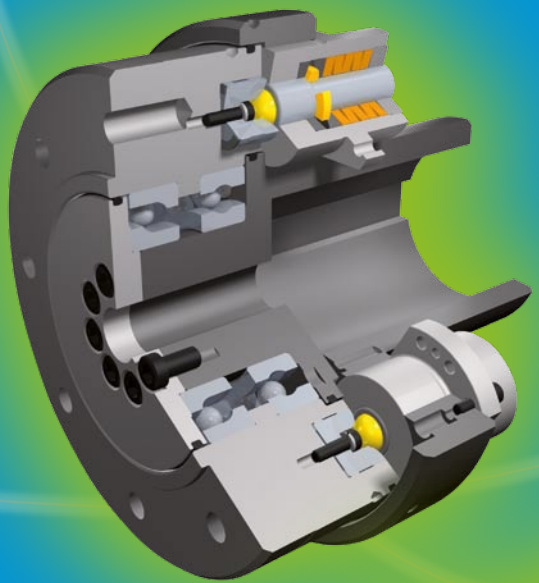
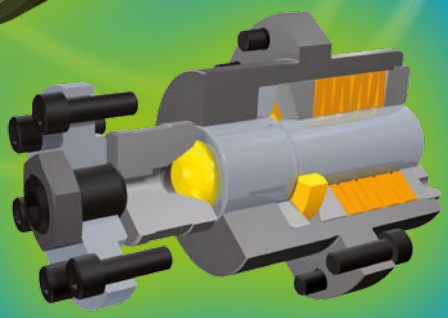
mayr®

your reliable partner

EAS®-element clutch
EAS®-elements

Perfect overload protection for high torques





K.440.V10.EN

www.mayr.com

EAS®-element clutch/EAS®-element

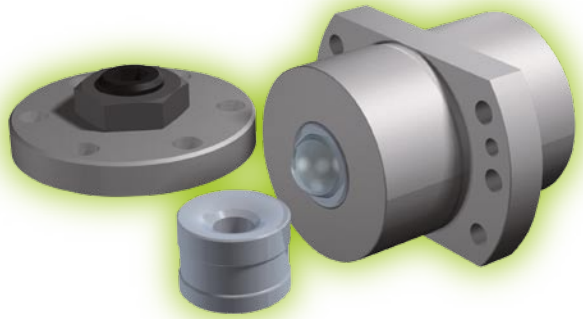
Non-destructive Overload Protection

In heavy-duty machine building and on drives with high torques, high speeds and high mass moments of inertia, disengaging element clutches guarantee that the input and the output are separated completely in the event of a collision or a malfunction, and that the stored rotational energy can slow down freely. In contrast to shear pins and hydraulic clamping sets, these clutches work in a non-destructive way and are therefore an interesting and economical alternative.

EAS®-elements

If the set circumferential force is exceeded in case of overload, the EAS®-elements disengage; the positive-locking connection is interrupted.

- Torque and force-limiting elements
- Residual torque-free separation of input and output in case of overload
- Mechanical re-engagement or re-engagement via pneumatic or hydraulic devices
- Fast and easy repeat operation start-up without using replacement parts
- Exact torque adjustment



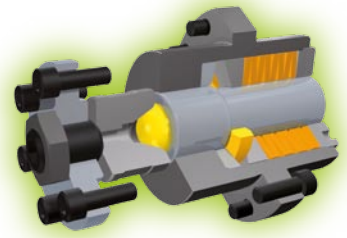
EAS®-element clutch

The EAS®-element clutch is based on individual overload elements (EAS®-elements), which are integrated into hubs and flanges. Due to the modular structure, integration into existing constructions provided by the customer and ensuring of very high torques are possible.

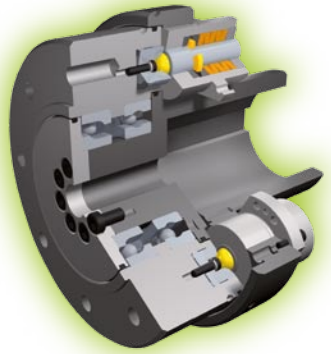
- Torque limitation for heavy and high-speed drives in connection with large rotating masses, which have to slow down freely in case of overload
- Designs for direct attachment of drive elements
- Combinations with torsionally flexible couplings to connect two shafts and to compensate for shaft misalignments
- Extremely compact design as the perfect alternative to hydraulic clamping sets and shear pins

EAS®-element clutch/ EAS®-element

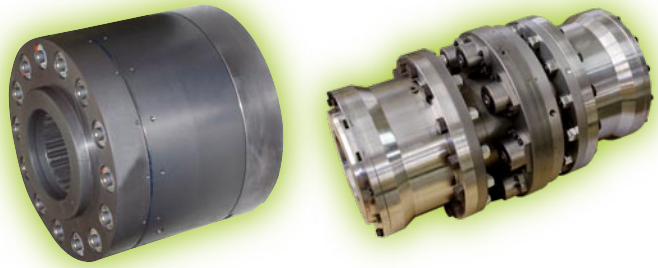
EAS®-elements



EAS®-element clutch (Standard)



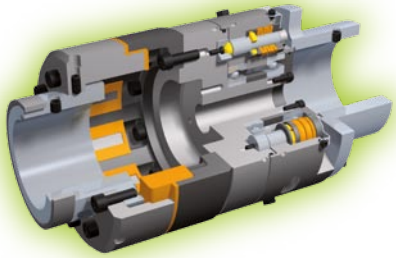
EAS®-special designs



Please Observe

EAS®-dutytorque

Perfect protection for extruders



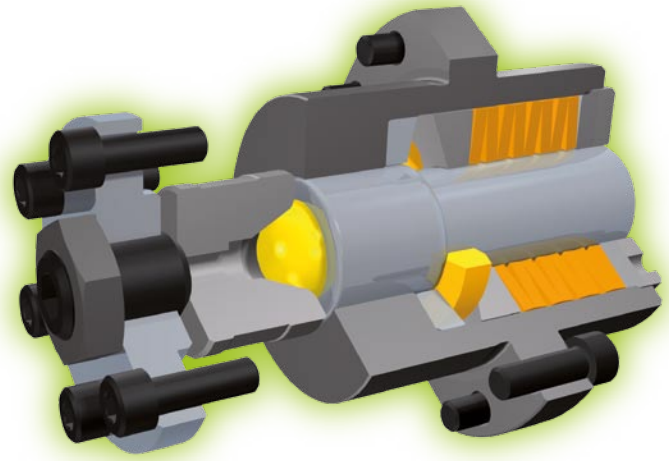
Contents

For detailed information, detailed Technical Data and Dimensions, please see our Catalogue K.4043.V_ _. _ _

High Torque, Small Element - EAS®-element

Characteristics

- ❒ The torques on large clutches are limited
- ❒ Suitable for retrofitting into existing constructions
- ❒ Using EAS®-elements, customer-specific special requirements can be catered for



Application

- ❒ Also suitable for turntable and slew ring drives etc.
- ❒ Load securement, even in inclined or linear operation
- ❒ Even the largest torques are rendered manageable due to the application of as many EAS®-elements as necessary

Advantages/Benefits

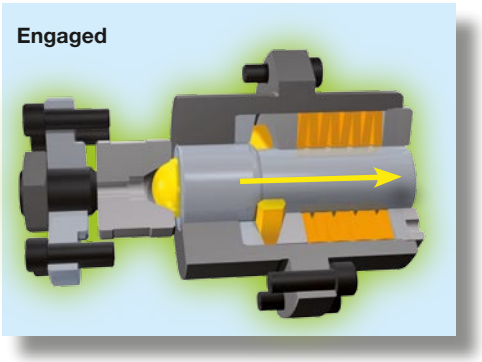
- ❒ On overload, the entire system can be stopped by a speed monitor
- ❒ EAS®-elements allow a multitude of individual requirements
- ❒ The most cost-effective alternative in the field of large clutches
- ❒ Simple adjustment (force/torque)

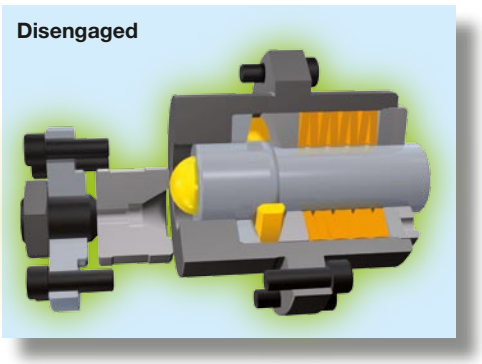
EDELSTAHL Rostfrei

Rustproof design available on request

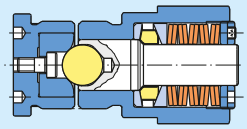
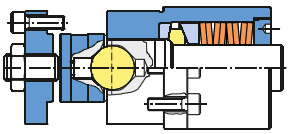
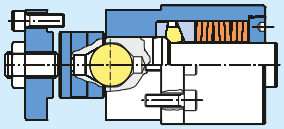
Functional Principle of the EAS®-element

- ❒ If the circumferential force per element is too large, the resulting axial force causes an axial movement of the bolt via the ball/calotte system and therefore disconnects the torque transmission.
- ❒ The maximum circumferential force is determined individually via the adjusting nut and the mayr®-cup springs. This limits the transmittable torque.
- ❒ Due to the axial stroke of the bolt (ball carrier), the control segments move radially outwards, thereby disconnecting the components axially.
- ❒ The ball is re-engaged via a bolt stroke in the direction of the calotte, either manually or via a mayr® re-engagement device.





