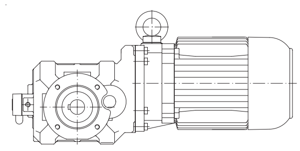
14 Geared motors for more efficient electric overhead conveyors



14.1

Bauer geared motors have been used in materials handling for more than 20 years to drive monorail electric overhead conveyors. The new BM (Bauer Monorail) series from Danfoss Bauer benefits from many years of experience in this demanding area. The size of drive required for the electric overhead conveyor (EHB) depends on the loads conveyed, the conveyor speed and the run of rail, i.e. if the rail has to negotiate any ascents or descents. Gross weights of 100 to 8000 kg can currently be conveyed by EHBs. The new overhead conveyor gear unit program offers four gear unit sizes with torques of approximately 50 to 680 Nm and permissible radial forces of 4400 to 25000 N.

As a special feature, EHB gear units boast a mechanical clutch integrated into the gear unit to cut the power transmission. This enables the carriages to be moved by hand in the event of a malfunction or dragged using special drag conveyors within working or inclined sections of the rail. When the clutch is disengaged, no attempt need be made to overcome the back driving torque of the gear unit.

14.1.1 Broad speed range required

An overhead rail is generally used for a conveyor system operated to fulfil its converying duty at a given maximum speed. Speeds commonly used in the past have been between 20 and 90 m/min. However, applications running at 180 m/min have already been implemented. Positioning speeds are required to obtain a controlled approach to the traget position. This calls for speeds between 3 m/min and 10 m/min depending on the particular application. Futhermore, defined rates of acceleration and deceleration have to be observed. The maximum permissible acceleration is defined by the frictional grip between the whell and the rail - the running wheel must not be allowed to slip.
Nowadays, drives are mostly supplied by frequency inverters so that the very slow speeds of approximately 1 m/min to 6 m/min standard in the working areas can be achieved in spite of the high travelling speed and without the use of drag conveyors.
Futhermore, the inverter always gives a constant rate of acceleration and deceleration, whether at no load or full load and offers greater flexibility in terms of the maximum speed. Pole- changing motors with speed ratios of 4:1 or 6:1 can be used for simpler applications. The varying rates of acceleration caused by different load scenarios (with conveyed goods / without conveyed goods) can be evened out to a certain degree by using a heavy cast-iron fan impeller.

14.1.2 Frame size gradation

A gradation in the frame sizes was the first stage in the development process. The gear unit size allocated to the particular weight class must provide the necessary torques and permissible radial force loads on the output shaft. The majority of customers do not want a fine gradation in the frame sizes for reasons of standardization. VDI code of practice 3643 (C1 standard) must be observed in the case of small gear units designed for low loads. In addition, the distance from the centre of the output shaft to the lower edge of the gear unit (shaft height) on all gear unit sizes must correspond to the running wheel diameters in standard use.

14.1.3 Gear unit design

The next stage was to decide on which gear ratios to use. Angular gear is the only option since the drive should sit as tightly as possible against the carriage assembly. The linear speeds demanded can, by and large, be achieved with one-stage or two-stage reduction ratios. The table below lists the benefits and drawbacks of six different angular gear designs currently available on the market.

Comparison of gear unit designs:

	Principle	Level of efficiency	Suitability as a propulsion drive	Price	Speed range	Customer acceptance
1	Worm-gear	-	-	++	+	?
2	Flat worm-gear	-	-	++	+	?
3	**Worm / bevel-gear**	**+**	**+**	**+**	**++**	**+**
4	Spur / worm-gear	0	-	+	++	?
5	**Spur / bevel-gear**	**++**	**++**	**+**	**++**	**+**
6	Spur / bevel / helical-gear	++	++	-	++	+

14.1.4 Worm-gear unit for the lower load range

Danfoss Bauer uses principle 3 for the first two gear unit sizes, BM09 and BM10, in the lower load range up to 2000 kg - worm for the first stage and spur for the second stage. The helical-gear stage uses special, very small reduction ratios with outstanding levels of efficiency that only slightly below those of bevel-gear units. This solution offers significantly better runing characteristics than principles 1, 2 or 4 due to the greater level of efficiency. The level of efficiency of worm-gear units is heavily influenced by the speed and is at its best at high speeds, i.e. in the first stage. Worm-gear stages have therefore been avoided for the slow final stage. Principle 3 is more cost-effective than a solution which uses bevel-gear units. The price of the geared motor is a major factor for systems that convey smaller weights due to the cost pressures on the conveyor system manufacturer and the high number of components required. The new BM09 and BM10 gear units are reasonably priced and offer advanced technology. In addition, the new BM09 gear unit offers exactly the same reduction ratio and mounting dimensions as the SZ2-V3209, which has sold in its thousands for many years. The continuity of system expansions is thus ensured.

14.1.5 Bevel-gear units for large loads

The market situation looks a little different for the large load range, i.e. up to 2 tonnes. Many end customers reject worm-gear units in this load range. The number of components is smaller and the technical benefits far outweigh the slightly higher price. The major benefit of Danfoss Bauer bevel-gear units is their two-stage design. They form the foundations for an economical priciple in the heavy-load range while proviging virtually all the reduction ratios required in two stages. For reasons of technology, the noise emissions from two-stage gear units are lower than those from three-stage gear units because the first gearwheel, which is key in the generation of noise, has a smaller diameter than that on the three-stage solution.

Where bevel / spur or worm / helical-gear units with high levels of efficiency are used, one might wonder whether the backwards-acting torques are low enough to move the carriages in the event of a malfunction with the brake released. There would be no need for a clutch in this case. However, practice clearly shows that the force required is significantly greater than with the clutch disengaged. In addition to the reversing torque, the motors´s rotor must be accelerated when the carriage is pushed on gear units without a clutch.

14.1.7 Additional benefit to the customer

Each new development must check which additional benefits can be included with as little effect on price as possible. The new sizes, BM10, BM30 and BM40, have the option of four large securing threads on the top and bottom of the gear unit in addition to the flanged version. This opens up new possibilities for the designer of integrating the drive into the carriage assembly. This mountable variant can also be used very successfully to drive floor conveyors. A version with an output shaft on borth sides is available for this particular application. This is possible because the cluth lever is not mounted opposite the output shaft but instead on the front of the gear unit, opposite the motor.

14.2 Questionnare

Design of geared motors for overhead conveyors

14.2.1 Carriage dimensions

Dimension X = ________________________ mm (distance between driven wheels)
Dimension Y = ________________________ mm (distance between revolute joints
Dimension Z = ________________________ mm (distance rail to centre of gravity
of the load to be conveyed)

14.2.2 Driven wheel diameter

d = ________ mm

14.2.3 Driven wheel material

Vulkollan = ☐ Steel = ☐ Other = _______________

14.2.4 Moving masses

Travelling gear = __________________ kg
Suspension gear = __________________ kg
Geared motors = __________________ kg
Load to be conveyed = __________________ kg

____

Total mass to be moved = _________________ kg

14.2.5 Travelling speeds

Horizontal = _______ m/min; Cornering = _______ m/min
Ascending / falling gradients = ___________ m/min

14.2.6 Mains operation with one speed

Travelling speed = ___________ m/min

14.2.7 Mains operation with two speeds (pole-changing)

High linear speed = ___________ m/min
Low linear speed = ___________ m/min
... only for positioning yes ☐ / no ☐. Required in continuous operation yes ☐ / no ☐
Linear speed on the gradient = ___________ m/min
Time taken on gradients = ___________s

14.2.8 Operation from an inverter

High linear speed = ___________ m/min
Low linear speed = ___________ m/min
... only for positioning yes ☐/ no ☐. Required in continuous operation yes ☐ / no ☐
Linear speed on the gradient = ___________ m/min
Time taken on gradients = ___________s

14.2.9 Design information

Minimum curve radius = _______m; Angle of the tightest curve = _____ degrees
Ambient temperature = ___________ ˚C
Maximum rise = _____ degrees, Maximum fall = _____ degrees, Difference in height = ___ m

14.2.10 Coupling

Manual coupling ☐, Mechanical coupling ☐

14.2.11 Acceleration / deceleration

Required acceleration = _______ m/s^2; Required deceleration = _______ m/s^2

14.2.12 Brakes

Mechanical brake yes ☐ / no ☐
Permissible braking travel when operational (from vmax) = ___________ mm
electrical and mechanical)
Necessary holding precision when operational = ___________ mm
(mechanical only)
Permissible braking travel in an emergency shutdown (from vmax) = ___________ mm
Non-lockable manual release yes ☐ / no ☐

14.2.13 Electrical data, motor, brake

Motor voltage = ___________ V, Frequency = ____ Hz
Brake system supply voltage = ___________ V, DC ☐ or AC ☐
Motor protection Thermistors (PTC) ☐/ Thermostat ☐
Brake rectifier in carriage control ☐ in the motor terminal box ☐
Operation the brakes AC sid ☐ / DC ☐
Motor connection Terminal box / plug

14.2.14 Switching durty / load cycles

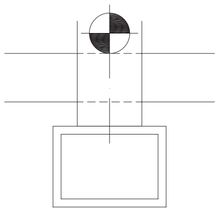
Number of starts per hour = ____ Duty factor = ____ %

14.2.15 Further information

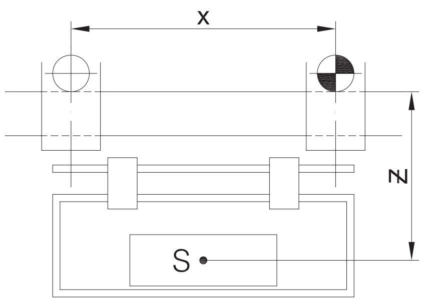
RAL paintwork ___________ (Danfoss Bauer-Standard RAL 7031)
Regulations: ____
Further important information

14.2.16 Carriage design

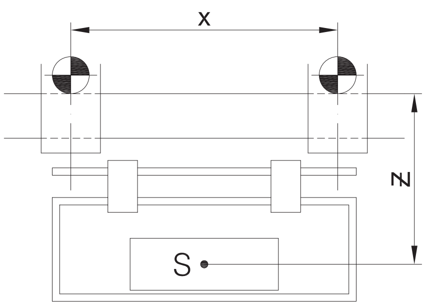
Principle "X/X" = "/" (Please enter principle used)
Principle "1/1": One running wheel / one driven wheel



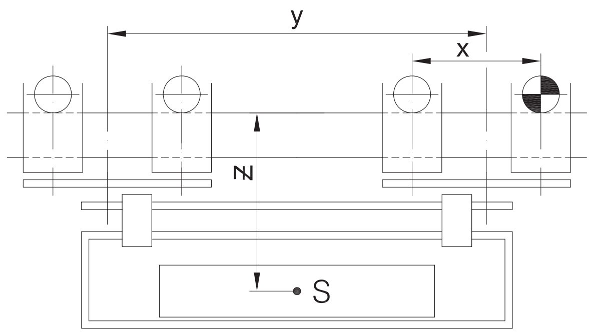
Principle "1/2": Two running wheels / one driven wheel



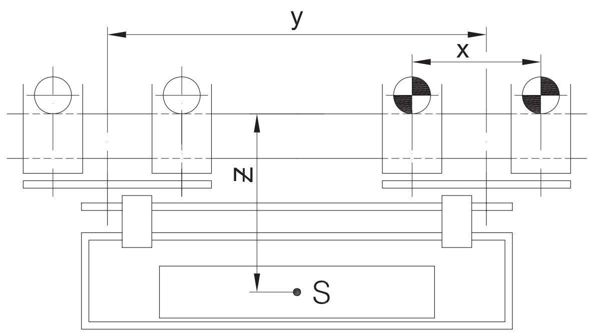
Principle "2/2": Two running wheels / two driven wheels



Principle "1/4": Four running wheels / one driven wheel



Principle "2/4": Four running wheels / two driven wheels



Note, "Principle 2/2" and "Principle 2/4" both involve carriages with two drives. Particular attention must be paid to cornering in such cases since different speeds will be present on the two drives when entering and exiting the corner; in practice this is resolved by the different motor slip on the two drives. This can cause considerable additional loading on the gear unit and motor, particularly where curves are tight and there are large distances between the drives wheels.

Please provide a sketch of your own principle here:

14.3 Description of BM geared motors

14.3.1 Assembly and possible applications of BM gear units

The BM (Bauer Monorail) series offers five gear unit sizes which differ in their permissible torques (from 50 to 680 Nm). The gear units are also offered in heavy duty versions for increased permissible radial loads.

Gear unit	F_{RN}	d_{AW}	Shaft height	Shaft collar
	in N	in mm	in mm	in mm
		(arranged)		
BM09	4400	20	61	30
BM09X	6500	25	61	30
BM10	8000	25	62,5 (60)	34,5
BM10X	10000	25	62,5 (60)	34,5
BM20	10000	30	70,5 (68)	35
BM20X	12000	30	70,5 (68)	35
BM30(Z)	12000	35	94 (90)	45
BM30(Z)X	15000	35	94 (90)	45
BM40(Z)	20000	55	125 (120)	60
BM40(Z)X	25000	55	125 (120)	60

The BM09 and BM10 gear units can run on "C1 profiles". Compliance with the VDI Code of practice 3643 (C1-Standard) and the need to reduce the cost of overhead conveyor drives of this size resulted in a thoroughly tested design which uses a worm-gear set in the first stage and a spur gear set in the second stage. The worm-gear stage with its very small reduction ratios offers particularly high levels of efficiency (greater than 85 %) thanks to the high speeds. The mechanical claw clutch engages the first stage on the BM09 and the final stage on the BM10.

BM20, BM30 and BM40 are heavy-load overhead conveyor drives and have a helical-gear set in the first stage and a bevel-gear set in the final stage. The clutch is mounted in the final stage on these gear units also.

All BM gear units have the clutch lever on the "L" gear side, i.e. on the side end opposite to the motor. The BM09 supersedes the familiar SZ2_V3209 gear unit. It offers the same reduction ratios and has the same mounting dimensions (flange, shaft, clutch lever) as the SZ2-V3209.

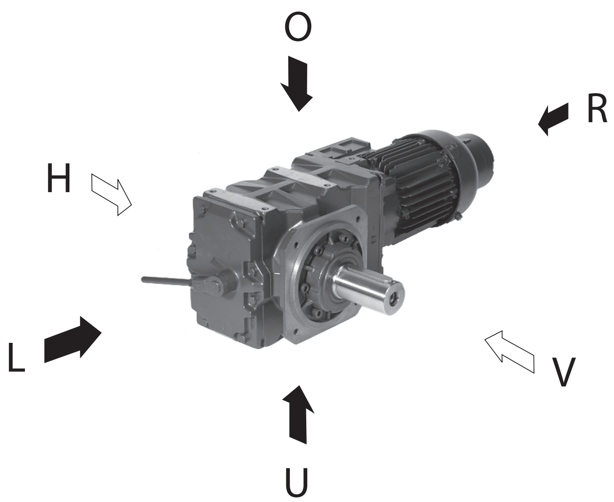
The BM10, BM20, BM30 and BM40 offer additional mounting options. The flange can be located outside on the front of the gear unit, or on the back ("H" side). A version with sturdy securing threads on the underside ("U") and on top ("O") of the gear unit can also be supplied. This enables new and easy - to - maintain carriage designs. The use of BM gear units as drive units for floor conveyors is simplified by the version with an output shaft on both sides. Hollow shaft design available on request.

Gear unit designs:

Gear unit	1st stage	2nd stage	Flange on rear	"U"and "O" foot threads	Output shaft on both sides	Preferred flange
BM09(X)	Worm-gear	Helical-gear	-	-	-	-
BM10(X)	Worm-gear	Helical-gear	Option	Option	Option	-
BM20(X)	Helical-gear	Bevel-gear	Option	Option	Option	-
BM30Z(X)	Helical-gear	Bevel-gear	Option	Option	Option	Option
BM40Z(X)	Helical-gear	Bevel-gear	Option	Option	Option	Option

14.3.2 Type designation and components of the MB-series geared motors

BM..-	Bauer Monorail geared motor Gear unit size (BM09, 20, 10, 30, 40)
BM..Z-..	Gear unit with additional primary stage for very high reduction ratios
BM..G-..	Gear unit with double gearing for extremely high reduction ratios
BM..X-..	Reinforced gear unit for high wheel loads
BM..-7.V	C-flange with threaded holes on the "V" side of the gear unit
BM..-7.H	C-flange with threaded holes on the "H" side of the gear unit (available on request)
BM..-6.UO/	Foot thread on the "U" and "O" sides of the gear unit (not with BM09)
BM..-.1/	Solid shaft on the "V" side of the gear unit
BM..-.2/	Solid shaft on the "H" side of the gear unit (available on request)
BM..-.3/	Solid shaft on the "V" and "H" sides of the motor (available on request))
BM..-07V/../S01	A-flange and solid shaft extended on the V side of the gear unit (BM30; BM40)
BM..-07V/../S02	A-flange and solid shaft "greatly" extended on the V side of the gear unit (BM30; BM40)



The type designation of a Bauer geared motor is a code designation all the features in the drive configuration:

example: Bauer-Monorail-gear motor with brake and standard add-ons

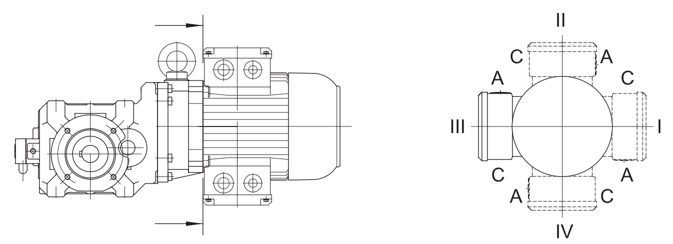
Gear / Motor / Brake

BM 10 - 7 1 V / D 09 S A 4 - TF - ST - G - SL - K / E 008 B 9 HN

- Bauer-Monorail-gear
- Gear size
- Separates gear type from gear design
- Gear housing (with flange with tapped holes)
- Solid output shaft at front
- **End of gear part / start of motor part**
- Three-phase motor
- Motor size
- Design version of motor
- Numbers of poles of winding
- Separates motor-type from motor supplement
- Motor protection, thermistors for thermal class F
- Separation between motor supplements
- Plug
- Encoder
- Heavy-duty cast iron fan
- Standard brake rectifier, in the motor terminal box
- **End of motor / start of brake**
- Single disk brake
- Brake size
- Design edition of brake
- Code for braking torque
- Manual release non lockable

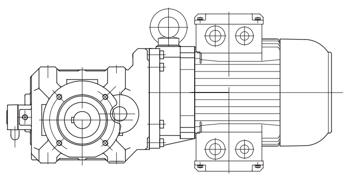
14.3.3 Position of the terminal box and the cable glands

The standard position of the terminal box for BM geared motors is position III, opposite the output shaft pointing towards the "H" side of the gear unit. This position is preferred for most overhead conveyor applications. The terminal box can be supplied rotated by 90 degrees about the motor axis upon request. The standard cable entry is from side A or C. Cable entry towards the fan cowl (B) available on request.



14.3.4 Standard fitting position of BM geared motors

Geared motor carriages for overhead conveyors are almost always installed horizontally in installation type H1. The lubricant quantity is adapted to suit the resulting inclined positions of the gear unit where ascents and descents have to be negotated. Please therefore specifiy the rise angle with your enquiries or orderes. BM-series geared motors can also **be used as** point operationg gears. Please indicate the mounting orientation. This usually difffers from the fitting position of the carriage drives.



Standardbauform H1
Standard Mounting Position H1
Disposition standard H1

14.3.5 Lubricant grade

Bauer geared motors are shipped ready-filled with gear lubricant. This protects the gear unit for ambient teperatures of -20 to + 40 ˚C (lubrication for operation at high ambient temperatures available on request). The quantity of lubricant is optimized for the individual application and is marked on the motor´s rating plate. BM-series geared motors are supplied as standard with a synthetic lubricant with a viscosity grade of 460 (PGLP 460).

14.3.6 Lubricant quantity for installation type H1

Gear unit	Litres in the main gear unit	Litres in the primary stage (Z)
BM09(X)	0,5	-
BM10(X)	0,65	-
BM20(X)	0,7	0,15
BM30(X)	1,2	-
BM40(X)	2,5	-
BM30Z(X)	1,8	0,2
BM40Z(X)	3,2	0,32

Lubricant quantities for other types of installation available on request.

14.3.7 Gear ventilation

BM gear units are shipped ready-equipped with a vent plug. Low operating temperatures are achieved thanks to the high levels of efficiency of BM gear units and the fact that their surfaces have been designed for optimum heat dissipation. This results in oil change intervals of 1500 hours or 3 to 4 years.

14.3.8 Operating noise

The typical operating noise levels of Bauer geared motors are within the limits stipulated by VDI directive 2159 for gears and EN60034-9, Table 2 for motors. For physical reasons, low-ratio, high-speed gears produce more noise than medium-ratio and high-ratio gears operating at low speeds.

See Danfoss Bauer special imprint SD18.. for more information.

14.3.9 Paint finish and corrosion protection

Bauer geared motors are spray-painted in RAL 7031 to DIN 1843 as standard. Other RAL colours are available on request. The output shafts are shipped in protective sleeves or with a protective coating to prevent corrosion. In the case of high requirements on corrosion resistance, the BM-series drives may be requested with enhanced corrosion protection: CORO1 or CORO2.

14.4 Geared motor selection

Danfoss Bauer has an experienced team of experts available for the dimensioning of EHB carriage drives.

