User's Manual

AC Servo Motors SDM281

Power and productivity
for a better world™

Contents

1. Safety instructions

The motors of the series SDM 281 are designed for use in commercial plants. They comply with the harmonised standards of the series EN 60034. They are not to be operated in hazardous areas unless expressly permitted (note additional reference).

The local conditions on site shall comply with the nameplate data. During operation (even at zero speed), the motors possess dangerous live and moving parts and may have hot surfaces. Only qualified and competent specialist personnel are allowed to handle, connect, commission and maintain the motors. (Observe IEC 364). Improper conduct may result in serious injury to persons and property.

In this manual, the following pictograms are used to mark warnings and important notes.

means that death or serious injury to persons or property will occur unless the appropriate precautions are taken.

means that death or serious injury to persons or property may occur unless the appropriate precautions are taken.

means that slight injury or damage to persons or property may occur unless the appropriate precautions are taken.

Only qualified personnel are allowed to perform any planning, installation or maintenance work.

The personnel must be trained for the job and must be familiar with the installation, assembly, commissioning and operation of the product.

The instructions given in this manual or any other instructions supplied must always be observed.

- Remove power to the machine before starting any work on the motors.
- Check the proper functioning of the brake (if provided) after installing the motor.
- Repairs may only be carried out by the manufacturer or an authorised repair agency. Unauthorised opening and tampering may lead to bodily injury and property damage and may entail the loss of warranty rights.
- Before commissioning motors with a shaft key, secure the key to ensure that it cannot be thrown out if this is not already prevented by driving elements such as a belt pulley, coupling, etc.

- The motors are not designed for direct connection to the three-phase system but are to be operated via an electronic power converter. Direct connection to the system may destroy the motor.
- Surface temperatures of more than 100°C may occur on the motors. Therefore, no temperature-sensitive parts must be allowed to come into contact or be attached to them. Protection against accidental contact should be provided, if required.
- The optional holding brake is only designed for a limited number of emergency brakings. Never use it as a working brake.
- On motors with plug connector and built-in brake, it is the user's responsibility to install the varistor provided to control the brake.
- Connect the winding temperature sensor and evaluate its signal by means of a suitable circuitry. The temperature sensor protects the motor from thermal overload if the temperature change is slow. It does not, however, provide an allround protection. Therefore, additional measures such as monitoring I^2t by the converter electronic system are required to protect the motor from fastarising thermal overload.
- Dangerous voltages are applied at the terminals of synchronous motors when the rotor is turning.

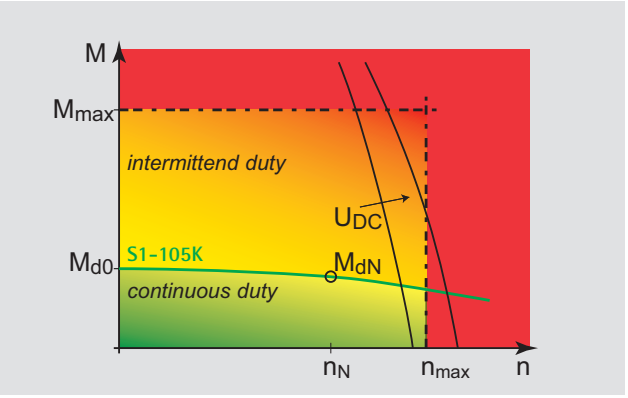
2. Overview

	Motor type SDM 281-	Stall torque 10 rpm M_{d10} [Nm]	Rated torque at 1.000 rpm M_{dN} [Nm]	1.500 rpm M_{dN} [Nm]	2.000 rpm M_{dN} [Nm]	3.000 rpm M_{dN} [Nm]	4.000 rpm M_{dN} [Nm]	6.000 rpm M_{dN} [Nm]
self-cooling	000N5-...	0.48						0.43
	000N7-...	0.68						0.62
	000N9-...	0.89						0.80
	001N1-...	1.17						1.05
	000N9-...	0.94				0.9	0.87	0.76
	001N8-...	1.84				1.83	1.75	1.5
	002N6-...	2.65				2.6	2.5	2.3
	003N9-...	4.0			3.8	3.5	3.1	
	005N7-...	5.8			5.5	4.8	4.2	
	007N1-...	7.2			6.9	6.4	5.7	
	008N5-...	8.6			8.3	7.6	6.8	
	008N2-...	8.3		8.0	7.6	6.8		
	011N6-...	11.8		11.5	11.0	9.5		
	015N3-...	15.6		15.0	14.0	11.9		
	018N4-...	18.8		18.0	16.9	13.7		
	023N5-...	23.7	23.0		19.0	14.0		
	035N0-...	35.5	34.4		28.0	19.0		
	048N0-...	48.5	47.0		40.0	27.0		
enforced-cooling	005N0-...	5.2			5.2	4.7	4.2	
	007N4-...	7.7			7.4	6.4	5.6	
	009N2-...	9.5			9.3	8.6	7.7	
	011N1-...	11.4			11.2	10.3	9.2	
	010N6-...	11.0		10.8	10.3	9.1		
	015N1-...	15.6		15.6	14.9	12.8		
	019N9-...	20.6		20.2	18.9	16.1		
	023N9-...	24.8		24.3	22.8	18.5		
	030N6-...	30.8	30		28	24		
	045N5-...	45.8	45		40	34		
	062N5-...	63.0	62		57	48		

Basic features

	Standard	Options
Construction type	IM B5 (IM V1, IM V3)	
Degree of protection	IP 65	
Shaft exit	IP 64	IP 65
Motor type	permanent-field synchronous servomotor	
Magnet material	neodymium-iron-boron	
Rated data	for duty S1 (continuous operation)	
Vibrational severity	B	
Flange accuracy	N	
Thermal class	155 (F); wire insulation class 180 (H)	
Winding protection	thermistor (PTC) 150°C (with reinforced insulation to EN 50178)	miniature thermal-delay switch
Connection to system	connector (rotatable, speedTEC - compatible)	
Feedback device connection	connector (rotatable, speedTEC - compatible)	
Feedback device	resolver	absolute sine-cosine encoder
Cooling	self-cooling	enforced cooling
Brake	-	permanent-field holding brake
Paint finish	RAL 9005 (dull black)	
Bearings	radial deep-groove ball bearing, life-lubricated (locating bearing at D-end)	
Bearing life	the average bearing life under nominal conditions is 20,000 h	
Shaft end	plain shaft end	key (to DIN 6885) balanced with half-key
Ambient temperature range	from -15°C to +40°C	
Max. rel. humidity	90 % at 20°C (no moisture condensation)	
UL-file number	pending	

Speed-torque characteristic



Definitions

Term		omment
M_{d0}	Stall torque	Thermal limiting torque of the motor at standstill (n = 0 rpm). This torque can be delivered for any length of time (S1).
M_{d10}	Stall torque	Thermal limiting torque of the motor at n > 10 rpm. This torque can be delivered for any length of time (S1).
$M_{max.}$	Max. torque	Maximum permissible torque which the motor can deliver for short periods.
M_{dN}	Rated torque	Thermal limiting torque of the motor at rated speed with duty S1
I_{dN}	Rated current	Rated current of the motor (at n_N and M_{dN})
n_N	Rated speed	Rated motor speed
$n_{max.}$	Max. speed	Maximum permissible motor speed
U_{DC}	D.c. link voltage	The d.c. link voltage determines the maximum available output voltage of the converter and thus the motor speed which can be achieved.

Standards, codes and regulations

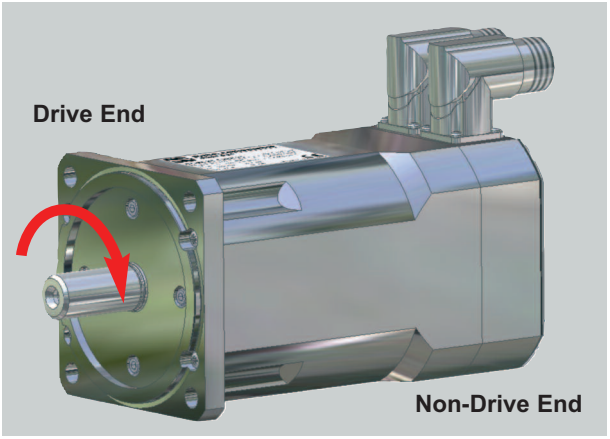
The servomotors of the SDM 281 series are designed in accordance with IEC recommendations and the applicable VDE and DIN standards (see table opposite).

The motors are manufactured in accordance with the international quality standard ISO 9001.

Title	DIN/VDE	EN	IEC
Rotating electrical machines; rating and performance	DIN VDE 0530 Part 1	EN 60 034-1	IEC 600 34-1
Terminal markings and direction of rotation	DIN VDE 0530 Part 8	EN 60 034-8	IEC 600 34-8
Classification of types of construction and mounting arrangements	DIN VDE 0530 Part 7	EN 60 034-7	IEC 600 34-7
Methods of cooling	DIN VDE 0530 Part 6	EN 60 034-6	IEC 600 34-6
Classification of degrees of protection by enclosures	DIN VDE 0530 Part 5	EN 60 034-5	IEC 600 34-5
Mechanical vibration of certain machines – Measurement, evaluation and limits of vibration severity	DIN VDE 0530 Part 14	EN 60 034-14	IEC 600 34-14
Noise limits	DIN VDE 0530 Part 9	EN 60 034-9	IEC 600 34-9
Cylindrical shaft ends for rotating electrical machinery	DIN 748 Part 3		IEC 600 72

3. Construction, definitions

The servomotors of the SDM 281 series are 6- or 8-pole permanent-field synchronous motors with a sine-wave induced voltage. A new compact coil technique ensures a high power density of the motors.



Drive end

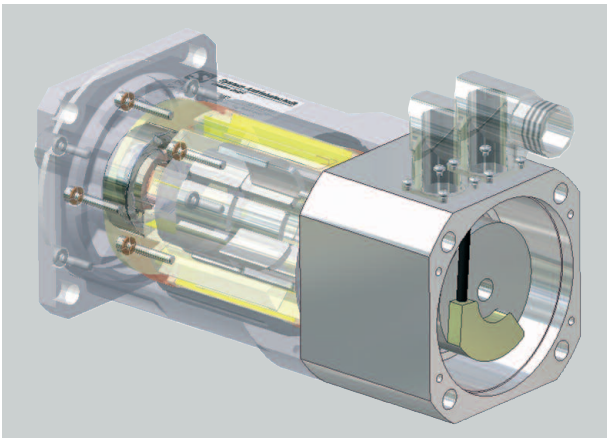
In DIN EN 60034-7, the two ends of a motor are defined as follows:

D: Drive end of the motor

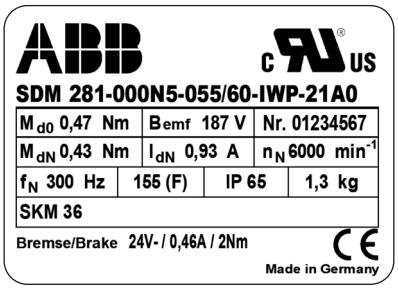
N: Non-drive end of the motor

Direction of rotation

When the motor terminals U1, V1, W1 are connected to a supply voltage L1, L2, L3 (with this same phase order) the motor rotates clockwise when viewed facing the D-end.



Nameplate



Symbols

M_{d0}	Stall torque (at n = 0 rpm)	I_{d0}	Current at stall torque (at n = 0 rpm)
M_{d10}	Stall torque (at n > 10 rpm)	I_{d10}	Current at stall torque (at n > 10 rpm)
M_{dN}	Rated torque	I_{dN}	Rated current
P_{dN}	Rated power	n_N	Rated speed
R_{u-v}	Phase-to-phase winding resistance (at 20°C)	L_{u-v}	Phase-to-phase winding inductance
p	Number of pole pairs	k_e	Voltage constant
M_{max}	Max. permissible torque	I_{max}	Max. permissible current
n_{max}	Max. permissible speed	J_L	Rotor inertia
m	Motor weight	f_N	Rated frequency
F_A	Axial force	F_Q	Radial force
R_S	Phase resistance (at 20°C)	L_S	Phase inductance

4. Installation and operation

Degree of protection

The motors of the SDM 281series are generally designed to meet degree of protection IP65 as specified in DIN EN 60034-5 (Option separately driven fan: IP 54). See table below for the respective sealing.

Shaft sealing	Degree of protection	User information
Diaphragm seal (standard)	IP 64	Exposure to moisture in the shaft and flange area must be kept to a minimum. No liquid may remain in the D end shield, if the motor is mounted with the "shaft end upward" (IM V3, IM V19, IM V36).
Rotary shaft seal (option)	IP 65	Suitable for the installation of non-sealed gear units to seal against oil.

Lubrication of the rotary shaft seal

When using a rotary shaft seal, note that the sealing lip needs to be sufficiently lubricated and cooled with a high-quality mineral oil such as SAE 20 to ensure the proper functioning of the seal. Sufficient lubricant supply is required for proper heat dissipation.

If the shaft seal is greased, the maximum permissible motor speed may need to be reduced.

Regular regreasing is imperative!

Excessive peripheral speeds destroy the sealing lip and its protective function is no longer guaranteed.

Cooling, altitude, ambient conditions, derating

The rated power (rated torque) applies to continuous operation (duty type S1) at a coolant temperature of 40°C and an altitude of up to 1,000 m a.s.l. It is determined by using defined aluminium test flanges.

If the motor flange is thermally insulated, it is not able to dissipate the motor heat. This requires a reduction of the rated motor torque.

Motor type SDM 281-	Test flange dimensions
...-055/...	200 x 100 x 10
...-090/...	232 x 232 x 19
...-102/...	232 x 300 x 19
...-140/...	370 x 370 x 19
...-195/...	410 x 396 x 23

Motor ratings are derated at higher temperatures or altitudes according to table beside.

Continuous ratings of the motor are valid with a inverter switching frequency at least 8 kHz. With 4 kHz switching frequency the values must be reduced by factor 0.95.

A.s.l.	Coolant temperature [°C]					
[m]	<30	30-40	45	50	55	60
1000	1.07	1.00	0.96	0.92	0.87	0.82
1500	1.04	0.97	0.93	0.89	0.84	0.79
2000	1.00	0.94	0.90	0.86	0.82	0.77
2500	0.96	0.90	0.86	0.83	0.78	0.74
3000	0.92	0.86	0.82	0.79	0.75	0.70
3500	0.88	0.82	0.79	0.75	0.71	0.67
4000	0.82	0.77	0.74	0.71	0.67	0.63

Surface temperatures of more than 100°C may occur on the motors. Therefore, no temperature-sensitive parts must be allowed to come into contact or be attached to them.

If the motor is equipped with a separately driven fan, connect the fan properly and check the direction of rotation (arrow on the fan housing). Make sure that the rotation of the fan wheel is not obstructed.

