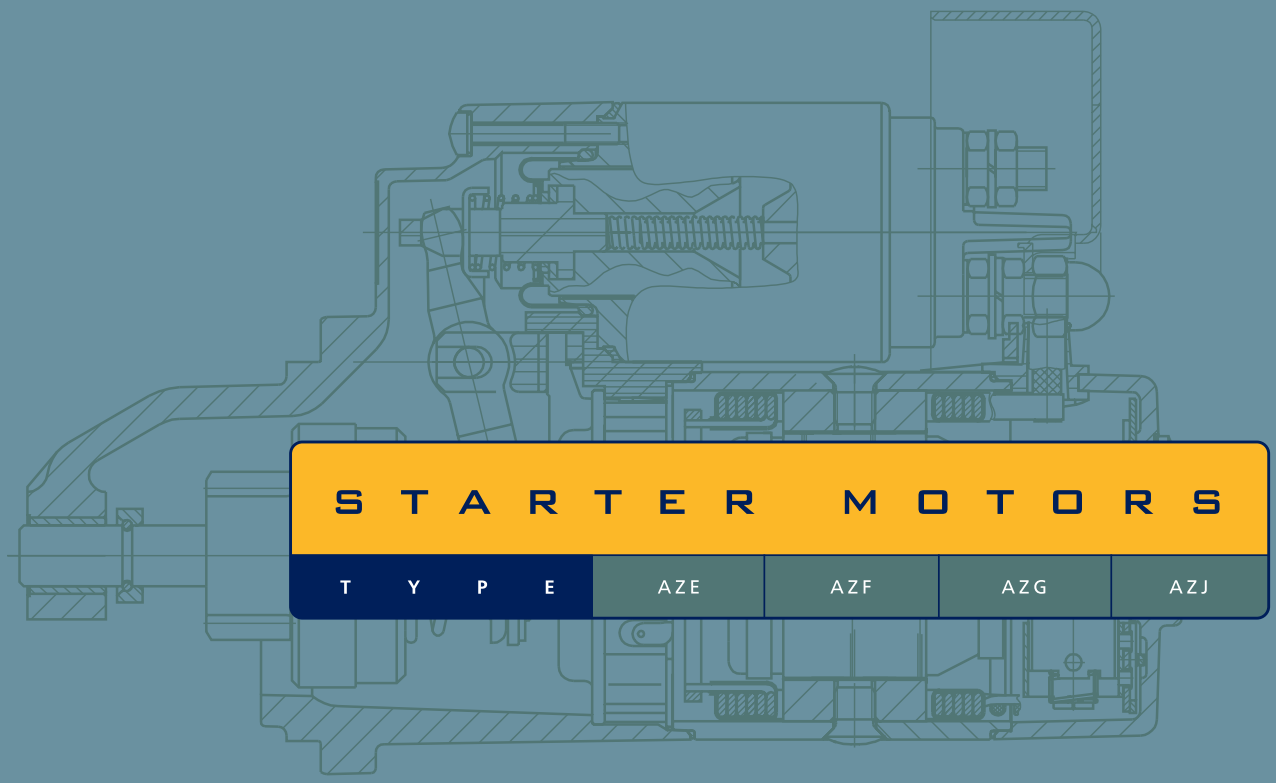


STARTER MOTORS

TYPE	AZE	AZF	AZG	AZJ

Iskra

Iskra Avtoelektrika d.d.

AZE 12
AZE 15

AZE 21
AZE 25
AZE 26

AZE 45
AZE 46

AZF 45
AZF 46

AZG

AZJ

The range of starter motors produced by Iskra Avtoelektrika is the result of long-standing co-operation with manufacturers of internal combustion engines. The liaison with our partners, their requirements and expectations, and an in-depth knowledge of cranking requirements are reflected in the optimised design of our starter families. Today Iskra Avtoelektrika can provide starters of all capacities for starting diesel and petrol engines used by the automotive, truck, tractor, and other industries.

We pay special attention to the latest developments in the field of starters and to continued technological progress. Our experts are acutely aware of the need for starter motors to become smaller, lighter and more efficient. The results of these approaches are up-to-the moment reduction gear starters that are gradually replacing all direct drive starter motors.

High performance starter motors are based on long-term co-operation with our customers in different industries, on their specific requirements and expectations, on the requirements of many complex applications, and on our long years' experience in planning, production, and testing in our own laboratories, as well as in the application. Iskra Avtoelektrika guarantees quality by applying procedures defined in the international standards ISO 9001 and QS-9000. All business processes from the customers' requirements and expectations through development and production to after-sales activities are carefully planned and controlled. High reliability in exploitation is guaranteed by considering different applications and conditions and is proved by tests of specific versions carried out in our own laboratories.

Various versions of the starters ensure long life in adverse operating conditions. They provide outstanding resistance to salt fog, humidity, water, dust, mud, vibration, high and low temperatures, and aggressive liquids. Their design complies with the standards of electromagnetic compatibility and with other international directives and standards.

Starter motors are produced on the basis of environmentally conscious technologies using environmentally friendly materials.

AZE permanent magnet reduction gear and direct drive starter motors

The diameter of these starter motors is 80 mm. They are used for starting diesel engines with up to a 3-litre displacement and petrol engines with up to a 5-litre displacement. They are designed for use on automotive engines, light commercial vehicles, agricultural machinery, and for other applications.

The motor part of the starter motor is excited by permanent magnets. The units are started and engaged by a solenoid switch and an efficient helical pinion. There are direct drive starter motors with powers of up to 1kW 12V. Starters of higher powers are available in reduction gear versions. The advantages of the reduction gear starters are in lower weight, smaller dimensions, higher specific powers and better efficiency.

For especially harsh operating conditions, we offer a sealed noseless starter.

AZE and AZF reduction gear starters with electrical excitation

The diameter of the AZE starter motors is 90 mm, while the diameter of the AZF starter motors is 95 mm. They are used for starting diesel engines with a 2 to 12 litre displacement. They are designed for commercial vehicles, trucks, tractors, agricultural machinery, construction equipment, ships, stationary motor sets, and for some other applications.

Both starter motor families are reduction gear starters with electrical excitation of the motor part. They are started and engaged by a switch and helical pinion. The advantages of these starters are especially low weight, small dimensions, high specific power and high efficiency. For especially harsh operating conditions specially sealed noseless versions are available.

AZG reduction gear starters with electrical excitation

AZG reduction gear starter motors are four-pole coil excited machines with a yoke diameter of 110 mm. They are distinguished by their high specific power output, efficiency, and excellent cold crank capability with low current drain from battery.

The basic 12V 5kW starter motors are used for starting diesel engines with 5 to 10 litre displacement. They have direct engagement by a switch and helical pinion.

The 24V 6.5kW version of starter motors is used for starting diesel engines with 7 to 17-litre displacement and they have two stage soft engagement controlled by a special electronic start relay.

In AZG reduction gear starter motors high quality thermal resistant materials have been used.

AZJ direct drive starters with electrical excitation

The AZJ family of starter motors is suitable for starting diesel engines with 3 to 8 litre displacement. They are used in commercial vehicles, trucks, tractors, agricultural machinery, construction equipment, ships, stationary engines, and on engines for other applications.

