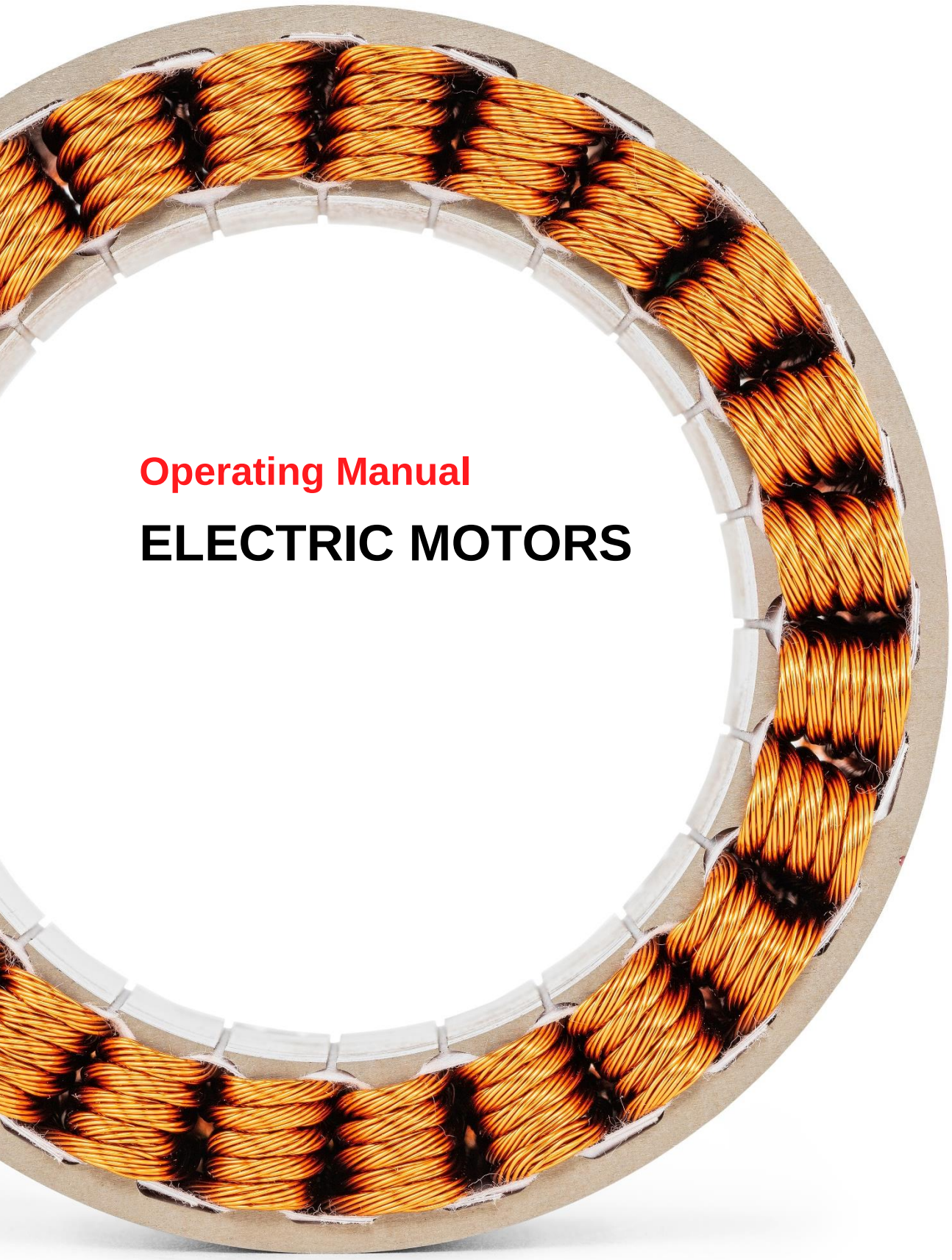
PLETTENBERG
HIGH-END ELECTRIC DRIVE SOLUTIONS



Operating Manual

ELECTRIC MOTORS

OM_Plettenberg_Electric_Motors | Version 1.1 | 2025.04.02

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1. About this document

Legal provisions

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Liability

We shall not be liable for the slightly negligent breach of non-essential contractual obligations. In the case of slightly negligent breaches of essential contractual obligations, also if they have been committed by our legal representatives or our vicarious agents, our liability is limited to the foreseeable damage typical for the contract. Unlimited liability on our part exists for damages to body and health of the customer culpably caused by us, our legal representatives or our vicarious agents, as well as in the case of intent and gross negligence and for the absence of the guaranteed quality.

