

# Universal Motors: Timeless Performance

The universal motor, an often maligned old workhorse, is a particularly adaptable motor, and still proves very useful in many applications. When an application calls for high starting torque, power, and speed - all combined in a small, lightweight package - the Universal Motor (UM) often emerges as the clear choice. This is especially true for intermittent duty applications. The UM can operate with nearly equivalent performance on both AC and DC power

## Universal Motor Components

Groschopp has, for many years, supplied universal motor components (an armature and field set) to an OEM manufacturer of high quality compact construction machines – in this case a concrete vibrator. The motor, which looks “standard” is actually manufactured to very tight tolerances. The design was upgraded last year to an IPX4 rating (washdown duty).

“The components are installed in a plastic housing, which is strong and lightweight, but its flexibility requires these tight specifications for the armature core laminations, and 100% inspection of the bearing journals,” said Ed Tullar, Sales Manager. “In this rugged, high vibration atmosphere we do everything we can to insure that the armature cannot make contact with the field, for both safety and performance considerations.”

All 230 volt electrical parts are insulated from any grounded metal parts, since the universal motor must be air cooled and some water ingress is possible. Double insulation helps, and working with the OEM, Groschopp engineers used their experience and design expertise to develop a venting system which minimizes this potential problem. The design also includes special fiberglass commutator insulation and corrosion-resistant coatings on the lamination core and shaft.

## Portable Pump - UM Integrated Assembly

Another use for the versatile universal motor came when a manufacturer of high performance products needed a motor for their portable hydraulic pumps. They trusted Groschopp to choose the motor, but also, as a partner, to source a special cast housing. A two-pole UM was optimized for rugged conditions, including creating custom bearings and windings for armature, machining the housing and end bells, and assembling, testing and providing quality assurance for the modules.

“There’s actually nothing about the motor that is particularly ‘magical’ in this application. It’s really about the whole product,” said Paul Ross, Lead Commercial Engineer. “We have been happy to supply motion technology to this customer for many years, and throughout that time we have grown more and more involved with production of their tools – including design, tooling, vendor selection, and production. They trust us as engineers and business partners to make sure the entire job gets done right.”

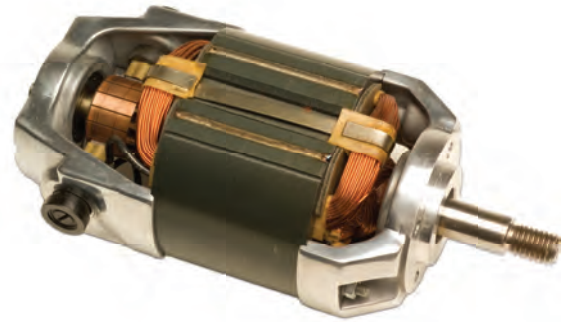
## UM Skeleton Frame Motor

When the US military needed an impact wrench for their vehicles, their vendor came to Groschopp for the motor. The UM was the perfect fit for the application with a need for a high quality, rugged, and durable tool to withstand the extreme conditions experienced in the Abrahams Tank, Bradley Fighting Vehicle, and the Humvee. With lives hanging in the balance this impact wrench can’t fail. The 30 Frame UM parts set was matched with a new housing from the vendor. The extensive testing to which Groschopp subjected the tool proved the design.

Groschopp’s latest project using the UM is powering a heavy duty concrete drill and resulted in a new standard product, the SK11100. This motor must work in tough construction situations drilling concrete foundations and the like. It is approximately 9 inches in length (plus output shaft and external cooling fan) and 4.6 inches in diameter, and has a peak HP rating of 3.5, and up to 2.5 continuous HP. It is capable of speeds of up to 20,000 RPM. This motor, supplied with a skeleton frame design, can be used for a quick prototype for testing purposes, and a custom housing can be designed for final assembly. Standard frame sizes can be fitted with application specific housings to accommodate special mounting, so they can be dropped into existing applications.

Despite the fact that the universal motor must have air flow for cooling, it is possible to make this rugged motor relatively resistant to environmental conditions. The IPX4 rating that can be achieved will handle all but the worst of extreme conditions. The high startup torque, high speed, and ruggedness of design make the universal motor the best choice for many construction and maintenance tools. It features an excellent performance to weight ratio, is able to withstand high temperatures, and is a cost-effective solution.

“This skeleton design UM has been developed for engineers and product designers who need a quick prototype for testing purposes,” said Tullar. “Most of the time the UM will eventually be installed in a custom-designed housing for the final motor assembly, so this design is great for testing purposes.” Groschopp often participates in the housing design to optimize the entire motion assembly performance, and to assist the customer in developing the most cost-effective final assembly. There are also instances where an OEM will continue to purchase a skeleton frame motor, and simply mount it into their machine assembly.



*Skeleton Frame Universal Motors allow machine/product designers to quickly prototype and test the motor in their application*