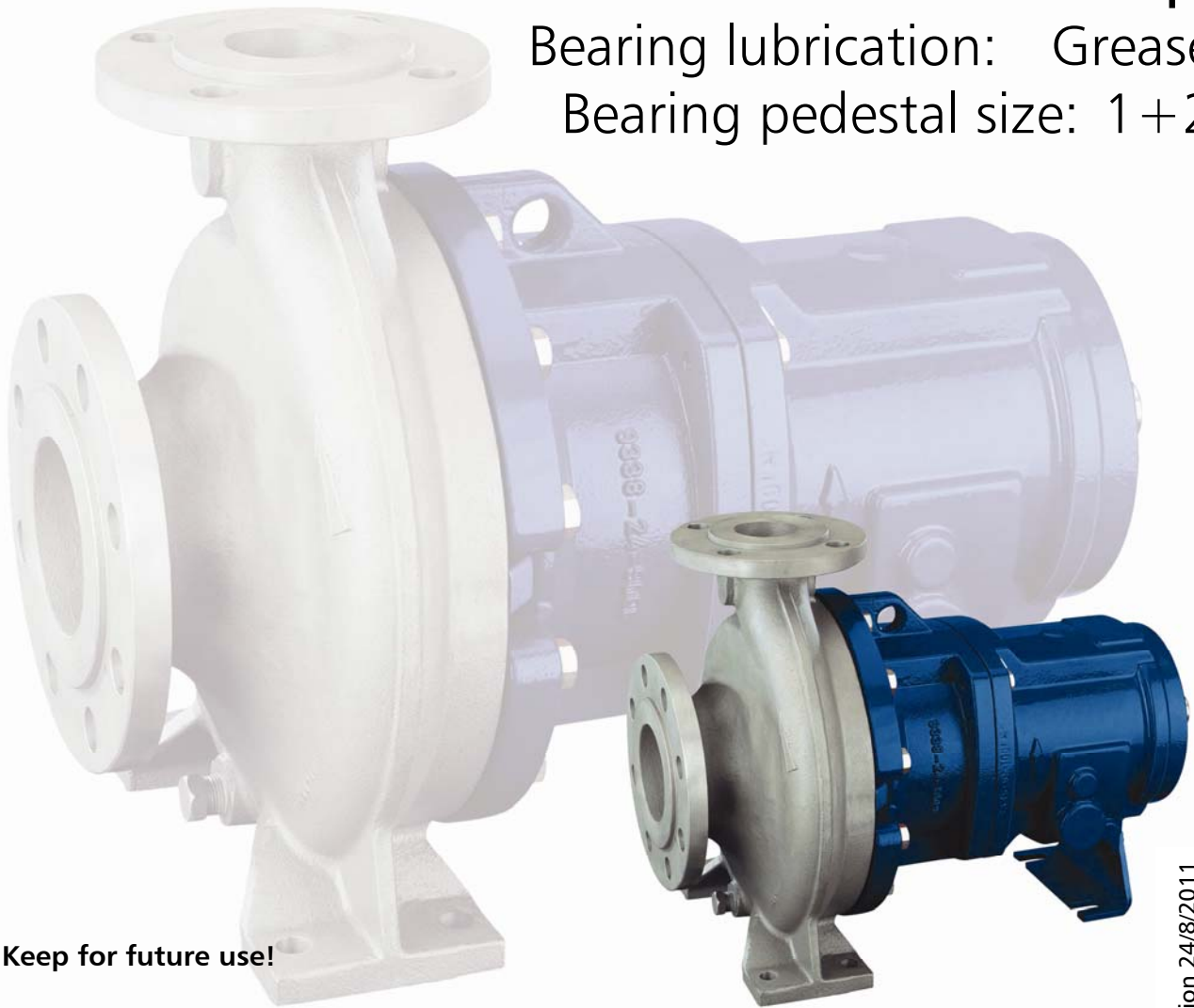




Magnetic Drive Chemical Process Pump

Bearing lubrication: Grease

Bearing pedestal size: 1 + 2



Keep for future use!

This operating manual must be strictly observed before transport, installation, commissioning etc.

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Engineered for life



Industrial Process Pump Safety Manual

IMPORTANT SAFETY NOTICE

To: Our Valued Customers

User safety is a major focus in the design of our products. Following the precautions outlined in this manual will minimize your risk of injury.

ITT Goulds pumps will provide safe, trouble-free service when properly installed, maintained, and operated.

Safe installation, operation, and maintenance of ITT Goulds Pumps equipment are an essential end user responsibility. This *Pump Safety Manual* identifies specific safety risks that must be considered at all times during product life. Understanding and adhering to these safety warnings is mandatory to ensure personnel, property, and/or the environment will not be harmed. Adherence to these warnings alone, however, is not sufficient — it is anticipated that the end user will also comply with industry and corporate safety standards. Identifying and eliminating unsafe installation, operating and maintenance practices is the responsibility of all individuals involved in the installation, operation, and maintenance of industrial equipment.

Please take the time to review and understand the safe installation, operation, and maintenance guidelines outlined in this Pump Safety Manual and the Instruction, Operation, and Maintenance (IOM) manual. Current manuals are available at www.gouldspumps.com/literature_ioms.html or by contacting your nearest Goulds Pumps sales representative.

These manuals must be read and understood before installation and start-up.

For additional information, contact your nearest Goulds Pumps sales representative or visit our Web site at www.gouldspumps.com.



SAFETY WARNINGS

Specific to pumping equipment, significant risks bear reinforcement above and beyond normal safety precautions.

 **WARNING**

A pump is a pressure vessel with rotating parts that can be hazardous. Any pressure vessel can explode, rupture, or discharge its contents if sufficiently over pressurized causing death, personal injury, property damage, and/or damage to the environment. All necessary measures must be taken to ensure over pressurization does not occur.

 **WARNING**

Operation of any pumping system with a blocked suction and discharge must be avoided in all cases. Operation, even for a brief period under these conditions, can cause superheating of enclosed pumpage and result in a violent explosion. All necessary measures must be taken by the end user to ensure this condition is avoided.

 **WARNING**

The pump may handle hazardous and/or toxic fluids. Care must be taken to identify the contents of the pump and eliminate the possibility of exposure, particularly if hazardous and/or toxic. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks.

 **WARNING**

Pumping equipment Instruction, Operation, and Maintenance manuals clearly identify accepted methods for disassembling pumping units. These methods must be adhered to. Specifically, applying heat to impellers and/or impeller retaining devices to aid in their removal is strictly forbidden. Trapped liquid can rapidly expand and result in a violent explosion and injury.

ITT Goulds Pumps will not accept responsibility for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this Pump Safety Manual or the current IOM available at www.gouldspumps.com/literature.

SAFETY

DEFINITIONS

Throughout this manual the words **WARNING**, **CAUTION**, **ELECTRICAL**, and **ATEX** are used to indicate where special operator attention is required.

Observe all Cautions and Warnings highlighted in this Pump Safety Manual and the IOM provided with your equipment.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Example: Pump shall never be operated without coupling guard installed correctly.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Example: Throttling flow from the suction side may cause cavitation and pump damage.




ELECTRICAL HAZARD

Indicates the possibility of electrical risks if directions are not followed.

Example: Lock out driver power to prevent electric shock, accidental start-up, and physical injury.



















When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. If there is any question regarding these requirements or if the equipment is to be modified, please contact an ITT Goulds Pumps representative before proceeding.



























Example:  Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.



















GENERAL PRECAUTIONS

WARNING

A pump is a pressure vessel with rotating parts that can be hazardous. Hazardous fluids may be contained by the pump including high temperature, flammable, acidic, caustic, explosive, and other risks. Operators and maintenance personnel must realize this and follow safety measures. Personal injuries will result if procedures outlined in this manual are not followed. ITT Goulds Pumps will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual and the IOM provided with your equipment.

General Precautions		
WARNING		NEVER APPLY HEAT TO REMOVE IMPELLER. The use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.
WARNING		NEVER use heat to disassemble pump due to risk of explosion from trapped liquid.
WARNING		NEVER operate pump without coupling guard correctly installed.
WARNING	 	NEVER run pump below recommended minimum flow when dry, or without prime.
WARNING	 	ALWAYS lock out power to the driver before performing pump maintenance.
WARNING		NEVER operate pump without safety devices installed.
WARNING	 	NEVER operate pump with discharge valve closed.
WARNING	 	NEVER operate pump with suction valve closed.
WARNING	 	DO NOT change service application without approval of an authorized ITT Goulds Pumps representative.
WARNING		<p>Safety Apparel:</p> <ul style="list-style-type: none"> ♦ Insulated work gloves when handling hot bearings or using bearing heater ♦ Heavy work gloves when handling parts with sharp edges, especially impellers ♦ Safety glasses (with side shields) for eye protection ♦ Steel-toed shoes for foot protection when handling parts, heavy tools, etc. ♦ Other personal protective equipment to protect against hazardous/toxic fluids
WARNING		<p>Receiving:</p> <p>Assembled pumping units and their components are heavy. Failure to properly lift and support equipment can result in serious physical injury and/or equipment damage. Lift equipment only at specifically identified lifting points or as instructed in the current IOM. Current manuals are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps sales representative. Note: Lifting devices (eyebolts, slings, spreaders, etc.) must be rated, selected, and used for the entire load being lifted.</p>

General Precautions		
WARNING	 	Alignment: Shaft alignment procedures must be followed to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.
WARNING	 	Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
CAUTION	 	Piping: Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.
WARNING		Flanged Connections: Use only fasteners of the proper size and material.
WARNING		Replace all corroded fasteners.
WARNING		Ensure all fasteners are properly tightened and there are no missing fasteners.
WARNING	 	Startup and Operation: When installing in a potentially explosive environment, please ensure that the motor is properly certified.
WARNING	 	Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
WARNING	 	Lock out driver power to prevent accidental start-up and physical injury.
WARNING	 	The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.
WARNING	 	If using a cartridge mechanical seal, the centering clips must be installed and set screws loosened prior to setting impeller clearance. Failure to do so could result in sparks, heat generation, and mechanical seal damage.
WARNING	 	The coupling used in an ATEX classified environment must be properly certified and must be constructed from a non-sparking material.
WARNING		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.
WARNING	 	Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
CAUTION	 	The mechanical seal used in an ATEX classified environment must be properly certified. Prior to start up, ensure all points of potential leakage of process fluid to the work environment are closed.

