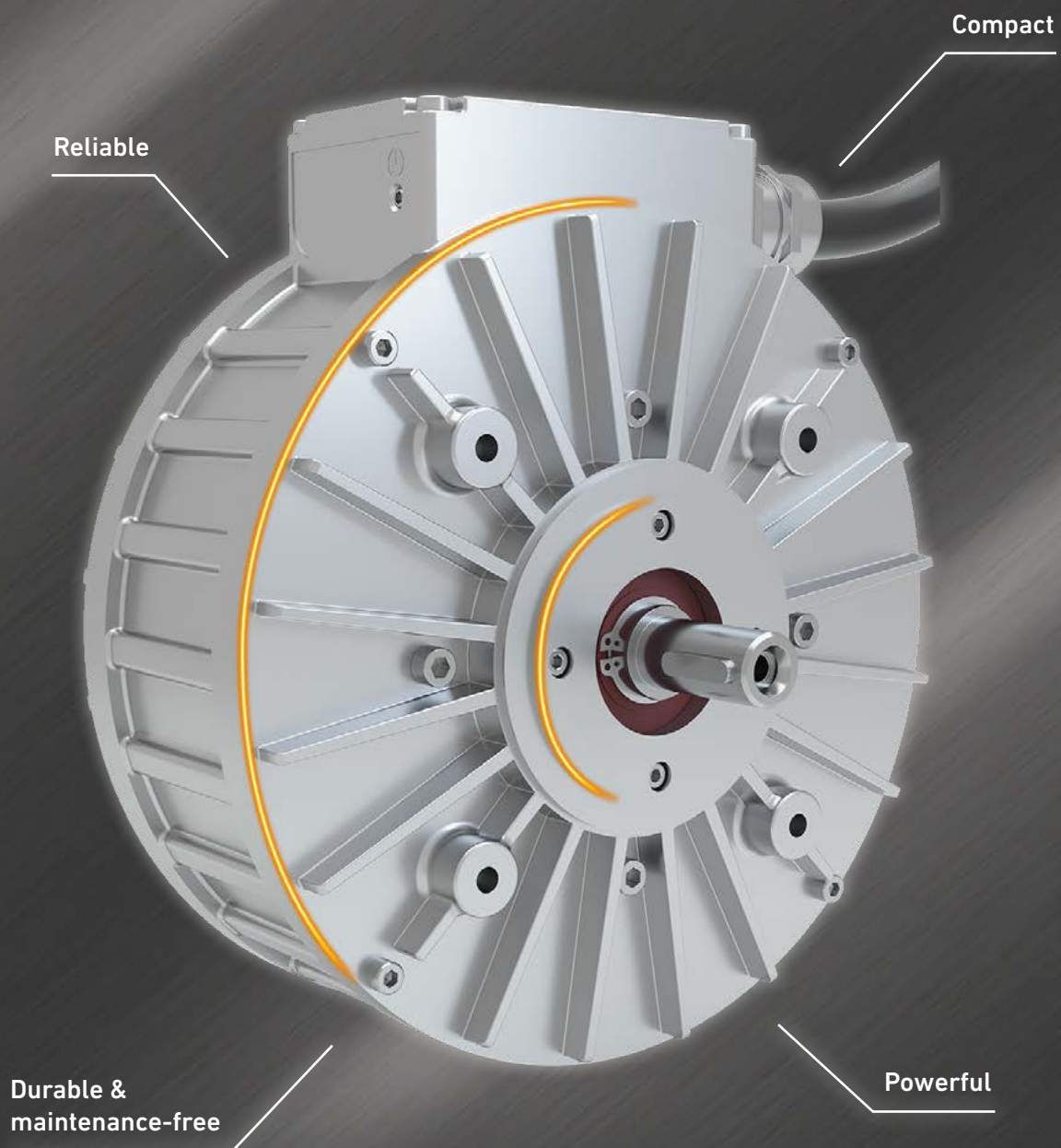


Electric drives for industry and e-mobility applications

# SYNCHRONOUS MOTORS

High performing & most efficient drive solutions



# SERIES OF SYNCHRONOUS MOTORS & GENERATORS

## SUITABLE DRIVE FOR YOUR APPLICATION

For decades now, HEINZMANN has been developing and producing robust, powerful electric drives rated up to 40 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.

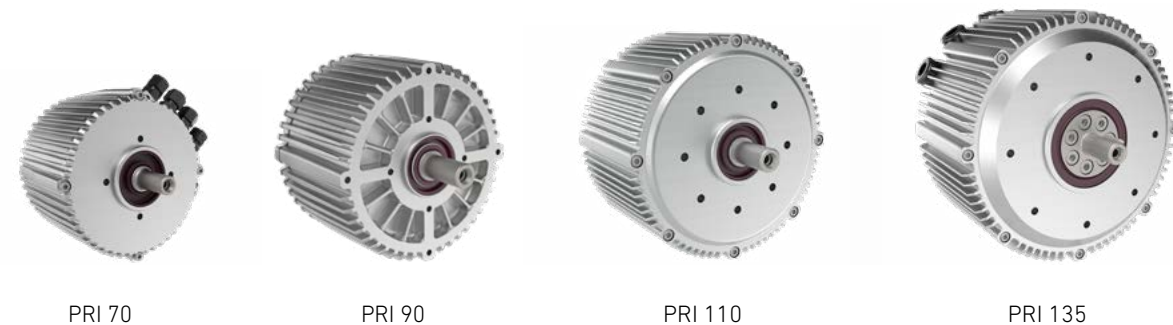
From industrially produced series motors to application-based redesigns, substitute solutions and individual new developments – our rotor technology constantly excels through above-average performance data and significant increases in efficiency.

### HEINZMANN PROVIDES

- ▶ Synchronous motors
- ▶ Synchronous generators
- ▶ Wheel hub motors
- ▶ Motor controller
- ▶ Motor feedback
- ▶ Gears
- ▶ Parking / holding brakes

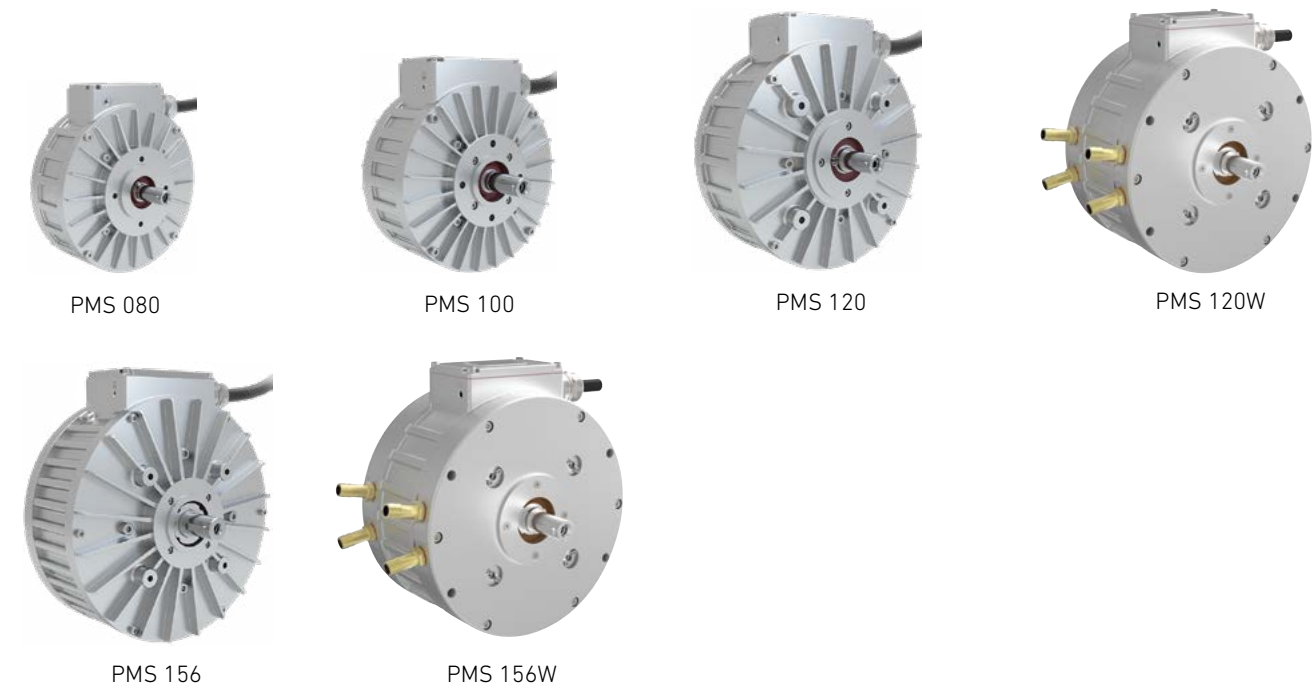
## PRI – RADIAL FLUX MOTORS & GENERATORS

Robust radial flux motors and generators for a wide range of applications. Further information can be found in the flyer "PRI 70/90/110/135".



