Installation and Operating Instructions for EAS®-NC clutch Type 45_. _ _ _ . _ Sizes 01 - 3

(B.4.8.2.GB)

Please read and observe this Operating Instruction carefully!
A possible malfunction or failure of the clutch and any damage may be caused by not observing it.

Table of contents:

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

Declaration of Conformity

A conformity evaluation for the applicable EU directives has been carried out for this product.
The conformity evaluation is set out in writing in a separate document and can be requested if required.
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 all applicable EU directives.
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.

Safety regulations

The submitted installation and operating instructions (E+B) is part of the clutch shipment.
Keep the E+B always well accessible near the clutch.

Danger!

- ❒ If the EAS®-clutches have been modified or reconverted.
- ❒ If the relevant standards of the safety or installation conditions are not observed.

Necessary protective measures to be undertaken by the user

- ❒ Cover all moving parts for protection against squeezing, seizing, dust deposit and hit of foreign objects.
- ❒ The clutches must not be put into operation without limit switch, unless otherwise agreed with *mayr*®.

Only qualified and well-trained specialists should work on the units to avoid any personal injury or damage to machinery under observance of the valid standards and guidelines. The installation and operating instructions are to be read carefully before installation and operation.

With these safety notes no claim on completeness is raised!

Safety and Guideline Signs

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

Please Observe!
Guidelines on important points.

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EAS®-NC Type 45 $\begin{matrix}0\\3\end{matrix}$. $\begin{matrix}5\\6\\7\end{matrix}$ $\begin{matrix}1\\2\\3\end{matrix}$ $\begin{matrix}0\\5\end{matrix}$. $\begin{matrix}0\\1\\2\end{matrix}$

