SAPIT flex®

GIUNTI DI TRASMISSIONE DI POTENZA

POWER TRANSMISSION COUPLINGS

OPERATING INSTRUCTION ATEX

ISO 9001

GIUNTI ELASTICI

ELASTIC COUPLINGS

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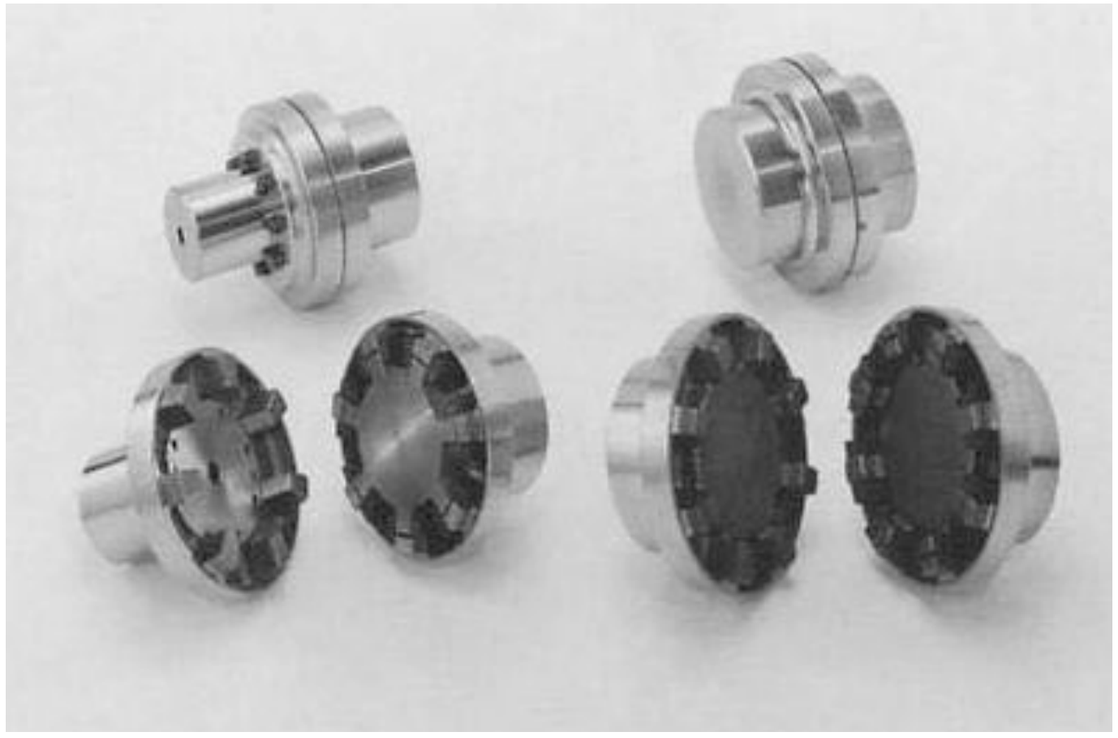
OPERATING INSTRUCTION
IUM-04-E
Elastic Couplings – Sapitflex
KNA – KLA – KTSA - KDA

Prescription Directives 2014/34/UE (ATEX) included ε X



Summary

1. GENERAL

These instructions are integral parts of the coupling supply.

Attention! **The personnel charged for assembling, operating, maintenance and eventual repairing of the coupling must be acquainted with these instructions and comply with all its points. In case of damages or wrong operation due to non-observance of the present instructions SAPITFLEX wil not undertake any responsibility.**

The elastic coupling has been designed for the use only within the stated technical data.
In case of working condition unforeseen by such technical data new contract conditions have to be undertaken.

2. TECHNICAL DESCRIPTION, TECHNICAL DATA

Features and advantages
The SAPITFLEX elastic coupling is composed by two integral gear rings (male and female). In the female half coupling are fitted the high resistance resilient rubber elements, wich work by compression.
The SAPITFLEX couplings have the torsional, angular, radial and axial elasticity. They may work in both rotation directions as well for reversible operationals and absorb the impacts generated by irregular and alternate loads.
The SAPITFLEX couplings grant the compensation of incidental little misalignements between the driving and driven machines consequently for instance to possible unproper assembling, to thermal expansion effects, to the main structure elasticity, to small foundations settling, etc.
The SAPITFLEX elastic couplings in the standard version are manufactured with high quality grey cast iron Q 250 UNI EN 1561. For coupling type KTSA the hubs part.2 are also available in steel C 45 EN10083/1. Upon specific request the couplings are also available in spheroidal graphite cast iron. The elastic rubber elements are made with a special oilproof compound prepared to support very high working loads, in the standard version withstand temperatures range from –20 to + 80°C and havean hardeness of 75-80 Shore.

