

**ROBUST AND COMPACT**

Full disengagement

# TORQUE LIMITERS

**SERIES ST | 1,000 – 160,000 Nm**



**R+W**<sup>®</sup>  
COUPLING TECHNOLOGY

THE ULTIMATE COUPLING FROM 1,000 – 160,000 NM

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# Series ST

## TORQUE LIMITERS

### Areas of application for the ST

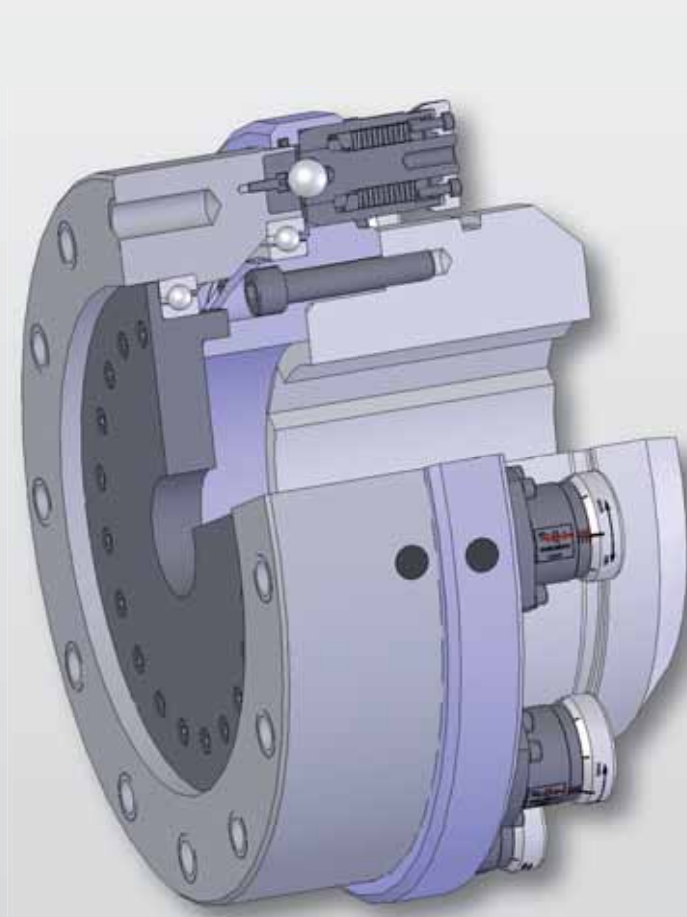
Heavy duty applications

- Rolling mills
- Dredgers
- Steel mills
- Industrial shredders
- Industrial conveyors
- Wind turbines
- Extruders
- Wastewater management
- Tunnel boring machines
- and much more

### Features of the ST

- Compact, simple design
- Full disengagement
- Robust
- Precise overload protection
- Torsionally rigid
- Adjustable torque setting
- Infinite life and maintenance free

## RELIABLE TORQUE OVERLOAD PROTECTION



The torque module consists of two components. These include the adjustable housing and plunger core. The set torque is easily visible on a scale.

**Use of ST torque limiters will minimize machine downtime due to crashes and increase the availability and productivity of your machine.**

ST torque limiters are designed for high torque applications. This is achieved through the use of individual torque modules evenly spaced around the circumference of the coupling.

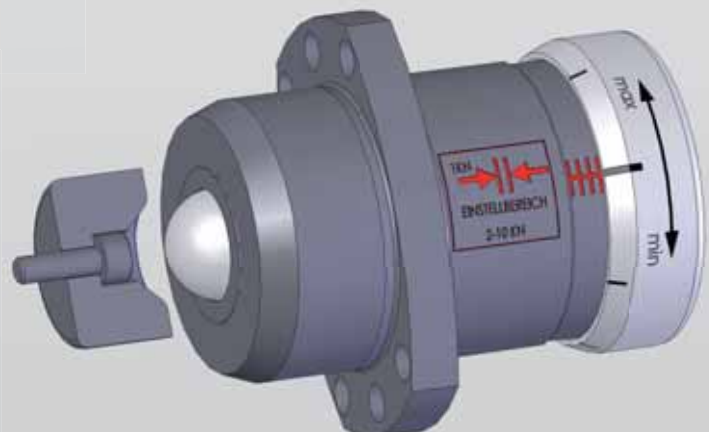
The ST torque limiter is based on a spring loaded, ball-detent design.

The transmittable torque is determined by the number of torque modules and their distance from the center of the coupling.

In the event of an overload, the balls exit the detents in the axial direction, resulting in a permanent separation of the drive and driven elements.

An axial force on the plunger re-engages the torque module.

The sealed torque module design prevents contamination by dirt and debris.





## MODELS

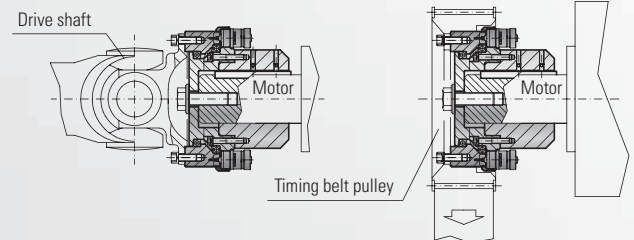
## FEATURES

## POSSIBLE APPLICATIONS

## ST 1


**with keyway connection  
for indirect drives**

- Compact, simple design
- Precise overload protection
- Torsionally rigid
- Integral bearings for timing belt pulley or sprocket

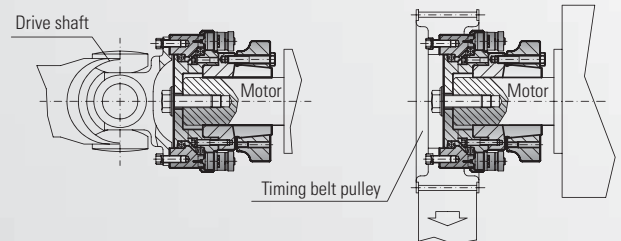


see page 4

## STN


**with conical clamp connection  
for indirect drives**

- High clamping force
- Compact, simple design
- Precise overload protection
- Torsionally rigid
- Integral bearings for timing belt pulley or sprocket

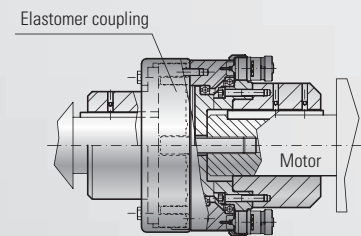


see page 5

## ST 2


**with keyway connection  
and elastomer coupling**

- Vibration damping
- Compensation for misalignment
- Precise overload protection

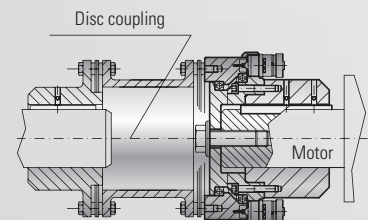


see page 8

## ST 3


**with keyway connection and  
disc coupling**

- Torsionally rigid
- Compensation for misalignment
- Precise overload protection

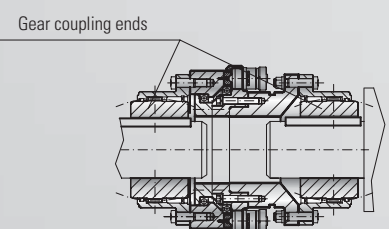


see page 7

## ST 4


**with keyway connection and  
gear coupling**

- High torque density
- Compensation for misalignment
- Precise overload protection



see page 10

Full disengagement



# MODEL ST 1

## TORQUE LIMITER



with keyway connection

**Material:**

High-strength, nitro-carburized steel

**Design:**

Drive side: Coupling hub with keyway connection or spline profile.

Driven side: Output flange with 12x fastening threads and integral bearings.

Torque modules: Evenly spaced around the circumference. Field adjustable within the selected range.

**Temperature range:**

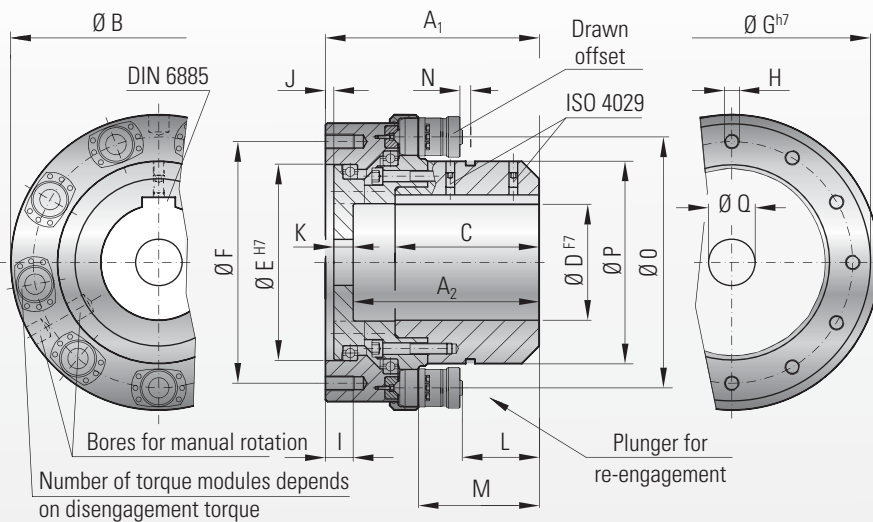
-30 to +120° C

**Service life:**

Infinite life and maintenance free when operated within the technical specifications.