General Precautions		
CAUTION	 	Never operate the pump without liquid supplied to mechanical seal. Running a mechanical seal dry, even for a few seconds, can cause seal damage and must be avoided. Physical injury can occur if mechanical seal fails.
WARNING		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
WARNING	 	Dynamic seals are not allowed in an ATEX classified environment.
WARNING	 	DO NOT operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.
WARNING		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
WARNING		Shutdown, Disassembly, and Reassembly: Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.
WARNING		The pump may handle hazardous and/or toxic fluids. Observe proper decontamination procedures. Proper personal protective equipment should be worn. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
WARNING		Operator must be aware of pumpage and safety precautions to prevent physical injury.
WARNING	 	Lock out driver power to prevent accidental startup and physical injury.
CAUTION		Allow all system and pump components to cool before handling them to prevent physical injury.
CAUTION	 	If pump is a Model NM3171, NM3196, 3198, 3298, V3298, SP3298, 4150, 4550, or 3107, there may be a risk of static electric discharge from plastic parts that are not properly grounded. If pumped fluid is non-conductive, pump should be drained and flushed with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.
CAUTION		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
CAUTION		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

ATEX CONSIDERATIONS and INTENDED USE

Special care must be taken in potentially explosive environments to ensure that the equipment is properly maintained. This includes but is not limited to:

1. Monitoring the pump frame and liquid end temperature.
2. Maintaining proper bearing lubrication.
3. Ensuring that the pump is operated in the intended hydraulic range.

The ATEX conformance is only applicable when the pump unit is operated within its intended use. Operating, installing or maintaining the pump unit in any way that is not covered in the Instruction, Operation, and Maintenance manual (IOM) can cause serious personal injury or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT Goulds Pumps. If there is any question regarding the intended use of the equipment, please contact an ITT Goulds representative before proceeding. Current IOMs are available at www.gouldspumps.com/literature_ioms.html or from your local ITT Goulds Pumps Sales representative.

All pumping unit (pump, seal, coupling, motor and pump accessories) certified for use in an ATEX classified environment, are identified by an ATEX tag secured to the pump or the baseplate on which it is mounted. A typical tag would look like this:



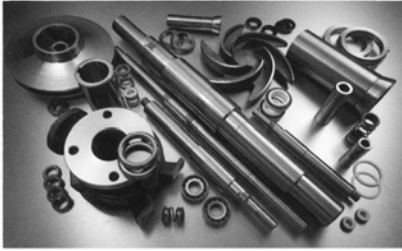
The CE and the Ex designate the ATEX compliance. The code directly below these symbols reads as follows:

- II = Group 2
- 2 = Category 2
- G/D = Gas and Dust present
- T4 = Temperature class, can be T1 to T6 (see Table 1)

Code	Max permissible surface temperature °F (°C)	Max permissible liquid temperature °F (°C)
T1	842 (450)	700 (372)
T2	572 (300)	530 (277)
T3	392 (200)	350 (177)
T4	275 (135)	235 (113)
T5	212 (100)	Option not available
T6	185 (85)	Option not available

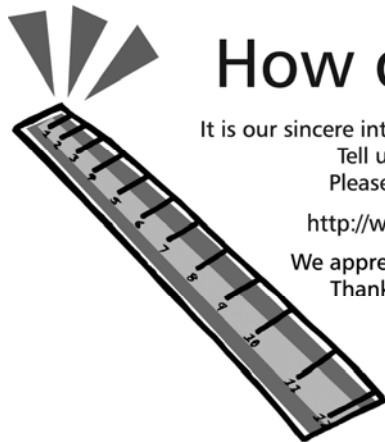
The code classification marked on the equipment must be in accordance with the specified area where the equipment will be installed. If it is not, do not operate the equipment and contact your ITT Goulds Pumps sales representative before proceeding.

PARTS



The use of genuine Goulds parts will provide the safest and most reliable operation of your pump. ITT Goulds Pumps ISO certification and quality control procedures ensure the parts are manufactured to the highest quality and safety levels.

Please contact your local Goulds representative for details on genuine Goulds parts.



How did we measure up?

It is our sincere intention to exceed our customer's expectations on every order.

Tell us whether we achieved our goal on your order.

Please take our customer satisfaction survey online at:

<http://www.ittindustrialproducts.com/feedbacksurvey.html>

We appreciate you taking the time to provide your feedback.

Thank you for buying ITT pumps, parts, and controls.

Visit our Web site at www.gouldspumps.com



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Relevant documents

- ◆ Data sheet
- ◆ Sectional drawing pumps
- ◆ GA drawing
- ◆ Performance curves
- ◆ Spare parts list
- ◆ Operating manual motor *
- ◆ Operating manual coupling *
- ◆ Declaration of conformity for the entire unit to Machine Directive 2006/42/EC
- ◆ Pump to ATEX :
Declaration of conformity for the pump to Directive 94/9/EC *

* if contained in the scope of delivery

1 Technical Data

Manufacturer :

ITT Goulds Pumps
 Millwey Rise Industrial Estate
 Axminster, Devon,
 EX13 5HU
 UK
 Tel : +44 (0)1297-639100
 Fax : +44 (0)1297-630476

Designation :

Model ICM Magnetic Chemical Process Pump,
 bearing lubrication: grease.

Model ICMP Magnetic Chemical Process Pump for
 high pressure / high temperature appli-
 cations, with center-line mounted cas-
 ing, bearing lubrication: grease.

Technical specifications to ISO 15783 and
 DIN ISO 5199

Connecting dimensions to ISO 2858 / DIN EN 22858

Flange connecting dimensions :
 DIN EN 1092-2, type B
 (ISO 7005-2, type B) PN 16

ATEX 100a Directive 94/9/EC
 Machine Directive 2006/42/EC

Materials :

Standard ICM/ICMP: Stainless steel (1.4408),
 Optional ICM: Ductile cast iron/ cast iron, Du-
 plex, Hastelloy C, titanium
 Optional ICMP: Steel/cast iron, Duplex, Hastel-
 loy C, titanium

Flow rates : up to 340 m³/h (at 2900 rpm)

Delivery heads : up to 150 mLC (at 2900 rpm)

Housing discharge pressure :

ICM 16 bar
 (max. 25 bar with 65-40-315, 50-32-315 and 80-50-315)

ICMP 25 bar

Temperature range : -40° C to +180° C

With temperatures up to 280° C oil bath lubrication
 has to be used

Note: Consult the manufacturer for higher pressures
 and lower or higher temperatures.

Temperature classes : see [Section 2.5.6](#)

Sizes:

Group 1	Group 2.1	Group 2.2
40-25-160*	100-65-160	40-25-250*
50-32-160	125-80-160	50-32-250
65-40-160	100-65-200	65-40-250
80-50-160	125-80-200	80-50-250
40-25-200*	125-100-200	100-65-250
50-32-200		125-80-250
65-40-200		50-32-315*
80-50-200		65-40-315
		80-50-315

