

A / F - D / M - K SERIES

Helical Gear Units

Parallel Shaft Mounted Gear Units

Helical Bevel Gear Units

GEAR UNIT WITH MOTORS / WITHOUT MOTORS

MAINTENANCE AND OPERATION INSTRUCTIONS



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1.1 Important Warnings

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

Table 1: Safety Alerts and Information Signs



EXPLOSION !

Indicates an immediate danger, which may result in death or serious injury.
Contains important information regarding explosion protection.



ATTENTION !

Dangerous position and possible result
Slight and unimportant woundings



NOTE !

Advices and necessary informations for the user



DANGER !

Harmful position and possible result
Damage in gear unit and environment



DANGER OF ELECTRICITY !

Danger of electrical shock and possible result
Death and heavy woundings




DANGER !

Danger possible result
Death and heavy woundings

1.2 General Information

This user guide is prepared by our firm to provide information about safety transportation of gear unit/gear unit with motors, storage, installation /mounting, connection, operating, maintenance and repair processes. All the purchase and technical datas are positioned at product catalogues. Beside engineering applications, the informations which placed in this instruction, should be well read and applied. The documents must be protected and to get ready for controlling by authorized person. The information about electrical motor could be found by guidance which prepared by motor - producing firm.

In case of loss of usage guide or becoming in unusable position it could be redemanded from NRW.

	<p>EXPLOSION !</p> <p>All the informations those boxes include would only state proper goods to the instruction of ATEX 2014/34/EU.</p> <p>Processes which related to these regulations should only be made by personnel (qualified) who has expertise regarding security in the fields that has the probability of being exploded.</p>
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1.3 Correct Use

NRW The products are designed to use in commercial plants and are operated convenient to the current standards and directions. Technical datas and allowed usage conditions are placed in product's power tab and usage guidance. Should be conformed to all the values.

Gearboxes are designed suitable to security necessities of machine order 2006/42/EC. In all systems of which these goods installed, we advice to take 2006/42/EC machine order into a consideration. Engine compatibilities belong to manufacturing company responsibility.


1.4 Safety Information

Carefully read the manual and any instructions marked directly on the nameplates fixed to the unit. Staff working on the unit must be technically qualified and experienced to do so, and must also be equipped with the necessary safety equipment (according to the current laws). Failure to observe this requirement may result in injury or damage. Use the unit only for the purposes specified by Motovario Group. Improper use is a health and safety hazard and may cause economic damages.

Keep the unit in good running order with programmed maintenance operations. The unit can reach high temperatures in operation (in the case of variators, even when running under no or reduced load). Do not touch the casings with bare hands-use appropriate safety equipment.

For proper maintenance ensure full safety precautions have been applied, including the use of safety clothing and equipment, as required by current workplace safety legislation.

Use only original Motovario spare parts. Use only oils and greases recommended by Motovario Group. Do not dump polluting materials-dispose of them according to environmental regulations. After changing the lubricant, clean the reducer/variator's casing as well as the work area.

	<p>EXPLOSION !</p> <p>In environments with potentially explosive atmospheres, only ATEX units are allowed, after verifying their certification limits. In case of non-ATEX units, or ATEX units with certification non-compliant with environmental conditions, it is compulsory to disconnect the unit power supply. Adopt all the necessary measures of environmental safety.</p>
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Safety information;

In gear units /gear units with motors and motors, there could be pieces subjected to voltage, movable pieces and hot areas. During all the works to be done; transportation, storage, placing, mounting, connection, operating, maintenance-repair processes could be implemented by qualified employees and responsible managers.

All the processes to be implemented during the working period;

- Related usage and maintenance instructions,
- Warning and Safety Tags in gear unit/gear unit with motor,
- Instructions and Requirements related to the system,
- Local and International requirements for safety and accidental protection,
- Disassembly of gearbox should only be made by authorized personnels.

Our Firm is not responsible where the listed items are implemented below:

- Violation of work health and safety rules in gear unit /gear unit with motors,
- Improper usage (The usage which stated out of bounds in guidance and all the usages except tag/catalogue values especially usage in high moment and different cycle) and mismounting and misuse of gear unit/gear unit with motor in plant,
- Extremely dirty and maintenance free of gear unit/gear unit with motor,
- Unlubricated usage,
- Usage of product other than out of tag/catalogue values,
- Wrong motor selection,
- Take out of the necessary protective plugs,
- Disuse of original pieces in gear unit/gear unit with motor,
- The using, mounting, maintaining and taking place of the uneducated, unauthorized and unqualified 3. persons,
- Additional dangers that could be generated during power cut can be prevented by materials such as brake/key.

1.5 Responsibility

NRW, declines any responsibility in case of:

- Use of the reducer not compliant with national laws on safety and accident prevention,
- Work done by unqualified personnel,
- Incorrect installation,
- Tampering with the product,
- Incorrect or failure to follow the instructions in the manual,
- Incorrect or failure to follow the indications marked on the identification labels fixed on the units,
- For motor gearboxes, wrong delivery of electrical power,
- Incorrect connections and/or use of temperature sensors (when present),
- Use of gearbox under unlubricated conditions,
- The contents of this manual were reviewed to ensure consistency with the catalogues and etc. documents. We cannot guarantee full consistency since the changes cannot be completely prevented. However, the informations in this manual are reviewed regularly and necessary revisions are made in next editions.

The products supplied by NRW are intended to be incorporated into "complete machines", so it is prohibited to put them into service until the entire machine has not been declared compliant.

**ATTENTION !**

The configurations provided in the catalogue of the unit are the only ones allowed. Do not use the product in contrast with the indications provided in it. The instructions provided in this manual do not replace but compensate the obligations of current laws concerning safety regulations.

1.6 Transportation

1.6.1 Transportation and Freightage;

- Take into consideration of the article stated on package during the product delivery.
- During the delivery, product should be controlled about possible damages in carrying period.
- The firm should be informed about possible damages.
- The damaged products should not be put into use.
- Lifting flanged eyebolts must be tightened. These flanged eyebolts sized to carry the weight of only gear unit/gear unit with motor. The additional weight should not be added. The flanged eyebolts must be suitable to the DIN 580 norm.
- If there are 2 lifting flanged eyebolts in gear unit with motor, both of them could be used in carrying process upon the size of gear unit and motor. In necessary situations, the suitable and adequated-size carrier should be used.
- Carrying safeties should be removed before the start of operating.
- The weights of the movable gear units/gear units with motors are placed in product catalogues.
- The dangerous area should be got into the secure to prevent damage to the persons.
- During the carrying process, to stand under the gear unit could cause danger of death.
- The damage of gear unit must be prevented. The crushes to the free input shafts could damaged into the gear unit.

1.6.2 Package Transportation;

- There could be no loads on packages or the shelved surfaces should be prepared.
- The necessary carrying equipments should be prepared.
- The carrying and lifting equipments should be larged - enough to the sufficient capacity.
- The calculations should be made to the connection points and center of gravity.
- If necessary, this information should be written on the package.
- The carrying equipments (steel rope, belt, chain etc.) must be robust and suitable to the applied weight.
- During the carrying process, the load centering could be done without oscillation.

1.6.3 Equipment Transportation;

- The connection carrying point should be appointed.
- The carrying equipments (hook, chain, belt) must be prepared. To the alternative, pallet must be used for the load -lifting.
- If the Crane will be used, it could be lifted perpendicular from inside to the outside of the package.
- If the forklift or palletized carrying equipment will be used, the product which removed from package should be placed on the pallet.
- The fork of the equipment should be carried out the way that gripped the pallet.
- The weight must be lifted both with slowly and constant speed and must take measure to the sudden oscillation.



ATTENTION !

During the carrying process, the fixings like the lifting lug, hook, belt, rope, locked hook must be sufficient to the load and have conformity certificate. The weights of the movable gear unit/gear unit with motor have given in product catalogue.



NOTE !

In all carrying processes, there should be avoided from both sudden movements and sudden liftings.



ATTENTION !

If the connection tool is coupling between electric motor and gear unit, lifting eyebolt should not be used.

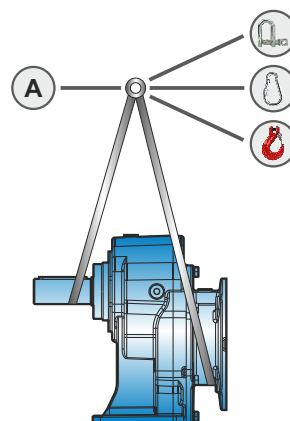
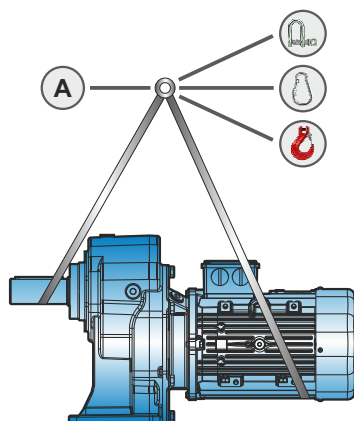
1.6.4 Transport of Gearboxes;

Figure 1: Transport of Gearboxes (A / F)

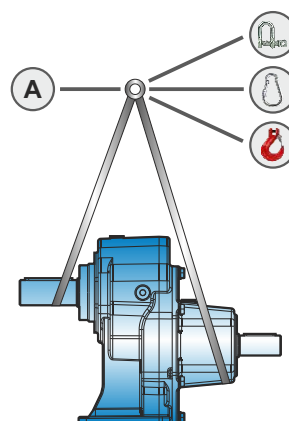
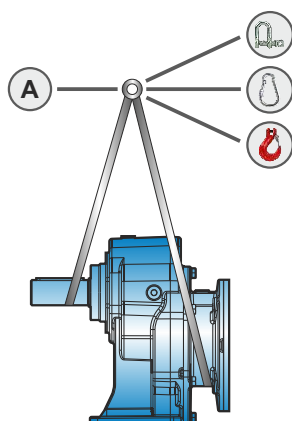
A / F

SINGLE STAGE

MOTOR / PAM



IEC / W



A Hoop equipped (swab)

Load hook

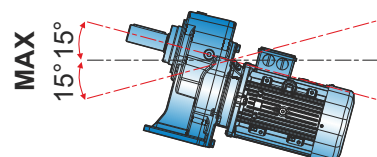
Screw hook

Locked hook

Manuel lifting (Weight ≤ 15 kg)
(ref. ILO Contract)
Not valid for the continuous carrying.



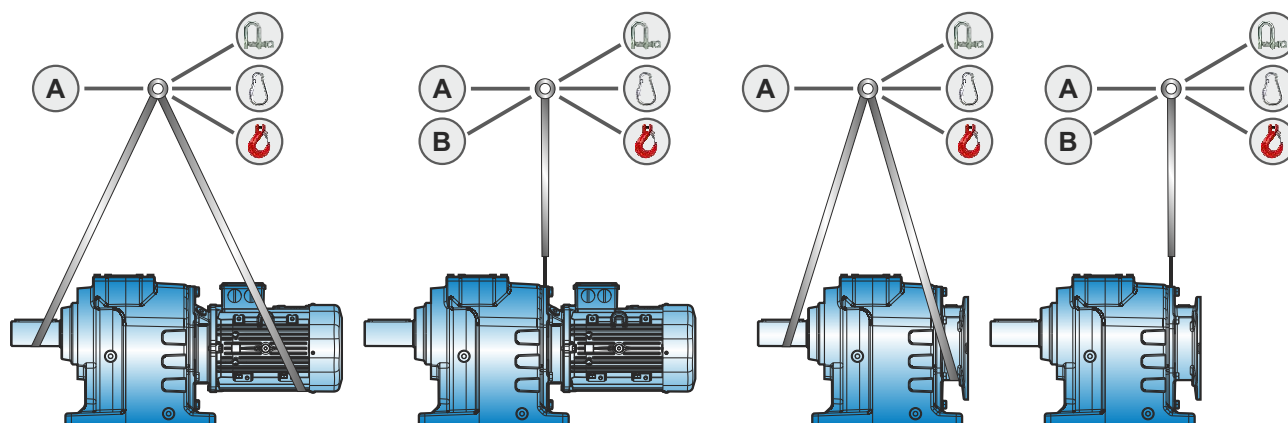
The allowable maximum slope is 15 degree.



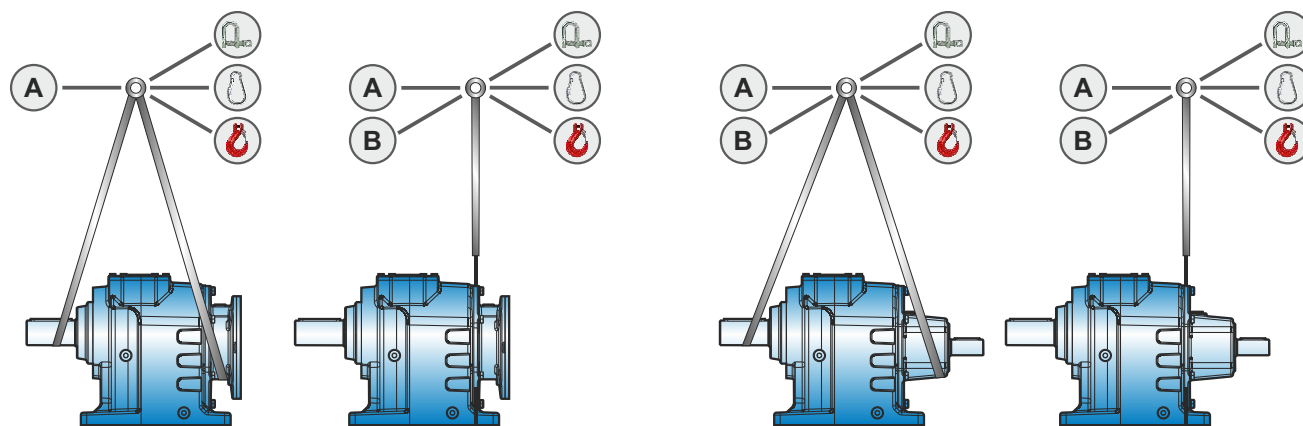
A / F

MOTOR / PAM

DOUBLE STAGE
TRIPLE STAGE



IEC / W



A Hoop equipped (swab)



Load hook



Screw hook



Locked hook

B Hoop equipped (chain)

Manuel lifting (Weight ≤ 15 kg)
(ref. ILO Contract)
Not valid for the continuous carrying.



The allowable maximum
slope is 15 degree.

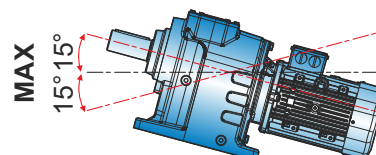
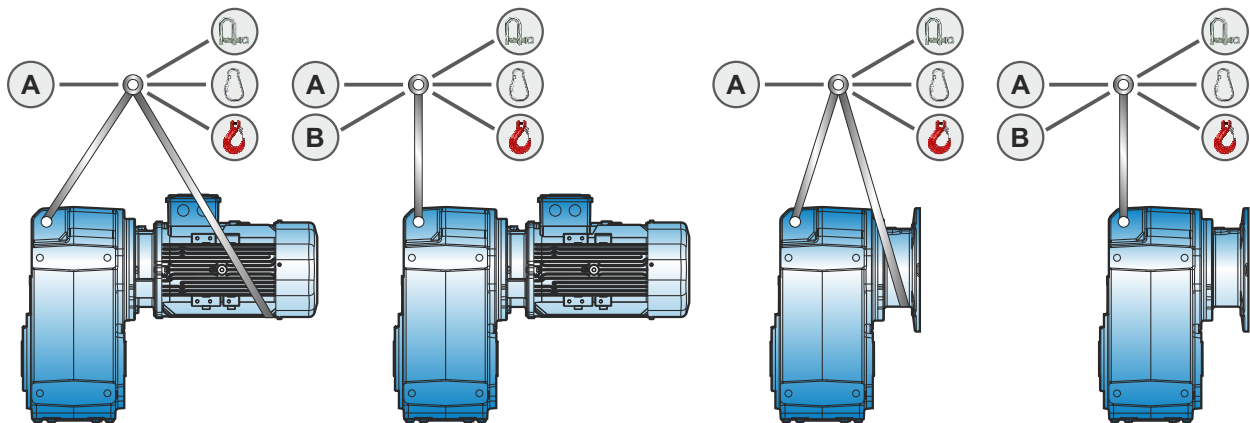


Figure 2: Transport of Gearboxes (D / M)

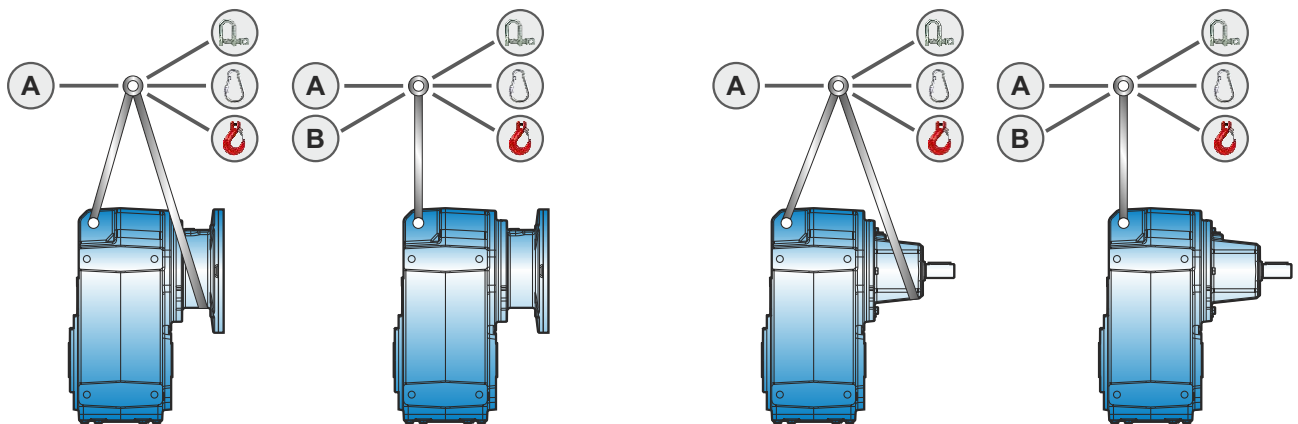
D

DOUBLE STAGE
TRIPLE STAGE

MOTOR / PAM



IEC / W



A Hoop equipped (swab)



Load hook



Screw hook



Locked hook

B Hoop equipped (chain)

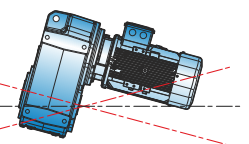
Manual lifting (Weight ≤ 15 kg)
(ref. ILO Contract)
Not valid for the continuous carrying.



The allowable maximum slope is 15 degree.

MAX

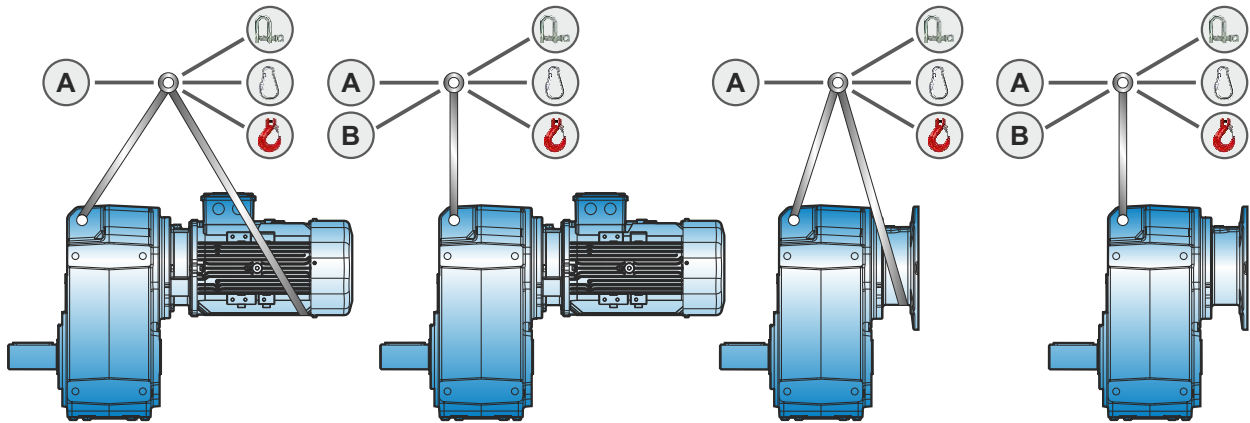
15° 15°



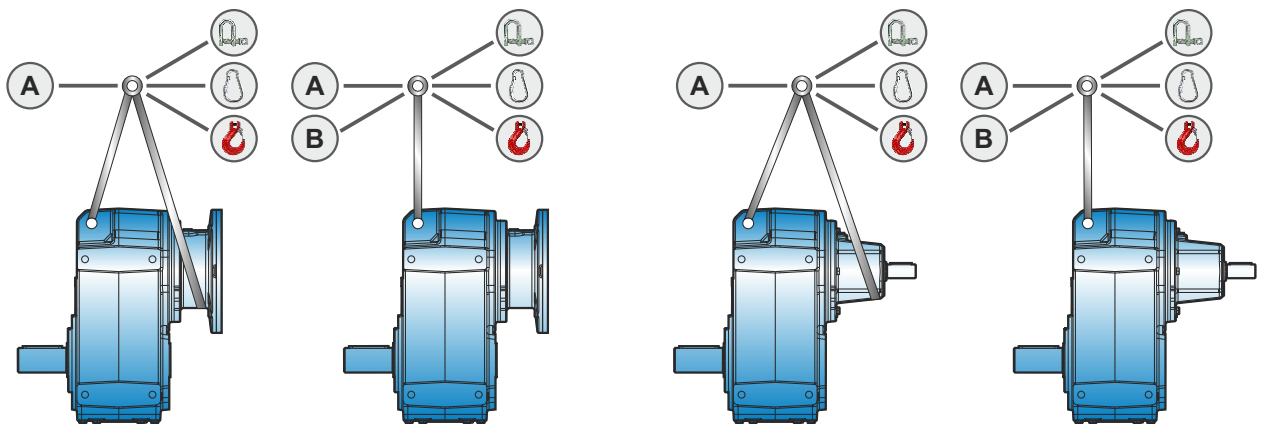
M

MOTOR / PAM


**DOUBLE STAGE
TRIPLE STAGE**





IEC / W



A Hoop equipped (swab)

 Load hook

 Screw hook

 Locked hook

B Hoop equipped (chain)

Manuel lifting (Weight ≤ 15 kg)
(ref. ILO Contract)
Not valid for the continuous carrying.