The starter motors are designed as direct drive starter motors. The base diameter of the AZJ starter motors is 115 mm. The power is supplied by a four-pole series wound electric motor. The solenoid switch with pull-in and hold-in windings establishes the engagement of the drive assembly into the ring gear by means of a lever. The roller clutch permits operation in extreme conditions. These starter motors are built with different pinions, flanges and electrical connections corresponding to their installation on various engines and different versions are available for a variety of ambient conditions.

MEANING OF THE TYPE DESIGNATION

A Z X XX XX

Manufacturer's symbol

Starter motor

Yoke diameter:

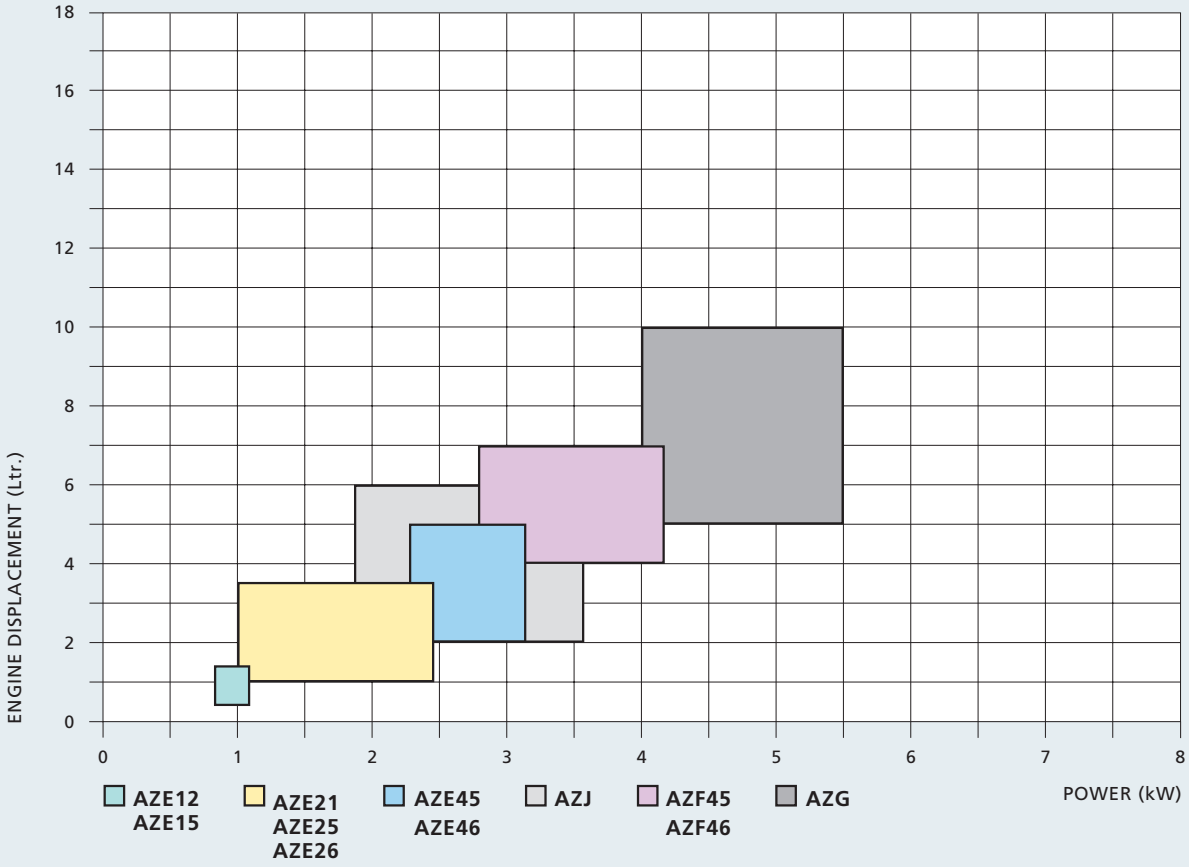
E	80	.....	89 mm
F	90	.....	99 mm
G	100	.....	109 mm
J	110	.....	119 mm

Design versions:

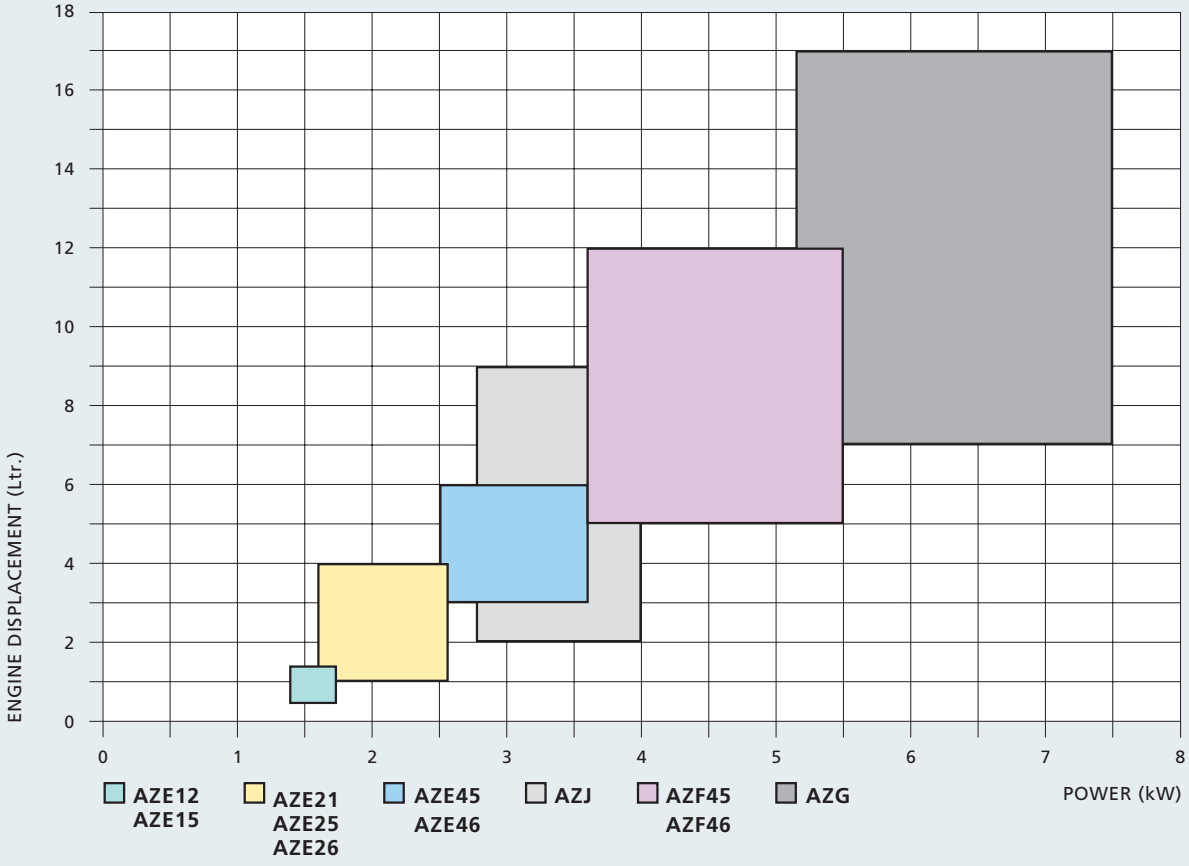
12	- permanent magnet stator
15	- permanent magnet stator with magnetic shunts
21/25/26	- permanent magnet stator and reduction gear nose/noseless
35	- coil stator
45/46	- coil stator and reduction gear nose/noseless

Running number in the subgroup

STARTER MOTORS 12V



STARTER MOTORS 24V



DIRECT DRIVE STARTER MOTORS

APPLICATIONS

Petrol engines of up to 1.5 litre displacement for passenger cars.
Small diesel engines with up to 0.5 litre displacement for marine and agricultural applications.