* Low-Flow sizes :
 not included in ISO 2858 / DIN EN 22858
 not as model ICMP

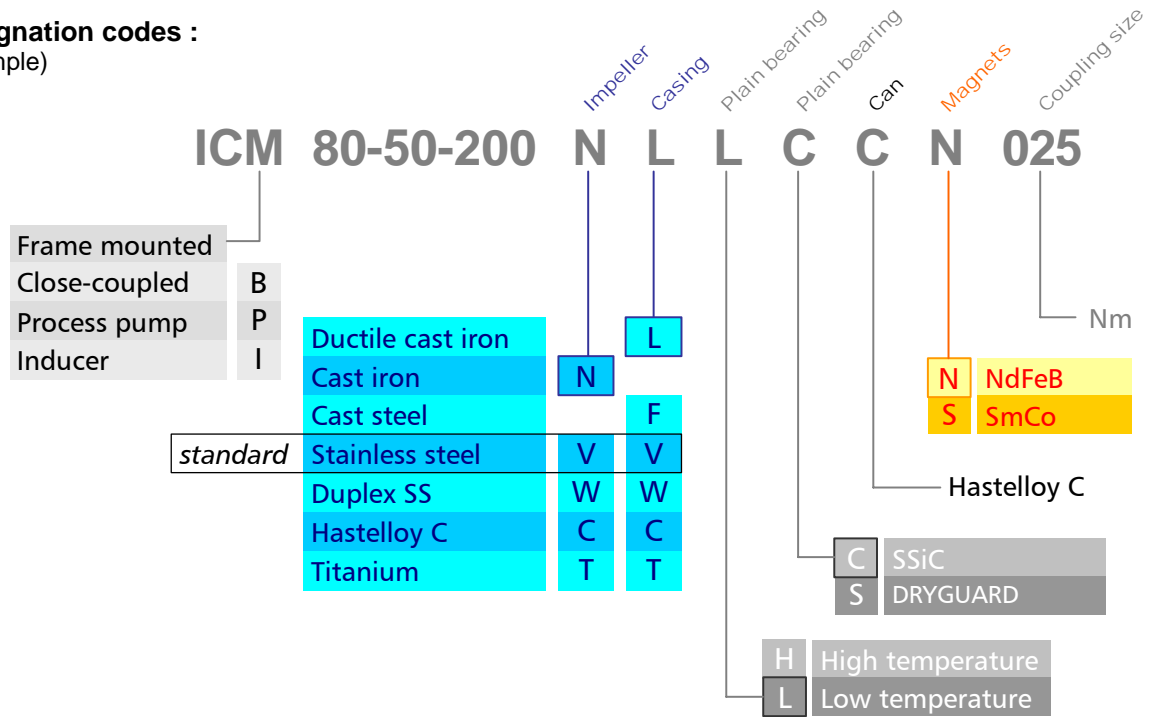
Weight :

See installation drawing

Dimensions :


See installation drawing

Designation codes :
 (example)



1.1 Intended use

The pump is equipped with a permanent-magnet synchronous drive. It is suitable for the leak-free conveyance of aggressive, toxic, ignitable or hot liquids.

 The observance of the specified physical limits is important for perfect functioning and safe operation, especially with regard to explosion protection to prevent potential sources of ignition (see **Section 2.5**):


- ◆ It must be ensured that the pump is always filled with liquid during operation.
- ◆ The flow rate must lie between 0.3 and 1.1 Q_{opt}. It is necessary to consult the manufacturer for operations outside this range. The specified maximum operating temperature must not be exceeded. See **Section 2.5.6**.
- ◆ The manufacturer must be consulted in the event of entrainment of gas or solids in order to avoid a lack of lubrication and dry-running.
- ◆ The plant NPSH value (NPSHA) must be 0.5 m higher than the NPSH value of the pump (NPSHR). **See Section 5.4.1**.

Inadmissible modes of operation, even for a short period, may result in serious damage to the unit.



In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

Furthermore, reference is made in this connection to the Directive 95/C332/06 (ATEX 118a) which contains the minimum regulations for improving the occupational health and safety of the workers who may be at risk from an explosive atmosphere.

 This unit must not be operated above the values specified in the data sheet as regards the liquid to be conveyed, flow rate, speed, density, delivery head and operating temperature as well as the motor rating.

The instructions contained in the operating manual or contract documentation must be observed; if necessary consult the manufacturer.

All important features are documented in the data sheet included in the scope of delivery.

In the event of operating conditions other than those described in the data sheet, the following are to be checked again :

- ◆ design of the pump
- ◆ design of the accessories
- ◆ resistance of the materials.

1.2 Tightening torques

Screws greased, tighten in diametrically opposite sequence

Housing screws 901/3

Pump size	No. x size	Nm
Group 1		
40-25-160	8 x M12	48
50-32-160	8 x M12	48
65-40-160	8 x M12	48
80-50-160	8 x M12	48
40-25-200	12 x M12	48
50-32-200	12 x M12	48
65-40-200	12 x M12	48
80-50-200	12 x M12	48
Group 2.1		
100-65-160	12 x M12	48
125-80-160	12 x M12	48
100-65-200	12 x M12	48
125-80-200	12 x M12	48
125-100-200	12 x M12	48
Group 2.2		
40-25-250	8 x M16	119
50-32-250	8 x M16	119
65-40-250	8 x M16	119
80-50-250	8 x M16	119
100-65-250	8 x M16	119
125-80-250	8 x M16	119
50-32-315	16 x M16	119
65-40-315	16 x M16	119
80-50-315	16 x M16	119

Pipe screws, flanges to DIN/ISO

DN	No. x size	Nm
25	4 x M12	12
32	4 x M16	18
40	4 x M16	22
50	4 x M16	30
65	4 x M16	40
80	8 x M16	25
100	8 x M16	40
125	8 x M16	55

Impeller nut 231

	No. x size	Nm
Group 1	1 x M12x1,5	35
Group 2	1 x M16x1,5	70

Plain bearing cartridge screws 901/1

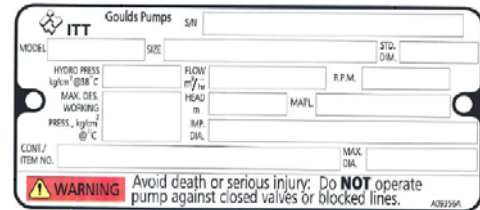
	3 x M8	12 Nm
--	--------	-------

1.3 Type plate, dry-running, CE and housing markings

The stainless steel type plate is firmly riveted to the bearing pedestal:

If the operator attaches his identification, it must be ensured that the pump matches the application in question.

Example of type plate:



CE-marking:



When CE Applies



When CE & ATEX Applies

Housing identification:

The following are visible on the housing according to DIN EN 19:

- ◆ Nominal size
- ◆ Rated pressure
- ◆ Housing material
- ◆ Manufacturer's identification
- ◆ Melt number/Foundry identification
- ◆ Foundry date

2 Notes on safety

This operating manual contains fundamental information which is to be observed during installation, operation and maintenance. **It must be read before installation and commissioning.**

This operating manual must always be available at the place of use of the machine/plant.

In addition to the general notes on safety under the main heading "Safety", special notes on safety are included at other points and must be observed.

Installation, operation and maintenance are to be performed by skilled staff.

The area of responsibility, authority and supervision of the staff must be exactly regulated by the customer.

If the staff do not have the necessary expertise, they are to be trained and instructed.

If necessary, this can be provided by the manufacturer/supplier on behalf of the machine operator.



General hazard symbol! People may be put at risk.



Safety symbol! The pump and its function may be put at risk if this safety symbol is not observed.



EU Symbol! Explosion-protected equipment must be identified for work in explosive atmospheres.



Warning of a magnetic field!



Warning of electric power!



The following warning sign must be used if people with a pacemaker are at risk, e.g. from a strong magnetic field.

It is imperative to observe signs attached directly to the pump / unit, e.g.:

- ◆ Direction of rotation arrow
- ◆ Warning against dry-running

and they are to be kept legible.

Non-observance of the notes on safety may result in the loss of any and all claims for damages.

Non-observance may involve the following hazards :

- ◆ Failure of important functions of the machine/plant.
- ◆ Failure of electronic equipment and measuring instruments due to magnetic fields.
- ◆ Risk to people and their personal property from magnetic fields.
- ◆ Risk to people from electric, mechanical and chemical effects.
- ◆ Risks to the environment through leaks of hazardous substances.



If the unit is used in potentially explosive areas, special attention is to be paid to the sections identified with "Ex" in this operating manual.

2.1 For the customer/operator

The following must be observed:

- ◆ The notes on safety contained in this operating manual,
- ◆ the prevailing regulations on accident prevention,
- ◆ in-house work, operating and safety regulations of the customer.
- ◆ Hot or cold machine parts must be protected by the customer against being touched.
- ◆ No protective facilities may be removed when the machine is in operation.
- ◆ Hazards due to electricity are to be excluded.
- ◆ Leaks of hazardous media (e.g. explosive, toxic, hot) must be removed so that no risk arises for people and the environment. The statutory provisions are to be observed.



Caution when using the units in potentially explosive area! Inadmissible modes of operation must be prevented.

2.2 For maintenance

In principle, work on the unit may only be performed when it is at a standstill.

It is imperative to observe the procedure for stopping the machine described in this operating manual. See **Section 6.3**.

Pumps which convey media which are a health hazard must be decontaminated.

All safety and protective facilities must be remounted or enabled immediately after the end of work.

In the assemble state, the magnetic drives do not cause any risks or have any affect on the environment.



During dismantling and assembly as well as during transport and storage of the magnetic drives as single components, the notes on safety in **Section 7.5.2** must be observed.

The points listed in **Section 6.1** must be followed before recommissioning.

2.3 Conversion work and production of spare parts by the customer

Conversion of or changes to the machine are only admissible after consultation with the manufacturer.

Original spare parts and accessories authorised by the manufacturer serve to enhance safety.

The use of other parts may annul the liability for any resultant consequences.

2.4 Inadmissible modes of operation

The operational safety of the machine supplied is only guaranteed if it is used properly in accordance with **Section 1.1** of this operating manual.

The operating limits specified in the data sheet must under no circumstances be exceeded.

2.5 Explosion protection

If the units are used in potentially explosive areas, the measures and notes in **Sections 2.5.1 to 2.5.8** are imperative to guarantee the explosion protection.

2.5.1 Filling the unit



During pump operation the wetted interior of the pump must always be filled with the liquid medium.

This prevents any explosive atmosphere and the risk of dry-running.



If the customer cannot ensure this, appropriate monitoring facilities must be provided.