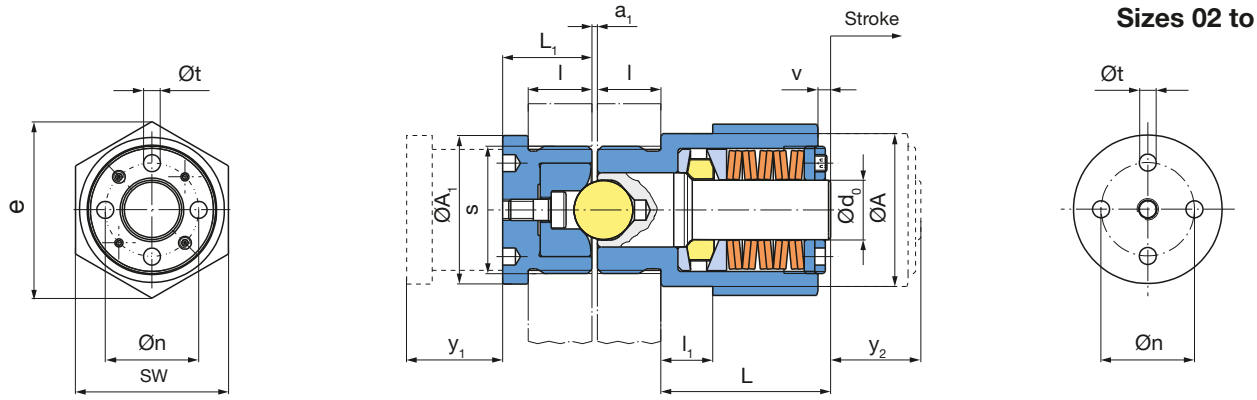
EAS®-elements Summary of Constructional Designs

EAS®-element Standard 	Sizes 02 – 01 Type 440._04.0	• Torque or force-limiting elements for installation into two bearing-supported flanges facing each other or for integration into existing constructions. • In case of overload, the EAS®-elements separate the input and output mechanically, so that the system can slow down freely.	**Pages 6/7**
EAS®-element Standard 	Sizes 0 – 2 Type 440._04.0		**Pages 6/7**
EAS®-element Reinforced 	Sizes 0 – 2 Type 441.604.0		• **It is possible to transmit larger torques using the same installation size. Especially recommended for narrow installation conditions.** **Pages 6/7**

