Electric Drives

Product Catalogue

Synchronous Motors

Synchronous Generators

Wheel Hub Drives

DC Disc Motors
Electric Drives

ELECTRIC DRIVES & COMPLETE SYSTEMS

From its headquarters in Germany’s Black Forest, Heinzmann GmbH & Co. KG develops and produces the most advanced drive technology solutions. We supply complete system solutions on request, tailored to the specific requirements of the application in question.

HEINZMANN took over Perm Motor GmbH and its electric motors with patented rotor technology in 2008. Our customers around the world benefit from the synergies of a flexible and innovative hotbed of ideas, and from the experience and reliability of a global yet traditional company with an international service and sales network. Make the most of our pooled expertise to gain outstanding drive solutions in consistently reliable quality.

HEINZMANN drive systems are used in a diverse range of industrial applications, in LEVs and electric vehicles, in block heating plants and within the rehabilitation field.

Synchronous Motors
Powerful brushless disc motors in patented rotor technology.

Synchronous Generators
Generators with outstanding key performance indicators and significant efficiency gains.

Wheel Hub Drives
HEINZMANN, pioneer in the field of e-bike drives, delivers complete drive systems.

DC Disc Motors
Disc motors with brushes in flat design.

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For decades now, HEINZMANN has been developing and producing robust, powerful electric drives rated up to 25 kW for use in a whole host of applications, which have proven themselves to be ideal within tough industrial environments in particular.

Our range of reliable, high-performance electric motors offers the optimal solution for your application. From industrially produced series motors to application-based redesigns, substitute solutions and individual new developments – our patented rotor technology constantly excels through above-average performance data and significant increases in efficiency.

**HEINZMANN provides**
- Synchronous motors
- Synchronous generators
- Wheel hub drives
- DC disc motors

**Suitable drive for your application**

**PMS/PGS - Double-sided Synchronous Disc Motors & Generators up to 25 kW**

Powerful brushless disc motors and generators in patented rotor technology excel through above-average performance and significant increases in efficiency.

**PMS F/PGS F - Single-sided Synchronous Disc Motors & Generators**

Powerful brushless disc motors and generators in flat design ideal for applications with very limited axial installation space and reduced weight.

**PRA/RN - High Torque Wheel Drives**

Wide range of motors designed for tight integration into the wheel hub and for multiple applications.

**PMG - DC Disc Motors up to 5 kW**

Multi-pole, permanently excited disc motor with brushes. Efficiency up to approx. 90 %.

**SL - Disc Motors with Brushes up to 1 kW**

Robust DC motor with brushes in extremely flat design.
Range of Application

PARTNER FOR INNOVATIVE PROJECTS

HEINZMANN is a reliable partner for innovative, complete drive solutions for a wide range of application areas.

In addition to industrial applications, our drive systems are also in tune with the times when it comes to the hot topic of electric mobility.

Our powerful and robust motors have proven themselves in robotics, mobile machines, fans, pumps and agricultural technology. LEVs, electric vehicles, electric motorbikes and boats. As generators, electrical power generation also forms a part of the diverse range of applications.

Industry & Agriculture
- Climbing systems
- Parking systems
- Harvesting and sowing machines
- Mobile lifting platforms
- Pumps
- Printing, textile and machine tools
- Lifters
- Forklift trucks

Mobility & Transport
- LEVs
- E-Motorcycles
- E-Karts
- E-Scooter
- Handicap vehicles
- Multi-purpose vehicles
- Driverless transport vehicles
- Boats and ships

E-Bikes & Cargo Bikes
- Cargo bikes
- E-Bikes
- Velotaxis
- Special bikes

Rehabilitation & Medical Care
- Stair climber
- Bedsides
- Centrifuges
- Medical pumps

Electric Energy
- Combined heat and power units

Consumer Products
- Cross trainer
- Turf applications, lawn tractors
- Cleaning machines

APPLICATION EXAMPLES

A typical application in the agricultural sector is the deployment of HEINZMANN electric drives in a seeder. In this machine, direct current brush motors from the SL product line are used to drive the sowing mechanism. Over the course of many years, the SL motors have proven to be robust and reliable drives for challenging environments.

The innovative, mobile electric lift system from the Swiss company HighStep is easy to transport while providing the full functionality of a climbing system. It is equipped with HEINZMANN disc-type motors with brushes. These are powerful, light, small and thus the ideal solution for this application.

Sarnatec EVO4 lifting platforms are equipped with PMSG 100-1500 brushless disc-type motors. Their sophisticated design makes them ideal for the axially confined installation space on the EVO4 wheel hubs. Among other uses, the mobile lifting platforms are employed in agricultural settings as apple harvesters.

The PMS 120 serves as drive for the modern robot system RAY™ of SERVA Transport Systems GmbH. It is used among others on production sites, in car parks and on airports. Since February 2015, for example, these robots have been in operation at the AUDI plant in Ingolstadt, Germany, and transport in three-shift operation up to 2,000 cars per day.

www.heinzmann-electric-motors.com
Phone: +49 7673 8208 0
Drive Systems
Wheel Hub Motors

Applications

Range of Application

Generators within the PGS series are a central module of small, modern block heating plants for obtaining electrical energy and heat. The PGS smart design allows very small total dimensions of CHPL.

The HYMOG of PTH Product Maschinenbau is a robotic platform with a powerful electric drive on tracks. Its compact design with low centre of gravity and broad base make the vehicle specifically qualified for use off-road. The powerful PMSG 100-1500 motors draw their energy from a smart lithium-ion battery with self-regulating heating system.

The Ziesel tracked vehicle from Mattro Mobility Revolutions is an innovative, electrically driven work-mobile and recreational vehicle. The drive comprises PMS disc-type motors from HEINZMANN, which are particularly flat and feature a high power density. Like all PMS motors they stand out as a result of their very good acceleration characteristics and wide ranges.

The powerful and easy controllable PMG 132 is ideal for drives in boats. The electrical drive system ensures a virtually silent glide through the water and is thus an alternative and improvement on loud combustion engines. With no emissions, this drive makes water sports much more environmentally friendly.

KTM, the market leader for electric motorbikes, has used the HEINZMANN PMS 120 to motorise its Enduro „Freeride“. The water-cooled electric motor delivers a peak output of 16 kW (22 hp) and a torque of 42 Nm from a standstill. In other words: with a weight of just 111 kilos, the motorcycle gets off to an utterly flying start. Pure riding pleasure – without the noise and emissions.

Customers such as Deutsche Post and Post Danmark rely on cargo bike drive systems from HEINZMANN. HEINZMANN’s revolutionary cargo bike drive system CargoPower is extremely powerful and robust. The powerful motor combined with proven system components guarantees maximum driving force for a wide range of professional and commercial applications.

As an e-bike pioneer from the very beginning, HEINZMANN has decades of experience when it comes to motors for electric bicycles. The latest generation of e-bikes showcases the series of DirectPower motors. Combined with the appropriate system components, the DirectPower e-bike system meets every requirement.

Alber has used the reliable HEINZMANN SL 120-2NFB drive in its stair climbers for decades now. Stairs are often a difficult obstacle for the disabled and elderly. The HEINZMANN drive system helps overcome this problem in typically reliable fashion.

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Series of PMS Motors

PMS MOTORS

The brushless synchronous disc motor excels in comparison with a conventional electric motor, providing benefits including compact size, flat design, low weight with identical power and higher efficiency. This makes it ideal as a motor for drive tasks in axially confined installation spaces. Its small size yet high power makes it an efficient drive that is frequently used within machinery and equipment manufacture and within the traction sector.

HEINZMANN provides its customers with a complete range of these brushless drives. They deliver continuous loads of up to 25 kW and torques up to 59 Nm depending on the cooling type, and feature variable intermediate circuit voltage. The brushless design means that the synchronous disc motors do not require any wearing parts such as charcoal or collectors. The drives offer a long service life and are almost maintenance free. As such, overall costs for maintenance, servicing and parts are significantly reduced.

Features

- **Patented rotor technology**
  The special patented design and construction of the rotor discs make them lightweight by comparison. They are characterised by low inertia, which permits short run-up times. Their mechanical strength also makes them suitable for use in high-speed applications. Another benefit of the design (of the rotor discs) lies in the minimal detent torques.

- **Powerful**
  The benefits of the large air gap area of the disc motor, coupled with the incorporation of the coil in the stator, enables a high torque and a powerful, highly efficient motor. With two stators, the effect is even more pronounced on the double-sided version. The result is a powerful motor within a small installation space.

- **Maintenance-free and durable**
  The electronic commutation on PMS motors replaces the mechanical commutator. This makes the PMS motors maintenance-free. Our long-lasting motors are designed for use in a variety of settings.

