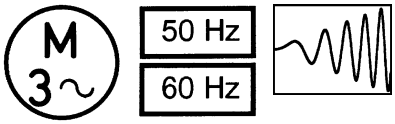
14



USA – Energy Policy and Conservation Act

Integral Horsepower Rule (IHP rule)

Department of Energy

10 CFR Part 431: Energy conservation Program: Energy Conservation Standards for Commercial and Industrial Electric Motors

Effective date: June 1, 2016

Motors, as shown below, covered under the IHP rule shall have a nominal full-load efficiency not less than Premium efficiency level shown under §431.25 and NEMA MG1, Table 12-12.

From the IHP rule covered Motors:

- Single speed motor
- Contains a squirrel-cage (MG 1) or cage (IEC) rotor
- Operated on polyphase alternating current (AC) 60-hertz sinusoidal line power
- Rated output PN between 1HP and 500 HP
- 2-, 4-, 6-, or 8-pole motors
- Rated voltage of UN up to 600 V
- Rated for continuous duty (MG 1) operation or for duty type S1 (IEC)

From the IHP rule exempt motors :
- Air-over electric motors
- Component sets of an electric motor
- Liquid-cooled electric motors
- Intermittent duty motors (S2-S8)
- Inverter-only electric motors (S9)
- Multi-speed motors (pole change motors)
- Submersible electric motors
- Where ambient temperatures exceed +40°C (NEMA MG1-2009 Part 14.2)
- Where ambient temperatures are less than -15°C (NEMA MG1-2009 Part 14.2)
- At altitudes exceeding 3300 feet (1000 meters) (NEMA MG1-2009 Part 14.2)
- Single phase motors
- Synchronous AC motors
- Permanent magnet rotor AC motors
- Servo motors

European ErP Directive 2009/125/EC

Directive 2009/125/EC of the European Parliament and the Council, issued in 2009, specifies requirements for the environmentally responsible design of energy-related products (ErPs). In November 2009 it superseded Directive 2005/32/EC, which formed the framework for requirements for the environmentally responsible design of energy-using products (EuPs). This change has no effect on already proclaimed implementation measures.
From 16 June 2011 onward, new motors or geared motors marketed in the EU must comply with the requirements of **energy efficiency class IE2**. **From 1 January 2015 onward, motors with rated outputs from 7.5 to 375 kW** destined for the European market must comply with **energy efficiency class IE3**, and **from 1 January 2017 onward this requirement also applies to smaller motors rated at 0.75 kW or more.**

Objectives
The ErP Directive has several objectives:

1. **Mitigating the environmental impact of energy-using products**
   This objective is intended to be achieved by the documentation and labelling of products, by regulations for inspection, and by the formulation of individual requirements in implementation measures. As the entire product life cycle is taken into consideration, action must be taken as early as the design phase.

2. **Climate protection**
   Achievement of the EU climate protection objectives is to be supported. This can be implemented by reducing energy consumption and the emission of global warming gasses in the production, operation and disposal of energy-using products.

3. **Harmonised legislation**
   The directive creates a framework for the European regulation of environmental design requirements. This avoids trade impediments resulting from differences in national regulations. This can be achieved by means of the proclamation of legally binding implementation measures for the entire Community and protection of free trade in goods against further-reaching regulations of the Member States.

IEC 60034-30-1

Rotating electrical machines. Efficiency classes of line operated AC motors (IE-code) This new edition of IEC 60034-30-1 specifies efficiency classes for single-speed electric motors that are rated according to IEC 60034-1 or IEC 60079-0, are rated for operation on a sinusoidal voltage supply IEC 60034-30-1 widens the product range with no distinction between motor technologies, supply voltage and frequency. All technical constructions of electric motors are covered as long as they are rated for on-line operation including Line-Start-Permanent-Magnet-Motors.

This IEC standard provides for the global harmonization of energy-efficiency classes IE1, IE2, IE3 and IE4 of electric motors.

Efficiency class designation		**Comparison with CEMEP classification**	
Efficiency	**Code**	**Efficiency**	**Logo**
Super Premium	**IE4**	**-**	**-**
Premium	**IE3**	**-**	**-**
High	**IE2**	**High**	EFF 1
Standard	**IE1**	**Improved**	EFF 2
Lower than Standard	**No designation**	**Standard**	EFF 3

Motors subject to the ErP Directive as specified by the Electric Motors Regulation 640/2009/EC

The new Electric Motors Regulation has a broader scope than the standard previously used in Europe.

- → Single-speed, three-phase, 50 Hz and 50/60 Hz
- → 2-, 4- or 6-pole motors
- → Rated output from 0.75 to 375 kW
- → Rated voltage up to 1000 V
- → Duty type S1 (continuous running)
- → For operation directly from the mains (50 Hz or 60 Hz)
- → For Design N motors complying with IEC 60034-12
- → Motors with two switchable rated voltages, under the condition that the magnetic flux is the same with both voltages
- → Geared motors

Motors excluded from regulation

- → Motors exclusively manufactured for converter operation in accordance with IEC 60034-25
- → Pole-changing motors
- → Motors fully integrated into a machine (such as pumps, fans and compressors) that cannot be tested separately from the machine
- → At altitudes exceeding 4000 meters above sea-level
- → Where ambient air temperarures exceed 60°C
- → Where ambient air temperarures are less than -30 °C
- → From 16 June 2011 onward: IE1 motors for none S1 duty destined for the European market
- → Explosion-proof motors (explosion protection has higher priority)
- → Brake motors
- → as from 2015/2017, IE2-Motors for use with variable speed drives (Additional name plate)

Example :

Method for determining motor efficiency according to IEC 60034-2-1

Individual loss method
Additional losses using the residual loss method
Low measurement uncertainty

Bauer geared motors for connection to three-phase supply are supplied with specially designed induction motors. This design ensures maximum operating safety with high breakaway torque and minimum starting current.

The torque/speed characteristic is largely free of torque dips. Torque is optimized to suit requirements and application parameters. See "www.bauergears.com" for more information.

Torques

The torques as stated in the selection tables are fully available at the output shaft. These figures apply for continuous operation (S1-100%) at a maximum ambient temperature of 40° C and at site elevations up to 1000 m above sea level. Drives for higher ambient temperatures and site elevations are available on request. Gear efficiencies, which are lower than the usual values for spur gears, are taken into account in the torques listed in the selection tables.

Line voltages

BAUER motors are available as standard for the following three-phase line voltages:

- **230V / 460V 60 HZ (Standard)**
- 230V / 400V 50 Hz*
- 240V / 415V 50 Hz
- 440V/ 60 Hz
- 460V / 60 Hz
- 480V / 60 Hz
- 575V / 60 Hz
- 380V / 660V 50 Hz
- 400V / 690V 50 Hz*
- 415V / 50 Hz

*Voltage recommended world-wide by IEC 38 and in Europe by CENELEC.

**= Insulation Class F is necessary.

Designs for other voltages available on request and at extra cost.

Unless otherwise specified, motors for operation in conjunction with frequency converters with a 50 or 60 Hz frequency have a Y-circuit to optimise operating noise and winding load.

Unless otherwise stated, the tolerance for the rated voltage is +/- 5 %, in accordance with IEC 60034-1.

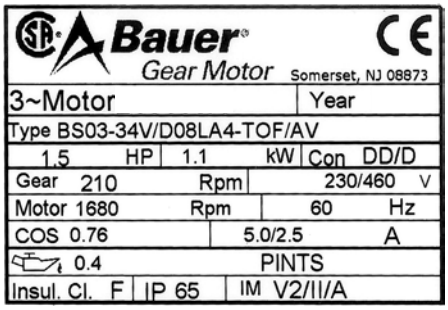
The D04 to D18 motors in 4 pole design can be operated within a tolerance of +/- 10 % of the rated voltage (400 V 50 Hz).

Line frequencies

All motors are available with the same power ratings for either 50 or 60 Hz . Increased power models are available on request.

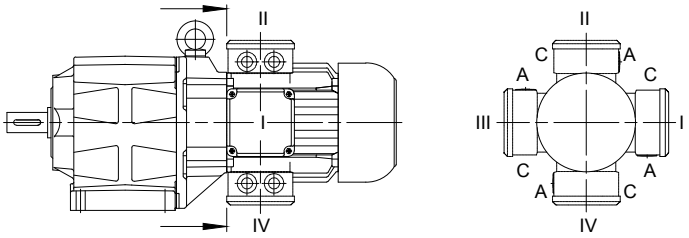
Rating plate

Bauer geared motors are supplied with a corrosion-proof rating plate as standard. The standard rating plate is made of special plastic tried and tested in many years of practical use and approved for hazardous areas by the Physikalisch-Technische-Bundesanstalt (PTB).



Terminal box

The cables of motors with and without brakes can be introduced into the motor terminal box from side A, B, C or side D.

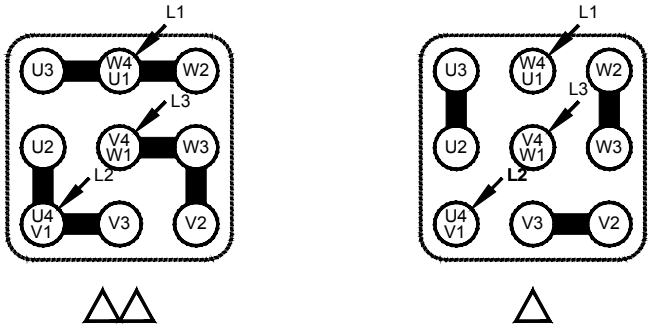


The standard position for the motor terminal box is shown in the dimensional drawings for the geared motors (see chapter 10,11,12 and 13). The terminal box can be installed at any of 3 other positions on request, if on-site space is restricted. The 4 possible positions are 90° offsets around the axis of the motor (dimensional drawing and designation for standard terminal box, see chapter 17 "Dimensional drawing standard terminal box").

Screw- on terminal boxes, see page 486 for inlet screw dimensions.

Please note holes on terminal box sides are for brake installation and are metric.

Motor for dual voltage connection 1 : 2 DD/D

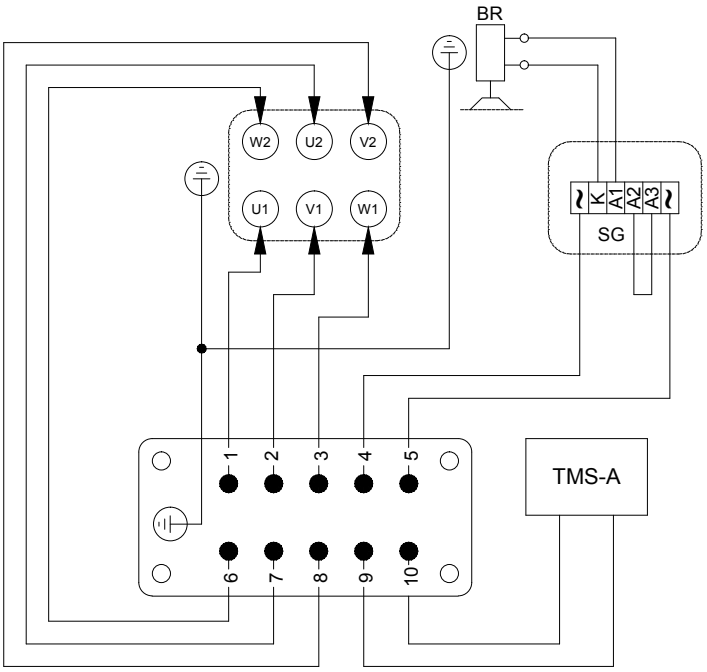


	IEC / EN 60034-8	NEMA MG 1	Colour	
Supply lines	L1 L2 L3	L1 L2 L3		
Motor winding	U1 - U2	T1 - T4	black-black	
	U3 - U4	T7 - T10	yellow-yellow	
	V1 - V2	T2 - T5	blue-blue	
	V3 - V4	T8 - T11	red-red	
	W1 - W2	T3 - T6	brown-brown	
	W3 - W4	T9 - T12	violet-violet	
DD	Connections for the low rated voltage (e.g.: 230 V)			
D	Connections for the high rated voltage (e.g.: 460 V)			

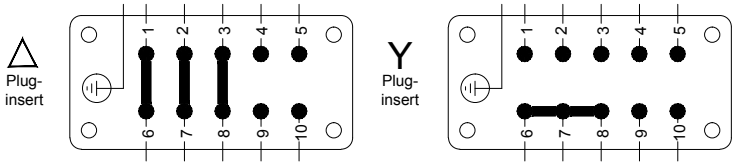
Plug-and-socket connection

D06 to D..16 Bauer motors are available with plug-in motor connection. The socket housing is mounted on the fan-cowl side of the terminal box as standard. This layout minimizes the protrusion caused by the plug.
The standard plug-and-socket type connection incorporates the attachment housing, pin insert and cover. Grommet-type housings and jack inserts are available on request at extra cost. Pin assignments on request (dimensional drawing, see chapter 17 "Dimensional drawing, plug-connector terminal box").