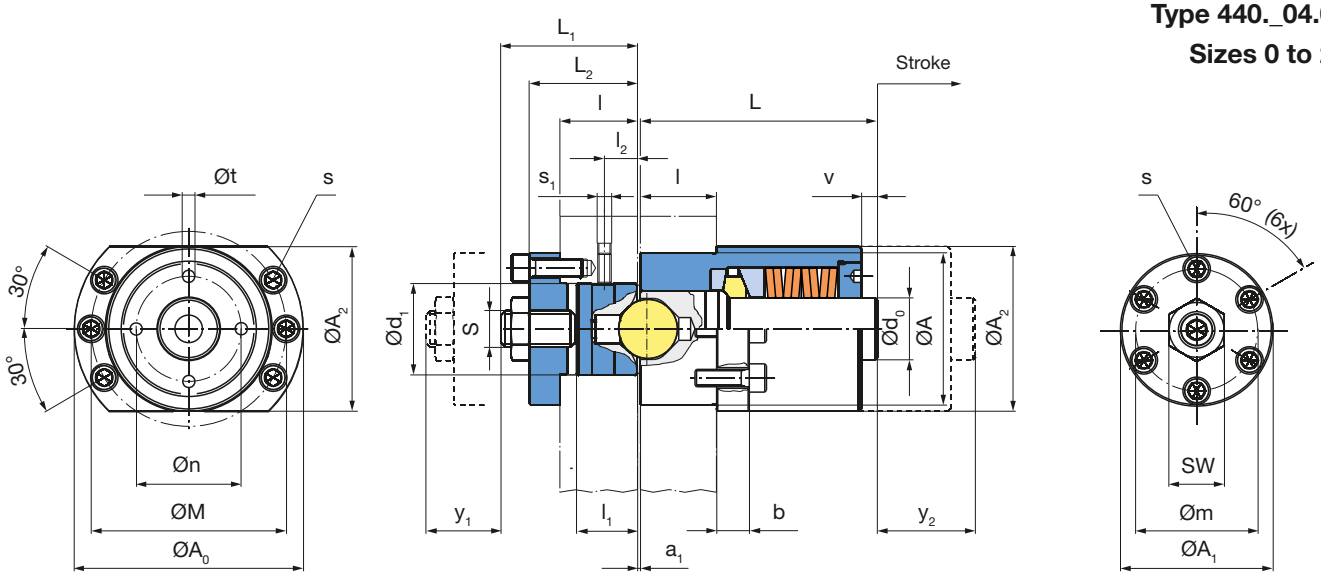
EAS®-element

Standard

Type 440._04.0
Sizes 02 to 01

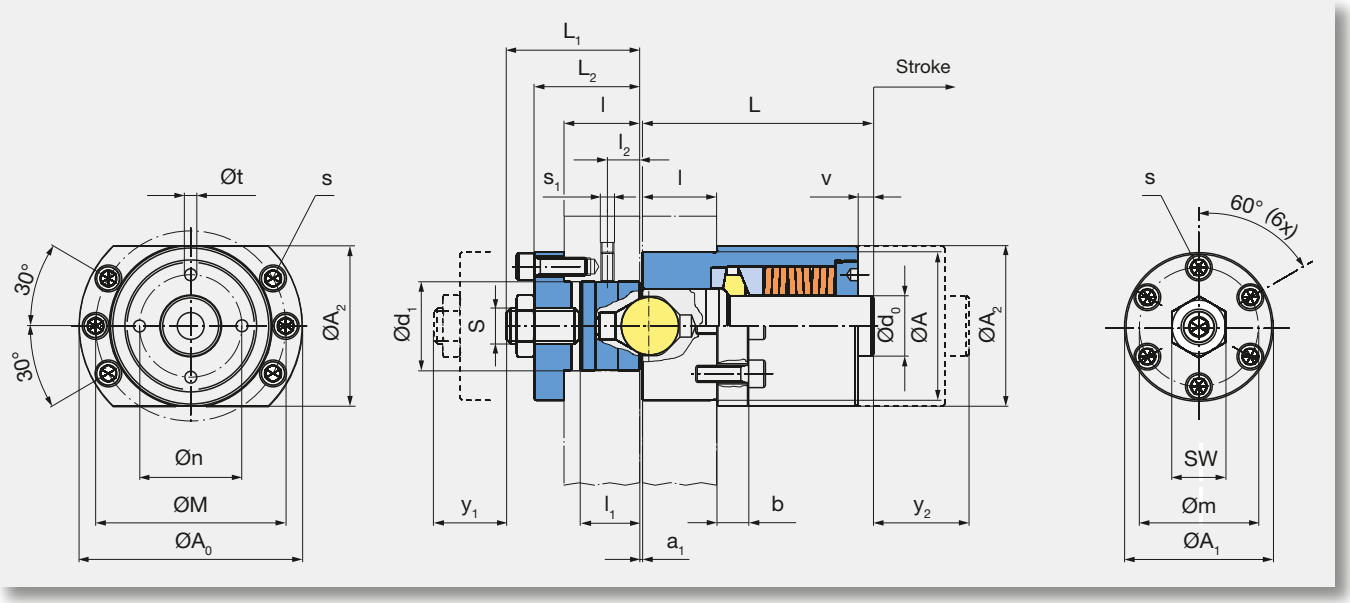


Type 440._04.0
Sizes 0 to 2



Reinforced

Type 441.604.0
Sizes 0 to 2



EAS®-element

Technical Data				Size				
				02	01	0	1	2
Circumferential force	Type 440.404.0 (Low torque range)	$F_{u\,min}$	[kN]	0,22	1	1,8	5	4
		$F_{u\,max}$	[kN]	0,54	2	5	10	11
	Type 440.504.0 (Medium torque range)	$F_{u\,min}$	[kN]	0,5	1,25	3,75	7,5	10
		$F_{u\,max}$	[kN]	1,4	2,5	7,5	15	30
	Type 440.604.0 (High torque range)	$F_{u\,min}$	[kN]	1,2	2,5	7,5	15	30
		$F_{u\,max}$	[kN]	2,5	5	15	30	60
	Type 441.604.0 Reinforced design	$F_{u\,min}$	[kN]	-	-	19	38	75
		$F_{u\,max}$	[kN]	-	-	38	75	150
Axial force	Type 440.404.0 (Low torque range)	$F_{ax\,min}$	[kN]	0,2	0,9	1,62	4,5	3,6
		$F_{ax\,max}$	[kN]	0,48	1,8	4,5	9	9,9
	Type 440.504.0 (Medium torque range)	$F_{ax\,min}$	[kN]	0,45	1,12	3,37	6,75	9
		$F_{ax\,max}$	[kN]	1,26	2,25	6,75	13,5	27
	Type 440.604.0 (High torque range)	$F_{ax\,min}$	[kN]	1,08	2,25	6,75	13,5	27
		$F_{ax\,max}$	[kN]	2,25	4,5	13,5	27	54
	Type 441.604.0 Reinforced design	$F_{ax\,min}$	[kN]	-	-	10	20	40
		$F_{ax\,max}$	[kN]	-	-	20	40	80
Bolt stroke on overload			[mm]	2,5	4	6	8	12
Weight			[kg]	0,25	0,6	1,75	4,1	11,3

Dim. [mm]	Size				
	02	01	0	1	2
A^{H8}_{h7}	28	38	55	75	100
A_0	-	-	85	110	150
A_1	28	35	55	75	100
A_2	-	-	55	75	108
a_1	1,0	1,5	2	2	3
b	-	-	12	15	20
d_0	10	14	20	30	40,6
$d_1^{H8}_{h7}$	-	-	30	40	60
e	31,2	41,6	-	-	-
L	28	40	73	96	160
L_1	15	21	52	65	80
L_2	-	-	42	51	70
l	12	15	30	40	50

Dim. [mm]	Size				
	02	01	0	1	2
l_1	7	10	22	30	40
l_2	-	-	12	17	22
M	-	-	72	95	128
m	-	-	44	60	80
n	17	22	31	48	69
S	-	-	M12	M20	M24
s	M24x1 [1]	M30x1,5 [2]	M6 [3]	M8 [4]	M12 [5]
s_1	-	-	M5	M6	M8
SW	27	36	19	30	36
t	3	4	5	6	8
v	2	3	3	4	15
y_1 [6]	12	15	8	10	10
y_2 [6]	16	21	38	50	65

We reserve the right to make dimensional and constructional alterations.

EAS®-element Standard

Order Number

__ / 4 4 0 . __ 0 4 . 0

△ △

Size	Torque range	
02	low	4
01	medium	5
0	high	6
1		
2		

Example: Order number 0 / 440.504.0

EAS®-element Reinforced

Order Number

__ / 4 4 1 . 6 0 4 . 0

△

Size
0
1
2

Example: Order number 0 / 441.604.0

1) Tightening torque M_A = 40 Nm
2) Tightening torque M_A = 60 Nm
3) Fixing screw DIN EN ISO 4762 10.9 M_A = 9 Nm
4) Fixing screw DIN EN ISO 4762 10.9 M_A = 19 Nm
5) Fixing screw DIN EN ISO 4762 10.9 M_A = 76 Nm
6) y_1 and y_2 are extension dimensions

EAS®-element

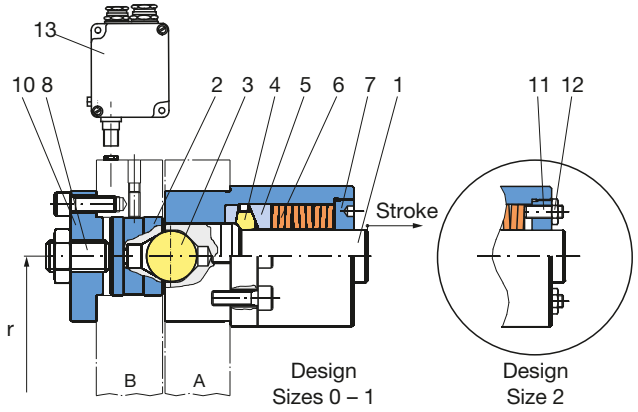


Fig. 1: EAS®-element engaged

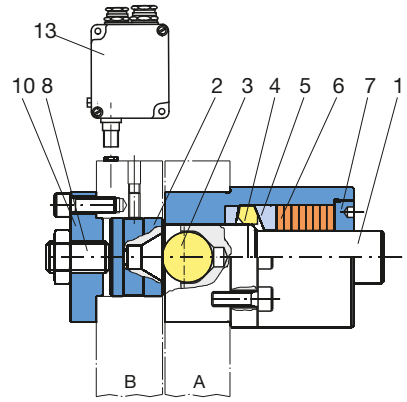


Fig. 2: EAS®-element disengaged

Function:

EAS®-elements for installation in two bearing-supported flanges facing each other or for integration into existing constructions.
The EAS®-elements are available in 5 sizes (02 – 2).
In case of overload, the EAS®-elements separate the input and output mechanically, so that the system can slow down freely. Re-engagement of the individual elements is carried out by hand (automatic re-engagement available on request).

Torque Path:

Flange A (customer-side) – bolt 1 – balls 3 – thrust piece 2 – flange B (customer-side).

Processes for Torque Switch-off on Overload:

On overload, the two flanges A and B begin to turn against each other. Bolt 1 is pressed via the control segments 4 and the thrust washer 5 against the force of the cup springs 6 from the thrust pieces 2. The control segments 4 travel radially outwards over the bolt 1 switching edge and hold bolt 1 in a disengaged position (see Fig. 2). The positive-locking connection of the two clutch flanges A and B is nullified. The originally coupled masses can slow down freely. The drive is switched off electrically via speed monitoring device 13.

Design:

All element components consist of high-quality quenched and tempered steels with a zinc-phosphated surface which provides a basic corrosion protection for further surface treatments.

The bolt 1, the thrust pieces 2, the ball 3, the control segments 4 and the thrust washers 5 are hardened. The ball 3 is supported in bolt 1. It can be rotated and is secured against falling out.
The elements are also suitable for oil-running.

Size Selection:

The limit torque for overload M_G on a clutch composed of elements can be calculated as follows:

$$\mathbf{M_G = z \times F_u \times r \quad [kNm]}$$

M_G = Limit torque for overload in [kNm]
F_u = Circumferential force per element in [kN] (see Dimensions Sheets)
r = Pitch circle radius onto which the elements are mounted in [m] (see Fig. 1)
z = Number of elements [-]

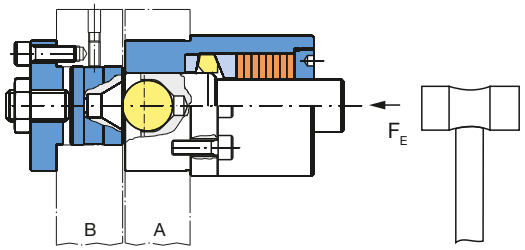


Fig. 3

The engagement procedure can be automated or operated by remote control when using mechanical, pneumatic or hydraulic aids.

Re-engagement:

Re-engagement is carried out by applying axial pressure on the bold end. The level of engagement force F_E is dependent on the set circumferential force F_u and can be roughly calculated using the following formula.

