat **10** at approx. 50°C.

- Draw off bearing **10**, distance-rings **8** and **9**, shim **6** and preloading-ring **7**, bearing **5** and supporting-ring **4** from shaft.
- Remove circlip **3** and draw off bearing internal ring **2** from shaft.

12.2 Gearbox disassembling, type G2/EM (Drawing No. 1 11231)

- Drain lubricant.
- Remove screwing **1, 2, 3** and pull off gearbox-casing **11** from motor flange. (if necessary use forcing screws, corresponding threaded holes being on casing-flange).
- Dismount ring **20** only, if to be changed.
- Remove circlip **19** and pull off gear **9**.
- Remove lubricant slinger-disc **10** and ring **8** only if damaged.

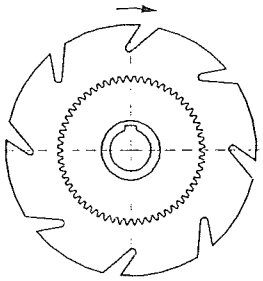
13 Assembling

13.1 Gearbox assembling, type G2/EM (Drawing No. 1 11231)

- **Prior to assembling, all parts must be carefully degreased** and checked for damages. **Spare parts shall remain originally packed until they are used.**

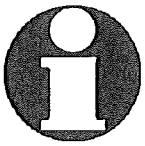
WARNING!

Greasing of seats and screwing should be done only with oxygen compatible grease!



- Place key **18**.
- Mount lubricant slinger-disc **10** and ring **8** on gear **9**. **Observe rotational direction!**
- Secure screws **5** with Loctite Nr. 0601 or Nr. 0270.
- Pull gear-unit on motor shaft.

RECOMMANDATION!



Warm up gear-unit to approx. 100°C

- Secure with circlip **19**.
- Press in ring **20**, secure with Loctite Nr. 0672 or Nr. 0641.
- Mount fittings and plug-screws according to drawing.
- Place gasket **12** on motor flange.
- Fasten gearbox-casing on motor-flange.

13.2 Pump Assembling (Drawing No. 2 12000 and Checklist Nr. 4 12818)

WARNING!

Observe chapter 3 " Safety " when working at the pump.

- **Prior to assembling, all parts must be carefully degreased** and checked for damages. **Spare parts shall remain originally packed until they are used.**
- **Greasing of seats and screwing should be done only with oxygen compatible grease!**
- Shaft concentric running tolerance: 0,03 mm (measured between end-centres).
- Pull bearing internal ring **2** on shaft **1**.

RECOMMENDATION!

Warm-up internal ring to approx.100°C

- Mount circlip **3**.
- Mount supporting-ring **4**.
- Pull split-race ball-bearing **5** on shaft.

RECOMMENDATION!

Warm-up internal rings to approx.100°C

- Mount distance-ring **9**.
- Pull bearing internal ring **10** on shaft **1**.

RECOMMENDATION!

Warm-up internal ring to approx.100°C

- Put in bearing **2** in bearing-casing support **21**.
- Introduce shaft **1** in bearing-casing support **21**.

RECOMMENDATION!

Warm up bearing-casing support at seat of bearing **10** to approx. 50-60°C.

- Put in shim **6**, preloading-ring **7**and distance-ring **8**.
- Mount bearing **10** and secure with circlip **11**.
- Measure of shaft axial clearance: 0,15mm to 0,35mm.

Measuring procedure:

Push shaft in gear direction, until preloading-ring **7** is completely compressed (approx. 300 N). Measure gap between external-ring of bearing **5** and bearing-casing shoulder, using thickness gauge through side-slot of bearing-casing.

Adjust clearance, using shim **6**, ∅ 60 x 72 x 0,2, placed between preloading-ring **7**and ball-bearing **5**.

- Put in ring **12** and keys **13**.
- Put gear **26** on shaft **1**.

RECOMMENDATION!

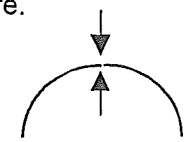
Warm up gear to approx. 100°C

- Secure with shaft-nut **15** and safety washer **14**. (using safety-washer only once!).
- Mount V-Ring **16** very carefully.
- Mount O-Ring **18** and cover **17**; observe positioning-pin **25**!

WARNING!

Do not use lubricants for further mounting!

- Mount slinger disc **30**. (align screws to the flattened areas of the shaft)
- Mount labyrinth-bushing **41** and labyrinth shaft-bushing **42**.
- Press wear-rings **34** in rear-casing **33** and **62** in pump casing **61** and secure with screws **35 / 63**. Slightly hammer screw-thread to secure.
- Mount diffusor **68**:
  Observe position according to sketch
  Secure screws **69** with circlips **72**.



- Press labyrinth outer-bushing **36** in rear-casing **33**.
- Place insulation-ring **32** and rear-casing **33** on bearing-casing support **21** and fasten with screws **38** (observe position).
- Place softened seal-washer **46** in rear-casing **33**.
- Place mechanical seal **43** in lead-bushing **44** and check **pretension of approx.1 mm**, then adjust mechanical seal concentrically and fix with screws **45**.
- Mount lead-bushing together with mechanical-seal in rear-casing **33**.
- Place shims **50** and rotating-ring **51** on shaft (the rotating-ring must move easily on shaft).

CAUTION!

Pretension of mechanical seal:
The mechanical seal **43** must be prestressed through the rotating-ring **51** of

2,3 to 2,6 mm

Measuring procedure: (see Checklist No. 4 12818 §C)

1. Move rotating-ring **51** on shaft until touching the PTFE compound ring of the mechanical seal **43**:
   Measure distance rotating-ring to shaft-end: measurement ①
2. Press rotating-ring **51** against shim **50**:
   Measure distance rotating-ring to shaft-end: measurement ②
3. ② - ① = Pretension
4. Adjust required pretension through peeling of shim **50**: The shim consists of metal-sheets (0,05 mm thickness) which can be peeled with a sharp knife one by one.
5. Check if pretension is correct

- Mount impeller **52**, place both keys **53**, mount impeller cap **54** or inducer **55** and tighten with screws **58** at approx. 38 Nm. Secure with screw **59** and circlip **60**.
- Put self adhesive seal-cord **67** on seal face of pump-casing **61**, **ends overlapped**.
- Mount pump-casing **61** and tighten uniformly.

CAUTION!

During the whole tightening process, check shaft for free rotation.

Same control of free-rotating after pump installation and before motor-start

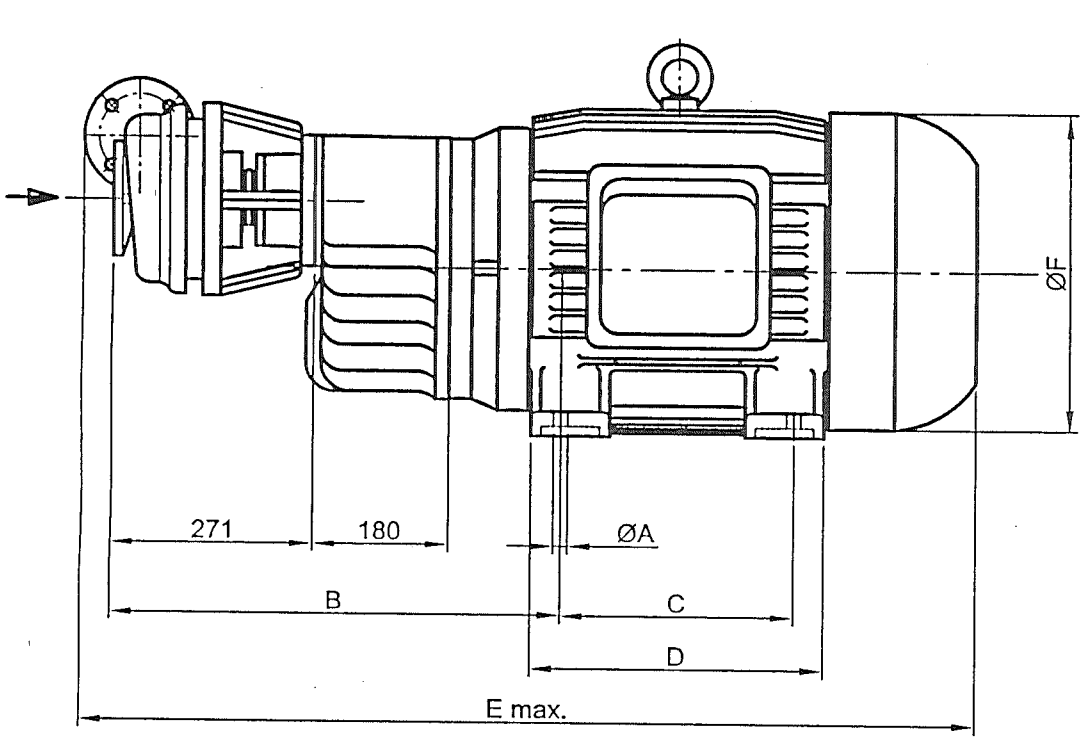
- Mount plug-in unit complete on gearbox.
- Fill in lubricant in Gearbox and check lubricant level.

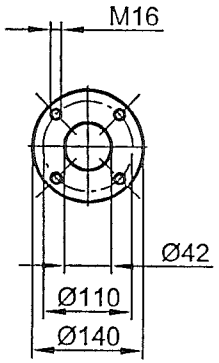
		Gezeichnet Dessiné	Geprüft Controlé
	07.02.2000	NS.	
1	26.02.2002	NS	

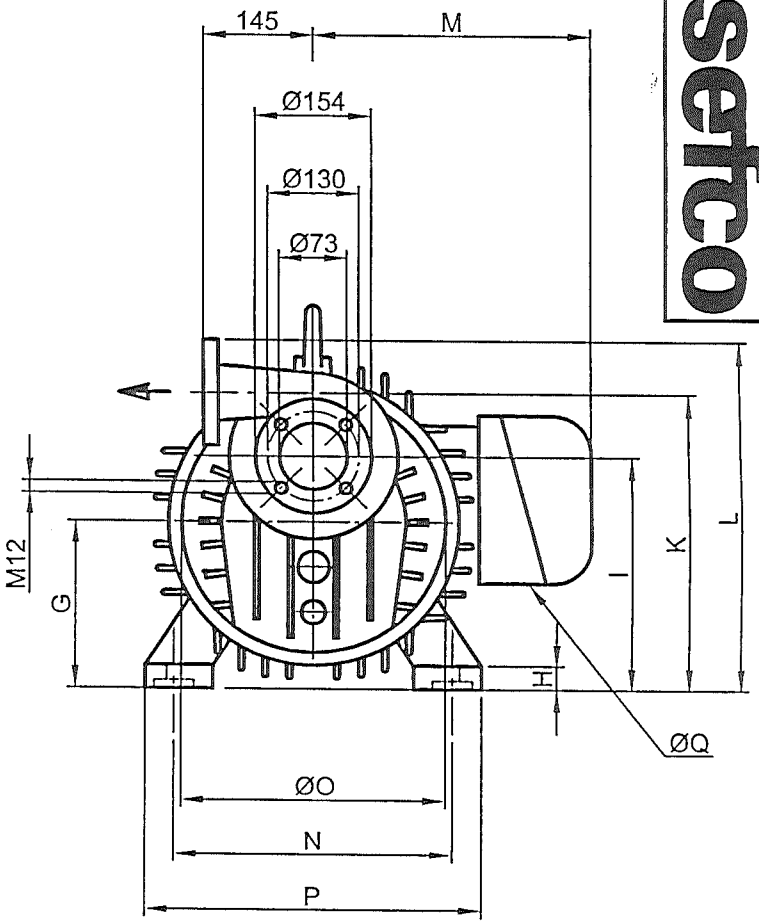
Gezeichnet Dessiné	Geprüft Controlé

LIQUID GAS CENTRIFUGAL PUMP
Type : C - 19 / G2 / EM

sefco







Subject to change

" External forces according to drawing 4 13576 "

Dimensions in mm

Motor type	kW	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q
250M		25	619	349	420	1276	489	250	35	339	423	493	405	406	350	505	2 x M50 x 1.5
225M		20	600	311	395	1189	431	225	32	314	398	468	365	356	350	450	2 x M50 x 1.5
200L		20	584	305	365	1142	392	200	30	289	373	443	329	318	350	400	2 x M50 x 1.5
180M		15	572	241	300	1072	341	180	28	269	353	423	280	279	350	345	2 x M40 x 1.5
160L		15	559	254	300	1048	310	160	25	249	333	403	245	254	350	310	2 x M40 x 1.5
160M		15	559	210	255	1004	310	160	25	249	333	403	245	254	350	310	2 x M40 x 1.5

4 12205

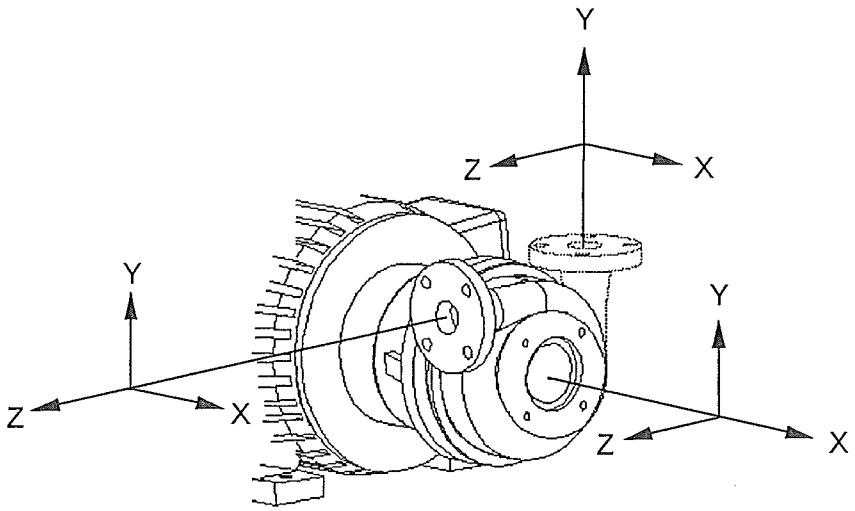
Maximale Flanschbelastungen / Kräfte- Momente

Max. Nozzle Loadings / Forces- Moments

Efforts max. aux brides / Forces- Moments

Pumpen-Typ :
Pump- Type :
Pompe- Type :

C-19, C-19/G2, C-19/PA, CL-19



		Saugflansch Suction nozzle Bride d'aspiration	Druckflansch vertikal Top discharge nozzle Bride de refoulement verticale	Druckflansch horiz. Side discharge nozzle Bride de refoulement horizontale
Kräfte Forces *[N]*	F_x	330	170	170
	F_y	270	130	190
	F_z	220	190	130
	F_r	480	280	280
Moments *[Nm]*	M_x	210	120	120
	M_y	105	60	60
	M_z	160	85	85
	M_r	285	160	160

r = Resultierende, Resultant, Résultante

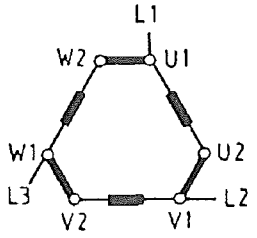
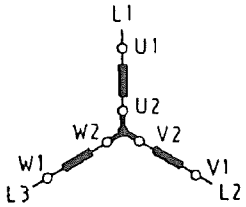
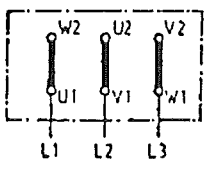
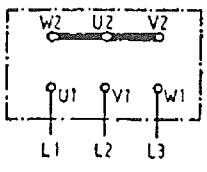
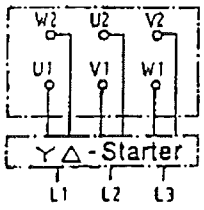
Connection for squirrel cage induction motors

Squirrel-cage induction motors are connected to the three-phase conductors L1, L2, L3. The rated voltage of the motor in the running connection must agree with the phase-to-phase voltage of the supply system.