If damage caused by slight negligence on the part of the customer attributable to us is covered by an existing insurance policy of the customer, our liability in the event of damage to property and/or financial loss shall be limited to the disadvantages for the customer associated with the claim against the insurance company.

We shall not be liable for damage caused by improper handling of our products as well as improper influence of third parties on our products, improper assembly and/or installation, overstressing or overvoltage, unless these are due to our fault or a fault of our representatives or vicarious agents. The same applies in the event of unauthorised and improper repairs or interventions in the delivery item by the purchaser or third parties.

We shall not be liable for damage caused by incorrect information and communications from the customer, unless these are due to our fault or a fault of our representatives or vicarious agents.

We expressly point out that our standard motors, motor controllers and other products have not been subjected to the safety and endurance tests prescribed for aircraft and aircraft equipment. Therefore, we are not liable for damage of any kind which occurs during and/or through the operation of our motors, motor controllers and other products in manned aircraft or related airborne systems, such aeroplanes, microlight aircraft, rockets, hang-gliders and gliders, parachutes, air traffic control systems, etc. We are also expressly not liable for damages due to aircraft being grounded. The use of our products in aircrafts or other airborne systems needs to be specifically agreed with us and relevant safety and endurance tests will have to be performed.

We expressly point out that our motors, motor controllers and other products are not designed and approved for use in control systems of nuclear reactors.

We are not liable for any kind of damage caused during and/or by the operation of our motors, motor controllers and other products in control systems of nuclear reactors or in/at nuclear reactors.

We are not liable for damages of any kind that arise from applications and use of our products that are subject to the German war weapons act.

Our liability under the product liability act remains unaffected.

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Scope of validity

This document applies for the following motor series:

Motor Type			
BLDC Inrunner		**BLDC Outrunner**	**Brushed DC**
NOVA 1	ADVANCE 1 (*)	ORBIT 1	ALPHA 1
NOVA 3	ADVANCE 3	ORBIT 5	ALPHA 2
NOVA 4 LW (*)	ADVANCE 5 (*)	ORBIT 15 (*)	
NOVA 5			
NOVA 10			
NOVA 15 LW (*)			
NOVA 15 WK (*)			
NOVA 30 (*)			
NOVA 50			

(*) Part of COTS Portfolio

Across the above stated motor series, Plettenberg offers various lengths and configurations. Please note that this operating manual covers all relevant configurations and subvariants.

Target group

The activities described in this document may only be executed by qualified, skilled workers. The qualified, skilled workers must possess the following qualifications:

- Knowledge regarding the functional methods and operation for the product
- Knowledge and observation of these instructions with all safety notes
- Technical standards must be observed

Updated additional information

Links regarding updated additional information can be found under: www.plettenbergmotors.com

Symbols

Symbol	Clarification
	Warning, the non-observance of which leads directly to death or serious injury
	Warning, the non-observance of which may result in serious injury
	Warning, the non-observance of which may result in minor or moderate injury
	Warning, non-observance of which may result in damage to property
	Information, which is important for a specific subject or goal, but not relevant to safety.

Nomenclature

Name used in this document	Full name
LW	Light weight
WK	Water cooled
CW	Clockwise
CCW	Counter clockwise
ESC	Electronic speed controller
BLDC	Brushless direct current
DC	Direct current

2. Product overview

Introduction

Plettenberg is a leading developer and manufacturer of electric drive solutions for mission critical applications, including aerospace & defense, uncrewed systems, maritime, racing and many others. We are the global leader in ultra-rugged high-performance inrunner BLDC motors. Our portfolio also includes outrunner BLDC motors, brushed DC motors, ESCs, starter & generator systems as well as accessories. It is our mission to help our customers to be successful, by solving their most demanding challenges with our cutting-edge tailored drive solutions and by providing the best power-to-weight-to-robustness ratio on the market. We manufacture 100% of our products at our HQ in Germany and have a quality system which is EN 9100:2018 certified.

Our **Commercial-Off-The-Shelf ("COTS")** drive solutions have been designed to cover a wide range of applications in demanding end-markets. Our portfolio of more than 30 COTS standard motors comprises rugged inrunner BLDC motors from our NOVA and ADVANCE series as well as outrunner BLDC motors from our ORBIT series. Datasheets for all COTS motors are available.

