



SAPIT

flex®

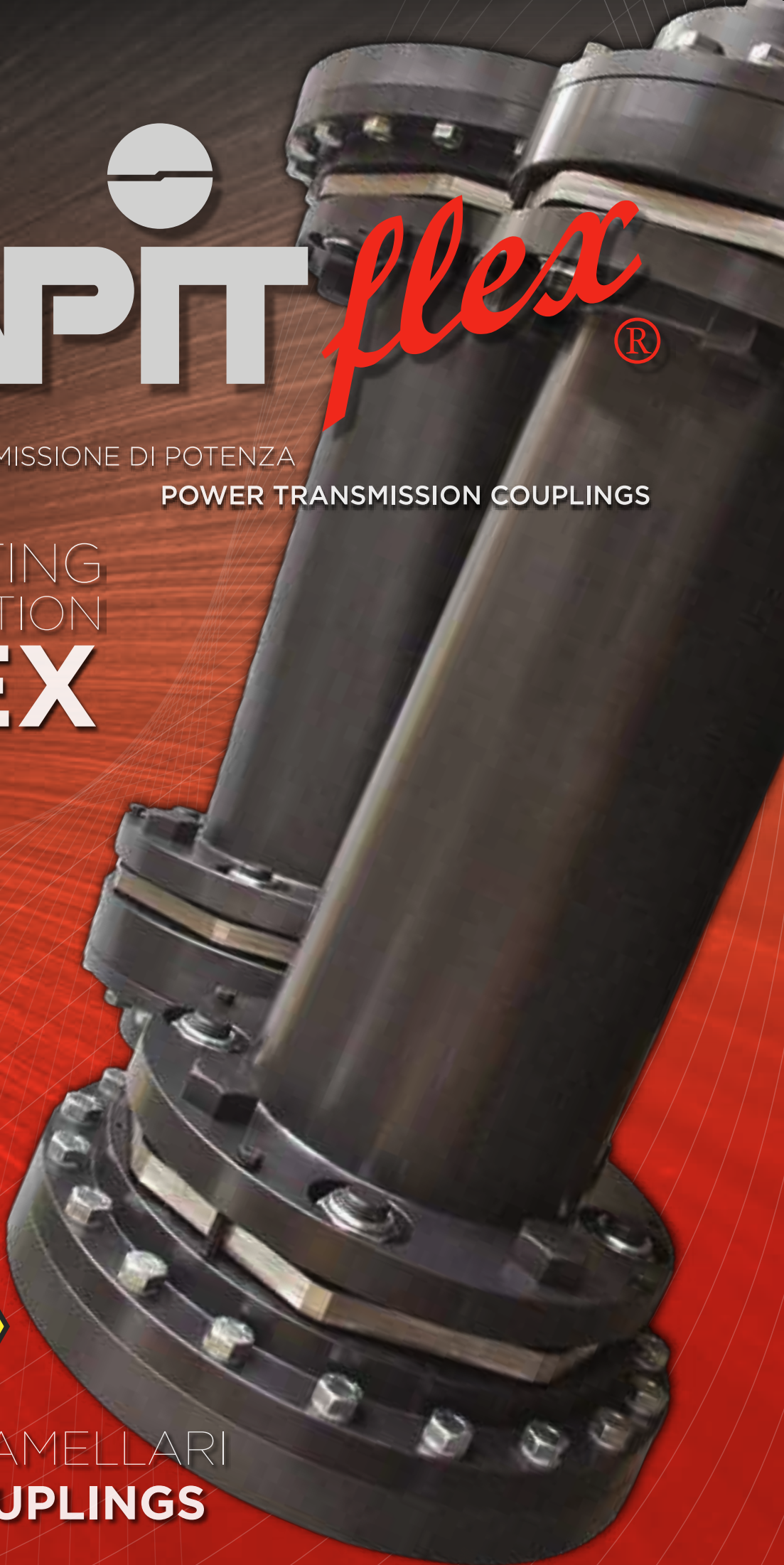
GIUNTI DI TRASMISSIONE DI POTENZA

POWER TRANSMISSION COUPLINGS

OPERATING
INSTRUCTION
ATEX



GIUNTI LAMELLARI
DISC COUPLINGS





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**OPERATING INSTRUCTIONS
 IUM-04-L-HN**



Disc Couplings - Sapit Flex

HN-HNS 4/6/8

Prescription Directives 2014/34/UE (ATEX) included



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1 - GENERAL INFORMATION

These instructions are integral parts of the coupling supply.