Single speed motors:
For direct on-line starting, the running connection of the motor may be the star connection or delta connection. (For star/delta starting, the running connection must be the delta connection).

Motor winding arranged for	Supply voltage V	Running connection	
		Direct on-line starting in	Y / Δ-starting
230 Δ / 400 Y	230 400	230 Δ 400 Y	230 Δ not possible
400 Y 400 Δ	400	400 Y 400 Δ	not possible 400 Δ
500 Y 500 Δ	500	500 Y 500 Δ	not possible 500 Δ
400 Δ / 690 Y	400 690	400 Δ 690 Y	400 Δ not possible
690 Y 690 Δ	690	690 Y 690 Δ	not possible 690 Δ

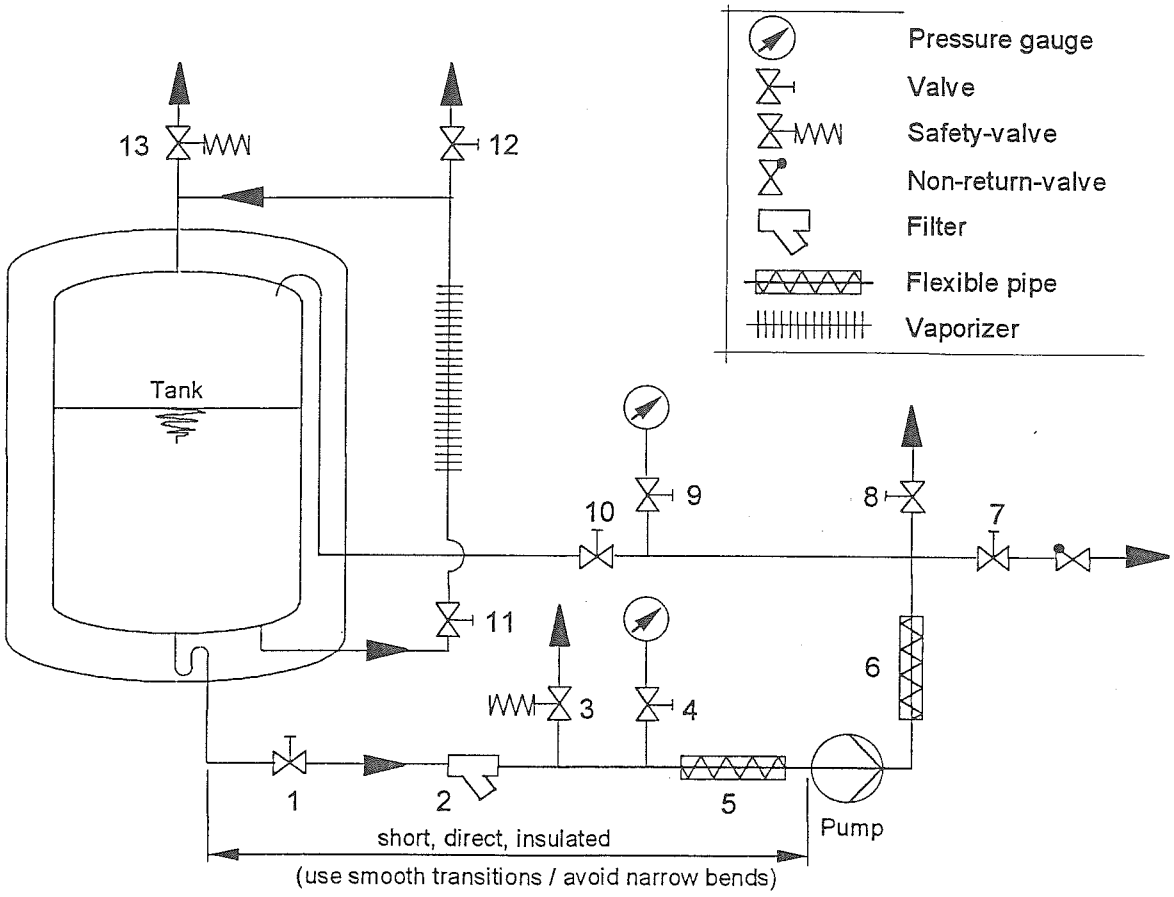
The connection of links and lines on the terminal board are dependant of the rated voltage and winding phase; e.g. for a squirrel cage induction motor with winding phase for 230 V Δ / 400 V Y with one speed the following connections must be done:

	Running connection		
	Direct-on-line starting in		Y Δ - starting
	230 V	400 V	230 V
Connection of the winding phases			The ends of the 3 windings are connected to the Y-Δ starter
Connection of links and lines	 Δ-connection	 Y-connection	

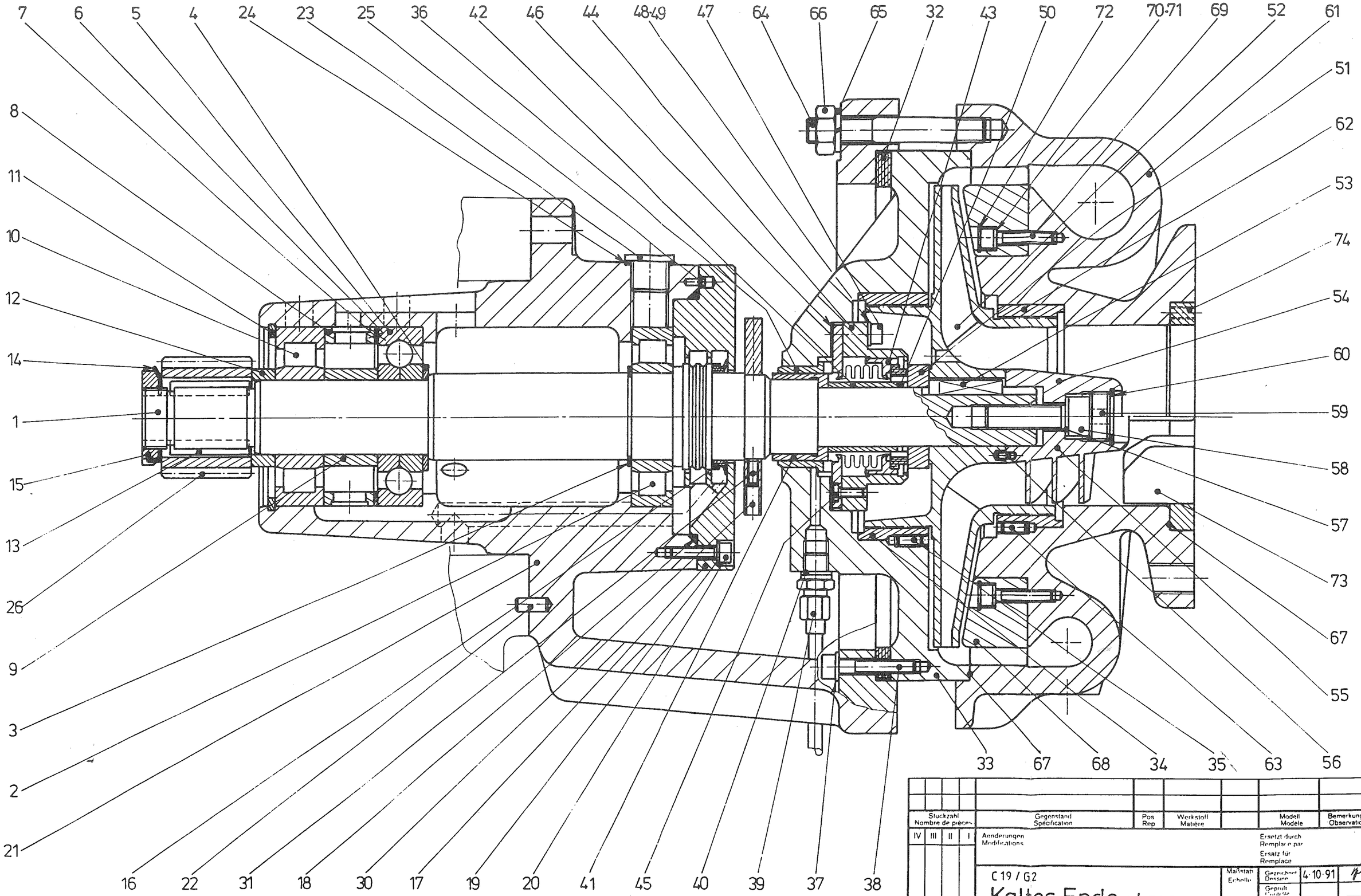
Instead of star-delta-starter preferably an electric soft-starter can be used.

Installation schematic for centrifugal pump

The present schematic illustrates a typical system-installation for liquid-gas centrifugal pump operation, and can be extended according to needs. Accessories should at this stage be reduced to a minimum.



Pos.	Designation	Required	Recommended
1	Suction-Valve	X	
2	Filter	X	
3	Safety-Valve (Suction line)	X	
4	Pressure gauge (Suction line)		X
5	Flexible Pipe (Suction line)	X	
6	Flexible Pipe (Discharge line)	X	
7	Pressure- and Non-return-valve (to consumer)	X	
8	Degassing-Valve (Discharge line)	X	
9	Pressure gauge (Discharge line)		X
10	Bypass-Valve	X	
11	Pressure build-up System (Tank)		X
12	Degassing-Valve (Tank)	X	
13	Safety-Valve (Tank)	X	



Stückzahl Nombre de pièces				Gegenstand Spécification	Pos Rep	Werkstoff Matière		Modell Modèle	Bemerkungen Observations
IV	III	II	I						
				Aenderungen Modifications				Ersetzt durch Remplacé par Ersatz für Remplace	
				C 19 / G2 Kaltes Ende + Lagerung (Cold End + Bearing Casing)			Maßstab Echelle 1.	Gezeichnet Dessiné 4.10.91 Geprüft Contrôlé Genehmigt Vu	
				sefco				2 12000	

C-19/G2, Drawing 2 12000 **Cold End**

Item-No.	Parts Per Unit	Required Spare Parts	Recommended Spare Parts	Nomenclature	Material
1	1		1	Shaft	
2	1	1	1	Roller-bearing	
3	1			Circlip ∅ 35 x 1,5	
4	1			Supporting-ring ∅ 30 x 42 x 2,5	
5	1	1	1	Split-race ball-bearing	
6	2	2	2	Shim ∅ 60 x 72 x 0,2	
7	1	1	2	Preloading-ring ∅ 71 x 61 x 0,5	
8	1		1	Distance-ring	
9	1			Distance-ring	
10	1	1	1	Roller-bearing	
11	1			Circlip ∅ J72 x 2,5K	
12	1			Ring	
13	2			Key C6 x 6 x 32	
14	1	1	2	Safety washer MB5	
15	1			Shaft-nut	
16	1	1	1	V-Ring	
17	1			Cover	
18	1	1	1	O-Ring ∅ 94 x 3	
19	4			Split lock washer M5	
20	4			Socket head cap screw M5 x 20	
21	1			Bearing-casing support	
22	1			Spring tension pin ∅ 6 x 14	
23	1			Screw-plug M16 x 1,5	
24	1			Seal-washer ∅ 16 x 22 x 1,5	
25	1			Spring tension pin ∅ 3 x 8	
26	1			Gear	
27	-				
28	-				
29	-				
30	1			Slinger disc	
31	2			Socket set screw M5 x 10	
32	1			Insulation-ring	

