

# 2AD AC Motor

Project Planning

DOK-MOTOR\*-2AD\*\*\*\*\*-PRJ2-EN-P

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*Type of documentation* Project Planning

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*The purpose of this documentation* This documentation

- introduces 2AD motors,
- supplies explanatory technical information about the structural features of main spindle motors,
- assists in selecting the main spindle motor relevant to your needs and applications, and,
- outlines the technical data pertaining to 2AD motors.

*Editing sequence*

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# 1. Introducing 2AD AC Motors

*Application* AC motors of the 2AD series are used in:

- machine tools as main spindle drives and servo drives with high performance capabilities
- printing machines
- packaging machines
- reshaping machines

*Power range* In conjunction with drive controllers, these motors feature:

- a broad speed range, and,
- a broad speed range under field control of 1:6.

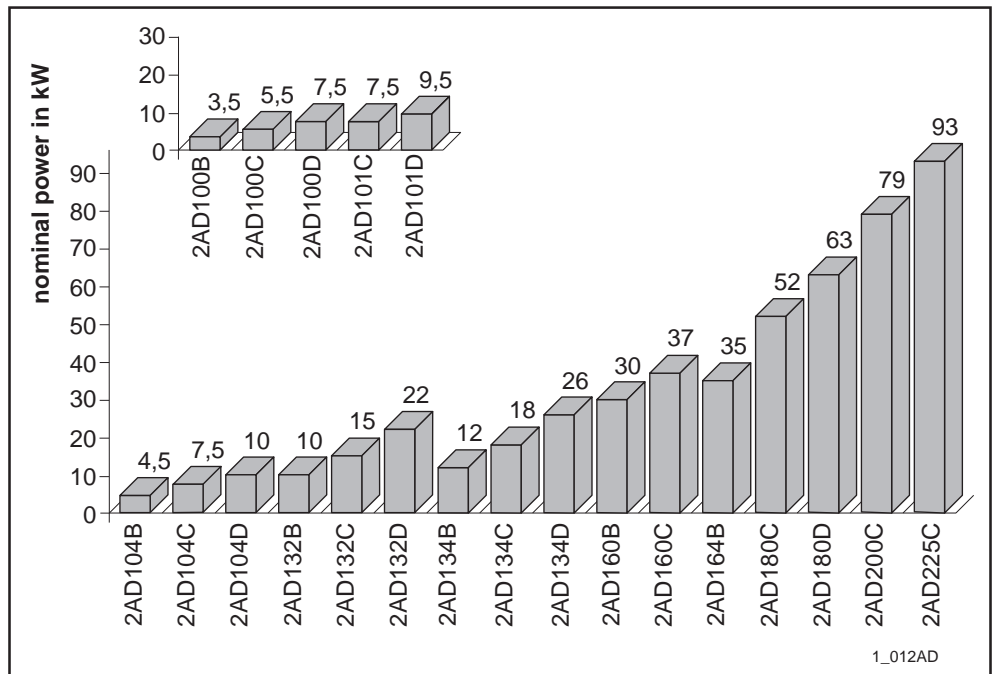


Fig. 1.1: Nominal power stages of 2AD motors

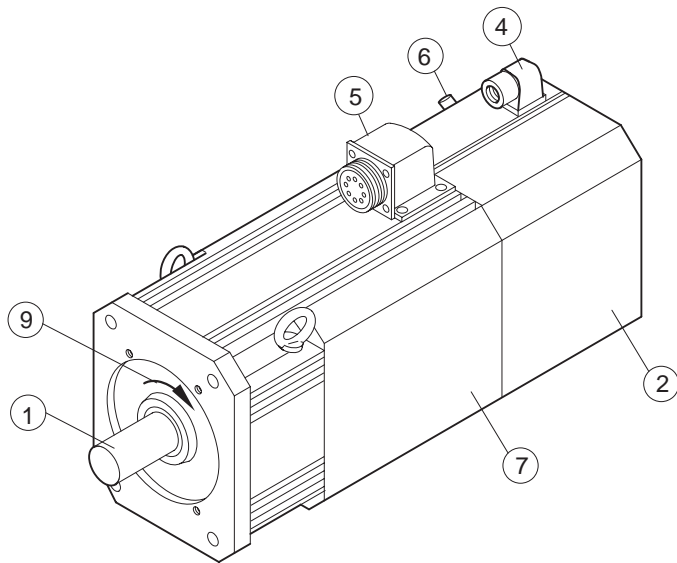
*Motor feedback* The motor feedback measures rotor position and signals it to the drive. This regulates speed and rotor position. It functions with a resolution of 1/2 000 000th revolution.

*Holding brake* The output shaft can be clamped into position at standstill using the holding brake. This means that the main spindle is safely held in place within the machine tool. Versions with either electrical clamp or electrical release capabilities are available.

*Shaft extension* A shaft extension makes it possible to attach an additional position encoder to the B side of the motor. This, however, requires the use of a radial blower.

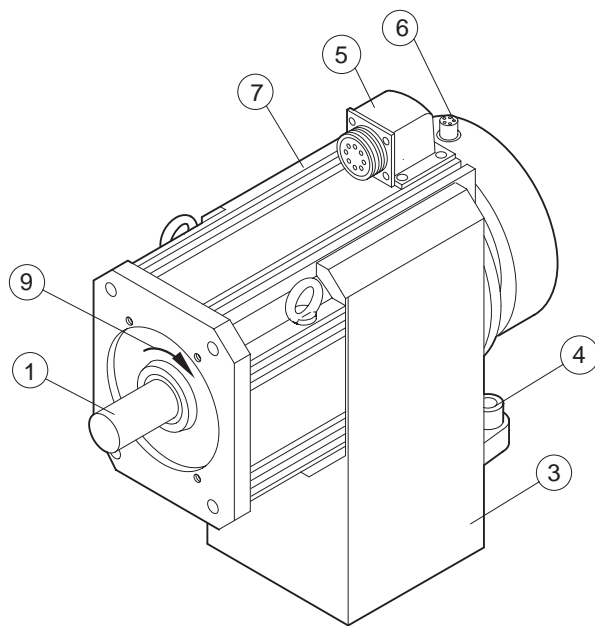
*Construction* Either flange or foot installation is available to help meet the demands of the varying installation requirements and conditions.

*No maintenance* As the main spindle motor is an asynchronous motor, it requires no maintenance.



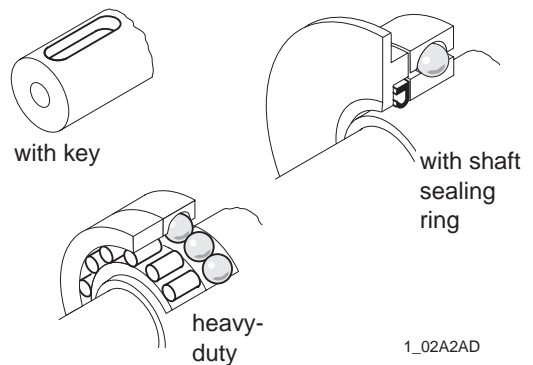
**2AD100, 101, 104  
with axial blower**

- ① Output shaft
- ② axial blower
- ③ radial blower
- ④ motor blower connection
- ⑤ power connection with integral connections for
  - thermal sensor
  - holding brake
- ⑥ Motor feedback connectin
- ⑦ Holding brake (integral)
- ⑧ side B shaft end
- ⑨ clockwise rotational direction



**2AD100, 104  
with radial blower**

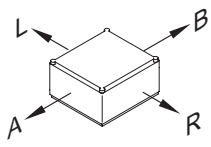
**Output shaft**



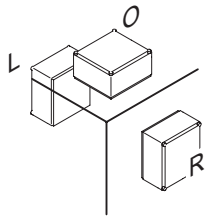
1\_02A2AD



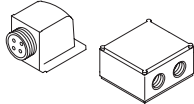
**Power connection**



output direction can be selected

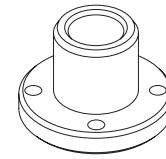
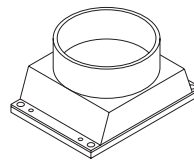


position can be selected



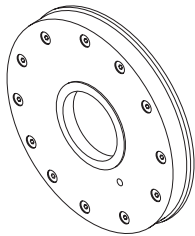
power connector/terminal box can be selected

**Accessories**

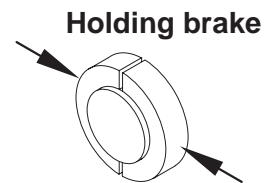
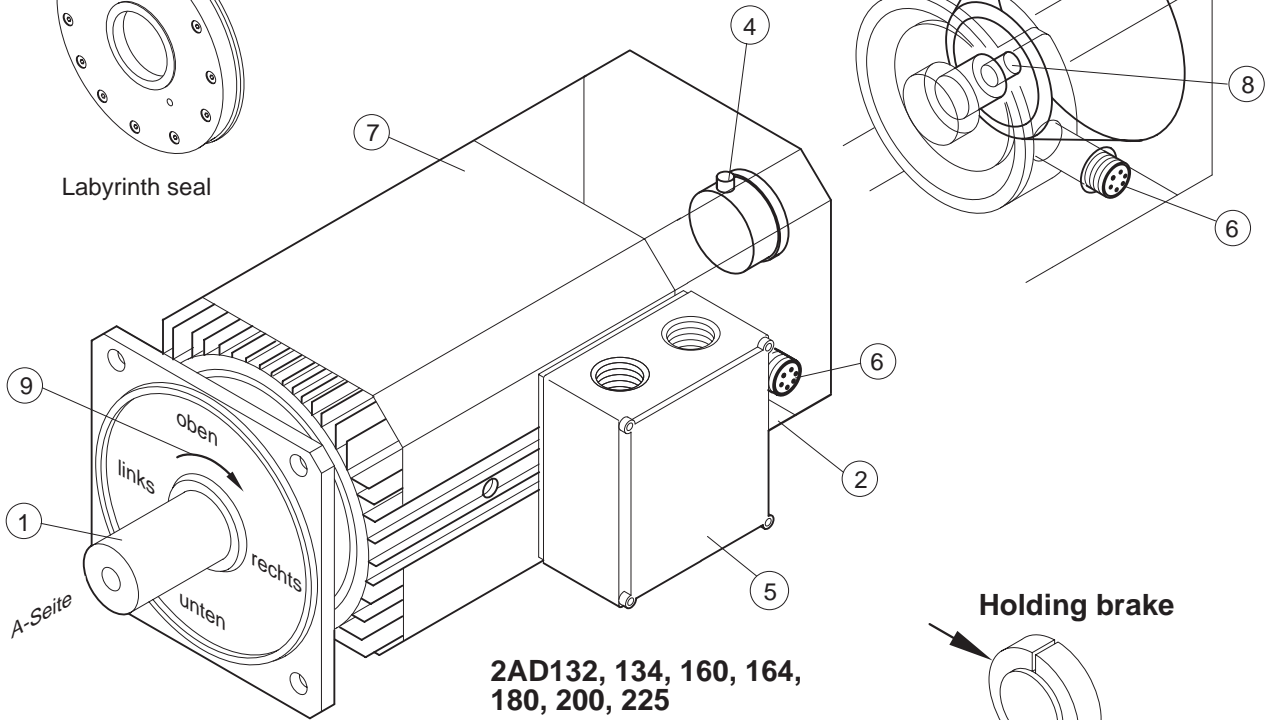


blower base

**Accessories**

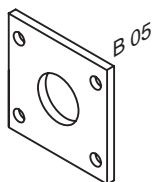


Labyrinth seal

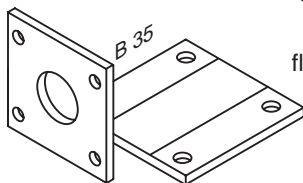


**Holding brake**

**Construction**

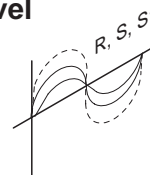


flange mounting



Flange or foot mounting

**Vibration severity level**



1\_02B2AD

Fig. 1.2: 2AD motors - definition of terms

## 2. Technical information

### 2.1. Ambient conditions

*Installation altitude,  
ambient temperature*

The ratings outlined in document: "AC main spindle drives with 2AD regulated main spindle motor - selection data, doc. no. 9-567-013-4" are achieved under the following conditions:

ambient temperature: from 0° to +45°C

installation altitude: up to 1,000 meters above sea level

The diagrams in Figure 2.1 depict the drop in power under other than above conditions. If deviating ambient temperatures and higher installation altitudes occur simultaneously, then multiply both power factors.

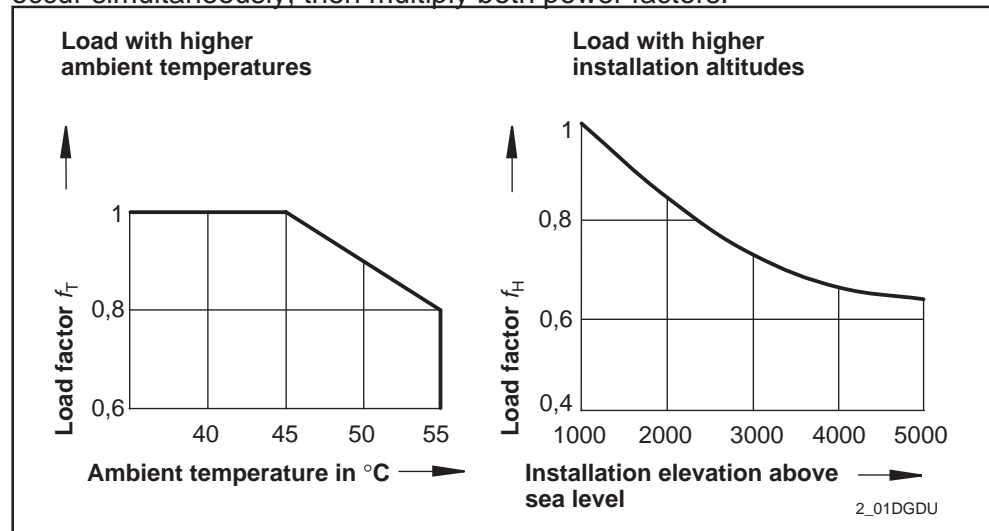


Fig. 2.1: Load capacities with higher ambient temperatures and installation altitudes

*Type of protection*

The main spindle motor with housing and cover are, per DIN 40050, protected against:

- contact with parts either moving or to which voltage is being applied, and,
- penetration by solid objects and water.

The category of protection is indicated by the abbreviation "IP" (International Protection), with two digits for the protection grade, e.g., IP 40.

The first digit denotes the protection grade for contact and penetration by foreign objects (see table in Figure 2.2).

The second digit denotes the protection grade for water (see table in Figure 2.3).

Figure 2.4 lists the range of protection categories for main spindle motors.

## 2. Technical information

1st digit	Protection category (protection against contact and foreign objects)
0	No protection
1	Protection against penetration by solid objects with a diameter greater than 50 mm. No protection against deliberate penetration, e.g., hands, but will keep larger body surfaces out.
2	Protection against penetration by solid objects with a diameter greater than 12 mm. Keeps out fingers and similar objects.
3	Protection against penetration by solid objects with a diameter greater than 2.5 mm. Keeps out tools, wires and similar objects with a thickness greater than 2.5 mm.
4	Protection against penetration by solid objects with a diameter greater than 1 mm. Keeps out tools, wires and similar objects with a thickness greater than 1 mm.
5	Protection against dust deposits. Penetration by dust is not completely prevented. Does not permit dust to penetrate to the extent that it influences the operation of the equipment (protection against dust). Total protection against penetration.
6	Protection against dust (dust-proof). Total protection.

Fig. 2.2: Categories of protection against contact and penetration by foreign objects

2nd digit	Protection grade (protection against water)
0	No protection
1	Protection against vertically dripping water. Does not permit any damaging affects (dripping water).
2	Protection against vertically dripping water. Does not permit any damaging affects to equipment (housing) tilted up to 15° in comparison to the normal position (water dripping at an angle).
3	Protection against water falling at an angle of up to 60°. Does not permit any damaging effects (spraying water).
4	Protection against water sprayed at the equipment (housing) from all directions. Does not permit any damaging affects (splashing water).
5	Protection against a jet of water sprayed from a nozzle onto the equipment (housing) and coming from all directions. Does not permit any damaging affects (jet of water).

Fig. 2.3: Categories of protection against penetration by water

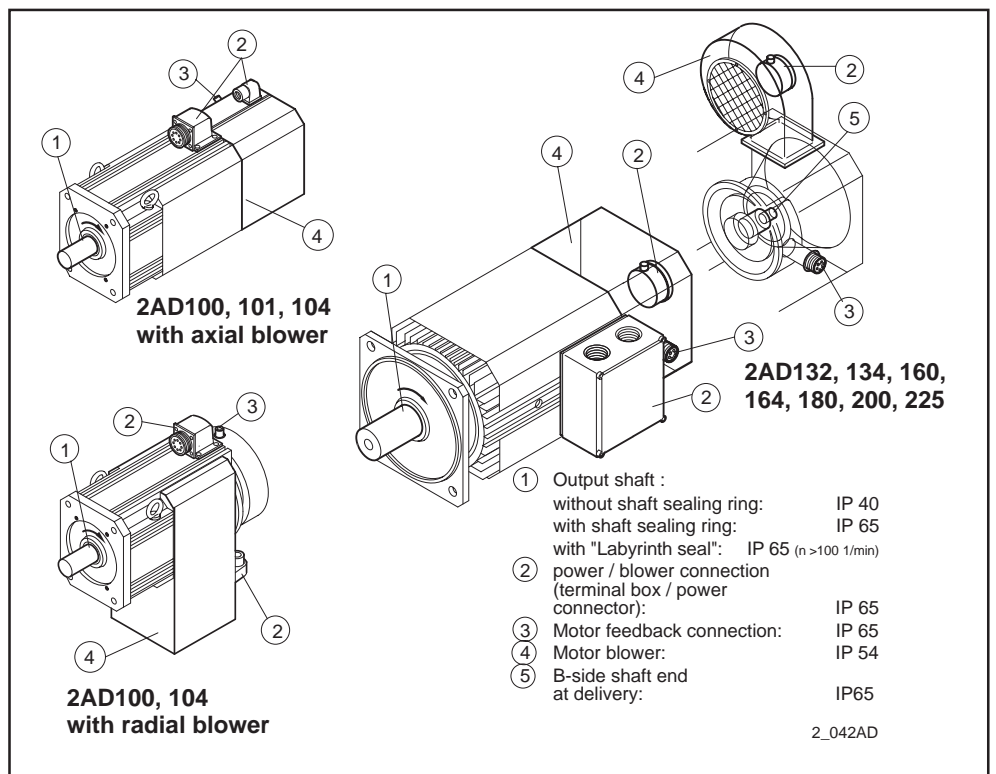


Fig. 2.4: Protection categories for the 2AD main spindle motors

## 2.2. Mechanical features

Type of construction,  
installation position

2AD motors are available in versions

- B05 for flange mounting
- B35 for flange and foot mounting

Figure 2.5, "Permissible installation positions", depicts installation positions and outlines important guidelines.

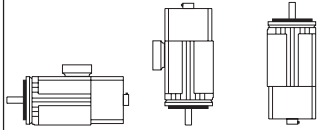
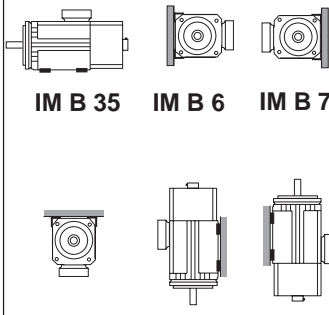
Motor	allowable mounting positions per DIN IEC 34-7	Important mounting instructions
B05 B14	 <p>IM B 5    IM V 1    IM V 3</p>	<p><b>Vertical installation</b>  <b>IMV1, IMV3 / IMV5, IMV6:</b>                      Do not allow liquids (water, oil, coolant, etc.) to run into the motor along the output shaft. Even the use of a seal at the output shaft does not prevent liquids penetrating the motor.                      Prevent contamination by liquids penetrating the output shaft (side A shaft feed through) when attaching the motor.</p>
B35	 <p>IM B 35    IM B 6    IM B 7</p> <p>IM B 8    IM V 5    IM V 6</p> <p style="text-align: right;">2_052AD</p>	<p><b>Foot installation:</b>                      Do not permit the following loads on the motor feet:</p> <ul style="list-style-type: none"> <li>• Radial loads affecting the motor feet in the form of a tractive force. In this case, alter the installation position, or mount on the flange.</li> <li>• Transmission of loads occurring at the drive. If possible, mount the motor to the drive with a flange, or mount motor and drive separately.</li> </ul>

Fig. 2.5: Permissible installation positions

Output shaft

**Plain shaft:**

For friction-locked shaft-hub connections.

The higher run quality and the backlash-free connection between shaft and hub are a significant advantage of this recommended design.

Use tension sets, pressure sleeves or other such elements to couple in pinions, belt discs or similar drive elements.

**Output shaft with key** (as per DIN 6885 Blatt 1; Ed. 08/1968):

This connection is suited to take up torques which make low demands of the shaft-hub connection.



**Shaft damage!**

During a powerful reverse operation it is possible for the key to swing out. Ever-increasing deformations in this area can, in turn, cause the shaft to break.

**The use of a plain shaft is recommended.**

This connection is suited to take up torques with a constant direction. The hub must be axially secured in this case. A tapped center hole with thread is on the small side.

Balanced with full key:

The rotor is balanced with the key used in the shaft-hub assembly. The **rotor** is balanced **with the full key**. A balanced, interconnecting part (toothed wheel etc.) must be used. The keyway in the hub is not dependent upon the length of the key.

Balancing with half a key:

There is half a key in the keyway in the shaft. The mass ratios occurring at the keyway are comparable to those of a plain shaft. If a full key is inserted, then the projecting section of the key creates a state of imbalance. **The rotor with the full key is not balanced.**

The interconnecting part must equalize the rotor's state of imbalance. The keyway in the hub should correspond to the length of the key. Use a stepped key for shorter keyways. The customer must modify the keyway.

### *Output shaft with seal*

The motor is equipped with a sealing ring, per DIN 3760, type A, at the output shaft where it is attached to a drive which has an oil bath or circulating-oil lubrication.

The shaft seal is a rubbing seal. Wear and frictional heat occur at the lip of this seal. **Make sure the points of contact are sufficiently lubricated.** This ensures the least wear. The points of contact may not be permitted to ever run dry!

The lubricant is simultaneously a coolant. It dissipates the frictional heat occurring at the point of contact.

Please note the "Important installation guidelines" in Figure 2.5 and "Permissible installation orientations", on page 12, if the motor is vertically mounted.

### *Shaft loads*

#### **Radial shaft load:**

The permissible radial force at the output shaft is dependent upon bearing assembly and average speed. The diagrams in the "Technical data" section outline the values for:

- standard bearing assemblies, and,
- heavy-duty assemblies.

The heavy-duty assembly can take greater radial loads. The cylindrical roller bearing on side A of the bearing assembly absorbs the radial forces. This assembly should only be used in exceptional cases as it doubles the rate of lubricant consumption.

Motors with heavy-duty bearing assemblies may only be operated with radial loads. Sliding friction could otherwise damage the bearings. See the "Technical data" section for minimum radial load values.

### **Axial shaft loads:**

Only very low axial loads are acceptable (see "Technical data"). Thus, the motors are not suited for helical toothed output pinions.

### *Bearing service life*

### **Mechanical service life:**

Indramat main spindle motors are equipped with lifetime lubricated deep-groove ball and cylindrical roller bearings.

The mechanical service life of the bearings equals 20,000 working hours (bearing calculations as per DIN 662, section 1), if the radial loads and average speeds listed in section "Technical data" are maintained. Lubricant consumption also has a significant affect on bearing service life.

The duration of lubricant consumption is longer than the mechanical service life if the bearings have a normal load. Normal loads are:

- Radial loads:  
corresponding to the "Permissible radial loads" diagrams in the "Technical data" section.
- Average speeds:  
as outlined in the "lubricant consumption" diagram in the "Technical data" section, whereby,  $n_m < n_{m(tf=20\ 000\ h)}$
- Operating the motor within the permissible ambient temperature range of: 0° to +45°C.

### **Lubricant consumption:**

Non-conforming loads cause the lubricant to be consumed in less than 20,000 working hours. This has an adverse affect on bearing service life.

Lubricant consumption is outlined in the "Lubricant consumption" diagram in the "Technical data" section.

If higher average speeds occur with a heavy-duty bearing assembly, the lubricant can be consumed more quickly. Thus, the working life of the motor is limited to that period in which the lubricant is available.

A longer working life for the motor can be anticipated if a standard bearing assembly is used as the time over which lubricant is available is doubled if the load remains constant. A higher than specified load on the standard bearing assembly reduces the mechanical service life to under 20,000 working hours.

If the working life of the motor is limited by increased lubricant consumption, then it is possible to increase the working life of the motor, in some cases, by using a standard bearing assembly instead of the heavy-duty one.

In this case, Indramat must re-calculate bearing service life. Please contact our Sales Office and inform them of your application requirements (load cycle, speeds, bearing loads, etc.).

The following flow chart in Figure 2.6, "Sequential determination of the bearing assembly", offers assistance in determining which bearing assembly to select.

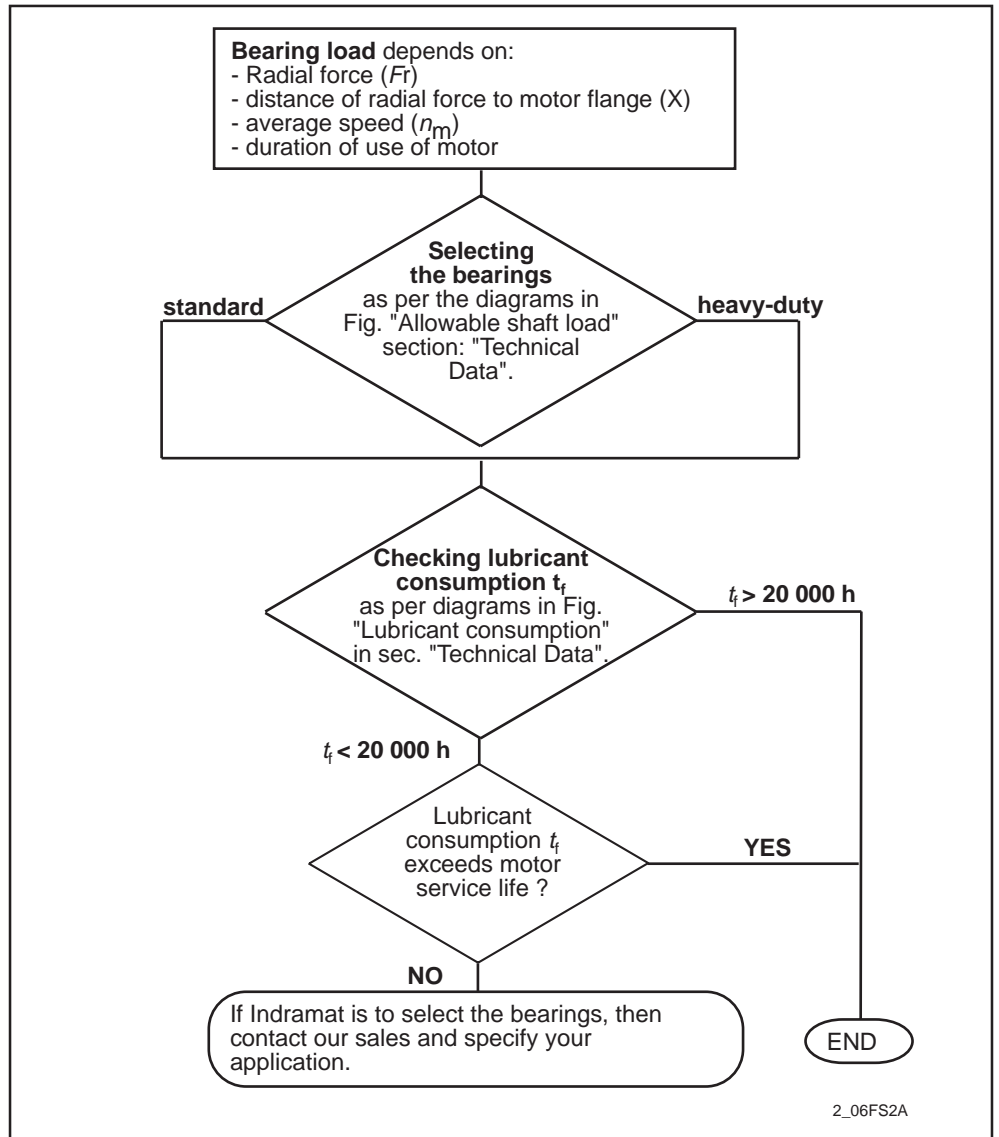


Fig. 2.6: The sequence for determining bearing assembly

*Holding brake*

The 2AD motor series is available with integral holding brakes which can be ordered with **electrically-engaged clamp** or **electrically-engaged release**.

Main spindle applications of the 2AD motors:

The **electrically-engaged holding brake** is a locking element of the main spindle when it is standing still or when the drive enable is switched off (for example, when exchanging tools without a closed position control loop).

There can be no clamping until the drive has signalled that the motor is at a standstill.

Do not use an electrically-released holding brake in main spindle applications. If the brake is unintentionally applied, in this case, (for example, as a result of a power failure or wire breakage), the brake could be destroyed at high speeds.



Servo-applications of the 2AD motors:

The **electrically-released holding brake** holds linear axes when at standstill and when the drive enable signal is not applied. With vertical axes, in particular, the drive enable should not be switched off until the brake has clamped the mechanical system once it is standing still! The occasional closing of the holding brake because of a power failure or in an E-stop situation is acceptable within the range of the braking energy permitted for the respective type of holding brake.

A heavy-duty electrically-released holding brake is also available.

The electrically-clamped holding brake should not be used in servo applications. There is no clamping of the axis when there is no power!

Do not use the holding brake as if it were a working brake. It may only close when the motor is standing still.

*Shaft extension*

A side-B shaft end is only needed if drives with DIAX01 controllers (KDA, TDA, RAC) require absolute actual rotor position values for track control. An absolute encoder is coupled in for this purpose on side B.

Actual rotor position values can more advantageously be directly relayed by the drive controllers to the controls. Controllers of the DIAX01 series (KDA, TDA, RAC) can tap off incremental actual position values while controllers of the DIAX03 series (DDS02.2, DKR) and those of the DIAX04 series (HDD, HDS) can tap off absolute actual position values from the motor feedback and relay this information to the controls. No encoder is needed for this purpose.

The 2AD motor is available, upon request, with a mounted absolute encoder (see "AC main spindle drives with regulated 2AD main spindle motors, doc. no. 9-567-013-4"). A notation on the order next to the absolute encoder is all that is required.

The B-side shaft extension is a plain shaft. The protection category at delivery is IP 65 for the motor with a B-side shaft extension without encoder. Encoders must also have protection category IP 65 because the feed through of the shaft extension is not sealed.

Due to lack of space, motors with a shaft extension may only have radial blowers at the B end.

*Balance class*

The main spindle motor is dynamically balanced as per balance class R (reduced) as per DIN ISO 2373.

Balance classes S (special) and S1 are also available, if special demands need to be made of the run quality. The table in Figure 2.7 outlines the root-mean square values of the vibrations.



Vibrations $V_{\text{eff}}$ in mm/s								
balance class	Motor size							
	100 to 132				160 to 225			
	speed in $\text{min}^{-1}$				speed in $\text{min}^{-1}$			
	600- 1800	1800- 3600	3600- 6000	6000- 8000	600- 1800	1800- 3600	3600- 6000	6000- 8000
R	0,71	1,12	1,8	2,8	1,8		2,8	4,5
S	0,45	0,71	1,12	1,8	0,71	1,12	1,8	2,8
S1	0,28	0,45	0,71	1,12	0,45	0,71	1,12	1,8

Fig. 2.7: Root-mean square vibrational values

**Cooling method** A 2AD motor is always equipped with a blower on side B. An air stream fed over the surface of the motor via air baffles is used for cooling. Two air stream directions are available for axial blowers:

- air stream from side B to side A of the motor (blowing)
- air stream from side A to side B of the motor (suction).

The air stream in a radial blower always blows from side B to side A of the motor. We strongly recommend the use of radial blowers in main spindle motors with a second shaft end.

There must be a sufficient supply of air for cooling once the motor is mounted. See the "Motor blower" section in the "Technical data" section for the average air requirements.

### 2.3. Electrical features

*Terminal diagram* Figure 2.8 is a schematic diagram. It is the checklist for all the electrical connections needed to operate the 2AD motor.

The following electrical connections are on the 2AD motor:

- power connection with the motor's NTC thermistor connection and holding brake connection
- motor feedback connection
- motor blower connection

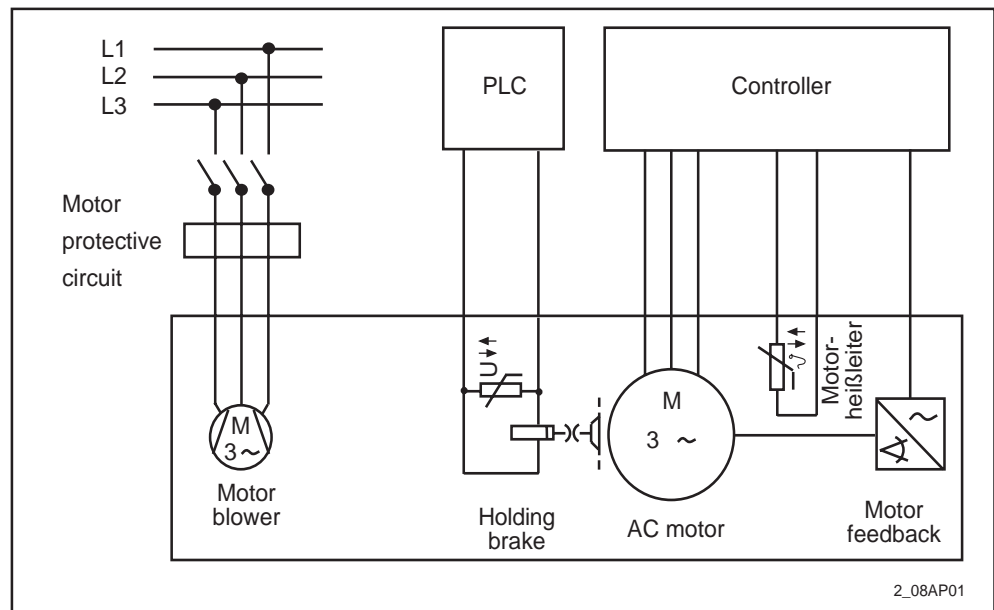


Fig. 2.8: Schematic main spindle motor diagram

*Power terminal* The power terminal in main spindle motors can be either

- a terminal box, or,
- a power connector.

Whether or not both options can be used depends on the motor size. This information is specified in the relevant type codes.

The position of the power connection is selected when ordered. It cannot be changed after delivery.

The position of the power terminal can be specified when the order is placed, but cannot be changed after delivery. The cable output direction out of the terminal box or power connector can be turned in increments of 90°. It can be changed after the motor is delivered.

Integrated into the power terminals are the connections for the:

- motor NTC thermistor and
- the holding brake.

*Motor NTC thermistor* The motor NTC thermistor is built into the motor windings. The NTC thermistor monitor in the drive protects the motor against overheating. The drive sends out an error message if the motor is shutdown for thermal reasons. The connection is integrated into the power connection.

*Holding brake* The holding brake connection is integrated into the power terminal. The holding brake is triggered by the unit's control circuits (DDS02.2, DKR, HDS).

*Motor feedback* The motor feedback connection is on the same side of the motor as the power terminal. It is a flanged socket. The position of the motor feedback connection cannot be changed once the motor is delivered.

The motor feedback is available in three versions:

- high-resolution motor feedback (type "3") for use with KDA/TDA/RAC/DDS02.2/DKR/HDS
- Digital servo feedback (type "6") for use with DDS02.2/DKR/HDS
- Digital servo feedback with integral multiturn absolute encoder (type "7") for use with DDS02.2/DKR/HDS

Motor feedback	Absolute accuracy	Relative accuracy
high-resolution motor feedback (in 2AD and ADF: type 3)	$\pm 0.02^\circ$ ( $\pm 1.2'$ )	rel.: $\pm 0.01'$
digital servo feedback (in 2AD and ADF: types 6 and 7)	$\pm 0.009^\circ$ ( $\pm 0.5'$ )	rel.: $\pm 0.01'$

Fig. 2.9: Motor feedback accuracy

*High-resolution motor feedback* For relative indirect position detection. Replaces separate incremental encoder on the motor.

*Digital servo feedback* Digital servo feedback features: After a power failure or the initial POWER ON, the axis must be run to its point of reference before operation can begin.

*Digital servo feedback with integral multiturn absolute encoder* For absolute indirect position detection within 4096 motor revolutions. Replaces a separate absolute encoder on the motor.

The absolute axis position in this feedback option is retained even after the power is shut off.

*Motor blower* The type of motor blower connection corresponds to the selected power connection (up to 2AD 132: either power connector or terminal box). The motor blower is connected over its own protective circuit and thus works independently of the controller.

## 2.4 Mechanical accessories

### *Labyrinth seal (M02 2AD...)*

Motors which must be protected against liquids penetrating the motor output shaft should be equipped with a labyrinth seal because it cannot wear down. The labyrinth seal is available as an accessory for motors 2AD132, 2AD160, 2AD180 and 2AD200. It is mounted before the motor is mounted.

The effectiveness of the labyrinth seal starts at  $200 \text{ min}^{-1}$ . This is why it should only be used in connection with the optional shaft sealing ring, which becomes effective at  $0 \dots 200 \text{ min}^{-1}$ . Liquid levels must retain a minimum clearance to the motor shaft!

### *Blower support base (M01 2AD...)*

If motors are to be operated in very dirty environments (dust, oil, vapors of various kinds), then it is possible to conduct clear air via a pipe or air channel for the motor cooler. To connect the air channel in motors 2AD132, 2AD160 and 2AD180 it is possible to obtain an additional blower support base.

The blower support base can only be mounted to the blower housing of radially cooled motors. This, of course, means that the motor must be equipped with such. To connect the air channel, replace the radial blower with the blower support base.

If the ventilating air is being brought from a short distance (up to about 1.5 m), from the roof or a side wall of the room in which the machine is installed, then the blower can be connected to the motor over an air channel! Any directional change in this path should not exceed  $90^\circ$ !

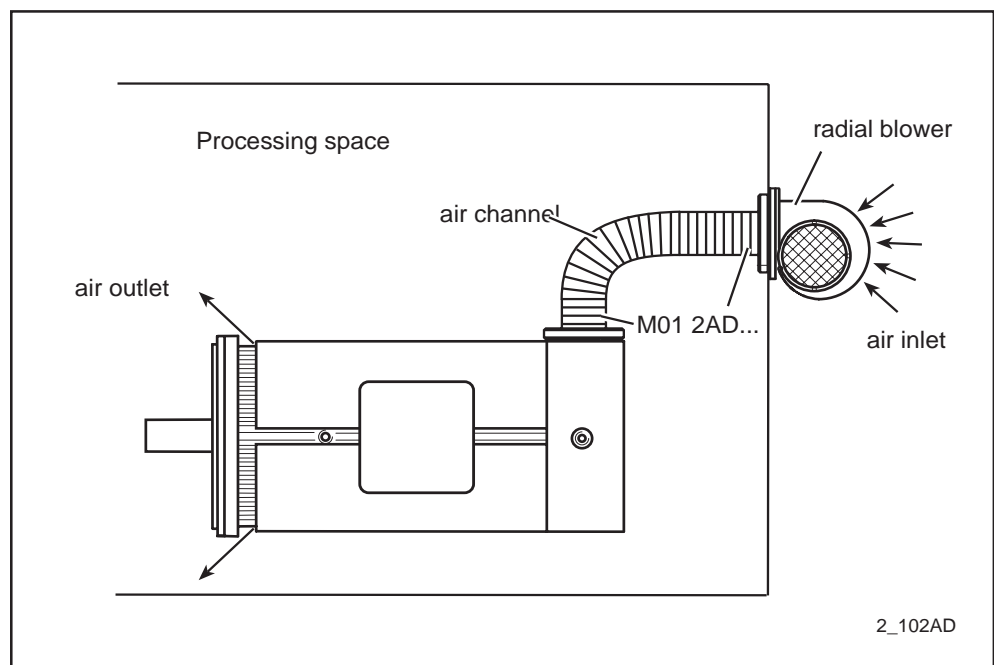


Fig. 2.10: Motor cooling via air channel - possible solution

## 2.5 Mounting Gearboxes

If the motor uses a coaxial planetary gearbox, then order the motor from Indramat with the gearbox already mounted!

## 3. Technical data - 2AD 100

### 3.1 Nominal data

Designation	Symbol	Unit	2AD100		
			B	C	D
Motor size			B	C	D
Windings designation			AS		
Nominal power <sup>1)</sup>	$P_n$	kW	3.5	5.5	7.5
Nominal torque <sup>1)</sup>	$M_n$	Nm	22	35	48
Base speed	$n$	min <sup>-1</sup>	1500		
Maximum speed	$n_{max}$	min <sup>-1</sup>	9000		
Nominal current	$I_n$	$A_{eff}$	17	27	35
Nominal voltage	$U_n$	$V_{eff}$	182	168	173
Rotor inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0.014	0.021	0.028
Thermal time constant	$t_{th}$	min	35	40	45
Min. terminal cross-section EN 60204, section 1/ 2/86	$A$	mm <sup>2</sup>	4		6
Average sound pressure level at 1 meter (PWM=4kHz)	$L_p$	dB(A)	70		
Mass <sup>3)</sup>	$m$	kg	37	49	60
Ambient temperature		°C	0° to 45°		
Insulation classification DIN VDE 0530 section 1			F		
Balance class <sup>4)</sup> DIN ISO 2373	)		R, S, S1		R, S
<sup>1)</sup> Values determined as per DIN VDE 0530, section 1 Characteristic operating curves are available for the listed nominal rates to help in the selection of the AC main spindle motor. These take operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brake. <sup>3)</sup> Values without holding brake, with blower. <sup>4)</sup> See Figure 2.7 "Vibrations in mm/s" for values.					