- **Dynamic**
  Thanks to the patented rotor technology, PMS motors with two stators have low inertia and therefore are the perfect solution for dynamic applications. They also have a low detent torque, enabling sound, simple control of dynamic servo drives.

- **Flat**
  PMS motors are extremely flat, especially the variant with single-side stator (type F). This achieves space savings in an axial direction and means a significantly lower weight.

- **Flexible**
  PMS motors are constructed as servo motors or slow-running, high-torque motors in various versions. They are produced with a high degree of protection, with air or liquid cooling. The models are available with a solid or hollow shaft or as a kit for integration within machines.

Applications

PMS motors are suited for use in applications within industry, medicine and traction. Their flat design makes them ideal for using where installation space is at a premium. Malfunctions caused by issues such as brush arcing, wear or dirt accumulation no longer apply, making the motors virtually maintenance-free. Together with the controller, these motors are the ideal drive for any application where speed control and high dynamic requirements prevail, and where quick changes in load or direction of rotation and fast run-ups are required. They are available with various sensor systems and also in a sensor-free version. PMS motors can also function as highly efficient generators (see page 30 PGS generators).

Range of Applications

- Industrial applications like printing, textile and machine tools, robotics
- Traction drive for electric vehicles, boats, lawn mowers or turf applications
- Compact pumps and fans for low-maintenance continuous service
- Drive for auxiliary generators in vehicles
- Medical equipment
- Cross trainer
- E-Motorcycles and E-Scooters

Power range PMS disc motors

- **PMS 156 W**
- **PMS 150**
- **PMS 120**
- **PMS 100**
- **PMS 100F**
- **PMS 080**
- **PMS 080F**
- **PMS 066F**

Torque range PMS disc motors

- **PMS 156 W**
- **PMS 150**
- **PMS 120**
- **PMS 100**
- **PMS 100F**
- **PMS 080**
- **PMS 080F**
- **PMS 066F**

Liquid-cooled design
Series of PMS Motors

CUSTOM-BUILT PMS MOTOR VARIANTS

Our experts will advise you on finding the right motor variant to suit your needs. Choose from one of our established standard versions or a special custom-built version. In this case, our engineers select a motor to meet your specifications and provide you with a quote once the technical details have been confirmed.

This guarantees you a tailored solution that meets your specific circumstances and requirements.

A number of satisfied industrial clients can testify to our expertise in this area.

Application: Electric Enduro

With its electric Enduro Freeride-E, the world market leader for off-road sports motorbikes KTM has brought new momentum to the off-road sport. PMS disc motors help here to lend an entirely new image to motocross bikes: offering pure riding pleasure without the noise and emissions. KTM has integrated the active components of the PMS motors into its own housing.

PMS 066F

PMS 066F is the smallest motor from the single-sided synchronous motor series. Suitable for applications with very limited axial installation space.

Its design, high power density and low inertia, which delivers very good acceleration characteristics, make the disc motor ideal for installation in a motorbike.

Application: Electric tracked vehicle

Mattro Mobility Revolutions, based in Schwaz, Austria, is causing a real sensation with the Ziesel: its revolutionary new electric fun and work-mobile. Using both PMS 120 motors, the Mattro Ziesel can reach a continuous load of 4.8 kW/6.5 hp and peak output of 15.4 kW/21 hp. Put your foot down and the torque reaches a solid 400 Nm, hitting the top speed of 35 km/h in under two seconds.

Fully integrated PMS Motor of KTM E-Enduro Freeride-E

CUSTOM-BUILT PMS MOTOR VARIANTS

Our experts will advise you on finding the right motor variant to suit your needs. Choose from one of our established standard versions or a special custom-built version. In this case, our engineers select a motor to meet your specifications and provide you with a quote once the technical details have been confirmed.

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### PMS 080F

PMS 080F is a larger variant of the single-sided synchronous motor series.

#### Dimensions

![PMS 080F Dimensions](image)

#### Standard motor feedback: sin/cos

#### Technical Data

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<th>I_n</th>
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- Cooling: External ventilation
- \( m = \text{approx. } 3.2 \text{ kg} \)
- \( J = 6.5 \text{ kg} \cdot \text{cm}^2 \)
- Max. permissible load = 6/60 sec
- Operating mode = S1

### PMS 100F

The PMS 100F motor is a variant of the single-sided synchronous motor series offering above-average torque with comparatively low overall height.

#### Dimensions

![PMS 100F Dimensions](image)

#### Standard motor feedback: sin/cos

#### Technical Data

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- Cooling: External ventilation
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- \( J = 7.5 \text{ kg} \cdot \text{cm}^2 \)
- Max. permissible load = 6/60 sec
- Operating mode = S1

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**Series of PMS Motors**

**PMS 080F**

PMS 080F is a larger variant of the single-sided synchronous motor series.

**PMS 100F**

The PMS 100F motor is a variant of the single-sided synchronous motor series offering above-average torque with comparatively low overall height.
**PMS 080**

PMS 080 is the smallest from the series with double-sided stators. Suitable for applications with very limited axial installation space.

### Technical Data

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- **Cooling**: External ventilation
- **m**: 3.8 kg
- **J**: 3.8 kg cm²
- **Max. permissible load**: 6/60 sec
- **Operating mode**: 51

**Dimensions**

- Standard motor feedback: sin/cos

---

**PMS 100**

The PMS 100 motor is a variant of the double-sided stator series offering above-average torque with comparatively low overall height.

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>n (rpm)</th>
<th>Pn (W)</th>
<th>In (A)</th>
<th>Mn (Nm)</th>
<th>Kn (Nm/A)</th>
<th>V/1000 (V)</th>
<th>Pmax (W)</th>
<th>Imax (A)</th>
<th>Mmax (Nm)</th>
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- **Cooling**: External ventilation
- **m**: 7.2 kg
- **J**: 9.6 kg cm²
- **Max. permissible load**: 6/60 sec
- **Operating mode**: 51

**Dimensions**

- Standard motor feedback: sin/cos

---

**Series of PMS Motors**
Series of PMS Motors

PMS 120
The PMS 120 is a particularly powerful motor from the series with two stators.

Dimensions

Technical Data

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<th>I_r (A (AC))</th>
<th>M_r (Nm)</th>
<th>K_t</th>
<th>K_e</th>
<th>P_m (kW)</th>
<th>I_m (A)</th>
<th>M_m (Nm)</th>
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<td>57.80</td>
<td>12.1</td>
<td>50</td>
<td>45</td>
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</table>

Cooling: External ventilation
m = 12.3 kg
J = 26.3 kg • cm²
Max. permissible load = 6/60 sec
Operating mode = S1

PMS 120W
The disc motor PMS 120W from the series with two stators achieves a considerable increase in performance by liquid cooling compared to the air-cooled variant.

Dimensions

Technical Data

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<th>M_r (Nm)</th>
<th>K_t</th>
<th>K_e</th>
<th>P_m (kW)</th>
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</table>

Cooling: Liquid-cooled
m = 16 kg
J = 26.3 kg • cm²
Max. permissible load = 6/60 sec
Operating mode = S1
PMS 150
The PMS 150 is by far the strongest member of the series with two stators within the forced-ventilated cooled versions.

PMS 156W
Compared to the forced-ventilated cooled variant the PMS 156W from the series with two stators obtains maximum power density by its compact design and liquid cooling compared to motors of a similar performance class.

**Technical Data**

<table>
<thead>
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<th>Ie</th>
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**Dimensions**

Standard motor feedback: sin/cos
Standard motor feedback >100 VDC: Resolver

**Technical Data**

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<tr>
<th>Voltage</th>
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<th>Me</th>
<th>Ke</th>
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**Dimensions**

Standard motor feedback: sin/cos
Standard motor feedback >100 VDC: Resolver
PMS System Components

SYSTEMS FROM A SINGLE SOURCE

As well as supplying the right type of motor for your application, we provide the associated system components to form a complete solution. The benefit to you is that the HEINZMANN team of experts gives you support in choosing a tailored drive system for your application and you receive perfectly harmonised components from a single source.

Motor Controller

Permanently excited synchronous motors require electronic controllers for their operation. These controllers are subject to the utmost dynamic requirements and must demonstrate extreme performance characteristics. That’s why a selection of tried-and-tested motor controllers is available for the motors in the PMS series. As a result, the interplay of both components achieves optimum results.

System Overview

Motor

Motor controller

Motor

Motor controller

USB/CAN adapter for laptops
Operating Unit
Changeover contactor

Motor Controllers of varying levels of performance

Motor Controller

Depending on requirements, we offer three types of sensors for the motor feedback within the PMS series: Hall and sin/cos motor feedback and resolver. This enables control of PMS motors by virtually any conventional motor controller.