The allowable maximum
slope is 15 degree.

MAX

15° 15°

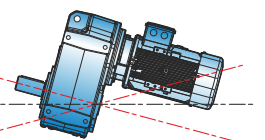
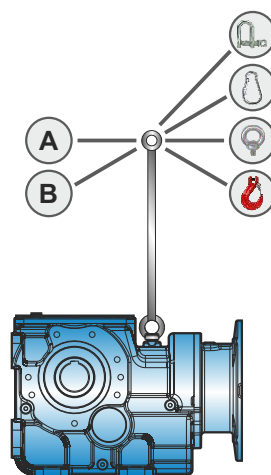
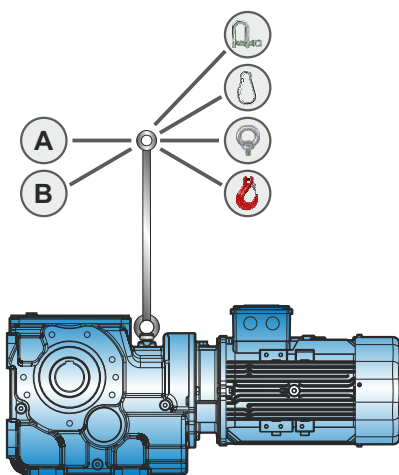


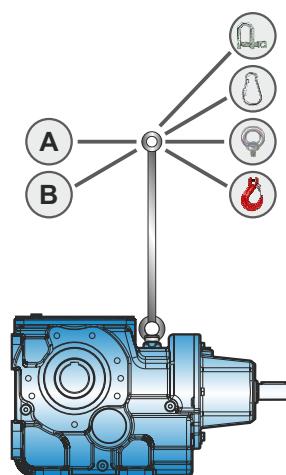
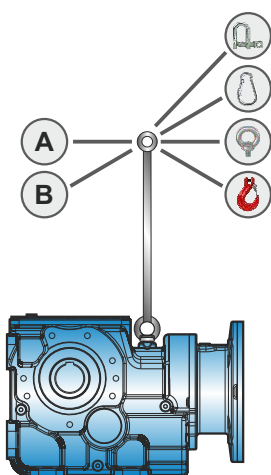
Figure 3: Transport of Gearboxes (K)

K - A / F - A - F

MOTOR / PAM



IEC / W



A Hoop equipped (swab)

Load hook

Screw hook

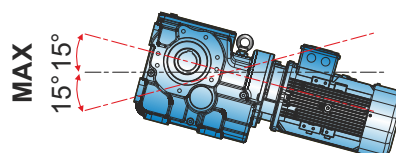
Locked hook

B Hoop equipped (chain)

Manuel lifting (Weight ≤ 15 kg)
(ref. ILO Contract)
Not valid for the continuous carrying.



The allowable maximum slope is 15 degree.



1.7 Storage

The certain suggestions have given about the storage conditions of the gear unit/gear unit with motor below;

- In clear and moist-airs, the storage should not be made.
- The gear unit/gear units with motor should not directly be contacted to the ground.
- The place must be moveless where the both gear unit/gear units with motors are contacted. Otherwise there could be damage during the movement.
- The gear unit should be got into the secure to the falling.
- The processed surfaces of the gear units and both solid and hollow shafts must be lubricated with protective oil.
- Gear unit/Gear units with motors must be in the place where there will be no big temperature differences between -5°C and +40°C.
- Relative humidity must be less than %60.
- Not directly be exposed to sunlight and infraded light.
- Must be kept away from the abrasive materials which causes corrosion (dirty weather, ozon, gases, solvents, acids, salts, radioactivity, etc.) in environment.
- The protective oil SHELL ENSIS or similar product should be used on the corrodible pieces.
- If the gear unit is without oil, it must be filled with lubrication oil.



EXPLOSION !

Gearboxes during storage;
Provide protection of unpainted and processed areas by lubricant.
In case of areas getting rusted, ATEX certificate will be no longer valid.



EXPLOSION !

These processes should be made far away from explosive atmosphere.
If there is an improper oil inside of gearbox to operate, this oil must be discharged and be cleaned.



SECURITY MEASURES !

Precautions to be taken when returning the gear unit to service after storage:




The output shafts and external surfaces must be thoroughly cleaned of all rustproofing product, contaminants and other impurities (use a standard commercial solvent).

Do this outside the explosion hazard area. The solvent must not touch the seal rings as this may damage them, causing them to leak.

If the oil or protective material used during storage is not compatible with the synthetic oil used during the machine's operation, the interior of the unit must be thoroughly cleaned before filling with the operating oil.

The service life of the bearing grease is reduced if the unit is stored for more than 1 year. The bearing grease must be synthetic.

1.7.1 Long Term Storage Suggestions;

	NOTE ! <ul style="list-style-type: none">- In the long-term storage or during the short-term storage, if the excessive temperature differences occur, the oil in the gear unit must be changed before the operating.- In the fully oil filled gear unit, the oil level should be reduced according to the mounting position.
	ATTENTION ! <ul style="list-style-type: none">- The incorrect and excessive long storage could cause the gearbox getting defected.- Please control not to exceed allowed storage period before starting up the gearbox.
	NOTE ! <ul style="list-style-type: none">- NRW, recommends long-term storage option for periods of more than 9 months holding and pausing times.- By paying attention both to the long-term storage option and precautions which listed below, the holding of goods up to 2 years could be possible. Because of real efficiency of gearboxes depending on local conditions widely, these periods could be seen solely guide values.

Long term storage suggestions;

- Mineral oil or synthetic oil according to mounting position is filled of getting available for operating. Despite this, the oil level should be controlled before operating.
- The VCI Corrosion protected tool are mixed into the gear unit's oil.
- The carrying safety of the ventilation plug must not be removed during the storage.
- The gear unit must be closed to the shape of unsealed.



2.1 Gear Unit Label

EXPLOSION !

Explosion hazard: Failure to comply may cause severe, or even fatal injuries. It must be checked and ensured that the gear unit type, all technical data and the ATEX labelling conform to the planning of the plant or the machine.

The type plate must be firmly attached to the gear unit and must not be subjected to permanent soiling. Please contact the NRW service department if the type plate is illegible or damaged.

EXPLOSION !

Gearboxes that are suitable to 2014/34/EU instruction; have "ATEX" label which is at the standard of EN ISO 80079-36:2016, EN ISO 80079-37:2016 and also proper to stated contents. **An example is given below:**

Figure 4: Gearbox Nameplate and Explanation

Marking according to ATEX (EN ISO 80079-36:2016, EN ISO 80079-37:2016):

1. Group (Always II, quarries are not included)
2. Category (for gas **2G-3G**, for powder **2D-3D**)
3. If firing protective type (**c**) is put
4. Implementing explosive group (**IIC, IIB**)
5. Temperature Class (for gas **T1-T3** or **T4**) or maximum surface heat (for example for powder **125 °C**) or specific maximum surface heat, look at private documents. (**TX**)
6. Temperature measurement during access to a plant. (**X**)

2.2 Compatibility Declaration

All gear units or gearmotors (when supplied with electric motor) are designed in compliance with the provisions of applicable Essential Health and Safety Requirements, the "Machinery Directive" 2006/42/EC and, if requested, can be supplied with a Manufacturer's Declaration-Annex IIB as provided by said Directive.

EXPLOSION !

The nameplate specifications regarding the maximum surface temperature, refer to readings taken in normal ambient and installation conditions. Even minimal variations to said conditions (e.g. smaller mounting cabinet) may have a significant effect on the unit's heat output.



2.3 Explanations

Table 2: Product Description (A / F)

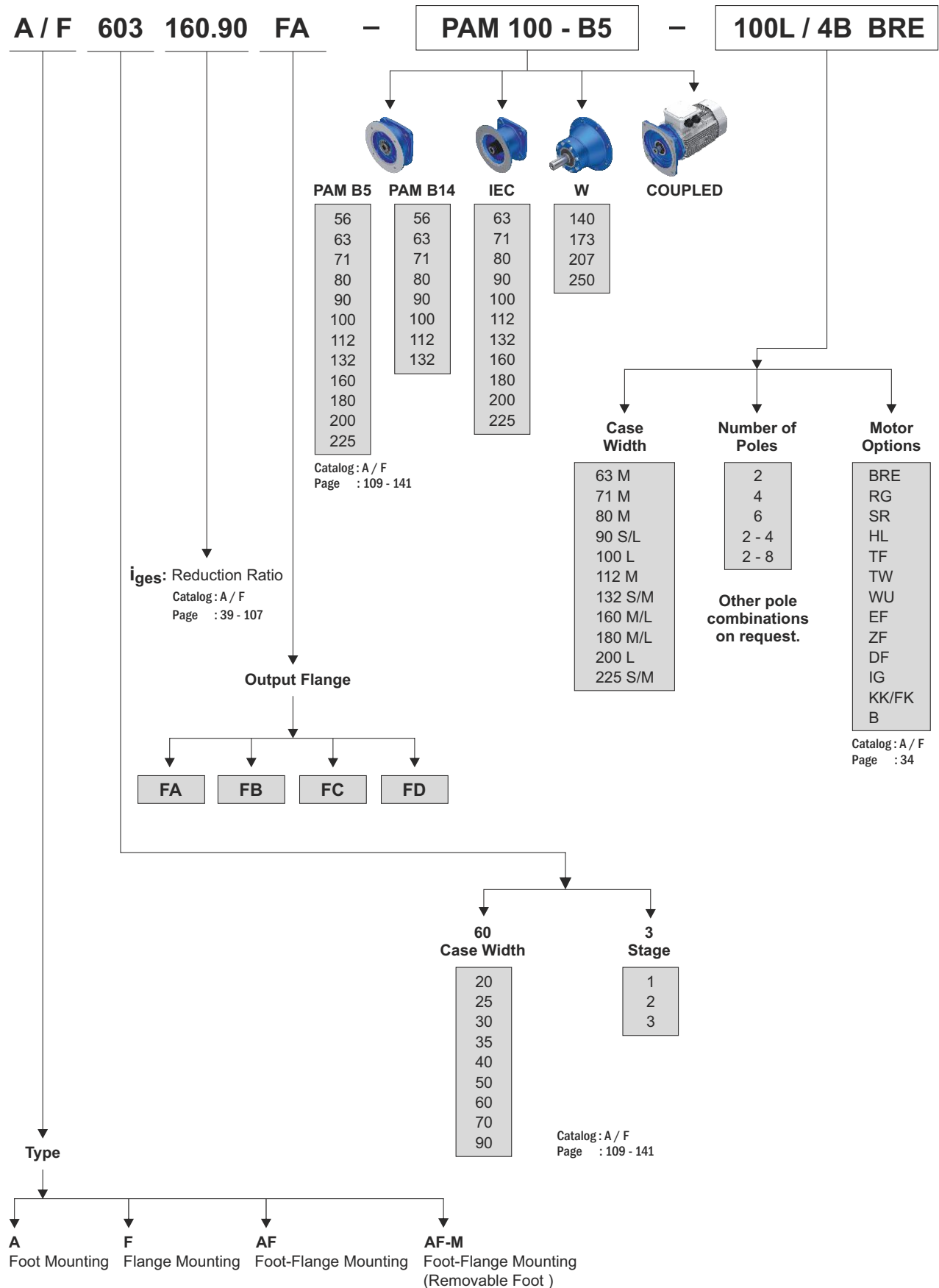
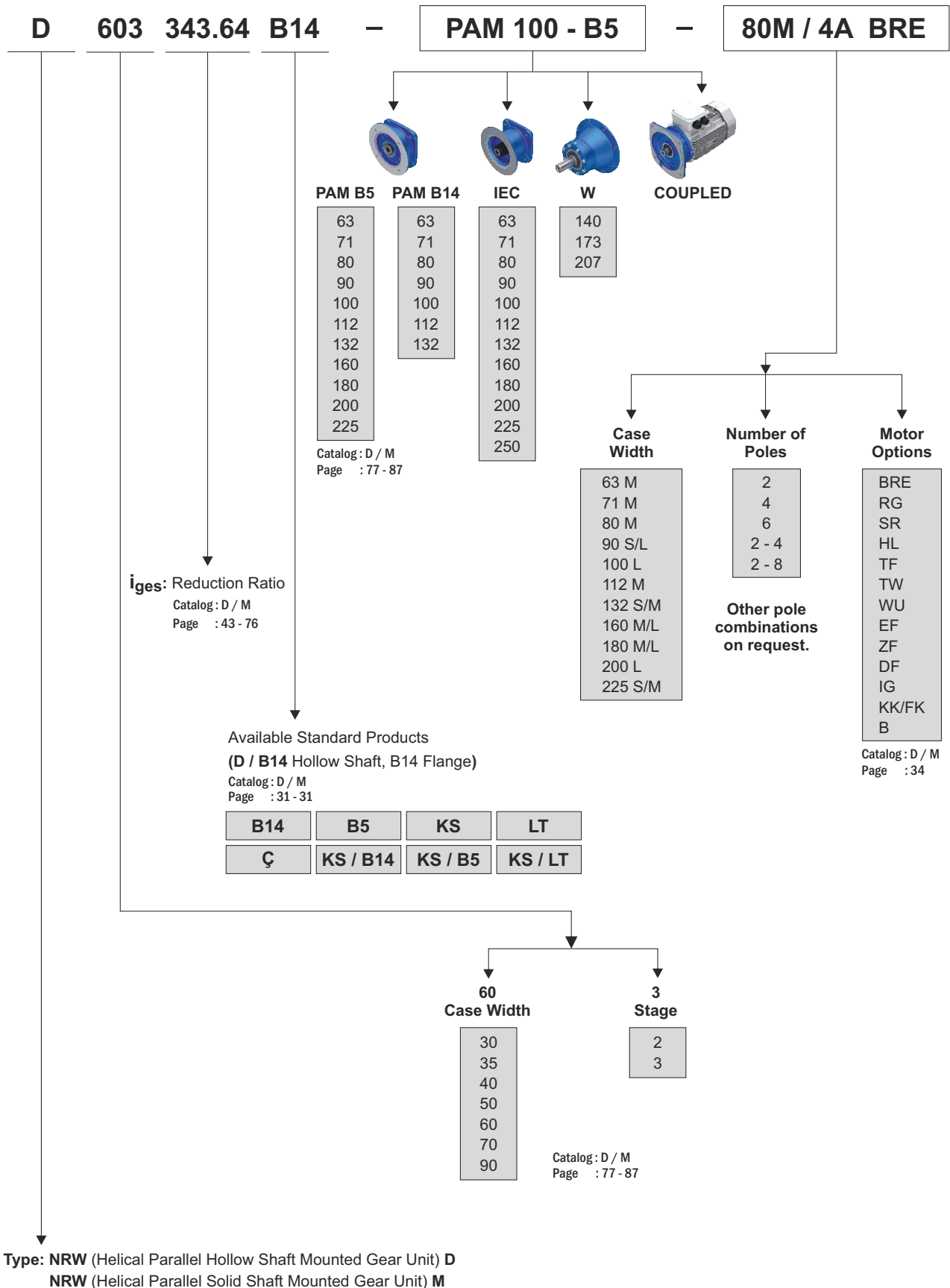




Table 3: Product Description (D / M)

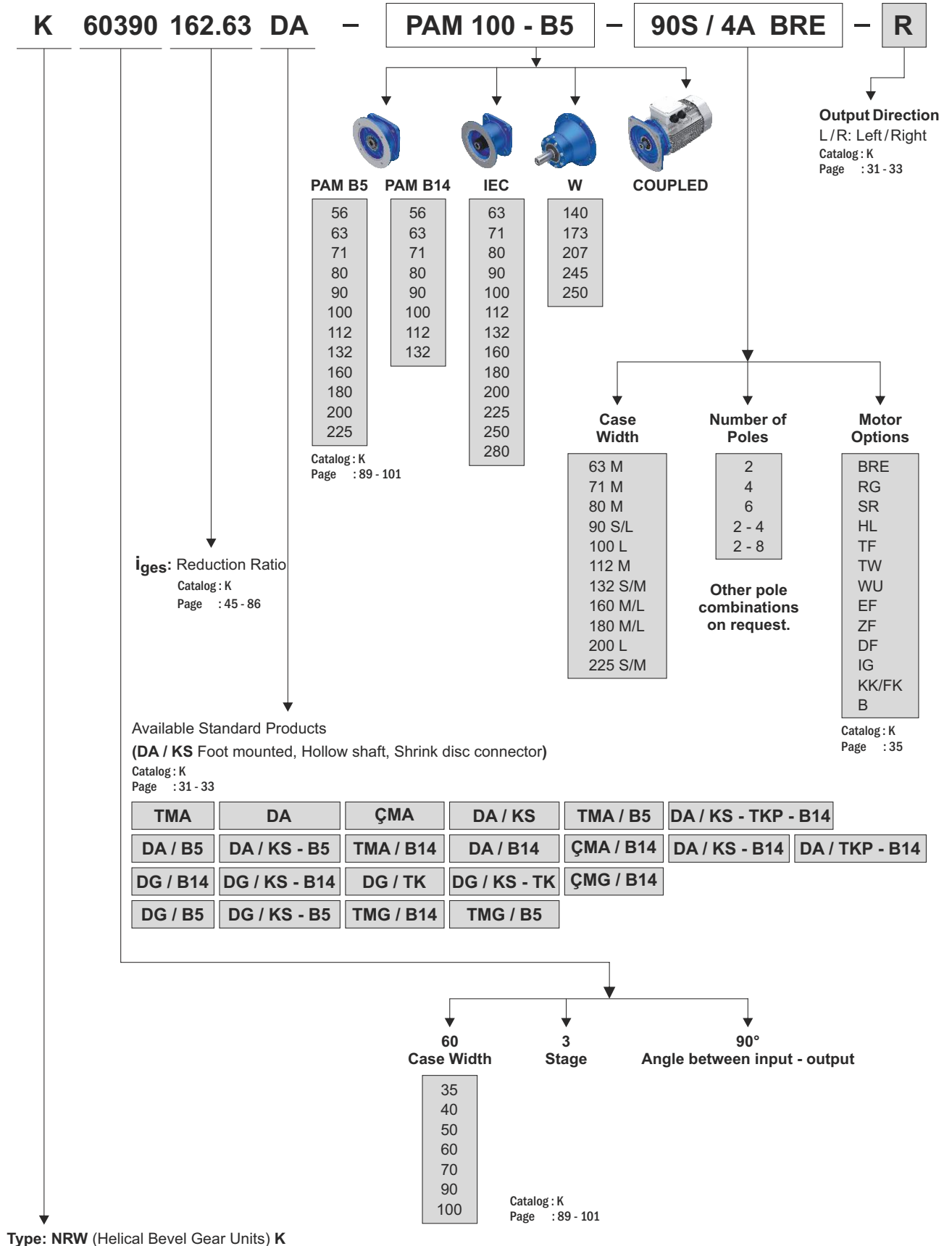




2. UNIT

PRODUCT DESCRIPTION

Table 4: Product Description (K)





2.4 Abbreviations

Table 5: Abbreviations (A / F)

Abbreviations	Meaning	Helical Gear Units
A	Foot Mounted	✓
F	Flange Mounted	✓
IEC	IEC Adapter	✓
W	Free Input Shaft	✓
B	Backstop	✓
GR	Reinforced Bearing	✓
WB	Backstop in W Adapter	✓
PAM	PAM B5 - B14 Adapter	✓
FA - FB - FC - FD	Output Flange	✓

✓ : Existing designs are marked with a tick.

Table 6: Abbreviations (D / M)

Abbreviations	Meaning	Parallel Shaft Gear Units
D	Hollow Shaft	✓
M	Solid Shaft	✓
B5	Flange B5	✓
B14	Flange B14	✓
Ç	Puller Washer	✓
LT	Rubber Buffer	✓
KS	Shrink Disc	✓
KK	Protection Cap	✓
IEC	IEC Adapter	✓
W	Free Input Shaft	✓
B	Backstop	✓
GR	Reinforced Bearing	✓
PAM	PAM B5 - B14 Adapter	✓
FA - FB - FC - FD	Output Flange	✓

✓ : Existing designs are marked with a tick.



