Installation and Operational Instructions for EAS®-HSE element clutch Type 4136._04_ _ Sizes 2 to 9

(B.413.2.EN)

Translation of the Original Operational Instructions

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

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

Safety and Guideline Signs

CAUTION

Danger of injury to personnel and damage to machines.

Please Observe!
Guidelines on important points.

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 initial operation of the product until you have ensured that all applicable EU directives and 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 impacts or foreign body impact.
- ❒ Replace self-locking hexagon nuts when they become ineffective after frequent loosening and tightening (for ROBA®-DS connection).
- ❒ The clutches may not be put into operation without an overload detection provided by the customer unless *mayr®* has been contacted and has agreed otherwise.

To prevent injury or damage, only specialist personnel are allowed to work on the components. They must be familiar with the dimensioning, transport, installation, initial operation, maintenance and disposal according to the relevant standards and regulations.
Please read the Installation and Operational Instructions carefully prior to installation and initial operation of the device.

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

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
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Clutch Illustrations

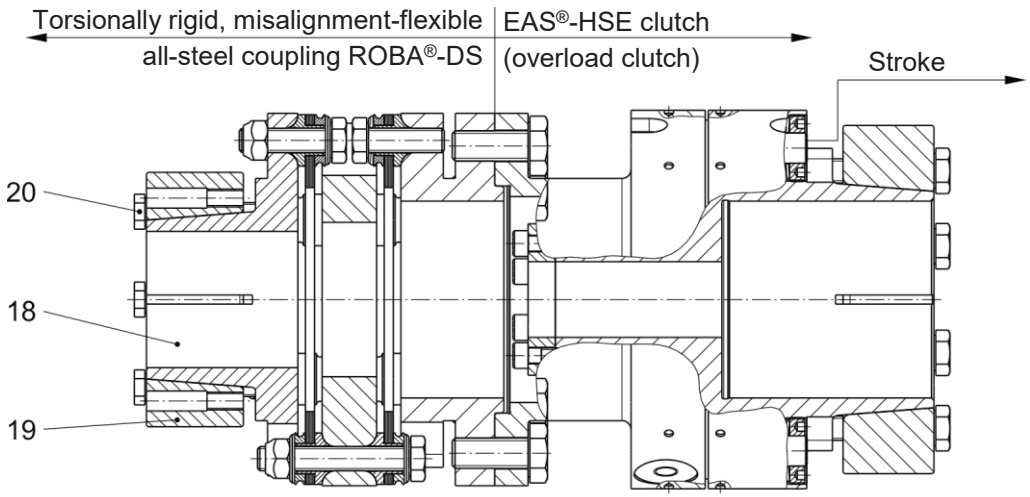

Fig. 1: Type 4136._0412

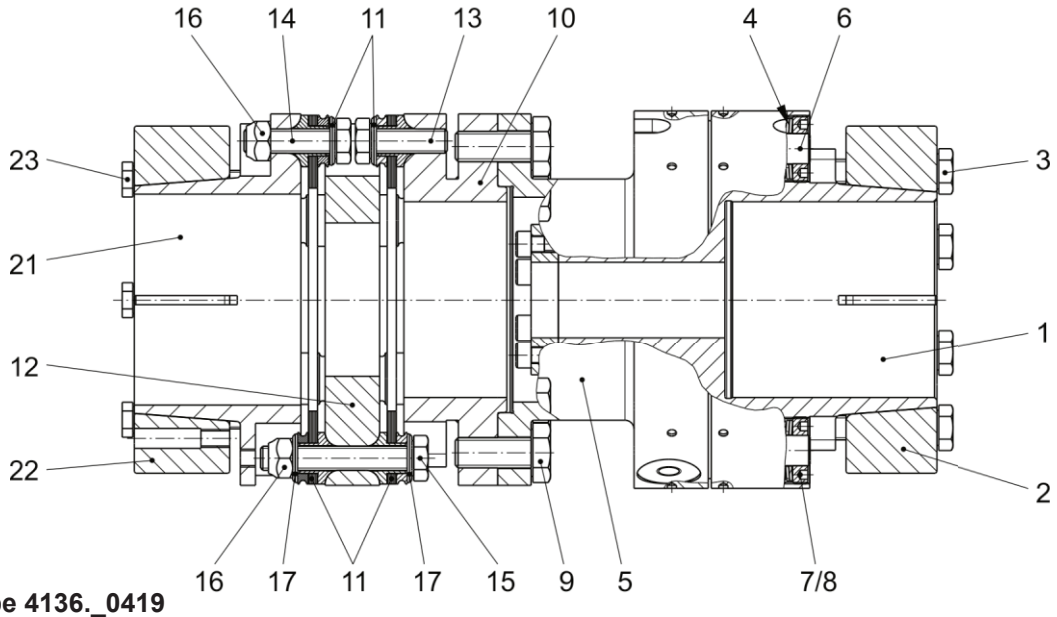