Types
For satisfying the different requirements the SAPITFLEX couplings . have been designed in various versions.

- The series KNA and KLA in two pieces, with standard hubs and long hubs, for powers from 0,003 HP up to 1,153 HP at 1 RPM, is advisable for all application where it is possible the machine displacement for the change of the rubber elements.

- The series KTSA, in three pieces, allows the rubber elements change without connected machines moving and vertical assembling and disassembling of one machine without axially moving back the same.

- The series KDA with powers from 0,009 HP up to 0,498 Hp at 1 RPM, has been realised with one spacer that allows the disassembling of the centrifugal pump impeller without moving the electric motor.

SAPITFLEX produce on regular basis special couplings too with particular features on customer specific request.

Selection
The proper size selection of couplings depends by several factors. First of all the choice have to be done for a coupling suitable to transmit the maximum torque necessary to suit the nominal power (installed power) of the driving machine assuming that it will be higher than the driven machine power (absorbed power).
After having determined the power (HP or KW) to be transmitted as well as the related operating speed (RPM) and the suitable service factor, (Fs) for standard use or (Fsx) for operation in explosive environments, it is possible to select the coupling with the use of the formulas here below.
It is also necessary to check that the shaft diameters of the driving and driven machines are lower than the max allowed bores of the coupling (see Table A on the catalogue of Elastic Couplings)

Selection of coupling based on power:

$$\text{Power} = \frac{\text{HP or KW}}{\text{RPM}} \times \text{Fs or Fsx}$$

Selection of coupling based on torque:

$$\text{Torque (Nm)} = \frac{\text{HP x 7025 or KW x 9550}}{\text{RPM}} \times \text{Fs}$$

All couplings of our catalogue withstand a starting torque equal to 2 times the nominal torque.

Ex **In case of too high overload moments the coupling and/or the driven machine can break. In such a case the coupling became a fire source.**

Attention! **For the coupling right choice pay attention to the maximum permitted working speed. (See table B on the catalogue of elastic couplings)**

Attention! **The values of operation maximum misalignment are stated at the chapter: installation/alignement**

Service Factors
For every application is foreseen a service factor
Fs = Service factor
Fsx = Service factor for ATEX couplings
Fsp = Primary service factor (see table C)
Ft = Thermal factor (see table D)

Fs = Fsp x Ft
Fsx = Fsp x Ft x 1,5

TAB. C

Service Factors Fs			
	Electric motors Steam or gas turbines	Steam engines Water turbines	Diesel engines
Constant torque Centrifugal pumps Light conveyors Alternators Light fans	**1,0**	**1,5**	**3,0**
Slight torque fluctuation Machine tools Screw compressors Screw pumps Liquid ring compressors Rotary dryers	**1,5**	**2,0**	**3,0**
Substantial torque fluctuations Reciprocating pumps Low viscosity mixers Cranes Winches	**2,0**	**2,5**	**4,0**
Exceptionally high torque fluctuations Rotary presses Raciprocating compressors High viscosity mixers Marine propellers	**3,0**	**3,5**	**5,0**

According to the environment temperature range in the coupling proximity a value of thermal factor is applied.

Thermal factor Ft			
T temperature range in the coupling proximity	**from –20°C up to +40°C**	**from +40°C up to +60°C**	**from +60°C up to +80°C**
Ft	**1,0**	**1,4**	**1,8**

Attention! **For a right working, the couplings have to be chosen according to the data given on the above table with a service factor suitable for the application.**
In case of working condition modification (i.e. power, RPM, start-up frequency, modification to the driving and driven machines) it is necessary to verify the coupling choice.

