

Assembly instructions

Torque limiter

TL1 / TL2 / TL3



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1 About this manual

This operating manual contains necessary information to safely operate the coupling.

If this manual is supplied with any amendments (e.g. for special applications), the information in the amendments is primarily and exclusively valid.

The operator must ensure that this operating manual is read and fully understood by all persons assigned to install, operate, or maintain the coupling.

This manual should be stored where it can be easily accessed near the coupling.

Inform colleagues who work in the area around the machine about the **safety and warning notices** to avoid injuries.

The original instructions were prepared in German; all other language versions are translations of these instructions.

1.1 Information symbols and cross references

The following information symbols are used:

- Indicates an action to be performed
- ➡ Indicates the results of an action
- ① Provides additional information about the action

A cross reference refers to the chapter number and the header of the target section (e. g. 2.3 "Intended use").

A cross reference on a table refers to the table number (e. g. Table "Tbl-15").

1.2 Scope of delivery

- Check the completeness of the delivery against the delivery note.
 - ① Missing parts or damage must be notified immediately in writing to the carrier, the insurance company, or **WITTENSTEIN alpha GmbH**.

2 Safety

These instructions, especially the safety and warning notices and the rules and regulations valid for the operating site, must be observed by all persons working with the coupling.

The following, especially, must be strictly adhered to:

- Observe the instructions for transport and storage.
- Use the coupling only in accordance with its intended use.
- Carry out maintenance and repair work appropriately and professionally in conformity with the specified intervals.
- Always mount, dismantle, and operate the coupling properly (e.g. even test run only with secure mounting).
- In accordance with his risk assessment, the manufacturer of the higher-level machine shall, if necessary, install protective devices and equipment to protect the user from the residual hazards of the coupling. Operate the coupling only if these protective devices and guards are intact and active.
- Prevent the coupling from becoming extremely soiled.
- Only carry out modifications or reconstructions when these are approved in writing by the **WITTENSTEIN alpha GmbH**.

Personal injuries or material damage, or other claims arising from non-observance of these minimum requirements, are the sole responsibility of the operator.

In addition to the safety-related information in this manual, also observe any legal and otherwise applicable rules and regulations, particularly for accident prevention (e.g. personal safety equipment) and environmental protection.

2.1 Product conformity

2.1.1 Machine safety

The coupling is considered a "machine component" and is therefore not subject to the EC Machinery Directive 2006/42/EC.

Startup is prohibited within the scope of the EC directive until it has been determined that the machine in which this coupling is installed corresponds to the regulations within this directive.

2.2 Personnel

Only technicians who have read and understood this operating manual may perform work on the coupling. Based on their training and experience, technicians must be able to evaluate the tasks assigned to them in order to recognize and avoid risks.

2.3 Intended use

The coupling is used for torque transmission and is intended for mounting on shafts while complying with the performance data. It is suitable for all industrial applications.

The coupling may not be operated in potentially explosive atmospheres.

The coupling has been constructed according to current technological standards and accepted safety regulations.

- To avoid any hazard to the operator or damage to the machine, use the coupling only in accordance with its intended use and in a technically flawless and safe condition.
- If you notice any altered operating behavior, check the coupling in accordance with chapter 8 "Malfunctions".
- Read the general safety instructions before starting any work (see chapter 2.5 "General safety instructions").

2.4 Reasonably foreseeable misuse

Any use is prohibited if

- it contradicts the requirements of chapter 2.3 "Intended use",
- it exceeds the permissible technical data, e.g. speed, force and torque load, temperature, service life (see also chapter 3.3 "Dimensions and performance data").

2.5 General safety instructions

The functioning of the coupling involves residual risks even when adhering to the intended use.

Rotating components can cause serious injuries:

- Before startup, remove objects, loose components, and tools from the coupling, in order to avoid danger from thrown parts.
- Keep a sufficient distance to moving machine components when the coupling is running.
- Secure the higher-level machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes).

A **hot coupling** can cause serious burns:

- Only touch the hot coupling with protective gloves.

Loose or overloaded screw connections can cause damage to the coupling:

- Use a calibrated torque wrench to tighten and check all screw connections for which tightening torques have been specified.

Solvents are flammable, can cause skin irritation, and can pollute soil and water:

- In case of fire: Do not use a jet of water to extinguish.
 - ① Suitable extinguishing agents are powder, foam, water mist and carbon dioxide.
- Use protective gloves to avoid direct skin contact with solvents.
- Use and dispose of solvents properly.