FEATURES

- High specific power output and efficiency.
- Excellent cold crank capability with low current drain from battery.
- Reduced weight and dimensions in comparison to starter motors with field windings.
- Highly efficient drive assembly for idle run of the pinion.

DESIGN

Excitation by high quality and high coercivity ferrite 6-pole permanent magnets for high torque output.

Magnetic shunts improve the output power and enable high stability and resistance to demagnetisation.

Pinion shift mechanism with solenoid, fork lever and helix.

Five-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

Solenoid switch with pull-in and hold-in windings.

High quality thermal resistant materials.

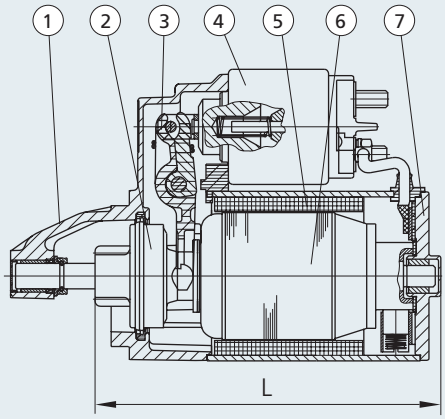
Support brackets of die cast aluminium.

Free of asbestos, cadmium, beryllium and ammonia.

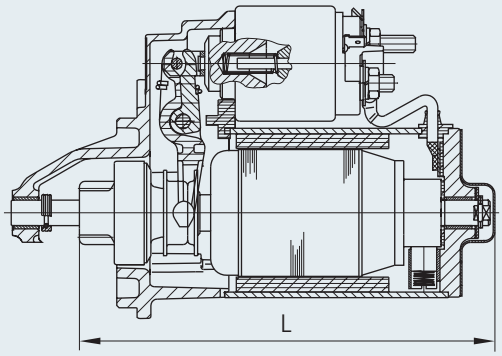
MAIN TECHNICAL DATA

Type	AZE12.. / AZE15..		
Nominal voltage (V)	12		24
Rated power (kW)	0.9	1.0	1.6
Length-AZE12../AZE15.. "L" (mm)	< 157	< 170	<157
Weight-AZE12../AZE15.. (kg)	3.8 to 4.0	3.5	3.8 to 4.0
Yoke diameter (mm)	80		
Stator	6 permanent magnets		
Drive assembly	5 rollers		
Solenoid 12V	pull-in current < 50 A hold-in current < 10 A		
24V	pull-in current < 30 A hold-in current < 7.5 A		
Terminals	30 - M8 31 - M8 50 - M5, M6, 6.3 x 0.8 15a - 6.3 x 0.8, M5 (option)		
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)		
Ambient temperature	- 40°C to + 110°C		

CROSS SECTION



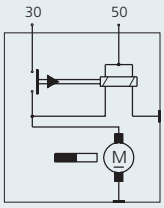
AZE12..

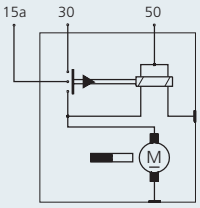


AZE15..

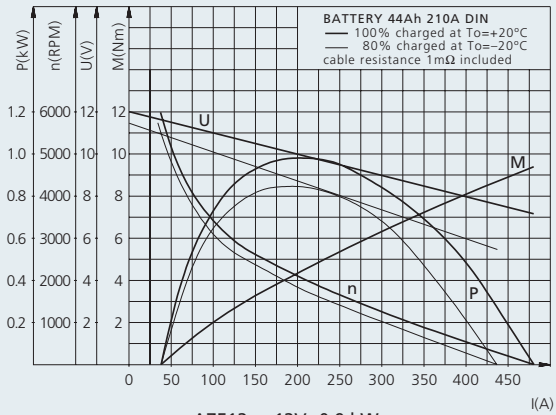
1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Starter switch • 5. Stator • 6. Armature
7. Commutator end bracket

CONNECTION DIAGRAMS

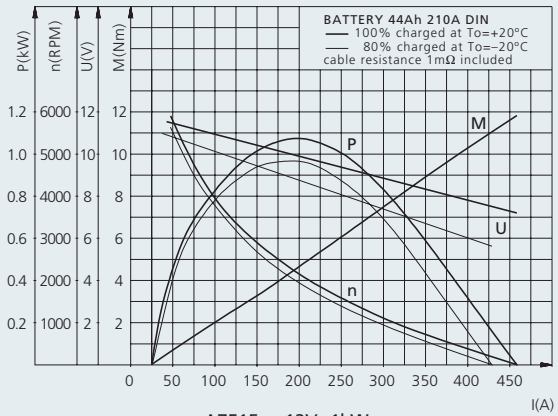




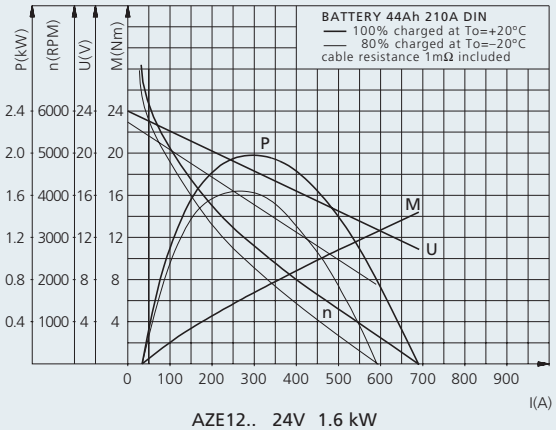
CHARACTERISTICS



AZE12.. 12V 0.9 kW



AZE15.. 12V 1kW



AZE12.. 24V 1.6 kW

MAIN TECHNICAL DATA

Type	AZE21.. / AZE25..- nose / AZE26..- noseless			
Nominal voltage (V)	12			24
Rated power (kW)	1.2	1.4	2.1	2.5
Length - nose Length - noseless "L" (mm)	< 161 < 196	< 175 < 210	<186 < 221	<186 < 221
Weight - nose Weight - noseless (kg)	3.3 3.6	3.75 3.9	4.05 4.2	4.05 4.2
Yoke diameter (mm)	80			
Stator	6 permanent magnets			
Drive assembly	5 rollers or 6 rollers			
Solenoid 12V	pull-in current < 50 A hold-in current < 10 A			
24V	pull-in current < 30 A hold-in current < 7.5 A			
Terminals	30 - M8 31 - M8 50 - M5, M6, 6.3 x 0.8 15a - 6.3 x 0.8, M5 (option)			
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)			
Ambient temperature	- 40°C to + 110°C			

STARTER MOTORS WITH REDUCTION GEAR

APPLICATIONS

Petrol engines of 1 to 5 litre and diesel engines of 1 to 3 litre displacement. Passenger cars, light commercial vehicles, agricultural equipment, marine applications.

