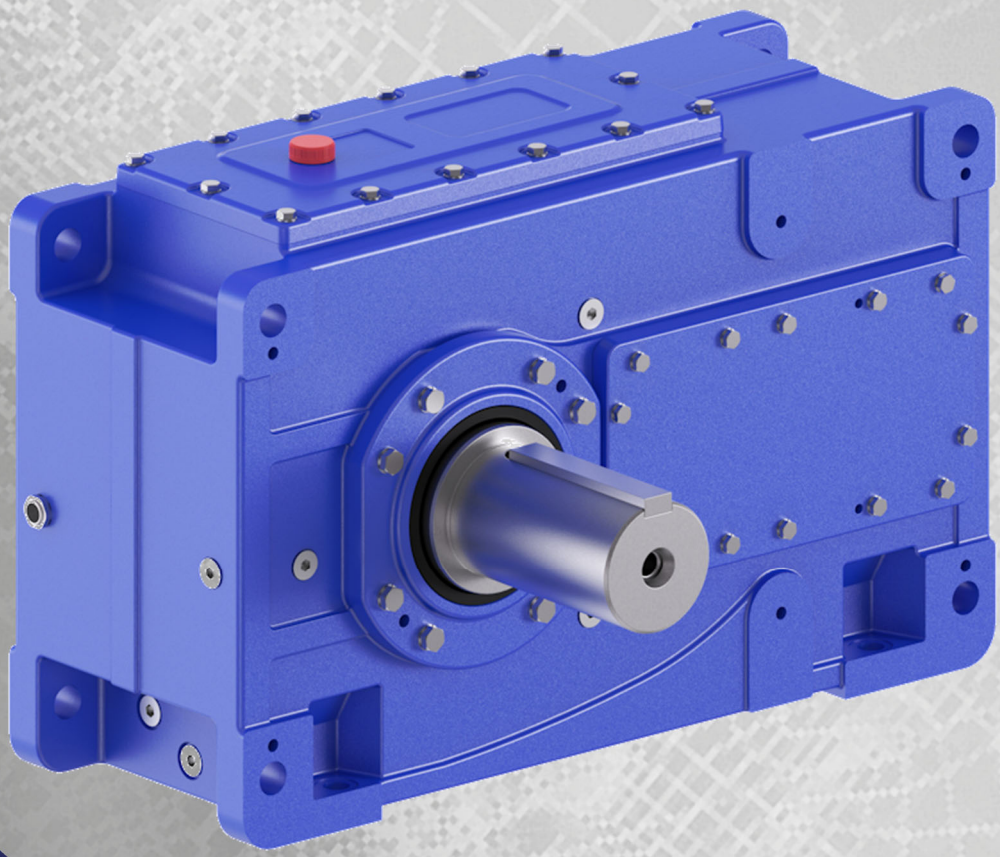


Renold Gears

Maintenance & Operating Instructions

H / HB Series

RENOLD | Gears

CONTENTS

1. UNIT — GENERAL INFORMATION

1.1	Important Warnings	8 - 9
1.2	General Information	10
1.3	Correct Use	10
1.4	Safety Information	11
1.4.1	Qualified Personnel	11
1.4.2	Special Types of Hazards and Personal Protective Equipment	11 - 13
1.5	Responsibility	14
1.6	Transportation, Freightage and Storage	15 - 16
1.6.1	Scope of Delivery	15
1.6.2	Freightage	15 - 16
1.6.3	Connection Points	16
1.6.4	Special Conditions for Lubricating and Protecting the Reducer	16
1.6.5	Special Conditions of Protection of the Reducer	16
1.7	Transportation	17 - 18
1.7.1	Transport of Gearboxes	17 - 18
1.8	Storage	19
1.8.1	Long Term Storage Suggestions	19

2. UNIT — PRODUCT DESCRIPTION

2.1	Gear Unit Label	20
2.2	Explanations	21 - 23
2.3	Abbreviations	24

3. UNIT — TECHNICAL INFORMATION AND ACCESSORIES

3.1	Output Shaft Versions	25
3.2	Housing	25
3.2.1	Reducer Equipment	26 - 27
3.3	Oil Supply to Reducer	27
3.3.1	Splashed Lubrication	27
3.3.2	Pressure Lubrication	28 - 29
3.3.2.1	Pump	29
3.3.2.2	Oil Filter	29
3.4	Bearing Arrangement of Shafts	29
3.5	Seals	29
3.5.1	Rotary Shaft Seals	29 - 30
3.5.2	Labyrinth Seal	30
3.5.3	Taconite Seals	30 - 32
3.5.4	Tacolab Seal	32 - 33
3.6	Backstop	33
3.7	Torque Limiter Backstop (Special Version)	34
3.8	Cooling	35
3.8.1	Fan	35
3.8.2	Cooler Coil	36
3.8.3	Mounted Oil Supply System	37
3.8.3.1	Oil Supply System Mounted with Air-Oil Cooler	37 - 38
3.8.3.2	Oil Supply System Mounted with Water-Oil Cooler	38 - 39
3.8.3.3	Pump	39
3.8.3.4	Oil Filter	39
3.8.4	External Oil Supply System	40
3.9	Couplings	40
3.10	Shrink Disc	40
3.11	Heating	40 - 42
3.12	Oil Level Indicator	42

CONTENTS

3. UNIT **TECHNICAL INFORMATION AND ACCESSORIES**

3.13	Oil Level Indicator System	**42**
3.14	Oil Temperature Indicator	**43**
3.15	Bearing Indicator	**44**
3.15.1	Bearing Control Using Pt 100 Resistance Thermometer	**44**
3.15.2	Bearing Monitoring with Shock Impact Converter	**44**
3.15.3	Bearing Monitoring with Speed Sensor	**45**
3.16	Encoder	**45**
3.17	Auxiliary Drive Reducer	**45 - 46**
3.17.1	Auxiliary Drive Reducer Designed as Maintenance Gear Reducer	**46 - 47**
3.17.2	Auxiliary Drive Reducer Designed as a Load Reducer	**47 - 48**

4. UNIT **ASSEMBLY**

4.1	Assembly	**49**
4.1.1	General Assembly Instructions	**49**
4.2	Unpacking the Reducer	**50**
4.3	Installation of Reducer	**50**
4.3.1	Foundation	**50**
4.3.2	Description of Assembly Work	**51 - 52**
4.3.2.1	Alignment	**52 - 53**
4.3.3	Reducer Mounting on Housing Foot	**53**
4.3.3.1	Installation on Foundation Housing	**53 - 54**
4.3.3.2	Installation on Concrete Foundation Using Concrete Bolts or Foundation Blocks	**54 - 55**
4.3.3.3	Mounting on Concrete Foundation Using Joint Bolts	**56 - 57**
4.3.3.4	Mounting the Reducer on the Connection Platform	**57 - 58**
4.3.4	Mounting on Block Flange	**59**
4.3.4.1	Assembly of Reducer with Block Flange	**60**
4.3.5	Torque Arm Assembly for Reducer Housing	**60**
4.3.5.1	Torque Arm Assembly	**60 - 61**
4.4	Hollow Shaft Coupled Reducer	**61**
4.4.1	Shaft Coupled Gearbox with Hollow Shaft and Wedge Connection	**61**
4.4.1.1	Preparation	**61**
4.4.1.2	Assembly	**62 - 63**
4.4.1.3	Disassembly	**63 - 65**
4.4.2	Hollow Shaft and Sliding Shaft Coupled Reducer According to DIN 5480	**66**
4.4.2.1	Preparations	**66**
4.4.2.2	Assembly	**66 - 68**
4.4.2.3	Disassembly	**68 - 70**
4.4.3	Hollow Shaft and Conical Compression Shaft Coupled Reducer	**70**
4.4.3.1	Assembly	**70 - 72**
4.4.3.2	Disassembly	**72**
4.5	F Type Flange Shaft Reducer	**72**
4.5.1	Requirements	**72**
4.5.2	Installation of Reducer	**73**
4.6	Couplings	**73 - 74**
4.7	Connecting Components	**74**
4.7.1	Reducers with Mounted Components	**74**
4.7.2	Making Terminal Box Connections for Pre-Wired Reducers	**74**
4.7.3	Connecting the Cooler Coil	**75**
4.7.4	Connecting the Air-Oil Cooler	**75**
4.7.5	Connecting the Water-Oil Cooler	**75**
4.7.6	Connecting the Heating Element	**76**
4.7.7	Connecting the Pressure Indicator	**76**
4.7.8	Establishing a Separate Oil Supply System	**76**
4.7.9	Connecting the Oil Level Indicator System	**76**

CONTENTS

4. UNIT ASSEMBLY

4.7.10	Connecting the Pt 100 Resistance Thermometer	**77**
4.7.11	Connecting the Temperature Indicator	**77**
4.7.12	Connecting the Bearing Monitoring System	**77**
4.7.13	Connecting the Encoder	**77**
4.7.14	Connecting the Motor Pump	**77**
4.7.15	Electrical Connections	**78**
4.8	Clamping Procedure	**78**
4.8.1	Bolts	**78**
4.8.2	Bolt Connection Classes	**79**
4.8.3	Preload Forces and Tightening Torques	**79 - 80**
4.9	Final Things to be Completed	**81**

5. UNIT COMMISSIONING

5.1	Commissioning	**82**
5.1.1	Pre-Commissioning Measures	**82**
5.1.2	Locked Reducer	**82**
5.1.3	Auxiliary Drive Reducer	**83**
5.1.4	Oil Level Indicator System	**83**
5.1.5	Cooler Coil Reducers	**83**
5.1.6	Heated Reducer	**84**
5.1.7	Reducer with Oil Supply System	**84**
5.1.8	Oil Filling in Lock or Auxiliary Drive Reducers	**84**
5.2	Precautions During Commissioning	**85**
5.2.1	Torque Limiter Locked Reducers	**85**

6. UNIT OPERATING THE REDUCER

6.1	Operating	**86**
6.1.1	Operating Data	**86**
6.2	Disorders in Operation	**86**

7. UNIT CONTROL AND MAINTENANCE

7.1	Service	**87**
7.1.1	General Maintenance Information	**87**
7.2	Control and Periodic Maintenance	**87 - 88**
7.3	Maintenance and Service Work	**88**
7.3.1	Checking the Oil Temperature	**89**
7.3.2	Filling the Lock with Oil	**89**
7.3.3	Checking the Outer Cage of the Torque-Limiting Backstop	**89 - 90**
7.3.4	Filling the Auxiliary Drive Reducer's Mechanical Clutch with Oil	**90**
7.3.5	Checking Auxiliary Drive Reducer	**90**
7.3.6	Cleaning the Fan and Reducer	**90**
7.3.7	Checking the Cooler Coil	**91**
7.3.8	Control of Shrink Disc	**91**
7.3.9	Cleaning the Strainer Filter	**91**
7.3.10	Cleaning the Double Filter	**92**
7.3.11	Checking Speed Indicator of Auxiliary Drive Reducer	**92**
7.3.12	Measuring the Vibration Levels of Bearings	**92**
7.3.13	Measuring Temperature in Bearings	**92**
7.3.14	Check all Fastening Bolts are Tight	**93**
7.3.15	General Inspection of Reducer	**93**
7.3.16	Final Things to be Completed	**93**

CONTENTS

8. UNIT **TROUBLESHOOTING**

8.1	Product Disposal	**94**
8.1.1	Disposal	**94**
8.2	Possible Errors	**95**
8.2.1	Possible Malfunctions and their Remedies	**95**
8.2.1.1	Troubleshooting	**95 - 99**

9. UNIT **AUTHORIZED SERVICE**

9.1	Authorized Service	**100**

10. UNIT **SPARE PART**

10.1	Spare Parts	**101**
10.1.1	Required Information for Ordering Spare Parts	**101**

11. UNIT **TECHNICAL DESCRIPTIONS**

11.1	Ambient Temperature	**102**
11.2	Product Types	**103**
11.3	Weights	**104 - 105**
11.4	Oil Quantities	**105 - 107**
11.5	Measuring Surface Sound Pressure Level	**108 - 111**

12. UNIT **THE ELECTRICAL MOTOR AND BRAKE CONNECTION**

12.1	The Electrical Motor and Brake Connection	**112**
12.2	The Electrical Motor Connection Schema	**113**
12.3	Standard Type Brake Anchorage Schema	**114**

13. UNIT **CONTACT INFORMATION**

13.1	Contact Information	**115**

CONTENTS

List of illustrations

Figure 1	: Cross and Side Pull on Eyebolts	**16**
Figure 2	: Transport of Gearboxes	**17 - 18**
Figure 2- a	: Position of Additional Lifting Points for Reducers of Type **H / HB**	**17**
Figure 2 - b:	Positions of Additional Lifting Points for Geared Motor Reducers of Type **H**	**17**
Figure 2 - c:	Positions of Additional Lifting Points for Geared Motor Reducers of Type **HB**	**18**
Figure 2 - d:	Position of Additional Lifting Points for Reducers with Torque Arm, Type **HB**	**18**
Figure 2 - e:	Position of Additional Lifting Points for Auxiliary Drive Reducers of Type **HB / H**	**18**
Figure 3	: Gearbox Nameplate and Explanation	**20**
Figure 4	: Output Shaft Versions	**25**
Figure 5	: **H - H ≤ 12** Type Reducer Equipment	**26**
Figure 6	: **H - H ≥ 13** Type Reducer Equipment	**26**
Figure 7	: **HB - H ≥ 13** Type Reducer Equipment	**26**
Figure 8	: **HB3 - H ≤ 12** Type Reducer Equipment	**27**
Figure 9	: **HB3 - H ≥ 12** Type Reducer Equipment	**27**
Figure 10	: Oil Supply System in **H** Type Reducers	**28**
Figure 11	: Oil Supply System in **HB** Type Reducers	**29**
Figure 12	: Rotary Shaft Seal	**30**
Figure 13	: Labyrinth Seal	**30**
Figure 14	: Taconite Seal	**30**
Figure 15	: Taconite Seal Types	**31**
Figure 16	: Tacolab Seal	**32**
Figure 17	: Backstop	**33**
Figure 18	: Torque Limiter Backstop	**34**
Figure 19	: Fan	**35**
Figure 20	: Cooler Coil Connection	**36**
Figure 21	: Air Oil Cooling System Mounted on **H** Type Reducer	**37**
Figure 22	: Air Oil Cooling System Mounted on **HB** Type Reducer	**37**
Figure 23	: Aqueous Oil Cooling System Mounted on **H** Type Reducer	**38**
Figure 24	: Aqueous Oil Cooling System Mounted on **HB** Type Reducer	**39**
Figure 25	: Heating System in **H / HB** Type Reducers	**41**
Figure 26	: Oil Level Monitoring System in **H / HB** Type Reducers	**42**
Figure 27	: Oil Temperature Monitoring System in **H / HB** Type Reducers	**43**
Figure 28	: Bearing Monitoring Using a Pt 100 Resistance Thermometer	**44**
Figure 29	: Monitoring Using Shock Pulses Transducer	**44**
Figure 30	: Encoder	**45**
Figure 31	: Basic Design of Main and Auxiliary Reducers	**46**
Figure 32	: Reducer Design (Connecting Auxiliary Drive Reducer)	**47**
Figure 33	: Gap Size in Grease Labyrinth	**51**
Figure 34	: Alignment Surfaces for Reducers up to Frame Size 12	**52**
Figure 35	: Alignment Surfaces for Reducers with Frame Size 13 and Above	**53**
Figure 36	: Concrete Bolt	**54**
Figure 37	: Base Block	**55**
Figure 38	: Installing Anchor Bolt	**56**
Figure 39	: Clamping Anchor Bolt	**56**
Figure 40	: Torque Support for Reducer	**58**
Figure 41	: Block Flange Reducer	**59**
Figure 42	: Torque Arm for Reducer Housing	**60**

List of illustrations

Figure 43: Hollow Shaft, Keyway Reducers	**61**
Figure 44: Ball Screw Assembly Process	**63**
Figure 45: Dismantling by using a Puller	**64**
Figure 46: Disassembly Using Hydraulic Pulling Equipment	**64**
Figure 47: Keyway, Hollow Shaft	**65**
Figure 48: Preparation for a Hollow Shaft Gear Unit with a Flat Hole on one Side and a Spline on the Other Side	**66**
Figure 49: Pre-Assembled Bushing Sleeve Assembly	**67**
Figure 50: Dismantling by using a Puller	**69**
Figure 51: Disassembly Using Hydraulic Pulling Equipment	**69**
Figure 52: Preparation for Hollow Shaft, Conical Compression Reducers	**71**
Figure 53: Coupling Assembly	**73**
Figure 54: Alignment Process with Flexible Coupling	**74**
Figure 55: Torque Limit Backstop	**89**
Figure 56: Product Types	**103**
Figure 57: The Electrical Motor Connection Schema	**113**
Figure 58: Standard Type Brake Anchorage Schema	**114**

CONTENTS

List of tables

Table 1	: Safety Alerts and Information Signs	**8**
Table 2	: Symbols and Marks	**9**
Table 3	: Product Description **(H)**	**21**
Table 4	: Product Description **(HB)**	**22**
Table 5	: Product Description **(HB-PKD)**	**23**
Table 6	: Abbreviations	**24**
Table 7	: Taconite Seal Models	**31 - 32**
Table 8	: Water Flow Rates in the Coil	**36**
Table 9	: Specific Heat Output Table	**41**
Table 10	: Motor Selection for Reducer Base	**58**
Table 11	: Motor Selection for Foundation Support	**61**
Table 12	: Guide Dimensions on Shaft Surface of Hollow Shaft Reducer	**65**
Table 13	: Maximum Forcing Pressures	**65**
Table 14	: Tightening Torques of Flange Connections	**73**
Table 15	: Information on Tightening the Connecting Bolts	**79**
Table 16	: Preload Forces and Tightening Torques	**79 - 80**
Table 17	: Operating Data	**86**
Table 18	: Service and Maintenance Operations	**87 - 88**
Table 19	: Disposal Table	**94**
Tablo 20	: Troubleshooting	**95 - 99**
Table 21	: Authorized Service	**100**
Table 22	: Weights	**104 - 105**
Tablo 22 - 1a:	Weights	**104**
Tablo 22 - 1b:	Weights	**104**
Table 22 - 2a:	For Auxiliary Driven Reducers (Failure Maintenance Work)	**104**
Table 22 - 2b:	For Auxiliary Driven Reducers (Failure Maintenance Work)	**105**
Table 22 - 3a:	For Auxiliary Driven Reducers (Working Under Load)	**105**
Table 22 - 3b:	For Auxiliary Driven Reducers (Working Under Load)	**105**
Table 23	: Oil Quantities	**105 - 107**
Table 23 - 1a:	Output Seal Oil Quantities	**105**
Table 23 - 1b:	Output Seal Oil Quantities	**106**
Table 23 - 1c:	Output Seal Oil Quantities	**106**
Table 23 - 2	: Labyrinth Seal Oil Quantities	**106**
Table 23 - 3a:	Oil Quantities for Intermediate Flange	**106**
Table 23 - 3b:	Oil Quantities for Intermediate Flange	**106**
Table 23 - 4a:	Immersion Lubrication	**107**
Table 23 - 4b:	Immersion Lubrication	**107**
Table 23 - 5a:	Pressure Lubrication	**107**
Table 23 - 5b:	Pressure Lubrication	**107**
Table 24	: Measurement Surface Sound Pressure Level	**108 - 111**
Table 24 - 1	: Measuring Surface Sound Pressure Level for Fan Cooled Conical Helical Reducer LpA, dB [A]	**108**
Table 24 - 2	: Measuring Surface Sound Pressure Level LpA, dB [A] for Fanless Conical Helical Reducer	**109**
Table 24 - 3	: Sound pressure level for fan cooled Helical Gearbox LpA, dB [A]	**110**
Table 24 - 4	: Sound pressure level for Fanless Helical Gearbox LpA, dB [A]	**111**

1.1 Important Warnings

Take into consideration the listed safety warnings and information signs below!

Table 1: Safety Alerts and Information Signs

ATTENTION !

Dangerous situation and possible outcome

Mild or major/minor injuries

This indicates that minor personal injury may occur if proper precautions are not taken.

NOTE !

Advice and useful information for the user

This indicates that property damage may occur if proper precautions are not taken.

DANGER !

Harmful situation and possible outcome

Damage occurs in the reducers and the environment.

If proper precautions are not taken, serious damage on the gearbox may occur, death or serious personal injury will result.

DANGER OF ELECTRICITY !

Electrical shock hazard and possible outcome

Death and serious injuries

DANGER !

Danger and possible outcome

Death and serious injuries

WARNING !

General usage information

If proper precautions are not taken that indicates serious personal injury may occur.

Table 2: Symbols and Marks


Vent plug


Drain plug


Oil level plug


Oil level


Oil fill point


Lubrication point


Oil control stick


Use grease


Eye bolt


Eye bolt


Earthing connection point


Vibration indicator connection point


Correction surface, (vertical)


Correction surface, (horizontal)


Do not disassemble

For oil level control with oil control stick;

1.) Unscrew the oil control stick,

2.) Check the oil level,

3.) Reinstall if appropriate.

These symbols indicate that there is an oil dipstick, it must be screwed tightly.

1.2 General Information

This User Manual has been prepared by our company to provide information on the safe handling, storage, placement / assembly, connection, operation, maintenance - repair operation of the reducer / geared motor reducer. Information on all purchasing and technical data is available in our product catalogues for these products. Besides accepted engineering practices, the information given in this manual should be carefully read and applied.
Documents should be kept by the authorized person and made available for checking. You can find information about the electric motor in the user manual prepared by the motor manufacturer.

1.3 Correct Use

Renold reducers/gear reducers are designed for use in commercial facilities. They operate in accordance with applicable standards and regulations. Technical data and permissible conditions of use are given on the power label of the reducer and in the User's Manual. All given values must be complied with.
This user manual has been prepared by our company in accordance with the 2006/42/EC European Union Machinery Safety directive.

In addition: These operating instructions are not covered by the 2014/34/EU "Regulation on equipment and protective systems used in potentially explosive atmospheres".

When using the reducer, please pay special attention to the following:

- Do not make any changes to the reducer beyond the permitted use described in this user manual. This also applies to safety equipment designed to prevent accidental contact.
- Only use original spare parts.

Other spare parts have not been tested and approved by Renold. Unapproved spare parts can change the design features of the reducer and thus impair its active or passive safety.
Renold accepts no liability for damage caused by the use of non-approved spare parts. The same applies to accessories not supplied by Renold.
If you have any questions, please contact us.

us

DANGER !

Falling risk!
Possible risk of serious injury from falling.
When the reducer is not running, you can walk or stand on the reducer only for maintenance and repair work. Do not step on or stand on shaft ends, protection covers, assembled components or pipes.

1.4 Safety Information

Personnel who will read the manual and the instructions directly indicated on the labels fixed on the reducer carefully and work on the reducer must be technically qualified and experienced and must also be equipped with the necessary safety equipment (according to current laws). Failure to observe these instructions may result in injury or damage.
Only use the reducer for the purposes specified by Renold. There is a health and safety hazard in case of misuse and may cause economic damages. Perform the maintenance operations on the reducer as programmed. It can reach high temperature when the reducer is working. Do not touch the enclosures with bare hands, use suitable safety equipment.
Ensure that full safety precautions are taken for proper maintenance, including the use of protective clothing and equipment required by applicable workplace safety legislation.
Only use original parts from Renold and our recommended oils and greases. Do not throw away materials that will cause contamination. Dispose of in accordance with environmental regulations. After changing the lubricant, clean the reducer and the working area.

Five Safety Rules;

In order to protect yourself and avoid any material damage, while working on electrical components of the plant, please take into safety related info and the following 5 safety rules into consideration (EN 50110-1 Standard Operation of Electrical Installation)

Before starting to work on the machine, follow the safety rules listed below:

1. Removing connections,
   Also, disconnect auxiliary circuits such as anti-condensation, heater,
2. Protection against restarting
3. Make sure the system is de-energized,
4. Grounding and short circuit,
5. Close or cordon off the live parts.

* When all work is completed, cancel the successive security measures.

1.4.1 Qualified Personnel

The product / system described in this document may only be operated by authorized personnel for a specific task in accordance with the relevant warnings and, in particular, warning notices and safety instructions. Qualified personnel are people who, based on their training and experience, can identify risks and avoid potential hazards when working with these products / systems.

1.4.2 Special Types of Hazards and Personal Protective Equipment

Before starting to work on the reducer, fulfill the following conditions:

- Make sure that the oil pressure lines are not pressurized.
- Work on the reducer only when the system is stationary and not working.
- Disconnect electrical systems from the power source.

DANGER OF ELECTRICITY !

Electric shock!
Moving parts can cause electric shock.
Before starting the electrical installation work, make sure that the entire facility is deenergized.

Protective equipment;

When using the reducer, wear the following personal protective equipment:

- Safety shoes,
- Overalls,
- Helmet,
- Protective gloves,
- Protection glasses.

DANGER !

Risk of eye injury!

Small foreign particles such as sand or dust can enter the protection plate of the rotating parts and be thrown back from there.
Wear safety glasses.

Hazards during operation;

The reducer may be damaged.
If incomprehensible changes are noticed during operation, stop the reducer immediately. Such changes may include unusual reducer noise or a significant increase in operating temperature.

DANGER !

Falling risk!

Standing or walking on the gear unit during operation creates a risk of falling.
Walk or stop on the gear unit only if the gear unit is not working for maintenance and repair work on the gear unit and its assembled components. Do not walk or stop on shaft ends, protection covers, mounted components or pipes.

DANGER !

Danger to life due to rotating or moving parts!

There is a danger that rotating or moving parts could catch you or pull you in.
Take safety precautions against contact and/or moving parts.

Surface temperature;

The surface temperatures of the reducer can be very extreme depending on the operating conditions.

DANGER !

Risk of burns!

Risk of serious burns from hot surfaces (> 55 °C). Wear suitable protective gloves and protective clothing.

DANGER !

Risk of Scalding!

There is a risk of serious injury of hot working environment during the replacements of the parts on the gearbox. Wear protective gloves,goggles and clothing.

DANGER !

Danger due to low temperatures!

Risk of serious injury (<0 °C) from frost (pain, numbness, frostbite) on cold surfaces.
Wear suitable protective gloves and protective clothing.

Chemicals;

Injuries can continue when chemicals are used.

WARNING !

Risk of chemical burns due to chemicals!

There is a risk of chemical burns when working with aggressive cleaning agents.
Follow the manufacturer's instructions on how to use cleaning agents and solvents. Use suitable protective equipment (gloves, safety glasses). Please use binders to immediately clean up all spilt solvents.

ATTENTION !

Risk of injury due to chemically aggressive operating materials!

There is a risk of eye and hand injury when working with chemically aggressive operating materials. Please follow the safety instructions in the data sheets of the oil used. Use suitable protective equipment (gloves, safety glasses). Use an oil-binding agent to clean up spilled oil immediately.

Explosion hazard;

An explosion may occur in an explosive atmosphere.

DANGER !

Danger of explosion by ignition of a potentially explosive atmosphere!

Danger to life due to possible explosive atmosphere igniting while the reducer is operating.
Do not use the reducer in explosive atmospheres.

DANGER !

Life-threatening risk due to the movable system!

Death or serious injury will occur.
Before doing any work, always turn off the reducer and any oil supply system (whether separate or attached to the reducer). Secure the drive against accidental starting as follows:

* Turn off the operating switch (turn the system off).
* Remove the fuses from the power supply.
* Attach a warning to the start switch that clearly indicates that the reducer is working.

Make sure the entire unit is unloaded so there is no danger once you start removing components.

1.5 Responsibility

Renold accepts no liability if the following occurs:

- Use of reducers that do not comply with national laws on safety and accident prevention,
- Work done by unqualified personnel,
- Wrong installation,
- Tampering with the product (making changes),
- It does not accept any liability for non-observance or inaccuracy of the instructions in the manual, for damage or malfunctions resulting from non-observance of these operating instructions.
- To follow the signs indicated on the product labels of the reducers incorrectly or inappropriately,
- Wrong electrical energy for geared motor reducers,
- Incorrect connections and/or use of temperature sensors (if any),
- Oil-free use of the reducer,
- The content of this guide has been reviewed to ensure consistency with the documents such as catalog etc. We cannot guarantee full consistency, as dynamic required by the system cannot be completely blocked. However, the information in this manual is regularly reviewed and corrections are made in subsequent editions.

Since products supplied by Renold are designed to be included in "complete machines", commissioning them is prohibited until the full machine has been declared compatible.

Restarting the reducer:

When installing the reducer on machines or systems, the machine or system manufacturers must ensure that the regulations, notes and descriptions contained in this operating manual are included in their operating manual.

DANGER !

Only the configurations found in the product catalogue are allowed. Do not use the product contrary to the indications given in the product. The instructions given in this manual do not replace the obligations of current laws regarding safety regulations and do not compensate for any damages.

1.6 Transportation, Freightage and Storage

1.6.1 Scope of Delivery;

The scope of delivery is listed in the shipping documents. Immediately after receiving the reducer, check that it has been delivered completely. Immediately report damaged and / or missing parts to Customer Service.

DANGER !

Serious injury with defective product!

Serious injuries can occur. If there is visible damage to the reducer, you should not put it into operation.

1.6.2 Freightage;

The reducer is delivered fully assembled. Additional parts such as conical clamps, couplings, oil coolers, piping and valves can be packaged separately as required.

To avoid damage to the reducer while transporting the reducer, follow the instructions below:

- Always use suitable equipment to transport the reducer,
- Transport the reducer without oil filling and leave it in the transported packaging.
  Depending on the order specifications, the reducer can be shipped filled with oil. Take into account the extra weight (liter x 10 N) and move the reducer to its final mounting position,
- Do not use wrong connection points.
  Threaded holes in shaft end surfaces cannot be used for attachment of lifting equipment,
- Do not use the piping system to move or carry the reducer.
- Make sure that the lifting equipment is properly designed to support the weight of the reducer.

DANGER !

Risk of crushing!

There is a risk of being crushed by a part to be dismantled because the lift reducer and load suspension device are not suitable for holding the part.
Please follow the load distribution information on the packaging during lifting.
When the product is in a raised position, move it slowly and carefully to avoid injury to persons or damage to the reducer.

Connecting the reducer

To carry the reducer, attach the suspension straps to the marked attachment points made for this purpose only. Please note the following when attaching or raising, lowering or moving the slings to the load:

- Do not exceed the specified load limits,
- If you are using a load suspension device with several load hooks, make sure that the load is evenly distributed between them,
- Note the eccentric center of gravity,
- Make sure the lifting equipment is securely attached,
- Reduce your speed while carrying the load,
- Do not allow the load to swing and do not tie the load to objects or structures inside the building,
- Loads should not hang from the end of the load hook,
- Products should always be placed on a flat, non-displacement and stable base.

DANGER !

Falling load!

There is a risk of fatal injury from falling if the load is not securely attached to the lifting equipment. Never stand or sit under suspended loads. Do not exceed the load limits of the lifting equipment.

Packaging

The reducer is delivered fully assembled. Additional equipment is also packaged separately as needed.
The reducer can be packaged in various ways, depending on its size and shipping method.
Please observe the symbols applied on the packaging.

1.6.3 Connection Points;

Lifting eye bolts

Lifting eyebolts are attached to the reducer to aid handling during fabrication and assembly.
When the lifting equipment is attached to strap loop, the rope transport direction must not exceed 45°.

Belt ring

Screw holes of the transport eyebolts are provided on the reducer to assist in carrying during manufacturing and assembly.
When the lifting equipment is attached to the belt rings, the scissor pull must not exceed 45°.

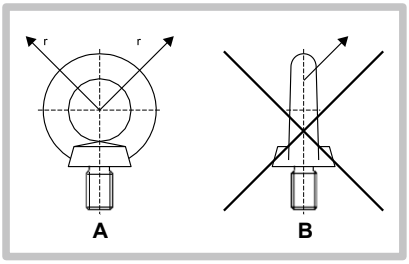
Eye bolts

It is generally recommended to use belt rings instead of eyebolts.
When using eyebolts, please note that their load-bearing capacity may be reduced if they are alternately connected to different components that need to be moved.
It is forbidden to load the eyebolts by pulling them sideways in the opposite direction to the hole direction.

Location of connection points

Drive units with additional components (reducer motor, coupling, etc.) mounted on the reducer may require an extra connection point due to the displacement in the centre of gravity caused by the mounted components. Further information, a detailed drawing of the reducer and the position of the reducer can be found in the technical drawing in the reducer documentation.

Figure 1: Cross and Side Pull on Eyebolts



A Permissible diagonal pull in the direction of the ring surface (maximum angle of 45°).
B Inadmissible side pull towards the opposite direction of the ring surface.

1.6.4 Special Conditions for Lubricating and Protecting the Reducer;

Re-greasing the Bearings

- Grease-lubricated rotating ball bearing:

The reducer can be supplied with bearings lubricated with grease. Grease-lubricated bearings are filled with grease prior to shipment. For information on oil quantities and relubrication intervals, please refer to the labels at the relubrication points.

1.6.5 Special Conditions of Protection of the Reducer;

Internal Protection by Oil Filling

Oil filling should not be used as a means of protecting reducers using grease-lubricated bearings.

1.7 Transportation

1.7.1 Transport of Gearboxes;

Figure 2: Transport of Gearboxes

H / HB

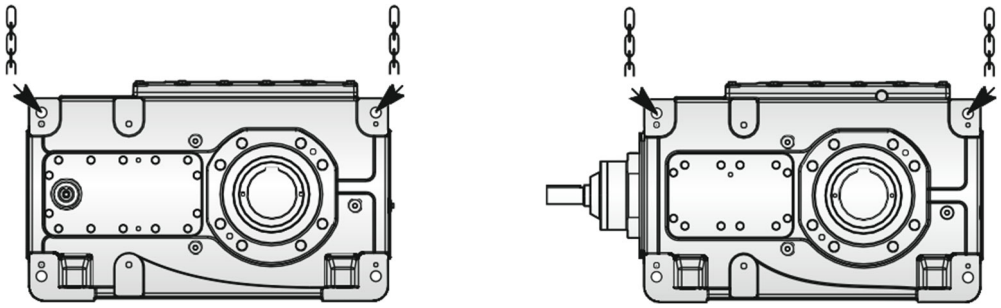


Figure 2 - a: Position of additional lifting points for reducers of type **H / HB**

If additional units such as the electric motor, clutch are connected to the reducer, an additional connection point may be required due to the change in the centre of gravity.

NOTE !

The load will not be lifted in an inclined position if fastened with eyebolts.

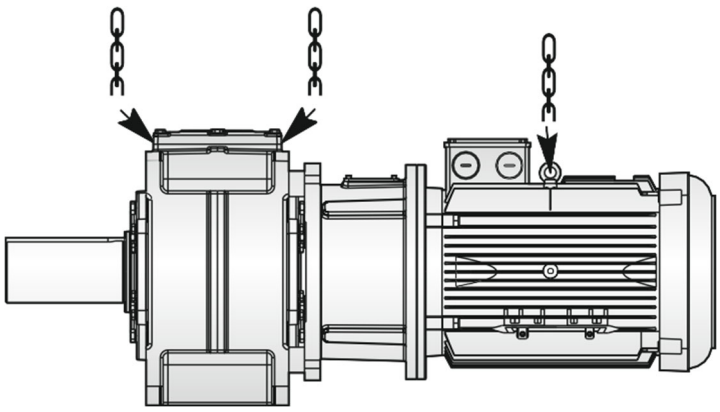


Figure 2 - b: Positions of additional lifting points for geared motor reducers of type **H**

H / HB

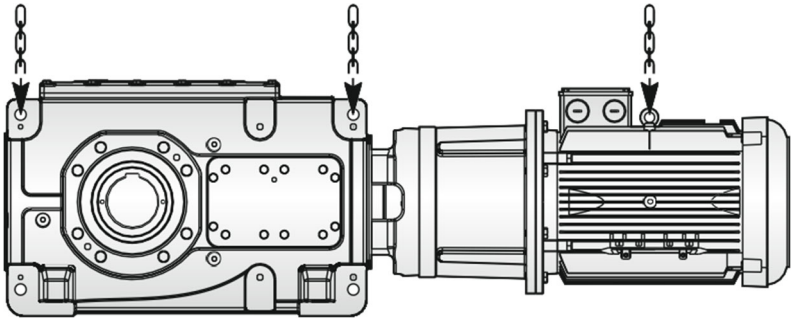


Figure 2 - c: Positions of additional lifting points for geared motor reducers of type **HB**

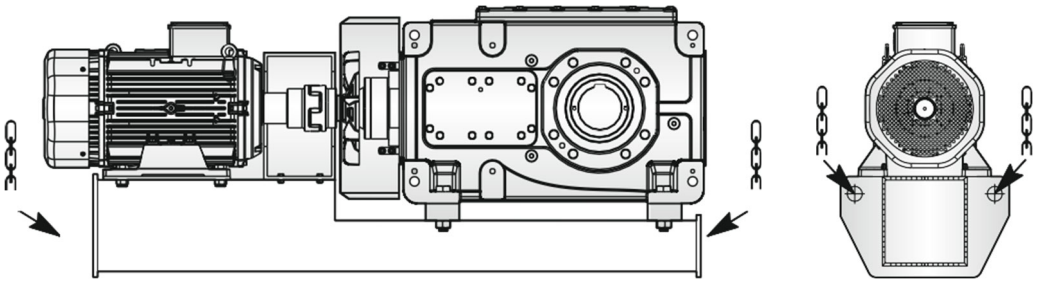


Figure 2 - d: Position of additional lifting points for reducers with torque arm, type **HB**

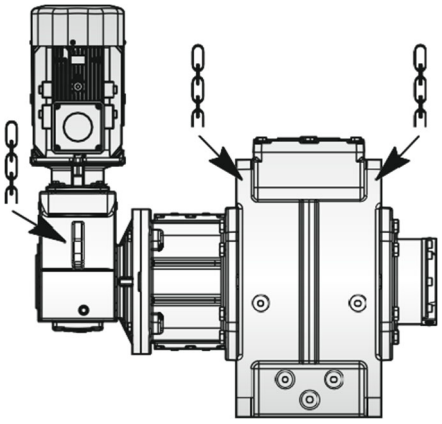


Figure 2 - e: Position of additional lifting points for auxiliary drive reducers of type **HB / H**

The connection point positions can be found in the documentation of the reducer to order.