Fig. 2: Type 4136._0419

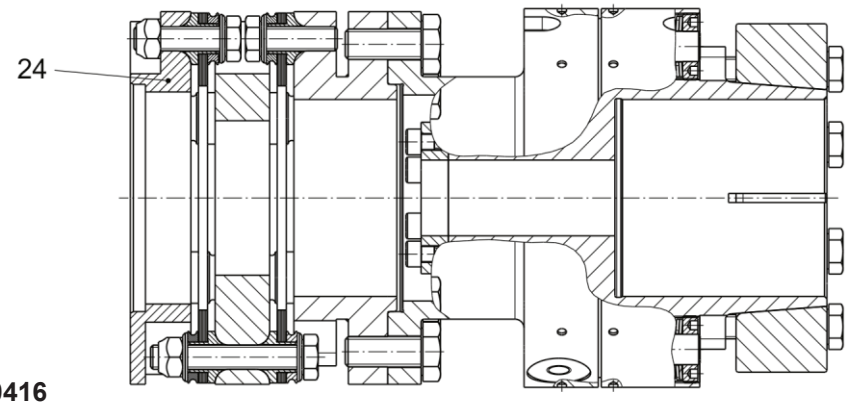

Fig 3: Type 4136._0416

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Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

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

Item	Name
1	Hub
2	Shrink disk
3	Hexagon head screw
4	Overload element
5	Pressure flange
6	Bolt
7	Adjusting nut
8	Set screw (only for Sizes 5 to 9)
9	Hexagon head screw
10	Flange
11	Disk pack
12	Connection plate
13	Hexagon head screw
14	Hexagon head screw
15	Hexagon head screw
16	Hexagon nut
17	Washer
18	Shrink disk hub
19	Shrink disk
20	Hexagon head screw
21	Shrink disk hub, large
22	Shrink disk
23	Hexagon head screw
24	Flange
25	Eyebolt (installation aid / only Sizes 4 to 9)

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

Table 1: Technical Data

Size	Limit torques for overload M_G [Nm] (number of overload elements per clutch)				Max. speed [rpm]	Bolt (6) stroke [mm]	Permitted ambient temperature
	Type 4136.404_ _	Type 4136.504_ _	Type 4136.604_ _	Type 4136.704_ _			
2	45 – 90 (2)	68 – 136 (3)	90 – 180 (4)	135 – 270 (6)	13600	2.5	-20 °C to +80 °C
3	93 – 186 (2)	140 – 280 (3)	185 – 370 (4)	280 – 560 (6)	10100	2.5	
4	125 – 250 (2)	250 – 500 (4)	375 – 750 (6)	500 – 1000 (8)	8500	2.5	
5	250 – 500 (2)	375 – 750 (3)	500 – 1000 (4)	750 – 1500 (6)	8500	4	
6	325 – 650 (2)	650 – 1300 (4)	1000 – 2000 (6)	1300 – 2600 (8)	6200	4	
7	500 – 1000 (2)	1000 – 2000 (2)	1500 – 3000 (3)	2000 – 4000 (4)	6200	6	
8	1150 – 2300 (2)	1750 – 3500 (3)	2300 – 4600 (4)	3500 – 7000 (6)	5200	6	
9	1400 – 2800 (2)	2800 – 5600 (4)	4200 – 8400 (6)	5600 – 11200 (8)	4400	6	

