Installation and Operational Instructions for ROBATIC®-clutch Type 500.1_ _ and Type 580.1_ _ Sizes 3 – 9

(B.5.0.GB)

Please read the Operational Instructions carefully and follow them accordingly!
Ignoring these Instructions may lead to malfunctions or to clutch failure, resulting in damage to other parts.

Contents:

Manufacturer's Declaration

This product is intended for installation in a machine or system, based on the machine directive 98/37/EC.
It is forbidden to start use of the product until the machine or system into which it should be built is operating in accordance with the EC directives.

The product corresponds to the low voltage directive 73/23/EEC.

The customer is responsible for compliance with the EMC directive 89/336/EEC.

Safety and Guideline Signs

Danger!
Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

Please Observe:
According to German notation, decimal points in this document are represented with a comma (e.g. 0,5 instead of 0.5).

Chr. Mayr GmbH + Co. KG
Eichenstraße 1
87665 Mauerstetten
Germany

Tel.: 08341 / 804-241
Fax: 08341 / 804-422
http://www.mayr.de
eMail: info@mayr.de

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Safety Regulations

These Safety Regulations are user hints only and must not be complete!

Danger!
Danger of death! Do not touch voltage-carrying cables and components.

To prevent injury or damage, only professionals and specialists should work on the devices.

Danger!

This warning applies if:

- ❒ the electromagnetic clutch is used incorrectly.
- ❒ the electromagnetic clutch is modified.
- ❒ the relevant standards for safety and / or installation conditions are ignored.

Warning!
Before product installation and initial operation, please read the Installation and Operational Instructions carefully and observe the Safety Regulations. Incorrect operation can cause injury or damage.
The electromagnetic clutches have been developed in accordance with the latest technology regulations and are, at the point of delivery, operationally safe.

Warning:
Without a conformity inspection, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the directive 94/9/EC (ATEX directive).

Please Observe!

- ❒ Only specialists who are trained in the transport, installation, operation, maintenance and general operation of these devices and who are aware of the relevant standards should be allowed to carry out this work.
- ❒ Technical data and specifications (Type tags and documentation) must be followed.
- ❒ The correct connection voltage must be connected according to the Type tag.
- ❒ Never loosen electrical connections or carry out installations, maintenance or repairs while the voltage connection is energised!
- ❒ Cable connections must not be placed under mechanical strain.
- ❒ Check electrical components for signs of damage before putting them into operation. Never bring them into contact with water or other fluids.
- ❒ The torque is lost if the friction lining and / or the friction surface come into contact with oil or grease.

Appointed Use

ROBATIC®-clutches are for use in machines and systems and must only be used in the situations for which they are ordered and confirmed.
Using them for any other purpose is not allowed!

Guidelines for Electromagnetic Compatibility (EMC)

In accordance with the EMC directives 89/336/EEC, the individual components produce no emissions. However, functional components e.g. rectifiers, phase demodulators, ROBA®-switch devices or similar controls for mains-side energisation of the clutches can produce disturbance which lies above the allowed limit values.
For this reason it is important to read the Installation and Operational Instructions very carefully and to keep to the EMC directives.

Device Conditions

The catalogue values are standards which can, in certain cases, vary. When dimensioning the clutches, please remember that installation situations, torque fluctuations, permitted friction work, run-in behaviour and wear as well as general ambient conditions can all affect the given values. These factors should therefore be carefully assessed, and alignments made accordingly.

Please Observe!

- ❒ Mounting dimensions and connecting dimensions must be adjusted according to the size of the clutch at the place of installation.
- ❒ The clutches are designed for a relative duty cycle of 100 %.
- ❒ The clutches are only designed for dry running.
  The torque is lost if the friction surfaces come into contact with oil, grease, water or similar substances.
- ❒ The torque is dependent on the present run-in condition of the clutches.
- ❒ Manufacturer-side corrosion protection of the metallic surface is provided.

Protection Class I

This protection can only be guaranteed if the basic insulation is intact and if all conductive parts are connected to the PE conductor of the permanent installation. Should the basic insulation fail, the contact voltage cannot remain (VDE 0580).

Protection (Electrical) IP 54:

Dust-proof and protected against contact as well as against splashing water from all directions.
Valid for coil, casting compound and connection strands.
On the design with a connection terminal, the connection terminal itself corresponds to Protection Class IP00.

Ambient Temperature –20 °C up to +40 °C

Warning!

At temperatures of around or under freezing point, condensation can strongly reduce the torque. During longer downtimes, the friction surfaces can stick. The user is responsible for taking appropriate counter measures.

