

Technical article, Konstruktions Praxis, Fluid and O+P

High-Performance Field Workers

Combining high speeds with quiet operation, QXM internal gear motors from Bucher Hydraulics deliver impressive performance in seed drills

With rising seed costs and ever-tighter environmental-protection regulations, precision dosing and distribution are becoming increasingly important in sowing technology. Bucher Hydraulics' innovative QXM-Mobil internal gear motors make an outstanding contribution to the successful achievement of these objectives. As drives for fans, blowers and generators in seed drills, they offer high speeds of up to 6,000 rpm coupled with reassuringly quiet running and long service life. On top of that, application-specific valves can be incorporated.

In the agricultural-technology chain, which is characterised by increasing efficiency, sowing technology is an important link. Sowing is the focal point of a successful increase in yield. On the one hand, it is determined by the nature of the preceding soil preparation and, on the other, it is of crucial importance for the fertilizing and plant-protection strategy. This special role in agricultural technology is also driving the trend in seed drills towards still further improvements in factors such as the speed and efficiency of working and the placement accuracy, while at the same time reducing noise emissions.

Selecting the drives for fans, blowers and generators is a key issue in this situation. No matter how different the drive functions in self-propelled and towed machines may be, they share a common requirement for a reliable and low-noise motor with high working speeds. Focussing on these user objectives, Bucher Hydraulics took the proven QX series as the starting point and designed new internal gear motors for the mobile sector. They are available in the two sizes QXM12 and QXM22 with displacements of between 2.5 and 8 cm³ per revolution and have a maximum operating pressure of 210 bar.

In the case of seed drills, reducing noise emission and optimising the working efficiency are the focus of recent developments. With quiet running, high speeds and a high load rating for external forces, the internal gear motors from Bucher Hydraulics' QXM-Mobil series meet the exacting requirements for drives for fans, blowers and compressors.en.

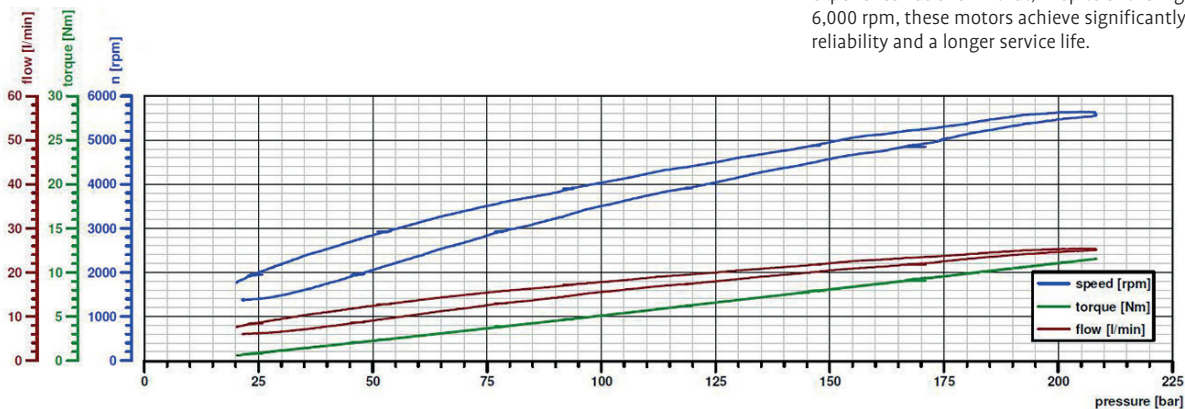


High speeds support optimisation

Reaching speeds of up to 6,000 rpm, QXM motors provide future-proofing because they will support the progressive optimisation of self-propelled machines. To reduce installation space and costs, fans and blowers are becoming smaller and smaller. However, as the units shrink in diameter the drive speed must be increased to ensure that their high performance can be maintained. Thanks to their design, QXM motors also offer significantly higher levels of operating reliability and longer service life compared with other drives typically used in sowing technology. The basis for these advantages is the forced lubrication of the hydrodynamic bearings in the non-compensated system, which virtually excludes any possibility of thermal overload of the lubricating films.