Attention! The personnel charged with assembling, maintenance and possible coupling repairing must have read and understood these instructions and follow all its points. In case of damages or wrong operation due to non-observance of the present instructions SAPITFLEX will not undertake any responsibility.

The flexible disc 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 AND TECHNICAL DATA

Features and advantages

The SAPITFLEX disc coupling is a continuous ring laminated diaphragm type in stainless steel. At high resistance the torque is stiffly transmitted through alternated driving and driven bolts on common original diameter.

The basic features of SAPITFLEX disc couplings are:

- No lubrication,
- High rotation speeds,
- Low weight with high torque capacity,
- High construction strength,
- Allow axial, parallel and angular misalignment,
- Work in both rotation directions,
- No torsional clearance and high torsional stiffness,
- Possibility to replace the element blades without displacement of coupled machines.

The SAPITFLEX disc couplings in the standard version are manufactured with stainless steel membranes, bolts and bushes in high resistant steel and the other parts in carbon steel. The couplings can work at a temperature range from -30°C to +250°C with metallic locknut and from -30°C to + 100°C with locknut with nylon insert.

The disc couplings can be manufactured upon specific request:

- Completely in stainless or with a specific surface treatment to face specific corrosion problems;
- In special steel to work at very low operational temperatures;
- With titanium or aluminium alloys hubs and spacers to reduce the weight and the inertia;
- With spacer in composite to reduce the weight and thus to get couplings with very high length without intermediate bearings;
- In accordance with 2014/34/UE (ATEX) specification.

Types

To satisfy the different requirements of torque, speed, misalignment and axial thrust different versions of standard couplings have been designed and many versions for special applications.

Furthermore SAPITFLEX disc couplings have been designed in different types to meet the different needs of special applications.

- The series HNS-4-6-8, HNS-4-6-V and HNS-4-W with two disc packs, with powers from 0,014kW up to 15.92kW at 1 RPM, composed by two hubs, two disc packs and one centre spacer, allow angular, axial and parallel misalignments.

On the "Disc Coupling" catalogue the maximum allowed values are stated.

The axial and parallel misalignments are a consequence of the angular misalignment and then are inversely proportional, i.e. when the first increases, the second diminishes. Axial misalignment generates axial thrusts, the values of such thrusts are available by SAPITFLEX technical office.



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- The series HN-4-6-8 with single disc pack, with powers from 0,014 kW up to 15.92 kW 1 RPM, composed by two hubs and one disc pack, allow an angular and axial misalignment but not the parallel one. For this reason their use is linked to a perfect alignment of the connected machines. These couplings are usually employed together with an intermediate shaft in order to get a double joint.
- The series HNS-6-V-CF, with powers from 0,078 Kw up to 0,701 kW 1RPM equipped with spacer in composite material, has been designed and realised for cooling towers. It allows the central spacer weight reduction of about 70% , thus an easier assembling, and it allows to reach shaft lengths up to 6 meters without an intermediate support.
- The series HNS-6-AH-ALH AND HNS-8-AH with powers from 0,033 kW up to 15.92 kW at 1 RPM, equipped with adapters and increased hub diameters, allow to support higher shafts with the same. Furthermore, their particular configuration allows the balancing of the assembled central group (adapters, disc packs and spacer) giving a high repeatability degree of the residual imbalance which is kept during the assembling because this group will no longer be disassembled.
- The series HNS-8-RH , with powers from 0,126 kW up to 15.92 kW at 1 RPM, with overturned hubs and spacer divided in two parts, has been designed to realise couplings perfectly interchangeable, in functionality and dimensions, with the standard steel gear couplings commonly on the market, with however the advantages of the disc couplings. These couplings can replace the gear coupling even on existing plants without modifying the position of the connected machines.