Thermic Class F (+155 °C)

The magnetic coil and the casting compound are suitable for use up to a maximum operating temperature of +155 °C.

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Safety Regulations

These Safety Regulations are user hints only and must not be complete!

User-implemented Protective Measures:

- ❑ Please cover moving parts to protect against injury through seizure and catapulted objects.
- ❑ Place a cover on the magnetic part to protect against injury through high temperatures.
- ❑ Protect against electric shocks by installing a conductive connection between the magnetic component and the PE conductor on the permanent installation (Protection Class I) and by carrying out a standardised inspection of the continuous PE conductor connection to all contactable metal parts.
- ❑ Protect against highly inductive switch-off peaks by installing varistors, spark quenching units or similar devices according to VDE 0580/2000-07, Paragraph 4.6, to prevent damage to the coil insulations or switch contact consumption in extreme conditions (this protection is contained in *mayr*® rectifiers).
- ❑ The connection cable or connection strands on the clutches have a sheathing which is not resistant against all materials. On contact with chemical materials, please check for compatibility.
- ❑ Install additional protective measures against corrosion if the brake is subject to extreme ambient conditions or is installed in open air conditions, unprotected from the weather.
- ❑ Take precautions against freeze-up of the armature disk and the rotor in high humidity and at low temperatures.

Regulations, Standards and Directives Used:

98/37/EC	Machine directive
73/23/EEC	Low voltage directive
89/336/EEC	EMC directive
DIN VDE 0580	Electromagnetic devices and components, general directives

Please Observe the Following Standards:

DIN EN ISO 12100-1 and 2	Machine safety
DIN EN61000-6-4	Noise emission
DIN EN61000-6-2	Interference immunity
EN60204	Electrical machine equipment

Liability

- ❒ The information, guidelines and technical data in these documents were up to date at the time of printing.

  Demands on previously delivered clutches are not valid.
- ❒ Liability for damage and operational malfunctions will not be taken if
  - the Installation and Operational Instructions are ignored or neglected.
  - the clutches are used inappropriately.
  - the clutches are modified.
  - the clutches are worked on unprofessionally.
  - the clutches are handled or operated incorrectly.

Guarantee

- ❒ The guarantee conditions correspond with the Chr. Mayr GmbH + Co. KG Sales and Delivery Conditions.
- ❒ Mistakes or deficiencies are to be reported to *mayr*® at once!

Conformity Markings

The product conforms to the CE according to the low voltage directive 73/23/EEC.

Identification

mayr® components are clearly marked and described on the Type tag:

Manufacturer

***mayr*®**

Product name / Type

Article number

Serial number

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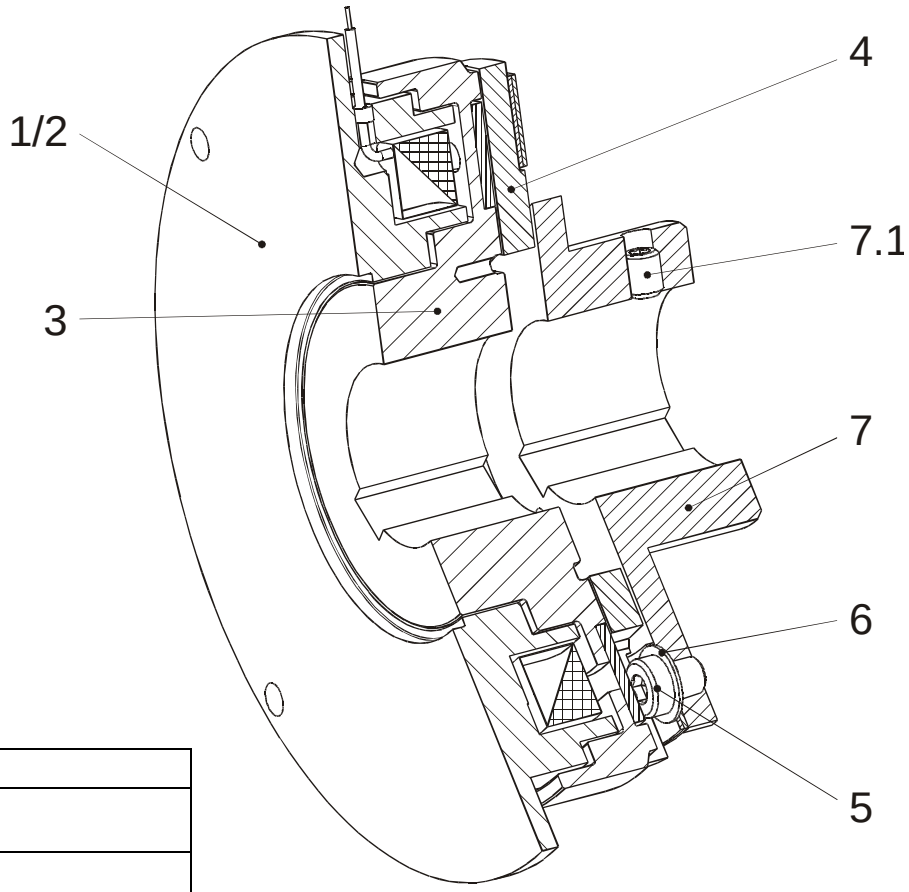