A design with single clamp lever according to the DESINA regulation of the „Verbandes Deutscher Werkzeugmaschinenhersteller" (VDW) is also available.



△ - or Y-Connection in the plughousing or installation cabinet is performed by the machine manufacturer.



Han 10ESS

The motors are also available with a low-cost round plug connector as an alternative. This is fitted at the factory in the standard terminal box and is also suitable for brake connection, thermistors and thermostats. Additional information on request.

Bauer motors from D08 with motor-mounted brake are also available with plug-in brake connection. This means that if it requires attention, the brake can be replaced on site with no loss of time.

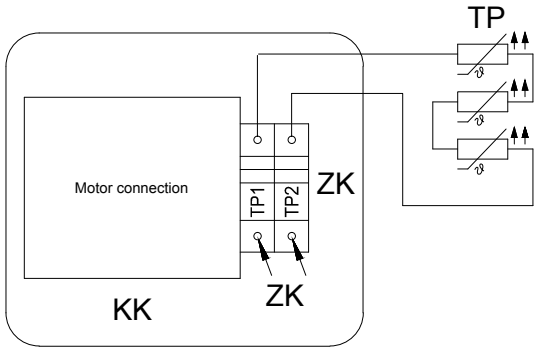
Motor protection

Each geared motor requires a current-dependent motor protection switch or an overcurrent relay with thermal delay in the switchgear to protect the motor windings. The rated motor currents required for settings are stated in the order acknowledgment. T hermal protection for the winding is recommended as an additional safety measure for special operating conditions (short-time or intermittent periodic duty, high switching frequency, severe voltage fluctuations or restricted cooling) and for operation in conjunction with a frequency converter.

Thermistors (PTC)

Thermistors are temperature-dependent resistors which are fitted in each phase winding. In conjunction with a motor protection switch, they ensure optimum protection for the winding in the event of rapid temperature rise. Characteristic to DIN 44081 and "Mark A" to IEC 34-11-2. Thermistors are available for all motors at extra cost. The requisite monitoring device is not included in the scope of supply.

Thermal motor protection with PTC-thermistors



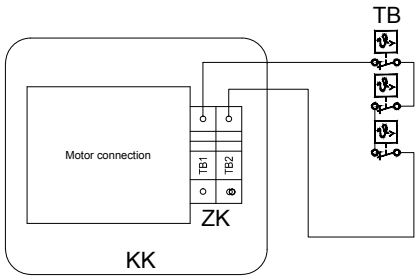
KK	Terminal box
ZK	Additional terminals
TP	PTC-thermistors DIN 44081/IEC 34-11-2 Mark A
TCU	Connection of thermistor control unit EN 60947 Max. permissible testing voltage 2,5 VDC / thermistor in case of Ex with auth. certificate: PTB

The location of the additional terminals in the drawing is not necessarily identical with the actual arrangement.

Thermostatic protection

Bimetal switches are used for slow-acting, independent temperature monitoring and are embedded in each winding section of the motor.
The bimetal disc is sized such that when the temperature rises above a specific, previously set value, the disc suddenly snaps from a convex state to a concave state and the contact moves vertically away from the contact plate. In this state the switch is either open (normally closed switch) or closed (normally open switch). A significant temperature change is necessary to allow the bimetal disc to independently snap back to its initial position. When it does, the switch is again closed (normally closed switch) or open (normally open switch). Thermal protection switches are available for all motors at additional cost. For technical reasons, this option is not recommended for large motors (D11 to D18).

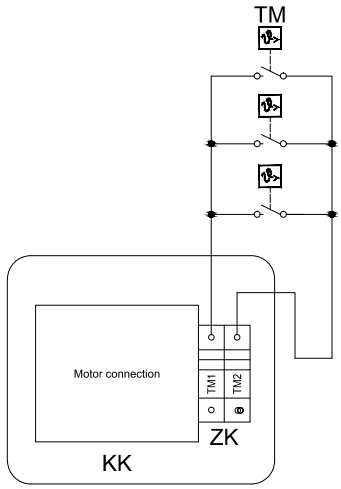
Thermal motor protection with thermostats
(with normally closed contacts)



KK	Terminal box
ZK	Additional terminals
TB	Thermostats with normally closed contacts max. 250VAC 1,6A

The location of the additional terminals in the drawing is not necessarily identical with the actual arrangement.

Thermal motor protection with thermostats
(with normally opened contacts)



KK	Terminal box
ZK	Additional terminals
TB	Thermostats with normally closed contacts max. 250VAC 1,6A

The location of the additional terminals in the drawing is not necessarily identical with the actual arrangement.

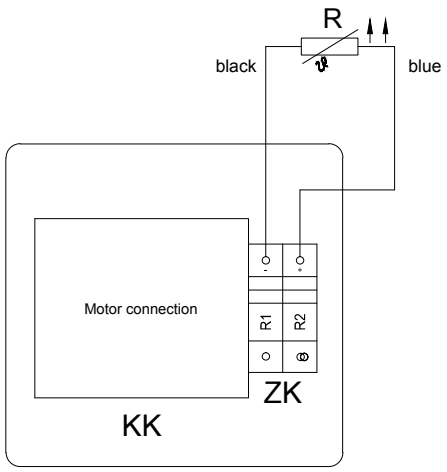
KTY sensors

KTY sensors with heat-shrink insulation can be used to measure and monitor critical surface temperatures and internal temperatures of motors and machines. These sensors are suitable for use in harsh industrial environments in all places where accurate measurements with a single sensor are required. KTY sensors are available for all types of motors at additional cost.

Type 84-130SH: primarily installed in motors that are operated with Siemens frequency converters.

Working principle: KTY sensors are temperature-dependent components. The resistance of the KTY sensor increases when its temperature rises. The characteristic curve is nearly linear in the sensor's measuring range; the reference resistance (at 100 °C) is 970 to 1030 ohms.

Resistance temperature sensor KTY84-130SH



KK	Terminal box
ZK	Additional terminals
R	Resistance temperature sensor

The location of the additional terminals in the drawing is not necessarily identical with the actual arrangement.

PT100 sensors

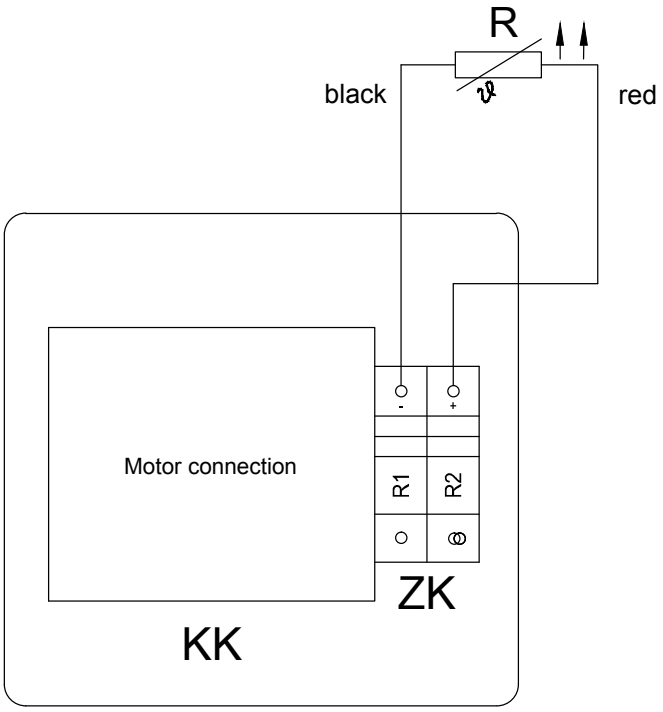
Precise monitoring of motor temperatures is necessary in many fields of industry. Pt100 sensors feature high accuracy, short response time and long-term stability, and they are suitable for use over a wide range of temperatures. Pt100 sensors are available for all motor types at additional cost.

Specifications

Nominal resistance: 100 Ω at 0 ° C

The resistance characteristics are specified in EN 60751.

Resistance temperature sensor PT 100



KK	Terminal box
ZK	Additional terminals
R	Resistance temperature sensor

Insulation

The gearmotors described in the selection tables of this catalog with the motor sizes D04, D05, D06, D08, D..09S and D..09L are executed in insulation class B. Temperature class F is available on request at extra cost.

4-pole motors D07 and D..09XA4 (2.2 kW) to D..18XA4 (30 kW) and all multi-speed motors are rated in Temperature Class F as standard.
Insulation Class F bestows the winding a multiple protection against high humidity, acidic gases and heavy tropical influences while making the same shock resistant and more resistant to heat. Protection against insects (termites) is guaranteed through the complete enclosure (IP65) as long as the mains cables are encased in metal.

Degree of protection

Bauer motors from motor size D06 are manufactured to IP65 degree of protection as standard. Motor sizes D04 and D05 have smooth housings, degree of protection IP 54, on request in IP65 at extra cost. The motor terminal box is always IP 65.

Special corrosion protection

If high requirements for corrosion resistance are required, the geared motors are available with three levels of enhanced corrosion protection:

CORO1: Finished with two-component paint to protect against chemically aggressive gases and vapours.

CORO2: External paint as CORO1. In addition, sheet steel fan cowl with coating. The screws for the terminal-box cover are non-rusting steel.

CORO3 with IP 66: Available from motor size D06. Corrosion protection as CORO2. All motors manufactured within Temperature Class F. Terminal box compartment separated from motor interior by cast resin. Threaded cable entries and mating faces have special seals. See Bauer special imprint SD1 for more information.

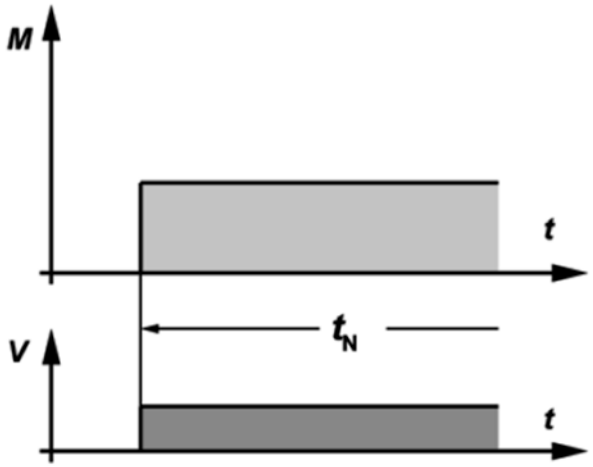
Speed of output shaft

The rated speeds in the selection tables are guidelines for load at rated power. Speed can vary depending on degree of load and temperature (particularly in the case of relatively small motors). Combination gear units for lower speeds are available on request.