SAPITFLEX regularly manufactures special couplings too for particular applications upon customer specific request.

Selection

The proper size selection of the couplings depends on several factors. First of all the choices 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 is higher than the driven machine power (absorbed Power). After having determined the power in HP or kW to be transmitted as well as the related operating speed (RPM) and the suitable service factor (Fs) for standard applications or environments with explosive atmosphere, it is possible to select the coupling with the use of the formulas here below.

Selection of coupling based on power:

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

Selection of coupling based on torque:

$$\text{Torque (Nm)} = \frac{\text{HP} \times 7025 \text{ or } \text{kW} \times 9550}{\text{RPM}} \times F_s$$

After that it is necessary to check that all shafts diameters of all the connected machines are less than the higher hole allowed by the coupling (see table A on the "Disc Coupling" catalogue).

All couplings in the catalogue withstand a starting torque equal to 1,5 times the nominal torque and a short circuit torque of 3 times the nominal torque.



In case of too high overloaded moments the coupling can break and/or the connected machine can destroy. In such a case the coupling could become a fire source.

Attention! For the coupling right choice pay attention to the maximum allowed working speed too. (See table B on the disc couplings catalogue).

Attention! The values of maximum misalignment while operating are stated on the disc coupling catalogue.

Service Factors

For each application a service factor is foreseen

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 Alternative 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

Attention! For a continuous right lasting working, the coupling has 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 connected machines) it is necessary to check again the coupling choice.

3 - SAFETY ADVICE

The coupling has been manufactured according to the updated technical know-how and supplied for safe operation. Non-authorized modifications by SAPITFLEX can compromise the working safety and consequently are not allowed.

The coupling must be employed only within the limit conditions of the technical supply specification respecting the safety running rules.

Prescription for Customer

The Customer must be sure that the personnel in charge of couplings installation, operation, maintenance and repairing, have read and understood the present operating instructions and that the same are observed in all its points in order to:

- avoid damages to the proper and of third parties safety and life
- grant safe working conditions
- avoid failure due to the use not allowed

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 in non-working conditions . The coupling assembling, as rotating part, has to completed with suitable safety protection devices against involuntary contacts. Such devices must not compromise the coupling working. The driven machine must be immediately stopped if during the operation arise some coupling change or modification.

The couplings spare parts must be bought by SAPITFLEX.



This symbol states the safety rules to be observed for the explosion proof protection



The coupling surface temperature increase is dissipated in the atmosphere thanks to the ventilation created by the rotation of the coupling itself. In the standard coupling manufacturing there are not present outside protections which may prevent from the heat dissipation; then be careful to install protection which do not compromise the natural coupling cooling capacity.



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



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



In case the coupling is working immersed, even partially, into liquids (lubricating oil, etc.) it is necessary to make sure that the liquid temperature, increasing due to rotating friction with the coupling, does not reach the flammability point of the liquid itself and that the involved coupling surface temperature is kept lower than the one of the belonging coupling class. Furthermore it is necessary to keep into consideration the risks of hot liquid leak.



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

Working condition, Temperature classes

The couplings are suitable to work in conditions foreseen by the directive 2014/34/UE, concerning the non electrical equipments for operation in potentially explosive atmospheres.

According to the directive ATEX 2014/34/UE the couplings are classified as follows:

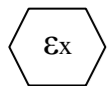
Group II - Category 2 GD

Equipments Group II of the category 2 and 3 for environments where are present gas explosive mixtures, steams, spray systems, 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 equipment label certification and it 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 +50°C	from +50°C up to +70°C	from +70°C up to +100°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 the contrary the safety consideration concerning the coupling use fall down.

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



II 2 GD T4/T5/T6 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.



If painted couplings are used in fields at risk of explosion, it must comply both with the requirements of the coating conductivity and with the limitation on the thickness of the paint layer applied in accordance with UNI EN 13463-1 point 7.4.4
 Where pain coatings have a thickness less than 0.2 mm no electrostatic charge should be present. Any repainting can only be made using anti-static products.

4 - ASSEMBLING

Balancing

Couplings are balanced upon Customer request.