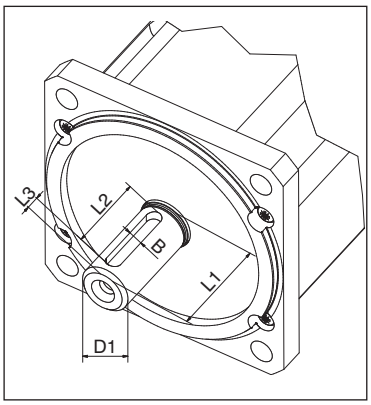
The different cycle frequencies of the electronic converter output stages may require the motor to be derated, resulting from an increased harmonic content.

Shaft ends

Motors of the SDM 281 series have cylindrical shaft ends to DIN 748. As an option, the shaft end is also available with a keyway to DIN 6885, Part 1.

Use suitable devices for mounting and pulling off driving elements such as gears, pulleys, couplings, etc. Support the device at the DE shaft end.

Do not expose the motor to any impacts or blows.



Motor type SDM 281-	Shaft end		Keyway		
	D1	L1	B	L2	L3
...-055/...	Ø 9 k6	20	3	12	4
...-090/...	Ø 14 k6	30	5	22	3
...-102/...	Ø 19 k6	40	6	32	4
...-140/...	Ø 24 k6	50	8	40	5
...-195/...	Ø 32 k6	58	10	50	5

Holding brake

The optional built-in holding brake is used to fix the motor shaft when the motor is at rest or de-energised. It is a permanent-field single-disc brake which operates on the closed-circuit principle, i.e. the brake is effective when the motor is de-energised, thus braking the motor shaft.

The holding brake is not a working brake.

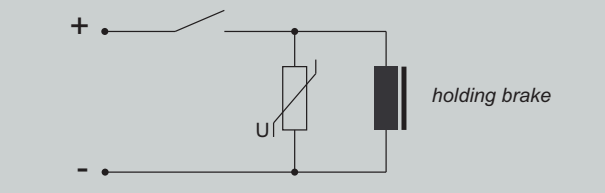
Holding brakes are operated on d.c. current. The nominal voltage is 24 V. They can be connected to a central d.c. voltage supply. Overvoltages, even transient, are not permitted since they deteriorate the permanent magnets irreversibly. The excitation current ripple must be less than 20 % to ensure reliable opening of the brake and prevent disturbing humming noises.

Since the holding brakes are permanent-magnet brakes, be sure to observe the correct polarity of the d.c. voltage, otherwise the brake will not open.

Modern (field-oriented) frequency converters are able to produce a high torque even at low motor speeds. If the converter has a sufficient current reserve, a multiple of the rated motor torque can be produced. In this case the motor shaft may turn even if the holding brake is applied, because the holding torque of the brake is exceeded.

Suppressor circuit

If the excitation current of the holding brake is switched off on the d.c. side, a voltage peak occurs which can be higher than 1,000 V. It is caused by the inductance of the holding brake. A varistor R should be connected in parallel to the coil to prevent this voltage peak. Recommended type: Q69-X3022 (S 14 K 30).



Winding, insulation system

The insulation materials we use ensure insulation class 155 (F) to DIN EN 60034. Therefore, the winding temperature rise may be max. 105 K at a coolant temperature of + 40°C. We also use insulation materials with the temperature profile TI 200 of class 180 (H) to increase the reliability of the motors.

The maximum permissible rate of voltage rise (dU/dt) at the motor terminals may be max. 4 kV/µs. The overvoltage at the motor terminals must not exceed 1.56 kV. It may be necessary to use motor current filters or reactors to achieve these values.

Separately driven fan

The motors „SDM 281 enforced-cooling" are forced-air-cooled by an axial fan. The connection data are given on the motor name-plate. The necessary terminal plug is included in the delivery of the motor.

Motor type SDM 281-	Rated voltage	Rated current	Degree of protection
...-102/...	230 V (+6%/-10%) 50/60 Hz	0.12 A	IP 54
...-140/...	230 V (+6%/-10%) 50/60 Hz	0.30 A	IP 54
...-195/...	3 x 400 V (+6%/-10%) 50/60 Hz	0.15 A	IP 44

Conductor size

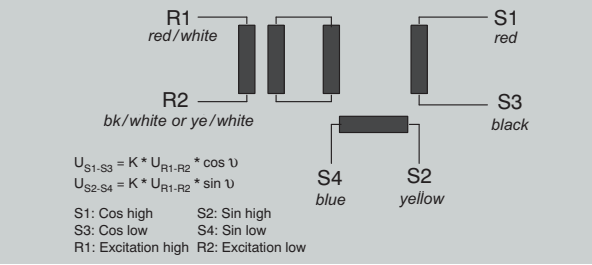
The recommended values for the dimensioning of the conductor cross-sections are given in the table. They are specified in DIN VDE 0113 (EN 60 204) "Electrical equipment of industrial machines" for the current carrying capacity of PVC-insulated cables with copper conductor routed in cable ducts. The maximum permissible ambient temperature is +40 °C.

Conductor size [mm²]	perm. maximum current - r.m.s. [A]
0.75	7.8
1.0	9.6
1.5	14.4
2.5	18.3
4.0	25.0
6.0	32.0
10.0	43.0
16.0	58.0

Feedback device - resolver

The SDM 281 motors are equipped with 2-pole resolvers, size 15, for speed and shaft position control.

Technical data	
Number of poles	2
Transformation ratio	0.5 ±5%
Input voltage/frequency	7 V / 10 kHz
Input current	65 mA max.
Electrical error	±10' max.
Phase displacement	0° nom.



The feedback device of synchronous motors (SDM 281) must be adjusted to the respective converter. Any mis-adjustment may lead to uncontrolled motor response or complete failure of the motor.

Note: 2-pole resolvers are installed as standard. Other feedback devices are available (e.g. absolute sine-cosine encoders - see next page).

Other feedback devices

The following other feedback devices are availible depending on the motor size:

Motor type SDM 281-	Feedback system X1 = (see type code)														
	000	AAG	AAH	A8F	A8G	A8K	A8L	INH	INN	INP	IWN	IWP	IW3	IW7	IW8
...-055/...	✓	✓	✓	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓
...-090/...	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
...-102/...	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
...-140/...	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓
...-195/...	✓	✓	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	✓

✓ ... available; - ... **not** available;

Monitoring the winding temperature

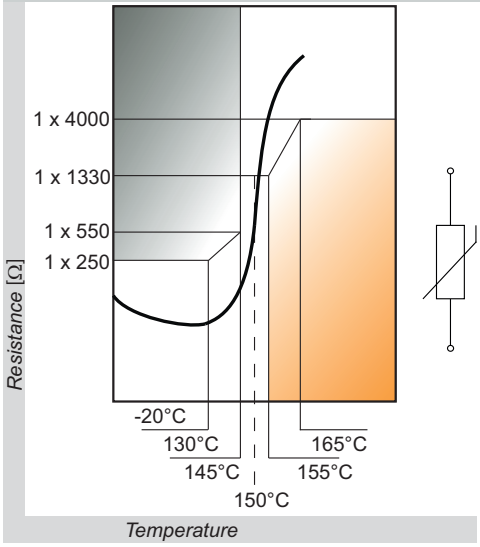
PTC thermistors are installed as standard in the DE winding head to protect the winding from thermal overload when the temperature change is slow (temperature change in minutes or hours). Optionally also klixon (thermal switch) can selected for motor thermal protection for SDM types except the smallest frame (flange size "055")

The maximum operating voltage of the PTC thermistors must not exceed 2.5 V-.

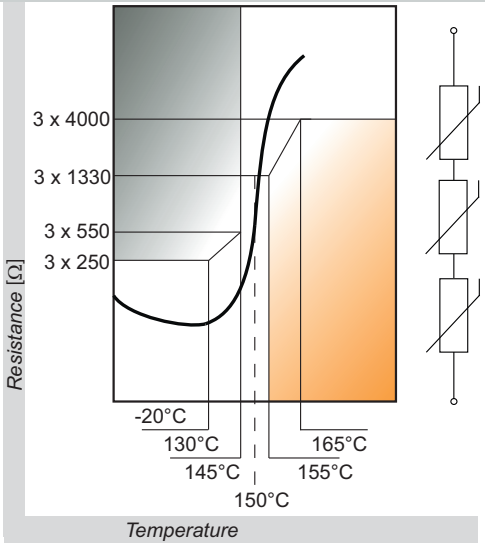
Due to the non-ideal thermal coupling, the temperature sensor follows rapid winding temperature changes only with delay, thus being unable to protect the winding if the thermal overload of the motor is transient and high. Therefore, additional protection is required (such as monitoring I^2xt by the converter electronic system) to protect the motor from fast-rising thermal overload.

The evaluation of the temperature sensor belongs to the monitoring of the motor winding. The temperature sensor follows rapid temperature changes only with delay. Especially the windings of small motors (SDM 281-...-055/.. and SDM 281-...-090/..) are very sensitive to overload.

SDM 281-...-055/.. and SDM 281-...-090/..
with single PTC thermistor STM 150 E



SDM 281-...-102/.. ;
SDM 281-...-140/.. and SDM 281-...-195/..
with triplex PTC thermistor STM 150 D



5. Transport and packaging

The packaging and transport technologies are dependent on the shipping conditions. The following types of packaging are provided:

- Folding boxes
- Covered and steel-strapped flat pallets (transport by lorry)
- Special pallets
- Special packaging in wooden cases

The motors should always be shipped so that no damage can occur in transit.

Avoid any impacts, sharp sudden movements and strong vibrations during transport. Operate the crane only at creeping speed to lift or place down the motors. This prevents damage to the bearings or the machine.

The motors leave the factory in a faultless condition after being tested.

Make a visual check for any external damage immediately upon their arrival on site. If any damage caused in transit is found, make a notice of claim in the presence of the forwarder. In addition, report the damage to the manufacturer at the latest within one week. Do not put these motors into operation.

6. Storage

If the motors are not installed immediately after their arrival, they should be properly stored.

Store the motors only in closed, dry, dust-free, well-ventilated and vibration-free rooms. Damp rooms are unsuitable for storage! Do not remove the anti-corrosive coat from the shaft ends, flange surfaces, etc. Check it at certain intervals depending on the ambient conditions, and touch up, if required.

Take care that no vibrations occur in storage to prevent the anti-friction bearings from being damaged. It is advisable to turn the rotor several times at certain intervals to prevent corrosion of the bearings.

After prolonged storage (>3 months), rotate the motor in both directions at a low speed (≤ 100 rpm) to allow the grease to distribute evenly in the bearings.

7. Maintenance

Repairs may only be carried out by the manufacturer or an authorised repair agency. Unauthorised opening and tampering may lead to injuries to persons and property and may lead to a loss of warranty rights.

Safety instructions

Before starting any work on the motors, and particularly before opening any covers of active parts, make sure that the motor and plant have been properly isolated.

This refers also to any additional or auxiliary circuits.

The " 5 safety rules" to be applied according to DIN VDE 0105 are:

- Disconnect the motor.
- Lock it against unintentional restarting.
- Verify the safe isolation from supply.
- Earth and short (with voltages above 1,000V).
- Safeguard or cover adjacent live parts.

Maintenance intervals

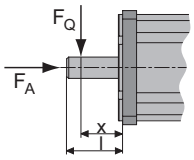
Careful and regular maintenance and inspections are required to recognise and remedy troubles in good time, before they lead to major damage.

Since the operating conditions of the motors differ considerably, only general maintenance intervals to ensure trouble-free operation can be specified. They need to be adapted to the local conditions such as the actual level of contamination, number of starts, load, etc.

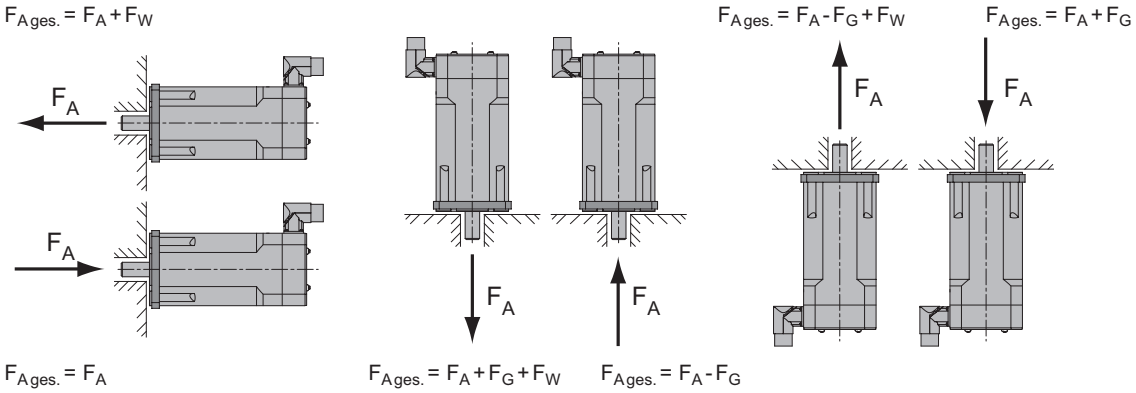
- Clean the motor, depending on the local level of contamination.
- Retighten the electrical and mechanical connections. Check for deterioration of running smoothness or bearing noise: after approx. 500 operating hours, but after 1 year at the latest.
- With rotary shaft seal option only: Regrease the rotary shaft seal depending on the operating mode every 50 to 500 operating hours (applies only to grease lubrication!).

8. Permissible axial and radial forces

The maximum permissible axial and radial forces must not be exceeded in order to ensure smooth running of the motor.



Axial forces



Construction type	B5	V1	V3

The following forces $F_{Apermiss.}$ are permitted in axial direction with the radial force F_Q acting simultaneously.

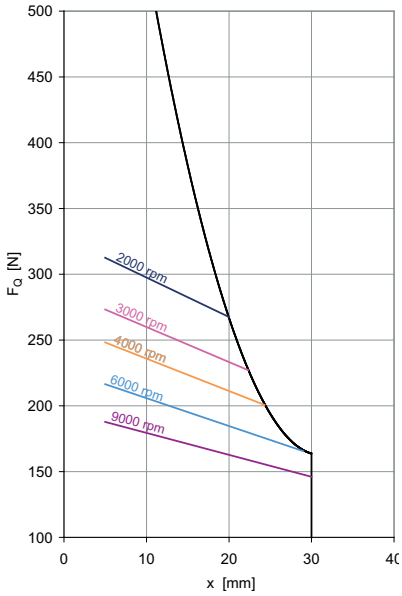
Depending on the mounting arrangement of the motors and the direction of the effective axial force F_A, the rotor inertial force F_G and the force of the ondular washer F_W must be taken into consideration. The total effective axial force $F_{Ages.}$ is calculated as shown in the above figure.

