

Electric drives for industry and e-mobility applications

# PRODUCT CATALOGUE

High performing & most efficient drive solutions



# Electric Drives

## ELECTRIC DRIVES & COMPLETE SYSTEMS

HEINZMANN is a renowned and experienced manufacturer of electric drives up to 35 kW and has proven itself as a leading supplier and system provider for electric drive applications.

In addition to the design of the electric motors, the range of services includes the entire project engineering to obtain the customer-specific adaptation of the motors, as well as the system integration of controllers.

The product portfolio includes a wide range of permanent magnet disc type motors, synchronous generators, wheel hub as well as e-bike drives. These have proven as highly effective in a variety of applications.

Areas of application in industry include robotics, automated guided vehicles, mobile machines, tracked vehicles, agricultural technology, cleaning and care machines, fans and pumps.

In electromobility, these include e-bikes, cargo bikes, rehab vehicles, e-motorcycles, boats and airfield logistics systems.

Our customers are benefiting from our flexible approach to these applications and from the excellent performance features and high efficiency of our drive technology.

### SYNCHRONOUS MOTORS

Powerful brushless disc motors in patented rotor technology.



### SYNCHRONOUS GENERATORS

Generators with outstanding key performance indicators and significant efficiency gains.





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### WHEEL HUB DRIVES

HEINZMANN, compact, strong wheel hub drives for the AGV market.



### DC DISC MOTORS

Disc motors with brushes in flat and compact design.



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# Series of Motors & Generators

## SUITABLE DRIVE FOR YOUR APPLICATION

For decades now, HEINZMANN has been developing and producing robust, powerful electric drives rated up to 35 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

### PMS/PGS - Double-sided Synchronous Disc Motors & Generators up to 35 kW

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



PMS/PGS 080

### 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.



PMS/PGS 066F

### PRA - High Torque Wheel Drives

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



PRA 230

### SL – Disc Motors with Brushes

Robust DC motor with brushes in extremely flat design.



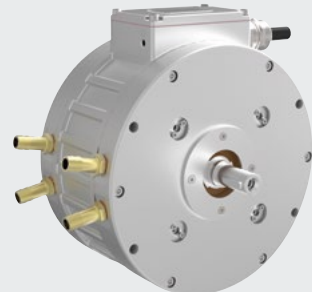
PMS/PGS 100



PMS/PGS 120



PMS/PGS 150



PMS/PGS 156W



PMS/PGS 080F



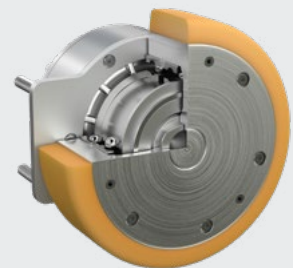
PMS/PGS 100F

### PMSG - Wheel Hub Motors with Gears

Wheel hub drives with completely integrated planetary gear.



PMSG 150-1500



PMSG 066F-060 (AGV Drive)



SL 100-F/SL 100-1NFB/SL 100-2NFB



SL 120-F/SL 120-1NFB/SL 120-2NFB



SL 140-2NFB



# 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 compact 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.

## APPLICATION RANGE

- ▶ Industry & Agriculture
- ▶ Mobility & Transport
- ▶ Rehabilitation & Medical Care
- ▶ Electric Energy
- ▶ Consumer Products
- ▶ E-Bikes & Cargo Bikes

## 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

## 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

## E-BIKES & CARGO BIKES\*

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

\* For further information refer to the respective documents.



## 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.



Samatec EV04 **lifting platforms** are equipped with PMSG 100-1500 brushless disc-type motors. Among other uses, the mobile lifting platforms are employed in agricultural settings as apple harvesters.

# Range of Application



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.



The British company Gardner Denver has developed a small compressor for automotive applications.

Compressed air is key to the 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 HEINZMANN PMS 120 water-cooled disc motor lent itself as the solution from development to series supply of the solution.



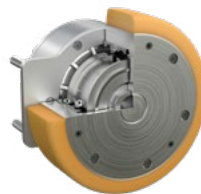
The RTE Robot of Rosenbauer International is a radio-controlled, electrically driven multifunctional crawler vehicle with a payload up to 650 kg.

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 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.



A heavy-duty planetary gear and a high-torque HEINZMANN PMS 066F electric disc motor combine to form an ultra-compact drive system for **automated guided vehicles**, also known as **AGVs**.

Long service life and low emissions are guaranteed. The traction-optimised dual-channel motor driver can be adapted to customer specific applications and offers worry-free integration solutions for industrial automation.



AAT Alber Antriebstechnik GmbH is a manufacturer of stair climbing systems and auxiliary drives in the fields of transport and rehabilitation technology. For its CargoMaster C120, AAT Alber relies on the reliable, extremely flat designed SL120 brushed disc motor. A specially adapted gearbox in cooperation with the SL allows AAT to produce a very compact **staircase drive**. It proves to be the ideal solution for the innovative stair climber system, as it is extremely robust and ideally suited for harsh industrial environments.

# 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 35 kW and torques up to 80 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.

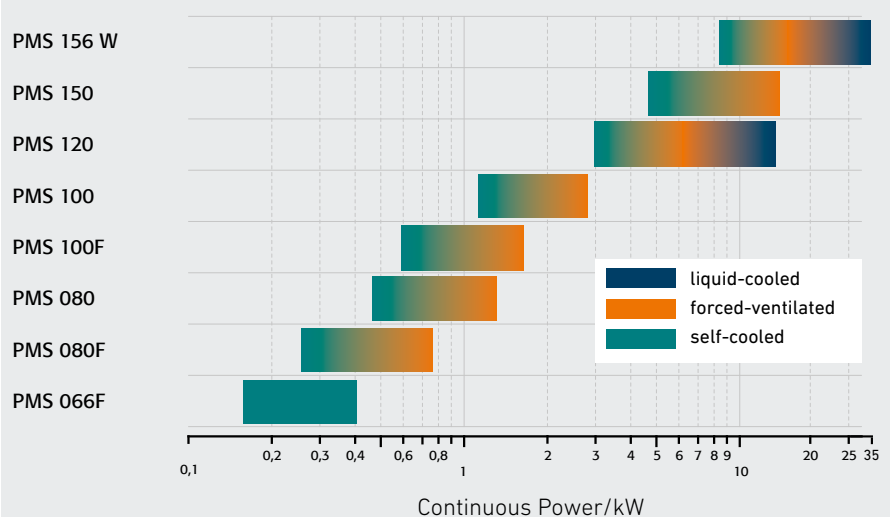
They are available with various sensor systems and also in a sensor-free version.

PMS motors can also function as highly efficient generators.

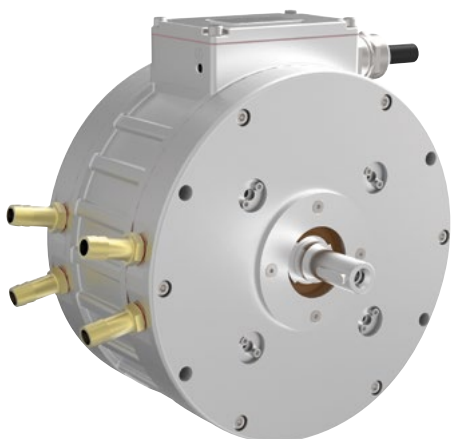
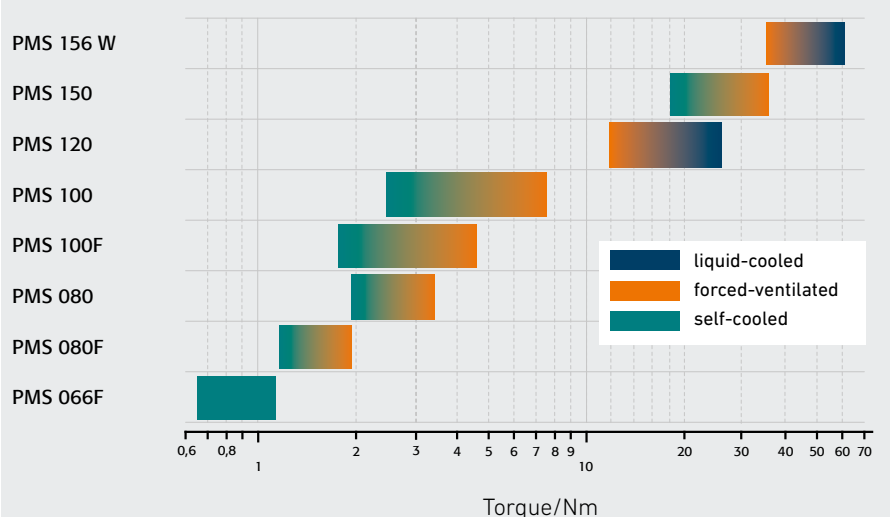
## RANGE OF APPLICATIONS

- 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



### Torque range PMS disc motors



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.



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

## 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, 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.





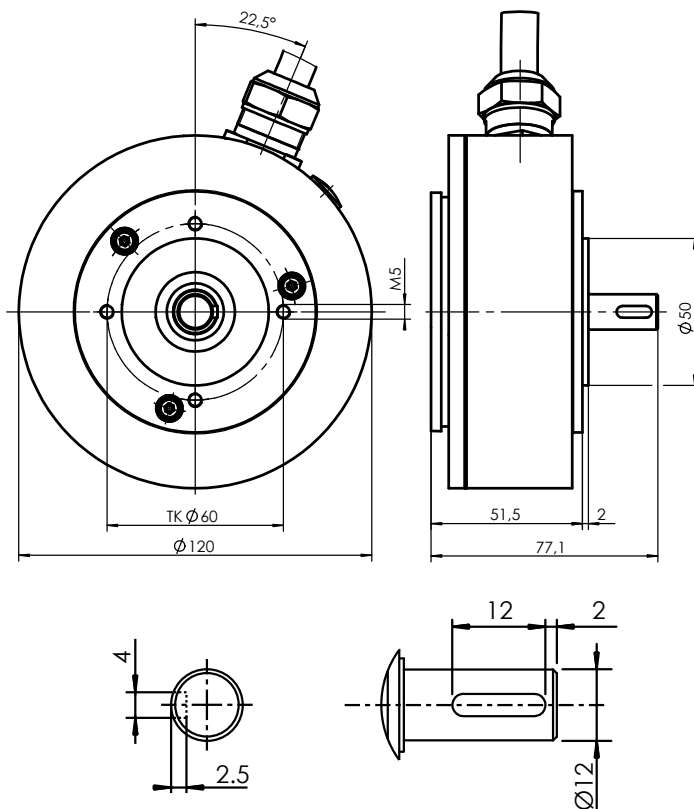
## PMS 066F

PMS 066F is the smallest motor from the single-sided synchronous motor series.

Suitable for applications with very limited axial installation space.