For element Type 440._04.0 $\quad \mathbf{F_E = 0{,}12 \times F_u}$ **[kN]**

For element Type 441.604.0 $\quad \mathbf{F_E = 0{,}08 \times F_u}$ **[kN]**

F_E = Engagement force per overload element in [kN]
F_u = Set circumferential force in [kN]

EAS®-element

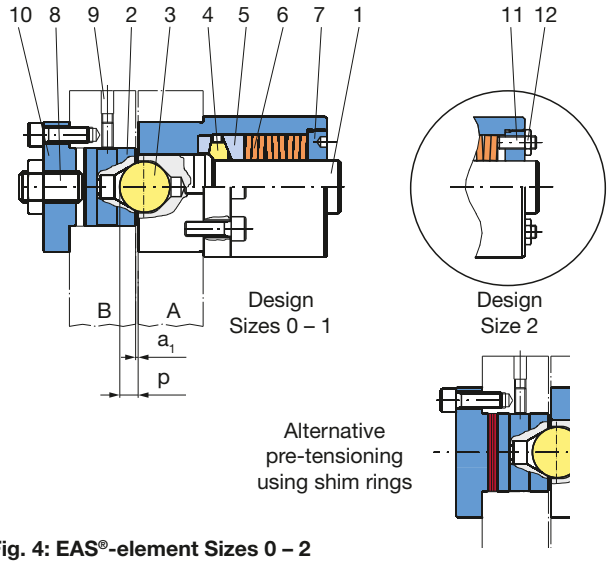


Fig. 4: EAS®-element Sizes 0 – 2

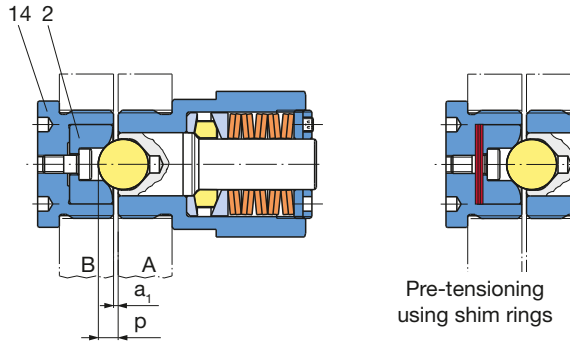


Fig. 5: EAS®-element Sizes 02 – 01

EAS®-element		Size				
		02	01	0	1	2
Inspection dim. p	[mm]	3,5	5,5	8,0	10,5	15,5
Distance dim. a_1	[mm]	1,0	1,5	2,0	2,0	3,0
Bolt pre-tension	[mm]	0,2	0,2	0,5	0,6	0,6

Table 1

Installation of the EAS®-elements, Sizes 02 – 2:

- ❒ The adaptor bores and the threaded holes for the EAS®-elements must be produced according to the Dimension Sheets or the Installation and Operational Instructions B.4.4.GB.
- ❒ Before installation, please make sure that the elements are engaged. Measure the inspection dimension “p” according to the Table below. The elements are delivered in an engaged position ex works.
- ❒ Install the EAS®-element into flange A. Please observe the tightening torque M_A according to the details in the Dimension Sheets.
- ❒ Grease the thrust piece 2 (Fig. 4) or the adaptor bushing 14 (Fig. 5) well (Please use: grease NLGI class 2 with a basic oil viscosity of 220 mm²/s at 40 °C, e.g. Mobilgrease HP222) and insert in or screw onto flange B. The set screw 9 must be removed.
- ❒ Screw-on the cover 10. The set screw 8 must be removed. Please observe the tightening torque M_A according to the details given in the Dimension Sheets.
- ❒ Adjust the distance dimension a_1 according to Table 1 below.
- ❒ Pre-tensioning the elements on Sizes 0 – 2:
  Tighten the set screw 8. After adjustment, counter the set screw 8.
  For operation with impact and vibration occurrences it is recommended to carry out the bolt pre-tensioning alternatively by inserting shim rings.
  Secure thrust piece 2 using set screw 9.
  Pre-tensioning the elements on Sizes 02 – 01:
  Insert shim rings between the adaptor bushing and the thrust piece. (see Installation and Operational Instructions B.4.4.GB).
- ❒ Record the set distance dimension a_1 for subsequent inspections (the set distance dimension is calculated as follows: Distance dimension a_1 - bolt pre-tension).

Torque Adjustment:

The limit torque for overload on the clutch is adjusted by changing the cup spring pre-tension of each element. For Sizes 02 – 1, adjustment is carried out via the adjusting nut 7, for Size 2 via 4 set screws 11 (Fig. 4). All 4 set screws must be evenly adjusted and countered. During torque adjustment, it is essential that all elements on the clutch are adjusted evenly.
The EAS®-elements can be set to the required circumferential force F_U at the place of manufacture. Subsequent adjustment or re-adjustment via an adjustment diagram is also possible (see Installation and Operational Instructions B.4.4.GB).

Inspection Intervals:

For element Type 440._04.0: approx. 1 year or after every 1.000 disengagements.
For element Type 441.604.0: approx. 1 year or after every 100 disengagements.
Should the device be subject to very dirty, dusty or extreme ambient conditions, it may be necessary to carry out inspections at much shorter intervals. If the distance dimension a_1 increases substantially (see Table 2), the axial bearing of both clutch flanges must be checked.

EAS®-element		Size				
		02	01	0	1	2
Distance dimension a_1 increase	[mm]	0,1	0,1	0,3	0,4	0,4

Table 2

Maintenance:

The EAS®-elements are completely enclosed and have a grease filling, meaning that they are mainly maintenance-free.

Maintenance work on the clutch is limited to the following:

- ❒ After the first 20 disengagements, check the clutch circumferential backlash and the originally set adjustment dimension “a_1”; if necessary, re-adjust the bolt pre-tension.
- ❒ Re-grease the contact components and thrust pieces (2).

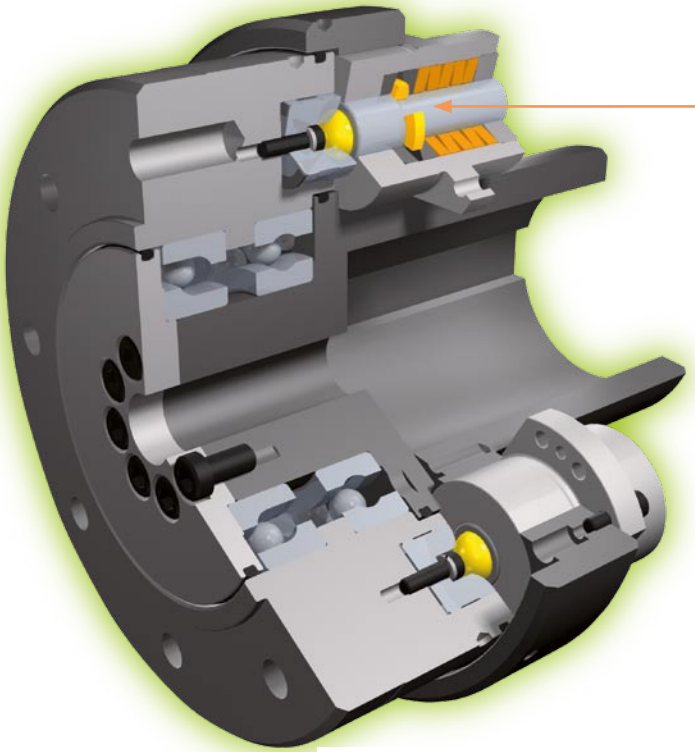
For greasing, use an NLGI Class 2 grease with a basic oil viscosity of 220 mm²/s at 40°C, e.g. Mobilgrease HP222.

These inspections and re-greasing of the contact components and thrust pieces (2) are also necessary later during routine inspections.