FEATURES

- High specific power output and efficiency.
- Excellent cold crank capability with low current drain from battery.
- Reduced weight and dimensions in comparison to direct drive starter motors.
- Highly efficient drive assembly for idle run of the pinion.
- High reliability and long life operation.

DESIGN

Nose or noseless versions for specific applications on the engine.

Excitation by high quality and high coercivity 6-pole ferrite permanent magnets for high torque output.

Magnetic shunts improve the output power and enable high stability and resistance to demagnetisation.

Plastic or iron planetary low-noise reduction gear using a coaxial pinion with an armature.

Pinion shift mechanism with solenoid, fork lever and helix.

Solenoid switch with pull-in and hold-in winding.

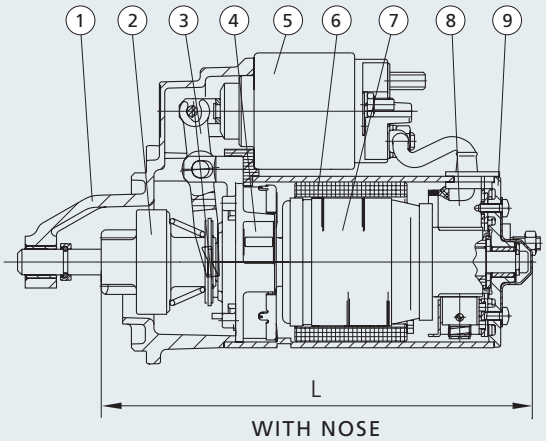
Five or six-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

High quality thermal resistant materials.

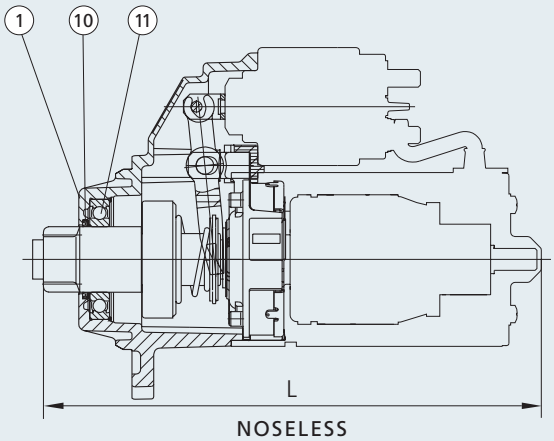
Support brackets of die cast aluminium.

Free of asbestos, cadmium, beryllium and ammonia.

CROSS SECTION



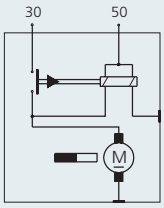
WITH NOSE

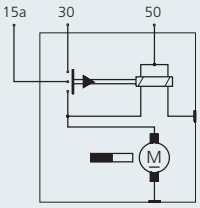


NOSELESS

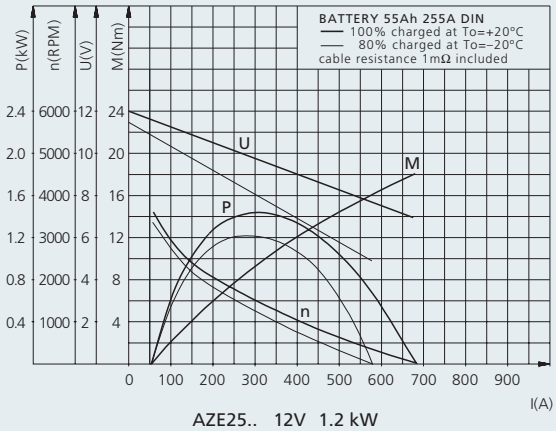
1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Reduction gear • 5. Starter switch • 6. Stator
7. Armature • 8. Brush holder • 9. Commutator end bracket • 10. Gasket • 11. Bearing

CONNECTION DIAGRAMS

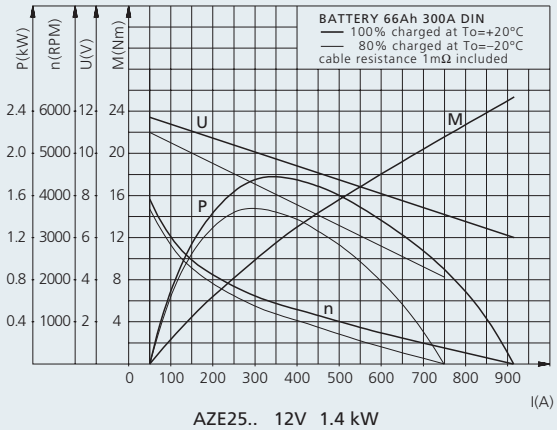




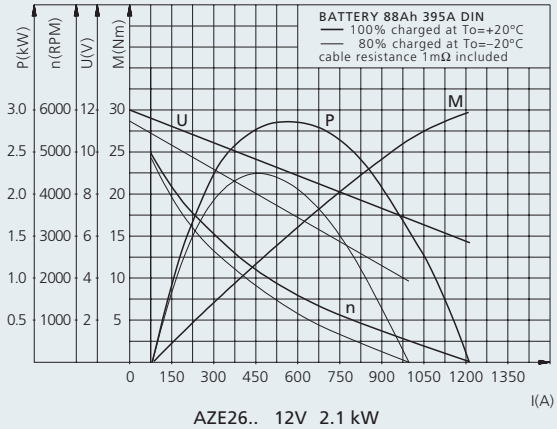
CHARACTERISTICS



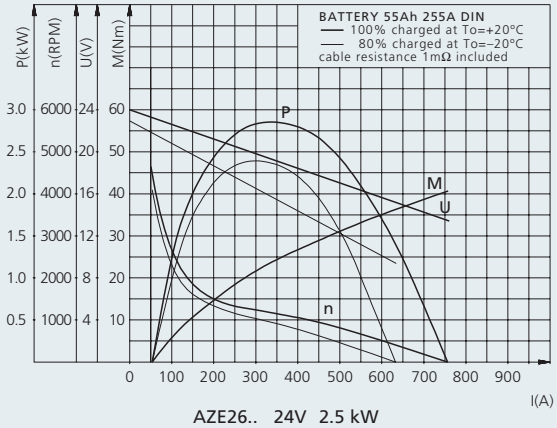
AZE25.. 12V 1.2 kW



AZE25.. 12V 1.4 kW



AZE26.. 12V 2.1 kW



AZE26.. 24V 2.5 kW

MAIN TECHNICAL DATA

Type	AZE45..- nose / AZE46..- noseless	
Nominal voltage (V)	12	
Rated power (kW)	2.8	3.0
Length-nose Length-noseless (mm)	< 235 < 274	< 245 < 284
Weight-nose Weight-noseless (kg)	6.5 DCA 7.5 NCI, GCI 6.5 DCA	6.5 DCA 7.5 NCI, GCI 6.5 DCA
Yoke diameter (mm)	90	
Stator	4-pole windings	
Drive assembly	6 rollers	
Solenoid 12V 24V	pull-in current < 62 A hold-in current < 14 A pull-in current < 30 A hold-in current < 6 A	
Terminals	30 - M8, M10 31 - M8 50 - M4, M5, M6, 6.4 x 0.8	
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)	
Ambient temperature	- 40°C to + 110°C	

STARTER MOTORS WITH REDUCTION GEAR

APPLICATIONS

Diesel engines of 2 to 6 litre displacement.