1.8 Storage

Some suggestions are given below regarding the storage conditions of reducers/geared motor reducers.

- Storage should not be done outdoors and in an environment with high humidity.
- Reducers/ geared motor reducers should not be in direct contact with the ground.
- The contact point of the reducers/geared motor reducers must be stationary. Otherwise, damage may occur during relocation.
- The reducer must be secured against rolling.
- The machined surfaces of the reducers and shafts must be lubricated with protective oil.
- Reducers/geared motor reducers must be in an environment with no big temperature difference between 0 °C and +40 °C.
- Relative humidity should be less than 60%.
- It should not be exposed to direct sunlight or infrared rays.
- It should be kept away from corrosive and corrosive substances (polluted air, ozone, gases, solvents, acids, salts, radioactivity etc.) in the environment.
- Protective oil SHELL ENSIS or an equivalent product should be used on corrodible parts.
- If the reducer is oil-free, it must be filled with lubricating oil.

1.8.1 Long Term Storage Suggestions;

NOTE !

- If there is an excessive temperature difference during long-term or short-term storage, the oil in the reducer must be changed before starting.
- In a fully oil-filled reducer, the oil level must be reduced in accordance with the mounting position.

DANGER !

- Incorrect or excessively long storage may cause the reducer to malfunction.
- Before commissioning the reducer, check that the permissible storage time is not exceeded.

NOTE !

- Renold recommends the long-term storage option for storage or downtimes greater than 9 months.
- Storage up to 2 years is possible with the long-term storage option and taking into account the precautions listed below. Since the actual effects of the reducer are highly dependent on local conditions, these times should be viewed as guide values only.

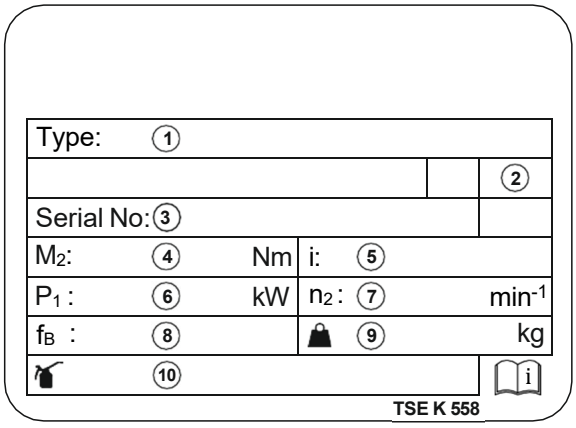
Long-term storage recommendations;

- Mineral oil or synthetic oil must be filled ready for operation, according to the mounting position. However, the oil level should be checked before operating.
- VCI corrosion inhibitor must be mixed with the reducer oil.
- The transport safety of the ventilation plug on the reducer must not be removed during storage.
- There should be no oil leakage from the reducer.

2.1 Gear Unit Label

Important technical information are found on gearbox's label.

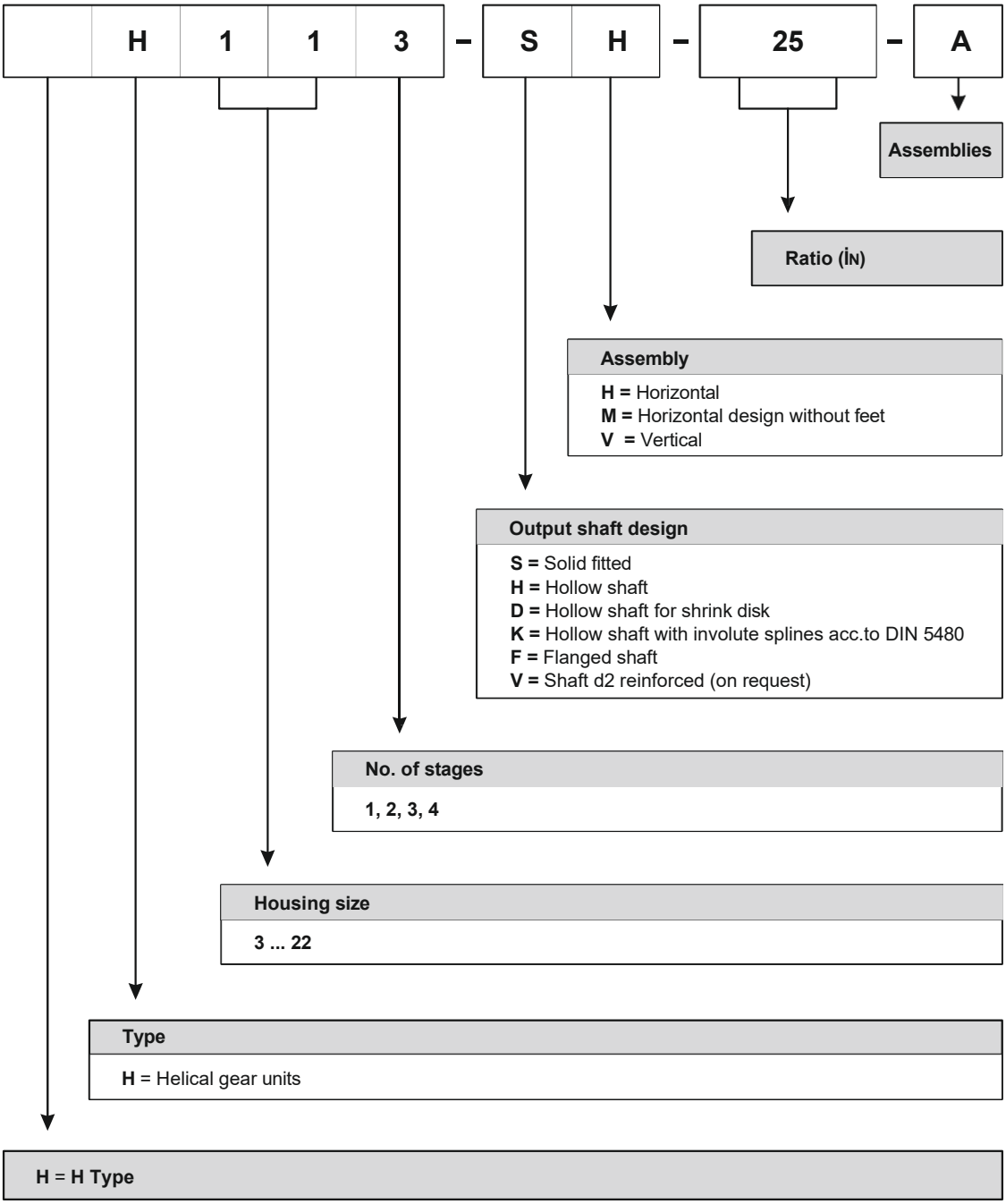
Figure 3: Gearbox Nameplate and Explanation



1. Type
2. Mounting position
3. Serial number
4. Output torque (Nm)
5. Reduction ratio
6. Rated power of motor [kW]
7. Output speed [rpm]
8. Service factor
9. Weight of the geared motor (kg)
10. Used oil kind and amount (lt)

2.2 Explanations

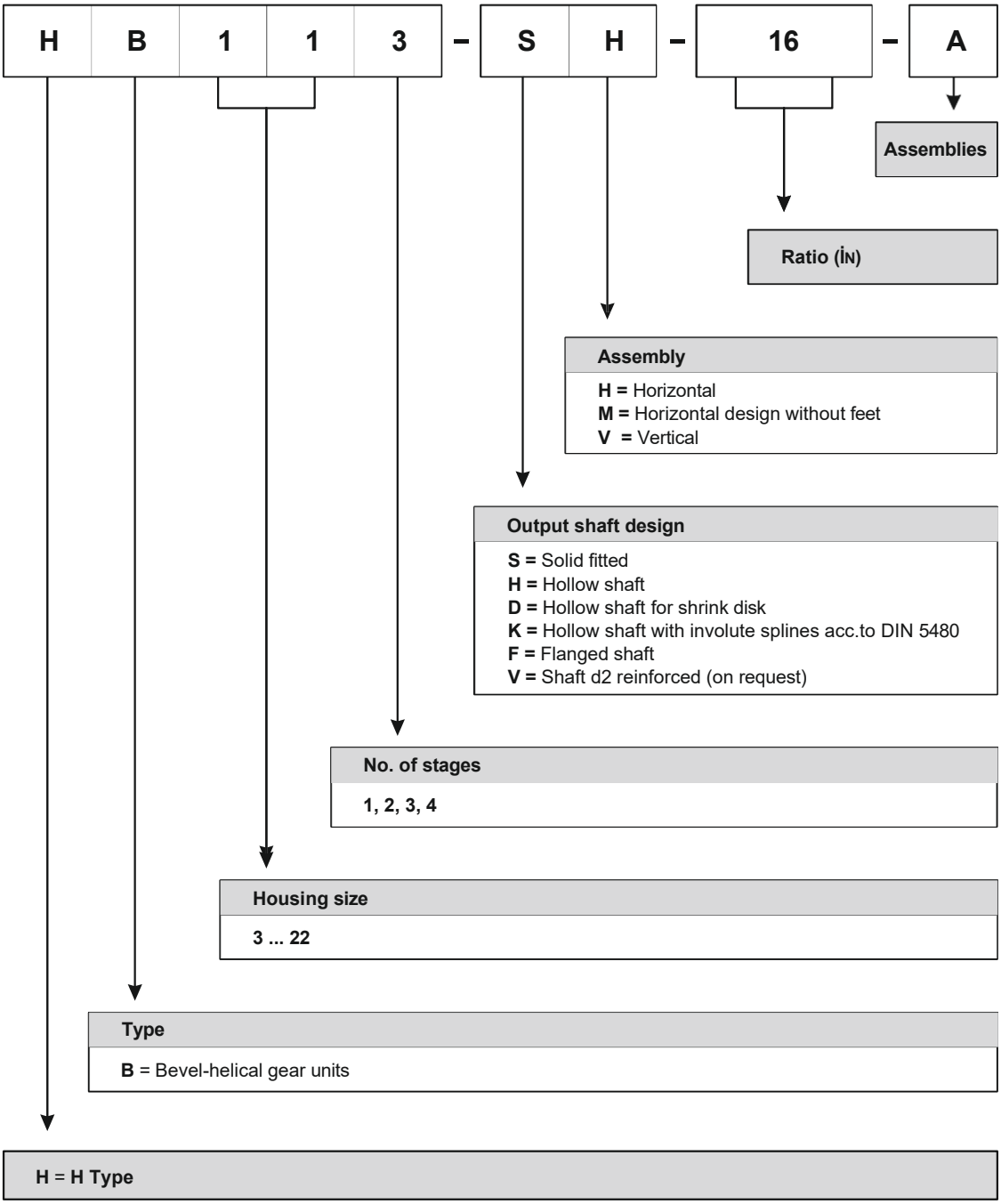
Table 3: Product Description **(H)**



Detailed information required for ordering:
Transfer rate i, A, B, C, D, etc. design,

Example H 113-SH
Helical gear reducer, Body size 11, 3 stages, Ratio: 25, Shaft output, A mounting arrangement, Horizontal mounting position.

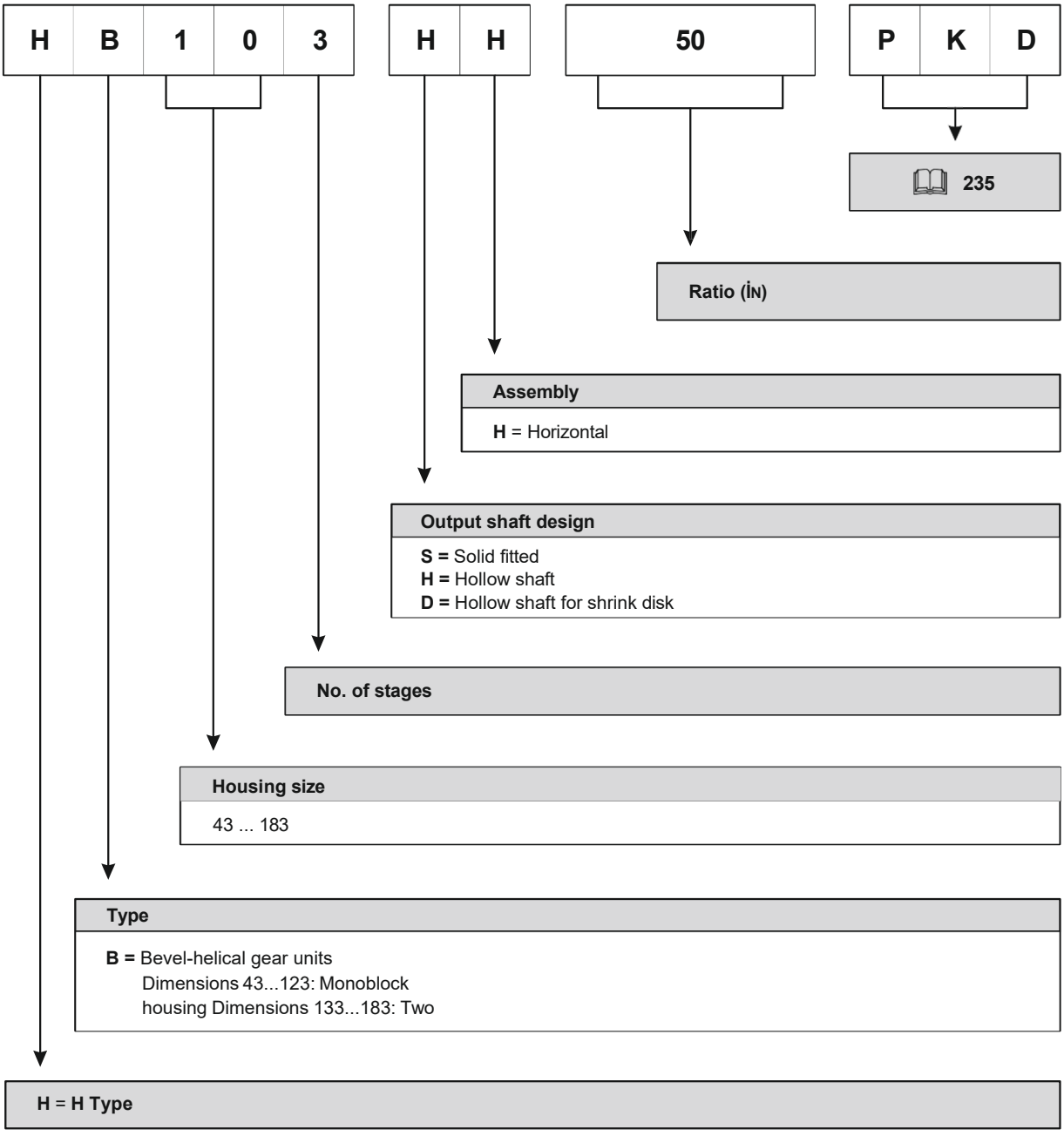
Table 4: Product Description **(PB)**



Detailed information required for ordering:
Transfer rate i, A, B, C, D, etc. design,

Example H 113-SH
Bevel-helical gear units, Body size 11, 3 stages, Ratio: 16, Shaft output, A mounting arrangement, Horizontal mounting position.

Table 5: Product Description **(HB-PKD)**



Additional information required when ordering:
Conversion rate i, design B, D, etc.
When viewed from the forehead of the output shaft, the rotation direction of the output shaft and the rotation direction of the shaft where the auxiliary reducer is connected to the main reducer is the same.

Example HB 103-HH 50 PKD
Bevel-helical gear units, Body size 10, 3 stages, Ratio: 50, Hollow shaft output, PKD bucket elevator (operation under load), d_2 shaft rotation of direction CCW.

2.3 Abbreviations

Table 6: Abbreviations

Abbreviations	Meaning	Industrial Type Gear Units
H	Horizontal	✓
M	Horizontal design without feet	✓
V	Vertical	✓
S	Spindle Output	✓
H	Hollow shaft	✓
K	Sliding Shaft (DIN 5480)	✓
F	Flanged	✓
V	Reinforced Shaft	✓
SH	Spindle Output - Horizontal	✓
HH	Hollow Shaft - Horizontal	✓
DH	Conical Clamping-Horizontal	✓
KH	Spline DIN 5480 - Horizontal	✓
FH	Flanged Shaft - Horizontal	✓
HM	Hollow Shaft - Mounting without feet - Horizontal	✓
DM	Conical Clamping - Mounting without feet - Horizontal	✓
KM	Spline DIN 5480 - Footless Mounting - Horizontal	✓
FM	Flanged - Without Feet - Horizontal	✓
SV	Spindle Output - Vertical	✓
HV	Hole Shaft - Vertical	✓
DV	Conical Clamping - Vertical	✓
FV	Flanged - Vertical	✓
KV	Spline DIN 5480 - Vertical	✓

✓ **: Existing designs are marked with a tick.**

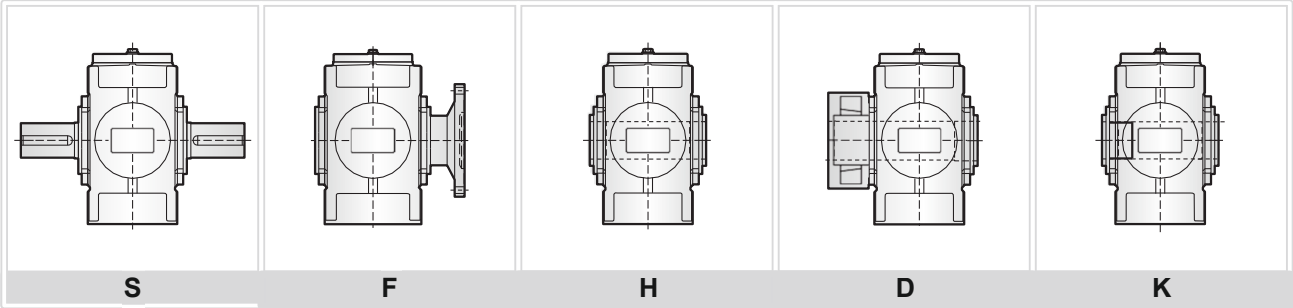
3.1 Output Shaft Versions

The following versions of the output shaft are available:

- S = Output shaft.
- F = Flange shaft.
- H = Hollow shaft, keyed.
- D = Conical clamping.
- K = Hollow shaft splined to DIN 5480.

The available versions of the output shaft are shown in the diagram below:

Figure 4: Output Shaft Versions



S ... Output Shaft
F ... Flanged Output Shaft
H ... Hollow Spindle
D ... Conical Clamping
K ... Hollow Shaft with Slider (DIN 5480)

3.2 Housing

The housing is made of cast iron.
The reducer housing has the following features:

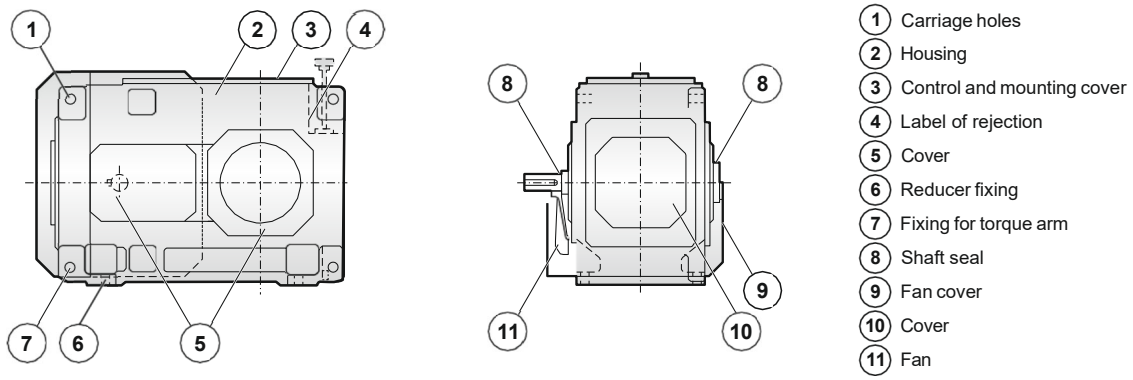
- Connection points for the transport of the reducer.
- Inspection and mounting cover for control.
- Oil filling point for filling oil.
- Oil sight glass, oil level indicator or dipstick to check the oil level.
- Oil drain plug or oil drain valve for changing the oil.
- Air filter or wet air filter for ventilation or deaeration.

The dipstick should be considered the most reliable if several components are installed on the reducer to control the oil level.

3.2.1 Reducer Equipment

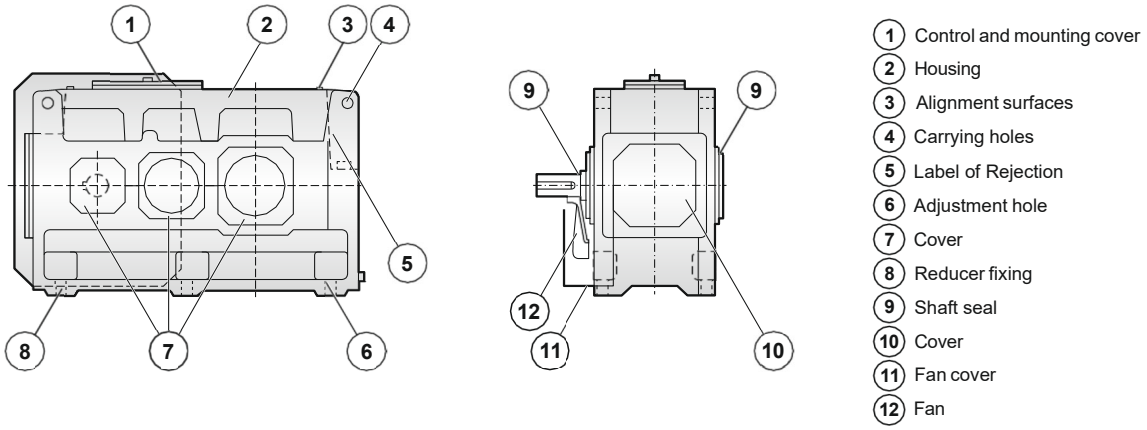
The following figure shows the equipment in the reducer with a housing size of **H-H ≤ 12:**

Figure 5: H - H ≤ 12 Type Reducer Equipment



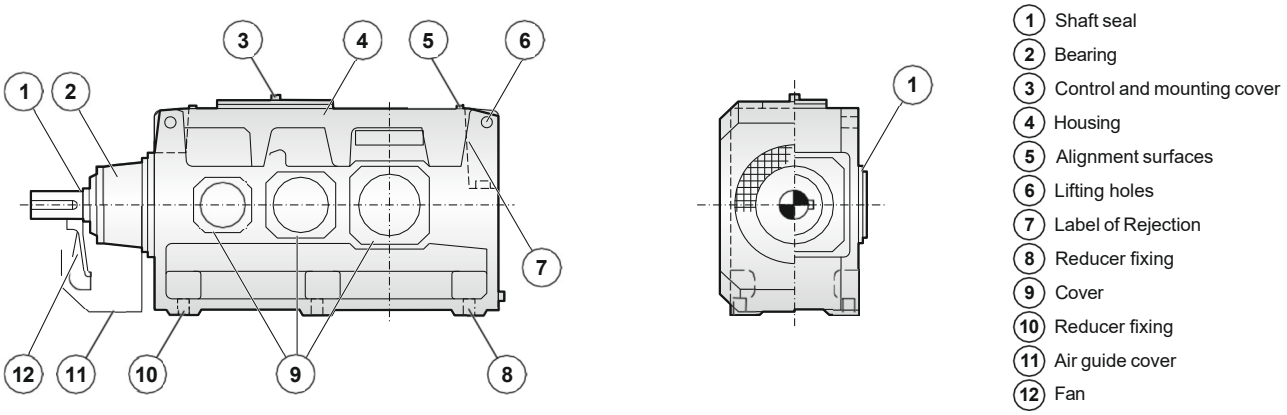
The following figure shows the equipment in the reducer with a housing size of **H-H ≥ 13:**

Figure 6: H - H ≥ 13 Type Reducer Equipment



The following figure shows the equipment in the reducer with a housing size of **HB-H ≥ 13:**

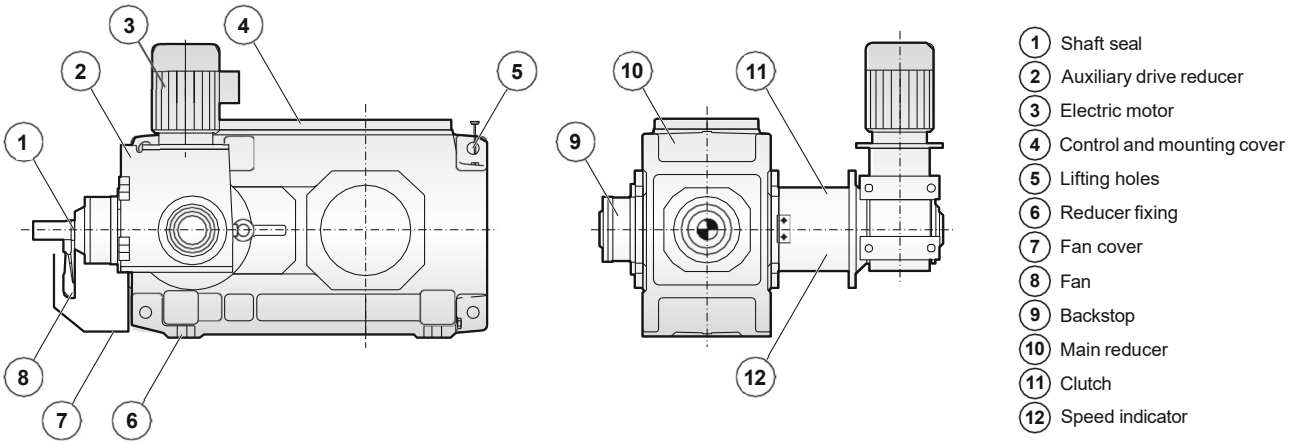
Figure 7: HB - H ≥ 13 Type Reducer Equipment



Reducer equipment in auxiliary drive reducers:

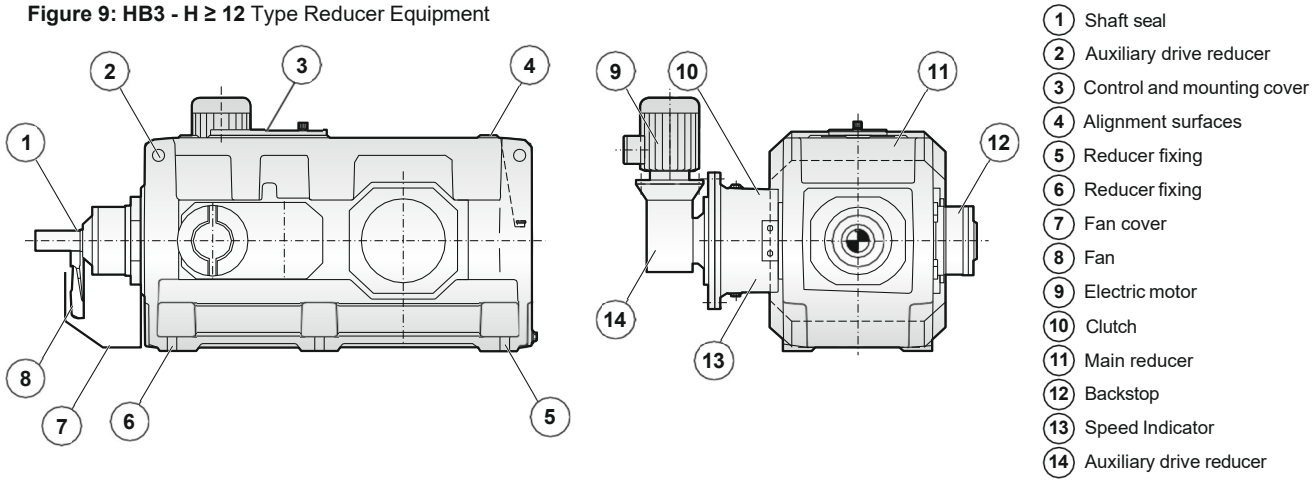
The following figure shows the equipment in the reducer with a housing size of **HB3 - H ≤ 12:**

Figure 8: HB3 - H ≤ 12 Type Reducer Equipment



The following figure shows the equipment in the reducer with a housing size of **HB3 - H ≥ 1:**

Figure 9: HB3 - H ≥ 12 Type Reducer Equipment



More information on the location of the assembled parts and a detailed representation of the reducer can be found in the dimension drawing in the complete documentation for the reducer.

3.3 Oil Supply to Reducer

The oil supply to the various reducer components can be implemented using the following types of oil sources:

- Splashed Lubrication,
- Pressure Lubrication,
- Combination of both oil source options.

3.3.1 Splashed Lubrication

Unless otherwise agreed by contract, gear and roller bearings are supplied with a sufficient amount of oil by splashed lubrication.
Depending on the order specifications, the splashed lubrication system can also be supplemented with grease lubrication of the roller bearings.

3.3.2 Pressure Lubrication

Depending on the order, a pressure lubrication system can be added to the splashed type lubrication.

- A non-horizontal mounting position.
- Higher bearing speeds.
- High peripheral speed gear.

Roller bearings and gears, which are above the oil level with pressure lubrication, are supplied with enough oil by lubricating pipes.

Designs;

The following designs are possible:

- Assembled oil supply system.
- Separate oil supply system.

Pressure lubrication with mounted oil supply system;

The oil supply system is mounted on the reducer and includes the following parts:

- Flanged or motorized pump,
- Oil filter
- Pressure monitor,
- Piping.

Before starting the reducer, run the motor pump for 5 minutes.

NOTE !

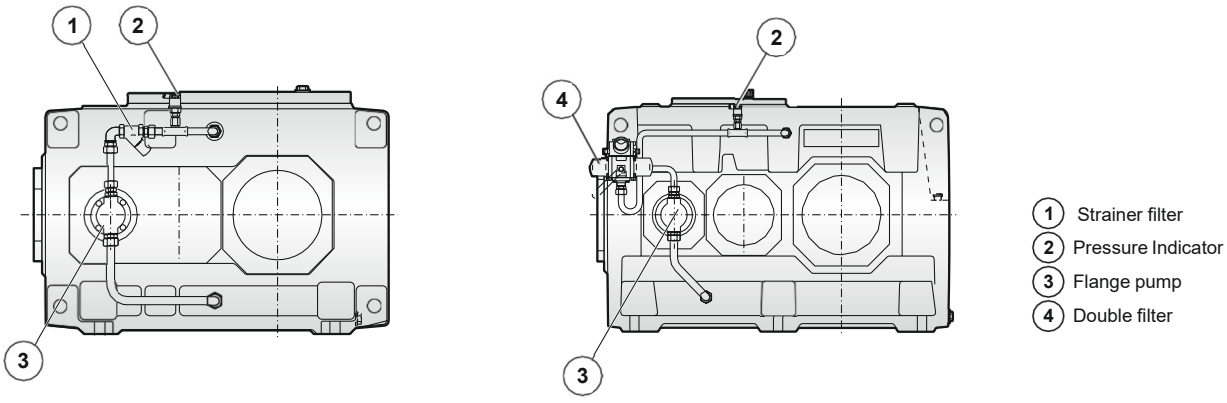
Pay attention to the flow direction of the pump!

When connecting the valves, pay attention to the actual flow direction of the pump. To determine whether the flow direction of the pump used is dependent on the direction of rotation, refer to the documentation for the complete reducer.

Assembled oil supply system;

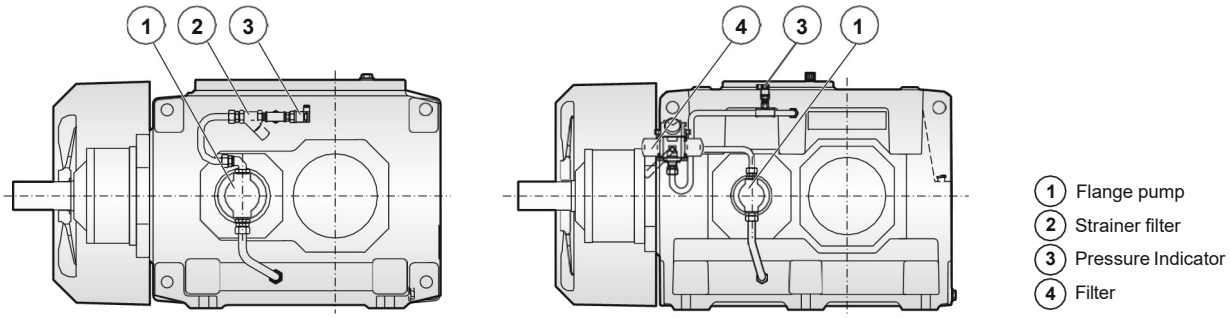
The figure below shows the oil supply system mounted on the **H** type reducer:

Figure 10: Oil Supply System in **H** Type Reducers



The figure below shows the oil supply system mounted on the **HB** type reducer:

Figure 11: Oil Supply System in **HB** Type Reducers



Depending on the order specifications, a motorized pump can also be used instead of a flanged pump.
Additional information and a detailed pictorial description of the reducer and the oil supply system can be found in the technical drawing in the reducer documentation.
Additional information on the oil supply system and control instructions can also be found in the oil supply system operating instructions provided in the datasheet, equipment list and reducer documentation.

3.3.2.1 Pump

Requirements placed in the pumped environment;

The pump used is suitable for pumping the lubricating oil. The oil should not contain abrasive components and chemicals that may damage the pump.
Clean oil with good lubricating properties is a prerequisite to ensure correct function, high operating reliability and long pump service life.

3.3.2.2 Oil Filter

The oil filter protects subunits, measuring and control devices from dirt and contamination. Up to 12 body sized reductors a strainer filter is mounted as standard; for size 13 and above a separate filter assembly is necessary. The oil filter may vary depending on the order specifications. The type of oil filter installed on the reducer is specified in the equipment list in the reducer documentation.
The oil filter consists of a housing with connection points and a strainer. The oil flows into the filter housing, where most of the dirt particles larger than a certain size in the oil are filtered out, depending on the filter spacing. Dirty filter screens should be cleaned or replaced.

3.4 Bearing Arrangement of Shafts

All shafts are mounted on slewing ball bearings.

3.5 Seals

Depending on the requirements, the seals prevent oil leakage from the reducer or dirt entering the reducer.

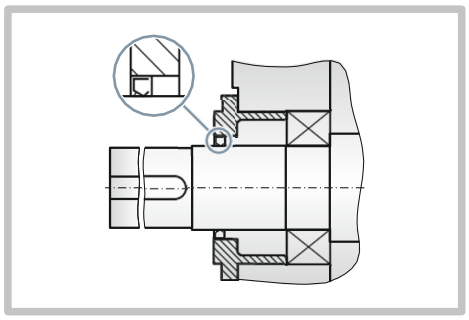
3.5.1 Rotary Shaft Seals

Rotary shaft sealing seals are the standard seals that are used. Whenever possible, the rotary shaft seals are equipped with an additional dust lip that protects the actual sealing lip against external contaminants.