For applications that require more customization, our **Modified-Off-The-Shelf ("MOTS")** motors offer the same mechanical components as our COTS motors, but with a tailored winding that determines the motor's Kv (rpm/V), allowing us to adapt the motor to specific requirements. Plettenberg provides MOTS motors with electrical design support from our engineering team, including engineering studies, data sheets, and performance simulations.

If a MOTS solution is not sufficient and significant tailorization is required, a **Fully Custom ("FC")** solution is the best choice. FC drive solutions are often highly application specific and adjusted to complex requirements. Examples of customization options include custom housing and shaft, IP67 rating, compliance with MIL-STD 810H or RTCA DO-160, special wrapping of magnets for ultra-high rpm applications, redundant winding solutions, etc. Based on our experience, most projects begin with a COTS or MOTS solution, progressing to FC solutions as initial data is collected and requirements become more defined.

Customization

All our drive solutions are made-to-order and tailored to the specific requirements of our customers. This can include adjustments to housing, shaft, number of poles, winding, cooling, potting, IP rating, etc. These adjustments allow us to build the most efficient, lightest and robust drive solutions for our customers.

Total Efficiency

We take a holistic perspective and always look at total efficiency over the entire load profile. We tailor our products such that endurance and performance is maximized, and weight is minimized. Often, a tailored drive solution can increase efficiency by 15-30%, mitigate the need for gearboxes and reduce overall system cost.

Life Cycle

We support our customers throughout the entire product life cycle. Our engineers provide extensive development and system integration advise and support with prototyping. Following development, we manufacture the final series inhouse for as many years as required by our customers. We also offer an extensive spare parts program.

Robustness

All our drive solutions are rugged in design and built for application in harsh environments. Our NOVA series of BLDC inrunners is available with ingress protection of up to 67. This makes them ideally suited for missions in the harshest environments, such as snow, desert or sea water operation.

Quality

All our drive solutions are developed and manufactured at our HQ in Germany. We employ highly experienced professionals with many years of experience. We believe in products built by hand, as it provides for the highest quality and a great degree of flexibility. We have a strict quality system which is EN 9100:2018 certified.

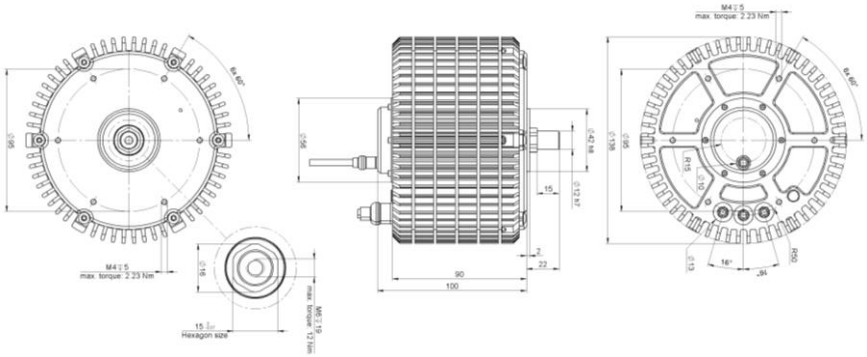
Solution Focus

We provide customers with tailored system solutions, comprising motor, ESC as well as related accessories. Next to the hardware, we provide extensive engineering and system integration support. In the case of starter-generators, we provide the generator as well as starter-generator electronic boxes.

BLDC Inrunner

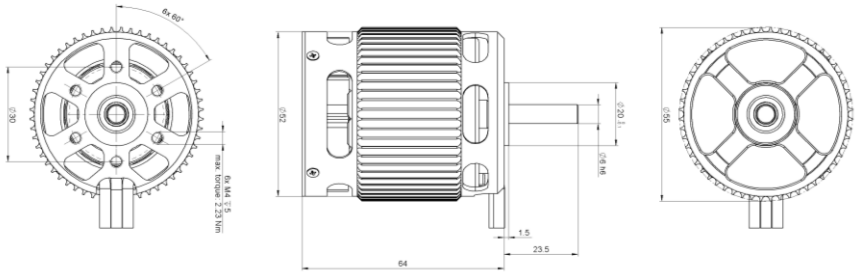
Our inrunner motors consist of the **NOVA** and the **ADVANCE** families.

The **NOVA** series of inrunners feature an extra rugged closed housing design with ingress protection of up to IP67. The motors can be applied in the harshest environments, such as desert, snow and sea water operations. At the same time, the NOVA motors are designed to be extremely efficient and have market leading power-to-weight ratios. The NOVA series is available in the power range from below 1kW to 50kW.