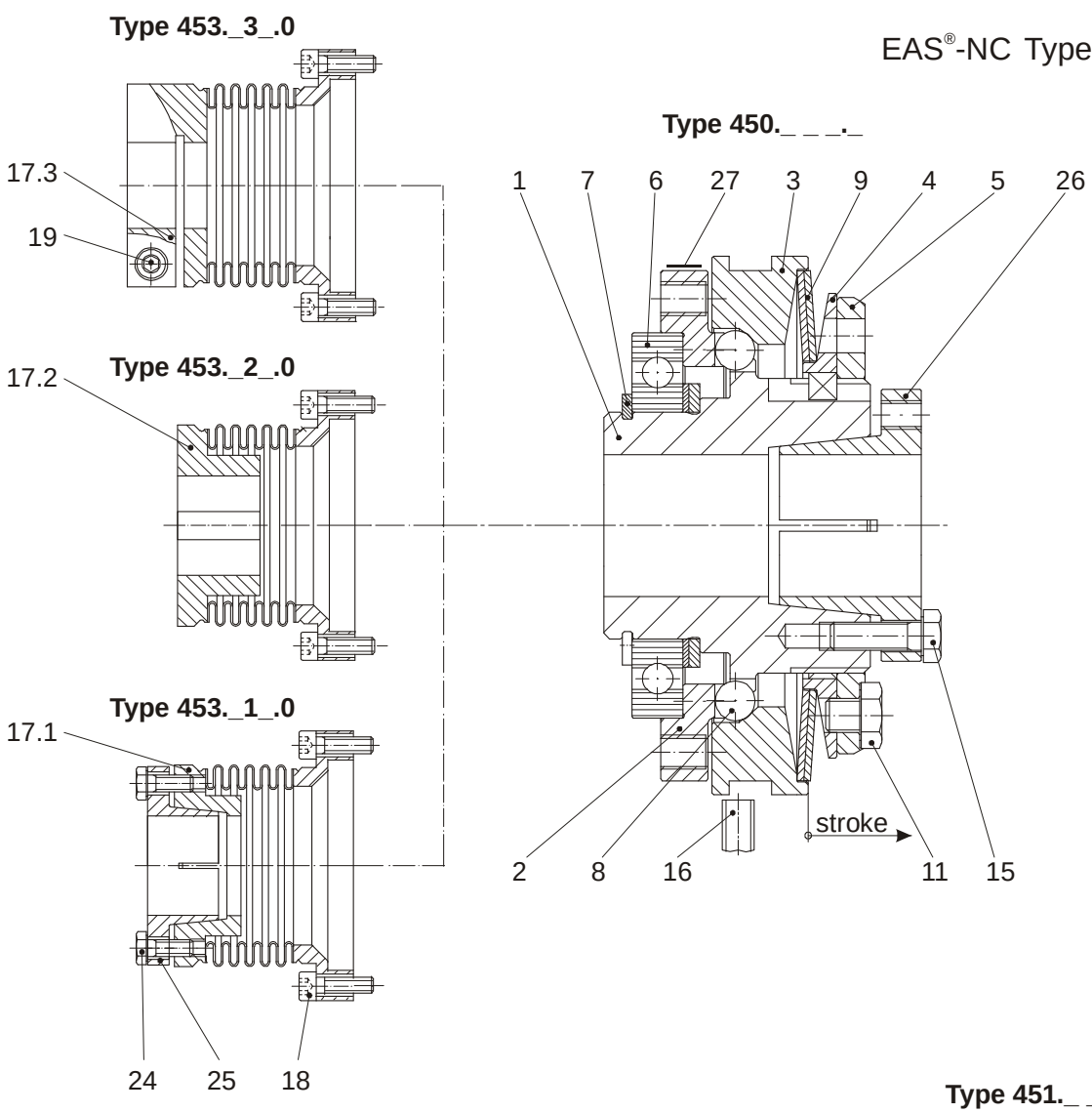

Fig. 1

EAS®-NC Type 451 . $\begin{matrix}5\\6\\7\end{matrix}$ $\begin{matrix}1\\2\end{matrix}$ $\begin{matrix}0\\5\end{matrix}$. $\begin{matrix}0\\1\\5\end{matrix}$

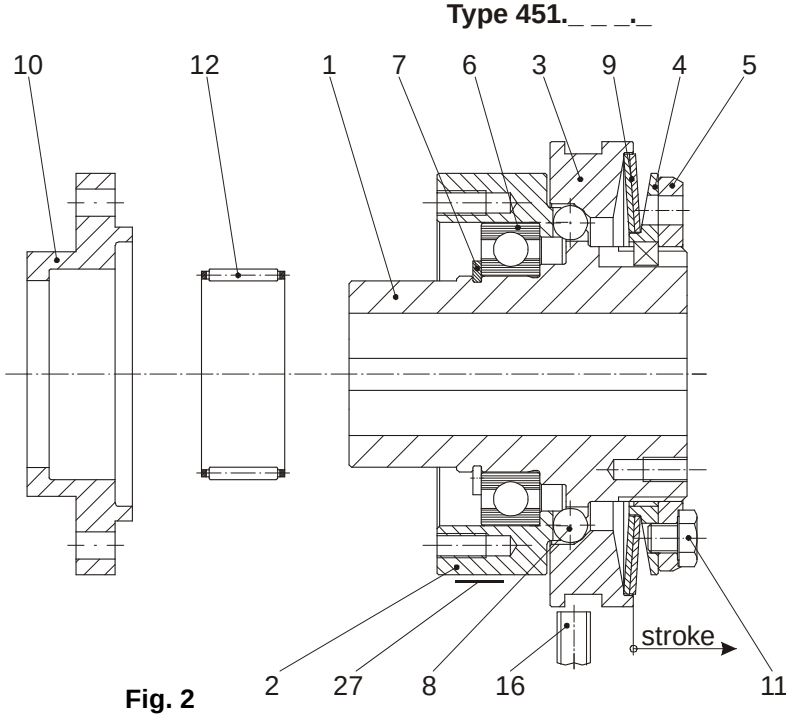

Fig. 2

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Parts List *(only mayr®-original parts are to be used)*

Parts for Type 450._ _ _ . _ and 453._ _ _ .0

1	Hub
2	Pressure flange
3	Thrust washer
4	Locking ring
5	Adjusting nut
6	Deep groove ball bearing
7	Locking ring
8	Steel ball
9	Cup spring
11	Hexagon head cap screw
15	Hexagon head cap screw
16	Limit switch
17.1	Steel bellows with flange and hub for cone bushing
17.2	Steel bellows with flange and hub for keyway
17.3	Steel bellows with flange and clamping hub
18	Cap screw
19	Cap screw
24	Hexagon head cap screw
25	Cone bushing
26	Cone bushing
27	Type tag

Parts for Type 451._ _ _ . _

1	Hub
2	Pressure flange
3	Thrust washer
4	Locking ring
5	Adjusting nut
6	Deep groove ball bearing
7	Locking ring
8	Steel ball
9	Cup spring
10	Flange
11	Hexagon head cap screw
12	Needle bearing
15	Hexagon head cap screw
16	Limit switch
26	Cone bushing
27	Type tag

Please Observe!
The limit switch pos. 16 does not belong to the scope of supply as standard.
Lock the cap screws pos. 18 with Loctite 243.