Rev:	Date:
0	5.10.00

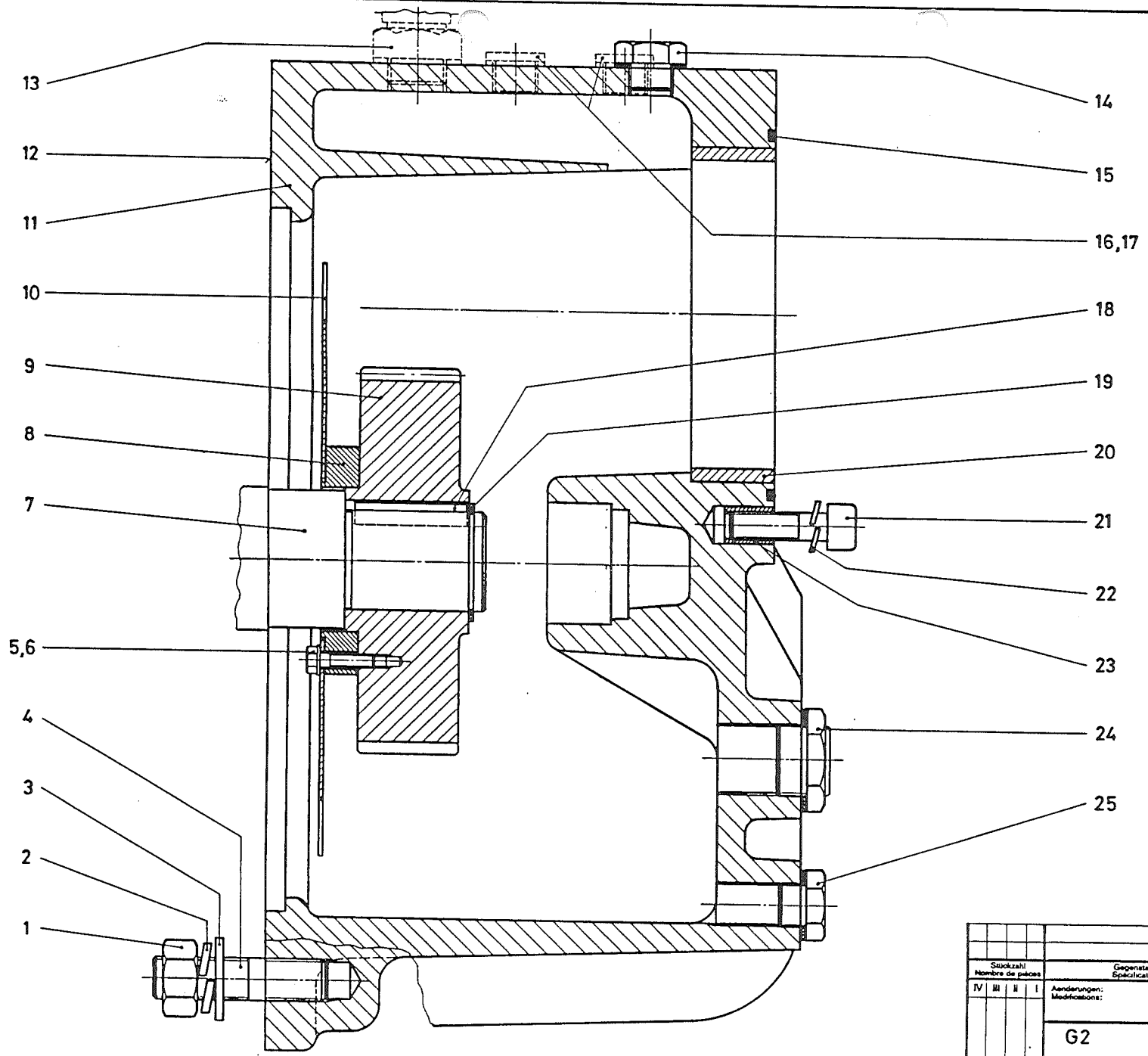
C-19/G2, Drawing 2 12000 **Cold End**

33	1			Rear casing	
34	1	1	1	Wear-ring	
35	2			Socket set screw M5 x 10	
36	1		1	Labyrinth outer-bushing	
37	4			Washer M5	
38	4			Socket head cap screw M5 x 30	
39	2			Male adapter elbow union	
40	-			Seal-washer ∅ 13,5 x 10 x 1	
41	1		1	Labyrinth-bushing	
42	1		1	Shaft-bushing	
43	1	1	1	Mechanical seal	
44	1	1	1	Lead bushing	
45	4			Socket head cap screw M4 x 10	
46	1	1	3	Seal-washer ∅ 75 x 48 x 0,2	
47	8			Socket head cap screw M5 x 25	
48	8			Washer M5	
49	8			Strain washer M5	
50	3	1	1	Shim ∅ 30 x 24 x 1	
51	1	1	2	Rotating-ring	
52	1			Impeller	
53	2			Key C 8 x 6 x 30	
54	1			Impeller-cap (Inducer 55 as alternative)	
55	1			Inducer (Impeller-cap 54 as alternative)	
56	2			Spring tension pin ∅ 3 x 8	
57	2			Strain washer M10	
58	1			Socket head cap screw M10 x 35	
59	1			Safety screw M20 x 1	
60	1			Circlip ∅ 20 x 1	
61	1			Pump-casing	
62	1	1	1	Wear-ring	
63	2			Socket set screw M5 x 10	
64	12			Stud M10 x 60	
				Nomenclature	**Material**
			Recommended Spare Parts	**Rev:**	**Date:**
		Required Spare Parts		0	5.10.00
	Parts Per Unit				

C-19/G2, Drawing 2 12000 **Cold End**

65	12			Split lock washer M10	
66	12			Hexagon nut M10	
67	1m	2m	10m	Seal cord 3 x 1,5 x approx. 1000	
68	1			Diffusor	
69	6			Socket head cap screw M5 x 25	
70	6			Washer M5	
71	6			Strain-washer M5	
72	6			Circlip ∅ 10 x 1	
73	1			Blade-ring (Ring 74 as alternative)	
74	1			Ring (Blade-ring 73 as alternative)	
			3	PTFE compound ring for mechanical seal	

Nomenclature	Material	
Recommended Spare Parts	Rev:	Date:
Required Spare Parts	0	5.10.00
Parts Per Unit		



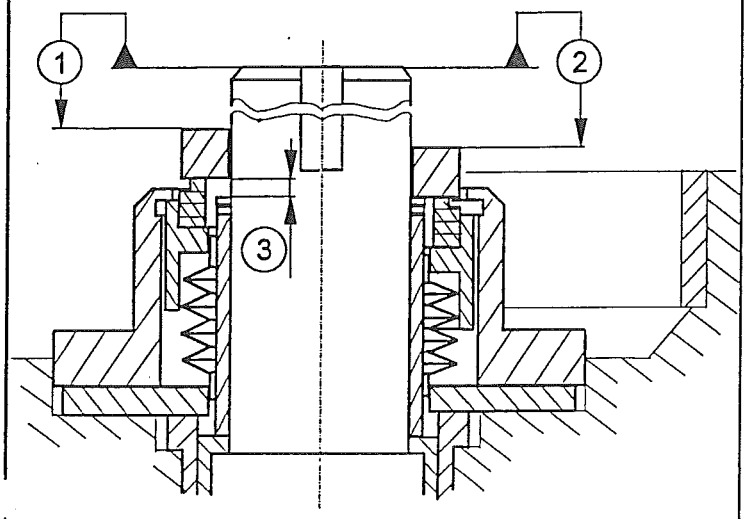
Stückzahl Nombre de pièces				Gegenstand Spécification	Pos. Rep.	Werkstoff Matière		Modell Modèle	Bemerkungen Observations
IV	III	II	I						
				Aenderungen: Modifications:				Ersetzt durch Remplace par:	
								Ersatz für: Remplace:	
				G2 Getriebe			Maßstab Echelle 1/	Gezeichnet Dessiné 24.3.83	
								Geprüft Contrôlé	
								Gesehen Vu	
				SEFCO AG				2 11231	

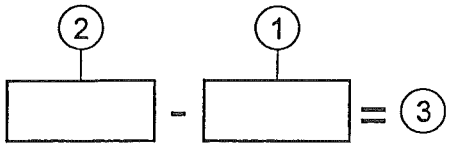
G2/EM, Drawing: 2 11231 **Gearbox**

Item-No	Parts Per Unit	Required Spare Parts	Recommended Spare Parts	Nomenclature	Material
1	4			Hex. nut M16	
2	4			Split lock washer M16	
3	4			Washer M16	
4	4			Stud M16 x 40	
5	2			Hex. cap screw M5 x 20	
6	2			Strain washer M5	
7	-			Motorshaft	
8	1			Ring	
9	1			Gear	
10	1			Lubricant slinger disc	
11	1			Casing	
12	1			Gasket ∅ 252 x 348 x 0,5	
13	1		1	Vent-filter G 1/2"	
14	1			Lubricant-filling plug G 3/8"	
15	1	1	1	O-ring ∅ 124,5 x 3	
16	2			Plug screw M16 x 1,5	
17	2			Seal-washer ∅16 x 22 x 1,5	
18	1			Key A10 x 8 x 40	
19	1			Circlip ∅ 35 x 1,5	
20	1			Ring	
21	4			Socket head cap screw M10 x 35	
22	4			Split lock washer M10	
23	4			Thread-bushing M10	
24	1		1	Lubricant-level check-glass G 3/4"	
25	1			Lubricant-drain screw	
	2 lit.		2 lit.	Lubricant LUBCON Turmoxygen LC40	

Rev:	Date:
0	26.10.00

C Gleitringdichtung - Gleitring / Mechanical seal - Rotating ring / Joint mécanique - Bague tournante





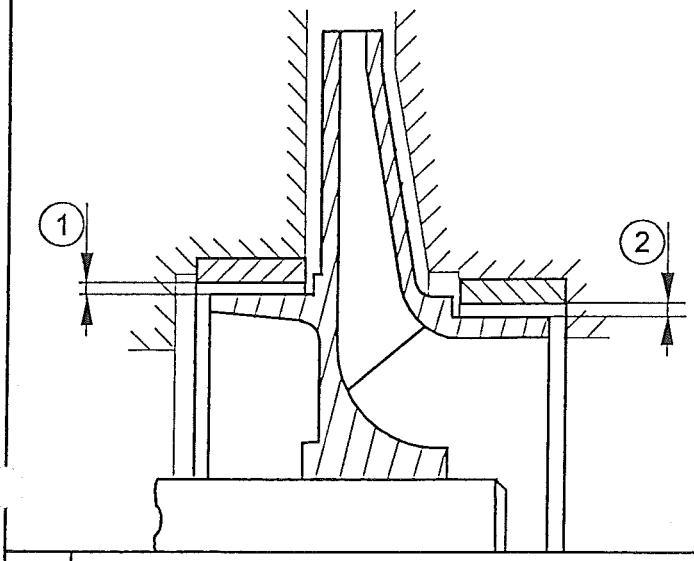
	min.	max.	gemessen measured mesuré
3	2,3	2,6	

Um Maß 3 einstellen zu können, siehe in Betriebsanleitung Paragraph 13.2 "Messvorgang".

To adjust measure 3 see Instruction manual chapter 13.2 "Measuring procedure".

Pour ajuster la cote 3, voir dans le Manuel d'instruction le paragraphe 13.2 " Procédure de mesure".

D Laufrad - Spaltringe / Impeller - wear rings / Roue - bagues contre labyrinthes



	min.	max.	gemessen measured mesuré
1	0,17	0,25	
2	0,17	0,25	

E Endkontrolle / Final control / Contrôle final

Dreht die Pumpenwelle frei? Ja
Is the pump shaft rotating free? Yes ☐
L'arbre de la pompe tourne t'il librement? Oui

F Dichtheitsprüfung GRD / Tightness test mechanical seal / Contrôle de l'étanchéité du joint mécanique

Prüfdruck / Test pressure / Pression d'épreuve: 7 bar

nach 15 Minuten / after 15 minutes / après 15 minutes:

min.	gemessen measured mesuré
4 bar	bar

Datum / Date	Monteur / Fitter	Kontrolliert / Checked / Contrôlé	

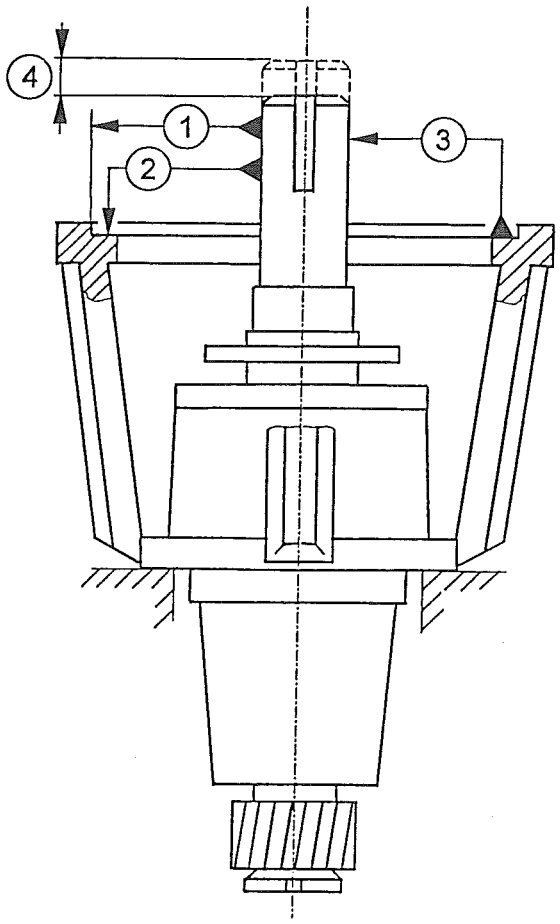
sefco

Checkliste / Checklist / Liste de Contrôle
Pumpe / Pump / Pompe C-19/G2

4 12818

Motor Nr. / Moteur no.	Pumpe Nr. / Pump no. / Pompe no.	Ref. / Réf.

A Laterne - Welle / Bearing-casing support - Shaft / Lanterne support - Arbre



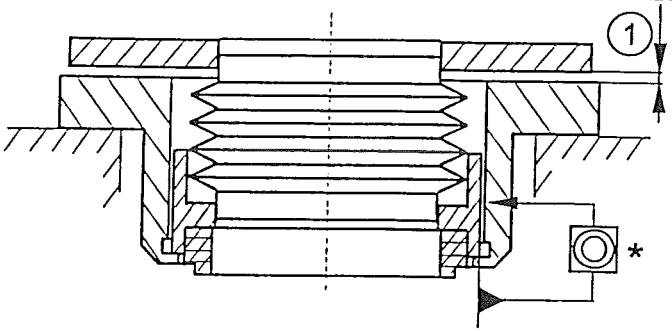
	min.	max.	gemessen measured mesuré
1	-	0,05	
2	-	0,05	
3	-	0,04	
4	0,15	0,35	

Um Maß 4 einstellen zu können, siehe in Betriebsanleitung Paragraph 13.2 "Messvorgang".

To adjust measure 4 see Instruction manual chapter 13.2 "Measuring procedure".

Pour ajuster la cote 4, voir dans le Manuel d'instruction le paragraphe 13.2 " Procédure de mesure".

B Gleitringdichtung - Führungsbüchse / Mechanical seal - Lead bushing / Joint mécanique - Manchon de guidage



	min.	max.	gemessen measured mesuré
1	0,8	1,5	

* Bestmögliche Konzentrizität einhalten
* Observe best possible concentricity
* Respecter la meilleure concentricité possible

REV	Date	Drawn	Checked
0	13.02.02	MR	

ANNEX

Gezeichnet / Dessiné	Geprüft / Controlé
31.01.2005	C.M.