For couplings with finished bores or with soldered spacer it is carried out upon request the dynamic 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. The balancing is done with a shaft passing through the coupling and blocked in the bores of the hubs or with separate components. In order to obtain a high repeatability grade it is advisable the use of the range with adaptor (AH).

Usually during balancing of couplings for medium and high speeds, some references (e.g. alphabetic letters) are printed on flanges to be respected when assembling. Furthermore to make easier the balancing precision on site we foresee some tapped hole on flanges in order to have the possibility to add balancing weights.

The accurate working of the SAPITFLEX coupling is such that for medium speed applications the balancing is not necessary unless heavy joints are exceptionally involved.

The maximum operating speed of the SAPITFLEX coupling without balancing are shown in Table B of the general catalogue for each couplings series.

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.

Hubs have to be assembled on machine shafts so that the hub flange faces are aligned with shaft ends, unless different instruction. The length of spacer complete with disc packs, and possible adapters, will be then equal to the distance between the axes heads.

The hubs with bores foreseen for low interference must 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 enough to cause a bore dilatation suitable to grant a right shrinking-on operation because with a Δt of ab.100°C we get a dilatation of 1‰. enough for a shrinking-on with a medium interference of 0.5‰.

The couplings with adapters are assembled to hubs with calibrated centerings; to assemble and disassemble the central part it is necessary to press it just enough in order to exceed in length the step. This operation can be done with the aid of the holes for the compression screws located between the spacer flanges and the adapters.

Attention! Remove the compression screws before start up.

All SAPITFLEX couplings have as peculiarity, with the exception of the RH series, the possibility of replacing the flexible and any central spacers without removing the coupled machines.

ASSEMBLY PROCEDURES DISC PACKS

Installation and dismantling diagrams for disc packs.