NOTE !

Irreversible damage to the rotating shaft seal caused by high-density dust!
A damaged rotating shaft seal may not seal the reducer effectively. Do not use damaged rotating shaft seals in very dusty environments unless they have additional protection.

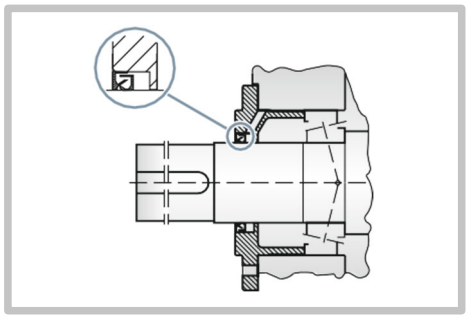
Figure 12: Rotary Shaft Seal



3.5.2 Labyrinth Seal

Labyrinth seals as non-contact seals prevent shaft wear. It does not require any maintenance and improves the temperature behavior of the reducer. Labyrinth seals can only be used for certain gear ratios and minimum speeds or in combination with a pressure lubrication system.
You can see whether the reducer is equipped with a labyrinth seal or not in the spare parts drawing and spare parts list.
These seals require a stable, horizontal installation for safe operation in areas free of dirty water or high dust. Leakage (oil leakage) may occur if the gearbox is filled with an excessive amount of oil. The same is true when using a high foaming oil.

Figure 13: Labyrinth Seal



3.5.3 Taconite Seals

Taconite seal is a combination of two sealing elements:

- Rotating shaft seal to prevent lubricating oil from escaping,
- Oil-filled dust seal (includes a labyrinth and a lamella seal) to ensure the reducer works in extremely dusty environments,

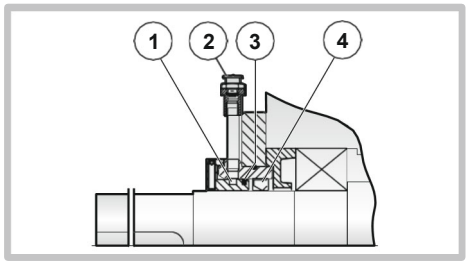
* Taconite seal is ideal for use in dusty environments.

NOTE !

Gearbox leaks due to poor sealing!

Re-lubricate the labyrinth seals at the specified lubrication intervals. The lubrication intervals are specified in the maintenance schedule (Pages 87-88) .

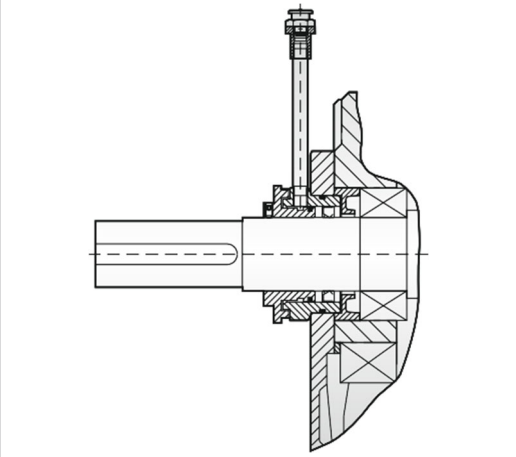
Figure 14: Taconite Seal



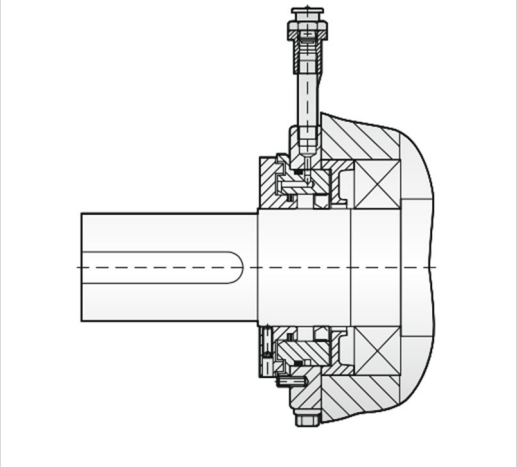
1. Oil-filled labyrinth, to be lubricated again
2. Grease nipple
3. Lamellar seal
4. Rotary shaft seal

The following design variants of the taconite seal are available:

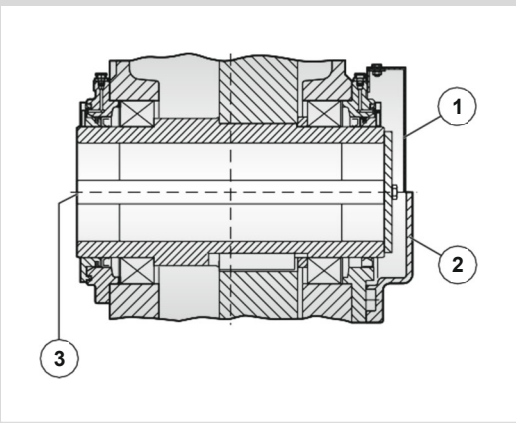
Figure 15: Taconite Seal Types



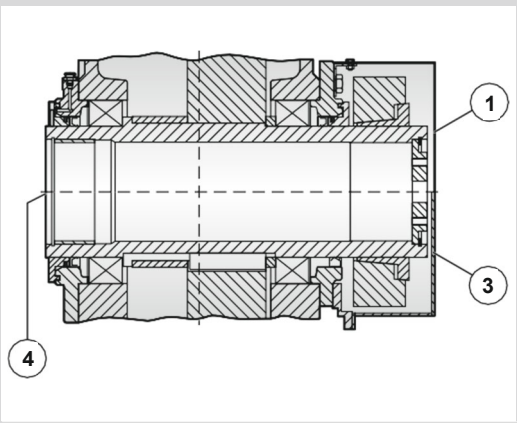
Taconite E



Taconite F



Taconite F-F
Taconite F-H



Taconite F-F
Taconite F-K

1 Taconite F-F
2 Taconite F-H
3 Taconite F-K
4 Output

The various taconite seals are described in the table below:

Table 7: Taconite Seal Models

Taconite seal models	Application	Warnings
“ E ”	All input shafts with or without fan	• It can be regreased
“ F ”	Output shaft	
	Model **S:** Solid shaft	
	Model **F:** Flange shaft	
“ F-F ”	Output shaft Model **H:** Keyed shaft with hollow shaft Model **K:** Spline shaft with hollow shaft (DIN 5480) Model D: Conical clamping shaft	Labyrinth seal structure that can be lubricated on both sides, including the seal on the shaft.

Table 7: Taconite Seal Models

Taconite seal models	Application	Warnings
“ F-F ”	Output shaft Model **H:** Keyed shaft with hollow shaft Model **K:** Spline shaft with hollow shaft (DIN 5480)	Labyrinth seal can be lubricated on output shaft side. There is also a dust seal on the shaft.
“ F-K ”	Output shaft Model **D:** Conical clamping shaft	

DANGER !

Sparks, unacceptable temperature rise and seal wear due to insufficient clearance size!

Insufficient clearance size can cause sparks, unacceptable temperature rise and seal wear. In the case of taconite seals, shaft seals, ensure that the setting range of $1^{+0.5}$ mm in the oil labyrinth is not changed when the inlet and outlet elements (e.g. coupling parts) are installed. Rotating and fixed parts must not come into contact with each other.

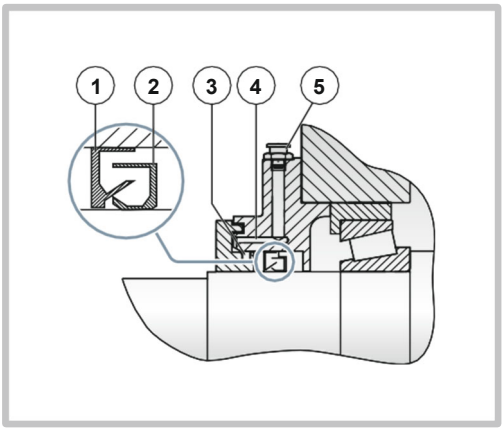
3.5.4 Tacolab Seal

Tacolab seals can only be used for certain ratios and minimum speeds or with pressure lubrication. Tacolab seals, as non-contact seals, prevent shaft wear. It does not require any maintenance and improves the temperature behavior of the reducer. Tacolab seals also protect against dust ingress.

The tacolab seal is a combination of two seals:

- Labyrinth seal with two labyrinth sealing rings to prevent lubrication leakage.
- Oil-filled dust seal, to ensure the gear unit works in extremely dusty environments (a labyrinth and a lamella seal are included)

Figure 16: Tacolab Seal



1. Outer labyrinth
2. Seal Inner
3. Labyrinth seal
4. The labyrinth is filled with grease, can be re-lubricated.
5. Grease nipple

DANGER !

Sparks, unacceptable temperature rise and seal wear due to insufficient clearance size!

Insufficient clearance size can cause sparks, unacceptable temperature rise and seal wear. In the case of taconite seals, shaft seals, ensure that the setting range of $1^{+0.5}$ mm in the oil labyrinth is not changed when the inlet and outlet elements (e.g. coupling parts) are installed. Rotating and fixed parts must not come into contact with each other.

Insufficient lubrication due to oil leakage from the reducer;

To ensure the reliable operation of the tacolab seals, the reducer must be permanently installed in a horizontal position and not exposed to wastewater.
Excessive oil filling of the reducer can cause leaks, as well as oil filling with a high foam content, can cause leaks.

NOTE !

Reducer oil leaks due to poor sealing!

There may be oil leaks from the reducer due to poor sealing. Re-lubricate the labyrinth seals at the specified relubrication intervals. Relubrication intervals are specified in the maintenance schedule (Pages 87-88).

Check the spare parts drawing and spare parts list whether there are tacolab seals in the reducer or not.

3.6 Backstop

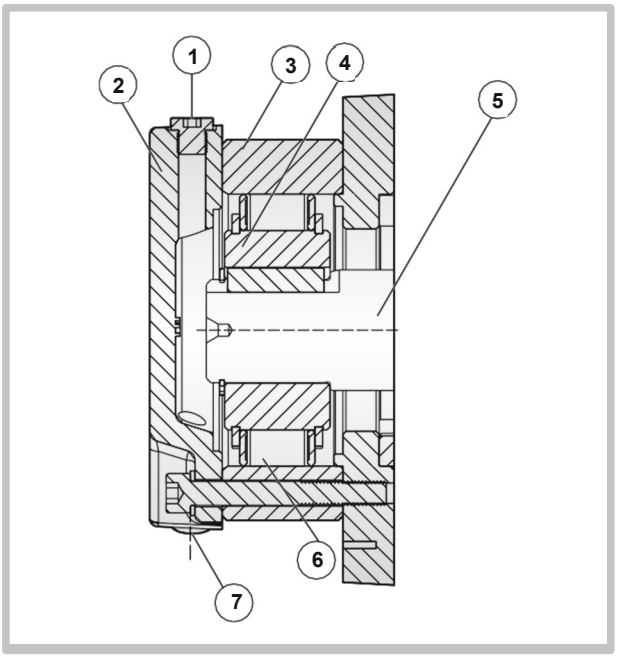
Some of the requirements for reducer can be fitted with a mechanical lock. In operation, the lock only allows the specified direction of rotation. The direction of rotation is indicated by using an arrow at the inlet and outlet of the reducer.
The lock is mounted on the gear via a sealing intermediate flange. The lock is integrated into the reducer lubrication system.
The lock is equipped with a centrifugal brake block. If the reducer rotates in the specified direction, the inner ring rotates with the brake wedge cage in the direction of rotation of the shaft while the outer ring is stationary. Above a certain speed (disengagement speed), the brake block is disengaged from the outer ring. In this working condition, the lock works without any wear.
Before connecting the motor, determine the phase sequence of the three-phase power system using a phase sequence indicator. Connect the motor corresponding to the defined direction of rotation.
The block direction of the lock can be changed by turning it over the cage. If you want to change the blocking direction, you should always contact Renold.
When the bucket elevator is installed (as maintenance or load drive), the rotation direction is specifically defined.

DANGER !

Damage to the lock and reducer due to the wrong direction of rotation!

Damage to the lock and reducer may occur due to the wrong direction of rotation. Do not run the motor in the opposite direction of the reducer blocking direction. Observe the note attached to the reducer.

Figure 17: Backstop



1. Backstop oil filler plug
2. Cover
3. Outer cage
4. Inner cage
5. Shaft
6. Backstop
7. Waste oil discharge point

3.7 Torque Limiter Backstop (Special Version)

A torque limiting locking system is available for special applications, e.g. dual drives. This type of lock is a combination of a centrifugal brake shoe and a brake.
The torque-limiting lock is mounted on the gear via a sealing intermediate flange; the lock is integrated into the reducer lubrication system.

Slip Torque

The guide screws of the springs are locked using the locking wire so that the set slip torque cannot be changed. If the locking wire for the screws is missing or damaged, the warranty is void.
In general, the lock works without any wear. As a preventive measure, the measure "x min." should be checked each time the reversing lock is actuated (type FXM only) - and then checked every 12 months.

ATTENTION !

The danger of injury as a result of moving system parts!

There is a risk that the load may not be safely held in place and may accelerate in the opposite direction after the engine has been switched off.
The slip torque is set at the factory at the correct values and must not be changed.

The slip torque is adjusted using a series of springs. As a result of "displacement", the reducer and lock brake block are protected against unacceptably high stresses when rotated backwards.
In addition, for double reducers, the load is evenly distributed to both reducers when it rotates backward.

Before connecting the motor, determine the phase sequence of the three-phase power system using a phase sequence indicator. Connect the motor corresponding to the defined direction of rotation.

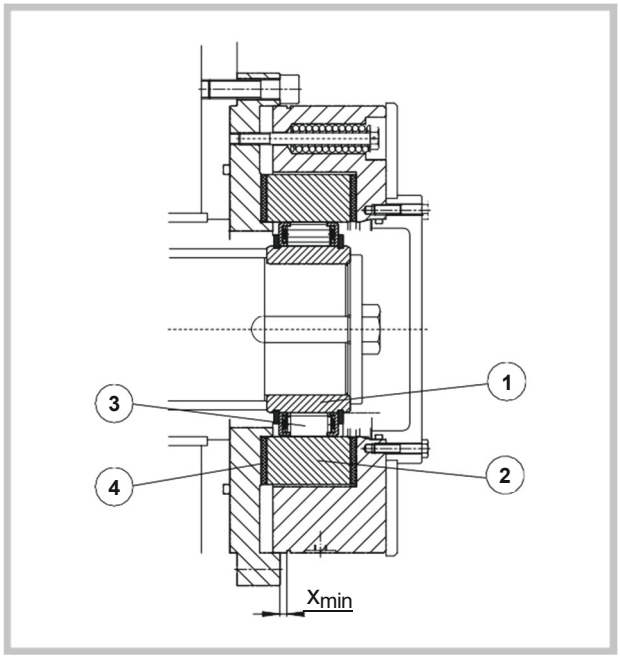
You can change the lock-blocking direction by turning the cage. If you wish to change the blocking direction, you should always contact Renold.

DANGER !

Damage to the lock and reducer due to the wrong direction of rotation!

Damage to the lock and reducer may occur due to the wrong direction of rotation. Do not run the motor in the opposite direction of the reducer blocking direction. Observe the note attached to the reducer.

Figure 18: Torque Limiter Backstop



1 Inner ring
2 Outer ring
3 Pan lock
4 Friction coating

3.8 Cooling

The reducer can be equipped with the following cooling equipment if needed:

- Fan,
- Cooler Coil,
- Air-oil cooler mounted oil supply system,
- Water-oil cooler mounted oil supply system,
- Separate oil supply system,

When installing the reducer, make sure that unobstructed heat dissipation on the housing surface is possible to protect the reducer from overheating.

3.8.1 Fan

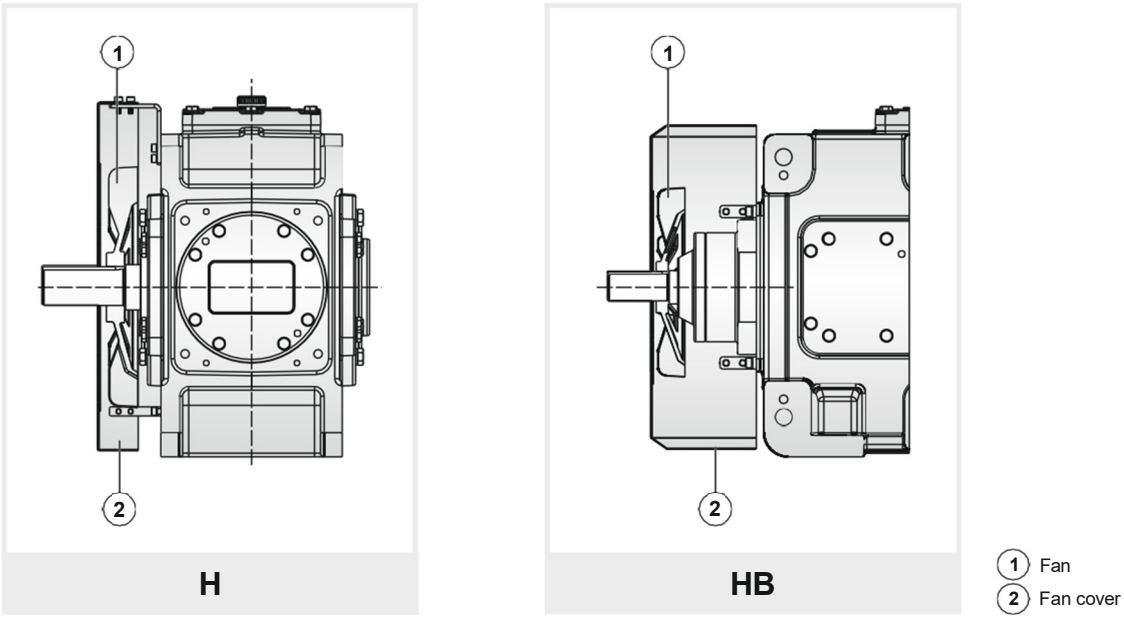
Generally, the fan is mounted on the input shaft of the reducer and is protected from accidental contact by using an air baffle. The fan draws air from the grille of the air guiding curtain and blows it through the side air ducts in the reducer housing. The fan dissipates a certain amount of heat in the housing.

Improper use can damage the reducer. To protect the reducer from overheating, follow the instructions below:

- When using couplings or protective devices for reducers equipped with a fan, be sure to leave sufficient space for cooling air to be drawn into the fan.
  The required recommendation is specified in the dimensional technical drawing in the documentation of the reducer.
- Make sure the fan cover is connected correctly.
- Protect the fan cover from damage by external components.
- Make sure that there is no contact between the fan and the fan cover.
- Note that the cooling effect can be significantly impaired if the fan is dirty or if the surface of the reducer housing is covered with dust or contaminants that act as an insulating layer.
  Clean the fan and reducer. Follow the cleaning instructions in the section of cleaning the fan and reducer (Page 90).

A fan mounted on a reducer is shown in the diagram below:

Figure 19: Fan



You can find more information in the technical drawings of the reducer's documentation and the location of the parts assembled with a detailed drawing of the reducer.

3.8.2 Cooler Coil

The reducer can be equipped with an oil pan cooler coil. The cooler coil is connected to a cooling water source. The cooling water connection must be provided by the operator. The coolant can be fresh water, sea water or brackish water. The heat from the reducer oil is transferred to the cooling water by means of the cooler coil.

NOTE !

Make sure the cooler coil is fully immersed in the oil to prevent condensation.

Misuse can damage the cooler coil. Be sure to take the following precautions:

- Make sure that the coolant pressure does not exceed 8 bar. The water flow direction in the reducer is optional.
- Make sure that the ends of the cooling coil are not bent and the bolts of the reducer are not removed or loosened.
- Never loosen the linkage nuts.
- If there is a risk of freezing or the gear unit needs to be out of service for a long time, drain the coolant from the serpentine and to remove residual water by blowing air to surfaces and pipes.
- Use a suitable coolant flow regulator (eg, a pressure reducing valve or a suitable isolating valve) to prevent excessive water pressure at the coolant inlet.

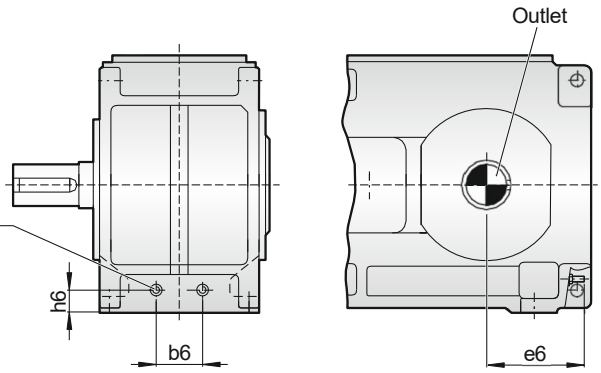
ATTENTION !

Risk of eye injury from compressed air!

Water residue and dirt particles can damage the eyes.
Wear suitable safety glasses.

Figure 20: Cooler Coil Connection

Cooling coil water connection G1/2"
The cooling system is suitable for sea water and brackish water.
x) Required amount of coolant; pressure 8 bar



Water flow rates in the cooler;

Table 8: Water Flow Rates in the Coil

Type	Housing Length															
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
H1 - SH	4	-	4	-	4	-	8	-	8	-	8	-	8	-	8	-
H2 - H	-	4	4	4	4	4	8	8	8	8	8	8	8	8	8	8
H3 - H	-	-	4	4	4	4	4	4	8	8	8	8	8	8	8	8
B2 - H	-	4	8	4	8	4	8	8	8	8	8	8	8	8	8	8
B3 - H	-	4	4	4	4	4	8	8	8	8	8	8	8	8	8	8

* H4 ... For B4 type reducers, water flow rates in the 19 housing size coolers will be given upon request.

For more information and a detailed representation of the reducer and connection dimensions, please refer to the technical drawings in the reducer documentation.
The required coolant flow rate and the maximum allowable inlet temperature can be found in a separate technical data sheet, in the equipment list or in the technical drawing in the reducer documentation.

3.8.3 Mounted Oil Supply System

3.8.3.1 Oil Supply System Mounted with Air-Oil Cooler

Depending on the order specifications, an oil supply system with an air-oil cooler may be used. This oil cooling system is mounted on the reducer.
The air-oil cooler is used to cool the reducer oil; ambient air is used as a cooler. While the oil passes by the fan by the ambient air blown from the cooler, it is fed from the cooler in one or more channels depending on the volumetric flow. In cold starts, a bypass pipe with a temperature- controlled valve is provided. For certain applications, a motor pump may be used instead of a flange pump.

An oil supply system with an air-oil cooler may include the following components:

- Air-oil cooler,
- Flange or motor pump,
- Oil filter (Strainer filter or double filter),
- Pressure monitor,
- Temperature control valve,
- Piping.

NOTE !

Pay attention to the flow direction of the pump!

When connecting the valves, pay attention to the actual flow direction of the pump. Refer to the pump operating instructions in the reducer documentation to determine if the direction of flow of the pump used depends on the direction of rotation.

Improper use may damage the reducer. Be sure to take the following precautions:

- When installing a reducer fitted with an air-oil cooler, carefully allow air to circulate freely. The technical drawings in the reducer documentation indicate the minimum gaps required in adjacent components such as walls and panels.
- Note that the cooling effect can be significantly impaired if the surface of the air-oil cooler and housing is covered with dust or contaminants that act as an insulating layer. This may cause the reducer to overheat. Clean the air-oil cooler and reducer. Cleaning information is given in the section on cleaning the fan and reducer (Page 90).

Figure 21: Air Oil Cooling System Mounted on **H** Type Reducer

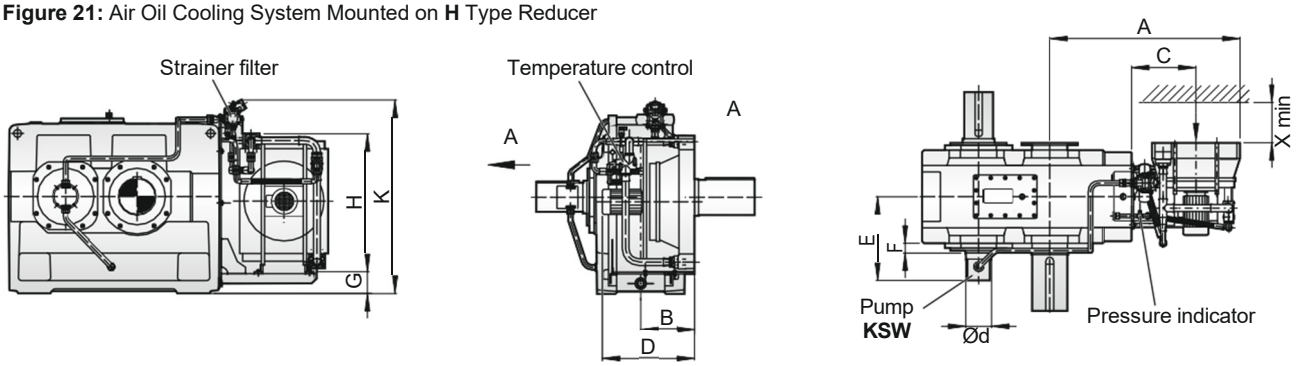
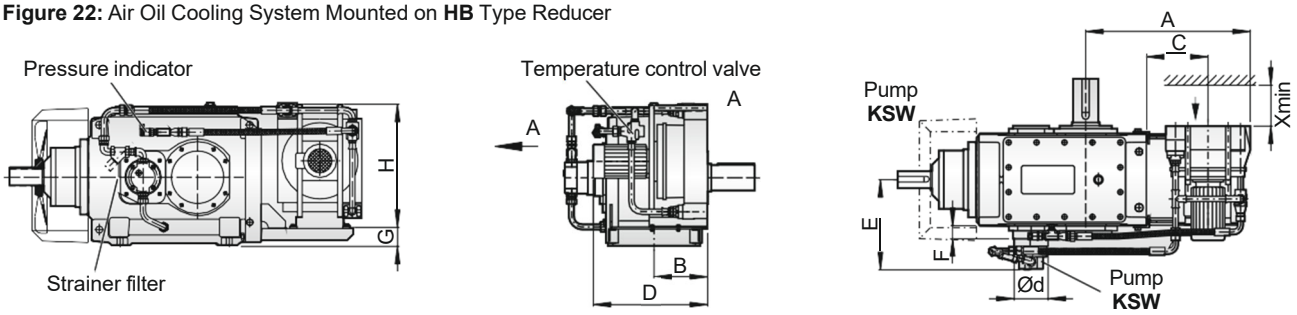


Figure 22: Air Oil Cooling System Mounted on **HB** Type Reducer



The connection dimensions and a detailed illustrated description of the reducer and additional information such as the air-oil cooled oil supply system can be found in the technical drawing in the reducer documentation. Additional information on the oil supply system and control notes can also be found in the oil supply system operating instructions provided in the datasheet, equipment list and reducer documentation.

3832 Oil Supply System Mounted with Water-Oil Cooler

Depending on the order specifications, an oil supply system with a water-oil cooler may be used. This oil cooling system is mounted on the reducer.
The water-oil cooler is used to cool the reducer oil; water is used as a coolant. For certain applications, a motor pump may be used instead of a flange pump.

An oil supply system mounted with a water-oil cooler may include the following components:

- Air-oil cooler,
- Flange or motor pump,
- Oil filter (Strainer filter or double filter),
- Pressure monitor,
- Piping.

The operating company must establish the required cooling water connection.

NOTE !

Pay attention to the flow direction of the pump!

When connecting the valves, pay attention to the actual flow direction of the pump. Refer to the pump operating instructions in the reducer documentation to determine if the direction of flow of the pump used depends on the direction of rotation.

Improper use may damage the reducer. Be sure to take the following precautions:

- Make sure that the coolant pressure does not exceed 8 bar.
- Maintain the specified flow direction of the water-oil cooler so that optimum cooling power is obtained. Do not change the coolant inlet and outlet.
- If there is a risk of freezing or if the reducer needs to be out of service for a long period of time, drain the coolant from the system and hold the pipes with compressed air to drain the remaining water.

WARNING !

Risk of eye injury from compressed air!

Water residue and dirt particles can damage the eyes. Wear suitable safety glasses.

Figure 23: Aqueous Oil Cooling System Mounted on **PH** Type Reducer

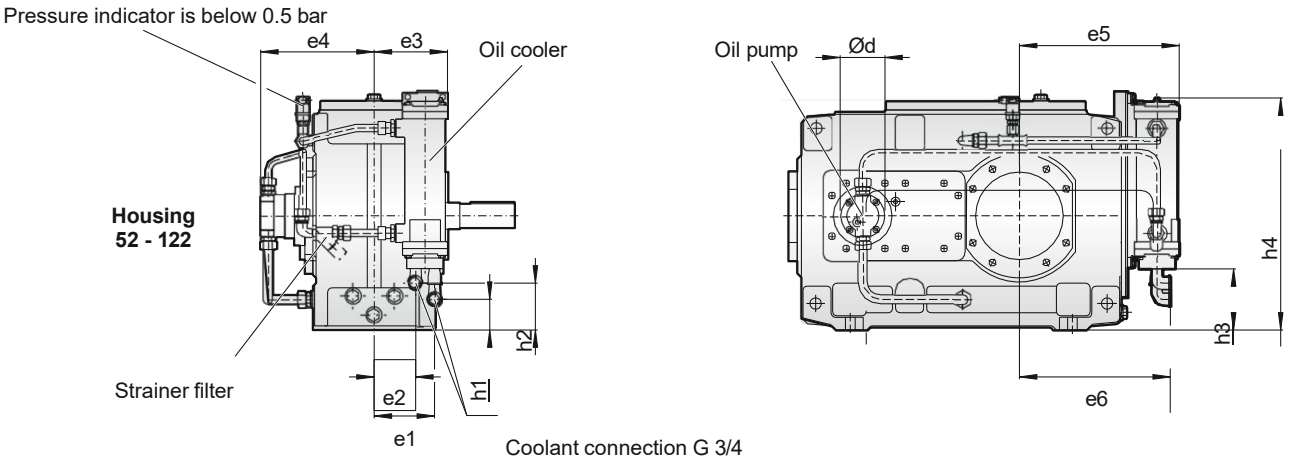
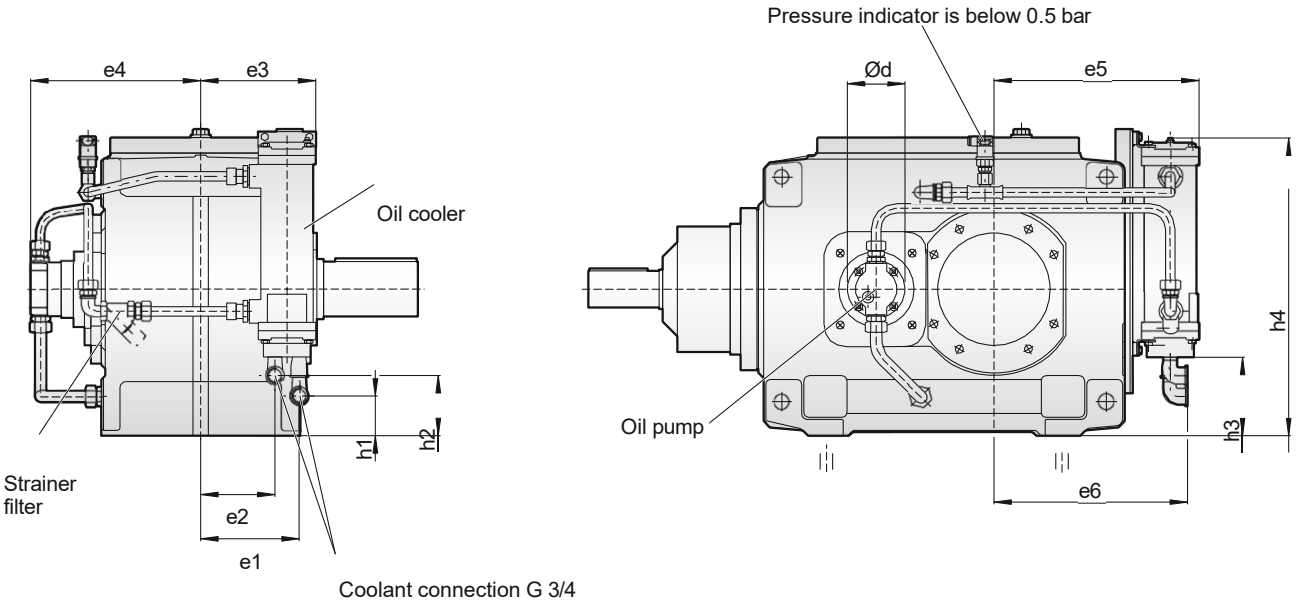


Figure 24: Aqueous Oil Cooling System Mounted on **HB** Type Reducer



The connection dimensions and a detailed illustrated description of the reducer and additional information such as the air-oil cooled oil supply system can be found in the technical drawing in the reducer documentation.
Additional information on the oil supply system, inspection notes, the amount of coolant required and the maximum permissible water inlet temperature can also be found in the oil supply system operating instructions provided in the datasheet, equipment list and reducer documentation.

3833 Pump

Requirements of the oil to be used in the pump:

The pump used is suitable for lubrication. The oil to be used in the pump must not contain abrasive components and must not chemically damage the materials used in the pump.
Clean oil with good lubrication properties is a prerequisite for ensuring correct function, high operating reliability and long service life of the pump.

3834 Oil Filter

The oil filter protects the subunits, measuring and controlling devices against dirt and contamination.
The oil filter may vary depending on the order specifications. The type of oil filter mounted on the reducer is specified in the equipment list in the documentation of the reducer.

The oil filter contains a housing with connection points and a filter cartridge. The oil flows through the filter body, where, depending on the filter gauge, most of the dirt particles larger than a certain size in the oil are filtered. Dirty filter cartridges should be cleaned or replaced.

The connection dimensions and a detailed illustrated description of the reducer and additional information such as the air-oil cooled oil supply system can be found in the technical drawing in the reducer documentation.
Additional information on the oil supply system and control notes can also be found in the oil supply system operating instructions provided in the datasheet, equipment list and reducer documentation.

3.8.4 External Oil Supply System

A separate oil supply system can be used to cool the oil.
Further information on separate oil supply systems can be found in the oil supply system operating instructions in the documentation of the reducer.
Additional technical data can be found on the separate data sheet and in the equipment list in the reducer documentation.

3.9 Couplings

Flexible couplings or safety couplings are usually used on the inlet side of the reducer. For gearbox types with solid output shaft, flexible couplings or safety clutches are used for the output shaft. The use of fixed couplings or other inlet or outlet elements that generate additional radial or axial forces (e.g. gear wheels, belt pulleys, flywheels or hydraulic fasteners) must be agreed upon according to the contract.
If the hydraulic coupling is to be used with a fan reducer, mount the hydraulic part of the coupling on the motor shaft to provide sufficient space to bleed cooling air.

Additional information about the couplings can be found in the coupling operating instructions provided in the reducer documentation.

3.10 Shrink Disc

Shrink disc is an equipment used to provide an easy assembling on the hollow shaft that drives in the gearbox. Conical clamping provides a tight insertion between the bore shaft and a stud shaft (machine shaft), hereinafter referred to as the “stud shaft”. A Retaining Clamp can transfer torques, bending moments, and forces. What is important for the successful transmission of torques and/or power is the common pressure between the bore shafts and the stud shafts formed by the conical clamping.
You can find more information about conical clamping in the user manual of conical clamping. These are included in the reducer documentation.

3.11 Heating

At low ambient temperatures, it may be necessary to preheat the reducer oil before starting the reducer or while it is running.

Heating Elements

For example, heating elements can be used for these applications. Heating elements convert electricity into heat and transfer this heat to the oil in which it is immersed. The parts of the heating elements required for heating are installed in the protective pipes inside the reducer housing so that the parts required for this heating can be replaced without first draining the oil.
Make sure that the heating elements are completely immersed in the oil bath and that the oil is at the minimum possible level by mounting the reducer in the correct position as shown in the technical drawings in the documentation.

ATTENTION !