NOVA 15-50 LW. Note: Only for illustration, please refer to motor datasheets and our COTS brochure.

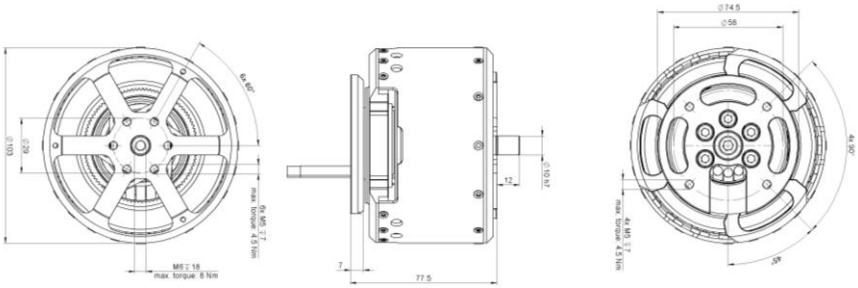
The **ADVANCE** series of inrunners feature a weight-optimized open housing design. This allows for best-in-class power-to-weight ratios and makes the motors very suitable for applications with constraints in space, weight and power supply. The ADVANCE series is available in the power range from 1kW to 5kW.



Advance 1-30. Note: Only for illustration, please refer to motor datasheets and our COTS brochure.

BLDC Outrunner

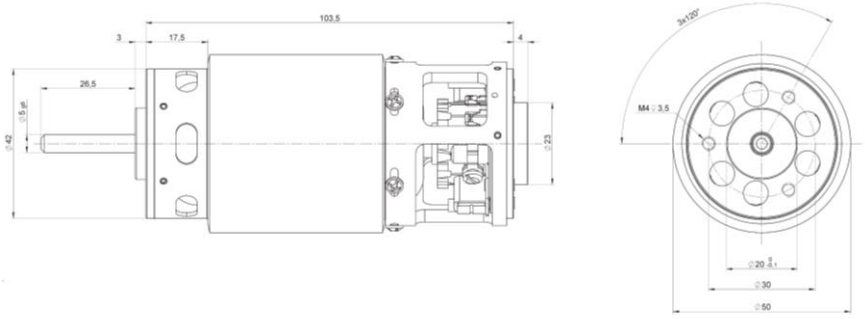
The **ORBIT** series of outrunners have been developed for applications with constraints in space, weight and power supply. Compared to other outrunners in the market, the ORBIT series is built much more robust and features a reinforced rotor casing. The ORBIT Series is available in the power range from below 1kW to 15kW.



Orbit 15-30. Note: Only for illustration, please refer to motor datasheets and our COTS brochure.

Brushed DC

The **ALPHA** series of brushed DC motors are ideally suited for industrial and other applications, with highest requirements regarding power-to-weight ratio, durability, efficiency and cost. The ALPHA series is available in the power range from below 500W to 1.5kW.



Alpha 2-50. Note: Only for illustration, please refer to motor datasheets and our COTS brochure

Type designation and Partnumber

Plettenberg motors are designed based a modular system and are available in +5,000 configurations. In Addition, 30 COTS / standard motor are available. Customers are advised to provide all their relevant details and specifications in the form of the Plettenberg Specification Sheet (Please reach out to sales@plettenbergmotors.com for more information). Based on the received information, the engineering team of Plettenberg will determine the electrical design of the relevant drive system. The format of the resulting motor design designation is based on a code system. The below figure provides an illustrative (non-comprehensive) configuration for a Plettenberg motor. Please note that the type designation is not a unique identifier. Each motor receives an individual part number ("P/N") which should serve as its identifier of configuration and revision.

	Type Designation																			
	Integration kits	Motor type	Stator inner diameter	Stator active length	Winding type	Number of windings	Multiple windings	Armoring	Number of poles	Light-weight version	High voltage versions	Shaft design	Gear ratio	Outer housing diameter	Cooling	Sensor type	Front/rear mounting	Ingress protection class	Integrated ESC	Integrated ESC max. voltage	Integrated ESC max. current
Options	EBS	NOVA	0-9999	0-999	A	1-99	X2	S	P2-P99	LW	HV	PF	G1-99	D129	WK	SR	FM	IP00-68	iMST	1-999	1-999
	ABS	ORBIT			B		X3				HV+	2PF		D138	FC	SL	RM				
		ADVANCE										6K		D158		SN	FRM				
		ALPHA														ER					
		HP														EL					
		PT														EN					

Motor rotation designation

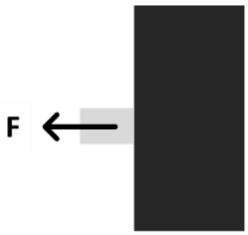
COTS and MOTS motors do not have a preferred direction of rotation. Only FC sensor guided motors may have a specified direction (CW or CCW), which needs to be specified when ordering the motor. Please use the definitions as illustrated in the below chart.