## PMS – DOUBLE-SIDED AXIAL FLUX MOTORS & GENERATORS

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



## PMSG – PMS MOTORS WITH GEARS

Wheel hub drives with completely integrated planetary gear.



PMSG 100-500 / PMSG 100-1500 / PMSG 120-1500 / PMSG 156W-4000 / Further combination options



## APPLICATION EXAMPLES



The **electric SiNUS iONs** find their latest application on a kart track of superlatives on the Norwegian cruise ship ENCORE. Two brushless disc motors of the PMS 100 series - 2 x 2.7 kW (peak 13.4 kW) - together with the matching motor controllers form the ideal solution for the RIMO SINUS. In coordination with our customer the optimal setting for motor, controller and kart was developed to convince with best performance worldwide.



The British company Gardner Denver has developed a small **compressor** for automotive applications. Compressed air is key to safe and reliable operation of critical applications on most commercial vehicles. New hybrid-electric vehicles (HEVs) and fully-electric vehicles (FEVs) demand much more of their sub-systems than their current diesel counterparts. The liquid-cooled HEINZMANN PMS 120 disc motor lent itself as the best solution for this application.



The RTE Robot of Rosenbauer International is a radio-controlled, electrically driven **multifunctional crawler vehicle** with a payload up to 650 kg. In very close cooperation with Rosenbauer, HEINZMANN has designed the optimal drive solution which consists of two highly efficient PMSG motor-gearbox units including motor controller. Due to the high degree of protection IP6K9K, these are ideally suitable for demanding firefighting applications.



KTM, the market leader for **electric motorbikes**, has used the HEINZMANN PMS 120 to motorise its Enduro Freeride. The 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 noise and emissions.



Samatec EV04 **lifting platforms** are equipped with PMSG 100-1500 brushless disc-type motors. Thanks to their special design, these are ideally suited for the axially confined installation space on the wheel hubs of the EV04. Among other uses, the mobile lifting platforms are employed in agricultural settings as apple harvesters.



The demand for emission-free machines to maintain our landscapes in urban areas is increasing. That is why Royal Reesink subsidiaries Jean Heybroek and Motrac Industries have developed an **all-electric tool carrier**, the RECO eTrac. For the electrification of this application, HEINZMANN supplies two powerful PMSG 156 hub geared motors as the main drives. The central cooling system is driven by a blower with PMS 120 motor. To complete the system, a PMS 150 gear motor drives the vertical weed wacking brush.



# 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 40 kW and torques up to 80 Nm depending on the cooling type, and feature various intermediate circuit voltages.

The brushless design means that the synchronous disc motors do not require any wearing parts such as carbon brushes or collectors. The drives offer a long service life and are entirely maintenance free. As such, overall costs for maintenance, servicing and parts are significantly reduced.

All motors are also suitable for generator operation.



## FEATURES

### ► 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.

### ► Dynamic

Thanks to the sophisticated rotor technology, PMS motors have low inertia and therefore are the perfect solution for dynamic applications.

### ► Flexible

PMS motors have a wide range of applications and can be customised to suit specific requirements. The voltage range and protection class are flexible and can be adjusted on request.

### ► Interchangeable

The motors are calibrated at the factory and do not need to be reprogrammed on the controller when replaced. This helps to avoid downtime.

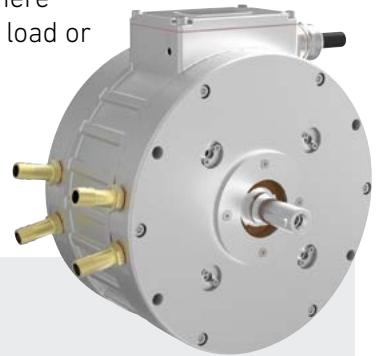
## RANGE OF APPLICATIONS

- 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
- E-Motorcycles and e-scooters
- Medical equipment
- Generators

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.

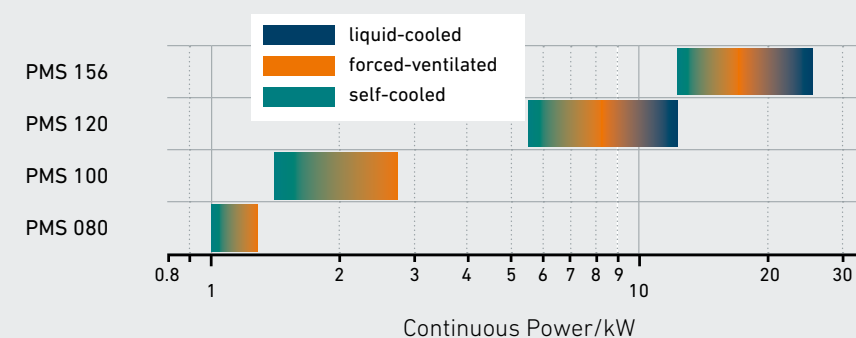
Together with the controller, these motors are the ideal drive for any application where speed control and high dynamic requirements prevail, and where quick changes in load or direction of rotation and fast run-ups are required.

They are available with various sensor systems and also in a sensor-free version. PMS motors can also function as highly efficient generators.

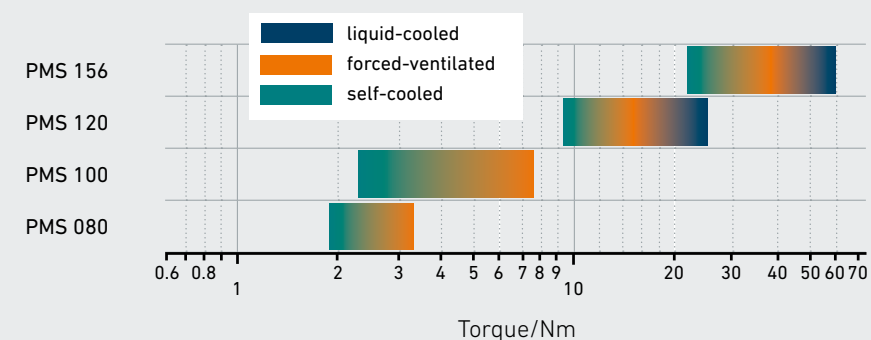


Liquid-cooled design

### POWER RANGE PMS MOTORS / GENERATORS



### TORQUE RANGE PMS MOTORS / GENERATORS



## 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.

Here are two examples from our wide range of customer-specific motor variants.



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

### 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.



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 from Schwaz, Austria, has created an exciting electrically powered fun and work vehicle called Ziesel.

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.