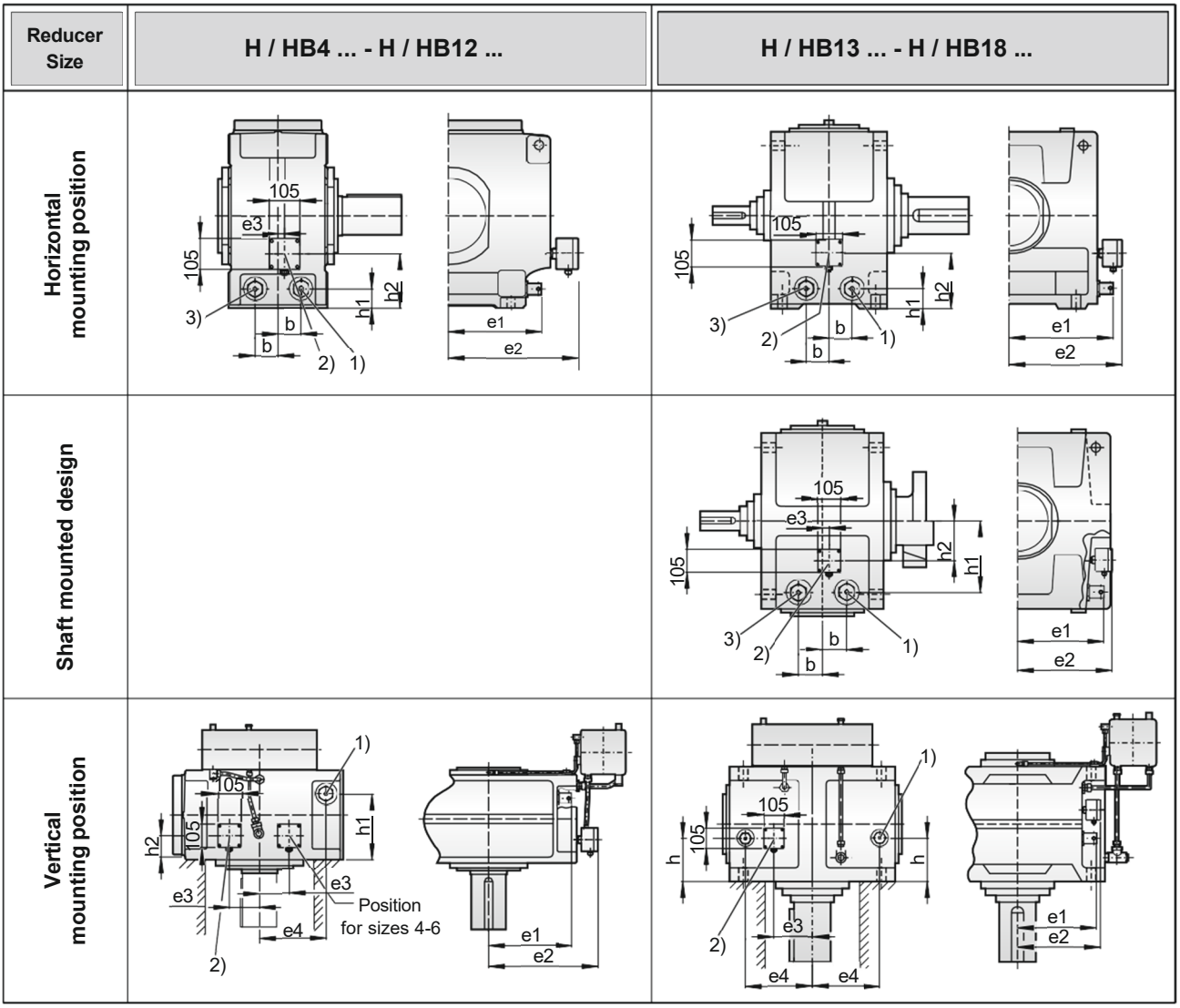
Fire danger!
Exposed heating elements pose a fire hazard.
Do not operate the heating elements unless you check that they are completely submerged in the oil bath. If the heating elements are replaced, the heat output from the outer surface of the heating element must not exceed the maximum values specified in the table below.

The following table contains information about the specific heat output of the P_{HO} as a function of the ambient temperature:

Table 9: Specific Heat Output Table

P_{HO} in W/cm²	Ambient Temperatures °C
0.9	10 ... 0
0.8	0 ... -25
0.7	-25 ... -50

Figure 25: Heating System in **H / HB** Type Reducers



1) Technical data and information of screw-applied heating components:
Protection class: IP65, 230 V, 50 Hz, Power rating depends on the respective design.(It must be consulted with Renold).

2) Temperature control indicators ATH - SW22 Technical data and information:
Protection class: IP65, on /off switches (adjustable), Max. Working Capacity: 2A / 230 V AC / 460 VA cos φ=0.6 (Alternating Current) 0.25 A / 230 V DC / 58 W (Direct Current)

3) Not available on these models: 4, 6, 8, 10, 12, 14, 16, 18 Heating rods must be used when the lubrication limit value decreases.
Depending on the design of the reducer, screw-applied heaters and temperature monitoring indicators can be mounted, taking into account the mirror image.
Dimensions are available on request.

Heating Element Control

The heating elements can be controlled by a temperature indicator or oil temperature gauge (Page 43). The temperature indicator signals with a loud sound when the minimum and maximum temperature is reached.

More information on the location of the assembled parts and a detailed representation of the reducer can be found in the reducer documentation in the technical drawing.
Further information on heating elements can be found in a separate data sheet, equipment list and heating element operating instructions in the documentation of the reducer.
Further information on the temperature indicator and control instructions can be found in the equipment list and in the operating instructions list of the temperature indicator in the documentation of the reducer.

3.12 Oil Level Indicator

The following parts can be mounted on the reducer for visual monitoring of the oil level:

- Oil level plug,
- Oil level indicator,
- Oil dipstick.

The dipstick should be considered the most reliable if several components are installed on the reducer to control the oil level. Check the oil level while the reducer is not working and the oil is cold.

More information on the oil level indicator and oil checking can be found in the documentation for the reducer. A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.

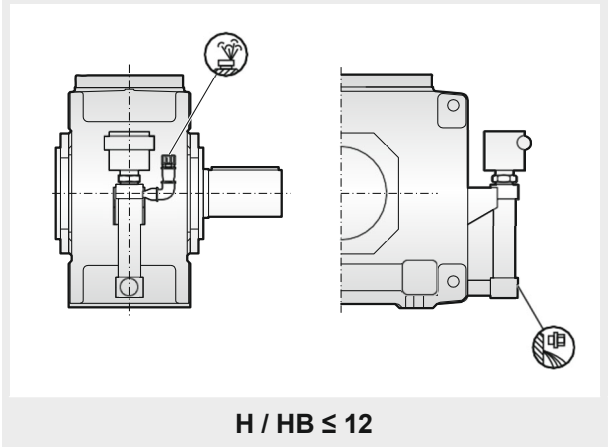
3.13 Oil Level Indicator System

Depending on the ordering specifications, the reducer can be equipped with an oil level indicator system using the oil fill level safety switch.
The oil level indicator system is designed to check the oil level at a standstill before the reducer is started

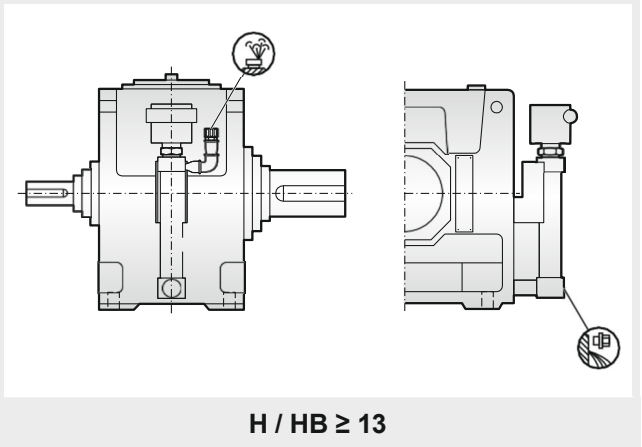
Mounting Position

If you are using an oil level indicator system, make sure that the reducer is in the horizontal mounting position.

Figure 26: Oil Level Monitoring System in **H / HB** Type Reducers



H / HB ≤ 12



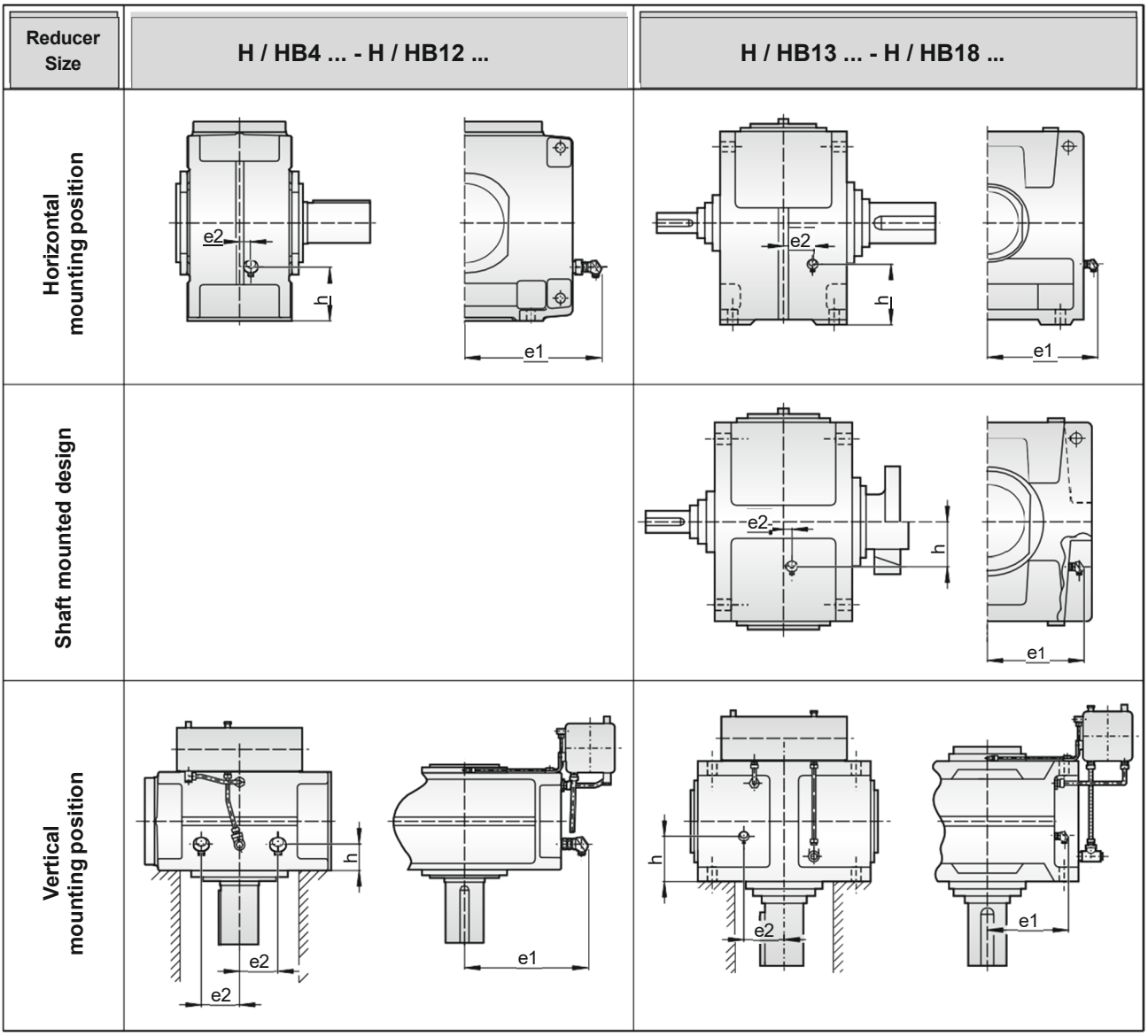
H / HB ≥ 13

A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.
More information on the oil level indicator and technical data can be found in the operating manual of the oil level indicator system, the equipment list and the supplementary data sheet in the reducer documentation.

3.14 Oil Temperature Indicator

Depending on the order specifications, a Pt 100 resistance thermometer can be fitted to the reducer to measure the oil temperature in the oil sump.
Connect the Pt 100 resistance thermometer to an evaluation unit (customer-supplied) to measure temperatures or temperature differences. A terminal for wiring is built into the resistance thermometer.

Figure 27: Oil Temperature Monitoring System in **H / HB** Type Reducers



PT 100 Resisitance Thermometer Technical Data and Information:

Connection head protection class:

- IP54, two-wire connection.
- Applications with three er four connection wires can be configured by the customer.
- It must be connected to an evaluation device!
- Depending on the design model, the resistance thermometer can be mounted in mirror image.
- Dimensions are available on request.

A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.
More information on oil temperature monitoring (such as control instructions) and technical data can be found inthe operating manual of the oil temperature monitor and in the equipment list in the reducer documentation.

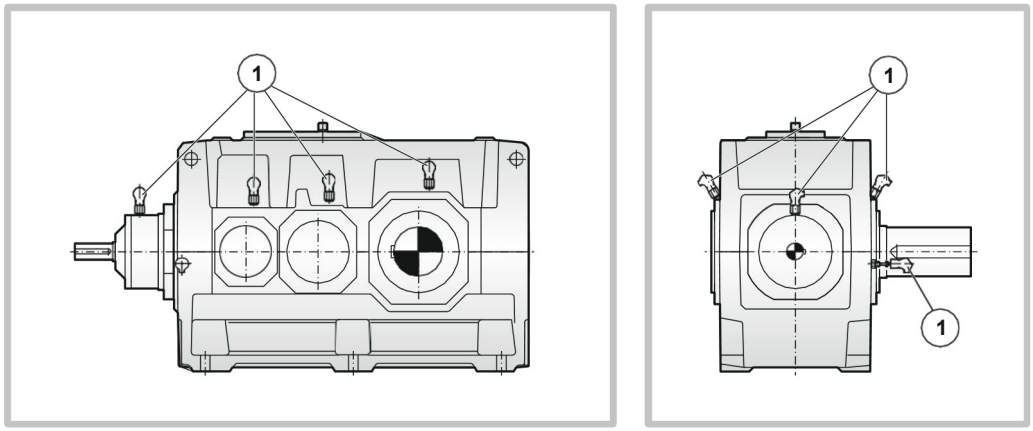
3.15 Bearing Indicator

3.15.1 Bearing Control Using Pt 100 Resistance Thermometer

Depending on the order specifications, Pt 100 resistance thermometers can be placed in the reducer to check the bearings, or the mounting locations of such thermometers can be prepared.
To be able to measure temperature or temperature differences, you must connect the Pt 100 resistance thermometer to a customer-supplied evaluation unit.
The resistance thermometer has a terminal for wiring.

The use of the Pt 100 resistance thermometer as a bearing indicator is shown in the figure below:

Figure 28: Bearing Monitoring Using a Pt 100 Resistance Thermometer



(1) Resistance thermometer

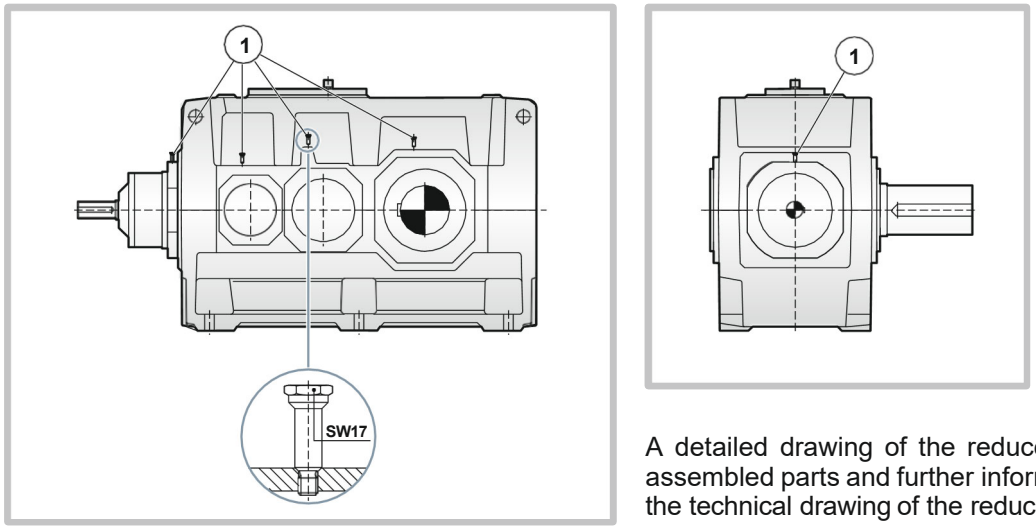
A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.
More information on bearing monitoring using a Pt 100 resistance thermometer (such as inspection instructions) and technical data can be found in the Pt 100 resistance thermometer's operating manual and in the equipment list in the reducer documentation.

3.15.2 Bearing Monitoring with Shock Impact Converter

Depending on the order specifications, measuring nipples for bearing monitoring can be mounted on the reducer close to the bearings to be monitored. Alternatively, the reducer can be supplied with pre-machined threaded holes for mounting measuring nipples.
These measuring nipples are used to connect quick-release couplings and shock-pulse transducers.

The following figure shows the bearing monitoring system with the shock pulse transducer:

Figure 29: Monitoring Using Shock Pulses Transducer



(1) Shock pulse transducer

A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.

More information about the parts can be found in the part operating instructions in the reducer documentation.
More information on technical data can be found in a separate data sheet or in the equipment list in the reducer documentation.

3.15.3 Bearing Monitoring with Speed Sensor

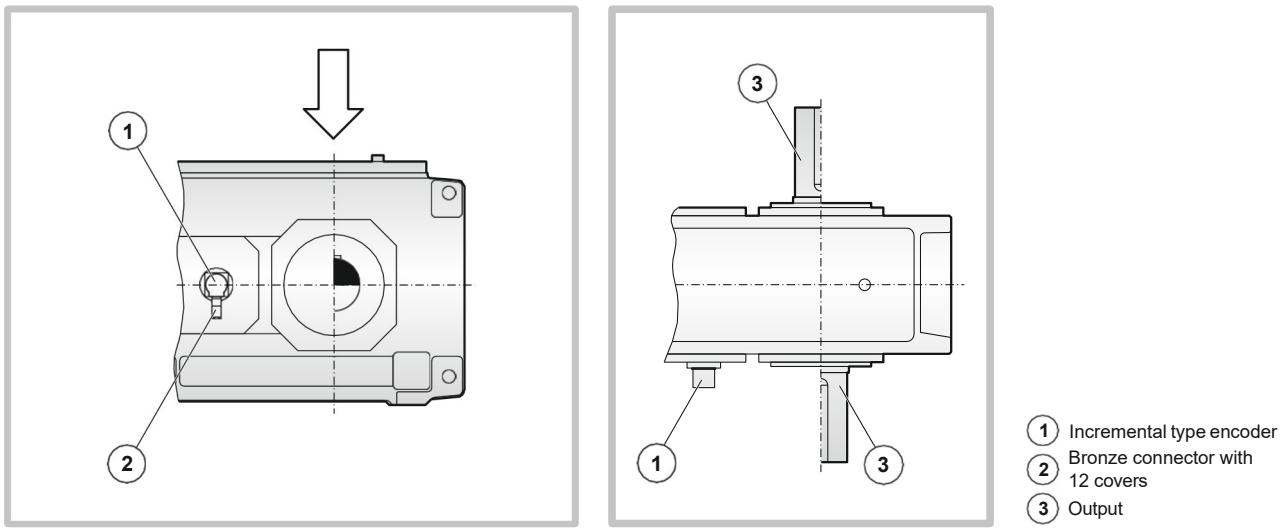
Depending on the order specifications, the reducer can be supplied with threaded holes into which speed sensors can be placed. More information and a detailed representation of the mounted reducer with speed sensor can be found in the technical drawing in the reducer documentation.
For more information on speed sensors, see the corresponding vibration sensor operating instructions.

3.16 Encoder

Depending on the order specifications, an incremental encoder can be mounted on the reducer. Customers must install the electrical installation and supply the necessary evaluation unit.

The following figure shows the encoder:

Figure 30: Encoder



A detailed drawing of the reducer, the position of the assembled parts and further information can be found in the technical drawing of the reducer in its documentation.
You can find more information about the encoder (such as control instructions) and technical data in the encoder operating instructions and in the equipment list supplied in the reducer documentation.

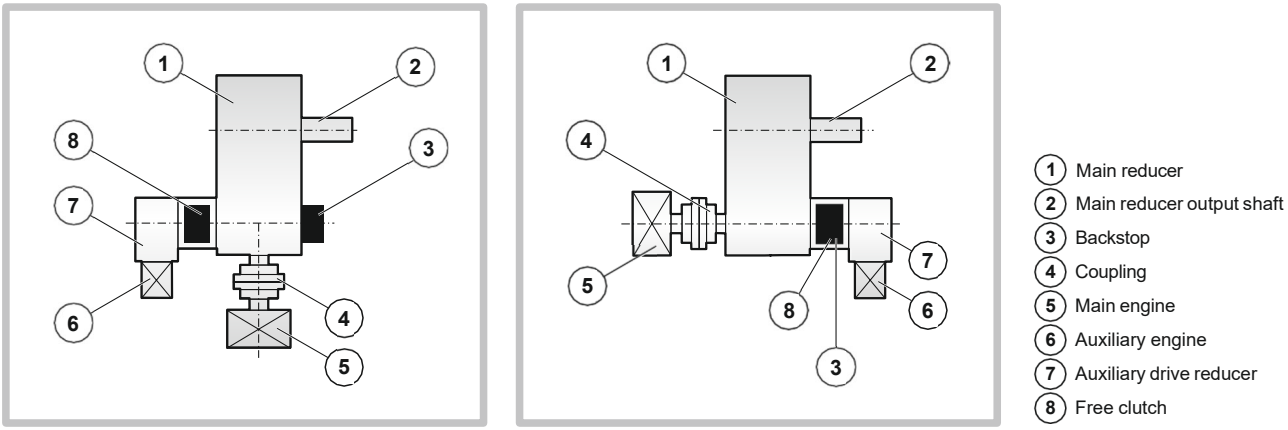
3.17 Auxiliary Drive Reducer

For special applications, the reducer can be supplied with an auxiliary drive reducer. The auxiliary drive reducer drives the main reducer to be driven at a lower output speed in the same direction of rotation. Renold or the customer can supply the auxiliary drive reducer. The auxiliary drive reducer is connected to the main reducer via a one-way mechanical clutch. The auxiliary drive reducer is mounted on a connecting flange connected to the main reducer.

Before connecting the motor, define the phase sequence of the three-phase network using a phase sequence indicator. Then connect the motor so that it rotates in the defined direction.
Observe the note attached to the reducer.

The basic configuration of the reducer with main and auxiliary drives is shown in the picture below:

Figure 31: Basic Design of Main and Auxiliary Reducers



Depending on the particular application, two auxiliary drives with two different housing sizes are available for each reducer size.

3.17.1 Auxiliary Drive Reducer Designed as Maintenance Gear Reducer

The auxiliary drive motor reducer is dimensioned so that it is possible to operate the conveyor system at low speeds, in the same rotational direction, under no-load conditions.
The auxiliary drive reducer is connected to the main reducer via an intermediate flange and is connected to the main reducer by a one-way mechanical clutch. The one - way mechanical clutch is located inside the intermediate flash and is lubricated with the oil of the main reducer. The auxiliary drive reducer has its own oil.

DANGER !

Overload of auxiliary drive reducer!

Destruction or damage to the auxiliary drive reducer due to overload. The conveyor system should only be driven by the auxiliary drive reducer when operating under no-load conditions.

Oil Supply for Auxiliary Drive Reducer

The auxiliary drive reducer has its own oil circuit separate from the main reducer. The auxiliary drive reducer is already filled with oil on delivery.

Speed indicator

To avoid excessive speeds in case of failure of the one-way mechanical clutch, for safety reasons, customers should add a speed monitoring system to the reducer. The speed monitor includes an intermediate flange-mounted pulse encoder and an evaluation unit. To install the pulse encoder, a threaded screw hole is drilled in a suitable position in the intermediate flange-this is ordered and supplied by the customer. The "X" dimension is based on the device manufacturer's data. The pulse encoder must be suitable for flush mounting.
The speed controller must be connected in such a way that the main reducer automatically turns off for ">zero" speed on the output shaft of the auxiliary drive reducer. For safety reasons, the shutdown function should be tested at regular intervals at least four times a year. The auxiliary drive reducer is started to test the shutdown function. If the speed monitor responds, e.g. using a warning light - the speed monitor is functioning correctly.

ATTENTION !

Serious injury when auxiliary drive reducer explodes into pieces!

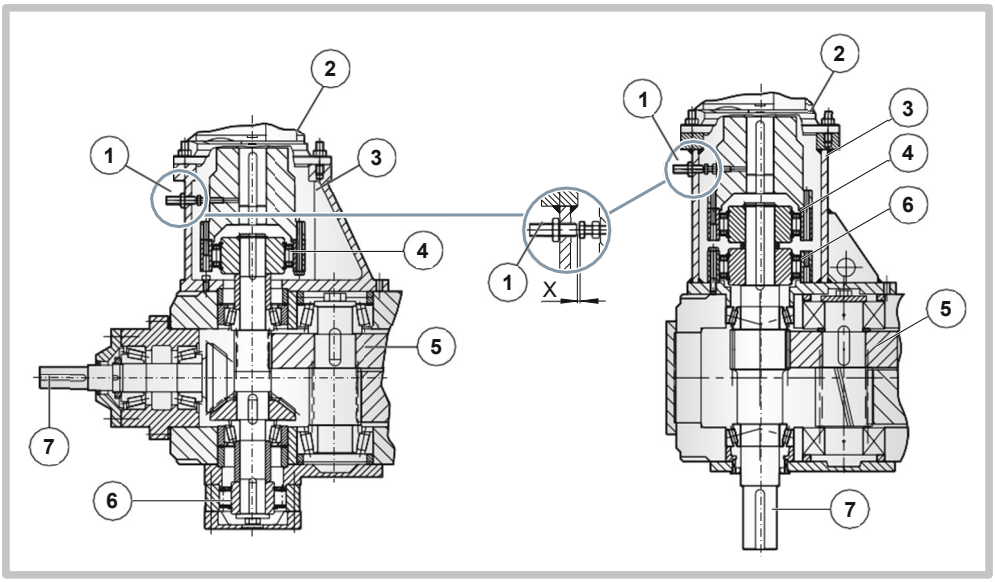
If the overloading system fails, the auxiliary drive reducer can suddenly explode and disassemble due to the resulting high speeds. The speed monitoring function is mandatory for safety reasons.

Connecting Auxiliary Drive Reducer

Before connecting the motor, define the phase sequence of the three-phase network using a phase sequence indicator. Then connect the motor so that it rotates in the defined direction.
Observe the note attached to the reducer.

The following figure shows the auxiliary drive reducer:

Figure 32: Reducer Design (Connecting Auxiliary Drive Reducer)



Further information, a detailed drawing of the reducer and the position of the auxiliary drive reducer can be found in the technical drawing in the reducer documentation.
Additional information about the auxiliary reducer can be found in the reducer documentation in the auxiliary reducer operating instructions.
You can find the accurate design and mounting position of the reducer in the technical drawings in the reducer documentation.

3.17.2 Auxiliary Drive Reducer Designed as a Load Reducer

Auxiliary Drive Reducer

The auxiliary drive motor is sized so that a properly loaded conveyor system can run in the same direction and at low speeds.The auxiliary drive reducer is connected to the main reducer via an intermediate flange and is connected to the main reducer by a one-way mechanical clutch. The one-way mechanical clutch is located inside the intermediate flash and is lubricated with the oil of the main reducer. The auxiliary drive reducer has its own oil.

Oil Supply for Auxiliary Drive Reducer

The auxiliary drive reducer has its own oil circuit separate from the main reducer. The auxiliary reducer is already filled with oil on delivery.

Positions related to auxiliary drive with reducer are shown on page 46 of the assembly chart.
Further information, a detailed drawing of the reducer and the position of the auxiliary drive reducer can be found in the technical drawing in the reducer documentation.
Additional information about the auxiliary reducer can be found in the reducer documentation in the auxiliary reducer operating instructions.
You can find the accurate design and mounting position of the reducer in the technical drawings in the reducer documentation.

Clutch

If this gearbox is equipped with its own main drive system as well as an auxiliary drive system, the connection equipment required for this is realized by a free clutch system. In the case of drive by the bucket elevator by the clutch system, a torque transmission is allowed in only one direction of rotation, and in case of actuation via the main drive, a freewheeling will be observed by the bucket elevator.
In the case of driving over the main motor and also driven by the auxiliary drive system equipment, the output drive shaft of the main gearbox operates in the same direction of rotation. The sliding free clutch assembly is mounted in the intermediate flange and integrated into the gearbox's own oil recirculation system. During the maintenance and oil change in question, the maintenance and oil change work of the main gearbox must also be carried out.
There are compression elements in the free clutch system that move with centrifugal force. When the main gearbox rotates in the prescribed rotational direction, the inner ring and cage rotate together with the clamping elements, while the outer ring stops. After a certain speed, the compression elements move away from their places and the free clutch system equipment operates without wear at this stage. If the drive condition is realized by the motor of the auxiliary drive system equipment through the outer ring, the free-clutch system equipment has a **"clipped-lock operation"**, which means that the main gearbox is then slowly rotated in the selected direction of rotation.
During this process, the drive shaft of the main gearbox and, if necessary, the main motor can also rotate simultaneously, and the main motor and the gearbox rotate slowly together if an elastic clutch is used between them.

NOTE !

Electrically lock the main motor and the auxiliary drive reducer motor so that only one of the two motors can be opened. Only one of these two engines should operate operationally.

NOTE !

When driven by the auxiliary drive reducer, the input shaft of the main reducer also rotates slowly. This rotational movement is not allowed to be prevented. A brake located on the drive side of the main drive unit must be released when driven by the auxiliary drive reducer.

NOTE !

Damage or destruction of one-way mechanical clutch!

Damage or destruction of the one - way mechanical clutch is possible as a result of increased wear due to operation below the separation speeds.
When operating the reducer at speeds below the disengagement speed of the one-way mechanical clutch, change the one-way mechanical clutch regularly.
The data showing the replacement intervals are supplied in the technical drawing and on a warning label attached to the reducer. This label is attached to the reducer housing next to the one-way mechanical clutch.

The one-way mechanical clutch is placed in an intermediate flap and supplied with oil from the main drive unit.

4.1 Assembly

4.1.1 General Assembly Instructions

Installation work must be carried out very carefully by authorized, trained and appropriately trained personnel. No liability shall be accepted for damages resulting from the faulty performance of this work.

Improper use may damage the reducer. Be sure to take the following precautions:

- Protect the reducer against falling objects and being covered,
- Do not weld any part of the reducer,
- Do not use the reducer as a grounding point for electrical welding,
- Use all fixing points specified in the reducer design,
- Replace the bolts that are not suitable for use with new bolts of the same durability class and type as before,
- Ensure that sufficient lifting devices are available.

Mounting Position and Connection Points

During the actual planning phase, make sure to leave enough space around the reducer to ensure subsequent maintenance and service work. When unobstructed convection is possible on the body surface, ensure that appropriate measures are taken to prevent overheating of the reducer. Allow sufficient space to allow free air flow to the fan-supplied reducers.
Do not use incorrect connection points (Page 16). The position of the connection points is shown in the technical drawing of the reducer in the documentary direction. To ensure proper lubrication of the unit during operation, please pay attention to the installation position specified in the technical drawings.

NOTE !

Heating of the reducer with external heat sources!

The reducer should not be heated with external heat sources (e.g. direct sunlight exposure) while it is running and precautions should be taken when necessary.

To protect the reducer against this hazard, you can take the following measures:

- A solar shield,
- An additional cooling device,
- A portable temperature indicator in the oil pan.

If you are using a sunshade, this can cause heat build-up. If you are using a temperature indicator, it should alarm when the oil sump reaches the maximum allowable temperature. Turn off the reducer when the maximum allowable oil sump temperature is exceeded. The operator's operation may be interrupted when the reducer is switched off.

ATTENTION !

Ignition of vapours from solvents!

There is a risk of injury due to the ignition of vapours from solvents during cleaning work.

Please note the following:

- Provide adequate ventilation.
- Do not smoke

4.2 Unpacking the Reducer

The scope of delivery is listed in the shipping documents.

ATTENTION !

Risk of serious injury due to defective product!

A faulty reducer can cause serious injury. Do not operate the reducer if any damage is observed. Contact Customer Service (Page 115).

Check that everything is delivered completely after the order is delivered.

NOTE !

Damage to the reducer due to corrosion!

Exposure of the reducer to moisture may cause corrosion of the reducer. If the packaging is designed to protect the reducer, do not open the package before time or damage the package.

To unpack and use the reducer, follow the steps below:

1. Remove packaging and transport equipment in accordance with regulations,
2. Check for damage and accumulated dirt,
3. Immediately report damaged and/or missing parts to Customer Service (Page 115),
4. Dispose of packaging materials and transport equipment in accordance with regulations.

4.3 Installation of Reducer

4.3.1 Foundation

Features of the foundation;

The foundation must have the following characteristics:

- Horizontal and level,
- Stable,
- Designed for torsional resistance,
- The reaction forces of the reducer are supported.

The requirements of the foundation;

The installation must meet the following requirements:

- Construct the foundation so that it does not produce any resonant vibrations and is isolated from the transmission of vibrations from adjacent foundations.
- Considering the forces acting on the reducer, design the foundation according to the relevant weight and torque.
- Carefully align the foundation with the equipment installed on the input and output sides of the reducer.
- Take into account any elastic deformation caused by actuation forces.
- If external forces are acting on the reducer, put wedges on the sides to prevent displacement.

DANGER !

Lack of solid foundation for the reducer!

If the reducer is not mounted on a stable foundation, it may be damaged. Use 8.8 bolts with a minimum durability class. Information and instructions on tightening torque can be found in the tightening procedure section (Page 78). Tighten the fixing bolts and nuts to the specified tightening torque. When tightening the fixing bolts, make sure that there is no mechanical tension in the reducer.

Further information on measurements, space requirements and regulation of supply connections can be found in the documentation of the reducer.

4.3.2 Description of Assembly Work

Precautions to be Taken Before Installation

ATTENTION !

Risk of chemical burns due to chemicals!

There is a risk of chemical burns when working with aggressive cleaning agents. Follow the manufacturer's instructions on how to use cleaning agents and solvents. Use suitable protective equipment (gloves, safety glasses). Please use binders to immediately clean up all spilt solvents.

DANGER !

Risk of burns!

There is a serious risk of burns due to the hot surfaces (>55 °C). Wear suitable protective gloves and protective clothing.

Improper use may damage the reducer. Be sure to take the following precautions:

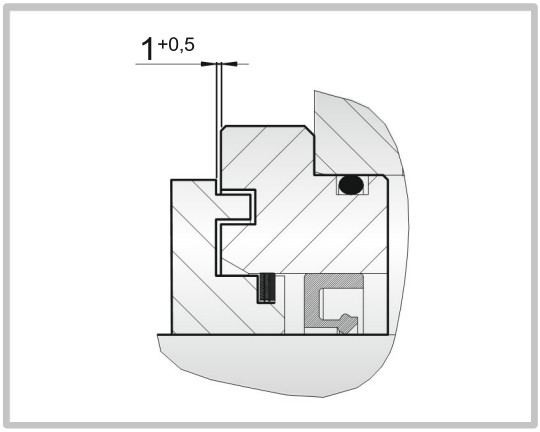
- Use a suitable cleaning agent to remove corrosion protection from shafts and mounting surfaces.
- Do not allow the cleaning agent to come into contact with the seals.
- Use a mounting fixture to mount and securely lock input and output elements (eg coupling components) onto shafts.
- Do not use a hammer when installing couplings, etc. as this will cause damage to the reducer.
- When assembling the coupling components, be careful not to damage the seals or the shaft running surfaces.
- If the inlet and outlet elements need to be heated before installation, the required combining temperatures are listed in the technical drawings in the coupling operating instructions.
- Unless otherwise stated, heat the coupling parts with an induction heater in a torch or in an oven.
- Use heat shields designed to protect shaft sealing rings from damage or radiant heat to temperatures above 100 °C.
- Coupling elements should be pulled quickly to the shaft specified in the dimension drawing prepared according to the order specifications.
- Use suitable lifting gear to place the reducer in place.

DANGER !

Misalignment!

The reducer or its components or equipment may be damaged as a result of misalignment. When installing and assembling the reducer, make sure that each component is perfectly aligned with each other. High misalignment at shaft ends can cause premature wear and material damage as a result of angular or axial misalignment. Main body or substructures that are too soft can cause radial or axial displacement of coupling parts during operation. This displacement cannot be measured when the reducer is stopped.

Figure 33: Gap Size in Grease Labyrinth



DANGER !

Sparks, unacceptable temperature rise and seal wear due to insufficient clearance size!

Insufficient clearance size can cause sparks, unacceptable temperature rise and seal wear. If the reducer's shaft seals are taconite or tacolab seals, make sure that the adjusted clearance dimensions of $1^{+0.5}$ mm in the grease labyrinth are not changed when the input and output elements (eg coupling parts) are installed. Rotating and fixed parts must not come into contact with each other.