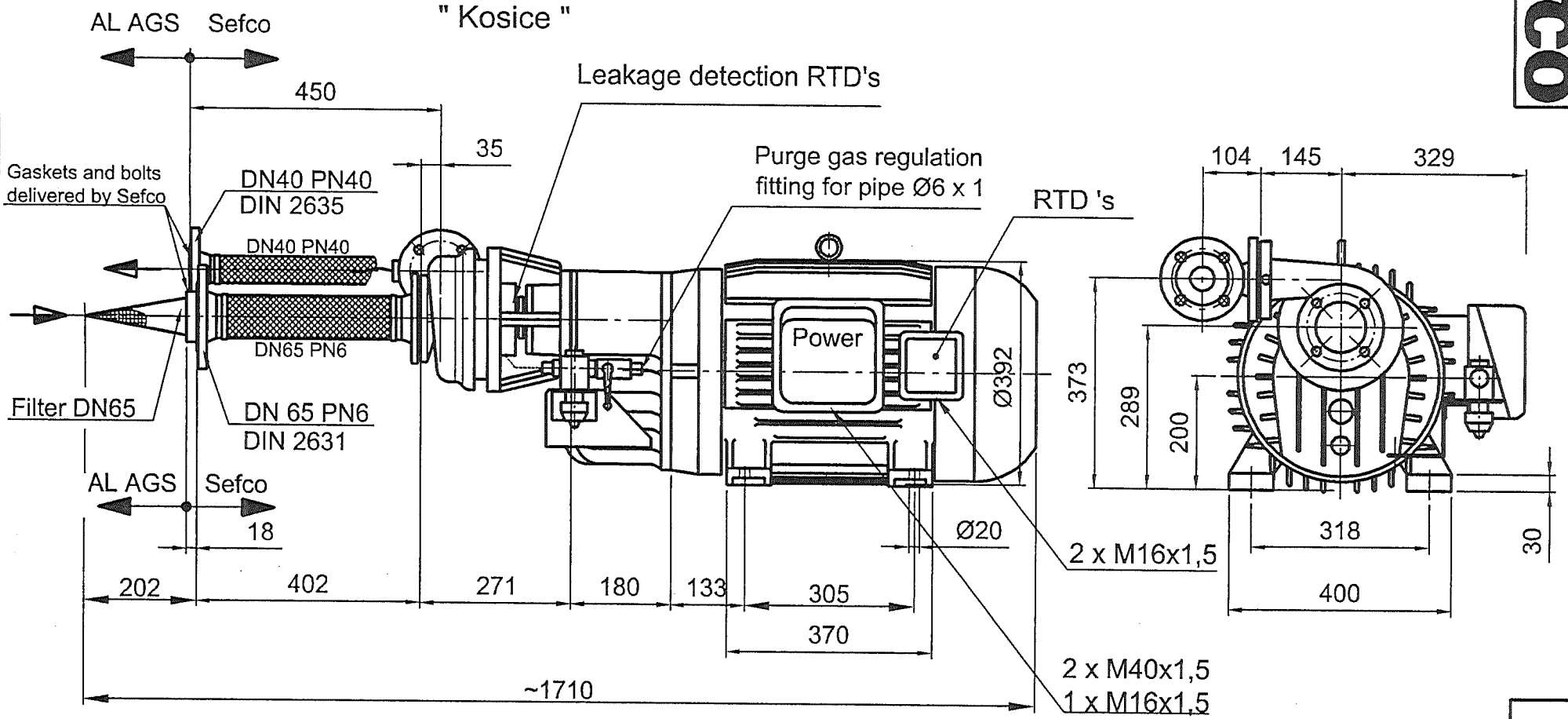
Gezeichnet / Dessiné	Geprüft / Controlé

Arrangement drawing : LAR Backup Pump P48001

Air Liquide AGS GmbH
4500023387
" Kosice "

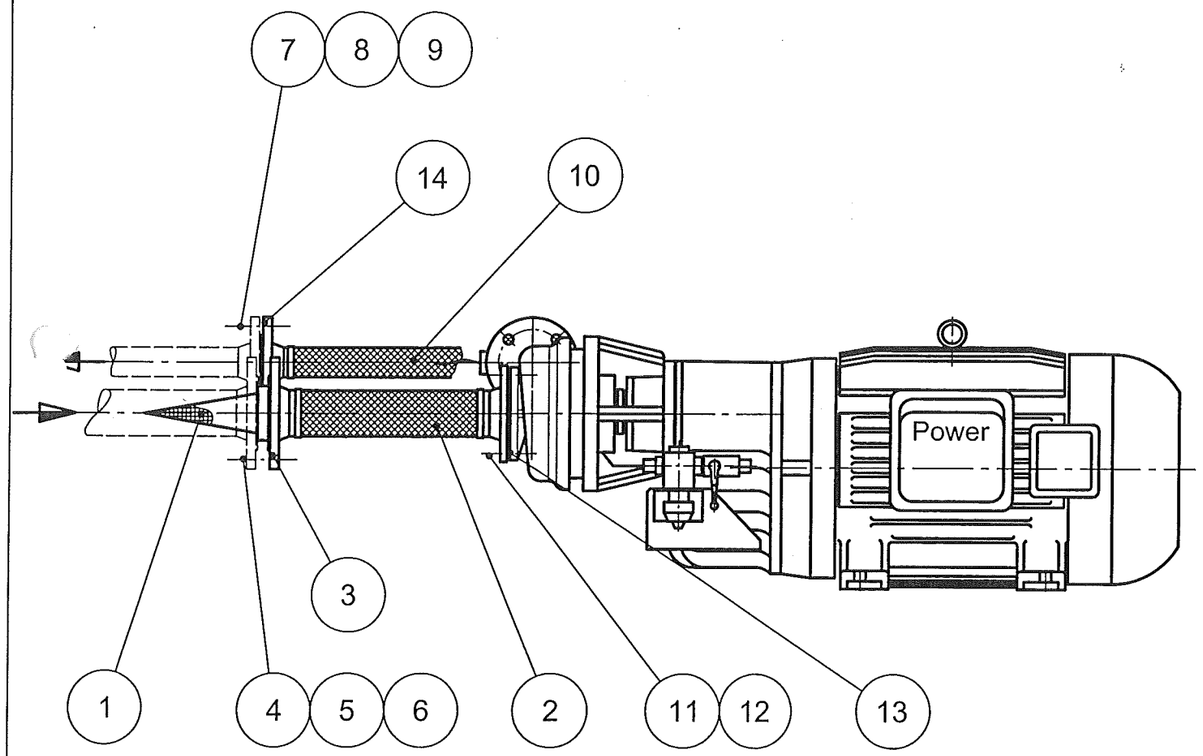
Pump type : C - 19 / G2 / EM - 30
Motor type : 200L - 30 kW
Weight : approx. 340 Kg

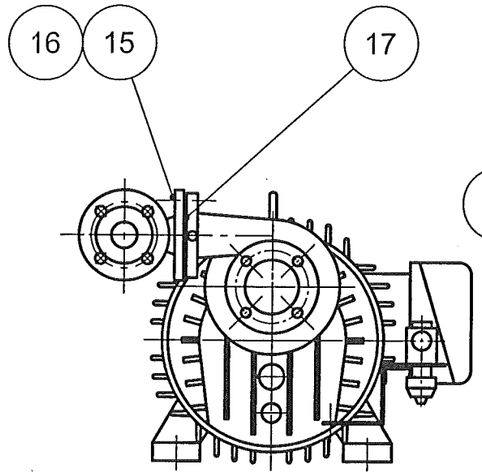
sefco

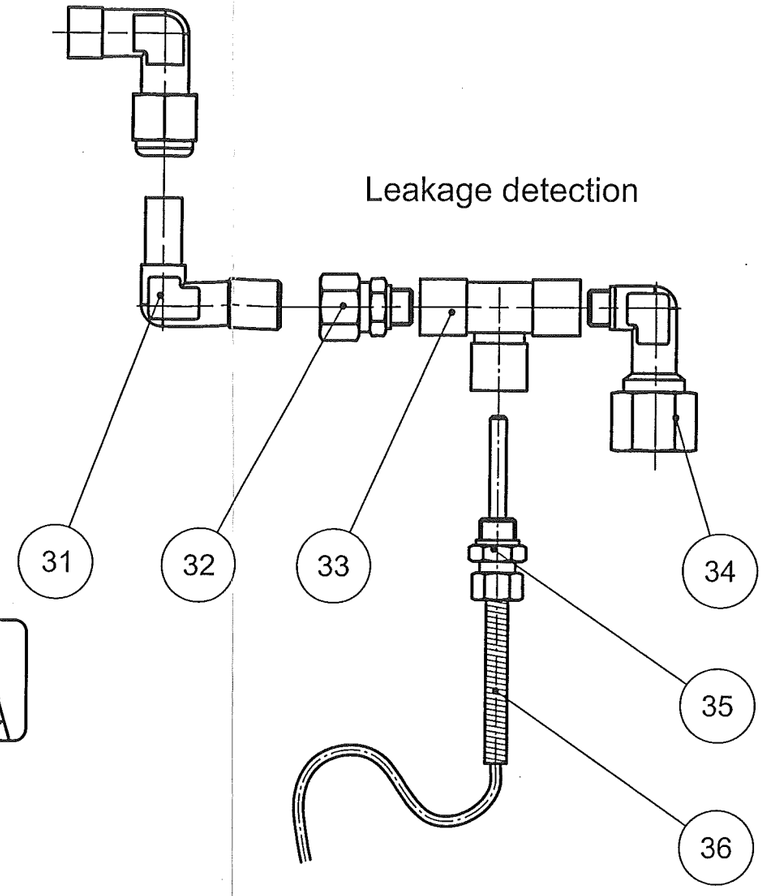


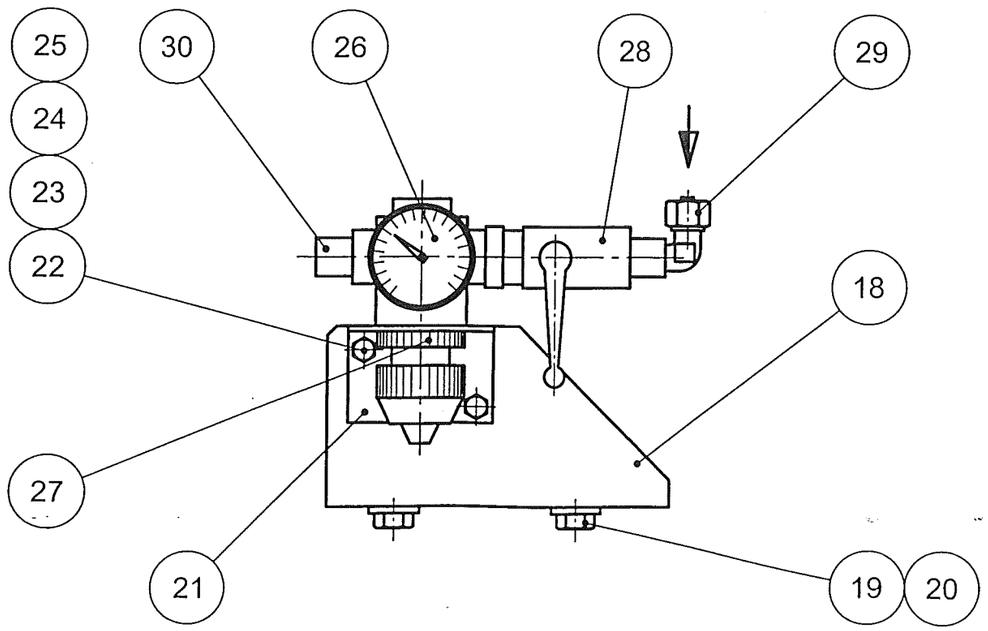
Max nozzle loadings according to drawing 4 13576

05.041









LAR Backup Pump P48001
Air Liquide AGS GmbH - 4500023387
" Kosice "

Stück Nbre	Gegenstand Spécification	Pos. Rep.	Werkstoff Matière		Modell Modèle	Bemerkungen Observations
	Masse ohne Toleranzangabe		Aenderungen		Ersetzt durch :	
	0 bis 6 / uber 6 bis 30 / uber 30 bis 100 / uber 100 bis 300 / uber 300 bis 1000 / uber 1000 bis 3000 / uber 3000 bis 4000 / uber 4000 -				Remplacé par :	
Fein	± 0.05 / ± 0.1 / ± 0.15 / ± 0.2 / ± 0.3 / ± 0.5				Ersatz für :	
Mittel	± 0.1 / ± 0.2 / ± 0.3 / ± 0.5 / ± 0.8 / ± 1.2 / ± 2 / ± 3				Remplace :	

C - 19 / G2 / EM - 30

Accessories

Massstab Echelle			
1:1	Gezeichnet Déssiné	N.S.	26.04.2005
	Geprüft Controllé		
	Normgeprüft Conforme aux normes		
	Gesehen Vu		

sefco

05.041/14

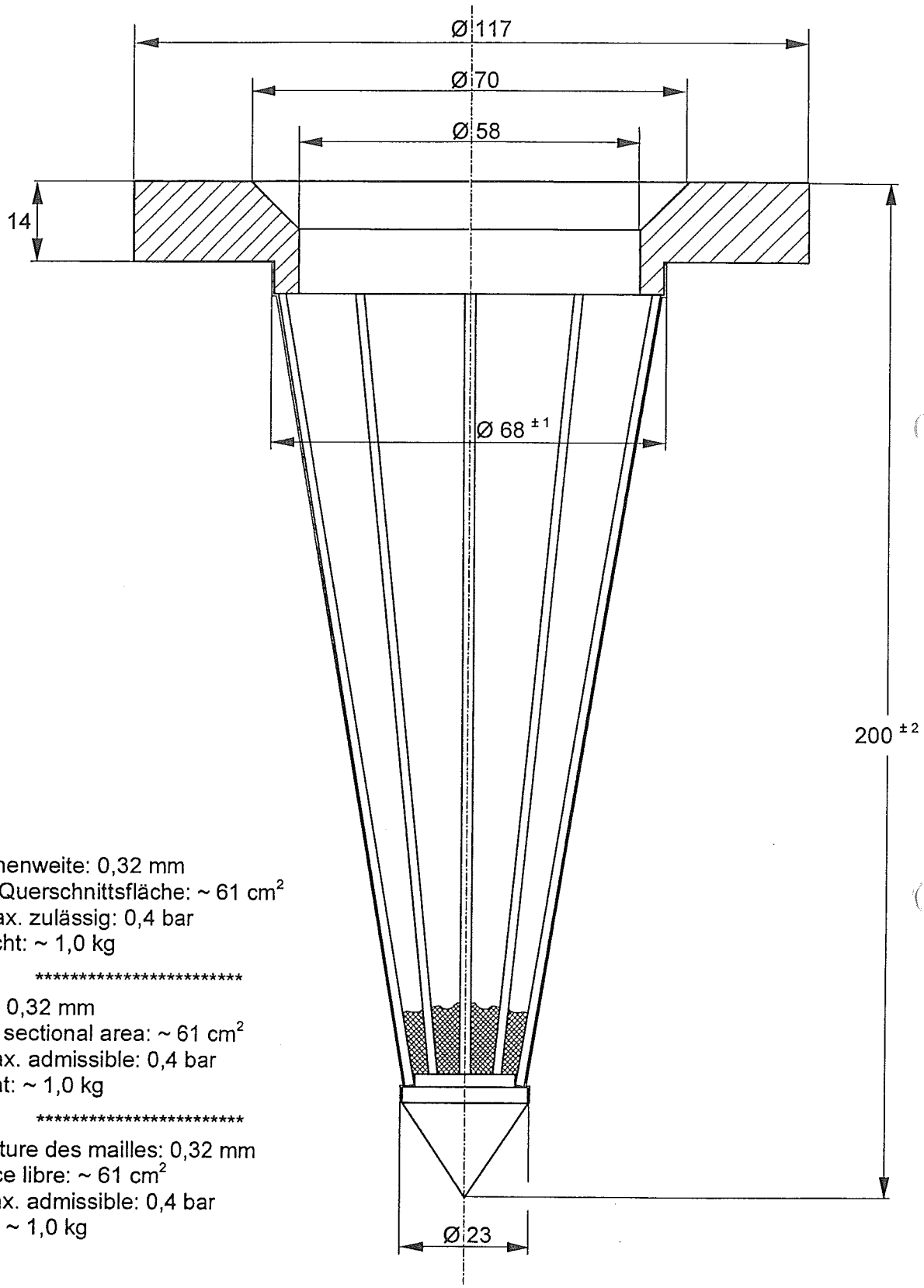
Drawing: 05.041/14 **Accessories P48001**