Motor feedback

Hall motor feedback

HEINZMANN provides

- Motors
- Motor controller
- Motor feedback
- Gears
- Brakes

Motors in the PMS series are also available with a gear on request. 1-, 2- or 3-stage planetary gears are used to adjust speed and torque to meet requirements. For more details, please refer to the section on PMSG Systems Solutions.

Gears

Gear type 500

Gear type 1500

Brakes

All PMS motors can also be equipped with brakes. Depending on requirements, this can be a service brake or parking brake with electric or manual control, and safety brakes are also available.

Brakes

Electrically-actuated service brake

Brake with additional manual actuation
Series of PMSG System Solutions

PMSG MOTOR & GEAR COMBINATIONS

The PMSG wheel hub motor from HEINZMANN sets itself apart with a clean, environmentally-friendly drive concept that produces no emissions or noise. It boasts a high starting torque with large overload factor, plus the option of energy recuperation during braking. This powerful motor requires no maintenance and also has a high level of efficiency in its favour. It mounts directly on the rim, so no axle is required. The PMSG features an integrated planetary gear and inbuilt wheel bearing for direct mounting on the rim. A parking brake is available as an option. This product is suitable for both 2-wheel and 4-wheel drives.

Features
- Maintenance-free
- Energy recuperation
- High efficiency
- Low noise
- High starting torque

Range of Applications
- Turf applications, lawn tractors
- Harvester
- Forklift trucks
- Lifters
- Floor care machinery
- Municipal vehicles
- Commercial vehicles
- Electric cars and NEV
- Replacement for hydraulic drives

Gearing data

<table>
<thead>
<tr>
<th>Reduction possibilities (same reduction possibilities are not available in standard versions)</th>
<th>PMSG xxx-500</th>
<th>PMSG xxx-1500</th>
<th>PMSG xxx-4000</th>
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</thead>
</table>

Max. continuous torque
- 160 Nm
- 800 Nm
- 1,600 Nm

Max. peak torque
- 500 Nm
- 2,000 Nm
- 4,000 Nm

Max. axial forces
- 2,500 N
- 5,000 N
- 9,000 N

Max. radial forces
- 8,000 N
- 25,000 N
- 45,000 N

Lubrication
- Lifetime
- Lifetime
- Lifetime

Lifetime
- 20,000 hours (depending on application)
- 20,000 hours (depending on application)
- 20,000 hours (depending on application)

Degree of protection
- up to IP67
- up to IP67
- up to IP67

Weight planetary gear
- ~ 7 kg
- 14 – 17.5 kg
- 38 – 44 kg

Implementation
- Power connection: Cable length 1 m, open cable ends
- Encoder connection: Cable length 1 m, open cable ends
- Motor feedback: Probe with sin/cos output
- Temperature sensor: KTY 84-150
- Cooling: External ventilation, generated independently from motor, min. air velocity > 5 m/s

PMSG System Overview

The combinations described on the following pages are only a selection. The complete list of standard combinations consists of the motors (page 13-21) and the gear list above. Other variants on request.
**Series of PMSG System Solutions**

**PMSG 100-500**  
**MOTOR & GEAR COMBINATION 1.45 - 2.7 KW**

The PMSG 100-500 combines a PMS 100 motor with a gear and an output torque of up to 160 Nm.

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
<th>Gearing data</th>
</tr>
</thead>
<tbody>
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<td>Rated speed</td>
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</tr>
<tr>
<td></td>
<td>2.7</td>
<td>6000</td>
</tr>
<tr>
<td>PMSG 100-500-2-42</td>
<td>24 VDC</td>
<td>1.45</td>
</tr>
<tr>
<td></td>
<td>1.4</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>4500</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>2.6</td>
<td>4500</td>
</tr>
<tr>
<td></td>
<td>2.7</td>
<td>6000</td>
</tr>
</tbody>
</table>

- Cooling: Forced ventilation  
- m = 14.5 kg  
- Operating mode = S1

**PMSG 120-500**  
**MOTOR & GEAR COMBINATION 3.0 - 8.0 KW**

The PMSG 120-500 combines a PMS 120 motor with a gear and an output torque of up to 160 Nm.

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
<th>Gearing data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated power</td>
<td>Rated speed</td>
</tr>
<tr>
<td>48 VDC</td>
<td>5.5</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>4500</td>
</tr>
<tr>
<td>96 VDC</td>
<td>6.4</td>
<td>3000</td>
</tr>
<tr>
<td></td>
<td>7.5</td>
<td>4500</td>
</tr>
<tr>
<td></td>
<td>8.0</td>
<td>6000</td>
</tr>
</tbody>
</table>

- Cooling: Forced ventilation  
- m = 19.6 kg  
- Operating mode = S1
# Series of PMSG System Solutions

## PMSG 120-1500

**MOTOR & GEAR COMBINATION 3.0 - 8.0 KW**

The PMSG 120-1500 combines a PMS 120 motor with a gear and an output torque of up to 500 Nm.

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
<th>Gearing data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated power</td>
<td>Rated speed</td>
</tr>
<tr>
<td>kW</td>
<td>rpm Nm A</td>
<td>rpm   Nm A</td>
</tr>
</tbody>
</table>

### Dimensions

![Dimensions Diagram](image)

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>i % rpm</td>
</tr>
</tbody>
</table>

### PMSG 150-1500

**MOTOR & GEAR COMBINATION 5.0 - 14.0 KW**

The PMSG 150-1500 combines a PMS 150 motor with a gear and an output torque of up to 500 Nm.

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>i % rpm Nm</td>
</tr>
</tbody>
</table>

### Dimensions

![Dimensions Diagram](image)

### Technical Data

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Motor data</th>
</tr>
</thead>
<tbody>
<tr>
<td>kW</td>
<td>i % rpm</td>
</tr>
</tbody>
</table>

---

**PMSG 120-1500-2-40**

- **48 VDC**
  - 5.5 kW: 3000 rpm, 175 Nm, 27.1 i, 94% efficiency, 75 rpm, 500 Nm
  - 6.0 kW: 4500 rpm, 12.7 Nm, 126.9 i, 94% efficiency, 113 rpm, 500 Nm
  - 6.0 kW: 6000 rpm, 11.9 Nm, 134.0 i, 94% efficiency, 150 rpm, 449 Nm
- **96 VDC**
  - 6.4 kW: 3000 rpm, 20.4 Nm, 73.6 i, 94% efficiency, 75 rpm, 500 Nm
  - 7.5 kW: 4500 rpm, 15.9 Nm, 83.7 i, 94% efficiency, 113 rpm, 500 Nm
  - 8.0 kW: 6000 rpm, 12.7 Nm, 93.4 i, 94% efficiency, 150 rpm, 479 Nm

- **Cooling**: Forced ventilation  ▶  m = 27.8 kg  ▶  Operating mode = S1

**PMSG 150-1500-2-16**

- **48 VDC**
  - 8.5 kW: 3000 rpm, 27.1 Nm, 191.9 i, 94% efficiency, 75 rpm, 500 Nm
  - 8.5 kW: 4500 rpm, 18.0 Nm, 190.8 i, 94% efficiency, 113 rpm, 500 Nm
  - 8.5 kW: 6000 rpm, 13.5 Nm, 192.0 i, 94% efficiency, 150 rpm, 270 Nm
  - **96 VDC**
    - 10.5 kW: 3000 rpm, 33.4 Nm, 150.8 i, 94% efficiency, 75 rpm, 500 Nm
    - 14.0 kW: 4500 rpm, 29.7 Nm, 167.4 i, 94% efficiency, 113 rpm, 447 Nm
    - 13.0 kW: 6000 rpm, 20.7 Nm, 157.5 i, 94% efficiency, 150 rpm, 311 Nm

- **Cooling**: Forced ventilation  ▶  m = 27.8 kg  ▶  Operating mode = S1

---

**PMSG 150-1500-2-40**

- **48 VDC**
  - 8.5 kW: 3000 rpm, 27.1 Nm, 191.9 i, 94% efficiency, 75 rpm, 500 Nm
  - 8.5 kW: 4500 rpm, 18.0 Nm, 190.8 i, 94% efficiency, 113 rpm, 500 Nm
  - 8.5 kW: 6000 rpm, 13.5 Nm, 192.0 i, 94% efficiency, 150 rpm, 270 Nm
  - **96 VDC**
    - 10.5 kW: 3000 rpm, 33.4 Nm, 150.8 i, 94% efficiency, 75 rpm, 500 Nm
    - 14.0 kW: 4500 rpm, 29.7 Nm, 167.4 i, 94% efficiency, 113 rpm, 447 Nm
    - 13.0 kW: 6000 rpm, 20.7 Nm, 157.5 i, 94% efficiency, 150 rpm, 311 Nm

- **Cooling**: Forced ventilation  ▶  m = 27.8 kg  ▶  Operating mode = S1

---
Series of PGS Generators

PGS GENERATORS
The PGS synchronous generators are brushless, highly efficient disc generators with patented rotor technology. This series of generators boasts a great power density, low weight, high efficiency and an extremely flat design. Their housing makes them completely enclosed.

