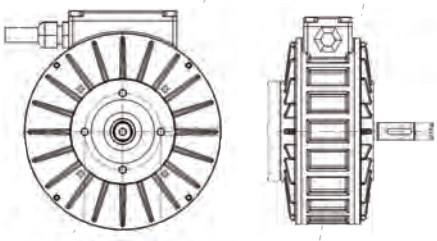
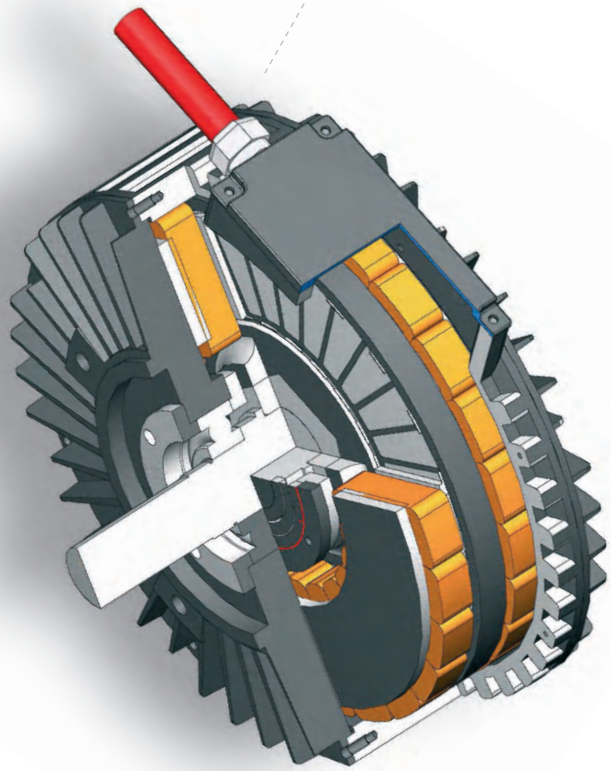
HEINZMANN®

PERM TECHNOLOGY



PRODUCT CATALOGUE

Electric Drives



HEINZMANN®

Electric & Hybrid Drives

Your partner for

Disc motors

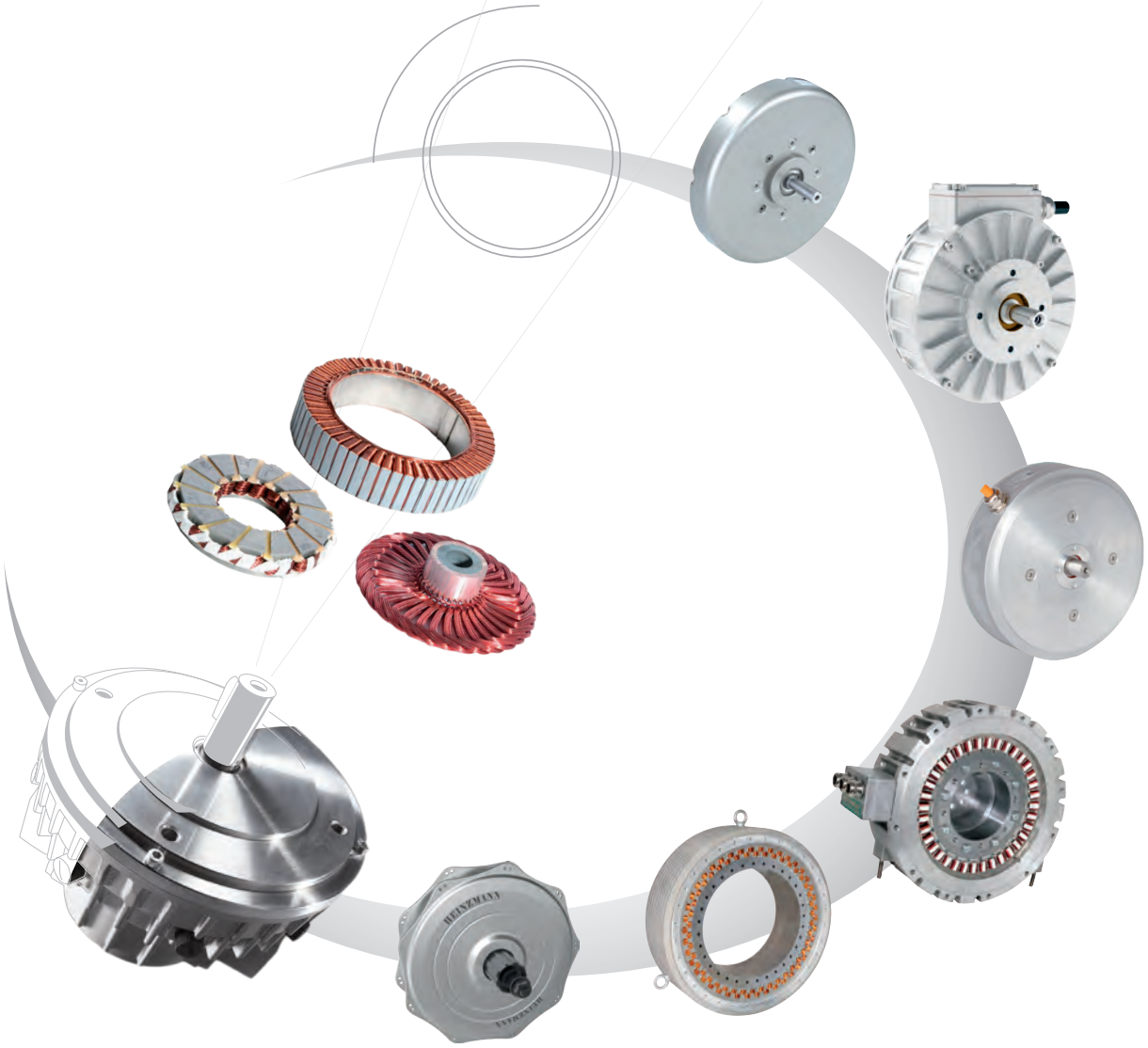
Wheel hub motors

Motors for battery driven vehicles

Hybrid drives for industrial applications

Generators for windmills and block heating plants

Electric vehicle drives



HEINZMANN - driving your innovation

Product Catalogue

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HEINZMANN
Electric Drives

For decades, HEINZMANN has been developing and producing sturdy, powerful electric drives up to approx. 60 kW, which have proven their worth in numerous applications, particularly in harsh industrial environments.

Over one hundred years of experience in engine management for combustion engines has put HEINZMANN in an ideal position to develop innovative hybrid drives.

These have been used in industrial applications and mobile work machines since 2006. They are suitable for diesel, gas and petrol engines.

In 2008, our range of products was further expanded by the Group's acquisition of Perm Motor GmbH. Since January 2012, the portfolio of Perm Motor GmbH, manufacturer of electric motors with patented rotor technology, has been completely integrated into HEINZMANN's division of Electric Drives.

Today, our customers around the world benefit from the synergies of this flexible, innovative melting pot of ideas, and from the experience and reliability of a global yet traditional company with an international services and sales network. Make the most of our pooled expertise to gain outstanding drive solutions in consistently reliable quality.

Based in the heart of the Black Forest, HEINZMANN develops and produces progressive solutions for drive technology. From industrially batch-produced engines to application-based redesigns, substitute solutions and individual new developments: our patented drive technology constantly excels through above-average performance data and significant increases in efficiency.

HEINZMANN drive systems are used in a diverse range of industrial applications, in electric cars, wind turbines and mobility scooters.

HEINZMANN® | PERM TECHNOLOGY

PMS Series

Brushless AC Synchronous Disc Motors

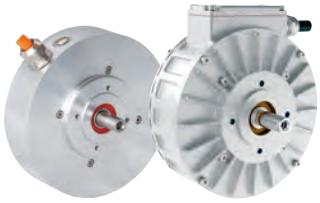
A disc motor has several advantages over a typical electric motor. Small size, flat shape of construction, reduced weight at equivalent power rating and a high efficiency factor are its plus. As a servo motor for drive functions in an axially confined area, it is ideally suited. Its small overall size as well as its high capacity and quiet synchronous operation make it a very efficient drive, which is often used in the production of machines and apparatus as well as traction applications.

HEINZMANN offers its customers a complete range of these brushless drive motors. They have a continuous motor output of up to 13 kW and torque of up to 26 Nm, depending on the type of cooling. The DC link voltage is variable.

The brushless design means that the disc motor does not have any wearing parts, e.g. carbon brushes and collectors. These drive motors have a longer service life and are almost maintenance-free. This gives a considerable reduction in maintenance, service and replacement costs.

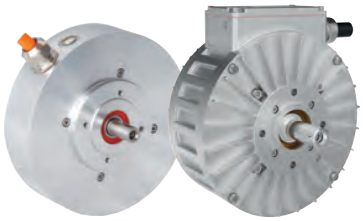
PMS 060F/PMS 066F

(SL-EC 80-11B)



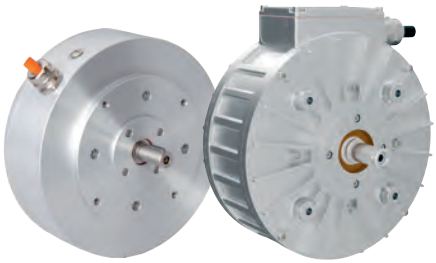
PMS 080F/PMS 080

(SL-EC 100-11B/SL-EC 100-22B)



PMS 100F/PMS 100

(SL-EC 120-11B/SL-EC 120-22B)



PMS 120F/PMS 120

(SL-EC 160-11B/SL-EC 160-22B)

PMS 150F

(SL-EC 180-11B)

Advantages of PMS Motors

Powerful

The advantages of the large air gap area of disc motors, coupled with the winding housed in iron packets, allow for high torque and a powerful motor with high efficiency. In the double-sided variant this effect is further enhanced by the use of two stators and doubled magnets.

This provides a powerful operating range housed in a compact device.

Maintenance-free and durable

Having replaced the mechanical commutator with electronic commutation, PMS motors are maintenance-free. Service life is limited only by the bearings. Depending on dimensioning of the bearings, the motors allow up to 20,000 operating hours.

Our durable motors are designed for operation in the most diverse environments.

Dynamic

With their self-supporting magnets, PMS motors with two stators have a low inertial torque and are well suited for dynamic applications. In addition, they have a minimal cogging torque.

This allows precise and easy control of dynamic servo drives.

Flat

PMS motors are built very flat, especially the variant with a one-side stator (Type F).

This saves mounting space in axial direction and reduces weight considerably.

Flexible

HEINZMANN PMS motors are available in many other versions besides the ones presented here. They are built as servo drives or slow running motors with high torque in different variants. The series is produced with high protection grade, with air or liquid cooling. The various types are available with a solid or hollow shaft and as assembly kits for machine integration.

HEINZMANN PMS motors are the better solution.

- Patented rotor technology
- Powerful
- Maintenance-free
- Durable
- Dynamic
- Flat
- Flexible

PMS 120 liquid-cooled

PMS 120 air-cooled

Applications for PMS Motors

Brushless PMS motors are used in industrial, medical and traction applications. Their flat design makes them ideal for using where space is at a premium. Malfunctions caused, e.g. through brush arcing, or wear and dirt accumulation no longer apply, and therefore they are almost maintenance-free.

The motors are available in a sensorless version, and several other sensor drive solutions.

Along with the controller, these motors are the ideal drive where speed control and high dynamic requirements are called for, or where fast changes in load or directions of rotation and fast acceleration are required.

PMS motors can also be used as highly-efficient alternators.

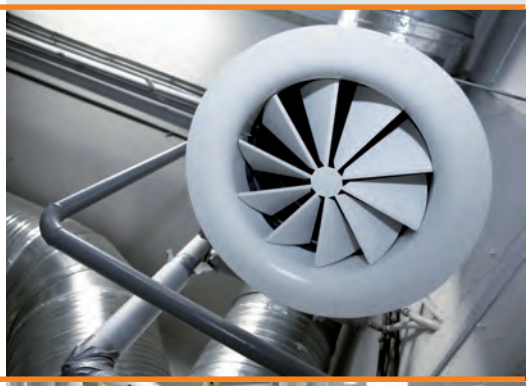
Range of application

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

Examples for Application

Actuator

Fan drive

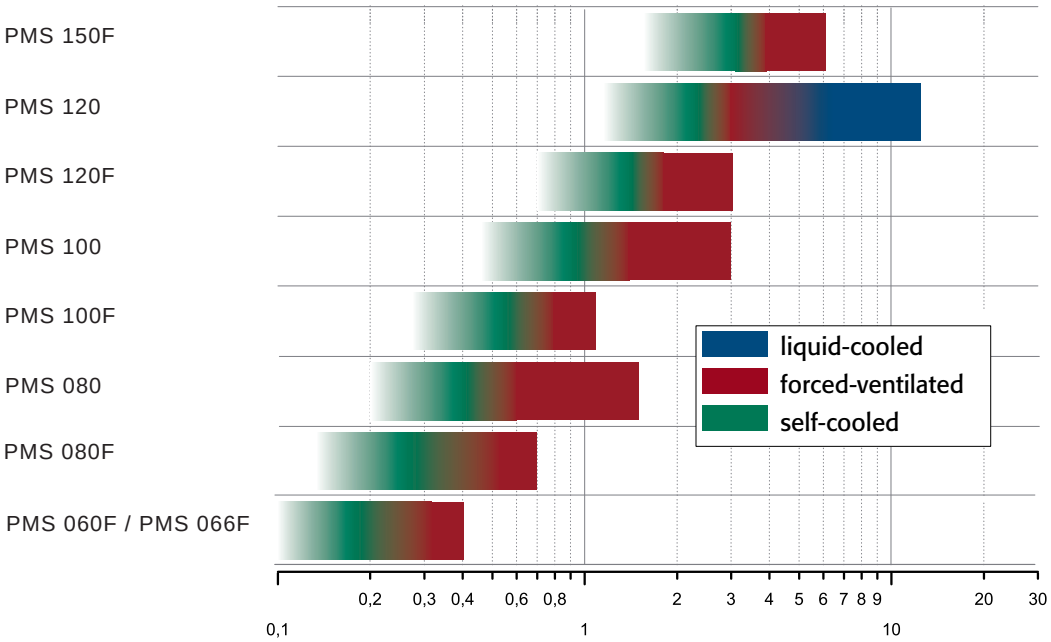


Production line

Electric vehicle

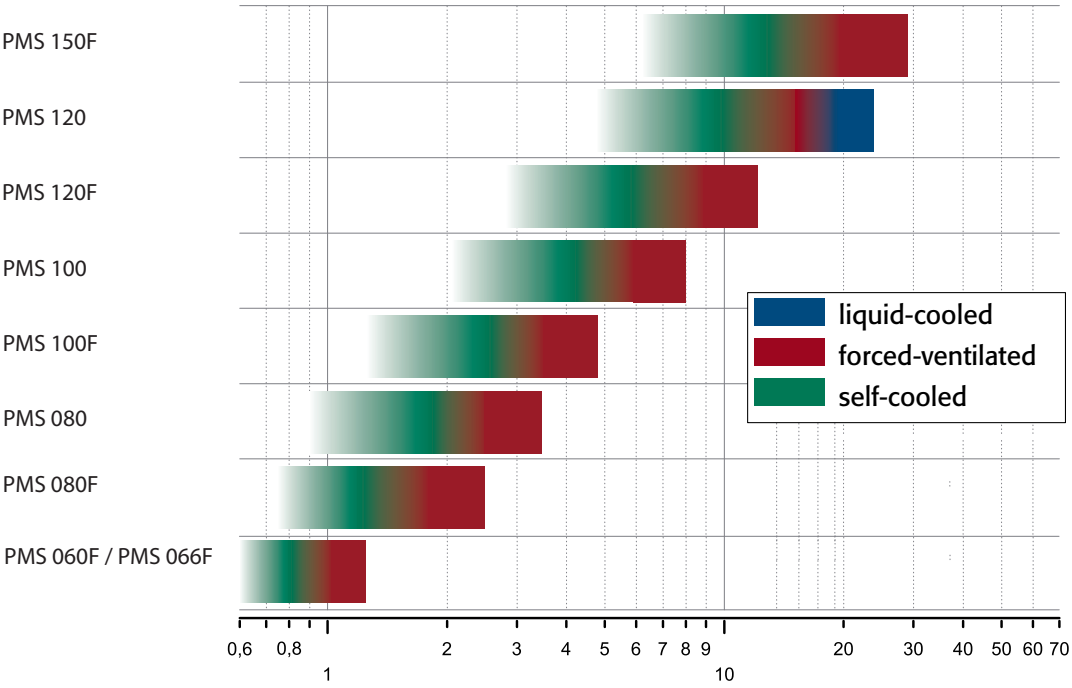
Auxilliary drive

Power range PMS Disc Motors



Continuous power/kW

Torque range PMS Disc Motors



Nominal torque/Nm

PMS Standard Motors

PERM TECHNOLOGY

Motor	Intermediate circuit voltage	Output power	Speed	Torque	Current	Cooling	Encoder system	Initialised for controller
		P	n	M	I			
	VDC	kW	min^{-1}	Nm	A (AC)			
PMS 060F	24	0.23	3000	0.73	12.6	Self cooling	Hall Sensor	
	560	0.35	6000	0.56	1.0	Self cooling	Resolver	LTi
PMS 080F	24	0.42	4500	0.89	21.7	Self cooling	8 Bit	Sevcon
	48	0.78	4500	1.66	19.2	External ventilation	8 Bit	Sevcon
PMS 080	24	1.20	6000	1.91	65.9	External ventilation	8 Bit	Sevcon
	48	0.60	3000	1.91	14.2	Self cooling	8 Bit	Sevcon
	48	1.00	3000	3.18	24.5	External ventilation	8 Bit	Sevcon
PMS 100F	24	1.40	4500	2.97	70.0	External ventilation	8 Bit	Sevcon
	48	1.50	4500	3.18	36.4	External ventilation	8 Bit	Sevcon
PMS 100	24	1.50	3000	4.77	73.9	Self cooling	8 Bit	Sevcon
	24	1.45	4500	3.08	71.9	External ventilation	8 Bit	Sevcon
	24	1.40	6000	2.23	71.4	External ventilation	8 Bit	Sevcon
	48	2.60	4500	5.52	65.4	External ventilation	8 Bit	Sevcon
	48	2.70	6000	4.30	66.9	External ventilation	8 Bit	Sevcon
PMS 120	24	3.00	4500	6.37	142.3	External ventilation	8 Bit	Sevcon
	48	5.50	3000	17.5	127.1	External ventilation	8 Bit	Sevcon
	80	7.50	4500	15.9	108.2	External ventilation	8 Bit	Sevcon
	80	10.0	6000	15.9	144.7	Liquid cooling	8 Bit	Sevcon

Implementation

Power connection: Cable length 1 m, open cable ends
Encoder connection: 8 bit, cable length 1 m, open cable ends
Hall sensor: Cable length 1 m, open cable ends
Resolver: M23 connector, 12-pole
Temperature sensor: KTY 84-130

Custom-made motors from the PMS series

In the following tables, you will find the whole range of motors available in our PMS series.