If you give a precise description of the conditions of operation, using our questionnaire (see 14.2), a quote for the best drive for you can be processed as quickly as possible.

For frequently used applications where the drives are supplied from a frequency inverter, however, the selection tables below can be used for rough drive dimensioning.

14.4.1 Procedure for selecting BM-series geared motors

1) Establish the wheel load and running wheel diameter

$F_A = m_A \cdot g$

F_A	[N]	(Wheel load on running wheel)
m_A	[kg]	(Mass acting on the drive wheel)
g	[9,81 m/s²]	Acceleration due to gravity
F_{RN}	[N]	(Maximum permissible radial force at the centre, of the wheel, see table 14.3.1 and 14.4.1)

Selection is baded on the following: $\mathbf{F_A}$<F_{RN}

Running wheel diameter d is determined by the plant engineer (preferred diameters: 125 mm, 160 mm, 200 mm, 300 mm). Criteria are wheel load and carriage design, for example.

2) The travelling speed is a further important criterion in the selection tables.
Two characteristics are available for selection: The 50 Hz characteristic curve or the 87 Hz characteristic curve. The full range of rated torques up to these frequencies are available. At higher frequencies, the torque decreases as a result of the speed range under field control. As a rule, geared motors with the 50 Hz characteristic curve are somewhat quieter in operation and those with the 87 Hz characteristic curve have smaller, less expensive motor components. The 87 Hz characteristic curve facilitates lower positioning speeds.

$$n_2 = \frac{v}{d \cdot \pi}$$

v	[m/min]	(Travelling speed)
n_2	[1/min]	(Speed at the output shaft)
d	[m]	(Running wheel diameter)

3) Geared motor selection in accordance with the required acceleration torque M_{acc2} (specification: $M_{acc2} > M_{tot}$) and the permissible long-term rated torque M_{N2} (specification: $M_{N2} > M_r + M_h$).
The values for M_{acc2} and M_{N2} are contained in the selection tables. If acceleration torque M_{acc2} is not sufficient, the table usually provides higher values for torques M_{acc2} and M_{N2} at a higher permissible radial force F_{RN}.

Torque from rolling friction [Nm]:

$$M_w = F_w \cdot \frac{d}{2} = m \cdot f_w \cdot \frac{d}{2}$$

Lift on gradient: [Nm]:

$$M_h = m \cdot g \cdot \sin\alpha \cdot \frac{d}{2}$$

Acceleration torque [Nm]:

$$M_a = m \cdot a \cdot \frac{d}{2} = m \cdot \frac{v}{t_a} \cdot \frac{d}{2}$$

Total torque required during acceleration [Nm]:

$$M_{tot} = M_W + M_h + M_a$$

M_{acc2} = Torque [Nm] available at the output shaft during acceleration

M_{N2} = Torque [Nm] available at the output shaft during continuous operation.

d	[m]	(Running wheel diameter)
m	[kg]	(Moving mass)
f_W	[N/kg]	(Rolling resistance form rolling friction per 1000 kg , guide value approcimately ca. 200 N / 1000 kg = 0.2 N/kg)
F_W	[N]	(Rolling resistance from rolling friction)
v	[m/s]	(Maximum travelling speed)
t_a	[s]	(Run-up time)
a	[m/s²]	(Acceleration, standard values approximately 0,3 m/s²...1 m/s²)
α		(Angle of inclination)

4) Establishing the brake size in the brake selection table.

Choose a brake which can be fitted externally and then select the required braking torque.
Guide value for braking torque on the forizontal $M_{br1} = 0{,}9 \cdot M_{N1}$.

Total load and rotor at the moment of inertia at the rotor shaft [kgm²]

$$J_{tot1} = J_{Last1} + J_{rot} \; (+J_{SL})$$ **(J_{SL}, with heavy cast-iron fan impeller)**

Load at the moment of inertia at the rotor shaft [kgm²]

$$J_{Last1} = m \cdot \frac{\left(\frac{d}{2}\right)^2}{i^2} \text{ oder } J_{Last1} = 91{,}2 \cdot m \cdot \frac{v^2}{n_1^2}$$

Braking time [s]:

$$t_{br} = \frac{J_{tot1} \cdot n_1}{9{,}55 \cdot M_{br}}$$

n1	[1/min]	Rotor shaft speed
M_{br}	[Nm]	Brake torque of the mechanical brake

Rate of deceleration [m/s²]:

$$a_{br} = \frac{v}{t_{br}}$$

v	[m/s]	Travelling speed
a_{br}	[m/s²]	Rate of deceleration

The calculated rate of deceleration a_{br} is a guide value which is exceeded somewhat in practice since the rolling resistance and level of efficiency are not taken into account.

d	[m]	(Running wheel diameter)
m	[kg]	(Moving mass)
i		Gear reduction ratio
v	[m/s]	Travelling speed
n_1	[1/min]	Rotor shaft speed
J_{rot}	[kgm²]	Moment of inertia of the rotor at the rotor shaft from the motor table
J_{SL}	[kgm²]	Moment of inertia of the heavy cast-iron fan from the motor table

5) Compare the dimensional drawing of the geared motor with the carriage design, and determine the position of the terminal box.

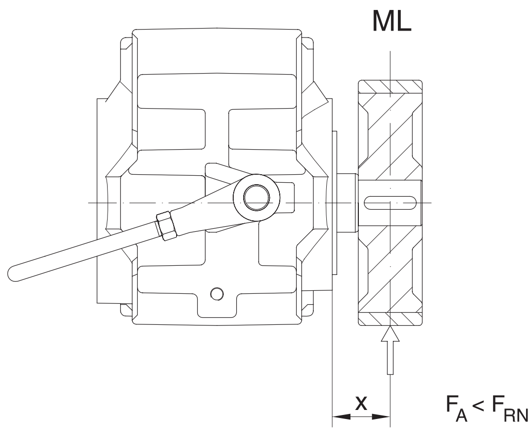
6) Compare the electrical data of the motor (I_N und I_{acc}) with the data of the inverter supplied.

Permissible radial forces

In each of the 13 tables for 50 Hz and 60 Hz, the wheel diameters and permissible radial forces for the various geared motors are assigned M_{acc2}, M_{N2}, n_2 and weights.

Selection table	d_{Wheel}	F_{RN}	Gear unit type	D_{Shaft}
	in mm	in N		in mm
1	**125**	4400	BM09	20
2	**125**	6500	BM09X	25
3	**125**	8000	BM10	25
4	**160**	6500	BM09X	25
5	**160**	8000	BM10	25
6	**200**	8000	BM10	25
7	**200**	10000	BM10X	25
8	**200**	10000	BM20	30
9	**200**	12000	BM20X	30
10	**200**	12000	BM30(Z)	35
11	**200**	15000	BM30(Z)X	35
12	**250**	15000	BM30(Z)	35
13	**250**	20000	BM40(Z)	55
14	**300**	20000	BM40(Z)	55
15	**300**	25000	BM40(Z)X	55

Definition des Kraftangriffes der Radlast
Definition of Force on wheel
Définition de la force appliquée par la roue

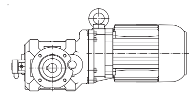


Maß x, siehe entsprechendes Maßbild
Dimension x, see related drawing
Cote x, voir le schéma correspondant

Abbreviations in the selection tables:

v	Travelling speed of the wheel diameter at a synchronous speed
i	Gear reduction ratio
M_{acc2}	Acceleration torque at the output shaft
M_{N2}	Permissible permanent load torque at the output shaft between 30 and 50 or 30 and 87 Hz in inverter duty
I_{acc}	Acceleration current (must be produced by the inverter)
I_L	Required current in inverter duty with $M_L = M_{N2}$
P	Rated output
n_2	Rated speed of the output shaft on a 50 Hz system
F_{RN}	Permissible radial force at the centre of the wheel (see dimension diagram)
d_{Rad}	Running wheel diameter
d_{AW}	Output shaft diameter

P = 0.03 kW

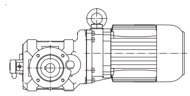


50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
16.5	**15.4**	**10**	82.54	**BM10G06-../D04LA4**	23	8000	10000	20	12.7	12
15	**17.3**	**8.7**	90.78	"	"	8000	10000	18	14.4	10
13.5	**18.6**	**8.1**	102.7	"	"	8000	10000	16	15.7	9.6
11.5	**21.5**	**7.0**	120.5	"	"	8000	10000	13.5	18.6	8.1
10.5	**24**	**6.7**	133.7	"	"	8000	10000	12.5	20	8.0
9.0	**27**	**5.6**	150.7	"	"	8000	10000	11	22	6.8
8.1	**30**	**5.3**	167.2	"	"	8000	10000	9.7	25	6.4
7.2	**35**	**4.3**	189.8	"	"	8000	10000	8.6	29	5.2
6.2	**39.5**	**4.1**	219.4	"	"	8000	10000	7.4	33	4.8
5.3	**46**	**3.5**	258.1	"	"	8000	10000	6.3	39	4.1
4.4	**55**	**2.9**	308.9	"	"	8000	10000	5.3	46	3.5
4.0	**61**	**2.6**	345.4	"	"	8000	10000	4.7	52	3.1
3.6	**68**	**2.4**	377.0	"	"	8000	10000	4.3	57	2.8
3.3	**74**	**2.2**	415.3	"	"	8000	10000	4.0	61	2.6
3.0	**82**	**1.95**	452.9	"	"	8000	10000	3.6	68	2.4
2.5	**98**	**1.65**	544.2	"	"	8000	10000	3.0	82	1.95
2.3	**107**	**1.5**	593.9	"	"	8000	10000	2.8	87	1.85
2.0	**123**	**1.3**	698.8	"	"	8000	10000	2.4	102	1.55
1.7	**144**	**1.1**	836.2	"	"	8000	10000	2.0	123	1.3
1.5	**164**	**0.98**	938.2	"	"	8000	10000	1.8	136	1.2
1.2	**160***	**1.0**	1186	"	"	8000	10000	1.4	160	1.0
0.95	**160***	**1.0**	1482	"	"	8000	10000	1.1	160	1.0
0.8	**160***	**1.0**	1701	"	"	8000	10000	1.0	160	1.0
0.7	**160***	**1.0**	1935	"	"	8000	10000	0.85	160	1.0
0.65	**160***	**1.0**	2111	"	"	8000	10000	0.8	160	1.0
0.6	**160***	**1.0**	2254	"	"	8000	10000	0.75	160	1.0
0.55	**160***	**1.0**	2459	"	"	8000	10000	0.7	160	1.0
2.1	**122**	**2.9**	663.4	**BM30G06-../D04LA4**	44	12000	15000	2.5	103	3.4
1.8	**143**	**2.4**	780.6	"	"	12000	15000	2.1	122	2.9
1.5	**171**	**2.0**	934.1	"	"	12000	15000	1.8	143	2.4
1.2	**210**	**1.65**	1143	"	"	12000	15000	1.5	171	2.0
1.1	**230**	**1.5**	1325	"	"	12000	15000	1.3	198	1.75
0.9	**285**	**1.25**	1518	"	"	12000	15000	1.1	230	1.5
0.85	**300**	**1.15**	1656	"	"	12000	15000	1.0	255	1.35
0.75	**340**	**1.05**	1900	"	"	12000	15000	0.9	285	1.25
0.65	**350***	**1.0**	2162	"	"	12000	15000	0.75	350	1.0
0.6	**350***	**1.0**	2358	"	"	12000	15000	0.7	350	1.0
0.5	**350***	**1.0**	2747	"	"	12000	15000	0.6	350	1.0

P = 0.04 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
25.5	**13.6**	**10**	53.03	**BM10G06-../D04LA4**	23	8000	10000	31	11.2	12
23	**15.1**	**9.9**	58.79	"	"	8000	10000	28	12.4	11.8
19.5	**17.8**	**7.9**	69.61	"	"	8000	10000	23.5	14.7	9.5
18.5	**18.3**	**7.9**	74.41	"	"	8000	10000	22	15.4	9.4
16.5	**20.5**	**7.6**	82.54	"	"	8000	10000	20	16.9	9.2
15	**23**	**6.5**	90.78	"	"	8000	10000	18	19.3	7.8
13.5	**24.5**	**6.1**	102.7	"	"	8000	10000	16	21	7.1
11.5	**29**	**5.2**	120.5	"	"	8000	10000	13.5	24.5	6.1
10.5	**32**	**5.0**	133.7	"	"	8000	10000	12.5	26.5	6.0
9.0	**36.5**	**4.1**	150.7	"	"	8000	10000	11	29.5	5.1
8.1	**40.5**	**4.0**	167.2	"	"	8000	10000	9.7	33.5	4.8
7.2	**46.5**	**3.2**	189.8	"	"	8000	10000	8.6	39	3.8
6.2	**52**	**3.1**	219.4	"	"	8000	10000	7.4	44	3.6
5.3	**61**	**2.6**	258.1	"	"	8000	10000	6.3	52	3.1
4.4	**74**	**2.2**	308.9	"	"	8000	10000	5.3	61	2.6
4.0	**82**	**1.95**	345.4	"	"	8000	10000	4.7	69	2.3
3.6	**91**	**1.75**	377.0	"	"	8000	10000	4.3	76	2.1
3.3	**99**	**1.6**	415.3	"	"	8000	10000	4.0	82	1.95
3.0	**109**	**1.45**	452.9	"	"	8000	10000	3.6	91	1.75

P = 0.04 kW

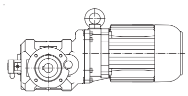


50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
2.5	**131**	**1.2**	544.2	**BM10G06-../D04LA4**	"	8000	10000	3.0	109	1.45
2.3	**142**	**1.15**	593.9	"	"	8000	10000	2.8	117	1.35
2.0	**164**	**0.98**	698.8	"	"	8000	10000	2.4	136	1.2
1.7	**193**	**0.83**	836.2	"	"	8000	10000	2.0	164	0.98
3.0	**114**	**3.1**	463.9	**BM30G06-../D04LA4**	44	12000	15000	3.5	98	3.6
2.6	**132**	**2.7**	533.9	"	"	12000	15000	3.1	110	3.2
2.1	**163**	**2.1**	663.4	"	"	12000	15000	2.5	137	2.6
1.8	**191**	**1.85**	780.6	"	"	12000	15000	2.1	163	2.1
1.5	**225**	**1.55**	934.1	"	"	12000	15000	1.8	191	1.85
1.2	**285**	**1.25**	1143	"	"	12000	15000	1.5	225	1.55
1.1	**310**	**1.15**	1325	"	"	12000	15000	1.3	260	1.35

P = 0.06 kW

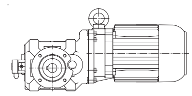
50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**4.2**	**7.1**	11.34	**BM09-../D05LA4**	13	4400	6500	143	3.5	8.6
103	**4.85**	**6.6**	13.23	"	"	4400	6500	123	4.05	7.9
77	**6.5**	**7.2**	17.73	"	"	4400	6500	92	5.4	8.7
64	**7.8**	**7.2**	21.20	"	"	4400	6500	77	6.5	8.6
55	**9.1**	**6.5**	24.74	"	"	4400	6500	66	7.6	7.8
52	**9.6**	**7.2**	25.98	"	"	4400	6500	63	8.0	8.6
45	**11.2**	**6.4**	30.31	"	"	4400	6500	54	9.3	7.7
41	**12.2**	**7.1**	32.97	"	"	4400	6500	49.5	10.1	8.6
35.5	**14.2**	**6.5**	38.46	"	"	4400	6500	42.5	11.8	7.8
32	**15.5**	**5.5**	42.44	"	"	4400	6500	38.5	12.9	6.6
25.5	**19.5**	**5.5**	53.85	"	"	4400	6500	30.5	16.3	6.6
10.5	**48**	**3.3**	133.7	**BM10G06-../D06LA4**	26	8000	10000	12.5	40	4.0
9.0	**54**	**2.8**	150.7	"	"	8000	10000	11	44.5	3.4
8.1	**60**	**2.7**	167.2	"	"	8000	10000	9.7	50	3.2
7.2	**70**	**2.1**	189.8	"	"	8000	10000	8.6	58	2.6
6.2	**79**	**2.0**	219.4	"	"	8000	10000	7.4	66	2.4
5.3	**92**	**1.75**	258.1	"	"	8000	10000	6.3	78	2.1
4.4	**111**	**1.45**	308.9	"	"	8000	10000	5.3	92	1.75
4.0	**123**	**1.3**	345.4	"	"	8000	10000	4.7	104	1.55
3.6	**136**	**1.2**	377.0	"	"	8000	10000	4.3	114	1.4
3.3	**149**	**1.05**	415.3	"	"	8000	10000	4.0	123	1.3
3.0	**164**	**0.98**	452.9	"	"	8000	10000	3.6	136	1.2
2.5	**197**	**0.81**	544.2	"	"	8000	10000	3.0	164	0.98
7.6	**71**	**2.9**	178.9	**BM20Z-../D06LA4**	24	12000	12000	9.1	59	3.5
6.6	**82**	**2.4**	205.3	"	"	12000	12000	7.9	68	2.8
4.7	**109**	**3.2**	288.3	**BM30G06-../D06LA4**	47	12000	15000	5.7	90	3.9
4.0	**128**	**2.7**	345.1	"	"	12000	15000	4.7	109	3.2
3.5	**147**	**2.4**	385.8	"	"	12000	15000	4.2	122	2.9
3.0	**171**	**2.0**	463.9	"	"	12000	15000	3.5	147	2.4
2.6	**198**	**1.75**	533.9	"	"	12000	15000	3.1	166	2.1
2.1	**245**	**1.45**	663.4	"	"	12000	15000	2.5	205	1.7
1.8	**285**	**1.25**	780.6	"	"	12000	15000	2.1	245	1.45
1.5	**340**	**1.05**	934.1	"	"	12000	15000	1.8	285	1.25
1.2	**425**	**0.82**	1143	"	"	12000	15000	1.5	340	1.05
2.5	**205**	**3.3**	540.0	**BM40G10-../D06LA4**	68	20000	25000	3.0	171	4.0
2.1	**245**	**2.8**	660.2	"	"	20000	25000	2.5	205	3.3
1.8	**285**	**2.4**	756.7	"	"	20000	25000	2.2	230	3.0
1.7	**300**	**2.3**	838.4	"	"	20000	25000	2.0	255	2.7
1.4	**365**	**1.85**	998.3	"	"	20000	25000	1.7	300	2.3
1.2	**425**	**1.6**	1189	"	"	20000	25000	1.4	365	1.85
0.95	**540**	**1.25**	1428	"	"	20000	25000	1.2	425	1.6
0.8	**640**	**1.05**	1798	"	"	20000	25000	0.95	540	1.25

P = 0.09 kW



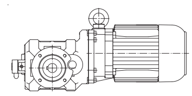
50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**6.3**	**4.8**	11.34	**BM09-../D05LA4**	13	4400	6500	143	5.2	5.8
103	**7.3**	**4.4**	13.23	"	"	4400	6500	123	6.1	5.2
77	**9.8**	**4.8**	17.73	"	"	4400	6500	92	8.2	5.7
64	**11.8**	**4.7**	21.20	"	"	4400	6500	77	9.8	5.7
55	**13.7**	**4.3**	24.74	"	"	4400	6500	66	11.4	5.2
52	**14.5**	**4.8**	25.98	"	"	4400	6500	63	12	5.8
45	**16.8**	**4.3**	30.31	"	"	4400	6500	54	14	5.1
41	**18.4**	**4.7**	32.97	"	"	4400	6500	49.5	15.2	5.7
35.5	**21**	**4.4**	38.46	"	"	4400	6500	42.5	17.7	5.2
32	**23**	**3.7**	42.44	"	"	4400	6500	38.5	19.4	4.4
25.5	**29**	**3.7**	53.85	"	"	4400	6500	30.5	24.5	4.4
15	**52**	**2.9**	90.78	**BM10G06-../D06LA4**	26	8000	10000	18	43	3.5
13.5	**56**	**2.7**	102.7	"	"	8000	10000	16	47	3.2
11.5	**65**	**2.3**	120.5	"	"	8000	10000	13.5	56	2.7
10.5	**72**	**2.2**	133.7	"	"	8000	10000	12.5	60	2.7
9.0	**82**	**1.85**	150.7	"	"	8000	10000	11	67	2.2
8.1	**91**	**1.75**	167.2	"	"	8000	10000	9.7	76	2.1
7.2	**105**	**1.45**	189.8	"	"	8000	10000	8.6	87	1.7
6.2	**119**	**1.35**	219.4	"	"	8000	10000	7.4	99	1.6
5.3	**139**	**1.15**	258.1	"	"	8000	10000	6.3	117	1.35
4.4	**167**	**0.96**	308.9	"	"	8000	10000	5.3	139	1.15
4.0	**184**	**0.87**	345.4	"	"	8000	10000	4.7	157	1.0
11.5	**71**	**3.1**	117.9	**BM20Z-../D06LA4**	24	12000	12000	14	58	3.8
9.5	**85**	**2.6**	142.8	"	"	12000	12000	11.5	71	3.1
7.6	**107**	**1.95**	178.9	"	"	12000	12000	9.1	89	2.3
6.6	**123**	**1.55**	205.3	"	"	12000	12000	7.9	103	1.85
7.3	**105**	**3.3**	186.7	**BM30G06-../D06LA4**	47	12000	15000	8.7	88	4.0
6.5	**120**	**2.9**	208.6	"	"	12000	15000	7.8	100	3.5
5.6	**138**	**2.5**	245.1	"	"	12000	15000	6.7	115	3.0
4.7	**164**	**2.1**	288.3	"	"	12000	15000	5.7	135	2.6
4.0	**193**	**1.8**	345.1	"	"	12000	15000	4.7	164	2.1
3.5	**220**	**1.6**	385.8	"	"	12000	15000	4.2	184	1.9
3.0	**255**	**1.35**	463.9	"	"	12000	15000	3.5	220	1.6
2.6	**295**	**1.2**	533.9	"	"	12000	15000	3.1	245	1.45
2.1	**365**	**0.96**	663.4	"	"	12000	15000	2.5	305	1.15
1.8	**425**	**0.82**	780.6	"	"	12000	15000	2.1	365	0.96
3.9	**178**	**2.8**	348.7	**BM40Z-../D06LA4**	64	20000	25000	4.7	148	3.4
3.2	**210**	**2.4**	430.0	"	"	20000	25000	3.8	180	2.8
2.8	**275**	**2.5**	487.3	**BM40G10-../D06LA4**	68	20000	25000	3.4	225	3.0
2.5	**305**	**2.2**	540.0	"	"	20000	25000	3.0	255	2.7
2.1	**365**	**1.85**	660.2	"	"	20000	25000	2.5	305	2.2
1.8	**425**	**1.6**	756.7	"	"	20000	25000	2.2	350	1.95
1.7	**455**	**1.5**	838.4	"	"	20000	25000	2.0	385	1.75
1.4	**550**	**1.25**	998.3	"	"	20000	25000	1.7	455	1.5
1.2	**640**	**1.05**	1189	"	"	20000	25000	1.4	550	1.25