The High-Torque-EAS®-element Clutch

Characteristics

- ❒ Designed for high torques
- ❒ As standard design up to 190.000 Nm
- ❒ Available with torque adjustment
- ❒ Individual constructional design according to the customer's requests
- ❒ In case of overload, the drive is switched off via a speed monitor
- ❒ Large and expensive heavy-duty machines are protected reliably against damage due to overload



Application

Used for example in:

- ❒ Shovel excavators
- ❒ Dredgers
- ❒ Turbine construction
- ❒ Water lock drives
- ❒ Rolling mills
- ❒ Steel plants

Advantages/Benefits

- ❒ Avoids downtimes
- ❒ Increases the availability
- ❒ Increases the production capacity

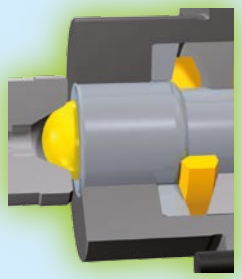
EDELSTAHL Rost frei

Rustproof design available on request

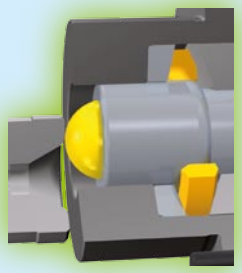
Functional Principle of the EAS®-element clutch Overload elements

- ❒ If the proportional circumferential force on the individual elements proves too large, the resulting axial force causes an axial movement of the bolt via the ball/calotte system and therefore the disconnection of the torque transmission.
- ❒ The maximum circumferential force is individually determined through the adjusting nut and mayr®-cup springs. The transmittable torque is determined in this way.
- ❒ Due to the axial stroke of the bolt (ball carrier), the control segments move radially outwards and thus causes axial overload.
- ❒ Re-engagement of the balls through a bolt stroke in the direction of the calotte takes place either manually or via a mayr® re-engagement device (pneumatic, hydraulic, electromechanical or mechanical).

Engaged

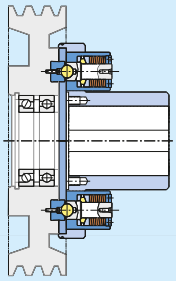


Disengaged



EAS®-element clutch Summary of Constructional Designs

EAS®-element clutch Flange design



Torque:
0,25 to 190 kNm

Sizes 6 to 14
Type 400._04.0

The clutch thrust piece can be integrated into the bearing-supported drive element; the hub part (with the installed EAS®-elements) can be secured onto the shaft.

- Torque limitation for heavy and high-speed drives in connection with large rotating masses, which have to slow down freely in case of overload.
- Flange design for the attachment of sprocket wheels and toothed wheels, V-belt disks etc.
- The respective element bearings on the shaft must be provided customer-side.

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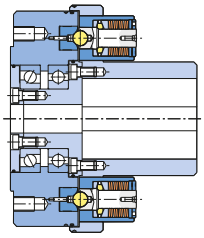
EAS®-element clutch Short bearing-supported hub



Torque:
0,25 to 190 kNm

Sizes 6 to 14
Type 400._04.5

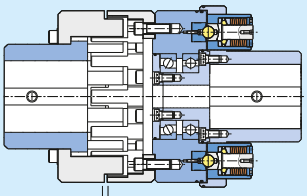
On this design, the drive element can be mounted directly onto the bearing-supported, output-side clutch flange.
The bearing is able to absorb high additional forces in axial and radial directions. However, the maximum permitted forces on the flange connection in radial and axial directions must not be exceeded (see Technical Data, page 13).

- Torque limitation with integrated output-side bearing
- Drive elements such as sprocket wheels and toothed wheels, V-belt disks etc. can be mounted directly without requiring an additional bearing position.

See Installation Example, Fig. 2, page 17

Pages 12/13

EAS®-element clutch Divisible positive locking



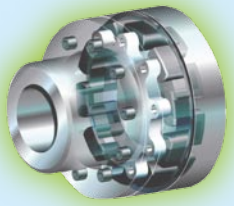


Fig. 1

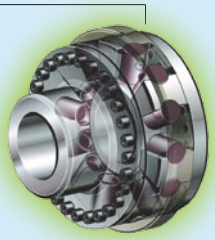


Fig. 2

Torque:
0,25 to 190 kNm

Sizes 6 to 14
Type 435._04.5

EAS®-element clutch in combination with a positive-locking, flexible coupling part for the connection of two shafts.

On Sizes 6 – 11 the flexible coupling part is produced as a positive-locking claw coupling with replaceable intermediate ring made from highly damping, oil-resistant and temperature resistant material (Fig. 1).

On Sizes 12 – 14 a claw coupling with radially mountable, large-volume, flexible buffers is used (Fig. 2). Replacing the flexible buffers is possible without clutch disassembly.

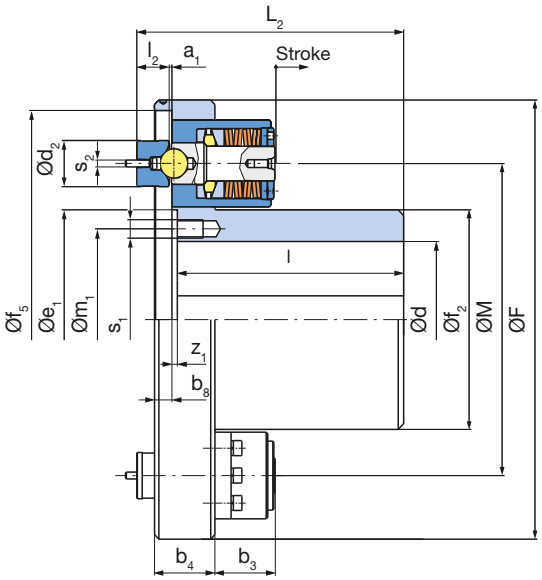
- Torque limitation with a positive-locking, torsionally flexible coupling for the connection of two shafts.
- The flexible coupling is insertable axially, compensates for shaft misalignments and has a damping effect on impact-type loads.

Pages 14/15

EAS®-element clutch

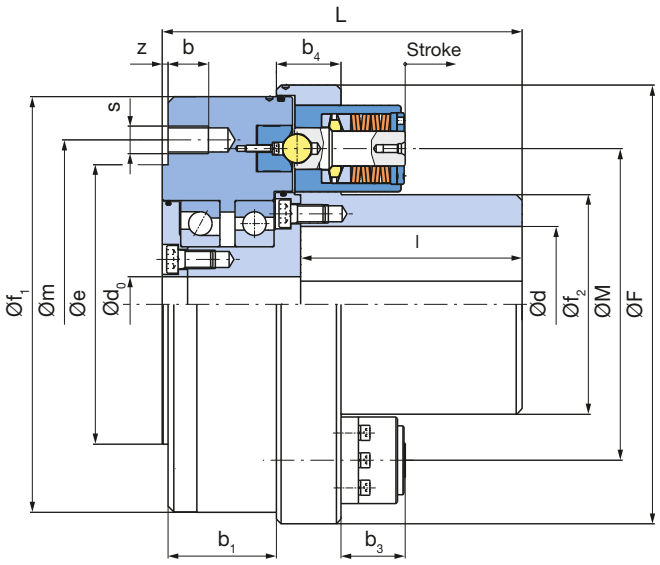
Flange Design

Type 400._04.0
Sizes 6 to 14



Short bearing-supported hub

Type 400._04.5
Sizes 6 to 14



Order Number

__ / 4 0 0 . __ 0 4 . __ / __ / __

Size	Torque range [1]		Design		Bore [2] [3]	Bore
6 to 14	low	4	Flange design	0	Ø d^{H7} (dependent on size ≦ d_{max})	Ø d_0 (dependent on size ≦ $d_{0\,max}$)
	medium	5	Short bearing-supported hub	5		
	high	6				

Example: Order number 8 / 400.604.0 / 95 /

1) See Technical Data, limit torque for overload M_G
2) On Type 400._04.0: Position of the keyway to the tapped hole "s_2" in the thrust piece is not defined. Defined position available on request.
3) On Type 400._04.5: Position of the keyway to the tapped hole "s" in the thrust piece is not defined. Defined position available on request.