FEATURES

- High specific power output and efficiency.
- Excellent cold crank capability with low current drain from battery.
- Reduced weight and dimensions in comparison to direct drive starter motors.
- Highly efficient drive assembly for idle run of the pinion.

DESIGN

Nose or noseless versions for specific applications on the engine.

Rubber shock absorber, low-noise, iron planetary reduction gear using a coaxial pinion with an armature.

Pinion shift mechanism with solenoid, fork lever and helix.

Solenoid switch with pull-in and hold-in winding and double return spring for effective breaking of the main contacts.

Six-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

High quality thermal resistant materials.

Support brackets of grey cast iron (GCI), nodular cast iron (NCI) or die cast aluminium (DCA).

Free of asbestos, cadmium, beryllium and ammonia.

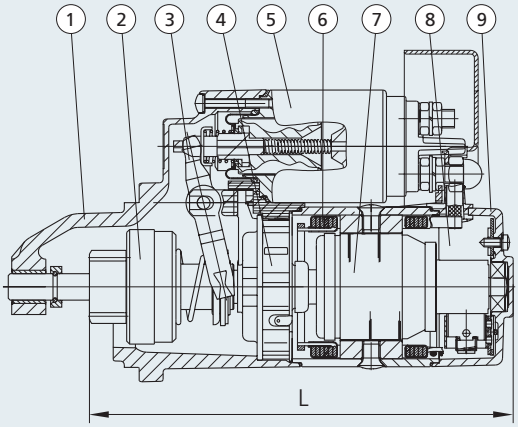
Additional dust protection is available with lip seal on the pinion.

Water protection is achieved using drain holes, O-rings and a rubber boot.

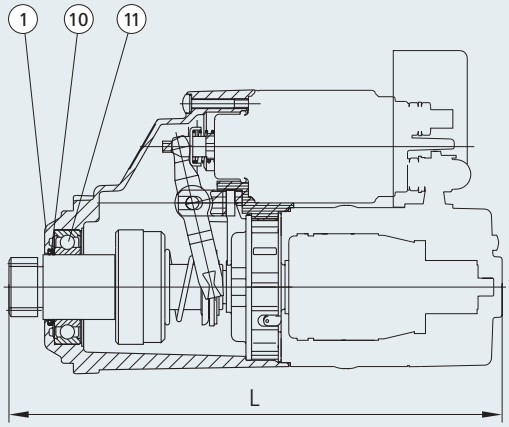
Oil-proof versions for wet clutch applications.

Insulated return versions are available.

CROSS SECTION



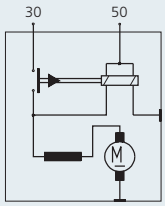
WITH NOSE

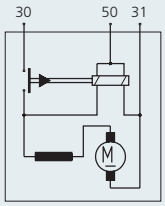


NOSELESS

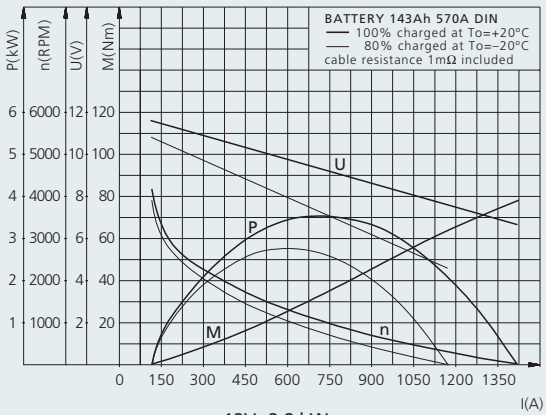
1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Reduction gear • 5. Starter switch • 6. Stator
7. Armature • 8. Brush holder • 9. Commutator end bracket • 10. Gasket • 11. Bearing

CONNECTION DIAGRAMS

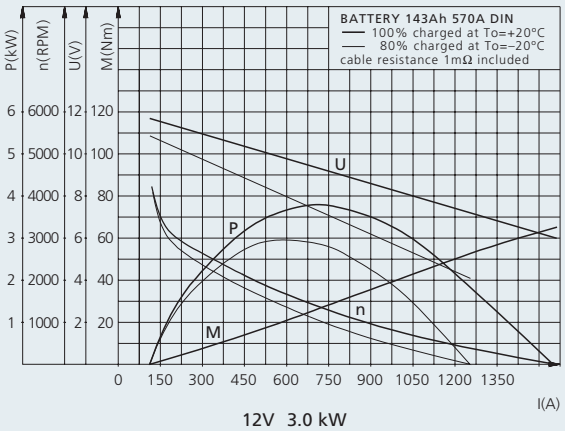




CHARACTERISTICS



12V 2.8 kW



12V 3.0 kW

MAIN TECHNICAL DATA

Type	AZF45..- nose / AZF46..- noseless			
Nominal voltage (V)	12		24	
Rated power (kW)	3.4	4.2	4.0	5.5
Length-nose Length-noseless (mm)	< 274 < 321			
Weight-nose Weight-noseless (kg)	9.8 to 10.3 11			
Engagement	direct		two stage	
Yoke diameter (mm)	95			
Stator	4-pole windings			
Drive assembly	6 rollers			
Solenoid 12V 24V	pull-in current < 62 A hold-in current < 14 A pull-in current < 30 A hold-in current < 7.5 A			
Terminals	30 - M8, M10 50 - M4, M5, M6, 6.3 x 0.8			
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)			
Ambient temperature	- 40°C to + 110°C			

STARTER MOTORS WITH REDUCTION GEAR

APPLICATIONS

Diesel engines of 4 to 12 litre displacement.

FEATURES

- High specific power output and efficiency.
- Excellent cold crank capability with low current drain from battery.
- Reduced weight and dimensions in comparison to direct drive starter motors.
- Highly efficient drive assembly for idle run of the pinion.

DESIGN

Nose or noseless versions for specific applications on the engine.

Excitation using 4-pole windings enables high torque output.

Rubber shock absorber, low-noise, iron planetary reduction gear with pinion and armature in one axis.

Pinion shift mechanism with solenoid, fork lever and helix enabling direct engagement.

Solenoid switch with pull-in and hold-in winding and double return spring for effective breaking of the main contacts.

Six-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

High quality thermal resistant materials.

Support brackets of grey cast iron, nodular cast iron or die cast aluminium.

Free of asbestos, cadmium, beryllium and ammonia.

24V starter motors with direct engagement can be additionally equipped with an auxiliary electronic or electro-mechanical start relay which enables triggering of the starter motor with low current (< 2A).

Electronic soft start relay in a 24V version enables effective two-stage soft engagement. It controls the starting process and prevents damage and overloading of the starter pinion and the engine ring gear.