Versions include self cooling, external ventilation and liquid cooling.

Our experts will be more than happy to help you find the right motor to suit your needs. Choose from one of our established standard designs (see also overview on page 9) or a special custom-made version. In this case, one of our engineers will select the motor according to your specifications.

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.

Side view of PMS Motor

Application electric off-road motorbike

With its new Freeride segment KTM, the world's market leader for off-road motorbikes, injects fresh potential into the off-road sport.

Brushless synchronous disc motors from the PMS series give a whole new meaning to the name of the new Freeride E enduros. They deliver maximum off-road ride fun - without all the noise and exhaust.

KTM has integrated the active parts of the motor into its own carrier casing.

Its design, its high power density and its low inertia which offers extremely good acceleration

characteristics and a good range makes this motor predestined for the bike segment.

Fully integrated PMS Motor of KTM E-Enduro Freeride E

PMS Series

PERM TECHNOLOGY

Application electric off-road vehicle

Mattro Mobility Revolutions GmbH, based in Schwaz, Austria, is causing a real sensation with its new electric recreational and utility vehicle. Using both PMS 120 motors the Mattro Ziesel can reach a continuous load of 4.8 kW/6.5 HP and peak pulse power of 15.4 kW/21 HP. Put your foot down and the torque reaches a solid 400 Nm, hitting the top speed of 22 mph, in under two seconds.

PMS 060F/PMS 066F

(SL-EC 80, Type 11B)

PMS 060F

Weight: approx. 1.5 kg
Inertia: 2.14 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.10	1500	0.64	6.4
		0.23	3000	0.73	12.6
		0.35	4500	0.74	20.0
		0.35	6000	0.56	20.1
36 VDC		0.10	1500	0.64	4.3
		0.23	3000	0.73	8.4
		0.35	4500	0.74	12.5
		0.35	6000	0.56	12.3
48 VDC		0.10	1500	0.64	3.5
		0.23	3000	0.73	6.7
		0.35	4500	0.75	9.2
		0.35	6000	0.56	9.6
330 VDC		0.35	4500	0.74	1.4
		0.35	6000	0.56	1.4
560 VDC		0.35	6000	0.56	1.0

PMS 066F

Weight: approx. 1.5 kg
Inertia: 2.14 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.10	1500	0.64	5.6
		0.27	3000	0.86	14.4
		0.40	4500	0.85	21.8
		0.40	6000	0.64	22.4
36 VDC		0.14	1500	0.89	6.3
		0.30	3000	0.95	10.7
		0.40	4500	0.85	14.6
		0.40	6000	0.64	14.9
48 VDC		0.14	1500	0.89	4.8
		0.30	3000	0.95	8.0
		0.40	4500	0.85	10.9
		0.40	6000	0.64	10.7
330 VDC		0.40	4500	0.85	1.5
		0.40	6000	0.64	1.6
560 VDC		0.40	6000	0.64	1.0

* Orange marked motor versions are standard configurations.

PMS 080F/PMS 080

(SL-EC 100, Type 11B/Type 22B)

PMS 080F

Weight: approx. 3.2 kg
Inertia: 6.5 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.22	1500	1.4	11.1
		0.39	3000	1.2	19.4
		0.42	4500	0.9	21.7
		0.39	6000	0.6	18.8
	External ventilation	0.29	1500	1.8	15.0
		0.66	3000	2.1	32.8
		0.75	4500	1.6	37.0
		0.82	6000	1.3	39.5
36 VDC	*Self cooling*	0.24	1500	1.5	8.2
		0.39	3000	1.2	13.1
		0.45	4500	1.0	14.7
		0.38	6000	0.6	12.6
	External ventilation	0.30	1500	1.9	10.4
		0.65	3000	2.1	22.0
		0.78	4500	1.7	25.5
		0.82	6000	1.3	26.6
48 VDC	*Self cooling*	0.23	1500	1.5	5.9
		0.38	3000	1.2	9.4
		0.45	4500	1.0	11.1
		0.38	6000	0.6	9.8
	External ventilation	0.30	1500	1.9	8.0
		0.65	3000	2.1	16.0
		0.78	4500	1.7	19.2
		0.82	6000	1.3	19.8
330 VDC	*Self cooling*	0.21	1500	1.3	0.8
		0.37	3000	1.2	1.4
		0.45	4500	1.0	1.6
		0.38	6000	0.6	1.4
	External ventilation	0.27	1500	1.7	1.1
		0.62	3000	2.0	2.3
		0.78	4500	1.7	2.7
		0.82	6000	1.3	3.0
560 VDC	*Self cooling*	0.21	1500	1.3	0.6
		0.35	3000	1.1	0.8
		0.45	4500	1.0	0.9
		0.36	6000	0.6	0.8
	External ventilation	0.27	1500	1.7	0.8
		0.61	3000	1.9	1.3
		0.76	4500	1.6	1.6
		0.80	6000	1.3	1.7

PMS 080

Weight: approx. 3.8 kg
Inertia: 3.8 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.35	1500	2.2	19.1
		0.60	3000	1.9	31.9
		0.65	4500	1.4	32.0
		0.60	6000	1.0	33.6
	External ventilation	0.44	1500	2.8	24.6
		0.98	3000	3.1	52.4
		1.10	4500	2.3	58.1
		1.20	6000	1.9	65.9
36 VDC	*Self cooling*	0.38	1500	2.4	13.6
		0.63	3000	2.0	20.0
		0.69	4500	1.5	24.0
		0.60	6000	1.0	20.7
	External ventilation	0.48	1500	3.1	17.5
		0.95	3000	3.0	31.9
		1.20	4500	2.5	41.6
		1.15	6000	1.8	39.3
48 VDC	*Self cooling*	0.35	1500	2.2	9.5
		0.60	3000	1.9	14.2
		0.65	4500	1.4	16.3
		0.60	6000	1.0	15.5
	External ventilation	0.45	1500	2.9	12.5
		1.00	3000	3.2	24.5
		1.20	4500	2.5	28.8
		1.15	6000	1.8	27.5
330 VDC	*Self cooling*	0.35	1500	2.2	1.3
		0.60	3000	1.9	2.0
		0.65	4500	1.4	2.3
		0.60	6000	1.0	2.2
	External ventilation	0.43	1500	2.7	1.8
		0.90	3000	2.9	3.2
		1.20	4500	2.5	4.0
		1.15	6000	1.8	4.2
560 VDC	*Self cooling*	0.60	3000	1.9	1.3
		0.65	4500	1.4	1.4
		0.55	6000	0.9	1.2
	External ventilation	0.90	3000	2.9	1.9
		1.20	4500	2.5	2.6
		1.15	6000	1.8	2.4

PMS 100F/PMS 100

(SL-EC 120, Type 11B/Type 22B)

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PMS 100F

Weight: approx. 5.5 kg
Inertia: 17.5 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.58	1500	3.7	33.2
		0.80	3000	2.6	39.8
		1.00	4500	2.1	52.8
	External ventilation	0.65	1500	4.1	37.9
		1.35	3000	4.3	66.3
		1.40	4500	3.0	70.0
36 VDC	*Self cooling*	0.58	1500	3.7	20.0
		0.80	3000	2.6	27.5
		1.00	4500	2.1	34.9
	External ventilation	0.65	1500	4.1	22.7
		1.40	3000	4.5	47.6
		1.50	4500	3.2	52.1
		1.60	6000	2.6	58.1
48 VDC	*Self cooling*	0.58	1500	3.7	14.2
		0.80	3000	2.6	19.7
		1.00	4500	2.1	26.3
	External ventilation	0.65	1500	4.1	16.2
		1.45	3000	4.6	35.2
		1.50	4500	3.2	36.4
		1.60	6000	2.6	43.5
330 VDC	*Self cooling*	0.58	1500	3.7	2.6
		0.80	3000	2.5	3.1
		1.00	4500	2.1	4.2
	External ventilation	0.65	1500	4.1	2.9
		1.40	3000	4.5	5.4
		1.45	4500	3.1	6.2
560 VDC	*Self cooling*	0.50	1500	3.5	1.2
		0.80	3000	2.6	1.8
		1.00	4500	2.1	2.2
	External ventilation	0.58	1500	3.7	1.3
		1.45	3000	4.6	3.2
		1.50	4500	3.2	3.4

PMS 100

Weight: approx. 7.2 kg
Inertia: 9.6 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
24 VDC	*Self cooling*	0.90	1500	5.7	45.0
		1.50	3000	4.8	73.9
		1.45	4500	3.1	71.9
	External ventilation	1.10	1500	7.0	62.5
		1.50	3000	4.8	73.9
		1.45	4500	3.1	71.9
		1.40	6000	2.2	71.4
36 VDC	*Self cooling*	0.92	1500	5.9	31.7
		1.50	3000	4.8	50.1
		1.50	4500	3.2	49.4
	External ventilation	1.10	1500	7.0	40.3
		2.20	3000	7.0	73.0
		2.20	4500	4.7	72.5
		2.00	6000	3.2	72.3
48 VDC	*Self cooling*	0.92	1500	5.9	24.2
		1.50	3000	4.8	36.3
		1.60	4500	3.4	40.2
	External ventilation	1.15	1500	7.3	30.8
		2.30	3000	7.3	57.7
		2.60	4500	5.5	65.4
		2.70	6000	4.3	66.9
330 VDC	*Self cooling*	0.90	1500	5.7	3.7
		1.40	3000	4.5	5.1
		1.60	4500	3.4	6.1
	External ventilation	1.10	1500	7.0	4.6
		2.30	3000	7.3	8.3
		2.60	4500	5.5	10.0
		2.60	6000	4.1	9.9
560 VDC	*Self cooling*	0.86	1500	5.5	2.1
		1.40	3000	4.5	3.1
		1.60	4500	3.4	3.4
	External ventilation	1.10	1500	7.0	2.8
		2.40	3000	7.6	5.2
		2.60	4500	5.5	5.8
		2.70	6000	4.3	6.0

PMS 120F/PMS 120

(SL-EC 160, Type 11B/Type 22B)

PMS 120F

Weight: approx. 10 kg
Inertia: 26.3 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
48 VDC	*Self cooling*	1.5	1500	9.5	36.5
		2.5	3000	8.0	60.3
		2.2	4500	4.7	52.0
	External ventilation	1.8	1500	11.5	44.5
		3.3	3000	10.5	76.7
		3.7	4500	7.9	83.0
		3.5	6000	5.6	85.8
80 VDC	*Self cooling*	1.5	1500	9.5	22.7
		2.4	3000	7.6	33.4
		2.5	4500	5.3	36.5
	External ventilation	1.8	1500	11.5	27.5
		3.7	3000	11.8	54.0
		3.9	4500	8.3	55.5
		3.9	6000	6.2	55.0
96 VDC	*Self cooling*	1.5	1500	9.5	17.9
		2.4	3000	7.6	27.8
		2.2	4500	4.7	26.6
	External ventilation	1.9	1500	12.1	22.5
		3.7	3000	11.8	43.3
		3.9	4500	8.3	45.0
		3.8	6000	6.0	45.9
330 VDC	*Self cooling*	1.5	1500	9.5	5.3
		2.3	3000	7.3	8.0
		2.2	4500	4.7	7.5
	External ventilation	1.8	1500	11.5	6.5
		3.5	3000	11.1	12.0
		3.8	4500	8.1	13.6
		3.8	6000	6.0	13.4
560 VDC	*Self cooling*	1.5	1500	9.5	3.2
		2.4	3000	7.6	4.9
		2.4	4500	5.1	4.9
	External ventilation	1.7	1500	10.8	3.6
		3.5	3000	11.1	7.3
		3.9	4500	8.3	8.2
		3.9	6000	6.2	8.2

PMS 120

Weight: approx.12.3 kg
Inertia: 26.3 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
48 VDC	*Self cooling*	2.0	1500	12.7	47.6
		4.5	3000	14.3	103.7
		4.8	4500	10.2	115.1
	External ventilation	2.5	1500	15.9	66.8
		5.5	3000	17.5	127.1
		6.0	4500	12.7	143.2
		6.0	6000	9.5	144.8
80 VDC	*Self cooling*	2.5	1500	15.9	35.3
		4.5	3000	14.3	61.8
		5.0	4500	10.6	75.4
	External ventilation	3.0	1500	19.1	49.0
		6.5	3000	20.7	95.0
		7.5	4500	15.9	108.2
		8.0	6000	12.7	114.7
	Liquid cooling	3.7	1500	23.6	61.5
		7.8	3000	24.8	118.9
		10.0	4500	21.2	145.2
		10.0	6000	15.9	144.7
96 VDC	*Self cooling*	2.5	1500	15.9	30.4
		4.5	3000	14.3	50.6
		5.0	4500	10.6	58.1
	External ventilation	3.0	1500	19.1	39.2
		6.4	3000	20.4	76.0
		7.5	4500	15.9	91.7
		7.8	6000	12.4	93.3
	Liquid cooling	3.7	1500	23.6	51.8
		8.0	3000	25.5	106.8
		11.5	4500	24.4	139.1
		11.5	6000	18.3	144.6
330 VDC	*Self cooling*	2.5	1500	15.9	9.3
		4.5	3000	14.3	15.1
		5.0	4500	10.6	16.8
	External ventilation	3.0	1500	19.1	11.3
		6.0	3000	19.1	20.8
		7.5	4500	15.9	25.5
		7.5	6000	11.9	25.2
	Liquid cooling	3.8	1500	24.2	15.7
		8.0	3000	25.5	31.3
		12.0	4500	25.5	43.6
		13.0	6000	20.7	46.4
560 VDC	*Self cooling*	2.4	1500	15.3	5.0
		4.5	3000	14.3	8.7
		4.8	4500	10.2	9.3
	External ventilation	2.8	1500	17.8	6.1
		6.0	3000	19.1	12.2
		7.5	4500	15.9	15.7
		7.5	6000	11.9	15.2
	Liquid cooling	3.5	1500	22.3	8.4
		8.0	3000	25.5	17.6
		11.5	4500	24.4	24.8
		13.0	6000	20.7	28.3

PMS 150F

(SL-EC 180, Type 11B)

PMS 150F

Weight: approx. 16 kg
Inertia: 58.6 kg · cm²

		Output power	Speed	Torque	Current
		P	n	M	I
		kW	min⁻¹	Nm	A (AC)
48 VDC	*Self cooling*	2.7	1500	17.2	62.7
		5.0	3000	15.9	112.1
		4.5	4500	9.5	102.7
	External ventilation	3.2	1500	20.4	75.2
		5.5	3000	17.5	127.2
		5.4	4500	11.5	126.6
		5.5	6000	8.8	126.5
80 VDC	*Self cooling*	2.7	1500	17.2	37.8
		5.1	3000	16.2	68.2
		4.9	4500	10.4	67.5
	External ventilation	3.2	1500	20.4	45.3
		6.8	3000	21.6	92.1
		8.1	4500	17.2	111.6
		8.0	6000	12.7	107.0
96 VDC	*Self cooling*	2.7	1500	17.2	29.9
		5.1	3000	16.2	54.7
		4.8	4500	10.2	52.5
	External ventilation	3.3	1500	21.0	37.4
		6.8	3000	21.6	73.6
		8.0	4500	17.0	87.5
		7.9	6000	12.6	85.0
330 VDC	*Self cooling*	2.7	1500	17.2	9.0
		5.0	3000	15.9	16.1
		5.0	4500	10.6	16.4
	External ventilation	3.2	1500	20.4	10.9
		6.7	3000	21.3	21.8
		8.2	4500	17.4	26.9
		7.8	6000	12.4	24.7
560 VDC	*Self cooling*	2.6	1500	16.6	5.3
		5.0	3000	15.9	9.8
		5.0	4500	10.6	9.6
	External ventilation	3.2	1500	20.4	6.6
		6.7	3000	21.3	13.3
		8.2	4500	17.4	15.8
		7.8	6000	12.4	15.0

PGS Series

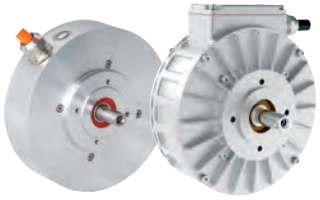
Brushless Disc Generators

The PGS Synchronous Generators are brushless, highly efficient disc rotor generators with patented rotor technology. This series of generators boasts greater power density, low weight, optimum efficiency and an extremely flat design.