General

Aside from special drives (such as lifting equipment), standard motors are always designed for continuous running duty. If the drive is operated with frequent on/off cycles, it may be necessary to select a larger motor with a special design. On the other hand, with pronounced short-time duty it is often possible to select a smaller model. **For this reason, it is technically necessary or economically advantageous to inform the motor manufacturer of any duty type that differs from continuous running.**

Continuous running duty (S1)



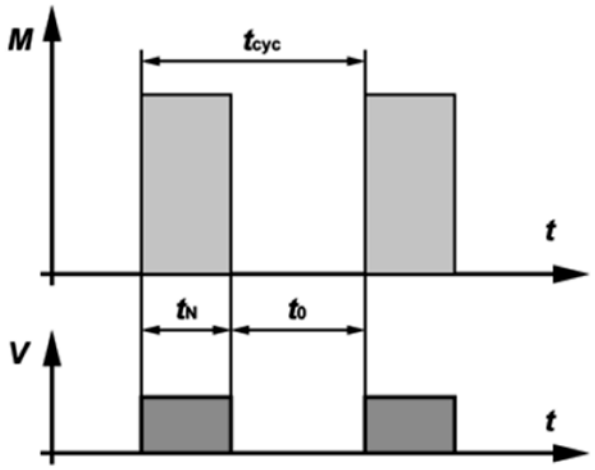
Operation under rated load for sufficient time to allow temperature equilibrium to be attained, such that the temperature does not increase any more with continued operation. The equipment can operate continuously under the rated load without exceeding the allowable temperature.

Short-time duty (S2)

The operating time under rated load is short compared with the subsequent rest period. The standard operating times are 10, 30, 60 and 90 minutes. The equipment can operate for this period under the rated load without exceeding the allowable temperature.

Example: S2 – 60 min

Intermittent periodic duty (S3)



S3 duty consists of a sequence of identical cycles, each composed of an operating time with constant load and a rest time with the windings de-energized. The cycle is such that the starting current does not significantly affect the temperature rise. The operating time under rated load and the subsequent pause are both short. The equipment can operate under load only during the period indicated by the duty cycle as a percentage of the total cycle time (cycle duration).
The standardized duty cycles are 15, 25, 40 and 60%. The cycle duration is 10 minutes unless otherwise specified.

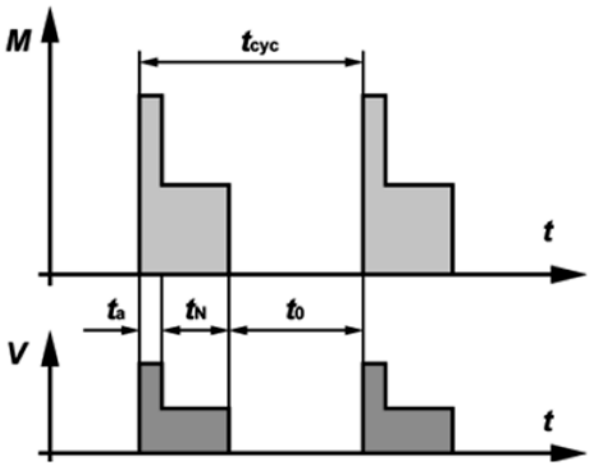
Intermittent periodic duty means that a state of thermal equilibrium is not reached during the load interval.

The duty cycle can be determined as follows:

$$ED = \frac{t_N}{t_{cyc}} \times 100\% = \frac{t_N}{t_N + t_0} \times 100\%$$

Example: S3 – 25%

Intermittent periodic duty with starting (S4)



S4 duty consists of a sequence of identical cycles, each of which is composed of a distinct starting time, a time of operation under constant load, and a rest period with the windings de-energized.

The operating time under rated load and the subsequent pause are both short. The equipment can operate under load only during the period indicated by the duty cycle as a percentage of the total cycle time (cycle duration).

The standardized duty cycles are 15, 20, 40 and 60 %. The cycle duration is 10 minutes unless otherwise specified.

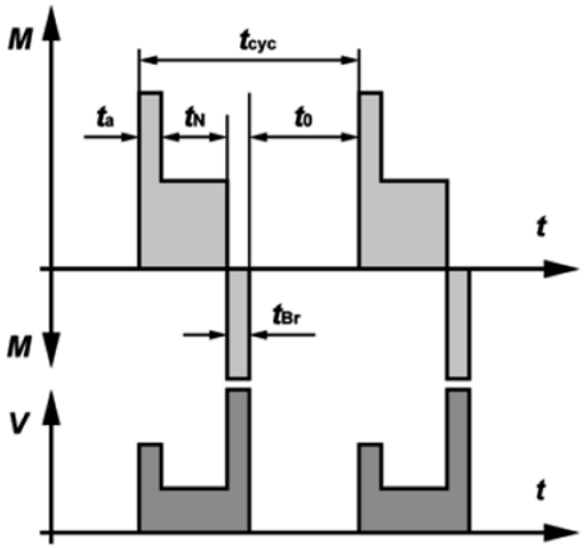
The load cycle corresponds to mode S3, but with additional heating during the starting time that must be taken into account.

The duty cycle can be determined as follows:

$$ED = \frac{(t_a + t_N)}{t_{cyc}} \times 100\% = \frac{t_a + t_N}{t_a + t_N + t_0} \times 100\%$$

Example: S4 – 25%, $J_M = 0.15\ kgm^2$

Intermittent periodic duty with electric braking (S5)



S5 duty consists of a sequence of identical cycles, each of which is composed of a starting time, a time of operation under constant load, a time of fast electric braking, and a rest period with the windings de-energized.
The operating time under rated load and the subsequent pause are both short. The equipment can operate under load only during the period indicated by the duty cycle as a percentage of the total cycle time (cycle duration).
The standardized duty cycles are 15, 20, 40 and 60 %. The cycle duration is 10 minutes unless otherwise specified.

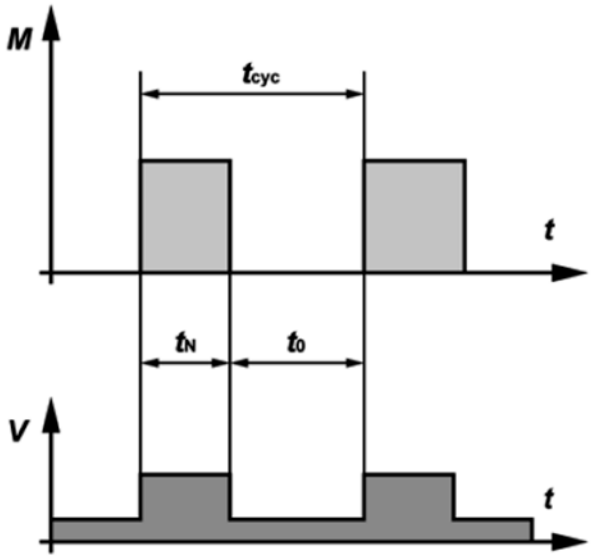
The load cycle corresponds to S3 duty, but with additional warming during the starting time t_a and the braking time t_{Br} taken into account.

The duty cycle can be determined as follows:

$$ED = \frac{(t_a + t_N + t_{Br})}{t_{cyc}} \times 100\% = \frac{t_a + t_N + t_{Br}}{t_a + t_N + t_{Br} + t_0} \times 100\%$$

Example: S5 – 25%; $J_M = 0.15\ kgm^2$, $J_{ext} = 0.7\ kgm^2$

Continuous-operation periodic duty (S6)



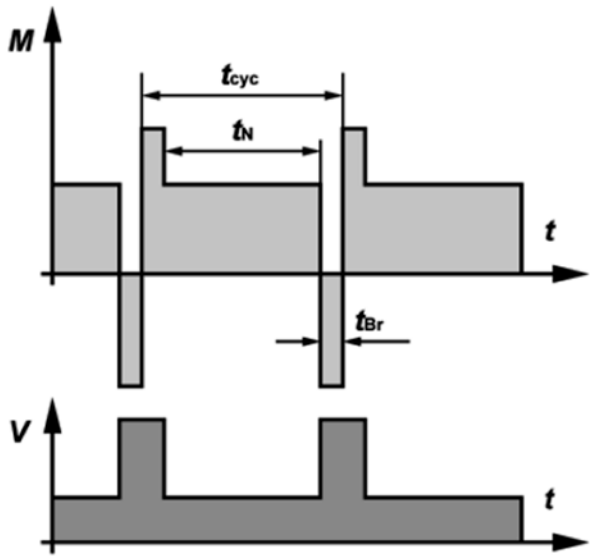
This type of duty corresponds to S3, with the exception that the equipment remains energized during the rest periods. In other words, it operates with no load during these periods. The duty cycle and cycle duration are specified the same way as for S3 duty.

The duty cycle can be determined as follows:

$$ED = \frac{t_N}{t_{cyc}} \times 100\% = \frac{t_N}{t_N + t_0} \times 100\%$$

Example: S6 – 40%

Continuous-operation periodic duty with electric braking (S7)

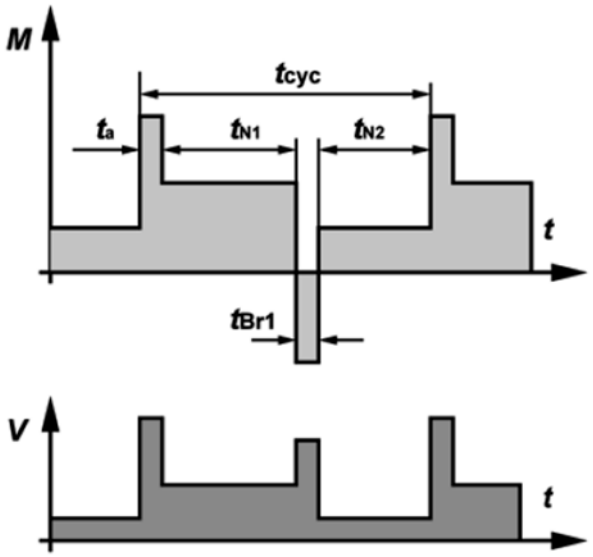


The machine starts up, operates under load, and then is braked electrically, for example by feeding it from a DC power source. Following this, it starts up again immediately. The machine can operate continuously in this manner if the specified moments of inertia of the motor J_M and of the load J_{Ext} as well as the specified duty cycle are not exceeded. If the cycle duration is not specified, it is assumed to be 10 minutes.