Motor type SDM 281-	Axial forces $F_{Apermiss.}$ [N] at speeds n [rpm] (with $F_Q \neq 0$)								F_W [N]	F_G [N]
	1,000	1,500	2,000	3,000	4,000	4,500	6,000	9,000		
000N5-...										2
000N7-...			130	105	95		80	70	90	3
000N9-...										4
001N1-...										5
000N9-...										5
001N8-...			230	195	175		150	130	110	7
002N6-...										9
003N9-... / 005N0-...										13
005N7-... / 007N4-...			310	260	230		200		110	17
007N1-... / 009N2-...										20
008N5-... / 011N1-...										24
008N2-... / 010N6-...										25
011N6-... / 015N1-...			330	280		240			150	31
015N3-... / 019N9-...										37
018N4-... / 023N9-...										43
023N5-... / 030N6-...										65
035N0-... / 045N5-...	890	780	700	590	520				435	80
048N0-... / 062N5-...										95

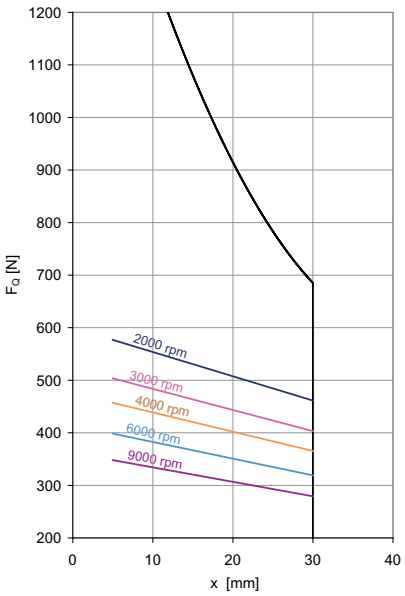
Radial forces

The endurance strength of the shaft and the bearing life (20,000) are decisive for the permissible radial load. Taking the endurance strength into consideration, F_Q is not permitted to be exceeded even during dynamic processes (acceleration, braking).

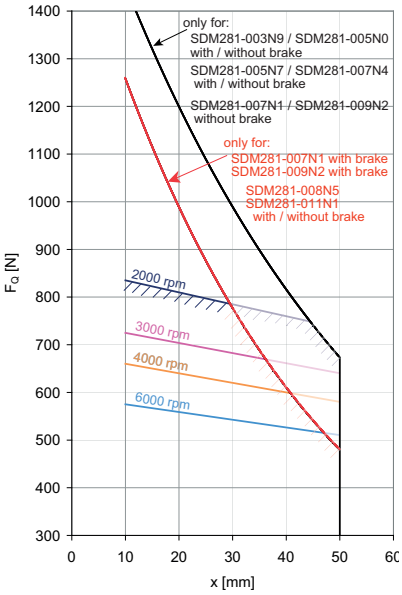
SDM 281-...-055/...



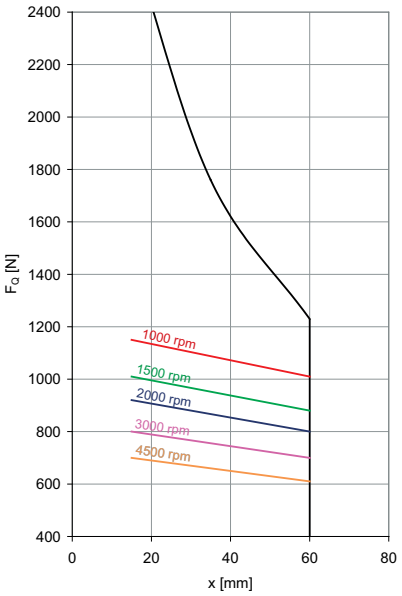
SDM 281-...-090/...



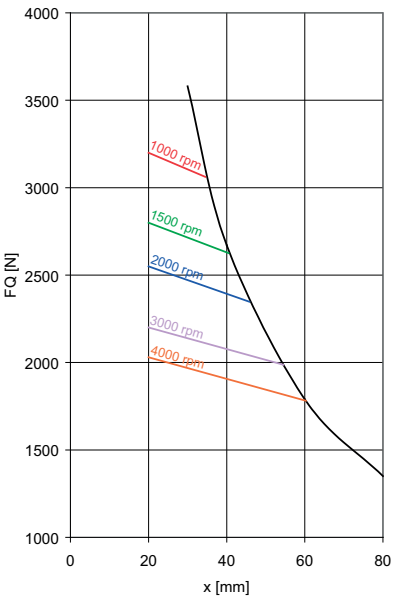
SDM 281-...-102/...



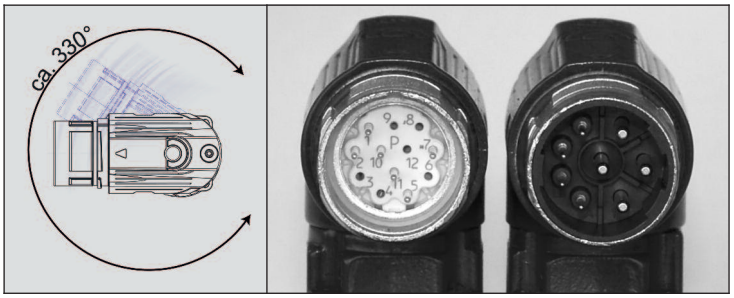
SDM 281-...-140/...

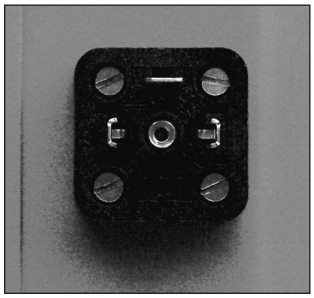


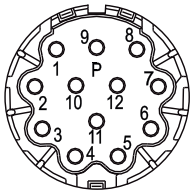
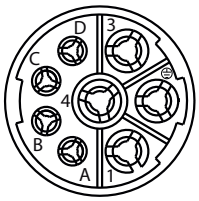
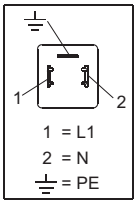
SDM 281-...-195/...



9. Connection system SDM 281-...-055/... - SDM 281-...-140/...



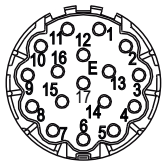


	Resolver connection (X1 = 000)	Connection to system	Fan connection
Socket type	12-pin rotatable angle socket	8-pin rotatable angle socket	Connector plug (2-pole + ground wire)
Recommended connector	MCSRES-12	MCSPOW-08	included in delivery
Pinning configuration (view of motor connecting pins)			
Pin assignment	1 - S2 / Sin + 2 - S4 / Sin - 5 - Therm. sens. + 1) 6 - Therm. sens. + 1) 7 - S3 / Cos - 8 - S1 / Cos + 10 - R1 / EXC + 12 - R2 / EXC -	1 - U1 2 - PE 3 - W1 4 - V1 A - brake + (if any) B - brake – (if any) C - Therm.sens. + 1) / DSL+ 2) D - Therm.sens. - 1) / DSL - 2)	1 - L1 2 - N 3 - PE

2) With DSL feedback the thermal sensor is connected to feedback device.

1) Thermal sensor can be connected via feedback or power connector, see motor option item X5 in type code.

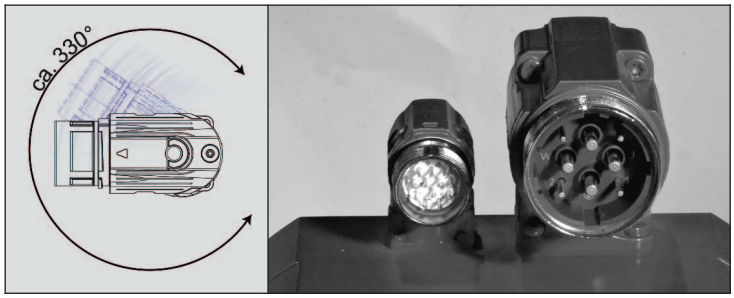
Feedback device options

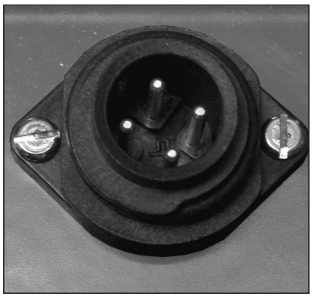
	Feedback connection
Socket type	17-pin rotatable angle socket
Recommended connector	MCSENC-17
Pinning configuration (view of motor connecting pins)	

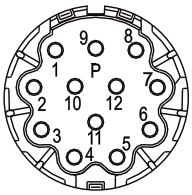
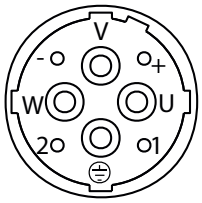
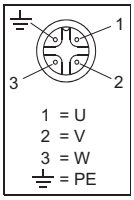
X1 =	EnDat 2.1, with Sin/Cos signals A8F, A8G (EQN 1325) A8K (EQI 1331) INH (EQN 1125)	BiSS, without Sin/Cos AAG, AAH (AD 34)	HIPERFACE, with Sin/Cos signals IWN (SKS 36) IWP (SKM 36)	Incremental Sin/Cos encoder A8L (ERN 1387) INN, INP (ERN 1185)	Incremental pulse encoder IW3 (CKS 36)
1	- -	- -	- -	- D +	- Therm. sens. + 1)
2	- -	- -	- -	- -	- Therm. sens. - 1)
3	- -	- -	- -	- -	- -
4	- -	- -	- -	- D -	- U +
5	- Therm. sens. + 1)	- Therm. sens. + 1)	- Therm. sens. + 1)	- Therm. sens. + 1)	- U -
6	- Therm. sens. - 1)	- Therm. sens. - 1)	- Therm. sens. - 1)	- Therm. sens. - 1)	- V +
7	- Up	- Up	- Up	- Up	- V -
8	- Clock +	- Clock +	- -	- C +	- W +
9	- Clock -	- Clock -	- -	- C -	- W -
10	- 0 V	- 0 V	- 0 V	- 0 V	- A +
11	- -	- -	- -	- -	- Z +
12	- B +	- -	- COS +	- B +	- Z -
13	- B -	- -	- COS -	- B -	- A -
14	- Data +	- Data +	- Data +	- R +	- B +
15	- A +	- -	- SIN +	- A +	- B -
16	- A -	- -	- SIN -	- A -	- Up
17	- Data -	- Data -	- Data -	- R -	- 0 V

1) Thermal sensor can be connected via feedback or power connector, see motor option item X5 in type code.

10. Connection system SDM 281-...-195/...



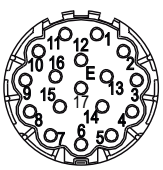


	Resolver connection (X1 = 000)	Connection to system	Fan connection
Socket type	12-pin rotatable angle socket	8-pin rotatable angle socket	Connector plug (3-pole + ground wire)
Recommended connector	MCSRES-12	MCSPOW-08A	included in delivery
Pinning configuration (view of motor connecting pins)			
Pin assignment	1 - S2 / Sin + 2 - S4 / Sin - 5 - Therm. sens. + 1) 6 - Therm. sens. + 1) 7 - S3 / Cos - 8 - S1 / Cos + 10 - R1 / EXC + 12 - R2 / EXC -	U - U1 V - V1 W - W1 PE - PE + - brake + (if any) - - brake – (if any) 1 - Therm.sens. + 1) / DSL+ 2) 2 - Therm.sens. - 1) / DSL - 2)	1 - U 2 - V 3 - W 4 - PE

2) With DSL feedback the thermal sensor is connected to feedback device.

1) Thermal sensor can be connected via feedback or power connector, see motor option item X5 in type code.

Feedback device options

	Feedback connection
Socket type	17-pin rotatable angle socket
Recommended connector	MCSENC-17
Pinning configuration (view of motor connecting pins)	

X1 =	EnDat 2.1, with Sin/Cos signals: A8F, A8G (EQN 1325) A8K (EQI 1331) INH (EQN 1125)	BiSS, without Sin/Cos: AAG, AAH (AD 34)	HIPERFACE, with Sin/Cos signals: IWN (SKS 36) IWP (SKM 36)	Incremental Sin/Cos encoder: A8L (ERN 1387) INN, INP (ERN 1185)	Incremental pulse encoder: IW3 (CKS 36)
1	- -	- -	- -	- D +	- Therm. sens. + 1)
2	- -	- -	- -	- -	- Therm. sens. - 1)
3	- -	- -	- -	- -	- -
4	- -	- -	- -	- D -	- U +
5	- Therm. sens. + 1)	- Therm. sens. + 1)	- Therm. sens. + 1)	- Therm. sens. + 1)	- U -
6	- Therm. sens. - 1)	- Therm. sens. - 1)	- Therm. sens. - 1)	- Therm. sens. - 1)	- V +
7	- Up	- Up	- Up	- Up	- V -
8	- Clock +	- Clock +	- -	- C +	- W +
9	- Clock -	- Clock -	- -	- C -	- W -
10	- 0 V	- 0 V	- 0 V	- 0 V	- A +
11	- -	- -	- -	- -	- Z +
12	- B +	- -	- COS +	- B +	- Z -
13	- B -	- -	- COS -	- B -	- A -
14	- Data +	- Data +	- Data +	- R +	- B +
15	- A +	- -	- SIN +	- A +	- B -
16	- A -	- -	- SIN -	- A -	- Up
17	- Data -	- Data -	- Data -	- R -	- 0 V

1) Thermal sensor can be connected via feedback or power connector, see motor option item X5 in type code.