More information on removing corrosion protection can be found in the reducer documentation.
Additional information on how to assemble reducers that require cranes or hoists as a result of their weight is given in the application planning section (Page 16).

If the reducer is to be transported with parts and components mounted to it, additional attachment points may be required. The position of these connection points can be found in the technical drawing in the reducer documentation.

4321 Alignment

Depending on the order specification, the upper part of the body has machined surfaces (alignment surfaces) to assist in the temporary alignment of the reducer in the horizontal direction.

DANGER !

Risk of fatal injury from moving parts!

Failure to align the reducer with the required precision may cause the shaft to break. A broken shaft can cause serious or fatal injury.
Align the reducer in accordance with the specified alignment values. Damage to the reducer or its components or mounted parts is possible. The accuracy of the alignment between the shaft axes largely determines the product life of shafts, bearings and couplings. Therefore, always make an effort to obtain zero deviation in the alignment of the shaft axes. In this context, for example, for more information on the requirements of the couplings, please refer to the relevant operating instructions.

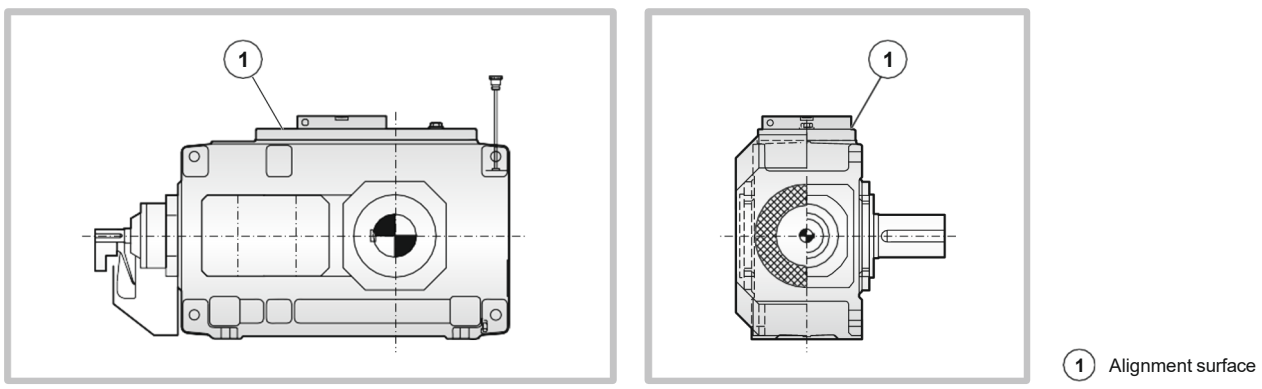
Alignment screws on the housing feet can be added to the reducer for easier alignment.

To align the reducer with the alignment surface, proceed as follows:

1. For the precise position of the alignment surfaces, see the technical drawings in the documentation.
2. Note down the values written on the alignment surfaces.
3. Use these surfaces as a guide to align the reducer horizontally to ensure proper operation.

The following figure shows the alignment surfaces and alignment guides for reducers up to size 12:

Figure 34: Alignment Surfaces for Reducers up to Frame Size 12

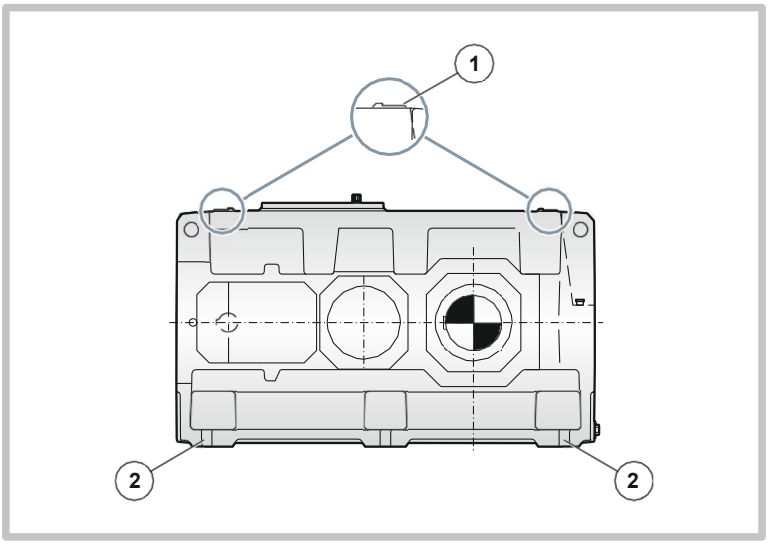


(1) Alignment surface

Reducers with 13 housings or larger also have special alignment surfaces on the top of the housing for realignment of the reducer. To further facilitate alignment, reducers of this size have alignment screws on the housing feet.

The following figure shows the alignment surfaces and alignment guides for reducers of frame size 13 and above:

Figure 35: Alignment Surfaces for Reducers with Frame Size 13 and Above



(1) Alignment surface
(2) Alignment guides

Further information and a detailed description of the reducer can be found in the technical drawing in the reducer documentation.

Tools

The following tools are required to operate the final precision alignment (Page 73-74) on the equipment mounted on the shaft axes of the reducer and on the input and output sides:

- Rulers,
- Water gauge,
- Comparator,
- Laser alignment system,
- Thickness Gauge, etc.

When the reducer is precisely aligned, tighten the main bolts and recheck the settings. Record the alignment measurements and keep the report in a safe place with these operating instructions.

4.3.3 Reducer Mounting on Housing Foot

If necessary, remove the fan sheet iron from the H1 and H2 type gearboxes, so that you can squeeze the base fixing bolts and then reassemble the lids.

4331 Installation on Foundation Housing

The following requirements must be met before starting assembly work:

- The foundation must be horizontal and flat.
- When tightening the fixing bolts, make sure that there is no mechanical tension in the reducer.

DANGER !

Insufficient fixation!

If the reducer is not mounted on a stable foundation, it may be damaged. Make sure the foundation body is horizontal and flat. It is especially important that the surface on which the reducer is mounted is flat; because this determines the contact of the gears and the load on the bearings and therefore has an impact on the product life of the reducer. All points on the gear unit mounting surface must lie between 2 imaginary parallel platforms. (2 platforms 0,1 mm apart)
Design the foundation body according to the relevant weight and torque, taking into account the forces acting on the reducer. The feet of the reducer must be properly supported.
Main housing or very soft substructures can cause radial or axial displacement during operation.
This displacement is not measurable when the reducer is stopped.

To mount the reducer on a solid base, do the following:

1. Clean the lower side of the reducer feet.
2. Use a suitable lifting device to place the reducer on the foundation body.
3. Tighten the foundation bolts to the specified tightening torque (Page 79-80). If necessary, install the shims to prevent displacement.
4. Align the reducer exactly with the input and output equipment (Page 52-53).
5. Record the alignment measurements.
6. Keep the assembly report in a safe place with these operating instructions.

DANGER !

Damage caused by uneven tightening of the fixing bolts!

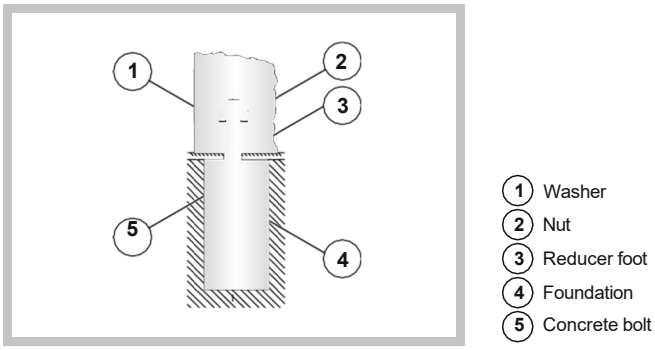
The reducer can be damaged by uneven tightening of the fixing bolts. Tighten the fixing bolts evenly. When tightening the fixing bolts, make sure that there is no mechanical tension in the reducer.

4332 Installation on Concrete Foundation Using Concrete Bolts or Foundation Blocks

The lower side of the reducer mounting feet should be clean.

Installation of reducer using concrete bolt:

Figure 36: Concrete Bolt



1 Washer
2 Nut
3 Reducer foot
4 Foundation
5 Concrete bolt

To install the reducer with concrete bolts, proceed as follows:

1. Install the concrete bolts with washers and hexagon nuts to the basic mounting points on the reducer housing.
2. Using a suitable crane or hoist, place the reducer on the concrete foundation.
3. Align the reducer so that the input and output shafts are horizontal by using the liners (Page 52-53).
4. For higher external forces, if necessary, use lateral shims to prevent the reducer from displacement.
5. Pour concrete on the inner sides of the concrete bolts on the foundation.
6. After the concrete has been prepared, tighten the hexagon nuts of the concrete bolts to the specified tightening torque (Page 79-80).
7. Record the alignment measurements and keep the report together with these work instructions in a safe place.

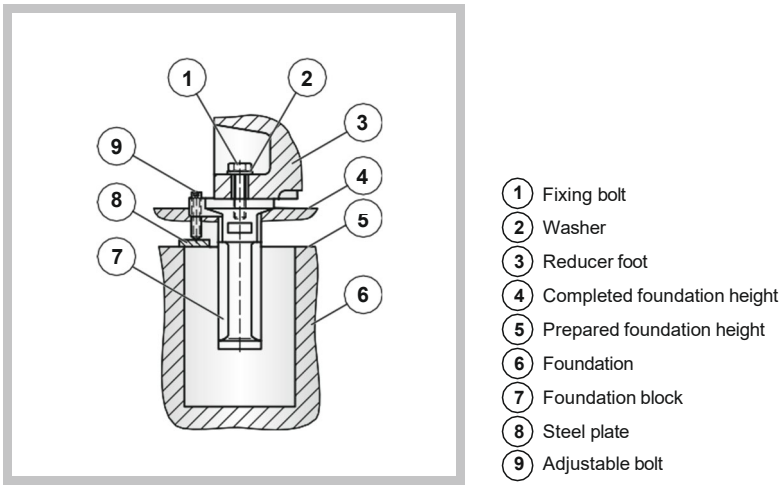
DANGER !

Damage caused by uneven tightening of hexagon nuts!

The reducer may be damaged by uneven tightening of the hex nuts. Tighten the hexagon nuts evenly. Make sure that the reducer is not deformed or distorted while tightening the fixing bolts.

Reducer assembly using foundation blocks:

Figure 37: Base Block



1. Fixing bolt
2. Washer
3. Reducer foot
4. Completed foundation height
5. Prepared foundation height
6. Foundation
7. Foundation block
8. Steel plate
9. Adjustable bolt

To assemble the reducer using the foundation blocks, proceed as follows:

1. Attach the foundation blocks with washers and fixing bolts to the foundation mounting points on the reducer housing.
2. Tighten the fixing bolts until the housing feet are flat on the foundation blocks.
3. Using a suitable crane or hoist, place the reducer on the concrete foundation.
4. Align the reducer so that the input and output shafts are horizontal, using the adjusting screws (if any) Page 52-53).
5. For higher external forces, if necessary, use lateral shims to prevent the reducer from displacement.
6. Before casting to the foundation, seal the openings in the foundation blocks using a suitable material (eg, using polystyrene).
7. Pour concrete inside the concrete foundation of the foundation blocks.
8. After the concrete has been set, tighten the fixing bolts of the foundation blocks with the specified tightening torque (Page 79-80).
9. Record the alignment measurements and keep the report together with these work instructions in a safe place.

DANGER !

Damage caused by uneven tightening of the fixing bolts!

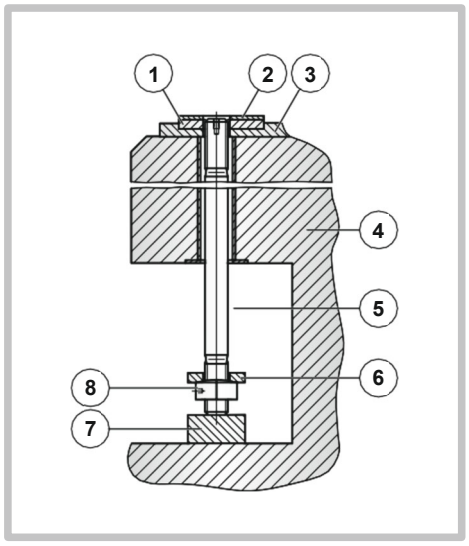
The reducer can be damaged by uneven tightening of the fixing bolts. Tighten the fixing bolts evenly. Make sure that the reducer is not deformed or distorted while tightening the fixing bolts.

4333 Mounting on Concrete Foundation Using Joint Bolts

The lower side of the reducer mounting feet should be clean.

Inserting the connecting bolt:

Figure 38: Installing Anchor Bolt



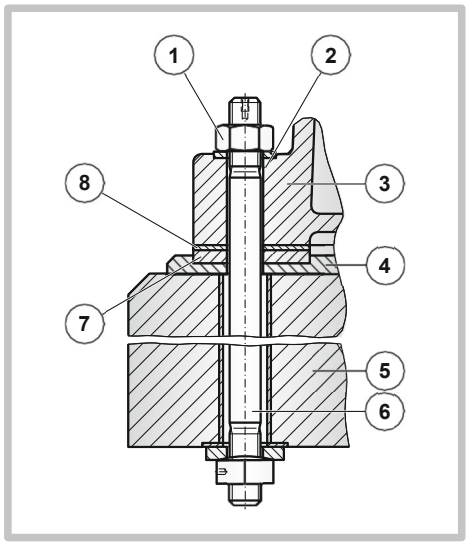
1. Base plate
2. Support
3. Fine concrete
4. Raw foundation
5. Anchorage bolt
6. Pressure plate
7. Wood
8. Nut

Proceed as follows to insert the connecting bolt:

1. Place the support on the base plate embedded in the thin mortar concrete.
2. Insert the connecting bolt.
3. Insert the pressure plate and tighten the nuts.
4. Place a piece of wood under the anchorage bolt approximately 10 mm from the top edge of the support.
5. Using the appropriate lifting gear, move the reducer to its down position.

Mounting the reducer with connecting bolts:

Figure 39: Clamping Anchor Bolt



1. Nut
2. Washer
3. Housing feet
4. Fine concrete
5. Raw foundation
6. Anchorage bolts
7. Base plate
8. Support

Proceed as follows to mount the reducer using the connecting bolts:

1. Pull the connecting bolts upwards. To do this, you can use a threaded rod or a screw on the end surface.
2. Install the washer.
3. Screw in the hex nut several turns by hand.

4. Align the reducer with the supports (Page 52-53).
   - Pay attention to the values on the alignment strips.
   - Maintain the alignment tolerances of the units connected to the inlet and outlet according to the allowable angular and axial displacements of the couplings.
5. Document the alignment measures in the form of a report and archive it with these instructions.
6. Keep the fastening bolts in place by tightening the nuts by hand.
7. Locate the guard bush.
8. Install the hydraulic clamping device.
9. Tighten the screws in sequence, taking into account the preload forces (Page 79-80).
10. Fully tighten the hexagon nuts using a suitable tool.
11. Document the tensile pressures and preloading forces and archive this report with these instructions.

ATTENTION !

Incorrect use of the front loader!

Incorrect use of the preload tool can result in injury.
To ensure correct use and adjustment of the preload tool, you must carefully follow the preload tool manufacturer's instructions given in the operating manual.

DANGER !

Insufficient concrete hardness and strength!

Damages due to insufficient fixation of the reducer as a result of insufficient concrete hardness and strength are possible.
Thin mortar concrete should be allowed to cure for at least 28 days before tightening the anchorage bolts.

4334 Mounting the Reducer on the Connection Platform

To mount the reducer on the connection platform, proceed as follows:

1. Clean the underside of the reducer mounting feet and the connection platform.
2. Using a suitable crane or lifting gear, place the reducer on the coupling platform.
3. Tighten the foot fixing bolts to the specified tightening torque (Page 79-80). If necessary, install shims to prevent displacement.
4. Align the reducer exactly with the input and output equipment (Page 52-53).
5. Record the alignment measurements.
6. Keep the report together with these work instructions in a safe place.

DANGER !

Insufficient fixation!

If the reducer is not mounted on a stable foundation, it may be damaged.
Make sure that the wavy base of the reducer is horizontal and flat. It is especially important that the surface on which the reducer is mounted is flat; because this determines the contact of the gears and the load on the bearings and therefore has an impact on the product life of the reducer.
All points on the gear unit mounting surface must lie between 2 imaginary parallel platforms. (2 platforms 0,1 mm apart)
Design the corrugated base of the reducer according to the relevant weight and torque, taking into account the forces acting on the reducer. The feet of the reducer must be properly supported. Main housing or very soft substructures can cause radial or axial displacement during operation. This displacement is not measurable when the reducer is stopped.

DANGER !

Damage caused by uneven tightening of the connecting bolts!

The reducer can be damaged by uneven tightening of the fixing bolts.
Tighten the fixing bolts evenly.
When tightening the fixing bolts, make sure that there is no mechanical tension in the reducer.

Support for Reducer's Connection Platform

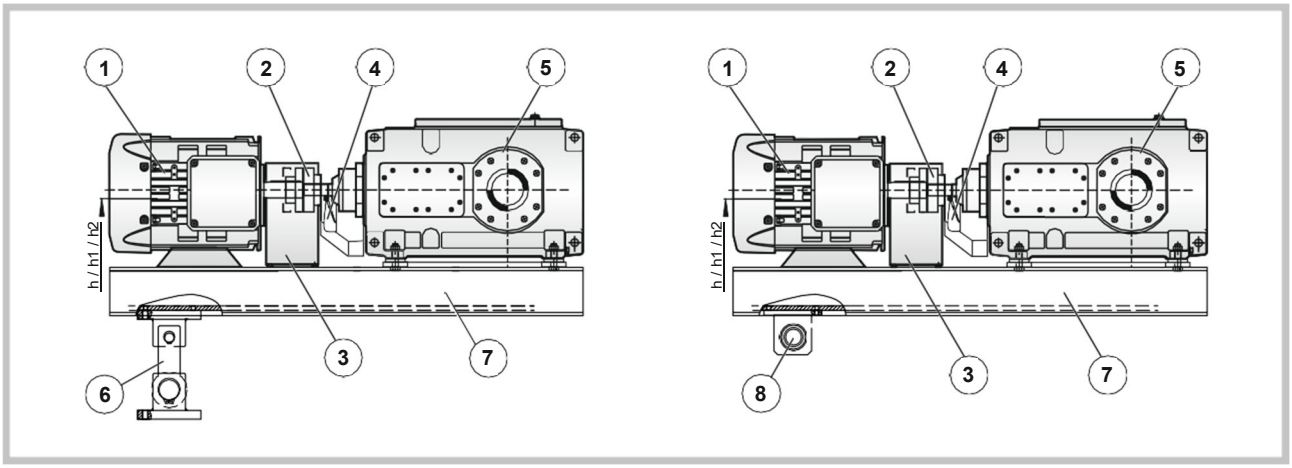
NOTE !

Damage to the reducer due to the incorrect mounting of the motor and reducer mounting platform!

The reducer may be damaged due to incorrect mounting of the motor and reducer connection platform.
The engine and platform may only be mounted after prior consultation with Renold. Mount the torque arm away from mechanical stress.

After the reducer is mounted on the connection platform, check whether the equipment on the input and output side is still correctly aligned.

Figure 40: Torque Support for Reducer



1. IEC motor according to DIN 42673
2. Coupling N
3. Coupling protection
4. Fan
5. Helical - Conical Reducer
6. Torque arm
7. Reducer chassis
8. Rubber shim

The largest permitted stationary motor for reducer in the table:

Table 10: Motor Selection for Reducer Base

Reducer's Size	Largest Standard Motor Permitted for the Relevant Reducer Type		
	HB ... 2	HB ... 3	HB ... 4
4	When requested	200	-
5 ... 6		225M	160
7 ... 8		280M	200
9 ... 10		315	225M
11 ... 12		355	280S
13 ... 14		400M	315M
15 ... 16		400M	315
17 ... 18		400M	355L
19 ... 22	When requested		

More information on building a foundation for reducers with a torque arm can be found in the foundation section. (Page 50)

4.3.4 Mounting on Block Flange

Before installing the block flange on the outlet side, make sure the following precautions are taken:

- The block flange on the output side of the reducer has a centering rib. Machine a pipe that matches the centering rib in the flange that joins on this machine side. The centering rib and detailed specifications for the pipe can be found in the technical drawing in the reducer documentation.
- Keep the radial and angular misalignment as low as possible when aligning the machine shaft with the combining flange.
- The area around the face of the block flange and the flange joining on the machine side must be absolutely free from oil. The reliability with which the torque is transmitted largely depends on it.
- Do not use contaminated solvents or dirty cleaning cloths or cleaning agents containing oils (such as petroleum or turpentine) to lubricate surfaces.
- The transferable reducer torque is limited by the bolted connection on the hole circle Øe1.

DANGER !

Risk of fatal injury from moving parts!

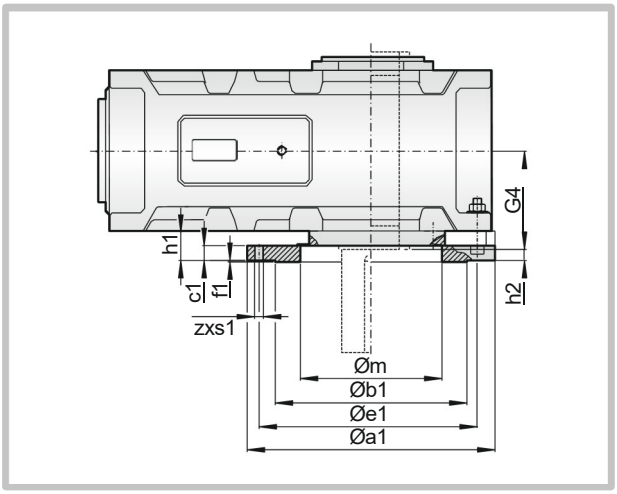
Failure to comply with alignment accuracy can result in a broken shaft and, as a result, the risk to life and injury.
Align the reducer in accordance with the specified alignment values.
Damage to the reducer or its components or mounted parts is possible. The accuracy of the alignment between the shaft axes largely determines the product life of shafts, bearings and couplings. Therefore, always make an effort to achieve zero deviation in the alignment of the shaft axes.

ATTENTION !

Risk of injury due to chemicals!

Chemicals pose a risk of injury.
Follow the manufacturer's guidelines on how to use lubricants and solvents. Wear suitable protective clothing.

Figure 41: Block Flange Reducer



DANGER !

Damage to the reducer due to the uneven tightening of the connecting bolts!

The reducer can be damaged by uneven tightening of the connecting bolts.
Tighten the connecting bolts crosswise and evenly with the specified torque. When tightening the connection bolts, make sure that there is no mechanical tension in the reducer.

4.3.4.1 Assembly of Reducer with Block Flange

To mount the reducer with a block flange, proceed as follows:

1. Clean the contact surfaces of the reducer flange and the union flange on the machine side.
2. Place the reducer on the coupling flange using the appropriate lifting gear.
3. Make sure that the fixing holes of the flanges are locked.
4. Tighten the connecting bolts with the specified torque. For the correct tightening torque, please refer to the tightening torques and preload forces (Page 79-80).

Always use bolts with a strength class (property class) of at least 8.8.
You can find more information about permissible operating tolerances in the relevant operating instructions in the gearbox catalogue.

4.3.5 Torque Arm Assembly for Reducer Housing

4.3.5.1 Torque Arm Assembly

For reducers coupled to the entire shaft, absorb the reaction torque corresponding to the torque of the machine and act in the opposite direction to the housing.

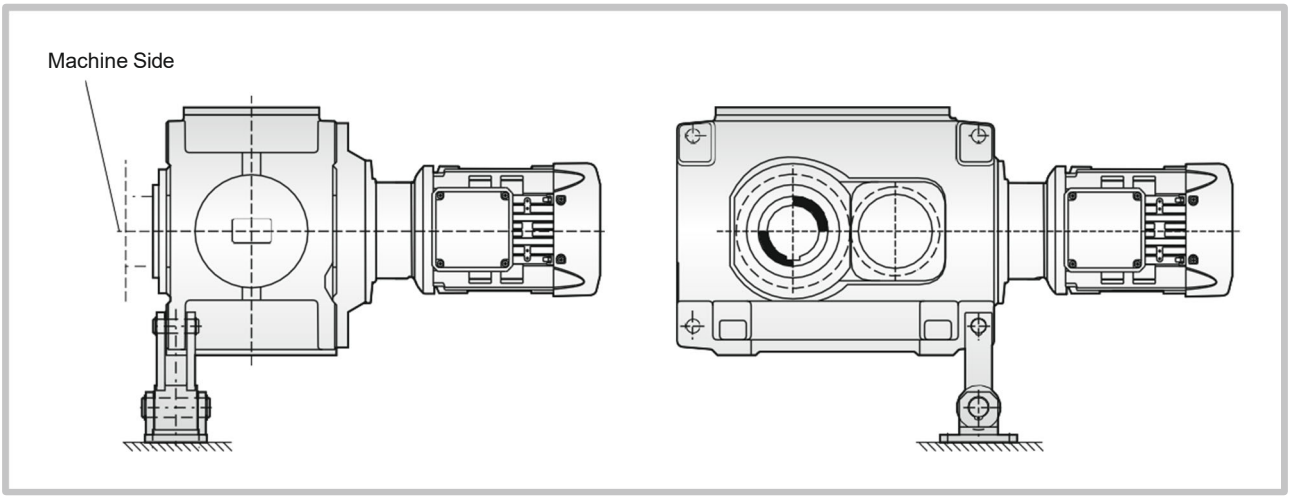
DANGER !

Reducer damage due to incorrect mounting of the motor and torque arm!

The reducer may be damaged due to incorrect assembly of the motor and torque arm.
The engine and torque arm can only be mounted after prior consultation with Renold.
Mount the torque arm to the machine side without causing any distortion or deformation.

Mount the torque arm on the machine side away from mechanical stress.
In helical reducers with IEC motors, the torque arm is opposite the IEC motor connection.

Figure 42: Torque Arm for Reducer Housing



The maximum transferable torque is limited by the torque supports:
T_{max} = FDMST x T^2 Rated

Table 11: Motor Selection for Foundation Support

FDMST Peak Torque Factor for Torque Supports 1)						
Reducer Housings	Type					
	H ... 2	H ... 3	H ... 4	HB ... 2	HB ... 3	HB ... 4
4 ...	1.3	-	-	1.2	1.2	–
5 ...	1.9	2.0	-	1.2	1.6	2.0
6 ...	1.6	1.7	-	1.2	1.4	1.7
7 ...	2.0	2.0	2.0	1.3	1.8	2.0
8 ...	1.7	2.0	2.0	1.2	1.6	2.0
9 ...	1.5	1.6	1.7	1.2	1.2	1.7
10 ...	1.3	1.4	1.4	1.2	1.2	1.4
11 ...	2.0	2.0	2.0	1.9	2.0	1.2
12 ...	2.0	2.0	2.0	1.8	2.0	1.2
13 ...	-	2.0	2.0	1.4	1.8	2.0
14 ...	-	1.9	2.0	1.3	1.7	2.0
15 ...	-	1.5	1.7	-	1.4	1.6
16 ...	-	1.4	1.5	-	1.3	1.5
17 ...	-	1.2	1.3	-	1.2	1.3
18 ...	-	1.2	1.2	-	1.2	1.2
19 ... - 22 ...	When requested					

1) The specified table values are minimum values. Depending on the direction of rotation of the motor, higher torque values are probably permissible. It is absolutely necessary to consult with Renold!

Larger motors can only be installed after consultation with Renold.
If you want to install a torque rod supplied by the customer, use an elastic element to connect it to the foundation.
More information on building foundations for reducers with torque rods can be found in foundation section (Page 50).

4.4 Hollow Shaft Coupled Reducer

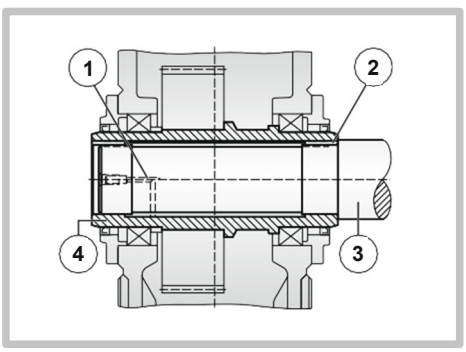
4.4.1 Shaft Coupled Gearbox with Hollow Shaft and Wedge Connection

The shaft end of the driven machine shaft (material C60 + N or higher strength) must have a parallel key as defined in form DIN 6885, Part 1, A. Also, DIN 332, form DS (threaded screw) must have a hole centred on the end surface as defined. Connection dimensions of the driven machine shaft can be found in the technical drawing in the documentation.

4.4.1.1 Preparation

To facilitate disassembly (Page 63-64-65), Renold recommends that you install a pressurized oil connector on the shaft end of the driven machine until the machine shaft is embedded in the hole shaft. This connector can also be used as a rust remover. Failure to comply with this recommendation shall not impose any liability on the plant operator and the plant builder.

Figure 43: Hollow Shaft, Keyway Reducers



1. Pressure oil connection
2. Spline
3. Machine shaft
4. Fan

4412 Assembly

Precautions to be taken before assembly;

ATTENTION !

Risk of injury due to chemicals!

Follow the manufacturer's guidelines on how to use lubricants and solvents. Wear suitable protective clothing.

Improper use may damage the reducer. Be sure to take the following precautions:

- Use a suitable cleaning agent to remove corrosion protection from hollow shaft and machine shaft.
- Inspect hollow shafts and machine shafts for damaged places and edges.
- If necessary, reprocess and clean the components with a suitable tool.
- Apply a suitable lubricant to the contact surfaces to protect against friction corrosion.

DANGER !

Risk of damage to the shaft seals due to the cleaning agent!

Aggressive chemical cleaners can damage shaft seals. Do not allow the cleaning agent to come into contact with the shaft seals.

Assembly;

DANGER !

Damage to the reducer!

The reducer may be damaged if bent during assembly.
The hollow shaft must be embedded in the machine shaft during the assembly of the reducer on the machine shaft. Do not allow the reducer to tilt.

DANGER !

Damage to the bearings!

Bearings can be damaged if the reducer is tilted during assembly.
The hollow shaft can be mounted on the flange of the machine shaft only if the reducer has one of the following:

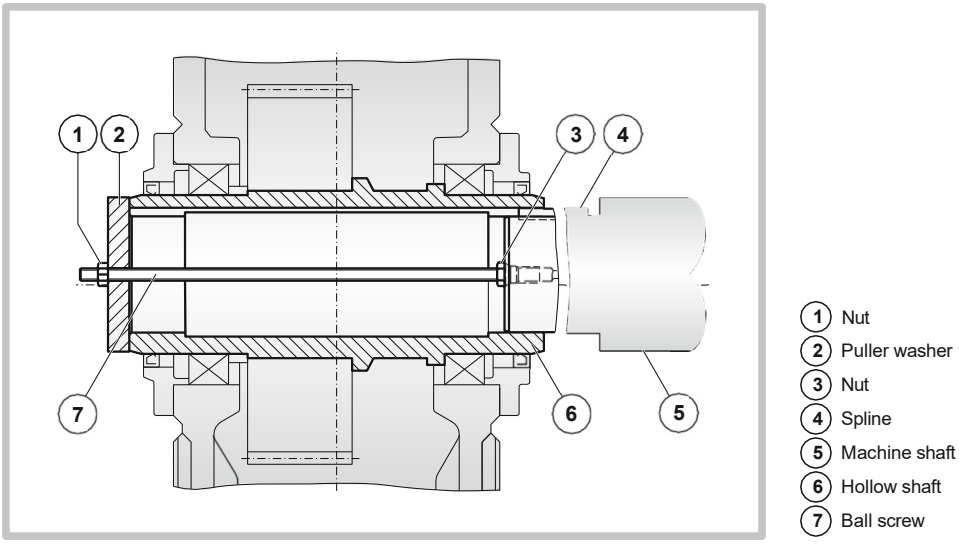
- Torque arm,
- Elastic element,
- When the reducer is supported by the connection platform.

Proceed as follows to mount the reducer:

1. Use suitable lifting gear to lift the reducer.
2. Mount the reducer using the nut and screw shaft.
3. The reducer is supported by a hollow shaft.

The figure below shows mounting on a splined hollow shaft with a ball screw.
Hydraulic puller equipment can be used instead of the nut and screw shaft shown in the figure.

Figure 44: Ball Screw Assembly Process



Axial locking;

Depending on the version, lock the hollow shaft axially onto the machine shaft (eg. with a locking ring, end plate, set screw).

4413 Disassembly

Precautions before disassembly;

DANGER !

Damage to the reducer due to bending!

If the reducer is bent during disassembly, it may be damaged.
Do not allow the reducer to bend when you remove it from the machine shaft. When removing the reducer with hydraulic pulling equipment, excessive force can be applied to the housing, bearings and other reducer components. Before reinstalling the reducer on the machine shaft, always check the hollow shaft bearings for damage.

NOTE !

Reducing the risk of corrosion!

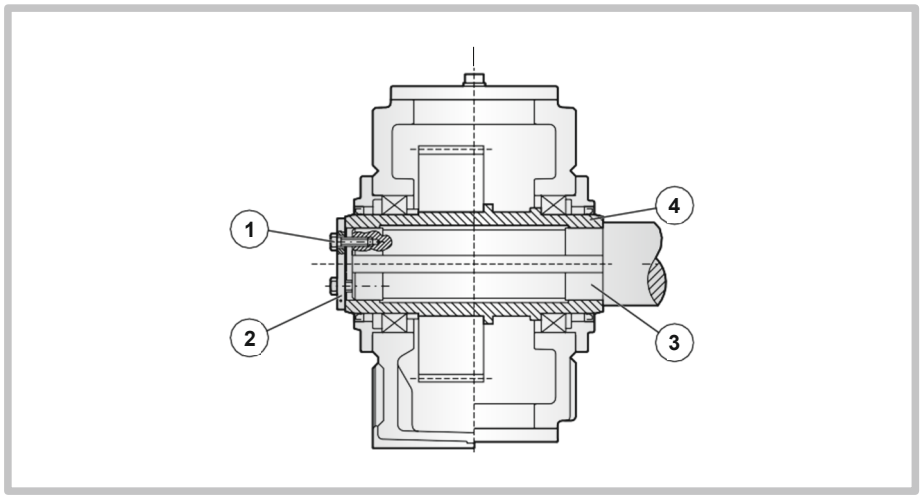
When using jacking screws or screw shafts, round off and lubricate the screw female end (head) loaded on the driven machine to avoid the risk of corrosion.

To disassemble the shaft coupled reducer from the machine shaft, do the following:

1. Fix the reducer in place.
2. Remove the axial locking element from the hollow shaft.
3. If friction corrosion has occurred on the field surfaces, rust remover should be used to make the reducer easier to disassemble. Rust remover can be pumped through the pressure oil connector.
4. Wait for the rust remover to take effect, then lift the reducer with a suitable device and disassemble it with a suitable fixing element.
5. Depending on the conditions in the field, you can use one of the following methods to remove the reducer from the machine shaft:
   - With jacking screws on an endplate,
   - With a central screw shaft,
   - By using hydraulic pulling equipment.