**Fit tolerance:**

Tolerance between hub and shaft 0.02 – 0.07 mm



Bores for manual rotation  
Number of torque modules depends on disengagement torque

Plunger for re-engagement

MODEL ST 1		Series											
		10			25			60			160		
Adjustment range available from - to (KNm)		1-6	2-10	6-18	2-8	4-15	10-25	8-18	15-35	30-60	20-50	40-100	80-160
		3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 30	6 x ST 30	9 x ST 30	3 x ST 70	6 x ST 70	9 x ST 70
Overall length (mm)	A <sub>1</sub>	183			230			320			410		
Bore depth (mm)	A <sub>2</sub>	158			200			275			360		
Flange outside diameter (mm)	B	270			318			459			648		
Fit length (mm)	C	120			155			220			290		
Bore diameter possible Ø to Ø F7 (mm)	D	40-110			60-140			80-200			100-290		
Flange centering diameter H7 (mm)	E	170			210			300			450		
Bolt circle diameter ±0.3 (mm)	F	220			260			360			570		
Outside diameter h7 (mm)	G	259			298			418			618		
Fastening threads	H	12 x M16			12 x M16			12 x M20			12 x M24		
Thread depth (mm)	I	25			30			35			40		
Fit length (mm)	J	6			8			8			10		
Wall thickness (mm)	K	17			20			30			38		
Distance (mm)	L	45			83			96			136		
Distance (mm)	M	95			130			165			225		
Actuation path (mm)	N	4			4			7,5			10		
Bolt circle diameter - modules (mm)	O	220			270			376			532		
Hub outside diameter (mm)	P	170			218			295			418		
Bore for fastening screw (mm)	Q	max. 110			max. Ø 140			max. Ø 200			max. Ø 290		
Moment of inertia (approx.) D max. (10 <sup>-3</sup> kgm <sup>2</sup> )		370			780			4600			24600		
Speed max. (1/min.)		4200			3800			2500			2000		
Allowable max. radial force standard* (KN)		40			60			100			200		
Approx. weight at D max. (kg)		40			63			179			463		

\* higher radial force through additional bearing support.

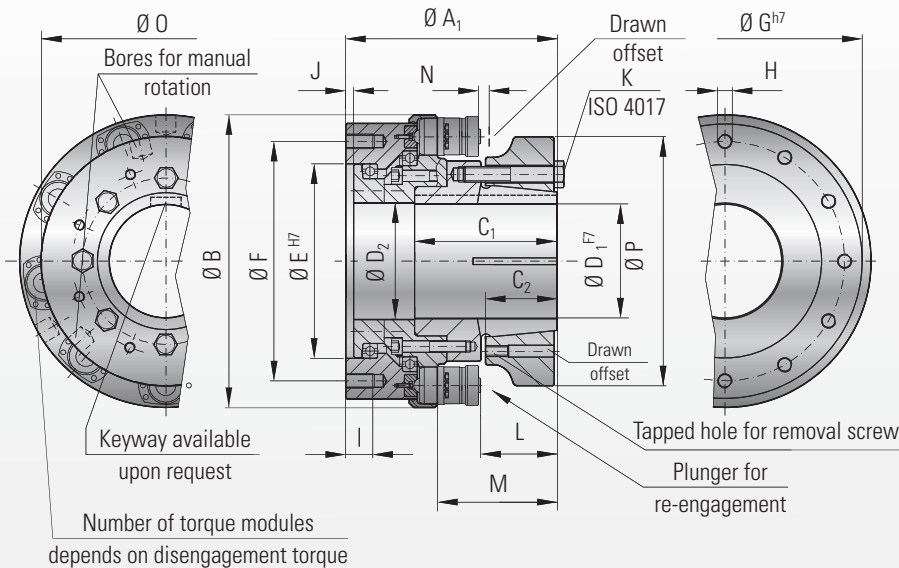


# MODEL STN

## TORQUE LIMITER



with backlash free conical clamping connection



**Material:**

High-strength, nitro-carburized steel

**Design:**

Drive side: Coupling hub with tapered conical clamping connection

Driven side: Output flange with 12x fastening threads and integral bearings.

Torque modules: Evenly spaced around the circumference. Field adjustable within the selected range.

**Temperature range:**

-30 to +120° C

**Service life:**

Infinite life and maintenance free when operated within the technical specifications.

**Fit tolerance:**

Tolerance between hub and shaft 0.02 – 0.07 mm

MODEL STN		Series											
		10			25			60			160		
Adjustment range available from - to (KNm)		1-6	2-10	6-18	2-8	4-15	10-25	8-18	15-35	30-60	20-50	40-100	80-160
		3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 30	6 x ST 30	9 x ST 30	3 x ST 70	6 x ST 70	9 x ST 70
Overall length (mm)	A <sub>1</sub>	210			227			318			425		
Flange outside diameter (mm)	B	270			318			459			648		
Fit length / keyway length (mm)	C <sub>1</sub>	147			152			218			305		
Effective clamping length (mm)	C <sub>2</sub>	62			67			93			125		
Bore diameter possible Ø to Ø F7 (mm)	D <sub>1</sub>	65 - 110			70 - 150			80 - 200			140 - 290		
Bore diameter max. Ø F7 with keyway (mm)	D <sub>1</sub>	100			140			180			270		
Inside diameter (mm)	D <sub>2</sub>	110,2			140,2			200,2			290,2		
Flange centering diameter H7 (mm)	E	170			210			300			450		
Bolt circle diameter ±0.3 (mm)	F	220			260			360			570		
Outside diameter h7 (mm)	G	259			298			418			618		
Fastening threads	H	12 x M16			12 x M16			12 x M20			12 x M24		
Thread depth (mm)	I	25			30			35			40		
Fit length (mm)	J	6			8			8			10		
Tightening screw ISO 4017	K	8 x M16			9 x M16			8 x M20			8 x M24		
Tightening torque (Nm)		180			180			300			710		
Distance (mm)	L	72			80			94			151		
Distance (mm)	M	122			127			163			240		
Actuation path (mm)	N	4			4			7,5			10		
Bolt circle diameter - modules (mm)	O	220			270			376			532		
Hub outside diameter (mm)	P	218			278			378			535		
Moment of inertia (approx.) D max. (10 <sup>-3</sup> kgm <sup>2</sup> )		446			789			5700			30700		
Speed max. (1/min.)		4200			3800			2500			2000		
Allowable max. radial force standard* (KN)		40			60			100			200		
Approx. weight at D max. (kg)		50			65			200			550		

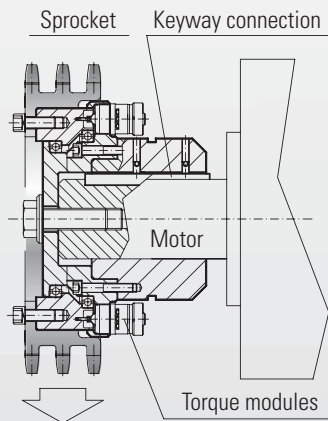
\* higher radial force through additional bearing support.