Item-No.	Parts per Unit	Nomenclature	Material
1	1	Suction strainer DN 65	
2	1	Flexible suction hose DN65 PN6	
3	2	Gasket Ø 115 x 77 x 2	
4	4	Hexagon cap screw M16 x 75	
5	4	Washer M16	
6	4	Hexagon nut M16	
7	4	Hexagon cap screw M16 x 55	
8	4	Washer M16	
9	4	Hexagon nut M16	
10	1	Flexible discharge hose DN40 PN40	
11	4	Washer M12	
12	4	Hexagon cap screw M12 x 40	
13	1	Gasket Ø 115 x 77 x 2	
14	1	Gasket Ø 92 x 49 x 2	
15	4	Hexagon cap screw M16 x 45	
16	4	Washer M16	
17	1	Gasket Ø 92 x 49 x 2	
18	1	Support	
19	2	Washer M12	
20	2	Hexagon cap screw M12 x 20	
21	1	Support	
22	2	Hexagon cap screw M6 x 16	
23	2	Washer M6	
24	2	Spring washer M6	
25	2	Hexagon nut M6	
26	1	Pressure regulator	
27	1	Nut	
28	1	Ball valve 1/4"	
29	1	Male adaptor elbow union Ø 6 - 1/4"	
30	1	Male adaptor union Ø 6 - 1/4"	
31	1	Adjustable elbow union Ø 6	
32	1	Male adaptor Ø 6 - 1/4"	
33	1	T female Ø 1/4"	

Rev:	Date
0	26.05.2005

Drawing: 05.041/14 **Accessories P48001**

Item-No.	Parts per Unit	Nomenclature	Material	Rev:	Date
34	1	Male adaptor elbow union Ø 6 - 1/4"		0	26.05.2005
35	1	Temperature probe union Ø 6 - 1/4"			
36	1	RTD's for seal leakage detection			



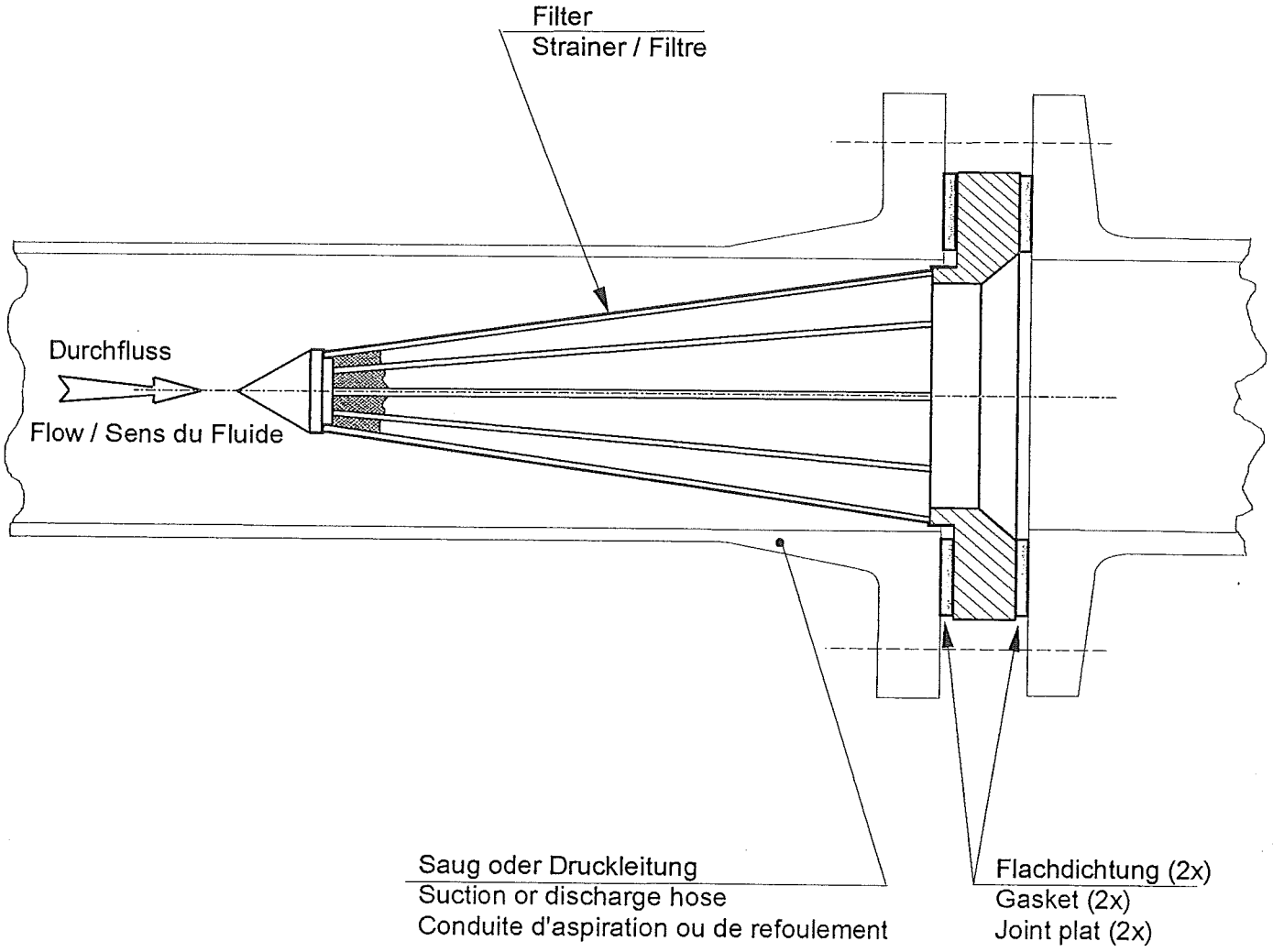
Maschenweite: 0,32 mm
Freie Querschnittsfläche: ~ 61 cm^2
Δp max. zulässig: 0,4 bar
Gewicht: ~ 1,0 kg

****

Mesh: 0,32 mm
Cross sectional area: ~ 61 cm^2
Δp max. admissible: 0,4 bar
Weight: ~ 1,0 kg

****

Ouverture des mailles: 0,32 mm
Surface libre: ~ 61 cm^2
Δp max. admissible: 0,4 bar
Poids: ~ 1,0 kg


Filter
Strainer / Filtre
Durchfluss
Flow / Sens du Fluide
Saug oder Druckleitung
Suction or discharge hose
Conduite d'aspiration ou de refoulement
Flachdichtung (2x)
Gasket (2x)
Joint plat (2x)

Temperaturüberwachung an der Pumpe
Temperature control at the pump
Protection thermique de la pompe

Die Pumpe *kann* mit folgenden Fühlern ausgerüstet sein :
The pump *can* be equipped with the following sensors :
La pompe *peut* être équipée des sondes suivantes :

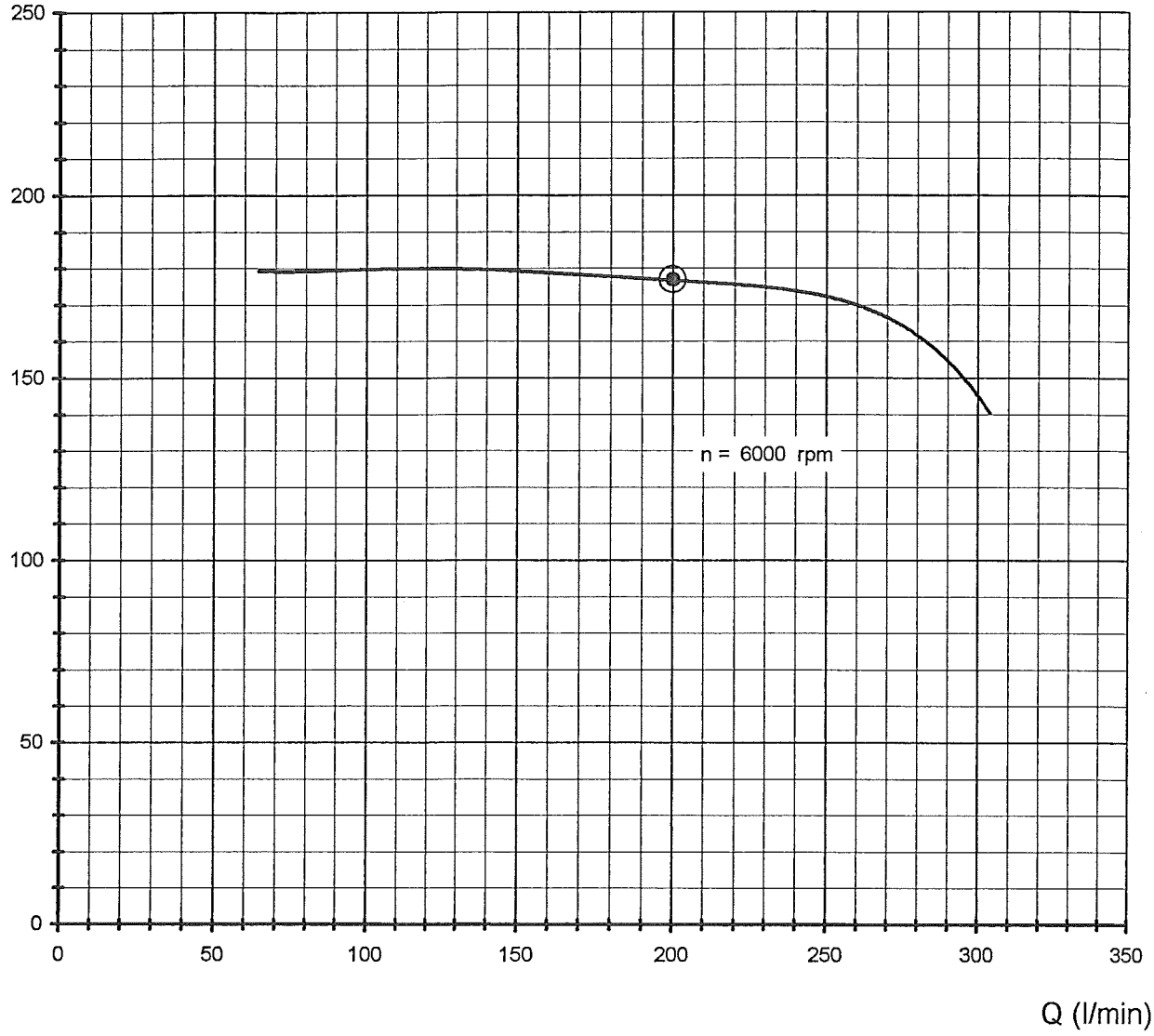
Funktion	**Fühler Typ**	**Wellendichtung Typ**	**Empfohlene Schaltpunkte**
Function	**Sensor type**	**Shaft seal type**	**Recommended set point**
Fonction	**Type de sonde**	**Etanchéité type**	**Réglage recommandé**

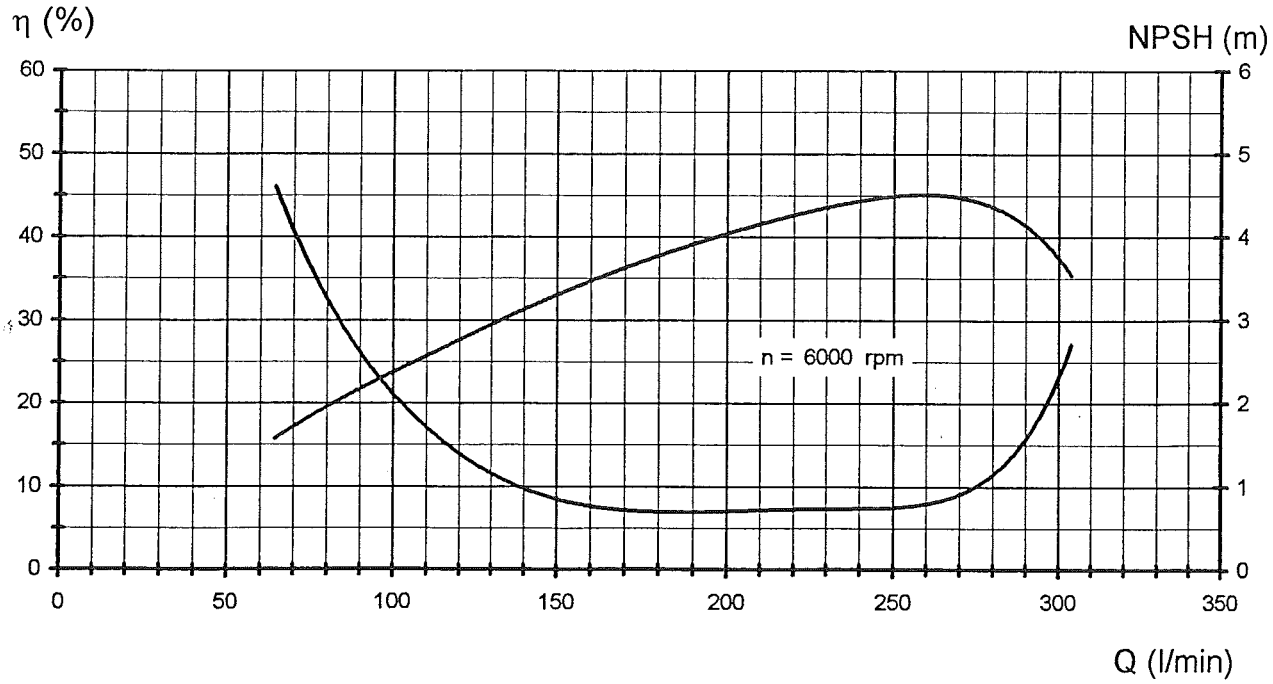
Kaltfahrüberwachung	PT100		-140°C
Cool down survey	RTD		
Contrôle de mise à froid	PT100		

Leckage an der Dichtung	PT100	GRD oder Labyrinth	Alarm, alarme : -130° C Abschalten, shutdown, arrêt : -150° C
Seal leakage detection	RTD	Mechanical or labyrinth	
Détection de fuite à l'étanchéité	PT100	Mécanique ou à labyrinthes	

