Installation and Operational Instructions for EAS®-NC Clutches Type 45_._ _ _._ Sizes 02 and 03

(B.4.8.2.1.EN)

Please read these 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:

Safety and Guideline Signs

CAUTION

Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

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

Safety Regulations

These Installation and Operational Instructions (I + O) are part of the clutch delivery.
Please keep them handy and near to the clutch at all times.

It is forbidden to start use of the product until you have ensured that all applicable EU directives, directives for the machine or system into which the product has been installed have been fulfilled.
At the time these Installation and Operational Instructions go to print, the EAS®-clutches accord with the known technical specifications and are operationally safe at the time of delivery.
Without a conformity evaluation, this product is not suitable for use in areas where there is a high danger of explosion. This statement is based on the ATEX directive.

CAUTION

- ❒ If the EAS®-clutches are modified.
- ❒ If the relevant standards for safety and / or installation conditions are ignored.

User-implemented Protective Measures

- ❒ Cover all moving parts to protect against seizure, dust or foreign body impact.
- ❒ The clutches may not be put into operation without a limit switch unless *mayr*® has been contacted and has agreed otherwise.

To prevent injury or damage, only professionals and specialists should work on the devices, following the relevant standards and directives. Please read the Installation and Operational Instructions carefully before installation and initial operation of the device.

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

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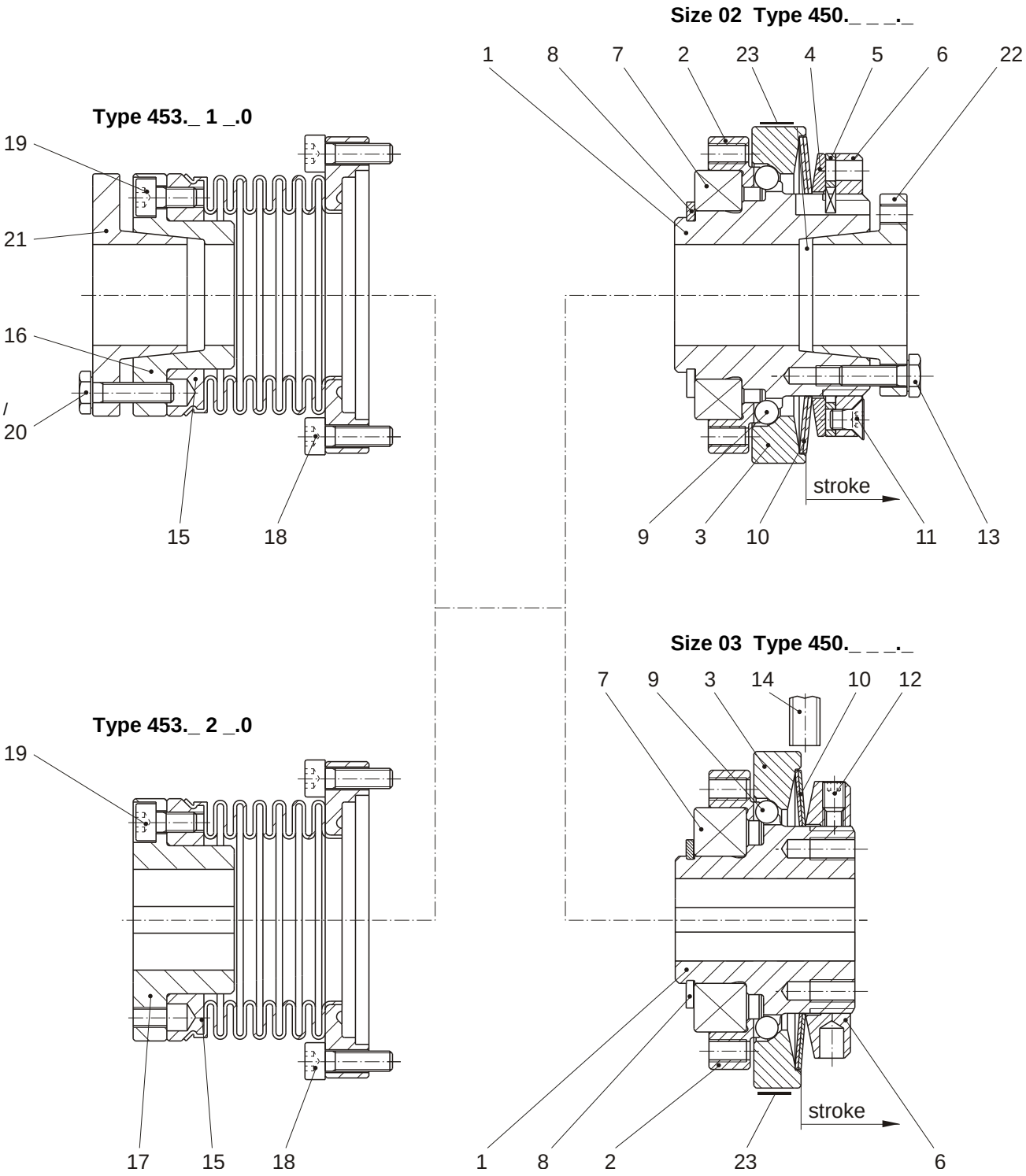