Table 7: Abbreviations (K)

Abbreviations	Meaning	Helical Bevel Gear Units
DG	Case Mounted	✓
DA	Foot Mounted	✓
Ç	Puller Washer	✓
KK	Protection Cap	✓
IEC	IEC Adapter	✓
ÇMA	Foot Mounted, Solid Shaft on Both Sides	✓
B	Backstop	✓
WB	Backstop in W Adapter	✓
KS	Shrink Disc	✓
GR	Reinforced Bearing	✓
TMA	Foot Mounted, Solid Shaft on One Side	✓
W	Free Input Shaft	✓
TK	Torque Arm	✓
TKP	Torque Arm Platform	✓
PAM	PAM B5 - B14 Adapter	✓
FA - FB - FC - FD	Output Flange	✓



✓ : Existing designs are marked with a tick.



3.1 Prerequisites of Assembly

Take into the consideration which listed below;

- The informations placed on gear unit with motor in accordance with current network voltage.
- There could be no damage in the gear unit.
At standard gear units;
- The ambient temperature should be fitted temperature values given in the "Lubricant" part.

	<p>EXPLOSION !</p> <p>Before access to a plant, those belows should be controlled and be secured:</p> <ul style="list-style-type: none"> • During assembly of gearbox, whatever any explosion danger such as due to lubricant, acid, gas and steam radiation, could not be happened and there should not be powder accumulation at gearbox more than 5 mm. • During operating process, gearbox should be put in a well-vented room and not to be exposed in an effect of substantially heat radiation from outside. • During operating process, the temperature of cooling air should not exceed 40 °C. • Controlling of lubricant and both discharging plugs and valves must be easily accessible. • Several other devices belong to gearbox, seperately from their own functions should have an ATEX Certificate. (Protective electrical working substance against explosion) • The setting of gearboxes which have hollow shafts (even if there may be a friction preventer connection or may not) should be made properly according to an instructions at this hand guide. • After set up process is completed, cleaning of gearbox would be required. • Please be sure that all parts expanding and shifting with help of machine operator or all operating devices which prevent unwanted contacts between gearbox gaskets, would be operativeness.
	<p>DANGER !</p> <p>The Gear unit must not be mounted in the ambient conditions listed below:</p> <ul style="list-style-type: none"> - Explosive atmosphere, high corrosive and / or oils, acids, gases, steams, radiation, - Places directly contacted to the food.

Gearboxes are either dispatched without motor or motors by ATEX are assembled to a gearbox after getting supplied from electrical motor manufacturer. Electric connection belongs to end user.

At special applications the configuration of gear unit/gear unit with motor are realized convenient to the ambient conditions. Output shafts, processed surfaces, corrosion preventive material on the solid shaft/hallow shaft, jerks etc. must be cleaned.

Extensive usage-solvent must be used. The solvent should not be contacted to the bearing houses and sealing components.

In the abrasive ambient conditions, both output shaft, sealing components must be protected to the wearing Connection flanges must be attached to the hollow shaft/solid shaft according to DIN 332.

The situations where the wrong direction of rotation could caused to damages and dangers, before the mounting, the test work should implemented to the gear unit so the right direction of rotation could be determined and must got into the secure for the next operating.

In the one-way locked gear units, nibs are placed at the entry and exit side of the gear unit. The ends of the nibs shows the direction of rotation of the gear unit. During the motor connection and motor-operating with the help of magnetic field, the gear unit must be operated just at the direction of rotation.



3. UNIT

ASSEMBLY INSTRUCTIONS; PREPARATION, INSTALLATION



DANGER !

In the one-way locked gear units, the gear unit must be operated at the direction of lock rotation, otherwise the damage could be occurred.

Around the mounting position, there must be sured that there are not any materials fused to metal, lubricating tool or elastomers which causes corrosion or will not be emerged.



EXPLOSION !

Maximum surface temperature states gotten measurements in normal setup and usage conditions.

If the usage conditions of gearbox are different from those, surface temperature could up to higher values.

In that case oil circulating cooling unit must be used.



EXPLOSION !

In case of below actions that were taken, the ATEX Certificate will be invalid.

- Different using other than label values based on the gearbox.
- Use in more dangerous area (explosive environment) other than stated level at the label of gearbox.
- Use of gearbox in the area whose equipment class is I. (quarries under dangerous originated by fire-damp).
- Use of gearbox at different forces apart from gotten one.
- Changing of assembly position.



3.2 Critical Applications

The performance given in the catalogue correspond to mounting position M1 or similar, ie. when the first stage is not entirely immersed in oil.

For other mounting positions and/or particular input speeds, refer to the tables that highlight different critical situations for each size of reduction unit. It is also necessary to take due consideration of and carefully assess the following applications by calling our Technical Service:

- As a speed increasing.
- Use in services that could be hazardous for people if the reduction unit fails.
- Applications with especially high inertia.
- Use as a lifting winch.
- Applications with high dynamic strain on the case of the reduction unit.
- In places with T° under -5°C or over 40°C.
- Use in chemically aggressive environments.
- Use in a salty environment.
- Mounting positions not envisaged in the catalogue.
- Use in radioactive environments.
- Use in environments pressures other than atmospheric pressure.
- Avoid applications where even partial immersion of the reduction unit is required.

The maximum torque;

(*) that the gear reducer can support must not exceed two times the nominal torque ($f_B=1$) stated in the performance tables.

(*) intended for momentary overloads due to starting at full load, braking, shocks or other causes, particularly those that are dynamic.a

Table 8: Critical Applications (Speed Control **A / F**)

A / F	202	202 G	252 253	301 302 303	351 352 353	401 402 403	501 502 503	601 602 603	701 702 703	902 903
M4: $1500 < n_1 < 3000$	P	P	-	-	-	-	-	-	P	P
$n_1 > 3000$	X	X	P	P	P	P	P	P	X	X
M2	P	P	P	P	P	P	P	P	P	P

Table 9: Critical Applications (Speed Control **D / M**)

D / M	302 303	352 353	402 403	502 503	602 603	702 703	902 903
$2000 < n_1 < 3000$	-	-	-	-	-	-	-
M2	P	P	P	P	P	P	P
$n_1 > 3000$	P	P	P	P	P	P	P
... L : M2 - M4	P	P	P	P	P	P	P

Table 10: Critical Applications (Speed Control **K**)

K	35390	40390	50390	60390	70390	90390	100390
$2000 < n_1 < 3000$	-	-	-	P	P	P	P
M2	P	P	P	P	P	P	P
$n_1 > 3000$	P	P	P	P	X	X	X
... L : M5 - M6	P	P	P	P	P	P	P

A : Application not recommended.

B : Check the application and/or call our Technical Service.



3.3 Gear Unit Mounting

Pay special attention to the installation conditions as these are the principal cause of damage and downtime. When choosing the motor, consider the mounting position and presence, below the motor itself, of parts, things or materials which may be damaged by oil leaks, however limited in amount. Choosing the right mounting position can eliminate many problems. It is often sufficient to place a guard under the drive to ensure operation in optimal safety.



ATTENTION !

The unit can only be mounted in the operating position indicated on the nameplate: a different operating position must be authorised by NRW.

Before the commissioning of the unit, carry out the following operations:

- Check the nameplate data of the unit and/or electric motor.
- Make sure the equipment supplied corresponds to the equipment ordered.
- Fixing to the structure of the machine must be stable, vibration-free. The structure shall not be subject to torsional movements, must ensure a continuity of transmission of any electrical and electrostatic discharges. Otherwise provide a grounding system, via a cable securely attached to the mounting areas, making sure to remove any paint in the contact area and using conductors of adequate cross section.
- For fixing use the fixing screws of minimum 8.8 quality and be careful not to buckle the casings due to improper fixing, making sure that the support surface is coplanar to the fixing surface.
- Do not install the unit in mounting positions other than those stated in the order, since different positions provide different positions of the loading, unloading and oil level plugs, in addition to a different amount of lubricant, if indicated/present.
- Check the position of the level plug. If the casing is provided with a hole with closed plug symmetric with respect to the level plug itself, if necessary, for level visibility, reverse their positions. Check the accessibility to oil loading/unloading plugs.
- Check, if possible, the correct quantity of oil, according to the operating position required. If the oil level of the unit is restored, do it according to the plug diagram and use oil of the same type indicated on the label.
- Replace, if any, the closing plug with the vent plug provided in the supplied kit, in the suitable operating position indicated in the relevant drawings.
- Check for any leakage of lubricant.
- Eliminate, if possible, any traces of dirt, from the shafts and from the areas around the sealing rings.
- Lubricate the contact surfaces to prevent oxidation or seizure.
- Check the static seals and the bolted joints.
- Do not install the unit in an environment with fumes or abrasive and/or corrosive dust.
- Do not install the unit in direct contact with food products in bulk. Occasional contact with foodstuff is allowed only with series SWFX gearmotors.
- Install all the protections designed for the rotary organs so as to ensure the system safety according to the current rules.
- Check the correct rotation direction of the output shaft of the unit.
- In case of shaft mounting configuration it is recommended to use the torque arms that can be supplied by NRW, specially designed.
- Ensure proper cooling of the motor through a good flow of air from the fan side.
- Avoid solar radiation or other heat sources, the cooling air temperature must never exceed 40°C.
- Check that the assembly of the various parts (pulleys, sprockets, couplings, etc.) on shafts is performed by using the proper threaded holes or any other systems able to ensure a correct operation without risking damage to the bearings or the outer parts of the units.
- To prevent overloading of machine equipment which gearbox is connected, supply of extreme current breaker, temperature delimeter, extreme speed monitors etc. equipments by end user is required.
- During operation of urgent stopping system, accumulated energy should be swiftly and securely be distributed or would be isolated the way that no danger is created. Distribution of accumulated energy is related with system connected to the gearbox. Necessary precautions must be taken at those systems.

For the operating fields with temperatures below 0°C, please consider the following;

- The motors must be suitable for operation with the expected ambient temperature:
- The electric motor power must be adjusted when exceeding the higher starting torques required.



EXPLOSION !

Additional procedures for ATEX units:

- Check all nameplate data to ensure they are consistent with the application: group, category, area, maximum surface temperature, P1, n1 and M2 maximum limits, installation position, ambient temperature.
- Check for the absence of solar radiation or other heat sources.
- In case of expected ambient temperatures $< -20^{\circ}\text{C}$ or $> 40^{\circ}\text{C}$ contact in advance the Technical Service by NRW.
- Check there are no fumes or abrasive and/or corrosive dust.
- Make sure not to be in close proximity to sources of ultrasound and/or ionizing radiation.
- Check that the facility has adequate protection from lightning fall.
- Check for any leakage of lubricant (if detected, stop the installation and consult the Technical Service by NRW).
- Eliminate any traces of dirt from the shafts and from the areas around the oil seal, using materials that do not generate electrostatic charges.
- Check that the environment has been cleared from the presence of a potentially explosive atmosphere, and that such a condition is maintained for the whole duration of the installation.
- Check that the components connected to the unit at both the input and output are ATEX approved.
- Use the torque arms that can be supplied.
- Ensure proper cooling of the motor through a good flow of air from the fan side; check that there are no obstructions or covers preventing the cooling of the unit.
- Check the accessibility to the warning light (or dipstick) for oil level check.
- Install the unit and connect to appropriate intervention system, any sensor thermal protection, supplied separately and when provided for. Specific instructions are given in the Annex to the manual.



EXPLOSION !

- It is vital to determine surface temperature of unit during operation under conditions provided by implementation. Observation should be repeated periodically as shown at "CONTROL and MAINTENANCE" table.
- The surface temperature must be measured around intake of action or in the connection area between motor and unit and in any case should be at a place where airstream is lesser.
- The difference between measured surface temperature (T_s) plus allowed maximum ambient temperature (T_{am}) and measured ambient temperature (T_a) would be at least 10°C lower than allowed maximum surface temperature. (T_c , stated at label):
 $T_s + (T_{am} - T_a) < T_c - 10^{\circ}\text{C}$

Please stop operation of gearbox at improper temperatures and be consult to NRW Technical Service.



3. UNIT

ASSEMBLY INSTRUCTIONS; PREPARATION, INSTALLATION

3.4 Bolt Tightening Torque Value

Table 11: Bolt Tightening Moments

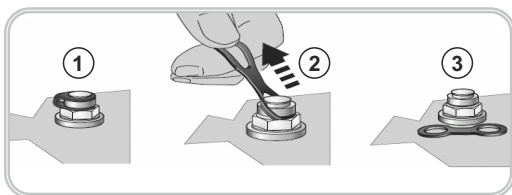
Bolt Tightening Moments [Nm]						
Dimensions	Bolt Quality			Cover Bolts	Coupling Bolts	Protective Cover Connection Bolts
	8.8	10.9	12.9			
M4	3.2	5	6	-	-	-
M5	6.4	9	11	-	2	-
M6	11	16	19	-	-	6.4
M8	27	39	46	11	10	11
M10	53	78	91	11	17	27
M12	92	135	155	27	40	53
M16	230	335	390	35	-	92
M20	460	660	770	-	-	230
M24	790	1150	1300	80	-	460
M30	1600	2250	2650	170	-	-
M36	2780	3910	4710	-	-	1600
M42	4470	6290	7540	-	-	-
M48	6140	8640	16610	-	-	-
M56	9840	13850	24130	-	-	-
G½	-	-	-	75	-	-
G¾	-	-	-	110	-	-
G1	-	-	-	190	-	-
G1¼	-	-	-	240	-	-
G1½	-	-	-	300	-	-

3.5 Gear Unit Ventilation

In moist places or in open air usage, the gear unit which is resistant to corrosion is recommended. The damages in paint (in ventilation plug) must soon be corrected.

The carrying safety of the ventilation plug on the gear unit is to be remove. If ventilation plug was sent seperately, it has to be inserted.

Figure 5: Activation of Vent Plug



1. The carrying secured ventilation plug,
2. Remove the carrying safety,
3. The ventilation safety is active.



3.6 Temperature Sticker



EXPLOSION !

Explosion hazard: due to lack of labelling.

Failure to comply may cause severe, or even fatal injuries.

With temperature class **T4** gear units or gear units with a maximum surface temperature of less than **135 °C**, the supplied self-adhesive temperature sticker (printed with value **121 °C**) must be affixed to the gear unit housing.

The temperature class or the maximum surface temperature can be seen from the ATEX labelling in the last line of the type plate.

Examples: II 2G c IIC T4 X or II 3D 125 °C X

The temperature sticker must be affixed next to the oil level screw and (please see chapter 4.12 "Temperature Measurement" page 39-40) towards the motor. For gear units with an oil level vessel, the temperature sticker must be affixed in the same position as for gear units without an oil level vessel. For gear units which are lubricated for life, without oil maintenance, the temperature sticker should be affixed next to the type plate.

Figure 6: Temperature Sticker (A / F)

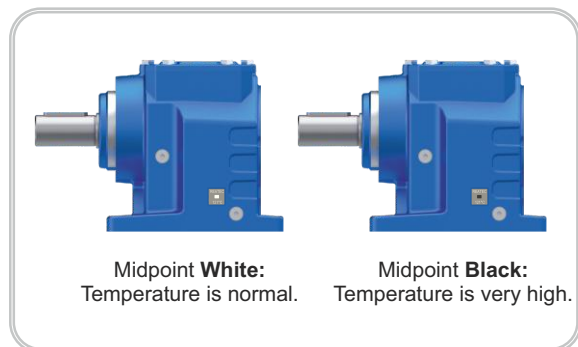


Figure 7: Temperature Sticker (F)

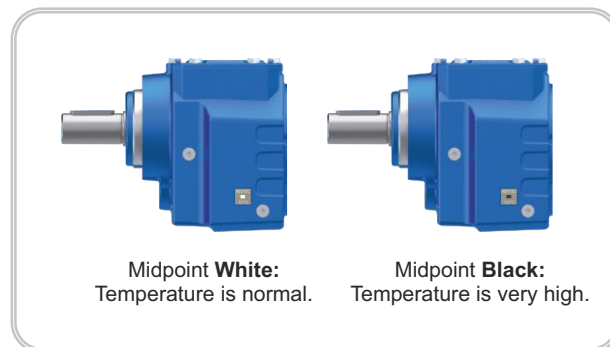


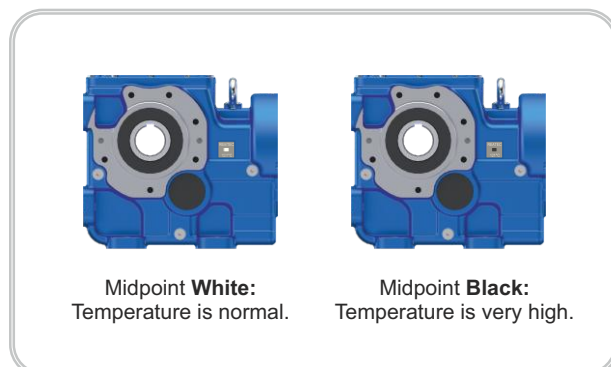
Figure 8: Temperature Sticker (D)



Figure 9: Temperature Sticker (M)



Figure 10: Temperature Sticker (K)





3. UNIT

ASSEMBLY INSTRUCTIONS; PREPARATION, INSTALLATION

3.6.1 Visual Inspection of the Temperature Sticker



EXPLOSION !

Explosion hazard: Failure to comply is likely to cause severe or even fatal injuries.

- Check whether the temperature sticker has turned black.
- If the temperature sticker has turned black, the gear unit has become too hot.

The cause of overheating must be established. Please contact the NRW service department immediately. The drive unit must not resume operation before the cause of overheating has been remedied and renewed overheating can be ruled out. Before putting into operation again, a new temperature-sensitive adhesive label must be attached to the gear unit. Remove dust (only necessary for category 2D)



EXPLOSION !

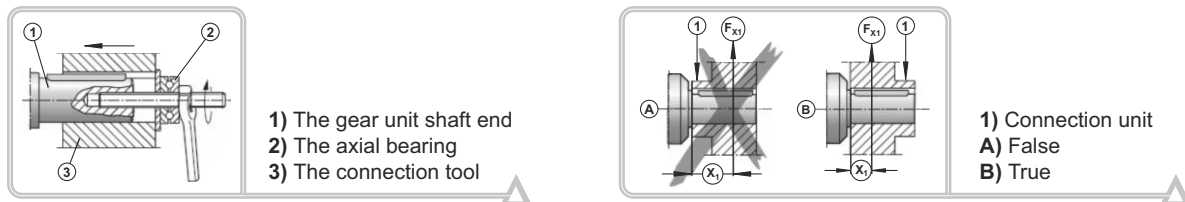
Explosion hazard: Failure to comply is likely to cause severe or even fatal injuries.

- Dust deposits on the gear unit housing must be removed if they are more than 5 mm thick.

3.7 The Mountage of the Connection Tool to the Output Shaft

For the mountage of the output shaft tools look at the schema below.

Figure 11: The Mountage of the Connection Tool to the Output Shaft



* To prevent high radial forces: the gear and sprocket must be mounted as seen in shape B.

For the mounting of the connection tools only pulling device must be used. For the position adjustment the bearing strip which is at output shaft end must be used.



NOTE !

The belt and pulleys, couplings, gears and etc. Must not be installed with hammering to the shaft end. Otherwise there could be a damage in body, bearings and shaft. In belt and pulleys, the rightness of the belt voltage must be paid attention. (suitable to the producer's data). For the not emerging of disallowed radial and axial forces, balance adjustment of the connection tool must be made.



NOTE !

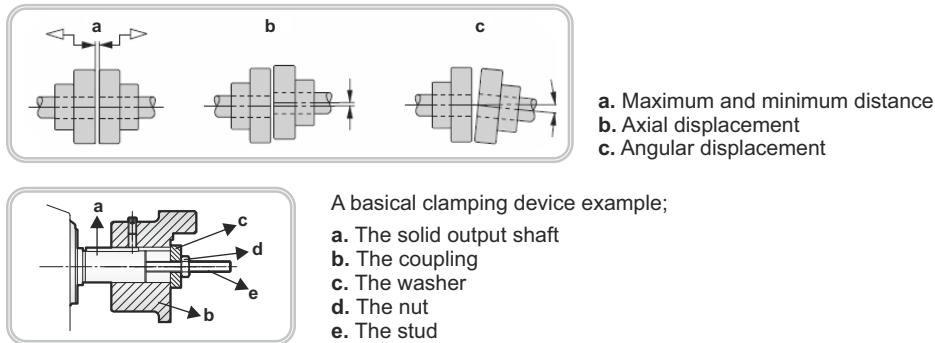
With smearing a little amount of grease or heating the connection tool in a short-time (80....100 °C), the mounting easiness may be provided.



3.8 The Mountage of the Couplings

While the couplings are mounting, it's balances must be made suitable to the datas of the producers. Must be implemented with suitable clamping device. Before mounting with the smearing of corrosion oil material to the solid output shaft/hollow shaft, mounting and demounting processes may be easened.