Table 2: Technical Data

Size	Corresponding ROBA®-DS Size	Nominal torque ROBA®-DS [Nm]	Permitted misalignments		
			axial ΔKa [mm]	radial ΔKr [mm]	angular [2] ΔKw [°]
2	16	300	0.8	0.2	0.7
3	40	650	1.1	0.25	0.7
4	64	1100	1.3	0.3	0.7
5	64	1100	1.3	0.3	0.7
6	300	3500	1.2	0.25	0.5
7	300	3500	1.2	0.25	0.5
8	500	5800	1.4	0.35	0.5
9	850	9500	1.6	0.4	0.5

[2] Angular misalignment per disk pack

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
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Table 3: Technical Data

Size	Hub bore (1) from – to [mm]	Hub (18) bore from – to [mm]	Hub (21) bore from – to [mm]	Weight [1] Type 4136.50412 [kg]	Weight [1] Type 4136.50416 [kg]	Weight [1] Type 4136.50419 [kg]
2	20 – 36	14 – 26	25 – 45	4.92	4.69	5.22
3	25 – 45	25 – 45	40 – 60	6.97	6.46	7.65
4	35 – 65	30 – 45	45 – 70	12.76	11.87	13.58
5	35 – 60	30 – 45	45 – 70	15.86	14.97	16.68
6	42 – 80	50 – 85	-	32.83	27.95	-
7	42 – 80	50 – 85	-	39.21	34.33	-
8	70 – 95	60 – 100	-	64.90	55.54	-
9	70 – 120	70 – 120	-	105.78	90.69	-

[1] Weights are valid for maximum bore.

Table 4: Mass Moments of Inertia

Size	Mass moments of inertia [10^{-3} kgm^2] [2]				
	EAS®-side Hub-side	EAS®-side Pressure flange-side	ROBA®-DS-side Type 4136.50412	ROBA®-DS-side Type 4136.50416	ROBA®-DS-side Type 4136.50419
2	2.05	1.65	1.13	1.09	1.62
3	3.34	2.02	3.11	3.16	4.92
4	10.44	4.99	9.95	9.45	13.27
5	14.93	6.41	9.95	9.45	13.27
6	44.45	20.91	57.69	39.73	-
7	66.76	38.67	57.69	39.73	-
8	144.52	65.10	150.12	98.83	-
9	335.58	140.52	348.98	236.33	-

[2] Mass moments of inertia are valid for maximum bore.

Table 5: Screw Tightening Torques

Size	Screw tightening torques [Nm]				
	Item 3	Item 9	Items 13 / 14 / 15 / 16	Item 20	Item 23
2	6	37	8.5	6	6
3	6	37	14	8.5	8.5
4	24	74	35	10	14
5	32	74	35	10	14
6	32	127	120	35	-
7	63	127	120	35	-
8	127	220	240	56	-
9	93	340	450	93	-

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

Table 6

Size	Transmittable torques T_R [Nm] of the shrink disk hubs frictional locking (Item 1) - dependent on bore - valid for tolerance constellation H6/g6												
	Ø 20	Ø 22	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 45	Ø 48	Ø 50
2	283	320	375	428	468	509	568	-	-	-	-	-	-
3	-	-	339	404	448	492	558	620	659	694	738	-	-
4	-	-	-	-	-	-	865	1024	1138	1258	1451	1660	1807
5	-	-	-	-	-	-	1291	1432	1533	1642	1817	2010	2148
6	-	-	-	-	-	-	-	-	-	2234	2453	2650	2794
7	-	-	-	-	-	-	-	-	-	2938	3179	3437	3621
8	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-	-

Size	Ø 52	Ø 55	Ø 60	Ø 65	Ø 70	Ø 75	Ø 80	Ø 85	Ø 90	Ø 95	Ø 100	Ø 110	Ø 120
2	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1962	2207	2653	3148	-	-	-	-	-	-	-	-	-
5	2295	2530	2967	-	-	-	-	-	-	-	-	-	-
6	2930	3150	3488	3835	4255	4627	5214	-	-	-	-	-	-
7	3834	4119	4680	5309	6011	6790	7650	-	-	-	-	-	-
8	-	-	-	-	7501	8329	9238	10231	11314	12490	-	-	-
9	-	-	-	-	10723	11719	12750	13750	14777	15720	16665	18607	20603