Design

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

Supply condition

The clutch is completely assembled and adjusted to the torque requested in the order.
The clutch is set to approx. 70 % of the maximum torque, if the customer does not request any other torque adjustment.
Check supply condition!

Function

The clutch has the task to the protect the drive line against high changes in torque, which can occur due to unintended blockages.
During operation the EAS®-NC clutch transmits the set torque backlash-free from the hub (1) via the pressure flange (2) to the output element on the customer side.
If the set limiting torque (overload) is exceeded the clutch disengages, the thrust washer (3) makes an axial stroke movement, a limit switch on the customer side scans this movement and provides a signal to switch off the drive.
The residual torque amounts to approx. 5 – 15 % (with approx. 1500 rpm).
The EAS®-NC clutch is consequently not load-holding. The clutch is automatically ready for operation after removing the overload.

Re-engagement
EAS®-NC ratchetting clutch **Type 45_._ _ 0._** after 15°
EAS®-NC synchronous clutch **Type 45_._ _ 5._** after 360°

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Technical data

Table 1:

Size	Limiting torques for overload M_G Type 45_.5_ _._ [Nm]	Type 45_.6_ _._ [Nm]	Type 45_.7_ _._ [Nm]	Max. speed [rpm]	Stroke of the thrust washer (Figs. 1 and 2; Pos. 3) with overload [mm]	Bore hub (1) from – to Type 45_._1_._ + Type 45_._3_._ [mm]	Type 45_._2_._ [mm]
01	4 – 10	8 – 20	12 – 30	4000	1,2	9 – 16	9 – 20
0	8 – 20	15 – 40	23 – 60	4000	1,5	12 – 20	12 – 20
1	15 – 36	30 – 72	45 – 108	3000	1,8	15 – 25	15 – 25
2	30 – 75	60 – 150	90 – 225	2500	2,0	22 – 35	22 – 35
3	60 – 150	120 – 300	180 – 450	2000	2,2	32 – 45	32 – 45

Table 2: References for torque adjustment (page 8)

Size	Type 45_.5_ _._ Maximum torque M_G [Nm]	Insp. dim. "a" (Fig. 11) with approx. 70 % M_G [mm]	Type 45_.6_ _._ Maximum torque M_G [Nm]	Insp. dim. "a" (Fig. 11) with approx. 70 % M_G [mm]	Type 45_.7_ _._ Maximum torque M_G [Nm]	Insp. dim. "a" (Fig. 11) with approx. 70 % M_G [mm]
01	10	7,5	20	8,3	30	9,1
0	20	7,6	40	8,6	60	9,6
1	36	8,1	72	9,3	108	10,5
2	75	9,5	150	10,9	225	12,3
3	150	9,2	300	11,1	450	13

Table 3:

Size	Thread in the pressure flange (2) with Type 450 with tightening torque	Max. reach of screw in pressure flange (2) with Type 450. [mm]	Thread in the pressure flange (2) with Type 451 with tightening torque	Max. reach of screw in pressure flange (2) with Type 451. [mm]	Screw tightening torques Pos. 15 [Nm]	Pos. 18 [Nm]	Pos. 19 [Nm]	Pos. 24 [Nm]
01	6 x M4 / 2,7 Nm	6	6 x M5 / 5,5 Nm	8	3	2,7	10	3
0	6 x M5 / 5,5 Nm	7	–	–	3	5,5	18	5
1	6 x M6 / 9,5 Nm	7,5	6 x M5 / 5,5 Nm	10	5,5	9,5	18	9,5
2	6 x M6 / 9,5 Nm	8,5	6 x M6 / 9,5 Nm	10	9,5	9,5	43	17
3	6 x M8 / 23 Nm	9,5	6 x M8 / 23 Nm	12	9,5	23	87	17

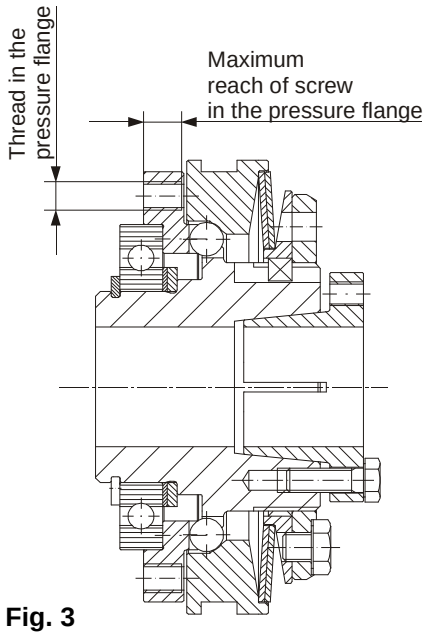

Fig. 3

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Table 4:

Size	Shaft misalignments steel bellows coupling Type 453.-			Nominal torque T_{KN} Steel bellows coupling Type 453.-	Bores steel bellows side		
	Axial ΔK_a [mm]	Radial ΔK_r [mm]	Angular ΔK_w [°]	[Nm]	Type 453._1_.0 [mm]	Type 453._2_.0 [mm]	Type 453._3_.0 [mm]
01	±0,4	0,15	2	50	9 – 20	9 – 20	- - -
0	±0,6	0,15	2	100	12 – 25	12 – 25	15 – 32
1	±0,8	0,20	2	200	15 – 35	15 – 35	25 – 42
2	±1,0	0,25	2	350	22 – 42	22 – 42	30 – 45
3	±1,0	0,30	2	600	32 – 50	32 – 50	35 – 55

Table 5:

Size	Bores of the steel bellows coupling with Type 453._1_.0 and related transmittable torques TR [Nm] of the frictional locking of the cone bushing																								
	Ø 9	**Ø 10**	**Ø 11**	**Ø 12**	**Ø 13**	**Ø 14**	**Ø 15**	**Ø 16**	**Ø 18**	**Ø 19**	**Ø 20**	**Ø 22**	**Ø 24**	**Ø 25**	**Ø 28**	**Ø 30**	**Ø 32**	**Ø 35**	**Ø 38**	**Ø 40**	**Ø 41**	**Ø 42**	**Ø 45**	**Ø 48**	**Ø 50**
01	**34**	**38**	**42**	**46**	**48**	50	50	50	50	50	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0	-	-	-	**55**	**60**	**65**	**70**	**78**	**93**	100	100	100	100	100	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	**85**	**90**	**105**	**110**	**115**	**130**	**140**	**155**	200	200	200	200	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	**180**	**196**	**204**	**229**	**245**	**290**	350	350	350	350	350	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**380**	**420**	**520**	**580**	600	600	600	600	600

Table 6:

Size	Bores of the steel bellows coupling with Type 453._3_.0 and related transmittable torques TR [Nm] of the frictional locking of the clamping hub																							
	Ø 12	**Ø 13**	**Ø 14**	**Ø 15**	**Ø 16**	**Ø 18**	**Ø 19**	**Ø 20**	**Ø 22**	**Ø 24**	**Ø 25**	**Ø 28**	**Ø 30**	**Ø 32**	**Ø 35**	**Ø 37**	**Ø 38**	**Ø 40**	**Ø 42**	**Ø 45**	**Ø 48**	**Ø 50**	**Ø 55**
01	**42**	**46**	50	50	50	50	50	50	50	50	50												
0	-	-	-	**70**	**78**	**93**	100	100	100	100	100	100	100	100	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	**140**	**150**	**160**	**175**	**190**	200	200	200	200	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	**245**	**290**	350	350	350	350	350	350	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**420**	**480**	600	600	600	600	600	600	600

Table 7:

Size	Maximum permissible		
	Axial forces [N]	Radial forces [N]	Shear force torques * [Nm]
01	740	1500	2
0	1100	2200	5
1	1500	2500	10
2	2700	3300	20
3	4500	5000	40

* Torques which strain the deep groove ball bearing due to axial forces affecting the pressure flange.

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Assembly of the output elements (Figs. 1, 2 and 4)

Please Observe!
Observe thread diameter and max. reach of screw in the pressure flange (2) according to Table 3.

In case of the **EAS®-NC Type 450.-** the output element is located on the deep groove ball bearing (6) and screwed with the pressure flange (2).
In case of the **EAS®-NC Type 451.-** the output element is directly screwed with the pressure flange (2).

If the resulting radial force of the output element is nearly in the centre of the ball bearing (6) and below the maximum permissible radial load according to Table 7, an additional bearing of the output element is not required.
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.
Ensure that no significant axial forces (see Table 7) are transmitted from the output element onto the pressure flange (2) of the clutch.
For extremely wide output elements or for elements with a small diameter the EAS®-NC with long projecting hub is recommended (Type 450._ _ _.1).
In the case of a very small diameter the output element is attached to the pressure flange (2) of the clutch via an intermediate adapter flange provided by the customer.
Ball bearings, needle bearings or bearing bushings are suitable as bearing for the output element depending on the mounting situation and installation facility.
Ensure that the bearing of the output element is designed as location bearing (Fig. 4).