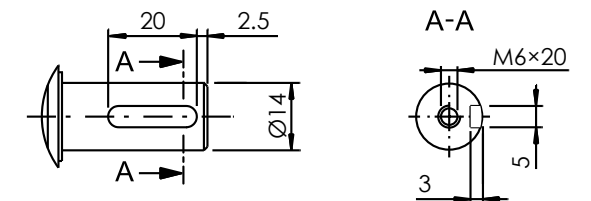
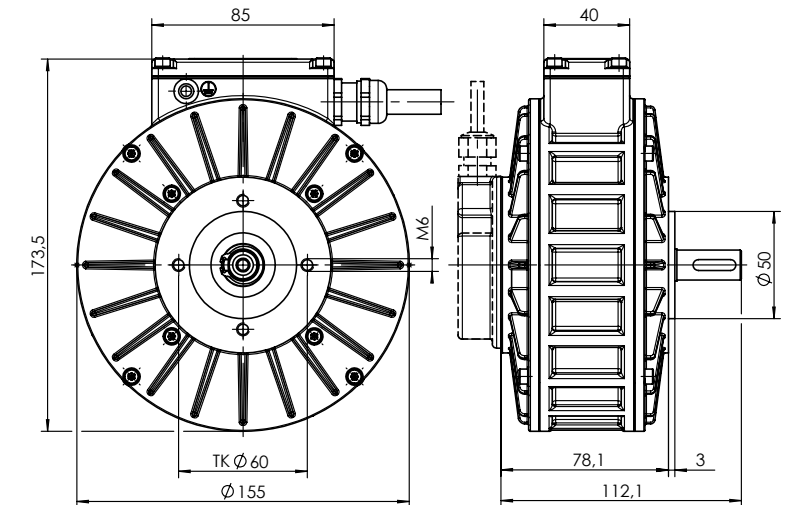


## PMS 080

PMS 080 is the smallest in the series with double-sided stators.

Suitable for applications with very limited axial installation space.

### DIMENSIONS



Standard motor feedback: sin/cos



### TECHNICAL DATA

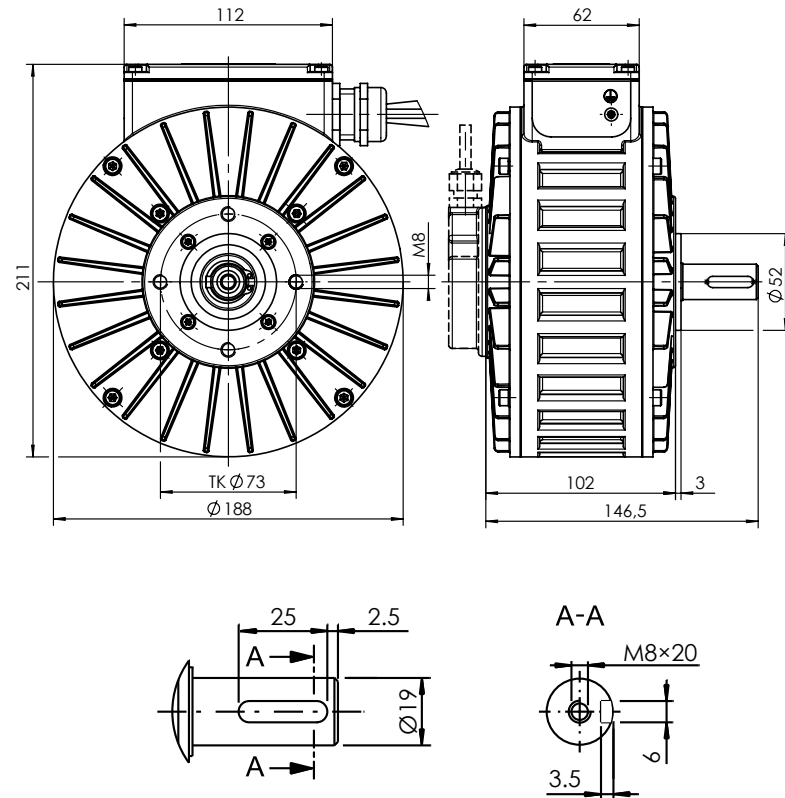
|         | Rated speed        | Rated power | Rated current   | Rated load torque | Torque constant | Voltage constant           | Max. power      | Max. current   | Max. load torque |
|---------|--------------------|-------------|-----------------|-------------------|-----------------|----------------------------|-----------------|----------------|------------------|
| Voltage | $n \cdot min^{-1}$ | $P_N$<br>kW | $I_N$<br>A (AC) | $M_N$<br>Nm       | $K_t$<br>Nm/A   | $K_e$<br>V/1000 $min^{-1}$ | $P_{max}$<br>kW | $I_{max}$<br>A | $M_{max}$<br>Nm  |
| 24 VDC  | 3000               | 1.00        | 47.2            | 3.2               | 0.070           | 4.60                       | 2.2             | 150            | 10               |
|         | 4500               | 1.10        | 57.9            | 2.3               | 0.040           | 2.80                       | 2.7             | 250            | 10               |
|         | 6000               | 1.20        | 65.7            | 1.9               | 0.030           | 2.00                       | 3.7             | 350            | 10               |
| 48 VDC  | 3000               | 1.00        | 24.5            | 3.2               | 0.130           | 8.80                       | 2.5             | 78             | 10               |
|         | 4500               | 1.25        | 29.8            | 2.7               | 0.090           | 6.00                       | 3.3             | 120            | 10               |
|         | 6000               | 1.15        | 27.3            | 2.0               | 0.070           | 4.50                       | 3.5             | 150            | 10               |

► Cooling: External ventilation ►  $m = 3.8 \text{ kg}$  ►  $J = 3.8 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1

## PMS 100

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

### DIMENSIONS



Standard motor feedback: sin/cos



### TECHNICAL DATA

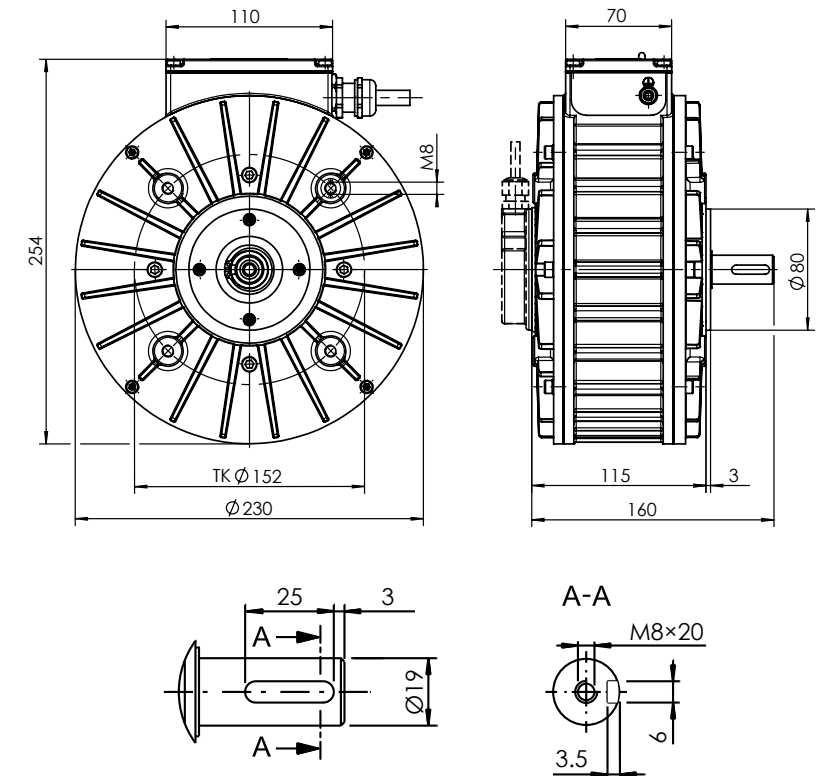
|         | Rated speed          | Rated power      | Rated current        | Rated load torque | Torque constant    | Voltage constant              | Max. power            | Max. current         | Max. load torque      |
|---------|----------------------|------------------|----------------------|-------------------|--------------------|-------------------------------|-----------------------|----------------------|-----------------------|
| Voltage | $n \text{ min}^{-1}$ | $P_N \text{ kW}$ | $I_N \text{ A (AC)}$ | $M_N \text{ Nm}$  | $K_t \text{ Nm/A}$ | $K_e \text{ V/1000 min}^{-1}$ | $P_{\max} \text{ kW}$ | $I_{\max} \text{ A}$ | $M_{\max} \text{ Nm}$ |
| 24 VDC  | 3000                 | 1.40             | 69                   | 4.46              | 0.07               | 4.3                           | 4.2                   | 320                  | 20                    |
|         | 4500                 | 1.68             | 83                   | 3.57              | 0.04               | 2.9                           | 3.7                   | 370                  | 16                    |
|         | 6000                 | 1.40             | 71                   | 2.23              | 0.03               | 2.2                           | 4.4                   | 460                  | 14                    |
| 48 VDC  | 3000                 | 2.30             | 60                   | 7.32              | 0.12               | 8.1                           | 5.0                   | 170                  | 20                    |
|         | 4500                 | 2.60             | 65                   | 5.52              | 0.09               | 5.7                           | 7.1                   | 240                  | 20                    |
|         | 6000                 | 2.70             | 67                   | 4.30              | 0.09               | 4.3                           | 6.7                   | 320                  | 20                    |