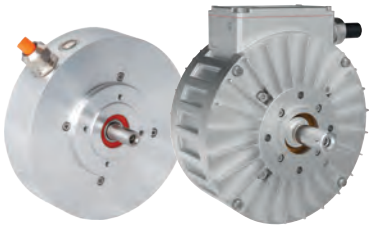
PGS generators are available as both double- and single-sided versions. With a housing in compliance with protection class IP54, they are completely closed. The PGS series has been designed for a power range of 0.1 to 20 kVA at variable speeds and voltage. The voltage range reaches a maximum of 500 VAC.

Whether block heating plant or APU, we deliver the generator that meets your air- or liquid-cooled requirements. From special developments to large-scale production, we are the partner you can rely on.

PGS 060F



PGS 080F/PGS 080



PGS 100F/PGS 100

PGS 120F/PGS 120

PGS 150F/PGS 150

Advantages of PGS Generators

High power-density due to double-stators

With the double-sided version, the rotor disc acts on two stators. The generator reaches its full potential here with the neodymium iron boron magnets.

High efficiency

The disc rotor design facilitates greater efficiency across a broad range of speeds.

Flat design

The small axial length of the PGS generators means they can even be used in restricted spaces. Here, mechanical components such as angular gears can often be dispensed with. For extreme applications, where even the double-sided generators are mechanically unsuitable, the flatter one-sided generators can be used (F-types).

Flexible

The PGS Generators have been designed by HEINZMANN with special consideration given to customer requirements. The designs thus cover nominal speeds from 1500 – 6000 rpm and nominal voltages of up to 500 VAC. Our customers can remain flexible when it comes, for example, to selecting speed. The customised design facilitates a high degree of efficiency in all nominal speed ranges.

- High efficiency
- Flat design
- Small dimensions
- Low weight
- High power spectrum

Range of application

- *Combined heat and power plants*
- *Auxiliary power supplies*
- *Auxiliary power units*
- *Range extender*
- *Hydro-electric power plants*

Combined heat and power plants

PGS 060F

Weight: approx. 1.5 kg
Inertia: 2.14 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	0.12	1500	1.05	111	1.3	73
	0.28	3000	1.14	115	1.4	78
	0.35	4500	0.93	108	1.4	80
	0.32	6000	0.65	104	1.3	78

PGS 080F

Weight: approx. 3.2 kg
Inertia: 6.5 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	0.24	1500	1.89	101	6.7	81
	0.33	3000	1.25	101	7.0	84
	0.30	4500	0.77	101	6.5	83
External ventilation	0.36	1500	2.90	102	6.7	79
	0.55	3000	2.08	101	7.6	84
	0.55	4500	1.39	101	7.5	84
	0.50	6000	0.96	101	6.7	83

PGS 080

Weight: approx. 3.8 kg
Inertia: 3.8 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	0.45	1500	3.41	104	8.2	84
	0.75	3000	2.74	103	8.4	87
	0.75	4500	1.81	102	7.2	88
	0.70	6000	1.28	102	6.4	87
External ventilation	0.55	1500	4.27	106	8.2	82
	1.10	3000	4.00	105	8.4	88
	1.30	4500	3.11	104	8.1	89
	1.50	6000	2.67	104	7.0	90

PGS 100F

Weight: approx. ca. 5.5 kg
Inertia: 17.5 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	0.55	1500	4.19	101	12.2	84
	0.85	3000	3.13	101	13.3	87
	0.85	4500	2.08	101	12.3	87
External ventilation	0.70	1500	5.43	102	12.2	82
	1.40	3000	5.12	102	12.2	87
	1.60	4500	3.88	101	13.9	88
	1.60	6000	2.91	101	12.9	88

PGS 100

Weight: approx. 7.2 kg
Inertia: 9.6 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	0.9	1500	6.66	105	13.1	86
	1.8	3000	6.37	105	13.6	90
	1.8	4500	4.24	103	13.6	90
	1.8	6000	3.18	102	12.5	90
External ventilation	1.1	1500	8.34	108	13.1	84
	2.2	3000	7.82	107	13.6	90
	3.2	4500	7.46	106	13.6	91
	3.5	6000	6.12	106	12.5	91

PGS 120F/120/150F/150

PERM TECHNOLOGY

PGS 120F

Weight: approx. 10 kg
Inertia: 26.3 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	1.5	1500	10.9	115	16.2	87
	2.25	3000	7.9	107	13.0	90
	2.0	4500	4.8	103	8.8	89
External ventilation	1.7	1500	12.5	120	16.2	87
	3.2	3000	11.4	116	16.2	90
	3.5	4500	8.2	109	8.8	91
	3.4	6000	6.0	110	9.1	90

PGS 150F

Weight: approx. 16 kg
Inertia: 58.6 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	2.4	1500	17.5	114	23.1	88
	4.0	3000	14.1	109	27.7	91
	3.75	4500	8.9	105	12.4	90
External ventilation	2.7	1500	19.9	120	23.1	86
	5.4	3000	19.1	119	27.7	90
	6.3	4500	14.7	112	13.9	91
	5.5	6000	9.8	111	14.0	90

PGS 120

Weight: approx. 12.3 kg
Inertia: 26.3 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	2.4	1500	17.1	110	25.7	89
	4.3	3000	14.9	108	26.3	92
	4.2	4500	9.7	105	23.9	92
	4.2	6000	7.3	103	23.3	92
External ventilation	2.9	1500	21.1	116	25.7	88
	5.7	3000	19.8	114	26.1	92
	7.0	4500	16.1	110	26.3	92
	7.8	6000	13.3	108	22.7	93
Liquid cooling	3.0	1500	21.9	118	25.7	87
	6.3	3000	22.0	119	26.1	91
	9.5	4500	21.9	118	26.3	92
	12.0	6000	20.7	115	26.4	92

PGS 150

Weight: approx. 22.3 kg
Inertia: 58.6 kg · cm²

	Output power	Speed	Torque	Open-circuit voltage	Breakdown torque	Efficiency
	P	n	M	U_o/U_N	M_K	η
	kVA	min⁻¹	Nm	%	Nm	%
Self cooling	4.2	1500	29.7	112	41.4	90
	8.4	3000	28.8	111	42.2	93
	9.2	4500	21.0	108	36.4	93
External ventilation	5.0	1500	36.2	120	42.0	88
	9.7	3000	33.5	116	42.1	92
	12.5	4500	28.6	111	42.3	93
	13.5	6000	23.1	110	36.2	93
Liquid cooling	5.0	1500	36.2	120	42.0	88
	10.5	3000	36.4	120	42.0	92
	16.0	4500	36.9	121	42.4	92
	20.0	6000	34.2	117	42.6	93

Technical Data and Information

Motor type	Brushless synchronous disc motor/generator, excited by permanent magnet in disc motors 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-cooled = 6 l/min, max. coolant temperature 60 °C, max. operating pressure 3 bar, customer specific design on request
Pairs of poles	4 (5 at PMS/PGS 060F/066F)
Magnet material	Neodymium iron boron (NdFeB)
Electrical connection	Terminal box with cable approx. 1 m, wire cross-section depending on motor current Plug on request
Electric strength	According to standard DIN EN 60034 Insulation class F
System protection	IP54, alternatives obtainable on request
Permissible ambient temperature	-10 °C ... +40 °C
Motor feedback/variants of pick-up	Resolver two-pin Digital Hall probe Analogue Hall probe with sin/cos-output Further types of motor feedback on request
Temperature sensor	KTY84-130, optional PTC
Painting	On request Standard finish: cast aluminium
Shaft	Shaft with key groove
Types	PMS/PGS Type F: one stator, one rotor with closed magnetic circuit PMS/PGS double-sided: two stators, one rotor self-contained
Specific features	The customer has the option of integrating components from PMS/PGS series drives into machinery in kit form.

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Permissible Forces

for 20,000 hours lifespan

Radial force F_R [N] at n rpm					
Speed	**0**	**1500**	**3000**	**4500**	**6000**
Type					
PMS/PGS 060	710	625	540	460	375
PMS/PGS 080	925	815	700	600	490
PMS/PGS 100	1975	1745	1510	1280	1050
PMS/PGS 120	1975	1745	1510	1280	1050
PGS 150	3025	2670	2315	1965	1610

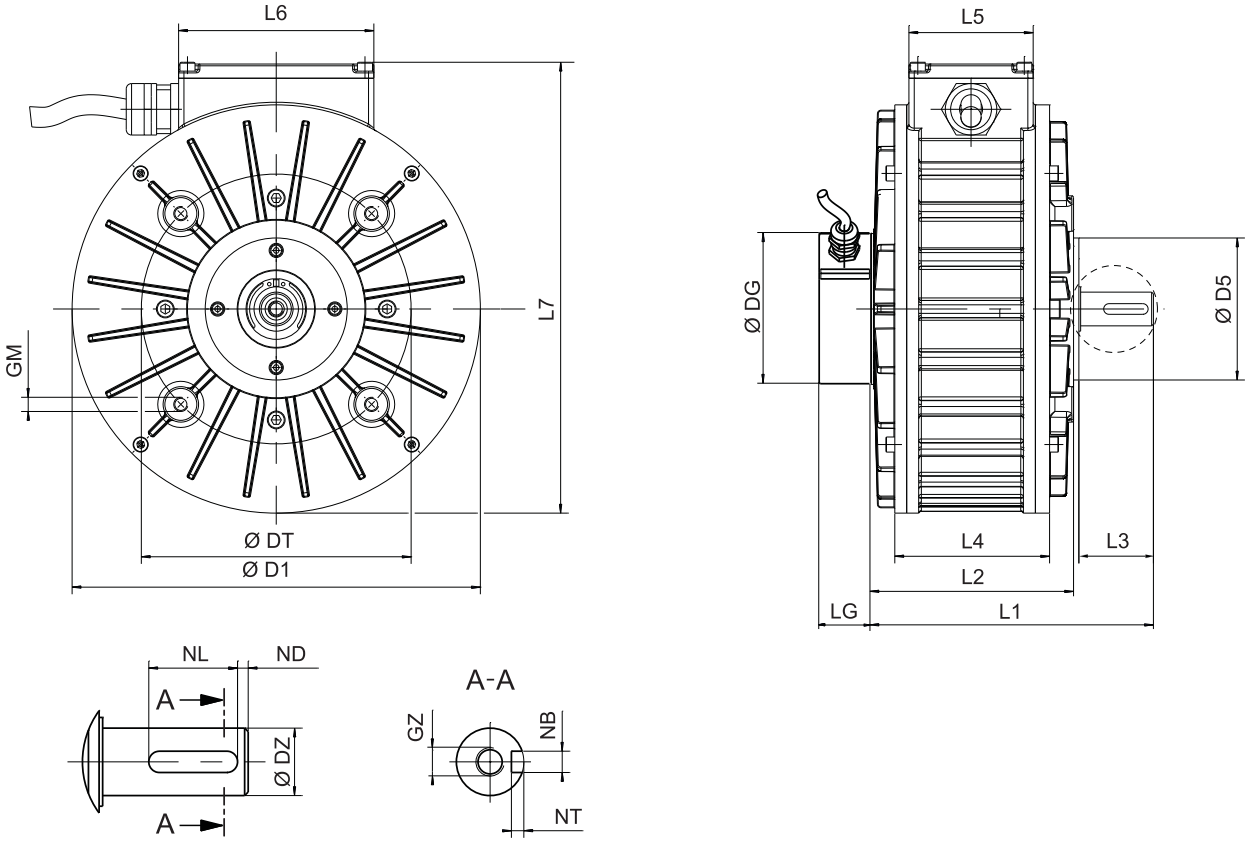
Axial force F_R [N] at n rpm					
Speed	**0**	**1500**	**3000**	**4500**	**6000**
Type					
PMS/PGS 060	140	125	105	90	75
PMS/PGS 080	185	160	140	120	95
PMS/PGS 100	395	345	300	255	210
PMS/PGS 120	395	345	300	255	210
PGS 150	605	530	460	390	320

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

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

Additional mounting of gearbox or brake obtainable on request.

Double-sided Model



Motor type	Ø D1	Ø DT	Ø D5	L1	L2	L3	L4	L5	L6	L7	GM
PMS/PGS 080	155	60	50	112	78	31	54	40	85	173.5	M6×12
PMS/PGS 100	188	73	52	146.5	102	41.5	77	62	112	211	M8×12
PMS/PGS 120	230	152	80	160	113	42	87	70	110	254	M8×12
PGS 150	274	152	65	186	142	42	106	78	126	301	M8×16

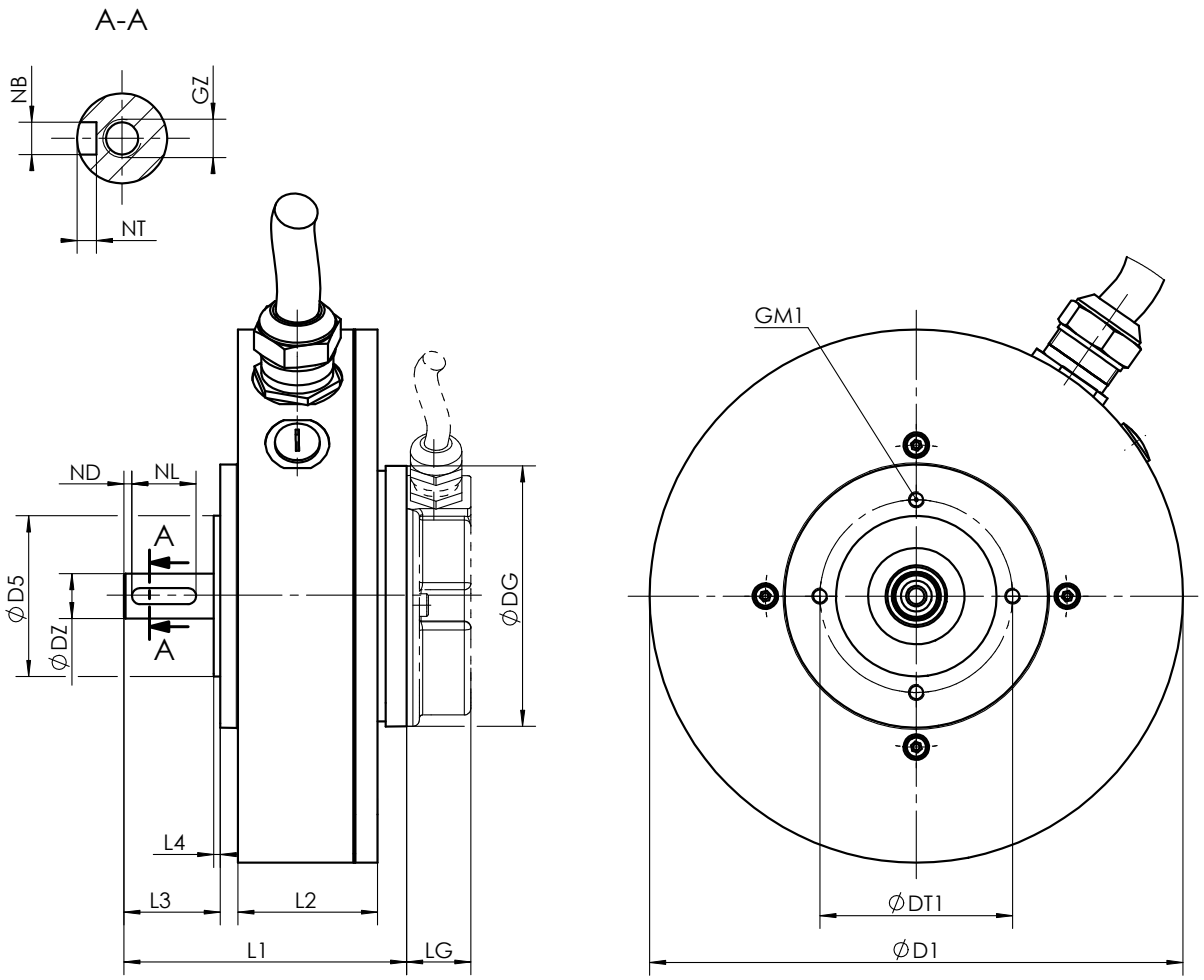
Motor type	Ø DZ	NL	NB	NT	ND	GZ
PMS/PGS 080	14	20	5	3	2.5	M6×20, DIN332-D
PMS/PGS 100	19	25	6	3.5	2.5	M8×20, DIN332-D
PMS/PGS 120	19	25	6	3.5	3	M8×20, DIN332-D
PGS 150	24	30	8	4	5	M8×25, DIN332-D