The PGS series has been designed for a power range of 0.1 to 20 kVA at variable speeds and voltage. The voltage range reaches a maximum of 500 VAC. Whether block heating plant or emergency power supply, we deliver the generator that meets your requirements, air or liquid-cooled. From special developments to large-scale production, we are the partner you can rely on.

Detailed information on the individual models of generator within the PGS series, including technical data and drawings, is available on request.

Features
- **Double stator for high power density**
  The double-sided design sees the patented rotor disc operate using 2 stators. The generator demonstrates its full potential here with the neodymium iron boron magnets.

- **High level of efficiency**
  The large air gap area on the double-sided version makes the PGS generators highly efficient. The result is a maximum-efficiency generator within a small installation space.

- **Flat design**
  The small axial length of the PGS generators means they can even be used in restricted installation spaces. For even more extreme applications where even the double-sided generators can no longer be accommodated mechanically, the even flatter generators within the F series with single-side stator can be employed.

- **Maintenance-free and long service life**
  As PGS generators have no mechanical commutation, they are completely maintenance-free. Designed to deliver an extremely long service life, these products are intended for use in a wide variety of environments and to meet high levels of requirements.

- **Flexible**
  The PGS generators have been designed by HEINZMANN with special consideration given to customer requirements. The range of sizes cover a nominal speed range of 3,000 – 6,000 rpm and nominal voltages of up to 500 VAC. We therefore offer our customers the flexibility to resolve their technical problem from an individual standpoint.

Customer-Specific Applications
The generators in the PGS series are available in various versions. They can be self-cooled, forced-ventilated or liquid-cooled.

Our experts will advise you on finding the right generator to suit your needs. If our standard variants don’t fit the bill, you can also opt for a custom-built design.

Our engineers work with you to develop a specific solution and provide you with a quote once all the technical details have been confirmed.

This guarantees you a tailored solution that meets your specific circumstances and requirements.

A number of satisfied industrial clients can testify to our expertise in this area.

Range of Applications
- Combined heat and power plants
- Auxiliary power supplies
- Auxiliary power units
- Range extender
- Hydro-electric power plants
Technical Data and Information

Motor type
Brushless synchronous disc motor/generator, excited by permanent magnet in disc motor technology

Miscellaneous provisions
Relevant standards DIN EN 60034

Operational mode
S1 (continuous duty)

Cooling
Self-cooling = without fan, mounting on satisfactory cooling surface
Forced ventilation = generated independently from motor, min. air velocity > 5 m/s required
Liquid cooling = 6 l/min, max. coolant temperature 60 °C, max. operating pressure 3 bar, customer specific design on request

Pairs of poles
4 (5 at PMS/PGS 066F)

Magnet material
Neodymium iron boron (NdFeB)

Electrical connection
Terminal box with cable approx. 1 m, wire cross-section depending on motor current
Plug on request

Electric strength
According to standard DIN EN 60034

Thermal class
F (155 °C)

Degree of protection
IP54, alternatives obtainable on request

Permissible ambient temperature
-25 ... +40 °C

Motor feedback
Resolver two-pin
Digital Hall probe
Analogue Hall probe with sin/cos output
Further types of motor feedback on request

Temperature sensor
KTY84-130, optional PTC according to DIN 44081

Painting
On request
Standard finish: cast aluminium

Shaft
Shaft with key groove

Types
PMS/PGS Type F: one stator, one rotor with closed magnetic circuit
PMS/PGS double-sided: two stators, one rotor self-contained

Specific features
The customer has the option of integrating components from PMS/PGS series drives into machinery in kit form

Permissible Forces
for 20,000 hours lifespan

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Rating speed 3000</th>
<th>Rating speed 4500</th>
<th>Rating speed 6000</th>
<th>Bearing A-side</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS/PGS 066</td>
<td>360</td>
<td>310</td>
<td>280</td>
<td>602</td>
</tr>
<tr>
<td>PMS/PGS 080</td>
<td>500</td>
<td>430</td>
<td>400</td>
<td>6202 6004</td>
</tr>
<tr>
<td>PMS/PGS 100</td>
<td>1000</td>
<td>900</td>
<td>810</td>
<td>6304</td>
</tr>
<tr>
<td>PMS/PGS 120</td>
<td>900</td>
<td>780</td>
<td>720</td>
<td>6205</td>
</tr>
<tr>
<td>PMS/PGS 150</td>
<td>900</td>
<td>780</td>
<td>720</td>
<td>6205 6206</td>
</tr>
</tbody>
</table>

Axial force $F_x$ [N] at n rpm

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Rating speed 3000</th>
<th>Rating speed 4500</th>
<th>Rating speed 6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS/PGS 066</td>
<td>105</td>
<td>90</td>
<td>75</td>
</tr>
<tr>
<td>PMS/PGS 080</td>
<td>140</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>PMS/PGS 100</td>
<td>300</td>
<td>255</td>
<td>210</td>
</tr>
<tr>
<td>PMS/PGS 120</td>
<td>300</td>
<td>255</td>
<td>210</td>
</tr>
<tr>
<td>PMS/PGS 150</td>
<td>460</td>
<td>390</td>
<td>320</td>
</tr>
</tbody>
</table>

All given characteristics of the motors are calculated data which may differ slightly. Subject to alterations.

On request: Alternative voltage, speed, torque or power for customised applications obtainable and additional mounting of gearbox or brake obtainable.
Permissible Mounting Orientation
For any PMS motors with protection grade lower than IP65 mounting with vertical or approx. vertical shaft is critical. These motors are not absolutely waterproof. Water accumulated at the bearing (e.g. spray, condensate or similar) may penetrate into the housing. Corrosion and motor failure may be the result.

Electrical Connections

Motor connection
Where possible the motors are equipped as standard with highly flexible, two-norm-servo cables (UL/CSA and VDE-REG. no.) suitable for drag chains. These cables combine supply cores and pilot cores for thermal protection KTY 84-130. The cables are equipped with an additional overall screen for increased interference immunity (EMC). Motors with bigger wire cross-section are equipped with single strands.

Technical data/design
Special PUR drag chain cable in accordance with UL AWM Style. Overall screen from galvanised copper braid with approx. 85% cover.

Pilot cores
Imprint BR1, BR2
Thermal protection

Outer sheath
PUR, extremely abrasion-resistant, low-adhesion, halogen-free, resistant to UV, oil, hydrolysis and microbes
Sheath colour: orange (RAL 2003) in accordance with DESINA

Lowest permissible bend radius
At least 7.5 x cable diameter

Temperature range cable
Flexing: -30 ... +80 °C
Fixed installation: -40 ... +80 °C

Rated voltage according to VDE
Power cores: Uo/U 600/1000 V
Pilot cores: Uo/U 300/500 V

Structure Diagram of a Drive System with Synchronous Motor

Core measurement motor connection & KTY cable

<table>
<thead>
<tr>
<th>Number of cores x cross section mm²</th>
<th>Current A</th>
<th>Outer diameter mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>4×1.5/(2×1)</td>
<td>up to 18</td>
<td>11.5</td>
</tr>
<tr>
<td>4×2.5/(2×1)</td>
<td>up to 26</td>
<td>13.6</td>
</tr>
<tr>
<td>4×4/(2×1)</td>
<td>up to 34</td>
<td>15</td>
</tr>
<tr>
<td>4×6/(2×1)</td>
<td>up to 44</td>
<td>16.1</td>
</tr>
<tr>
<td>4×10/(2×1)</td>
<td>up to 61</td>
<td>20.2</td>
</tr>
<tr>
<td>4×16/(2×1)</td>
<td>up to 82</td>
<td>23.8</td>
</tr>
</tbody>
</table>
**PMS/PGS Technical Data**

**Resolver connector:** Coninvers - M 23 - Series RC - 12-pole
Type: Pin insert on motor side, reverse rotation, coding centre