11. Type code

SDM 281	-	002N6	-	090	/	30	-	000	-	2	0	0	0

Synchronous servo motor SDM 281

Stall torque
e. g. 002N6 = 2.6 Nm

Mounting window
055 - 55 mm 090 - 90 mm 102 - 102 mm
140 - 140 mm 195 - 195 mm

Rated speed (in rpm x 100)
e. g. 30 = 3,000 rpm

Mechanical design, options
...-000-2000 (standard design)

X1: Feedback device, feedback device pin assignement, modifications

000 - resolver 2-pole
A8F - Absolute multiturn, EnDat (EQN 1325: Endat 2.1, 13bits per rev., 512 Sin/Cos per rev., 12bits revolutions), 1)
A8G - Absolute multiturn, EnDat (EQN 1325: Endat 2.1, 13bits per rev., 2048 Sin/Cos perrev., 12bits revolutions), 1)
A8K - Absolute multiturn, EnDat (EQI 1331: Endat 2.1, 19bits per rev., 32 Sin/Cos per rev., 12bits revolutions), 1)
INH - Absolute multiturn, EnDat (EQN 1125: Endat 2.1, 13bits per rev., 512 Sin/Cos per rev., 12bits revolutions), 2)
AAG - Absolute singleturn, BiSS (AD34/0017: BiSS-B, 17bits per rev., without Sin/Cos signals), 5)
AAH - Absolute Multiturn, BiSS (AD34/1217: BiSS-B, 17bits per rev., 12bits revolutions, without Sin/Cos signals), 5)
IWN - Absolute singleturn, HIPERFACE (SKS 36: HIPERFACE, 12bits per rev., 128 Sin/Cos per rev.), 6)
IWP - Absolute multiturn, HIPERFACE (SKM 36: HIPERFACE, 12bits per rev., 128 Sin/Cos per rev., 12bits rev.), 6)
A8L - Incremental Sin/Cos encoder (ERN 1387: 2048 Sin/Cos per rev. With C and D tracks), 1)
INN - Incremental Sin/Cos encoder (ERN 1185: 512 Sin/Cos per rev. With C and D tracks), 2)
INP - Incremental Sin/Cos encoder (ERN 1185: 2048 Sin/Cos per rev. With C and D tracks), 2)
IW3 - Incremental pulse encoder (CKS 36: 2048 pulses per rev. With commutation signals)
IW7 - Absolute singleturn, DSL (EKS 36: DSL, HIPERFACE, 18bits per rev., 1bit revolutions), 7)
IW8 - Absolute multiturn, DSL (EKM 36: DSL, HIPERFACE, 18bits per rev., 12bit revolutions), 7)

X2: Construction type, shaft end, power connector

2 - Standard construction, Plain shaft end, Rotatable angle power connector
6 - Standard construction, Shaft end with fitted key and keyway (half-key balancing), Rotatable angle power connector
9 - Customized design

X3: Brake, vibrational severity, flange accuracy

0 - without brake, vibrational severity „B", flange accuracy „N"
1 - with brake, vibrational severity „B", flange accuracy „N"

X4: Feedback device, rated voltage

0 - resolver with flange socket, rated voltage 400 V
A - other feedback devices, rated voltage 400 V

X5: Separately driven fan, rotary shaft seal

0 - Self-cooling, Without shaft seal (IP64), PTC (in feedback connection)
2 - Self-cooling, Without shaft seal (IP64), Klixon (in feedback connection)
K - Self-cooling, Without shaft seal (IP64), Klixon *(in power connection), 4)*
P - Self-cooling, Without shaft seal (IP64), PTC *(in power connection), 8)*
5 - Self-cooling, With shaft seal (IP65), PTC (in feedback connection)
7 - Self-cooling, With shaft seal (IP65), Klixon (in feedback connection)
M - Self-cooling, With shaft seal (IP65), Klixon (in power connection), 4)
R - Self-cooling, With shaft seal (IP65), PTC (in power connection), 8)
1 - Enforced cooling, Without shaft seal (IP64), PTC (in feedback connection)
3 - Enforced cooling, Without shaft seal (IP64), Klixon (in feedback connection)
L - Enforced cooling, Without shaft seal (IP64), Klixon (in power connection), 4)
Q - Enforced cooling, Without shaft seal (IP64), PTC (in power connection), 8)
6 - Enforced cooling, With shaft seal (IP65), PTC (in feedback connection)
8 - Enforced cooling, With shaft seal (IP65), Klixon (in feedback connection)
N - Enforced cooling, With shaft seal (IP65), Klixon (in power connection), 4)
S - Enforced cooling, With shaft seal (IP65), PTC (in power connection), 8)

Notes:

1) Not available with flange size "055"
2) Available only with flange size "055"
4) With MicroFlex and MotiFlex drives the thermal sensor (Klixon) is connected via power connector, when ABB standard cables are used.
5) BiSS feedback devices are compatible only with Micro/MotiFlex drives
6) HIPERFACE feedback devices are compatible only with MFE180-04 and ACSxxx drives (with FEN-11)
7) DSL feedback devices are only available with SDM281 (with MotiFlex e180 drives). With DSL option X5 should be with "PTC (in power connection)"
8) PTC used with DSL

12. Technical data SDM 281-...-055/.. - self-cooling

SDM 281-000N5-055/60...

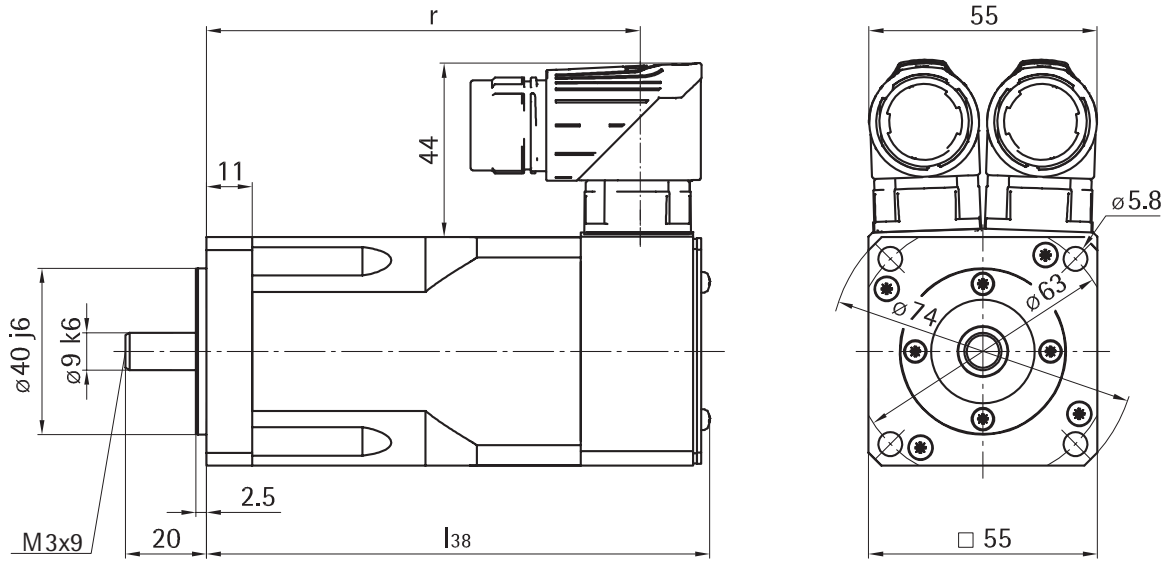
for supply voltages U_N from 400 V

Motor type				SDM 281-000N5- 055/60	SDM 281-000N7- 055/60	SDM 281-000N9- 055/60	SDM 281-001N1- 055/60
Stall torque		M_{d0}	[Nm]	0.47	0.66	0.87	1.14
Current at stall torque		I_{d0}	[A]	0.94	1.24	1.43	1.55
Stall torque	>10rpm	M_{d10}	[Nm]	0.48	0.68	0.89	1.17
Current at stall torque	>10rpm	I_{d10}	[A]	1.02	1.28	1.48	1.70
Number of poles		2p		6			
Nominal rating							
Rated torque		M_{dN}	[Nm]	0.43	0.62	0.80	1.05
Rated current		I_{dN}	[A]	0.93	1.16	1.44	1.64
Rated speed		n_N	[rpm]	6000	6000	6000	6000
Rated power		P_{dN}	[kW]	0.27	0.39	0.50	0.66
Voltage constant [1]		k_e	[V/1000rpm]	31.2	34.1	35.8	41.5
Winding resistance [2]		R_{u-v}	[Ω]	37.4	24.0	17.8	12.6
Winding inductance		L_{u-v}	[mH]	19.0	13.1	11.5	9.6
Max. values							
Max. torque		M_{max}	[Nm]	2.1	2.9	3.8	5.0
Max. current (peak value)		I_{max}	[A]	4.5	5.6	6.9	8.0
Max. speed		n_{max}	[rpm]	9,000			
Mechanical data [3]							
Inertia		J_L	[kgcm²]	0.13	0.18	0,.23	0.34
Weight		m	[kg]	1.0	1.2	1.4	1.9

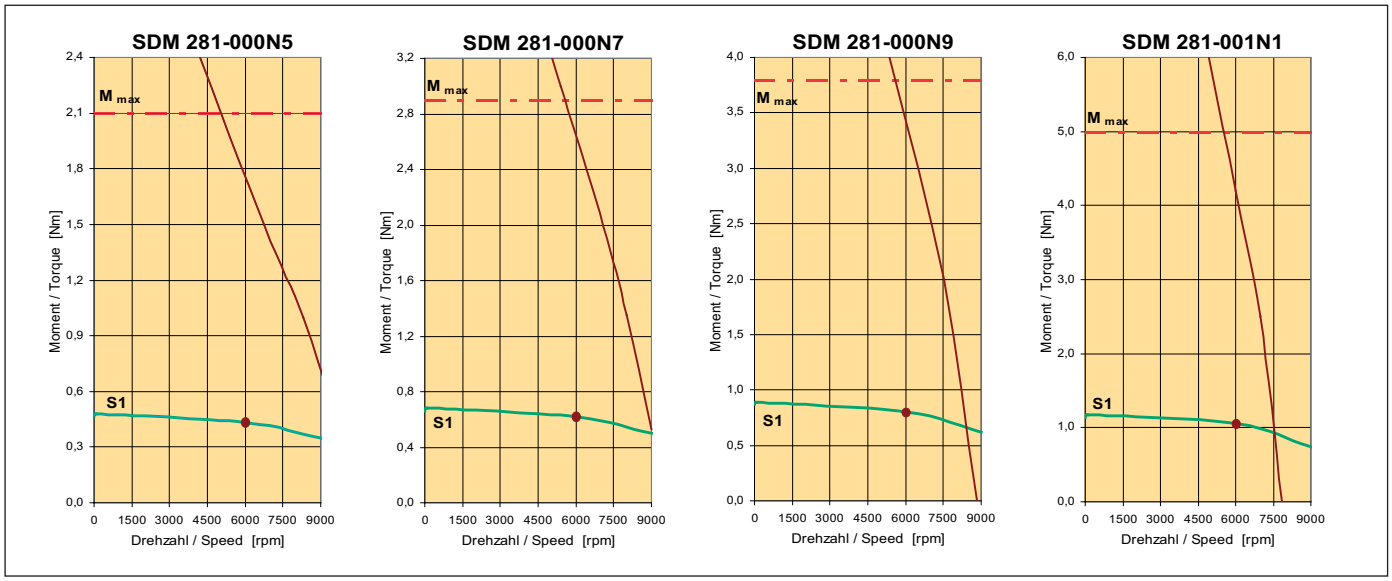
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{38}	r	l_{38}	r	l_{38}	r	l_{38}	r
000N5-...	121	105	156	136	145	129	180	160
000N7-...	133	117	168	148	157	141	192	172
000N9-...	145	129	180	160	169	153	204	184
001N1-...	170	153	205	185	194	178	229	209



Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	2.0
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.46
Weight	m	[kg]	0.18
Rotor inertia	J_{Br}	[kgcm²]	0.07

13. Technical data SDM 281-...-090/.. - self-cooling

SDM 281-000N9-090/60...

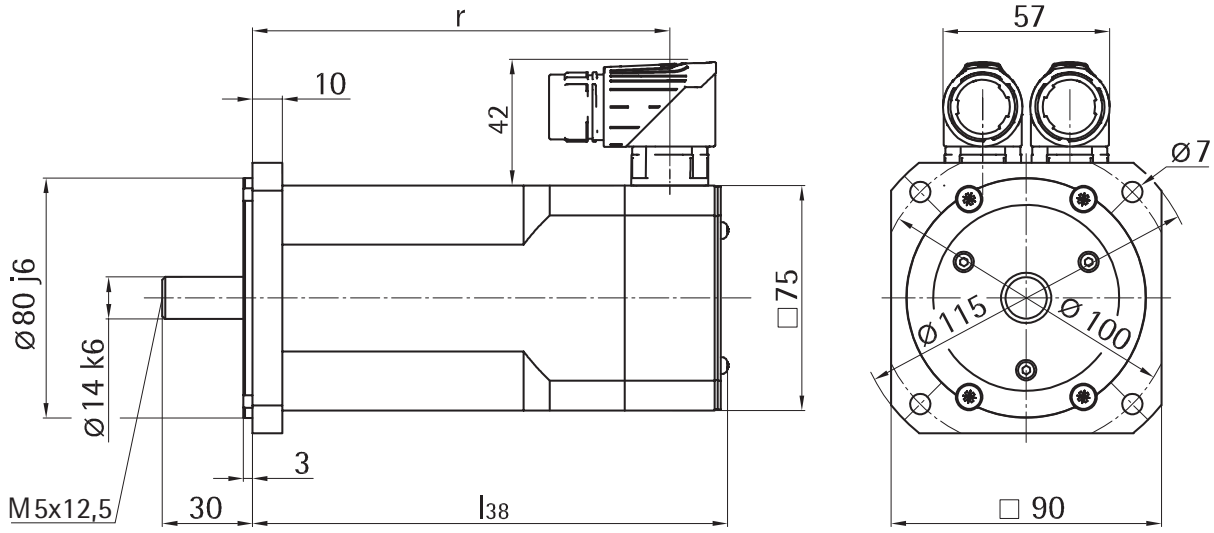
for supply voltages U_N from 400 V

Motor type				SDM 281-000N9-			SDM 281-001N8-			SDM 281-002N6-		
				090/30	090/40	090/60	090/30	090/40	090/60	090/30	090/40	090/60
Stall torque		M_{d0}	[Nm]		0.92			1.8			2.6	
Current at stall torque		I_{d0}	[A]	1.0	1.2	1.5	1.6	2.0	2.5	2.3	2.7	3.9
Stall torque	>10rpm	M_{d10}	[Nm]		0.94			1.84			2.65	
Current at stall torque	>10rpm	I_{d10}	[A]	1.0	1.2	1.5	1.6	2.0	2.6	2.4	2.8	4.1
Number of poles		2p						6				
Nominal rating												
Rated torque		M_{dN}	[Nm]	0.9	0.87	0.76	1.83	1.75	1.5	2.6	2.5	2.3
Rated current		I_{dN}	[A]	1.0	1.2	1.3	1.7	2.1	2.3	2.6	2.9	3.6
Rated speed		n_N	[rpm]	3000	4000	6000	3000	4000	6000	3000	4000	6000
Rated power		P_{dN}	[kW]	0.28	0.37	0.48	0.58	0.73	0.94	0.83	1.03	1.35
Voltage constant [1]		k_e	[V/1000rpm]	54.1	44.4	35.4	64.0	51.0	39.6	61.5	52.6	36.4
Winding resistance [2]		R_{u-v}	[Ω]	37.2	24.6	15.7	17.7	11.1	6.9	9.3	7.6	3.4
Winding inductance		L_{u-v}	[mH]	66.0	44.4	28.3	41.4	26.3	15.9	25.1	18.4	8.8
Max. values												
Max. torque		M_{max}	[Nm]		2.7			5.4			7.8	
Max. current (peak value)		I_{max}	[A]	3.6	4.5	5.5	6.1	7.7	9.9	9.2	10.8	15.5
Max. speed		n_{max}	[rpm]					9000				
Mechanical data [3]												
Inertia		J_L	[kgcm²]		0.30			0.56			0.79	
Weight		m	[kg]		2.3			3.0			3.7	