The figure below shows the procedure for removing the wedged hollow shaft by using a puller:

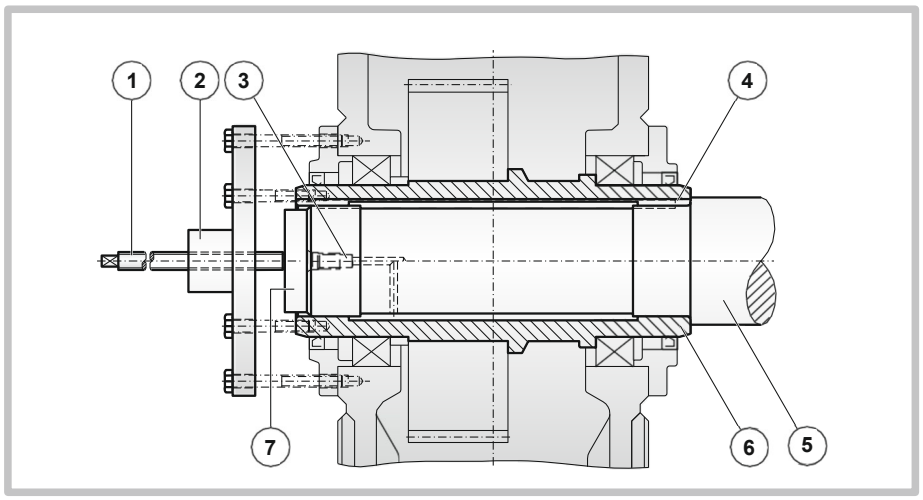
Figure 45: Dismantling by using a Puller



1. Puller bolt
2. Puller
3. Shaft
4. Hollow shaft

The figure below shows disassembly procedure to wedged hollow shaft by using hydraulic puller equipment:

Figure 46: Disassembly Using Hydraulic Pulling Equipment



1. Ball screw
2. Hydraulic puller equipment
3. Pressure oil connection
4. Spline
5. Machine shaft
6. Hollow shaft
7. Auxiliary washer (for printing)

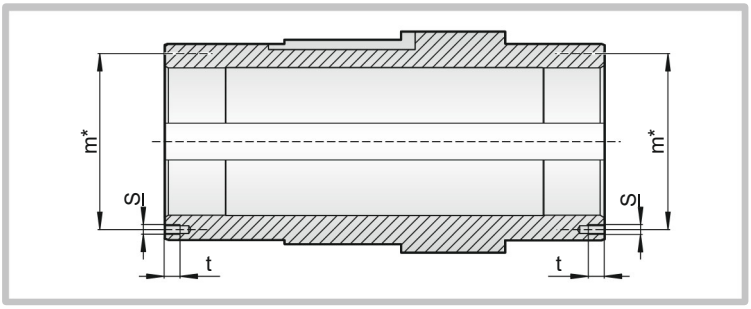
Puller;

For removing the gear unit, a puller is not supplied with the gear unit as standard. In addition, both sides of the hollow shaft have threaded holes to attach the puller to the shaft. This method can also be used for disassembling.

Detailed information and additional information on threaded holes can be found in the technical drawing in the reducer documentation.

The following figure shows the splined hollow shaft.

Figure 47: Keyway, Hollow Shaft



*) 2 guides are positioned at 180°.

Threaded holes in the face of the reducer hollow shafts;

For the dimensions of the threaded holes on the face of the reducer hollow shafts, see the table below:

Table 12: Guide Dimensions on Shaft Surface of Hollow Shaft Reducer

Reducer Housing	m in mm	S	t in mm	Reducer Housing	m in mm	S	t in mm
4	95	M8	25	12	215	M12	25
5	115	M8	25	13	230	M12	25
6	125	M8	25	14	250	M12	25
7	140	M10	25	15	270	M16	30
8	150	M10	25	16	280	M16	30
9	160	M10	25	17	300	M16	30
10	170	M12	25	18	320	M16	30
11	195	M12	25	≥ 19	When requested		

DANGER !

Damage to reducer housing or other reducer components!

If forced pressures exceeding the specified maximum values are applied, the reducer housing or other reducer components may be damaged.
The forced pressures specified in the table below must not be exceeded not only in the supported hollow shaft but also in the body while the reducer is being dismantled. Hollow shaft bearings must always be checked for damage before the reducer is mounted on the machine shaft.

Maximum forcing pressure;

See the table below for maximum forcing pressures:

Table 13: Maximum Forcing Pressures

Reducer Housing	Maximum Forcing Pressure in (N)	Reducer Housing	Maximum Forcing Pressure in (N)
4	22 600	12	113 600
5	33 000	13	140 000
6	37 500	14	160 000
7	50 000	15	193 000
8	56 000	16	215 000
9	65 000	17	240 000
10	82 000	18	266 000
11	97 200	≥ 19	When requested

4.4.2 Hollow Shaft and Sliding Shaft Coupled Reducer According to DIN 5480

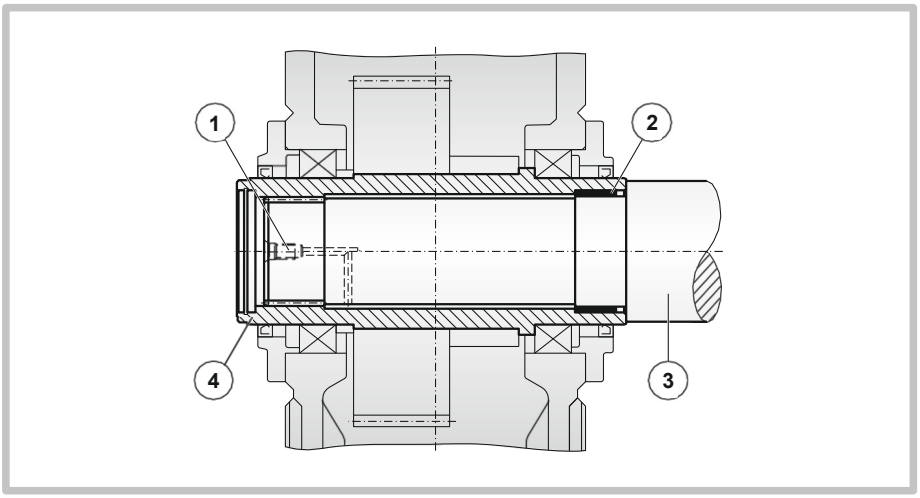
The end of the driven machine shaft (material C60 + N or higher strength) must have a slider according to DIN 5480. In addition, there should be lifting holes on the hollow shaft or splined shaft surface in accordance with DIN 332 standards.
The connection dimensions of the driven machine shaft can be found in the dimensional drawing in the documentation.

4421 Preparations

To facilitate disassembly (Page 68-69-70), Renold recommends that you should install a pressurized oil connector on the shaft end of the driven machine until the machine shaft is embedded in the hole shaft. This connector can also be used as a rust remover. Failure to comply with this recommendation shall not impose any liability on the plant operator and the plant builder.

The following figure shows the mounting of a spline shaft and a hollow shaft:

Figure 48: Preparation for a Hollow Shaft Gear Unit with a Flat Hole on one Side and a Spline on the Other Side



4422 Assembly

Precautions to be taken before assembly;

ATTENTION !

Risk of injury due to chemicals!

Follow the manufacturer's guidelines on how to use lubricants and solvents. Wear suitable protective clothing.

Improper use may damage the reducer. Be sure to take the following precautions:

- Use a suitable cleaning agent to remove corrosion protection from hollow shaft and machine shaft.
- Inspect hollow shafts and machine shafts for damaged places and edges.
- If necessary, reprocess and clean the components with a suitable tool.
- Apply a suitable lubricant to the contact surfaces to protect against friction corrosion.

DANGER !

Risk of damage to shaft seals!

Aggressive chemical cleaners can damage the seals. Do not allow the cleaning agent to come into contact with the seals.

Pre-assembled bushing mount;

DANGER !

Damage to the reducer!

The reducer may be damaged if bent during assembly.
When assembling the reducer, make sure that the hollow shaft and the machine shaft are aligned, and make sure that the slides of the machine shaft and the slides of the hollow shaft match.
You can determine the correct slider position by turning the input shaft or slightly turning it on the reducer's hollow shaft.

NOTE !

Damage to the bearings!

Bearings can be damaged if the reducer is tilted during assembly.
The hollow shaft can be mounted on the flange of the machine shaft only if the reducer has one of the following:

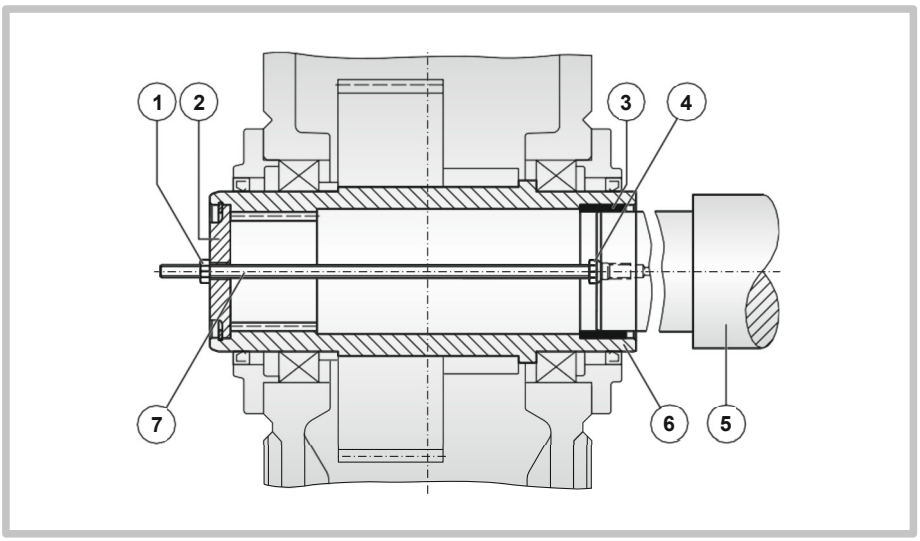
- Torque arm,
- Elastic element,
- When the reducer is supported by the connection platform.

Proceed as follows to mount the reducer in the integral bushing:

1. Use suitable lifting gear to lift the reducer.
2. Mount the reducer using the nut and screw shaft.
3. The reducer is supported by a hollow shaft.

The following figure shows the bushing assembly process on a splined hollow shaft:
Hydraulic puller equipment can be used instead of the nut and screw shaft shown in the figure.

Figure 49: Pre-Assembled Bushing Sleeve Assembly



Assembly with bushing as a separate component;

DANGER !

Damage to the reducer!

The reducer may be damaged if bent during assembly.
When assembling the reducer, make sure that the hollow shaft and the machine shaft are aligned, and make sure that the slides of the machine shaft and the slides of the hollow shaft match.
You can determine the correct slider position by turning the input shaft or slightly turning it on the reducer's hollow shaft.

DANGER !

Damage to the bearings!

Bearings can be damaged if the reducer is tilted during assembly.
The hollow shaft can be mounted on the flange of the machine shaft only if the reducer has one of the following:

- Torque arm,
- Elastic element,
- When the reducer is supported by the connection platform.

For mounting the reducer with a hollow shaft and mounting a bushing on the driven machine shaft with the slider as a separate component, proceed as follows:

1. Use suitable lifting gear to lift the reducer.
2. Push the separately supplied bushing against the machine shaft.
3. Use a belt fastener to tighten the bushing until it is securely in contact with the shaft.
4. Move the bushing together with the machine shaft towards the hollow shaft of the reducer.

* Hydraulic pulling equipment can be used instead of the nut and screw shaft shown in the diagram.

Axial locking;

Depending on the version, lock the hollow shaft axially onto the machine shaft (eg. with a locking ring, end plate, set screw).

4423 Disassembly

Precautions before disassembly;

DANGER !

Damage to the reducer!

If the reducer is bent during disassembly, it may be damaged.
Do not allow the reducer to bend when you remove it from the machine shaft. When removing the reducer with hydraulic pulling equipment, excessive force can be applied to the housing, bearings and other reducer components. Before reinstalling the reducer on the machine shaft, always check the hollow shaft bearings for damage.

NOTE !

Reducing the risk of corrosion!

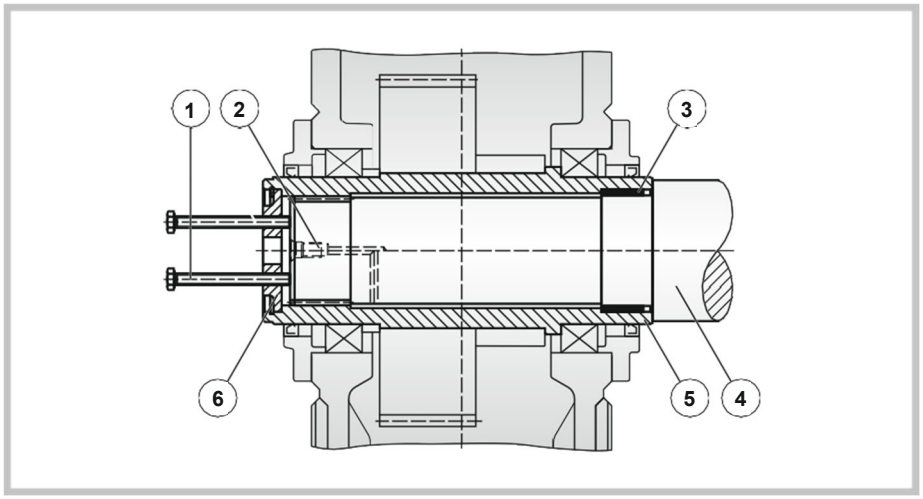
When using jacking screws or screw shafts, round off and lubricate the screw female end (head) loaded on the driven machine to avoid the risk of corrosion.

To remove the hollow shaft coupled reducer from the machine shaft, proceed as follows:

1. Fix the reducer in place.
2. Remove the axial locking element from the hollow shaft.
3. If friction corrosion has occurred on the field surfaces, rust remover should be used to make the reducer easier to disassemble. Rust remover can be pumped through the pressure oil connector.
4. To do this, first remove the puller plate and segment.
5. Wait for the rust remover to work and then use the appropriate equipment to lift the reducer and disassemble it using a fastening device.
6. Depending on the conditions in the field, you can use one of the following methods to remove the reducer from the machine shaft:
   - With jacking screws on an puller plate,
   - With a central screw shaft,
   - By using hydraulic pulling equipment.

The figure below shows the procedure for removing the splined hollow shaft using the shrink washer:

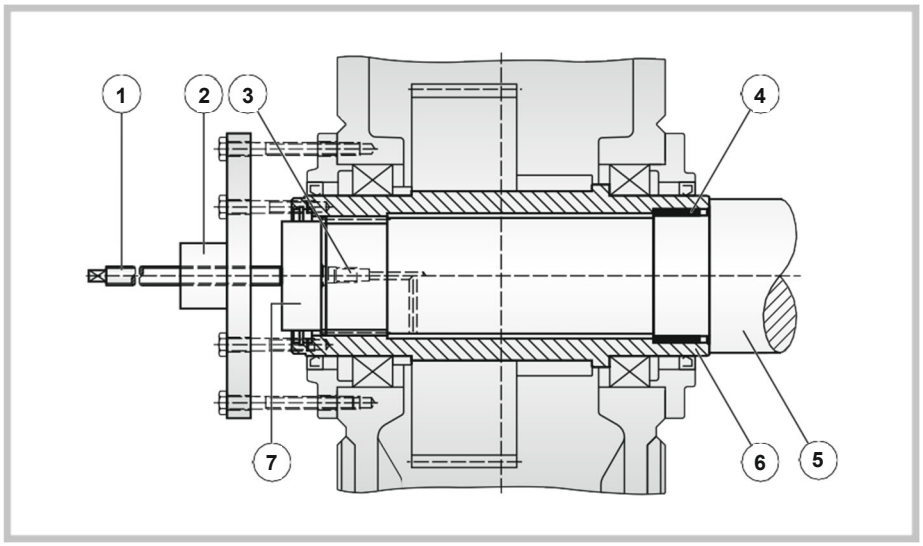
Figure 50: Dismantling by using a Puller



1. Pull bolt
2. Pressure oil connection
3. Bushing
4. Machine shaft
5. Hollow shaft
6. Puller Washer

The figure below shows the disassembly procedure of the splined hollow shaft using hydraulic puller equipment:

Figure 51: Disassembly Using Hydraulic Pulling Equipment



1. Ball screw
2. Hydraulic puller equipment
3. Pressure oil connection
4. Bushing
5. Machine shaft
6. Hollow shaft
7. Auxiliary washer (for printing)

DANGER !

Damage to reducer housing or other reducer components!

If forced pressures exceeding the specified maximum values are applied, the reducer housing or other reducer components may be damaged. When disassembling a reducer not only in the supported hollow shaft but also in the body, the forced pressures specified in the table below must not be exceeded. Hollow shaft bearings must always be checked for damage before the reducer is mounted on the machine shaft.

*** See the table on page 65 for the maximum forcing pressures.**

NOTE !

The auxiliary plate is not supplied with the reducer as standard!

The auxiliary plate for removal of the reducer is not supplied with the reducer as standard.

4.4.3 Hollow Shaft and Conical Compression Shaft Coupled Reducer

The end of the driven machine shaft (material C60 + N or higher strength) must have a hole centred on the end surface, as defined in DIN 332. The connection dimensions of the driven machine shaft can be found in the technical drawing in the documentation.

4431 Assembly

Precautions to be taken before assembly;

ATTENTION !

Risk of injury due to chemicals!

Follow the manufacturer's guidelines on how to use lubricants and solvents. Wear suitable protective clothing.

Improper use may damage the reducer. Be sure to take the following precautions:

- Use a suitable cleaning agent to remove corrosion protection from hollow shaft and machine shaft.
- Inspect hollow shafts and machine shafts for damaged places and edges.
- If necessary, reprocess and clean the components with a suitable tool.
- Apply a suitable lubricant to the contact surfaces to protect against friction corrosion.

DANGER !

Risk of damage to shaft seals!

Aggressive chemical cleaners can damage the seals. Do not allow the cleaning agent to come into contact with the seals.

NOTE !

The outlet shaft bore and the machine shaft must be free of any oil!

Ensure that the outlet shaft bore and the machine shaft contact surface of the conical clamping point are completely oil-free.
The reliability with which the torque is transmitted largely depends on it.
Do not use contaminated solvents or dirty cleaning cloths or cleaning agents containing oils (such as petroleum or turpentine) to lubricate surfaces.

Pulling with combined bushing;

DANGER !

Damage to the reducer!

The reducer may be damaged if bent during assembly.
The hollow shaft must be embedded in the machine shaft during the assembly of the reducer on the machine shaft. Do not allow the reducer to tilt.

DANGER !

Damage to the bearings!

Bearings can be damaged if the reducer is tilted during assembly.
The hollow shaft can be mounted on the flange of the machine shaft only if the reducer has one of the following:

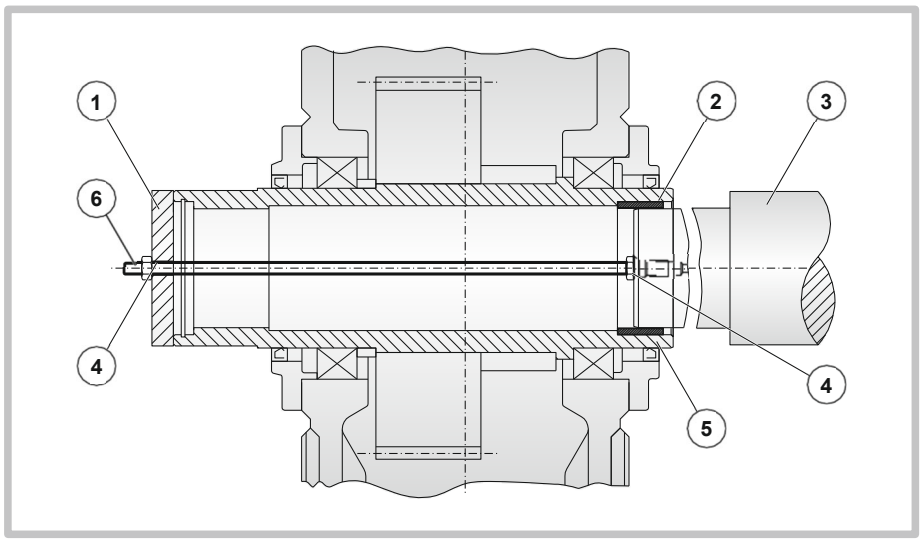
- Torque arm,
- Elastic element,
- When the reducer is supported by the connection platform

To mount tapered clamping on the driven machine shaft and the hole shaft of the reducer together with the combined bushing, proceed as follows:

1. Use suitable lifting gear to lift the reducer.
2. Mount the reducer using the nut and screw shaft. The reducer is supported by a hollow shaft.
3. Tighten the reducer with the hollow shaft to the place under the conical clamping on the machine shaft. The machine shaft centers itself on the ground under the taper clamping and bushing.
4. Attach the hollow shaft to the machine shaft.

The following figure shows the conical clamping and shafts:

Figure 52: Preparation for Hollow Shaft, Conical Compression Reducers



1 Puller Washer
2 Bushing
3 Machine shaft
4 Nut
5 Hollow shaft
6 Ball screw

Assembly with bushing as a separate component;

DANGER !

Damage to the reducer!

The reducer may be damaged if bent during assembly. The hollow shaft must be embedded in the machine shaft during the assembly of the reducer on the machine shaft.
Do not allow the reducer to tilt.

DANGER !

Damage to the bearings!

Bearings can be damaged if the reducer is tilted during assembly.
The hollow shaft can be mounted on the flange of the machine shaft only if the reducer has one of the following:

- Torque arm,
- Elastic element,
- When the reducer is supported by the connection platform.

For mounting the reducer with a hollow shaft and mounting a bushing on the driven machine shaft with the slider as a separate component, proceed as follows:

1. Use suitable lifting gear to lift the reducer.
2. Push the separately supplied bushing against the machine shaft.
3. Use a belt fastener to tighten the bushing until it is securely in contact with the shaft.
4. Move the bushing together with the machine shaft towards the hollow shaft of the reducer.

*Hydraulic pulling equipment can be used instead of the nut and screw shaft shown in the diagram.

Axial locking;

Tightening the conical clamp to specification ensures axial locking of the reducer. It is not necessary to install other axial locking elements.

4432 Disassembly

To remove the hollow shaft and conical shaft coupled reducer from the machine shaft, proceed as follows:

1. Fix the reducer in place.
2. Unscrew the conical clamp,
3. Lift the reducer from the machine shaft by using jack screws until it contacts the places under the conical tightening and bushing,
4. Use suitable lifting gear to lift the reducer from the machine shaft.

4.5 F Type Flange Shaft Reducer

4.5.1 Requirements

Before installing an F-type flanged reducer, make sure that the following precautions are taken:

- The area around the flange shaft and the combining flange must be absolutely free of oil. The reliability with which the torque is transmitted largely depends on it.
- Do not use contaminated solvents or dirty cleaning cloths or cleaning agents containing oils (such as petroleum or turpentine) to lubricate surfaces.

ATTENTION !

Risk of injury due to chemicals!

Chemicals pose a risk of injury. Follow the manufacturer's guidelines on how to use lubricants and solvents. Wear suitable protective clothing

4.5.2 Installation of Reducer

To assemble a F type flanged shaft reducer, proceed as follows:

1. Clean the flange shaft and combining flange contact surfaces,
2. Place the reducer on the coupling flange using the appropriate lifting gear,
3. Before tightening the fixing bolts, make sure that the fixing gaskets of the flanges are locked,
4. Tighten the connecting bolts crosswise and evenly with the specified torque.

DANGER !

Damage to the reducer due to the uneven tightening of the connecting bolts!

The reducer can be damaged by uneven tightening of the connecting bolts.Tighten the connecting bolts crosswise and evenly with the specified torque. When tightening the connection bolts, make sure that there is no mechanical tension in the reducer.

The following table lists the tightening torques for the flange connections:

Table 14: Tightening Torques of Flange Connections

Reducer Housing	Bolt Class		Tightening Torque
	Bolt DIN 931	Nut DIN 934	
5 ... 6	10.9	10	610 Nm
7 ... 10	10.9	10	1 050 Nm
11 ... 16	10.9	10	2 100 Nm
17 ... 20	10.9	10	3 560 Nm
21 ... 22	10.9	10	5 720 Nm

4.6 Couplings

Couplings must be balanced as specified in the relevant user manual. Balance the couplings if necessary.

Coupling parts may be misaligned as a result of:

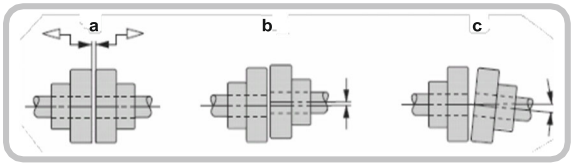
- Parts are not aligned correctly during assembly,
- During system operation, eg;
  - Due to thermal expansion,
  - Due to shaft bending,
  - Due to machine frames or too soft foundations.

DANGER !

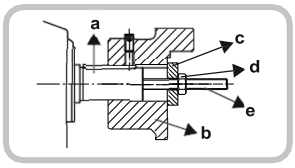
Premature wear and material damage to reducers due to misalignment!

Reducers can suffer premature wear and material damage if misaligned. Make sure that the maximum allowable displacement values are never exceeded during operation. These values can be found in the coupling's operating manual. Angular and radial displacements can occur simultaneously. Make sure that the total value of both displacements does not exceed the maximum allowable angular or radial displacement. If you use couplings provided by other manufacturers, contact these companies and ask for the maximum permissible misalignment tolerances, be sure to specify the potential radial loads for your application.

Figure 53: Coupling Assembly



a. Maximum and minimum distance
b. Axial displacement
c. Angular displacement



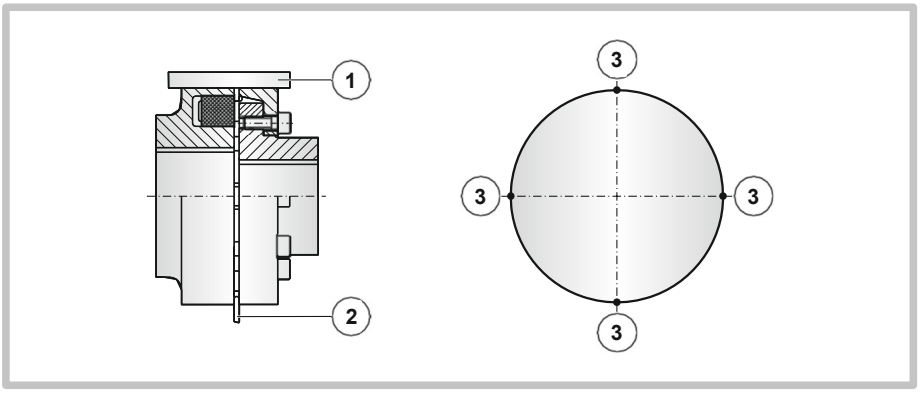
An example of a simple clamping device;
a. Output Shaft
b. Coupling
c. Washer
d. Nut
e. Stud

Alignment:

Alignment must be made in the planes of two axes perpendicular to each other. This is possible using rulers (radial offset) and precision indicators (angular offset) as shown in the diagram. You will achieve higher alignment accuracy by using a dial gauge or laser alignment system.

The diagram below shows the alignment process based on an example of a flexible coupling:

Figure 54: Alignment Process with Flexible Coupling



NOTE !

It is recommended to place liners or metal parts under the mounting feet to align the drive components in the vertical direction. It is useful to use the base set screws and support components to adjust the drive components laterally.

Hollow shaft output shaft and output flange shaft;

It is not necessary to mount the output side coupling on reducers with hollow shaft output shaft or flanged output shaft.

More information on misalignment tolerances for couplings supplied by Renold can be found in the relevant operating manual for couplings in the reducer documentation.
If couplings from other manufacturers are to be used, then ask the manufacturer what misalignment errors are allowed, specifying the radial loads incurred.
You can find additional information about connections in the relevant user guide.

4.7 Connecting Components

4.7.1 Reducers with Mounted Components

Depending on the order specifications, the reducer can be equipped with various components.
Connect closed-loop control and open-loop control electrical devices in accordance with the specifications of the device supplier.
Additional information on operation and maintenance can be found in the relevant operating instructions in the reducer documentation. You can find the technical data of the assembled parts in the equipment contract list in the reducer documentation.

4.7.2 Making Terminal Box Connections for Pre-Wired Reducers

Proceed as follows to wire the reducer:

1. Connect all pre-wired reducers as shown in the circuit diagram in the terminal box.
2. If a pressure monitor is installed, disable the pressure monitor signal for approximately 20 seconds during commissioning.
   * This is necessary as the pressure in the reducer must first be balanced.

4.7.3 Connecting the Cooler Coil

To connect the cooling coil to the reducer, do the following:

1. Before connecting the cooling coil, remove the sealing plugs and connecting bushes,
2. Wash the cooling coil to remove dirt or dust,
3. Connect the coolant inlet and drain lines. For the location of the connections, see the technical drawing,

* More information about the cooling coil can be found in the reducer documentation.

NOTE !

Follow the information given in section of cooling coil (Page 36).

4.7.4 Connecting the Air-Oil Cooler

To connect the air-oil cooler to the reducer, do the following:

1. Before connecting the air-oil cooler, make sure that the air can circulate freely,
2. Fill the air-oil cooler with compressed air,
3. Electrically connect the contamination indicator of the double-control filter and pressure gauge,
4. Electrically connect the fan motor.

* Additional information about the air-oil cooler can be found in the air-oil cooler operating instructions given in the reducer documentation.

NOTE !

See the information in the section on reducer with oil supply system installed with air-oil cooler (Page 37-38).

4.7.5 Connecting the Water-Oil Cooler

NOTE !

Damage to the water-oil cooler!

When installing the piping, the connections of the water-oil cooler are not allowed to be subjected to force, torque or vibration.

To connect the water-oil cooler to the reducer, do the following:

1. Before connecting the water-oil cooler, remove the connecting bushings from the cooling water connection,
2. Wash the water-oil cooler to clean the dirt and pollution,
3. Connect the cooling water inlet and discharge lines,
   See the technical drawing for the flow direction and the location of the connections,
4. Electrically connect the pressure gauge (only for properly equipped reducers).

* Additional information about the water-oil cooler can be found in the operating manual of the water-oil cooler unit specified in the reducer documentation.

NOTE !

See the information in the chapter on the reducer fitted with oil supply system with water-oil cooler (Page 38-39).

4.7.6 Connecting the Heating Element

To connect the heating elements to the reducer, do the following:

1. Check if the heating element connection is damaged,
2. Connect the oil temperature monitoring system to the oil pan,
3. Install the electrical wires for the heating elements.

DANGER !

Fire danger!

Exposed heating elements pose a fire hazard. Do not operate the heating elements until you are sure that they are completely immersed in the oil bath.

More information on heating can be found in the heating operating instructions in the reducer documentation.

4.7.7 Connecting the Pressure Indicator

For reducers equipped with a pressure gauge, you must connect the pressure gauge correctly. Disable the pressure monitor signal for about 20 seconds during commissioning.

Additional information on pressure control can be found in the pressure gauge operating manual in the reducer documentation.

4.7.8 Establishing a Separate Oil Supply System

To connect the oil supply system to the reducer, do the following:

1. Remove the flange connections from the suction and distribution lines before connecting the system,
2. Connect the system to the reducer in accordance with the technical drawings in the documentation and mount it as a separate system,
3. When installing the system, make sure that the piping is not subjected to mechanical stress.

* More information on the oil supply system can be found in the oil supply system operating manual in the reducer documentation.

4.7.9 Connecting the Oil Level Indicator System

To connect the oil level indicator system to the reducer, do the following:

1. Make sure that the filling level safety switch connection is not damaged,
2. Electrically connect the fill level safety switch,
3. Connect the signal so that when the "oil level too low" signal is active, the gearmotor cannot start and gives an alarm.
   Disable this signal at runtime.

Additional information about the oil level indicator system can be found in the user manual for the oil level indicator system components, provided in the reducer documentation.
You can find technical data in the separate data sheet and in the equipment list in the reducer documentation.

4.7.10 Connecting the Pt 100 Resistance Thermometer

To connect the Pt 100 resistance thermometer, proceed as follows:

1. Make sure that the connection of the Pt 100 resistance thermometer is not damaged,
2. Connect the electrical wires between the Pt 100 resistance thermometer and the evaluation unit. The customer is responsible for providing the evaluation unit.
   * More information on the Pt 100 resistance thermometer can be found in the Pt 100 resistance thermometer operating instructions in the reducer documentation.

4.7.11 Connecting the Temperature Indicator

To connect the temperature monitor to the reducer, proceed as follows:

1. Make sure the temperature gauge connection is undamaged,
2. Plug in the electrical wires for the temperature gauge.
   * More information about the temperature gauge can be found in the temperature gauge operating manual, in the reducer documentation.

4.7.12 Connecting the Bearing Monitoring System

To connect the bearing indicator system to the reducer, do the following:

1. Make sure that the connections provided to hold the bearing indicator equipment are undamaged,
2. Install the bearing indicator equipment on the reducer at the customer's facility.
   * More information about the bearing monitoring system can be obtained from the equipment-related datasheets.

4.7.13 Connecting the Encoder

To connect the speed encoder to the reducer, do the following:

1. Make sure the speed encoder connection is not damaged,
2. Electrically connect the speed encoder.
   * You can get more information about the encoder from the encoder-related datasheets.

4.7.14 Connecting the Motor Pump

To connect the motor pump, do the following:

1. Make sure that the motor pump connections are not damaged,
2. Connect the motor pump according to the terminal diagram and the relevant operating instructions.
   * More information about the motor pump can be obtained from the datasheets related to the motor pump.

4.7.15 Electrical Connections

DANGER OF ELECTRICITY !

Electric shock!
Parts under stress can cause electric shock. Before starting the electrical installation work, make sure that the electricity of the entire facility is cut off.

To connect motors and monitoring devices, do the following:

1. Make sure that the connections of the motors and monitoring devices are not damaged,
2. Connect the motors and monitoring devices according to the terminal diagram and related operating instructions,
3. Insulate all cable entry points (sleeves) in electrical equipment required for the environment in which the equipment will operate.

* You can find additional information on electrical connections in the terminal diagrams and equipment lists provided in the reducer documentation.

4.8 Clamping Procedure

4.8.1 Bolts

Bolts must have the following characteristics:

- Made of steel,
- Annealed or phosphated,
- Lightly oiled (do not add additional oil).

NOTE !

Replacing the bolts!
Replace unsuitable bolts with bolts of the same type and strength class.

Screw splines to be mounted;

Screw splines to be mounted must have the following characteristics:

- Must be made of steel or cast iron,
- It should be dry and reinforced.

NOTE !

Using a lubricant!
As a rule, lubricants should not be used as this can cause the bolt connection to become overloaded.

4.8.2 Bolt Connection Classes

Note the information in the table below to install the fixing bolts:

Table 15: Information on Tightening the Connecting Bolts

Mounting Position	Bolt Connection Class	Torque Spread to Part	Clamping Procedure
Reducer Motor Brake Torque arm	**C**	± 5 % ... ± 10 %	• Hydraulic tightening with mechanical screwdriver. • Torque controlled tightening with a torque wrench or a signal emitting torque wrench. • Tightening with precision mechanical screwdriver with dynamic torque measurement.
	D	± 10 % ... ± 20 %	• Controlled tightening with a mechanical screwdriver.
Protection Fan Cover	**E**	± 20 % ... ± 50 %	• Tightening with impact wrench without setting controller. • Hand tightening using a wrench without a torque measuring device

Additional information on tightening torques when installing the motor and brake can be found in the operating instructions of a particular manufacturer.

4.8.3 Preload Forces and Tightening Torques

The specified bolted connections must be tightened to the torques specified in the table below:
The tightening torques are valid for friction values of µtotal = 0.14.