Figure 12: The Mountage of the Coupling



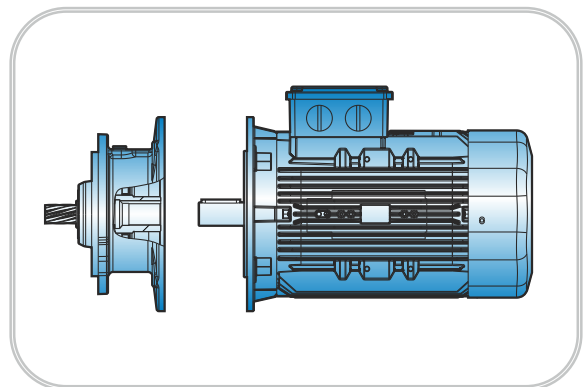
ATTENTION !

The belt-pulley, chain and gear drives must be protected from the contact of the external effects.

3.9 The Mountage of the Standard B5 Motor to the PAM Gear Unit

1. The motor and the solid output shaft of the motor with PAM adapted, flange surfaces must be cleaned and damage control must be made. The sizes and tolerances of the motor fixing elements must be suitable to EN 60079-0.
2. Must be pushed till to stand to the block of motor solid output shaft.
3. If the mountage is to be done in open air and the environment is wet, it is recommended that the surfaces of the motor flange and PAM adaptor have to be isolated. Before and after the motor mounting, in the shape of flange is isolated, loctite 574 or loxeal 58-14 surface isolation material should be used to flange surfaces.
4. The motor, must be installed to PAM adaptor.
5. The bolt of the PAM adaptor has to be mounted with suitable tightening moment.

Figure 13: The Mountage of the Standard B5 Motor to the PAM Gear Unit



EXPLOSION !

- If all controls that were stated above are positive and all instructions were performed completely/properly, electric motor could be set up with ATEX protection that is suitable to the gearbox and in the same way 2014/34/EU regulation adaptable a gearbox motor could be generated.

Although during the connection of motor and gearbox, in the use of a process which is not stated in this handbox and/or not follow a single or more instructions, the operator should calculate analysis and must define by himself that the risk could emerge from motor-gearbox connection. In the situation of gearbox would be feeding motor, this risk analysis will always be required.

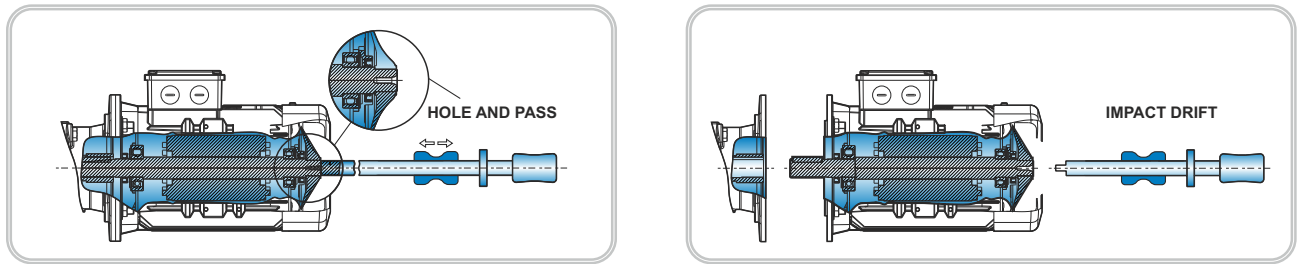
Only just in this manner, complete system would be subject to both certificate of manufacturer and 2014/34/EU regulation adaptable gearbox.



3.10 The Demountage of the Electrical Motor (PAM)

During the operating, it is crucial that the surface of the connection tool between the motor and gear unit is not rusted, for the removal of the motor not to exercise excessive load is necessary. During the separation of motor from the gear unit without forcing, the method at the below must be implemented. Must be avoided the implementations that causes strain and harm to the gear unit.

Figure 14: The Demountage of the Electrical Motor (PAM)



1. By fan with drilling the motor solid output shaft, the thread cutting must be opened.
2. The impact drift has to be installed to the threaded place.
3. The connection screws between the motor and gear unit must be removed.
4. By the help of impact drift inertial force, the motor must be separated from the gear unit.

The use of slots in the body of PAM, with the help of screwdriver or lever in a way that the motor is not harmed, may be removed by pushing back.



3.11 Gear Unit Operating

Before starting up the machine incorporating the unit make sure that:

- The machine is compliant with Machinery Directive 2006/42/EC, in addition to any other safety regulations in force.
- It is compliant with regulations EN 60204-1 and EN 60079-0.
- The voltage corresponds to the expected one.
- The facility complies with all applicable standards on safety and health of people at the workplace.

Moreover;

- Check for correct amount of oil through the appropriate level indicator, or dipstick, if any. In life lubricated units, without the level control, the right quantity of oil is ensured by Motovario. If the gear reducers are supplied without oil, fill them up with the quantity and type of oil indicated on the proper label on the gear reducer. Fill in the label. If topping up is necessary, use the same brand and type of lubricant as the one already used. Use Motovario approved lubricants.
- Make sure that the vent plug is free from obstructions.
- The start-up should be done in a gradual manner, avoiding the immediate application of the maximum load the machine can bear, in order to check for the absence of operating failures or residual application criticality.
- During start-up, to allow the oil to spread and reach optimum temperature and viscosity, it is advisable to make the device run with no load for some minutes.
- During the first hour of operation check for any anomalous vibrations and noises or overheating. If necessary stop immediately the motor and contact the Technical Service. After stopping the motor, wait 30' before disassembly.

EXPLOSION !

Additional procedures for ATEX units:

- Check the level of external cleaning of the units, especially in the areas most affected by cooling.
 - Check for leaks of lubricant, especially in areas of the sealing rings.
 - To clean, use materials that do not generate electrostatic discharges.
 - Check for correct amount of oil through the appropriate level indicator, or dipstick, if any. In life lubricated units, without the level control (ATEX 3GD), the right quantity of oil is ensured by NRW. Should it be necessary to top up with lubricant follow the instructions on section 6. LUBRICATION.
 - In case of any abnormal noise and vibration, or high overheating, immediately stop the motor and contact the Technical Service by NRW.
 - It is recommended to run in the unit at reduced load (approx. max. 40% of nominal) for 24 hours. In the running-in phase the unit is subject, for a short time, to condition of internal friction, and therefore temperature, higher than the usual ones, but still compatible with the specified limits. It is normal during this phase to detect a small release of grease from the oil seals.
- PLEASE NOTE !** In the event of prolonged storage at low temperature it is necessary to bring the oil to the normal fluidity with a gradual dry start. Only after bringing the surface of the unit to at least 10 °C, proceed, necessarily, to the above-mentioned running in phase.
- After about 3 hours of operation at full load, it is necessary to measure the surface temperature as indicated in section SURFACE TEMPERATURE. In the event that the rating value is exceeded, immediately shut off the motor and contact the Technical Service by NRW.
 - In case of need, after stopping the motor, wait 30' before disassembly.



ATTENTION !

The temperature data on the nameplate indicate maximum admissible values on the unit, referring to the ambient temperature between -20 °C and +40 °C: operation is not allowed at different ambient temperatures.
If necessary contact the Technical Service.





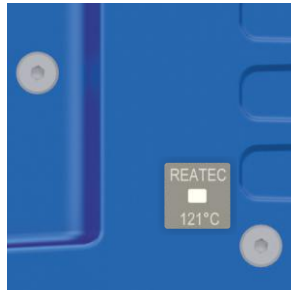
3. UNIT

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EXPLOSION !



Use of sticky heat sensitive detectors (if available), surface temperature could also be detected by using sticky indicators. Those could be provided for private branches or optional.



Midpoint **White**:
Temperature is normal.



Midpoint **Black**:
Temperature is very high.

EXPLOSION !



Thermal protector (when present);

It is a PTC probe (see Figure 15) with a trigger temperature of 120°C.

The customer shall perform the electric connection to the main electric panel to ensure the resistance thermometer correct operation regardless of the connections necessary for the system operation.

The connection must apply the positive safety logic.

Main powerboard, connections and logic must, taken together, provide a locking system to prevent, in the event of a shutdown, the unwanted start-up of the device.

In case of intervention of the PTC probe, wait about 10 min. before resetting the main powerboard.

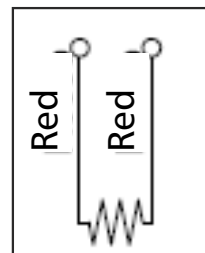
Figure 15: PTC Probe



Unit Electric Characteristics

Power to sensor	< 280 mW
Voltage to sensor	< 30 Vdc
Current to sensor	< 8 mA

Connection:



ATTENTION !



Do not use the unit:

- In an environment with fumes or abrasive and/or corrosive dust;
- In direct contact with food products in bulk.

Dangerous zone,

The dangerous area of the unit is the rotating shaft extension where any person could be subject to mechanical risks from direct contact (cutting, dragging, crushing).

Make the machine compliant with DIRECTIVE 2006/42/EC providing a safety guard when the unit works in accessible zones.



4.1 Control and Periodic Maintenance

	<p>NOTE !</p> <p>The maintenance and periodic maintenance works are performed by qualified person/ operator who is well-educated and is sufficient in electric and mechanic issues; the rules convenient to job health and safety and specific environmental problems are performed as protected.</p>
	<p>DANGER !</p> <p>Before the start of the maintenance work of the gear unit, gear unit should be closed at first (get into the voltage-free position), be sure service-free, needed to take measures against any accident or spinning items with the help of unexpected external load. Also all environmental safety precautions must be taken.</p>

The precise machining of the unit's internal components ensures correct operation with minimum maintenance. In general the following rules are valid:

- Periodic check of the unit external cleaning, especially in the areas more involved in the cooling process.
- Periodic check of any leaks of lubricant, especially in the areas of the sealing rings.
- Check and cleaning of the breather plug hole. For the products non-lubricated for life, check periodically by means of the specific level indicators the correct quantity of lubricant. If topping up is necessary, use the same brand and type of lubricant as the one already used, or in any case compatible with it.
- Use oils and greases recommended by NRW. (see. **6.3 Lubrication Table**, page 55)
- During an oil change (products non-lubricated for life) follow the above mentioned recommendations.

Do not hesitate to replace unreliable components. Replace worn parts only with original spare parts. Using non-original spare parts can compromise the operation of the unit, and also voids the warranty. If you require spare parts, follow the instructions given in the spare parts section for the unit in question.

Keep the unit in good running order with periodic checks of vibration and noise, absorption and tension, wear of friction surfaces, lubricant leaks, gaskets, bolted gaskets for wear, deformation and corrosion and restore them as necessary; keep the unit clean of dust and process residue (do not use solvents or other products incompatible with the materials of construction, and do not direct high pressure jets of water directly at the unit).

For the units used in aggressive environments and food industries:

In the event of accidentally damaging the paint, restore it as soon as possible by using the repair kit available on request. Following the above mentioned rules ensures the operation of the unit and the provided safety level.

Control and Periodic Maintenance Board

Table 12: Control and Periodic Maintenance Board

Frequency	Object	Check	Operation
Weekly	Vent Plug.	Obstruction Due to the Presence of Dust. For the Positions of the Plugs Please Refer to the Operating Positions.	Release the Vent Plug.
1000h/5 months	Oil.	Level.	Topping up.
	Sealing Rings, Gaskets and Plugs.	Oil leaks and ageing.	Replacement.
	Torque Arm and Rubber Buffer.	Ageing.	Replacement.
4000h/3 years	Mineral Oil, (gear reducers non-lubricated "for life").	None.	Replacement.
8000h/6 years	Synthetic Oil, (gear reducers non-lubricated "for life").	None.	Replacement.



EXPLOSION !

Atex Certified Products

Frequency, type of checks and related operations are shown in Table Maintenance Checks And Operations. Their respect is essential for the maintenance of the ATEX certification. All operations involving replacement of components must be reported in the "REDUCER MAINTENANCE SHEET" (enclosed with the reducer), filling in all the fields provided.

Observe the following precautions:

- On units equipped with cover plate for any reason not to remove the said cover.
- All operations involving the removal of covers and/or flanges should be made by experts from the Technical Centres by NRW authorized to Atex maintenance.
- Always use official Motovario spare parts. For the request of the components, follow the instructions given in the spare parts section of the specific unit.

In case you need to replace the oil seals be sure to replace only those externally accessible without removing covers and/or flanges. For other oil seals, contact an authorized Technical Service authorized to ATEX maintenance.

Replacement Procedure of External Sealing Rings

Locate the seal to be replaced and proceed as follows:

- Remove the sealing ring taking the utmost care not to cause any kind of damage to the seat and to the shaft (scratches, dents, etc.).
- The new seals which will be mounted should be as same as previous one. Before assembly, the new ring should be greased on the lip (the one with double lip TC also in the space between the two sealing lips) which lip must slide always on a protection if on the shaft there are slots for keyways and/or grooves for elastic rings (e.g., spinner, ...). the grease used must be clean and free of dust, shavings and other impurities, the recommended grease to be used is AGIP-MU EP 2 (For sealing rings with double lip in VITON use the special grease TECNOLUBE BC 101).
- Be careful not to match the position of the lip in the same position of the seal lip just gotten off.
- Never insert any kind of lubricant in the outer area of the oil seal in as it would facilitate the release and make sure that the housing is clean and free of grease.
- Clean the surface of the reducer with materials that do not generate electrostatic discharges.
- After 24-hour check for leaks, in the case of oil leakage contact an authorized Technical Service by NRW authorized for Atex maintenance.



4.2 Visual Inspection

Controlling whether there is any oil leakage exists or not should be made at gearbox.

There must be controlled that if there is oil filled or not in gear unit. Should be controlled that if there is any damage in gear unit's items and whether if the connection spots are rusted.

Also must be controlled that if any cracks could emerge in hose connection lines and in rubber wedges.

Leakproofing likes of dripping of gear unit's oil or dripping of cooling water and in damages and cracks, repair of the gear unit must be provided. Like these situations please get in contact with NRW.

The PAM and W input shaft bearings of the gear unit are the double capped bearings which form interruption. (ZZ or 2RS) These are with the inner ring, form long sealing space. By this way the bearing operates almost frictionlessly. Losses could be minimized and in these bearings the temperature rises could not be seen.

Because of the storage and carrying, before the operation of gear unit and during at first operation, low amount of grease could flow out from bearing, this type of oil leak could not create any technical failure, the safety of gear unit and bearing operation could not be effected.



4.3 Check for Running Noises

The emerge of unusual operation voice or vibrations in gear units could mean damages. In this type of situations, the gear unit must be stopped and overall revision must be made.

4.4 Oil Change Procedure

Bring the reducer to a surface temperature below 40°C before changing the oil: with warm oil, the emptying procedure and the removal of deposits is easier. Take all necessary precautions to avoid burns due to high temperature of the reducer and/or oil.

- In the case of life lubricated units (see. **6.1 Lubrication**, page 53) do not perform any oil change.
- The oil must be of the same type as the one replaced (see. **6.3 Lubrication Table**, page 55) use lubricants approved by NRW. Wanting to change the family is required to run a wash with the same type of oil you going to use.
- Locate the loading and unloading plugs (the loading plug can match the vent plug or the dipstick); place a container of suitable capacity under the reducer at the unloading plug (see. **6.2 Lubricant Fill Quantities**, page 53-54).
- Unscrew the loading and unloading plugs paying attention to progressively reduce any internal overpressure.
- Completely drain the oil and collect it in the underlying container.
- Replace the seal of the unloading plug and tighten it again by applying the appropriate tightening torque (see. **4.5 Oil Plugs Squeezing Torc Chart**, page 36).
- Fill the reducer with new oil until the level reaches the centre line of the indicator plug or the top notch on the dipstick.
- Replace the seal of the loading plug and tighten it again by applying the appropriate tightening torque (see. **4.5 Oil Plugs Squeezing Torc Chart**, page 36).
- After about 30 minutes check the correctness of the level (if necessary, provide to its restoration) and any oil leaks. Clean the surface of the reducer with materials that do not generate electrostatic discharges.
- Dispose of used oil in accordance with current regulations.



NOTE !

In standard helical gear units glassed oil level plug is not available. At this place the oil filling is made from the ventilation plug.

4.5 Oil Plugs Squeezing Torc Chart

Table 13: Oil Plugs Squeezing Torc Chart

Plug	Torc [Nm]
1/4"	7
3/8"	7
1/2"	12

4.6 Change of the Ventilation Plug

In excessive pollution situations, ventilation plug must be dismantled and got cleaned or with aluminum washer, the new ventilation plug must be mounted.



4.7 Change of the Oil Seal and Oil Cover

- The electric connection of motor drive unit must be cut and got into safety for mistakenly re-activation.
- At the time oil seal is changing, the sufficient amount of grease must be found between leakproofing lips and should be paid attention that the surface is not dirty and dusty.
- When the double seal is used, 3/2 of the part which remained between two seal must be filled with grease convenient to the oil type inside the gear unit.
- During the change of the oil seal the proper devices must be used for not to harm the body and shaft.
- During the change of the oil seal and oil filler cup, the original product must be used.

4.8 The Bearing Greases

- To the bearings of motorized gearboxes, greases should be used which are available at the grease table given by our company.
- Our company (NRW) recommends also replacing of grease while changing lubricant at the greased bearings.

4.9 General Overhaul

The gear unit must fully be dismantled and works written below have to be done respectively.

- All parts of the gear unit must be cleaned.
- The damage control must be done to all parts of the gear unit.
- The damaged parts must be changed with original part.
- All roller bearings must be changed.
- If there are, locks must be changed.
- All oil seals and nilos caps must be changed.

All plastic and elastomer parts of the motor coupling must be changed.



NOTE !

The general revision should be made by the qualified personnel with considering the international laws and regulations in the plants which has the required equipments. We recommend that the general revision has to be made at the NRW service.

4.10 The Maintenance of the Motor

Our firm recommends to change the grease in greased bearings.

Before the start of motor maintenance, the operator should closed the unit, must be sured that it is out of service and must taken all the measures against any accident or unexpected load.

- To prevent overheating, if there is, the dust coat on it must be cleaned.
- The bearings must be dismantled, cleaned and greased.
- By 1/3 of bearing, the grease must be used.
- The proper grease must be selected from the oil tables.
- Motor oil seals must be changed.



4.11 Checks and Maintenance Table

4.11.1 Checks Table

Table 14: Checks Table

Frequency (hours of operation/ time of installation)	Object	Check	Possible Intervention
A responsibility of the user, depending on the environmental conditions.	Whole unit.	Thickness of deposits of dust < 2 mm.	Eliminating the dust.
	Breather plug.	Obstruction due to the presence of dust. For the positions of the plugs, please refer to the operating positions.	Release the vent plug.
1 week	Whole unit.	Noise and/or mechanical vibrations.	Change the oil (if not lubricated "for life"), and if the problem persists, stop immediately the unit for general overhaul (1).
	Unit surface.	State of the protection (painting/treatment).	Restore the missing or damaged protection.
1 month	Adhesive thermal sensors (if any) (2).	Surface temperature (colour of the adhesive).	If excessive, compared to what is stated on the label, change the oil (products non-lubricated "for life"), and apply a new sensor. If the problem persists, immediately stop the unit for general overhaul (1).
	Oil level (life lubricated products).	Level: use the appropriate indicator or dipstick / measuring rod. For the positions of the plugs please refer to the operating positions.	Topping up the oil.
	Oil plug indicator (if any).	Functions.	Replacement.
1000 hours/3 months	Unit surface.	Operating temperature. For value and check position (see. 4.12 Temperature Measurement , page 39-40)	If excessive, compared to what is stated on the label, change the oil. If the problem persists, immediately stop the unit for general overhaul (1).
	Sealing rings and plugs externally accessible.	Oil leaks and ageing.	Replacement (see "Procedure for the replacement of external oil sealing rings").
	Sealing rings not externally accessible, seals.	Oil leaks.	Replacing seals and gaskets (1).
	Torque arms (polymer bushings).	Ageing/cracking.	Replacing the bushings.
6 months	Thermal protection (if any).	Functionality of thermal protector and user circuit.	Replacing the thermal protector (2).
1 year	Product data labels.	Readability.	Request for a copy and NRW S.p.A. Technical Service.

4.11.2 Maintenance Table

Table 15: Maintenance Table

Frequency (hours of operation/ time of installation)	Object	Possible Intervention
4000 hours / 3 years	Oil (if mineral and/or Tam <5°C, and/or sudden changes in temperature) gearboxes not lubricated for life.	Replacement.
8000 hours / 5 years	Oil, sealing rings, gaskets and plugs.	Replacement (1)
(8000 F.N.K) hours / *(3) - *(4)	Whole unit	General overhaul (1)



NOTE !

(1) NRW or at an authorised NRW Atex certified Technical Service.

(2) The user is responsible for checking the circuit to which the thermal protector is connected.

* (3) - $F = (fs)^3$, where: $fs = M2_{max} / Mr2$, with:

M2max = maximum transmissible torque, on the product nameplate

Mr2 = required torque to the output shaft; if not known, use the maximum torque of the motor installed

- $N = 1500/n_1$, in the case of the variable-reducer, for the reducer (second element): $n_1 = n_2$ max variator

- k = 1 in case of application areas 1,21 (category 2)

- k = 1.5 in case of application areas 2,22 (category 3)

* (4) in case of coupled products, consider, for the assembly, the closest overhaul date



ATTENTION !

The customer must keep updated and available the documentation on all routine and unscheduled maintenance on:



NOTE !

The general revision should be made by the qualified personnel with considering the international laws and regulations in the plants which has the required equipments. We recommend that the general revision has to be made at the NRW service.