The duty cycle can be determined as follows: DC = 1

Example: S7 – $J_M = 0.4\ kgm^2$, $J_{ext} = 7.5\ kgm^2$

Continuous-operation periodic duty with relative load/speed changes (S8)



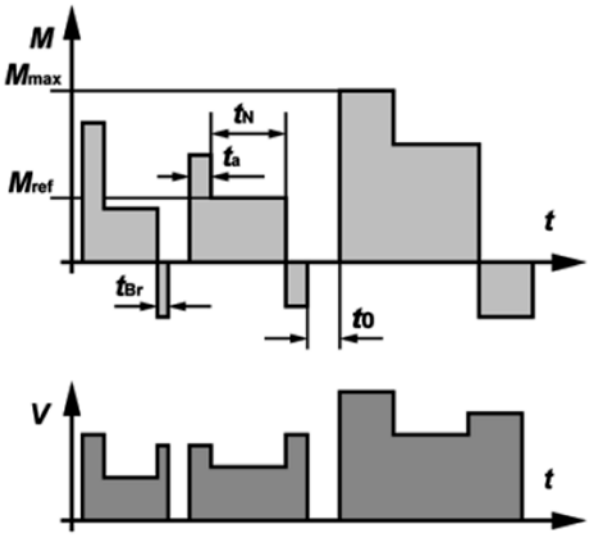
The machine runs continuously under variable load with frequent speed variations. The machine can operate continuously in this manner if at each speed the specified values are not exceeded (moments of inertia J_M and J_{Ext} cycle duration (if other than 10 minutes), rated output and duty cycle. With a moment of inertia of 1 kg m², the acceleration characteristics are the same as with a mass of 1 kg at a distance of 1 m from the axis of rotation).

The duty cycle can be determined as follows:

$$ED = \frac{t_a + t_{N1}}{t_{cyc}} \times 100\% = \frac{t_{Br} + t_{N2}}{t_{cyc}} \times 100\%$$

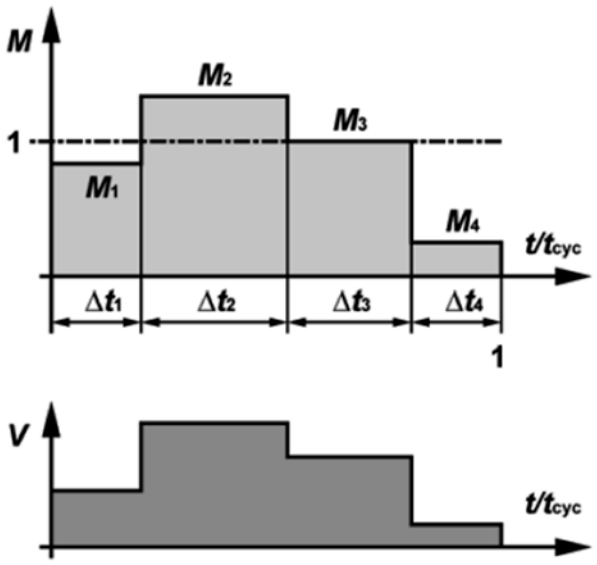
Example: S8 – $J_M = 0.5$ kgm², $J_{ext} = 6$ kgm²

Duty with non-periodic load and speed variations (S9)



In S9 duty the load and the speed vary non-periodically within the permissible operating range. This includes frequently applied overloads, which must never exceed the reference load.
For this duty type, a constant load appropriately selected and based on duty type S1 shall be taken as the reference value M_{ref} for the overload.

Duty with discreet constant loads and speeds (S10)



S10 duty comprises operation with at most four different load levels, each of which is maintained long enough to allow the machine to reach thermal equilibrium.
The minimum load within a duty cycle may have a value of zero (no-load operation or at rest with the windings de-energized).
The appropriate abbreviation is S10 followed by the per unit quantities $p/\Delta t$ for the respective load and its duration and the per unit quantity *TL* for the relative thermal life expectancy of the insulation system. The reference value for the thermal life expectancy is the thermal life expectancy at rating for continuous running duty and permissible limits of temperature rise based on duty type S1. For a time de-energized and at rest, the load shall be indicated by the letter *r*.

Example: S10 $p/\Delta t$ = 1.1/0.4, 1/0.3, 0.9/0.2, *r*/0.1; *TL* = 0.6

4-pole motors for continuous running duty S1 and 60 Hz mains frequency

Except for brake motors

P		Type	n_N	M_N		I_N (460V)	I_N (575V)		cosφ	η	η	η	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot}		Brake
HP	kW		1/min	lb.f-in	Nm	A	A			100%	75%	50%					$lbf.ft^2$	kgm^2	
0.075	0.055	**D04LA4**	1620	2.8	0.320	0.270	0.22	Y	0.60	-	-	-	2.5	2.5	2.5	3.0	0.00415	0.000175	
0.1	0.075	**D04LA4**	1620	3.8	0.430	0.350	0.28	Y	0.60	-	-	-	2.2	2.1	2.1	2.4	0.00415	0.000175	E003
0.12	0.09	**D04LA4**	1620	4.6	0.52	0.380	0.30	Y	0.69	-	-	-	2.7	2.4	2.4	2.9	0.00415	0.000175	
0.15	0.11	**D04LA4**	1620	5.7	0.64	0.420	0.34	Y	0.73	-	-	-	2.5	2.1	2.1	2.3	0.00415	0.000175	
0.1	0.075	**D05LA4**	1620	4	0.450	0.320	0.26	Y	0.59	-	-	-	5.5	3.5	3.3	3.5	0.007	0.000295	
0.12	0.09	**D05LA4**	1620	4.7	0.53	0.350	0.28	Y	0.70	-	-	-	3.7	3.3	3.1	3.3	0.007	0.000295	
0.15	0.11	**D05LA4**	1620	5.8	0.65	0.380	0.30	Y	0.70	-	-	-	3.5	2.7	2.5	2.7	0.007	0.000295	E003
0.25	0.18	**D05LA4**	1620	9.4	1.06	0.60	0.48	Y	0.65	-	-	-	3.4	2.8	2.7	2.8	0.007	0.000295	
0.33	0.25	**D05LA4**	1620	13	1.47	0.80	0.64	Y	0.69	-	-	-	3.2	2.5	2.4	2.5	0.007	0.000295	
0.4	0.30	**D05LA4**	1620	15.5	1.75	0.93	0.74	Y	0.70	-	-	-	3.1	2.6	2.6	2.7	0.007	0.000295	
0.1	0.075	**D06LA4**	1620	4	0.450	0.320	0.26	Y	0.59	-	-	-	5.5	3.5	3.3	3.5	0.007	0.000295	
0.12	0.09	**D06LA4**	1620	4.7	0.53	0.350	0.28	Y	0.70	-	-	-	3.7	3.3	3.1	3.3	0.007	0.000295	
0.15	0.11	**D06LA4**	1620	5.8	0.65	0.380	0.30	Y	0.70	-	-	-	3.5	2.7	2.5	2.7	0.007	0.000295	E003
0.25	0.18	**D06LA4**	1620	9.4	1.06	0.60	0.48	Y	0.65	-	-	-	3.4	2.8	2.7	2.8	0.007	0.000295	
0.33	0.25	**D06LA4**	1620	13	1.47	0.80	0.64	Y	0.69	-	-	-	3.2	2.5	2.4	2.5	0.007	0.000295	
0.4	0.30	**D06LA4**	1620	15.5	1.75	1.00	0.80	Y	0.70	-	-	-	3.1	2.1	2.0	2.1	0.007	0.000295	
0.5	0.37	**D07LA4**	1620	18.6	2.1	1.24	0.99	Y	0.66	-	-	-	2.8	2.4	2.4	2.5	0.0091	0.000385	E003, E004
0.75	0.55	**D08MA4**	1680	27.4	3.1	1.40	1.12	Y	0.75	-	-	-	4.6	2.3	2.1	2.5	0.0273	0.00115	ES(X)010
0.75	0.55	**DPE08XA4**	1740	26.7	3,0	1.25	1	Y	0.66	83.3	81.9	77.8	6.1	3.5	3.2	4	0.0403	0.0017	EH(X)027
1	0.75	**DPE08XB4**	1740	36.4	4,1	1.65	1.32	Y	0.68	84.8	84.5	82	6.4	3.6	3.1	3.8	0.0475	0.002	
1	0.75	**DPE09LA4**	1750	36.2	4,1	1.5	1.2	Y	0.73	85.8	84.4	81.3	7.2	3.6	3.2	4.2	0.0759	0.0032	
1.5	1.1	**DPE09XA4**	1750	53.1	6,0	2.1	1.68	Y	0.73	86.7	84.8	81.5	8	4.2	3.7	4.5	0.0902	0.0038	ES(X)010/027
2	1.5	**DPE09XB4**	1750	72.4	8,2	2.7	2.16	Y	0.81	86.7	86.4	83.9	7.9	3.4	3	4.2	0.1163	0.0049	EH(X)040
3	2.2	**DPE09XB4C**	1760	105.7	11,9	4	3.2	Y	0.77	89.5	89.1	86.8	8.2	2.7	2.3	4.1	0.1637	0.0069	
3	2.2	**DPE11MA4**	1760	105.7	11,9	4	3.2	Y	0.78	89.5	89	86.5	8.5	4.5	3.6	4.9	0.2492	0.0105	
4	3	**DPE11LA4**	1760	144.1	16,3	5.4	4.32	D	0.78	89.5	89.3	87.1	9.9	4.3	3.7	5.2	0.3322	0.014	
5	3.7	**DPE11LA4**	1760	177.7	20,1	6.7	5.36	D	0.78	89.5	87.5	85.6	9	3.9	3.6	5	0.3322	0.014	ES(X)027/040/070
5.5	4	**DPE11LB4**	1760	192.1	21,7	6.9	5.52	D	0.81	90.7	90.6	89.3	9.4	3.6	3.1	4.6	0.4034	0.017	EH(X)125
6	4.5	**DPE11LB4**	1760	216.1	24,4	7.6	6.08	D	0.83	90.1	90.6	89.5	8.6	3.2	2.8	4.2	0.4034	0.017	
7.5	5.5	**DPE11LB4C**	1760	264.1	29,8	9.7	7.76	D	0.78	91.7	91.5	89.9	9	3	2.6	4.8	0.5221	0.022	
10	7.5	**DPE13XA4**	1760	360.2	40,7	12.9	10.32	D	0.8	91.7	91.7	90.3	9.3	3.9	3.5	4.2	0.9492	0.04	ES(X)040/070/125 EH(X)200
12.75	9.5	**DPE16LB4**	1770	453.7	51,3	16.6	13.28	D	0.78	92.4	91.8	90.2	9.1	3.8	3.1	4.1	1.8	0.076	ES(X)125/200
15	11	**DPE16LB4**	1770	525.3	59,4	19.2	15.36	D	0.78	92.4	92.2	90.6	9	3.6	3	3.8	1.8	0.076	EH(X)400
20	15	**DPE16XB4**	1770	716.3	80,9	25.1	20.08	D	0.81	93	93	92.6	8.8	3.7	3	3.8	2.3	0.097	ZS(X)300
25	18.5	**DPE18LB4**	1770	883.4	99,8	31.5	25.2	D	0.79	93.6	93.5	92.1	9.6	4.7	3.8	4.3	4.03	0.17	ES(X)250, EH(X)400
30	22	**DPE18XB4**	1770	1050.6	118,7	36	28.8	D	0.82	93.6	93.6	92.8	9.7	4.8	3.9	4.4	4.63	0.195	ZS(X)500
40	30	**DPE20LA4**	1780	1424.6	160,9	47	37.6	D	0.85	94.1	93.7	93.6	9.5	3.5	3.1	4.1	8.35	0.352	ES(X)250 ZS(X)500/800
50	37	**DPE22SA4**	1780	1757	198,5	56	44.8	D	0.87	94.6	94.7	94.2	9.4	3.5	2.3	4.1	9.23	0.389	ES(X)250
60	45	**DPE22MA4**	1780	2136.9	241,4	71	56.8	D	0.84	95	95	94.5	9.8	3.5	2.4	4.4	10.25	0.432	ZS(X)500/800

P Rated torque at 60 Hz mains frequency
n_N Typical rated rotor shaft speed at 60 Hz Mains frequency
M_N Rated torque at rotor shaft
I_N Rated current at 460 V (for other special voltages, multiply by the inverse voltage ratio to convert the current at 460 V to the current at the desired voltage)
cos φ Power factor
I_A/I_N Relative starting current
M_A/M_N Relative starting torque
M_S/M_N Relative pull-up torque
M_K/M_N Relative breakdown torque
J_{rot} Rotor moment of inertia
η Efficiency with different loads
Brake Brake configuration (see Section 15)

The standard motor winding configuration is for 460 V / 60 Hz.