Parts List

(Only use mayr® original parts)

Item	Name
1	Coil carrier assembly Type 500.1_ _ with magnetic coil and Type tag
2	Coil carrier assembly Type 580.1_ _ with magnetic coil and Type tag
3	Rotor
4	Armature disk assembly incl. transmission spring
5	Cap screw
6	Spring washer
7	Flange hub (dependent on Type)
7.1	Set screw (dependent on Type)

Table 1: Technical Data

	Size	3	4	5	6	7	8	9
Nominal torque M_2 [1]	**[Nm]**	10	20	45	80	160	320	640
Maximum bore d_{max} in rotor (3)	**[mm]**	20	25	30	40	55	70	80
Air gap "a" (Figs. 3 / 4)	**[mm]**	$0,2^{+0,1}_{-0,05}$	$0,2^{+0,15}_{-0,05}$	$0,2^{+0,15}_{-0,05}$	$0,3^{+0,15}_{-0,05}$	$0,3^{+0,15}_{-0,05}$	$0,5^{+0,15}_{-0,1}$	$0,5^{+0,15}_{-0,1}$
Max. permitted centre offset "V" (Figs. 5 / 6)	**[mm]**	0,05	0,05	0,05	0,05	0,1	0,1	0,1
Max. permitted centre offset "V_1" (Figs. 5 / 6)	**[mm]**	0,1	0,15	0,15	0,15	0,2	0,2	0,25
Dimension "Z" (Fig. 5)	**[mm]**	35 H8	42 H8	52 H8	62 H8	80 H8	100 H8	125 H8
Dimension "z" (Fig. 6)	**[mm]**	2	2,5	3	3,5	3,5	4	4
Tightening torque cap screws (5)	**[Nm]**	1,1	2,9	5,7	9,9	24	48	83
Tightening torque on fixing screws [2] **for coil carrier Type 500.1_ _**	**[Nm]**	2,9	5,7	9,9	9,9	24	24	48
Tightening torque on fixing screws [2] **for coil carrier Type 580.1_ _**	**[Nm]**	2,9	5,7	5,7	9,9	9,9	24	24

[1] Please observe run-in specifications and minimum speed acc. Table 2
[2] Not included in standard delivery

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State of Delivery

Please check the state of delivery immediately according to the Parts List!
mayr® will take no responsibility for belated complaints.
Please report transport damage immediately to the deliverer.
Please report incomplete delivery and obvious defects to the manufacturer.

Function

ROBATIC®-clutch devices are energised to engage, electromagnetic pole face clutches.
By applying DC voltage to the magnetic coil in the coil carrier (1/2), a magnetic field is built up. This pulls the armature disk (4) against the rotor (3).
The torque is transmitted via frictional locking.

Please Observe:
In new condition, torque transmission first takes place via the metal outer pole on the rotor (3) and, after a short operation period, then additionally via the inner pole. After the entire run-in procedure, an even frictional combination occurs on the metal poles and on the friction linings lying between them.

Design

ROBATIC®-clutches have Electrical Protection IP 54 and Insulation Class F (up to 155 °C) for coil, casting compound a nd connection strands. On the design with a connection terminal, the connection terminal itself corresponds to Protection Class IP00.
At 100 % duty cycle, the coil has a temperature of c. 65 °C.
The surfaces on the coil carrier (1/2), rotor (3) and flange hub (7) are phosphated, the armature disk (4) is gas nitrocarburized (friction surfaces are ground), and the transmission spring is made of stainless steel.
The clutch rotor (3) is pilot bored or finished bored with a keyway acc. DIN 6885. When the rotor bore and keyway are produced customer-side, the Guidelines on page 6 of the Installation and Operational Instructions, “Boring the Rotor Hub” must be followed!