All auxiliary, heating and cooling systems must also be carefully filled.

2.5.2 Special operating conditions



In the standard design the can chamber and the plain bearings are cooled and lubricated by a flushing flow.

The cooling flow may be interrupted and an inadmissible rise in temperature may occur due to properties of the liquid (e.g. sticking, possibly by an inadmissible ingress of solids, clogging, ingress of gas etc.). Appropriate monitoring facilities are to be provided. See **Section 5.6**.

Operation at $Q < 0.3 Q_{opt}$ is to be avoided as there is a risk of a lack of lubrication or dry-running and therefore the maximum operating temperature might be exceeded.

If the cooling flow is too low or there is none at all, this may lead to an inadmissible rise in temperature on the metallic can owing to eddy current losses.

Operation at $Q > 1.1 Q_{opt}$ is to be avoided as the differential pressure upstream and downstream of the plain bearings could fall so much that this may result in a lack of lubrication or dry-running. Consult the manufacturer for operation with $Q < 0.3 Q_{opt}$ and/or $Q > 1.1 Q_{opt}$.

Overloading, overheating, non-observance of the design data or the incorrect selection of the magnetic drive can lead to the decoupling of the inner and outer magnet assemblies. As a result, eddy currents are induced on the can and the inner and outer magnet assemblies and an inadmissible rise in temperature may occur.

The situation is to be remedied by providing appropriate monitoring facilities. See **Section 5.6**.

The plant NPSH value (NPSHA) must be 0.5 m higher than the NPSH value of the pump (NPSHR) to prevent a lack of lubrication or dry-running of the plain bearings.

2.5.3 Identification

The identification on the pump relates to the pump section. A separate declaration of conformity must be provided for the shaft coupling and motor and for other attachments as well as corresponding identification.

Example of the identification of the pump section: CE Ex II 2 G/D T1-T... .

The identification indicates the theoretically available range of the temperature classes. The admissible temperature depending on the pump design are derived in accordance with **Section 2.5.6**. The same applies to the drive.

For an overall unit (pump, coupling, motor) with various temperature classes, the lowest class in each case applies as follows :

Example 1 : Pump **T3**, motor **T4**, coupling **T4 T3** applies, i.e. the unit may only be used in atmospheres which may ignite at temperatures <200° C (+safety margin). The maximum medium temperature of the pump for this example is 175° C (see table in **Section 2.5.6**).

Example 2 : Pump **T4**, Motor **T3**, coupling **T4 T3** applies, i.e. the unit may only be used in atmospheres which may ignite at temperatures <200° C (+safety margin).

2.5.4 Check of the direction of rotation



If there is also a risk of explosion during the installation phase, the check of the direction of rotation must under no circumstances be conducted by briefly switching on the unfilled pump in order to prevent an inadmissible rise in temperature at the plain bearings.



Only perform the direction of rotation check with the coupling disengaged! See also **Section 6.1.2**.

2.5.5 Mode of operation of the pump

The pump may only be started with the suction side shut-off element fully opened and the discharge side shut-off element slightly opened. Start-up against a closed check valve is also possible. The discharge side shut-off element is to be regulated to the operating design point directly after run-up. See also **Section 5.4.1**.

Operation with closed shut-off elements in the suction and/or discharge lines is not permitted!



There is a risk that even after a short time high surface temperatures on the pump housing may occur owing to rapid heating of the liquid in the pump interior.



A rapid rise in the pressure inside the pump involves the risk of overloading to the point of bursting.



The pump must not be in operation in the unfilled or partially filled state (dry running). This results in serious damage to the pump and additional risks to the environment can arise.



Dry-running cannot only occur with an insufficiently filled interior but also in the event of high gas contents in the liquid medium.

Operation of the pump outside the admissible operating range may also lead to dry-running (e.g. due to evaporation in the interior).

2.5.6 Temperature limits



In the normal operating condition the highest temperatures are to be expected at the metallic can and in the area of the rolling bearings.

In the case of liquids >40° C the surface temperature of the pump housing is generally lower than the temperature of the liquid.



If the pump is heated (e.g. heating jacket), it must be ensured that the temperature classes prescribed in the annex are observed.

The entire pump surface must have free contact with the environment.



During operation of the pump it must be ensured that excessive deposits of dust are prevented (regular cleaning) in order to prevent the pump surface from heating to above the admissible temperature.

The plant customer must ensure that the prescribed operating temperature is observed. The maximum admissible temperature of the liquid medium at the pump inlet depends on the temperature class and the selected lining material required in each case.

The following table contains the resultant theoretical limit values of the temperature of the liquid medium allowing for the temperature classes according to PrEN 13463-1.

Temperature class acc. to PrEN 13463-1	Limit value of the temperature of the liquid	
	LT	HT
T6 ¹⁾ (85° C)	60° C ³⁾	60° C ³⁾
T5 ²⁾ (100° C)	75° C ³⁾	75° C ³⁾
T4 (135° C)	110° C ³⁾	110° C ³⁾
T3 (200° C)	175° C ³⁾	175° C ³⁾
T2 (300° C)	175° C ³⁾	275° C ^{3) 4)}
T1 (450° C)	175° C ³⁾	275° C ^{3) 4)}

HT = High temperature
 LT = Low temperature

- 1) T6: Oil lubrication with optionals necessary (oil cooling, oil mist lubrication, contactless shaft seal, e.g. labyrinth seal, etc...)
- 2) T5 : Oil lubrication
- 3) The limit values specified for the temperature of the medium at the pump inlet are determined for the most unfavourable case (high speed, low flow rate, low heat capacity of the medium, large magnetic drive). Under favourable operating conditions the limit values specified may be increased by up to 10 K after consultation with the manufacturer.
- 4) Consult the manufacturer for higher temperatures than 280° C.



The admissible operating temperature of the pump is indicated in the data sheet and on the type plate of the pump.

The observance of the temperature class T4 is guaranteed in the area of the rolling bearings, assuming an ambient temperature of 40° C, grease lubrication and proper maintenance and operating conditions.

Observance of T5 is only possible with oil lubrication, T6 only with oil lubrication and a special design. Consult the manufacturer in these cases and in the event of ambient temperatures higher than 40° C.

2.5.7 Maintenance



For safe and reliable operation, it must be ensured with regular inspection intervals that the unit is properly serviced and kept in a perfect technical condition.

Example: Functioning of the rolling bearings. The mode of operation and operating conditions largely determine the actual service life that can be attained.

Regular checks of the bearings and their running noise can prevent excess temperatures due to hot-running bearings, collision of the outer magnet assembly against the lantern or even defective bearing seals. See **Section 7.2**.

If auxiliary systems (e.g. external flushing, cooling, heating) are installed, a check must be made to see whether monitoring facilities are required to safeguard their operation.

2.5.8 Electric peripheral equipment



Electric peripheral equipment, e.g. pressure, temperature and flow sensors etc. must comply with the prevailing safety requirements and explosion protection provisions.

3 Transport and storage



The pump or the unit must be transported properly. It must be ensured that during transport the pump/unit remains in the horizontal position and does not slip out of the transport suspension points.

A pump or motor can be suspended from the ring bolt provided for this purpose.

The suspension points are not suitable for transporting a complete unit, i.e. pump with base plate and motor.

In this case, the slinging points for the ropes on the base plate are to be used. See **Fig. 1**.

The slinging ropes must not be attached to free shaft ends or to the ring bolt of the motor.

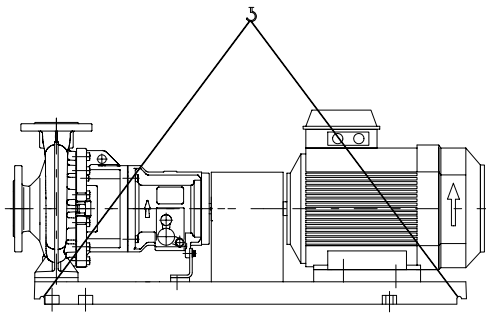


Fig. 1

Directly after receipt of the goods, the consignment must be checked for completeness and any in-transit damage.

Damaged pumps must not be installed in the plant.



When unpacking magnetic drives as single parts, the relevant notes in **Section 7.5.2** must be observed.

Handle goods carefully to prevent damage.

Flange covers serve as protection during transport and must not be removed.

If the unit is not installed immediately after delivery, it must be put into proper storage.

It should be stored in a dry, vibration-free room as at constant a temperature as possible.



If magnetic drives are stored as single parts, the relevant notes in **Section 7.5.2** are to be observed.

In the case of **prolonged storage** conservation agents on machined component surfaces and packing with a desiccant may be necessary.

3.1 Return consignments



Pumps which have conveyed aggressive or toxic media must be well flushed and cleaned before being returned to the manufacturer's works.

A **General Safety Certificate** on the field of application is to be enclosed with the returned goods.

Pre-printed forms are enclosed with the installation and operating manual.

Safety precautions and decontamination methods are to be mentioned.

4 Product description

The housing dimensions of the pump model ICM comply with ISO 2858 / DIN EN 22858.

The technical requirements and nominal ratings of the pump models ICM and ICMP comply with ISO 2858 / DIN EN 22858 / ISO 15783 / DIN ISO 5199.

The **sectional drawing** shows the pump set-up. See **Section 9**.