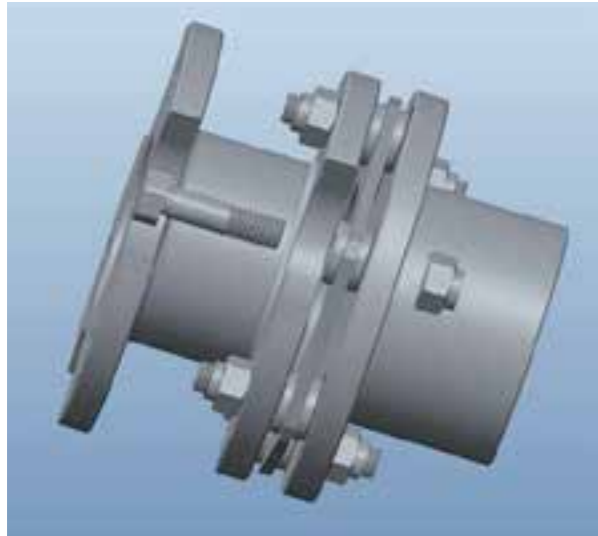


Diagram for couplings series HN – HNS

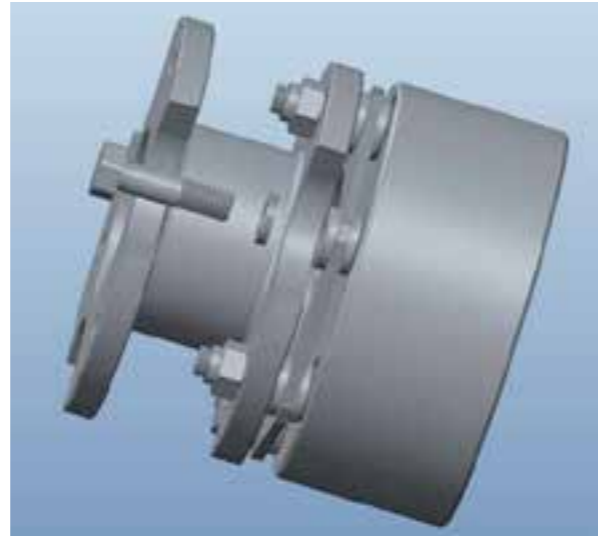


Diagram for couplings series HNS-V-W

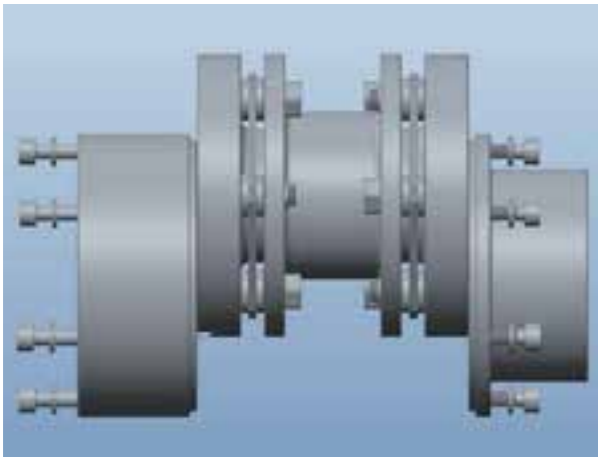


Diagram for couplings series HNS-AH-ALH



Diagram for couplings series HNS-RH

Alignment

SAPITFLEX disc couplings tolerate misalignments which vary with the number of disc pack bolts, as indicated in the Tab B of the general catalogue for each couplings series.

4 bolts coupling:

angular misalignment of 1° - parallel misalignment of 0,017 mm per mm (max working value)

6 bolts coupling:

angular misalignment of 0°45' - parallel misalignment of 0,012 mm per mm (max working value)

8 bolts coupling:

angular misalignment of 0°30' - parallel misalignment of 0,0085 mm per mm (max working value)

The angular/parallel misalignment allowed in working conditions will vary according to the axial deflection and vice versa; consequently these maximum working values are not valid in the initial alignment step, in which the alignment must be as much precise as possible in order to make the variations during operation acceptable.

The alignment procedure will vary according to the involved machinery. Then we are not proposing to give operation details regarding the alignment method, but rather to propose misalignment limits and suggest the ways to check them.

Axial Alignment

Generally, lower is the number of coupling disc pack bolts, higher is the allowed tolerance during initial alignment. We advice to respect the following limits, unless different specific instruction are given.

The distance between hub flanges (DBSE) must be:

For 4 bolts coupling $\Delta a = \pm 1$ mm
For 6 bolts coupling $\Delta a = \pm 0,8$ mm
For 8 bolts coupling $\Delta a = \pm 0,5$ mm

Parallel and Angular Alignment

We have three ways to check the parallel and angular alignments.

The most used is the classic one with the dial gauge, supported by the more innovative one with laser system. The third more practical way consists in checking the gap between flanges, on both disc packs, on 360°; that is possible if all coupling components are assembled.

This last method it is commonly used also to verify periodically the coupling parallel and angular alignment, without removing the transmission components.

Calculation of the maximum allowable misalignments:

For 4 bolts coupling: $\Delta\alpha = 1^{\circ}00'$ [max working value] - during assembling $0^{\circ}15'$ - **K=0.004**;
For 6 bolts coupling: $\Delta\alpha = 0^{\circ}45'$ [max working value] - during assembling $0^{\circ}11'$ - **K=0.003**;
For 8 bolts coupling: $\Delta\alpha = 0^{\circ}30'$ [max working value] - during assembling $0^{\circ}7.5'$ - **K=0.002**.

So the alignment values to be respected during assembling to comparator or laser control system are the following ones:

Parallel alignment: Δp [mm] $\leq K \times L_a$ (central distance disc packs);
Angular alignment: $\Delta\alpha$ [mm] $\leq K \times D$ (coupling external diameter).

While the alignment values with opening control flanges are the following ones:

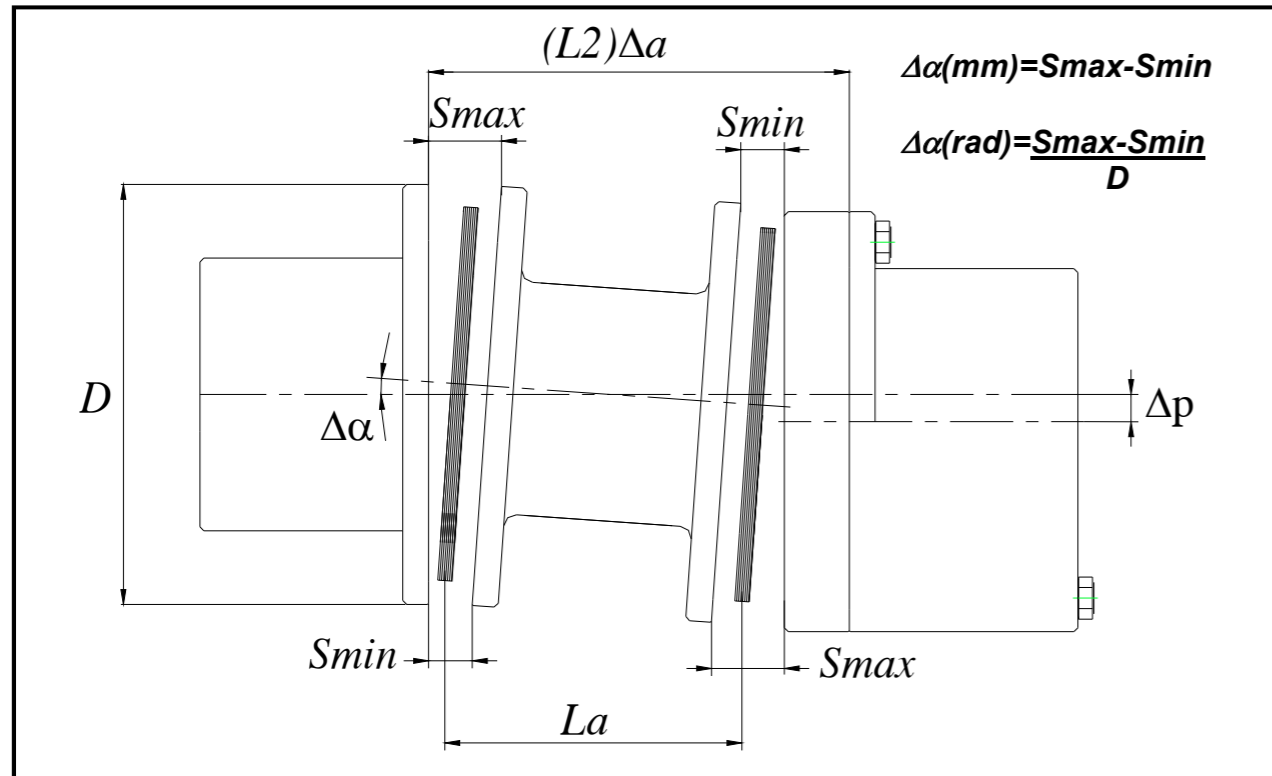
Opening control flanges at 12 and at 6 (parallel and angular vertical alignment check):

$$S_{max} - S_{min} \leq \Delta p_a;$$

Opening control flanges at 9 and at 3 (parallel and angular vertical alignment check):

$$S_{max} - S_{min} \leq \Delta p_a;$$

Parallel/angular alignment Δp_a [mm] $\leq K \times D$ (outside coupling diameter).



Attention! The stated values are for general use and can vary in specific cases, for instance for couplings working at high dilatations or speeds. For any further question please contact the SAPITLEX technical office.

Attention! In any case, better is the initial alignment, higher is the tolerance at unforeseen misalignments due to structure movements.

Attention! After having properly aligned the coupling, make sure that all the bolts or fixing screws are tightened. If possible check the tightening after some hours of operation too.

Attention! Displacement of coupling parts among them can arise due to a wrong alignment during installation but also due to the following operation: thermal dilatation, shaft inflection, foundation settling, etc.

Tightening torques with a contact surface lubricated with grease MoS₂ (molybdenum disulfide).