Table 7

Size	Transmittable torques T_R [Nm] of the shrink disk hubs frictional locking (Item 18) - dependent on bore - suitable for tolerance constellation H7/g6												
	Ø 14	Ø 16	Ø 20	Ø 22	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 45
2	158	186	240	269	312	-	-	-	-	-	-	-	-
3	-	-	-	-	429	495	546	600	669	741	796	852	932
4	-	-	-	-	-	-	704	769	863	960	1031	1104	1206
5	-	-	-	-	-	-	704	769	863	960	1031	1104	1206

Size	Ø 50	Ø 55	Ø 60	Ø 65	Ø 68	Ø 70	Ø 75	Ø 80	Ø 85	Ø 90	Ø 95	Ø 100	Ø 110	Ø 120
6	3569	4024	4500	5177	5658	6334	7348	8453	9652	-	-	-	-	-
7	3569	4024	4500	5177	5658	6334	7348	8453	9652	-	-	-	-	-
8	-	-	5970	6629	7108	7500	8156	8830	9523	10234	10888	11542	-	-
9	-	-	-	-	-	10723	11719	12750	13750	14777	15721	16665	18607	20603

Table 8

Size	Transmittable torques T_R [Nm] of the large shrink disk hubs frictional locking (Item 21) - dependent on bore - suitable for tolerance constellation H7/g6															
	Ø 25	Ø 28	Ø 30	Ø 32	Ø 35	Ø 38	Ø 40	Ø 42	Ø 45	Ø 48	Ø 50	Ø 52	Ø 55	Ø 60	Ø 65	Ø 70
2	339	404	448	492	558	620	659	694	738	-	-	-	-	-	-	-
3	-	-	-	-	-	-	873	937	1036	1132	1195	1255	1338	1454	-	-
4	-	-	-	-	-	-	-	-	1268	1394	1480	1565	1691	1890	2065	2204
5	-	-	-	-	-	-	-	-	1268	1394	1480	1565	1691	1890	2065	2204

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
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Installation and Operational Instructions for EAS®-HSE element clutch Type 4136._04_ _ Sizes 2 to 9

(B.413.2.EN)

Design

The EAS®-HSE element clutch **Type 4136._04_ _** is designed as a mechanically disengaging overload clutch according to the ball detent principle. Here, an EAS®-HSE module is combined with a torsionally rigid, misalignment-flexible all-steel coupling part (ROBA®-DS coupling).
The misalignment-flexible coupling part compensates for axial, radial and angular shaft misalignments, whereby the total sum of misalignments must not exceed 100%.

In the case of clutches with deviating ROBA®-DS combinations (see ROBA®-DS catalogue) or special application data (technical data) released by the manufacturer, these are defined with any associated restrictions in the corresponding configurator drawings or release drawings.

Scope of Delivery / State of Delivery

- ❑ The clutches **Types 4136._04_ _** are delivered completely manufacturer-assembled in the standard version.
- ❑ The torque is set manufacturer-side according to the customer's request (please compare the torque stipulated in the order with the torque imprinted/engraved in the identification).
  Otherwise, the clutch must be adjusted to the required torque by using the Adjustment Diagram (attachment) (see section Torque Adjustment).
- ❑ All screw connections are tightened to tightening torque.

Please check the scope of delivery according to the Parts List as well as the state of delivery immediately after receiving the goods. *mayr*® will take no responsibility for belated complaints.
Please report transport damage immediately to the deliverer.
Please report incomplete delivery and obvious defects immediately to the manufacturer.

Function

The clutch protects the drive line from excessively high, unpermitted torque impacts which can occur due to unintentional blockages.
After overload has taken place, the transmitting mechanism is completely disconnected. Only the bearing friction continues to have an effect.
This means that no re-engagement impacts or metallic sliding movements occur on the clutch torque transmission geometries.
In order to make the clutch ready for operation again after an overload occurrence, the clutch must be re-engaged.
When in operation, the set torque is transmitted backlash-free from the drive via the EAS®-clutch with the misalignment-flexible coupling (ROBA®-DS) onto the output. If the set limit torque is exceeded (overload), the clutch disengages. On disengagement, the bolts (6) in the overload elements (4) perform an axial movement (stroke).
The bolts (6) remain disengaged.
The input and output are separated residual torque-free.
After-acting masses can slow down freely.