Explanation of Terms

The **nominal torque M_2** is the largest transmittable torque (after run-in has been completed), with which the closed clutch can be loaded without slipping occurring.

The **relative duty cycle** is the ratio of duty cycle to backlash duration in percent (% duty cycle).

Table 2

Size	Friction work Q_a [J]	Clutch speed n_{min} [rpm]
3	16	300
4	29	250
5	55	200
6	105	160
7	200	130
8	380	120
9	600	100

Torque Characteristics

In new condition, c. 50 % of the catalogue nominal torque (M_2) is transmitted.

The components reach the catalogue nominal torque when the friction surfaces are run in. Please take c. 100 – 200 switchings in dynamic operation, a typical speed of c. 500 to 1000 rpm and a medium friction work (see Table 2) as rough reference values. Longer slipping on the clutch, especially at low speeds, is to be avoided, as this can lead to scoring and therefore to damage to the friction surfaces.
Clutches used in static or virtually static operation do not reach the nominal torque (M_2) shown in the Technical Data (Table 1).

On request, the clutch can also be run in manufacturer-side. In this case, please ensure that the customer-side installation is carried out exactly according to the specifications, in order to re-create the best possible friction conditions. Also, the “friction carbon” must not be wiped away.
If the clutches are run in manufacturer-side to the nominal torque and then run in static or virtually static operation, please expect a nominal torque reduction of c. 60 to 70 %. This is the case if the clutch under-runs the speed or friction work (Q_a) given in Table 2. For static and virtually static applications, we therefore recommend our "doubled magnetic flow designs", Type series 500.3_ _.0 (available on request).

Run-in conditions

Please carry out an "artificial" run-in if a run-in procedure on the machine is not possible for the application (see section Torque Characteristics). This is the case e.g. when the friction work, the speed or the switching frequencies are too low.

Run-in Possibility 1

- ❑ Apply a voltage c. 1/3 of U_{Nom} (do not apply nominal voltage!).
- ❑ Speed on sizes 3 – 6: c. 50 rpm, on sizes 7 – 9: c. 30 rpm
- ❑ c. 2 – 3 minutes slipping against blocked output.

Run-in Possibility 2

- ❑ Synchronize against unblocked output by producing a larger rotating mass and / or by synchronizing at higher speed (values should lie above the minimum values, Table 2)
- ❑ Allow to synchronize for c. 2 – 3 minutes.

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Installation Example 1 (Fig. 3)

Please Observe: Positions 8 to 11 are customer-side-mounting components which are not included in delivery.

In operation, the armature disk (4) is pulled against the rotor (3). The torque is transmitted via frictional locking from the drive shaft (9) via the rotor (3) and the armature disk (4) onto the V-belt disk (8).
The coil carrier (1/2) is screwed onto the machine wall, centred onto the shaft bearing (10).
The air gap "a" between the rotor (3) and the armature disk (4) is defined via the distance ring (11) between the rotor (3) and the V-belt disk (8) bearing.
The V-belt disk (8) should be made from a material which is a poor magnetic conductor in order to prevent magnetic loss due to leaking flux and therefore loss of force. IN VOC it says: leakage flux

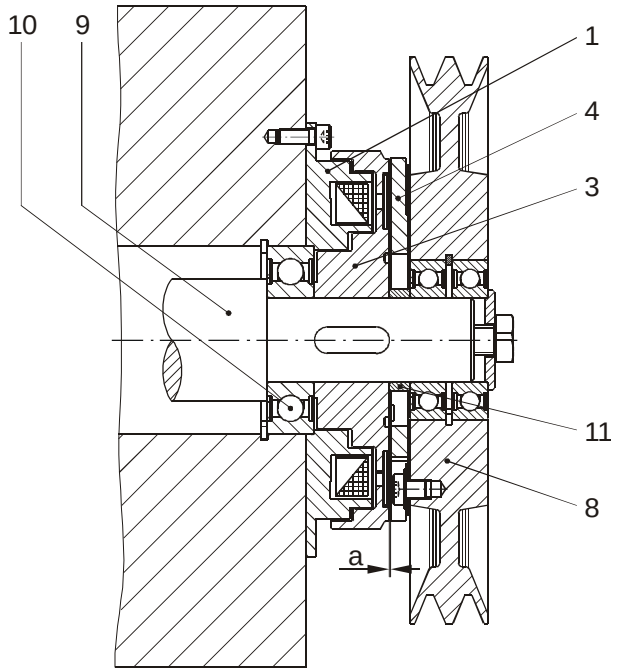

Fig. 3

Installation Example 2 (Fig. 4)

Electromagnetic clutch with flange hub (7) for the connection of two aligning shafts.