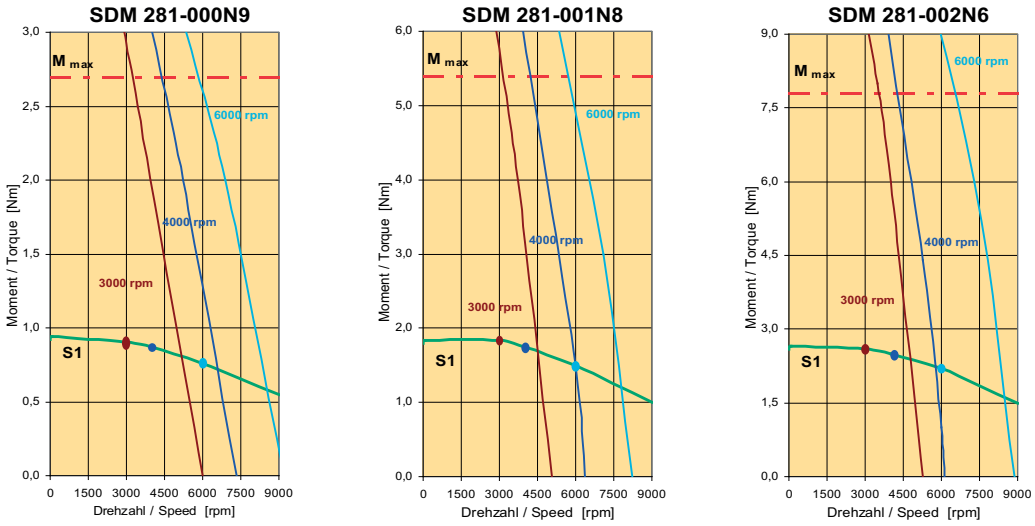
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{38}	r	l_{38}	r	l_{38}	r	l_{38}	r
000N9-...	132	113	174	148	164	145	206	180
001N8-...	158	139	200	174	190	171	232	206
002N6-...	184	165	226	200	216	197	258	232



Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	4.5
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.58
Weight	m	[kg]	0.28
Rotor inertia	J_{Br}	[kgcm²]	0.19

14. Technical data SDM 281-...-102/.. - self-cooling

SDM 281-003N9-102/40...

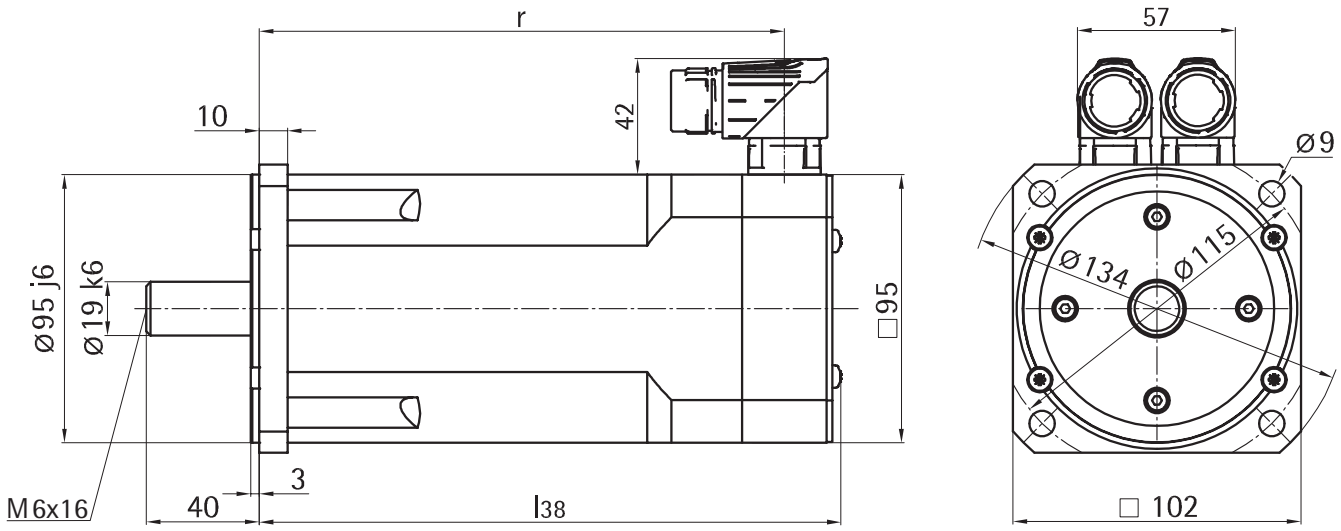
for supply voltages U_N from 400 V

Motor type				SDM 281-003N9-			SDM 281-005N7-			SDM 281-007N1-			SDM 281-008N5-		
				102/20	102/30	102/40	102/20	102/30	102/40	102/20	102/30	102/40	102/20	102/30	102/40
Stall torque		M_{d0}	[Nm]		3.9			5.7			7.1			8.5	
Current at stall torque		I_{d0}	[A]	2.5	3.1	3.9	3.8	5.0	6.1	5.7	7.0	8.8	5.5	8.5	10.7
Stall torque	>10rpm	M_{d10}	[Nm]		4.0			5.8			7.2			8.6	
Current at stall torque	>10rpm	I_{d10}	[A]	2.5	3.1	3.9	3.8	5.1	6.2	4.5	5.5	6.9	4.3	6.7	8.4
Number of poles		2p						8							
Nominal rating															
Rated torque		M_{dN}	[Nm]	3.8	3.5	3.1	5.5	4.8	4.2	6.9	6.4	5.7	8.3	7.6	6.8
Rated current		I_{dN}	[A]	2.5	2.8	3.1	3.7	4.2	4.5	4.3	4.9	5.5	4.2	6.0	6.6
Rated speed		n_N	[rpm]	2000	3000	4000	2000	3000	4000	2000	3000	4000	2000	3000	4000
Rated power		P_{dN}	[kW]	0.8	1.1	1.3	1.2	1.5	1.8	1.4	2.0	2.4	1.7	2.4	2.8
Voltage constant [1]		k_e	[V/1000rpm]	98.3	78.9	62.9	92.5	69.4	57.0	97.9	79.5	63.4	122	79.1	63.3
Winding resistance [2]		R_{u-v}	[Ω]	11.6	7.4	4.7	6.1	3.6	2.4	4.4	2.9	1.8	5.3	2.2	1.4
Winding inductance		L_{u-v}	[mH]	29.5	19.0	12.1	16.5	9.3	6.3	13.5	8.9	5.7	20.0	8.4	5.4
Max. values															
Max. torque		M_{max}	[Nm]		12			17.5			22			26	
Max. current (peak value)		I_{max}	[A]	8.4	10.5	13.2	12.6	16.8	20.4	16.2	20.0	25.1	15.3	23.8	29.6
Max. speed		n_{max}	[rpm]					6000							
Mechanical data [3]															
Inertia		J_L	[kgcm²]		2.7			3.7			4.7			6.0	
Weight		m	[kg]		4.8			6.3			7.4			8.6	

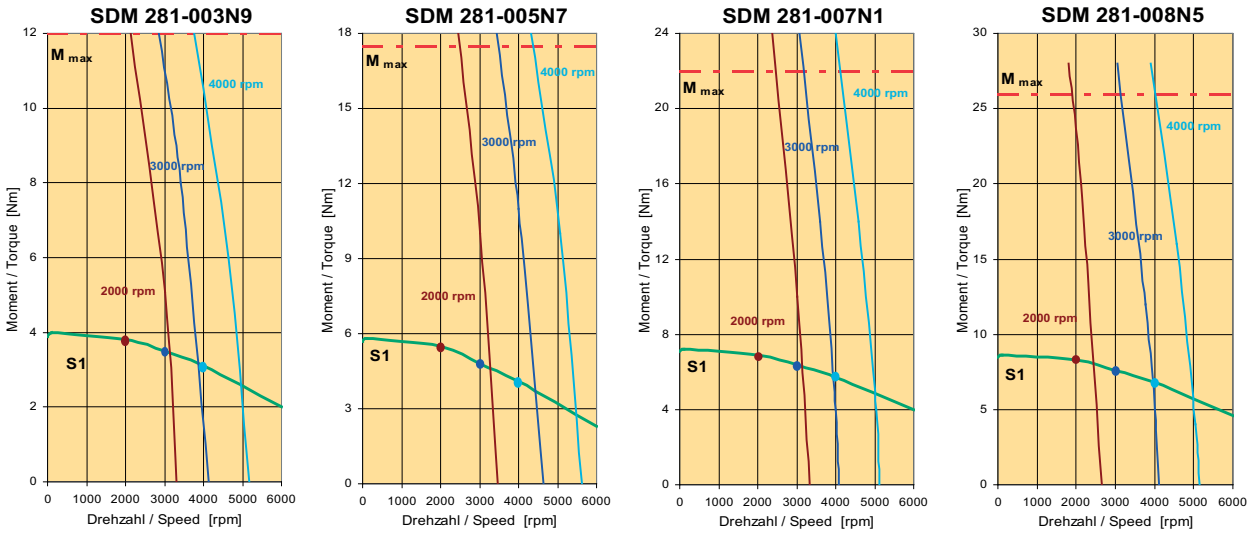
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{38}	r	l_{38}	r	l_{38}	r	l_{38}	r
003N9-...	178	158	220	193	214	194	256	229
005N7-...	206	186	248	221	242	222	284	257
007N1-...	234	214	276	249	270	250	312	285
008N5-...	262	242	304	277	298	278	340	313



Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	10
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.71
Weight	m	[kg]	0.57
Rotor inertia	J_{Br}	[kgcm²]	1.01

15. Technical data SDM 281-...-140/.. - self-cooling

SDM 281-008N2-140/30...

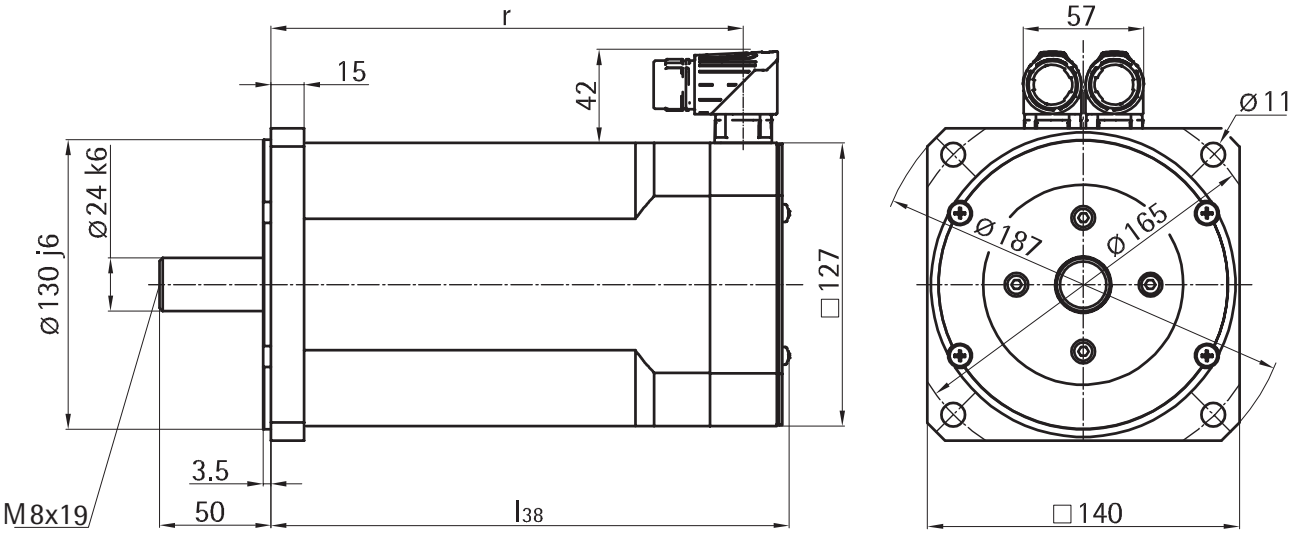
for supply voltages U_N from 400 V

Motor type				SDM 281-008N2-			SDM 281-011N6-			SDM 281-015N3-			SDM 281-018N4-		
				140/15	140/20	140/30	140/15	140/20	140/30	140/15	140/20	140/30	140/15	140/20	140/30
Stall torque		M_{d0}	[Nm]		8.2			11.6			15.3			18.4	
Current at stall torque		I_{d0}	[A]	3.6	4.6	6.0	5.6	6.9	8.9	6.8	8.8	11.2	8.2	10.4	14.0
Stall torque	>10rpm	M_{d10}	[Nm]		8.3			11.8			15.6			18.8	
Current at stall torque	>10rpm	I_{d10}	[A]	3.3	4.2	5.5	5.1	6.2	8.1	6.1	7.9	10.2	7.4	9.5	12.7
Number of poles		2p						8							
Nominal rating															
Rated torque		M_{dN}	[Nm]	8.0	7.6	6.8	11.5	11.0	9.5	15.0	14.0	11.9	18.0	16.9	13.7
Rated current		I_{dN}	[A]	3.3	4.0	4.6	5.1	6.0	6.7	6.1	7.3	8.0	7.4	8.8	9.6
Rated speed		n_N	[rpm]	1500	2000	3000	1500	2000	3000	1500	2000	3000	1500	2000	3000
Rated power		P_{dN}	[kW]	1.3	1.6	2.1	1.8	2.3	3.0	2.4	2.9	3.8	2.8	3.5	4.3
Voltage constant [1]		k_e	[V/1000rpm]	150	118	90.3	138	112	86.9	151	117	91.0	150	118	87.9
Winding resistance [2]		R_{u-v}	[Ω]	8.0	4.9	3.0	4.0	2.6	1.6	3.2	2.0	1.2	2.4	1.5	0.9
Winding inductance		L_{u-v}	[mH]	35.0	21.5	12.7	19.0	12.6	7.5	15.3	9.2	5.6	9.4	5.8	3.2
Max. values															
Max. torque		M_{max}	[Nm]		25			36			47			57	
Max. current (peak value)		I_{max}	[A]	12.1	15.5	20.1	19.0	23.3	30.1	22.7	29.4	37.7	27.2	35.3	47.4
Max. speed		n_{max}	[rpm]					4500							
Mechanical data [3]															
Inertia		J_L	[kgcm²]		7.9			11.2			14.4			19.5	
Weight		m	[kg]		10.0			11.9			14.0			18.0	