The overload - i.e. the relative movement between the hub (1) and the pressure flange (5) - can be detected using the keyways of the two components (each 2 x 180° on the circumference, see Fig. 4 on page 9) which are aligned in operating condition, e. g. by means of speed monitors or optoelectronic sensors.

CAUTION

After overload occurrence, the clutch has no load-holding function.

The run-out time after disengagement must be max. 2 minutes.

In order to prepare the clutch for renewed operation, the bolts (6) must be re-engaged manually (see section Re-engagement).

Chr. Mayr GmbH + Co. KG
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Re-engagement (Figs. 4 and 5)

In order to make the clutch ready for operation again after overload occurrence, the bolts (6) in the overload elements (4) must be re-engaged.
The marking bores on the outer diameters of the hub (1) and the pressure flange (5) must align with each other (Fig. 4).
Re-engagement takes place by placing axial pressure onto the bolt end of each overload element (4).
Depending on the equipment available, the accessibility of the installation point etc., re-engagement can be carried out in the following ways:

- ❒ Manually, using a suitable tool.
- ❒ By using an engagement mechanism. The engagement procedure can also be automated using pneumatic or hydraulic cylinders.

The level of engagement force is dependent on the set limit torque for overload and can be roughly calculated using the formula below.

F_E = 1.5 x M_G [kN]

F_E = Total engagement force of all clutch overload elements [kN].

M_G = Set limit torque for overload [kNm].

$F_Ü$ = Engagement force per overload element [kN].

$F_Ü = \frac{F_E}{n}$

n = Number of overload elements

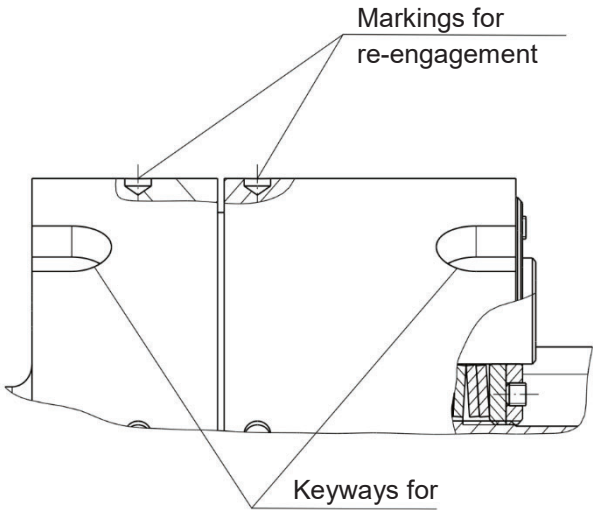

Fig. 4

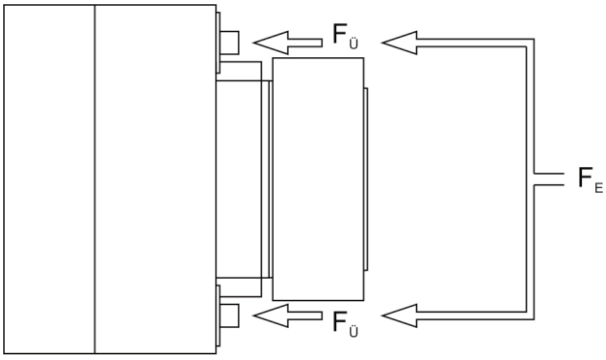

Fig. 5

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Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

General Installation Guidelines

❑ Recommended fit tolerances for the shafts:

Hub	Standard hub tolerances	Recommended shaft tolerances
Item 1	H6	g6
		h6
	F6	k6
		m6
Items 18 + 21	H7	g6
		h6
	F7	k6
		m6

❑ Shaft surface:
finely turned or ground Ra = 0.8 µm

❑ Shaft material: Yield point min. 350 N/mm^2.

❑ The shafts must be solid shafts without a keyway.

❑ The shafts and the hub bores must not be oiled or greased.

❑ Any conserving layers in the clutch bores must be removed.