All motors designed for thermal class F are suitable for operation over the voltage range 440–480 V or 460 V +/- 10 %.

Note: the current, power factor and torque vary depending on the deviation from 460 V.

See "www.bauergears.com" for more information.

4-pole motors for continuous running duty S1 and 60 Hz mains frequency

Except for brake motors

P		Type	n_N	M_N		I_N (230V)	I_N (460V)		cosφ	η	η	η	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot}		Brake
HP	kW		1/min	lb.f-in	Nm	A	A			100%	75%	50%					lbf.ft²	kgm²	
0.075	0.055	**D04LA4**	1620	2.8	0.320	0.54	0.270	DD/D	0.60	-	-	-	2.5	2.5	2.5	3.0	0.00415	0.000175	
0.1	0.075	**D04LA4**	1620	3.8	0.430	0.7	0.350	DD/D	0.60	-	-	-	2.2	2.1	2.1	2.4	0.00415	0.000175	E003
0.12	0.09	**D04LA4**	1620	4.6	0.52	0.76	0.380	DD/D	0.69	-	-	-	2.7	2.4	2.4	2.9	0.00415	0.000175	
0.15	0.11	**D04LA4**	1620	5.7	0.64	0.84	0.420	DD/D	0.73	-	-	-	2.5	2.1	2.1	2.3	0.00415	0.000175	
0.1	0.075	**D05LA4**	1620	4	0.450	0.64	0.320	DD/D	0.59	-	-	-	5.5	3.5	3.3	3.5	0.007	0.000295	
0.12	0.09	**D05LA4**	1620	4.7	0.53	0.7	0.350	DD/D	0.70	-	-	-	3.7	3.3	3.1	3.3	0.007	0.000295	
0.15	0.11	**D05LA4**	1620	5.8	0.65	0.76	0.380	DD/D	0.70	-	-	-	3.5	2.7	2.5	2.7	0.007	0.000295	E003
0.25	0.18	**D05LA4**	1620	9.4	1.06	1.2	0.60	DD/D	0.65	-	-	-	3.4	2.8	2.7	2.8	0.007	0.000295	
0.33	0.25	**D05LA4**	1620	13	1.47	1.6	0.80	DD/D	0.69	-	-	-	3.2	2.5	2.4	2.5	0.007	0.000295	
0.4	0.30	**D05LA4**	1620	15.5	1.75	1.86	0.93	DD/D	0.70	-	-	-	3.1	2.6	2.6	2.7	0.007	0.000295	
0.1	0.075	**D06LA4**	1620	4	0.450	0.64	0.320	DD/D	0.59	-	-	-	5.5	3.5	3.3	3.5	0.007	0.000295	
0.12	0.09	**D06LA4**	1620	4.7	0.53	0.7	0.350	DD/D	0.70	-	-	-	3.7	3.3	3.1	3.3	0.007	0.000295	
0.15	0.11	**D06LA4**	1620	5.8	0.65	0.76	0.380	DD/D	0.70	-	-	-	3.5	2.7	2.5	2.7	0.007	0.000295	E003
0.25	0.18	**D06LA4**	1620	9.4	1.06	1.2	0.60	DD/D	0.65	-	-	-	3.4	2.8	2.7	2.8	0.007	0.000295	
0.33	0.25	**D06LA4**	1620	13	1.47	1.6	0.80	DD/D	0.69	-	-	-	3.2	2.5	2.4	2.5	0.007	0.000295	
0.4	0.30	**D06LA4**	1620	15.5	1.75	2	1.00	DD/D	0.70	-	-	-	3.1	2.1	2.0	2.1	0.007	0.000295	
0.5	0.37	**D07LA4**	1620	18.6	2.1	2.48	1.24	DD/D	0.66	-	-	-	2.8	2.4	2.4	2.5	0.0091	0.000385	E003, E004
0.75	0.55	**D08MA4**	1680	27.4	3.1	2.8	1.40	DD/D	0.75	-	-	-	4.6	2.3	2.1	2.5	0.0273	0.00115	
0.75	0.55	**DPE08XA4**	1740	26.7	3,0	2.5	1.25	DD/D	0.66	83.3	81.9	77.8	6.1	3.5	3.2	4	0.0403	0.0017	ES(X)010 EH(X)027
1	0.75	**DPE08XB4**	1740	36.4	4,1	3.3	1.65	DD/D	0.68	84.8	84.5	82	6.4	3.6	3.1	3.8	0.0475	0.002	
1	0.75	**DPE09LA4**	1750	36.2	4,1	3	1.5	DD/D	0.73	85.8	84.4	81.3	7.2	3.6	3.2	4.2	0.0759	0.0032	
1.5	1.1	**DPE09XA4**	1750	53.1	6,0	4.2	2.1	DD/D	0.73	86.7	84.8	81.5	8	4.2	3.7	4.5	0.0902	0.0038	ES(X)010/027
2	1.5	**DPE09XB4**	1750	72.4	8,2	5.4	2.7	DD/D	0.81	86.7	86.4	83.9	7.9	3.4	3	4.2	0.1163	0.0049	EH(X)040
3	2.2	**DPE09XB4C**	1760	105.7	11,9	8	4	DD/D	0.77	89.5	89.1	86.8	8.2	2.7	2.3	4.1	0.1637	0.0069	
3	2.2	**DPE11MA4**	1760	105.7	11,9	8	4	DD/D	0.78	89.5	89	86.5	8.5	4.5	3.6	4.9	0.2492	0.0105	
4	3	**DPE11LA4**	1760	144.1	16,3	10.8	5.4	DD/D	0.78	89.5	89.3	87.1	9.9	4.3	3.7	5.2	0.3322	0.014	
5	3.7	**DPE11LA4**	1760	177.7	20,1	13.4	6.7	DD/D	0.78	89.5	87.5	85.6	9	3.9	3.6	5	0.3322	0.014	ES(X)027/040/070
5.5	4	**DPE11LB4**	1760	192.1	21,7	13.8	6.9	DD/D	0.81	90.7	90.6	89.3	9.4	3.6	3.1	4.6	0.4034	0.017	EH(X)125
6	4.5	**DPE11LB4**	1760	216.1	24,4	15.2	7.6	DD/D	0.83	90.1	90.6	89.5	8.6	3.2	2.8	4.2	0.4034	0.017	
7.5	5.5	**DPE11LB4C**	1760	264.1	29,8	19.4	9.7	DD/D	0.78	91.7	91.5	89.9	9	3	2.6	4.8	0.5221	0.022	
10	7.5	**DPE13XA4**	1760	360.2	40,7	25.8	12.9	DD/D	0.8	91.7	91.7	90.3	9.3	3.9	3.5	4.2	0.9492	0.04	ES(X)040/070/125 EH(X)200
12.75	9.5	**DPE16LB4**	1770	453.7	51,3	33.2	16.6	DD/D	0.78	92.4	91.8	90.2	9.1	3.8	3.1	4.1	1.8	0.076	ES(X)125/200
15	11	**DPE16LB4**	1770	525.3	59,4	38.4	19.2	DD/D	0.78	92.4	92.2	90.6	9	3.6	3	3.8	1.8	0.076	EH(X)400
20	15	**DPE16XB4**	1770	716.3	80,9	50.2	25.1	DD/D	0.81	93	93	92.6	8.8	3.7	3	3.8	2.3	0.097	ZS(X)300
25	18.5	**DPE18LB4**	1770	883.4	99,8	63	31.5	DD/D	0.79	93.6	93.5	92.1	9.6	4.7	3.8	4.3	4.03	0.17	ES(X)250, EH(X)400
30	22	**DPE18XB4**	1770	1050.6	118,7	72	36	DD/D	0.82	93.6	93.6	92.8	9.7	4.8	3.9	4.4	4.63	0.195	ZS(X)500
40	30	**DPE20LA4**	1780	1424.6	160,9	94	47	DD/D	0.85	94.1	93.7	93.6	9.5	3.5	3.1	4.1	8.35	0.352	ES(X)250 ZS(X)500/800
50	37	**DPE22SA4**	1780	1757	198,5	112	56	DD/D	0.87	94.6	94.7	94.2	9.4	3.5	2.3	4.1	9.23	0.389	ES(X)250
60	45	**DPE22MA4**	1780	2136.9	241,4	142	71	DD/D	0.84	95	95	94.5	9.8	3.5	2.4	4.4	10.25	0.432	ZS(X)500/800

P — Rated torque at 60 Hz mains frequency
n_N — Typical rated rotor shaft speed at 60 Hz Mains frequency
M_N — Rated torque at rotor shaft
I_N — Rated current at 460 V (for other special voltages, multiply by the inverse voltage ratio to convert the current at 460 V to the current at the desired voltage)
cos φ — Power factor
I_A/I_N — Relative starting current
M_A/M_N — Relative starting torque
M_S/M_N — Relative pull-up torque
M_K/M_N — Relative breakdown torque
J_{rot} — Rotor moment of inertia
η — Efficiency with different loads
Brake — Brake configuration (see Section 15)

The standard motor winding configuration is for 460 V / 60 Hz.

All motors designed for thermal class F are suitable for operation over the voltage range 440–480 V or 460 V +/- 10%.

Note: the current, power factor and torque vary depending on the deviation from 460 V.

See "www.bauergears.com" for more information.

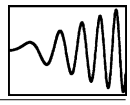
4-pole motors for intermittent periodic duty (S3/S6) and 60 Hz mains frequency

P kW	DC	Type	n 1/min	M_N Nm	I_N (460 V) A	Connec-tion	cos φ	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm²
0.15	15%	D04LA4	1620	0.87	0.56	Y	0.77	2.2	1.8	1.7	1.8	0.000175
0.3	15%	D05LA4	1620	1.75	0.9	Y	0.75	2.8	2.1	2.0	2.1	0.000295
0.3	60%	D06LA4	1620	1.75	0.9	Y	0.75	2.8	2.1	2.0	2.1	0.000295
0.55	60%	D07LA4	1620	3.2	1.78	Y	0.86	3.7	1.8	1.6	1.8	0.000385
0.75	60%	D08MA4	1680	4.2	1.84	Y	0.81	3.7	1.8	1.5	1.9	0.00115
1.1	60%	D08LA4	1680	6.2	2.5	Y	0.82	3.6	1.6	1.5	1.9	0.0015
1.5	60%	D09SA4	1680	8.5	3.3	Y	0.84	4.3	1.9	1.6	2.2	0.00245
2.2	60%	D09LA4	1680	12.5	4.5	Y	0.86	4.3	1.8	1.6	2.1	0.0032
3.0	60%	D09XA4	1680	16.6	6.2	Y	0.86	3.7	1.9	1.8	2.1	0.0038
4.0	60%	D11SA4	1710	22	8.1	D	0.85	4.4	1.8	1.5	2.2	0.0081
5.5	60%	D11MA4	1710	30.5	10.7	D	0.87	4.7	1.6	1.6	2.2	0.0105
7.5	60%	D11LA4	1710	41.5	14.6	D	0.87	5.0	2.0	1.9	2.3	0.014
9.5	60%	D13MA4	1710	53	17.3	D	0.87	5.4	2.1	1.8	2.4	0.029
11	60%	D13LA4	1710	60	20	D	0.84	6.0	2.6	2.3	2.7	0.0335
13.5	60%	D16MA4	1760	73	25.5	D	0.84	6.1	2.3	1.8	2.2	0.057
18.5	60%	D16LA4	1760	100	35	D	0.84	5.6	2.1	1.8	2.3	0.076
22	60%	D16XA4	1760	120	42	D	0.84	5.9	2.3	1.4	2.2	0.087
30	60%	D18LA4	1760	163	53	D	0.89	4.9	2.0	1.6	1.9	0.16
37	60%	D18XA4	1760	200	68	D	0.85	6.0	2.7	2.2	2.5	0.195

P	Rated output at 60 Hz mains frequency, S3/S6 duty
DC	Permissible duty cycle
n	Typical rated rotor shaft speed at 60 Hz Mains frequency
M_N	Rated shaft torque
I_N	Rated current at 460 V (for other special voltages, multiply by the inverse voltage ratio to convert the current at 460 V to the current at the desired voltage)
cos φ	Power factor
I_A/I_N	Relative starting current
M_A/M_N	Relative starting torque
M_S/M_N	Relative pull-up torque
M_K/M_N	Relative breakdown torque
J_{rot}	Rotor moment of inertia

The standard motor winding configuration is for 460 V / 60 Hz.