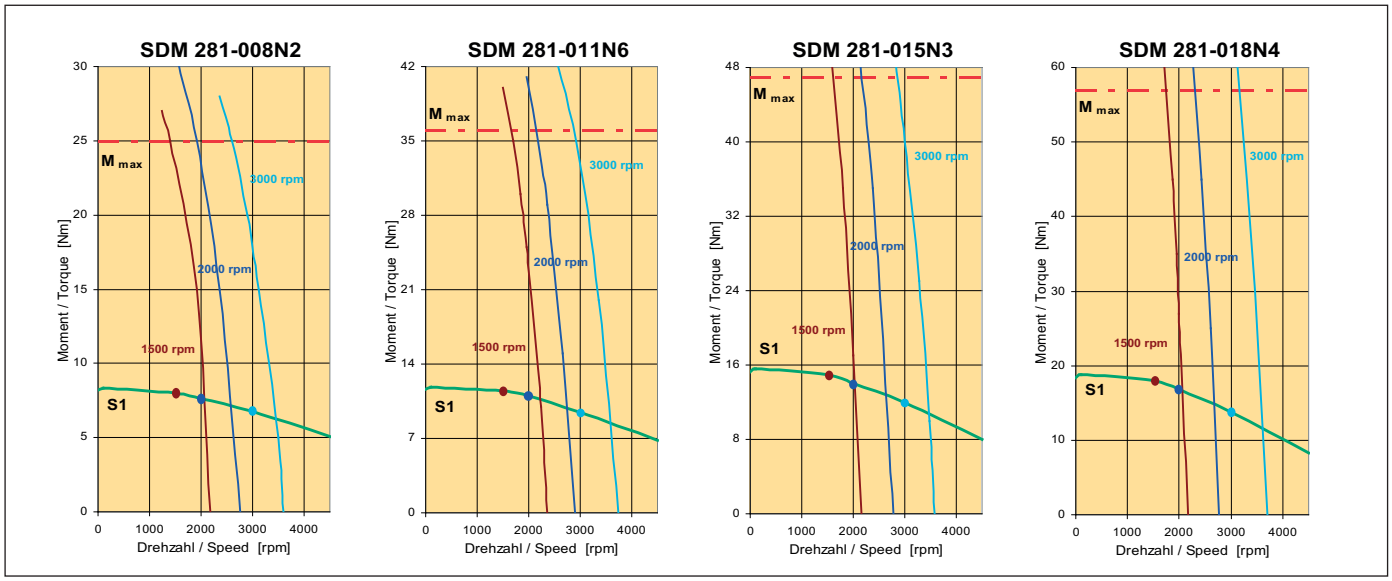
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{38}	r	l_{38}	r	l_{38}	r	l_{38}	r
008N2-...	203	182	245	217	237	216	279	251
011N6-...	233	212	275	247	267	246	309	281
015N3-...	263	242	305	277	297	276	339	311
018N4-...	293	272	335	307	327	306	369	341



Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	22
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.83
Weight	m	[kg]	1.15
Rotor inertia	J_{Br}	[kgcm²]	2,76

16. Technical data SDM 281-...-195/.. - self-cooling

SDM 281-023N5-195/10...

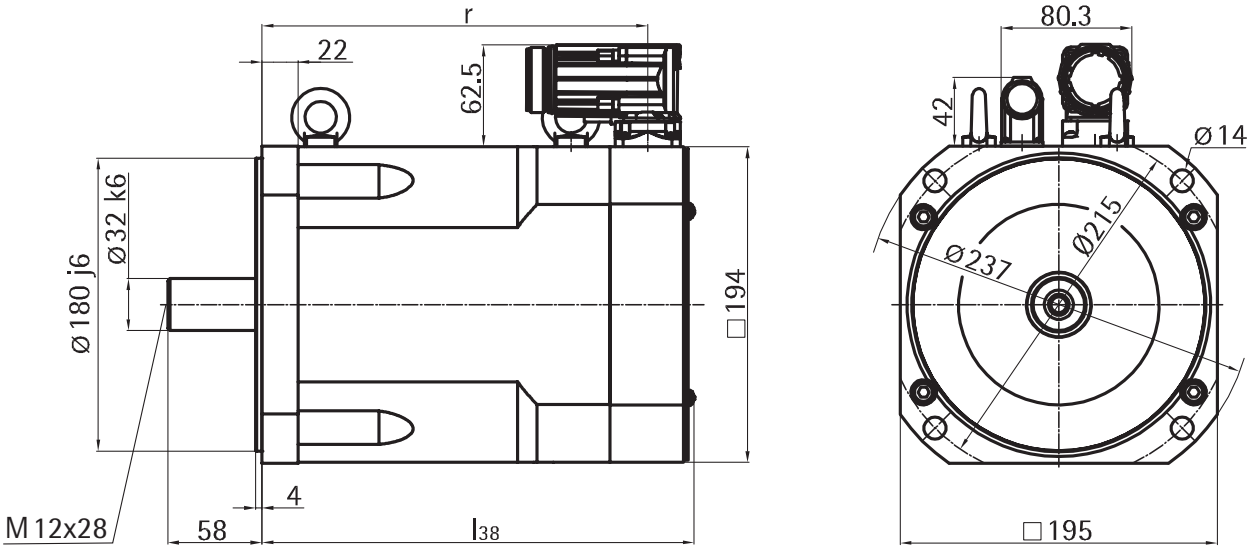
for supply voltages U_N from 400 V

Motor type				SDM 281-023N5-			SDM 281-035N0-			SDM 281-048N0-		
				195/10	195/20	195/30	195/10	195/20	195/30	195/10	195/20	195/30
Stall torque		M_{d0}	[Nm]		23,5			35,0			48,0	
Current at stall torque		I_{d0}	[A]	7,6	12,7	16,9	10,9	19,3	24,8	16,1	27,7	38,2
Stall torque	>10rpm	M_{d10}	[Nm]		23,7			35,5			48,5	
Current at stall torque	>10rpm	I_{d10}	[A]	7,0	11,7	15,5	10,0	17,7	22,8	14,8	25,4	35,0
Number of poles		2p						8				
Nominal rating												
Rated torque		M_{dN}	[Nm]	23	19	14	34	28	19	47	40	27
Rated current		I_{dN}	[A]	6,9	9,7	9,4	9,8	14,2	12,4	14,5	20,8	19,6
Rated speed		n_N	[rpm]	1000	2000	3000	1000	2000	3000	1000	2000	3000
Rated power		P_{dN}	[kW]	2,4	4,0	4,4	3,6	5,8	6,0	4,9	8,3	8,4
Voltage constant [1]		k_e	[V/1000rpm]	206,0	120,5	90,4	212,1	119,1	93,0	198,9	116,7	82,5
Winding resistance [2]		R_{u-v}	[Ω]	2,31	0,79	0,5	1,42	0,44	0,27	0,87	0,3	0,15
Winding inductance		L_{u-v}	[mH]	38,9	13,3	7,5	26,1	8,2	5,0	17,3	5,9	3,0
Max. values												
Max. torque		M_{max}	[Nm]		65			106			145	
Max. current (peak value)		I_{max}	[A]	23,3	39,3	52,2	36,3	64,1	81,7	53,2	90,4	127,0
Max. speed		n_{max}	[rpm]					4000				
Mechanical data [3]												
Inertia		J_L	[kgcm²]		57			79			102	
Weight		m	[kg]		29			34			39	

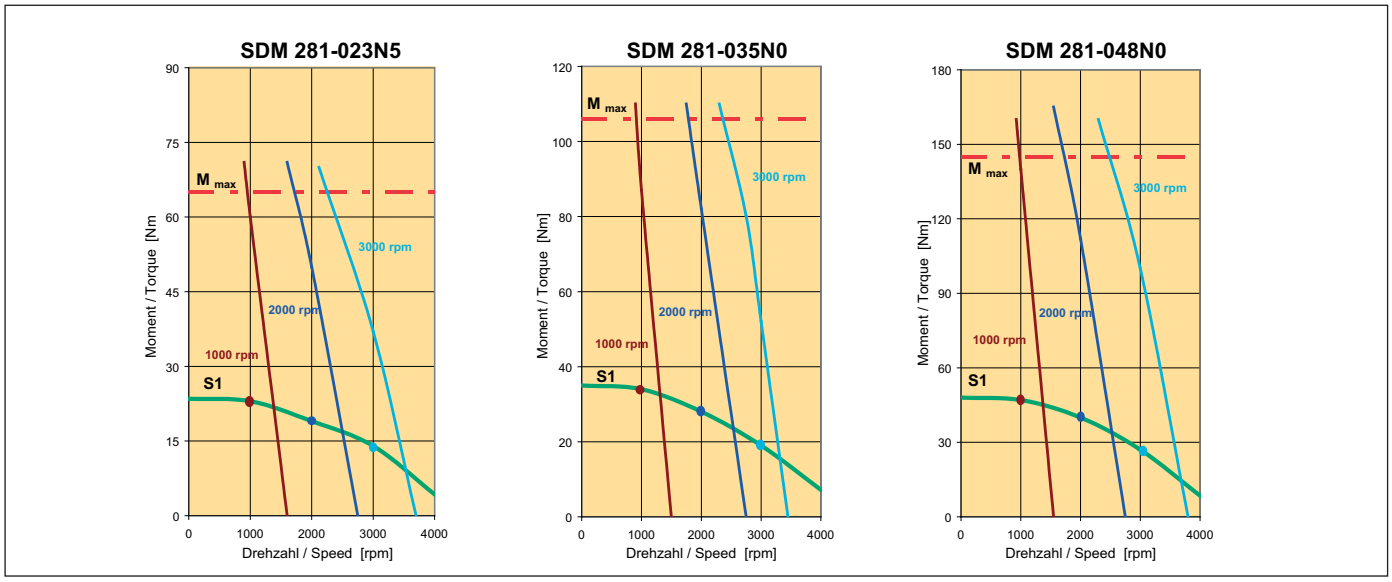
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{38}	r	l_{38}	r	l_{38}	r	l_{38}	r
023N5-...	266	237	293	264	300	271	327	298
035N0-...	294	265	321	292	328	299	355	326
048N0-...	322	293	349	320	356	327	383	354



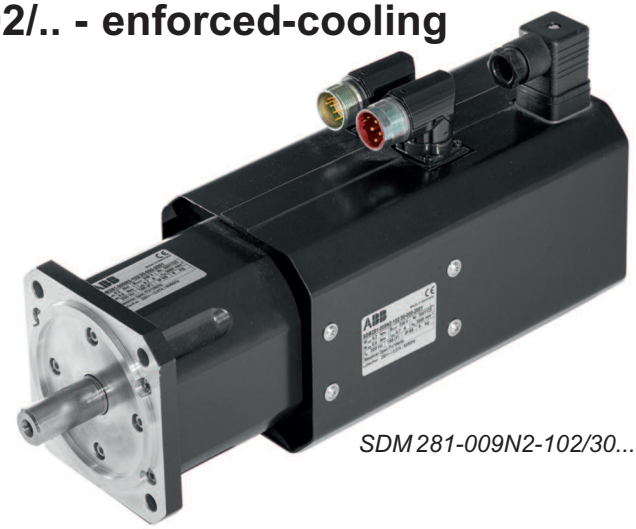
Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	70
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	1,5
Weight	m	[kg]	3,4
Rotor inertia	J_{Br}	[kgcm²]	20.1

17. Technical data SDM 281-...-102/.. - enforced-cooling



SDM 281-009N2-102/30...

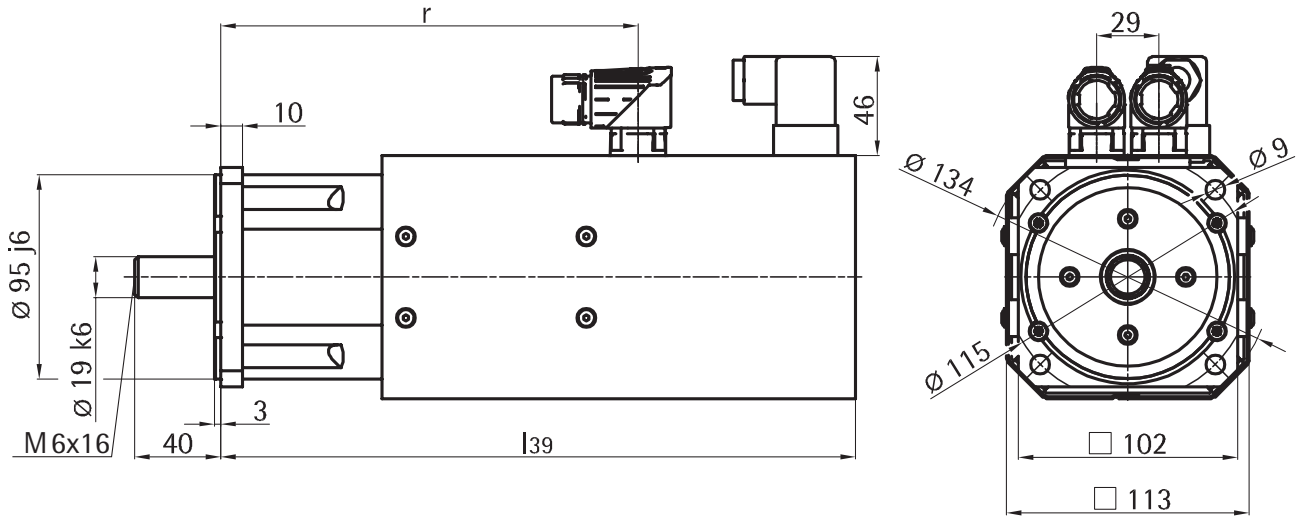
for supply voltages U_N from 400 V

Motor type				SDM 281-005N0-			SDM 281-007N4-			SDM 281-009N2-			SDM 281-011N1-		
				102/20	102/30	102/40	102/20	102/30	102/40	102/20	102/30	102/40	102/20	102/30	102/40
Stall torque		M_{d0}	[Nm]		5.0			7.4			9.2			11.1	
Current at stall torque		I_{d0}	[A]	3.2	4.0	5.0	4.9	6.5	7.9	7.4	9.1	11.4	7.1	11.0	13.7
Stall torque	>10rpm	M_{d10}	[Nm]		52			7.7			9.5			11.4	
Current at stall torque	>10rpm	I_{d10}	[A]	3.3	4.1	5.2	5.0	6.7	8.2	5.9	7.3	9.1	5.6	8.7	10.9
Number of poles		2p						8							
Nominal rating															
Rated torque		M_{dN}	[Nm]	5.2	4.7	4.2	7.4	6.4	5.6	9.3	8.6	7.7	11.2	10.3	9.2
Rated current		I_{dN}	[A]	3.3	3.8	4.2	4.9	5.7	6.1	5.8	6.7	7.5	5.7	8.0	8.9
Rated speed		n_N	[rpm]	2000	3000	4000	2000	3000	4000	2000	3000	4000	2000	3000	4000
Rated power		P_{dN}	[kW]	1.1	1.5	1.8	1.6	2.0	2.4	1.9	2.7	3.2	2.3	3.2	3.8
Voltage constant [1]		k_e	[V/1000rpm]	98.3	78.9	62.9	92.5	69.4	57.0	97.9	79.5	63.4	122	79.1	63.3
Winding resistance [2]		R_{u-v}	[Ω]	11.6	7.4	4.7	6.1	3.6	2.4	4.4	2.9	1.8	5.3	2.2	1.4
Winding inductance		L_{u-v}	[mH]	29.5	19.0	12.1	16.5	9.3	6.3	13.5	8.9	5.7	20.0	8.4	5.4
Max. values															
Max. torque		M_{max}	[Nm]		12			17.5			22			26	
Max. current (peak value)		I_{max}	[A]	8.4	10.5	13.2	12.6	16.8	20.4	16.2	20.0	25.1	15.3	23.8	29.6
Max. speed		n_{max}	[rpm]					6000							
Mechanical data [3]															
Inertia		J_L	[kgcm²]		2.7			3.7			4.7			6.0	
Weight		m	[kg]		6.3			7.8			9.0			10.4	