The following table lists the preload forces and tightening torques for screw connections, various power classes 8.8: 10.9, 12.9

Table 16: Preload Forces and Tightening Torques

Nominal Thread Diameter	Bolt Strength Class	Preloading forces and tightening torques according to bolt qualities should be taken from page 79-80.			Bolt tightening torques should be taken from the bolt tightening table on page 79-80.		
		C	D	E	C	D	E
d mm		$F_{M\,min.}$ N			F_A Nm		
M10	8.8	18 000	11 500	7 200	44.6	38.4	34.3
	10.9	26 400	16 900	10 600	65.4	56.4	50.4
	12.9	30 900	19 800	12 400	76.5	66.0	58.9
M12	8.8	26 300	16 800	10 500	76.7	66.1	59.0
	10.9	38 600	24 700	15 400	113	97.1	86.6
	12.9	45 100	28 900	18 100	132	114	101
M16	8.8	49 300	31 600	19 800	186	160	143
	10.9	72 500	46 400	29 000	273	235	210
	12.9	85 000	54 400	34 000	320	276	246

Table 16: Preload Forces and Tightening Torques

Nominal Thread Diameter	Bolt Strength Class	Preloading forces and tightening torques according to bolt qualities should be taken from page 79-80.			Bolt tightening torques should be taken from the bolt tightening table on page 79-80.		
d mm		C	D	E	C	D	E
		$F_{M\,min.}$ N			F_A Nm		
M20	8.8	77 000	49 200	30 800	364	313	280
	10.9	110 000	70 400	44 000	520	450	400
	12.9	129 000	82 400	51 500	609	525	468
M24	8.8	109 000	69 600	43 500	614	530	470
	10.9	155 000	99 200	62 000	875	755	675
	12.9	181 000	116 000	72 500	1 020	880	790
M30	8.8	170 000	109 000	68 000	1 210	1 040	930
	10.9	243 000	155 000	97 000	1 720	1 480	1 330
	12.9	284 000	182 000	114 000	2 010	1 740	1 550
M36	8.8	246 000	157 000	98 300	2 080	1 790	1 600
	10.9	350 000	224 000	140 000	2 960	2 550	2 280
	12.9	409 000	262 000	164 000	3 460	2 980	2 670
M42	8.8	331 000	212 000	132 000	3 260	2 810	2 510
	10.9	471 000	301 000	188 000	4 640	4 000	3 750
	12.9	551 000	352 000	220 000	5 430	4 680	4 180
M48	8.8	421 000	269 000	168 000	4 750	4 090	3 650
	10.9	599 000	383 000	240 000	6 760	5 820	5 200
	12.9	700 000	448 000	280 000	7 900	6 810	6 080
M56	8.8	568 000	363 000	227 000	7 430	6 400	5 710
	10.9	806 000	516 000	323 000	10 500	9 090	8 120
	12.9	944 000	604 000	378 000	12 300	10 600	9 500
M64	8.8	744 000	476 000	298 000	11 000	9 480	8 460
	10.9	1 060 000	676 000	423 000	15 600	13 500	12 000
	12.9	1 240 000	792 000	495 000	18 300	15 800	14 100
M72x6	8.8	944 000	604 000	378 000	15 500	13 400	11 900
	10.9	1 340 000	856 000	535 000	22 000	18 900	16 900
	12.9	1 570 000	1 000 000	628 000	25 800	22 200	19 800
M80x6	8.8	1 190 000	760 000	475 000	21 500	18 500	16 500
	10.9	1 690 000	1 100 000	675 000	30 500	26 400	23 400
	12.9	1 980 000	1 360 000	790 000	35 700	31 400	27 400
M90x6	8.8	1 510 000	968 000	605 000	30 600	26 300	23 500
	10.9	2 150 000	1 380 000	860 000	43 500	37 500	33 400
	12.9	2 520 000	1 600 000	1 010 000	51 000	43 800	39 200
M100x6	8.8	1 880 000	1 200 000	750 000	42 100	36 200	32 300
	10.9	2 670 000	1 710 000	1 070 000	60 000	51 600	46 100
	12.9	3 130 000	2 000 000	1 250 000	70 000	60 400	53 900

4.9 Final Things to be Completed

After all the elements are assembled or connected, perform the following final work:

- Check if all devices disassembled due to transportation have been reassembled,
- After the assembly of the reducer is completed, check the tightness of all bolted connections,
- Check the alignment after tightening the fasteners. The alignment must not have changed in any way,
- Lock the oil drain valves against accidental opening,
- Protect the reducer against falling objects,
- Check that the guards on the rotating parts are securely attached,
  Contact with the rotating parts (accidental or deliberate) is not allowed,
- Perform potential balancing in accordance with the relevant regulations and rules,
  If the reducer does not have threaded holes for an earth connection; please take suitable alternative precautions, this work should always be done by qualified electricians.
- Protect the cable entries from penetrating moisture.

More information about the reducer and all the assembled or separately supplied parts are found in the operating instructions for the respective components in the reducer documentation.
Additional technical documentation can be found in the reducer documentation in a separate data sheet.

5.1 Commissioning

5.1.1 Pre-Commissioning Measures

Before commissioning the reducer, take the following precautions:

- Read and consider the user manual,
- Replace screw plug with air filter or wet air filter,
- Locked reducers: Take appropriate measures before commissioning locked reducers (Page 82).
- Auxiliary drive reducer: Take appropriate measures before commissioning auxiliary drive reducers (Page 83),
- Fill the reducer with oil,
- Reducer with oil supply system: Check that the oil supply system is working properly,
- Check the oil level.
- Check the reducer for tightness,
- Check if the monitoring devices are connected and turned on,
- Reducer with oil supply system: Before commissioning the oil supply system, **follow the instructions in the precautions section** (Page 84),
- Make sure all pipes and components are filled with oil.

More information on lubricating and replacing air filters can be found in the reducer documentation. More information on the individual components can be found in the operating instructions for the components in the reducer documentation.

5.1.2 Locked Reducer

Before commissioning the locked reducer, take the following precautions:

- Fill the amount of oil (indicated on the nameplate of the reducer) through the oil filler plug of the lock. Use the same oil type and oil viscosity value that is in the gearbox itself.
- Check that the lock can be turned freely in one direction easily without applying excessive force. While doing this, look at the direction of the rotation arrows on the reducer.
- Before connecting the motor, determine the phase sequence of the three-phase power system using a phase sequence indicator. Connect the motor corresponding to the defined direction of rotation.

DANGER !

The lock and reducer may be damaged!

If you operate the reducer in the opposite direction of the block of the backstop, the lock and reducer may be damaged.
Do not operate the reducer in the opposite direction to the blocking direction of the lock.
Observe the information on the reducer's nameplate.

5.1.3 Auxiliary Drive Reducer

Before commissioning a reducer with auxiliary drive, take the following precautions:

- Please observe the information given in the operating instructions of the auxiliary drive,
- Fill the one-way mechanical clutch with oil over the intermediate flange. Use the same oil type and viscosity as in the reducer itself,
- If necessary, release the brake on the auxiliary motor,
- Check that the one-way mechanical clutch can be turned freely in one direction without having to apply excessive force,
  To do this, turn the motor shaft of the auxiliary drive gear in the opposite direction of the direction of rotation,
- Before connecting the motor, determine the phase sequence of the three-phase power supply using a phase sequence indicator, connect the motor corresponding to the defined rotation direction,
- Electrically lock the main motor and the auxiliary motor so that only one of the two motors can be opened,
- For the maintenance of the reducer: Check the shutdown function of the speed monitoring (Page 92).

ATTENTION !

The lock and reducer may be damaged!

If you operate the reducer in the opposite direction of the block of the lock, the lock and reducer may be damaged. Do not operate the reducer in the opposite direction to the blocking direction of the lock. Observe the information on the reducer's nameplate.

Additional information about the auxiliary reducer can be found in the reducer documentation in the operating manual for the auxiliary reducer.

5.1.4 Oil Level Indicator System

The reducer can be equipped with an oil level monitoring system using a level safety switch.
The oil level monitoring system is designed to check the oil level when the reducer stops before starting.

NOTE !

Connect the signal so that when the "oil level too low" signal is active, the gearmotor cannot start and an alarm sounds. Disable this signal while the reducer is in operation.

5.1.5 Cooler Coil Reducers

Before commissioning the reducer with cooling coil, apply the following precautions:

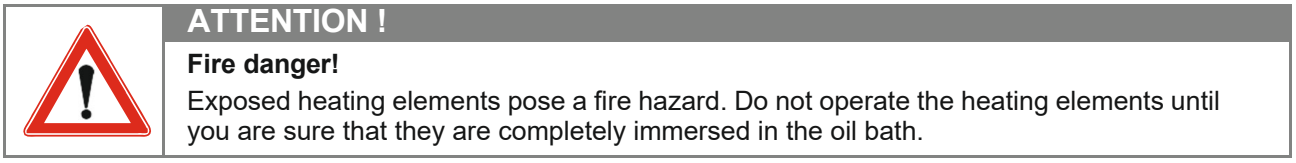
- Make sure that the connecting pipes are firmly seated and tightened,
- Open the shut-off valves on the cooling water inlet and outlet lines of the cooling system wide,
- Make sure that the pressure in the cooling coil does not exceed the maximum allowable pressure,
- Make sure that the temperature of the coolant is not higher than the maximum allowed.

More information about the cooling coil can be found in the data sheet and in the equipment list in the reducer documentation.
More information on connection dimensions and cooling water parameters can be found in the reducer's technical drawing in the reducer documentation.
More information on the required coolant flow rate and the maximum allowable inlet temperature can be found in the data sheet and in the equipment list in the reducer documentation

5.1.6 Heated Reducer

Take the following precautions for heating the reducer:

- Make sure that the heating elements are not exposed,
- Check the switch points of the temperature indicator.

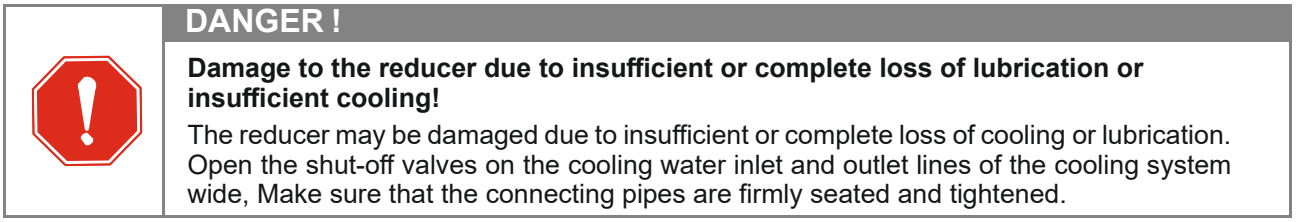


More information about the heating elements can be found in the reducer documentation, in the heating element operating instructions.

5.1.7 Reducer with Oil Supply System

Before commissioning the with the oil supply system, take the following precautions:

- Make sure that the maximum allowable pressure in the oil supply system components is not exceeded,
- Make sure that the maximum allowable temperature of the oil supply system components is not exceeded,
- Using the oil supply system, lubricate the reducer for 2 minutes using the prelubrication stage. During this time, the bearings and gears are supplied with enough oil to start working.



5.1.8 Oil Filling in Lock or Auxiliary Drive Reducers

To fill reducers with lock or auxiliary drive, proceed as follows:

1. Check the product label or supplement label to check the amount of oil to be filled and the oil class.
2. Remove the oil plug from the mechanical clutch or lock.
3. Pour the oil through a fill filter with a maximum mesh size of 25 µm.
4. Reinstall the oil plug and tighten.
5. Before commissioning, perform a functional test of the mechanical clutch.

5.2 Precautions During Commissioning

Observe the following precautions for commissioning the reducer and document these considerations:

- Reducer with oil supply system: Check that the oil supply system is working properly,
- Check the oil level.
- Measure the oil sump temperature after the reducer starts.
- Check the sealing of the shaft seal in the reducer (Page 29).
- Check if there is any possibility of contact with rotating parts.
- Check whether all valves (except oil drain valves) on the reducer are open.
  - Check that all oil drain valves are closed.
- Check that all connection lines are tight.
- For reducers with bearing monitoring device by measuring vibration: Measure the vibration levels of the bearings to establish initial and comparison values.
- For reducers with bearing monitoring using a Pt 100 resistance thermometer: Measure the temperature of the bearings to establish initial and comparison values.
- Deactivate the pressure gauge signal for approx. 20 seconds during commissioning. This is because the pressure in the reducer must first be balanced. If the oil pressure still does not occur after 20 seconds, you can extend this time slightly by consulting the manufacturer.

You can find more information about oil in the reducer documentation.
More information on the oil supply system can be found in the oil supply system operating manual in the reducer documentation.

5.2.1 Torque Limiter Locked Reducers

Damage due to overheating:

Overheating can cause damage or destruction of the lock.
Check the "xmin" dimensions at 12-month intervals (page 34). The size specified on the lock label should never be smaller than the minimum size "xmin".

More information on the torque limiter lock can be found in the torque limiter lock operating instructions provided in the reducer documentation.

6.1 Operating

6.1.1 Operating Data

In order to ensure a correct and trouble-free operation of the system, pay attention to the data in the oil supply system user manual, depending on the usage data of the reducer and the order specifications.
Valid usage data can be found in the attached Technical data (Page 20).

You can find information about the oil pressure in the data sheet, in the equipment list or in the technical drawing in the reducer documentation.

Table 17: Operating Data

Maximum operating temperature	90 °C	It is suitable for mineral oils, API groups I or II and saturated synthetic ester.
	100 °C	Suitable for semi-synthetic oils, API group III, PAO and PG oils
Maximum operating temperature (for short periods)	100 °C	It is suitable for mineral oils, API groups I or II and saturated synthetic ester.
	110 °C	Suitable for mineral oils, API group III, PAO and PG oils.
Water pressure of the coil or water oil cooler	< 8.0 bar	

More information on the technical data of the reducer can be found in the data sheet and in the equipment list in the reducer documentation.

6.2 Disorders in Operation

If the reducer shows irregular movements during use, turn it off immediately.

A few irregularities are listed below as examples:

- The oil temperature exceeds the maximum allowable value,
- The pressure monitor in the oil cooling system or the oil supply system triggers the alarm,
- Unusual operating noise.

NOTE !

Faults can cause damage to the reducer!
If a fault occurs, the reducer may be damaged if the shutdown is not performed.
If any error condition occurs, turn off the reducer immediately.

Correcting irregularities in use:

To improve any irregularity in use, do the following:

1. If the reducer shows irregular movements during use, turn it off immediately,
2. To find the cause of the malfunction, refer to the error information (Page 95),
3. If you still cannot determine the cause of the malfunction, contact Renold.

7.1 Service

7.1.1 General Maintenance Information

The operator must ensure that the specified time limits are respected. This also applies if maintenance activities are included in the operator's internal maintenance programs.
The reducer may be damaged if the stipulated time limits for maintenance and service are not observed. The time limits specified in the maintenance schedule largely depend on the use conditions of the reducer. Therefore, it is possible to specify only average time limits here.

These are subject to the following conditions of use:

- Daily working time is 24 hours,
- Working cycle "ED" 100%,
- Reducer input speed 1500 rpm,
- Average oil temperature in the oil pan.

DANGER !

Life-threatening risk due to the movable system!

Working on a reducer in operation can result in dangerous and potentially fatal injury. Before doing any work, always turn off the reducer and any oil supply system (whether separate or attached to the reducer). Take precautions to prevent accidental restart of the reducer. Post a warning notice clearly stating that work is being done on the reducer.

7.2 Control and Periodic Maintenance

Maintenance and service works;

The table below provides an overview of all service and maintenance work that you must perform continuously or at regular intervals.

Table 18: Service and Maintenance Operations

Intervals and Time Limits	Measures
When needed:	• Change the wet air filter. • Clean the air filter. • Clean the fan and reducer.
Daily:	• Check the oil temperature. • Check the oil pressure (if pressure lubrication is available). • Check for changes in reducer noise. • Check the water pressure.
At each monthly and pre-planned start:	• Check for leaks. • Check the oil level.
400 operating hours after commissioning:	• Check the water content of the oil. • Change the oil (or depending on the results of the oil sample test). • Check that all fixing bolts are tight.
Every 3 months:	• Check the speed indicator of the auxiliary drive reducer. • Check the auxiliary drive reducer. • Clean the oil filter. • Clean the air filter. • Clean the vent plug.

Table 18: Service and Maintenance Operations

Intervals and Time Limits	Measures
Every 3000 operating hours:	• Measure the vibration levels of the bearings.
Every 3000 operating hours, at least every 6 months:	• Re-lubricate the taconite seals with grease. • Re-lubricate the taconite seals with grease.
At least every 6 months (See lubrication specification on product label):	• Re-lubricate bearings lubricated with grease.
Every 5000 operating hours, at least every 10 months:	• Refill the grease in the grease strainer.
Every 12 months:	• Check the friction linings of the torque limiter locks. • Examine the hose lines. • Examine the conical clamping. • Check the water content of the oil.
Every 10000 operating hours, at least every 2 years:	• Change the oil if API Group I or II mineral oils or saturated synthetic esters are used (or depending on oil sample test result). • Check the air-oil cooler (when you change the oil). • Check the water-oil cooler (when you change the oil).
Every 2 years:	• Make a general check of the reducer. • Check the cooling coil. • Check that all fixing bolts are tight. • Clean the fan and reducer.
Every 20 000 operating hours, at least 4 years:	• If you are using the semi-synthetic oil of API Group III, PAO or PG oil (or depending on the oil sample result), change the oil.
6 years after the specified date of manufacture:	• Change the hoses.

More information on additional maintenance and service work can be found in the separate data sheet in the reducer documentation.
More information on assembled components can be found in the operating instructions for the components in the reducer documentation.

7.3 Maintenance and Service Work

You can find the maintenance and service precautions for reducer lubrication and protection, which are not given in this section, in the reducer documents.

7.3.1 Checking the Oil Temperature

Reducer damage due to excessively high oil sump temperatures!

If you allow the reducer to operate at oil pan temperatures above the maximum allowable temperature, it may be damaged by insufficient lubrication.
Do not operate the reducer above the maximum permissible oil sump temperature.

To check the oil temperature, proceed as follows:

1. Allow the reducer to reach its normal operating temperature,
2. Operate the reducer with maximum driven machine power,
3. Measure the temperature of the oil in the oil pan,
4. Compare the measured value with the maximum allowable oil temperature (Page 86),
5. When the maximum permissible oil temperature is exceeded, stop the reducer immediately.
   * Please contact Renold Customer Service.

7.3.2 Filling the Lock with Oil

Oil type and filling filter:

When filling the lock with oil, pay attention to the following points:

- Use the same oil type and oil viscosity as in the reducer itself,
- Use a filling filter with the same mesh filter size as the reducer itself.

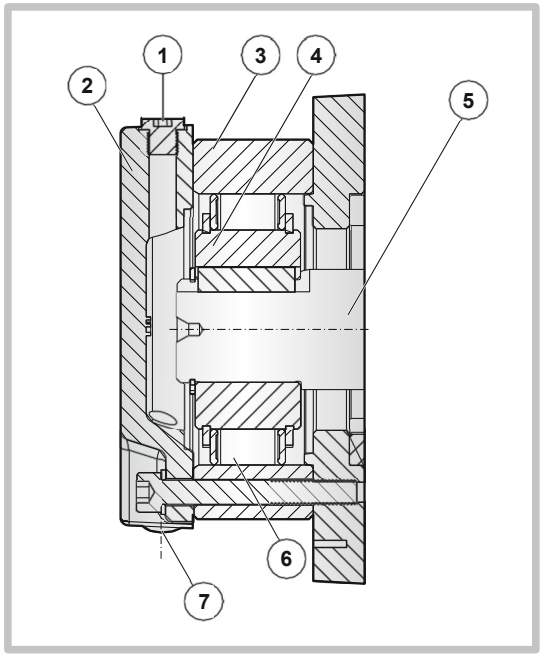
To fill the lock with oil, proceed as follows:

1. Clean the oil filling point of the lock,
2. Open the oil filler plug of the lock,
3. Fill in the amount of oil indicated on the label of the lock; use the same oil type and oil viscosity as in the reducer itself,
   Use a filling filter with the same mesh filter size as the reducer,
4. Install the oil filler plug.

7.3.3 Checking the Outer Cage of the Torque-Limiting Backstop

The outer cage of the torque-limiting latch can wear out, especially with continuous sliding.

Figure 55: Torque Limit Backstop



1. Lock oil filler plug
2. Cover
3. Outer cage
4. Inner cage
5. Shaft
6. Backstop
7. Waste oil discharge point

To check the friction linings of the torque limiting backstop, proceed as follows:

1. Clean the measuring place of the lock,
2. Measure the dimensions "x" (page 34),
3. If the dimension "x" falls below the limit value "xmin" printed on the label of the lock, then you must replace the torque-limiting lock.
   * The reducer must be stopped immediately.

NOTE !

Warranty loss!

If you remove or damage the locking wire on the guide screws of the springs, the warranty will be void.
Do not change the slip torque setting. The slip torque is set to the correct value at the factory

More information on the torque-limiting backstop can be found in the operating instructions for the torque-limiting lock provided in the reducer documentation.

7.3.4 Filling the Auxiliary Drive Reducer's Mechanical Clutch with Oil

To fill the mechanical clutch with oil, proceed as follows:

1. Clean the oil filling point of the mechanical clutch,
2. Open the oil filler plug of the mechanical clutch,
3. Fill in the amount of oil indicated on the label of the mechanical clutch; use the same oil type and oil viscosity as in the reducer itself,
   Use a filling filter with the same porous filter size as the filter used to fill the reducer,
4. Install the oil filler plug.

7.3.5 Checking Auxiliary Drive Reducer

Follow the operating instructions of the auxiliary reducer in the complete documentation of the reducer.

7.3.6 Cleaning the Fan and Reducer

If you operate the reducer with a damaged or dirty fan, it may be damaged by insufficient cooling. Depending on the conditions at the installation site, the fan and reducer may need to be cleaned more frequently than specified in the maintenance schedule.
Take appropriate measures to prevent the shaft seals from coming into contact with cleaning agents.

To clean the fan and reducer, proceed as follows:

1. Remove the fan sheet plate,
2. For stubborn dirt; use a stiff brush to remove from the fan, fan sheet plate and protective grille,
   Never use a high pressurized cleaning device,
3. Intervene with all areas containing corrosion,
4. Reinstall the fan sheet plate.
   Make sure that the fan sheet plate is connected correctly. Make sure that there is no contact between the fan and the fan sheet plate.

7.3.7 Checking the Cooler Coil

A contaminated cooling coil can damage the reducer. It is therefore important to regularly check the cooling coil.

To check the cooling coil, do the following:

1. Turn off the coolant supply.
2. Disconnect the cooling water inlet and discharge lines from the cooling coil.
3. Check for deposits on the inner surface of the cooling coil.
   - If you notice heavy deposits inside the cooling coil, arrange to analyze the coolant or deposits. Such analysis services are offered by specialist chemical cleaning companies. These companies also sell special cleaning agents to remove buildup.
   - Before using a cleaning agent, check that the cooling coil materials are suitable for use. Renold Customer Service should be contacted. Before using different types of cleaning agents, carefully read the instructions for use provided by the manufacturer.
   - Especially replace the very dirty cooling coil with new ones. Please consult Renold Customer Service (Page 115) for further advice.
4. Reconnect the coolant inlet and drain lines to the cooling coil.

DANGER !

Heat build-up due to dirty cooling coils!

Overheating can damage the reducer.
If the cooling coil is severely contaminated, effective cooling of the reducer can no longer be guaranteed.
In such cases, you should clean the inside of the cooling coil with chemicals or replace it with a new one.

7.3.8 Control of Shrink Disc

Conical tightening control is limited to visual assessment of its condition.

Aspects of control;

Note the following points when examining conical tightening:

- Loose bolt,
- Damage due to the use of force,
- Loosening of the inner ring against the outer ring.

* More information on conical clamping can be found in the conical clamping operating manual in the reducer documentation.

7.3.9 Cleaning the Strainer Filter

To clean the strainer filter, do the following:

1. Check the strainer filter,
2. Remove the drain plug,
3. Pull out the strainer and remove the dirt particles,
4. Replace defective strainers or sealing rings.

Additional information about the strainer filter can be found in the strainer filter operating instructions given in the gear unit documentation.
You can find additional technical data in the equipment list provided in the separate data sheet and in the reducer documentation.

7.3.10 Cleaning the Double Filter

To clean the double filter, do the following:

1. Examine the double filter,
2. Follow the instruction book for the double filter.

Additional information about the double filter can be found in the double filter operation manual provided in the gearbox documentation.
You can find additional technical data in the equipment list provided in the separate data sheet and in the reducer documentation.

7.3.11 Checking Speed Indicator of Auxiliary Drive Reducer

Proceed as follows to check the speed indicator of the auxiliary drive reducer:

1. Open the auxiliary drive reducer,
2. Check if the speed monitoring changes automatically.

Results:
If the speed indicator does not change automatically, repair it or replace it if necessary.

Additional information about the auxiliary reducer can be found in the auxiliary reducer operating instructions in the reducer documentation.

7.3.12 Measuring the Vibration Levels of Bearings

To measure the vibration levels of the bearings, do the following:

1. Measure the vibrations of the bearings,
2. Document the measurement results,
3. Compare the measured values with the values documented when the reducer is commissioned,
4. Archive the report with these instructions,
5. Customer Service should replace defective bearings.

* In the operating instructions in the reducer documentation, you can find additional information required for the measuring sensor to measure vibration levels in bearings.

7.3.13 Measuring Temperature in Bearings

To measure the temperature in the bearings, apply the following:

1. Measure the temperature in the bearings,
2. Document the measurement results,
3. Compare the measured values with the values documented during the commissioning of the reducer,
4. Archive the report with these instructions,
5. Customer Service should replace defective bearings.

* More information on measuring temperature in bearings can be found in the Pt 100 resistance thermometer user manual

7.3.14 Check all Fastening Bolts are Tight

Pay attention to the following points when checking that the fixing bolts are tight:

- Observe the data on connection classes (Page 79), preload forces and tightening torques (Page 79-80).
- Replace bolts that are not suitable for use with bolts of the same strength class and type.

7.3.15 General Inspection of Reducer

Call Renold Customer Service for the inspection of the reducer. Thanks to their experience, these engineers have the best knowledge to evaluate which reducer components need to be replaced.

7.3.16 Final Things to be Completed

After completing all the work listed in the maintenance schedule, replace unsuitable bolts with bolts of the same strength class and type.

8.1 Product Disposal

Dismantle the machine, separating the parts following the instructions given in this manual.
You must group the parts according to the materials they are made of: iron, aluminium, copper, plastic and rubber.
The parts must be disposed of by the relative centres in full compliance with the laws and force on the matter of dismantling and demolishing industrial waste.

Waste Oil: At the disposal of waste oil, please obey both to the environmental protection laws as well as rules and regulations those are in force into countries which the machine has been using of.

8.1.1 Disposal

The valid regulations must be taken into the consideration for the waste materials.

Table 19: Disposal Table

GEAR UNIT COMPONENTS	MATERIAL
Toothed wheels, shafts, rolling bearings, parallel keys, locking rings,...	Steel
Gear unit housing, housing components,...	Grey cast iron
Light alloy gear unit housing, light alloy gear unit housing components,...	Aluminium
Worm gears, bushes,...	Bronz
Radial seals, sealing caps, rubber components,…	Steel spring and elastomer material
Coupling components	Plastic with steel
Flat seals	Asbestos - free sealing material
Gear oil	Additive mineral oil
Synthetic gear oil (rating plate code: CLP PG)	Polyglycol - based lubricants
Cooling channel, Serpentine cooling resistances and resistance connection equipment, screw connection.	Copper, epoxy, yellow brass

NOTE !

Please do not diffuse any biologically indivisible materials, oil and non inclusive components (PVC,rubber,resins and etc.) to the environment.

ATTENTION !

Do not reuse damaged parts during inspection, only should be changed by expert personnels.

8.2 Possible Errors

The faults listed below are intended as a troubleshooting guide only.
If any malfunction occurs while the unit is still under warranty, do not allow anyone other than Renold Customer Service to attempt repairs.
Even after the expiry of the warranty period, you still have to negotiate with Renold Customer Service to have the faults fixed.

NOTE !

Warranty loss!

If you make any changes without prior Renold approval or using original spare parts, you may void the reducer's warranty.
Only use original spare parts from Renold. Always call Renold Customer Service to repair malfunctions that occur while the reducer is under warranty.

8.2.1 Possible Malfunctions and their Remedies

The table below gives an overview of possible faults and shows how to fix them.

8.2.1.1 Troubleshooting

Tablo 20: Troubleshooting

NO	PROBLEM	OBSERVED	SOLUTION
1	The lock blocking function has failed.	Damaged Backstop.	• Contact Customer Service. • Checking the lock and replacing it if necessary.
2	Pressure switch alarms.	The oil pressure has dropped below the minimum value.	• Check the oil level at room temperature . • Fill with oil if necessary. • Check the oil pump. • If necessary, replace the oil pump. • Check the oil filter and the strainer filter. • If necessary, replace the oil filter or clean the strainer filter.
3	Oil leakage from output shaft.	Defective rotary shaft seals.	• Check the rotating shaft seals and replace if necessary.
4	Noise in the reducer.	Damage to gears.	• Contact Customer Service. • Inspect the gear parts. • If necessary, replace damaged parts.
		Bearing clearance is excessive.	• Contact Customer Service. • Adjust the bearing clearance.
		Defective bearings.	• Contact Customer Service. • Replace the defective bearings.
		Overcurrent noises caused by operation in the frequency converter.	• Contact Customer Service. • Check the closed-loop motor control system.

NO	PROBLEM	OBSERVED	SOLUTION
4	Noise in the reducer.	Loosening of reducer connections during operation.	• Tighten the bolts and nuts to the specified tightening torque. • Replace the wrapped bolts and nuts.
5	Reducer outer surface contaminated with oil.	Insufficient sealing of the housing cover or its connections.	• Seal the housing cover or connections.
		Labyrinth seals contaminated with oil, incorrect transport position.	• Check the oil filling. • Clean the labyrinth seals.
6	The main drive motor is not running.	Motor rotation direction is wrong.	• Change the polarity of the motor.
		Incorrectly installed or faulty lock cage.	• Contact Customer Services. • Turn the backstop cage 180° - or replace it.
		Mechanical clutch blocked.	• Contact Customer Service. • Install a new mechanical clutch.
		Incorrectly installed and/ or defective mechanical clutch cage.	• Contact Customer Services. • Turn the mechanical clutch cage 180° - or replace it.
7	While the auxiliary drive gear is running, the main drive motor can start.	Faulty electrical interlock between main and auxiliary motor.	• Check the connections. • If necessary, replace defective devices.
		Defective speed indicator.	• Check the connections. • If necessary, replace defective devices.
8	Auxiliary drive gear motor does not start.	Overload at the reducer output.	• Reduce the load at the reducer output.
		Defective auxiliary gearmotor.	• Repair or replace the engine.
		Engine brake is not released.	• Correct the electrical connection of the engine brake. • If necessary, replace the engine brake.
9	Auxiliary drive gear motor starts, main gear drive output shaft does not rotate.	Motor rotation direction is wrong.	• Change the polarity of the motor.
		Incorrectly installed mechanical clutch cage.	• Contact Customer Service. • Turn the single lever mechanical clutch cage 180° - or replace it.
		Defective mechanical clutch.	• Contact Customer Service. • Install a new mechanical clutch.

NO	PROBLEM	OBSERVED	SOLUTION
10	Leak.	Labyrinth seals contaminated with oil, incorrect transport position.	• Check the oil filling. • Clean the labyrinth seals.
		Insufficient sealing of the housing cover or its connections.	• Check the seals and replace if necessary. • Seal the housing cover or connections.
		Defective rotary shaft seals.	• Check the rotating shaft seals. • Replace if necessary.
11	Serious discoloration of the wet air filter.	Wet air filter is permeable.	• Change the wet air filter.
12	Wet air filter changes color from top to bottom.	There is water in the oil.	• Take a sample from the oil with a test tube to find out the state of water mixing into the oil. • Have the oil examined by a chemical laboratory. • Change the oil if necessary.
13	The oil is foaming in the reducer.	The preservative is not completely discharged.	• Change the oil.
		The oil supply system has been left to operate for too long at low temperatures.	• Turn off the oil supply system. • Degas the oil.
		Reducer is too cold during operation.	• Turn off the reducer. • Degas the oil. • Operate without coolant during cold start up again.
		There is water in the oil.	• Take a sample from the oil with a test tube to find out the state of water mixing into the oil. • Have the oil examined by a chemical laboratory. • Change the oil if necessary.
		The oil defoamer is finished.	• Examine the oil. • Change the oil if necessary.
		Inappropriate mixture of oils.	• Examine the oil. • Change the oil if necessary.
14	Oil leaking from reducer.	Insufficient sealing of the housing cover or its connections.	• Check the seals and replace if necessary. • Seal the housing cover or connections. • Check the compression seals and retighten the screws if necessary.
		Leaky pipes.	• Check the pipes and replace or close if necessary.
15	Oil supply system malfunction.	-	• Follow the operating instructions of the oil supply system.

NO	PROBLEM	OBSERVED	SOLUTION
16	High temperature during operation.	The oil level in the reducer housing is too high.	• Check the oil level. • If necessary, correct the oil level.
		The oil is out of date.	• Find out when the last oil change was done. • Change the oil if necessary.
		The oil is seriously contaminated.	• Change the oil.
		The oil supply system or the cooler coil is faulty.	• Check the oil supply system or the cooling coil. • If necessary, replace the defective parts. • Follow the operating instructions of the oil supply system.
		Reducer with water-oil cooler: The coolant flow is too low or too high.	• Adjust valves, supply and return lines. • Check the water-oil cooler for free flow.
		Reducer with air-oil cooler: Insufficient air flow.	• Clean the air-oil cooler
		Gear unit with air-oil cooler: The cooling equipment is dirty	• Clean the cooling equipment.
		Oil-cooled reducer: Insufficient oil flow from oil cooler.	• Check the oil filter and coarse filter. • If necessary, replace the oil filter or clean the coarse filter.
		Reduceres with cooling coil: Deposits inside the cooling coil.	• Clean or replace the cooling coil if necessary.
		Reducer with fan: The air guide cover or the air inlet opening in the reducer body is dirty.	• Clean the air guide cover and reducer housing.
		The coolant temperature is too high.	• Check the temperature; correct it if necessary.
		Defective oil pump.	• Check the oil pump function. • If necessary, repair or replace the oil pump.
	High temperature at bearing points.	The oil level in the reducer housing is too low or too high.	• Check the oil level at room temperature. • If necessary, correct the oil level.
		The oil is out of date.	• Find out when the last oil change was done. • Change the oil if necessary.
		The oil supply system is faulty.	• Check the oil supply system or the cooling coil. • If necessary, replace the defective parts. • Follow the operating instructions of the oil supply system.
		Defective bearings.	• Contact Customer Service. • Check the bearings and replace if necessary.

NO	PROBLEM	OBSERVED	SOLUTION
17	High temperature at bearing points.	Defective oil pump.	• Check the oil pump function. • If necessary, repair or replace the oil pump
18	High temperature in the lock.	Damaged lock.	• Contact Customer Service. • Check the lock and replace if necessary.
19	Increased vibration amplitude at bearing points.	Defective bearings.	• Contact Customer Service. • Check the bearings and replace if necessary.
		Gear wheels are defective.	• Contact Customer Service. • Check the gear wheels and replace if necessary.
20	The contamination indicator of the double filter triggers an alarm.	The double filter is clogged.	• Completely replace the double filter in accordance with the separate operating instructions. • Clean the filter element.
21	Water in oil.	The oil supply system or the cooler coil is faulty.	• Check the oil supply system or the cooling coil. • If necessary, replace the defective parts. • Follow the operating instructions of the oil supply system.
		The engine room fan blows cold air into the reducer: Water condensation.	• Install suitable thermal insulation to protect the reducer body. • Close the air outlet or change the air outlet direction using structural measures.
		Climate conditions.	• Contact Customer Service. • If necessary, use a wet air filter.
		Oil foams in the oil pan.	• Take a sample from the oil with a test tube to find out the state of water mixing into the oil. • Have the oil examined by a chemical laboratory.

In case of problems or malfunctions other than those described here, consult Renold Technical Service.

9.1 Authorized Service

They are skill and qualified people, which are determined by company. They have education about electrical and mechanical subject.

NOTE !

Below is the list of actions that must be followed by our company, authorized service and customer. Must be obliged to the informations which were given in the list. To the contrary that Usage and Maintenance directions become invalid.

Table 21: Authorized Service

No	CRITERIA	MANUFACTURER (Renold)	AUTHORIZED SERVICE	CUSTOMER (USER)
1	Disassembly of geared unit	✓	✓	X
1.1	Case changing	✓	✓	X
1.2	Gear changing	✓	✓	X
1.3	Solid / shaft changing	✓	✓	X
1.4	Changing of all consumable material except sealing materials	✓	✓	X
2	Oil cup changing	✓	✓	✓
3	Seal changing	✓	✓	✓
4	Oil changing	✓	✓	✓
5	Motor montage to IEC adapter type	✓	✓	✓
6	Assembly of geared unit with W cylinder type	✓	✓	✓
7	Disassembly of motor from IEC type	✓	✓	✓

✓ **: SUITABLE**
X : NOT SUITABLE

2-3 : Send to the contaminated waste disposal (licensed firm).
4 : Send to the licensed firm for the purpose of disposal.

10.1 Spare Parts

By stocking the most important spare parts in the installation area, you can ensure that the reducer is ready for use at any time.

DANGER !

Damage to the reducer due to the use of unsuitable spare parts!

Only use original Renold spare parts. Renold will not accept warranty claims for spare parts not supplied by Renold. Other spare parts have not been tested and approved by Renold. Unapproved spare parts can change the design features of the reducer and thus impair its active or passive safety.
Renold accepts no liability for damage caused by the use of non-approved spare parts. The same applies to accessories not supplied by Renold.

- The contact address of Renold Customer Service can be found under the CONTACT heading (Page 115).

10.1.1 Required Information for Ordering Spare Parts

To order spare parts, see the spare parts list. Only use Renold spare parts.

When ordering spare parts, please obtain the following information:

- Order item and number,
- Product type and size,
- Part number,
- Quantity.

11.1 Ambient Temperature

The reducer can be operated at an ambient temperature between -20 °C and 40 °C. By applying various suitable measures, the reducer can be used in the ambient temperature range from -40 °C to 60 °C. However, this must always be authorized by Renold and specified in the order text.

