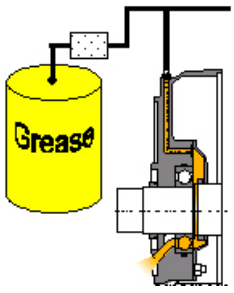
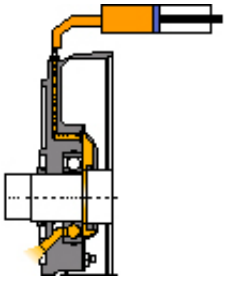
Bearing regreasing methods for motors for high ambient temperatures

PM606 EN Rev A 2006

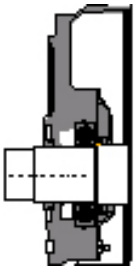
Product notes



Automatic lubrication



Periodic manual lubrication



Permanent lubrication

Grease quality requirements	Auto	Manual	Perm.	Notes
Mechanical stability	●	●●●	●●	Resistance to loss of consistency due to shear degradation. Can cause bearing leakage and dry runs.
Thermal stability	●	●●	●●●	Resistance to thermal ageing. Includes oxidation stability, evaporation loss and oil separation. Can cause bearing failurers due to formation of tar / coke residues.
Pumpability/Applicability	●●●	●●	●	Ability to produce required flow and depressurization in central systems.
Oil separation tendency	●	●●	●●●	Ability to resist abnormal oil separation/bleeding. Can cause bearing failures due to leakage, dry runs and formation of tar / coke residues.
EP/AW properties	●	●●●	●●	Ability to prevent wear caused by inadequate grease film thickness, even though products of the correct viscosity are in use.
Service costs	**Auto**	**Manual**	**Perm.**	**Notes**
Grease, price / kg	●	●●	●●●	Purchase price, cost of stock and internal management.
Grease, price / hr	●●●	●●	●	Purchase price, cost of stock and internal management.
Labor cost	●●	●●●	●	Personnel expenses and down time cost for manual lubrication.
Investment in equipment	●●●	●●	●	Includes pumps, pipes, compressed air, filters, truck barrels, syringes, distributor blocks, injectors, pressure gags, reversing valves,etc.
Equipment maintenance	●●●	●●	●	Repair and service costs. Includes wear on injectors, distributor blocks, valves, replacement of houses, filters and barrels, and cleaning.
Waste disposal	●●●	●●	●	Collection and disposal of used grease and empty packing, including transport.
Operational reliability	**Auto**	**Manual**	**Perm.**	**Notes**
Risk of contamination	●●	●●●	●	Risk of contamination of grease or bearing housing through handling and positioning of drum pumps, dirt on nipples, syringes, grease guns and packing.
Product mix up	●●	●●●	●	Risk of applying incorrect product.
Over-lubrication	●●	●●●	●	Risk of applying too much grease. Can lead to overheating and accelerated thermal and mechanical degradation.
Insufficient lubrication	●●	●●●	●	Risk of applying too little grease (insufficient replenishment). Can result in dry runs and accelerated thermal and mechanical degradation.
Uneven bearing temperature	●●	●●●	●	Increased bearing temperature as a result of an intermittent supply of new grease caused by an an uneven filling ratio in the bearing housing.
Energy/power losses	●●	●●●	●	Effect of uneven filling ratio in the bearing housing and an intermittent supply of new grease, causing increased energy consumption and power losses.
Theoretical bearing life	●●●	●●	●	Effect of the requisite supplied amount of grease on the risk of dry runs, 'starvation' or the risk of producing an insufficient grease film thickness.
Working environment	●●	●●●	●	Handling of petrochemical products, waste and detergents.

● = Lowest quality requirement, cost, risk or effect on operation

●●● = Highest quality requirement, cost, risk or effect on operation

Motors for high ambient temperatures are available in the follwoing range:

- 4-pole: 4-55 kW
- 6-pole: 2.2-37 kW

Sizes 112-132 are supplied with aluminum frame, sizes 160-250 with cast iron frame.