Clockwise rotation (**CW**)

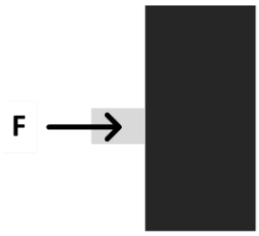
Counter-clockwise rotation (**CCW**)

Motor force direction designation

Plettenberg motors may be specified for pull or push application (or both for some series). The force direction needs to be specified when ordering the motor.



Side view: Force (Tractor/Pull)



Side view: Force (Pusher)

RPM limits

The table below illustrates the RPM limit by motor type.

RPM limits	
Motor Type	**RPM Limit (1/min)**
NOVA 1	15,000
NOVA 3	20,000
NOVA 4 LW (*)	8,000 | S-Version 16,000
NOVA 5	10,000
NOVA 10 (*)	12,000
NOVA 15 LW (*)	8,000 | S-Version 11,000
NOVA 15 WK (*)	8,000 | S-Version 11,000
NOVA 30	5,000 | S-Version 7,000
NOVA 50	5,600
ADVANCE 1	15,000
ADVANCE 3	25,000
ADVANCE 5	8,000
ORBIT 1	25,000
ORBIT 5	8,000
ORBIT 15	7,000
ALPHA 1	25,000
ALPHA 2	20,000

(*) Higher RPM versions available as option.

3. Safety

Intended use

The area of validity is defined as:

- Drive unit

The following are considered improper use in the sense of a foreseeable misuse:

- Using the motor in public vehicles and transport without approval by Plettenberg
- Using the motor in manned aircrafts and other manned airborne systems without approval by Plettenberg
- Using the motor as a toy
- Using the motor in potentially explosive atmospheres
- Any use other than those provided for

The use of our products outside the area of validity needs to be specifically agreed with us and relevant safety and endurance tests will have to be performed.

Safety Information

This chapter contains safety instructions which must always be observed when working on and with the product. In order to prevent personal injury and property damage and to ensure continuous operation of the product, always read this chapter carefully and follow all safety instructions at all times.

Danger

Slight, moderate or severe injuries

Malfunctions can be caused by electromagnetic interference. Communication equipment and other devices in the surroundings must not be exposed to impermissible electromagnetic interference.

- Modifications to the product are not permitted.
- Before the first operation, the product must be checked for damages and the correct connection of all connections must be checked again.
- The phase cables must not touch any metal surfaces. (capacitive and inductive coupling)
- Power cables and control cables must be minimum 3 cm distance from each other.
- The phase cables must not be laid as a coil.
- The phase cables must be laid twisted (one turn every 20 cm).

Warning

Cut injures, loss of eyesight!

- The product must never be contaminated with foreign bodies / adhesives / paint during assembly.
- Modifications to the product are forbidden.
- Always ensure that the motor is properly fastened.
- Always ensure that the motor controller settings are correct.
- The product must be sufficiently cooled.
- Operation of the motor at idling speed without load is prohibited.

Warning

Electric shock, burns, fire
Caused by energised parts.

- The product must always be protected against overheating, dirt and moisture, otherwise the components will be damaged. This can cause short circuits.
- The product as well as the contacts must be inspected for overheating, soiling, deformation, fire and moisture before commissioning.
- Assembly and disassembly must be carried out only when in de-energised condition.
- Always ensure proper handling.
- Modifications to the product are not permitted.
- Always ensure that the motor is properly fastened.
- The bending radius of the connecting cables must be greater than 6x outer diameter.
- The product must be sufficiently cooled.
- Operation of the motor at idling speed without load is prohibited.

⚠ Warning

Injuries due to crushing, being caught up
Malfunction due to electromagnetic interference.

- The control and phase cables must not be extended. The product must be inspected and the fastening must be controlled again before commissioning.
- Modifications to the product are not permitted.

⚠ Danger

Danger from magnetic radiation
Malfunction / destruction of magnetically sensitive parts.

- The motor must never come into contact with magnetically sensitive parts such as pacemakers or data carriers. The strong magnets can lead to damage and / or malfunction or extinction of these.