The metal housing **100** has an axial suction nozzle and radial discharge nozzle. The housing drain screw **103** permits the entire pump including the can interior to be drained.

The impeller **230** is of closed design. The back vanes serve to offset the axial thrust. The impeller is attached to the magnet assembly shaft by an impeller nut **231** and key **940/2** and rests against the distance washer **551/1**.

The plain bearing pedestal **339** has flushing bores which serve to dissipate the heat on the can and lubricate the plain bearing cartridge **310**. Depending on the pump design, connection tapped bores can be provided on the plain bearing pedestal to permit access to the pump interior (e.g. for monitoring devices or external flushing).

The plain bearing cartridge **310** encapsulates all the individual parts of the bearing system and permits the exchange of the complete unit in one piece. It is attached to the plain bearing pedestal with hex. screws **901/1**. The inner magnet assembly **859** is fitted with permanent magnets. These magnets of the inner magnet assembly are protected against the medium by a corrosion-resistant metallic cover. The inner magnet assembly and shaft are one piece.

A parallel pin **562/1** serves as an anti-torsion insert for the plain bearing cartridge.

The inner magnet assembly accommodates axial vanes to promote the flushing flow.

The metallic can **159** seals the pump interior against the atmosphere to ensure it is leak-proof.

The lantern **344** is screwed against the housing with hex. screws **901/3** and washers **554/3**. Both the housing gasket **401** and the can gasket **406** are tightly sealed through the direct action of the bolting force. The lantern has a safety rubbing surface which protects the can against damage from the drive magnet assembly if the rolling bearings become defective.

The hex. screws **901/5** prevent the individual parts from falling apart when the entire slide-in unit is being removed from the pump housing. These screws are not provided in some pump sizes. Instead the set-screws **904/2** perform this function.

The bearing pedestal **330** contains grease-lubricated radial ball bearings **321** which cannot be regreased. They are sealed on both sides. The wavy spring washer **953/1** exerts an axial pre-load on the radial ball bearings and rests against the rear bearing cover **361**. The torque is transmitted to the drive magnet assembly **858** by the key **940/1** and the drive shaft **213**. The magnets are glued into the drive magnet assembly which is axially secured by the hex. socket screw **914/1**.

Should the can become defective, the flat gasket **400/1** at least seals the medium against the atmosphere for a short period.

The flushing/cooling flow is fed into the can chamber through the flushing bores in the plain bearing pedestal. The flushing flow passes through the plain bearings back into the housing. The rotating magnets generate an eddy current in the can which heats the flushing/cooling flow.

Design details are provided in the **sectional drawing, Section 9**.

Additional information is also contained in the **Brochure** and **Pricebook**.

5 Installation

5.1 Safety regulations



Equipment which is operated in potentially explosive areas must satisfy the explosion protection regulations.



People with a pacemaker are at risk from the strong magnetic field of the magnetic drive. It may be life-threatening for them to stay at a distance of less than 50 cm to the pump.

5.2 Installation of pump/unit

The structural work must be prepared in accordance with the dimensions in the installation drawing.

Method of installation: on a grouted base plate and firm foundation

- Align base plate on the ground foundation.
- Insert foundation bolts and grout base plate.
- Do not tighten the foundation bolts uniformly and firmly until the mortar has set.

5.3 Alignment of pump - coupling - motor



The following information is of a general nature. If necessary, special notes of the coupling manufacturer are to be observed.



After attachment of the base plate on the foundation and connection of the pipes, the alignment of the coupling must be carefully checked and, if necessary, the unit re-aligned with the motor.

- A coupling check and possible re-alignment is also necessary if the pump and motor are supplied on a common base plate and aligned.
- Prior to alignment undo the support bracket **183** and then tighten it without stress.
- The pump is to be aligned in all directions using a spirit level (on shaft/discharge nozzle) (admissible position deviation max. 0.2 mm/m).
- A distance depending on the coupling used is to be observed between the pump and motor shafts. See installation drawing.
- Use supports in the direct vicinity of the bolts foundation/base plate.



Ensure that the unit cannot be started during work without the coupling guard.

5.4 Piping

Before the pump is installed, both the suction and supply lines as well as the discharge line are to be cleaned.

Dirt or damage to the sealing surfaces is best avoided if the flange covers remain on the flanges until just before installation.

Use flange gaskets suitable for the medium.

The screw tightening torques in **Section 1.2** are to be observed for tightening the flange screws.

5.4.1 Nominal size

The operating design point of a centrifugal pump lies at the intersection of the pump curve and the pipe curve, see **Fig. 2**. The pump curve is provided by the pump manufacturer. The pipe curve is determined using diagrams or PC programs.

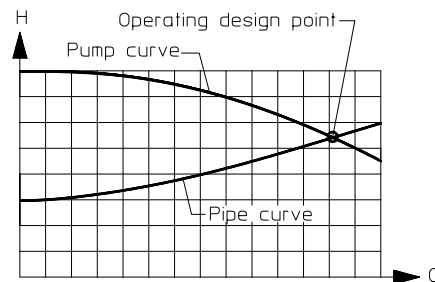


Fig. 2

9299-00-5009_en/4-0

Under no circumstances can the nominal size of the piping be derived from the connected nominal size of the pump.

The pipe nominal size can also be determined using the flow rate as a rough guide.

$$v(\text{m/s}) = \frac{Q(\text{m}^3/\text{s})}{A(\text{m}^2)}$$

The velocity in the suction line should not exceed 2.0 m/s and 5.0 m/s in the discharge line.

When determining the suction line nominal size, the NPSH value (net positive suction head) must also be observed. The **NPSHR value** required for the pump is specified in the data sheet.



The NPSHR available in the plant should be at least 0.5 m higher than the NPSHR required for the pump. Otherwise, this will lead to a drop in the delivery head, cavitation or even failure of the pump.

5.4.2 Nozzle loads

The pump can be subjected to nozzle loads in accordance with ISO 5199. See also **Pricebook**.

Changes in the length of the piping caused by temperature are to be allowed for by appropriate measures, e.g. the installation of expansion joints.

5.4.3 Suction line

The suction lines must always be laid on a rising gradient towards the pump. Otherwise, gas bubbles may form which considerably reduce the suction line cross section. Eccentric transition elements must be installed between different pipe diameters.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.

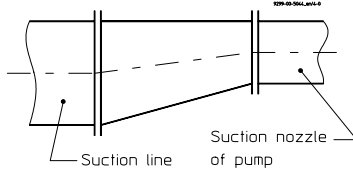


Fig. 3

5.4.4 Supply lines

Supply lines should vent towards the reservoir and are therefore to be laid with a constant downward gradient towards the pump. Should the piping internals upstream of the pump be horizontal, a low point can, of course, be located upstream of these internals. From here the pipe is then laid with an upward gradient to the pump so that the gas bubbles which form here can escape through the pump.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.

5.4.5 Discharge line

Do not arrange the shut-off valve directly above the pump but initially provide a transition section.

The discharge nozzle velocity of the medium can – if necessary – be reduced.

5.4.6 Venting and evacuating

Venting can take place into the discharge line or upstream of the discharge valve.

A venting line can also be used as a bypass, drain or flushing line.

The pump housing is fitted with a drain connection as a standard feature. Optionally, the drain bore can be enlarged.

5.5 Not Used

5.6 Monitoring facilities



Appropriate monitoring facilities are to be recommended, depending on the requirements placed on operational safety and availability of the unit.

Goulds provides information on request and can supply:

- ◆ Flow meters
- ◆ Filling level indicators
- ◆ Motor load monitors
- ◆ Temperature monitors
- ◆ Rolling bearing monitors
- ◆ Leak monitors
- ◆ Pump management "Pump Smart"®

5.7 Drive

The power consumption of the pump at the operating design point is specified in the data sheet and works certificate. If the operating design point was not known when the pump was dispatched, the power consumption can be read off the appropriate performance curves. The max. density, the max. viscosity and a safety margin are to be allowed for.

Care must be taken when selecting the motor size to ensure that the excess power is not too great. During start-up the magnetic drive could otherwise stop.

The magnetic drive rating at the nominal speed of 2900 rpm is given in the pump data sheet.

If the motor power exceeds this rating, it is necessary to check the stoppage of the magnetic drive.

The same also applies if the required drive rating exceeds 80 % of the magnetic drive rating.

Consult ITT Goulds if necessary.

Different operating data can be achieved without changing the pump through the use of different speeds, e.g. by means of a frequency converter.

The pump with base plate and motor is illustrated in the **installation drawing**.

The **operating manual of the motor manufacturer** must be observed.



A motor with a valid Atex certificate is to be used if employed in zone 1 and 2.

5.8 Coupling

If one coupling half engages with the other, the claw section is normally to be mounted on the pump shaft and the coupling half with the smooth end face on the motor shaft.

Observe the operating manual of the coupling manufacturer.



A coupling with a valid Atex certificate is to be used if deployed in zone 1 and 2.

Regulations exist, e.g. for the following details:

- ◆ Arrangement of the coupling halves
- ◆ Max. bore diameter
- ◆ Max. transmitted power
- ◆ Spacing of the coupling halves
- ◆ Maximum values for offset and angular misalignment.

Should the pump housing and motor remain on the base plate for repair work, a spacer type coupling is required.

5.9 Coupling guard

The pump may only be operated with a coupling guard in accordance with the accident prevention regulations.