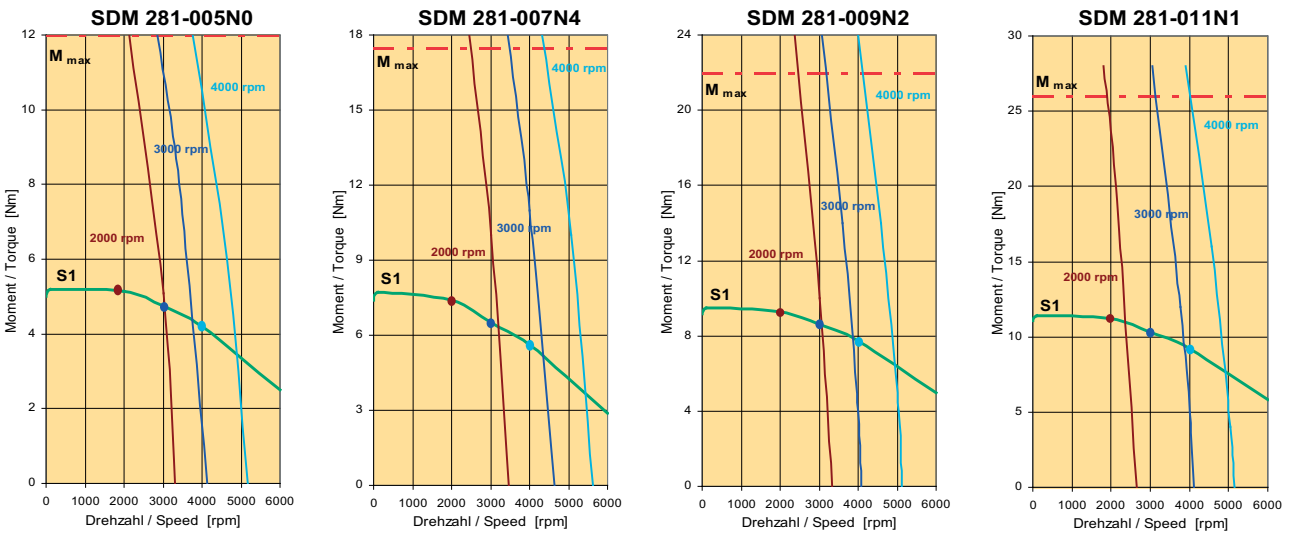
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{39}	r	l_{39}	r	l_{39}	r	l_{39}	r
005N0-...	259	158	301	193	295	194	337	229
007N4-...	287	186	329	221	323	222	365	257
009N2-...	315	214	357	249	351	250	393	285
011N1-...	343	242	385	277	379	278	421	313



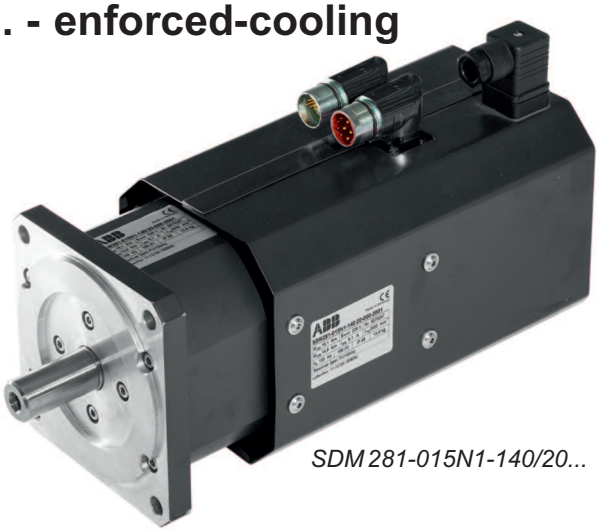
Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	10
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.71
Weight	m	[kg]	0.57
Rotor inertia	J_{Br}	[kgcm²]	1.01

18. Technical data SDM 281-...-140/.. - enforced-cooling



SDM 281-015N1-140/20...

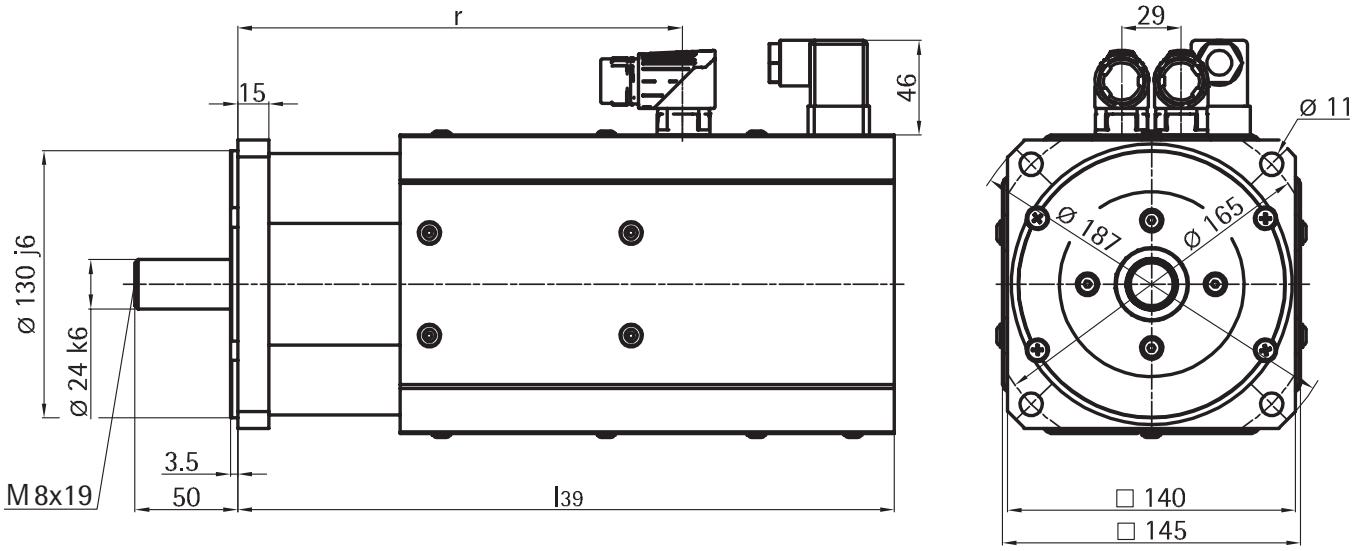
for supply voltages U_N from 400 V

Motor type				SDM 281-010N6-			SDM 281-015N1-			SDM 281-019N9-			SDM 281-023N9-		
				140/15	140/20	140/30	140/15	140/20	140/30	140/15	140/20	140/30	140/15	140/20	140/30
Stall torque		M_{d0}	[Nm]		10.6			15.1			19.9			23.9	
Current at stall torque		I_{d0}	[A]	4.7	6.0	7.9	7.3	9.0	11.6	8.8	11.4	14.6	10.7	13.6	18.2
Stall torque	>10rpm	M_{d10}	[Nm]		11.0			15.6			20.6			24.8	
Current at stall torque	>10rpm	I_{d10}	[A]	4.4	5.6	7.2	6.7	8.2	10.6	8.1	10.5	13.4	9.8	12.5	16.7
Number of poles		2p						8							
Nominal rating															
Rated torque		M_{dN}	[Nm]	10.8	10.3	9.1	15.6	14.9	12.8	20.2	18.9	16.1	24.3	22.8	18.5
Rated current		I_{dN}	[A]	4.4	5.4	6.2	6.9	8.1	9.1	8.2	9.9	10.9	9.9	11.9	12.9
Rated speed		n_N	[rpm]	1500	2000	3000	1500	2000	3000	1500	2000	3000	1500	2000	3000
Rated power		P_{dN}	[kW]	1.7	2.2	2.9	2.4	3.1	4.0	3.2	4.0	5.1	3.8	4.8	5.8
Voltage constant [1]		k_e	[V/1000rpm]	150	118	90.3	138	112	86.9	151	117	91.0	150	118	87.9
Winding resistance [2]		R_{u-v}	[Ω]	8.0	4.9	3.0	4.0	2.6	1.6	3.2	2.0	1.2	2.4	1.5	0.9
Winding inductance		L_{u-v}	[mH]	35.0	21.5	12.7	19.0	12.6	7.5	15.3	9.2	5.6	9.4	5.8	3.2
Max. values															
Max. torque		M_{max}	[Nm]		25			36			47			57	
Max. current (peak value)		I_{max}	[A]	12.1	15.5	20.1	19.0	23.3	30.1	22.7	29.4	37.7	27.2	35.3	47.4
Max. speed		n_{max}	[rpm]					4500							
Mechanical data [3]															
Inertia		J_L	[kgcm²]		7.9			11.2			14.4			19.5	
Weight		m	[kg]		11.9			13.8			16.2			20.4	

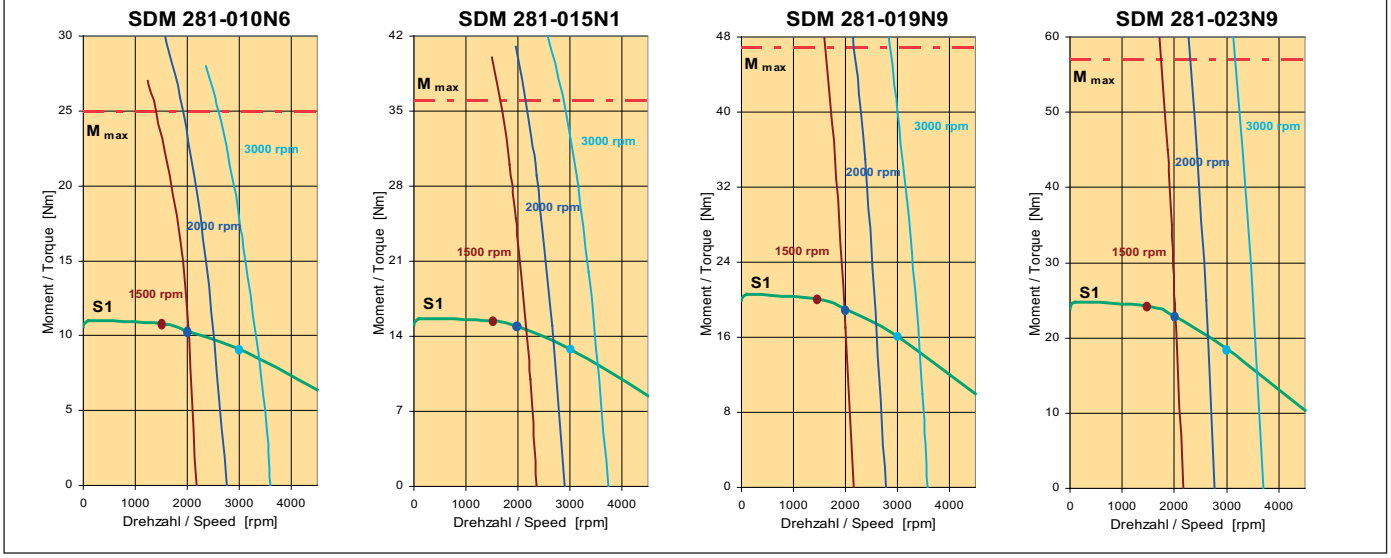
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{39}	r	l_{39}	r	l_{39}	r	l_{39}	r
010N6-...	285	182	327	217	319	216	361	251
015N1-...	315	212	357	247	349	246	391	281
019N9-...	345	242	387	277	379	276	421	311
023N9-...	375	272	417	307	409	306	451	341



Speed-torque characteristics



Holding brake

Holding torque	M_{Br}	[Nm]	22
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	0.83
Weight	m	[kg]	1.15
Rotor inertia	J_{Br}	[kgcm²]	2,76

19. Technical data SDM 281-...-195/.. - enforced-cooling

SDM 281-030N6-195/30...