4.12 Temperature Measurement

The details of the ATEX temperature class or the maximum surface temperature are based on normal installation conditions. Even small changes to the installation conditions can have a significant effect on the temperature of the gear unit.



EXPLOSION !

Explosion hazard: Failure to comply may cause severe, or even fatal injuries.

Explosion hazard: Failure to comply may cause severe, or even fatal injuries.
On commissioning, a surface temperature measurement of the gear unit must be made under maximum load. (This does not apply to gear units which are labelled as temperature class **T4** or a maximum surface temperature of **130 °C** in the last line of the type plate.)



For the temperature measurement, a normal temperature measuring device is required, with a measurement range from 0 °C to 130 °C and a precision of at least ± 4 °C and which enables the measurement of the surface temperature and the temperature of the air. Temperature measurement procedure:

1. Allow the gear unit to run at maximum speed under maximum load for approx. 4 hours.
2. Following warm-up, the temperature of the gear unit housing surface "T_{gm}" must be measured close to the temperature indication label.
3. Measure the temperature of the air "T_{um}" in the immediate vicinity of the gear unit.



EXPLOSION !

Explosion hazard: Failure to comply may cause severe, or even fatal injuries. The gear unit must be shut down and NRW must be consulted if any of the following criteria do not apply.

- The measured air temperature "T_{um}" is within the permissible range stated on the type plate;
- The measured temperature of the surface of the gear unit housing "T_{gm}" is below 121 °C and the temperature indication label has not turned black (see Figure 16).
- The measured temperature of the surface of the gear unit housing plus the difference between the highest permissible air temperature "T_u" stated on the type plate and the measured air temperature must be at least 15 °C lower than the maximum permissible surface temperature, i.e.:

ATEX labelling: II 2G Ex h IIC T4 Gb	:	$T_{gm} + T_u - T_{um} < 135 \text{ °C} - 15 \text{ °C}$
ATEX labelling: II 2D Ex h IIC T120°C Db	:	$T_{gm} + T_u - T_{um} < T_{max} - 15 \text{ °C}$
T_{gm} : Measured temperature of the surface of the gear unit housing in °C		
T_{um} : Measured air temperature in °C		
T_{max} : Maximum surface temperature according to gear unit type plate (ATEX labelling) in °C		
T_u : Upper value of the permissible ambient temperature range according to the type plate in °C		



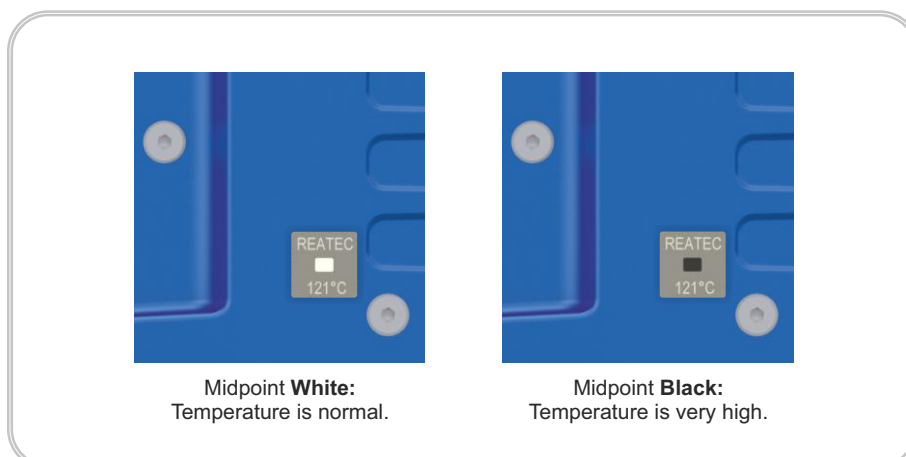
EXPLOSION !

At normal working conditions, surface temperature should be controlled by initial operating.

The temperature must be measured under below conditions:

- Ambient temperature should not be higher than +40 °C.
 - At full load, it should not be operated minimum 4 hour long continuously.
 - There should not be potentially explosive atmosphere.
- * Besides please control that there would not be any abnormal temperature at places which are close to channels,
- * If temperature exceeds **130 °C**, please immediately stop machine and get in contact with NRW.

Figure 16: Temperature Sticker



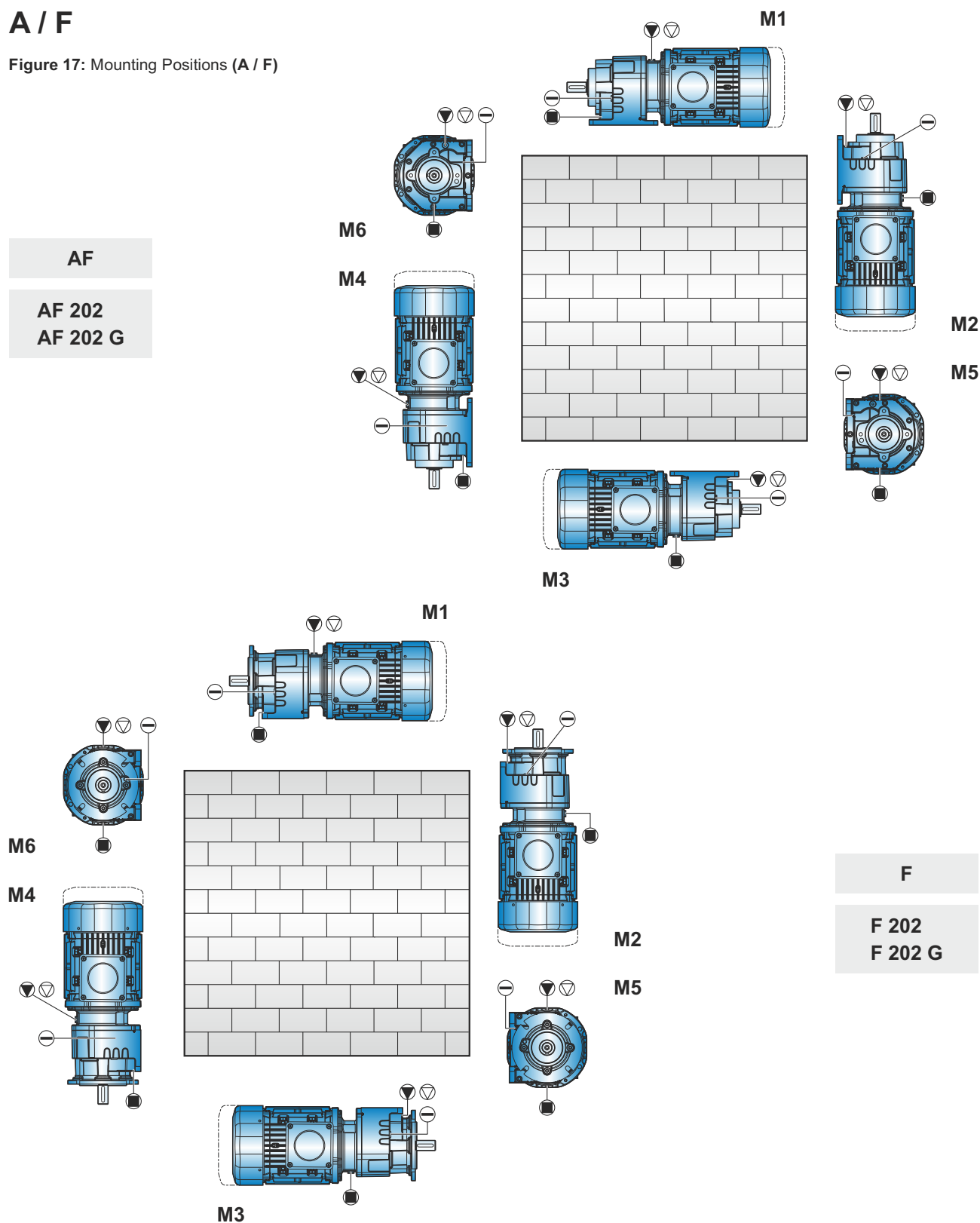


5.1 Mounting Positions

Install the gearbox at the projected mountage position. For the other mountage positions except this one, please consult to our Technical Service.

A / F

Figure 17: Mounting Positions (A / F)



Filling Plug



Vent Plug



Oil Level Plug

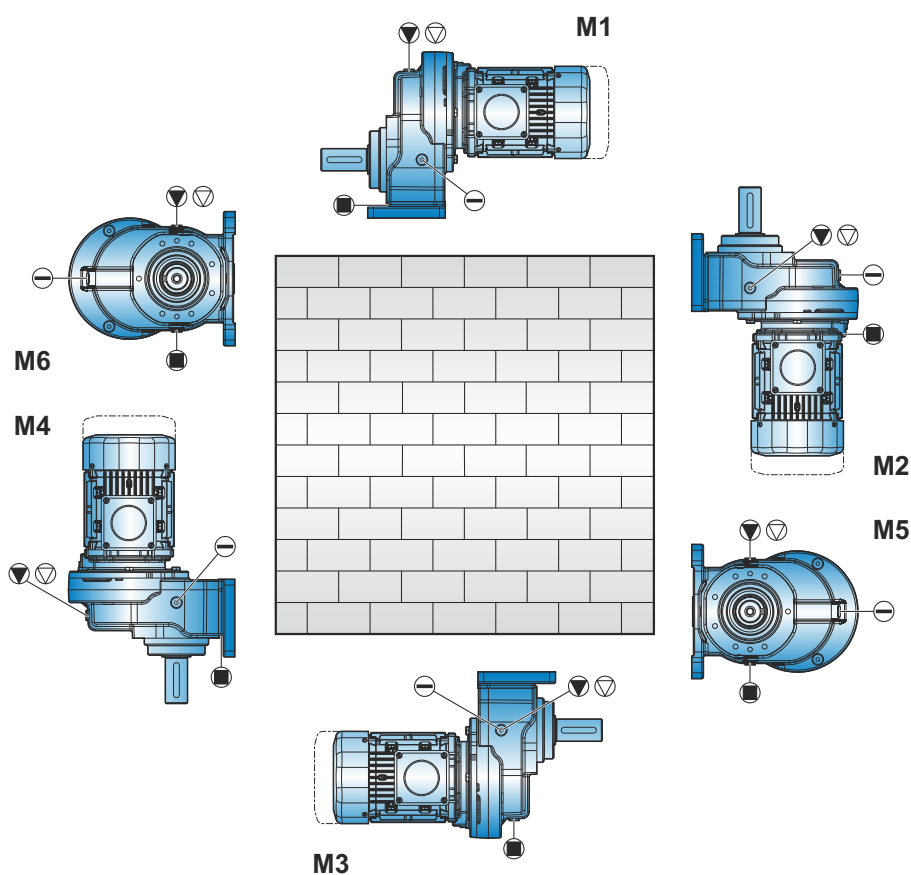
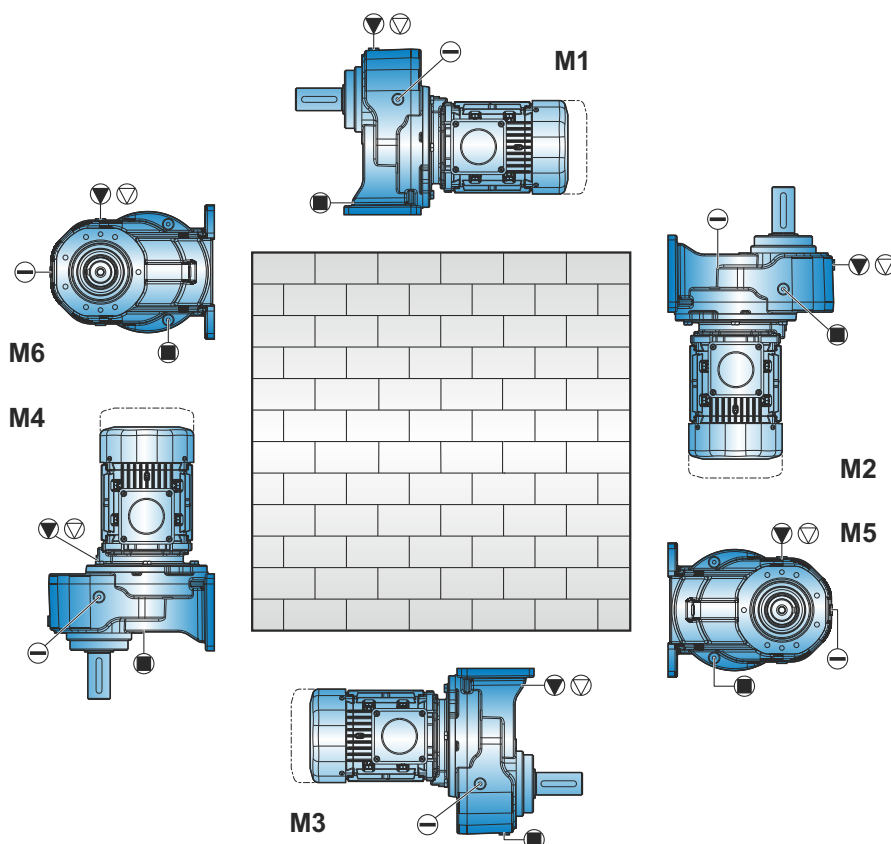


Drain Plug



AF

AF 301
AF 351
AF 401
AF 501
AF 601
AF 701



AF - M

AF - M 301
AF - M 351
AF - M 401
AF - M 501
AF - M 601
AF - M 701



Filling Plug



Vent Plug



Oil Level Plug

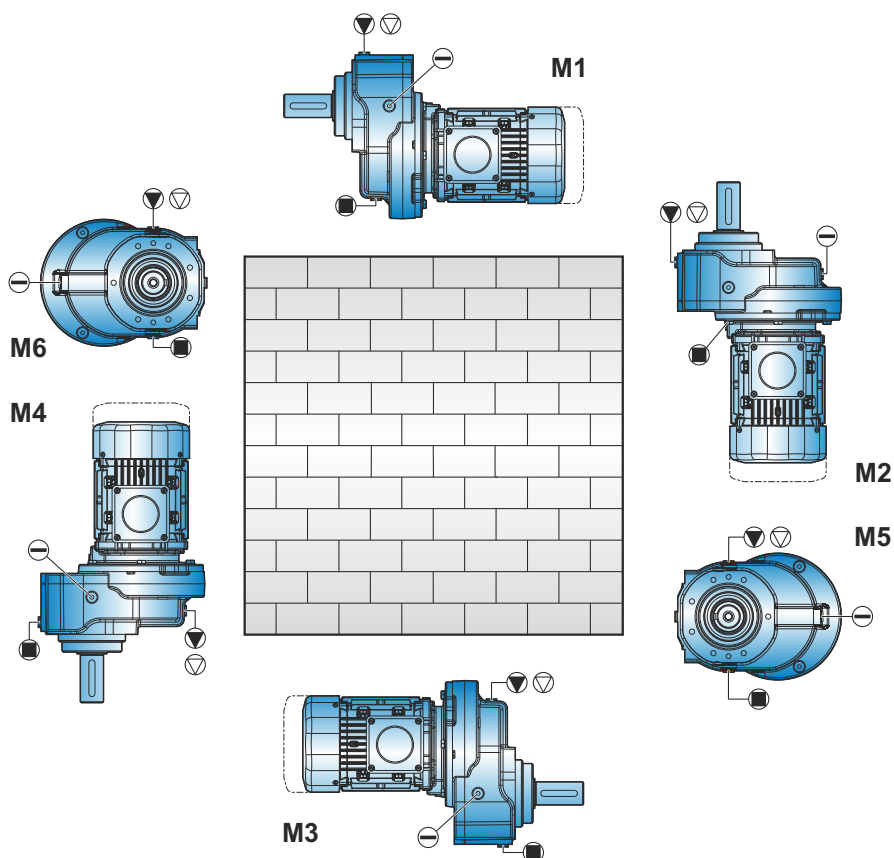


Drain Plug



F

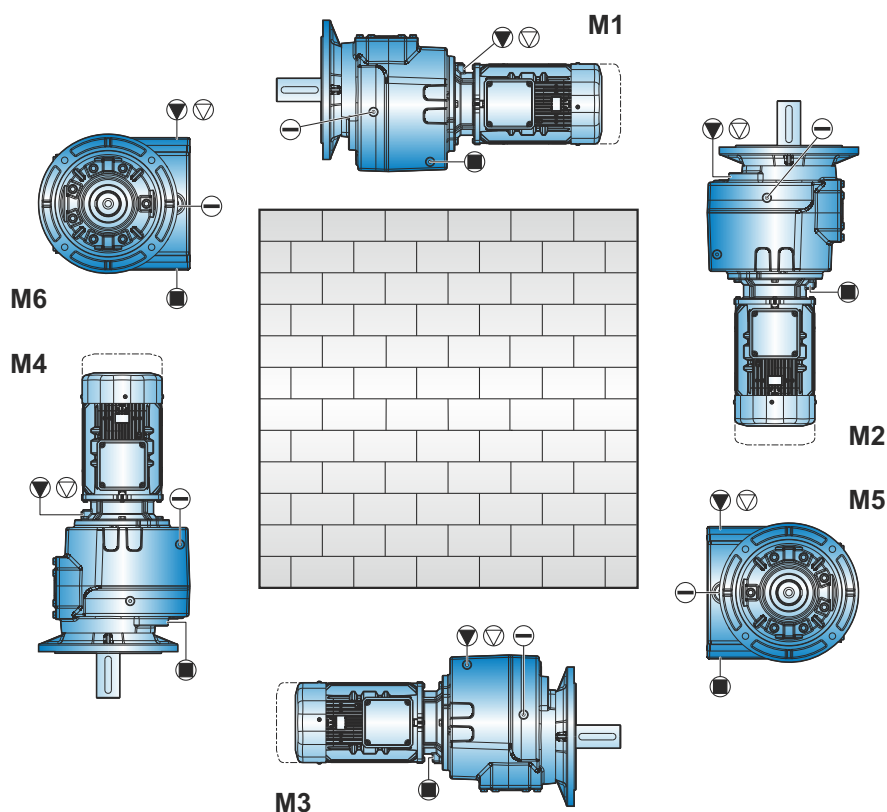
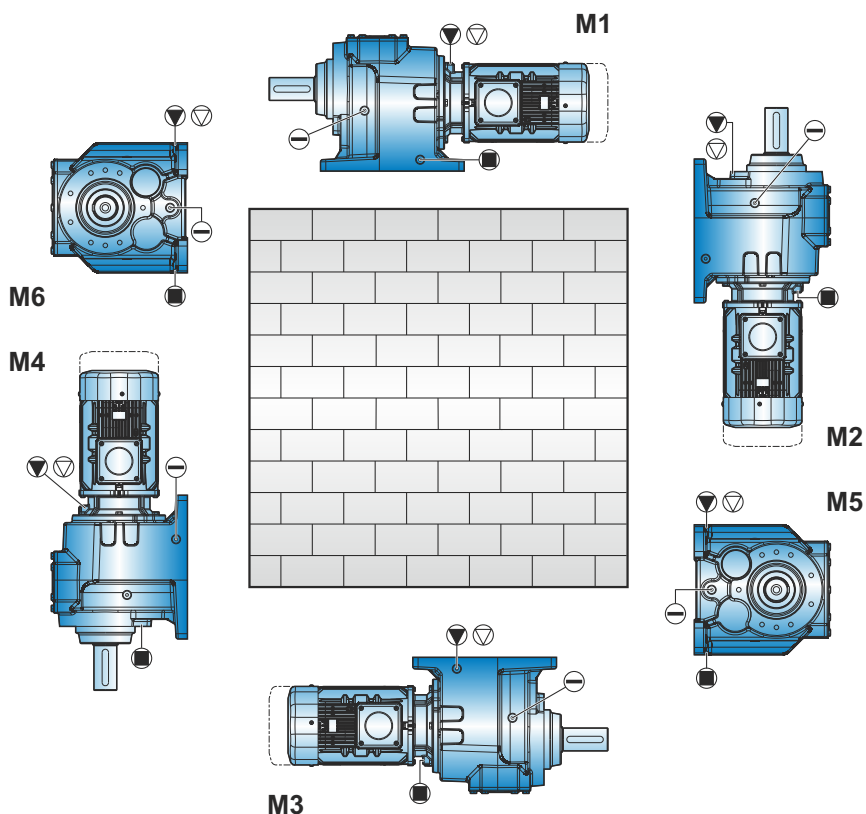
F 301
F 351
F 401
F 501
F 601
F 701





A - AF

AF 252 - 253
AF 302 - 303
AF 352 - 353
AF 402 - 403
AF 502 - 503
AF 602 - 603
AF 702 - 703
AF 902 - 903



F

F 252 - 253
F 302 - 303
F 352 - 353
F 402 - 403
F 502 - 503
F 602 - 603
F 702 - 703
F 902 - 903



Filling Plug



Vent Plug



Oil Level Plug

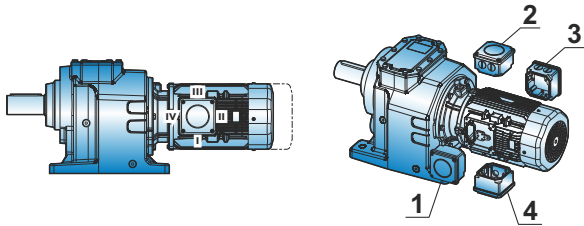
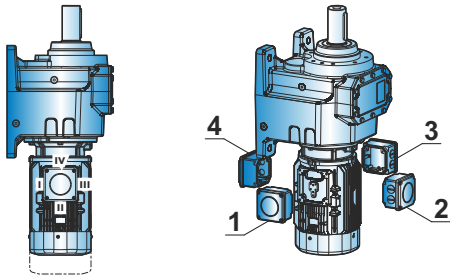
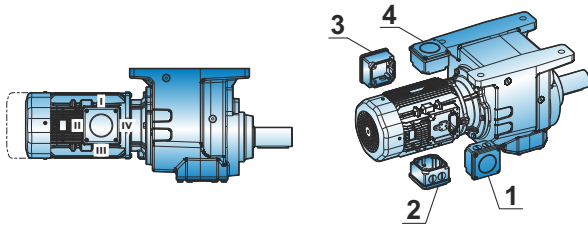
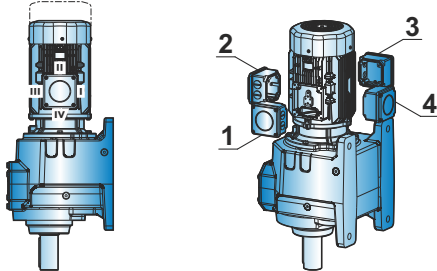
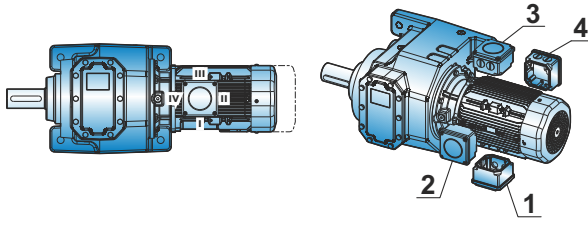
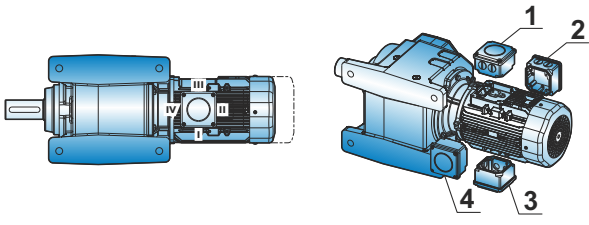


Drain Plug



5.2 Terminal Box and Cable Entrance Sides (A / F)

Table 16: Terminal Box and Cable Entrance Sides (A / F)

A/F	
M1 	M2 
M3 	M4 
M5 	M6 

* 1 - 2 - 3 - 4 : Shows terminal box position.