Clutch Installation (Figs. 1, 2, 3 and 6)

1. Mount the hub (1) onto the shaft using a suitable device and bring them into the position.
   Please see the note in Fig. 6 regarding the clutch alignment.
2. Tighten the tensioning screws (3) of the shrink disk (2) using a torque wrench evenly and one after the other in max. 6 sequences to the torque stated in Table 5.
3. **for Types 4136._04_6 (Fig. 3)**
   Produce a screw connection with the flange (24).
   The customer is responsible for defining the screw tightening torques and for providing the screws.

   for Types 4136._04_2 and 4136._04_9 (Figs. 1 and 2)
   Mount the shrink disk hub (18 or 21) onto the shaft and bring it into position. Tighten the tensioning screws (20 or 23) in the shrink disk (19 or 22) using a torque wrench evenly and one after the other in max. 6 sequences to the torque stated in Table 5.

Please observe the permitted misalignment values (acc. Table 2).

Before initial operation of the clutch, please remove the eyebolt (25) (installation aid).

Reference diameter for clutch alignment during installation

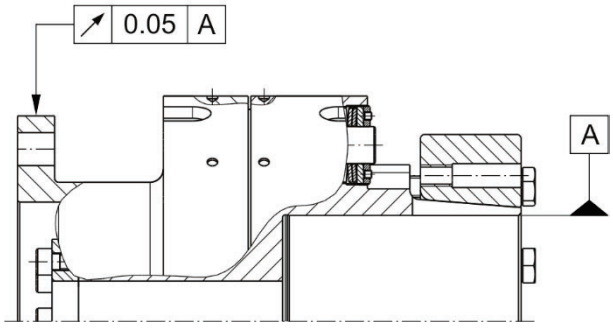

Fig. 6

De-Installation of the Shrink Disks (Items 2/19/22):

1. Unscrew all hexagon head screws (Items 3/20/23) completely and screw them into the tapped extracting holes next to them up to their limits.
2. Tighten the hexagon head screws (Items 3/20/23) evenly and step-wise so that the shrink disk (Items 2/19/22) is loosened from the hub (1/18/21).

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

Permitted Shaft Misalignments

The EAS®-HSE element clutches Types 4136._04_ _ compensate for radial, axial and angular shaft misalignments (Fig. 7) without losing their backlash-free function.
However, the permitted shaft misalignments indicated in Table 2 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. 8.
The sum total of the actual misalignments in percent of the maximum value must not exceed 100 %.
The permitted misalignment values given in Table 2 refer to clutch operation at nominal torque and an ambient temperature of +30 °C.
If the clutch is operated in other or more extreme operating conditions, please contact the manufacturers.

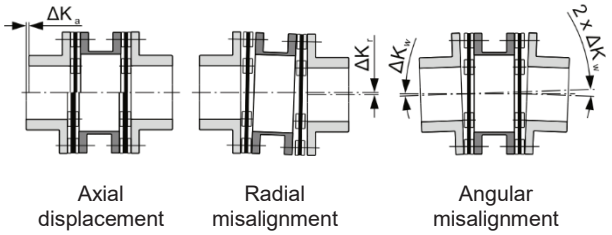

Fig. 7

Example (Size 5 / Type 4136.50412):
Axial displacement occurrence ΔK_a = 0.16 mm equals 40 % of the permitted maximum value ΔK_a = 0.4 mm.
Angular misalignment occurrence ΔK_w = 0.06 ° equals 30 % of the permitted maximum value ΔK_w = 0.2°.
=> permitted radial misalignment K_r = 30 % of the maximum value ΔK_r = 0.1 mm => ΔK_r = 0.03 mm