EAS®-element clutch

Technical Data				Size								
				6	7	8	9	10	11	12	13	14
Limit torques for overload	Type 400.404._ (Low torque range)	$M_{G\,min}$	[kNm]	0,25	0,45	0,75	2,0	3,3	6,3	4	7,6	12,5
		$M_{G\,max}$	[kNm]	0,7	1,3	2,1	4,0	6,6	12,6	11	21	34,5
	Type 400.504._ (Medium torque range)	$M_{G\,min}$	[kNm]	0,55	1,0	1,625	3,0	5	9,5	10	19	31,5
		$M_{G\,max}$	[kNm]	1,1	2,0	3,25	6,0	10	19	30	57,5	95
	Type 400.604._ (High torque range)	$M_{G\,min}$	[kNm]	1,1	2,0	3,25	6,0	10	19	30	57,5	95
		$M_{G\,max}$	[kNm]	2,2	4,0	6,5	12	20	38	60	115	190
EAS®-element	Size			0	0	0	1	1	1	2	2	2
	Pieces			2	3	4	3	4	6	4	6	8
Maximum speed		n_{max}	[rpm]	3500	3000	2800	2500	2200	2000	1800	1500	1200
Bolt stroke on overload			[mm]	6	6	6	8	8	8	12	12	12

Max. permitted Forces [1] on the Flange Connection				Size								
				6	7	8	9	10	11	12	13	14
Radial forces	Type 400._04.5	F_R	[kN]	30	45	60	90	120	180	240	360	480
Axial forces		F_A	[kN]	21	31,5	42	63	84	126	168	252	336

Mass Moment of Inertia and Weight				Size								
				6	7	8	9	10	11	12	13	14
Hub-side	Type 400._04._	J	[kgm²]	0,09	0,16	0,31	0,95	1,96	4,01	11,10	26,5	60,9
Flange-side	Type 400._04.5	J	[kgm²]	0,10	0,19	0,41	1,34	2,79	6,41	14,97	40,2	103
Weight at d_{max}	Type 400._04.0		[kg]	13,4	18,6	28,4	57,6	84,3	119	223	355	631
	Type 400._04.5		[kg]	31	46	70	140	212	320	550	900	1650

Bores [mm]			Size								
			6	7	8	9	10	11	12	13	14
Hub-side	Type 400._04._	d_{max}	70	90	110	135	160	200	250	300	350
Flange-side	Type 400._04.5	$d_{0\,max}$	25	30	40	48	58	85	95	110	140

Dim. [mm]	Size								
	6	7	8	9	10	11	12	13	14
a_1	2	2	2	2	2	2	3	3	3
b	20	25	30	35	35	40	45	50	50
b_1	58	68	78	94	110	122	134	170	192
b_3	43	43	43	56	56	56	110	110	110
b_4	44	44	44	56	56	56	70	70	75
b_8	14	14	14	16	16	16	20	20	25
d_2	30	30	30	40	40	40	60	60	60
e_1^{H7}	98	123	150	190	240	290	350	430	480
e_{h7}	136	147	165	242	276	380	385	430	600
F	230	260	304	380	450	535	660	800	960
f_1	210	238	280	360	418	504	606	740	900
f_2	96	120	150	190	220	260	320	390	500
f_5	212	240	282	362	420	506	609	743	903
L	189	228	270	330	387	441	508	599	686
L_2	127	158	188	231	271	311	366	418	485
l	110	140	170	210	250	290	340	390	450
l_2	22	22	22	30	30	30	40	40	40
M [2]	155	180	225	270	340	425	505	640	795
m	175	190	220	285	325	430	500	600	750
m_1	84	110	130	157	190	240	290	350	400
s	8xM12	8xM16	8xM20	8xM24	12xM24	12xM27	12xM30	12xM36	16xM36
s_1	8xM8	8xM10	8xM12	8xM16	8xM16	12xM16	12xM20	16xM24	16xM24
s_2	M6	M6	M6	M6	M6	M6	M8	M8	M8
z	4	4	4	5	6	8	8	10	10
z_1	3	4	4	5	5	5	6	8	10

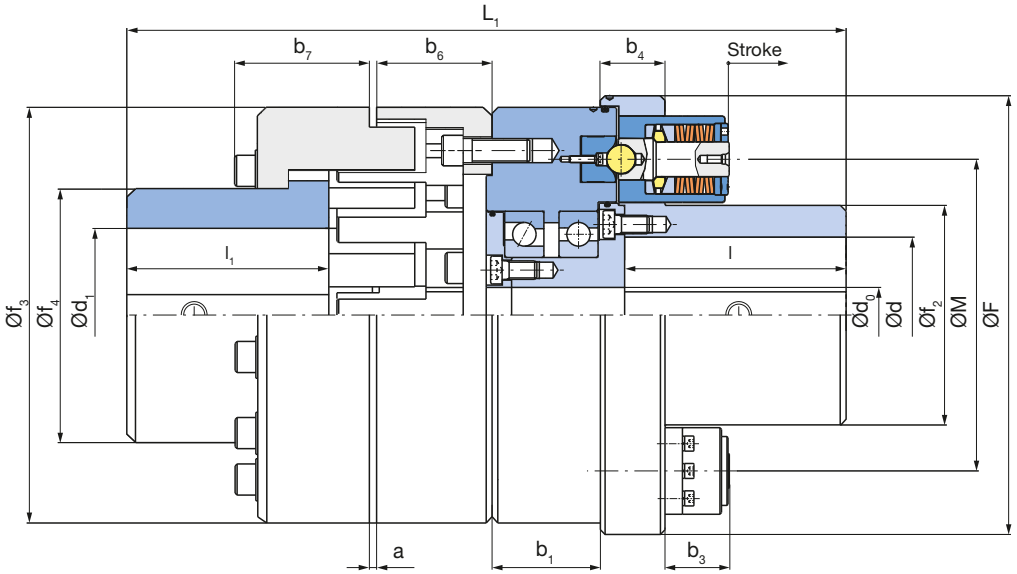
We reserve the right to make dimensional and constructional alterations.

1) Line of influence of the radial force at the screw-on level.
2) Type 400._04.0: Tolerance for installation of the thrust pieces (customer-side): Sizes 6 – 8 ±0,03; Sizes 9 – 14 ±0,05

EAS®-element clutch

Divisible positive locking

Type 435._04.5
Sizes 6 to 14



For Dimensioning the Flexible Coupling Part, please see Pages 17/18.

Order Number

__ / 4 3 5 . __ 0 4 . 5 / __ / __ / __

Size	Torque range [1]		Bore	Bore	Bore
6 to 14	low medium high	4 5 6	Ø d^{H7} (dependent on size ≦ d_{max})	Ø d_1^{H7} (dependent on size ≦ $d_{1\,max}$)	Ø d_0 (dependent on size ≦ $d_{0\,max}$)

Example: Order number 9 / 435.504.5 / 110 / 130 / 45

1) See Technical Data, limit torque for overload M_G

EAS®-element clutch

Technical Data					Size								
					6	7	8	9	10	11	12	13	14
Limit torques for overload	Type 435.404.5 (Low torque range)		$M_{G\,min}$	[kNm]	0,25	0,45	0,75	2,0	3,3	6,3	4	7,6	12,5
			$M_{G\,max}$	[kNm]	0,7	1,3	2,1	4,0	6,6	12,6	11	21	34,5
	Type 435.504.5 (Medium torque range)		$M_{G\,min}$	[kNm]	0,55	1,0	1,625	3,0	5	9,5	10	19	31,5
			$M_{G\,max}$	[kNm]	1,1	2,0	3,25	6,0	10	19	30	57,5	95
	Type 435.604.5 (High torque range))		$M_{G\,min}$	[kNm]	1,1	2,0	3,25	6,0	10	19	30	57,5	95
			$M_{G\,max}$	[kNm]	2,2	4,0	6,5	12	20	38	60	115	190
EAS®-element	Size				0	0	0	1	1	1	2	2	2
	Pieces				2	3	4	3	4	6	4	6	8
Maximum speed			n_{max}	[rpm]	3500	3000	2800	2500	2200	2000	1800	1500	1200
Bolt stroke on overload				[mm]	6	6	6	8	8	8	12	12	12
Flexible shaft coupling	Permitted misalign-ments [1]	axial	ΔK_a	[mm]	±2,0	±2,0	±2,5	±2,5	±2,5	±2,5	±0,5	±0,7	±0,7
		radial	ΔK_r	[mm]	0,3	0,3	0,3	0,3	0,3	0,3	0,55	0,55	0,65
		angular	ΔK_w	[mm]	0,3	0,3	0,3	0,3	0,3	0,3	1,0	1,25	1,25
Nominal and maximum torques, flexible coupling			T_{KN}	[kNm]	1,5	2,4	3,7	8,9	13,2	27	45	65	120
			$T_{K\,max}$	[kNm]	3,1	4,8	7,5	18,2	27	54	135	176	380

Mass Moments of Inertia and Weight				Size								
				6	7	8	9	10	11	12	13	14
Mass moments of inertia	Hub-side	J	[kgm²]	0,09	0,16	0,31	0,95	1,96	4,01	11,10	26,5	60,9
	Flexible side	J	[kgm²]	0,24	0,42	0,81	3,25	6,12	18,15	23,78	66,6	169,6
Weight at d_{max}			[kg]	56	78	115	251	367	655	860	1440	2630

Bores [mm]			Size								
			6	7	8	9	10	11	12	13	14
Hub-side	d_{max}		70	90	110	135	160	200	250	300	350
Bearing flange	$d_{0\,max}$		25	30	40	48	58	85	95	110	140
Flexible side	$d_{1\,max}$		95	100	115	160	180	240	200	250	320

Dim. [mm]	Size								
	6	7	8	9	10	11	12	13	14
a	4	4	5,5	8	8	8	12	13	13
b_1	58	68	78	94	110	122	134	170	192
b_3	43	43	43	56	56	56	110	110	110
b_4	44	44	44	56	56	56	70	70	75
b_6	62,5	66,5	76	94	102	108	60	73	80
b_7	75,6	80,6	91,7	111,3	119,3	130,5	118	131	147
F	230	260	304	380	450	535	660	800	960
f_2	96	120	150	190	220	260	320	390	500
f_3	214	240	265	370	415	575	580	680	840
f_4	136	146	164	241	275	368	280	350	450
L_1	380,5	437,5	512	638	724	826	845	980	1161
l	110	140	170	210	250	290	340	390	450
l_1	107	117	137	176	196	240	228	258	338
M	155	180	225	270	340	425	505	640	795

We reserve the right to make dimensional and constructional alterations.