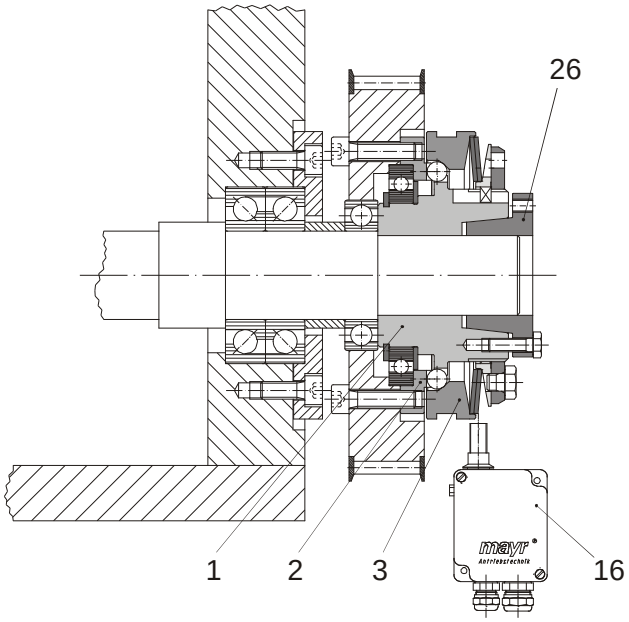

Fig. 4
Type 450.61_.0

Attachment onto the shaft

The EAS®-NC clutches are supplied with cone bushings, clamping hubs or keyways already fitted as standard.
Following points have to be noticed for the assembly of cone bushings or clamping hubs:

- ❒ Shaft fits:
  up to diameter 38 h6 up to k6,
  above diameter 38 h8 up to k6
- ❒ Surface of the shafts:
  fine 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.
- ❒ Shafts and bores must be degreased or the preservation is to be washed off before installation of the clutch or clutch hubs. **Greasy or oily bores or shafts do not transmit the torque T_R indicated in the order.**
- ❒ Push the clutch or clutch hub onto both shaft ends with a suitable device and bring them to the correct position.
- ❒ Uniformly tighten the clamping screws one after another (in 3 to max. 6 tightening circulations) using a torque wrench to the torque indicated in Table 3.

Please Observe!
The clutch or clutch hub executes an axial displacement in direction of the cone bushing when tightening the cone bushing.
In case of the EAS®-NC clutch with steel bellows (Type 453._ _ _.0) it must be observed that at first only one cone bushing is completely tightened (e.g. component 15/26), and then the other (steel bellows) side (component 24/25, Fig. 5) because of the above mentioned effect.
Additionally it must be observed when assembling the Type 453._ _ _.0, that no axial pressure is exerted on the steel bellows (damage).

Disassembly

There are extractor threads beside of clamping screws (15 and 24) in the cone bushings.

1) Release all clamping screws by several threads.
2) Unscrew the clamping screws located beside the extraction threads and screw them into the extraction threads until contact. Afterwards tighten these screws until the clamping connection is released.

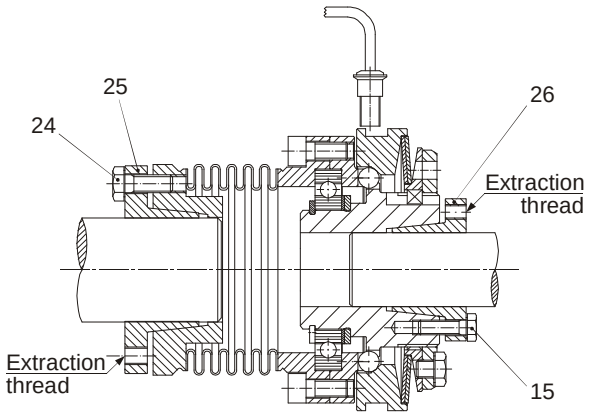

Fig. 5

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Shaft assembly via keyway connection

In case of an EAS®-NC with keyway the clutch must be fixed axially after pushing it onto the shaft, e.g. with a cover and a screw (Fig. 6), screwed into the tapped centre hole of the shaft.