For any type	Ø DG	LG
Pick-up with cable glands (RLS)	81	20
Pick-up with connector and/or resolver	93	33
Motor types with Hall sensors	81	20
Without pick-up	0	0

Dimensions in mm

Model F

PERM TECHNOLOGY



Motor type	Ø D1	Ø DT1	Ø D5	L1	L2	L3	GM1
PMS/PGS 060F	120	60	50	75.1±1	38	25.6	M5×8
PMS/PGS 080F	166	60	50	88 ±1	43.5	30	M5×8
PMS/PGS 100F	200	73	52	119.5 ±1	55	44.5	M8×10
PMS/PGS 120F	250	152	80	137.5 ±1	74.5	45	M8×10
PMS/PGS 150F	290	152	65	153 ±1	85	45	M8×16

Motor type	Ø DZ	NL	NB	NT	ND	GZ
PMS/PGS 060F	12	12	4	2.5	2	-
PMS/PGS 080F	14	20	5	3	2.5	M6×20
PMS/PGS 100F	19	25	6	3.5	2.5	M6×20
PMS/PGS 120F	19	25	6	3.5	3	M8×20
PMS/PGS 150F	24	30	8	4	5	M8×20

For any type	Ø DG	LG
Pick-up with cable glands (RLS)	81	20
Pick-up with connector and/or resolver	93	33
Types with Hall probe or without pick-up	0	0

Dimensions in mm

Motor connection

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

Technical data/design

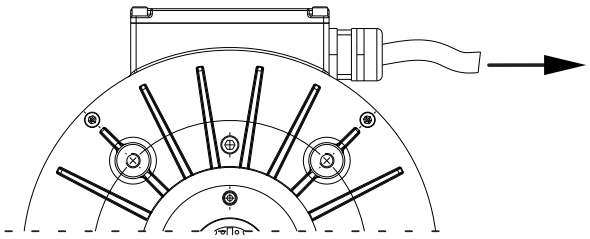
Special PUR drag chain cable in accordance with UL AWM Style. Overall screen from galvanised copper braid with approx. 85 % cover.

Pilot cores	Imprint BR1, BR2 Thermal protection
Outer sheath	PUR, extremely abrasion-resistant, low-adhesion, halogen-free, resistant to UV, oil, hydrolysis and microbes Sheath colour: orange (RAL 2003) in accordance with DESINA
Lowest permissible bend radius	At least 7.5 × cable diameter
Temperature range	Flexing: -30 °C to +80 °C Fixed installation: -40 °C to +80 °C
Rated voltage in	Power cores: Uo/U 600/1000 V

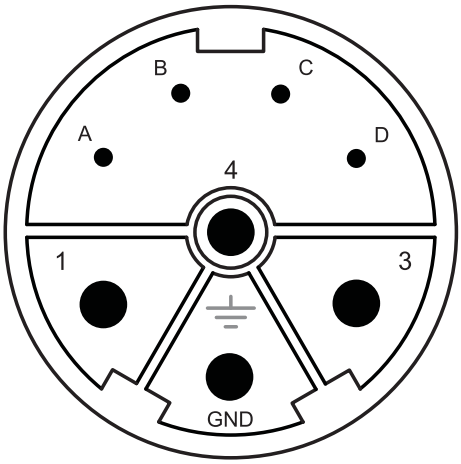
Core measurement motor connection & KTY cable

Number of cores x cross section mm²	Rated current A	Outer diameter mm
4×1.5 / (2×1)	up to 18	11.5
4×2.5 / (2×1)	up to 26	13.6
4×4 / (2×1)	up to 34	15
4×6 / (2×1)	up to 44	16.1
4×10 / (2×1)	up to 61	20.2
4×16 / (2×1)	up to 82	23.8

Electrical Connections PMS/PGS



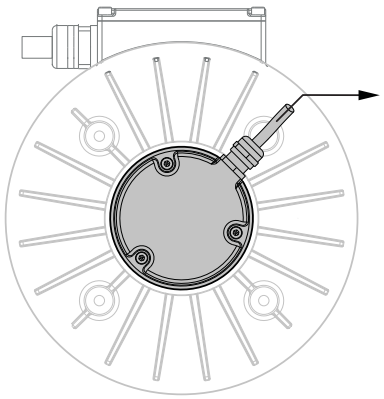
Open end		
Core colour	No.	Function
black	1	Phase U
black or blue	2	Phase V
black or red	3	Phase W
green-yellow	-	PE
brown	-	KTY +
blue	-	KTY -



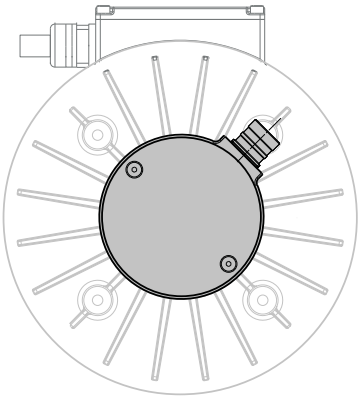
View of pin insert from the connector side

Power connector M23 Pin insert, motor	
Pin	Function
1	Phase U
4	Phase V
3	Phase W
GND / 2	PE
A	n.c.
B	n.c.
C	Temperature sensor PTC / KTY 84 (optional)
D	

Transmitter connection



Transmitter with cable gland



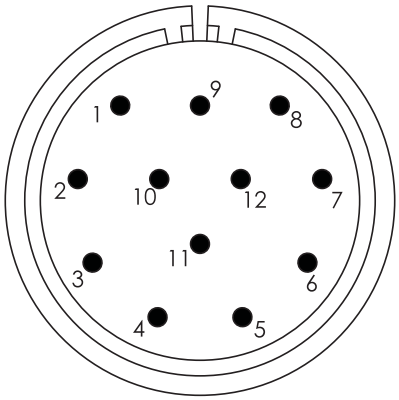
Transmitter with connector

Technical Data/Structure

Overall screen from galvanised copper braid

Cores	Braided in pairs Core colour in accordance with DIN 47100
Outer sheath	PVC
Lowest permissible bend radius	At least 6 × cable diameter
Temperature range	Flexing: -5 °C to +70 °C Fixed installation: -40 °C to +80 °C
Rated voltage in accordance with VDE	500 V
Effective capacitance	Core/core: approx. 120 nF/km Core/sheath: approx. 160 nF/km

Electrical Connections PMS/PGS



Coninvers-M23 pin, RC Series, 12-pole, view on pin insert from connector side

Resolver-Connector: Coninvers - M 23 - Series RC - 12 pol., Type: Pin insert, motor, reverse rotation, coding centre			
	LTI Servo One	KEB F5-Multi	LENZE
Pin	Function	Function	Function
1	COS + (S1)	SIN -	REF +
2	COS – (S3)	COS -	REF –
3	SIN + (S2)	n.c.	n.c.
4	SIN – (S4)	n.c.	COS +
5	n.c.	REF -	COS –
6	REF + (R1)	n.c.	SIN +
7	REF – (R2)	REF +	SIN –
8	n.c.	n.c.	n.c.
9	n.c.	n.c.	n.c.
10	n.c.	SIN +	n.c.
11	KTY +/PTC	COS +	KTY +
12	KTY –/PTC	n.c.	KTY –

Hall-Sensors: open cable ends		
	F version (single-sided)	Double-sided
Function	Core colour	Core colour
Hall 1	yellow	yellow
Hall 2	green	green
Hall 3	grey	grey
Vcc	brown	brown
GND	white	white
KTY-	blue	
KTY+	pink	pink

RLS sensors: open cable ends	
Function	Core colour
SIN	pink
COS	brown
Vcc	green
GND / KTY-	yellow
KTY+	white

PGSR Series

Brushless Generators for Small Power Plants and Combined Heat and Power Plants (CHP)

HEINZMANN develops compact permanently excited synchronous generators for direct attachment to the flywheel housing of combustion engines. The rotor is mounted directly on the combustion engine flywheel with no additional coupling elements.

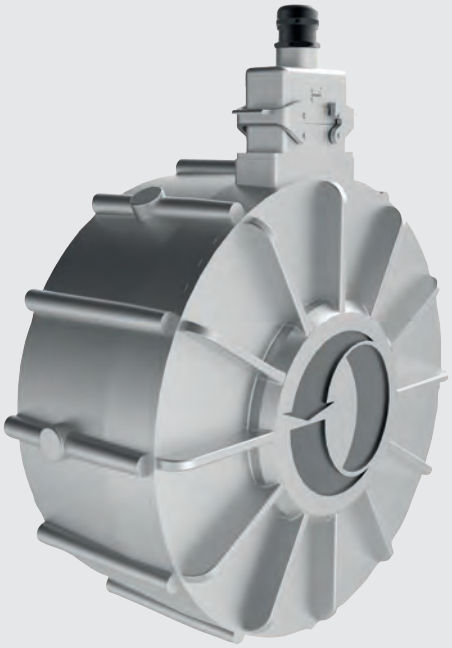
The generator is electrically coupled to the power supply using a double inverter. This enables the system to be operated at a variable speed, i.e. at different load points it is always possible to set the speed at which the highest efficiency or the lowest emissions are achieved.

HEINZMANN works in partnership with you to develop these generators especially for your application: whether you need a stator/rotor installation kit or a complete water-cooled housing ring.

- Compact, permanently excited synchronous machine
- Cantilevered/single sided bearing
- Liquid cooling
- Variable speed
- Optimised efficiency
- Starter functionality

Range of application

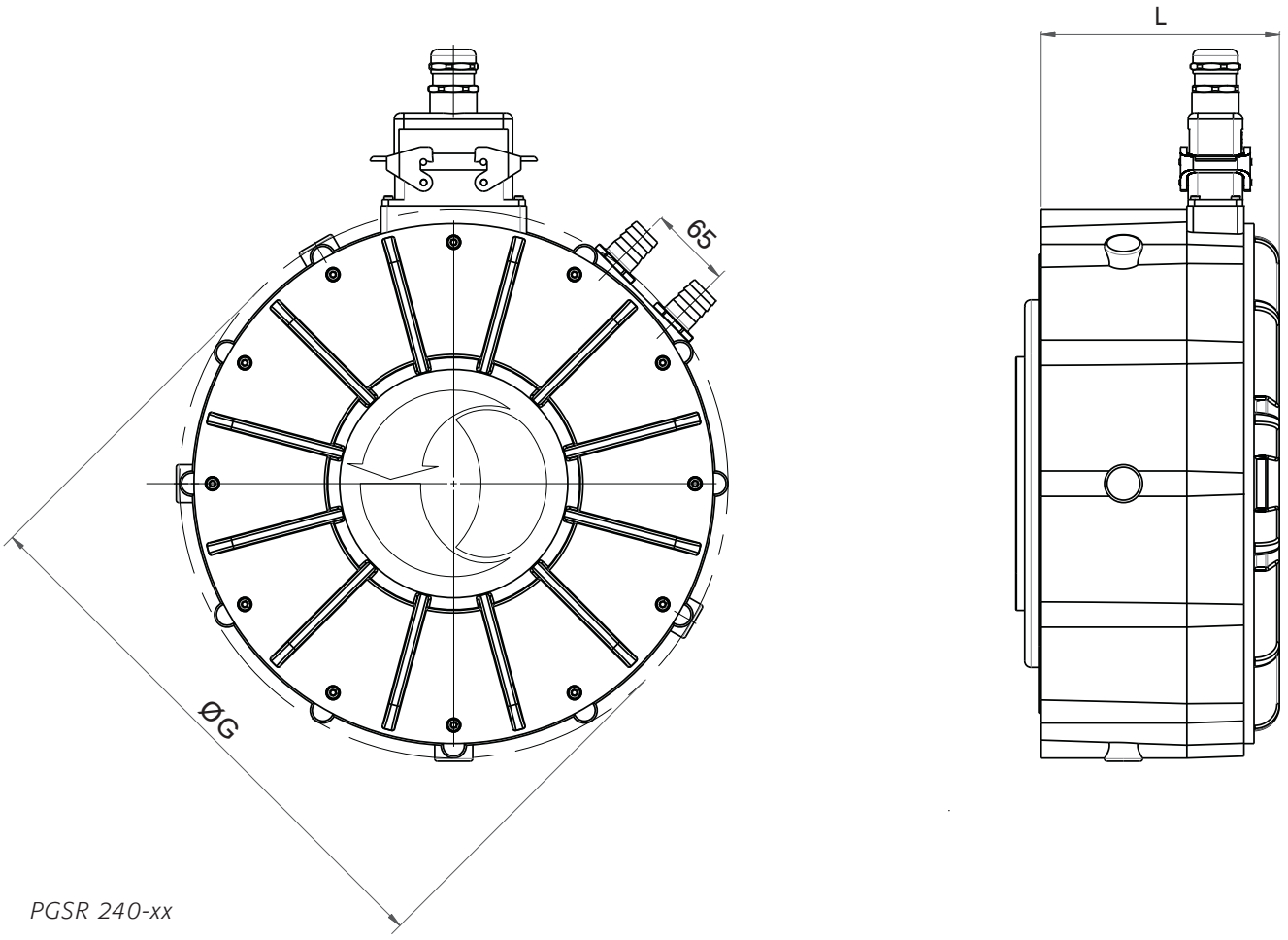
- *Small power plants*
- *Combined heat and power plants (CHP)*
- *Mild hybrid drives*



Technical Data

Motor data		PGSR 240-30	PGSR 230-60	PGSR 240-100	PGSR 320-75
	Rated power	10 kVA	20 kVA	20 kVA	50 kVA
	Speed	2300 rpm	2300 rpm	1500 rpm	1500 rpm
	Housing diameter ØG	433 mm	408 mm	436 mm	480 mm
	Stator active length	30 mm	60 mm	100 mm	75 mm
	Total housing ring length L	150 mm	150 mm	190 mm	150 mm
	Possible flywheel housing	SAE4	SAE4	SAE4	SAE3
	Weight	40 kg	56 kg	70 kg	80 kg
	Coolant flow	15 l/min	6 l/min	35 l/min	55 l/min

Dimensions



PGSR 240-xx

PMSG Series

High-Torque Wheel Hub Drive

The HEINZMANN PMSG Wheel Hub Drive convinces due to clean and environmental-friendly drive system without any pollution and noise.

His advantages are a huge starting torque with a high overload factor. Furthermore it's highly efficient and maintenance-free motor.

Because of the direct mount to the rim no axle is needed. The PMSG has an integrated planetary gear and a wheel bearing for a direct mount on the rim. An emergency brake is optional.

It is suitable for 2- as well as for 4-wheel drives.