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COS +</td>
</tr>
<tr>
<td>2</td>
<td>COS –</td>
</tr>
<tr>
<td>3</td>
<td>SIN +</td>
</tr>
<tr>
<td>4</td>
<td>SIN –</td>
</tr>
<tr>
<td>5</td>
<td>n.c.</td>
</tr>
<tr>
<td>6</td>
<td>REF +</td>
</tr>
<tr>
<td>7</td>
<td>REF –</td>
</tr>
<tr>
<td>8</td>
<td>n.c.</td>
</tr>
<tr>
<td>9</td>
<td>n.c.</td>
</tr>
<tr>
<td>10</td>
<td>n.c.</td>
</tr>
<tr>
<td>11</td>
<td>KTY +/PTC</td>
</tr>
<tr>
<td>12</td>
<td>KTY –/PTC</td>
</tr>
</tbody>
</table>

**Open cable ends**

<table>
<thead>
<tr>
<th>Core colour</th>
<th>No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>black</td>
<td>1</td>
<td>Phase U</td>
</tr>
<tr>
<td>black</td>
<td>2</td>
<td>Phase V</td>
</tr>
<tr>
<td>black</td>
<td>3</td>
<td>Phase W</td>
</tr>
<tr>
<td>green-yellow</td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>red or black</td>
<td>KTY +</td>
<td></td>
</tr>
<tr>
<td>black</td>
<td>KTY –</td>
<td></td>
</tr>
</tbody>
</table>

**Motor feedback connection**

**Technical Data/Structure**

- **Overall screen:** Galvanised copper braid
- **Outer sheath:** PVC
- **Lowest permissible bend radius:** At least 6 x cable diameter
- **Temperature range sensor**
  - Flexing: -5 ... +70 °C
  - Fixed installation: -40 ... +80 °C
- **Rated voltage according to VDE:** 500 V
- **Effective capacitance**
  - Core/core: approx. 120 nF/km
  - Core/sheath: approx. 160 nF/km

---

**Power connector M23**

**Pin insert on motor side**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phase U</td>
</tr>
<tr>
<td>2</td>
<td>Phase V</td>
</tr>
<tr>
<td>3</td>
<td>Phase W</td>
</tr>
<tr>
<td>GND/2</td>
<td>PE</td>
</tr>
<tr>
<td>A</td>
<td>n.c.</td>
</tr>
<tr>
<td>B</td>
<td>n.c.</td>
</tr>
<tr>
<td>C</td>
<td>KTY –/PTC</td>
</tr>
<tr>
<td>D</td>
<td>KTY +/PTC</td>
</tr>
</tbody>
</table>

**View of pin insert from the connector side**

**Coninvers-M23 pin, RC Series, 12-pole**

---

**Synchronous Motors & Generators**

**DC Disc Motors**

---

**www.heinzmann-electric-motors.com**

Phone: +49 7673 8208 0

---

**Resolver connector:** Coninvers - M 23 - Series RC - 12-pole
Type: Pin insert on motor side, reverse rotation, coding centre

**Function**

- **SIN**
- **COS**
- **GND/KTY –**
- **KTY +**
- **KTY –**

**Wire colour**

- **SIN:** pink, black
- **COS:** brown, green
- **GND/KTY –:** yellow, yellow
- **KTY +:** white, beige
- **KTY –:** red, blue

---

**Sinus-Cosinus Encoder**

**Type:** RMB 29AC (RLS)

**Function**

- **UNITRONIC PUR CP**
  - **UNITRONIC 100 CY**

**Wire colour**

- **SIN:** pink, black
- **COS:** brown, green
- **VCC:** green, green
- **GND/KTY –:** yellow, yellow
- **KTY +:** white, beige
- **KTY –:** red, blue

---

**Hall-type sensors (HEINZMANN)**

**Function**

- **Hall 1:** yellow
- **Hall 2:** green
- **Hall 3:** grey
- **VCC:** brown
- **GND:** white

**Wire colour**

- **Hall 1:** yellow
- **Hall 2:** green
- **Hall 3:** grey
- **VCC:** brown
- **GND:** white

---

**SSI Encoder, 12bit**

**Type:** RMB 28SC (RLS)

**Function**

- **UNITRONIC 100 CY**

**Wire colour**

- **CLOCK+:** pink
- **CLOCK –:** blue
- **DATA+:** white
- **DATA –:** brown
- **VCC:** green
- **GND:** yellow
- **KTY +:** brown
- **KTY –:** blue

---

**Motor feedback with cable gland**

**Motor feedback with connector**

---

**View of pin insert from the connector side**

---
DIRECTPOWER PRA 180-25

HEINZMANN Bicycle drives from the DirectPower series are characterised by innovative technology and flexibility. The independent control unit built into the battery box means that they can be integrated into a variety of systems. The power electronics are located outside the motor. So it is not affected by potential motor heat that might impair system performance. Whether used as a front or rear wheel drive, HEINZMANN e-bike drives will meet your needs.

The regeneration-enabled system can charge the battery during downhill travel and braking to achieve an increase in range.

Our drive can be installed in the front or rear wheel thanks to strict compliance with the standard dimensions used in the bicycle industry. This reduces manufacturing costs and gives our customers the highest possible flexibility in product design. After Sales Service and spare parts planning are therefore made significantly easier.

The option of turning the drives in both directions opens up a wealth of usage options, including outside the e-bike market. The mobility scooter sector is just one example.

Features

- Front/rear wheel drive
- Support up to 50 km/h*
  - Nominal output up to 500 W*
  - 11 Nm nominal and 60 Nm peak torque
  - Weight: 4.5 kg (front wheel), 4.7 kg (rear wheel)
  - Regeneration in the front and rear wheel
  - Brake discs can be mounted on the front and rear wheel
  - No gear, no brush, no wear, no noise

- Cassette can be used
- The power electronics are not installed in the motor, so motor heat does not impair their performance
- Backwards travel is possible for special applications

* Comply with the relevant legal requirements when using.

Range of Applications

- E-Bikes
- Rehab bikes
- Pedelecs
- Special applications

Technical Data

<table>
<thead>
<tr>
<th>DC supply voltage</th>
<th>Pedelec</th>
<th>Pedelec 20&quot;</th>
<th>Speed Pedelec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36 VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power</td>
<td>250 W</td>
<td>250 W</td>
<td>500 W</td>
</tr>
<tr>
<td>Nominal speed</td>
<td>210 rpm</td>
<td>275 rpm</td>
<td>380 rpm</td>
</tr>
<tr>
<td>Typical speed limit in km/h according to rim size</td>
<td>20&quot;</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>24&quot;</td>
<td>32</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>26&quot;</td>
<td>34</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>28&quot;</td>
<td>37</td>
<td>50</td>
</tr>
<tr>
<td>Impulse torque</td>
<td>60 Nm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>4.5 kg front wheel motor</td>
<td>4.7 kg rear wheel motor</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions

![Diagram of DirectPower E-Bike Motors dimensions]
DirectPower System Components

**DIRECTPOWER COMPLETE SYSTEM**

HEINZMANN supplies complete drive systems based on the DirectPower motor. A selection of system components has been specially tailored to the DirectPower drive. Customers can make a personal selection to meet their needs.

### Battery pack
- Optionally perfectly integrated in the luggage carrier or as downtube battery
- Safe, tested and proven lithium ion technology
- Carrier battery: 36 V/11 Ah
- Downtube battery: 36 V/14.25 Ah
- Passive cell balancing increases the service life of the battery pack
- Technically, mechanically and visually sophisticated
- Magnetic plug connections for quick mounting of the battery
- Watertight and robust
- Shock and vibration resistant

### Luggage carrier
- Universal e-bike carrier
- Aluminium tube 10 mm, weight 1000 g
- Outstanding weight/stability ratio and lateral rigidity
- Corrosion-resistant
- Various adaptation options through the built-in Quick Snap System
- With LineTec lighting
- Max. load limit 30 kg

### Display
- Separate control unit on the handlebar for safe operation when traveling
- Clear display of key operating data
- Quick setting of support levels
- Simple activation of assisted pull-away
- Bicycle anti-theft protection through user-specific PIN
- Easy to read, even in bright conditions

### Service Software
- Clear user interface
- Quick troubleshooting in the event of faults
- Built-in wizard for convenient quick configuration
- Parameters can be set easily by the dealer
- All major system parameters can be configured in the field
- Protection system against plant data manipulation
- Control firmware can be updated in the field
- Automatic Internet

### Control
- Drive control in the luggage carrier or on the downtube
- Pre-programmed for various merchantable torque sensors
- Various parameters can be adapted by the customer to set an individual driving style (support levels, assisted pull-away and many more)
- Optimal monitoring of the electrical system
- Integrated safety routines
- Software can be updated via an interface
- Optionally prepared for regeneration and equipped with brake levers with switches
- Assisted pull-away can be parameterized via a control element on the display or via handle bar

### Sensor
- The pedal speed sensor can be mounted on the right or left
- Cable length on request

### Twist grip
- Can be combined with display and control unit
- Assisted pull-away up to 6 km/h or 20 km/h: E-bike and S-Pedelec
- For handlebars with a diameter of 22.2 mm
CARGOPOWER RN 111

HEINZMANN has developed a drive system for cargo bikes that leaves nothing to be desired. This powerful wheel hub motor combined with proven system components guarantee maximum driving force for a wide range of professional and commercial applications.