► Cooling: External ventilation ►  $m = 7.2 \text{ kg}$  ►  $J = 9.6 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1

## PMS 120

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

### DIMENSIONS



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



### TECHNICAL DATA

|         | Rated speed          | Rated power      | Rated current        | Rated load torque | Torque constant    | Voltage constant              | Max. power            | Max. current         | Max. load torque      |
|---------|----------------------|------------------|----------------------|-------------------|--------------------|-------------------------------|-----------------------|----------------------|-----------------------|
| Voltage | $n \text{ min}^{-1}$ | $P_N \text{ kW}$ | $I_N \text{ A (AC)}$ | $M_N \text{ Nm}$  | $K_t \text{ Nm/A}$ | $K_e \text{ V/1000 min}^{-1}$ | $P_{\max} \text{ kW}$ | $I_{\max} \text{ A}$ | $M_{\max} \text{ Nm}$ |
| 48 VDC  | 3000                 | 5.5              | 127                  | 17.50             | 0.138              | 8.84                          | 11.1                  | 330                  | 45                    |
|         | 4500                 | 6.0              | 134                  | 12.70             | 0.095              | 6.03                          | 16.9                  | 480                  | 45                    |
|         | 6000                 | 6.0              | 137                  | 9.50              | 0.070              | 4.44                          | 18.5                  | 650                  | 45                    |
| 96 VDC  | 3000                 | 6.4              | 74                   | 20.40             | 0.277              | 17.70                         | 11.3                  | 170                  | 45                    |
|         | 4500                 | 7.5              | 84                   | 15.90             | 0.190              | 12.10                         | 17.3                  | 240                  | 45                    |
|         | 6000                 | 8.0              | 94                   | 12.70             | 0.136              | 8.63                          | 20.8                  | 340                  | 45                    |
| 330 VDC | 3000                 | 6.0              | 21                   | 19.10             | 0.904              | 57.80                         | 12.1                  | 50                   | 45                    |
|         | 4500                 | 7.5              | 25                   | 15.90             | 0.639              | 40.60                         | 16.3                  | 71                   | 45                    |
|         | 6000                 | 7.5              | 25                   | 11.90             | 0.480              | 30.50                         | 19.0                  | 94                   | 45                    |
| 560 VDC | 3000                 | 6.0              | 12                   | 19.10             | 1.560              | 100.00                        | 11.9                  | 29                   | 45                    |
|         | 4500                 | 7.5              | 14                   | 15.90             | 1.110              | 70.70                         | 17.2                  | 41                   | 45                    |
|         | 6000                 | 7.5              | 15                   | 11.90             | 0.818              | 52.00                         | 18.8                  | 55                   | 45                    |

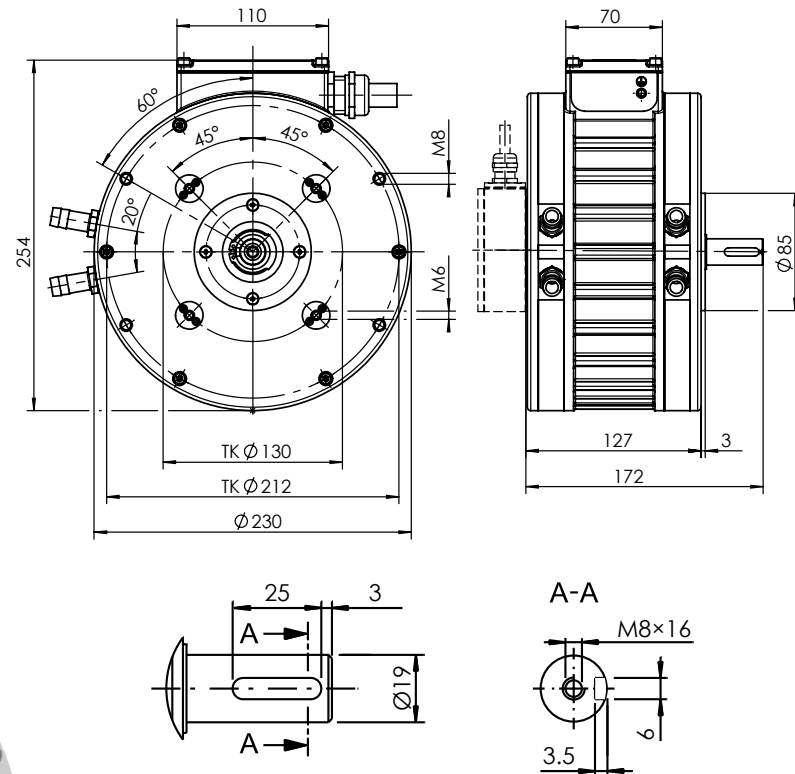
► Cooling: External ventilation ►  $m = 12.3 \text{ kg}$  ►  $J = 26.3 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1