Torque Procedure:
Input shaft – rotor (3) – armature disk (4) – flange hub (7) – output shaft.
The coil carrier (1/2) and the rotor (3) are mounted input-side, the flange hub (7) with the screwed-on armature disk (4) is mounted onto the output shaft.
Axial securement of the rotor (3) takes place via a press cover and a screw, screwed into the central shaft thread. A set screw (7.1) secures the flange hub (7) onto the output shaft. For adjustment of air gap "a" between the rotor (3) and the armature disk (4), the set screw is loosened and the flange hub (7) is moved onto the output shaft.

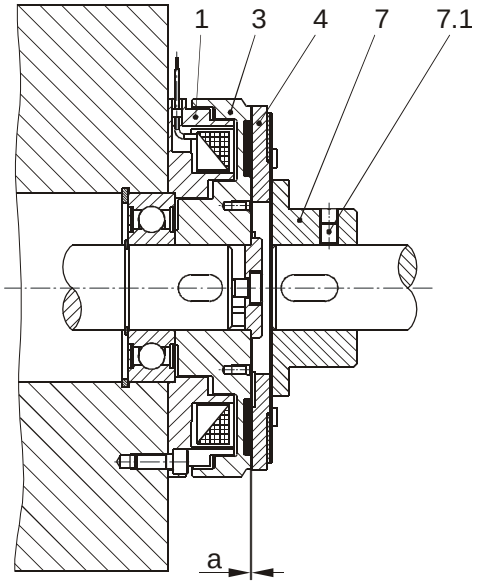

Fig. 4

Boring the rotor hub (Fig. 2)

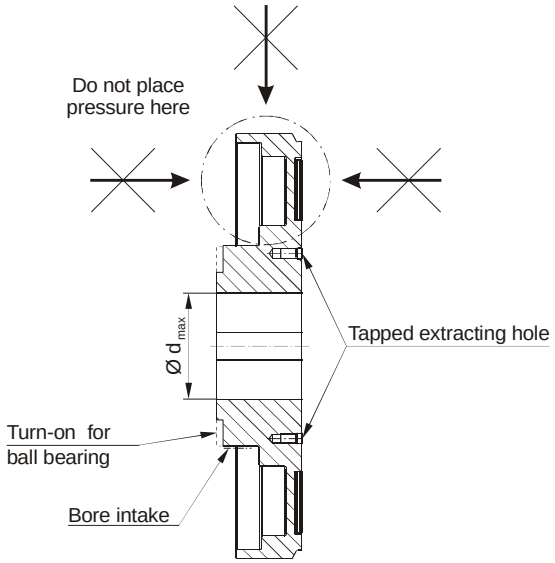

Fig. 2

The rotor (3) must not be bent during boring.
Do not place pressure on the outer, thin-walled rotor area, see Fig. 2.
To bore, clamp on the rotor hub.
The maximum permitted bore diameter $d_{max.}$, acc. Table 1, must not be exceeded. The keyway is produced acc. DIN 6885/1.
Exception for size 4: Here, the keyway is produced up to Ø 23 keyway acc. DIN 6885/1 and over Ø 23 keyway acc. DIN 6885/3.
We recommend H7/k6 as a suitable hub-shaft tolerance.

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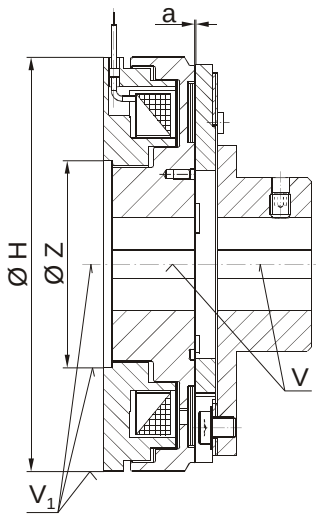

Fig. 5

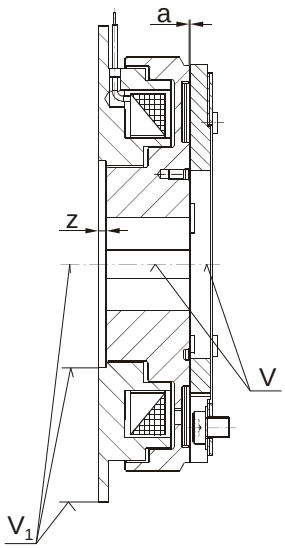

Fig. 6

Installation

1. Mounting the coil carrier (1/2):

Screw the coil carrier (1 / 2) onto the machine wall (observe the tightening torque acc. Table 1).