3 - SAFETY ADVICE

The couplings are manufactured according to the up to date technical know-how and supplied for safe operation. Modifications non authorised by Sapitflex, that can compromise the working safety, are not permitted.
The couplings must be employed only within the limit condition of the technical supply specification and respecting the safety running rules.

Prescription for the Customer
The Customer must be sure that the personnel in charge of couplings installation, operation, maintenance and repairing , have get acquainted and understood the present operating instructions and that the same are observed in order to:
- avoid damages to the proper and of third parties safety and life
- grant a safe operation
- avoid failure due to non permitted use

The couplings alignment, operation, maintenance and repair are reserved to authorised skilled personnel specifically taught for the job.

All intervention on the couplings must be done at machine still.
The couplings assembling, being the same rotating, have to completed with suitable safety protection devices against involuntary contacts. Such devices must not compromise the coupling operation.
The driven machine must be immediately stopped if during the operation arise some coupling change or modification.

The couplings spare parts must be bought from **SAPITFLEX s.r.l.**.

This symbol state the safety rules to observe for the **explosion proof protection**

The coupling surface temperature increase is dissipated thanks to the ventilation due to the rotation of the same coupling. In the standard coupling manufacturing there are not outside protections that may reduce the heat dissipation; then be careful to install protection that do not compromise the natural coupling cooling capacity.

Before coupling start up its body must be connected to the general earth of the electric plant. This connection can be realised also through the mechanical connection to the motor and driven machine; in such a case must be verified.

Avoid consecutive start up unless a coupling temperature control system is foreseen.

In case the coupling is working immersed , also partially, into liquids (lubricating oil, etc.) it is necessary to make sure that the liquid temperature, increasing due to rotating friction with the coupling, do not reach the flammability point and the coupling surface temperature maintain lower than the of coupling class one.
Besides it is necessary to keep into consideration the risks of hot liquid going out.

Avoid coupling installation in places where there is possibility of contacts with corrosive fluid.

Working condition, Temperature classes

The couplings are suitable for the working conditions foreseen by the directive 2014/34/UE, concerning the non electrical apparatuses for operation in potentially explosive atmospheres.
According to the directive ATEX 2014/34/UE the couplings are classified as follows:

Group II - Category 2 GD

Apparatuses Group II of the category 2 and 3 for environments where are present gas explosive mixtures, steams, nebulizations, air and for environments where the dust can produce explosive atmospheres.

The couplings can be installed in potentially explosive atmosphere classified as zone 1, zone 2, zone 21, zone 22. The class of temperature is stated on the apparatus mark and corresponds to the maximum temperature of the coupling surface; classification according to UNI EN 13463-1 standards.

The temperature class is assigned according to the environment temperature in the coupling proximity.

Environment temperature	**from –20°C up to +40°C**	**from +40°C up to +60°C**	**from +60°C up to +80°C**
Temperature class	**T6 (max surface temperature +85°C)**	**T5 (max surface temperature +100°C)**	**T4 (max surface temperature +135°C)**

The end user must check the temperature in the coupling proximity and respect the stated temperature class. On contrary the safety consideration concerning the coupling use fall down.

Example of coupling mark for apparatus of the group II category 2 suitable for environments with gas G or dust D, temperature class T4/T5/T6:

CE εx II 2 GD T4/T5/T6 -20°C≤Ta≤+100°C+70°C+50°C

Attention! In case of coupling use not in conformity with the environment condition (class and temperature) , without previous SAPITFLEX agreement , we decline all responsibility or guaranty concerning the coupling use.

4. INSTALLATION

Balancing
Couplings are balanced on Customer request.
For couplings with finished bores it is carried out upon request the dinamic balancing grade G 6.3 ISO 1940, unless otherwise required. It is anyway necessary to determine if the balancing has to be realized with or without key way.
Due to the machining accuracy of Sapitflex couplings, for application at medium speed, the balancing it is not necessary except in case of very heavy couplings.
Usually the couplings.
up to 100 mm. overall diameter and 4500 RPM operating speed;
from 100 up to 200 mm. overall diameter and 3000 RPM operating speed;
from 200 up to 500 mm. overall diameter and 1500 RPM operating speed;
are supplied without balancing.

General instruction for coupling installation
Installation must be carried out by skilled personnel.

Before assembling starts, the shaft ends and the coupling parts, including the disc packs, have to be accurately cleaned. Before cleaning with solvents the nylon cylinders and ring have to be removed.