⚠ Danger

Crushing, pulling in / being caught up
Caused by careless touching and too small a distance from rotating parts.

- There must be sufficient distance retained to the motor so that no people or objects can be caught up or drawn in.

⚠ Caution

Burns
Caused by carelessly touching hot surfaces.

- The surfaces could be hot after operating the product. Always let the product cool down.

Notice

Thermal overload / destruction

- Always ensure sufficient cooling for the motor (air or water cooling)
- A high load on the motor is only permissible in short operation. Under no circumstances must the motor exceed the temperature of 100°C.
- Only motor controllers and regulators approved by Plettenberg must be used.

4. Commissioning

Safety during commissioning

Danger

Severe, moderate or minor injuries.
Destruction or damage to the product

- Safety instructions from Chapter 2 must be complied with!
- Test runs with prop should only be executed outdoors or with special safety equipment, such as caged test stand.
- The side and front of the rotating plane needs to be kept clear.

Assembly & mounting

Notice

Destruction / damage of the motor

- Always use suitable screws or bolts.
- Sawed or ground screws or bolts can destroy the thread in the motor's bearing shield.
- After each use, the motor must cool down again to ambient temperature.
- Only motor controllers and regulators approved by Plettenberg must be used.
- Never exceed the maximum screw-in depth. Screws or bolts which are screwed too far will damage or destroy the motor.
- Only use original screws or bolts.
- The motor phases must not be shortened without prior consultation. Crimping of connections must also not be executed without previous consultation.

Mounting of the motor shall be performed on a firm base with an appropriate number of bolts. Please refer to the Datasheets for recommended bolt sizes and torque. Depending on the model, the motor may be specified for front mounting, back mounting or both. Please contact us for any questions on mounting and installation.

Cable connections

Only motor controllers and regulators approved by Plettenberg must be used. If other motor controllers or regulators are used, Plettenberg cannot assume any guarantee or liability in the event of destruction of the motor, regulator or the motor controller.

Motor connection cables must never be shortened or extended.

The three motor phases must be connected to the motor controller according the manufacturer´s instructions.

The sensor cable must be connected to the motor controller in accordance with the manufacturer´s specifications.

Soldered connections

Notice

Destruction of / damage to the motor due to poor-quality or high-resistance connections.

⚠ Caution

Burns
Caused by carelessly touching hot surfaces.

Additionally required tools/materials
(not included)

- No-clean lead-free solder
- Heat shrink tubing
- Cable
- Soldering iron rated at least 100 W
- Heat gun

Sensors

Plettenberg motors are available with various positioning and temperature sensors, which are used for commutation and monitoring. The below table provides an overview on the availability of sensor types.

Sensor Types				
Motor Type	**Positioning Sensor**			**Temperature Sensor**
	Stator	**Rotor**	**Shaft**	
NOVA 1	!	!	!	✓
NOVA 3	!	!	!	✓
NOVA 4 LW	✗	!	✓	✓
NOVA 5	!	!	!	✓
NOVA 10	!	!	!	✓
NOVA 15 LW	!	!	✓	✓
NOVA 15 WK	✓	✗	!	✓
NOVA 30	✓	✗	✗	✓
NOVA 50	✗	✓	✗	✓
ADVANCE 1	✗	✗	✗	✗
ADVANCE 3	✗	✗	✗	✗
ADVANCE 5	✗	✗	✗	✗
ORBIT 1	✗	✗	✗	!
ORBIT 5	✗	✗	✗	!
ORBIT 15	!	✗	✗	!
ALPHA 1	-	-	-	✗
ALPHA 2	-	-	-	✗

Note: ✓ *available in COTS Portfolio*
! *optional, not available in COTS Portfolio*
✗ *not available*

Plettenberg's standard positioning sensor for the NOVA Series, except for the NOVA 30, is an angular shaft encoder with integrated Hall sensors for precise position detection. It provides commutation signals (U, V, W), while incremental signals (A, B, Z) are available upon request but are not part of the standard COTS portfolio. Designed for high-speed operation, the sensor is suitable for EC motors with up to 16 pole pairs.

For specific applications, alternative solutions such as rotor or stator sensors can be provided upon request, but they are not included in the commercial-off-the-shelf (COTS) portfolio. Custom encoder and positioning sensor integration is also available. All sensors operate at a voltage of 5V.

The Advance and Orbit series of brushless DC motors do not feature built-in commutation sensors and are offered exclusively as sensorless motors in the standard COTS portfolio.