Fig. 3.1: Nominal data 2AD100

Permissible shaft load

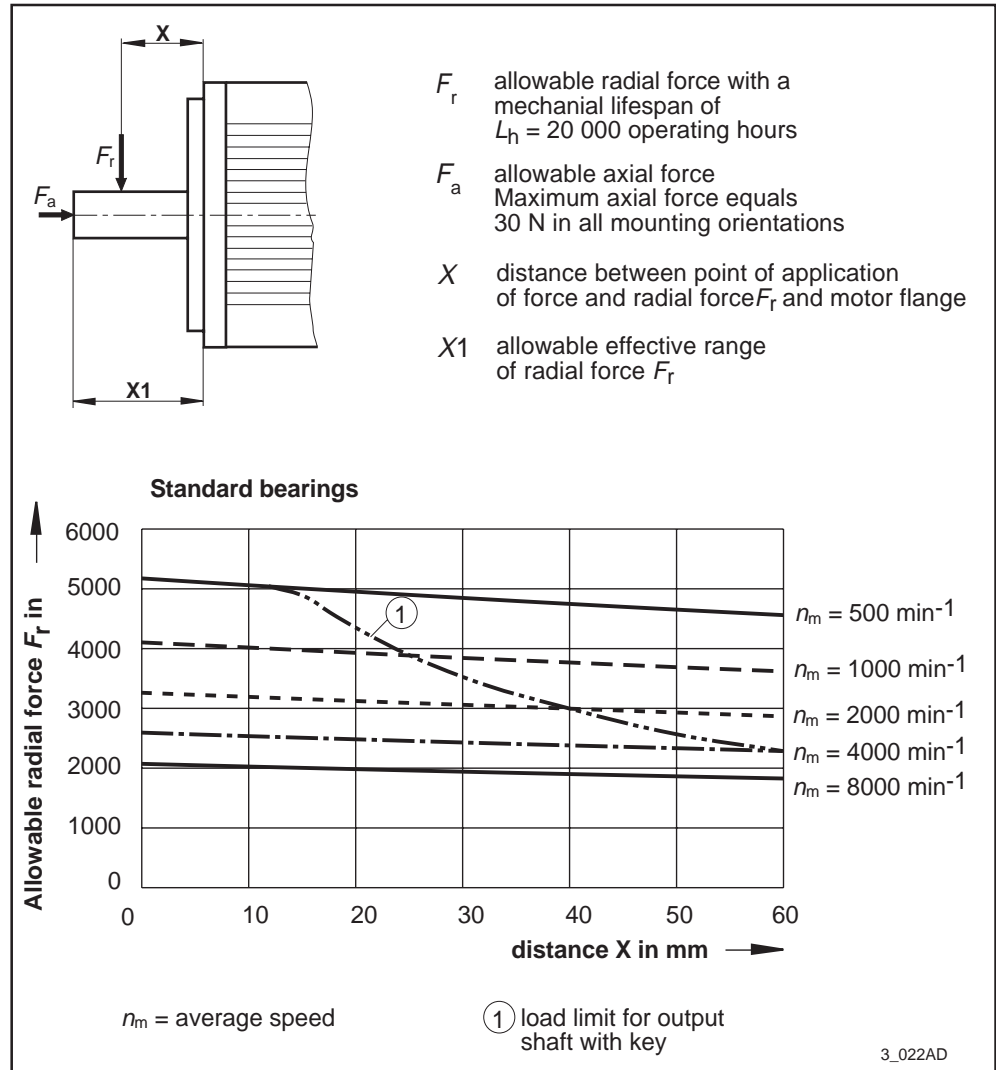


Fig. 3.2: Permissible shaft load 2AD100

Lubricant consumption

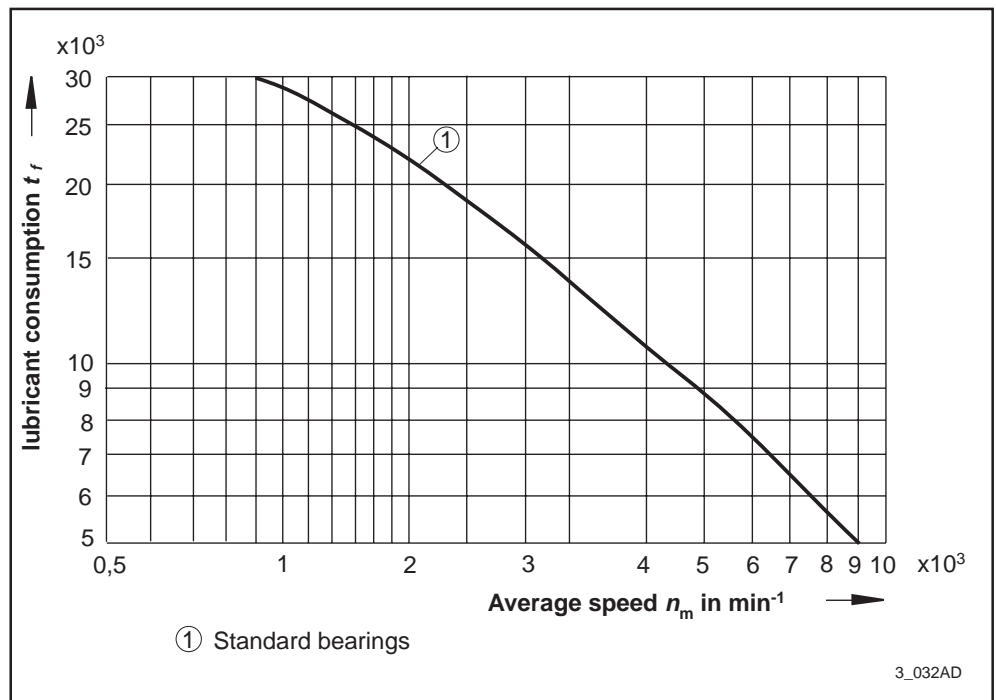


Fig. 3.3: Lubricant consumption duration 2AD100

### 3.2. Holding brake

Designation	Symbol	Unit	Version	
			electrically engaged	electrically released
Operating principle			electrically engaged	electrically released
Holding torque	$M_h$	Nm	30	24
Nominal terminal voltage	$U_n$	V	24 ± 10%	
Nominal current	$I_n$	A	0.9	
Moment of inertia	$J_B$	kgm <sup>2</sup>	0.0007	
Maximum braking energy	$W_{max}$	Ws	20,000	
Maximum speed	$n_{max}$	min <sup>-1</sup>	9,000 <sup>1)</sup>	
Release delay	$t_l$	ms	50	100
Clamping delay	$t_k$	ms	50	60
Mass	$m$	kg	1,5	
<p><sup>1)</sup> In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor moment of inertia  <math>J_B</math> holding brake moment of inertia  <math>J_L</math> load moment of inertia, reduced (attachments to output shaft) </p>				

Fig. 3.4: Technical data of holding brake for 2AD100

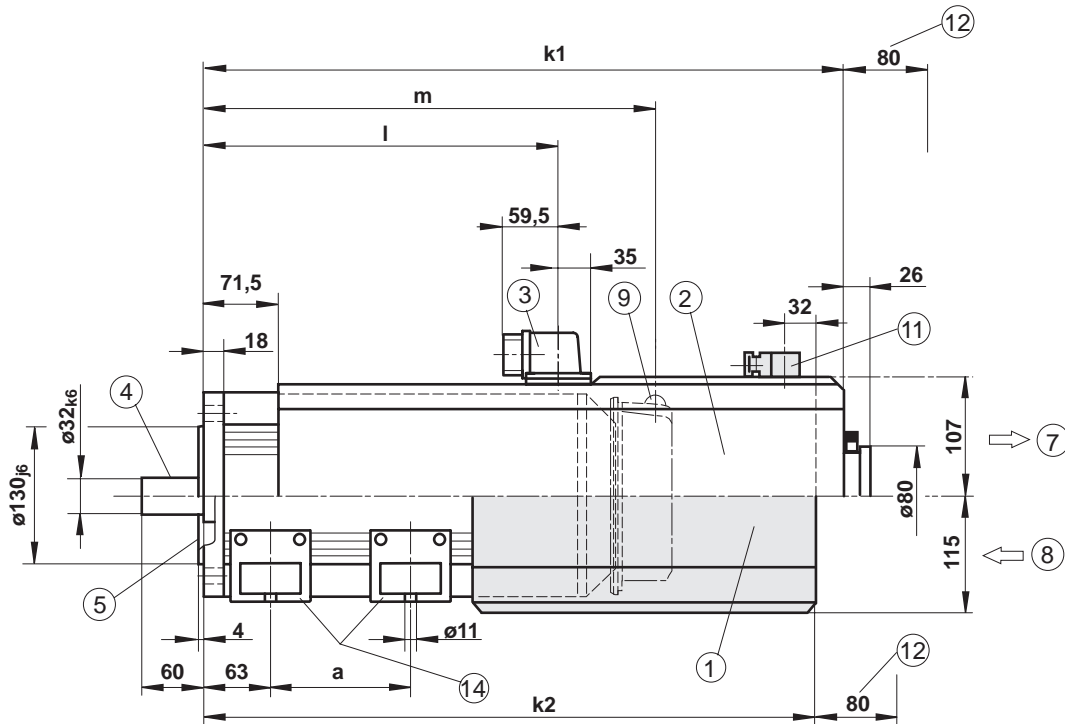
### 3.3 Motor blower

Designation	Symbol	Unit	Version		
			axial blower		radial blower
Air current			B → A blowing <small>recommended</small>	A → B suction	B → A blowing
Power consumption	$S_N$	VA	60	70	60
Nominal voltage	$U_N$	V	230 or 115V, 50/60 Hz, ±10%		
Average air volume	$V$	m <sup>3</sup> /h	230		

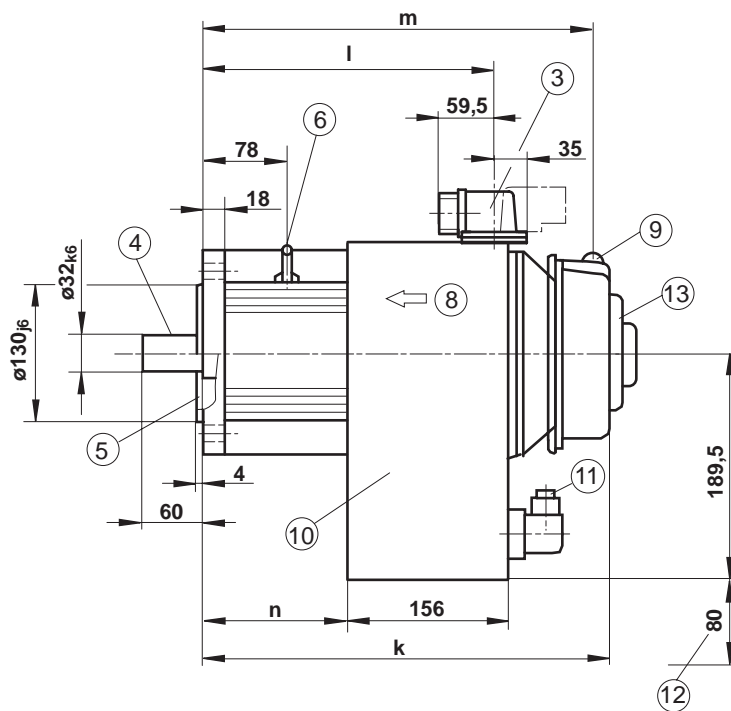
Fig. 3.5: Technical data of motor blower for 2AD100

### 3.4. Dimensional data

Motor with axial blower and feedback types 3, B05, B35

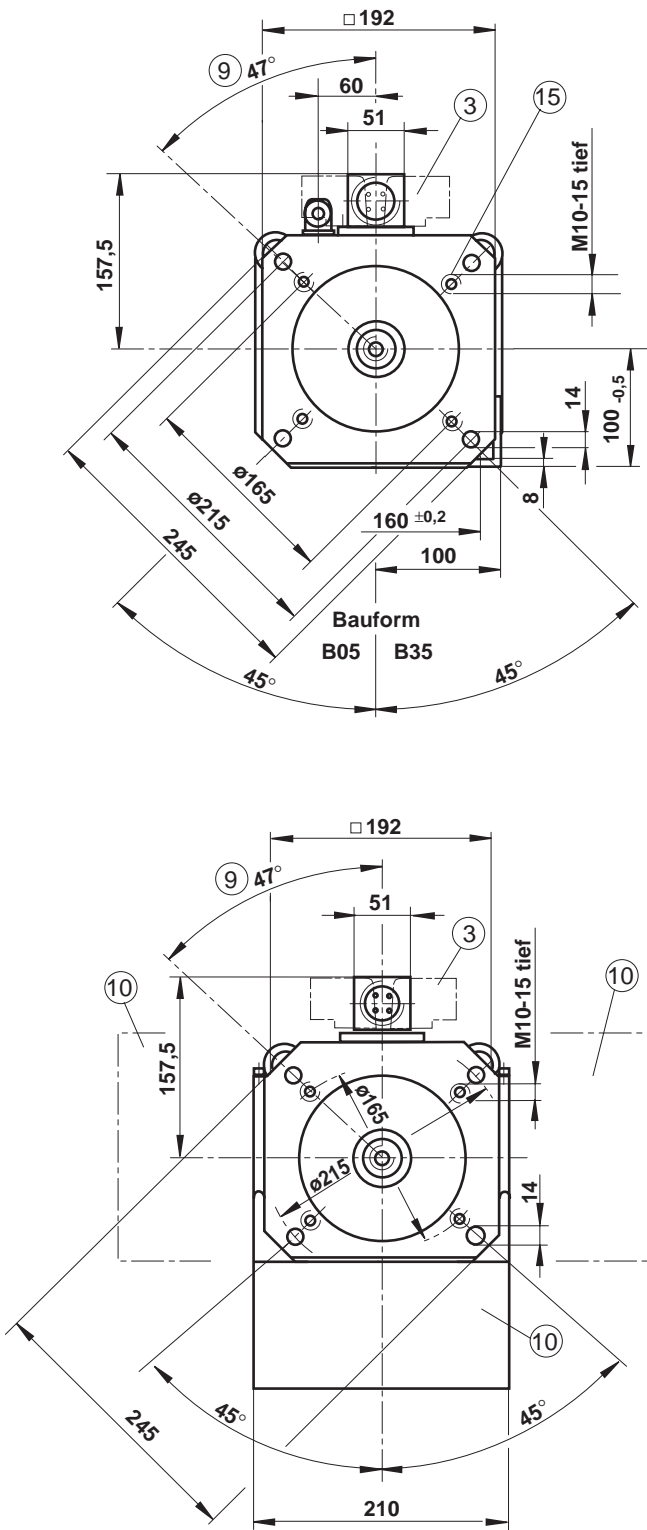


Motor with radial blower and feedback types 3, B05



3\_06100A





For available version see Fig. 3.10 - type codes

Fig. 3.6: Dimensional data 2AD100

Dim.:	2AD100B	2AD100C	2AD100D
k1	538	613	688
k2	507	582	657
k	370	445	520
l	256	331	406
m	348,5	423,5	498,5
n	120	100	175
a	80	140	215

- ① Axial blower air stream B → A blowing  
Blower connection: connector turnable by 90°
- ② Axial blower air flow A → B suction  
Blower connection: terminal box with cable threaded joint.
- ③ Power connection
- ④ Plain shaft end tolerance  
DIN 42955 - R  
center drill hole on front  
DIN 332 - DS M8x19
- ⑤ flange dimensions per  
DIN 42948
- ⑥ ring screw M8 - DIN 580
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type 3  
(flange socket), arranged per position  
of power connection
- ⑩ Radial blower;  
position of radial blower may  
not be the same as power connection
- ⑪ motor blower connection:  
connector turnable by 90°
- ⑫ Mounting distance (minimum  
for pulling in ventilating air)
- ⑬ B side shaft end, for dim.  
see Fig. 3.8
- ⑭ B35 (Flange and foot mounting)  
only with axial blower air flow B → A
- ⑮ thread holes for mounting type  
B14 (Standard)

**Tolerances:**

Dim. to	6	30	120	400	1000	2000
<b>Tolerance</b>	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

3\_06100B

### 3. Technical data - 2AD 100

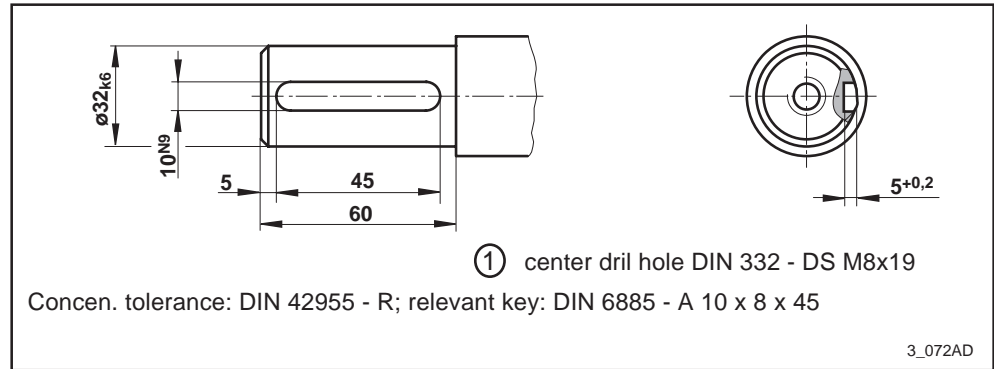


Fig. 3.7: Output shaft with key for 2AD100

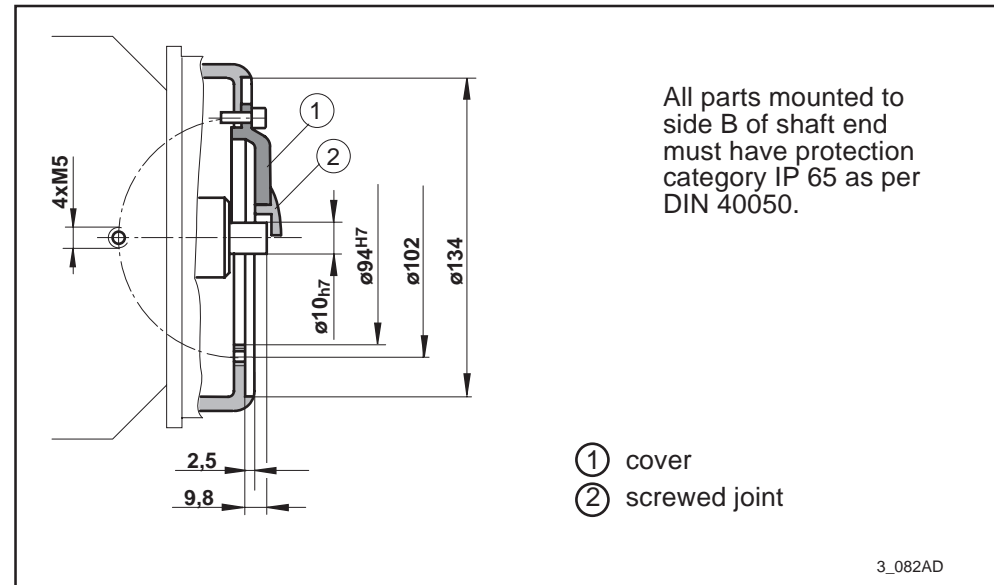


Fig. 3.8: Side B shaft end 2AD100

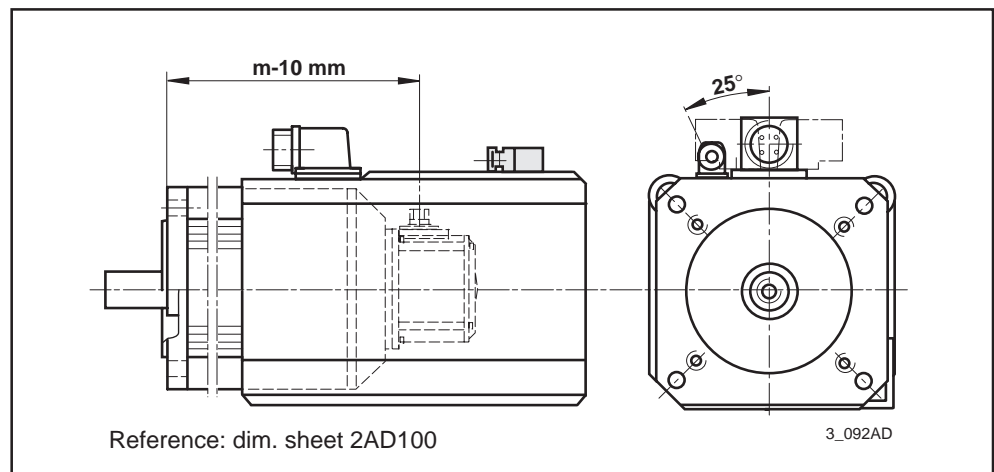


Fig. 3.9: 2AD100 with feedback types 6, 7

### 3.5. Type codes

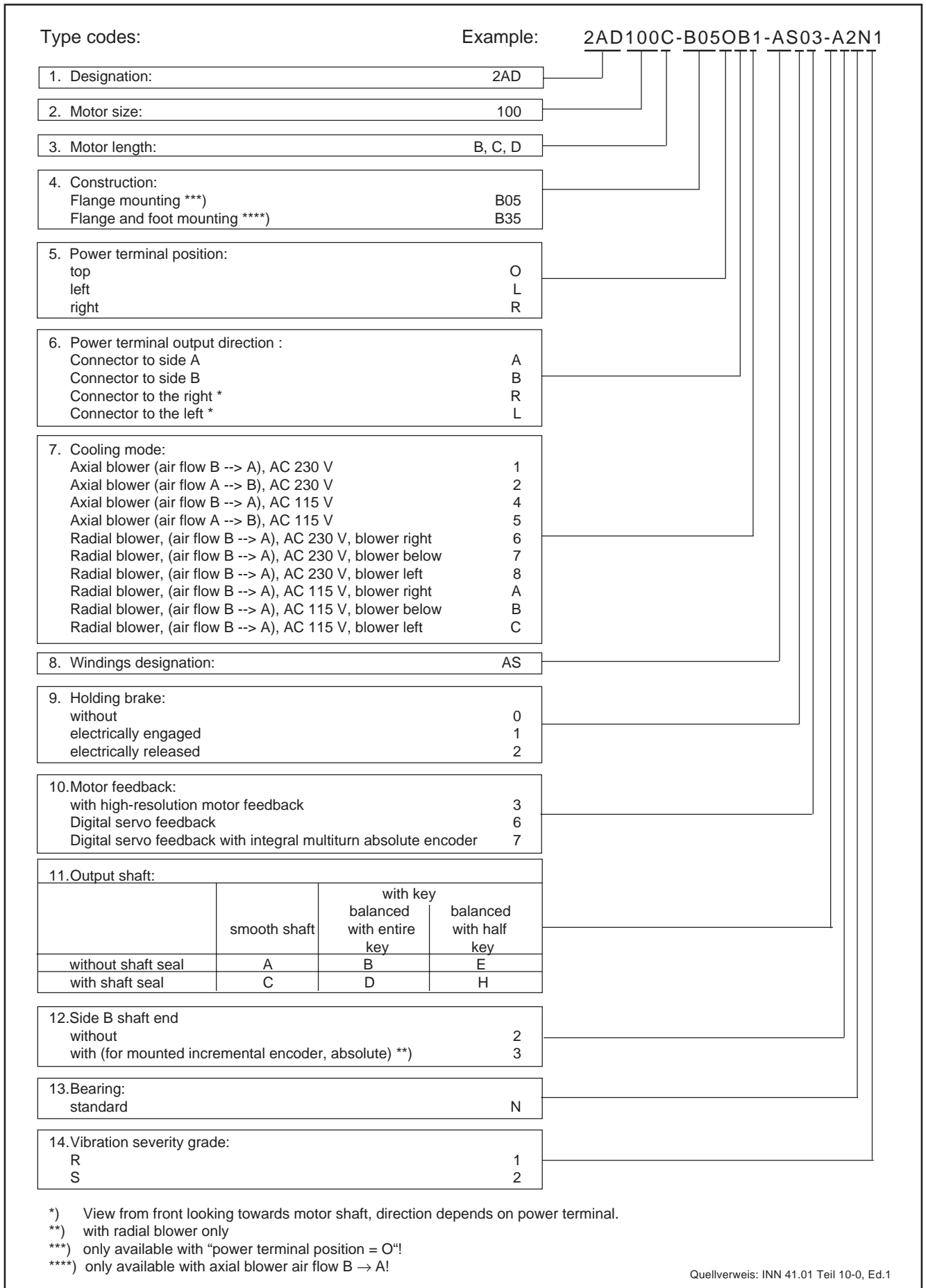


Fig. 3.10: Type codes 2AD100

Notes

## 4. Technical data - 2AD 101

### 4.1 Nominal data

Designation	Symbol	Unit	2AD101		
			C	D	
Motor size			C	D	
Windings designation			BD		BS
Nominal power <sup>1)</sup>	$P_n$	kW	7.5	9.5	
Nominal torque <sup>1)</sup>	$M_n$	Nm	48	60	
Base motor speed	$n$	min <sup>-1</sup>	1500		
Peak speed	$n_{max}$	min <sup>-1</sup>	9000		
Nominal current	$I_n$	A <sub>eff</sub>	37	42	31
Nominal voltage	$U_n$	V <sub>eff</sub>	166	187	259
Rotor inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0.021	0.028	
Thermal time constant	$t_{th}$	min	40	45	
Min. connection cross section EN 60204, part 1 / 2/86	$A$	mm <sup>2</sup>	10		
Average sound pressure level at 1 meter (PWM=4kHz)	$L_p$	dB(A)	70		
Mass <sup>3)</sup>	$m$	kg	49	60	
Ambient temperature		°C	0° to 45°		
Insulation classification DIN VDE 0530 Teil 1			F		
Balance class <sup>4)</sup> DIN ISO 2373			R, S, S1	R, S	
<sup>1)</sup> Values determined as per DIN VDE 0530, section 1 Characteristic operating curves are available for the listed nominal rates to help in the selection of the AC main spindle motor. These take operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brake. <sup>3)</sup> Values without holding brake, with blower. <sup>4)</sup> See Figure 2.7 "Vibrations in mm/s" for values.					

Fig. 4.1: Nominal data 2AD101

Permissible shaft load

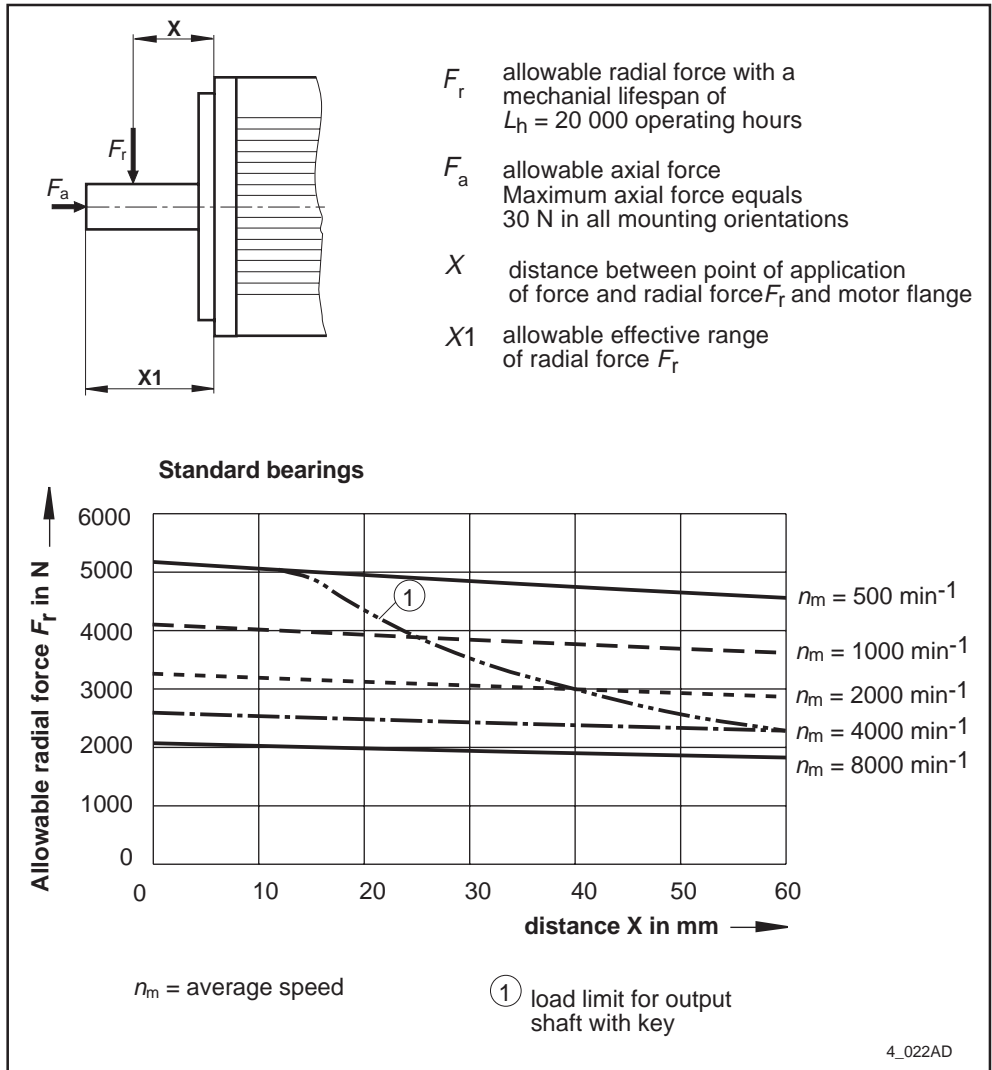


Fig. 4.2: Permissible shaft load 2AD101

Lubricant consumption

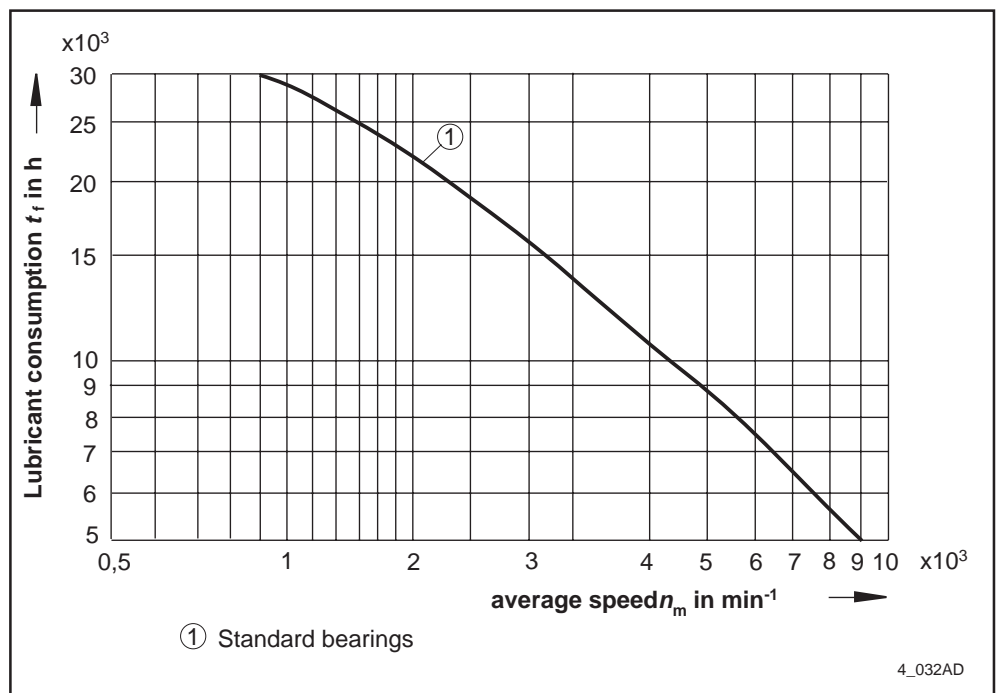


Fig. 4.3: Lubricant consumption duration 2AD101

### 4.2. Holding brake

Designation	Symbol	Unit	Version	
			electrically engaged	electrically released
Operating principle			30	24
Holding torque	$M_h$	Nm	30	24
Nominal terminal voltage	$U_n$	V	24 ± 10%	
Nominal current	$I_n$	A	0.9	
Moment of inertia	$J_B$	kgm <sup>2</sup>	0.0007	
Maximum braking energy	$W_{max}$	Ws	20,000	
Peak speed	$n_{max}$	min <sup>-1</sup>	9000 <sup>1)</sup>	
Release delay	$t_l$	ms	50	100
Clamp delay	$t_k$	ms	50	60
Mass	$m$	kg	1,5	
<p><sup>1)</sup> In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor inertia  <math>J_B</math> holding brake inertia  <math>J_L</math> load inertia                      (attachments to the output shaft)                 </p>				

Fig. 4.4: Technical data of holding brake for 2AD101

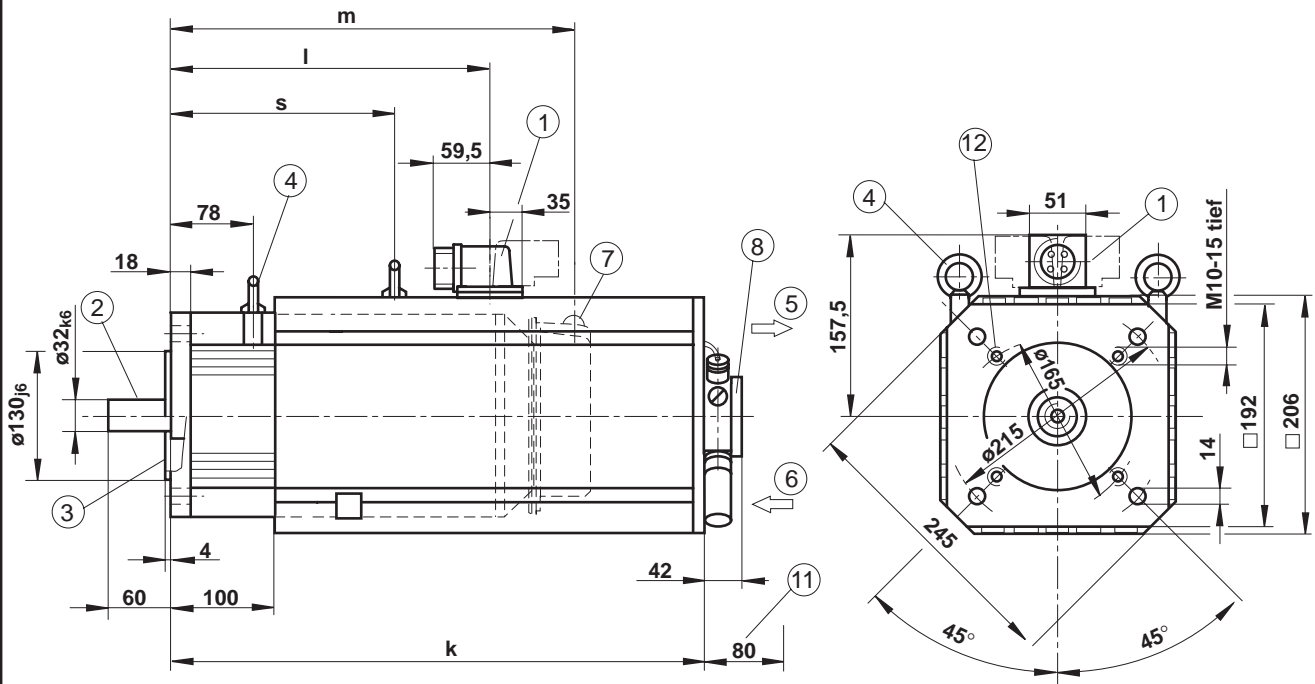
### 4.3. Motor blower

Designation	Symbol	Unit	Version		
			Axial blower		
Air current			B → A blowing recommended	A → B suction	A → B suction
Power consumption	$S_N$	VA	50		55
Nominal voltage	$U_N$	V	230V, 50/60Hz±10%		115V, 50/60Hz±10%
Average air volume	$V$	m <sup>3</sup> /h	460		

Fig. 4.5: Technical data of motor blower for 2AD101

### 4.4 Dimensional data

#### Motor with axial blower and feedback types B05



- ① Power connection
- ② Plain shaft end tolerance  
DIN 42955 - R  
center drill hole on front  
DIN 332 - DS M8x19
- ③ flange dimensions per  
DIN 42948
- ④ ring screw M8 - DIN 580
- ⑤ air flow A → B
- ⑥ air flow B → A
- ⑦ Motor feedback connection type 3  
(flange socket), arranged per position  
of power connection
- ⑧ motor blower connection:  
connector turnable by 90°
- ⑨ Motor blower connection
- ⑩ output shaft with key;  
concen. tolerance: DIN 42955 - R;  
corresponding keyway:  
DIN 6885 - A 10 x 8 x 45
- ⑪ Mounting distance (minimum  
for pulling in ventilating air)
- ⑫ thread holes for mounting type  
B14 (Standard)

Dim.:	2AD101C	2AD101D
k	565	640
l	331	406
m	424,5	499,5
s	241	316

**Tolerances:**

Dim. to	6	30	120	400	1000	2000
<b>Tolerance</b>	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

For available version see Fig. 4.7 - type codes

4\_06101

Fig. 4.6: Dimensional data 2AD101



### 4.5 Type codes

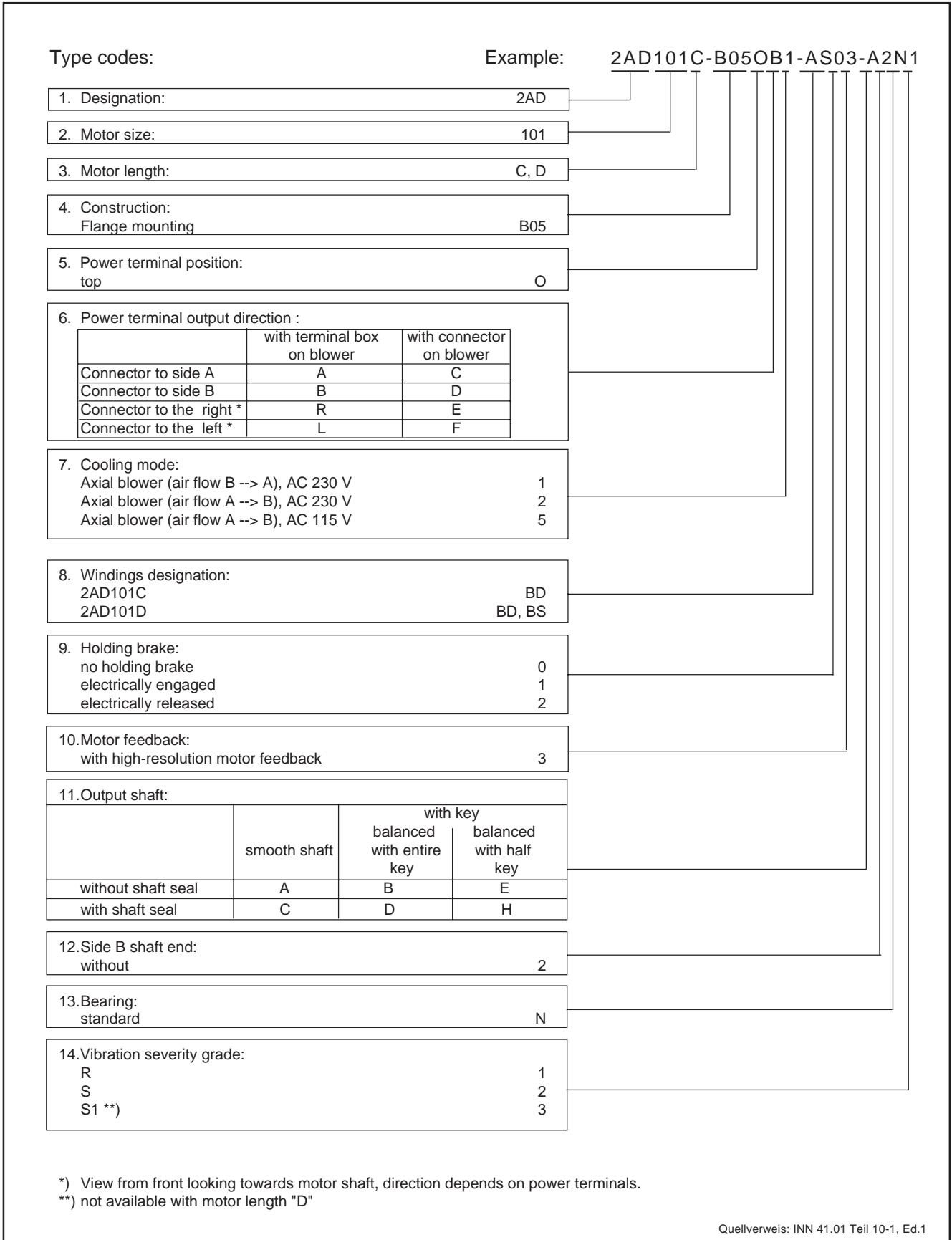


Fig. 4.7: Type codes 2AD101

Notes

## 5. Technical data 2AD104

### 5.1 Nominal data

Designation	Symbol	Unit	2AD132			
			B	C	D	
Motor size			B	C	D	
Windings designation			CS	ES	FS	
Nominal power <sup>1)</sup>	$P_n$	kW	4,5	7,5	10,0	10,0
Nominal torque <sup>1)</sup>	$M_n$	Nm	29	48	64	
Base motor speed	$n$	min <sup>-1</sup>	1500			
Peak speed	$n_{max}$	min <sup>-1</sup>	9000			
Nominal current	$I_n$	A <sub>eff</sub>	12,0	19,9	22,3	28,4
Nominal voltage	$U_n$	V <sub>eff</sub>	330	321	390	303
Rotor inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0,014	0,021	0,028	
Thermal time constant	$t_{th}$	min	35	40	45	
Min. connection cross section of Indramat cables (INK...)	A	mm <sup>2</sup>	1,5	2,5	4	4
Average sound pressure level at 1 meter (PWM=4kHz)	$L_p$	dB(A)	70			
Mass <sup>3)</sup>	$m$	kg	37	49	60	
Ambient temperature		°C	0 ... 45			
Insulation classification DIN VDE 0530 Teil 1			F			
Balance class <sup>4)</sup> DIN ISO 2373			R, S, S1			R, S
<sup>1)</sup> Values determined as per DIN VDE 0530, section 1 Characteristic operating curves are available for the listed nominal rates to help in the selection of the AC main spindle motor. These take operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brake. <sup>3)</sup> Values without holding brake, with blower. <sup>4)</sup> See Figure 2.7 "Vibrations in mm/s" for values.						

Fig. 5.1: Nominal data 2AD104

Permissible shaft load

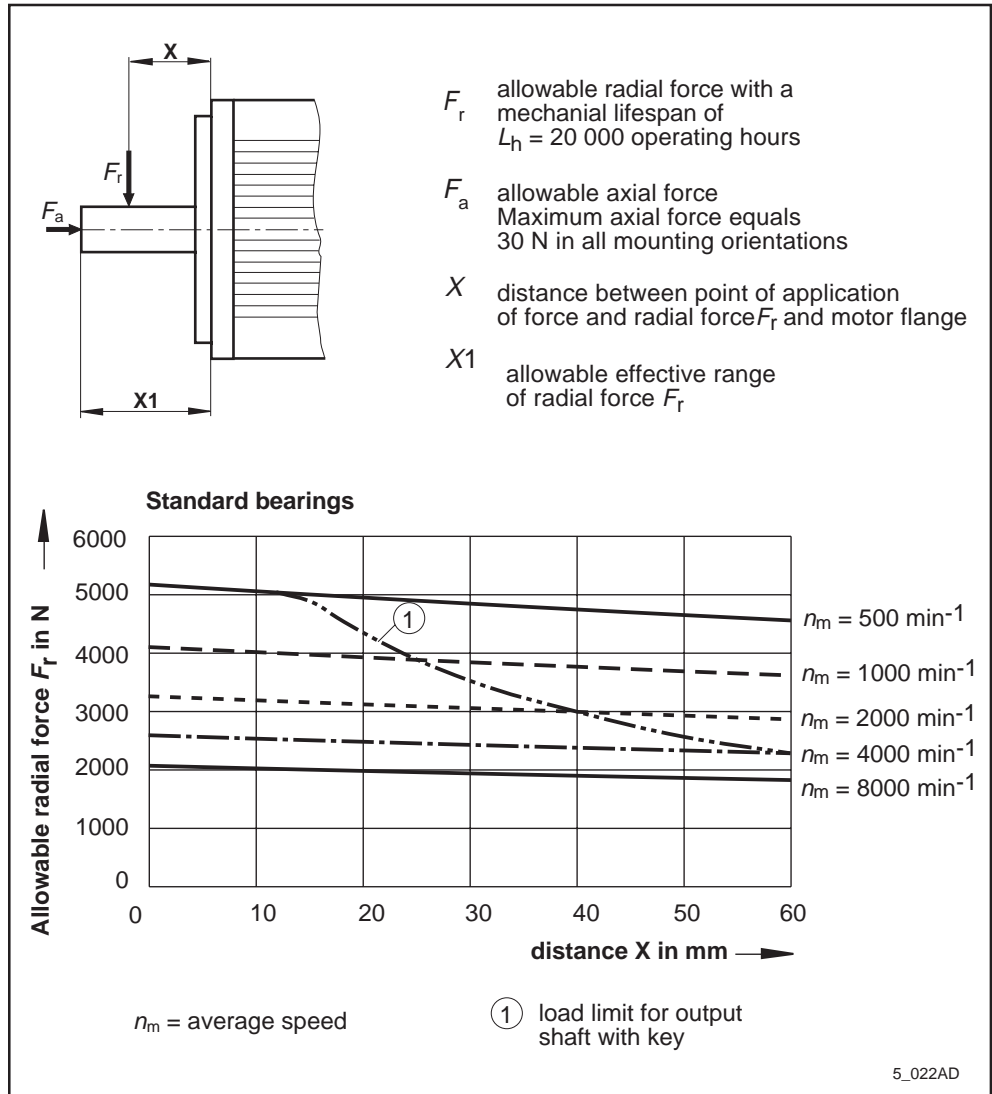


Fig. 5.2: Permissible shaft load 2AD104

Lubricant consumption

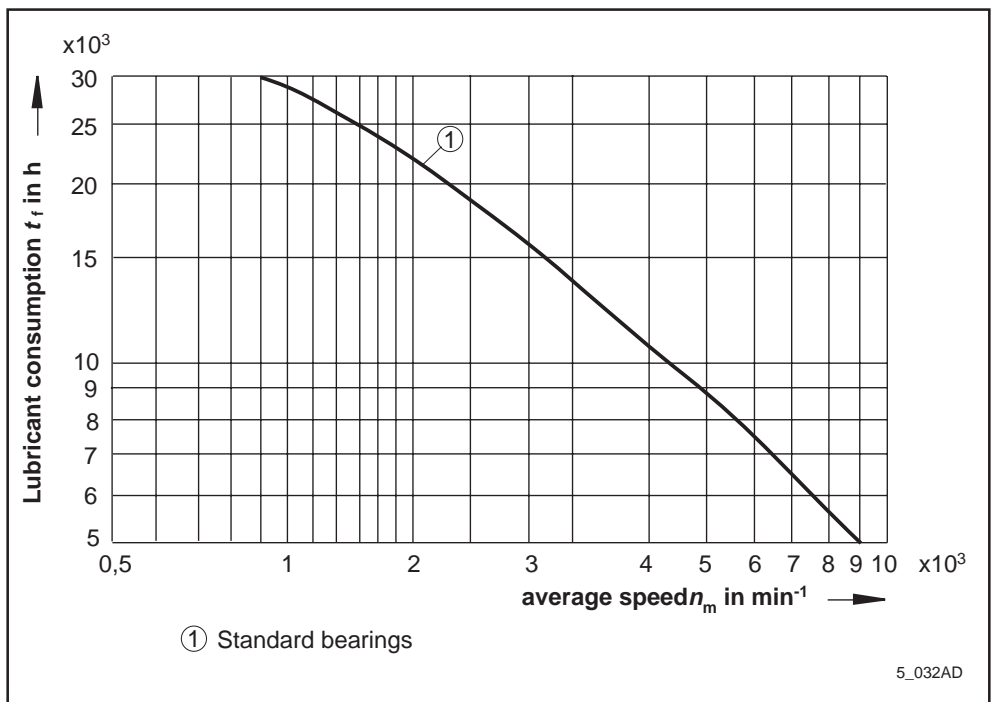


Fig. 5.3: Lubricant consumption duration 2AD104

## 5.2. Holding brake

Designation	Symbol	Unit	Version	
			electrically engaged	electrically released
Operating principle				
Holding torque	$M_h$	Nm	30	24
Nominal terminal voltage	$U_n$	V	24 ± 10%	
Nominal current	$I_n$	A	0,9	
Moment of inertia	$J_B$	kgm <sup>2</sup>	0,0007	
Maximum braking energy	$W_{max}$	Ws	20000	
Peak speed	$n_{max}$	min <sup>-1</sup>	9000 <sup>1)</sup>	
Release delay	$t_l$	ms	50	100
Clamp delay	$t_k$	ms	50	60
Mass	$m$	kg	1,5	
<p>1) In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor inertia  <math>J_B</math> holding brake inertia  <math>J_C</math> load inertia            (attachments to the output shaft)         </p>				

Fig. 5.4: Technical data of holding brake for 2AD104

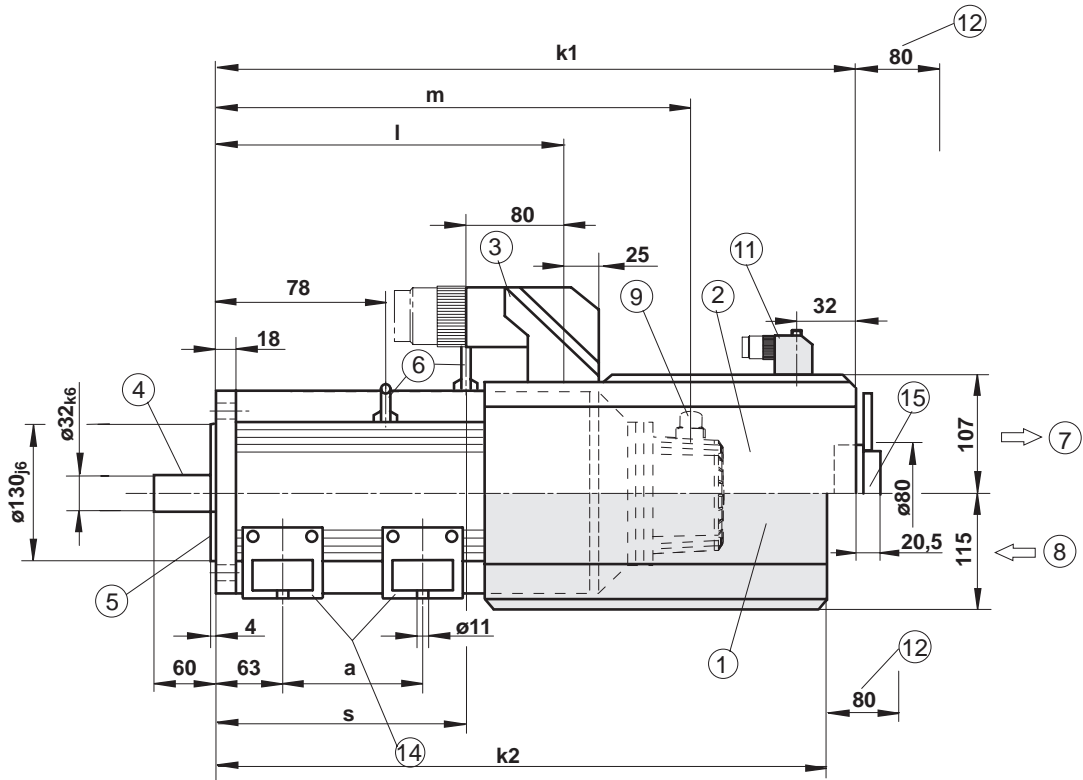
## 5.3 Motor blower

Designation	Symbol	Unit	Version		
			axial blower		radial blower
Air current			B → A blowing recommended	A → B suction	B → A blowing
Power consumption	$S_N$	VA	60	70	60
Nominal voltage	$U_N$	V	230 or 115V, 50/60 Hz, ±10%		
Average air volume	$V$	m <sup>3</sup> /h	230		

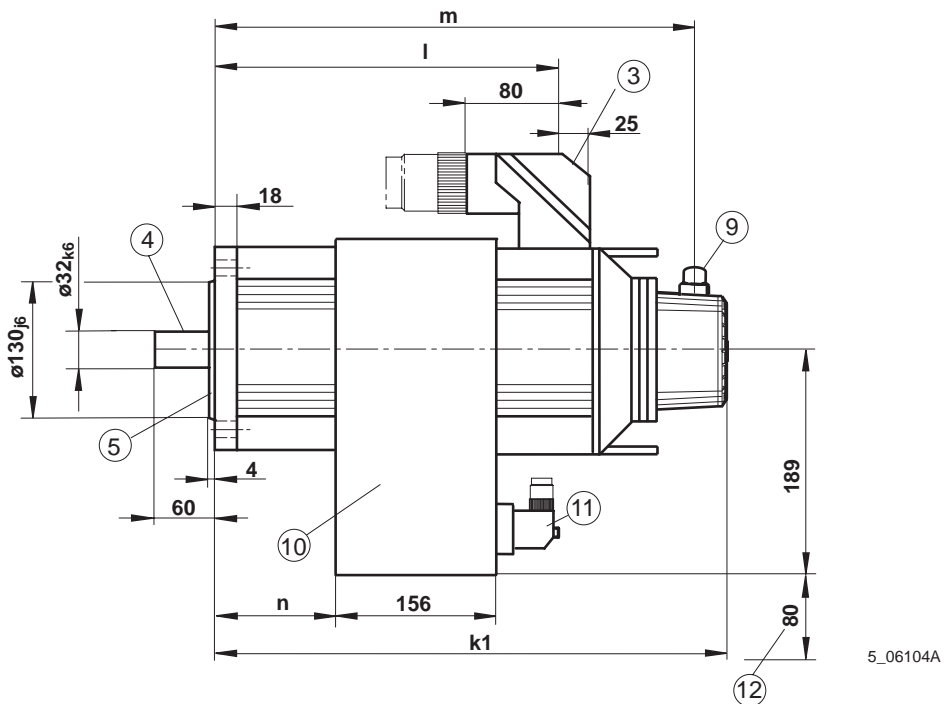
Fig. 5.5: Technical data of motor blower for 2AD104

### 5.4 Dimensional data

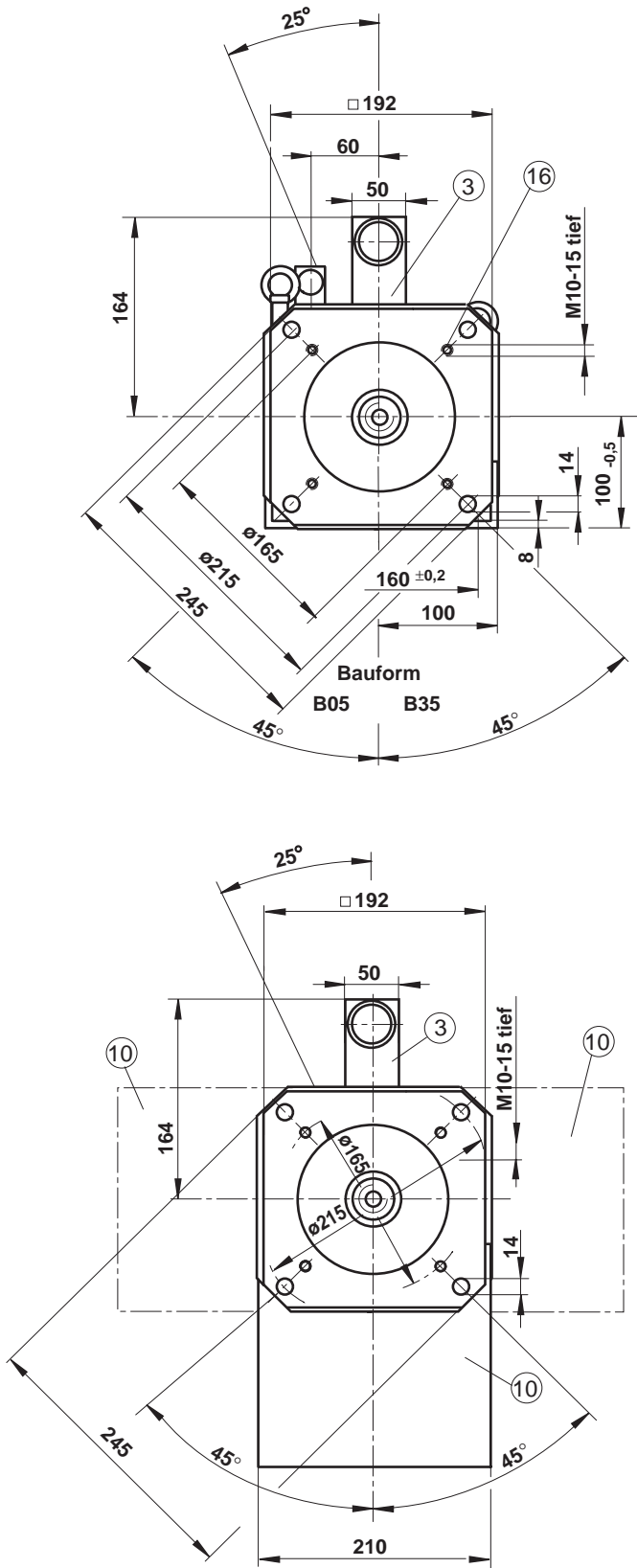
**Motor with axial blower, B05, B35**



**Motor with radial blower, B05**



5\_06104A



For available version see Fig. 5.8 - type codes

Dim.:	2AD104B	2AD104C	2AD104D
k1	538	613	688
k2	507	582	657
k	372	447	522
l	247	322	397
m	339	414	489
n	63	138	213
a	80	140	215
s	166	241	316