P = 0.12 kW



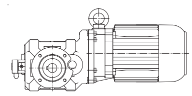
50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**8.4**	**3.6**	11.34	**BM09-../D05LA4**	13	4400	6500	143	7.0	4.3
103	**9.7**	**3.3**	13.23	"	"	4400	6500	123	8.1	4.0
77	**13**	**3.6**	17.73	"	"	4400	6500	92	10.9	4.3
64	**15.7**	**3.6**	21.20	"	"	4400	6500	77	13	4.3
55	**18.3**	**3.2**	24.74	"	"	4400	6500	66	15.2	3.9
52	**19.3**	**3.6**	25.98	"	"	4400	6500	63	16	4.3
45	**22**	**3.3**	30.31	"	"	4400	6500	54	18.6	3.9
41	**24.5**	**3.6**	32.97	"	"	4400	6500	49.5	20	4.4
35.5	**28**	**3.3**	38.46	"	"	4400	6500	42.5	23.5	3.9
32	**31**	**2.7**	42.44	"	"	4400	6500	38.5	25.5	3.3
25.5	**39**	**2.8**	53.85	"	"	4400	6500	30.5	32.5	3.3
23	**45**	**3.3**	58.79	**BM10G06-../D06LA4**	26	8000	10000	28	37	4.1
19.5	**53**	**2.6**	69.61	"	"	8000	10000	23.5	44	3.2
18.5	**55**	**2.6**	74.41	"	"	8000	10000	22	46	3.2
16.5	**61**	**2.5**	82.54	"	"	8000	10000	20	50	3.1
15	**69**	**2.2**	90.78	"	"	8000	10000	18	57	2.6
13.5	**74**	**2.0**	102.7	"	"	8000	10000	16	63	2.4
11.5	**87**	**1.7**	120.5	"	"	8000	10000	13.5	74	2.0
10.5	**96**	**1.65**	133.7	"	"	8000	10000	12.5	80	2.0
9.0	**109**	**1.4**	150.7	"	"	8000	10000	11	89	1.7
8.1	**121**	**1.3**	167.2	"	"	8000	10000	9.7	101	1.6
7.2	**140**	**1.05**	189.8	"	"	8000	10000	8.6	117	1.3
6.2	**158**	**1.0**	219.4	"	"	8000	10000	7.4	133	1.2
5.3	**185**	**0.86**	258.1	"	"	8000	10000	6.3	156	1.05
18.5	**58**	**3.1**	74.76	**BM20-../D06LA4**	23	12000	12000	22	49	3.7
16	**68**	**3.2**	85.45	**BM20Z-../D06LA4**	24	12000	12000	19	57	3.9
14	**77**	**2.9**	99.47	"	"	12000	12000	16.5	65	3.4
11.5	**94**	**2.3**	117.9	"	"	12000	12000	14	77	2.9
9.5	**114**	**1.95**	142.8	"	"	12000	12000	11.5	94	2.3
7.6	**143**	**1.45**	178.9	"	"	12000	12000	9.1	119	1.75
6.6	**164**	**1.2**	205.3	"	"	12000	12000	7.9	137	1.4
9.0	**108**	**3.2**	150.3	**BM30Z-../D06LA4**	41	12000	15000	11	88	4.0
7.7	**126**	**2.8**	177.2	"	"	12000	15000	9.2	105	3.3
7.3	**141**	**2.5**	186.7	**BM30G06-../D06LA4**	47	12000	15000	8.7	118	3.0
6.5	**160**	**2.2**	208.6	"	"	12000	15000	7.8	133	2.6
5.6	**184**	**1.9**	245.1	"	"	12000	15000	6.7	153	2.3
4.7	**215**	**1.65**	288.3	"	"	12000	15000	5.7	180	1.95
4.0	**255**	**1.35**	345.1	"	"	12000	15000	4.7	215	1.65
3.5	**290**	**1.2**	385.8	"	"	12000	15000	4.2	245	1.45
3.0	**340**	**1.05**	463.9	"	"	12000	15000	3.5	290	1.2
2.6	**395**	**0.89**	533.9	"	"	12000	15000	3.1	330	1.05
4.7	**197**	**3.0**	289.8	**BM40Z-../D06LA4**	64	20000	25000	5.6	165	3.6
3.9	**235**	**2.2**	348.7	"	"	20000	25000	4.7	197	2.6
3.2	**285**	**1.75**	430.0	"	"	20000	25000	3.8	240	2.1
2.8	**365**	**1.85**	487.3	**BM40G10-../D06LA4**	68	20000	25000	3.4	300	2.3
2.5	**410**	**1.65**	540.0	"	"	20000	25000	3.0	340	2.0
2.1	**490**	**1.4**	660.2	"	"	20000	25000	2.5	410	1.65
1.8	**570**	**1.2**	756.7	"	"	20000	25000	2.2	465	1.45
1.7	**600**	**1.15**	838.4	"	"	20000	25000	2.0	510	1.35
1.4	**730**	**0.93**	998.3	"	"	20000	25000	1.7	600	1.15
1.2	**850**	**0.8**	1189	"	"	20000	25000	1.4	730	0.93

P = 0.18 kW



50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**12.6**	**2.4**	11.34	**BM09-../D05LA4**	13	4400	6500	143	10.5	2.9
103	**14.6**	**2.2**	13.23	"	"	4400	6500	123	12.2	2.6
77	**19.6**	**2.4**	17.73	"	"	4400	6500	92	16.4	2.9
64	**23.5**	**2.4**	21.20	"	"	4400	6500	77	19.6	2.9
55	**27.5**	**2.1**	24.74	"	"	4400	6500	66	22.5	2.6
52	**29**	**2.4**	25.98	"	"	4400	6500	63	24	2.9
45	**33.5**	**2.1**	30.31	"	"	4400	6500	54	28	2.6
41	**36.5**	**2.4**	32.97	"	"	4400	6500	49.5	30.5	2.9
35.5	**42.5**	**2.2**	38.46	"	"	4400	6500	42.5	35.5	2.6
32	**46.5**	**1.85**	42.44	"	"	4400	6500	38.5	38.5	2.2
25.5	**58**	**1.85**	53.85	"	"	4400	6500	30.5	49	2.2
30	**48**	**3.3**	45.00	**BM10-../D06LA4**	21	8000	10000	36	40	4.0
26	**54**	**2.8**	52.44	"	"	8000	10000	31	45	3.3
23.5	**59**	**2.7**	58.18	"	"	8000	10000	28	50	3.2
23	**68**	**2.2**	58.79	**BM10G06-../D06LA4**	26	8000	10000	28	55	2.7
19.5	**80**	**1.75**	69.61	"	"	8000	10000	23.5	66	2.1
18.5	**82**	**1.75**	74.41	"	"	8000	10000	22	69	2.1
16.5	**92**	**1.7**	82.54	"	"	8000	10000	20	76	2.0
15	**104**	**1.45**	90.78	"	"	8000	10000	18	86	1.75
13.5	**112**	**1.35**	102.7	"	"	8000	10000	16	94	1.6
11.5	**131**	**1.15**	120.5	"	"	8000	10000	13.5	112	1.35
10.5	**144**	**1.1**	133.7	"	"	8000	10000	12.5	121	1.3
9.0	**164**	**0.91**	150.7	"	"	8000	10000	11	134	1.1
8.1	**182**	**0.88**	167.2	"	"	8000	10000	9.7	152	1.05
22.5	**72**	**2.7**	60.64	**BM20-../D06LA4**	23	10000	12000	27	60	3.2
18.5	**88**	**2.1**	74.76	"	"	10000	12000	22	74	2.5
16	**102**	**2.2**	85.45	**BM20Z-../D06LA4**	24	10000	12000	19	85	2.6
14	**116**	**1.9**	99.47	"	"	10000	12000	16.5	98	2.2
11.5	**142**	**1.55**	117.9	"	"	10000	12000	14	116	1.9
9.5	**171**	**1.3**	142.8	"	"	10000	12000	11.5	142	1.55
7.6	**210**	**1.0**	178.9	"	"	10000	12000	9.1	179	1.15
19	**79**	**3.3**	71.09	**BM30-../D06LA4**	39	12000	15000	23	65	4.0
13.5	**109**	**3.2**	100.7	**BM30Z-../D06LA4**	41	12000	15000	16.5	89	3.9
11	**134**	**2.6**	128.2	"	"	12000	15000	13	113	3.1
9.0	**162**	**2.2**	150.3	"	"	12000	15000	11	132	2.7
7.7	**189**	**1.85**	177.2	"	"	12000	15000	9.2	158	2.2
7.3	**210**	**1.65**	186.7	**BM30G06-../D06LA4**	47	12000	15000	8.7	177	2.0
6.5	**240**	**1.45**	208.6	"	"	12000	15000	7.8	200	1.75
5.6	**275**	**1.25**	245.1	"	"	12000	15000	6.7	230	1.5
4.7	**325**	**1.1**	288.3	"	"	12000	15000	5.7	270	1.3
4.0	**385**	**0.91**	345.1	"	"	12000	15000	4.7	325	1.1
3.5	**440**	**0.8**	385.8	"	"	12000	15000	4.2	365	0.96
6.4	**220**	**3.1**	211.5	**BM40Z-../D06LA4**	64	20000	25000	7.7	183	3.7
5.5	**250**	**2.7**	246.6	"	"	20000	25000	6.6	210	3.2
4.7	**295**	**2.0**	289.8	"	"	20000	25000	5.6	245	2.4
3.9	**355**	**1.45**	348.7	"	"	20000	25000	4.7	295	1.7
3.2	**425**	**1.2**	430.0	"	"	20000	25000	3.8	360	1.4
2.8	**550**	**1.25**	487.3	**BM40G10-../D06LA4**	68	20000	25000	3.4	455	1.5
2.5	**610**	**1.1**	540.0	"	"	20000	25000	3.0	510	1.35
2.1	**730**	**0.93**	660.2	"	"	20000	25000	2.5	610	1.1
1.8	**850**	**0.8**	756.7	"	"	20000	25000	2.2	700	0.97

P = 0.25 kW



50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	17.5	1.7	11.34	BM09-../D05LA4	13	4400	6500	143	14.6	2.1
103	20	1.6	13.23	″	″	4400	6500	123	17	1.9
77	27	1.75	17.73	″	″	4400	6500	92	22.5	2.1
64	32.5	1.7	21.20	″	″	4400	6500	77	27	2.1
55	38	1.55	24.74	″	″	4400	6500	66	31.5	1.85
52	40	1.75	25.98	″	″	4400	6500	63	33	2.1
45	46.5	1.55	30.31	″	″	4400	6500	54	38.5	1.85
41	51	1.7	32.97	″	″	4400	6500	49.5	42	2.1
35.5	59	1.55	38.46	″	″	4400	6500	42.5	49	1.9
32	64	1.35	42.44	″	″	4400	6500	38.5	53	1.6
25.5	81	1.35	53.85	″	″	4400	6500	30.5	68	1.6
41	50	3.0	33.19	BM10-../D06LA4	21	8000	10000	49	41.5	3.6
37	55	2.9	36.82	″	″	8000	10000	44	46.5	3.4
33.5	59	2.5	40.56	″	″	8000	10000	40	50	3.0
30	66	2.4	45.00	″	″	8000	10000	36	55	2.9
26	75	2.0	52.44	″	″	8000	10000	31	63	2.4
23.5	83	1.95	58.18	″	″	8000	10000	28	69	2.3
23	94	1.6	58.79	BM10G06-../D06LA4	26	8000	10000	28	77	1.95
19.5	111	1.25	69.61	″	″	8000	10000	23.5	92	1.5
18.5	114	1.25	74.41	″	″	8000	10000	22	96	1.5
16.5	128	1.2	82.54	″	″	8000	10000	20	106	1.45
15	144	1.05	90.78	″	″	8000	10000	18	120	1.25
13.5	155	0.97	102.7	″	″	8000	10000	16	131	1.15
11.5	182	0.82	120.5	″	″	8000	10000	13.5	155	0.97
10.5	200	0.8	133.7	″	″	8000	10000	12.5	168	0.95
32.5	69	3.2	42.18	BM20-../D06LA4	23	12000	12000	38.5	58	3.8
26	87	2.4	52.84	″	″	12000	12000	31	73	2.9
22.5	100	1.95	60.64	″	″	12000	12000	27	84	2.3
18.5	122	1.5	74.76	″	″	12000	12000	22	103	1.75
16	141	1.55	85.45	BM20Z-../D06LA4	24	12000	12000	19	119	1.85
14	162	1.35	99.47	″	″	12000	12000	16.5	137	1.6
11.5	197	1.1	117.9	″	″	12000	12000	14	162	1.35
9.5	235	0.94	142.8	″	″	12000	12000	11.5	197	1.1
22.5	93	2.9	61.33	BM30-../D06LA4	39	12000	15000	26.5	79	3.4
19	110	2.3	71.09	″	″	12000	15000	23	91	2.8
16	129	2.7	85.96	BM30Z-../D06LA4	41	12000	15000	19	109	3.2
13.5	152	2.3	100.7	″	″	12000	15000	16.5	124	2.8
11	186	1.9	128.2	″	″	12000	15000	13	157	2.2
9.0	225	1.55	150.3	″	″	12000	15000	11	184	1.9
7.7	260	1.35	177.2	″	″	12000	15000	9.2	220	1.6
7.3	290	1.2	186.7	BM30G06-../D06LA4	47	12000	15000	8.7	245	1.45
6.5	330	1.05	208.6	″	″	12000	15000	7.8	275	1.25
5.6	380	0.92	245.1	″	″	12000	15000	6.7	320	1.1
9.5	210	3.2	143.0	BM40Z-../D06LA4	64	20000	25000	11.5	174	3.9
8.0	245	2.8	169.0	″	″	20000	25000	9.6	205	3.3
6.4	305	2.2	211.5	″	″	20000	25000	7.7	250	2.7
5.5	350	1.95	246.6	″	″	20000	25000	6.6	290	2.3
4.7	410	1.45	289.8	″	″	20000	25000	5.6	345	1.75
3.9	495	1.0	348.7	″	″	20000	25000	4.7	410	1.25
3.2	590	0.85	430.0	″	″	20000	25000	3.8	500	1.0
2.8	760	0.89	487.3	BM40G10-../D06LA4	68	20000	25000	3.4	630	1.1
2.5	850	0.8	540.0	″	″	20000	25000	3.0	710	0.96

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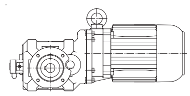
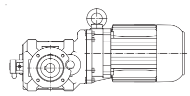


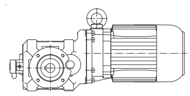
50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2	M_2	f_B						n_2	M_2	f_B
1/min	Nm				kg	N	N	1/min	Nm	
120	21	1.45	11.34	BM09-../D07LA4	17	4400	6500	143	17.6	1.7
103	24	1.35	13.23	"	"	4400	6500	123	20	1.6
77	32.5	1.45	17.73	"	"	4400	6500	92	27	1.75
64	39	1.45	21.20	"	"	4400	6500	77	32.5	1.7
55	45.5	1.3	24.74	"	"	4400	6500	66	38	1.55
52	48	1.45	25.98	"	"	4400	6500	63	40	1.75
45	56	1.3	30.31	"	"	4400	6500	54	46.5	1.55
41	61	1.45	32.97	"	"	4400	6500	49.5	50	1.75
35.5	71	1.3	38.46	"	"	4400	6500	42.5	59	1.55
32	77	1.1	42.44	"	"	4400	6500	38.5	64	1.35
25.5	97	1.1	53.85	"	"	4400	6500	30.5	81	1.35
51	49	3.1	26.55	BM10-../D07LA4	23	8000	10000	62	40.5	3.7
46	54	3.0	29.45	"	"	8000	10000	56	45	3.6
41	60	2.5	33.19	"	"	8000	10000	49	50	3.0
37	66	2.4	36.82	"	"	8000	10000	44	55	2.9
33.5	71	2.1	40.56	"	"	8000	10000	40	60	2.5
30	80	2.0	45.00	"	"	8000	10000	36	66	2.4
26	90	1.65	52.44	"	"	8000	10000	31	75	2.0
23.5	99	1.6	58.18	"	"	8000	10000	28	83	1.95
23	113	1.35	58.79	BM10G06-../D07LA4	28	8000	10000	28	93	1.6
19.5	133	1.05	69.61	"	"	8000	10000	23.5	110	1.25
18.5	137	1.05	74.41	"	"	8000	10000	22	115	1.25
16.5	154	1.0	82.54	"	"	8000	10000	20	127	1.2
15	173	0.87	90.78	"	"	8000	10000	18	144	1.05
13.5	186	0.81	102.7	"	"	8000	10000	16	157	0.96
38.5	70	3.1	35.25	BM20-../D07LA4	26	12000	12000	46	59	3.7
32.5	83	2.7	42.18	"	"	12000	12000	38.5	70	3.1
26	104	2.0	52.84	"	"	12000	12000	31	87	2.4
22.5	120	1.6	60.64	"	"	12000	12000	27	100	1.95
18.5	147	1.25	74.76	"	"	12000	12000	22	123	1.5
16	170	1.3	85.45	BM20Z-../D07LA4	27	12000	12000	19	143	1.55
14	194	1.15	99.47	"	"	12000	12000	16.5	164	1.35
11.5	235	0.94	117.9	"	"	12000	12000	14	194	1.15
22.5	112	2.4	61.33	BM30-../D07LA4	41	12000	15000	26.5	95	2.8
19	132	1.95	71.09	"	"	12000	15000	23	109	2.4
16	155	2.3	85.96	BM30Z-../D07LA4	44	12000	15000	19	131	2.7
13.5	182	1.9	100.7	"	"	12000	15000	16.5	149	2.3
11	220	1.6	128.2	"	"	12000	15000	13	189	1.85
9.0	270	1.3	150.3	"	"	12000	15000	11	220	1.6
7.7	315	1.1	177.2	"	"	12000	15000	9.2	260	1.35
7.3	350	1.0	186.7	BM30G06-../D07LA4	50	12000	15000	8.7	295	1.2
6.5	400	0.88	208.6	"	"	12000	15000	7.8	330	1.05
11.5	210	3.2	118.2	BM40Z-../D07LA4	66	20000	25000	14	173	3.9
9.5	250	2.7	143.0	"	"	20000	25000	11.5	205	3.3
8.0	295	2.3	169.0	"	"	20000	25000	9.6	245	2.8
6.4	365	1.85	211.5	"	"	20000	25000	7.7	305	2.2
5.5	420	1.6	246.6	"	"	20000	25000	6.6	350	1.95
4.7	490	1.2	289.8	"	"	20000	25000	5.6	410	1.45
3.9	590	0.86	348.7	"	"	20000	25000	4.7	490	1.05