## DIMENSIONS



Motor feedback: Hall sensor

## TECHNICAL DATA

	Rated voltage	Rated power	Rated current	Rated load torque	Torque constant	Voltage constant	Max. power	Max. current	Max. load torque
<b>Voltage</b>	<b>n</b> <b>rpm</b>	<b>P<sub>N</sub></b> <b>kW</b>	<b>I<sub>N</sub></b> <b>A (AC)</b>	<b>M<sub>N</sub></b> <b>Nm</b>	<b>K<sub>t</sub></b> <b>Nm/A</b>	<b>K<sub>e</sub></b> <b>V/1000 rpm</b>	<b>P<sub>max</sub></b> <b>kW</b>	<b>I<sub>max</sub></b> <b>A</b>	<b>M<sub>max</sub></b> <b>Nm</b>
24 VDC	3000	0.35	20	1.11	0.055	4.05	0.5	37	2
	4500	0.40	20	0.85	0.041	2.97	0.7	49	2
	6000	0.35	19	0.56	0.029	2.09	0.9	71	2
48 VDC	3000	0.35	10	1.11	0.111	8.11	0.6	19	2
	4500	0.40	10	0.85	0.083	5.95	0.8	25	2
	6000	0.40	11	0.64	0.058	4.19	1.0	35	2

► Cooling: Self-cooled ► m = approx. 1.5 kg ► J = 2.14 kg · cm<sup>2</sup> ► Max. permissible load = 6/60 sec ► Operating mode = S1

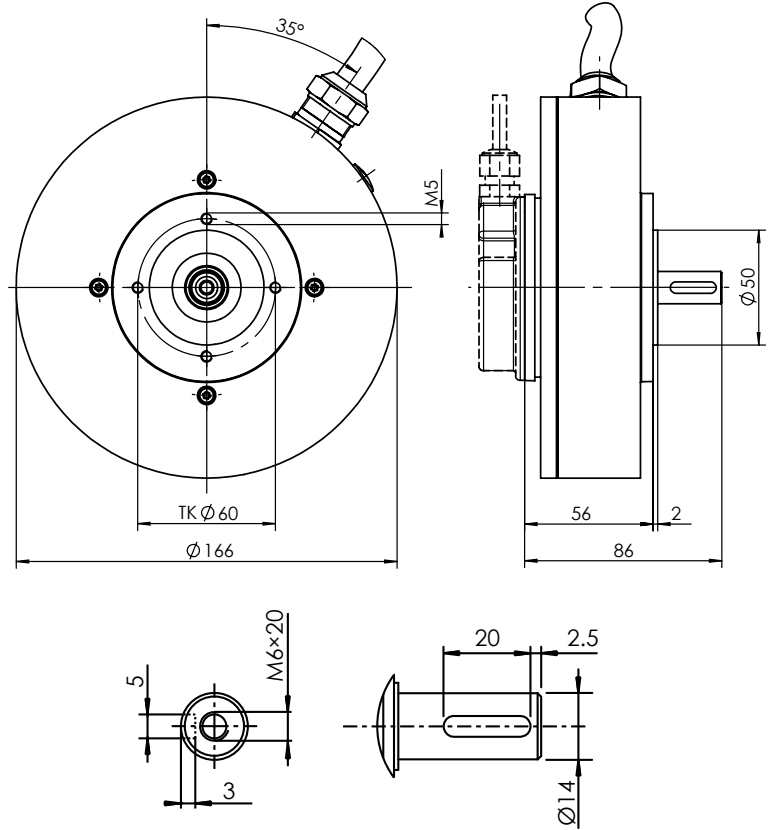
# Series of PMS Motors

## PMS 080F

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



### 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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	$K_t$ Nm/A	$K_e$ V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ Nm
24 VDC	3000	0.55	27	1.75	0.064	4.41	1.2	78	5
	4500	0.75	37	1.59	0.043	2.88	1.9	120	5
	6000	0.75	36	1.19	0.033	2.25	1.8	160	5
48 VDC	3000	0.55	13	1.75	0.132	9.10	1.2	38	5
	4500	0.75	18	1.59	0.087	5.88	1.9	58	5
	6000	0.75	18	1.19	0.066	4.49	1.9	76	5

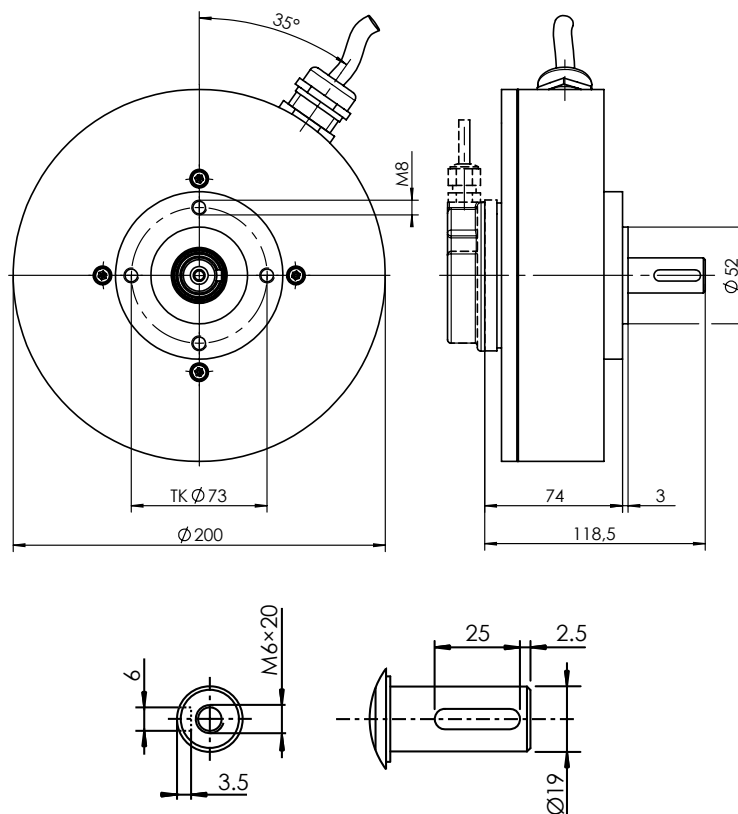


## PMS 100F

The PMS 100F motor from the series series of single-sided synchronous motors offers comparatively low overall height above-average torques.



## 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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	$K_t$ Nm/A	$K_e$ V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ Nm
24 VDC	3000	0.65	32	2.07	0.065	4.38	2.4	210	13
	4500	1.40	70	2.97	0.042	2.80	3.0	310	13
	6000	1.50	74	2.39	0.320	2.15	4.2	410	13
48 VDC	3000	1.35	37	4.30	0.116	7.79	3.3	120	13
	4500	1.50	36	3.18	0.087	5.81	3.5	150	13
	6000	1.50	38	2.39	0.063	4.22	4.6	210	13

► Cooling: External ventilation ► m = approx. 5.5 kg ► J = 17.5 kg · cm<sup>2</sup> ► Max. permissible load = 6/60 sec ► Operating mode = S1

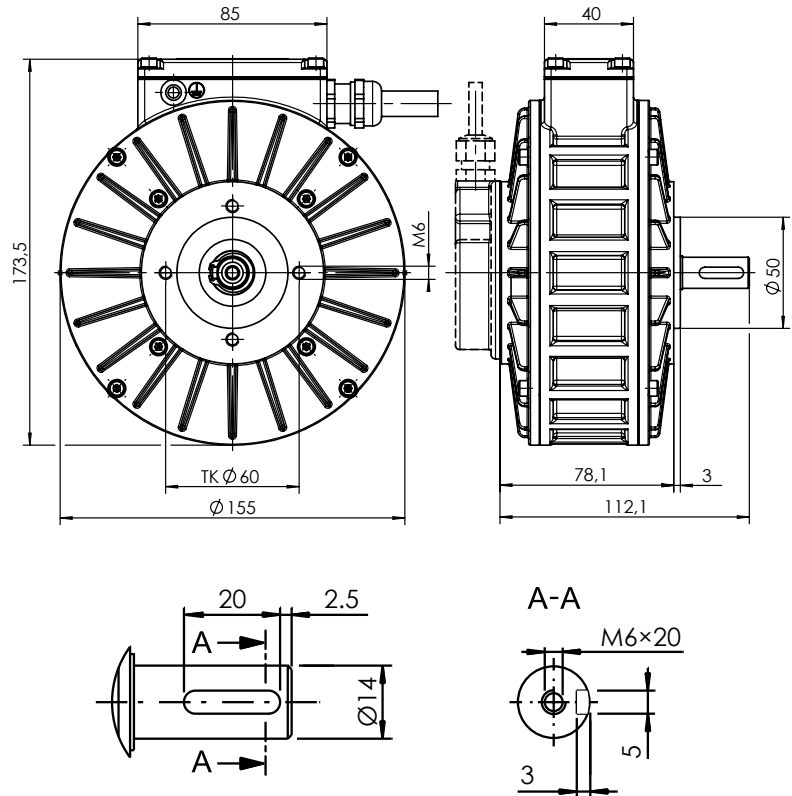
# Series of PMS Motors

## PMS 080

PMS 080 is the smallest from 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
<b>Voltage</b>	<b>n</b> <b>rpm</b>	<b>P<sub>N</sub></b> <b>kW</b>	<b>I<sub>N</sub></b> <b>A (AC)</b>	<b>M<sub>N</sub></b> <b>Nm</b>	<b>K<sub>t</sub></b> <b>Nm/A</b>	<b>K<sub>e</sub></b> <b>V/1000 rpm</b>	<b>P<sub>max</sub></b> <b>kW</b>	<b>I<sub>max</sub></b> <b>A</b>	<b>M<sub>max</sub></b> <b>Nm</b>
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



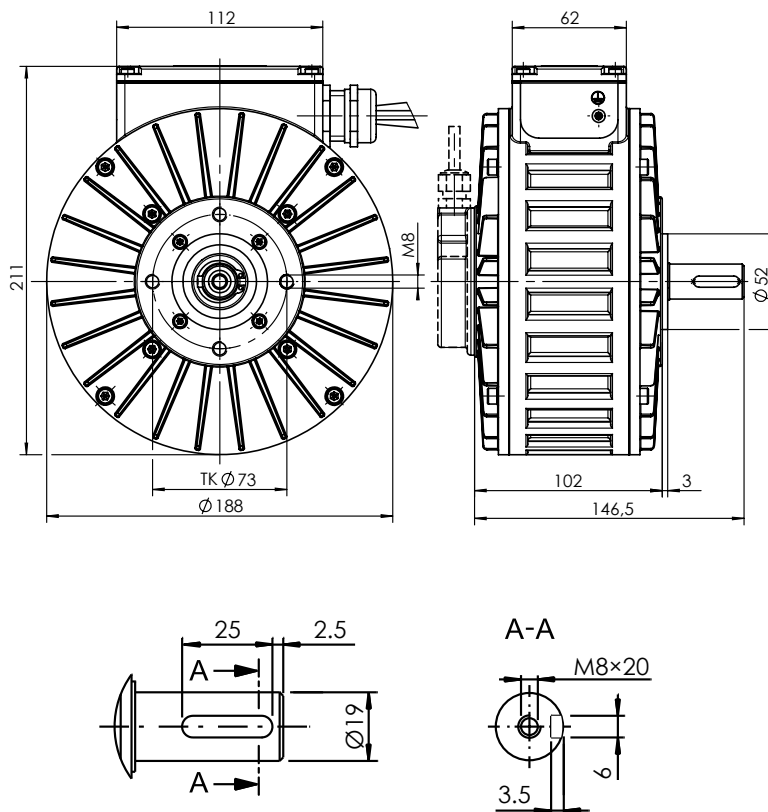


## PMS 100

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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	$K_t$ Nm/A	$K_e$ V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ 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