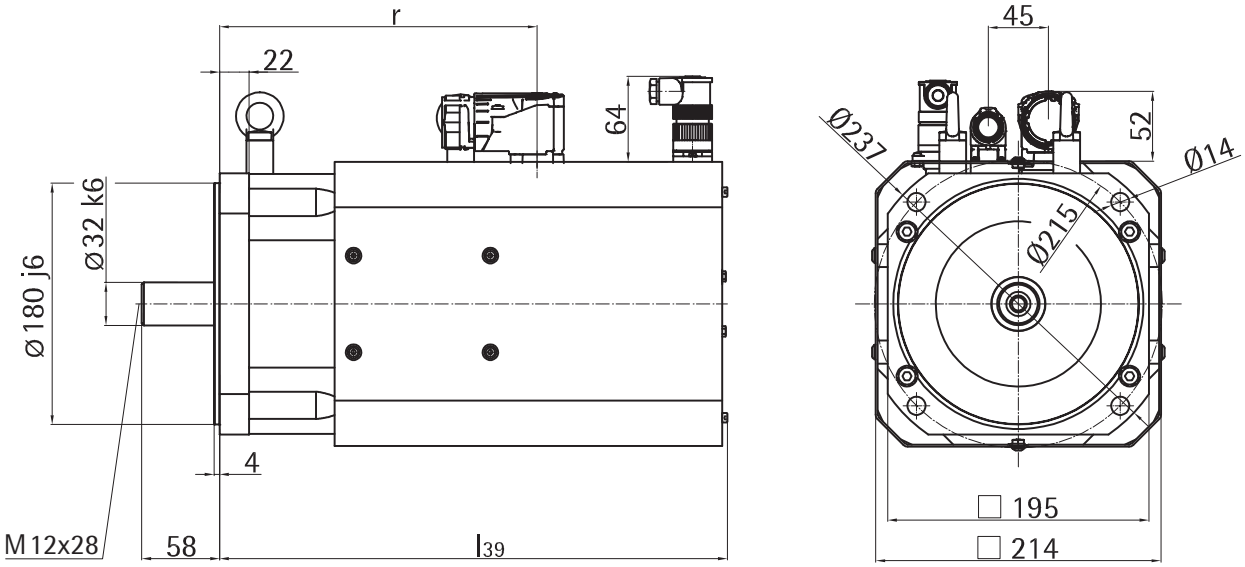
for supply voltages U_N from 400 V

Motor type				SDM 281-030N6-			SDM 281-045N5-			SDM 281-062N5-		
				195/10	195/20	195/30	195/10	195/20	195/30	195/10	195/20	195/30
Stall torque		M_{d0}	[Nm]		30,6			45,5			62,5	
Current at stall torque		I_{d0}	[A]	9,9	17,1	22,8	14,4	25,5	32,5	21,4	36,9	51,6
Stall torque	>10rpm	M_{d10}	[Nm]		30,8			45,8			63,0	
Current at stall torque	>10rpm	I_{d10}	[A]	9,1	15,1	20,2	13,0	23,0	29,6	19,2	33,0	45,6
Number of poles		2p						8				
Nominal rating												
Rated torque		M_{dN}	[Nm]	30	28	24	45	40	34	62	57	48
Rated current		I_{dN}	[A]	9,3	14,4	16,6	13,3	21,0	22,3	19,9	30,8	36,2
Rated speed		n_N	[rpm]	1000	2000	3000	1000	2000	3000	1000	2000	3000
Rated power		P_{dN}	[kW]	3,1	5,8	7,6	4,7	8,4	10,6	6,5	11,9	15,2
Voltage constant [1]		k_e	[V/1000rpm]	206,0	120,5	90,4	212,1	119,1	93,0	198,9	116,7	82,5
Winding resistance [2]		R_{u-v}	[Ω]	2,31	0,79	0,5	1,42	0,44	0,27	0,87	0,3	0,15
Winding inductance		L_{u-v}	[mH]	38,9	13,3	7,5	26,1	8,2	5,0	17,3	5,9	3,0
Max. values												
Max. torque		M_{max}	[Nm]		65			106			145	
Max. current (peak value)		I_{max}	[A]	23,3	39,3	52,2	36,3	64,1	81,7	53,2	90,4	127,0
Max. speed		n_{max}	[rpm]					4000				
Mechanical data [3]												
Inertia		J_L	[kgcm²]		57			79			102	
Weight		m	[kg]		32			37			42	

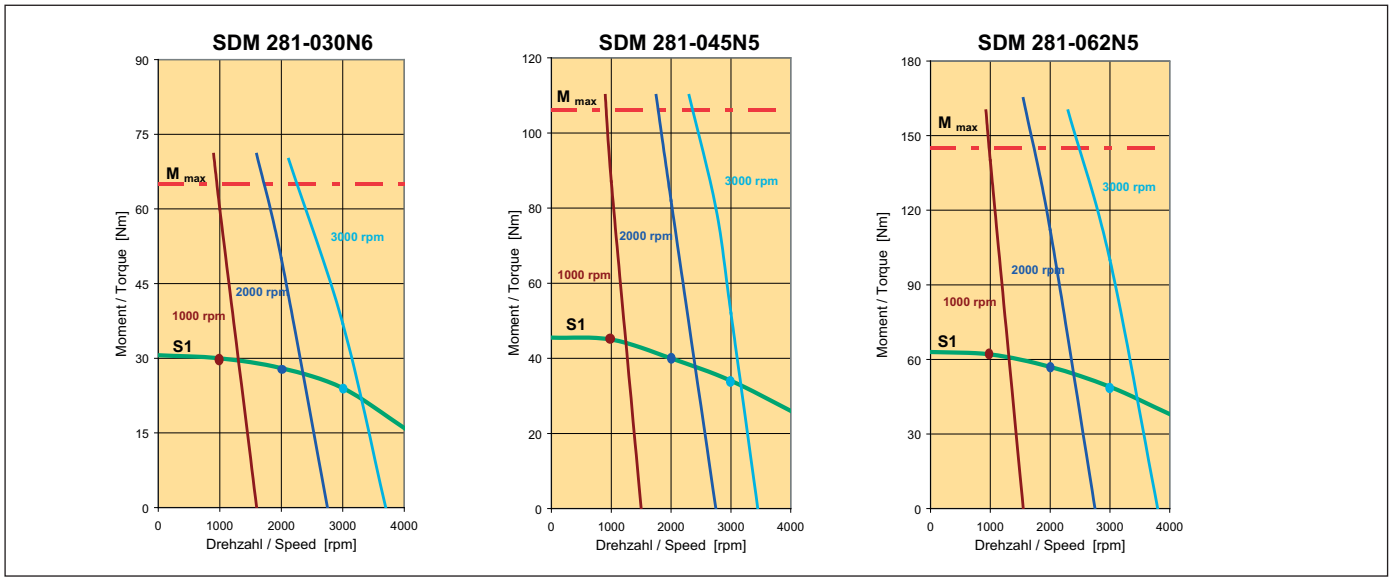
[1] at operating temperature, RMS-value
[2] at 20°C
[3] with resolver size 15 (X1 = 000), without holding brake

Dimensions

Motor type	without holding brake				with holding brake			
	with resolver		with other feedbacks		with resolver		with other feedbacks	
SDM 281-	l_{39}	r	l_{39}	r	l_{39}	r	l_{39}	r
030N6-...	380	237	414	264	414	271	448	298
045N5-...	408	265	435	292	442	299	469	326
062N5-...	436	293	463	320	470	327	497	354



Speed-torque characteristics



Holding brake

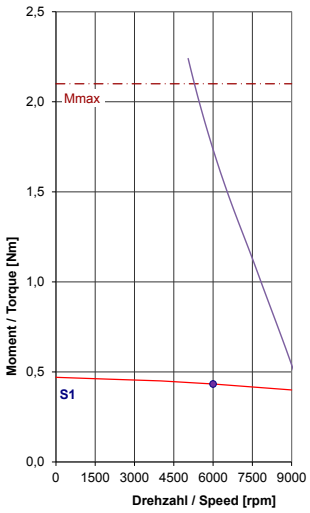
Holding torque	M_{Br}	[Nm]	70
Rated voltage	U_{Br}	[V]	24
Rated current (20°C)	I_{Br}	[A]	1,5
Weight	m	[kg]	3,4
Rotor inertia	J_{Br}	[kgcm²]	20.1

20. Annex

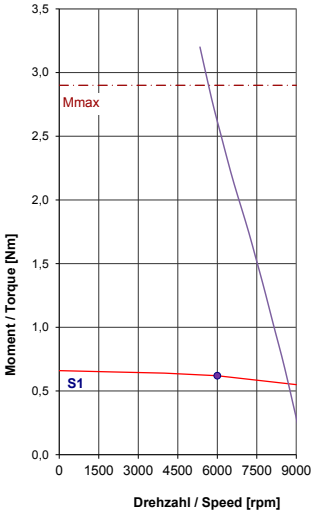
Speed-torque characteristics for motors for a supply voltage from 230 V AC

The following diagrams applicable to 310 V d.c. link voltage and for motors with a special 230 V-winding.

SDM 281-000N5-



SDM 281-000N7-



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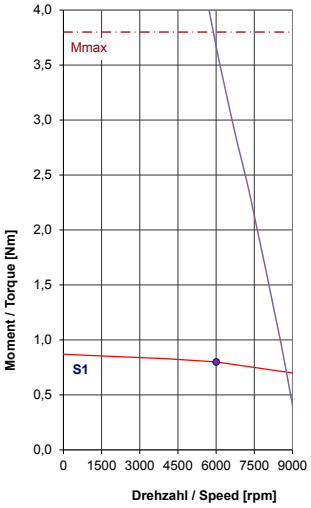
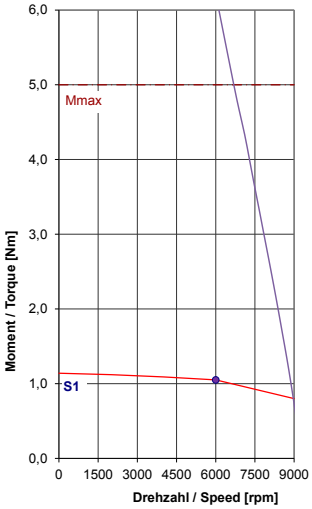
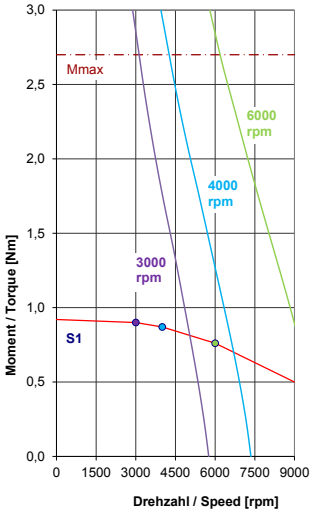


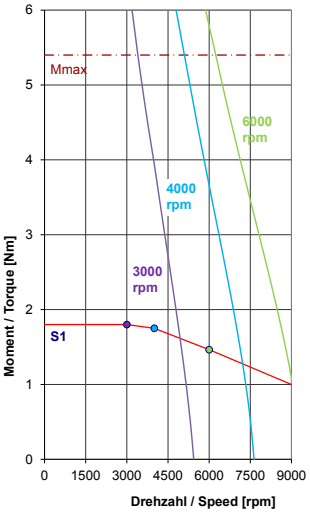
SDM 281-001N1-



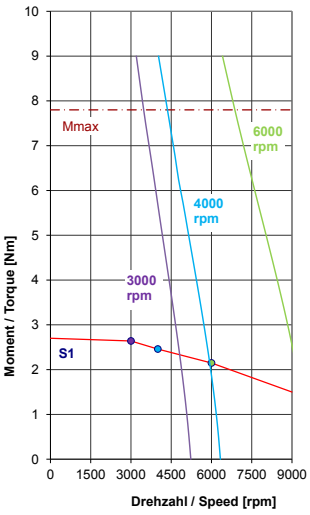
SDM 281-000N9-



SDM 281-001N8-



SDM 281-002N6-



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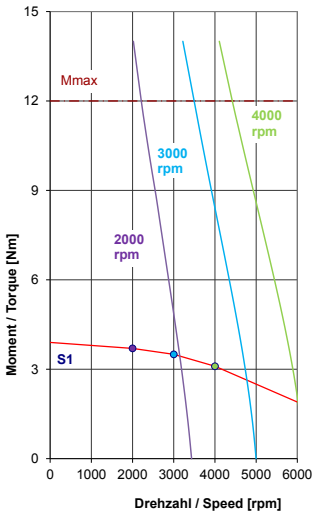
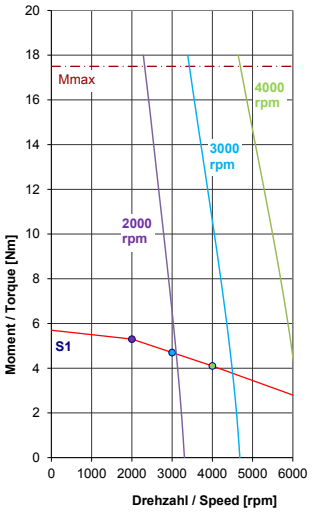


SDM 281-005N7-



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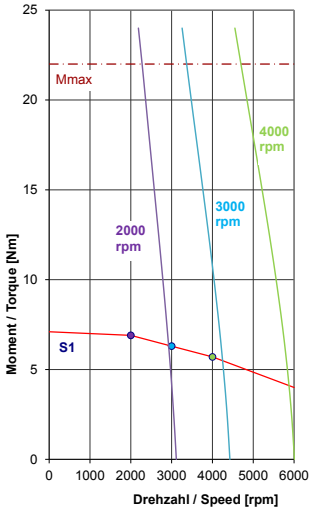

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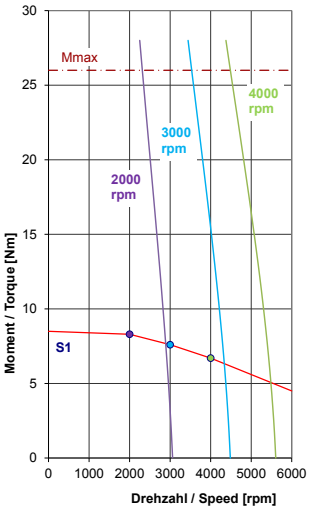
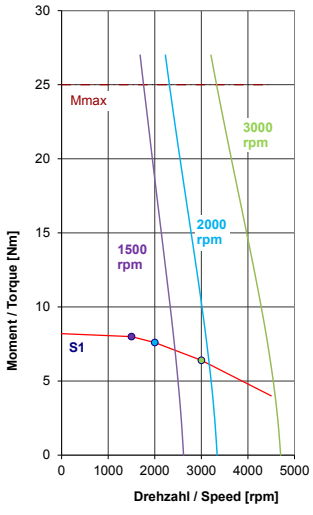


SDM 281-008N2-



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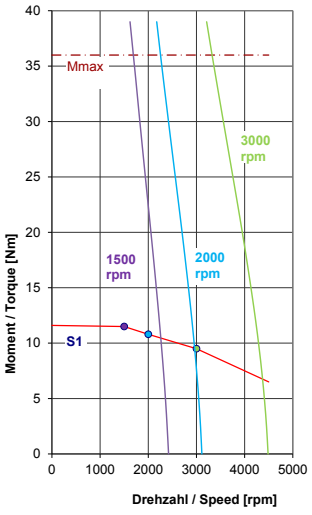
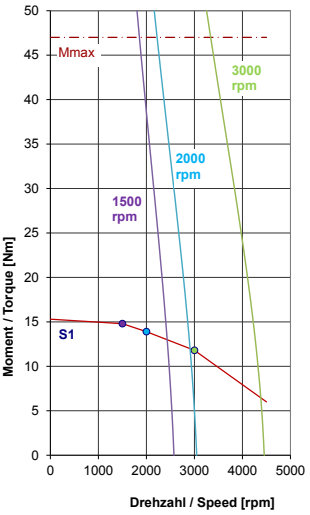
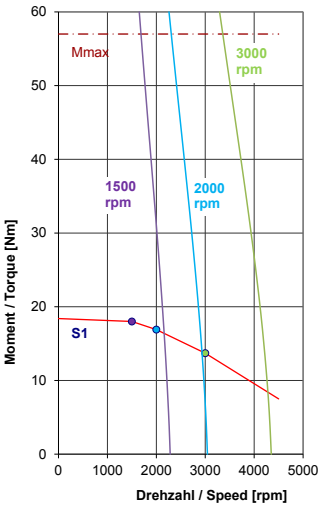


SDM 281-015N3-



SDM 281-018N4-



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