# MODEL ST1 / STN

## Mounting example with sprocket and keyway connection

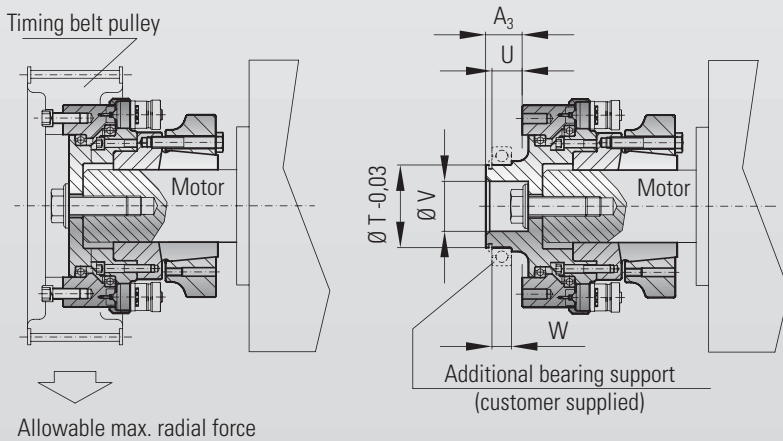


### Ordering example

ST1 / 025 / 4-15 / 12 / 120 / 25 / xx

Model	ST1
Series	025
Adjustment range (KNm)	4-15
Disengagement torque (KNm)	12
Bore Ø D H7	120
Bore for fastening screw (Ø Q)	25
Non-standard (e.g. stainless steel)	xx

## Mounting example with timing belt pulley and conical clamping hub



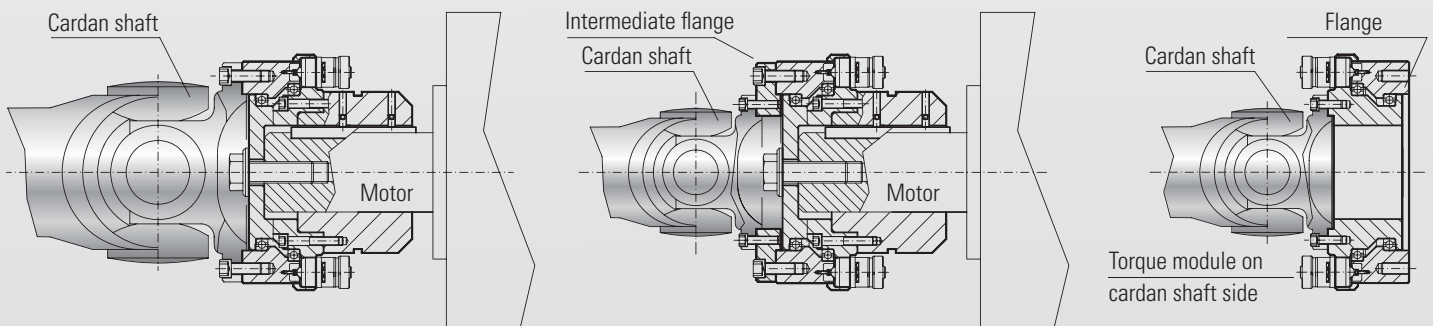
Allowable max. radial force

### Ordering example

STN / 025 / 4-15 / 12 / 120 / 25 / xx

Model	STN
Series	025
Bore Ø D H7	120
Bore for fastening screw (Ø Q)	25
Adjustment range (KNm)	4-15
Disengagement torque (KNm)	12
Non-standard (e.g. stainless steel)	xx

## Mounting example for cardan shafts



Bolt circle and centering diameter are matched to the cardan shaft.

Mounting with intermediate flange.

Flange mounting on both sides possible.



# Designs for Direct Drives

with integral elastomer jaw coupling

## MODEL ST 2



**Torque 1,000 – 160,000 Nm**

### Features

- Vibration damping
- Compensation for axial, lateral, and angular misalignment
- Robust
- Mounts axially

see pages 8/9

with integral disc pack coupling

## MODEL ST 3



**Torque 1,000 – 160,000 Nm**

### Features

- Torsionally rigid for precise torque transmission
- Compensation for axial, lateral, and angular misalignment
- Low restoring forces
- Wear and maintenance free

upon request

with integral gear coupling

## MODEL ST 4



**Torque 1,000 – 160,000 Nm**

### Features

- High torque density
- Compensation for axial, lateral, and angular misalignment
- Low restoring forces
- Robust

see page 10

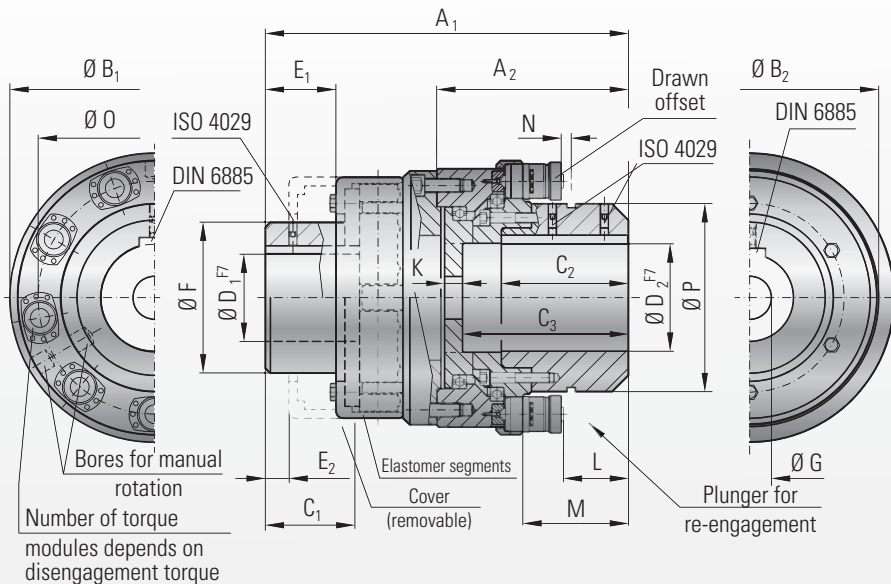


# MODEL ST 2

## TORQUE LIMITER



with integral elastomer coupling



### Material:

**Torque limiter:** High-strength, nitro-carburized steel

**Elastomer segments:** precision molded, wear resistant rubber compound (75-80 Shore A)

**Elastomer coupling:** coupling hubs made from high-strength, cast steel (coated)

**Design:** with keyway or spline connection. Elastomer segments for misalignment compensation. Torque modules evenly spaced around the circumference. Field adjustable within the selected range.

**Temperature range:** see page 9

**Service life:** Infinite life and maintenance free when operated within the technical specifications.

### Fit tolerance:

Tolerance between hub and shaft 0.02 – 0.07 mm

**Balancing:** Standard balancing G16

(higher speeds upon request)

MODEL ST 2		Series											
		10			25			60			160		
Adjustment range available from - to (KNm)		1-6	2-10	6-18	2-8	4-15	10-25	8-18	15-35	30-60	20-50	40-100	80-160
		3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 30	6 x ST 30	9 x ST 30	3 x ST 70	6 x ST 70	9 x ST 70
Overall length $\pm 2$	(mm) $A_1$	360			437			580			730		
Length of torque limiting portion	(mm) $A_2$	183			230			320			410		
Flange OD (ST portion)	(mm) $B_1$	270			318			459			648		
Flange OD (elastomer portion)	(mm) $B_2$	290			330			432			553		
Fit length/keyway length D1	(mm) $C_1$	97			116			160			230		
Fit length/keyway length D2	(mm) $C_2$	120			155			220			290		
Bore depth (torque limiting portion)	(mm) $C_3$	158			200			275			360		
Bore diameter (elastomer portion) $\varnothing - \varnothing F7$ (mm)	$D_1$	40-105*			60-130*			80-160*			100-200*		
Bore diameter (torque limiting portion) $\varnothing - \varnothing F7$ (mm)	$D_2$	40-110			60-140			80-200			100-290		
Length to cover	(mm) $E_1$	70			87			112			152		
Length to (cover removed)	(mm) $E_2$	22			26			40			65		
Hub diameter	(mm) $F$	160			200			255			300		
Bore for fastening screw	(mm) $G$	max. 110			max. 140			max. 200			max. 290		
Distance	(mm) $L$	45			83			96			136		
Distance	(mm) $M$	95			130			165			225		
Actuation path	(mm) $N$	4			4			7.5			10		
Bolt circle diameter ST	(mm) $O$	220			270			376			532		
Hub outside diameter	(mm) $P$	170			218			295			418		
Moment of inertia (approx.) $D$ max. ( $10^{-3}$ kgm <sup>2</sup> )		854			1850			8960			36858		
Speed max.	(1/min.)	2700			2300			1800			1500		
Approx. weight at $D$ max.	(kg)	80			115			287			729		
Axial	(mm)	1.5			1.5			2			2.5		
Lateral	(mm)	0.4			0.5			0.6			0.7		
Angular	(Degrees)	1			1			1			1		
Dynamic torsional stiffness at $T_{KN}$ (Standard A Insert) ( $10^3$ Nm/rad)		145			230			580			1000		

\* larger bore diameters upon request.





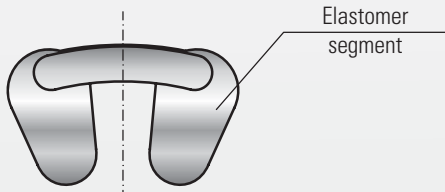
# MODEL ST2

## The elastomer segments

The compensating element of the ST2 torque limiters are the elastomer segments. These transmit the torque, while damping vibrations. The elastomer segments determine the properties of the entire coupling. The elastomer segments will also compensate for lateral, axial, and angular misalignment.