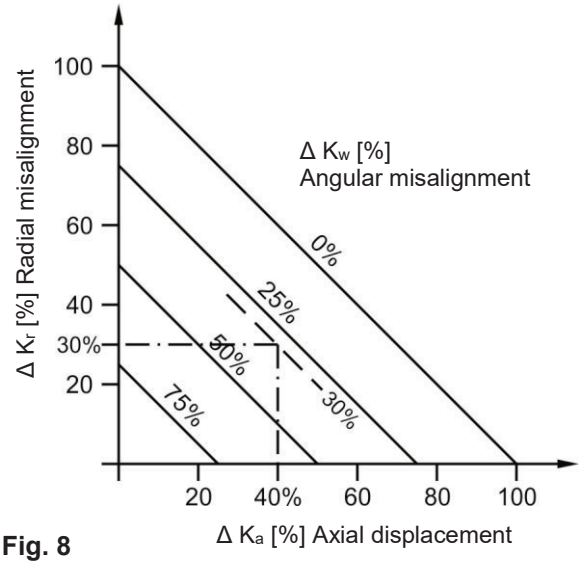

Fig. 8

Clutch Alignment

Exact alignment of the clutch increases the clutch service lifetime and reduces the load on the shaft bearings.
However, we recommend alignment of the clutch (of the shaft ends) using a dial gauge or laser measurement devices on drives operating at very high speeds.

Torque Adjustment (Figs. 1, 2, 3 and 9)

Set the limit torque M_G for overload on the clutch by changing the cup spring pre-tension on each overload element (4) according to the Adjustment Diagram.
On the clutch the adjusting nuts (7) are adjusted by turning them in the overload elements (4) using a face wrench.

During torque adjustment, please ensure that all overload elements (4) on the clutch are evenly adjusted!

Torque Adjustment:

1. Determine the limit torque M_G for overload.
2. Please determine dimension “a” using the Adjustment Diagram included in the clutch delivery.
   This dimension is equal to the required limit torque M_G.
3. **Only for Sizes 5 to 9:**
   Loosen the locking set screws (8) on the adjusting nuts (7).
4. Set all overload elements (4) by turning the adjusting nut (7) to the dimension “a” found in the Adjustment Diagram.
   For Sizes 2 to 4:
   Secure the adjusting nuts (7) with Loctite 243.
5. **For Sizes 5 to 9:**
   Tighten the locking set screws (8) again in the adjusting nuts (7).

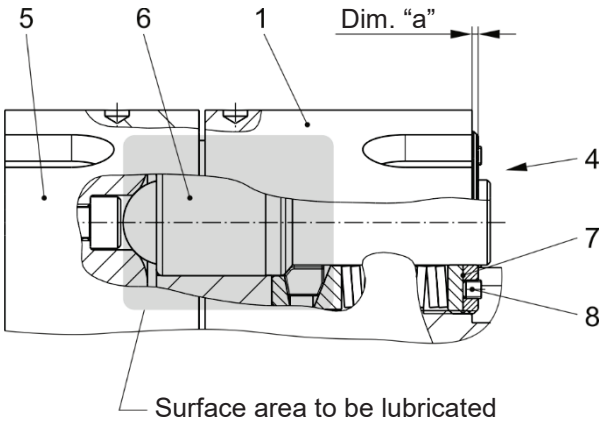

Fig. 9

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). Our experience has shown that an adjustment factor of 1.5 to 4 gives good results. On very high load alternations, high accelerations and irregular operation, please set the adjustment factor higher.

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com

Maintenance and Maintenance Intervals

Maintenance work, which should be carried out after 2000 operating hours, after 1000 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 (see table 5 on page 6) must be maintained.
- ➔ Clutch release inspection
- ➔ Inspection of the set torque
- ➔ Inspection of the bearing or bearing pre-tension
- ➔ Re-greasing of the contact components of the overload elements (4).
  Depending on the load type and intensity, re-lubrication work on the clutch is required. For this purpose, the overload elements (4) must be opened and the individual components must be removed, cleaned, greased and reassembled.
  Specialist knowledge is required for lubricating the contact components of the overload elements (4). Lubrication may therefore only be carried out by specially trained personnel or at the manufacturer's plant.
  See Fig. 9 for the surface area to be lubricated.
  Please use NLGI Class 1.5 grease with a basic oil viscosity of 460 mm^2/s at 40 °C, e.g. Mobilith SHC460.
  Re-lubrication of the clutch bearing is not required.

When re-installing the clutch, please secure all screws with Loctite 243 (medium hard).

Once installation has been completed, the torque must be re-adjusted and re-checked.

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 maintenance intervals.

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)

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

Chr. Mayr GmbH + Co. KG
Eichenstraße 1, D-87665 Mauerstetten, Germany
Phone: +49 8341 804-0, Fax: +49 8341 804-421
www.mayr.com, E-Mail: public.mayr@mayr.com