A **damaged coupling** can cause accidents and injury:

- Immediately shut down the coupling that has been overloaded due to misuse or a machine crash (see chapter 2.4 "Reasonably foreseeable misuse").
- Replace the damaged coupling, even if no external damage is visible.

2.6 Signal words

The following signal words are used to indicate possible hazards, prohibitions, and important information:

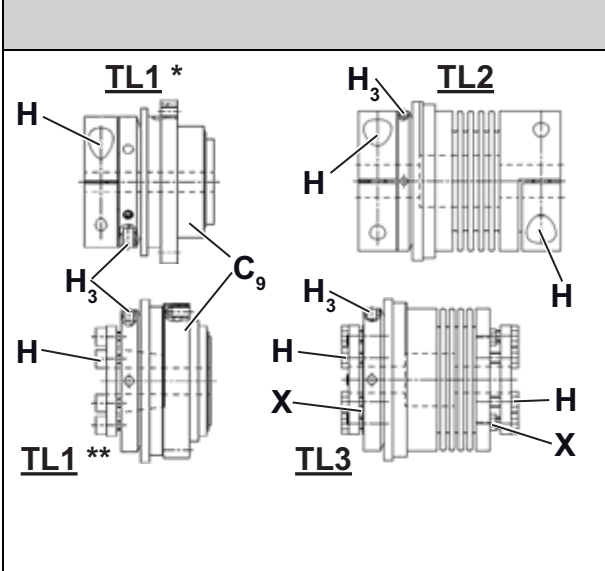
| | |
|--|--|
| | <p style="text-align: center;">⚠ DANGER</p> <p>This signal word indicates an imminent danger that will cause serious injuries or even death.</p> |
| | <p style="text-align: center;">⚠ WARNING</p> <p>This signal word indicates a potential hazard that could cause serious injuries and even death.</p> |
| | <p style="text-align: center;">⚠ CAUTION</p> <p>This signal word indicates a potential hazard that could cause minor or serious injuries.</p> |
| | <p style="text-align: center;">NOTICE</p> <p>This signal word indicates a potential hazard that could lead to material damage.</p> |
| | <p>A note without a signal word indicates application hints or especially important information for handling the coupling.</p> |

3 Coupling description

WITTENSTEIN alpha torque limiter couplings operate as spring-loaded form-fit couplings, protecting downstream components from overload. The torque limiter couplings are factory adjusted to the specified disengagement torque, which is marked on the coupling. Torque transmission of the torque limiter couplings takes place without backlash via hardened balls arranged in conical countersinks on the circumference. The balls are pressed into these counterbores by the disc springs via an actuation ring. The disengaging torque is continuously adjustable via the adjustment nut. In the event of an overload, the actuation ring moves away to the rear by pushing through the disc springs. Input and output sides are separated. The axial travel of the actuation ring activates the mechanical limit switch or proximity switch and switches off the input.

For the use of the coupling, both external conditions (e.g. dust, high humidity, temperature, etc.) as well as the technical design (torque to be transmitted, maximum speeds, shaft diameter, etc.) should be inspected for compliance with the maximum permissible values listed in our accessories product catalog (www.wittenstein-alpha.de).





3.1 Overview of coupling components

| Coupling components | | |
|--|----------------|--|
|  | TL1 * | Miniature version with standard clamping hub |
| | TL1 ** | Standard version with tapered clamping hub |
| | TL2 | Coupling with standard clamping hub |
| | TL3 | Coupling with tapered clamping hub |
| | C ₉ | Mounting flange |
| | H | Clamping screw |
| | H ₃ | Bore for torque adjusting wrench |
| | X | Forcing screw |