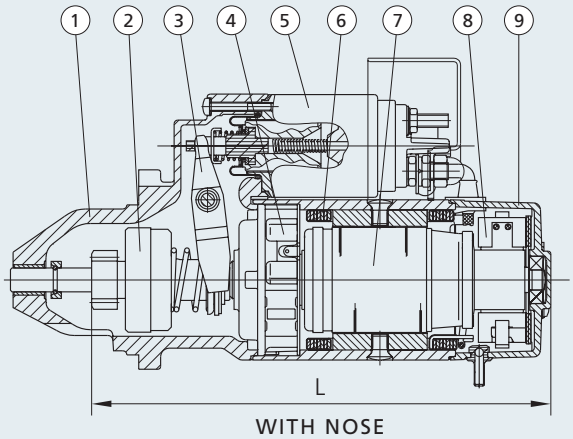
For the nose version additional dust protection with a lip seal on the pinion is available.

Water protection is achieved with drain holes, O-rings and a rubber boot.

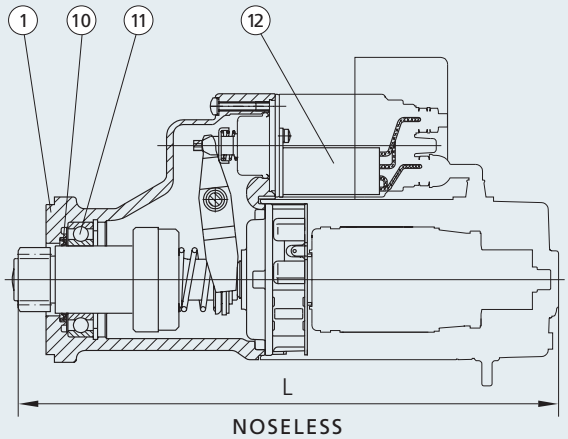
Oil-proof versions for wet clutch applications.

Insulated return versions are available.

CROSS SECTION



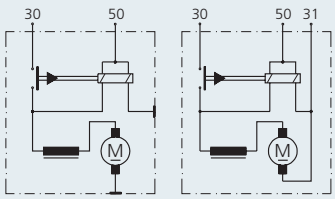
WITH NOSE



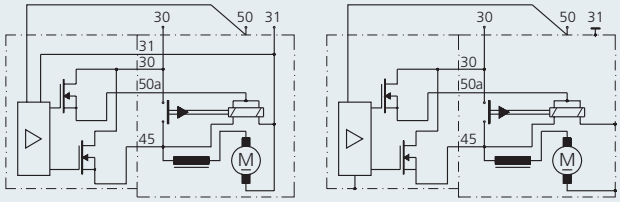
NOSELESS

1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Reduction gear • 5. Starter switch • 6. Stator
7. Armature • 8. Brush holder • 9. Commutator end bracket • 10. Gasket • 11. Bearing • 12. Soft start relay (option)

CONNECTION DIAGRAMS

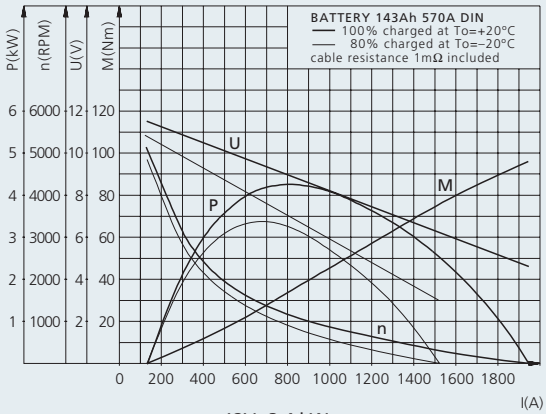


Direct engagement

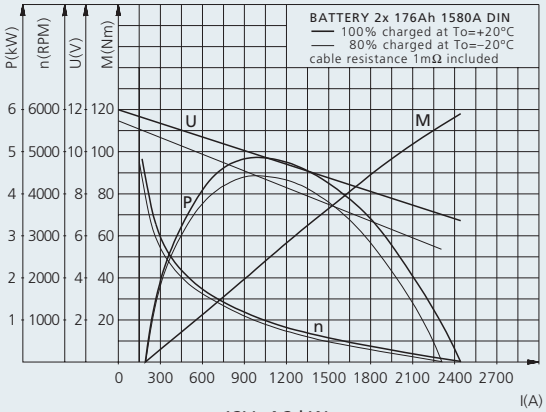


Two stage engagement

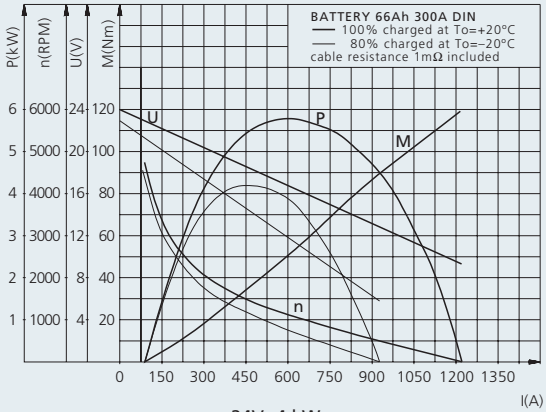
CHARACTERISTICS



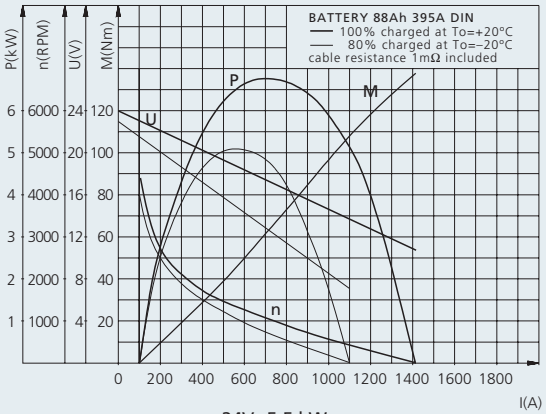
12V 3.4 kW



12V 4.2 kW



24V 4 kW



24V 5.5 kW

MAIN TECHNICAL DATA

Type	AZG	
Nominal voltage (V)	12	24
Rated power (kW)	5.0	6.5
Length (mm)	< 346	< 354
Weight (kg)	12 - 14.4	13.6 - 14
Engagement	direct	two-stage
Yoke diameter (mm)	110	
Stator	4-pole windings	
Drive assembly	6 rollers	
Solenoid 12V	pull-in current < 62 A hold-in current < 14 A	
24V	pull-in current < 30 A hold-in current < 7.5 A	
Terminals	30 - M10 31 - M10, M12 50 - M4, M5, M6, 6.3 x 0.8	
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)	
Ambient temperature	- 40°C to + 110°C	

STARTER MOTORS WITH REDUCTION GEAR

APPLICATIONS

Basic 12V version for diesel engines of 5 to 10 litre displacement.
24V version for diesel engines of 7 to 17 litre displacement.

FEATURES

- High specific power output and efficiency.
- Excellent cold crank capability with low current drain from battery.
- Reduced weight and dimensions in comparison to direct drive starter motors.
- Highly efficient drive assembly for idle run of the pinion.