See Bauer Publication SD4xx for additional information.



The figures given in the table below are for Bauer motors operating in conjunction with the frequency inverter. The torques referred to in tables can be entered for the respective frequencies in continuous operation (S1 = duty factor 100 %).

Motor torques for frequency-converter range 5 Hz - 80 Hz, line frequency 60 Hz

P		Type		5 Hz	10 Hz	20 Hz	30 Hz	60 Hz	70 Hz	80 Hz	5 Hz	10 Hz	20 Hz	30 Hz	60 Hz	70 Hz	80 Hz
				M	M	M	M	M	M	M	I	I	I	I	I	I	I
HP	kW			lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	A	A	A	A	A	A	A
0.075	0.055	D04LA4	Y	1.68	2.12	2.52	2.79	2.83	2.83	2.52	0.265	0.270	0.270	0.270	0.270	0.300	0.310
0.1	0.075	D04LA4	Y	2.26	2.83	3.41	3.72	3.81	3.81	3.19	0.310	0.325	0.340	0.350	0.350	0.390	0.375
0.12	0.09	D04LA4	Y	2.74	3.45	4.12	4.51	4.6	4.6	4.12	0.380	0.380	0.380	0.380	0.380	0.425	0.430
0.15	0.11	D04LA4	Y	3.36	4.25	5.04	5.58	5.66	5.66	4.51	0.405	0.410	0.420	0.420	0.420	0.465	0.430
0.1	0.075	D05LA4	Y	2.39	2.96	3.58	3.89	3.98	3.98	3.58	0.275	0.290	0.310	0.320	0.320	0.355	0.365
0.12	0.09	D05LA4	Y	2.79	3.5	4.2	4.6	4.69	4.69	4.2	0.330	0.340	0.345	0.350	0.350	0.390	0.400
0.15	0.11	D05LA4	Y	3.45	4.29	5.13	5.66	5.75	5.75	5.13	0.340	0.355	0.370	0.380	0.380	0.425	0.430
0.25	0.18	D05LA4	Y	5.58	6.99	8.41	9.2	9.38	9.38	8.41	0.54	0.56	0.59	0.60	0.60	0.67	0.68
0.33	0.25	D05LA4	Y	7.79	9.74	11.68	12.83	13.01	13.01	11.42	0.77	0.78	0.80	0.80	0.80	0.89	0.89
0.4	0.30	D05LA4	Y	9.29	11.59	13.9	15.22	15.49	15.49	13.9	0.89	0.91	0.92	0.93	0.93	1.03	1.06
0.1	0.075	D06LA4	Y	2.39	2.96	3.58	3.89	3.98	3.98	3.58	0.275	0.290	0.310	0.320	0.320	0.355	0.365
0.12	0.09	D06LA4	Y	2.79	3.5	4.2	4.6	4.69	4.69	4.2	0.330	0.340	0.345	0.350	0.350	0.390	0.400
0.15	0.11	D06LA4	Y	3.45	4.29	5.13	5.66	5.75	5.75	5.13	0.340	0.355	0.370	0.380	0.380	0.425	0.430
0.25	0.18	D06LA4	Y	5.58	6.99	8.41	9.2	9.38	9.38	8.41	0.54	0.56	0.59	0.60	0.60	0.67	0.68
0.33	0.25	D06LA4	Y	7.79	9.74	11.68	12.83	13.01	13.01	11.42	0.77	0.78	0.80	0.80	0.80	0.89	0.89
0.4	0.30	D06LA4	Y	9.29	11.59	13.9	15.22	15.49	14.87	11.42	0.84	0.90	0.96	1.00	1.00	1.07	0.97
0.5	0.37	D07LA4	Y	11.42	14.25	17.08	18.59	18.59	18.59	16.64	1.22	1.23	1.24	1.24	1.24	1.38	1.37
0.75	0.55	D08MA4	Y	16.46	20.36	24.78	26.55	27.44	27.44	23.9	1.22	1.28	1.35	1.40	1.40	1.55	1.55
1	0.75	D08MA4	Y	22.13	27.44	33.63	36.29	37.17	37.17	32.75	2.1	2.2	2.2	2.2	2.2	2.5	2.5
0.75	0.55	DPE08XA4	Y	15.93	19.47	23.9	25.67	26.55	26.55	23.9	1.08	1.14	1.21	1.25	1.25	1.39	1.42
1	0.75	DPE08XB4	Y	21.24	27.44	32.75	36.29	36.29	36.29	32.75	1.41	1.5	1.59	1.65	1.65	1.83	1.87
1	0.75	DPE09LA4	Y	21.24	26.55	31.86	35.4	36.29	36.29	31.86	1.24	1.33	1.43	1.5	1.5	1.67	1.7
1.5	1.1	DPE09XA4	Y	31.86	39.83	47.79	52.22	53.1	53.1	47.79	1.81	1.93	2.1	2.2	2.2	2.4	2.5
2	1.5	DPE09XB4	Y	44.25	54.87	65.5	71.69	73.46	73.46	65.5	2.2	2.5	2.7	2.8	2.8	3.1	3.2
3	2.2	DPE09XB4C	Y	63.73	79.66	95.59	104	106	106	95.59	3.2	3.5	3.8	4	4	4.5	4.5
3	2.2	DPE11MA4	Y	63.73	79.66	95.59	104	106	106	95.59	3.4	3.6	3.8	4	4	4.5	4.5
4	3	DPE11LA4	Y	85.85	107	129	142	144	144	129	4.2	4.6	5.1	5.4	5.4	6	6.2
5	3.7	DPE11LA4	Y	106	132	159	174	177	177	159	5.3	5.8	6.4	6.7	6.7	7.5	7.6
5.5	4	DPE11LB4	Y	116	146	175	190	194	194	175	5.1	5.8	6.5	6.9	6.9	7.7	7.8
6	4.5	DPE11LB4	Y	126	158	190	207	207	207	190	5.5	6.2	7.1	7.6	7.6	8.5	8.6
7.5	5.5	DPE11LB4C	Y	159	199	238	261	265	265	238	7.6	8.3	9.2	9.7	9.7	10.8	11
10	7.5	DPE13XA4	Y	212	265	323	354	358	358	323	9.8	10.9	12.1	12.8	12.9	14.3	14.6
12.75	9.5	DPE16LB4	Y	265	331	398	433	442	442	398	12.7	14.1	15.6	16.5	16.6	18.4	18.8
15	11	DPE16LB4	Y	309	389	469	513	522	522	469	14.6	16.2	18	19.1	19.2	21.5	22
20	15	DPE16XB4	Y	429	531	637	708	716	716	637	17.9	20.5	23.5	25	25.5	28	28.5
25	18.5	DPE18LB4	Y	531	663	796	867	885	885	796	23.5	26.5	29.5	31.5	31.5	35	36
30	22	DPE18XB4	Y	619	778	938	1026	1044	1044	938	26.5	30	33.5	36	36	40	41
40	30	DPE20LA4	Y	849	1062	1274	1398	1416	1416	1274	31	36	42	45.5	46	51	52
50	37	DPE22SA4	Y	1062	1327	1593	1743	1770	1770	1593	37	43.5	51	56	56	62	64
60	45	DPE22MA4	Y	1283	1601	1902	2079	2124	2124	1902	48.5	56	65	70	70	78	80

14

Field weakening for frequencies above 60 Hz, winding for standard voltage **460 V Y / 60 Hz**, Temperature Class F.

P Rated output
n Guideline value for rated speed at the rotor shaft
M permissible load torque (S1-100 %) for operation with frequency inverter
M_N Rated torque at the rotor shaft
I Load current for operation with frequency inverter

Motors with standard windings can be switched from Y- to Δ- circuit for operation with a converter having a single-phase mains connection. This has no effect on the torques and

frequencies as listed in the table above. As regards the choice of converter, however, note that currents are higher than those of the Y-circuit by a factor of 1.73.

The load currents in the table are guideline values for selecting the size of frequency inverter. Load current is lower if the load torque is below the values permitted for 30-70 Hz and the frequency inverter used is of the high-grade type. This means that a smaller inverter can sometimes be used, particularly in conjunction with large motors.