Tbl-1: Overview of coupling components

3.1.1 Functional systems

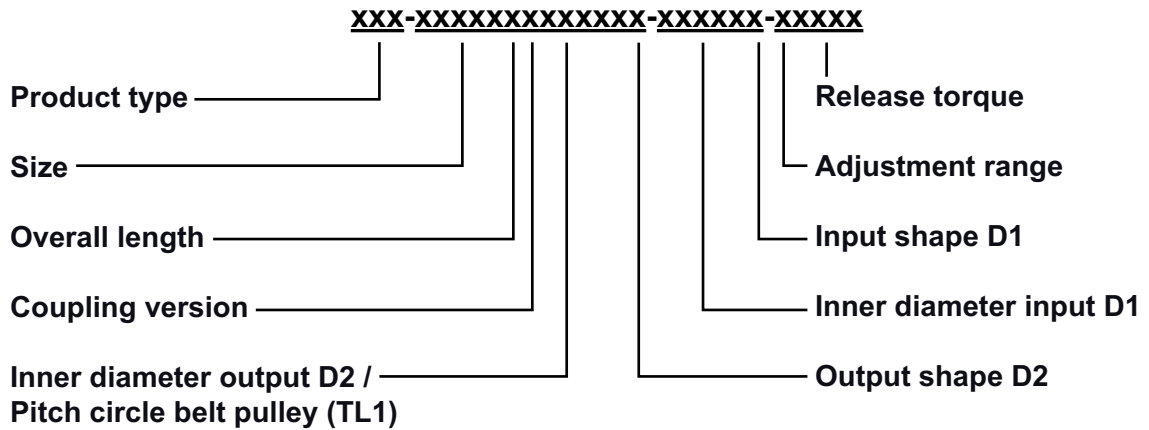
The coupling is available in the following functional systems:

| | Coupling version |
|---|--|
|  | <p>Angle-synchronous re-engagement - Standard</p> <p>Once the overload has been removed, re-engagement of the torque limiter coupling is possible after exactly 360 degrees of the original disengagement position. Guaranteed synchronism thanks to proven principle. Switch signal in the event of overload. Use of the torque limiter coupling e.g. in machine tools, packaging machines and automation systems.</p> |
|  | <p>Locked version</p> <p>In case of overload, no or only limited separation of input and output. Ensuring that the load is secured. Automatic engagement of the torque limiter coupling possible after torque drop. Switch signal in the event of overload. Use, for example, on presses or load-lifting equipment.</p> |
|  | <p>Multi-position</p> <p>A multi-position coupling automatically re-engages at the directly following ball recess. The multi-position coupling is ready for operation again immediately after an overload event at several points. Immediate availability of the machine or system after the overload has passed. Switch signal in the event of overload. Default setting after 60 degrees. Engagement after 30, 45, 60, 90 and 120 angular degrees optional.</p> |
|  | <p>Full engagement</p> <p>In the event of an overload, permanent separation of the input and output sides. Spring jumps completely switching signal on overload. No residual friction. Torque limiter coupling is re-engaged manually (re-engagement possible every 60 degrees).</p> |

Tbl-2: Functional systems

3.2 Ordering code

① The ordering code is specified on the delivery note.



More information is available in our catalog or at www.wittenstein-alpha.de.

3.3 Dimensions and performance data

The dimensions, the maximum permissible speeds and torques, and information on the service life can be found

- in our accessories product catalog,
- under www.wittenstein-alpha.de
- in the **cymex**[®] design software,
- in the respective customized performance data (X093-D...).

Consult our Customer Service department if the coupling is older than one year. The user will then receive the valid performance data.


4 Transport and storage


4.1 Packaging

The coupling is delivered packed in foil and cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the applicable national regulations concerning disposal.

4.2 Transport

| | |
|---|---|
|  | ⚠ WARNING |
| | <p>Suspended loads can fall and can cause serious injuries and even death.</p> <ul style="list-style-type: none"> • Do not stand under suspended loads. • Secure the coupling before transport with suitable fasteners (e.g. belts). |

| | |
|---|---|
|  | NOTICE |
| | <p>Hard knocks, for instance because of falling or hard dropping, can damage the coupling.</p> <ul style="list-style-type: none"> • Only use hoisting equipment and lifting accessories with sufficient capacity. • Never exceed the maximum permissible load for hoisting equipment. • Slowly put down the coupling. |

The table "Tbl-3" specifies the maximum coupling weights. Depending on the version, the actual weight can be considerably less.

| | | | | | | | | |
|----------------------------|------------|------------|------------|------------|------------|-------------|-------------|-----------|
| Series TL. | 1.5 | 2 | 4.5 | 10 | 15 | 30 | 60 | 80 |
| Maximum weight [kg] | 0.047 | 0.07 | 0.2 | 0.3 | 0.4 | 0.7 | 1.2 | 2.0 |
| Series TL. | 150 | 200 | 300 | 500 | 800 | 1500 | 2500 | |
| Maximum weight [kg] | 2.4 | 4.0 | 5.9 | 9.6 | 14 | 21 | 35 | |

Tbl-3: Maximum weight [kg]

4.2.1 Transport of couplings up to and including series 1500

No special transport mode is prescribed for transporting the coupling.