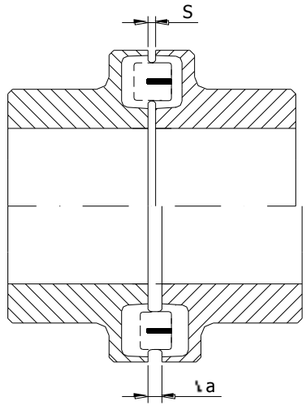
The hubs with bores foreseen for low interference fit have to be uniformly heated at max 120-130° C and quickly assembled on shafts. Do not heat locally in order to avoid stresses and permanent distortions.
The above stated temperatures are sufficient to cause a bore dilatation suitable to grant a right shrinking-on operation, because, with a ∆t of ab. 100°C we get a dilatation of 1‰ sufficient for a shrinking-on with a medium interference of 0, 5‰.
Before hubs heating the nylon cylinders and ring have to be removed. The nylon ring can be cut in order to allow their opening and then their easier assembling on hub.

When using painted couplings in areas with explosion risk, we must take in consideration the painting conductivity characteristics, furthermore the thickness limits of the painting layer that must be in accordance with the UNI EN 13463-1 point 7.4.4 standards.
In case of painting layer with thickness less than 0,2 mm the electrostatic charge would not take place. Eventual new painting can be done with use of non-static product only.

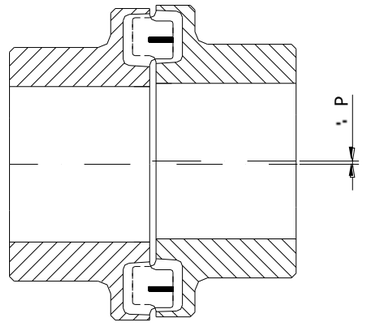
Alignment
The alignment procedure will vary according to the involved machinery. Then we are not proposing to give operation details, but to propose misalignment limits and suggest the ways for checking the same.
The couplings compensate the misalignment between the connected machines within the limits given in the following table.
In all cases a better initial alignment, less will be the possibility for contingencies misalignments due to structure movements. In these working condition it will help to preserve the elastic rubber elements.

Coupling type	Max. axial misalignment Δa (mm)		Max. parallel misalignment Δp (mm)			Max. angular misalignment Δα (mm)		
	exercise	assembly	exercise		assembly	exercise		assembly
	Std÷Ex		Std.	Ex		Std.	Ex	
KNA/KLA KDA 12011	**1 ÷ 3**	**1,5 ÷ 2,5**	**0,2**	**0,15**	**0,1**	**0,8**	**0,4**	**0,2**
KNA/KLA 12016						**0,8**	**0,4**	**0,2**
KNA/KLA KDA 12022						**0,8**	**0,4**	**0,2**
KNA/KLA/KTSA KDA 16027						**1**	**0,5**	**0,25**
KNA/KLA/KTSA KDA 16037						**1**	**0,5**	**0,25**
KNA/KLA/KTSA 16049						**1,2**	**0,6**	**0,3**
KNA/KLA/KTSA 16062						**1,4**	**0,7**	**0,35**
KNA/KLA/KTSA KDA 20078	**1,5 ÷ 4,5**	**2,5 ÷ 3,5**	**0,3**	**0,2**	**0,15**	**1,4**	**0,7**	**0,35**
KNA/KLA/KTSA KDA 20102						**1,6**	**0,8**	**0,4**
KNA/KLA/KTSA 20130						**1,8**	**0,9**	**0,45**
KNA/KLA KDA 25145	**2 ÷ 6**	**3 ÷ 5**	**0,4**	**0,3**	**0,2**	**1,8**	**0,9**	**0,45**
KNA/KLA/KTSA KDA 25199						**2**	**1**	**0,5**
KNA/KLA/KTSA KDA 25261						**2,2**	**1,1**	**0,55**
KNA/KLA/KTSA 25330						**2,4**	**1,2**	**0,6**
KNA/KLA/KTSA 35368	**3,5 ÷ 8,5**	**5 ÷ 7**	**0,5**	**0,35**	**0,25**	**2,2**	**1,1**	**0,55**
KNA/KLA/KTSA 35480						**2,4**	**1,2**	**0,6**
KNA/KLA/KTSA 35606						**2,8**	**1,4**	**0,7**
KTSA 55370	**5 ÷ 11**	**6 ÷ 9**	**0,5**	**0,35**		**3**	**1,5**	**0,75**
KTSA 55440						**3,6**	**1,8**	**0,9**
KTSA 55510			**0,6**	**0,45**	**0,3**	**4**	**2**	**1**
KTSA 55620						**4,8**	**2,4**	**1,2**
KTSA 55725			**0,7**	**0,5**	**0,35**	**5,6**	**2,8**	**1,4**
KTSA 55795						**6,4**	**3,2**	**1,6**