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

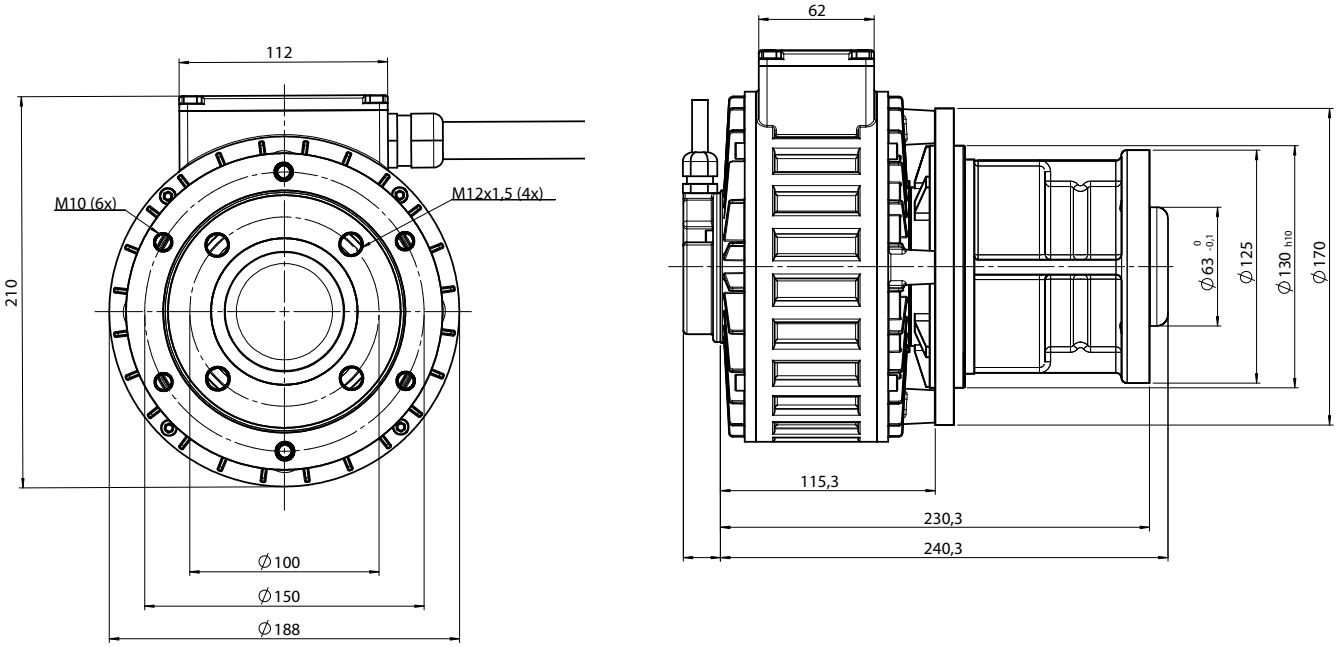
Range of application

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

Technical Data

		PMSG xxx-500	PMSG xxx-1500
Motor data 	Rated power	2 – 17 kW	
	Speed range	1500 – 6000 rpm	
	Max. torque	25 – 80 Nm	
	System voltage	24 – 96 VDC	
	Motor weight	6 – 29 kg	
Planetary gear	Reduction possibilities	1:4/1:7/1:16/ 1:24/1:42	1:5/1:25/1:40/ 1:100/1:150 (optional manual decoupling possible)
	Max. continous torque	160 Nm	500 Nm
	Max. peak torque	500 Nm	1500 Nm
	Max. axial forces	2500 N	5000 N
	Max. radial forces	7000 N	21000 N
	Lubrication	Lifetime	Lifetime
	Durability	5000 hours	5000 hours (depending on application)
	Protection class	Up to IP67	Up to IP67
	Planetary gear weight	~ 7 kg	14 – 17.5 kg

Dimensions



Note:

Dimensions of each particular drive system depends on the different motor/gearbox combination

In this example: PMSG 100-500 (Motor 2.2 kW, 48 V, 6000 rpm, gear with reduction ratio 1:24, 2 step, max. peak torque 500 Nm)

(Drawings of other motor/gearbox combinations on request)

Direct Drive PRA 230

Gearless Wheel Hub Drive

The HEINZMANN PRA 230 is a gearless axial air gap motor with integrated wheel bearing for direct mount to the rim.

Maintenance-free and noiseless operation, energy regeneration and a high starting torque are some of the benefits of this often used direct drive

PRA Direct Drives are offered without gears. The wheel drive is mounted directly to the rim / via clamp-connection to the chassis. The protection class is IP65.

The PRA 230 is available as 1-, 2- or all-wheel drive.

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

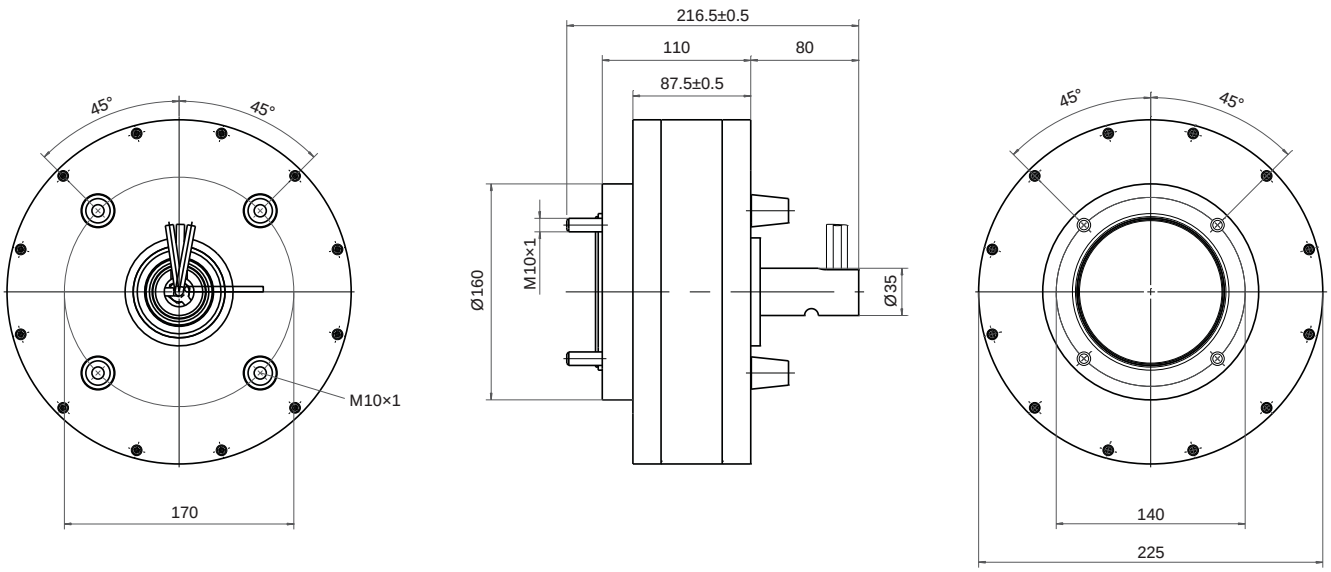
Range of application

- *Light electric vehicles*
- *Electric scooters*
- *Handicapped vehicles*
- *Driverless transport vehicles*

Technical Data

Motor data		PRA 230
	Rated power	1.6 kW – 100 % ED
	Speed	420 rpm
	Max. torque	160 Nm
	Battery voltage	48 V
	Max. wheel load	2000 N
	Weight	16 kg

Dimensions



PRA 180-25

Direct Drive
DirectPower for E-Bikes

HEINZMANN direct drives from the DirectPower series are characterised by innovative technology and flexibility. They can be integrated in different systems thanks to the independent control built into the battery box. The power electronics is not installed in the motor, so the motor power is not limited as a result of the electronics heating up. Whether front or rear wheel drive - HEINZMANN E-Bike Drives can be adapted to suit your requirements.

The regeneration-enabled system can charge the battery during downhill travel and braking. This can achieve an increase in range up to 15%.

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

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

- Front/rear wheel drive
- Support up to 50 km/h*
- Rates power up to 500 W*
- 11 Nm nominal and 40 Nm peak torque
- Weight: 4.7 kg (rear wheel), 4.5 kg (front wheel)

* For application an operation licence and a vehicle insurance may be required in your country. Keep to customary regulations.

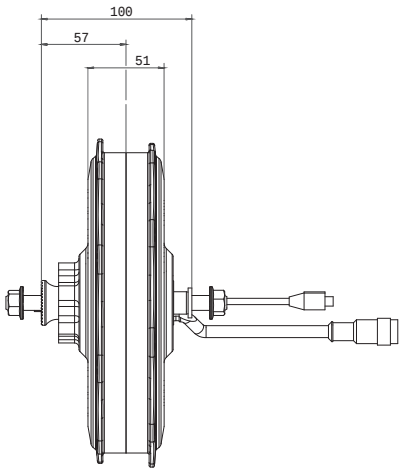
Benefits PRA 180-25 DirectPower Motors

- *Regeneration in the front and rear wheel*
- *Brake discs can be mounted in the front and rear wheel*
- *Gearless, brushless, free from wear, free from noise*
- *Customer-defined colour of choice on request*
- *Cassette can be used*
- *The power electronics is not installed in the motor, so the motor power is not limited as a result of the electronics heating up*
- *Backwards travel is possible for special applications*

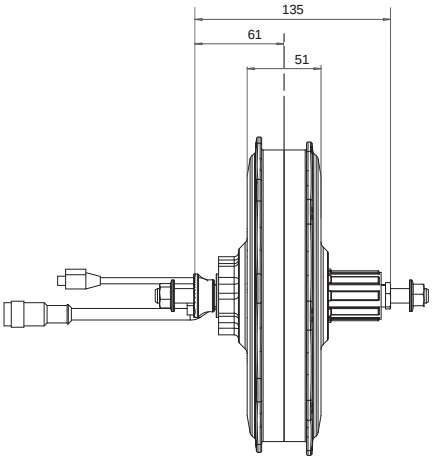
Technical Data

Motor data	Type		Pedelec	Pedelec 20"	Speed Pedelec
	DC supply voltage		36 VDC		
	Rated power		250 W	250 W	500 W
	Nominal speed		210 rpm	275 rpm	380 rpm
	Typical speed limit in km/h according to rim size	20"	25	38	38
		24"	32	42	42
		26"	34	46	46
		28"	37	50	50
	Impulse torque		60 Nm		
	Weight		4.5 kg front wheel 4.7 kg rear wheel		

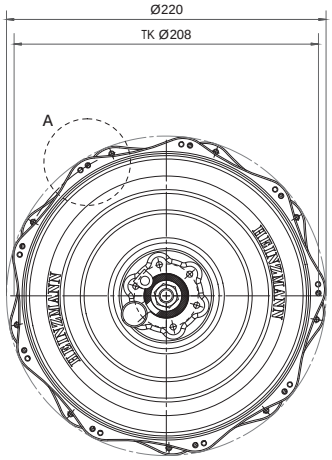
Dimensions

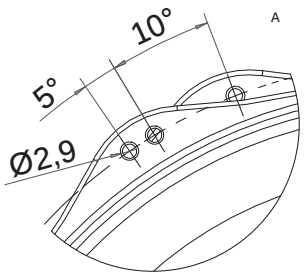


Front wheel



Rear wheel





Further information on www.ebike.heinzmann.com

RN 120

E-Bike Drive Classic

HEINZMANN Classic Motors have been proven since decades. The HEINZMANN Classic E-Bike Drive is characterised by the proven and tested robust technology, combined with the innovative optimisation of its components and properties. The powerful DC motor offers even power development with economical use of the battery capacity.

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

The RN 120 Motor is the heart of the Classic Drive System and combines the Classic Motor with robust and reliable system components.

Decades of experience in the field of e-bike drives make us a reliable partner. The reliability of HEINZMANN drives is also highly valued by Deutsche Post and is fitted on their electric bicycles.

- Support up to 25 km/h
- Rated power 250 W
- Torque up to nominal 11.5 Nm (28“), up to nominal 13.2 Nm (26“)
- Weight: approx. 3.5 kg
- Max. values for the torques are 35 to 60 Nm depending on the design (see rating plate)

Benefits RN 120 Classic Motors

- *Powerful, proven DC wheel hub motor*
- *Front/rear wheel drive*
- *Gear for highest torques*

Range of Application

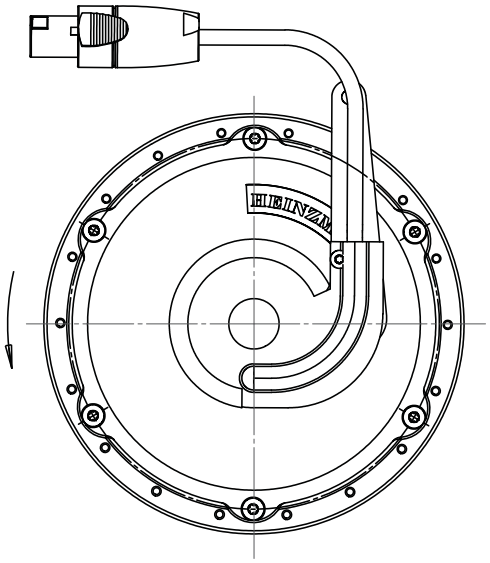
- *Cargo bikes*
- *Velotaxis*
- *Rehab bikes*
- *Three-wheelers for rehab*
- *Special applications*

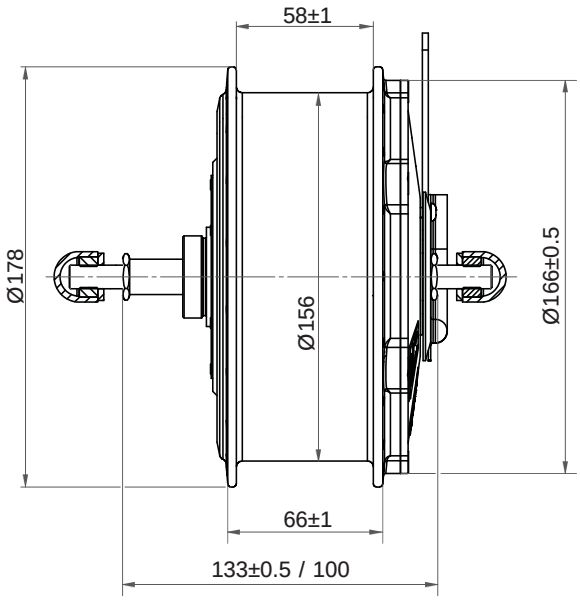
E-Bike Deutsche Post

Technical Data

Motor data			
	Nominal voltage	36 VDC	
	Rated power	250 W	
	Weight	3.5 kg	
	Wheel size	26“	28“
	Nominal speed	210 rpm	180 rpm
	Rated torque in operational mode S1	11.4 Nm	13.2 Nm

Dimensions





Further information on www.ebike.heinzmann.com

E-Bike Danish Post

PMG Series

Disc Motors with Brushes

The PMG 132 is a multi-pole, permanently excited DC disc motor.

The excitation field is created using high-performance permanent magnets from rare earth.

The disc-shaped rotor has been made with copper profiled lamella at whose inner end a disc commutator is moulded by means of suitable profiling. Power is transmitted via metalliferous carbon brushes which are optimally adapted to the shape of the commutator and conducted via a special brush holder alignment.

The magnetic flow passes axially through the lamination stacks. This alignment reduces the air gap to the minimum required mechanically and reduces magnetic losses. What results is far greater efficiency (approx. 90 %) across a broad range of operating conditions.

- Compact
- Cost-efficient
- High efficiency

Benefits PMG Motors

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

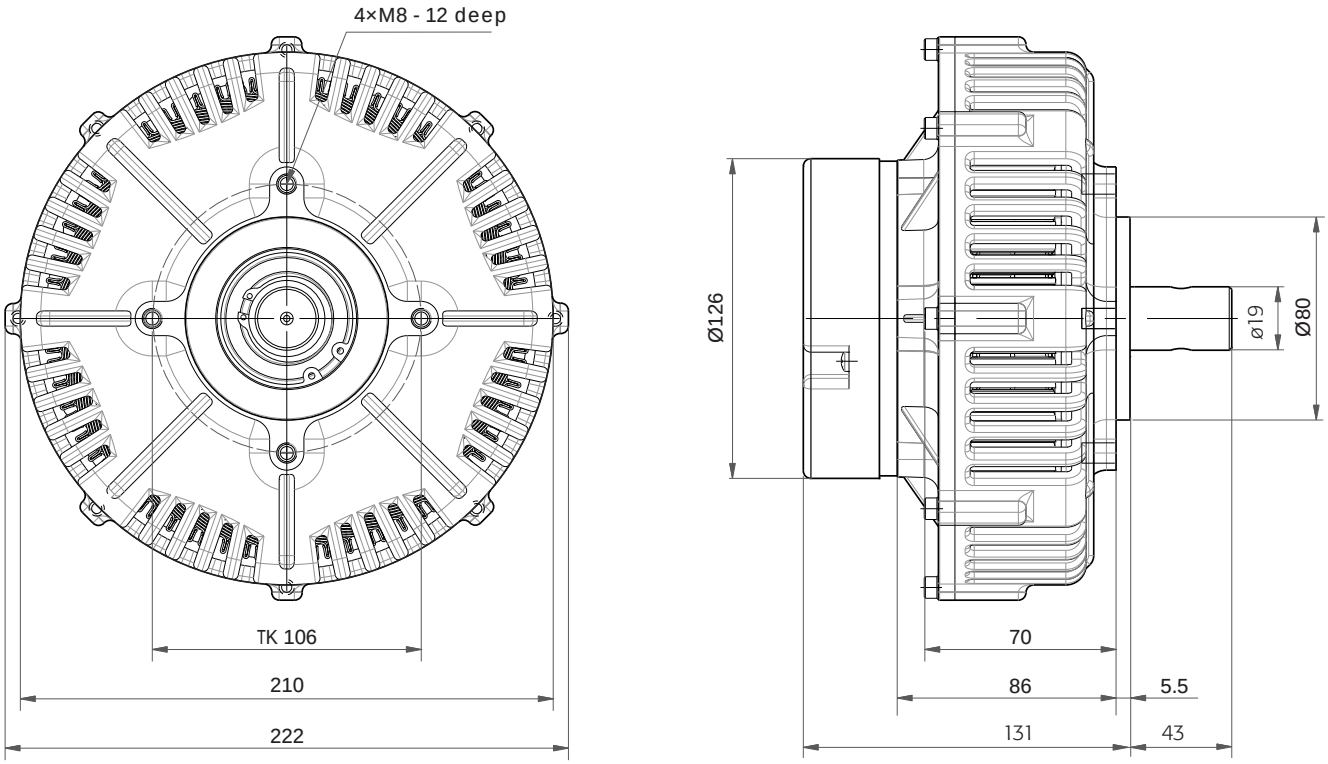
Range of application

- *Generally all kind of battery driven and electric vehicles*
- *Cleaning machines*
- *Boat drives*
- *Fans*
- *Wind powered generators*

Technical Data PMG 132

Motor data					
	Operation voltage	24 V	36 V	48 V	60 V
	Rated power	1.8 kW	3.1 kW	4.7 kW	5.1 kW
	Speed	1100 rpm	1800 rpm	2400 rpm	3000 rpm
	DC current in duty type S1	90 A	100 A	110 A	96 A
	Rated torque	15 Nm	16 Nm	19 Nm	16 Nm
	DC current in short-time duty S2 10 min	210 A			
	Peak torque	38 Nm			
	Mass inertia	0.025 kgm²			
	Inductance	0.019 mH			
	Resistance	16 mΩ			
	Protection class	IP20			
	Weight	approx. 12.5 kg			

Dimensions



SL Series

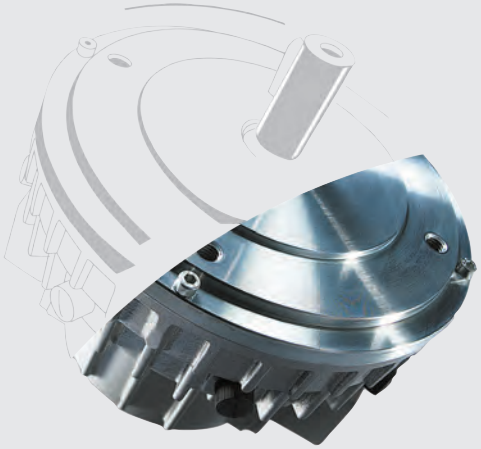
Disc Motors with Brushes

They are flat, dynamic and very adaptable: disc motors from HEINZMANN. As they differ from other electric motors in their flat shape, they are an optimal solution when a drive motor of up to 1.1 kW is needed, that is easy to control accurately and for installation in a narrow space.