4.2.2 Transport of couplings as of series 2500

For series 2500 and higher, we recommend the use of hoisting equipment.

4.3 Storage

Store the coupling in a dry area in the closed original packaging.

For storage logistics, we recommend the "first in - first out" method.

5 Assembly

- Read the general safety instructions before beginning to work (see Chapter 2.5 "General safety instructions").
- If you have questions about correct mounting, consult our Customer Service department.

5.1 Preparations

| | |
|--|---|
| | <h3>⚠ CAUTION</h3> |
| | <p>Burrs can damage components and cause injury.</p> <ul style="list-style-type: none"> • Remove burrs and dirt from components to be connected, such as shafts and couplings, before assembly. • Wear protective gloves. |
| | <p>Lubricants can reduce the transmission of force in the area of the coupling (slippage).</p> <ul style="list-style-type: none"> • Do not use any oils/greases with molybdenum disulfide or other high-pressure additives or gliding pastes. |

- Clean/de-grease the following components with a clean and lint-free cloth and grease-dissolving, non-aggressive detergent:
 - All fitting surfaces to neighboring components
 - Bores, hubs and the shafts to be connected
- In addition, check the fitting surfaces for damage and impurities.
- Check all connection dimensions (e.g. shafts) and check tolerances (e.g. key dimensions). The coupling has a H7 fit. The fit tolerance of the shaft/hub connection has to lie between 0.01 and 0.05 mm.
- Check that the coupling runs smoothly on the shaft.

During assembly and disassembly, the coupling must not be displaced by more than 1.5 times the permissible misalignment values specified in the catalog.

- Avoid applying any type of force.

5.1.1 Types of misalignment

| Axial misalignment (ΔK_a) | Angular misalignment (ΔK_w) | Lateral misalignment (ΔK_r) |
|---|--|--|
| | | |
| <p>The axial misalignment is the term for the misalignment in the length of an axis or shaft, i.e., in the axial direction. [specification in mm]</p> | <p>The angular misalignment is the term for the angular misalignment of two shafts in relation to each other. [specification in °]</p> | <p>The lateral misalignment is the term for the misalignment parallel to the shaft axis. [specification in mm]</p> |

Tbl-4: Types of misalignment

| | |
|--|---|
| | <p>Observe maximum values to offset.</p> <ul style="list-style-type: none"> • Ensure that the maximum values are not exceeded during operation. • Refer to the catalog for the maximum values of the misalignments (lateral, axial, angular) under www.wittenstein-alpha.de. |
|--|---|

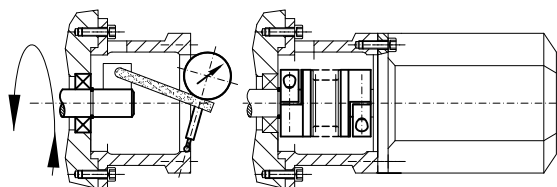
The lateral misalignment is detrimental to the service life of the metal bellows.

Accurate alignment of the coupling significantly increases the service life of the metal bellows. The loads for the neighboring bearings are reduced and the smooth running of the entire drive train is influenced positively.

For inputs with very high speeds, we recommend aligning the coupling with a dial gauge.

5.2 Mounting of the coupling

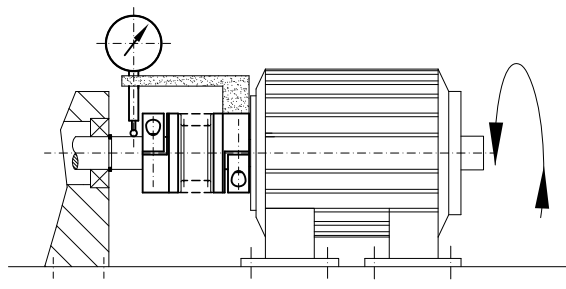
- When mounting the coupling, observe the different types of mounting:



Installation with intermediate housing

When the coupling is installed in a housing:

- Arrange the centering of the fit and the plane parallelism of the machine/housing and housing/input as precisely as possible, in order to minimize misalignments.