It must be ensured that the coupling guard used is made of spark-free material.

5.10 Final check

Check the alignment of the coupling again in accordance with **Section 5.3**.

It must be possible to easily turn the unit at the coupling by hand.

5.11 Electric connection



Only have the electric connection performed by a qualified electrician. Compare the available mains voltage with the information on the type plate of the motor and select a suitable circuit.

It is urgently recommended to use motor protection facilities (motor protection switch).



In potentially explosive areas IEC 60079-14 must also be observed for the electrical installation.



It must be ensured that the pump is grounded. This can be achieved in the simplest case by using a tooth-lock washer at the housing support if the substructure itself is grounded.

Otherwise, grounding must be ensured by other means, e.g. cable bridges.

Units supplied by Goulds (pump and base plates) are to be grounded using suitable devices on the base plate.

6 Commissioning/Shutdown


6.1 Initial commissioning

Normally, the pumps have already been test-run with water. Unless special agreements have been made, there could still be residual amounts of water in the pump. This must be noted in view of a possible reaction with the medium.


The rolling bearings are greased for life. Regreasing is not possible and not necessary.

For service lives, see [Section 7.2](#).

6.1.1 Filling the pump housing

- Check to see whether the screws on the suction flange, discharge flange, housing flange and drain flange are tightened. When retightening the housing screws, make sure that the support bracket is undone. Otherwise, the pump could be deformed. For screw tightening torques see [Section 1.2](#).
- Open the suction line fully so that the medium can flow into the pump.
- Open the discharge valve so that the air in the pump can escape.
- If air cannot be vented into the discharge line, e.g. a drop in pressure in this line is not permitted, venting must be performed upstream of the discharge valve.
- Monitor the venting operation until no air but only liquid emerges.
- Turn the pump shaft at the coupling several times.
- Monitor the venting operation again until no more air emerges.
- Close the discharge valve again until only the minimum flow rate is obtained after the motor has been started. 

6.1.2 Start-up

- Check to see whether the pump shaft can be readily turned by hand. 
- Check the direction of rotation of the motor with the coupling disengaged.
- As viewed from the motor, the direction of rotation of the pump is clockwise. See also the **direction of rotation arrow** of the pump.



The pump must not run dry during the check of the direction of rotation.

- Engage coupling, check alignment and secure.
- Mount coupling guard.



The pump must be completely filled with liquid. The maximum admissible flow rate must not be exceeded.



Otherwise the plain bearings can run dry in both cases.

- Switch the motor on.
- Set the desired flow by opening the discharge valve.



When the motor is running but the pump is not conveying, this means that the magnetic drive has stopped.

Switch the motor off immediately to prevent overheating of the magnets.

Then proceed as follows:

- Close discharge valve down to the position "minimum flow rate".
- Start motor again.

If the magnetic drive stops again, look for the cause.

6.2 Operating limits



The operating limits of the pump/unit in terms of pressure, temperature, power and speed are entered in the data sheet and it is imperative to observe them!

6.2.1 Abrasive media



If liquids with abrasive constituents are conveyed, increased wear at the pump is to be expected.

The inspection intervals should be reduced compared with the usual times.

6.2.2 Min./max. flow rate

The operating range generally recommended lies at 0.3 Q_{opt} to 1.1 Q_{opt} . Consult the manufacturer for operation outside this range.

6.3 Shutdown

- Close discharge valve down to the position "minimum flow rate"
- Switch motor off.
- Close discharge valve completely.

Only close the suction line if the pump is to be evacuated or dismantled.



For all work on the machine, make sure that the motor cannot be inadvertently switched on.



If the pump is to be evacuated or flushed, observe the local regulations.

It is recommended to wait one hour before the pump is dismantled from the plant to permit static peak charges to be eliminated.

If the pump is returned to the manufacturer's, clean the pump very thoroughly.

See also **Section 3.1**.

6.4 Restarting

When the pump is restarted, it must be ensured that all the relative steps as described in **Section 6.1** are repeated, depending on the progress of the shutdown operation.

6.5 Inadmissible modes of operations and their consequences (examples)



Inadmissible modes of operation, even for a short time, can result in serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

Pump is started up without medium :

- ◆ The plain bearings in the pump may be destroyed.
- ◆ Other pump components may be destroyed due to overheating.

Suction line not opened or not opened fully :

- ◆ Pump suffers cavitation – material damage.
- ◆ Pump does not achieve the necessary head or flow rate.
- ◆ Pump may be destroyed due to overheating.

Discharge valve closed too much :

- ◆ Pump may be destroyed due to overheating.
- ◆ Axial thrust too great.

Discharge valve opened too much :

- ◆ Pump can cavitate. Particularly severe with an empty discharge line.
- ◆ Risk of pressure surge.
- ◆ Possible damage to the plain bearings.
- ◆ Magnetic drive may stop.
- ◆ Motor may be overloaded.

Suction valve and discharge valve closed :

- ◆ Destruction due to rapid overheating and sharp rise in pressure.

Control of the pump with the suction valve :

- ◆ Cavitation – the flow is only to be regulated on the discharge side.

Operation with magnetic drive stopped :

- ◆ If no heat is dissipated, damage to the inner and drive magnet assemblies may occur.

7 Maintenance

7.1 Screw connections of the housing

After initial loading by the operating pressure and operating temperature the tightening torques of all connection screws must be checked at the following points:

- ◆ housing flange
- ◆ suction flange
- ◆ discharge flange

See also **Section 6.1, para. 1.**

Other inspections are to be performed regularly, depending on the operating requirements.

7.2 Bearing pedestal



The temperature of the bearing pedestal should not be more than 50°C above the ambient temperature and must under no circumstances exceed 80°C.

At higher temperatures, call in qualified staff without delay. If this is not possible, the pump must be shut down and taken out of service.

In many cases it is also recommended to measure vibration in order to detect bearing wear in good time.

Grease-filled bearings of the type 2RS are installed as a standard feature. The grease is lithium-saponified. The admissible temperature range is -30°C to +110°C.

As the bearings cannot be regreased, they must be replaced in accordance with the instructions.

Size	Bearing size > Service life
Group 1	6207-2RS / 15000 hours*
Group 2	6210-2RS / 15000 hours*

* At bearing temperature <50°C
 At bearing temperature 70°C appr. 7500 hr

If maintenance work on the pump is required for other reasons, it is recommended to also replace the bearings as a precaution.



In explosion-hazardous works it is advisable to monitor the bearing temperature.

7.3 Cleaning

Care must be taken when cleaning the pump to ensure that it is not exposed to a strong water jet. The ingress of water into the bearing pedestal would substantially impair bearing lubrication.

7.4 Stand-by pumps

If a pump is on stand-by, it is to be started up from time to time. Regularly turn the shaft by hand in the direction of rotation.

This operation is to be performed more often for pumps which are exposed to very strong vibrations from the plant.

When dismantling the pump from the plant, drain it, thoroughly clean it, seal with flange covers and store in accordance with the instructions.

7.5 Notes on dismantling

All repair and maintenance work is to be performed by skilled staff using appropriate tools and original spare parts.

Is the necessary **documentation** available?

Has the pump been taken out of operation, evacuated and flushed correctly? See also **Section 6.3.**

7.5.1 Protective clothes



Even if the pump has been properly evacuated and rinsed, residue of the medium may still remain in the pump. Example: Between sealing surfaces or in the bearing seats.



Protective clothing in accordance with the regulations is to be worn.

Protective clothing is also to be worn even if only the bearing pedestal is to be removed. It may be that medium has penetrated into the lantern chamber through the can.

7.5.2 Magnetic fields



Caution! Strong magnetic fields

Risk during dismantling and in the vicinity of magnetic drives as single parts.

Remove loose parts and other magnetisable metals from the work bench. They could otherwise be attracted : **Risk of accident !**

Place any tools needed at a safe distance.

Keep electronic equipment and measuring instruments at a distance. In cases of doubt ask the equipment manufacturer.

Hold magnetic drives as single parts firmly or secure. Otherwise, they could be attracted, for example, by a vice : **Risk of accident !**



People with an artificial pacemaker
 Keep torso **at a minimum distance of 50 cm.**

Mechanical watches and electric data carriers as well as digital watches or pocket calculators :

150 mm distance.

Data carriers such as credit cards, cheque cards, ID cards with magnetic strips or magnetic tapes :

150 mm distance.

7.5.3 Changing the radial ball bearings

When changing the radial ball bearings, you merely need to remove the bearing pedestal from the plant.

For removal and dismantling of the bearing pedestal, see **Sections 7.6.1 and 7.6.2.**

7.6 Dismantling

There are three possibilities for dismantling:

1. Dismantling the entire pump from the plant.
2. Dismantling the entire slide-in unit, i.e. the housing remains in the plant.
3. Removing only the drive section, i.e. the pump does not need to be drained (back-pull-out design). See **Section 5.8.**

Dismantling of the entire pump is described.

- Secure pump on a workbench or worktop with the suction nozzle facing downwards.
- Screw ring bolt M 8 into the drive shaft.

7.6.1 Removing bearing pedestal



**Caution! Magnetic forces!
Risk of accident!**

Axial forces are produced when the bearing pedestal is pulled out of the lantern. These forces diminish again abruptly after it has been removed.

The operating torque of the magnetic coupling installed is specified on the **type plate**.