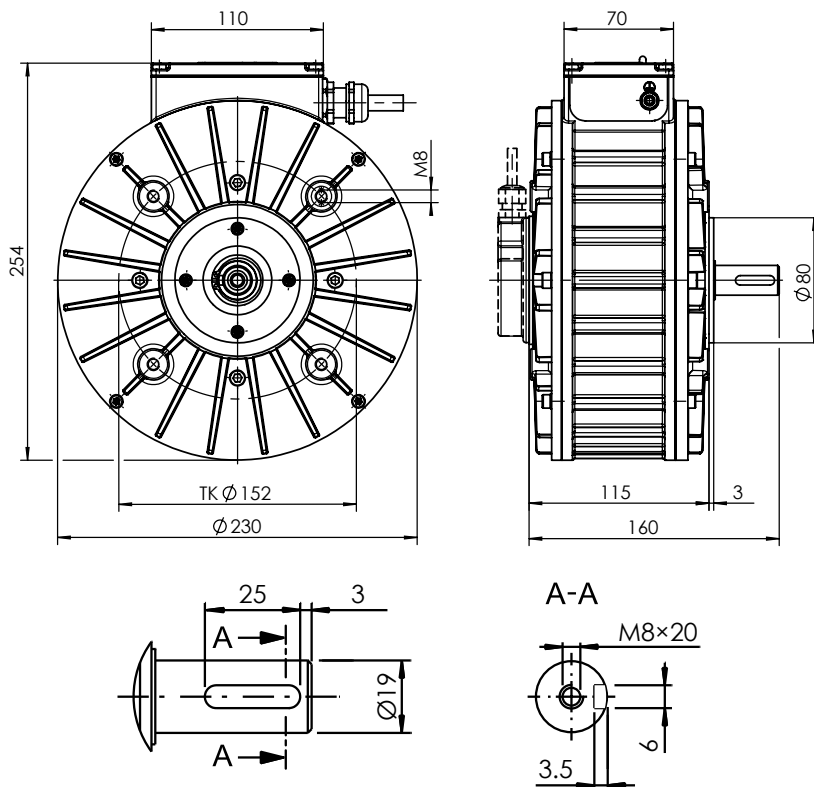
# Series of PMS Motors

## PMS 120

The PMS 120 is a particularly powerful motor from 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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	Kt Nm/A	Ke V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ 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

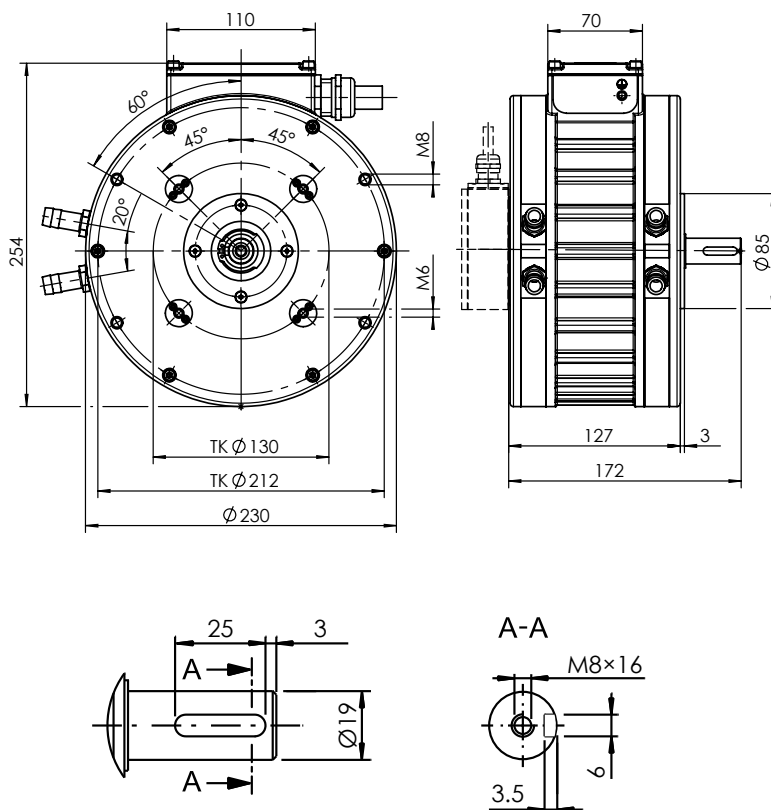


## PMS 120W

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



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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	$K_t$ Nm/A	$K_e$ V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ 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 kg ► J = 26.3 kg · cm<sup>2</sup> ► Max. permissible load = 6/60 sec ► Operating mode = S1

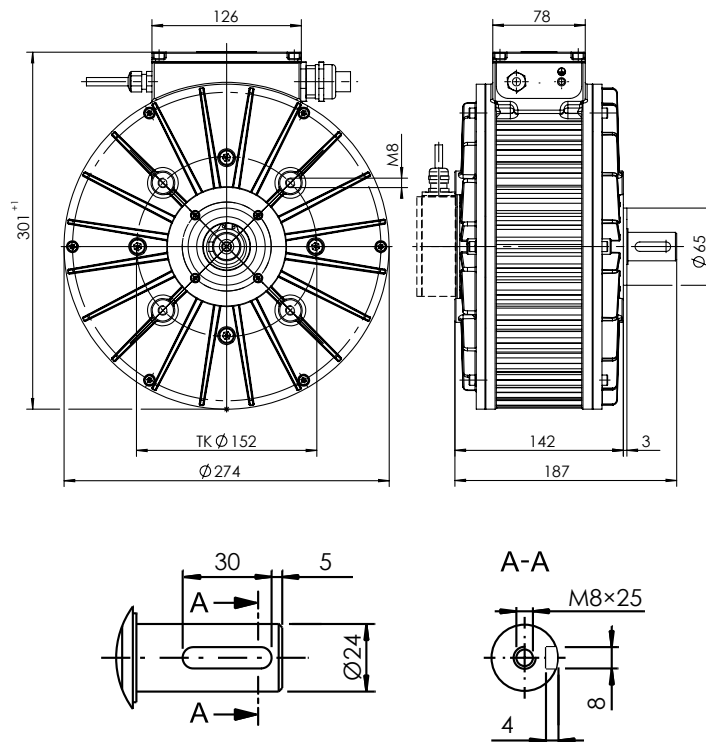
# Series of PMS Motors

## PMS 150

The PMS 150 is by far the strongest member of the series with two stators within the forced-ventilated cooled versions.



## DIMENSIONS



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

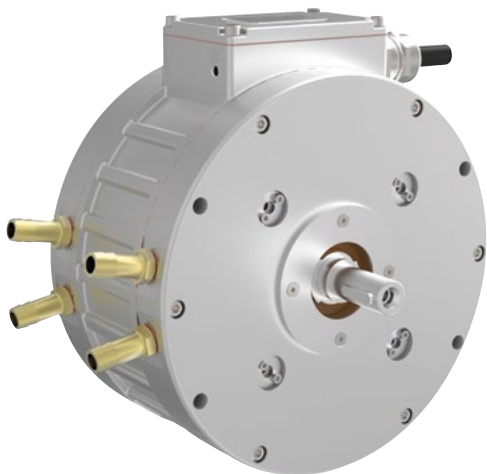
## TECHNICAL DATA

	Rated speed	Rated power	Rated current	Rated load torque	Torque constant	Voltage constant	Max. power	Max. current	Max. load torque
Voltage	n rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	$K_t$ Nm/A	$K_e$ V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ Nm
48 VDC	3000	8.5	192	27.1	0.141	8.95	18.7	570	80
	4500	8.5	191	18.0	0.095	6.03	27.7	850	80
	6000	8.5	192	13.5	0.070	4.55	33.6	1140	80
96 VDC	3000	10.5	131	33.4	0.256	16.22	21.5	320	80
	4500	14.0	167	29.7	0.178	11.19	31.8	460	80
	6000	13.0	157	20.7	0.131	8.30	34.0	610	80
330 VDC	3000	10.0	32	31.8	0.966	61.50	19.5	83	80
	4500	14.0	46	29.7	0.646	40.79	28.8	130	80
	6000	13.0	42	20.7	0.491	31.10	33.0	170	80
560 VDC	3000	10.0	24	31.8	1.334	85.04	24.4	60	80
	4500	14.0	26	29.7	1.134	71.60	29.0	71	80
	6000	13.0	26	20.7	0.802	50.71	34.3	100	80

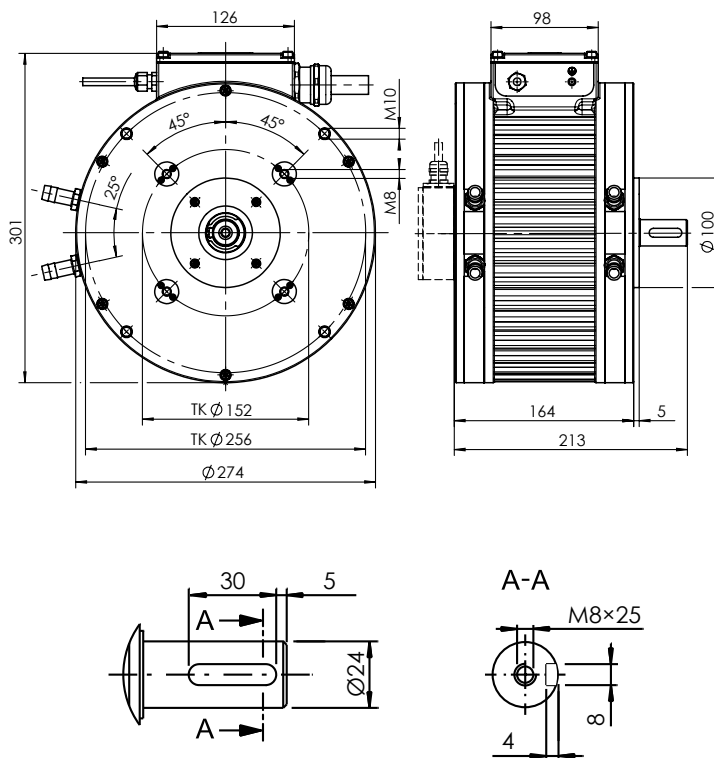


## PMS 156W

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 rpm	$P_N$ kW	$I_N$ A (AC)	$M_N$ Nm	Kt Nm/A	Ke V/1000 rpm	$P_{max}$ kW	$I_{max}$ A	$M_{max}$ 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 kg ► J = 58.6 kg · cm<sup>2</sup> ► Max. permissible load = 6/60 sec ► Operating mode = S1

# PMS/PGS Technical Data

## TECHNICAL DATA AND INFORMATION

<b>Motor type</b>	Brushless synchronous disc motor/generator, excited by permanent magnet in disc motor technology
<b>Miscellaneous provisions</b>	Relevant standards DIN EN 60034
<b>Operational mode</b>	S1 (continuous duty)
<b>Cooling</b>	<p>Self-cooling = without fan, mounting on satisfactory cooling surface</p> <p>Forced ventilation = generated independently from motor, min. air velocity &gt; 5 m/s required</p> <p>Liquid cooling = 6 l/min, max. coolant temperature 60 °C, max. operating pressure 3 bar, customer specific design on request</p>
<b>Pairs of poles</b>	4 (5 at PMS/PGS 066F)
<b>Magnet material</b>	Neodymium iron boron (NdFeB)
<b>Electrical connection</b>	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> )
<b>Electric strength</b>	According to standard DIN EN 60034
<b>Thermal class</b>	F (155 °C)
<b>Degree of protection</b>	IP54, alternatives obtainable on request
<b>Permissible ambient temperature</b>	-25 ... +40 °C
<b>Motor feedback</b>	Resolver two-pin Digital Hall probe Analogue Hall probe with sin/cos output Further types of motor feedback on request
<b>Temperature sensor</b>	KTY84-130, optional PTC according to DIN 44081
<b>Painting</b>	On request Standard finish: cast aluminium
<b>Shaft</b>	Shaft with key groove
<b>Types</b>	PMS/PGS Type F: one stator, one rotor with closed magnetic circuit PMS/PGS double-sided: two stators, one rotor self-contained
<b>Specific features</b>	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

Rated speed	Radial force FR [N] at n rpm			Bearing A-side
	3000	4500	6000	
<b>Motor type</b>				
PMS/PGS 066	360	310	280	6002
PMS/PGS 080	500	430	400	6202 6004
PMS/PGS 100	1000	900	810	6304
PMS/PGS 120	900	780	720	6205
PMS/PGS 150	900	780	720	6205 6206

Rated speed	Axial force FA [N] at n rpm		
	3000	4500	6000
<b>Motor type</b>			
PMS/PGS 066	105	90	75
PMS/PGS 080	140	120	95
PMS/PGS 100	300	255	210
PMS/PGS 120	300	255	210
PMS/PGS 150	460	390	320

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.