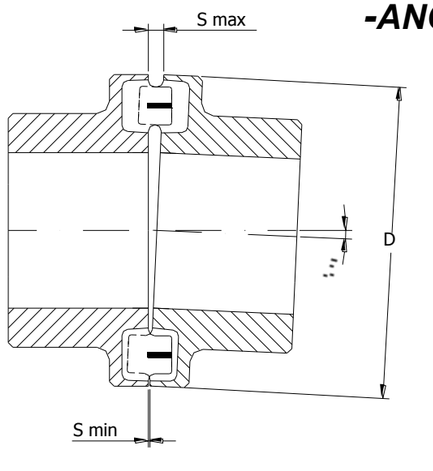
-AXIAL MISALIGNMENT-



-PARALLEL MISALIGNMENT-



-ANGULAR MISALIGNMENT-



$$\Delta\alpha(mm) = Smax - Smin$$

$$\Delta\alpha(rad) = \frac{Smax - Smin}{D}$$

Misalignments of the coupling parts can be caused by innacurate alignment during assembly, but also by actual operation of the plant (thermal expansion, shaft deflection, failure of foundations etc.).

Warning! The maximum displacements indicated by the situation considered (in the installation or operation) must not be exceeded under any circumstances

εx If couplings are used in potentially explosive atmospheres, consider the reduced displacement values shown in the table. Otherwise they are less considerations related to the use in the safety of the coupling

Tightening Torque

Table of tightening torques for coupling type KTSA

Coupling type	Mounting screws for Hub/Crown		Tightening Torque (Nm)
	N°	Type	
KTSA 16027	**8**	**M 6**	**10**
KTSA 16037	**8**	**M 6**	**10**
KTSA 16049	**12**	**M 6**	**10**
KTSA 16062	**12**	**M 6**	**10**
KTSA 20078	**12**	**M 8**	**25**
KTSA 20102	**12**	**M 8**	**25**
KTSA 20130	**12**	**M 8**	**25**
KTSA 25199	**16**	**M 8**	**25**
KTSA 25261	**16**	**M 8**	**25**
KTSA 25330	**16**	**M 8**	**25**
KTSA 35368	**12**	**M 8**	**50**
KTSA 35480	**16**	**M 10**	**50**
KTSA 35606	**16**	**M 10**	**50**
KTSA 55370	**16**	**M 14**	**135**
KTSA 55440	**16**	**M 16**	**205**
KTSA 55510	**16**	**M 20**	**400**
KTSA 55620	**12**	**M 24**	**690**
KTSA 55725	**12**	**M 27**	**1010**
KTSA 55795	**12**	**M 30**	**1370**

Table of Tightening torque for coupling type KDA

Coupling type	Mounting screws for Hub/Crown		Tightnening Torque (Nm)
	N°	Type	
KDA 12011	**5**	**M 6**	**10**
KDA 12022	**7**	**M 6**	**10**
KDA 16027	**6**	**M 8**	**25**
KDA 16037	**7**	**M 8**	**25**
KDA 20078	**7**	**M 10**	**50**
KDA 20102	**8**	**M 10**	**50**
KDA 25145	**6**	**M 12**	**85**
KDA 25199	**7**	**M 12**	**85**
KDA 25261	**8**	**M 12**	**85**

5. OPERATION

During coupling normal operation we do not have unusual vibration or noises; on contrary cases, we have to stop the group quickly in order to find the possible defect.
In case of sudden noise level change or vibrations, the cause should be wrong coupling alignment or start breaking of elastic rubber elements.