- Undo bearing pedestal screwing **901/1, 554/4**.
- Detach the bearing pedestal from the lantern centering, if necessary using 2 levers.

If required you have the possibility to use the two threaded holes in the bearing frame for jacking screws.

Group 1 - M 12

Group 2 - M 14

- Raise the bearing pedestal unit off the lantern with a crane or pull it by hand out of the lantern.
- Remove flat gasket **400/1**.

7.6.2 Dismantling bearing pedestal

- Clamp drive shaft **213** with its end in the vice.
- Undo hex. socket screw **914/1** in counterclockwise direction.
- Pull off drive magnet assembly **858**.
- Remove pump from the vice.
- Undo rear bearing cover **361**.
- Remove wavy spring washer **953/1**.
- Pull out drive shaft **213** with both ball bearings **321**.
- Both radial ball bearings lie against the shaft collar so remove singly on a press.
- Remove support bracket **183**.

7.6.3 Removing lantern, can and plain bearing pedestal

- Undo housing screwing **901/3, 554/3**.
- Do not undo the two screws **901/5** (if installed). They hold the lantern **344**, can **159** and plain bearing pedestal **339** together.
- Pull the entire slide-in unit out of the housing **100**.
- If the housing does not move (e.g. owing to corrosion at the centering), remove the two plastic plugs from the lantern **344**.
- Screw in jacking screws M8 and use them to press off the lantern.

7.6.4 Dismantling lantern, can and plain bearing pedestal

- Place the unit lantern **344** / plain bearing pedestal **339** / impeller **230** on the workbench with the impeller facing upwards.
- Remove the two hex. screws **901/5** or the 3 set-screws **904/2** (depending on size).
- Remove lantern **344** and can **159**.
- Place remaining unit on the inner magnet assembly.
- Place strap wrench around the impeller and undo the impeller nut **231** counterclockwise.
- Pull off impeller **230**.
- Remove key **940/2**, distance washer **551/1** and intermediate ring **509/2**.
- Pull the plain bearing cartridge **310** with plain bearing pedestal **339** out of the inner magnet assembly **859**.
- Remove 2nd intermediate ring **509/1** from the inner magnet assembly **859**.
- Undo screws **901/1** and remove plain bearing cartridge **310** from the plain bearing pedestal **339**.

7.6.5 Dismantling the plain bearing

The plain bearing cartridge **310** is one unit which - if necessary - is replaced completely.

7.7 Notes on assembly

All the details in **Section 7.5** are to be observed, in particular the notes on safety.

Good mechanical engineering practice is to be observed for assembly work.

Use original spare parts. See also **Section 2.3**. Do not use defective parts.

Treat close-tolerance areas (not stainless steel components) with a corrosion inhibitor. Grease screw threads prior to assembly.

Check whether all parts fit and only then perform assembly.

Important dimensions are to be checked before assembly, e.g. by fitting parts together as a test.

These important dimensions are centerings, bearing seats or bearing clearances.

During assembly, gaskets **400**, **401** and **406** are to be replaced, intermediate rings **509** must be replaced.

Prior to assembly, remove any metallic particles adhering to parts fitted with magnets.

7.8 Assembly

A complete assembly operation is described in the following.

Sub-sections can be deduced from this.

7.8.1 Bearing pedestal

- Press both radial ball bearings **321** onto the drive shaft **213**.
- Insert key **940/1** into the drive shaft.
- Install the pre-assembled drive shaft into the bearing pedestal from the motor side.
- Insert wavy spring washer **953/1** into the bearing pedestal.
- Mount rear bearing cover **361** with the hex. socket screw **914/2**.
- Mount support bracket **183** with hex. screws **901/2** and toothed lock washers **936/2**.
The attachment slots of the support surface face towards the housing.

7.8.2 Drive magnet assembly

- Clamp the pre-assembled bearing pedestal on the shaft end in the vice so that the carrier groove is facing upwards.
- Mount drive magnet assembly **858** onto the drive shaft so that the driver cams engage.
- Screw in hex. socket screw **914/1** with tooth lock washer **936/1**. Secure thread, with a drop e.g. of Loctite 234. A hex. socket screw key with a minimum length of 120 mm is required for tightening.

7.8.3 Plain bearing pedestal with impeller, inner magnet assembly and plain bearings

- Insert the plain bearing cartridge **310** into the centering of the plain bearing pedestal **339**.
- Move the plain bearing cartridge into a position which permits all 3 hex. screws **901/1** to be inserted.
- Tighten screws with an open-jaw wrench.
For tightening torques, see **Section 1.2**.
- If the parallel pin **562/1** in the clearance bore in the inner magnet assembly **859** has to be replaced, drive it in carefully. It is to protrude by about 3 mm towards the impeller.
- Cut out a small corner on the inside diameter of the intermediate ring **509/1** so that a recess for the parallel pin **562/1** is produced.
- Then mount the intermediate ring **509/1** onto the shaft of the inner magnet assembly **859**.
- Apply Anti-Seize paste to the shaft and impeller holder.
- Place inner magnet assembly on the workbench and mount the pre-assembled unit plain bearing pedestal / plain bearing cartridge from above onto the inner magnet assembly. **Make sure that the parallel pin 562/1 engages in the carrier groove of the plain bearing cartridge.** To facilitate alignment, the plain bearing pedestal can be turned to and fro slightly.
- Mount 2nd intermediate ring **509/2** onto the drive shaft.
- Mount distance washer **551/1**.
- Insert key **940/2**.
- Mount impeller **230**.
- Insert PTFE O-ring **912/1** into the groove of the impeller nut **231**.
- Tighten impeller nut. Secure it with a drop of e. g. Loctite 234. Countercheck the inner magnet assembly with a strap wrench.
For tightening torques, see **Section 1.2**.

- It must be possible to easily turn the plain bearing pedestal **339** by hand. When raising the plain bearing pedestal, a slight axial play of the plain bearing of up to 1 mm must be felt.
- The axial play of the plain bearing is automatically set during assembly.

7.8.4 Can and lantern

- Place the can gasket **406** in the centering on the plain bearing pedestal **339**.
- Mount can **159** and lantern **344**.
- Screw the two connection screws **901/5** or the 3 setscrews **904/2** (depending on size) of the lantern **344** into the plain bearing pedestal **339** and tighten.

7.8.5 Final assembly

- Secure the housing **100** with the suction nozzle facing downwards on a workbench or worktop.
- Insert the housing gasket **401** into the housing centering.
- Insert the unit pre-assembled as described in **Sections 7.8.3** and **7.8.4** into the housing so that the crane hook of the lantern faces the centre of the discharge nozzle.
- Screw in the housing screws **901/3** with washers **554/3** and tighten.
For tightening torques, see **Section 1.2**.
- Insert flat gasket **400/1** into the centering of the lantern **344**.
- Place the bearing pedestal/drive magnet assembly unit pre-assembled in **Sections 7.8.1** and **7.8.2** on the drive magnet assembly.
- Screw a commercially available ring bolt M 8 into the end of the drive shaft.



Place the bearing pedestal unit on the lantern **344** using a crane.

- Screw in hex. screws **901/1** with washers **554/4** and tighten.
- Insert plastic plugs into the tapped bores for the jacking screws on the lantern **344**.
- Turn the inner magnet assembly shaft by hand to check its function. Check by looking into the suction nozzle whether the impeller turns.

7.9 Tests

The pumps are tested with water at the manufacturer's works if specified by the customer.

The operating data measured are documented in a **test certificate**.

The following data can be checked using the **pump performance curves** :

- ◆ Flow rate
- ◆ Head
- ◆ Power requirement
- ◆ NPSHR

8 Faults



Faults may result from inadmissible modes of operation. Such inadmissible modes of operation – even brief ones – may cause serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) can result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

See also **Section 6.5**.

Should there be any uncertainty about the remedy to be applied, please inquire at the in-house pump office or at the pump manufacturer's.

No delivery :

- ◆ Is the pump filled and vented?
- ◆ Is the suction line open, vented, cleaned and correctly laid?
- ◆ Is the discharge line open, vented, cleaned and correctly laid?
- ◆ Is the geodetic head too high?
- ◆ Is air being drawn in?
- ◆ Has the magnetic drive stopped?

Flow rate too low :

- ◆ Have the pump, suction line and discharge line been completely vented, filled and cleaned?
- ◆ Have any strainers installed been cleaned?
- ◆ Are all shut-off devices closed?
- ◆ Is the geodetic head too high?
- ◆ Is the NPSHA too low or the NPSHR too high?
- ◆ Are the pipe resistances too high?
- ◆ Is the viscosity too high?
- ◆ Is the direction of rotation correct?
- ◆ Is the speed too low or the impeller diameter too small?
- ◆ Are pump parts worn?
- ◆ Gas in the medium?

Flow rate too high :

- ◆ Is the geodetic head too low?
- ◆ Are the pipe or nozzle resistances too low?
- ◆ Is the pump speed too low or the impeller diameter too large?

Delivery pressure too high :

- ◆ Is the speed too high or the impeller diameter too large?
- ◆ Is the density too high?

Motor consumes too much electricity :

- ◆ Is the flow rate, density or viscosity too high?
- ◆ Is the speed too high or the impeller diameter too large?
- ◆ Is the coupling correctly aligned?
- ◆ Can the drive shaft be turned properly?