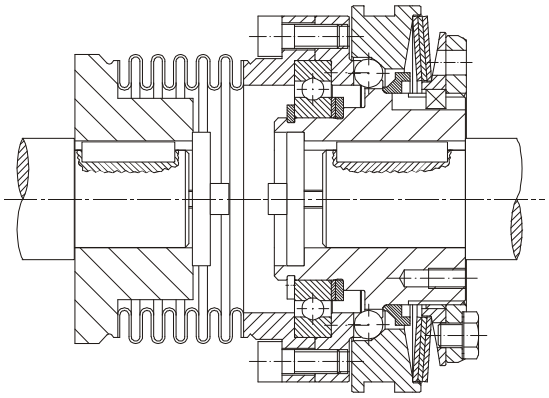


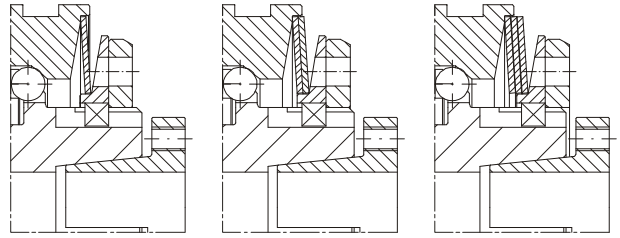
Fig. 6

Cup spring layer (Fig. 7)

A troublefree function of the clutch and a torque adjustment is only possible with the correct cup spring configuration.
For all sizes
one cup spring (Type 45_.5_ _._) is fitted for the low torque range,
for the medium torque range **two** cup springs (Type 45_.6_ _._) and
for the high torque range **three** cup springs
(Type 45_.7_ _._) are fitted.

Check Type indication (Type tag)!

single layer | double layer | triple layer



Type 45_.5_ _._ | Type 45_.6_ _._ | Type 45_.7_ _._

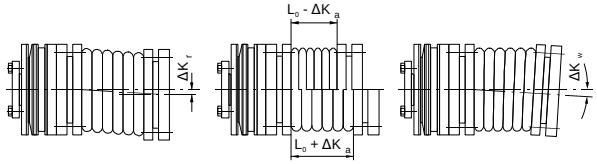
Fig. 7

Jointing (screwing) of both coupling hubs (1/17) EAS®-NC Type 453._ _ _.0 (Fig. 1)

Danger!
When fitting the hubs (1 and 17) the jointing force must not be initiated via the steel bellows.
=> Danger of bellows deformation.

Permissible shaft misalignments

EAS®-NC clutches of the Type 453._ _ _.0 (with steel bellows) compensate radial, axial and angular shaft misalignments (Fig. 8) without loosening its backlash-free design.



Radial misalignment | Axial displacement | Angular misalignment

Fig. 8

However, the permissible shaft misalignments indicated in Table 4 must not achieve simultaneously the maximum value. Should several types of misalignments occur simultaneously, they will influence each other, i.e. the permissible values of the misalignment depend on each other according to Fig. 9.
The amount of the actual misalignment in percentage of the maximum value must not exceed 100 %.

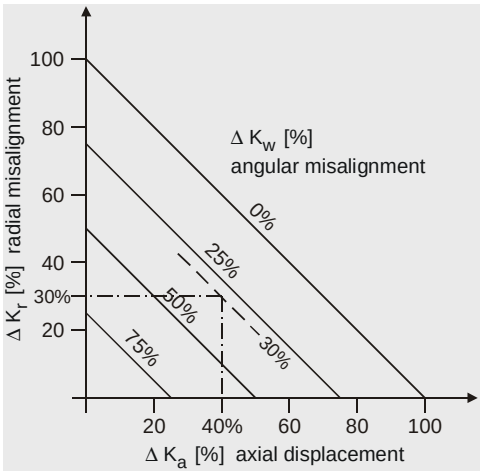


Fig. 9

Example:
EAS®-NC size 3,
Existing axial displacement ΔK_a = 0,4 mm
corresponds to 40 % of the permissible maximum value.
Existing angular misalignment ΔK_w = 0,6°
corresponds to 30 % of the permissible maximum value.
=> permissible radial misalignment ΔK_r = 30 % of the maximum value => ΔK_r = 0,1 mm

The permissible misalignment values indicated in Table 4 refer to a coupling application with a nominal torque, an ambient temperature of +30 °C and a operation speed of 1500 rpm. Please contact the factory in case of different or extreme coupling-application conditions.

Alignment of the coupling

An exact alignment of the coupling increases the service life of the coupling considerably and decreases the load for the shaft misalignments.
For drives with a very high speed the coupling should be aligned by means of a dial gauge or special devices for alignment.
Normally the alignment of the coupling with a straight-edge in two levels being vertically to each other is sufficient.

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Indicated torque adjustment (Fig. 10)

The EAS®-NC offers the comfort of the indicated torque adjustment at the adjusting nut (5).
The possibility for indication offers a substantially simplified torque adjustment and a simple monitoring of the set releasing value with an installed clutch.
The torque can be indicated in % of the maximum indicated torque by the graduation (40 – 100 %) on the adjusting nut (5).