P = 0.37 kW



50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2	M_2	f_B						n_2	M_2	f_B
1/min	Nm				kg	N	N	1/min	Nm	
120	**25.5**	**1.2**	11.34	**BM09-../D07LA4**	17	4400	6500	143	21.5	1.4
103	**30**	**1.05**	13.23	"	"	4400	6500	123	25	1.3
77	**40**	**1.2**	17.73	"	"	4400	6500	92	33.5	1.4
64	**48.5**	**1.15**	21.20	"	"	4400	6500	77	40	1.4
55	**56**	**1.05**	24.74	"	"	4400	6500	66	47	1.25
52	**59**	**1.15**	25.98	"	"	4400	6500	63	49	1.4
45	**69**	**1.05**	30.31	"	"	4400	6500	54	57	1.25
41	**75**	**1.15**	32.97	"	"	4400	6500	49.5	62	1.4
35.5	**87**	**1.05**	38.46	"	"	4400	6500	42.5	73	1.25
32	**96**	**0.89**	42.44	"	"	4400	6500	38.5	79	1.1
25.5	**120**	**0.9**	53.85	"	"	4400	6500	30.5	100	1.1
60	**51**	**2.9**	22.62	**BM10-../D07LA4**	23	8000	10000	72	43	3.5
54	**57**	**2.8**	25.09	"	"	8000	10000	65	47.5	3.4
51	**60**	**2.5**	26.55	"	"	8000	10000	62	50	3.0
46	**67**	**2.4**	29.45	"	"	8000	10000	56	55	2.9
41	**74**	**2.0**	33.19	"	"	8000	10000	49	62	2.4
37	**82**	**1.95**	36.82	"	"	8000	10000	44	69	2.3
33.5	**88**	**1.7**	40.56	"	"	8000	10000	40	74	2.0
30	**98**	**1.65**	45.00	"	"	8000	10000	36	82	1.95
26	**111**	**1.35**	52.44	"	"	8000	10000	31	93	1.6
23.5	**123**	**1.3**	58.18	"	"	8000	10000	28	103	1.55
23	**139**	**1.1**	58.79	**BM10G06-../D07LA4**	28	8000	10000	28	114	1.3
19.5	**164**	**0.85**	69.61	"	"	8000	10000	23.5	136	1.05
18.5	**169**	**0.86**	74.41	"	"	8000	10000	22	142	1.0
16.5	**190**	**0.82**	82.54	"	"	8000	10000	20	157	0.99
46	**72**	**3.1**	29.39	**BM20-../D07LA4**	26	12000	12000	56	59	3.7
38.5	**87**	**2.5**	35.25	"	"	12000	12000	46	72	3.1
32.5	**103**	**2.1**	42.18	"	"	12000	12000	38.5	87	2.5
26	**129**	**1.6**	52.84	"	"	12000	12000	31	108	1.95
22.5	**149**	**1.3**	60.64	"	"	12000	12000	27	124	1.55
18.5	**181**	**1.0**	74.76	"	"	12000	12000	22	152	1.2
16	**205**	**1.05**	85.45	**BM20Z-../D07LA4**	27	12000	12000	19	176	1.25
14	**235**	**0.94**	99.47	"	"	12000	12000	16.5	200	1.1
27.5	**114**	**2.8**	49.66	**BM30-../D07LA4**	41	12000	15000	33	95	3.3
22.5	**138**	**1.95**	61.33	"	"	12000	15000	26.5	117	2.3
19	**163**	**1.6**	71.09	"	"	12000	15000	23	135	1.9
16	**192**	**1.8**	85.96	**BM30Z-../D07LA4**	44	12000	15000	19	161	2.2
13.5	**225**	**1.55**	100.7	"	"	12000	15000	16.5	184	1.9
11	**275**	**1.25**	128.2	"	"	12000	15000	13	230	1.5
9.0	**330**	**1.05**	150.3	"	"	12000	15000	11	270	1.3
7.7	**390**	**0.9**	177.2	"	"	12000	15000	9.2	325	1.1
7.3	**435**	**0.8**	186.7	**BM30G06-../D07LA4**	50	12000	15000	8.7	365	0.96
11.5	**260**	**2.6**	118.2	**BM40Z-../D07LA4**	66	20000	25000	14	210	3.2
9.5	**310**	**2.2**	143.0	"	"	20000	25000	11.5	255	2.7
8.0	**365**	**1.85**	169.0	"	"	20000	25000	9.6	305	2.2
6.4	**450**	**1.5**	211.5	"	"	20000	25000	7.7	375	1.8
5.5	**520**	**1.3**	246.6	"	"	20000	25000	6.6	430	1.6
4.7	**600**	**1.0**	289.8	"	"	20000	25000	5.6	510	1.15

P = 0.55 kW

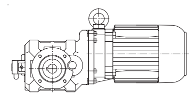


50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
124	**37**	**0.81**	11.34	**BM09-../D08MA4**	18	4400	6500	149	31	0.97
79	**58**	**0.81**	17.73	"	"	4400	6500	95	48.5	0.97
67	**68**	**0.82**	21.20	"	"	4400	6500	80	57	0.98
54	**85**	**0.81**	25.98	"	"	4400	6500	65	71	0.97
42.5	**108**	**0.81**	32.97	"	"	4400	6500	51	90	0.97
86	**54**	**2.7**	16.39	**BM10-../D08MA4**	24	8000	10000	103	45	3.2
78	**59**	**2.6**	18.18	"	"	8000	10000	93	50	3.1
62	**74**	**2.0**	22.62	"	"	8000	10000	75	61	2.5
56	**82**	**1.95**	25.09	"	"	8000	10000	67	68	2.4
53	**87**	**1.7**	26.55	"	"	8000	10000	64	72	2.1
48	**96**	**1.65**	29.45	"	"	8000	10000	58	79	2.0
42.5	**106**	**1.4**	33.19	"	"	8000	10000	51	88	1.7
38.5	**117**	**1.35**	36.82	"	"	8000	10000	46	98	1.65
35	**126**	**1.2**	40.56	"	"	8000	10000	41.5	106	1.4
31.5	**140**	**1.15**	45.00	"	"	8000	10000	37.5	117	1.35
27	**159**	**0.94**	52.44	"	"	8000	10000	32.5	132	1.15
24.5	**175**	**0.91**	58.18	"	"	8000	10000	29	148	1.1
71	**70**	**3.1**	19.72	**BM20-../D08MA4**	26	12000	12000	86	58	3.8
56	**89**	**2.5**	25.25	"	"	12000	12000	67	74	3.0
48	**103**	**2.1**	29.39	"	"	12000	12000	58	86	2.6
40	**124**	**1.75**	35.25	"	"	12000	12000	48	103	2.1
33.5	**148**	**1.5**	42.18	"	"	12000	12000	40	124	1.75
26.5	**188**	**1.1**	52.84	"	"	12000	12000	32	155	1.35
23.5	**210**	**0.92**	60.64	"	"	12000	12000	28	178	1.1
21	**235**	**0.94**	66.74	**BM20Z-../D08MA4**	28	12000	12000	25.5	195	1.15
40.5	**118**	**3.0**	34.88	**BM30-../D08MA4**	42	12000	15000	48.5	98	3.6
34.5	**137**	**2.6**	41.13	"	"	12000	15000	41	115	3.0
28.5	**164**	**1.95**	49.66	"	"	12000	15000	34	137	2.3
23	**200**	**1.35**	61.33	"	"	12000	15000	27.5	168	1.6
20	**230**	**1.1**	71.09	"	"	12000	15000	24	192	1.35
16.5	**275**	**1.25**	85.96	**BM30Z-../D08MA4**	45	12000	15000	20	225	1.55
14	**320**	**1.1**	100.7	"	"	12000	15000	17	265	1.3
11	**410**	**0.85**	128.2	"	"	12000	15000	13.5	330	1.05
20	**225**	**3.0**	70.11	**BM40-../D08MA4**	63	20000	25000	24	190	3.6
17	**265**	**2.3**	84.36	"	"	20000	25000	20	225	2.7
13.5	**330**	**1.8**	104.0	"	"	20000	25000	16.5	270	2.2
12	**370**	**1.85**	118.2	**BM40Z-../D08MA4**	67	20000	25000	14.5	305	2.2
9.8	**450**	**1.5**	143.0	"	"	20000	25000	12	365	1.85
8.3	**520**	**1.3**	169.0	"	"	20000	25000	10	435	1.55
6.7	**640**	**1.05**	211.5	"	"	20000	25000	8.0	530	1.3
5.7	**740**	**0.92**	246.6	"	"	20000	25000	6.9	610	1.1

P = 0.75 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**54**	**2.6**	11.68	**BM10-../D08LA4**	26	8000	10000	144	45	3.1
109	**59**	**2.5**	12.95	"	"	8000	10000	130	50	3.0
86	**74**	**1.95**	16.39	"	"	8000	10000	103	61	2.4
78	**81**	**1.9**	18.18	"	"	8000	10000	93	68	2.3
62	**101**	**1.5**	22.62	"	"	8000	10000	75	84	1.8
56	**112**	**1.45**	25.09	"	"	8000	10000	67	94	1.7
53	**118**	**1.25**	26.55	"	"	8000	10000	64	98	1.55
48	**131**	**1.2**	29.45	"	"	8000	10000	58	108	1.5
42.5	**144**	**1.05**	33.19	"	"	8000	10000	51	120	1.25
38.5	**159**	**1.0**	36.82	"	"	8000	10000	46	133	1.2
35	**171**	**0.88**	40.56	"	"	8000	10000	41.5	144	1.05
31.5	**191**	**0.84**	45.00	"	"	8000	10000	37.5	160	1.0
84	**81**	**2.7**	16.72	**BM20-../D08LA4**	28	12000	12000	101	67	3.3
71	**95**	**2.3**	19.72	"	"	12000	12000	86	79	2.8

P = 0.75 kW

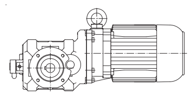


50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
56	**121**	**1.8**	25.25	**BM20-../D08LA4**	"	12000	12000	67	101	2.2
48	**141**	**1.55**	29.39	"	"	12000	12000	58	117	1.9
40	**170**	**1.3**	35.25	"	"	12000	12000	48	141	1.55
33.5	**200**	**1.1**	42.18	"	"	12000	12000	40	170	1.3
26.5	**255**	**0.82**	52.84	"	"	12000	12000	32	210	1.0
25	**270**	**0.81**	56.58	**BM20Z-../D08LA4**	30	12000	12000	30	225	0.98
60	**108**	**3.2**	23.38	**BM30-../D08LA4**	44	12000	15000	72	90	3.9
47.5	**137**	**2.6**	29.76	"	"	12000	15000	57	114	3.1
40.5	**160**	**2.2**	34.88	"	"	12000	15000	48.5	134	2.6
34.5	**186**	**1.9**	41.13	"	"	12000	15000	41	157	2.2
28.5	**220**	**1.45**	49.66	"	"	12000	15000	34	187	1.7
23	**270**	**1.0**	61.33	"	"	12000	15000	27.5	225	1.2
20	**315**	**0.82**	71.09	"	"	12000	15000	24	260	0.99
16.5	**375**	**0.93**	85.96	**BM30Z-../D08LA4**	46	12000	15000	20	310	1.15
14	**435**	**0.8**	100.7	"	"	12000	15000	17	360	0.97
27.5	**225**	**3.0**	51.18	**BM40-../D08LA4**	64	20000	25000	33	191	3.6
23.5	**265**	**2.6**	59.66	"	"	20000	25000	28.5	220	3.1
20	**310**	**2.2**	70.11	"	"	20000	25000	24	255	2.7
17	**365**	**1.65**	84.36	"	"	20000	25000	20	310	1.95
13.5	**450**	**1.35**	104.0	"	"	20000	25000	16.5	365	1.65
12	**500**	**1.35**	118.2	**BM40Z-../D08LA4**	69	20000	25000	14.5	415	1.65
9.8	**610**	**1.1**	143.0	"	"	20000	25000	12	500	1.35
8.3	**710**	**0.96**	169.0	"	"	20000	25000	10	590	1.15

P = 1.1 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**79**	**1.75**	11.68	**BM10-../D09SA4**	30	8000	10000	144	66	2.1
109	**87**	**1.7**	12.95	"	"	8000	10000	130	73	2.1
86	**108**	**1.35**	16.39	"	"	8000	10000	103	90	1.6
78	**119**	**1.3**	18.18	"	"	8000	10000	93	100	1.55
62	**149**	**1.0**	22.62	"	"	8000	10000	75	123	1.2
56	**165**	**0.97**	25.09	"	"	8000	10000	67	137	1.15
53	**174**	**0.86**	26.55	"	"	8000	10000	64	144	1.05
48	**192**	**0.83**	29.45	"	"	8000	10000	58	159	1.0
138	**72**	**3.1**	10.15	**BM20-../D09SA4**	32	12000	12000	166	60	3.7
105	**95**	**2.3**	13.34	"	"	12000	12000	126	79	2.8
84	**118**	**1.85**	16.72	"	"	12000	12000	101	98	2.2
71	**140**	**1.55**	19.72	"	"	12000	12000	86	116	1.9
56	**178**	**1.25**	25.25	"	"	12000	12000	67	148	1.5
48	**205**	**1.05**	29.39	"	"	12000	12000	58	172	1.3
40	**245**	**0.9**	35.25	"	"	12000	12000	48	205	1.05
87	**111**	**3.2**	16.10	**BM30-../D09SA4**	48	12000	15000	105	92	3.8
71	**136**	**2.6**	19.96	"	"	12000	15000	85	113	3.1
60	**159**	**2.2**	23.38	"	"	12000	15000	72	132	2.7
47.5	**200**	**1.75**	29.76	"	"	12000	15000	57	167	2.1
40.5	**235**	**1.5**	34.88	"	"	12000	15000	48.5	197	1.8
34.5	**270**	**1.3**	41.13	"	"	12000	15000	41	230	1.5
28.5	**325**	**0.97**	49.66	"	"	12000	15000	34	270	1.15
26.5	**340**	**0.82**	53.67	**BM30Z-../D09SA4**	50	12000	15000	31.5	290	0.97
40.5	**230**	**3.0**	34.61	**BM40-../D09SA4**	68	20000	25000	49	192	3.5
34.5	**270**	**2.5**	40.88	"	"	20000	25000	41.5	225	3.0
27.5	**335**	**2.0**	51.18	"	"	20000	25000	33	280	2.4
23.5	**390**	**1.75**	59.66	"	"	20000	25000	28.5	320	2.1
20	**455**	**1.5**	70.11	"	"	20000	25000	24	380	1.8
17	**530**	**1.15**	84.36	"	"	20000	25000	20	455	1.3
13.5	**660**	**0.91**	104.0	"	"	20000	25000	16.5	540	1.1
12	**740**	**0.92**	118.2	**BM40Z-../D09SA4**	72	20000	25000	14.5	610	1.1

P = 1.5 kW

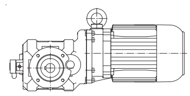


50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**108**	**1.3**	11.68	**BM10-../D09LA4**	34	8000	10000	144	90	1.55
109	**119**	**1.25**	12.95	"	"	8000	10000	130	100	1.5
86	**148**	**0.98**	16.39	"	"	8000	10000	103	123	1.2
78	**163**	**0.95**	18.18	"	"	8000	10000	93	137	1.15
183	**74**	**2.7**	7.66	**BM20-../D09LA4**	36	9100	10900	220	61	3.3
138	**98**	**2.2**	10.15	"	"	12000	12000	166	81	2.7
105	**129**	**1.7**	13.34	"	"	12000	12000	126	108	2.0
84	**162**	**1.35**	16.72	"	"	12000	12000	101	134	1.65
71	**191**	**1.15**	19.72	"	"	12000	12000	86	158	1.4
56	**240**	**0.92**	25.25	"	"	12000	12000	67	200	1.1
113	**116**	**3.0**	12.46	**BM30-../D09LA4**	52	12000	15000	135	97	3.6
87	**151**	**2.3**	16.10	"	"	12000	15000	105	125	2.8
71	**185**	**1.9**	19.96	"	"	12000	15000	85	155	2.3
60	**215**	**1.65**	23.38	"	"	12000	15000	72	181	1.95
47.5	**270**	**1.3**	29.76	"	"	12000	15000	57	225	1.55
40.5	**320**	**1.1**	34.88	"	"	12000	15000	48.5	265	1.3
34.5	**370**	**0.95**	41.13	"	"	12000	15000	41	310	1.15
49	**260**	**2.6**	28.59	**BM40-../D09LA4**	72	20000	25000	59	215	3.2
40.5	**315**	**2.2**	34.61	"	"	20000	25000	49	260	2.6
34.5	**370**	**1.85**	40.88	"	"	20000	25000	41.5	310	2.2
27.5	**455**	**1.5**	51.18	"	"	20000	25000	33	380	1.8
23.5	**530**	**1.3**	59.66	"	"	20000	25000	28.5	440	1.55
20	**620**	**1.1**	70.11	"	"	20000	25000	24	510	1.35
17	**730**	**0.82**	84.36	"	"	20000	25000	20	620	0.97

P = 2.2 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	M_2 Nm	f_B			kg	N	N	n_2 1/min	M_2 Nm	f_B
120	**159**	**0.88**	11.68	**BM10-../D09XA4**	38	8000	10000	144	132	1.05
109	**175**	**0.86**	12.95	"	"	8000	10000	130	147	1.0
183	**109**	**1.85**	7.66	**BM20-../D09XA4**	40	9100	10900	220	90	2.2
138	**144**	**1.55**	10.15	"	"	12000	12000	166	120	1.85
105	**190**	**1.15**	13.34	"	"	12000	12000	126	158	1.4
84	**235**	**0.94**	16.72	"	"	12000	12000	101	197	1.1
177	**109**	**3.0**	7.91	**BM30-../D09XA4**	56	11000	13800	215	89	3.6
140	**138**	**2.5**	10.06	"	"	12000	15000	167	115	3.0
113	**171**	**2.0**	12.46	"	"	12000	15000	135	143	2.4
87	**220**	**1.6**	16.10	"	"	12000	15000	105	184	1.9
71	**270**	**1.3**	19.96	"	"	12000	15000	85	225	1.55
60	**315**	**1.1**	23.38	"	"	12000	15000	72	265	1.3
47.5	**400**	**0.88**	29.76	"	"	12000	15000	57	335	1.05
78	**240**	**2.8**	18.05	**BM40-../D09XA4**	76	20000	25000	94	200	3.4
63	**300**	**2.3**	22.44	"	"	20000	25000	75	250	2.7
49	**385**	**1.75**	28.59	"	"	20000	25000	59	320	2.1
40.5	**465**	**1.45**	34.61	"	"	20000	25000	49	385	1.75
34.5	**540**	**1.25**	40.88	"	"	20000	25000	41.5	455	1.5
27.5	**670**	**1.0**	51.18	"	"	20000	25000	33	560	1.2
23.5	**780**	**0.87**	59.66	"	"	20000	25000	28.5	640	1.05

P = 3 kW



50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	**M_2 Nm**	**f_B**			kg	N	N	n_2 1/min	M_2 Nm	f_B
128	**200**	**3.1**	11.17	**BM40-../D11SA4**	84	18300	22900	154	167	3.7
98	**260**	**2.6**	14.50	"	"	20000	25000	118	215	3.2
79	**325**	**2.1**	18.05	"	"	20000	25000	95	270	2.5
64	**400**	**1.7**	22.44	"	"	20000	25000	77	330	2.1
50	**510**	**1.35**	28.59	"	"	20000	25000	60	425	1.6
41.5	**620**	**1.1**	34.61	"	"	20000	25000	49.5	520	1.3
35	**730**	**0.93**	40.88	"	"	20000	25000	42	610	1.1

P = 4 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	**M_2 Nm**	**f_B**			kg	N	N	n_2 1/min	M_2 Nm	f_B
128	**265**	**2.4**	11.17	**BM40-../D11MA4**	90	18300	22900	154	220	2.8
98	**350**	**1.95**	14.50	"	"	20000	25000	118	290	2.3
79	**435**	**1.55**	18.05	"	"	20000	25000	95	360	1.9
64	**530**	**1.3**	22.44	"	"	20000	25000	77	445	1.55
50	**680**	**1.0**	28.59	"	"	20000	25000	60	570	1.2
41.5	**820**	**0.83**	34.61	"	"	20000	25000	49.5	690	0.99

P = 5.5 kW

50 Hz			i	Type	m	F_{RN}	F_{RV}	60 Hz		
n_2 1/min	**M_2 Nm**	**f_B**			kg	N	N	n_2 1/min	M_2 Nm	f_B
128	**365**	**1.7**	11.17	**BM40-../D11LA4**	102	18300	22900	154	305	2.0
98	**480**	**1.4**	14.50	"	"	20000	25000	118	400	1.7
79	**590**	**1.15**	18.05	"	"	20000	25000	95	495	1.35
64	**730**	**0.93**	22.44	"	"	20000	25000	77	610	1.1

14.5 Brake selection

	50 Hz	50 Hz	50 Hz	**60 Hz**	60 Hz	60 Hz	**Code**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**
Motor	**P**	$M_{acc\,1}$	M_{N1}	**P**	$M_{acc\,1}$	M_{N1}	Brake	max M_{br}	red. M_{br}	red. M_{br}	red. M_{br}	red. M_{br}	red. M_{br}	red. M_{br}	red. M_{br}
	kW	Nm	Nm	**kW**	Nm	Nm		Nm	Nm	Nm	Nm	Nm	Nm	Nm	Nm
D05LA4	**0,18**	2,0	1,28	**0,18**	1,7	1,06	**E003B**	**3**		**2,2**			**1,5**		
D05LA4	**0,25**	3,0	1,75	**0,25**	2,3	1,45									
D06LA4	**0,18**	2,0	1,28	**0,18**	1,7	1,06	**E003B**	**3**		**2,2**			**1,5**		
D06LA4	**0,25**	3,0	1,75	**0,25**	2,3	1,45									
D07LA4	**0,30**	3,5	2,1	**0,30**	2,8	1,76	**E003B**	**3**		**2,2**			**1,5**		
D07LA4	**0,37**	4,0	2,6	0,37	3,4	2,1	**E004B**	**5**	4		2,8		2		1,4
D08MA4	**0,37**	4,0	2,5	**0,37**	3,2	2,0									
D08MA4	**0,55**	6,5	3,8	**0,55**	5,0	3,1	E008B	10	8		6,5	5	3,5		2,5
D08LA4	**0,75**	8,5	5,1	**0,75**	6,7	4,2									
							Z008B	20	16		13	10	7		
D09SA4	**1,1**	12	7,5	**1,1**	10	6,2									
D09LA4	**1,5**	17	10,2	**1,5**	14	8,5	**E008B**	10	8		6,5	5	3,5		2,5
D09XA4	**2,2**	24	15	**2,2**	20	12,5									
							Z008B	20	16		13	10	7		
							Z015B	40	34		27	22	16		
D11SA4	**3,0**	32	20	**3,0**	27	16,6									
D11MA4	**4,0**	43	26,5	**4,0**	36	22									
D11LA4	**5,5**	60	37	**5,5**	50	30,5									
							Z015B	40	34		27	22	16		
							E075B	70	63	50	42	33	25		19

M_{acc1} Acceleration torque at the motor shaft (see 14.7)
M_{N1} Rated torque (S1-100) at the motor shaft (see 14.7)
max. M_{br} Maximum braking torque
red M_{br} Reduced braking torque
Code Code number for the braking torques

Examples of brake selection:
Selected geared motor: BM10-71V/D08MA4 0,55 kW, 78/ min, M_{N1} = 3,8 Nm
M_{acc1} = 6,5 Nm
Externally mounted brakes: E008B, Z008B
Brake selection: M_{N1} = 3,8 Nm, M_{br} = 0,9 x M_{n1} = 3,4 Nm
Brake E008B selected with 3,5 Nm braking torque (= Code 4) i.e.: E008B4
If a non-lockable manual release is required: E008B4HN

14.5.1 Types designation for brakes

E	Single-disc brake
Z	Double-disc brake
008	Brake size (compare section 14.5)
B	Design date
HA	Lockable manual release
HN	Non-lockable manual release
K/E008	Terminal in the motor terminal box
S/E008	Standard rectifier in the motor terminal box
E/E008	Rectifier for electronic quick disconnection in motor terminal box
M/E008	Rectifier for over excitation and quick disconnection in motor terminal box
EK	Single-disc brake (option with separate braking terminals)
ZK	Double-disc brake (option with separate braking terminals box)
EK**S**008	Standard rectifier in the braking terminal box
EK**K**008	Terminal in the braking terminal box
EK**E**008	Rectifier for electronic quick disconnection in brake terminal box
EK**M**008	Rectifier for over excitation and quick disconnection in brake terminal box

14.5.2 Bauer brakes

BM-series geared motors are delivered with an externally mounted spring-loaded brake. The brake secures the carriage in position when the motor is switched off, and brakes the moving masses mechanically during an emergency shutdown or a power.