By now, disc motors have conquered large sectors of machine and apparatus production, such as medical equipment. They are used to carry out the most varied drive functions reliably and with quiet synchronous operation.

Through continuous further development of the materials used, the maintenance intervals of wearing parts, such as carbon brushes and collectors, are considerably lengthened. For this reason, the life expectancy of HEINZMANN brushed motors is increased appreciably.

That is why disc motors are a drive solution that, apart from the significant advantages mentioned, also has a very convincing price-performance ratio.



SL 80-F

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

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

SL 140-2NFB

SL 160-2NFB

SL 180-2NFB

Advantages of SL Motors

- Flat
- Dynamic
- Versatile
- Robust

Flat

HEINZMANN disc motors are built flat. It is this extremely flat (pancake) design that offers excellent mounting options for which other motors are not suited. The permanent magnets being arranged in a circle around the shaft generate an axial field through the disc rotor and at the same time a large air gap area which in turn is proportional to the available torque.

This yields a powerful motor for extremely narrow mounting spaces.

Dynamic

Due to the non-ferrous thin disc armature the HEINZMANN disc motor has a very low inertial torque. Since the windings are manufactured as air coils they have a very small electrical time constant due to their small inductance and their low internal resistance. Besides, the non-ferrous disc motors are entirely free of cogging torques.

Thus, dynamic drives are created that are well suited for easy and simple control.

Versatile

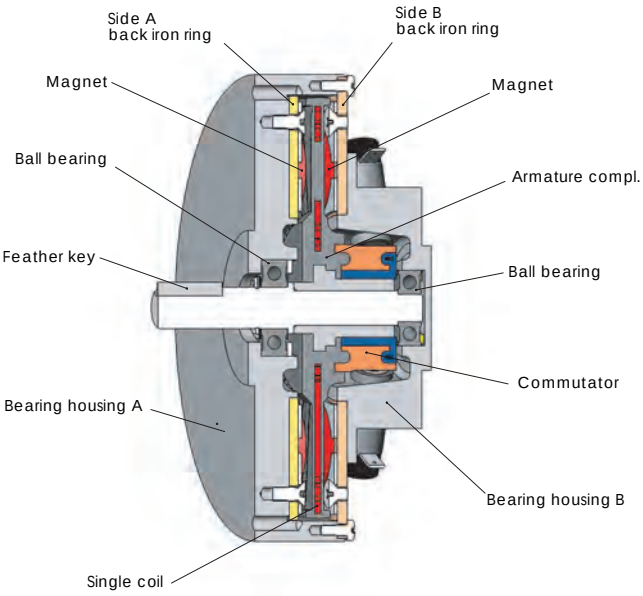
HEINZMANN disc motors are available in many other versions besides the ones presented here. These versions represent a selection of possibilities to facilitate your first choice. Customer specific solutions are our strong points.

Strong teams specialised on sales, design and motor development will take care of your requirements and interests. We are convinced that by cooperation we will find the optimum solution for your drive.

Robust

Originally, HEINZMANN had developed and optimised its disc motors for application in its own products. The aforesaid properties have been optimally implemented in proprietary mechatronical systems.

In long-time tests we develop robust motors which work under most demanding environmental conditions.



Cross section of a disc motor SL 120-2NFB

Applications for SL Motors

Disc armature motors with brushes have been used for several decades now in rough environments in HEINZMANN positioning devices for medium and large combustion engines.

In other industrial application they are deployed wherever reliable operation at the supply voltage itself is required, without any need for a controller. With an optional controller however, torque and speed can also be regulated.

Range of application

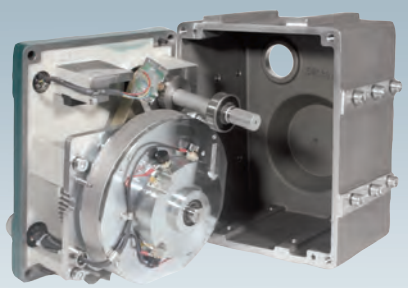
- *Industrial and individual transport systems with greater range than electric vehicles, guided warehouse vehicles or disabled person assistance systems*
- *Positioning and delivery systems or handling units*
- *Machine tools, winding devices*
- *Pumps*
- *Replacement for hydraulic systems in agricultural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

Well pump

Examples for Application

Agricultural machinery

HEINZMANN actuators



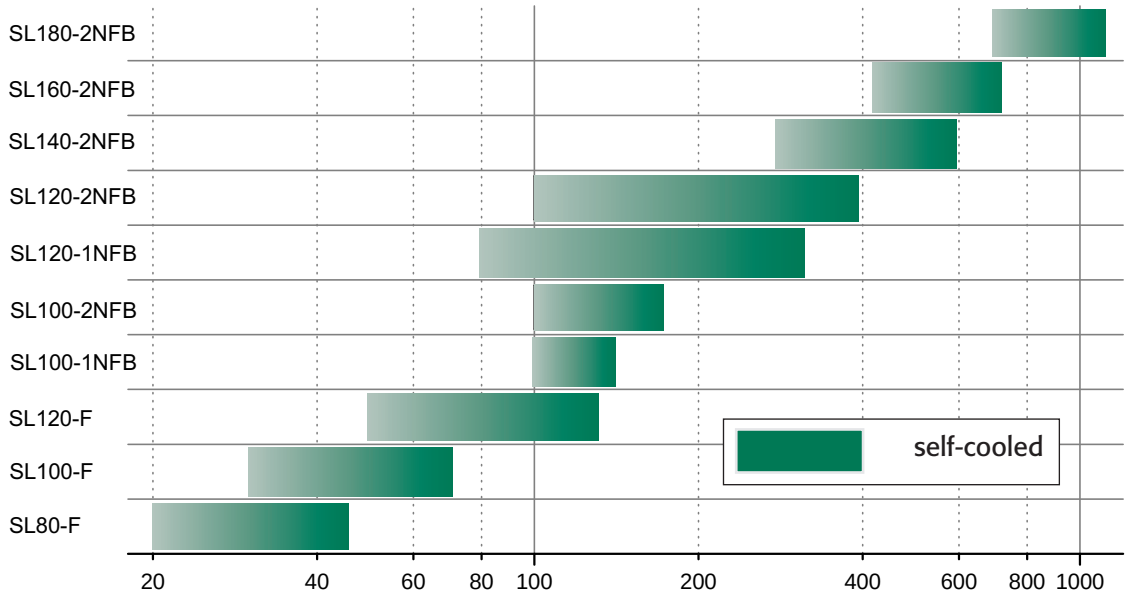
Sewer vehicles

Stair climbers

Medical pumps

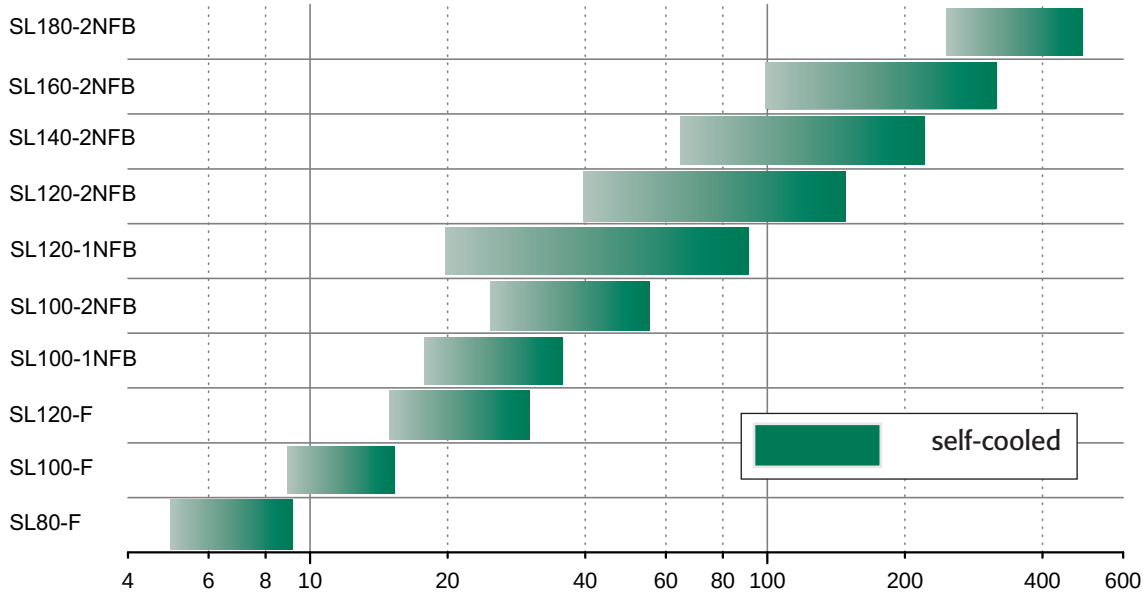
Overviews

Power range SL Motors



Continuous power/W

Torque range SL Motors

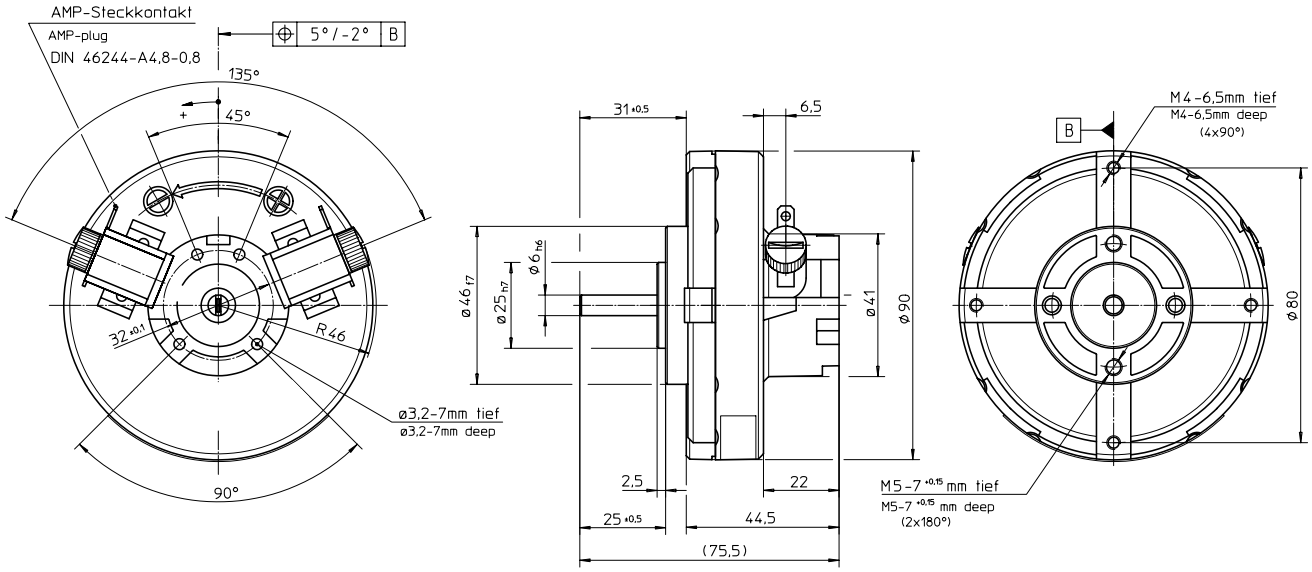


Nominal torque/Ncm

SL 80F Series

Weight: 0.9 kg
Inertia: 0.9 kg · cm²

	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
11/53	12	22	3500	6	2.9	2.9	2.7
	18	38	6000	6	3.0		
	20	43	6800	6	3.1		
17/40	18	26	2900	8.5	2.6	4.4	4.2
	20	29	3500	8	2.5		
	24	37	4700	7.5	2.3		
22/31.5	24	22	3000	7	1.7	5.7	5.5
	30	31	4200	7	1.7		
	33	33	4900	6.5	1.6		

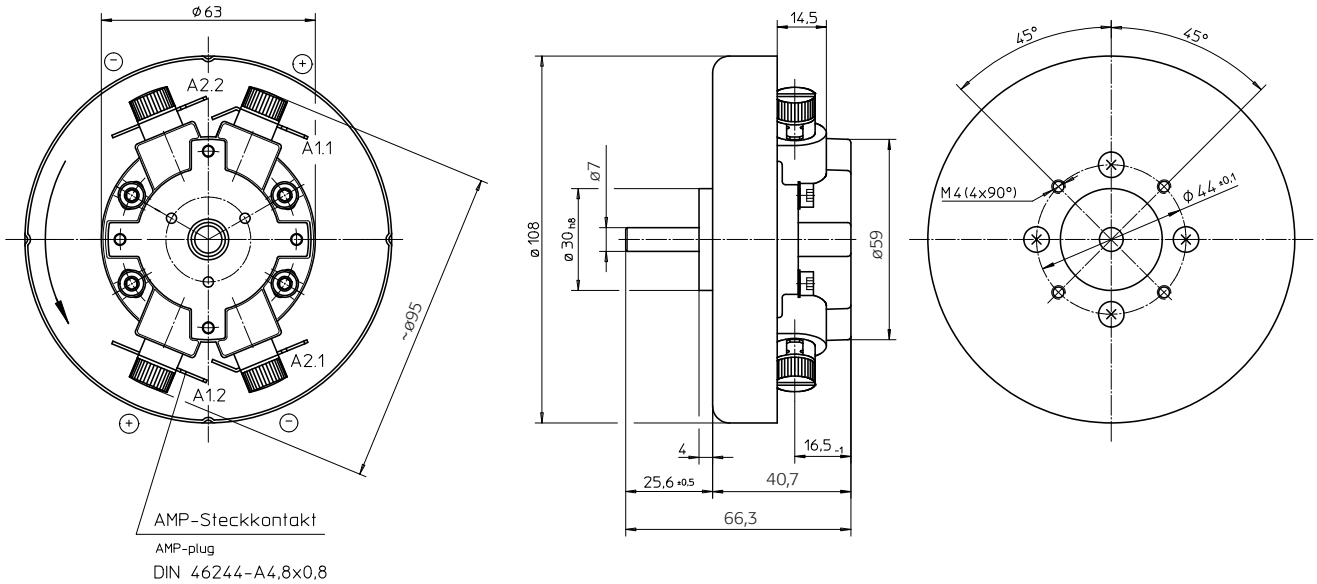


Rating

SL 100F Series

Weight: 0.9 kg
Inertia: 1.2 kg · cm²

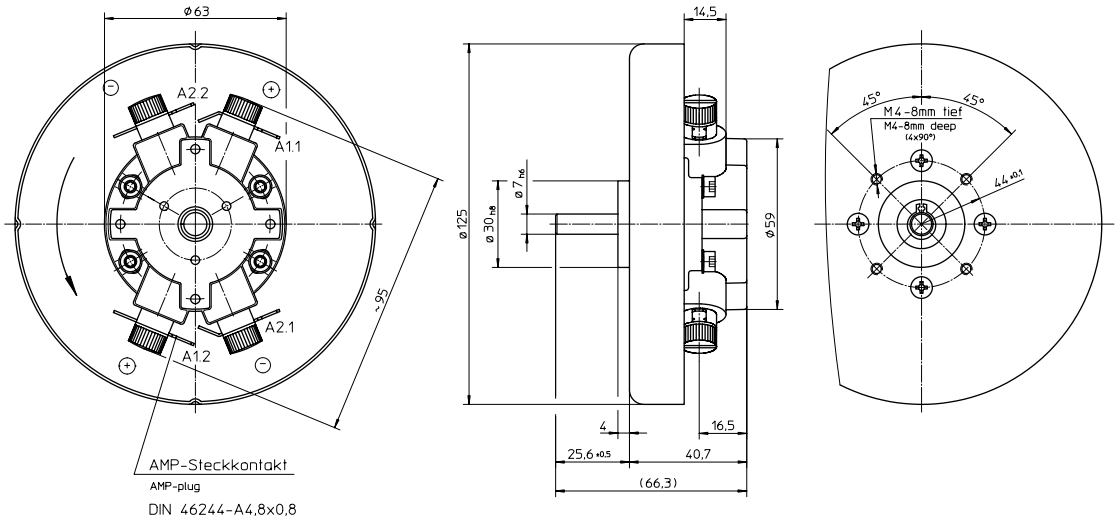
	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
6/63	12	59	4700	12	7.8	2.1	2.0
	15	68	6500	10	6.8		
10/50	18	50	4000	12	4.6	3.5	3.4
	24	70	6100	11	4.4		
14/45	24	57	3900	14	3.8	5.0	4.7
	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		