1) The values refer to 1500 rpm.

Technical Explanations

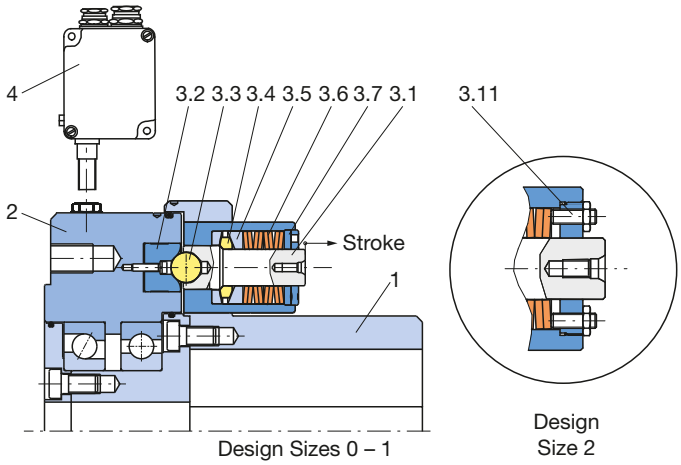


Fig. 1: EAS®-element clutch engaged

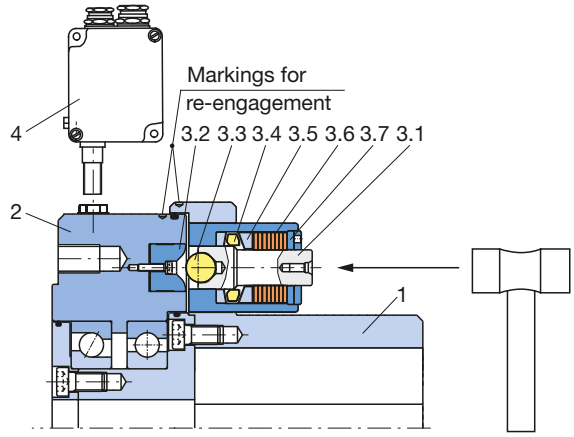


Fig. 2: EAS®-element clutch disengaged

$F_E = k \times M_G$ [kN]

F_E = Total engagement force for all clutch overload elements [kN] (see Fig. 3)

k = Calculation factor [1/m] acc. Table 1

M_G = Set limit torque for overload in [kNm]

		EAS®-Size								
		6	7	8	9	10	11	12	13	14
Calculation factor k	[1/m]	1,7	1,4	1,3	1,0	0,8	0,6	0,5	0,4	0,3

Table 1

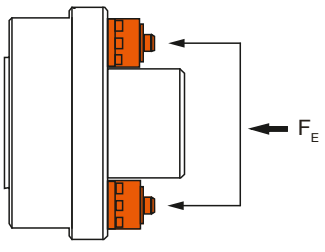


Fig. 3

Design:

All element components are made of steel, are machined on all sides and have a zinc-phosphated surface which provides a basic corrosion protection for further surface treatments. The design of the installed EAS®-elements is as described on page 8. The clutch is also suitable for oil-running.

Torque Adjustment:

The limit torque for overload on the clutch can be adjusted by changing the cup spring pre-tension of each overload element. For Sizes 6 – 11, adjustment is carried out via the adjusting nut 3.7, for Sizes 12 – 14 via set screws 3.11 (see Fig. 1). It is essential that all overload elements on the clutch are adjusted evenly. The EAS®-element clutches Sizes 6 – 14 can be set to the required limit torque for overload at the place of manufacture. Subsequent adjustment or re-adjustment via an adjustment diagram is also possible (see Installation and Operational Instructions B.4.3.EN).

Torque Path:

Hub part 1 – bolt 3.1 – balls 3.3 – thrust piece 3.2 - output flange 2

Processes for Torque Switch-off on Overload:

On overload, the hub part 1 and the output flange 2 begin to turn against each other. The bolts 3.1 in the overload elements are pressed via the control segments 3.4 against the force of the cup springs 3.6 from the thrust washers 3.2. The control segments 3.4 travel radially outwards over the bolt 3.1 switching edge and hold the bolts 3.1 in a disengaged position (see Fig. 2). The positive-locking connection of the hub part 1 and the output flange 2 is nullified. The originally coupled masses can slow down freely. The drive is switched off electrically via speed monitoring device 4.

Re-engagement:

Re-engagement is carried out by applying axial pressure on the bolt end 3.1 of each overload element. The hub part 1 and the output flange 2 are turned into the correct angular position to one another (re-engagement position can be recognized via the marking bores on the clutch outer diameter, Fig. 2). By hitting the bolt end with a plastic hammer, the bolts 3.1 are brought back into an engaged position. The clutch is ready for operation when all clutch overload elements are engaged. The level of engagement force is dependent on the set limit torque for overload and can be calculated roughly using the formula below.

Re-engagement can also be carried out automatically using compressed air. If you are interested in this feature, please contact the manufacturer.

Mounting onto the Shaft:

In a standard delivery, the EAS®-element clutches Sizes 6 – 14 are delivered with a finish bore and a keyway acc. DIN 6885. The clutch can be secured axially onto the shaft e.g. using a washer and a screw, screwed into the shaft threaded centre hole.

Other shaft-hub connections, e.g. multi-splines, toothings, shrink fits, pressurised oil assemblies etc. are also possible.

Technical Explanations

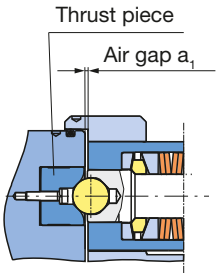


Fig. 1

Maintenance

The EAS®-element clutches Sizes 6 – 14 do not require special maintenance work. They are largely protected against dust and humidity, they have an initial grease filling and are therefore mainly maintenance-free.

The distance dimension a_1 between the thrust piece and the overload element facing side is set manufacturer-side and does not require any re-adjustment (Fig. 1).
Special maintenance work may be necessary, however, if the device is subject to large amounts of dirt or dust or is operating in extreme ambient conditions.

In this case, please contact the manufacturer.

Installation Example

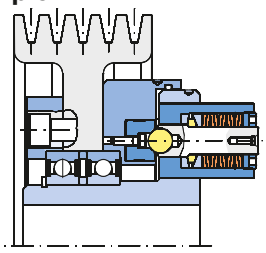


Fig. 2

Connecting the drive elements as shown in Fig. 2 means better distribution of the radial and axial forces on the bearing. In this case, the resulting radial force of the drive element lies approximately in the bearing centre.

For this design, please contact the manufacturer.

Dimensioning the Flexible Coupling Part Type 435._04.5

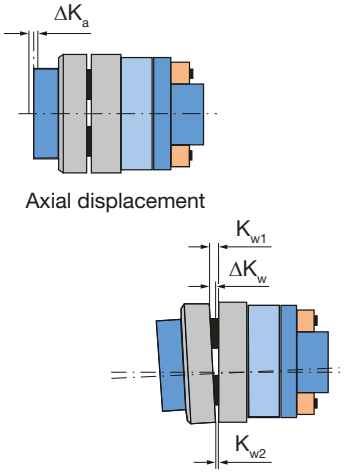


Fig. 3

Shaft Misalignments

Flexible coupling for the compensation of axial, radial and angular shaft misalignments.