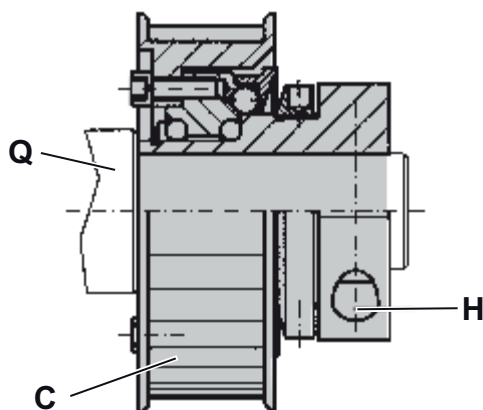
Open installation

For open installation of the coupling between gearbox/motor with feet as well as installation of the connecting load shaft.

- Carefully and thoroughly perform the alignment using a dial gauge, straight edge, or sensing gauge.

5.2.1 Mounting of TL1

Mounting of the coupling with clamping hub (TL1)




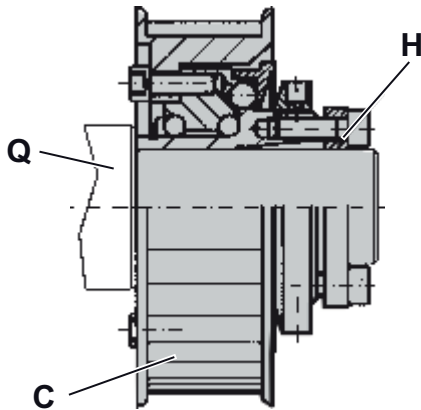
- Slide the complete coupling [C] onto the motor shaft/gearbox shaft stub [Q] until the correct axial position is reached.
- Tighten the clamping screw [H] with a torque wrench.
 - ① The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
 - ➡ The coupling must lie flush across the entire fitting length.

For information on **disassembly** of the coupling:

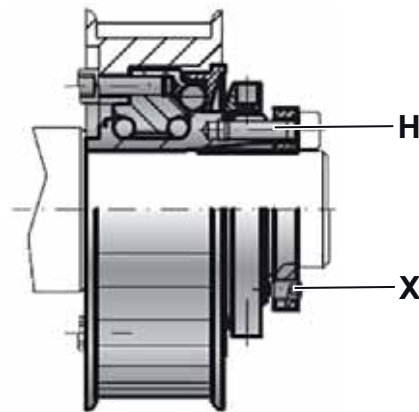
- Loosen the clamping screw [H].

Mounting of the coupling with tapered clamping hub (TL1)

| | |
|---|---|
|  | NOTICE |
| | <p>Risk of destruction of the clamp connection.</p> <ul style="list-style-type: none"> ● Tighten the clamping screws [H] in several cycles. ● Do not tighten coupling any further. This is possible and can damage the coupling. |



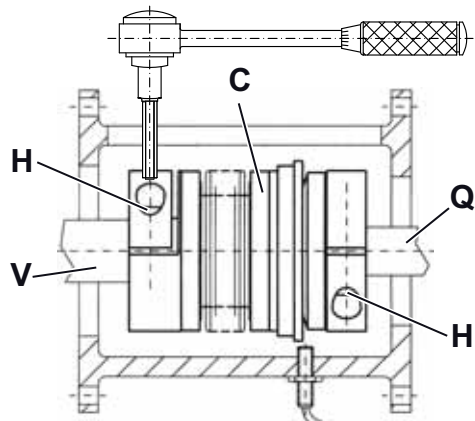
- Slide the complete coupling [C] onto the motor shaft/gearbox shaft stub [Q] until the correct axial position is reached.
- Tighten the clamping screws [H] on the input side as follows:
 - using the torque wrench
 - in order
 - in three circular passes with 1/3, 2/3 and the entire prescribed tightening torque
- ① When the clamping screws are tightened, the coupling shifts slightly in the direction of the tapered clamping hub.
- The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
- The clamping process is finished. Further tightening of the clamping screws [H] may damage the coupling.



For information on **disassembly** of the coupling:

- Evenly loosen the clamping screws [H].
- Evenly screw the forcing screws [X] into the tapered clamping hub. Use it to push off the tapered clamping hub.
- Screw the forcing screws [X] back immediately.