14.5.3 Design

Single-disc or double-disc BAUER brakes are available. Braking torque is applied by spring force when the motor is de-energised. The brake releases electromagnetically when electric power is applied. The D.C. solenoid is designed for continuous operation (S1). BAUER brakes are safety brakes with holding function. They are mounted on the motors form the outside. This design renders the brakes very easy to service (shorter down time for inspection). On D05, D06, D07 motors, the brakes are mounted on the B-end bearing plate below the fan cowl; on D08 motors and larger they are mounted externally on a fan cowl. The externally mounted BAUER brakes can also be supplied with brake terminal boxes if required. On EHB carriages, the brake rectifier is usually integrated in the carriage control system. The brake rectifer can generally also be mounted in the motor terminal box if required, or in the brake terminal box for D08 motors and larger.

14.5.4 Run-on limits in an emergency shutdown

In inverter duty, holding precision is achieved by the inverter. The brake acts as a holding brake. Holding in an emergency shutdown is influenced by several factors. Run-on during actuation time (see table) is virtually independent of load and practically constant. This component can be relatively large, because almost full speed is maintained during the actuation time. The figures for t_A in the tables are for interruption of the solenoid´s d.c. circuit (see Operationg Instructions), the recommended means of actuating the brake in applications benefiting from short run-on, and for gradients. It is important to note the inhernet delays and variance of the switching devices. Run-on during braking time depends on load, on external mass moments of inertia and on the braking torque. Variation in friction due to physical factors is always possible, so for safety´s sake the tolerances used in calculations should always be relatively large. We recommend a tolerance of roughly +/- 25% for total run-on time and total run-on travel, and the inclusion of additional margins to all for fluctuating conditions (load, temperature, response times of the switching devices and controllers).

14.5.5 Brake electrical ratings for the brakes

Type	M_{br}	t_{DC}	t_{AC}	P_{el}	W_{rot}	W_{th}	W_L	M_{red}
	Nm	ms	ms	W	10^3J	10^3J	10^6J	ms
E003B9	3	15	150	20	1,5	36	55	2,2/1,5
E003B4	1,5	20	275	20	2,1	36	140	-
E004B9	5	15	125	30	2,5	60	50	4/2,8/2/1,4
E..008B9	10	10	60	30	50	250	60	8/6,5/5/3,5/2,5
E..008B5	5	15	100	30	50	250	180	3,5/2,5
Z..008B9	20	10	60	30	50	250	60	16/13/10/7
Z..015B9	40	10	80	45	50	350	470	34/27/22/16
Z..015B6	27	15	100	45	50	350	690	22/16
E..075B9	70	20	150	110	100	600	600	63/50/42/33/25/19
E..075B7	50	20	150	110	100	600	1200	42/33/25/19

M_{br} Rated brake torque
t_{DC} Brake application response time with DC-side break
t_{AC} Brake application response time with AC-side break
P_{el} Electrical power consumption of the solenoid coil
W_{rot} Permissible switching work per braking operation
W_{th} Thermally permissible switching work per hour
W_L Permissible switching energy before the friction discs must be replaced
M_{red} Setting values for reduced brake torque (response times and permissible switching work on request)

14.5.6 Connection

The electrical brake connection in overhard conveyor drives is usually created by EHB control using DC voltage via terminals or rectifiers in the motor terminal box.

Standard voltages:

Direct, via the terminal connectiont:	Via the rectifier with supply voltage:
24 V DC	
105 V DC	220 ... 230 V 50/60 Hz
180 V DC	380 ... 420 V 50/60 Hz

Other voltages available at extra cost.

14.5.7 D.C. connection via terminal (K)

The brake must be connected directly to the direct current via separate terminals in the motor terminal box or brake terminal box. The standard voltages are 180 V DC, 105 V DC and 24 V DC. Brakes for other voltages are available at extra cost.

14.5.8 Standard rectifier (S)

The brake must be connected to the alternating current via the standard rectifier in the motor terminal box or brake terminal box. Standard voltages are 380 ... 420 V 50/60 Hz or 220 ... 230 V 50/60 Hz. Other voltages up to 575 V can be supplied at additional cost. In a configuration with standard rectifier, the brake circuit can be interrupted by an extra contact on the d.c. side in order to reduce the reponse time.

14.5.9 Rectifier for electronic quick disconnection (E)

This rectifier makes the electronic DC disconnection of the brake circuit possible. There is no additional cabling needed to the rectifier. The response time of the brake are reduced considerably compared with the AC disconnection, however longer than DC disconnection by means of a mechanical switch. The brake must be connected to an AC supply over the quick disconnection rectifier in either the motor or brake terminal box. Standard voltages are 380 ... 420 V 50/60 Hz or 220 ... 230 V 50/60 Hz. Other voltages up to 460 V are available at extra cost.

14.5.10 Rectifier for over excitation and quick disconnection (M)

Should the motor have a high switching frequency, the brake can be opened quicker by means of this rectifier thus reducing the thermal motor loading considerably. Additionally the electronic DC disconnection of the brake circuit makes a considerable reduction of the response time possible. Dependant on the application, the rectifier MSG 2.480 U (quick disconnection due to missing supply voltage) or MSG 2.480 I (quick disonnection due to missing motor current in one phase). Voltage supply 220 ... 480 V AC.

14.5.11 Brake connection, operation with frequency inverter

The voltage at the motor terminal board of a motor operating with a frequency inverter is frequency-dependent. Brakes require a constant voltage, so they need an electrical connection of their own. This is the reason why the brake is never connected to the motor terminals ex-works.

14.5.12 Brake connection, pole-changing motors

The brakes of pole-changing motors also need an electrical connection of their own. As is the case with motors for operation with frequency inverters, the brake is not conneted to the motor terminals ex-works.

14.5.13 Manual release (HA, HN)

All brakes are available with mechanical manual release on request. Non-lockable manual release is the standard version (HN). A latching manual release (HA) can be supplied if required from brake size 008 and above. For reasons of safety, however, this manual release is not usual on overhead conveyors.

14.5.14 Degree of protection

All BAUER brakes comply with degree of protection IP 65.

Specical corrosion protection on request.

14.5.15 Special corrosion protection

If high requirements for corrosion resistance apply, the brakes are available with two levels of enhanced corrosion protection:
CORO1 (C1): Finished with two-component paint to protect against chemically aggressive gases and vapours.
CORO2 (C2): Same finish as CORO1. The screws for the terminal-box cover are nonrusting steel. The mechanical internals of the brake are made of corrosion-proofed material.

14.5.16 CE mark

Bauer geared motors with externally mounted spring-loaded brakes bear the CE mark.

The brakes comply with:

- Machinery Directive (89/392(EEC), manufacturer´s declarations may also be required
- the Low Voltage Directive (73/23/EEC), bearing the CE mark
- the EMW Directive (89/336/EEC), bearing the CE mark

See Danfoss Bauer special publication SD 33.. for more information.

14.5.17 Dimensional drawings: (see section 9)

E003-E004, E008-Z015, E075-Z100

14.6 Important notes

14.6.1 Notes for ordering

Please refer to our quotation when ordering (if applicable). When ordering spare parts, please quote the motor number from the original shipment so that we can take the special features of the motor into account.

14.6.2 Support for drive design

It would be helpful to our overhead conveyor systems experts it you could offer a preliminary design of the optimum drive solution for your overhead conveyor. Please complete the questionnaire (section 14.2) and return it to us.

14.6.3 Notes on safety

See the safety notes in Bulletin 122 .. regarding installation. Important: Secure the carriage before disconnecting while on ascending / falling gradients.

14.6.4 Covers for rotating parts

The guards required under German law (Law Concerning Industrial Equipment (Equipment safety law) or Accident Prevention Reqlations (UVV)) are not included in the standard scope of supply because they are usually fitted by the customer or the risk of accident can be eliminated by suitable installation. See Bulletin 122 .. .

14.6.5 Dimensions and fits of output shafts and keyways

Output shaft and second shaft, keyway and key are in compliance with the DIN standards and ISO fits listed below:
Solid shaft
Shaft diameter to D = 50 mm in ISO k6 (DIN 748 Part 1)
as of D = 50 mm in ISO m6 (DIN 748 Bl.1)
Keyway ISO P9 (DIN 6885 Page 1)
Key, high ISO h9 (DIN 6885 page 1 and DIN 6880)
Bore - customer ISO H7

14.6.6 Mounting of running wheels

Always exercise meticulous care when fitting running wheels onto output shafts and, whenever possible, use the DIN 332 tapped end hole provided for this purpose. It has been found that fitting is made easier by heating the running wheel being installed to approximately 100 °C. Dimension the locating bore to ISO H7. Gears with solid shaft at each end (gear code -.3/): alignment of the two keys is subject to the DIN 7168 tolerances, the degree of accuracy is fine.

14.7 Motor data

14.7.1 4-pole motors for continuous operation S1-100 % at 50 Hz-system

P kW	Type	Y/Δ	n 1/min	M_N Nm	I_N(400V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2
0,12	D06LA4	Y	1350	0,85	0,42	0,73	3,4	2,2	2,1	2,2	0,000295
0,18	D06LA4	Y	1350	1,28	0,63	0,70	3,4	2,3	2,2	2,4	0,000295
0,25	D06LA4	Y	1350	1,75	0,88	0,69	3,2	2,3	2,2	2,3	0,000295
0,30	D07LA4	Y	1350	2,1	1,3	0,60	2,7	2,6	2,6	2,8	0,000385
0,37	D07LA4	Y	1350	2,6	1,35	0,66	2,6	2,1	2,1	2,3	0,000385
0,55	D08MA4	Y	1400	3,8	1,60	0,75	4,2	2,1	1,9	2,3	0,00115
0,75	D08LA4	Y	1400	5,1	2,0	0,76	4,6	2,2	2,0	2,5	0,00150
1,1	D09SA4	Y	1400	7,5	2,8	0,78	5,1	2,3	2,1	2,7	0,00245
1,5	D09LA4	Y	1400	10,2	3,6	0,80	5,4	2,4	2,2	2,8	0,00320
2,2	D09XA4	Y	1400	15	5,1	0,80	4,6	2,2	2,1	2,6	0,00380
3,0	D11SA4	Δ	1420	20	6,8	0,82	5,3	2,1	1,9	2,7	0,0081
4,0	D11MA4	Δ	1420	26,5	8,5	0,83	5,2	2,1	2,0	2,7	0,0105
5,5	D11LA4	Δ	1420	37	11,6	0,83	5,9	2,4	2,3	2,9	0,0140

14.7.2 Operation from a frequency inverter with constant torque up to 50 Hz

P (50 Hz)	Type	Y	30-50 Hz M_L	30-50 Hz I_L(400V)	bis 50 Hz M_{acc}	bis 50 Hz I_{acc}	5 Hz * M	10 Hz * M	20 Hz * M	60 Hz * M	70 Hz * M
kW			Nm	A	Nm	A	Nm	Nm	Nm	Nm	Nm
0,12	D06LA4	Y	0,85	0,42	1,5	0,75	0,51	0,63	0,76	0,85	0,59
0,18	D06LA4	Y	1,28	0,63	2,0	1,0	0,76	0,96	1,15	1,28	0,97
0,25	D06LA4	Y	1,75	0,88	3,0	1,5	1,05	1,32	1,58	1,75	1,29
0,30	D07LA4	Y	2,1	1,3	3,5	2,1	1,27	1,59	1,9	2,1	1,81
0,37	D07LA4	Y	2,6	1,35	4,0	2,2	1,57	1,96	2,3	2,6	1,92
0,55	D08MA4	Y	3,8	1,6	6,5	2,8	2,20	2,8	3,30	3,8	2,8
0,75	D08LA4	Y	5,1	2,0	8,5	3,4	3,0	3,8	4,5	5,1	4,0
1,1	D09SA4	Y	7,5	2,8	12	4,4	4,5	5,6	6,7	7,5	6,4
1,5	D09LA4	Y	10,2	3,6	17	6,0	6,1	7,6	9,1	10,2	8,7
2,2	D09XA4	Y	15	5,1	24	8,2	9,0	11,2	13,5	15	12,4
3,0	D11SA4	Y	20	6,4	32	10,9	12	15	18	20	17,1
4,0	D11MA4	Y	26,5	8,5	42,4	13,6	15,9	19,8	23,5	26,5	22,5
5,5	D11LA4	Y	37	11,6	59,2	18,5	22	27,5	33	37	31,5

*Thermally permissible torques at S1-100 % operation

14.7.3 Operation from a frquency inverter with constant torque up to 87 Hz

P (50 Hz) kW	Type	Δ	30-87 Hz M_L Nm	30-87 Hz I_L(400V) A	bis 87 Hz M_{acc} Nm	bis 87 Hz I_{acc} A	5 Hz * M Nm	8,7 Hz * M Nm	10 Hz * M Nm	20 Hz * M Nm	100 Hz * M Nm
0,12	D06LA4	Δ	0,85	0,72	1,5	1,3	0,51	0,61	0,63	1,76	1,85
0,18	D06LA4	Δ	1,28	1,09	2,0	1,7	0,76	0,92	0,96	1,15	1,28
0,25	D06LA4	Δ	1,75	1,52	3,0	2,6	1,05	1,26	1,32	1,58	1,76
0,30	D07LA4	Δ	2,1	2,2	3,5	3,6	1,27	1,52	1,59	1,9	2,1
0,37	D07LA4	Δ	2,6	2,4	4,0	3,8	1,57	1,88	1,96	2,3	2,6
0,55	D08MA4	Δ	3,8	2,8	6,5	4,8	2,2	2,7	2,8	3,3	3,8
0,75	D08LA4	Δ	5,1	3,5	8,5	5,9	3,0	3,6	3,8	4,5	5,1
1,1	D09SA4	Δ	7,5	4,9	12	7,6	4,5	5,4	5,6	6,7	7,5
1,5	D09LA4	Δ	10,2	6,2	17	10,5	6,1	7,3	7,6	9,1	10,2
2,2	D09XA4	Δ	15	8,8	24	14,5	9,0	10,7	11,2	13,5	15
3,0	D11SA4	Δ	20	11,8	32	19	12	14,3	15	18	20
4,0	D11MA4	Δ	26,5	14,7	43	24	15,9	19	19,8	23,5	26,5
5,5	D11LA4	Δ	37	20	60	33	22	26,5	27,5	33	37

* Thermally permissible torques at S1 - 100 % operation

Legend for motor data (7.1 to 7.3)

P	Rated power at 50 Hz line frequency
n	Guideline value for rated speed at the rotor shaft at 50 Hz line frequency
M_N	Rated torque at the rotor shaft
I_N	Rated current at 400 V
cos	Power factor
I_A/I_N	Relative starting currents
M_A/M_N	Relative starting torques
M_S/M_N	Relative pull-up torques
M_K/M_N	Relative breakdown torques
J_{rot}	Mass moment of inertia of the rotor

Important for the correct dimensioning of the frequency inverter:

M_L	Permissible load torque at the rotor shaft (S1-100 %)
I_L	Permissible load current at 400 V (S1-100 %)
M_{acc}	Acceleration torque at the rotor shaft (up to 50 or 87 Hz)
I_{acc}	Acceleration current at 400 V (up to 50 or 87 Hz)

14.7.4 4-pole motors for continuous operation S1-100 % at 60 Hz system

P kW	Type	Y/Δ	n 1/min	M_N Nm	I_N(460V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2
0,12	D06LA4	Y	1620	0,70	0,38	0,73	3,7	2,4	2,3	2,4	0,000295
0,18	D06LA4	Y	1620	1,06	0,58	0,7	3,7	2,5	2,4	2,6	0,000295
0,25	D06LA4	Y	1620	1,45	0,8	0,69	3,6	2,5	2,4	2,5	0,000295
0,37	D07LA4	Y	1620	2,1	1,24	0,66	2,8	2,3	2,3	2,5	0,000385
0,55	D08MA4	Y	1680	3,1	1,47	0,75	4,6	2,3	2,1	2,5	0,00115
0,75	D08LA4	Y	1680	4,2	1,82	0,76	5	2,4	2,2	2,7	0,0015
1,1	D09SA4	Y	1680	6,2	2,5	0,78	5,6	2,5	2,3	3,0	0,00245
1,5	D09LA4	Y	1680	8,5	3,3	0,8	4,9	2,6	2,4	3,1	0,0032
2,2	D09XA4	Y	1680	12,5	4,6	0,8	5,0	2,4	2,3	2,8	0,0038
3,0	D11SA4	Δ	1710	16,6	6,2	0,82	5,8	2,3	2,1	3,0	0,0081
4,0	D11MA4	Δ	1710	22,0	7,7	0,85	6,4	2,2	2,2	3,0	0,0105
5,5	D11LA4	Δ	1710	30,5	10,7	0,85	6,5	2,6	2,5	3,2	0,0140

14.7.5 Operation from a frequency inverter with constant torque up to 60 Hz

P (60 Hz) kW	Type	Y	36-60 Hz M_L Nm	36-60 Hz I_L(460V) A	bis 60 Hz M_{acc} Nm	bis 60 Hz I_{acc} A	5 Hz * M Nm	10 Hz * M Nm	20 Hz * M Nm	70 Hz * M Nm	80 Hz * M Nm
0,12	D06LA4	Y	0,7	0,38	1,15	0,65	0,45	0,55	0,65	0,7	0,53
0,18	D06LA4	Y	1,06	0,58	1,7	0,95	0,67	0,83	0,99	1,06	0,87
0,25	D06LA4	Y	1,45	0,8	2,3	1,27	0,92	1,14	1,36	1,45	1,15
0,37	D07LA4	Y	2,1	1,24	3,4	2,0	1,37	1,69	2,0	2,1	1,7
0,55	D08MA4	Y	3,1	1,47	5,0	2,4	2,0	2,4	2,9	3,1	2,4
0,75	D08LA4	Y	4,2	1,82	6,7	2,9	2,7	3,3	3,9	4,2	3,6
1,1	D09SA4	Y	6,2	2,5	10,0	4,0	3,9	4,8	5,8	6,2	5,3
1,5	D09LA4	Y	8,5	3,3	14,0	5,5	5,4	6,7	7,9	8,5	7,2
2,2	D09XA4	Y	12,5	4,6	20,0	7,5	7,9	9,8	11,7	12,5	10,7
3,0	D11SA4	Y	16,6	6,2	27,0	10,0	10,6	13,1	15,5	16,6	14,2
4,0	D11MA4	Y	22,0	7,7	36,0	12,6	14,0	17,3	20,5	22,0	18,8
5,5	D11LA4	Y	30,5	10,7	50,0	17,5	19,5	24,0	28,5	30,5	26,0

* Thermally permissible torques at S1 - 100 operation

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14.7.6 Operation from a frequency inverter with constant torque up to 104 Hz

P (60 Hz) kW	Type	Δ	36-104 Hz M_L Nm	36-104 Hz I_L(460V) A	to 104 Hz M_{acc} Nm	to 104 Hz I_{acc} A	5 Hz * M Nm	10 Hz * M Nm	20 Hz * M Nm	120 Hz * M Nm
0,12	D06LA4	Δ	0,7	0,66	1,15	1,15	0,45	0,55	0,65	0,53
0,18	D06LA4	Δ	1,06	1,0	1,7	1,65	0,67	0,83	0,99	0,87
0,25	D06LA4	Δ	1,45	1,39	2,3	2,2	0,92	1,14	1,36	1,15
0,37	D07LA4	Δ	2,1	2,15	3,4	3,5	1,37	1,69	2,0	1,7
0,55	D08MA4	Δ	3,1	2,55	5,0	4,2	2,0	2,4	2,9	2,4
0,75	D08LA4	Δ	4,2	3,15	6,7	5,0	2,7	3,3	3,9	3,6
1,1	D09SA4	Δ	6,2	4,35	10,0	7,0	3,9	4,8	5,8	5,3
1,5	D09LA4	Δ	8,5	5,8	14,0	9,5	5,4	6,7	7,9	7,2
2,2	D09XA4	Δ	12,5	8,0	20,0	13,0	7,9	9,8	11,7	10,7
3,0	D11SA4	Δ	16,6	10,8	27,0	17,5	10,6	13,1	15,5	14,2
4,0	D11MA4	Δ	22,0	13,4	36,0	22,0	14,0	17,3	20,5	18,8
5,5	D11LA4	Δ	30,5	18,5	50,0	31,0	19,5	24,0	28,5	26,0

* Thermally permissible torques at S1-100% operation

Legend for motor data (7.4 to 7.6)

P	Rated power at 60 Hz line frequency
n	Guideline value for rated speed at the rotor shaft at 60 Hz line frequency
M_N	Rated torque at the rotor shaft
I_N	Rated current at 460 V
cos	Power factors
I_A/I_N	Relative starting currents
M_A/M_N	Relative starting torques
M_S/M_N	Relative pull-up torques
M_K/M_N	Relative breakdown torques
J_{rot}	Mass moment of inertia of the rotor

Important for the correct dimensioning of the frequency inverter:

M_L	Permissible load torque at the rotor shaft (S1 - 100%)
I_L	Permissible load current at 460 V (S1 - 100%)
M_{acc}	Acceleration torque at the rotor shaft (up to 60 or 104 Hz)
I_{acc}	Acceleration current at 460 V (up to 60 or 104 Hz)

14.7.7 Information about operation with frequency inverter

The figures given in the table are for Bauer motors operating in conjunction with Danfoss frequency inverters. See section 3.23.10 for notes on the use of other frequency inverters. The torques mentioned in tables 3.23.1 and 3.23.2 can be entered for the respective frequencies in continuous operation (S1 = duty factor 100 %).