- ① Axial blower air stream B → A blowing  
Blower connection: connector turnable by 90°
- ② Axial blower air flow A → B suction  
Blower connection: terminal box with cable threaded joint.
- ③ Power connection
- ④ Plain shaft end tolerance  
DIN 42955 - R  
center drill hole on front  
DIN 332 - DS M8x19
- ⑤ flange dimensions per  
DIN 42948
- ⑥ ring screw M8 - DIN 580
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type 3  
(flange socket), arranged per position  
of power connection
- ⑩ Radial blower;  
position of radial blower may  
not be the same as power connection
- ⑪ motor blower connection:  
connector turnable by 90°
- ⑫ Mounting distance (minimum  
for pulling in ventilating air)
- ⑭ type B35 (flange and foot mounting)  
only with axial blower, air flow B → A
- ⑮ Motor blower connection with suction
- ⑯ thread holes for mounting type  
B14 (Standard)

**Tolerances:**

Dim. to	6	30	120	400	1000	2000
<b>Tolerance</b>	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

5\_06104B

Fig. 5.6: Dimensional data 2AD104

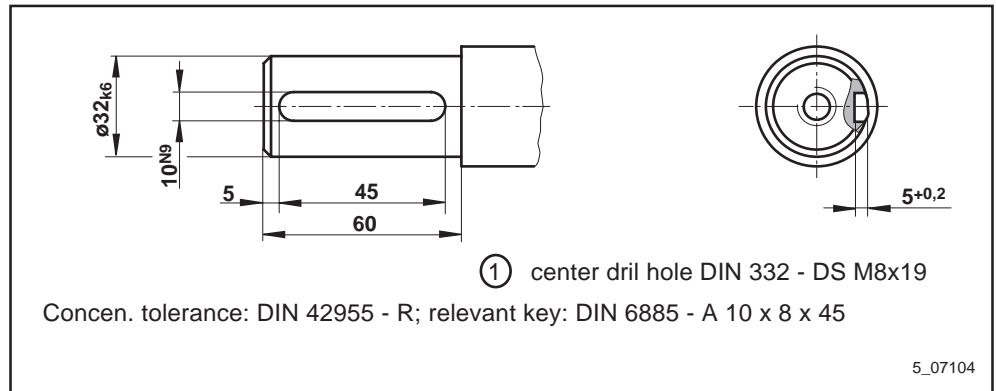


Fig. 5.7: Output shaft with key for 2AD104



### 5.5 Type codes

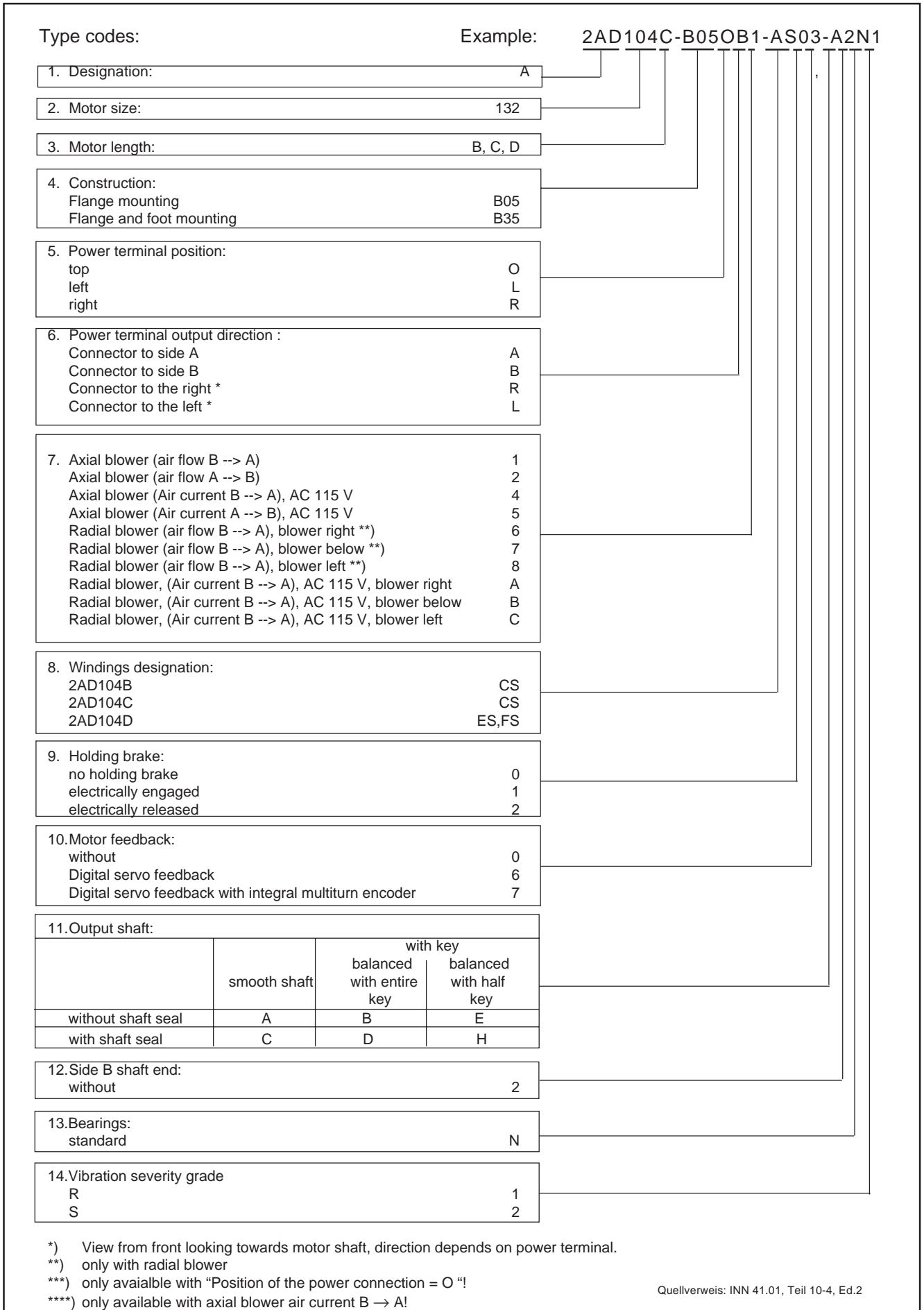


Fig. 5.8: Type codes 2AD104

Notes

## 6. Technical data - 2AD 132

### 6.1 Nominal data

Designation	Symbol	Unit	2AD132					
			B		C		D	
Motor size			B		C		D	
Windings designation			DS	BS		CS	BD	AS
Nominal power <sup>1)</sup>	$P_n$	kW	10		15		22	
Nominal torque <sup>1)</sup>	$M_n$	Nm	64		96		140	
Base motor speed	$n$	min <sup>-1</sup>	1500					
Peak speed	$n_{max}$	min <sup>-1</sup>	7500					
Nominal current	$I_n$	A <sub>eff</sub>	30	45	65	39	80	54
Nominal voltage	$U_n$	V <sub>eff</sub>	258	168	167	279	217	290
Rotor inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0.054		0.076		0.118	
Thermal time constant	$t_{th}$	min	45		50		55	
Min. connection cross section EN 60204, part 1 / 2/86	A	mm <sup>2</sup>	10	16	10	25	16	
Average sound pressure level at 1 meter (PWM=4kHz)	$L_p$	dB(A)	75					
Mass <sup>3)</sup>	$m$	kg	90		115		135	
Ambient temperature		°C	0 ... 45					
Insulation classification DIN VDE 0530 Teil 1			F					
Balance class <sup>4)</sup> DIN ISO 2373			R, S, S1					
<sup>1)</sup> Values determined as per DIN VDE 0530, section 1 Characteristic operating curves are available for the listed nominal rates to help in the selection of the AC main spindle motor. These take operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brake. <sup>3)</sup> Values without holding brake, with blower. <sup>4)</sup> See Figure 2.7 "Vibrations in mm/s" for values.								

Fig. 6.1: Nominal data 2AD132

Permissible shaft load

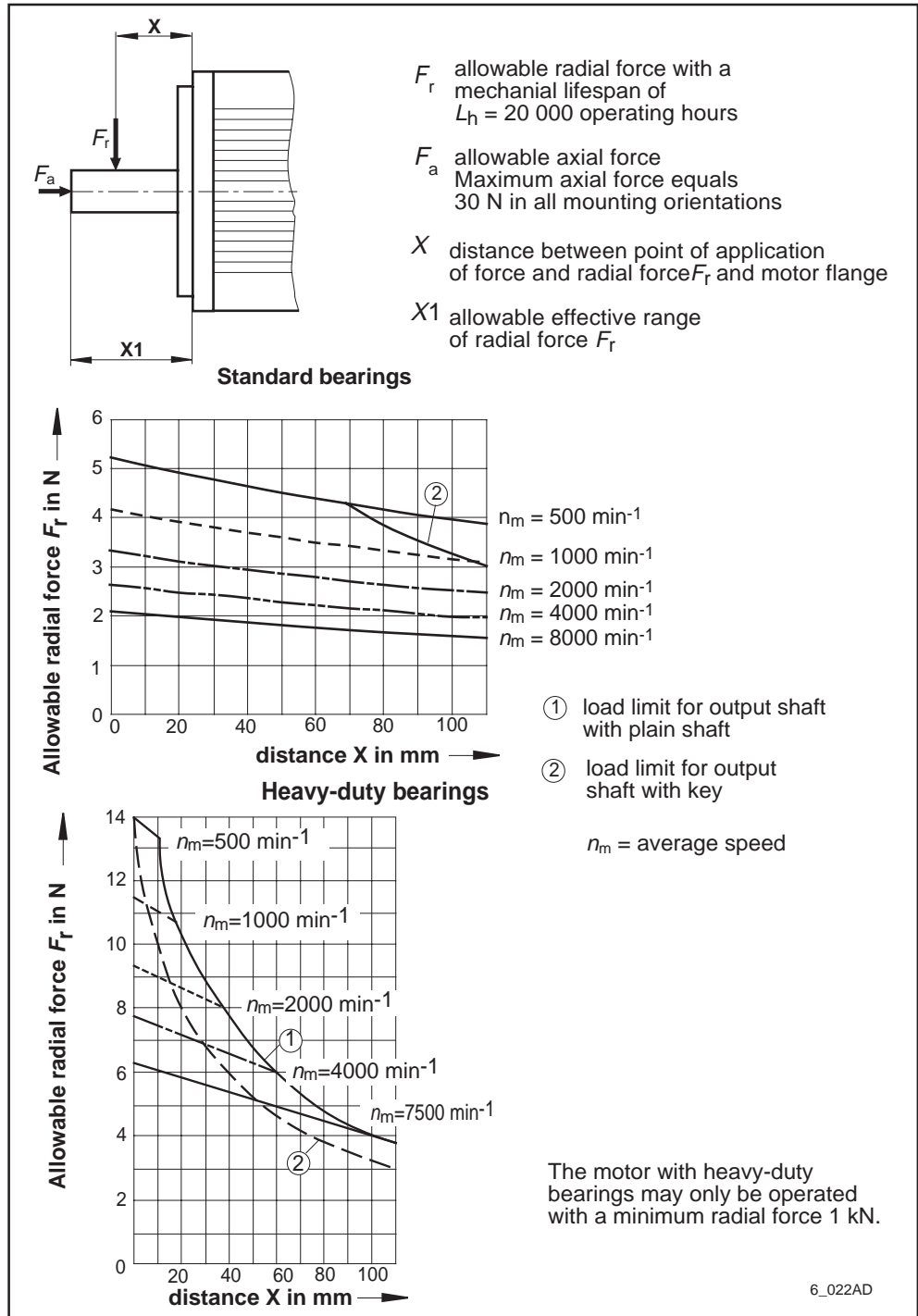


Fig. 6.2: Permissible shaft load 2AD132

Lubricant consumption

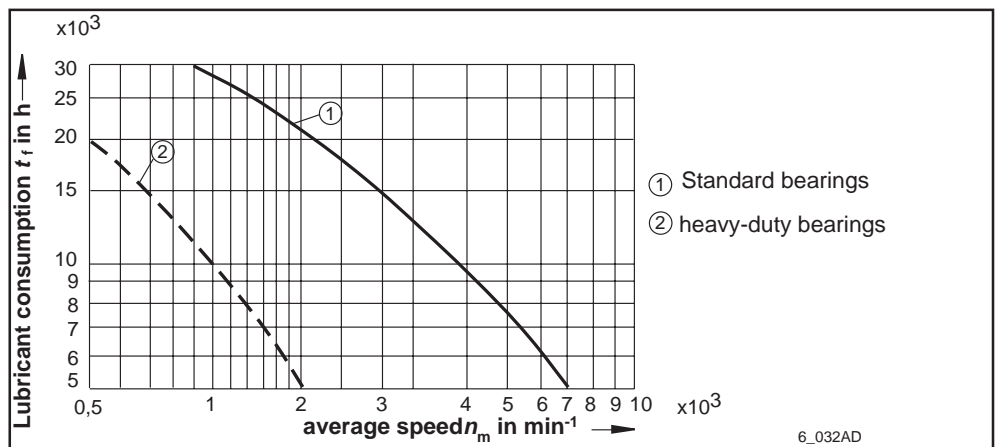


Fig. 6.3: Lubricant consumption duration 2AD132

## 6.2 Holding brake

Designation	Symbol	Unit	Version			
			electrically engaged	electrically released	electrically released heavy-duty	electrically released extra heavy-duty
Operating principle						
Holding torque	$M_h$	Nm	100	30	100	140
Nominal terminal voltage <sup>1)</sup>	$U_n$	V	24 ± 10%			
Nominal current	$I_n$	A	1.5	1.3	1.8	2,8
Moment of inertia	$J_B$	kgm <sup>2</sup>	0.002	0.0018	0.002	
Maximum braking energy	$W_{max}$	Ws	30000			
Peak speed	$n_{max}$	min <sup>-1</sup>	7500 <sup>1)</sup>			
Release delay	$t_l$	ms	140	120	110	
Clamp delay	$t_k$	ms	110	65	70	
Mass	$m$	kg	4			
<p><sup>1)</sup> In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor inertia  <math>J_B</math> holding brake inertia  <math>J_L</math> load inertia            (attachments to the output shaft))         </p>						

Fig. 6.4: Technical data of holding brake for 2AD132

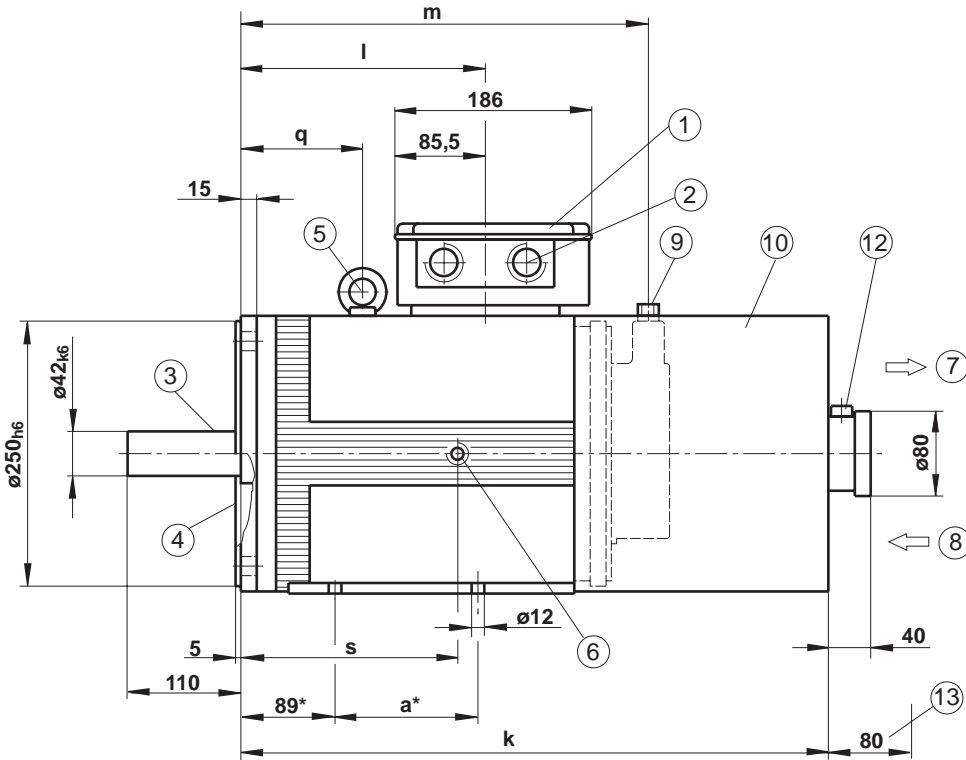
## 6.3 Motor blower

Designation	Symbol	Unit	Version		
			axial blower		radial blower
Air current			B → A blowing recommended	A → B suction	B → A blowing
Power consumption	$S_N$	VA	170 145		330
Nominal voltage	$U_N$	V	3 x 400 V, 50 Hz, ± 15 % 3 x 460 V, 60 Hz, ± 10 %		
Average air volume		V	m <sup>3</sup> /h		1000

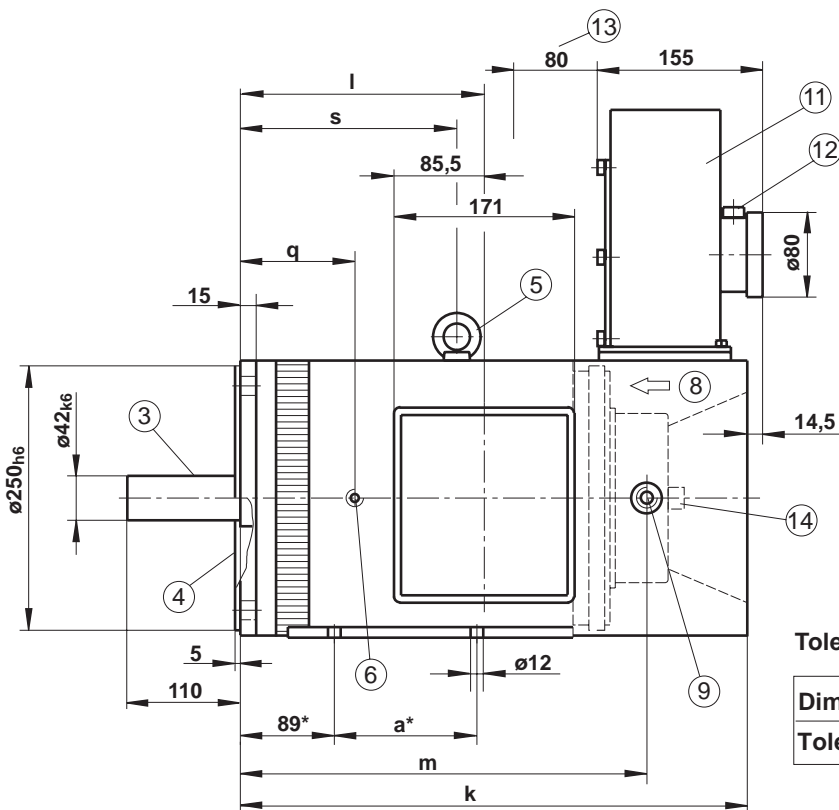
Fig. 6.5: Technical data of motor blower for 2AD132

### 6.4 Dimensional data

**Motor with axial blower and feedback type 3, B05, B35**



**Motor with radial blower and feedback type 3, B05, B35**



**Tolerances**

Dim. to	6	30	120	400	1000	2000
Tolerance	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

6\_06132A

Dim.:	2AD132B	2AD132C	2AD132D
a*	135	205	335
w/o hold. brake	555	625	755
k with hold. brake	617	687	817
w/ hold. brake heavy-duty	663	733	863
l	231	301	431
w/o hold. brake	384,5	454,5	584,5
m with hold. brake	446,5	516,5	646,5
w/ hold. brake heavy-duty	492,5	562,5	692,5
q	115	185	275
s	205	230	275

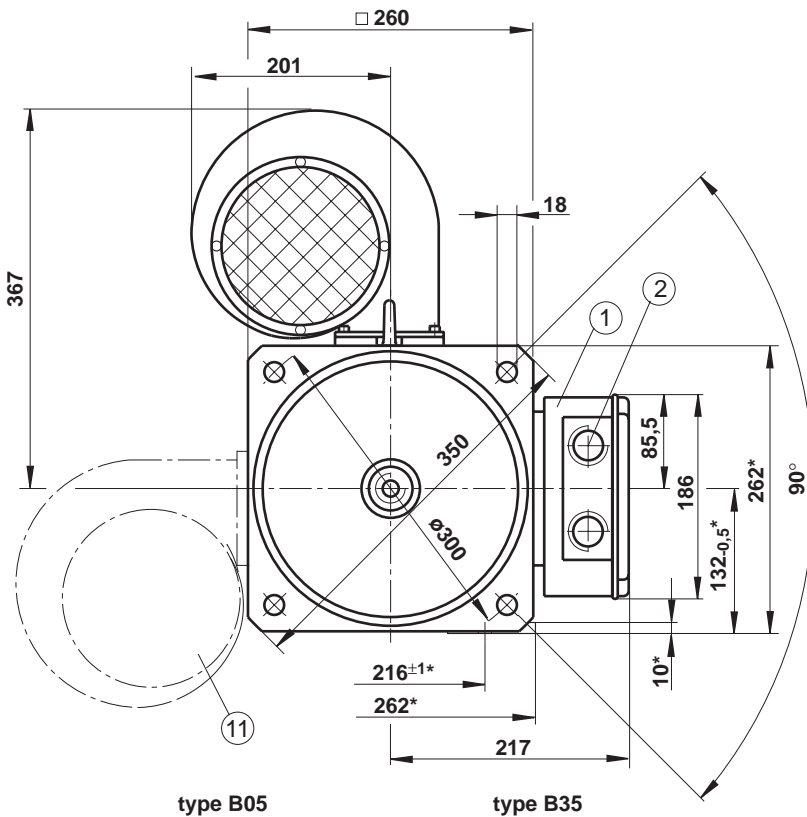
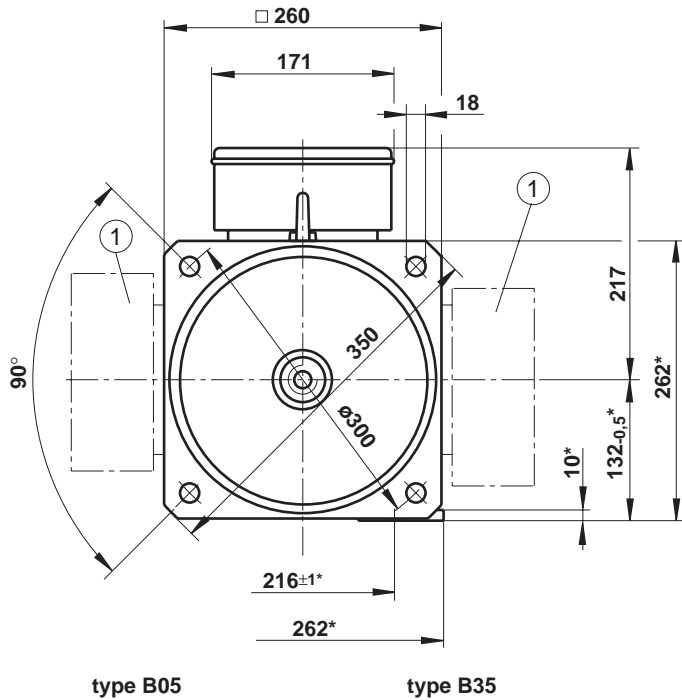
\* with foot mounting only, B35

- ① terminal box as power connection; arrangement can be selected, can be turned by 90 degrees, corresponds to output direction of power connection
- ② cable output: PG 29
- ③ plain shaft end concen. tolerance DIN 42955 - R on front center drill hole DIN 332 - DS M16x36
- ④ flange dimensions per DIN 42948
- ⑤ ring screw M10 - DIN 580
- ⑥ add. thread M10 for ring screw second thread opposite
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type 3 (flange socket), arranged per position of power connection
- ⑩ axial blower
- ⑪ Radial blower; position of radial blower may not be the same as power connection
- ⑫ Motor blower connection: terminal box with cable screw joint
- ⑬ Mounting distance (minimum for pulling in ventilating air)
- ⑭ B-side shaft end: see Fig. 6.9 for dimensions

Dim.	2AD132B	2AD132C	2AD132D
a*	135	205	335
w/o hold. brake	480	550	680
k with hold. brake	542	612	742
w/ hold. brake heavy-duty	588	658	176
l	231	301	431
w/o hold. brake	384,5	454,5	584,5
m with hold. brake	446,5	516,5	646,5
w/ hold. brake heavy-duty	492,5	562,5	692,5
q	115	185	275
s	205	230	275

\* Foot mounting only, B35

6\_06132B



For available version see Fig. 6.3 - type codes

Fig. 6.6: Dimensional data 2AD132

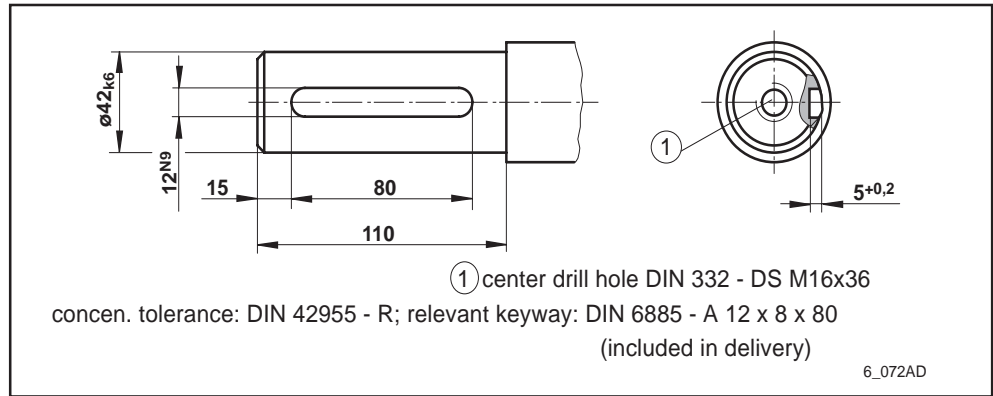


Fig. 6.7: Output shaft with key for 2AD132

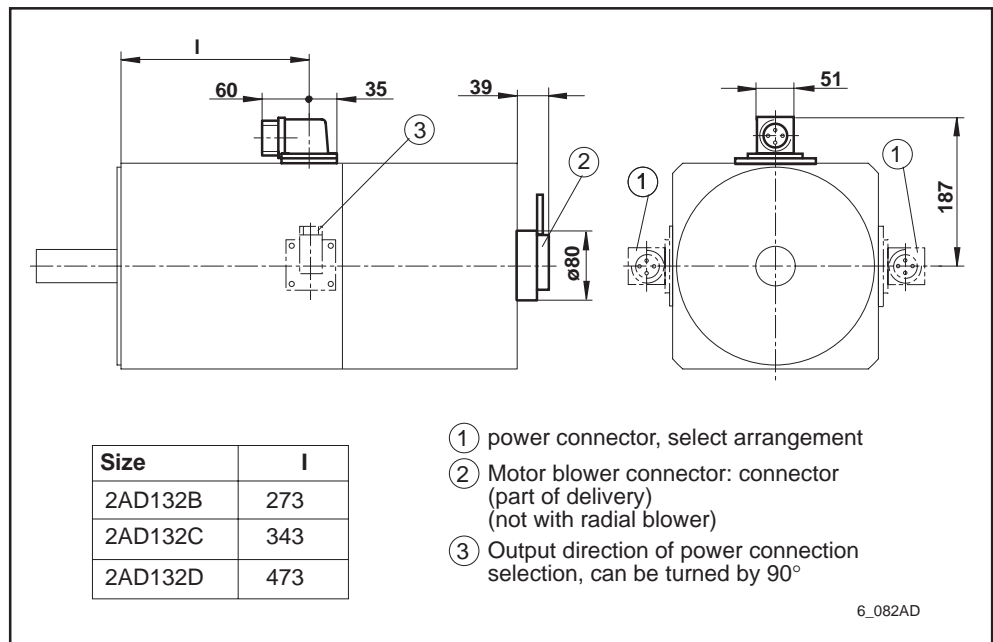


Fig. 6.8: Power connector 2AD132

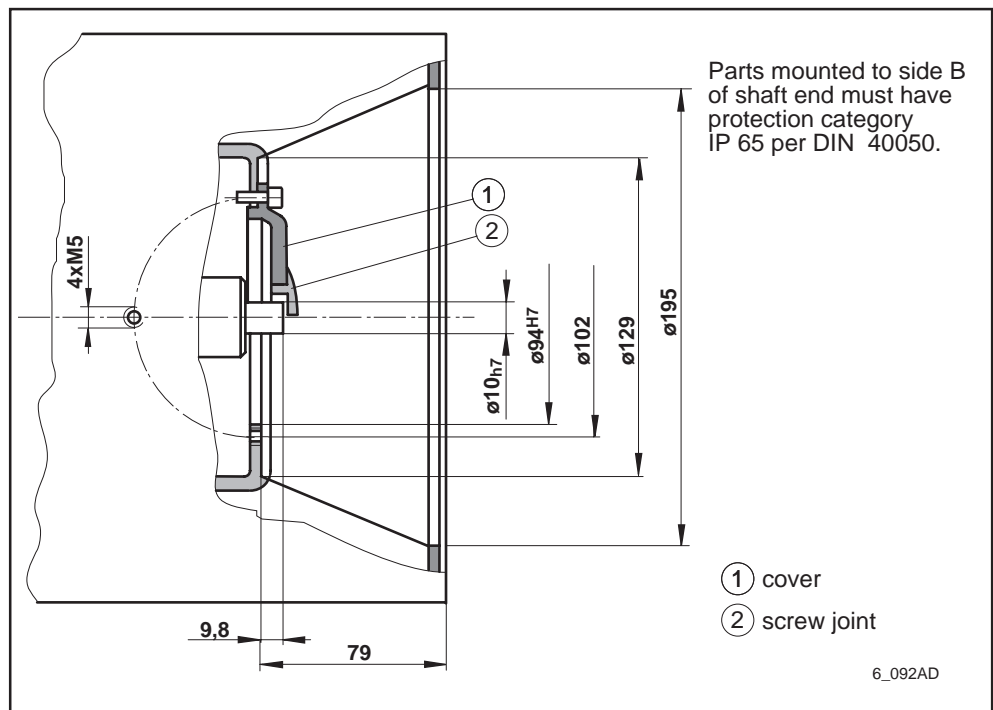
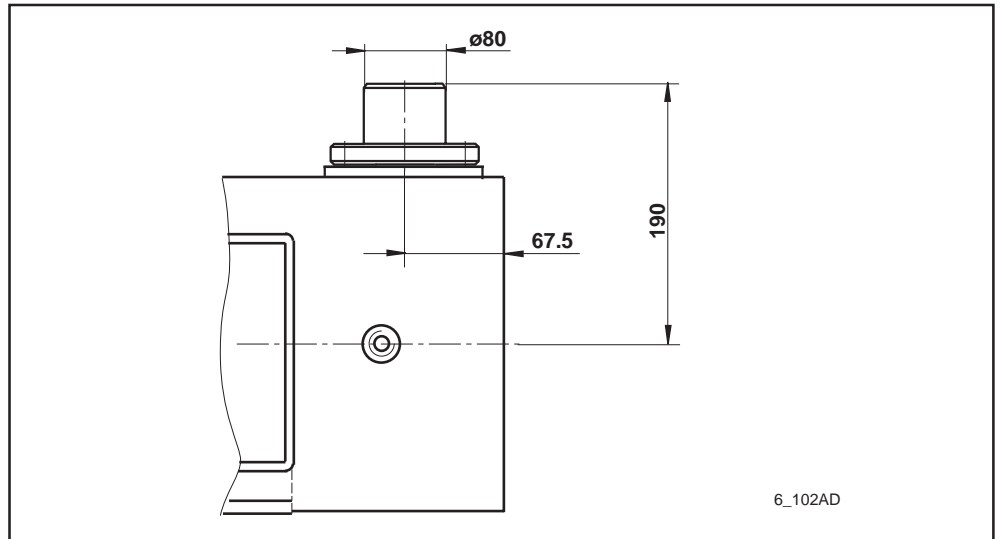


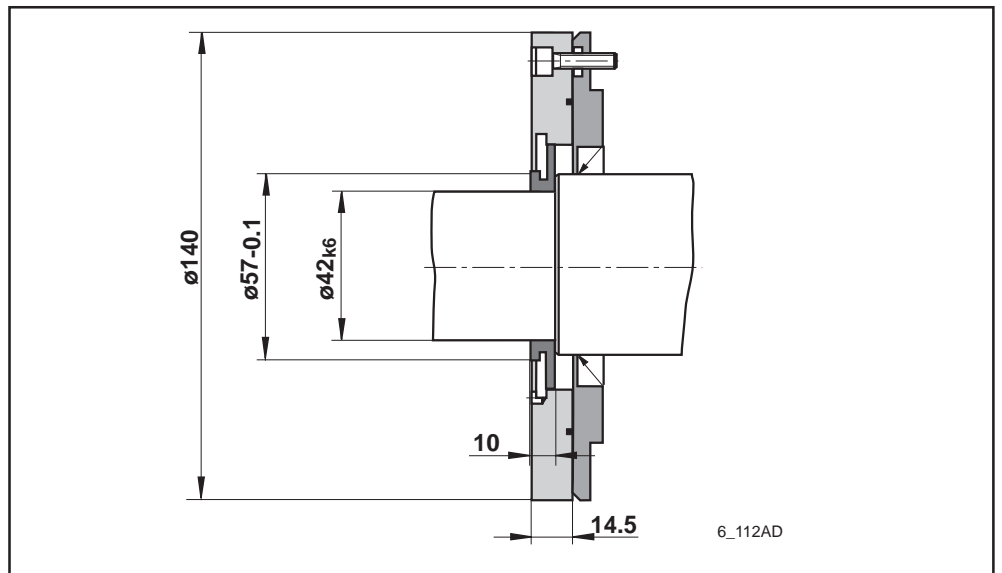
Fig. 6.9: Side B shaft end 2AD132





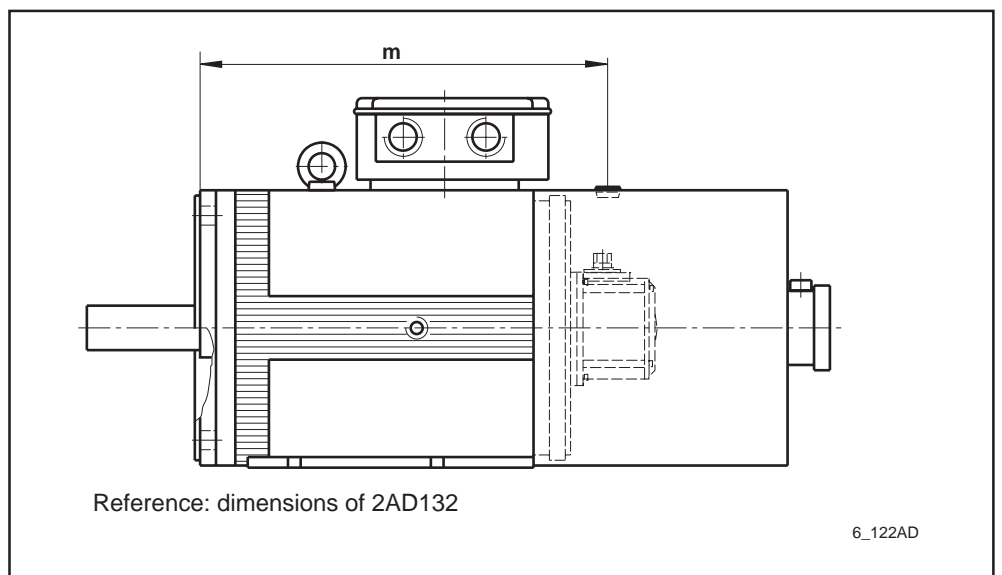
6\_102AD

Fig. 6.10: 2AD132 with accessories M01 mounted 2AD132/134 (blower support base)



6\_112AD

Fig. 6.11: 2AD132 with accessories M02 mounted 2AD132/134 (Labyrinth seal)



Reference: dimensions of 2AD132

6\_122AD

Fig. 6.12: 2AD132 with feedback types 6, 7

### 6.5 Type codes

Type codes:	Example:	2AD132C-B35OB1-BS03-A2N1															
1. Designation:	2AD	2AD															
2. Motor size:	132	132															
3. Motor length:	B, C, D	B															
4. Construction:	Flange mounting Flange and foot mounting	B05 B35															
5. Power terminal position:	top left right	O L R															
6. Power terminal output direction :	<table border="1"> <thead> <tr> <th></th> <th>terminal box connection (terminal box on blower)</th> <th>connector (connector on blower)</th> </tr> </thead> <tbody> <tr> <td>to side A</td> <td>A</td> <td>C</td> </tr> <tr> <td>to side B</td> <td>B</td> <td>-</td> </tr> <tr> <td>to the right *</td> <td>R</td> <td>E</td> </tr> <tr> <td>to the left *</td> <td>L</td> <td>F</td> </tr> </tbody> </table>		terminal box connection (terminal box on blower)	connector (connector on blower)	to side A	A	C	to side B	B	-	to the right *	R	E	to the left *	L	F	
	terminal box connection (terminal box on blower)	connector (connector on blower)															
to side A	A	C															
to side B	B	-															
to the right *	R	E															
to the left *	L	F															
7. Cooling mode:	Axial blower (air flow B --> A) Axial blower (air flow A --> B) Radial blower (air flow B --> A), blower top **) Radial blower (air flow B --> A), blower right **) Radial blower (air flow B --> A), blower below **) Radial blower (air flow B --> A), blower left **)	1 2 3 6 7 8															
8. Windings designation:	2AD132B 2AD132C 2AD132D	BS, DS BS, CS AS, BD															
9. Holding brake:	no holding brake electrically engaged electrically released electrically released, heavy-duty electrically released, extra heavy-duty	0 1 2 3 4															
10. Motor feedback:	with high-resolution motor feedback Digital servo feedback Digital servo feedback with integral multiturn absolute encoder	3 6 7															
11. Output shaft:	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th rowspan="2">smooth shaft</th> <th colspan="2">with key</th> </tr> <tr> <th>balanced with entire key</th> <th>balanced with half key</th> </tr> </thead> <tbody> <tr> <td>without shaft seal</td> <td>A</td> <td>B</td> <td>E</td> </tr> <tr> <td>with shaft seal</td> <td>C</td> <td>D</td> <td>H</td> </tr> </tbody> </table>		smooth shaft	with key		balanced with entire key	balanced with half key	without shaft seal	A	B	E	with shaft seal	C	D	H		
	smooth shaft			with key													
		balanced with entire key	balanced with half key														
without shaft seal	A	B	E														
with shaft seal	C	D	H														
12. Side B shaft end:	without with (for mounted encoder - incremental and absolute) ***)	2 3															
13. Bearings:	standard heavy-duty	N V															
14. Vibration severity grade	R S S1 ****)	1 2 3															

\*) View from front looking towards motor shaft, direction depends on power terminal.  
 \*\*) Position of blower may not be same as that of power terminal.  
 \*\*\*) Only available with radial blower and motor feedback "3"  
 \*\*\*\*) not available with heavy-duty bearings

Quellverweis: 41.01 Teil 13-2, Ed. 1

Fig. 6.13: Type codes 2AD132

## 7. Technical data 2AD134

### 7.1 Nominal data

Designation	Symbol	Unit	2AD134			
			B	C	D	
Motor size			B		C	D
Windings designation			ES	FS	DS	CS
Nominal power <sup>1)</sup>	$P_n$	kW	12,0	12,0	18,0	26,0
Nominal torque <sup>1)</sup>	$M_n$	Nm	76		115	166
Base motor speed	$n$	min <sup>-1</sup>	1500			
Peak speed	$n_{max}$	min <sup>-1</sup>	7500			
Nominal current	$I_n$	A <sub>eff</sub>	27,8	40,9	54,4	52
Nominal voltage	$U_n$	V <sub>eff</sub>	328	224	248	387
Rotor inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0,054		0,076	0,118
Thermal time constant	$t_{th}$	min	45		50	55
Min. connection cross section of Indramat cables (INK...)	A	mm <sup>2</sup>	6	10	10	10
Average sound pressure level at 1 meter (PWM=4kHz)	$L_p$	dB(A)	75			
Mass <sup>3)</sup>	$m$	kg	90	115	135	
Ambient temperature		°C	0 ... 45			
Insulation classification DIN VDE 0530 Teil 1			F			
Balance class <sup>4)</sup> DIN ISO 2373			R, S, S1			
<sup>1)</sup> Values determined as per DIN VDE 0530, section 1. Characteristic operating curves are available for the listed nominal rates to help in the selection of the AC main spindle motor. These take operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brake. <sup>3)</sup> Values without holding brake, with blower. <sup>4)</sup> See Figure 2.7 "Vibrations in mm/s" for values.						