5.2.2 Mounting of TL2




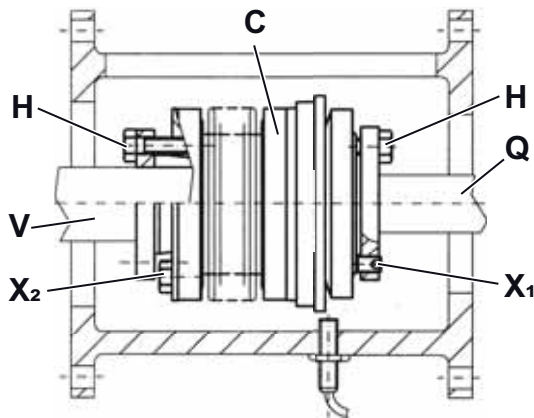
- Slide the complete coupling [C] onto the motor shaft/gearbox shaft stub [Q] until the correct axial position is reached.
- Tighten the clamping screw [H] with a torque wrench.
 - ① The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
- Guide the ball screw/load shaft stub [V] into the coupling until the correct axial position is reached.
- Tighten the clamping screw [H] on the output side with a torque wrench.
 - ① The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
 - ➡ The coupling must lie flush across the entire fitting length.

For information on **disassembly** of the coupling:

- Loosen the clamping screws [H].

5.2.3 Mounting of TL3

| | |
|---|---------------|
|  | NOTICE |
| <p>Risk of destruction of the clamp connection.</p> <ul style="list-style-type: none"> ● Tighten the clamping screws [H] in several cycles. ● Do not tighten coupling any further. This is possible and can damage the coupling. | |



- Slide the complete coupling [C] onto the motor shaft/gearbox shaft stub [Q] until the correct axial position is reached.
- Tighten the clamping screws [H] on the input side as follows:
 - using the torque wrench
 - in order
 - in three circular passes with 1/3, 2/3 and the entire prescribed tightening torque
- The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
- The clamping process is finished. Further tightening of the clamping screws [H] may damage the coupling.
- Tighten the clamping screws [H] on the output side with a torque wrench.
 - ① The screw size and specified tightening torque can be found in chapter 9.1 "Information for mounting the coupling".
 - ➔ The coupling must lie flush across the entire fitting length.

For information on **disassembly** of the coupling:

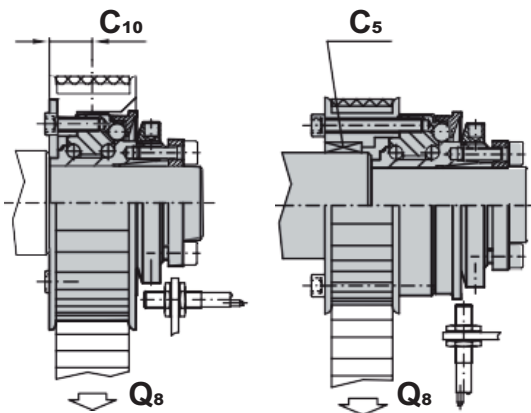
- Evenly loosen the clamping screws [H] by approx. 2 – 3 mm.
- Evenly screw the forcing screws [X₁] into the tapered clamping hub. Use it to push off the tapered clamping hub.
- Evenly screw the forcing screws [X₂] out of the tapered clamping hub. Use it to push off the tapered clamping hub.
- Screw the forcing screws [X] back immediately.

5.2.4 Attachments to coupling TL1

The coupling has an integrated bearing [C₅] for the attachment (e.g. toothed belt pulley, chain sprocket).

- Observe the max. lateral force [Q₈], see table "Tbl-6".

If the spacing [C₁₀] is observed, the force is introduced between both balls. Separate bearing is not required. For offset installation, an additional bearing must be provided. This is recommended e.g. for small diameters or extreme width of the attachment. Depending on the mounting situation, ball bearings, needle bearings or plain bearings are suitable as bearing supports.

| TL1 | | Designation |
|---|-----------------|--------------------|
|  | C ₅ | Storage |
| | Q ₈ | Max. lateral force |
| | C ₁₀ | Spacing |

Tbl-5: Assembly instruction TL1

| Series | Max. lateral force [N] | Spacing [mm] | Clamping hub | | Tapered clamping hub | |
|----------|------------------------|--------------|--------------------------|------------------------|-------------------------------------|------------------------|
| | | | Fastening screw ISO 4762 | Tightening torque [Nm] | Fastening screw ISO 4017 / ISO 4762 | Tightening torque [Nm] |
| 1.5 | 50 | 3 – 6 | M2.5 | 1 | — | — |
| 2 | 100 | 5 – 8 | M3 | 2 | — | — |
| 4.5 | 200 | 6 – 11 | M4 | 4 | — | — |
| 10 | 600 | 6 – 14 | M4 | 4.5 | — | — |
| 15 | 1400 | 7 – 17 | M5 | 8 | M4 | 4 |
| 30 | 1800 | 10 – 24 | M6 | 15 | M5 | 6 |
| 60 | 2200 | 10 – 24 | M8 | 40 | M5 | 8 |
| 80 / 150 | 3000 | 10 – 24 | M10 | 70 | M6 | 12 |
| 200 | 3400 | 12 – 26 | M12 | 120 | M6 | 14 |
| 300 | 4400 | 12 – 28 | M12 | 130 | M8 | 18 |
| 500 | 5600 | 16 – 38 | M16 | 200 | M8 | 25 |
| 800 | 8000 | 16 – 42 | 2x M16 | 250 | M10 | 40 |
| 1500 | 10000 | 20 – 50 | 2x M20 | 470 | M12 | 70 |
| 2500 | 14000 | 28 – 60 | — | — | M16 | 120 |