Field attenuation for frequencies above 50 Hz, winding for standard voltage 400 V Y / 50 Hz, temperature class F.

Motor with standard windings can be switched from star to delta connection for operation with a frequency inverter 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 frequency inverter, however, note that currents are higher than those of the star connection 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 conjuction with large motors.

Field weakening for frequencies above 87 Hz, winding design for 230 V~/50 Hz (Umax = 400 V~/87 Hz), temperature class F. The load currents given in the table serve as guide values for the frequency inverter size selection. Load current is lower if the load torque is below the values permitted for 30-100 Hz and the inverter used is of the high-grade type. This means that a smaller inverter can sometimes be used, particularly in conjunction with large motors.

14.7.8 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 to torque being lower in the field-weakening range. 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 x n / 9550 x f / 50
or
P = M x n / 9550 x f / 60.

If a FC302 Danfoss frequency inverter is used in conjunction with a pulse generator, the full 50 Hz of 60 Hz rated torque is available as holding torque at motor standstill (external fan required for prolonged periods at standstill). In many instances, however, a mechanical brake is necessary for holding a position exactly for safety reasons. The use of thermistors (available for all motor sizes at extra cost) is strongly recommended for thermal protection of the windings of motors operating in conjuction with frequency inverters.

14.7.9 Elevated 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 requirement approximate
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, meas 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 1.6 x S1 torque generally cannot be achieved.

14.7.10 Energy-saving function

FC-series VLT frequency inverters reduce voltage in part-load operation to lower the motor current and thus improve efficiency. This inverter function emulates the method of operation of commercially available energy-saving devices.

14.7.11 Regeneration

Regenerative torques (braking torques) are required of motors used on gradients, for example. In conjuction with VLT frequency inverters, the motor torques listed in the table can be applied as regenerative torques. As with motor torque, an increase in regenerative torque with reduced duty factor is permissible.

14.7.12 Notes on operation with other-make frequency inverters

The precondition is that the motor current generated by the frequency inverter is largely free of harmonics. The harmonics generated in the motor by some old-style frequency inverters result in additional losses and cut available torque by some 10 % across the entire frquency range. There is also a risk of oscillation causing damage to the gear unit. At frequencies below approximately 5 Hz, operation without pulse generators is possible only using a frequency inverter with state-of-the-art control. If the frequency inverter does not feature load-dependent frequency and voltage adjustment, the increase in the motors´s current consumption means that particularly in the case of small motors (D05-D09), torque has to be reduced at frequencies below approximately 10 Hz even if an external fan is used or the duty factor is reduced. Regenerative operation is possible only under certain cirumstances.

14.7.13 BM-series geared motors with pole-changing winding on a 50 Hz system

14.7.13.1 8/2-pole motors Y/Y for travelling gears in S3-25/75 duty, supply frequency 50 Hz

P kW	**Type**	n 1/min	M_N Nm	I_N(400V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2	J_{SL} kgm^2
0,050/0,20	**D06LA82**	680/2700	0,70/0,70	0,51/1,02	0,63/0,75	1,4/2,8	1,7/2,0	1,7/1,9	1,8/2,1	0,000295	0,0014
0,063/0,25	**D07LA82**	650/2840	0,87/0,87	0,60/1,55	0,69/0,62	1,4/2,3	1,8/1,3	1,8/1,2	1,9/2,8	0,000385	0,0014
0,071/0,280	**D07LA82**	650/2840	0,98/0,98	0,68/1,85	0,69/0,62	1,4/2,1	1,8/1,2	1,8/1,2	1,9/2,6	0,000385	0,0014
0,09/0,36	**D08LA82**	700/2800	1,22/1,22	0,70/1,05	0,60/0,92	2,9/4,5	2,0/2,6	2,0/2,5	2,4/2,9	0,00150	0,004
0,12/0,50	**D08LA82**	700/2800	1,70/1,70	0,95/1,43	0,60/0,92	2,9/4,5	2,0/2,6	2,0/2,5	2,4/2,9	0,00150	0,004
0,16/0,63	**D08LA82**	700/2800	2,2/2,1	1,20/1,45	0,63/0,90	2,0/4,6	1,8/2,1	1,8/2,0	2,2/2,4	0,00150	0,004
0,25/1,00	**D09XA82**	700/2800	3,4/3,4	1,30/2,3	0,62/0,90	2,2/5,2	1,9/2,3	1,9/2,3	2,0/2,6	0,00380	0,007
0,36/1,40	**D09XA82**	700/2800	4,9/4,8	2,1/3,3	0,57/0,87	2,0/4,5	1,9/2,1	1,9/2,1	2,0/2,4	0,00380	0,007
0,45/180	**D09XA82**	700/2800	6,1/6,1	2,4/4,3	0,65/0,89	2,0/4,3	1,7/2,0	1,7/2,0	2,0/2,5	0,00380	0,007
0,56/2,2	**D11LA82**	710/2840	7,5/7,3	2,3/4,7	0,60/0,94	3,2/4,9	1,9/2,9	1,9/2,4	2,2/2,9	0,0140	-
0,71/2,8	**D11LA82**	710/2840	9,5/9,4	2,8/5,6	0,58/0,94	2,5/4,7	1,9/2,3	1,9/2,0	2,1/2,4	0,0140	-
0,90/3,6	**D11LA82**	710/2840	12,1/12,1	3,5/7,9	0,58/0,94	2,5/4,5	1,8/2,0	1,8/1,8	2,0/2,1	0,0140	-

14.7.13.2 12/2-pole motors Y/Y for travelling gears in S3-25/75 duty, supply frequency 50 Hz

P kW	**Type**	n 1/min	M_N Nm	I_N(400V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2	J_{SL} kgm^2
0,045/0,28	**D08LA122**	470/2800	0,92/0,95	0,55/0,86	0,70/0,90	1,4/4,5	1,9/2,4	1,9/2,4	1,9/2,7	0,00150	0,004
0,063/0,40	**D08LA122**	470/2800	1,29/1,36	0,66/1,10	0,70/0,90	1,4/4,5	1,7/2,2	1,7/2,2	1,7/2,4	0,00150	0,004
0,09/0,56	**D08LA122**	470/2800	1,85/1,91	1,00/1,45	0,63/0,89	1,4/4,1	1,7/2,1	1,7/2,3	1,8/2,4	0,00150	0,004
0,11/0,71	**D09XA122**	470/2800	2,3/2,4	1,05/1,6	0,59/0,88	1,5/5,5	1,7/2,7	1,7/2,6	1,8/3,3	0,00380	0,007
0,16/1,00	**D09XA122**	470/2800	3,3/3,4	1,70/2,4	0,62/0,89	1,5/5,5	1,8/2,6	1,8/2,5	1,8/3,3	0,00380	0,007
0,20/1,25	**D09XA122**	470/2800	4,1/4,3	2,0/3,0	0,62/0,89	1,5/5,0	1,7/2,4	1,7/2,3	1,7/3,1	0,00380	0,007
0,25/1,60	**D11LA122**	470/2840	5,1/5,3	2,3/3,4	0,53/0,95	1,6/4,9	1,7/2,6	1,7/2,4	2,0/2,8	0,0140	-
0,32/2,0	**D11LA122**	470/2840	6,5/6,7	3,0/4,0	0,53/0,94	1,6/4,7	1,7/2,5	1,7/2,2	2,0/2,7	0,0140	-
0,45/2,8	**D11LA122**	470/2840	9,2/9,4	4,2/5,6	0,52/0,94	1,6/4,7	1,5/2,3	1,5/2,0	1,8/2,4	0,0140	-

P	Rated powers at 50 Hz line frequency, operating mode S3-25/75%
n	Guideline values for rated speeds at the rotor shaft at 50 Hz line frequency
M_N	Rated torques at the rotor shaft
I_N	Rated currents 400 V Y/Y (currents can be converted as inverse ratios of voltages from 400 V to the desired special voltage)
cos	Power factors
I_A/I_N	Relative starting currents
M_A/M_N	Relative starting torques
M_S/M_N	Relative pull-up torques
M_K/M_N	Relative breakdown torques
J_{rot}	Mass moment of inertia of the rotor
J_{SL}	Mass moment of inertia of the heavy cast-iron fan impeller

14.7.14 BM-series geared motors with pole-changing winding on a 60 Hz system

14.7.14.1 8/2-pole motors Y/Y for travelling gears in S3-25/75 % duty, supply frequency 60 Hz

P kW	**Type**	n 1/min	M_N Nm	I_N(460V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2	J_{SL} kgm^2
0,050/0,20	**D06LA82**	810/3240	0,58/0,59	0,450/0,90	0,63/0,75	1,5/3,1	1,9/2,2	1,9/2,1	2,0/2,3	0,000295	0,0014
0,063/0,25	**D07LA82**	800/3420	0,75/0,75	0,55/1,42	0,69/0,62	1,5/2,5	2,0/1,4	2,0/1,3	2,1/3,1	0,000385	0,0014
0,071/0,280	**D07LA82**	800/3420	0,82/0,81	0,63/1,70	0,69/0,62	1,5/2,3	2,0/1,3	2,0/1,3	2,1/2,9	0,000385	0,0014
0,09/0,36	**D08LA82**	840/3360	1,01/1,01	0,65/0,98	0,60/0,92	3,2/4,9	2,2/2,9	2,2/2,8	2,7/3,2	0,00150	0,004
0,12/0,50	**D08LA82**	840/3360	1,41/1,41	0,90/1,33	0,60/0,92	3,2/4,9	2,2/2,9	2,2/2,8	2,7/3,2	0,00150	0,004
0,16/0,63	**D08LA82**	840/3360	1,79/1,75	1,12/1,35	0,63/0,90	2,2/5,0	2,0/2,3	2,0/2,2	2,5/2,7	0,00150	0,004
0,25/1,00	**D09XA82**	840/3360	2,8/2,8	1,19/2,1	0,62/0,90	2,4/5,7	2,1/2,5	2,1/2,5	2,2/2,8	0,00380	0,007
0,36/1,40	**D09XA82**	840/3360	4,0/3,9	1,91/3,0	0,57/0,87	2,2/4,9	2,1/2,3	2,1/2,3	2,2/2,6	0,00380	0,007
0,45/1,80	**D09XA82**	840/3360	5,1/5,0	2,2/3,9	0,65/0,89	2,2/4,7	1,9/2,2	1,9/2,2	2,2/2,7	0,00380	0,007
0,56/2,2	**D11LA82**	850/3420	6,2/6,0	2,1/4,3	0,60/0,94	3,5/5,4	2,1/3,2	2,1/2,6	2,4/3,2	0,0140	-
0,71/2,8	**D11LA82**	850/3420	7,9/7,8	2,5/5,1	0,58/0,94	2,7/5,1	2,1/2,5	2,1/2,2	2,3/2,6	0,0140	-
0,90/3,6	**D11LA82**	850/3420	10/10	3,2/7,2	0,58/0,94	2,7/4,9	2,0/2,2	2,0/2,0	2,2/2,3	0,0140	-

14.7.14.2 12/2-pole motors Y/Y for travelling gears in S3-25/75 % duty, supply frequency 60 Hz

P kW	**Type**	n 1/min	M_N Nm	I_N(460V) A	cos	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J_{rot} kgm^2	J_{SL} kgm^2
0,045/0,28	**D08LA122**	560/3360	0,76/0,79	0,51/0,79	0,70/0,90	1,5/4,9	2,1/2,7	2,1/2,7	2,1/3,0	0,00150	0,004
0,063/0,40	**D08LA122**	560/3360	1,07/1,13	0,61/1,02	0,70/0,90	1,5/4,9	1,9/2,4	1,9/2,4	1,9/2,7	0,00150	0,004
0,09/0,56	**D08LA122**	560/3360	1,54/1,59	0,95/1,35	0,63/0,89	1,5/4,5	1,9/2,3	1,9/2,5	2,0/2,6	0,00150	0,004
0,11/0,71	**D09XA122**	560/3360	1,88/2,0	1,0/1,5	0,59/0,88	1,6/6,0	1,9/3,0	1,9/2,9	2,0/3,6	0,00380	0,007
0,16/1,00	**D09XA122**	560/3360	2,7/2,8	1,56/2,2	0,62/0,89	1,6/6,0	2,0/2,9	2,0/2,7	2,0/3,6	0,00380	0,007
0,20/1,25	**D09XA122**	560/3360	3,4/3,5	1,85/2,8	0,62/0,89	1,6/5,5	1,9/2,6	1,9/2,5	1,9/3,4	0,00380	0,007
0,25/1,60	**D11LA122**	560/3420	4,3/4,4	2,1/3,1	0,53/0,95	1,8/5,4	1,9/2,8	1,9/2,6	2,2/3,1	0,0140	-
0,32/2,0	**D11LA122**	560/3420	5,4/5,5	2,7/3,6	0,53/0,94	1,8/5,1	1,9/2,7	1,9/2,4	2,2/3,00	0,0140	-
0,45/2,8	**D11LA122**	560/3420	7,6/7,8	3,8/5,1	0,52/0,94	1,8/5,1	1,6/2,5	1,6/2,2	2,0/2,6	0,0140	-

P	Rated powers at 60 Hz line frequency, operating mode S3-25/75%
n	Guideline values for rated speeds at the rotor shaft at 60 Hz line frequency
M_N	Rated torques at the rotor shaft
I_N	Rated currents at 460 V Y/Y (currents can be converted as inverse ratios of voltages form 460 V to the desired special voltage)
cos	Power factors
I_A/I_N	Relative starting currents
M_A/M_N	Relative starting torques
M_S/M_N	Relative pull-up torques
M_K/M_N	Relative breakdown torques
J_{rot}	Mass moment of inertia of the rotor
J_{SL}	Mass moment of inertia of the heavy cast-iron fan impeller

14.7.15 Switching and braking

Indexing is a very common application for geared motors. Standard Bauer geared motors can be used in most instances. Pole-changing motors are suitable for direct starts in both speeds. It is advisable to consult us beforehand if your application involves very high switching frequencies, speed changes, braking by reversal or reversals in direction of rotation. When a pole-changing motor goes from high to low speed, the drive functions as an asynchronous generator for the brief period of time in which it is in the oversynchronous speed range; the braking torque developed in this phase is significantly higher than the torque developed by the drive as a motor. It is strongly recommended that an electronic device (e.g. Bauer SPR) be used for speed changing given the mechanical loading of gear units and driven machinery, or an electromagnetically susceptible load. The drive should always be shut down to a standstill directly from high speed and not from high speed to low speed and then to a standstill. Only motors with external mechanical brakes should be slowed down electrically to low speed, before being braked mechanically to a standstill. Rotary energy diminishes as the square of speed, so this type of shutdown means considerably less wear and tear on the brake. The drives can also be adapted for extreme applications and operating conditions by special measures. See Bauer special publication SD4.. for more information.

14.7.16 Heavy cast fan impeller

A heavy cast fan impeller can be used instead of the standard fan impeller with motors D05 to D11 in applications requiring soft start or a reduction in switching shock when poles are changed. The heavy cast fan impeller reduces the permissible switching frequency of the motor.

14.7.17 Plug connector terminal box

The motor terminal box can be supplied with an externally mounted plug if necessary.

14.8 Dimensional drawings

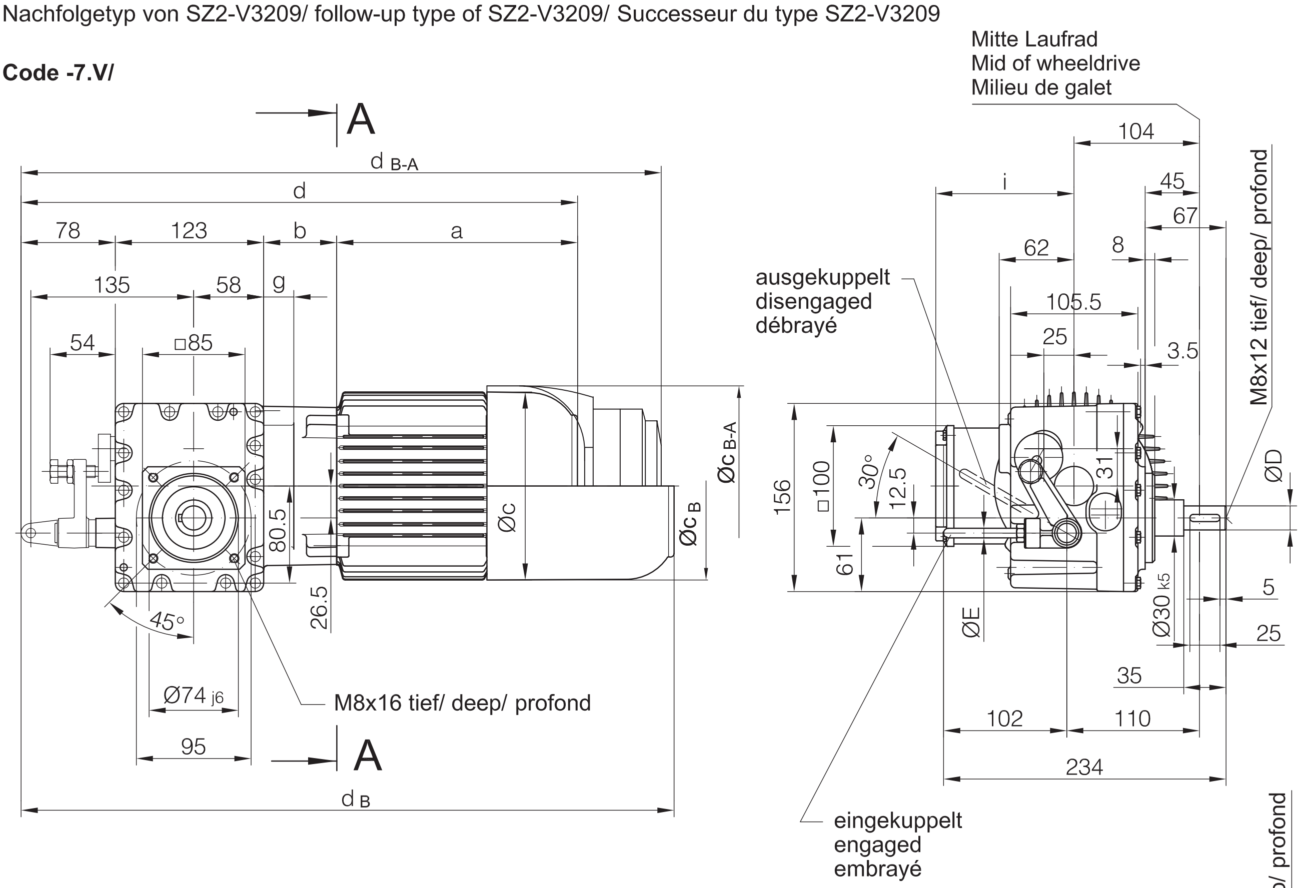
Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

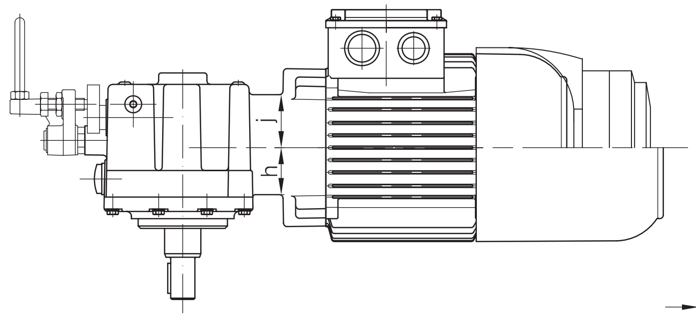
BM09

Flansch mit Gewindelöchern vorne/ flange with tapped holes at front/ bride avec trous taraudés à l'avant