Fig. 7.1: Nominal data 2AD134

Permissible shaft load

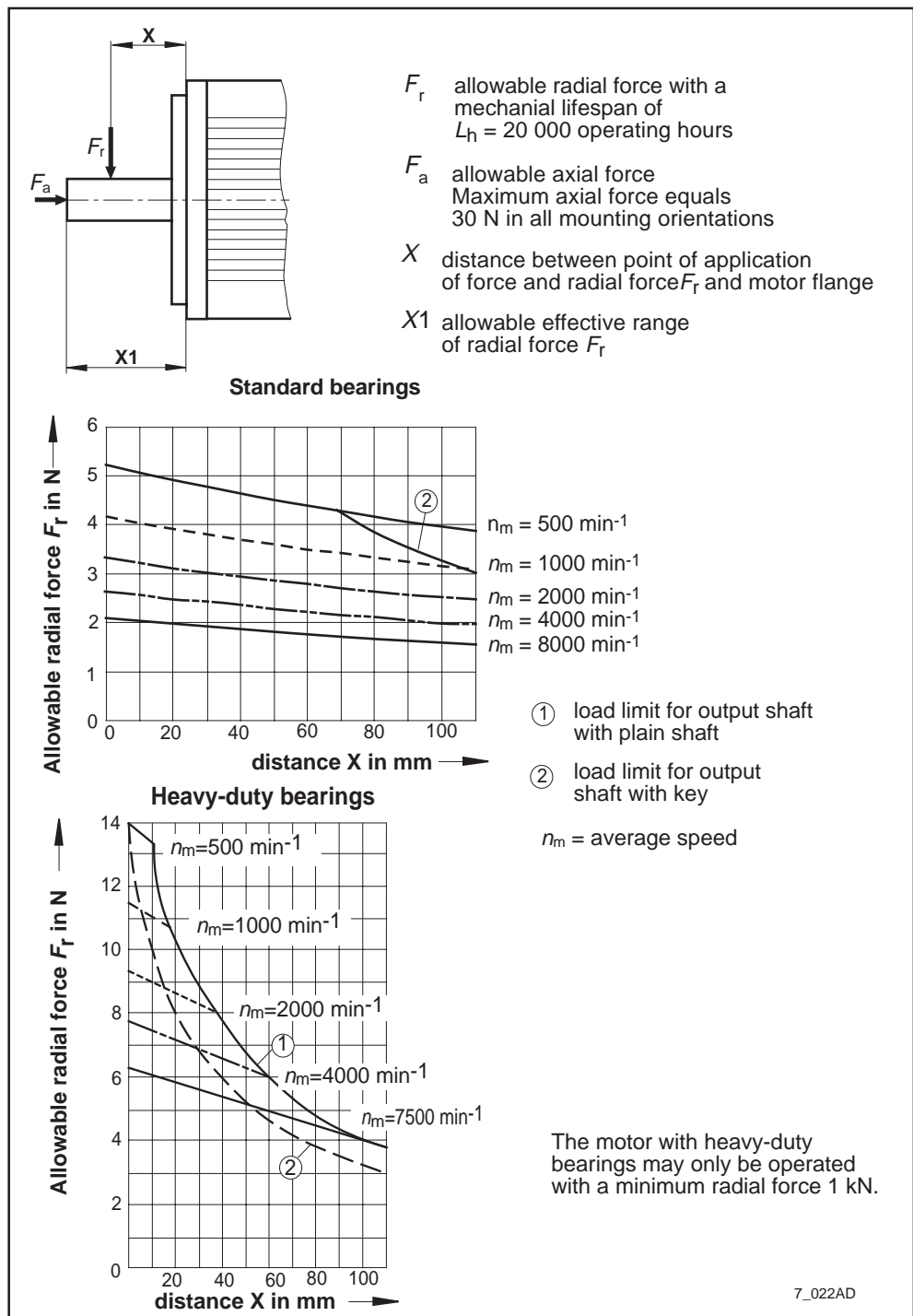


Fig. 7.2: Permissible shaft load 2AD134

Lubricant consumption

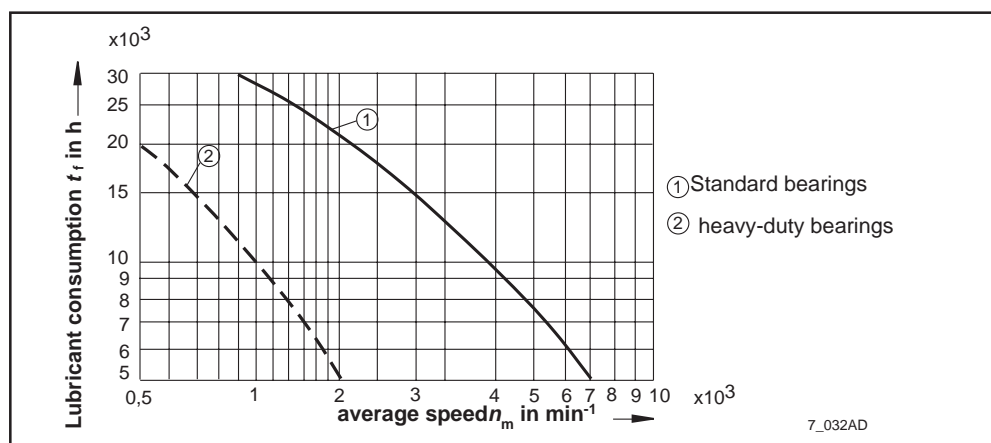


Fig. 7.3: Lubricant consumption duration 2AD134

## 7.2 Holding brake

Designation	Symbol	Unit	Version			
			electrically engaged	electrically released	electrically released heavy-duty	electrically released extra heavy-duty
Operating principle						
Holding torque	$M_h$	Nm	100	30	100	140
Nominal terminal voltage	$U_n$	V	24 ± 10%			
Nominal current	$I_n$	A	1,5	1,3	1,8	2,8
Moment of inertia	$J_B$	kgm <sup>2</sup>	0,002	0,0018	0,002	
Maximum braking energy	$W_{max}$	Ws	30000			
Peak speed	$n_{max}$	min <sup>-1</sup>	7500 <sup>1)</sup>			
Release delay	$t_l$	ms	140	120	110	
Clamp delay	$t_k$	ms	110	65	70	
Mass	$m$	kg	4			
<p><sup>1)</sup> In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor inertia  <math>J_B</math> holding brake inertia  <math>J_C</math> load inertia            (attachments to the output shaft)         </p>						

Fig. 7.4: Technical data of holding brake for 2AD134

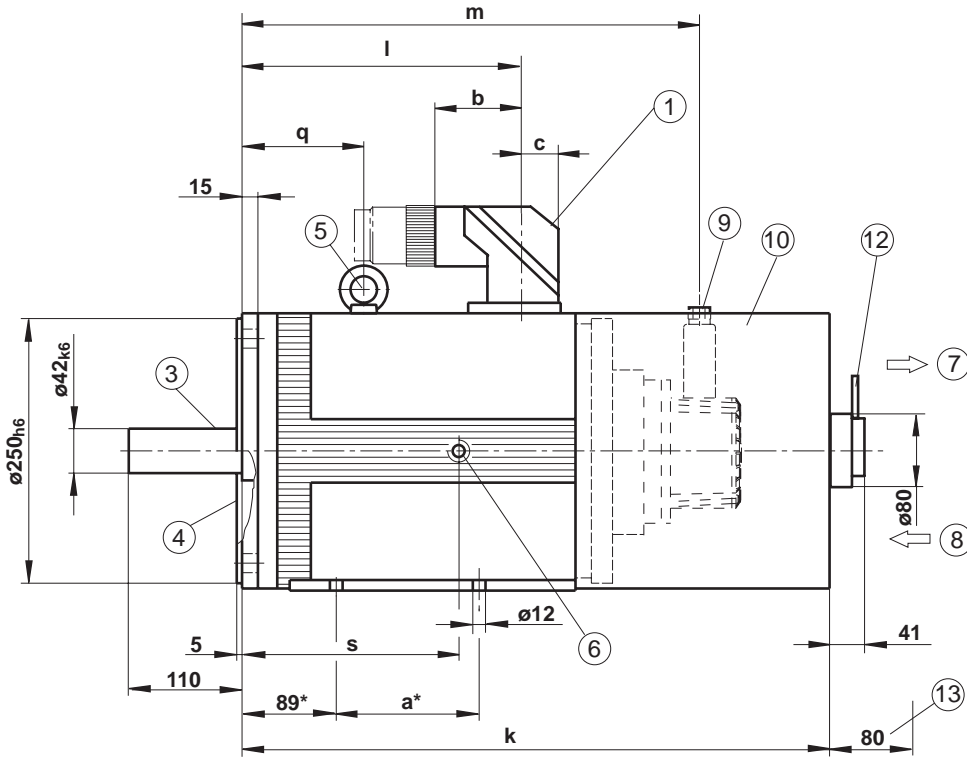
## 7.3 Motor blower

Designation	Symbol	Unit	Version		
			Axial blower		Radial lower
Air current			B → A blowing recommended	A → B suction	B → A blowing
Power consumption	$S_N$	VA	170 145		330
Nominal voltage	$U_N$	V	3 x 400 V, 50 Hz, ± 15 % 3 x 460 V, 60 Hz, ± 10 %		
Average air volume	$V$	m <sup>3</sup> /h	1000		

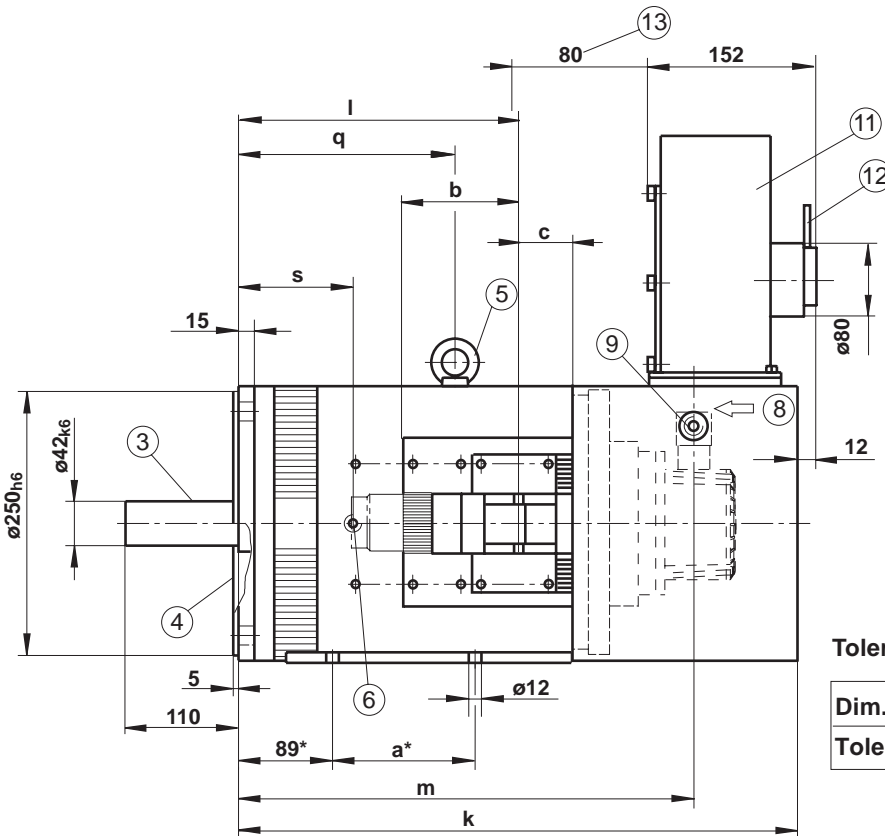
Fig. 7.5: Technical data of motor blower for 2AD134

### 7.4 Dimensional data

Motor with axial blower, type B05, B35



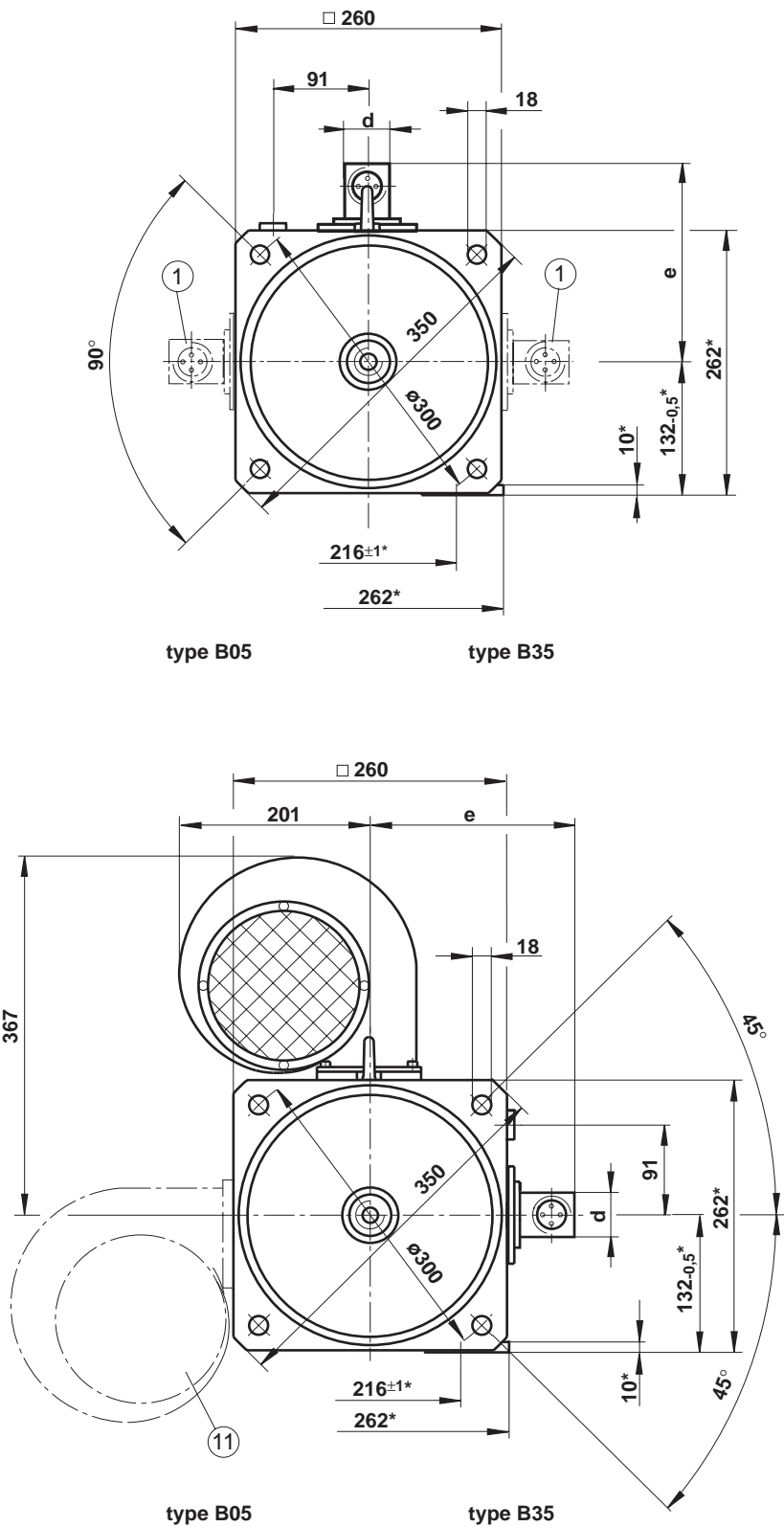
Motor with radial blower, type B05, B35



Tolerances:

Dim. to	6	30	120	400	1000	2000
Tolerance	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

7\_06134A



For available versions see Fig. 7.10 - Type codes

Dim.:	2AD134B	2AD134C	2AD134D
a*	135	205	335
b	80	84,5	84,5
c	25	35,5	35,5
d	50	71	71
e	204	206	206
w/o hold. brake	550	620	750
k with hold. brake	612	682	812
w/ hold. brake heavy-duty	658	728	858
l	274	335	465
w/o hold. brake	402	472	602
m with hold. brake	464	534	664
w/ hold. brake heavy-duty	510	580	710
q	115	185	275
s	205	230	275

\* with foot mounting only, B35

- ① power connection, plug-in connection
- ③ plain shaft end concen. tolerance DIN 42955 - R on front center drill hole DIN 332 - DS M16x36
- ④ flange dimensions per DIN 42948
- ⑤ ring screw M10 - DIN 580
- ⑥ add. thread M10 for ring screw second thread opposite
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type 3 (flange socket), arranged per position of power connection
- ⑩ axial blower
- ⑪ Radial blower; position of radial blower may not be the same as power connection
- ⑫ Motor blower connection: terminal box with cable screw joint
- ⑬ Mounting distance (minimum for pulling in ventilating air)

Dim.	2AD134B	2AD134C	2AD134D
a*	135	205	335
b	80	84,5	84,5
c	25	35,5	35,5
d	50	71	71
e	204	206	206
w/o hold. brake	480	550	680
k with hold. brake	542	612	742
w/ hold. brake heavy-duty	588	658	788
l	274	335	465
w/o hold. brake	402	472	602
m with hold. brake	464	534	664
w/ hold. brake heavy-duty	510	580	710
q	205	230	275
s	115	185	275

\* Foot mounting only, B35

7\_06134B

Fig. 7.6: Main spindle motor 2AD132 - Dimensional data

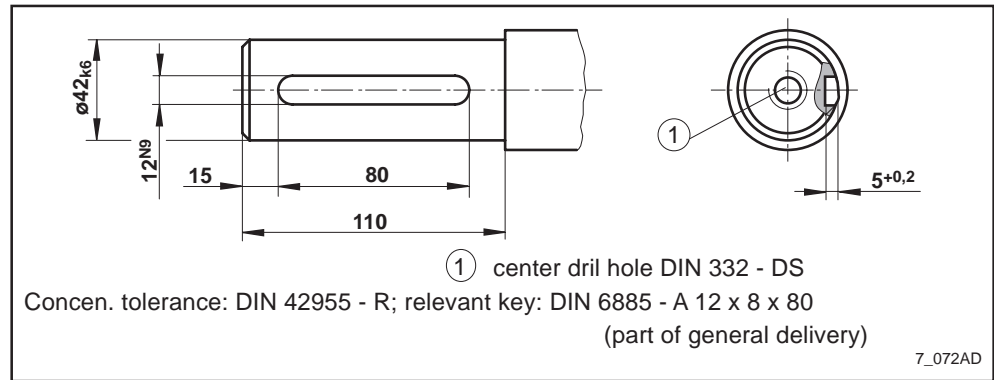


Fig. 7.7: Output shaft with key for 2AD134

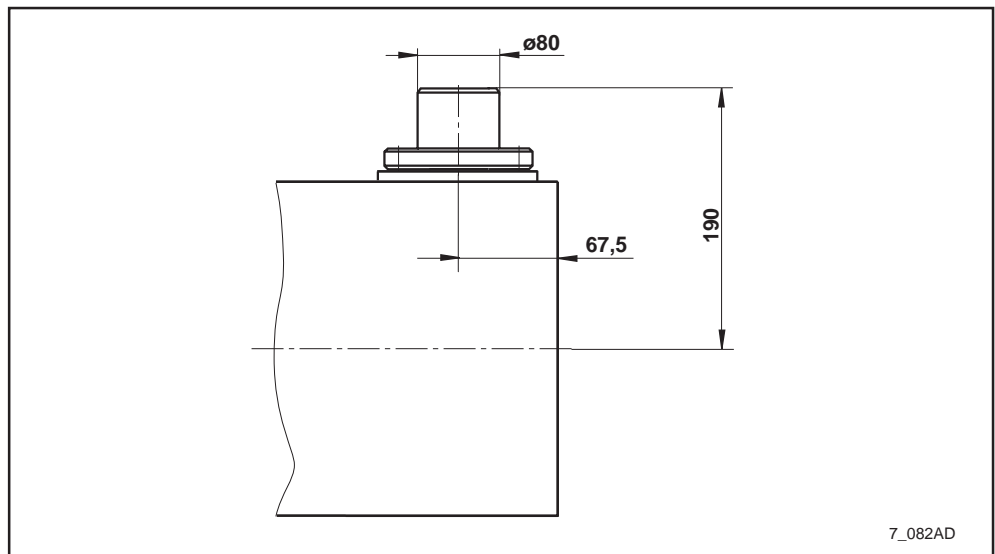


Fig. 7.8: 2AD134 with accessories mounted M01 2AD132/134 (Blower support base)

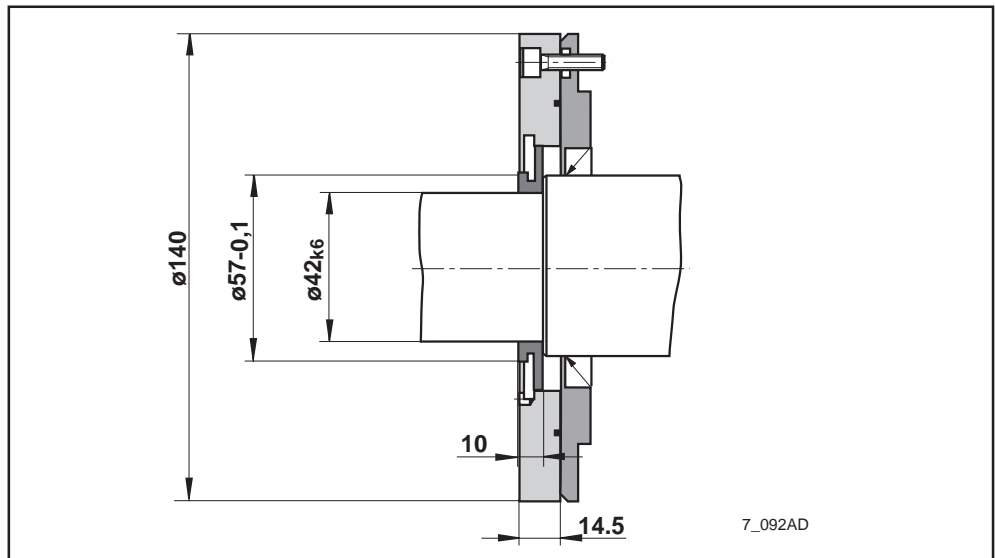


Fig. 7.9: 2AD134 with accessories mounted M02 2AD132/134 (Labyrinth seal)



## 7.5 Type codes

Type codes:	Example:	2AD134C-B35OC1-DS06-A2N1
1. Name:	2AD	2AD
2. Motor size:	134	134
3. Motor length:	B, C, D	C
4. Construction: flange mounting flange and foot mounting	B05 B35	B35
5. Position of the power connection: above left right	O L R	O
6. Output direction of the power connection: Connector to side A Connector to side B Connector to the right * Connector to the left *	A B R L	B
7. Cooling type: Axial blower (Air current B --> A) Axial blower (Air current A --> B) Radial blower (Air current B --> A), blower above **) Radial blower (Air current B --> A), blower right **) Radial blower (Air current B --> A), blower below **) Radial blower (Air current B --> A), blower left **)	1 2 3 6 7 8	1
8. Windings designation: 2AD134B 2AD134C 2AD134D	ES, FS DS CS	DS
9. Holding brake: without electrically engaged electrically released, heavy-duty electrically released, extra heavy-duty	0 1 3 4	0
10. Motor feedback: without Digital servo feedback Digital servo feedback with integral multiturn encoder	0 6 7	6
11. Output shaft:		
	plain shaft	with key with whole key balanced
		with half key balanced
without shaft sealing ring	A	B
with shaft sealing ring	C	D
		E
		H
12. Side B shaft end: without	2	2
13. Bearings: Standard heavy-duty	N V	N
14. Vibration severity level: R S S1 ****)	1 2 3	1

\*) View from front looking towards motor shaft, direction depends on power terminal.  
 \*\*) Position of blower may not be same as that of power terminal.  
 \*\*\*) Only available with radial blower and motor feedback "3"  
 \*\*\*\*) not available with heavy-duty bearings

Quellverweis: INN 41.01 Teil 13-4, Ed. 2

Fig. 7.10: Type codes 2AD134

Notes

## 8. Technical data 2AD160

### 8.1 Nominal data

Name	Symbol	Unit	2AD160		
			B	C	DD
Motor size			B	C	
Windings designation			BS	BS	DD
Nominal power <sup>1)</sup>	$P_n$	kW	30	37	46
Nennmoment <sup>1)</sup>	$M_n$	Nm	191	236	220
Motor nominal speed	$n$	min <sup>-1</sup>	1500		2000
Peak speed	$n_{max}$	min <sup>-1</sup>	6000		
Nominal current	$I_n$	A <sub>eff</sub>	72	90	109
Nominal voltage	$U_n$	V <sub>eff</sub>	305	299	316
Rotor moment of inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0,174	0,229	
Thermal time constant	$t_{th}$	min	60	65	
Minimum conn. cross section EN 60204, sec. 1/02.86	A	mm <sup>2</sup>	25	35	
Average noise level at a distance of 1 m (PWM=4kHz)	$L_p$	dB(A)	75±3		
Mass <sup>3)</sup>	$m$	kg	205	240	
Ambient temperature		°C	0 ... 45		
Insulation classification DIN VDE 0530 Teil 1			F		
Vibration severity level <sup>4)</sup> DIN ISO 2373			R, S, S1		
<p><sup>1)</sup> Values determined as per DIN VDE 0530, section 1 When selecting AC main spindle motors, the specified nominal operating characteristics available must also be taken into consideration with operating modes S1, S2 and S6.</p> <p><sup>2)</sup> Values without holding brake</p> <p><sup>3)</sup> Values without holding brake, with blower</p> <p><sup>4)</sup> Values see Fig. 2.7 "RMS oscillation speed"</p>					

Fig. 8.1: Nominal data 2AD160

Permissible shaft load

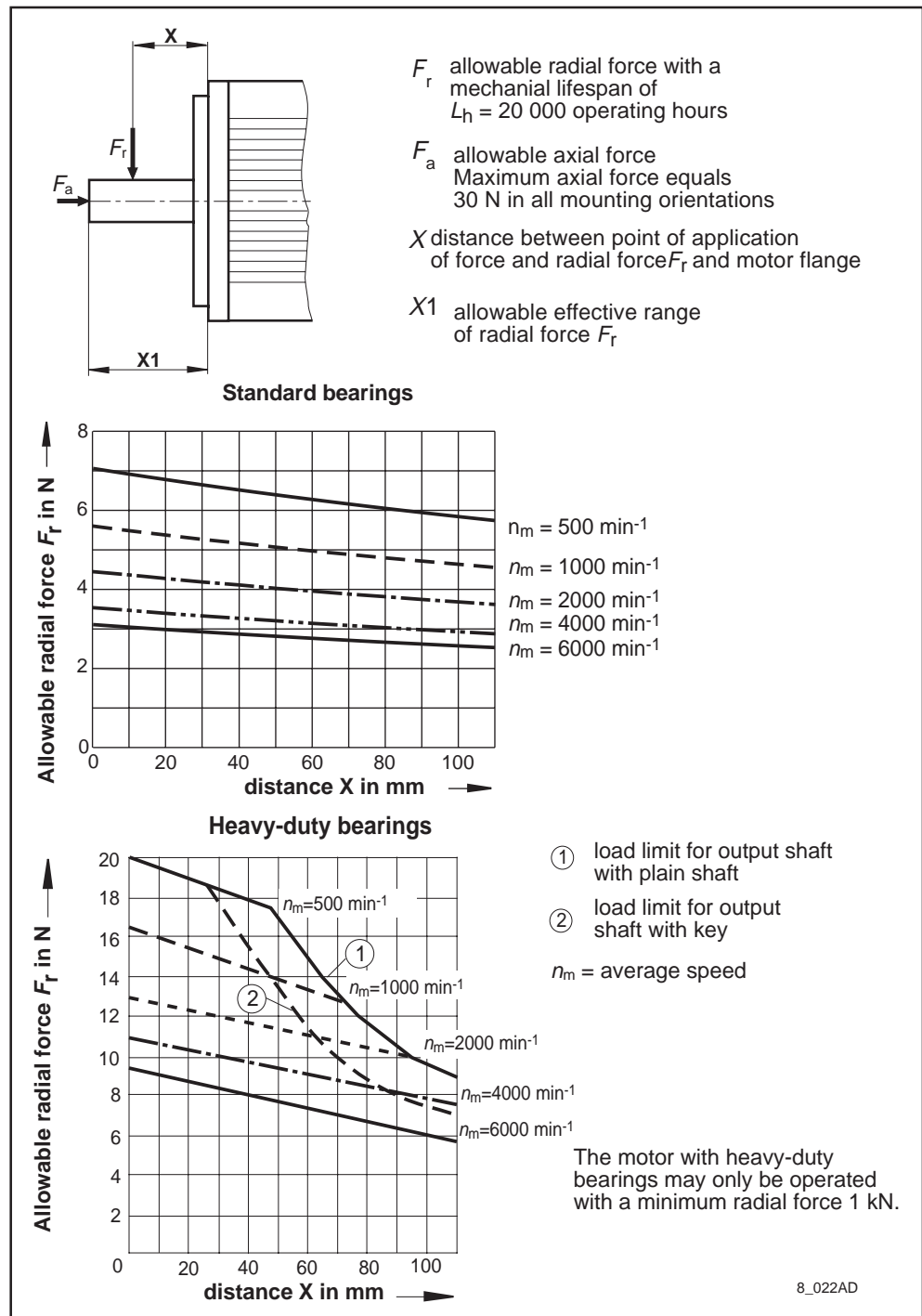


Fig. 8.2: Permissible shaft load 2AD160

Lubricant consumption

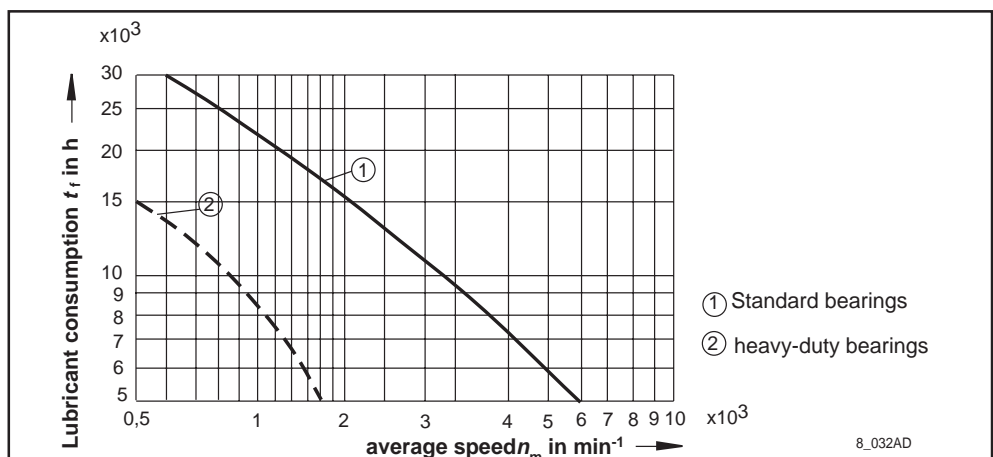


Fig. 8.3: Lubricant consumption duration 2AD160

## 8.2 Holding brake

Designation	Symbol	Unit	Version		
			electrically engaged	electrically released	electrically released heavy-duty
Operating principle			electrically engaged	electrically released	electrically released heavy-duty
Holding torque	$M_h$	Nm	130	70	240
Nominal terminal voltage	$U_n$	V	24±10%		
Nominal current	$I_n$	A	1,8	2,0	2,0
Moment of inertia	$J_B$	kgm <sup>2</sup>	0,0065		0,0097
Maximum braking energy	$W_{max}$	Ws	40000		70000
Peak speed	$n_{max}$	min <sup>-1</sup>	6000 <sup>1)</sup>		
Release delay	$t_l$	ms	120	130	110
Clamp delay	$t_k$	ms	90	85	60
Mass	$m$	kg	5		11
<p><sup>1)</sup> In the case of electrically-released holding brakes, the maximum speed is determined by the maximum braking energy, <math>W_{max}</math>, of the holding brake. It is calculated as follows:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor moment of inertia  <math>J_B</math> moment of inertia of holding brake  <math>J_L</math> moment of inertia of load (attachment to output shaft) </p>					

Fig. 8.4: Technical data of holding brake for 2AD160

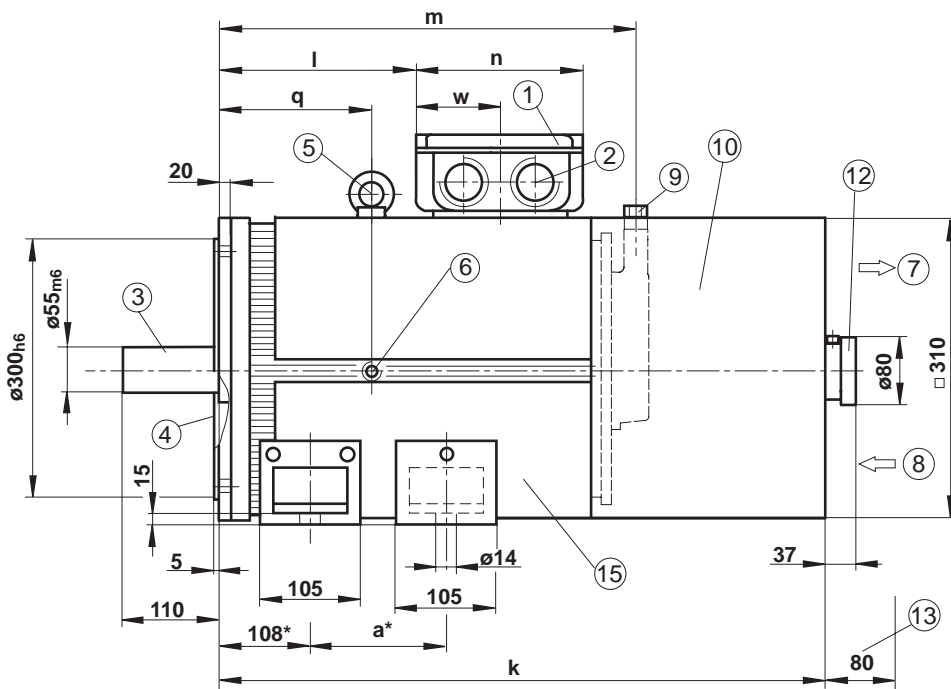
## 8.3 Motor blower

Designation	Symbol	Unit	Version		
			Axial blower		Radial
Air current			B → A blowing recommended	A → B suction	B → A blowing
Power consumption	$S_N$	VA	220		330
Nominal voltage	$U_N$	V	3 x AC 400 V, 50/60 Hz 3 x AC 460 V, 60 Hz		
Average air volume	$V$	m <sup>3</sup> /h	1120		

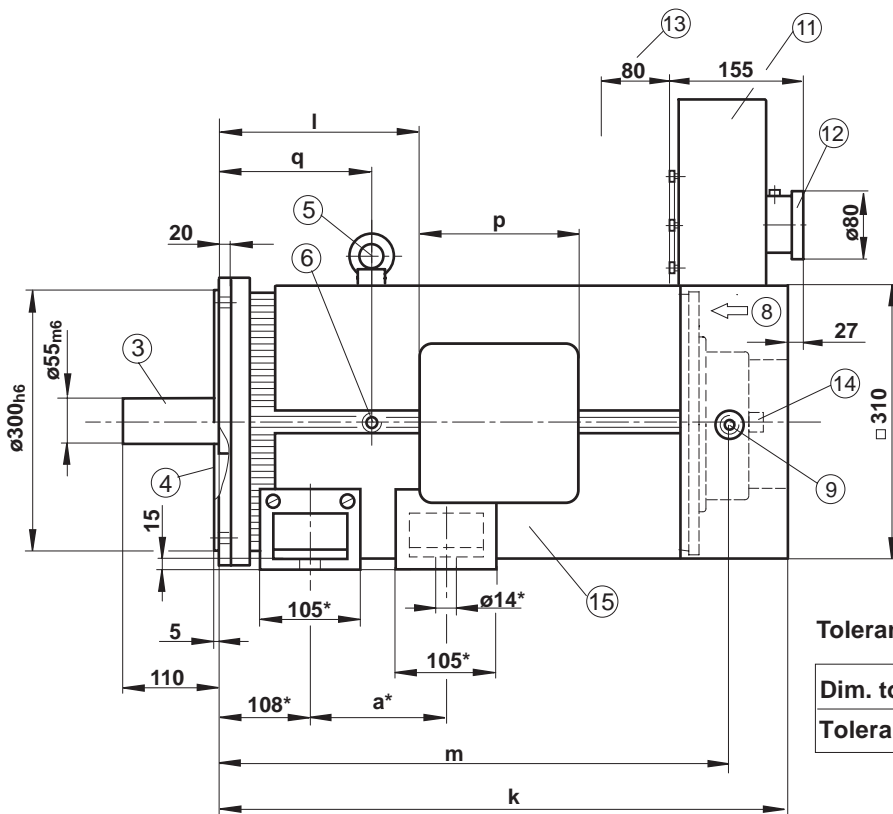
Fig. 8.5: Technical data of motor blower for 2AD160

### 8.4 Dimensional data

**Motor with axial blower and feedback type 3, type B05, B35**



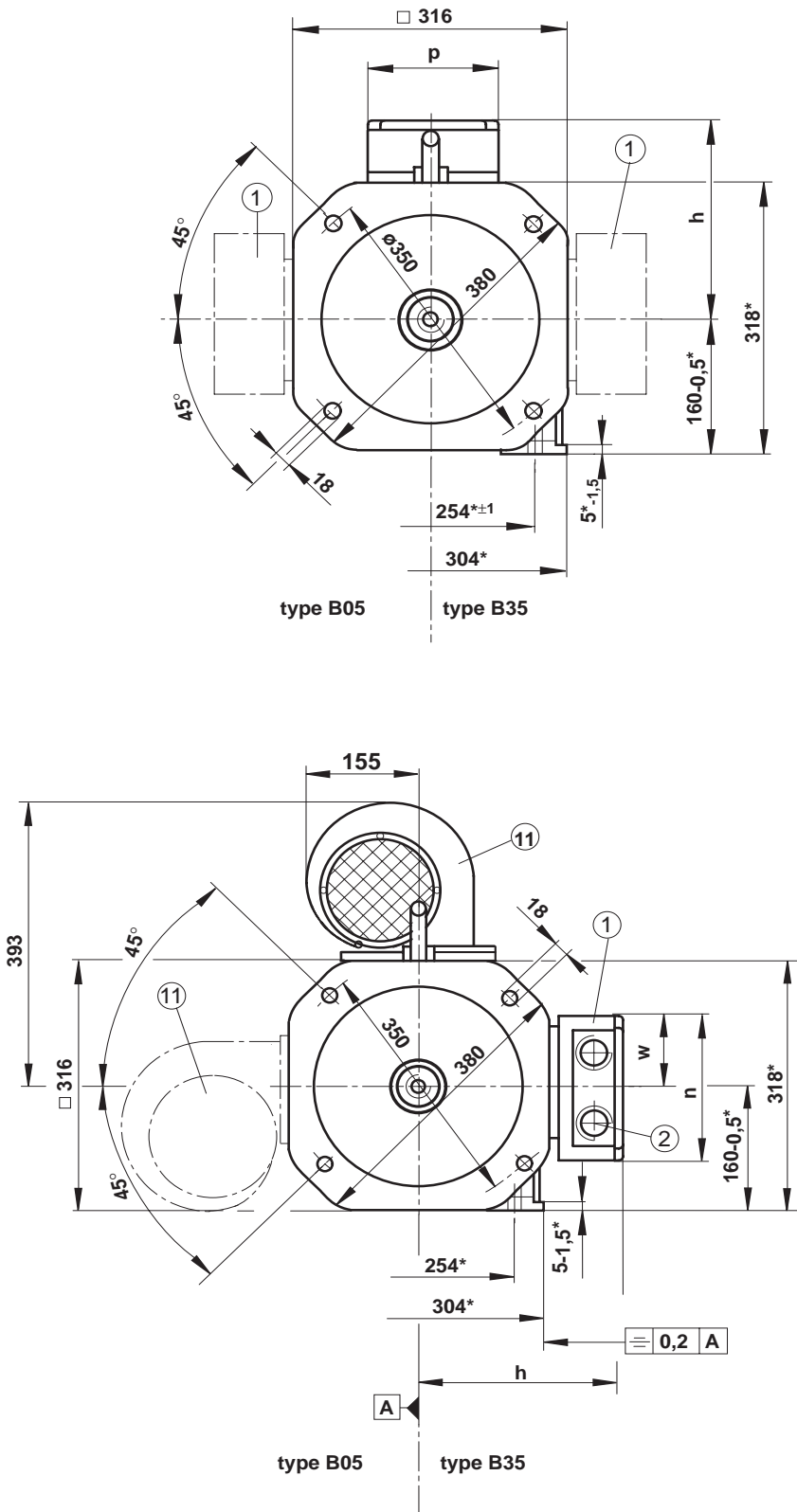
**Motor with radial blower and feedback type 3, type B05, B35**



**Tolerances**

Dim. to	6	30	120	400	1000	2000
Tolerance	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

8\_06160A



Dim.:	2AD160B	2AD160C
a*	254	344
w/o hold. brake	751	841
k with hold. brake	813	903
w/ hold. brake heavy-duty	881	971
l	330,5	400
w/o hold. brake	582	672
m with hold. brake	644	734
w/ hold. brake heavy-duty	712	802
q	280	330
n	186	200
h	242	265
p	171	200
w	85,5	100

- \* with foot mounting only, B35
- ① terminal box as power connection; arrangement can be selected, can be turned by 90 degrees, corresponds to output direction of power connection
- ② Cable output:  
2AD160A / 2AD160B: PG 29  
2AD160C: PG 42
- ③ plain shaft end concen. tolerance DIN 42955 - R on front center drill hole DIN 332 - DS M20x42
- ④ flange dimensions per DIN 42948
- ⑤ ring screw M20 - DIN 580
- ⑥ add. thread M10 for ring screw second thread opposite
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type 3 (flange socket), arranged per position of power connection
- ⑩ axial blower
- ⑪ Radial blower; position of radial blower may not be the same as power connection
- ⑫ Motor blower connection: terminal box with cable screw joint
- ⑬ Mounting distance (minimum for pulling in ventilating air)
- ⑭ B-side shaft end: see Fig. 8.8 for dimensions
- ⑮ air baffle

Dim.	2AD160B	2AD160C
a*	254	344
w/o hold. brake	632	722
k with hold. brake	694	784
w/ hold. brake heavy-duty	762	852
l	330,5	400
w/o hold. brake	582	672
m with hold. brake	644	734
w/ hold. brake heavy-duty	712	802
q	280	330
n	186	200
h	242	265
p	171	200
w	85,5	100

\* Foot mounting only, B35

8\_06160B

For available version see Fig. 8.12 - type codes

Fig. 8.6: Dimensional data 2AD160

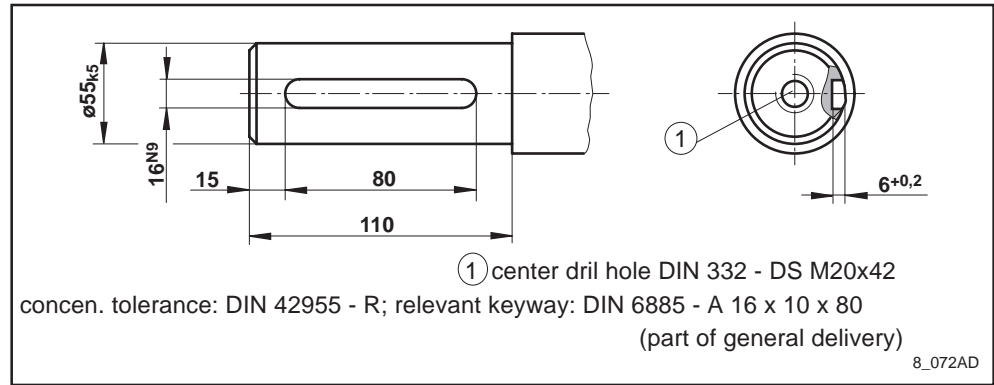


Fig. 8.7: Output shaft with key for 2AD160

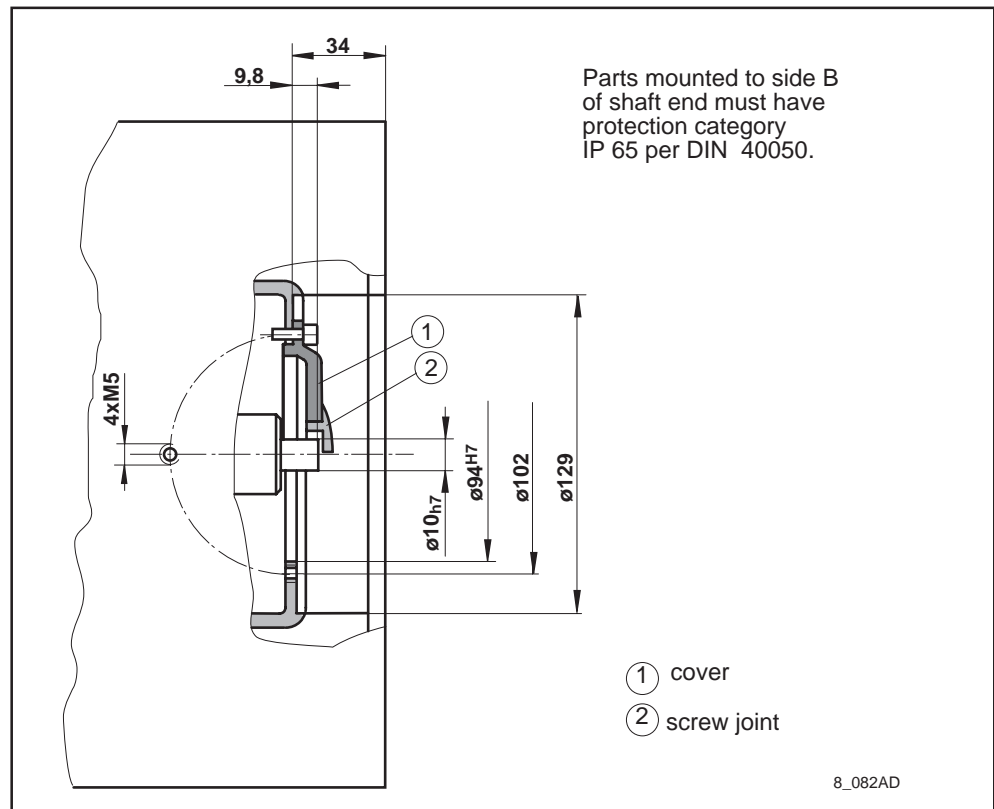


Fig. 8.8: Side-B shaft end 2AD160

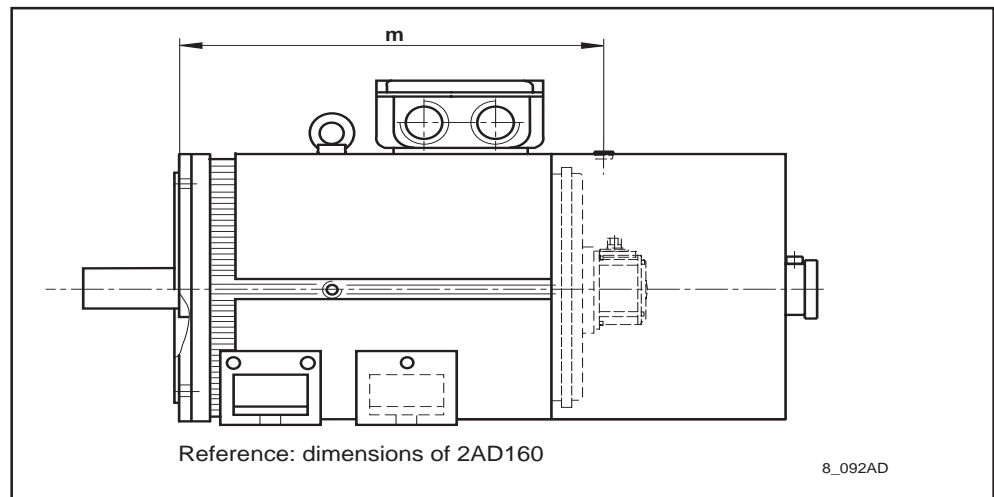


Fig. 8.9: 2AD160 with feedback types 6, 7



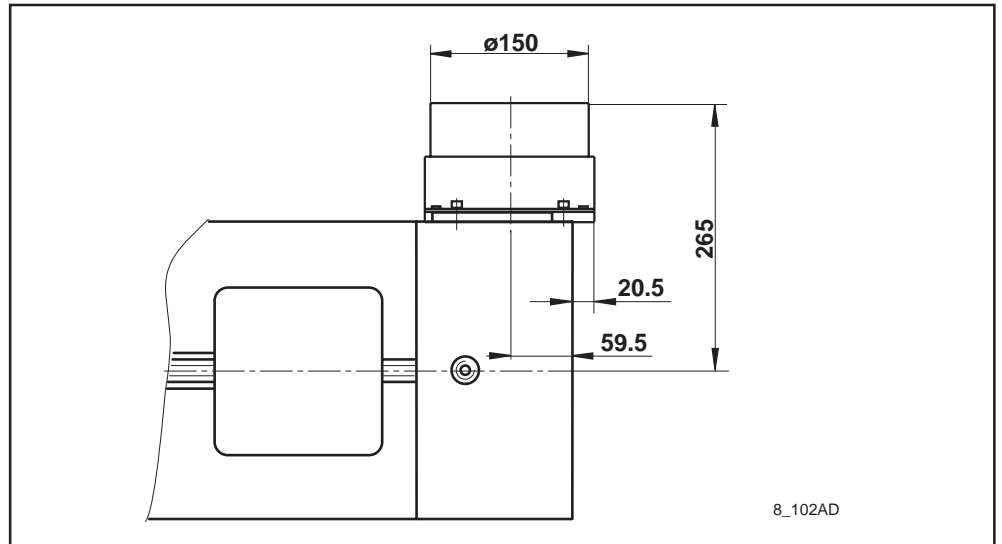


Fig. 8.10: 2AD160 with accessories mounted M01 2AD160/164 (Blower support base)

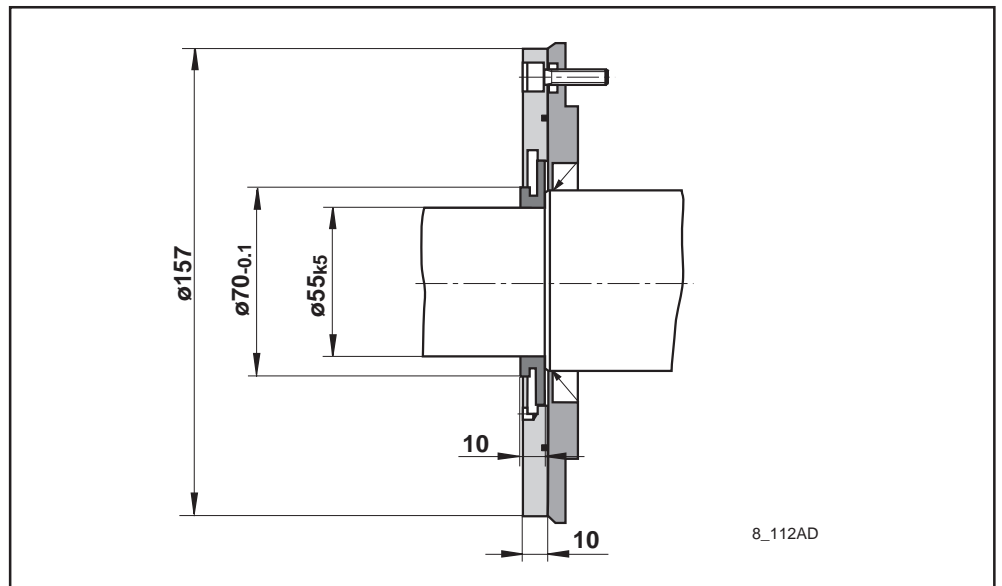


Fig. 8.11: 2AD160 with accessories mounted M02 2AD160/164 (Labyrinth seal)

### 8.5 Type codes

Type codes:	Example:	2AD160C-B05OB1-BS03-A2N1
1. Name:	2AD	2AD
2. Motor size:	160	160
3. Motor length:	B, C	B, C
4. Construction: flange mounting flange and foot mounting	B05 B35	B05
5. Position of the power connection: above left right	O L R	O
6. Output direction of the power connection: to side A, terminal box to side B, terminal box to the right, terminal box to the left, terminal box	A B R L	A
7. Cooling type: Axial blower (Air current B --> A) Axial blower (Air current A --> B) Radial blower (Air current B --> A), blower above **) Radial blower (Air current B --> A), blower right **) Radial blower (Air current B --> A), blower below **) Radial blower (Air current B --> A), blower left **)	1 2 3 6 7 8	3
8. Windings designation: 2AD160B 2AD160C	BS BS, DD	BS
9. Holding brake: without electrically engaged electrically released electrically released, heavy-duty	0 1 2 4	1
10. Motor feedback: high-resolution motor feedback Digital servo feedback Digital servo feedback with integral multturn absolute encoder	3 6 7	3
11. Output shaft:		
	plain shaft	with key with whole key balanced with half key balanced
without shaft sealing ring	A	B E
with shaft sealing ring	C	D H
12. side B shaft end: without with (for mounted encoder, incremental, absolute) ***)	2 3	2
13. Bearings: Standard heavy-duty	N V	N
14. Vibration severity level: R S S1 ****)	1 2 3	1

\*) View from front looking towards motor shaft, direction depends on power terminal.  
 \*\*) Position of blower may not be same as that of power terminal.  
 \*\*\*) Only available with radial blower and motor feedback "3"  
 \*\*\*\*) not available with heavy-duty bearings

Quellverweis: INN 41.01 Teil 16-0, Ed.1

Fig. 8.12: Type codes 2AD160

## 9. Technical data 2AD164

### 9.1 Nominal data

Name	Symbol	Unit	2AD164	
			B	C
Motor size			B	C
Windings ID letters			DS	ES
Nominal power <sup>1)</sup>	$P_n$	kW	35	44
Nominal torque <sup>1)</sup>	$M_n$	Nm	223	280
Motor nominal speed	$n$	$\text{min}^{-1}$	1500	
Maximum speed	$n_{\text{max}}$	$\text{min}^{-1}$	6000	
Nominal current	$I_n$	$A_{\text{eff}}$	55,6	74
Nominal voltage	$U_n$	$V_{\text{eff}}$	470	453
Rotor moment of inertia <sup>2)</sup>	$J_M$	$\text{kgm}^2$	0,174	0,229
Thermal time constant	$t_{\text{th}}$	min	60	65
Minimum conn. cross section of INDRAMAT cables (INK...)	$A$	$\text{mm}^2$	16	25
Average sound pressure at 1m (PWM=4kHz)	$L_p$	dB(A)	75±3	
Mass <sup>3)</sup>	$m$	kg	205	240
Ambient temperature		°C	0 ... 45	
Insulation classification DIN VDE 0530 section 1			F	
Vibration severity level <sup>4)</sup> DIN ISO 2373			R, S, S1	
<sup>1)</sup> Values determined per DIN VDE 0530 section 1 Characteristics are available when selecting AC main spindle motors at the specified nominal ratings taking operating modes S1, S2 and S6 into account. <sup>2)</sup> Values without holding brakes <sup>3)</sup> Values without holding brakes, with blower <sup>4)</sup> For values see Fig. 2.7 "RMS vibration speed"				