DESIGN

Noseless versions for specific applications on the engine.

Excitation using 4-pole windings enables high torque output.

Rubber shock absorber, low-noise, iron planetary reduction gear with pinion and armature in one axis.

Pinion shift mechanism with solenoid, fork lever and helix enables direct engagement in a 12V version.

Solenoid switch with pull-in and hold-in winding and double return spring for effective breaking of the main contacts.

Six-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

High quality thermal resistant materials.

Support brackets of die cast aluminium or grey cast iron.

Free of asbestos, cadmium, beryllium and ammonia.

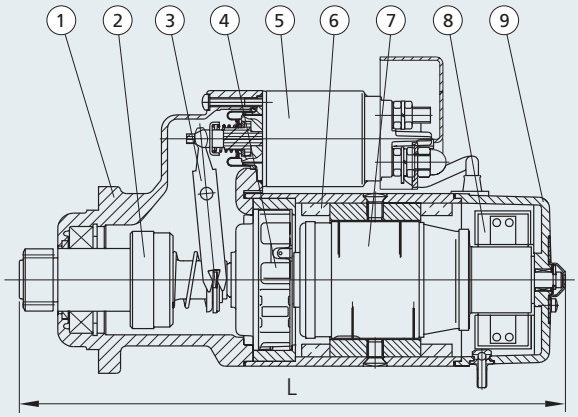
Electronic soft start relay in the 24V version enables effective two-stage soft engagement. It controls the starting process and prevents damage and overloading of the starter pinion and the engine ring gear.

Protection against water is achieved by drain holes, O-rings and a rubber boot.

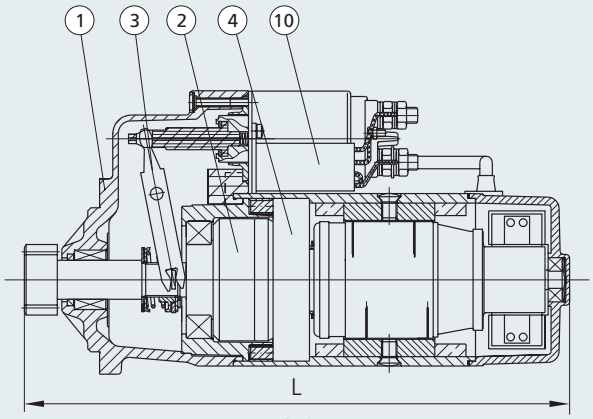
Oil-proof versions for wet clutches are available.

Insulated return versions are available.

CROSS SECTION



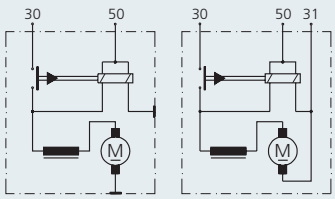
AZG-12V



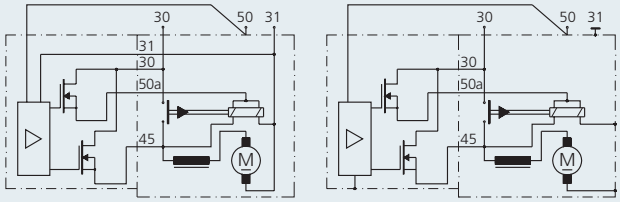
AZG-24V

1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Reduction gear • 5. Starter switch • 6. Stator
7. Armature • 8. Brush holder • 9. Commutator end bracket • 10. Soft start relay

CONNECTION DIAGRAMS

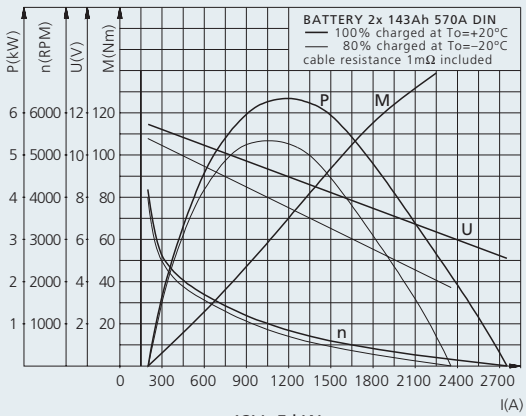


Direct engagement

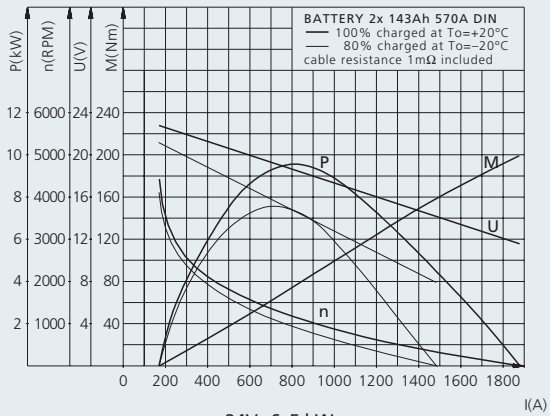


Two stage engagement

CHARACTERISTICS



12V 5 kW



24V 6.5 kW

MAIN TECHNICAL DATA

Type	AZJ			
Nominal voltage (V)	12		24	
Rated power (kW)	2.7	3.0	3.2	4.0
Length (mm)	< 239.5	< 281	< 239.5	< 281
Weight (kg)	12.5	13.9	12.5	13.9
Yoke diameter (mm)	115			
Stator	4-pole windings			
Drive assembly	6 rollers			
Solenoid 12V	pull-in current < 62 A hold-in current < 14 A			
24V	pull-in current < 30 A hold-in current < 6 A			
Terminals	30 - M8, M10 31 - M8, M10 50 - M4, M6, M5, 6.3 x 0.8			
Basic protection	Protected against ingress of dust, solid foreign objects and splashing water (IP 56)			
Ambient temperature	- 40°C to + 110°C			

DIRECT DRIVE STARTER MOTORS

APPLICATIONS

Diesel engines with 3 to 9 litre displacement.

FEATURES

- High specific power output and efficiency.
- High cold crank capability.
- Highly efficient drive assembly for idle run of the pinion.

DESIGN

Nose versions for specific applications on the engine.

Direct drive.

Pinion shift mechanism with solenoid, fork lever and helix.

Solenoid switch with pull-in and hold-in winding and double return spring for effective breaking of the main contacts.

Six-roller clutch and drive assembly is designed to transmit power from the starter motor to the engine.

High quality thermal resistant materials.

Support brackets of grey cast iron, nodular cast iron or die cast aluminium.

Free of asbestos, cadmium, beryllium and ammonia.

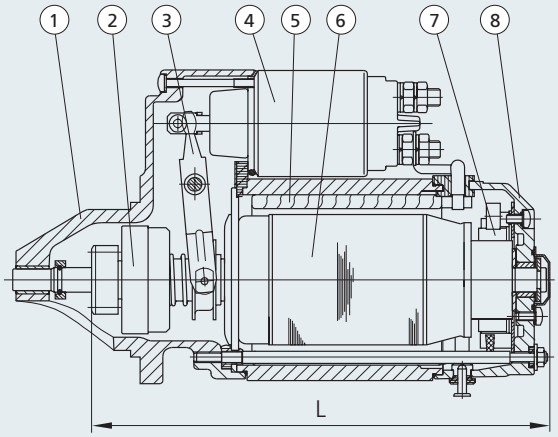
Additional dust protection with a lip seal on the pinion.