Motor torques for frequency-converter range 5 Hz - 80 Hz, line frequency 60 Hz

P		Type		5 Hz M	10 Hz M	20 Hz M	30 Hz M	60 Hz M	70 Hz M	80 Hz M	5 Hz I	10 Hz I	20 Hz I	30 Hz I	60 Hz I	70 Hz I	80 Hz I
HP	kW			Nm	Nm	Nm	Nm	Nm	Nm	Nm	A	A	A	A	A	A	A
0.075	0.055	D04LA4	Y	0.190	0.240	0.285	0.315	0.320	0.320	0.285	0.265	0.270	0.270	0.270	0.270	0.300	0.310
0.1	0.075	D04LA4	Y	0.255	0.320	0.385	0.420	0.430	0.430	0.360	0.310	0.325	0.340	0.350	0.350	0.390	0.375
0.12	0.09	D04LA4	Y	0.310	0.390	0.465	0.51	0.52	0.52	0.465	0.380	0.380	0.380	0.380	0.380	0.425	0.430
0.15	0.11	D04LA4	Y	0.380	0.480	0.57	0.63	0.64	0.64	0.51	0.405	0.410	0.420	0.420	0.420	0.465	0.430
0.1	0.075	D05LA4	Y	0.270	0.335	0.405	0.440	0.450	0.450	0.405	0.275	0.290	0.310	0.320	0.320	0.355	0.365
0.12	0.09	D05LA4	Y	0.315	0.395	0.475	0.52	0.53	0.53	0.475	0.330	0.340	0.345	0.350	0.350	0.390	0.400
0.15	0.11	D05LA4	Y	0.390	0.485	0.58	0.64	0.65	0.65	0.58	0.340	0.355	0.370	0.380	0.380	0.425	0.430
0.25	0.18	D05LA4	Y	0.63	0.79	0.95	1.04	1.06	1.06	0.95	0.54	0.56	0.59	0.60	0.60	0.67	0.68
0.33	0.25	D05LA4	Y	0.88	1.10	1.32	1.45	1.47	1.47	1.29	0.77	0.78	0.80	0.80	0.80	0.89	0.89
0.4	0.30	D05LA4	Y	1.05	1.31	1.57	1.72	1.75	1.75	1.57	0.89	0.91	0.92	0.93	0.93	1.03	1.06
0.1	0.075	D06LA4	Y	0.270	0.335	0.405	0.440	0.450	0.450	0.405	0.275	0.290	0.310	0.320	0.320	0.355	0.365
0.12	0.09	D06LA4	Y	0.315	0.395	0.475	0.52	0.53	0.53	0.475	0.330	0.340	0.345	0.350	0.350	0.390	0.400
0.15	0.11	D06LA4	Y	0.390	0.485	0.58	0.64	0.65	0.65	0.58	0.340	0.355	0.370	0.380	0.380	0.425	0.430
0.25	0.18	D06LA4	Y	0.63	0.79	0.95	1.04	1.06	1.06	0.95	0.54	0.56	0.59	0.60	0.60	0.67	0.68
0.33	0.25	D06LA4	Y	0.88	1.10	1.32	1.45	1.47	1.47	1.29	0.77	0.78	0.80	0.80	0.80	0.89	0.89
0.4	0.30	D06LA4	Y	1.05	1.31	1.57	1.72	1.75	1.68	1.29	0.84	0.90	0.96	1.00	1.00	1.07	0.97
0.5	0.37	D07LA4	Y	1.29	1.61	1.93	2.1	2.1	2.1	1.88	1.22	1.23	1.24	1.24	1.24	1.38	1.37
0.75	0.55	D08MA4	Y	1.86	2.3	2.8	3.0	3.1	3.1	2.7	1.22	1.28	1.35	1.40	1.40	1.55	1.55
1	0.75	D08MA4	Y	2.5	3.1	3.8	4.1	4.2	4.2	3.7	2.1	2.2	2.2	2.2	2.2	2.5	2.5
0.75	0.55	DPE08XA4	Y	1.8	2.2	2.7	2.9	3	3	2.7	1.08	1.14	1.21	1.25	1.25	1.39	1.42
1	0.75	DPE08XB4	Y	2.4	3.1	3.7	4.1	4.1	4.1	3.7	1.41	1.5	1.59	1.65	1.65	1.83	1.87
1	0.75	DPE09LA4	Y	2.4	3	3.6	4	4.1	4.1	3.6	1.24	1.33	1.43	1.5	1.5	1.67	1.7
1.5	1.1	DPE09XA4	Y	3.6	4.5	5.4	5.9	6	6	5.4	1.81	1.93	2.1	2.2	2.2	2.4	2.5
2	1.5	DPE09XB4	Y	5	6.2	7.4	8.1	8.3	8.3	7.4	2.2	2.5	2.7	2.8	2.8	3.1	3.2
3	2.2	DPE09XB4C	Y	7.2	9	10.8	11.8	12	12	10.8	3.2	3.5	3.8	4	4	4.5	4.5
3	2.2	DPE11MA4	Y	7.2	9	10.8	11.8	12	12	10.8	3.4	3.6	3.8	4	4	4.5	4.5
4	3	DPE11LA4	Y	9.7	12.2	14.6	16.1	16.3	16.3	14.6	4.2	4.6	5.1	5.4	5.4	6	6.2
5	3.7	DPE11LA4	Y	12	15	18	19.7	20	20	18	5.3	5.8	6.4	6.7	6.7	7.5	7.6
5.5	4	DPE11LB4	Y	13.2	16.5	19.8	21.5	22	22	19.8	5.1	5.8	6.5	6.9	6.9	7.7	7.8
6	4.5	DPE11LB4	Y	14.3	17.9	21.5	23.5	23.5	23.5	21.5	5.5	6.2	7.1	7.6	7.6	8.5	8.6
7.5	5.5	DPE11LB4C	Y	18	22.5	27	29.5	30	30	27	7.6	8.3	9.2	9.7	9.7	10.8	11
10	7.5	DPE13XA4	Y	24	30	36.5	40	40.5	40.5	36.5	9.8	10.9	12.1	12.8	12.9	14.3	14.6
12.75	9.5	DPE16LB4	Y	30	37.5	45	49	50	50	45	12.7	14.1	15.6	16.5	16.6	18.4	18.8
15	11	DPE16LB4	Y	35	44	53	58	59	59	53	14.6	16.2	18	19.1	19.2	21.5	22
20	15	DPE16XB4	Y	48.5	60	72	80	81	81	72	17.9	20.5	23.5	25	25.5	28	28.5
25	18.5	DPE18LB4	Y	60	75	90	98	100	100	90	23.5	26.5	29.5	31.5	31.5	35	36
30	22	DPE18XB4	Y	70	88	106	116	118	118	106	26.5	30	33.5	36	36	40	41
40	30	DPE20LA4	Y	96	120	144	158	160	160	144	31	36	42	45.5	46	51	52
50	37	DPE22SA4	Y	120	150	180	197	200	200	180	37	43.5	51	56	56	62	64
60	45	DPE22MA4	Y	145	181	215	235	240	240	215	48.5	56	65	70	70	78	80

Field weakening for frequencies above 60 Hz, winding for standard voltage **460 V Y / 60 Hz**, Temperature Class F.

P Rated output
n Guideline value for rated speed at the rotor shaft
M Permissible load torque (S1-100 %) for operation with frequency inverter
M_N Rated torque at the rotor shaft
I Load current for operation with frequency inverter

Motors with standard windings can be switched from Y- to Δ- circuit for operation with a converter having a single-phase mains connection. This has no effect on the torques and

frequencies as listed in the table above. As regards the choice of converter, however, note that currents are higher than those of the Y-circuit by a factor of 1.73.

The load currents in the table are guideline values for selecting the size of frequency inverter. Load current is lower if the load torque is below the values permitted for 30-70 Hz and the frequency inverter used is of the high-grade type. This means that a smaller inverter can sometimes be used, particularly in conjunction with large motors.

Motor torques for frequency-converter range 5 Hz - 140 Hz, line frequency 60 Hz

P		Type		5 Hz M	10 Hz M	20 Hz M	30 Hz M	104 Hz M	120 Hz M	140 Hz M	5 Hz I	10 Hz I	20 Hz I	30 Hz I	104 Hz I	120 Hz I	140 Hz I
HP	kW			lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	lb.f-in	A	A	A	A	A	A	A
0.075	0.055	D04LA4	D	1.68	2.12	2.52	2.79	2.83	2.83	2.52	0.460	0.465	0.470	0.470	0.470	0.52	0.53
0.1	0.075	D04LA4	D	2.26	2.83	3.41	3.72	3.81	3.81	3.14	0.54	0.56	0.59	0.61	0.61	0.67	0.64
0.12	0.09	D04LA4	D	2.74	3.45	4.12	4.51	4.6	4.6	4.07	0.66	0.66	0.66	0.66	0.66	0.73	0.75
0.15	0.11	D04LA4	D	3.36	4.25	5.04	5.58	5.66	5.66	4.43	0.70	0.71	0.72	0.73	0.73	0.80	0.74
0.1	0.075	D05LA4	D	2.39	2.96	3.58	3.89	3.98	3.98	3.54	0.475	0.50	0.54	0.56	0.56	0.61	0.63
0.12	0.09	D05LA4	D	2.79	3.5	4.2	4.6	4.69	4.69	4.16	0.57	0.59	0.60	0.61	0.61	0.67	0.69
0.15	0.11	D05LA4	D	3.45	4.29	5.13	5.66	5.75	5.75	5.04	0.59	0.61	0.64	0.66	0.66	0.73	0.75
0.25	0.18	D05LA4	D	5.58	6.99	8.41	9.2	9.38	9.38	8.32	0.93	0.97	1.01	1.04	1.04	1.15	1.18
0.33	0.25	D05LA4	D	7.79	9.74	11.68	12.83	13.01	13.01	11.15	1.34	1.35	1.38	1.39	1.39	1.53	1.52
0.4	0.30	D05LA4	D	9.29	11.59	13.9	15.22	15.49	15.49	13.81	1.54	1.57	1.60	1.61	1.62	1.78	1.83
0.1	0.075	D06LA4	D	2.39	2.96	3.58	3.89	3.98	3.98	3.54	0.475	0.50	0.54	0.56	0.56	0.61	0.63
0.12	0.09	D06LA4	D	2.79	3.5	4.2	4.6	4.69	4.69	4.16	0.57	0.59	0.60	0.61	0.61	0.67	0.69
0.15	0.11	D06LA4	D	3.45	4.29	5.13	5.66	5.75	5.75	5.04	0.59	0.61	0.64	0.66	0.66	0.73	0.75
0.25	0.18	D06LA4	D	5.58	6.99	8.41	9.2	9.38	9.38	8.32	0.93	0.97	1.01	1.04	1.04	1.15	1.18
0.33	0.25	D06LA4	D	7.79	9.74	11.68	12.83	13.01	13.01	11.15	1.34	1.35	1.38	1.39	1.39	1.53	1.52
0.4	0.30	D06LA4	D	9.29	11.59	13.9	15.22	15.49	15.22	11.15	1.45	1.55	1.66	1.73	1.74	1.88	1.67
0.5	0.37	D07LA4	D	11.42	14.25	17.08	18.59	18.59	18.59	16.37	2.2	2.2	2.2	2.2	2.2	2.4	2.4
0.75	0.55	D08MA4	D	16.46	20.36	24.78	26.55	27.44	27.44	23.01	2.2	2.2	2.4	2.5	2.5	2.7	2.7
1	0.75	D08MA4	D	22.13	27.44	33.63	36.29	37.17	37.17	31.86	3.6	3.7	3.8	3.8	3.8	4.2	4.2
0.75	0.55	DPE08XA4	D	15.93	19.47	23.9	25.67	26.55	26.55	23.01	1.86	1.97	2.1	2.2	2.2	2.4	2.5
1	0.75	DPE08XB4	D	21.24	27.44	32.75	36.29	36.29	36.29	32.75	2.5	2.6	2.8	2.8	2.9	3.2	3.2
1	0.75	DPE09LA4	D	21.24	26.55	31.86	35.4	36.29	36.29	31.86	2.2	2.3	2.5	2.6	2.6	2.9	3
1.5	1.1	DPE09XA4	D	31.86	39.83	47.79	52.22	53.1	53.1	46.91	3.2	3.4	3.6	3.8	3.8	4.1	4.2
2	1.5	DPE09XB4	D	44.25	54.87	65.5	71.69	73.46	73.46	64.61	3.8	4.2	4.6	4.9	4.9	5.4	5.5
3	2.2	DPE09XB4C	D	63.73	79.66	95.59	104	106	106	93.82	5.6	6.1	6.6	6.9	7	7.7	7.9
3	2.2	DPE11MA4	D	63.73	79.66	95.59	104	106	106	93.82	5.8	6.2	6.6	6.9	7	7.7	7.9
4	3	DPE11LA4	D	85.85	107	129	142	144	144	128.34	7.3	8	8.8	9.3	9.4	10.3	10.6
5	3.7	DPE11LB4	D	117	146	175	190	195	195	173	8.8	9.9	11.1	11.9	12	13.2	13.6
5.5	4	DPE11LA4C	D	114	142	171	186	190	190	169	9.1	10.1	11.1	11.7	11.8	13	13.4
6	4.5	DPE11LB4	D	127	158	190	208	208	208	186	9.4	10.7	12.2	13.1	13.2	14.5	14.9
7.5	5.5	DPE11LB4C	D	159	199	239	261	266	266	235	13.1	14.4	15.8	16.7	16.9	18.5	19
10	7.5	DPE13XA4	D	212	266	323	354	358	358	319	16.9	18.8	21	22.5	22.5	25	25.5
12.75	9.5	DPE16LB4	D	266	332	398	434	443	443	394	22	24.5	27	29	29	32	32.5
15	11	DPE16LB4	D	310	389	469	513	522	522	460	25.5	28	31.5	33	33.5	37	38
20	15	DPE16XB4	D	429	531	637	708	717	717	637	31	35.5	40.5	43.5	43.5	48	49.5
25	18.5	DPE18LB4	D	531	664	797	867	885	885	788	41	45.5	51	55	55	60	62
30	22	DPE18XB4	D	620	779	938	1027	1044	1044	929	45.5	52	58	62	63	69	71
40	30	DPE20LA4	D	850	1062	1275	1398	1416	1416	1257	54	63	73	79	80	88	91
50	37	DPE22SA4	D	1062	1328	1593	1744	1770	1770	1575	64	76	88	96	97	107	110
60	45	DPE22MA4	D	1283	1602	1903	2080	2124	2124	1903	84	97	111	120	122	134	137

Field weakening for frequencies above 104 Hz, winding for
265 V Δ/ 60 Hz (U_{max} = 460 V Δ/104 Hz), Temperature Class F.