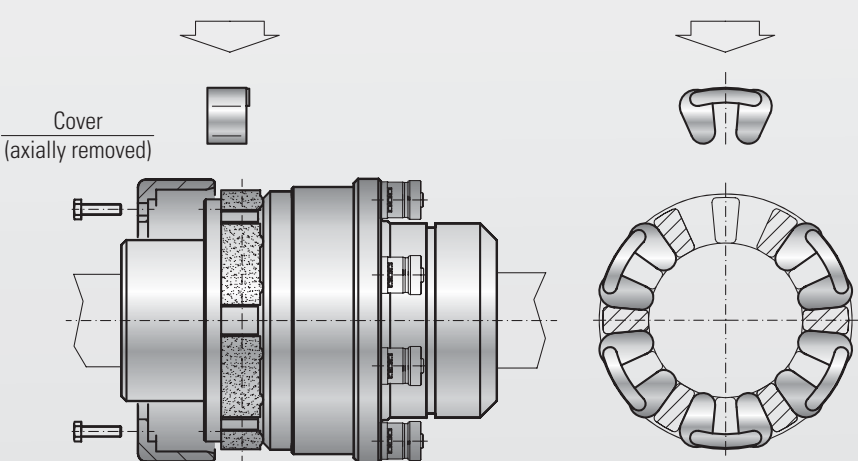
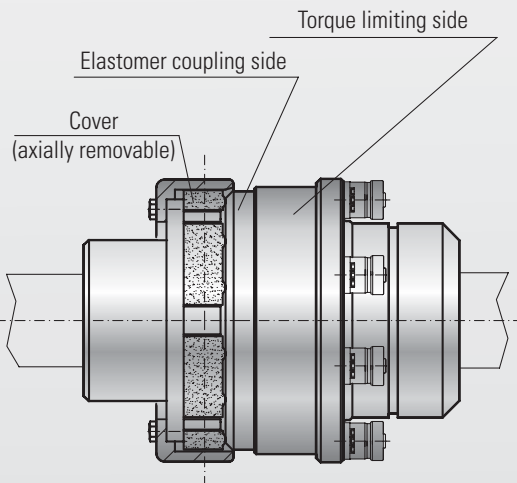
The standard elastomer segment is the type "A". Three different types are available.

Type	Relative damping ( $\psi$ )	Temperature range constant peak	Material	Shore hardness	Features
A (Standard)	1,0	-40°C to +80°C +90°C	Natural and synthetic rubber	75-80 Shore A	Very high wear resistance
B	1,0	-40°C to +100°C +120°C	Synthetic rubber	73-78 Shore A	Resistant to mineral oils and power fuel
C	1,0	-70°C to +120°C +140°C	Silicone rubber	70-75 Shore A	High temperature range



**Note:** Elastomer segments can easily be changed after installation. Every coupling utilizes 6x elastomer segments. The elastomer segments do not need to be installed prior to installation.

## Changing the elastomer segments



### Ordering example

ST2/025/10-25/15 / 100 / 120 / xx

Model	ST2
Series	025
Adjustment range (KNm)	10-25
Disengagement torque (KNm)	15
Bore $\varnothing$ D <sub>1</sub> F7	100
Bore $\varnothing$ D <sub>2</sub> F7	120
Non-standard (e.g. stainless steel)	xx

For easier handling, the coupling will be shipped unassembled.

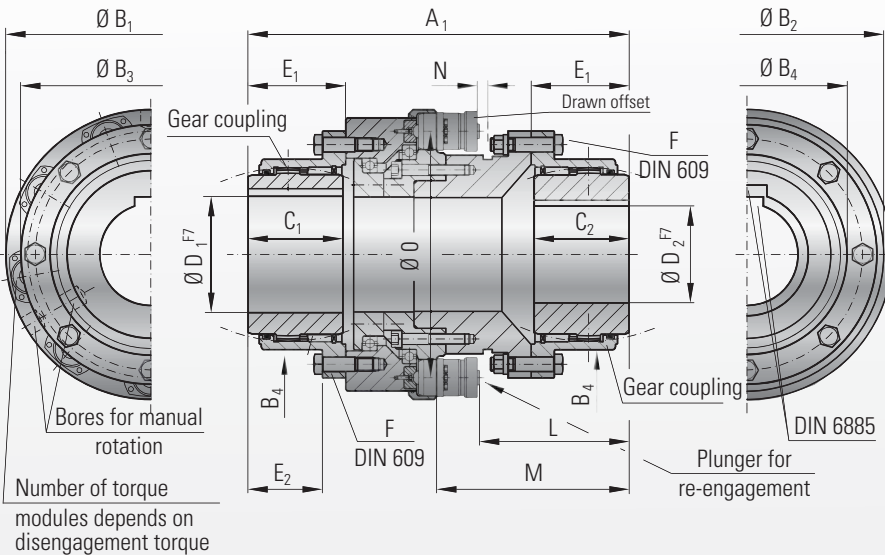
Full disengagement



# MODEL ST 4

## TORQUE LIMITER

with integral gear coupling



### Material:

**Torque limiter:** High-strength, nitro-carburized steel

**Gear coupling ends:** Extremely wear resistant tooth geometry made from high-strength alloyed steel (surface nitro-carburized)

**Design:** with keyway or spline connection. Gear coupling for misalignment compensation. Torque modules evenly spaced around the circumference. Field adjustable within the selected range.

**Temperature range:** -30 to +120° C

### Service life:

Infinite life and maintenance free when operated within the technical specifications.

### Fit tolerance:

Tolerance between hub and shaft 0.02 – 0.07 mm

**Balancing:** Standard balancing G16 (higher speeds upon request)

MODEL ST 4		Series											
		10			25			60			160		
Adjustment range available from - to (KNm)		1-6	2-10	6-18	2-8	4-15	10-25	8-18	15-35	30-60	20-50	40-100	80-160
		3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 15	6 x ST 15	9 x ST 15	3 x ST 30	6 x ST 30	9 x ST 30	3 x ST 70	6 x ST 70	9 x ST 70
Overall length (mm)	A <sub>1</sub>	377			430			615			850		
Flange OD (ST portion) (mm)	B <sub>1</sub>	270			318			459			648		
Mounting flange (ST portion) (mm)	B <sub>2</sub>	259			298			418			618		
Flange diameter (gear coupling) (mm)	B <sub>3</sub>	234			274			380			506		
Hub diameter (gear coupling) (mm)	B <sub>4</sub>	181			209			307			426		
Fit length/keyway length (mm)	C <sub>1/2</sub>	90			105			150			220		
Bore diameter Ø – Ø F7 (mm)	D <sub>1/2</sub>	40-112*			55-132*			90-198*			150-275*		
Length (mm)	E <sub>1</sub>	92.5			108			154			225		
Length (mm)	E <sub>2</sub>	70			79			116			196		
Screw DIN 609 12.9 (mm)	F	8 x M16			8 x M20			10 x M20			16 x M24		
Tightening torque (Nm)	F	280			650			650			1100		
Distance (mm)	L	146			172			237			320		
Distance (mm)	M	196			222			306			412		
Actuation path (mm)	N	4			4			7.5			10		
Bolt circle diameter ST (mm)	O	220			270			376			532		
Moment of inertia (approx.) D max. (10 <sup>-3</sup> kgm <sup>2</sup> )		545			1298			7547			39742		
Speed max. (1/min.)		2700			2300			1800			1500		
Approx. weight at D max. (kg)		69			115			325			870		
Axial (mm)		4			5			6			8		
Lateral (mm)		6			7			8			10		
Angular (Degrees)		1.2			1.2			1.2			1.2		

\* larger bore diameters upon request.

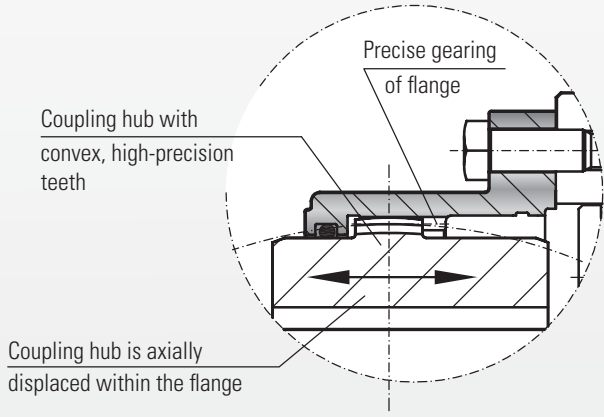


# MODEL ST 4

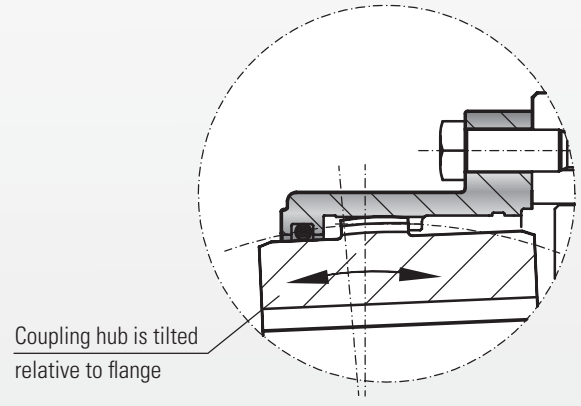
## Function of the gear coupling

Shaft misalignment is compensated for through the high precision gearing of the coupling hub and flange. The gearing transmits the torque with minimal backlash and a high degree of torsional rigidity. The precise geometry of the gearing ensures the performance of the coupling.