Tightening torques disc packs

Tightening torques (Nm)	Coupling type
10	HN-HNS 63/4 - 75/4 - 85/6
27	HN-HNS 88/4 - 98/4 - 105/6 - 125/6 - 120/8
53	HN-HNS 122/4 - 140/6 - 150/8
95	HN-HNS 137/4 - 162/4 - 160/6 - 185/8
230	HN-HNS 192/4 - 215/4 - 185/6 - 205/6 - 215/8
470	HN-HNS 245/8
630	HN-HNS 275/8
800	HN-HNS 305/8
1150	HN-HNS 345/8
1600	HN-HNS 375/8
2200	HN-HNS 410/8
2700	HN-HNS 445/8
3450	HN-HNS 475/8
4350	HN-HNS 520/8
14	HNS 105/6 – 125/6 steel screws and nuts AISI 316
26	HNS 140/6 steel screws and nuts AISI 316
48	HNS 160/6 steel screws and nuts AISI 316
115	HNS 185/6 – 205/6 steel screws and nuts AISI 316
35	HN-HNS 345/8 - 375/8 supernut screws and nuts
68	HN-HNS 410-8 - 445-8 supernut screws and nuts
122	HN-HNS 475-8 - 520-8 supernut screws and nuts

Coupling type HNS-6-AH-ALH	85/6	105/6	125/6	140/6	160/6	185/6	205/6
Tightening torques adaptors screws (Nm)	13	13	13	30	60	110	110

Coupling type HNS-8-AH	215/8	245/8	275/8	305/8	345/8	375/8	410/8	445/8	475/8	520/8
Tightening torques adaptors screws (Nm)	60	110	110	110	170	260	370	520	700	700

Coupling type HBSX-8-RH	120/8	150/8	185/8	215/8	245/8	275/8	305/8	345/8
Tightening torques spacers nuts (Nm)	10	27	27	27	53	53	95	95
Coupling type HBSX-8-RH	375/8	410/8	445/8	475/8	520/8			
Tightening torques spacers nuts (Nm)	230	230	470	470	470			

Attention! For special custom design or made in stainless steel couplings the tightening torques will be stated on the specific drawing or assembly instructions.



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5. OPERATION

During coupling normal operation unusual vibration or noises have not to be present; on contrary cases, we have to stop the group quickly in order to find the possible anomaly.

In case of sudden noise level change or vibrations, there could be failures in coupling alignment or start breaking of disc pack or unloosed bolts/nuts.

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 unwanted start up. Apply a notice sign of machine under repair.

 In case of transmission of the torsion moment by worn flexible discs 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 suggests a particular attention both by the manufacturer and end user side.

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

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 noticed.
- The torsion moment of the plant is too high.
- The RPM considered is wrong or too high.
- Wrong choice of the service factor
- It has not been taken into consideration that the environment is potentially aggressive (chemically or biologically).
- The environment temperature is not admissible or in any case 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 130°C) and locally.
- The machines alignment is not in accordance with the existing operation instructions
- The disc packs are positioned, after a replacement, in a wrong way or they are not of the right type.
- The possible coupling protection is not suitable for operation according to the directives 2014/34/UE or for an explosion proof operation



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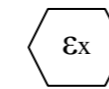
6 - MAINTENANCE

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 signs (plaques) in the working area.



It has to be foreseen a periodical dust cleaning from the areas which can be considered deposit places. The end user must check the dust thickness and the inflammation temperature (if inflammable).

Maintenance timing, Wear limits



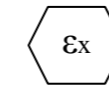
The torsion clearance between the coupling parts must be checked after three months from installation and then every six months.



The disc pack condition (wear and possible discs breakage) and the bolts/nuts tightening must be checked after three month from installation and then every six months.

Attention! If the above maintenance prescription are not accomplished it is no more granted the regular operation according to the directives 2014/34/UE. Therefore it is forbidden the operation in explosion areas.

Attention! All SAPITFLEX couplings, except the series RH, have as peculiarity the possibility to replace the flexible elements and possible spacer without moving the connected machines. Assembling and disassembling drawings of disc packs, for all the coupling series are shown at page 10.



In environments at explosion risks it is forbidden the use of couplings with worn disc packs or packs with broken discs.