The HEINZMANN heavy-duty motor CargoPower RN 111 offers innovative technology, robust design and good reliability. It has been specially developed for heavy-duty applications. Torque, torque support and the reliable axle loads are specifically designed for uses like these.

CargoPower is the most compact motor in its class. A unique high torque and equally high power density are achieved with a high-performance planetary gear made from hardened steel and innovative oil lubrication and cooling. The wheel hub motor can run in reverse and regenerate. This makes manoeuvring easier, even on three-wheel models. The optimised geometry of the flanges enables easy spoking on 20” to 29” rims.

The motor is suitable for rear wheel, front wheel or single sided mounting.

Features

- High torque at low speeds
- Maximum efficiency over the entire speed range
- High power and torque density due to optimal heat dissipation through oil cooling
- Reduced derating
- Torque sensor integrated in the rear wheel motor

Installation Versions

The compact design enables the motor to be installed in standard forks (100 mm) or standard frame dropouts (135 mm).

Mounting on one side is also possible, e.g. for three-wheel models. The optimised geometry of the flanges enables easy spoking on 20” to 29” rims.

The motor is suitable for rear wheel, front wheel or single sided mounting.

Range of Applications

- Cargo bikes
- Rehab bikes
- Special applications

Technical Data

- Nominal output: 250 ... 600 W
- Nominal speed: 200 rpm
- Torque: up to 31 Nm
- Voltage: 36 / 48 VDC
- Temporary peak power: 1350 W
- Maximum torque: 113 Nm
- Degree of protection: IP65
- Weight: 5.1 kg
- Speed: 25 km/h
- Axle load: Front wheel 150 kg, Rear wheel 125 kg, Single side mounting 100 kg

Dimensions

- Rear wheel (single side)
- Front wheel (single side)
- Single side mounting
**CargoPower System Components**

**CARGOPOWER COMPLETE SYSTEM**

The system components for the CargoPower system are coordinated specifically for this powerful drive.

The complete system comprises a motor, a control unit, battery with mounting system, operating panel plus – depending on the configuration – supplementary sensors.

There are two types of battery available to meet various power requirements (Heavy Duty and Active Power Battery). Our systems can also be combined with batteries from other manufacturers.

A torque sensor is deployed in the hub as standard in order to control the support. Other options for the system include a twist grip. Further variants are also possible. Our sales team will advise you on a tailored solution.

---

### Control
- Drive control in a separate housing
- Various parameters can be adapted by the OEM to set an individual driving style (support levels, assisted pull-away and many more)
- Optimal monitoring of the electrical system
- Optionally prepared for regeneration and connecting brake handles with installed actuation switch
- Parametrizable assisted pull-away either via the control element on the display or via twist grip
- Reverse travel
- CAN bus interface
- Degree of protection IP65

### Service software
- Clear user interface
- Quick troubleshooting in the event of faults
- Built-in wizard for convenient quick configuration
- Easy parameterisation for manufacturers
- All major system parameters can be configured in the field
- Protective system against plant data manipulation
- Control firmware can be updated in the field

### Control panel
- Can be mounted on the left or right side of handlebar and easily be switched to a laterally correct image on the screen
- Quick setting of support levels, safe operation while travelling
- Convenient display functions
- Outstanding readability, even in sunlight
- Bluetooth interface
- Micro USB interface with charging function for smartphone
- Degree of protection IP65

### Battery pack
- Heavy Duty Battery
- Safe, tried-and-tested lithium-ion technology
- 46.8 V/807 Wh
- Passive cell balancing increases the service life of the battery pack
- Technically, mechanically and visually sophisticated
- CAN bus interface
- Degree of protection IP65

### Sensor
- Cadence sensor can be mounted on the right or left side
- Cable length on request

### Twist grip
- For handlebars with a diameter of 22.2 mm

---

**System overview**

System modules for front and rear wheel installation and optional components.
System overviews

Front wheel installation

<table>
<thead>
<tr>
<th>System components</th>
<th>Part numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front wheel motor</td>
<td>880-00-181-xx</td>
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<tr>
<td>Controller</td>
<td>880-81-248-xx</td>
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<tr>
<td>Heavy Duty Battery</td>
<td>880-80-281-00</td>
</tr>
<tr>
<td>Charger</td>
<td>010-33-037-00</td>
</tr>
<tr>
<td>Control unit</td>
<td>010-69-325-20</td>
</tr>
</tbody>
</table>
| Cadence sensor            | 870-81-154-10 (right pedal side) 870-81-145-10 (left pedal side) 010-29-049-00 (magnetic disc)

Variants on request

Rear wheel installation

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<td>Charger</td>
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<td>Control unit</td>
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</table>

Variants on request

Optional components

<table>
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<tr>
<td>Twist grip</td>
<td>870-90-069-00</td>
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</tbody>
</table>

CLASSIC RN 120

HEINZMANN Classic motors have been proving themselves in electric bicycles for decades. The HEINZMANN Classic bicycle drive is characterised by the tried-and-tested robust technology, combined with the innovative optimisation of its components and properties. The powerful DC motor offers even power development with economical use of the battery capacity.

Powerful torques are achieved with the built-in gear, which offers the rider maximum support, even during uphill travel or with increased loads. This makes this drive particularly suited to use in mobility scooters, for cargo bikes and for special applications.

At the heart of the Classic drive system is the RN 120, which combines the proven Classic motor with robust and reliable system modules.

Decades of experience in the field of bicycle drives make us a reliable partner. The reliability of HEINZMANN drives is also highly valued by Deutsche Post, who have them fitted on their electric bicycles.

Features

- Powerful, proven DC wheel hub motor
- Front/rear wheel drive
- Gear for highest torques
- Support up to 25 km/h
- Rated power 250 W
- Torque up to nominal 11.4 Nm (28”), up to nominal 13.2 Nm (26”)
- Weight: approx. 3.5 kg
- Max. values for the torques are 35 to 60 Nm depending on the design

Range of Applications

- E-Bikes
- Velotaxis
**Technical Data**

<table>
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<th>Value</th>
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<tr>
<td>Rated power</td>
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<tr>
<td>Weight</td>
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<td>Max. weight vehicle*</td>
<td>120 kg</td>
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<tr>
<td>Wheel size</td>
<td>26&quot; / 28&quot;</td>
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<tr>
<td>Rated speed</td>
<td>210 rpm / 180 rpm</td>
</tr>
<tr>
<td>Rated torque in operational mode S1</td>
<td>13.2 Nm / 11.4 Nm</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
</tbody>
</table>

* with load

**Dimensions**

**Complete System Classic**

The Classic Drive System combines long-established system components.

- **Control**
  - The digital control unit offers two control options: customers can choose between a twist grip with pedal speed sensor or a solution with twist grip only.
  - The control is pre-parameterised for all requirements, such as assisted pull-away up to 6 km/h or heavy load start.

- **Battery**
  - The lithium ion battery is in the saddle bag.
  - Supplied with a built-in battery management system for longer battery life.
  - Available with 9 or 13 Ah.

- **Luggage carrier**
  - The luggage carrier is designed for mounting a control unit and up to two batteries.
  - Max. permitted total weight 30 kg.

- **Twist grip**
  - Digital twist grip.
  - LED light indicator charge condition.
  - ON/OFF switch.
  - Eco Mode.
  - Cable length on request.

- **Sensor**
  - The pedal speed sensor can be mounted on the right or left.
  - Cable length on request.
PRA 230

The gearless PRA 230 wheel hub drive is a permanently excited, synchronous external-rotor motor with built-in wheel bearing and is mounted directly on the rim.

Successfully employed many times over, this wheel drive is maintenance-free, quiet and boasts impressive braking energy recuperation and a high starting torque.

Part of the PRA series, this direct drive is available in a gearless design and operated using a commercial controller. It is connected to the chassis via clamp connection. Naturally, it also has a brake-disc connection. Its degree of protection is IP54.

The PRA 230 is suitable for use on 1-wheel, 2-wheel and all-wheel drives.