NOVA Series motors are equipped with a built-in 47k NTC temperature sensor (Murata Electronics NCU18WB473F60RB) in standard. This sensor is mounted on a PCB that is potted onto the stator. Therefore, the measured temperature is slightly delayed compared to the actual stator temperature, which must be considered for short bursts/peak loads to avoid permanent damage to the windings. For more information and specific data of the NTC, please refer to the datasheet. Optionally, Plettenberg can integrate a PT1000 sensor either directly into the winding or onto the stator PCB. Please note that the PT1000 sensor is not compatible with Plettenberg's MST series.

Commutation sequences

Notice

Destruction of / damage to the motor controller due to short-circuits or incorrect wiring.

Block commutation with sensors

The feedback of the rotor position is implemented through a positioning sensor integrated into the motor. The sensors are electrically offset by 120-degree and deliver six different switch positions per revolution. The three partial windings are driven by the motor controller in accordance with the sensor information.

Forwards switch positions:

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Fault 1	Fault 2
Phase A (U)	+	Z	-	-	Z	+	Z	Z
Phase B (V)	Z	+	+	Z	-	-	Z	Z
Phase C (W)	-	-	Z	+	+	Z	Z	Z
Sensor A	1	1	0	0	0	1	0	1
Sensor B	0	1	1	1	0	0	0	1
Sensor C	0	0	0	1	1	1	0	1

Reverse switch positions:

	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Fault 1	Fault 2
Phase A (U)	-	-	Z	+	+	Z	Z	Z
Phase B (V)	Z	+	+	Z	-	-	Z	Z
Phase C (W)	+	Z	-	-	Z	+	Z	Z
Sensor A	1	1	0	0	0	1	0	1
Sensor B	0	0	0	1	1	1	0	1
Sensor C	0	1	1	1	0	0	0	1

Index	Description
Z	High-resistance
+	Plus
-	Minus
1	> 3V
0	< 2V

Motor sensor

Cable	Color	Designation	Description
1	Green	Motor Sensor C	Output Hall Sensor C
2	Red	+5V Power Supply	Sensor Power Supply
3	White	Motor Sensor B	Output Hall Sensor B
4	Black	GND	Sensor Ground
5	Yellow/Orange	Motor Sensor A	Output Hall Sensor A
6	Blue	Temperature Sensor	NTC 47k or PT1000

Plettenberg MST / iMST RS-232 / analog / digital

Pin	Colour	Designation	Description
1	Orange/Black	Target value, brake (Aux)	Analog input 0-5V
2	Green/Black	Target value, throttle (Throttle)	Analog input 0-5V
3	White/Black	RxD	RS-232 receiver signal
4	Blue/Black	NC	Not used
5	Blue	TxD	RS-232 transmitter signal
6	Orange	Pulse input (optional)	Digital input[1]
7	Green	Reverse switch	0V forwards / 5V reverse
8	Red	+5V (max. 30mA)[2]	Potentiometer supply
9	Black	GND	Signal Ground
10	White	CAN-H	CAN bus high
11	Red/Black	CAN-L	CAN bus low
12	Black/White	I/O (optional)	Digital switch output (max. 60V / 2A) or control part supply

Thermal management

The general guideline for air-cooled motors is that airflow should pass through the entire cooling fins in the axial direction. The specific airflow speed required depends on the motor type, load profile, and customer application. As a reference, an airflow speed of 10 m/s serves as a good starting point. Therefore, Plettenberg recommends consulting its engineering team to receive a detailed thermal simulation. For applications with insufficient or non-ideal airflow, Plettenberg has a wide range to active and passive cooling solutions available.

For water-cooled motors, Plettenberg recommends minimum flow of 7 litres-per-minute at max. 40 degrees Celsius inlet temperature. Coolant pressure shall not exceed 2 bar/ 29 PSI. For specific pressure drops by motor type please reach out to us.

[1] PWM signal high min. 1.5V, recommended 5V, max. 28V, low max. 0.5V
[2] Supply for an electronic accelerator pedal and/or electronic brake pedal. The 5V power supply can deliver a maximum **total** of 50mA. If the Hall sensors of the motor require a total of 20mA, 30mA remain available for the accelerator pedal and brake pedal.

Plettenberg motors of the NOVA series are equipped with a temperature sensor. The sensor measures the temperature in the stator, which shall never exceed 100 degrees Celsius.

Visual inspection and mechanical inspection

All fastening screws or bolts for the motor must be checked for tightness before commissioning.