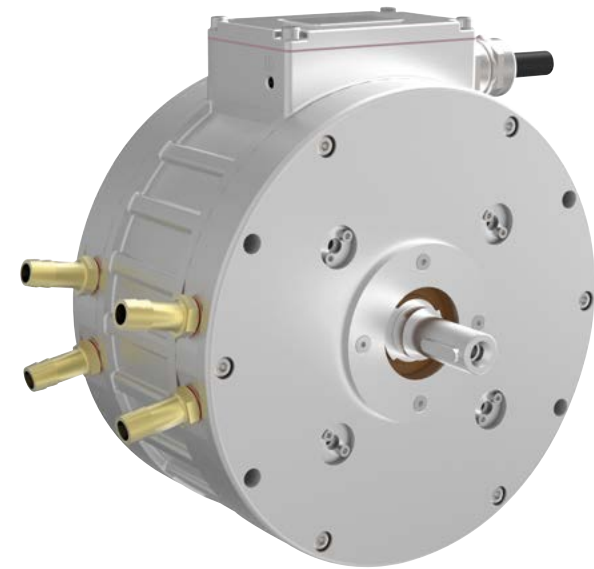
## PMS 120W

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

### DIMENSIONS



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



### TECHNICAL DATA

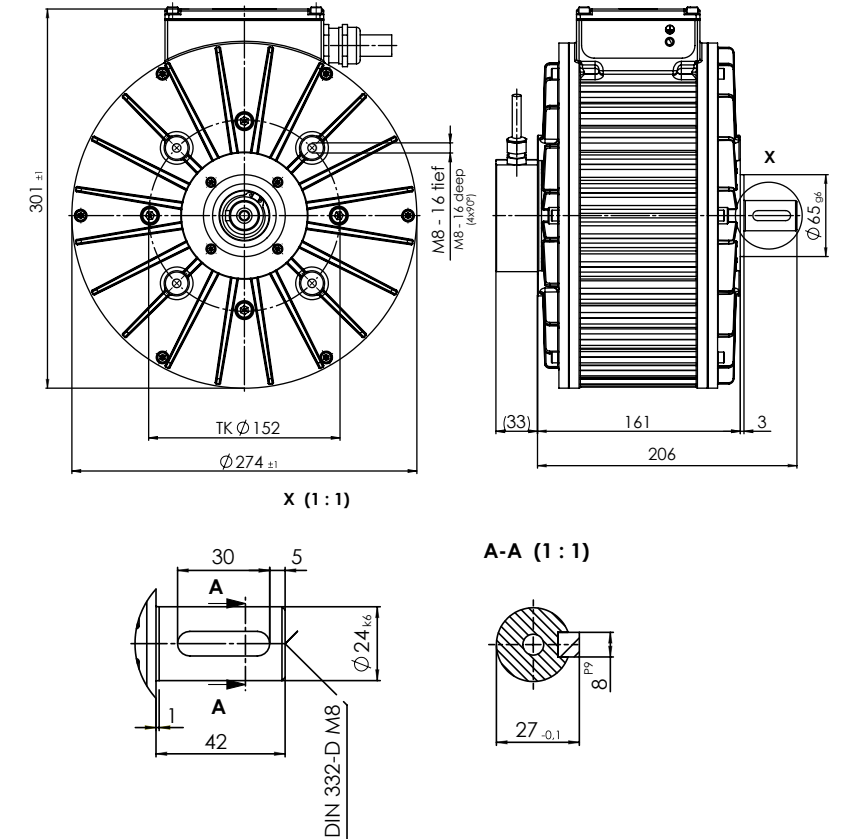
|         | Rated speed              | Rated power | Rated current   | Rated load torque | Torque constant | Voltage constant                  | Max. power       | Max. current    | Max. load torque |
|---------|--------------------------|-------------|-----------------|-------------------|-----------------|-----------------------------------|------------------|-----------------|------------------|
| Voltage | $n$<br>$\text{min}^{-1}$ | $P_N$<br>kW | $I_N$<br>A (AC) | $M_N$<br>Nm       | $K_t$<br>Nm/A   | $K_e$<br>V/1000 $\text{min}^{-1}$ | $P_{\max}$<br>kW | $I_{\max}$<br>A | $M_{\max}$<br>Nm |
| 96 VDC  | 3000                     | 8.0         | 99              | 25.50             | 0.26            | 16.50                             | 12.6             | 180             | 45               |
|         | 4500                     | 12.0        | 144             | 25.50             | 0.18            | 11.20                             | 18.9             | 260             | 45               |
|         | 6000                     | 13.0        | 148             | 20.70             | 0.14            | 8.90                              | 24.0             | 330             | 45               |
| 330 VDC | 3000                     | 8.0         | 28              | 25.50             | 0.90            | 57.80                             | 12.1             | 51              | 45               |
|         | 4500                     | 11.5        | 40              | 24.40             | 0.61            | 38.60                             | 18.5             | 75              | 45               |
|         | 6000                     | 13.0        | 49              | 20.70             | 0.42            | 26.80                             | 23.6             | 110             | 45               |
| 560 VDC | 3000                     | 8.0         | 17              | 25.50             | 1.50            | 96.30                             | 12.6             | 31              | 45               |
|         | 4500                     | 11.5        | 23              | 24.40             | 1.10            | 67.50                             | 18.3             | 43              | 45               |
|         | 6000                     | 13.0        | 27              | 20.70             | 0.80            | 49.00                             | 22.4             | 59              | 45               |

► Cooling: Liquid-cooled ►  $m = 16 \text{ kg}$  ►  $J = 26.3 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1

## PMS 156

The PMS 156 is by far the strongest member in the series with two stators within the forced-ventilated cooled versions.

### DIMENSIONS



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



### TECHNICAL DATA

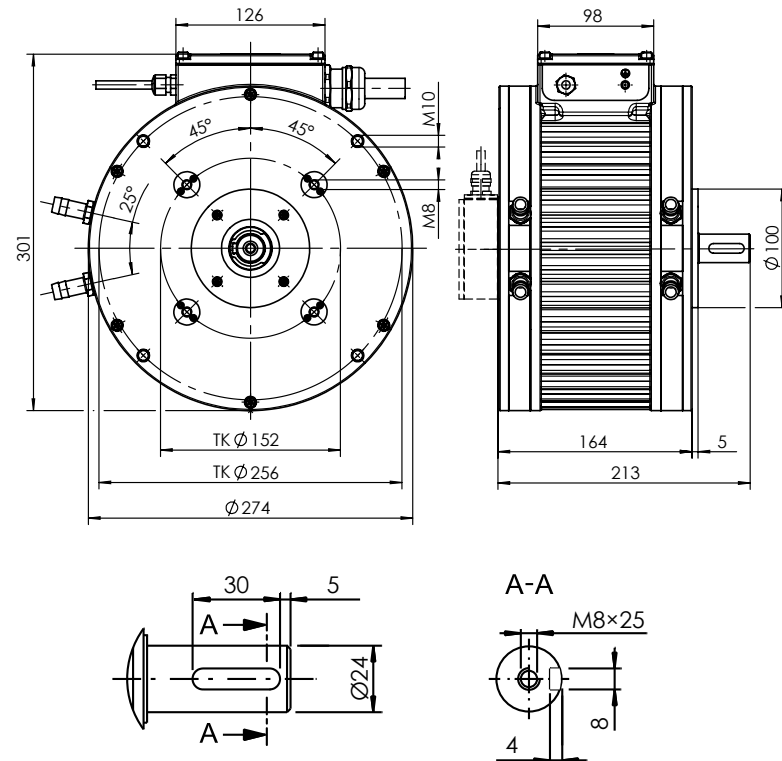
|         | Rated speed              | Rated power | Rated current   | Rated load torque | Torque constant | Voltage constant                  | Max. power       | Max. current    | Max. load torque |
|---------|--------------------------|-------------|-----------------|-------------------|-----------------|-----------------------------------|------------------|-----------------|------------------|
| Voltage | $n$<br>$\text{min}^{-1}$ | $P_N$<br>kW | $I_N$<br>A (AC) | $M_N$<br>Nm       | $K_t$<br>Nm/A   | $K_e$<br>V/1000 $\text{min}^{-1}$ | $P_{\max}$<br>kW | $I_{\max}$<br>A | $M_{\max}$<br>Nm |
| 96 VDC  | 3000                     | 16.0        | 195             | 50.8              | 0.261           | 16.50                             | 24.6             | 310             | 80               |
|         | 4500                     | 17.5        | 227             | 37.1              | 0.163           | 10.30                             | 36.2             | 490             | 80               |
|         | 6000                     | 17.0        | 211             | 26.7              | 0.127           | 7.99                              | 44.2             | 640             | 80               |
| 330 VDC | 3000                     | 15.0        | 53              | 48.1              | 0.9             | 56.80                             | 24.6             | 89              | 80               |
|         | 4500                     | 17.0        | 67              | 36.5              | 0.542           | 34.00                             | 39.2             | 150             | 80               |
|         | 6000                     | 15.0        | 50              | 23.9              | 0.473           | 30.00                             | 44.2             | 170             | 80               |
| 560 VDC | 3000                     | 13.0        | 28              | 41.4              | 1.460           | 97.20                             | 24.1             | 55              | 80               |
|         | 4500                     | 17.0        | 35              | 36.7              | 1.040           | 65.10                             | 36.2             | 78              | 80               |
|         | 6000                     | 16.0        | 38              | 25.3              | 0.674           | 42.50                             | 50.3             | 120             | 80               |

► Cooling: External ventilation ►  $m = 25 \text{ kg}$  ►  $J = 58.6 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1

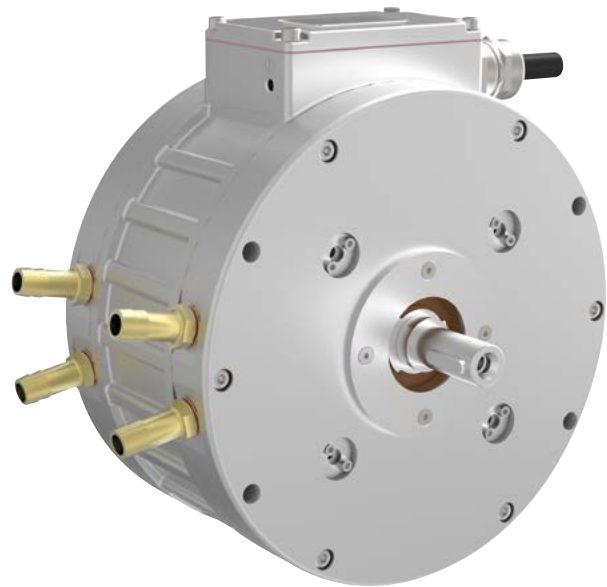
## PMS 156W

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.