Fig. 1

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(B.4.8.2.1.EN)

Parts List (Only use *mayr*® original parts)

Parts for Size 02

Item	Name
1	Hub
2	Pressure flange
3	Thrust washer
4	Thrust ring
5	Locking ring
6	Adjusting nut
7	Deep groove ball bearing
8	Locking ring
9	Steel ball
10	Cup spring
11	Countersunk screw
13	Hexagon head screw
14	Limit switch [1] (see Fig. for Size 03)
15	Steel bellows with welding flanges
16	Hub for cone bushing
17	Hub with keyway
18	Cap screw [2]
19	Cap screw
20	Hexagon head screw
21	Cone bushing
22	Cone bushing
23	Type tag

Parts for Size 03

Item	Name
1	Hub
2	Pressure flange
3	Thrust washer
6	Adjusting nut
7	Deep groove ball bearing
8	Locking ring
9	Steel ball
10	Cup spring
12	Set screw
13	Hexagon head screw (see Fig. for Size 02)
14	Limit switch [1]
15	Steel bellows with welding flanges
16	Hub for cone bushing
17	Hub with keyway
18	Cap screw [2]
19	Cap screw
20	Hexagon head screw
21	Cone bushing
22	Cone bushing (see Fig. for Size 02)
23	Type tag

[1] The limit switch Item 14 is not part of the standard scope of delivery

[2] Secure the cap screws Item 18 with Loctite 243

Design

The EAS®-NC clutch is designed as a mechanical overload clutch according to the ball detent principle.

State of Delivery

The clutch is manufacturer-assembled and set to the torque stipulated in the order.
Unless the customer requests a particular torque setting when ordering, the clutch must be set according to the Adjustment Diagram as described in the section Torque Adjustment.
Please check state of delivery!

Function

The clutch protects the drive line from excessively high, unpermitted torque impacts which can occur due to unintentional blockages.

Function in normal operation

When in operation, the EAS®-NC clutch transmits the torque via the hub (1), the steel balls (9) and the pressure flange (2) onto the customer-side output.
The torque transmission takes place backlash-free over the entire clutch lifetime.

Function in case of overload

If the set limit torque is exceeded (overload), the clutch disengages, the thrust washer (3) carries out an axial hub movement, a customer-side mounted limit switch senses this stroke movement and emits a signal to switch off the drive. The residual torque is approx. 5 to max. 15 % of the set torque (with approx. 1500 rpm).
This means that the EAS®-NC clutch is not load holding.
Once the overload is removed, the clutch becomes automatically ready for operation again on reaching an engagement position.

Re-engagement:

The ratchetting division on the EAS®-NC ratchetting clutch **Type 45_._ _ 0._** is **15°**.

The ratchetting division on the EAS®-NC synchronous clutch **Type 45_._ _ 5._** is **360°**.

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Technical Data

Table 1:

Size	Limit torques for overload M_G Type 45_.5_ _._ [Nm]	Type 45_.6_ _._ [Nm]	Type 45_.7_ _._ [Nm]	Max. speed [rpm]
03	0,65 – 1,3	1,3 – 2,6	2 – 3,8	4000
02	2 – 5	5 – 10	6 – 15	4000

Table 2:

Size	Bore hub (1) from – to Type 45_._1_._ [mm]	Type 45_._2_._ [mm]	Thrust washer stroke on overload (Fig. 1, Item 3) [mm]	Permitted ambient temperature
03	6 – 12	6 – 11	0,8	-20 °C to +80 °C
02	8 – 15	8 – 16	1,0	-20 °C to +80 °C

Table 3:

Size	Max. permitted bearing loads Axial forces [N]	Radial forces[N] 1-bearing design	2-bearing design	Transverse force torques [3] [Nm]	Screw tightening torques Item 13 [Nm]	Item 18 [Nm]	Item 19 [Nm]	Item 20 [Nm]
03	120	100	150	0,5	1,3	1,3	1,3	1,3
02	280	250	375	1,5	1,3	1,3	1,3	1,3

[3] Torques, which put strain on the deep groove ball bearing due to the non-centric axial forces having an effect on the pressure flange.

Table 4:

Size	Shaft misalignment steel bellows coupling Type 453.- Axial ΔK_a [mm]	Radial ΔK_r [mm]	Angular ΔK_w [°]	Nominal torque T_{KN} steel bellows coupling Type 453.- [Nm]	Bores steel bellows side Type 453._1_.0 [mm]	Type 453._2_.0 [mm]
03	±0,2	0,1	2	12	6 – 12	6 – 11
02	±0,3	0,1	2	25	8 – 15	8 – 16

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Output Elements Installation

In case of the **EAS®-NC Type 450.-** the output element is centred on a deep groove ball bearing (7) (tolerance H7/h5) and bolted together with the pressure flange (2).

Please observe the maximum permitted screw-in depth in the pressure flange (2) as well as the connection dimensions "a" and "e" for the output elements, see Figs. 3 or 4 and Table 5.