The misalignment possibilities of the flexible coupling are general guideline values, which can be regarded as adequate with regard to producing the required longest possible clutch service lifetime and bearing support for the shafts (see Table “Technical Data”, page 15).

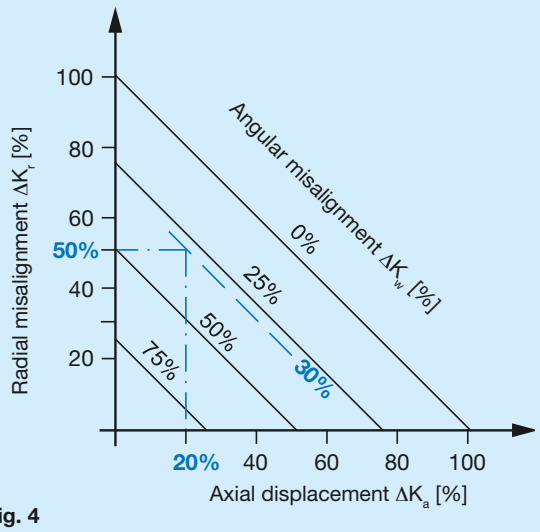


Fig. 4

If more than one kind of misalignment occur simultaneously, they influence each other. The permitted misalignment values are dependent on one another, see Fig. 4. The sum total of the misalignments – in percent of the maximum value – must not exceed 100 %.

Example:

EAS®-element clutch, Size 6, Type 435.604.5

- **Axial displacement** occurrence:
  ΔK_a = 0,4 mm, equals **20 %** of the permitted maximum value ΔK_a = 2 mm
- **Angular misalignment** occurrence:
  ΔK_w = 0,09 mm, equals **30 %** of the permitted maximum value ΔK_w = 0,3 mm
- Required **permitted radial misalignment**:
  ΔK_r = **50 %** of the permitted maximum value ΔK_r = 0,3 mm equals ΔK_r = 0,15 mm

Technical Explanations

Dimensioning the Flexible Coupling Part Type 435._04.5

1. Approximate Calculation of the Coupling Torque

The nominal torque T_N and the maximum torque T_{max} from the basis of the flexible coupling dimensioning.

$$T_N = \frac{9550 \times P_N}{n}$$

2. If Nominal Torque is Applied, the Following Applies:

$$T_{KN} > T_N \times S_\vartheta \times S_f$$

3. Checking the Coupling Maximum Torque:

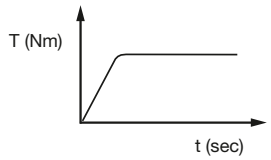
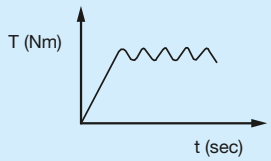
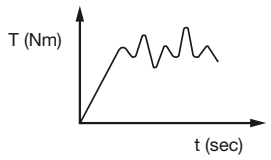
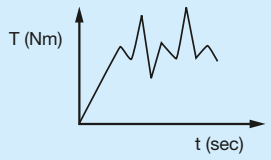
For short torque impacts, which occur for example when starting an electromotor, the following applies:

$$T_{Kmax} > T_{max} \times S_\vartheta \times S_Z$$

Terms

P_N	[kW]	System performance	
T_N	[Nm]	System torque	
T_{KN}	[Nm]	Coupling torque	see page 15
T_{Kmax}	[Nm]	Maximum coupling torque	see page 15
T_{max}	[Nm]	Maximum torque impact of the system	
n_N	[rpm]	Operating speed	
S_A	[-]	Load factor, input-side	see Table
S_L	[-]	Load factor, output-side	see Table
S_f	[-]	Service factor	$= S_A \times S_L$
S_Z	[-]	Start-up factor	see Table
S_ϑ	[-]	Temperature factor	see Table

S_L = Load Factor, Output-side

Torque characteristics at the operating point, input-side	Minimum load factor [S_L]
Consistent, even without torque fluctuations	 1
Even, with minor fluctuations, light impacts	 1,25
Uneven, also API-671, API-610, moderate impacts	 1,5
Uneven, fluctuating, strong impacts	 1,75
Other torque characteristics	Own data/torsional vibration calculation

S_ϑ = Temperature Factor, Depending on the Intermediate Ring Material

Pb 72, Pb 82 (NBR)

Ambient temperature range [°C]	Temperature factor for intermediate ring quality [S_ϑ]
-30/ +60	1
+80	1,2
+100	1,3
> +100	On request

S_A = Load Factor, Input-side

Driven by	Minimum load factor [S_A]
E-motor, turbine	1
Hydraulics motor	1,1
Internal combustion engine, 4 or more cylinders, U-degree ≤ 1 : 100	1,2 (TVC) [1]
Internal combustion engine, 1 or 3 cylinders, U-degree ≥ 1 : 100	1,4 (TVC) [1]

S_Z = Start-up Factor

Start-up frequency [1/h]	Start-up factor [S_Z]
< 120	1
120 - 240	1,3
> 240	On request

1) We recommend carrying out a torsional vibration calculation (TVC) for coupling dimensioning on drives with internal combustion engines.

Special Designs

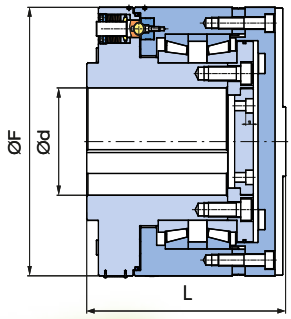
Apart from our established EAS®-element clutch designs, we also offer specially constructed variants according to customer request. EAS®-element clutches can be combined with many different components, for example flexible couplings, gear coupling etc.

We are happy to assist you in dimensioning and assembling your optimum design.

Example 1: EAS®-element clutch

with cardan shaft connection and stable bearing for absorbing large forces

Technical Data						
Limit torques for overload		[kNm]	5 – 10	10 – 20	20 – 40	40 – 80
EAS®-element Type 441.604.0	Size		0	0	0	1
	Pieces		3	8	10	14
Dimensions						
d		[mm]	90	110	130	150
F		[mm]	230	270	315	375
L		[mm]	242	242	280	340

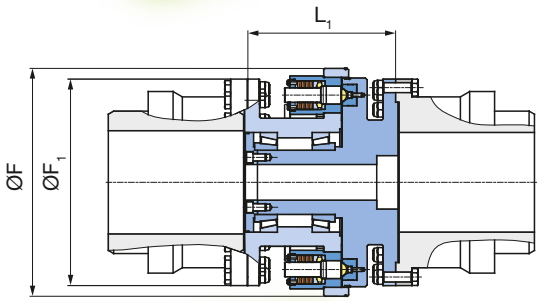


EAS®-element clutch in “compact” design

Example 2: EAS®-element clutch

for mounting flexible couplings and gear couplings

Technical Data						
Limit torques for overload		[kNm]	20 – 40	40 – 80	80 –160	140 – 280
EAS®-Element Type 440.604.0	Size		1	2	2	2
	Pieces		8	6	6	10
Dimensions						
F_1		[mm]	535	620	690	730
F		[mm]	550	650	760	760
L_1		[mm]	220	395	395	395

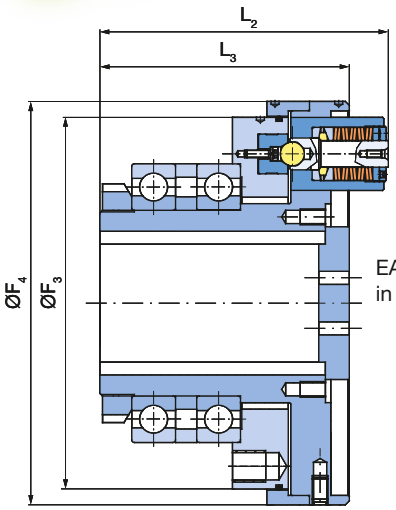


EAS®-element clutch with attachment (gear coupling)

Example 3: EAS®-element clutch

for mounting sprocket and toothed wheels, V-belt disk etc.

Technical Data			
Limit torques for overload		[kNm]	8,5 – 17
EAS®-element Type 440.604.0	Size		0
	Pieces		6
Dimensions			
F_3		[mm]	280
F_4		[mm]	304
L_2		[mm]	218
L_3		[mm]	188



EAS®-element clutch in flange design

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You can find the complete address for the representative responsible for your area under www.mayr.com in the internet.

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