SL 120-F Series

Weight: 1.2 kg
Inertia: 2.5 kg · cm²

Coil	Voltage U [V]	Output power P [W]	Speed n [min⁻¹]	Torque M [Ncm]	Current I [A]	Back-EMF constant (25 °C) K_E [V/1000min⁻¹]	Torque-constant (25 °C) K_T [Ncm/A]
8/63	12	44	1600	26	7.8	4.4	4.2
	15	63	2500	24	7.3		
	24	110	5000	20	6.5		
10/56	18	63	2400	25	6.1	5.5	5.3
	24	89	3700	23	5.8		
	36	110	6600	16	4.4		
12/53	24	79	2900	26	5.3	6.6	6.3
	36	110	5200	21	4.5		
	42	120	6400	18	4.1		
14/50	24	70	2300	29	5.0	7.7	7.4
	36	110	4300	25	4.6		
	48	125	6300	19	3.6		
16/45	24	53	1800	28	4.2	8.8	8.4
	36	95	3500	26	4.0		
	48	120	5200	22	3.5		
	60	120	7100	16	2.8		
22/40	36	64	2100	29	3.2	12.0	11.5
	48	96	3400	27	3.0		
	60	120	4700	24	2.8		
	72	130	5900	21	2.5		

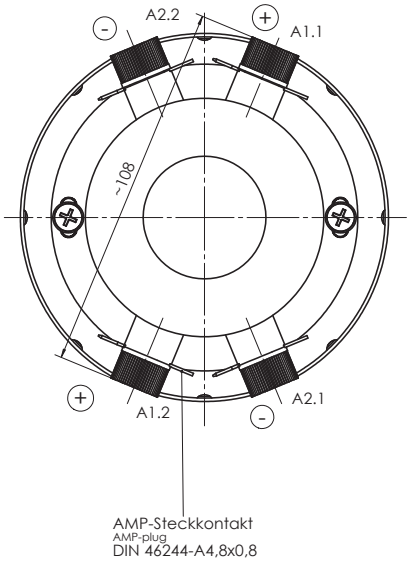


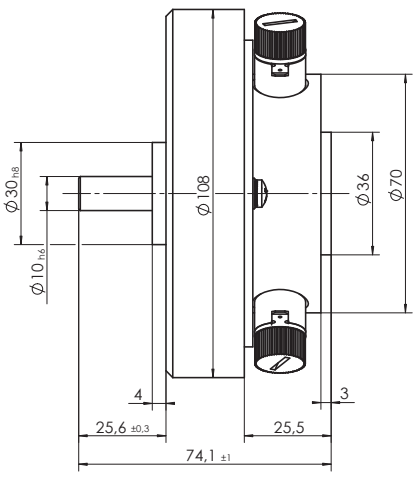
Rating

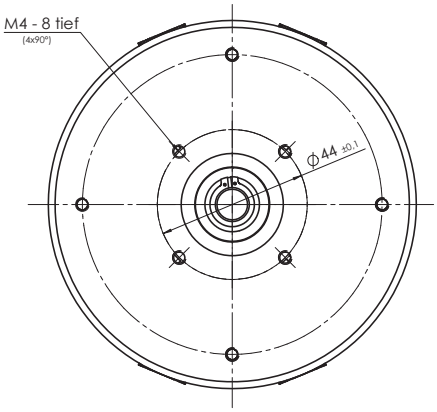
SL 100-1NFB Series

Weight: 0.9 kg
Inertia: 1.6 kg · cm²

	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	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		



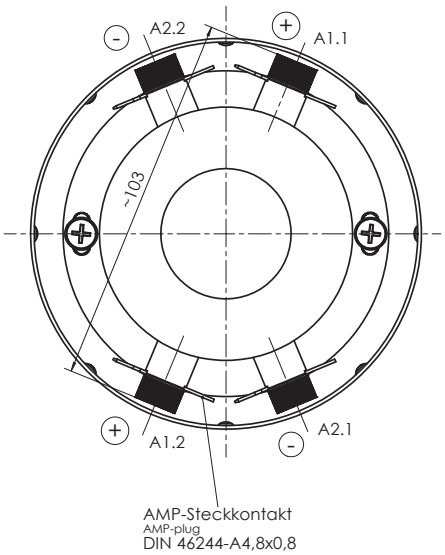


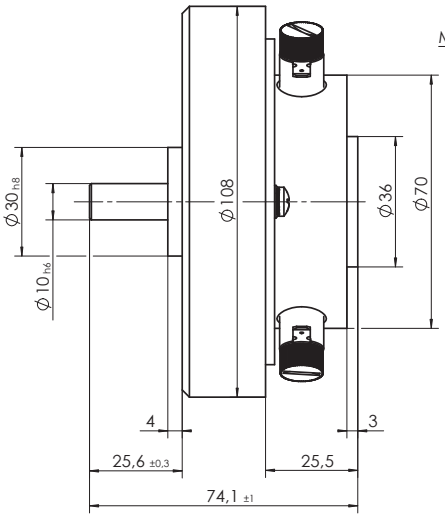


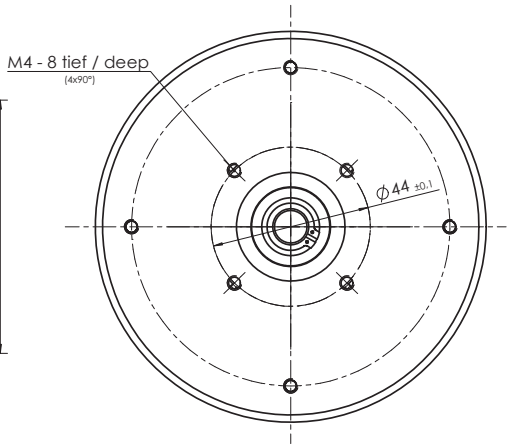
Reihe SL 100-2NFB

Weight: 1.0 kg
Inertia: 1.6 kg · cm²

	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
4/90	12	110	2800	36	13	3.6	3.5
	15	140	3700	35	13		
5/85	18	160	3600	42	12	4.5	4.3
	24	130	5200	24	8.0		
7/71	18	120	2300	51	10	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		





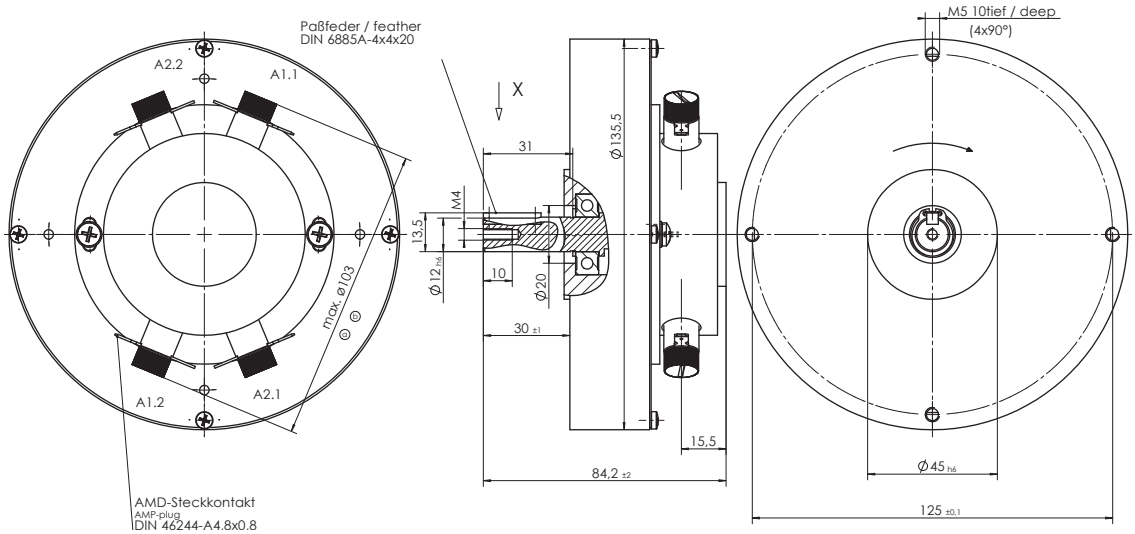


Rating

Reihe SL 120-1NFB

Weight: 1.8 kg
Inertia: 3.5 kg · cm²

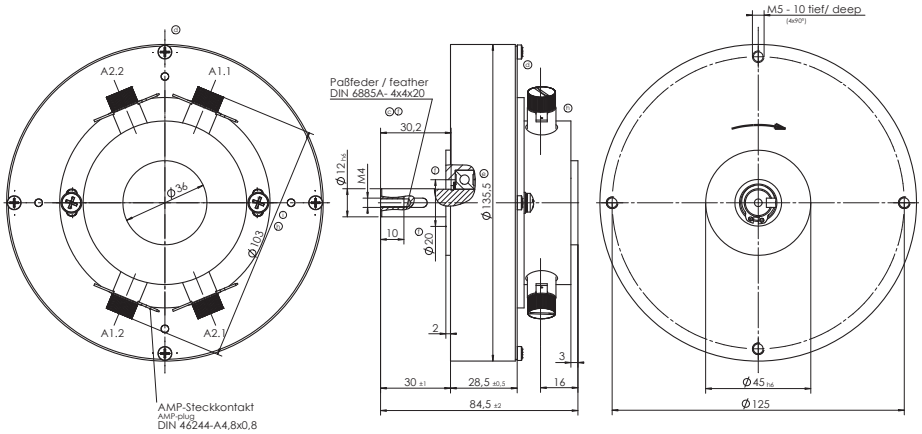
	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
3/106	12	77	3700	20	9.9	3.0	2.9
	15	96	4800	19	10		
5/100	18	140	3400	38	10	5.0	4.7
	24	180	4700	37	10		
	27	200	5400	36	10		
7/90	24	200	3100	60	11	6.9	6.6
	36	270	5100	50	9.4		
10/75	24	160	1900	82	9.7	9.9	9.5
	36	260	3300	74	9.2		
	48	300	4700	60	7.7		
15/63	36	180	1900	90	7.2	15	14
	48	250	2800	84	6.8		
	72	310	4700	63	5.4		
17/56	36	140	1600	85	6.0	17	16
	48	200	2400	80	5.7		
	60	250	3200	75	5.4		
	72	280	4000	67	4.9		
22/47.5	48	140	1600	84	4.6	22	21
	60	190	2300	80	4.4		
	72	230	2900	76	4.2		
	80	250	3300	73	4.1		



SL 120-2NFB Series

Weight: 1.9 kg
Inertia: 3.5 kg · cm²

Coil	Voltage U [V]	Output power P [W]	Speed n [min⁻¹]	Torque M [Ncm]	Current I [A]	Back-EMF constant (25 °C) K_E [V/1000min⁻¹]	Torque-constant (25 °C) K_T [Ncm/A]
3/106	12	100	2300	41	11	4.8	4.6
	18	150	3600	40	12		
5/100	24	210	2900	70	11	8.1	7.7
	30	270	3700	70	11		
	36	240	4500	50	8.7		
7/90	24	180	1900	90	9.7	11	10
	36	280	3100	85	9.7		
	48	290	4300	65	7.7		
10/75	36	270	2000	130	9.6	16	15
	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	23
	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	26
	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	34
	60	200	1400	135	4.5		
	72	250	1800	133	4.5		
	80	260	2000	126	4.3		

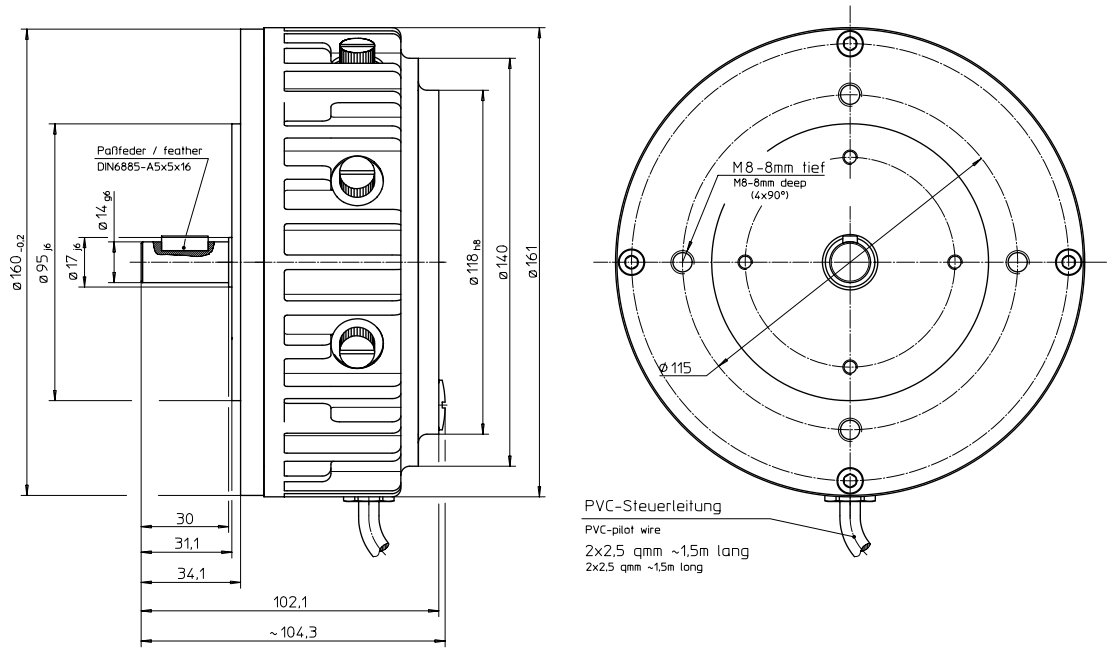


Rating

SL 140-2NFB Series

Weight: 4.9 kg
Inertia: 4.9 kg · cm²

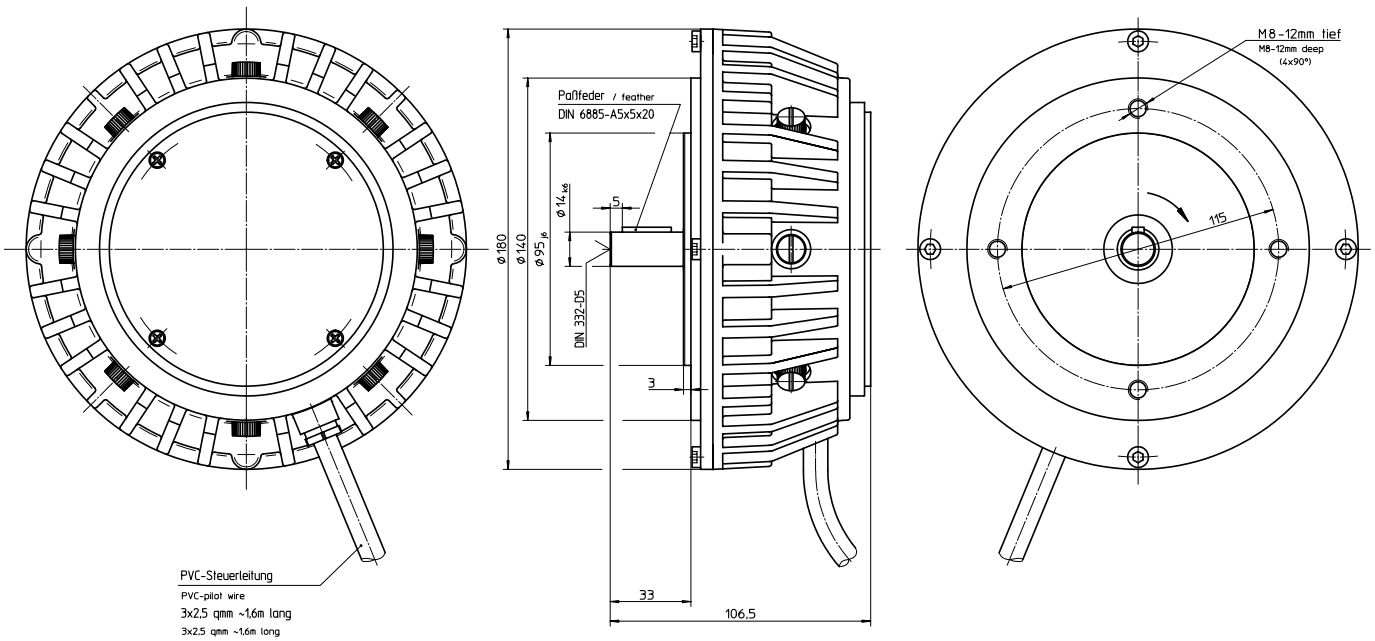
	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
3/90	24	280	2000	135	16	11	10
	36	410	3300	120	14		
	48	310	4600	64	8.6		
6/71	48	410	2100	185	11	21	20
	60	480	2700	170	9.8		
	80	530	3800	132	7.9		
9/60	60	360	1700	200	7.6	32	31
	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	40
	96	410	2100	185	5.3		
	110	480	2500	185	5.3		
15/47.5	96	370	1600	220	4.9	53	50
	110	430	1900	215	4.8		
	120	460	2100	210	4.8		