If the resulting radial force from the output element is anywhere near the centre of the ball bearing (7) and under the max. permitted radial load acc. Table 3, an additional bearing for the output element is not necessary.In case of very wide output elements and a force application of the resulting radial force outside the bearing centre, the output element is additionally located on the shaft, Fig. 4.

No appreciable axial forces (see Table 3) should be transferred from the output element onto the clutch pressure flange (2).

The EAS®-NC with a long protruding hub (Type 450._ _ _.1 / Fig. 2a) is recommended for extremely wide output elements, or for elements with small diameters.

On very small diameters, the output element is screwed together with the clutch pressure flange (2) via a customer-side intermediate flange.

In case of increased radial forces, a 2-bearing design (Type 450._ _ _.2 / Fig. 2b) should be used.

Example:

Type 450.61_.1

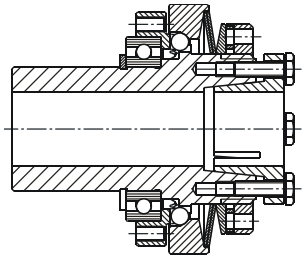

Fig. 2a

Type 450.61_.2

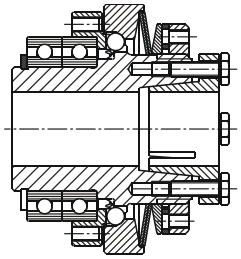

Fig. 2b

Ball bearings, needle bearings or bearing bushings are suitable as bearings for the output element, depending on the installation situation and the installation space.

Please ensure that the output element bearing is designed as a fixed bearing (Fig. 4).

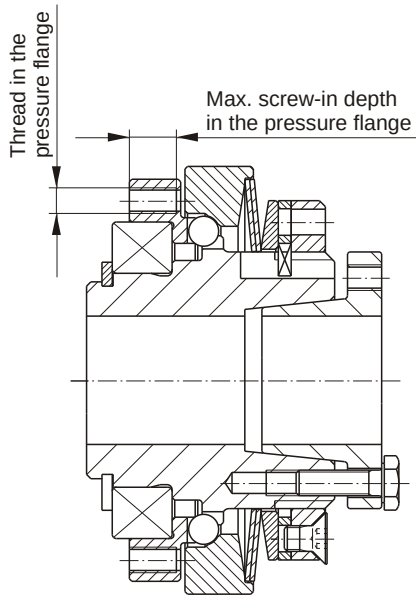

Fig. 3

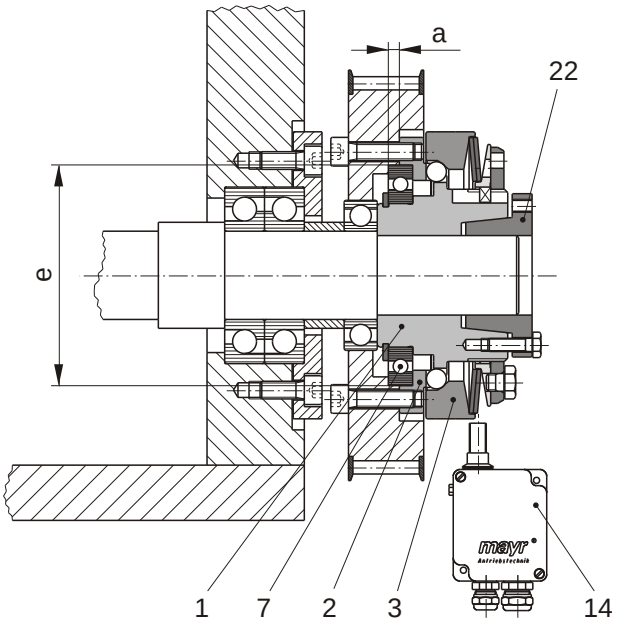

Fig. 4
Type 450.61_.0

Table 5:

Size	Thread in the pressure flange (Fig. 3) with required screw quality and tightening torque for the customer-side screw connection	Max. screw-in depth in the pressure flange (2) for Type 450. (Fig. 3) [mm]	Connection dimensions [mm] (Fig. 4)	
			$a^{+0,1}$	$e^{H7/h5}$
03	6 x M3 / 8.8 / 1,3 Nm	5	2	30
02	6 x M3 / 8.8 / 1,3 Nm	5	2	37

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Mounting onto the Shaft

EAS®-NC clutches include cone bushings or keyways as part of the standard delivery.

During installation of cone bushings, please observe the following:

- ❒ Recommended shaft tolerance for cone bushings: h6
- ❒ Shaft surface:
  finely turned or ground (Ra = 0,8 µm)
- ❒ Shaft material: Yield point at least 400 N/mm^2,
  e. g. St 60, St 70, C 45, C 60.
- ❒ Degrease or remove conserving layers on the shafts and bores before installing the clutch.
  Greasy or oily bores or shafts do not transmit the torques defined in the catalogue.
- ❒ Mount the clutch or clutch hubs onto both shaft ends using a suitable device and bring it / them into the correct position.
- ❒ Tighten the tensioning screws (13/20) in 2 steps cross-wise and then in 3 to max. 6 tightening sequences evenly using a torque wrench to the torque stated in Table 3.