It needs to be ensured that all energized cables, plugs and sockets are insulated so that unintentional switching on of the motor by cable contact is prevented.

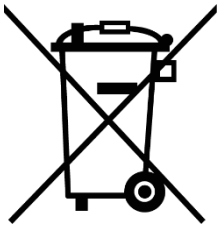
5. Maintenance

General

The housing surfaces can be cleaned with compressed air and a dry, lint-free cloth.

The maintenance requirements can vary by the type of motor. Please consult sales@plettenbergmotors.com for detailed information on requirements.

6. Disposal



A motor that has reached the end of its service life is electrical scrap.

Electrical scrap consists of valuable materials, which can be recovered as secondary raw materials, but also of environmentally hazardous substances.

Information regarding optimum material recycling is available from commercial waste disposal companies.

7. Service / Contact

Please contact us for any questions and/or information on service.

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sales@plettenbergmotors.com

8. EU Declaration of Conformity

In the sense of the EU Directives

- **EMC Directive 2014/30/EU Appendix IV**
- **Low Voltage Directive 2014/35/EU Appendix IV**
- **RoHS Directive 2011/65/EU Appendix I**

CE

Plettenberg Elektromotoren GmbH & Co. KG

Rostocker Straße 30
34225 Baunatal, Germany

hereby declares, as the manufacturer, that the articles and objects described below comply with the provisions of the relevant community harmonisation legislation referred to above.

Motor Type			
BLDC Inrunner		**BLDC Outrunner**	**Brushed DC**
NOVA 1	ADVANCE 1	ORBIT 1	ALPHA 1
NOVA 3	ADVANCE 3	ORBIT 5	ALPHA 2
NOVA 4 LW	ADVANCE 5	ORBIT 15	
NOVA 5			
NOVA 10			
NOVA 15 LW			
NOVA 15 WK			
NOVA 30			
NOVA 50			

Emitted interference	**EMC Directive Article 6 Appendix I.1.a**
DIN EN 61000-6-3:2011-09	Electromagnetic Compatibility (EMC)- Part 6-3: Generic standards - Interference emission for residential areas, business and commercial areas as well as small businesses (IEC 61000-6-3:2006 + A1:2010); German Edition EN 61000-6-3:2007 + A1:2011
Immunity to interference	**EMC Directive Article 6 Appendix I.1.b**
DIN EN 61000-6-1:2007-10	Electromagnetic Compatibility (EMC)- Part 6-1: Generic standards - Immunity for residential environments, business and commercial areas as well as small businesses (IEC 61000-6-1:2005);

Safety of machinery	
DIN EN 60335-1:2012-10	Safety Household and similar electrical appliances - Part 1: General requirements (IEC 603351:2010, modified);
DIN EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk mitigation ISO 12100:2010: German Edition EN ISO 12100
DIN EN 60204-11:2014-10	Safety for Machinery – Electrical Equipment for Machinery – Part 1: General requirements (IEC 44/709/CDV:2014); German Edition FprEN 60204-1:2014

Maximum permissible concentrations in homogeneous materials in % by weight	RoHS Directive Appendix II
Lead	0.1%
Cadmium	0.01%
Polybrominated biphenyl (PBB)	0.1%
Polybrominated diphenyl ether (PBDE)	0.1%
Mercury	0.1%
Hexavalent chromium	0.1%

Note:

The sole responsibility for drawing up this declaration of conformity lies with the manufacturer. This declaration of conformity will lose its validity when the product is converted, extended or altered in any other manner without the express consent of Plettenberg Elektromotoren GmbH & Co. KG and when components, not belonging to Plettenberg Elektromotoren GmbH & Co. KG, or accessories are installed in the product as well as in the event of improper connection or improper use of the product.

Baunatal, 02.04.2025 .....

(Bastian Greiner, Managing Director)

9. Document Changelog

Version	Date	Author	Revised Sections	Justification
V1.0	14.07.2023	MG	All Sections	Initial Release
V1.1	01.04.2025	MW	Product Overview Safety Commissioning Appendix	• Integrated COTS/MOTS and FC Solutions in Product Overview. • Adjustment of section “Type designation” in chapter 2 to latest standard. • Addition of “RPM limits” as new section in chapter 2. • Adjustment of description as well as table “Sensor Types” under section “Sensors” in chapter 4. • Change of certain images and atble designs throughout the document • Addition of document changelog • Update release dates and Version to V1.1 • Delete appendix and reference to datasheets