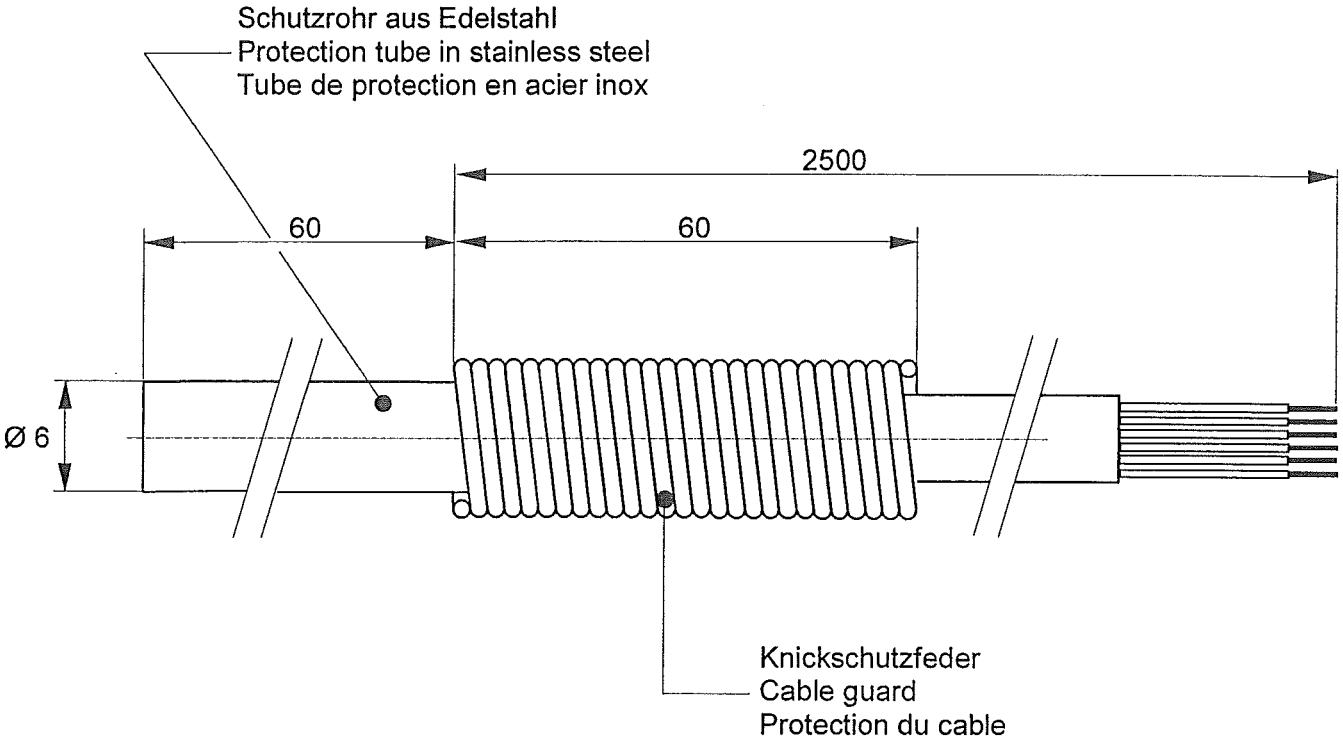
Leckage an der Dichtung	PT100	GRS (abhebende Dichtung)	Alarm, alarme : -160° C Abschalten, shutdown, arrêt : -180° C
Seal leakage detection	RTD	GRS (gas riding seal)	
Détection de fuite à l'étanchéité	PT100	GRS (à film gazeux)	

Impeller ∅ 176 / 4.5 mm with Inducer, Blade-ring
Diffuser 150





Gezeichnet / Dessiné: CM
Geprüft / Controllé:
20.08.2004



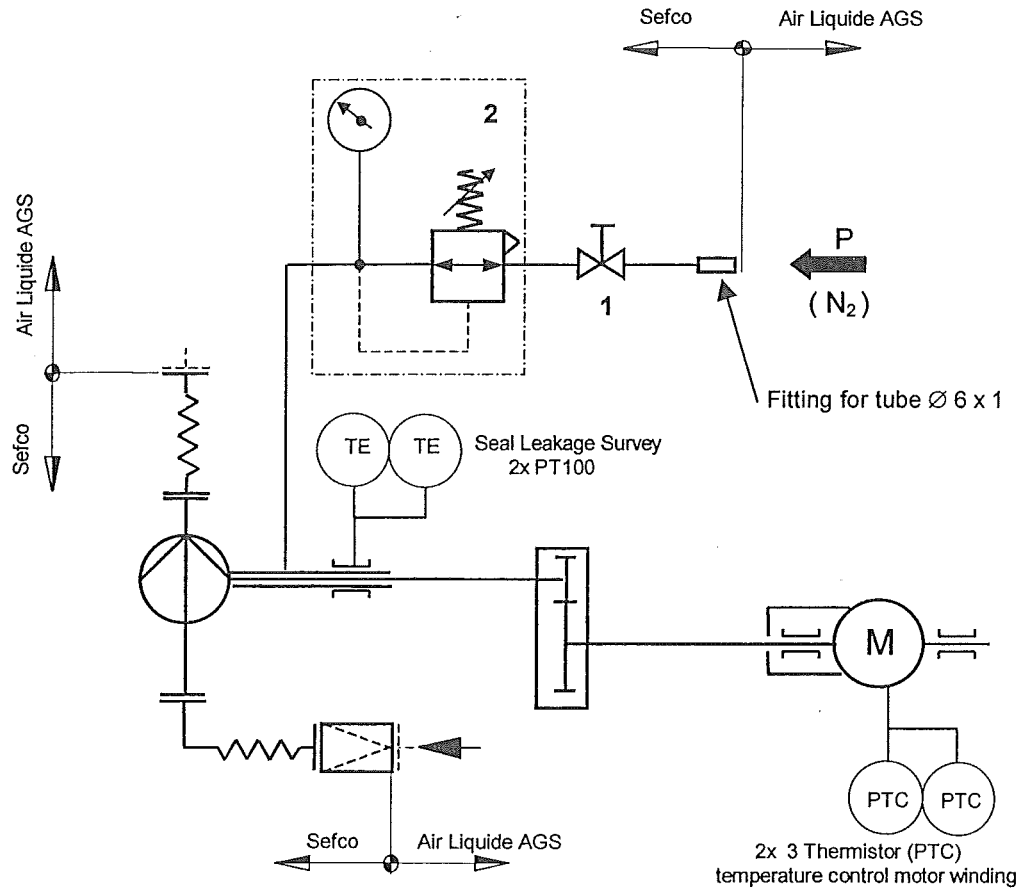
Typ - Type

- Widerstandsfühler 2x PT100, 2x 3 Leiter Klasse B
- Temperature sensor 2x PT100 (dual RTD's), 2x 3 wires class B
- Sonde de température 2x PT100, 2x 3 conducteurs classe B

Temperatur :
Temperature: ± 200°C
Température:

Air Liquide AGS GmbH

Order- Nr. : 4500023387
Tag –Nr. : **P48001**
Project Name: „ ASU Kosice "



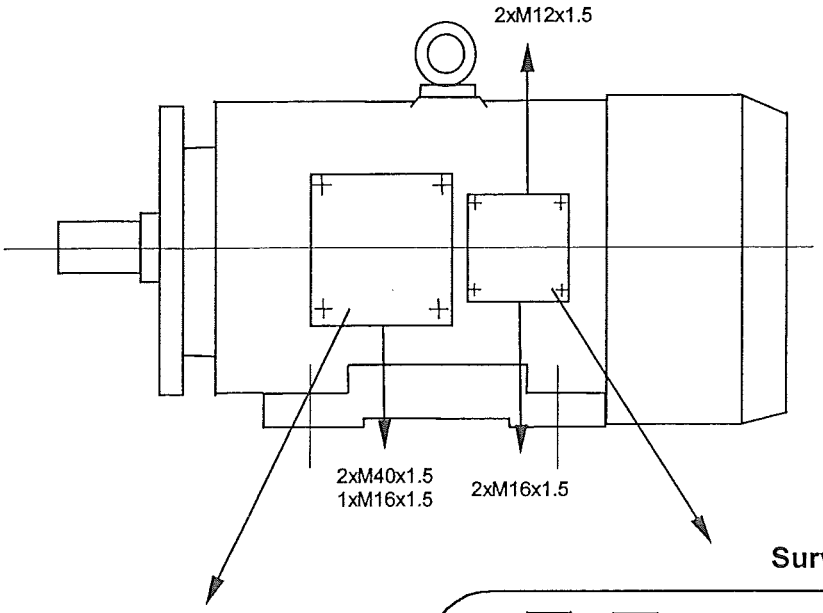
P:	Purge gas feeding
Medium:	Dry nitrogen at 15-20°C
Pressure:	min. 0,1 bar at pump inlet
	1< **P** <17 bar at Regulator inlet
Capacity:	approx. 0,5 Nm^3 / h

0	26.01.2005	WP	
REV	DATE	DWG	CHECKED

Control point	No.off	Instruments	Manufacturer	Type	Technical Data	Remarks
P 1	1	Ball valve	Legris	0402 0713 22		
2	1	Pressure Regulator	Wilkerson	P16-C2-L00	0,1...2,1 bar	Gauge ports:1/4"

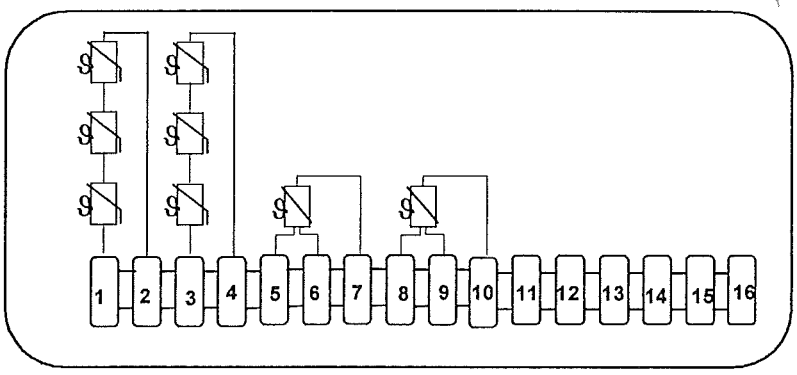
Air Liquide AGS GmbH
Order No.: 4500023387
Tag No.: **P48001**
Project Name: „ASU Kosice"

0	26.05.2005	MR	MR	
REV	**Date**	**Drawn**	**Checked**	

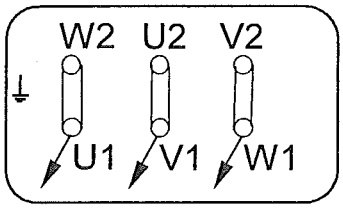


Air Liquide AGS GmbH
Order No.: 4500023387
Tag No.: **P48001**
Project Name: „ASU Kosice"

Survey



Motor 200 L



Δ-Connection 400V / 50Hz / 53A / 30KW

Wiring-Table

1-2	PTC alarm	winding	ISO F ISO F
3-4	PTC disconnecting	winding	ISO F ISO F
5-6-7 8-9-10	Temperature Detector RTD	Seal leakage detection	Dual
11-12-13 14-15-16	Reserve		

!	**RTD :**	Measuring current: 1 mA
!	**PTC thermistor sensors:**	Do not apply more than 2.5V!

0	16.02.2005	WP	
REV	DATE	DWG	CHECKED

Temperaturüberwachung E-Motor
Motor temperature control
Protection thermique du moteur

Der Motor *kann* mit folgenden Fühlern ausgerüstet sein :
The motor *can* be equipped with the following sensors :
Le moteur *peut* être équipé des sondes suivantes :

Messstelle	**Fühler Typ**	**Schaltpunkt** Werte können von Hersteller zu Hersteller leicht ändern	**Empfohlene Schaltpunkte** Alarm Zwischenwerte können nach belieben gesetzt werden
Control point	**Sensor type**	**Trip point** Values can change slightly by different manufacturers	**Recommended set point** Alarm points can be set in between upon need
Point de contrôle	**Type de sonde**	**Température de commutation** Ces valeurs peuvent différer légèrement suivant le fabricant du moteur	**Réglage recommandé** Les points d'alarme peuvent être placés au choix entre ces extrêmes

Lager AS	PT100		-40°C .. +120°C
Bearing DE	RTD		
Palier entraînement	PT100		

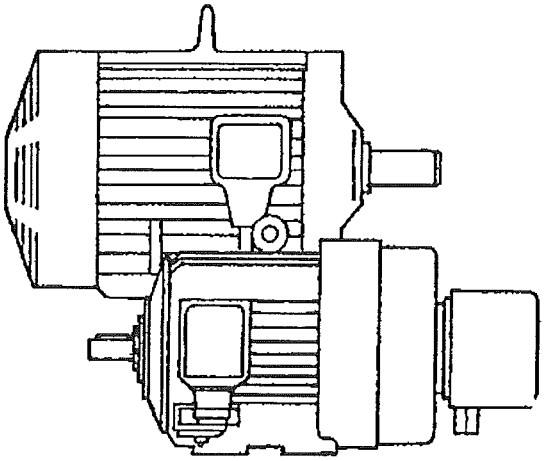
Lager BS	PTC	max. +120°C	
Bearing NDE	Thermistor		
Palier ventilateur	Thermistor		

Lager BS	PT100		-40°C .. +120°C
Bearing NDE	RTD		
Palier ventilateur	PT100		

Wicklung	PTC	Isolationsklasse F Alarm : +130°C Abschaltung : +150°C	
Winding	Thermistor	Insulation class F Alarm : +130°C Trip : +150°C	
Bobinage	Thermistor	Isolation svt. F Alarme : +130°C Arrêt : +150°C	

Treephase Induction Motors
Type DDA/DDG

Mounting & Maintenance



www.halter-motoren.de
e-mail: info@halter-motoren.de

THREEPHASE INDUCTION MOTORS TYPE DDA/DDG

- MOUNTING & MAINTENANCE -

TABLE OF CONTENTS

1. GENERAL INFORMATION

This manual concerns normal three phase induction motors with an output varying from small to middle size; they are externally cooled, totally enclosed, supplied in a cast iron frame and provided with ball bearings or roller bearings lubricated with grease.

2. DELIVERY

After receipt, remove the package material if any and mind the parts that have been delivered loose. In the case of unpacked motors, the glands are often put in the terminal box to protect them against damage.

Check the motor to see whether transport damage has occurred.
You should be able to rotate the shaft easily and smoothly with the hand.

Compare the details on the rating plate with those of the power network and with the requirements of the motor.

3. MOUNTING

The motor must be fixed on a stable, clean and flat foundation with good fitting foundation bolts, using washers.
Never mount a motor manufactured for a horizontal mounting on a surface with an angle of inclination of more than 15 degrees without consulting the supplier in advance.