The clutch or clutch hub carries out an axial movement in the direction of the cone bushing when tightening the cone bushing.
Because of this effect, please ensure that on the EAS®-NC clutch with steel bellows (Type 453._ _ _.0), first one cone bushing is completely tightened (e.g. Items 13/22), then the other (steel bellows) side (Items 20/21, Fig. 5).
Please also ensure during installation of Type 453._ _ _.0 that no axial pressure is placed on the steel bellows (can cause damage).

De-installation

There are tapped extracting holes next to the tensioning screws (13/20) in the cone bushings.

1) Loosen all tensioning screws by several thread turns.
2) Screw out the tensioning screws located next to the tapped extracting holes and screw them into the tapped extracting holes up to their limits. Then tighten these screws until the tensioning connection loosens.

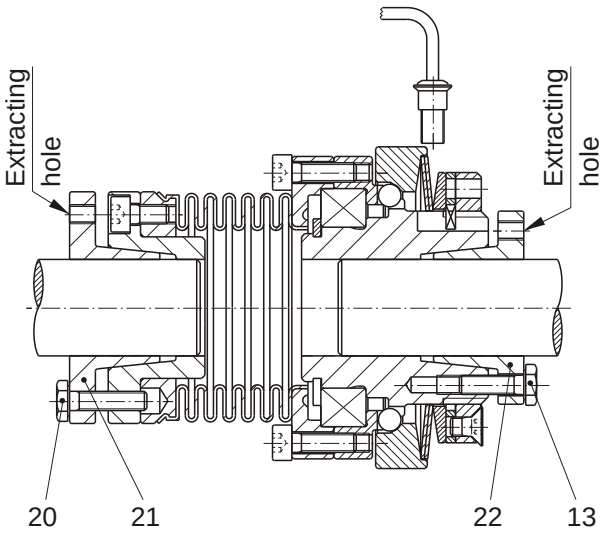

Fig. 5

Shaft Installation via Key Connection

On the EAS®-NC with a keyway, the clutch must be axially fixed onto the shaft after mounting, e.g. with a press cover and a screw (Fig. 6), screwed into the shaft central thread.

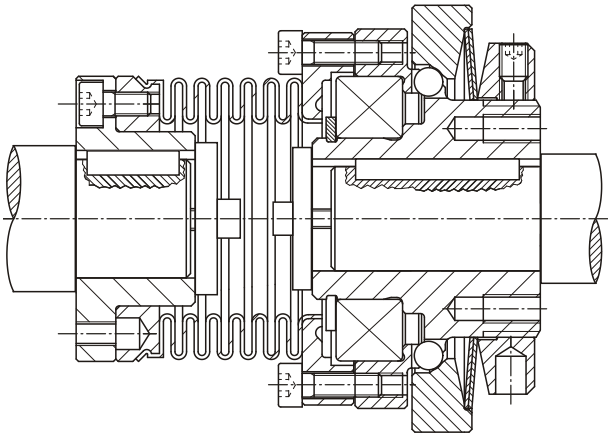

Fig. 6

Cup Spring Layering (Fig. 7)

Correct cup spring layering is a prerequisite for problem-free clutch function and torque adjustment.

For the lower torque range, **one** cup spring (Type 45_.**5**_ _._),

for the medium torque range, **two** cup springs (Type 45_.**6**_ _._),

and for the high torque range **three** cup springs (Type 45_.**7**_ _._) are installed.

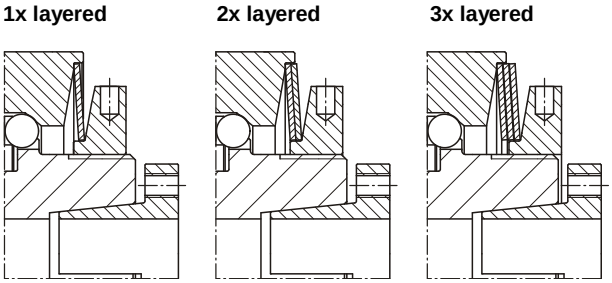

Fig. 7

Joining (Screwing) Both Clutch Hubs (1/17) EAS®-NC Type 453._ _ _.0 (Fig. 1)

When mounting the hubs (1 and 17), the joining force must not be transferred via the steel bellows
=> danger of bellows deformation.

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Permitted Shaft Misalignments

The EAS®-NC clutches Type 453._ _ _.0 (with steel bellows) compensate for radial, axial and angular shaft misalignments (Fig. 8) without losing its backlash-free function.
However, the permitted shaft misalignments indicated in Table 4 must not simultaneously reach their maximum value.
If more than one kind of misalignment takes place simultaneously, they influence each other. This means that the permitted misalignment values are dependent on one another, see Fig. 9.
The sum total of the actual misalignments in percent of the maximum value must not exceed 100 %.
The permitted misalignment values given in Table 4 refer to coupling operation at nominal torque, an ambient temperature of +30 °C and an operating speed of 1500 rpm.
If the coupling is operated in other or more extreme operating conditions, please contact the manufacturers.