P Rated output
n Guideline value for rated speed at the rotor shaft
M Permissible load torque (S1-100%) for operation with frequency inverter
M_N Rated torque at the rotor shaft
I Load current for operation with frequency inverter

The load currents in the table are guideline values for selecting the size of frequency inverter. Load current is lower if the load torque is below the values permitted for 30-100 Hz and the frequency inverter used is of the high-grade type. This means that a smaller inverter can sometimes be used, particularly in conjunction with large motors.

Motor torques for frequency-converter range 5 Hz - 140 Hz, line frequency 60 Hz

P		Type		5 Hz	10 Hz	20 Hz	30 Hz	104 Hz	120 Hz	140 Hz	5 Hz	10 Hz	20 Hz	30 Hz	104 Hz	120 Hz	140 Hz
				M	M	M	M	M	M	M	I	I	I	I	I	I	I
HP	kW			Nm	Nm	Nm	Nm	Nm	Nm	Nm	A	A	A	A	A	A	A
0.075	0.055	D04LA4	D	0.190	0.240	0.285	0.315	0.320	0.320	0.285	0.460	0.465	0.470	0.470	0.470	0.52	0.53
0.1	0.075	D04LA4	D	0.255	0.320	0.385	0.420	0.430	0.430	0.355	0.54	0.56	0.59	0.61	0.61	0.67	0.64
0.12	0.09	D04LA4	D	0.310	0.390	0.465	0.51	0.52	0.52	0.460	0.66	0.66	0.66	0.66	0.66	0.73	0.75
0.15	0.11	D04LA4	D	0.380	0.480	0.57	0.63	0.64	0.64	0.50	0.70	0.71	0.72	0.73	0.73	0.80	0.74
0.1	0.075	D05LA4	D	0.270	0.335	0.405	0.440	0.450	0.450	0.400	0.475	0.50	0.54	0.56	0.56	0.61	0.63
0.12	0.09	D05LA4	D	0.315	0.395	0.475	0.52	0.53	0.53	0.470	0.57	0.59	0.60	0.61	0.61	0.67	0.69
0.15	0.11	D05LA4	D	0.390	0.485	0.58	0.64	0.65	0.65	0.57	0.59	0.61	0.64	0.66	0.66	0.73	0.75
0.25	0.18	D05LA4	D	0.63	0.79	0.95	1.04	1.06	1.06	0.94	0.93	0.97	1.01	1.04	1.04	1.15	1.18
0.33	0.25	D05LA4	D	0.88	1.10	1.32	1.45	1.47	1.47	1.26	1.34	1.35	1.38	1.39	1.39	1.53	1.52
0.4	0.30	D05LA4	D	1.05	1.31	1.57	1.72	1.75	1.75	1.56	1.54	1.57	1.60	1.61	1.62	1.78	1.83
0.1	0.075	D06LA4	D	0.270	0.335	0.405	0.440	0.450	0.450	0.400	0.475	0.50	0.54	0.56	0.56	0.61	0.63
0.12	0.09	D06LA4	D	0.315	0.395	0.475	0.52	0.53	0.53	0.470	0.57	0.59	0.60	0.61	0.61	0.67	0.69
0.15	0.11	D06LA4	D	0.390	0.485	0.58	0.64	0.65	0.65	0.57	0.59	0.61	0.64	0.66	0.66	0.73	0.75
0.25	0.18	D06LA4	D	0.63	0.79	0.95	1.04	1.06	1.06	0.94	0.93	0.97	1.01	1.04	1.04	1.15	1.18
0.33	0.25	D06LA4	D	0.88	1.10	1.32	1.45	1.47	1.47	1.26	1.34	1.35	1.38	1.39	1.39	1.53	1.52
0.4	0.30	D06LA4	D	1.05	1.31	1.57	1.72	1.75	1.72	1.26	1.45	1.55	1.66	1.73	1.74	1.88	1.67
0.5	0.37	D07LA4	D	1.29	1.61	1.93	2.1	2.1	2.1	1.85	2.2	2.2	2.2	2.2	2.2	2.4	2.4
0.75	0.55	D08MA4	D	1.86	2.3	2.8	3.0	3.1	3.1	2.6	2.2	2.2	2.4	2.5	2.5	2.7	2.7
1	0.75	D08MA4	D	2.5	3.1	3.8	4.1	4.2	4.2	3.6	3.6	3.7	3.8	3.8	3.8	4.2	4.2
0.75	0.55	DPE08XA4	D	1.8	2.2	2.7	2.9	3	3	2.6	1.86	1.97	2.1	2.2	2.2	2.4	2.5
1	0.75	DPE08XB4	D	2.4	3.1	3.7	4.1	4.1	4.1	3.7	2.5	2.6	2.8	2.8	2.9	3.2	3.2
1	0.75	DPE09LA4	D	2.4	3	3.6	4	4.1	4.1	3.6	2.2	2.3	2.5	2.6	2.6	2.9	3
1.5	1.1	DPE09XA4	D	3.6	4.5	5.4	5.9	6	6	5.3	3.2	3.4	3.6	3.8	3.8	4.1	4.2
2	1.5	DPE09XB4	D	5	6.2	7.4	8.1	8.3	8.3	7.3	3.8	4.2	4.6	4.9	4.9	5.4	5.5
3	2.2	DPE09XB4C	D	7.2	9	10.8	11.8	12	12	10.6	5.6	6.1	6.6	6.9	7	7.7	7.9
3	2.2	DPE11MA4	D	7.2	9	10.8	11.8	12	12	10.6	5.8	6.2	6.6	6.9	7	7.7	7.9
4	3	DPE11LA4	D	9.7	12.2	14.6	16.1	16.3	16.3	14.5	7.3	8	8.8	9.3	9.4	10.3	10.6
5	3.7	DPE11LB4	D	13.2	16.5	19.8	21.5	22	22	19.6	8.8	9.9	11.1	11.9	12	13.2	13.6
5.5	4	DPE11LA4C	D	12.9	16.1	19.3	21	21.5	21.5	19.1	9.1	10.1	11.1	11.7	11.8	13	13.4
6	4.5	DPE11LB4	D	14.3	17.9	21.5	23.5	23.5	23.5	21	9.4	10.7	12.2	13.1	13.2	14.5	14.9
7.5	5.5	DPE11LB4C	D	18	22.5	27	29.5	30	30	26.5	13.1	14.4	15.8	16.7	16.9	18.5	19
10	7.5	DPE13XA4	D	24	30	36.5	40	40.5	40.5	36	16.9	18.8	21	22.5	22.5	25	25.5
12.75	9.5	DPE16LB4	D	30	37.5	45	49	50	50	44.5	22	24.5	27	29	29	32	32.5
15	11	DPE16LB4	D	35	44	53	58	59	59	52	25.5	28	31.5	33	33.5	37	38
20	15	DPE16XB4	D	48.5	60	72	80	81	81	72	31	35.5	40.5	43.5	43.5	48	49.5
25	18.5	DPE18LB4	D	60	75	90	98	100	100	89	41	45.5	51	55	55	60	62
30	22	DPE18XB4	D	70	88	106	116	118	118	105	45.5	52	58	62	63	69	71
40	30	DPE20LA4	D	96	120	144	158	160	160	142	54	63	73	79	80	88	91
50	37	DPE22SA4	D	120	150	180	197	200	200	178	64	76	88	96	97	107	110
60	45	DPE22MA4	D	145	181	215	235	240	240	215	84	97	111	120	122	134	137

Field weakening for frequencies above 104 Hz, winding for
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M_N Rated torque at the rotor shaft
I Load current for operation with frequency inverter

The load currents in the table are guideline values for selecting the size of frequency inverter. Load current is lower if the load torque is below the values permitted for 30-100 Hz and the frequency inverter used is of the high-grade type. This means that a smaller inverter can sometimes be used, particularly in conjunction with large motors.

Notes on design

Use the torque required at the lowest operating speed to select motors for applications which require constant torque over the entire speed range, as is the case, for example, with lifting gear and conveyors. Bear in mind, too, the possibility of torque being lower in the field-weakening range.

Use only the torque required at the highest operating speed to select motors for applications which require square-law torque over the speed range, as is the case, for example, with pumps and fans. Field weakening is not permissible.

The motor's power is frequency-dependent. It can be approximated in kW from torque M in Nm, the 50 Hz or 60 Hz speed n and the frequency f in Hz by means of the equation

$P = M \times n / 9550 \times f/50$
or
$P = M \times n / 9550 \times f/60$

If a frequency inverter is used in conjunction with a pulse generator, the full 50 Hz or 60 Hz rated torque is available as holding torque at motor standstill (independent fan required for prolonged periods at standstill). In many instances, however, a mechanical brake is necessary for holding a position exactly or for safety reasons.

The use of thermistors for the thermal protection of the motor winding for frequency inverter duty are strictly recommended (available at extra cost for all motor sizes).

Increased torque with reduced duty factor

A reduction in duty factor increases the torque available at the low end of the frequency range (up to the transition frequency for field weakening) in accordance with the factors in the table below:

Duty factor	Motor torque with reduced duty factor	Increase in current requirementapproximate
100 %	-	-
60 %	1.15 x S1 torque	1.15 x S1 current
40 %	1.30 x S1 torque	1.30 x S1 current
25 %	1.45 x S1 torque	1.45 x S1 current
15 %	1.60 x S1 torque	1.60 x S1 current

This, in turn, means that short-term overload by a factor of 1.6 is permissible for starting from a low speed, for example. An increase in torque in the field-weakening range due to a reduction in duty factor is possible only under certain conditions; the 1.6x S1 torque generally cannot be achieved

Increased torque with external fan

If an independent fan is used, the S1- torque in the lower frequency range (below 30 Hz) need not be reduced, i.e., when it has an independent fan the motor can provide the 50 Hz or 60 Hz rated torque throughout the entire frequency range to the cut-off frequency of the field weakening.

With a high quality frequency inverter of 160 %, when independent ventilation is combined with a reduced duty factor the 50 Hz or 60 Hz torque is available from rest through to the transition frequency of the field weakening range.

External ventilation is available for motor types D08 and larger (see chapter 16 "Motor-independent fan (FV)). In many instances, a more economical alternative is to select a larger motor without external ventilation.