Tbl-6: Information for installation at coupling TL1

5.2.5 Disengaging torque setting

| | | Designation |
|--|-----------------------|-------------------------|
| | C₈ | Positive stop |
| | C₁₁ | Steel actuation ring |
| | C₁₂ | Adjustment range |
| | C₁₃ | Marking |
| | H₄ | Adjustment nut |
| | H₅ | Locking screw |
| | Z₇ | Torque adjusting wrench |

Tbl-7: Disengaging torque setting

Torque limiter couplings are set and marked at the factory to the desired disengaging torque.

For the couplings, the reference for the marking is

- TL1 (series 1.5 - 10) / TL2 the slot of the clamping hub.
- TL1 (Series 15 - 2500) / TL3 a reference mark on the tapered clamping hub.

The min. to max. adjustment range is indicated on the adjustment nut [H₄]. The disengaging torque can be continuously adjusted within the adjustment range [C₁₂] by different pretensioning of the disc springs.

ⓘ The adjustment range must not be left during adjustment.

After loosening the locking screws [H₅], the disengaging torque can be changed using a suitable tool, e.g. torque adjusting wrench (DIN 1816). Afterwards, retighten the 3x locking screws [H₅].

| NOTICE | |
|---------------|--|
| | <p>Torque limiter couplings are fitted with disc springs with special spring characteristics.</p> <ul style="list-style-type: none"> • The operating range for the disengaging torque from min. to max. lies on the descending branch of the disk spring characteristic curve and must not be fallen below or exceeded, see table "Tbl-8". |

| | | Designation |
|--|-----------------------|--------------------|
| | A | Spring travel |
| | B | Spring force |
| | C₁₂ | Adjustment range |
| | D | Actuation distance |

Tbl-8: Disc spring characteristic

6 Startup and operation

- Read the general safety instructions before beginning to work (see Chapter 2.5 "General safety instructions").

Improper use can cause damage at the coupling.

- Make sure that the **operating temperature** is not exceeded.
 - ① Information about your coupling is available in the catalog under www.wittenstein-alpha.de, or from our Customer Service / Sales department.
- Use the coupling only up to its maximum limits, see chapter 3.3 "Dimensions and performance data". For other conditions of use, consult our Customer Service department.

7 Maintenance and disposal

- Read the general safety instructions before beginning to work (see Chapter 2.5 "General safety instructions").

7.1 Maintenance schedule

| Maintenance work | At startup | First time after 2200 operating hours or 100 disengagements | Yearly |
|-----------------------------------|------------|---|--------|
| Visual inspection | X | X | X |
| Checking the tightening torques | X | X | X |
| Checking the shaft-hub connection | X | | |

Tbl-9: Maintenance schedule

7.2 Maintenance work

7.2.1 Visual inspection

- Check the coupling for external damage.

7.2.2 Checking the tightening torques

- Check the tightening torque of the clamping bolt. If you discover while checking the tightening torque that the clamping bolt can be turned further, tighten it with the prescribed tightening torque.
 - ① The prescribed tightening torques can be found in chapter 9.1 "Information for mounting the coupling".

7.2.3 Checking the shaft-hub connection



- Check the fit tolerance of the shaft-hub connection. The fit tolerance must be between 0.01 and 0.05 mm.

7.3 Disposal

Additional information on disassembly of the coupling can be found in chapter 5.2 "Mounting of the coupling" or contact our customer Service.

- Dispose of the coupling at the recycling sites intended for this purpose.
 - ① Observe the applicable national regulations concerning disposal.