Foot & flange motors always have to be mounted in such a way that the drain holes, if any, are situated at the bottom, otherwise you run the risk that moisture has condensed into the motor and cannot be drained off. To this end you need to remove the drain plugs.

Under no circumstance must the free flow of air be obstructed to the cooling fan or the motor will overheat.
This has also to be borne in mind when you are mounting motors in enclosed spaces of small size.
The ambient temperature must not exceed 40 degrees centigrade, unless otherwise agreed upon at the time of ordering.

4. COUPLING

4.1 Direct coupling

The motor and driven shafts must be accurately aligned. In case of a flexible coupling, the manufacturers distance between the parts to be coupled must be adhered to, also the degree of misalignment must be within the makers tolerance. We do not recommend using solid couplings.

4.2 Indirect coupling

4.2.1. Flat or V Belts

Mount the motor on slide rails in order to adjust belt tension.
The belt pulley has to be fitted hard up the shoulder of the shaft. The pulley center line should be within the shaft center line. Use correctly sized belts with a correct profile and in sufficient numbers to drive without slip and undue tension. Align both pulleys accurately in such a way that the center of both pulleys are in line.
Multi V belt drives need to be matched sets.

A belt pulley, which is either too small or too wide, or too high, a tension on the belt may damage the bearing or cause a shaft break.
In case of doubt, consult the supplier.

4.2.2. Spur Gear Drives

The motor and the driven machine have to be positioned in such a way that the two gears mesh correctly. The motor should then be fixed with dowels.

4.3. Shaft couplings and pulleys etc.

Remove the corrosion protection from the shaft extension and the coupling elements. The coupling parts, belt pulleys and gear wheels need to be dynamically balanced and fit easily on the shaft and to be provided with good fitting keyway.

In the factory the rotor has already been dynamically balanced including a half key in the shaft.

The dimension and the tolerances of the shaft extension and the key are indicated on the motor dimension sheet.

Assembling the coupling elements has to been done with great care. Careless handling may damage the bearings, shaft or end shields.

Do not file or emery the shaft to achieve a fit!

hen fitting pulleys couplings or bearings, we recommend using heat to elements; therefore the part to be mounted has to be heated till ± 80 degrees above the ambient temperature.

A large washer and set screw can be useful for pushing on pulleys using the tapped hole in the shaft. Only use proper tools for removing the above mentioned parts e.g. pulley drawers.

5. ELECTRICAL CONNECTION

5.1. General information

On delivery the motor will rotate clockwise looking at the drive when the phases L1, L2 and L3 are connected respectively to the connection terminals U1, U2 and U3.
Exchanging any two-phase lines can change the direction of rotation.
When a motor is only suited for one direction of rotation, it is indicated with an arrow on the motor fan cowl.

Connecting cables must conform to IEE regulations, as must earthing requirements.
Line fuses only protect the cables in case of short–circuiting and do not constitute a safeguard against the overheating of the winding caused by overload. Therefore it is recommended that a motor starter and overload is fitted, giving single phasing and overload protection.

5.2. Circuit

Normally our motors are provided with a terminal box with six connections, to which six leads from the winding are connected either in a delta connection or in a star connection by means of connection links.

Usually two voltages are indicated on the rating–plate of these motors, which means that the motor can be connected to a circuit having one of these voltages.
If the mains voltage is corresponding with the lowest indicated voltage, the winding has to be connected in delta connection (see figure 1); if it is corresponding with the highest indicated voltage, the winding has to be connected in star connection (see figure 2).

A motor with e.g. 230/400 V on its rating–plate is suited to be switched on directly, on a circuit with a voltage of 230 V between phases with the winding connected in a delta connection, or on a circuit with a voltage of 400 V with the winding connected in a star connection.

But if the motor is switched on with a star–delta starter the motor is only suited for a mains voltage on the rating-plate, this is the delta voltage. In this case, the connection strips on the terminal box have to be removed when the motor is connected; the star and delta connection will be made successively in the starter during the run up.
If only one voltage is indicated on the rating–plate together with the delta sign, the motor can be switched on directly at the indicated voltage or with a star/delta starter.

Pole change motors (for two or more speeds) are connected according to a diagram sent together with the motor.

6. PUTTING INTO SERVICE

Before putting a motor into service, one should check especially when the motor has not been used for a long time that the insulation resistance of the winding is sufficient. The insulation resistance has to be at least 10 meg/ohms on a 1000V megger.
If the insulation resistance is not high enough, the motor has to be dried out and revarnished or rewound.
Check all connections and adjust the thermal protection units to the correct current. Switch the motor on in a no load state to determine the direction of rotation. Load the motor gradually and check whether it runs without vibration.

The motor can be used under deviation of the main voltage ± 5% or frequency of max. ± 2% compared to the nominal frequency or nominal voltage, in compliance with the international regulations for electric machines.

7. MAINTENANCE

The totally enclosed and fan cooled three phase squirrel cage induction motors require very little maintenance.
Nevertheless it is recommended to check the motor regularly in order to prevent a breakdown caused by dust, moisture, vibrations, too much or too little greasing.

7.1. Dust

The outer parts of the totally enclosed motors, especially the cooling ribs or cooling channels, have to be kept as clean as possible in order not to obstruct the cooling air from the fan extracting the heat from the motor frame.

7.2. Moisture

Motors, which are not often run, should be started from time to time to prevent moisture affecting the windings in the long term.

7.3. Wear & vibration

To prevent abnormal wear & vibration, one should:
a. take care that the tension of the belt or the chain is not too high;
b. check whether the mounting of directly coupled machines is correct;
c. Check whether the foundation bolts the bolts to fasten the motor and the slide rails are tight.

7.4. Greasing

Before they leave the factory, the bearings of the HALTER Motors are filled with a high quality Lithium base grease.

The sizes 56 up to and including 250 are provided with shielded/sealed bearings (ZZ-C3), witch have been filled with life-time grease by the manufacture of the bearings.

Motors with sealed bearings and no re-lubrication system require no maintenance other than checking for noise & temperature during their lifetime.
Sizes 280 up to and including 400, has been provided with a permanent lubrication system containing a grease valve.
The lubrication must take place when the machine is running.
The old grease is ejected from the grease valve thus maintaining the correct level and avoiding overfilling which would be harmful.

7.5. Replacement of ball or roller-bearings

When a bearing has to be replaced, the old bearing has to be removed from the shaft with proper tools in order not to damage the shaft. Thereupon the bearing location on the shaft has to be cleaned and checked thoroughly.

To fit a new bearing correctly, heat to 80 – 90 degrees centigrade with an electric induction heater, then slip quickly onto the shaft up to the stop. In the case of a roller bearing only fit the inner race in this manner.

A suitable sleeve may be used to help by tapping gently to seat the bearing home. Note that under no circumstances must a bearing be driven home cold with excess force. We must also stress that pressure must not be applied to the outer race of a ball bearing.

Do not mount the end shield until the bearing has cooled down.

8. Bearing type and bearing inside diameter

! Only for standard motors

HALTER Motor type	Poles	type of bearing Driven end	Non Driven end	Bearing inside diameter(mm)
DDA-56	2/4	6201 ZZ C3	6201 ZZ C3	12/12
DDA-63	2/4	6202 ZZ C3	6202 ZZ C3	15/15
DDA-71	2/4/6	6203 ZZ C3	6202 ZZ C3	17/15
DDA/DDG-80	2/4/6/8	6204 ZZ / 6204 ZZ C3	6204 ZZ / 6203 ZZ C3	20/20/20/17
DDA/DDG-90	2/4/6/8	6205 ZZ / 6205 ZZ C3	6205 ZZ / 6204 ZZ C3	25/25/25/20
DDA/DDG-100	2/4/6/8	6206 ZZ / 6206 ZZ C3	6206 ZZ / 6206 ZZ C3	30/30/30/30
DDA/DDG-112	2/4/6/8	6306 ZZ / 6306 ZZ C3	6306 ZZ / 6306 ZZ C3	30/30/30/30
DDA/DDG-132	2/4/6/8	6308 ZZ / 6308 ZZ C3	6308 ZZ / 6308 ZZ C3	40/40/40/40
DDG-160	2/4/6/8	6309 ZZ C3	6309 ZZ C3	45/45
DDG-180	2/4/6/8	6311 ZZ C3	6311 ZZ C3	55/55
DDG-200	2/4/6/8	6312 ZZ C3	6312 ZZ C3	60/60
DDG-225	2/4/6/8	6313 ZZ C3	6313 ZZ C3	65/65
DDG-250	2/4/6/8	6314 ZZ C3	6314 ZZ C3	70/70
DDG-280	2	6314 C3	6314 C3	70/70
DDG-280	4/6/8	6317 C3	6317 C3	85/85
DDG-315	2	6317 C3	6317 C3	85/85
DDG-315	4/6/8	6319 C3	6319 C3	95/95
DDG-355	2	NU317	6317 C3	85/85
DDG-355	4/6/8	NU322	6320 C3	110/100
DDG-400	4/6/8	NU326	6326 C3	130/130

Figure 1

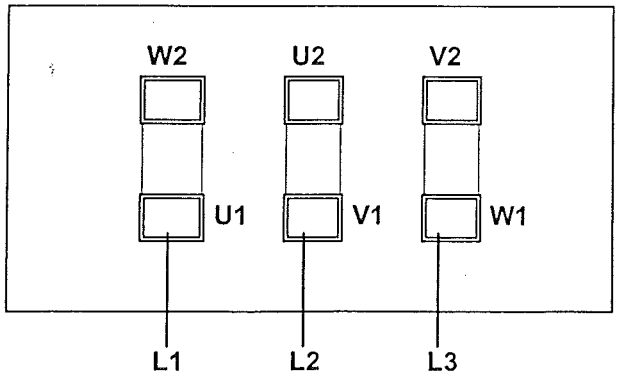
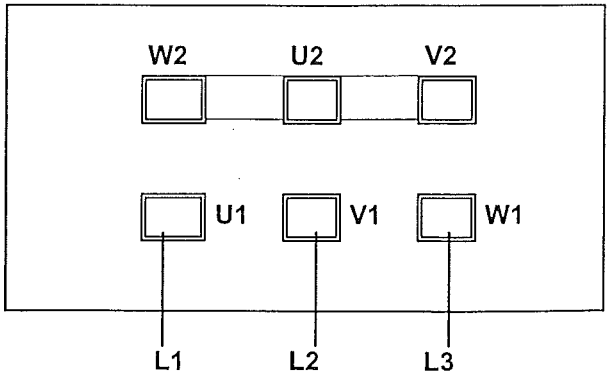


Figure 2



9 Grease-interval Bearings

By the term "greasing interval" we mean the number of working hours after which the bearing lubricant has to be replaced.

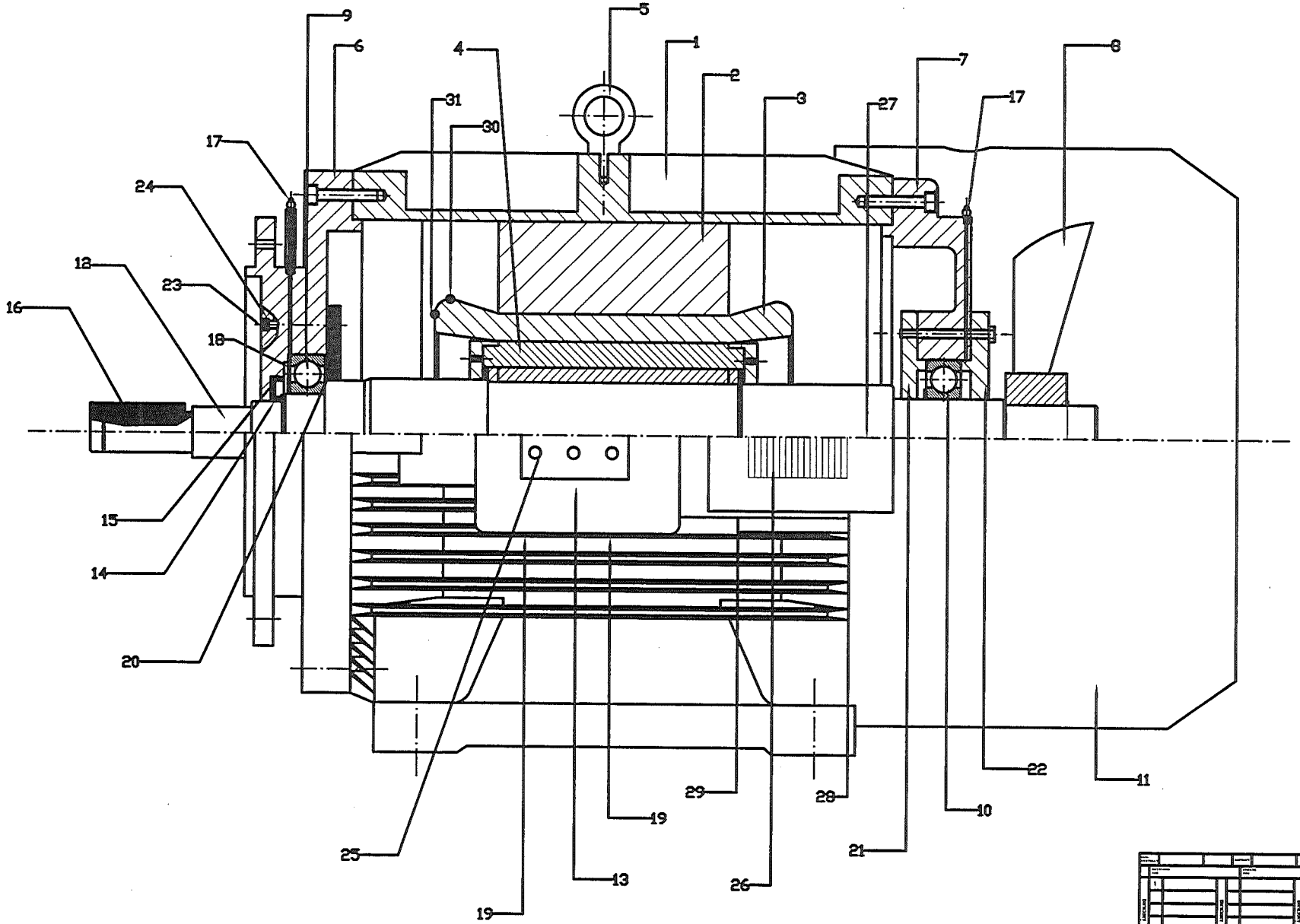
Electric motors have such a wide range of application that they must cope with many adverse conditions as for instance dust, moisture, vibration, temperature, chemicals, marine atmosphere and of course, the mounting position and loading of the driven machine.
Generally we can say lubrication life is a product of time, speed and the bearing size. Due to the impact of all these factors, it is practically impossible to determine any exact values that are valid under all circumstances. Nevertheless it is necessary to provide at least some guidelines concerning greasing to the user.