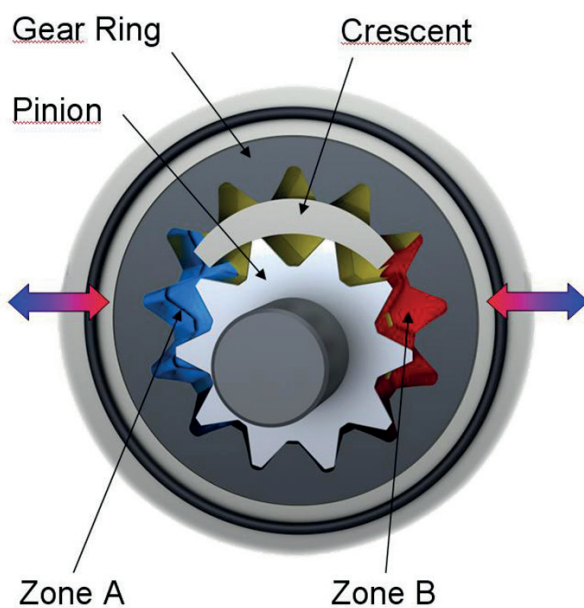
This technology has already delivered convincing results when applied as a tractor fan-drive for cooling the charge air from turbochargers. In seed drills, the QXM motors meet the requirements of the vacuum-fan drives and blower drives with which the seed is transported within the towed machine from the central tank to the distribution discs. These internal gear motors therefore support the goal of modern seed distribution systems i.e. to increase efficiency through faster filling of the machine and optimised sowing times.

While continuous high speeds of more than 3,000 rpm are problematic for other motors, the QXM is just getting into its stride. Field experience has shown that, in spite of the high working speed of 6,000 rpm, these motors achieve significantly higher levels of reliability and a longer service life.



Quiet running reduces noise emission

Quiet running, stable torque and optimal start-up performance are further strengths of the internal gear motors. Particularly at high speeds, these strengths mean that the QXM concept scores heavily over conventional drive technology such as external-gear or axial-piston motors. The factors that determine this are design details such as the long pressure-decay zone around the crescent and the gradual opening and displacement thanks to the special internal gearing. Used as a drive for fans, blowers and generators in seed drills, the motor operates extremely quietly, and even at high speeds the low pulsation level means that there are hardly any oscillations in the hydraulic system. The sound is consequently agreeable for both driver and the environment.



The special design is crucial in ensuring that the QXM internal gear motor starts up optimally, operates quietly and delivers stable torques, even at high speeds. These advantages are based on the long pressure-decay zone around the crescent and the special features of the gear profile.

Cost-effective and heavy duty

One technical finesse is that instead of a one-piece pinion shaft, the pinion and shaft are separate parts, which offers several advantages. Due to the design, the pinion can rotate freely in the non-compensated chamber system, so that the motor starts smoothly without any stick-slip effect. Because the pinion does not have a fixed connection to the shaft and is free to move axially, Bucher Hydraulics can incorporate an outboard bearing directly on the motor shaft. As a result, the user is saved the effort and costs of fitting the special outboard bearing that would otherwise be required with external gear motors. The QXM motor also needs less installation space.

In addition, the combination of shaft and integral outboard bearing can carry high external forces and is thus extremely resilient. This high load capacity also pays for itself in driving fans and blowers. The weight of the blower impeller, which is usually mounted directly on the end of the shaft, is securely supported by this design. Moreover, even the increased radial forces that result from machine vibrations when driving over uneven ground are reliably absorbed.

Power splitting in hybrid systems

QXM motors take on another important function by driving electrical generators. The current produced is used, mainly in the towed part of seed drills, to power the electric motors that drive the distribution discs. The end users' declared goal is clearly a higher degree of flexibility and precision in sowing. In order to meet every situation there is a need to be able to set individual speeds, and consequently the demand for electrical operation of individual disk drives is rising. This trend requires more electric power than tractors can currently provide. Extra electrical power is therefore produced by hydraulically driven generators.