Storage of the reducer;

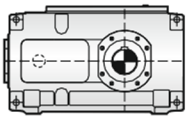
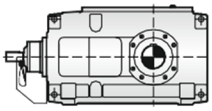
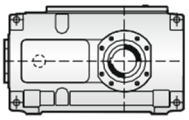
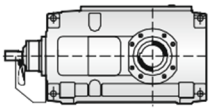
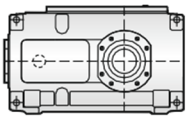
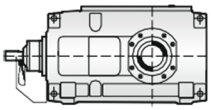
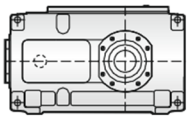
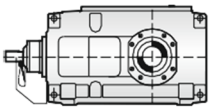
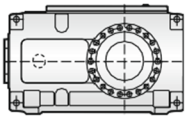
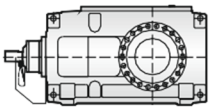
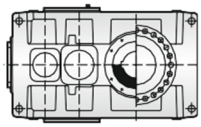
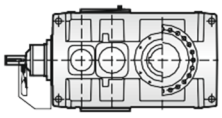
Do not expose the reducer to harmful effects such as aggressive chemical products, environments with high air pollution or humidity, or ambient temperatures below 0 °C or above 40 °C.

11.2 Product Types

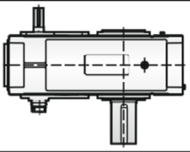
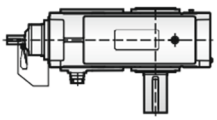
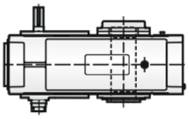
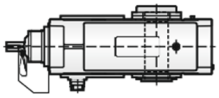
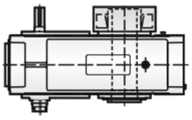
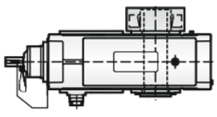
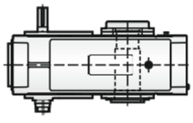
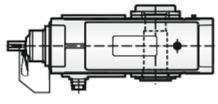
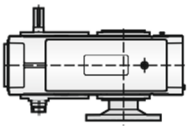
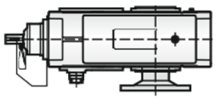
The following product types are available in the reducer. More information and a detailed description of the reducer can be found in the technical drawing in the reducer documentation.

Figure 56: Product Types

Horizontal Mounting Position

 H ... -SH	**Helical gear units**	 HB ... -SH	**Bevel - Helical Gear Units**
 H ... -HH		 HB ... -HH	
 H ... -DH	**Type** H ... 1 H ... 2 H ... 3 H ... 4	 HB ... -DH	**Type** HB ... 2 HB ... 3 HB ... 4
 H ... -KH		 HB ... -KH	
 H ... -FH	**1 ... 4 Stage** iN = 1.25 - 450	 HB ... -FH	**2 ... 4 Stage** iN = 5 - 400
 H ... -HM H ... -DM H ... -KM H ... -FM		 HB ... -HM HB ... -DM HB ... -KM HB ... -FM	

Vertical Mounting Position

 H ... -SV	**Helical gear units**	 HB ... -SV	**Bevel - Helical Gear Units**
 H ... -HV		 HB ... -HV	
 H ... -DV	**Type** H ... 2 H ... 3 H ... 4	 HB ... -DV	**Type** HB ... 2 HB ... 3 HB ... 4
 H ... -KV	**2 ... 4 Stage** iN = 6.3 - 450	 HB ... -KV	**2 ... 4 Stage** iN = 5 - 400
 H ... -FV		 HB ... -FV	

11.3 Weights

The exact weights are specified in the technical documentation, documentation or on the product label.
All weight specifications refer to products excluding oil filling or assembled components.
For the weights of the reducers (approximate values in kg), see the tables below:

Table 22: Weights

Tablo 22 - 1a: Weights

Type	~ Kg									
	3	4	5	6	7	8	9	10	11	12
H1 - SH	130	-	305	-	550	-	865	-	1520	-
H2 - H	-	195	305	360	510	600	840	970	1350	1630
H2 - M	-	-	-	-	-	-	-	-	-	-
H3 - H	-	-	325	370	550	635	890	1040	1430	1705
H3 - M	-	-	-	-	-	-	-	-	-	-
H4 - H	-	-	-	-	560	655	890	1030	1480	1750
H4 - M	-	-	-	-	-	-	-	-	-	-
H2 - H	-	240	365	415	620	710	1010	1165	1655	1930
HB2 - M	-	-	-	-	-	-	-	-	-	-
HB3 - H	-	215	330	385	555	645	900	1030	1470	1745
HB3 - M	-	-	-	-	-	-	-	-	-	-
HB4 - H	-	-	340	390	560	670	905	1040	1505	1770
HB4 - M	-	-	-	-	-	-	-	-	-	-

Tablo 22 - 1b: Weights

Type	~ Kg									
	13	14	15	16	17	18	19	20	21	22
H1 - SH	2400	-	3210	-	4260	-	5850	-	-	-
H2 - H	2030	2600	3460	3700	4700	5150	6650	7550	8960	9700
H2 - M	1910	2460	3270	3510	4470	4895	6350	7250	8460	9300
H3 - H	2320	2650	3500	3910	4595	5070	6750	8150	9200	9900
H3 - M	2180	2515	3285	3660	4285	4780	6250	7650	8600	9400
H4 - H	2400	2750	3655	3990	4710	5220	6850	8250	9270	9990
H4 - M	2280	2620	3460	3765	4475	5950	6350	7750	8670	9490
H2 - H	2460	2845	4010	4350	5650	6200	-	-	-	-
HB2 - M	2360	2745	3815	4175	5350	5910	-	-	-	-
HB3 - H	2400	2770	3760	4025	5025	5530	7040	8150	9250	9990
HB3 - M	2280	2635	3570	3795	4795	5275	6540	7650	8650	9490
HB4 - H	2295	2620	3650	4005	4720	5030	6850	8250	9260	9990
HB4 - M	2290	2650	3455	3785	4485	4960	6350	7750	8660	9490

Table 22 - 2a: For Auxiliary Driven Reducers (Failure Maintenance Work);

Type	~ Kg								
	4	5	6	7	8	9	10	11	12
HB3 - H	288	405	455	684	764	1044	1284	1704	1979

Table 22 - 2b: For Auxiliary Driven Reducers (Failure Maintenance Work);

Type	~ Kg					
	13	14	15	16	17	18
HB3 - H	2691	3041	4106	4371	5581	6036

Table 22 - 3a: For Auxiliary Driven Reducers (Working Under Load);

Type	~ Kg								
	4	5	6	7	8	9	10	11	12
HB3 - H	290	424	474	716	796	1092	1332	1786	2061

Table 22 - 3b: For Auxiliary Driven Reducers (Working Under Load);

Type	~ Kg					
	13	14	15	16	17	18
HB3 - H	2917	3267	4802	5067	6332	6787

11.4 Oil Quantities

The required amount of oil is indicated on the product label on the reducer.
For oil quantities (approximate values in liters) of a reducer in horizontal mounting position with rotary shaft seal gaskets and taconite seals, see the tables below.

Table 23: Oil Quantities

Table 23 - 1a: Output Seal Oil Quantities

Type	Reducer Housing											
	1	2	3	4	5	6	7	8	9	10	11	12
H - 1SH	-	-	7	-	22	-	42	-	68	-	120	-
H - 2H	-	-	-	10	15	16	27	30	44	45	74	82
H - 2M	-	-	-	-	-	-	-	-	-	-	-	-
H - 3H	-	-	-	-	16	18	30	35	48	52	85	93
H - 3M	-	-	-	-	-	-	-	-	-	-	-	-
H - 4H	-	-	-	-	-	-	29	32	49	50	85	96
H - 4M	-	-	-	-	-	-	-	-	-	-	-	-
HB - 2H	-	-	-	10	19	23	37	45	57	60	95	114
HB - 2M	-	-	-	-	-	-	-	-	-	-	-	-
HB - 3H	-	-	-	10	17	18	29	34	50	52	80	92
HB - 3M	-	-	-	-	-	-	-	-	-	-	-	-
HB - 4H	-	-	-	-	18	20	32	36	52	55	87	100
HB - 4M	-	-	-	-	-	-	-	-	-	-	-	-

Table 23 - 1b: Output Seal Oil Quantities

Type	Reducer Housing									
	13	14	15	16	17	18	19	20	21	22
H - 1SH	175	-	190	-	270	-	390	-	-	-
H - 2H	135	140	210	215	290	300	320	340	320	340
H - 2M	110	115	160	165	230	240	300	320	350	370
H - 3H	160	165	235	245	305	315	420	450	470	490
H - 3M	125	130	190	195	240	250	390	415	515	540
H - 4H	130	140	230	235	290	305	430	380	395	420

Table 23 - 1c: Output Seal Oil Quantities

Type	Reducer Housing									
	13	14	15	16	17	18	19	20	21	22
H - 4M	120	125	170	175	225	230	310	330	430	450
HB - 2H	140	155	220	230	320	335	-	-	-	-
HB - 2M	120	130	180	190	260	275	-	-	-	-
HB - 3H	130	140	210	220	290	300	380	440	370	430
HB - 3M	110	115	160	165	230	235	360	420	420	490
HB - 4H	145	150	230	235	295	305	480	550	540	620
HB - 4M	120	125	170	175	230	235	440	510	590	680

This table shows the amount of oil to be used in the horizontal mounting position (in labyrinth seals):

Table 23 - 2: Labyrinth Seal Oil Quantities

Type	Reducer Housing																
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
H - 1SH	5.2	-	18	-	34	-	57	-	100	-	155	-	156	-	225	-	330
H - 2SH	-	7	11	12	21	23	33	34	58	60	120	130	190	200	260	270	-

Additional oil quantity tables required for the intermediate flange used when connecting to the main gearbox with auxiliary drive system:

Table 23 - 3a: Oil Quantities for Intermediate Flange

Type	Reducer Housing								
	4	5	6	7	8	9	10	11	12
HB - 3H	1	2	2	5	5	5	6	12	12

Table 23 - 3b: Oil Quantities for Intermediate Flange

Type	Reducer Housing									
	13	14	15	16	17	18	19	20	21	22
HB - 3H	15	15	20	20	25	25	40	40	60	60

Additional information on the auxiliary reducer can be found in the reducer documentation in the auxiliary drive gear operating manual.

Table 23 - 4a: Immersion Lubrication

Type	Reducer Housing											
	1	2	3	4	5	6	7	8	9	10	11	12
H - 2V	-	-	-	23	35	37	62	69	98	110	160	180
H - 3V	-	-	-	-	37	40	64	76	106	116	185	200
H - 4V	-	-	-	-	-	-	62	70	108	110	180	210
HB - 2V	-	-	-	23.5	38	46	74	81	115	120	190	225
HB - 3V	-	-	-	20	34	36	58	68	100	105	160	184
HB - 4V	-	-	-	-	36	40	65	73	105	110	175	200

Table 23 - 4b: Immersion Lubrication

Type	Reducer Housing									
	13	14	15	16	17	18	19	20	21	22
H - 2V	120	135	185	200	265	285	-	-	-	-
H - 3V	160	180	255	260	325	335	-	-	-	-
H - 4V	140	160	220	230	280	300	-	-	-	-
HB - 2V	125	140	190	200	270	295	-	-	-	-
HB - 3V	115	130	180	190	260	275	-	-	-	-
HB - 4V	135	150	210	220	270	285	-	-	-	-

Table 23 - 5a: Pressure Lubrication

Type	Reducer Housing											
	1	2	3	4	5	6	7	8	9	10	11	12
H - 2V	-	-	-	11.5	17.5	20	31	35	50	53	83	90
H - 3V	-	-	-	-	24.5	27	42	50	71	77	109	118
H - 4V	-	-	-	-	-	-	46	52	80	81	120	135
HB - 2V	-	-	-	-	19	23	37	40	57	60	95	114
HB - 3V	-	-	-	10	17	18	29	34	50	52	80	92
HB - 4V	-	-	-	-	18	20	32	36	52	55	87	100

Table 23 - 5b: Pressure Lubrication

Type	Reducer Housing									
	13	14	15	16	17	18	19	20	21	22
H - 2V	120	135	185	200	265	285	-	-	-	-
H - 3V	160	180	225	260	325	335	-	-	-	-
H - 4V	140	160	220	230	280	300	-	-	-	-
HB - 2V	125	140	190	200	270	295	-	-	-	-
HB - 3V	115	130	180	190	260	275	-	-	-	-
HB - 4V	135	150	210	220	270	285	-	-	-	-

11.5 Measuring Surface Sound Pressure Level

The measurement surface sound pressure level value of the reducer, measured from a distance of 1m, is given in **Table 24**. This measurement was made according to the DIN EN ISO 9614/2 standard.
Personnel operating the reducer must be in the area 1m away from the reducer.

The measuring surface sound pressure is valid if the input speed (n1) specified on the reducer nameplate reaches the input power (P1). If the values are more than one, the highest speed and power are valid.
The measurement surface was determined by considering the sound pressure lubrication units.

The current measured values in the table were obtained as a result of the statistical evaluations made by our quality control department.

Table 24: Measurement Surface Sound Pressure Level

Table 24 - 1: Measuring Surface Sound Pressure Level for Fan Cooled Conical Helical Reducer LpA, dB [A]

Type	i_N	n_1 1/min	Reducer Housing Size																		
			4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
HB2	5 ... 8	1500	76	79	81	83	84	85	87	88	89	91	92	94	-	-	-	-	-	-	-
		1000	71	73	74	77	78	79	80	82	83	84	85	87	89	90	-	-	-	-	-
		750	64	66	67	70	71	72	73	75	76	77	78	81	82	83	85	-	-	-	-
	9 ... 14	1500	73	75	76	78	81	82	83	84	85	86	87	88	90	-	-	-	-	-	-
		1000	67	68	70	73	74	75	77	79	80	81	82	83	84	86	87	-	-	-	-
		750	61	62	64	66	67	68	70	72	73	74	75	77	78	79	80	-	-	-	-
	16 ... 22.4	1500	71	74	76	78	79	80	81	83	84	87	88	89	90	-	-	-	-	-	-
		1000	64	67	68	70	72	73	74	78	79	80	81	82	83	84	84	-	-	-	-
		750	*	61	63	65	67	68	69	71	72	73	73	74	74	75	76	-	-	-	-
HB3	12.5 ... 31.5	1500	72	75	77	79	80	81	82	83	85	88	89	90	91	93	93	93	93	95	95
		1000	65	68	69	71	72	73	74	77	78	80	82	83	83	84	85	86	86	88	88
		750	*	63	64	66	68	69	70	71	73	74	75	76	77	78	78	79	79	81	81
	35.5 ... 56	1500	69	72	73	74	75	77	79	82	84	86	87	88	89	90	91	92	92	93	93
		1000	63	65	66	67	69	71	72	73	75	77	78	79	80	81	82	83	84	85	86
		750	*	*	*	62	64	65	67	69	70	71	72	73	74	75	76	77	78	79	79
	63 ... 90	1500	68	70	71	73	74	76	78	81	83	85	86	87	88	89	90	91	91	92	92
		1000	61	63	64	66	68	69	71	73	75	77	78	79	80	81	81	82	82	83	84
		750	*	*	*	61	63	64	66	67	68	70	71	72	73	74	75	75	76	77	77

* LpA < 60 dB [A]

Table 24 - 2: Measuring Surface Sound Pressure Level LpA, dB [A] for Fanless Conical Helical Reducer

Type	i_N	n_1 1/min	Reducer Housing Size																		
			4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
HB2	5 ... 8	1500	75	78	80	82	83	84	86	87	88	89	90	93	-	-	-	-	-	-	-
		1000	70	72	73	76	77	78	79	81	82	83	84	86	88	89	-	-	-	-	-
		750	63	65	66	69	71	72	73	74	75	77	78	80	82	83	84	-	-	-	-
	9 ... 14	1500	71	74	75	77	79	80	81	83	84	85	86	87	89	-	-	-	-	-	-
		1000	65	67	69	72	73	74	76	77	78	80	81	82	83	85	86	-	-	-	-
		750	*	60	63	65	66	67	69	71	72	73	74	76	77	78	79	-	-	-	-
	16 ... 22.4	1500	66	69	71	72	74	75	77	78	80	81	82	85	85	-	-	-	-	-	-
		1000	61	63	65	67	68	69	71	72	74	75	77	79	80	81	81	-	-	-	-
		750	*	*	*	60	62	63	64	66	67	68	70	72	73	74	75	-	-	-	-
HB3	12.5 ... 31.5	1500	68	71	74	75	76	77	79	81	83	84	85	86	87	87	88	89	90	91	92
		1000	63	66	68	69	70	72	73	75	77	78	80	80	81	82	82	84	85	86	86
		750	*	*	61	62	64	65	66	68	71	71	73	73	74	75	75	77	78	79	79
	35.5 ... 56	1500	65	67	70	71	71	72	74	77	79	80	81	82	83	83	84	86	86	88	88
		1000	*	62	65	65	66	66	69	71	73	75	76	76	77	77	78	80	81	82	83
		750	*	*	*	*	*	*	62	65	67	68	69	70	70	71	72	74	74	75	76
	63 ... 90	1500	61	64	70	67	68	68	70	73	75	76	78	78	79	79	80	82	83	84	84
		1000	*	*	63	62	62	62	65	68	70	71	72	73	73	74	75	76	77	78	79
		750	*	*	*	*	*	*	*	61	63	64	65	66	67	67	68	70	70	72	72
HB4	8 ... 125	1500	-	64	65	67	68	70	72	75	76	77	79	80	81	82	83	84	85	86	86
		1000	-	*	*	61	63	64	67	69	70	72	73	74	75	76	77	78	79	80	80
		750	-	*	*	*	*	*	*	62	64	65	66	68	68	69	71	71	72	73	74
	140 ... 224	1500	-	60	61	63	65	66	68	71	72	73	75	76	77	78	79	80	81	82	82
		1000	-	*	*	*	*	61	63	65	67	68	69	71	71	72	74	75	75	76	77
		750	-	*	*	*	*	*	*	*	*	61	62	64	65	66	67	68	69	69	70
	250 ... 400	1500	-	*	*	*	62	63	65	67	69	70	71	73	73	75	76	77	77	78	79
		1000	-	*	*	*	*	*	*	62	63	64	66	67	68	69	70	71	72	73	73
		750	-	*	*	*	*	*	*	*	*	*	*	*	61	62	63	64	65	66	66

* LpA < 60 dB [A]

Table 24 - 3: Sound pressure level for fan cooled Helical Gearbox LpA, dB [A]

Type	i_N	n_1 1/min	Reducer Housing Size																			
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
H1	12.5 ... 2	1500	76	-	81	-	84	-	87	-	91	-	-	-	-	-	-	-	-	-	-	-
		1000	71	-	76	-	79	-	81	-	83	-	85	-	-	-	-	-	-	-	-	-
		750	67	-	72	-	75	-	78	-	80	-	82	-	85	-	-	-	-	-	-	-
	22.4 ... 3.55	1500	73	-	79	-	82	-	84	-	89	-	90	-	-	-	-	-	-	-	-	-
		1000	68	-	74	-	77	-	79	-	82	-	84	-	87	-	-	-	-	-	-	-
		750	64	-	70	-	72	-	75	-	78	-	80	-	83	-	84	-	-	-	-	-
	4 ... 5.6	1500	70	-	77	-	81	-	83	-	86	-	89	-	93	-	-	-	-	-	-	-
		1000	65	-	71	-	75	-	77	-	80	-	82	-	84	-	85	-	87	-	-	-
		750	61	-	68	-	71	-	72	-	75	-	77	-	79	-	81	-	83	-	-	-
H2	6 ... 10	1500	-	75	76	77	80	81	82	84	85	86	88	90	92	94	96	96	-	-	-	-
		1000	-	69	71	72	74	75	77	79	80	81	83	84	85	86	87	88	88	89	90	-
		750	-	66	68	69	70	72	73	75	76	77	79	80	81	82	83	83	84	84	85	85
	11.2 ... 16	1500	-	73	75	77	79	80	81	82	85	88	90	91	92	93	95	95	-	-	-	-
		1000	-	68	69	70	72	73	75	77	79	80	82	83	84	85	85	86	86	87	87	87
		750	-	64	66	67	69	70	71	73	74	76	78	79	79	80	81	81	82	82	83	83
	18 ... 28	1500	-	71	73	75	77	78	80	82	84	86	87	90	91	92	93	94	94	95	95	95
		1000	-	65	67	68	71	72	73	75	77	78	80	81	82	83	83	84	85	85	86	86
		750	-	62	64	65	67	68	69	71	73	74	75	77	78	79	79	80	80	81	81	81
H3	22.4 ... 35.5	1500	-	-	71	72	75	75	77	77	80	80	81	81	84	84	84	85	-	-	-	-
		1000	-	-	65	66	69	70	71	72	74	75	75	75	78	78	78	79	-	-	-	-
		750	-	-	62	62	66	67	67	68	70	70	71	72	74	74	75	76	-	-	-	-
	4 ... 63	1500	-	-	70	71	73	74	76	76	79	79	80	80	83	82	83	83	-	-	-	-
		1000	-	-	64	65	67	68	69	70	73	73	73	74	77	77	77	77	-	-	-	-
		750	-	-	62	62	63	64	65	66	69	69	69	70	72	73	73	73	-	-	-	-
	71 ... 112	1500	-	-	70	70	72	72	75	75	78	78	78	78	82	82	82	82	-	-	-	-
		1000	-	-	64	64	65	66	68	69	71	72	72	72	75	75	75	76	-	-	-	-
		750	-	-	61	61	62	62	64	65	67	67	68	68	71	71	71	72	-	-	-	-

Table 24 - 4: Sound pressure level for Fanless Helical Gearbox LpA, dB [A]

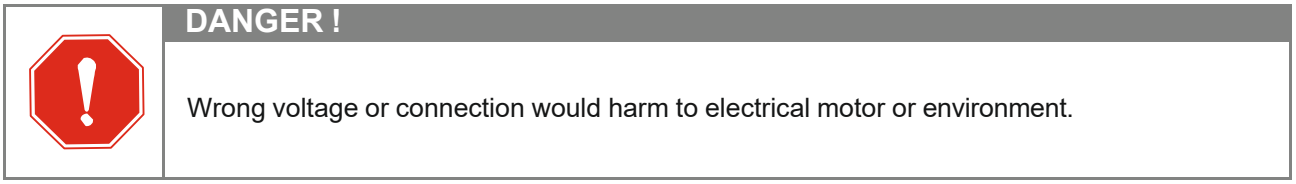
Type	i_N	n_1 1/min	Reducer Housing Size																		
			3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
H1	12.5 ... 2	1500	73	-	77	-	79	-	81	-	83	-	-	-	-	-	-	-	-	-	-	-
		1000	69	-	72	-	75	-	76	-	78	-	80	-	-	-	-	-	-	-	-	-
		750	65	-	69	-	71	-	73	-	75	-	77	-	79	-	-	-	-	-	-	-
	22.4 ... 3.55	1500	70	-	75	-	77	-	79	-	81	-	83	-	-	-	-	-	-	-	-	-
		1000	66	-	70	-	72	-	74	-	76	-	78	-	80	-	-	-	-	-	-	-
		750	62	-	67	-	68	-	71	-	73	-	75	-	77	-	79	-	-	-	-	-
	4 ... 5.6	1500	67	-	72	-	74	-	76	-	78	-	79	-	82	-	-	-	-	-	-	-
		1000	*	-	67	-	70	-	71	-	73	-	75	-	77	-	79	-	81	-	-	-
		750	*	-	63	-	66	-	67	-	70	-	71	-	74	-	76	-	78	-	-	-
H2	6 ... 10	1500	-	71	74	75	76	77	79	79	80	81	81	82	84	85	85	86	-	-	-	-
		1000	-	66	69	70	71	72	74	74	75	76	76	77	80	80	80	81	83	83	84	-
		750	-	63	66	67	67	69	70	71	72	73	73	74	76	77	77	78	80	80	81	81
	11.2 ... 16	1500	-	69	72	73	74	75	77	77	78	79	79	80	82	83	83	84	-	-	-	-
		1000	-	64	67	68	69	70	72	72	73	74	74	75	77	78	78	79	81	81	82	82
		750	-	61	64	65	66	67	69	69	70	71	71	72	74	75	75	76	77	78	79	79
	18 ... 28	1500	-	66	69	70	71	72	74	74	75	76	77	78	80	80	81	82	83	84	84	85
		1000	-	61	64	65	66	68	69	69	70	71	72	73	75	75	76	77	78	79	79	80
		750	-	*	61	62	63	64	66	66	67	68	69	70	72	72	73	73	75	75	76	76
H3	22.4 ... 31.5	1500	-	-	68	69	73	74	74	75	77	77	78	79	81	81	82	83	83	84	85	86
		1000	-	-	63	65	68	69	69	71	72	73	73	74	76	77	77	78	79	79	81	81
		750	-	-	60	61	65	66	65	67	69	69	70	71	73	73	74	75	75	76	77	78
	35.5 ... 63	1500	-	-	65	67	70	71	71	73	74	75	76	76	78	79	79	80	81	81	83	83
		1000	-	-	*	62	65	66	66	68	69	70	71	72	73	74	75	75	76	77	78	78
		750	-	-	*	*	62	63	63	65	66	67	67	68	70	71	71	72	73	73	75	75
	71 ... 112	1500	-	-	62	64	67	68	68	70	71	72	73	74	76	76	77	78	78	79	80	81
		1000	-	-	*	*	62	63	63	65	66	67	68	69	71	71	72	73	73	74	75	76
		750	-	-	*	*	*	*	*	62	63	64	65	66	68	68	69	70	70	71	72	72
H4	100 ... 140	1500	-	-	-	-	66	67	68	69	70	71	72	73	75	75	76	76	77	78	78	78
		1000	-	-	-	-	62	63	63	64	65	66	67	68	70	70	71	72	72	73	73	74
		750	-	-	-	-	*	*	*	61	62	63	64	64	66	67	68	68	69	69	70	70
	160 ... 250	1500	-	-	-	-	64	65	66	66	68	68	69	70	72	73	73	74	74	75	75	76
		1000	-	-	-	-	*	60	61	62	63	64	64	65	67	68	68	69	70	70	71	71
		750	-	-	-	-	*	*	*	*	60	61	61	62	64	64	65	66	66	67	67	68
	280 ... 450	1500	-	-	-	-	61	62	63	64	65	66	67	67	69	70	70	71	72	72	73	73
		1000	-	-	-	-	*	*	*	*	60	61	62	63	64	65	66	66	67	68	68	68
		750	-	-	-	-	*	*	*	*	*	*	*	*	61	62	62	63	64	64	65	65

* LpA < 60 dB [A]

12.1 The Electrical Motor and Brake Connection

The connections must be made according to electric connection schema (If there is brake, it must be made according to brake connection schema).

- Must be sured that the supply voltage and frequency are the same as tag values.
- Both the protective tag values and connection must be controlled.
- If the motor is operated at the opposite direction, two stages must be changed.
- Unused cable entries should be closed.
- Not to have excessive load and stage failures, the protector must be used (stage protection or thermic etc.)
- The motor protection must be set to the nominal current.
- The gear unit and motor must be grounded against potential differences.
- The electrical motor and/or brake connections must be made by the experienced electric technicians.

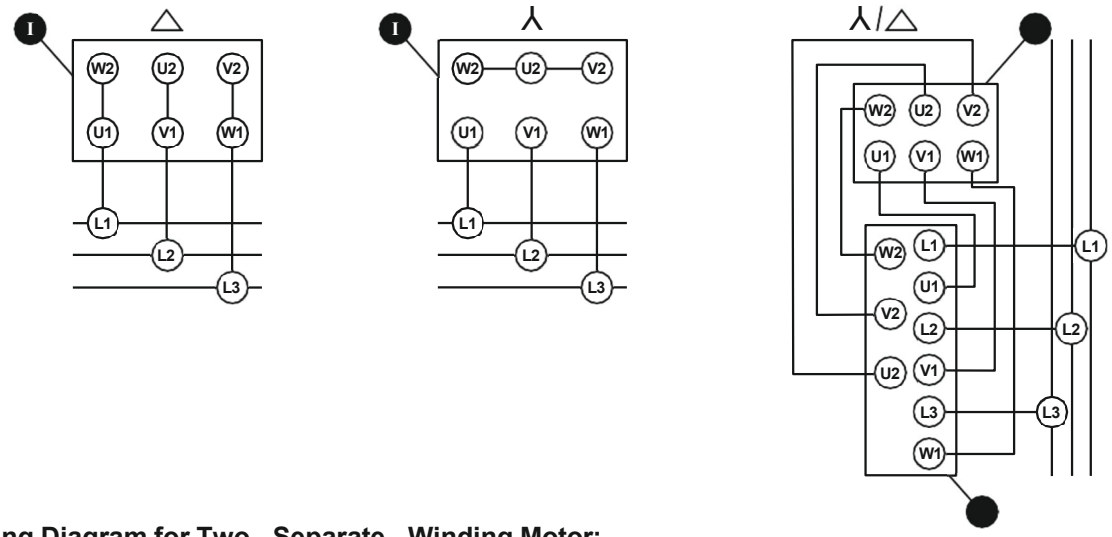


12.2 The Electrical Motor Connection Schema

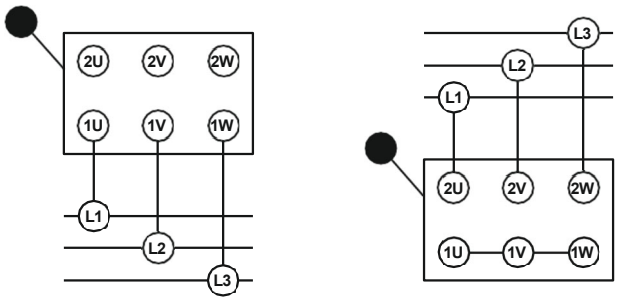
Three Phase Squirrel - Cage Motor

Figure 57: The Electrical Motor Connection Schema

I. Terminal Box
II. Circuit Breaker

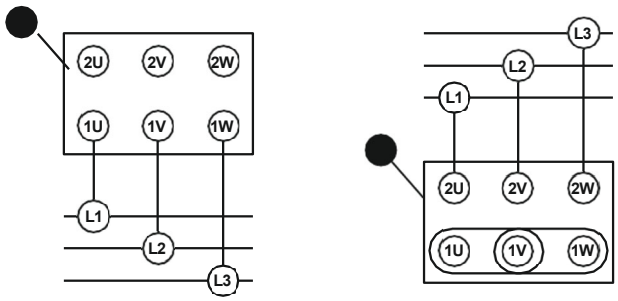


Wiring Diagram for Two - Separate - Winding Motor:



Low Speed High Speed

Dahlender Motor Connection Diagram:

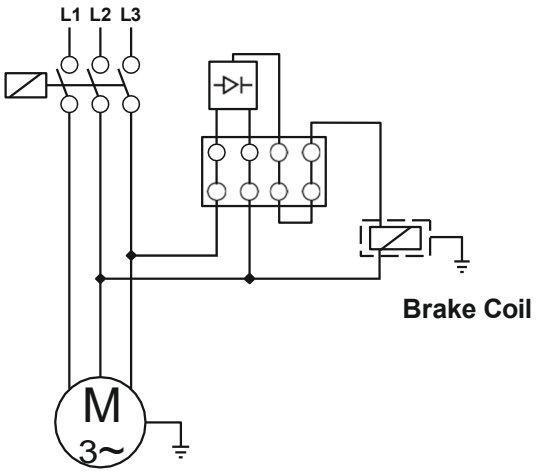


Low Speed High Speed

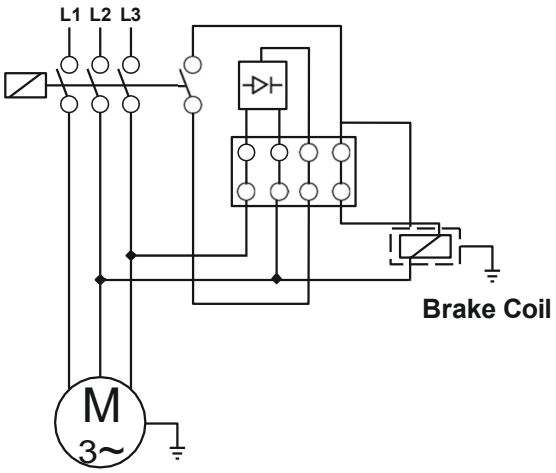
12.3 Standard Type Brake Anchorage Schema

Delayed Running Brake (400V)

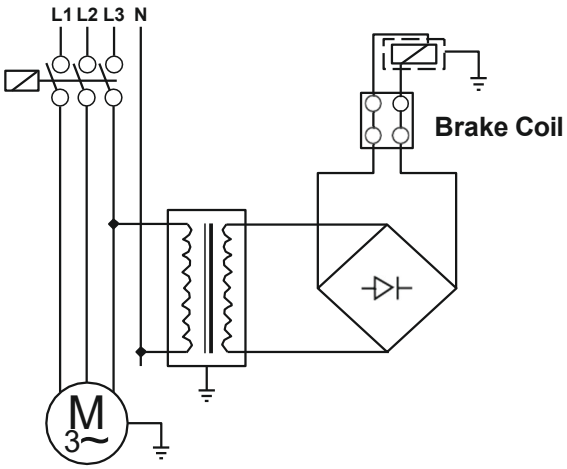
Figure 58: Standard Type Brake Anchorage Schema



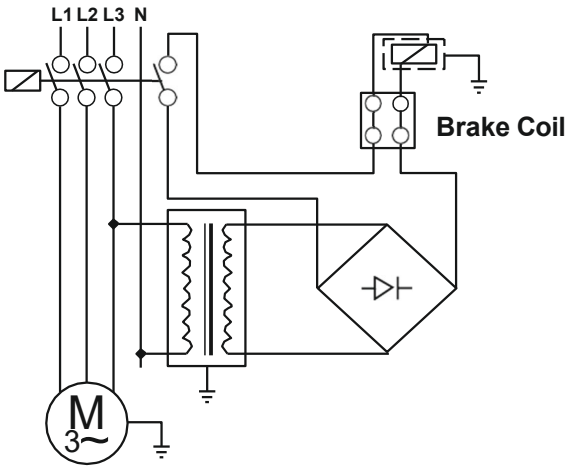
Sudden Brake (400V)



Delayed Running Brake (24V)

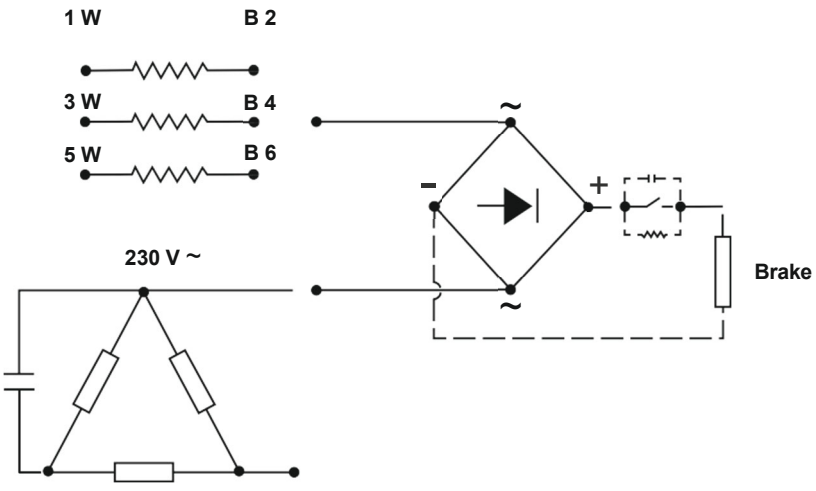


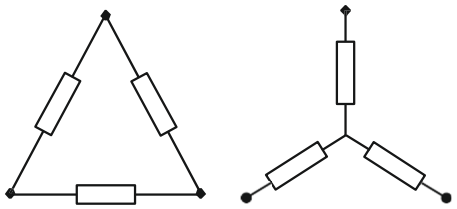
Sudden Brake (24V)



Please check brake coil by using a tester.

DELTA CONNECTION	STAR CONNECTION
△ 230 V	⅄400 V





Get in touch

For your local Renold sales and service location

+44 (0) 1706 751000

gears.sales@renold.com

www.renold.com

Station Rd, Milnrow,
Rochdale
OL16 3LS

FSC Supplier

The FSC Logo identifies products which may contain wood from well managed forests certified in accordance with the rules of the Forest Stewardship Council.

www.fsc.org
© 1996 Forest Stewardship Council

REN132/BROSCSC/03.24/E
A Business of Renold Power Transmission Ltd.

RENOLD | Gears