Attention! **In case of non proper coupling operation, coupling modification without the prior SAPITFLEX permission or in case of use of non original SAPITFLEX spare parts, we decline all responsibility or guaranty for any further coupling use.**

Attention! **During breakdown repair the coupling must be absolutely still.**
Be careful to protect the driving switch board in order to prevent not wanted start up and apply a notice sign of machine under repair.

εx **In case of transmission of the torsion moment by worn elastic rubber elements, the regular operation is no more granted according to the explosion proof standard stated by the directive 2014/34/UE.**

The working conditions hereunder stated can cause an improper coupling use. The directive 2014/34/UE suggest a particular attention by the manufacturer and end user side.

Attention! **An improper use of the coupling, can cause the coupling failure**.

Attention! **The coupling failure can cause a stop of the motion transmission and then of the complete plant.**

Wrong consideration for the coupling choice:

- Non suitable consideration is given to important information on the driving unit description and on surrounding environment or wrong information are taken.
- The torsion moment of the plant is too high.
- The RPM considered is wrong or too high.
- Wrong choice of the service factor
- Has not been taken into consideration that the environment is potentially aggressive (chemical or biological)
- The environment temperature is not admissible or anyway not compatible with the temperature class (for couplings at ATEX standards)
- Finished bores with diameters higher than the maximum admissible by the coupling or with inadmissible tolerances.

Wrong consideration for the coupling installation:

- During hot assembling of coupling the hubs are heated too much (over 100°C) and in a too small zone.
- The machines alignment is not according to the present operation instruction.
- The elastic rubber elements are assembled , during their substitution, in a wrong way or they are not of the right type.
- The eventual coupling protection is not suitable for operation according to the directive 2014/34/UE or for an explosion proof operation.

6 - MAINTENANCE

Attention! **All intervention on the coupling must be done only with machine still.**
Make the motor set sure against unforeseen start up.
It is advisable to put notice sign in the working area.

εx **Have to be foreseen a periodical dust cleaning.**
The end user must check the dust thickness and the inflammation temperature (if inflammable)

Maintenance timing, Wear limits

εx **The torsion clearance between the coupling parts must be checked after three month from installation and then every six months.**

If the torsional backlash do not compromise the use of coupling, the elastic elements can be working properly until the increasing-rate wear limit has been reached.
The values of increasing-rate wear are reported in the following tables.
The evaluation of torsional backlash must be carried out with coupling in still position without any torque, ruotate half coupling in clockwise direction and the other half coupling in counterclockwise direction until they stopped.
Score the external diameters with a reference line, see Figure 1a.
Reversing the rotation of the two coupling halves up to the stop and make the reading of the distance between the two references, see figure 1b.

Attention! **If the above maintenance prescription are not accomplished it is no more guarantee the regular operation according to the directive 2014/34/UE. Therefore it is forbidden the operation in explosive areas.**

Warning: **the replacement of elastic rubber elements without moving the machinaries is possible only for KTSA model.**

TABLE- WEAR LIMITS

Coupling Size	12011	12016	12022	16027	16037	16049	16062	20078	20102	20130
Wear Markings ΔUt (mm)	5	5	5	6	6	6	6	6,5	6,5	6,5

Coupling Size	25145	25199	25261	25330	35368	35480	35606
Wear Markings ΔUt (mm)	8	8	8	8	10,5	10,5	10,5

Coupling Size	55370	55440	55510	55620	55725	55795
Wear Markings ΔUt (mm)	13	13	13	13	13	13

Figure 1a

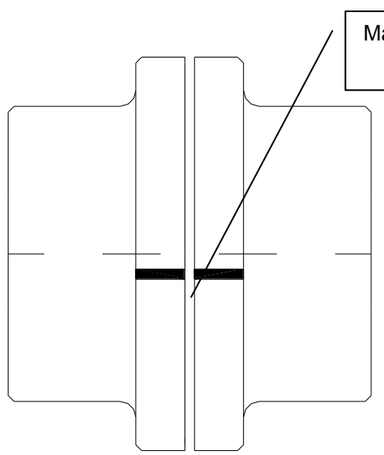
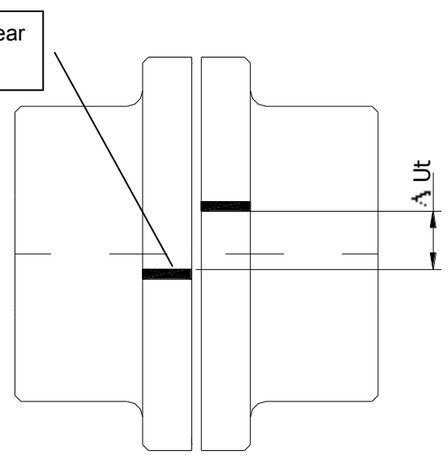