Under normal load and environmental conditions the quality of the grease ensures proper operation of the motor for about 10000 service hours with 2-pole designs and 20000 service hours with multi pole designs. If not otherwise agreed upon the grease need not be refilled during this period. Nevertheless the condition of the grease filling should be occasionally checked also within the said lubricating intervals.
The stated service hours are only current under operation with rated speed. For relubrication thoroughly clean the bearings with a suitable solvent and use the same or substitute grades specified by the motor manufacturer. Bear in mind, however, that the bearings should be filled only up to about 2/3 of their free space as a complete filling of the bearings and bearing covers results in an increased bearing temperature and therefore in increased wear. For bearings with relubricating facility regrease at the grease fitting with the motor running according to the grease amount required for the motor in case. The relubrication intervals should be looked up in the following table:

A chemically aggressive environment, extreme moistness, strong vibrations, high or low ambient temperatures are not normal circumstances and such conditions must be taken into account.

Motortype	Bearing	Grease	Regreasing	Amount
DDG 200LA2	2 x 6312 – C3	Lubcon Turmogrease CAN 1802	2.000h	10 – 15 g

Motor Type:	DDG200LA2
Customer:	Sefco AG
Motor – No:	05038484
Output Power:	30,0 Kw
Speed:	2940 min/1
Voltage:	400 / 690 V
Frequency:	50 Hz
Full - load power factor:	0,90
Connection:	Delta
Rated current at 400 / 690 V	52,7 / 30,4 A
Full – load efficiency	91,5
Protection class	IP 55
Insulation class	F
Operating mode	S1
Constuction type	IMB 35
Weight	220 kg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Motor – No. 05038484

DDG 200 LA2

Spare - List

Pos.	indication	marking	pieces	Supplier/norm
1	Stator – frame	DDG200LA2	1	Halter – Germany
2	Stator	DDG200LA2	1	Halter – Germany
3	Winding	DDG200LA2	1	Halter – Germany
4	Rotor	DDG200LA2	1	Halter – Germany
5	Eye – bolt	M20	1	DIN580
6	Drive – end –shield	02 / 2314 – 2	1	B5/350
7	None – drive-end shield	DDG200LA2	1	LS – BS
8	Fan	DDG200LA2	1	Halter – Germany
9	Drive-end-bearing	6312 – C3	1	Halter – Germany
10	None-drive-end-bearing	6312 – C3	1	Halter – Germany
11	Fan cowl	DDG200LA2	1	Halter – Germany
12	Shaft	03 / 2389 – 3	1	C45
13	Terminal box	DDG200LA2	1	Halter - Germany
14	Protect – tin	No. 99196	1	Eriks
15	Sealing – ring	50 x 70 x 8	1	Viton
16	Key	10 x 8 x 41	1	C45
17	Lubrication – nipple	M6	2	H1
18	Bearing spring washer	KAS 129	1	Halter – Germany
19	Cable gland	M40 x 1,5	2	PVC
20	Drive-end inner bearing cap	DDG200LA2	1	Halter – Germany
21	Non-drive-end inner bearing cap	DDG200LA2	1	Halter – Germany
22	None-drive-end outer bearing cap	DDG200LA2	1	Halter – Germany
23	Drive-end-outer bearing cap screw	M8 x 70	3	DIN 931
24	Screw – sealing ring	M8	3	TM 108
25	Terminal Board	DDG200LA2	1	Halter - Germany
26	Clip	AKZ 4	16	Weidmüller - Germany
27	Terminal box survey	DE132	1	Halter – Germany
28	Cable gland	M12 x 1,5	2	Halter - Germany
29	Cable gland	M16 x 1,5	2	Halter – Germany
30	Temperature detector	155°	3	Halter – Germany
31	Temperature detector	130°	3	Halter – Germany

Certificates

sefco — Delivery Certificate

Ref. No.: 05.041/1

Customer:	Air Liquide AGS GmbH - 4500023387 - ASU Košice - K70101 P48001				
Pump Type:	C-19/G2/EM-30				
Motor:	Manufacture : Halter	Type: DDG200LA2	No.: 05038484		
	P: 30 [KW]	U: Δ 400 [V]	I: 52,7 [A]		
	n_{range}: 2940 / f_{range}: [Hz]	$f_{field\ weakening\ point}$: 50 [Hz]			
Gearbox:	Manufacture : Sefco	Type: G2	Nr: 05.041	i: 2,03:1	
Pressure Test (EN 13275:2000/§5.2.2)	Hydraulic pressure test of pump casing completed at 60 bar for 5 min				
	Date: 18.01.05	Signature: CP			
Degreasing (EN 12300:1999)	Pump cold end has been degreased with Trichlorethylene for LOX Operation.				
	Date: 26.04.05	Signature: JMG			

LIN-Test

γ	0.776 [daN/l]

Q [l/min]	p_{suct} [barg]	p_{del} [barg]	Δp [bar]	ΔH [m]	P_{el} 1) [kW]	$P_{mech.}$ [kW]	η_{pump} [%]	T [°C]	n [rpm]	$f_{Converter\ at\ operation}$ [Hz]
80	1.32	16.10	14.78	190.5	12.1			-192.2	6055	50
100	1.35	16.15	14.80	190.7	12.6			-192.2	6055	50
150	1.34	16.30	14.96	192.8	14.0			-192.2	6055	50
170	1.35	16.40	15.05	193.9	14.7			-192.2	6055	50
200	1.40	16.40	15.00	193.3	15.6			-192.2	6055	50
250	1.39	15.90	14.51	187.0	17.0			-192.2	6055	50
300	1.39	14.45	13.06	168.3	18.9			-192.2	6055	50

1) P_{el} measured at converter inlet

Mechanical shaft seal

Preloading by Lead - Bushing	:	1.40 mm
Preloading by Rotating Sealring	:	2.58 mm
Total Preloading	:	3.98 mm

Date: 27.04.05 Signature: JMG

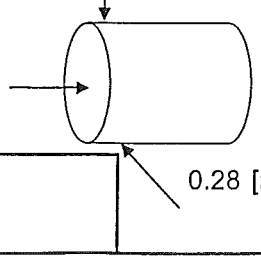
Remarks: Seal leakage RTD's, and motor winding PTC thermistors: functional check OK

Impeller ∅ at test:	176 mm
Tip width:	4,5 mm
With Inducer	yes
With Blade- ring	yes
Diffusor type:	150
Orifice ∅ :	

Vibrations: (at DE motorshield) 0.3 [mm/s]

(at 200 l/min)

0.32 [mm/s]



0.28 [mm/s]

Sound pressure level (at 200 l/min)

84 dB(A)

Date : 24.05.05 Signature: B. Gutknecht

Angst+Pfister

Suction hose item 2 on drawing
no 05.041/14

Angst+Pfister AG
Thurgauerstrasse 66
CH-8052 Zürich
Postfach Hardhofstrasse 31
Telefon +41 1 306 61 11
Telefax +41 1 302 18 71

Angst+Pfister SA
Route du Bois-des-Frères 52
Case postale 19
CH-1219 Genève-Le Lignon
Téléphone +41 22 979 28 00
Téléfax +41 22 979 28 78

Lieferadresse / Adresse de livraison /
Delivery address:
Angst+Pfister AG – Logistikcenter

CH-8424 Embrach
Telefon +41 1 866 66 11
Telefax +41 1 866 66 22

Bankverbindung:
CS, 8050 Zürich, Kto. 570500-91, BC 4857
UBS, 8050 Zürich, Kto. 803.917.01J, BC 269

Customer No. 111219

Sefco AG
Herr F. Brodesser
Wuhrmattstr. 15

CH-4103 Bottmingen

Sefco AG
Maschinen-Anlagen
Wuhrmattstr. 15

CH-4103 Bottmingen

Official in Charge: Frau Ch. Schweri
Tel. direct: 044 306 64 05
23.05.05 13:07:05 /

Inspection certificate EN 10204-3.1 B FT-A05.292282

Your reference			Our reference
Herr Brodesser / Best.Nr. 05/2629			Frau Ch.Schweri
Job No.	**Order Date**	**Delivery Date**	**VS**
FT-A05.292282	11.03.2005	25.04.2005	A+P Zürich

Order specification/acceptance requierements:	
Test item:	Our part-no 80.0003.6171 Metal hose assembly ASSIWELL® 100 1.4541 DN 65, U1, NL 400 mm Fitting 1: welding flange DN 65 PN 6 Fitting 2: welding flange DN 65 PN 6 Your part/drawing-no. 4 14870
Quantity:	2 pieces
Marking:	A+P, ASSIWELL® 100 1.4541, 05/05, PS 6, A05.292282, 414870
Test:	Tightness Test (+20° C): 2 bar air / Duration: 1 min. Pressure Test (+20° C): 10 bar water / Duration: 1 min.
Test result:	The hose(s) meet(s) the requirements.
Remarks:	

Material certificate

Element	Material	Ladle No.
Corrugated hose	1.4541	E41208/E41870
Braid	1.4301	V3933
Welding Flange DN 65 PN 6	1.4435	E31602

We hereby certify, that the material described above has been tested and complies with the terms of the order contract.

Best regards
Angst + Pfister AG

ppa. H. Birmele

i.A. Ch. Schweri

Angst+Pfister

Discharge hose item 10 on drawing
nº 05.041/14

Angst+Pfister AG
Thurgauerstrasse 66
CH-8052 Zürich
Postfach Hardhofstrasse 31
Telefon +41 1 306 61 11
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Angst+Pfister SA
Route du Bois-des-Frères 52
Case postale 19
CH-1219 Genève-Le Lignon
Téléphone +41 22 979 28 00
Téléfax +41 22 979 28 78

Lieferadresse / Adresse de livraison /
Delivery address:
Angst+Pfister AG – Logistikcenter

CH-8424 Embrach
Telefon +41 1 866 66 11
Telefax +41 1 866 66 22

Bankverbindung:
CS, 8050 Zürich, Kto. 570500-91, BC 4857
UBS, 8050 Zürich, Kto. 803.917.01J, BC 269

Customer No. 111219

Sefco AG
Herr F. Brodesser
Wuhrmattstr. 15

CH-4103 Bottmingen

Sefco AG
Maschinen-Anlagen
Wuhrmattstr. 15

CH-4103 Bottmingen

Official in Charge: Frau Ch. Schweri
Tel. direct: 044 306 64 05
23.05.05 11:50:47 /

Inspection certificate EN 10204-3.1 B FT-A05.292282

Your reference			Our reference
Herr Brodesser / Best.Nr. 05/2629			Frau Ch.Schweri
Job No.	**Order Date**	**Delivery Date**	**VS**
FT-A05.292282	11.03.2005	20.05.2005	A+P Zürich

Order specification/acceptance requierements:	
Test item:	Our part-no 80.0002.1515 Metal hose assembly ASSIWELL® 100 1.4541 DN 40, U1, NL 400 mm-PED Fitting 1: welding flange DN 40 PN 40 Fitting 2: welding flange DN 40 PN 40 Your part/drawing-no. 4 14824
Quantity:	1 pieces
Marking:	SB/A+P C540235-03, PS 40, DN 40, -196/+20°C, 05/2005, CE0091, 414824
Test:	Pressure and Tightness Test: 60 bar air Duration: 1 min.
Test result:	The hose(s) meet(s) the requirements.
Remarks:	

Material certificate

Element	Material	Ladle No.
Corrugated hose	1.4541	G32040
Braid	1.4301	V3871
Welding Flange DN 40 PN 40	1.4435	502744

We hereby certify, that the material described above has been tested and complies with the terms of the order contract.

Best regards
Angst + Pfister AG

ppa. H. Birmele

i.A. Ch. Schweri

Konformitätserklärung

nach Druckgeräterichtlinie 97/23/EG

für ein Druckgerät

Der Hersteller

Senior Berghöfer GmbH

Frankfurter Str. 199
D-34121 Kassel

erklärt hiermit, dass das Druckgerät

Beschreibung / Verwendungszweck:	Rohrleitung/ Edelstahl-Wellschlauch	
Typ-, Serien-, Fabrikationsnummer:	MW22 U1 // C 540235-03 // 414824	
max. zulässiger Druck PS:	40,00	bar
zulässige max./min. Temperatur TS:	+20/-196	°C
Nennweite DN:	40	
Herstelljahr.	05/2005	
Aufgebrachter Prüfdruck PT:	60	bar
Prüfmedium:	Wasser	

mit der Druckgeräterichtlinie 97/23/EG übereinstimmt.

Angewandte Konformitätsbewertungsverfahren:	Modul A1
Angewandte Normen und techn. Spezifikationen:	AD 2000, DIN EN 287-1, DIN EN 288
Weitere angewandte EG-Richtlinien:	keine

Eingeschaltete benannte Stellen:

Überwachung QS-System:	--
Prüfung / Überwachung / Kontrollen während der Fertigung:	TÜV Hessen (0091)

Zugehörige Bescheinigungen:

EG-Entwurfsprüfbescheinigung Nr.:	./.
EG-Baumusterprüfbescheinigung Nr.:	./.
EG-Konformitätsbescheinigung Nr.:	./.

Ort, Datum:
Kassel, 19.05.2005

Unterschrift Geselle

CERTIFICATE of CONFORMITY

Theo Halter GmbH
Elektromotoren
Gleisstrasse 36

68766 Hockenheim

The electrical apparatus:

Three phase asynchronous squirrel cage motors series:

DDG / DDA

are in conformity with the instructions of:

- 73 / 23 EWG
Low Voltage Directive amended by: RL 93 / 68 / EWG

- 89 / 336 / EWG
Directive on Electromagnetic Compatability
amended by: RL 91 / 263 / EWG, 92 / 31 / EWG and 93 / 68 / EWG

The conformity with the instructions of these directives is proved by the observation of the following standards:

1. IEC Publ. 34-1	Rating and performance NEN 3173; 1991
2. IEC Publ. 34-5	Degrees of protection (IP code) NEN-EN 60034-5
3. IEC Publ. 34-7	Classification of types of construction and mounting arrangements (IM code) NEN-EN 60034-7
4. IEC Publ. 34-9	Noise limits NEN-EN 60034-9
5. IEC Publ. 34-14	Limits of mechanical vibrations NEN 10034-14
6. IEC Publ. 34-8	Terminal markings and direction of rotation NEN 2248
7. IEC Publ. 72-1	Relationships of the dimensions and output rating of totally enclosed fan cooled 3-phase cage indution motors.

Hockenheim, 28.11.02
Theo Halter GmbH, Elektromotoren

T. Noor-Herbert ppa. F. Heinemann

This certificate attests to the conformity with the named directives, however, it is not a guarantee of properties in the meaning of product liability.