Long service life raises machine availability

Rough conditions are routine in agriculture, and they demand absolute reliability in order to ensure the availability of machines. The QXM motor's heavy-duty design gives an impressively long service life that is based not just on the non-compensated design but also on the well thought-out selection of the materials employed. For this reason, Bucher Hydraulics does not use aluminium and other non-ferrous metals in the internal gear motors, and systematically exploits the dimensional stability of grey cast iron, which is also resistant to fatigue and to the fluids that are used.

More convenience thanks to additional functions

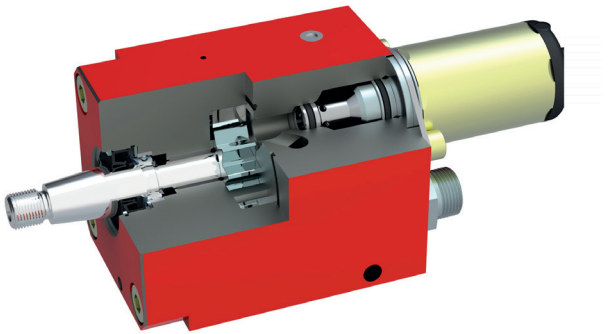
Reliability is also a decisive criterion with internal gear motors when the focus is on preventing external leakage. After all, contamination of soil and seed must always be avoided when working in the field. Bucher Hydraulics has therefore developed a sealing variant for ultra-high protection against external leakage. It consists of a special arrangement of two shaft seals with a tell-tale hole in the space between them, which safely prevents an uncontrolled escape of oil.

The QXM motors offer further convenience thanks to the option of integral valve functions. Pressure relief valves, make-up valves and flow control valves, all optimally matched to the requirements of the particular application, can be fitted directly in the motor. In addition, directional control valves allow the driver to switch the unit on and off, or to change from left-hand to right-hand rotation when the direction of the fan is to be reversed. This can be helpful for cleaning out the airways in a radiator, for example.

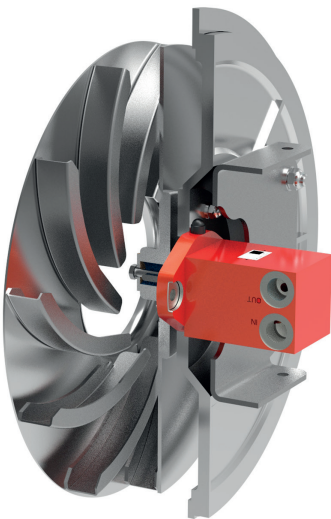
Economical, on-demand operation

Apart from seed drills, the features of the QXM internal gear motors are also needed in all mobile applications where designers have to meet requirements for demand-regulated, and therefore economical, operation. For example, QXM motors can power fans in tractors, self-propelled harvesters and forestry harvesters, as well as in a range of construction machines.

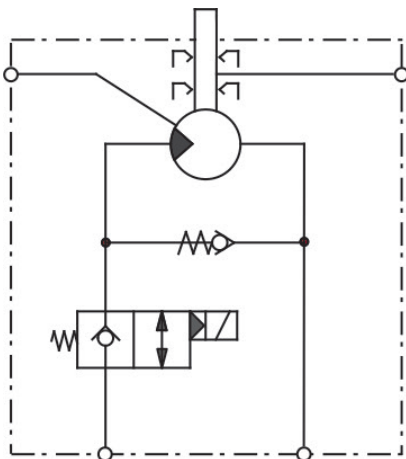
As a compressor-drive for air conditioning units in construction machines, the motor's quiet running is at the top of the selection criteria. The harsh working environments of these large machines require dependable operational reliability as well as long service life, just the characteristics that the internal gear motors exhibit.



On request, users can get the QXM internal gear motors with integral valve functions. Bucher Hydraulics offers the direct mounting of pressure relief, make-up and flow control valves. In addition, directional control valves enable the unit to be switched on and off and changed from left- to right-hand rotation.



One of the most important features of the QXM internal gear motors from Bucher Hydraulics is the high load capacity. Whether used as a drive for fans, blowers or generators with belt drive, the rugged design can reliably absorb the increased radial forces that result from machine vibrations when driving over uneven ground.



QXM internal gear motors with make-up valve, ON/OFF valve, external drain port, sealing variant for ultra-high protection against external leakage, and tell-tale hole.

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