Features

- Gearless
- Maintenance-free
- Low noise
- Integrated wheel bearing
- Energy recuperation
- High starting torque

Technical Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tr>
<td>Rated speed</td>
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<td>Max. torque</td>
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<tr>
<td>Battery voltage</td>
<td>48 V</td>
</tr>
<tr>
<td>Max. wheel load</td>
<td>2000 N</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Weight</td>
<td>16 kg</td>
</tr>
</tbody>
</table>

Range of Applications

- Light electric vehicles
- E-Scooters
- Handicap vehicles
- Driverless transport vehicles

Dimensions

- Rated power: 1.6 kW
- Operational mode: S1
- Rated speed: 420 rpm
- Max. torque: 160 Nm
- Battery voltage: 48 V
- Max. wheel load: 2000 N
- Degree of protection: IP54
- Weight: 16 kg

The gearless PRA 230 wheel hub drive is a permanently excited, synchronous external-rotor motor with built-in wheel bearing and is mounted directly on the rim.

Successfully employed many times over, this wheel drive is maintenance-free, quiet and boasts impressive braking energy recuperation and a high starting torque.

Part of the PRA series, this direct drive is available in a gearless design and operated using a commercial controller. It is connected to the chassis via clamp connection. Naturally, it also has a brake-disc connection. Its degree of protection is IP54.

The PRA 230 is suitable for use on 1-wheel, 2-wheel and all-wheel drives.

Features

- Gearless
- Maintenance-free
- Low noise
- Integrated wheel bearing
- Energy recuperation
- High starting torque

Technical Data

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Rated power</td>
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<td>Operational mode</td>
<td>S1</td>
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<td>Rated speed</td>
<td>420 rpm</td>
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<td>Max. torque</td>
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<td>Battery voltage</td>
<td>48 V</td>
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<tr>
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<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Weight</td>
<td>16 kg</td>
</tr>
</tbody>
</table>

Range of Applications

- Light electric vehicles
- E-Scooters
- Handicap vehicles
- Driverless transport vehicles

Dimensions

- Rated power: 1.6 kW
- Operational mode: S1
- Rated speed: 420 rpm
- Max. torque: 160 Nm
- Battery voltage: 48 V
- Max. wheel load: 2000 N
- Degree of protection: IP54
- Weight: 16 kg
PMG Motor

PMG 132
The PMG 132 is a multi-pole, permanently excited DC disc motor. The excitation field is created using high-performance permanent magnets from rare earths.

Features
- Compact
- Cost-efficient
- High efficiency
- Less installation space thanks to compact design
- Lower power-to-weight ratio
- Strong torque
- Greater efficiency over broad range of operating conditions
- Simple control
- Energy recovery possible through regenerative operation
- Cost advantage through integration of commutator into winding ends

Dimensions

The disc-shaped rotor has been made with copper-profiled lamellae at whose inner end a disc commutator is moulded by means of suitable profiling. Power is transmitted via metalliferous carbon brushes that are optimally adapted to the shape of the commutator and conducted via a special brush holder alignment. The magnetic flow passes axially through the lamination stacks. This alignment reduces the air gap to the minimum required mechanically and reduces magnetic losses. What results is far greater efficiency (approx. 90 %) across a broad range of operating conditions.

Range of Applications
- Generally all kind of battery driven and electric vehicles
- Cleaning machines
- Boat drives
- Fans

Technical Data

<table>
<thead>
<tr>
<th>Operation voltage</th>
<th>24 V</th>
<th>36 V</th>
<th>48 V</th>
<th>60 V</th>
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</thead>
<tbody>
<tr>
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<td>3.1 kW</td>
<td>4.7 kW</td>
<td>5.1 kW</td>
</tr>
<tr>
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<td>1100 rpm</td>
<td>1800 rpm</td>
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<td>3000 rpm</td>
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<td>Rated current</td>
<td>90 A</td>
<td>97 A</td>
<td>110 A</td>
<td>97 A</td>
</tr>
<tr>
<td>Rated load torque</td>
<td>15 Nm</td>
<td>16 Nm</td>
<td>19 Nm</td>
<td>16 Nm</td>
</tr>
</tbody>
</table>

Table valid for operation in duty type S1

DC current in short-time duty S2 10 min: 210 A

Peak torque: 38 Nm
Mass inertia: 0.025 kgm²
Inductance: 0.019 mH
Resistance: 16 mΩ
Degree of protection: IP20
Weight: approx. 12.5 kg

Selection Diagram

Motor type: PMG 132
Magnet system: 3.9/1.2
Edition: 08/2014
**Series of SL Motors**

**SL MOTORS**

Flat, dynamic and extremely adaptable: HEINZMANN DC disc motors. Because of their streamlined design, which distinguishes them from other electric motors, they constitute the best solution for a customer seeking a drive of up to 1.1 kW that can be easily and precisely controlled and can fit in a restricted installation space.

Disc motors have proven themselves in many applications within machinery and equipment manufacture and also medical engineering, reliably performing a wide variety of drive tasks with quiet synchronous operation.

The continuous development of the materials used has achieved a much greater gap between maintenance intervals for wearing parts (e.g. charcoal and collectors). This is why brush drives offer a much better price-performance ratio.

**Features**

- **Flat**
  HEINZMANN disc motors are flat when installed. It is this extremely flat design that opens up installation options that are just not possible with other motors. The permanent magnets arranged in a circle around the shaft produce an axial field through the disc rotor while ensuring a large air gap area proportional to the available installation space.

- **Dynamic**
  DC disc motors have a thin, non-ferrous disc armature for an extremely low intrinsic moment of inertia. Manufactured as air coils, the windings are characterised by low inductance and low internal resistance to ensure a very low electrical time constant. This results in dynamic drives that can be easily and precisely controlled.

- **Adaptable**
  SL disc motors are not only available in the versions presented here. They are also deployed in other industrial applications wherever reliable operation at the supply voltage itself is required, without any need for a controller. However, an optional controller does allow torque and speed to be regulated as well.

- **Robust**
  HEINZMANN originally developed and optimised disc motors for use in proprietary products. The features mentioned above have been implemented to optimum levels in our internal mechatronic systems.

The continuous development of the materials used has achieved a much greater gap between maintenance intervals for wearing parts (e.g. charcoal and collectors). This is why brush drives offer a much better price-performance ratio.

**Applications**

DC disc motors with brushes have been used for several decades now in rough environments in HEINZMANN actuators for medium and large combustion engines.

**Range of Applications**

- Industrial and individual transport systems with greater range than electric vehicles, guided warehouse vehicles or disabled person assistance systems
- Positioning and delivery systems or handling units
- Machine tools, winding devices
- Pumps
- Replacement for hydraulic systems in agricultural vehicles and machinery
- Medical engineering, e.g. centrifuges, hose and metering pumps

**Cross section of a disc motor SL 120-2NFB**

They are also deployed in other industrial applications wherever reliable operation at the supply voltage itself is required, without any need for a controller. However, an optional controller does allow torque and speed to be regulated as well.
**Series of SL Motors**

**SL 80-F**

SL 80-F is the smallest DC disc motor with brushes of the SL series equipped with ferrite magnets.

**Dimensions**

**Technical Data**

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</thead>
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<td>12</td>
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**SL 100-F**

The SL 100-F is the next larger variant of a disc motor with brushes and ferrite magnets.

**Dimensions**

**Technical Data**

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</table>
**Series of SL Motors**

**SL 120-F**
The SL 120-F is the largest SL series motor with brushes equipped with ferrite magnets.

**Technical Data**

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<thead>
<tr>
<th>Coil</th>
<th>Rated Voltage</th>
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<th>Rated Speed</th>
<th>Rated Load</th>
<th>Rated Current</th>
<th>Back-EMF constant (25 °C)</th>
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**SL 100-1NFB**
The SL 100-1NFB is the smallest DC disc motor with brushes of the SL series equipped with neodymium iron boron magnets.

**Technical Data**

<table>
<thead>
<tr>
<th>Coil</th>
<th>Rated Voltage</th>
<th>Rated Power</th>
<th>Rated Speed</th>
<th>Rated Load</th>
<th>Rated Current</th>
<th>Back-EMF constant (25 °C)</th>
<th>Torque constant (25 °C)</th>
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</table>

| m = 1.2 kg | J = 2.5 kg · cm² | m = 0.9 kg | J = 1.6 kg · cm² |
Series of SL Motors

SL 100-2NFB
In comparison, the SL 100-2NFB disc motor with brushes contains larger neodymium iron boron magnets.