Torque adjustment (Figs. 10, 11, and 12)

The adjustment is made by turning the adjusting nut (5). The fitted cup springs (9) operate in the negative area of their characteristics (see Fig. 12), i.e. a tightening of the adjusting nut (5) effects a decrease of the spring force, or a release of the adjusting nut (5) an increase of the spring force.
The clutch is **adjusted generally** at approx. 70 % of the corresponding maximum torque and **marked** (calibrated) at the factory, if the customer does not require a different torque adjustment.
An inspection **„spring application in the setting range"** (Fig. 12) can be made via the dimension "a" (distance from adjusting nut-front face (4) until thrust washer-front face (3) (Fig. 11). Please take the data from Table 2.

Please Observe!
Turning the adjusting nut (5) within the setting range in a clockwise direction reduces the torque, and in anti-clockwise direction increases the torque.
Viewed in the direction of the adjusting nut (5) as indicated on Figs. 10 and 11.

Please Observe!
If the torque of the preset clutch should not be changed any more by the customer, the retaining screw (11) must be secured with Loctite 243 by the customer nevertheless.

Adjusting the torque

a) Convert the required torque by the aid of the formula mentioned below in percentage of the max. adjusting value (see Table 2).

$$\frac{\text{Required torque adjustment}}{\text{Max. torque adjustment (Table 2)}} \times 100 = \text{adjustment in \%}$$

b) Remove the retaining screw (11) from the adjusting nut (5).

c) Turn the adjusting nut (5) clockwise or anti-clockwise with the use of a face wrench according to the engraved graduation (Fig. 10) until the required torque is set.

d) The required torque is achieved when the graduation (D) in the retaining ring (4) and the indication on the percentage (C) in the adjusting nut (5) (Figs. 10 and 11) is overlapped.

e) Put Loctite 243 onto the retaining screw (11) and screw it into the adjusting nut (5); the 4 graduations (A) in the adjusting nut (5) and the graduations (B) in the retaining ring (4) must remain in the same position (10). If necessary, a slight correction must be made.

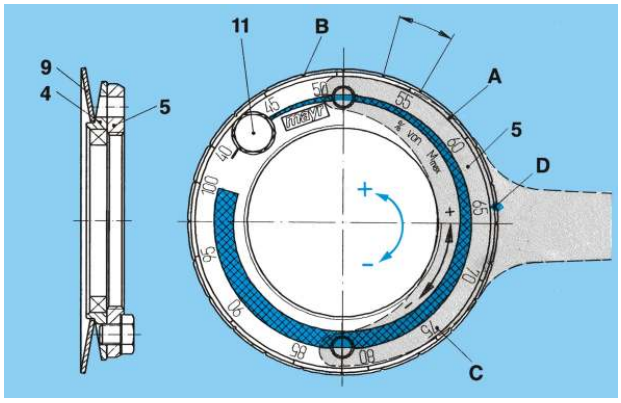

Fig. 10

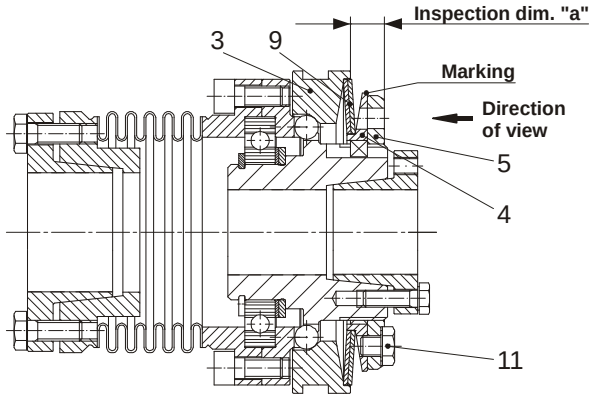

Fig. 11

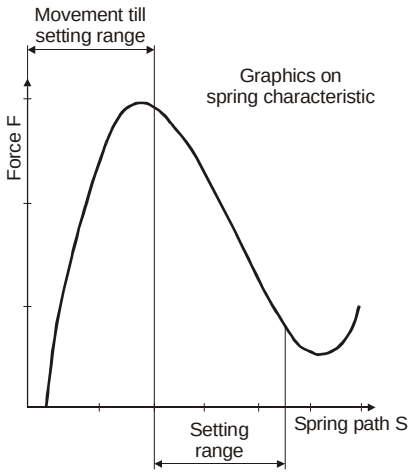

Fig. 12

Please Observe!
The clutch does not function any more if the adjusting nut (5) is adjusted or the cup springs (9) are distorted outside the setting range of the cup spring characteristic (see Fig. 12).
After dismantling the clutch (e.g. by changing the cup springs or cup spring layers) the clutch must be re-adjusted via the dimension "a" (see Table 2 and Fig. 11) and calibrated.