Fig. 9.1: Nominal data 2AD164

Permissible shaft load

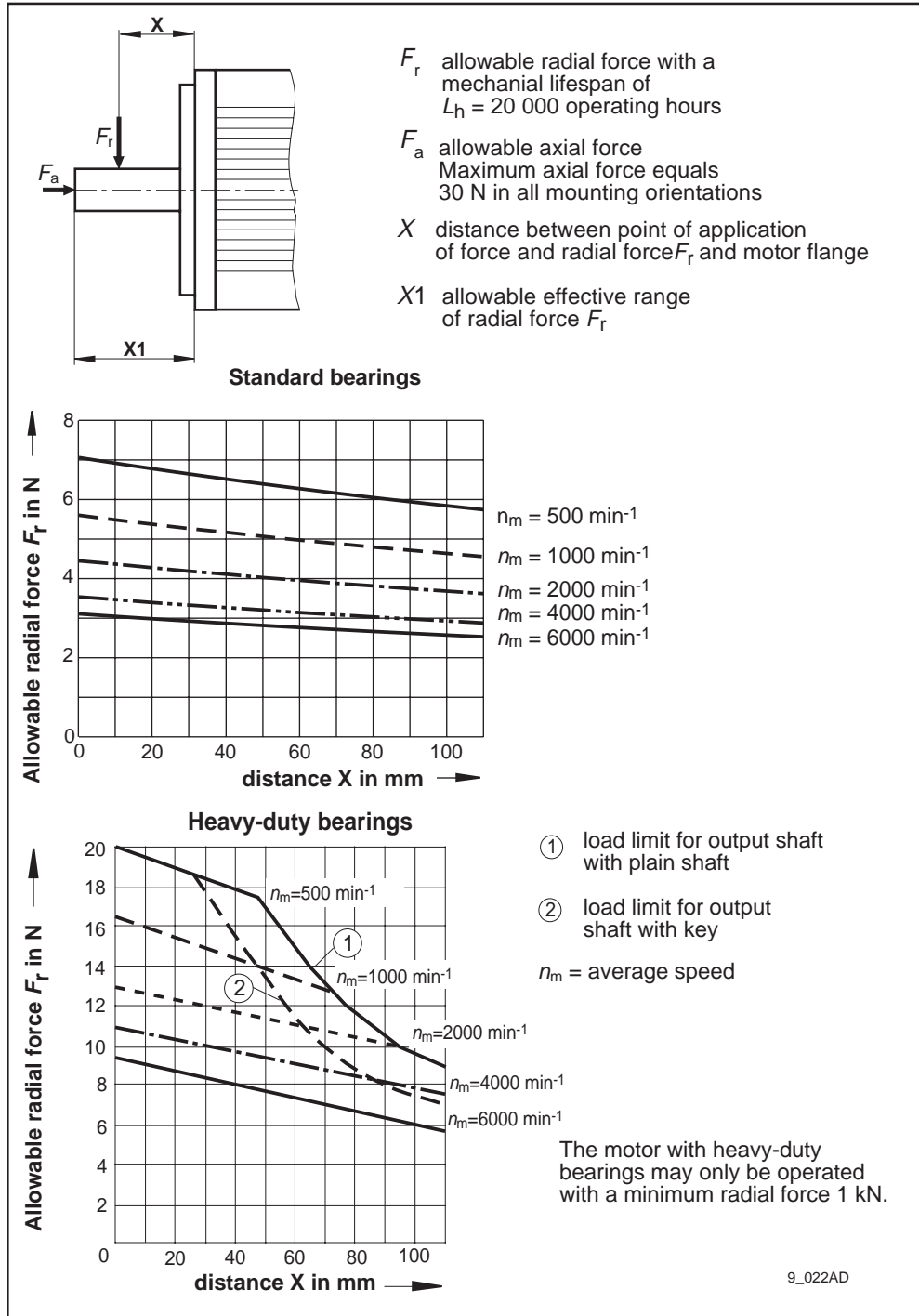


Fig. 9.2: Permissible shaft load 2AD164

Lubricant consumption

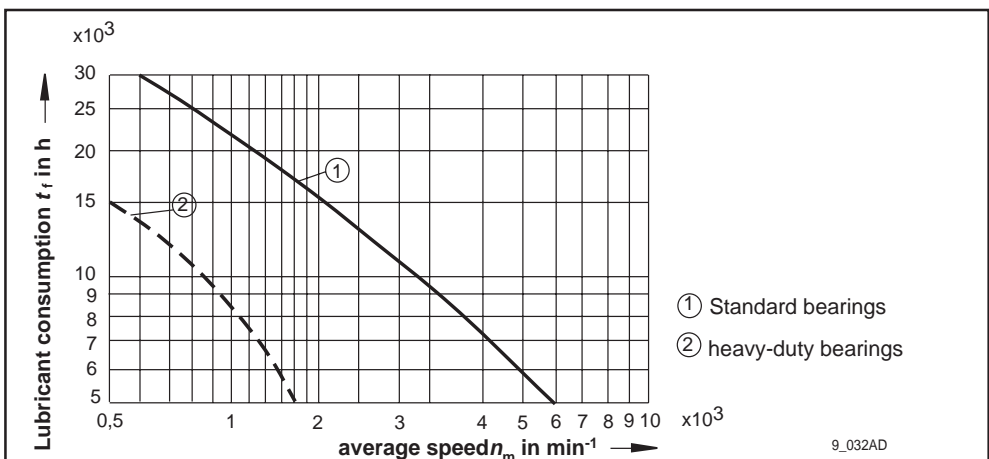


Fig. 9.3: Lubricant consumption 2AD164

## 9.2 Holding brake

Designation	Symbol	Unit	Design		
			electrical clamp	electrical release	electrical release heavy-duty
Functional principle			electrical clamp	electrical release	electrical release heavy-duty
Holding torque	$M_h$	Nm	130	70	240
Nominal conn. voltage	$U_n$	V	24±10%		
Nominal current	$I_n$	A	1,8	2,0	2,0
Moment of inertia	$J_B$	kgm <sup>2</sup>	0,0065		0,0097
Max. decel energy	$W_{max}$	Ws	40000		70000
Maximum speed	$n_{max}$	min <sup>-1</sup>	6000 <sup>1)</sup>		
Release delay	$t_l$	ms	120	130	110
Clamp delay	$t_k$	ms	90	85	60
Mass	$m$	kg	5		11
<p><sup>1)</sup> With electrically released holding brake the maximum speed is determined by maximum decel energy <math>W_{max}</math> of the holding brake. It is computed:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor moment of inertia  <math>J_B</math> moment of inertia of holding brake  <math>J_L</math> moment of inertia of load (attachment mounted to output shaft) </p>					

Fig. 9.4: Technical data of holding brake on 2AD164

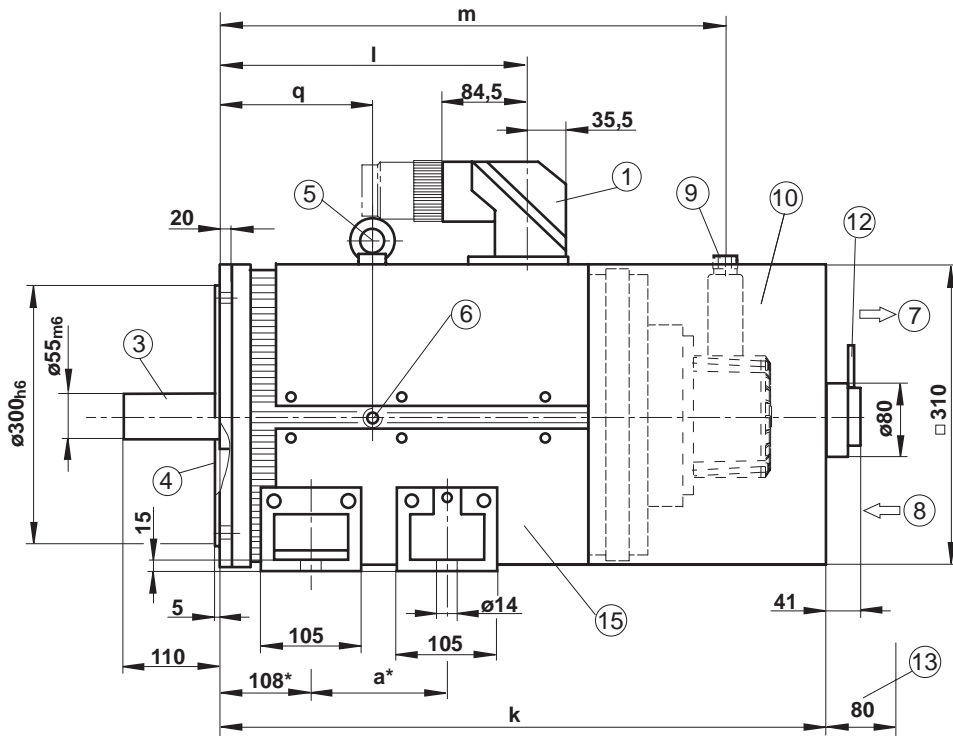
## 9.3 Motor blower

Designation	Symbol	Unit	Design		
			Axial blower		Radial
Air current			B → A blowing (recommended)	A → B suction	B → A blowing
Power consumption	$S_N$	VA	220		330
Nominal voltage	$U_N$	V	3 x AC 400 V, 50/60 Hz 3 x AC 460 V, 60 Hz		
Average air volume	$V$	m <sup>3</sup> /h	1120		

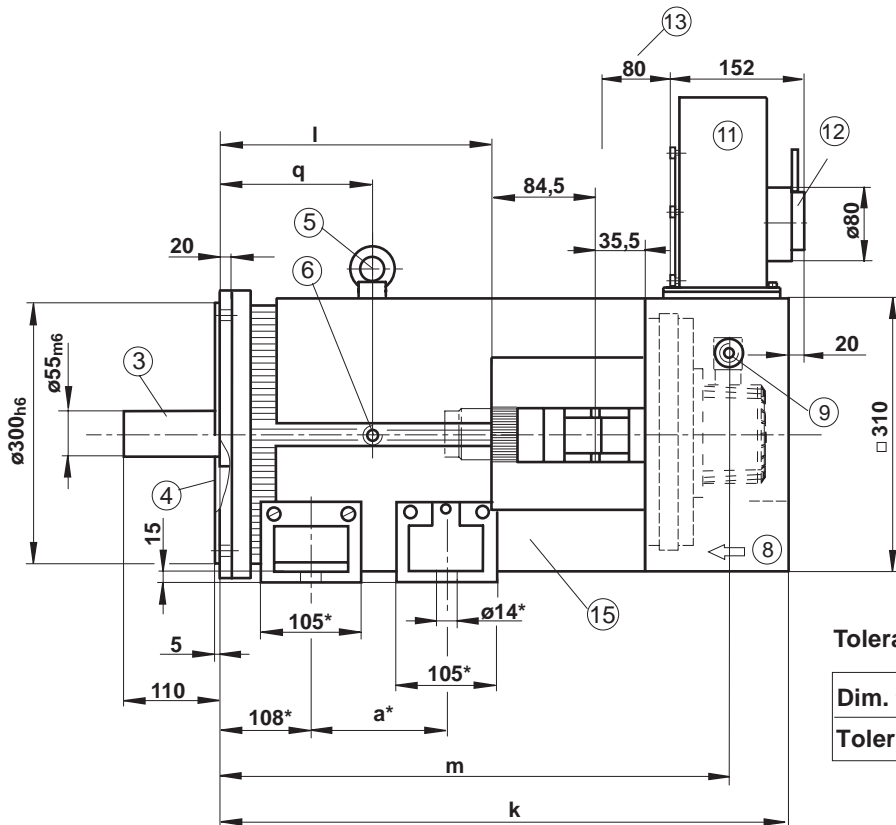
Fig. 9.5: Technical data of motor blower on 2AD164

### 9.4 Dimensions

Motor with axial blower, type B05, B35



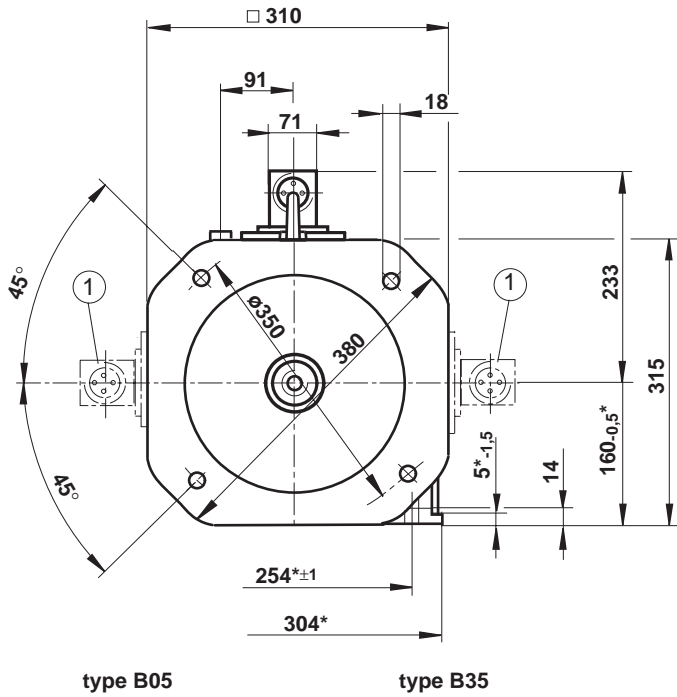
Motor with radial blower, type B05, B35



**Tolerances**

Dim. to	6	30	120	400	1000	2000
Tolerance	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$	$\pm 0,5$	$\pm 0,8$	$\pm 1,2$

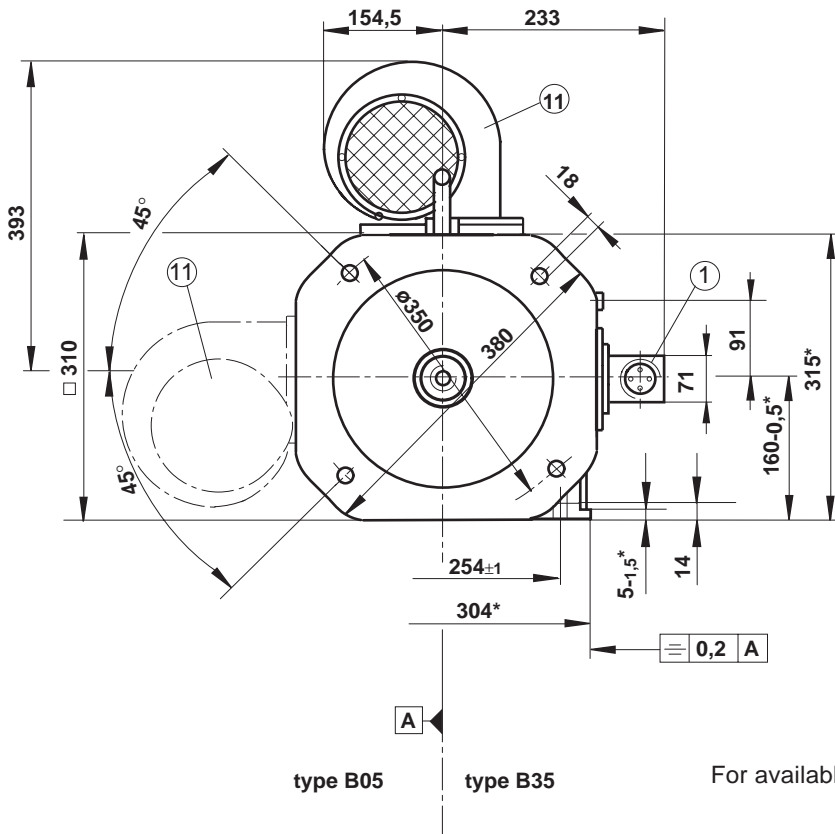
9\_06164A



Dim.:	2AD164B	2AD164C
a*	254	354
w/o hold. brake	751	841
k with hold. brake	813	903
w/ hold. brake heavy-duty	881	971
l	460,5	550,5
w/o hold. brake	598	688
m with hold. brake	660	750
w/ hold. brake heavy-duty	728	818
q	280	330

\* with foot mounting only, B35

- ① power connection, plug-in connector
- ③ plain shaft end concn. tolerance DIN 42955 - R on front center drill hole DIN 332 - DS M20x42
- ④ flange dimensions per DIN 42948
- ⑤ ring screw M20 - DIN 580
- ⑥ add. thread M20 for ring screw second thread opposite
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback connection type (flange socket), arranged per position of power connection
- ⑩ axial blower
- ⑪ Radial blower; position of radial blower may not be the same as power connection
- ⑫ Motor blower connection: plug-in connector
- ⑬ Mounting distance (minimum for pulling in ventilating air)
- ⑮ air baffle



Dim.	2AD164B	2AD164C
a*	254	344
w/o hold. brake	637	727
k with hold. brake	699	789
w/ hold. brake heavy-duty	767	857
l	460,5	550,5
w/o hold. brake	598	688
m with hold. brake	660	750
w/ hold. brake heavy-duty	728	718
q	280	330

\* Foot mounting only, B35

For available version see Fig. 9.10 - type codes

9\_06164B

Fig. 9.6: Dimensions for 2AD164

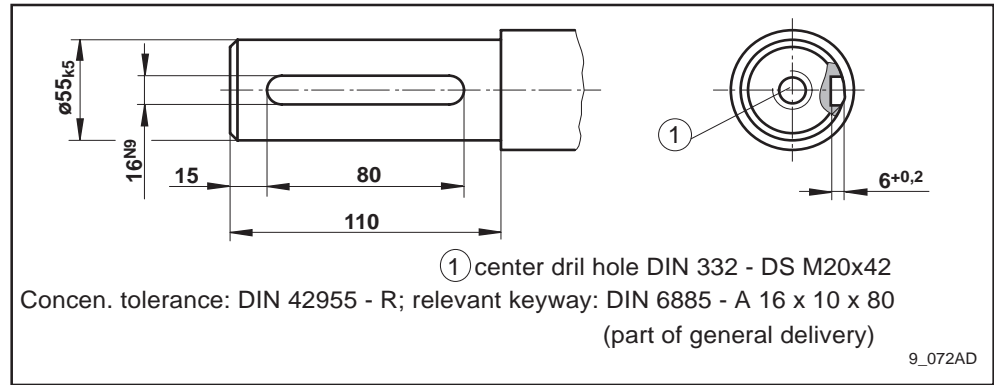


Fig. 9.7: Output shaft with key 2AD164

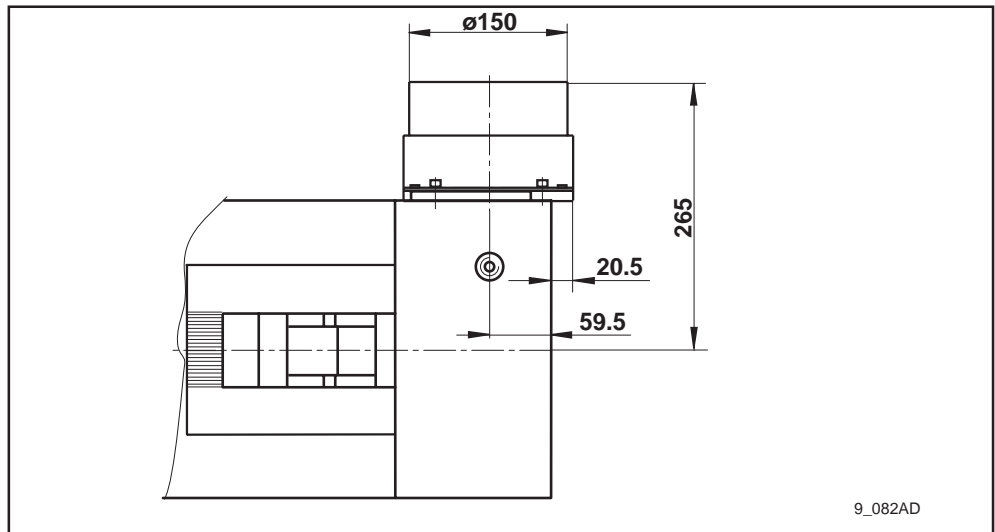


Fig. 9.8: 2AD164 with mounted accessories - M01 2AD160/164 (blower base)

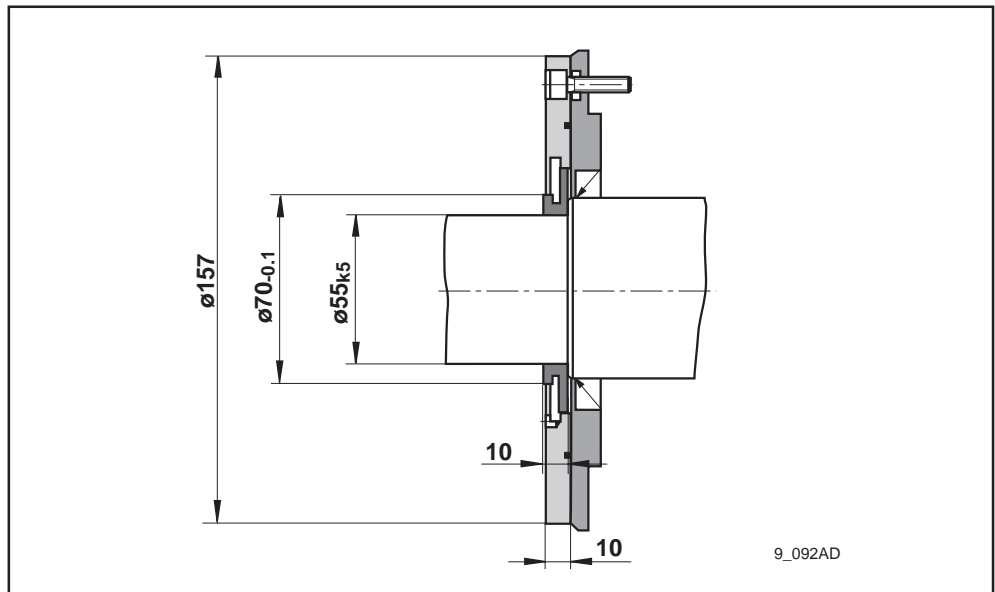


Fig. 9.9: 2AD164 with mounted accessories - M02 2AD160/164 (labyrinth seal)



### 9.5 Type codes

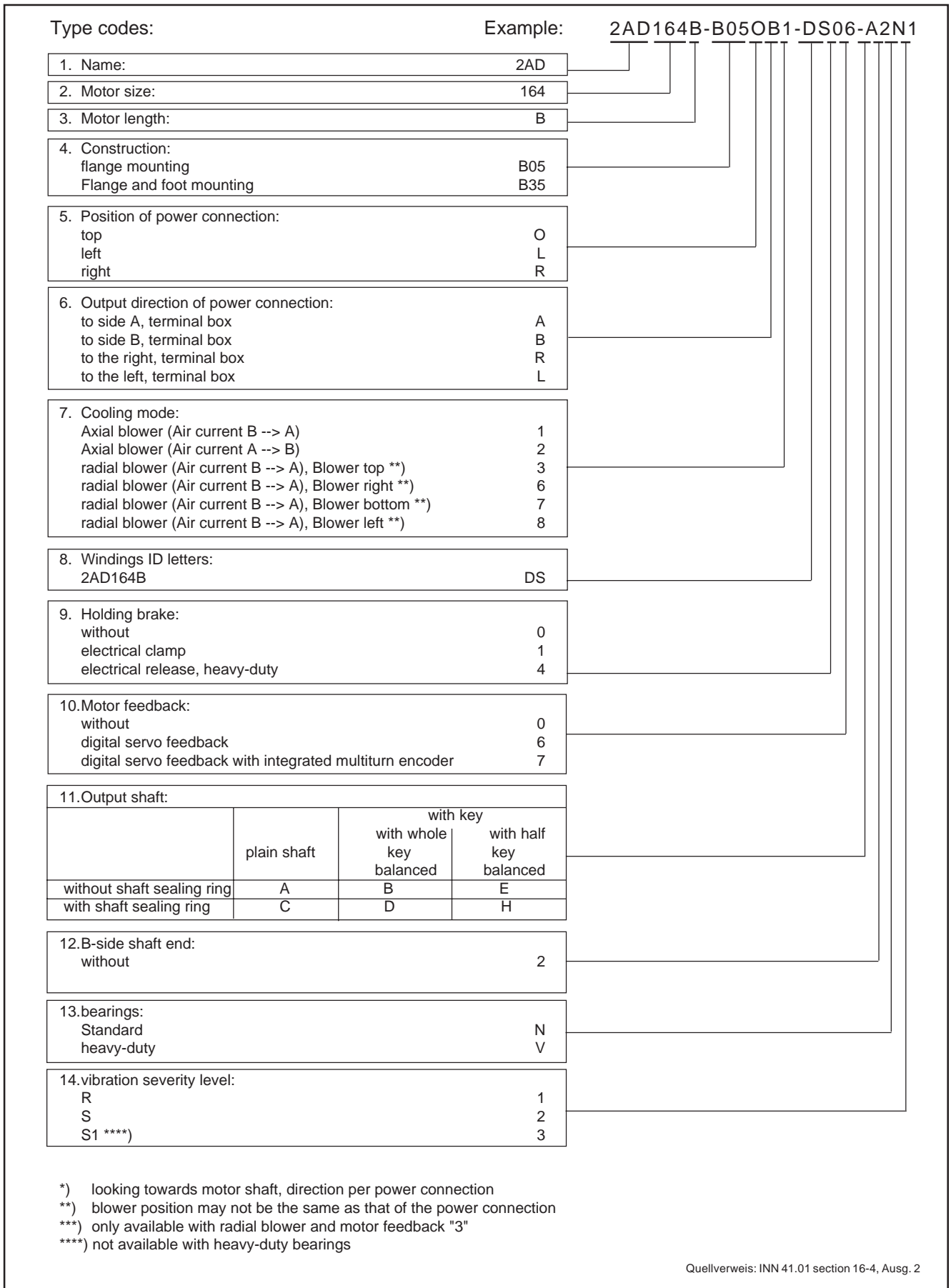


Fig. 9.10: Type codes 2AD164

Notes

## 10. Technical data 2AD180

### 10.1 Nominal data

Name	Symbol	Unit	2AD180		
			C	AS	D
Motor size			C	D	
Windings ID letters			BS	AS	BS
Nominal power <sup>1)</sup>	$P_n$	kW	52	49	63
Nominal torque <sup>1)</sup>	$M_n$	Nm	331	425	401
Motor nominal speed	$n$	min <sup>-1</sup>	1500	1100	1500
Maximum speed	$n_{max}$	min <sup>-1</sup>	6000		
Nominal current	$I_n$	A <sub>eff</sub>	110		133
Nominal voltage	$U_n$	V <sub>eff</sub>	351	322	365
Rotor moment of inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0,373	0,45	
Thermal time constant	$t_{th}$	min	70	75	
Minimum conn. cross section EN 60204 section 1/02.86	A	mm <sup>2</sup>	35		50
Average noise level at 1m (PWM=4kHz)	$L_p$	dB(A)	80±3		
Mass <sup>3)</sup>	$m$	kg	310	402	
Ambient temperature		°C	0 ... 45		
Insulation classification DIN VDE 0530 section 1			F		
Vibration severity level <sup>4)</sup> DIN ISO 2373			R, S, S1		
<sup>1)</sup> Values determined per DIN VDE 0530 section 1 For the selection of an AC main spindle motor, curves are available for the specified nominal powers which take operating modes S1, S2 and S6 into consideration. <sup>2)</sup> Values without holding brakes <sup>3)</sup> Values without holding brakes, with blower <sup>4)</sup> For values see Fig. 2.7 "RMS vibration speed"					

Fig. 10.1: Nominal data 2AD180

Permissible shaft load

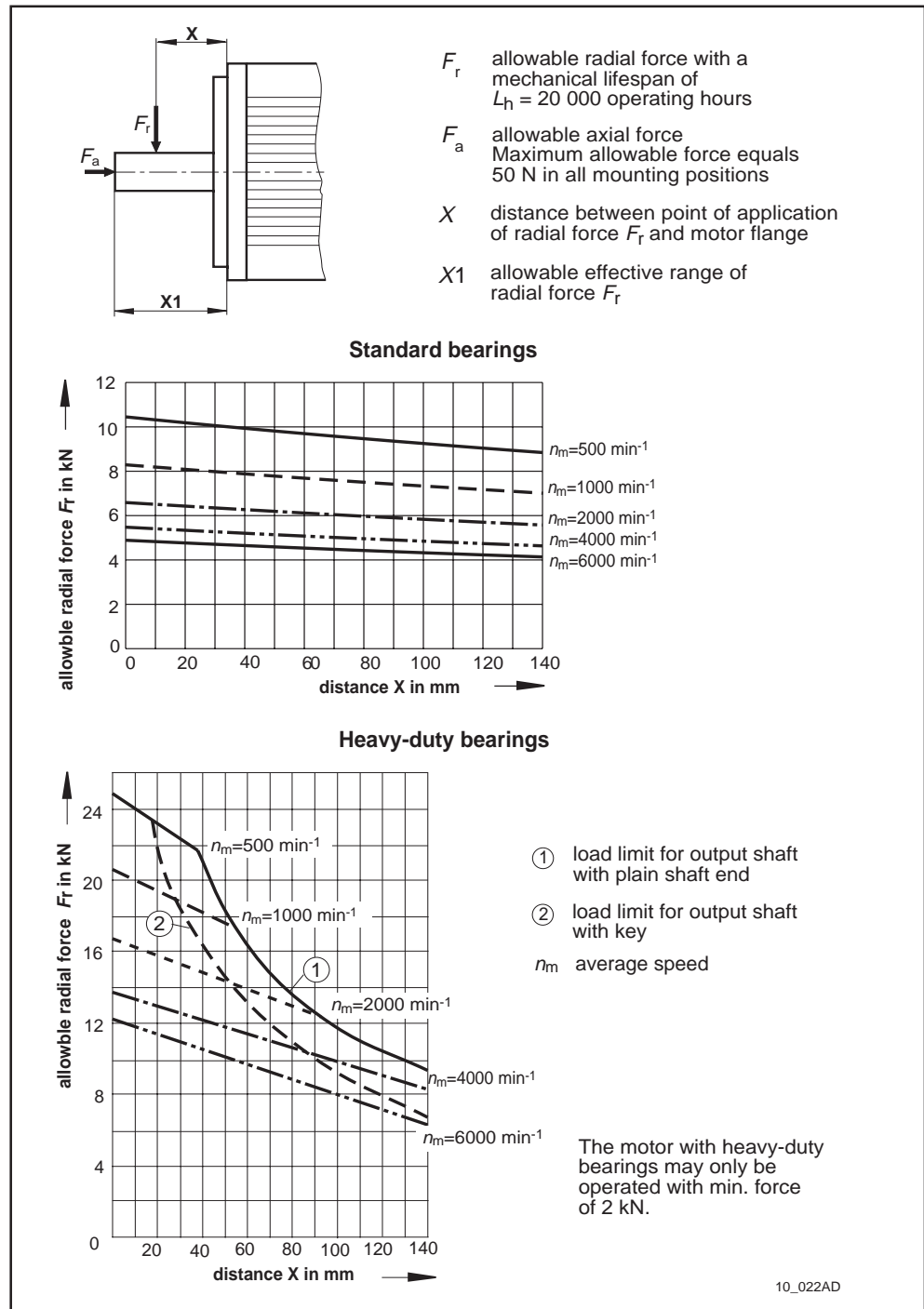


Fig. 10.2: Permissible shaft load 2AD180

Lubricant consumption

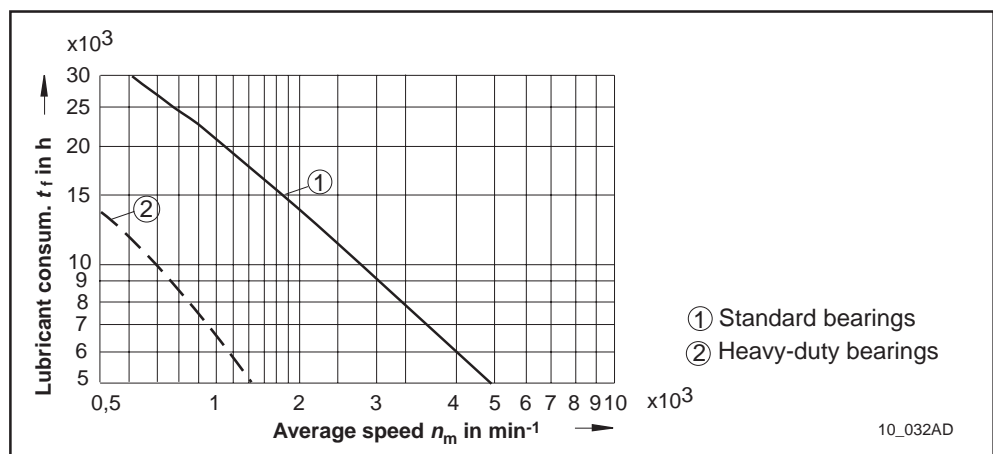


Fig. 10.3: Lubricant consumption 2AD180

## 10.2 Holding brake

(Only possible with motor length "C".)

Designation	Symbol	Unit	Design	
			electrical clamp	electrical release
Functional principle			electrical clamp	electrical release
Holding torque	$M_h$	Nm	300	200
Nominal conn. voltage	$U_n$	V	24±10%	
Nominal current	$I_n$	A	2	
Moment of inertia	$J_B$	kgm <sup>2</sup>	0,0097	
Max. decel energy	$W_{max}$	Ws	70000Maximum	
Speed	$n_{max}$	min <sup>-1</sup>	6000 <sup>1)</sup>	
Release delay	$t_l$	ms	160	110
Clamp delay	$t_k$	ms	120	60
Mass	$m$	kg	11	
<p>1) With an electrically released holding brake, the peak speed of is determined by the maximum decel energy <math>W_{max}</math> of the holding brake. It is computed:</p> $n_{max} = \sqrt{\frac{2 W_{max}}{J_M + J_B + J_C}} \cdot \frac{30}{3,14}$ <p> <math>J_M</math> rotor moment of inertia  <math>J_B</math> moment of inertia of holding brake  <math>J_L</math> moment of inertia of load reduced (attachment mounted to output shaft)                 </p>				

Fig. 10.4: Technical data of holding brake on 2AD180

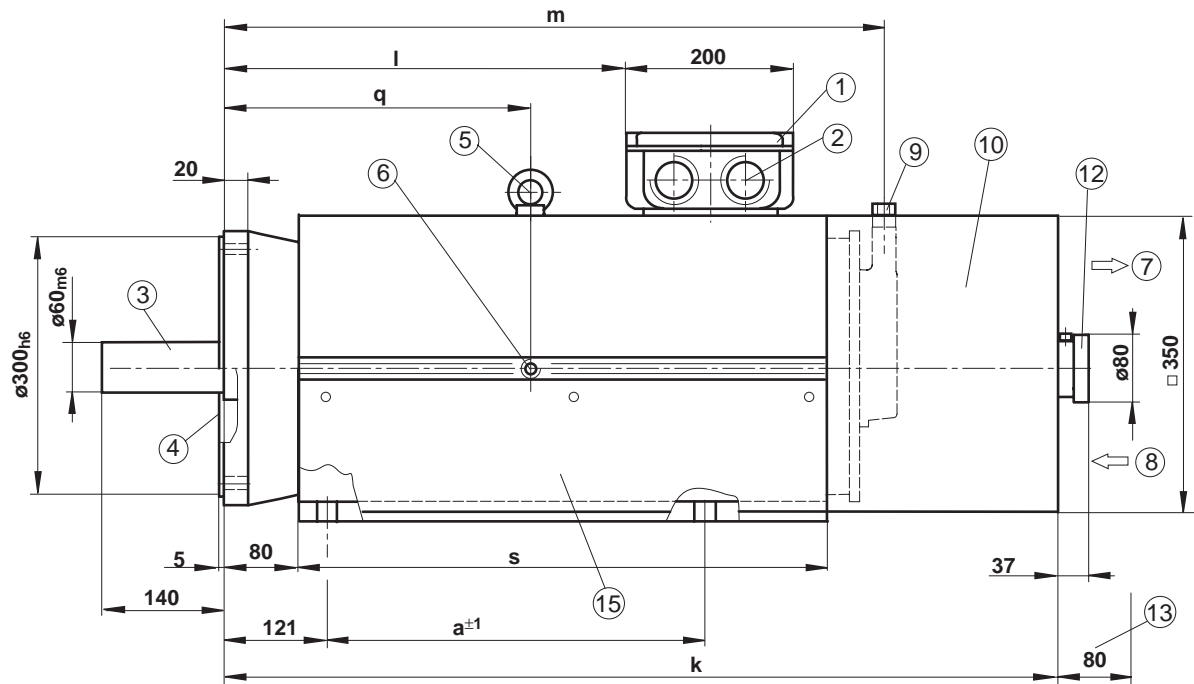
## 10.3 Motor blower

Designation	Symbol	Unit	Design		
			axial blower		radial blower
Air current			B → A blowing (recommended)	A → B suction	A → B suction
Power consumption	$S_N$	VA	220		330
Nominal voltage	$U_N$	V	3 x AC, 400V 50/60Hz 3 x AC, 460V 60Hz		
Average air volume	$V$	m <sup>3</sup> /h	1950		

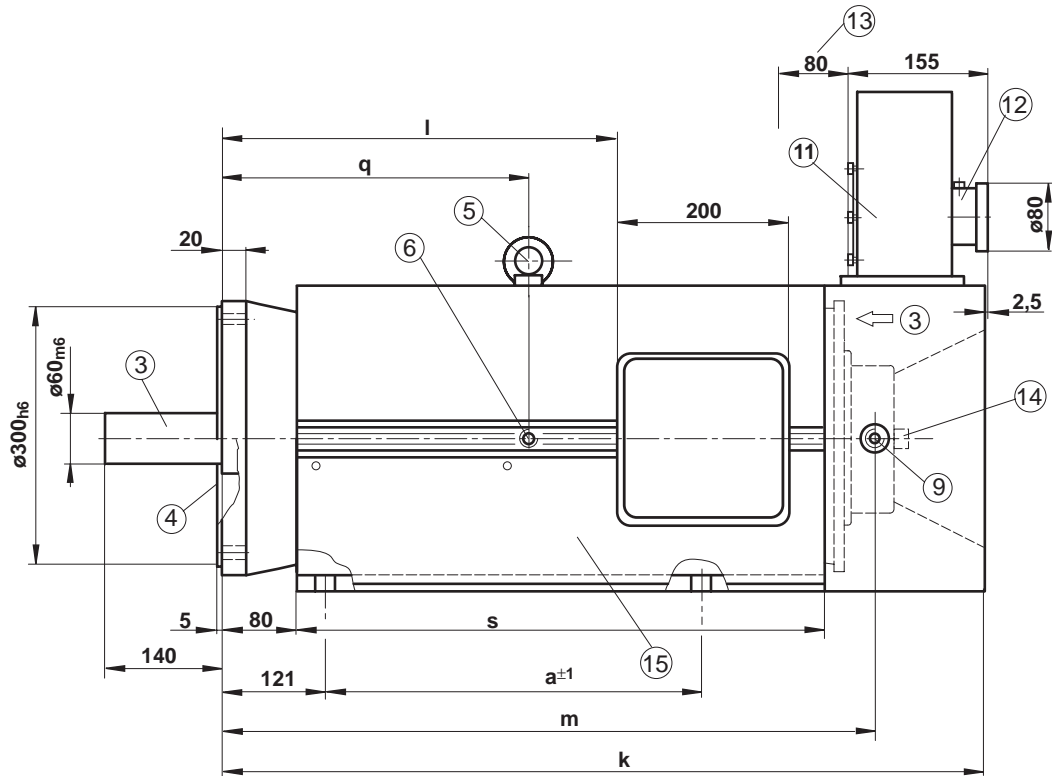
Fig. 10.5: Technical data of motor blower on 2AD180

### 10.4 Dimensions

Motor with Axial blower and feedback types 3, B35



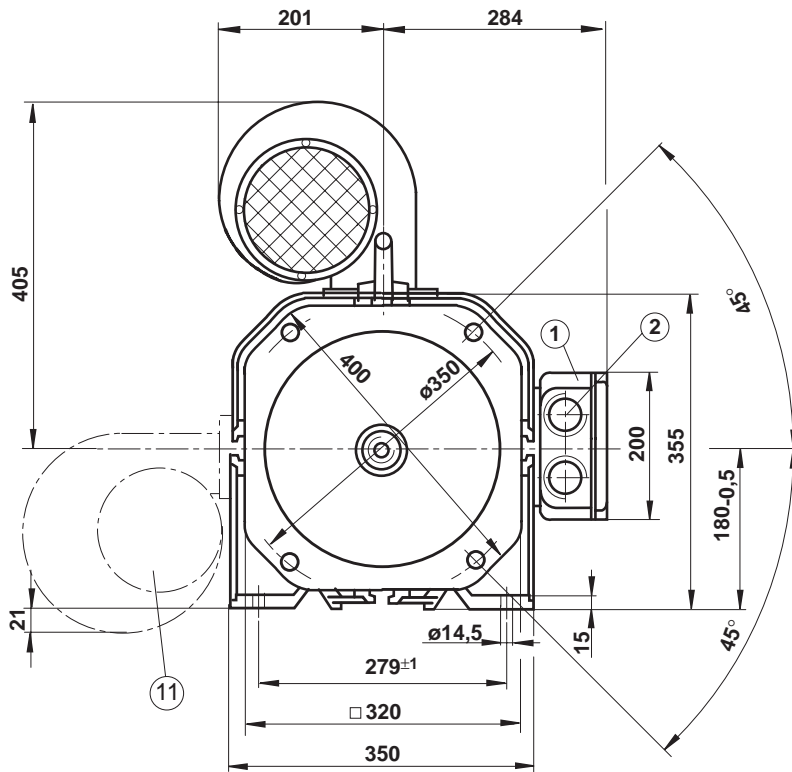
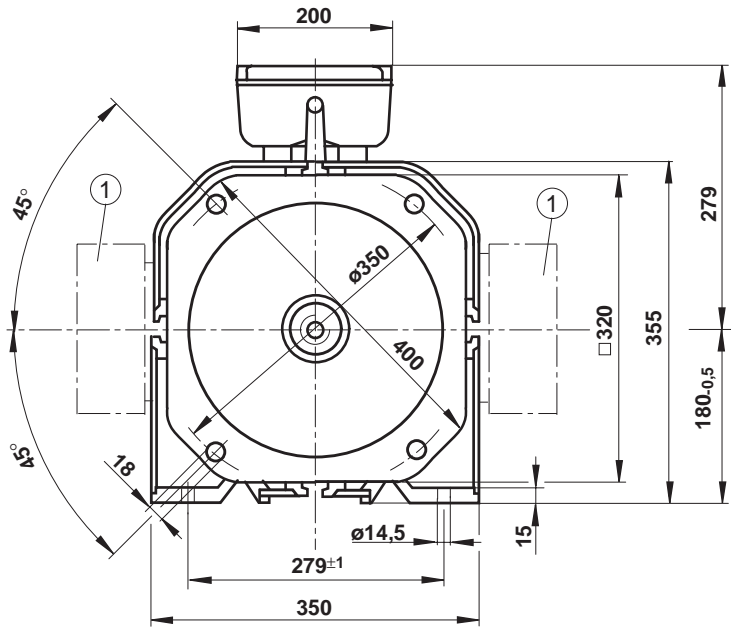
Motor with radial blower and feedback type 3, B35



**Tolerances**

Dim. upto	6	30	120	400	1000	2000
Tolerance	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

10\_0618A



Dim.:	2AD180C	2AD180D
a	430	540
k	944	1054
l	464	574
m	743,5	853,5
q	360	415
s	599	709

- ① power connection; arrangement selectable, can be turned by 90°, in terms of output direction of power connection
- ② cable output: PG 42
- ③ plain shaft end concentricity tolerance DIN 42955 -R; center drill hole on front DIN 332 DS M20x42
- ④ flange dimensions per DIN42948
- ⑤ ring screws M20 - DIN 580
- ⑥ add. threads M20 for ring screws; second thread opposite
- ⑦ air flow A → B
- ⑧ air flow B → A
- ⑨ Motor feedback conn. type 3 (flanged socket), allocation per position of power connection
- ⑩ Axial blower
- ⑪ Radial blower arrangement selectable; pos. if radial blower may not be same as that of power connection.
- ⑫ Motor blower connection terminal box with cable threaded joint
- ⑬ Mounting distance (min. clearance for taking in air for cooling).
- ⑭ B-side shaft end dimensions, see Fig. 10.8
- ⑮ Air baffle

Dim.:	2AD180C	2AD180D
a	430	540
k	889	999
l	464	574
m	743,5	853,5
q	360	415
s	599	709

Available designs, see Fig. 10.12 - Type codes

10\_0618B

Fig. 10.6: Dimensions for 2AD180

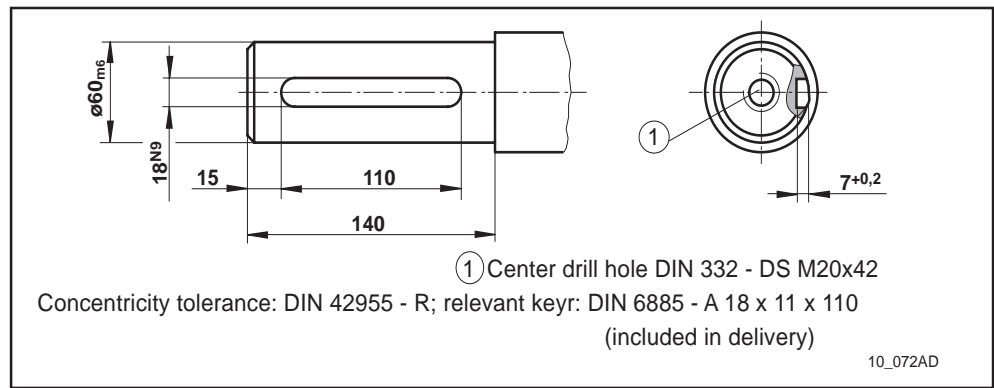


Fig. 10.7: Output shaft with key 2AD180

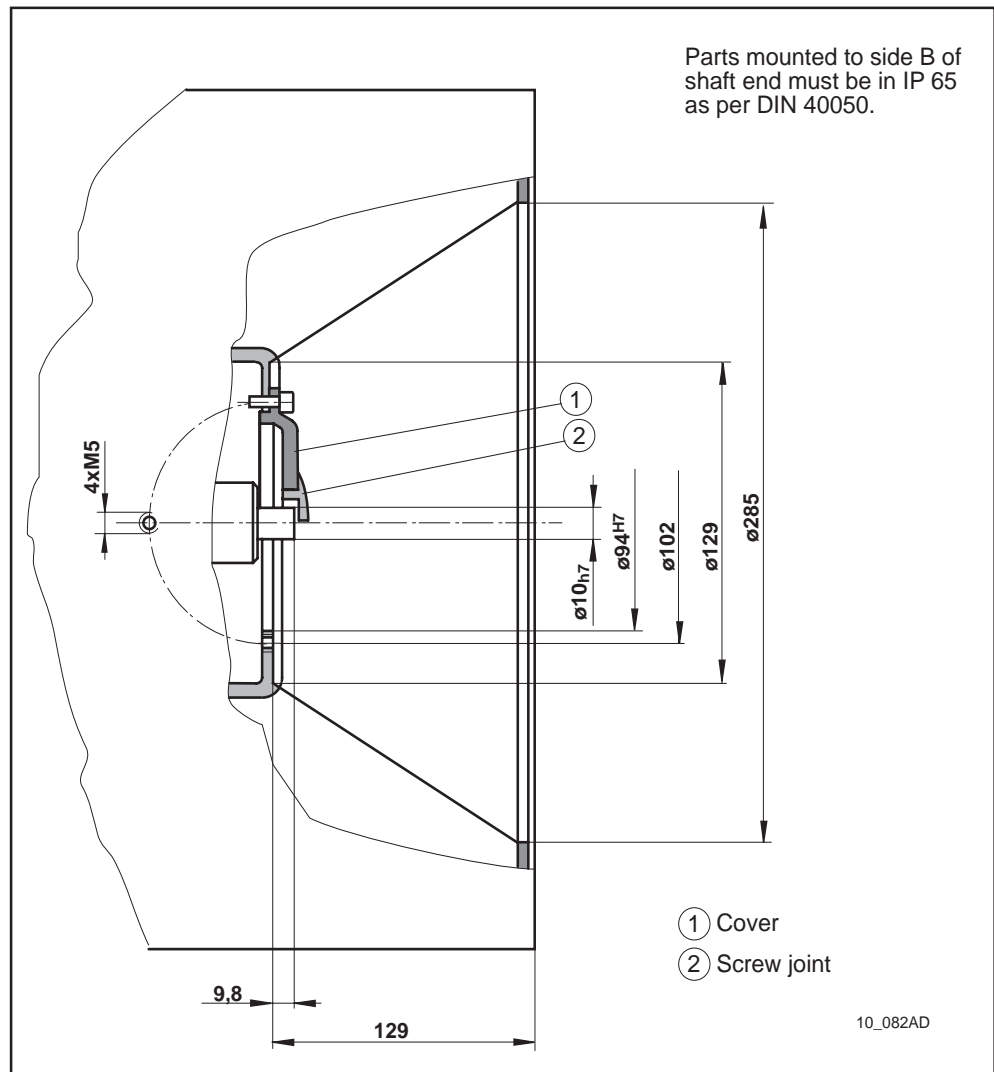


Fig. 10.8: B-side shaft end 2AD180



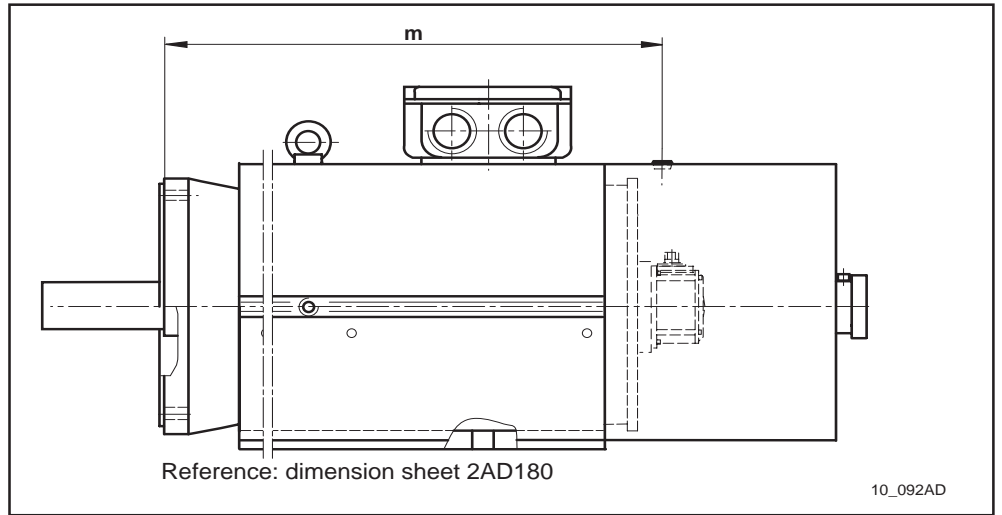


Fig. 10.9.: 2AD180 with feedback types 6, 7

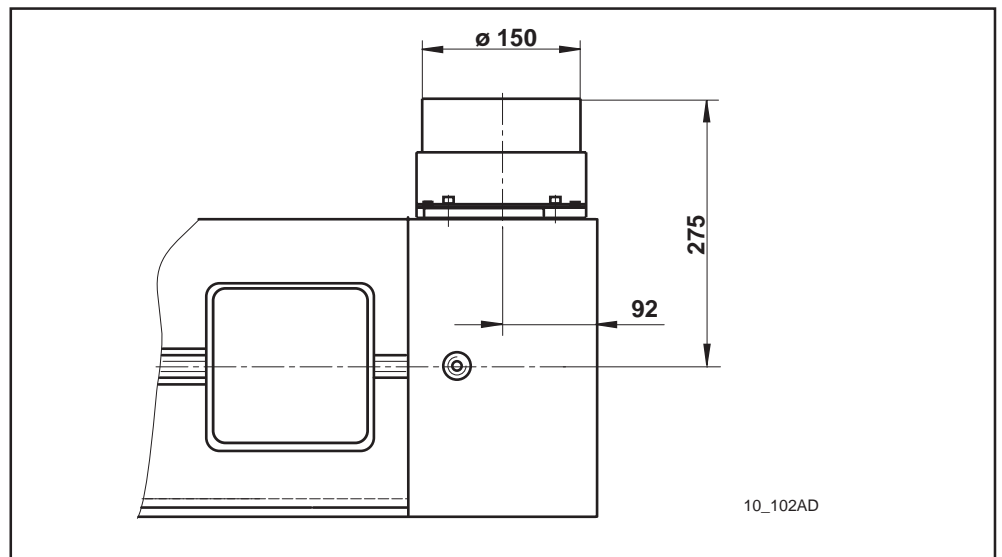


Fig. 10.10.: 2AD180 with mounted accessories - M01 2AD180 (blower base)