- ➔ Centred by a ball bearing (10), Figs. 3/4.
- ➔ Centred on diameter "Z", Fig. 5 and Table 1.
- ➔ Centred on outer diameter "H", Fig. 5.

The maximum permitted centre offset "V_1" acc. Table 1 must not be exceeded (Figs. 5 and 6).

2. Installation of the rotor (3):

The rotor (3) is mounted onto the shaft using a suitable mounting device.

Please Observe:

- ➔ Do not place pressure on the outer area of the rotor (3) (Fig. 2).
- ➔ Do not mount by hitting with a hammer.
- ➔ Keep to dimension "z", Table 1 and Fig. 6.

The rotor (3) must be kept grease-free.
The rotor (3) must be secured axially in operation, see Installation Examples Figs. 3 and 4.
Axial backlash can lead to the rotor (3) rubbing against the armature disk (4) or the coil carrier (1 / 2).

3. Installation of the armature disk (4):

3.1. Lay the spring washers (6) under the cap screws.(5).
The cap screws (5) must be secured with Loctite 243.

3.2. Mount the armature disk (4) onto the mounting part or onto the flange hub (7) (observe the tightening torque acc. Table 1).

3.3. Align the armature disk (4)
(max. permitted radial run-out 0,15 mm).

Please Observe:
The armature disk (4) must be kept grease-free.

4. Installation of the mounting part or the flange hub (7):

4.1. Adjust the air gap "a" according to Table 1 and Figs. 3/4.

4.2. Secure the mounting part or flange hub (7) axially backlash-free.
Axial backlash changes the air gap "a" and can lead to the rotor (3) running against the armature disk (4) (see Installation Examples Figs. 3 and 4).
Please observe the maximum permitted centre offset "V" according to Table 1 and Figs. 5 or 6.

Rotor De-installation (Fig. 2 / Page 6)

In order to remove the rotor (3) from the shaft, there are tapped holes in the rotor hub.
Do not place pressure on the outer, thin-walled rotor area (3).

Rotor Turn-on for the Ball Bearing

If the coil carrier (1 / 2) is centred on the inner diameter Z" using a ball bearing (Fig. 3), the rotor hub (3) must be turned-on to the facing side.

To turn-on:

- ➔ Clamp the rotor (3) into the hub bore.
Do not clamp on the outer diameter. Do not place pressure on the outer, thin-walled rotor area (3).
- ➔ Turn the rotor (3) free on the hub facing side, see Fig. 2. The hub facing side must only lie against the ball bearing inner ring (10) (see Installation Examples Figs. 3 and 4).

If specified on order, the rotor hub will be turned-on manufacturer-side. No turn-on is made on standard deliveries.

Electrical Connection

The clutch coil is connected to DC voltage.
The voltage value is shown on the Type tag.

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Maintenance and Inspection

Please inspect the air gap "a" and the permitted centre offsets “V" and "V_1" according to Table 1, at regular intervals.
Bearing backlash and wear on the friction surfaces alter the permitted Table values. Apart from this, ROBATIC®-electromagnetic clutches are maintenance-free.

Disposal

Our electromagnetic clutch components must be disposed of separately as they consist of different materials. Please observe the relevant authority regulations. Code numbers must vary according to the dismantling process (metal, plastic and cable).

Electronic components
(Rectifier / ROBA®-switch):

Products which have not been dismantled can be disposed of under the Code No. 160214 (Mixed Materials) or Components under Code No. 160216; or the objects can be disposed of by a certified waste disposal firm.

Coil carriers (coil carriers with coil and strands) and all other steel components:
Steel scrap (Code No. 160117)

Clutch rotors (steel girders with friction linings):
Brake linings (Code No. 160112)

Malfunctions / Breakdowns:

Malfunction	Possible Causes	Solutions
Clutch does not switch	❑ Incorrect voltage applied	❑ Apply correct voltage
	❑ Rectifier failure	❑ Replace rectifier
	❑ Air gap too large	❑ Re-adjust air gap
	❑ Interrupted coil	❑ Replace clutch
Clutch does not couple	❑ Grease and / or oil on the friction surfaces	❑ De-grease friction surfaces

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