Clutch Alignment

Exact alignment of the clutch improves the running smoothness of the drive line substantially, reduces the load on the shaft bearings and increases the clutch service lifetime.
We recommend alignment of the clutch using a dial gauge or special laser on drives operating at very high speeds.

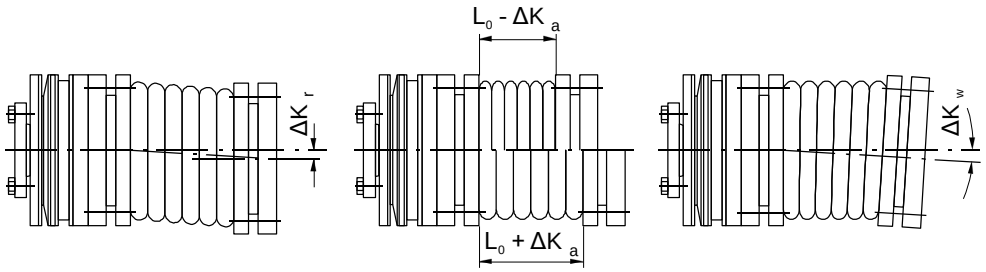

Fig. 8

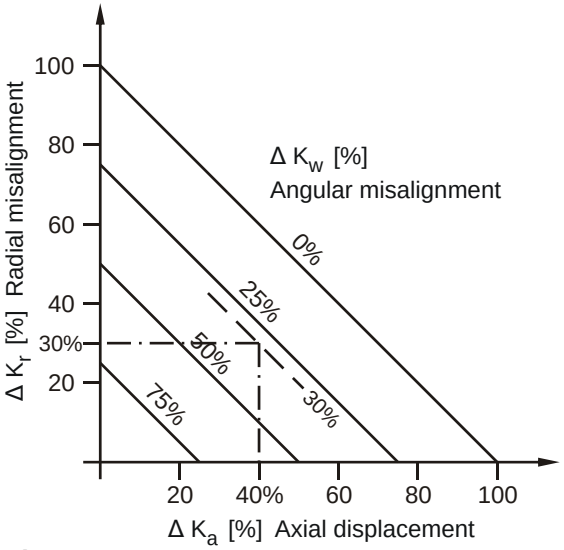

Fig. 9

Example (Size 02 / Type 453. _ _ _.0):

Axial displacement occurrence ΔK_a = 0,12 mm equals 40 % of the permitted maximum value ΔK_a = 0,3 mm.
Angular misalignment occurrence ΔK_w = 0,6° equals 30 % of the permitted maximum value ΔK_w = 2°.
=> Permitted radial misalignment ΔK_r = 30 % of the maximal value ΔK_r = 0,1 mm => ΔK_r = 0,03 mm

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Torque Adjustment

In order to guarantee low-wear clutch operation, it is essential that the clutch torque is set to a sufficiently high service factor (overload torque to operating torque).
Experience has shown that an **adjustment factor of 1,5 to 3** gives good results.
On very high load alternations, high accelerations and irregular operation, please set the adjustment factor higher.
The respective torque adjustment range is printed on the Type tag (23).Torque adjustment is carried out by turning the adjusting nut (6). The installed cup springs (10) are operated in the negative range of the characteristic curve (see Fig. 10); this means that a stronger pre-tensioning of the cup spring results in a decrease of the spring force.
The torque is set manufacturer-side according to the customer's request.

If no particular torque adjustment is requested customer-side, the clutch will only be pre-assembled manufacturer-side. As a general rule, in this case torque adjustment must be carried out as described below.

Turning the adjusting nut (6) within the operating range in a clockwise direction reduces the torque. Turning it anti-clockwise causes an increase in torque. You should be facing the adjusting nut (6) as shown in Figs. 11 and 12.

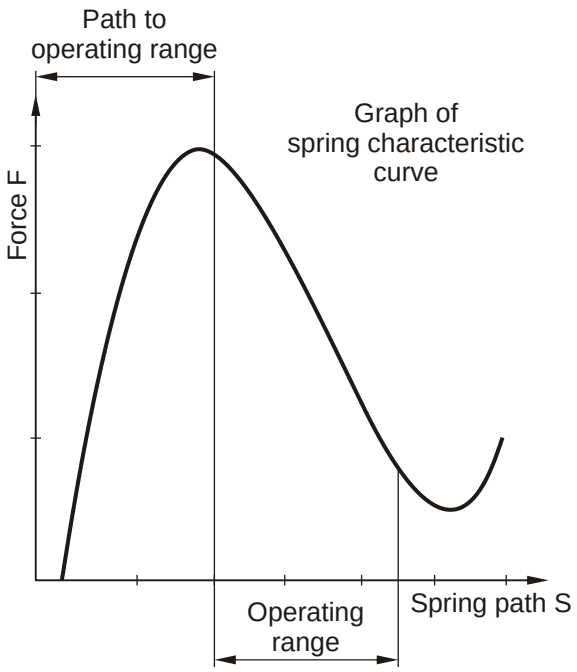

Fig. 10

Adjustment of the Torque with Size 02:

a) Loosen the locking screw (11).
b) Grease the thread and contact surfaces on the adjusting nut (6), the locking ring (5) and the hub (1).
c) Set the adjusting nut (6) by hand up to contact on the cup spring (10).
d) Continue to turn until the four notches on the circumference of the adjusting nut (6) and the notches in the locking ring (5) align.
e) Turn the adjusting nut (6) further using a face wrench to the number of graduation lines which equal the required torque (corresponding diagram 1 to 3 on page 9).
f) The notches on the circumference of the adjusting nut (6) and the notches on the locking ring (5) must be in the same position.
g) Paint the locking screw (11) with Loctite 243 and screw it into the adjusting nut (6).

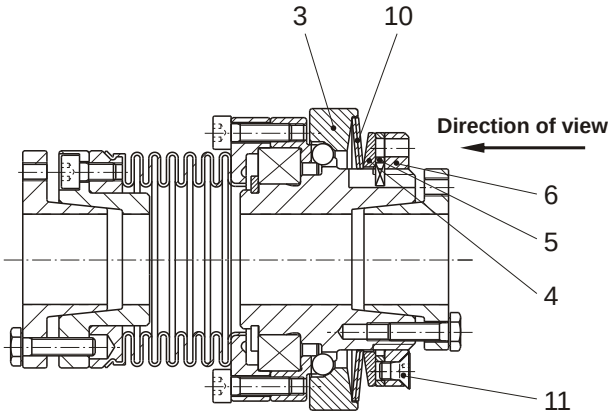

Fig. 11

Adjustment of the Torque with Size 03:

a) Unscrew both set screws (12) from the adjusting nut (6).
b) Grease the thread surfaces on the adjusting nut (6) and the hub (1).
c) Set the adjusting nut (6) to the required dimension “a” using a hook wrench. Dimension "a" see corresponding diagrams 4 to 6, page 9.
d) Paint **both** set screws (12) with Loctite 243, screw them into the adjusting nut (6) and tighten them.