SL 160-2NFB Series

Weight: 5.5 kg
Inertia: 11.3 kg · cm²

	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
3/90	36	440	2800	150	16	12	11
	48	420	4000	100	12		
6/80	48	510	1800	270	13	24	23
	60	600	2300	250	12		
	72	680	2900	225	11		
9/63	72	460	1800	245	8.1	36	35
	96	640	2500	245	8.2		
	120	710	3300	205	7.0		
12/60	96	570	1800	300	7.3	48	46
	110	630	2100	285	7.1		
	120	690	2400	275	6.8		
15/53	110	500	1600	300	5.8	61	58
	120	570	1800	300	5.9		
17/50	110	460	1400	315	5.4	69	66
	120	520	1600	310	5.3		

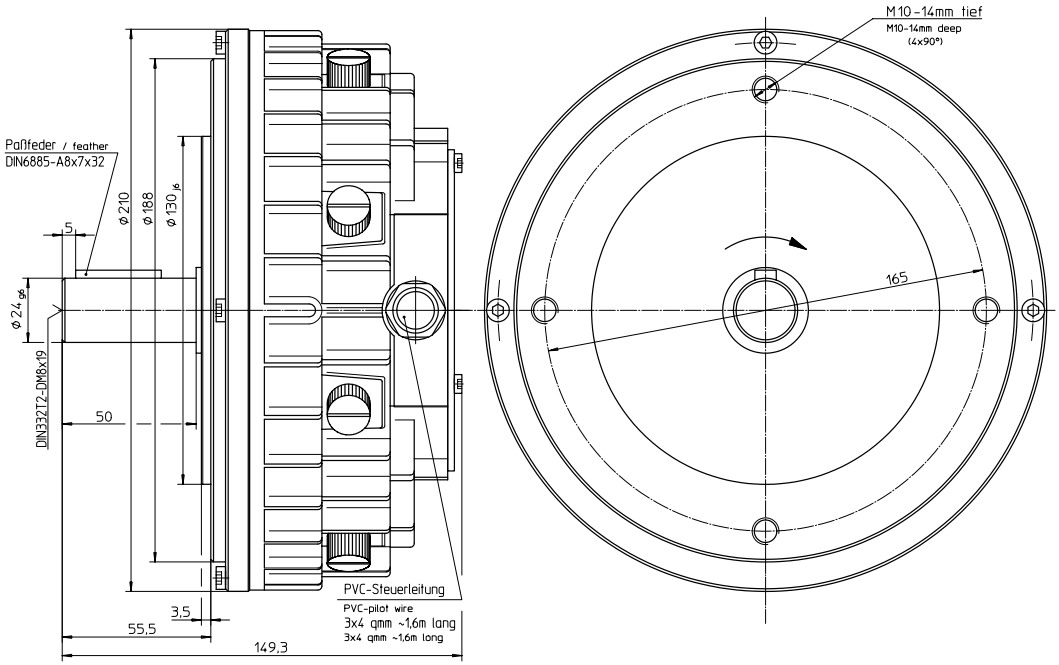


Rating

SL 180-2NFB Series

Weight: 10.2 kg
Inertia: 23.5 kg · cm²

	Voltage	Output power	Speed	Torque	Current	Back-EMF constant (25 °C)	Torque-constant (25 °C)
Coil	U [V]	P [W]	n [min⁻¹]	M [Ncm]	I [A]	K_E [V/1000min⁻¹]	K_T [Ncm/A]
3/90	60	770	2100	350	16	27	26
	80	910	2900	300	14		
6/63	125	830	2200	360	8.1	54	52
	150	930	2700	330	7.6		
	190	940	3600	250	5.9		
9/56	150	780	1700	440	6.5	81	77
	190	960	2300	400	5.9		
	220	1100	2700	375	5.7		
12/45	190	700	1600	415	4.6	110	100
	220	800	1900	400	4.5		
15/45	220	750	1500	480	4.2	130	120



Technical Data and Information

Motor type	Permanent magnet DC motor in disc armature technology
General regulations	Complying with IEC 60034
Operational mode	S1 (continuous)
Cooling	Without cooling fan, without cooling circuit, mounting at adequate cooling surface is recommended
Permissible ambient temperature	-10 °C … +40 °C
Pairs of poles	4
Magnetic material	Ferrite (F) Neodymium iron boron (1NFB, 2NFB); 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	155 (F)
System protection	IP44, alternatives obtainable on request
Fastening	On customer's request
Shaft	On customer's request, hollow shaft optional
Optional extensions	Gearbox, tachometer generator, encoder, holding break
Temperature sensor	On request
Kind of surface	Steel: zinc coating Aluminium: uncoated
Rating	All given characteristics of the motors are calculated data which may differ slightly, subject to alterations Without exception for the operating temperature status, based on: armature temperature ~ 125 °C solenoid temperature ~ 105 °C housing temperature ~ 85 °C Tolerances: Back-EMF constant and torque constant: ±6 % of nominal value Speed: ±8 % of nominal value Efficiency: 1.15 % of nominal value - 15 % Alternative voltage, speed, torque or power for customised applications obtainable on request.

Permissible Forces

for 20,000 hours lifespan

Radial force F_R [N] at n rpm							
Speed	**C_o**	**0**	**1500**	**3000**	**4500**	**6000**	**7000**
Type							
SL80-F	0.95	238	210	182	154	127	108
SL100-F	1.37	343	303	263	223	183	156
SL120-F	1.37	343	303	263	223	183	156
SL100-1NFB	1.37	343	303	263	223	183	156
SL100-2NFB	1.96	490	433	376	319	261	223
SL120-1NFB	2.36	590	521	452	384	315	269
SL120-2NFB	2.36	590	521	452	384	315	269
SL140-2NFB	3.25	813	718	623	528	433	370
SL160-2NFB	3.25	813	718	623	528	433	370
SL180-2NFB	7.8	1950	1723	1495	1268	1040	888

Axial force F_R [N] at n rpm							
Speed		**0**	**1500**	**3000**	**4500**	**6000**	**7000**
Type							
SL80-F		48	42	36	31	25	22
SL100-F		69	61	53	45	37	31
SL120-F		69	61	53	45	37	31
SL100-1NFB		69	61	53	45	37	31
SL100-2NFB		98	87	75	64	52	45
SL120-1NFB		118	104	90	77	63	54
SL120-2NFB		118	104	90	77	63	54
SL140-2NFB		163	144	125	106	87	74
SL160-2NFB		163	144	125	106	87	74
SL180-2NFB		390	345	299	254	208	178

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

HEINZMANN offers a wide range of disc armature motor variants. Selection diagrams are therefore available in full scope on our product CD *Electric Drives* or on our homepage ***www.heinzmann.com***.

How to use the selection diagrams

Each selection diagram consists of 2 sub diagrams.

The upper diagram in each case shows the characteristics:

- Speed - Torque (blue wide)
- Current - Torque (red narrow)

The lower diagram in each case shows the 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 only show 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.

The diagrams are valid without exception for the operating temperature status, based on:

- armature temperature ~ 125 °C
- solenoid temperature ~ 105 °C
- ambient temperature 25 °C

Application example:

Given:	Voltage	U = 48 V
	Torque	M = 115 Ncm
Required:	Speed n	
	Current I	
	Output P	
	Efficiency η	

Readings in upper diagram:

- Starting from M = 115 Ncm vertical (1) go to the speed characteristic for U = 48 V. Intersecting point A is on the borderline, i.e. still in the permitted area.
- Go from A 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.
- Go from B horizontally (3) to the right to the current scale and then read off the relevant amperage (here: ~8.7 A).

Readings in lower diagram:

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

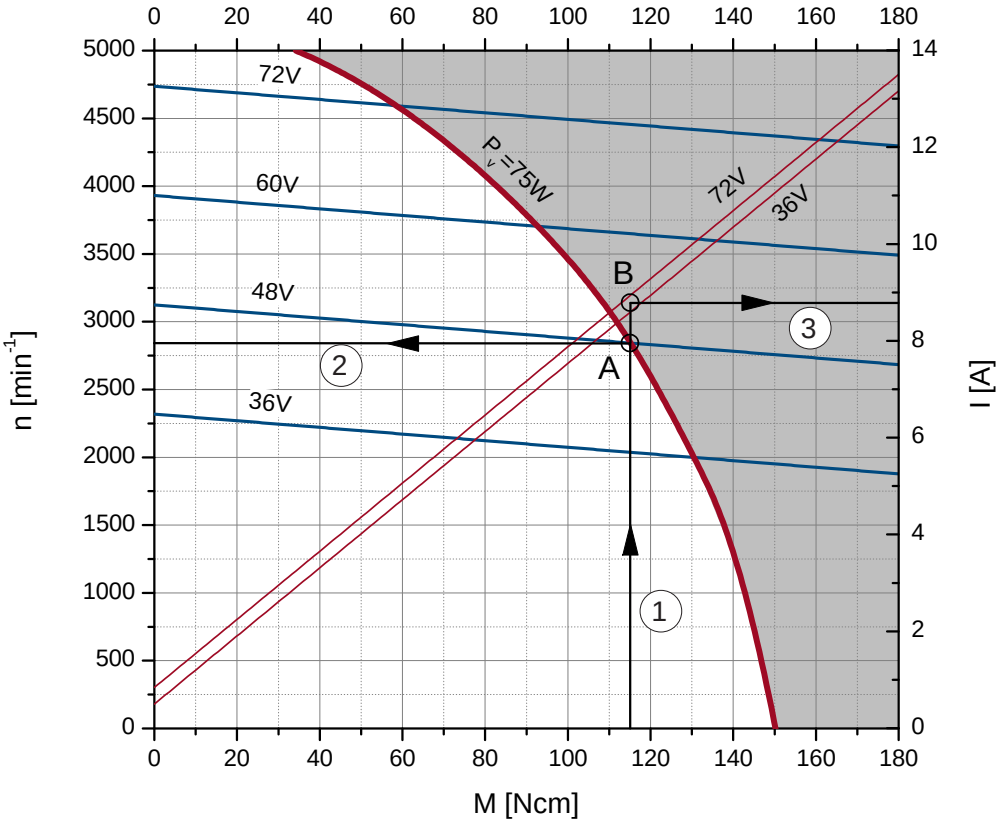
Unknown values can be determined for other given variables in the same manner.

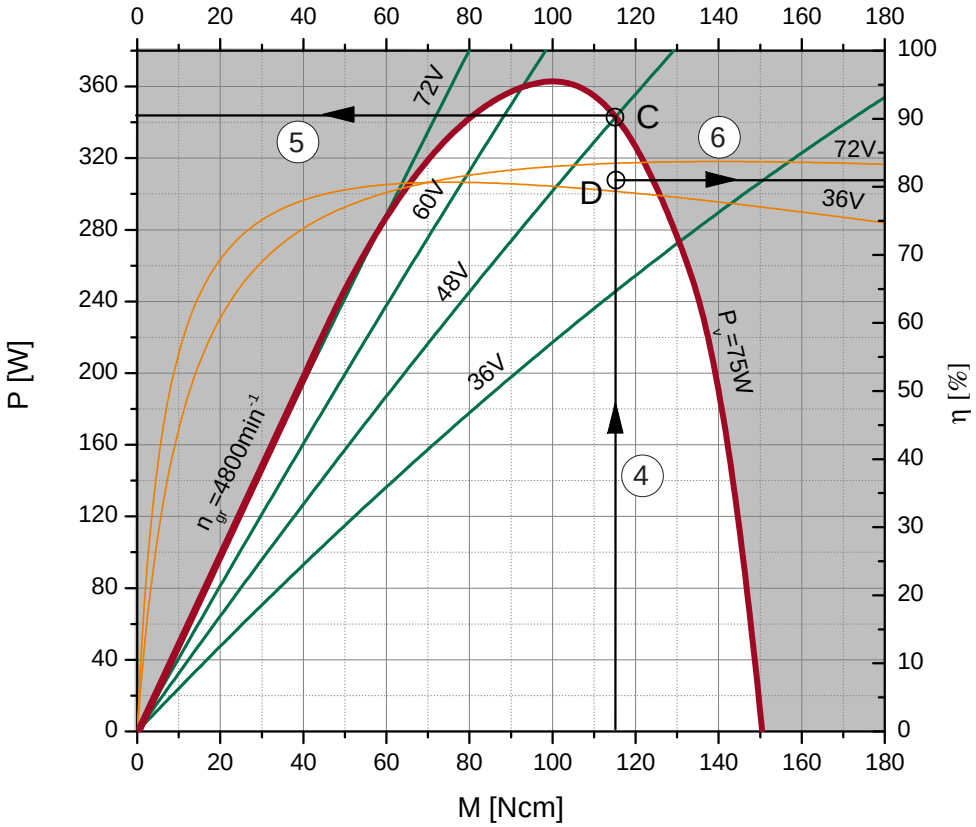
Additional example:

Required:	Speed n = 2000 rpm
	Torque M = 120 Ncm = 1.2 Nm
	(i.e. P = 0.104•M•n = 250 W)
Required:	The relevant required operating voltage
Result:	U ≈ 36 V

Selection Diagrams

Instructions for Use





Notes

Notes

HEINZMANN®

PERM TECHNOLOGIE

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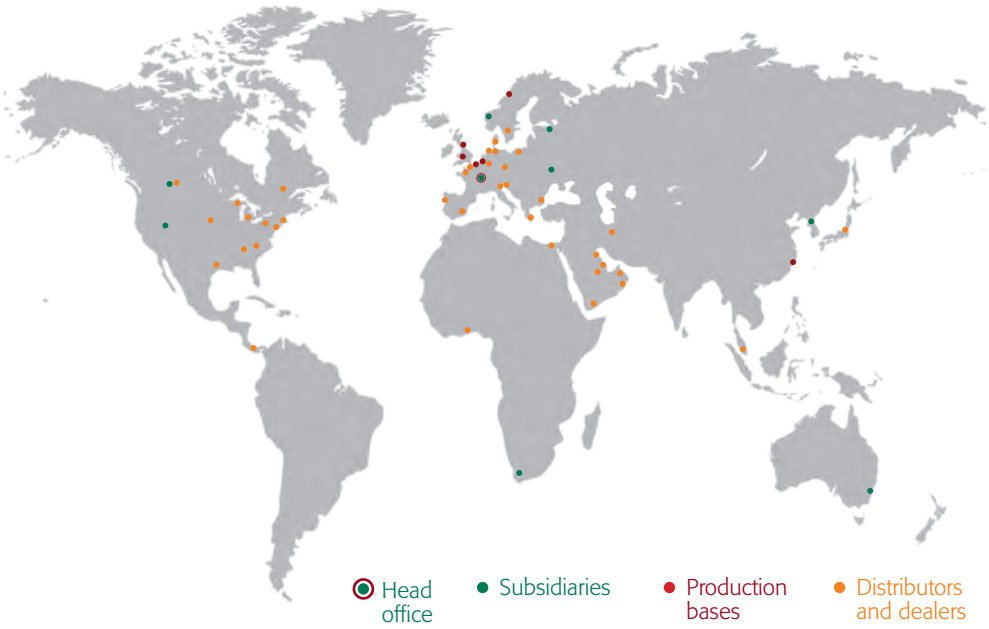

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