8 Malfunctions

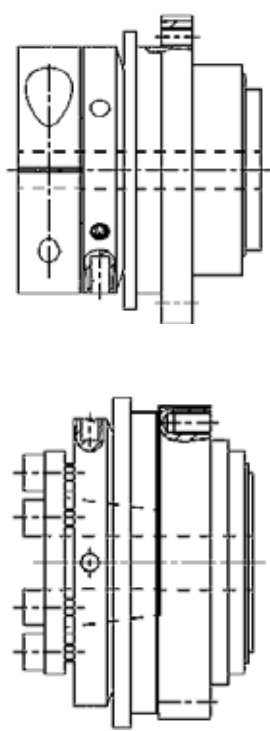
| | |
|--|---|
|  | NOTICE |
| <p>A changed operational behavior can be an indication for an existing damage of the coupling or cause a damage to the coupling.</p> <ul style="list-style-type: none"> Do not put the coupling back into operation until the cause of the malfunction has been rectified. | |
|  | <p>Rectifying of malfunctions may only be done by specially trained technicians.</p> |

| Fault | Possible cause | Solution |
|--------------------------------------|-------------------------|--|
| Operating noise | Input system overloaded | Carry out the motor mounting again. |
| Bellows breakage / elastomer failure | Lateral misalignment | Consult our Customer Service department. |
| | Angular misalignment | |
| | Torque overload | |

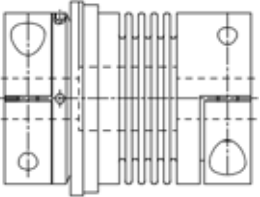
Tbl-10: Malfunctions

9 Appendix

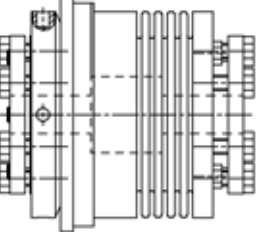
9.1 Information for mounting the coupling

| Product type: TL1 | | | |
|---|-------------|----------------------------------|---|
| | Size | Screw size / Property class 12.9 | Tightening torque [Nm] Standard screw ISO 4762 |
|  | 1.5 | M2.5 | 1 |
| | 2 | M3 | 2 |
| | 4.5 | M4 | 4 |
| | 10 | M4 | 4.5 |
| | 15 | 6 x M4 | 4 |
| | 30 | 6 x M5 | 6 |
| | 60 | 6 x M5 | 8 |
| | 150 | 6 x M6 | 12 |
| | 200 | 6 x M6 | 14 |
| | 300 | 6 x M8 | 18 |
| | 500 | 6 x M8 | 25 |
| | 800 | 6 x M10 | 40 |
| | 1500 | 6 x M12 | 70 |
| | 2500 | 6 x M16 | 120 |

Tbl-11: Information for mounting the coupling TL1

| Product type: TL2 | | | |
|---|-------------|---|---|
| | Size | Screw size / Property class 12.9 | Tightening torque [Nm] Standard screw ISO 4762 |
|  | 1.5 | M2.5 | 1 |
| | 2 | M3 | 2 |
| | 4.5 | M4 | 4 |
| | 10 | M4 | 4.5 |
| | 15 | M5 | 8 |
| | 30 | M6 | 15 |
| | 60 | M8 | 40 |
| | 80 | M10 | 50 |
| | 150 | M10 | 70 |
| | 200 | M12 | 120 |
| | 300 | M12 | 130 |
| | 500 | M16 | 200 |
| | 800 | 2 x M16 | 250 |
| 1500 | 2 x M20 | 470 | |

Tbl-12: Information for mounting the coupling TL2

| Product type: TL3 | | | |
|---|-------------|---|---|
| | Size | Screw size / Property class 10.9 | Tightening torque [Nm] Standard screw ISO 4017 |
|  | 15 | 6 x M4 | 4 |
| | 30 | 6 x M5 | 6 |
| | 60 | 6 x M5 | 8 |
| | 150 | 6 x M6 | 12 |
| | 200 | 6 x M6 | 14 |
| | 300 | 6 x M8 | 18 |
| | 500 | 6 x M8 | 25 |
| | 800 | 6 x M10 | 40 |
| | 1500 | 6 x M12 | 70 |
| | 2500 | 6 x M16 | 120 |

Tbl-13: Information for mounting the coupling TL3

Revision history

| Revision | Date | Comment | Chapter |
|----------|------------|------------------------|---------|
| 01 | 23.11.2009 | New version | All |
| 02 | 16.08.2018 | TL2 | All |
| 03 | 28.06.2022 | Layout, Technical data | All |



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