### DIMENSIONS



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



### TECHNICAL DATA

|         | Rated speed              | Rated power          | Rated current            | Rated load torque    | Torque constant        | Voltage constant                  | Max. power                | Max. current             | Max. load torque          |
|---------|--------------------------|----------------------|--------------------------|----------------------|------------------------|-----------------------------------|---------------------------|--------------------------|---------------------------|
| Voltage | $n$<br>$\text{min}^{-1}$ | $P_N$<br>$\text{kW}$ | $I_N$<br>$\text{A (AC)}$ | $M_N$<br>$\text{Nm}$ | $K_t$<br>$\text{Nm/A}$ | $K_e$<br>$\text{V/1000 min}^{-1}$ | $P_{\max}$<br>$\text{kW}$ | $I_{\max}$<br>$\text{A}$ | $M_{\max}$<br>$\text{Nm}$ |
| 96 VDC  | 3000                     | 18.5                 | 237                      | 58.9                 | 0.25                   | 15.60                             | 23.2                      | 330                      | 80                        |
|         | 4500                     | 21.0                 | 250                      | 44.6                 | 0.18                   | 11.14                             | 32.5                      | 450                      | 80                        |
|         | 6000                     | 21.0                 | 245                      | 33.4                 | 0.14                   | 8.56                              | 40.7                      | 590                      | 80                        |
| 330 VDC | 3000                     | 18.5                 | 69                       | 58.9                 | 0.85                   | 53.48                             | 23.3                      | 95                       | 80                        |
|         | 4500                     | 23.0                 | 85                       | 48.8                 | 0.57                   | 35.65                             | 35.6                      | 150                      | 80                        |
|         | 6000                     | 25.0                 | 90                       | 39.8                 | 0.45                   | 27.74                             | 40.5                      | 190                      | 80                        |
| 560 VDC | 3000                     | 18.5                 | 42                       | 58.9                 | 1.40                   | 88.02                             | 24.0                      | 58                       | 80                        |
|         | 4500                     | 25.0                 | 53                       | 53.1                 | 1.00                   | 62.95                             | 34.3                      | 80                       | 80                        |
|         | 6000                     | 25.0                 | 54                       | 39.8                 | 0.74                   | 46.20                             | 40.4                      | 110                      | 80                        |

► Cooling: Liquid-cooled ►  $m = 29.8 \text{ kg}$  ►  $J = 58.6 \text{ kg} \cdot \text{cm}^2$  ► Max. permissible load = 6/60 sec ► Operating mode = S1

## PMS TECHNICAL DATA

### 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                                                                                                                                                                                                                                                                                   |   |                                                                                                             |
| 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 (for further details visit <a href="http://www.heinzmann-electric-motors.com/en/downloads/pms-disc-motors">www.heinzmann-electric-motors.com/en/downloads/pms-disc-motors</a> ) |   |                                                                                                             |
| 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<br>Digital Hall probe, analogue Hall probe with sin/cos output<br>Further types of motor feedback on request                                                                                                                                                       |   |                                                                                                             |
| Temperature sensor              | KTY84-130                                                                                                                                                                                                                                                                           |   |                                                                                                             |
| Painting                        | On request<br>Standard finish: cast aluminium                                                                                                                                                                                                                                       |   |                                                                                                             |
| Shaft                           | Shaft with key groove                                                                                                                                                                                                                                                               |   |                                                                                                             |
| Specific features               | Option of integrating components from PMS series drives into customer machinery as kit                                                                                                                                                                                              |   |                                                                                                             |

### PERMISSIBLE FORCES for 20,000 hours lifespan.

|             | Radial force FR [N] at n rpm |      |      | Axial force FA [N] at n rpm |      |      |
|-------------|------------------------------|------|------|-----------------------------|------|------|
| Rated speed | 3000                         | 4500 | 6000 | 3000                        | 4500 | 6000 |
| Motor type  |                              |      |      |                             |      |      |
| PMS 080     | 500                          | 430  | 400  | 140                         | 120  | 95   |
| PMS 100     | 1000                         | 900  | 810  | 300                         | 255  | 210  |
| PMS 120     | 900                          | 780  | 720  | 300                         | 255  | 210  |
| PMS 156     | 900                          | 780  | 720  | 460                         | 390  | 320  |

### CUSTOMER-SPECIFIC ADAPTATION

On request: Alternative voltage, speed, torque or power for customised applications obtainable and additional mounting of gearbox or brake obtainable.



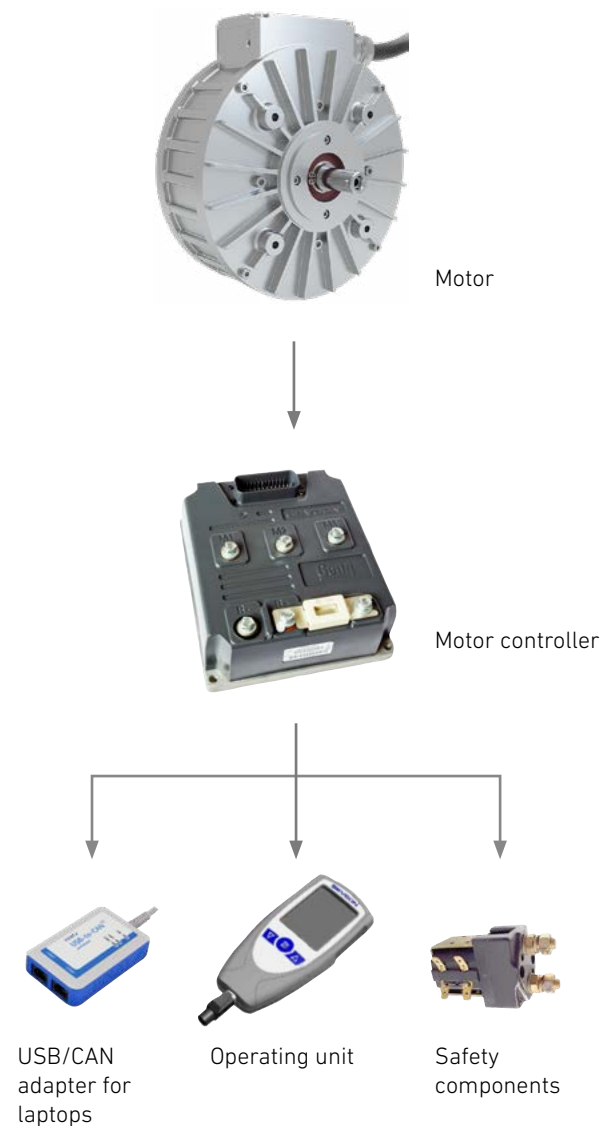
# PMS SYSTEM COMPONENTS

## HEINZMANN drive solutions 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.

### SYSTEM OVERVIEW



### MOTOR CONTROLLER

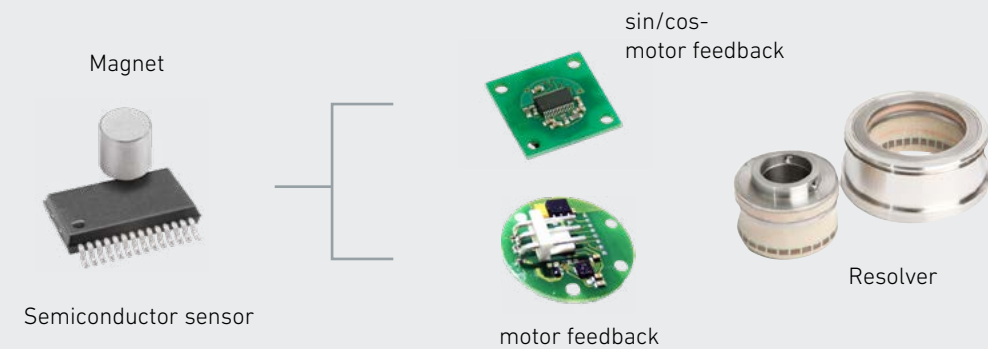
Permanently excited synchronous motors require electronic controllers for their operation. These controllers are subject to the utmost dynamic requirements and must demonstrate extreme performance characteristics. That's why a selection of tried-and-tested motor controllers is available for the motors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