* I - II - III - IV: Shows cable entry position.

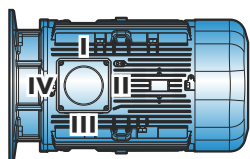


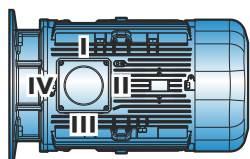


Table 17: Terminal Box and Cable Entrance Sides (F)

F	
<p>M1</p>	<p>M2</p>
<p>M3</p>	<p>M4</p>
<p>M5</p>	<p>M6</p>

* 1 - 2 - 3 - 4 : Shows terminal box position.

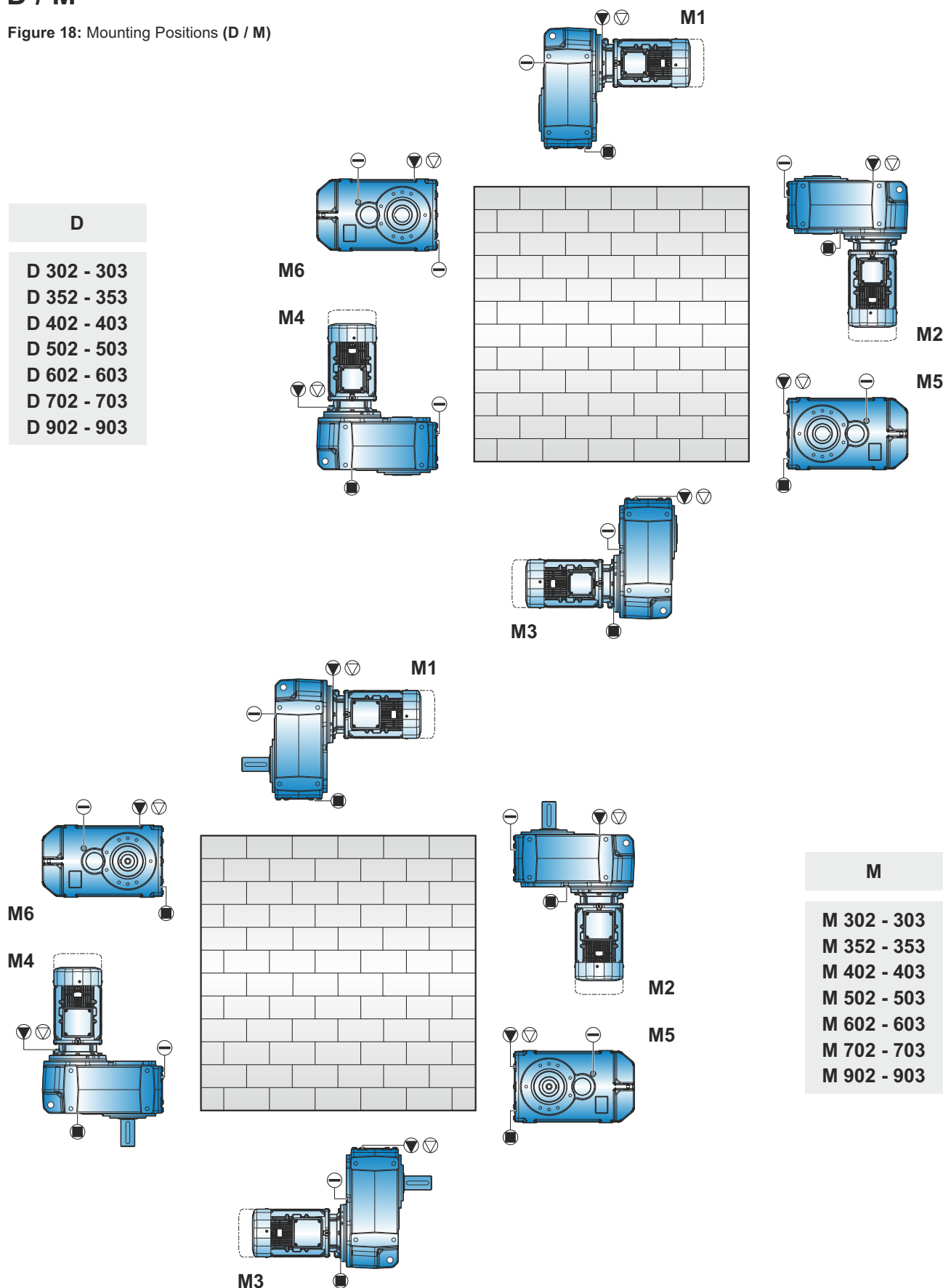
* I - II - III - IV: Shows cable entry position.





D / M

Figure 18: Mounting Positions (D / M)





D / M

Table 18: Terminal Box and Cable Entrance Sides (D)

D	
<p>M1</p>	<p>M2</p>
<p>M3</p>	<p>M4</p>
<p>M5</p>	<p>M6</p>

* 1 - 2 - 3 - 4 : Shows terminal box position.

* I - II - III - IV: Shows cable entry position.

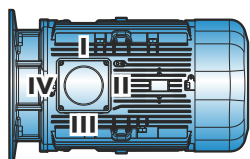
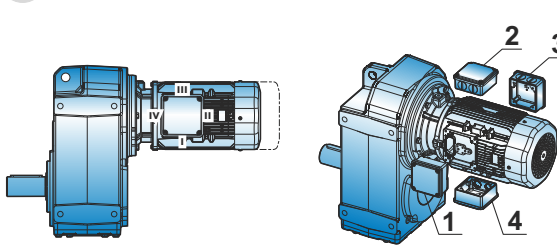
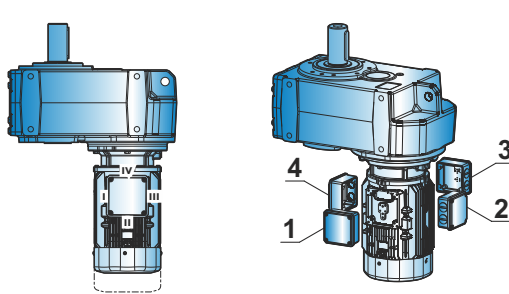
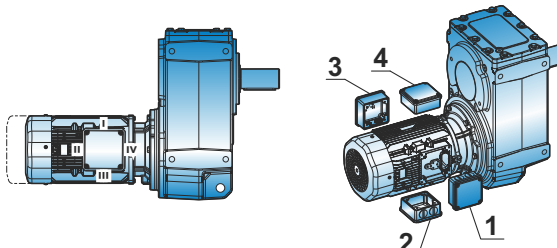
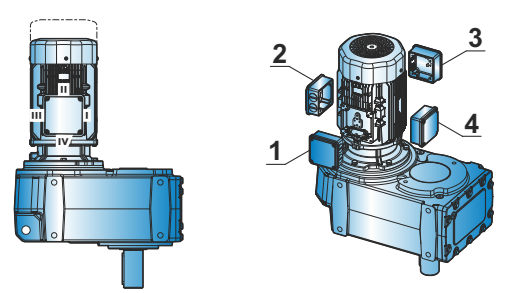
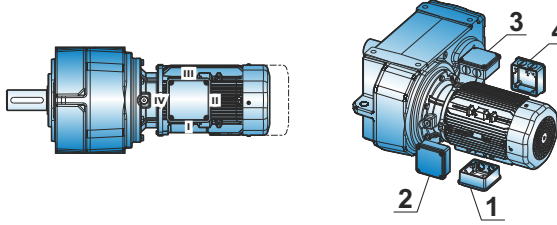
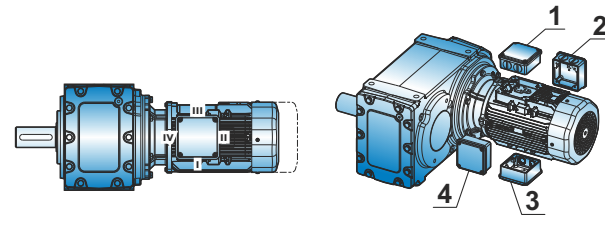


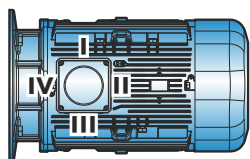


Table 19: Terminal Box and Cable Entrance Sides (M)

M	
<p>M1</p> 	<p>M2</p> 
<p>M3</p> 	<p>M4</p> 
<p>M5</p> 	<p>M6</p> 

* 1 - 2 - 3 - 4 : Shows terminal box position.

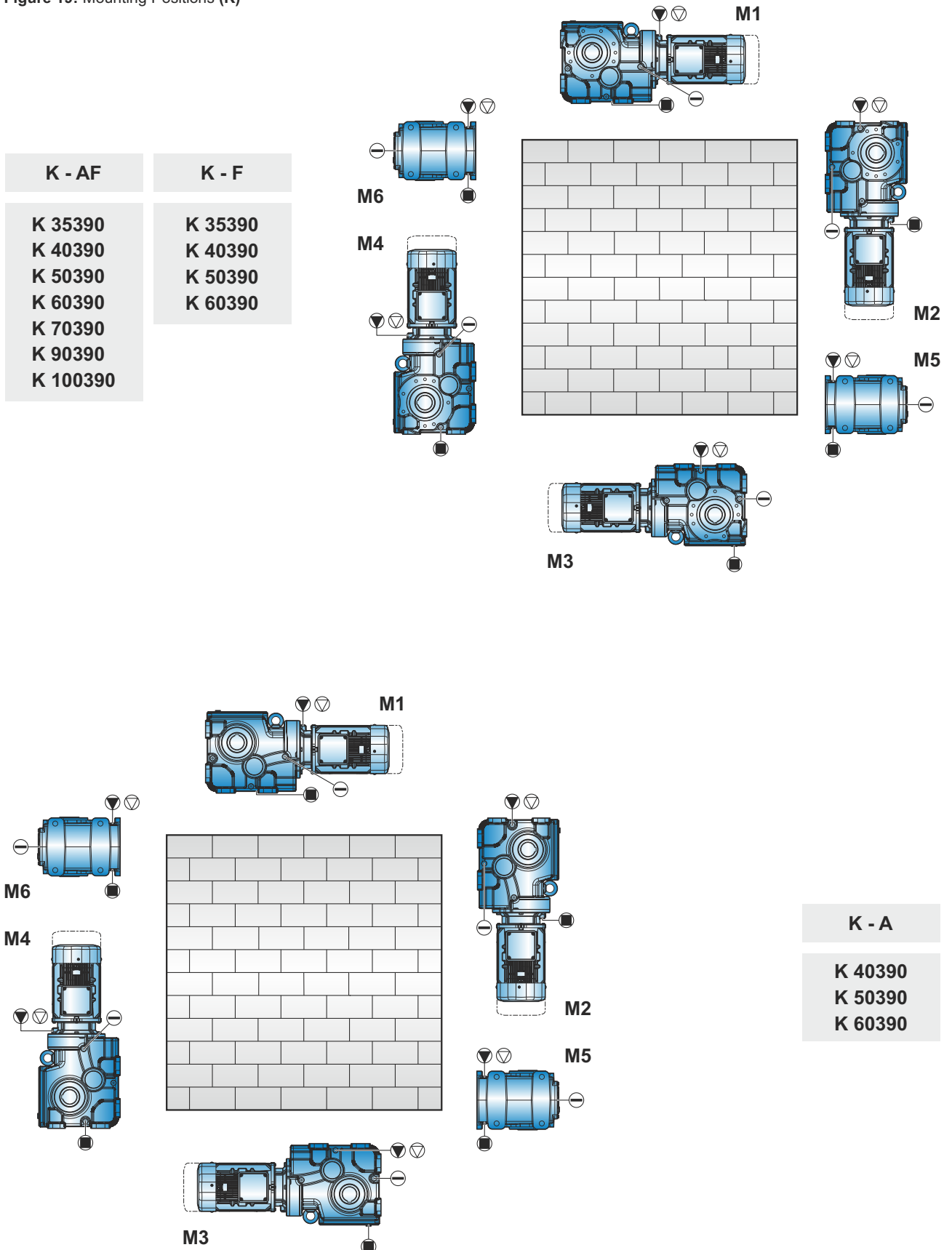
* I - II - III - IV: Shows cable entry position.





K

Figure 19: Mounting Positions (K)



Filling Plug



Vent Plug



Oil Level Plug



Drain Plug



K

Table 20: Terminal Box and Cable Entrance Sides (K - AF)

K-AF	
M1 	M2
M3 	M4
M5 	M6

* 1 - 2 - 3 - 4 : Shows terminal box position.

* I - II - III - IV: Shows cable entry position.

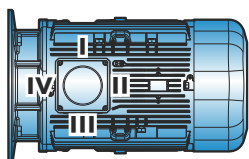


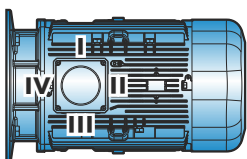


Table 21: Terminal Box and Cable Entrance Sides (K - A)

K-A	
<p>M1</p>	<p>M2</p>
<p>M3</p>	<p>M4</p>
<p>M5</p>	<p>M6</p>

* 1 - 2 - 3 - 4 : Shows terminal box position.

* I - II - III - IV: Shows cable entry position.





6.1 Lubrication

Before operating the gear unit, please check the oil level. If it is required, the same type of oil (shown on the label) should be added again (see oil table), when the gear unit is brought to the predetermined mounting position. In case it can not be used, please contact NRW Technical Service.

For possible use of different type of oils, replace the oil completely (after consulting NRW Technical Service). If synthetic oil will be used, it can be used after the oil in the gear unit has been drained and after the inside of the gear unit has been washed. For non-fat gear units, check the amount of oil that can be used and the amount required according to the working position from the additional nameplate and fill the required same lubricant on the product label according to the oil quantity table.



NOTE !

If there is an oil leak, find the cause before restoring the lubricant level.
Do not dump the lubricant in the environment, adopt all the necessary environmental safety measures, dispose of the lubricant in compliance with the current regulations.

In case of ambient temperature not listed in the table, contact our Technical Service. If the temperature is lower than -30°C or higher than 60°C use special mixture seal rings. For oil changes follow what indicated in the "ORDINARY MAINTENANCE Table".



EXPLOSION !

Check the oil level before starting up the unit, operation that must be carried out when the unit is arranged in the predetermined mounting position, if necessary restore the level with oil of the same type as the one supplied by the Manufacturer (see the table in FIRST SUPPLY LUBRICANTS, ATEX CERTIFIED FOR USE BY NRW) shown on the nameplate. In case of unavailability, contact the Technical Service by NRW.

6.2 Lubricant Fill Quantities



NOTE !

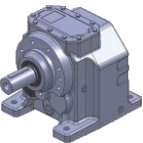
The oil amount at the chart is only indicator and for filling correctly your consultation to oil level plug or oil gauge is required if either one exists. Any deviation at degree, generally related with construction tolerance, also could be changed depending to the placing of gearbox or mountage surface at the customer's working place. Therefore customer controls level when gearbox is set up and if necessary, restore level.

A / F**Table 22:** Lubricant Fill Quantities (A / F)

Mounting Positions / Litre (L)							
	TYPE	M1	M2	M3	M4	M5	M6
	A / F 202	0.16	0.32	0.21	0.23	0.23	0.23
	A / F 202 G	0.30	0.59	0.42	0.50	0.42	0.42
Mounting Positions / Litre (L)							
	TYPE	M1	M2	M3	M4	M5	M6
	A / F 301	0.50	0.35	0.20	0.50	0.35	0.35
	A / F 351	0.60	0.45	0.25	0.65	0.45	0.45
	A / F 401	0.75	0.45	0.40	0.90	0.60	0.60
	A / F 501	1.45	1.50	1.50	1.50	1.50	1.50
	A / F 601	3.80	3.20	1.30	2.70	2.60	2.60
	A / F 701	5.70	4.00	2.30	6.50	4.00	4.00

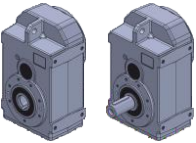
NOTE: With backstop, the amount of oil should be increased!


A / F
Table 22: Lubricant Fill Quantities (A / F)

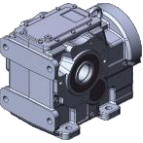
Mounting Positions / Litre (L)							
	TYPE	M1	M2	M3	M4	M5	M6
	A / F 252 - 253	0.80	1.20	1.10	1.30	1.00	1.00
	A / F 302 - 303	1.20	1.70	1.30	1.70	1.20	1.20
	A / F 352 - 353	1.50	2.00	1.80	2.20	1.80	1.80
	A / F 402 - 403	3.00	4.40	3.60	4.10	3.40	3.40
	A / F 502 - 503	5.70	7.90	6.20	7.80	6.60	6.60
	A / F 602 - 603	10.00	14.30	11.20	13.40	11.00	11.00
	A / F 702 - 703	16.70	22.20	16.90	21.20	18.20	18.20
	A / F 902 - 903	29.00	40.00	28.50	34.50	27.50	27.50

NOTE: With backstop, the amount of oil should be increased!

D / M
Table 23: Lubricant Fill Quantities (D / M)

Mounting Positions / Litre (L)							
	TYPE	M1	M2	M3	M4	M5	M6
	D / M 302 - 303	2.20	2.60	2.20	3.00	2.00	1.60
	D / M 352 - 353	2.90	3.20	2.90	3.70	2.40	2.10
	D / M 402 - 403	5.40	6.80	5.40	7.00	5.70	3.90
	D / M 502 - 503	7.90	10.00	7.90	10.50	8.60	5.70
	D / M 602 - 603	15.60	19.00	15.60	20.00	15.50	11.50
	D / M 702 - 703	22.00	27.50	22.00	28.50	20.00	19.20
	D / M 902 - 903	29.30	33.30	29.30	34.40	29.70	31.00

K
Table 24: Lubricant Fill Quantities (K)

Mounting Positions / Litre (L)							
	TYPE	M1	M2	M3	M4	M5	M6
	K 35390	1.40	1.40	1.50	2.00	1.50	1.70
	K 40390	2.70	3.30	3.20	4.00	3.50	3.20
	K 50390	4.30	4.50	4.60	6.40	6.00	5.50
	K 60390	6.80	7.50	8.50	9.90	8.50	7.80
	K 70390	13.20	13.00	14.50	19.50	16.50	14.80
	K 90390	22.00	21.50	23.00	31.00	29.00	24.00
	K 100390	33.10	37.40	43.00	54.60	43.10	30.10



6. UNIT

6.3 Lubrication Table

At below table, registered brands or names of goods have been showed according to gearbox lubricant type which stated on product label (see. **2.1 Gear Unit Label**, page 16). This situation means that just a product should be used convenient to the lubricant type that shown on the label. In particular situations, stated product's name is shown on gearbox product label.