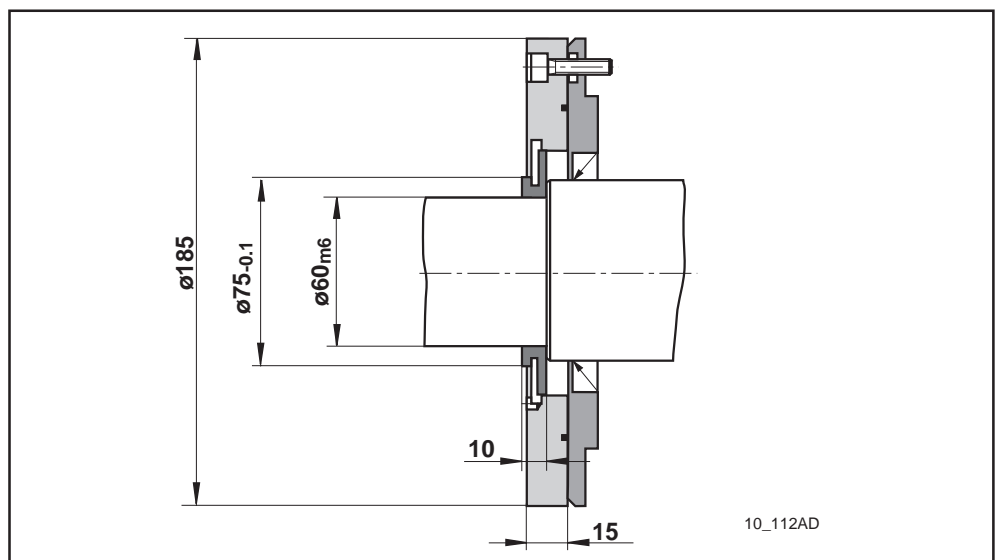


Fig. 10.11: 2AD180 with mounted accessories - M02 2AD180 (labyrinth seal)

### 10.5 Type codes

Type codes:	Example:	2AD180C-B35OB1-BS03-A2N1
1. Name:	2AD	
2. Motor size:	180	
3. Motor length:	C, D	
4. Construction: Flange and foot mounting	B35	
5. Position of power connection: top left right	O L R	
6. Output direction of power connection: to side A, terminal box to side B, terminal box to the right, terminal box to the left, terminal box	A B R L	
7. Cooling mode: Axial blower (Air current B --> A) Axial blower (Air current A --> B) radial blower (Air current B --> A), Blower top ** radial blower (Air current B --> A), Blower right ** radial blower (Air current B --> A), Blower bottom ** radial blower (Air current B --> A), Blower left **	1 2 3 6 7 8	
8. Windings designation: 2AD180C 2AD180D	BS BS	
9. Holding brake****): without electrical clamp electrical release, heavy-duty	0 1 3	
10. Motor feedback: high-resolution motor feedback digital servo feedback digital servo feedback with integral multiturn absolute encoder	3 6 7	
11. Output shaft:		
	plain shaft	with key with whole key balanced with half key balanced
without shaft sealing ring	A	B E
with shaft sealing ring	C	D H
12. B-side shaft end: without with (for mounted encoder, incremental/absolute) ***	2 3	
13. bearings: Standard heavy-duty	N V	
14. vibration severity level: R S S1 ****)	1 2 3	

\*) looking towards motor shaft, direction per power connection  
 \*\*) blower position may not be the same as that of the power connection  
 \*\*\*) only available with radial blower and motor feedback "3";  
 \*\*\*\*) not available with heavy-duty bearings  
 \*\*\*\*\*) only available with motor length C

Quellverweis: INN 41.01 section 18-0, Aug. 1

Fig. 10.12: Type codes 2AD180

# 11. Technical data 2AD200

## 11.1 Nominal data

Name	Symbol	Unit	2AD200
Motor size			C
Windings ID letters			AS
Nominal power <sup>1)</sup>	$P_n$	kW	79
Nominal torque <sup>1)</sup>	$M_n$	Nm	503
Motor nominal speed	$n$	min <sup>-1</sup>	1500
Maximum speed	$n_{max}$	min <sup>-1</sup>	5000
Nominal current	$I_n$	A <sub>eff</sub>	186
Nominal voltage	$U_n$	V <sub>eff</sub>	325
Rotor moment of inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	0,66
Thermal time constant	$t_{th}$	min	
Minimum conn. cross section EN 60204 section 1/02.86	A	mm <sup>2</sup>	or 2 x 25 1 x 70
Average noise level at 1m (PWM=4kHz)	$L_p$	dB(A)	77±3
Mass <sup>3)</sup>	$m$	kg	450
Ambient temperature		°C	0 ... 45
Insulation classification DIN VDE 0530 section 1			F
Vibration severity level <sup>4)</sup> DIN ISO 2373			R, S, S1
<sup>1)</sup> Values determined per DIN VDE 0530 section 1 For the selection of an AC main spindle motor, curves are available for the specified nominal powers which take operating modes S1, S2 and S6 into consideration. <sup>2)</sup> Values without holding brakes <sup>3)</sup> Values without holding brakes, with blower <sup>4)</sup> For values see Fig. 2.7 "RMS vibration speed"			

Fig. 11.1: Nominal data 2AD200

Permissible shaft load

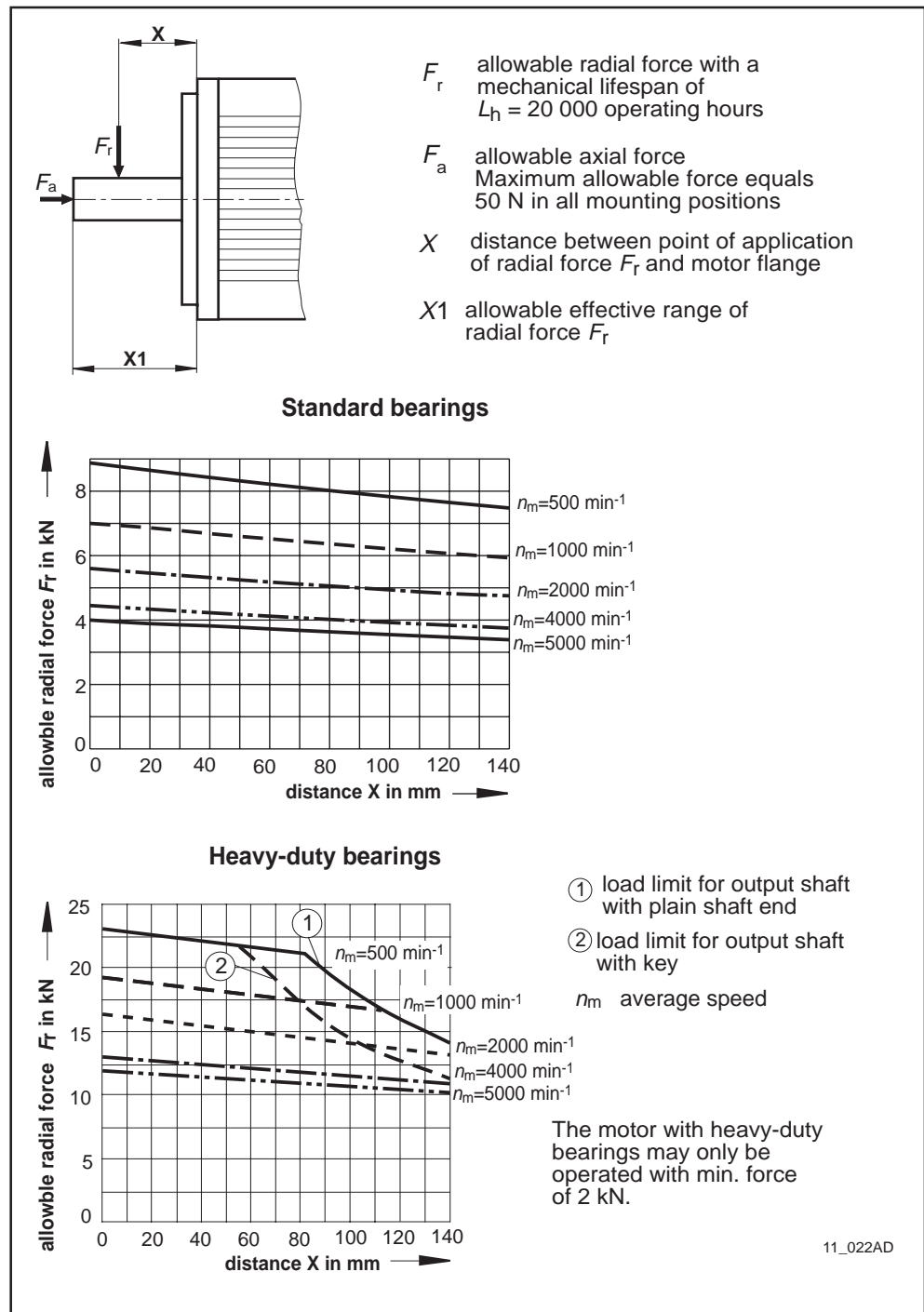


Fig. 11.2: Permissible shaft load 2AD200

Lubricant consumption

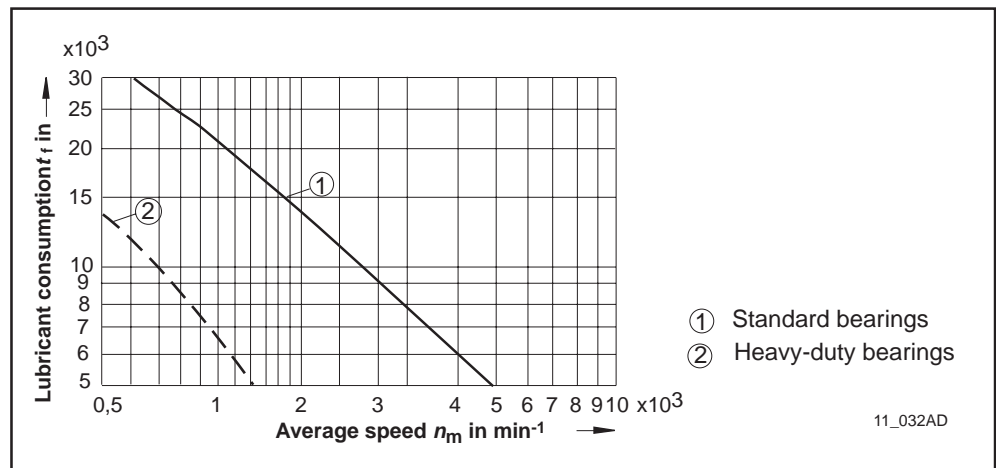


Fig. 11.3: Lubricant consumption 2AD200

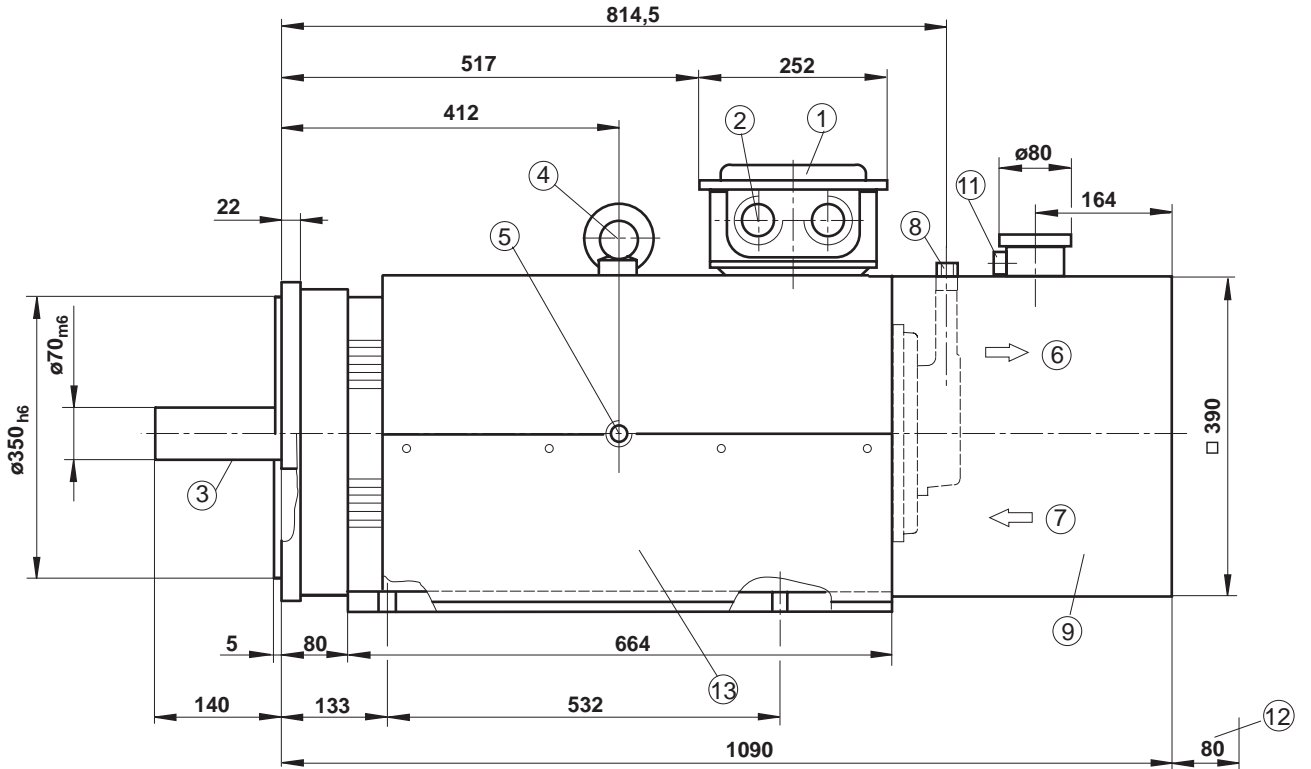
## 11.2 Motor blower

Designation	Symbol	Unit	Design		
			axial blower	radial blower	
Air current			B → A blowing (recommended)	A → B suction	B → A blowing
Power consumption	$S_N$	VA	600		340
Nominal voltage	$U_N$	V	3 x AC, 400V, 50/60Hz 3 x AC, 460V, 60Hz		
Average air volume	$V$	m <sup>3</sup> /h	2500		

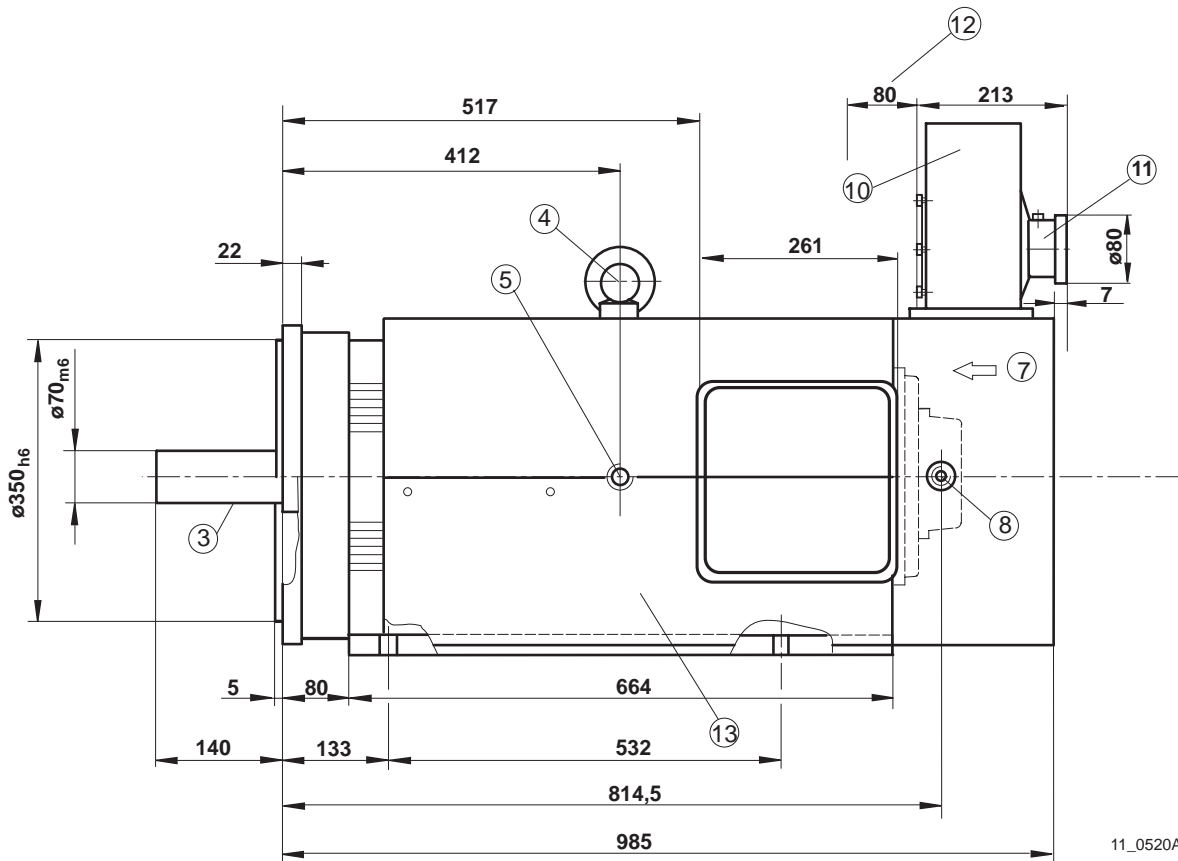
Fig. 11.4: Technical data of motor blower on 2AD200

### 11.3 Dimensions

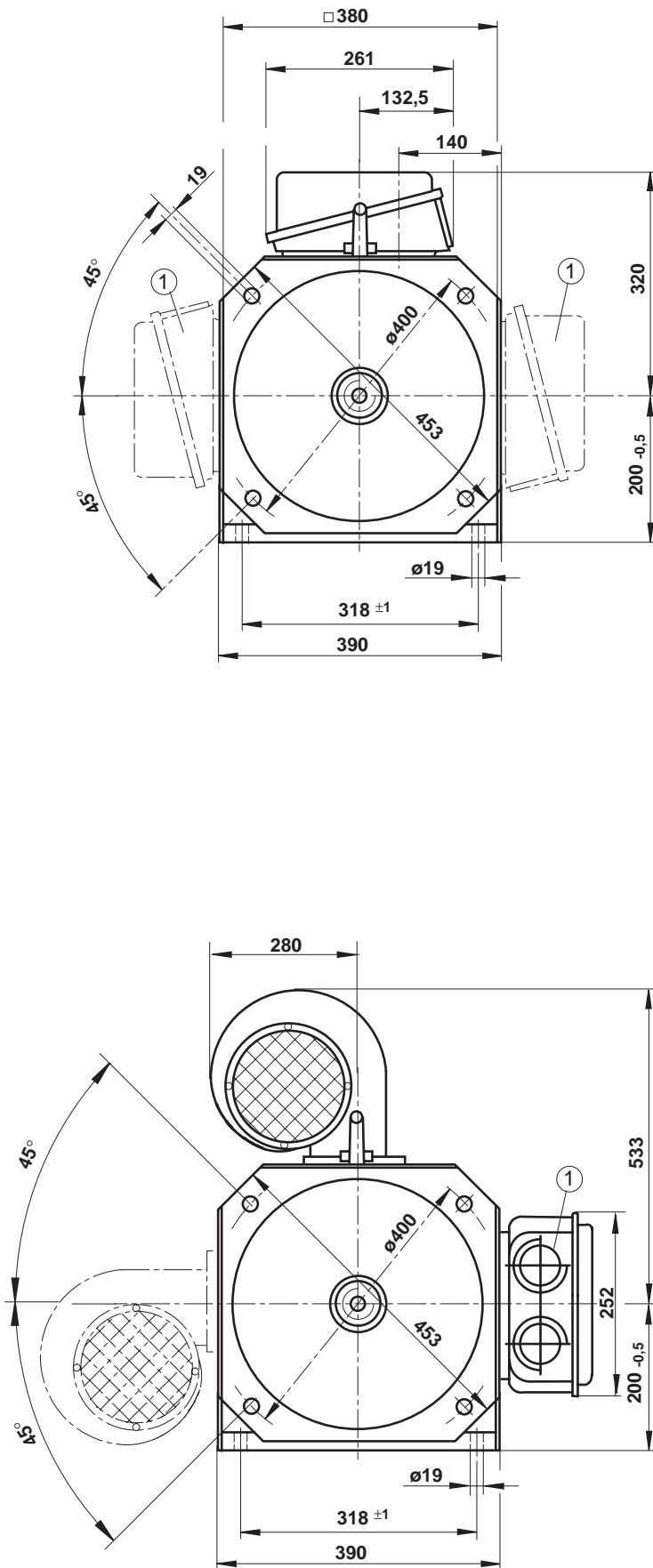
**Motor with axial blower and feedback types 3, B35**



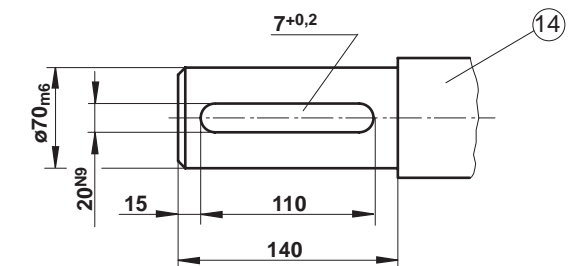
**Motor with radial blower and feedback type 3, B35**



11\_0520A



- ① power connection; arrangement selectable, can be turned by 90°, in terms of output direction of power connection
- ② cable output: PG 48
- ③ plain shaft end concentricity tolerance DIN 42955 -R; center drill hole on front DIN 332 DS M20x42
- ④ ring screws M20 - DIN 580
- ⑤ add. threads M20 for ring screws; second thread opposite
- ⑥ air flow A → B
- ⑦ air flow B → A
- ⑧ Motor feedback conn. type 3 (flanged socket), allocation per position of power connection
- ⑨ Axial blower
- ⑩ Radial blower
- ⑪ Motor blower connection terminal box with cable threaded joint
- ⑫ Mounting distance (min. clearance for taking in air for cooling).
- ⑬ Air baffle
- ⑭ output shaft with key; concen. tolerance: DIN 42955 - R; key: DIN 6885 - A 20 x 12 x 110 (part of delivery)



**Tolerances:**

Dim. to	6	30	120	400	1000	2000
<b>Tolerance</b>	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

For available designs see Fig.11.8 - type codes

11\_0520B

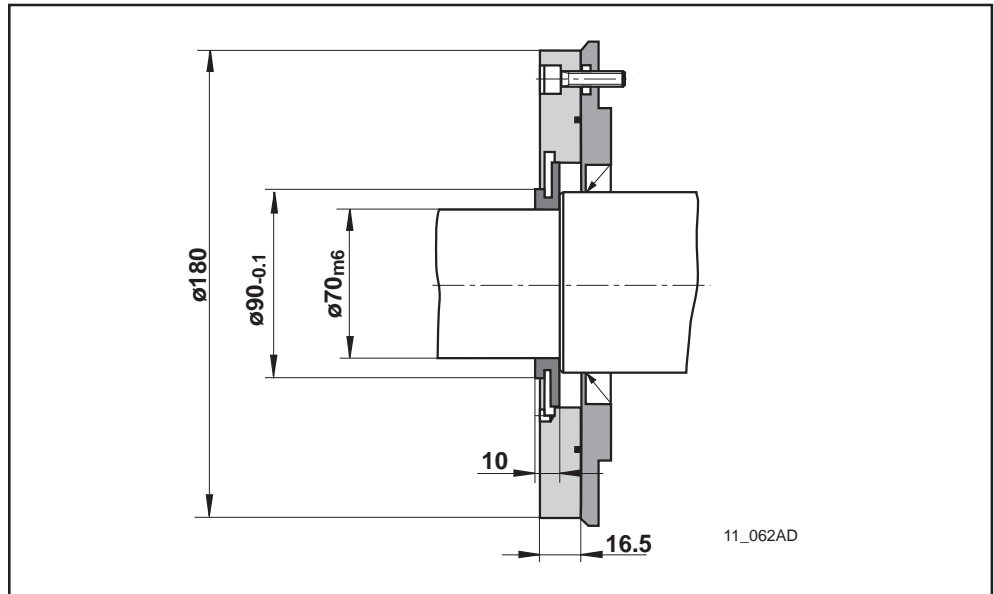


Fig. 11.6: 2AD200 with mounted accessories - M02 2AD200 (labyrinth seal)

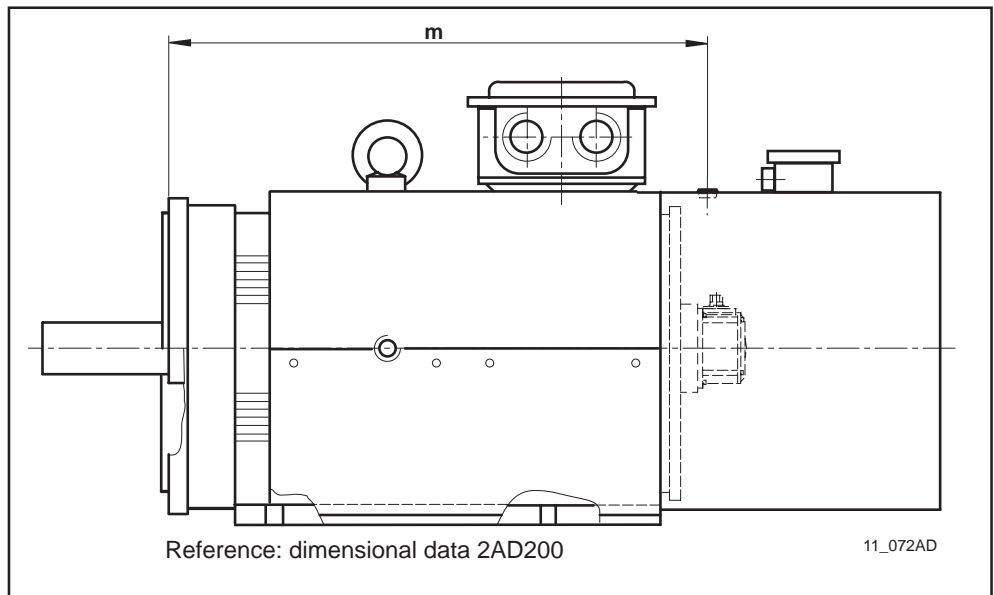


Fig. 11.7: 2AD200 with feedback types 6, 7



### 11.4 Type codes

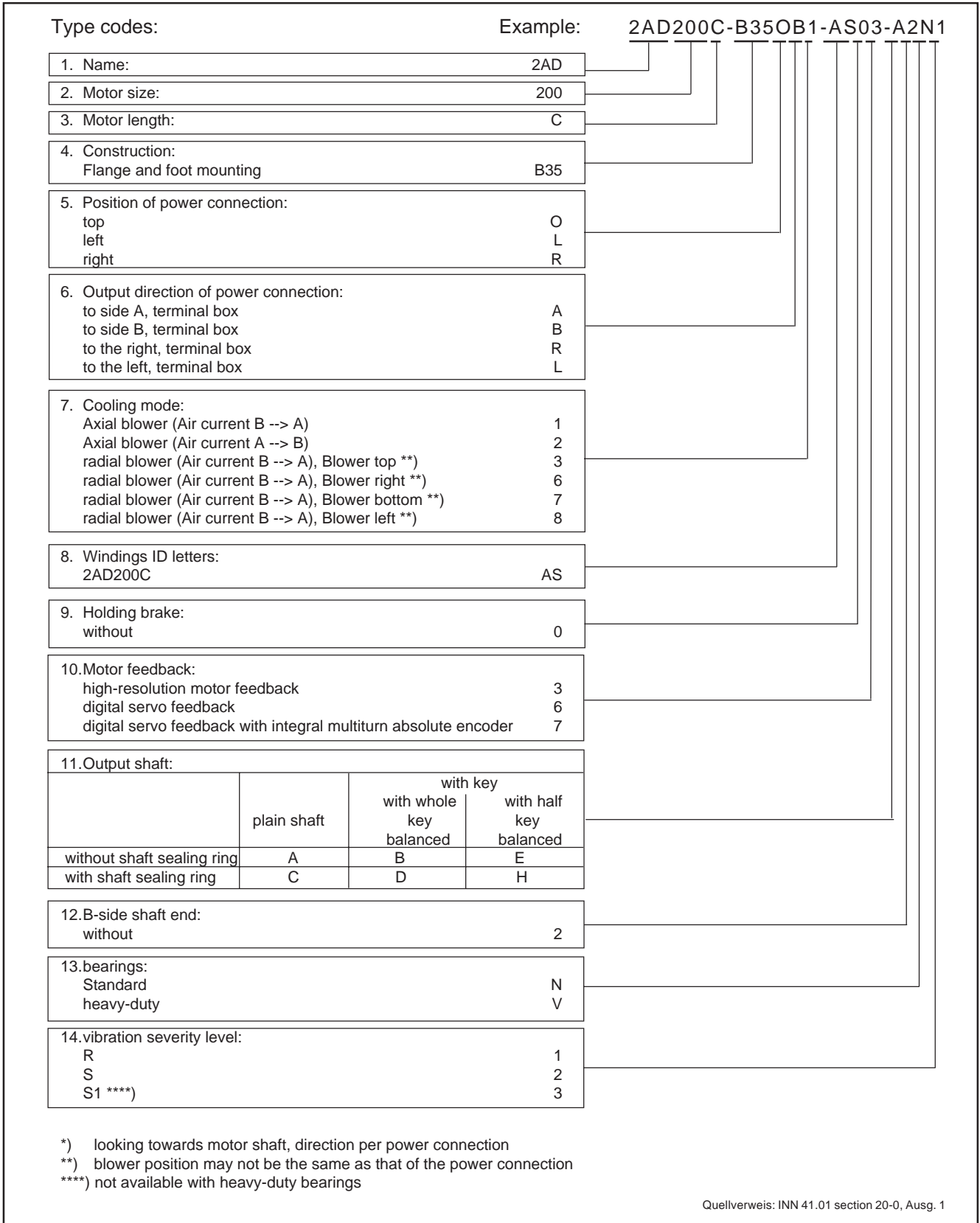


Fig. 11.8: Type codes 2AD200

Notes

## 12. Technical data 2AD225

### 12.1 Nominal data

Name	Symbol	Unit	2AD225
Motor size			C
Windings ID letters			AS
Nominal power <sup>1)</sup>	$P_n$	kW	93
Nominal torque <sup>1)</sup>	$M_n$	Nm	592
Motor nominal speed	$n$	min <sup>-1</sup>	1500
Maximum speed	$n_{max}$	min <sup>-1</sup>	5000 standard bearings
			4500 heavy-duty bearings
Nominal current	$I_n$	A <sub>eff</sub>	210
Nominal voltage	$U_n$	V <sub>eff</sub>	330
Rotor moment of inertia <sup>2)</sup>	$J_M$	kgm <sup>2</sup>	1,05
Thermal time constant	$t_{th}$	min	130
Minimum conn. cross section EN 60204 section 1/02.86	$A$	mm <sup>2</sup>	2 x 35
Average noise level at 1m (PWM=4kHz)	$L_p$	dB(A)	78±3
Mass <sup>3)</sup>	$m$	kg	705
Ambient temperature		°C	0 ... 45
Insulation classification DIN VDE 0530 section 1			F
Vibration severity level <sup>4)</sup> DIN ISO 2373			R, S, S1
<sup>1)</sup> Values determined per DIN VDE 0530 section 1 For the selection of an AC main spindle motor, curves are available for the specified nominal powers which take operating modes S1, S2 and S6 into consideration. <sup>2)</sup> Values without holding brakes <sup>3)</sup> Values without holding brakes, with blower <sup>4)</sup> For values see Fig. 2.7 "RMS vibration speed".			

Fig. 12.1: Nominal data 2AD225

Permissible shaft load

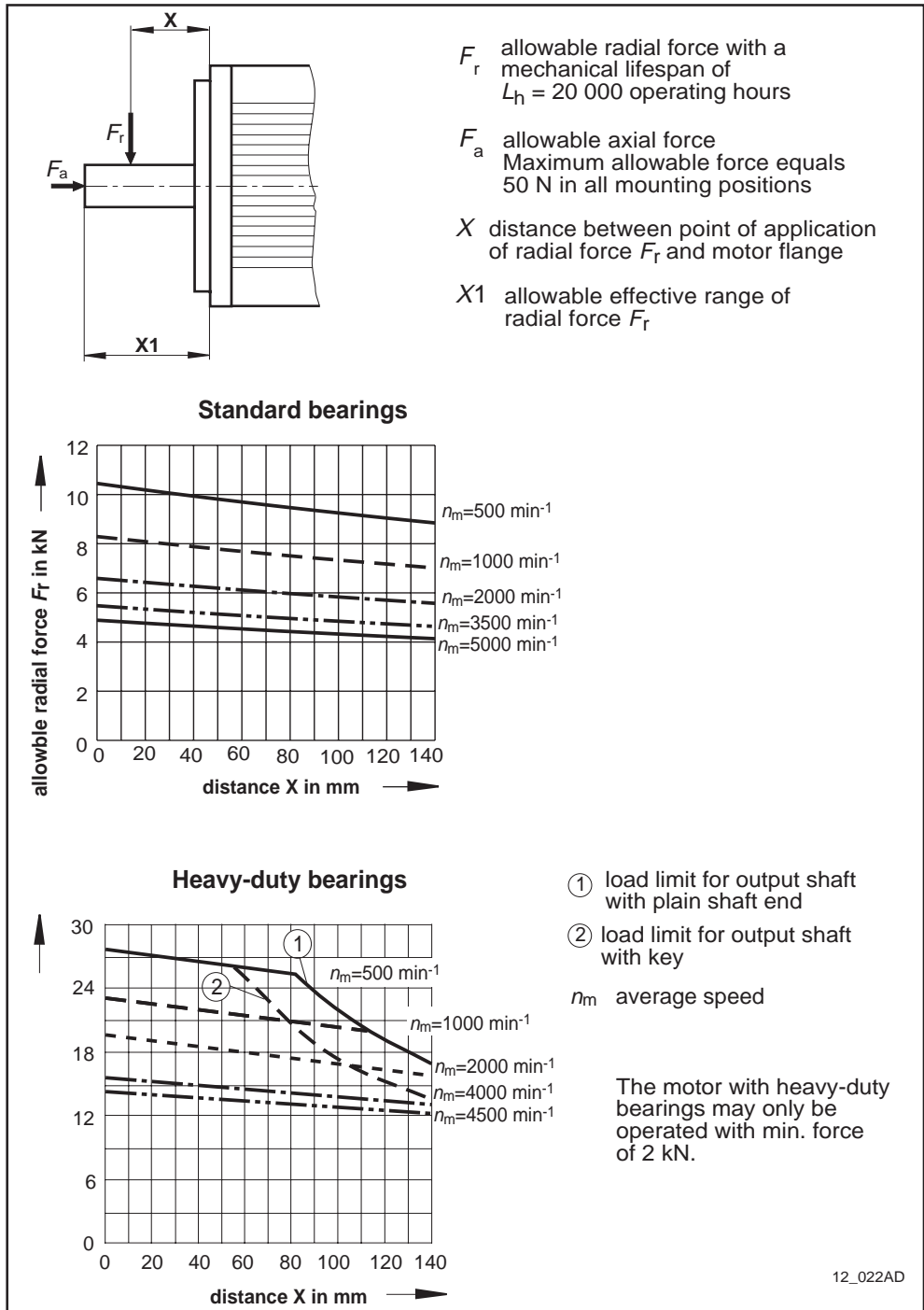


Fig. 12.2: Permissible shaft load 2AD225

Lubricant consumption

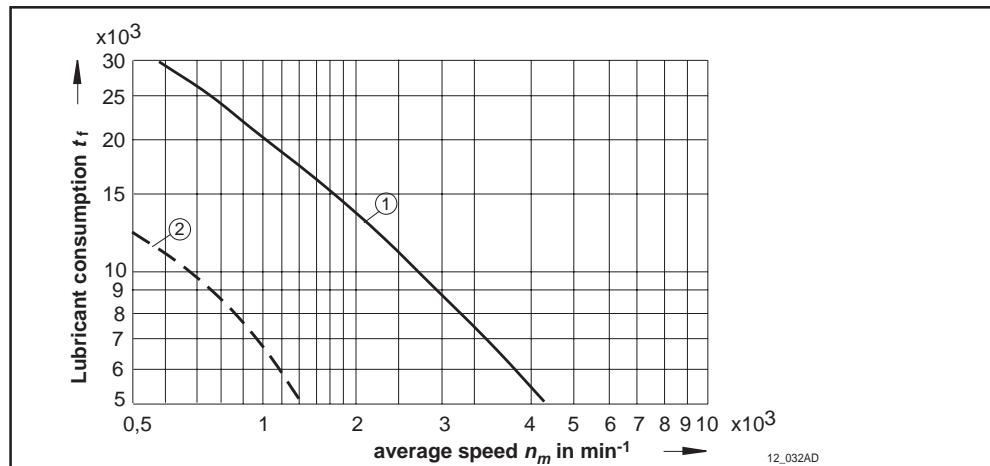


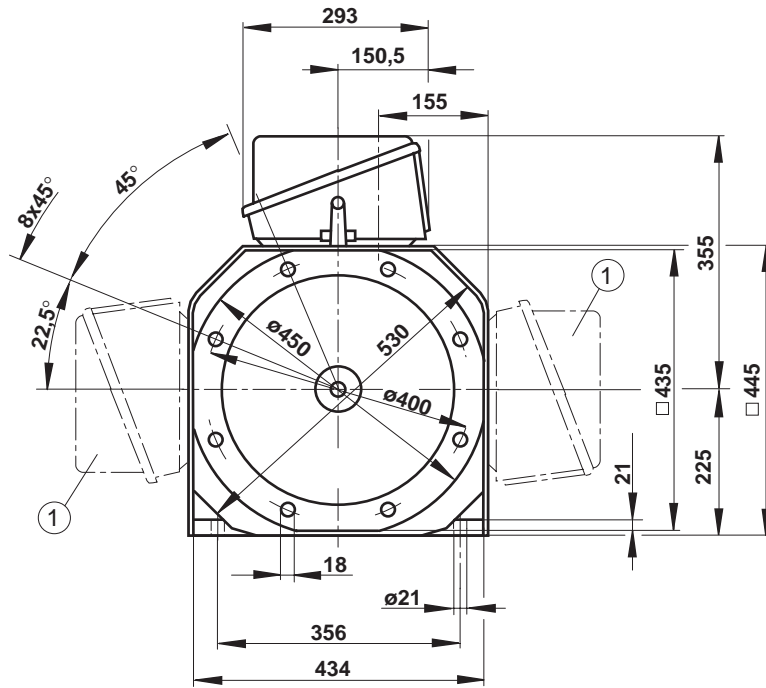
Fig. 12.3: Lubricant consumption 2AD225

## 12.2 Motor blower

Designation	Symbol	Unit	Design		
			axial blowerradial blower		
Air current			B → A blowing (recommended)	A → B suction	A → B blowing
Power consumption	$S_N$	VA	460		500
Nominal voltage	$U_N$	V	3 x AC, 400V, 50/60Hz 3 x AC, 460V, 60Hz		
Average air volume	$V$	m <sup>3</sup> /h	3500		

Fig. 12.4: Technical data of motor blower on 2AD225





- ① Power connection
- ② cable output: PG 48
- ③ plain shaft end concentricity tolerance DIN 42955 -R; center drill hole on front DIN 332 DS M20x42
- ④ ring screws M20 - DIN 580
- ⑤ add. threads M10 for ring screws; second thread opposite
- ⑥ air flow A → B
- ⑦ air flow B → A
- ⑧ Motor feedback conn. type 3 (flanged socket), allocation per position of power connection
- ⑨ Axial blower
- ⑩ Motor blower connection terminal box with cable threaded joint
- ⑪ Mounting distance (min. clearance for taking in air for cooling).
- ⑫ output shaft with key; concen. tolerance: DIN 42955 - R; key: DIN 6885 - A 20 x 12 x 110 (part of delivery)
- ⑬ Air baffle
- ⑭ Motor feedback conn. types 6, 7 (flange socket), arranged in terms of the position of the power connection

12\_05225B

**Tolerances:**

Dim.	6	30	120	400	1000	2000
<b>Tolerance</b>	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2

For available designs see Fig.11.8 - type codes

Fig. 12.5: Dimensions for 2AD225

### 12.4 Type codes

Type codes:	Example:	2AD225C-B35OB1-AS03-A2N1
1. Name:	2AD	
2. Motor size:	225	
3. Motor length:	C	
4. Construction: Flange and foot mounting	B35	
5. Position of power connection: top left right	O L R	
6. Output direction of power connection: to side A, terminal box to side B, terminal box to the right, terminal box to the left, terminal box	A B R L	
7. Cooling mode: Axial blower (Air current B --> A) Axial blower (Air current A --> B)	1 2	
8. Windings ID letters: 2AD225C	AS	
9. Holding brake: without	0	
10. Motor feedback: high-resolution motor feedback digital servo feedback digital servo feedback with integral multiturn absolute encoder	3 6 7	
11. Output shaft:		
	plain shaft	with key with whole key balanced
without shaft sealing ring	A	B
with shaft sealing ring	C	D
		with half key balanced
		E
		H
12. B-side shaft end: without	2	
13. bearings: Standard heavy-duty	N V	
14. vibration severity level: R S S1 ****)	1 2 3	

\*) looking towards motor shaft, direction per power connection  
 \*\*) blower position may not be the same as that of the power connection  
 \*\*\*\*) not available with heavy-duty bearings

Quellverweis: INN 41.01 section 22-5, Ausg.1

Fig. 12.6: Type codes 2AD225



# 13. Mechanical Accessories

## 13.1 Blower base

Blower base  
M01 2AD132/134

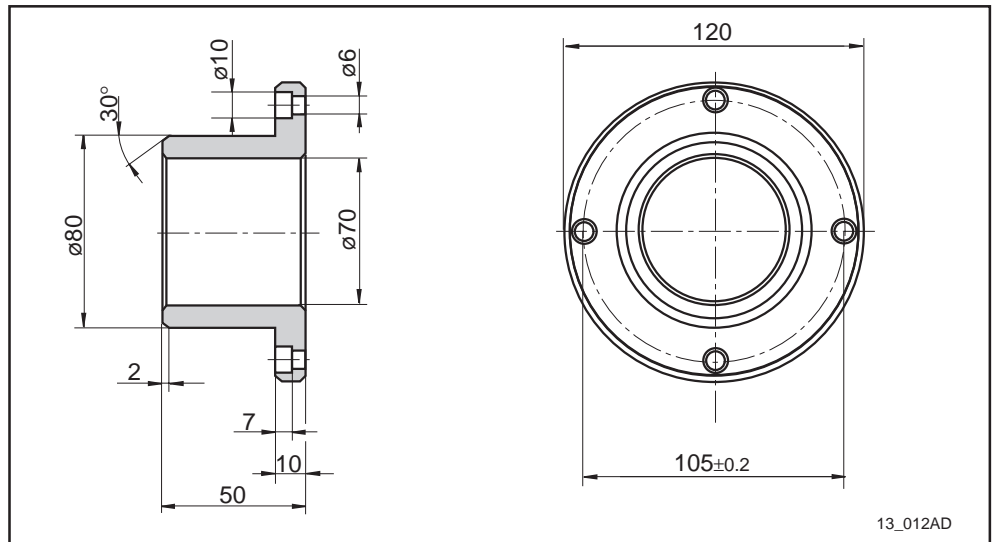


Fig. 13.1: Dimensions of blower base for 2AD132/134

Blower base  
M01 2AD160/164

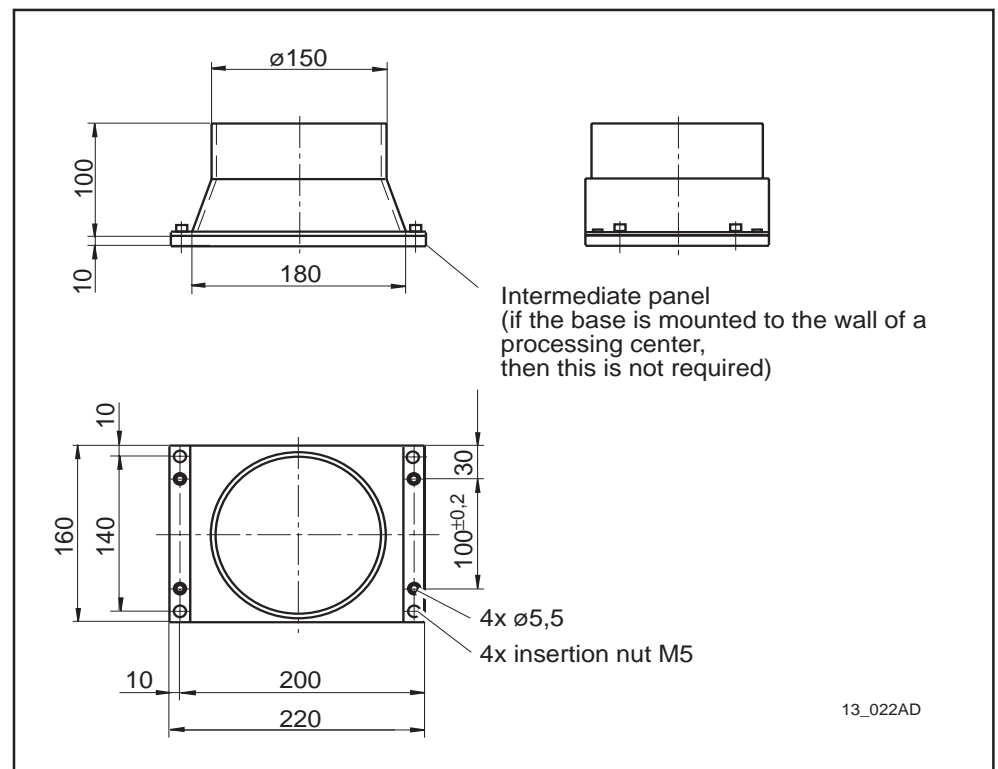


Fig. 13.2: Dimensions of blower base for 2AD160/164

Blower base  
M01 2AD180

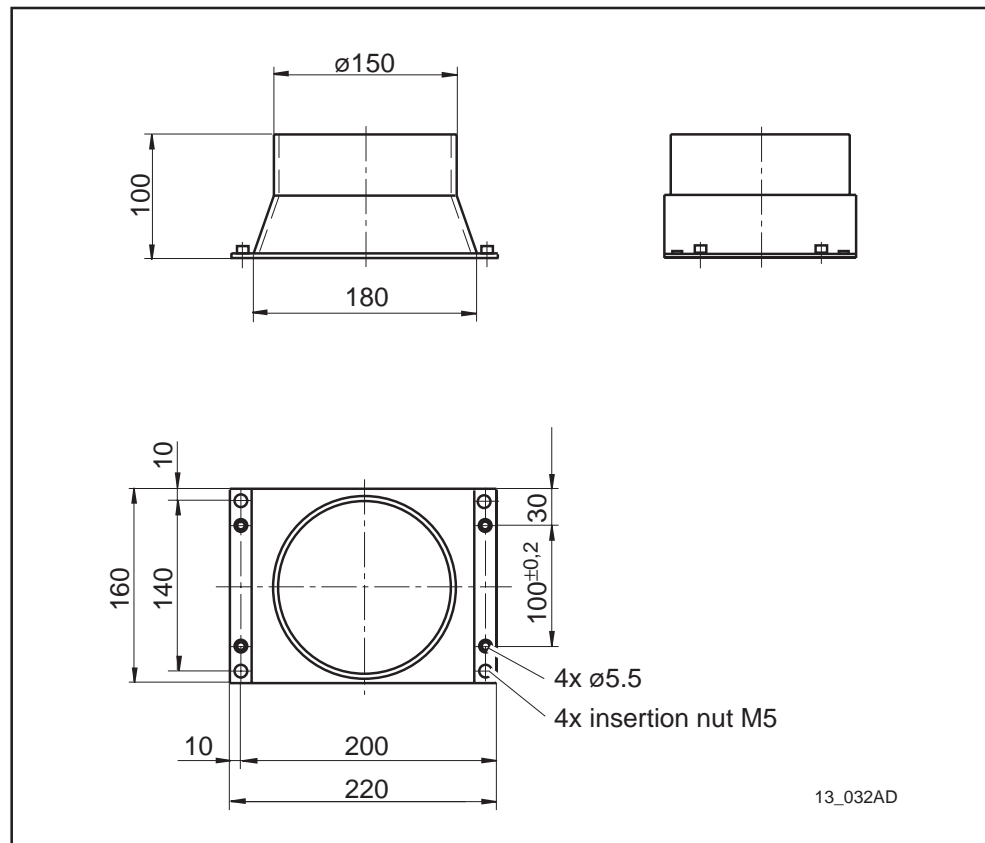


Fig. 13.3: Dimensions of blower base for 2AD180

### 13.2 Labyrinth seal

Labyrinth seal  
M02 2AD...