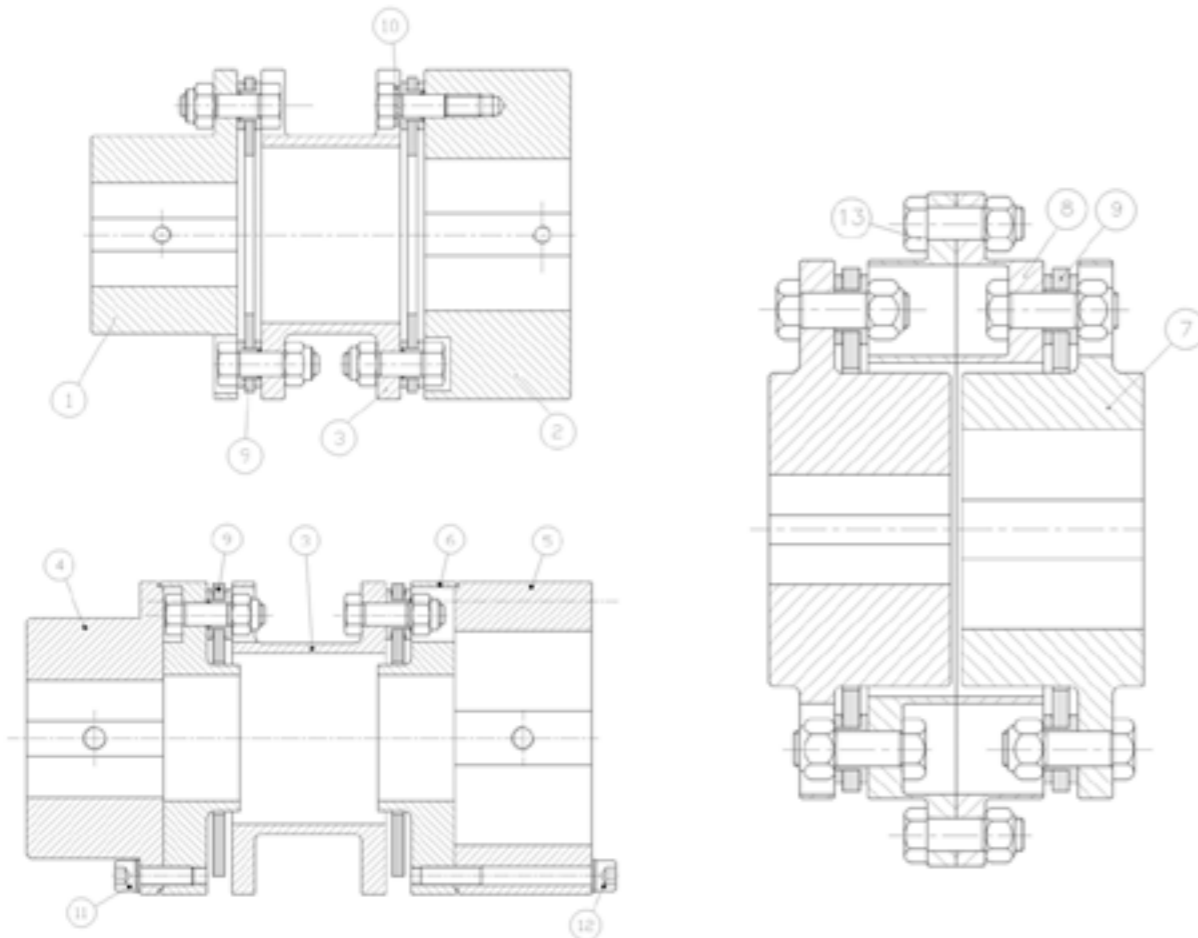
We grant only the original spare parts supplied by SAPITFLEX.

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



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COMPONENTS OF SAPIT FLEX DISC COUPLINGS (see diagrams)	
N°	COMPONENTE
01	HUB
02	OVERSIZED HUB
03	SPACER
04	HUB for ADAPTER (for couplings series AH)
05	OVERSIZED HUB for ADAPTER (for couplings series ALH)
06	ADAPTER
07	REVERSE HUB (for couplings series RH)
08	HALF SPACER (for couplings series RH)
09	DISK PACK COMPLETE OF BOLTS/NUTS
10	NORD LOCK® DISC
11	SCREW + NORD LOCK® HUB for ADAPTER (for couplings series AH)
12	SCREW + NORD LOCK® OVERSIZED HUB for ADAPTOR (for couplings series ALH)
13	SCREW + HALF SPACERS NUT (for couplings series RH)





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