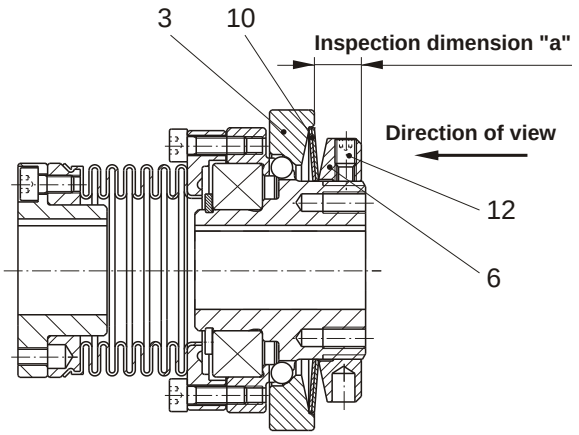

Fig. 12

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Adjustment Diagrams

Diagram 1: Size 02 / Type 45_.5_ _._

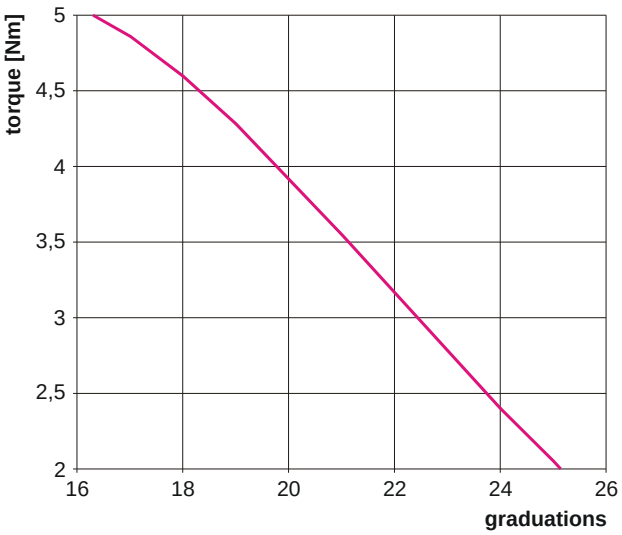


Diagram 2: Size 02 / Type 45_.6_ _ ._

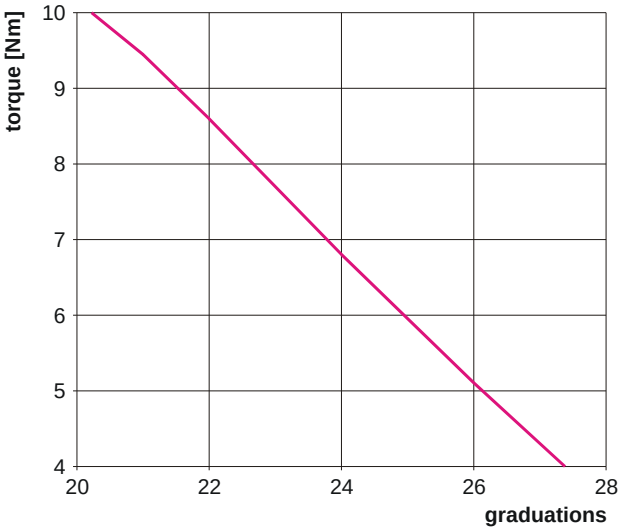


Diagram 3: Size 02 / Type 45_.7_ _._

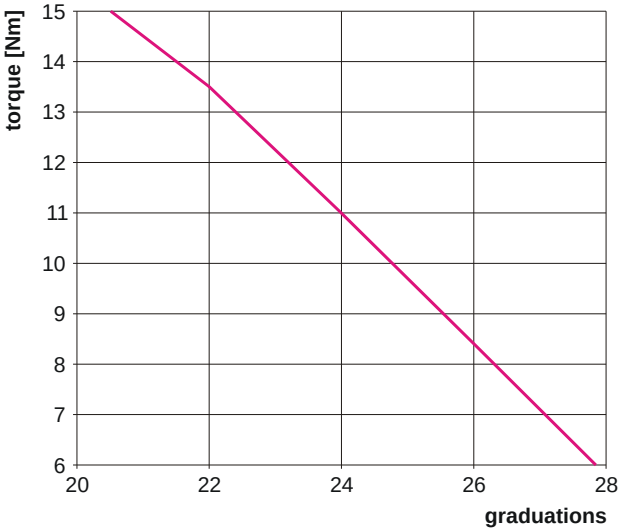


Diagram 4: Size 03 / Type 45_.5_ _._

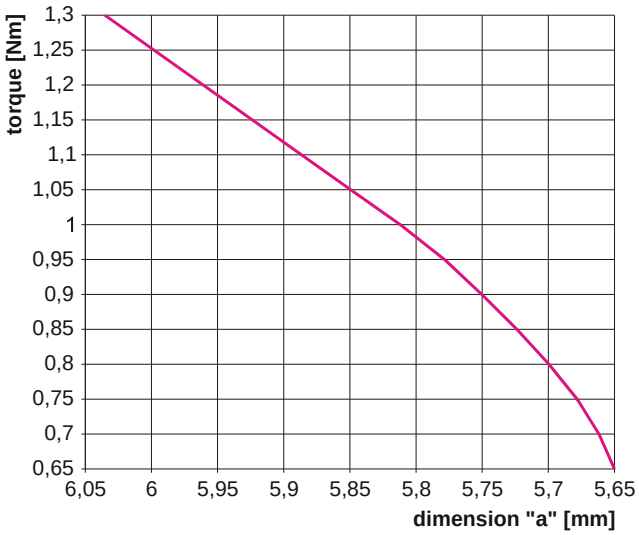


Diagram 5: Size 03 / Type 45_.6_ _._

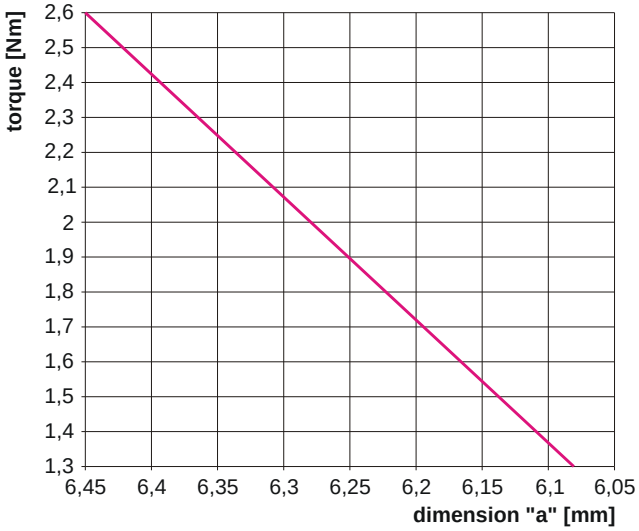
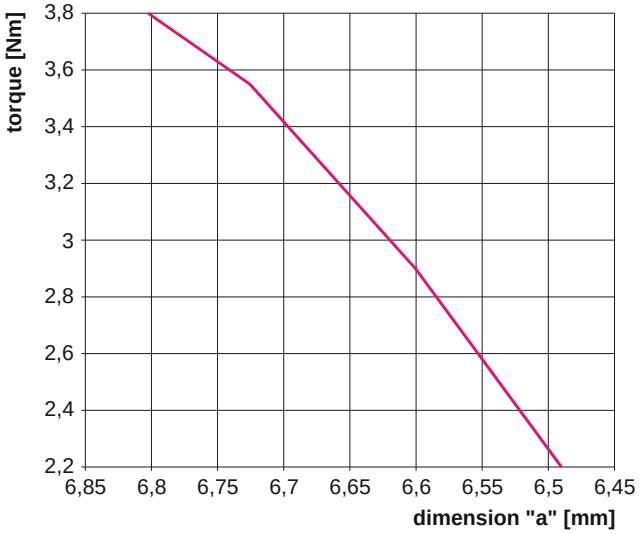