The gearing compensates for lateral, angular, and axial misalignment.

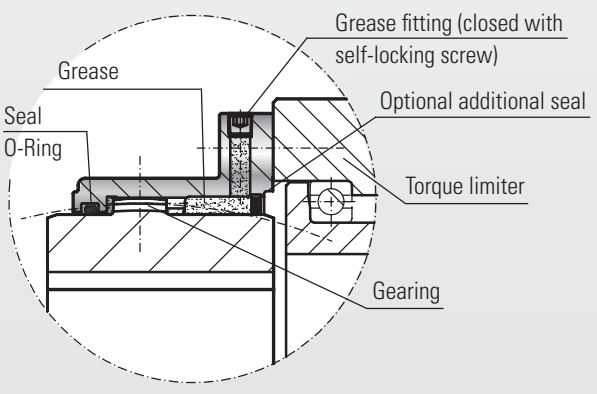


**Axial misalignment**



**Angular and lateral misalignment**

## Maintenance and lubrication



### Ordering example

**ST4 / 025 / 10-25 / 15 / 100 / 120 / xx**

Model	ST4
Series	025
Adjustment range (KNm)	10-25
Disengagement torque (KNm)	15
Bore Ø D <sub>1</sub> F7	100
Bore Ø D <sub>2</sub> F7	120
Non-standard (e.g. stainless steel)	xx

## Recommended lubricants

**Note:** The lubrication of the gearing is very important to the service life of the gear coupling.

An additional seal (optional) ensures the lubrication of the gearing over a long period of time.

Lubricant: High performance grease

Normal speed and operating load		High speed and operating load	
Castrol	Impervia MDX	Caltex	Coupling Grease
Esso	Fibrax 370	Klüber	Klüberplex GE 11-680
Klüber	Klüberplex GE 11-680	Mobil	Mobilgrease XTC
Mobil	Mobilux EPO	Shell	Albida GC1
Shell	Alvania grease EP R-O or ER 1	Texaco	Coupling Grease
Total	Specis EPG		

**For easier handling, the coupling will be shipped unassembled.**

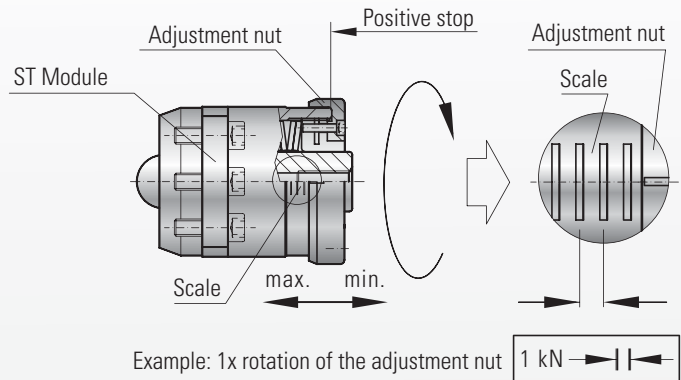
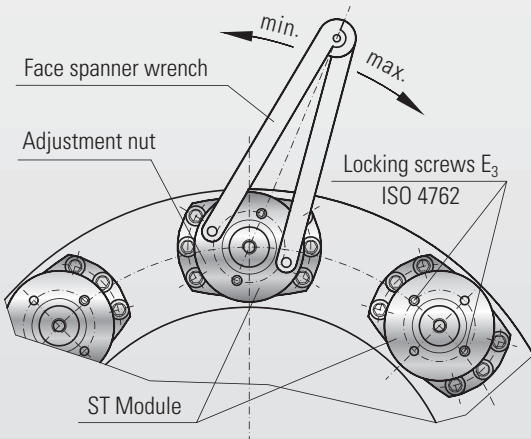


# MODEL ST 1 / STN / ST 2 / ST 3 / ST 4

## TORQUE LIMITEREN

### Mounting Instructions

#### Torque adjustment

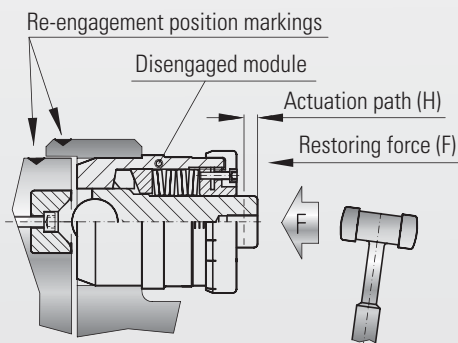


After loosening (approx. 1 rotation) the locking screws (E<sub>3</sub>), the adjustment nut be turned to adjust the disengagement setting. The adjustment is limited by a positive stop at the max setting. The upper value at min. is marked on the adjustment scale. After adjustment, the torque setting is secured by tightening the locking screws (E<sub>3</sub>).

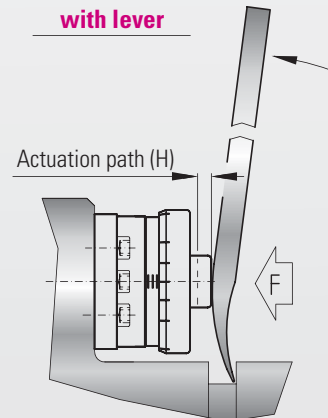
**Note:** All torque modules must be set to the same value.

### Re-engagement of the torque modules

#### with rubber mallet



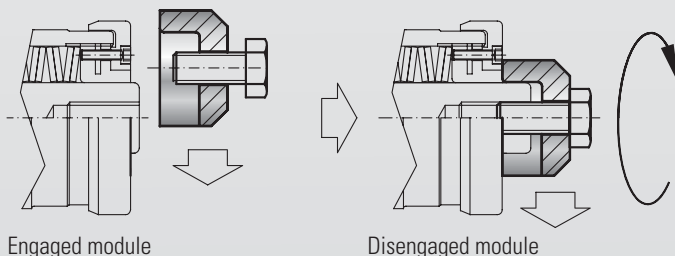
#### with lever



After the overload has been cleared, the drive and driven side must be rotated until the re-engagement position markings are lined up. The modules can only be re-engaged in this position.

The module is re-engaged through applying an axial force to the plunger. You will hear the module re-engage. Once this is complete, the torque limiter is ready for operation.

### Manual disengagement of modules



Prior to machine start-up, the individual modules can be manually disengaged in an assembled state. A manual disengagement tool is available from R+W for this task (see page 13).



# MODEL ATEX

## FOR USE IN EXPLOSIVE ATMOSPHERES

**Regulated under the new European directive, ATEX 95a. Explosive atmospheres are classified into 3 different zones.**

**Zone 0:** An explosive atmosphere consisting of a mixture of air and flammable substances, in the form of a gas, vapor, or mist, that is present frequently, continuously, or for extended periods of time.

**Zone 20:** An explosive atmosphere consisting of clouds of combustible dust in the air under the same conditions above.

**Zone 1:** An explosive atmosphere consisting of a mixture air and flammable substances, in the form of gas, vapor, or mist, that is likely to occur in normal operation occasionally.

**Zone 21:** An explosive atmosphere consisting of clouds of combustible dust in the air under the same conditions above.

**Zone 2:** An explosive atmosphere consisting of a mixture air and flammable substances, in the form of gas, vapor, or mist, that is unlikely to occur in normal operation, but would only persist for a short period of time if it were to occur.

**Zone 22:** An explosive atmosphere consisting of clouds of combustible dust in the air under the same conditions above.

**For zones 1/21 and 2/22, ST-EEx torque limiters can be supplied with ATEX 95a accreditation.**

**Mounting and operating instructions:**

Detailed mounting and instruction manuals are supplied with the ST-EEx torque limiters.

The following information is included:

- Assembly of the ST-EEx torque limiter
- Precise tightening torques and misalignment ratings
- Details covering proper implementation
- Maintenance
- Inspection intervals
- Troubleshooting
- Coupling identification markings
- Certificate of conformance

**Identification:**

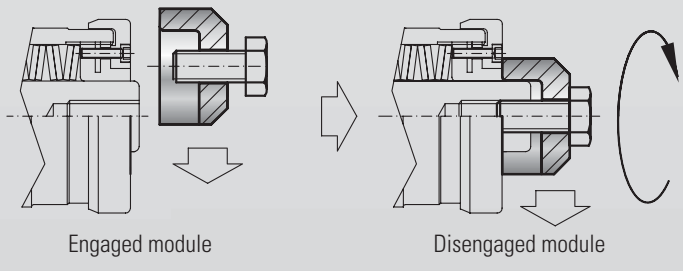
All ST-EEx torque limiters are inscribed with manufacturer and accreditation information.