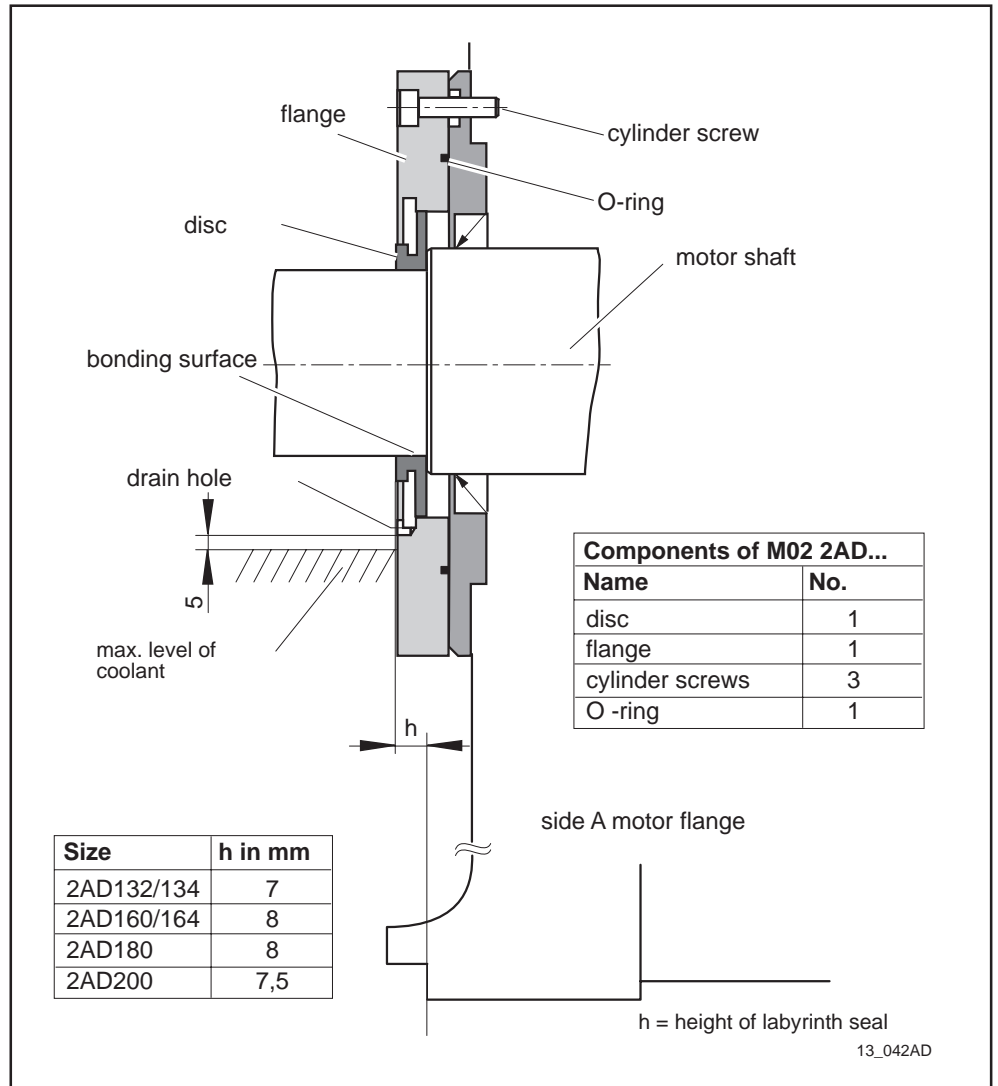


Fig. 13.4: Construction principle of the labyrinth seal

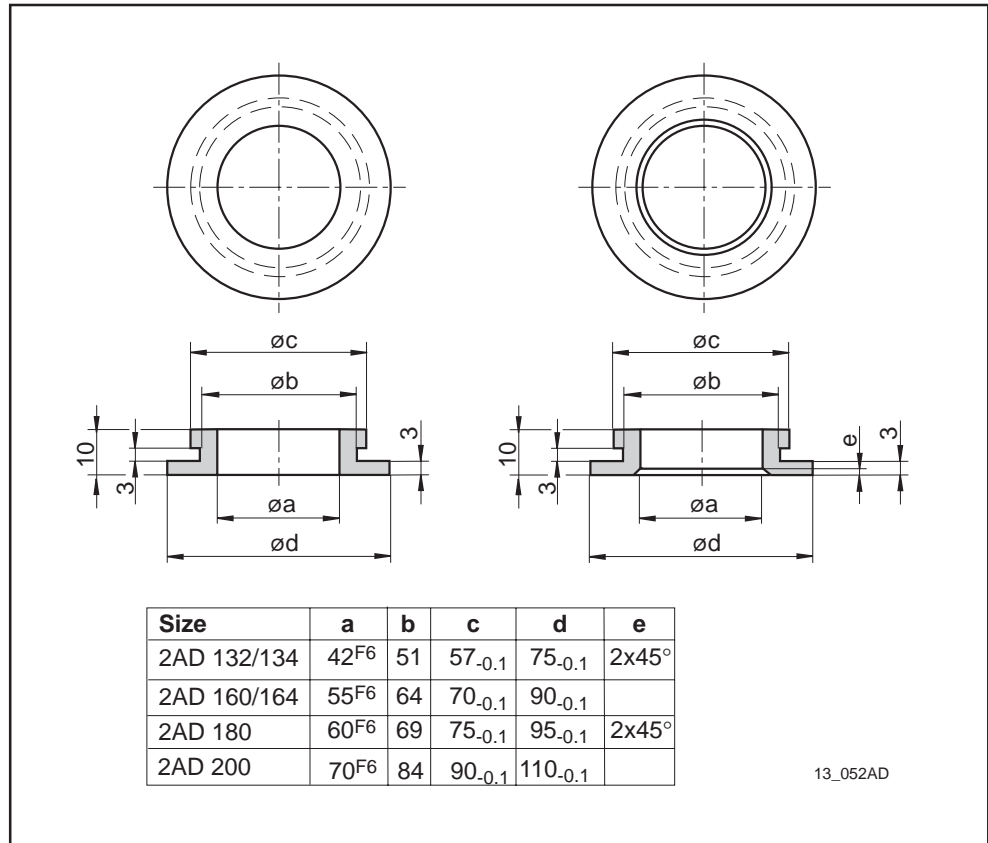


Fig. 13.5: Disc of mechanical accessories M02 2AD...

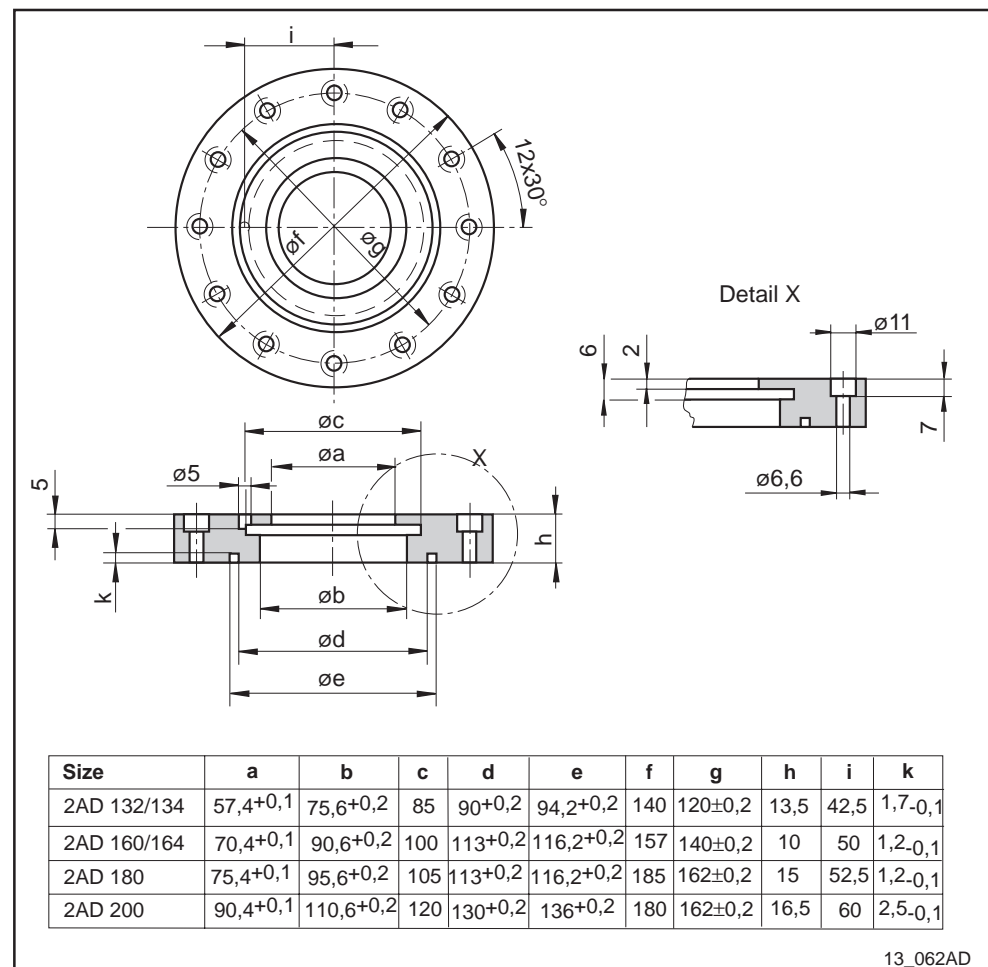


Fig. 13.6: Flange of the mechanical accessories M02 2AD...

# 14. Electrical connections

## 14.1 Motor power connections

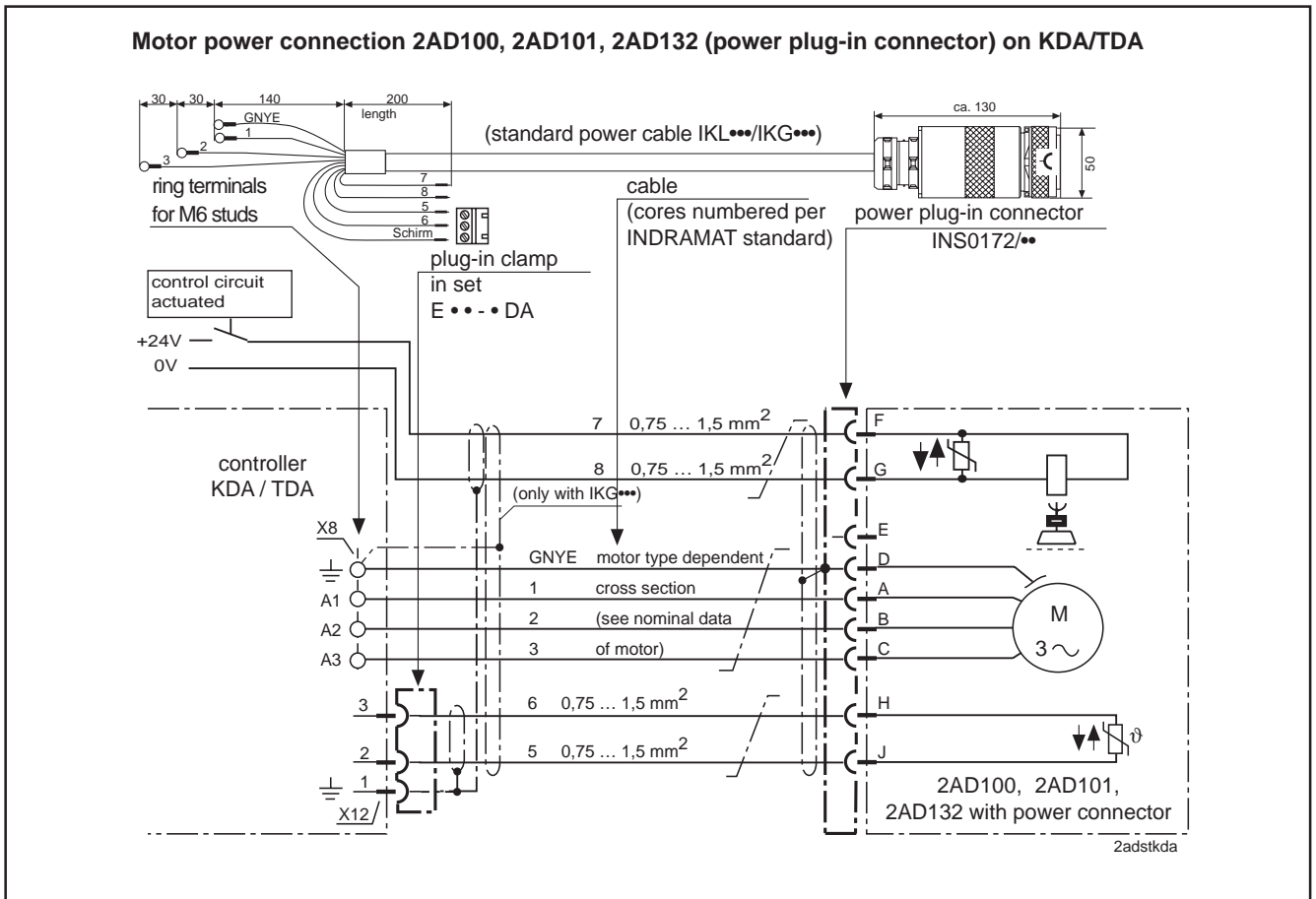


Fig. 14.1: Terminal diagram for motors with power connector on KDA/TDA

## 14. Electrical connections

### Motor power connection 2AD100, 2AD101, 2AD132 (power plug-in connector) on DDS02.2

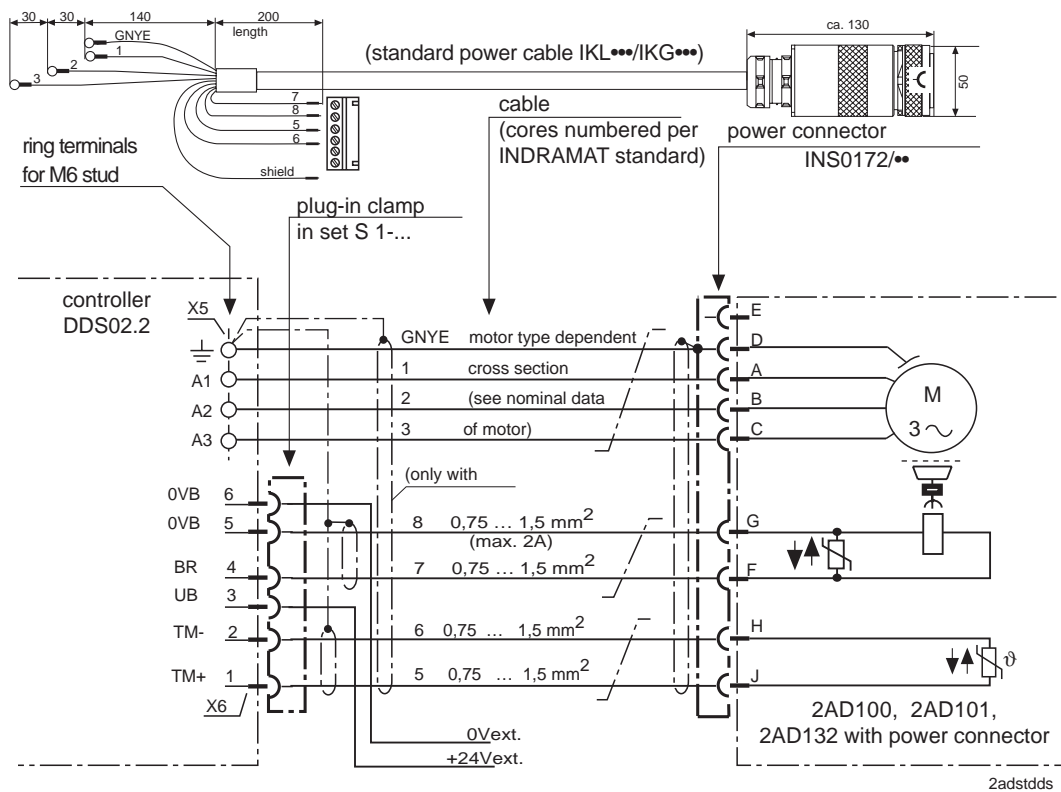


Fig. 14.2: Terminal diagram for motors with power plug-in connector on DDS02.2

### Motor power connection 2AD104 (power plug-in connector) on HDS02

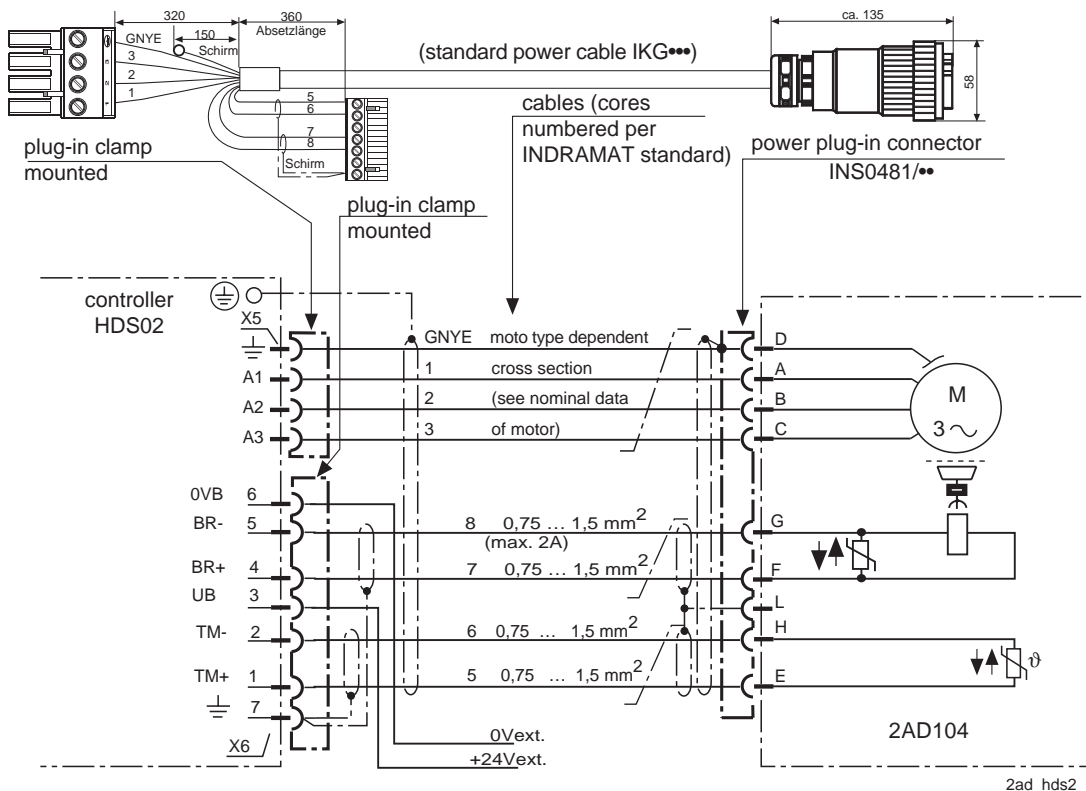


Fig. 14.3: Terminal diagram for motors with power plug-in connector on HDS02

## 14. Electrical connections

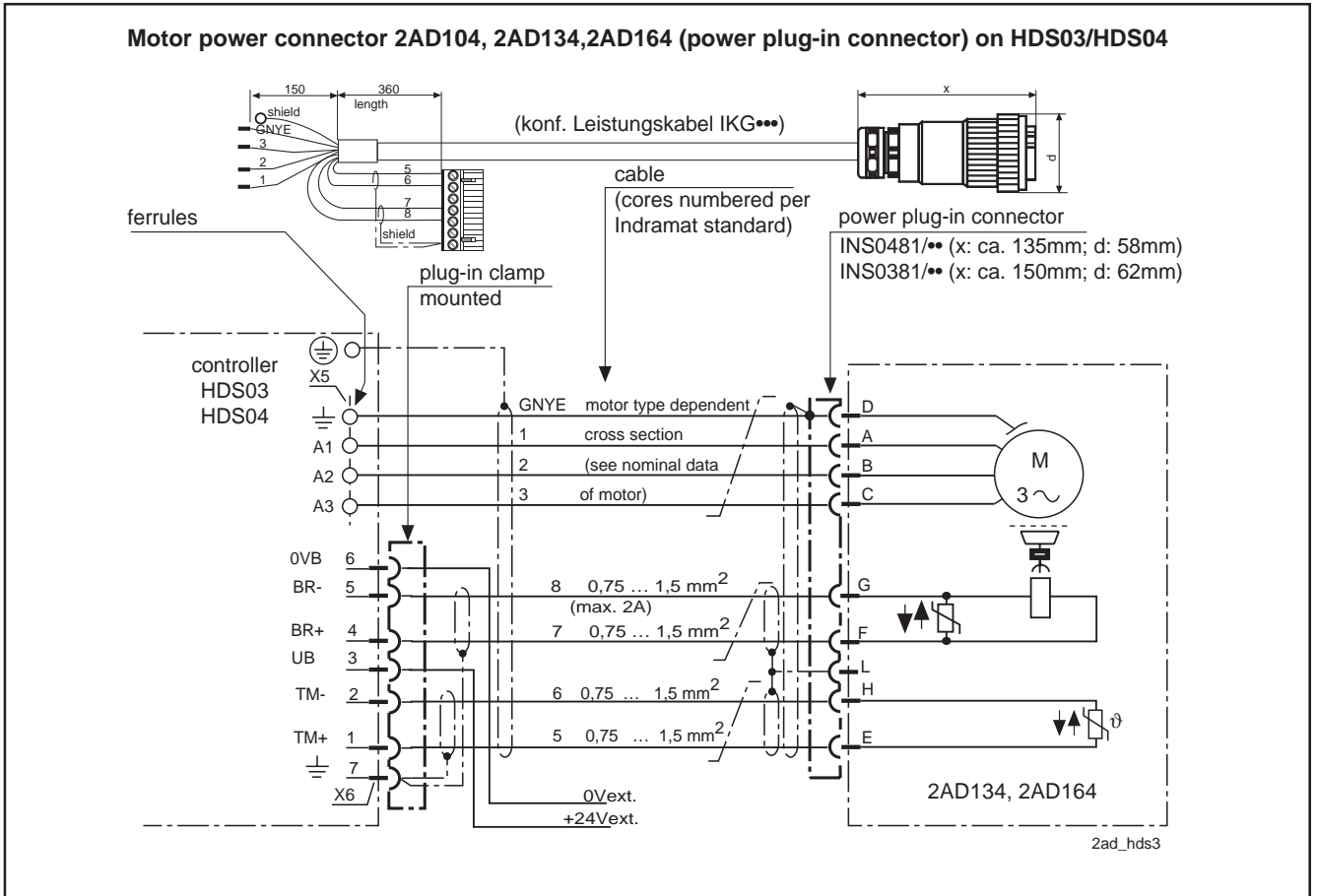


Fig. 14.4: Terminal diagram for motors with power plug-in connector on HDS03/HDS04

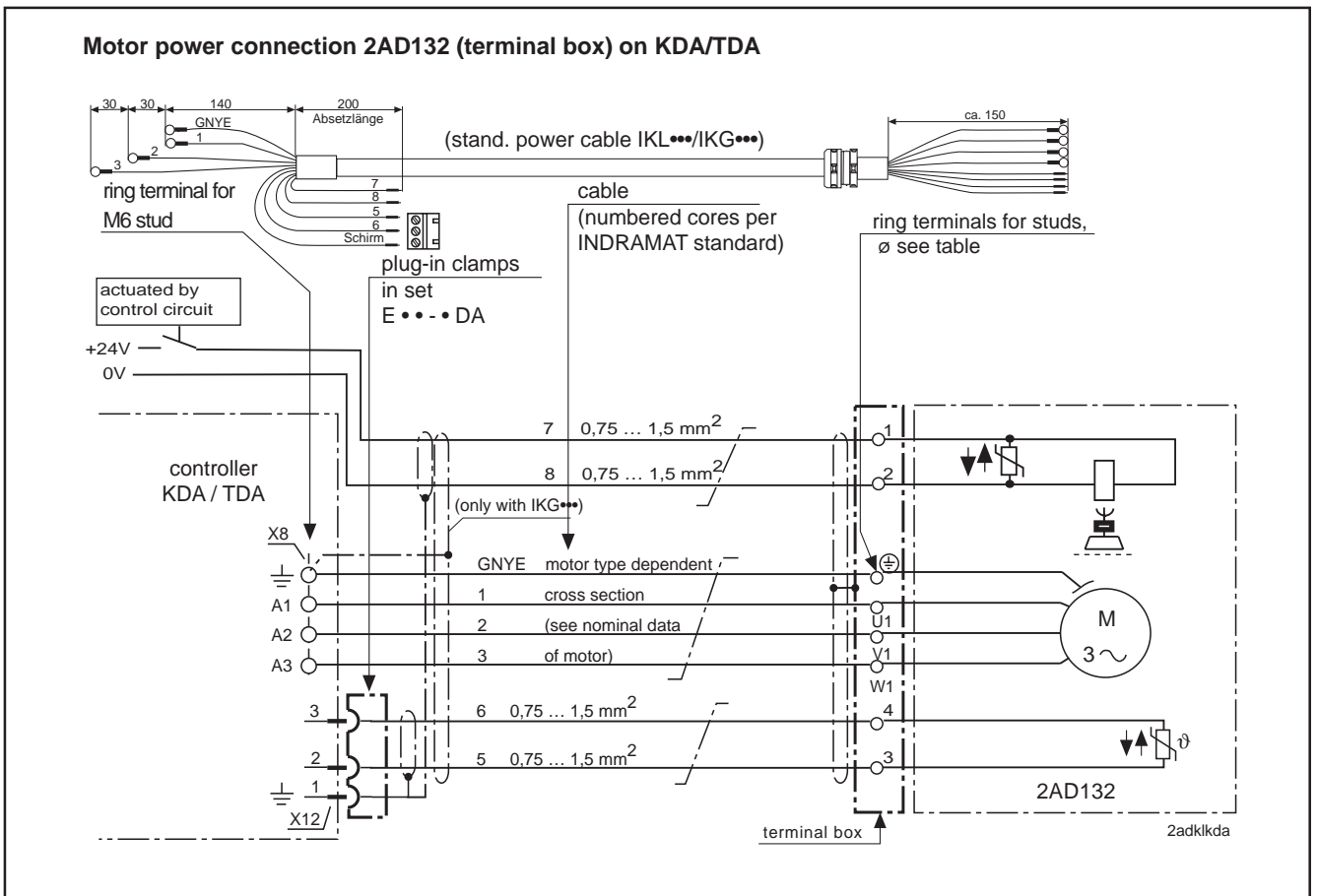


Fig. 14.5: Terminal diagram for motors with terminal box on KDA/TDA

**Motor power connection 2AD132 (terminal box) on DDS02.2**

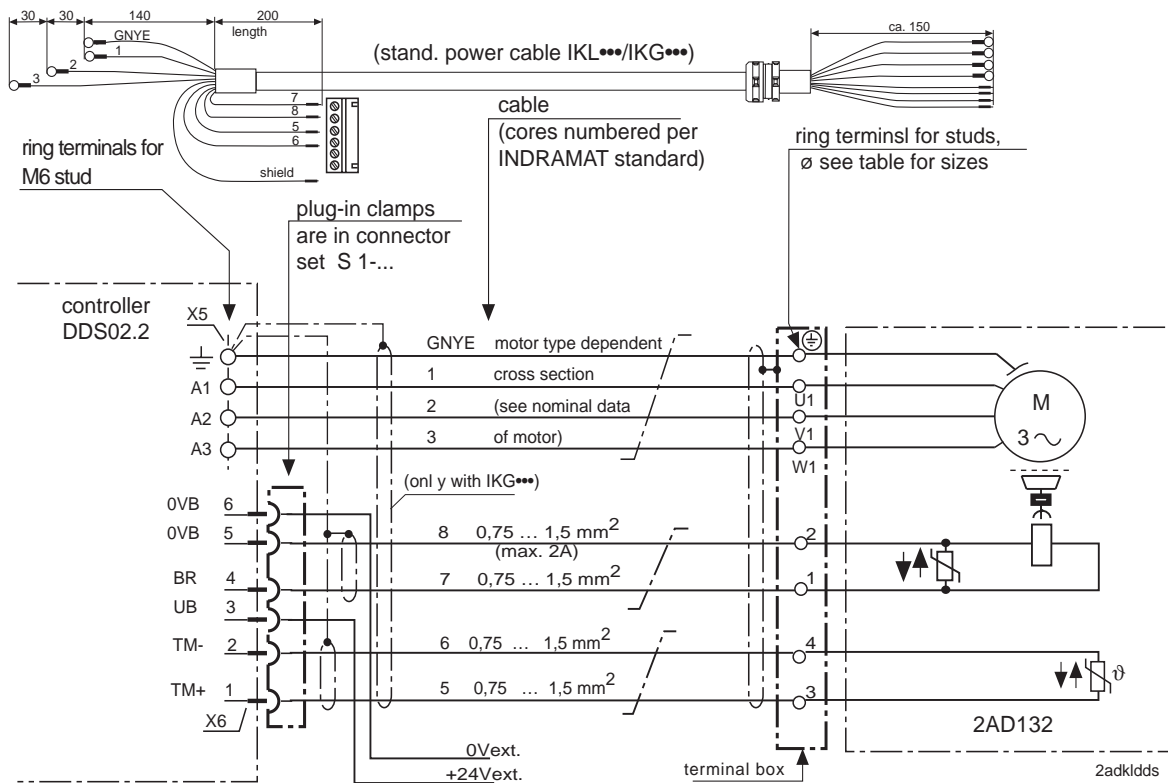


Fig. 14.6: Terminal diagram for motors with terminal box on DDS02.2

**Motor power connection 2AD132 (power plug-in connector) on RAC**

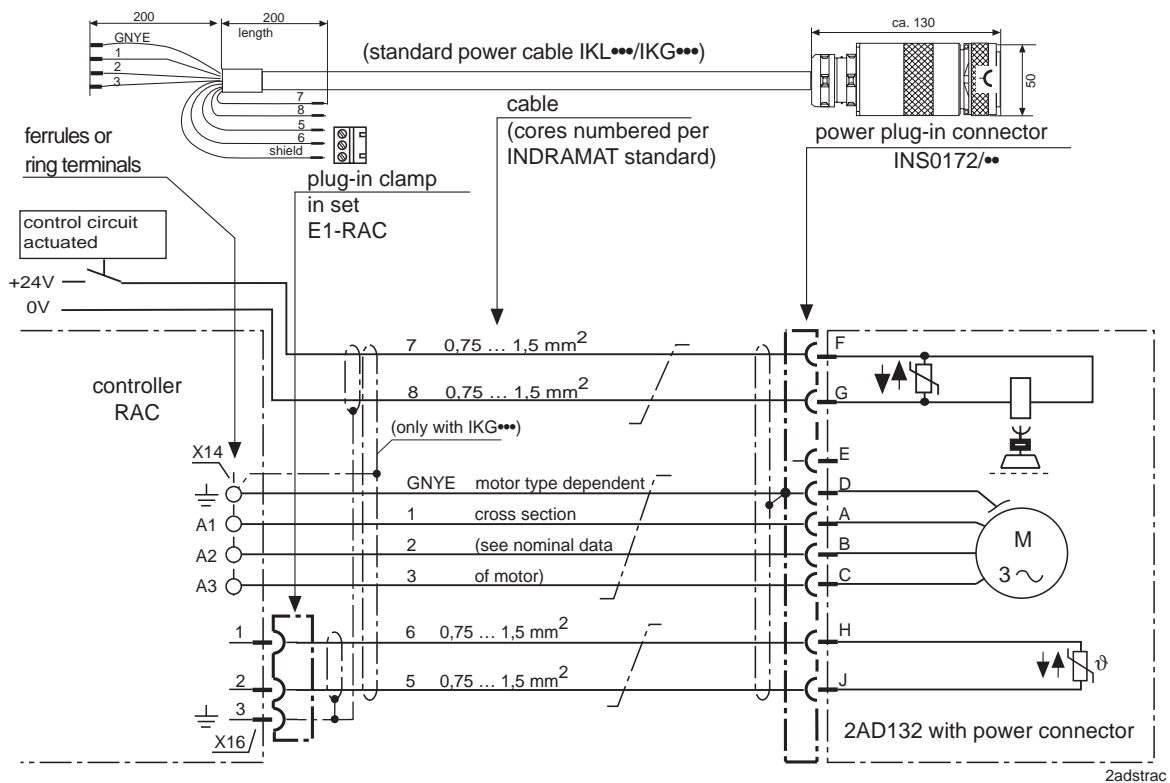


Fig. 14.7: Terminal diagram for motors w/ power plug-in connector at RAC



## 14. Electrical connections

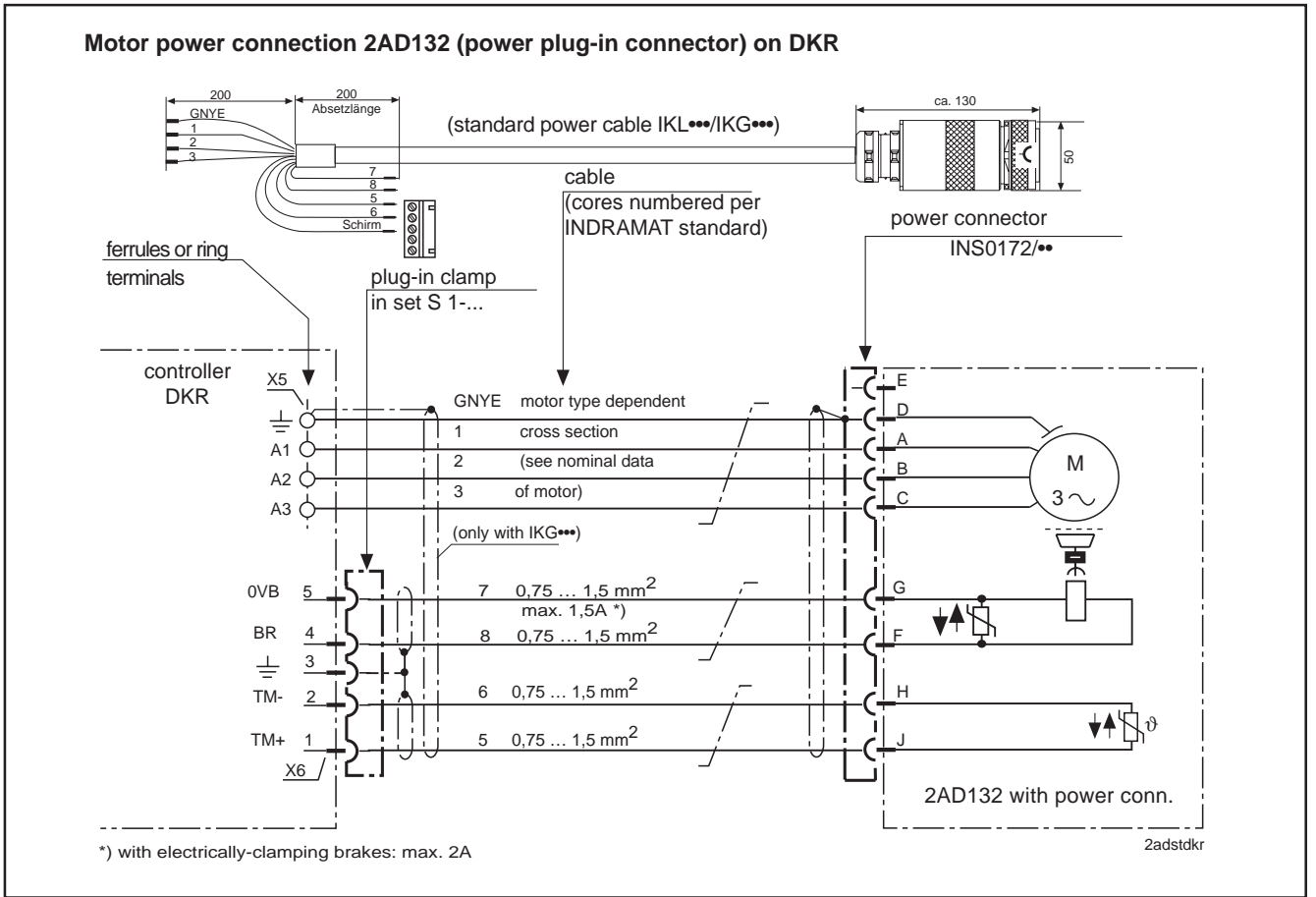


Fig. 14.8: Terminal diagram for motors with power plug-in connector on DKR

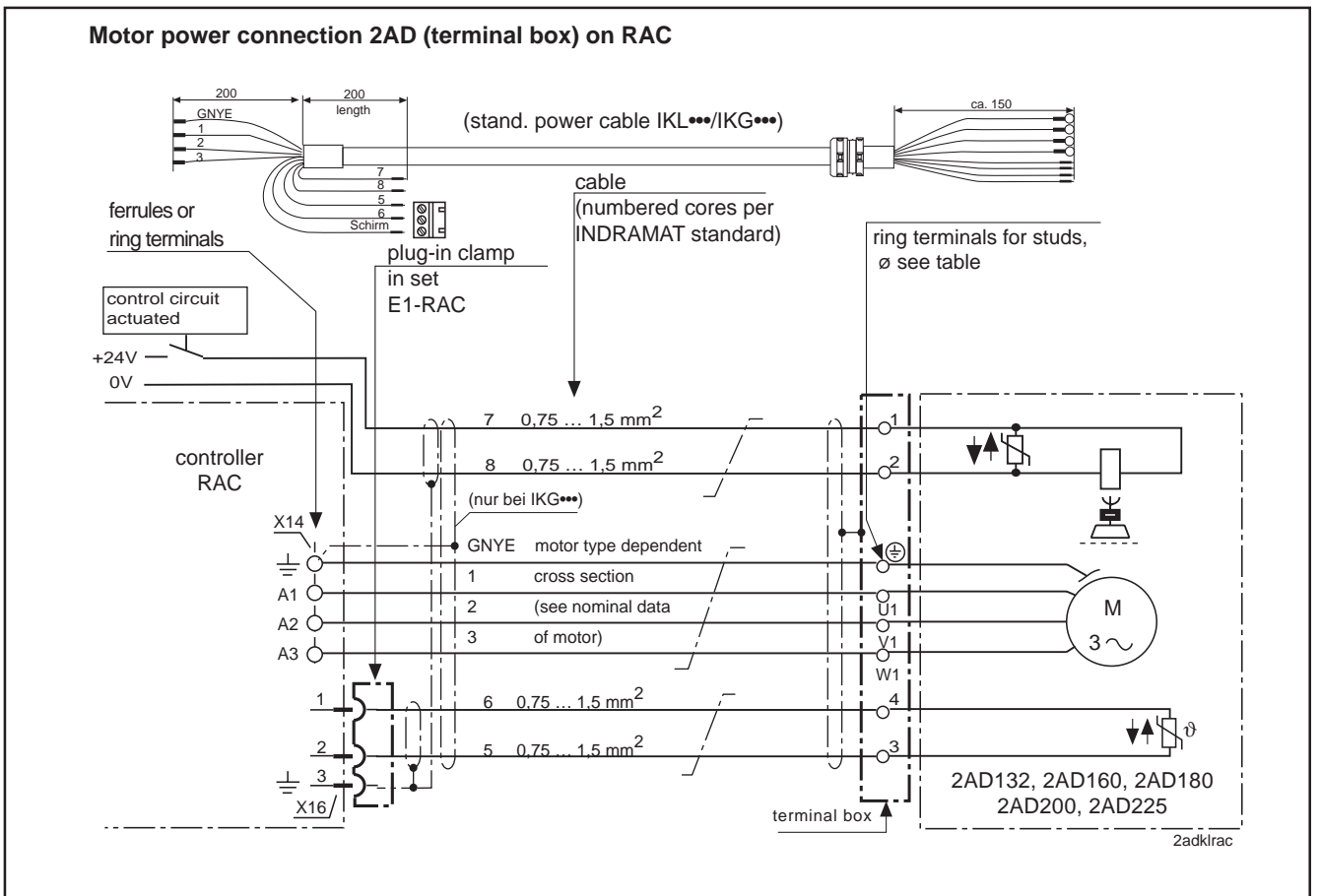


Fig. 14.9: Terminal diagram for motors with terminal box on RAC

## 14. Electrical connections

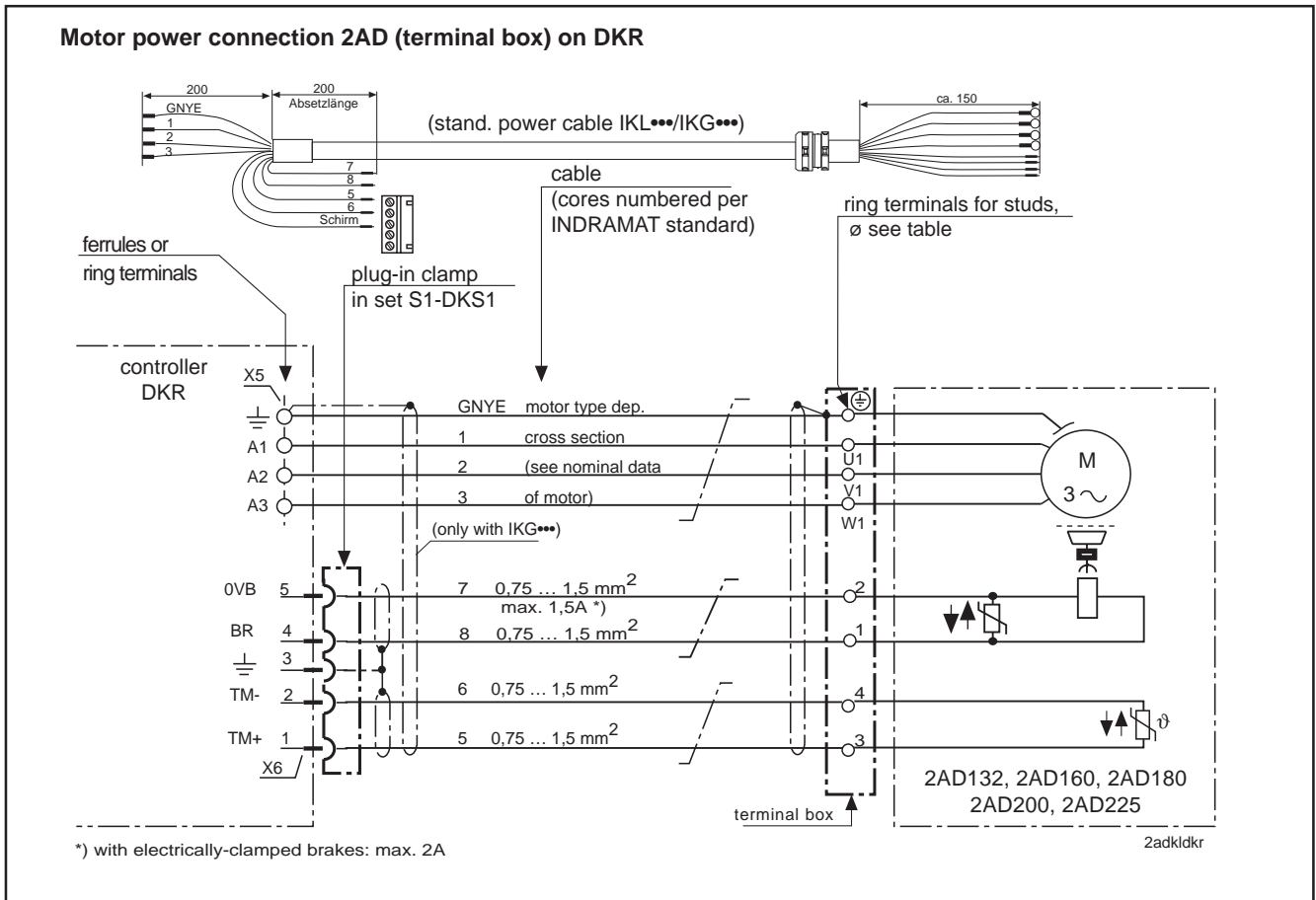


Fig. 14.10: Terminal diagram for motors with terminal box on DKR

### 14.2 Motor Power Cables

The required cable cross sections depend on the motor type. They are listed in the relevant Technical Data documentation.

Motor type	Conn. to drive	Cable cross section of INK... A [mm <sup>2</sup> ]	Ready-made cables for direct connection		Components for standard cables for direct connection			Standard cables for intermediate clamping to terminal strip	
			flex./flex., shielded	on the motor	on the motor	flex./flex., shielded	on controller	on the motor	on the controller
2AD100B.-AS 2AD100C.-AS	KDA TDA DDS	4			INS0172/10	INK0203/INK0603	For...		
		6			INS0172/16	INK0204/INK0604	...Studs M6 (KDA/TDA/DDS)		not available
2AD101D.-BD 2AD101D.-BS	KDA TDA DDS	10			INS0172/10	INK0205/INK0605	...Studs M6 (KDA/TDA/DDS)		not available
		16			INS0172/16	INK0206/INK0606	...Studs M6 (KDA/TDA/DDS)		not available
2AD132B.-BS 2AD132D.-BD	KDA TDA DDS	25			INS0172/25	INK0207/INK0607	...Studs M6 (KDA/TDA/DDS)		not available
		16			INS0172/16	INK0206/INK0606	For...		not available
2AD101D.-BS 2AD132B.-DS 2AD132C.-CS	RAC2 RAC3 DKR2 DKR3	10			INS0172/10	INK0205/INK0605	...terminal block (RAC2/3, DKR2/3)		not available
		16			INS0172/16	INK0206/INK0606	...terminal block (RAC2/3, DKR2/3)		not available

2ADKAB01















Symbols:

- power plug-in connector
- conduit thread
- ring terminals
- ferrules


Fig. 14.11: Standard motor power cables for motors with power connector, section I

## 14. Electrical connections


The required cable cross sections depend on the motor type. They are outlined in the relevant Technical Data.

Motor type	Contr. conn.	INK... cross section A [mm <sup>2</sup> ]	Standard cable for direction conn. flex./flex., shielded	Standard cable components for direct connection	Standard cable for intermediate clamping to terminal block	controller flex./flex., shielded
ZAD104B--CS	<b>HDS02</b>	1,5		motor  cable flex./flex., shielded controller For...		
ZAD104C--CS		2,5		INS0481/CO3 ...terminal block/ plug-in clamps		not available
ZAD104D--FS ZAD104D--ES	<b>HDS03/ HDS04</b>	4		INS0481/CO4 ...terminal block/ plug-in clamps		not available
ZAD134B--ES		6		INS0481/CO4 ...terminal block/ plug-in clamps		not available
ZAD134B--FS ZAD134C--DS ZAD134D--CS		10		INS0381/C10 ...terminal block/ plug-in clamps		not available
ZAD164B--DS		16		INS0381/C16 ...terminal block/ plug-in clamps		not available


**Symbols:**




power plug-in  
connector



conduit thread



ferrules

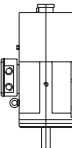
























ferrules, if needed  
mounted connector

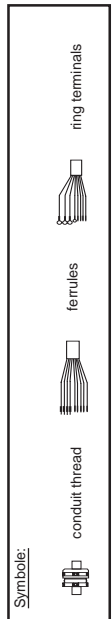
ZADKAB03

Fig. 14.12: Standard motor power cables for motors with power connector, section II

The required cable cross sections depend on the motor type. They are listed in the relevant Technical Data documentation.