Pump does not run smoothly or creates noises:

- ◆ Is the coupling well aligned?
- ◆ Are the coupling elements worn?
- ◆ Are the rolling bearings damaged?
- ◆ Are parts of the hydraulics damaged?
- ◆ Is the flow rate too low or too high?
- ◆ Is the impeller balanced?
- ◆ Is the pump twisted?
- ◆ Is there foreign matter in the pump?

Temperature of the rolling bearings is too high:

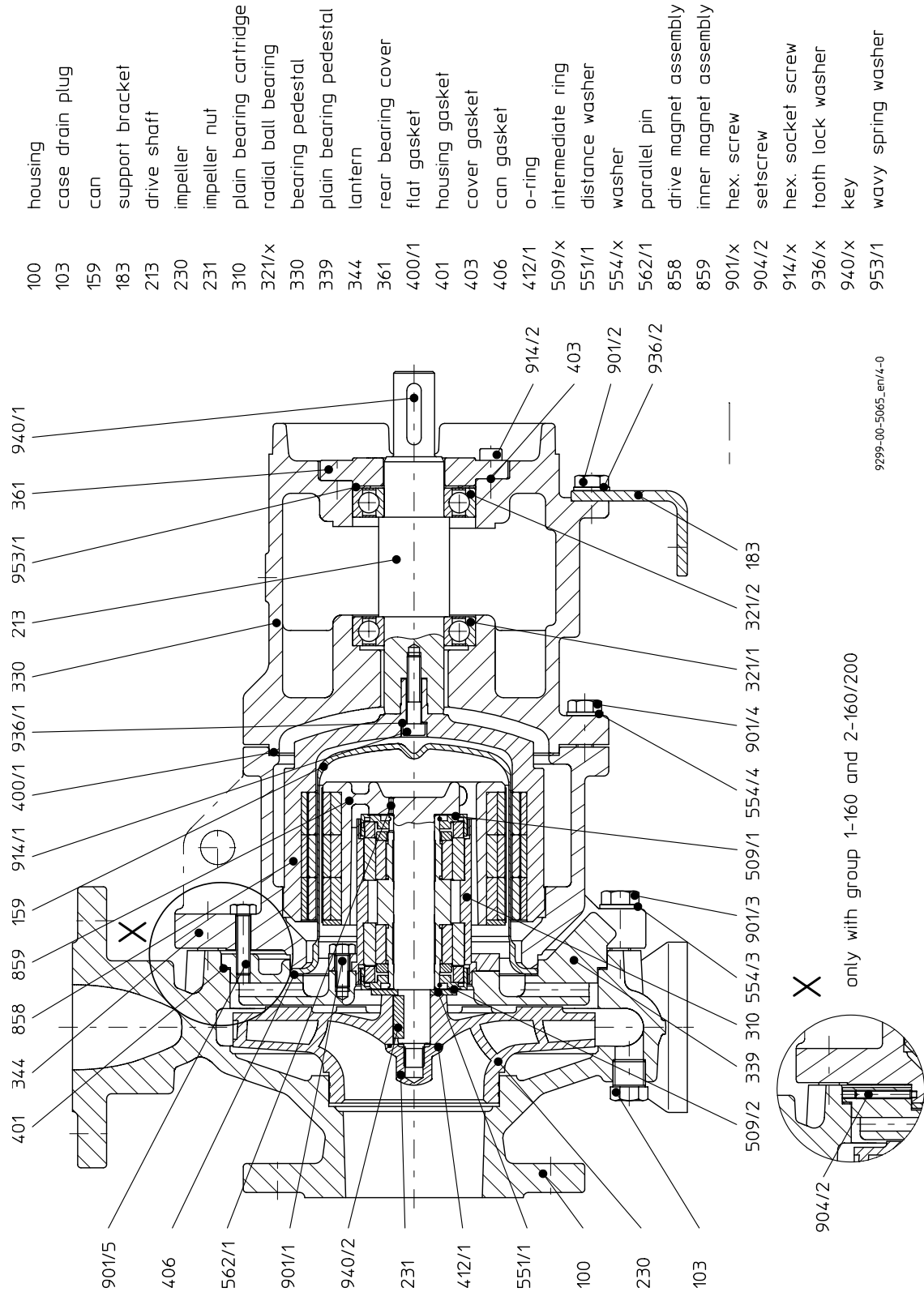
- ◆ How high is the actual temperature measured?
- ◆ How high may it be acc. to the operating manual?
- ◆ Is the running-in phase already over?

Leak from the pump :

- ◆ Are all screws tightened to the correct tightening torque?
- ◆ Were the sealing surfaces assembled in a clean state?
- ◆ Have approved gaskets been installed?

9 Sectional drawings

9.1 ICM with for life grease lubrication

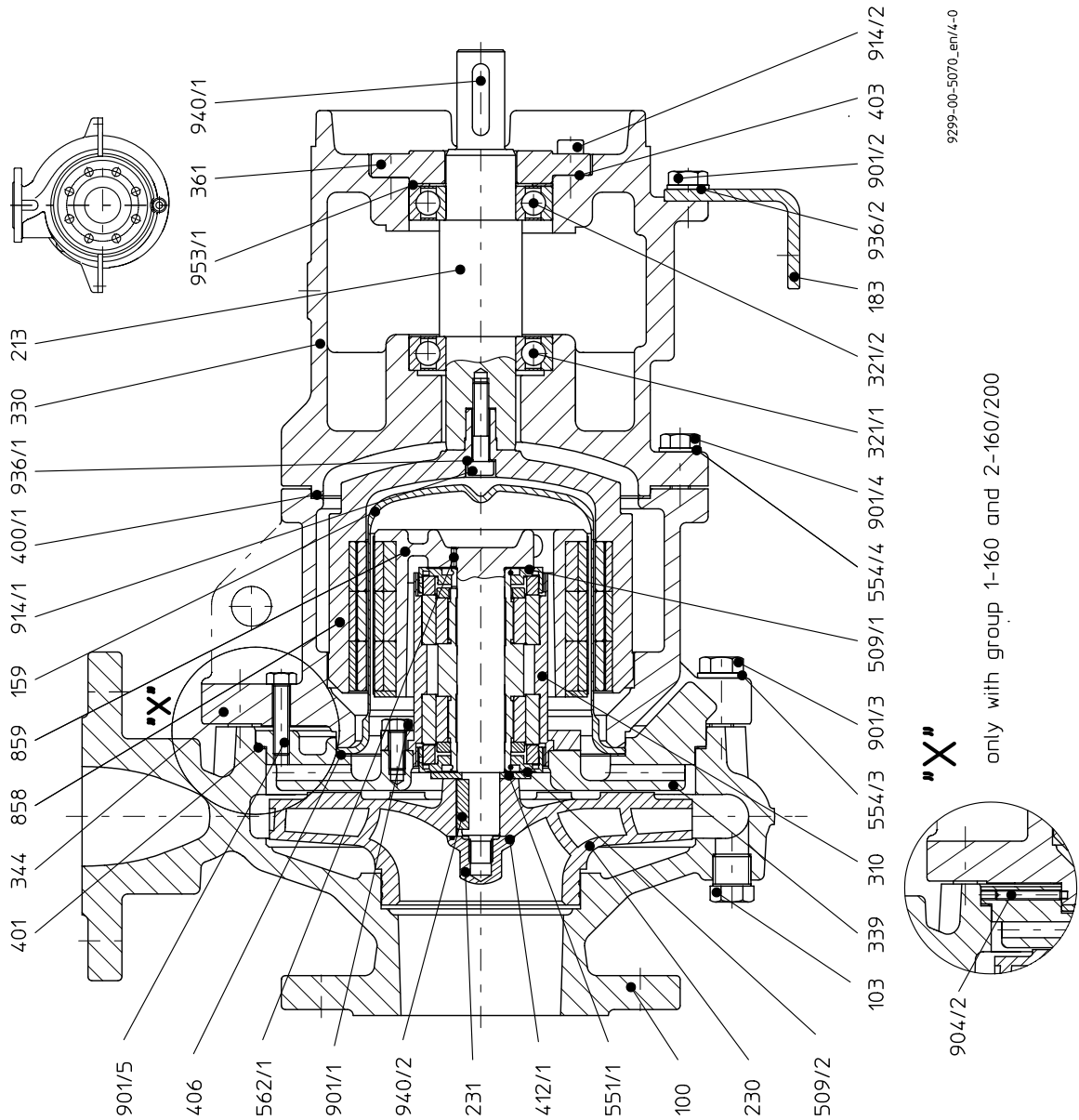


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only with group 1-160 and 2-160/200

9.2 ICMP with for life grease lubrication

100	housing
103	case drain plug
159	can
183	support bracket
213	drive shaft
230	impeller
231	impeller nut
310	plain bearing cartridge
321/x	radial ball bearing
330	bearing pedestal
339	plain bearing pedestal
344	lantern
361	rear bearing cover
400/1	flat gasket
401	housing gasket
403	cover gasket
406	can gasket
412/1	o-ring
509/x	intermediate ring
551/1	distance washer
554/x	washer
562/1	parallel pin
858	inner magnet assembly
859	drive magnet assembly
901/x	hex. screw
904/2	setscrew
914/x	hex. socket screw
936/x	toothed lock washer
940/x	key
953/1	wavy spring washer



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only with group 1-160 and 2-160/200