Table 25: Lubrication Table

Type of gearbox	Type of Lubricant	Ambient Temp. °C	ISO viscosity class	Shell	Mobil	bp	Esso	DEA	ARAL	Castrol	TRIBOL	KLÜBER
Helical Gear-boxes	Mineral oil	- 5...40 Normal -15...25 # - 50...-15	ISO VG 220 ISO VG 100 ISO VG 15	Shell Omala Oel 220 Shell omala Oel 100 Shell Tellus Oel T 15	Mobilgear 600 XP 220 Mobilgear 600 XP 150 Mobil DTE 10 Excel 15	Energol GR-XP 220 Energol GR-XP 100 Bartran HV 15	Spartan EP 220 Spartan EP 100 Univis J 13	Deagear DX SAE 85W-90 Falcon CLP 220 Deagear DX SAE 80W Falcon CLP 150 Alrkraft Hydraulic Oil 15	Degol BG 220 Degol BG 100 Vitamol 1010	Alpha SP 220 Alpha MW 220 Alpha MAX 220 Alpha SP 100 Alpha MW 100 Alpha MAX 220 Hyspin AWS 15 Hyspin SP 15 Hyspin ZZ 15	Tribol 1100/220 Tribol 1100/100 Tribol 770	Klüberoil GEM 1-220 Klüberoil GEM 1-100 Isoflex MT 30 rot
	Synthetic oil	- 25...80	ISO VG 220	Shell Tivela Oel WB	Mobil Glygoyle 30	Energyn SG-XP 220	ESSO Glycolube 220	Polydea PGLP 220	Degol GS 220	Alphasyn PG 220	Tribol 800/220	Klübersynth GH 6 - 220
	Bio-degradable oil	- 25...80	ISO VG 220					Plantogear 220 S	Bio-Degol S 220	Carelube GES 220	Tribol Bio Top1418/220	Klüber - Bio GM 2 - 220
	Food - grade oil	- 25...80	ISO VG 220	Cassida 220	Mobil SHC Cibus 220		GEAR OIL FM 220	Renolin 220	Degol FG 220	OPTIMOL optileb GE 220	Tribol Food Proof 1810/220	Klüberoil 4UH1 - 220
	Synthetic fluid grease	- 35...60			Shell Tivela compound A	Energyn GSF	Fliessfett S 420	Glissando 6833 EP 00	Aralub SKA 00	Alpha Gel 00	Tribol 800/1000	Klübersynth GE 46 -1200
Anti Friction Bearings	Mineral oil grease	- 30...60 Normal # 50...110		Alvania Fett R 3 oder Alvania Fett RL 3	Mobil SHC Polyrex 005 Mobilux 3 Mobilux 2	Energrease LS 3 Energrease LS 2	Beacon 3 Beacon 2	Glissando 30 Glissando 20 Glissando FT 3	Aralub HL 3 Aralub HL 2 Aralub BAB EP 2	Spheerol AP 3 Spheerol AP 2 LZV - EP Spheerol EPL 2	Tribol 3030/100-2 Tribol 4020/220-2 Tribol 3785	Centoplex 3 Centoplex 2
	Synthetic grease	# - 50...110		Aero Shell Grease 16 oder 7	Mobiltemp SHC 32		Beacon 325	Discor 8 - EP 2	Aralub SKL 2	Product 783/46	Tribol 3499	Isoflex Topas NB52



DANGER !

The synthetic and mineral oils must not be mixed with eachother.



NOTE !

At ambient temperatures under -30° degree and above 60° degree for leakproofing element inside the shaft, special quality material must be used.



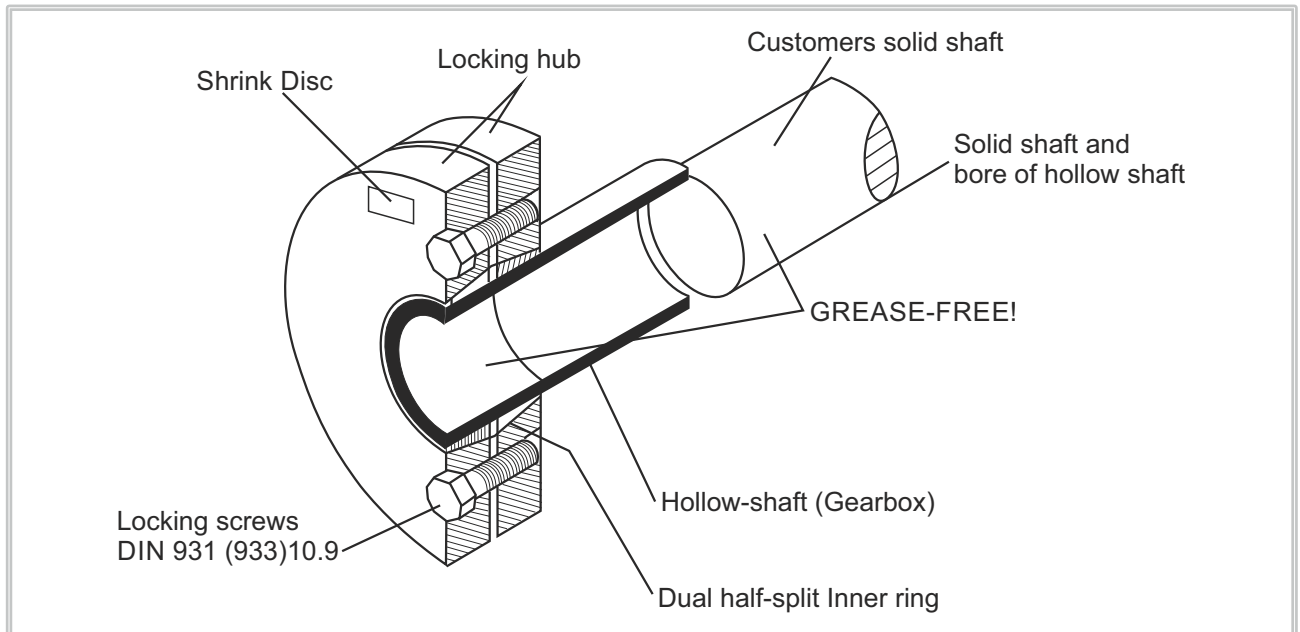
NOTE !

This table shows the oil types of different companies. Oils of different companies should not be mixed. Please contact NRW if you want to change the oil type and viscosity class. Otherwise we provide no guarantee for the function of the gearbox.



7.1 Shrink Disc (D / M, K)

Figure 20: Shrink Disc (D / M, K)



NOTE !

Shrink disc would be sent ready to assembly by manufacturer. Please do not segment the shrink disc into pieces before assembly process. There could be wounding risk during both assembly and disassembly. Please obey instructions given below.



NOTE !

Do not tighten screws on the shrink disc without installing the shaft. If it is tightened, hollow shaft could be damaged.


7.1.1 Mounting Position of the Shrink Disc (D / M, K);

- If there is, the shrink disc must be removed from the package.
- The clamping bolts are loosened but must not be removed. Must be squeezed with the help of hand until to get the space out of between the flanges and inner loop.
- The external clamping flange connected to the gear unit's shaft, shrink disc must be pushed on to the output shaft. Soft grease must applied to the hole at inner ring. (for easing the pushing process).
- The soft grease must be applied to the spacer side of customer applications solid shaft. The oil must not be touched the compressed side of the shrink disc. For not creating that kind of risk, the grease should not be applied directly on the spacer.
- The grease both on the gear unit's shaft and customer's application shaft must be fully cleaned and be ungreased.
- The Customer's applications solid shaft must be mounted completely to the hollow shaft to the shrink disc's shrinking area.
- To positioned the shrink disc, the clamping bolts must slightly tightened.
- The clamping bolts must be tightened at clockwise a few times respectively (approximately ¼ bolt tour per tour). Never be tightened diagonally.
- After tightened the clamping bolts, there should be an equal space between the clamping bolts. If this space is not ensured, the gear unit must be dismantled and the sensibility of the external tightened flange of the shrink disc must be controlled.



7.1.2 Demounting Position of the Shrink Disc (D / M, K);

- The clamping bolts must be loosened respectively a few times. (approximately ¼ bolt tour per tour) But clamping bolts must not be fully removed.
- The shrink disc should not be separated from the gear unit's shaft.
- The gear unit must be removed from customer's applications solid shaft.

	DANGER !
	If the shrink disc are mounted and dismantled incorrectly, the wounding danger could exist.

7.1.3 Cleaning of the Shrink Disc (D / M, K);

- Dismantled shrink disc before remounting, is not needed to subject the cracking process.
- Only the polluted surfaces of the shrink disc must be cleaned.
- The conical surfaces must be lubricated with one of the the solid material lubricants listed below.

Table 26: Lubrication Schedule While Cleaning of Shrink Disc

Lubricant (Mo S2)	Type
<ul style="list-style-type: none"> ▶ Molykote 321 (Slippery lac) ▶ Molykote Spray (Powder spray) ▶ Molykote G Rapid ▶ Aemasol MO 19P ▶ Aemasol DIO-setral 57 N (Slippery lac) 	<ul style="list-style-type: none"> ▪ Spray ▪ Spray ▪ Spray or paste ▪ Spray or paste ▪ Spray

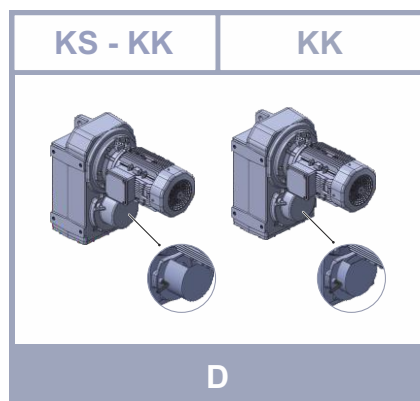
For the lubricating of clamping screws Molykote BR 2 or similar material must be used.

7.2 The Mounting of the Protection Caps (D / M, K)

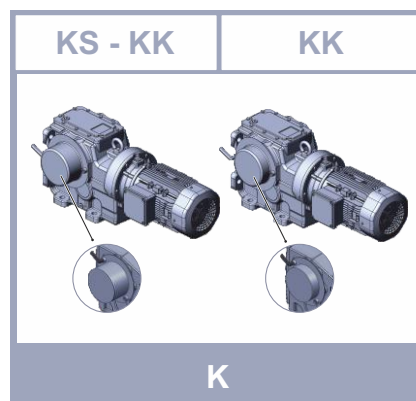
The contact protection is required to prevent shrink disc and free rolling output solid shaft (the side which the customer is not using) windings. A protection cap (KK or KS-KK) may be put as a contact protection.

- The protection cap must be attached with fixing bolts to the mounting place.
- Must be tightened with the proper torc.

Figure 21: Protection Cover (D / M, K)



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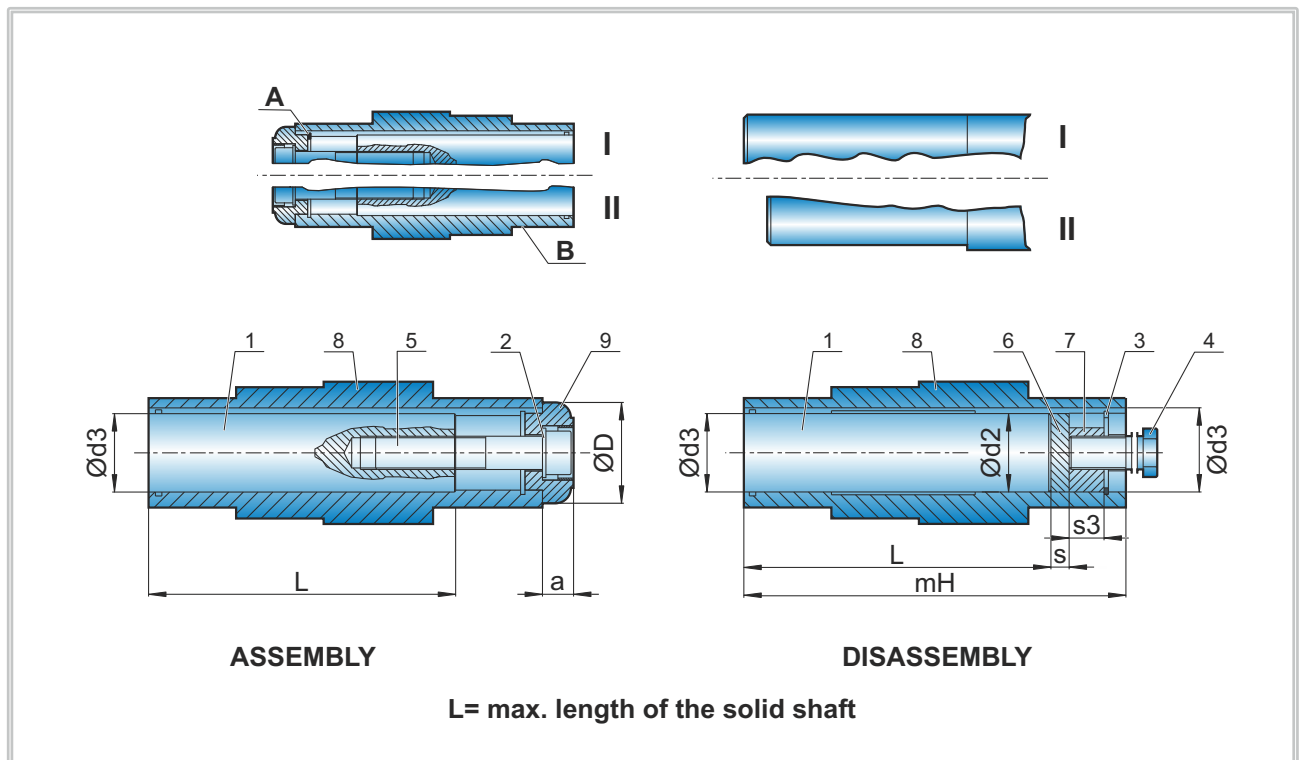
Catalog: K
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7.3 Fixing Kit (D, K)

- The fixing kit is optionally available on shaft mounted gear units.
- Center bore of the customer solid shaft must be machined appropriately DIN 322/2.
- Customer shaft can be mounted either with a shaft shoulder or without shaft shoulder.
- When the assembly in Fig. I is used, the customer shaft is fasten by the circlip in the gear unit shaft. **(A)**
- When the assembly in Fig. II is used, it is used, the customer shaft is fasten directly by its shaft shoulder to the gearbox shaft. **(B)**

Figure 22: Fixing Kit (D, K)



1. Customer's shaft
2. Washer DIN 127
3. *Circlip DIN 472
4. *Fixing screw
5. Socket head screw DIN 912
6. *Washer
7. *Nut
8. Hollow shaft
9. Fixing disc

* **ATTENTION:** Star signs are shown this item are not provided by NRW.



Table 27: Fixing Kit Dimensions (D)

TYPE	1	2	3	4	5	6		7			8	9	
	L					d2	s	d3	s3		d x mH	a	D
D 302 - 303 / Ç	96	A10	I 30 x 1.5	M12	M10 X 45	29.9	3	29.9	12	M12	30 x 120	20	40
D 352 - 353 / Ç	110	A12	I 35 x 1.5	M12	M12 X 55	34.9	3	34.9	16	M16	35 x 140	24.5	45
D 402 - 403 / Ç	148	A16	I 40 x 2.0	M16	M16 X 70	39.9	4	39.9	16	M16	40 x 180	25	55
D 502 - 503 / Ç	170	A16	I 50 x 2.5	M20	M16 X 70	49.9	4	49.9	20	M20	50 x 210	26	65
D 602 - 603 / Ç	195	A20	I 60 x 3.0	M24	M20 X 90	59.9	5	59.9	24	M24	60 x 240	31	75
D 702 - 703 / Ç	255	A20	I 70 x 3.0	M24	M20 X 90	69.9	5	69.9	24	M24	70 x 300	32	78
D 902 - 903 / Ç	305	A24	I 90 x 4.0	M30	M24 X 110	89.9	8	89.9	22	M30	90 x 350	36	102

Table 28: Fixing Kit Dimensions (K)

TYPE	1	2	3	4	5	6		7			8	9	
	L					d2	s	d3	s3		d x mH	a	D
K 35390 DA - DG / Ç	110	A12	I 35 x 1.5	M16	M12 X 55	34.9	3	34.9	16	M16	35 x 140	24.5	45
K 40390 DA - DG / Ç	150	A16	I 40 x 2.0	M16	M16 X 70	39.9	4	39.9	16	M16	40 x 180	25	55
K 50390 DA - DG / Ç	170	A16	I 50 x 2.5	M20	M16 X 70	49.9	4	49.9	20	M20	50 x 210	26	65
K 60390 DA - DG / Ç	195	A20	I 60 x 3.0	M24	M20 X 90	59.9	5	59.9	24	M24	60 x 240	31	75
K 70390 DA / Ç	255	A20	I 70 x 3.0	M24	M20 X 90	69.9	5	69.9	24	M24	70 x 300	32	78
K 90390 DA / Ç	305	A24	I 90 x 4.0	M30	M24 X 110	89.9	8	89.9	22	M30	90 x 350	36	102
K 100390 DA / Ç	390	A24	I 100 x 4.0	M30	M24 X 110	99.9	8	99.9	30	M30	100 x 445	36.5	120

7.3.1 Assembling of the Fixing Kit (D, K);

- The customer shaft must be mounted inside the gear units shaft. (1-8)
- The fixing disc must be mounted inside the gear units shaft. (8-9)
- The bolt and washer (DIN 127) must be fixed with the fixing disc. (2-5)
(see. **Figure 22: Fixing Kit (D, K)**, page 58)



NOTE !

Consider that the customer's shaft should not exceed the length "L max". Otherwise, fixing cannot be done. (1-5-6-7 (see. **Figure 22: Fixing Kit (D, K)**, page 58))

7.3.2 Disassembling of the Fixing Kit (D, K);

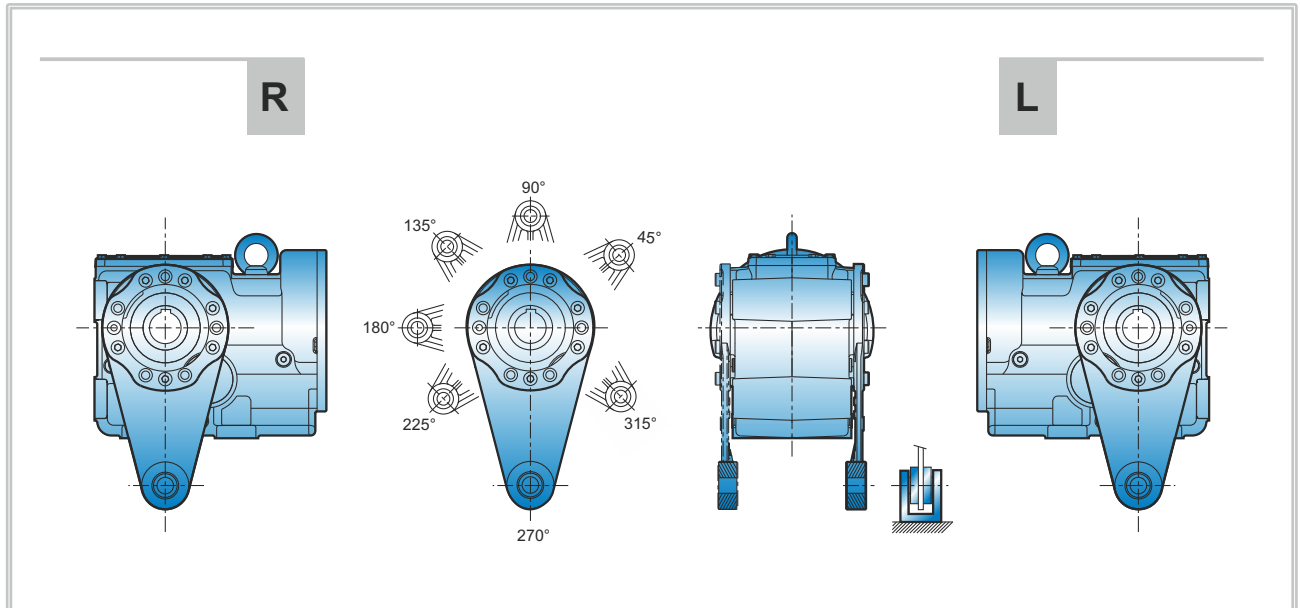
- Loosen the socket head screw. (2-5)
- Remove fixing disc. (9)
- Install washer. (6)
- Install nut. (7)
- Install circlip. (3-8)
- Remove solid shaft from hollow shaft with using fixing screw. (4)
(see. **Figure 22: Fixing Kit (D, K)**, page 58)



7.4 Torque Arm and Torque Arm Platform (K)

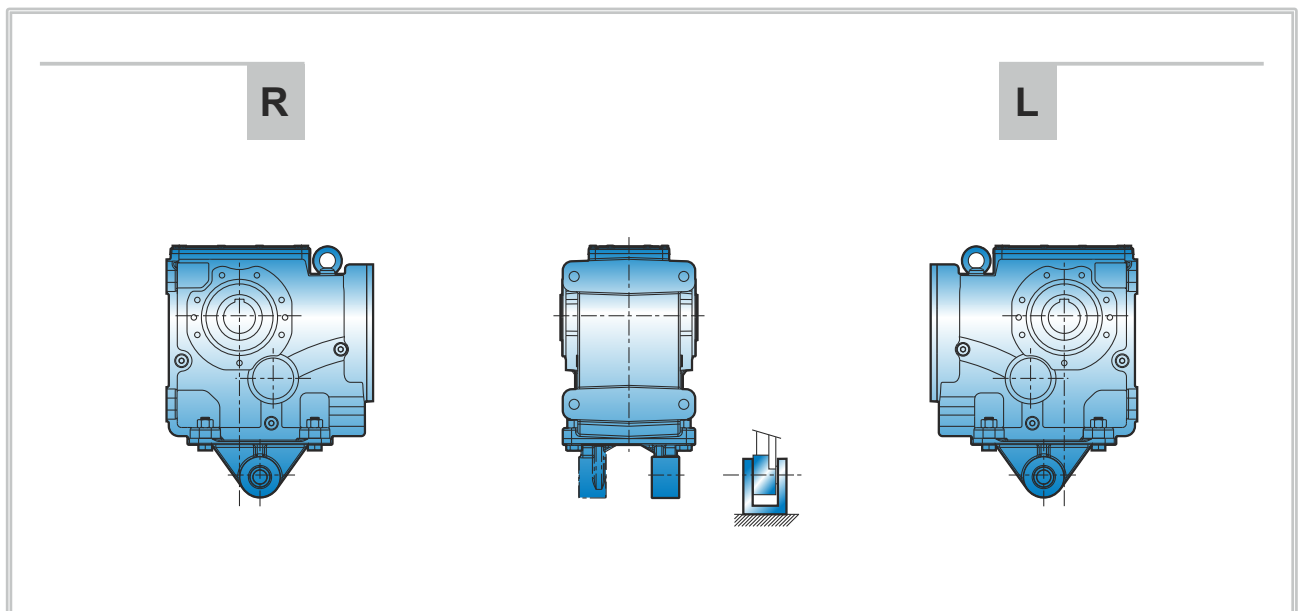
- The rubber wedge part of the torque arm must be taken into the bearing from both sides.
- Torque arms must be mounted as a voltage-free.
- For the correct mounting, the sticky (LOCTITE 510 OR EQUIVALENT) which absorbs vibration must be used.
- The screw connection of the torque arm must be tightened with proper torque and must get into the safe against loosening (LOCTITE 510 or equivalent).