# 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.

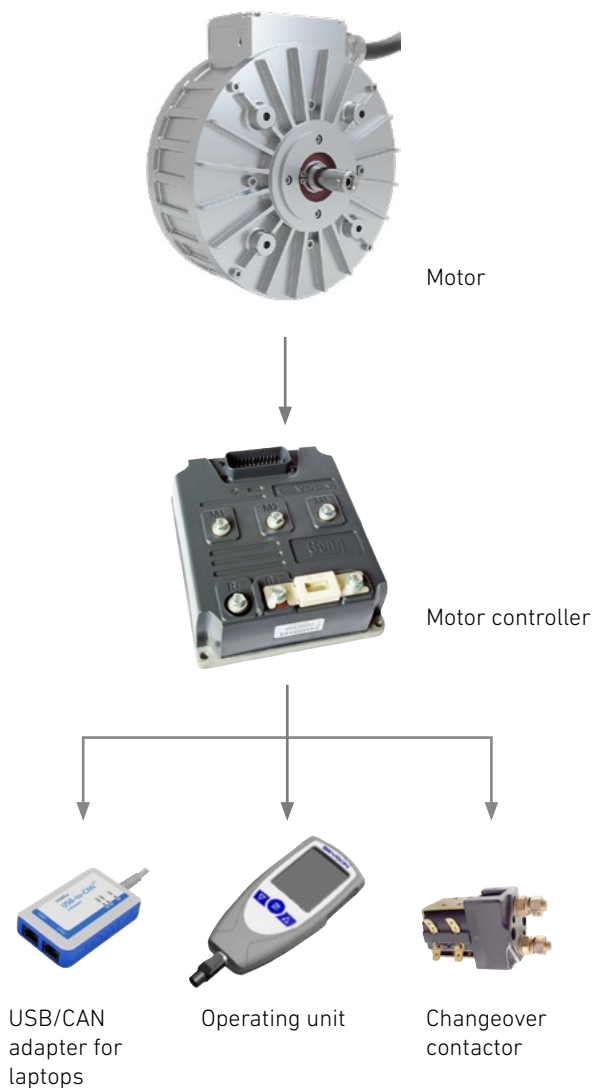
## HEINZMANN PROVIDES

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

## 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



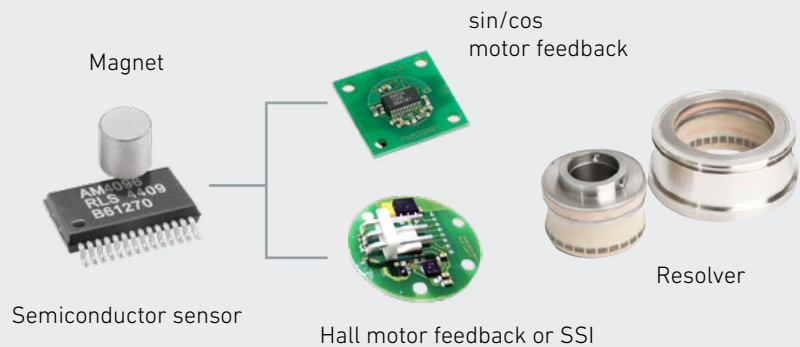




Motor controllers of varying levels of performance

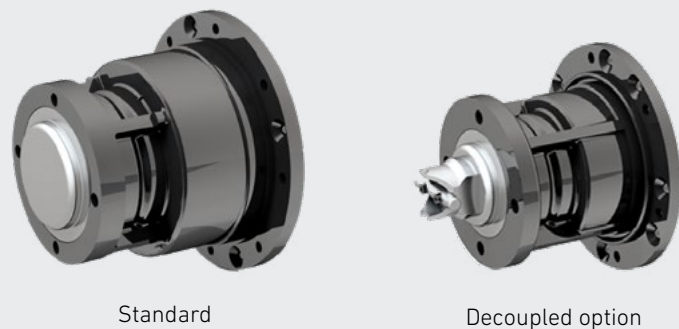
## MOTOR FEEDBACK

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.



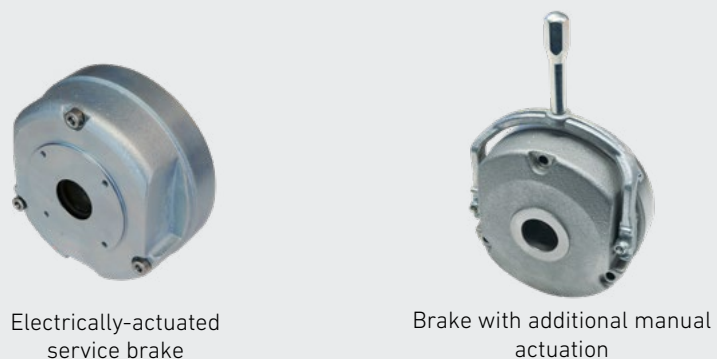
## GEARS

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.



## 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.



# 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

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

### 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



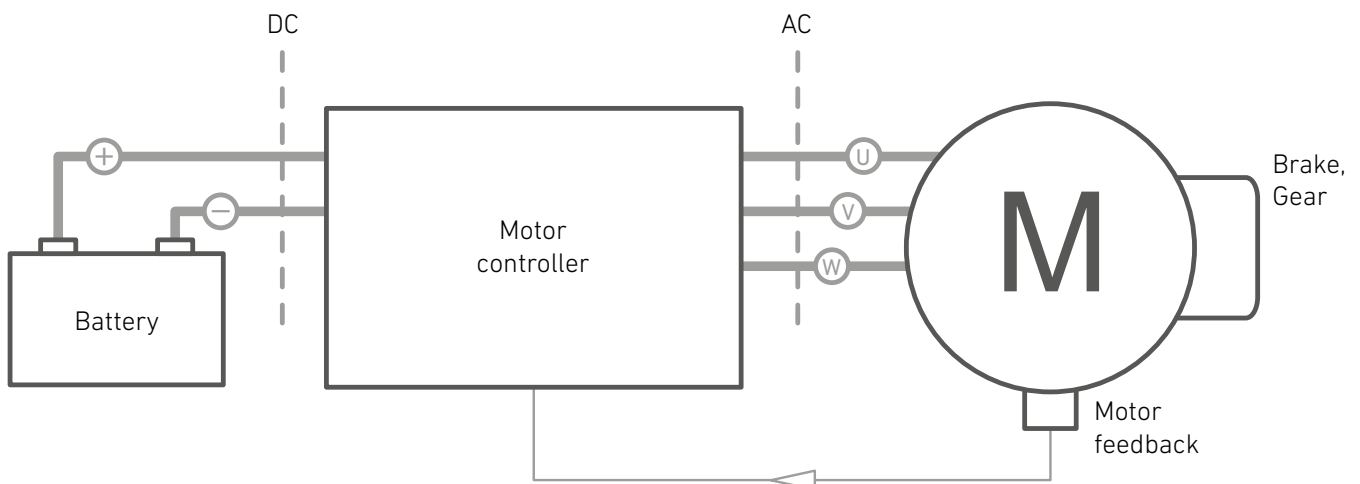
# PMSG GEAR BOX SELECTION



## GEARING DATA

	PMSG xxx-500	PMSG xxx-1500	PMSG xxx-4000
1 stage	4*	5*	5*
2 stage	16*, 24*	17*, 25*, 40*	24*, 32*, 43*
3 stage	96*, 144*, 252	100*, 150*, 240	120*, 198*, 298*
*de-couple possible			
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
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

## STRUCTURE DIAGRAM OF A DRIVE SYSTEM WITH SYNCHRONOUS MOTOR



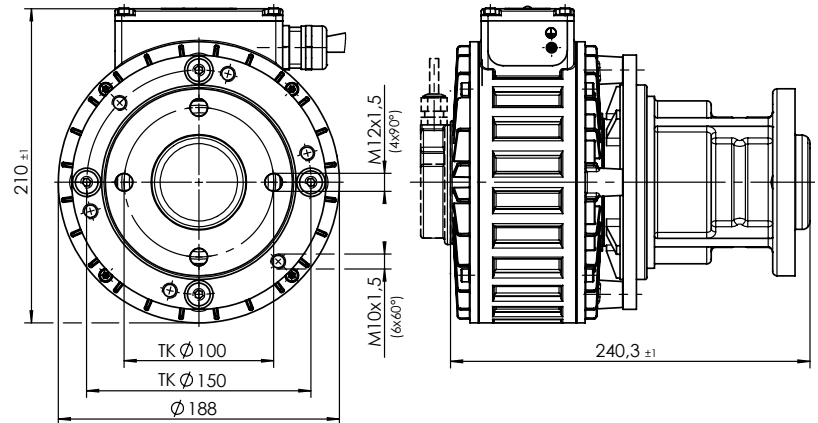
# Series of PMSG System Solutions

## PMSG 100-500

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



## DIMENSIONS



## TECHNICAL DATA

### Motor data

	Rated power	Rated speed	Rated load torque	Rated current
<b>Voltage</b>	<b>kW</b>	<b>rpm</b>	<b>Nm</b>	<b>A</b>
<b>PMSG 100-500-2-16</b>				
24 VDC	1.4	3000	4.5	69
	1.7	4500	2.2	83
48 VDC	2.3	3000	7.3	60
	2.6	4500	5.5	65
<b>PMSG 100-500-2-42</b>				
24 VDC	1.4	3000	4.5	69
	1.68	4500	3.6	83
48 VDC	2.3	3000	7.3	60
	2.6	4500	5.5	65

### Gearing data

Gear ratio	Efficiency	Rated speed	Rated load torque
<b>i</b>	<b>%</b>	<b>rpm</b>	<b>Nm</b>
<b>PMSG 100-500-2-16</b>			
16	94	188	67
16	94	281	54
<b>PMSG 100-500-2-42</b>			
42	94	71	160
42	94	107	141
42	94	71	160
42	94	107	160

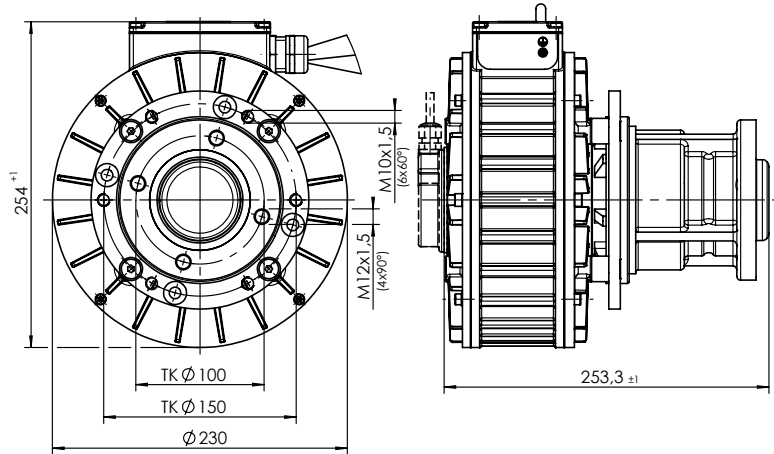


## PMSG 120-500

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



## DIMENSIONS



## TECHNICAL DATA

### Motor data

	Rated power	Rated speed	Rated load torque	Rated current
<b>Voltage</b>	<b>kW</b>	<b>rpm</b>	<b>Nm</b>	<b>A</b>
<b>PMSG 120-500-2-16</b>				
<b>48 VDC</b>	5.5	3000	17.5	126.9
	6.0	4500	12.7	134.0
<b>96 VDC</b>	6.4	3000	20.4	73.6
	7.5	4500	15.9	83.7