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Product notes

Automatic lubrication

In this method the bearings are automatically fed with lubrication grease from an external system.

Automatic lubrication requires pumpability throughout the system. To ensure that the characteristics of the grease are not compromised it is important to dimension the system according to the requirements of the grease and not vice versa. Unfortunately, in many installations the characteristics of the grease are compromised to achieve pumpability.

High shear stresses from throttling in the distributor blocks and injectors and high residual pressure due to insufficient system depressurization can lead to oil separation and clogging of distributor blocks, injectors, lubricating ducts and pipes. ABB therefore only recommends the use of electromechanical automatic lubrication systems.

High thermal load caused by piping too close to heat sources can lead to accelerated separation, oxidation and partial consumption of additives such as antioxidants, EP and AW, resulting in thermal ageing and mechanical degradation before the grease reaches the bearing.

The position of drum pumps and handling of pumps, covers and follower plates can contribute to contamination. Contamination can occur even if filters are used since lubrication grease is very difficult to filter due to the particle size and the matrix structure of the thickener.

Central systems require maintenance, cleaning and regular replacement of components (clogged injectors, distributor blocks and blocked pipes).

Automatic lubrication allows reduced grease quality requirements, but requires relative high consumption, which often leads to higher total service cost.

As automatic lubrication takes place 'unsupervised', there could be uncertainty about whether the lubricant is reaching the bearing, and whether the outlet is open or clogged.

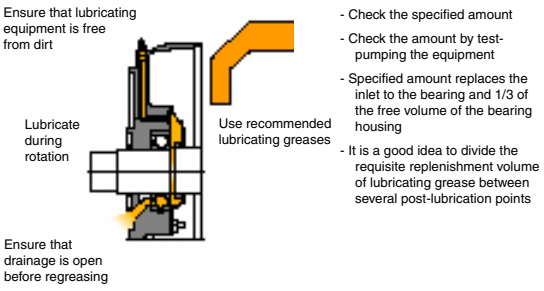
Periodic manual lubrication

This method requires that the motor supplier's recommendations are closely followed. Very long operating times can be achieved if using lubrication grease of proper quality, if seals are functioning in a satisfactory manner and if packing, nipples and lubrication equipment are kept clean.

Manual lubrication causes increased bearing temperatures at the time of lubrication due to temporarily elevated filling ratio. However, the temperature drops by time as the excess grease is ejected.

There is a risk for over-lubrication, particularly in the case of bearing housings without effective drainage or with insufficient buffer space.

Over-lubrication can cause shear thinning, separation and bearing leakage, which can lead to inadequate replenishment and related problems such as premature mechanical and thermal degradation. It also significantly increases power and efficiency losses.



If the lubrication interval exceeds the expected service life of the grease, the lubrication film may become thin and fall below the calculated thickness for the constituent base oil, causing starvation.

Greases recommended for motors operating in extreme ambient temperatures have a viscosity that provides acceptable film thickness even at these high temperatures.

An advantage coming with manual lubrication is that the bearings are regularly inspected when lubricated. Bearing faults might therefore be discovered before causing unplanned stops.

Permanent lubrication

Permanently lubricated bearings in motors for high ambient temperatures are filled with high quality grease that was developed for service in such high temperatures.

Both synthetic and thickener are inert and do not react with oxygen at atmospheric pressure, i.e. do not oxidize despite high temperatures and long periods of operation. Filling is done under special conditions to minimize the risk for contamination of the grease and bearing.

The seals help to prevent external particles entering the grease during operation, which could otherwise cause reduction in service life.

Permanent lubrication ensures maintenance free bearings for long operation periods - normally 2 to 3 years. Once the grease lifespan has been exceeded, the bearing must be replaced as it is not possible to replace the lubricant.

The same type of grease can also be used for periodic manual lubrication, but then requires a significantly higher quantity to achieve the same service life as the permanently lubricated bearing.

For larger motors, i.e. motors not included in the motors for high ambient temperatures range, permanent lubrication might not be suitable due to shortened bearing life.