Nachfolgetyp von SZ2-V3209/ follow-up type of SZ2-V3209/ Successeur du type SZ2-V3209

Code -7.V/





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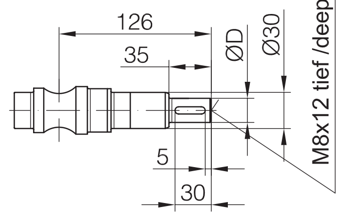
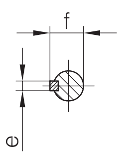
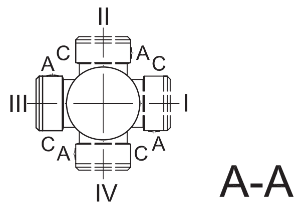






Typ/ Wellen Ø D/ Kupplungshebel Ø E
Type/ Shaft Ø D/ Clutch lever Ø E
Type/ Diamètre d'arbre/ Levier de embrayage Ø E

Typ/ Type/ Type	Ø D	e	f	Kupplungshebel Ø	Ø E	
BM09-../ D...	20k6	6	22.5	Clutch lever Ø	8mm	Standard
BM09X-../ D...	25k6	8	28	Levier de embrayage Ø	10mm	Verstärkte Ausführung/ Reinforced Version/ Exécution Renforcée

Typ/ Type/	a	b	c	d	g	h	i	j	Ausführung mit Bremse/ with brake/ avec frein											
									E003		E004		E008							
									c_B	d_B	c_B	d_B	c_B	d_B						
BM09(X)-../D05..	170	14	123	386	-	-	100	-	123	428										
BM09(X)-../D06..	170	14	123	386	-	-	100	-	123	428										
BM09(X)-../D07..	190	14	123	406	-	-	100	-	123	448	123	448								
BM09(X)-../D08..	200	60.5	156	461	25	39	115	44					166	536						

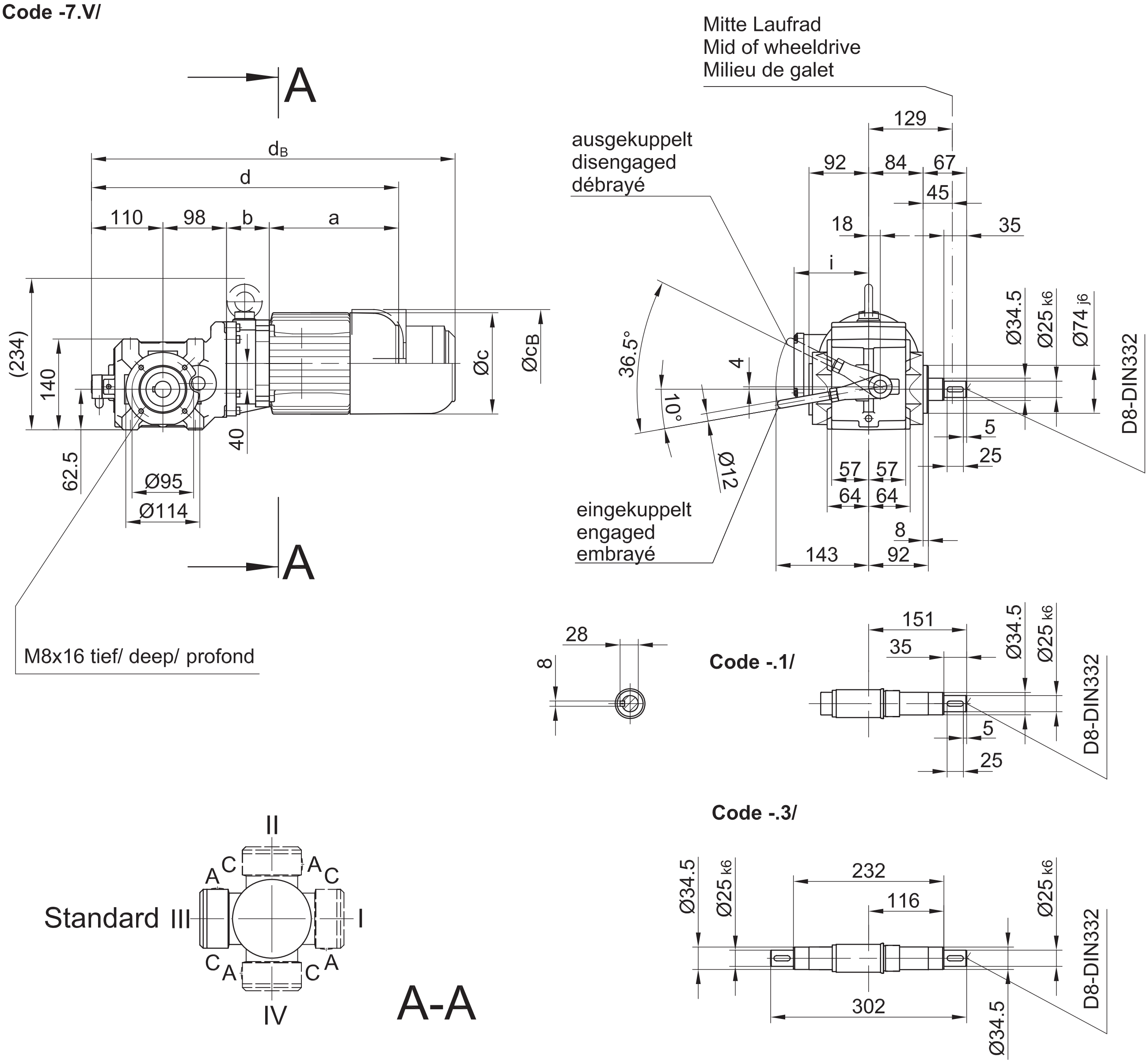
14

Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

BM10

Flansch mit Gewindelöchern vorne/ flange with tapped holes at front/ bride avec trous taraudés à l'avant

Code -7.V/



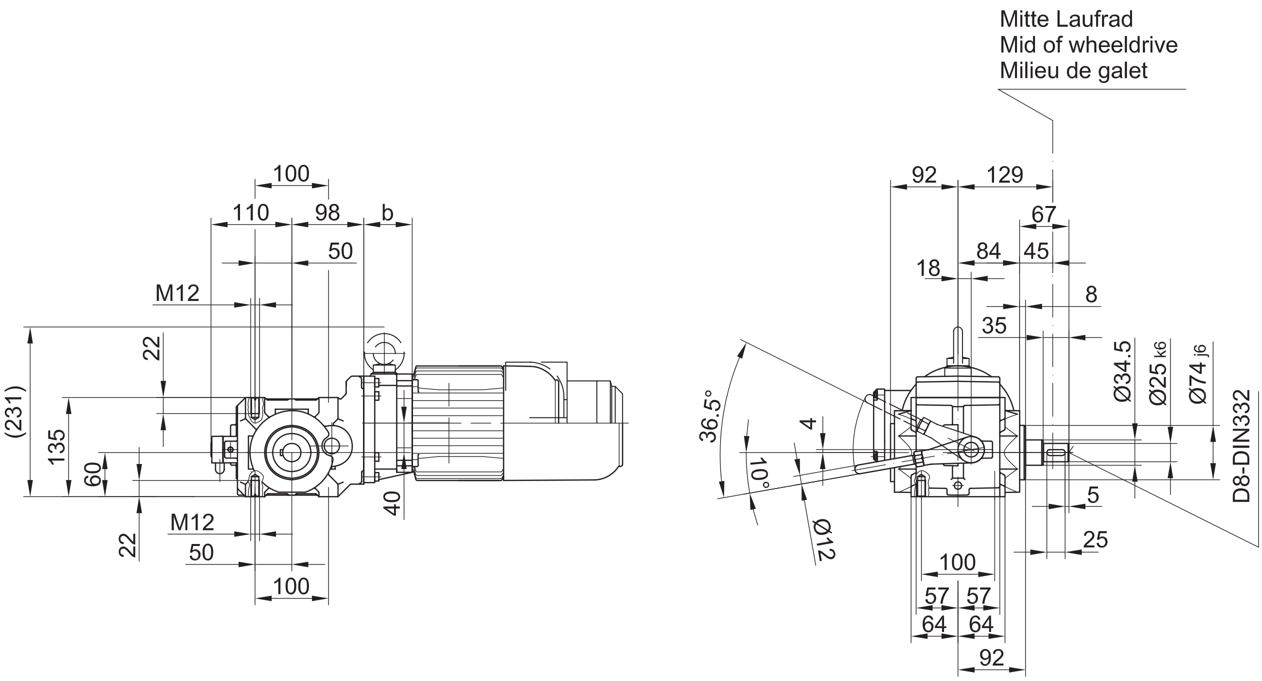
Typ/ Type/ Type	a	b	c	d	i	Ausführung mit Bremse/ with brake/ avec frein											
						E003		E004		E008		Z008		Z015			
						c_B	d_B	c_B	d_B	c_B	d_B	c_B	d_B	c_B	d_B		
BM10-../D05..	170	62	123	441	100	123	483										
BM10-../D06..	170	62	123	441	100	123	483										
BM10-../D07..	190	62	123	461	100	123	503	123	503								
BM10-../D08..	200	66	156	474	115					166	549						
BM10-../D09..	251	80.5	181	539	124					192	619	192	633	192	639		

Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

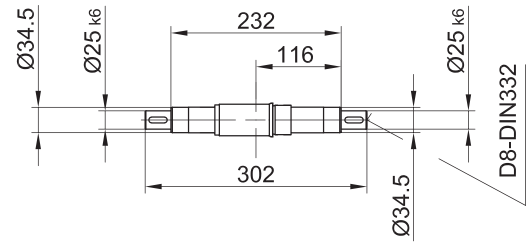
BM10

Fuss mit Gewindelöchern unten und oben/ Foot with tapped holes at bottom and top/
fixation inférieure et supérieure: trous taraudés

Code -6.UO/



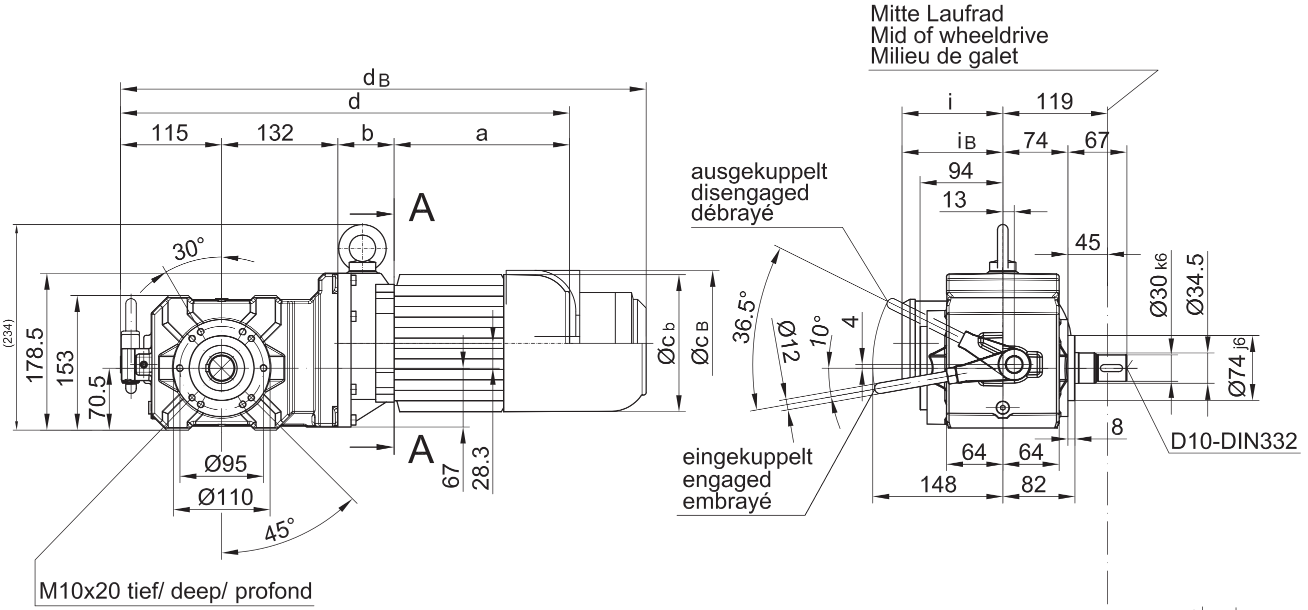
Code -.3/



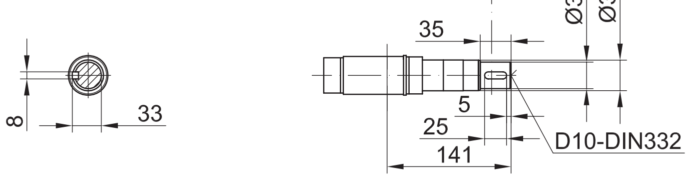
Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

BM20-BM20Z

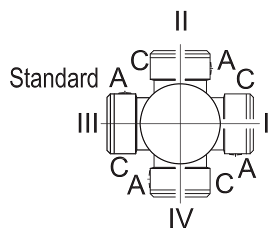
Flansch mit Gewindelöchern vorne / Flange with tapped holes at front /
bride avec trous taraudés à l'avant
Code -7.V/



Code -.1/



A-A



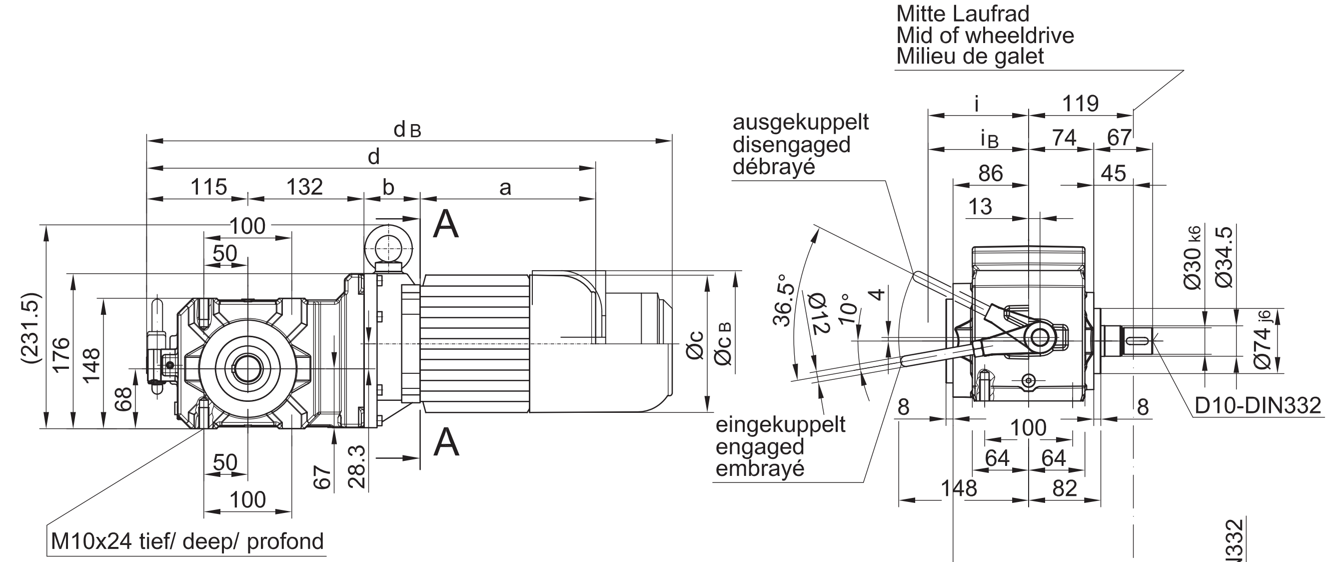
Typ/Type/Type	a	b	c	d	i	Ausführung mit Bremse / with brake / avec frein												
						iB	E003		E004		E008		Z008		Z015			
							cB	dB	cB	dB	cB	dB	cB	dB	cB	dB		
BM20Z-.1/D04..	143	100	111	490	90	90	111	533										
BM20-.1/D05..	170	60	123	478	100	100	123	520										
BM20Z-.1/D05..	170	102	123	520	100	100	123	562										
BM20-.1/D06..	170	60	123	478	100	100	123	520										
BM20Z-.1/D06..	170	102	123	520	100	100	123	562										
BM20-.1/D07..	190	60	123	598	100	100	123	540	123	540								
BM20Z-.1/D07..	190	102	123	540	100	100	123	582	123	582								
BM20-.1/D08..	200	64	156	512	115	115					166	586						
BM20Z-.1/D08..	200	146	156	594	115	115					166	668						
BM20-.1/D09..	251	78.5	181	577.5	124	124					192	656	189	670	189	679		

Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

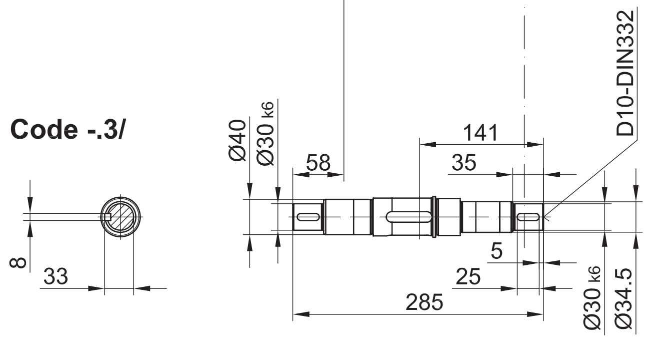
BM20-BM20Z

Fuß mit Gewindelöchern unten und oben / Foot with tapped holes at bottom and top / fixation inférieure et supérieure: trous taraudés

Code -6.UO/



Code -.3/



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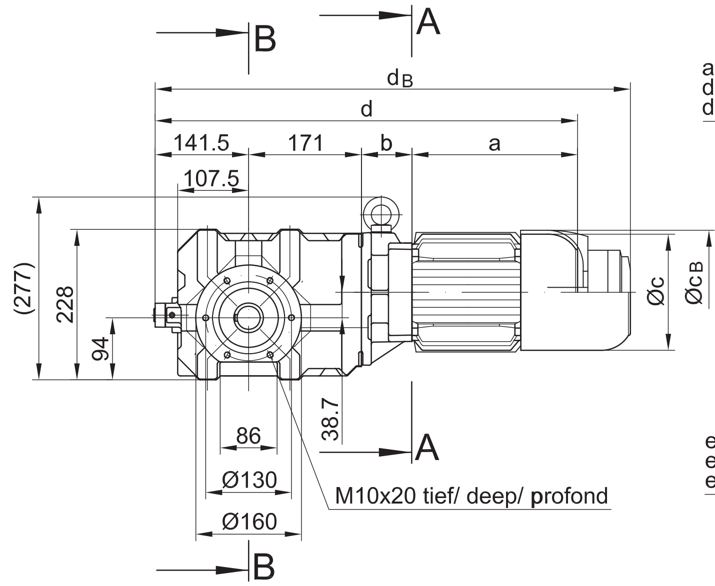
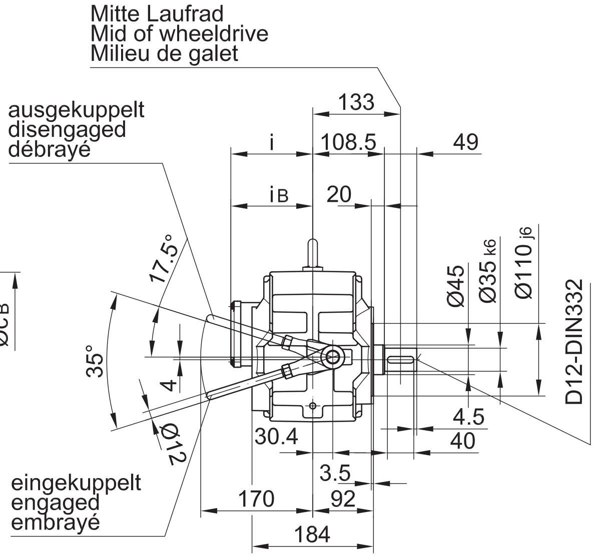
Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

BM30 - BM30Z

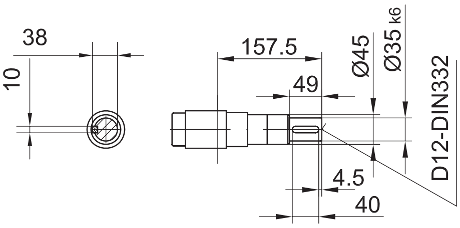
Flansch mit Gewindelöchern vorne/ flange with tapped holes at front/ bride avec trous taraudés à l'avant