**Accreditation information example:**

	Typ: ST4 25 EEx-2009 II 2 G D EEx fr c T3 / 135°C Ser.No.: A 200101.1 Tech.Ref.No.:2009/008RW
--	---

## ACCESSORIES

### Engagement / disengagement tool

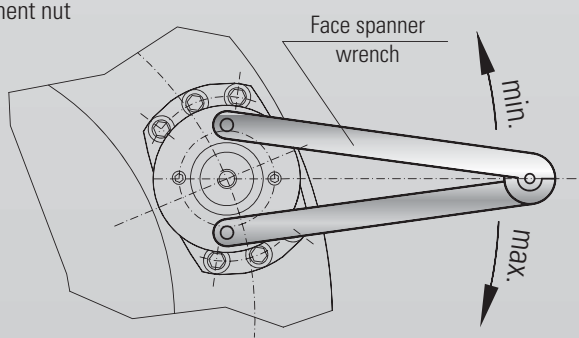


Order-No.: see table

Series	Engagement / disengagement tool
15	Order-No. AV/0015
30	Order-No. AV/0030
70	Order-No. AV/0070

### Face spanner wrench

For rotation of adjustment nut



Order-No.: see table

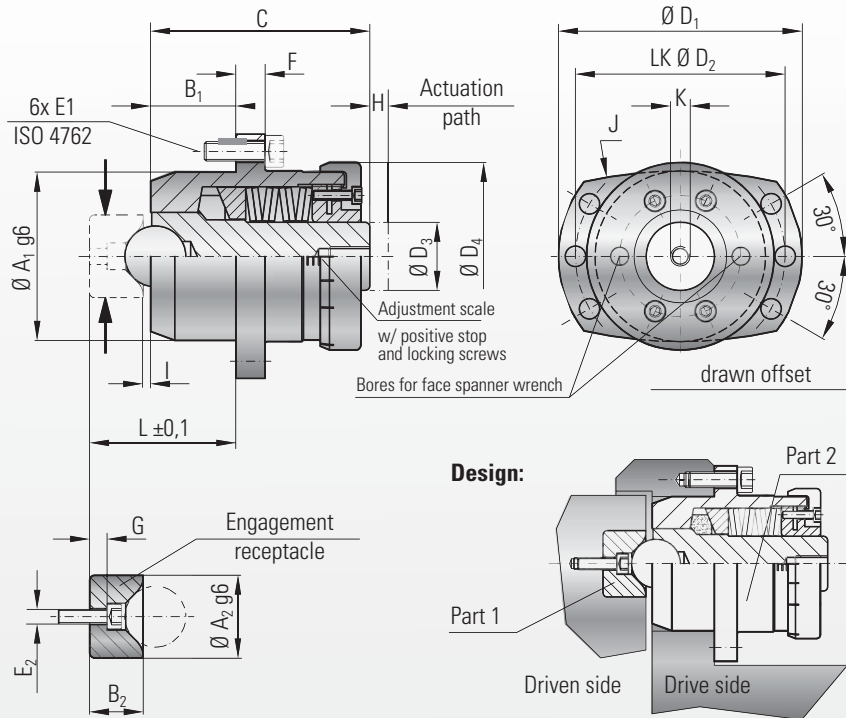
Series	Face spanner wrench
15	Order-No. SLS/0015
30	Order-No. SLS/0030
70	Order-No. SLS/0070





# MODEL ST

## TORQUE MODULE



**Material:** High-strength, nitro-carburized steel

**Design:** Two part assembly for installation into prefabricated coupling components.

**Part 1:** Engagement receptacle

**Part 2:** Module with self-contained, spring loaded plunger.

The spring tension is adjustable in the field.

The set force is visible on the adjustment scale.

**Temperature range:** -30 to +120° C

**Service life:** Infinite life and maintenance free when operated within the technical specifications.

**Fit tolerance:** For mounting of the ST torque modules, an H7 bore tolerance is required.

**Re-engagement:** The modules are re-engaged by applying an axial force to the plunger when a synchronized angularity of the drive and driven side is present.

MODEL ST		Series		
		15	30	70
Tangential force (KN) Adjustment range available from - to (ranges)	1	1-4	5-10	8-20
	2	2-8	10-20	15-40
	3	6-20	20-35	30-70
Centering diameter torque module g6 (mm)	A <sub>1</sub>	40	70	90
Centering diameter engagement receptacle g6 (mm)	A <sub>2</sub>	24	34	44
Centering length torque module (mm)	B <sub>1</sub>	20	35	45
Centering length engagement receptacle (mm)	B <sub>2</sub>	14	22	30
Overall length (mm)	C	70	103	135
Outside diameter (mm)	D <sub>1</sub>	59	100	129
Bolt circle diameter (mm)	D <sub>2</sub>	50	86	110
Diameter plunger (mm)	D <sub>3</sub>	16	28	35
Diameter adjustment nut (mm)	D <sub>4</sub>	44	75	92
Screw / tightening torque ISO 4762 (mm)	E <sub>1</sub>	6 x M5 x 16 / 10 Nm	6 x M8 x 25 / 40 Nm	6 x M12 x 35 / 120 Nm
Screw / tightening torque ISO 4762 (mm)	E <sub>2</sub>	M4 x 14 4.5 Nm	M6 x 20 15.5 Nm	M8 x 25 38 Nm
Flange thickness (mm)	F	7	12	16
Distance (mm)	G	5	8	10
Actuation path (mm)	H	4	7.5	10
Distance (mm)	I	2	3	4
Radius (mm)	J	110	200	250
Inner thread (mm)	K	M8 x 15	M10 x 25	M16 x 30
Distance ± 0,1 (mm)	L	36	60	79
Weight (kg)		0.65	2.7	6

axial spring force  $\approx$  tangential force/1.4



# MODEL ST

## Ordering example

ST / 30 / 2 / 12 / xx

Model	ST
Series	30
Adjustment range 1/2/3	2
Tangential force (KN)	12
Non-standard (e.g. stainless steel)	xx

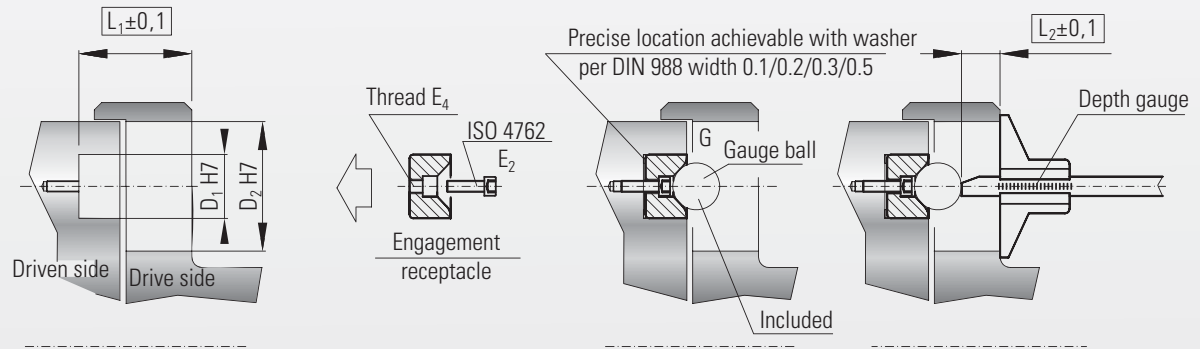
## Maintenance

The ST modules are lubricated and sealed for life. Routine maintenance is not required. The modules have an extreme service life, however, after several disengagements, the function of the modules should be checked.

## Mounting instructions ST

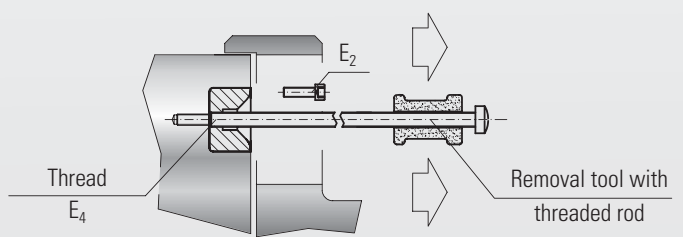
### Mounting engagement receptacle

**Note:** Measurements L1 and L2 must be checked prior to installing the torque modules.

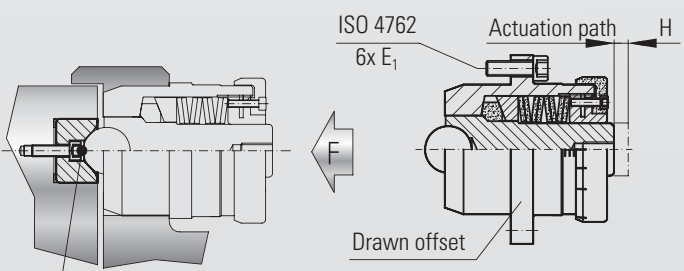


### Dismounting of engagement receptacle

After loosening the mounting screw E2, the engagement receptacle can be dismounted with a removal tool.