Figure 1b



In environments with explosion risks it is forbidden the use of couplings with worn Elastic rubber elements.

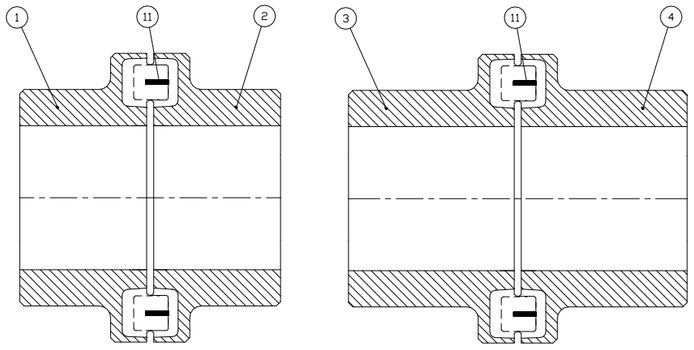
We grant only the original spare parts manufactured by SAPITFLEX.

The spare parts and accessory not original are not checked and approved by SAPITFLEX. For such a reason the installation and/or the operation of the product can worsen the stated coupling design characteristics, consequently compromising the active and/or passive safety. SAPITFLEX not assume any responsibility or guaranty for damages due to the use of spare parts or accessory not SAPITFLEX original.

Storage of the elastic rubber elements parts

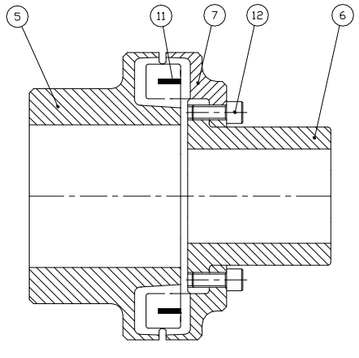
If stored properly, the elastic rubber elements maintain their characteristics for up to 3 years. Unfavorable storage conditions or improper use of the elements, may result in a negative change of physical characteristics. Such changes may include, for example: extreme temperatures (over 45°C), exposure to direct sunlight or artificial light, high humidity load (over 65%), effect of solvents, the massive presence of dust, sand or debris .

COUPLING TYPE KNA

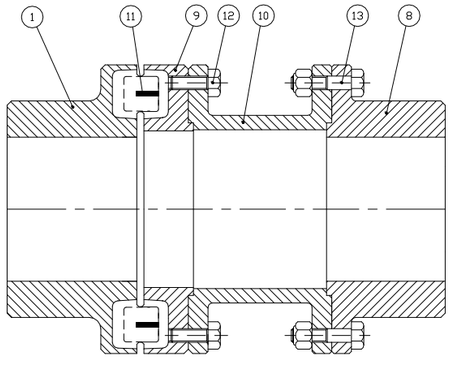


COUPLING TYPE KLA

COUPLING TYPE KTSA



COUPLING TYPE KDA



COMPONENTS ELASTIC COUPLING SAPIT FLEX (see figure previous page)	
N°	**Component**
01	**FEMALE HALF COUPLING part. 1 type KNA and KDA**
02	**MASCHIO HALF COUPLING part. 2 type KNA**
03	**FEMMALE HALF COUPLING part. 1 type KLA**
04	**MALE HALF COUPLING part. 2 type KLA**
05	**FEMALE HALF COUPLING part. 1 type KTSA**
06	**HUB part. 2 type KTSA**
07	**CROWN part.2 type KTSA**
08	**HUB part. 2 type KDA**
09	**CROWN part. 2 type KDA**
10	**SPACER part. 2 type KDA**
11	**ELASTIC RUBBER ELEMENTS**
12	**BOLT + WASHER**
13	**BOLT + NUT**

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