Motor controllers of varying levels of performance and manufacturers

### MOTOR FEEDBACK

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



### GEARBOXES

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



### 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.



# PMSG SYSTEM SOLUTIONS

## MOTOR & GEARBOX 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 gearbox 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

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

## RANGE OF APPLICATIONS

- ▶ Turf applications, lawn tractors
- ▶ Harvester
- ▶ Forklift trucks
- ▶ Lifters
- ▶ Floor care machinery
- ▶ Municipal vehicles
- ▶ Commercial vehicles
- ▶ Electric vehicles
- ▶ Replacement for hydraulic drives



## PMSG GEARBOX SELECTION



### GEARING DATA

| Series                                                                   | PMSG xxx-500                               | PMSG xxx-1500                              | PMSG xxx-4000                              |
|--------------------------------------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|
| <b>Gear ratio</b>                                                        |                                            |                                            |                                            |
| Single-stage                                                             | 7                                          | –                                          | –                                          |
| Two-stage                                                                | 16, 24, 42                                 | 25, 40                                     | 24, 32                                     |
| Three-stage                                                              | –                                          | 100, 150                                   | –                                          |
| Decoupling optionally possible, except for gear ratio $i = 7$ & $i = 42$ |                                            |                                            |                                            |
| 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                                                       | 7,000 N                                    | 21,000 N                                   | 45,000 N                                   |
| Efficiency                                                               | 94 %                                       | 94 %                                       | 94 %                                       |
| Lubrication                                                              | Lifetime                                   | Lifetime                                   | Lifetime                                   |
| Lifetime                                                                 | 20,000 hours<br>(depending on application) | 20,000 hours<br>(depending on application) | 20,000 hours<br>(depending on application) |
| Degree of protection<br>*only gearbox                                    | up to IP67                                 | up to IP67                                 | up to IP67                                 |
| Weight planetary gearbox                                                 | ~ 7 kg                                     | 14 – 17.5 kg                               | 38 – 44 kg                                 |

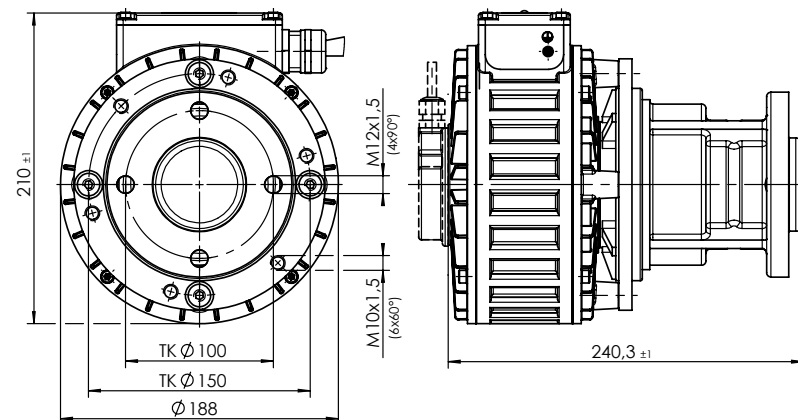


## PMSG 100-500

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



### DIMENSIONS



### TECHNICAL DATA

#### Motor data

|                   | Rated power | Rated speed | Rated load torque | Rated current |
|-------------------|-------------|-------------|-------------------|---------------|
| Voltage           | kW          | rpm         | Nm                | A             |
| PMSG 100-500-1-7  |             |             |                   |               |
| 24 VDC            | 1.4         | 3000        | 4.5               | 69            |
|                   | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC            | 2.3         | 3000        | 7.3               | 60            |
|                   | 2.6         | 4500        | 5.5               | 65            |
| PMSG 100-500-2-16 |             |             |                   |               |
| 24 VDC            | 1.4         | 3000        | 4.5               | 69            |
|                   | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC            | 2.3         | 3000        | 7.3               | 60            |
|                   | 2.6         | 4500        | 5.5               | 65            |
| PMSG 100-500-2-24 |             |             |                   |               |
| 24 VDC            | 1.4         | 3000        | 4.5               | 69            |
|                   | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC            | 2.3         | 3000        | 7.3               | 60            |
|                   | 2.6         | 4500        | 5.5               | 65            |
| PMSG 100-500-2-42 |             |             |                   |               |
| 24 VDC            | 1.4         | 3000        | 4.5               | 69            |
|                   | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC            | 2.3         | 3000        | 7.3               | 60            |
|                   | 2.6         | 4500        | 5.5               | 65            |

#### Gearing data

| Gear ratio        | Rated speed | Rated load torque |
|-------------------|-------------|-------------------|
| i                 | rpm         | Nm                |
| PMSG 100-500-1-7  |             |                   |
| 7                 | 429         | 32                |
| 7                 | 643         | 25                |
| 7                 | 429         | 51                |
| 7                 | 643         | 39                |
| PMSG 100-500-2-16 |             |                   |
| 16                | 188         | 72                |
| 16                | 281         | 56                |
| 16                | 188         | 117               |
| 16                | 281         | 88                |
| PMSG 100-500-2-24 |             |                   |
| 24                | 125         | 108               |
| 24                | 188         | 84                |
| 24                | 125         | 160               |
| 24                | 188         | 132               |
| PMSG 100-500-2-42 |             |                   |
| 42                | 70          | 160               |
| 42                | 105         | 147               |
| 42                | 70          | 160               |
| 42                | 105         | 160               |

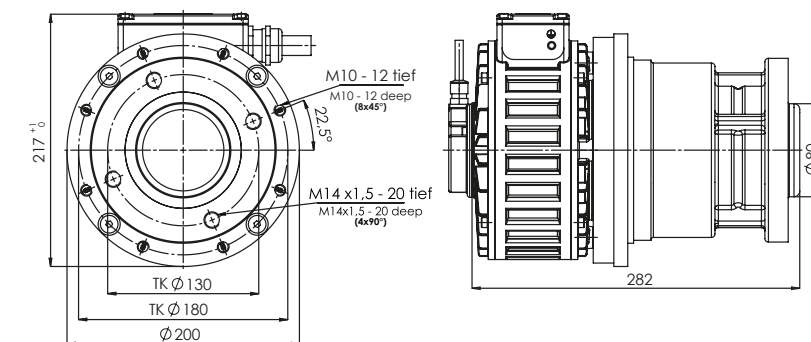
► Cooling: Forced ventilation ► m = 14.5 kg ► Operating mode = S1

## PMSG 100-1500

The PMSG 100-1500 combines a PMS 100 motor with a gearbox and an output torque of up to 290 Nm.