Technical Data

<table>
<thead>
<tr>
<th>Coil</th>
<th>Rated voltage (U [VDC])</th>
<th>Rated power (P [W])</th>
<th>Rated speed (n [rpm])</th>
<th>Rated load (M [Ncm])</th>
<th>Rated current (I [A])</th>
<th>Back-EMF constant (25 °C) (K_e) ([V/1000 \text{ rpm}])</th>
<th>Torque constant (25 °C) (K_t) [Ncm/A]</th>
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<tbody>
<tr>
<td>4/90</td>
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<td>2800</td>
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| m = 1.0 kg | J = 1.6 kg · cm² |

SL 120-1NFB
DC disc motor with brushes equipped with neodymium iron boron magnets.

Technical Data

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<th>Rated voltage (U [VDC])</th>
<th>Rated power (P [W])</th>
<th>Rated speed (n [rpm])</th>
<th>Rated load (M [Ncm])</th>
<th>Rated current (I [A])</th>
<th>Back-EMF constant (25 °C) (K_e) ([V/1000 \text{ rpm}])</th>
<th>Torque constant (25 °C) (K_t) [Ncm/A]</th>
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</table>

| m = 1.8 kg | J = 3.5 kg · cm² |

Dimensions
**Series of SL Motors**

**SL 120-2NFB**

Disc motor variant 120-2NFB with brushes is equipped with enlarged neodymium iron boron magnets.

---

**Technical Data**

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**Dimensions**

Series of SL Motors

**SL 140-2NFB**

Disc motor with brushes equipped with an enlarged rotor and neodymium iron boron magnets.

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**Dimensions**

Series of SL Motors
**Series of SL Motors**

**SL 160-2NFB**
The SL 160-2NFB is a disc motor with brushes, enlarged rotor and larger neodymium iron boron magnets.

**Technical Data**

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</table>

► $m = 5.5$ kg  ► $J = 11.3$ kg·cm²

**Dimensions**

![Dimensions Diagram]

**SL 180-2NFB**
The SL 180-2NFB is the largest disc motor with brushes and large neodymium iron boron magnets.

**Technical Data**

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</table>

► $m = 10.2$ kg  ► $J = 23.5$ kg·cm²

**Dimensions**

![Dimensions Diagram]
Technical Data and Information

Motor type
Permanently excited DC motor in disc armature technology

General regulations
Complying with IEC 60034

Operational mode
S1 (continuous duty)

Cooling
Without cooling fan, without cooling circuit, mounting at adequate cooling surface is recommended

Permissible ambient temperature
-10 ... +40 °C

Pairs of poles
4

Magnetic material
Ferrite (F)
Neodymium iron boron (1 NFB, 2 NFB), 1, 2 indicates size of magnets

Electrical connection
According to motor size and customer’s request: flat connectors, terminal box, free cable

Electric strength
According to IEC 60034

Thermal class
F (155 °C)

Degree of protection
IP44, alternatives obtainable on request

Constructional type and fastening
On customer’s request

Mounting orientation
Arbitrary

Shaft
On customer’s request, hollow shaft optional

Optional extensions
Gearbox, tachometer generator, encoder, holding break

Temperature sensor
On request

Kind of surface
Steel: zinc coating
Aluminium: uncoated

Rating
All given characteristics of the motors are calculated data which may differ slightly, subject to alterations

Without exception for the operating temperature status, based on:
armature temperature ~125 °C
solenoid temperature ~105 °C
housing temperature ~85 °C

Tolerances:
Back-EMF constant and torque constant: ±6 % of nominal value
Speed: ±8 % of nominal value
Efficiency: 1.15 % of nominal value - 15 %

Alternative voltage, speed, torque or power for customised applications obtainable on request.

Permissible Forces
for 20,000 hours lifespan

Radial force $F_r$ [N] at n rpm

<table>
<thead>
<tr>
<th>Speed</th>
<th>1500</th>
<th>3000</th>
<th>4500</th>
<th>6000</th>
<th>7000</th>
<th>Bearing A-side</th>
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Axial force $F_a$ [N] at n rpm

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Selection Diagrams

The operational characteristics of the HEINZMANN disc motors are best illustrated through motor diagrams. They enable the ideal motor variant to be selected to suit a particular application. The procedure for this is described below.

HEINZMANN offers a wide range of disc motor variants. You can access the full range of selection diagrams from our home page: www.heinzmann.com/en/e-motor.

How to use the selection diagrams

Each selection diagram consists of 2 subdiagrams.

The upper diagram in each case shows these characteristics:
- Speed - Torque (blue wide)
- Current - Torque (red narrow)

The lower diagram in each case shows these characteristics:
- Output - Torque (green wide)
- Efficiency - Torque (orange narrow)

The characteristics are shown for several voltages.

For overview purposes, the characteristics for the current and efficiency show only the lowest and the highest practical voltage (in this example, 36 V and 72 V). Characteristic values for voltages in between (in this instance, 48 V and 60 V) must be estimated.

The area highlighted in white on the diagram represents the safe operating range for the S1 operation of an uncooled motor mounted to a sufficiently sized cooling area. The wide red line represents the limit for a power loss that is just on the borderline (in this example 75 W).

The section highlighted in light grey in the diagram represents the permitted area. The wide red line represents the limit for a power loss that is just on the borderline (in this example 75 W).

For the ideal motor variant to be selected to suit a particular application, the procedure for this is described below.

How to use the selection diagrams

The characteristics are shown for several voltages. Each selection diagram consists of 2 subdiagrams.

The upper diagram in each case shows these characteristics:
- Speed - Torque (blue wide)
- Current - Torque (red narrow)

The lower diagram in each case shows these characteristics:
- Output - Torque (green wide)
- Efficiency - Torque (orange narrow)

The characteristics are shown for several voltages.

The area highlighted in white on the diagram represents the permitted area. The wide red line represents the limit for a power loss that is just on the borderline (in this example 75 W).

The selection highlighted in light grey in the diagram represents the range for which additional cooling measures are required to operate motors. Without them this operating range must be avoided. Depending on the type of motor and the winding design, there is a borderline for the maximum permissible speed (n_B). The relevant value is also specified in case it does not coincide with the borderline for power loss.

The diagrams are valid without exception for the operating temperature status, based on:
- Armature temperature – 125 °C
- Magnet temperature – 105 °C
- Ambient temperature 25 °C

Application example:

Given: Voltage U = 48 V
Torque
Required: Speed n
Current I
Output P
Efficiency η

Readings in upper diagram:
- Starting from M = 115 Ncm, go vertically (1) go to the speed characteristic for U = 48 V. Intersecting point A is on the borderline, i.e. still in the permitted area.
- From A, go left horizontally (2) to the left to the speed scale and then read off the relevant speed (here: ~2800 rpm).
- Continue from A vertically into the range between the two current characteristics (between 36 V and 72 V) and estimate point B.
- From B, go right horizontally (3) to the right to the current scale and then read off the relevant amperage (here: ~8.7 A).

Readings in lower diagram:
- Starting from M = 115 Ncm, go vertically (4) go to the output characteristic for U = 48 V. Intersecting point C is also on the borderline, i.e. still in the permitted area.
- From C, go left horizontally (5) to the left to the output scale and then read off the relevant output (here: ~340 W).
- Continue from C vertically into the range between the two efficiency characteristics and estimate point D.
- From D, go right horizontally (6) to the right to the efficiency scale and then read off the relevant efficiency (here ~81 %).

Unknown values can be determined for other given variables in the same manner.

Additional example:

Appointed: Speed n = 2000 rpm
Torque M = 120 Ncm = 1.2 Nm
(i.e. P = 0.104 • M • n = 250 W)
Required: The relevant required operating voltage
Result: U = 36 V
The Group started in 1897 with Heinzmann GmbH & Co. KG, and now includes HEINZMANN UK, HEINZMANN China, HEINZMANN Korea, HEINZMANN India, HEINZMANN Australia, HEINZMANN AUTOMATION, REGULATEURS EUROPA, and CPK Automotive as member companies.

The HEINZMANN Group operates numerous global subsidiaries, including eight production sites and an international distributor network.

Our product portfolio comprises engine management system solutions, as well as exhaust gas aftertreatment solutions, for industrial combustion engines and turbines. It also encompasses automation systems, primarily for the shipping industry.

For decades, HEINZMANN also has been developing and producing sturdy, powerful electric drives up to 30 kW, which have proven their worth in numerous applications, particularly in harsh industrial environments.

HEINZMANN - Electric Drives

Based in the heart of the Black Forest, HEINZMANN develops and produces progressive solutions for drive technology.

From industrially batch produced engines to application based redesigns, substitute solutions and individual new developments: our patented drive technology constantly excels through above-average performance data and significant increases in efficiency.

Sales network: www.heinzmann-electric-motors.com/en/contact/sales-network
Service network: www.heinzmann-electric-motors.com/en/service-e