### Mounting of torque module



**Note:** Prior to mounting the torque module, the ball seat must be lubricated (e.g. Klüber Isoflex Topas NB 52).

MODEL ST	Series		
	15	30	70
Screws	E <sub>1</sub> 6 x M5 x 16 (12.9)	6 x M8 x 25 (12.9)	6 x M12 x 35 (12.9)
Tightening torque	10 Nm	40 Nm	120 Nm
Screws	E <sub>2</sub> 1 x M4 x 12	1 x M6 x 20	1 x M8 x 25
Tightening torque	4,5 Nm	15,5 Nm	38 Nm
Screws	E <sub>3</sub> 4 x M4 x 14	4 x M4 x 16	4 x M5 x 20
Tightening torque	4,5 Nm	4,5 Nm	10 Nm
Thread	E <sub>4</sub> M5	M8	M10
Actuation path	H 4 mm	7,5 mm	10 mm
Restoring force	F max. 2 KN	max. 4 KN	max. 6 KN
Fit length	L <sub>1</sub> ±0,1 36	60	79
Depth measurement	L <sub>2</sub> ±0,1 10	20,5	29
Gauge ball	Ø G 16	25	30



# SELECTION

## According to disengagement torque

As a rule, torque limiters are rated according to the required disengagement torque, which must be greater than the necessary operating torque.

The disengagement torque is determined according to the drive specifications.

The following formula provides a basis for calculation:

$$T_{AR} \geq K \cdot T_{max} \text{ (Nm)}$$

K = 1,3 uniform load  
 K = 1,5 light, non-uniform load  
 K = 1,8 sheavy, non-uniform load  
 or

$$T_{Drive} \geq 9550 \cdot \frac{P_{Drive}}{n} \text{ (Nm)}$$

- $T_{AR}$  = Disengagement torque of coupling (Nm)
- K = service factor
- $T_{max}$  = peak operating torque (Nm)
- $T_{Drive}$  = Nominal torque of drive (Nm)
- $P_{Drive}$  = Drive power (kW)
- n = Drive speed (min<sup>-1</sup>)

## According to acceleration torque (start-up at no load)

**S<sub>A</sub> = Shock or load factor**

- S<sub>A</sub> = 1 (uniform load)
- S<sub>A</sub> = 2 (non-uniform load)
- S<sub>A</sub> = 3 (highly dynamic load)

$$T_{AR} \geq \alpha \cdot J_L \geq \frac{J_L}{J_A + J_L} \cdot T_{AS} \cdot S_A \text{ (Nm)}$$

- $T_{AR}$  = Disengagement torque of coupling (Nm)
- $\alpha$  = Angular acceleration  $\frac{1}{s^2}$
- $\alpha = \frac{\omega}{t} = \frac{\pi \cdot n}{t \cdot 30}$
- t = Acceleration time (sec.)
- $\omega$  = Angular velocity (1/s)
- n = Drive speed (min<sup>-1</sup>)
- J<sub>L</sub> = Moment of inertia on load side (kgm<sup>2</sup>)
- J<sub>A</sub> = Moment of inertia on drive side (kgm<sup>2</sup>)
- T<sub>AS</sub> = Peak torque of motor (Nm)

## According to acceleration and load torque (start-up with load)

$$T_{AR} \geq \alpha \cdot J_L + T_{AN} \geq \left[ \frac{J_L}{J_A + J_L} \cdot (T_{AS} - T_{AN}) + T_{AN} \right] \cdot S_A \text{ (Nm)}$$

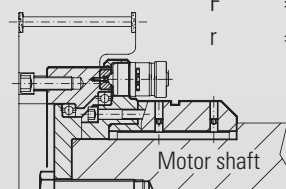
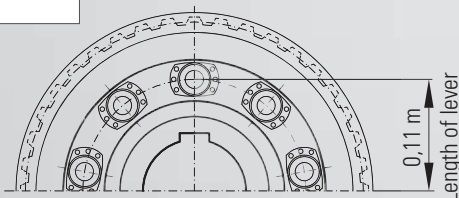
**S<sub>A</sub> = Shock or load factor**

- S<sub>A</sub> = 1 (uniform load)
- S<sub>A</sub> = 2 (non-uniform load)
- S<sub>A</sub> = 3 (highly dynamic load)

- $T_{AR}$  = Disengagement torque of coupling (Nm)
- $\alpha$  = Angular acceleration  $\frac{1}{s^2}$
- $\alpha = \frac{\omega}{t} = \frac{\pi \cdot n}{t \cdot 30}$
- t = Acceleration time (s)
- $\omega$  = Angular velocity (1/s)
- n = Drive speed (min<sup>-1</sup>)
- J<sub>L</sub> = Moment of inertia on load side (kgm<sup>2</sup>)
- T<sub>AN</sub> = Load torque (Nm)
- J<sub>A</sub> = Moment of inertia on drive side (kgm<sup>2</sup>)
- T<sub>AS</sub> = Peak torque of motor (Nm)

## According to number of torque modules

$$T_{AR} = S \cdot F \cdot r$$



- $T_{AR}$  = Disengagement torque of coupling (Nm)
- S = Number of torque modules
- F = Tangential force (kN)
- r = Length of lever (m)



# SELECTION

## According to linear feed force

Spindle drive

$$T_{AN} = \frac{s \cdot F_V}{2000 \cdot \pi \cdot \eta} \text{ (Nm)}$$

- $T_{AN}$  = Load torque (Nm)
- $s$  = Pitch (mm)
- $F_V$  = Linear feed force (N)
- $\eta$  = Efficiency factor

Timing belt drive

$$T_{AN} = \frac{d_0 \cdot F_V}{2000} \text{ (Nm)}$$

- $T_{AN}$  = Load torque (Nm)
- $d_0$  = Gear diameter (timing belt pulley) (mm)
- $F_V$  = Linear feed force (N)

## According to resonant frequency

The resonant frequency of the coupling must be higher or lower than the frequency of the machine.

The following calculation is used for a 2 mass system:

$$f_e = \frac{1}{2 \cdot \pi} \sqrt{C_T \times \frac{J_{Machine} + J_{Mot}}{J_{Machine} \cdot J_{Mot}}} \text{ (Hz)}$$

- $C_T$  = Torsional stiffness of coupling (Nm/rad)
- $J_{Masch.}$  = Moment of inertia total machine (Spindle + carriage + components + coupling half) (kgm<sup>2</sup>)
- $J_{Mot.}$  = Moment of inertia motor (Rotor + coupling half) (kgm<sup>2</sup>)
- $f_e$  = Resonant frequency of 2 mass system (Hz)

## Specifications of elastomer jaw coupling ST2

Series	ST2 / 10	ST2 / 25	ST2 / 60	ST2 / 160
$T_{KN}$ Rated torque (Nm)	10,000	15,000	40,000	80,000
$T_{Kmax}$ Peak torque (Nm)	22,000	33,000	88,000	176,000
Dynamic torsional stiffness (10 <sup>3</sup> Nm/rad)	145	230	580	1000
Relative damping	1	1	1	1

## Rating factors

### Shock or load factor $S_A$

Drive	Load variables of machine		
	G	M	S
Electric motors, turbines, hydraulic motors	1.25	1.6	2.0
Internal combustion engines ≥ 4 cylinders Degree of uniformity ≥ 1:100	1.5	2.2	2.5

G = Uniform load, M = Average load, S = Heavy load

### Temperature factor $S_v$

Ambient temperature	-40 C° +30 C°	+40 C°	+60 C°	+80 C°	> +80 C°
$S_t$	1.0	1.1	1.4	1.8	upon request

### Start factor $S_z$

Start frequency per hour	30	60	120	240	>240
$S_z$	1.0	1.1	1.2	1.3	upon request



# SELECTION

## According to torque

1. Calculation of drive torque  $T_{DR}$ .

$$T_{DR} \text{ [Nm]} = 9550 \frac{P \text{ [kW]}}{n \text{ [rpm]}}$$

2. Calculation of the rated torque of the coupling based on drive torque  $T_{DR}$  considering all rating factors.

$$T_{KN} \geq T_{DR} \times S_A \times S_v \times S_z$$

### Selection example:

Calculation of coupling for use between an electric motor (P= 450 kW at 980 rpm) and belt conveyor.