### Gearing data

Gear ratio	Efficiency	Rated speed	Rated load torque
<b>i</b>	<b>%</b>	<b>rpm</b>	<b>Nm</b>
16	94	188	160
16	94	281	160
16	94	188	160
16	94	281	160

► Cooling: Forced ventilation ► m = 19.6 kg ► Operating mode = S1

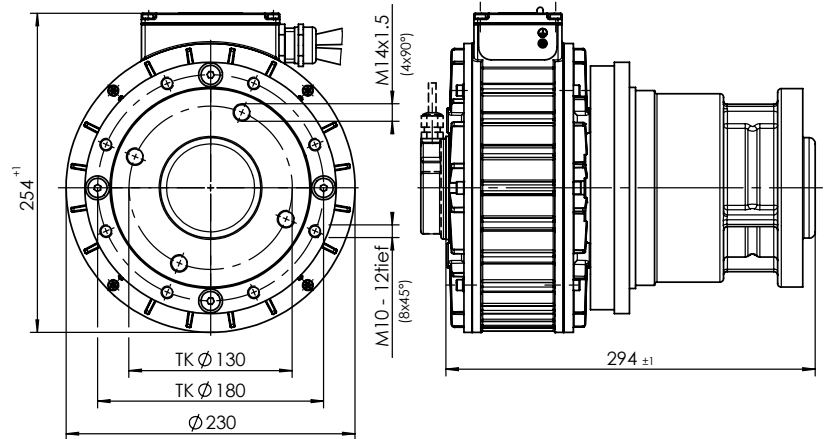
# Series of PMSG System Solutions

## PMSG 120-1500

The PMSG 120-1500 combines a PMS 120 motor with a gear 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 120-1500-2-40				
48 VDC	5.5	3000	17.5	126.9
	6.0	4500	12.7	134.0
96 VDC	6.4	3000	20.4	73.6
	7.5	4500	15.9	83.7

### Gearing data

Gear ratio	Efficiency	Rated speed	Rated load torque
i	%	rpm	Nm
40	94	75	500
40	94	113	500
40	94	75	500
40	94	113	500

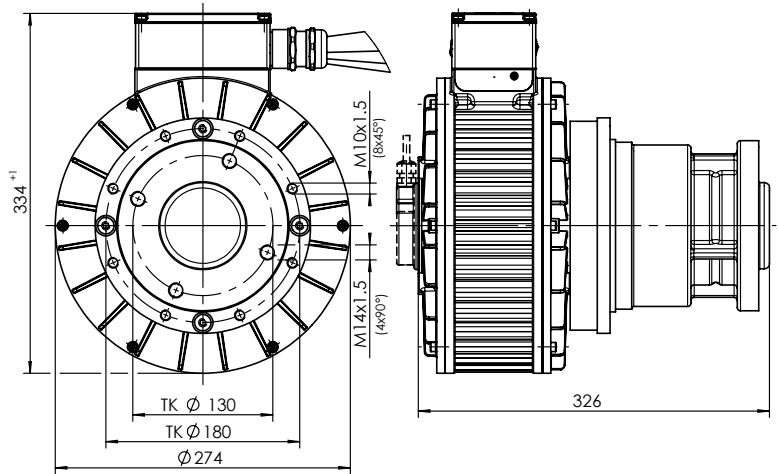
► Cooling: Forced ventilation ► m = 27.8 kg ► Operating mode = S1

# PMSG 150-1500

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



## DIMENSIONS



## TECHNICAL DATA

### Motor data

	Rated power	Rated speed	Rated load torque	Rated current
<b>Voltage</b>	<b>kW</b>	<b>rpm</b>	<b>Nm</b>	<b>A</b>
<b>PMSG 150-1500-2-16</b>				
<b>48 VDC</b>	8.5	3000	27.1	191.9
	8.5	4500	18.0	190.8
<b>96 VDC</b>	10.5	3000	33.4	130.8
	14.0	4500	29.7	167.4
<b>PMSG 150-1500-2-40</b>				
<b>48 VDC</b>	8.5	3000	27.1	191.9
	8.5	4500	18.0	190.8
<b>96 VDC</b>	10.5	3000	33.4	130.8
	14.0	4500	29.7	167.4

### Gearing data

Gear ratio	Efficiency	Rated speed	Rated load torque
<b>i</b>	<b>%</b>	<b>rpm</b>	<b>Nm</b>
16	94	188	408
16	94	281	270
16	94	188	500
16	94	281	447
40	94	75	500
40	94	113	500
40	94	75	500
40	94	113	500

► Cooling: Forced ventilation ► m = 37.8 kg ► Operating mode = S1

# PRA Motor



## PRA 230

The gearless wheel hub drive PRA 230 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

Rated power	1.6 kW Operational mode S1
Rated speed	420 rpm
Rated torque	36.4 Nm
Max. torque	160 Nm
Battery voltage	48 V
Max. wheel load	2,000 N
Degree of protection	IP54
Weight	16 kg

## RANGE OF APPLICATIONS

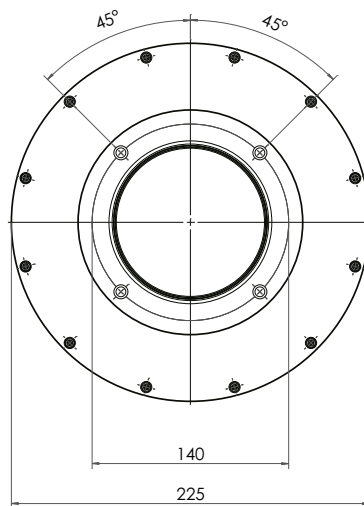
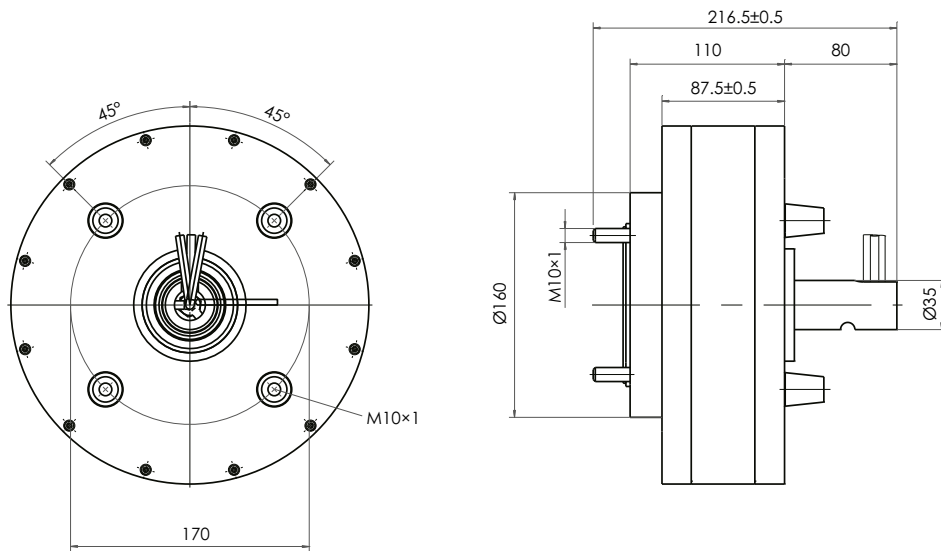
- Light electric vehicles
- E-Scooters
- Handicap vehicles
- Driverless transport vehicles



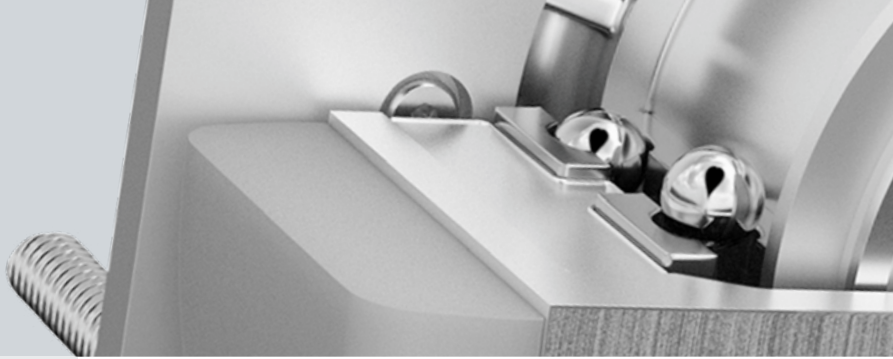




## DIMENSIONS



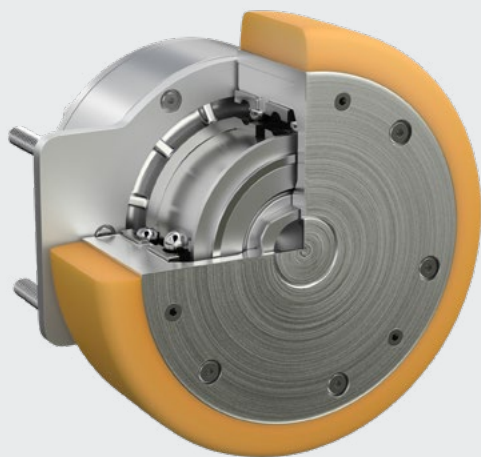
# PMSG Motor



## PMSG 066F-060 (AGV DRIVE)

This complete, ultra-compact wheel hub drive module can mobilise your industry. A heavy-duty planetary gear and high torque HEINZMANN PMS 066F electric disc motor are integrated to an unequalled, compact and complete system. Long service life and low noise emissions are guaranteed.

The traction enhanced dual channel motor driver can be matched to your specific application and offers worry-free automation integration solution. Drive module options are available to provide the flexibility to match your individual requirements. The drive system PMSG 066F-060 made in Germany is your partner for reliable and cost-efficient engineering solutions.

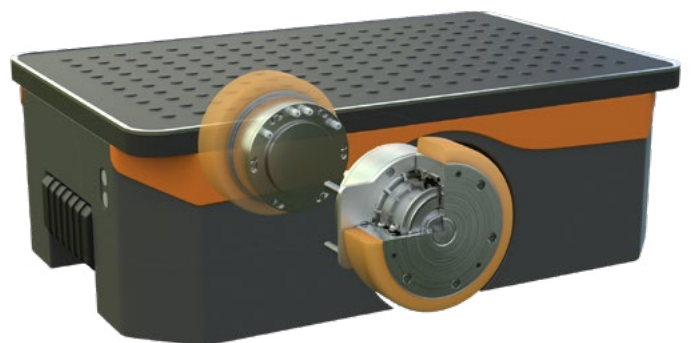


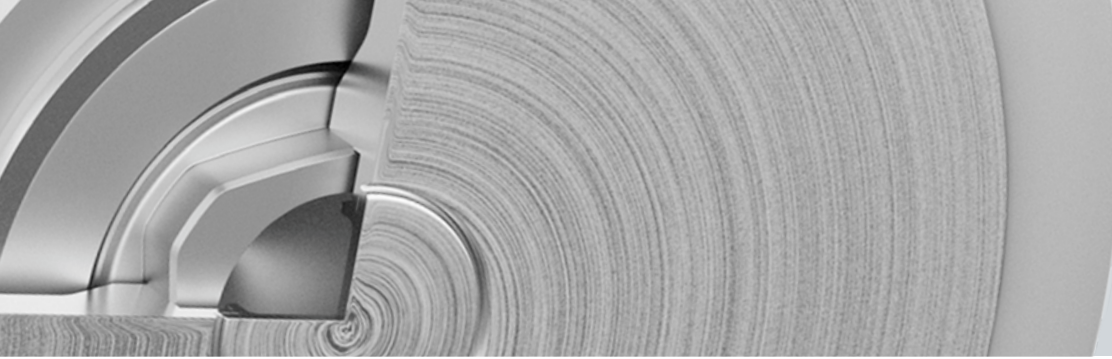
## FEATURES

- ▶ Power: 2x 400 W / 2x 900 W max.
- ▶ Dual channel controller
- ▶ Load capacity: total 1,000 kg
- ▶ IP54 standard, IP67 optional
- ▶ Wheels: Ø 160 mm or Ø 200 mm