Code -7.V/

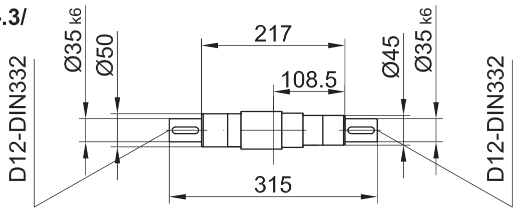


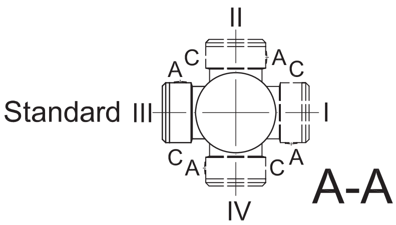


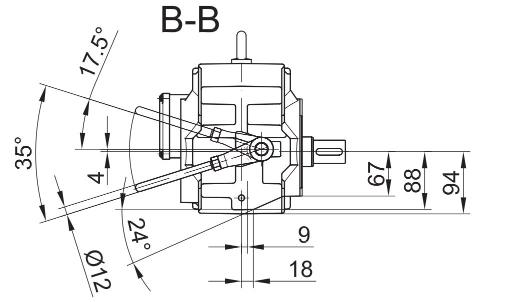
Code -.1/



Code -.3/







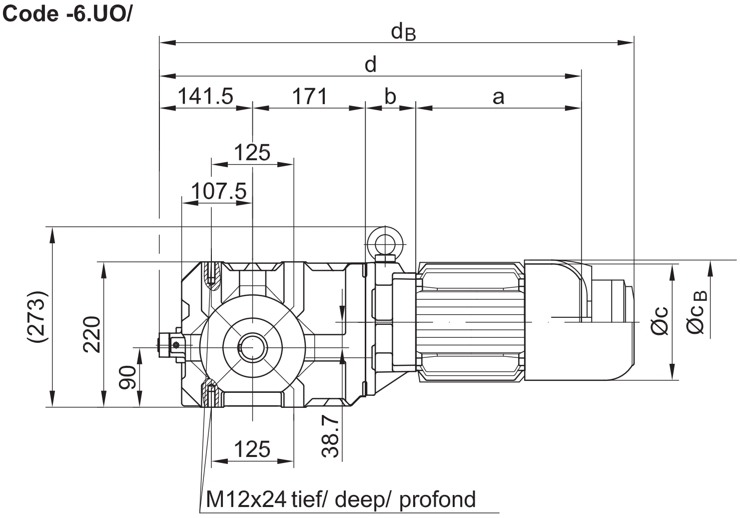
Typ/Type/Type	a	b	c	d	i	iB	Ausführung mit Bremse/ with brake/ avec frein											
							E003		E004		E008		Z008		Z015		E075	
							cB	dB	cB	dB	cB	dB	cB	dB	cB	dB	cB	dB
BM30-../D05..	170	58	123	541	100	100	123	583										
BM30Z-../D05..	170	133.5	123	617	100	100	123	659										
BM30-../D06..	170	58	123	541	100	100	123	583										
BM30Z-../D06..	170	133.5	123	617	100	100	123	659										
BM30-../D07..	190	58	123	561	100	100	123	603	123	603								
BM30Z-../D07..	190	133.5	123	637	100	100	123	679	123	679								
BM30-../D08..	200	62	156	574	115	115					166	649						
BM30Z-../D08..	200	137.5	156	650	115	115					166	725						
BM30-../D09..	251	76.5	181	640	124	124					192	719	192	733	192	739		
BM30Z-../D09..	251	152	181	715.5	124	124					192	795	192	809	192	815		
BM30-../D11..	319	83	228	714.5	181	181									231	816.5	231	846.5

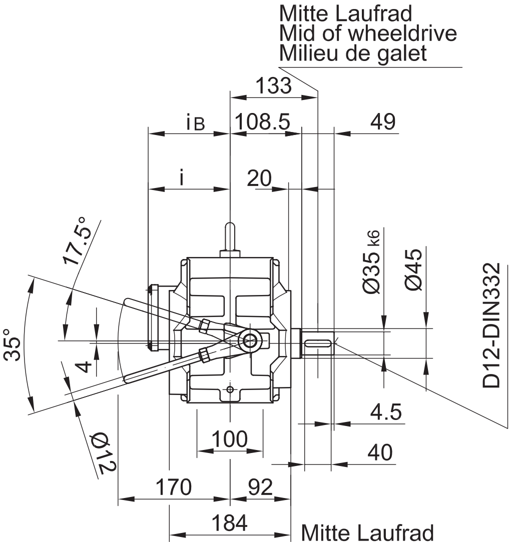
Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

BM30 - BM30Z

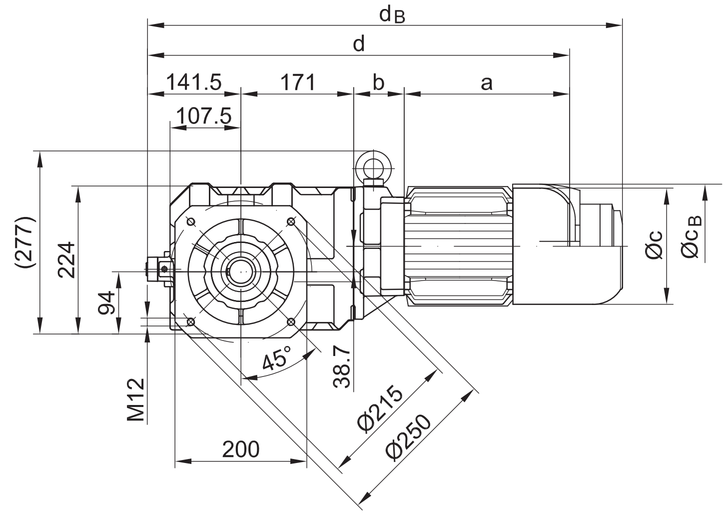
Fuss mit Gewindelöchern unten u. oben/ foot with tapped holes at bottom and top/
fixation inférieure et supérieure: trous taraudés

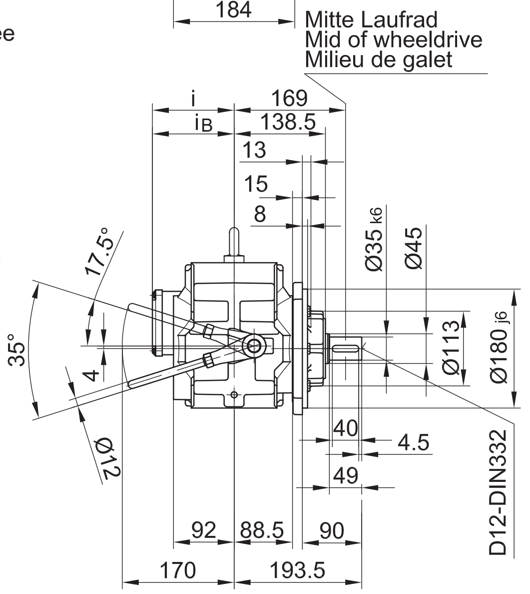
Code -6.UO/



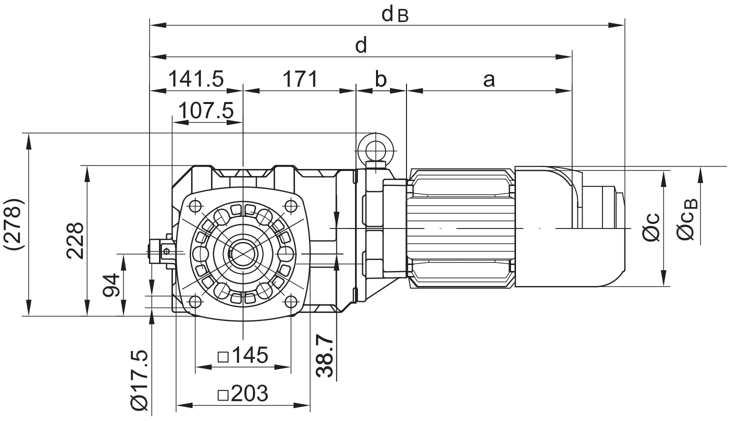


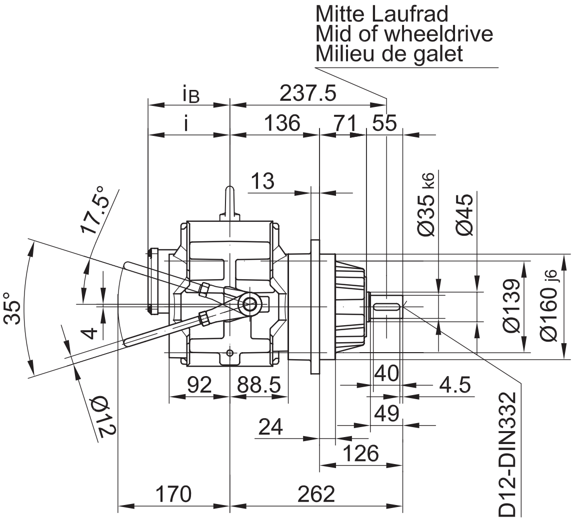
vorgezogener Flansch vorne/ drawed flange at front/ bride avant avancée
Code -07V/.../S01





weit vorgezogener Flansch vorne/ far drawed flange at front/ bride avant très avancée
Code -07V/.../S02





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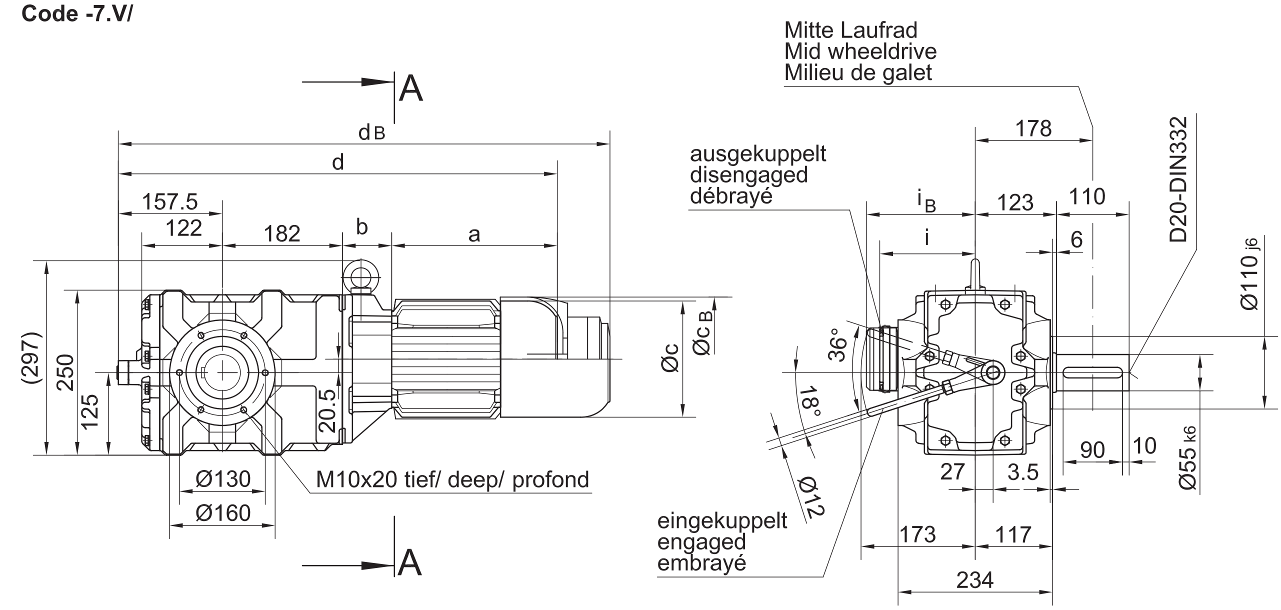
Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

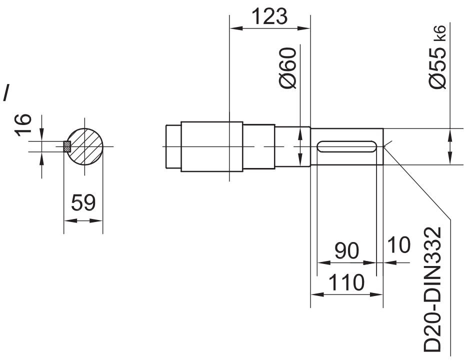
BM40 - BM40Z

Flansch mit Gewindelöchern vorne/ flange with tapped holes at front/ bride avec trous taraudés à l'avant

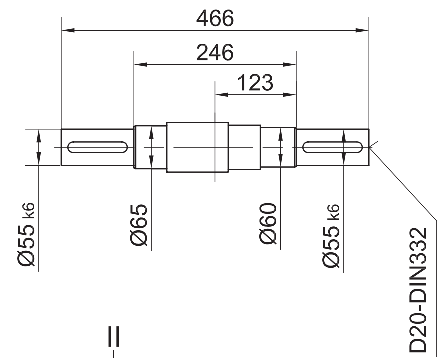
Code -7.V/

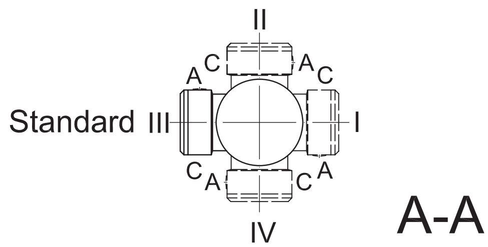


Code -.1/



Code -.3/





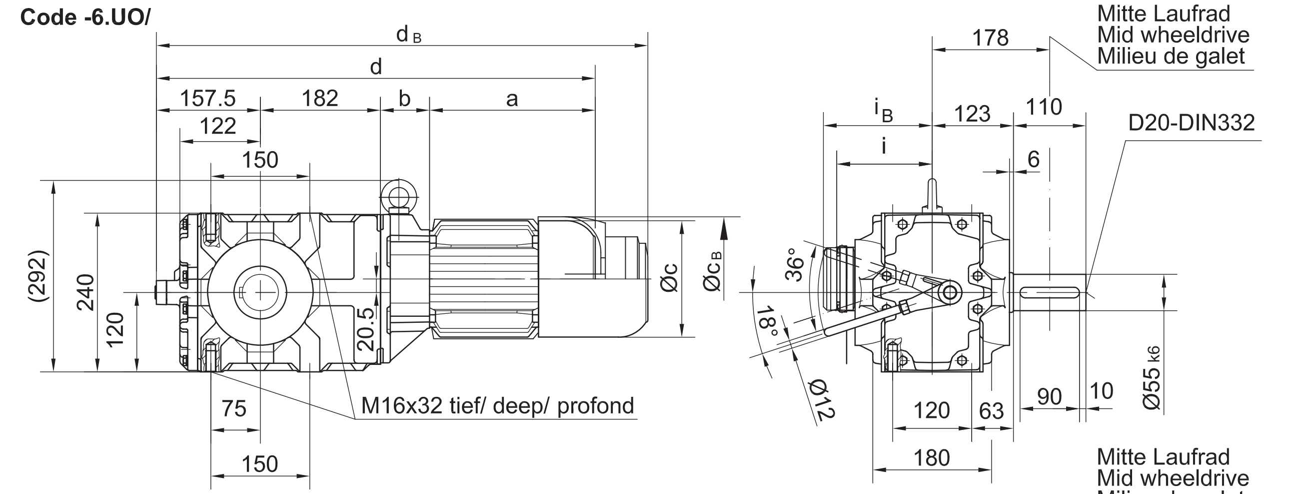
Type/Type/Type	a	b	c	d	i	i_B	Ausführung mit Bremse/ with brake/ avec frein											
							E003		E004		E008		Z008		Z015		E075	
							c_B	d_B	c_B	d_B	c_B	d_B	c_B	d_B	c_B	d_B	c_B	d_B
BM40Z-../D05..	170	138.5	123	649	100	100	123	691										
BM40Z-../D06..	170	138.5	123	649	100	100	123	691										
BM40Z-../D07..	190	138.5	123	669	100	100	123	711	123	711								
BM40-../D08..	200	60	156	599	115	115					166	639						
BM40Z-../D08..	200	142.5	156	682	115	115					166	721						
BM40-../D09..	251	74.5	181	665	124	124					192	744	192	758	192	764		
BM40Z-../D09..	251	157	181	747	124	124					192	827	192	841	192	847		
BM40-../D11..	319	81	228	740	181	181									231	842	231	872

Three-phase Monorail Geared Motors
Drehstrom-Hängebahn-Getriebemotoren
Motoréducteurs de convoyeur aérien

BM40 - BM40Z

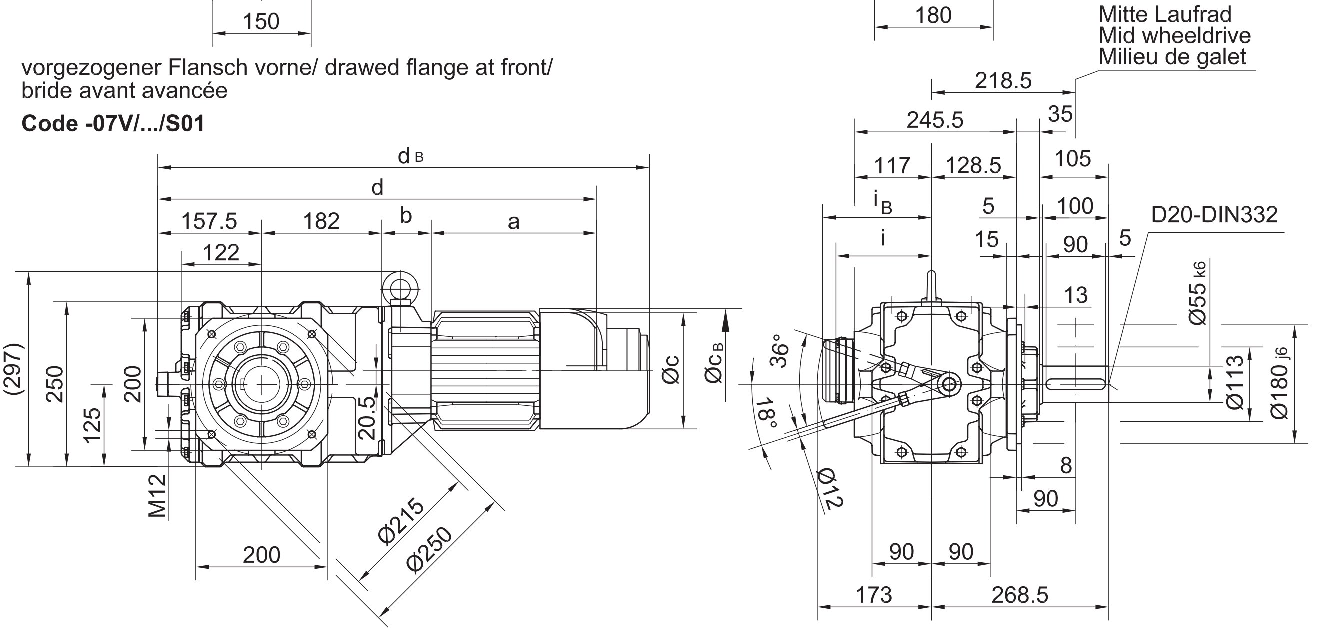
Fuss mit Gewindelöchern unten u. oben/ foot with tapped holes at bottom and top/
fixation inférieure et supérieure: trous taraudés

Code -6.UO/



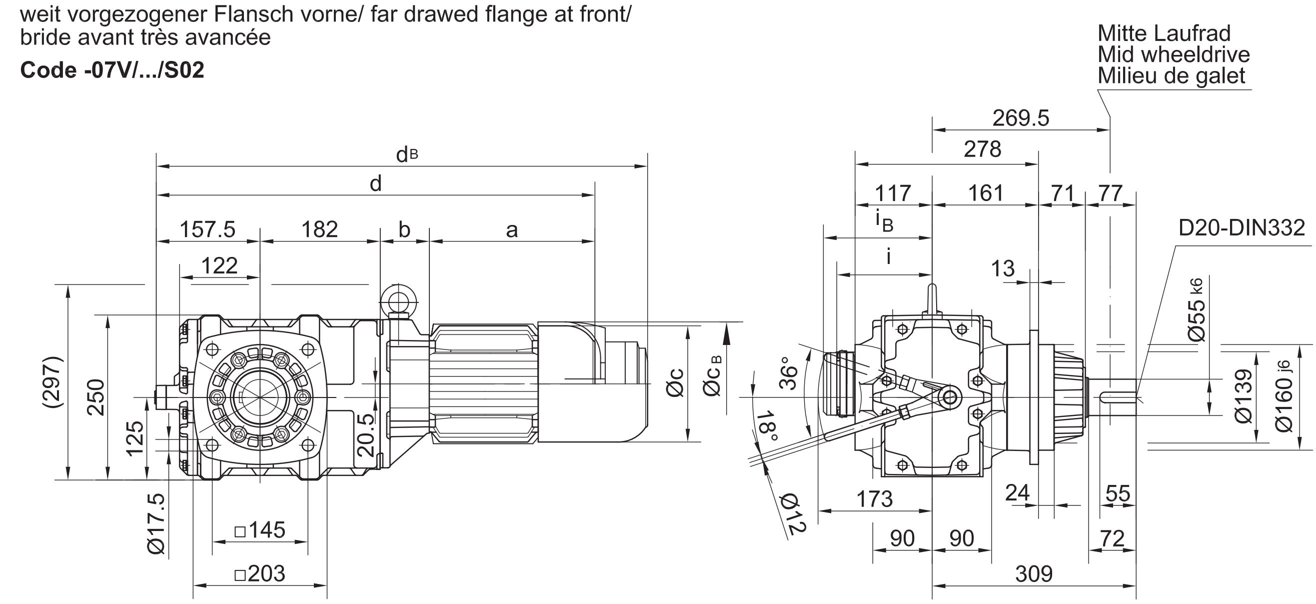
vorgezogener Flansch vorne/ drawed flange at front/
bride avant avancée

Code -07V/.../S01



weit vorgezogener Flansch vorne/ far drawed flange at front/
bride avant très avancée

Code -07V/.../S02



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