Uniform load present	= G	:	$S_A$	=	1.25
Ambient temperature	40°C	:	$S_v$	=	1.1
Start frequency	30/h	:	$S_z$	=	1.0

$$T_{DR} = 9550 \frac{450 \text{ kW}}{980 \text{ rpm}} = 4385.2 \text{ Nm}$$

$$T_{KN} \geq T_{DR} \times S_A \times S_v \times S_z$$
$$T_{KN} \geq 4385.2 \text{ Nm} \times 1.25 \times 1.1 \times 1.0 = 6029.7 \text{ Nm}$$

Selected coupling: ST2/10 with  $T_{KN}$  = 6030 Nm

## Classification of load by type of machine

### Excavators

- S bucket-chain excavators
- S traveling gear (caterpillar)
- M traveling gear (rails)
- M suction pumps
- S bucket wheels
- M slewing mechanisms

### Construction machines

- M concrete mixers
- M road construction machines

### Chemical industry

- M mixers
- G agitators (light fluids)
- M dryer drums
- G centrifuges

### Conveyor systems

- S conveyor machines
- G belt conveyors (bulk materials)
- M band pocket conveyors
- M chain conveyors
- M circular conveyors
- M hoists
- G flour bucket conveyors
- M screw conveyors
- M gravel bucket conveyors
- M steel belt conveyors

### Blowers, ventilators<sup>1</sup>

- G blowers (axial/radial) P:n ≤ 0.007
- M blowers (axial/radial) P:n ≤ 0.007
- S blowers (axial/radial) P:n ≤ 0.007
- G cooling tower fans P:n ≤ 0.007
- M cooling tower fans P:n ≤ 0.007
- S cooling tower fans P:n ≤ 0.007

### Generators, converters

- S generators

### Rubber machinery

- S extruders
- S kneading mills
- M mixers
- S rolling mills

### Woodworking machines

- G woodworking machines

### Cranes

- S traveling gear
- S lifting gear
- M slewing mechanisms

### Plastics machines

- M mixers
- M shredders

### Metalworking machines

- M sheet metal bending machines
- S plate straightening machines

- S presses
- M shears
- S stamp punches
- M machine tools, main drives

### Foodstuffs machines

- G filling machines
- M kneading machines
- M sugarcane crushers
- M sugarcane cutters
- S sugarcane mills
- M sugar beet cutters
- M sugar beet washers

### Paper machines

- S wood cutters
- S calenders
- S wet presses
- S suction presses
- S suction rollers
- S drying cylinders

### Pumps

- S piston pumps
- G rotary pumps
- S plunger pumps

### Stone, clay

- S crushers
- S rotary kilns

- S hammer mills
- S brick presses

### Textile machines

- M tanning vats
- M willows
- M looms

### Compressors

- S piston compressors
- M turbo-compressors

### Rolling mills

- M plate turner
- S pig transport equipment
- M wire drawing mills
- S descaling breakers
- S cold-roll mills
- M chain drags
- M traverse drags
- M roller tables
- S pipe welding machines
- S continuous casting machines
- M roller adjust mechanisms

### Laundry machines

- M drum dryers
- M washing machines

### Water treatment

- M aerators
- G water screw conveyors

<sup>1</sup>) P = Power of drive in kW  
n = speed in rpm





# SELECTION

## Specifications of gear coupling ST4

Series		ST4 / 10	ST4 / 25	ST4 / 60	ST4 / 160
T <sub>KN</sub> Rated torque	(Nm)	16,000	22,000	62,000	174,000
T <sub>Kmax</sub> Peak torque	(Nm)	32,000	44,000	124,000	348,000
Grease	(dm <sup>3</sup> )	0.5	0.8	1.5	3.3
n Ref (Speed max.)	(1/min.)	6,050	5,150	3,600	3,050

\* only allowable at reduced torque and misalignment

## Selection based on torque

1. Calculation of drive torque T<sub>DR</sub>.

$$T_{AN} \text{ [Nm]} = 9550 \frac{P \text{ [kW]}}{n \text{ [rpm]}}$$

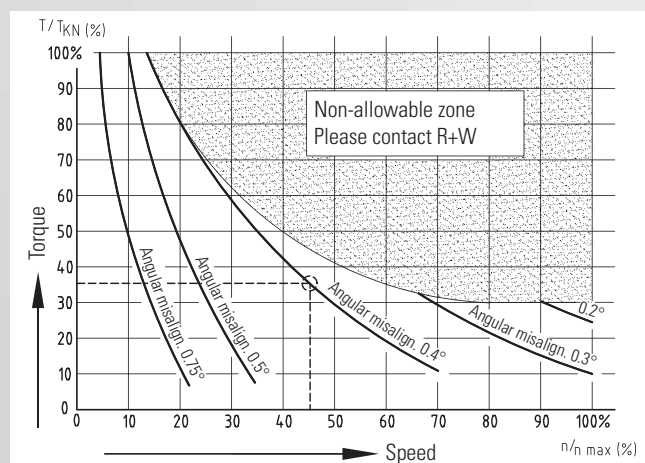
2. Calculation of the rated torque of the coupling based on drive torque T<sub>DR</sub> considering all rating factors (Shock or load factor S<sub>A</sub>, see page 17)

$$T_{KN} \geq T_{DR} \times S_A$$

## Application graph

Max torque, max speed, and max misalignment should never occur at the same time.

Calculation of T / T<sub>KN</sub> and n / n<sub>max</sub> ▶ Calculate values and enter and check in the diagram below.



**Example: Coupling ST4/10**

T = 5600 Nm       $T/T_{KN} = \frac{5600}{16000} \cdot 100 = 35\%$

n = 2700 rpm       $n/n_{max} = \frac{2700}{6050} \cdot 100 = 45\%$

Angular misalignment: 0.4°

▶ In allowable zone; selected coupling ST4 can be used.

## Selection example:

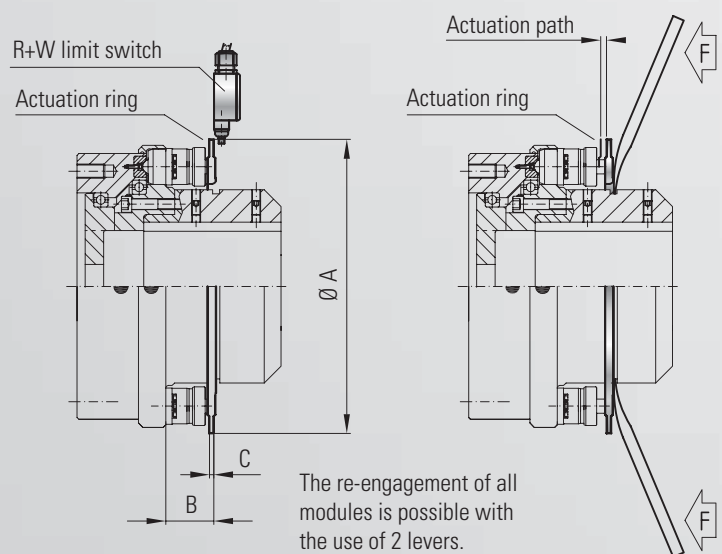
Calculation of a coupling for use between an electric motor (P= 1000 kW at 980 rpm) and screw conveyor (S<sub>A</sub>= 1.6).

$$T_{DR} = 9550 \frac{1000 \text{ kW}}{980 \text{ rpm}} = 9744 \text{ Nm}$$

$$\begin{matrix} T_{KN} \geq T_{AN} & \times & S_A \\ T_{KN} \geq 9744 \text{ Nm} & \times & 1.6 = 15,591 \text{ Nm} \end{matrix}$$

Selected coupling: ST4/10 with T<sub>KN</sub> = 16,000 Nm

## Optional actuation ring



MODEL ST 1	Series				
	10	25	60	160	
Outside diameter	A	278	328	upon request	upon request
Distance	B	57	57	upon request	upon request
Actuation ring thickness	C	4.5	4.5	upon request	upon request

# THE R+W-PRODUCT RANGE



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## **TORQUE LIMITERS Series SK/ST**

From 0.1 – 160,000 Nm, Bore diameters 3 – 290 mm  
Available as a single position, multi-position, load holding, or full disengagement version  
Single piece or press-fit design



## **BELLOWS COUPLINGS Series BK**

From 2 – 10,000 Nm  
Bore diameters 10 – 180 mm  
Single piece or press-fit design



## **LINE SHAFTS Series ZA/ZAe**

From 10 – 4,000 Nm  
Bore diameters 10 – 100 mm  
Available up to 6 mtr. length



## **MINIATURE BELLOWS COUPLINGS Series MK**

From 0.05 – 10 Nm  
Bore diameters 1 – 28 mm  
Single piece or press-fit design



## **SERVOMAX® ELASTOMER COUPLINGS Series EK**

From 2 – 2,000 Nm, Shaft diameters 3 – 80 mm  
backlash-free, press-fit design



## **ECOLIGHT® ELASTOMER COUPLINGS Series TX 1**

From 2 – 810 Nm  
Shaft diameters 3 – 45 mm



## **LINEAR COUPLINGS Series LK**

From 70 – 2,000 N  
Thread M5 – M16



## **POLYAMID COUPLINGS MICROFLEX Series FK 1**

Rated torque 1 Ncm  
Bore diameters 1 – 1.5 mm