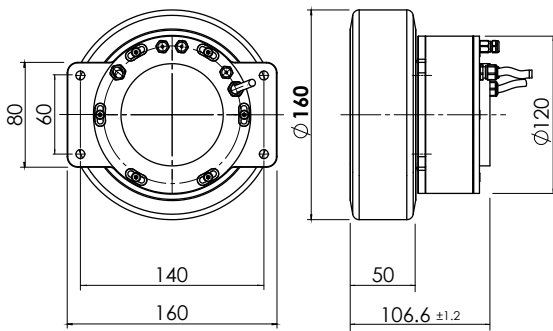
## RANGE OF APPLICATIONS

- Automated Guided Vehicles (AGV)
- Intralogistics
- Tractions for light vehicles
- Robotics

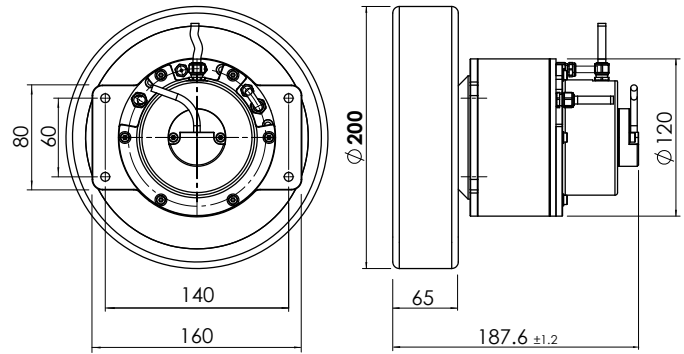




## DIMENSIONS



Dimensions of single-stage gear version and wheel diameter  $\varnothing$  160 mm



Dimensions of two-stage gear version with brake, encoder and wheel diameter  $\varnothing$  200 mm

## TECHNICAL DATA

<b>General</b>	high power density geared motor drive
<b>Technology</b>	permanent magnet synchronous motor planetary gearing (single or two-stage)
<b>Voltage</b>	24, 36, 48 VDC
<b>Power</b>	up to 2x 400 W / peak 2x 900 W
<b>Gear ratio</b>	8, 16, 20, 32
<b>Torque output</b>	2x 21 Nm nom. / 2x 60 Nm max.
<b>Speed range</b>	up to 8 km/h
<b>Axial length</b>	starting from 110 mm
<b>Load capacity</b>	radial: 2x 500 kg (2x 5,000 N) axial: 2x 170 kg (2x 1,700 N)
<b>Service life</b>	up to 20,000 h
<b>Unit weight</b>	starting from 2x 7.5 kg
<b>Wheels</b>	Intralogistics as standard, outdoor application customer specific
<b>Brake</b>	optional
<b>Encoder</b>	type on request

# 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 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 with a somewhat limited service life now have only a subordinate role to play.

The „disc rotor“ is thus a drive solution that not only provides the aforementioned benefits, but also offers an impressive 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 torque. The result is a powerful motor within the smallest possible 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. These are just a selection of the possibilities on offer in order to facilitate that first choice. We excel at providing customised solutions.

Our strong sales, design and motor development teams will dedicate themselves to your request so we can arrive at the optimum solution for your drive together.

### ► 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.

Our many years of testing has resulted in robust motors that can operate under the toughest of environmental conditions.



# 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.

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.

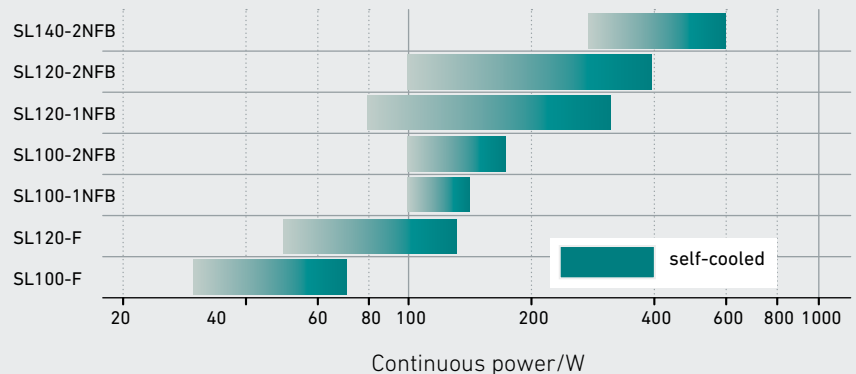
## RANGE OF APPLICATIONS

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

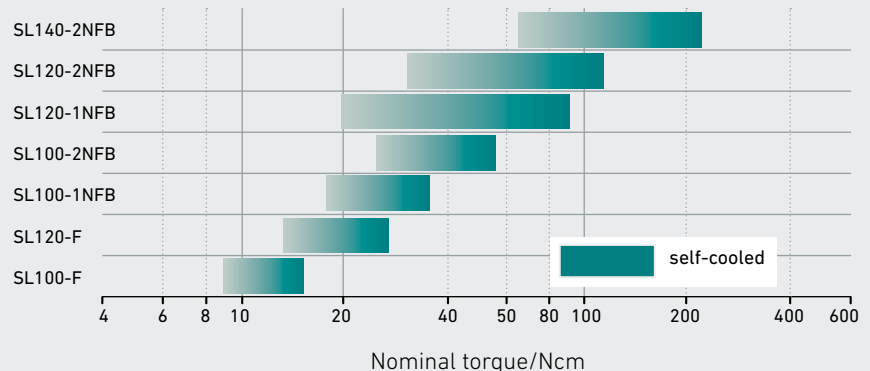


Cross section of a disc motor SL 120-2NFB

## POWER RANGE SL MOTORS



## TORQUE RANGE SL MOTORS



# POWERFUL DRIVES FOR NARROW SPACES

Where operating time and space for a brushless motor version are not given, the extremely flat design of the HEINZMANN SL disc type motor line opens up a wide range of design options at affordable prices

The use of electric drives for innovative application tasks requires field-proven know-how and availability of appropriate technologies. HEINZMANN's SL disc type motor drive solutions offer great advantages for applications with limited installation space. They are flat, dynamic and of a highly adaptable design.

The motors can be applied in medical technology, i.e. in analytical equipment as well as food vending machines. They also find their use in fans in military applications, traction devices in home care and rehabilitation and material handling in logistical warehouse applications.

## FEATURES

- ▶ Fast rotation
- ▶ Instantaneous torque with low inertia
- ▶ Smooth rotation without cogging
- ▶ Compact size when space is a premium

## ROTARY CLEANING EQUIPMENT

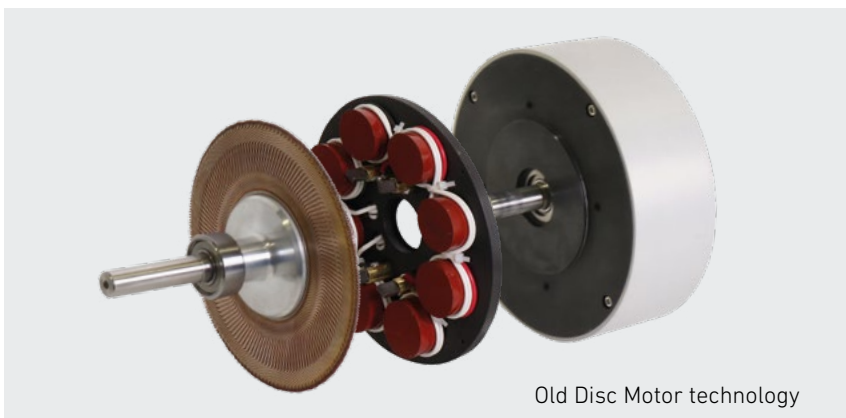
In some applications the budget for a brushless version is not available. The ability to service a faulty motor on site keeps the floor clean and prevents high-tech downtime.



## REPLACEMENT PROGRAMME

Brushed disc motors have been developed for many applications. Your suppliers have discontinued their product range and you need a replacement?

HEINZMANN can match the performance and offer you an affordable and reliable solution to reactive your original investment.



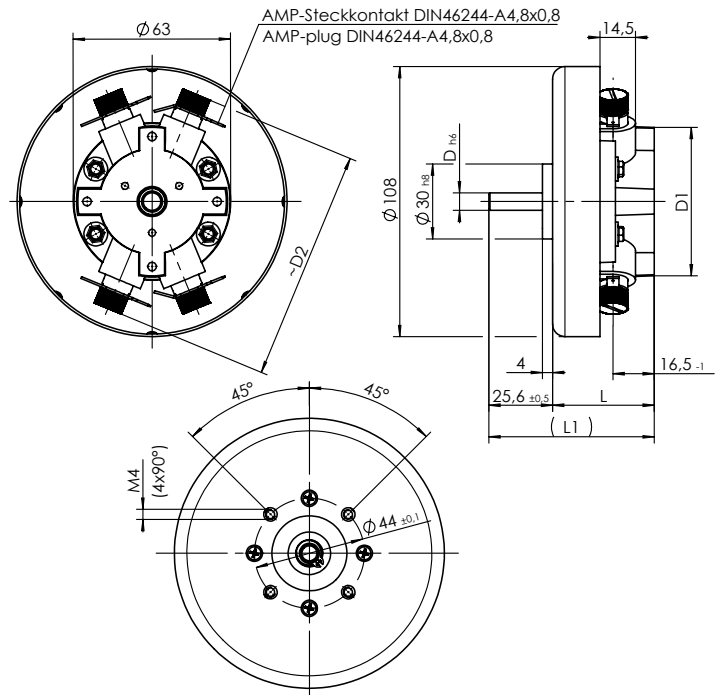
# Series of SL Motors

## SL 100-F

The brushed disc motor SL 100-F is equipped with ferrite magnets.



## DIMENSIONS



## TECHNICAL DATA

	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
6/63	12	59	4700	12	7.8	2.1	2.0
	15	68	6500	10	6.8		
10/50	18	50	4000	12	4.6	3.5	3.4
	24	70	6100	11	4.4		
14/45	24	57	3900	14	3.8	5.0	4.7
	27	64	4700	13	3.6		
18/40	24	37	2500	14	2.9	6.4	6.1
	30	52	3800	13	2.8		
	36	67	4900	13	2.8		
21/37.5	24	30	1900	15	2.7	7.4	7.1
	36	57	3900	14	2.6		
	42	68	5000	13	2.4		
26/31.5	36	44	2800	15	2.2	9.2	8.8
	42	54	3700	14	2.0		
	48	65	4400	14	2.1		

► m = 0.9 kg    ► J = 1.2 kg · cm<sup>2</sup>

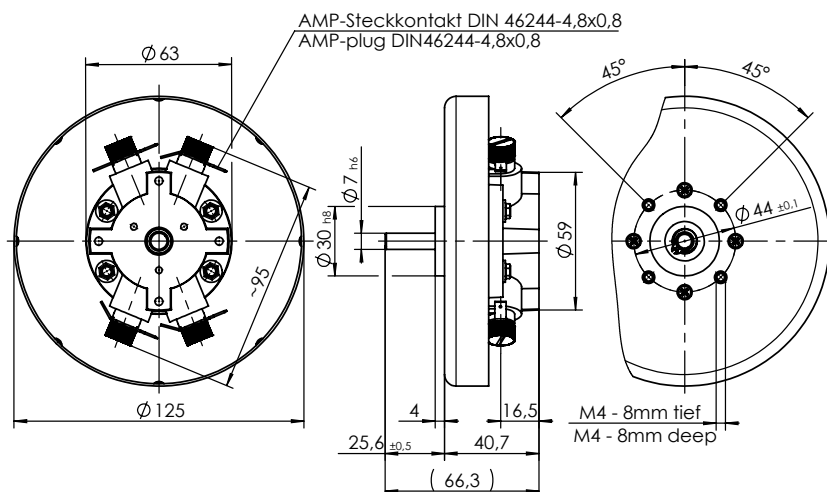
# Series of SL Motors

## SL 120-F

The SL 120-F is the largest brushed disc motor in the SL range equipped with ferrite magnets.