Water protection is achieved with drain holes, O-rings and rubber boot.

Oil-proof versions for wet clutch applications.

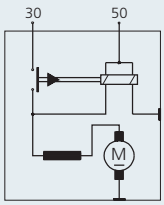
Insulated return versions are available.

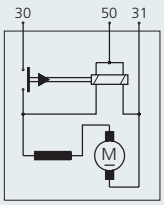
CROSS SECTION



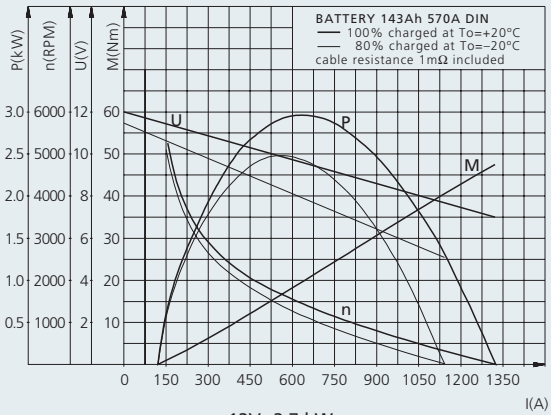
1. Drive end bracket • 2. Drive assembly • 3. Engaging lever • 4. Starter switch • 5. Stator • 6. Armature
7. Brush holder • 8. Commutator end bracket

CONNECTION DIAGRAMS

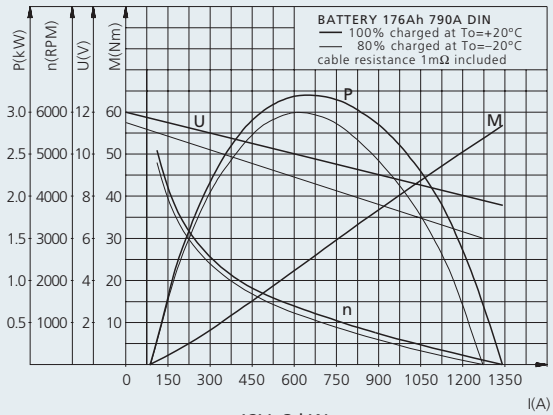




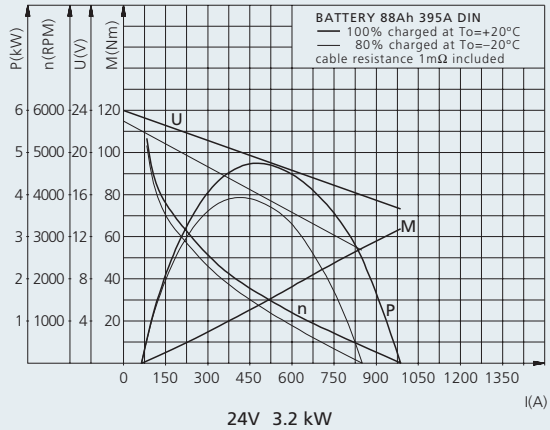
CHARACTERISTICS



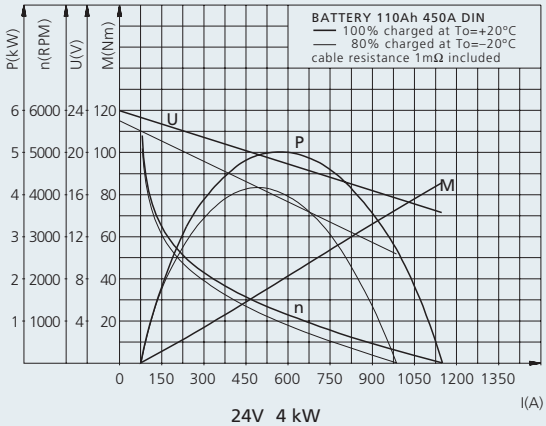
12V 2.7 kW



12V 3 kW



24V 3.2 kW



24V 4 kW

STARTER MOTORS | PRODUCT REQUIREMENTS FORM | Iskra

1. CUSTOMER

Company: _____

Address: _____ Country: _____

Responsible person: _____

Phone: _____ Fax: _____ E-mail: _____

2. PROJECT DATA

Customer: _____ Inquiry: ☐ Brief Description: _____

Project: _____ New project: ☐ _____

Project No.: _____ Modification: ☐ _____

Predecessor /equivalent type:

Engine: _____ Supplier: _____

Vehicle: _____ Type: _____

Starter motor: _____ Technical data: _____

Offer drawing: _____ Drawing: _____

Release No.: _____ Release No.: _____

Remarks _____

_____

3. ENGINE DATA

Petrol: ☐ No. of cylinders: _____ Cooling _____ water / air _____

Diesel: ☐ No. of valves: _____ Fuel supply _____

Compression: _____ : 1 _____ Rated output at _____ kW

Capacity: _____ litres Nom. speed _____ min^{-1}

Bore/stroke: _____ /mm _____ Engine oil/viscosity _____ / _____

Starting temperature limit _____ °C

Cranking torque _____ Nm at _____ °C

Minimum starting speed _____ Nm at _____ °C

Break away torque _____ Nm at _____ °C

Additional parasitic load _____ Nm at _____ °C

Inertia engine (referred to ring gear) _____ kgm^2

Additional inertia (referred to ring gear) _____ kgm^2

Starting aid _____ Required current _____ A _____

Glow plugs _____ Duration _____ S _____

Flame start _____ Engine preheating below _____ °C up to _____ °C

Other _____ Battery preheating below _____ °C up to _____ °C

Ring gear No. of teeth _____ Module _____ Center Distance _____ mm

Rotation direction (looking at the pinion) Clockwise ☐ Counter clockwise ☐

Remarks _____

_____

4. VEHICLE DATA

Battery Capacity ..... Ah No: ..... Standard DIN ☐ SAE ☐ IEC ☐

Nominal voltage ..... V Type .....

Cold discharged current ..... A Internal resistance ..... mΩhm

Battery cables Total resistance ..... mΩhm

Length ..... m Cross section ..... mm^2

Remarks .....

.....

5. STARTER FEATURES

Direct drive ☐ Reduction gear ☐

Drive end shield preferred type yes ☐ no ☐ modification .....

Pinion preferred type yes ☐ no ☐ No. of teeth ..... module .....

Solenoid Preferred type

Terminal 31 yes ☐ insolated ☐ type .....

Terminal 50 right ☐ left ☐ type .....

Terminal 30 length ..... mm diameter M .....

Terminal 45 length ..... mm diameter M .....

Max. current Terminal 50 ..... A hold ..... A pull ..... A

Additional start relay Terminal 50 yes ☐ no ☐ current ..... A

Water/Dust protection Starter IP ..... Solenoid IP .....

Additional requirements .....

Remarks .....

.....

6. CUSTOMER TESTS

Date/duration

Specifications .....

Vehicle test .....

Bench test .....

Samples .....

Pre-series .....

Remarks .....

.....

Date: ..... Signature: .....