Figure 23: Torque Arm (K)



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Figure 24: Torque Arm Platform (K)



Catalog: K
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NOTE !

The failure of the using of the original parts on the gear unit is not in our firm's responsibility.

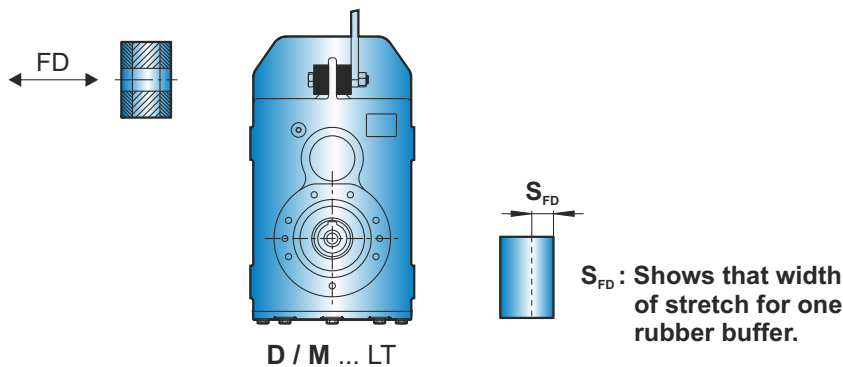


7.5 Reinforced Seals

Series A/F-D/M-K reducers may be equipped with reinforced seals. Reinforced seals, depending on the size of the unit, will be composed of two seal rings or a standard seal ring +VRM ring. Coaxial reducers, sizes 30 to 90 (excluding single stage units) in mounting positions V1/V5 already have 2 seal rings as standard supply. It is not necessary to pay special attention during installation, only make sure that the machine is running at start-up.

7.6 Rubber Buffer (D / M)

Figure 25: Rubber Buffer (D / M)



7.6.1 The Rubber Wedge Assembly Row (D / M);

- In unloaded conditions the screw connection must be tightened until the space between contact surfaces are eliminated.
- To exercise prevoltage to the rubber wedge, the fixing nut should be turned half tour (not permitted larger prevoltage).
- LOCTITE 242 or equivalent or second nut-screw connection must got into safety for loosening.

7.6.2 The Rubber Wedge Disassembly Row (D / M);

- To remove voltage on the rubber wedge, the fixing nut must be loosened by half tour.
- The screw connection must be separated from the rubber wedge.

7.7 Backstop

Backstop prevents output shaft from rotation in the wrong direction. Depending on the type and size of the gearbox, the backstop can be installed to the case, input flange or motor. It is important to specify the required output rotation direction.



NOTE !

- The action of the motor in locking direction could cause fracturing of the lock.
- The motor absolutely must not rotated to the direction of locking. To provide specified direction of rotation, it must be careful that the motor is supplied by direct current.
- As a control, the output shaft/hollow shaft of the gearbox should be turned half a turn against the backstop direction.

The allowed direction of rotation is marked on the gear unit.
If the backstop direction is wrong, please contact NRW.



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 29: 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,...	Elastomers with steel
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 spiral, embedding material of the cooling spiral, screw fittings	Copper, epoxy, yellow brass



NOTE !

Please do not diffuse any biologically indivisible materials, oil and noninclusive 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 Troubleshooting

Table 30: Troubleshooting

NO	PROBLEM	OBSERVED	SOLUTION
①	Gearbox does not work.	The noise is not coming from gearbox. Output shaft of the gearbox is not rotating. Driver / frequency inverter is not be used.	Check the connection of electric motor, voltage and frequency. The values could be same with the values which are on the motor label. Look at to the motor usage guide. If the solution is not found look to the article 50.
②	Gearbox does not work.	The noise is not coming from gearbox. Output shaft of the gearbox is not rotating. Driver / frequency inverter is used.	Look to the guide of driver / frequency inverter or driver usage guide. Determine that error is not originated from driver / frequency inverter by separating electric motor either from driver and frequency inverter and making direct connection to the motor.
③	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Driver / frequency inverter or magnetic brake are not used.	The first thing that has to be made is to check whether motor connection, voltage and frequency are identical with motor label values. If there is not any problem, to pull out gearbox from the machine and try to operate in neutral. If gearbox works, the power of motor may not be enough to operate system. If the motor which connected to the gearbox is monophase, take off capacitors should be controlled. Even the motor does not work despite all tests and examinations, look at to the article 50.
④	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Driver / frequency inverter or magnetic brake are used.	The frequency inverter or driver usage guide should be examined. Determine that error is originated whether from driver / frequency inverter by separating electric motor either from driver and frequency inverter and making direct connection to the motor. If the gearbox does not work, look at to the article 50.
⑤	Gearbox does not work.	A different noise is coming out of the gearbox. But gearbox and motor shaft are not rotating. Magnetic brake is used.	It is necessary to check whether electric motor connection, voltage and frequency are identical with motor label values. Look at to the motor usage guide. Be sure that brake is working. If the brake is assembled by us to check whether it is made correctly according to the schema at the usage and maintenance instructions. If the error is not found to check whether the brake is operating by making direct connection to the brake appropriate to the brake voltage. When the electric is given, the noise of the opening of brake will come. If the brake is not working even by giving electric, the diode of brake could be in failure. To feed the motor directly according to the informations on the label when the brake is separated from disc. If the problem is continuing, the power of the motor may not be enough. Look to the article 50.
⑥	Gearbox does not work at low speeds / frequencies.	Use driver / frequency inverter.	The motor feeding frequency is declining at low speeds. For the operating of motor at very low frequencies, it is essential to adjust motor parameters and frequency inverter parameters very well. Besides for the low speeds, there could be big changes even at the gearbox efficiency. To enlarge motor power and inverter or for to reach your requested cycle range, change the gearbox ratio.



NO	PROBLEM	OBSERVED	SOLUTION
7	Gearbox does not work after long awaitings or at mornings.	Environmental temperatures are dropping below -5°C.	The gearbox oil is not suitable to the environmental temperatures where it works. It is necessary to use low viscosity oils or to protect gearbox group from cold. To find proper oil look to usage guide or examine lubricating pages from the product catalogs. To work at higher environmental temperatures could be a solution. If the problem is continuing, the motor power should be increased.
8	Gearbox is very heating up.	You use worm screw type gearbox and environmental temperature is under +40°C.	When the gearbox is working under the full load, gauge gearbox surface temperature with heat meter. If it is under +90°C it is normal and no harm to gearbox. All worm screw and ATEX compatible helical gearboxes could be used up to the +120°C surface temperatures. If the temperature is above the +120°C and gearbox is ATEX compatible immediately stop gearbox and inform to NRW. Look to the article 50. If it is the product without ATEX, to check the oil amount according to the mountage position. Be sure that the mounting position written on the label and mounting position which gearbox is working should be identical. If not look to the article 50. To the gearboxes without worm screw types at heatings above +80°C, look to the articles 9 and 50.
9	Gearbox is very heating up.	You use helical gearboxes and environmental temperature is under +40°C.	When the gearbox is working under the full load, gauge gearbox surface temperature with heat meter. If it is under +90°C it is normal and no harm to the gearbox. All gearboxes with ATEX are designed to work at maximum +120°C. If the temperature is above +120°C and gearbox is ATEX compatible immediately stop gearbox and inform to NRW. The gearboxes without ATEX are designed to work at maximum +90°C temperature values. If the gearbox temperature is above the +90°C, control the oil amount according to mounting position. Be sure that the mounting position written on the label and mounting position which gearbox is working should be identical. If there is inconsistency look to the article 50.
10	Gearbox is very heating up.	Environmental temperature is above +40°C.	The standard gearboxes are designed to work at maximum +40°C. Temperatures above +40°C, special applications and additions should be done. In these situations please consult to NRW.
11	Gearbox is working noisy.	Noise is regular and perpetual.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If you hear the same noise, bearings which belong to gearbox or motor could be in failure. Look to the article 50.
12	Gearbox is working noisy.	Noise is irregular.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If the same noise is continuing, foreign objects could be in the oil. Change the oil and control the foreign objects in the oil. If the metal piece is found into the controlled oil, the gearbox could be damaged. Look to the article 50.



8. UNIT

TROUBLESHOOTING

NO	PROBLEM	OBSERVED	SOLUTION
13	Gearbox is working noisy.	Noise is regular with clicking.	Control the mobile machine elements. Operate gearbox without load by separating from the system. If the same noise is continuing, gearbox parts could be damaged. Look to the article 50.
14	Gearbox is working noisy.	Noise is regular and fluctuating.	Control the flexure of connection elements which connect to output shaft. Separate element which is connected to output shaft and operate gearbox without load. If the same noise is continuing, look to the article 50.
15	Gearbox is working noisy.	Gearbox has motor with brake and noise is coming from the brake side.	The noises could be coming from the brake like in the shape of low level randomly tickings and it is normal. If the noise level is disturbing, brake could be damaged or there may be a problem at the gap adjustment between lining and disc. Look to the article 50.
16	Gearbox is working noisy.	You use frequency inverter and the noise is changing every time by the change of cycle.	Frequency inverter parameters may not be compatible with your used motor. Examine frequency inverter usage guide and if the same problem is continuing look to the article 50.
17	Oil leakage is existing.	Oil leakage from the seal.	If the environmental temperature is above +40°C and there is continuous working over 16 hours, according to the mounting position pull out a plug which is on the top and use ventilation plug instead of it. If your situation is not suited to this, seal could be damaged. Look to the article 50.
18	Oil leakage is existing.	Oil is leaking from the plug.	If you use the ventilation plug, be sure that the plug is at the right position. According to the mounting position of the gearbox, plug which is on the top could be ventilation plug. The plug may loosen, clean the surface and plug itself and squeeze it again. If the same problem is continuing, look to the article 50.
19	Oil leakage is existing.	Oil is coming out of the the housing.	To observe where the oil is exactly coming from. It is leaking from the oil plug, oil cover or seal and could flow onto the housing. If the situation is like this, look to the article 18 and 19. If you sure that oil is coming out of the housing there could be cracks and fractures at the housing. Look to the article 50.
20	Oil leakage is existing.	Oil is coming out of the the cover.	A gasket that is used between cover and housing is not performing its leaktightness duty. Dismantle the cover clean the bottom side and assemble cover to its place by smearing liquid gasket. If the problem continues look to the article 50.
21	Gearbox is making regular vibrations when it is worked at the assemble point.	You use torc arm.	The reason of the vibration of gearbox is originated from the shaft flexure which gearbox is connected. When the torc arm is used, it has no harm to gearbox and it is usual situation.



NO	PROBLEM	OBSERVED	SOLUTION
(22)	Gearbox is making random vibrations when it is worked at the assemble point.	You use torc arm.	The reason of the vibration of gearbox is because of shaft flexure which the gearbox is connected and passing gap between shaft and bushing. Control your shaft hole passing tolerance. When the torc arm is used, it has no harm to gearbox and it is usual situation.
(23)	Motor is warming a lot.	Motor is working above its normal ampere. Environment is clear.	There could be overloading or motor power is insufficient. Motor could be in failure. Look to the article 50.
(24)	Motor is warming a lot.	Environment is dusty.	Be sure of whether motor fan bowl and motor cooler cores are clean for the air passing. If you use extra fan be sure that it is working. If there is invertor usage at the motor and works at low frequencies, the motor fan may not be sufficient. Use extra fan in these situations. If the problem continues look to the article 50.
(25)	Motor shaft is rotating but gearbox shaft is not.	Friction noise is coming from inside of gearbox or only there is motor noise.	There could be a damage at the gearbox parts. Look to the article 50.
(26)	Motor shaft is rotating but gearbox shaft is not.	You use chain geared or pinion geared at the output shaft of gearbox.	The damage could be originated of polygon impact formed by chain geared or from the radial load. Gearbox connection points may not be rigid enough. Be sure that you are able to use proper chain geared and pinion geared for used gearbox. Recalculate maximum allowable radial load according to this position. Look to the article 50.
(27)	Output shaft is cut.	You use either chain geared or pinion geared.	The damage could be originated of polygon impact formed by chain geared or from the radial load. Gearbox connection points may not be rigid enough. Be sure that you are able to use proper chain geared and pinion geared for used gearbox. Recalculate maximum allowable radial load according to this position. Look to the article 50.
(28)	Gearbox is stopping too late.	You use motor with brake	Control the electric connection schema of brake. Be sure that there is not assembled delayed diode onto the brake. If there is delayed diode, it could be changed. (Hoisting gearboxes are excluded PCS)
(50)	Service is required.	Informing of NRW Company.	Please contact with NRW company. Communication informations are given at the usage guides,catalogs. Mechanical parts can only be changed either by NRW or within the knowledge. Any change that is to be made without the knowledge of NRW would cancel both guarantee of product and all certificate decelerations and remove the responsibilities of NRW over the product.

If there are problems or malfunctions different to the onesdescribed here contact a NRW Industries Assistance Centre.



9. UNIT

AUTHORIZED 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 !

At below; the list took in place decided by our firm, authorized service and customer (user) which is about control and maintenance criterias/applications. Must be obliged to the informations which were given in the list. To the contrary that Usage and Maintenance directions become invalid.

Table 31: Authorized Service

No	CRITERIA	MANUFACTURER (NRW)	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	Motor montage to PAM type	✓	✓	✓
7	Assembly of geared unit with W cylinder type	✓	✓	✓
8	Disassembly of motor from IEC / PAM 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 Declaration of Conformity (A / F)



DECLARATION OF CONFORMITY

COMPANY

NAME : NRW

ADDRESS : In Der Schlinge 6, D-59227 Ahlen / **GERMANY**
Ata OSB Mah. Astim 1.Cad. No: 4, PK 105 Efeler / Aydın / **TURKEY**

PHONE : +49 (0) 238 2855 7010
+90 256 231 19 12 - 16 (pbx)

FAX : +49 (0) 238 2855 7015
+90 256 231 19 17

PRODUCT

NAME : HELICAL GEAR UNITS

TYPE : A / F

BRAND : NRW

MODEL : A / F 301 ... 701
202 ... 902
253 ... 903

APPLIED REGULATIONS:

Machinery Directive	2006/42/EC
ATEX	2014/34/EU
Low Voltage Directive	2014/35/EU

APPLIED HARMONIZED STANDARDS:

TS EN ISO 12100:2010
TS EN ISO 13857
TS EN 60204
TS EN ISO 80079-36:2016
TS EN ISO 80079-37:2016

Our products comply with the regulations and standards described above. When our products are fitted with an electric motor, we fulfill the requirements to the extent that the Low Voltage Regulation is included in the application area 2014/35/EU.



Applied Person
Necdet DEMİR
General Manager

Date: 11 July 2016



D / M



DECLARATION OF CONFORMITY

COMPANY

NAME : NRW

ADDRESS : In Der Schlinge 6, D-59227 Ahlen / GERMANY
Ata OSB Mah. Astim 1.Cad. No: 4, PK 105 Efeler / Aydın / TURKEYPHONE : +49 (0) 238 2855 7010
+90 256 231 19 12 - 16 (pbx)FAX : +49 (0) 238 2855 7015
+90 256 231 19 17

PRODUCT

NAME : PARALLEL SHAFT MOUNTED GEAR UNITS

TYPE : D / M

BRAND : NRW

MODEL : D / M 302 ... 902
303 ... 903

APPLIED REGULATIONS:

Machinery Directive	2006/42/EC
ATEX	2014/34/EU
Low Voltage Directive	2014/35/EU

APPLIED HARMONIZED STANDARDS:

TS EN ISO 12100:2010
TS EN ISO 13857
TS EN 60204
TS EN ISO 80079-36:2016
TS EN ISO 80079-37:2016

Our products comply with the regulations and standards described above. When our products are fitted with an electric motor, we fulfill the requirements to the extent that the Low Voltage Regulation is included in the application area 2014/35/EU.



Applied Person
Necdet DEMİR
General Manager

Date: 11 July 2016



K



DECLARATION OF CONFORMITY

COMPANY

NAME : NRW

ADDRESS : In Der Schlinge 6, D-59227 Ahlen / **GERMANY**
Ata OSB Mah. Astim 1.Cad. No: 4, PK 105 Efeler / Aydın / **TURKEY**

PHONE : +49 (0) 238 2855 7010
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FAX : +49 (0) 238 2855 7015
+90 256 231 19 17

PRODUCT

NAME : HELICAL BEVEL GEAR UNITS

TYPE : K

BRAND : NRW

MODEL : K 35390 ... 100390

APPLIED REGULATIONS:

Machinery Directive	2006/42/EC
ATEX	2014/34/EU
Low Voltage Directive	2014/35/EU

APPLIED HARMONIZED STANDARDS:

TS EN ISO 12100:2010
TS EN ISO 13857
TS EN 60204
TS EN ISO 80079-36:2016
TS EN ISO 80079-37:2016

Our products comply with the regulations and standards described above. When our products are fitted with an electric motor, we fulfill the requirements to the extent that the Low Voltage Regulation is included in the application area 2014/35/EU.



Applied Person
Necdet DEMİR
General Manager

Date: 11 July 2016



10.2 ATEX Document



[1] **CERTIFICATE OF RECEIPT OF TECHNICAL FILE**
ACCORDING TO ATEX 2014/34/EU DIRECTIVE

- [2] According to Article 13.1 b (ii), Directive 2014/34/EU, we confirm the receipt of documentation to retain it.
- [3] Receipt Number: SCA18TDEX006/Rev.01
Rev.01: Revised to add the manufacturer's trademark.
- [4] Technical File Number: PGRATEX18 / Rev.00
- [5] Date: 22.03.2018
- [6] Equipment or Protective System: GEARBOX - GEAR UNIT
Model: P,PA,PF,PD,PM,PKD,PSH,P/A,PMRV,PMRV Plus,A,F,D,M,K,PL,PLB,PH,PB,PYK,PRC/PRCF,PEX,PCS
- [7] Manufacturer: POLAT GROUP REDUKTOR SAN. VE TIC. A.S.
- [8] Trademark: NRW Drive Technologies
- [9] Address : ATA MAH. ASTIM. OSB 1. CADDE , NO:4 EFELER-AYDIN/TURKEY
- [10] SCA, notified body that no. 2336, in accordance with the Council Directive 2014/34/EU of 26 February 2014, herewith acknowledges receipt, from the Manufacturer, of the technical documents (Technical File).
- [11] This acknowledgement is an evidence about fulfilment of manufacturer duties concerning communicate the dossier of technical documentation to notified body in accordance with clause Article 13.1 b (ii) of Directive 2014/34/EU ATEX. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective
- [12] SCA holds the Technical File for at least ten years from the date of the last manufactured apparatus. In case of lack of a written acknowledgement from the manufacturer about the intention of maintaining the Technical File deposit, SCA will hold the TECHNICAL FILE in its archives for 10 years, starting from the date this receipt is confirmed.
- [13] This receipt can be reproduced only entirely and with no change.
- [14] Reference standards:
EN ISO 80079-36:2016 , EN ISO 80079-37:2016
- [15] Marking of the equipment or protective system according to manufacturer's declaration :



II 2G Ex h IIC T4 Gb
II 2D Ex h IIIC T120°C Db

Issue Date : 26.03.2018

Revision Date : 22.07.2020




CONFIRMATION

İsmail OĞLAKCIOĞLU
SCA Technical Manager

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**11.1 Contact Information****FACTORY**

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