Diagram 6: Size 03 / Type 45_.7_ _._



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Limit Switch Installation

Adjust the switch distance for the contactless limit switch acc. Fig. 13.
The distance of the thrust washer (3) to the switching point can be adjusted using a hexagon head screw, wrench opening 7 (Fig. 13).

contactless limit switch

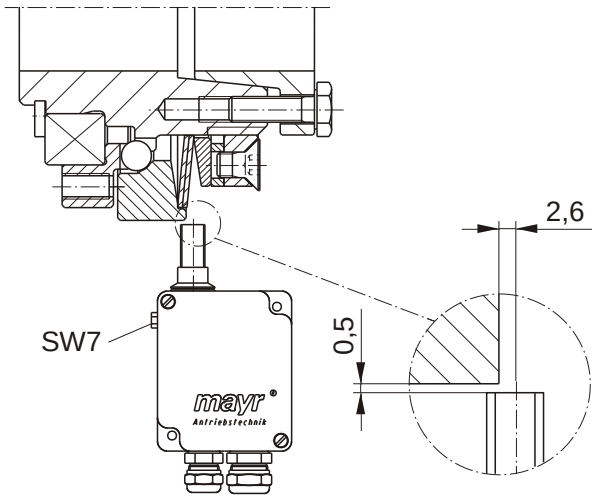

Fig. 13

Maintenance and Maintenance Intervals

Maintenance work, which should be carried out after approx. 2000 operating hours, after 100 disengagements or at the latest after 1 year, includes:

- ➔ Visual inspection
- ➔ Functional inspection
- ➔ Inspection of the shaft-hub connection
- ➔ Inspection of the screw tightening torques
  The specified tightening torques (Table 3) must be maintained.
- ➔ Inspection of the set torque
- ➔ Clutch release inspection
- ➔ Bearing or bearing pre-tension inspection
- ➔ Re-greasing of the transmission geometries, balls, recesses and sealing elements.

Clutch re-greasing must only be carried out by specially trained personnel.
For greasing, please use NLGI Class 2 grease with a basic oil viscosity of 220 mm^2/s at 40 °C, e.g. Mobilgrease XHP222.
When re-installing the clutch, please secure all screws with Loctite 243 (medium hard).

If large amounts of dirt or dust are present or in extreme ambient conditions, it may well be necessary to carry out inspections at shorter intervals.
We recommend that maintenance work is carried out at the site of manufacture.

Disposal

Electronic components
(Limit switch):
Products which have not been disassembled can be disposed of under Code No. 160214 (mixed materials) or components under Code No. 160216, or can be disposed of by a certified disposal firm.

All steel components:
Steel scrap (Code No. 160117)

All aluminium components:
Non-ferrous metals (Code No. 160118)

Seals, O-rings, V-seals, elastomers:
Plastic (Code No. 160119)

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Malfunctions / Breakdowns Type 45_._ _ _._

Result of Malfunction	Possible Causes	Solutions
Premature clutch release	Incorrect torque adjustment Adjustment nut has changed position Worn clutch	1) Set the system out of operation 2) Check the torque adjustment 3) Secure the adjusting nut 4) If the cause of malfunction cannot be found, the clutch must be inspected at the place of manufacture
Clutch does not release on overload	Incorrect torque adjustment Adjustment nut has changed position Worn clutch	1) Set the system out of operation 2) Check whether foreign bodies influence the disengagement mechanism function 3) Check the torque adjustment 4) Secure the adjusting nut 5) If the cause of malfunction cannot be found, the clutch must be inspected at the place of manufacture
Running noises in normal operation	Insufficient clutch securement Loosened screws Loosened adjusting nut	1) Set the system out of operation 2) Check the clutch securement 3) Check the screw tightening torques 4) Check the torque adjustment and that the adjusting nut sits securely 5) If the cause of malfunction cannot be found, the clutch must be inspected at the place of manufacture

Malfunctions / Breakdowns Type 453._ _ _.0

Result of Malfunction	Possible Causes	Solutions
Steel bellows breakage	Incorrect alignment	1) Set the system out of operation 2) Replace the entire clutch 3) Check the alignment
	Steel bellows have already been damaged in transport or during installation	1) Set the system out of operation 2) Replace the entire clutch 3) Check the alignment
	Operating parameters are not appropriate for the clutch performance	1) Set the system out of operation 2) Check the operating parameters and select a suitable clutch (observe installation space) 3) Install a new clutch 4) Check the alignment
	Steel bellows is energised in natural frequency; resonance	1) Set the system out of operation 2) Re-align the line characteristics 3) Replace the entire clutch 4) Check the alignment
Changes in running noise and / or vibration occurrence	Screws are loosened, resonances, Insufficient clutch securement	1) Set the system out of operation 2) Check the screw tightening torques 3) Check the line characteristics 4) Check the coupling parts and replace if damaged

Please Observe!
mayr® will take no responsibility or guarantee for replacement parts and accessories which have not been delivered by *mayr*®, or for damage resulting from the use of these products.

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