### DIMENSIONS



### TECHNICAL DATA

#### Motor data

|                    | Rated power | Rated speed | Rated load torque | Rated current |
|--------------------|-------------|-------------|-------------------|---------------|
| Voltage            | kW          | rpm         | Nm                | A             |
| PMSG 100-1500-2-25 |             |             |                   |               |
| 24 VDC             | 1.4         | 3000        | 4.5               | 69            |
|                    | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC             | 2.3         | 3000        | 7.3               | 60            |
|                    | 2.6         | 4500        | 5.5               | 65            |
| PMSG 100-1500-2-40 |             |             |                   |               |
| 24 VDC             | 1.4         | 3000        | 4.5               | 69            |
|                    | 1.7         | 4500        | 3.5               | 83            |
| 48 VDC             | 2.3         | 3000        | 7.3               | 60            |
|                    | 2.6         | 4500        | 5.5               | 65            |

#### Gearing data

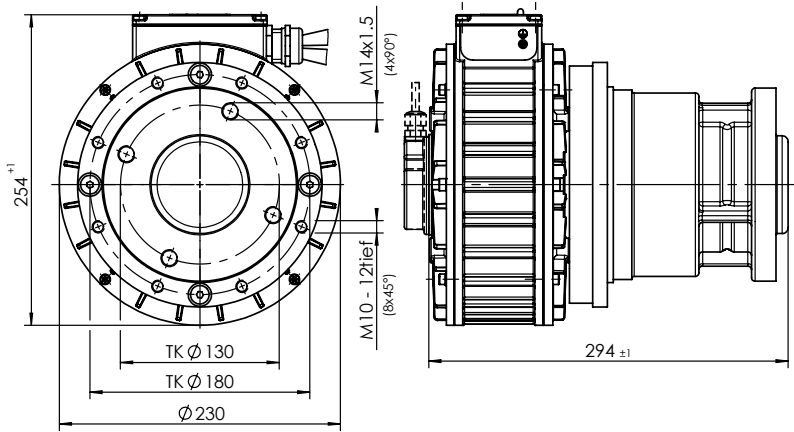
| Gear ratio         | Rated speed | Rated load torque |
|--------------------|-------------|-------------------|
| i                  | rpm         | Nm                |
| PMSG 100-1500-2-25 |             |                   |
| 25                 | 120         | 112.5             |
| 25                 | 180         | 87.5              |
| 25                 | 120         | 182.5             |
| 25                 | 180         | 137.5             |
| PMSG 100-1500-2-40 |             |                   |
| 40                 | 75          | 180               |
| 40                 | 112.5       | 140               |
| 40                 | 75          | 292               |
| 40                 | 112.5       | 220               |

► Cooling: Forced ventilation ► m = 25 kg ► Operating mode = S1

PMSG 120-1500

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

DIMENSIONS



TECHNICAL DATA

Motor data

|                    | Rated power | Rated speed | Rated load torque | Rated current |
|--------------------|-------------|-------------|-------------------|---------------|
| Voltage            | kW          | rpm         | Nm                | A             |
| PMSG 120-1500-2-25 |             |             |                   |               |
| 48 VDC             | 5.5         | 3000        | 17.5              | 127           |
|                    | 6           | 4500        | 12.7              | 134           |
| 96 VDC             | 6.4         | 3000        | 20.4              | 74            |
|                    | 7.5         | 4500        | 15.9              | 84            |
| PMSG 120-1500-2-40 |             |             |                   |               |
| 48 VDC             | 5.5         | 3000        | 17.5              | 127           |
|                    | 6           | 4500        | 12.7              | 134           |
| 96 VDC             | 6.4         | 3000        | 20.4              | 74            |
|                    | 7.5         | 4500        | 15.9              | 84            |

Gearing data

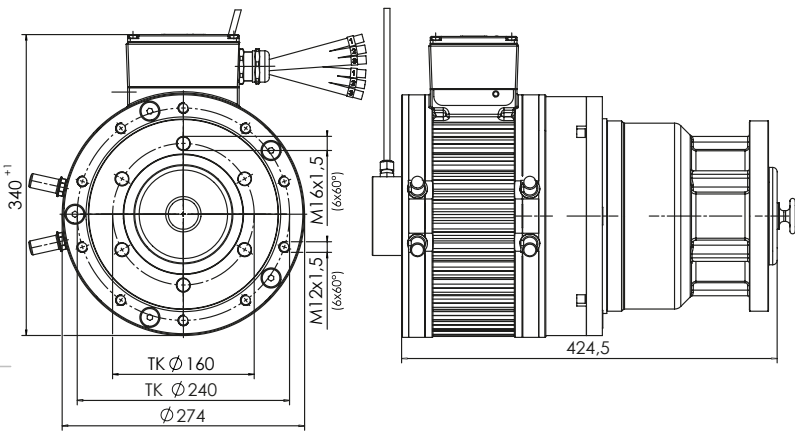
| Gear ratio | Rated speed | Rated load torque |
|------------|-------------|-------------------|
| i          | rpm         | Nm                |
|            |             |                   |
| 25         | 120         | 438               |
| 25         | 180         | 318               |
| 25         | 120         | 510               |
| 25         | 180         | 398               |
|            |             |                   |
| 40         | 70          | 735               |
| 40         | 105         | 533               |
| 40         | 70          | 800               |
| 40         | 105         | 668               |

► Cooling: Forced ventilation ► m = 27.8 kg ► Operating mode = S1

PMSG 156W-4000

The PMSG 156W-4000 combines a liquid-cooled PMS 156W motor with a gearbox and an output torque of up to 1600 Nm.

DIMENSIONS



TECHNICAL DATA

Motor data

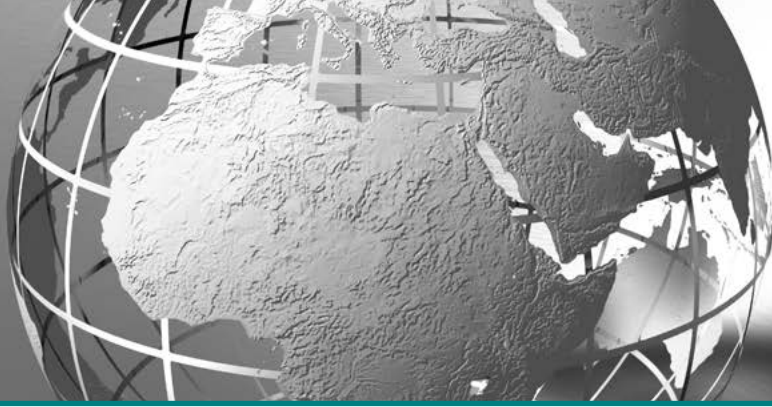
|                     | Rated power | Rated speed | Rated load torque | Rated current |
|---------------------|-------------|-------------|-------------------|---------------|
| Voltage             | kW          | rpm         | Nm                | A             |
| PMSG 156W-4000-2-24 |             |             |                   |               |
| 96 VDC              | 18.5        | 3000        | 58.9              | 237           |
|                     | 21          | 4500        | 44.6              | 250           |
| PMSG 156W-4000-2-32 |             |             |                   |               |
| 96 VDC              | 18.5        | 3000        | 58.9              | 69            |
|                     | 23          | 4500        | 48.8              | 85            |

Gearing data

| Gear ratio | Rated speed | Rated load torque |
|------------|-------------|-------------------|
| i          | rpm         | Nm                |
|            |             |                   |
| 24         | 125         | 1413              |
| 24         | 188         | 1070              |
|            |             |                   |
| 32         | 93          | 1600              |
| 32         | 140         | 1561              |

► Cooling: Liquid-cooled ► m = 72 kg ► Operating mode = S1





## HEINZMANN GROUP – THINKING IN DRIVE AND CONTROL

HEINZMANN is a globally active family business founded in 1897 with its headquarters in Schöna u (Germany), in the Black Forest.

Today, in the field of engine management HEINZMANN is one of the leading suppliers of components and systems for industrial combustion engines, generators and turbines. As a specialist and development partner, HEINZMANN is committed to developing exactly the right solution for increasing efficiency and reducing emissions.

In the Electric Drives division, HEINZMANN also demonstrates innovative strength and development expertise in engine technologies of the future. The company has established itself as a reliable partner and system provider for electric drive systems.

Our collaborative interaction with more than 40 globally active subsidiaries and sales companies characterizes the spirit within the HEINZMANN group of companies and makes us a reliable partner.

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