## DIMENSIONS



## TECHNICAL DATA

	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
8/63	12	44	1600	26	7.8		
	15	63	2500	24	7.3	4.4	4.2
	24	110	5000	20	6.5		
10/56	18	63	2400	25	6.1		
	24	89	3700	23	5.8	5.5	5.3
	36	110	6600	16	4.4		
12/53	24	79	2900	26	5.3		
	36	110	5200	21	4.5	6.6	6.3
	42	120	6400	18	4.1		
14/50	24	70	2300	29	5.0		
	36	110	4300	25	4.6	7.7	7.4
	48	125	6300	19	3.6		
16/45	24	53	1800	28	4.2		
	36	95	3500	26	4.0		
	48	120	5200	22	3.5	8.8	8.4
	60	120	7100	16	2.8		
22/40	36	64	2100	29	3.2		
	48	96	3400	27	3.0		
	60	120	4700	24	2.8	12.0	11.5
	72	130	5900	21	2.5		



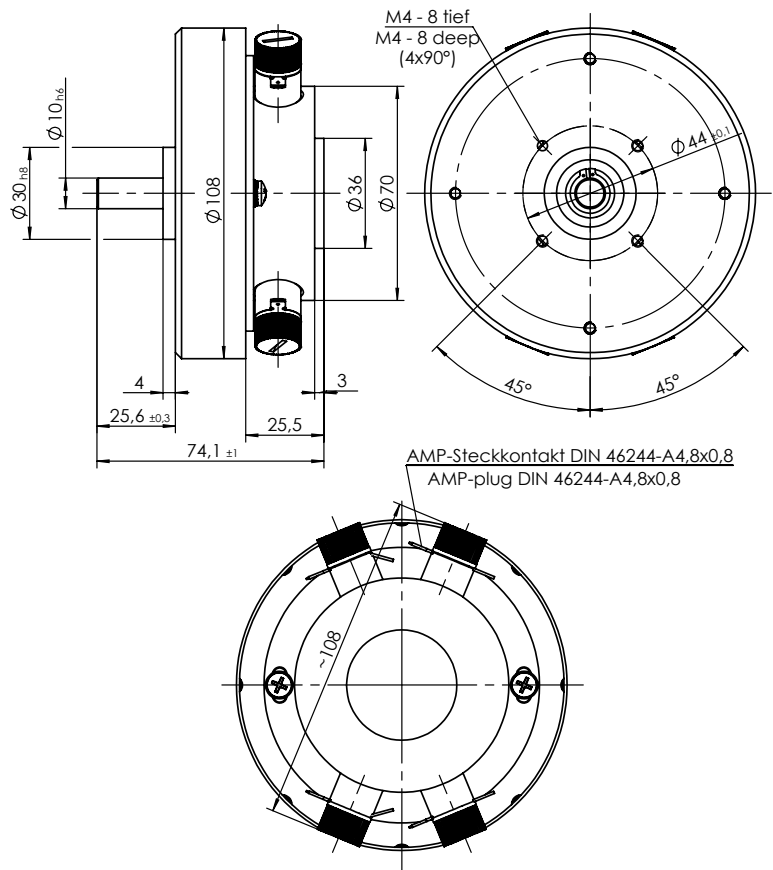


## SL 100-1NFB

The SL 100-1NFB is the smallest DC disc motor with brushes of the SL series equipped with neodymium iron boron magnets.



## DIMENSIONS



## TECHNICAL DATA

	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
4/90	12	100	4000	24	13	2.6	2.5
	15	100	5400	18	10		
5/85	12	100	3000	32	13	3.2	3.1
	18	120	5200	22	10		
7/71	18	110	3200	33	9.6	4.5	4.3
	24	120	4900	24	7.6		
	27	110	5700	18	6.2		
10/60	24	120	3100	36	7.2	6.4	6.1
	30	140	4200	31	6.5		
	36	130	5300	24	5.3		

► m = 0.9 kg    ► J = 1.6 kg · cm<sup>2</sup>

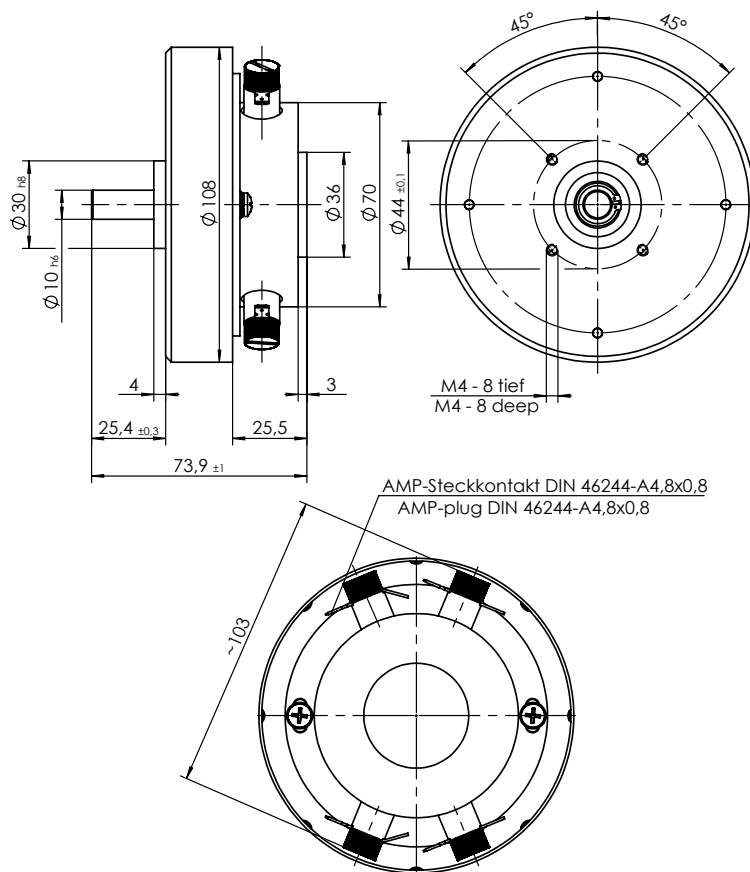
# Series of SL Motors

## SL 100-2NFB

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



## DIMENSIONS



## TECHNICAL DATA

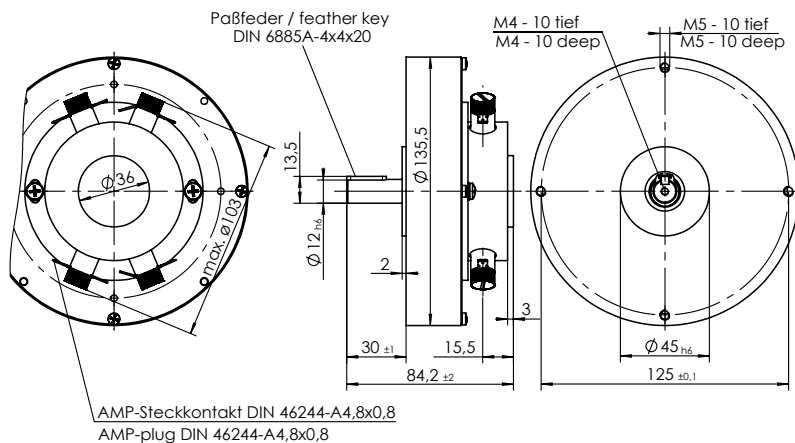
	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
4/90	12	110	2800	36	13.0	3.6	3.5
	15	140	3700	35	13.0		
5/85	18	160	3600	42	12.0	4.5	4.3
	24	130	5200	24	8.0		
7/71	18	120	2300	51	10.0	6.3	6.1
	24	160	3400	44	8.9		
	27	160	3900	40	8.3		
10/60	24	120	2100	56	7.6	9.0	8.6
	36	170	3600	46	6.5		
	48	140	5300	26	4.2		

## SL 120-1NFB

DC disc motor with brushes equipped with neodymium iron boron magnets.



## DIMENSIONS



## TECHNICAL DATA

	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
3/106	12	77	3700	20	9.9	3.0	2.9
	15	96	4800	19	10.0		
5/100	18	140	3400	38	10.0	5.0	4.7
	24	180	4700	37	10.0		
7/90	27	200	5400	36	10.0	6.9	6.6
	24	200	3100	60	11.0		
10/75	36	270	5100	50	9.4	9.9	9.5
	24	160	1900	82	9.7		
15/63	36	180	1900	90	7.2	15.0	14.0
	48	250	2800	84	6.8		
17/56	72	310	4700	63	5.4	17.0	16.0
	36	140	1600	85	6.0		
22/47,5	48	200	2400	80	5.7	22.0	21.0
	60	250	3200	75	5.4		
	72	280	4000	67	4.9		
	48	140	1600	84	4.6		
	60	190	2300	80	4.4		
	72	230	2900	76	4.2		
	80	250	3300	73	4.1		