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Fitting the limit switch

The switch direction of the mechanical limit switch points in the direction of the adjusting nut (5), or in stroke direction of the thrust washer (3) Fig. 14.
Adjust the switch distances for the mechanical and contactless limit switch according to Figs. 13 or 14 respectively.
The distance of the thrust washer (3) from the switching point can sensitively be adjusted with a hexagon head cap screw SW7, Fig. 13 and 14.
The EAS®-NC size 01 has no groove in the thrust washer (3).
The limit switch is located at the edge of the thrust washer (3) (switching edge see details “X” in Figs. 13 and 14).
For the sizes 0 – 3 the edge of the thrust washer (3) can also be used as switching edge.

Contactless limit switch

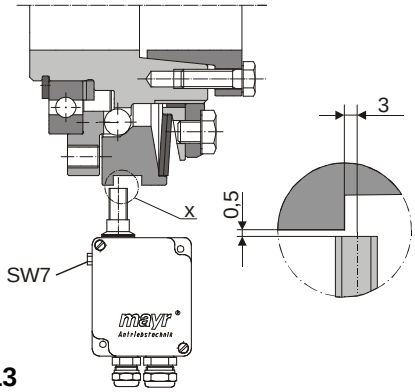

Fig. 13

Mechanical limit switch *

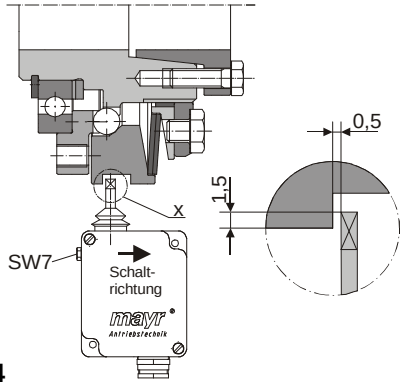

Fig. 14

***** For the clutch size 01 only the contactless limit switch should be used.

Maintenance

The EAS®-NC clutch is nearly maintenance-free.
Special maintenance work may become necessary only where there is considerable amount of dust and dirt or under extreme ambient conditions.
See maintenance and inspection intervals for clutches in hazardous areas.

Disposal

Electronic Components (Limit switch):
Products which have not been dismantled can be disposed of under Key No. 160214 (mixed materials) or components under Key No. 160216; or the objects can be disposed of by a certified waste disposal firm.

All steel components:
scrap (Code No. 160117)

All aluminium components:
Non-ferous metal (Code No. 160118)

Seals, O-rings, V-Seal, Elastomers:
plastic (Code No. 160119)

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mayr® Antriebstechnik

Breakdowns

Failures	Possible reasons	Solution
Premature activation of the clutch	False torque adjustment	1) Set the equipment out of operation 2) Check torque adjustment 3) Lock the adjusting nut 4) If the cause of defect cannot be determined, the clutch must be checked in the factory
	Adjustment of the adjusting nut has changed (position)	
	Clutch worn	
Clutch does not act in the case of an overload	False torque adjustment	1) Set the equipment out of operation 2) Check torque adjustment 3) Lock the adjusting nut 4) If the cause of defect cannot be determined, the clutch must be checked in the factory
	Adjustment of the adjusting nut has changed (position)	
Running noises in a standard operation	Fixing of the clutch insufficient	1) Set the equipment out of operation 2) Check clutch attachment 3) Check tightening torques of the screws 4) Check torque adjustment and safe location of the adjusting nut
	Screws loosened	
	Adjusting nut released	
Breakage of the bellows Type 453.-	Alignment error	1) Set the equipment out of operation 2) Completely exchange the clutch 3) Check alignment
	Pre-damage of the bellows by transport or assembly	1) Set the equipment out of operation 2) Completely exchange the clutch 3) Check alignment
	Operating parameter does not correspond to the clutch capacity	1) Set the equipment out of operation 2) Check the operating parameter and select the correct clutch (observe installation space) 3) Install new clutch 4) Check alignment
	Bellows are excited in natural frequency, resonance	1) Set the equipment out of operation 2) The drive train characteristics must be designed newly 3) Completely exchange the clutch 4) Check alignment
Change of the running noises and arising vibrations Type 453.-	Loosening of screws, resonances, fixing of the clutch insufficient	1) Set the equipment out of operation 2) Check tightening torques of the screws 3) The drive train characteristics must be checked 4) Check the clutch components and exchange damaged components

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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