Motor type 	Conn. to drive	Cable cross section of INK... A [mm <sup>2</sup> ]	Ready-made cables for direct connection flex./flex., shielded	Components for standard cables for direct connection		Standard cables for intermediate clamping to terminal strip	
				on the motor	Leitung flex./flex., shielded	on the motor flex./flex., shielded	on the controller flex./flex., shielded
2AD132B-.-BS 2AD132C-.-BS 2AD132D-.-BD	KDA TDA DDS	10	 IKL0135/IKG0135 (PG 29)	Für... ..Stehb. M6 ⊕ M8	INK0205/INK0605	For... ..Stud M6 (KDA/TDA/DDS)	 IKL0136/IKG0136 not available
		16	 IKL0157/IKG0157 (PG 29)	..Stehb. M6 ⊕ M8	INK0206/INK0606	..Stud M6 (KDA/TDA/DDS)	 IKL0151/IKG0151 not available
		25	 IKL0174/IKG0174 (PG 29)	..Stehb. M8 ⊕ M8	INK0207/INK0607	..Stud M6 (KDA/TDA/DDS)	 IKL0172/IKG0172 not available
2AD132B-.-DS 2AD132C-.-CS 2AD132D-.-AS 2AD160B-.-BS 2AD160C-.-BS 2AD180C-.-BS	RAC2 RAC3 DKR2 DKR3	6	 IKL0110/IKG0110 (PG 29)	Für... ..Stehb. M6 ⊕ M8	INK0204/INK0604	For... ...terminal block (RAC2/3, DKR2/3)	 see previous column not available
		10	 IKL0136/IKG0136 (PG 29)	..Stehb. M6 ⊕ M8	INK0205/INK0605	...terminal block (RAC2/3, DKR2/3)	 see previous column not available
		16	 IKL0151/IKG0151 (PG 29)	..Stehb. M8 ⊕ M8	INK0206/INK0606	...terminal block (RAC2/3, DKR2/3)	 see previous column not available
		25	 IKL0172/IKG0172 (PG 36)	..Stehb. M8 ⊕ M8	INK0207/INK0607	...terminal block (RAC2/3, DKR2/3)	 see previous column not available
		35	 IKL0182/ * (PG 42)	..Stehb. M10 ⊕ M10	INK0667	...terminal block (RAC2/3, DKR2/3)	 see previous column not available
2AD180C-.-BS 2AD200C-.-AS 2AD225C-.-AS	RAC4 DKR4	50	 IKL 0191/ * (PG 42)	Für... ..Stehb. M10 ⊕ M10	INK0268/ *)	For... ...screw M12 (RAC4, DKR4)	 *) not available
		2x25	 2xIKL0175/ 2xIKG0175 (PG 48)	..Stehb. M12 ⊕ M12	INK0207/INK0607	...screw M12 (RAC4, DKR4)	 *) not available
		2x35	 2xIKL0183/ * (PG 48)	..Stehb. M12 ⊕ M12	INK0267*)	...screw M12 (RAC4, DKR4)	 *) not available

\*) available, request type designations from INDRAMAT, Abt. ENT



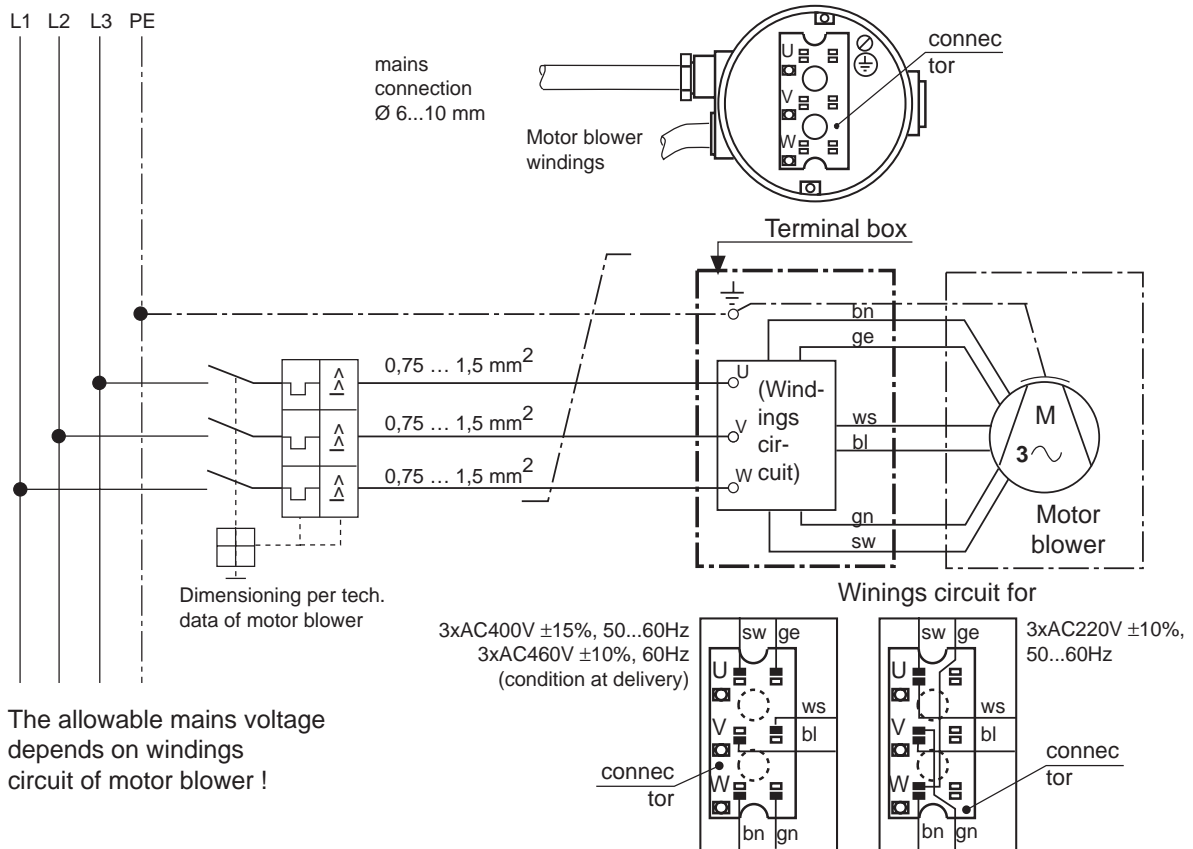
2ADKAB02

Fig. 14.13: Standard motor power cables for motors with terminal box





**Motor blower conn. with 2AD132 (terminal box on blower)**



**Axial blower connection in 2AD132/2AD134/2AD164 (conn. on blower)**

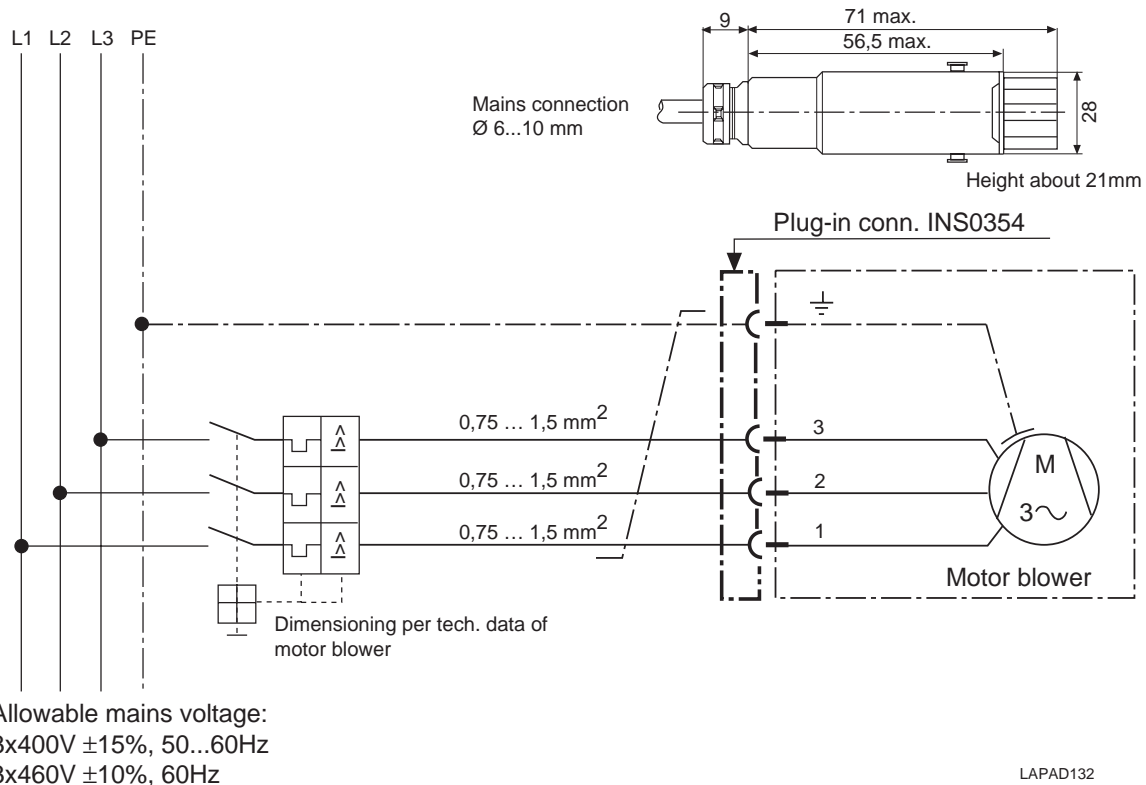


Fig. 14.16: Terminal diagrams for motor blower of 2AD132/-134/-164



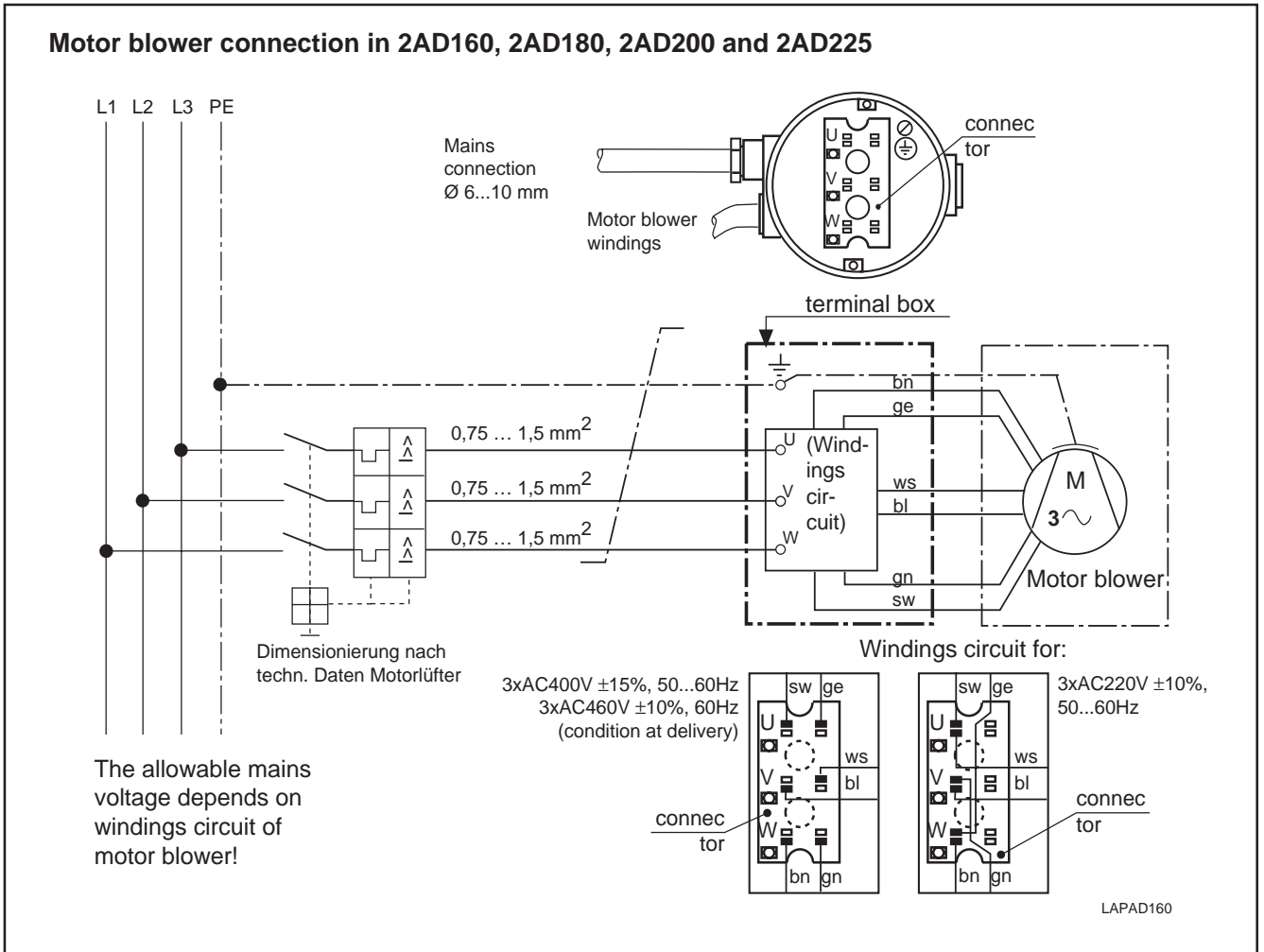


Fig. 14.17: Terminal diagrams for motor blower of 2AD160/-180/-200/-225

### 14.4 Motor feedback connection

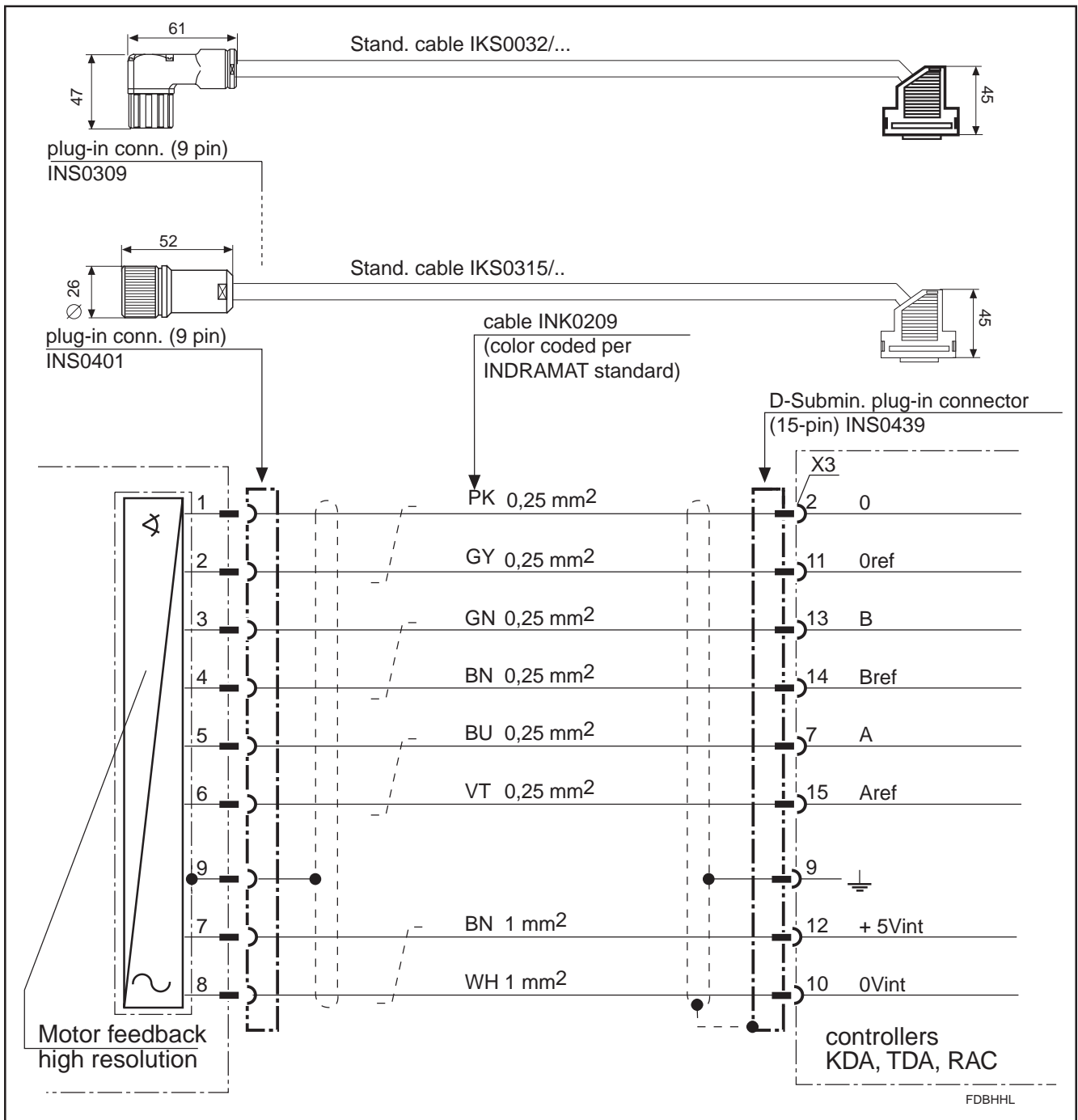


Fig. 14.18: Terminal diagrams for high-resolution motor feedback ("3") on KDA/TDA/RAC

14. Electrical connections

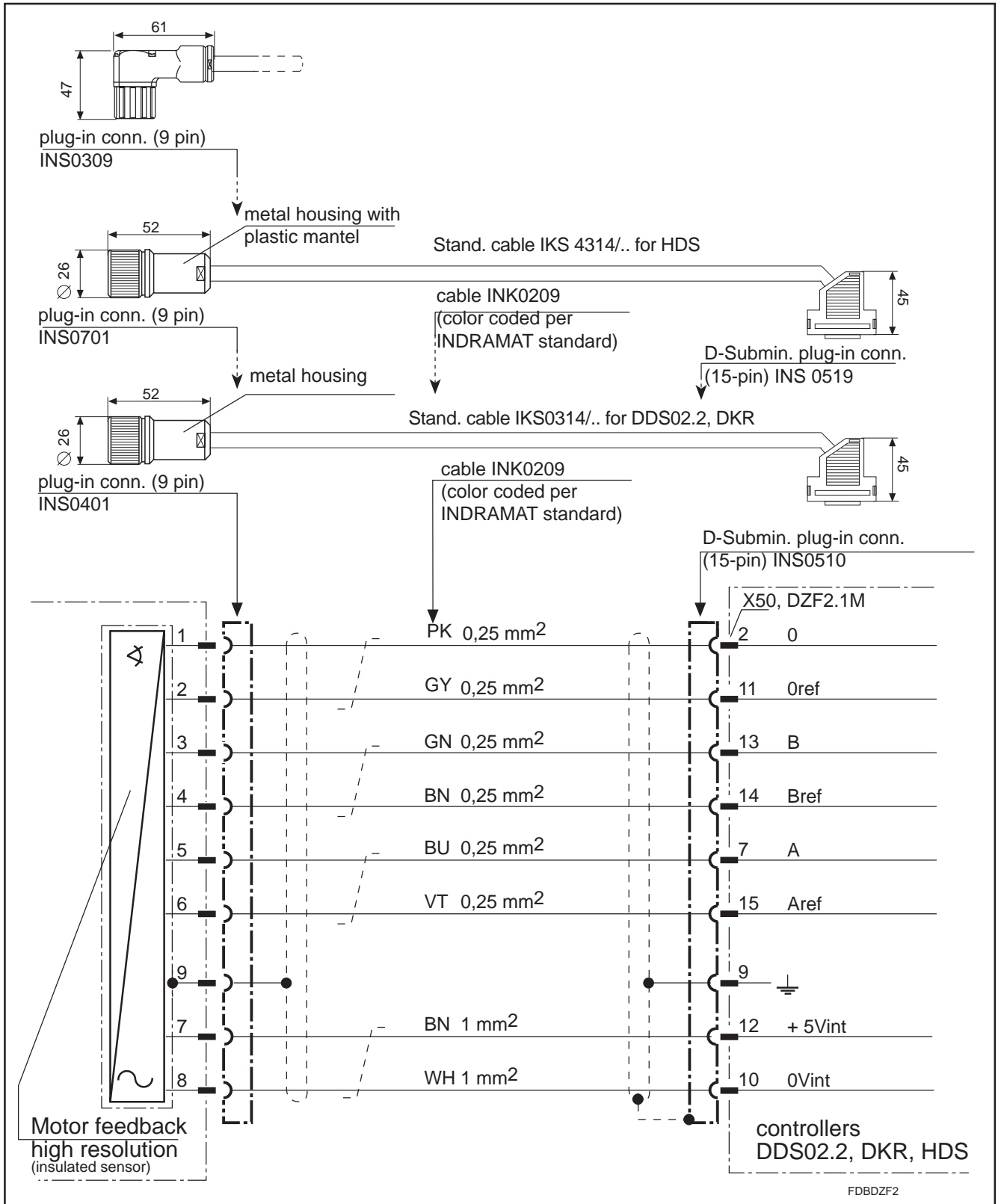


Fig. 14.19: Terminal diagrams for high-resolution motor feedback ("3") on DDS02.2/DKR/HDS

## 14. Electrical connections

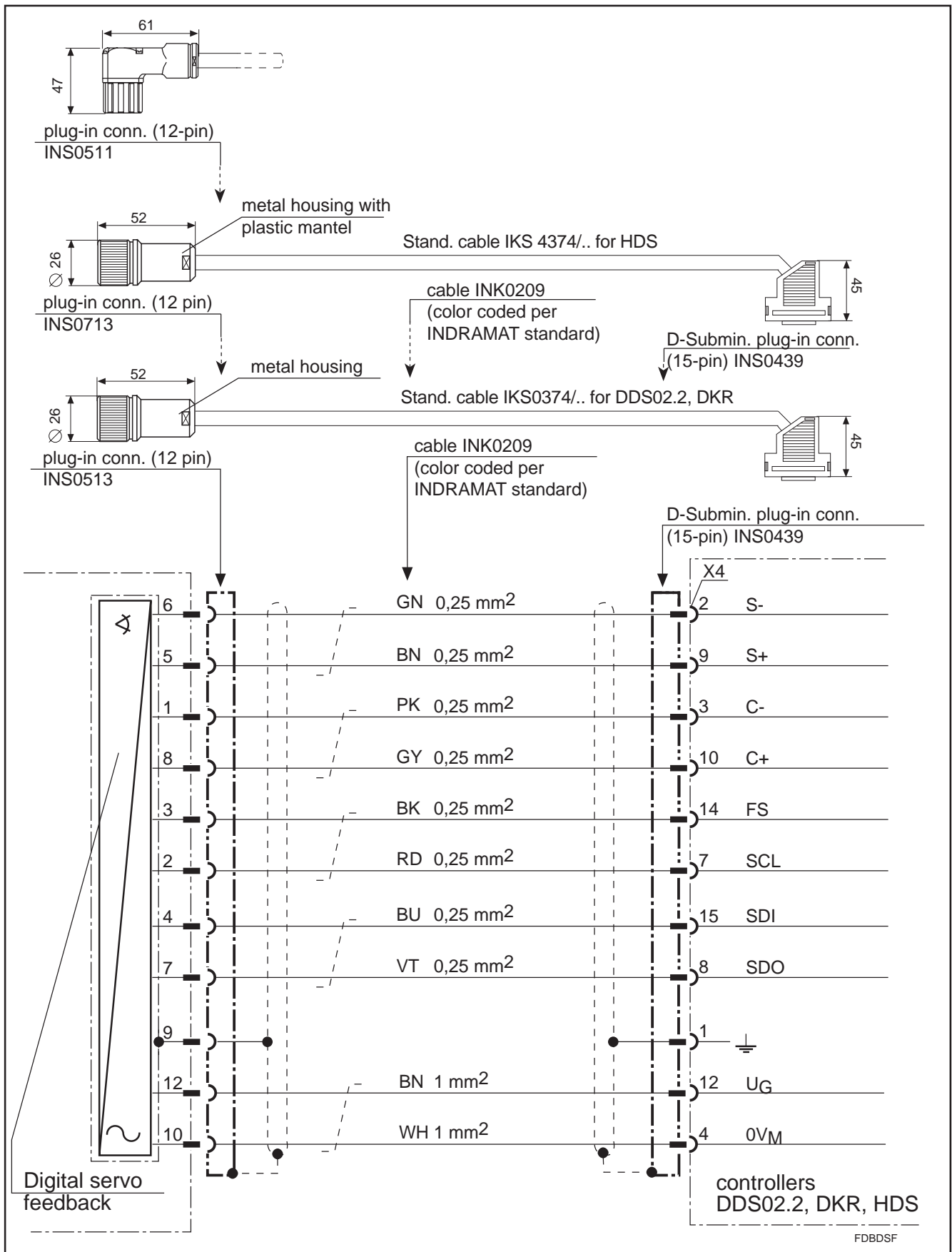


Fig. 14.20: Terminal diagrams for high-resolution motor feedback ("6","7") on DDS02.2/DKR/HDS

## 14.5 Type Designations

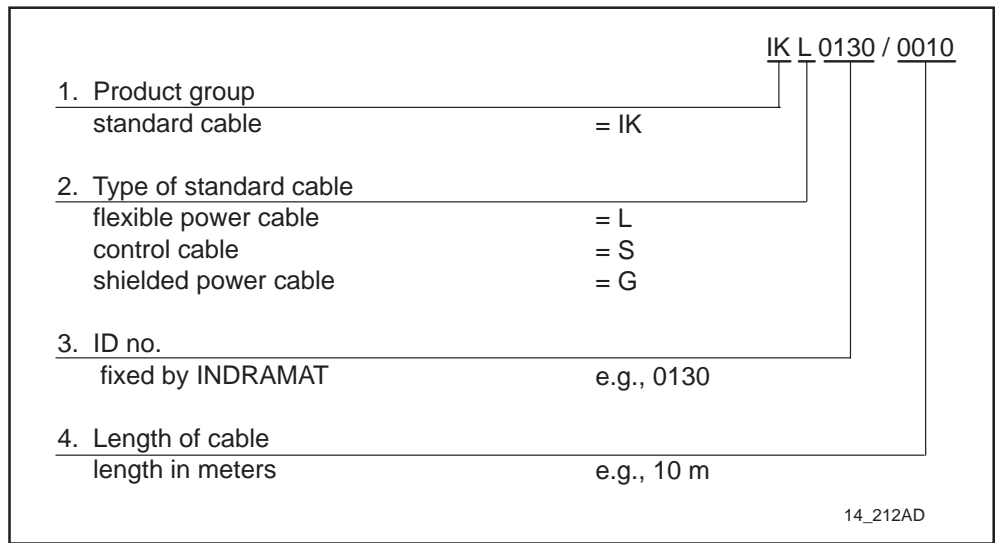


Fig. 14.21: Type designation of standard cables

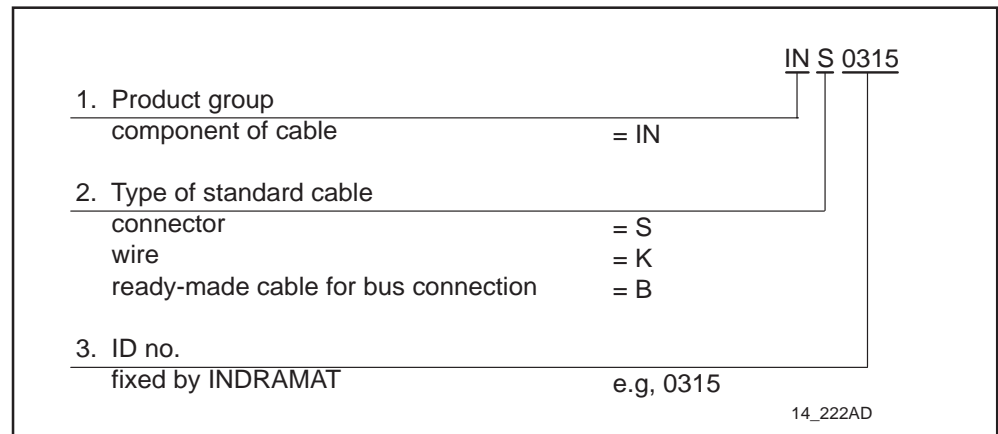


Fig. 14.22: Type designation of components of standard cables

## 15. State of Delivery

The merchandise is packed onto a pallet or in a carton (2AD100) at the time of delivery.

Pallet:

In the case of single item order, the motor is secured against movement with wooden pegs wedged into strategic spots and is further fastened into place with taut metal bands. If several motors are simultaneously delivered, then there will be up to three motors fixed into place on one pallet. These are, in turn, prevented against moving into other with the styrofoam which has been wedged in between them.

A carton is placed over the pallet to protect against any inclement weather and this also fixed firmly into place with taut bands.



**Tension in bands!**

**Danger of injury from uncontrolled movements of the taut bands upon removal!**

**Maintain sufficiently large distance! Remove the metal bands with care!**

By carefully opening the metal bands it is possible to unpack the merchandise without causing any damage.

There is a carton on the envelope in which a delivery slip and a sticker indicating information about customer, delivery slip number, consignment and freight company are listed. Unless request, there are no further consignment documents.

## 16. Identifying the merchandise

There is a single copy of the delivery slip on the carton. The listed contents of the delivery can be distributed over several transport containers. This is specified in the delivery slip or on the freight papers.

The delivery slip specifies the merchandise by name and order designation.

The packaging of the motor has a barcode sticker on it. It helps identify the contents in terms of design and order processing.

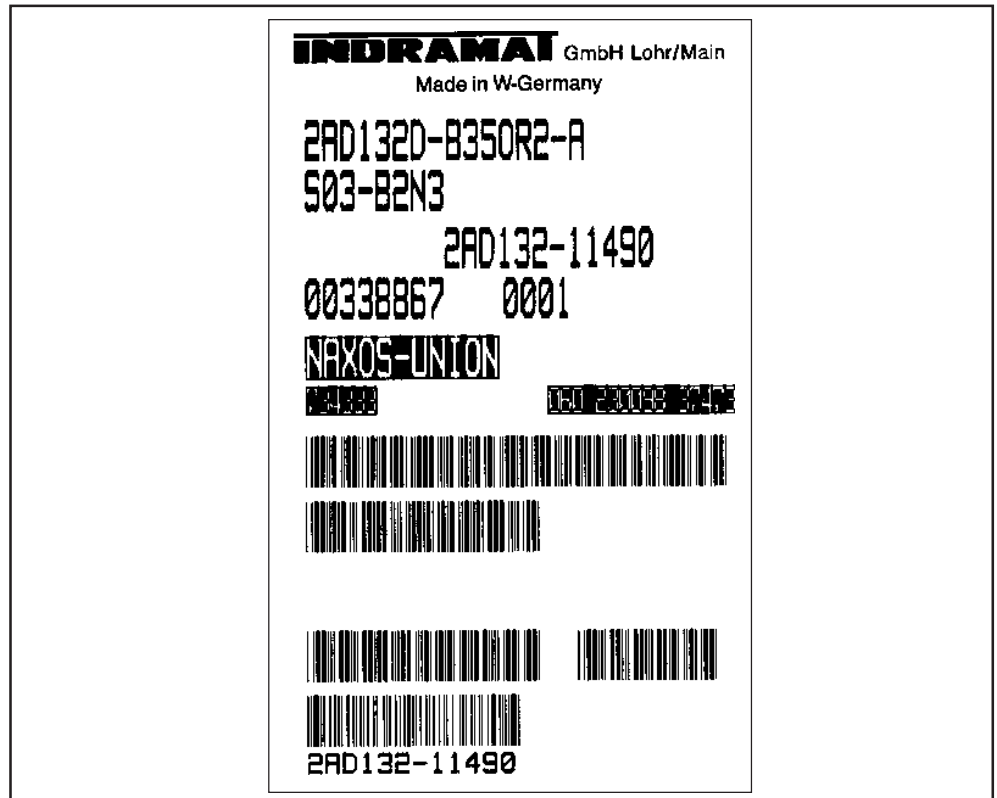


Fig. 16.1: Barcode sticker on the packaging of a 2AD132 (Example)

If several motors are in the packaging, then there is a barcode sticker for each motor on the packaging.

The motor itself has a type plate. It is on the front of the air baffle on the right upper hand side (when looking onto motor shaft).

Each motor has two type plates at delivery. The second one is taped over the original one but can be removed.

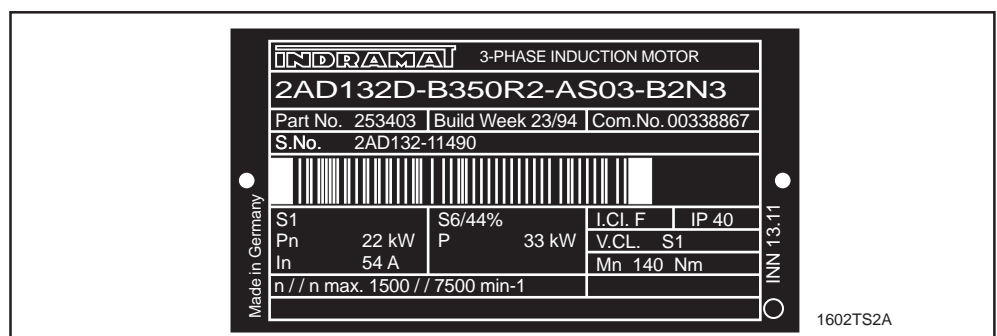


Fig. 16.2: Type plate (Example 2AD132)

## 17. Storage and Transport

### 17.1 Notes on Packaging

There are instructions on the packaging regarding transportation, handling of packaging and so on. These must be complied with.

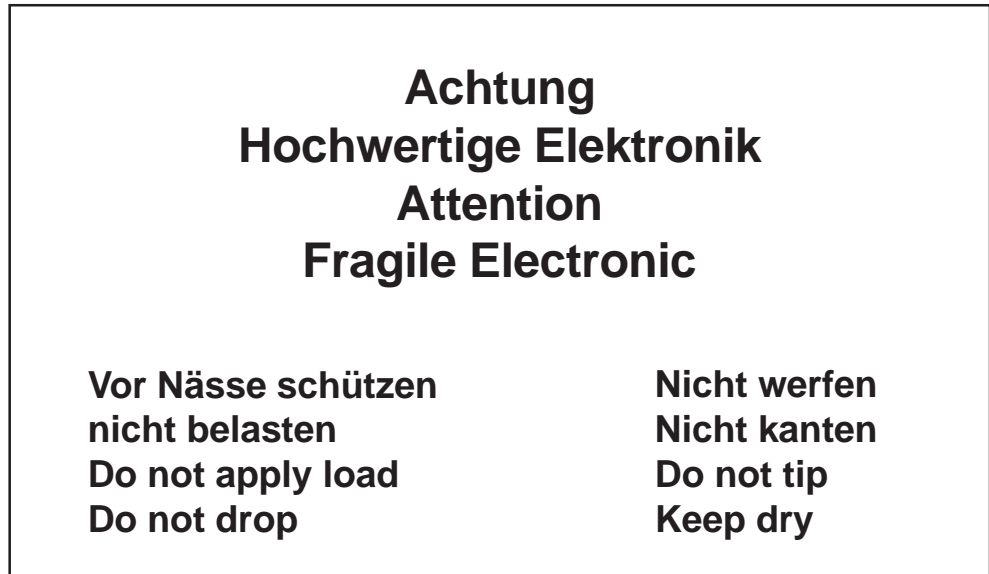
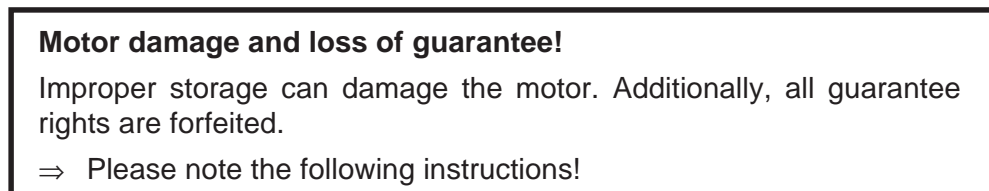


Fig. 17.1: Instructions on storage and transport on the packaging

### 17.2 Storage



Maintain the following conditions during storage:

- ⇒ Permissible temperature range: -20° C to +80° C.
- ⇒ Motors must be stored dry, dust and shock free.
- ⇒ Store motors in horizontal position.
- ⇒ Do not remove the protective plastic sleeves from the connector housing and output shaft. They protect against moisture and mechanical damage.



## 18. Safety Guidelines for Electrical Drives

### 18.1 General Information

- The safety guidelines specified in this document must always be complied with. Any improper handling of the equipment and non-compliance with the warnings can cause property damage, bodily injury or, in extreme cases, lead to death. Indramat assumes no responsibility in the case of damage ensuing from non-compliance with all warnings and guidelines.
- The safe and easy operation of this drive assumes proper transport, storage, mounting and installation as well as careful use and maintenance.
- Only qualified personnel may work on, with or near this equipment. Personnel is qualified if it is trained in mounting, installation and operation of the products as well as is familiar with all warnings and precautionary measures as specified in this document. It is further considered as trained if it can switch current circuits and equipment on and off, to ground and label these. It is equipped with safety equipment and trained in first aid.
- Only use replacement parts specified by the manufacturer.
- Note the safety guidelines and regulations for each application.
- The motors are intended for mounting into machines that will be commercially used.
- Do not start up the machine until it has been ascertained that the machine into which the product has been installed meets EU guidelines 89/392/EEG (machine guides).
- Operation is only permitted if the national EMC guidelines for an application are met. In the EU, EMC guidelines 89/336/EEG are determinative.

## 18.2 Guidelines on Protection Against Contact with Electrical Parts

If parts conducting voltages exceeding 50 volts are touched, then this could seriously injure personnel. When operating electrical components, certain parts of these inevitably conduct dangerous voltage levels.



### High electrical voltage!

Danger to life and limb and serious injury!

- ⇒ Note general construction and safety guidelines when working on high-voltage installations.
- ⇒ Upon completion of installation, check the permanent connections of the protective conductor in all electrical components.
- ⇒ Any operation, even for measuring or test purposes, is only allowed with permanently connected protective conductor in all electrical components.
- ⇒ Prior to accessing electrical parts with voltages exceeding 50 volts, remove electrical components from network or power source. Secure against being switched back on.
- ⇒ Wait the five minutes discharge time after switching the power off before accessing the motors.
- ⇒ Do not touch the electrical connecting points of the components if power is on.
- ⇒ Cover sections conducting power to avoid contact before switching the unit back on.
- ⇒ Protection against indirect contact must be implemented (per DIN EN 50178/Ausg.11.94, section 5.3.2.3).



### High leakage current!

Danger of life and limb or serious bodily injury!

- ⇒ Prior to powering up, connect or ground the electrical equipment, each drive controller, power supply unit and the motor to the protective conductor.
- ⇒ The leakage current exceeds 3.5 mA. Units therefore need a permanent connection to the power supply system (per DIN EN 50178/ed. 11.94, section 5.3.2.3).
- ⇒ Prior to startup, even for test purposes, always connect the protective conductor. Otherwise, high voltage levels could occur on the housing.

### 18.3 Instructions on „Safely-isolated extra low voltages“

The connections and interfaces on the drive components for the signal voltages lie within a voltage range of 5 to 30 volts. These current circuits are a part of the safely-isolated current circuits (safely-isolated low voltages).



#### **High electrical voltages due to incorrect connections!**

Danger of life and serious bodily injury!

⇒ To the signal voltage connections of these components only those units, electrical components or lines may be connected that have a sufficiently safe isolation of the connected current circuits that comply with the standards (per DIN EN 50178/ed. 11.94, section 5.3.2.3).

### 18.4 Instructions on Protection While Handling and Mounting



#### **Danger of serious injury during handling!**

Bodily injury caused by pinching, shearing, cutting and impacts!

- ⇒ General construction and safety guidelines on handling and mounting must be noted.
- ⇒ Use suitable mounting and transport devices and install correctly. Use special equipment, if necessary.
- ⇒ Pinching and clamping can be avoided with the use of suitable preventive measures.
- ⇒ If necessary, wear suitable protective clothing (e.g., eye wear, safety shoes, gloves and so on).
- ⇒ Do not stand under hanging loads.
- ⇒ Wipe up all spills immediately.

### 18.5 Instructions on Protecting Against Dangerous Motions

The causes of dangerous motions can be various:

- a faulty setting from the control
- a software error
- a fault in the components
- wiring or cable fault
- error in the measurand and signal encoders
- problem in the use of the components

This problems can occur immediately after powering up or any time thereafter.



### **Dangerous movements!**

Danger to life, serious bodily injury or property damage!

- ⇒ The monitors in the drive components by and large exclude a malfunction of the the connected drives. In consideration of protection of personnel, however, this should not be exclusively relied upon. Until such time as the built in monitoring devices are active it must be assumed that faulty drive motions will occur the extent of which depend on the nature of the problem and the current operating state. For this reason, personnel protection should be secured by monitors or measures within the installation overall. These are implemented in accordance with the specifics of the installation and after a danger and error analysis has been conducted by the builder of the installation. The safety measures applicable to the installation are included in this concept.
- ⇒ Personnel should not remain within the motional area of the machine. Possible steps to secure unintentional accessing by personnel are:
  - protective fences
  - protective bars
  - covers
  - and light barriers
- ⇒ The fences should have sufficient resistance to take up the maximum possible motional energy of anything intruding.
- ⇒ Emergency stop switch should be easily accessible and within easy reached of the user of the machine. The emergency off setup should be checked for proper functioning prior to commissioning.
- ⇒ Secure against unintentional startups by shutting down the power connection of the drive via the emergency stop loop or use a reliable starting lockout.
- ⇒ Prior to accessing the hazardous area, ensure that the drives are standing still.
- ⇒ Electrical equipment must be completely shut down by means of the main switch and secured against being switched back on during:
  - maintenance and service work
  - when cleaning
  - prior to long operational breaks
- ⇒ Avoid the use of high-frequency, remote control and radio equipment in the vicinity of the electronics of the machine and its lines. If the use of such equipment is unavoidable, then before bringing the machine back up, check the system and installation for any possible malfunctions in all applications. If necessary, run a special EMC check.

## 19. Assembly and Installation

### 19.1 General Assembly Instructions

- ⇒ Note the warning and safety instructions outlined in section 18 “Safety Guidelines for Electrical Drives”. This minimizes the risk of accident and avoids damage to the installation and motor.
- ⇒ Carefully conduct these instructions step by step. This ensures that both assembling and disassembling components and parts will be easy and safe.
- ⇒ If the motor is equipped with a labyrinth seal (M02-2AD...) or with a blower base (M01-2AD...) then conduct assembly prior to mounting. The mounting instructions are outlined in the relevant accessories kit.

### 19.2 Mounting the Motor

- ⇒ Obtain all tools, auxiliary equipment, measuring and testing equipment.
- ⇒ Check to ensure that all parts are clean.
- ⇒ Check whether any parts have visible damage. If they do, then do not mount them.
- ⇒ Make sure that assembly takes place in an environment that is clean, dry, and free of dust.
- ⇒ Make sure that the motor flange is burr free.
- ⇒ If lifting devices are used to mount the motor, then use the rings.



**ATTENTION!**

**Do not grip the blower unit to pick up the motor!  
Danger of ripping off!**

- ⇒ Mount the motor. All dimensions and tolerances must be maintained. The relevant data is specified in the dimensional sheets.

### 19.3 Connecting the Motor

Once the motor is mechanically mounted, connect it.



**DANGER**

**High electrical voltage!**

Touching the motor in areas which conduct voltage is dangerous. Therefore:

- ⇒ Only trained personnel may conduct work on the electrical parts. The use of appropriate tools is absolutely necessary.
- ⇒ Before commencing work, switch power to the machine off and secure the mains switch against being switched back on unintentionally or otherwise.
- ⇒ Before commencing work, check whether there is any residual power in the machine and use special tools to do so (e.g., from capacitors, etc.). Wait discharge time.


**Injury to personnel or property damage possible!**

Disconnecting or connecting voltage-conducting lines can trigger unpredictable dangerous situations or cause property damage. Therefore:

- ⇒ Connect or disconnect all plug-in connections only if there are dry and no power is present.
- ⇒ All plug-in connections must be firmly in place while the machine is in operation.


**Danger of short circuit caused by coolant or greases!**

A short-circuit of voltage-conductive lines can trigger unpredictable dangerous situations or cause serious property damage. Therefore:

- ⇒ Cover open connections of power lines during installation or when replacing drive components with protective caps, particularly if the possibility of contamination by coolant or grease exists.

Terminal diagrams from INDRAMAT should exclusively be used to put circuit diagrams of the installation together!

- ⇒ Connect the motor as per the installation circuit diagram of the manufacturer of the machine.

*Power connector*

When connecting a power connector with bajonet joint (2AD104, -134, -164) please proceed as follows:

- ⇒ Set the power connector on the bajonet thread of the connective housing into the correct position.
- ⇒ Manually turn the power connector until it has audibly clicked into the final position (this is visible if the red dot is opposite the red triangle).

When connecting a power connector with thread (2AD100, -101, -132), proceed as follows:

- ⇒ Set the power connector on the thread of the connective housing into the correct position.
- ⇒ Pull the power connector manually through. By feeding the cable through, the power connector is gradually brought into its final position.
- ⇒ Tighten until it is manually "firm".

**With applications with high vibration and shock loads it is advisable to secure the power connector with a bonding agent before removing.**

*Motor feedback*

To connect the digital servo feedback, it is necessary with 2AD132, 160, 180, 200, 225 to remove a section the blower housing which is adjacent to the motor feedback cable leadthrough!

## 20. Servicing Guidelines

### 20.1 Maintenance

It is necessary to regularly (no later than one year)

- to clean the motor of excessive dust, chips or similar,
- to check the function of surface motor blower,
- to check air circulation of any surface cooling system.

### 20.2 Contacting Customer Service

To quickly and effectively eliminate faults, the Service Hotline is available.

⇒ Prior to calling, make a note of the following:

- type data of the drive controller and motor involved
- fault conditions
- fault and diagnostic displays (if present)

The Service-Hotline can be reached

Monday through Friday	7 - 23 CET
Saturday	8 - 20 CET
Sundays and holidays	9 - 19 CET

at

0171 - 333 882 6 **or** 0172 - 660 040 6.

⇒ If you return the motor, then copy the repair slip, fill it out and include it with the return.

⇒ If motors are air-cooled, then transport the motors only after all coolants have been removed. There otherwise exists the danger of the coolant freezing and damaging the coolant lines.

⇒ Include the fault report in the machine documentation, or a copy thereof, so that the user of the machine can implement it in the event of another repair.

This will facilitate repairs and help locate application-specific problems quickly.

### 20.3 Repair Card

REPAIR CARD for INDRAMAT equipment and components			
Name:		Co./loc.:	Date:
If single parts replaced, then part designation:		SN:	Del. cons. no.:
		SN:	Del. date:
Mach. manuf.:	Type	Mach. no.:	Commissioning date:
Fault in axis:	<input type="checkbox"/> horizontal <input type="checkbox"/> vertical <input type="checkbox"/>	Ref. time:	Date of fault:
<p><b>Problem:</b></p> <p>Fault _____</p> <p>_____</p> <p><input type="checkbox"/> always present  <input type="checkbox"/> occurs sporadically  <input type="checkbox"/> occurs after approx.    hrs.  <input type="checkbox"/> occurs after vibrations  <input type="checkbox"/> temperature-dependent  <input type="checkbox"/> other</p> <p>* _____</p> <p>* _____</p> <p>* _____</p>	<p><b>Add. notes:</b> (e.g., LED diagnostics, fault message on displ.)</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p><b>Cause:</b></p> <p><input type="checkbox"/> unknown  <input type="checkbox"/> terminal fault  <input type="checkbox"/> ext. short-circuit  <input type="checkbox"/> mech. damage  <input type="checkbox"/> loose wiring/line  <input type="checkbox"/> other</p> <p>* _____</p> <p>* _____</p> <p>* _____</p>	
Additional notes			
<p><b>General information:</b></p> <p><input type="checkbox"/> no function  <input type="checkbox"/> drive not running smooth  <input type="checkbox"/> uncontr. drive movements  <input type="checkbox"/> fault in one direction only  <input type="checkbox"/> supply fuse blown  <input type="checkbox"/> other</p>	<p><b>Additional problems:</b></p> <p><input type="checkbox"/> problem with mechanics  <input type="checkbox"/> mains failure  <input type="checkbox"/> control unit failure  <input type="checkbox"/> motor failure  <input type="checkbox"/> break in failure  <input type="checkbox"/> other</p>	<p><b>Drive, supply unit, amplifier, mains:</b></p> <p><input type="checkbox"/> control volt. fault  <input type="checkbox"/> mains failure, fuse F  <input type="checkbox"/> blower def.  <input type="checkbox"/> bleeder res. def.  <input type="checkbox"/> power supply fault  <input type="checkbox"/> bolt torn off  <input type="checkbox"/> other</p>	
<p><b>Control unit</b></p> <p><input type="checkbox"/> no function  <input type="checkbox"/> no display  <input type="checkbox"/> no command value output  <input type="checkbox"/> diagnostics  <input type="checkbox"/> dim. offset in direction  <input type="checkbox"/> E-stop loop interrupt  <input type="checkbox"/> pos. control loop won't close  <input type="checkbox"/> program seq. fault  <input type="checkbox"/> aux. func. int. fault              (outputs)  <input type="checkbox"/> acknowledgements not acc.              (inputs)  <input type="checkbox"/> other _____</p> <p>_____</p> <p>_____</p>	<p><b>Motor</b></p> <p><input type="checkbox"/> defective  <input type="checkbox"/> thermocouple  <input type="checkbox"/> defective brake  <input type="checkbox"/> defective blower  <input type="checkbox"/> defective feedback  <input type="checkbox"/> defective speed  <input type="checkbox"/> enc. signal  <input type="checkbox"/> defective BLC signal  <input type="checkbox"/> ground short-circuit  <input type="checkbox"/> overheating  <input type="checkbox"/> other _____</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p><b>Remarks:</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	

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Fig. 20.1: Repair card



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