► m = 1.8 kg    ► J = 3.5 kg · cm<sup>2</sup>

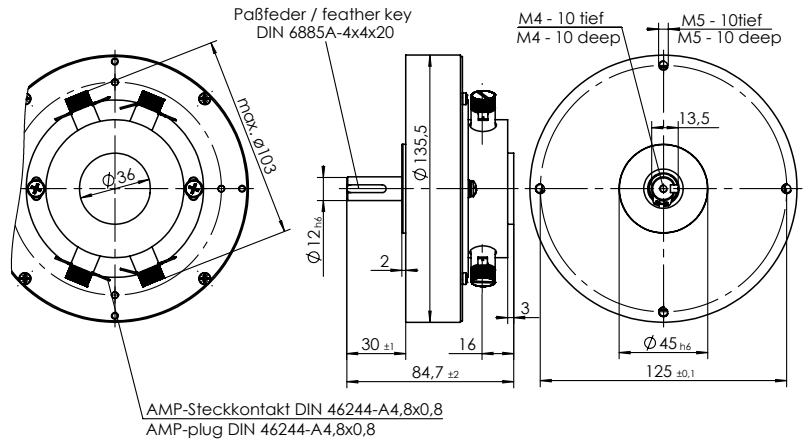
# Series of SL Motors

## SL 120-2NFB

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



## DIMENSIONS



## TECHNICAL DATA

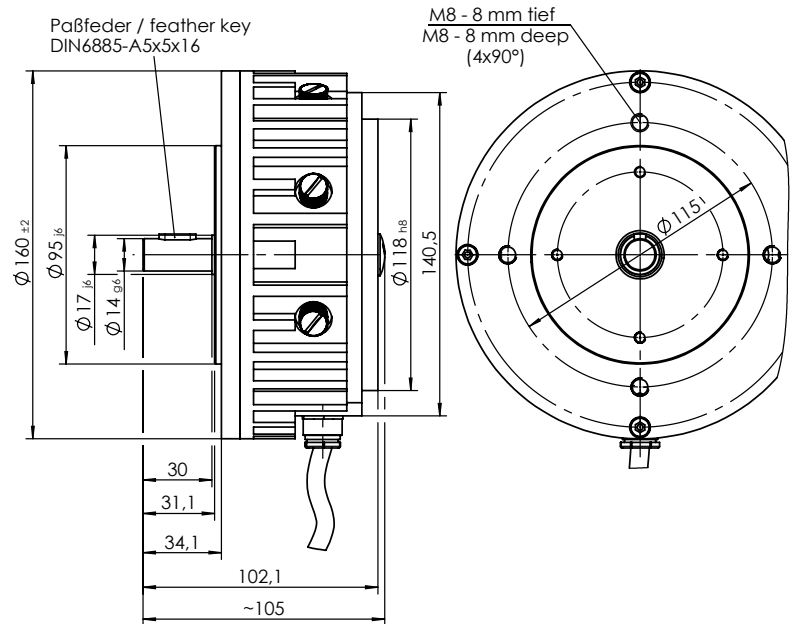
	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)																																																																																																																													
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]																																																																																																																													
3/106	12	100	2300	41	11.0	4.8	4.6																																																																																																																													
	18	150	3600	40	12.0			5/100	24	210	2900	70	11.0	8.1	7.7	30	270	3700	70	11.0	36	240	4500	50	8.7	7/90	24	180	1900	90	9.7	11.0	10.0	36	280	3100	85	9.7	48	290	4300	65	7.7	10/75	36	270	2000	130	9.6	16.0	15.0	48	340	2800	115	8.7	60	350	3700	90	7.1	72	290	4600	60	5.1	15/63	48	260	1700	145	7.1	24.0	23.0	60	320	2300	135	6.7	72	360	2900	120	6.0	80	380	3200	114	5.8	17/56	48	200	1400	138	5.9	27.0	26.0	60	270	2000	130	5.6	72	310	2400	122	5.4	80	340	2800	116	5.2	22/47,5	48	150	1000	140	4.6	35.0	34.0	60	200	1400	135	4.5	72	250	1800	133	4.5	80	260
5/100	24	210	2900	70	11.0	8.1	7.7																																																																																																																													
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	72	310	2400	122	5.4																																																																																																																															
	80	340	2800	116	5.2																																																																																																																															
22/47,5	48	150	1000	140	4.6	35.0	34.0																																																																																																																													
	60	200	1400	135	4.5																																																																																																																															
	72	250	1800	133	4.5																																																																																																																															
	80	260	2000	126	4.3																																																																																																																															

## SL 140-2NFB

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



## DIMENSIONS



## TECHNICAL DATA

	Rated voltage	Rated power	Rated speed	Rated load	Rated current	Back-EMF constant (25 °C)	Torque constant (25 °C)
Coil	U [VDC]	P [W]	n [rpm]	M [Ncm]	I [A]	$K_E$ [V/1000 rpm]	$K_T$ [Ncm/A]
3/90	24	280	2000	135	16.0	11.0	10.0
	36	410	3300	120	14.0		
	48	310	4600	64	8.6		
6/71	48	410	2100	185	11.0	21.0	20.0
	60	480	2700	170	9.8		
	80	530	3800	132	7.9		
9/60	60	360	1700	200	7.6	32.0	31.0
	80	490	2400	196	7.4		
	96	570	3000	180	6.9		
	110	590	3500	160	6.2		
12/50	80	330	1700	185	5.3	42.0	40.0
	96	410	2100	185	5.3		
	110	480	2500	185	5.3		
15/47,5	96	370	1600	220	4.9	53.0	50.0
	110	430	1900	215	4.8		
	120	460	2100	210	4.8		

► m = 4.9 kg    ► J = 4.9 kg · cm<sup>2</sup>

# SL Technical Data

## 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 FR [N] at n rpm						
Speed	1500	3000	4500	6000	7000	Bearing A-side
<b>Motor type</b>						
SL 100-F	303	263	223	183	156	6000
SL 120-F	303	263	223	183	156	6000
SL 100-1NFB	303	263	223	183	156	6000
SL 100-2NFB	360	300	260	230	220	6000
SL 120-1NFB	303	263	223	183	156	6001
SL 120-2NFB	360	300	260	230	220	6001
SL 140-2NFB	480	380	340	310	290	6003

Axial force FA [N] at n rpm					
Speed	1500	3000	4500	6000	7000
<b>Motor type</b>					
SL 100-F	61	53	45	37	31
SL 120-F	61	53	45	37	31
SL 100-1NFB	61	53	45	37	31
SL 100-2NFB	87	75	64	52	45
SL 120-1NFB	104	90	77	63	54
SL 120-2NFB	104	90	77	63	54
SL 140-2NFB	144	125	106	87	74

# SL Technical Data

## 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-electric-motors.com](http://www.heinzmann-electric-motors.com).

## HOW TO USE THE SELECTION DIAGRAMS

Each selection diagram consists of 2 sub diagrams.

**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 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<sub>gr</sub>). 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  $U = 48 \text{ V}$   
Torque  $M = 115 \text{ Ncm}$

Required: Speed  $n$   
Current  $I$   
Output  $P$   
Efficiency  $\eta$

### Readings in upper diagram:

- ▶ Starting from  $M = 115 \text{ Ncm}$ , go vertically (1) go to the speed characteristic for  $U = 48 \text{ V}$ . 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  $M = 115 \text{ Ncm}$ , go vertically (4) go to the output characteristic for  $U = 48 \text{ V}$ . 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.

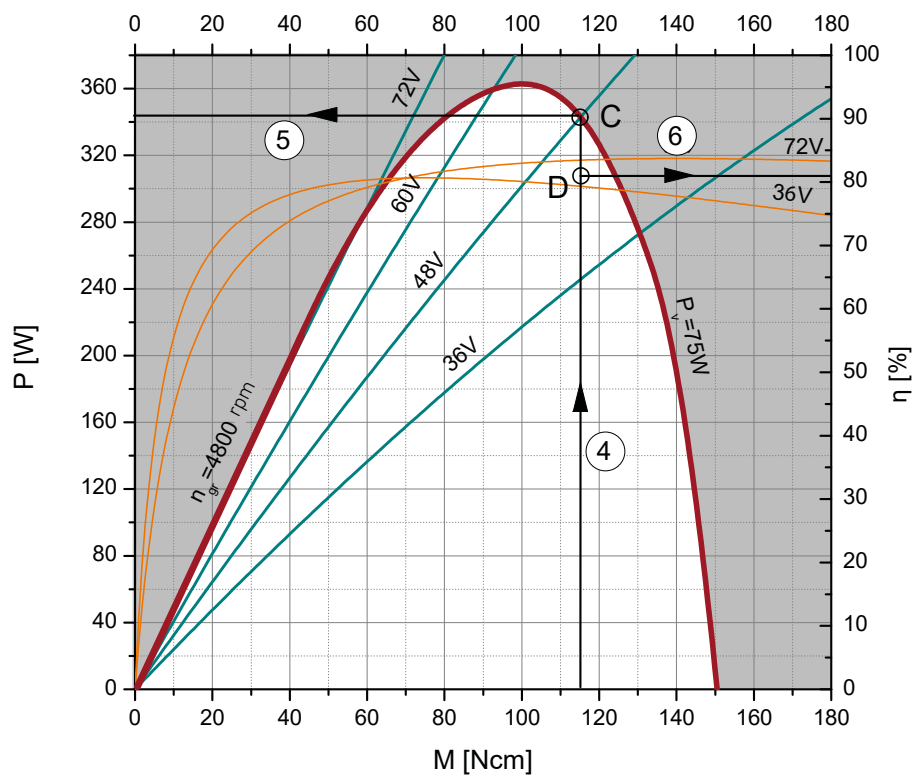
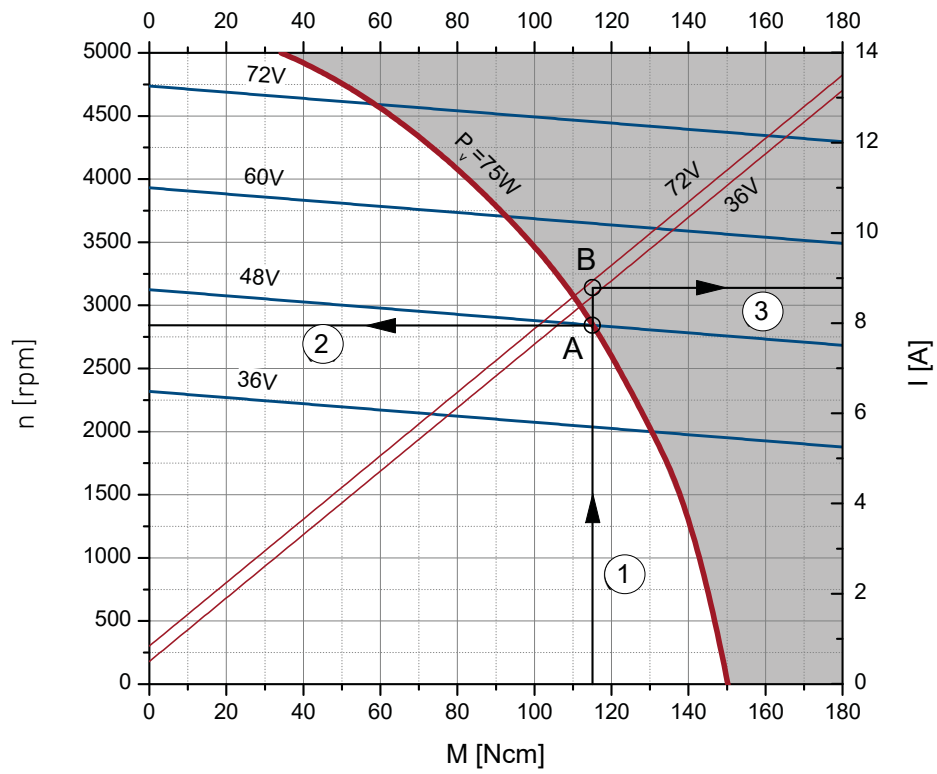
### Additional example:

Appointed: Speed  $n = 2000 \text{ rpm}$   
Torque  $M = 120 \text{ Ncm} = 1.2 \text{ Nm}$   
(i.e.  $P = 0.104 \cdot M \cdot n = 250 \text{ W}$ )

Required: The relevant required operating voltage

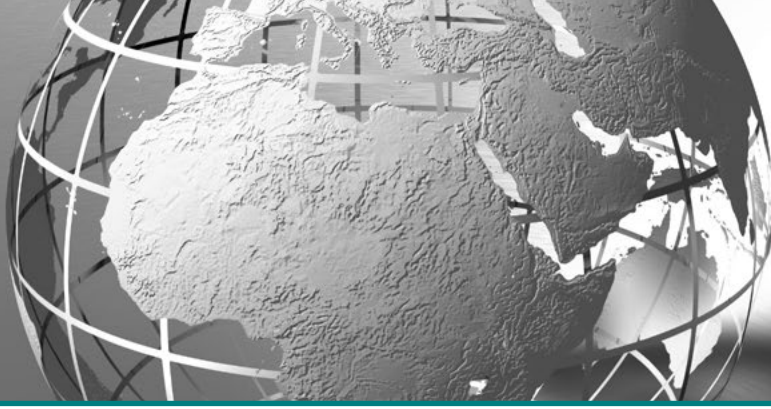
Result:  $U \approx 36 \text{ V}$











## HEINZMANN GROUP - THINKING IN DRIVE AND CONTROL

HEINZMANN is a globally active family business founded in 1897 with its headquarters in Schönau (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 demonstrates innovative strength and development expertise in engine technologies of the future. The company has proven itself as a leading supplier and system provider for electric drive applications.

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

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